FOR CONTRACT NO.: 05-330774

INFORMATION HANDOUT

WATER QUALITY

RWQCB 401 Certifications Cert # 34007WQ04

PERMITS AND AGGREMENTS

California Dept of Fish and Game Notification No. 1600-2011-0206-R4
US Army Corps of Engineers Permit and Modification of Permit
US Department of the Interior Fish and Wildlife Service (Biological Opinion Document # P43727 (1-8-03-F-59), dated December 12, 2005)
California Department of Fish and Game Incidental Take Permit (ITP No. 2081-2007-020-04)

MATERIALS INFORMATION

Portions of Asbestos and Lead Containing Paint Survey Report
Non Mandatory Disposal Site
Select Material Testing
Shimmin Creek Bridge Removal Information
Geotechnical Design Report, dated August 31, 2010
Foundation Report-Retaining Wall 1, dated September 13, 2010
Foundation Report-Retaining Wall 2, dated September 16, 2010
Foundation Report-Retaining Wall 3, dated September 20, 2010
Foundation Report-Retaining Wall 4, dated September 22, 2010
Foundation Report - McMillan Canyon Creek Bridge (New) (Bridge No. 49-0253) dated December 30, 2010
Final Hydraulic Report - McMillan Canyon Creek Bridge, dated January 21, 2011

ROUTE: 46-SLO-40.7/46.3(PM)

FOR CONTRACT NO.: 05-330774

WATER QUALITY

RWQCB 401 Certifications Cert # 34007WQ04

ROUTE: 46-SLO-40.7/46.3(PM)

California Regional Water Quality Control Board
Central Coast Region

895 Aerovista Place, Suite 101, San Luis Obispo, California 93401-7906
(805) 549-3147 • FAX (805) 543-0397
http://www.waterboards.ca.gov/centralcoast

Matthew Rodriquez
Secretary for Environmental Protection

Edmund G. Brown Jr.
Governor

February 15, 2012

Larry Bonner **VIA ELECTRONIC MAIL**
Senior Environmental Planner
California Department of Transportation, District 5
50 Higuera Street
San Luis Obispo, CA 93401
Email: larry_bonner@dot.ca.gov

Dear Mr. Bonner:

FOURTH AMENDED WATER QUALITY CERTIFICATION NUMBER 34007WQ04 FOR ROUTE 46 CORRIDOR IMPROVEMENT PROJECT- WHITLEY PHASE 2A, SAN LUIS OBISPO COUNTY

Thank you for the opportunity to review your December 9, 2011 amended water quality certification application for Whitley Phase 2A of the Route 46 Corridor Improvement Project. The California Department of Transportation (Caltrans) has requested a change to the Route 46 Corridor Improvement Project Water Quality Certification No. 34007WQQ4 (Certification), which previously was amended on December 1, 2009, February 25, 2011, and October 28, 2011. In response to this request, we are adding Whitley Phase 2A Attachments 1, 2, and 3 to the Certification. These changes allow Caltrans to commence with project activities associated with the construction of Whitley Phase 2A.

All other aspects of the project are to remain as originally proposed, including conditions identified in previous Attachments to the Certification. This amendment should not result in additional impacts to water quality, provided that Caltrans implements the required best management practices and mitigation and complies with all conditions as described in the Certification, amendments, and related application documents. This letter serves as authorization for the revised project; a new Certification is not required.

If you have any questions or would like to meet to discuss these comments, please contact **Julia Dyer** at (805) 542-4624 or at jdyer@waterboards.ca.gov, or Phil Hammer at (805) 549-3882. Please mention the Certification number in all future correspondence pertaining to this project.

Sincerely,

for
Roger W. Briggs
Executive Officer

Attachments:

1. Whitley Phase 2A Attachment 1 - Fourth Amended Action for Clean Water Act Section 401 Water Quality Certification 34007WQ04
2. Whitley Phase 2A Attachment 2 - Route 46 Corridor Improvement Project Construction Activities Description
3. Whitley Phase 2A Attachment 3 - Location Maps

CC: (electronic)

Marissa Nishikawa, California Department of Transportation
marissa_nishikawa@dot.ca.gov

Jennifer Moonjian, California Department of Transportation
jennifer_moonjian@dot.ca.gov

Cameron Johnson, U.S. Army Corps of Engineers
cameron.l.johnson@usace.army.mil

Laura Peterson-Diaz, California Department of Fish and Game
LPDIAZ@dfg.ca.gov

401 Program Manager
State Water Resources Control Board
Stateboard401@waterboards.ca.gov

R9-WTR8-Mailbox@epa.gov

S:\Shared\Section 401 Certification\Certifications\San Luis Obispo\2009\34007WQ04-Route46\Certifications\12-09-11_Phase2A_Whitley\401Cert_FourthAmendedHwy46_final.docx

Fourth Amended Action for Clean Water Act Section 401
Water Quality Certification 34007WQ04
For Discharge of Dredged and/or Fill Materials

Whitely Phase 2A Attachment 1

Whitley Phase 2A - Route 46 Corridor Improvement Project
Project Information and Conditions

Applicant	California Department of Transportation (Caltrans)
Applicant Representative	Jennifer Moonjian Associate Biologist (805) 542-4763 jennifer_moonjian@dot.ca.gov Caltrans District 5 50 Higuera Street San Luis Obispo, CA 93401
Project Name	Whitley Phase 2A – Route 46 Corridor Improvements
Water Board Application Number	34007WQ04
Type of Project	Road widening, bridge construction, interchange construction
Project Location	Unincorporated areas of north-eastern San Luis Obispo County 120.4/120.6° W; 35.6° N
County	San Luis Obispo
Receiving Water(s)	Shimmins Canyon Creek, McMillan Canyon Creek, and three unnamed drainages 317.00 Hydrologic Unit; 309.81 Hydrologic Subarea
Water Body Types	Shallow, sandy ephemeral creeks
Designated Beneficial Uses	Municipal and Domestic Supply Agricultural Supply Industrial Ground Water Recharge Water Contact Recreation Non-Contact Recreation Wildlife Habitat

	Warm Fresh Water Habitat Commercial and Sport Fishing
Project Description (purpose/goal)	The purpose of the project is to improve safety and provide congestion relief on State Route 46 between post miles 36.6 and 41.2. The purpose of the entire corridor project is to improve safety and provide congestion relief on State Route 46. This is to be accomplished by creating an additional travel lane in each direction (east and west), separating the east and west-bound lands by a median, improving inside and outside paved shoulder widths, and by producing left-turn channelization at all public road intersections within the project limits. Due to the size and cost of the project, construction is being done in phases, as funding becomes available. Phase 1 began construction in January 2008 and is now completed. Phase 2 of the project continues to convert the conventional two-lane highway to a four-lane, divided expressway. Whitley Phase 2A is expected to begin in October 2012 and be complete by March 2015. The total length of Whitley Phase 2A is 5.6 miles.
Preliminary Water Quality Concerns	Central Coast Regional Water Quality Control Board (Water Board) staff finds the project has the potential to cause the loss of functions and values of waters of the State as a result of project impacts. Water Board staff also finds the project has the potential to discharge pollutants from earth-moving equipment, especially since work may occur when water is present at Shimmins Creek – Location #2. Primary sources of pollutants are: leaking oil, gasoline, hydraulic fluid, concrete, and other liquid contaminants associated with earth-moving equipment. In addition, Water Board staff finds the project has the potential to cause sedimentation and siltation in the waterways. Erosion may be caused by a) construction activities, b) altering the channel form of the waterway such that downstream or upstream portions of the waterway experience modified hydrology, leading to erosion, or c) installation of culverts that are not large enough to pass storm water flow and its associated debris, causing water to back up and erode the sides of the bank.

Water Board Requirements	Caltrans must notify Water Board staff if mitigations as described in the 401 Water Quality Certification, application or amendments for this project are altered by the imposition of subsequent permit conditions by any local, state, or federal regulatory authority. Caltrans shall notify Water Board staff of any modifications that interfere with compliance with this certification. Conditions required to comply with 401 Water Quality Certification are as follows: **General Conditions** • Caltrans shall conduct work as described in Whitley Phase 2A Attachment 2– Route 46 Corridor Improvement Project Construction Activities Description. • Caltrans may not conduct work in jurisdictional drainages when there is standing or flowing water, except at Shimmins Canyon – Location #2. Prior to work in standing or flowing water at Shimmins Canyon – Location #2, Caltrans must obtain Water Board staff approval for the dewatering and/or diversion plan and implement the plan. • All rock slope protection (RSP) installed by Caltrans must be un-grouted. • At no time, even during low flow events, may equipment, oil, grease, fuel, wet concrete, etc. come in contact with standing or flowing water in water bodies. • Caltrans must notify Water Board staff within 24 hours of encountering any unexpected issues impacting water quality or beneficial uses of waters. • Caltrans shall abide by Minimization Measures of the Route 46 Corridor Improvement Project FEIR/Environmental Assessment with Finding of No Significant Impact (May 2006) and all CEQA Mitigation measures as described in the original Certification. • A biologist must survey the U.S. Army Corps of Engineers jurisdictional Waters of the U.S. two weeks before the onset of project activities. • A biologist must conduct onsite monitoring during construction in all areas, and if California red-legged frogs, tadpoles, or eggs are found, Caltrans must stop work in that location until the appropriate level of consultation with the U.S. Fish and Wildlife Service (USFWS) has been completed or the frog leaves on its own accord. Similar

	protective measures must be initiated with California Department of Fish and Game if Spadefoot toads or Southwestern pond turtles are found during construction. • Construction at all locations, except Location #2 – Shimmins Canyon (see conditions below), must take place during dry conditions. At all locations, during active construction, Caltrans must keep erosion control measures onsite and immediately available for installation. If the National Weather Service predicts a 25% or more chance of rain within 24 hours, all construction activities in waters must cease and the site manager must install effective erosion and sediment control measures. Disturbed soils and active and inactive stockpiles must be protected from erosion and sedimentation with soil stabilization measures. Construction activities in waters may resume after the rain event has passed and site conditions are dry enough to continue work without additional risk of discharging to waters. • In order to complete work at Location #2 - Shimmins Canyon in a timely manner and meet seasonal restrictions for nearby nesting birds, Caltrans is requesting the ability to work during wet conditions. Work at Location #2 – Shimmins Canyon may occur during the wet conditions with implementation of a Water Board staff approved dewatering/diversion plan. • Any dewatering and/or diversion work will require consultation with Water Board staff and development of specific plans, for Water Board staff review and approval, at least four-weeks prior to the start of the activity. The dewatering/diversion plan must include a contingency plan to protect the dewatering/diversion in anticipation that the National Weather Service predicts significant rain events (e.g., > 5-yr 6-hr events). Dewatering activities must not contribute excessive sediment to the channel and must be monitored for pH and sediment at least daily after stabilization of flows. **Temporary Best Management Practices (BMPs) during Construction** • Caltrans and its Contractors must use an effective combination of temporary erosion and sedimentation control BMPs (e.g., erosion control fabrics, silt fences, fiber rolls or wattles, hydraulically applied mulches and native

seed mixes) around construction areas to control and eliminate erosion and sedimentation.

- Erosion and sedimentation control BMPs shall be applied to all disturbed earth surfaces.
- Stockpiles must be protected from erosion and sedimentation with soil stabilization measures. These measures must include plastic sheeting, jute mesh, geosynthetic material, or other effective BMPs. All stockpiles must be surrounded with a linear sediment barrier to prevent erosion and sedimentation in runoff. Stockpiles must also be protected from wind erosion to protect the beneficial uses of waters of the state.
- Gravel bags shall be filled with clean gravel. Sand bags may be employed for stabilizing stockpile coverings. Gravel bags must be used in all applications to control water movement.

Spill Containment and Control

- All construction vehicles and equipment used onsite must be well maintained and checked daily for fuel and hydraulic fluid leaks or other problems that could result in spills of toxic materials.
- Caltrans and its contractors must have oil absorbent pads onsite in case a spill occurs.
- Caltrans must conduct all vehicle fueling and storage activities, for mobile equipment, at least 100 feet away from waterways, and in designated staging areas in a location where these fluids will not flow into waterways.

<table>
<tr><td>Area of Disturbance (Acres)</td><td>

	Permanent		Temporary		**Total**
	Federal Waters	Non-Federal Waters	Federal Waters	Non-Federal Waters	
Location 1	0.064		0.002		**0.066**
Location 2	0.285		0.447		**0.732**
Location 3	0.026		0.044		**0.070**
Location 4	0.051		0.424		**0.472**
Location 5		0.046		0.002	**0.048**
Total	**0.472**		**0.919**		**1.391**

All impacts are within streambed/riparian areas.</td></tr>
<tr><td>Fill Volume (cubic feet)</td><td>

	Permanent	
	Federal Waters	Non-Federal Waters
Location 1	1399	
Location 2	8694	
Location 3	1117	
Location 4	3091	
Location 5		2482
Total	16783	

All permanent and temporary fill volumes listed above are for fill below the Ordinary High Water Mark.</td></tr>
<tr><td>U.S. Army Corps of Engineers Permit No.</td><td>Individual Permit File No. 2457305</td></tr>
<tr><td>Department of Fish and Game Streambed Alteration Agreement</td><td>No. 2009-0149-R4</td></tr>
<tr><td>Possible Listed Species</td><td>California red-legged frog (Rana draytonii)
Spadefoot toad (Spea hammondii)
western pond turtle (Actinemys marmorata)</td></tr>
<tr><td>Status of CEQA Compliance</td><td>FEIR/Environmental Assessment with Finding of No Significant Impact. May 2006. SCH No. 2000011033. Lead Agency: Caltrans/US. Dept. of Transportation Federal Highway Administration</td></tr>
</table>

Water Board Compensatory Mitigation Requirements	Caltrans shall mitigate permanent impacts to streambed and riparian areas at a 2:1 ratio through the restoration and/or enhancement of 0.944 acres of streambed and/or riparian areas. Caltrans shall mitigate temporary impacts to streambed and riparian areas at a 1:1 ratio through the restoration of 0.919 acres of streambed and riparian areas. Caltrans shall select a Mitigation Project and develop and submit a Mitigation Plan for Water Board staff approval. Caltrans must comply with the following required conditions when selecting a Mitigation Project and developing the Mitigation Plan: • Detailed Mitigation Design. • Success Criteria and Performance Standards. • Implementation Plan. • Maintenance Measures. • Monitoring Plan. • Long-term Management Plan. • Adaptive Management Measures. • Onsite mitigation shall be the first priority. • The habitat replacement ratio for temporary riparian, streambed, and wetland impacts shall be at least 1:1. • Wetlands that are permanently affected by the activities of the project shall be mitigated at a ratio of 3:1 by creation of new wetlands, or 6:1 by restoration of degraded wetlands. • Streambed that is permanently affected by extended culverts, riprap, or concrete bridgeworks shall be mitigated at a ratio of 2:1 by restoration of stream banks or enhancement of riparian vegetation.
Amendment Application Fee	$6,387
Amended Project Fee	N/A
Total Amended Certification Fee	N/A
Additional Conditions	The Water Board requires visual monitoring and annual reports for this project: • Visually inspect the site (at least one reach upstream and downstream of project) after completion of the project and for two subsequent rainy seasons to ensure that the new structures are not causing excessive erosion or other water quality problems. If the project does cause erosion or other water quality problems, contact the Water Board staff member

	overseeing the project. You will be responsible for obtaining any additional permits necessary for implementing plans for restoration to prevent further water quality problems. • First Report: Within 30 days of completion of each phase, submit a project completion report that contains a summary of daily activities, monitoring observations, and problems incurred and actions taken; include properly identified post-project photos. • Subsequent Annual Monitoring Reports: Caltrans shall monitor and maintain all mitigation sites for five years and submit annual reports by December 31 of each monitoring year. Annual reports must quantify growth and progress of restoration and determine to what extent performance criteria have been met. All areas of the revegetation site shall be assessed for percent cover, general health and stature, and signs of reproduction. The reports shall also include photographs of revegetation progress over time.

Whitley Phase 2A Attachment 2 - Route 46 Corridor Improvement Project
Construction Activities Description

General Description

Whitley Phase 2A is the third phase of the overall Route 46 Corridor Improvement Project and will continue to convert the conventional two-lane highway to a four-lane, divided expressway. The total length of Whitley Phase 2A is 5.6 miles. Whitley Phase 2A begins just east of Whitley Gardens Road and extends just past McMillan Canyon Creek. The roadway in this section crosses five drainages: Shimmins Canyon, McMillan Canyon Creek, one unnamed non-federal jurisdictional drainage, and two unnamed jurisdictional drainages. All locations are ephemeral drainages; no wetlands are affected by this phase of the project.

Caltrans will replace and extend culverts at Shimmins Canyon and the three unnamed drainages and will build a bridge to replace a culvert at McMillan Canyon Creek. Finally, AT&T will conduct trenching at McMillian Canyon for an underground line relocation project. No work will occur in jurisdictional drainages when there is standing or flowing water except at Location #2 – Shimmins Canyon. As specified in the Water Board Compensatory Mitigation Requirements section of Whitely Phase 2A Attachment 1, Caltrans must implement a Water Board staff approved dewatering/diversion plan at Location #2 when water is present. Any dewatering/diversion work will require consultation with Water Board staff and development of specific plans, for Water Board staff review and approval, at least four-weeks prior to the start of the activity.

Location #1 - Other Water (16/17) @ STA 631+50 to STA 637+00

An existing forty-eight inch reinforced concrete pipe (RCP), approximately one hundred and six (106) feet long combines and conveys two unnamed drainages under Highway 46 at Location 1, running perpendicular to the existing highway. Caltrans will ultimately abandon the existing pipe and associated headwall, but will extend the culvert temporarily during construction to accommodate current flows. Caltrans will install a new four hundred and fifty-eight (458) foot long forty-eight inch diameter alternative pipe culvert (APC) that will run diagonally underneath the highway. In addition, Caltrans will add a new two hundred and forty-five (245) foot long thirty-six inch diameter RCP immediately to the west to allow additional water to flow from north to south underneath the highway. Although the forty-eight inch diameter culvert will be replaced in-kind, the additional culvert at this location will compensate for additional run-off. Caltrans will place rock slope protection (RSP) at the inlet and outlet of both of these culverts to dissipate energy and reduce erosion. This activity will place both of the drainages in this location in their original alignment.

Location #2 – Shimmins Canyon

An existing twelve foot by ten foot reinforced concrete box that is approximately one hundred and twenty (120) feet long conveys Shimmins Canyon Creek at Location 2. Caltrans will remove the existing box and associated headwall and replace it with two adjoining boxes side-by-side to accommodate the highway widening. The new culvert will be a double ten foot by ten foot reinforced concrete box that will be approximately three hundred and eighty-six (386) feet long with new head and wingwalls. By replacing one box culvert with two, the capacity of the drainage will be increased by a width of eight feet, which will reduce potential velocities and therefore erosion at the downstream end. Due to the occurrence of a nesting pair of threatened Swainson's Hawks, the wildlife agencies are prohibiting work at this location from March 1 through September 1. Therefore, Caltrans is requesting for the ability to work at this location when water is present.

Location #3 – Other water (19) @ STA 743+60

Caltrans will remove the existing twelve foot by twelve foot one hundred and twenty-one (121) foot long reinforced box and associated headwall and replace it with a new two hundred and forty-six (246) foot long twelve foot by fourteen foot concrete box with new head and wingwalls to accommodate the highway widening. The new culvert will provide two feet additional clearance and Caltrans will place RSP at the inlet and outlet to reduce headcutting and erosion.

Location #4 - McMillan Canyon

An existing twelve foot wide reinforced concrete box that is approximately sixty-two feet long conveys McMillan Canyon Creek. Caltrans will remove the existing box and associated headwall and construct a new bridge to accommodate the highway widening. The new bridge will be approximately one hundred and twenty (120) feet long. Caltrans chose a bridge to replace the existing culvert because of the large amount of sediment frequently deposited along the channel. The bridge will reduce sediment build-up in this area and will also open up the crossing to wildlife that prefer greater vertical clearance to cross under a structure.

<u>AT&T Trenching</u>

AT&T will be relocating their underground cable across McMillan Canyon north of the bridge. In order to install the cable, AT&T will excavate a three foot deep trench using mechanized trenching equipment. AT&T will stockpile the spoils from this trenching activity immediately adjacent to the trench. AT&T will then use the native soil to back fill the trench. Once the project is complete, no permanent structure will be visible from above ground. AT&T will commence work after April 1 and conclude prior to November 1. Once AT&T commences with work at this location, activities will be complete within forty-eight hours.

Unnamed Drainage (Non-Federal Jurisdiction) – Location #5

Caltrans will remove three existing one hundred and three (103) foot long twenty-four inch diameter reinforced concrete pipe culverts that run under the roadway. Caltrans will replace the three existing culverts with two box culverts that are two hundred and one (104) feet long and forty-eight inch by thirty-two inches in diameter. Caltrans will tie the inlets of the new culverts into an existing bioswale that runs parallel with the highway. Caltrans will install wingwalls and RSP at the inlet and outlet of both culverts.

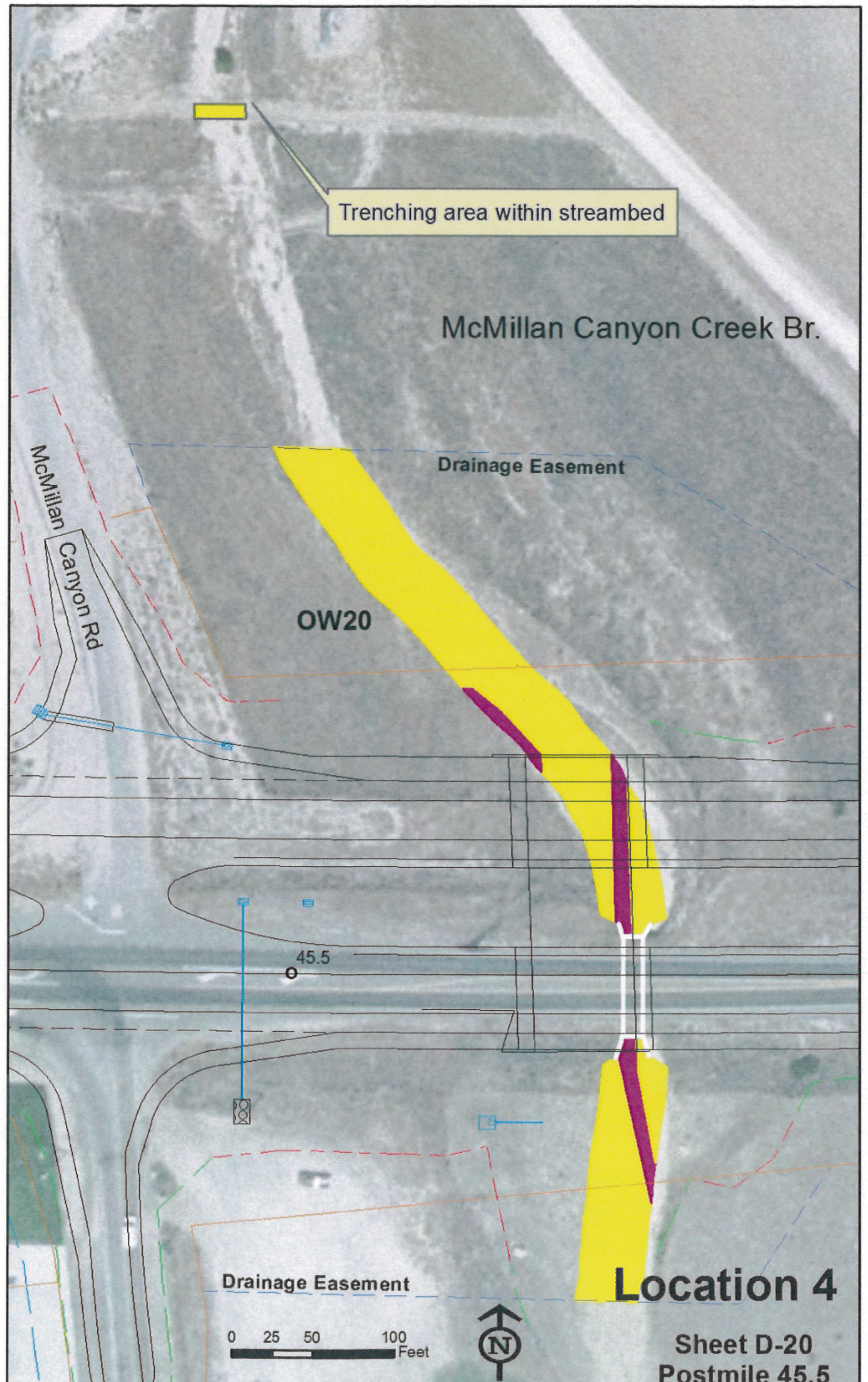
Whitley Phase 2A Location Map

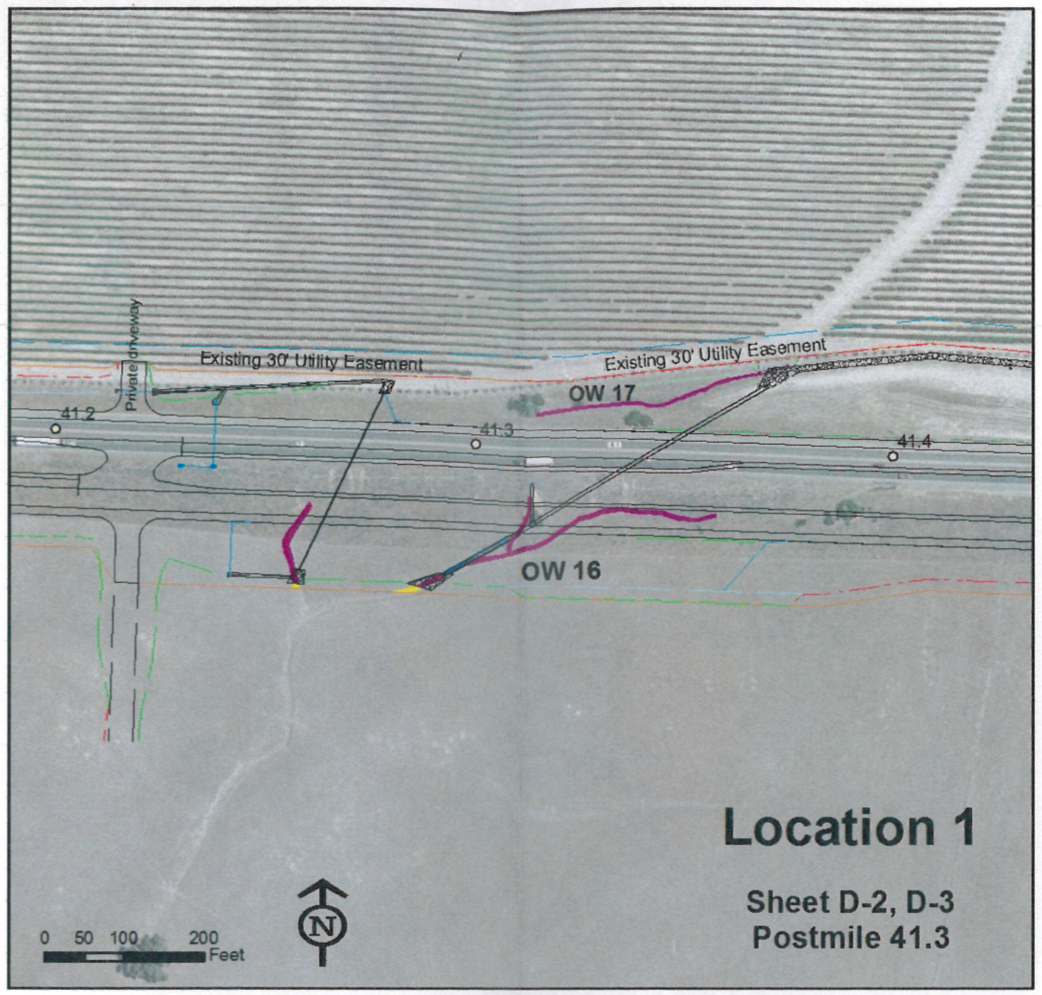
Attachment 3

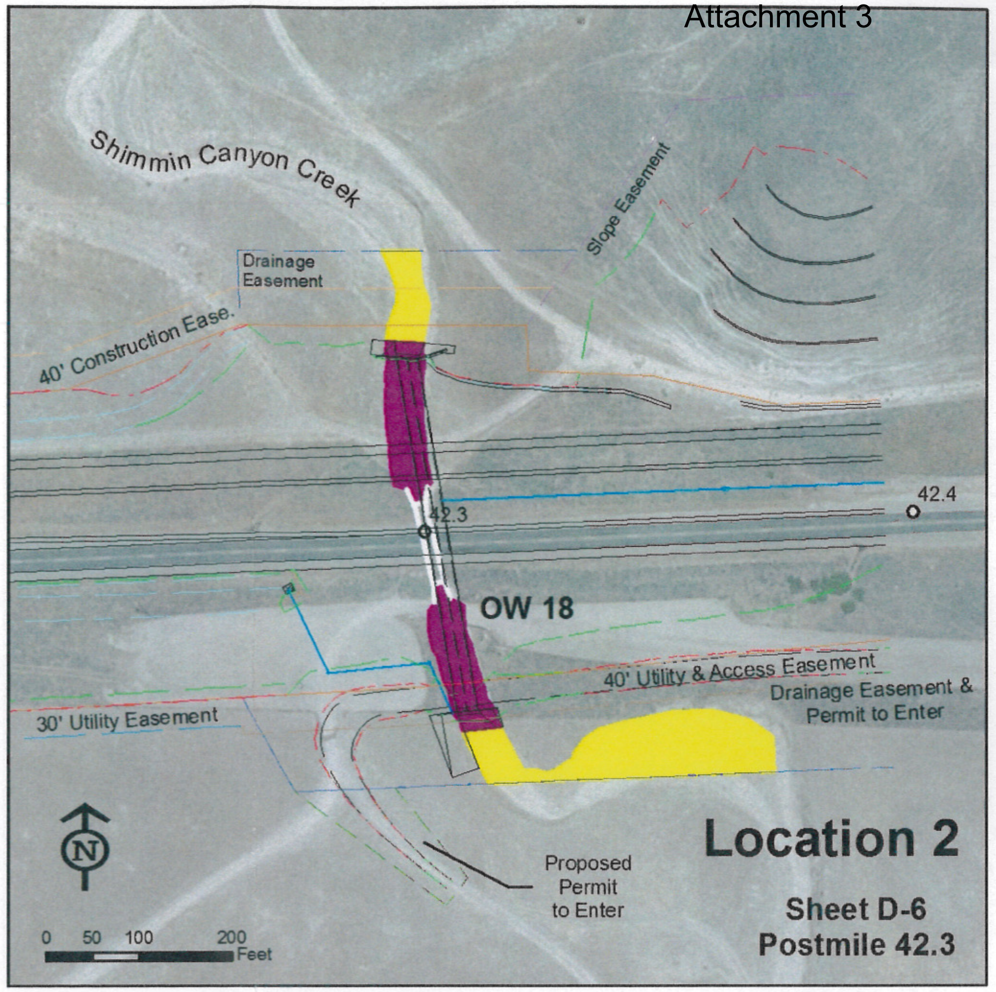
SLO-46-Whitley 2A

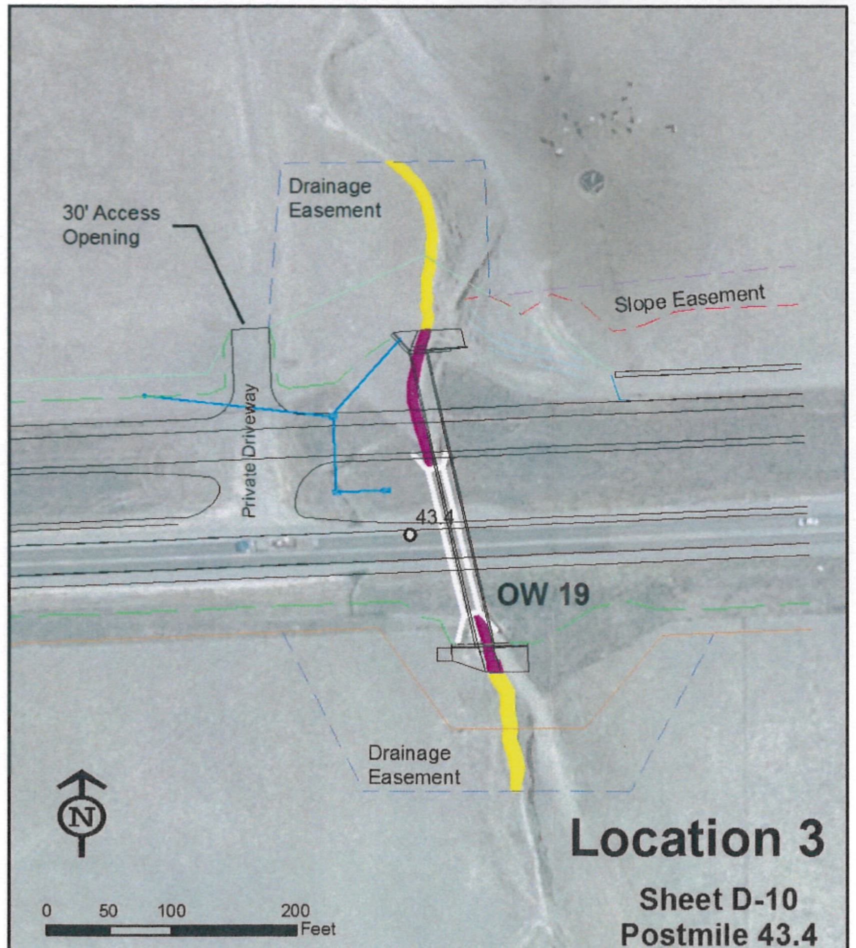
Potential Impacts to Other Waters

- permanent
- temporary
- Existing Culvert/Wingwall



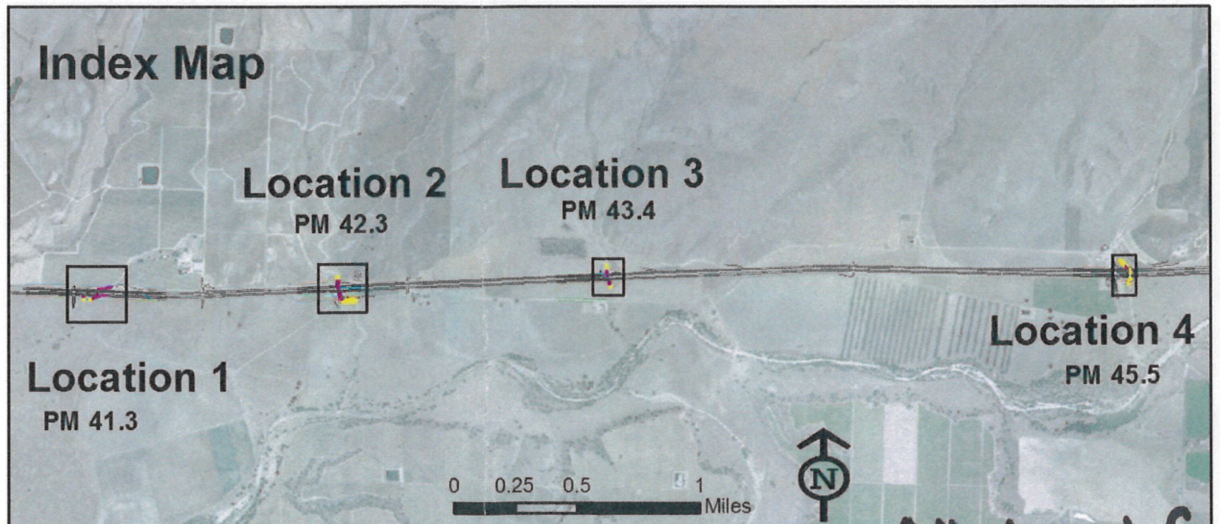






Whitley 2A Impacts							
Location #	OW	OHWM	Permanent Other Waters	Temporary Other Waters	Volume of Fill below OHWM	Permanent Linear Extent	Temporary Linear Extent
			ft2 (acres)	ft2 (acres)	cubic feet	ft	ft
1	16/17	0.5	2798 (0.064)	104 (0.002)	1399	911	32
2	18	0.7	12420 (0.285)	19469 (0.447)	8694	335	435
3	19	1.0	1117 (0.026)	1912 (0.044)	1117	164	249
4	20	1.4	2208 (0.051)	18355 (0.421)	3091	256	530
Total:			18543 (0.426)	39840 (0.915)	14301	1666	1246

Prepared Dec. 9, 2011



FOR CONTRACT NO.: 05-330774

PERMITS AND AGGREMENTS

California Dept of Fish and Game Notification No. 1600-2011-0206-R4

ROUTE: 46-SLO-40.7/46.3(PM)

State of California – The Natural Resources Agency
DEPARTMENT OF FISH AND GAME
Central Region
1234 East Shaw Avenue
Fresno, California 93710
(559) 243-4005
http://www.dfg.ca.gov

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

February 9, 2012

Larry Bonner
California Department of Transportation
50 Higuera Street
San Luis Obispo, California 93401

Subject: Final Lake or Streambed Alteration Agreement
Notification No. 1600-2011-0206-R4
Shimmon Canyon Creek, McMillan Canyon Creek and
2 unnamed drainages - San Luis Obispo County
SR 46 Corridor Improvement Project – Phase 3 (Whitley 2A)
05-SLO-46 PM 40.7-46.3, EA 05-33023

Dear Mr. Bonner:

Enclosed is the final Streambed Alteration Agreement (Agreement) for the SR 46 Corridor Improvement Project – Phase 3 (Whitley 2A) (Project). Before the Department of Fish and Game (Department) may issue an Agreement, it must comply with the California Environmental Quality Act (CEQA). In this case, the Department, acting as a Responsible Agency, filed a Notice of Determination (NOD) on the same date it signed the Agreement. The NOD was based on information contained in the final Environmental Impact Report the Lead Agency prepared for the Project.

Under CEQA, filing an NOD starts a 30-day period within which a party may challenge the filing agency's approval of the Project. You may begin your Project before the 30-day period expires if you have obtained all necessary local, State, and Federal permits or other authorizations. However, if you elect to do so, it will be at your own risk.

If you have any questions regarding this matter, please contact Laura Peterson-Diaz, Environmental Scientist, at (559) 243-4014, extension 225, or lpdiaz@dfg.ca.gov.

Sincerely,

Jeffrey R. Single, Ph.D.
Regional Manager

Enclosures

Conserving California's Wildlife Since 1870

CALIFORNIA DEPARTMENT OF FISH AND GAME
REGION 4 - CENTRAL REGION
1234 East Shaw Avenue
Fresno, California 93710

STREAMBED ALTERATION AGREEMENT
NOTIFICATION NO. 1600-2011-0206-R4
Shimmon Canyon Creek, McMillan Canyon Creek and
2 unnamed drainages - San Luis Obispo County

CALIFORNIA DEPARTMENT OF TRANSPORTATION
CALTRANS DISTRICT 5
Larry Bonner
50 Higuera Street
San Luis Obispo, California 93401

SR 46 CORRIDOR IMPROVEMENT PROJECT – PHASE 3 (WHITLEY 2A)
05-SLO-46 PM 40.7-46.3, EA 05-330771

This Streambed Alteration Agreement (Agreement) is entered into between the California Department of Fish and Game (DFG) and California Department of Transportation Caltrans District 5 (Permittee) as represented by Larry Bonner acting on behalf of Permittee.

RECITALS

WHEREAS, pursuant to Fish and Game Code (FGC) section 1602, Permittee notified DFG on September 6, 2011, that Permittee intends to complete the Project described herein.

WHEREAS, pursuant to FGC section 1603, DFG has determined that the Project could substantially adversely affect existing fish or wildlife resources and has included measures in the Agreement necessary to protect those resources.

WHEREAS, Permittee has reviewed the Agreement and accepts its terms and conditions, including the measures to protect fish and wildlife resources.

NOW THEREFORE, Permittee agrees to complete the Project in accordance with the Agreement.

PROJECT LOCATION

The Corridor Improvement Project (Project) is located on State Route (SR) 46 from Post Mile (PM) 40.7 to PM 46.3 west of Shandon where it crosses Shimmon Canyon Creek, McMillan Canyon Creek and two unnamed drainages in San Luis Obispo County in Township 26 South, Range 14 East, Sections 13, 15, 16, 17 and 20, United States Geological Survey (USGS) map Shandon, Mount Diablo meridian (See Figure 1).

PROJECT DESCRIPTION

The Project is limited to:

- Permittee is in the process of converting SR 46 PM 32.2 to 56.3 from a conventional two-lane highway to a four-lane divided expressway. The Project is being done in phases and the portion covered by this Agreement is for Whitley 2A – Phase 3 of the Corridor Improvement Project. The total length of this phase is 5.6 miles and there are four locations within this stretch that fall under DFG jurisdiction pursuant to Fish and Game Code 1600 et seq.

- Location 1 (Other Water 16/17 at PM 41.3) – An existing 48-inch Reinforced Concrete Pipe (RCP), approximately 106 feet long, currently conveys an unnamed drainage. The existing pipe and associated headwall will ultimately be abandoned but will be temporarily extended during construction to accommodate current flows. The new 48-inch Alternative Pipe Culvert, approximately 458 feet long, will be installed running diagonally underneath the highway. In addition, a new 245 foot long 36-inch RCP will be added immediately to the west to allow additional run-off to flow from north to south underneath the highway. Rock Slope Protection (RSP) will be placed at the inlet and outlet of both of these culverts to dissipate energy and reduce erosion.

- Location 2 (Other Water 18 at PM 42.3) – An existing 12 foot by 10 foot reinforced concrete box that is approximately 120 feet long conveys Shimmin Canyon Creek. The existing box and associated headwall will be removed and replaced with a new double 10 foot by 10 foot reinforced concrete box culvert, approximately 396 feet long, to accommodate the highway widening with new head and wingwalls. The capacity of the drainage will be increased by a width of 8 feet which will reduce potential velocities and therefore erosion at the downstream end.

- Location 3 (Other Water 19 at PM 43.4) – An existing 12 foot by 12 foot reinforced concrete box, approximately 121 feet long, conveys an unnamed drainage. The existing box and associated headwall will be removed and a new 12 foot by 14 foot reinforced box, approximately 246 feet long, with new head and wingwalls will be installed to accommodate the highway widening. The new culvert will provide 2 feet additional clearance and the RSP to be placed at the inlet and outlet will reduce head-cutting and erosion.

- Location 4 (Other Water 20 at PM 45.5) – An existing 12 foot wide reinforced concrete box that is approximately 62 feet long currently conveys McMillan Canyon Creek. The existing box and associated headwall will be removed and a new approximately 120 feet long bridge will be installed to accommodate the highway widening. A bridge was chosen to replace the existing culvert because of the large amount of sediment frequently deposited along the channel and also to open up the crossing to wildlife that may prefer greater vertical clearance to cross under a structure. Bridge construction will require pile driving at this location.

- Utility relocation will involve open trench installation with a trench depth of 30 inches. Temporary impacts will occur to an area approximately 3 to 4 feet wide along the trench line were it crosses McMillan Canyon Creek north of SR 46.

- Equipment to be used includes a backhoe, loader, excavator, scraper, grader, Light and Heavy Duty trucks, bulldozer, water truck, crane, drill rig, and pile driver. Some Construction equipment will need to enter the channel.

- No work will occur in jurisdictional drainages, with the exception of Shimmon Canyon Creek, between November 1 to March 31 so water is not expected to be present when work is done and a water diversion is not anticipated.

- The Project will temporarily impact 0.911 acres including 1,241 linear feet of riparian habitat. The Project will also permanently impact 0.426 acres (1,666 linear feet) of stream channel including 14,301 cubic yards of fill material including native soil, RSP, and concrete.

- The Project will not require the removal of any riparian trees within DFG 1600 jurisdiction; however the parent Project will remove three blue oaks (*Quercus douglasii*) which will be mitigated for at the Whitley 1 site at a ratio of 10:1, which is the ratio being used for all blue oaks over four inches in diameter at breast height (DBH).

- Phase 3 of the SR 46 Corridor Improvement Project requires 286.18 acres habitat compensation for impacts to San Joaquin kit fox before ground-disturbing activities before Phase 3 begins. This requirement was met by the purchase of credits at the State-approved Palo Prieto Conservation Bank on May 13, 2010.

PROJECT IMPACTS

This Agreement is intended to avoid, minimize, and mitigate adverse impacts to the fish and wildlife resources that occupy the area of Shimmon Canyon, McMillan Canyon Creek and two (2) unnamed drainages, and the immediate adjacent riparian habitat. Absent implementation of the protective measures required by this Agreement, the following species and habitat types could potentially be impacted within the area covered by this Agreement: Federal endangered and State threatened San Joaquin kit fox (*Vulpes macrotis mutica*), State threatened Swainson's hawk (*Buteo swainsoni*), State threatened San Joaquin antelope squirrel (*Ammospermophilus nelsoni*), Species of Special Concern prairie falcon (*Falco mexicanus*), Species of Special Concern burrowing owl (*Athene cunicularia*), Species of Special Concern Tulare grasshopper mouse (*Onychomys torridus tularensis*), Species of Special Concern San Joaquin pocket mouse (*Perognathus inornatus inorntus*), Species of Special Concern American badger (*Taxidea taxus*), Species of Special Concern western pond turtle (*Actinemys* marmorata), Species of Special Concern San Joaquin whipsnake (*Masticophis flagelium ruddocki*), and Species of Special Concern coast horned lizard (*Phrynosoma* *coronatum*), as well as birds, mammals, fish, reptiles, amphibians, invertebrates and plants that comprise the local riparian ecosystem.

MEASURES TO PROTECT FISH AND WILDLIFE RESOURCES

1. Administrative Measures

Permittee shall meet each administrative requirement described below.

1.1. Documentation at Project Site: Permittee shall make the Agreement, any extensions and amendments to the Agreement, and all related notification materials and California Environmental Quality Act (CEQA) documents, readily available at the Project site at all times and shall be presented to DFG personnel or personnel from another State, Federal, or local agency upon request.

1.2. Providing Agreement to Persons at Project Site: Permittee shall provide copies of the Agreement and any extensions and amendments to the Agreement to all persons who will be working on the Project at the Project site on behalf of Permittee; including but not limited to contractors, subcontractors, inspectors, and monitors.

1.3. Notification of Conflicting Provisions: Permittee shall notify DFG if Permittee determines or learns that a provision in the Agreement might conflict with a provision imposed on the Project by another local, State, or Federal agency. In that event, DFG shall contact Permittee to resolve any conflict.

1.4. Project Site Entry: Permittee agrees that DFG personnel may enter the Project site at any time to verify compliance with the Agreement.

1.5. Legal Obligations: This Agreement does not exempt the Permittee from complying with all other applicable local, State, and Federal law, or other legal obligations.

1.6. Unauthorized "Take": This Agreement does not authorize the "take" (defined in FGC Section 86 as to hunt, pursue, catch, capture, or kill; or attempt to hunt, pursue, catch, capture, or kill) of State- or Federal-listed threatened or endangered species. Any such "take" shall require separate permitting as may be required.

1.7. Water Diversion: To the extent that the Provisions of this Agreement provide for the diversion of water, they are agreed to with the understanding that the Permittee possesses the legal right to so divert such water.

1.8. Trespass: To the extent that the Provisions of this Agreement provide for activities that require the Permittee to trespass on another owner's property, they are agreed to with the understanding that the Permittee possesses the legal right to so trespass.

1.9. Construction/Work Schedule: The Permittee shall submit a **construction/work schedule** to DFG (lpdiaz@dfg.ca.gov with reference to Agreement 1600-2011-0206-R4) prior to beginning any activities covered by this Agreement. The Permittee shall also notify DFG upon the completion of the activities covered by this Agreement.

1.10. Training: Prior to starting any activity within the stream, all employees, contractors, and visitors who will be present during Project activities shall have received training from a qualified individual on the contents of this Agreement, the resources at stake, and the legal consequences of non-compliance. A **training sign-in sheet** for the employees and contractors shall be provided to DFG and shall include the date of the training and who gave the training.

2. Avoidance and Minimization Measures

To avoid or minimize adverse impacts to fish and wildlife resources identified above, Permittee shall implement each measure listed below.

2.1. Construction/Work Hours: All non-emergency work activities during the construction phase with the exception of traffic movement and striping will be confined to daylight hours.

2.2. Flagging/Fencing: Prior to any activity within the lake or creek, the Permittee shall identify the limits of the required access routes and encroachment into the stream. These "work area" limits shall be identified with brightly colored flagging/fencing. Work completed under this Agreement shall be limited to this defined area only. Flagging/fencing shall be maintained in good repair for the duration of the Project. All areas beyond the identified work area limits shall be considered Environmentally Sensitive Areas (ESA) and shall not be disturbed.

2.3. Listed Species: This Agreement does not allow for the "take," or "incidental take," of any State- or Federal-listed threatened or endangered species.

2.3.1. The Permittee affirms that no "take" of listed species will occur as a result of this Project and will take prudent measures to ensure that all "take" is avoided. The Permittee acknowledges that they fully understand that they do not have "incidental take" authority. If any State- or Federal-listed threatened or endangered species occur within the proposed work area or could be impacted by the work proposed, and thus "taken" as a result of Project activities, the Permittee is responsible for obtaining and complying with required State and Federal threatened and endangered species permits or other written authorization before proceeding with this Project.

2.3.2. Liability for any "take," or "incidental take," of such listed species remains the separate responsibility of the Permittee for the duration of the Project.

2.3.3. The Permittee shall immediately (the same day) notify DFG of the discovery of any such rare, threatened, or endangered species prior to and/or during construction.

2.4. Swainson's Hawk (SWHA) Specific Measures:

2.4.1. **Focused SWHA Surveys:** Surveys shall be conducted by a qualified biologist no more than 14 days before the onset of any ground-disturbing activities and no earlier then March 20. See attached SWHA Technical Advisory Committee May 31, 2000 protocol for appropriate survey details (Exhibit B).

2.4.2. No work shall occur which could result in either direct or indirect impacts to nesting Swainson's hawk. Between March 1 and September 1, Project activities shall not be conducted within a minimum 0.5 mile of any active Swainson's hawk (SWHA) nest. This minimum buffer may be reduced for any particular nest, but only if DFG concurs in writing that a reduced buffer will not result in a direct or indirect adverse impact to any nesting SWHA adults, chicks, or eggs. In the event a qualified biologist with appropriate raptor experience determines Project activities are having or could cause an adverse impact to any nesting SWHA adults, chicks, or eggs based on bird behavior or other indicators regardless of the existing buffer, Permittee shall immediately cease such activities and shall not resume without written approval to do so by DFG.

2.5. San Joaquin Kit Fox (SJKF) Specific Measures: All measures in the Incidental Take Permit 2081-2007-020-04 for the SR 46 Corridor Improvement Project shall be followed. These include but are not limited to the following:

2.5.1. Workers shall inspect for SJKF under vehicles and equipment before vehicles and equipment are moved. If a SJKF is present, the worker shall wait for the SJKF to move on its own to a safe location.

2.5.2. If a SJKF is injured as a result of Project-related activities, it shall be immediately taken to a DFG-approved wildlife rehabilitation or veterinary facility. The Permittee shall identify the facility prior to the start of ground- or vegetation-disturbing activities. Permittee shall bear any costs associated with the care or treatment of such injured SJKF. Permittee shall notify the United States Fish and Wildlife Service (USFWS) and DFG immediately unless the incident occurs outside of normal business hours. In that event the USFWS and DFG shall be notified no later than noon on the next business day. Notification to DFG shall be via telephone or e-mail, followed by a written incident report. Notification shall include the date, time, location, and circumstances of the incident and the name of the facility where the animal was taken.

2.5.3. The Designated Biologist shall perform a **pre-construction survey for SJKF** no more then 30 days prior to ground- or vegetation-disturbing activities for each Phase of the Project. Surveys shall cover the proposed construction right-of-way (ROW) with a 200-foot buffer for all areas along the Project length with habitat to support SJKF. A report documenting the results of the pre-construction surveys shall be submitted to DFG within 30 days after performing any such survey.

2.5.4. If a potential SJKF den (one that shows evidence of current use or was used in the past) is discovered or a SJKF is found in an "atypical" den (e.g., a pipe or culvert), a 50-foot buffer shall be established using flagging. If a known SJKF den is discovered, a buffer of at least 100 feet shall be established using fencing. If a natal den (den in which SJKF young are reared) is discovered, a buffer of at least 200 feet shall be established using fencing. Buffer zones shall have restricted entry. Permittee shall notify the USFWS and DFG's Regional Representative immediately via telephone or email if any SJKF dens, natal dens or atypical dens are discovered.

2.5.5. For dens found within the portion of the Project area to be disturbed, natal dens shall not be excavated until the pups and adults have vacated and then only after consultation with the USFWS and DFG. If, after four consecutive days of monitoring with tracking medium or infrared camera the Designated Biologist has determined that a SJKF is not currently present, known dens may be destroyed. Potential dens (any hole three inches or larger) may be excavated without monitoring if a take permit has been obtained from the USFWS, but if the process reveals evidence of use inside then destruction shall cease and the USFWS and DFG shall be notified immediately.

2.5.6. Destruction of SJKF dens shall be accomplished by careful excavation until it is certain no SJKF are inside. The den should be fully excavated, filled with dirt and compacted to ensure that SJKF cannot reenter or use the den during the construction period. If at any point during excavation a SJKF is discovered inside the den, excavation shall cease immediately and monitoring of the den as described above shall be resumed. Destruction of the den shall only be completed when, in the judgment of the Designated Biologist, the animal has escaped from or otherwise vacated the partially destroyed den.

2.5.7. Any SJKF den that must be destroyed shall be replaced with an artificial den. This will compensate for the loss of important shelter used by SJKF for protection, reproduction, and escape from predators. Den design and placement should be determined on a site-specific basis in consultation with the USFWS and DFG.

2.5.8. All open holes and trenches within the Project construction boundary shall be inspected at the beginning of the day, middle of the day, and end of the day for trapped animals. To prevent inadvertent entrapment of SJKF or any other animals during the construction phase of the Project, all excavated, steep-walled holes or trenches more than 2 feet deep shall be covered at the close of each working day by plywood or similar materials or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they shall be thoroughly inspected for trapped animals. If at any time a trapped or injured Covered Species is discovered, the USFWS and DFG will be notified within one (1) working day of the incident.

2.5.9. All construction pipe, culverts, or similar structures with a diameter of 7.6 centimeters (3 inches) or greater that are stored at the construction site for one or more overnight periods will be thoroughly inspected for Covered Species before the pipe is subsequently moved, buried, or capped. If a Covered Species is discovered inside a pipe during inspection, that section of pipe shall not be moved until the animal has escaped on its own.

2.6. Fish and Wildlife: If any fish or wildlife is encountered during the course of construction, said fish and wildlife shall be allowed to leave the construction area unharmed.

2.6.1. An approved biologist shall perform **general wildlife surveys** of the Project area (including access routes and storage areas) prior to Project construction start with particular attention to evidence of the presence of the species listed above and shall report any possible adverse affect to fish and wildlife resources not originally reported. If any State- or Federal-listed threatened or endangered species are found within the proposed work area or could be impacted by the work proposed, a new Agreement and/or a 2081(b) State Incidental Take Permit may be necessary and a new CEQA analysis may need to be conducted, before work can begin.

2.6.2. To protect nesting birds, no construction shall be completed from February 15 through August 31 unless the following **avian surveys** are completed by a qualified biologist:

- Raptors: Survey for nesting activity of raptors within a 0.25-mile radius of the construction site. Surveys shall be conducted at appropriate nesting times and concentrate on trees with the potential to support raptor nests. If any active nests are observed, these nests and nest trees shall be designated an ESA and protected (while occupied) with a minimum 500-foot buffer during Project-construction unless otherwise agreed upon and approved in writing by DFG.

- Other Avian Species: Survey riparian areas for nesting activity within a 500-foot radius of the defined work area two (2) to three (3) weeks before construction begins. If any nesting activity is found, these nests and nest trees shall be designated an ESA and protected (while occupied) with a minimum 250-foot buffer during Project construction unless otherwise agreed upon and approved in writing by DFG.

2.7. <u>Coast Horned lizard</u>: Preconstruction surveys shall be conducted to determine the presence of the coast horned lizard. Any of these species that are found in the area prior to construction shall be relocated to a suitable habitat area outside of the construction site by a qualified biologist with all required permits. The results of the survey shall be sent to the Department within one week of survey completion. The biologist hired by Permittee shall provide Permittee a list of exclusion measures that construction staff shall use to minimize risk of take or injury to any individual animals in the vicinity of the Project site. Permittee shall ensure that these exclusion measures are in place prior to construction.

2.8. <u>Vegetation:</u> The disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations and shall only occur within the defined work area. Precautions shall be taken to avoid other damage to vegetation by people or equipment. Vegetation or material removed from the riparian area shall not be stockpiled in the streambed or on its banks without measures to ensure its stability, preventing accidental discharge into the stream.

2.8.1. Native riparian trees and shrubs with a DBH of four inches or greater that are damaged or removed shall be replaced by replanting like species at a 3:1 ratio. Mitigation for heritage trees 24-inches or greater shall require replanting of like species at a 10:1 ratio. (See Revegetation under Compensation below.)

2.8.2. When possible, roots and stumps shall be left to facilitate re-growth.

2.9. <u>Vehicles and Equipment:</u> Any equipment or vehicles driven and/or operated within or adjacent to the stream shall be checked and maintained daily to prevent leaks of materials that, if introduced to water, could be deleterious to aquatic and terrestrial life.

2.9.1. Construction vehicle access to the stream's banks and bed shall be limited to predetermined ingress and egress corridors on existing roads. All other areas adjacent to the work site shall be considered an ESA and shall remain off-limits to construction equipment. Vehicle corridors and the ESA shall be identified by the Permittee's resident engineer in consultation with the Designated Biologist.

2.10. Staging and Storage Areas: Staging and storage areas for equipment, materials, fuels, lubricants, and solvents shall be located outside of the stream channel and banks, and to the extent possible, on previously disturbed ground. Stationary equipment such as motors, pumps, generators, compressors and welders, located within or adjacent to the stream, shall be positioned over drip-pans. Vehicles shall be moved away from the stream prior to refueling and lubrication.

2.11. Pollution: The Permittee and all contractors shall be subject to the water pollution regulations found in the Department of Fish and Game Code Sections 5650 and 12015.

2.11.1. Raw cement, concrete or washings thereof, asphalt, drilling fluids or lubricants, paint or other coating material, oil or other petroleum products, or any other substances which could be hazardous to fish or wildlife resulting from or disturbed by Project-related activities, shall be prevented from contaminating the soil and/or entering the "Waters of the State."

2.11.2. All Project-generated debris, building materials, and rubbish shall be removed from the stream and from areas where such materials could be washed into the stream.

2.11.3. In the event that a spill occurs, all Project activities shall immediately cease until cleanup of the spilled materials is completed. DFG shall be notified immediately by the Permittee of any spills and shall be consulted regarding cleanup procedures.

2.12. Structures: The Permittee shall confirm that all structures are designed (i.e., size and alignment), constructed, and maintained such that they shall not cause long-term changes in water flows that adversely modify the existing upstream or downstream stream bed/bank contours or increase sediment deposition or cause significant new erosion.

2.13. Fill: Rock, gravel, and/or other materials shall not be imported into or moved within the stream, except as otherwise addressed in this Agreement. Only on-site materials and clean imported fill shall be used to complete the

Project. Fill shall be limited to the minimal amount necessary to accomplish the agreed activities. Excess and temporary fill material shall be moved off-site at Project completion.

2.14. Spoil: Spoil storage sites shall not be located within the stream, where spoil will be washed into the stream, or where it will cover aquatic or riparian vegetation. Rock, gravel, and/or other materials shall not be imported into or moved within the bed or banks of the stream, except as otherwise addressed in this Agreement.

2.15. Erosion: No work within the banks of the stream will be conducted during or immediately following large rainfall events, or when there is water flowing within the channel. All disturbed soils within the Project site shall be stabilized to reduce erosion potential, both during and following construction. Temporary erosion control devices, such as straw bales, silt fencing, and sand bags, may be used as appropriate to prevent siltation of the stream. Any installation of non-erodible materials not described in the original Project description shall be coordinated with DFG. Coordination may include the negotiation of additional Agreement Provisions for this activity.

2.16. Turbidity: Turbid water shall not be discharged into the stream, or created within the stream. The Permittee's ability to minimize siltation shall be the subject of preconstruction planning and feature implementation. Precautions to minimize siltation may require that the work site be isolated so that silt or other deleterious materials are not allowed to pass to downstream reaches. The placement of any structure or materials in the stream for this purpose, not included in the original Project description, shall be coordinated with DFG. If it is determined that silt levels resulting from Project-related activities constitute a threat to aquatic life, activities associated with the siltation shall be halted until effective DFG-approved control devices are installed, or abatement procedures are initiated.

2.17. Stream Diversion: If work cannot be completed when the stream is dry and work must occur within the wetted portion of the channel, the Permittee shall develop a **Stream Diversion Plan**. This Stream Diversion Plan shall be completed and approved prior to commencement of any proposed diversion or activities within the wetted portion of the stream. The Plan shall include, at a minimum, the following: flow diversion shall be done in a manner that shall prevent pollution and/or siltation, and which shall provide flows to downstream reaches; flows to downstream reaches shall be provided during all times that the natural flow would have supported aquatic life; said flows shall be of sufficient quality and quantity, and of appropriate temperature to support aquatic life, both above and below the diversion; and normal flows shall be restored to the affected stream immediately upon completion of work at that location.

2.18. Restoration: Excess material must be removed from the Project site, pursuant to Department of Transportation Standard Specifications Section 7-1.13

2.18.1. All disturbed soils and new fill, including recontoured slopes and all other cleared areas, shall be revegetated with riparian vegetation or other plants, as appropriate to prevent erosion. If the Project causes any exposed slopes or exposed areas on the stream banks, these areas shall be seeded with a blend of a minimum of three (3) locally native grass species and covered with a protective layer of weed-free straw or mulch. One (1) or two (2) sterile non-native perennial grass species may be added to the seed mix provided that amount does not exceed 25 percent of the total seed mix by count. Locally native wildflower and/or shrub seeds may also be included in the seed mix. The seeding shall be completed as soon as possible, but no later than November 15 of the year construction ends. A **seed mixture** shall be submitted to DFG for approval prior to application. At the discretion of DFG, all exposed areas where seeding is considered unsuccessful after 90 days shall receive appropriate soil preparation and a second application of seeding, straw, or mulch as soon as is practical on a date mutually agreed upon.

3. Compensatory Measures

To compensate for adverse impacts to fish and wildlife resources identified above that cannot be avoided or minimized, Permittee shall implement each measure listed below.

3.1. Revegetation: The Notification states that no trees need to be removed within the riparian zone for the implementation of this Project. If any native riparian trees or shrubs greater than four (4) inches DBH is/are accidentally damaged or removed from the Project area due to unplanned construction activities, the Permittee shall develop a **Revegetation Plan** for the site and immediately submit it to DFG for approval. All Plans shall specifically address what, where, when and how replacement shrubs and trees will be planted.

3.1.1. What species and the number of trees both removed and to be planted should be identified. Native riparian trees and shrubs (e.g., cottonwood, willow, sycamore, valley oak, etc.) between four (4) to 25-inches DBH shall be replaced in-kind at a ratio of 3:1, and trees greater then 25-inches DBH shall be replaced at a ratio of 10:1.

3.1.2. Where should be on-site whenever possible.

3.1.3. When should be the first suitable season after construction is complete.

3.1.4. How should include layout, monitoring, and maintenance to ensure a minimum of 70 percent survival for the plantings after five (5) years.

4. Monitoring and Reporting Measures

Permittee shall meet each reporting and monitoring requirement described below.

4.1. Monitoring Obligations of the Permittee:

4.1.1. The Permittee shall have primary responsibility for monitoring compliance with all protective measures included as "Measures" in this Agreement. Protective measures must be implemented within the time periods indicated in the Agreement. DFG shall be notified immediately if monitoring reveals that any of the protective measures were not implemented during the period indicated in this program, or if it anticipates that measures will not be implemented within the time period specified.

4.1.2. The Permittee (or the Permittee's designee) shall ensure the implementation of the Measures of the Agreement, and shall monitor the effectiveness of these Measures. DFG shall be notified immediately if any of the protective measures are not providing the level of protection that is appropriate for the impact that is occurring, and recommendations, if any, for alternative protective measures.

4.2. Reporting Obligations of the Permittee:

4.2.1. The Permittee shall submit the following Reports described in the Measures above to DFG:

- Construction/work schedule (Measure 1.9).
- Employees and contractors training sign-in sheet (Measure 1.10).
- Results of focused SWHA surveys (Measure 2.4.1).
- Results of SJKF Pre-constructions surveys (Measure 2.5.3).
- Results of general wildlife surveys (Measure 2.6.1).

- Results of avian surveys if construction is scheduled during the nesting season (Measure 2.6.2).
- Stream Diversion Plan if diversion is required (Measure 2.17).
- The seed mixture to be used post Project for erosion control (Measure 2.18.1).
- If required, a Revegetation Plan (Measure 3.1).

4.2.2. A Final Project Report shall be submitted to DFG within 30 days after the Project is completed. The final report shall summarize the Project construction, including any problems relating to the protective measures of this Agreement and how the problems were resolved. "Before and after" photo documentation of the Project site shall be included.

VERIFICATION OF COMPLIANCE:

DFG may verify compliance with protective measures to ensure the accuracy of Permittee's monitoring and reporting efforts at any point in time it is deemed necessary. DFG may, at its sole discretion, review relevant Project documents maintained by the Permittee, interview Permittee employees and agents, inspect the Project area, and take other actions to assess compliance with or effectiveness of protective measures for the Project.

CONTACT INFORMATION

Any communication that Permittee or DFG submits to the other shall be in writing and any communication or documentation shall be delivered to the address below by United States mail, fax, or email, or to such other address as Permittee or DFG specifies by written notice to the other.

To Permittee:

California Department of Transportation (Caltrans)
District 5
Jennifer Moonjian
50 Higuera Street
San Luis Obispo, California 93401
(805) 542-4763
Jennifer_moonjian@dot.ca.gov

To DFG:

Department of Fish and Game
Region 4 - Central Region
1234 East Shaw Avenue
Fresno, California 93710
Attn: Lake and Streambed Alteration Program – Laura Peterson-Diaz
Notification No.1600-2011-0169-R4
Phone: (559) 243-4017, extension 225
Fax: (559) 243-4020
lpdiaz@dfg.ca.gov

LIABILITY

Permittee shall be solely liable for any violations of the Agreement, whether committed by Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents or contractors and subcontractors, to complete the Project or any activity related to it that the Agreement authorizes.

This Agreement does not constitute DFG's endorsement of, or require Permittee to proceed with the Project. The decision to proceed with the Project is Permittee's alone.

SUSPENSION AND REVOCATION

DFG may suspend or revoke in its entirety the Agreement if it determines that Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, is not in compliance with the Agreement.

Before DFG suspends or revokes the Agreement, it shall provide Permittee written notice by certified or registered mail that it intends to suspend or revoke. The notice shall state the reason(s) for the proposed suspension or revocation, provide Permittee an opportunity to correct any deficiency before DFG suspends or revokes the Agreement, and include instructions to Permittee, if necessary, including but not limited to a directive to immediately cease the specific activity or activities that caused DFG to issue the notice.

ENFORCEMENT

Nothing in the Agreement precludes DFG from pursuing an enforcement action against Permittee instead of, or in addition to, suspending or revoking the Agreement.

Nothing in the Agreement limits or otherwise affects DFG's enforcement authority or that of its enforcement personnel.

OTHER LEGAL OBLIGATIONS

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from obtaining any other permits or authorizations that might be required under other Federal, State, or local laws or regulations before beginning the Project or an activity related to it.

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from complying with other applicable statutes in the FGC including, but not limited to, FGC sections 2050 et seq. (threatened and endangered species), 3503 (bird nests and eggs), 3503.5 (birds of prey), 5650 (water pollution), 5652 (refuse disposal into water), 5901 (fish passage), 5937 (sufficient water for fish), and 5948 (obstruction of stream).

Nothing in the Agreement authorizes Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, to trespass.

AMENDMENT

DFG may amend the Agreement at any time during its term if DFG determines the amendment is necessary to protect an existing fish or wildlife resource.

Permittee may amend the Agreement at any time during its term, provided the amendment is mutually agreed to in writing by DFG and Permittee. To request an amendment, Permittee shall submit to DFG a completed DFG "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the corresponding amendment fee identified in DFG's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

TRANSFER AND ASSIGNMENT

This Agreement may not be transferred or assigned to another entity, and any purported transfer or assignment of the Agreement to another entity shall not be valid or effective, unless the transfer or assignment is requested by Permittee in writing, as specified below, and thereafter DFG approves the transfer or assignment in writing.

The transfer or assignment of the Agreement to another entity shall constitute a minor amendment, and therefore to request a transfer or assignment, Permittee shall submit to DFG a completed DFG "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the minor amendment fee identified in DFG's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

EXTENSIONS

In accordance with FGC section 1605(b), Permittee may request one extension of the Agreement, provided the request is made prior to the expiration of the Agreement's term. To request an extension, Permittee shall submit to DFG a completed DFG "Request to Extend Lake or Streambed Alteration" form and include with the completed form payment of the extension fee identified in DFG's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5). DFG shall process the extension request in accordance with FGC 1605(b) through (e).

If Permittee fails to submit a request to extend the Agreement prior to its expiration, Permittee must submit a new notification and notification fee before beginning or continuing the Project the Agreement covers (Fish & G. Code, § 1605, subd. (f)).

EFFECTIVE DATE

The Agreement becomes effective on the date of DFG's signature, which shall be: 1) after Permittee's signature; 2) after DFG complies with all applicable requirements under CEQA; and 3) after payment of the applicable FGC section 711.4 filing fee listed at http://www.dfg.ca.gov/habcon/ceqa/ceqa_changes.html.

TERM

This Agreement shall remain in effect for five (5) years beginning on the date signed by DFG, unless it is terminated or extended before then. All provisions in the Agreement shall remain in force throughout its term. Permittee shall remain responsible for implementing any provisions specified herein to protect fish and wildlife resources after the Agreement expires or is terminated, as FGC section 1605(a)(2) requires.

CEQA COMPLIANCE

In approving this Agreement, DFG is independently required to assess the applicability of CEQA. The features of this Agreement shall be considered as part of the overall Project description. The Permittee's concurrence signature on this Agreement serves as confirmation to DFG that the activities that shall be conducted under the terms of this Agreement are consistent with the Project described in Notification No. 2011-0206-R4. Caltrans, as CEQA Lead Agency, adopted a final Environmental Impact Report regarding the Project on May 31, 2006, State Clearinghouse No. 20000011033, for the parent Project the SR 46 Corridor Improvement Project. A copy of the Notice of Determination for the Project was provided with the Section 1602 Notification. DFG, as a CEQA Responsible Agency, shall make findings and submit a Notice of Determination to the State Clearinghouse upon signing this Agreement.

EXHIBITS

The document(s) listed below is included as an exhibit to the Agreement and incorporated herein by reference.

A. Figure 1. Project Location USGS Quad Map.

B. SWHA Technical Advisory Committee May 31, 2000 protocol

AUTHORITY

If the person signing the Agreement (signatory) is doing so as a representative of Permittee, the signatory hereby acknowledges that he or she is doing so on Permittee's behalf and represents and warrants that he or she has the authority to legally bind Permittee to the provisions herein.

AUTHORIZATION

This Agreement authorizes only the Project described herein. If Permittee begins or completes a Project different from the Project the Agreement authorizes, Permittee may be subject to civil or criminal prosecution for failing to notify DFG in accordance with FGC section 1602.

CONCURRENCE

The undersigned accepts and agrees to comply with all provisions contained herein.

FOR CALIFORNIA DEPARTMENT OF TRANSPORTATION

Larry E. B[signature] — 2-8-12

Larry Bonner
Senior Environmental Planner

Date

FOR DEPARTMENT OF FISH AND GAME

[signature] — 2-10-12

Jeffrey R. Single, Ph.D.
Regional Manager

Date

Prepared by: Laura Peterson-Diaz
Environmental Scientist

Figure 1

Exhibit A

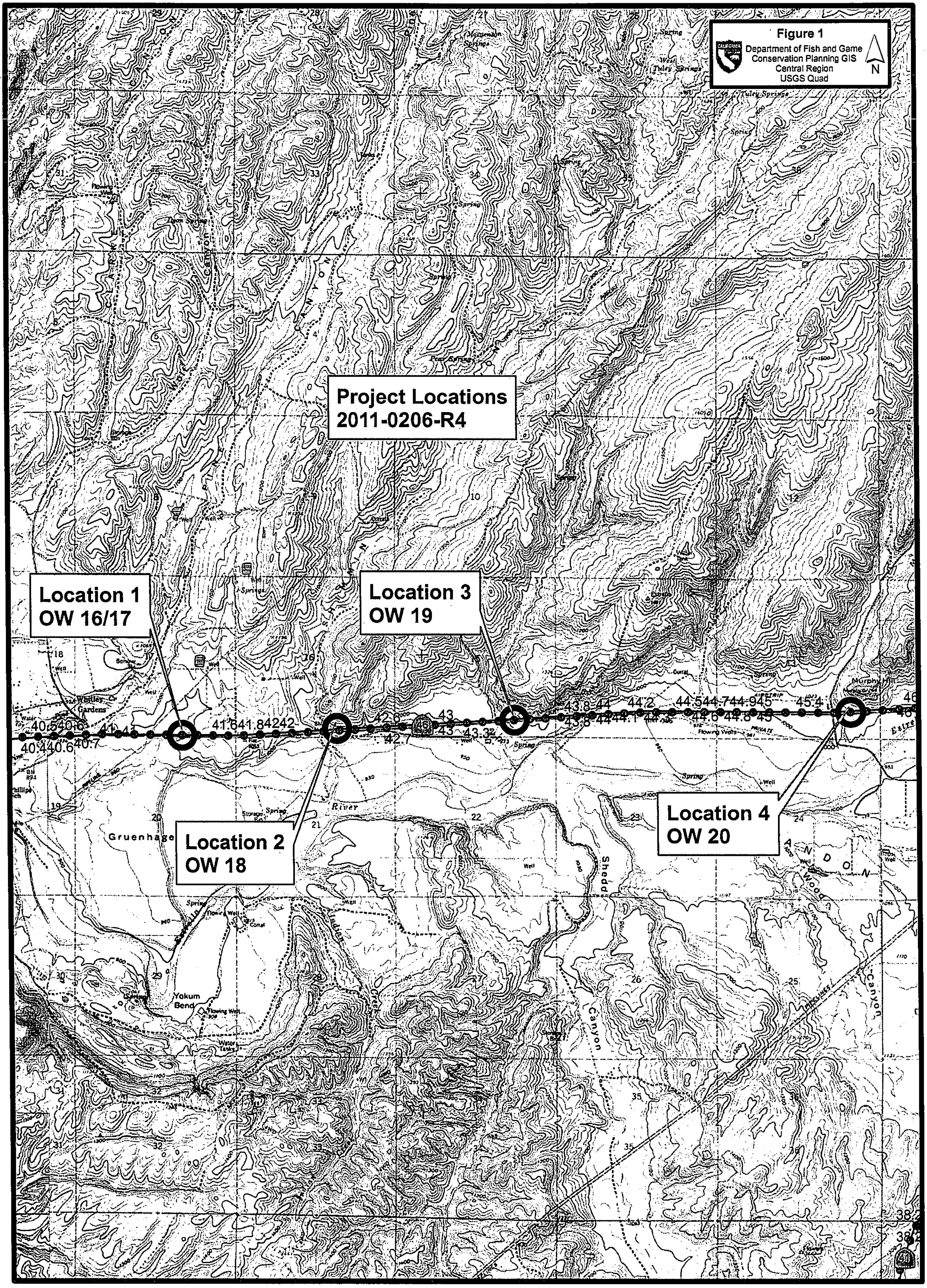


Figure 1
Department of Fish and Game
Conservation Planning GIS
Central Region
USGS Quad
N
Project Locations
2011-0206-R4
Location 1
OW 16/17
Location 2
OW 18
Location 3
OW 19
Location 4
OW 20

SWHA Technical Advisory Committee May 31, 2000 Protocol

Exhibit B

RECOMMENDED TIMING AND METHODOLOGY FOR SWAINSON'S HAWK NESTING SURVEYS IN CALIFORNIA'S CENTRAL VALLEY

Swainson's Hawk Technical Advisory Committee

May 31, 2000

This set of survey recommendations was developed by the Swainson's Hawk Technical Advisory Committee (TAC) to maximize the potential for locating nesting Swainson's hawks, and thus reducing the potential for nest failures as a result of project activities/disturbances. The combination of appropriate surveys, risk analysis, and monitoring has been determined to be very effective in reducing the potential for project-induced nest failures. As with most species, when the surveyor is in the right place at the right time, Swainson's hawks may be easy to observe; but some nest sites may be very difficult to locate, and even the most experienced surveyors have missed nests, nesting pairs, mis-identified a hawk in a nest, or believed incorrectly that a nest had failed. There is no substitute for specific Swainson's hawk survey experience and acquiring the correct search image.

METHODOLOGY

Surveys should be conducted in a manner that maximizes the potential to observe the adult Swainson's hawks, as well as the nest/chicks second. To meet the California Department of Fish and Game's (CDFG) recommendations for mitigation and protection of Swainson's hawks, surveys should be conducted for a ½ mile radius around all project activities, and if active nesting is identified within the ½ mile radius, consultation is required. In general, the TAC recommends this approach as well.

Minimum Equipment

Minimum survey equipment includes a high-quality pair of binoculars and a high quality spotting scope. Surveying even the smallest project area will take hours, and poor optics often result in eye-strain and difficulty distinguishing details in vegetation and subject birds. Other equipment includes good maps, GPS units, flagging, and notebooks.

Walking vs Driving

Driving (car or boat) or "windshield surveys" are usually preferred to walking if an adequate roadway is available through or around the project site. While driving, the observer can typically approach much closer to a hawk without causing it to fly. Although it might appear that a flying bird is more visible, they often fly away from the observer using trees as screens; and it is difficult to determine from where a flying bird came. Walking surveys are useful in locating a nest after a nest territory is identified, or when driving is not an option.

Angle and Distance to the Tree

Surveying subject trees from multiple angles will greatly increase the observer's chance of detecting a nest or hawk, especially after trees are fully leafed and when surveying multiple trees in close proximity. When surveying from an access road, survey in both directions. Maintaining a distance of 50 meters to 200 meters from subject trees is optimal for observing perched and flying hawks without greatly reducing the chance of detecting a nest/young: Once a nesting territory is identified, a closer inspection may be required to locate the nest.

Speed
Travel at a speed that allows for a thorough inspection of a potential nest site. Survey speeds should not exceed 5 miles per hour to the greatest extent possible. If the surveyor must travel faster than 5 miles per hour, stop frequently to scan subject trees.

Visual and Aural Ques
Surveys will be focused on both observations and vocalizations. Observations of nests, perched adults, displaying adults, and chicks during the nesting season are all indicators of nesting Swainson's hawks. In addition, vocalizations are extremely helpful in locating nesting territories. Vocal communication between. hawks is frequent during territorial displays; during courtship and mating; through the nesting period as mates notify each other that food is available or that a threat exists; and as older chicks and fledglings beg for food.

Distractions
Minimize distractions while surveying. Although two pairs of eyes may be better than one pair at times, conversation may limit focus. Radios should be off, not only are they distracting, they may cover a hawk's call.

Notes and Species Observed
Take thorough field notes. Detailed notes and maps of the location of observed Swainson's hawk nests are essential for filling gaps in the Natural Diversity Data Base; please report all observed nest sites. Also document the occurrence of nesting great homed owls, red-tailed hawks, red-shouldered hawks and other potentially competitive species. These species will infrequently nest within 100 yards of each other, so the presence of one species will not necessarily exclude another.

TIMING

To meet **the minimum level** of protection for the species, surveys should be completed for **at least** the two survey periods immediately prior to a project's initiation. For example, if a project is scheduled to begin on June 20, you should complete 3 surveys in Period III and 3 surveys in Period V. However, it is always recommended that surveys be completed in Periods II, III and V. **Surveys should not be conducted in Period IV.**

The survey periods are defined by the timing of migration, courtship, and nesting in a "typical" year for the majority of Swainson's hawks from San Joaquin County to Northern Yolo County. Dates should be adjusted in consideration of early and late nesting seasons, and geographic differences (northern nesters tend to nest slightly later, etc). If you are not sure, contact a TAC member or CDFG biologist.

Survey dates **Justification and search image**	**Survey time**	**Number of Surveys**
I. *January-March 20 (recommended optional)*	*All day*	*1*

Prior to Swainson's hawks returning, it may be helpful to survey the project site to determine potential nest locations. Most nests are easily observed from relatively long distances, giving the surveyor the opportunity to identify potential nest sites, as well as becoming familiar with the project area. It also gives the surveyor the opportunity to locate and map competing species nest sites such as great homed owls from February on, and red-tailed hawks from March on. After March 1, surveyors are likely to observe Swainson's hawks staging in traditional nest territories.

II. *March 20 to April 5*	*Sunrise to 1000* *1600 to sunset*	*3*

Most Central Valley Swainson's hawks return by April 1, and immediately begin occupying their traditional nest territories. For those few that do not return by April 1, there are often hawks ("floaters") that act as place-holders in traditional nest sites; they are birds that do not have mates, but temporarily attach themselves to traditional territories and/or one of the site's "owners." Floaters are usually displaced by the territories' owner(s) if the owner returns.

Most trees are leafless and are relatively transparent; it is easy to observe old nests, staging birds, and competing species. The hawks are usually in their territories during the survey hours, but typically soaring and foraging in the mid-day hours. Swainson's hawks may often be observed involved in territorial and courtship displays, and circling the nest territory. Potential nest sites identified by the observation of staging Swainson's hawks will usually be active territories during that season, although the pair may not successfully nest/reproduce that year.

III. *April 5 to April 20*	*Sunrise to 1200* *1630 to Sunset*	*3*

Although trees are much less transparent at this time, ‘activity at the nest site increases significantly. Both males and females are actively nest building, visiting their selected site frequently. Territorial and courtship displays are increased, as is copulation. The birds tend to vocalize often, and nest locations are most easily identified. This period may require a great deal of "sit and watch" surveying.

IV. *April 21 to June 10*	*Monitoring known nest sites only* ***Initiating Surveys is not recommended***	

Nests are extremely difficult to locate this time of year, and even the most experienced surveyor will miss them, especially if the previous surveys have not been done. During this phase of nesting, the female Swainson's hawk is in brood position, very low in the nest, laying eggs, incubating, or protecting the newly hatched and vulnerable chicks; her head may or may not be visible. Nests are often well-hidden, built into heavily vegetated sections of trees or in clumps of mistletoe, making them all but invisible. Trees are usually not viewable from all angles, which may make nest observation impossible.

Following the male to the nest may be the only method to locate it, and the male will spend hours away from the nest foraging, soaring, and will generally avoid drawing attention to the nest site. Even if the observer is fortunate enough to see a male returning with food for the female, if the female determines it is not safe she will not call the male in, and he will not approach the nest; this may happen if the observer, or others, are too close to the nest or if other threats, such as rival hawks, are apparent to the female or male.

V. ***June 10 to July 30 (post-fledging)*** ***Sunrise to 1200*** ***1600 to sunset*** *3*

Young are active and visible, and relatively safe without parental protection. Both adults make numerous trips to the nest and are often soaring above, or perched near or on the nest tree. The location and construction of the nest may still limit visibility of the nest, young, 'and adults.

DETERMINING A PROJECT'S POTENTIAL
FOR IMPACTING SWAINSON'S HAWKS

LEVEL OF RISK	REPRODUCTIVE SUCCESS (Individuals)	LONGTERM SURVIVABILITY (Population)	NORMAL SITE CHARACTERISTICS (Daily Average)	NEST MONITORING
HIGH	Direct physical contact with the nest tree while the birds are on eggs or protecting young. (Helicopters in close proximity)	Loss of available foraging area. Loss of nest trees.	Little human-created noise, little human use: nest is well away from dwellings, equipment yards, human access areas, etc. *Do not include general cultivation practices in evaluation.*	MORE
	Loss of nest tree after nest building is begun prior to laying eggs.	Loss of potential nest trees.		
	Personnel within 50 yards of nest tree (out of vehicles) for extended periods while birds are on eggs or protecting young that are < 10 days old.	Cumulative: Multi-year, multi-site projects with substantial noise/personnel disturbance.		
	Initiating construction activities (machinery and personnel) within 200 yards of the nest after eggs are laid and before young are > 10 days old.	Cumulative: Single-season projects with substantial noise/personnel disturbance that is greater than or significantly different from the daily norm.		
	Heavy machinery only working within 50 yards of nest.			
	Initiating construction activities within 200 yards of nest before nest building begins or after young > 10 days old.		Substantial human-created noise and occurrence: nest is near roadways, well-used waterways, active airstrips, areas that have high human use. *Do not include general cultivation practices in evaluation.*	
LOW	All project activities (personnel and machinery) greater than 200 yards from nest.	Cumulative: Single-season projects with activities that "blend" well with site's "normal' activities.		LESS

FOR CONTRACT NO.: 05-330774

PERMITS AND AGGREMENTS

US Army Corps of Engineers Permit and Modification of Permit

ROUTE: 46-SLO-40.7/46.3(PM)

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94103-1398

Regulatory Branch

SUBJECT: File Number 245730S

Mr. John Luchetta
California Department of Transportation
Office of Environmental Planning
50 Higuera Street
San Luis Obispo, California 93401-5415

Dear Mr. Luchetta:

Enclosed is your signed copy of a Department of the Army permit (Enclosure 1) to conduct work and place fill in waters of the United States, including wetlands, associated with the Highway 46 Corridor Improvement Project. The project is located in San Luis Obispo County on Highway 46, beginning at Airport Road, just east of Paso Robles, post mile (PM) 32.2) to the eastern most junction of State Routes 46 and 41, PM 56.3. The new roadway will be a four-lane, access controlled, divided expressway. It will be constructed mostly on the existing alignment with a few sections of the new expressway on new alignments to avoid environmental impacts. This permit initially authorizes construction of the Estrella Section (PMs 32.2-37.2) of the project, and the permit may be subsequently modified to authorize future construction phases.

Please complete the appropriate parts of "Project Status" form (Enclosure 2), and return it to this office as your work progresses. You are responsible for ensuring that the contractor or workers executing the activity authorized herein are knowledgeable of the terms and conditions of this authorization.

Should you have any questions regarding this matter, please call Tyson S. Eckerle of our Regulatory Branch at 415-503-6791 or Tyson.S.Eckerle@usace.army.mil. Please address all correspondence to the Regulatory Branch and refer to the File Number at the head of this letter. If you would like to provide comments on our permit review process, please complete the Customer Survey Form available through the Forms and Contacts Block on our website: www.spn.usace.army.mil/regulatory.

Sincerely,

Jane M. Hicks

for Craig W. Kiley
Lieutenant Colonel, U.S. Army
Commanding

Enclosures

Copy Furnished (w/encl 1 only):

US EPA, San Francisco, CA
US FWS, Ventura, CA
CA DFG, Monterey, CA
CA RWQCB, San Luis Obispo, CA

DEPARTMENT OF THE ARMY PERMIT

PERMITTEE: John Luchetta, California Department of Transportation

PERMIT NO. 245730S

ISSUING OFFICE: San Francisco District, U.S. Army Corps of Engineers

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate District or Division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below:

PROJECT DESCRIPTION: The California Department of Transportation (CalTrans) has applied for a Department of the Army permit to conduct work and place approximately 194,154 cubic yards of fill into 6.9 acres of waters of the United States, including wetlands, associated with the Highway 46 Corridor Improvement Project (this fill estimate accounts for all fill expected to be placed on top of jurisdictional water features, not just fill placed below Corps jurisdiction). This project is located in San Luis Obispo County on Highway 46, beginning at Airport Road, just east of Paso Robles (kilo post (KP) 51.8, post mile (PM) 32.2) to the eastern most junction of State Routes 46 and 41 (KP 90.6, PM 56.3), commonly known as the "Wye," a distance of approximately 38.8 kilometers (24.1 miles). The new roadway will be a four-lane, access controlled, divided expressway. It will be constructed mostly on the existing alignment with a few sections of the new expressway on new alignments to avoid environmental impacts.

For permitting and construction purposes, this project has been divided into four sections:

- Estrella Section, post mile 32.2 to 37.2, Construction Phase 1
- Shandon Section, post mile 37.2 to 50.2, Construction Phase 2
- Cholame Section, post mile 50.2 to 54.8, Construction Phase 3
- Wye Section, post mile 54.8 to 56.3, Construction Phase 4

As denoted above, the project will be carried out in phases over the course of approximately 20 years. This permit initially authorizes only the construction of the Estrella Section, Construction Phase 1, and its associated impacts to and permanent loss of 0.267 acre of jurisdictional wetlands. **Prior to constructing Phases 2 through 4 of the overall project, CalTrans is required to obtain from the Corps written approval and a permit modification specifically authorizing such work and related impacts to waters of the United States.**

The Estrella Section will be carried out as shown in the enclosed drawing set titled "Project Plans For Construction on State Highway In San Luis Obispo County In And Near Paso Robles From Airport Road to Geneseo Road," dated January 2006, which designates the prescribed Erosion Control Plan, the Proposed Planting Plan, and Environmentally Sensitive Areas that must be avoided. Authorized impacts to jurisdictional features are outlined in the enclosed "SLO-46 Highway Corridor Improvement Project: Union Phase, 05-SLO-46-PM 32.1/37.2," and shown in the corresponding enclosed October 2006 "SLO-46-Corridor Improvements" Aerial Photo Maps, Sheets 1 through 7. These impacts will be mitigated for as described in the "Wetland Mitigation and Monitoring Plan, Route 46 Corridor Improvement, Construction Phase 1, From Huer Huero Creek Bridge to Geneseo Road, San Luis Obispo County, SLO-46-kp51.74/63.27 (pm 32.15-37.16)" dated October 18, 2006 (enclosed).

Phases 2 and 3 (the Shandon and Cholame sections) shall be implemented using the Least Environmentally Damaging Practicable Alternative (LEDPA), as described in the September 14, 2005 "Route 46 Corridor Improvement Project Section 404(b)(1) Analysis for Determination of the Least Environmentally Damaging Practicable Alternative." At the time of issuance of this authorization, CalTrans and the Environmental Protection Agency (EPA) had not agreed on a LEDPA for the Wye Section (Phase 4). As such, CalTrans must come to an agreement with the Corps and EPA, and gain final Corps approval, prior to construction of Phase 4.

PROJECT LOCATION: Templeton, San Luis Obispo County, California

GENERAL CONDITIONS:

1. The time limit for completing the work authorized ends on **December 30, 2027**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

7. You understand and agree that, if future operations by the United States require the removal, relocation or other alteration of the structure or work authorized herein, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, you will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

SPECIAL CONDITIONS:

1. This Corps permit does not authorize you to take an endangered species. In order to legally take a listed species, you must have a separate authorization under the Endangered Species Act (ESA) (e.g., an ESA Section 10 permit or a Biological Opinion (BO) under ESA Section 7 with "incidental take" provisions with which you must comply). The enclosed U.S. Fish and Wildlife Service (FWS) BO dated **December 12, 2005** contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is also specified in the BO. Your authorization under this Corps permit is conditional upon your compliance with all of the mandatory terms and conditions associated with incidental take authorized by the attached BO, whose terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with incidental take of the BO, where a take of the listed species occurs, would constitute an unauthorized take and it would also constitute non-compliance with this Corps permit. The FWS is the appropriate authority to determine compliance with the terms and conditions of its BO and with the ESA.

2. To compensate for the loss of 0.267 acre of wetlands attributed to construction of the Estella Section, Construction Phase 1, a minimum of 0.730 acre of wetlands shall be created, maintained, and monitored in the manner specified in the aforementioned Wetland Mitigation and Monitoring Plan, dated October 18, 2006. Mitigation Monitoring Reports shall be submitted by December 31st of each year and should not exceed 10 pages in length, including photos. As stated in the Mitigation and Monitoring Plan, if success criteria are not met, additional mitigation shall be implemented during the Construction Phase 2.

3. All avoidance, minimization, best management practices (BMPs) and mitigation measures outlined in Chapter 6 of the "Route 46 Corridor Improvement Project Environmental Assessment with Finding of No Significant Impact/Final Environmental Impact Report," (EA/FONSI/FEIR) dated May 2006, shall be implemented. Mitigation for each project phase shall be completed prior to the finish of construction of that phase. No phase will be authorized for construction prior to the completion of mitigation for the previous phase.

4. All temporary water diversion structures must be completely removed from Corps jurisdiction upon project completion.

5. Prior to the implementation of Phases 2, 3, and 4 of the project, CalTrans must confirm in writing to the Corps that any newly listed threatened or endangered species and designated critical habitat found in the project area are not impacted by project construction. If CalTrans determines that future phases of the project would impact such species and critical habitat, the Corps presumes the Federal Highway Administration will continue to serve as the federal lead agency for the purpose of initiating and concluding Section 7 consultation under the Endangered Species Act of 1973, as amended (16 U.S.C. § 1531 *et seq.*).

6. Prior to any permit authorization of Phases 2, 3 and 4, the Corps must receive the following information at least 6 months prior to the desired implementation date of each remaining project phase:

- Titled and dated Project Description and Plans that clearly outline impacts to jurisdictional features
- Mitigation and Monitoring Plan,
- Updated and verified wetland delineation, *if necessary**

The above material will be reviewed by the Corps. Prior to construction, CalTrans must obtain a letter from the Corps verifying that the subject phase can be implemented under the terms and conditions of this permit or a modification to this permit.

The current delineation map will expire* ***October 6, 2009*.

7. Prior to any permit authorization of Phase 4, CalTrans must attain a written concurrence from EPA and the Corps on the LEDPA for the Wye Section of the overall project.

FURTHER INFORMATION:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(X) Section 404 of the Clean Water Act (33 U.S.C. Section 1344).

2. Limits of this authorization:

a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability: In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision: This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate. (See Item 4 above.)

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 C.F.R. Section 325.7 or enforcement procedures such as those contained in 33 C.F.R. Sections 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 C.F.R. Section 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions: General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

John Lowery

(PERMITTEE)

5-7-07

(DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Jane M. Kiley

Craig W. Kiley
Lieutenant Colonel, U.S. Army
Commanding

5/10/07

(DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE)

(DATE)

PERMITS AND AGGREMENTS

US Department of the Interior Fish and Wildlife Service (Biological Opinion Document # P43727 (1-8-03-F-59), dated December 12, 2005)

ROUTE: 46-SLO-40.7/46.3(PM)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
PAS 681.731.927

December 12, 2005

Gene K. Fong, Division Administrator
Federal Highway Administration, California Division
650 Capitol Mall, Suite 4-100
Sacramento, California 95814

Subject: Biological Opinion for the State Route 46 Corridor Improvement Project, Post Mile 32.2 – 56.3, San Luis Obispo County, California (Document # P43727) (1-8-03-F-59)

Dear Mr. Fong:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological and conference opinion on the effects of the California Department of Transportation's (Caltrans) proposed State Route (SR) 46 Improvement Project on the federally endangered San Joaquin kit fox (*Vulpes macrotis mutica*), and the federally threatened California tiger salamander (*Ambystoma californiense*), and California red legged frog (*Rana aurora draytonii*), in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (16 U. S. C. 1531 *et seq*.).

The subject project would be funded by the Federal Highways Administration (FHWA) and would widen SR 46 from a two-lane conventional highway to a four-lane expressway. Your June 25, 2003, request for formal consultation was received on June 27, 2003.

CONSULTATION HISTORY

Your request for consultation included a determination that the proposed project would not affect on the California red-legged frog. You also determined the proposed project may affect the California tiger salamander and requested technical assistance regarding this species. Following discussions between biologists from Caltrans and our Office, we received your October 24, 2005, letter requesting formal consultation on the California red-legged frog and California tiger salamander.

On August 23, 2005, we designated critical habitat for the California tiger salamander, Central population, in four regions: Central Valley, Southern San Joaquin Valley, East Bay, and Central Coast (70 Federal Register [FR] 49380). However, the action described in this biological opinion is outside the boundary of critical habitat. Consequently, the proposed action would have no effect on critical habitat for this species.

The federally threatened vernal pool fairy shrimp (*Branchinecta lynchi*) also occurs in the vicinity of the proposed project. Critical habitat was designated on August 3, 2003 (68 FR 46684). FHWA has determined there would be no effect to vernal pool fairy shrimp because Caltrans has designed the new alignment of the highway to avoid both direct and indirect effects to this species and its critical habitat (Caltrans 2003a). Therefore, this biological opinion does not address the vernal pool fairy shrimp or its critical habitat.

This biological opinion is based on information that accompanied the request for consultation, subsequent discussions between our staffs, the scientific literature, a site visit on May 17, 2005, and information in our files. A complete administrative record of this consultation is on file at the Ventura Fish and Wildlife Office.

In addition to the action proposed in this biological opinion, Caltrans and FHWA plan to widen SR 46 to the east of the proposed project site. On March 10, 2005, we issued a biological opinion for the Highway 46 Improvement Project, Post Mile (PM) 55.1 to 60.9 (Service 2005), in which we concluded that project is not likely to jeopardize the continued existence of the San Joaquin kit fox or the California red-legged frog. On September 22, 2003, the Service's Sacramento Fish and Wildlife Office issued a biological opinion concluding the section of the SR 46 Improvement Project from PM 0.0 to PM 33.5, east of Interstate 5, is not likely to jeopardize the continued existence of the San Joaquin kit fox (Service 2003).

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

State Route 46, also known as the "Paso Robles Highway," is predominantly an east-west highway that spans from State Route 1 near Cambria in San Luis Obispo County eastward to State Route 99 near Famoso in Kern County. Truck traffic currently comprises nearly 20 percent of the average daily traffic volume between Highway 101 and Interstate 5. State Route 46 is heavily used on weekends as a corridor for vehicles traveling between the San Joaquin Valley and communities on the California central coast.

Caltrans proposes to convert a 24 mile section of SR 46, from two to four lanes, between Paso Robles and the interchange of SR 41 and SR 46 near Cholame. The interchange is known locally as the "Y". The eastern end of the proposed project would adjoin SR 46 at the Antelope Grade, which was included in our previous biological opinion (Service 2005).

The width of the median separating east and westbound traffic would vary between 61 feet and 46.3 feet. All public road intersections would be improved with left turn channels (lanes). The existing roadbed would be improved to meet current design standards for a four-lane expressway. Horizontal and vertical curves would be upgraded to meet the design speed of 80 miles per hour with the exception one 65 mile per hour horizontal curve just west of the Cholame Creek Bridge, in the Shandon section.

Caltrans and FHWA analyzed the proposed project in four sections and selected the least environmentally damaging practicable alternative (LEDPA), for each section, as their proposed action. In each section, the existing highway would be widened from two to four lanes. The following four sections make up the proposed action:

1. Estrella – Alternative 8N;
2. Shandon – Alternative 1;
3. Cholame – Alternative 1; and
4. Y – Alternative 8b (overflow variation).

The following is a summary of the proposed action. A complete description of the alternatives, including the LEDPA, can be found in Caltrans 2003b.

Estrella – Alternative 8N (PM 32.2 to 41.2)

The Estrella section would start at the western end of the SR 46 where it intersects with Airport Road. Caltrans would construct two new eastbound lanes south of the existing highway. The existing highway would be converted into two westbound lanes. This section of the project would include a 46.3-foot wide, vegetated median between PM 32.2 and 34.4. The vegetated median would minimize impacts to blue oak (*Quercus douglasii*) woodlands. A 1,148-foot segment of the existing roadbed, west of Estrella Road, would be restored with native vegetation. A new 778-foot bridge would be constructed across the Estrella River. The new bridge would be 62.3 feet higher and 516 feet longer than the existing bridge. Estrella Road would be re-routed under the new bridge. The new bridge would span the entire Estrella River Valley, including an extensive Freemont cottonwood (*Populus fremontii*) woodland, which occurs along the Estrella River.

Shandon – Alternative 1 (PM 41.2 to 50.2)

Two new lanes would be built in the Shandon section to improve the flow of traffic. The location of the new lanes, relative to the existing highway, would vary between the north and south sides of the existing highway. Between PM 46.0 and 46.8, the highway alignment would be shifted to the north to reduce impacts to Cholame creek. This section would include a 61.0-foot wide median along its entire 9 mile length.

Minor modifications to the access and circulation at the Shandon Safety Roadside Rest would be implemented. Additions to the rest area would include new right-turn and left-turn lanes and a paved median crossover. Several utilities including electric, gas, telephone, jet fuel, and oil would be relocated outside of the Caltrans right-of-way.

Cholame – Alternative 1 (PM 50.2 to 54.8)

This section would include the largest highway realignment of the proposed project, from PM 50.2 to 52.2. In this area Caltrans would construct four new traffic lanes and re-route SR 46 to the North, around the existing Tosco Oil pumping plant. The new alignment would rejoin the existing route at PM 52.2. Between this point and the end of the Cholame section, two new lanes would be constructed to make SR 46 a four lane expressway. From PM 52.2, the location of the two new lanes, relative to the existing highway, would vary between the north and south sides of the existing highway. Two new bridges would be built across Cholame Creek approximately 0.16 mile north of the existing Cholame Creek Bridge. The existing bridge would be removed. Several utilities including electrical, gas, jet fuel, and oil would be relocated outside of the Caltrans right-of-way.

Y – Alternative 8b (overflow variation - PM 54.8 to 56.3)

This section is located in the Cholame Valley, at the east end of the project, and includes the interchange of SR 46 and SR 41. The new design would realign the interchange to the north and west of its existing location. The new highway would then veer back to the south, across the Cholame Creek floodplain to meet up with the existing State Route 46 alignment near PM 56.3.

SR 41 would be relocated south of its alignment near PM 45.4, to connect with State Route 46 near PM 55.6. The existing State Route 41 roadway, between PM 43.9 and 44, would be removed and the land restored with native vegetation. The new eastbound and westbound lanes would be separated with a 61-foot median.

The existing Cholame Creek Bridge would be removed and replaced. The new Cholame Creek Bridge would be 394 feet long and between 13 and 20 feet above the floodplain at their lowest point and highest points, respectively. It would have two support piers approximately 120 feet apart.

A second bridge, the Cholame Creek Overflow/secondary wildlife crossing, would be built beginning at PM 55.6. The Cholame Creek Overflow/secondary wildlife crossing would be a single-span bridge, 131 feet long, nearly 15 feet above the ground, and would partially span the wetland complex on the Cholame Valley floor. These new bridges would be elevated above the Cholame Valley floor, and are designed to provide San Joaquin kit fox with a clear line of sight under the highway.

Construction of the SR 46 Improvement Project is scheduled to begin in 2007, with the Estrella section at the west end of the highway. The remaining sections would be completed from west to east and are scheduled for completion by 2013. Working hours for the proposed project have not been established. Caltrans anticipates typical road-building equipment would be used for this project including, but not limited to: bulldozers, pile drivers, steam rollers, concrete trucks, concrete pumps, hand compactors, gas compressors, pavers, pavement rollers, rippers, backhoes, chainsaws, and graders. Caltrans would put the project out for bid to the private sector for construction.

Minimization Measures

Caltrans has proposed the following measures to minimize adverse effects to the Joaquin kit fox:

1. The Service's recommendations for protection of San Joaquin kit fox prior to or during ground disturbance (Service 1997) have been incorporated into the project description.

2. A full time, qualified biologist will implement the Service's recommendations and other project related biological monitoring requirements.

3. Dry culverts, a minimum of 36" high, will cross all four lanes of traffic and will be located along the entire length of the proposed project every 0.3 mile based on recommendations in the literature (Cypher 2000). Culverts will not be placed at 0.3 mile intervals where drainage culverts or bridges greater than 36" high are already proposed.

4. Wire mesh drift fencing (<2 inch squares) will be used to funnel San Joaquin kit fox toward culvert openings. Drift fencing will extend out approximately 150 feet on either side of culvert openings.

5. Box culverts, 12 feet tall and 12 feet across, will be placed on both SR 46 and SR 41 east of the Y interchange to facilitate cattle drives. Additional 12-foot box culverts will be installed at known deer crossing points (PM 32.9, PM 34.1 (Dry Creek) and PM 37.7). San Joaquin kit fox may also use these additional undercrossings.

Caltrans proposes to purchase conservation easements to compensate for permanent impacts to San Joaquin kit fox habitat using the following ratios based on the CDFG San Joaquin kit fox habitat assessment form: 4:1 between PM 37.6 through the Cholame Valley; 3:1 between Airport Road and Jardine Road; and 2:1 between Jardine Road and PM 37.6. Up to 352 acres would be permanently impacted. Caltrans proposes to compensate for temporary impacts at a 1/3:1 ratio. Up to 283 acres of San Joaquin kit fox habitat would be temporarily impacted. Caltrans would purchase a total of approximately 1200 acres of off-site San Joaquin kit fox habitat at a CDFG-approved conservation bank within the corridor connecting the southern Salinas Valley to the Carrizo Plain. Two conservation banks are currently being developed by CDFG. Caltrans will evaluate both banks and will purchase credits at the bank which best suits the proposed project (D, Hacker pers. comm. 2005).

Caltrans will remove several acres of abandoned roadbed in each of the four sections, and restore these areas with native California grassland species, suitable for San Joaquin kit fox.

For every acre restored, Caltrans proposes to reduce the amount of their off-site compensation by one acre.

Caltrans will also construct artificial dens in the off-site conservation area or other areas approved by the Service and CDFG. The number of artificial dens will be based on the existing number of dens and the condition of the conservation site.

Caltrans has provided the following specific measures to minimize adverse effects to the California red-legged frog:

1. All earthwork within 270 feet of California red-legged frog aquatic habitat will be completed between May 1 and October 31.

2. A qualified biologist will conduct pre-construction surveys for California red-legged frogs within the project area within two days of initiation of project construction.

3. Any California red-legged frogs encountered will be reported to the Service immediately or as soon as practicable (i.e. the following business day if encountered at night). California red-legged frogs found in harm's way will be captured and relocated to appropriate habitat as determined after discussions with Service staff.

4. All new sightings of California red-legged frogs within project areas will be reported to the Service and the CNDDB.

5. Pre-construction meetings with the construction contractor and crew will be conducted to brief them on the potential presence of California red-legged frogs in the project area, and educate onsite workers in the identification and habitat requirements of California red-legged frogs, as well as the ramifications of take of listed species. The minimization measures outlined will also be discussed.

6. To the maximum extent practicable, contractors will avoid all project-related activities including road construction within 300 feet of all wetlands/water courses that provide suitable breeding and foraging habitat for the California red-legged frog.

7. Pesticide application will be avoided within 500 feet of all wetlands/water courses.

8. Bank slope protection placed on creek channel banks will be designed for erosion control by means of riparian function enhancement. Designs using native topsoil and native riparian local stock are preferred (biotechnology, logs, willow wattles, potted willows, "soft-tech" or low-tech dirt terracing, etc.).

9. Prior to the commencement of construction activities, Caltrans will coordinate with the CDFG to prepare a riparian vegetation replacement program for the project. Riparian vegetation removed as a result of the project will be replaced at a 3:1 ratio.

10. California native species (local stock preferred) will be utilized in re-vegetation and habitat enhancement efforts associated with the project.

11. Erosion control devices will be installed adjacent to work areas to control sedimentation and turbidity. Measures will be taken to control post-construction runoff and pollutant discharge.

12. Within 300 feet of potential California red-legged frog breeding habitat, only water will be used for dust abatement.

Caltrans has proposed the following measures to minimize adverse effects to the California tiger salamander:

1. All areas greater than 15 feet beyond the proposed cut/fill limits would be off limits to construction equipment.

2. Equipment and materials storage would be within the proposed median to the maximum extent practicable. If a median location is unavailable, then equipment and material storage areas would be selected in areas with no small mammal burrows or areas greater than 2200 feet from potential breeding pools.

STATUS OF THE SPECIES

San Joaquin Kit Fox

The San Joaquin kit fox was federally listed as endangered on March 11, 1967 (32 FR 4001), and state listed as threatened on June 27, 1971. Critical habitat has not been designated for this species. A recovery plan was published in 1983 (Service 1983). The San Joaquin kit fox recovery strategy was subsequently incorporated into an ecosystem-wide recovery plan for upland species of the San Joaquin valley (Service 1998).

Historically, San Joaquin kit foxes may have existed in a metapopulation structure of core and satellite populations, some of which may have periodically experienced local extinctions and recolonization (Service 1998). In the San Joaquin Valley before 1930, the San Joaquin kit fox was distributed within an 8,700-square mile range in central California from the vicinity of Tracy in the upper San Joaquin Valley south to the general vicinity of Bakersfield. Although the current range of San Joaquin kit fox now appears to be reduced by half of its historical range, the species still extends from Contra Costa County to the southern end of the Cuyama River watershed in Ventura, Santa Barbara, and southeastern San Luis Obispo counties, and east to the surrounding foothills of the Sierra Nevada.

Historically, the San Joaquin kit fox was associated with shrub, grassland, alkalai, and vernal pool plant communities native to the San Joaquin Valley (Service 1998). San Joaquin kit foxes also exhibit a capacity to utilize some habitats that have been altered by man, such as oil fields, grazed pasture land, and wind farms (Cypher 2000), the margins and fallow lands near irrigated row crops, orchards, and vineyards, and may forage occasionally in these agricultural areas (Service 1998). The San Joaquin kit fox seems to prefer more gentle terrain and decreases in abundance as terrain ruggedness increases (Grinnell et al. 1937; Morrell 1972).

Throughout their range, San Joaquin kit foxes are currently limited to remaining grassland, saltbush, open woodland, alkali sink valley floor habitats, and other similar habitats located along bordering foothills and adjacent valleys and plains. The largest extant populations of San Joaquin kit foxes are in the Elk Hills and the Buena Vista Naval Petroleum Reserve in Kern County, and the Carrizo Plain Natural Area in San Luis Obispo County (Service 1998).

No current population estimate exists for San Joaquin kit foxes. Prior to 1930, range-wide estimates between 8,667 and 12,134 were suggested (Service 1983). In 1975, 6,961 San Joaquin kit foxes were estimated from 14 counties (Service 1983). However, these estimates are unreliable as they were not based on direct counts of individuals, but instead were based on den counts or assumed San Joaquin kit fox densities combined with estimates of available habitat. Also, because natural popoulation fluctuations are observed among San Joaquin kit foxes, point estimates of population size may not be good indications of the overall status of the population. Subsequently, these estimates likely over estimated true abundance of San Joaquin kit fox (Cypher 2000).

The San Joaquin kit fox is a small canid, with an average body length of 20 inches and weighing about 5 pounds. They are lightly built, with long legs and large ears. Diet of San Joaquin kit foxes varies geographically, seasonally, and annually, based on variation in abundance of prey. San Joaquin kit foxes feed primarily on kangaroo rats (*Dipodomys*), California ground squirrels (*Spermophilus beechyi*), desert cottontails (*Sylvilagus audubonii*), black-tailed jackrabbits (*Lepus californicus*), and various rodents, insects, birds, and vegetation.

Kit foxes can breed at one year old, but may not breed their first year of adulthood (Morrell 1972). During September and October, adult females begin to clean and enlarge natal or pupping dens (Morrell 1972). Mating and conception take place between late December and March (Egoscue 1956, Morrell 1972, Zoellick et al. 1987*a*). Litters of from two to six pups are born sometime between February and late March (Egoscue 1962, Morrell 1972, Zoellick et al. 1987*a*).

Reproductive success of kit foxes is correlated with abundance of their prey (Egoscue 1975). Periods of prey scarcity, owing to drought or excessive precipitation, could contribute to episodes of low reproduction and population crashes. Conversely, when densities of prey increase in response to favorable precipitation levels, foxes may reproduce at their biotic potential and contribute to population explosions (White and Garrott 1999).

Female San Joaquin kit foxes are rarely seen hunting during the time they are lactating. During this period males provide most of the food for females and pups. The pups emerge above ground at slightly more than 1 month of age. After 4 to 5 months, usually in August or September, the young begin dispersing.

San Joaquin kit foxes maintain core home range areas that are exclusive to mated pairs and their offspring (White and Ralls 1993, Spiegel 1996). Home ranges of approximately 1 to 12 square miles have been reported (Morrell 1972, Knapp 1978, Zoellick et al. 1987*b*, Spiegel and Bradbury 1992, White and Ralls 1993). Individuals often move independently within their home range, traveling an average of 5.8 to 9.1 miles per night (Cypher 2000).

The territorial spacing behavior exhibited by San Joaquin kit fox eventually limits the number of individuals that can inhabit an area owing to shortages of available space and/or per capita prey (White and Garrott 1999). Hence, as habitat is fragmented or destroyed, the carrying capacity of a particular area is reduced and a larger proportion of the juvenile population is likely forced to disperse. Increased dispersal can lead to lower juvenile survival rates and possibly decreased abundance.

Approximately 65 percent of dispersing juvenile San Joaquin kit foxes on the Naval Petroleum Reserves, California, died within 10 days of leaving their natal range (Koopman et al. 2000). Juvenile San Joaquin kit foxes would likely be less familiar with the location of escape dens and, as a result, may be more susceptible to predation by coyotes. At higher San Joaquin kit fox densities, the number of juveniles that encounter coyotes probably increases. Also, a larger proportion of juveniles probably disperse as San Joaquin kit fox density increases because there is a shortage of available territories. Dispersing juveniles may be highly susceptible to predation by coyotes because they have little or no knowledge of the location of potential escape dens when traversing unfamiliar areas (White and Garrott 1999). Dispersal likely occurs most often at night.

An anual mortality rate of approximately 50 percent has been reported for adult San Joaquin kit foxes (Morrell 1972, Egoscue 1975, Berry et al. 1987*a*, Ralls and White 1995, Standley et al. 1992). The annual mortality rate for juvenile San Joaquin kit foxes may be closer to 70 percent (Berry et al. 1987*a*). Predation by larger carnivores, such as coyotes, accounts for the majority of San Joaquin kit fox mortality. The effects of disease, parasites and accidental death are largely unknown, but were thought to account for only a small portion of mortality (Berry et al. 1987*a*).

San Joaquin kit foxes use dens for temperature regulation, shelter from adverse environmental conditions, reproduction, and escape from predators. San Joaquin kit foxes may build their own dens or modify and use dens constructed by other animals, such as ground squirrels, badgers (*Taxidea taxus*), and coyotes (Jensen 1972, Morrell 1972, Hall 1983, Berry et al. 1987*b*), and human-made structures such as culverts, abandoned pipelines, and banks in sumps or roadbeds. However, there is no evidence to suggest San Joaquin kit foxes give birth in human structures (Spiegel et al. 1996). San Joaquin kit foxes often change dens and numerous dens may be used throughout the year. San Joaquin kit foxes change dens four or five times during the summer months, and change natal dens one or two times per month (Morrell 1972).

San Joaquin Kit foxes prefer loose-textured soils (Grinnell et al. 1937, Hall 1946, Egoscue 1962, Morrell 1972), but are found on virtually every soil type. Throughout their range, San Joaquin kit foxes are currently limited to remaining grassland, saltbush, open woodland, alkali sink valley floor, and other similar habitats located along bordering foothills and adjacent valleys and plains.

Dens appear to be scarce in areas with shallow soils because of the proximity to bedrock (OFarrell and Gilbertson 1979, OFarrell et al. 1980), high water tables (McCue et al. 1981), or impenetrable hardpan layers (Morrell 1972). In general, plant communities such as Northern Hardpan Vernal Pool, Northern Claypan Vernal Pool, Alkali Meadow, and Alkali Playa do not provide good denning habitat for San Joaquin kit foxes because all have moist or waterlogged clay or clay-like soils.

Although there are many causes of San Joaquin kit fox mortality (Service 1998) the principal factors that have contributed to the population decline are loss, degradation, and fragmentation of habitat associated with agricultural, industrial, and urban developments in the San Joaquin Valley (Laughrin 1970, Jensen 1972, Morrell 1975, Knapp 1978). By 1979, only about 6.7 percent of the San Joaquin Valley floor's original wildlands south of Stanislaus County remained untilled and undeveloped. Loss and degradation of habitat by agricultural and industrial developments and urbanization continue, decreasing carrying capacity of remaining habitat and threatening San Joaquin kit foxes through displacement, increased predation, direct mortalities such as vehicle strikes, and reduction of prey populations. Livestock grazing is not thought to be detrimental to San Joaquin kit foxes (Morrell 1975, Orloff et al. 1986), but may alter the numbers of different prey species, depending on the intensity of the grazing. Other developments within the range of the San Joaquin kit fox include cities and towns, aqueducts, irrigation canals, surface mining, road networks, non-petroleum industrial projects, power lines, and wind farms. Although these types of developments may negatively impact its habitat and indirectly lead to injury or mortality of individuals, the San Joaquin kit fox may survive within or adjacent to them given adequate prey base and den sites.

The coyote and the introduced red fox (*Vulpes vulpes*) compete for food resources with the smaller San Joaquin kit fox and are known to prey upon San Joaquin kit foxes as well. Predation, competition, poisoning, illegal shooting and trapping, prey reduction from rodent control programs, and vehicle strikes contribute substantially to the vulnerability of this species (Service 1998).

A primary strategy in the recovery plan is to establish and maintain a viable complex of San Joaquin kit fox populations (*i.e.*, a viable metapopulation) on private and public lands throughout its geographic range. The recovery plan (Service 1998) recommends protecting the Carrizo Plain Natural Area, western Kern County, and the Ciervo-Panoche Natural Area as core populations, maintaining multiple satellite populations, and enhancing natural connections between populations to help reduce the harmful effects of habitat loss and fragmentation. Recent observations suggest that the size of the Ciervo-Panoche Natural Area population may be more modest than previously thought, and this site may not support a core population of San Joaquin kit fox (B. Cypher, pers. comm 2005a).

In the northern most part of the range, west of the town of Tracy, the topography and structures (interstates, canals, aqueducts, etc.) form a triangle on maps. This area has been dubbed the "Tracy Triangle". The northern extent of this area includes the protected lands around Bethany Reservoir and the southern boundary is the county line shared by Stanislaus and San Joaquin Counties. The existing structures and natural topography in the area create a pinch point in the linkage area around the San Joaquin Valley edge (Service 1998). This area is under pressure by increasing development. Communities within Alameda, Contra Costa, and San Joaquin counties have expanded, in part, to low housing prices and to the growth in the Silicon Valley (Kit Fox Planning and Conservation Team 2001). In February 2001, the Service, San Joaquin County, and several cities signed the San Joaquin County Multi-species Habitat Conservation and Open Space Plan. A draft HCP/Natural Communities Conservation Plan (NCCP) for East Contra Costa County has been prepared and a notice of availability was published in the federal register on September 2, 2005 (70 FR 52434). This HCP/NCCP proposes to mitigate the effects of proposed urban development activities, rural infrastructure projects, and preserve management activities on San Joaquin kit foxes and other species, using a system of new preserves linked to existing protected areas.

The Santa Nella area, in Western Merced County, California, is another crucial area to the San Joaquin kit fox. In the past, this area has provided a narrow corridor connecting the northern and southern populations. This area is also considered a pinch point as surrounding development limits movement of San Joaquin kit fox and increases fragmentation of habitat. Further development may eliminate usable habitat in the Santa Nella area and further isolate the northern kit fox populations. Recently a notice of availability was published in the Federal Register regarding a HCP for the Santa Nella area (70 FR 6452). Habitat preservation associated with the HCP is intended to achieve the goal of protecting and maintaining habitat to facilitate population interchange between the core population to the south and northern kit fox populations.

Information regarding movement patterns in northeast San Luis Obispo County and southeast Monterey County is limited. Three occurrences of San Joaquin kit fox movement have been documented between Salinas-Pajaro Region and the Carrizo Plain Natural Area and the area east of Paso Robles. In 1989, a San Joaquin kit fox tagged at Camp Roberts military installation, along the Monterey/San Luis Obispo County line, was captured in the town of California Valley at the northern end of the Carrizo Plain (Standley 1989). In 2000, two San Joaquin kit foxes moved from Camp Roberts to areas south of SR 46, in the San Juan Valley, San Luis Obispo County (R. Root pers. comm. 2005a).

In June 2001, a San Joaquin kit fox was observed on the west side of Cholame Road, approximately 3 miles north of SR 46 (R. Stafford 2001). Recently, a 10 month old female San Joaquin kit fox was found dead on highway 58 near San Juan Creek, several miles northwest of the Carrizo Plain (B. Cypher pers. comm. 2005b).

Larger than average numbers of San Joaquin kit fox observed on the Carrizo Plain in 2005 (R. Stafford, pers. comm. 2005) may result in increased competition for food and space, leading to increased dispersal to places like the San Juan Creek drainage and areas south of Shandon and Cholame (where two kit foxes that dispersed from Camp Roberts were trapped and collared in 2000), as well as along the Estrella River corridor north to San Miguel, Camp Roberts, King City, and the rest of the Salinas Valley. The role that natural connections between the Salinas Valley and the Carrizo Plain Natural Area may play in maintaining the vigor and ensuring the survival of the metapopulation is complex and yet to be characterized.

Although the extent of movement of San Joaquin kit foxes between the Salinas Valley and the Carrizo Plain Natural Area is unknown, land development along the natural movement corridors between these areas may have contributed to reduced immigration of San Joaquin kit foxes into the Salinas Valley. The number of San Joaquin kit foxes captured at Camp Roberts during annual live-trapping decreased from 103 to 20 from 1988 to 1991. This trend continued through 1997 when only 3 San Joaquin kit foxes were captured. Scent station visits and observations of San Joaquin kit foxes during spotlighting sessions also decreased. Low numbers of previously unmarked young-of-the-year or immigrant San Joaquin kit foxes suggests that recruitment into the Camp Roberts population was low (White et al. 2000).

The cause of the population decline at Camp Roberts has been attributed to a combination of factors including predation by coyotes; displacement by red foxes, rabies and low recruitment (White et. al 2000). Prey abundance did not appear to be a primary factor in the decreased population. Mammalian prey species never appeared to be sufficiently scarce to drastically reduce reproductive or neonatal survival rates (White and Garrott 1997). There is also little evidence that military activities contributed substantially to the decrease in abundance of San Joaquin kit foxes (White et al. 2000). Currently, few San Joaquin kit fox are believed to occur at Camp Roberts. In the northern Salinas Valley, CDFG is working through their Resource Assessment Program to begin evaluating the status of San Joaquin kit fox in San Benito and Monterey Counties (R. Root, pers.comm. 2005b).

In contrast to the Camp Roberts population, the San Joaquin kit fox population at the Carrizo Plain Natural Area reached a record high by the mid-1990s. Even though numbers decreased slightly again in 1997 and 1998, the population is within normal bounds and is considered to be stable. The abundance of San Joaquin kit foxes at the Carrizo Plain Natural Area appears tied closely to the abundance of their prey species, kangaroo rats and lagomorphs (R. Stafford, pers. comm. 2005). During the summer of 2005, a new record number of San Joaquin kit foxes were sighted on the Carrizo Plain. CDFG observed 119 foxes on two combined spotlighting routes, surpassing the previous high of 85 in 1996. CDFB estimated the typical number of San Joaquin kit foxes observed at the Carrizo Plain during the summer is around 60 (R. Stafford, pers. comm. 2005).

A recent survey effort conducted during the spring of 2005 revealed 29 sightings of San Joaquin kit fox in western Kern County and eastern San Luis Obispo County near the Palo Prieto area. Two individuals were also seen along South Bitterwater Valley Road (J. Moonjian, pers. comm).

Population trends in each of the core areas are not clear. Based on CDFG surveys and recent observations in the Lokern area (western Kern County), San Joaquin kit fox numbers appear relatively high. Numbers on the Carrizo and in western Kern County fluctuate with environmental conditions, but these two populations tend to remain fairly robust. In large part, this is attributable to the fact that habitat quality for San Joaquin kit foxes in these two areas is the highest of anywhere in the range (B. Cypher, pers. comm. 2005b).

California Red-legged Frog

On May 23, 1996, the Service published a final rule to list the California red-legged frog as threatened (61 FR 25813). The Service has published a recovery plan for the species (Service 2002). Critical habitat for the California red-legged frog was designated on March 13, 2001 (66 FR 14625). On November 6, 2002, the United States District Court for the District of Columbia set aside the designation and ordered the Service to publish a new final rule with respect to the designation of critical habitat for the California red-legged frog *(Home Builders Association of Northern California et al. versus Gale A Norton, Secretary of the Department of Interior et al.* Civil Action No. 01-1291 (RJL) U.S. District Court, District of Columbia.). We proposed a revised critical habitat designation April 13, 2004 (69 *FR* 19620). On November 3, 2005, we re-proposed critical habitat based on more refined mapping (70 FR 66906). Detailed information on the biology of California red-legged frogs can be found in Storer (1925), Stebbins (1985), and Jennings et al. (1992).

The California red-legged frog is one of two subspecies of the red-legged frog (*Rana aurora*) found on the Pacific coast. The historical range of the California red-legged frog extended from the vicinity of Point Reyes National Seashore, Marin County, California, coastally and from the vicinity of Redding, Shasta County, California, inland southward to northwestern Baja California, Mexico.

The California red-legged frog has been extirpated or nearly extirpated from 70 percent of its former range. At present, California red-legged frogs are known to occur in approximately 243 streams or drainages from 22 counties, primarily in central coastal California. Habitat loss and alteration, combined with over-exploitation and introduction of exotic predators, were important factors in the decline of the California red-legged frog in the early to mid 1900s. Ongoing threats include fragmentation, degradation, loss of habitat and establishment of non-native vegetation and predators as a result of urbanization and agricultural activities.

The California red-legged frog occupies habitat that combines both specific aquatic and riparian components. The adults are typically found in dense, shrubby or emergent riparian vegetation closely associated with deep (more than two feet in depth) still or slowly moving water. They breed and migrate from November through March and into spring depending on rainfall, although earlier breeding has been recorded in the southern part of their range. Female California red-legged frogs deposit egg masses on emergent vegetation, floating on the surface of the water. Egg masses contain about 2,000 to 5,000 moderate-sized (0.08 to 0.11 inch in diameter), dark reddish-brown eggs. Eggs hatch in 6 to 14 days. Tadpoles undergo metamorphosis 3.5 to 7 months after hatching. California red-legged frogs normally reach sexual maturity at 3 to 4 years of age. Individuals may live 8 to 10 years.

Juvenile and adult California red-legged frogs have been observed in areas of riparian vegetation where they may use small mammal burrows, moist litter, and debris such as old boards for cover. Radio telemetry studies showed that individual California red-legged frogs move within the riparian zone from vegetated areas to pools. During wet periods (particularly winter and spring), California red-legged frogs may move long distances between aquatic habitats, often traveling through habitats considered to be unsuitable. California red-legged frogs have been found more than one mile from breeding habitat and may reach isolated aquatic habitats up to a mile away from the nearest known California red-legged frog populations.

The diet of California red-legged frogs is highly variable. Tadpoles probably eat algae. Invertebrates are the most common food item for adults. Vertebrates, such as Pacific chorus frogs (*Pseudacris regilla*) and California mice (*Peromyscus californicus*), represented over half of the prey mass eaten by larger individuals. Juveniles are active diurnally and nocturnally, whereas adults are largely nocturnal. Feeding activity probably occurs along the shoreline and on the surface of the water.

Habitat loss and alteration, combined with over-exploitation and introduction of exotic predators, were important factors in the decline of the California red-legged frog in the early to mid-1900s. Habitat loss and degradation continue to threaten California red-legged frogs where agriculture and urbanization are found within their range. Road maintenance projects, off-road vehicle use, and livestock grazing contribute to erosion of stream banks and siltation of streams where California red-legged frog eggs can be smothered. Siltation that occurs during the breeding season can lead to asphyxiation of eggs resulting in small California red-legged frog larvae. Exotic predators like the bullfrog (*Rana catesbeiana*), catfish (*Ictalurus* spp.), bass (*Micropterus* spp.), mosquito fish (*Gambusia affinis*), red swamp crayfish (*Procambarus clarkii*), and signal crayfish (*Pacifastacus leniusculus*) were introduced in the 1800s to 1900s, and prey on at least one life stage of the California red-legged frog. Raccoons (*Procyon lotor*) are known to depress California red-legged frog populations and are often associated with rural developments. The most important mortality factor in the pre-hatching stage is water salinity. On the central California coast, drought may also play a role in decreased reproduction where California red-legged frogs occur in coastal lagoons. High salinity in lagoons can be attributed to drought in many instances.

California Tiger Salamander

On August 4, 2004, we listed the California tiger salamander, Central population, as threatened (69 FR 47212). The California tiger salamander is recognized as a species of special concern by the CDFG. The species persists in disjunct remnant vernal pool and isolated ponds scattered mainly along narrow strips of rangeland on each side of the Central Valley from southern Colusa County south to northern Kern County, and in sag ponds and human-maintained stock ponds in the coast ranges from Suisun Bay south to the Temblor Range. Populations of California tiger salamanders located in Sonoma and Santa Barbara counties are federally listed as endangered.

The California tiger salamander has been eliminated from an estimated 55 to 58 percent of its historic breeding sites and has lost an estimated 75 percent of its upland and dispersal habitat. Although there are approximately 150 known local populations of California tiger salamanders, only the populations at Jepson Prairie Natural Preserve and Hickson Preserve occur in a permanently protected conservation area.

The California tiger salamander is a large, stocky, terrestrial salamander with a broad, rounded snout. Adults may reach a total length of 8.2 inches, with males generally averaging about 8 inches and females averaging 6.8 inches. For both sexes, the average snout–vent length is approximately 3.6 inches. The small eyes have black irises and protrude from the head. Coloration consists of white or pale yellow spots or bars on a black background on the back and sides and a yellow belly. Males can be distinguished from females, especially during the breeding season, by their swollen cloacae (a common chamber into which the intestinal, urinary, and reproductive canals discharge), more developed tail fins, and larger overall size (Stebbins 1962; Loredo and Van Vuren 1996).

The California tiger salamander inhabits low elevation vernal pools and seasonal ponds and associated grassland, oak savannah, and coastal scrub plant communities. Although California tiger salamanders are adapted to natural vernal pools and ponds, they now frequently use manmade or modified ephemeral and permanent ponds, including stock ponds. California tiger salamanders prefer open grassland to areas of continuous woody vegetation.

California tiger salamanders spend the majority of their lives in upland habitats. The upland component typically consists of grassland savannah, but also can consist of grasslands with scattered oak trees, and scrub and chaparral habitats. Juvenile and adult California tiger salamanders spend the dry summer and fall months in the burrows of California ground squirrels and Botta's pocket gopher (*Thomomys bottae*). California tiger salamanders cannot dig their own burrows, and as a result their presence is associated with active burrows of small mammals such as ground squirrels and pocket gophers.

The California tiger salamander was first described as a distinct species, *Ambystoma californiense*, by Gray in 1853 from specimens collected in Monterey (Grinnell and Camp 1917). Storer (1925) and Bishop (1943) likewise considered the California tiger salamander to be a distinct species. However, Gehlbach (1967) and Frost (1985) classified the California tiger salamander as a subspecies (*Ambystoma tigrinum californiense*) within the *A. tigrinum* complex. Based on recent morphological and genetic work, evidence of geographic isolation, and ecological differences among the members of the *A. tigrinum* complex, the California tiger salamander is currently considered to be a distinct species (Shaffer and Stanley 1991; Jones 1993; Shaffer and McKnight 1996; Irschick and Shaffer 1997) and was recognized as such in an Annual Notice of Review published by the Service on November 21, 1991 (56 FR 58804).

The most comprehensive analysis of the California tiger salamander's taxonomic status currently available is based on an examination of mitochondrial DNA (mtDNA) sampled from the entire tiger salamander complex, including all 14 currently recognized species and five additional subspecies from across the U.S. and Mexico (Shaffer and McKnight 1996). This study recognized the California tiger salamander as a distinct species and found that it was the sister-species to the remaining 13 species in the tiger salamander complex. Other published and ongoing studies of allozymes (Shaffer et al. 1993), nuclear gene sequences (Shaffer et al. 2004) and morphology (Krauss 1988) concur that *A. californiense* is a well-differentiated taxon that is most appropriately recognized as a full species. The recent literature has uniformly accepted this position (Petranka 1998).

Although California tiger salamanders spend most of their lives in upland habitats, their reproduction is tied to aquatic habitats. Historically, they bred primarily in natural vernal pools, but they have been able to breed successfully in human-made stock ponds created for ranching and agricultural purposes. Migrations to and from breeding ponds occur during the rainy season (November to May), with the greatest activity from December to February (Storer 1925; Loredo and Van Vuren 1996; Trenham et al. 2000). Breeding migrations are strongly associated with rainfall events (Loredo and Van Vuren 1996; Trenham et al. 2000). Breeding may occur in one major bout or during a prolonged period of several months, depending on the rainfall pattern (Loredo and Van Vuren 1996; Trenham et al. 2000).

Female California tiger salamanders mate and lay their eggs singly or in small groups (Twitty 1941; Shaffer et al. 1993). The number of eggs laid by a single female ranges from approximately 400 to 1,300 per breeding season (Trenham et al. 2000). The eggs are typically attached to vegetation near the edge of the breeding pond (Storer 1925; Twitty 1941), but in ponds with limited or no vegetation, they may be attached to objects (rocks, boards, etc.) on the bottom of the pond (Jennings and Hayes 1994). After breeding, adults leave the pond and return to small mammal burrows (Loredo et al. 1996; Trenham 2001), although they may continue to come out nightly for approximately the next two weeks to feed (Shaffer et al. 1993).

Lifetime reproductive success for other tiger salamanders is typically low, with fewer than 30 metamorphic juveniles per breeding female. Trenham et al. (2000) found even lower numbers for California tiger salamanders, with roughly 12 lifetime metamorphic offspring per breeding female. In part, this low reproductive success is due to the extended time it takes for

California tiger salamanders to reach sexual maturity: most do not breed until 4 or 5 years of age. While individuals may survive for more than 10 years, fewer than 50 percent breed more than once (Trenham et al. 2000). Combined with low survivorship of metamorphosed individuals (in some populations, less than 5 percent of marked juveniles survive to become breeding adults (Trenham et al. 2000), reproductive output in most years is not sufficient to maintain populations. This trend suggests that the species requires occasional "boom" breeding events to prevent extirpation (temporary or permanent loss of the species from a particular habitat) or extinction (Trenham et al. 2000). With such low recruitment, isolated subpopulations can decline greatly as a result of unusual, randomly occurring natural events and human-caused factors that reduce breeding success and individual survival.

Movements made by California tiger salamanders can be grouped into two main categories: (1) breeding migration; and (2) interpond dispersal. Breeding migration is the movement of salamanders to and from a pond from the surrounding upland habitat. After metamorphosis, juveniles move away from breeding ponds into the surrounding uplands, where they live continuously for several years (on average, 4 years). Upon reaching sexual maturity, most individuals return to their natal/birth pond to breed, while 20 percent disperse to other ponds (Trenham et al. 2001). Following breeding, adult California tiger salamanders return to upland habitats, where they may live for one or more years before breeding again (Trenham et al. 2000).

California tiger salamanders are known to travel large distances from breeding ponds into upland habitats. Maximum distances moved are generally difficult to establish for any species, but California tiger salamanders have been recorded to disperse 1.3 mile from breeding ponds (S. Sweet in litt. 1998). California tiger salamanders are known to travel between breeding ponds; one study found that 20 to 25 percent of the individuals captured at one pond were recaptured later at ponds approximately 1,900 and 2,200 feet away (Trenham et al. 2001).

Although the observations above show that California tiger salamanders can travel far, typically they stay closer to breeding ponds. Evidence suggests that juvenile California tiger salamanders disperse further into upland habitats than adults. A trapping study conducted in Solano County during winter 2002–03 found that juveniles used upland habitats further from breeding ponds than adults (Trenham and Shaffer 2005). More juvenile salamanders were captured at distances of 328, 656, and 1,312 feet from a breeding pond than at 164 feet. Large numbers (approximately 20 percent of total captures) were found 1,312 feet from a breeding pond.

Results from a 2003–04 trapping efforts detected juvenile California tiger salamanders at even further distances, with a large proportion of the total salamanders caught at 2,297 feet from the breeding pond. Surprisingly, most juveniles captured, even those at 2,297 feet were still moving away from ponds (B. Fitzpatrick pers. comm. 2004). These data show that many California tiger salamanders travel far while still in the juvenile stage. Post-breeding movements away from breeding ponds by adults appear to be much smaller. During post-breeding emigration, radio-equipped adult California tiger salamanders were tracked to burrows between 62 and 813 feet from their breeding ponds (Trenham 2001). These reduced movements may be due to adult California tiger salamanders having depleted physical reserves post breeding, or also due to the drier weather conditions that can occur during the period when adults leave the ponds.

The spatial distribution of California tiger salamanders in the uplands surrounding breeding ponds is a key issue for conservation planning. Although it might be supposed that California tiger salamanders will move only short distances if abundant burrows are found near their ponds, this is not the case. In the aforementioned study in Solano County, while abundant burrows are available near the pond, a nearly equal number of California tiger salamanders were captured at 328, 656, and 1,312 feet from the breeding pond (Trenham and Shaffer 2005). Similarly, Trenham (2001) tracked salamanders to burrows up to 813 feet from a breeding pond, although burrows were abundant at distances nearer to the pond. In addition, rather than staying in a single burrow, most individuals used several successive burrows at increasing distances from the pond.

Generally, the rate of natural California tiger salamander movement both within a subpopulation (i.e., between breeding and upland sites) and among subpopulations (i.e., between individual pools or pool complexes) depends on the distance between these habitats and the conditions within intervening areas (e.g., topography, vegetation, distribution of small mammal burrows, etc.). Dispersal distance is also closely tied to precipitation, as California tiger salamanders are known to travel farther in years with more rainfall.

The primary cause of the decline of the California tiger salamanders is the loss, degradation, and fragmentation of habitat from human activities. Several other factors, including competition from introduced species and predation, may have negative effects on California tiger salamanders and their aquatic and upland habitats. Non-native or introduced predators of California tiger salamanders include bullfrogs (*Rana catesbeiana*), mosquitofish (*Gambusia affinis*), Louisiana red swamp crayfish (*Procambarus clarki*), catfish (*Ictalurus* sp.), bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), fathead minnow (*Pimephales promelas*) and other introduced fish (Shaffer et al. 1993, Graf 1993; Gamradt and Kats 1996, Anderson 1968, Morey and Guinn 1992).

Various nonnative subspecies of the tiger salamander within the *Ambystoma tigrinum* complex have been imported into California for use as fish bait. The introduced salamanders may out-compete the California tiger salamanders. A deformity-causing infection, possibly caused by a parasite in the presence of other factors, has affected pond-breeding amphibians at known California tiger salamander breeding sites. This same infection has become widespread among amphibian populations in Minnesota and poses the threat of becoming widespread in California.

Reduction of ground squirrel populations to low levels through widespread rodent control programs may reduce availability of burrows and adversely affect the California tiger salamander. Poison typically used on ground squirrels is likely to have a disproportionately adverse effect on California tiger salamanders, which are smaller than the target species and have permeable skins. Use of pesticides, such as methoprene, in mosquito abatement may have an indirect adverse effect on the California tiger salamander by reducing the availability of prey. Automobiles and off-road vehicles can kill a significant number of migrating California tiger salamanders, and contaminated runoff from roads, highways and agriculture may adversely affect them.

ENVIRONMENTAL BASELINE

The implementing regulations for section 7(a)(2) of the Act define the "action area" as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 *Code of Federal Regulations* 402.02). For the purposes of this biological opinion, we consider the action area to be the 24 mile length of the widening project and extending outward perpendicular to the road to varying widths. The extent of the boundary of the affected area varies based on topography, wind and water movement, habitat suitability, and the biology of the species evaluated (Forman 2003). We are not able to determine the precise area that would be affected, based on the information Caltrans has provided us for this project. For example, in the absence of site-specific surveys for San Joaquin kit fox it is impossible to know what project-related effects would affect San Joaquin kit fox at specific locations and how far reaching those effects would occur. After review of the scientific literature (Trombulak and Frissell 2000, Forman and Alexander 1998, Forman 2003, Bulger et al. 2003, Sweet in litt. 1998)) and the information provided by FHWA and Caltrans, we assume that an area extending out 1.5 mile on each side of the proposed project likely encompasses the direct and indirect effects of the action on the San Joaquin kit fox, California red-legged frog and California tiger salamander. The discussion in the Effects of the Action section of this biological opinion will explain how these effects radiate out from the project area.

San Joaquin Kit Fox

The San Joaquin kit fox is known to have historically occupied grassland and blue oak woodlands along the entire length SR 46 (Caltrans 2003a). San Joaquin kit foxes have been documented within the action area, although not in high numbers. In 1999, one adult was recorded in the action area, near the east end of the proposed project, about 0.2 mile southeast of the SR 41/46 interchange (Smallwood 1999). Near the west end of the proposed project, one San Joaquin kit fox was documented in the vicinity of Barney Schwartz Park in Paso Robles in 1991 (Caltrans 2003a.). A lack of focused surveys for San Joaquin kit fox may explain why there are few documented occurrences within the action area.

Within the last decade much of the suitable habitat between Paso Robles and Shandon (about two-thirds of the entire project length) has been converted to vineyards or other development. However, San Joaquin kit fox can still move through the action area, dispersing from nearby populations. The proposed project is located within two important movement corridors.

Lands along SR 46, between Blackwell's Corner and Paso Robles, provide connectivity between the Salinas River Valley and Antelope Plain-Blackwell's Corner satellite populations. Lands in the San Juan Creek Valley, between the northern Carrizo Plain and Shandon, provide connectivity between the Carrizo Plain population and the Salinas River Valley and Antelope Plain-Blackwell's Corner satellite populations (Cypher 2000). A recent effort to model potential movement corridors using land use, parcel size, known San Joaquin kit fox occurrences, habitat suitability, and development pressure, consistently assumed a likely movement corridor that broadly intersects SR 46 between Shandon and the Cholame Valley (McElwee 2005). Most of the Cholame Valley is non-tilled rangeland that includes the best and most un-fragmented habitat in the action area. This area contains extensive undeveloped grasslands containing a variety of badger dens and other dens that could be used by San Joaquin kit fox, as well as a variety of prey species for San Joaquin kit fox (Caltrans 2003).

Although movement of San Joaquin kit foxes across SR 46 has been documented (Standley 1989, R. Root, pers. comm. 2005a) it has not been examined extensively. Only limited studies of marked individuals have been conducted on the populations to the north and south of SR 46 (i.e. Camp Roberts and Carrizo Plain). Consequently, the significance of this area to the structure and success of the metapopulation remains unknown.

California Red-legged Frog

A creek that crosses SR 41 at PM 45.5, within the Y section, is intermittent, but contains six permanent pools along a 1,476-foot stream reach. Surveys were not conducted because the property is on private land. These pools are suitable breeding habitat for California red-legged frogs and are approximately 1 mile downstream of a permanent water source where Caltrans found one California red-legged frog during surveys for the Antelope Grade section of SR 46 (Caltrans 2003c). Two additional permanent ponds also considered in our previous biological opinion (Service 2005) are located several hundred feet south of the SR 46 and approximately 1.2 miles east of the proposed interchange of SR 41 and SR 46. Caltrans biologists documented approximately 100 hundred adult and 100 juvenile frogs in these ponds and identified the ponds as breeding sites (Caltrans 2003c). These ponds have the potential to produce thousands of metamorph and juvenile California red-legged frogs.

Two other annual streams cross under SR 46 at PM 56.3 and 57.4. These streams flow from the south side of SR 46 northward under SR 46 via a box culvert where they eventually empty into a flood basin at the SR 41/46 interchange. No California red-legged frogs were found in these streams during the course of surveys.

California tiger salamander

Although surveys for California tiger salamanders have not been conducted in the action area, Caltrans and the Service believe it is reasonable to assume California tiger salamanders are present due to the presence of suitable upland and breeding habitat. Five ponds (Cholame

Ponds) occur at varying distances, between 0.5 mile and 1.7 miles, from the proposed project site (Caltrans 2003a). The nearest known California tiger salamander breeding ponds are Kerr Lake, 3.45 miles north of the project site, and O' Brien Lake, 3.3 miles south of the project site. Additional un-surveyed ponds occur between the known breeding sites and the Cholame Ponds nearest the project site (Caltrans 2003a).

Although the distances between the known and un-surveyed ponds are beyond the maximum known dispersal distance of 1.3 miles, there are apparently no barriers that would preclude dispersal between the known breeding sites, the un-surveyed ponds, and the Cholame Ponds. California tiger salamanders occur in sag ponds and vernal pools created by the San Andeas fault, from the temblor range in San Luis Obispo County, north to Santa Cruz County (Caltrans 2003). We surmise that additional ponds or wetland complexes may have occurred within the San Andreas rift zone at some point in the past, possibly contributing to California tiger salamander dispersal.

Because the Cholame Ponds appear to be suitable breeding habitat (Caltrans 2003), occupied ponds and additional un-surveyed ponds occur to the north and south of the Cholame Ponds, and there are no known dispersal barriers, Caltrans and the Service assume California tiger salamanders are present in the action area.

EFFECTS OF THE ACTION

San Joaquin Kit Fox

The proposed project would result in the permanent loss of approximately 352 acres, and temporary impacts to 283 acres of San Joaquin kit fox habitat, along the 24 mile length of the project site. Caltrans determined all undeveloped land in the study area of the proposed project is potential foraging and or denning habitat for the San Joaquin kit fox (Caltrans 2003). San Joaquin kit fox foraging or denning within the construction footprint of the proposed project will be permanently displaced during and following construction.

Resident San Joaquin kit foxes or individuals moving through the action area may use existing dens and project components (i.e. pipes) for shelter. San Joaquin kit foxes that are dispersing through the action area are likely to be moving through at night and would likely be sheltering in dens during the day (Koopman et al. 2000). San Joaquin kit foxes that are present in the action area during the proposed project may be injured or killed by construction activities. Injury or mortality of San Joaquin kit foxes may occur if they are trapped or crushed in dens by heavy equipment, or inadvertently trapped in open trenches, uncapped pipes, or culverts.

Caltrans has included measures in their project description in order to minimize the potential for San Joaquin kit foxes to be trapped or crushed during construction. These minimization measures include but are not limited to:

a. Covering trenches at the close of each working day;

b. Providing escape ramps in trenches and excavations;

c. Placing caps on pipes with diameters of 4 inches or greater;

d. Conducting pre-construction surveys and construction monitoring, using Service-approved biologists, to reduce the chance that an occupied San Joaquin kit fox den would be subject to excavation, grading, or construction activity;

e. All construction pipe, culverts, or similar structures with a diameter of three inches or greater that are stored at a construction site for one or more nights will be thoroughly inspected for San Joaquin kit foxes before the pipe is subsequently moved, buried, or capped. If during inspection a San Joaquin kit fox is found inside a pipe, Caltrans will not move that section of pipe until the animal escapes or they will move the section of pipe once, out of the immediate construction area.

Construction related traffic could result in vehicles striking San Joaquin kit foxes. Because San Joaquin kit foxes are likely to be active at night, and may be moving around or through the action area, there is a greater chance they could be struck by construction traffic if construction also occurs at night. Death of adult San Joaquin kit foxes during the breeding season (November-January) could result in reduced reproductive success, and death of females during gestation or prior to pup weaning could result in loss of an entire litter of young, and therefore, reduced recruitment into the population (Cypher 2000). Caltrans proposes to provide project employees with training and written guidance governing vehicle use when traveling within the project area, and to strongly encourage a speed limit of 20 miles per hour on unpaved roads within San Joaquin kit fox habitat.

Protective actions may disrupt normal movement patterns and displace San Joaquin kit fox making them more susceptible to predation. For instance, Caltrans proposes to excavate and destroy potential and known dens if they can not be avoided during construction. A San Joaquin kit fox may be more susceptible to predation or subject to temperature extremes, after being removed from an excavated den.

San Joaquin kit foxes may be injured or killed if exposed to hazardous materials, such as spilled or leaking fuels, antifreeze, and herbicides and rodenticides used for the control of weeds and rodents. Caltrans has proposed to restrict the use of rodenticides and herbicides to Service and CDFG approved plans, we anticipate a low potential for injury or mortality associated with the hazardous materials described in this biological opinion.

Project-related garbage may attract San Joaquin kit foxes and predators such as coyotes, red fox, and pet or feral dogs and cats to the project area. To minimize the potential for San Joaquin kit foxes and predators to be attracted to the project site, Caltrans proposes to keep all food-related trash items in closed containers and to remove food-related trash at least once per week. Caltrans will also ban pets from the construction area, and provide a worker awareness training program.

Because the proposed project would be completed in four sections, over approximately 10 years, construction would not occur along the entire length of the project at the same time. Consequently, San Joaquin kit fox would not be exposed to direct adverse effects, such as construction vehicle strikes, entombment, crushing, etc., along the entire 24-mile length of the project at the same time, but would be subject to these stressors during each separate phase of the project. Two sections (Estrella, Shandon) are each approximately 10 miles long while the other two sections (Cholame, Y) are each approximately two miles long.

The proposed widening of SR 46 from two to four lanes, as well as an increase in the speed limit from 55 to 70 miles per hour, may result in increased injury or mortality of San Joaquin kit fox due to the potential for more frequent vehicle strikes. The number of strikes likely increases with road size, traffic volume, and average speed (Clevenger and Waltho 1999).

The proposed project will likely contribute to a reduction in landscape connectivity and increased habitat fragmentation. Landscape connectivity may be important for animals foraging within their home range, for dispersal to establish a new home range, and for migration between locations. When landscape connectivity is high, animals are able to re-populate areas that have suffered local population declines and extirpations, and minimize the effects of inbreeding (Forman 2003, Cypher 2000). Movement and dispersal corridors are important for alleviating over-crowding and intraspecific competition during years when San Joaquin kit fox abundance is high. Roads may reduce the suitability of habitat for San Joaquin kit foxes by fragmenting it into areas to small for effective use. As habitat areas decrease in size the number of San Joaquin kit foxes the area can support also decrease (Cypher 2000).

The likelihood of a road acting as barrier increases with a larger road size, higher traffic volume, and the presence of fences or median barriers. Knapp (1978) monitored movements of radio-collared San Joaquin kit foxes in the vicinity of Interstate 5 in Kern County. Many of the San Joaquin kit foxes used areas within 3 kilometers of the highway, and most exhibited movement and home range patterns that parallel the highway, but did not cross it. Only on 2 occasions were animals located on the opposite side of the highway from their primary area of use. Interstate 5 has altered kit fox space use patterns, and effectively restricted movements by San Joaquin kit foxes (Cypher 2000).

The fragmentation of habitat associated with the proposed SR 46 widening could also eventually lead to reduced genetic variation in populations of San Joaquin kit foxes. Genetically isolated populations are at greater risk of deleterious genetic effects such as inbreeding, genetic drift, and founder effects (Cypher 2000). An increase in inbreeding and the loss of genetic variation could increase the extinction risk for small, isolated populations of kit foxes by interacting with demography to reduce fecundity, juvenile survival, and lifespan (Lande 1988, Frankham and Ralls 1998, Saccheri et al. 1998).

The effects from roads may extend some distance beyond the footprint of the road. Foreman and Deblinger (1998) described this affected area as the "road-effect" zone, where a variety of statistically significant adverse effects (e.g. mortality, habitat degradation, fragmentation, disturbance, environmental contaminants, etc.) can occur. The lateral extent of the road-effect zone is asymmetrical and is determined by variables such as topography, vegetation, traffic volume, animal locomotion, wind, or groundwater movement. Effects that extend farther from the road surface normally define the margin of the road-effect zone (e.g. human-access disturbances, spread of exotic species, blocking of wildlife movement routes). Road-effects typically transmit farther into grassland ecosystems than forests (Foreman 2003). The presence of a road-effect zone in the action area is already likely adversely affecting San Joaquin kit fox as a result of the existing highway. As the footprint of the highway is increased, the road-effect zone, and associated adverse effects, would also increase.

Determining exactly how, and when, a road will affect a wildlife population is difficult to determine. Variables such as loss of habitat, decreased landscape connectivity, disease, predation, and vehicle strikes may all contribute to variations in wildlife populations over time. For example, the effect of a road as a barrier to dispersal would likely take several generations to be observed and would also depend on the time interval between local extinctions in a species' regional population (Forman 2003). Consequently, at this time we are unable to determine the extent to which the proposed project may affect San Joaquin kit fox dispersal. However, we assume that an increase in traffic volume and average vehicle speed associated with a four lane expressway would make it increasingly more difficult for San Joaquin kit fox to disperse across SR 46.

Additionally, potential increased residential and commercial, and industrial development that is likely to occur along the highway over time would likely exacerbate the barrier effect of the road corridor. A reduction in dispersal is likely to negatively affect San Joaquin kit fox population in a variety of ways as described above. Development associated with road construction is particularly common where roads intersect, such as the intersection of Interstate 5 and Highway 99 (Cypher 2000). Habitat loss, fragmentation, and the reduction or elimination of movement corridors are likely the most severe effects to San Joaquin kit foxes (Cypher 2000). If San Joaquin kit fox populations in the Southern Salinas Valley, or other areas near the action area increase, or more information regarding the structure of the metapopulation becomes available, effects of the project may be greater than as analyzed in this biological opinion.

Caltrans and FHWA have included multiple measures intended to minimize the adverse effects of the proposed project on San Joaquin kit fox, and to facilitate movement of San Joaquin kit fox across the highway. Caltrans has proposed to construct large (61-foot wide) medians, to eliminate the need for solid median barriers as a traffic safety feature. Wide grassy medians between north and southbound traffic lanes may provide a safe opportunity for animals to rest while trying to cross traffic lanes. The elimination of solid median barriers should also increase the potential for San Joaquin kit fox to successfully cross SR 46 within the action area as these structures can be formidable obstacles to movement for most wildlife (Foreman 2003).

Caltrans has also incorporated the installation of dry culverts into their project description, for the specific purpose of facilitating movement of San Joaquin kit fox across under the highway. Caltrans recruited expert advice (Cypher 2000) regarding the frequency and size of culverts that would likely maximize use by San Joaquin kit fox.
Caltrans also funded a field study, initiated in 2005, to evaluate the use of existing highway crossing structures by San Joaquin kit foxes and desert kit foxes on 4 lane highways in natural land environments. Caltrans will incorporate the results of the study into the proposed project design.

In addition to wildlife culverts, Caltrans has also proposed to increase the size and number of bridges in the Y section, to facilitate movement of San Joaquin kit fox and other wildlife across the highway. These new bridges would be 394 feet long and 130 feet long, and elevated to a heights ranging from 13 and 19 feet above the valley floor, providing San Joaquin kit foxes with a clear line of sight under the highway and improving the crossing potential for San Joaquin kit foxes in this area.

Caltrans proposes to provide approximately 1200 acres of conservation lands off-site at a CDFG-approved conservation bank within the corridor connecting the southern Salinas Valley to the Carrizo Plain San Joaquin kit fox core population. With this minimization measure, Caltrans would attempt to enhance movement corridors, link natural lands, and protect habitat for San Joaquin kit foxes.

California Red-legged Frog

Construction would not affect any of the known California red-legged frog breeding sites in the action area. However, surface water quality of aquatic habitat, adjacent to the highway, may be temporarily degraded as a result of project construction. Aquatic habitat may also be adversely affected by highway runoff during winter rains. However, the new highway alignment would be buffered from perennial aquatic habitat by distances ranging from 131 to 164 feet, minimizing the potential for highway runoff to reach the aquatic habitat. Project-related releases of sediments from areas cleared of vegetation during construction or of contaminants, such as fuels and oils, from construction equipment into the riparian area or water may negatively affect the quality of habitat for California red-legged frogs by killing native plants used for resting or foraging and by decreasing availability of prey. Released contaminants may also adversely affect or kill California red-legged frogs. Such effects would be reduced or eliminated by the use of erosion control devices, and measures taken to control post-construction runoff and pollutant discharge.

If Caltrans limits construction to the dry season, it does not anticipate direct adverse effects to California red-legged frogs during construction because they do not expect individuals to move away from permanent water sources during the dry season (May 1 through October 31).

However, because Caltrans does not expect to complete the Y section for approximately 8-10 years, and they have not finalized the work schedule to limit the proposed construction to the dry season, construction may occur during winter rainy seasons when California red-legged frogs are likely to be migrating or dispersing through the action area.

Bulger et al. (2003) found that less than 25 percent of an adult California red-legged frog population in Santa Cruz County, California, migrated away from breeding sites during the winter. These authors also noted that migration is spread out over time and does not occur as a synchronous en mass event, and that the density of California red-legged frogs migrating through uplands is usually very low (Bulger et al. 2003).

The dispersal of metamorph and juvenile California red-legged frogs has not been well documented. However, California red-legged frogs are believed to disperse widely the first 6 to 8 months after metamorphosis and through the winter. Once they reach the juvenile stage (approximately 1 year old) they will remain in aquatic habitat (either breeding or summer) until breeding age (approximately 2 to 3 years old). If they did not disperse to suitable breeding habitat as metamorphs, California red-legged frogs will migrate to suitable breeding habitat when they reach breeding age. Some adults may return to summer habitat after breeding (N. Scott pers. comm. 2005).

Although there are large numbers of California red-legged frogs in the action area, the highest known densities are found in ponds approximately 1.2 mile southeast of the proposed SR 41/46 interchange. We anticipate few adult California red-legged frogs will migrate this far from permanent water sources in the arid climate of northeast San Luis Obispo County. Given the number of California red-legged frogs present in the action area, and the distances of the aquatic habitat from the construction area, we anticipate that fewer than 25 adults may migrate from the breeding ponds during the winter rainy months. However, hundreds of metamorphs may disperse through the action area. Migrating or dispersing California red-legged frogs may be struck and killed by vehicle traffic and construction traffic.

California red-legged frogs could be injured or killed if they are improperly handled or contained during capture and relocation efforts if they are found in construction areas. Caltrans would reduce the chances of incidental injury by using only Service-approved biologists to capture and move California red-legged frogs.

Chytrid fungus (*Batrachochytrium dendrobatidis*) could be spread if infected California red-legged frogs are relocated and introduced into areas with healthy California red-legged frogs or vice-versa. Chytrid fungus is a water-borne fungus that can be spread through direct contact between aquatic animals and by a spore that can move short distances through the water. The fungus only attacks the parts of a frog's skin that have keratin (thickened skin), such as the mouthparts of tadpoles and the tougher parts of adults' skin, such as the toes. The fungus can decimate amphibian populations, causing fungal dermatitis, which usually results in death in 1 to 2 weeks. Infected animals may spread the fungal spores to other ponds and streams before they die. Once a pond has become infected with chytrid fungus, the fungus stays in the water for an undetermined amount of time. It is possible that during the relocation of California red-legged frogs proposed by the applicant that infected individuals or equipment could introduce Chytrid fungus into areas where it did not previously occur. If this occurs, many California red-legged frogs could be affected.

California red-legged frogs have strong homing tendencies (Rathbun and Schneider 2001). As a result, relocated individuals may be at risk of injury or death through predation or dehydration during an attempt to return to a work area from which they had been moved. This risk may increase with the distance of the relocation site from the work area. However, if individuals are moved far enough they are more likely to remain at the relocation site. (Rathbun and Schneider 2001).

California red-legged frogs may be killed or injured from inadvertent trampling by workers from foot traffic and operation of construction equipment during the construction of the highway improvement project. Such effects to California red-legged frogs would be reduced by Caltrans' proposed measures to hold pre-construction meetings with the contractor and crew to brief them on the potential presence of California red-legged frogs in the project area, educate onsite workers in the identification and habitat requirements of California red-legged frogs and ramifications of take of listed species, and discuss minimization measures.

Predation of California red-legged frogs may increase in the project vicinity with the attraction of predators, such as raccoons (*Procyon lotor*), pet and feral dogs (*Canis familiaris*) and cats (*Felis domesticus*), to the work area by food-related trash. Such effects would be reduced by Caltrans' protective measures to manage trash properly and ban pets from the construction area. Additionally, increased exposure to predation and desiccation could occur with the disruption of normal foraging and sheltering behavior by construction noise and activity. Such effects would be minimized by the following measures: pre-construction surveys using Service approved biologists within two days prior to initiation of project construction, properly containing and removing trash; conducting awareness training sessions for workers; and relocating California red-legged frogs, if any are found in harm's way, prior to the start of construction activities.

California tiger salamander

California tiger salamanders dispersing from ponds within the action area are subject to mortality or injury from vehicle strikes and construction activities associated with the proposed project, particularly if work is conducted during the wet season (November to May). Adult migrations to and from breeding ponds occur during the wet season, with the greatest activity from December to February. Because we lack any population data from the ponds within the action area, we are unable to quantify the amount of California tiger salamanders that may disperse into the construction area or attempt to cross the highway following construction. However, based on Trenham's (2001) method for calculating dispersal probabilities, Caltrans (2005) estimated that of the four ponds within the action area, 3.23 percent of one potential breeding population, and less than one percent of each three additional potential breeding populations are likely to disperse far enough to be adversely affected by construction.

California tiger salamanders may also be crushed if they are present in small mammal burrows within the construction footprint of the proposed project. All small mammal burrows, in the construction footprint of the new traffic lanes, would be destroyed during grading and ground compaction that is part of the road building process. California tiger salamanders may also become trapped in construction trenches where they are subject to predation and desiccation.

The new bridges proposed by Caltrans would be built directly between the two nearest known breeding populations as well as between the two nearest potential breeding pools. The bridges would span a 394-foot wide corridor in the area that is most likely to be used by California tiger salamanders. An additional 131-foot long bridge may also facilitate movement of California tiger salamanders under the highway. The creation of these large under-crossings would enhance a likely movement corridor and may facilitate movement of California tiger salamanders under the highway, and result in fewer vehicle strikes.

California tiger salamanders could be injured or killed if they are improperly handled or contained during capture and relocation efforts if they are found in construction areas. Caltrans would reduce the chances of incidental injury by using only Service-approved biologists to capture and move California tiger salamanders. Handling California tiger salamanders or introducing equipment into their breeding ponds can also result in the spread of chytrid fungus, a pathogen linked to declines in amphibians. The first case of chytrid fungus in California tiger salamanders was reported in 2005 (Padgett-Flohr and Longcore 2005).

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Caltrans has recognized the completion of the SR 46 Improvement Project may result in future increased road mortality of San Joaquin kit fox. Consequently, Caltrans has proposed to work cooperatively with the Service to attempt to remedy any increased future mortality of San Joaquin kit foxes on SR 46 following completion of the proposed project (Luchetta, pers. comm. 2005).

In April 2004, the San Luis Obispo County Board of Supervisors voted to update the Community Plan for Shandon (Community Plan). Shandon is a small, primarily agricultural community, located approximately 20 miles east of Paso Robles and adjacent to SR 46. It has a population of approximately 1000 residents within a 380-acre Urban Reserve line.

The Community Plan will include but not be limited to future population, housing development, land use, traffic, infrastructure, and economic development alternatives (County 2005). The study area will include the area within the Urban Reserve line and approximately 1620 additional acres surrounding the community. Expansion of Shandon beyond the existing Urban Reserve line will likely encroach into San Joaquin kit fox habitat, and may adversely affect the population through increased loss of habitat and a reduction or loss of movement corridors. The area between Shandon and the Cholame Valley has been identified as some of the best remaining San Joaquin kit fox habitat in the action area and a likely movement corridor (McElwee 2005). Open space areas, incorporated into the Community Plan Update, which provide connectivity to the north and south of SR 46, would likely benefit the San Joaquin kit fox.

CONCLUSION

After reviewing the current status of the San Joaquin kit fox, California red-legged frog, and California tiger salamander, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the State Route 46 Improvement Project for PM 32.2 to PM 56.3, is not likely to jeopardize the continued existence of these species for the following reasons:

San Joaquin kit fox

1. Caltrans and FHWA have proposed to install numerous wildlife under-crossings along the entire 24 mile length of the project, to facilitate movement of San Joaquin kit foxes across SR 46.

2. Within the Cholame Valley, Caltrans has proposed to use large bridges to facilitate connectivity and potentially improve crossing opportunities for San Joaquin kit foxes in an important movement corridor.

3. Caltrans has proposed to use the best and most updated science available, to design and implement wildlife under-crossings for San Joaquin kit fox.

4. Caltrans will conserve approximately 1200 acres of San Joaquin kit fox habitat determined by the Service, CDFG, and species experts to be important to dispersal.

5. Caltrans has proposed to work with the Service to attempt to remedy any increased future road mortality that occurs following completion of the proposed project.

6. Because the proposed project would be completed in four phases, and the final phase (the Y section) will not be completed until approximately 2013, we will have an opportunity to monitor the effectiveness of the proposed minimization measures, and to determine if additional protective measures are necessary.

7. In addition to wildlife under-crossings, FHWA and Caltrans will implement numerous other measures to minimize adverse effects to San Joaquin kit fox during construction.

California red-legged frog

8. Known breeding locations in the action area would not be affected by the proposed project.

9. Caltrans would minimize adverse effects to aquatic habitat for the California red-legged frog through implementation of erosion control methods and other best management practices.

10. Elevating the highway in the Y section will likely reduce any existing road mortality in this area, and may result in an improved crossing situation when compared to the existing two lane highway.

California tiger salamander

11. No California tiger salamander breeding habitat would be affected by the project.

12. Elevating the highway in the Y section will likely reduce any existing road mortality in this area and may increase the potential for dispersal north and south of SR 46.

13. Only a small amount of upland habitat would be adversely affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and FHWA must make them binding conditions of any grant or permit issued to Caltrans, as appropriate, for the exemption in section 7(o)(2) to apply. FHWA has a continuing duty to regulate the activity covered by this incidental take statement. If FHWA fails to require Caltrans to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, FHWA must report the progress of the action and its impact on the California red-legged frog, California tiger salamander, and the San Joaquin kit fox to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

The amount of incidental take of San Joaquin kit foxes that may occur during construction is difficult to quantify because there is a lack of information on occurrences of and movement patterns of San Joaquin kit foxes in the action area. Estimating the number of individuals that are subject to harassment is not possible, given the unknown number of San Joaquin kit foxes that may occur in the action area at any given time. However, based on the information in the Status of the Species and Environmental Baseline sections of this biological opinion, we expect few San Joaquin kit fox to be subject to harassment as a result of direct project related effects.

It will be difficult to find injured or dead California red-legged frogs and California tiger salmanders due to their small size and because the large earth moving equipment that would be used during the project would likely destroy any evidence of dead or injured individuals. For these reasons and because there are a large number of California red-legged frogs, in the action area, we are unable to determine the exact number of California red-legged frogs that will be incidentally taken in the form of injury or mortality. However, based upon the information described in this biological opinion, we anticipate that less than 25 percent of the adult California red-legged frogs in the action area would be subject to injury or mortality. An unknown number of metamorph and juvenile California red-legged frogs could be killed or injured by project activities. Although we cannot predict how many individuals may be in the construction footprint at a given time, we anticipate that all California red-legged frogs found in harm's way will be incidentally taken in the form of harassment during capture and relocation efforts.

We are also unable to determine the number of California tiger salamanders that may be incidentally taken because we have no occurrence data from the action area. Caltrans and the Service assume California tiger salamanders are present in the action area based on the presence of suitable breeding habitat and existing land use practices. However, based on Trenham's (2001) method for calculating dispersal probabilities, we estimate that 3.23 percent of one potential breeding population, and less than one percent of each three additional potential breeding populations, in the action area, are likely to disperse far enough to be adversely affected by project activities. Consequently, these calculations suggest that the number of California tiger salamanders that may be incidentally taken are extremely low.

This biological opinion does not exempt any activity from the prohibitions against take contained in section 9 of the Act that is not incidental to the action as described in this biological opinion. Take that occurs outside of demarcated work areas or from any activity not described in this biological opinion is not exempted from the prohibitions against take described in section 9 of the Act.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of California red-legged frogs, California tiger salamanders and San Joaquin kit foxes:

1. Caltrans and FHWA must reduce the potential for injury or mortality of San Joaquin kit foxes, California red-legged frogs, and California tiger salamanders as a result of construction activities and vehicle traffic.

2. Only personnel authorized under this biological opinion may implement those avoidance and minimization measures, included in this biological opinion, which require biological expertise and experience with San Joaquin kit fox, California red-legged frogs, and California tiger salamanders.

3. Biologists who handle California red-legged frogs and California tiger salamanders must ensure that their activities do not transmit diseases

The Service's evaluation of the effects of the proposed action includes consideration of the minimization measures proposed by Caltrans and included in the description of the proposed action section of this biological opinion. Any subsequent changes to these measures may constitute a modification of the proposed action and may warrant re-initiation of formal consultation, as specified at 50 CFR 402.16. These reasonable and prudent measures are intended to supplement the protective measures that were proposed by Caltrans as part of the proposed action.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, FHWA must ensure that Caltrans complies with the following terms and conditions, which implement the reasonable and prudent measures described above and outlined in the reporting and monitoring requirements. These terms and conditions are non-discretionary.

1. The following terms and conditions implement reasonable and prudent measure 1:

   a. If a San Joaquin kit fox is found injured or killed as a result of the activities described in this biological opinion, FHWA or Caltrans must contact our office immediately so we can review the project activities to determine if additional protective measures are needed. Project activities may continue during this review period, provided that all protective measures proposed by Caltrans and the terms and conditions of this biological opinion have been and continue to be implemented.

b. Prior to the completion of the first phase of the project, Caltrans must provide our office with a draft plan to monitor the wildlife undercrossings associated with the proposed project. Following our review, a final monitoring plan must be completed within one year.

c. Caltrans must implement the final monitoring plan during the project, to determine if their protective measures are effective in reducing San Joaquin kit fox mortality.

d. If more than 10 adult California red-legged frogs or 25 metamorphs are found injured or killed due to project activities in any calendar year, Caltrans must contact our office immediately so we can review the project activities to determine if additional protective measures are needed. Project activities may continue during this review period, provided that all protective measures proposed by FHWA and Caltrans and the terms and conditions of this biological opinion have been and continue to be implemented.

e. FHWA or Caltrans must immediately report any sighting of live California tiger salamanders within the action area to the VFWO.

f. Any live California tiger salamanders found within the construction footprint of the proposed project must be relocated out of harm's way.

g. If a California tiger salamander is found injured or killed, Caltrans must contact our office immediately (or the following day if found at night) so we can review the project activities to determine if additional protective measures are needed. Project activities may continue during this review period, provided that all protective measures proposed by FHWA and Caltrans and the terms and conditions of this biological opinion have been and continue to be implemented.

h. Caltrans must enforce a maximum speed limit of 20 miles per hour on unpaved roads within the action area of this project.

i. Caltrans must ensure that project related vehicles do not leak anti-freeze or other hazardous materials.

j. Caltrans must not place fences that act as barriers to movement of California red-legged frogs, within or along the boundary of the project site.

k. A qualified biologist, approved by the service, must be on-site: 1) when construction occurs on rainy nights; 2) when project activities would occur within

100 feet of aquatic California red-legged frog habitat; and 3) for 72 hours following the sighting of a San Joaquin kit fox in the action area. The biologist must be given the authority to stop any work that may result in the take of San Joaquin kit foxes, California red-legged frogs, or California tiger salamanders. If the biologist(s) exercises this authority, the Service must be notified by telephone and electronic mail within one (1) working day.

2. The following terms and conditions implement reasonable and prudent measure 2:

   a. At least 30 days prior to the onset of project activities, the project proponent must submit the name(s) and credentials of the biologist(s) who would conduct activities for the San Joaquin kit fox, California red-legged frog, and California tiger salamander, as specified in this biological opinion. Project activities must not begin until Caltrans has received our written approval of the biologist(s) they intend to use.

   b. Before initiating project activities, the Service-approved biologist must identify appropriate areas to relocate California red-legged frogs and California tiger salamanders found in the construction area. These areas must be near the potential capture site or another site approved by the Service, must support suitable vegetation (as appropriate for the species) and be free of exotic predatory species (e.g., bullfrogs).

   c. If captured, California red-legged frogs and California tiger salamanders must be placed in moist cloth bags or plastic buckets and kept shaded and moist until they are released at the new site. The relocation process must be implemented as quickly as possible.

3. The following term and condition implements reasonable and prudent measure 3:

   To avoid transferring disease or pathogens between aquatic habitats during the course of surveys and handling of California red-legged frogs and California tiger salamanders, the Service-approved biologist shall follow the Declining Amphibian Population Task Force's Code of Practice. A copy of this Code of Practice is enclosed. A bleach solution (0.5 to 1.0 cup of bleach to 1.0 gallon of water) may be substituted for the ethanol solution. Care must be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat.

REPORTING REQUIREMENTS

FHWA or Caltrans must provide an annual written report to the Service by January 31, each year of the project. The report must discuss activities for the previous calendar year and include a table summarizing California red-legged frog, California tiger salamander, and San Joaquin kit fox sightings and any take that occurs. The report must document the number of

California red-legged frogs and California tiger salamanders, if any, relocated from the project area, the date and time of capture, specific location of capture, approximate size and age of individuals, and a description of relocation sites. The report must also include the number of California red-legged frogs and California tiger salamanders killed or injured, if any, and the date(s) such incidental take occurred. The report must document any observations of San Joaquin kit fox in the action area, the number of any San Joaquin kit foxes harassed, injured or killed, and the date(s) such incidental take occurred. The report must contain a discussion of the activities conducted, results of the wildlife undercrossing monitoring, any problems encountered in implementing terms and conditions, and any recommendations for improving the protective measures. This document will assist the Service and FHWA in evaluating future measures for the conservation of the California red-legged frog, California tiger salamander, and the San Joaquin kit fox.

DISPOSITION OF INJURED OR DEAD SPECIMENS

Upon locating a dead or injured California red-legged frog, California tiger salamander, or San Joaquin kit fox, you must notify the Service's Division of Law Enforcement in writing (370 Amapola Avenue, Suite 114, Torrance California 90501) and the Ventura Fish and Wildlife Office by telephone (805/644-1766) and in writing (2493 Portola Road, Suite B, Ventura, California 93003). The report must include the date, time, and location of the carcass, a photograph, cause of death, if known, and any other pertinent information.

Care must be taken in handling dead specimens to preserve biological material in the best possible state for later analysis. Should any injured California red-legged frog, California tiger salamander, or San Joaquin kit fox survive, the Service must be contacted regarding their final disposition. The remains of California red-legged frogs and California tiger salamanders must be placed with the California Academy of Sciences Herpetology Department (contact: Jens Vindum, Collections Manager, California Academy of Sciences Herpetology Department, Golden Gate Park, San Francisco, California 94118, telephone 415/750-7037); or Santa Barbara Natural History Museum (contact: Paul Collins, Santa Barbara Natural History Museum, Vertebrate Zoology Department, 2559 Puesta Del Sol, Santa Barbara, California 93105, telephone 805/682-4711 ext. 321).

Any San Joaquin kit fox found dead shall be provided to CDFG unless agreements have been made with CDFG to the contrary. Notification must be made to Bob Stafford, wildlife biologist, at (805) 528-8670.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. We recommend the following:

1. FHWA and Caltrans should fund and participate in a study of San Joaquin kit movements between the Salinas River Valley, Carrizo plain, and Antelope Plain-Blackwell's Corner.

2. The FHWA and Caltrans should involve the Service in long-range planning so its projects are designed and implemented in a manner that meets the conservation needs of the California red-legged frog, California tiger salamander, and San Joaquin kit fox.

3. The FHWA and Caltrans should ensure that material hauled to project sites for fill is free of weedy exotic species.

4. Caltrans should conduct surveys for California tiger salamanders in the action area of this biological opinion.

The Service requests notification of the implementation of any conservation recommendations so we may be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats.

REINITIATION NOTICE

This concludes formal consultation on the proposed construction of the State Route 46 Improvement Project, PM 32.2 to 56.3. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions regarding this matter, please contact Steve Kirkland of my staff at (805) 644-1766, extension 267.

Sincerely,

Steve Henry
Assistant Field Supervisor
San Luis Obispo/Northern Santa Barbara

Enclosure

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PERMITS AND AGGREMENTS

California Department of Fish and Game Incidental Take Permit (ITP No. 2081-2007-020-04)

ROUTE: 46-SLO-40.7/46.3(PM)

California Natural Resources Agency
DEPARTMENT OF FISH AND GAME
Central Region
1234 East Shaw Avenue
Fresno, California 93710
http://www.dfg.ca.gov

ARNOLD SCHWARZENEGGER, *Governor*
DONALD KOCH, *Director*

March 13, 2009

Chuck Cesena
Branch Chief
California Department of Transportation
50 Higuera Street
San Luis Obispo, California 93401

Subject: Incidental Take Permit No. 2081-2007-020-04
State Route 46 Corridor Improvement Project
San Luis Obispo County

Dear Mr. Cesena:

After multiple conversations with Cecilia Boudreau and Jennifer Moonjian, we understand that Caltrans has some concerns with the clarity of the language in the Incidental Take Permit (ITP) No. 2081-2007-020-04 for State Route 46 Corridor Improvement Project in San Luis Obispo County. Caltrans and Department of Fish and Game (DFG) staff have discussed the issues, but due to the extended duration of Project implementation and the ITP, Caltrans requested written clarification for the file on the intent of some of the ITP language to avoid any possibility of it being interpreted differently in the future.

The ITP (Page 5) states:

> *"Permittee commits to perform a protocol-level survey within the construction boundary for each phase of the Project as designated above in Table 2. DFG's Approved Survey Methodology for blunt-nosed leopard lizard is included with this ITP as Attachment 1."* This applies to all portions of the Project area within suitable blunt-nosed leopard lizard (BNLL) habitat, and not necessarily all portions of the Project footprint. If guidance is needed on what constitutes suitable BNLL habitat, prior to each Project phase, the Designated Biologist should evaluate the habitat for BNLL suitability and submit the findings to the DFG ITP contact. If there is no potential BNLL habitat present within a particular Project phase footprint then protocol-level BNLL surveys would not be warranted.

Also on Page 5, the ITP states:

> *"Permittee commits to conduct a survey for giant kangaroo rat a maximum of 30 days prior to initiating ground- or vegetation-disturbing activities in the Cholame Valley between PM 50.2 and PM 54.8. These surveys shall be conducted by a biologist, approved by DFG, with knowledge of and experience in the biology and natural history of the giant kangaroo rat. The biologist approved by DFG to conduct the survey shall hold or acquire prior to the survey a scientific collecting permit from DFG for giant kangaroo rat. Permittee commits to immediately notify DFG if the survey conducted by the approved biologist prior to any ground- or vegetation- disturbing activities associated with Phase 4 of the Project identifies any potential signs of giant kangaroo rat, including*

burrows, scat, or tail drag marks." For clarification, a scientific collecting permit would only be required if small mammal trapping (capture) were necessary to determine what species of kangaroo rats are present if burrows, scat, tail drags, or other typical kangaroo rat sign found during the initial visual surveys are inconclusive as to species identification.

On Page 9, under Provision 5.4, the ITP states:

"Monthly Report: The Designated Biologist shall be on-site daily while construction and/or surface-disturbing activities are taking place to minimize take of the Covered Species; to ensure compliance with all mitigation and avoidance measures; to check all exclusion zones; and to ensure that signs, stakes, and fencing are intact, and that human activities are restricted to outside of these protective zones. Weekly compliance inspections shall be conducted after clearing, grubbing, and grading are completed..." For clarification, the Designated Biologist does not need to be on-site daily for the entire construction of the Project. The Designated Biologist should be on-site full-time for the duration of any initial surface-disturbing activities (clearing, grubbing, and grading) at whatever point in time they occur, which would be expected at the beginning of each phase. Once the initial surface-disturbing activities are completed, as it states in the last line above, the Designated Biologist needs to check in at least once a week to ensure compliance with all mitigation and avoidance measures.

On page 10, under Provision 5.8, the ITP states:

"Restoration of Project lands where temporary impacts occur shall be monitored and the status of the restoration included in the Annual Reports beginning after completion of Phase I of the Project. Restoration of all areas subject to temporary ground- or vegetation disturbance shall be recontoured, as necessary, covered with stockpiled top-soil, and seeded with native species. Monitoring for 2 years post-construction of each Phase shall insure that noxious weeds do not become dominant in the restored area and that native species found in the vicinity are successfully reintroduced. If the temporary impact lands have not returned to pre-Project conditions two years after completion of each Phase, additional mitigation and an amendment to this ITP might be required." Caltrans has concerns about there being an insufficient quantity of quality top-soil and that some areas may need compost to aid in restoration. Provided that the compost is one that is guaranteed as "weed free" as possible, the addition of compost to aid in restoration is acceptable. If pre-Project conditions include non-native grasses (*Bromus*, etc.) these would not be expected to be prevented from returning to the site. The monitoring is expected to prevent invasive weeds from becoming established as a result of Project-related disturbance. Attached is a list of noxious weeds that would need to be addressed.

On Page 13, under 6.8 the ITP states:

> *"All open holes and trenches within the Project construction boundary shall be inspected at the beginning of the day, middle of the day, and end of the day for trapped animals. To prevent inadvertent entrapment of Covered Species or any other animals during the construction phase of the Project, all excavated, steep-walled holes or trenches more than 2 feet deep shall be covered at the close of each working day by plywood or similar materials or provided with one or more escape ramps constructed of earth fill or wooden planks..."* Caltrans had some questions regarding the necessity for the frequency and timing of these checks. On any given day, in the areas where work is occurring, the trenches need to be checked three times a day. The reason for the mid-day check is if the work crews stop work for lunch, then the trenches need to be rechecked before work resumes. This is a "take" avoidance and minimization measure; depending on weather conditions, without a midday check, entrapped wildlife may not survive entrapment between the morning and the end of the work day. This check can be performed by trained construction staff and should be covered in the worker education program. At the end of the work day escape ramps need to be put in place at reasonable intervals to allow animals to climb out on their own. For trenches in areas where no work will occur on a particular day, the escape ramps should be left in place. If an area is not going to be worked on for multiple days, there should be a daily check to make sure the ramps are in place and functioning (no trapped wildlife). Alternatively, if no work is done in an area for an extended period of time, earthen ramps may be put into the trenches with a suitable slope to ensure that any animal that could potentially fall in the trench could get out. Trenches with earthen ramps would still need to be checked at least once a week to be sure they are functioning.

If you have any further questions, or concerns, please contact Laura Peterson-Diaz, Environmental Scientist, at the address provided on this letterhead, by e-mail at lpdiaz@dfg.ca.gov, or by telephone at (559) 243-4017, extension 225.

Sincerely,

Jeffrey R. Single, Ph.D.
Regional Manager

Attachment

ec: Jennifer Deleon
Department of Fish and Game
Habitat Conservation and Planning Branch

Laura Peterson-Diaz,
Department of Fish and Game
Central Region

Invasive Plants in San Luis Obispo County:

- Artichoke Thistle – Cynara cardunculus
- Arundo or Giant Reed – Arundo donax
- Barb Goatgrass – Aegilops triuncial
- Cape Ivy – Delairea odorata
- French Broom – Genista monspessulana
- Hoary Cress – Cardaria spp.
- Jubatagrass – Cortaderia jubata
- Medusahead – Taeniatherum caput-medusae
- Oblong Spurge – Euphorbia oblongata
- Pampasgrass – Cortaderia selloana
- Perennial Pepperweed – Lepidium latifolium
- Purple Starthistle – Centaurea calcitrapa
- Spanish Broom – Spartium junceum
- Tree of Heaven – Ailanthus altissima
- Veldt Grass – Ehrharta calycina
- Wooly Distaff Thistle – Carthamus lanatus
- Yellow Starthistle – Centaurea solstitialis
- Bull Thistle - Cirsium vulgare
- Castor Bean - Ricinis communis
- European Beachgrass - Ammophila arenaria
- Ice Plant - Carpobrotus edulis
- Italian Thistle - Carduus pycnocephalus
- Periwinkle - Vinca major
- Poison Hemlock - Conium maculatum
- Puncture Vine - Tribulus terrestris
- Russian Knapweed - Acroptilon repens
- Russian Thistle - Salsola tragus
- Saltcedar/Tamarisk - Tamarix species
- Skeleton Weed - Chondrilla juncea
- Tocalote - Centaurea melitensis
- Wild Fennel - Foeniculum vulgare
- White Horsenettle/Silverleaf Nightshade - Solanum elaeagnifolium

California Department of Fish and Game
Central Region
1234 East Shaw Avenue
Fresno, California 93710

California Endangered Species Act
Incidental Take Permit No. 2081-2007-020-04

CALIFORNIA DEPARTMENT OF TRANSPORTATION
ROUTE 46 CORRIDOR IMPROVEMENT PROJECT
SAN LUIS OBISPO COUNTY

Authority: This California Endangered Species Act (CESA) Incidental Take Permit (ITP) is issued by the Department of Fish and Game (DFG) pursuant to Fish and Game Code sections 2081(b) and 2081(c), and California Code of Regulations, title 14, subdivision 3, chapter 6, article 1, commencing with section 783. CESA prohibits the take[1] of any species of wildlife designated as an endangered, threatened, or candidate species[2] by the Fish and Game Commission. DFG, however, may authorize the take of such species by permit if the conditions set forth in Fish and Game Code sections 2081(b) and 2081(c) are met. (See also Cal. Code Regs., tit. 14, § 783.4.)

Permittee:	**California Department of Transportation (Caltrans), District 5**
Name and title of principal officer:	**Mr. Chuck Cesena, Branch Chief, Central Coast Environmental Management**
Contact person:	**Ms. Cecilia Boudreau, Environmental Planner, (805) 549-3376 Central Coast Environmental Branch**
Mailing address:	**50 Higuera Street San Luis Obispo, California 93401**

Effective Date and Expiration Date of the ITP:
This ITP shall be executed in duplicate original form and shall become effective once a duplicate original is acknowledged by signature of the Permittee on the last page of the ITP and returned to DFG's Habitat Conservation Branch at the address listed in the Notices section of this ITP. Unless renewed by DFG, this ITP's authorization to take the Covered Species shall expire on **December 31, 2020.**

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[1]Pursuant to Fish and Game Code section 86, "'Take' means hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture or kill."

[2]"Candidate species" are species of wildlife that have not yet been placed on the list of endangered species or the list of threatened species, but which are under formal consideration for listing pursuant to Fish and Game Code section 2074.2.

Project Location:
The project site is located along State Route (SR) 46 beginning on the east side of Huer Huero Creek Bridge within the City of Paso Robles and ending on the east side of Cholame Valley in the County of San Luis Obispo. (See Figure 1.)

Project Description:
The proposed project (Project) will widen SR 46 between Airport Road and the Cholame Valley from two lanes to four lanes by constructing two new eastbound lanes to the south of the current SR 46, which will become the two westbound lanes. There will be a 61-foot wide median, except between post mile (PM) 32.2 and PM 34.4 where it will be 46.3 feet wide to minimize environmental impacts. The shoulders will be widened and left-turn lanes added at all public road intersections, which will be constructed to Caltrans' full expressway standards. No median barriers will be constructed, and the existing k-rail west of Jack Ranch will be removed. The Project will be constructed in five phases. (See Table 1 below.) The Project will result in the permanent loss of 333.5 acres and temporary impacts to 280.1 acres of San Joaquin kit fox (*Vulpes macrotis mutica*) habitat. These activities and impacts are likely to result in the incidental take of individual kit fox, a species designated as threatened under CESA. (Cal. Code Regs., tit. 14, § 670.5, subd. (b)(6)(E).).

Table 1:

Phase	Approximate Location	Schedule
1 - Union	Airport Road (PM 32.2) to Geneseo Road (PM 37.2)	April 2008
2 - Whitley	Geneseo Road through Whitley Gardens (PM 41.2)	July 2010
3 - Shandon	East of Whitley Gardens through Shandon Rest Area (PM 50.2)	2013 (no funding yet)
4 - Cholame	East of Shandon Rest Area to Jack Ranch Café (PM 54.8)	2016 (no funding yet)
5 - Wye	Jack Ranch Café through Cholame Valley (PM 56.3)	2018 (no funding yet)

Covered Species Subject to the Take Authorization Provided by this ITP:

This ITP covers the following species:

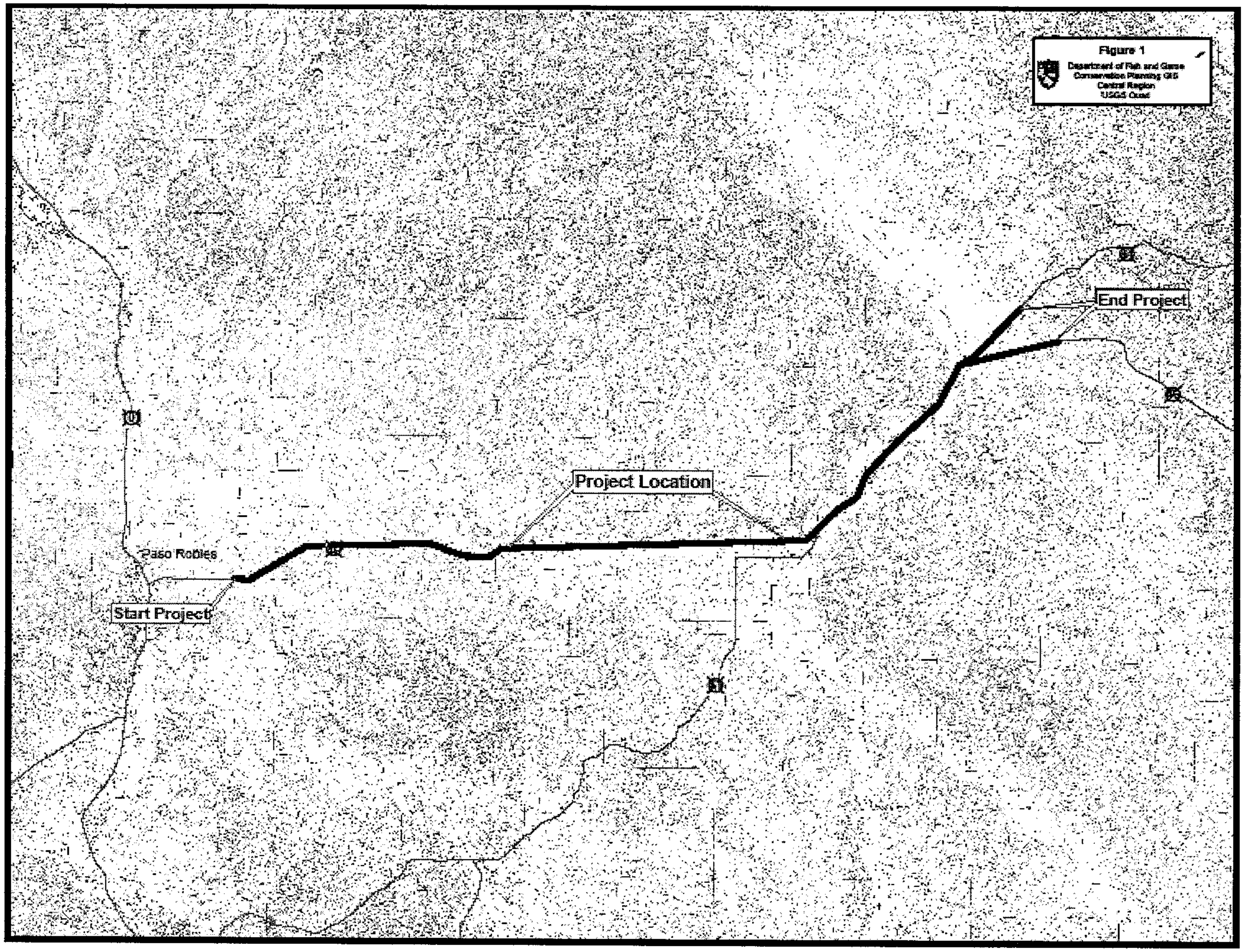
Name	**CESA Status**[3]
San Joaquin kit fox (*Vulpes macrotis mutica*)	Threatened

This species, and only this species, is hereinafter referred to as the "Covered Species."

---

[3]Under CESA, a species may be on the list of endangered species, the list of threatened species, or the list of candidate species. All other species are "unlisted."

Figure 1. Project Location



Impacts to Covered Species:

The Project will result in permanent impacts to 333.5 acres and temporary impacts to 280.1 acres of Covered Species habitat. (See Table 2) Incidental take of individuals of the Covered Species may occur as a result of mortality due to development activities, Project-related traffic on and off the Project site, and direct loss of habitat caused by the Project. Impacts of the taking on the Covered Species also includes increased incidence of vehicle strikes after construction, temporal losses of habitat, increased habitat fragmentation and edge effects, and the Project's incremental contribution to cumulative impacts on the Covered Species (indirect impacts). Impacts of the taking also include temporary impacts to the Covered Species associated with Project-related temporary ground disturbance within the construction boundary, including storage and staging areas and temporary roads, which may also cause additional incidental take of Covered Species.

Table 2:

San Joaquin kit fox habitat	Permanent Impacts			Temporary Impacts			Total
	# of acres Impacted	Mitigation Ratio	Compensation (acres)	# of acres Impacted	Mitigation Ratio	Compensation (acres)	Compensation (acres)
Airport Road to Jardin Road	23.03	3:1	69.09	25.48	1/3:1	8.49	77.58
Jardin Road to Post Mile 37.6	33.66	2:1	67.32	30.26	1/3:1	10.09	77.41
Total for Phase 1	56.69		136.41	55.74		18.58	154.99
Phase 2 starting at PM 37.6	50.36	4:1	201.44	36.50	1/3:1	12.17	213.61
Phase 3	91.46	4:1	365.84	108.20	1/3:1	36.07	401.91
Phase 4	68.59	4:1	274.36	35.04	1/3:1	11.68	286.04
Phase 5	66.40	4:1	265.60	44.62	1/3:1	14.87	280.47
Total for all Phases	**333.50**		**1,243.65**	**280.10**		**93.37**	**1,337.02**

Other Species Not Subject to the Take Authorization Provided by this ITP:

Fully Protected Species:

This ITP does not authorize the take of any fully protected species. (See Fish & G. Code, §§ 3511, 4700, 5050, 5515.) DFG believes Caltrans can implement the Project as described in this ITP in a manner consistent with the Fish and Game Code provisions governing fully protected species. DFG's determination regarding Project consistency with Fish and Game Code provisions governing fully protected species is based, in part, on the Permittee's commitment independent of this ITP to implement and adhere to the following general avoidance and minimization measures during Project implementation related to blunt-nosed leopard lizard (*Crotaphytus wislizenii silus*), a fully protected and CESA designated endangered species (*id.*, § 5050, subd. (b)(1); Cal. Code Regs., tit. 14, § 670.5, subd. (a)(4)(B)):

- Permittee commits to perform a protocol-level survey within the construction boundary for each phase of the Project as designated above in Table 2. DFG's Approved Survey Methodology for blunt-nosed leopard lizard is included with this ITP as Attachment 1.

- If the results of any protocol-level survey detect the presence of blunt-nosed leopard lizard within the construction boundary of any phase of the Project, Permittee commits to notify and consult with DFG prior to any activity that could result in the take of blunt-nosed leopard lizard in order to develop and implement measures acceptable to DFG that will avoid take of individuals of the species.

Giant Kangaroo Rat:
This ITP does not authorize take of giant kangaroo rat (*Dipodomys ingens*), a species designated as endangered under CESA. (Cal. Code Regs., tit. 14, § 670.5, subd. (a)(6)(C).) Phase 4 of the Project (between PM 50.2 and PM 54.8) is the only area of the Project site that contains potential habitat for giant kangaroo rats. No giant kangaroo rats were found within the Project area during prior biological surveys. Implementation of the Project is not expected to result in the take of giant kangaroo rat as a result.

DFG and the Permittee acknowledge that, due to the extended time line for the Project, with construction occurring in multiple separate phases, there is a possibility giant kangaroo rat could establish new populations in the Project area during and prior to completion of Project construction. Because of this possibility, the Permittee has committed to take the following actions to avoid unauthorized incidental take of giant kangaroo rat during Phase 4 of the Project:

- Permittee commits to conduct a survey for giant kangaroo rat a maximum of 30 days prior to initiating ground- or vegetation-disturbing activities in the Cholame Valley between PM 50.2 and PM 54.8. These surveys shall be conducted by a biologist, approved by DFG, with knowledge of and experience in the biology and natural history of the giant kangaroo rat. The biologist approved by DFG to conduct the survey shall hold or acquire prior to the survey a scientific collecting permit from DFG for giant kangaroo rat.

- Permittee commits to immediately notify DFG if the survey conducted by the approved biologist prior to any ground- or vegetation- disturbing activities associated with Phase 4 of the Project identifies any potential signs of giant kangaroo rat, including burrows, scat, or tail drag marks.

Incidental Take Authorization of Covered Species:
This ITP authorizes incidental take of the Covered Species and only the Covered Species. With respect to incidental take of the Covered Species, DFG authorizes the Permittee, its employees, contractors, and agents to take the Covered Species incidentally in carrying out the Project, subject to the limitations described in this section and the Conditions of Approval identified below. This ITP does not authorize: take of Covered Species from activities outside the scope of the Project as described above, take of Covered Species resulting from violation of this ITP, or intentional take of Covered Species except for capture and relocation of Covered Species as authorized by this ITP. In addition, as set forth above, this ITP does not authorize take of any species designated as fully protected under the Fish and Game Code or giant kangaroo rat.

Conditions of Approval:
Unless specified otherwise, the following measures shall pertain to all ground- or vegetation-disturbing activities within the Project construction boundaries, including areas used for ingress and egress routes during construction. DFG's issuance of this ITP and Permittee's authorization to take the Covered Species are subject to Permittee's compliance with and implementation of the following conditions of approval:

1. Permittee shall comply with all applicable State, federal, and local laws in existence on the effective date of this ITP or adopted thereafter.

2. Permittee shall implement and adhere to the mitigation measures related to the Covered Species in the Biological Resources section of the Environmental Assessment/Final Environmental Impact Report (SCH Number: 2000011033) adopted by the Permittee as lead agency for the Project under the California Environmental Quality Act (CEQA) on May 10, 2006. Permittee shall also implement and adhere to all conservation measures, terms and conditions related to the Covered Species in the December 2005 Biological Opinion, Biological Opinion for State Route 46 Corridor Improvement Project"" (Number 1-8-03-F59) issued to the Permittee for the Project by the United States Fish and Wildlife Service (USFWS).

3. Permittee shall fully implement and adhere to the conditions of this ITP within the time frames set forth below and as set forth in the Mitigation Monitoring and Reporting Program (MMRP), which is included as Attachment 2 to this ITP.

4. **General Provisions:**

   4.1 Before initiating ground- or vegetation-disturbing activities, Permittee shall designate a representative (Designated Representative) responsible for communications with DFG and for overseeing compliance with this ITP. The Permittee shall notify DFG in writing prior to commencement of ground- or vegetation-disturbing activities of the

Designated Representative's name, business address and contact information, and shall notify DFG in writing if a substitute Designated Representative is selected or identified at any time during the term of this ITP.

4.2 At least 30 days before initiating ground- or vegetation-disturbing activities, Permittee shall submit to DFG in writing the name, qualifications, business address, and contact information for a biological monitor (Designated Biologist). The Designated Biologist shall be knowledgeable and experienced in the biology and natural history of the Covered Species. The Designated Biologist will be responsible for monitoring construction and/or ground- or vegetation-disturbing activities in areas of Covered Species' habitat to help minimize or avoid the incidental take of individual Covered Species and to minimize disturbance of Covered Species' habitat. Permittee shall obtain DFG approval of the Designated Biologist prior to the commencement of Project-related activities that may result in the incidental take of the Covered Species.

4.3 To ensure compliance with the Conditions of Approval of this ITP, the Designated Biologist shall have authority to immediately stop any activity that is not in compliance with this ITP and/or to order any reasonable measure to avoid the take of an individual of the Covered Species or any fully protected species. Neither the Authorized Biologist(s) nor DFG shall be liable for any costs incurred in complying with the management measures, including cease-work orders.

4.4 Permittee shall conduct an education program for all persons employed or otherwise working on the Project site prior to performing any work on-site. Instruction shall consist of a presentation by the Designated Biologist that includes a discussion of the biology and general behavior of the Covered Species, information about the distribution and habitat needs of the Covered Species, sensitivity of the Covered Species to human activities, its status under CESA including legal protection, recovery efforts, penalties for violations, and Project-specific protective management measures provided in this ITP. Interpretation shall be provided for non-English speaking workers, and the same instruction shall be provided for any new workers prior to on-site Project activity. Copies of this ITP shall be maintained at the worksite. Permittee shall prepare and distribute wallet-sized cards or a fact sheet handout containing this information for workers to carry on-site. Upon completion of the program, employees shall sign an affidavit stating they attended the program and understand all protection measures. These forms shall be filed at the worksite offices and be available to DFG upon request.

4.5 Permittee shall initiate a trash abatement program during pre-construction phases of the Project and continue the program throughout the duration of the Project. Trash and food items shall be contained in closed (raven-proof) containers and removed regularly (at least once a week) to avoid attracting opportunistic predators such as ravens, coyotes, and feral dogs.

4.6 Permittee shall implement dust control measures during Project activities to facilitate visibility for monitoring of the Covered Species by the Designated Biologist.

4.7 Permittee shall prohibit firearms and domestic dogs from the Project site and site access routes during construction and development of the Project, except those in the possession of authorized security personnel or local, State, or Federal law enforcement officials.

4.8 Permittee shall clearly delineate property boundaries of the Project site with fencing, stakes, or flags and shall similarly delineate the limits of construction areas.

4.9 Permittee shall clearly delineate habitat of the Covered Species on the Project site with posted signs, posting stakes, flags, and/or rope or cord, and place Environmentally Sensitive Area (ESA) fencing as necessary to minimize disturbance of Covered Species' habitat.

4.10 Project-related personnel shall access the Project site during construction and development activities using existing routes and shall not cross Covered Species' habitat outside of and in route to the Project site. Project-related vehicle traffic shall be restricted to established roads, staging and parking areas. Vehicle speeds shall not exceed 20 miles per hour, except when traveling on existing highway, in order to avoid Covered Species on or traversing the roads. If the Permittee determines construction of off-site routes for travel are necessary, Permittee shall contact DFG prior to carrying out any such an activity. DFG may require an amendment to this ITP if additional take of Covered Species may result from Project modification.

4.11 Permittee shall confine all Project-related parking, storage areas, laydown sites, equipment storage, and any other surface-disturbing activities to the Project site using, to the extent possible, previously disturbed areas. Additionally, Permittee shall not use or cross Covered Species' habitat outside of the marked Project boundaries unless specifically provided for in this ITP.

4.12 Permittee shall immediately stop/repair any fuel or hazardous waste leaks or spills on the Project site during construction and development activities and immediately clean up such spills at the time of occurrence. Permittee shall exclude the storage and handling of hazardous materials from the construction zone and shall properly contain and dispose of any unused or leftover hazardous products off-site.

4.13 Permittee shall provide DFG staff with reasonable access to the Project site and mitigation lands under Permittee control, and shall otherwise fully cooperate with DFG efforts to verify compliance with or effectiveness of mitigation measures set forth in the ITP. Neither the Designated Biologist nor DFG shall be liable for any costs incurred in complying with the Conditions of Approval, including cease-work orders issued by DFG.

4.14 Upon completion of Project construction, Permittee shall remove from the Project site and properly dispose of all construction refuse, including, but not limited to, broken equipment parts, wrapping material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, and boxes.

4.15 Notwithstanding any expiration date on the take authorization provided by this ITP, Permittee's obligations under this ITP do not end until DFG accepts as complete the Permittee's Final Mitigation Report required by Condition 5.9 of this ITP.

5. Notification, Reporting and Monitoring:

5.1 Permittee shall provide DFG with written detailed construction plans, including engineering drawings, a minimum of 30 days prior to ground- or vegetation-disturbing activities authorized by this ITP. These plans as provided to DFG by the Permittee shall include the protection and restoration features and techniques made part of the Permittee's construction contract for the Project, including the features and techniques and any other modifications to the Project made since the Permittee submitted its application to DFG for this ITP.

5.2 Permittee shall notify DFG 14 calendar days before initiating ground- or vegetation-disturbing activities for each phase of the Project and document compliance with all pre-Project Conditions of Approval before initiating ground- or vegetation-disturbing activities.

5.3 Permittee shall immediately notify DFG in writing if it determines that it is not in compliance with any Conditions of Approval of this ITP, including but not limited to any actual or anticipated failure to implement mitigation measures within the time periods indicated in this ITP and MMRP. Permittee shall report any non-compliance with the ITP during the construction phase of the Project to DFG within 24 hours.

5.4 Monthly Report: The Designated Biologist shall be on-site daily while construction and/or surface-disturbing activities are taking place to minimize take of the Covered Species; to ensure compliance with all mitigation and avoidance measures; to check all exclusion zones; and to ensure that signs, stakes, and fencing are intact, and that human activities are restricted to outside of these protective zones. Weekly compliance inspections shall be conducted after clearing, grubbing, and grading are completed. These inspections shall be compiled into Monthly Compliance Reports along with a copy of the MMRP table with notes showing the current implementation status of each mitigation measure. Monthly Compliance Reports shall be submitted to DFG's Regional Office at the address listed in the Notices section of this ITP or via e-mail to DFG's Regional Representative. At the time of this ITP's approval, the DFG Regional Representative is Laura Peterson-Diaz (e-mail address lpdiaz@dfg.ca.gov). DFG may at any time increase the timing and number of compliance inspections and reports required under this provision depending upon the results of previous compliance inspections (see Condition 5.5).

5.5 All observations of Covered Species and their sign, oversight activities, verifications, compliance inspections, surveys, monitoring, and records required by this ITP shall be reported in writing to DFG by the Designated Representative or Designated Biologist. Permittee shall submit reports of these activities to DFG in the next Monthly Compliance Report.

5.6 All Covered Species sightings confirmed by the Designated Biologist shall include the following documented information: the date, time, and location of each occurrence using GPS technology, the name of the party that actually identified the animal, circumstances of the incident, the general condition and health of each individual, any diagnostic markings, sex, age (juvenile or adult), and actions undertaken and habitat description. The Permittee shall submit this information to the California Natural Diversity Database (CNDDB).

5.7 Annual Report: Permittee shall provide DFG with an Annual Status Report (ASR) no later than January 31 of every year beginning with the issuance of the ITP and continuing until DFG accepts the Final Mitigation Report identified below. Each ASR shall include, at a minimum: 1) a general description of the status of the Project site and construction activities, including actual or projected completion dates, if known; 2) a copy of the table in the MMRP with notes showing the current implementation status of each mitigation measure; 3) a copy of the Monthly Compliance Reports from the previous year; and 4) a description of any site-specific avoidance and minimization measures that were employed and an assessment of the effectiveness of each completed or partially completed mitigation measure in minimizing and compensating for Project impacts.

5.8 Restoration of Project lands where temporary impacts occur shall be monitored and the status of the restoration included in the Annual Reports beginning after completion of Phase I of the Project. Restoration of all areas subject to temporary ground- or vegetation disturbance shall be recontoured, as necessary, covered with stockpiled top-soil, and seeded with native species. Monitoring for 2 years post-construction of each Phase shall insure that noxious weeds do not become dominant in the restored area and that native species found in the vicinity are successfully reintroduced. If the temporary impact lands have not returned to pre-Project conditions two years after completion of each Phase, additional mitigation and an amendment to this ITP might be required.

5.9 Final Mitigation Report: No later than 60 days after completion of the Project, including completion of all mitigation measures, Permittee shall provide DFG with a Final

Mitigation Report. The Final Mitigation Report shall be prepared by the Designated Biologist and shall include, at a minimum: 1) a copy of the table in the MMRP with notes showing when each of the mitigation measures was implemented; 2) all available information about Project-related incidental take of the Covered Species; 3) information about other Project impacts on the Covered Species; 4) construction dates; 5) an assessment of the effectiveness of the ITP's Conditions of Approval in minimizing and compensating for Project impacts; 6) recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future projects on the Covered Species; and 7) any other pertinent information, including the level of take of the Covered Species associated with the Project.

5.10 If a Covered Species is killed by a Project-related activity during construction of the Project or if a Covered Species is otherwise found dead, the Designated Biologist shall be immediately notified and initial notification shall be made to the Sacramento Office of the USFWS at (916) 414-6620, and DFG by calling the DFG Regional Office at (559) 243-4017. The initial notification to the USFWS and DFG shall include information regarding the location, species, number of animals injured or killed, and the DFG ITP Number. Following initial notification, Permittee shall send DFG a written report within 2 calendar days. The report shall include the date and time of the finding or incident, location of the carcass, and if possible provide a photograph, explanation as to cause of death, and any other pertinent information. The Designated Biologist shall collect the carcass, place it in plastic, and keep it on ice or in a freezer until a DFG representative can either collect the specimen or issue alternative instructions.

6. Take Minimization Measures:

Take avoidance of Covered Species is the first priority of this ITP. Relocation of Covered Species discovered within the work area prior to ground- or vegetation-disturbing activities, as well as during Project construction, is the second priority of this ITP. Permittee shall implement and adhere to the following conditions to avoid or minimize take of Covered Species.

6.1 Workers shall inspect for Covered Species under vehicles and equipment before vehicles and equipment are moved. If a Covered Species is present, the worker shall wait for the Covered Species to move on its own to a safe location.

6.2 If a Covered Species is injured as a result of Project-related activities, it shall be immediately taken to a DFG-approved wildlife rehabilitation or veterinary facility. The Permittee shall identify the facility prior to the start of ground- or vegetation-disturbing activities. Permittee shall bear any costs associated with the care or treatment of such injured Covered Species. Permittee shall notify the USFWS and DFG immediately unless the incident occurs outside of normal business hours. In that event the USFWS and DFG shall be notified no later than noon on the next business day. Notification to DFG shall be via telephone or e-mail, followed by a written incident report. Notification shall include the date, time, location, and circumstances of the incident and the name of the facility where the animal was taken.

6.3 The Designated Biologist shall perform a pre-construction survey for Covered Species no more then 30 days prior to ground- or vegetation-disturbing activities for each Phase of the Project. Surveys shall cover the proposed construction right-of-way (ROW) with a 200-foot buffer for all areas along the Project length with habitat to support Covered Species. A report documenting the results of the pre-construction surveys shall be submitted to DFG within 30 days after performing any such survey.

6.4 If a potential Covered Species den (one that shows evidence of current use or was used in the past) is discovered or a Covered Species is found in an "atypical" den (e.g., a pipe or culvert), a 50-foot buffer shall be established using flagging. If a known Covered Species den is discovered, a buffer of at least 100 feet shall be established using fencing. If a natal den (den in which Covered Species young are reared) is discovered, a buffer of at least 200 feet shall be established using fencing. Buffer zones shall have restricted entry. Permittee shall notify the USFWS and DFG's Regional Representative immediately via telephone or email if any Covered Species dens, natal dens or atypical dens are discovered.

6.5 For dens found within the portion of the Project area to be disturbed, natal dens shall not be excavated until the pups and adults have vacated and then only after consultation with the USFWS and DFG. If, after 4 consecutive days of monitoring with tracking medium or infrared camera the Designated Biologist has determined that a Covered Species is not currently present, known dens may be destroyed. Potential dens (any hole 3 inches or larger) may be excavated without monitoring if a take permit has been obtained from the USFWS, but if the process reveals evidence of use inside then destruction shall cease and the USFWS and DFG shall be notified immediately.

6.6 Destruction of Covered Species dens shall be accomplished by careful excavation until it is certain no Covered Species are inside. The den should be fully excavated, filled with dirt and compacted to ensure that Covered Species cannot reenter or use the den during the construction period. If at any point during excavation a Covered Species is discovered inside the den, excavation shall cease immediately and monitoring of the den as described above shall be resumed. Destruction of the den shall only be completed when, in the judgment of the Designated Biologist, the animal has escaped from or otherwise vacated the partially destroyed den.

6.7 Any Covered Species' den that must be destroyed shall be replaced with an artificial den. This will compensate for the loss of important shelter used by Covered Species for protection, reproduction, and escape from predators. Den design and placement should be determined on a site-specific basis in consultation with the USFWS and DFG.

6.8 All open holes and trenches within the Project construction boundary shall be inspected at the beginning of the day, middle of the day, and end of the day for trapped animals. To prevent inadvertent entrapment of Covered Species or any other animals during the construction phase of the Project, all excavated, steep-walled holes or trenches more than 2 feet deep shall be covered at the close of each working day by plywood or similar materials or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they shall be thoroughly inspected for trapped animals. If at any time a trapped or injured Covered Species is discovered, the USFWS and DFG will be notified within one (1) working day of the incident.

6.9 All construction pipe, culverts, or similar structures with a diameter of 7.6 centimeters (3 inches) or greater that are stored at the construction site for one or more overnight periods will be thoroughly inspected for Covered Species before the pipe is subsequently moved, buried, or capped. If a Covered Species is discovered inside a pipe during inspection, that section of pipe shall not be moved until the animal has escaped on its own.

7. **Mitigation Measures/Compensation for Take:**
DFG has determined that permanent protection of compensatory habitat is necessary and required under CESA to fully mitigate the impacts of the taking on the Covered Species that will result with implementation of the Project.

7.1 Permittee shall acquire and permanently preserve 1,337.02 acres as total compensation for the loss of Covered Species' habitat for the entire Project. The required acreage is based on factors including an assessment of the quality of the habitat at the Project site and DFG's estimate of the acreage required to provide for adequate biological carrying capacity at a replacement location.

7.2 Permittee has identified five Phases of the Project. (See Table 1.) Permittee shall complete all compensatory mitigation requirements separately and in their entirety for each Phase of the Project in sequential order prior to commencing ground- or vegetation-disturbing activities for the next Project Phase. As described in Table 2 of this ITP, the required compensation for each Phase of the Project is as follows: Phase 1 is 154.99 acres, Phase 2 is 213.61 acres, Phase 3 is 401.91 acres, Phase 4 is 286.04 acres, and Phase 5 is 280.47 acres; for a total of 1,337.02 acres.

7.3 For Project Phases 1 through 3, Permittee intends to mitigate at the Palo Prieto Conservation Bank, which approved DFG on February 26, 2008, as authorized to sell habitat mitigation credits for the Covered Species. Permittee is not authorized to commence ground- or vegetation-disturbing activities associated with the Project until this ITP is effective and the Permittee has complied with ITP Condition of Approval 5.2, including providing written documentation to DFG that Permittee has purchased the required habitat mitigation credits.

7.4 For Project Phases 4 and 5, the Permittee shall purchase credits at the Palo Prieto Conservation Bank or another conservation bank approved by DFG in San Luis Obispo County that is authorized to sell habitat mitigation credits for the Covered Species. Permittee shall not commence ground- or vegetation-disturbing activities associated with Project Phases 4 and 5 until the Permittee has complied with ITP Condition of Approval 5.2, including providing written documentation to DFG that Permittee has purchased the required habitat mitigation credits.

Amendment:
This ITP may be amended without the concurrence of the Permittee if DFG determines that continued implementation of the Project under existing ITP conditions would jeopardize the continued existence of the Covered Species or that Project changes or changed biological conditions necessitate an ITP amendment to ensure that impacts to the Covered Species are minimized and fully mitigated. DFG may also amend the ITP at any time without the concurrence of the Permittee as required by law.

Stop-Work Order:
DFG may issue Permittee a written stop-work order to suspend any activity covered by this ITP for an initial period of up to 25 days to prevent or remedy a violation of ITP conditions (including but not limited to failure to comply with reporting, monitoring, or habitat acquisition obligations) or to prevent the illegal take of an endangered, threatened, or candidate species. Permittee shall comply with the stop-work order immediately upon receipt thereof. DFG may extend a stop-work order under this provision for a period not to exceed 25 additional days, upon written notice to the Permittee. DFG shall commence the formal suspension process, pursuant to California Code of Regulations, Title 14, section 783.7, within five working days of issuing a stop-work order.

Compliance with Other Laws:
This ITP contains DFG's requirements for the Project pursuant to CESA. This ITP does not necessarily create an entitlement to proceed with the Project. Permittee is responsible for complying with all other applicable State, federal, and local laws.

Notices:
The Permittee shall deliver the fully executed duplicate original ITP by first class mail or overnight delivery to the following address:

Habitat Conservation Planning Branch
Attention: CESA Permitting Program
1416 Ninth Street, Suite 1260
Sacramento, California 95814

Written notices, reports, and other communications relating to this ITP shall be delivered to DFG by first-class mail at the following addresses or at addresses DFG may subsequently provide the Permittee. Notices, reports, and other communications shall reference the Project name, Permittee, and ITP Number (2081-2007-020-04) in a cover letter and on any other associated documents.

Original cover with attachment(s) to:

Jeffrey R. Single, Ph.D., Regional Manager
1234 East Shaw Avenue
Fresno, California 93710
Phone (559) 243-4005, Fax (559) 243-4026

Copy of cover without attachment(s) to:

Office of the General Counsel
California Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, California 95814

And:

Habitat Conservation Planning Branch
California Department of Fish and Game
1416 Ninth Street, Suite 1260
Sacramento, California 95814

Unless Permittee is notified otherwise, DFG's Regional Representative for purposes of addressing issues that arise during implementation of the ITP is:

Ms. Laura Peterson-Diaz
1234 East Shaw Avenue
Fresno, California 93710
Phone (559) 243-4017, extension 225, Fax (559) 243-4020

Compliance with the California Environmental Quality Act (CEQA):
DFG's issuance of the ITP is subject to CEQA. DFG is a responsible agency under CEQA with respect to the ITP because of prior environmental review of the Project by the Permittee as lead agency. (See generally Pub. Resources Code, §§ 21067, 21069.) The Permittee's prior legal agency review of the Project is set forth in the State Route 46 Corridor Improvement Environmental Assessment with Finding of No Significant Impact/Final Environmental Impact Report (EIR) (SCH No. 2000011033), as approved on May 10, 2006. At the time that Permittee certified the EIR as lead agency and approved the Project, it also

adopted all mitigation measures described in the EIR as conditions of Project approval. In fulfilling its obligations as a responsible agency, DFG's obligations under CEQA are more limited than the lead agency. (CEQA Guidelines, § 15096, subds. (a), (f).)[5] DFG, in particular, is responsible for considering only the effects of those activities involved in the Project which it is required by law to carry out or approve and mitigating or avoiding only the direct or indirect environmental effects of those parts of the Project which it decides to carry out, finance, or approve. (Pub. Resources Code, § 21002.1, subd. (d); CEQA Guidelines, §§ 15041, subd. (b), 15096, subds. (f), (g).) Accordingly, because DFG's exercise of discretion is limited to issuance of the ITP, DFG is responsible for considering only the environmental effects that fall within its permitting authority under CESA.

This ITP, along with DFG's CEQA findings for the ITP and Project, which are available as a separate document, provides evidence of DFG's consideration of the lead agency's EIR for the Project and the environmental effects related to issuance of the ITP. (CEQA Guidelines, § 15096, subd. (f).) DFG finds that issuance of the ITP will not result in any previously undisclosed potentially significant effects on the environment or a substantial increase in the severity of any potentially significant environmental effects previously disclosed by the lead agency. Furthermore, to the extent the potential for such effects exists, DFG finds adherence to and implementation of the lead agency's conditions of approval as well as adherence to and implementation of the Conditions of Approval of the ITP will avoid or reduce to below a level of significance any such potential effects. DFG consequently finds that issuance of the ITP will not result in any significant, adverse impacts on the environment.

Findings Under CESA:
These findings are intended to document DFG's compliance with the specific findings requirements set forth in CESA and related regulations. (Fish & G. Code, 2081, subs. (b)-(c); Cal. Code Regs., tit. 14, §§ 783.4, subds. (a)-(b), 783.5, subd. (c)(2).)

DFG finds that the issuance of this ITP complies and is consistent with the criteria governing the issuance of ITPs under CESA:

(1) Take of Covered Species, as defined in the ITP, will be incidental to the otherwise lawful activities covered under the ITP;

(2) Impacts of the taking of the Covered Species will be minimized and fully mitigated through the implementation of measures required by this ITP, as described in the MMRP. Measures include: 1) permanent habitat protection; 2) measures to avoid take of the Covered Species during Project activities; 3) worker education; and 4) Monthly Compliance Reports. DFG evaluated the quality of the habitat on the

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[5]The "CEQA Guidelines" are found in Title 14 of the California Code of Regulations, commencing with section 15000.

Project site, the scope and extent of direct impacts, the scope and extent of indirect impacts, and other relevant information available to DFG or provided by the Permittee. Based on this evaluation, DFG determined that the protection and management in perpetuity of 1,337.02 acres of compensatory habitat that is contiguous with other protected Covered Species habitat and/or is of higher quality than the habitat being destroyed by the Project, along with the minimization, monitoring, reporting, and funding requirements of this ITP, meet the CESA issuance criteria.

(3) The take avoidance and mitigation measures required pursuant to the conditions of this ITP and its attachments are roughly proportional to the impacts of the taking authorized by this ITP;

(4) The measures required by this ITP maintain Permittee's objectives to the greatest extent possible;

(5) All required measures are capable of successful implementation;

(6) The ITP is consistent with any regulations adopted, pursuant to Fish and Game Code sections 2112 and 2114;

(7) Permittee has ensured adequate funding to implement the measures required by the ITP as well as for monitoring compliance with and the effectiveness of those measures for the Project; and

(8) Issuance of the ITP will not jeopardize the continued existence of the Covered Species based on the best scientific and other information reasonably available, and this finding includes consideration of the species' capability to survive and reproduce, and any adverse impacts of the taking on those abilities in light of (a) known population trends; (b) known threats to the species; and (c) reasonably foreseeable impacts on the species from other related projects and activities. Moreover, DFG's finding is based, in part, on DFG's express authority to amend the terms and conditions of the ITP without concurrence of the Permittee as necessary to avoid jeopardy and as required by law.

Attachments:

ATTACHMENT 1	Approved Survey Methods for Blunt-Nosed Leopard Lizard
ATTACHMENT 2	Mitigation Monitoring and Reporting Program

ISSUED BY THE CALIFORNIA DEPARTMENT OF FISH AND GAME

on 1-27-09 .

JEFFREY R. SINGLE, PH.D.,
Regional Manager
CENTRAL REGION

APPROVED AS TO FORM:

John H. Mattox
Senior Staff Counsel
Lead Counsel for CESA Permitting

ACKNOWLEDGMENT

The undersigned: 1) warrants that he or she is acting as a duly authorized representative of the Permittee, 2) acknowledges receipt of this ITP, and 3) agrees on behalf of the Permittee to comply with all terms and conditions of the ITP.

By: Chuck Cesena Date: 3/24/09

Printed Name: Chuck Cesena Title: Senior Environmental Planner

Attachment 1

July 2008

Dear Blunt-nosed Leopard Lizard Surveyor,

Attached is the revised survey methodology for the blunt-nosed leopard lizard (*Gambelia sila*). The protocol was developed by the Central Region of the California Department of Fish and Game (DFG) with input from the United States Fish and Wildlife Service (USFWS), the Bureau of Land Management (BLM), and various species experts. This protocol supersedes previous versions of DFG survey protocols for the blunt-nosed leopard lizard. The range-wide decline of population numbers in the past decade has provided the impetus for development of a more rigorous methodology to detect species presence. Additionally, since DFG is not able to issue an incidental take permit for the blunt-nosed leopard lizard due to its status as a fully-protected reptile under the California Fish and Game Code **§5050**, detection of species presence on a project site is crucial.

This standard methodology has been developed to provide consultants, local, state and federal agencies with minimum acceptable standards for surveys conducted to determine the status of this state and federally endangered species. The survey methods described within this protocol were designed to optimize the likelihood of detecting the presence of blunt-nosed leopard lizards should they occur on a project site.

When the presence of blunt-nosed leopard lizards is detected, we request that you notify DFG's local Permitting and Project Review staff for further instructions of what additional information will be needed to assess the project's potential impact on the species. This will assist in expediting the review of the project and help control the project sponsor's biological survey costs. Additionally, the USFWS should be contacted for further advice since this is also a federally-listed species. Use of this protocol and notification of DFG does not exempt you from consultation with the USFWS.

DFG is willing to cooperate with surveyors who have circumstances or needs not addressed by this protocol and who may wish to propose alternative methods to comply with State law prohibiting take of blunt-nosed leopard lizards. If you have any questions or comments regarding this methodology or if you want to propose the use of a different methodology, please contact the Central Region's Habitat Conservation Planning staff at (559) 243-4014 (Fresno, Merced, Madera, Kings, Tulare, and Kern Counties) or (805) 528-8670 (San Benito and San Luis Obispo Counties).

CALIFORNIA DEPARTMENT OF FISH AND GAME

APPROVED SURVEY METHODOLOGY FOR THE
BLUNT-NOSED LEOPARD LIZARD
JULY 2008

Blunt-nosed leopard lizard, *Gambelia sila* = (*Gambelia silus*)
STATUS: SE, FE, DFG fully protected

This protocol has been developed to provide a minimum level of protection for blunt-nosed leopard lizards (BNLL) when projects or maintenance activities are scheduled to occur within potential BNLL habitat. Disturbing activities should not proceed until appropriate surveys are conducted to determine if the species is present on the site. Surveys conducted according to the following protocol by qualified researchers provide a reasonable, although not conclusive, indication of BNLL presence at a particular site and yield critical information needed to prevent mortality and minimize impacts to the species. Researchers conducting the surveys are expected to understand the basic biological requirements of the species and have the ability to recognize potential BNLL habitat. This protocol satisfies the Department of Fish and Game requirements when it is determined that formal BNLL surveys are needed. [Note: This protocol is appropriate for pre-project BNLL surveys, however, population monitoring over time on a site is best conducted using a permanent survey grid, such as described in Tollestrup (1976).]

METHODS:
A minimum of two researchers, walking in parallel on adjacent transects, should conduct a BNLL survey. Optimum BNLL activity periods occur when air temperature is between 25C-35C (77F-95F) (Tollestrup 1976; USFWS 1985, 1998). Surveys must be conducted when the air temperature falls within the optimal range. Surveys may begin after sunrise as soon as the minimum air temperature criterion is met, and must end by 1400 hours or when the maximum temperature is reached, whichever occurs first (Tollestrup 1976). Time of day and air temperature should be recorded at the start and end of each survey. Air temperature should be periodically checked to ensure that the maximum has not been exceeded. Air temperature should be measured at 1-2 cm above the ground over a surface most representative of the area being surveyed. The researcher must shade the thermometer from direct sunlight while taking the reading. Other factors that affect BNLL activity such as soil temperature (measured at 1cm below soil surface with a shaded thermometer) and weather conditions must be recorded at the start and end of each survey. Surveys should not be conducted on overcast days (cloud cover > 90%) or when sustained wind velocity exceeds 10 mph (force > 3 on Beaufort wind scale) (Montanucci 1965; Tollestrup 1976; J. Vance, pers. comm.).

Surveys must be conducted on foot, and researchers must survey all areas with potential BNLL habitat. BNLL are often difficult to detect, particularly in areas where shrubs are fairly numerous (>30% cover) and/or the herbaceous vegetation is tall (>30 cm). In such conditions, 10 meter wide transects should be walked at a slow pace. In areas with few shrubs and shorter herbaceous vegetation (<15 cm), transects as wide as 30 meters are acceptable. When feasible, transects should be walked in a north-south orientation to minimize glare from the sun. The surveyor should stop periodically and scan the transect for BNLL using close-focusing binoculars (minimum 7X35 magnification). In addition to recording the location of all BNLL observed (must provide UTM coordinates), the presence of habitat features important for BNLL (washes, playas, relative abundance of small mammal burrows) should also be recorded for each transect. Streambeds, washes, roads, etc., should be walked in addition to transect lines since BNLL are often seen in these areas.

TIMING AND LENGTH OF SURVEY:
Survey intensity should be commensurate with the anticipated level of disturbance to the BNLL habitat. The primary concern for BNLL when disturbance occurs during maintenance activities is direct mortality from equipment or personnel. Removal of intact BNLL habitat has a much greater potential for "take" due to direct impact on animals aboveground as well as any hibernating animals or eggs underground. A longer survey effort including both spring adult surveys and fall hatchling surveys is therefore required for activities that cause impacts to undisturbed BNLL habitat. The more intensive survey effort increases the chances of observing the species, even if the population is small. Once a BNLL has been observed, surveys may cease and consultation with the Department must begin regarding avoidance measures. If BNLL are observed incidentally while conducting surveys for other species, specific surveys for BNLL are not required. Surveys will be accepted for one year from the date of completion.

Disturbances for Maintenance Activities
Examples of maintenance activities include grading existing roads, grass mowing on roadsides, and maintaining existing structures. BNLL are active and above ground from April through September, but optimum activity periods for adults occur between April 15 and July 15 (Montanucci 1965; Tollestrup 1979; USFWS 1985, 1998). BNLL surveys should be conducted for a total of 8 days over the course of the 90-day time span. A minimum of 3 survey days should be conducted consecutively, with a maximum of 6 days completed within any 30-day time period. Fall hatchling surveys are not required for activities in this category.

Disturbances Leading to Habitat Removal
Examples of disturbances that impact intact habitat include establishment of new roads or structures, housing subdivisions, and changes in historic land use. BNLL surveys should be conducted for 12 days over the course of the 90-day adult optimal survey period (April 15 to July 15), with a maximum of 4 survey

days per week and 8 days within any 30-day time period. At least one survey session should be conducted for 4 consecutive days, weather permitting. BNLL hatchlings and subadults are most commonly observed from August 1 to September 15, along with a few adults that are still active above ground (Montanucci 1965; Tollestrup 1979; USFWS 1985, 1998). In addition to the 12 days of adult BNLL surveys required for activities in this category, 5 more survey days are required during the hatchling optimal survey period for a total of 17 survey days overall.

QUALIFICATIONS OF RESEARCHERS:
An acceptable BNLL survey crew should consist of no more than 3 Level I researchers for every Level II researcher. This restriction should reduce the number of incorrect/missed identifications. The names and affiliations of all researchers must be recorded for each survey day.

Level I: Researcher has demonstrated the ability to distinguish BNLL from other common lizard species that may inhabit the area;

Level II: Researcher has demonstrated the ability to distinguish BNLL from other common lizard species that may inhabit the area and has participated in at least 50 survey days for BNLL (or 25 survey days and a BNLL identification course recognized by/acceptable to the Department of Fish and Game). Researcher has made at least one confirmed* field sighting of a BNLL.

REPORTING
All BNLL observations should be reported to the California Natural Diversity Database within 30 days. A sample form is attached. Additional forms can be obtained at http://www.dfg.ca.gov/whdab/html/animals.html .

SPECIAL REQUIREMENT FOR SURVEYS IN San Luis Obispo County
Lands with potential BNLL habitat in San Luis Obispo County have different conditions compared to other counties within the range of BNLL. The sites with habitat in San Luis Obispo County tend to be at higher elevations, where nighttime temperatures can remain low even though daytime temperatures meet minimum survey criteria. In such conditions, BNLL activity is likely to be low and surveys conducted at this time could result in non-detection of the species even though they are present. As such, an additional requirement of a visit to a known voucher site to check for BNLL activity applies to surveys conducted in this County. Once the species has been observed at the voucher site, formal surveys can begin. The Elkhorn Plain ER has been selected as the voucher site for San Luis Obispo County.

LITERATURE CITED

Montanucci, R.R., 1965. Observations of the San Joaquin leopard lizard, *Crotaphytus wislizenii silus* Stejneger. Herpetologica 21(4): 270-283.

Tollestrup, K. 1976. A standardized method of obtaining an index of densities of blunt-nosed leopard lizards, *Crotaphytus silus.* Unpub. Rpt. U. S. Fish and Wildlife Service, Sacramento, CA. 11pp + Appendices.

Tollestrup, K. 1979. The ecology, social structure, and foraging behavior of two closely-related leopard lizards, *Gambelia silus* and *Gambelia wislizenii.* PhD Dissertation, University of California Berkeley.

United States Fish and Wildlife Service. 1985. Revised blunt-nosed leopard lizard recovery plan. United States Fish and Wildlife Service. Region 1, Portland, OR. 85 pp.

United States Fish and Wildlife Service. 1998. Recovery plan for upland species of the San Joaquin Valley, California. United States Fish and Wildlife Service. Region 1, Portland, OR. 319 pp.

PERSONAL COMMUNICATIONS

Julie Vance, California Department of Water Resources, San Joaquin District, 3374 E. Shields Ave, Fresno, California, 93726.

*A minimum of one confirmed field sighting must be documented for each Level II researcher and be available to the Department upon request. As with all BNLL sightings, it should also be submitted to the California Natural Diversity Database. Information to be included in documentation of BNLL sighting: Name of researcher, date of survey, location of survey, names of accompanying researchers who can confirm the sighting, and details of sighting (distance, BNLL activity, etc).

CONTACT INFORMATION

California Department of Fish and Game
Central Region
Habitat Conservation Planning
1234 Shaw Ave
Fresno, CA 93710
559/243-4005

The Department is willing to cooperate with researchers who have circumstances or needs not addressed by this protocol and who may wish to propose alternative methods to comply with State law prohibiting take of BNLL.

<u>Attachment 2</u>

CALIFORNIA DEPARTMENT OF FISH AND GAME
MITIGATION MONITORING AND REPORTING PROGRAM (MMRP)
CALIFORNIA ENDANGERED SPECIES ACT

INCIDENTAL TAKE PERMIT NO. 2081-2007-020-04

Permittee: California Department of Transportation (Caltrans)

Project: Route 46 Corridor Improvement Project

PURPOSE OF THE MMRP

The purpose of the MMRP is to ensure that the minimization and mitigation measures required by the California Department of Fish and Game (DFG) for the above-referenced Project are properly implemented and thereby to ensure compliance with Section 2081(b) of the Fish and Game Code and Section 21081.6 of the Public Resources Code. A table summarizing the mitigation measures required by DFG is attached. This table is a tool for use in monitoring and reporting on implementation of mitigation measures, but the descriptions in the table do not supersede the mitigation measures set forth in the California Incidental Take Permit (ITP) and in omission of a permit requirement from the attached table does not relieve the Permittee of the obligation to ensure that the requirement is performed.

OBLIGATIONS OF THE PERMITTEE

Mitigation measures must be implemented within the time periods indicated in the table that appears below. The Permittee has the primary responsibility for monitoring compliance with all mitigation measures and for reporting to DFG on the progress in implementing those measures. These monitoring and reporting requirements are set forth in the ITP itself and are summarized at the front of the attached table.

The ITP requires that the Permittee identify and fund at least one full-time biologist to oversee and implement the mitigation activities that are required conditions of approval. The Permittee, through the "Designated Biologist", the "Designated Representative", or some other specific Permittee's designee shall insure the implementation of all Avoidance and Mitigation Measures listed in the ITP and shall monitor the effectiveness of these measures.

VERIFICATION OF COMPLIANCE, EFFECTIVENESS

DFG may, at its own discretion, verify compliance with any mitigation measure or independently assess the effectiveness of any mitigation measure.

TABLE OF MITIGATION MEASURES

The following items are identified for each mitigation measure: Mitigation Measure, Source, Implementation Schedule, Responsible Party, and Status/Date/Initials. The Mitigation Measure column summarizes the mitigation requirements of the ITP. The Source column identifies the ITP document that sets forth the mitigation measure. The Implementation Schedule column shows the date or phase when each mitigation measure shall be implemented. The Responsible Party column identifies the agency that is primarily responsible for implementing the mitigation measure. The Status/Date/Initials column shall be completed by the Permittee during preparation of each Status Report and the Final Mitigation Report, and must identify the implementation status of each mitigation measure, the date that status was determined, and the initials of the person determining the status.

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
PRE-CONSTRUCTION					
1	Before initiating ground- or vegetation-disturbing activities, Permittee shall designate a representative (Designated Representative) responsible for communications with DFG and for overseeing compliance with the ITP. The Permittee shall notify DFG in writing prior to commencement of ground- or vegetation-disturbing activities of the Designated Representative's name, business address and contact information, and shall notify DFG in writing if a substitute Designated Representative is selected or identified at any time during the term of the ITP.	ITP Condition #4.1	Before commencing ground or vegetation disturbing activities Entire Project	Permittee	
2	At least 30 days before initiating ground- or vegetation-disturbing activities, Permittee shall submit to DFG in writing the name, qualifications, business address, and contact information for a biological monitor (Designated Biologist). The Designated Biologist shall be knowledgeable and experienced in the biology and natural history of the Covered Species. The Designated Biologist will be responsible for monitoring construction and/or ground- or vegetation-disturbing activities in areas of Covered Species' habitat to help minimize or avoid the incidental take of individual Covered Species and to minimize disturbance of Covered Species' habitat. Permittee shall obtain DFG approval of the Designated Biologist prior to the commencement of Project-related activities that may result in the incidental take of the Covered Species.	ITP Condition #4.2	Before commencing ground or vegetation disturbing activities Entire Project	Permittee	
3	The Designated Biologist shall have authority to immediately stop any activity that is not in compliance with this ITP and/or to order any reasonable measure to avoid the take of an individual of the Covered Species or any fully protected species. Neither the Authorized Biologist(s) nor DFG shall be liable for any costs incurred in complying with the management measures, including cease-work orders.	ITP Condition #4.3	Before commencing ground or vegetation disturbing activities Entire Project	Permittee	
4	Permittee shall conduct an education program for all persons employed or otherwise working on the Project site prior to performing any work on-site. Instruction shall consist of a presentation by the Designated Biologist that includes a discussion of the biology and general behavior of the Covered Species, information about the distribution and habitat needs of the Covered Species, sensitivity of the Covered Species to human activities, its status under CESA including legal protection, recovery efforts, penalties for violations, and Project-specific protective management measures provided in the ITP. Interpretation shall be provided for non-English speaking workers, and the same instruction shall be provided for any new workers prior to on-site Project activity. Copies of the ITP shall be maintained at the worksite. Permittee shall prepare and distribute wallet-sized cards or a fact sheet handout containing this information for workers to carry on-site. Upon completion of the program, employees shall sign an affidavit stating they attended the program and understand all protection measures. These forms shall be filed at the worksite offices and be available to DFG upon request.	ITP Condition #4.4	Before commencing ground or vegetation disturbing activities Entire Project	Permittee	
5	Permittee shall initiate a trash abatement program during pre-construction phases of the Project and continue the program throughout the duration of the Project. Trash and food items shall be contained in closed (raven-proof) containers and removed regularly (at least once a week) to avoid attracting opportunistic predators such as ravens, coyotes, and feral dogs.	ITP Condition #4.5	Before commencing ground or vegetation disturbing activities Entire Project	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
6	Permittee shall provide DFG with written detailed construction plans, including engineering drawings, a minimum of 30 days prior to ground- or vegetation-disturbing activities authorized by this ITP. These plans as provided to DFG by the Permittee shall include the protection and restoration features and techniques made part of the Permittee's construction contract for the Project, including the features and techniques and any other modifications to the Project made since the Permittee submitted its application to DFG for this ITP.	ITP Condition #5.1	Before commencing ground or vegetation disturbing activities of each phase	Permittee	
7	Permittee shall notify DFG 14 calendar days before initiating ground- or vegetation-disturbing activities for each phase of the Project and document compliance with all pre-Project Conditions of Approval before initiating ground- or vegetation-disturbing activities.	ITP Condition #5.2	Before commencing ground or vegetation disturbing activities of each phase	Permittee	
8	If a Covered Species is injured as a result of Project-related activities, it shall be immediately taken to a DFG-approved wildlife rehabilitation or veterinary facility. The Permittee shall identify the facility prior to the start of ground- or vegetation-disturbing activities. Permittee shall bear any costs associated with the care or treatment of such injured Covered Species. Permittee shall notify the USFWS and DFG immediately unless the incident occurs outside of normal business hours. In that event the USFWS and DFG shall be notified no later than noon on the next business day. Notification to DFG shall be via telephone or e-mail, followed by a written incident report. Notification shall include the date, time, location, and circumstances of the incident and the name of the facility where the animal was taken.	ITP Condition #6.2	Before commencing ground or vegetation disturbing activities Entire Project	Permittee	
9	The Designated Biologist shall perform a pre-construction survey for Covered Species no more then 30 days prior to ground- or vegetation-disturbing activities for each Phase of the Project. Surveys shall cover the proposed construction right-of-way (ROW) with a 200-foot buffer for all areas along the Project length with habitat to support Covered Species. A report documenting the results of the pre-construction surveys shall be submitted to DFG within 30 days after performing any such survey.	ITP Condition #6.3	Before commencing ground or vegetation disturbing activities of each phase	Permittee	
10	If a potential Covered Species den (one that shows evidence of current use or was used in the past) is discovered or a Covered Species is found in an "atypical" den (e.g., a pipe or culvert), a 50-foot buffer shall be established using flagging. If a known Covered Species den is discovered, a buffer of at least 100 feet shall be established using fencing. If a natal den (den in which Covered Species young are reared) is discovered, a buffer of at least 200 feet shall be established using fencing. Buffer zones shall have restricted entry. Permittee shall notify the USFWS and DFG's Regional Representative immediately via telephone or email if any Covered Species dens, natal dens or atypical dens are discovered.	ITP Condition #6.4	Before commencing ground or vegetation disturbing activities Entire Project	Permittee	
11	For dens found within the portion of the Project area to be disturbed, natal dens shall not be excavated until the pups and adults have vacated and then only after consultation with the USFWS and DFG. If, after 4 consecutive days of monitoring with tracking medium or infrared camera the Designated Biologist has determined that a Covered Species is not currently present, known dens may be destroyed. Potential dens (any hole 3 inches or larger) may be excavated without monitoring if a take permit has been obtained from the USFWS, but if the process reveals evidence of use inside then destruction shall cease and the USFWS and DFG shall be notified immediately.	ITP Condition #6.5	Before commencing ground or vegetation disturbing activities of each phase	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
12	Destruction of Covered Species dens shall be accomplished by careful excavation until it is certain no Covered Species are inside. The den should be fully excavated, filled with dirt and compacted to ensure that Covered Species cannot reenter or use the den during the construction period. If at any point during excavation a Covered Species is discovered inside the den, excavation shall cease immediately and monitoring of the den as described above shall be resumed. Destruction of the den shall only be completed when, in the judgment of the Designated Biologist, the animal has escaped from or otherwise vacated the partially destroyed den.	ITP Condition #6.6	Before commencing ground or vegetation disturbing activities of each phase	Permittee	
13	Any Covered Species' den that must be destroyed shall be replaced with an artificial den. This will compensate for the loss of important shelter used by Covered Species for protection, reproduction, and escape from predators. Den design and placement should be determined on a site-specific basis in consultation with the USFWS and DFG.	ITP condition #6.7	Before commencing ground or vegetation disturbing activities of each phase	Permittee	
14	Permittee shall acquire and permanently preserve 1,337.02 acres as total compensation for the loss of Covered Species' habitat for the entire Project. The required acreage is based on factors including an assessment of the quality of the habitat at the Project site and DFG's estimate of the acreage required to provide for adequate biological carrying capacity at a replacement location. Permittee has identified five Phases of the Project. (See Table 1.) Permittee shall complete all compensatory mitigation requirements separately and in their entirety for each Phase of the Project in sequential order prior to commencing ground- or vegetation-disturbing activities for the next Project Phase. As described in Table 2 of this ITP, the required compensation for each Phase of the Project is as follows: Phase 1 is 154.99 acres, Phase 2 is 213.61 acres, Phase 3 is 401.91 acres, Phase 4 is 286.04 acres, and Phase 5 is 280.47 acres; for a total of 1,337.02 acres.	ITP Conditions #7.1, 7.2	Before commencing ground or vegetation disturbing activities of each phase	Permittee	
15	For Project Phases 1 through 3, Permittee intends to mitigate at the Palo Prieto Conservation Bank, which approved DFG on February 26, 2008, as authorized to sell habitat mitigation credits for the Covered Species. Permittee is not authorized to commence ground- or vegetation-disturbing activities associated with the Project until this ITP is effective and the Permittee has complied with ITP Condition of Approval 5.2, including providing written documentation to DFG that Permittee has purchased the required habitat mitigation credits.	ITP Condition #7.3	Before commencing ground or vegetation disturbing activities of each phase	Permittee	
16	For Project Phases 4 and 5, the Permittee shall purchase credits at the Palo Prieto Conservation Bank or another conservation bank approved by DFG in San Luis Obispo County that is authorized to sell habitat mitigation credits for the Covered Species. Permittee shall not commence ground- or vegetation-disturbing activities associated with Project Phases 4 and 5 until the Permittee has complied with ITP Condition of Approval 5.2, including providing written documentation to DFG that Permittee has purchased the required habitat mitigation credits.	ITP Condition #7.4	Before commencing ground or vegetation disturbing activities of each phase	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
DURING CONSTRUCTION					
17	Permittee shall implement dust control measures during Project activities to facilitate visibility for monitoring of the Covered Species by the Designated Biologist.	ITP Condition #4.6	Entire Project	Permittee	
18	Workers shall inspect for Covered Species under vehicles and equipment before vehicles and equipment are moved. If a Covered Species is present, the worker shall wait for the Covered Species to move on its own to a safe location.	ITP Condition #6.1	Entire Project	Permittee	
19	Permittee shall prohibit firearms and domestic dogs from the Project site and site access routes during construction and development of the Project, except those in the possession of authorized security personnel or local, State, or Federal law enforcement officials.	ITP Condition #4.7	Entire Project	Permittee	
20	Permittee shall clearly delineate property boundaries of the Project site with fencing, stakes, or flags and shall similarly delineate the limits of construction areas.	ITP Condition #4.8	Entire Project	Permittee	
21	Permittee shall clearly delineate habitat of the Covered Species on the Project site with posted signs, posting stakes, flags, and/or rope or cord, and place Environmentally Sensitive Area (ESA) fencing as necessary to minimize disturbance of Covered Species' habitat.	ITP Condition #4.9	Entire Project	Permittee	
22	Project-related personnel shall access the Project site during construction and development activities using existing routes and shall not cross Covered Species' habitat outside of and in route to the Project site. Project-related vehicle traffic shall be restricted to established roads, staging and parking areas. Vehicle speeds shall not exceed 20 miles per hour, except when traveling on existing highway, in order to avoid Covered Species on or traversing the roads. If the Permittee determines construction of off-site routes for travel are necessary, Permittee shall contact DFG prior to carrying out any such an activity. DFG may require an amendment to this ITP if additional take of Covered Species may result from Project modification.	ITP Condition #4.10	Entire Project	Permittee	
23	Permittee shall confine all Project-related parking, storage areas, laydown sites, equipment storage, and any other surface-disturbing activities to the Project site using, to the extent possible, previously disturbed areas. Additionally, Permittee shall not use or cross Covered Species' habitat outside of the marked Project boundaries unless specifically provided for in this ITP.	ITP Condition #4.11	Entire Project	Permittee	
24	Permittee shall immediately stop/repair any fuel or hazardous waste leaks or spills on the Project site during construction and development activities and immediately clean up such spills at the time of occurrence. Permittee shall exclude the storage and handling of hazardous materials from the construction zone and shall properly contain and dispose of any unused or leftover hazardous products off-site.	ITP Condition #4.12	Entire Project	Permittee	
25	Permittee shall immediately notify DFG in writing if it determines that it is not in compliance with any Conditions of Approval of this ITP, including but not limited to any actual or anticipated failure to implement mitigation measures within the time periods indicated in this ITP and MMRP. Permittee shall report any non-compliance with the ITP during the construction phase of the Project to DFG within 24 hours.	ITP Condition #5.3	Entire Project	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
26	**Monthly Report**: The Designated Biologist shall be on-site daily while construction and/or surface-disturbing activities are taking place to minimize take of the Covered Species; to ensure compliance with all mitigation and avoidance measures; to check all exclusion zones; and to ensure that signs, stakes, and fencing are intact, and that human activities are restricted to outside of these protective zones. Weekly compliance inspections shall be conducted after clearing, grubbing, and grading are completed. These inspections shall be compiled into Monthly Compliance Reports along with a copy of the MMRP table with notes showing the current implementation status of each mitigation measure. Monthly Compliance Reports shall be submitted to DFG's Regional Office at the address listed in the Notices section of this ITP or via e-mail to DFG's Regional Representative. At the time of this ITP's approval, the DFG Regional Representative is Laura Peterson-Diaz (e-mail address lpdiaz@dfg.ca.gov). DFG may at any time increase the timing and number of compliance inspections and reports required under this provision depending upon the results of previous compliance inspections (see Condition 5.5).	ITP Condition #5.4	Entire Project	Permittee	
27	All observations of Covered Species and their sign, oversight activities, verifications, compliance inspections, surveys, monitoring, and records required by this ITP shall be reported in writing to DFG by the Designated Representative or Designated Biologist. Permittee shall submit reports of these activities to DFG in the next Monthly Compliance Report.	ITP Conditions #5.5	Entire Project	Permittee	
28	All Covered Species sightings confirmed by the Designated Biologist shall include the following documented information: the date, time, and location of each occurrence using GPS technology, the name of the party that actually identified the animal, circumstances of the incident, the general condition and health of each individual, any diagnostic markings, sex, age (juvenile or adult), and actions undertaken and habitat description. The Permittee shall submit this information to the California Natural Diversity Database (CNDDB).	ITP Conditions #5.6	Entire Project	Permittee	
29	**Annual Report**: Permittee shall provide DFG with an Annual Status Report (ASR) no later than January 31 of every year beginning with the issuance of the ITP and continuing until DFG accepts the Final Mitigation Report identified below. Each ASR shall include, at a minimum: 1) a general description of the status of the Project site and construction activities, including actual or projected completion dates, if known; 2) a copy of the table in the MMRP with notes showing the current implementation status of each mitigation measure; 3) a copy of the Monthly Compliance Reports from the previous year; and 4) a description of any site-specific avoidance and minimization measures that were employed and an assessment of the effectiveness of each completed or partially completed mitigation measure in minimizing and compensating for Project impacts.	ITP Condition #5.7	Entire Project	Permittee	
30	Restoration of Project lands where temporary impacts occur shall be monitored and the status of the restoration included in the Annual Reports beginning after completion of Phase I of the Project. Restoration of all areas subject to temporary ground- or vegetation disturbance shall be recontoured, as necessary, covered with stockpiled top-soil, and seeded with native species. Monitoring for 2 years post-construction of each Phase shall insure that noxious weeds do not become dominant in the restored area and that native species found in the vicinity are successfully reintroduced. If the temporary impact lands have not returned to pre-Project conditions two years after completion of each Phase, additional mitigation and an amendment to this ITP might be required.	ITP Condition #5.8	After completion of phase 1 until 2 years post-construction of phase 5	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
31	If a Covered Species is killed by a Project-related activity during construction of the Project or if a Covered Species is otherwise found dead, the Designated Biologist shall be immediately notified and initial notification shall be made to the Sacramento Office of the USFWS at (916) 414-6620, and DFG by calling the DFG Regional Office at (559) 243-4017. The initial notification to the USFWS and DFG shall include information regarding the location, species, number of animals injured or killed, and the DFG ITP Number. Following initial notification, Permittee shall send DFG a written report within 2 calendar days. The report shall include the date and time of the finding or incident, location of the carcass, and if possible provide a photograph, explanation as to cause of death, and any other pertinent information. The Designated Biologist shall collect the carcass, place it in plastic, and keep it on ice or in a freezer until a DFG representative can either collect the specimen or issue alternative instructions.	ITP Condition #5.10	Entire Project	Permittee	
32	If a Covered Species is injured as a result of Project-related activities, it shall be immediately taken to a DFG-approved wildlife rehabilitation or veterinary facility. The Permittee shall identify the facility prior to the start of ground- or vegetation-disturbing activities. Permittee shall bear any costs associated with the care or treatment of such injured Covered Species. Permittee shall notify the USFWS and DFG immediately unless the incident occurs outside of normal business hours. In that event the USFWS and DFG shall be notified no later than noon on the next business day. Notification to DFG shall be via telephone or e-mail, followed by a written incident report. Notification shall include the date, time, location, and circumstances of the incident and the name of the facility where the animal was taken.	ITP Condition #6.2	Entire Project	Permittee	
33	All open holes and trenches within the Project construction boundary shall be inspected at the beginning of the day, middle of the day, and end of the day for trapped animals. To prevent inadvertent entrapment of Covered Species or any other animals during the construction phase of the Project, all excavated, steep-walled holes or trenches more than 2 feet deep shall be covered at the close of each working day by plywood or similar materials or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they shall be thoroughly inspected for trapped animals. If at any time a trapped or injured Covered Species is discovered, the USFWS and DFG will be notified within one (1) working day of the incident.	ITP Condition #6.8	Entire Project	Permittee	
34	All construction pipe, culverts, or similar structures with a diameter of 7.6 centimeters (3 inches) or greater that are stored at the construction site for one or more overnight periods will be thoroughly inspected for Covered Species before the pipe is subsequently moved, buried, or capped. If a Covered Species is discovered inside a pipe during inspection, that section of pipe shall not be moved until the animal has escaped on its own.	ITP Condition #6.9	Entire Project	Permittee	
35	DFG may issue Permittee a written stop-work order to suspend any activity covered by this ITP for an initial period of up to 25 days to prevent or remedy a violation of ITP conditions (including but not limited to failure to comply with reporting, monitoring, or habitat acquisition obligations) or to prevent the illegal take of an endangered, threatened, or candidate species. Permittee shall comply with the stop-work order immediately upon receipt thereof. DFG may extend a stop-work order under this provision for a period not to exceed 25 additional days, upon written notice to the Permittee. DFG shall commence the formal suspension process, pursuant to California Code of Regulations, Title 14, section 783.7, within five working days of issuing a stop-work order.	ITP	Entire Project	DFG	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
POST-CONSTRUCTION					
36	Upon completion of Project construction, Permittee shall remove from the Project site and properly dispose of all construction refuse, including, but not limited to, broken equipment parts, wrapping material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, and boxes.	ITP Condition #4.14	Post-construction	Permittee	
37	**Final Mitigation Report**: No later than 60 days after completion of the Project, including completion of all mitigation measures, Permittee shall provide DFG with a Final Mitigation Report. The Final Mitigation Report shall be prepared by the Designated Biologist and shall include, at a minimum: 1) a copy of the table in the MMRP with notes showing when each of the mitigation measures was implemented; 2) all available information about Project-related incidental take of the Covered Species; 3) information about other Project impacts on the Covered Species; 4) construction dates; 5) an assessment of the effectiveness of the ITP's Conditions of Approval in minimizing and compensating for Project impacts; 6) recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future projects on the Covered Species; and 7) any other pertinent information, including the level of take of the Covered Species associated with the Project.	ITP Condition #5.9	Post-construction	Permittee	
38	DFG accepts the Final Mitigation Report as complete.	ITP Condition #4.15	Post-construction	DFG	

FOR CONTRACT NO.: 05-330774

MATERIALS INFORMATION

Portions of Asbestos and Lead Containing Paint Survey Report

ROUTE: 46-SLO-40.7/46.3(PM)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

INFORMATIONAL HANDOUT

05-SLO-46-40.7/46.3
WHITLEY 2A
05-330771

July 19, 2011

INDEX

Portions of Asbestos and Lead Containing Paint Survey Report

Department of Transportation
Construction Department
1150 Laurel Lane
San Luis Obispo, CA 93403

GEOCON

GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS

SITE INVESTIGATION REPORT

ASBESTOS AND LEAD-CONTAINING PAINT SURVEY

ROUTE 46 BRIDGES
SAN LUIS OBISPO COUNTY, CALIFORNIA

PREPARED FOR

CALIFORNIA DEPARTMENT OF TRANSPORTATION
DISTRICT 6
FRESNO, CALIFORNIA

CALTRANS TASK ORDER NO.
05-3307U0-2P
GEOCON PROJECT NO. E8000-06-68

JUNE 2001

GEOCON
CONSULTANTS, INC.
ENVIRONMENTAL ■ GEOTECHNICAL ■ MATERIALS

Project No. E8000-06-68
June 28, 2001

Mr. Shawn Ogletree
California Department of Transportation
3402 North Blackstone Avenue, Suite 201
Fresno, California 93726

Subject: ASBESTOS AND LEAD-CONTAINING PAINT SURVEYS
ROUTE 46 BRIDGES
SAN LUIS OBISPO COUNTY, CALIFORNIA
CONTRACT NO. 43A0012
TASK ORDER NO. 05-3307U0-2P

Dear Mr. Ogletree:

In accordance with California Department of Transportation (Caltrans) Contract No. 43A0012 and Task Order (TO) No. 05-3307U0-2P, Geocon Consultants, Inc. has performed asbestos and lead-containing paint surveys at five bridges on Route 46 in San Luis Obispo County, California (the Site). The scope of services provided by Geocon included surveying the bridges for asbestos and lead-containing paint, collecting bulk samples, and submitting the samples to laboratories for analyses.

PROJECT LOCATION AND PROPOSED IMPROVEMENTS

The Site consists of the following five bridges between Post Miles (PM) 39.95 and 54.77 on Route 46 in San Luis Obispo County, California:

- Bridge 49-0036 (Cholame Creek);
- Bridge 49-0029 (Cholame Creek);
- Bridge 49-0095 (Cholame Creek);— PM 48.32
- Simmons Creek Bridge; and
- Bridge 49-0033 (Estrella River).

The proposed project involves improvements to Route 46 that will require bridge retrofit activities. The approximate location of the Site is depicted on the attached Vicinity Map, Figure 1. Individual bridges and sample locations are presented in Figures 2a through 2e. Photographs of bridges and suspect materials are presented as Site Photos 1 through 20.

PURPOSE

The purpose of the scope of work was to determine the presence and quantity of asbestos and lead-containing paint on the bridges in advance of the construction contract. The information obtained from this investigation will be used by Caltrans to estimate removal and disposal costs and coordinate asbestos and/or lead-containing paint abatement, if necessary, within the proposed project work areas.

BACKGROUND

A review of as-built plans provided by Caltrans did not indicate the presence of asbestos in the bridges.

FIELD ACTIVITIES

The following field activities were performed in accordance with TO No. 05-3307U0-2P.

Asbestos Survey

The *Code of Federal Regulations (CFR),* 40 CFR 61, Subpart M, National Emissions Standards for Hazardous Air Pollutants (NESHAP) and Federal Occupational Safety and Health Administration (FED OSHA) classify asbestos-containing materials (ACM) as any material or product which contains more than 1% asbestos. Nonfriable ACM are classified by NESHAP as either Category I or Category II material defined as follows:

- **Category I** – asbestos-containing packings, gaskets, resilient floor coverings, and asphalt roofing products.
- **Category II** – all remaining types of non-friable asbestos-containing material not included in Category I that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Regulated asbestos-containing material (RACM) is classified as any material that contains greater asbestos by dry weight and is:

1. Friable;
2. Category I material that has become friable;
3. Category I material that has been subjected to sanding grinding, cutting or abrading; or
4. Category I non-friable material that has a high probability of becoming crumbled, pulverized, or reduced to a powder during demolition or renovation activities.

With respect to potential worker exposure, the California Code of Regulations (CCR), 8 CCR 341.6, defines asbestos-containing construction materials (ACCM) as construction material that contains more than 0.1% asbestos.

Mr. David Watts, a California Certified Asbestos Consultant (CAC), certification No. 98-2404, performed the asbestos surveys of the subject bridges on May 1, 2001.

Suspect ACM were grouped into homogeneous areas with representative samples collected from each. In addition, each potential ACM was evaluated for condition (evidence of deterioration, physical damage, and water damage) friability, and accessibility.

Fifty-four bulk asbestos samples, including mastics, concrete, resilient joint sheeting, joint expansion material, concrete sealant, and asphalt materials were collected from the subject bridges. No other suspected ACM was observed. The approximate sample locations are presented in Figures 2a through 2e.

Geocon's procedures for inspection and sampling are discussed below:

- Collected bulk asbestos samples after first wetting the material with a light mist of water. The samples were then cut from the substrate and transferred to a labeled container. Note that when multiple samples were collected, the sampling locations were distributed throughout the homogeneous area (spaces where the material was observed).

- Relinquished bulk asbestos samples to Advanced Technology Laboratories (ATL) who subcontracted the analyses to Scientific Laboratories of California (SCILAB), a California-licensed and Caltrans approved subcontractor, for asbestos analysis in accordance with EPA Test Method 600/M4-82-020 using polarized light microscopy (PLM) under standard chain-of-custody procedures. SCILAB is a laboratory accredited by the National Institute of Standards and Technology National Voluntary Laboratory Accreditation Program (NIST-NVLAP) for bulk asbestos fiber analysis.

Lead-Containing Paint Survey

Lead-based paint is defined by Title 17, CCR, Division 1, Chapter 8, §35033 as any surface coating that contains an amount of lead equal to, or in excess of one milligram per square centimeter (1.0 mg/cm^2) or more than half of one percent (0.5%) by weight. However, construction activities (including demolition) that disturb materials containing any amount of lead are subject to certain requirements of the California Division of Occupational Safety and Health (Cal/OSHA) lead standard contained in Title 8, CCR, Section 1532.1. Deteriorated lead-based paint is defined by Title 17, CCR, Division 1, Chapter 8, §35022 as a lead-based surface coating that is cracking, chalking, flaking, chipping, peeling, non-intact, failed, or otherwise separating from a component. Demolition of a deteriorated lead-containing paint (LCP) component would require waste characterization and appropriate disposal. Intact lead-containing paint on a component is currently accepted by most landfill facilities, however, contractor(s) should characterize painted waste materials prior to disposal.

Potential hazards exist to workers who remove or cut through lead-containing paint coatings during demolition. Dust containing hazardous concentrations of lead may be generated during scraping or cutting materials coated with lead-containing paint. Torching of these materials may produce lead oxide fumes. Therefore, air monitoring and/or respiratory protection may be required during the demolition of materials coated with lead-containing paint. Guidelines regarding regulatory provisions for construction work where workers may be exposed to lead are presented in the Title 8, CCR, Section 1532.1.

Mr. David Watts, a Certified Lead-Based Paint Inspector/Assessor and Project Monitor with the California Department of Health Services (DHS), certification nos. I-1734 and M-1734, performed the LCP survey of the five bridges on May 1, 2001. Four LCP samples were collected at the Site (two from white-painted guardrails on Bridge 49-0095 and two from silver-painted superstructure on Bridge 49-0033). Suspect LCP was not observed on the remaining three bridges.

In addition, each painted area was evaluated for evidence of deterioration such as flaking or cracking. The approximate sample locations are presented in Figures 2c and 2e.

Geocon's procedures for inspection and sampling are discussed below:

- Collected representative bulk samples of suspect LCP from Bridges 49-0095 and 49-0033 using techniques presented in the United States Department of Housing and Urban Development (HUD) guidelines.

- Relinquished LCP samples to Advanced Technology Laboratories (ATL), a California-licensed and Caltrans approved subcontractor, for chemical analysis for total lead following EPA Test Method 6010B under standard chain-of-custody procedures.

ANALYTICAL RESULTS

Asbestos

Chrysotile asbestos was detected in three samples of resilient joint sheeting collected from Bridge 49-0036 at concentrations ranging from 35% to 45%. The resilient joint sheeting is non-friable and was observed to be in good condition during the survey.

A trace level of chrysotile asbestos was reported in one sample of concrete (1920s era) used in Bridge 49-0029. However, a more detailed analysis of the same sample using EPA Point Count Methods (400 points) did not indicate the presence of asbestos. Such inconsistencies are not uncommon due to laboratory quantification limits, the occurrence of false positives, and the ubiquitous nature of asbestos in the environment.

No asbestos was detected in other suspect materials at the Site.

The laboratory asbestos results are summarized in Table 1. Copies of the laboratory report and chain-of-custody documentation are included herein as an attachment.

Lead-Containing Paint

Total lead was detected in two samples of white paint collected from guardrails on Bridge 49-0095 at concentrations of 830 and 1,300 milligrams per kilogram (mg/kg). Total lead was also detected in two samples of silver paint collected from Bridge 49-0033 superstructure at concentrations of 84,000 and 130,000 mg/kg. Soluble lead levels ranged from 0.27 to 670 mg/l. White-paint applied to guardrails on Bridge 49-0095 were observed to be in poor condition at the time of the survey. Painted areas on Bridge 49-0033 were observed to be in good condition at the time of the survey

The laboratory LCP results are summarized in Table 2. Copies of the laboratory report and chain-of-custody documentation are included herein as an attachment.

CONCLUSIONS AND RECOMMENDATIONS

Asbestos

Based on the analytical test results, Geocon recommends that resilient joint sheeting used on Bridge 49-0036 be treated as Category II, non-friable ACM. The resilient joint sheeting was observed to be in good condition.

Geocon recommends that resilient joint sheeting be separated from concrete bridge members and disposed of by a licensed and certified asbestos abatement contractor prior to concrete recycling or other activities that would disturb or render the ACM friable. The estimated quantity of resilient joint sheeting on Bridge 49-0036 is 5 square meters. For budgetary planning purposes, the approximate abatement cost for this material is $3,000.

Lead-Containing Paint

Geocon recommends that peeling/flaking LCP on Bridge 49-0095 be removed and disposed of by a licensed and certified abatement contractor in conjunction with the planned demolition work. The abatement contractor should be required to use personnel who have lead-related construction certification as supervisors or workers, as appropriate, from the California DHS for LCP removal work. Loose and peeling/flaking LCP require removal prior to demolition for waste segregation purposes: to separate potentially hazardous (Category III concentrated lead) waste from non-hazardous demolition debris (Category II intact lead-painted architectural components). For budgetary planning purposes, the approximate abatement cost for this material is $5,000.

Geocon also recommends that painted surfaces on Bridge 49-0033 be treated as lead-containing for purposes of determining the applicability of the Cal/OSHA lead standard during any maintenance, renovation, or demolition activities. This recommendation is based on LCP sample results, the age of the bridge, and the fact that lead was a common ingredient of paints manufactured before 1978 and is still an ingredient of some industrial paints.

Typically, only paints that are peeling, flaking, or have otherwise become separated from their substrates are of concern from a hazardous waste standpoint. The California Department of Toxic Substances Control (DTSC) "does not generally expect intact painted building materials to exhibit a characteristic of hazardous waste when disposed of." However, construction activities (including demolition) that disturb materials containing any amount of lead are subject to certain requirements of the Cal/OSHA lead standard contained in Title 8, CCR, Section 1532.1. Intact lead-painted building materials that are removed/demolished should not require disposal as hazardous waste; however, contractor(s) should characterize painted waste materials prior to disposal.

LIMITATIONS

The asbestos and lead-containing paint surveys were conducted in conformance with generally accepted standards of practice for identifying and evaluating asbestos and lead-containing paint in structures. However, asbestos and/or lead-containing paint may exist in areas of the structure not sampled in conjunction with this TO.

The contents of this report reflect the views of the author who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

If you have any questions concerning the contents of this report, or if we may be of further service, please contact the undersigned at your convenience.

Sincerely,

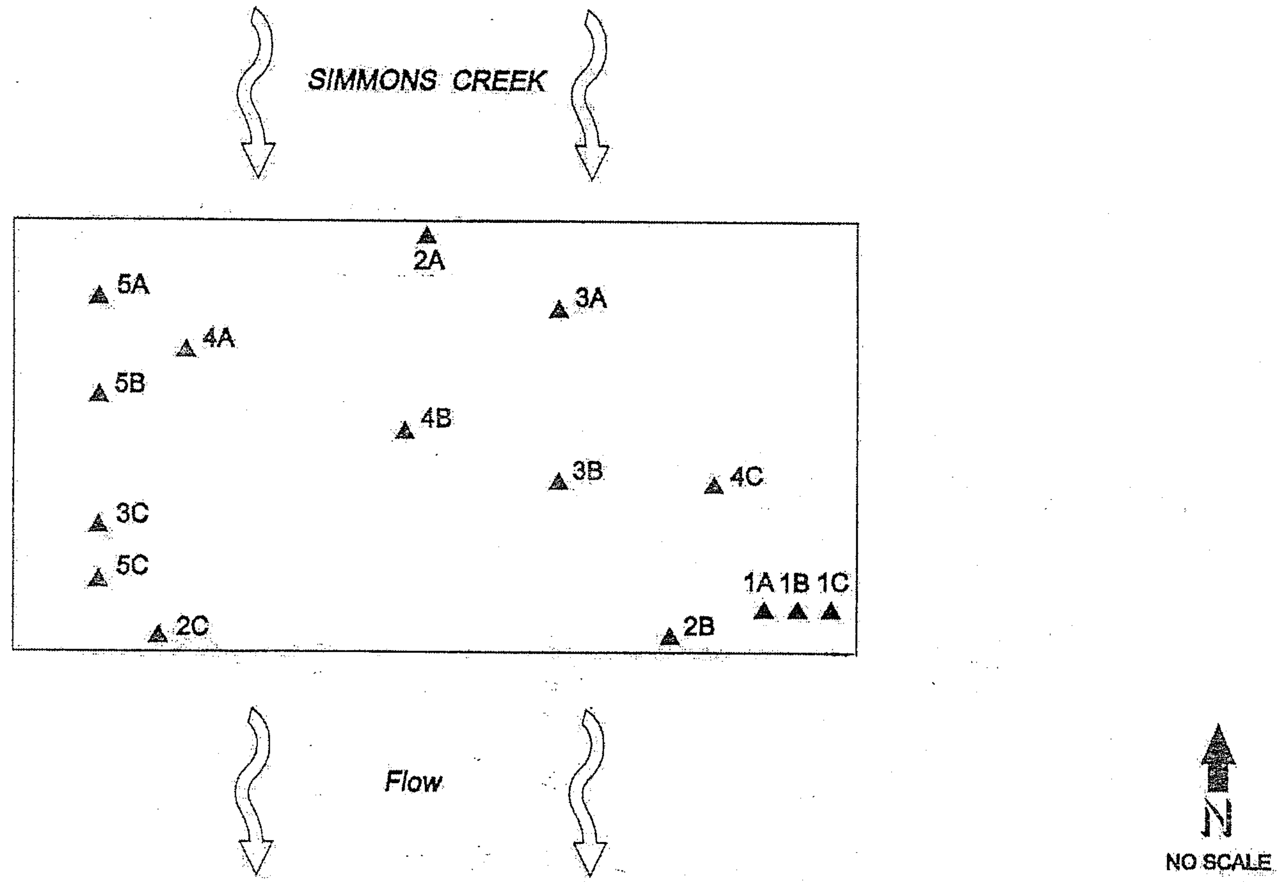
GEOCON CONSULTANTS INC.

David A. Watts, CAC
Project Scientist

Richard W. Day, CEG, CHG
Regional Manager

DAW:RWD:daw

(5) Addressee



LEGEND:

▲ Approximate Asbestos Sample Location

GEOCON CONSULTANTS INC. 2356 RESEARCH DRIVE, LIVERMORE, CALIFORNIA, 94550 PHONE 925 371-5900 - FAX 925 371-5915	
Route 46 PM 39.95 to 54.77	
San Luis Obispo County, California	SITE PLAN Simmons Creek Bridge
GEOCON Proj. No. E8000-06-68	
Task Order No. 05-3307U0-2P	June 2001 / Figure 2d

ASBESTOS

TABLE 1
SUMMARY OF ANALYTICAL LABORATORY TEST RESULTS - ASBESTOS
ROUTE 46 BRIDGES
SAN LUIS OBISPO COUNTY, CALIFORNIA

SAMPLE I.D.	BRIDGE	FRIABILITY	MATERIAL DESCRIPTION/CONDITION	APPROXIMATE QUANTITY (SQUARE METER OR LINEAR METER)	ASBESTOS EPA 600/M4-82-020 (TYPE AND % BY WEIGHT)
95-1A	BRIDGE 49-0095	NONFRIABLE	CONCRETE/GOOD	NQ	ND
95-1B					ND
95-1C					ND
SIMM-1A	SIMMONS CREEK BRIDGE	FRIABLE	CONCRETE SEALANT/POOR	NQ	ND
SIMM-1B					ND
SIMM-1C					ND
SIMM-2A		NONFRIABLE	CONCRETE/POOR	NQ	ND
SIMM-2B					ND
SIMM-2C					ND
SIMM-3A		NONFRIABLE	ASPHALT FILL MATERIAL/POOR	NQ	ND
SIMM-3B					ND
SIMM-3C					ND
SIMM-4A		NONFRIABLE	ASPHALT ROAD SURFACE/POOR	NQ	ND
SIMM-4B					ND
SIMM-4C					ND
SIMM-5A		NONFRIABLE	ASPHALT AND FIBER FILL MATERIAL/POOR	NQ	ND
SIMM-5B					ND
SIMM-5C					ND
33-1A	BRIDGE 49-0033	NONFRIABLE	CONCRETE/GOOD	NQ	ND
33-1B					ND
33-1C					ND
33-2A		NONFRIABLE	JOINT EXPANSION MATERIAL/GOOD	NQ	ND
33-2B					ND
33-2C					ND

Notes: ND = Not detected
NQ = Not quantified
* = Sample analyzed using EPA Point Counting Methods

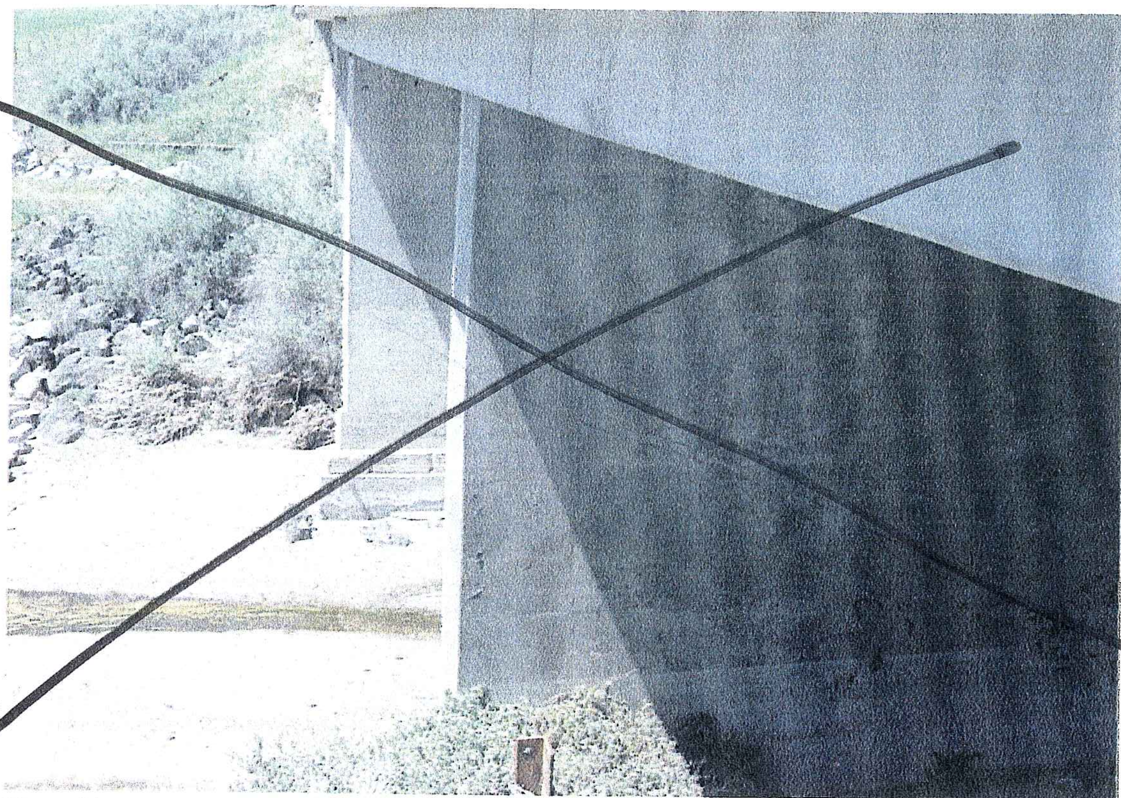


Photo No. 13 Bridge 49-0095 Concrete

Photo No. 14 Simmons Creek Bridge

SITE PHOTOS NO. 13 & 14

GEOCON
CONSULTANTS, INC.
5673 WEST LAS POSITAS BLVD. – SUITE 205 – PLEASANTON, CA. 94588
PHONE 925 469-9750 – FAX 925 469-9749

Route 46 Bridges		
GEOCON Proj. No. E8000-06-68	San Luis Obispo County, California	
Task Order No. 05-3307U0-2P	June 2001	

MATERIALS INFORMATION

Non Mandatory Disposal Site

ROUTE: 46-SLO-40.7/46.3(PM)

FOR CONTRACT NO. 05-330774

INFORMATION HANDOUT

MATERIALS INFORMATION

Non-Mandatory Disposal Site

ROUTE: 05-SLO-46-40.7/46.3

Contract 05-330774

MATERIALS INFORMATION HANDOUT --- NON-MANDATORY DISPOSAL SITE

Full compensation for all work required to be performed at the non-mandatory disposal site, such as clearing and grubbing, erosion control, stormwater items, etc, shall be considered as included in the contract price per cubic yard for roadway excavation and no additional compensation will be allowed therefor.

The Contractor shall notify the Engineer within the first 50 Working days if they plan on using this non-mandatory disposal site.

All work at the designated non-mandatory disposal site shall meet all contract specifications. Material shall be placed at this non-mandatory disposal site based on the grading plan included in this Materials Handout. Material shall be compacted to a relative compaction of not less than 95%. No asphalt concrete pavement or portland cement concrete materials shall be placed at this non-mandatory disposal site.

Erosion control items shall meet the following specifications:

10-1.01 ORDER OF WORK

Order of work shall conform to the provisions in Section 5-1.05, "Order of Work," of the Standard Specifications and these special provisions.

At least 60 days before applying seeds, furnish the Engineer a statement from the vendor that the order for the seed required for this contract has been received and accepted by the vendor. The statement from the vendor must include the names and quantity of seed ordered and the anticipated date of delivery.

Roughen embankment slopes to receive erosion control materials by either trackwalking or rolling with a sheepsfoot roller. Trackwalk slopes by running track mounted equipment perpendicular to slope contours.

10-1.__ EROSION CONTROL (SEQUENCING)

Place erosion control treatments in the following sequence for each erosion control type identified:

Erosion Control Type 1

Erosion Control (Compost Blanket)
Erosion Control (Hydroseed)

Place Fiber Roll before Erosion Control (Hydroseed) in the sequence.

Erosion Control Type 2

Compost (Incorporate)
Erosion Control (Hydroseed)

10-1.__ MOVE-IN/MOVE-OUT (EROSION CONTROL)

Move-in/move-out (Erosion Control) shall include moving onto the project when an area is ready to receive erosion control as determined by the Engineer, setting up all required personnel and equipment for the application of erosion control materials and moving out all personnel and equipment when erosion control in that area is completed.

10-1.__ EROSION CONTROL (HYDROSEED)

GENERAL

Summary

This work includes removing and disposing of weeds and applying erosion control materials including seed, fiber, straw, and tackifier to erosion control (Hydroseed) areas shown on the plans.

Comply with Section 20-3, "Erosion Control," of the Standard Specifications.

Comply with "Move-In/Move-Out (Erosion Control)" of these special provisions.

If notified by the Engineer that an area is ready to receive erosion control materials, start erosion control (Hydroseed) work within 5 business days of the Engineer's notification to perform the work.

The Engineer will designate the ground location of all erosion control (Hydroseed) areas in increments of one acre or smaller by directing the placing of stakes or other suitable markers. Furnish all tools, labor, materials, and transportation required to adequately indicate the various erosion control (Hydroseed) locations.

MATERIALS

Seed

Seed not required to be labeled under the California Food and Agricultural Code must be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Measure and mix individual seed species in the presence of the Engineer.

Seed must contain at most 1.0 percent total weed seed by weight.

Deliver seed to the job site in unopened separate containers with the seed tag attached. Containers without a seed tag attached are not accepted. The Engineer takes a sample of approximately one ounce or 0.25 cup of seed for each seed lot greater than 2 pounds.

Seed must comply with the following:

Seed

Botanical Name (Common Name)	Percent Germination (Minimum)	Pounds Pure Live Seed Per Acre (Slope Measurement)
Achillea millefolium (Common Yarrow)	85	0.5
Bromus arizonicus (Arizona Brome)	85	10
Eschscholzia californica (California Poppy)	85	2
Layia platyglossa (Tidy Tips)	60	0.5
Lotus purshianus (Spanish Lotus)	85	3
Lupinus densiflorus (No Common Name)	90	2
Nassella pulchra (Purple Needle Grass)	80	8
Vulpia microstachys (Three Weeks Fescue)	80	5
	Total	31

Seed Sampling Supplies

At the time of seed sampling, provide the Engineer a glassine lined bag and custody seal tag for each seed lot sample.

Straw

Straw must be Wheat or Barley, or a combination of both.

Wheat and barley straw must be derived from irrigated crops.
Straw must be free of plastic, glass, metal, rocks, and refuse or other deleterious material.

Tackifier

Tackifier must be:

1. Psyllium (Plant Based)

Tackifier must comply with the following:

1. Nonflammable
2. Nontoxic to aquatic organisms
3. Free from growth or germination inhibiting factors
4. Plant-based product

Tackifier classified as a plant based product must comply with the following:

1. A natural high molecular weight polysaccharide
2. A high viscosity hydrocolloid that is miscible in water
3. Functional for at least 180 days
4. Labeled as psyllium

Psyllium:

1. Made of the finely ground muciloid coating of plantago ovata or plantago ispaghula seeds
2. Able to dry and form a firm but rewettable membrane

Starch:

1. A non-ionic, water-soluble granular material derived from corn, potato, or other plant-based source.

Fiber

Fiber must be:

1. Wood

Fiber must comply with the following:

1. Free from lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, or chlorine bleach
2. Free from synthetic or plastic materials
3. At most 7 percent ash

Wood Fiber must comply with the following:

1. Long strand, whole wood fibers, thermo-mechanically processed from clean, whole wood chips
2. Not made from sawdust, cardboard, paper, or paper byproducts
3. At least 25 percent of fibers 3/8 inch long
4. At least 40 percent held on a No. 25 sieve

Coloring Agent

Use a biodegradable, nontoxic coloring agent free from copper, mercury, and arsenic.

CONSTRUCTION

Site Preparation

Immediately prior to applying seed to erosion control (Hydroseed) areas, trash and debris and weeds must be removed.

Removed weeds must be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Application

Apply erosion control (Hydroseed) materials in separate applications in the following sequence:

Erosion Control (Hydroseed) - Type 1

1. Apply the following mixture with hydroseeding equipment at the rates indicated within 60 minutes after the seed has been added to the mixture:

Material	Pounds Per Acre (Slope Measurement)
Seed	31
Fiber	500

2. Apply straw at the rate of 2 tons per acre based on slope measurements. Incorporation of straw will not be required. Distribute straw evenly without clumping or piling.
3. Apply the following mixture with hydro-seeding equipment at the corresponding rates:

Material	Pounds Per Acre (Slope Measurement)
Fiber	1000
Tackifier	150

Erosion Control (Hydroseed) - Type 2

1. Apply the following mixture with hydroseeding equipment at the rates indicated within 60 minutes after the seed has been added to the mixture:

Material	Pounds Per Acre (Slope Measurement)
Seed	31
Fiber	500

2. Apply the following mixture with hydroseeding equipment at the corresponding rates:

Material	Pounds Per Acre (Slope Measurement)
Fiber	1000
Tackifier	150

The ratio of total water to total tackifier in the mixture must be as recommended by the manufacturer.

Once straw work is started in an area, complete tackifier applications in that area on the same working day.

The Engineer may change the rates of erosion control (Hydroseed) materials to meet field conditions.

For any area where erosion control (Hydroseed) materials are to be applied, the application of all erosion control (Hydroseed) materials to be applied to that area must be completed within 72 hours from when the first materials were applied.

10-1.__ EROSION CONTROL (COMPOST BLANKET)

GENERAL

Summary

This work includes removing and disposing of weeds and applying compost to areas shown on the plans.

Comply with Section 20-3, "Erosion Control," of the Standard Specifications.

The Engineer will designate the ground location of all erosion control (Compost Blanket) areas in increments of one acre or smaller by directing the placing of stakes or other suitable markers. Furnish all tools, labor, materials, and transportation required to adequately indicate the various erosion control (Compost Blanket) locations.

MATERIALS

Compost

The compost producer must be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility must certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.

The compost producer must be a participant in United States Composting Council's Seal of Testing Assurance program.

Compost may be derived from any single, or mixture of the following feedstock materials:

1. Green material consisting of chipped, shredded, or ground vegetation, or clean processed recycled wood products
2. Biosolids
3. Manure
4. Mixed food waste

Compost feedstock materials to reduce weed seeds, pathogens and deleterious materials as specified under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3.

Compost must not be derived from mixed municipal solid waste and must be reasonably free of visible contaminates. Compost must not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Compost must not possess objectionable odors.

Metal concentrations in compost must not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

Compost must comply with the following:

Physical/Chemical Requirements

Property	Test Method	Requirement
pH	*TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30-60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	 80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	 8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	100% Passing, 3 inch 90-100% Passing, 1 inch 65-100% Passing, 3/4 inch 0 - 75% Passing, 1/4 inch Maximum length 6 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4mm fraction	None Detected

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Before compost application, provide the Engineer with a copy of the compost producer's compost technical data sheet and a copy of the compost producer's Seal of Testing Assurance certification.

The compost technical data sheet must include:

1. Laboratory analytical test results
2. List of product ingredients

Before compost application, provide the Engineer with a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

CONSTRUCTION

Site Preparation

Immediately prior to applying compost to erosion control (Compost Blanket) areas remove trash, debris and weeds.

Removed weeds must be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Application

Apply compost to a uniform thickness.

Erosion control (Compost Blanket) must extend to the edge of retaining sidewalks, walls, curbs, dikes, paving, and to within 4 feet from the flow line of paved and unpaved drainage ditches.

10-1.__COMPOST (INCORPORATE)

GENERAL

Summary

This work includes removing and disposing of weeds and incorporating compost into the surface of compost (Incorporate) areas with a slope of 4:1 (horizontal:vertical) or flatter as shown on the plans.

Comply with Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Apply compost when an area is ready to receive it as determined by the Engineer.

The Engineer will designate the ground location of all compost (Incorporate) areas in increments of one acre or smaller by directing the placing of stakes or other suitable markers. Furnish all tools, labor, materials, and transportation required to adequately indicate the various compost (Incorporate) locations.

MATERIALS

Compost

Comply with "Erosion Control (Compost Blanket)" of these special provisions, except that particle size must be:

Inches	% Passing
3	99%
3/8	< 25%

Max. Length 4 inches.

CONSTRUCTION

Site Preparation

Immediately prior to applying compost to compost (Incorporate) areas, remove trash, debris and weeds.

Removed weeds must be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Application

Apply and incorporate compost in separate applications in the following sequence:

1. Apply compost to a depth of 4 inches by using specialized equipment such as a pneumatic blower or side discharge spreader.
2. You may incorporate the compost by hand; by using an agricultural cultivator, disk ripper, till ripper or equivalent equipment approved by the Engineer to a depth between 6 and 8 inches. Do not incorporate compost to a strip 1 feet wide adjacent to the edge of pavement.
3. Following incorporation, compact the area to a relative compaction between 82 percent and 90 percent except as otherwise specified in Section 19-5 "Compaction," of the Standard Specifications.

10-1.__ FIBER ROLLS

GENERAL

Summary

This work includes installing fiber rolls.
At the option of the Contractor, fiber rolls shall be Type 1 or Type 2.

MATERIALS

Fiber Roll

Fiber roll shall be:

A premanufactured roll of rice,wheat or native grass straw,or coconut fiber encapsulated within a biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 8 inches and 12 inches in diameter. Rolls between 8 inches and 10 inches in diameter shall have a minimum weight of 1 pound per linear foot and a minimum length of 20 feet. Rolls between 10 inches and 12 inches in diameter shall have a minimum weight of 3 pounds per linear foot and a minimum length of 10 feet.

Stakes

Wood stakes shall be a minimum of 1" x 1" x 24" in size for Type 1 installation, or a minimum of 1" x 2" x 24" in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 1/4 inch.

CONSTRUCTION

Installation

Fiber rolls shall be installed as follows:

1. Fiber rolls (Type 1): Furrows shall be constructed to a depth between 2 inches and 4 inches, and to a sufficient width to hold the fiber roll. Stakes shall be installed 24 inches apart along the length of the fiber rolls and stopped at 12 inches from each end

of the rolls. Stakes shall be driven to a maximum of 2 inches above, or flush with the top of the roll.

2. Fiber rolls (Type 2): Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.
3. Fiber rolls shall be placed as shown on the Typical Cross Sections.
4. The bedding area for the fiber rolls shall be cleared of obstructions including rocks, clods, and debris greater than one inch in diameter before installation.
5. Fiber rolls shall be installed approximately parallel to the slope contour.

If the intended function of the fiber rolls to disperse concentrated water runoff and to reduce runoff velocities is impaired, the Contractor shall take action to repair or replace the fiber rolls. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

MEASUREMENT AND PAYMENT

Full compensation for all work required to be performed at the non-mandatory disposal site, such as clearing and grubbing, erosion control, stormwater items, etc., shall be considered as included in the contract price per cubic yard for roadway excavation and no additional compensation will be allowed therefor.

INDEX OF PLANS

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	46.1/48.2	1	11

STATE OF CALIFORNIA

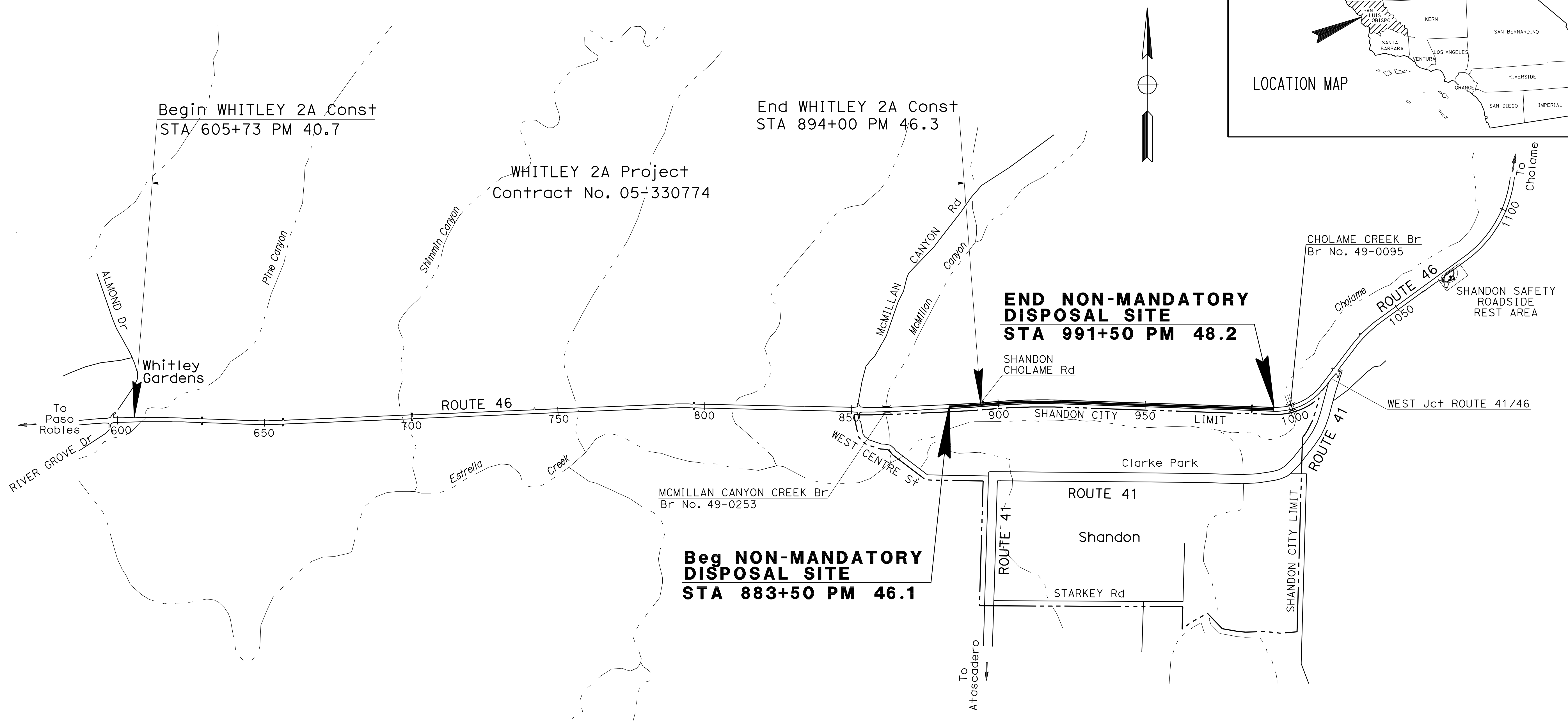
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON

STATE HIGHWAY

IN SAN LUIS OBISPO COUNTY
NEAR PASO ROBLES
FROM 0.6 MILE EAST OF WEST CENTRE St/McMILLAN CANYON Rd
TO 0.5 MILE WEST OF ROUTE 41

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2006



PROJECT MANAGER JOHN LUCHETTA

DESIGN ENGINEER JACK WALKER

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

NO SCALE

NON-MANDATORY DISPOSAL SITE

DATE PLOTTED => 06-JAN-2012
TIME PLOTTED => 09:16

LAST REVISION 01-06-12

BORDER LAST REVISED 8/1/2008 | CALTRANS WEB SITE IS: HTTP://WWW.DOT.CA.GOV/ | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | USERNAME => s128108 | DGN FILE => 533077nmds_LocMap.dgn | CU 06220 | EA 330771

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	46.1/48.2	2	11

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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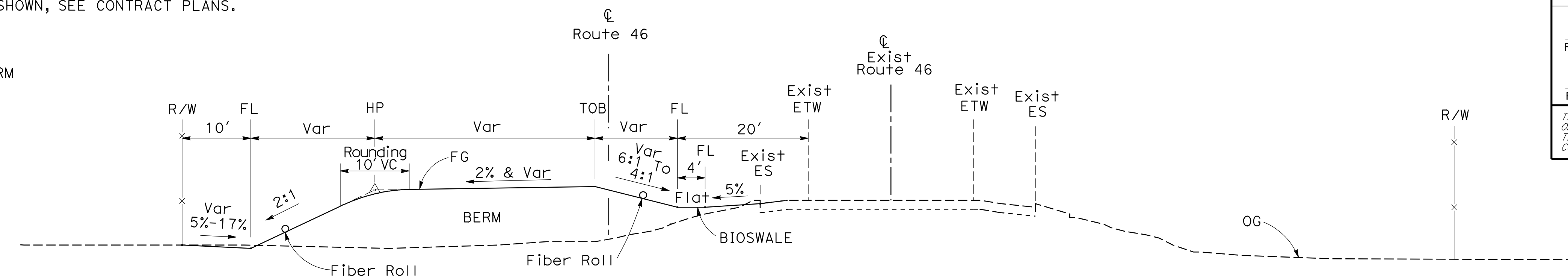
REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

NOTE:

FOR DETAILS NOT SHOWN, SEE CONTRACT PLANS.

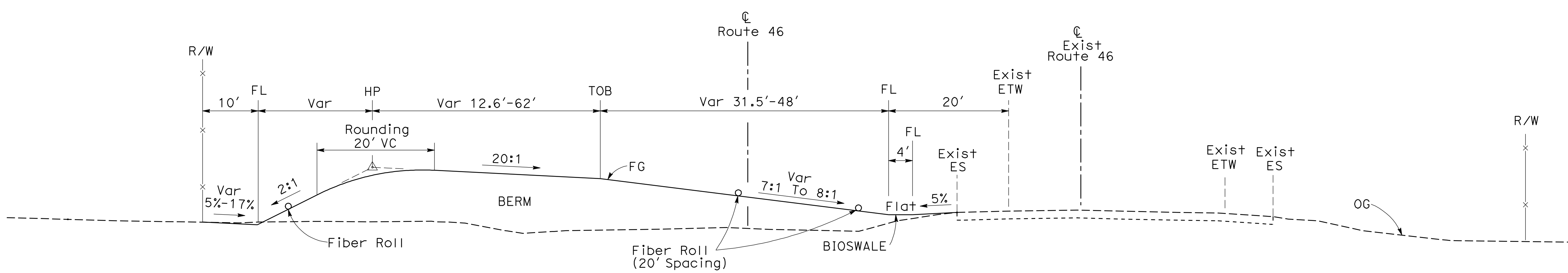
LEGEND

TOB TOP OF BERM



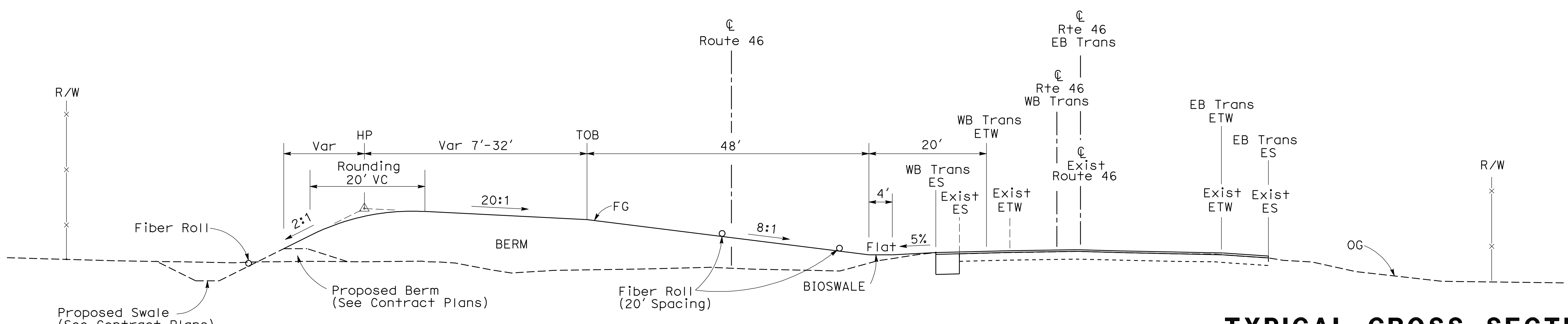
ROUTE 46

BERM No. 4 STA 919+00 TO STA 925+00
BERM No. 5 STA 925+75 TO STA 931+50
BERM No. 6 STA 932+25 TO STA 939+75
BERM No. 7 STA 940+25 TO STA 958+00
BERM No. 8 STA 958+50 TO STA 964+00
BERM No. 9 STA 964+75 TO STA 971+00
BERM No. 10 STA 972+00 TO STA 974+50
BERM No. 11 STA 975+75 TO STA 985+00
BERM No. 12 STA 987+25 TO STA 991+50



ROUTE 46

BERM No. 2 STA 897+50 TO STA 901+00
BERM No. 3 STA 902+00 TO STA 909+00
BERM No. 4 STA 909+75 TO STA 919+00



ROUTE 46

BERM No. 1 STA 883+50 TO STA 892+00

TYPICAL CROSS SECTIONS
(NON-MANDATORY DISPOSAL SITE)

NO SCALE

NMDS-X1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
06-DESIGN

FUNCTIONAL SUPERVISOR: JACK WALKER
CALCULATED-DESIGNED BY: JOSE ARGUELLO
CHECKED BY: JACK WALKER
REVISED BY
DATE REVISED

LAST REVISION 01-06-12
DATE PLOTTED => 06-JAN-2012
TIME PLOTTED => 09:11

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => s128108
DGN FILE => 533077nmds_TYP_XS.dgn

CU 06220

EA 330771

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	46.1/48.2	3	11

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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

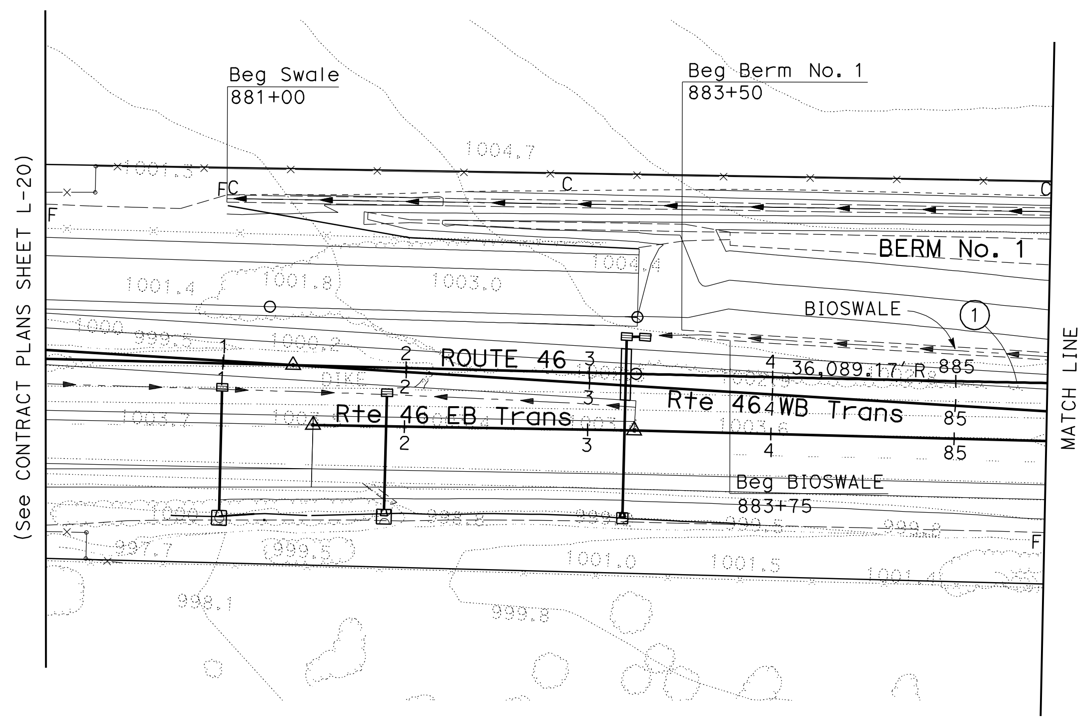
NOTES:

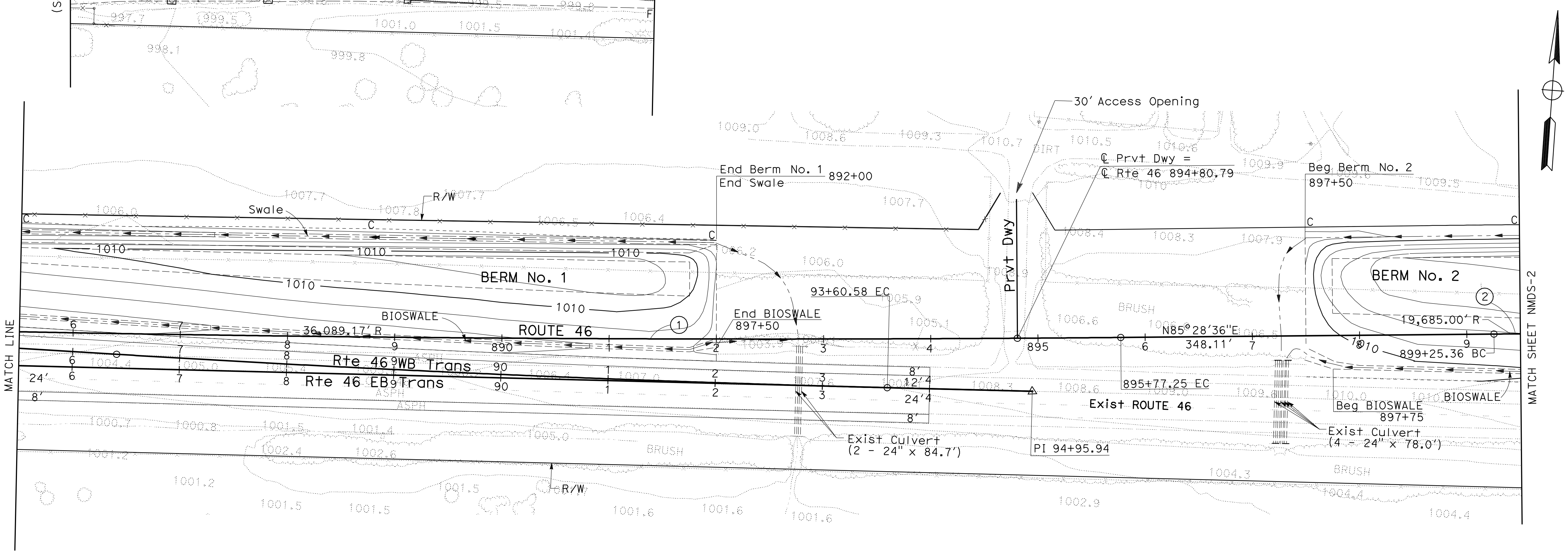
1.- FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

2.- FOR DETAILS NOT SHOWN, SEE CONTRACT PLANS.

CURVE DATA

No.	R	Δ	T	L	RP	LOCATION
1	36,089.17′	1°59′14"	625.96′	1251.79′	EC	℄ Rte 46 895+77.25
2	19,685.00′	6°28′26"	1113.31′	2224.24′	BC	℄ Rte 46 899+25.36





NON-MANDATORY DISPOSAL SITE

SCALE: 1" = 50′

NMDS-L1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

06-DESIGN

FUNCTIONAL SUPERVISOR	JACK WALKER
CALCULATED-DESIGNED BY	JOSE ARGUELLO
CHECKED BY	JACK WALKER
REVISED BY	
DATE REVISED	

LAST REVISION 01-06-12

DATE PLOTTED => 06-JAN-2012
TIME PLOTTED => 10:09

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	46.1/48.2	4	11

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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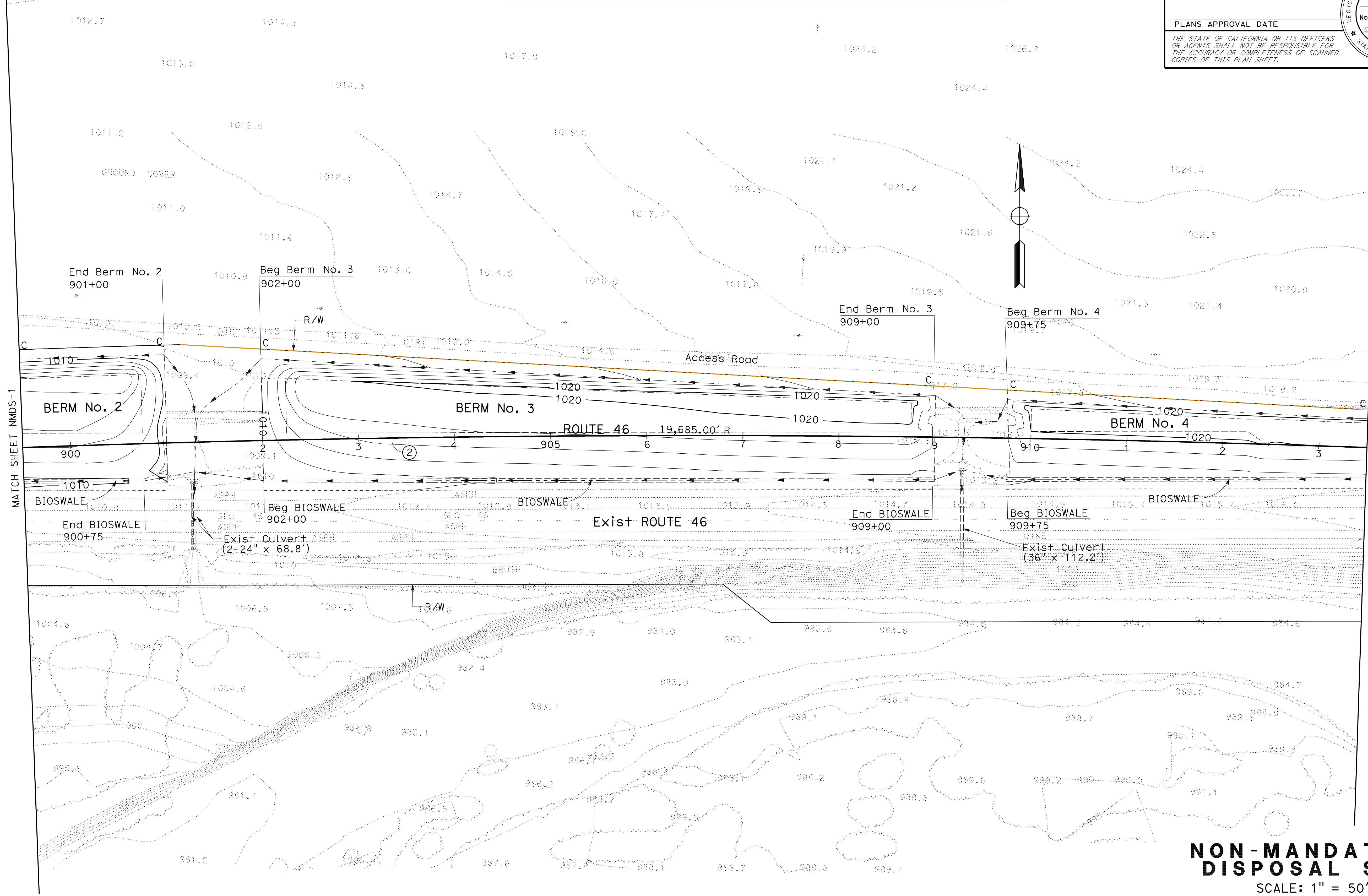
No.
Exp.
CIVIL
STATE OF CALIFORNIA

NOTE: FOR ACCURATE RIGHT OF WAY AND ACCESS DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

CURVE DATA

No.	R	Δ	T	L	RP	LOCATION
2	19,685.00′	6°28′26"	1113.31′	2224.24′	BC	℄ Rte 46 899+25.36



NON-MANDATORY DISPOSAL SITE

SCALE: 1" = 50′

NMDS-L2

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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DATE REVISED

DATE PLOTTED => 06-JAN-2012
TIME PLOTTED => 10:19

LAST REVISION 01-06-12

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => s128108
DGN FILE => 533077nmds002.dgn

CU 06220

EA 330771

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	46.1/48.2	5	11

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

NOTE: FOR ACCURATE RIGHT OF WAY AND ACCESS DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

CURVE DATA

No.	R	Δ	T	L	RP	LOCATION
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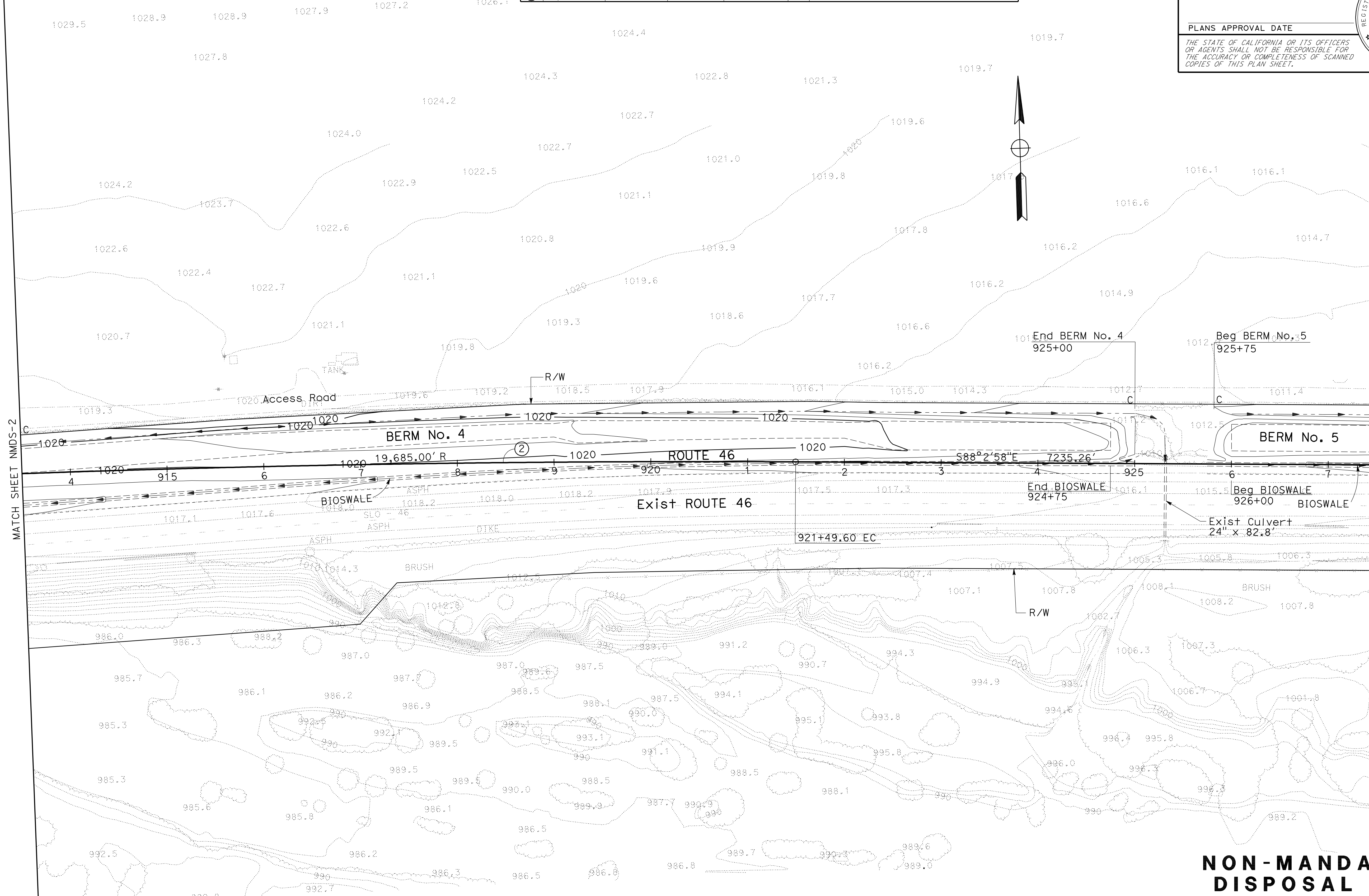

NON-MANDATORY DISPOSAL SITE

SCALE: 1" = 50'

NMDS-L3

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

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LAST REVISION 01-06-12

DATE PLOTTED => 06-JAN-2012
TIME PLOTTED => 10:23

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	46.1/48.2	6	11

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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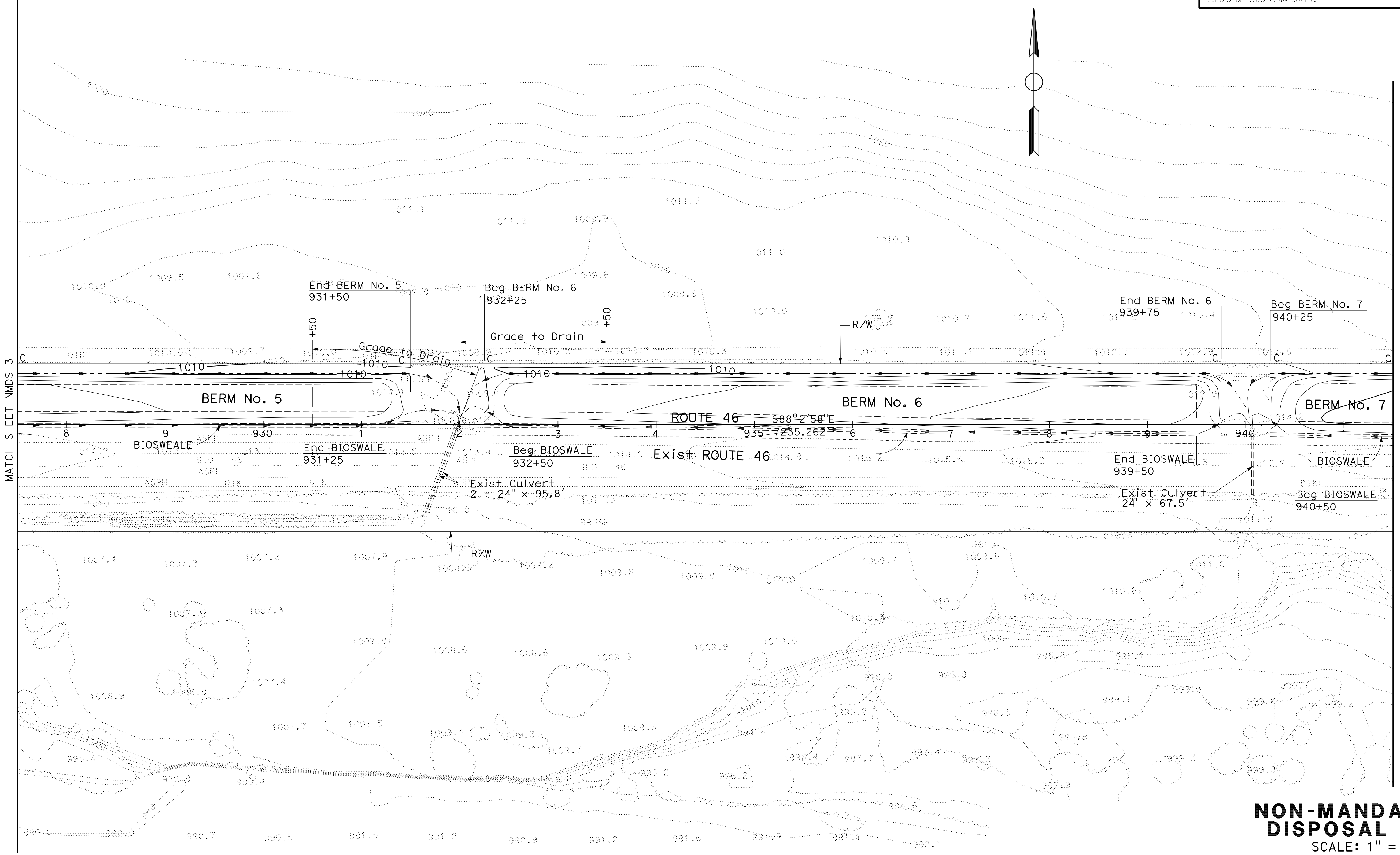

NON-MANDATORY DISPOSAL SITE

SCALE: 1" = 50'

NMDS-L4

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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LAST REVISION 01-06-12

DATE PLOTTED => 06-JAN-2012
TIME PLOTTED => 10:24

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => s128108
DGN FILE => 533077nmds004.dgn

CU 06220

EA 330771

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	46.1/48.2	7	11

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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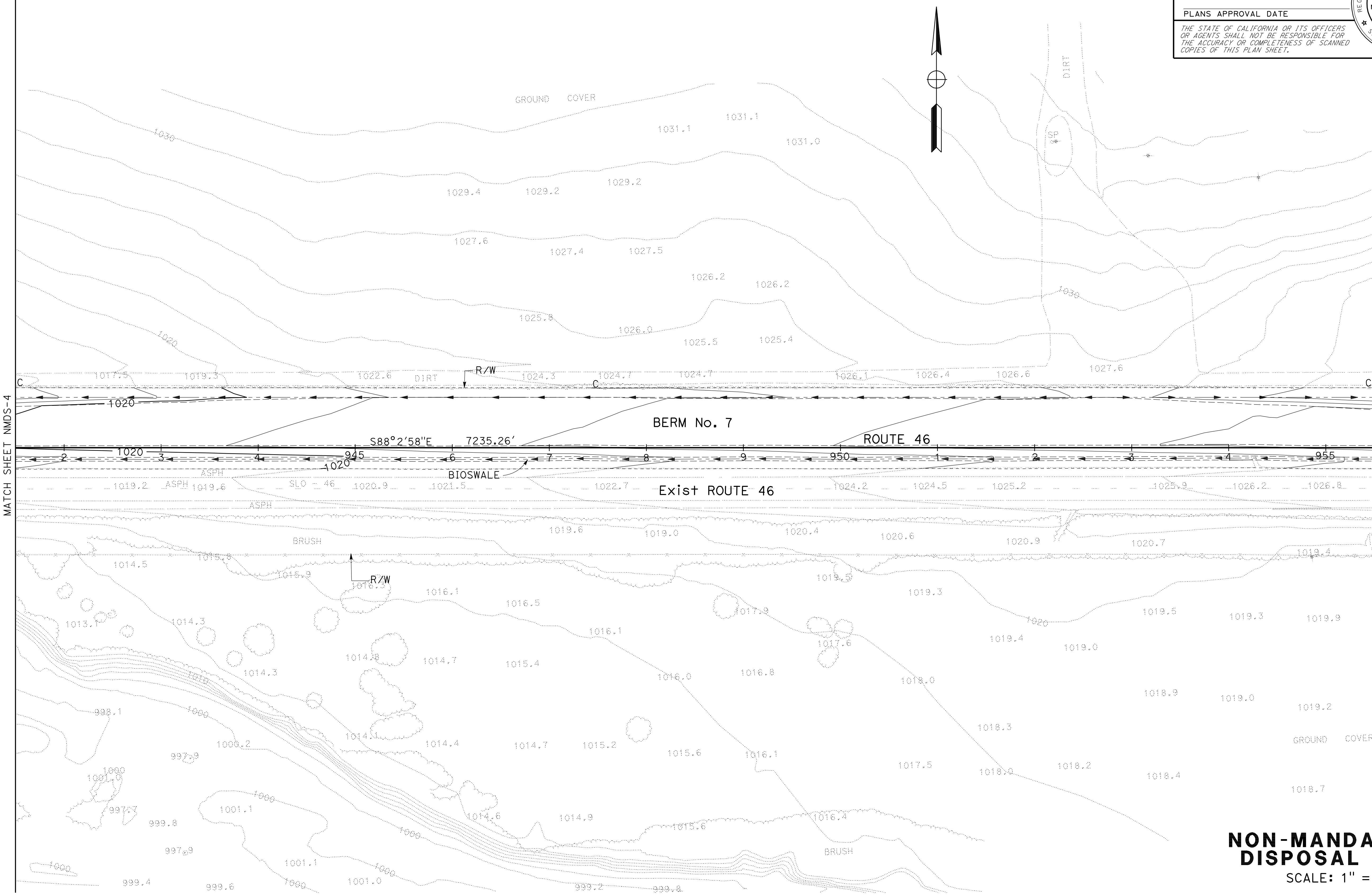
NOTE: FOR ACCURATE RIGHT OF WAY AND ACCESS DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.



NON-MANDATORY DISPOSAL SITE

SCALE: 1" = 50'

NMDS-L5

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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DATE REVISED

LAST REVISION 01-06-12

DATE PLOTTED => 06-JAN-2012
TIME PLOTTED => 10:26

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => s128108
DGN FILE => 533077nmds005.dgn

CU 06220

EA 330771

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	46.1/48.2	8	11

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
No.
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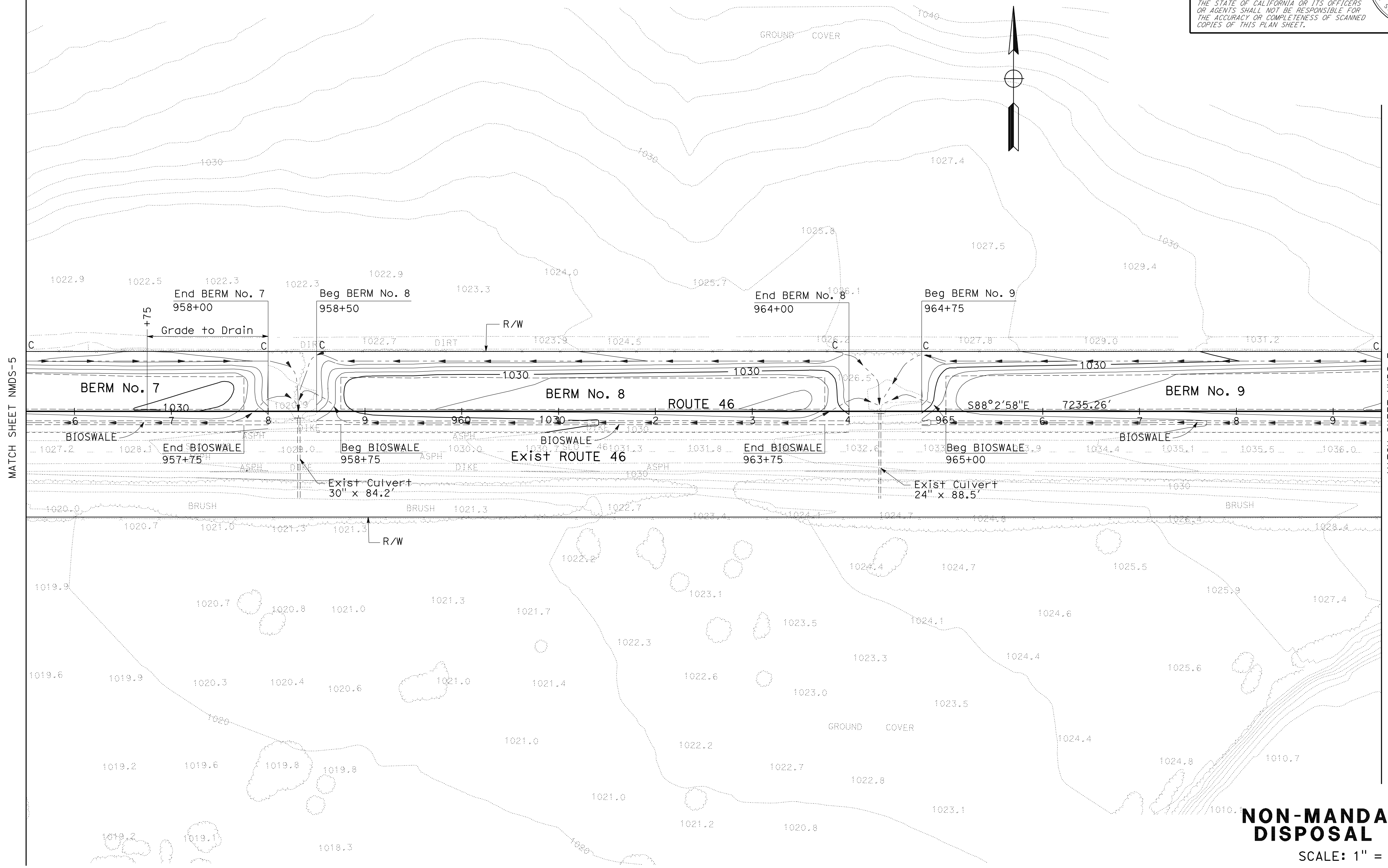
CIVIL
STATE OF CALIFORNIA

NOTE: FOR ACCURATE RIGHT OF WAY AND ACCESS DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.



NON-MANDATORY DISPOSAL SITE

SCALE: 1" = 50'

NMDS-L6

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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CALCULATED-DESIGNED BY: JOSE ARGUELLO

CHECKED BY: JACK WALKER

REVISED BY

DATE REVISED

LAST REVISION 01-06-12

DATE PLOTTED => 06-JAN-2012
TIME PLOTTED => 10:27

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => s128108
DGN FILE => 533077nmds006.dgn

CU 06220

EA 330771

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	46.1/48.2	9	11

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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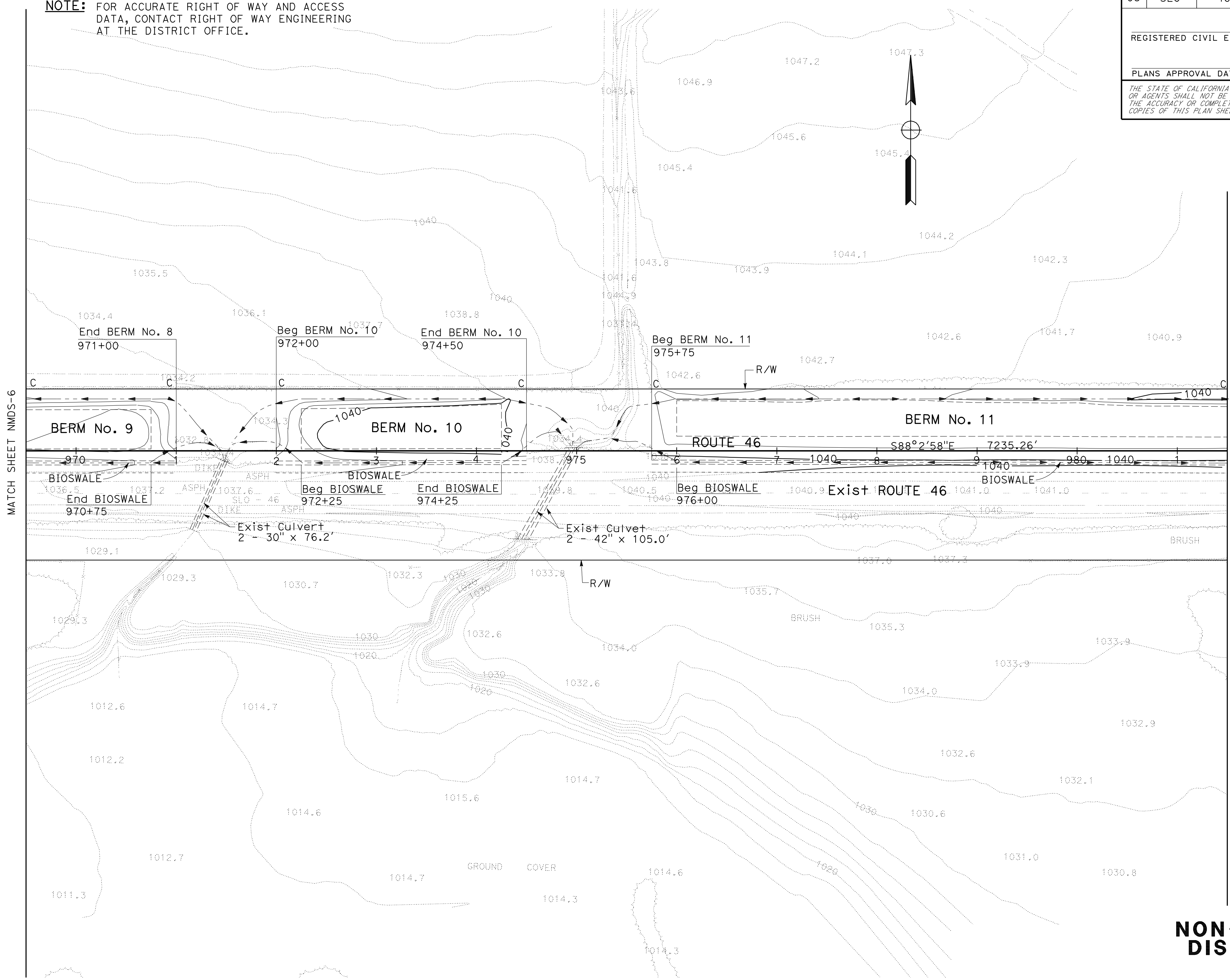

NON-MANDATORY DISPOSAL SITE

SCALE: 1" = 50'

NMDS-L7

CALCULATED-DESIGNED BY	JOSE ARGUELLO
CHECKED BY	JACK WALKER
FUNCTIONAL SUPERVISOR	JACK WALKER
REVISED BY	
DATE REVISED	

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

06-DESIGN

LAST REVISION 01-06-12

DATE PLOTTED => 06-JAN-2012
TIME PLOTTED => 10:28

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => s128108
DGN FILE => 533077nmds007.dgn

CU 06220

EA 330771

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	46.1/48.2	10	11

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

NOTE: FOR ACCURATE RIGHT OF WAY AND ACCESS DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

CURVE DATA

No.	R	Δ	T	L	RP	LOCATION
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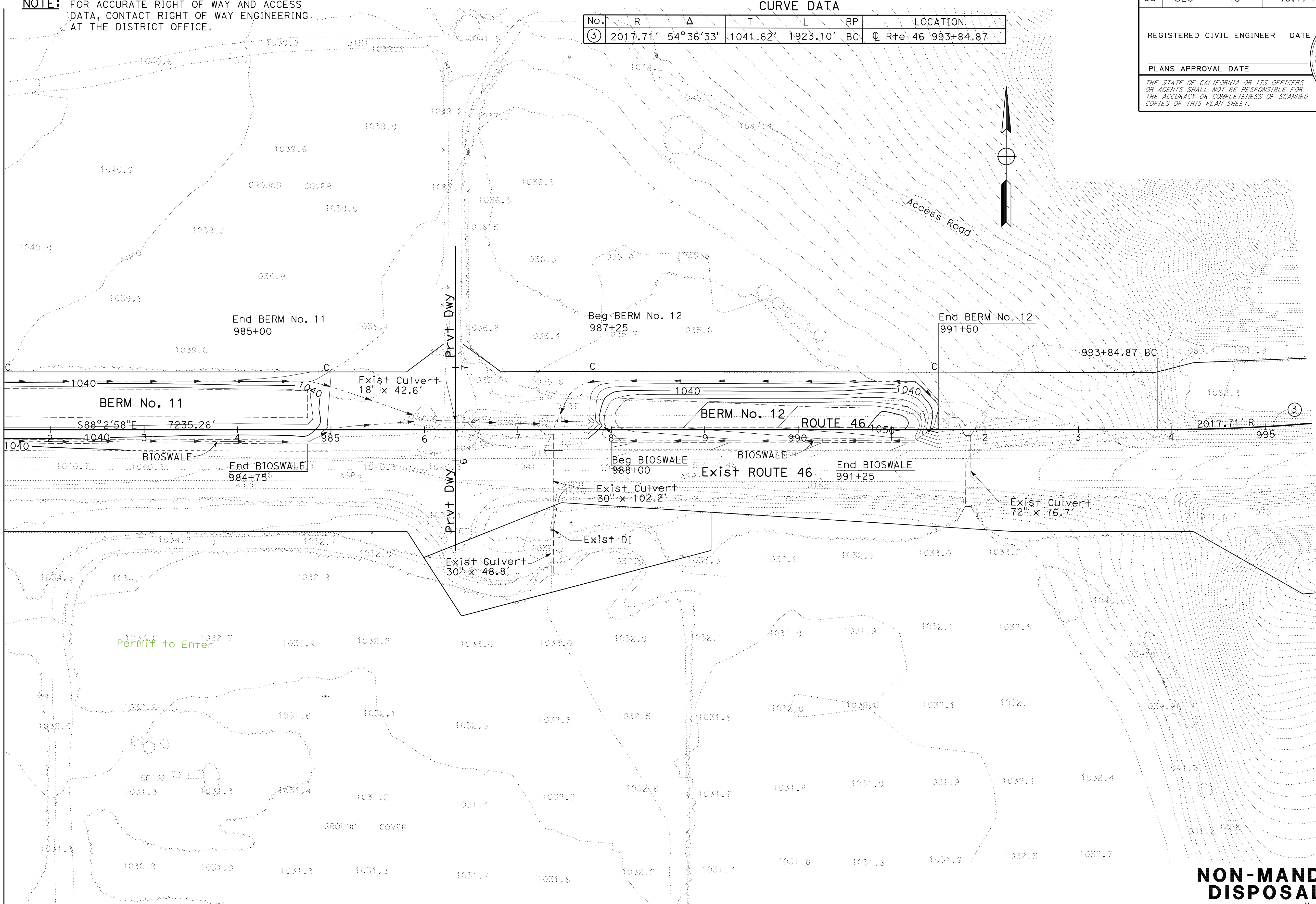


NON-MANDATORY DISPOSAL SITE

SCALE: 1" = 50′

NMDS-L8

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans®

06-DESIGN

FUNCTIONAL SUPERVISOR: JACK WALKER

CALCULATED-DESIGNED BY: JOSE ARGUELLO

CHECKED BY: JACK WALKER

REVISED BY

DATE REVISED

LAST REVISION 01-06-12

DATE PLOTTED => 06-JAN-2012

TIME PLOTTED => 10:29

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	46.1/48.2	11	11

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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

NOTE:

EMBANKMENT MATERIAL SHALL COME FROM THE EXCESS EXCAVATION OF WHITLEY 2A PROJECT, EA 330774.

EARTHWORK

DESCRIPTION	LOCATION	Rdwy Exc CY	Emb CY
BERM No. 1	℄ Rte 46 STA 883+50 TO STA 892+00	202	6,671
BERM No. 2	℄ Rte 46 STA 897+50 TO STA 901+00	25	10,563
BERM No. 3	℄ Rte 46 STA 902+00 TO STA 909+00	65	11,296
BERM No. 4	℄ Rte 46 STA 909+75 TO STA 925+00	44	10,300
BERM No. 5	℄ Rte 46 STA 925+75 TO STA 931+50	114	4,164
BERM No. 6	℄ Rte 46 STA 932+25 TO STA 939+75	22	8,191
BERM No. 7	℄ Rte 46 STA 940+25 TO STA 958+00	58	13,250
BERM No. 8	℄ Rte 46 STA 958+50 TO STA 964+00	70	7,879
BERM No. 9	℄ Rte 46 STA 964+75 TO STA 971+00	69	8,380
BERM No. 10	℄ Rte 46 STA 972+00 TO STA 974+50	31	2,249
BERM No. 11	℄ Rte 46 STA 975+75 TO STA 985+00	211	4,474
BERM No. 12	℄ Rte 46 STA 987+25 TO STA 991+50	32	8,883
	TOTAL	943	96,300

FIBER ROLLS

SHEET	DESCRIPTION	LOCATION	FIBER ROLLS (LF)
NOT SHOWN ON PLANS	BERM No. 1	℄ Rte 46 STA 881+00 TO STA 892+00	2,550
	BERM No. 2	℄ Rte 46 STA 897+50 TO STA 901+00	1,050
	BERM No. 3	℄ Rte 46 STA 902+00 TO STA 909+00	2,100
	BERM No. 4	℄ Rte 46 STA 909+75 TO STA 925+00	3,975
	BERM No. 5	℄ Rte 46 STA 925+75 TO STA 931+50	1,150
	BERM No. 6	℄ Rte 46 STA 932+25 TO STA 939+75	1,500
	BERM No. 7	℄ Rte 46 STA 940+25 TO STA 958+00	3,550
	BERM No. 8	℄ Rte 46 STA 958+50 TO STA 964+00	1,100
	BERM No. 9	℄ Rte 46 STA 964+75 TO STA 971+00	1,250
	BERM No. 10	℄ Rte 46 STA 972+00 TO STA 974+50	500
	BERM No. 11	℄ Rte 46 STA 975+75 TO STA 985+00	1,850
	BERM No. 12	℄ Rte 46 STA 987+75 TO STA 991+50	850
		TOTAL	21,425

SEE TYPICAL CROSS SECTIONS FOR FIBER ROLL LOCATION.

EROSION CONTROL

SHEET	DESCRIPTION	LOCATION	TYPE	EROSION CONTROL (COMPOST BLANKET) CY	COMPOST (INCORPORATE) SQFT	EROSION CONTROL (HYDROSEED) TYPE 1 SQFT	EROSION CONTROL (HYDROSEED) TYPE 2 SQFT
NOT SHOWN ON PLANS	BERM No. 1	℄ Rte 46 STA 881+00 TO STA 892+00	EROSION CONTROL TYPE 1	635	-	102,570	-
	BIOSWALE	℄ Rte 46 STA 883+50 TO STA 892+00	EROSION CONTROL TYPE 2	-	3,400	-	3,400
	BERM No. 2	℄ Rte 46 STA 897+50 TO STA 901+00	EROSION CONTROL TYPE 1	310	-	49,520	-
	BIOSWALE	℄ Rte 46 STA 897+50 TO STA 900+75	EROSION CONTROL TYPE 2	-	1,300	-	1,300
	BERM No. 3	℄ Rte 46 STA 902+00 TO STA 909+00	EROSION CONTROL TYPE 1	535	-	86,190	-
	BIOSWALE	℄ Rte 46 STA 902+00 TO STA 909+00	EROSION CONTROL TYPE 2	-	2,800	-	2,800
	BERM No. 4	℄ Rte 46 STA 909+75 TO STA 925+00	EROSION CONTROL TYPE 1	725	-	117,440	-
	BIOSWALE	℄ Rte 46 STA 909+75 TO STA 924+75	EROSION CONTROL TYPE 2	-	6,000	-	6,000
	BERM No. 5	℄ Rte 46 STA 925+75 TO STA 931+50	EROSION CONTROL TYPE 1	240	-	38,920	-
	BIOSWALE	℄ Rte 46 STA 926+00 TO STA 931+25	EROSION CONTROL TYPE 2	-	2,100	-	2,100
	BERM No. 6	℄ Rte 46 STA 932+25 TO STA 939+75	EROSION CONTROL TYPE 1	335	-	54,230	-
	BIOSWALE	℄ Rte 46 STA 932+50 TO STA 939+50	EROSION CONTROL TYPE 2	-	2,800	-	2,800
	BERM No. 7	℄ Rte 46 STA 940+25 TO STA 958+00	EROSION CONTROL TYPE 1	880	-	142,330	-
	BIOSWALE	℄ Rte 46 STA 940+50 TO STA 957+75	EROSION CONTROL TYPE 2	-	6,900	-	6,900
	BERM No. 8	℄ Rte 46 STA 958+50 TO STA 964+00	EROSION CONTROL TYPE 1	270	-	43,920	-
	BIOSWALE	℄ Rte 46 STA 958+75 TO STA 963+75	EROSION CONTROL TYPE 2	-	2,000	-	2,000
	BERM No. 9	℄ Rte 46 STA 964+75 TO STA 971+00	EROSION CONTROL TYPE 1	310	-	50,150	-
	BIOSWALE	℄ Rte 46 STA 965+00 TO STA 970+75	EROSION CONTROL TYPE 2	-	2,300	-	2,300
	BERM No. 10	℄ Rte 46 STA 972+00 TO STA 974+50	EROSION CONTROL TYPE 1	125	-	20,070	-
	BIOSWALE	℄ Rte 46 STA 972+25 TO STA 974+25	EROSION CONTROL TYPE 2	-	800	-	800
	BERM No. 11	℄ Rte 46 STA 975+75 TO STA 985+00	EROSION CONTROL TYPE 1	460	-	74,590	-
	BIOSWALE	℄ Rte 46 STA 976+00 TO STA 984+75	EROSION CONTROL TYPE 2	-	3,500	-	3,500
	BERM No. 12	℄ Rte 46 STA 987+75 TO STA 991+50	EROSION CONTROL TYPE 1	185	-	30,050	-
	BIOSWALE	℄ Rte 46 STA 988+25 TO STA 991+25	EROSION CONTROL TYPE 2	-	1,200	-	1,200
			TOTAL	5010	35,100	809,980	35,100

FOR EROSION CONTROL TYPE 1, DO NOT PLACE STRAW WITHIN 3 FEET OF SWALE OR FLOW LINE.
COMPOST MUST BE APPLIED 2 INCHES THICK.

NO SCALE

SUMMARY OF QUANTITIES (NON-MANDATORY DISPOSAL SITE)

NMDS-Q1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans®

06-DESIGN

FUNCTIONAL SUPERVISOR: JACK WALKER

CALCULATED-DESIGNED BY: JOSE ARGUELLO

CHECKED BY: JACK WALKER

REVISED BY

DATE REVISED

LAST REVISION 01-06-12

DATE PLOTTED => 06-JAN-2012
TIME PLOTTED => 10:06

MATERIALS INFORMATION

Select Material Testing

ROUTE: 46-SLO-40.7/46.3(PM)

FOR CONTRACT NO. 05-330774

INFORMATION HANDOUT

MATERIALS INFORMATION

Select Material Testing

ROUTE: 05-SLO-46-40.7/46.3

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	40.7/46.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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

NOTE:

1.- FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

2.- ALL LOCATIONS AND ELEVATION ARE APPROXIMATED.

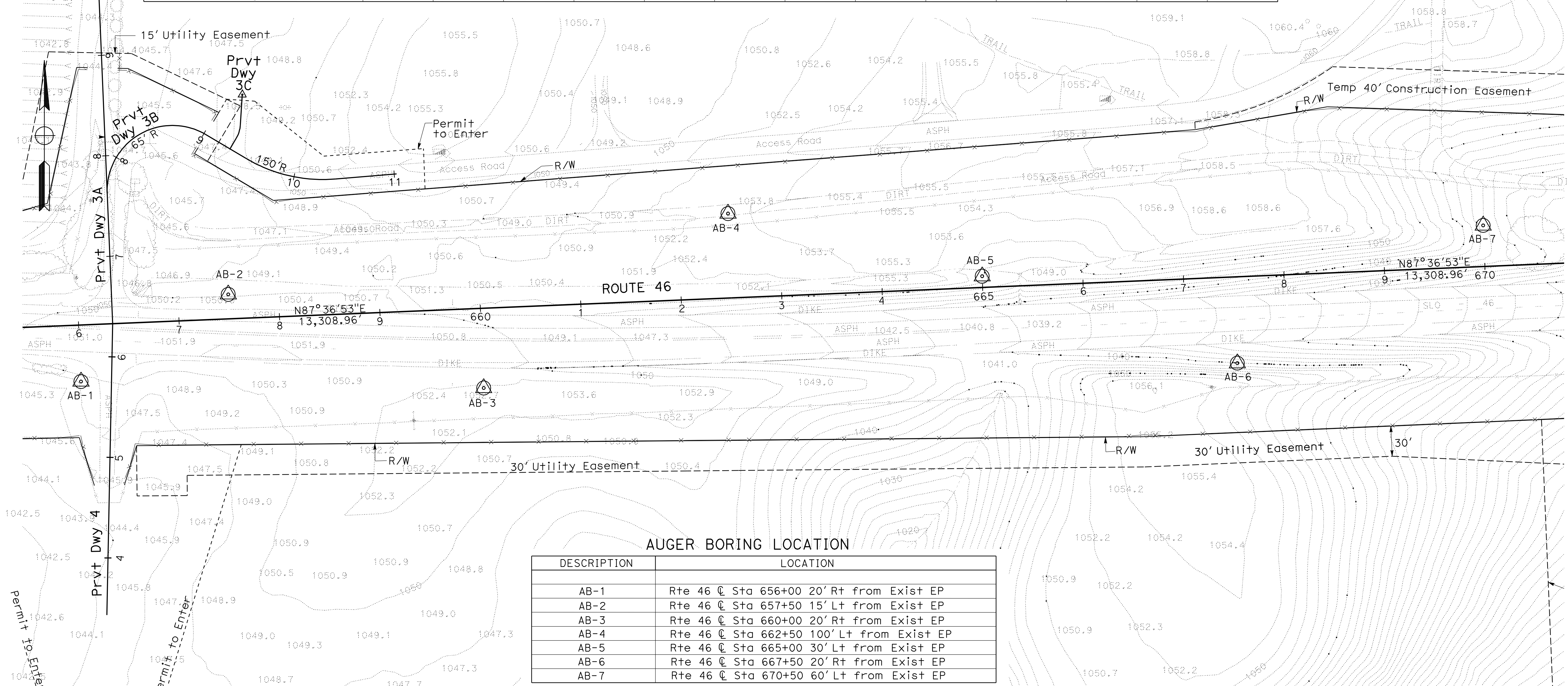
LEGEND:

AB AUGER BORING

NP NON-PLASTIC

AUGER BORING SAMPLE INFORMATION

AUGER BORING No.		AB-1		AB-2		AB-3	AB-4		AB-5	AB-6			AB-7	
Approximate OG Elev.		1050		1050		1052	1052		1050	1058			1035	
Approximate Sample Depth		15'-20'	25'-30'	15'-20'	20'-30'	15'-25'	10'-20'	20'-25'	10'-15'	5'-10'	10'-15'	20'-30'	5'-15'	15'-20'
GRADATION (Percent Passing)														
SIEVE SIZE	2½"	100	100	100	100	100	100	100	100	100	100	100	100	100
	No. 4	82	91	92	95	83	78	89	98	88	88	84	90	94
	No. 200	18	18	23	32	10	15	21	31	29	17	48	38	42
Sand Equivalent		25	26	18	16	32	25	21	17	20	29	8	12	12
R-Value		48	63	20	17	68	54	50	41	26	58	13	16	18
Platicity Index		4	NP	NP	7	NP	NP	NP	NP	4	4	13	14	10



AUGER BORING LOCATION

DESCRIPTION	LOCATION
AB-1	Rte 46 ℄ Sta 656+00 20' Rt from Exist EP
AB-2	Rte 46 ℄ Sta 657+50 15' Lt from Exist EP
AB-3	Rte 46 ℄ Sta 660+00 20' Rt from Exist EP
AB-4	Rte 46 ℄ Sta 662+50 100' Lt from Exist EP
AB-5	Rte 46 ℄ Sta 665+00 30' Lt from Exist EP
AB-6	Rte 46 ℄ Sta 667+50 20' Rt from Exist EP
AB-7	Rte 46 ℄ Sta 670+50 60' Lt from Exist EP

SELECT MATERIAL AUGER BORING INFORMATION

NO SCALE

SM-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans®

06-DESIGN

FUNCTIONAL SUPERVISOR: JACK WALKER

CALCULATED-DESIGNED BY: JOSE ARGUELLO

CHECKED BY: JACK WALKER

REVISED BY / DATE REVISED

DATE PLOTTED => 06-JAN-2012

TIME PLOTTED => 10:53

LAST REVISION

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => s128108

DGN FILE => SM1.dgn

CU 06220

EA 330771

FOR CONTRACT NO.: 05-330774

MATERIALS INFORMATION

Shimmin Creek Bridge Removal Information

ROUTE: 46-SLO-40.7/46.3(PM)

FOR CONTRACT NO.: 05-330774

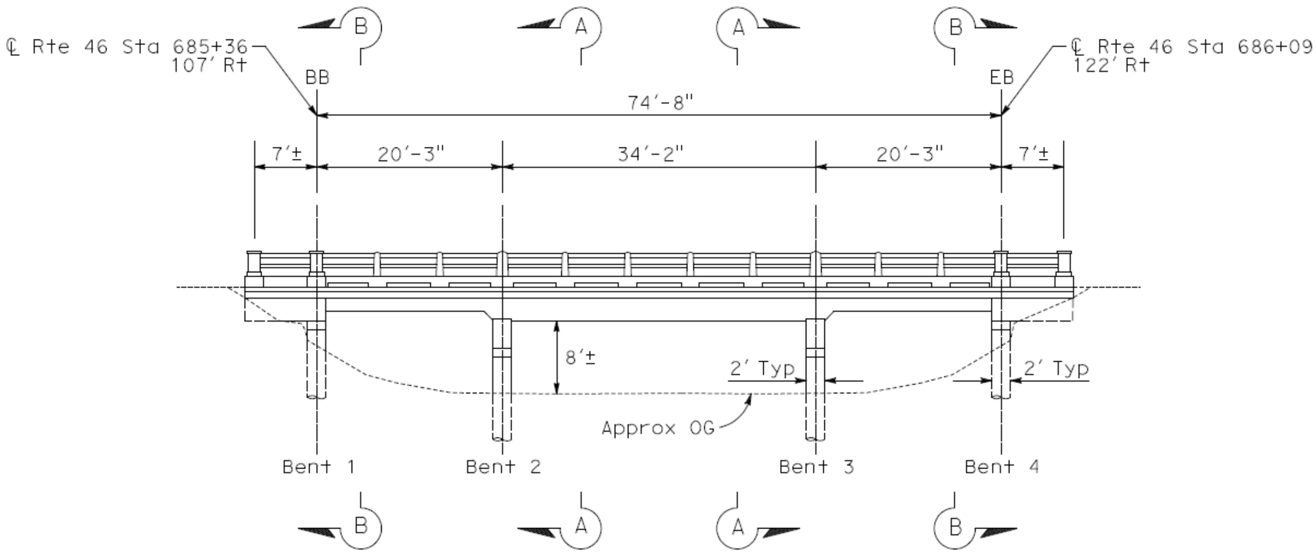
INFORMATION HANDOUT

MATERIALS INFORMATION

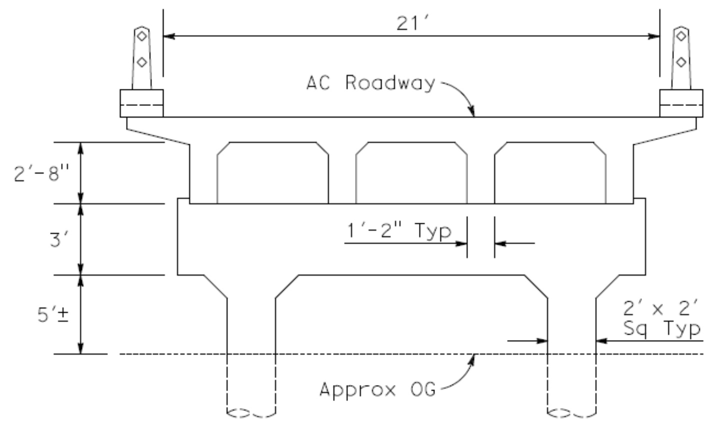
REMOVE SIMMONS CREEK BRIDGE

ROUTE: 05-SLO-46-40.7/46.3

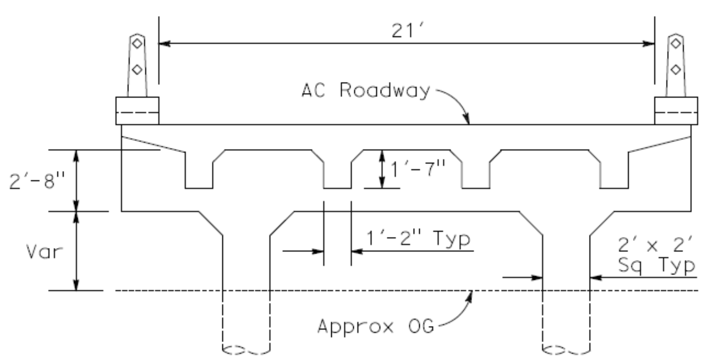
Existing Simmons Creek Bridge Detail: All dimensions are approximate.



ELEVATION



SECTION A-A



SECTION B-B

Existing Simmons Creek Bridge Pictures: taken Aug 23, 2011

Picture 1: Bridge Elevation, looking north

Picture 2: Span 2, looking north

Picture 3: Span 3, looking north

Picture 4: Bent 3, looking north

Picture 5: Bent 1, south column, looking west

Picture 6: Bent 1, looking west

Picture 7: Bent 2, looking west

Picture 8: Bent 3, looking east

Picture 9: Bent 4, south column, looking east

Picture 10: Bent 4, north column, looking southeasterly

FOR CONTRACT NO.: 05-330774

MATERIALS INFORMATION

Geotechnical Design Report, dated August 31, 2010

ROUTE: 46-SLO-40.7/46.3(PM)

State of California Business, Transportation and Housing Agency

Department of Transportation

M e m o r a n d u m *Flex your power!*

To: JACK WALKER
Senior Design Engineer
Office of Design II, Branch A
Project Development Central Region

Date: August 31, 2010

File: 05-330771 (0500020049)
05-SLO-46-41.0/46.3
Whitley 2A Segment

Attn: Jose Arguello
Project Engineer

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

Subject: Geotechnical Design Report

Introduction

A Geotechnical Design Report (GDR) is provided for the above referenced project per your request, dated October 29, 2009. Located on State Route 46 near Paso Robles, from 0.1 mile east of Almond Drive to 0.8 mile east of McMillan Canyon Road, the project proposes to widen the existing highway from a two-lane conventional highway to a four-lane divided expressway. This project is one segment of a larger project to improve operations and safety on Route 46 between the Central Valley and Route 101. The project will be funded from the 025.700 Interregional Improvement Program. It has been identified as a corridor project in the Statewide Transportation Improvement Program (STIP).

The recommendations presented herein are based on reviews of published data, site reconnaissance, subsurface investigations, and laboratory testing. The purpose of this report is to document subsurface geotechnical conditions, provide analyses of anticipated site conditions as they pertain to the project described herein, and to recommend design and construction criteria for the roadway portions of the project. This report also establishes a geotechnical baseline to be used in assessing the existence and scope of differing site conditions.

This report is intended for use by the project design engineer, construction personnel, bidders, and contractors.

Existing Facilities and Proposed Improvements

Route 46 in the project area is a two-lane conventional highway with 12-foot travel lanes and shoulders ranging in width between 4 feet and 8 feet. There are two sets of passing lanes within the project limits, one for eastbound traffic and one for westbound traffic. The eastbound passing lane extends from milepost 40.70 to milepost 41.77, and the westbound passing lane extends from milepost 43.58 to milepost 44.47.

Route 46 is one of the few east-west routes connecting Interstate 5 and U.S. Highway 101, and is a vital link between the Central Coast and Central Valley areas of California. The route primarily serves interregional and interstate traffic, although it is used daily by residents of the communities of Paso Robles, Cholame, Shandon, and Whitley Gardens. It is the only east-west route between Route 166 to the south and Route 156/152 to the north that can facilitate the movement of goods by truck.

It is proposed to convert Route 46 in the project area to a four-lane divided expressway by constructing two new lanes on a parallel alignment to the existing lanes. Between Route 46 Centerline Station 615+25 and Station 646+22 the new lanes will be constructed to the south of the existing lanes. Between approximately Station 666+00 and Station 894+00 the new lanes will be constructed to the north of the existing lanes. The horizontal alignment will transition the new lanes from south to north between Station 646+22 and Station 666+00. The existing lanes will be rehabilitated, and vertical curve corrections will be constructed as necessary to improve sight distance. The completed roadway will have a 5-foot inside shoulder, two 12-foot lanes, and a 10-foot outside shoulder for each direction of travel. Median width will typically measure 62 feet. Turn channelization will be provided to access the rural roads and most of the driveways that intersect the highway.

Roadway Cross Section

Roadway cut and fill descriptions summarized in the following sections are based on cross sections at 500-foot intervals, Layouts, and Profiles provided by the Division of Design.

Beginning at Route 46 centerline Station 615+25, the highway will be widened by constructing new lanes to the south of the existing lanes. The new lanes will start in a shallow cut that will continue to approximately Station 624+10.

The new lanes will transition from cut to fill at approximately Station 624+10. Most of the roadway cross section will remain in fill until approximately Station 649+55. The fill will reach a maximum height in excess of 25 feet at Station 635+00. The profile grade of the existing lanes will be raised through much of this section, by more than 10 feet at Station 640+00.

Between Station 646+22.42 and approximately Station 666+00 the horizontal alignment shifts the new lanes shifts from the south of the existing lanes to the north of the existing lanes. The roadway is in cut from 649+55 to approximately Station 672+00. The road cut will exceed 20 feet on the westbound side of the highway. The profile grade of the existing lanes will be lowered more than 15 feet at Station 660+00.

East of Station 672+00, the roadway transitions to fill. The fill section extends east to about Station 688+40. The embankment reaches a height of about 30 feet where it crosses Shimmin Canyon Creek, at approximately Station 685+50. The existing lanes will be raised approximately 16 feet at Station 685+00.

Between Station 688+40 and Station 700+00 the new lanes will be cut into the existing hillside north of the existing highway. The maximum depth of cut for the new lanes will be roughly 40 feet. Through much of this segment of roadway the profile grade of the existing lanes will remain unchanged.

Between Station 700+00 and Station 721+50 the new highway lanes will be constructed on an embankment, up to 20 feet in height. The profile grade of the existing lanes will remain unchanged.

Between Station 721+50 and Station 742+00 the new westbound roadway will be constructed roughly at existing grade, with cuts and fills less than 5 feet in magnitude. Between Station 742+00 and 746+00 the roadway will be on an embankment as it crosses an unnamed drainage. The roadway profile grade will be approximately 20 feet above the creek bottom.

Between Station 746+00 and Station 775+00 the new lanes of the roadway will be excavated into an existing hillside with the lanes in cuts up to 20 feet deep. The slope catch point will chase existing terrain, daylighting nearly 520 feet left of the highway centerline at Station 760+00.

Between Station 775+00 and Station 855+00 the roadway profile grade follows original ground elevation closely with minor cuts and fills of less than 10 feet. The highway will cross McMillan Canyon Creek on a new bridge that spans between approximately Station 855+00 and Station 855+55. The top of the bridge deck will be about 14 feet above the creek bottom.

East of McMillan Canyon Creek the highway profile grade again follows original ground elevation closely.

Pertinent Reports and Investigations

The following publications were used to assist in the assessment of site conditions:

1. *Caltrans ARS Online.*

2. *Cut Slope Recommendations: McMillan Segment,* Caltrans, Daniel L. Appelbaum, 2003.

3. *Environmental Assessment/Draft Environmental Impact Report: Route 46 Corridor Improvement Project, San Luis Obispo County, District 5-SLO-46-KP51.8/90.6,* Caltrans, July 2002.

4. *Geologic Map of the San Luis Obispo County, California,* Compiled by Lew Rosenberg.

5. *Geotechnical Design Report: Whitley 1 Segment,* Caltrans, Ryan Turner, 2009.

6. *Geotechnical Impact of Proposed Project: US Route 46 Widening, San Luis Obispo County, 05-SLO-46-32.2/36.4,* PSC Associates, Inc., 1992.

7. *Geotechnical Services Design Manual, Version 1.0,* Division of Engineering Services, August 2009.

8. *Route 46/41 Interchange Seismic Hazard Report,* Caltrans, John D. Duffy, 2000.

9. *Soil Survey of San Luis Obispo County, California*, United States Department of Agriculture, Soil Conservation Service.

Physical Setting

The project is located near the southern end of the Salinas Valley in the Coast Ranges geomorphic province. The Coast Ranges are a northwest trending series of mountains that parallel the California coastline and provide a nearly continuous topographic barrier between the coast and the Central Valley.

Climate

The project is located in the Paso Robles Hills and Valleys sub-region of the Central California Coast Ranges ecological section. The climate in the project area is semi-arid, with hot summers and cool winters. The mean annual precipitation is 12 to 18 inches and the mean annual air temperature is about 57° F. Winters are generally mild with occasional single digit lows and average highs in the 60's. The average high temperature in the summer is 91° F, with high temperatures often in the 100's. Nearly all precipitation accumulates during Pacific storms between October and May, with the majority falling during winter months. Vegetation in the project area primarily consists of grasslands and oak trees, with willow trees growing near sources of water.

Drainage and Topography

The westerly flowing Estrella River is the main drainage feature in the project area. It lies to the south of Route 46 through the project limits. The Estrella River is a tributary to the Salinas River, which drains to Monterey Bay northwest of the project area.

Three major drainages cross Route 46 within the project limits: Shimmin Canyon Creek at approximately Station 685+50; an unnamed drainage at approximately Station 743+50; and McMillan Canyon Creek at approximately Station 855+65. The southerly flowing creeks are steeply incised into the hills to the north of the highway. They drain into the Estrella River.

Topography in the project region consists of dissected plains surrounded by low, moderately steep to steep hills. The region is bounded by the Gabilan Range to the north, the San Andreas Fault and the Cholame Hills to the northeast, and the Santa Lucia Range to the southwest.

The highway alignment within the project limits traverses the Estrella River alluvial valley. Roadway elevations along the existing highway alignment within the project limits range between 950 feet and 1050 feet above mean sea level.

Geology

The region is divided into three geologic blocks separated by the San Andreas Fault and the Sur-Naciemento Fault Zone. The Diablo Range is in the block located northeast of the San Andreas Fault. The Gabilan Range and the Salinas Valley are located in the central block. The Santa Lucia Range is located in the western block. "Basement" rocks in the western and eastern blocks consist of Franciscan Assemblage rocks and a complex of metamorphic units. Granitic intrusions form the bedrock in the central block, beneath the project area.

Pre-Cretaceous age rocks of the Sur Series are the oldest rocks in the area. These have been intruded by Cretaceous-age granite or granodiorite. This metamorphic-granitic complex is confined to the central fault block, beneath the Salinas Valley and Gabilan Range. Sedimentary rock formations and some volcanic units were deposited on top of the basement rocks during the Cretaceous and Tertiary Periods. Subsequently, during the Quaternary Period, clastic sediments were deposited primarily in marine/transgression environments, which alternated with periods of uplift/regression during which erosion and subareal deposition occurred. The latest uplift (and/or drop in sea level) occurred in Late Pliocene to Mid-Pleistocene time, leaving the sediments at nearly their present-day elevations. Some of these formations have been folded and faulted by the same compressive forces that produced the San Andreas Fault system. Present-day topographic surface features and drainage patterns were established by Mid-Pleistocene time.

Dibblee (1971) mapped the bedrock beneath the project area as granitic rock ("gr"≅quartz granodiorite), which intruded and crystallized during Cretaceous time, 60 to 80 million years ago. Paso Robles Formation ("Q_{Tp}"), deposited in Late Pliocene and early Pleistocene time (2 to 3 million years ago), overlies the granitic bedrock. The Paso Robles Formation consists of easily eroded sands and gravels with lesser amounts of silts and clay, deposited by running water. The formation varies in thickness, from a few feet thick on top of the granitic ridges west of Paso Robles, up to several hundred feet thick along the existing Route 46 alignment in the eastern portion of the project area. Bedding within the Paso Robles Formation is not usually apparent. However, the few available exposures suggest that bedding dips generally toward the north at low angles (1 to 2 degrees): Dibblee mapped the axis of a gentle anticline southwest of the project area.

Seismicity

The project is located within a seismically active region of California. There are several earthquake faults in close proximity to the project area. Table 1 lists the active and potentially active faults in the project vicinity as described in Caltran's *2007 Fault Database*. Corresponding Moment Magnitudes and distances to the project area are also given. A fault map is included in the attachments to this report.

Table 1: Active and Potentially Active Faults

Fault	*Moment Magnitude of Maximum Credible Earthquake*[1]	*Distance to Fault from Project Area (miles)*	
		Westerly Project Limit	*Easterly Project Limit*
Rinconada Fault Zone (San Marcos section)	7.5	12.3	17.2
Oceanic Fault Zone	7.4	22.9	26.7
San Andreas Fault Zone (Parkfield section)	7.9	11.6	7.1
West Huasna Fault Zone	7.0	25.2	27.6
San Simeon-Hosgri Fault Zone (San Simeon Fault)	7.5	36.5	40.9
Cambria Fault	7.0	24.6	27.7
Los Osos Fault Zone (Irish Hills section)	7.0	29.8	32.8
Los Osos Fault Zone (Lopez Reservoir section)	7.0	32.5	34.4
Southern San Luis Range Fault Zone	7.2	36.4	38.5
San Simeon-Hosgri Fault Zone (Hosgri Fault)	7.5	40.0	45.5

Soil Survey Mapping

According to *Soil Survey of San Luis Obispo County, California,* (United States Department of Agriculture, Soil Conservation Service) the following soil types are represented in the project area:

- 102: Arbuckle-Positas complex, 9 to 15 percent slopes; well drained; form on the treads of terraces; parent material is alluvium derived from mixed rock sources.

- 106: Arbuckle-San Ysidro complex, 2 to 9 percent slopes; well drained; form on the treads of terraces; parent material is alluvium derived from mixed rock sources.

[1] According to Caltrans *2007 Fault Database*

- 113: Balcom-Calleguas complex, 50 to 75 percent slopes; well drained; form on the flanks of mountains; parent material is residuum weathered from sandstone and shale.

- 122: Capay silty clay; moderately well drained; form on the treads of flood plains; parent material is alluvium derived from sedimentary rock.

- 140: Elder loam, 0 to 5 percent slopes; well drained; form on the treads of flood plains; parent material is mixed alluvium derived from mixed rock sources.

- 167: Metz-Tujunga complex, 0 to 5 percent slopes; occasionally flooded; form on the treads of flood plains; parent material is alluvium derived from mixed rock sources.

- 173: Mocho clay loam, 0 to 2 percent slopes; well drained; form on the treads of alluvial flats; parent material is alluvium derived from calcareous sedimentary rock.

- 174: Mocho clay loam, 2 to 9 percent slopes; well drained; form on the treads of alluvial fans; parent material is alluvium derived from calcareous sedimentary rock.

- 177: Nacimiento-Ayar complex, 9 to 30 percent slopes; well drained; form on the side slopes of hills; parent material is residuum weathered from calcareous shale and/or sandstone.

- 184: Pico fine sandy loam, 2 to 9 percent slopes; well drained; form on the treads of alluvial fans; parent material is alluvium derived from calcareous sedimentary sources.

- 188: Rincon clay loam, 2 to 9 percent slopes; well drained; form on the treads of alluvial fans; parent material is alluvium derived from sedimentary rock.

- 195: San Emigdio fine sandy loam, 2 to 9 percent slopes; well drained; form on the footslopes of alluvial fans; parent material is calcareous alluvium.

The distribution of the different soil types through the project area is as follows:

Table 2: Soil Type Distribution

Post Mile Range	Soil Classification											
	102	106	113	122	140	167	173	174	177	184	188	195
42.0-42.2	X											
42.2-42.4					X							
42.4-42.6											X	
42.6-42.7				X								
42.7-43.6		X										
43.6-43.7			X									
43.7-44.0											X	
44.0-44.4				X								
44.4-44.7												X
44.7-44.8						X						
44.8-45.2												X
45.2-45.7										X		
45.7-45.8									X			
45.8-45.9								X				
45.9-46.2							X					

Exploration

Field investigations performed at the project site included geotechnical borings, visual evaluations of the performance of existing slopes, and monitoring of groundwater elevations.

Drilling and Sampling

Three mud rotary borings (R-09-001, R-09-004, and R-09-005) were drilled in the project area in 2003 to provide information for preliminary cut slope recommendations. Seventeen mud rotary borings (R-09-001 through R-09-007, and R10-001 through R-10-010) were drilled in the project area during the fall of 2009 and the spring of 2010 to provide information for this report. Holes were drilled at the proposed locations of highway embankments to assess the strength of the foundation soils. Holes were drilled where cut slopes will be constructed to evaluate the engineering properties of the material that will be used to build embankments. Three holes were drilled in the vicinity of the proposed McMillan Canyon Creek Bridge to provide information for the design of the structure foundations. The locations of the borings are shown on the drawings titled "Bore Locations" (BL-1 through BL-8) included in the attachments to this report. The corresponding Boring Records and a Boring Legend are also included.

Soils were visually classified in accordance with the Caltrans Soil and Rock Logging, Classification, and Presentation Manual (June 2010). Soil samples were also collected and submitted to the District 5 Materials Laboratory and the Headquarters Geotechnical Laboratory for mechanical analyses, triaxial testing, corrosion potential testing, determination of Atterburg limits, and evaluation of Expansion Index. Standard penetration tests (SPT), ASTM test method 1586, were performed at selected depth intervals to estimate in-place soil density of the soil. Soil strength parameters of cohesionless soils were estimated from correlations with SPT blow counts. Pocket penetrometer measurements of unconfined compressive strength were used to estimate the undrained shear strength of clay samples.

Site Geology

Lithology

The primary geologic units within the project area are late Pleistocene to Holocene alluvium, Q_a; early to late Pleistocene alluvial deposits, Q_{oa}; and Paso Robles Formation, Q_{Tp}. A geologic map of the project area is included in the attachments to this report.

The alluvium consists of gravel, sand, silt, and clay. The younger deposits are unconsolidated, while the older alluvium generally is weakly consolidated. The Paso Robles Formation typically consists of light-buff, fine to medium grained sand and interbedded gray gypsiferous clay. The sand contains gravels derived from Monterey Shale and granitic rocks. The clay contains beds of white marl, marly limestone, or small calcareous nodules.

The soils encountered during subsurface investigation generally appear consistent with the formations indicated on the geologic map. Two holes, R-09-004 and R-10-004, were drilled along the southerly toe of the existing embankment between Station 628+70 and Station 638+00. According to geologic mapping, the surficial soils in this area consist of older alluvium. Samples recovered from the mud rotary borings consisted of laterally discontinuous alternating layers of sand, and silt, and lesser amounts of clay. SPT blow counts in the upper 5 feet of soil generally indicate the soil to be loose. Below a depth of 5 feet, the granular soils were all found to be medium dense to very dense. The few clay layers encountered ranged in thickness from less than 0.5-foot to approximately 2 feet, and were found to have a consistency of medium stiff to stiff.

Two holes, R-10-005 and R-10-006, were drilled through the existing cut slope on the northerly side of the highway between Station 662+00 and Station 671+20, another section of the project area indicated by geologic mapping to be in older alluvium. The soils recovered from those borings consisted of medium dense to very dense sands and silts.

Boring R-10-003 was drilled on the southerly side of Route 46, at the toe of an embankment that extends from approximately Station 671+00 to Station 675+50. The boring encountered alternating layers of very stiff to hard silty clay and lean clay and medium dense to dense silt and sand, overlying a thick layer of very dense sand. Geologic mapping locates the boring in an area of older alluvium, but the subsurface stratigraphy appears more consistent with Paso Robles Formation.

Boring R-10-001 was drilled in the channel of Shimmin Canyon Creek on the north side of the existing roadway. The subsurface stratigraphy at that location was found to consist of approximately 12 feet of medium dense to dense sand overlying hard silty clay and dense to very dense sand and silt. Geologic mapping indicates the location is underlain younger alluvium. Material sampled from the geotechnical boring suggests that the alluvium is only a couple of feet thick at most. The hard clay and dense silt and sand encountered are more typical of Paso Robles Formation.

Three borings, R-09-005 through R-09-007, were advanced through a cut slope on the northerly side of the highway from Station 688+40 to Station 700+50. According to the project geologic map, this location is in Paso Robles Formation. The soils encountered in the borings included thick layers of hard lean clay and medium dense to very dense silt, with less frequent layers of dense to very dense sand and sand with gravel.

A total of four holes were drilled at the toe of the existing embankment located between Station 701+50 and Station 718+00. Three of the borings, R-09-001 through R-09-003, were drilled on the northerly side of the highway, and one, R-10-002, was drilled on the southerly side. According to geologic mapping, the embankment is founded on younger alluvium. SPT blow counts and observations of the material sampled from the borings suggest that the thickness of the alluvium increases from west to east. Boring R-09-001, located 28 feet left of Station 704+28, encountered loose material consistent with younger alluvium to a depth of 4.5 feet, which corresponds to an elevation of approximately 954 feet. Boring R-09-003, located 36 feet left of Station 712+17, encountered approximately 10 feet of recompacted clay and sand clay embankment material overlying 18 feet of loose alluvial soil. The bottom of the alluvium is at an elevation of approximately 943 feet. The soils encountered beneath the alluvium appear consistent with Paso Robles Formation.

Boring R-10-009, located 190 feet left of Station 743+26 in an unnamed drainage, encountered approximately 10.5 feet of stiff lean clay with sand and medium dense sandy silt overlying hard silt clay and very dense silt and sand. The upper 10.5 feet of soil is consistent with the younger alluvium depicted on the geologic map. The hard/dense material beneath the alluvium is characteristic of Paso Robles Formation.

Two borings, R-03-004 and R-03-005, were drilled above a cut slope on the northerly side of the existing roadway in March 2003 to provide information for preliminary cut slope recommendations. According to geologic mapping, both holes are located in Paso Robles Formation. The subsurface stratigraphy at the borings was described as consisting of thick layers of hard clay alternating with layers of dense to very dense sand, silty sand, and sand with gravel. This stratigraphy is consistent with Paso Robles Formation.

Borings R-10-007, R-10-008, and R-10-010 were drilled to provide information for the design of the foundations for the proposed McMillan Creek Bridge. The borings encountered 20 to 30 feet of alluvium, consisting of loose to medium dense silt and sand, overlying the hard clay and dense to very dense sands and silts of the Paso Robles Formation.

Groundwater

Several of the boreholes drilled for the subsurface investigation were instrumented as open-standpipe observation wells to monitor groundwater elevations. Long-term monitoring wells were constructed by installing 1½" slotted PVC pipe in the open boreholes and backfilling the annulus with #8 sand to within 5 feet of original ground. The wells were protected against surface water intrusion by sealing the tops of the borings with bentonite chips or grout and installing well caps. Some of the observation wells simply consisted of slotted PVC pipe installed in open borings. Water levels in the latter wells were measured after the rainy season, and the wells were abandoned by removing as much pipe as was possible, and backfilling the borings with bentonite chips.

Table 3: Groundwater Observations

Boring ID	*Station*	*Offset*	*Date*	*Surface Elevation (feet)*	*Depth to Groundwater (feet)*	*Groundwater Elevation (feet)*
R-03-004	758+09	184' Lt.	3/20/2003	1078.7	Dry	N/A
			7/19/2010		Dry	N/A
R-03-005	753+01	138' Lt.	3/20/2003	1038.1	75.6	962.5
			3/24/2003		76.2	961.9
			7/19/2010		76.0	962.1
R-09-001	704+28	28' Lt.	5/10/2010	958.7	38.3	920.4
R-09-002	707+50	47' Lt.	5/10/2010	955.2	34.7	920.5
R-09-004	633+64	61' Rt.	5/10/2010	972.5	Dry	N/A
R-09-007	696+98	111' Lt.	5/10/2010	996.5	Dry	N/A
R-10-001	685+59	47' Lt.	5/10/2010	946.7	25.9	920.8
			7/19/2010		26.3	920.4
R-10-006	668+07	75' Lt.	5/10/2010	1057.9	Dry	N/A
R-10-008	855+58	75' Lt.	5/20/2010	1006.9	35.1	971.8
			7/19/2010		35.0	971.9
R-10-009	743+26	190' Lt.	5/20/2010	978.6	21.8	956.8
			5/25/2010		21.8	956.8

Groundwater measurements indicate that the groundwater elevation trends from higher to lower moving from east to west in the project area. This corresponds to the direction of flow of the nearby Estrella River.

Project Site Seismicity

Ground Motion

Peak ground acceleration (PGA) in the project area due to an earthquake on one of the nearby faults was estimated using the *2009 Caltrans Seismic Design Procedure.* The procedure was developed to calculate the minimum seismic design requirements for bridges on State highways. The method calculates design response spectra over a range of periods. The design response spectrum is based on the envelope of a deterministic and a probabilistic spectrum. The deterministic spectrum is calculated as the arithmetic average of median response spectra computed using the Chiou & Youngs and Campbell & Bozorgnia ground motion prediction equations (CY-CB GMPE). These equations are applied to all faults in or near California considered to be active in the last 700,000 years (late Quaternary age) and capable of producing a moment magnitude earthquake of 6.0 or greater.

The probabilistic spectrum is obtained from the 2008 USGS Seismic Hazard Map for the 5% in 50 years probability of exceedance (or 975 year return period). The spectral values are adjusted with a soil amplification factor based on an average of the Boore-Atkinson (2008), Campbell Bozorgnia (2008), and Chiou-Youngs (2008) ground motion prediction models. For sites underlain by soils having an average shear wave velocity for the upper 30 meters of soil (V_{S30}) of less than 300 meters per second, the 2009 USGS Probabilistic Seismic Hazard Analysis Interactive Deaggregation Tool is used to develop the probabilistic spectrum.

The controlling faults in the project area are the Rinconada fault zone (San Marcos section), a right lateral slip strike fault with a maximum magnitude of 7.5; and the San Andreas fault zone (Parkfield section), a right lateral slip strike fault with a maximum magnitude of 7.9. The peak ground acceleration at the westerly end of the project is estimated to be 0.53 g (gravity). The peak ground acceleration is estimated to be 0.64 g at the easterly project limit. The probabilistic spectrum with a soil amplification factor for a V_{S30} of 250 meters per second governed the design response spectrum for both ends of the project site. The V_{S30} was generated using correlations to Standard Penetration Test (SPT) blow counts.

The Seismic Hazard Report prepared for another section of the Highway 46 Corridor Improvement Project predicts an average recurrence interval of 21.5 years for an earthquake along the Parkfield segment of the San Andreas fault zone. Therefore, there is a high likelihood of an earthquake occurring during the design life of this project, though probably of a lesser magnitude than the 7.9 maximum credible magnitude. Historically, earthquakes ranging in magnitude between 5 and 6 are the typical "major" events along the Parkfield segment of the San Andreas fault zone.

Ground Rupture

No known active or potentially active faults project towards or cross the highway alignment within the project limits. Therefore, there is no potential for surface fault rupture to occur and no mitigation efforts are necessary.

Liquefaction

Liquefaction is a near-total loss of soil strength due to an increase in pore water pressure during cyclic loading, such as occurs during an earthquake. Loose sands and gravels with 35 percent fines or less that have the potential of being saturated are susceptible to liquefaction. Generally, the younger and looser the sediment, and the shallower the water table, the more susceptible the soil is to liquefaction. Sediments most susceptible to liquefaction include historical and late Holocene-age river channel and flood plain deposits, and poorly compacted fills. Bedrock and dense soils, including well-compacted fills have a low susceptibility to liquefaction. Liquefaction is most prevalent in areas where groundwater lies within 30 feet of the ground surface; liquefaction rarely occurs in areas with groundwater deeper than 50 feet.

Published data indicates that liquefaction potential through much of the project area is high. The majority of the site is underlain by younger alluvium, groundwater is within 30 feet of the ground surface, and there is a high likelihood of strong ground shaking from an earthquake on one of the nearby faults. A map showing the liquefaction risk throughout the project area is provided in the attachments to this report.

Inspection of the Boring Records from the areas where the embankments are proposed suggests that liquefaction potential is low at those locations. Loose granular soils that are susceptible to liquefaction were not present at elevations where they would be likely to be saturated with ground water. Granular soils encountered below the water table were all determined to be dense to very dense. Therefore liquefaction was not considered in the evaluation of slope stability.

Corrosion

Representative soil samples taken during the foundation investigation for the McMillan Creek Bridge were submitted to the District Materials Laboratory for testing to determine corrosion potential. Test results have not been received to date. Corrosion test results on soils from nearby sections of Route 46, however, suggest that the project site is likely non-corrosive. Reporting of corrosion potential will be included in the Foundation Report for the McMillan Creek Bridge.

Geotechnical Analysis and Design

Embankment Settlement

Due to the heterogeneous nature of the soils within the project limits, settlement analyses were performed at the locations of the highest embankments using soil strength parameters obtained from field and laboratory testing. Elastic settlement in cohesionless soils was calculated using Hough's Method, which correlates soil grain size distribution and SPT values with a bearing capacity factor that is used in a settlement equation. Consolidation settlement in cohesive soils was calculated using consolidation indices estimated from in situ water content, soil gradation, and Atterburg Limits.

The following table summarizes the calculated settlements at the locations of the borings conducted for embankment foundation evaluation.

Table 4: Embankment Settlement

Station	*Boring ID*	*Embankment Height (feet)*	*Elastic Settlement (inches)*	*Consolidation Settlement (inches)*	*Total Settlement (inches)*
630+77	R-10-004	20	0.9	1.5	2.4
633+64	R-09-004	25	1.9	0.1	2
674+62	R-10-003	10	0.6	2.0	2.6
685+59	R-10-001	33	1.0	2.2	3.2
704+28	R-09-001	17	1.1	2.1	3.2
707+50	R-09-002	23	0.1	4.4	4.5
712+17	R-09-003	10	1.4	3.3	4.7
746+26	R-10-009	23	1.0	2.2	3.2

The cohesive soils encountered in all of the borings other than R-10-004 are derived from Paso Robles Formation. Based upon past experience with similar soil types, significant long-term consolidation is not expected to occur beneath the proposed embankments at the locations of the borings due to the highly over consolidated nature of the soils. Therefore, the expected settlement at these locations is considerably less than the calculated settlement. The clays encountered in boring R-10-004, however, are alluvial soils, and their stress history does not include loading of the magnitude that they will be subject to under the embankment loading. The consolidation settlement calculated for that location is probably a reasonable approximation of what will actually occur.

Embankment Stability

Existing embankment slopes are typically inclined at 1.5:1 (horizontal:vertical). The embankments appear to be globally stable. Many of the slopes, however, show general degradation exemplified by retreat of the hinge point due to erosion from sheet flow.

The new embankments proposed for this project will be constructed with side slopes inclined at 2:1 or flatter. Existing fill slopes will be flattened to 2:1 or flatter. The global stability of this slope geometry was evaluated by modeling the slopes in SLOPE/W, a slope stability computer program. Factors of safety were calculated using the Morgenstern-Price method, a limit equilibrium type of analysis for assessing slope stability that satisfies both force equilibrium and moment equilibrium equations of statics. A design factor of safety of 1.5, the minimum factor of safety for a Caltrans critical facility, was specified for a static analysis. A factor of safety of 1.1 was specified for a dynamic analysis of slope stability with an applied horizontal seismic load of 0.2g. Caltrans Guidelines for Foundation Investigations and Reports dated June 2002 recommends using one-third of the horizontal (PGA) with an upper limit of 0.2g for the seismic assessment of slopes and retaining systems with a minimum factor of safety of 1.1.

For the purpose of evaluating slope stability, it was assumed that embankment soil would be obtained from excavations in Paso Robles Formation. Soil shear strength parameters were based on laboratory test results on cohesive material extracted from borings R-09-005 and R-09-006. Soil strength parameters of the foundation soils were estimated from SPT blow count correlations in cohesionless soils, and pocket penetrometer measurements of unconfined compressive strength in cohesive soils. A phreatic water surface was modeled in the slope stability analysis based on groundwater measurements taken during the subsurface investigation. Traffic loading was modeled in the analysis by applying a 240-psf surcharge over the paved portion of the embankment, as specified in Caltrans Standard Plans.

The lowest calculated static factor of safety was obtained using a friction angle of 25.5 degrees and cohesion of 153 psf for the embankment soil. These values correspond to the effective stress strength parameters reported from tests on soil from boring R-09-006. The calculated factor of safety was slightly greater than 1.5.

The slope stability analyses indicate that embankments constructed of native soils with slope inclinations of 2:1 should be globally stable. Surficial stability, however, may be an issue if desiccation cracks develop in soils having high clay content. An aggressive revegetation plan would go far in addressing surficial stability concerns, and would minimize the potential for erosion in the more granular soils.

If right of way or other constraints dictate construction of fill slopes steeper than 2:1, it will be necessary to employ one of the following strategies:

- Use geosynthetic reinforcement in the embankments.
- Use select material to construct the embankments.
- Construct retaining walls.

This office should be consulted for site-specific recommendations on constructing embankments steeper than 2:1.

Cuts and Excavations

It is recommended that all cut slopes within the project limits be excavated at an inclination of 2:1 or flatter unless specifically addressed in the following sections. This will assure long-term stability and help reduce the potential for erosion. Cuts in Paso Robles Formation and alluvium can be expected to encounter mixed soil types, which may include layers of granular non-cohesive soil that may subject to erosion. The cuts will be particularly susceptible to erosion if water is allowed to sheet flow over the cut face from the slopes above. Top-of-cut ditches should be specified where offsite drainage could otherwise sheet flow down the slope face. Slough and debris can be expected to collect at bottom of cut slopes during rainstorms, particularly during the first winter following construction. The Landscape Architecture Branch should be consulted for recommendations regarding erosion control on all exposed cut faces in the project area.

The material in the proposed cuts can be expected to be readily rippable. An earthwork factor of 0.98 should be used for earthwork quantity calculations. Based on mechanical analyses of material sampled from Paso Robles Formation in the project area, a soil erodibility factor K of 0.30 can be used in the Universal Soil Loss Equation to estimate potential soil loss from erosion.

The existing cut slopes between Station 656+00 and Station 672+00 are inclined at approximately 2:1 and are performing satisfactorily. The global and surficial stability appear adequate, and the slopes are well vegetated with grasses. The native material consists of medium dense to very dense granular soil. Correlations with SPT blow counts suggest that the material has a high friction angle. It is expected that this material would be globally stable at inclinations as steep as 1.5:1. Due to the high percentage of fine sands in the soil, however, the slope is expected to be highly susceptible to erosion. The Landscape Architect Branch should be consulted for recommendations regarding plant selection and proper application of erosion control materials.

The existing cut slope on the northerly side of the highway between Station 688+40 and Station 700+00 is in Paso Robles Formation, and is inclined as steeply as 1.5:1. There is an existing ranch road cut into the hill further upslope, beyond the State right of way. Some of the cut slopes associated with that road are steeper than 1:1 (as steep as 0.6:1 in isolated locations). The highway cut slopes are performing satisfactorily; they appear globally stable and are well vegetated. The slopes associated with the ranch road appear globally stable, but are severely eroded in the steeper sections. Vegetative cover varies: it is non-existent in the steepest areas, while the undisturbed areas are well vegetated with grasses.

It is recommended that the slope at this location be cut no steeper than 2:1. The native soils at this location contain a large proportion of moderately expansive, highly over consolidated, clay and silty clay. Even at inclinations as steep as 1.5:1, the global stability should be adequate, and the slope would probably perform satisfactorily over the short-term. Over the long term, however, shallow failures would likely occur. Once the overburden stress is relieved by (by excavating), the surficial soils would become hydrated during the rainy season and would swell. During the dry months desiccation cracks would develop. Multiple cycles of swelling and shrinking would loosen the soils. Although this process may help facilitate plant establishment that would help prevent soil erosion, it is not favorable to preservation of slope stability. Future rainstorms could saturate the upper, loose, soil mass while the lower, highly consolidated, clay strata would prevent infiltration of water. Excess pore water pressure could develop, and the saturated soil mass could slide down slope. Any slide debris would be loose, and vulnerable to further erosion.

The existing cut slope between Station 746+00 and Station 767+00 is inclined at 1:1.5, and is interrupted at approximately the midpoint along a portion of its length by a concrete-lined drainage ditch. The existing slope is not performing well. While the global stability appears adequate, there are shallow slope failures above and below the drainage ditch at approximate Station 753+00. There is additional cracking above the head scarp of the upper failure, indicating that the slide is retrogressing. This location, too, has an existing ranch road cut into the hill further upslope, beyond the State right of way. Some of the cut slopes associated with that road are very steep. Those slopes appear globally stable, but are severely eroded in the steeper sections. Vegetation is non-existent in the steepest areas, and is sparse in other areas due to heavy grazing by cattle.

This location is also in Paso Robles Formation, and the native soil contains a large proportion of moderately expansive, highly over consolidated clay and silty clay. It is recommended that the slopes at this location be excavated no steeper than 2:1 for the same reasons as listed for the previous slope.

Construction Considerations

Foundation soils are generally adequate to support the proposed highway embankments and drainage structures throughout the project limits. Localized areas of unconsolidated or saturated foundation materials, however, may require stripping and recompaction, or removal of material deemed unsuitable. If standing water or unsuitable material is encountered to a depth where it cannot be economically removed, it is recommended that the unsuitable material be sub excavated 18 inches and replaced with Class 3 Permeable Material encapsulated in an AASHTO specification M288, Class 2 survivability geotextile. The permeable material will allow water to fill its pore spaces without a loss of strength. The geotextile fabric will act as a separator, preventing the soils above the fabric from filling the voids in the permeable material, and preventing the permeable material from penetrating the soft soils beneath the fabric. The geotextile will also serve to reinforce the subgrade soil. The permeable material encapsulated in geotextile fabric will provide a dry and stable working platform for embankment or drainage structure construction.

Recommendations

Refer to the preceding sections for detailed recommendations. The following list summarizes the recommendations provided in this report:

- Roadway cut and fill slopes are to be constructed with a slope of 2:1 or flatter from 0.1 mile east of Almond Drive to 0.8 mile east of McMillan Canyon Road unless otherwise noted.

- Re-vegetate all exposed slopes and implement erosion control measures to increase resistance to shallow slope instabilities.

The recommendations contained in this report are based on specific project information that has been provided by Office of Design II, Branch A. If any conceptual changes are made during final project design, the Office of Geotechnical Design – North, Branch D should review those changes to determine if the recommendations contained in this report are still applicable. Any questions regarding the recommendations contained herein should be directed to the attention of Dan Appelbaum, (805) 549-3745, or Mike Finegan, (805) 549-3194, at the Office of Geotechnical Design – North, Branch D.

Supervised by,

REGISTERED PROFESSIONAL ENGINEER
D.L. Appelbaum
No. C 50001
Exp. 6-30-11
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Geotechnical Design – North
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MICHAEL S. FINEGAN, PE, Chief
Geotechnical Design - North
Branch D

c: Roy Bibbens / GDN File (E-copy)
John Luchetta – Project Manager (E-copy)
Mark Willian – GS Corporate (E-copy)
R.E. Pending File
Doug Lambert – District Materials Engineer (E-copy)
Job File / Branch D Records

LIST OF ATTACHMENTS

INDEX OF PLANS

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

STATE OF CALIFORNIA

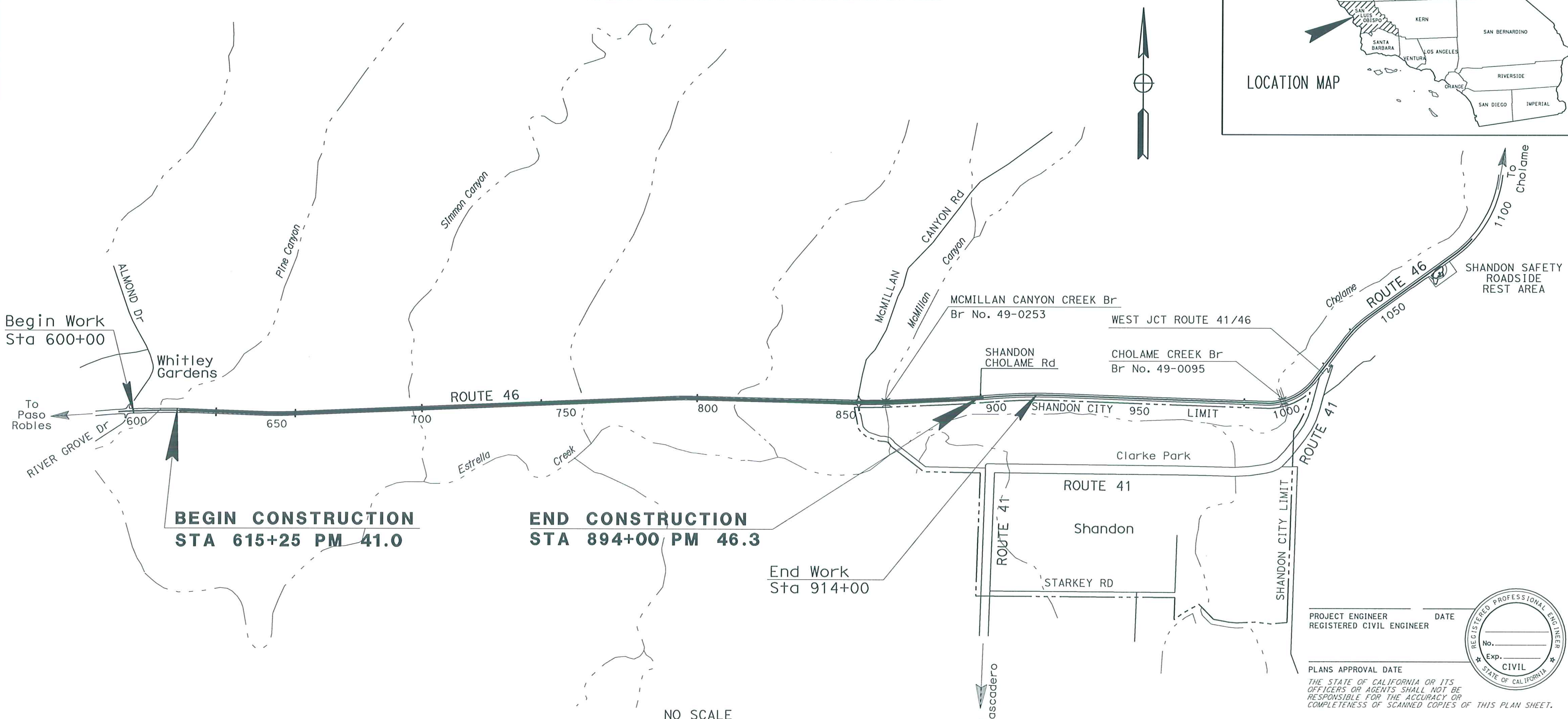
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON

STATE HIGHWAY

IN SAN LUIS OBISPO COUNTY
NEAR PASO ROBLES
FROM 0.1 MILE EAST OF ALMOND DRIVE TO 0.8 MILE EAST OF McMILLAN CANYON ROAD

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2006



NO SCALE

PROJECT ENGINEER REGISTERED CIVIL ENGINEER | DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

PLANS APPROVAL DATE

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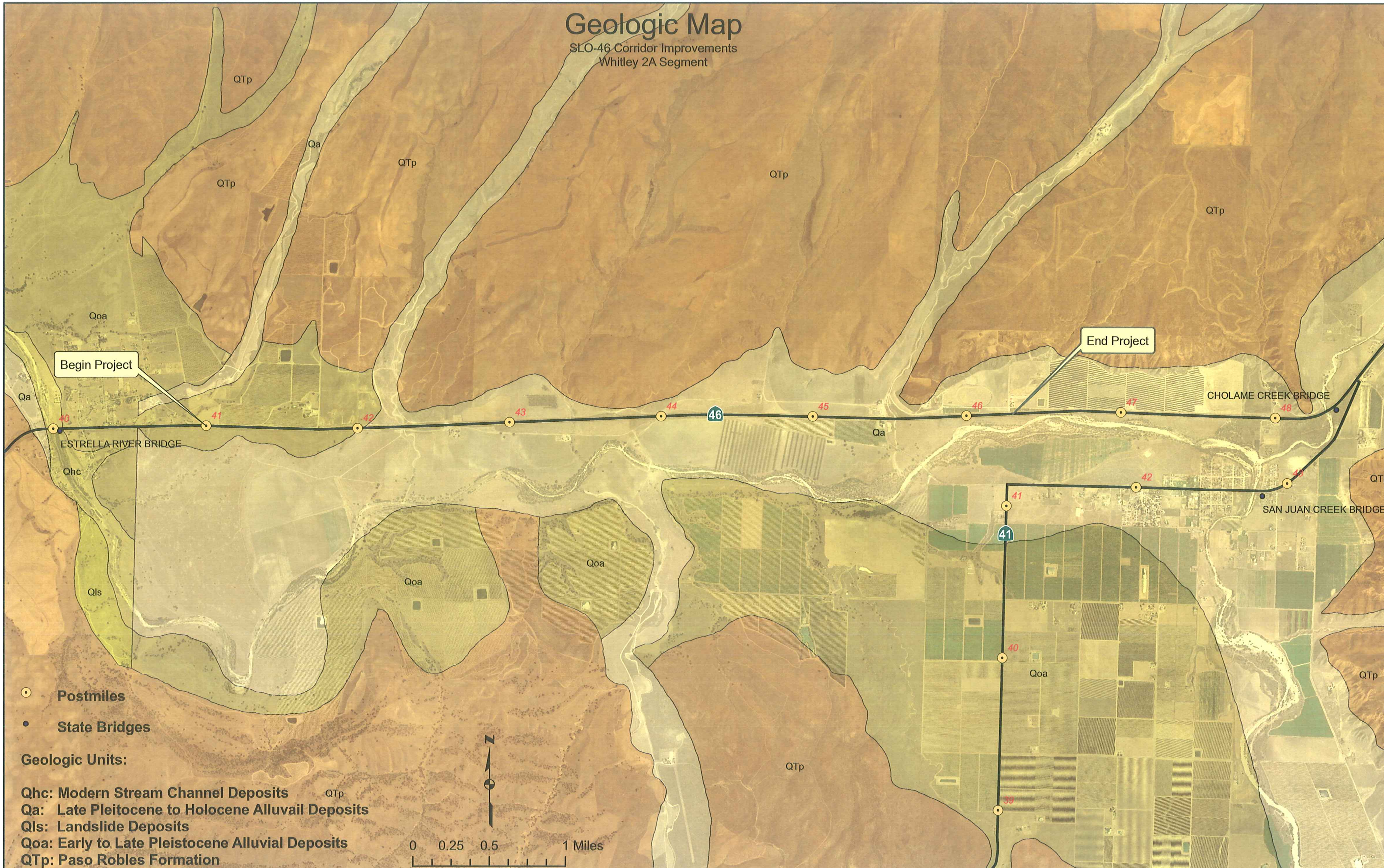
PROJECT MANAGER JOHN LUCHETTA

DESIGN ENGINEER JACK WALKER

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

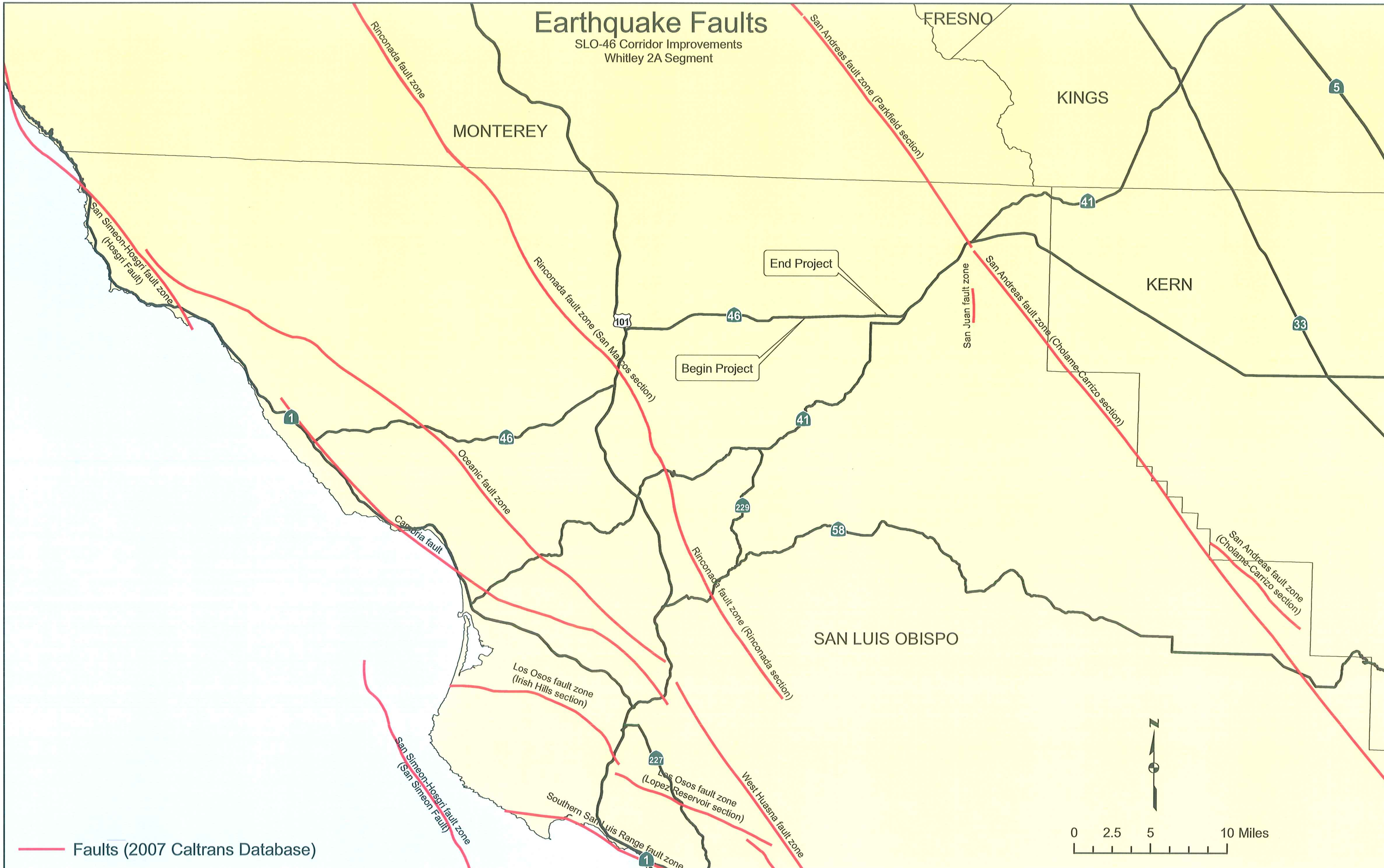
ATTACHMENT 1: VICINITY MAP

CONTRACT No.	05-330774
PROJECT ID	0500020049



Geologic Mapping Compiled by Lew Rosenberg

ATTACHMENT 2



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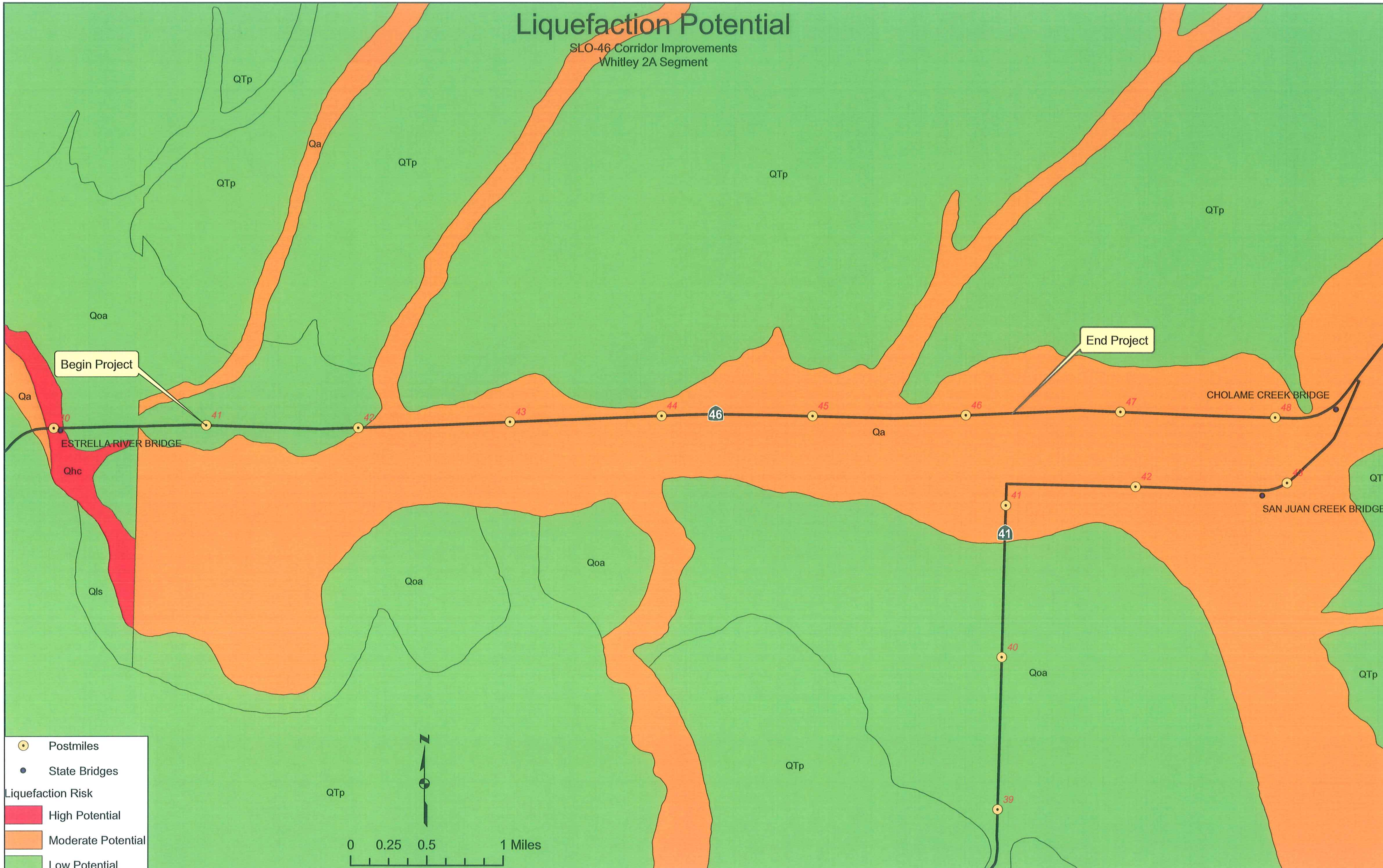

Geologic Mapping Compiled by Lew Rosenberg

ATTACHMENT 4

BORING LOCATIONS
05-SLO-46- 41.0/46.3
05-330771
ATTACHMENT 5

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FUNCTIONAL SUPERVISOR MIKE FINEGAN

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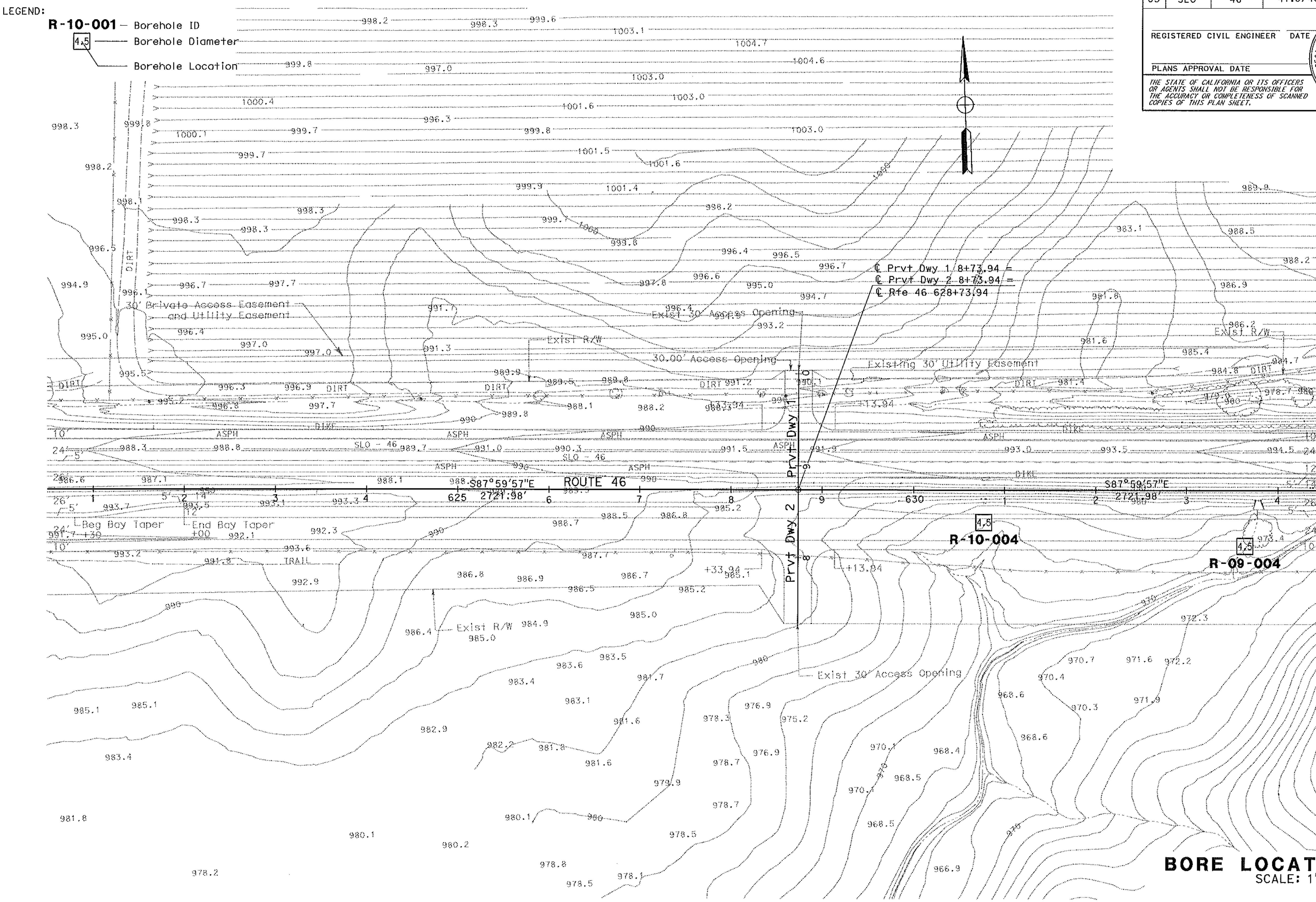
REVISED BY | DATE REVISED



BORE LOCATIONS

SCALE: 1" = 100'

BL-1

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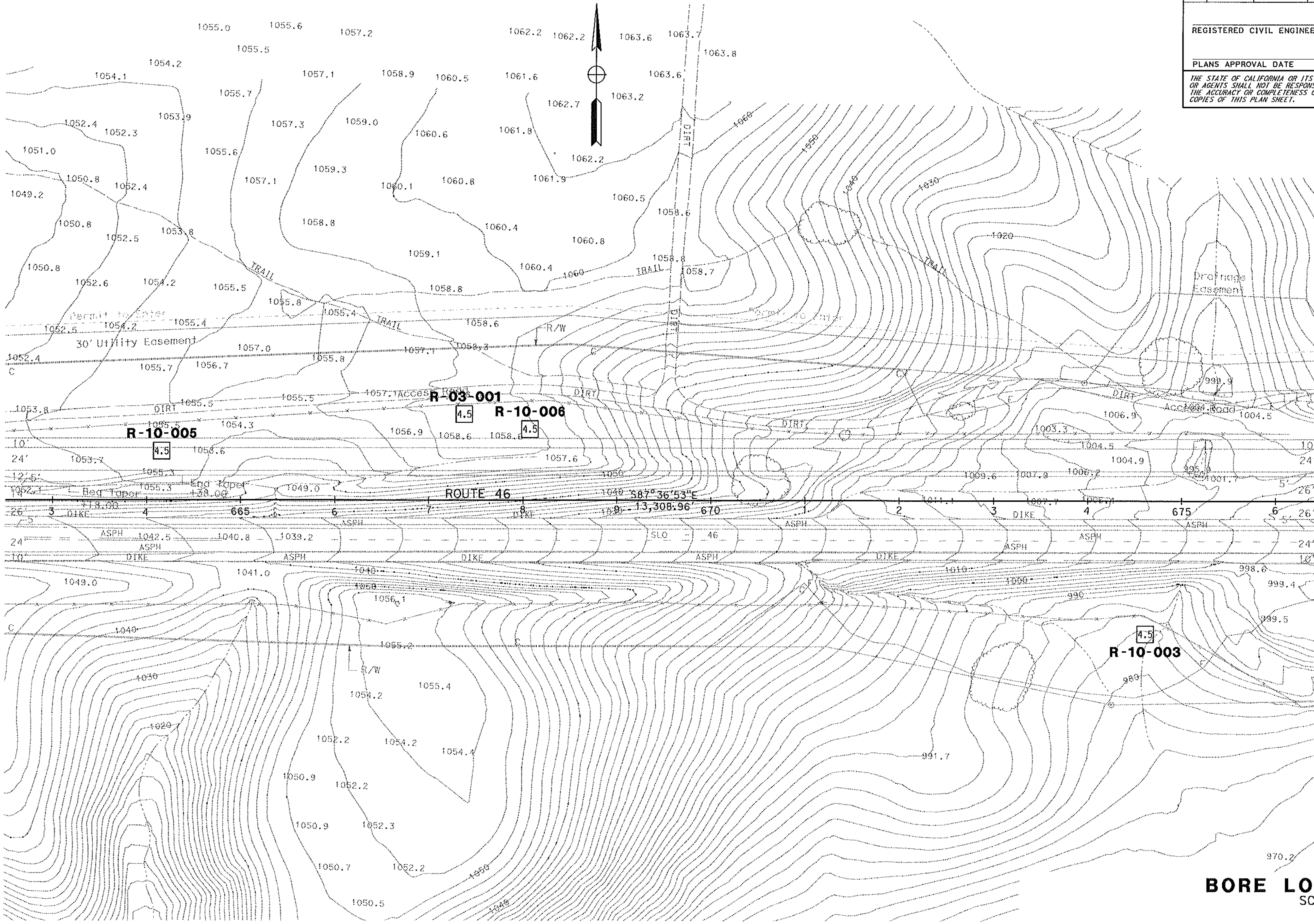

BORE LOCATIONS

SCALE: 1" = 100'

BL-2

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MIKE FINEGAN

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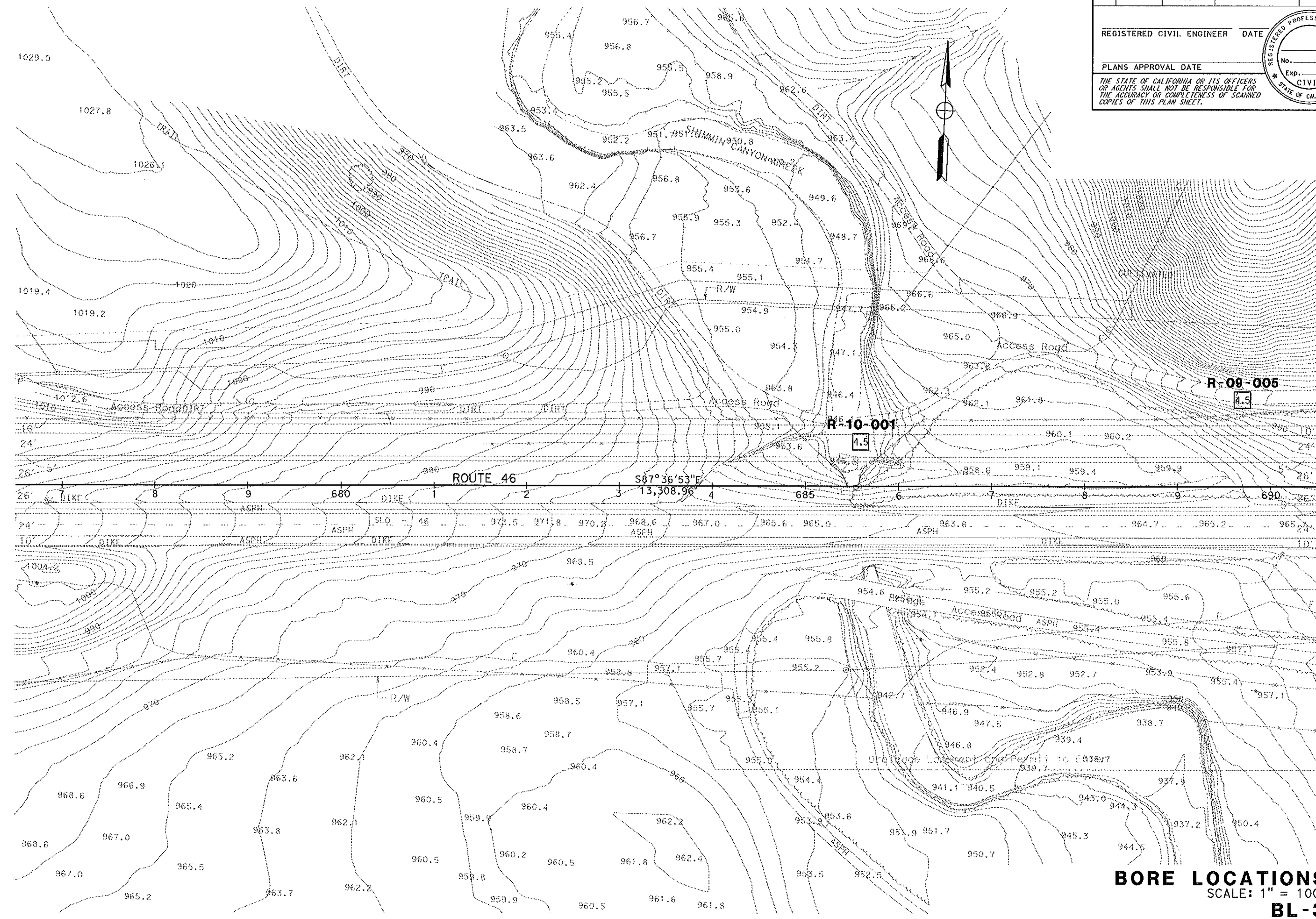

BORE LOCATIONS

SCALE: 1" = 100'

BL-3

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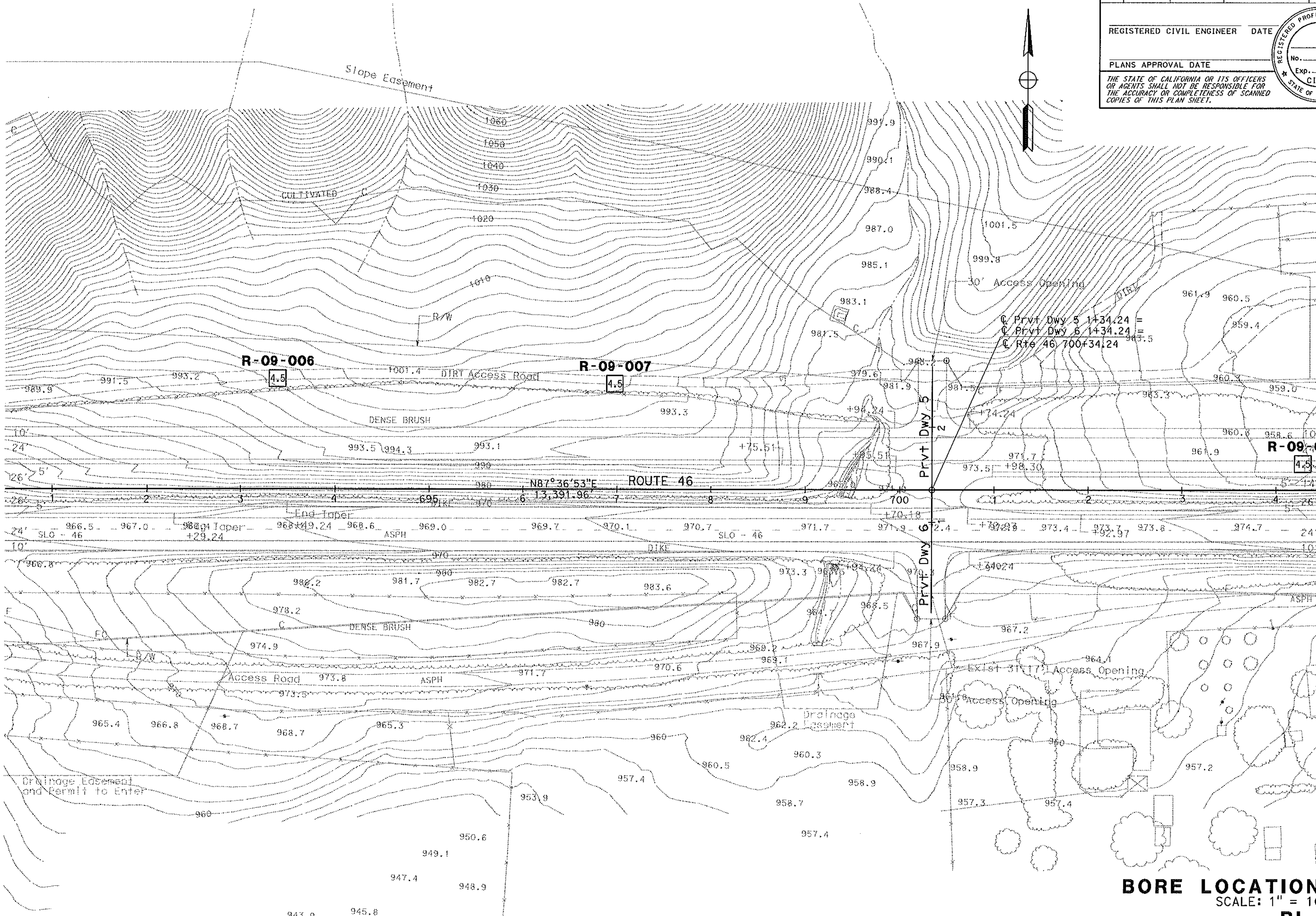

BORE LOCATIONS

SCALE: 1" = 100'

BL-4

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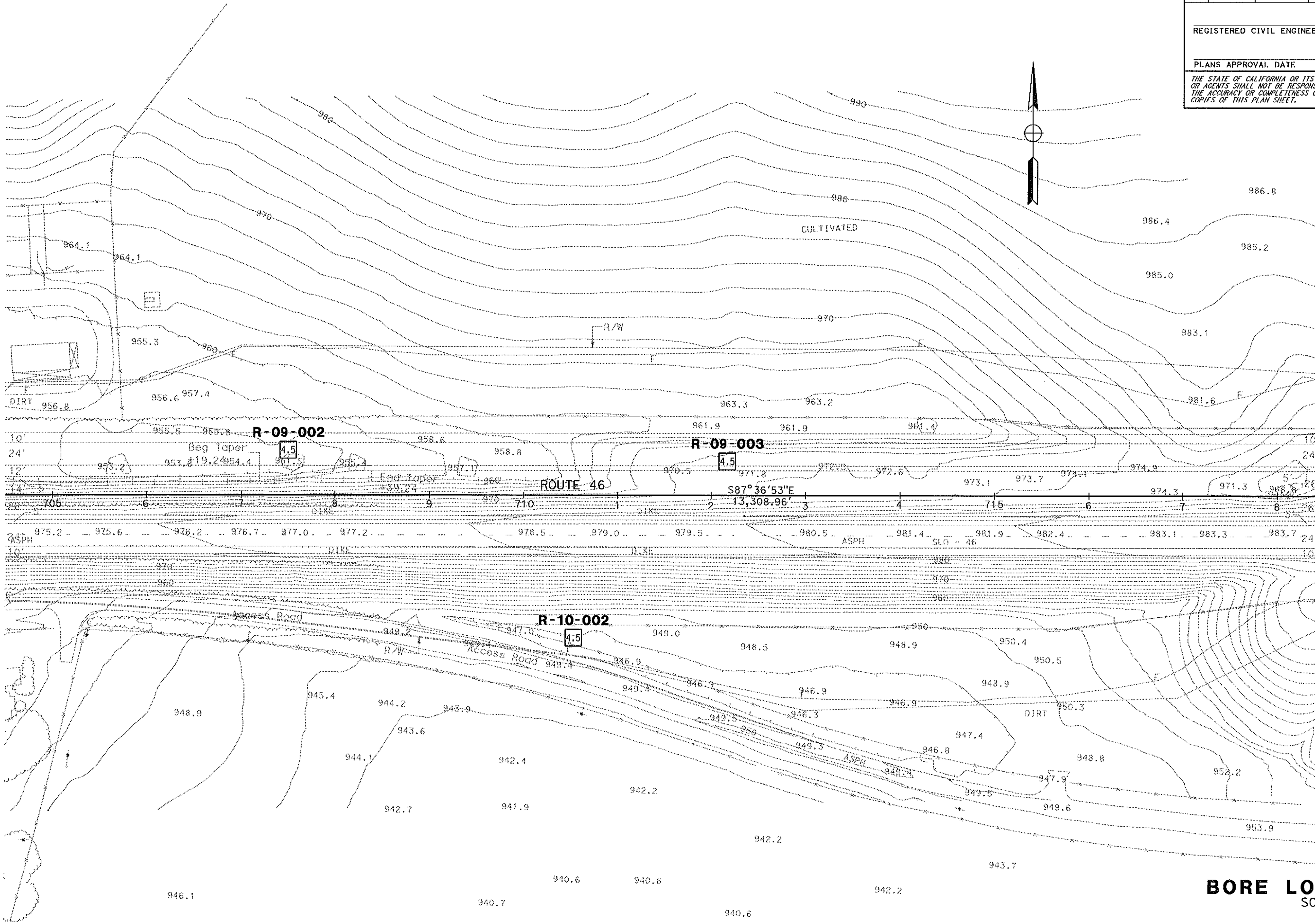

BORE LOCATIONS
SCALE: 1" = 100'
BL-5

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans GEOTECHNICAL DESIGN

FUNCTIONAL SUPERVISOR

MIKE FINEGAN

CALCULATED-DESIGNED BY

CHECKED BY

REVISED BY

DATE REVISED

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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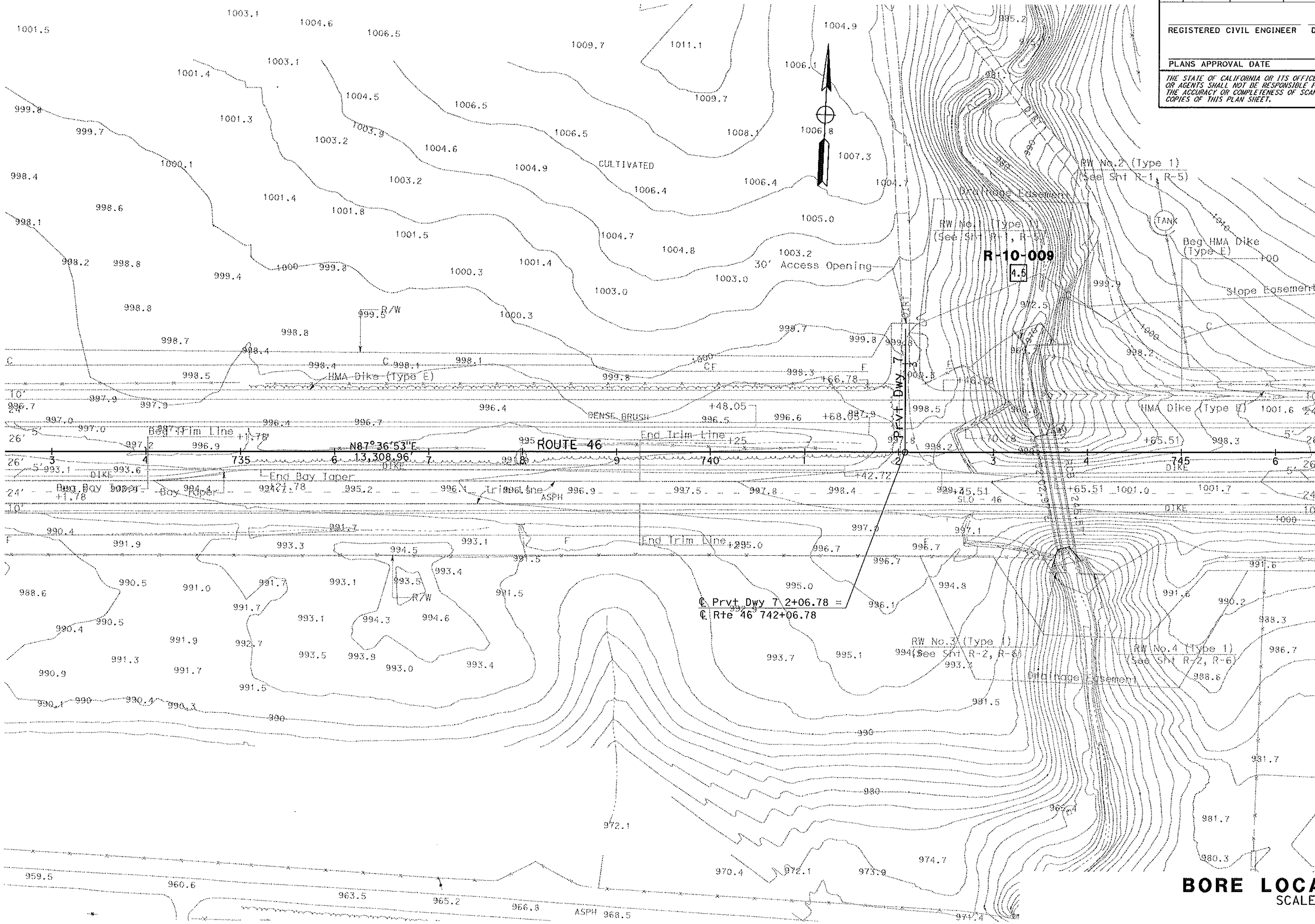

BORE LOCATIONS
SCALE: 1" = 100'

BL-6

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans® GEOTECHNICAL DESIGN

FUNCTIONAL SUPERVISOR

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DATE REVISED

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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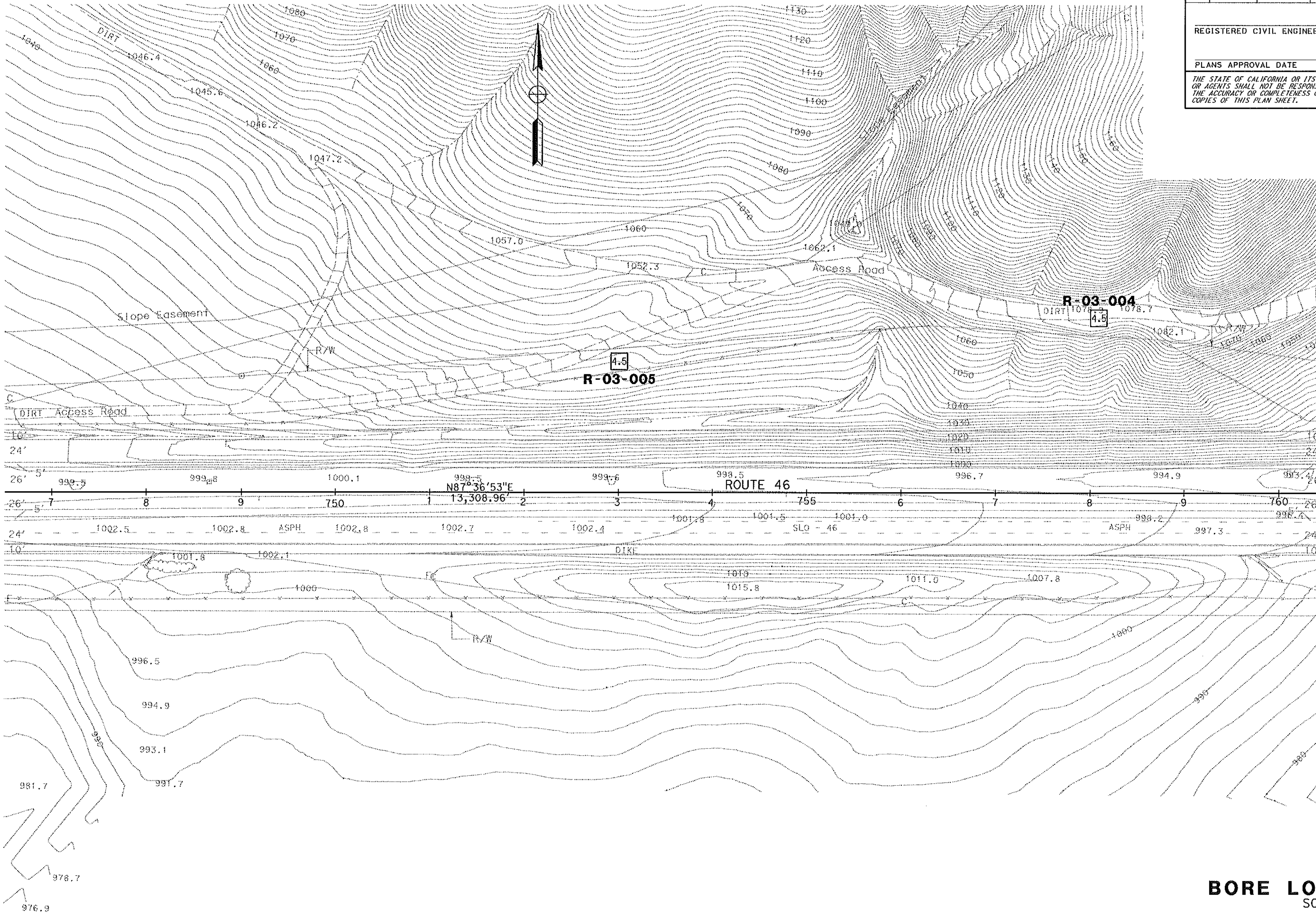

BORE LOCATIONS

SCALE: 1" = 100'

BL-7

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans® GEOTECHNICAL DESIGN

FUNCTIONAL SUPERVISOR

MIKE FINEGAN

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REVISED BY

DATE REVISED

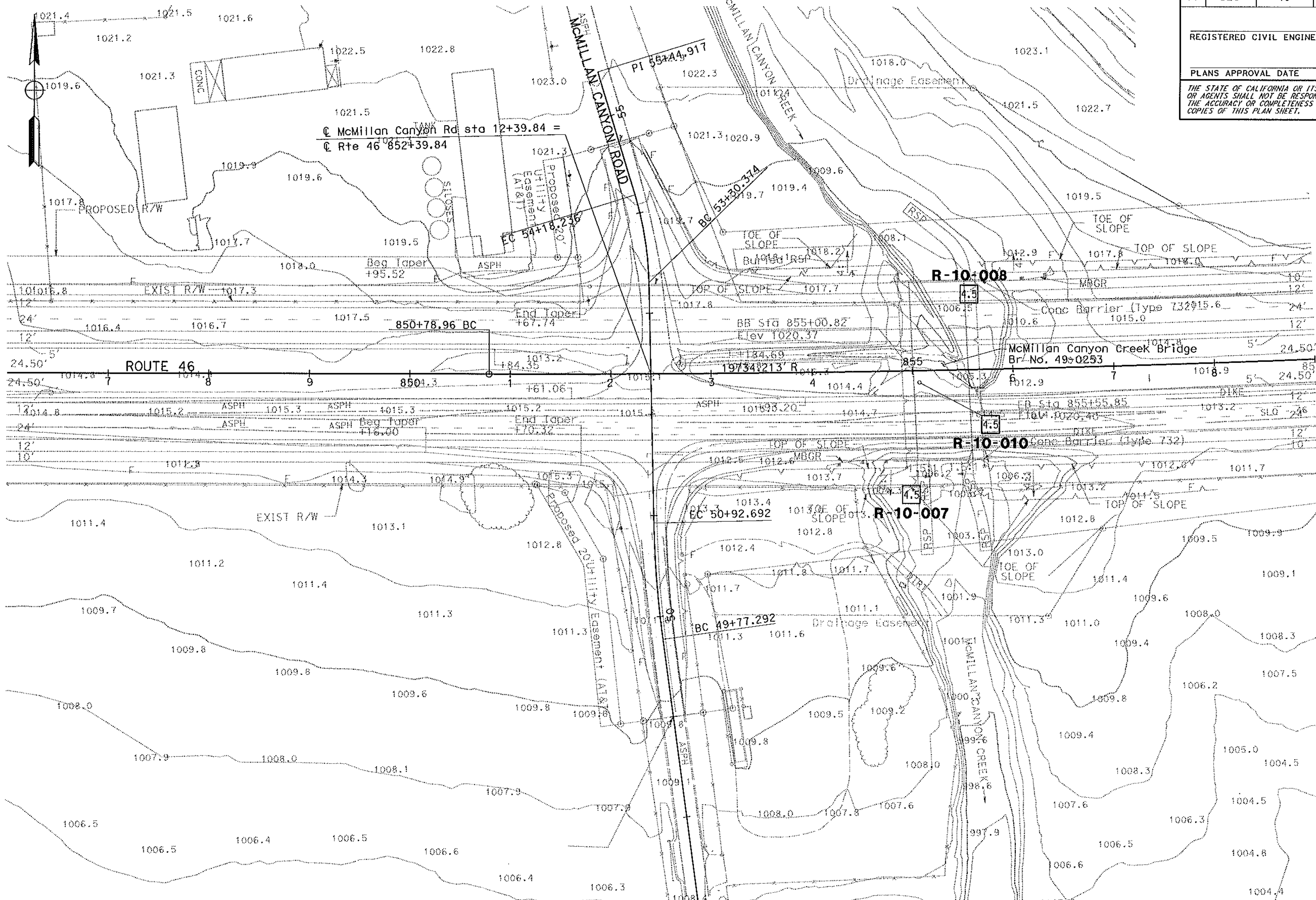
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA



CURVE DATA					
No.	R	Δ	T	L	RP	LOCATION
4	19734.21'	3°48'51"	657.08'	1313.68'	BC	℄ Rte 46 850+78.96

BORE LOCATIONS

SCALE: 1" = 100'

BL-8

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans GEOTECHNICAL DESIGN

FUNCTIONAL SUPERVISOR

MIKE FINEGAN

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DATE REVISED

BORING RECORDS

05-SLO-46- 41.0/46.3

05-330771

ATTACHMENT 6

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**3-10-03**	**3-10-03**	**35° 39' 41.0132" / -120° 26' 45.0298" WGS84**	**R-03-004**

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans	**184.00' Lt Sta 758+09RTE 46**	**1078.7 ft NGVD29**
DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Rotary Wash	**Mobile B80**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)	SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")	**Manual Safety Hammer 140#, 30" drop**	**59%**
BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Installed Open-standpipe Observation Well	**Dry on7-19-10**	**96.0 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	0	SANDY SILT (ML); dense; greenish gray; dry to moist; mostly nonplastic fines; fine SAND.	1			60					
	1										
1076.70	2										
	3										
1074.70	4										
	5										
1072.70	6		2	15 16 19	35	100					
	7	Lean CLAY (CL); very stiff; greenish gray mottled with light brown; moist; medium plasticity fines; calcite veins and nodules.	3			100					
1070.70	8										
	9										
1068.70	10	SILTY SAND (SM); very dense; greenish gray; moist; mostly fine SAND; nonplastic fines; moderately cemented with calcite.									
	11		4	19 31 50	81	94					
1066.70	12	Poorly graded SAND (SP); very dense; greenish gray; moist; mostly SAND, from medium to fine, subrounded; trace coarse subrounded SAND; zones cemented with calcite.	5			100					
	13										
1064.70	14										
	15										
1062.70	16		6	25 43 50	93	44					
	17		7			38					
1060.70	18										
	19										
1058.70	20	Lean CLAY (CL); hard; gray; moist; medium plasticity fines; calcite veins.									
	21		8	14 16 26	42	100					
1056.70	22		9			67					
	23	SILTY SAND (SM); very dense; gray; moist; mostly SAND, from medium to fine; nonplastic fines; moderately cemented with calcite.									
1054.70	24										
	25										

(continued)

5 BR - STANDARD 533073.GPJ CALTRANS_LIBRARY_DEC09.GLB 8/31/10

Department of Transportation
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Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-03-004**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **1 of 4**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION
	25	SILTY SAND (SM) *(continued)*.
1052.70	26	
	27	Poorly graded SAND (SP); very dense; gray; moist; mostly SAND, from medium to fine.
1050.70	28	
	29	Well-graded SAND (SW); very dense; gray with light brown; moist; mostly SAND, from coarse to fine; trace fine, subangular GRAVEL.
1048.70	30	
	31	
1046.70	32	
	33	
1044.70	34	
	35	
1042.70	36	
	37	
1040.70	38	
	39	
1038.70	40	
	41	
1036.70	42	
	43	
1034.70	44	
	45	
1032.70	46	
	47	
1030.70	48	
	49	
1028.70	50	Lean CLAY (CL); hard; greenish gray; mostly medium plasticity fines; calcite veins.
	51	
1026.70	52	
	53	
1024.70	54	
	55	

Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
9			67							
10	23 40 50	90	89							
11			81							
12	44 50/5"	50/5	64							
13			100							
14	29 45 50/4"	95/10	75							
15			82							
16	44 50/4"	50/4	100							
17			68							
18	32 36 50/5"	86/11	100							
19			80							
20	50/6"	REF	100							
21			100							

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		Lean CLAY (CL) *(continued)*.		21			100							
1022.70	56		Poorly graded SAND (SP); very dense; greenish gray; moist; mostly fine SAND.		22	20 40 46	86	100							
	57		Lean CLAY (CL); hard; greenish gray; moist; mostly medium plasticity fines; calcite nodules.												
1020.70	58				23			100							
	59		Poorly graded SAND (SP); very dense; greenish gray; moist; mostly fine SAND.												
1018.70	60														
	61		Lean CLAY (CL); hard; greenish gray mottled with light brown; moist; mostly medium plasticity fines; calcite nodules.		24	27 50/6"	50/6	100							
1016.70	62				25			83							
	63		Poorly graded SAND (SP); very dense; greenish gray; moist; mostly fine SAND.												
1014.70	64		Well-graded SAND (SW); very dense; greenish gray with light brown; moist; mostly SAND, from coarse to fine.												
	65														
1012.70	66				26	50/6"	REF	67							
					27			100							
	67														
1010.70	68														
	69														
1008.70	70														
	71				28	50/5"	REF	80							
					29			65							
1006.70	72														
	73														
1004.70	74		Poorly graded SAND (SP); very dense; greenish gray; moist; mostly fine SAND.												
	75		SANDY lean CLAY (CL); hard; greenish gray; moist; mostly medium plasticity fines; fine SAND.												
1002.70	76		Poorly graded SAND (SP); very dense; greenish gray; moist; mostly fine SAND.		30	34 50/5"	50/5	100							
	77		Lean CLAY (CL); hard; light brown mottled with greenish gray ; moist; mostly medium plasticity fines.		31			100							
1000.70	78														
	79		SANDY SILT (ML); very dense; greenish gray; moist; mostly nonplastic fines; fine SAND.												
998.70	80														
	81		Well-graded SAND (SW); very dense; greenish gray; moist; mostly SAND, from coarse to fine.		32	50/6"	REF	100							
					33			100							
996.70	82														
	83		Poorly graded SAND (SP); very dense; greenish gray; moist; mostly fine SAND; moderately cemented with calcite.												
994.70	84														
	85														

(continued)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	85	Well-graded SAND (SW); very dense; gray; moist; mostly SAND, from coarse to fine; trace fine, subangular GRAVEL.	33			100							
992.70	86		34	50/2"	REF	100							
			35			62							
	87	Poorly graded SAND (SP); very dense; light tan; dry; mostly fine SAND; strongly cemented with calcite.											
990.70	88												
	89	SANDY SILT (ML); very dense; greenish gray; moist; mostly nonplastic fines; fine SAND.											
988.70	90												
	91		36	50/6"	REF	100							
986.70	92		37			61							
	93	SILTY SAND (SM); very dense; greenish gray; moist; mostly fine SAND; nonplastic fines, weakly to moderately cemented with calcite.											
984.70	94	Well-graded SAND (SW); very dense; greenish gray with light brown; moist; mostly SAND, from coarse to fine; trace GRAVEL, from coarse to fine, 2" maximum diameter.											
	95												
982.70	96	Bottom of borehole at 96.0 ft bgs											
	97	Installed Open-standpipe Observation Well 3/10/2003 Ground Water Not Encountered											
980.70	98												
	99												
978.70	100												
	101												
976.70	102												
	103												
974.70	104												
	105												
972.70	106												
	107												
970.70	108												
	109												
968.70	110												
	111												
966.70	112												
	113												
964.70	114												
	115												

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**3-11-03**	**3-11-03**	**35° 39' 40.2261" / -120° 26' 51.1386" WGS84**	**R-03-005**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**138.00' Lt Sta 753+01RTE 46**	**1038.1 ft NGVD29**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			**Mobile B80**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")			**Manual Safety Hammer 140#, 30" drop**	**59%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS: DURING DRILLING / AFTER DRILLING (DATE) **76.0 ft on7-19-10**	TOTAL DEPTH OF BORING
Installed Open-standpipe Observation Well				**81.4 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	0	Fat CLAY (CH); very stiff; greenish gray with light brown; dry to moist; mostly high plasticity fines; calcite nodules.	1			53					
	1										
1036.10	2										
	3										
1034.10	4										
	5		2	7 10 13	23	72					
1032.10	6										
	7		3			100					
1030.10	8										
	9										
1028.10	10		4	6 9 13	22	89					
	11										
1026.10	12		5			74					
	13										
1024.10	14										
	15		6	7 9 14	23	89					
1022.10	16										
	17		7			83					
1020.10	18										
	19										
1018.10	20	SILTY SAND (SM); dense; greenish gray; moist; mostly fine SAND; nonplastic fines.	8	13 12 18	30	72					
	21	Fat CLAY (CH); hard; greenish gray; moist; mostly medium to high plasticity fines; calcite nodules.									
1016.10	22		9			60					
	23										
1014.10	24										
	25										

(continued)

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Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-03-005**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **1 of 3**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		Fat CLAY (CH) *(continued)*.		10	12 16 20	36	89							
1012.10	26		Lean CLAY (CL); hard; greenish gray; moist; mostly medium plasticity fines; calcite nodules.												
	27				11			83							
1010.10	28														
	29														
1008.10	30				12	9 16 20	36	100							
	31														
1006.10	32				13			71							
	33														
1004.10	34														
	35				14	13 17 26	43	67							
1002.10	36														
	37		Poorly graded SAND (SP); very dense; tan; moist; mostly SAND, from medium to fine.		15			86							
1000.10	38														
	39														
998.10	40		Well-graded SAND (SW); very dense; tan; moist; mostly SAND, from coarse to fine.		16	17 16 26	42	94							
	41		Poorly graded SAND (SP); very dense; tan; moist; mostly fine SAND; few coarse, subrounded GRAVEL, 2" maximum diameter.												
996.10	42				17			79							
	43														
994.10	44														
	45		Lean CLAY (CL); hard; greenish gray; moist; mostly medium plasticity fines; calcite nodules.		18	22 25 50/5"	75/11	94							
992.10	46		Poorly graded SAND (SP); very dense; greenish gray; moist; mostly fine SAND; weakly to moderately cemented with calcite in places.												
	47				19			67							
990.10	48														
	49														
988.10	50		Lean CLAY (CL); hard; greenish gray; moist; mostly medium plasticity fines; calcite veins.		20	21 32 43	75	100							
	51		Poorly graded SAND (SP); very dense; greenish gray; moist; mostly fine SAND; weakly cemented with calcite.												
986.10	52		Poorly graded SAND with CLAY (SP-SC); very dense; greenish gray; moist; mostly fine SAND; low plasticity fines; weakly cemented with calcite.		21			100							
	53		Well-graded SAND (SW); very dense; gray; moist; mostly SAND, from coarse to fine; trace coarse, angular to subrounded, elongated GRAVEL, 2" maximum diameter.												
984.10	54														
	55														

(continued)

Department of Transportation
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Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-03-005**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **2 of 3**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55	Well-graded SAND (SW) *(continued)*.	22	50/4"	REF	33							
			23			89							
982.10	56												
	57												
980.10	58												
	59												
978.10	60	Well-graded SAND with GRAVEL (SW); very dense; tan and gray; moist; mostly SAND, from coarse to fine; fine, angular to rounded GRAVEL; SANDSTONE fragments.	24	50/4"	REF	33							
			25			56							
	61												
976.10	62												
	63												
974.10	64												
	65	Well-graded SAND (SW); very dense; greenish gray; moist; mostly SAND, from coarse to fine; few GRAVEL, from coarse to fine, angular to subangular; few small COBBLES.	26	50/5"	REF	83							
			27			67							
972.10	66												
	67												
970.10	68												
	69												
968.10	70		28	50/4"	REF	67							
			29			89							
	71												
966.10	72												
	73												
964.10	74												
	75		30	50/5"	REF	83							
			31			96							
962.10	76	Fat CLAY (CH); hard; greenish gray mottled with light brown; moist; mostly medium to high plasticity fines.											
	77												
960.10	78												
	79												
958.10	80	SILTY SAND (SM); very dense; greenish gray; moist; mostly fine SAND; nonplastic fines.	32	23 50 50/4"	100/10"	100							
	81												
956.10	82	Bottom of borehole at 81.4 ft bgs Installed Open-standpipe Observation Well 3/11/2003											
	83												
954.10	84												
	85												

Department of Transportation
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Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE **BORING RECORD**				HOLE ID **R-03-005**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**10-13-09**	**10-13-09**	**35° 39' 35.9569" / -120° 27' 49.9666" WGS84**	**R-09-001**

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans	**28.00' Lt Sta 704+28RTE 46**	**958.7 ft NGVD29**
DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Rotary Wash	**CME 750**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)	SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")	**CME Automatic 140#, 30" drop**	**81%**
BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE) **38.3 ft on5-10-10**	TOTAL DEPTH OF BORING
Installed Open-standpipe Observation Well		**61.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY (CL); dark grayish brown; dry; mostly medium plasticity fines; some SAND, from coarse to fine, angular; trace fine, angular GRAVEL.												
956.65	2		Poorly graded SAND with GRAVEL (SP); medium dense; yellowish brown; dry; mostly SAND, from medium to fine; little GRAVEL, from coarse to fine, subangular; few low plasticity fines.												
	2.5				1	6 6 7	13								
954.65	4.5		Lean CLAY with SAND (CL); very stiff; brown; moist; mostly medium plasticity fines; little fine SAND; few fine, subrounded GRAVEL.												
	5				2	2 5 7	12								
950.65	7.5		PP=3.0 tsf.		3	4 5 6	11								
948.65	10				4	4 8 11	19								
946.65	11.5		Light olive brown; PP=3.5 tsf.		5										
944.65	14		Poorly graded SAND with CLAY (SP-SC); medium dense; light olive brown; moist; mostly SAND, from medium to fine; few medium plasticity fines; trace fine, angular GRAVEL.												
	15				6	6 6 6	12								
	16.5				7										
938.65	20		Lean CLAY (CL); very stiff; grayish brown; moist; mostly medium plasticity fines; trace SAND, from coarse to medium, subangular; PP=3.5-4.0 tsf.		8	4 5 7	12								
936.65	21.5		Hard; light olive brown; PP=4.25 tsf; calcite nodules.		9										
934.65	25														

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		PP=4.25 tsf. Lean CLAY (CL) *(continued)*.		10	2 5 6	11								
932.65	26														
	27		PP=4.5 tsf.		11										
930.65	28														
	29														
928.65	30				12	2 17 28	45								
	31		Poorly graded SAND (SP); very dense; grayish brown; moist; mostly fine SAND.												
926.65	32		Trace fine, subangular GRAVEL.		13										
	33														
924.65	34														
	35		Well-graded SAND (SW); dense; grayish brown; moist; mostly SAND, from coarse to fine; few GRAVEL, from coarse to fine, subangular to subrounded; iron oxide staining.		14	8 12 17	29								
922.65	36														
	37				15										
920.65	38														
	39														
918.65	40				16	12 10 13	23								
	41														
916.65	42				17										
	43														
914.65	44														
	45		Yellowish brown.		18	5 12 17	29								
912.65	46														
	47				19										
910.65	48		Light olive brown.												
	49														
908.65	50		Well-graded SAND with GRAVEL (SW); dense; yellowish red; moist; mostly SAND, from coarse to fine, subangular; little GRAVEL, from coarse to fine, subangular to subrounded, 1" maximum diameter.		20	7 13 15	28								
	51		SANDY lean CLAY (CL); hard; pale brown; moist; mostly medium plasticity fines; little fine SAND; PP>4.5 tsf.												
906.65	52				21										
	53		Lean CLAY (CL); hard; grayish brown; moist; mostly medium plasticity fines; calcite nodules; PP>4.5 tsf.												
904.65	54														
	55														

(continued)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-001**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **2 of 3**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		Lean CLAY (CL) *(continued)*.		22	5 12 22	34								
902.65	56		SANDY lean CLAY (CL); hard; yellowish brown; moist; mostly medium plasticity fines; little fine SAND; lenses of lean CLAY (CL): hard; PP>4.5 tsf.												
	57				23										
900.65	58														
	59														
898.65	60		Poorly graded SAND with SILT (SP-SM); very dense; yellowish brown; moist; mostly fine SAND; few low plasticity fines.		24	6 16 36	52								
	61														
896.65	62		Bottom of borehole at 61.5 ft bgs												
	63		Installed Open-standpipe Observation Well 10/13/2009												
894.65	64														
	65														
892.65	66														
	67														
890.65	68														
	69														
888.65	70														
	71														
886.65	72														
	73														
884.65	74														
	75														
882.65	76														
	77														
880.65	78														
	79														
878.65	80														
	81														
876.65	82														
	83														
874.65	84														
	85														

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
Z Dellamas	**10-14-09**	**10-14-09**	**35° 39' 36.3617" / -120° 27' 46.0901" WGS84**	**R-09-002**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**47.00' Lt Sta 707+50RTE 46**	**955.2 ft NGVD29**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			**CME 750**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")			**CME Automatic 140#, 30" drop**	**81%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Installed Open-standpipe Observation Well			**34.7 ft on5-10-10**	**61.3 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Remarks
	0	SANDY lean CLAY (CL); grayish brown; dry; mostly medium plasticity fines; little SAND, from medium to fine.				
953.23	2					
	3		1	2 5 5	10	
951.23	4					
	5	CLAYEY SAND (SC); medium dense; dark grayish brown; moist; mostly SAND, from medium to fine; little medium plasticity fines; trace fine GRAVEL.	2	2 4 4	8	
949.23	6					
947.23	8	SANDY lean CLAY (CL); hard; grayish brown; moist; mostly medium plasticity fines; some SAND, from medium to fine; trace fine GRAVEL; trace calcite nodules; PP=4.5 tsf.	3	3 5 7	12	
945.23	10		4	2 7 8	15	
	11	Lean CLAY (CL); hard; dark gray; moist; mostly medium plasticity fines; few SAND, from medium to fine; trace fine GRAVEL; PP=4.5 tsf.	5			
943.23	12					
941.23	14					
	15		6	4 9 14	23	
939.23	16					
	17	Grayish brown.	7			
937.23	18					
935.23	20	Very stiff; PP=3.5 tsf.	8	4 5 6	11	
933.23	22	PP=4.0 tsf.	9			
931.23	24	PP=3.5 tsf.				
	25					

Column headings also printed: Material Graphics, Sample Location, Recovery (%), RQD (%), Moisture Content (%), Dry Unit Weight (pcf), Shear Strength (tsf), Drilling Method, Casing Depth.

(continued)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	25	Lean CLAY (CL) *(continued)*. PP=3.5 tsf.	10	3 5 5	10						
929.23	26		11								
927.23	28	Well-graded SAND (SW); dense; light olive brown; moist; mostly SAND, from coarse to fine; trace GRAVEL, from coarse to fine; trace medium plasticity fines.									
925.23	30	Poorly graded SAND with GRAVEL (SP); very dense; light olive brown; moist; mostly SAND, from coarse to medium; little GRAVEL, from coarse to fine; trace medium plasticity fines.	12	11 16 24	40						
923.23	32		13								
921.23	34	Poorly graded SAND (SP); light olive brown; moist; mostly medium SAND; trace medium plasticity fines.									
	35	CLAYEY SAND (SC); very dense; light brownish gray; moist; mostly fine SAND; little medium plasticity fines.	14	6 14 24	38						
919.23	36		15								
917.23	38	Lean CLAY with SAND (CL); hard; grayish brown; moist; mostly medium plasticity fines; little fine SAND; PP>4.5 tsf.									
915.23	40		16	5 9 11	20						
	41	CLAYEY SAND (SC); dense; grayish brown; moist; mostly fine SAND; little medium plasticity fines.	17								
911.23	44	Poorly graded SAND (SP); dense; grayish brown; moist; mostly fine SAND; trace nonplastic fines.									
	45		18	11 16 21	37						
909.23	46	SANDY lean CLAY (CL); hard; grayish brown; moist; mostly medium plasticity fines; some fine SAND; PP>4.5 tsf.	19								
905.23	50		20	7 13 21	34						
	51	CLAYEY SAND (SC); very dense; grayish brown; moist; mostly fine SAND; little medium plasticity fines.	21								
901.23	54	Lean CLAY with SAND (CL); hard; brown; moist; mostly medium plasticity fines; little fine SAND; PP>4.5 tsf.									
	55										

Depth/elevation scale: 929.23 (26), 927.23 (28), 925.23 (30), 923.23 (32), 921.23 (34), 919.23 (36), 917.23 (38), 915.23 (40), 913.23 (42), 911.23 (44), 909.23 (46), 907.23 (48), 905.23 (50), 903.23 (52), 901.23 (54).

(continued)

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Division of Engineering Services
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Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				R-09-002
DIST. 05	COUNTY SLO	ROUTE 46	POSTMILE 41.0/46.3	EA 05-330771
PROJECT OR BRIDGE NAME: SLO-46 Corridor Improvements: Whitley 2A				
BRIDGE NUMBER N/A	PREPARED BY D Appelbaum		DATE 8-31-10	SHEET 2 of 3

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		Well-graded SAND (SW); very dense; light yellowish brown; moist; mostly SAND, from coarse to fine; trace medium plasticity fines.		22	20 50/5"	50/5								
899.23	56				23										
	57														
897.23	58		SANDY lean CLAY (CL); hard; brown; moist; mostly medium plasticity fines; some fine SAND; PP>4.5 tsf.												
	59														
895.23	60				24	11 25 50/4"	75/10								
	61		CLAYEY SAND (SC); very dense; light yellowish brown; moist; mostly SAND, from coarse to fine; little medium plasticity fines; trace calcite nodules.												
893.23	62		Bottom of borehole at 61.3 ft bgs												
	63		Installed Open-standpipe Observation Well 10/14/2009												
891.23	64														
	65														
889.23	66														
	67														
887.23	68														
	69														
885.23	70														
	71														
883.23	72														
	73														
881.23	74														
	75														
879.23	76														
	77														
877.23	78														
	79														
875.23	80														
	81														
873.23	82														
	83														
871.23	84														
	85														

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REPORT TITLE					HOLE ID
BORING RECORD					**R-09-002**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**		EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**					
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**			DATE **8-31-10**	SHEET **3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**10-14-09**	**10-20-09**	**35° 39' 36.5525" / -120° 27' 40.4348" WGS84**	**R-09-003**

DRILLING CONTRACTOR **Caltrans**	BOREHOLE LOCATION (Offset, Station, Line) **36.00' Lt Sta 712+17RTE 46**	SURFACE ELEVATION **971.0 ft NGVD29**
DRILLING METHOD **Rotary Wash**	DRILL RIG **CME 750**	BOREHOLE DIAMETER **4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID) **Other, SPT (1.4")**	SPT HAMMER TYPE **CME Automatic 140#, 30" drop**	HAMMER EFFICIENCY, ERi **81%**
BOREHOLE BACKFILL AND COMPLETION **Backfilled with bentonite chips**	GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING **41.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY (CL); brown; dry; mostly medium plasticity fines; little SAND, from coarse to fine, subangular; trace fine, subangular to subrounded GRAVEL.												
	1														
968.95	2														
	3				1	2 4 6	10								
966.95	4														
	5		Hard; PP>4.5 tsf.		2	3 4 6	10								
964.95	6														
	7		Lean CLAY (CL); very stiff; dark yellowish brown; moist; mostly medium plasticity fines; trace fine, subangular GRAVEL; trace SAND, from coarse to fine, subangular; PP=3.25 tsf.												
962.95	8				3	3 4 5	9								
	9														
960.95	10		Olive brown; PP=3.25-3.75 tsf.		4	2 4 4	8								
	11														
958.95	12		SILTY CLAY (CL-ML); hard; very dark grayish brown; moist; mostly low plasticity fines; trace fine, subangular GRAVEL; calcite nodules; PP=4.5 tsf.		5										
	13														
956.95	14		Very stiff to hard; olive brown; moderate reaction to HCl; PP=3.75-4.25 tsf.												
	15				6	2 2 2	4								
954.95	16														
	17		Hard; grayish brown; PP=4.5 tsf.		7										
952.95	18														
	19		SILT (ML); loose; light olive brown; moist; mostly low plasticity fines; moderate reaction to HCl; calcite nodules.												
950.95	20				8	3 2 2	4								
	21														
948.95	22		Trace fine, subangular to subrounded GRAVEL.		9										
	23		SANDY SILT (ML); loose; light olive brown; moist; mostly low plasticity fines; some fine SAND.												
946.95	24														
	25		SILT (ML); loose; light olive brown; moist; mostly low												

(continued)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	25	plasticity fines; moderate reaction to HCl; calcite nodules.	10	2 3 3	6						
944.95	26										
	27		11								
942.95	28	SILTY CLAY (CL-ML); very stiff; light olive brown; moist; mostly low to medium plasticity fines; calcite nodules; PP=4.0 tsf.									
	29										
940.95	30		12	3 6 10	16						
	31	SILT (ML); medium dense; very dark grayish brown; moist; mostly low plasticity fines.									
938.95	32	SILTY CLAY (CL-ML); hard; grayish brown; moist; mostly low plasticity fines; moderate reaction to HCl; PP=4.25-4.5 tsf.	13								
	33										
936.95	34										
	35	Lean CLAY (CL); very stiff to hard; grayish brown; moist; mostly medium plasticity fines; PP=3.5-4.5 tsf.	14	4 6 10	16						
934.95	36										
	37		15								
932.95	38										
	39	Poorly graded SAND (SP); dense; light olive brown; wet; mostly fine SAND; few low plasticity fines.									
930.95	40	Light yellowish brown; SAND grades from medium to fine, subangular to subrounded.	16	13 17 19	36						
	41										
928.95	42	Bottom of borehole at 41.5 ft bgs Ground Water Not Measured									
	43										
926.95	44										
	45										
924.95	46										
	47										
922.95	48										
	49										
920.95	50										
	51										
918.95	52										
	53										
916.95	54										
	55										

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-003**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**10-20-09**	**10-21-09**	**35° 39' 31.7134" / -120° 29' 15.4082" WGS84**	**R-09-004**

DRILLING CONTRACTOR **Caltrans**	BOREHOLE LOCATION (Offset, Station, Line) **61.00' Rt Sta 633+64RTE 46**	SURFACE ELEVATION **972.5 ft NGVD29**
DRILLING METHOD **Rotary Wash**	DRILL RIG **CME 750**	BOREHOLE DIAMETER **4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID) **Other, SPT (1.4")**	SPT HAMMER TYPE **CME Automatic 140#, 30" drop**	HAMMER EFFICIENCY, ERi **81%**
BOREHOLE BACKFILL AND COMPLETION **Installed Open-standpipe Observation Well**	GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE) **dry on5-10-10**	TOTAL DEPTH OF BORING **56.5 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	0	SANDY SILT (ML); loose; dark grayish brown; moist; mostly low plasticity fines; little fine SAND; trace coarse, subrounded GRAVEL.									
970.51	2										
	3	Well-graded SAND with CLAY and GRAVEL (SW-SC); loose; dark grayish brown; moist; mostly SAND, from coarse to fine, subrounded; little fine, subangular to subrounded GRAVEL; few low plasticity fines.	1	8, 3, 2	5						
968.51	4										
	5		2	4, 7, 5	12						
966.51	6	Poorly graded SAND (SP); medium dense; dark yellowish brown; moist; mostly SAND, from medium to fine, subangular; trace fine, subrounded GRAVEL.									
	7	Well-graded SAND (SW); dense; light yellowish brown; moist; mostly SAND, from coarse to fine, subangular to subrounded; trace fine, subrounded GRAVEL.	3	5, 12, 15	27						
964.51	8										
	9	Well-graded SAND with GRAVEL (SW); dense; light yellowish brown; moist; mostly SAND, from coarse to fine, subangular to subrounded; little fine, subangular to subrounded GRAVEL.									
962.51	10		4	6, 8, 15	23						
	11		5								
960.51	12	0.2' thick lense of lean CLAY (CL); very stiff; PP=2.25 tsf.									
958.51	14	Little GRAVEL, from coarse to fine, subrounded, 1" maximum diameter; some GRAVEL composed of chert.									
	15	Medium dense; dark yellowish brown.	6	5, 8, 7	15						
956.51	16										
	17	2-1/2" maximum diameter.	7								
954.51	18										
952.51	20	Dense; light yellowish brown.	8	10, 12, 15	27						
950.51	22		9								
948.51	24	SANDY SILT (ML); medium dense; light yellowish brown; moist; mostly nonplastic fines; some fine SAND.									
	25										

Drilling Method: Rotary Wash (0–25 ft)

(continued)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	25	SANDY SILT (ML) *(continued)*.	10	8 9 7	16						
946.51	26										
	27		11								
944.51	28										
	29	Poorly graded SAND with SILT (SP-SM); very dense; light yellowish brown; moist; mostly fine SAND; few nonplastic fines.									
942.51	30		12	18 26 27	53						
	31	Poorly graded SAND (SP); very dense; light yellowish brown; moist; mostly SAND, from medium to fine, subrounded.	13								
940.51	32										
	33	Trace GRAVEL, from coarse to fine, subrounded, 1-1/4" maximum diameter.									
938.51	34										
	35		14	11 23 29	52						
936.51	36		15								
	37	Weak cementation.									
934.51	38										
	39										
932.51	40		16	14 17 9	26						
	41	Well-graded SAND (SW); medium dense; light yellowish brown; moist; mostly SAND, from coarse to fine, subangular to subrounded.	17								
930.51	42										
	43	Fat CLAY (CH); stiff; light brownish gray; moist; mostly high plasticity fines; PP=1.75 tsf.									
928.51	44										
	45	Well-graded SAND (SW); very dense; light yellowish brown; moist; mostly SAND, from coarse to fine, subangular; few fine, subrounded GRAVEL.	18	15 26 22	48						
926.51	46		19								
	47										
924.51	48										
	49	Weak cementation.									
922.51	50	Not cemented.	20	25 29 28	57						
	51		21								
920.51	52										
	53										
918.51	54										
	55										

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-004**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **2 of 3**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		Well-graded SAND (SW) *(continued)*.		22	16 25 52	77								
916.51	56														
	57		Bottom of borehole at 56.5 ft bgs Installed Open-standpipe Observation Well 10/21/2009 Ground Water Not Encountered												
914.51	58														
	59														
912.51	60														
	61														
910.51	62														
	63														
908.51	64														
	65														
906.51	66														
	67														
904.51	68														
	69														
902.51	70														
	71														
900.51	72														
	73														
898.51	74														
	75														
896.51	76														
	77														
894.51	78														
	79														
892.51	80														
	81														
890.51	82														
	83														
888.51	84														
	85														

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-004**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**11-17-09**	**11-17-09**	**35° 39' 35.6428" / -120° 28' 7.653" WGS84**	**R-09-005**
DRILLING CONTRACTOR **Caltrans**			BOREHOLE LOCATION (Offset, Station, Line) **92.00' Lt Sta 689+69RTE 46**	SURFACE ELEVATION **986.2 ft NGVD29**
DRILLING METHOD **Rotary Wash**			DRILL RIG **CME 750**	BOREHOLE DIAMETER **4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID) **Other, SPT (1.4")**			SPT HAMMER TYPE **CME Automatic 140#, 30" drop**	HAMMER EFFICIENCY, ERi **81%**
BOREHOLE BACKFILL AND COMPLETION **Backfilled with bentonite chips**			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING **62.0 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	0	SILT (ML); medium dense; light olive brown; dry to moist; mostly low plasticity fines; trace GRAVEL, from coarse to fine, subangular to subrounded, 2" maximum diameter; trace fine SAND.	1								
984.16	2										
982.16	4										
980.16	6		2	3 6 7	13						
	7		3								
978.16	8	Few fine SAND; no GRAVEL.									
976.16	10		4	2 4 7	11						
	11	Calcite veins.									
974.16	12		5								
972.16	14	Strongly cemented with calcite. Not cemented.									
970.16	16		6	3 6 6	12						
	17		7								
968.16	18										
966.16	20		8	4 6 9	15						
	21	Trace fine, subrounded GRAVEL.									
964.16	22		9								
	23	Lenses of lean CLAY (CL): hard; PP>4.5 tsf; calcite inclusions.									
962.16	24										
	25										

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		SILT (ML) *(continued)*.												
					10	6 10 12	22								
960.16	26														
			Well-graded SAND (SW); dense; light olive brown; wet; mostly SAND, from coarse to fine, subangular to subrounded.												
	27				11										
958.16	28														
	29		Poorly graded SAND (SP); very dense; olive brown; moist; mostly SAND, from medium to fine, subangular to subrounded; trace nonplastic fines.												
956.16	30														
					12	15 22 25	47								
	31														
954.16	32				13										
	33														
			Well-graded SAND with GRAVEL (SW); very dense; olive brown; moist; mostly SAND, from coarse to fine, subangular to subrounded; little fine, subrounded GRAVEL.												
952.16	34														
	35														
			Lean CLAY (CL); hard; light olive brown; moist; mostly medium plasticity fines; PP>4.5 tsf.		14	10 22 26	48								
950.16	36														
	37				15										
948.16	38		PP>4.5 tsf.												
	39														
946.16	40														
			Few calcite nodules.		16	7 9 11	20								
	41														
944.16	42				17										
	43														
942.16	44		Trace calcite nodules; PP>4.5 tsf.												
	45														
			PP>4.5 tsf.		18	10 17 24	41								
940.16	46														
	47				19										
938.16	48														
			Poorly graded SAND (SP); very dense; dark grayish brown; moist; mostly SAND, from medium to fine, subangular.												
	49														
936.16	50														
					20	11 28 50/4"	78/10								
	51		Light olive brown.												
934.16	52				21										
	53		Some iron oxide staining.												
932.16	54														
	55														

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55														
930.16	56		Lean CLAY (CL); hard; bluish gray to olive; dry to moist; mostly medium plasticity fines; abundant calcite; PP>4.5 tsf.		22	10 50/4"	50/4								
	57		Light gray; strongly cemented with calcite.		23										
928.16	58		Light olive gray; not cemented; PP>4.5 tsf.												
	59														
926.16	60		Dark gray.												
	61		Olive gray; PP>4.5 tsf.		24	10 23 51	74								
924.16	62		Bottom of borehole at 62.0 ft bgs												
	63		Ground Water Not Measured												
922.16	64														
	65														
920.16	66														
	67														
918.16	68														
	69														
916.16	70														
	71														
914.16	72														
	73														
912.16	74														
	75														
910.16	76														
	77														
908.16	78														
	79														
906.16	80														
	81														
904.16	82														
	83														
902.16	84														
	85														

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-005**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **3 of 3**

5 BR - STANDARD 533073.GPJ CALTRANS_LIBRARY_DEC09.GLB 8/31/10

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	11-17-09	11-18-09	35° 39' 36.1208" / -120° 28' 3.2066" WGS84	R-09-006

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans	116.00' Lt Sta 693+39RTE 46	996.5 ft NGVD29
DRILLING METHOD	**DRILL RIG**	**BOREHOLE DIAMETER**
Rotary Wash	CME 750	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)	**SPT HAMMER TYPE**	**HAMMER EFFICIENCY, ERi**
Other, SPT (1.4")	CME Automatic 140#, 30" drop	81%
BOREHOLE BACKFILL AND COMPLETION	**GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)**	**TOTAL DEPTH OF BORING**
Backfilled with bentonite chips		66.3 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	0	SILT (ML); dark grayish brown; dry; mostly low plasticity fines; few fine SAND.	1								
992.49	4	SILT with SAND (ML); medium dense; olive brown; dry; mostly low plasticity fines; little SAND, from medium to fine.									
	5		2	4, 4, 6	10						
	6.5		3								
986.49	10	Lean CLAY with SAND (CL); hard; dark yellowish brown; moist; mostly medium plasticity fines; little SAND, from coarse to fine, subrounded; trace fine, rounded GRAVEL; PP=4.0-4.5 tsf.	4	5, 6, 7	13						
	11.5		5								
	15	Yellowish brown; PP=4.0 tsf.	6	7, 11, 11	22						
	16.5		7								
	17	PP>4.5 tsf.									
976.49	20	Calcite veins and nodules; PP=4.25 tsf.	8	5, 7, 10	17						
	21.5		9								
974.49	22	Lean CLAY (CL); hard; yellowish brown; moist; mostly medium plasticity fines; trace fine SAND; calcite nodules; PP=4.5 tsf.									
	25										

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		Lean CLAY (CL) *(continued)*.		10	4 8 10	18								
970.49	26														
	27				11										
968.49	28														
	29		SILTY SAND (SM); dense; yellowish brown; moist; mostly fine SAND; some low plasticity fines.												
966.49	30				12	7 13 14	27								
	31		Well-graded SAND (SW); dense; yellowish brown; moist; mostly SAND, from coarse to fine, subangular to subrounded.		13										
964.49	32														
	33														
962.49	34														
	35		Trace fine, subangular to subrounded GRAVEL.		14	12 15 16	31								
960.49	36														
	37				15										
958.49	38														
	39		Lean CLAY (CL); hard; light olive brown; moist; mostly medium plasticity fines; iron oxide staining; PP>4.5 tsf.												
956.49	40				16	11 13 22	35								
	41		Calcite inclusions.												
954.49	42				17										
	43		SANDY SILT (ML); moderately bedded with moderate beds of lean CLAY (CL). SANDY SILT: very dense; olive; moist; mostly low plasticity fines; some fine SAND. Lean CLAY (CL): hard; olive; moist; mostly medium plasticity fines.												
952.49	44														
	45				18	11 16 26	42								
950.49	46														
	47				19										
948.49	48														
	49		Lean CLAY (CL); hard; light olive brown; moist; mostly medium plasticity fines; PP>4.5 tsf.												
946.49	50				20	8 10 11	21								
	51				21										
944.49	52		Calcite nodules.												
	53														
942.49	54														
	55														

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		Lean CLAY (CL) *(continued)*.		22	8 15 18	33								
940.49	56														
	57		SILT (ML); dense; light olive brown; moist; mostly low plasticity fines.		23										
938.49	58														
	59		Lean CLAY (CL); hard; light olive brown; moist; mostly medium plasticity fines; PP>4.5 tsf.												
936.49	60				24										
	61		Zones containing abundant calcite.												
934.49	62														
	63														
932.49	64														
	65				25	8 15 35	50								
930.49	66														
	67		Bottom of borehole at 66.3 ft bgs Ground Water Not Measured												
928.49	68														
	69														
926.49	70														
	71														
924.49	72														
	73														
922.49	74														
	75														
920.49	76														
	77														
918.49	78														
	79														
916.49	80														
	81														
914.49	82														
	83														
912.49	84														
	85														

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				R-09-006
DIST. 05	COUNTY SLO	ROUTE 46	POSTMILE 41.0/46.3	EA 05-330771
PROJECT OR BRIDGE NAME: SLO-46 Corridor Improvements: Whitley 2A				
BRIDGE NUMBER N/A	PREPARED BY D Appelbaum		DATE 8-31-10	SHEET 3 of 3

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**11-18-09**	**11-18-09**	**35° 39' 36.3032" / -120° 27' 58.8643" WGS84**	**R-09-007**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**111.00' Lt Sta 696+98RTE 46**	**996.5 ft NGVD29**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			**CME 750**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")			**CME Automatic 140#, 30" drop**	**81%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS: DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Installed Open-standpipe Observation Well			**dry on5-10-10**	**61.9 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	0	Lean CLAY with SAND (CL); very stiff; dark yellowish brown; dry to moist; mostly medium plasticity fines; little SAND, from coarse to fine, subangular; few GRAVEL, from coarse to fine, subangular, 3" maximum diameter; PP=2.5 tsf.									
	1										
994.47	2		1								
	3										
992.47	4										
	5										
990.47	6		2	6 12 12	24						
	7		3								
988.47	8										
	9										
986.47	10										
	11		4	3 6 12	18						
984.47	12		5								
	13										
982.47	14										
	15										
980.47	16		6	6 10 10	20						
	17		7								
978.47	18										
	19										
976.47	20										
	21	PP=3.5 tsf.	8	5 7 11	18						
974.47	22		9								
	23										
972.47	24	Hard; PP=4.0-4.5 tsf.									
	25										

(continued)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	25	Lean CLAY with SAND (CL) *(continued)*.									
970.47	26		10	2 6 7	13						
	27		11								
968.47	28	Poorly graded SAND (SP); very dense; light olive brown; moist; mostly SAND, from medium to fine, subangular.									
	29										
966.47	30										
	31		12	7 16 21	37						
964.47	32		13								
	33										
962.47	34										
	35	Well-graded SAND (SW); very dense; light olive brown; moist; mostly SAND, from coarse to fine, subangular to subrounded; trace GRAVEL, from coarse to fine, subangular to subrounded, 2" maximum diameter.									
960.47	36		14	14 21 25	46						
	37		15								
958.47	38	Lean CLAY (CL); hard; olive; moist; mostly medium plasticity fines; calcite nodules; PP>4.5 tsf.									
	39										
956.47	40	Well-graded SAND (SW); very dense; olive; moist; mostly SAND, from coarse to fine, subangular to subrounded; trace GRAVEL, from coarse to fine, subangular to subrounded, derived from MONTEREY SHALE.									
	41		16	23 23 25	48						
954.47	42		17								
	43										
952.47	44										
	45	SILT (ML); olive gray; moist; mostly low plasticity fines.									
950.47	46	Lean CLAY (CL); hard; olive gray; moist; mostly medium plasticity fines; calcite nodules; PP>4.5 tsf.	18	11 29 36	65						
	47		19								
948.47	48	Light olive brown; PP>4.5 tsf.									
	49										
946.47	50										
	51		20	5 11 16	27						
944.47	52		21								
	53	PP>4.5 tsf.									
942.47	54										
	55										

(continued)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-007**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **2 of 3**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		Lean CLAY (CL) *(continued)*.												
940.47	56		Greenish gray.		22	7 13 22	35								
	57				23										
938.47	58														
	59														
936.47	60		SILTY CLAY (CL-ML); hard; gray; moist; mostly low plasticity fines; PP>4.5 tsf.												
	61				24	15 23 31	54								
934.47	62		Bottom of borehole at 61.9 ft bgs												
	63		Installed Open-standpipe Observation Well 11/18/2009 Ground Water Not Encountered												
932.47	64														
	65														
930.47	66														
	67														
928.47	68														
	69														
926.47	70														
	71														
924.47	72														
	73														
922.47	74														
	75														
920.47	76														
	77														
918.47	78														
	79														
916.47	80														
	81														
914.47	82														
	83														
912.47	84														
	85														

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	5-4-10	5-4-10	35° 39' 34.9286" / -120° 28' 12.581" WGS84	R-10-001
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			47.00' Lt Sta 685+59RTE 46	946.7 ft NGVD29
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker MP8	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")			Boart/Longyear Automatic 140#, 30" drop	74%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Installed Open-standpipe Observation Well			26.3 ft on7-19-10	62.7 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Remarks
	0	Well-graded SAND (SW); medium dense; pale brown; dry to moist; mostly SAND, from coarse to fine, subangular; few GRAVEL, from coarse to fine, subangular, 1" maximum diameter.				
	1					
944.70	2					
	3					
942.70	4		1	6 11 11	22	
	5					
940.70	6					
	7	Dense; trace fines.	2	5 10 15	25	
938.70	8					
	9	Medium dense; trace fine, subangular GRAVEL.	3	8 13 9	22	
936.70	10					
	11					
934.70	12	No recovery in sampler; possible void.	4	0 0 0	0	possible void
	13		5	2 0 0	0	
932.70	14	SILTY CLAY (CL-ML); hard; yellowish brown; moist; mostly low plasticity fines; PP=4.5 tsf.	6			
	15					
930.70	16					
	17		7	7 9 13	22	
928.70	18	Yellowish brown mottled with olive; calcite veins; PP>4.5 tsf.	8			
	19					
926.70	20					
	21	Light gray; abundant calcite; PP>4.5 TSF.				
924.70	22		9	8 50/5.5"	50/6	
	23		10			
922.70	24	Gray; PP>4.5 tsf.				
	25					

Columns also printed (no entries): Material Graphics; Sample Location; Recovery (%); RQD (%); Moisture Content (%); Dry Unit Weight (pcf); Shear Strength (tsf); Drilling Method; Casing Depth.

(continued)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	25	Light olive gray. SILTY CLAY (CL-ML) *(continued)*.	10								
920.70	26										
	27		11	18 20 25	45						
918.70	28		12								
	29	SILTY SAND (SM); olive gray; moist; mostly SAND, from medium to fine; some nonplastic fines.									
916.70	30	Well-graded SAND (SW); very dense; olive; wet; mostly SAND, from coarse to fine, subangular to subrounded; few fine, subrounded GRAVEL; trace nonplastic fines.									
	31										
914.70	32		13	28 38 45	83						
	33		14								
912.70	34										
	35										
910.70	36	Well-graded SAND with SILT (SW-SM); dense; olive; moist; mostly SAND, from coarse to fine; few low plasticity fines. Dark greenish gray; few fine, subrounded GRAVEL.	1	12 17 19	36						
	37										
908.70	38		16								
	39										
906.70	40										
	41	SILT (ML); very dense; dark greenish gray; moist; mostly nonplastic to low plasticity fines; few fine SAND.	17	16 26 32	58						
904.70	42										
	43	Well-graded SAND (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine, angular to subangular; trace fine, subrounded GRAVEL.	18								
902.70	44										
	45										
900.70	46	Few fine, subangular GRAVEL; trace low plasticity fines.	19	30 50 50/4"	100/10						
	47										
898.70	48		20								
	49	Well-graded SAND with GRAVEL (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular to subrounded; little GRAVEL, from coarse to fine, subangular to subrounded, 2" maximum diameter.									
896.70	50										
	51										
894.70	52		21	20 47 50/3.5"	97/10						
	53		22								
892.70	54	Poorly graded SAND (SP); olive gray; moist; mostly fine SAND.									
	55										

(continued)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-10-001**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **2 of 3**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		Poorly graded SAND (SP) *(continued)*.		22										
890.70	56		Well-graded SAND with GRAVEL (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular to subrounded; little GRAVEL, from coarse to fine, subangular to subrounded, 2" maximum diameter.												
	57				23	31 57 50/5"	107/11								
888.70	58				24										
	59														
886.70	60														
	61		Lean CLAY (CL); hard; olive; moist; mostly medium plasticity fines; PP>4.5 tsf.												
884.70	62		Olive mottled with dark greenish gray.		25	12 30 43	73								
	63		Bottom of borehole at 62.7 ft bgs												
882.70	64		Installed Open-standpipe Observation Well 5/4/2010												
	65														
880.70	66														
	67														
878.70	68														
	69														
876.70	70														
	71														
874.70	72														
	73														
872.70	74														
	75														
870.70	76														
	77														
868.70	78														
	79														
866.70	80														
	81														
864.70	82														
	83														
862.70	84														
	85														

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**5-4-10**	**5-4-10**	**35° 39' 34.6071" / -120° 27' 42.259" WGS84**	**R-10-002**

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans	**151.00' Rt Sta 710+54RTE 46**	**949.3 ft NGVD29**
DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Rotary Wash	**Acker MP8**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)	SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")	**Boart/Longyear Automatic 140#, 30" drop**	**74%**
BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with bentonite chips		**52.6 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	0	SILTY CLAY (CL-ML); hard; olive gray; dry to moist; mostly low plasticity fines; few fine, subangular to subrounded GRAVEL; calcite nodules; PP=4.5 tsf.									
	1										
947.32	2										
	3										
945.32	4		1	3, 5, 5	10						
	5										
943.32	6		2	3, 6, 7	13						
	7										
941.32	8	Lean CLAY (CL); hard; olive gray; moist; mostly medium plasticity fines; calcite nodules; PP=4.5 tsf.									
	9		3	4, 6, 7	13						
939.32	10										
	11	SILTY CLAY (CL-ML); hard; olive gray; moist; mostly low plasticity fines; PP=4.0 tsf.	4	3, 6, 10	16						
937.32	12										
	13	Poorly graded SAND (SP); medium dense; light olive brown; dry to moist; mostly SAND, from medium to fine; few low plasticity fines; sporatic 6" thick layers of SILTY CLAY (CL-ML).	5								
935.32	14										
	15										
933.32	16		6	5, 10, 14	24						
	17										
931.32	18	Trace fine, subrounded GRAVEL.	7								
	19										
929.32	20										
	21		8	10, 11, 17	28						
927.32	22	Well-graded SAND (SW); dense; light yellowish brown; moist; mostly SAND, from coarse to fine, subangular.									
	23		9								
925.32	24										
	25										

(continued)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-10-002**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **1 of 2**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		Well-graded SAND (SW) *(continued)*.		9										
923.32	26		Few GRAVEL, from coarse to fine, subrounded, 1-1/2" maximum diameter.		10	17 19 21	40								
	27														
921.32	28		Well-graded SAND with GRAVEL (SW); dense; light yellowish brown; moist; mostly SAND, from coarse to fine, subangular; little GRAVEL, from coarse to fine, subrounded, 2" maximum diameter.		11										
	29														
919.32	30		SILTY CLAY (CL-ML); hard; light olive brown; moist; mostly low plasticity fines; PP=4.5 tsf.												
	31				12	14 16 16	32								
917.32	32				13										
	33														
915.32	34														
	35		SILT (ML); medium dense; light olive brown; moist; mostly nonplastic to low plasticity fines; few fine SAND.												
913.32	36				14	6 8 12	20								
	37				15										
911.32	38		Interbedded 6" lenses of SILTY CLAY (CL-ML): hard; light olive brown; moist; mostly low plasticity fines; PP>4.5 tsf.												
	39														
909.32	40		SILTY SAND (SM); dense; yellowish brown; moist; mostly fine SAND; some nonplastic fines.												
	41				16	10 12 20	32								
907.32	42				17										
	43		Some low plasticity fines.												
905.32	44														
	45														
903.32	46		SILTY CLAY (CL-ML); hard; yellowish brown; moist; mostly low plasticity fines; PP=4.5 tsf.		18	8 14 17	31								
	47		SILTY SAND (SM); dense; yellowish brown; moist; mostly fine SAND; some low plasticity fines.		19										
901.32	48														
	49														
899.32	50		Very dense.												
	51				20	9 15 45	60								
897.32	52		Lean CLAY (CL); hard; yellowish brown; moist; mostly medium plasticity fines; PP>4.5 tsf.												
			SILTY SAND (SM); dense; yellowish brown; moist; mostly fine SAND; some low plasticity fines.												
	53		Bottom of borehole at 52.6 ft bgs												
895.32	54		Ground Water Not Measured												
	55														

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-10-002**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**5-5-10**	**5-5-10**	**35° 39' 32.3546" / -120° 28' 25.6969" WGS84**	**R-10-003**

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans	**141.00' Rt Sta 674+62RTE 46**	**981.7 ft NGVD29**

DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Rotary Wash	**Acker MP8**	**4.5 in**

SAMPLER TYPE(S) AND SIZE(S) (ID)	SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")	**Boart/Longyear Automatic 140#, 30" drop**	**74%**

BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS	DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with bentonite chips				**52.1 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY CLAY (CL-ML); very stiff; dark grayish brown; dry to moist; mostly low plasticity fines; few SAND, from coarse to fine, subangular; PP=3.5 tsf.												
	1														
979.69	2														
	3				1	3 4 4	8								
977.69	4														
	5		CLAYEY SAND (SC); dense; dark yellowish brown; moist; mostly SAND, from coarse to fine, subangular; little low plasticity fines; trace fine, subangular GRAVEL.												
975.69	6				2	11 15 16	31								
	7														
973.69	8		SILT (ML); medium dense; light yellowish brown; moist; mostly low plasticity to nonplastic fines; calcite nodules.		3	4 8 10	18								
	9														
971.69	10														
	11		SILTY CLAY (CL-ML); very stiff; yellowish brown; moist; mostly low plasticity fines; calcite nodules; PP=4.0 tsf.		4	5 12 13	25								
969.69	12		Hard; yellowish brown mottled with olive gray; PP>4.5 tsf.		5										
	13														
967.69	14														
	15		SANDY SILT (ML); dense; olive gray; moist; mostly nonplastic fines; some fine SAND.												
965.69	16				6	7 10 16	26								
	17				7										
963.69	18		SILTY CLAY (CL-ML); hard; olive gray; moist; mostly low plasticity fines; calcite nodules; PP>4.5 tsf. Yellowish brown.												
	19														
961.69	20		Lean CLAY (CL); hard; light olive brown; moist; mostly medium plasticity fines; calcite nodules; PP>4.5 tsf.												
	21				8	10 17 25	42								
959.69	22				9										
	23														
957.69	24		SILTY SAND (SM); olive gray; moist; mostly SAND, from medium to fine; little nonplastic fines.												
	25														

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		SILTY SAND (SM) *(continued)*.		9										
955.69	26		Well-graded SAND (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular; few fine, subangular to subrounded GRAVEL.		10	10 50 50/5"	100/11								
	27				11										
953.69	28														
	29														
951.69	30														
	31				12	18 31 47	78								
949.69	32				13										
	33														
947.69	34														
	35														
945.69	36				14	30 51/6"	51/6								
	37				15										
943.69	38		Trace low plasticity to nonplastic fines.												
	39														
941.69	40														
	41				16	17 35 54	89								
939.69	42				17										
	43		Few GRAVEL, from coarse to fine, rounded, 2" maximum diameter.												
937.69	44														
	45														
935.69	46		Few fine GRAVEL.		18	35 50/5.5"	50/6								
	47				19										
933.69	48														
	49														
931.69	50														
	51				20	19 38 47	85								
929.69	52		Bottom of borehole at 52.1 ft bgs												
	53		Ground Water Not Measured												
927.69	54														
	55														

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**5-5-10**	**5-5-10**	**35° 39' 31.9957" / -120° 29' 18.8786" WGS84**	**R-10-004**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**35.00' Rt Sta 630+77RTE 46**	**974.2 ft NGVD29**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			**Acker MP8**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")			**Boart/Longyear Automatic 140#, 30" drop**	**74%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with bentonite chips				**52.4 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	0	CLAYEY SAND (SC); loose to medium dense; brown; dry to moist; mostly SAND, from medium to fine; little low plasticity fines; trace fine, angular GRAVEL.									
	1										
972.21	2										
	3										
970.21	4		1	6 8 6	14						
	5										
968.21	6	Well-graded SAND (SW); medium dense; yellowish brown; moist; mostly SAND, from coarse to fine, subangular; trace fine subangular to subrounded GRAVEL.	2	4 6 6	12						
	7										
966.21	8										
	9		3	7 10 13	23						
964.21	10	Dense.									
	11		4	6 12 16	28						
962.21	12		5								
	13										
960.21	14										
	15	Very dense.									
958.21	16		6	13 22 27	49						
	17		7								
956.21	18										
	19										
954.21	20										
	21		8	2 8 20	28						
952.21	22	Fat CLAY (CH); medium stiff; light olive brown; moist; mostly high plasticity fines; PP=1.0 tsf.	9								
	23	Well-graded SAND (SW); yellowish brown; moist; mostly SAND, from coarse to fine, subangular; trace fine subangular to subrounded GRAVEL.									
950.21	24										
	25										

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		Well-graded SAND (SW) *(continued)*.		9										
948.21	26		Fat CLAY (CH); stiff; light olive brown; moist; mostly high plasticity fines; PP=1.75 tsf.		10	3 4 21	25								
	27		SILTY SAND (SM); very dense; light yellowish brown; moist; mostly fine SAND; little nonplastic fines.		11										
946.21	28														
	29		Fat CLAY (CH); stiff; light olive brown; moist; mostly high plasticity fines; PP=1.0-1.25 tsf.												
944.21	30		Well-graded SAND (SW); very dense; light yellowish brown; moist; mostly SAND, from coarse to fine, subangular; few fine subangular GRAVEL.												
	31				12	20 34 42	76								
942.21	32														
	33				13										
940.21	34														
	35		Fat CLAY (CH); medium stiff; light olive brown; moist; mostly high plasticity fines; PP=1.0 tsf.												
938.21	36		Poorly graded SAND (SP); dense; olive gray; moist; mostly SAND, from medium to fine.		14	10 12 16	28								
	37				15										
936.21	38														
	39		Well-graded SAND (SW); dense; olive gray; moist; mostly SAND, from coarse to fine, subangular to subrounded; few GRAVEL, from coarse to fine, subangular to subrounded; trace nonplastic fines.												
934.21	40														
	41				16	15 25 28	53								
932.21	42		Poorly graded SAND (SP); very dense; light olive gray; moist; mostly fine SAND; trace fine, subrounded GRAVEL.		17										
	43														
930.21	44		Mostly SAND, from medium to fine.												
	45		Well-graded SAND (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular; few fine, subrounded GRAVEL.												
928.21	46				18	15 30 31	61								
	47				19										
926.21	48														
	49														
924.21	50														
	51				20	17 30 30	60								
922.21	52														
	53		Bottom of borehole at 52.4 ft bgs												
920.21	54		Ground Water Not Measured												
	55														

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	5-5-10	5-5-10	35° 39' 33.5701" / -120° 28' 38.5003" WGS84	R-10-005
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			52.00' Lt Sta 664+15RTE 46	1055.0 ft NGVD29
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker MP8	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")			Boart/Longyear Automatic 140#, 30" drop	74%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with bentonite chips				42.6 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	0	Well-graded SAND (SW); loose to medium dense; yellowish brown; dry to moist; mostly SAND, from coarse to fine, subangular; trace fine subangular GRAVEL.									
	1										
1052.95	2										
	3										
1050.95	4										
	5										
1048.95	6		1	8 8 6	14						
	7										
1046.95	8		2								
	9										
1044.95	10	Poorly graded SAND (SP); very dense; pale brown; moist; mostly SAND, from medium to fine, subangular; trace fine subangular GRAVEL.									
	11		3	14 23 24	47						
1042.95	12										
	13		4								
1040.95	14	Well-graded SAND (SW); dense; pale brown; moist; mostly SAND, from coarse to fine, subangular; few fine subangular GRAVEL.									
	15										
1038.95	16		5	9 20 20	40						
	17		6								
1036.95	18										
	19										
1034.95	20	Very dense.									
	21		7	14 22 22	44						
1032.95	22		8								
	23										
1030.95	24										
	25										

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		Well-graded SAND (SW) *(continued)*.		8										
1028.95	26														
	27		SANDY SILT (ML); medium dense; light olive brown; moist; mostly nonplastic fines; some fine SAND.		9	7 11 9	20								
1026.95	28				10										
	29		Well-graded SAND (SW); dense; light olive brown; moist; mostly SAND, from coarse to fine, subangular to subrounded; trace GRAVEL, from coarse to fine, subrounded, 1-1/2" maximum diameter.												
1024.95	30														
	31				11	10 15 24	39								
1022.95	32														
	33				12										
1020.95	34		Well-graded SAND with GRAVEL (SW); dense; light olive brown; moist; mostly SAND, from coarse to fine, subangular to subrounded; little fine, subangular GRAVEL.												
	35														
1018.95	36				13	5 6 13	19								
	37		SILTY SAND (SM); medium dense; light yellowish brown; moist; mostly fine SAND; some nonplastic fines.												
1016.95	38				14										
	39		Well-graded SAND (SW); dense; light yellowish brown; wet; mostly SAND, from coarse to fine, subangular to subrounded; trace fine, subrounded GRAVEL.												
1014.95	40														
	41				15	15 25 15	40								
1012.95	42														
	43		Bottom of borehole at 42.6 ft bgs												
			Ground Water Not Measured												
1010.95	44														
	45														
1008.95	46														
	47														
1006.95	48														
	49														
1004.95	50														
	51														
1002.95	52														
	53														
1000.95	54														
	55														

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**5-6-10**	**5-6-10**	**35° 39' 34.0537" / -120° 28' 33.7858" WGS84**	**R-10-006**

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans	**75.00' Lt Sta 668+07RTE 46**	**1057.9 ft NGVD29**
DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Rotary Wash	**Acker MP8**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)	SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")	**Boart/Longyear Automatic 140#, 30" drop**	**74%**
BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Installed Open-standpipe Observation Well		**42.7 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	0	SILTY SAND (SM); yellowish brown; dry; mostly fine SAND; little nonplastic fines.									
	1										
1055.94	2										
	3	Well-graded SAND (SW); loose; yellowish brown; moist; mostly SAND, from coarse to fine, subangular; trace fine subangular to subrounded GRAVEL.									
1053.94	4										
	5										
1051.94	6		1	4 6 2	8						
	7										
1049.94	8	Sporatic weakly cemented zones.	2								
	9										
1047.94	10										
	11	Poorly graded SAND (SP); medium dense; brownish yellow; moist; mostly fine SAND.	3	9 11 10	21						
1045.94	12										
	13		4								
1043.94	14	Well-graded SAND with GRAVEL (SW); brownish yellow; moist; mostly SAND, from coarse to fine, subangular; little fine subangular to subrounded GRAVEL.									
	15	Poorly graded SAND (SP); brownish yellow; moist; mostly fine SAND.									
1041.94	16	SILT (ML); dense; light yellowish brown; moist; mostly nonplastic fines; few fine SAND.	5	9 14 21	35						
	17										
1039.94	18		6								
	19										
1037.94	20										
	21	Medium dense.	7	6 8 8	16						
1035.94	22										
	23		8								
1033.94	24										
	25	SILTY CLAY (CL-ML); hard; light yellowish brown; moist;									

(continued)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Remarks
	25	mostly low plasticity fines; PP>4.5 tsf.	8			
1031.94	26	SILT (ML); dense; light yellowish brown; moist; mostly nonplastic fines; few fine SAND.				
			9	9 14 17	31	
	27					
1029.94	28		10			
	29					
1027.94	30	SILTY SAND (SM); yellowish brown; moist; mostly SAND, from medium to fine; little nonplastic fines.				
	31	Poorly graded SAND (SP); dense; yellowish brown; moist; mostly SAND, from medium to fine.	11	10 16 11	27	
1025.94	32					
	33		12			
1023.94	34					
	35	Well-graded SAND (SW); very dense; yellowish brown; moist; mostly SAND, from coarse to fine, subangular to subrounded; trace fine subangular to subrounded GRAVEL.				
1021.94	36		13	18 27 22	49	
	37					
1019.94	38		14			
	39	Light yellowish brown.				
1017.94	40					
	41	Few fine subangular to subrounded GRAVEL.	15	27 32 23	55	
1015.94	42					
	43	Bottom of borehole at 42.7 ft bgs				
1013.94	44	Installed Open-standpipe Observation Well 5/6/2010 Ground Water not Encountered				
	45					
1011.94	46					
	47					
1009.94	48					
	49					
1007.94	50					
	51					
1005.94	52					
	53					
1003.94	54					
	55					

Other columns (not filled on this page): Material Graphics, Sample Location, Recovery (%), RQD (%), Moisture Content (%), Dry Unit Weight (pcf), Shear Strength (tsf), Drilling Method, Casing Depth.

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				R-10-006
DIST. 05	COUNTY SLO	ROUTE 46	POSTMILE 41.0/46.3	EA 05-330771
PROJECT OR BRIDGE NAME: SLO-46 Corridor Improvements: Whitley 2A				
BRIDGE NUMBER N/A	PREPARED BY D Appelbaum		DATE 8-31-10	SHEET 2 of 2

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**5-11-10**	**5-11-10**	**35° 39' 40.3138" / -120° 24' 47.5362" WGS84**	**R-10-007**
DRILLING CONTRACTOR **Caltrans**			BOREHOLE LOCATION (Offset, Station, Line) **122.00' Rt Sta 854+97RTE 46**	SURFACE ELEVATION **1005.1 ft NGVD29**
DRILLING METHOD **Rotary Wash**			DRILL RIG **Acker MP8**	BOREHOLE DIAMETER **4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID) **Other, SPT (1.4")**			SPT HAMMER TYPE **Boart/Longyear Automatic 140#, 30" drop**	HAMMER EFFICIENCY, ERi **74%**
BOREHOLE BACKFILL AND COMPLETION **Installed 100' 3" PVC Casing, Grout Backfill**			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING **102.5 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	0	Poorly graded SAND (SP); loose; grayish brown; dry; mostly fine SAND.	1								
	1										
1003.08	2										
	3	SILT (ML); loose; yellowish brown; moist; mostly nonplastic fines; few fine SAND; trace fine subrounded GRAVEL.									
1001.08	4										
	5										
999.08	6										
	7		2	3 4 4	8						
997.08	8		3								
	9										
995.08	10										
	11	Scattered thin layers of poorly graded SAND (SP): mostly fine SAND.									
993.08	12		4	5 4 4	8						
	13		5								
991.08	14										
	15										
989.08	16	Medium dense.									
	17		6	4 5 5	10						
987.08	18	Poorly graded SAND (SP); yellowish brown; moist; mostly SAND, from medium to fine; few nonplastic fines.	7								
	19	SILT (ML); yellowish brown; moist; mostly nonplastic fines; few fine SAND; trace fine subrounded GRAVEL.									
985.08	20										
	21										
983.08	22	Poorly graded SAND (SP); dense; pale brown; moist; mostly SAND, from medium to fine; trace fine angular to subrounded GRAVEL.	8	8 14 14	28						
	23		9								
981.08	24	Few fine, angular to subrounded GRAVEL.									
	25										

(continued)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	25	Poorly graded SAND (SP) *(continued)*.	9								
979.08	26										
	27		10	8 13 15	28						
977.08	28		11								
	29	Well-graded GRAVEL with SAND (GW); pale brown; wet; mostly GRAVEL, from coarse to fine, subangular, 2" maximum diameter; little SAND, from coarse to fine.									
975.08	30	SILTY SAND (SM); very dense; light yellowish brown; moist; mostly fine SAND; some nonplastic fines.									
	31										
973.08	32		12	17 28 24	52						
	33		13								
971.08	34										
	35										
969.08	36		14	10 20 33	53						
	37										
967.08	38		15								
	39										
965.08	40	SILTY CLAY (CL-ML); hard; brown; moist; mostly low plasticity fines; PP=4.5 tsf.									
	41		16	10 12 19	31						
963.08	42										
	43		17								
961.08	44	PP=4.5 tsf.									
	45										
959.08	46	Trace fine SAND.	18	10 19 22	41						
	47	PP=4.5 tsf.									
957.08	48		19								
	49	Lean CLAY (CL); hard; yellowish brown; moist; mostly medium plasticity fines; PP=4.5 tsf.									
955.08	50										
	51	SILT with SAND (ML); dense; brown; moist; mostly low plasticity to nonplastic fines; little fine SAND.	20	9 15 21	36						
953.08	52										
	53		21								
951.08	54	SILTY SAND (SM); light yellowish brown; moist; mostly									
	55										

(continued)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-10-007**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **49-0253**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **2 of 4**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	55	fine SAND; some low plasticity to nonplastic fines.	21								
949.08	56										
	57	SILTY CLAY (CL-ML); hard; light yellowish brown; moist; mostly low plasticity fines; PP>4.5 tsf.	22	9 20 24	44						
947.08	58	SILTY SAND (SM); very dense; light yellowish brown; moist; mostly fine SAND; some low plasticity to nonplastic fines.	23								
	59										
945.08	60										
	61	Lean CLAY (CL); hard; yellowish brown; moist; mostly medium plasticity fines; calcite nodules; PP> 4.5 tsf.									
943.08	62		24	7 9 14	23						
	63		25								
941.08	64	SILTY SAND (SM); very dense; pale brown; moist; mostly fine SAND; some low plasticity fines.									
	65										
939.08	66										
	67	Little nonplastic fines.	26	19 26 51	77						
937.08	68		27								
	69										
935.08	70										
	71	Poorly graded SAND (SP); very dense; pale brown; moist; mostly SAND, from medium to fine.									
933.08	72		28	28 32 52	84						
	73		29								
931.08	74										
	75										
929.08	76	SILTY CLAY (CL-ML); hard; pale brown; moist; mostly low plasticity to medium plasticity fines; trace fine SAND; PP>4.5 tsf.									
	77	Lean CLAY (CL); hard; pale brown; moist; mostly medium plasticity fines; PP=4.0-4.5 tsf.	30	5 9 12	21						
927.08	78		31								
	79	CLAYEY SAND (SC); pale brown; moist; mostly SAND, from medium to fine; some medium plasticity fines.									
925.08	80										
	81	Poorly graded SAND (SP); very dense; pale brown; moist; mostly SAND, from medium to fine; few low plasticity fines.									
923.08	82		32	24 33 50/3.5"	83/10						
	83	Well-graded SAND (SW); very dense; pale brown; moist; mostly SAND, from coarse to fine, subangular; few low plasticity fines.	33								
921.08	84										
	85	SILTY SAND (SM); very dense; light yellowish brown;									

(continued)

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Department of Transportation
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Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-10-007**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **49-0253**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **3 of 4**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Remarks
	85	moist; mostly fine SAND; some nonplastic fines.	33			
919.08	86					
	87	Little nonplastic fines.	34	28 43 50/3"	93/9	
917.08	88		35			
	89					
915.08	90	SANDY SILT (ML); very dense; pale brown; wet; mostly low plasticity to nonplastic fines; some fine SAND.				
	91					
913.08	92		36	28 35 44	79	
	93	SILTY SAND (SM); very dense; light yellowish brown; moist; mostly fine SAND; some nonplastic fines; scattered 4"-6" lenses of SILTY CLAY (CL-ML): hard; pale brown; moist; mostly low plasticity fines; few fine SAND: PP>4.5 tsf.	37			
911.08	94					
	95					
909.08	96					
	97		38	16 36 50/4"	86/10	
907.08	98	Mostly SAND, from medium to fine; fines content varies between little and some.	39			
	99					
905.08	100					
	101					
903.08	102		40	25 50/4.5"	50/5	
	103	Bottom of borehole at 102.5 ft bgs				
901.08	104	Installed 100' 3" PVC Casing with Grout Backfill 5/12/2010 Ground Water Not Measured				
	105					
899.08	106					
	107					
897.08	108					
	109					
895.08	110					
	111					
893.08	112					
	113					
891.08	114					
	115					

Column headings also printed (no entries): Material Graphics, Sample Location, Recovery (%), RQD (%), Moisture Content (%), Dry Unit Weight (pcf), Shear Strength (tsf), Drilling Method, Casing Depth.

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**5-12-10**	**5-18-10**	**35° 39' 42.2781" / -120° 24' 46.8565" WGS84**	**R-10-008**

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans	**75.00' Lt Sta 855+58RTE 46**	**1006.9 ft NGVD29**
DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Rotary Wash	**Acker MP8**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)	SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")	**Boart/Longyear Automatic 140#, 30" drop**	**74%**
BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Installed Open-standpipe Observation Well	**35.0 ft on7-19-10**	**101.8 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	0	Well-graded SAND (SW); loose; grayish brown; dry to moist; mostly SAND, from coarse to fine, subrounded; trace fine, subrounded GRAVEL.	1								
	1										
1004.85	2										
	3										
1002.85	4										
	5										
1000.85	6		2	4 3 7	10						
	7	SANDY lean CLAY (CL); stiff; yellowish brown; moist; mostly medium plasticity fines; little SAND, from medium to fine; PP=1.5 tsf.	3								
998.85	8										
	9	Well-graded SAND (SW); medium dense; yellowish brown; moist; mostly SAND, from coarse to fine, subangular to subrounded; trace fine GRAVEL; trace nonplastic to low plasticity fines.									
996.85	10										
	11										
994.85	12		4	11 12 10	22						
	13		5								
992.85	14										
	15	Dense.									
990.85	16		6	12 19 14	33						
	17		7								
988.85	18										
	19										
986.85	20										
	21	SANDY SILT (ML); yellowish brown; moist; mostly nonplastic fines; little fine SAND.									
984.85	22	Poorly graded SAND (SP); medium dense; pale brown; moist; mostly SAND, from medium to fine; trace fine, rounded GRAVEL.	8	9 11 7	18						
	23	Lean CLAY (CL); very stiff; yellowish brown; moist; mostly medium plasticity fines; PP=3.75 tsf.	9								
982.85	24	Poorly graded SAND with SILT (SP-SM); brown; moist; mostly SAND, from medium to fine; little low plasticity									
	25										

(continued)

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Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-10-008**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **49-0253**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **1 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		fines. Poorly graded SAND with SILT (SP-SM) *(continued)*.		9										
980.85	26		Well-graded SAND (SW); very dense; pale brown; wet; mostly SAND, from coarse to fine, subangular; few GRAVEL, from coarse to fine, subrounded, 1" maximum diameter.		10	31 42 45	87								
	27														
978.85	28				11										
	29														
976.85	30														
	31				12	23 39 52	91								
974.85	32														
	33		Well-graded SAND with GRAVEL (SW); very dense; pale brown; wet; mostly SAND, from coarse to fine, subangular; some fine subangular to subrounded GRAVEL.		13										
972.85	34														
	35														
970.85	36		SILTY SAND (SM); very dense; pale brown; moist; mostly fine SAND; little nonplastic fines.		14	43 49 50	99								
	37		SILT with SAND (ML); very dense; pale brown; moist; mostly nonplastic fines; little fine SAND.		15										
968.85	38														
	39														
966.85	40														
	41		SILTY CLAY (CL-ML); hard; pale brown; moist; mostly low plasticity to medium plasticity fines; PP=4.5 tsf.		16	14 18 17	35								
964.85	42														
	43				17										
962.85	44		Yellowish brown; PP=4.5 tsf.												
	45		Calcite nodules.												
960.85	46		PP=4.5 tsf.		18	6 12 19	31								
	47														
958.85	48				19										
	49		PP=4.5 tsf.												
956.85	50														
	51				20	15 18 24	42								
954.85	52		PP=4.5 tsf.												
	53				21										
952.85	54		PP=4.5 tsf.												
	55														

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		SILTY CLAY (CL-ML) *(continued)*.		21										
950.85	56				22	11 28 27	55								
	57		SILTY SAND (SM); very dense; light yellowish brown; moist; mostly fine SAND; little nonplastic fines.												
948.85	58				23										
	59		SILTY CLAY (CL-ML); hard; pale brown; moist; mostly low plasticity to medium plasticity fines; PP=4.5 tsf.												
946.85	60														
	61				24	12 15 17	32								
944.85	62														
	63		PP=4.5 tsf.		25										
942.85	64														
	65														
940.85	66		Poorly graded SAND (SP); dense; pale brown; moist; mostly SAND, from medium to fine. SILT (ML); moderately bedded with moderate interbeds of SILTY SAND (SM). SILT (ML): very dense; pale brown; moist; mostly nonplastic fines; some zones moderately cemented with calcite. SILTY SAND (SM): very dense; pale brown; moist; mostly fine SAND; some nonplastic fines.		26	19 50/5"	50/5								
	67				27										
938.85	68														
	69														
936.85	70														
	71				28	25 50/5"	50/5								
934.85	72		Poorly graded SAND (SP); very dense; pale brown; moist; mostly SAND, from medium to fine.		29										
	73														
932.85	74														
	75														
930.85	76		SANDY lean CLAY (CL); hard; pale brown; moist; mostly medium plasticity fines; some SAND, from medium to fine; PP=4.5 tsf.		30	12 16 20	36								
	77		SILTY CLAY (CL-ML); hard; yellowish brown; moist; mostly low plasticity to medium plasticity fines; PP=4.5 tsf. Light yellowish brown; PP=4.5 tsf.		31										
928.85	78														
	79														
926.85	80		SILTY SAND (SM); dense; light yellowish brown; moist; mostly fine SAND; some nonplastic fines.												
	81		SILT (ML); very dense; pale brown; moist; mostly nonplastic to low plasticity fines; trace fine SAND.		32	13 33 32	65								
924.85	82														
	83		SILTY SAND (SM); very dense; light yellowish brown; moist; mostly SAND, from medium to fine; some nonplastic fines.		33										
922.85	84		Well-graded SAND (SW); very dense; light yellowish brown; moist; mostly SAND, from coarse to fine,												
	85														

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	85		subangular; trace fine, subangular GRAVEL. Well-graded SAND (SW) *(continued)*.		33										
920.85	86		SILTY CLAY (CL-ML); hard; light yellowish brown; moist; mostly low plasticity fines.		34	16 27 50/5"	77/11								
	87		SILTY SAND (SM); very dense; pale brown; moist; mostly fine SAND; some nonplastic fines.												
918.85	88				35										
	89														
916.85	90		SILT (ML); very dense; pale brown; moist; mostly nonplastic fines; trace fine SAND.												
	91		SILT with SAND (ML); very dense; pale brown; moist; mostly nonplastic fines; little fine SAND.		36	25 50/5"	50/5								
914.85	92				37										
	93														
912.85	94		SILTY SAND (SM); very dense; pale brown; moist; mostly SAND, from medium to fine; little nonplastic fines.												
	95														
910.85	96				38	37 50/6"	50/6								
	97		SILTY CLAY (CL-ML); hard; light yellowish brown; moist; mostly medium plasticity to low plasticity fines; PP>4.5 tsf.		39										
908.85	98		SANDY SILT (ML); very dense; pale brown; moist; mostly nonplastic fines; some fine SAND.												
	99		Poorly graded SAND (SP); very dense; light yellowish brown; moist; mostly SAND, from medium to fine, subangular; trace nonplastic fines.												
906.85	100														
	101		SILT with SAND (ML); very dense; pale brown; moist; mostly nonplastic fines; little fine SAND.		40	48 50/2"	50/2								
904.85	102		Bottom of borehole at 101.8 ft bgs												
	103		Installed Open-standpipe Observation Well 5/18/2010												
902.85	104														
	105														
900.85	106														
	107														
898.85	108														
	109														
896.85	110														
	111														
894.85	112														
	113														
892.85	114														
	115														

Department of Transportation
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Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				R-10-008
DIST. 05	COUNTY SLO	ROUTE 46	POSTMILE 41.0/46.3	EA 05-330771
PROJECT OR BRIDGE NAME: SLO-46 Corridor Improvements: Whitley 2A				
BRIDGE NUMBER 49-0253	PREPARED BY D Appelbaum		DATE 8-31-10	SHEET 4 of 4

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
S Heredia	**5-18-10**	**5-18-10**	**35° 39' 40.1004" / -120° 27' 2.9653" WGS84**	**R-10-009**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**190.00' Lt Sta 743+26RTE 46**	**978.6 ft NGVD29**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			**Acker MP8**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")			**Boart/Longyear Automatic 140#, 30" drop**	**74%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE) **21.8 ft on5-25-10**	TOTAL DEPTH OF BORING
Installed Open-standpipe Observation Well				**62.8 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	0	Lean CLAY with SAND (CL); stiff; dark grayish brown; dry to moist; mostly medium plasticity fines; few fine SAND.									
	1										
976.59	2										
	3										
974.59	4		1	2 2 3	5						
	5										
972.59	6										
	7	Trace fine GRAVEL; PP=1.5 tsf.	2	2 4 6	10						
970.59	8										
	9	SANDY SILT (ML); medium dense; olive; dry; mostly nonplastic fines; some fine SAND.	3	4 10 10	20						
968.59	10										
	11	SILTY CLAY (CL-ML); hard; olive gray; moist; mostly low plasticity fines.									
966.59	12		4	10 19 21	40						
	13		5								
964.59	14	SILTY SAND (SM); very dense; olive; moist; mostly fine SAND; some nonplastic fines.									
	15										
962.59	16	From medium to fine SAND.									
	17		6	15 22 28	50						
960.59	18		7								
	19	Well-graded SAND (SW); very dense; olive; moist; mostly SAND, from coarse to fine, subangular; trace fine subangular GRAVEL.									
958.59	20										
	21	Well-graded SAND with SILT and GRAVEL (SW-SM); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular; little fine subangular GRAVEL; few nonplastic fines.									
956.59	22		8	16 20 28	48						
	23		9								
954.59	24	Well-graded SAND with GRAVEL (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine,									
	25										

(continued)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION
	25	subangular; little fine subangular GRAVEL; trace nonplastic fines. Well-graded SAND with GRAVEL (SW) *(continued)*.
952.59	26	Well-graded SAND (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular; trace fine subangular GRAVEL; trace nonplastic fines.
	27	
950.59	28	SILT with SAND (ML); dense; olive gray; moist; mostly low plasticity fines; little fine SAND.
	29	
948.59	30	
	31	
946.59	32	
	33	
944.59	34	
	35	Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.
942.59	36	
	37	
940.59	38	
	39	
938.59	40	
	41	Well-graded SAND (SW); very dense; olive; moist; mostly SAND, from coarse to fine.
936.59	42	
	43	
934.59	44	SILTY SAND (SM); very dense; pale yellow; moist; mostly fine SAND; some nonplastic fines.
	45	
932.59	46	
	47	
930.59	48	
	49	Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.
928.59	50	
	51	SILTY SAND (SM); very dense; pale yellow; moist; mostly fine SAND; some nonplastic fines.
926.59	52	
	53	
924.59	54	
	55	

Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
9								
10	21 28 28	56						
11								
12	12 16 24	40						
13								
14	27 46 50/5"	96/11						
15								
16	24 50/5"	50/5						
17								
18	24 50/5.5"	50/6						
19								
20	40 50/5"	50/5						
21								

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		SILTY SAND (SM) *(continued)*.		21										
922.59	56														
	57				22	20 41 50/4"	91/10								
920.59	58				23										
	59		Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.												
918.59	60														
	61		Lean CLAY (CL); hard; brown; moist; mostly medium plasticity fines; PP=4.5 tsf.												
916.59	62				24	8 11 18	29								
	63		Bottom of borehole at 62.8 ft bgs												
914.59	64		Installed Open-standpipe Observation Well 5/18/2010												
	65														
912.59	66														
	67														
910.59	68														
	69														
908.59	70														
	71														
906.59	72														
	73														
904.59	74														
	75														
902.59	76														
	77														
900.59	78														
	79														
898.59	80														
	81														
896.59	82														
	83														
894.59	84														
	85														

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D Appelbaum	**5-19-10**	**5-19-10**	**35° 39' 41.4094" / -120° 24' 47.4467" WGS84**	**R-10-010**

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans	**12.00' Rt Sta 855+07RTE 46**	**1013.8 ft NGVD29**
DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Rotary Wash	**Acker MP8**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)	SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")	**Boart/Longyear Automatic 140#, 30" drop**	**74%**
BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with bentonite chips		**57.8 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		CLAYEY SAND (SC); dark grayish brown; dry to moist; mostly SAND, from coarse to fine, angular; little medium plasticity fines; few fine GRAVEL, from angular to subrounded.												
	1														
1011.80	2														
	3														
1009.80	4														
	5		Medium dense.												
1007.80	6				1	7 9 10	19								
	7														
1005.80	8				2										
	9		SANDY lean CLAY (CL); grayish brown; moist; mostly medium plasticity fines; few SAND, from coarse to fine.												
1003.80	10														
	11		SILT (ML); loose; grayish brown; moist; mostly low plasticity fines; few SAND, from medium to fine.		3	3 2 3	5								
1001.80	12														
	13				4										
999.80	14		SANDY SILT (ML); loose; brown; moist; mostly low plasticity fines; little SAND, from coarse to fine, subangular to subrounded; trace fine, subrounded GRAVEL.												
	15														
997.80	16		Well-graded SAND (SW); medium dense; yellowish brown; moist; mostly SAND, from coarse to fine, subangular; few fine, subangular GRAVEL; trace nonplastic fines.		5	4 6 6	12								
	17														
995.80	18				6										
	19		Few GRAVEL, from coarse to fine, subangular to subrounded, 1-1/2" maximum diameter.												
993.80	20														
	21		Poorly graded SAND (SP); medium dense; brown; moist; mostly SAND, from medium to fine; trace fine, subrounded GRAVEL; trace nonplastic fines.		7	4 6 5	11								
991.80	22														
	23				8										
989.80	24		Well-graded SAND (SW); medium dense; yellowish brown; moist; mostly SAND, from coarse to fine, subangular; few fine, subangular to subrounded												
	25														

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		GRAVEL; trace nonplastic fines. Well-graded SAND (SW) *(continued)*.		8										
987.80	26		SILT (ML); medium dense; light olive brown; moist; mostly nonplastic to low plasticity fines; few fine SAND.		9	5 5 4	9								
	27														
985.80	28				10										
	29		SILTY SAND (SM); yellowish brown; moist; mostly fine SAND; little nonplastic fines.												
983.80	30														
	31				11	5 18 41	59								
981.80	32		Dense.												
	33		Poorly graded SAND (SP); very dense; very pale brown; dry; mostly fine SAND; few fine, angular GRAVEL.		12										
979.80	34														
	35		Lean CLAY (CL); stiff; yellowish brown; moist; mostly medium plasticity fines; PP=1.0-1.5 tsf.												
977.80	36		Well-graded GRAVEL (GW); moist; mostly GRAVEL, from coarse to fine, angular to subangular.		13	21 48 50/2.5"	98/9								
	37		Poorly graded SAND (SP); very dense; pale brown; moist; mostly SAND, from medium to fine; few GRAVEL, from coarse to fine, subangular to subrounded, 1" maximum diameter.		14										
975.80	38														
	39														
973.80	40		SILTY SAND (SM); yellowish brown; moist; mostly fine SAND; little nonplastic fines.												
	41				15	22 18 50/5"	68/11								
971.80	42														
	43		Poorly graded SAND (SP); very dense; light yellowish brown; moist; mostly fine SAND.		16										
969.80	44														
	45														
967.80	46														
	47				17	26 31 50	81								
965.80	48				18										
	49														
963.80	50														
	51				19	14 26 21	47								
961.80	52		Lean CLAY (CL); hard; yellowish brown; moist; mostly medium plasticity fines; PP=4.5 tsf.												
	53		Brown.		20										
959.80	54														
	55														

(continued)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-10-010**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **49-0253**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **2 of 3**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		Lean CLAY (CL) *(continued)*.		20										
957.80	56														
	57				21	13 17 14	31								
955.80	58		Bottom of borehole at 57.8 ft bgs												
	59		Ground Water Not Measured												
953.80	60														
	61														
951.80	62														
	63														
949.80	64														
	65														
947.80	66														
	67														
945.80	68														
	69														
943.80	70														
	71														
941.80	72														
	73														
939.80	74														
	75														
937.80	76														
	77														
935.80	78														
	79														
933.80	80														
	81														
931.80	82														
	83														
929.80	84														
	85														

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-10-010**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **49-0253**	PREPARED BY **D Appelbaum**		DATE **8-31-10**	SHEET **3 of 3**

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic / Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435-04)
CL	Collapse Potential (ASTM D 5333-03)
CP	Compaction Curve (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler
- Modified California Sampler
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE **BORING RECORD LEGEND**				
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY	DATE	SHEET **1 of 3**	

CONSISTENCY OF COHESIVE SOILS

Descriptor	Unconfined Compressive Strength (tsf)	Pocket Penetrometer (tsf)	Torvane (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS

Descriptor	SPT N_{60} - Value (blows / foot)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Descriptor	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OR PROPORTION OF SOILS

Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE

Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS

Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION

Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (July 2007), Section 2, for tables of additional soil description components and discussion of soil description and identification.

MATERIAL PROPERTIES SUMMARY

SLO-46 Corridor Improvements

Whitley 2A Segment

DESCRIPTION	BORING	R-09-005	R-09-006	R-09-007
	SAMPLE ID	C01-1, C02-1*	C01-1, C02-1, C03-1*	C01-1*
	DATE SAMPLED	11/17/2009	11/18/2009	11/18/2009
	STATION	689+69	693+39	696+98
	LINE	Rte 46 CL	Rte 46 CL	Rte 46 CL
	DISTANCE FROM LINE (Rt. OR Lt.)	92' Lt.	116' Lt.	111' Lt.
	DEPTH OR ELEVATION (FEET)	35.3'-48.5', 55.4'-62.0'	20'-29', 49'-57', 59'-66.3'	45.5'-59.5'
	USCS CLASSIFICATION	CH	CL	CL
SIEVE ANALYSIS	38 mm (1 1/2")			
	19 mm (3/4")			
	12 mm (1/2")	100		
	9.5 mm (3/8")	99	100	
	4.75 mm (No. 4)	97	98	100
	2.36 mm (No. 8)	93	97	99
	1.18 mm (No. 16)	90	96	98
	600 µm (No. 30)	87	94	98
	300 µm (N0. 50)	85	91	97
	150 µm (No. 100)	82	87	96
	75 µm (N0. 200)	75	81	92
	5 µm	41	43	48
	1µm	1	1	2
CLASSIFICATION TEST SUMMARY	MAXIMUM DRY DENSITY (lbs/ft^3)	109.5	112.0	108.4
	OPTIMUM MOISTURE (percent)	13.9	14.2	15.9
	SPECIFIC GRAVITY			
	LIQUID LIMIT	50	46	49
	PLASTICITY INDEX	31	28	29
	EXPANSION INDEX	72	63	
SOIL STRENGTH CUe TRIAXIAL	EFFECTIVE STRESS	Remolded	Remolded	
	FRICTION ANGLE (degrees)	0	25.5	
	COHESION (psf)	2808	153	
	TOTAL STRESS	Remolded	Remolded	
	FRICTION ANGLE (degrees)	12.3	15.9	
	COHESION (psf)	1685	383	
CORROSION	RESISTIVITY (ohm-cm)			
	pH			
	SULFATES (ppm)			
	CHLORIDES (ppm)			
	*Note: Combined Samples			

Attachment 7

FOR CONTRACT NO.: 05-330774

MATERIALS INFORMATION

Foundation Report-Retaining Wall 1, dated September 13, 2010

ROUTE: 46-SLO-40.7/46.3(PM)

Memorandum *Flex your power!*

Be energy efficient!

To: JACK R. WALKER
Senior Design Engineer
Office of Design II, Branch A
Central Region – District 6

Attn: Jose Arguello, Project Engineer

Date: September 13, 2010

File: 05-330771 (0500020049)
05-SLO-46-41.0/46.3
Whitley 2A Segment
Retaining Wall No. 1

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

Subject: Foundation Report

Scope of Work

A Foundation Report (FR) is provided for the above referenced project per your request dated April 6, 2010. The proposed improvements are part of the Whitley 2A Segment of the SLO-46 Corridor Improvement Project, which proposes to convert SR 46 east of Route 101 from a two-lane conventional highway to a four-lane expressway in San Luis Obispo County. Retaining Wall No. 1 will be constructed to serve as a wing wall to a 12' by 14' reinforced concrete box culvert at Station 743+61.36. One rotary wash boring was drilled approximately 70 feet from the retaining wall layout line in May 2010 to provide information for this report.

Project Description

Route 46 in the project area is a two-lane conventional highway with 12-foot travel lanes and shoulders ranging in width between 4 feet and 8 feet. Route 46 is one of the few east-west routes connecting Interstate 5 and U.S. Highway 101, and is a vital link between the Central Coast and Central Valley areas of California. The route primarily serves interregional and interstate traffic, although it is used daily by residents of the communities of Paso Robles, Cholame, Shandon, and Whitley Gardens. It is the only east-west route between Route 166 to the south and Route 156/152 to the north that can facilitate the movement of goods by truck.

It is proposed to convert Route 46 in the project area to a four-lane divided expressway by constructing two new lanes on a parallel alignment to the existing lanes. Between Route 46 Centerline Station 615+25 and Station 646+22 the new lanes will be constructed to the south of the existing lanes. Between approximately Station 666+00 and Station 894+00 the new lanes will be constructed to the north of the existing lanes. The horizontal alignment will transition the new lanes from south to north of the existing lanes between Station 646+22 and Station 666+00. The existing lanes will be rehabilitated, and vertical curve corrections will be constructed as necessary to improve sight distance. The completed roadway will have a 5-foot inside shoulder, two 12-foot lanes, and a 10-foot outside shoulder for each direction of travel. Median width will typically measure 62 feet. Turn channelization will be provided to access the rural roads and most of the driveways that intersect the highway.

Construction of a Standard Plan Type 1 Retaining Wall is proposed from approximately 128.49 feet left of CL Route 46 Station 743+21.28 to approximately 113.31 feet left of CL Route 46 Station 743+34.30. The maximum design height of the wall will be 20 feet and the length of the wall will be approximately 20 feet, measured along the wall layout line. Refer to the attached layout, cross sections, and elevation view provided by Design for the location of the proposed structure and its dimensions.

The following datum were used to reference horizontal and vertical positions of the proposed structure:

- Horizontal: North American Datum of 1983 (NAD83(92))
- Vertical: National Geodetic Vertical Datum of 1929 (NGVD29)

Pertinent Reports and Investigations

The following publications were used to assist in the assessment of site conditions:

1. *Caltrans ARS Online.*
2. *Environmental Assessment/Draft Environmental Impact Report: Route 46 Corridor Improvement Project, San Luis Obispo County, District 5-SLO-46-KP51.8/90.6*, Caltrans, July 2002.
3. *Geologic Map of the San Luis Obispo County, California*, Compiled by Lew Rosenberg.
4. *Geotechnical Impact of Proposed Project: US Route 46 Widening, San Luis Obispo County, 05-SLO-46-32.2/36.4*, PSC Associates, Inc., 1992.
5. *Geotechnical Services Design Manual, Version 1.0,* Division of Engineering Services, August 2009.
6. *Route 46/41 Interchange Seismic Hazard Report*, Caltrans, John D. Duffy, 2000.

Site Geology and Subsurface Conditions

Topography and Geology

The project is located near the southern end of the Salinas Valley in the Coast Ranges geomorphic province. The terrain consists of dissected plains surrounded by low to moderately steep hills. The westerly flowing Estrella River is the main drainage feature in the project area. It lies to the south of Route 46 through the project limits. The Estrella River is a tributary to the Salinas River, which drains to Monterey Bay northwest of the project area.

The region is divided into three geologic blocks separated by the San Andreas Fault and the Sur-Naciemento Fault Zone. The Diablo Range is in the block located northeast of the San Andreas Fault. The Gabilan Range and the Salinas Valley are located in the central block. The Santa Lucia Range is located in the western block. "Basement" rocks in the western and eastern blocks consist of Franciscan Assemblage rocks and a complex of metamorphic units. Granitic intrusions form the bedrock in the central block, beneath the project area.

Pre-Cretaceous age rocks of the Sur Series are the oldest rocks in the area. These have been intruded by Cretaceous-age granite or granodiorite. This metamorphic-granitic complex is confined to the central fault block, beneath the Salinas Valley and Gabilan Range. Sedimentary rock formations and some volcanic units were deposited on top of the basement rocks during the Cretaceous and Tertiary Periods. Subsequently, during the Quaternary Period, clastic sediments were deposited primarily in marine/transgression environments, which alternated with periods of uplift/regression during which erosion and subareal deposition occurred. The latest uplift (and/or drop in sea level) occurred in Late Pliocene to Mid-Pleistocene time, leaving the sediments at nearly their present-day elevations. Some of these formations have been folded and faulted by the same compressive forces that produced the San Andreas Fault system. Present-day topographic surface features and drainage patterns were established by Mid-Pleistocene time.

Dibblee (1971) mapped the bedrock beneath the project area as granitic rock ("gr"≅quartz granodiorite), which intruded and crystallized during Cretaceous time, 60 to 80 million years ago. Paso Robles Formation ("Q_{Tp}"), deposited in Late Pliocene and early Pleistocene time (2 to 3 million years ago), overlies the granitic bedrock. The Paso Robles Formation consists of easily eroded sands and gravels with lesser amounts of silts and clay, deposited by running water. The formation varies in thickness, from a few feet thick on top of the granitic ridges west of Paso Robles, up to several hundred feet thick along the existing Route 46 alignment in the eastern portion of the project area. Bedding within the Paso Robles Formation is not usually apparent. However, the few available exposures suggest that bedding dips generally toward the north at low angles (1 to 2 degrees): Dibblee mapped the axis of a gentle anticline southwest of the project area.

Old river terrace deposits ("Q_a" and "Q_{oa}"), composed of granitic gravel, sand, silt, and clay, line the sides of some of the stream valleys that cross the highway alignment near the Estrella River. Younger alluvial deposits ("Q_{rs}") composed of gravel, sand, silt, and clay have been deposited along the modern drainage courses.

Soil Conditions

Boring R-10-009, located 190' left of Route 46 centerline Station 743+26, was drilled to a depth of 62.8', which corresponds to elevation 915.8 feet. The geotechnical boring encountered interbedded layers of sand, silty sand, sand with gravel, lean clay, and sandy clay. The observed stratigraphy is consistent with geologic maps for the area, which show Pleistocene aged alluvial soils of the Paso Robles formation overlain by more recent alluvial deposits from the drainages. Stratigraphy comprised of layers of variable thickness and lateral extents are indicative of the alluvial environment in which they were deposited. Particle size distribution, layer thickness, and lateral extent of deposition change as the velocity of water depositing the materials varies.

Ground Water

Boring R-10-009 was instrumented as a short term open-standpipe monitoring well by installing 1½" slotted PVC pipe in the open borehole with no sand backfill. Depth to ground water was measured one week after completion of the drilling, and the well was abandoned by removing the pipe and backfilling the hole with bentonite chips. Ground water was measured 21.8 feet below original ground on May 25, 2010, corresponding to an elevation of 956.8 feet.

Corrosion Evaluation

Soil samples were obtained from hand-auger borings along the retaining wall alignment and sent to the District 5 Laboratory for corrosion analysis. Test results were not available at the time this report was written. Corrosion test results on soils from nearby sections of Route 46, however, suggest that the project site is likely non-corrosive. Reporting of site-specific corrosion potential will be conveyed in separate correspondence when test results become available.

Seismic Recommendations

The project is located within a seismically active region of California. There are several earthquake faults in close proximity to the project area. Table 1 lists the active and potentially active faults in the project vicinity as described in Caltran's *2007 Fault Database*. Corresponding Moment Magnitudes and distance to the retaining wall site are also given. A fault map is included in the attachments to this report.

Table 1: Active and Potentially Active Faults

Fault	*Moment Magnitude of Maximum Credible Earthquake*[1]	*Distance to Fault from Project Area (miles)*
Rinconada Fault Zone (San Marcos section)	7.5	16.5
Oceanic Fault Zone	7.4	26.2
San Andreas Fault Zone (Parkfield section)	7.9	7.7
West Huasna Fault Zone	7.0	27.3
San Simeon-Hosgri Fault Zone (San Simeon Fault)	7.5	40.3
Cambria Fault	7.0	27.4
Los Osos Fault Zone (Irish Hills section)	7.0	32.3
Los Osos Fault Zone (Lopez Reservoir section)	7.0	34.2
Southern San Luis Range Fault Zone	7.2	38.5
San Simeon-Hosgri Fault Zone (Hosgri Fault)	7.5	44.7

Peak ground acceleration (PGA) in the project area due to an earthquake on one of the nearby faults was estimated using the *2009 Caltrans Seismic Design Procedure.* The procedure was developed to calculate the minimum seismic design requirements for bridges on State highways. The method calculates design response spectra over a range of periods. The design response spectrum is based on the envelope of a deterministic and a probabilistic spectrum. The deterministic spectrum is calculated as the arithmetic average of median response spectra computed using the Chiou & Youngs and Campbell & Bozorgnia ground motion prediction equations (CY-CB GMPE). These equations are applied to all faults in or near California considered to be active in the last 700,000 years (late Quaternary age) and capable of producing a moment magnitude earthquake of 6.0 or greater.

The probabilistic spectrum is obtained from the 2008 USGS Seismic Hazard Map for the 5% in 50 years probability of exceedance (or 975 year return period). The spectral values are adjusted with a soil amplification factor based on an average of the Boore-Atkinson (2008), Campbell Bozorgnia (2008), and Chiou-Youngs (2008) ground motion prediction models. For sites underlain by soils having an average shear wave velocity for the upper 30 meters of soil (V_{S30}) of less than 300 meters per second, the 2009 USGS Probabilistic Seismic Hazard Analysis Interactive Deaggregation Tool is used to develop the probabilistic spectrum.

[1] According to Caltrans *2007 Fault Database*

The controlling fault at the retaining wall location is the San Andreas Fault zone (Parkfield section), a right lateral slip strike fault with a maximum magnitude of 7.9. The peak ground acceleration at the location of Retaining Wall No. 1 is estimated to be 0.58 g (gravity). The probabilistic spectrum with a soil amplification factor for a V_{S30} of 300 meters per second governed the design response spectrum. The V_{S30} value was generated using correlations to Standard Penetration Test (SPT) blow counts.

The Seismic Hazard Report prepared for another section of the Highway 46 Corridor Improvement Project predicts an average recurrence interval of 21.5 years for an earthquake along the Parkfield segment of the San Andreas Fault zone. Therefore, there is a high likelihood of an earthquake occurring during the design life of this project, though probably of a lesser magnitude than the 7.9 maximum credible magnitude. Historically, earthquakes ranging in magnitude between 5 and 6 are the typical "major" events along the Parkfield segment of the San Andreas Fault zone.

No known active or potentially active faults project towards or cross the highway alignment within the project limits. Therefore, there is low potential for surface fault rupture to occur and no mitigation efforts are necessary.

Liquefaction is a near-total loss of soil strength due to an increase in pore water pressure during cyclic loading, such as occurs during an earthquake. Loose cohesionless soils that may become saturated due to a high water table may liquefy during an earthquake. Embankments founded on liquefiable soils may be subject to slope instability and settlement during an earthquake event. Similarly, earth-retaining structures may settle or overturn should the soils beneath them liquefy.

Liquefaction potential at the location of Retaining Wall No. 1 should be low. For liquefaction to occur, three ingredients in combination are necessary: loose granular soils, saturated soil conditions, and strong ground shaking. All of the cohesionless soils that were encountered at an elevation where they may become saturated by ground water were found to be in a very dense condition. Therefore, even in the event of an earthquake, liquefaction is unlikely to occur.

Foundation Recommendations

Construction of a Standard Plan Type 1 Retaining Wall is recommended at the inlet to the proposed 12' X 14' reinforced concrete box culvert at Station 743+61.36 to retain the embankment soil at that location. The maximum retained height of the wall will be approximately 20 feet under loading condition Case II (refer to Caltrans Standard Plans).

Foundation soil bearing capacity was calculated using Hansen's method. Strength parameters for cohesionless soils were calculated using friction angle correlations to SPT blow counts. Strength parameters for cohesive soils were estimated using pocket penetrometer measurements of unconfined compression strength. Footing dimensions and corresponding allowable bearing pressures are presented in the following table. Refer to Caltrans Standard Plans for details of construction.

Table 2: Spread Footing Data for Standard Plan Type 1 Retaining Wall

Retaining Wall No. 1 Station Limits (feet)	Minimum Footing Width	Minimum Bottom of Footing Elevation (feet)	Toe Pressure (Case II)[2]	Allowable Bearing Pressure (q_{all})
Station 1+47.04 to Station 1+57.04	8'-0"	965.34	3.3 ksf	11.4 ksf
Station 1+57.04 to Station 1+67.04	11'-0"	962.34	4.7 ksf	7.5 ksf

In accordance with section 4.4.5.1, "Minimum Embedment and Bench Width," of the Bridge Design Specifications, the minimum footing embedment shall be 3 feet, measured from the bottom of the footing.

Elastic settlement in cohesionless soils was calculated using Hough's Method, which correlates soil grain size distribution and SPT values with a bearing capacity factor that is used in a settlement equation. The calculated maximum settlement of the foundation soils due to the construction of the retaining wall is approximately 1/4" for the segment between Station 1+47.04 and Station 1+57.04, and approximately 3/8" for the segment between Station 1+57.04 and 1+67.04. Both the total and the differential settlement are within tolerable limits for reinforced concrete construction.

Slope Stability

Global slope stability is not considered to be an issue for Retaining Wall No. 1. The retaining wall will be built at the foot of an embankment slope, with relatively flat terrain in front of the wall. Construction of the retaining wall will force potential failure surfaces deep, beneath the wall footing, since failure surfaces cannot go through the wall. Slope stability analyses using the calculated strength parameters for the foundation soil indicate that the deep failure surfaces all have a high factor of safety against sliding.

[2] Per Standard Plan B3-1, May 2006

Construction Considerations

The foundation soils at the site of the proposed retaining wall appear adequate to support the structure. Localized areas of unconsolidated or saturated foundation materials, however, may require stripping and recompaction, or removal of material deemed unsuitable. If standing water or unsuitable material is encountered to a depth where it cannot be economically removed, it is recommended that the unsuitable material be sub excavated 18 inches and replaced with Class 3 Permeable Material encapsulated in an AASHTO specification M288, Class 2 survivability geotextile. The permeable material will allow water to fill its pore spaces without a loss of strength. The geotextile fabric will act as a separator, preventing the soils above the fabric from filling the voids in the permeable material, and preventing the permeable material from penetrating the soft soils beneath the fabric. The geotextile will also serve to reinforce the subgrade soil. The permeable material encapsulated in geotextile fabric will provide a dry and stable working platform for embankment or drainage structure construction.

All temporary cut slopes shall conform to Cal OSHA guidelines, and shall not exceed 1:1 slope inclinations. Permanent cut and fill slopes shall not exceed 2:1 slope angles.

Closure

Standard Special Provision S5-280, "Project Information", discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The Department makes the following supplemental project information available:

Supplemental Project Information

Means	Description
Included in the Information Handout	Foundation Report for the Retaining Wall No. 1 dated September 13, 2010.
Available for inspection at the District Office	
Available for inspection at the Transportation Laboratory	
Available for inspection at _____; telephone (___) - ___	
Available as specified in the Standard Specifications	
Available at: http://www.dot.ca.gov/hq/esc/oe/weekly_ads/index.php	

Items listed to be included in the Information Handout will be provided in Acrobat (.pdf) format to the Addressee of this report via electronic mail.

The recommendations contained in this report are based on specific project information that has been provided by Office of Design II, Branch A. If any conceptual changes are made during final project design, the Office of Geotechnical Design – North, Branch D should review those changes to determine if the recommendations contained in this report are still applicable. Any questions regarding the recommendations contained herein should be directed to the attention of Dan Appelbaum, (805) 549-3745, or Mike Finegan, (805) 549-3194, at the Office of Geotechnical Design – North, Branch D.

Supervised by,

REGISTERED PROFESSIONAL ENGINEER
D.L. Appelbaum
No. C 50001
Exp. 6-30-11
CIVIL
STATE OF CALIFORNIA

DANIEL L. APPELBAUM, PE
Transportation Engineer
Geotechnical Design – North
Branch D

MICHAEL S. FINEGAN, PE, Chief
Geotechnical Design - North
Branch D

c: Roy Bibbens / GDN File (E-copy)
John Luchetta – Project Manager (E-copy)
Mark Willian – GS Corporate (E-copy)
R.E. Pending File
Doug Lambert – District Materials Engineer (E-copy)
Job File / Branch D Records

LIST OF ATTACHMENTS

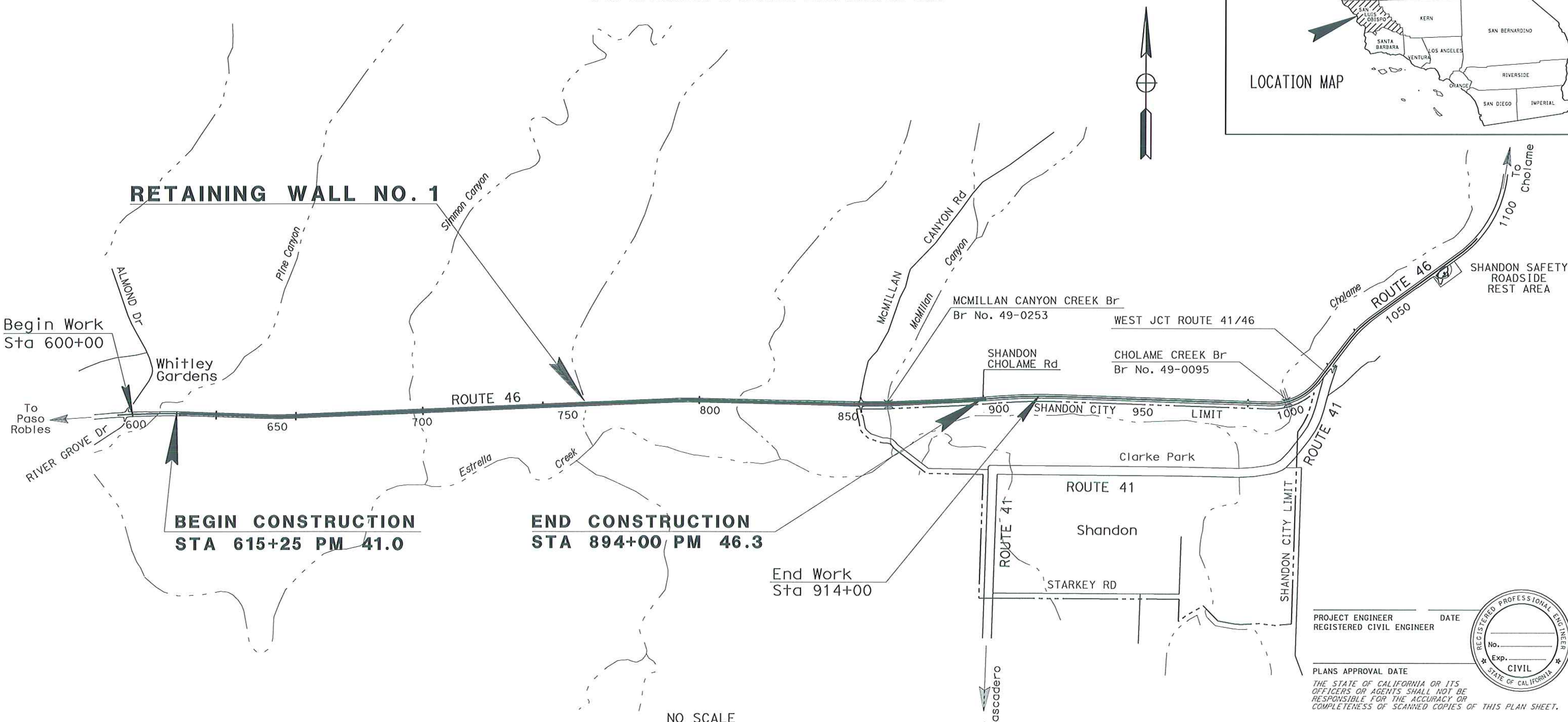
INDEX OF PLANS

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON
STATE HIGHWAY
IN SAN LUIS OBISPO COUNTY
NEAR PASO ROBLES
FROM 0.1 MILE EAST OF ALMOND DRIVE TO 0.8 MILE EAST OF McMILLAN CANYON ROAD

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2006



PROJECT ENGINEER DATE
REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

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

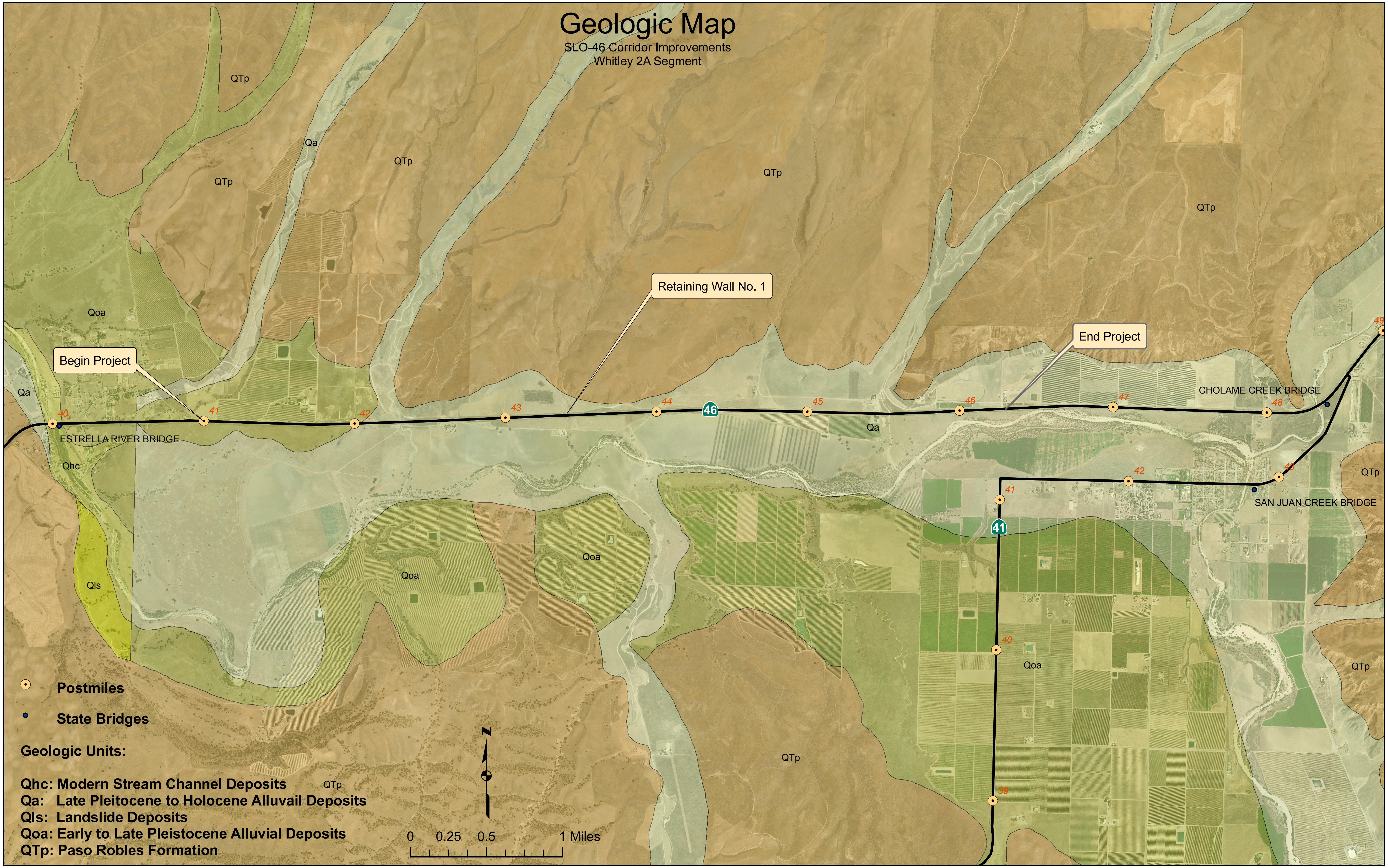
DESIGN ENGINEER JACK WALKER

PROJECT MANAGER JOHN LUCHETTA

ATTACHMENT 1: VICINITY MAP

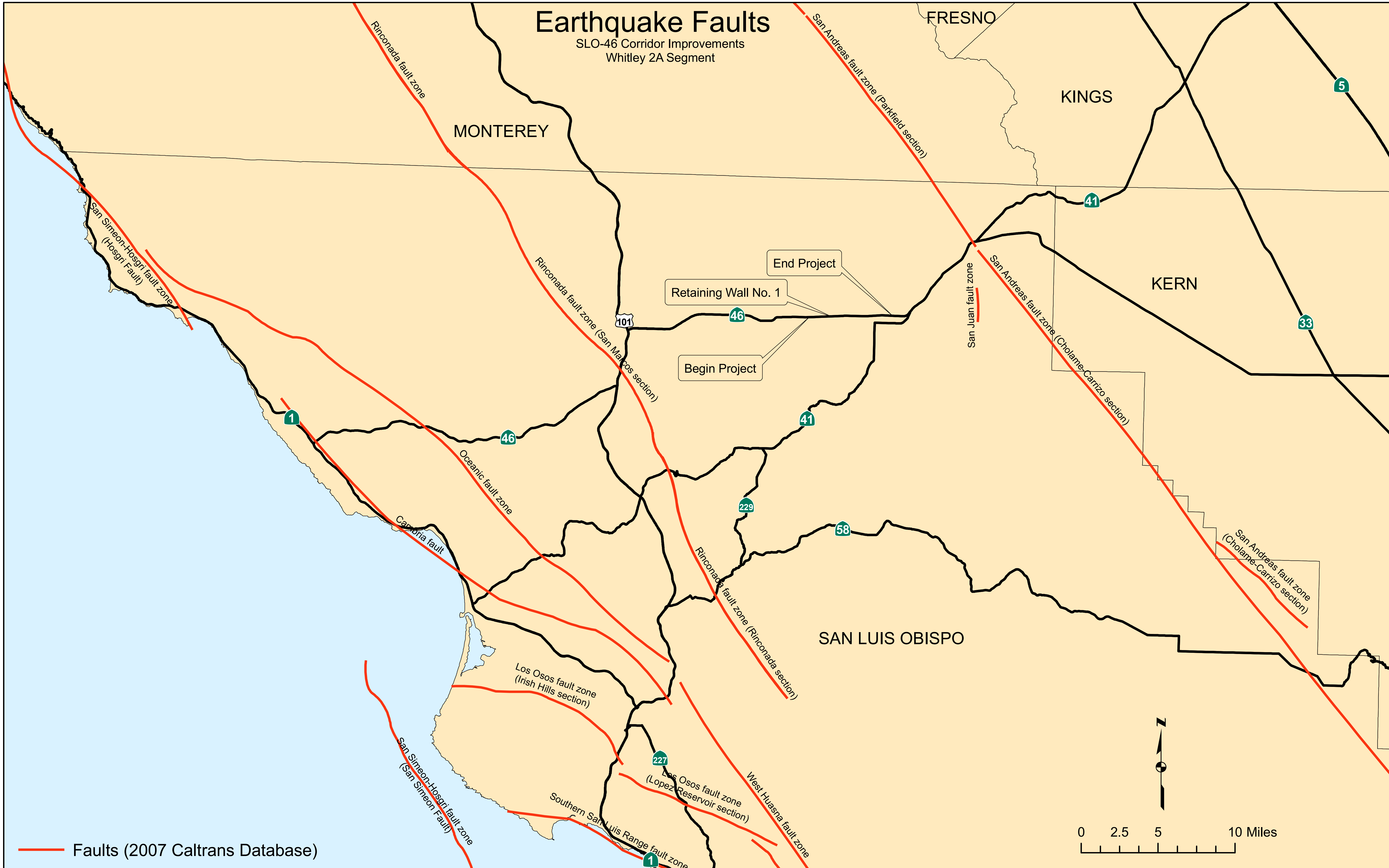
THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

CONTRACT No.	05-330774
PROJECT ID	0500020049



Geologic Mapping Compiled by Lew Rosenberg

ATTACHMENT 2


Earthquake Faults
SLO-46 Corridor Improvements
Whitley 2A Segment
MONTEREY
FRESNO
KINGS
KERN
SAN LUIS OBISPO
End Project
Retaining Wall No. 1
Begin Project
Rinconada fault zone
Rinconada fault zone (San Marcos section)
Rinconada fault zone (Rinconada section)
San Andreas fault zone (Parkfield section)
San Andreas fault zone (Cholame-Carrizo section)
San Andreas fault zone (Cholame-Carrizo section)
San Juan fault zone
San Simeon-Hosgri fault zone (Hosgri Fault)
San Simeon-Hosgri fault zone (San Simeon Fault)
Oceanic fault zone
Cambria fault
Los Osos fault zone (Irish Hills section)
Los Osos fault zone (Lopez Reservoir section)
Southern San Luis Range fault zone
West Huasna fault zone
101
46
41
1
229
58
227
33
5
0 2.5 5 10 Miles
Faults (2007 Caltrans Database)

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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No.
Exp.
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STATE OF CALIFORNIA

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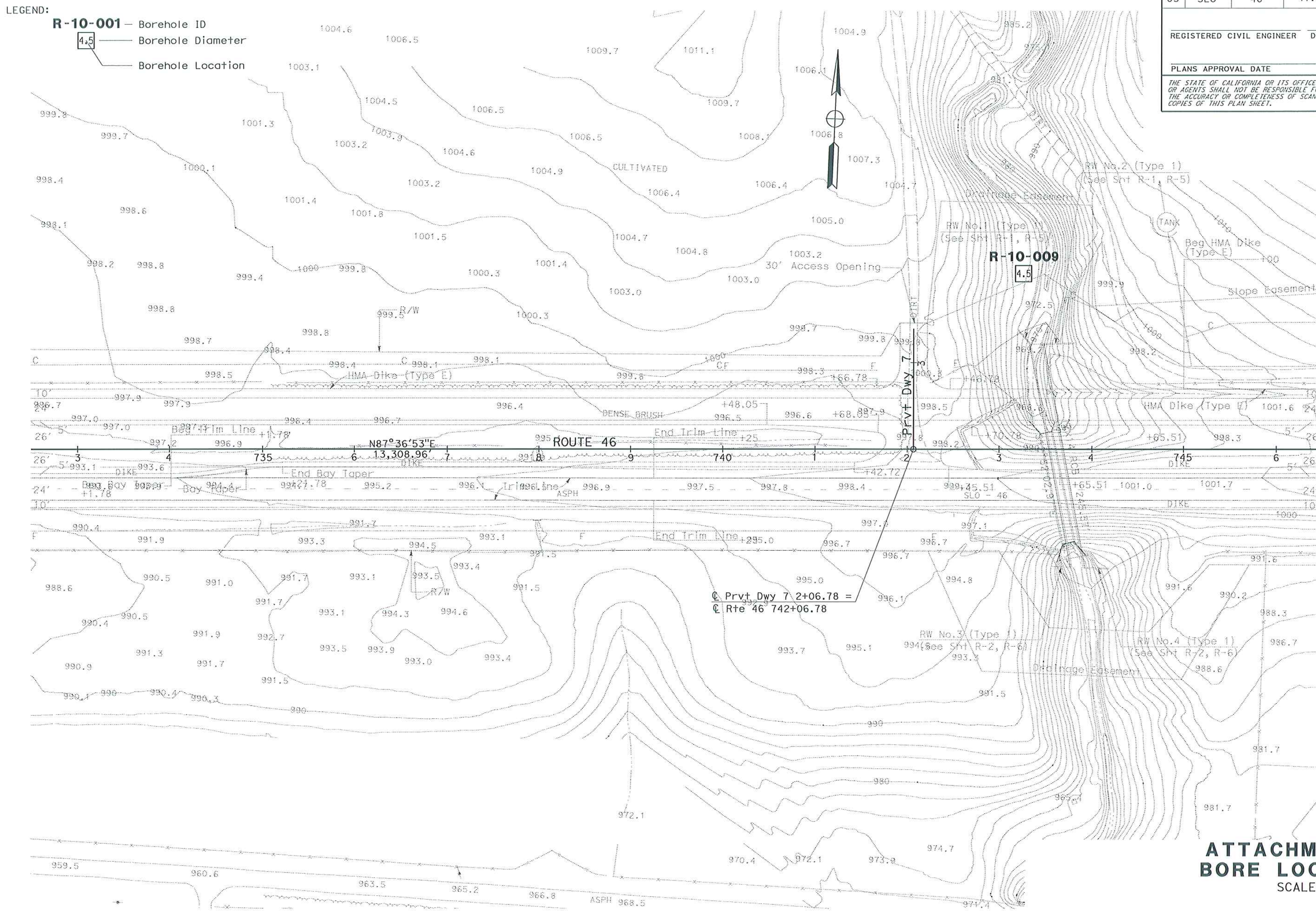

ATTACHMENT 4
BORE LOCATION
SCALE: 1" = 100'
BL-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans GEOTECHNICAL DESIGN
FUNCTIONAL SUPERVISOR
MIKE FINEGAN
CALCULATED-DESIGNED BY
CHECKED BY
REVISED BY
DATE REVISED
LAST REVISION

BORING RECORD

05-SLO-46- 41.0/46.3

EA: 05-330771, Project ID: 0500020049

ATTACHMENT 5

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
S Heredia	**5-18-10**	**5-18-10**	**35° 39' 40.1004" / -120° 27' 2.9653" WGS84**	**R-10-009**

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans	**190.00' Lt Sta 743+26RTE 46**	**978.6 ft NGVD29**
DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Rotary Wash	**Acker MP8**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)	SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")	**Boart/Longyear Automatic 140#, 30" drop**	**74%**
BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE) **21.8 ft on5-25-10**	TOTAL DEPTH OF BORING
Installed Open-standpipe Observation Well		**62.8 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Remarks
	0	Lean CLAY with SAND (CL); stiff; dark grayish brown; dry to moist; mostly medium plasticity fines; few fine SAND.				
	1					
976.59	2					
	3					
974.59	4		1	2 2 3	5	
	5					
972.59	6					
	7	Trace fine GRAVEL; PP=1.5 tsf.	2	2 4 6	10	
970.59	8					
	9	SANDY SILT (ML); medium dense; olive; dry; mostly nonplastic fines; some fine SAND.	3	4 10 10	20	
968.59	10					
	11	SILTY CLAY (CL-ML); hard; olive gray; moist; mostly low plasticity fines.				
966.59	12		4	10 19 21	40	
	13		5			
964.59	14	SILTY SAND (SM); very dense; olive; moist; mostly fine SAND; some nonplastic fines.				
	15					
962.59	16	From medium to fine SAND.				
	17		6	15 22 28	50	
960.59	18		7			
	19	Well-graded SAND (SW); very dense; olive; moist; mostly SAND, from coarse to fine, subangular; trace fine subangular GRAVEL.				
958.59	20					
	21	Well-graded SAND with SILT and GRAVEL (SW-SM); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular; little fine subangular GRAVEL; few nonplastic fines.				
956.59	22		8	16 20 28	48	
	23		9			
954.59	24	Well-graded SAND with GRAVEL (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine,				
	25					

Other column headings: Material Graphics, Sample Location, Recovery (%), RQD (%), Moisture Content (%), Dry Unit Weight (pcf), Shear Strength (tsf), Drilling Method, Casing Depth.

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		subangular; little fine subangular GRAVEL; trace nonplastic fines. Well-graded SAND with GRAVEL (SW) *(continued)*.		9										
952.59	26		Well-graded SAND (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular; trace fine subangular GRAVEL; trace nonplastic fines.		10	21 28 28	56								
	27														
950.59	28		SILT with SAND (ML); dense; olive gray; moist; mostly low plasticity fines; little fine SAND.		11										
	29														
948.59	30														
	31														
946.59	32				12	12 16 24	40								
	33				13										
944.59	34														
	35		Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.												
942.59	36														
	37				14	27 46 50/5"	96/11								
940.59	38				15										
	39														
938.59	40														
	41														
936.59	42		Well-graded SAND (SW); very dense; olive; moist; mostly SAND, from coarse to fine.		16	24 50/5"	50/5								
	43				17										
934.59	44		SILTY SAND (SM); very dense; pale yellow; moist; mostly fine SAND; some nonplastic fines.												
	45														
932.59	46														
	47				18	24 50/5.5"	50/6								
930.59	48				19										
	49		Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.												
928.59	50														
	51														
926.59	52		SILTY SAND (SM); very dense; pale yellow; moist; mostly fine SAND; some nonplastic fines.		20	40 50/5"	50/5								
	53				21										
924.59	54														
	55														

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		SILTY SAND (SM) *(continued)*.		21										
922.59	56														
	57				22	20 41 50/4"	91/10								
920.59	58				23										
	59		Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.												
918.59	60														
	61		Lean CLAY (CL); hard; brown; moist; mostly medium plasticity fines; PP=4.5 tsf.												
916.59	62				24	8 11 18	29								
	63		Bottom of borehole at 62.8 ft bgs												
914.59	64		Installed Open-standpipe Observation Well 5/18/2010												
	65														
912.59	66														
	67														
910.59	68														
	69														
908.59	70														
	71														
906.59	72														
	73														
904.59	74														
	75														
902.59	76														
	77														
900.59	78														
	79														
898.59	80														
	81														
896.59	82														
	83														
894.59	84														
	85														

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-10-009**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **9-13-10**	SHEET **3 of 3**

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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LEGEND

XXXX STANDARD PLAN No.

RSP

DRAINAGE SYSTEM No.

NOTES:

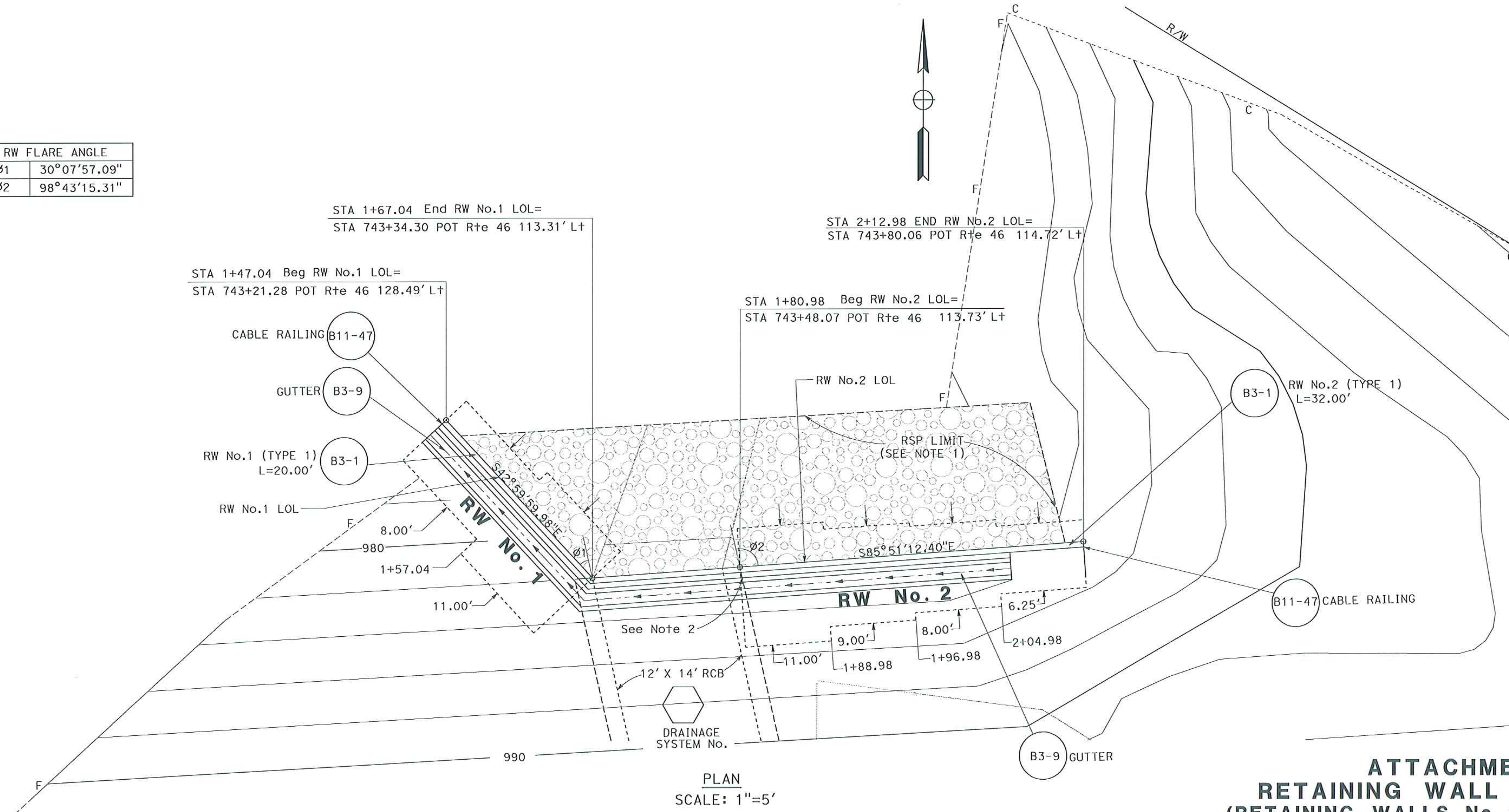
1. FOR RSP LIMITS, SEE DRAINAGE PLANS.
2. SEE STANDARD PLAN D84 FOR CONNECTION OF RCB TO RETAINING WALLS.
3. FOR DETAILS NOT SHOWN, SEE STANDARD PLANS.

ABBREVIATIONS:

RW RETAINING WALL

DRAFT: SUBJECT TO CHANGE

RW FLARE ANGLE	
Ø1	30°07′57.09″
Ø2	98°43′15.31″



PLAN

SCALE: 1″=5′

THIS PLAN IS ACCURATE FOR RETAINING WALL WORK ONLY.

ATTACHMENT 6
RETAINING WALL PLAN
(RETAINING WALLS No. 1 & 2)

R-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

06 DESIGN

FUNCTIONAL SUPERVISOR JACK WALKER

CALCULATED-DESIGNED BY WHECHIN LIU

CHECKED BY SUMI HOODE

REVISED BY

DATE REVISED

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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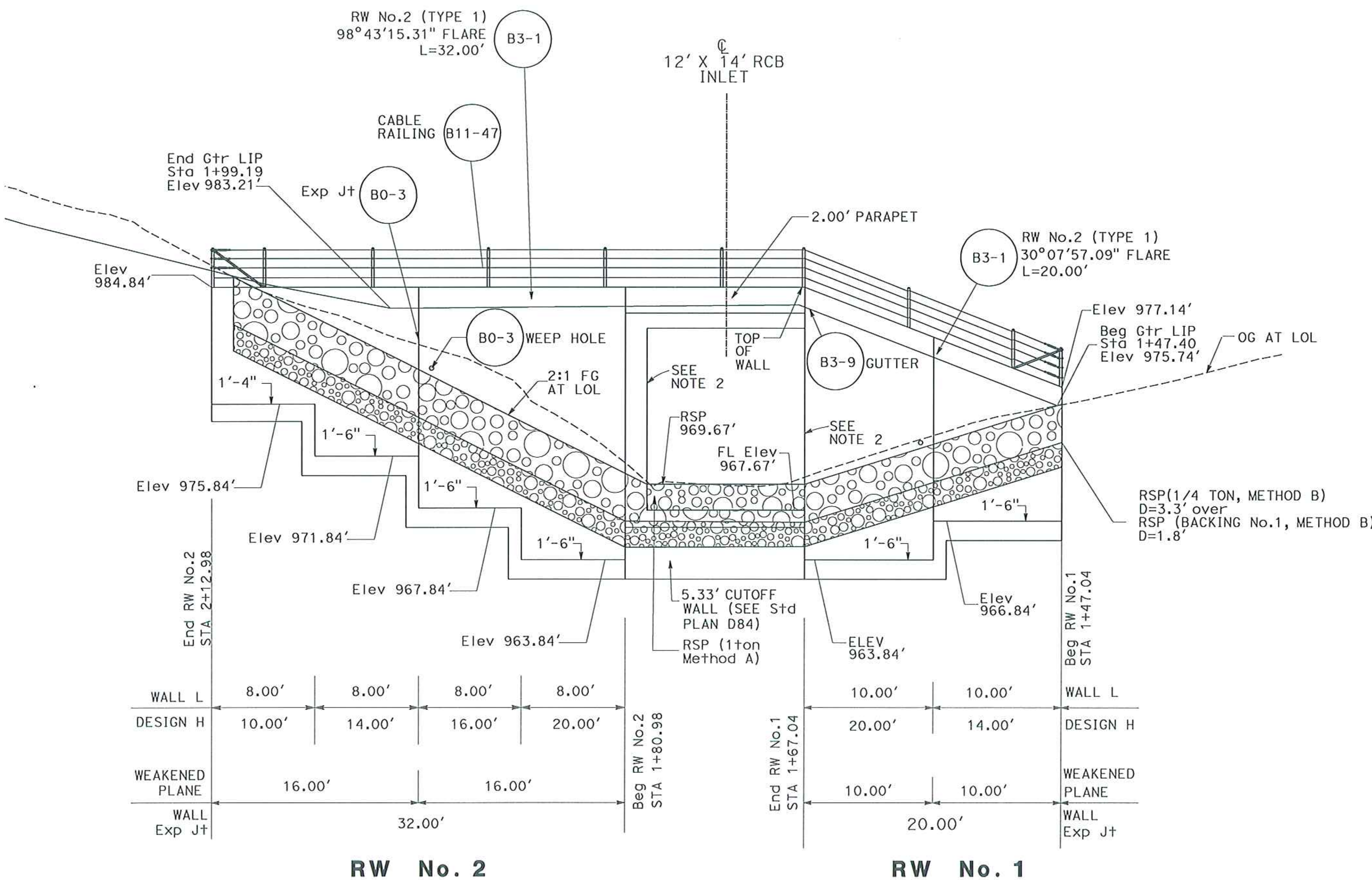
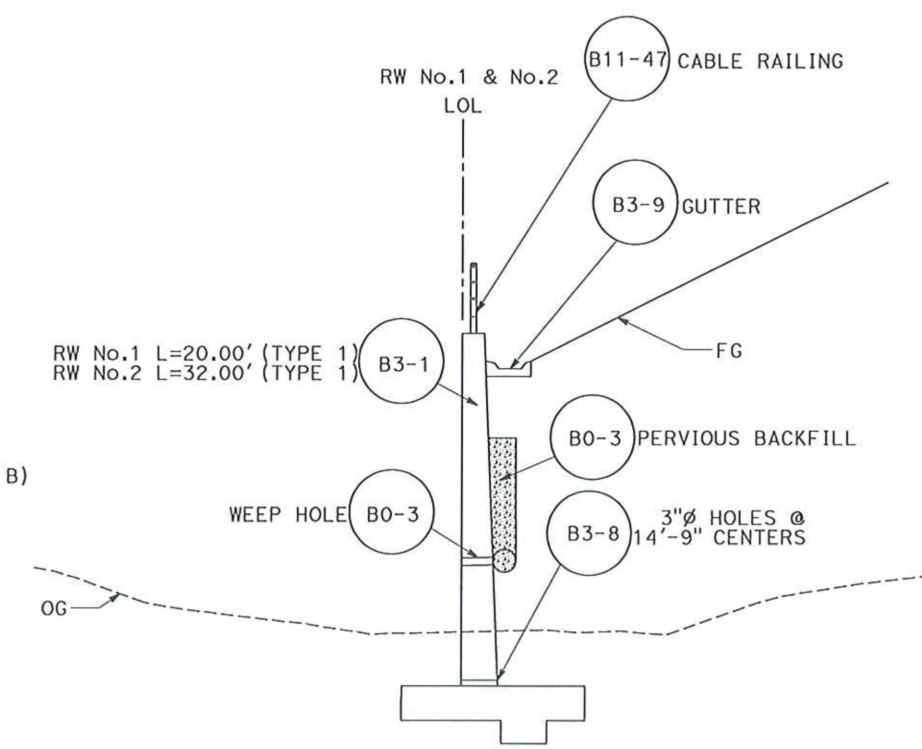
DRAFT: SUBJECT TO CHANGE





RW No.1 & No.2 TYPICAL SECTION

NO SCALE

THIS PLAN IS ACCURATE FOR RETAINING WALL WORK ONLY.

ATTACHMENT 7
RETAINING WALL DETAILS
(RETAINING WALLS No.1 & No.2)
R-3

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
06-DESIGN
FUNCTIONAL SUPERVISOR: JACK WALKER
CALCULATED-DESIGNED BY: WHECHIN LIU
CHECKED BY: SUMI HOODE
REVISED BY
DATE REVISED

FOR CONTRACT NO.: 05-330774

MATERIALS INFORMATION

Foundation Report-Retaining Wall 2, dated September 16, 2010

ROUTE: 46-SLO-40.7/46.3(PM)

State of California Business, Transportation and Housing Agency

Memorandum *Flex your power!*

Be energy efficient!

To: JACK R. WALKER
Senior Design Engineer
Office of Design II, Branch A
Central Region – District 6

Attn: Jose Arguello, Project Engineer

Date: September 16, 2010

File: 05-330771 (0500020049)
05-SLO-46-41.0/46.3
Whitley 2A Segment
Retaining Wall No. 2

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

Subject: Foundation Report

Scope of Work

A Foundation Report (FR) is provided for the above referenced project per your request dated April 6, 2010. The proposed improvements are part of the Whitley 2A Segment of the SLO-46 Corridor Improvement Project, which proposes to convert SR 46 east of Route 101 from a two-lane conventional highway to a four-lane expressway in San Luis Obispo County. Retaining Wall No. 2 will be constructed to serve as a wing wall to a 12' by 14' reinforced concrete box culvert at Station 743+61.36. One rotary wash boring was drilled approximately 79 feet from the retaining wall layout line in May 2010 to provide information for this report.

Project Description

Route 46 in the project area is a two-lane conventional highway with 12-foot travel lanes and shoulders ranging in width between 4 feet and 8 feet. Route 46 is one of the few east-west routes connecting Interstate 5 and U.S. Highway 101, and is a vital link between the Central Coast and Central Valley areas of California. The route primarily serves interregional and interstate traffic, although it is used daily by residents of the communities of Paso Robles, Cholame, Shandon, and Whitley Gardens. It is the only east-west route between Route 166 to the south and Route 156/152 to the north that can facilitate the movement of goods by truck.

It is proposed to convert Route 46 in the project area to a four-lane divided expressway by constructing two new lanes on a parallel alignment to the existing lanes. Between Route 46 Centerline Station 615+25 and Station 646+22 the new lanes will be constructed to the south of the existing lanes. Between approximately Station 666+00 and Station 894+00 the new lanes will be constructed to the north of the existing lanes. The horizontal alignment will transition the new lanes from south to north of the existing lanes between Station 646+22 and Station 666+00. The existing lanes will be rehabilitated, and vertical curve corrections will be constructed as necessary to improve sight distance. The completed roadway will have a 5-foot inside shoulder, two 12-foot lanes, and a 10-foot outside shoulder for each direction of travel. Median width will typically measure 62 feet. Turn channelization will be provided to access the rural roads and most of the driveways that intersect the highway.

Construction of a Standard Plan Type 1 Retaining Wall is proposed from 113.73 feet left of CL Route 46 Station 743+48.07 to 114.72 feet left of CL Route 46 Station 743+80.06. The maximum design height of the wall will be 20 feet and the length of the wall will be approximately 32 feet, measured along the wall layout line. Refer to the attached layout, cross sections, and elevation view provided by Design for the location of the proposed structure and its dimensions.

The following datum were used to reference horizontal and vertical positions of the proposed structure:

- Horizontal: North American Datum of 1983 (NAD83(92))
- Vertical: National Geodetic Vertical Datum of 1929 (NGVD29)

Pertinent Reports and Investigations

The following publications were used to assist in the assessment of site conditions:

1. *Caltrans ARS Online.*

2. *Environmental Assessment/Draft Environmental Impact Report: Route 46 Corridor Improvement Project, San Luis Obispo County, District 5-SLO-46-KP51.8/90.6*, Caltrans, July 2002.

3. *Geologic Map of the San Luis Obispo County, California*, Compiled by Lew Rosenberg.

4. *Geotechnical Impact of Proposed Project: US Route 46 Widening, San Luis Obispo County, 05-SLO-46-32.2/36.4*, PSC Associates, Inc., 1992.

5. *Geotechnical Services Design Manual, Version 1.0,* Division of Engineering Services, August 2009.

6. *Route 46/41 Interchange Seismic Hazard Report*, Caltrans, John D. Duffy, 2000.

Site Geology and Subsurface Conditions

Topography and Geology

The project is located near the southern end of the Salinas Valley in the Coast Ranges geomorphic province. The terrain consists of dissected plains surrounded by low to moderately steep hills. The westerly flowing Estrella River is the main drainage feature in the project area. It lies to the south of Route 46 through the project limits. The Estrella River is a tributary to the Salinas River, which drains to Monterey Bay northwest of the project area.

The region is divided into three geologic blocks separated by the San Andreas Fault and the Sur-Naciemento Fault Zone. The Diablo Range is in the block located northeast of the San Andreas Fault. The Gabilan Range and the Salinas Valley are located in the central block. The Santa Lucia Range is located in the western block. "Basement" rocks in the western and eastern blocks consist of Franciscan Assemblage rocks and a complex of metamorphic units. Granitic intrusions form the bedrock in the central block, beneath the project area.

Pre-Cretaceous age rocks of the Sur Series are the oldest rocks in the area. These have been intruded by Cretaceous-age granite or granodiorite. This metamorphic-granitic complex is confined to the central fault block, beneath the Salinas Valley and Gabilan Range. Sedimentary rock formations and some volcanic units were deposited on top of the basement rocks during the Cretaceous and Tertiary Periods. Subsequently, during the Quaternary Period, clastic sediments were deposited primarily in marine/transgression environments, which alternated with periods of uplift/regression during which erosion and subareal deposition occurred. The latest uplift (and/or drop in sea level) occurred in Late Pliocene to Mid-Pleistocene time, leaving the sediments at nearly their present-day elevations. Some of these formations have been folded and faulted by the same compressive forces that produced the San Andreas Fault system. Present-day topographic surface features and drainage patterns were established by Mid-Pleistocene time.

Dibblee (1971) mapped the bedrock beneath the project area as granitic rock ("gr"≅quartz granodiorite), which intruded and crystallized during Cretaceous time, 60 to 80 million years ago. Paso Robles Formation ("Q_{Tp}"), deposited in Late Pliocene and early Pleistocene time (2 to 3 million years ago), overlies the granitic bedrock. The Paso Robles Formation consists of easily eroded sands and gravels with lesser amounts of silts and clay, deposited by running water. The formation varies in thickness, from a few feet thick on top of the granitic ridges west of Paso Robles, up to several hundred feet thick along the existing Route 46 alignment in the eastern portion of the project area. Bedding within the Paso Robles Formation is not usually apparent. However, the few available exposures suggest that bedding dips generally toward the north at low angles (1 to 2 degrees): Dibblee mapped the axis of a gentle anticline southwest of the project area.

Old river terrace deposits ("Q_a" and "Q_{oa}"), composed of granitic gravel, sand, silt, and clay, line the sides of some of the stream valleys that cross the highway alignment near the Estrella River. Younger alluvial deposits ("Q_{rs}") composed of gravel, sand, silt, and clay have been deposited along the modern drainage courses.

Soil Conditions

Boring R-10-009, located 190' left of Route 46 centerline Station 743+26, was drilled to a depth of 62.8', which corresponds to elevation 915.8 feet. The geotechnical boring encountered interbedded layers of sand, silty sand, sand with gravel, lean clay, and sandy clay. The observed stratigraphy is consistent with geologic maps for the area, which show Pleistocene aged alluvial soils of the Paso Robles formation overlain by more recent alluvial deposits from the drainages. Stratigraphy comprised of layers of variable thickness and lateral extents are indicative of the alluvial environment in which they were deposited. Particle size distribution, layer thickness, and lateral extent of deposition change as the velocity of water depositing the materials varies.

Ground Water

Boring R-10-009 was instrumented as a short term open-standpipe monitoring well by installing 1½" slotted PVC pipe in the open borehole with no sand backfill. Depth to ground water was measured one week after completion of the drilling, and the well was abandoned by removing the pipe and backfilling the hole with bentonite chips. Ground water was measured 21.8 feet below original ground on May 25, 2010, corresponding to an elevation of 956.8 feet.

Corrosion Evaluation

Soil samples were obtained from hand-auger borings along the retaining wall alignment and sent to the District 5 Laboratory for corrosion analysis. Test results were not available at the time this report was written. Corrosion test results on soils from nearby sections of Route 46, however, suggest that the project site is likely non-corrosive. Reporting of site-specific corrosion potential will be conveyed in separate correspondence when test results become available.

Seismic Recommendations

The project is located within a seismically active region of California. There are several earthquake faults in close proximity to the project area. Table 1 lists the active and potentially active faults in the project vicinity as described in Caltran's *2007 Fault Database*. Corresponding Moment Magnitudes and distance to the retaining wall site are also given. A fault map is included in the attachments to this report.

Table 1: Active and Potentially Active Faults

Fault	*Moment Magnitude of Maximum Credible Earthquake*[1]	*Distance to Fault from Project Area (miles)*
Rinconada Fault Zone (San Marcos section)	7.5	16.5
Oceanic Fault Zone	7.4	26.2
San Andreas Fault Zone (Parkfield section)	7.9	7.7
West Huasna Fault Zone	7.0	27.3
San Simeon-Hosgri Fault Zone (San Simeon Fault)	7.5	40.3
Cambria Fault	7.0	27.4
Los Osos Fault Zone (Irish Hills section)	7.0	32.3
Los Osos Fault Zone (Lopez Reservoir section)	7.0	34.2
Southern San Luis Range Fault Zone	7.2	38.5
San Simeon-Hosgri Fault Zone (Hosgri Fault)	7.5	44.7

Peak ground acceleration (PGA) in the project area due to an earthquake along one of the nearby faults was estimated using the *2009 Caltrans Seismic Design Procedure.* The procedure was developed to calculate the minimum seismic design requirements for bridges on State highways. The method calculates design response spectra over a range of periods. The design response spectrum is based on the envelope of a deterministic and a probabilistic spectrum. The deterministic spectrum is calculated as the arithmetic average of median response spectra computed using the Chiou & Youngs and Campbell & Bozorgnia ground motion prediction equations (CY-CB GMPE). These equations are applied to all faults in or near California considered to be active in the last 700,000 years (late Quaternary age) and capable of producing a moment magnitude earthquake of 6.0 or greater.

The probabilistic spectrum is obtained from the 2008 USGS Seismic Hazard Map for the 5% in 50 years probability of exceedance (or 975 year return period). The spectral values are adjusted with a soil amplification factor based on an average of the Boore-Atkinson (2008), Campbell Bozorgnia (2008), and Chiou-Youngs (2008) ground motion prediction models. For sites underlain by soils having an average shear wave velocity for the upper 30 meters of soil (V_{S30}) of less than 300 meters per second, the 2009 USGS Probabilistic Seismic Hazard Analysis Interactive Deaggregation Tool is used to develop the probabilistic spectrum.

[1] According to Caltrans *2007 Fault Database*

The controlling fault at the retaining wall location is the San Andreas Fault zone (Parkfield section), a right lateral slip strike fault with a maximum magnitude of 7.9. The peak ground acceleration at the location of Retaining Wall No. 2 is estimated to be 0.58 g (gravity). The probabilistic spectrum with a soil amplification factor for a V_{S30} of 300 meters per second governed the design response spectrum. The V_{S30} value was generated using correlations to Standard Penetration Test (SPT) blow counts.

The Seismic Hazard Report prepared for another section of the Highway 46 Corridor Improvement Project predicts an average recurrence interval of 21.5 years for an earthquake along the Parkfield segment of the San Andreas Fault zone. Therefore, there is a high likelihood of an earthquake occurring during the design life of this project, though probably of a lesser magnitude than the 7.9 maximum credible magnitude. Historically, earthquakes ranging in magnitude between 5 and 6 are the typical "major" events along the Parkfield segment of the San Andreas Fault zone.

No known active or potentially active faults project towards or cross the highway alignment within the project limits. Therefore, there is low potential for surface fault rupture to occur and no mitigation efforts are necessary.

Liquefaction is a near-total loss of soil strength due to an increase in pore water pressure during cyclic loading, such as occurs during an earthquake. Loose cohesionless soils that may become saturated due to a high water table may liquefy during an earthquake. Embankments founded on liquefiable soils may be subject to slope instability and settlement during an earthquake event. Similarly, earth-retaining structures may settle or overturn should the soils beneath them liquefy.

Liquefaction potential at the location of Retaining Wall No. 2 should be low. For liquefaction to occur, three ingredients in combination are necessary: loose granular soils, saturated soil conditions, and strong ground shaking. All of the cohesionless soils that were encountered at an elevation where they may become saturated by ground water were found to be in a very dense condition. Therefore, even in the event of an earthquake, liquefaction is unlikely to occur.

Foundation Recommendations

Construction of a Standard Plan Type 1 Retaining Wall is recommended at the inlet to the proposed 12' X 14' reinforced concrete box culvert at Station 743+61.36 to retain the embankment soil at that location. The maximum retained height of the wall will be approximately 20 feet under loading condition Case II (refer to Caltrans Standard Plans).

Foundation soil bearing capacity was calculated using Hansen's method. Strength parameters for cohesionless soils were calculated using friction angle correlations to SPT blow counts. Strength parameters for cohesive soils were estimated using pocket penetrometer measurements of unconfined compression strength. Footing dimensions and corresponding allowable bearing pressures are presented in the following table. Refer to Caltrans Standard Plans for details of construction.

Table 2: Spread Footing Data for Standard Plan Type 1 Retaining Wall

Retaining Wall No. 2 Station Limits (feet)	Minimum Footing Width	Minimum Bottom of Footing Elevation (feet)	Toe Pressure (Case II)[2]	Allowable Bearing Pressure (q_{all})
Station 1+80.98 to Station 1+88.98	11'-0"	962.34	4.7 ksf	7.5 ksf
Station 1+88.98 to Station 1+96.98	9'-0"	966.34	3.7 ksf	8.3 ksf
Station 1+96.98 to Station 2+04.98	8'-0"	970.34	3.3 ksf	5.2 ksf
Station 2+04.98 to Station 2+12.98	6'-3"	974.51	2.3 ksf	4.3 ksf

In accordance with section 4.4.5.1, "Minimum Embedment and Bench Width," of the Bridge Design Specifications, the minimum footing embedment shall be 3 feet, measured from the bottom of the footing.

Elastic settlement in cohesionless soils was calculated using Hough's Method, which correlates soil grain size distribution and SPT values with a bearing capacity factor that is used in a settlement equation. Settlement of the cohesive soil layers was neglected in the calculation of total settlement because the cohesive soils underlying the site are highly over-consolidated, and settlement of the layers is expected to be minor. Calculated settlement is summarized in the following table. Both the total and the differential settlement are within tolerable limits for reinforced concrete construction.

[2] Per Standard Plan B3-1, May 2006

Table 3: Calculated Settlement for Standard Plan Type 1 Retaining Wall

Retaining Wall No. 2 Station Limits (feet)	Settlement (inches)
Station 1+80.98 to Station 1+88.98	0.39
Station 1+88.98 to Station 1+96.98	0.23
Station 1+96.98 to Station 2+04.98	0.22
Station 2+04.98 to Station 2+12.98	0.08

Slope Stability

Global slope stability is not considered to be an issue for Retaining Wall No.2. The retaining wall will be built at the foot of an embankment slope, with relatively flat terrain in front of the wall. Construction of the retaining wall will force potential failure surfaces deep, beneath the wall footing, since failure surfaces cannot go through the wall. Slope stability analyses using the calculated strength parameters for the foundation soil indicate that the deep failure surfaces all have a high factor of safety against sliding.

Construction Considerations

The foundation soils at the site of the proposed retaining wall appear adequate to support the structure. Localized areas of unconsolidated or saturated foundation materials, however, may require stripping and recompaction, or removal of material deemed unsuitable. If standing water or unsuitable material is encountered to a depth where it cannot be economically removed, it is recommended that the unsuitable material be sub excavated 18 inches and replaced with Class 3 Permeable Material encapsulated in an AASHTO specification M288, Class 2 survivability geotextile. The permeable material will allow water to fill its pore spaces without a loss of strength. The geotextile fabric will act as a separator, preventing the soils above the fabric from filling the voids in the permeable material, and preventing the permeable material from penetrating the soft soils beneath the fabric. The geotextile will also serve to reinforce the subgrade soil. The permeable material encapsulated in geotextile fabric will provide a dry and stable working platform for embankment or drainage structure construction.

All temporary cut slopes shall conform to Cal OSHA guidelines, and shall not exceed 1:1 slope inclinations. Permanent cut and fill slopes shall not exceed 2:1 slope angles.

Closure

Standard Special Provision S5-280, "Project Information", discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The Department makes the following supplemental project information available:

Supplemental Project Information

Means	Description
Included in the Information Handout	Foundation Report for the Retaining Wall No. 2 dated September 16, 2010.
Available for inspection at the District Office	
Available for inspection at the Transportation Laboratory	
Available for inspection at _____; telephone (___) - ___	
Available as specified in the Standard Specifications	
Available at: http://www.dot.ca.gov/hq/esc/oe/weekly_ads/index.php	

Items listed to be included in the Information Handout will be provided in Acrobat (.pdf) format to the Addressee of this report via electronic mail.

The recommendations contained in this report are based on specific project information that has been provided by Office of Design II, Branch A. If any conceptual changes are made during final project design, the Office of Geotechnical Design – North, Branch D should review those changes to determine if the recommendations contained in this report are still applicable. Any questions regarding the recommendations contained herein should be directed to the attention of Dan Appelbaum, (805) 549-3745, or Mike Finegan, (805) 549-3194, at the Office of Geotechnical Design – North, Branch D.

REGISTERED PROFESSIONAL ENGINEER
D.L. Appelbaum
No. C 50001
Exp. 6-30-11
CIVIL
STATE OF CALIFORNIA

DANIEL L. APPELBAUM, PE
Transportation Engineer
Geotechnical Design – North
Branch D

Supervised by,

MICHAEL S. FINEGAN, PE, Chief
Geotechnical Design - North
Branch D

c: Roy Bibbens / GDN File (E-copy)
John Luchetta – Project Manager (E-copy)
Mark Willian – GS Corporate (E-copy)
R.E. Pending File
Doug Lambert – District Materials Engineer (E-copy)
Job File / Branch D Records

LIST OF ATTACHMENTS

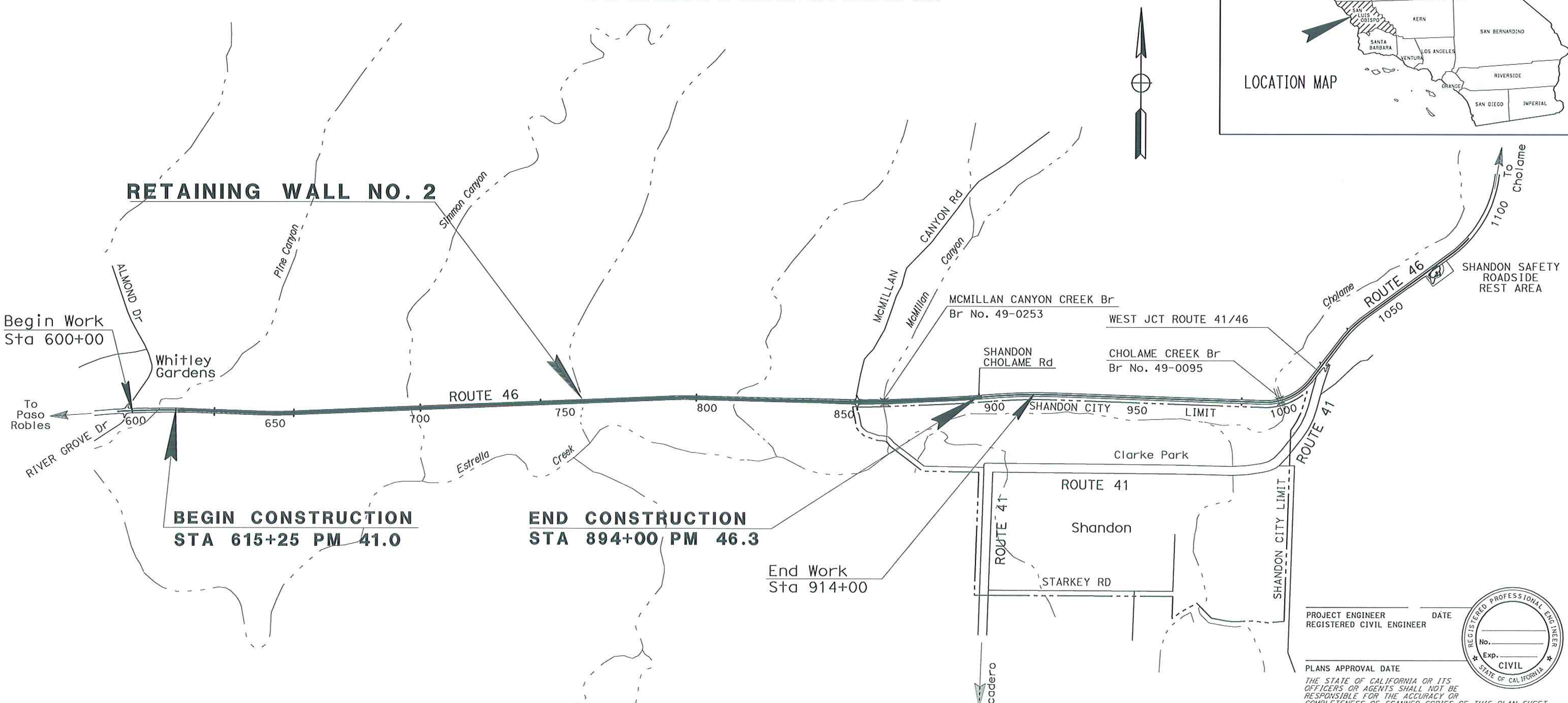
INDEX OF PLANS

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON
STATE HIGHWAY
IN SAN LUIS OBISPO COUNTY
NEAR PASO ROBLES
FROM 0.1 MILE EAST OF ALMOND DRIVE TO 0.8 MILE EAST OF McMILLAN CANYON ROAD

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2006



NO SCALE

ATTACHMENT 1: VICINITY MAP

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

PROJECT MANAGER: JOHN LUCHETTA

DESIGN ENGINEER: JACK WALKER

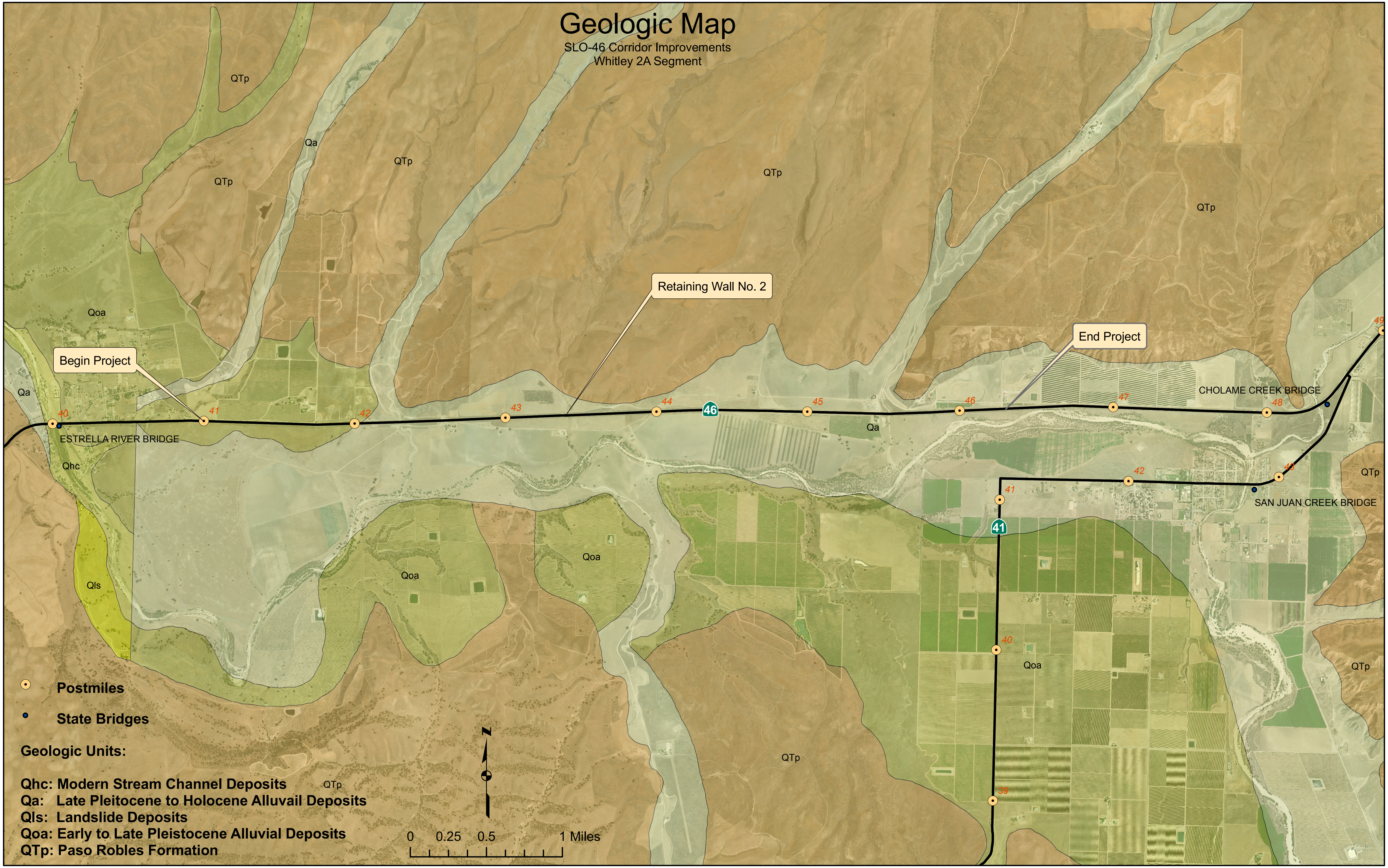
PROJECT ENGINEER
REGISTERED CIVIL ENGINEER
DATE

REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

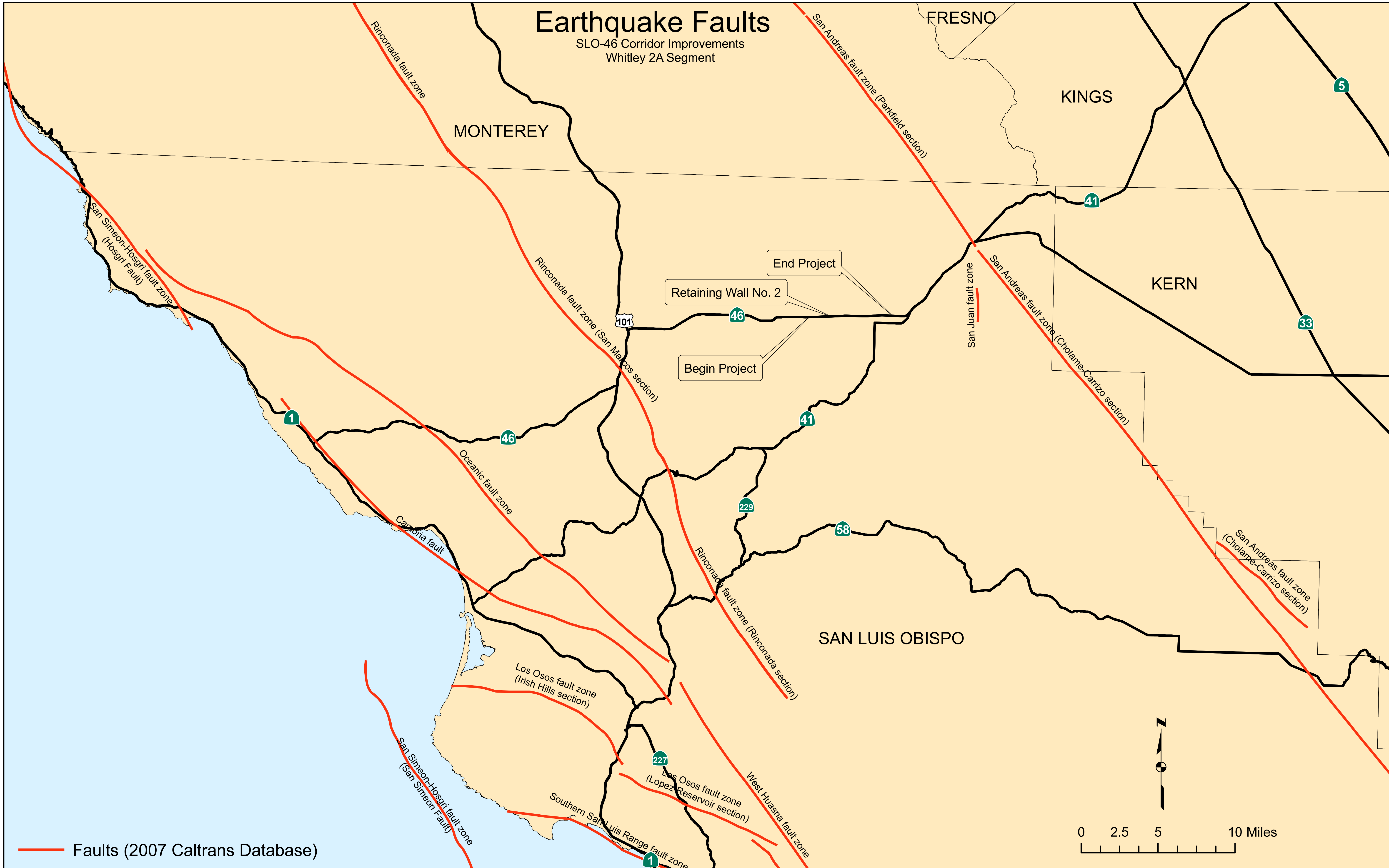
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

CONTRACT No.	05-330774
PROJECT ID	0500020049



Geologic Mapping Compiled by Lew Rosenberg

ATTACHMENT 2



ATTACHMENT 3

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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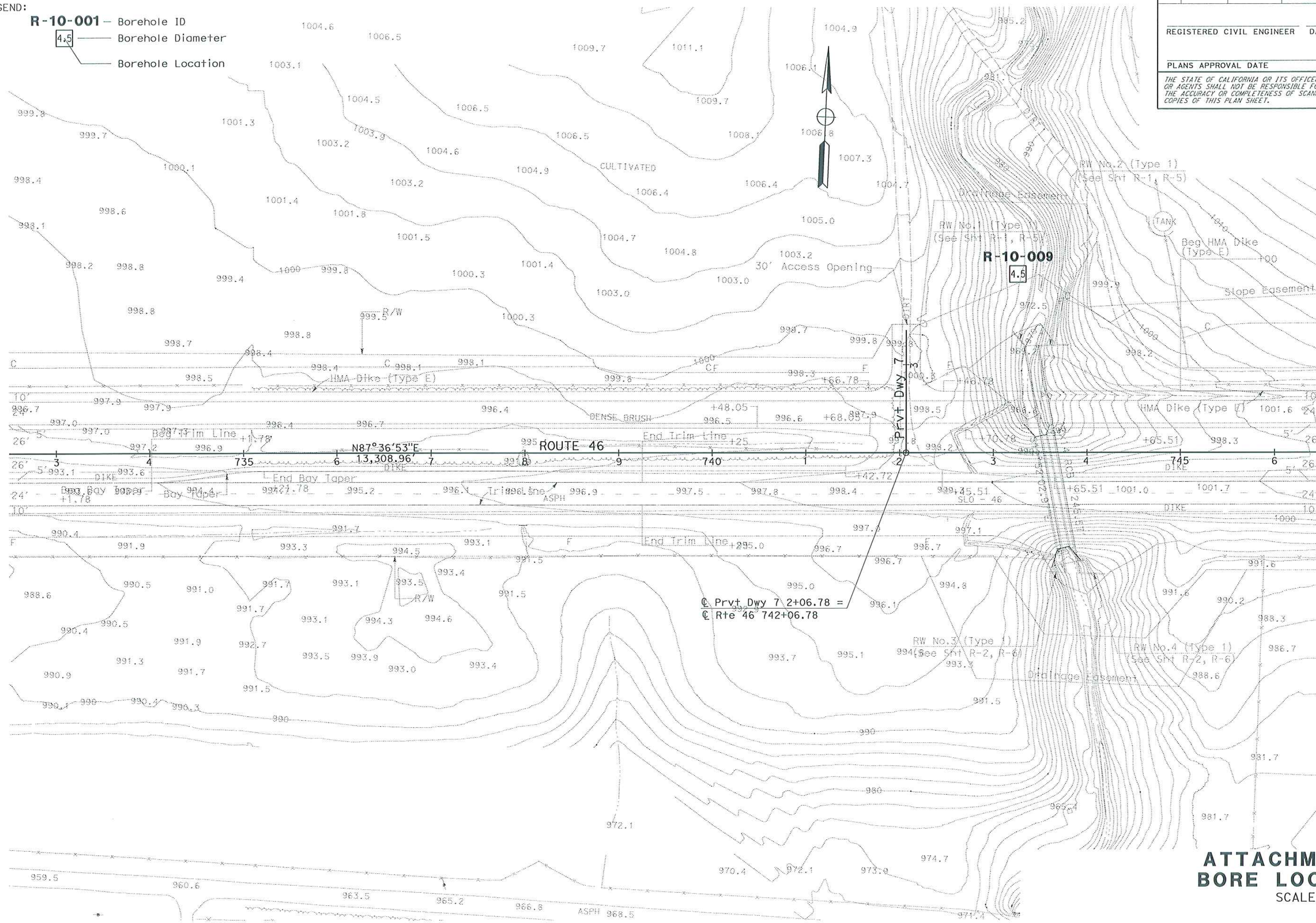
REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

LEGEND:

R-10-001 — Borehole ID

4.5 — Borehole Diameter

Borehole Location



ATTACHMENT 4
BORE LOCATION

SCALE: 1" = 100'

BL-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans GEOTECHNICAL DESIGN

FUNCTIONAL SUPERVISOR

MIKE FINEGAN

CALCULATED-DESIGNED BY

CHECKED BY

REVISED BY

DATE REVISED

BORING RECORD

05-SLO-46- 41.0/46.3

EA: 05-330771, Project ID: 0500020049

ATTACHMENT 5

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
S Heredia	**5-18-10**	**5-18-10**	**35° 39' 40.1004" / -120° 27' 2.9653" WGS84**	**R-10-009**
DRILLING CONTRACTOR **Caltrans**			BOREHOLE LOCATION (Offset, Station, Line) **190.00' Lt Sta 743+26RTE 46**	SURFACE ELEVATION **978.6 ft NGVD29**
DRILLING METHOD **Rotary Wash**			DRILL RIG **Acker MP8**	BOREHOLE DIAMETER **4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID) **Other, SPT (1.4")**			SPT HAMMER TYPE **Boart/Longyear Automatic 140#, 30" drop**	HAMMER EFFICIENCY, ERi **74%**
BOREHOLE BACKFILL AND COMPLETION **Installed Open-standpipe Observation Well**			GROUNDWATER READINGS DURING DRILLING; AFTER DRILLING (DATE) **21.8 ft on5-25-10**	TOTAL DEPTH OF BORING **62.8 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Remarks
	0	Lean CLAY with SAND (CL); stiff; dark grayish brown; dry to moist; mostly medium plasticity fines; few fine SAND.				
	1					
976.59	2					
	3					
974.59	4		1	2 2 3	5	
	5					
972.59	6					
	7	Trace fine GRAVEL; PP=1.5 tsf.	2	2 4 6	10	
970.59	8					
	9	SANDY SILT (ML); medium dense; olive; dry; mostly nonplastic fines; some fine SAND.	3	4 10 10	20	
968.59	10					
	11	SILTY CLAY (CL-ML); hard; olive gray; moist; mostly low plasticity fines.	4	10 19 21	40	
966.59	12					
	13		5			
964.59	14	SILTY SAND (SM); very dense; olive; moist; mostly fine SAND; some nonplastic fines.				
	15					
962.59	16	From medium to fine SAND.	6	15 22 28	50	
	17					
960.59	18		7			
	19	Well-graded SAND (SW); very dense; olive; moist; mostly SAND, from coarse to fine, subangular; trace fine subangular GRAVEL.				
958.59	20					
	21	Well-graded SAND with SILT and GRAVEL (SW-SM); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular; little fine subangular GRAVEL; few nonplastic fines.	8	16 20 28	48	
956.59	22					
	23		9			
954.59	24	Well-graded SAND with GRAVEL (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine,				
	25					

Column headers also include: Material Graphics, Sample Location, Recovery (%), RQD (%), Moisture Content (%), Dry Unit Weight (pcf), Shear Strength (tsf), Drilling Method, Casing Depth.

(continued)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	25	subangular; little fine subangular GRAVEL; trace nonplastic fines. Well-graded SAND with GRAVEL (SW) *(continued)*.	9								
952.59	26	Well-graded SAND (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular; trace fine subangular GRAVEL; trace nonplastic fines.	10	21 28 28	56						
	27										
950.59	28	SILT with SAND (ML); dense; olive gray; moist; mostly low plasticity fines; little fine SAND.	11								
	29										
948.59	30										
	31		12	12 16 24	40						
946.59	32										
	33		13								
944.59	34										
	35	Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.									
942.59	36		14	27 46 50/5"	96/11						
	37										
940.59	38		15								
	39										
938.59	40										
	41	Well-graded SAND (SW); very dense; olive; moist; mostly SAND, from coarse to fine.	16	24 50/5"	50/5						
936.59	42		17								
	43										
934.59	44	SILTY SAND (SM); very dense; pale yellow; moist; mostly fine SAND; some nonplastic fines.									
	45										
932.59	46		18	24 50/5.5"	50/6						
	47		19								
930.59	48										
	49	Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.									
928.59	50										
	51	SILTY SAND (SM); very dense; pale yellow; moist; mostly fine SAND; some nonplastic fines.	20	40 50/5"	50/5						
926.59	52		21								
	53										
924.59	54										
	55										

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		SILTY SAND (SM) *(continued)*.		21										
922.59	56														
	57				22	20 41 50/4"	91/10								
920.59	58				23										
	59		Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.												
918.59	60														
	61		Lean CLAY (CL); hard; brown; moist; mostly medium plasticity fines; PP=4.5 tsf.												
916.59	62				24	8 11 18	29								
	63														

Bottom of borehole at 62.8 ft bgs

Installed Open-standpipe Observation Well 5/18/2010

ELEVATION (ft)	DEPTH (ft)
914.59	64
	65
912.59	66
	67
910.59	68
	69
908.59	70
	71
906.59	72
	73
904.59	74
	75
902.59	76
	77
900.59	78
	79
898.59	80
	81
896.59	82
	83
894.59	84
	85

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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LEGEND

XXXX STANDARD PLAN No.

RSP

DRAINAGE SYSTEM No.

NOTES:

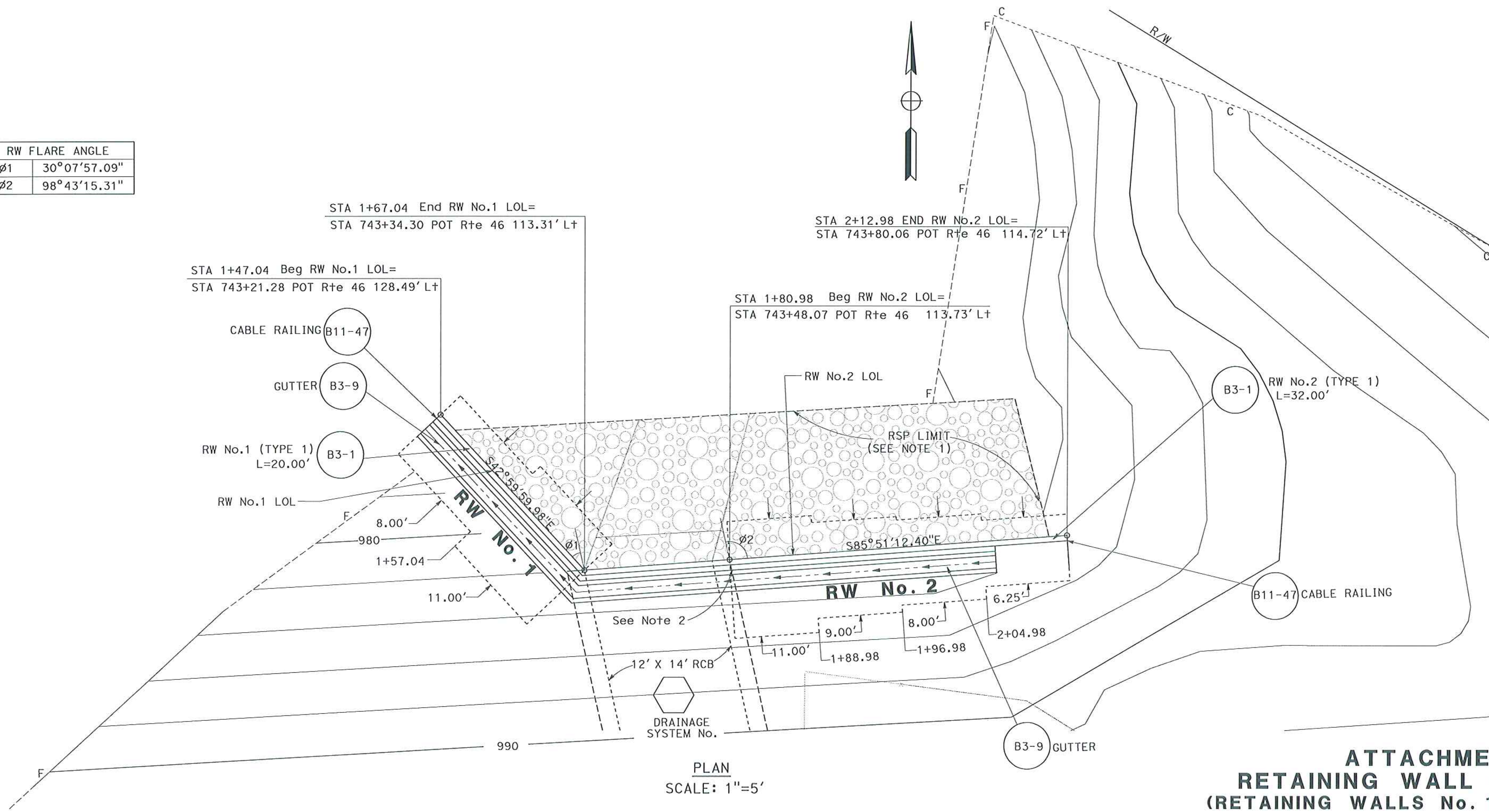
1. FOR RSP LIMITS, SEE DRAINAGE PLANS.
2. SEE STANDARD PLAN D84 FOR CONNECTION OF RCB TO RETAINING WALLS.
3. FOR DETAILS NOT SHOWN, SEE STANDARD PLANS.

ABBREVIATIONS:

RW RETAINING WALL

DRAFT: SUBJECT TO CHANGE

RW FLARE ANGLE	
ø1	30°07′57.09"
ø2	98°43′15.31"



PLAN
SCALE: 1"=5′

THIS PLAN IS ACCURATE FOR RETAINING WALL WORK ONLY.

ATTACHMENT 6
RETAINING WALL PLAN
(RETAINING WALLS No. 1 & 2)
R-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
06 DESIGN
FUNCTIONAL SUPERVISOR JACK WALKER
CALCULATED-DESIGNED BY WHECHIN LIU
CHECKED BY SUMI HOODE
REVISED BY
DATE REVISED
LAST REVISION

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans®
06-DESIGN

FUNCTIONAL SUPERVISOR	CALCULATED-DESIGNED BY	CHECKED BY	REVISED BY	DATE REVISED
JACK WALKER	WHECHIN LIU	SUMI HOODE		

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

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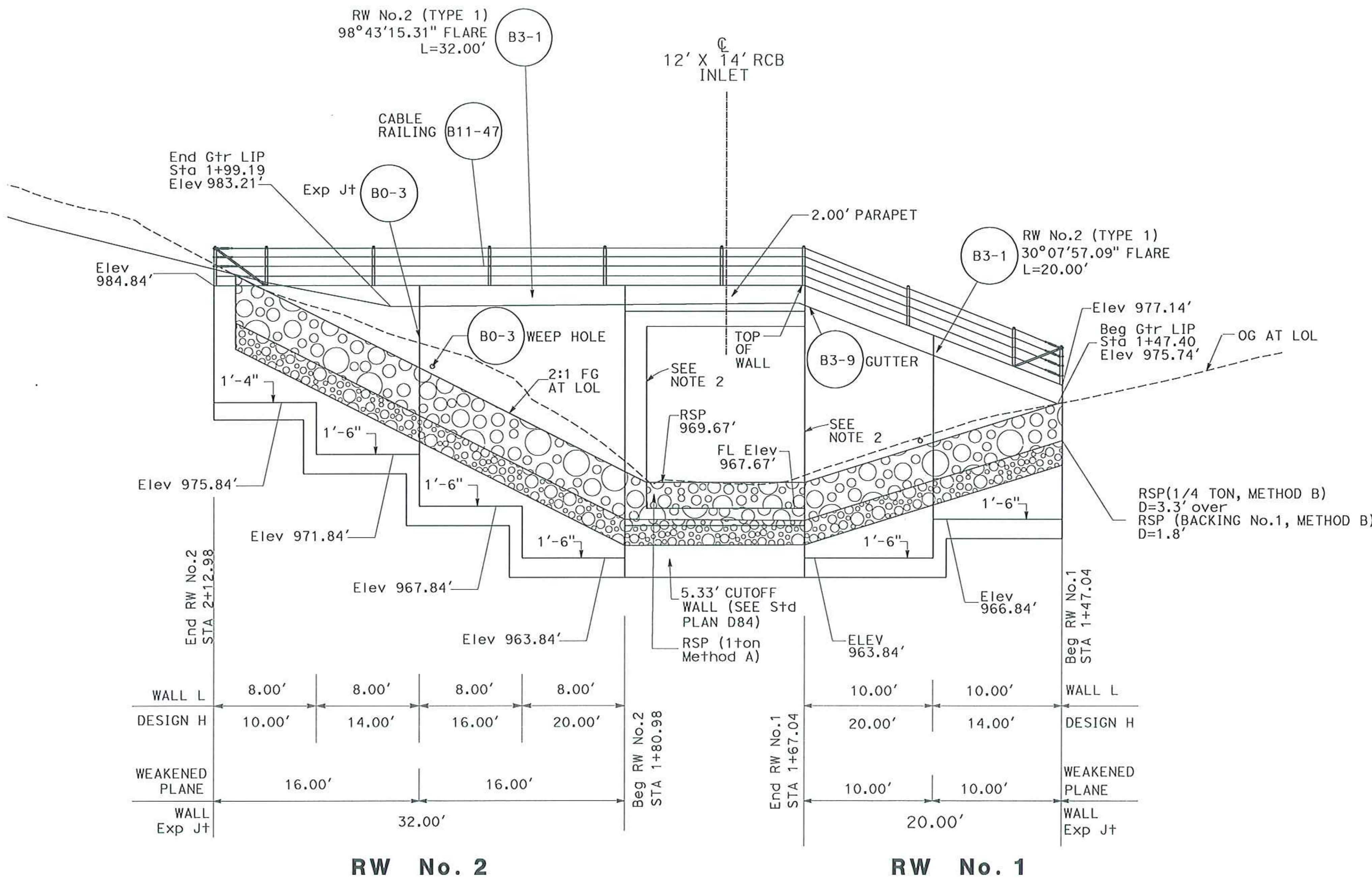
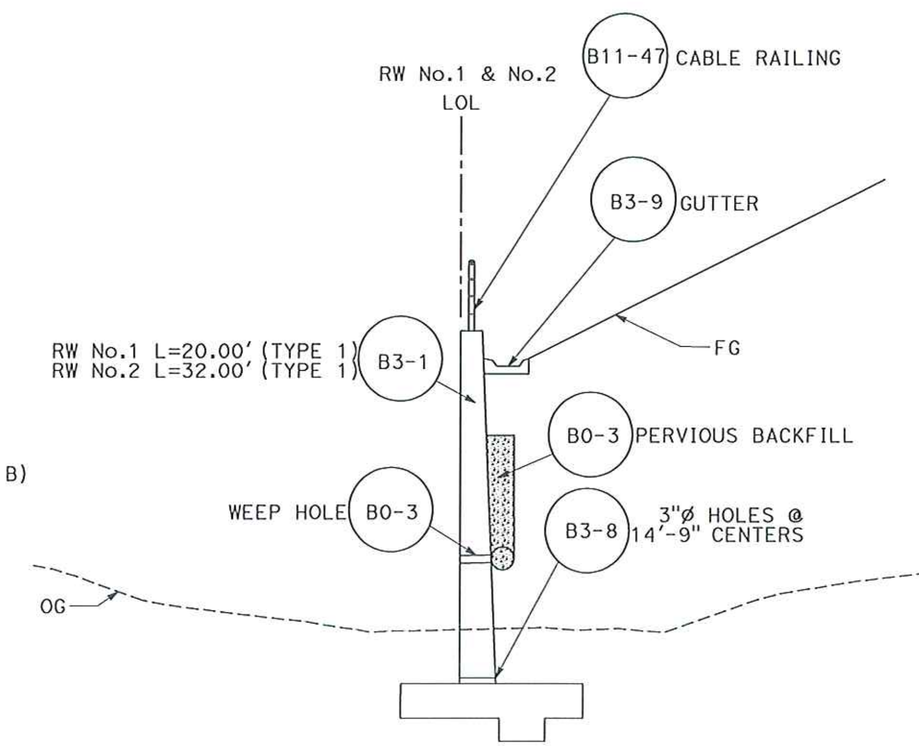
REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

DRAFT: SUBJECT TO CHANGE





RW No.1 & No.2 TYPICAL SECTION

NO SCALE

THIS PLAN IS ACCURATE FOR RETAINING WALL WORK ONLY.

ATTACHMENT 7
RETAINING WALL DETAILS
(RETAINING WALLS No.1 & No.2)
R-3

FOR CONTRACT NO.: 05-330774

MATERIALS INFORMATION

Foundation Report-Retaining Wall 3, dated September 20, 2010

ROUTE: 46-SLO-40.7/46.3(PM)

Memorandum *Flex your power!*

Be energy efficient!

To: JACK R. WALKER
Senior Design Engineer
Office of Design II, Branch A
Central Region – District 6

Attn: Jose Arguello, Project Engineer

Date: September 20, 2010

File: 05-330771 (0500020049)
05-SLO-46-41.0/46.3
Whitley 2A Segment
Retaining Wall No. 3

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

Subject: Foundation Report

Scope of Work

A Foundation Report (FR) is provided for the above referenced project per your request dated April 6, 2010. The proposed improvements are part of the Whitley 2A Segment of the SLO-46 Corridor Improvement Project, which proposes to convert SR 46 east of Route 101 from a two-lane conventional highway to a four-lane expressway in San Luis Obispo County. Retaining Wall No. 3 will be constructed to serve as a wing wall to a 12' by 14' reinforced concrete box culvert at Station 743+61.36. One rotary wash boring was drilled approximately 318 feet from the retaining wall layout line in May 2010 and a hand-auger hole was drilled on the retaining wall layout line in September 2010 to provide information for this report.

Project Description

Route 46 in the project area is a two-lane conventional highway with 12-foot travel lanes and shoulders ranging in width between 4 feet and 8 feet. Route 46 is one of the few east-west routes connecting Interstate 5 and U.S. Highway 101, and is a vital link between the Central Coast and Central Valley areas of California. The route primarily serves interregional and interstate traffic, although it is used daily by residents of the communities of Paso Robles, Cholame, Shandon, and Whitley Gardens. It is the only east-west route between Route 166 to the south and Route 156/152 to the north that can facilitate the movement of goods by truck.

It is proposed to convert Route 46 in the project area to a four-lane divided expressway by constructing two new lanes on a parallel alignment to the existing lanes. Between Route 46 Centerline Station 615+25 and Station 646+22 the new lanes will be constructed to the south of the existing lanes. Between approximately Station 666+00 and Station 894+00 the new lanes will be constructed to the north of the existing lanes. The horizontal alignment will transition the new lanes from south to north of the existing lanes between Station 646+22 and Station 666+00.

The existing lanes will be rehabilitated, and vertical curve corrections will be constructed as necessary to improve sight distance. The completed roadway will have a 5-foot inside shoulder, two 12-foot lanes, and a 10-foot outside shoulder for each direction of travel. Median width will typically measure 62 feet. Turn channelization will be provided to access the rural roads and most of the driveways that intersect the highway.

Construction of a Standard Plan Type 1 Retaining Wall is proposed from 127.17 feet right of CL Route 46 Station 743+57.25 to 127.75 feet right of CL Route 46 Station 743+77.24. The maximum design height of the wall will be 20 feet and the length of the wall will be approximately 20 feet, measured along the wall layout line. Refer to the attached layout, cross sections, and elevation view provided by Design for the location of the proposed structure and its dimensions.

The following datum were used to reference horizontal and vertical positions of the proposed structure:

- Horizontal: North American Datum of 1983 (NAD83(92))
- Vertical: National Geodetic Vertical Datum of 1929 (NGVD29)

Pertinent Reports and Investigations

The following publications were used to assist in the assessment of site conditions:

1. *Caltrans ARS Online*.

2. *Environmental Assessment/Draft Environmental Impact Report: Route 46 Corridor Improvement Project, San Luis Obispo County, District 5-SLO-46-KP51.8/90.6*, Caltrans, July 2002.

3. *Geologic Map of the San Luis Obispo County, California*, Compiled by Lew Rosenberg.

4. *Geotechnical Impact of Proposed Project: US Route 46 Widening, San Luis Obispo County, 05-SLO-46-32.2/36.4*, PSC Associates, Inc., 1992.

5. *Geotechnical Services Design Manual, Version 1.0,* Division of Engineering Services, August 2009.

6. *Route 46/41 Interchange Seismic Hazard Report*, Caltrans, John D. Duffy, 2000.

Site Geology and Subsurface Conditions

Topography and Geology

The project is located near the southern end of the Salinas Valley in the Coast Ranges geomorphic province. The terrain consists of dissected plains surrounded by low to moderately steep hills. The westerly flowing Estrella River is the main drainage feature in the project area. It lies to the south of Route 46 through the project limits. The Estrella River is a tributary to the Salinas River, which drains to Monterey Bay northwest of the project area.

The region is divided into three geologic blocks separated by the San Andreas Fault and the Sur-Naciemento Fault Zone. The Diablo Range is in the block located northeast of the San Andreas Fault. The Gabilan Range and the Salinas Valley are located in the central block. The Santa Lucia Range is located in the western block. "Basement" rocks in the western and eastern blocks consist of Franciscan Assemblage rocks and a complex of metamorphic units. Granitic intrusions form the bedrock in the central block, beneath the project area.

Pre-Cretaceous age rocks of the Sur Series are the oldest rocks in the area. These have been intruded by Cretaceous-age granite or granodiorite. This metamorphic-granitic complex is confined to the central fault block, beneath the Salinas Valley and Gabilan Range. Sedimentary rock formations and some volcanic units were deposited on top of the basement rocks during the Cretaceous and Tertiary Periods. Subsequently, during the Quaternary Period, clastic sediments were deposited primarily in marine/transgression environments, which alternated with periods of uplift/regression during which erosion and subareal deposition occurred. The latest uplift (and/or drop in sea level) occurred in Late Pliocene to Mid-Pleistocene time, leaving the sediments at nearly their present-day elevations. Some of these formations have been folded and faulted by the same compressive forces that produced the San Andreas Fault system. Present-day topographic surface features and drainage patterns were established by Mid-Pleistocene time.

Dibblee (1971) mapped the bedrock beneath the project area as granitic rock ("gr"≅quartz granodiorite), which intruded and crystallized during Cretaceous time, 60 to 80 million years ago. Paso Robles Formation ("Q_{Tp}"), deposited in Late Pliocene and early Pleistocene time (2 to 3 million years ago), overlies the granitic bedrock. The Paso Robles Formation consists of easily eroded sands and gravels with lesser amounts of silts and clay, deposited by running water. The formation varies in thickness, from a few feet thick on top of the granitic ridges west of Paso Robles, up to several hundred feet thick along the existing Route 46 alignment in the eastern portion of the project area. Bedding within the Paso Robles Formation is not usually apparent. However, the few available exposures suggest that bedding dips generally toward the north at low angles (1 to 2 degrees): Dibblee mapped the axis of a gentle anticline southwest of the project area.

Old river terrace deposits ("Q_a" and "Q_{oa}"), composed of granitic gravel, sand, silt, and clay, line the sides of some of the stream valleys that cross the highway alignment near the Estrella River. Younger alluvial deposits ("Q_{rs}") composed of gravel, sand, silt, and clay have been deposited along the modern drainage courses.

Soil Conditions

Boring R-10-009, located 190' left of Route 46 centerline Station 743+26, was drilled to a depth of 62.8', which corresponds to elevation 915.8 feet. The geotechnical boring encountered interbedded layers of sand, silty sand, sand with gravel, lean clay, and sandy clay. The observed stratigraphy is consistent with geologic maps for the area, which show Pleistocene aged alluvial soils of the Paso Robles formation overlain by more recent alluvial deposits from the drainages. Stratigraphy comprised of layers of variable thickness and lateral extents are indicative of the alluvial environment in which they were deposited. Particle size distribution, layer thickness, and lateral extent of deposition change as the velocity of water depositing the materials varies.

Hand-auger boring HA-10-001, located on Retaining Wall LOL at approximately Station 1+76, was advanced to a depth of 3.5 feet, whereupon further drilling by hand methods was impossible. The boring encountered hard lean clay through its entire depth.

Ground Water

Boring R-10-009 was instrumented as a short term open-standpipe monitoring well by installing 1½" slotted PVC pipe in the open borehole with no sand backfill. Depth to ground water was measured one week after completion of the drilling, and the well was abandoned by removing the pipe and backfilling the hole with bentonite chips. Ground water was measured 21.8 feet below original ground on May 25, 2010, corresponding to an elevation of 956.8 feet.

Corrosion Evaluation

Soil samples were obtained from hand-auger borings along the retaining wall alignment and sent to the District 5 Laboratory for corrosion analysis. Test results were not available at the time this report was written. Corrosion test results on soils from nearby sections of Route 46, however, suggest that the project site is likely non-corrosive. Reporting of site-specific corrosion potential will be conveyed in separate correspondence when test results become available.

Seismic Recommendations

The project is located within a seismically active region of California. There are several earthquake faults in close proximity to the project area. Table 1 lists the active and potentially active faults in the project vicinity as described in Caltran's *2007 Fault Database*.

Corresponding Moment Magnitudes and distance to the retaining wall site are also given. A fault map is included in the attachments to this report.

Table 1: Active and Potentially Active Faults

Fault	*Moment Magnitude of Maximum Credible Earthquake*[1]	*Distance to Fault from Project Area (miles)*
Rinconada Fault Zone (San Marcos section)	7.5	16.5
Oceanic Fault Zone	7.4	26.2
San Andreas Fault Zone (Parkfield section)	7.9	7.7
West Huasna Fault Zone	7.0	27.3
San Simeon-Hosgri Fault Zone (San Simeon Fault)	7.5	40.3
Cambria Fault	7.0	27.4
Los Osos Fault Zone (Irish Hills section)	7.0	32.3
Los Osos Fault Zone (Lopez Reservoir section)	7.0	34.2
Southern San Luis Range Fault Zone	7.2	38.5
San Simeon-Hosgri Fault Zone (Hosgri Fault)	7.5	44.7

Peak ground acceleration (PGA) in the project area due to an earthquake along one of the nearby faults was estimated using the *2009 Caltrans Seismic Design Procedure.* The procedure was developed to calculate the minimum seismic design requirements for bridges on State highways. The method calculates design response spectra over a range of periods. The design response spectrum is based on the envelope of a deterministic and a probabilistic spectrum. The deterministic spectrum is calculated as the arithmetic average of median response spectra computed using the Chiou & Youngs and Campbell & Bozorgnia ground motion prediction equations (CY-CB GMPE). These equations are applied to all faults in or near California considered to be active in the last 700,000 years (late Quaternary age) and capable of producing a moment magnitude earthquake of 6.0 or greater.

The probabilistic spectrum is obtained from the 2008 USGS Seismic Hazard Map for the 5% in 50 years probability of exceedance (or 975 year return period). The spectral values are adjusted with a soil amplification factor based on an average of the Boore-Atkinson (2008), Campbell Bozorgnia (2008), and Chiou-Youngs (2008) ground motion prediction models. For sites underlain by soils having an average shear wave velocity for the upper 30 meters of soil (V_{S30}) of

[1] According to Caltrans *2007 Fault Database*

less than 300 meters per second, the 2009 USGS Probabilistic Seismic Hazard Analysis Interactive Deaggregation Tool is used to develop the probabilistic spectrum.

The controlling fault at the retaining wall location is the San Andreas Fault zone (Parkfield section), a right lateral slip strike fault with a maximum magnitude of 7.9. The peak ground acceleration at the location of Retaining Wall No. 3 is estimated to be 0.58 g (gravity). The probabilistic spectrum with a soil amplification factor for a V_{S30} of 300 meters per second governed the design response spectrum. The V_{S30} value was generated using correlations to Standard Penetration Test (SPT) blow counts.

The Seismic Hazard Report prepared for another section of the Highway 46 Corridor Improvement Project predicts an average recurrence interval of 21.5 years for an earthquake along the Parkfield segment of the San Andreas Fault zone. Therefore, there is a high likelihood of an earthquake occurring during the design life of this project, though probably of a lesser magnitude than the 7.9 maximum credible magnitude. Historically, earthquakes ranging in magnitude between 5 and 6 are the typical "major" events along the Parkfield segment of the San Andreas Fault zone.

No known active or potentially active faults project towards or cross the highway alignment within the project limits. Therefore, there is low potential for surface fault rupture to occur and no mitigation efforts are necessary.

Liquefaction is a near-total loss of soil strength due to an increase in pore water pressure during cyclic loading, such as occurs during an earthquake. Loose cohesionless soils that may become saturated due to a high water table may liquefy during an earthquake. Embankments founded on liquefiable soils may be subject to slope instability and settlement during an earthquake event. Similarly, earth-retaining structures may settle or overturn should the soils beneath them liquefy.

Liquefaction potential at the location of Retaining Wall No. 3 should be low. For liquefaction to occur, three ingredients in combination are necessary: loose granular soils, saturated soil conditions, and strong ground shaking. All of the cohesionless soils that were encountered at an elevation where they may become saturated by ground water were found to be in a very dense condition. Therefore, even in the event of an earthquake, liquefaction is unlikely to occur.

Foundation Recommendations

Construction of a Standard Plan Type 1 Retaining Wall is recommended at the outlet to the proposed 12' X 14' reinforced concrete box culvert at Station 743+61.36 to retain the embankment soil at that location. The maximum retained height of the wall will be approximately 20 feet under loading condition Case II (refer to Caltrans Standard Plans).

Foundation soil bearing capacity was calculated using Hansen's method. Strength parameters for cohesionless soils were calculated using friction angle correlations to SPT blow counts. Strength parameters for cohesive soils were estimated using pocket penetrometer measurements of unconfined compression strength. Because geotechnical boring R-10-009 was so far from the retaining wall layout line and the lateral extent of the soils layers was not known, bearing capacity was conservatively calculated using the strength parameters of the weakest soil encountered in the subsurface exploration.

Footing dimensions and corresponding allowable bearing pressures are presented in the following table. Refer to Caltrans Standard Plans for details of construction.

Table 2: Spread Footing Data for Standard Plan Type 1 Retaining Wall

Retaining Wall No. 3 Station Limits (feet)	Minimum Footing Width	Minimum Bottom of Footing Elevation (feet)	Toe Pressure (Case II)[2]	Allowable Bearing Pressure (q_{all})
Station 1+46.29 to Station 1+56.29	8'-0"	960.94	3.3 ksf	5.8 ksf
Station 1+56.29 to Station 1+66.29	11'-0"	954.94	4.7 ksf	6.0 ksf

In accordance with section 4.4.5.1, "Minimum Embedment and Bench Width," of the Bridge Design Specifications, the minimum footing embedment shall be 3 feet, measured from the bottom of the footing.

Elastic settlement in cohesionless soils was calculated using Hough's Method, which correlates soil grain size distribution and SPT values with a bearing capacity factor that is used in a settlement equation. Settlement of the cohesive soil layers was neglected in the calculation of total settlement because the cohesive soils underlying the site are highly over-consolidated, and settlement of the layers is expected to be minimal. Calculated settlement is summarized in the following table. Both the total and the differential settlement are within tolerable limits for reinforced concrete construction.

[2] Per Standard Plan B3-1, May 2006

Table 3: Calculated Settlement for Standard Plan Type 1 Retaining Wall

Retaining Wall No. 3 Station Limits (feet)	Settlement (inches)
Station 1+46.29 to Station 1+56.29	0.19
Station 1+56.29 to Station 1+66.29	0.46

Slope Stability

Global slope stability is not considered to be an issue for Retaining Wall No. 3. The retaining wall will be built at the foot of an embankment slope, with relatively flat terrain in front of the wall. Construction of the retaining wall will force potential failure surfaces deep, beneath the wall footing, since failure surfaces cannot go through the wall. Slope stability analyses using the calculated strength parameters for the foundation soil indicate that the deep failure surfaces all have a high factor of safety against sliding.

Construction Considerations

The bottom of footing elevation for the segment of Retaining Wall No. 3 between LOL Station 1+56.29 and LOL Station 1+66.29 is below the ground water elevation measured on May 25, 2010. Therefore, it is highly likely that ground water will be encountered during construction. The contractor should anticipate having to dewater the excavation for the footing before and during the concrete pour.

The foundation soils at the site of the proposed retaining wall appear adequate to support the structure. Localized areas of unconsolidated or saturated foundation materials, however, may require stripping and recompaction, or removal of material deemed unsuitable. If saturated or otherwise unsuitable material is encountered to a depth where it cannot be economically removed, it is recommended that the material be sub excavated 18 inches and replaced with Class 3 Permeable Material encapsulated in an AASHTO specification M288, Class 2 survivability geotextile. The permeable material will allow water to fill its pore spaces without a loss of strength. The geotextile fabric will act as a separator, preventing the soils above the fabric from filling the voids in the permeable material, and preventing the permeable material from penetrating the soft soils beneath the fabric. The geotextile will also serve to reinforce the subgrade soil. The permeable material encapsulated in geotextile fabric will provide a dry and stable working platform for embankment or drainage structure construction.

All temporary cut slopes shall conform to Cal OSHA guidelines, and shall not exceed 1:1 slope inclinations. Permanent cut and fill slopes shall not exceed 2:1 slope angles.

Closure

Standard Special Provision S5-280, "Project Information", discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The Department makes the following supplemental project information available:

Supplemental Project Information

Means	Description
Included in the Information Handout	Foundation Report for the Retaining Wall No. 3 dated September 20, 2010.
Available for inspection at the District Office	
Available for inspection at the Transportation Laboratory	
Available for inspection at _____; telephone (___) - ___	
Available as specified in the Standard Specifications	
Available at: http://www.dot.ca.gov/hq/esc/oe/weekly_ads/index.php	

Items listed to be included in the Information Handout will be provided in Acrobat (.pdf) format to the Addressee of this report via electronic mail.

The recommendations contained in this report are based on specific project information that has been provided by Office of Design II, Branch A. If any conceptual changes are made during final project design, the Office of Geotechnical Design – North, Branch D should review those changes to determine if the recommendations contained in this report are still applicable. Any questions regarding the recommendations contained herein should be directed to the attention of Dan Appelbaum, (805) 549-3745, or Mike Finegan, (805) 549-3194, at the Office of Geotechnical Design – North, Branch D.

Supervised by,

REGISTERED PROFESSIONAL ENGINEER
D.L. Appelbaum
No. C 50001
Exp. 6-30-11
CIVIL
STATE OF CALIFORNIA

DANIEL L. APPELBAUM, PE
Transportation Engineer
Geotechnical Design – North
Branch D

MICHAEL S. FINEGAN, PE, Chief
Geotechnical Design - North
Branch D

c: Roy Bibbens / GDN File (E-copy)
John Luchetta – Project Manager (E-copy)
Mark Willian – GS Corporate (E-copy)
R.E. Pending File
Doug Lambert – District Materials Engineer (E-copy)
Job File / Branch D Records

LIST OF ATTACHMENTS

INDEX OF PLANS

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

STATE OF CALIFORNIA

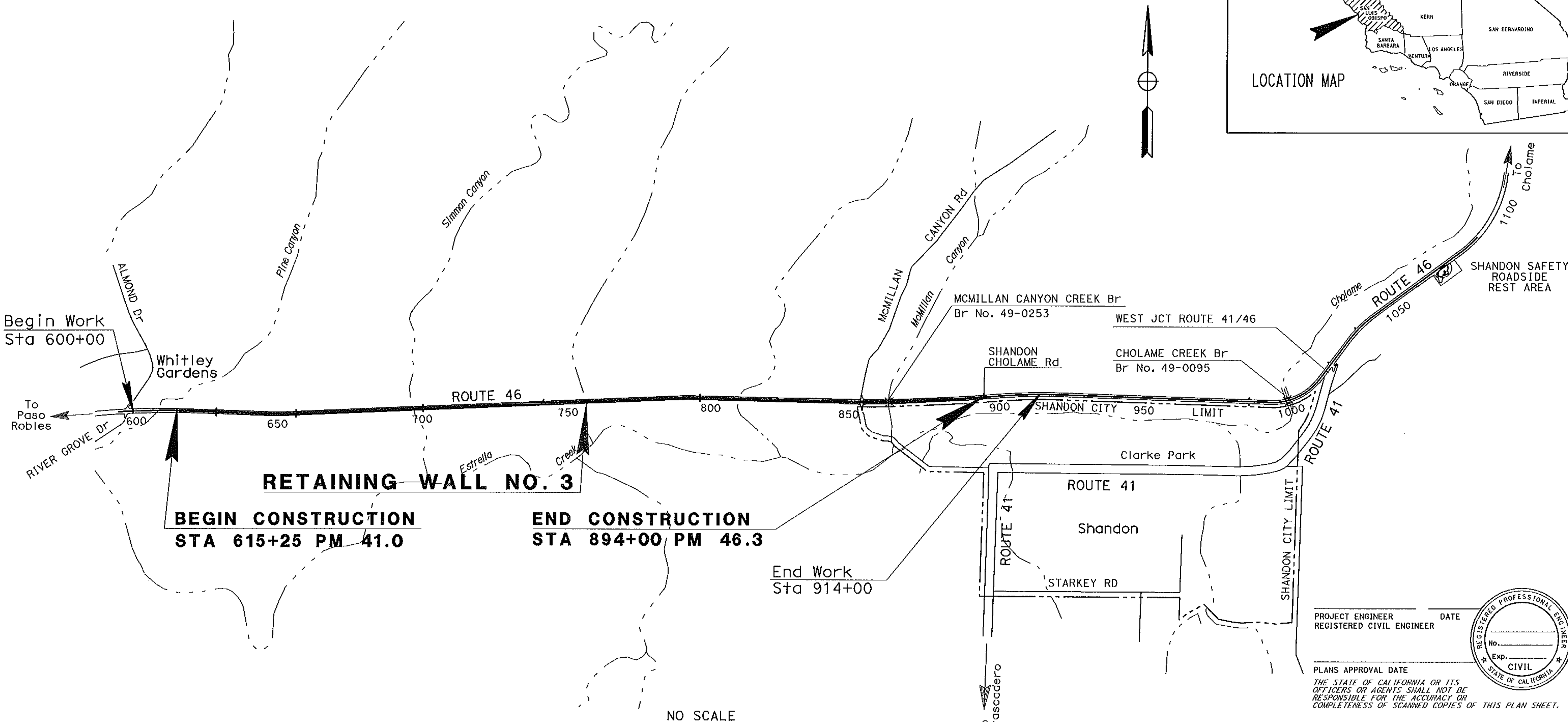
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON

STATE HIGHWAY

IN SAN LUIS OBISPO COUNTY
NEAR PASO ROBLES
FROM 0.1 MILE EAST OF ALMOND DRIVE TO
0.8 MILE EAST OF McMILLAN CANYON ROAD

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2006



NO SCALE

PROJECT ENGINEER REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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

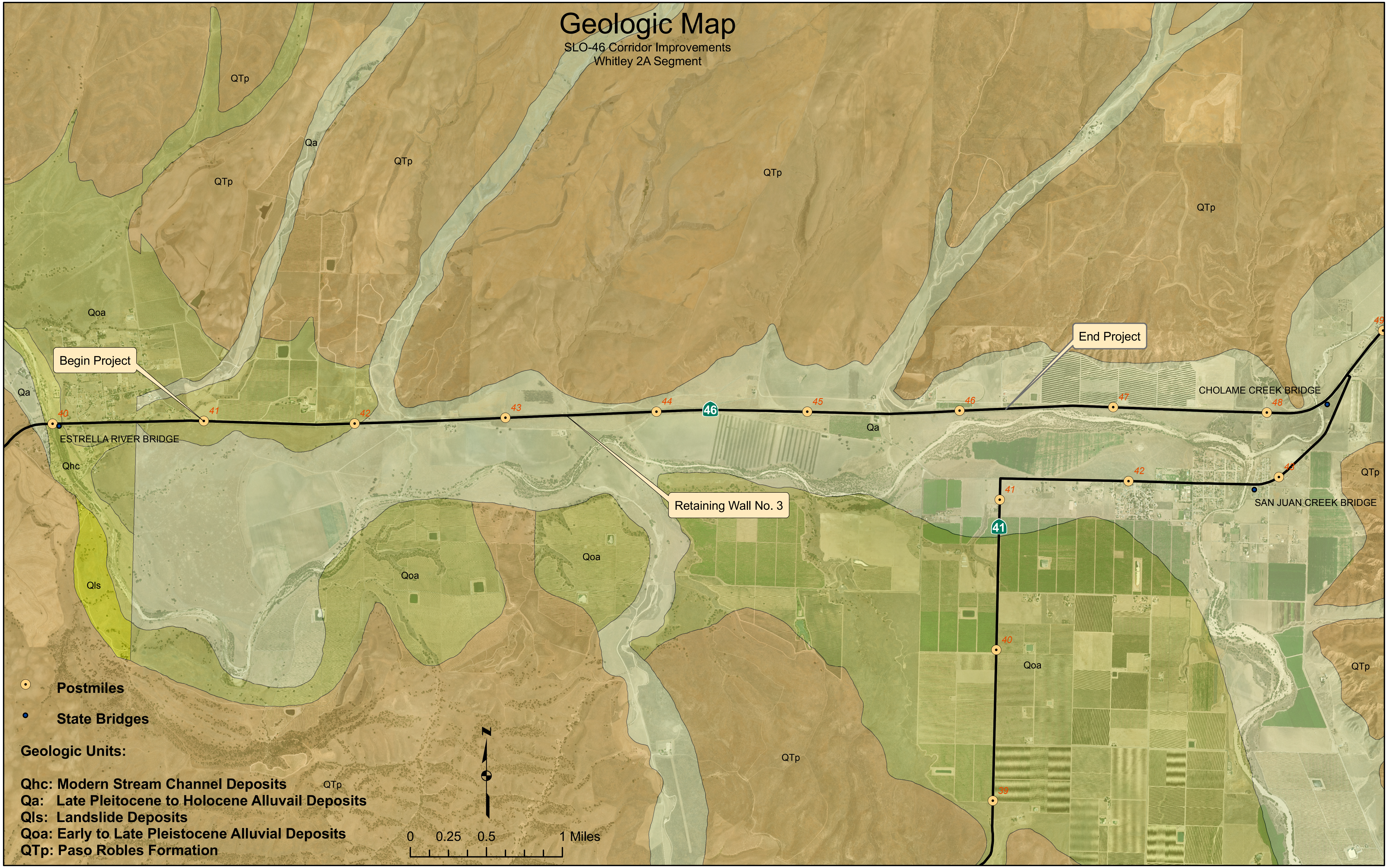
PROJECT MANAGER JOHN LUCHETTA

DESIGN ENGINEER JACK WALKER

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

ATTACHMENT 1: VICINITY MAP

CONTRACT No.	05-330774
PROJECT ID	0500020049



Geologic Mapping Compiled by Lew Rosenberg

ATTACHMENT 2

ATTACHMENT 3

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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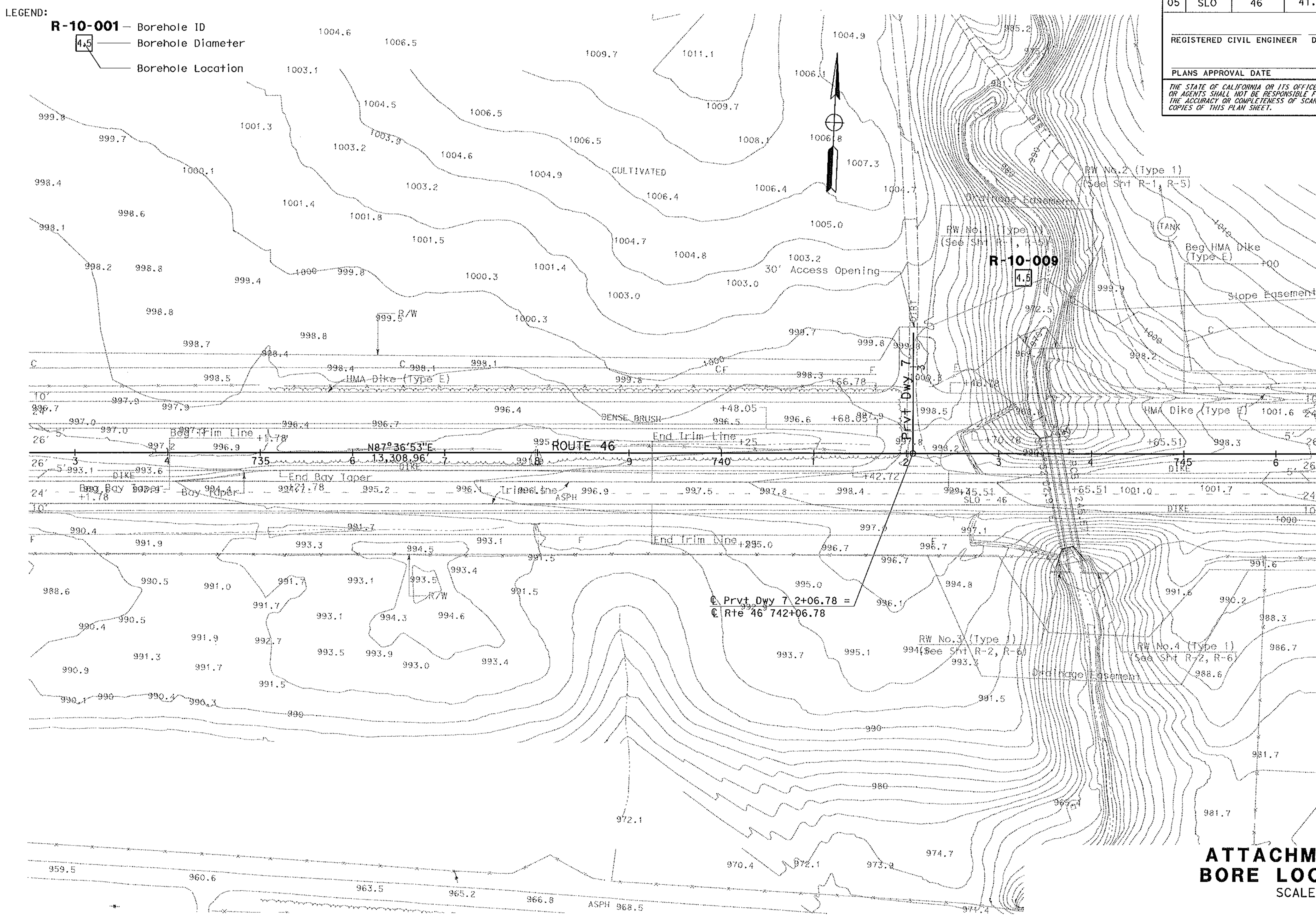
REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA



ATTACHMENT 4
BORE LOCATION
SCALE: 1" = 100'

BL-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans® GEOTECHNICAL DESIGN

FUNCTIONAL SUPERVISOR

MIKE FINEGAN

CALCULATED-DESIGNED BY

CHECKED BY

REVISED BY

DATE REVISED

BORING RECORD

05-SLO-46- 41.0/46.3

EA: 05-330771, Project ID: 0500020049

ATTACHMENT 5

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
S Heredia	**5-18-10**	**5-18-10**	**35° 39' 40.1004" / -120° 27' 2.9653" WGS84**	**R-10-009**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**190.00' Lt Sta 743+26RTE 46**	**978.6 ft NGVD29**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			**Acker MP8**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")			**Boart/Longyear Automatic 140#, 30" drop**	**74%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Installed Open-standpipe Observation Well			**21.8 ft on5-25-10**	**62.8 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY with SAND (CL); stiff; dark grayish brown; dry to moist; mostly medium plasticity fines; few fine SAND.												
	1														
976.59	2														
	3														
974.59	4				1	2 2 3	5								
	5														
972.59	6				2	2 4 6	10								
	7		Trace fine GRAVEL; PP=1.5 tsf.												
970.59	8														
	9		SANDY SILT (ML); medium dense; olive; dry; mostly nonplastic fines; some fine SAND.		3	4 10 10	20								
968.59	10														
	11		SILTY CLAY (CL-ML); hard; olive gray; moist; mostly low plasticity fines.		4	10 19 21	40								
966.59	12														
	13				5										
964.59	14		SILTY SAND (SM); very dense; olive; moist; mostly fine SAND; some nonplastic fines.												
	15														
962.59	16		From medium to fine SAND.		6	15 22 28	50								
	17														
960.59	18				7										
	19		Well-graded SAND (SW); very dense; olive; moist; mostly SAND, from coarse to fine, subangular; trace fine subangular GRAVEL.												
958.59	20														
	21		Well-graded SAND with SILT and GRAVEL (SW-SM); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular; little fine subangular GRAVEL; few nonplastic fines.		8	16 20 28	48								
956.59	22														
	23				9										
954.59	24		Well-graded SAND with GRAVEL (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine,												
	25														

(continued)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-10-009**
DIST.	COUNTY	ROUTE	POSTMILE	EA
05	**SLO**	**46**	**41.0/46.3**	**05-330771**
PROJECT OR BRIDGE NAME				
SLO-46 Corridor Improvements: Whitley 2A				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D Appelbaum**		**9-13-10**	**1 of 3**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		subangular; little fine subangular GRAVEL; trace nonplastic fines.		9										
952.59	26		Well-graded SAND with GRAVEL (SW) *(continued)*.												
	27		Well-graded SAND (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular; trace fine subangular GRAVEL; trace nonplastic fines.		10	21 28 28	56								
950.59	28		SILT with SAND (ML); dense; olive gray; moist; mostly low plasticity fines; little fine SAND.		11										
	29														
948.59	30														
	31														
946.59	32				12	12 16 24	40								
	33				13										
944.59	34														
	35		Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.												
942.59	36														
	37				14	27 46 50/5"	96/11								
940.59	38				15										
	39														
938.59	40														
	41														
936.59	42		Well-graded SAND (SW); very dense; olive; moist; mostly SAND, from coarse to fine.		16	24 50/5"	50/5								
	43				17										
934.59	44		SILTY SAND (SM); very dense; pale yellow; moist; mostly fine SAND; some nonplastic fines.												
	45														
932.59	46														
	47				18	24 50/5.5"	50/6								
930.59	48				19										
	49		Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.												
928.59	50														
	51														
926.59	52		SILTY SAND (SM); very dense; pale yellow; moist; mostly fine SAND; some nonplastic fines.		20	40 50/5"	50/5								
	53				21										
924.59	54														
	55														

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		SILTY SAND (SM) *(continued)*.		21										
922.59	56														
	57				22	20 41 50/4"	91/10								
920.59	58				23										
	59		Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.												
918.59	60														
	61		Lean CLAY (CL); hard; brown; moist; mostly medium plasticity fines; PP=4.5 tsf.												
916.59	62				24	8 11 18	29								
	63		Bottom of borehole at 62.8 ft bgs												
914.59	64		Installed Open-standpipe Observation Well 5/18/2010												
	65														
912.59	66														
	67														
910.59	68														
	69														
908.59	70														
	71														
906.59	72														
	73														
904.59	74														
	75														
902.59	76														
	77														
900.59	78														
	79														
898.59	80														
	81														
896.59	82														
	83														
894.59	84														
	85														

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE: BORING RECORD				HOLE ID: R-10-009
DIST. 05	COUNTY SLO	ROUTE 46	POSTMILE 41.0/46.3	EA 05-330771
PROJECT OR BRIDGE NAME: SLO-46 Corridor Improvements: Whitley 2A				
BRIDGE NUMBER N/A	PREPARED BY D Appelbaum		DATE 9-13-10	SHEET 3 of 3

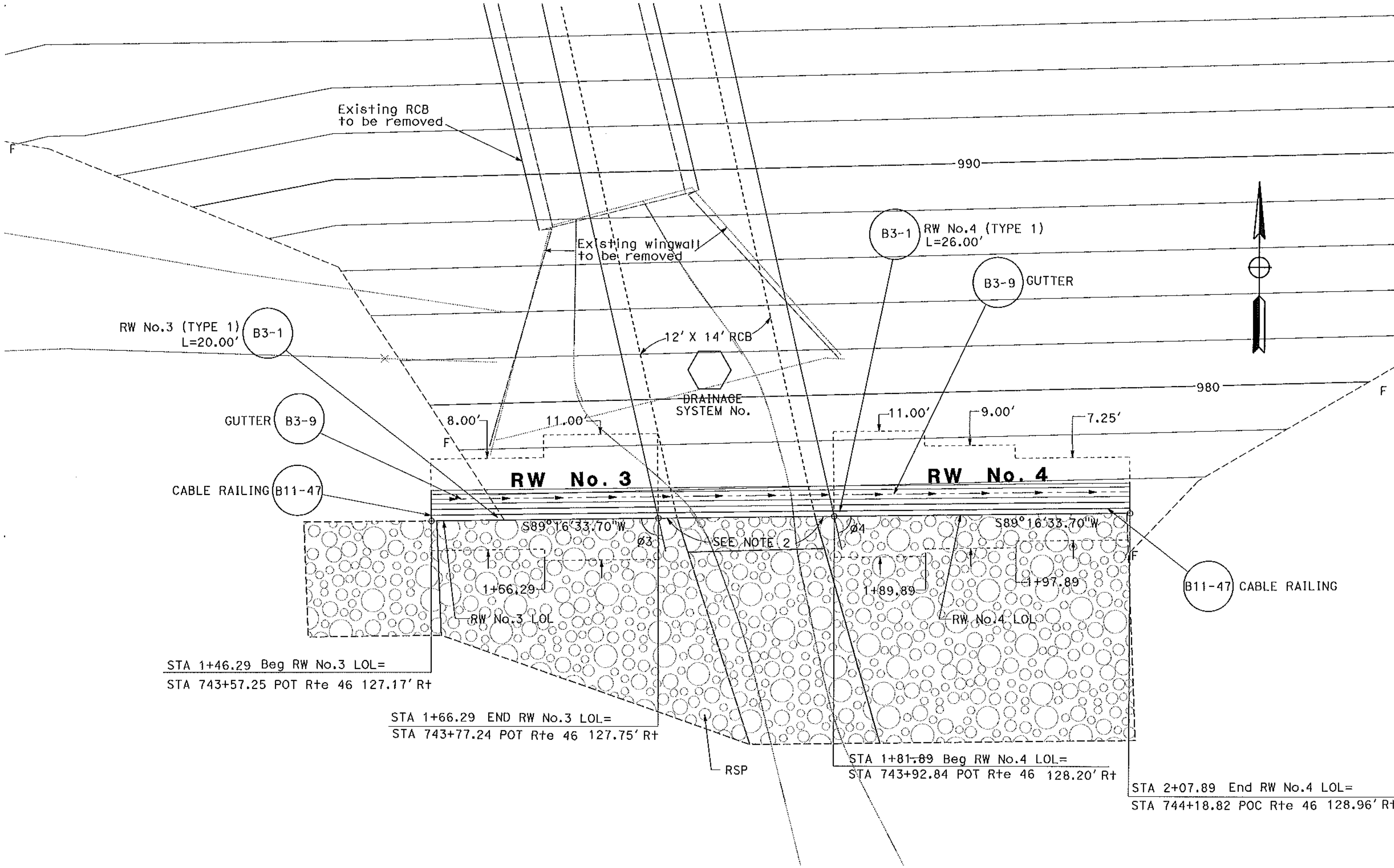
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA



PLAN

SCALE: 1"=5'

RW FLARE ANGLE	
Ø3	102°08'36.60"
Ø4	77°51'23.40"

DRAFT: SUBJECT TO CHANGE

ATTACHMENT 6
RETAINING WALL PLAN
(RETAINING WALLS No. 3 & 4)

R-2

THIS PLAN IS ACCURATE FOR RETAINING WALL WORK ONLY.

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

06-DESIGN

FUNCTIONAL SUPERVISOR JACK WALKER

CALCULATED-DESIGNED BY WHECHIN LIU

CHECKED BY SUMI HOODE

REVISED BY

DATE REVISED

LAST REVISION

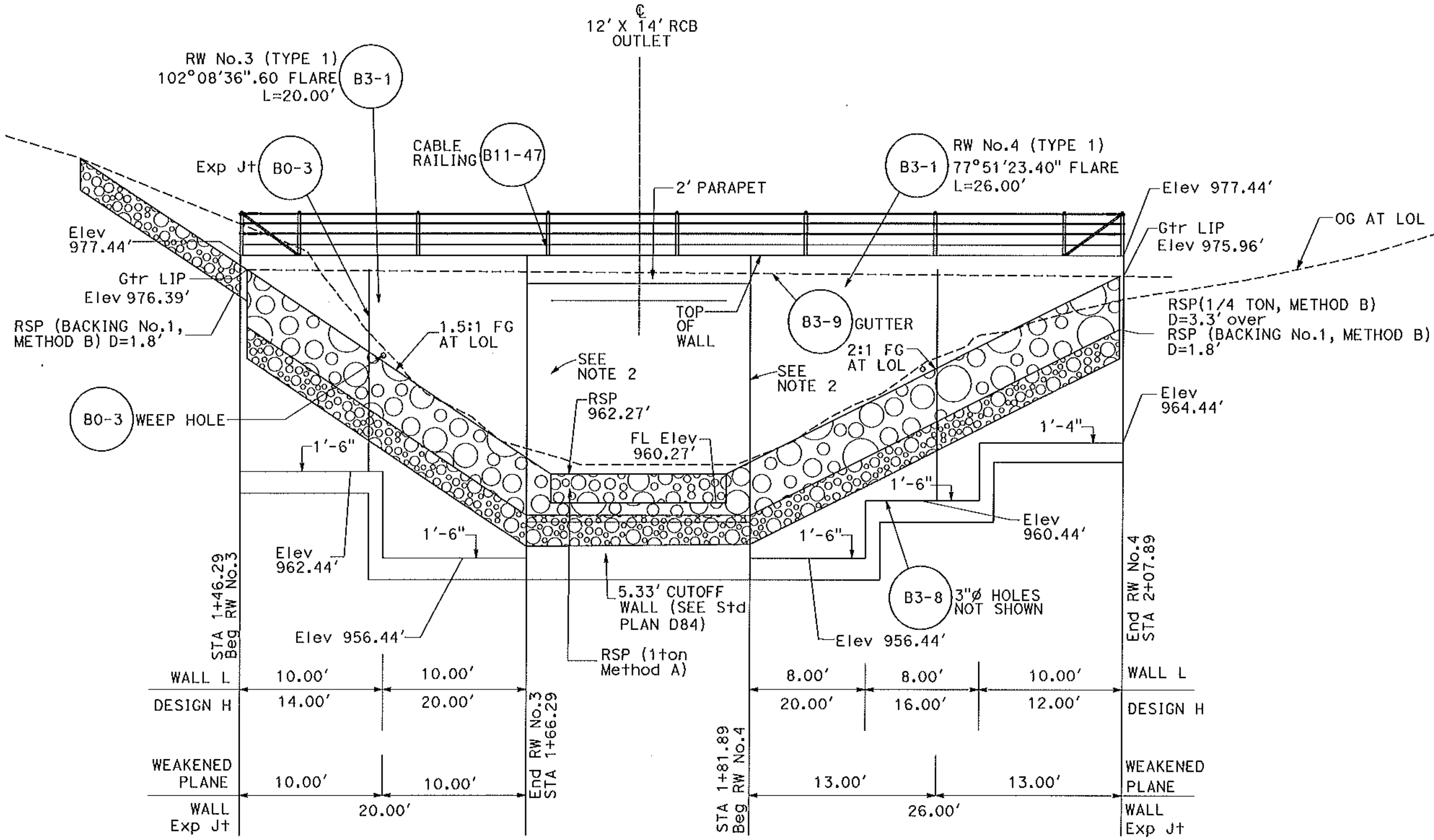
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

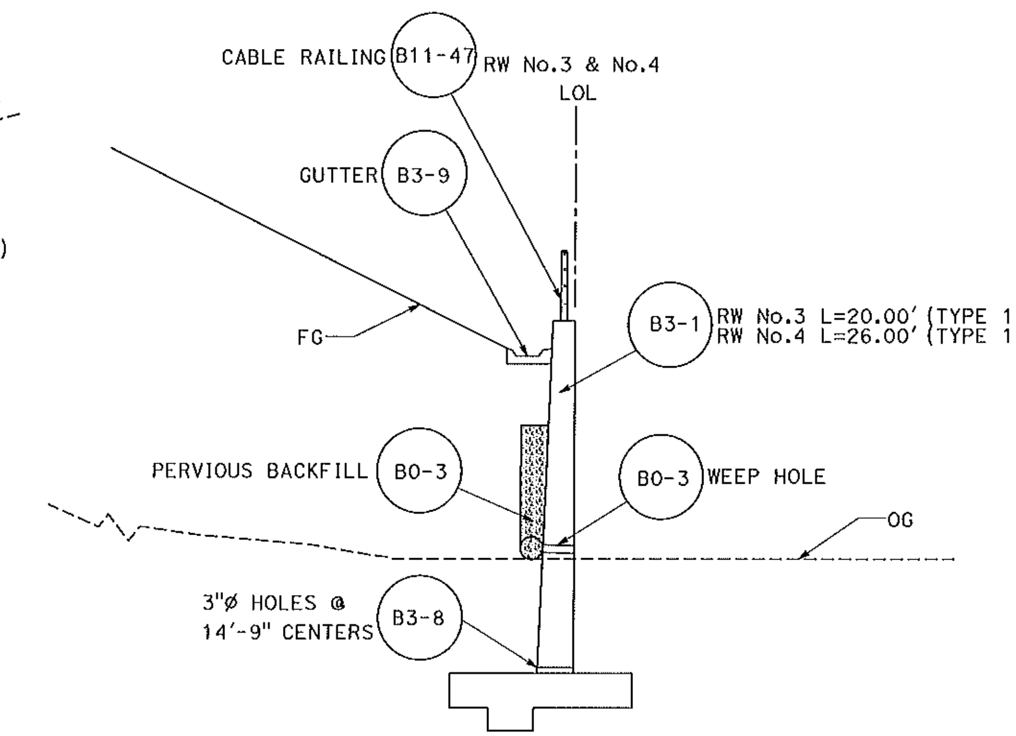
REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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



ELEVATION

SCALE: 1"=10'



RW No.3 & No.4 TYPICAL SECTION

NO SCALE

THIS PLAN IS ACCURATE FOR RETAINING WALL WORK ONLY.

ATTACHMENT 7
RETAINING WALL DETAILS
(RETAINING WALLS No.3 & No.4)
R-4

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
06-DESIGN
FUNCTIONAL SUPERVISOR JACK WALKER
CALCULATED-DESIGNED BY WHECHIN LIU
CHECKED BY SUMI HOODE
REVISED BY
DATE REVISED
LAST REVISION

MATERIALS INFORMATION

Foundation Report-Retaining Wall 4, dated September 22, 2010

ROUTE: 46-SLO-40.7/46.3(PM)

State of California Business, Transportation and Housing Agency

Memorandum *Flex your power!*

Be energy efficient!

To: JACK R. WALKER
Senior Design Engineer
Office of Design II, Branch A
Central Region – District 6

Attn: Jose Arguello, Project Engineer

Date: September 22, 2010

File: 05-330771 (0500020049)
05-SLO-46-41.0/46.3
Whitley 2A Segment
Retaining Wall No. 4

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

Subject: Foundation Report

Scope of Work

A Foundation Report (FR) is provided for the above referenced project per your request dated April 6, 2010. The proposed improvements are part of the Whitley 2A Segment of the SLO-46 Corridor Improvement Project, which proposes to convert SR 46 east of Route 101 from a two-lane conventional highway to a four-lane expressway in San Luis Obispo County. Retaining Wall No. 4 will be constructed to serve as a wing wall to a 12' by 14' reinforced concrete box culvert at Station 743+61.36. One rotary wash boring was drilled approximately 324 feet from the retaining wall layout line in May 2010 and a hand-auger hole was drilled on the retaining wall layout line in September 2010 to provide information for this report.

Project Description

Route 46 in the project area is a two-lane conventional highway with 12-foot travel lanes and shoulders ranging in width between 4 feet and 8 feet. Route 46 is one of the few east-west routes connecting Interstate 5 and U.S. Highway 101, and is a vital link between the Central Coast and Central Valley areas of California. The route primarily serves interregional and interstate traffic, although it is used daily by residents of the communities of Paso Robles, Cholame, Shandon, and Whitley Gardens. It is the only east-west route between Route 166 to the south and Route 156/152 to the north that can facilitate the movement of goods by truck.

It is proposed to convert Route 46 in the project area to a four-lane divided expressway by constructing two new lanes on a parallel alignment to the existing lanes. Between Route 46 Centerline Station 615+25 and Station 646+22 the new lanes will be constructed to the south of the existing lanes. Between approximately Station 666+00 and Station 894+00 the new lanes will be constructed to the north of the existing lanes. The horizontal alignment will transition the new lanes from south to north of the existing lanes between Station 646+22 and Station 666+00.

The existing lanes will be rehabilitated, and vertical curve corrections will be constructed as necessary to improve sight distance. The completed roadway will have a 5-foot inside shoulder, two 12-foot lanes, and a 10-foot outside shoulder for each direction of travel. Median width will typically measure 62 feet. Turn channelization will be provided to access the rural roads and most of the driveways that intersect the highway.

Construction of a Standard Plan Type 1 Retaining Wall is proposed from 128.20 feet right of CL Route 46 Station 743+92.84 to 128.96 feet right of CL Route 46 Station 744+18.82. The maximum design height of the wall will be 20 feet and the length of the wall will be approximately 26 feet, measured along the wall layout line. Refer to the attached layout, cross sections, and elevation view provided by Design for the location of the proposed structure and its dimensions.

The following datum were used to reference horizontal and vertical positions of the proposed structure:

- Horizontal: North American Datum of 1983 (NAD83(92))
- Vertical: National Geodetic Vertical Datum of 1929 (NGVD29)

Pertinent Reports and Investigations

The following publications were used to assist in the assessment of site conditions:

1. *Caltrans ARS Online.*

2. *Environmental Assessment/Draft Environmental Impact Report: Route 46 Corridor Improvement Project, San Luis Obispo County, District 5-SLO-46-KP51.8/90.6*, Caltrans, July 2002.

3. *Geologic Map of the San Luis Obispo County, California*, Compiled by Lew Rosenberg.

4. *Geotechnical Impact of Proposed Project: US Route 46 Widening, San Luis Obispo County, 05-SLO-46-32.2/36.4*, PSC Associates, Inc., 1992.

5. *Geotechnical Services Design Manual, Version 1.0,* Division of Engineering Services, August 2009.

6. *Route 46/41 Interchange Seismic Hazard Report*, Caltrans, John D. Duffy, 2000.

Site Geology and Subsurface Conditions

Topography and Geology

The project is located near the southern end of the Salinas Valley in the Coast Ranges geomorphic province. The terrain consists of dissected plains surrounded by low to moderately steep hills. The westerly flowing Estrella River is the main drainage feature in the project area. It lies to the south of Route 46 through the project limits. The Estrella River is a tributary to the Salinas River, which drains to Monterey Bay northwest of the project area.

The region is divided into three geologic blocks separated by the San Andreas Fault and the Sur-Naciemento Fault Zone. The Diablo Range is in the block located northeast of the San Andreas Fault. The Gabilan Range and the Salinas Valley are located in the central block. The Santa Lucia Range is located in the western block. "Basement" rocks in the western and eastern blocks consist of Franciscan Assemblage rocks and a complex of metamorphic units. Granitic intrusions form the bedrock in the central block, beneath the project area.

Pre-Cretaceous age rocks of the Sur Series are the oldest rocks in the area. These have been intruded by Cretaceous-age granite or granodiorite. This metamorphic-granitic complex is confined to the central fault block, beneath the Salinas Valley and Gabilan Range. Sedimentary rock formations and some volcanic units were deposited on top of the basement rocks during the Cretaceous and Tertiary Periods. Subsequently, during the Quaternary Period, clastic sediments were deposited primarily in marine/transgression environments, which alternated with periods of uplift/regression during which erosion and subareal deposition occurred. The latest uplift (and/or drop in sea level) occurred in Late Pliocene to Mid-Pleistocene time, leaving the sediments at nearly their present-day elevations. Some of these formations have been folded and faulted by the same compressive forces that produced the San Andreas Fault system. Present-day topographic surface features and drainage patterns were established by Mid-Pleistocene time.

Dibblee (1971) mapped the bedrock beneath the project area as granitic rock ("gr"≅quartz granodiorite), which intruded and crystallized during Cretaceous time, 60 to 80 million years ago. Paso Robles Formation ("Q_{Tp}"), deposited in Late Pliocene and early Pleistocene time (2 to 3 million years ago), overlies the granitic bedrock. The Paso Robles Formation consists of easily eroded sands and gravels with lesser amounts of silts and clay, deposited by running water. The formation varies in thickness, from a few feet thick on top of the granitic ridges west of Paso Robles, up to several hundred feet thick along the existing Route 46 alignment in the eastern portion of the project area. Bedding within the Paso Robles Formation is not usually apparent. However, the few available exposures suggest that bedding dips generally toward the north at low angles (1 to 2 degrees): Dibblee mapped the axis of a gentle anticline southwest of the project area.

Old river terrace deposits ("Q_a" and "Q_{oa}"), composed of granitic gravel, sand, silt, and clay, line the sides of some of the stream valleys that cross the highway alignment near the Estrella River. Younger alluvial deposits ("Q_{rs}") composed of gravel, sand, silt, and clay have been deposited along the modern drainage courses.

Soil Conditions

Boring R-10-009, located 190' left of Route 46 centerline Station 743+26, was drilled to a depth of 62.8', which corresponds to elevation 915.8 feet. The geotechnical boring encountered interbedded layers of sand, silty sand, sand with gravel, lean clay, and sandy clay. The observed stratigraphy is consistent with geologic maps for the area, which show Pleistocene aged alluvial soils of the Paso Robles formation overlain by more recent alluvial deposits from the drainages. Stratigraphy comprised of layers of variable thickness and lateral extents are indicative of the alluvial environment in which they were deposited. Particle size distribution, layer thickness, and lateral extent of deposition change as the velocity of water depositing the materials varies.

Hand-auger boring HA-10-001, located on Retaining Wall LOL at approximately Station 1+76, was advanced to a depth of 3.5 feet, whereupon further drilling by hand methods was impossible. The boring encountered hard lean clay through its entire depth.

Ground Water

Boring R-10-009 was instrumented as a short term open-standpipe monitoring well by installing 1½" slotted PVC pipe in the open borehole with no sand backfill. Depth to ground water was measured one week after completion of the drilling, and the well was abandoned by removing the pipe and backfilling the hole with bentonite chips. Ground water was measured 21.8 feet below original ground on May 25, 2010, corresponding to an elevation of 956.8 feet.

Corrosion Evaluation

Soil samples were obtained from hand-auger borings along the retaining wall alignment and sent to the District 5 Laboratory for corrosion analysis. Test results were not available at the time this report was written. Corrosion test results on soils from nearby sections of Route 46, however, suggest that the project site is likely non-corrosive. Reporting of site-specific corrosion potential will be conveyed in separate correspondence when test results become available.

Seismic Recommendations

The project is located within a seismically active region of California. There are several earthquake faults in close proximity to the project area. Table 1 lists the active and potentially active faults in the project vicinity as described in Caltran's *2007 Fault Database*.

Corresponding Moment Magnitudes and distance to the retaining wall site are also given. A fault map is included in the attachments to this report.

Table 1: Active and Potentially Active Faults

Fault	*Moment Magnitude of Maximum Credible Earthquake*[1]	*Distance to Fault from Project Area (miles)*
Rinconada Fault Zone (San Marcos section)	7.5	16.5
Oceanic Fault Zone	7.4	26.2
San Andreas Fault Zone (Parkfield section)	7.9	7.7
West Huasna Fault Zone	7.0	27.3
San Simeon-Hosgri Fault Zone (San Simeon Fault)	7.5	40.3
Cambria Fault	7.0	27.4
Los Osos Fault Zone (Irish Hills section)	7.0	32.3
Los Osos Fault Zone (Lopez Reservoir section)	7.0	34.2
Southern San Luis Range Fault Zone	7.2	38.5
San Simeon-Hosgri Fault Zone (Hosgri Fault)	7.5	44.7

Peak ground acceleration (PGA) in the project area due to an earthquake along one of the nearby faults was estimated using the *2009 Caltrans Seismic Design Procedure.* The procedure was developed to calculate the minimum seismic design requirements for bridges on State highways. The method calculates design response spectra over a range of periods. The design response spectrum is based on the envelope of a deterministic and a probabilistic spectrum. The deterministic spectrum is calculated as the arithmetic average of median response spectra computed using the Chiou & Youngs and Campbell & Bozorgnia ground motion prediction equations (CY-CB GMPE). These equations are applied to all faults in or near California considered to be active in the last 700,000 years (late Quaternary age) and capable of producing a moment magnitude earthquake of 6.0 or greater.

The probabilistic spectrum is obtained from the 2008 USGS Seismic Hazard Map for the 5% in 50 years probability of exceedance (or 975 year return period). The spectral values are adjusted with a soil amplification factor based on an average of the Boore-Atkinson (2008), Campbell Bozorgnia (2008), and Chiou-Youngs (2008) ground motion prediction models. For sites underlain by soils having an average shear wave velocity for the upper 30 meters of soil (V_{S30}) of

[1] According to Caltrans *2007 Fault Database*

less than 300 meters per second, the 2009 USGS Probabilistic Seismic Hazard Analysis Interactive Deaggregation Tool is used to develop the probabilistic spectrum.

The controlling fault at the retaining wall location is the San Andreas Fault zone (Parkfield section), a right lateral slip strike fault with a maximum magnitude of 7.9. The peak ground acceleration at the location of Retaining Wall No. 4 is estimated to be 0.58 g (gravity). The probabilistic spectrum with a soil amplification factor for a V_{S30} of 300 meters per second governed the design response spectrum. The V_{S30} value was generated using correlations to Standard Penetration Test (SPT) blow counts.

The Seismic Hazard Report prepared for another section of the Highway 46 Corridor Improvement Project predicts an average recurrence interval of 21.5 years for an earthquake along the Parkfield segment of the San Andreas Fault zone. Therefore, there is a high likelihood of an earthquake occurring during the design life of this project, though probably of a lesser magnitude than the 7.9 maximum credible magnitude. Historically, earthquakes ranging in magnitude between 5 and 6 are the typical "major" events along the Parkfield segment of the San Andreas Fault zone.

No known active or potentially active faults project towards or cross the highway alignment within the project limits. Therefore, there is low potential for surface fault rupture to occur and no mitigation efforts are necessary.

Liquefaction is a near-total loss of soil strength due to an increase in pore water pressure during cyclic loading, such as occurs during an earthquake. Loose cohesionless soils that may become saturated due to a high water table may liquefy during an earthquake. Embankments founded on liquefiable soils may be subject to slope instability and settlement during an earthquake event. Similarly, earth-retaining structures may settle or overturn should the soils beneath them liquefy.

Liquefaction potential at the location of Retaining Wall No. 4 should be low. For liquefaction to occur, three ingredients in combination are necessary: loose granular soils, saturated soil conditions, and strong ground shaking. All of the cohesionless soils that were encountered at an elevation where they may become saturated by ground water were found to be in a very dense condition. Therefore, even in the event of an earthquake, liquefaction is unlikely to occur.

Foundation Recommendations

Construction of a Standard Plan Type 1 Retaining Wall is recommended at the outlet to the proposed 12' X 14' reinforced concrete box culvert at Station 743+61.36 to retain the embankment soil at that location. The maximum retained height of the wall will be approximately 20 feet under loading condition Case II (refer to Caltrans Standard Plans).

Foundation soil bearing capacity was calculated using Hansen's method. Strength parameters for cohesionless soils were calculated using friction angle correlations to SPT blow counts. Strength parameters for cohesive soils were estimated using pocket penetrometer measurements of unconfined compression strength. Because geotechnical boring R-10-009 was so far from the retaining wall layout line and the lateral extent of the soils layers was not known, bearing capacity was conservatively calculated using the strength parameters of the weakest soil encountered in the subsurface exploration.

Footing dimensions and corresponding allowable bearing pressures are presented in the following table. Refer to Caltrans Standard Plans for details of construction.

Table 2: Spread Footing Data for Standard Plan Type 1 Retaining Wall

Retaining Wall No. 4 Station Limits (feet)	Minimum Footing Width	Minimum Bottom of Footing Elevation (feet)	Toe Pressure (Case II)[2]	Allowable Bearing Pressure (q_{all})
Station 1+81.89 to Station 1+89.89	11'-0"	954.94	4.7 ksf	6.0 ksf
Station 1+89.89 to Station 1+97.89	9'-0"	958.94	3.7 ksf	5.5 ksf
Station 1+97.89 to Station 2+07.89	7'-3"	963.11	2.7 ksf	6.4 ksf

In accordance with section 4.4.5.1, "Minimum Embedment and Bench Width," of the Bridge Design Specifications, the minimum footing embedment shall be 3 feet, measured from the bottom of the footing.

Elastic settlement in cohesionless soils was calculated using Hough's Method, which correlates soil grain size distribution and SPT values with a bearing capacity factor that is used in a settlement equation. Settlement of the cohesive soil layers was neglected in the calculation of total settlement because the cohesive soils underlying the site are highly over-consolidated, and settlement of the layers is expected to be minimal. Calculated settlement is summarized in the following table. Both the total and the differential settlement are within tolerable limits for reinforced concrete construction. It is recommended, however, that a weakened plane be placed between each segment of the retaining wall to force any cracking due to differential settlement to those locations.

[2] Per Standard Plan B3-1, May 2006

Table 3: Calculated Settlement for Standard Plan Type 1 Retaining Wall

Retaining Wall No. 4 Station Limits (feet)	Settlement (inches)
Station 1+81.89 to Station 1+89.89	0.45
Station 1+89.89 to Station 1+97.89	0.25
Station 1+97.89 to Station 2+07.89	0.20

Slope Stability

Global slope stability is not considered to be an issue for Retaining Wall No. 4. The retaining wall will be built at the foot of an embankment slope, with relatively flat terrain in front of the wall. Construction of the retaining wall will force potential failure surfaces deep, beneath the wall footing, since failure surfaces cannot go through the wall. Slope stability analyses using the calculated strength parameters for the foundation soil indicate that the deep failure surfaces all have a high factor of safety against sliding.

Construction Considerations

The bottom of footing elevation for the segment of Retaining Wall No. 4 between LOL Station 1+81.89 and LOL Station 1+89.89 is below the ground water elevation measured on May 25, 2010. Therefore, it is highly likely that ground water will be encountered during construction. The contractor should anticipate having to dewater the excavation for the footing before and during the concrete pour.

The foundation soils at the site of the proposed retaining wall appear adequate to support the structure. Localized areas of unconsolidated or saturated foundation materials, however, may require stripping and recompaction, or removal of material deemed unsuitable. If saturated or otherwise unsuitable material is encountered to a depth where it cannot be economically removed, it is recommended that the material be sub excavated 18 inches and replaced with Class 3 Permeable Material encapsulated in an AASHTO specification M288, Class 2 survivability geotextile. The permeable material will allow water to fill its pore spaces without a loss of strength. The geotextile fabric will act as a separator, preventing the soils above the fabric from filling the voids in the permeable material, and preventing the permeable material from penetrating the soft soils beneath the fabric. The geotextile will also serve to reinforce the subgrade soil. The permeable material encapsulated in geotextile fabric will provide a dry and stable working platform for embankment or drainage structure construction.

All temporary cut slopes shall conform to Cal OSHA guidelines, and shall not exceed 1:1 slope inclinations. Permanent cut and fill slopes shall not exceed 2:1 slope angles.

Closure

Standard Special Provision S5-280, "Project Information", discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The Department makes the following supplemental project information available:

Supplemental Project Information

Means	Description
Included in the Information Handout	Foundation Report for the Retaining Wall No. 4 dated September 22, 2010.
Available for inspection at the District Office	
Available for inspection at the Transportation Laboratory	
Available for inspection at _____; telephone (___) - ____	
Available as specified in the Standard Specifications	
Available at: http://www.dot.ca.gov/hq/esc/oe/weekly_ads/index.php	

Items listed to be included in the Information Handout will be provided in Acrobat (.pdf) format to the Addressee of this report via electronic mail.

The recommendations contained in this report are based on specific project information that has been provided by Office of Design II, Branch A. If any conceptual changes are made during final project design, the Office of Geotechnical Design – North, Branch D should review those changes to determine if the recommendations contained in this report are still applicable. Any questions regarding the recommendations contained herein should be directed to the attention of Dan Appelbaum, (805) 549-3745, or Mike Finegan, (805) 549-3194, at the Office of Geotechnical Design – North, Branch D.

Supervised by,

REGISTERED PROFESSIONAL ENGINEER
D.L. Appelbaum
No. C 50001
Exp. 6-30-11
CIVIL
STATE OF CALIFORNIA

DANIEL L. APPELBAUM, PE
Transportation Engineer
Geotechnical Design – North
Branch D

MICHAEL S. FINEGAN, PE, Chief
Geotechnical Design - North
Branch D

c: Roy Bibbens / GDN File (E-copy)
John Luchetta – Project Manager (E-copy)
Mark Willian – GS Corporate (E-copy)
R.E. Pending File
Doug Lambert – District Materials Engineer (E-copy)
Job File / Branch D Records

LIST OF ATTACHMENTS

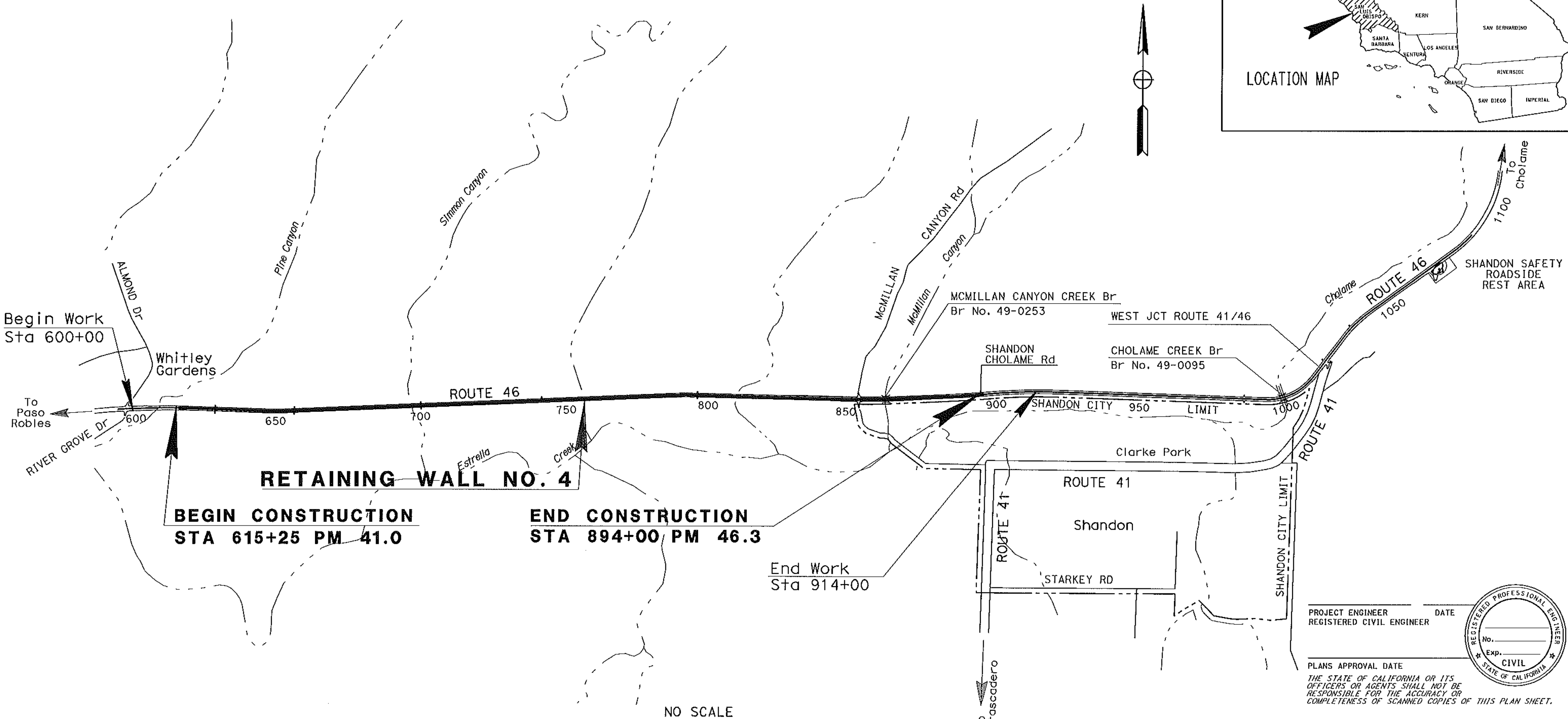
INDEX OF PLANS

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON
STATE HIGHWAY
IN SAN LUIS OBISPO COUNTY
NEAR PASO ROBLES
FROM 0.1 MILE EAST OF ALMOND DRIVE TO
0.8 MILE EAST OF McMILLAN CANYON ROAD

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2006



NO SCALE

PROJECT MANAGER JOHN LUCHETTA

DESIGN ENGINEER JACK WALKER

PROJECT ENGINEER DATE
REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

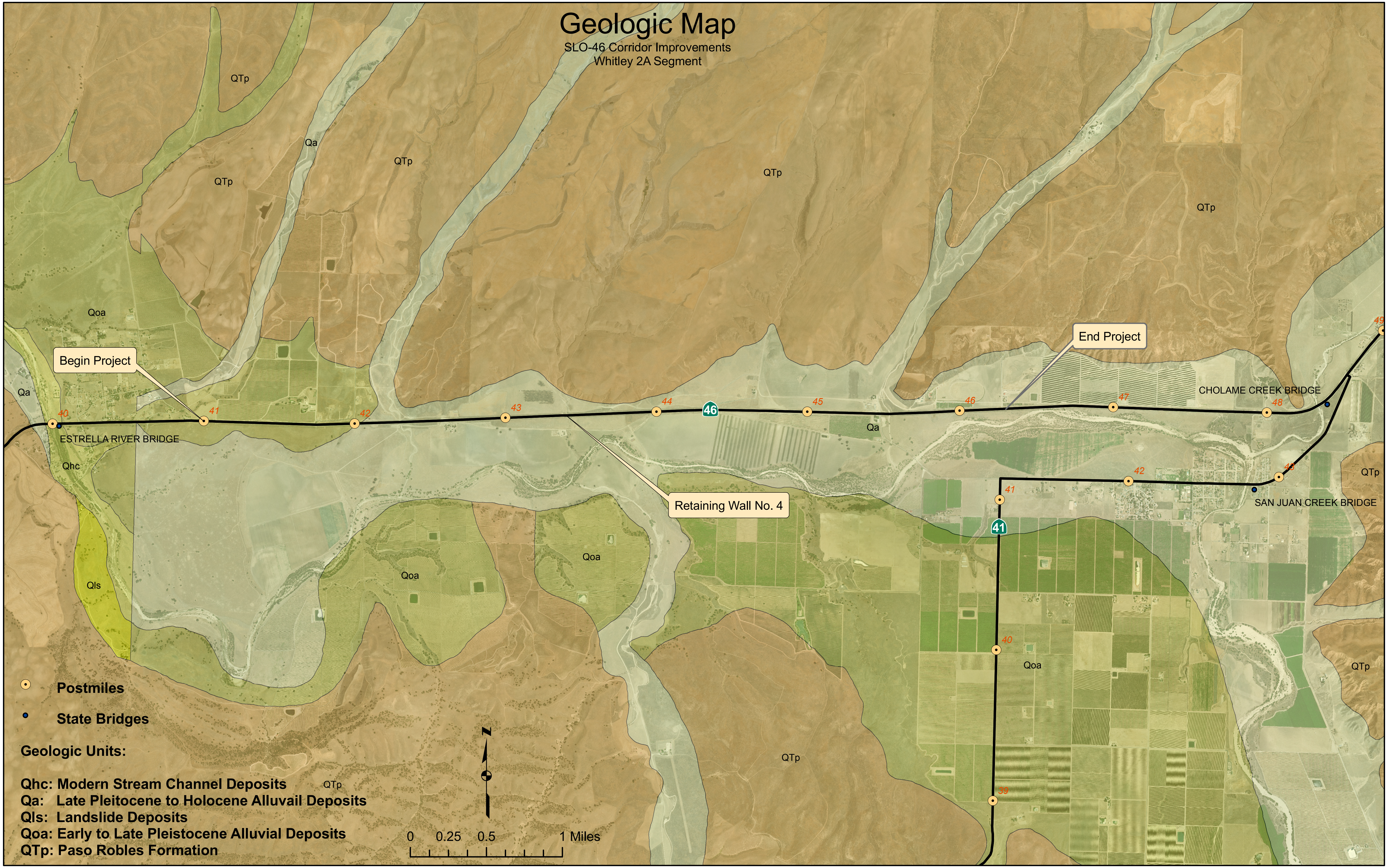
PLANS APPROVAL DATE

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

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

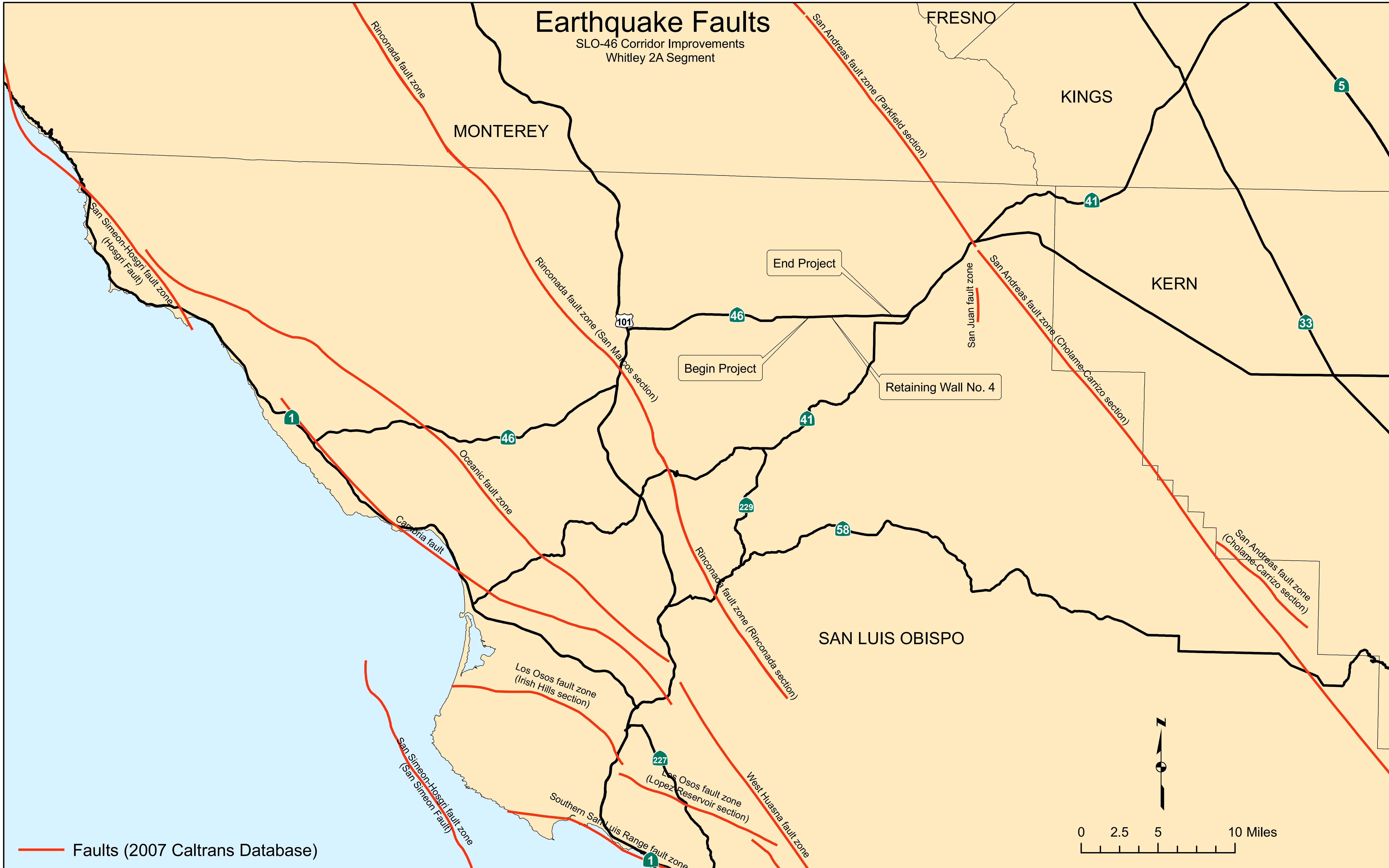
ATTACHMENT 1: VICINITY MAP

CONTRACT No.	05-330774
PROJECT ID	0500020049



Geologic Mapping Compiled by Lew Rosenberg

ATTACHMENT 2



ATTACHMENT 3

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

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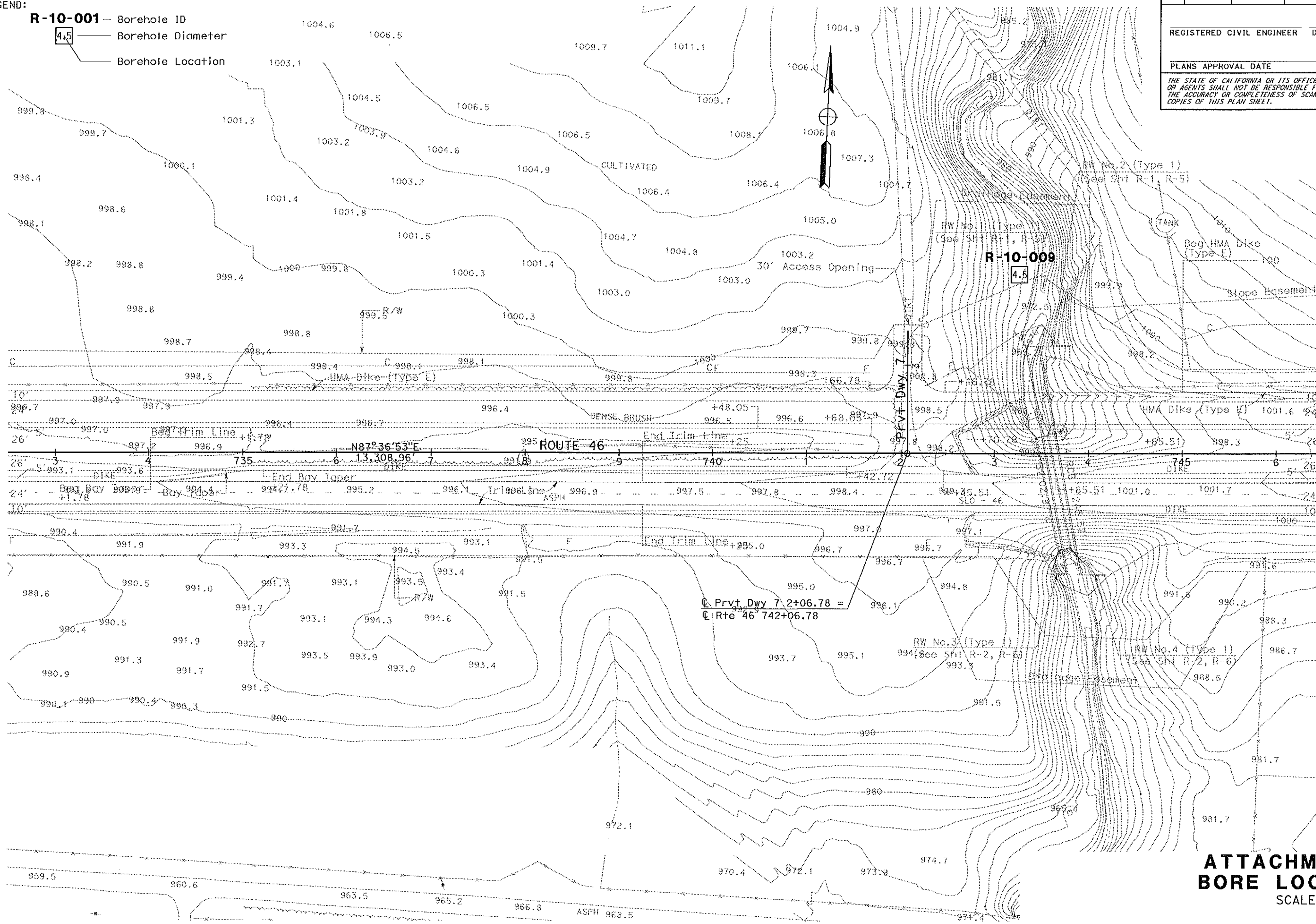
REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

LEGEND:

R-10-001 — Borehole ID

4.5 — Borehole Diameter

Borehole Location



ATTACHMENT 4
BORE LOCATION
SCALE: 1" = 100'

BL-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans GEOTECHNICAL DESIGN

FUNCTIONAL SUPERVISOR

MIKE FINEGAN

CALCULATED-DESIGNED BY

CHECKED BY

REVISED BY

DATE REVISED

LAST REVISION | DATE PLOTTED

BORING RECORD

05-SLO-46- 41.0/46.3

EA: 05-330771, Project ID: 0500020049

ATTACHMENT 5

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
S Heredia	**5-18-10**	**5-18-10**	**35° 39' 40.1004" / -120° 27' 2.9653" WGS84**	**R-10-009**

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans	**190.00' Lt Sta 743+26RTE 46**	**978.6 ft NGVD29**
DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Rotary Wash	**Acker MP8**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)	SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other, SPT (1.4")	**Boart/Longyear Automatic 140#, 30" drop**	**74%**
BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Installed Open-standpipe Observation Well	**21.8 ft on5-25-10**	**62.8 ft**

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0	Lean CLAY with SAND (CL); stiff; dark grayish brown; dry to moist; mostly medium plasticity fines; few fine SAND.											
976.59	2												
974.59	4		1	2 2 3	5								
972.59	6												
	7	Trace fine GRAVEL; PP=1.5 tsf.	2	2 4 6	10								
970.59	8	SANDY SILT (ML); medium dense; olive; dry; mostly nonplastic fines; some fine SAND.											
	9		3	4 10 10	20								
968.59	10	SILTY CLAY (CL-ML); hard; olive gray; moist; mostly low plasticity fines.											
966.59	11–12		4	10 19 21	40								
	13		5										
964.59	14	SILTY SAND (SM); very dense; olive; moist; mostly fine SAND; some nonplastic fines.											
962.59	16	From medium to fine SAND.	6	15 22 28	50								
960.59	18		7										
	18.5	Well-graded SAND (SW); very dense; olive; moist; mostly SAND, from coarse to fine, subangular; trace fine subangular GRAVEL.											
958.59	20												
	21	Well-graded SAND with SILT and GRAVEL (SW-SM); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular; little fine subangular GRAVEL; few nonplastic fines.	8	16 20 28	48								
956.59	22												
	23		9										
954.59	24	Well-graded SAND with GRAVEL (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine,											
	25												

(continued)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-10-009**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **9-13-10**	SHEET **1 of 3**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		subangular; little fine subangular GRAVEL; trace nonplastic fines.		9										
952.59	26		Well-graded SAND with GRAVEL (SW) *(continued)*.												
			Well-graded SAND (SW); very dense; olive gray; moist; mostly SAND, from coarse to fine, subangular; trace fine subangular GRAVEL; trace nonplastic fines.		10	21 28 28	56								
	27														
950.59	28		SILT with SAND (ML); dense; olive gray; moist; mostly low plasticity fines; little fine SAND.		11										
	29														
948.59	30														
	31														
946.59	32				12	12 16 24	40								
	33				13										
944.59	34														
	35		Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.												
942.59	36														
	37				14	27 46 50/5"	96/11								
940.59	38				15										
	39														
938.59	40														
	41														
936.59	42		Well-graded SAND (SW); very dense; olive; moist; mostly SAND, from coarse to fine.		16	24 50/5"	50/5								
	43				17										
934.59	44		SILTY SAND (SM); very dense; pale yellow; moist; mostly fine SAND; some nonplastic fines.												
	45														
932.59	46														
	47				18	24 50/5.5"	50/6								
930.59	48				19										
	49		Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.												
928.59	50														
	51														
926.59	52		SILTY SAND (SM); very dense; pale yellow; moist; mostly fine SAND; some nonplastic fines.		20	40 50/5"	50/5								
	53				21										
924.59	54														
	55														

(continued)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	55	SILTY SAND (SM) *(continued)*.	21								
922.59	56										
	57		22	20 41 50/4"	91/10						
920.59	58		23								
	59	Poorly graded SAND (SP); very dense; olive; moist; mostly SAND, from medium to fine.									
918.59	60										
	61	Lean CLAY (CL); hard; brown; moist; mostly medium plasticity fines; PP=4.5 tsf.									
916.59	62		24	8 11 18	29						
	63	Bottom of borehole at 62.8 ft bgs									
914.59	64	Installed Open-standpipe Observation Well 5/18/2010									
	65										
912.59	66										
	67										
910.59	68										
	69										
908.59	70										
	71										
906.59	72										
	73										
904.59	74										
	75										
902.59	76										
	77										
900.59	78										
	79										
898.59	80										
	81										
896.59	82										
	83										
894.59	84										
	85										

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**R-10-009**
DIST. **05**	COUNTY **SLO**	ROUTE **46**	POSTMILE **41.0/46.3**	EA **05-330771**
PROJECT OR BRIDGE NAME **SLO-46 Corridor Improvements: Whitley 2A**				
BRIDGE NUMBER **N/A**	PREPARED BY **D Appelbaum**		DATE **9-13-10**	SHEET **3 of 3**

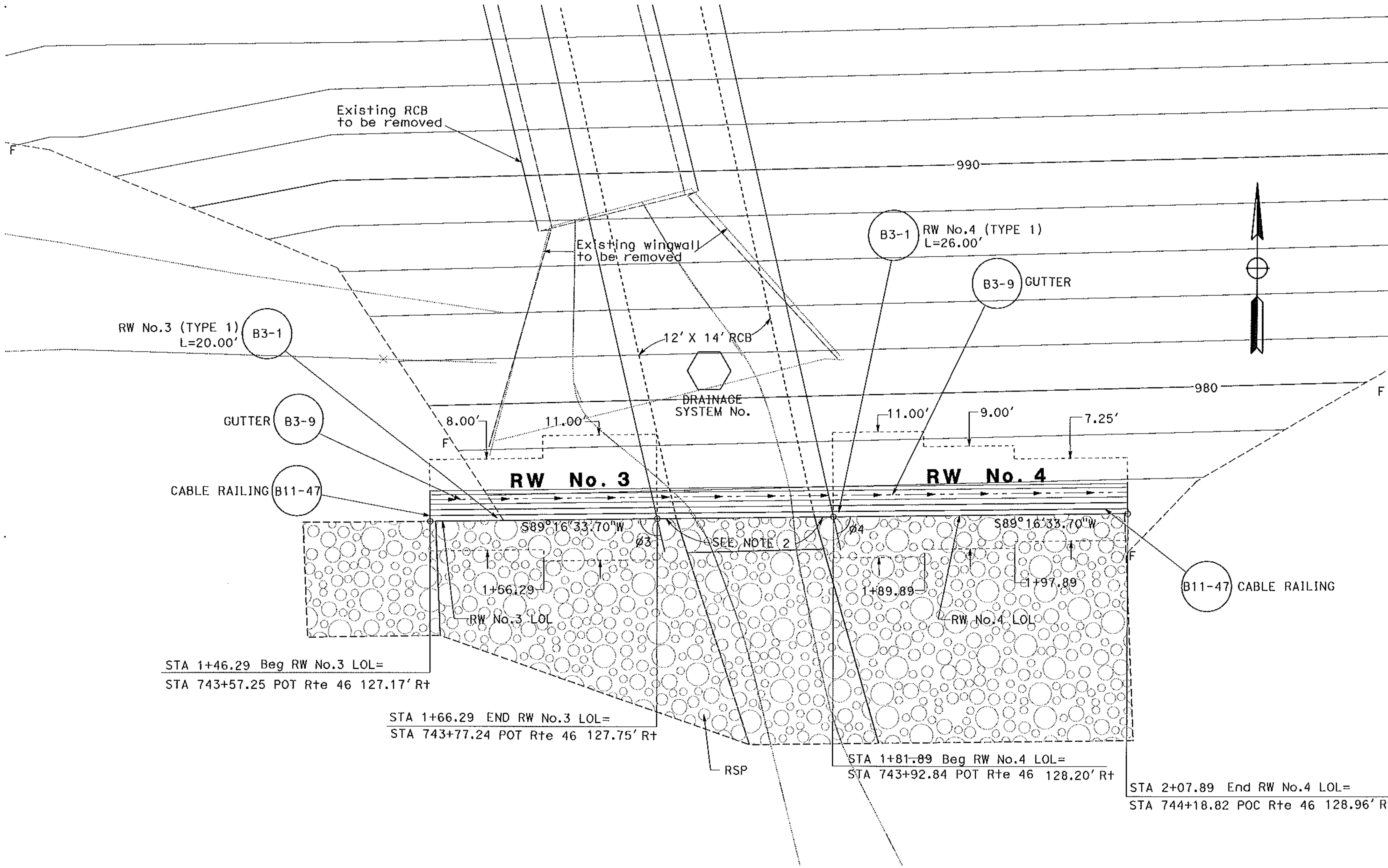
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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



PLAN
SCALE: 1"=5'

RW FLARE ANGLE	
Ø3	102°08'36.60"
Ø4	77°51'23.40"

DRAFT: SUBJECT TO CHANGE

THIS PLAN IS ACCURATE FOR RETAINING WALL WORK ONLY.

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
06-DESIGN
FUNCTIONAL SUPERVISOR JACK WALKER
CALCULATED-DESIGNED BY WHECHIN LIU
CHECKED BY SUMI HOODE
REVISED BY
DATE REVISED

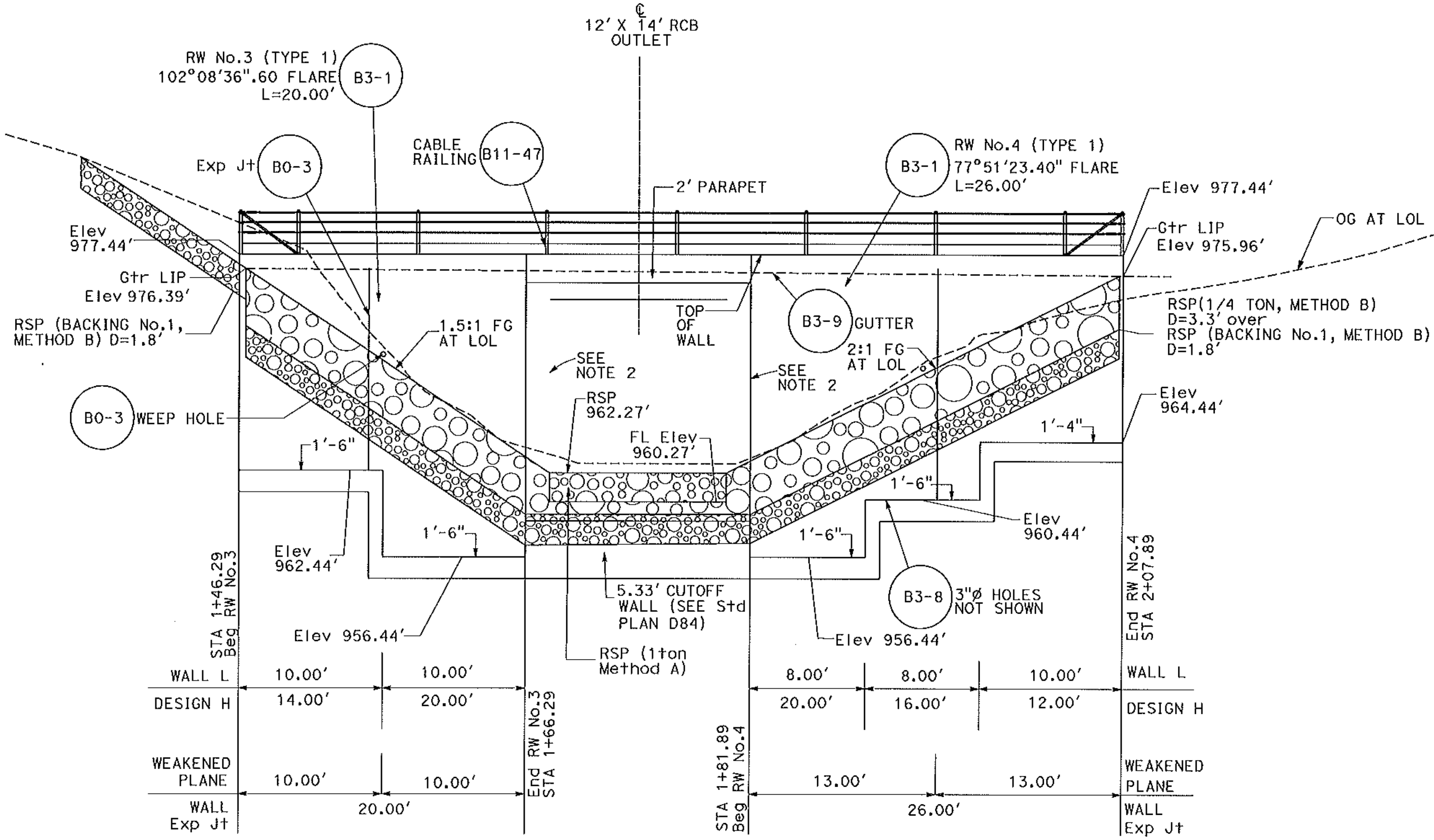
ATTACHMENT 6
RETAINING WALL PLAN
(RETAINING WALLS No. 3 & 4)
R-2

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

REGISTERED CIVIL ENGINEER DATE

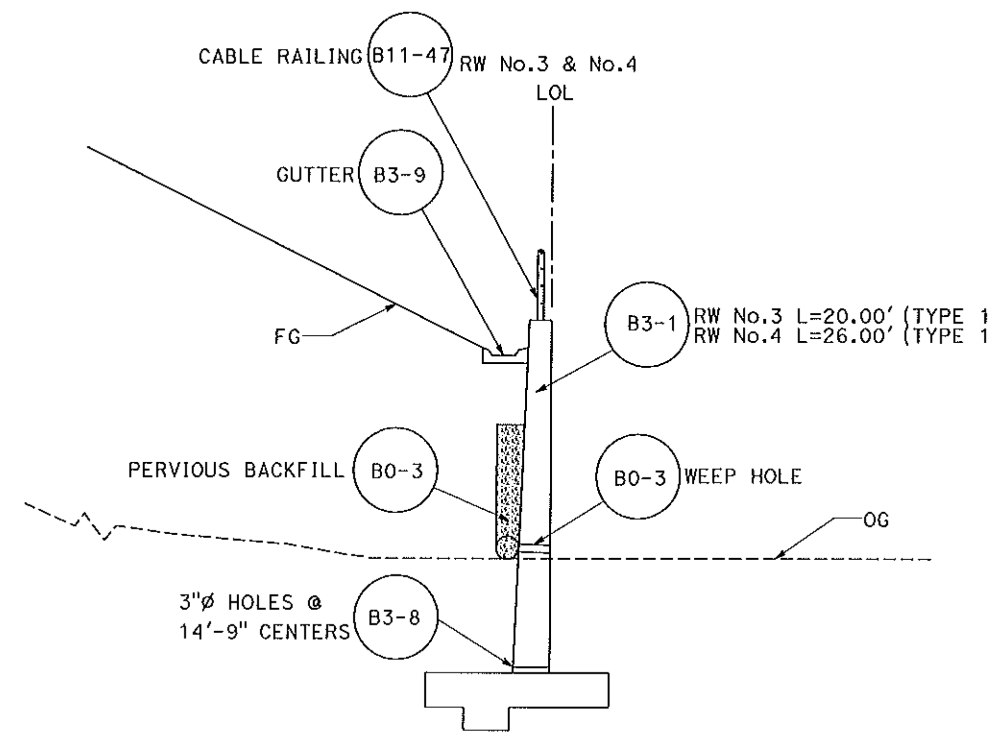
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA



ELEVATION

SCALE: 1"=10'



RW No.3 & No.4 TYPICAL SECTION

NO SCALE

THIS PLAN IS ACCURATE FOR RETAINING WALL WORK ONLY.

ATTACHMENT 7
RETAINING WALL DETAILS
(RETAINING WALLS No.3 & No.4)
R-4

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
06-DESIGN
FUNCTIONAL SUPERVISOR: JACK WALKER
CALCULATED-DESIGNED BY: WHECHIN LIU
CHECKED BY: SUMI HOODE
REVISED BY
DATE REVISED
LAST REVISION | DATE PLOTTED

FOR CONTRACT NO.: 05-330774

MATERIALS INFORMATION

Foundation Report - McMillan Canyon Creek Bridge (New) (Bridge No. 49-0253) dated December 30, 2010

ROUTE: 46-SLO-40.7/46.3(PM)

Memorandum *Flex your power!*

Be energy efficient!

To: FRITZ HOFFMAN
Branch Chief
Division of Engineering Services, Structure Design
Office of Bridge Design – Central, Branch 6

Attn: Don Nguyen-Tan

Date: December 30, 2010

File: 05-SLO-46-45.49
0500020049 (EA 05-330771)
Br. No. 49-0253
McMillan Canyon Creek
Bridge (New)

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

Subject: Foundation Report

Scope of Work

A Foundation Report (FR) is provided for the proposed bridge over McMillan Canyon Creek on Route 46 in San Luis Obispo County at milepost 45.49 per your request. The bridge construction is part of the Whitley 2A Segment of the SLO-46 Corridor Improvement Project, which proposes to convert State Route 46 east of Route 101 from a two-lane conventional highway to a four-lane expressway in San Luis Obispo County. This report is based on the subsurface data collected for this bridge in May 2010.

Project Description

Route 46 in the project area is a two-lane conventional highway with 12-foot travel lanes and shoulders ranging in width between 4 feet and 8 feet. Route 46 is one of the few east-west routes connecting Interstate 5 and U.S. Highway 101, and is a vital link between the Central Coast and Central Valley areas of California. The route primarily serves interregional and interstate traffic, although it is used daily by residents of the communities of Paso Robles, Cholame, Shandon, and Whitley Gardens. It is the only east-west route between Route 166 to the south and Route 156/152 to the north that can facilitate the movement of goods by truck.

It is proposed to convert Route 46 in the project area to a four-lane divided expressway by constructing two new lanes on a parallel alignment to the existing lanes. Between Route 46 Centerline Station 615+25 and Station 646+22 the new lanes will be constructed to the south of the existing lanes. Between approximately Station 666+00 and Station 894+00 the new lanes will be constructed to the north of the existing lanes. The horizontal alignment will transition the new lanes from south to north of the existing lanes between Station 646+22 and Station 666+00. The existing lanes will be rehabilitated, and vertical curve corrections will be constructed as necessary to improve sight distance. The completed roadway will have a 5-foot inside shoulder, two 12-foot lanes, and a 10-foot outside shoulder for each direction of travel. Median width will typically measure 62 feet. Turn channelization will be provided to access the rural roads and most of the driveways that intersect the highway.

The proposed improvements include the construction of a new bridge over McMillan Canyon Creek to replace the existing box culvert at that location. The proposed structure is a 63-foot long single-span CIP/PS slab bridge. The abutments will be founded on existing ground adjacent to the creek channel. The bridge will be on a slightly different alignment than the existing box culvert to better match the channel alignment along the increased roadway width.

The following datum was used to reference horizontal and vertical positions of the proposed structure:

- Horizontal: North American Datum of 1983 (NAD83(92))
- Vertical: National Geodetic Vertical Datum of 1929 (NGVD29)

Pertinent Reports and Investigations

The following publications were used to assist in the assessment of site conditions:

1. *Caltrans ARS Online.*

2. *Environmental Assessment/Draft Environmental Impact Report: Route 46 Corridor Improvement Project, San Luis Obispo County, District 5-SLO-46-KP51.8/90.6*, Caltrans, July 2002.

3. *Draft Final Hydraulic Report, McMillan Canyon Creek Bridge,* Caltrans Structure Hydraulics and Hydrology, Ronald L. McGaugh, September 1, 2010.

4. *Geologic Map of the San Luis Obispo County, California*, Compiled by Lew Rosenberg.

5. *Geotechnical Impact of Proposed Project: US Route 46 Widening, San Luis Obispo County, 05-SLO-46-32.2/36.4*, PSC Associates, Inc., 1992.

6. *Geotechnical Services Design Manual, Version 1.0,* Division of Engineering Services, August 2009.

7. *Route 46/41 Interchange Seismic Hazard Report*, Caltrans, John D. Duffy, 2000.

Field Investigation and Testing Program

Three geotechnical borings were performed to support foundation design recommendations for the proposed bridge. Continuous soil samples were obtained from the borings using a punch core apparatus retrieved via wire line. Soils were visually classified in accordance with the Caltrans Soil and Rock Logging, Classification, and Presentation Manual (June 2010). Standard Penetration Tests (SPT), ASTM test method 1586, were performed at approximately 5-foot depth intervals to estimate in situ density of the soils. Soil strength parameters of cohesionless soils were estimated from correlations with SPT blow counts. Pocket penetrometer measurements of unconfined compressive strength were used to estimate the undrained shear strength of clay samples.

Boring R-10-007, located 122 feet right of Station 854+97, was advanced 102.5 feet to elevation 902.6. The hole was cased with 3-inch PVC pipe encased in grout to facilitate P-S logging of the hole to determine the average shear wave velocity of the soil. Boring R-10-008, located 75 feet left of Station 855+58, was advanced 101.8 feet, to elevation 905.1 feet. The hole was instrumented as an open-standpipe observation well by installing 1-$^1/_2$" slotted PVC pipe in the hole and backfilling the annulus with washed #8 sand. Boring R-10-010, located 12 feet right of Station 855+07, was advanced 57.8 feet, to elevation 956.0 feet.

Laboratory Testing Program

Soil samples obtained during the subsurface investigation were submitted to the Headquarters Geotechnical Laboratory for mechanical analyses, corrosion potential testing, and determination of Atterburg limits.

Site Geology and Subsurface Conditions

Topography and Geology

The project is located near the southern end of the Salinas Valley in the Coast Ranges geomorphic province. The terrain consists of dissected plains surrounded by low to moderately steep hills. The westerly flowing Estrella River is the main drainage feature in the project area. It lies to the south of Route 46 through the project limits. The Estrella River is a tributary to the Salinas River, which drains to Monterey Bay northwest of the project area. McMillan Canyon Creek, the subject of this report, is an intermittent creek that drains to the Estrella River.

The region is divided into three geologic blocks separated by the San Andreas Fault and the Sur-Naciemento Fault Zone. The Diablo Range is in the block located northeast of the San Andreas Fault. The Gabilan Range and the Salinas Valley are located in the central block. The Santa Lucia Range is located in the western block. "Basement" rocks in the western and eastern blocks consist of Franciscan Assemblage rocks and a complex of metamorphic units. Granitic intrusions form the bedrock in the central block, beneath the project area.

Pre-Cretaceous age rocks of the Sur Series are the oldest rocks in the area. These have been intruded by Cretaceous-age granite or granodiorite. This metamorphic-granitic complex is confined to the central fault block, beneath the Salinas Valley and Gabilan Range. Sedimentary rock formations and some volcanic units were deposited on top of the basement rocks during the Cretaceous and Tertiary Periods. Subsequently, during the Quaternary Period, clastic sediments were deposited primarily in marine/transgression environments, which alternated with periods of uplift/regression during which erosion and subareal deposition occurred. The latest uplift (and/or drop in sea level) occurred in Late Pliocene to Mid-Pleistocene time, leaving the sediments at nearly their present-day elevations. Some of these formations have been folded and faulted by the same compressive forces that produced the San Andreas Fault system. Present-day topographic surface features and drainage patterns were established by Mid-Pleistocene time.

Dibblee (1971) mapped the bedrock beneath the project area as granitic rock ("gr"≅quartz granodiorite), which intruded and crystallized during Cretaceous time, 60 to 80 million years ago. Paso Robles Formation ("Q_{Tp}"), deposited in Late Pliocene and early Pleistocene time (2 to 3 million years ago), overlies the granitic bedrock. The Paso Robles Formation consists of easily eroded sands and gravels with lesser amounts of silts and clay, deposited by running water. The formation varies in thickness, from a few feet thick on top of the granitic ridges west of Paso Robles, up to several hundred feet thick along the existing Route 46 alignment in the eastern portion of the project area. Bedding within the Paso Robles Formation is not usually apparent. However, the few available exposures suggest that bedding dips generally toward the north at low angles (1 to 2 degrees): Dibblee mapped the axis of a gentle anticline southwest of the project area.

Old river terrace deposits ("Q_a" and "Q_{oa}"), composed of granitic gravel, sand, silt, and clay, line the sides of some of the stream valleys that cross the highway alignment near the Estrella River. Younger alluvial deposits ("Q_{rs}") composed of gravel, sand, silt, and clay have been deposited along the modern drainage courses.

Soil Conditions

The geotechnical borings encountered 25 feet to 35 feet of loose to medium dense sand and silt overlying hard clay and very dense silt and sand. The observed stratigraphy is consistent with geologic maps of the area, which show Pleistocene aged alluvial soils of the Paso Robles formation overlain by more recent alluvial deposits from the drainages. Stratigraphy comprised of layers of variable thickness and lateral extents are indicative of the alluvial environment in which they were deposited. Particle size distribution, layer thickness, and lateral extent of deposition change as the velocity of water depositing the materials varies.

Ground Water

Boring R-10-008 was instrumented as an open-standpipe monitoring well. Ground water was measured 35.0 feet below original ground on July 19, 2010, corresponding to an elevation of 971.9 feet.

Scour Evaluation

The following scour data was provided by Structures Hydraulics and Hydrology in their Draft Final Hydraulic Report:

Table 1: Scour Summary

Scour Type	Scour Depth (feet)	Scour Elevation (feet)
Degradation	3.8	
Contraction Scour	1.0	
Local Scour	7.5	
Total Potential Scour in 75 years	12.3	995.3

The McMillan Canyon Creek Bridge will be a single-span structure. The bridge abutments will be protected against scour with rock slope protection, so scour was not considered in calculating pile tip elevations.

Corrosion Evaluation

Representative soil samples taken during the subsurface investigation were tested for corrosion potential. The Department considers a site corrosive to foundation elements if one or more of the following conditions exist for the representative soil and/or water samples taken at the site:

- Chloride concentration is greater than or equal to 500 ppm
- Sulfate concentration is greater than or equal to 2000 ppm
- The pH is 5.5 or less

Since resistivity serves as an indicator parameter for the possible presence of soluble salts, tests for sulfate and chloride are usually not performed unless the resistivity of the soil is 1,000 ohm-cm or less.

Table 2: Corrosion Test Summary

Boring	Depth	SIC Number	Minimum Resistivity (Ohm-Cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
R-10-007	2'	C5022	1951	8.22	N/A	N/A
R-10-007	14'	C5023	1434	7.63	N/A	N/A
R-10-007	24'	C5024	3510	8.08	N/A	N/A
R-10-007	35'	C5025	3674	8.24	N/A	N/A
R-10-007	42'	C5026	856	8.20	20	83
R-10-007	52'	C5027	1900	8.30	N/A	N/A
R-10-007	62'	C5028	738	8.23	14	62
R-10-007	72'	C5029	5416	8.54	N/A	N/A
R-10-007	83'	C5030	4830	8.67	N/A	N/A
R-10-007	86'	C5031	4820	8.57	N/A	N/A
R-10-007	91'	C5032	1407	8.43	N/A	N/A
R-10-007	100'	C5033	2703	7.88	N/A	N/A
R-10-008	3'	C5007	5464	7.79	N/A	N/A
R-10-008	7'	C5008	1547	7.84	N/A	N/A
R-10-008	10'	C5009	2969	7.99	N/A	N/A
R-10-008	23'	C5010	1031	7.17	N/A	N/A
R-10-008	28'	C5011	4700	8.29	N/A	N/A
R-10-008	35'	C5012	4400	8.49	N/A	N/A
R-10-008	39'	C5013	2206	8.28	N/A	N/A
R-10-008	50'	C5014	1121	7.78	N/A	N/A
R-10-008	58'	C5015	4338	8.06	N/A	N/A
R-10-008	62'	C5016	577	7.96	10	77
R-10-008	69'	C5017	2266	8.16	N/A	N/A
R-10-008	79'	C5018	1663	8.22	N/A	N/A
R-10-008	92'	C5020	4829	8.39	N/A	N/A
R-10-008	100'	C5021	1998	8.16	N/A	N/A
R-10-010	5'	C5000	1469	7.48	N/A	N/A
R-10-010	10'	C5001	1721	7.96	N/A	N/A
R-10-010	17'	C5002	3696	7.89	N/A	N/A
R-10-010	22'	C5003	3349	8.02	N/A	N/A
R-10-010	33'	C5004	7822	8.37	N/A	N/A
R-10-010	42'	C5005	4385	8.70	N/A	N/A
R-10-010	52'	C5006	1071	7.16	N/A	N/A
Corrosive if:			**≤ 1000**	**≤ 5.5**	**≥ 500**	**≥ 2000**

Based on corrosion test results, and because the project area is not within 1000 feet of salt or brackish water, the site is considered non-corrosive.

Seismic Recommendations

The project is located within a seismically active region of California. There are several earthquake faults in close proximity to the project area. Table 1 lists the active and potentially active faults in the project vicinity as described in Caltran's *2007 Fault Database*. Corresponding Moment Magnitudes and distances to the bridge site are also given. A fault map is included in the attachments to this report.

Table 3: Active and Potentially Active Faults

Fault	*Moment Magnitude of Maximum Credible Earthquake*[1]	*Distance to Fault from Project Area (miles)*
Rinconada Fault Zone (San Marcos section)	7.5	15.5
Oceanic Fault Zone	7.4	25.4
San Andreas Fault Zone (Parkfield section)	7.9	8.6
West Huasna Fault Zone	7.0	26.8
San Simeon-Hosgri Fault Zone (San Simeon Fault)	7.5	39.5
Cambria Fault	7.0	26.7
Los Osos Fault Zone (Irish Hills section)	7.0	31.8
Los Osos Fault Zone (Lopez Reservoir section)	7.0	33.7
Southern San Luis Range Fault Zone	7.2	38.2
San Simeon-Hosgri Fault Zone (Hosgri Fault)	7.5	43.7

A design response spectrum for the project area was estimated using the *2009 Caltrans Seismic Design Procedure.* The procedure was developed to calculate the minimum seismic design requirements for bridges on State highways. The method calculates design response spectra over a range of periods. The design response spectrum is based on the envelope of a deterministic and a probabilistic spectrum. The deterministic spectrum is calculated as the arithmetic average of median response spectra computed using the Chiou & Youngs and Campbell & Bozorgnia ground motion prediction equations (CY-CB GMPE). These equations are applied to all faults in or near California considered to be active in the last 700,000 years (late Quaternary age) and capable of producing a moment magnitude earthquake of 6.0 or greater.

[1] According to Caltrans *2007 Fault Database*

The probabilistic spectrum is obtained from the 2008 USGS Seismic Hazard Map for the 5% in 50 years probability of exceedance (or 975 year return period). The spectral values are adjusted with a soil amplification factor based on an average of the Boore-Atkinson (2008), Campbell Bozorgnia (2008), and Chiou-Youngs (2008) ground motion prediction models. For sites underlain by soils having an average shear wave velocity for the upper 30 meters of soil (V_{S30}) of less than 300 meters per second, the 2009 USGS Probabilistic Seismic Hazard Analysis Interactive Deaggregation Tool is used to develop the probabilistic spectrum.

The controlling fault at the McMillan Canyon Creek Bridge site is the San Andreas Fault zone (Parkfield section), a right lateral slip strike fault with a maximum magnitude of 7.9. The design response spectrum was governed by the probabilistic spectrum with a soil amplification factor for a V_{S30} of 295 meters per second. The V_{S30} value was determined from a P-S log of boring R-10-007. The final design response spectrum is provided in the attachments to this report.

No known active or potentially active faults project towards or cross the highway alignment within the project limits. Therefore, there is low potential for surface fault rupture to occur and no mitigation efforts are necessary.

Liquefaction potential at the McMillan Canyon Creek Bridge site is low. For liquefaction to occur, three elements in combination are necessary: loose granular soils, saturated soil conditions, and strong ground shaking. Loose cohesionless soils are not present at an elevation where they may become saturated with ground water.

Foundation Recommendations

Caltrans Standard Plan driven open-ended pipe piles, Class 140 Alternative "W", are the recommended foundation type for the McMillan Canyon Creek Bridge. Driven piles having the recommended lengths and diameters will meet the requirements for permissible settlement under Service Limit State loads provided on the "Final Foundation Data Sheet." Pile tip elevations were conservatively calculated assuming the ground water elevation is at the surface of the stream channel.

Abutments Foundation Design Recommendations

Support	Pile	Cut-off Elevation (feet)	LRFD Service-I Limit State Load per Support (kips)		LRFD Service-I Limit State Total Load per Pile (Compression) (kips)	Nominal Resistance (kips)	Design Tip Elevations (feet)	Specified Tip Elevation (feet)	Nominal Driving Resistance Required (kips)
			Total	Permanent					
Abut. 1	Class 140 Alt. W	1001.42	4151	3322	134	270	955 (a) 969 (c)	955	270
Abut. 2	Class 140 Alt. W	1001.42	4151	3322	134	270	955 (a) 969 (c)	955	270

Notes:

1) *Design tip elevations are controlled by: (a) Compression and (c) Settlement, respectively.*
2) *The specified tip elevation shall not be raised if controlled by settlement.*
3) *The nominal driving resistance required is equal to the nominal resistance needed to support the factored load.*

Pile Data Table

Location	Pile Type	Nominal Resistance (kips)		Design Tip Elevation (feet)	Specified Tip Elevation (feet)	Nominal Driving Resistance (kips)
		Compression	Tension			
Abut. 1	Class 140 Alt. W	270	0	955 (a), 969 (c)	955	270
Abut. 2	Class 140 Alt. W	270	0	955 (a), 969 (c)	955	270

Notes:

1) *Design tip elevations are controlled by: (a) Compression and (c) Settlement, respectively.*
2) *The specified tip elevation shall not be raised if controlled by settlement.*
3) *The nominal driving resistance required is equal to the nominal resistance needed to support the factored load.*

Construction Considerations

For piles that are driven to the specified tip elevation and do not indicate the nominal resistance per the method prescribed in Section 49-1.08, *Pile Driving Acceptance Criteria*, of the Standard Specifications, the pile shall be re-struck with the same impact hammer not less than 16 hours after completion of the initial installation. Prior to the monitored restrike, the hammer should be warmed-up by impacting another pile or object a minimum of ten combustion cycles.

The Office of Geotechnical Design – North is to be contacted if the constructed pile tip elevation is above the specified tip elevation.

Project Information

Standard Special Provision S5-280, "Project Information", discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The Department makes the following supplemental project information available:

Supplemental Project Information

Means	Description
Included in the Information Handout	Foundation Report for the McMillan Canyon Creek Bridge dated December 30, 2010.
Available for inspection at the District Office	None
Available for inspection at the Transportation Laboratory	None
Available for inspection at _____; telephone (___) - ___	None
Available as specified in the Standard Specifications	
Available at: http://www.dot.ca.gov/hq/esc/oe/weekly_ads/index.php	

Items listed to be included in the Information Handout will be provided in Acrobat (.pdf) format to the Addressee of this report via electronic mail.

Closure

The recommendations contained in this report are based on specific project information that has been provided by Office of Bridge Design – Central, Branch 6. If any conceptual changes are made during final project design, the Office of Geotechnical Design – North, Branch D should review those changes to determine if the recommendations contained in this report are still applicable. Any questions regarding the recommendations contained herein should be directed to the attention of Dan Appelbaum, (805) 549-3745, or Mike Finegan, (805) 549-3194, at the Office of Geotechnical Design – North, Branch D.

REGISTERED PROFESSIONAL ENGINEER
D.L. Appelbaum
No. C 50001
Exp. 6-30-11
CIVIL
STATE OF CALIFORNIA

DANIEL L. APPELBAUM, PE
Transportation Engineer
Geotechnical Design – North
Branch D

Supervised by,

MICHAEL S. FINEGAN, PE, Chief
Geotechnical Design - North
Branch D

c: Roy Bibbens / GDN File (E-copy)
John Luchetta – Project Manager (E-copy)
Mark Willian – GS Corporate (E-copy)
R.E. Pending File
Doug Lambert – District Materials Engineer (E-copy)
Craig Whitten – DES Office Engineer, Office of PS&E
Job File / Branch D Records

LIST OF ATTACHMENTS

INDEX OF PLANS

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	46	41.0/46.3		

STATE OF CALIFORNIA

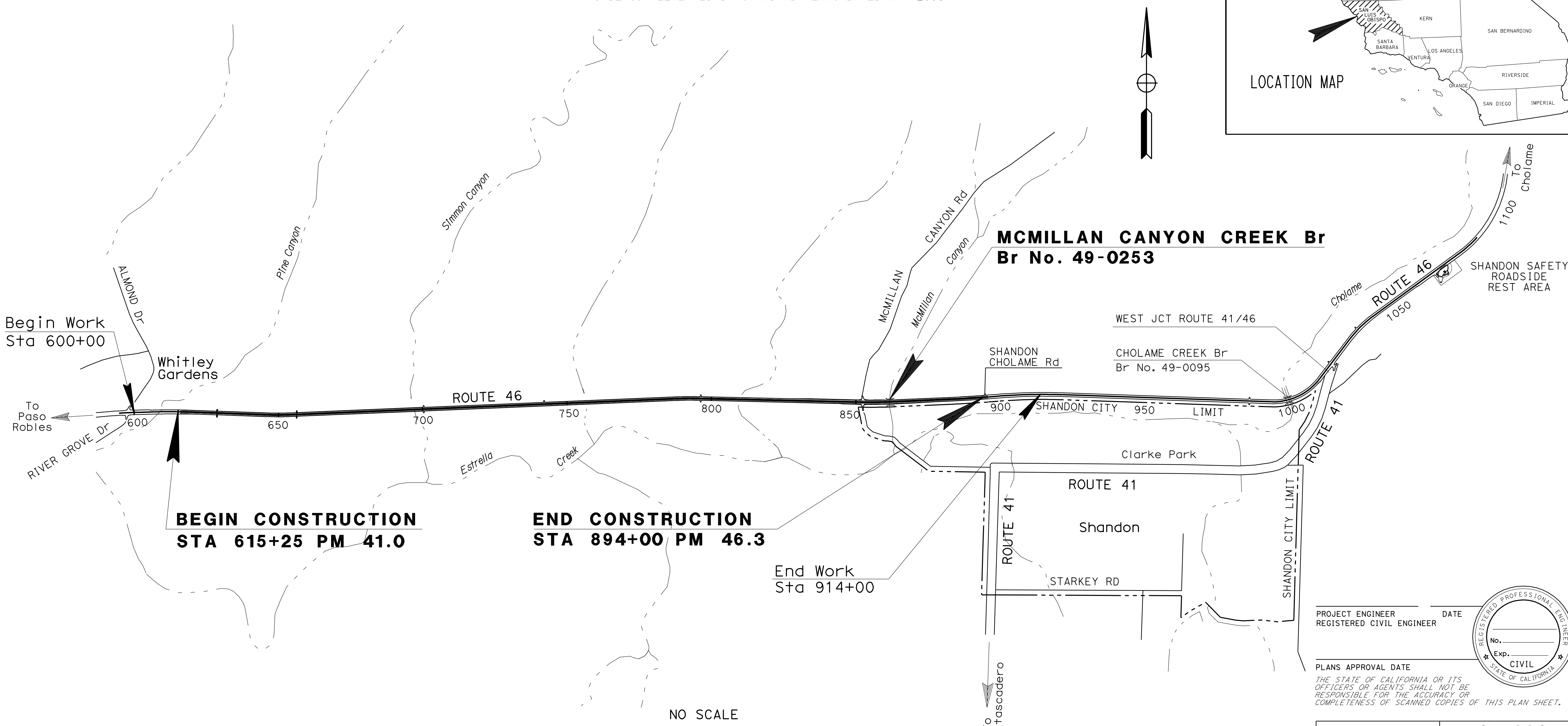
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON

STATE HIGHWAY

IN SAN LUIS OBISPO COUNTY
NEAR PASO ROBLES
FROM 0.1 MILE EAST OF ALMOND DRIVE TO
0.8 MILE EAST OF McMILLAN CANYON ROAD

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2006



PROJECT MANAGER JOHN LUCHETTA

DESIGN ENGINEER JACK WALKER

PROJECT ENGINEER DATE
REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

PLANS APPROVAL DATE

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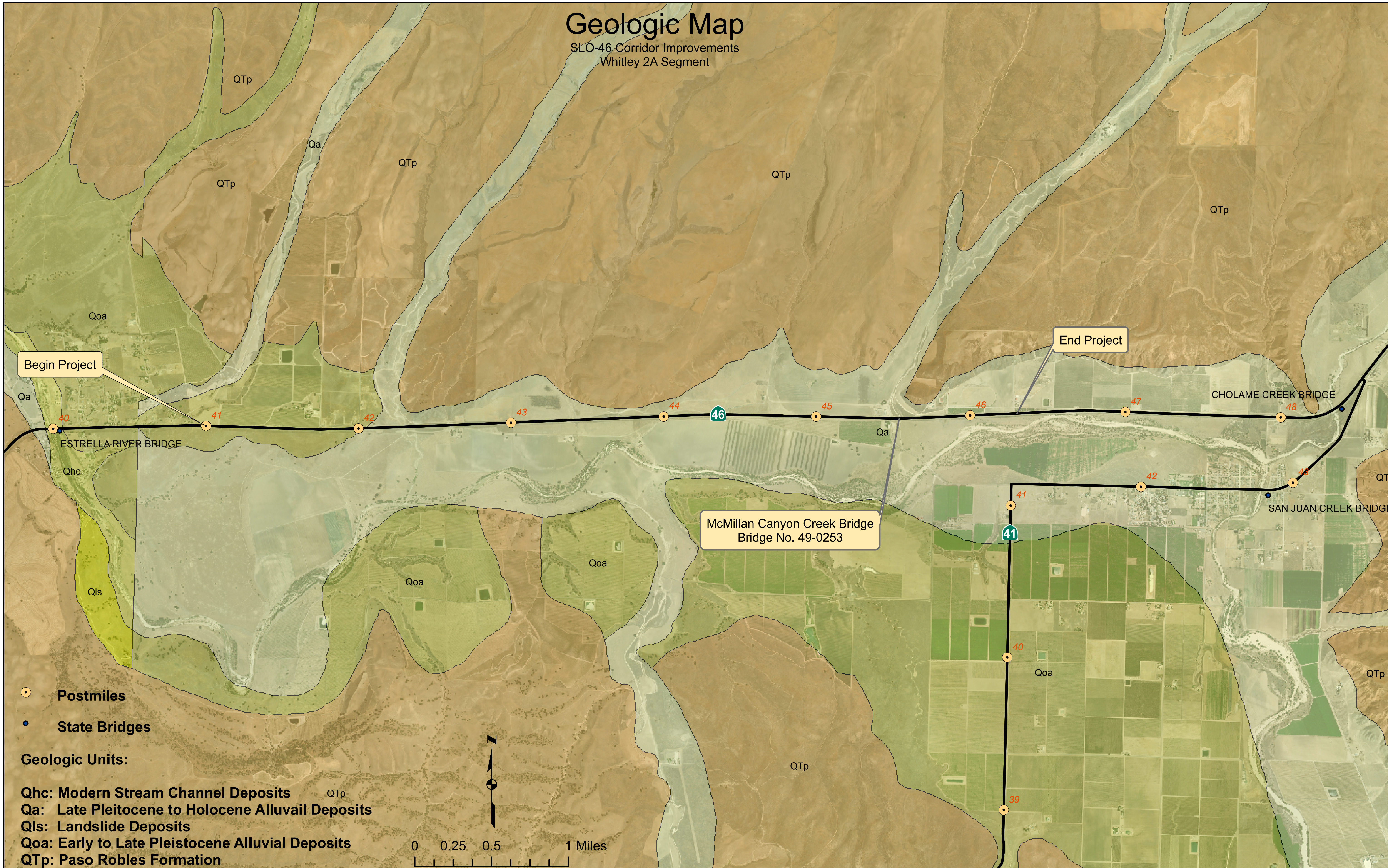
THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

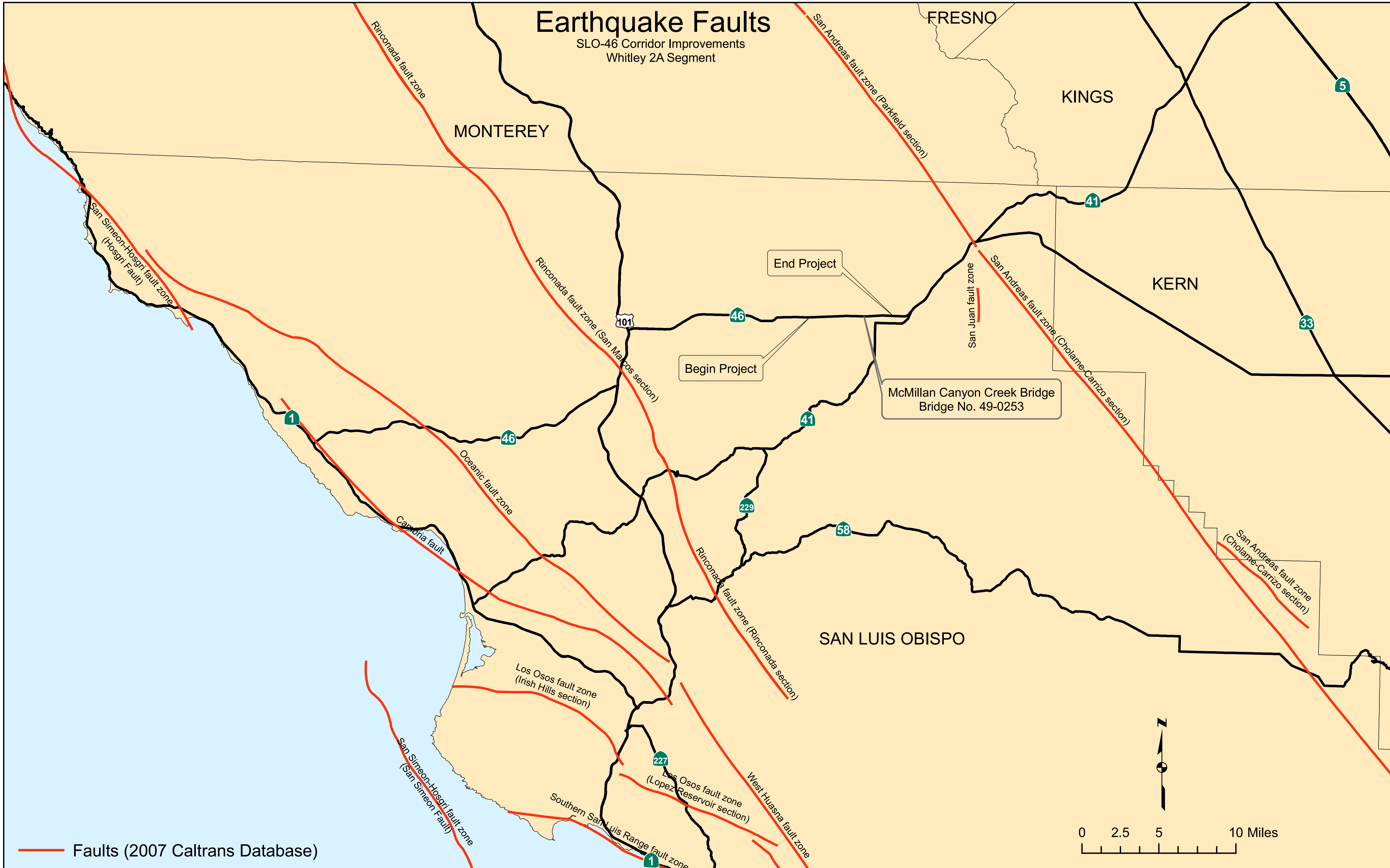
ATTACHMENT 1: VICINITY MAP

CONTRACT No.	05-330774
PROJECT ID	0500020049



Geologic Mapping Compiled by Lew Rosenberg

ATTACHMENT 2



ATTACHMENT 3

McMillan CK Bridge

Bridge No. **49-0253**

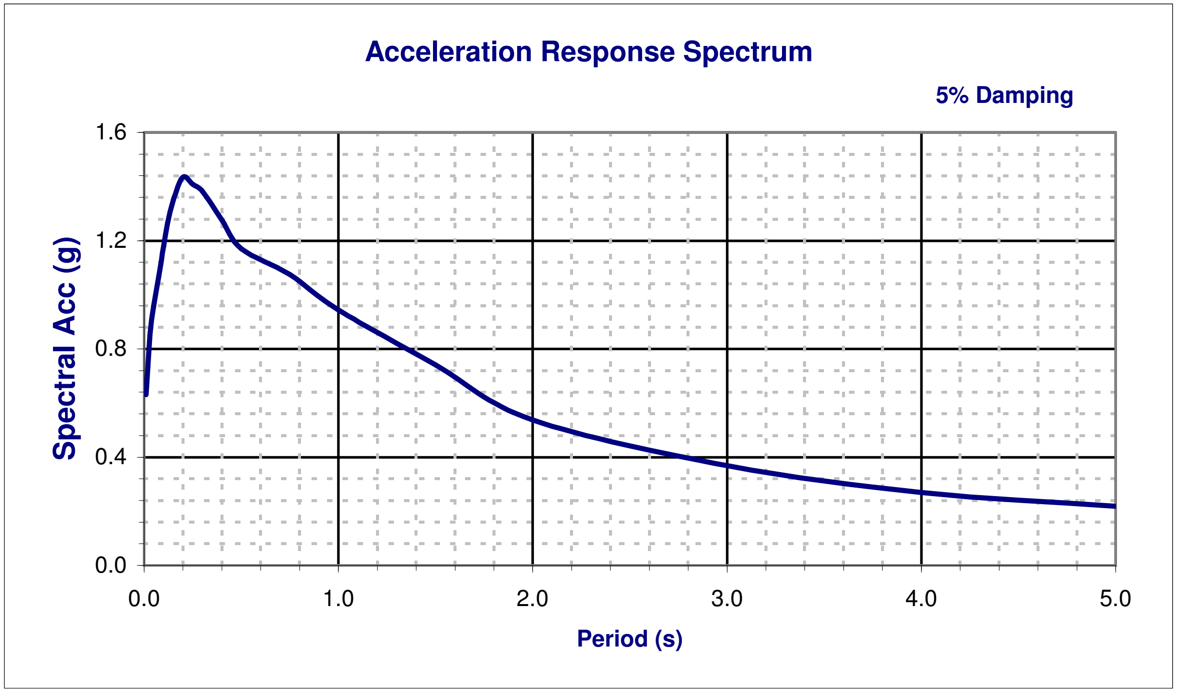
EA No. **05-330771**

Latitude 35.6612

Longitude -120.4132

Control **Probabilistic**

Period (s)	Sa(g)
0.010	0.631
0.020	0.741
0.030	0.851
0.050	0.961
0.075	1.070
0.100	1.180
0.120	1.265
0.150	1.350
0.200	1.434
0.250	1.408
0.300	1.382
0.400	1.276
0.500	1.169
0.750	1.076
1.000	0.944
1.500	0.741
2.000	0.538
3.000	0.368
4.000	0.270
5.000	0.218



Deterministic Procedure Data

Fault	San Andreas fault zone (Parkfield section)	
Fault ID	312	
Style	RLSS	
Mmax	7.9	
Dip	90	deg
Z_{TOR}	0	km

R_{rup}	13.8	km
R_{jb}	13.8	km
R_x	13.8	km
V_{S30}	295	m/s
$Z_{1.0}$	318	m
$Z_{2.5}$	2.00	km

Notes

Please note the Design ARS curve is based on the USGS 5% Probability of Excedence in 50 Years

Final

Design Response Spectrum

Attachment 4

MATERIAL PROPERTIES SUMMARY

McMillan Canyon Creek Bridge

Bridge No. 49-0253

DESCRIPTION	BORING	R-10-007								
	STATION	854+97								
	LINE	Rte 46 CL								
	DISTANCE FROM LINE (Rt. or Lt.)	122' Rt.								
	DATE SAMPLED	5/11/2010	5/11/2010	5/11/2010	5/11/2010	5/11/2010	5/11/2010	5/11/2010	5/11/2010	5/11/2010
	SAMPLE ID	C5022	C5023	C5024	C5025	C5026	C5027	C5028	C5029	C5030
	DEPTH OR ELEVATION (FEET)	2'	14'	24'	35'	42'	52'	62'	72'	83'
	USCS CLASSIFICATION	SC	CL	SP-SM	SM	CL	CL	CH	SM	SC
PARTICLE SIZE ANALYSIS	50 mm (2")									
	38 mm (1 1/2")			100						
	25 mm (1")			98						
	19 mm (3/4")			98						
	12 mm (1/2")			97						100
	9.5 mm (3/8")	100		95						98
	4.75 mm (No. 4)	97		91	100					86
	2.36 mm (No. 8)	92		88	99				100	70
	1.18 mm (No. 16)	89		79	96				98	55
	600 µm (No. 30)	82		54	90				90	42
	300 µm (N0. 50)	71		27	71				54	30
	150 µm (No. 100)	58		16	45				28	21
	75 µm (N0. 200)	47		11	29				17	16
	5 µm	22		7	11				8	10
	1µm	15		4	7				4	7
PI	LIQUID LIMIT	29	32			40	27	53		33
	PLASTICITY INDEX	13	13	NP	NP	20	11	35		16
CORROSION	RESISTIVITY (ohm-cm)	1951	1434	3510	3674	856	1900	738	5416	4830
	pH	8.22	7.63	8.08	8.24	8.20	8.30	8.23	8.54	8.67
	CHLORIDES (ppm)	N/A	N/A	N/A	N/A	20	N/A	14	N/A	N/A
	SULFATES (ppm)	N/A	N/A	N/A	N/A	83	N/A	62	N/A	N/A

MATERIAL PROPERTIES SUMMARY

McMillan Canyon Creek Bridge

Bridge No. 49-0253

DESCRIPTION	BORING	R-10-007			R-10-008					
	STATION	854+97			855+58					
	LINE	Rte 46 CL			Rte 46 CL					
	DISTANCE FROM LINE (Rt. or Lt.)	122' Rt.			75' Lt.					
	DATE SAMPLED	5/11/2010	5/11/2010	5/11/2010	5/18/2010	5/18/2010	5/18/2010	5/18/2010	5/18/2010	5/18/2010
	SAMPLE ID	C5031	C5032	C5033	C5007	C5008	C5009	C5010	C5011	C5012
	DEPTH OR ELEVATION (FEET)	86'	91'	100'	3'	7'	10'	23'	28'	35'
	USCS CLASSIFICATION	SM	CL-ML	CL-ML	SP-SC	CL	SP-SC	CL	SW-SC	SP-SC
PARTICLE SIZE ANALYSIS	50 mm (2")									
	38 mm (1 1/2")						100			100
	25 mm (1")				100		98			99
	19 mm (3/4")				99		98			98
	12 mm (1/2")				99		95		100	96
	9.5 mm (3/8")				96		90		99	92
	4.75 mm (No. 4)			100	87		82		97	78
	2.36 mm (No. 8)	100		99	74		69		93	61
	1.18 mm (No. 16)	99	100	98	55		57		86	38
	600 µm (No. 30)	95	99	90	34		39		66	19
	300 µm (N0. 50)	72	95	77	16		24		30	11
	150 µm (No. 100)	43	80	66	15		17		14	9
	75 µm (N0. 200)	24	65	53	11		14		9	8
	5 µm	10	29	19	8		11		8	5
	1µm	7	19	13	6		9		5	4
PI	LIQUID LIMIT		27	24				40		
	PLASTICITY INDEX	NP	10	5				23		
CORROSION	RESISTIVITY (ohm-cm)	4820	1407	2703	5464	1547	2969	1031	4700	4400
	pH	8.57	8.43	7.88	7.79	7.84	7.99	7.17	8.29	8.49
	CHLORIDES (ppm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	SULFATES (ppm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

MATERIAL PROPERTIES SUMMARY

McMillan Canyon Creek Bridge

Bridge No. 49-0253

DESCRIPTION	BORING	R-10-008								
	STATION	855+58								
	LINE	Rte 46 CL								
	DISTANCE FROM LINE (Rt. or Lt.)	75' Lt.								
	DATE SAMPLED	5/11/2010	5/11/2010	5/11/2010	5/18/2010	5/18/2010	5/18/2010	5/18/2010	5/18/2010	5/18/2010
	SAMPLE ID	C5013	C5014	C5015	C5016	C5017	C5018	C5019	C5020	C5021
	DEPTH OR ELEVATION (FEET)	39'	50'	58'	62'	69'	79'	83'	92'	100'
	USCS CLASSIFICATION	CL	CL	SM	CH	CL-ML	CL-ML	SM	SM	SM
PARTICLE SIZE ANALYSIS	50 mm (2")									
	38 mm (1 1/2")									
	25 mm (1")									
	19 mm (3/4")									
	12 mm (1/2")									
	9.5 mm (3/8")							100		
	4.75 mm (No. 4)							99		
	2.36 mm (No. 8)						100	95		100
	1.18 mm (No. 16)		100	100			98	87	100	99
	600 µm (No. 30)		99	99			94	72	99	86
	300 µm (N0. 50)		96	83			85	56	93	54
	150 µm (No. 100)		85	42			69	41	64	31
	75 µm (N0. 200)		71	23			55	30	37	18
	5 µm		41	16			27	12	9	7
	1µm		29	11			18	8	6	3
PI	LIQUID LIMIT	24	36		76	25	22	22		
	PLASTICITY INDEX	8	19	NP	48	6	6	4	NP	NP
CORROSION	RESISTIVITY (ohm-cm)	2206	1121	4338	577	2266	1663		4829	1998
	pH	8.28	7.78	8.06	7.96	8.16	8.22		8.39	8.16
	CHLORIDES (ppm)	N/A	N/A	N/A	10	N/A	N/A		N/A	N/A
	SULFATES (ppm)	N/A	N/A	N/A	77	N/A	N/A		N/A	N/A

MATERIAL PROPERTIES SUMMARY

McMillan Canyon Creek Bridge

Bridge No. 49-0253

DESCRIPTION	BORING	R-10-010						
	STATION	855+07						
	LINE	Rte 46 CL						
	DISTANCE FROM LINE (Rt. or Lt.)	12' Rt.						
	DATE SAMPLED	5/19/2010	5/19/2010	5/19/2010	5/19/2010	5/19/2010	5/19/2010	5/19/2010
	SAMPLE ID	C5000	C5001	C5002	C5003	C5004	C5005	C5006
	DEPTH OR ELEVATION (FEET)	5'	10'	17'	22'	33'	42'	52'
	USCS CLASSIFICATION	SC	SC	SP-SM	SP-SM	SP-SM	SM	CL
PARTICLE SIZE ANALYSIS	50 mm (2")					100		
	38 mm (1 1/2")			100		91		
	25 mm (1")	100	100	99		86		
	19 mm (3/4")	98	98	98		79		
	12 mm (1/2")	97	97	94		76		
	9.5 mm (3/8")	96	96	89		73		
	4.75 mm (No. 4)	93	93	76		61	100	
	2.36 mm (No. 8)	85	87	65		51	99	
	1.18 mm (No. 16)	77	78	49		43	95	
	600 μm (No. 30)	67	66	33		34	86	
	300 μm (N0. 50)	57	54	22		24	71	
	150 μm (No. 100)	48	44	16		15	51	
	75 μm (N0. 200)	41	37	12		11	34	
	5 μm	25	18	6		5	12	
	1μm	17	11	4		3	7	
PI	LIQUID LIMIT	41	26					31
	PLASTICITY INDEX	24	13		NP	NP	NP	12
CORROSION	RESISTIVITY (ohm-cm)	1469	1721	3696	3349	7822	4385	1071
	pH	7.48	7.96	7.89	8.02	8.37	8.70	7.16
	CHLORIDES (ppm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	SULFATES (ppm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SLO	46			

Dan Appelbaum 12-20-10
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Dan Appelbaum No. C50001 Exp. 6-30-11 CIVIL STATE OF CALIFORNIA

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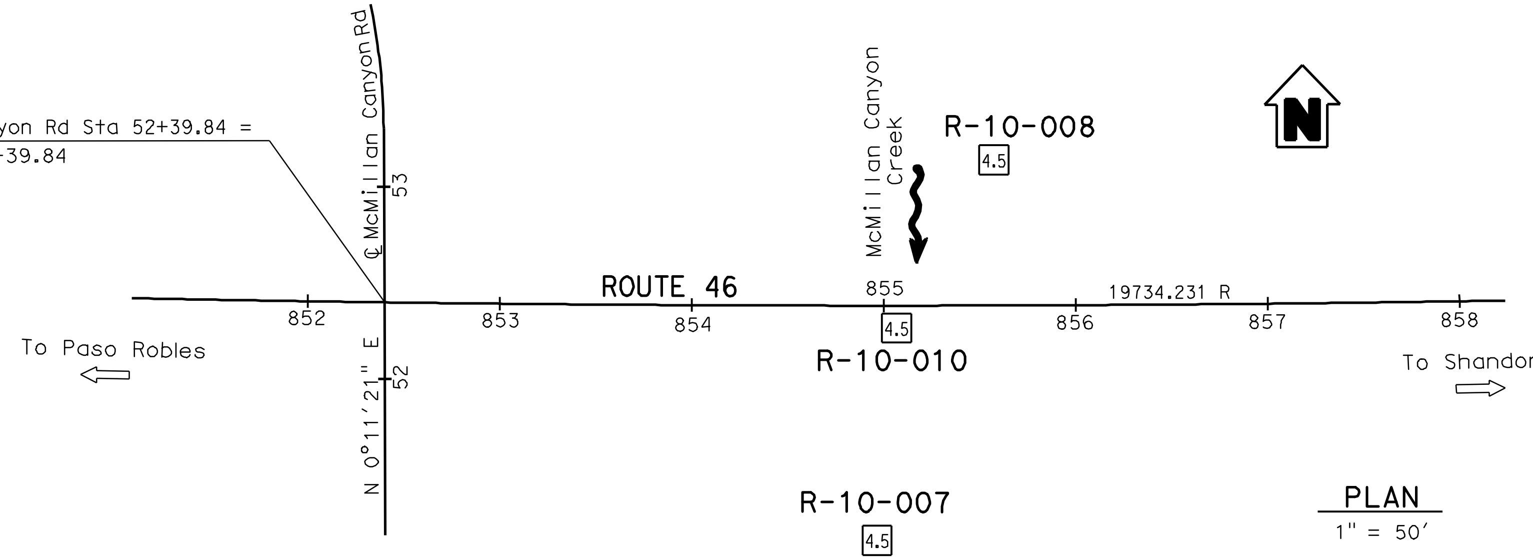
BENCH MARK

SLO 46 PM 45.45

Fnd 1" ip w/caltrans control pp
23.20' Lt "RTE46" Line ℄ Rte 46
Sta 856+06.24
N 2,435,730.096
E 5,844,914.522
Elev = 1013.016' (NGVD29)

SLO 46 PM 45.46

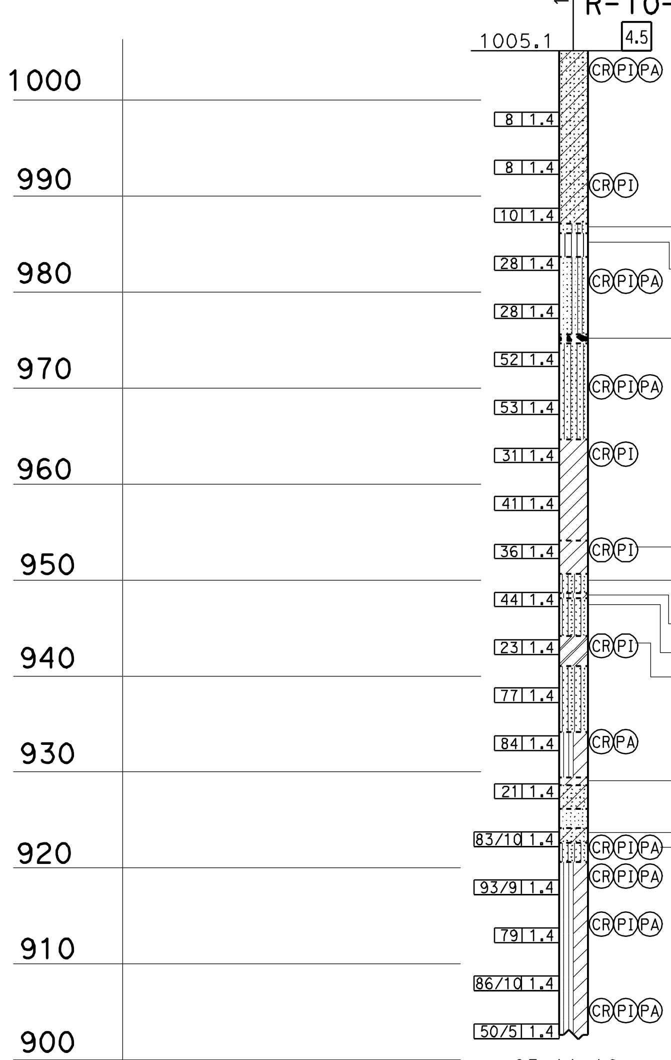
Fnd 1" ip w/caltrans control pp
163.06' Rt "RTE46" Line ℄ Rte 46
Sta 854+75.65
N 2,435,543.700
E 5,844,783.678
Elev = 1011.934' (NGVD29)



PLAN

1" = 50'

Note: Ground Water not measured in Borings R-10-007 and R-10-010.



CLAYEY SAND (SC); loose; grayish brown; dry; mostly medium and fine SAND (50%); some fines (47%); trace fine GRAVEL (3%).
-yellowish brown; moist.
-scattered thin layers of poorly graded SAND (SP); mostly fine SAND.
-medium dense.
Poorly graded SAND with SILT (SP-SM); medium dense; yellowish brown; moist; mostly medium and fine SAND; few nonplastic fines.
SILT (ML); medium dense; yellowish brown; moist; mostly nonplastic fines; few fine SAND; trace fine subrounded GRAVEL.
Poorly graded SAND with SILT (SP-SM); dense; pale brown; moist; mostly medium and fine SAND (80%); few fines (11%); few coarse and fine, subrounded GRAVEL (9%).
-fine GRAVEL.
Well-graded GRAVEL with SAND (GW); dense; pale brown; wet; mostly coarse and fine, subangular GRAVEL, 2" maximum diameter; little SAND, from coarse to fine.
SILTY SAND (SM); very dense; light yellowish brown; moist; mostly medium and fine SAND (71%); some fines (29%).
Lean CLAY (CL); hard; brown; moist; PP=4.5 tsf.
-trace fine SAND.
-yellowish brown.
Lean CLAY with SAND (CL); hard; brown; moist; little fine SAND.
SILTY SAND (SM); dense; light yellowish brown; moist; mostly fine SAND; some low plasticity to nonplastic fines.
SILTY CLAY (CL-ML); hard; light yellowish brown; moist; mostly low plasticity fines; PP>4.5 tsf.
SILTY SAND (SM); very dense; light yellowish brown; moist; mostly fine SAND; some low plasticity to nonplastic fines.
Fat CLAY (CH); hard; yellowish brown; moist; mostly high plasticity fines; calcite nodules; PP> 4.5 tsf.
SILTY SAND (SM); very dense; pale brown; moist; mostly medium and fine SAND (83%); little fines (17%).
SILTY CLAY (CL-ML); hard; pale brown; moist; mostly low plasticity to medium plasticity fines; trace fine SAND; PP>4.5 tsf.
Lean CLAY (CL); hard; pale brown; moist; mostly medium plasticity fines; PP=4.0-4.5 tsf.
CLAYEY SAND (SC); medium dense; pale brown; moist; mostly medium and fine SAND; some medium plasticity fines.
Poorly graded SAND (SP); very dense; pale brown; moist; mostly medium and fine SAND; few low plasticity fines.
CLAYEY SAND (SC); very dense; pale brown; moist; mostly SAND (70%), from coarse to fine, subangular; little fines(16%); few fine GRAVEL (14%).
SILTY SAND (SM); very dense; light yellowish brown; moist; mostly fine SAND (76%); little fines (24%).
SANDY SILTY CLAY (CL-ML); very dense; pale brown; moist; mostly fines (53%-65%); some fine SAND (35%-47%).
-light yellowish brown; moist; scattered 4"-6" lenses of SILTY CLAY (CL-ML): hard; pale brown; moist; mostly low plasticity fines; few fine SAND: PP>4.5 tsf.
-medium and fine SAND; fines content varies between little and some.

05-11-10
Terminated at Elev 902.6'
ERi = 74%
Installed 100' 3" PVC Casing with Grout Backfill 5/12/2010

854+50 855+50 856+50

PROFILE

Horiz: 1" = 10'
Vert: 1" = 10'

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 49-0253	MCMILLAN CANYON CREEK BRIDGE
FUNCTIONAL SUPERVISOR NAME: M. Finegan	DRAWN BY: I.G-Remmen, 12/10 CHECKED BY: M. Jurasius	FIELD INVESTIGATION BY: D. Appelbaum		DESIGN BRANCH X	POST MILE 45.49	LOG OF TEST BORINGS 1 OF 5

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3591
PROJECT NUMBER & PHASE: 05000200491

CONTRACT NO.: 05-330771

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 12-16-10 12-20-10 SHEET X OF X

FILE => mcmillan1of5.dgn

USERNAME => s108940 DATE PLOTTED => 20-DEC-2010 TIME PLOTTED => 13:01

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SLO	46			

Dan Appelbaum 12-20-10
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Dan Appelbaum No. C50001 Exp. 6-30-11 CIVIL STATE OF CALIFORNIA

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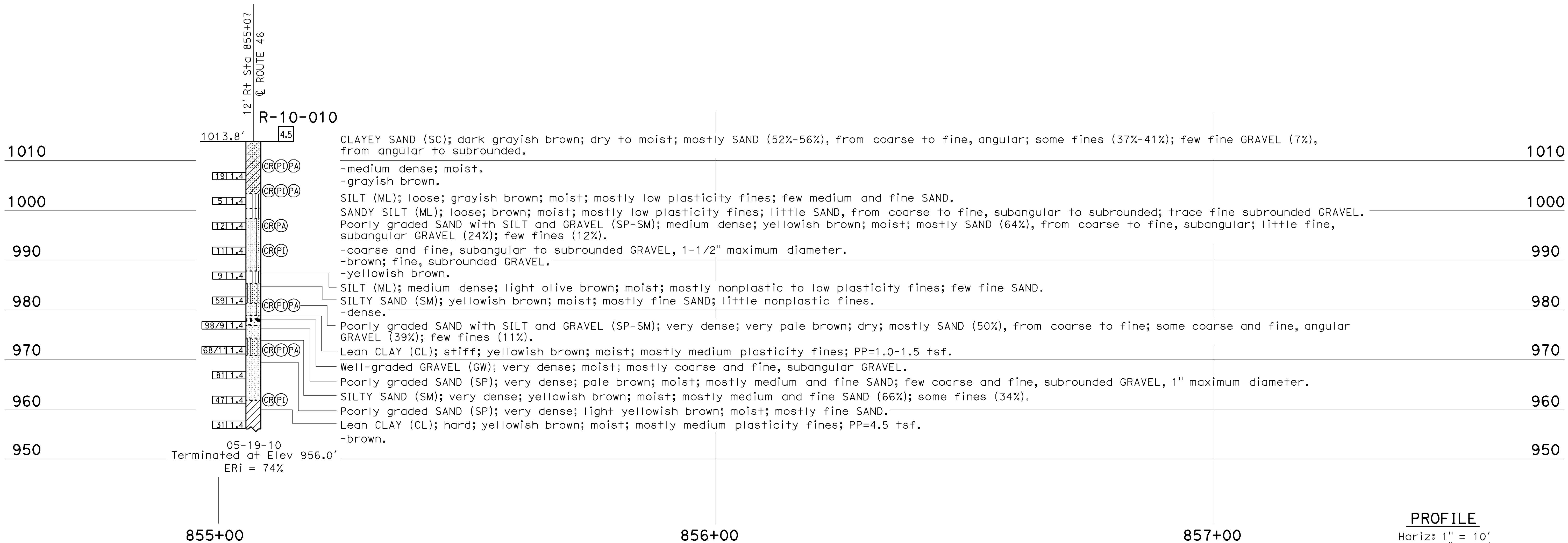
FOR PLAN VIEW, SEE "LOG OF TEST BORINGS 1 OF 5"



CLAYEY SAND (SC); dark grayish brown; dry to moist; mostly SAND (52%-56%), from coarse to fine, angular; some fines (37%-41%); few fine GRAVEL (7%), from angular to subrounded.
-medium dense; moist.
-grayish brown.
SILT (ML); loose; grayish brown; moist; mostly low plasticity fines; few medium and fine SAND.
SANDY SILT (ML); loose; brown; moist; mostly low plasticity fines; little SAND, from coarse to fine, subangular to subrounded; trace fine subrounded GRAVEL.
Poorly graded SAND with SILT and GRAVEL (SP-SM); medium dense; yellowish brown; moist; mostly SAND (64%), from coarse to fine, subangular; little fine, subangular GRAVEL (24%); few fines (12%).
-coarse and fine, subangular to subrounded GRAVEL, 1-1/2" maximum diameter.
-brown; fine, subrounded GRAVEL.
-yellowish brown.
SILT (ML); medium dense; light olive brown; moist; mostly nonplastic to low plasticity fines; few fine SAND.
SILTY SAND (SM); yellowish brown; moist; mostly fine SAND; little nonplastic fines.
-dense.
Poorly graded SAND with SILT and GRAVEL (SP-SM); very dense; very pale brown; dry; mostly SAND (50%), from coarse to fine; some coarse and fine, angular GRAVEL (39%); few fines (11%).
Lean CLAY (CL); stiff; yellowish brown; moist; mostly medium plasticity fines; PP=1.0-1.5 tsf.
Well-graded GRAVEL (GW); very dense; moist; mostly coarse and fine, subangular GRAVEL.
Poorly graded SAND (SP); very dense; pale brown; moist; mostly medium and fine SAND; few coarse and fine, subrounded GRAVEL, 1" maximum diameter.
SILTY SAND (SM); very dense; yellowish brown; moist; mostly medium and fine SAND (66%); some fines (34%).
Poorly graded SAND (SP); very dense; light yellowish brown; moist; mostly fine SAND.
Lean CLAY (CL); hard; yellowish brown; moist; mostly medium plasticity fines; PP=4.5 tsf.
-brown.

PROFILE
Horiz: 1" = 10'
Vert: 1" = 10'

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 49-0253	MCMILLAN CANYON CREEK BRIDGE
FUNCTIONAL SUPERVISOR NAME: M. Finegan	DRAWN BY: I.G-Remmen, 12/10 CHECKED BY: M. Jurasius	FIELD INVESTIGATION BY: D. Appelbaum		DESIGN BRANCH X	POST MILE 45.49	LOG OF TEST BORINGS 2 OF 5

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3591
PROJECT NUMBER & PHASE: 05000200491
CONTRACT NO.: 05-330771

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 12-16-10 12-20-10 SHEET X OF X

FILE => mcmillan2of5.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SLO	46			

Dan Appelbaum 12-20-10
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
Dan Appelbaum
No. C50001
Exp. 6-30-11
CIVIL
STATE OF CALIFORNIA

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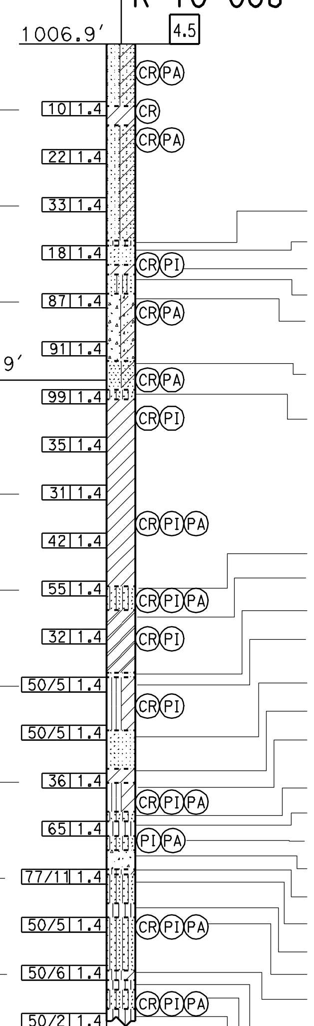
FOR PLAN VIEW, SEE
"LOG OF TEST BORINGS 1 OF 5"

75' Lt Sta 855+58
℄ ROUTE 46

R-10-008

1006.9'



Elevations: 1000, 990, 980, 970, 960, 950, 940, 930, 920, 910, 900

GWS Elev 971.9'
7-19-10

Poorly graded SAND with CLAY and GRAVEL (SP-SC); medium dense; grayish brown; from dry to moist; mostly SAND (76%), from coarse to fine, subrounded; little fine, subrounded GRAVEL (13%); few fines (11%).

SANDY lean CLAY (CL); stiff; yellowish brown; moist; mostly medium plasticity fines; little medium and fine SAND; PP=1.5 tsf.

Poorly graded SAND with CLAY and GRAVEL (SP-SC); medium dense; yellowish brown; moist; mostly SAND (68%), from coarse to fine, subangular to subrounded; little fine GRAVEL (18%); little fines (16%).

-dense.

SANDY SILT (ML); medium dense; yellowish brown; moist; mostly nonplastic fines; little fine SAND.

Poorly graded SAND (SP); medium dense; pale brown; moist; mostly SAND, from medium to fine; trace fines; rounded GRAVEL.

Lean CLAY (CL); very stiff; yellowish brown; moist; mostly medium plasticity fines; PP=3.75 tsf.

Poorly graded SAND with SILT (SP-SM); brown; moist; mostly medium and fine SAND; little low plasticity fines.

Well-graded SAND with CLAY (SW-SC); very dense; pale brown; wet; mostly SAND (88%), from coarse to fine, subangular; few fines (9%); trace GRAVEL (3%), coarse and fine, subrounded, 1" maximum diameter.

Poorly graded SAND with CLAY (SP-SC); very dense; pale brown; wet; mostly SAND (70%), from coarse to fine, subangular; little fine subangular to subrounded GRAVEL (22%); few fines (8%).

SILTY SAND (SM); very dense; pale brown; moist; mostly fine SAND; little nonplastic fines.

Lean CLAY with SAND (CL); hard; pale brown; moist; mostly fines (71%); some fine SAND (29%); PP=4.5 tsf.

-dense; yellowish brown.

-calcite nodules.

SILTY SAND (SM); very dense; light yellowish brown; moist; mostly fine SAND (77%); little fines (23%).

Fat CLAY (CH); hard; pale brown; moist; mostly high plasticity fines; PP=4.5 tsf.

Poorly graded SAND (SP); dense; pale brown; moist; mostly medium and fine SAND.

SILTY CLAY (CL-ML); moderately bedded with moderate interbeds of SILTY SAND (SM). SILTY CLAY (CL-ML); hard; pale brown; moist; mostly low plasticity fines; some zones moderately cemented with calcite. SILTY SAND (SM); very dense; pale brown; moist; mostly fine SAND; some low plasticity fines.

Poorly graded SAND (SP); very dense; pale brown; moist; mostly medium and fine SAND.

SANDY lean CLAY (CL); hard; pale brown; moist; mostly medium plasticity fines; some medium and fine SAND; PP=4.5 tsf.

SANDY SILTY CLAY (CL-ML); hard; yellowish brown; moist; mostly fines (55%); some fine SAND (45%); PP=4.5 tsf.

-light yellowish brown.

SILTY SAND (SM); dense; light yellowish brown; moist; mostly medium and fine SAND; some low plasticity fines.

SILT (ML); very dense; pale brown; moist; mostly nonplastic to low plasticity fines; trace fine SAND.

SILTY SAND (SM); very dense; light yellowish brown; moist; mostly medium and fine SAND (69%); some fines (30%); trace fine GRAVEL (1%).

Well-graded SAND (SW); very dense; light yellowish brown; moist; mostly SAND, from coarse to fine, subangular; trace fine, subangular GRAVEL.

SILTY CLAY (CL-ML); hard; light yellowish brown; moist; mostly low plasticity fines.

SILTY SAND (SM); very dense; pale brown; moist; mostly fine SAND; some nonplastic fines.

SILT (ML); very dense; pale brown; moist; mostly nonplastic fines; trace fine SAND.

SILTY SAND (SM); very dense; pale brown; moist; mostly fine SAND (63%); some fines (37%).

SILTY CLAY (CL-ML); hard; light yellowish brown; moist; mostly medium plasticity to low plasticity fines; PP>4.5 tsf.

SANDY SILT (ML); very dense; pale brown; moist; mostly nonplastic fines; some fine SAND.

SILTY SAND (SM); very dense; light yellowish brown; moist; mostly medium and fine subangular SAND (82%); little fines (18%).

SILT with SAND (ML); very dense; pale brown; moist; mostly nonplastic fines; little fine SAND.

05-18-10
Terminated at Elev 905.1'
ERi = 74%
Installed Open-standpipe
Observation Well 5-18-2010

855+50 856+50 857+50

PROFILE
Horiz: 1" = 10'
Vert: 1" = 10'

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN		
FUNCTIONAL SUPERVISOR	DRAWN BY: I.G-Remmen, 12/10	FIELD INVESTIGATION BY:		DESIGN BRANCH X	49-0253	MCMILLAN CANYON CREEK BRIDGE
NAME: M. Finegan	CHECKED BY: M. Jurasius	D. Appelbaum			POST MILE 45.49	LOG OF TEST BORINGS 3 OF 5

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3591
PROJECT NUMBER & PHASE: 05000200491
CONTRACT NO.: 05-330771

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 12-16-10 12-20-10 | SHEET X | OF X

FILE => mcmillan3of5.dgn

USERNAME => s108940 DATE PLOTTED => 20-DEC-2010 TIME PLOTTED => 13:03

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SLO	46			

Dan Appelbaum 12-20-10
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Dan Appelbaum No. C50001 Exp. 6-30-11 CIVIL STATE OF CALIFORNIA

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

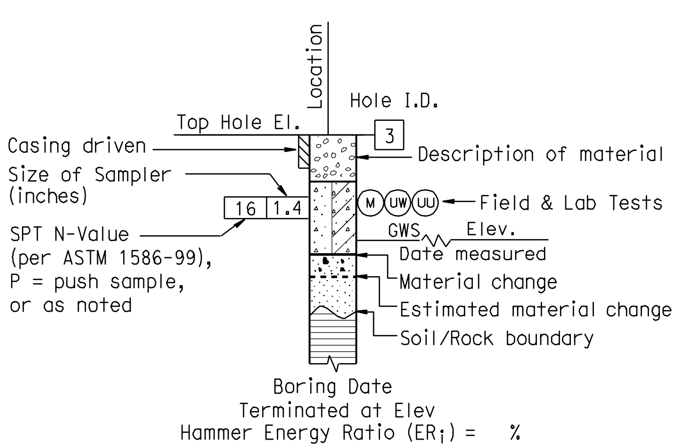
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring (hollow or solid stem bucket)
Size	R RW RC P	Rotary drilled boring (conventional) Rotary drilled with self-casing wire-line Rotary core with continuously-sampled, self-casing wire-line Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (1-inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778)
	O	Other (note on LOTB)

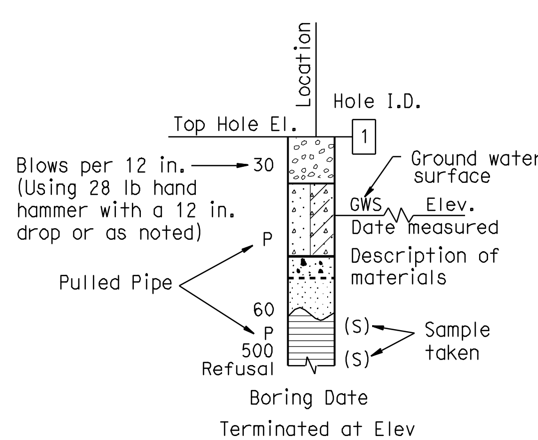
Note: Size in inches.

CONSISTENCY OF COHESIVE SOILS

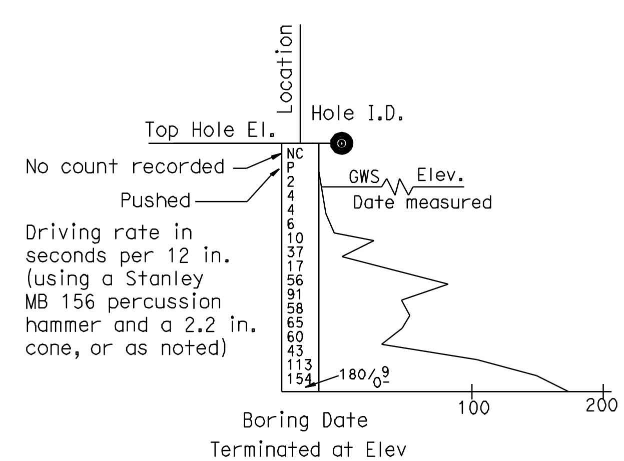
Description	Shear Strength (tsf)	Pocket Penetrometer Measurement, PP, (tsf)	Torvane Measurement, TV, (tsf)	Vane Shear Measurement, VS, (tsf)
Very Soft	Less than 0.12	Less than 0.25	Less than 0.12	Less than 0.12
Soft	0.12 - 0.25	0.25 - 0.5	0.12 - 0.25	0.12 - 0.25
Medium Stiff	0.25 - 0.5	0.5 - 1	0.25 - 0.5	0.25 - 0.5
Stiff	0.5 - 1	1 - 2	0.5 - 1	0.5 - 1
Very Stiff	1 - 2	2 - 4	1 - 2	1 - 2
Hard	Greater than 2	Greater than 4	Greater than 2	Greater than 2



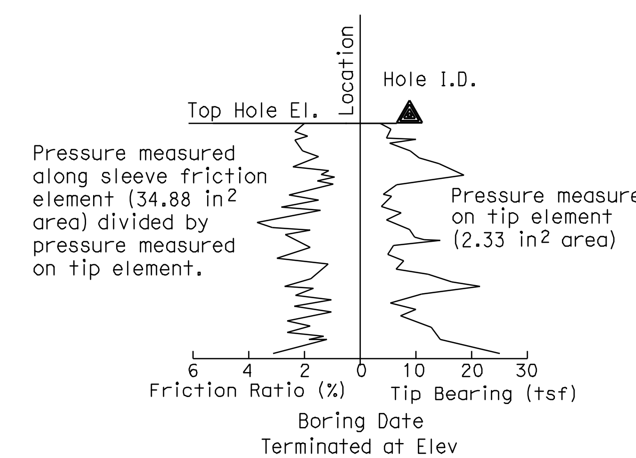
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) BORING

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	MCMILLAN CANYON CREEK BRIDGE
	PREPARED BY: I.G-Remmen		DESIGN BRANCH X	49-0253	LOG OF TEST BORINGS 4 OF 5
				POST MILE 45.49	

GS LOTB SOIL LEGEND

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3591
PROJECT NUMBER & PHASE: 05000200491

CONTRACT NO.: 05-330771

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 12-20-10 SHEET X OF X

FILE => mcmillan4of5.dgn

USERNAME => s108940 DATE PLOTTED => 20-DEC-2010 TIME PLOTTED => 13:04

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
05	SLO	46			

12-20-10
REGISTERED CIVIL ENGINEER
PLANS APPROVAL DATE
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REGISTERED PROFESSIONAL ENGINEER
Dan Appelbaum
No. C50001
Exp. 6-30-11
CIVIL
STATE OF CALIFORNIA

GROUP SYMBOLS AND NAMES

Graphic/Symbol		Group Names
	GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
	GP	Poorly-graded GRAVEL Poorly-graded GRAVEL with SAND
	GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
	GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
	GP-GM	Poorly-graded GRAVEL with SILT Poorly-graded GRAVEL with SILT and SAND
	GP-GC	Poorly-graded GRAVEL with CLAY (or SILTY CLAY) Poorly-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
	GM	SILTY GRAVEL SILTY GRAVEL with SAND
	GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
	GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
	SW	Well-graded SAND Well-graded SAND with GRAVEL
	SP	Poorly-graded SAND Poorly-graded SAND with GRAVEL
	SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
	SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
	SP-SM	Poorly-graded SAND with SILT Poorly-graded SAND with SILT and GRAVEL
	SP-SC	Poorly-graded SAND with CLAY (or SILTY CLAY) Poorly-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
	SM	SILTY SAND SILTY SAND with GRAVEL
	SC	CLAYEY SAND CLAYEY SAND with GRAVEL
	SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
	PT	PEAT
		COBBLES COBBLES and BOULDERS BOULDERS

Graphic/Symbol		Group Names
	CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
	CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
	ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
	OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
	OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
	CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
	MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
	OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
	OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
	OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTING

- C Consolidation (ASTM D 2435)
- CL Collapse Potential (ASTM D 5333)
- CP Compaction Curve (CTM 216)
- CR Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- CU Consolidated Undrained Triaxial (ASTM D 4767)
- DS Direct Shear (ASTM D 3080)
- EI Expansion Index (ASTM D 4829)
- M Moisture Content (ASTM D 2216)
- OC Organic Content-% (ASTM D 2974)
- P Permeability (CTM 220)
- PA Particle Size Analysis (ASTM D 422)
- PI Plasticity Index (AASHTO T 90) Liquid Limit (AASHTO T 89)
- PL Point Load Index (ASTM D 5731)
- PM Pressure Meter
- R R-Value (CTM 301)
- SE Sand Equivalent (CTM 217)
- SG Specific Gravity (AASHTO T 100)
- SL Shrinkage Limit (ASTM D 427)
- SW Swell Potential (ASTM D 4546)
- UC Unconfined Compression-Soil (ASTM D 2166) Unconfined Compression-Rock (ASTM D 2938)
- UU Unconsolidated Undrained Triaxial (ASTM D 2850)
- UW Unit Weight (ASTM D 4767)

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 12 in.)
Very Loose	0 - 5
Loose	5 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Greater than 50

MOISTURE

Description	Criteria
Dry	No discernable moisture
Moist	Moisture present, but no free water
Wet	Visible free water

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5% - 10%
Little	15% - 25%
Some	30% - 45%
Mostly	50% - 100%

PARTICLE SIZE

Description		Size (in.)
Boulder		Greater than 12
Cobble		3 - 12
Gravel	Coarse	3/4 - 3
	Fine	1/5 - 3/4
Sand	Coarse	1/16 - 1/5
	Medium	1/64 - 1/16
	Fine	1/300 - 1/64
Silt and Clay		Less than 1/300

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH X	BRIDGE NO. 49-0253 POST MILE 45.49	MCMILLAN CANYON CREEK BRIDGE LOG OF TEST BORINGS 5 OF 5
	PREPARED BY: I.G-Remmen				

GS LOTB SOIL LEGEND

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3591
PROJECT NUMBER & PHASE: 05000200491
CONTRACT NO.: 05-330771

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES				SHEET	OF
12-20-10				X	X

FILE => mcmillan5of5.dgn

USERNAME => s108940 DATE PLOTTED => 20-DEC-2010 TIME PLOTTED => 13:05

Borehole Abandonment Data Sheet

Project Information

District: 05 County: SLO Route: 46 PM: 41.0/46.3 EA: 330771

Report/LOTB Author: Daniel L. Appelbaum

Report/LOTB Date: December 30, 2010

LOTB Title: McMillan Canyon Creek Bridge Log of Test Borings or

Geotechnical Design Report Title ______________________________

Abandonment Methods and Codes

Method	Description
A	Backfill with cuttings
B	Backfill with bentonite-cement slurry
C	Backfill with cement slurry
D	Backfill with bentonite chips
E	Set inclinometer, grouted
F	Set inclinometer, sanded
G	Set slotted pipe
O	Other (describe below)

Borehole Abandonment Data

Boring ID	Method
R-03-004	G
R-03-005	G
R-09-001	D
R-09-002	D
R-09-003	D
R-09-004	D
R-09-005	D
R-09-006	D
R-09-007	D
R-10-001	D
R-10-002	D
R-10-003	D

Boring ID	Method
R-10-004	D
R-10-005	D
R-10-006	D
R-10-007	O
R-10-008	D
R-10-009	D
R-10-010	D

Explanation for method "O, Other" or additional information

R-10-007: Installed 3" PVC casing (grouted in place) for P-S Log.

FOR CONTRACT NO.: 05-330774

MATERIALS INFORMATION

Final Hydraulic Report - McMillan Canyon Creek Bridge, dated January 21, 2011

ROUTE: 46-SLO-40.7/46.3(PM)

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

Structure Hydraulics and Hydrology

FINAL HYDRAULIC REPORT

McMillan Canyon Creek Bridge

Located on US Route 46 over McMillan Canyon Creek in the County of San Luis Obispo

Bridge No. 49-0253

New Bridge

Project ID 05 0002 0049

05-SLO-46- PM 45.49

January 21, 2011

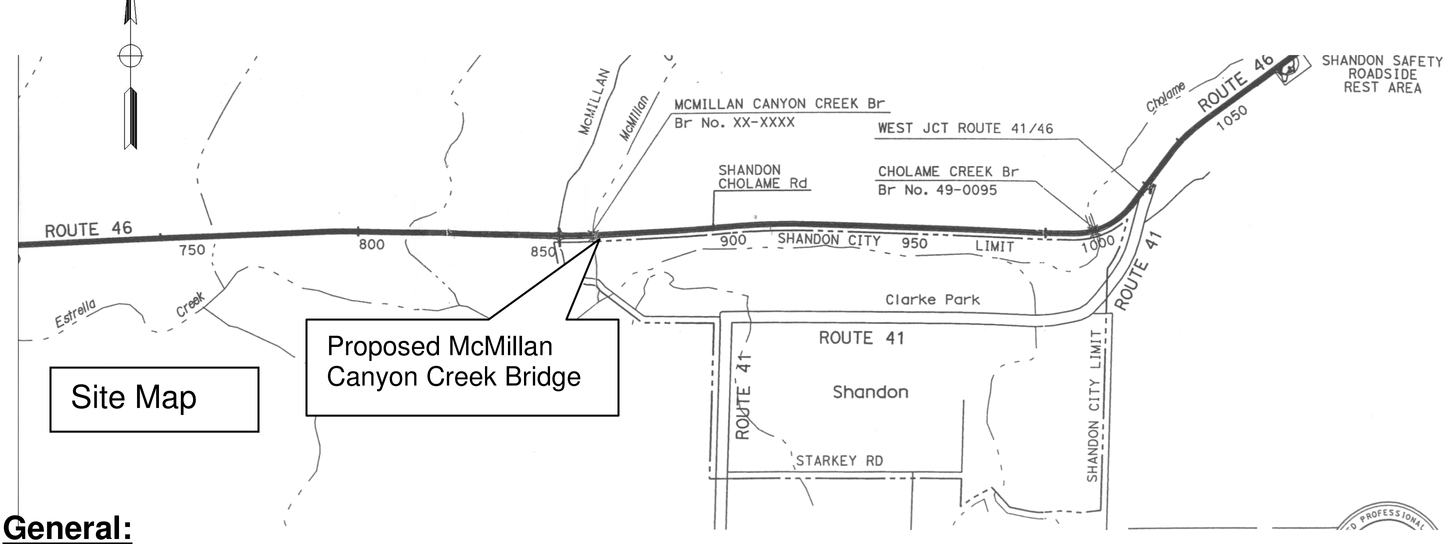
PREPARED BY:	REVIEWED BY:
Ronald McGaugh	Rick Macala

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

REGISTERED ENGINEER

REGISTRATION NUMBER C 61217

REGISTERED PROFESSIONAL ENGINEER
RONALD L. McGAUGH
Lic. # C61217
Exp. 06/2011
CIVIL
STATE OF CALIFORNIA



General:

This report evaluates the proposal to place a new single span bridge structure along the new alignment of State Route 46. This evaluation was based on the General Plan dated May 2010.

This evaluation is based on a review of Caltrans Bridge Maintenance Records, As-Built plans, hydrologic and hydraulic reports submitted for FEMA, and APS plans submitted by Structure Design. The General Plan is dated 5/2010 in English units.

The data and references of this hydraulic report are obtained from the following sources:

- Caltrans Bridge Maintenance Records.
- Preliminary Hydraulic Report dated October 2009.
- Field photo documentation, and bridge site submittal information received by this office dated September 2009.
- Historical cross sections for bridge 49-0095 Cholame Creek.
- US Geological Survey (Regional Regression Method) Magnitude and Frequency of Floods in California--Bulletin 77-21. Used for the National Stream Statistics Program.
- Evaluating Scour At Bridges 4th edition

All elevations in this report are based on the survey data provided by District 5 CAiCE, and the preliminary design information provided by Structure Design. The Vertical Datum is NGVD 29

Flood History:

There is no flooding history for this location. Presently there is a culvert

Basin:

McMillan Canyon drains approximately 14.2 square miles. The watershed is located on the South-eastern slopes of the southern part of the Cholame Valley. Watershed elevations range from approximately 2000 feet at the higher elevations to approximately 990 feet at the site. This watershed seems to have potential for moderate debris yield. Channel slope was estimated at 2 %. Average annual precipitation within the watershed is about 15 inches.

Drift:
It is not anticipated that there will be a problem with drift or debris.

Discharge:
Since this watershed is ungaged the National Streamflow Statistics program (NSS) was used to estimate the discharge. This yielded a Q_{100} flow value of approximately 1613 cfs. The Q_{50} flow value is approximately 1096 cfs.

Streambed:
The existing channel carrying the anticipated flow to the proposed structure is relatively straight. From the General Plan It is anticipated that the bridge will have no hydraulic or structural skew normal to the centerline of the channel. For the natural channel bottom there is no Log of Test Borings for the existing structure.

Model Preparation and Parameters
US Army Corps of Engineers software Hec-Ras was used to create the 1 dimensional model for this project. The lowest calculated chord of the proposed bridge was used for the soffit elevation. The structural section depth was added to the soffit to get the planned deck elevation height.

Figure 1 (below) shows the various modeled elevations, existing ground and proposed channel grading along the bridge profile.

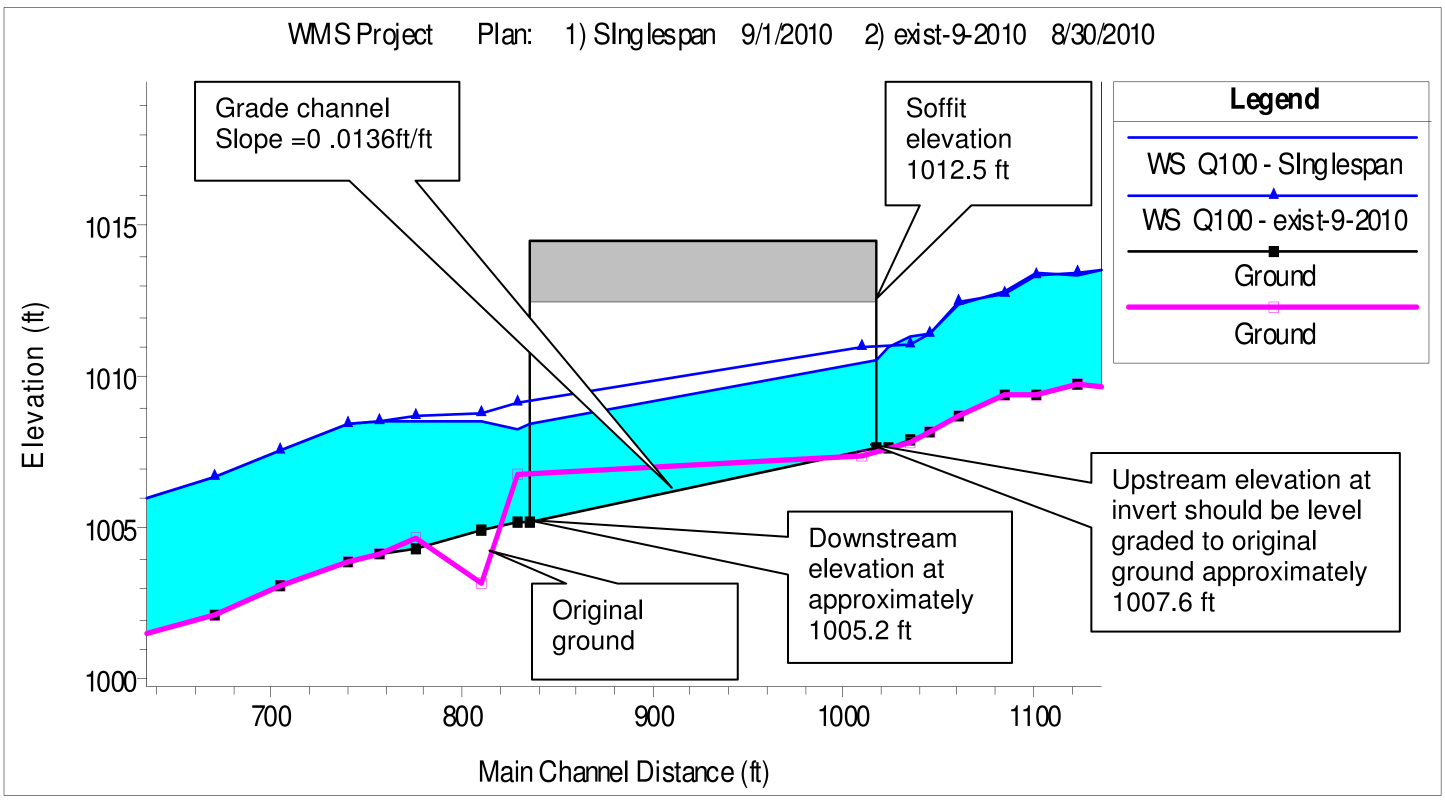


Figure 1: Bridge profile from Hec-Ras model

Figure 2 below depicts 4 cross sections (looking downstream and not to scale) located upstream of the entrance to the planned structure. These sections show the planned RSP wall and the entrance to the bridge. For these sections the original ground coincides with the proposed grade plans.

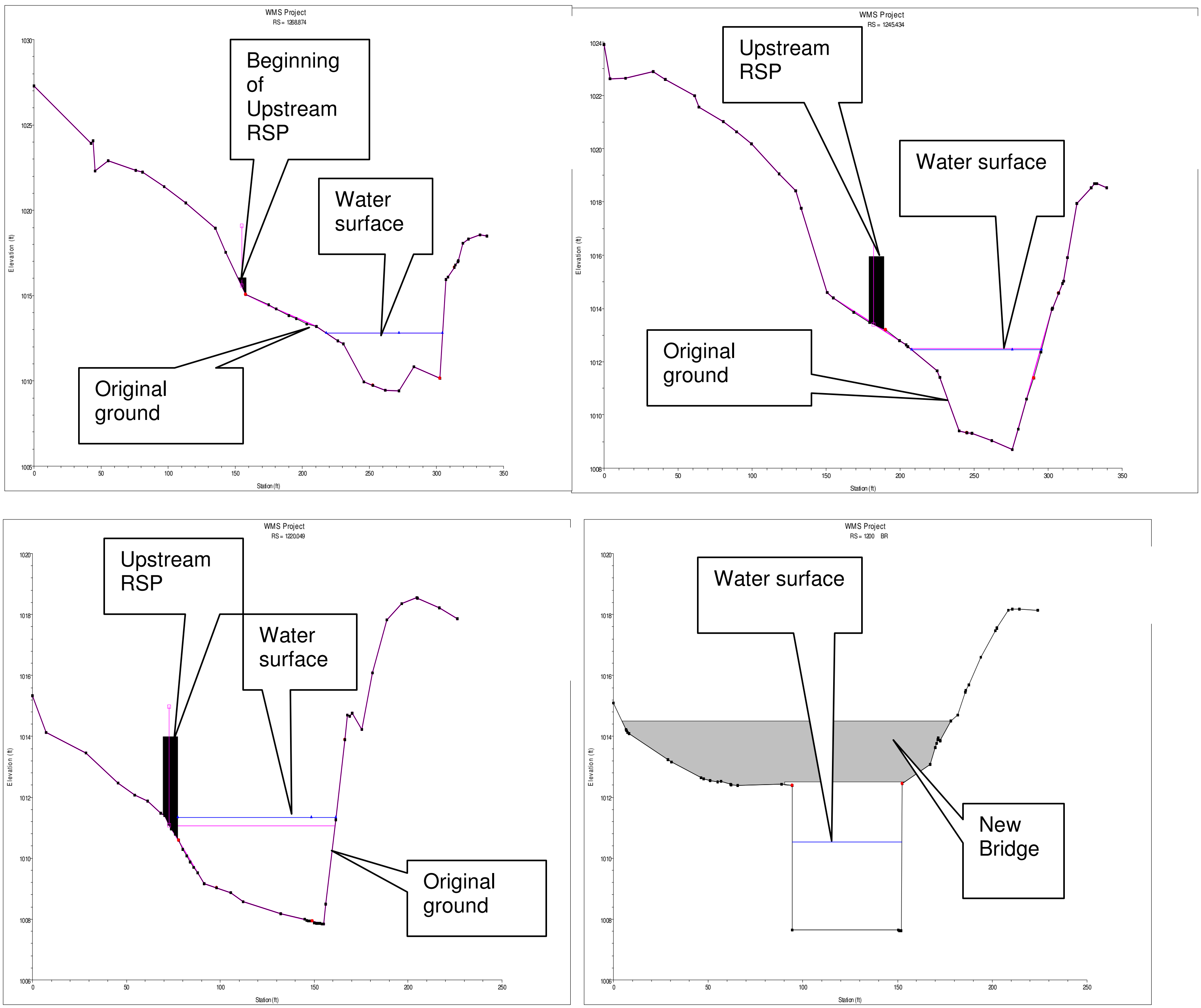


Figure 2: Selected Upstream HEC-RAS Cross Sections

Figure 3 below depicts 4 cross sections (looking downstream and not to scale) located downstream of the exit to the planned structure. These sections show the planned grading of the channel downstream of the proposed bridge. Note by the last section the water surface has returned to pre construction elevation.

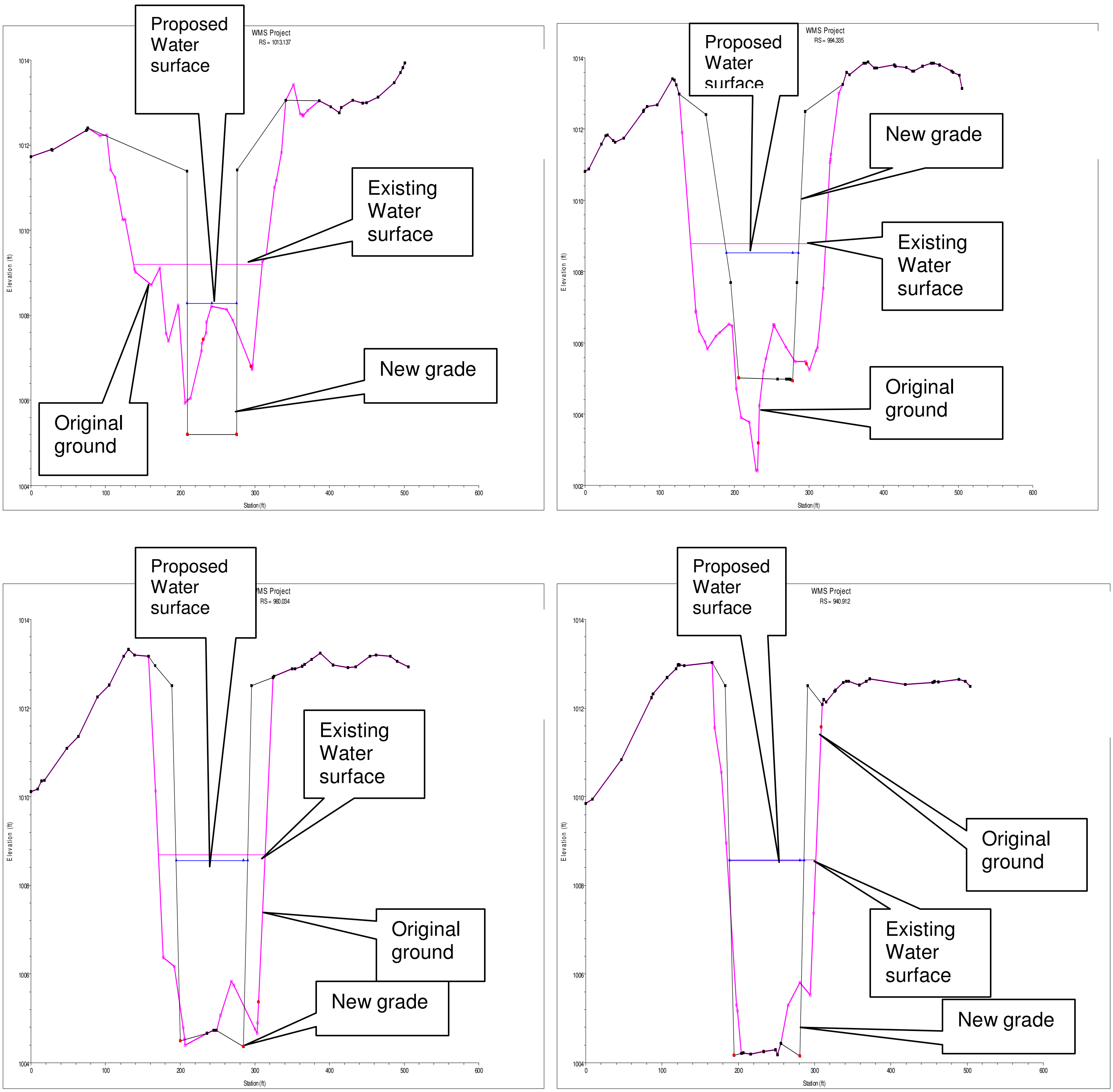


Figure 3: Selected downstream HEC-RAS Cross Sections

Water Surface Elevations:

Calculated from the General Plan the water surface at the upstream end of the proposed structure and other parameters are shown in the table below:

Model parameters Include

- Skew less than 15 degrees
- Manning's n=0.035
- Slope of 0.0136 ft/ft
- Bridge length of 63 feet
- Bridge width of 182.ft -10 in
- Structure depth of 2 ft
- Q_{100} =1613 cfs
- Q_{50} = 1096 cfs

Modeled results include:

- Max modeled Water surface elevation of 1010.5 ft
- Minimum modeled soffit elevation of 1012.5 ft
- Average velocity of 8.1 ft/s
- Froude number of 0.89
- Minimum of 2 foot of freeboard
- Unobstructed minimum waterway of 170 ft^2

Table 1: hydraulic parameters

Scour:

The scour calculations are based on the boring records from May 2010. The conditions indicate multiple layers of sand down to about 987 ft. These indicate a silty to fine sandy soil type foundation with no scour armoring capabilities, and low cohesion i.e. erodible. If a pier or column were used, degradation rates would be approximately 0.3 ft / year. Degradation rates for the proposed abutments are approximately 0.05 ft / year if abutments are built on same material as in the channel. It is anticipated that engineered fill is to be brought in which will encompass the proposed abutments and make them more scour resistant; so abutment degradation will be zero. It is anticipated that there will be no abutment scour, however since there are multiple layers of sands, 0.1 foot of scour is used for conservativeness.

Table 2: Scour Analysis based on an assumed average bridge life of 75 years

Scour type	Applicable scour rates
Local Scour	Single span no scour
Contraction Scour (ft):	no scour
Degradation Abutments	0
Pier Scour	Single span no piers
Abutment Scour	0.1

Summary & Recommendations:

The proposed structure meets hydraulic requirements and is designed not to become scour critical. The proposed bridge will not adversely affect the hydraulic capacity of the existing channel.

A hydrologic summary of the bridge site is provided in Table 3 below. Total Scour summary of the bridge site is provided in Table 4 below.

Table 3 **HYDROLOGIC/HYDRAULIC SUMMARY**	
New Bridge 49-0235	
Drainage Area: 14.2 mi^2	
0 degree bridge skew 60 foot-wide channel slope 0.1363ft/ft	
Design Q_{100} Discharge (cfs)	1,613
Minimum soffit Elevation (feet)	1012.5
Average Velocity (ft/s)	8.1
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.**	

Table 4: Scour Summary

For this proposed structure scour calculations are assumed on a 75 year average bridge life

Scour Type	**Scour Depth (ft)**	**Scour Elevation at upstream edge of abutments (ft)**
Local Scour	0	
Degradation at abutments	0	
Contraction Scour	0	
Total Potential Scour Depth in 75 years		995.3