GEOTECHNICAL
DESIGN/MATERIALS REPORT

US 50/Latrobe Road
West Bound Off and On Ramps
El Dorado County, California
PM 0.02/1.4, 03-ED-50, EA 03-2E5101

Prepared by:

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March 2012

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File No. 1072.8
March 30, 2012

Mr. Brent Lemon, P.E.
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Subject: **GEOTECHNICAL DESIGN/MATERIALS REPORT**
US 50/Latrobe Road West Bound On- and Off-Ramps
PM 0.02/1.4, 03-ED-50, EA 03-2E5101
El Dorado County, California

Dear Mr. Lemon:

Blackburn Consulting (BCI) is pleased to submit this Geotechnical Design/Materials Report for the US 50/Latrobe Road West Bound On- and Off-Ramps Project in El Dorado County, California. BCI prepared this report in accordance with our Agreement dated February 3, 2012 between BCI and Quincy Engineering, Inc. We submitted a draft report for review and comment on March 5, 2012 and no comment was made.

Thank you for the opportunity to be part of your design team. Please call if you have questions or require additional information.

Sincerely;

BLACKBURN CONSULTING

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GEOTECHNICAL DESIGN/MATERIALS

US 50/Latrobe Road West Bound On- and Off-Ramps

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"Approved as to impact on State facilities and conformance with applicable State standards and practices, and that technical oversight was performed as described in the California Department of Transportation A&E Consultant Services Manual."

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Caltrans

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Title

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Date

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Caltrans

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Title

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Date

GEOTECHNICAL DESIGN/MATERIALS
US 50/Latrobe Road West Bound On- and Off-Ramps
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1 INTRODUCTION

1.1 Purpose

BCI prepared this Geotechnical Design/Materials Report (GDMR) for use in design and construction of the US 50/Latrobe Road West Bound On- and Off-Ramp project, located in El Dorado County, California. The project extends from Post-Mile (PM) 0.20 to 1.40 and the central portion of the project is located at 38.6532º latitude and 121.0707º longitude. Figure 1 shows the general project location.

This Geotechnical Design/Materials Report is for roadway improvements. BCI completed a separate Foundation Report for the Latrobe Road West Bound Off-Ramp Undercrossing (UC).

This report documents subsurface geotechnical conditions, provides analysis of the anticipated site conditions as they pertain to the project described herein, and recommends geotechnical design and construction criteria for the roadway portions of the project. This report also establishes a geotechnical "baseline" to assess the existence and scope of possible changed site conditions.

1.2 Scope of Services

To prepare this report, BCI:

- Discussed the proposed improvements with Quincy Engineering, Inc. (QEI)
- Reviewed the preliminary drawing and cross sections provided by QEI
- Observed the subsurface conditions in 8 borings, 6 test pits, and 4 hand excavated pits
- Conducted three seismic refraction surveys
- Performed laboratory tests on soil and rock samples obtained from the exploration
- Performed engineering analysis and calculations to develop our conclusions and recommendations

2 EXISTING FACILITIES AND PROPOSED IMPROVEMENTS

2.1 Existing Facilities

US 50 through El Dorado County, extending east-west, is an east-west divided freeway, constructed in 1965, widened in 2000/02, and HOV lanes constructed in 2010.

The US 50/Latrobe Road interchange area is established within various cut and fill sections. Fill sections are located at the east and west ends of the west bound ramps. Fill slope gradients are typically about 1.5H:1V (horizontal:vertical) or flatter and vary in depth from a few feet to a maximum of about 15 feet. Existing embankment fill includes a mixture of soil and rock material (cobble size), likely derived from project cuts during original construction. Cuts slope gradients along the existing ramps vary from approximately 1.5H:1V to 2H:1V.

Other than minor sloughing/erosion, we did not observe significant slope instability or erosion and the existing cut and fill slopes appear to have performed well since constructed.

2.2 Proposed Improvements

The proposed project is approximately the 4th construction phase of the ultimate improvement project for this interchange. Funding for the proposed project will be State and Local.

The project consists of reconstruction of the westbound on- and off-ramps of the El Dorado Hills Boulevard/Latrobe Road interchange on US 50 from Post Mile (PM) 0.20 to 1.40. Proposed improvements include:

- West bound diagonal on-ramp
- West bound loop off-ramp and bridge
- Installation of new signals at the westbound ramp intersection
- Modifications to the existing intersection at El Dorado Hills Boulevard and Saratoga Way
- Overhead sign structure at the off-ramp exit, loop ramp, and El Dorado Hills Blvd.
- Drainage system improvements
- Removal of the existing west bound ramps and signalized intersection

Figure 2 shows the general interchange improvements, stationing, and BCI's exploration/test locations. Following is a brief description of the ramp components.

2.2.1 West Bound Off-Ramp

The new off-ramp will vary in width from approximately 24 to 51 ft with an 8 ft wide paved shoulder. At the east end of the ramp (east of El Dorado Hill Blvd./Latrobe Road), the ramp will generally be at existing grade and/or require several feet of embankment fill. The west end of the ramp, from the Latrobe Road undercrossing bridge and across the existing west bound on-ramp, will require 6 to 12 feet of embankment fill. The remainder will be cut to grade with approximate excavation depths ranging from 1 to 10 feet. Fill slopes will have a final gradient of 4H:1V (horizontal to vertical) or flatter, and cuts into rock will be at a gradient of 2H:1V or flatter. The undercrossing bridge is addressed in our Foundation Report for this project.

2.2.2 West Bound On-Ramp

The new on-ramp will vary in width from approximately 21 to 36 ft with an 8 to 15 ft wide paved shoulder. This ramp will generally require excavation for the full length except for the transition to the US 50 mainline where several feet of additional embankment fill will be required. Excavation depths vary from approximately 4 to 10 ft along most of the ramp length, but are up to 12 to 13 ft at the east end near El Dorado Hills Blvd. The cut slope on the north side of the ramp will be up to approximately 12 feet in height and cut at a gradient of 2H:1V or flatter. Fill slopes will have a final gradient of 4H:1V or flatter.

3 PERTINENT REPORTS AND INVESTIGATIONS

In preparing this GDMR, we reviewed the following information pertinent to the project geology, geotechnical conditions, and existing facilities.

3.1 Caltrans As-Built Plans

- Foundation Study, Latrobe Road UC, III-EC-11-A, Bridge No. 25-71 R/L, OR, March 15, 1963.
- As-Built Plans, Latrobe Road Undercrossing, Sheets 1/11 – 11/11, As-Built stamp undated, plans dated January 6, 1964.
- Memorandum, Foundation Report for Latrobe Road UC (Br-25-71 R/L & OR), August 3, 1965.
- Memorandum, Preliminary Geologic Recommendations and Resource Estimate for Advance Planning Study, Latrobe Road Undercrossing, Bridge No. 25-0071 LR, April 5, 2000.

3.2 Consultant Reports

- Blackburn Consulting, Geotechnical Design Report, US 50 Phase-1 HOV Lane CMIA Project, PM 0.0 to 2.9, El Dorado County, California, for Quincy Engineering, December 14, 2007.
- España Geotechnical Consulting, Final Materials Report for the El Dorado Hills Boulevard-SR 50 Interchange, 03-EL-50-KP 0.28/2.52, El Dorado County, for CH2M Hill, January 2002.
- Taber Consultants, Foundation Investigation, Latrobe Rd WB OR UC Bridge May 14, 2002.
- Taber Consultants, Foundation Investigation, Latrobe Road Retaining Wall, Bridge No. 25E0002, 03-ED-50-1.1/1.7, El Dorado County, December 6, 2004.
- Blackburn Consulting, Foundation Report, Latrobe Road UC, Bridge No. 25-0122, EA 03-3A7111, El Dorado County, March 11, 2008

4 PHYSICAL SETTING

4.1 Climate

The site is within the "Low Mountain" climate region as shown on the Caltrans Pavement Climate Regions map (October 2005). Table 1 presents monthly climatic data averages (1971-2000) recorded for Lehman Ranch (closest station with available data)[1], located along Latrobe Road about eight miles south of US 50.

[1] Western Regional Climate Center (WRCC) website (http://www.wrcc.dri.edu) from Blackburn Consulting (2007)

Table 1 - Climate Data

Data Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Total Precipitation (in)	4.03	3.24	3.21	1.81	0.47	0.26	0.38	0.41	0.61	1.92	3.70	3.13	23.16
Avg. Max. Temp. (F)	47.1	54.4	61.5	69.8	79.0	90.0	93.0	90.1	83.5	71.7	57.7	47.1	70.4
Avg. Min. Temp. (F)	21.3	25.5	31.1	36.9	45.3	54.2	62.0	61.1	52.9	40.1	28.7	21.0	40.0

Based on the above data, over 80 percent of the total annual precipitation occurs between October and March. The data also indicate that significant periods of daily temperature above 50 degrees Fahrenheit (required for paving operations) are not likely from November through March. Although freezing temperatures will occur, the duration is not considered significant to geotechnical engineering aspects (pavement, foundations, etc.).

4.2 Topography and Drainage

Existing ground elevations in the project area range from a low of approximately 605 ft above mean sea level (msl) at Latrobe Rd/El Dorado Hills Blvd to a high of approximately 645 ft at the west end of the project. Overall site topography slopes moderately to gently to the southeast, but this has been modified by cuts and fills along US 50.

Drainage in the project area is generally to the south/southeast through sheetflow, ditches, creeks, and drainage pipe. Roadway improvements along US 50 and Latrobe Road/El Dorado Hills Blvd. have modified the topography and drainage.

Site vegetation consists of a light to moderately thick cover of grass and weeds with small, scattered trees.

4.3 Man-Made and Natural Features of Engineering and Construction Significance Outside Caltrans Right-of-Way

There are no significant features of engineering or construction significance adjacent to the project other than existing roadway, overhead and underground electric, and water lines. We do not expect the project improvements (ramp embankments, cuts, overcrossing, road widening, culverts, etc.) to have a significant geotechnical impact to adjacent improvements.

4.4 Regional Geology

The project is located within the foothills of the Sierra Nevada geomorphic province of California. The Sierra Nevada has a general northwest topographic trend and is on the order of 430 miles long and 40 to 80 miles wide. Rock of the Sierra Nevada was created roughly 120 to 130 million years ago when sediments as thick as 30,000 feet along with volcanic rocks were buckled and warped resulting in a series of low mountain ranges. The roots of these mountain ranges were then intruded by granitic rock.

The Sierra Nevada was tilted upward as a result of faulting along the east edge of the mountain ranges. In the higher elevations of the Sierra Nevada, much of the older sedimentary rock has been eroded to expose granitic rock. Older rocks that remain have been metamorphosed and are exposed in the foothills of the Sierra Nevada.

Most of El Dorado County is underlain by Mesozoic-age metavolcanic and metasedimentary rocks. The metamorphic rock structure is dominated by a series of northwest-trending faults and fault zones that mark the boundaries of various rock types.

4.5 Local Geology

Published geologic mapping by Wagner[2] and Busch[3] shows Jurassic-age metavolcanic and metasedimentary rock throughout the project area. The mapping also shows the north-south trending West Bear Mountains Fault (a.k.a., Prairie Creek-Spenceville-Deadman Fault per Caltrans maps) about 1,000 feet east of the Latrobe Road UC. We show local site geology and faulting on Figure 3, based on Busch (2001).

West of the West Bear Mountains Fault, the referenced mapping shows metavolcanic rock associated with the Copper Hill Volcanics ("mostly mafic to andesitic pyroclastic rocks, lava and pillow lava; subordinate felsic porphyritic and pyroclastic rocks") and metasedimentary rock associated with the Salt Springs Slate ("mostly dark gray slate with subordinate tuff, greywacke and rare conglomerate"). East of the West Bear Mountain Fault, surface materials are mapped within an ophiolitic terrain comprised of metavolcanic rocks ("mafic to felsic; minor sedimentary rock") and metasedimentary rocks ("slate, quartzite, chert, carbonate rock").

Mapping does not show the project site within an ultramafic rock area. However, ultramafic rocks are mapped nearby. This is a common host rock for naturally occurring asbestos minerals (NOA). Geologic mapping of asbestos containing rocks by Churchill[4] shows an "area more likely to contain naturally occurring asbestos" about one mile north of the Latrobe Road UC and also east of Bass Lake Road (2 miles east of the project). The mapping shows the entire project interval to be within an area "that probably does not contain asbestos."

Mapping by Bruyn, 2005[5], shows the project within a "Quarter Mile Buffer for More Likely to Contain Asbestos or Fault Line". Churchill discusses the possibility of serpentine occurring in faults or within fault zones, which may contain chrysotile or tremolite/actinolite asbestos.

During our surface reconnaissance of the project area and in our subsurface explorations, we did not observe rock containing serpentinite, a host rock for NOA, or significant bands of visible fibrous (asbestiform) minerals. As discussed above, NOA mapping does not show the project site within an ultramafic rock area, although the project is near mapped faults and other areas known to contain naturally occurring asbestos.

[2] Wagner, D.L. et al, "Geologic Map of the Sacramento Quadrangle, California", California Geological Survey, Map No. 1A, 1981, revised 1987.
[3] Busch, "Generalized Geologic Map of El Dorado County, California", June, 2001, California Geological Survey, OFR 2000-03.
[4] Churchill, et al., 2000, "Areas More Likely to Contain Natural Occurrences of Asbestos in Western El Dorado County, California", California Geological Survey, OFR 2000-02
[5] Bruyn, 2005, "Asbestos Review Areas, Western Slope, County of El Dorado, State of California", El Dorado County

4.6 Regional Seismicity

Our review of published geologic mapping and site review did not reveal the presence of Late Quaternary (displacement within the last 700,000 years) or younger faults within or adjacent to the project site.

The site does not lie within or adjacent to an Alquist–Priolo Earthquake Fault Zone for fault rupture hazard (Bryant and Hart, 2007)[6], and no known active faults cross the project location. The referenced mapping by Busch shows the main trace of the West Bear Mountains Fault (Prairie Creek-Spenceville-Deadman Fault) crossing US 50 about 1,000 feet east of Latrobe Road and a north-south trending splay associated with this fault crossing US 50 about 3,000 feet east of the Latrobe Road. Jennings (1994)[7] shows the West Bear Mountains Fault as Pre-Quaternary in age (>1.6 million years), considered inactive. The Caltrans Deterministic PGA Map (September 2007) does not show this fault as an active seismic source and shows no active faults in the project area. The closest fault considered in ground motion analysis is the East Bear Mountains Fault (or Rescue section, Caltrans Fault Identification No. 83) located approximately 8 miles east of the site. We consider the potential for fault rupture at the site to be low.

We show approximate fault locations on Figure 4, Seismic Hazard Map, which is a copy of a portion of the Caltrans Deterministic PGA Map.

5 EXPLORATION

5.1 Drilling, Trenching, and Sampling

To characterize subsurface conditions at the site, BCI observed the drilling, excavation, and sampling of 8 borings, 6 test pits, and 4 hand excavations in February 2012. Boring depths ranged from 8.5 ft (auger refusal) to 25 ft below the ground surface (bgs). We excavated the test pits to depths from 5 to 16 ft bgs.

We show all boring and test pit locations on Figure 2. The logs of the borings and trenches and the Legend of Logs are in Appendix A. We also include the Log of Test Borings (LOTB) from the off-ramp bridge Foundation Report in Appendix A.

BCI planned the location and depth of exploration points based on 1) preliminary project geometrics, 2) site access, 3) anticipated soil and rock conditions, 4) the presence of existing fill, and 5) the proposed structures.

Our drilling sub-consultant (Taber Drilling) advanced the borings using a combination of solid augers and coring methods. Solid augers were about 4 inches in diameter and the core bit was approximately 3.8 inches in diameter (HQ). BCI obtained relatively undisturbed soil samples at various intervals using a 3-inch O.D. Modified California sampler (MCS) equipped with 2.4 inch I.D. brass liners. The drillers used an automatic, 140 lb. hammer falling approximately 30 inches to drive the samplers. We drilled and sampled rock using HQ wire-line rock coring techniques.

[6] Fault Rupture Hazard Zones in California, Special Publication 42, Interim Revision; California Geological Survey
[7] Fault Activity Map of California and Adjacent Areas, Geologic Map No. 6, California Division of Mines and Geology

We sealed the MCS liners with plastic caps. We placed continuous core samples in labeled core boxes. We also obtained bulk soil samples from auger cuttings and the backhoe bucket. During drilling, we performed field strength testing with a pocket penetrometer on select cohesive and/or cemented soil samples. We note the field tests on the logs.

Our excavation contractor (Monte Ricky) excavated the test pits with a Caterpillar 430D, rubber-tire backhoe equipped with an 18-inch wide bucket. We obtained bulk soil samples at select depth intervals from some test pits and placed small bulk samples into plastic bags and large bulk samples into large cloth bags, and labeled each for laboratory identification.

We located borings and test pits with a handheld GPS and estimate elevations based on available topographic mapping. Boring and test pit locations are not surveyed. A BCI geologist or engineer logged the borings and retrieved samples for laboratory testing.

5.2 Seismic Refraction Survey

BCI performed seismic refraction surveys at 3 locations in the area of the west bound onramp. Each line was 110 ft in length. We located the lines based on project plans and handheld GPS coordinates. A BCI geologist led the field exercise and monitored data acquisition. Figure 2 shows the location of the seismic refraction survey lines; our interpreted seismic velocity profiles are on the Seismic Profile sheets in Appendix C.

Each seismic refraction line consists of 5 shot points distributed along a collinear array of 12 geophones placed at 10-foot intervals. We use a multi-channel seismograph located at one end of the array to collect the data. We generate compressional wave energy (P-waves) at each shot point with multiple impacts of a 10-pound sledge hammer striking a steel plate on the ground surface. A Geode 24-Channel Seismograph was used to detect, digitize, and record the P-waves. We analyzed the acquired data with the computer program *SeisImager* by Geometrics, Inc.

We discuss seismic refraction results in the "Subsurface Soil and Rock Conditions" and "Rippability" sections of this report.

5.3 Geologic Mapping

BCI checked the mapped geologic conditions presented in the references during our fieldwork. Our site review and subsurface investigation confirms the presence of metavolcanic rock below a moderately thick soil horizon throughout the project area. We also recorded rock structure exposed in our test pits and at roadway cuts. The recorded rock structure is discussed further below.

5.4 Exploration Notes

We were able to excavate with a backhoe and auger drill to depths of 5 to 25 feet at most exploration locations within the site. Our test pits encountered practical refusal to excavation with an 18-inch wide bucket, generally within 5 to 10 feet of the surface. After exploration, we immediately backfilled the test pits with the excavated materials. Borings were also backfilled with soil cuttings.

6 GEOTECHNICAL TESTING

BCI completed the following laboratory tests on representative soil samples from exploratory borings and test pits:

- Moisture content (ASTM D2216) and unit weight (ASTM D2937)
- Plasticity Index (ASTM D4318)
- Sieve Analysis (ASTM D422)
- Direct shear (ASTM D3080)
- Unconfined Compression - (ASTM D2938)
- Resistance Value (CTM 301)
- Sulfate content (CTM 417), chloride content (CTM 422), pH (CTM 643) and resistivity testing (CTM 643)
- Naturally Occurring Asbestos (California Air Resources Board Method 435)

We attach laboratory test results and a summary of results in Appendix B.

7 GEOTECHNICAL CONDITIONS

7.1 Site Geology

Based on our geologic reconnaissance and subsurface exploration, site geology is consistent with published geologic mapping and previous site exploration by others.

7.1.1 Lithology

The predominant rock-type throughout the project is metavolcanic rock, which is intermittently exposed in cut slopes along the road/ramp shoulders. Cut slopes expose variably weathered and fractured metavolcanic rock. The rock weathering ranges from decomposed (i.e., effectively "soil-like") to intensely weathered, with areas of slightly weathered to fresh rock. Both rock fracture and weathering decrease with depth below the ground surface.

We did not observe serpentinite or other ultramafic rock types (a host rock for naturally occurring asbestos (NOA)), or significant bands of fibrous (asbestiform) minerals within rock outcrop, slope cuts, or in our borings and test pits. As discussed above, NOA mapping by others does not show the project within an ultramafic rock area.

7.1.2 Rock Structure

Rock is not well exposed at the site due to a deep weathering profile but existing cuts at El Dorado Hills Blvd and the west bound ramps do expose some weathered rock. Rock structure in the area has a predominant northwest/northeast foliation and fracture with a steep dip of 60º-90º to the east. The rock is also randomly fractured, generally by very short, stepped, blocky fractures. Fracture intensity varies with depth and is generally intense in the upper 10 to 15 feet and becomes moderate below that depth.

7.1.3 Natural and Built Slope Stability

Published mapping that we reviewed does not show landslide features within the project area. Natural slopes and highway cuts within the project area do not show signs of instability (e.g., significant rockfall or slope failure). Some rockfall and wedge/block failures have occurred on a high, steep, north facing rock cut on the south side of US 50 (east bound off-ramp). We did not observe evidence of significant geologic hazards, including landsliding, settlement, very soft soils, severe erosion, springs, etc., within the site. We did not observe any areas of distress (such as slumps, distortion or severe erosion) within existing embankment fill slopes within the project.

7.2 Subsurface Soil and Rock Conditions

7.2.1 General Field Exploration

We completed our exploration points in areas of the proposed interchange improvements, including the structure approaches and the ramp alignments. Figure 2 show the exploration locations.

7.2.2 Exploration

In the borings and test pits, we encountered two units significant to roadway elements:

- Unit 1: This unit consists of general fill and roadway fill that overlies the native soil and rock. The fill typically consists of what appears to be a locally derived mixture of soil and rock and is generally classified as silty/clayey sand with gravel. In general, Unit 1 is located at embankment fill locations for the existing highway/roads and in the area west of El Dorado Hills Blvd between the existing west bound on-ramp and Saratoga Way. In this area, the old Saratoga Way and Arrowhead Drive have been filled over.
- Unit 2: This unit consists of native soil and rock. In general, the native soils are comprised of very stiff to hard, sandy silt/clay with gravel, and medium dense to dense silty, clayey gravel with sand and are on the order of 2 to 4 feet thick. The soils overlie variably weathered and fractured metavolcanic rock, consistent with published geologic mapping. The upper portion of the rock unit is decomposed to moderately weathered, very intensely to intensely fractured, and soft (locally hard), and becomes generally less weathered and fractured and harder with depth. Unit 2 occurs throughout the site and underlies Unit 1.

Appendix A contains the boring and test pit logs that provide more specific soil and rock descriptions, blow count, and rock core data. For reference, we also include the LOTB for the Latrobe Road West Bound Off-ramp UC.

7.2.3 Seismic Refraction Exploration

As discussed above, we completed three seismic refraction surveys along the planned location of the west bound on-ramp. Our interpretations of the refraction data show that recorded seismic velocities range from ±1,000 to 11,000 feet per second (fps) in the upper 30 ft of the subsurface. Based on our subsurface explorations and previous experience, velocities greater than 3,000 to 4,000 fps appear consistent with the weathered metavolcanic near the surface. Lower velocities correspond to fill, native soils, and decomposed rock. A seismic velocity of 4,000 fps occurs along the planned west bound on-ramp at depths of 10 to 15 feet bgs.

7.3 Water

7.3.1 Surface Water

At the time of our field work (February) we observed some flowing water in the drainage along the south side of the west bound on-ramp, and at the east end of the project in the drainage at the north side of west bound off-ramp. In general, surface water drainage along the highway and roadways is directed along ditches to storm drain facilities beneath US 50 and in El Dorado Hills Blvd/Latrobe Road.

7.3.1.1 Scour

Drainages are underlain by rock that controls the rate of scour. We did not observe scour and/or significant erosion at the local drainages.

7.3.1.2 Erosion

We did not observe significant erosion of the existing embankment fills, cut slopes, unlined drainage ditches, or swales in the project area.

7.3.2 Groundwater

7.3.2.1 Caltrans

The 1963 Caltrans foundation study for the Latrobe Road UC states "Groundwater was not encountered during the field study; however, surface water was present." The April 5, 2000 Memorandum states "Groundwater was encountered during the field investigation in December 1962. The highest groundwater elevation (per 1963 datum) measured at the site is at elevation 187.3 m (614.5 ft)." The as-built LOTB shows groundwater levels as follows in Table 2:

Table 2 – Groundwater Summary from 1963 Foundation Study

Boring No.	Boring Elevation (Ground Surface, ft)	Measured Groundwater Elevation (ft)
B5	607.8	607.3
B6	614.5	613.5
B7	612.0	609.0
B8	612.6	612.6

Note: Elevations shown are referenced to datum used in 1963

7.3.2.2 Previous Consultant Explorations

In borings completed in February 1999 for the Latrobe Road UC, Taber encountered groundwater at depths ranging between about 7 feet and 14 feet bgs (elevation 614.7 feet to 592.2 feet).

Espana (2002) completed a number of borings for an interchange Materials Report. They observed no groundwater in their borings which were drilled to a maximum depth of 16.4 feet bgs and lowest elevation of approximately 584 feet.

7.3.2.3 BCI Observations

During the subsurface exploration for the Latrobe Road UC (June 2007), BCI encountered groundwater at a depth of about 36 feet (elevation 591.6 feet). Groundwater was not encountered within augered intervals of other borings extended to a maximum depth of 16 feet and lowest elevation of 600.2 feet.

During construction of the recent mainline UC improvements (May 2010), we observed groundwater in foundation excavations for the abutments and bent (excavated to elevation 598 ft). This water required pumping for removal prior to placement of concrete.

During this study, we did not observe groundwater seepage at the surface within the project area. With the exception of Boring A-12-101, we did not observe groundwater in any of our borings or trenches completed for this project. At Boring A-12-101, we observed groundwater at a depth of 24.5 feet bgs (elevation 588.2 feet); this boring is located adjacent to the drainage at the east end of the project.

In general, we expect:

- overburden soils and upper portions of decomposed rock to be seasonally wet/saturated,
- shallow groundwater and seepage along the soil/rock interface and within shallow, fractured rock during the winter months or extended periods of rainfall

7.4 Project Site Seismicity

7.4.1 Ground Motions

Based on Caltrans ARS Online (V1.0.4) and other mapping, the closest recognized Late Quaternary or younger fault is the Bear Mountains Fault Zone (Rescue Fault section, Caltrans Fault ID No. 83, Maximum Magnitude, MMax = 6.5) located approximately 8.75 miles (14 km) east of the site. Figure 4, Seismic Hazard Map shows the approximate fault locations.

We used the Caltrans ARS Online (web-based tool) to calculate both deterministic and probabilistic acceleration response spectra for the site based on criteria provided in Appendix B of the Caltrans Seismic Design Criteria (Revision Date:11/2010). Caltrans design spectrum is based on the larger of the deterministic and probabilistic spectral values.

The deterministic spectrum is determined as the average of median response spectra calculated using ground motion prediction equations developed under the "Next Generation Attenuation" (NGA) project. These equations are applied to all faults considered to be active in the last 750,000 years (late-Quaternary age) that are capable of producing a moment magnitude earthquake of 6.0 or greater.

The probabilistic spectrum is obtained from the USGS (2008) National Hazard Map for 5% probability of exceedance in 50 years. Probabilistic analysis includes deaggregation for applicable fault distance when near-fault effects apply (as for this site).

Both the deterministic and probabilistic spectra account for soil effects through incorporation of the parameter Vs30, the average shear wave velocity in the upper 30 meters of the soil profile. For the project site, we assume a Site Class B/C with Vs30 equal to 760 meters per second (approximately 2,500 feet per second) based on the mapped ground conditions (underlain by shallow metamorphic rock).

The peak ground acceleration (PGA) at the site is approximately 0.2g based on Caltrans ARS Online and minimum deterministic levels of ground acceleration.

7.4.2 Ground Rupture

Our review of published geologic mapping and preliminary site review did not reveal the presence of Late Quaternary (displacement within the last 700,000 years) or younger faults within or immediately adjacent to the project site. The potential for ground rupture at the site is low.

7.4.3 Liquefaction

Liquefaction can occur when loose to medium dense, granular, saturated soils (generally within 50 ft of the surface) are subjected to ground shaking. Our subsurface investigation indicates that the site is underlain by shallow rock, which is not liquefiable.

8 GEOTECHNICAL ANALYSIS AND DESIGN

8.1 Cuts and Excavations

Excavation depths up to approximately 12 feet are required for construction of the west bound loop off-ramp and west bound on-ramp. A cut slope, up to approximately 12 feet in final height, will be constructed along the north side of the on-ramp. Based on the good condition and performance of existing cut slopes, the presence of cohesive soils and weathered rock, and the results of our field exploration, we expect that the proposed slopes cut at a gradient of 1.5H:1V or flatter, to be stable.

Temporary slopes may be required for certain installations. Prepare all slopes and shore temporary excavations in accordance with current Cal OSHA requirements. Where the use of excavation sloping and/or shoring is required, a competent person must classify each soil deposit as Type A, Type B, or Type C in accordance with OSHA procedures. We expect most native soils to be classified as Type A, which requires a temporary slope gradient of 0.75:1 or flatter. Excavations in fill will require sloping or shoring for Type C soils.

8.1.1 Cut Slope Stability

Cuts will expose existing fill, surficial soils, and underlying rock. Existing fills and surficial soils/decomposed rock (Unit 1) are moderately thick (up to 10 to 15 feet) and these materials will control overall slope stability. Shallow rock underlying the proposed cut locations is generally decomposed to intensely weathered and intensely fractured. While rock within 10 to 15 feet of the surface is typically decomposed to intensely weathered (and more “soil like”) such that rock structure will generally not control slope stability, rock structure in the area has a generally steep dip to the east or west which is favorable for the planned south facing cut along the on-ramp.

Existing, south facing cut-slopes along the west bound on- and off-ramps appear grossly stable, with no significant erosion or sloughing apparent. Due to the presence of cohesive soils and weathered rock, we expect that the proposed cut-slopes will be stable at a gradient of 1.5H:1V (or flatter).

Review cut slopes upon completion to evaluate exposed soil and rock for conditions that may influence slope instability. We recommend crown ditches and slope rounding at the top of cuts to reduce slope erosion.

8.1.2 Rippability

Based on the subsurface conditions we observed and tested, and our experience with similar conditions, we expect that typical, heavy-duty, excavation equipment is sufficient to excavate existing fill, native soil and weathered rock to planned grade.

Based on our review of cuts and the results of our seismic refraction survey, we present an estimate of material rippability in Table 3.

Table 3 - Rippability

Seismic Velocity (feet per second, fps)	Material Type	Estimated Rippability
≤ 4,000	Fill, colluvium and decomposed to intensely weathered rock (generally less than 10 ft deep)	Rippable with heavy-duty construction equipment
4,000 to 7,000	Intensely to moderately weathered rock, with local less weathered blocks (generally between 10 to 20 feet deep)	Rippable, with local resistant blocks that may require alternative excavation methods (pneumatic hammer)
≥ 7,000	Moderately weathered to fresh rock (generally over 15 to 20 ft in depth)	Blasting or alternative excavation methods, with local blocks rippable along natural discontinuities

Section 1-68 of the 2009 Caterpillar Performance Handbook (Edition 39) indicates rock with seismic velocities up to about 7,000 fps is rippable with a Caterpillar D9, and marginally rippable for seismic velocities between 7,000 and 9,000 fps. Based on our boring / test pit data and geologic reconnaissance, we expect soil and weathered rock to be excavatable with a Caterpillar D-9 equipped with a single shank ripper to depths of 15 to 20 feet.

Hard rock and large boulders, which may require alternative excavation methods and/or localized blasting, may be present in isolated locations at depths of less than 15 feet within the project.

We do not anticipate a need for blasting. However, if blasting is required and allowable, perform in accordance with Caltrans "Standard Specifications" (including Sections 7-1.10 and 19-2.03). The specifications and special provisions developed for blasting should address safety issues and avoidance of damage to existing pavement, utilities, structures and other natural and man-made features.

8.1.3 Soil Moisture

In general, the moisture content of the upper soils ranges from about 9 to 15 percent at the time of our field exploration. Unless grading work is completed during or shortly after the wet season, we expect the soil to be generally dry of optimum and require moisture conditioning particularly when mixed with the underlying weathered rock. Over optimum moisture conditions can occur when soils are excavated in low lying areas at or adjacent to drainages.

8.1.4 Grading Factors

Based on data developed for this study, the majority of proposed cuts will be rippable to approximate depths in excess of 15 feet. We estimate that the majority of this material will break down to dimension of less than 8 inches and be suitable to use in project fills (not Structure Backfill). Oversize material (greater than 8 inches in diameter) will require disposal outside the structural fill limits and should not be included in grading factors. Resistant blocks of hard rock that will not readily break down may be encountered at shallow depths in isolated areas.

For usable fill material, we estimate an overall earthwork factor (i.e. in-place volume/re-compacted volume) ranging from 0.95 to 1.15 for materials placed at 90 to 95% relative compaction (per CTM 216). In consideration of material loss during transport and site work, potential for variability within the weathered/fractured rock, and unsuitable/oversize materials, we recommend a factor of 1.0 for determination of approximate material balance. This is an estimate based on very limited data and the general soil and rock types; significant variability in grading factors will occur based on actual site conditions and methods of material placement and compaction. Provisions should be made to allow for grade variation and/or materials import or export to accommodate site balance.

8.2 Existing Fill

Significant depth of embankment fill occurs along US 50, at existing ramps, and within the western portion of the project where old Saratoga Way and Arrowhead Drive have been covered. We assume that existing fill located within US 50 right-of-way is "engineered fill" placed in accordance with Caltrans "Standard Specifications" and is suitable for use as roadway embankment/subgrade. El Dorado County (John Kahling, Deputy Director – Construction) confirmed that fill placed over old Saratoga Way and Arrowhead Drive was placed as "engineered fill" in accordance with Caltrans specifications. It appears that existing fill will be exposed during ramp construction at subgrade elevation and in the cut slope along the on-ramp. Considering that this fill has been placed and compacted as an engineered fill, it is acceptable to remain at subgrade and within planned slopes.

8.3 Embankments

Construct embankments and place new fill in accordance with Caltrans "Standard Specifications" (including Section 19, "Earthwork"). Where new fill is to be placed onto existing fill slopes or on natural slopes exceeding 5H:1V, fully bond into the existing slope by placing on discrete horizontal benches cut fully into the slope and below any loose/soft or otherwise unsuitable materials (per Section 19 of Caltrans "Standard Specifications").

8.3.1 Embankment Material

Based on the planned improvements, embankment fill is required along most ramp locations. On-site materials are generally suitable for use as embankment fill. Some clay soils are present, above the weathered rock, and will be restricted from use adjacent to retaining walls and at abutment walls as described in the Foundation Report and as controlled by the requirements for Structure Backfill. Imported material used within 4 feet of roadway subgrade elevation must have a minimum R-Value of 20.

8.3.2 Slope Stability and Erosion Control

We expect that embankment slopes constructed at gradients of 2H:1V or flatter to be grossly stable when constructed with approved on-site and imported materials and when placed in accordance with the Caltrans Standard Earthwork Specifications.

Significant drainage areas will not be covered by embankment fill. Based on this and the lack of observed subsurface water in roadway borings and test pits completed for this project, BCI does not anticipate a need for subdrainage at the base of new fill slopes. However, review actual conditions exposed during construction (such as if local springs are exposed) and provide subdrainage if necessary.

Embankment slopes and areas disrupted by grading are susceptible to erosion from surface runoff. Control overside runoff with curbs, dikes, crown-ditches, down-drains, etc. Vegetate finished slopes to reduce erosion potential. We provide erosion control considerations (previously suggested by Caltrans along US 50) below:

1. During construction, slopes shall be protected during the rainy season with the following measures:
    a. Temporary rolled erosion control product (blanket) will be used to protect soil contact by rain drops
    b. Slopes longer than 15 feet shall require the use of temporary fiber rolls
    c. Soil not covered with a temporary blanket shall be stabilized by using Temporary Erosion Control (Poly Stabilizing Fiber Matrix) - no seed required.
2. All finished slopes with exposed soil shall be left or placed into a roughened state by track walking or other means
3. All finished slopes longer than 15 feet require fibers rolls (permanent installation)
4. Finished slopes steeper than 2H:1V shall be protected with an erosion control blanket (seed shall be placed beneath blanket prior to placement).

5. Finished slopes shall be sprayed with a Compost Blanket (Caltrans SSP, 2006 SSP No. 20-055). This measure shall also include a seed mix that contains natives to this region and that is conducive to establishing long term vegetation
6. Placement of Compost Blanket shall occur as late into growing season as possible (approximately late September/early October) to minimize predation of erosion control seed species

8.3.3 Settlement

Provided new embankment material is compacted in accordance with the recommendations of this report and in accordance with the Caltrans Standard Specifications, we do not expect significant settlement of embankment.

At the undercrossing bridge approaches, the foundation soils consist predominantly of 1 to 3 ft of medium dense, clayey/silty gravel over weathered rock. Based on this, we expect insignificant compression of soil and rock beneath embankments. The potential for significant long-term settlement is low and a waiting period for settlement is not required.

8.4 Culvert Foundation Support

8.4.1 General Conditions

Based on the preliminary drainage plans, we anticipate new culverts and culvert extensions will be constructed within stiff/dense surface soils, weathered rock, and/or engineered fill. Shallow native soils, embankment fills (constructed in accordance with the Standard Earthwork Specifications), and the underlying rock are suitable for culvert placement when designed and placed in accordance with the Highway Design Manual, Standard Plans, and Standard Specifications.

8.4.2 Corrosion Investigation

We completed 4 corrosivity tests on representative soil/rock samples from our borings and test pits. We summarize the test results in Table 4, along with corrosion test results by others, and include our laboratory test reports for this project in Appendix B.

Table 4 - Corrosion Test Results (CTM 417, 422, 643)

Exploration/ Test Location ID	Sample No.	Sample Depth (feet)	pH	Resistivity (ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
A-12-101	B7	0.5-5	8.5	2,676	7	12
A-12-104	B3	0.5-5	8.7	2,931	4	ND
A-12-111	B1	8-9	7.7	3,110	29	19
O-12-114	B2	5.5-6.5	7.9	1,810	10	18
R07-B1*	B1-1	5.5	7.01	1,930	16	52
R07-B1*	Run 1	15.5	7.55	1,050	32	154
A07-B2*	B2-4	21	7.25	3,220	6	19
A01-B2**	CB-2	0-6	7.0	3,880	8	5
A01-B5**	CB-5	0-6	6.9	3,347	13	8

*From BCI (2008) **From Espana (2002)

For structural elements, Caltrans[8] considers a site corrosive if one or more of the following conditions exist for the representative soil and/or water samples taken at a site:

- Chloride concentration is 500 parts per million (ppm) or greater,
- Sulfate concentration is 2000 ppm or greater,
- pH is 5.5 or less.

In addition, Caltrans states that the minimum resistivity of soil and/or water indicates the relative quantity of soluble salts present in the soil or water. Soil and water need not be tested for chlorides and sulfates if the minimum resistivity is greater than 1,000 ohm-cm, because a minimum resistivity greater than 1,000 ohm-cm indicates that the chloride and sulfate contents are low (i.e., low corrosion potential).

Based on our testing and observations, we consider the site soils and weathered rock as generally non-corrosive. The maximum chloride and sulfate concentrations we obtained are 32 and 154 part per million (ppm), respectively. The soil pH ranged from 6.9 to 8.7 and the minimum resistivity ranged from 1,050 to 3,880 ohm-cm (most greater than 2,000 ohm-cm). In general, our tests indicate that the surface soils and the underlying, weathered rock have a relatively neutral pH.

Based on anticipated site conditions, our pH, sulfate and chloride testing, and Table 855.4 of the Caltrans Highway Design Manual (CHDM), cementious materials must comply with Section 90-2.01C of the Standard Specifications. However, pH values can drop below 7.1; therefore, water content restriction does apply and a maximum water-to-cementious material ratio of 0.45 is applicable.

In accordance with the Caltrans Corrosion Guidelines (2003), the approximate life (years to perforation) of 18 gage corrugated steel pipe (CSP) for the site conditions is estimated at approximately 20 to 35 years.

For a 50-year service life, with respect to soil corrosivity, we recommend a minimum of 12 gage Galvanized Steel-Metal for CSP.

Aluminum or Aluminized Steel pipes with a minimum thickness of 16 gage are acceptable alternative culvert materials with the exception of the following locations (where the potential for a high pH and/or low resistivity makes Aluminum or Aluminized Steel pipe unsuitable):

- Culvert along the westbound off-ramp, east of El Dorado Hills Blvd ("W1" Station 57+00 to 67+00)
- Culvert along northbound Latrobe Road/El Dorado Hills Blvd.

The above minimum thicknesses do not take pipe abrasion resistance and overfill height into consideration.

[8] Caltrans Corrosion Guidelines (2003)

8.5 Pavement Design

For pavement design purposes, we expect pavement subgrade conditions to consist of the following material types:

- Embankment Fill: areas that will be underlain by new and/or existing embankment fill. New embankment fill will come primarily from on-site cuts.
- Native Silty/Clayey Soils: areas where excavation for pavement subgrade is expected to expose stiff to hard, medium dense to dense, in-place silty/clayey soil
- Weathered Rock: areas where excavation for pavement subgrade is expected to expose decomposed to intensely weathered, soft to moderately hard, in-place rock

We completed five R-value tests on soil and weathered rock samples, obtained from borings and test pits completed during our field investigation for the project. Figure 2 (attached) shows the boring and test pit locations. The sampled materials represent anticipated pavement subgrade soils for new roadway segments.

We summarize the R-Value test results in Table 5, below, and include complete laboratory test reports in Appendix B.

Table 5 - R-Value Test Results (CTM 301)

Exploration ID	Sample No.	Approximate Sample Depth (feet)	USCS Soil Classification	R-Value
A-12-102	B5	0.5 – 5.0	CL (Sandy Clay)	21
A-12-103	B5	0.5 – 5.0	CL (Sandy Clay)	28
O-12-111	B1	8 – 9.0	CL (Gravelly Clay)	32
O-12-114/115	B2/B1 combined	5 – 6.0	GC (Clayey Gravel)	16
O-12-116	B1	0.5 – 1.5	CL (Gravelly Lean Clay)	18

Our R-Value tests resulted in values ranging from 18 to 32. Based on the planned improvement elevations, our subsurface investigation, sampling and testing, and our experience with similar materials, we recommend an R-Value of 20 for overall design.

We calculated new pavement structural sections using Caltrans Flexible Pavement Design Methods (Highway Design Manual, Chapter 600). Table 6 lists structural sections for new pavement (ramps) based on several different Traffic Indices.

Table 6 – New Pavement Structural Sections

Design R-Value	Traffic Index	Dense Graded HMA (ft)	Class 2 Aggregate Baserock (ft)
20	10	0.50	1.50
	11	0.55	1.70
	12	0.60	1.85

We observed no groundwater seepage in the project area or groundwater in exploration points within the new ramp areas. Based on the absence of shallow groundwater, good site drainage, and firm subgrade conditions, roadways will not require subsurface drainage.

8.6 Overhead Sign

A new overhead sign will be installed at the west bound off-ramp. QEI indicates the sign type will be a single post truss. BCI completed a Boring A-12-101 near the planned sign location. Subsurface conditions at this location consist of 12.5 feet of dense, clayey gravel over decomposed to intensely weathered metavolcanic rock. The boring was auger drilled to a depth of 25 feet.

Based on the soil conditions observed at the boring and test results, the location is suitable for use of the Standard Plan CIDH pile foundation. Corrosion testing indicates non-corrosive soil conditions at this location. Caving of soils (clayey gravel) in the upper 10 to 12 feet can occur during excavation for the CIDH pile; use temporary casing for construction.

9 MATERIAL SOURCES

We assume that fill material will be composed of cuts from the planned ramp locations (on-site materials). At this time, other import material sources for general fill are not identified and aren't expected to be necessary. The geotechnical engineer of record must approve all fill borrow sources prior to transportation and placement.

Structural fill material should conform to gradation requirements presented in Section 19 of the Standard Specifications. From a geotechnical standpoint, oversized rock generated from cut excavations can be placed outside of structural fill slopes, near the toe of fill embankments, or within other designated spoil areas.

Commercial sources are available nearby for asphalt, Portland Cement Concrete, aggregate base, aggregate subbase and permeable materials, as required for this project. BCI must approve import material prior to placement.

10 CONSTRUCTION CONSIDERATIONS

10.1 Construction Advisories

The contractor should verify existing utility line locations and conditions. Do not stockpile excavated material or imported borrow material in these areas.

10.2 Naturally Occurring Asbestos

While rock containing potentially significant quantities of naturally occurring asbestos (NOA) were not observed during our site exploration, rock containing NOA could occur within the project.

Considering that there is a potential for encountering NOA, BCI recommends preparation of an Asbestos Hazard Mitigation Plan in compliance with provisions of El Dorado County Air Quality Management District (EDAQMD) Rule 223-2 and California Air Resources Board requirements, as applicable.

Visually monitor rock types exposed during construction for the potential presence of asbestos material. If construction activities expose NOA, comply with the applicable provisions of EDAQMD Rule 223-2 and the State of California Asbestos Airborne Toxic Control Measure (ACTM), CCR Title 17, Section 93105, and perform earthwork in areas containing NOA in accordance with Section 19 of the Standard Specifications and Section 19-910 of the 2006 Standard Special Provisions. In addition, prepare a worker health and safety program in accordance with all regulatory requirements, including CAL OSHA.

10.3 Perched Groundwater and Over-optimum Soil Moisture

Perched groundwater may be encountered during and shortly following the rainy season within shallow soils. If perched groundwater or surface water is encountered, sump pumps may be required to facilitate construction.

Excessively wet (over-optimum) soil conditions can make proper compaction difficult or impossible. Wet soil is commonly encountered during the winter and spring months, or in excavations where groundwater or perched groundwater is encountered.

In general, wet soil can be mitigated by:

- Discing the soil during prolonged periods of dry weather
- Overexcavating and replacement with drier material
- Lime/cement treatment or stabilization using aggregate and or stabilization fabric

If wet, unstable soil is encountered, BCI can observe the conditions and provide more specific mitigation recommendations.

10.4 Preparation of Existing Fill Locations

Clear and grub existing fill surfaces and bench into the fill slopes in accordance with the "Standard Specifications." The geotechnical engineer of record must approve fill surfaces prior to placement of embankment fill.

Where existing slopes are steeper than 5H:1V, new embankment fill should be benched into the existing slope in accordance with the earthwork specifications.

Existing drainage locations along existing ramps will likely have wet/soft soils present at the time of construction. Remove soft and/or excessively wet soils to firm subgrade prior to fill placement.

Existing pavement from old Saratoga Way remains where the ramps will intersect El Dorado Hills Blvd. Existing pavement will need to be removed prior to placement of fill and/or new pavement structural sections.

10.5 Underdrains

We did not identify areas that will require subsurface drainage. However, review subgrade conditions exposed by the new cuts for groundwater seepage and the need for additional drainage.

10.6 Construction Considerations that Influence Specifications

BCI anticipates the contractor will be required to prepare an Asbestos Compliance Plan in accordance with the Standard Special Provisions Update, and have personnel attend a safety training program in accordance with CCR, Title 8, Section 1529, (Asbestos), and Section 5192 (b)(4)(B), (Hazardous Waste Operations and Emergency Response). If encountered, NOA material left on-site must be covered with a minimum 1-foot layer of asbestos-free material.

Use of these additional erosion control measures discussed above may require modification of the Standard Specifications.

Temporary casing (10 -12 feet) may be necessary for construction of the CIDH pile foundation for the overhead sign located at the west bound off-ramp.

10.7 Construction Monitoring and Instrumentation

We do not expect geotechnical instrumentation will be necessary for this project. BCI should provide specific geotechnical review during construction of cut-slopes and excavation.

Visually monitor rock exposed during construction for the potential presence of naturally occurring asbestos (NOA). If construction activities expose NOA, comply with the applicable provisions of EDAQMD Rule 223-2 and the State of California Asbestos Airborne Toxic Control Measure (ACTM), CCR Title 17, Section 93105, and perform earthwork in areas containing NOA in accordance with Section 19 of the Standard Specifications and Section 19-910 of the 2006 Standard Special Provisions. In addition, prepare a worker health and safety program for excavations in areas with NOA in accordance with all regulatory requirements, including CAL OSHA.

10.8 Hazardous Waste Considerations

BCI is not aware of significant hazardous waste considerations for earthwork at the project location. Borrow locations must be reviewed for potential hazardous waste/materials considerations prior to use. Based on the local geologic conditions and our testing, the potential for naturally occurring asbestos (NOA) is low but it should be considered as a potential impact.

10.9 Differing Site Conditions and Report Limitations

We assume the soil and groundwater conditions encountered in our borings and test trenches, and those by others, are representative of the subsurface conditions across the site. Actual conditions between exploration points can be different. If differing site conditions are encountered, contact BCI immediately to provide additional recommendations.

BCI based this report on the observed site conditions and preliminary plans provided by QEI. Use this report only for planning, design, and construction of the roadway portion of the project as described herein.

Appendix A presents logs of borings and test pits. The lines designating the interface between soil types are approximate. The transition between material types may be abrupt or gradual. Our recommendations are based on the final logs, which represent our interpretation of the field logs, general knowledge of the site, and geological conditions.

Modern design and construction are complex, with many regulatory sources/restrictions, involved parties, construction alternatives, etc. It is common to experience changes and delays. The owner should set aside a reasonable contingency fund based on complexities and cost estimates to cover changes and delays.

BCI performed services in accordance with generally accepted geotechnical engineering principles and practices currently used in this area. We do not warranty our services.

11 GEOTECHNICAL RECOMMENDATIONS AND SPECIFICATIONS

In this section, we present our recommended geotechnical specifications, and special provisions to be used in design and construction of the roadway portions of the project. If designers have questions or problems with any of these recommendations, or, if conditions are found to be different during construction, contact BCI to determine if additional fieldwork, analysis, or recommendations are required.

Where referenced below, Standard Specifications and Standard Plans refer to the 2006 California Department of Transportation (Caltrans) Standard Specifications and Caltrans Standard Plans.

11.1 Earthwork

Earthwork shall be performed in accordance with Section 19 of the Standard Specifications. *Structural Backfill* shall conform to Section 19-3 of the Standard Specifications. Clearing and Grubbing will be performed as described and within the limits provided in Section 16 of the Standard Specifications. In addition, earthwork and structural backfill shall be performed in accordance with the following special provisions. If a conflict exists between the Standard Specifications and special provisions below, the special provisions govern.

11.2 Special Provision for Rocky Fill Compaction

It is possible that some on-site fill sources will generate "rocky" material. For structural embankment fill construction with "rocky" fill material, use *only* Section 19-5.02, Part C; specifically, fill which exhibits a maximum of 25 percent by volume of material exceeding 0.67 feet (8 inches) in any dimension. Where embankment fills have greater than 30 percent retained on a ¾-inch sieve, place rocky fill in loose lifts no thicker than 1 foot prior to compaction. Moisture condition the matrix soil uniformly to at least 2 percent over the optimum moisture content (visual manual method) prior to compaction. Where 90 percent relative compaction is specified, compact each lift of rocky fill with a minimum of five passes of a Caterpillar (CAT) 825 padded drum compactor making overlapping passes until coverage is complete. Where 95 percent relative compaction is specified, compact each lift of rocky fill with a minimum of seven passes of a CAT 825 compactor making overlapping passes until coverage is complete.

Where trench backfill has greater than 30 percent retained on a ¾-inch sieve, place rocky trench backfill in loose lifts no thicker than 1 foot prior to compaction. Moisture condition the matrix soil uniformly to at least 2 percent over the optimum moisture content (visual manual method) prior to compaction. Where 90 percent relative compaction is specified, compact each lift of rocky backfill with a minimum of seven passes of a sheepsfoot wheel attached to CAT 235 or larger excavator. Where 95 percent relative compaction is specified, compact each lift of rocky backfill with a minimum of nine passes of a sheepsfoot wheel attached to CAT 235 or larger excavator.

Modify the performance specification as required by the project engineer based on actual equipment used and observed compaction results.

11.3 Special Provision for Acceptable Fill and Borrow Material

On-site soil and weathered rock is suitable for use as fill for the project provided it is free of concentrations of organics, debris, and meets particle size requirements of the Standard Specifications and special provisions. Unsuitable materials include surface strippings, broken concrete, and other non-native material unearthed during general grading.

If borrow material is required, it must have a minimum R-value of 20 (when used within 4 feet of roadway subgrade elevation), contain no significant concentrations of vegetation, debris, or asbestos containing rock, and meet the project particle size requirements in the special provisions above.

12 RISK MANAGEMENT

Our experience and that of our profession clearly indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the geotechnical engineer of record to provide additional services during design and construction.

For this project, BCI should be retained to:

- Review and provide comments on the civil plans and specifications prior to construction.
- Monitor construction to check and document our report assumptions. At a minimum, BCI should monitor grading, trench backfill, culvert backfill, and pavement subgrade and aggregate base compaction.
- Review proposed borrow material for suitability.
- Update this report if design changes occur, 2 years or more lapse between this report and construction, and/or site conditions have changed.

If we are not retained to perform the above applicable services, we are not responsible for any other party's interpretation of our report, and subsequent addendums, letters, and discussions.

Figures

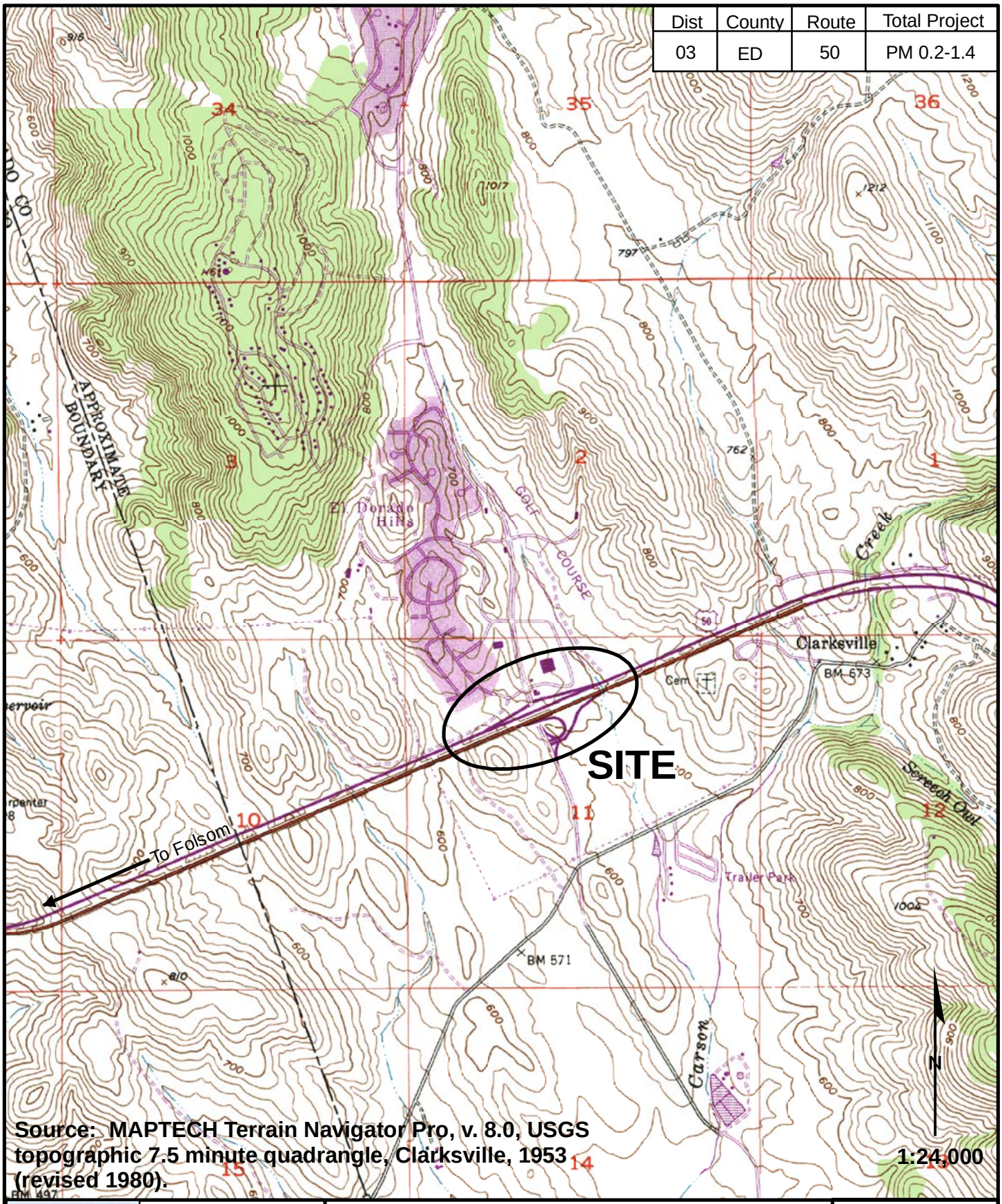
Figure 1 – Vicinity Map

Figure 2 – Site Plan (3sheets)

Figure 3 – Geologic Map

Figure 4 – Seismic Hazard Map

Dist	County	Route	Total Project
03	ED	50	PM 0.2-1.4



Source: MAPTECH Terrain Navigator Pro, v. 8.0, USGS topographic 7.5 minute quadrangle, Clarksville, 1953 (revised 1980).

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VICINITY MAP

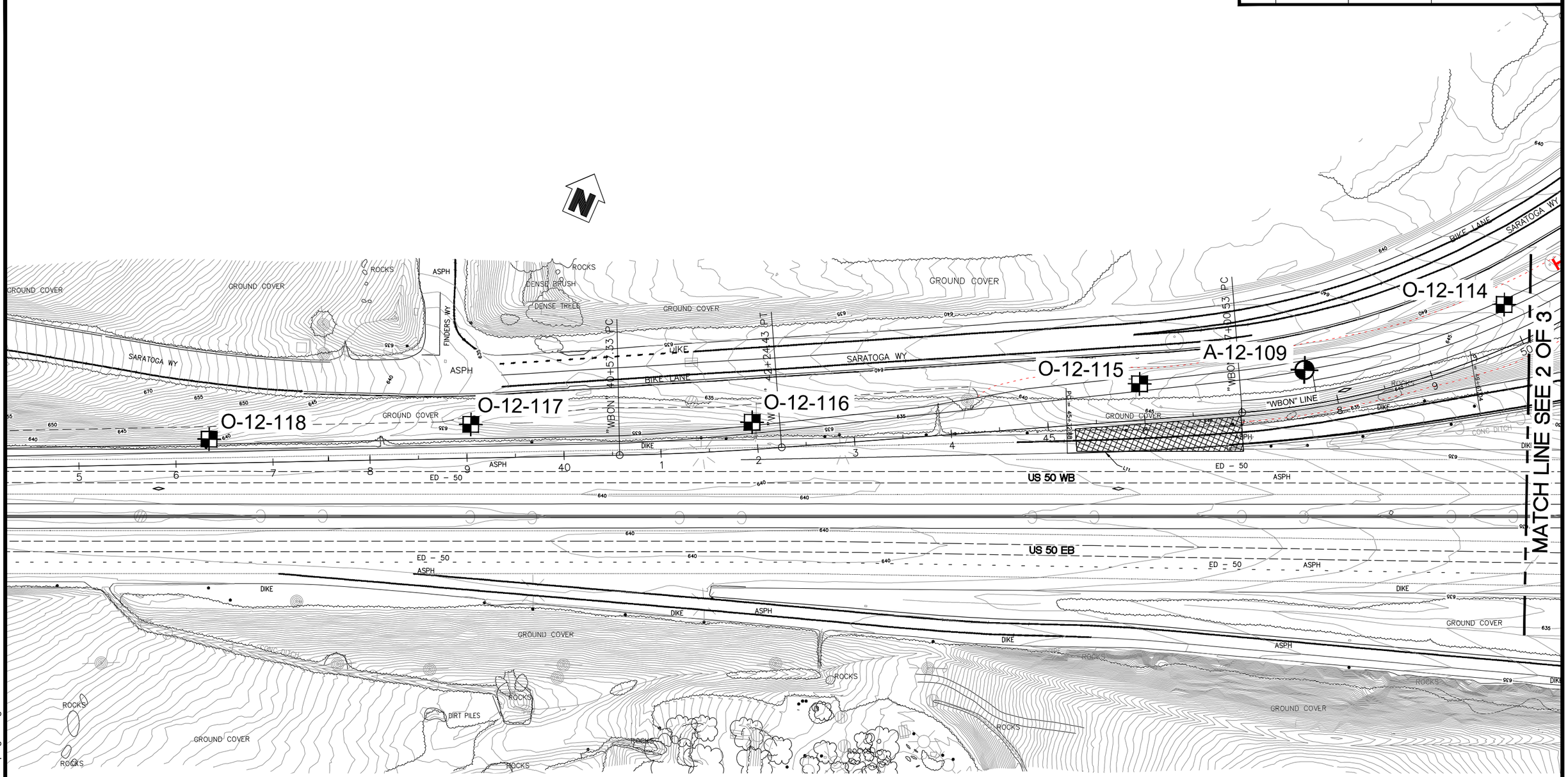
State Route 50 WB Latrobe Rd Ramps
EA 03-2E5101
El Dorado County, California

File No. 1072.8

March 2012

Figure 1

DIST	COUNTY	ROUTE	TOTAL PROJECT
03	ED	50	0.2/1.4



LEGEND

- Approximate Boring Location
- Approximate Test Pit Location
- SR-01 Approximate Seismic Line Location

Source: Project contours and alignments by R.E.Y. Engineers, Inc. and Quincy Engineering, Inc. received July 2007,September 2007 and February 2012 respectively.

Scale 1"=100'

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SITE PLAN

US 50/Latrobe Road WB Ramps Project
(EA # 03-2E5101)
El Dorado County, California

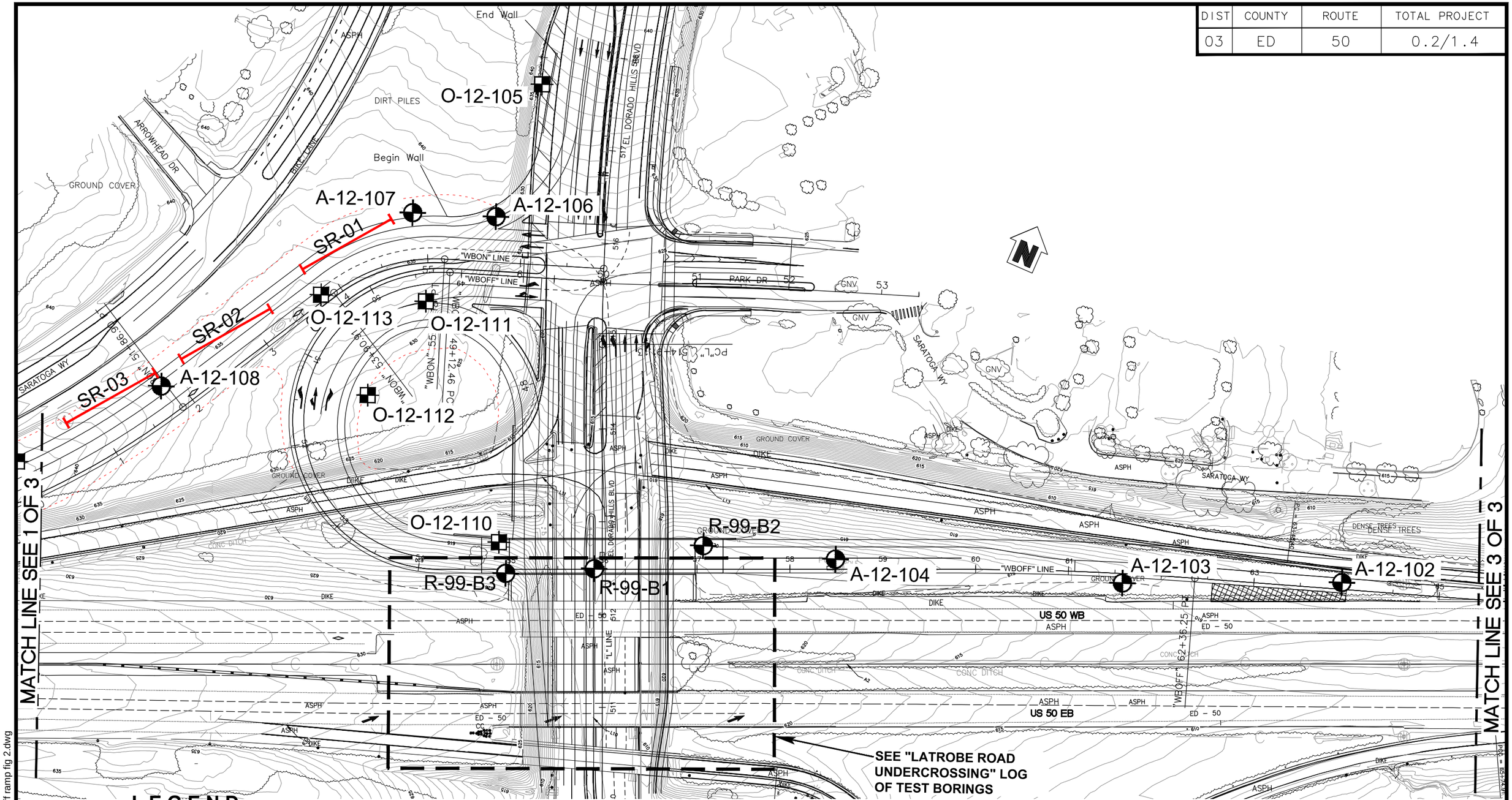
File No. 1072.8

March 2012

Figure 2
Page 1 of 3

3/2/12 1072.8 us 50 latrobe rd wb off ramp fig 2.dwg

DIST	COUNTY	ROUTE	TOTAL PROJECT
03	ED	50	0.2/1.4



LEGEND

- Approximate Boring Location
- Approximate Test Pit Location
- SR-01 — Approximate Seismic Line Location

Source: Project contours and alignments by R.E.Y. Engineers, Inc. and Quincy Engineering, Inc. received July 2007,September 2007 and February 2012 respectively.

Scale 1"=100'

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SITE PLAN

US 50/Latrobe Road WB Ramps Project
(EA # 03-2E5101)
El Dorado County, California

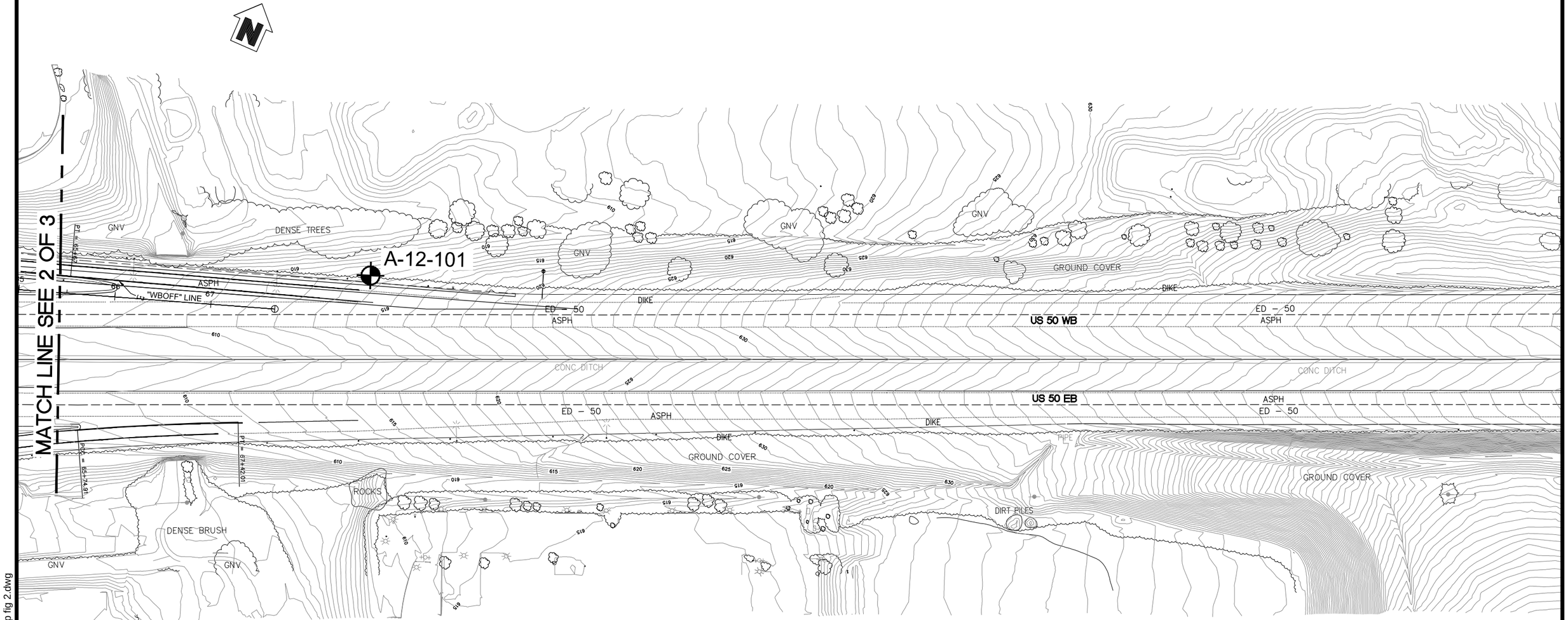
File No. 1072.8

March 2012

Figure 2
Page 2 of 3

3/2/12 1072.8 us 50 latrobe rd wb off ramp fig 2.dwg

DIST	COUNTY	ROUTE	TOTAL PROJECT
03	ED	50	0.2/1.4



LEGEND

- Approximate Boring Location
- Approximate Test Pit Location
- SR-01 Approximate Seismic Line Location

Source: Project contours and alignments by R.E.Y. Engineers, Inc. and Quincy Engineering, Inc. received July 2007,September 2007 and February 2012 respectively.

Scale 1"=100'

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SITE PLAN

US 50/Latrobe Road WB Ramps Project
(EA # 03-2E5101)
El Dorado County, California

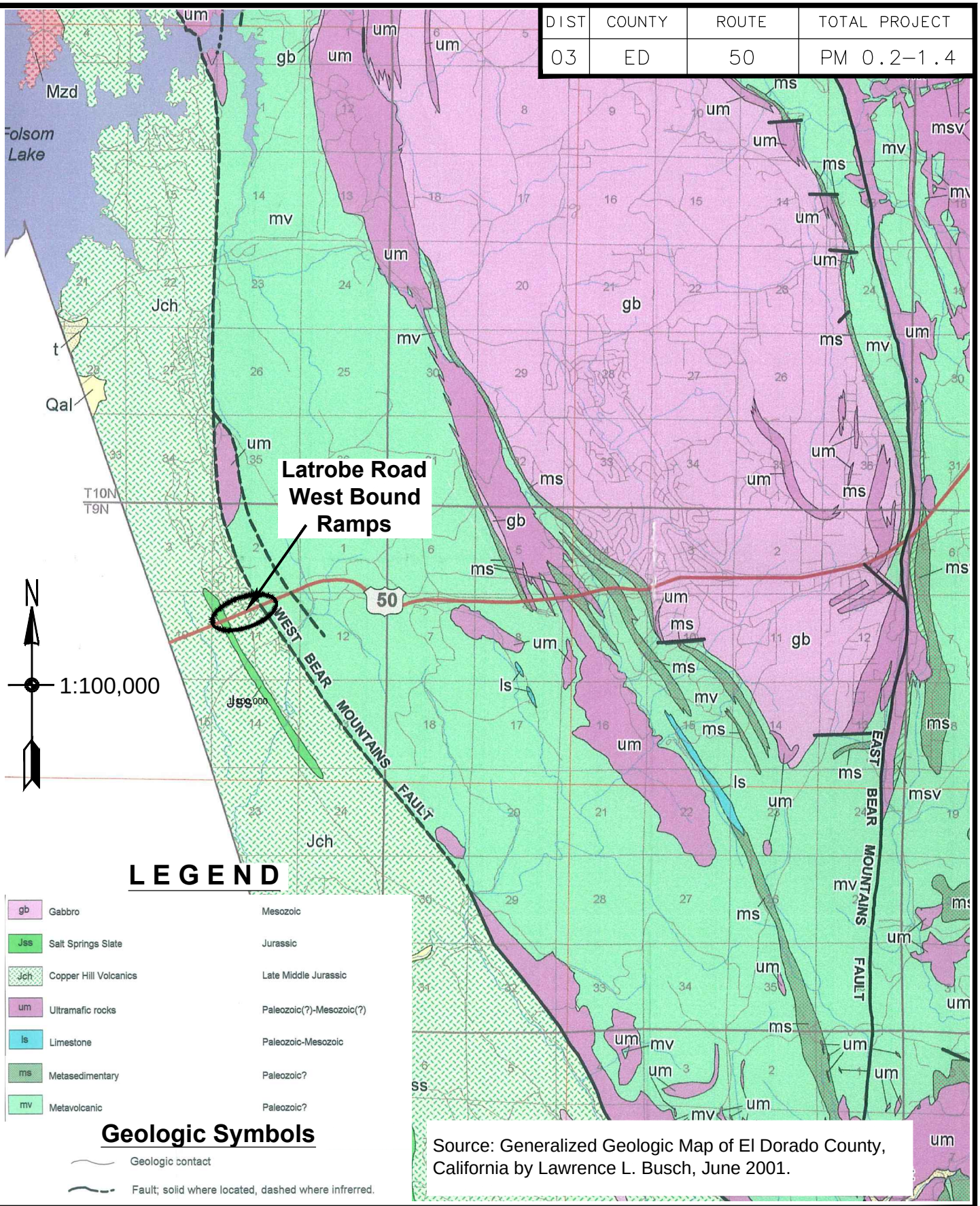
File No. 1072.8

March 2012

Figure 2
Page 3 of 3

3/2/12 1072.8 us 50 latrobe rd wb off ramp fig 2.dwg

DIST	COUNTY	ROUTE	TOTAL PROJECT
03	ED	50	PM 0.2–1.4



Source: Generalized Geologic Map of El Dorado County, California by Lawrence L. Busch, June 2001.

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GEOLOGIC MAP

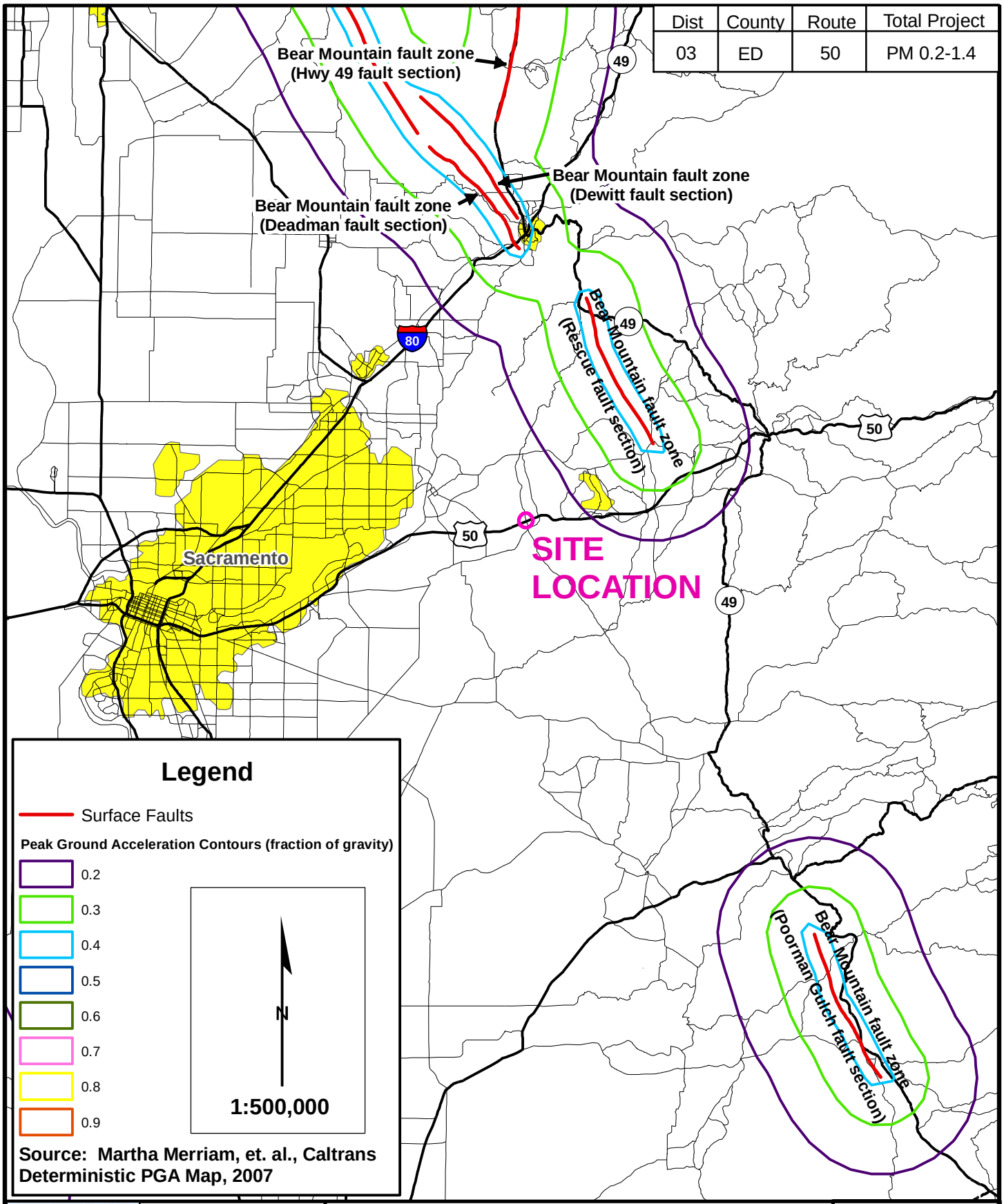
State Route 50 WB Latrobe Rd Ramps
EA 03-2E5101
El Dorado County, California

File No. 1072.8

March 2012

Figure 3

2/27/2012 1072.8 Geologic Map Fig 3.dwg



Dist	County	Route	Total Project
03	ED	50	PM 0.2-1.4

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SEISMIC HAZARD MAP

State Route 50 WB Latrobe Rd Ramps
EA 03-2E5101
El Dorado County, California

File No. 1072.8

March 2012

Figure 4

APPENDIX A

Boring and Test Pit Logs (A-12-101 to O-12-118)
Legend of Logs (3Sheets)
Log of Test Boring, Latrobe Road WB Off-Ramp UC (Sheets 1 through 4)

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	**2-6-12**	**2-6-12**	**38° 39' 16" / -121° 3' 59"**	**A-12-101**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber				**~612.7 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			**CME 75**	**4 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, SPT (1.4"), CAL MOD (2.5")			**140 lb**	**80%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Boring backfilled with cement and cuttings			**24.5 ft**	**24.5 ft on**	**25.0 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 GRAVEL (GC); dense; brown; moist; FILL.												
	1				7			100							CR
610.70	2				1	15 21 18	39	100							
	3									9	132	PP = 4.5+			
608.70	4														
	5				2	15 14 37	51	100							DS
606.70	6														
	7														
604.70	8														
	9														
602.70	10				3	14 17 20	37	100							
	11		CLAYEY GRAVEL (GC); dense; olive gray; moist.							17	116	PP = 4.0/2.5			
600.70	12														
	13		METAVOLCANIC ROCK, dark grayish green, decomposed to intensely weathered, intensely to moderately fracture, thinly foliated, soft to moderately soft, dry to moist.												
598.70	14														
	15				4	42 50/2"	50/2	100		6	122	PP = 3.25			
596.70	16														
	17														
594.70	18														
	19														Firm drilling
592.70	20				5	49 50/2"	50/2	100							
	21														
590.70	22														Moderately hard drilling
	23														
588.70	24														Groundwater encountered at 24.5 feet
	25		Bottom of borehole at 25.0 ft bgs		6	50/1"	REF	100							
586.70	26														
	27														
584.70	28														
	29														
	30														

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REPORT TITLE				HOLE ID
BORING RECORD				**A-12-101**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

5 BR - STANDARD LOGS.GPJ BCI 2010 LOG.GLB 3/2/12

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	**2-6-12**	**2-6-12**	**38° 39' 14" / -121° 4' 5"**	**A-12-102**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber				**~606.5 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			**CME 75**	**4 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, SPT (1.4"), CAL MOD (2.5")			**140 lb**	**80%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Boring backfilled with cement and cuttings				**15.7 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); medium dense to dense; brown; moist.												
	1				5			100							R
604.50	2														
	3				1	16 16 19	35	100							
602.50	4														
	5		METAVOLCANIC ROCK, yellow brown, decomposed to intensely weathered, intensely fractured, thinly foliated, soft to medium soft, moist, (Silty Gravel, very dense).		2	50/5"	REF	100							
600.50	6														
	7														
598.50	8														
	9		METAVOLCANIC ROCK, yellow brown, intensely weathered, very intensely fractured, thinly foliated, moderately soft to moderately hard, dry.												Drilling becomes harder
596.50	10				3	50/3"	REF	100							
	11														
594.50	12														
	13														
592.50	14														
	15				4	50/2"	REF	100							
590.50	16		Bottom of borehole at 15.7 ft bgs												
	17														
588.50	18														
	19														
586.50	20														
	21														
584.50	22														
	23														
582.50	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**A-12-102**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	**2-6-12**	**2-6-12**	**38° 39' 13" / -121° 4' 8"**	**A-12-103**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber				**~611.3 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			**CME 75**	**4 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, SPT (1.4"), CAL MOD (2.5")			**140 lb**	**80%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Boring backfilled with cement and cuttings				**16.5 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		Lean CLAY with GRAVEL (CL); medium dense; olive brown; moist.		5			100							R
609.30	2		METAVOLCANIC ROCK, yellow brown, very intensely weathered, very intensely fractured, thinly foliated, soft to moderately soft, moist.												
	3				1	16 34 50/3"	84/9	100		13	125	PP = 4.5+			
607.30	4														
	5				2	50/5"	REF	100							
605.30	6														
	7														
603.30	8														Moderately hard drilling, smooth
	9														
601.30	10				3	19 23 37	60	100							
	11														
599.30	12														
	13														
597.30	14														
	15				4	30 24 18	42	100							
595.30	16														
	17		Bottom of borehole at 16.5 ft bgs												
593.30	18														
	19														
591.30	20														
	21														
589.30	22														
	23														
587.30	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**A-12-103**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	**2-6-12**	**2-6-12**	**38° 39' 12" / -121° 4' 11"**	**A-12-104**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber				**~619.3 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			**CME 75**	**4 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, SPT (1.4"), CAL MOD (2.5")			**140 lb**	**80%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Boring backfilled with cement and cuttings				**8.5 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		SILT with GRAVEL (ML); medium dense; brown; moist.												
	1				3			100							CR
617.30	2		METAVOLCANIC ROCK, gray green to brown, intensely to moderately weathered, intensely fractured, moderately hard, dry.		1	50/6"	REF	100		10	107	PP = 2.5/4.5+			
	3														
615.30	4														Hard drilling
	5				2	50/3"	REF	100							
613.30	6														
	7														
611.30	8														
	9		Bottom of borehole at 8.5 ft bgs												Essential auger refusal
609.30	10														
	11														
607.30	12														
	13														
605.30	14														
	15														
603.30	16														
	17														
601.30	18														
	19														
599.30	20														
	21														
597.30	22														
	23														
595.30	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**A-12-104**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

5 BR - STANDARD LOGS.GPJ BCI 2010 LOG.GLB 3/2/12

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	**2-6-12**	**2-6-12**	**38° 39' 15" / -121° 4' 17"**	**O-12-105**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION **~634.0 ft**
DRILLING METHOD			DRILL RIG **Hand Excavation**	BOREHOLE DIAMETER
SAMPLER TYPE(S) AND SIZE(S) (ID) **NA**			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
BOREHOLE BACKFILL AND COMPLETION **Hand excavation backfilled with native material**			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING **1.7 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 GRAVEL (GM); loose; brown; moist.												Upper 1.7 feet contains approximately 20% cobble size metavolcanic rock 4-10 inches in diameter
632.00	2		Bottom of borehole at 1.7 ft bgs												Essential refusal at 1.7 feet
630.00	4														The upper 1.7 feet of fill material is underlain by METAVOLCANIC ROCK, greenish gray, slightly weathered, intensely to moderately fractured, hard
628.00	6														
626.00	8														
624.00	10														
622.00	12														
620.00	14														
618.00	16														
616.00	18														
614.00	20														
612.00	22														
610.00	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**O-12-105**
DIST. **03**	COUNTY **ED**	ROUTE **50**	POSTMILE **0.2/1.4**	EA **03-1072.8**
PROJECT OR BRIDGE NAME **El Dorado SR 50 HOV Lanes Phase 0**				
BRIDGE NUMBER	PREPARED BY **Joe F**		DATE **3-2-12**	SHEET **1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
GJF	**2-9-12**	**2-9-12**	**38° 39' 14" / -121° 4' 17"**	**A-12-106**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber				**~635.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			**CME 75**	**4 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
CAL MOD (2.5"), HQ Core			**140 lb**	**80%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Boring backfilled with cement and cuttings				**20.0 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 GRAVEL (GM); dense; brown; moist; with cobbles..												Cobble/Boulder at 1.0 bgs
	1				1			19	26						
633.00	2														The upper 14.5 feet of this boring contains a mixture of igneous and metavolcanic rock in a sandy silty soil matrix
	3														
631.00	4														
	5				2	15	50	100		6	147	PP = 4.5			
629.00	6					20									
	7					30									
627.00	8														
	9														
625.00	10		CLAYEY GRAVEL (GC); medium dense; brown; moist.		3	7	32	100		15	125	PP = 4.5+			
	11					15									
623.00	12					17									
	13		METAVOLCANIC ROCK, brown, very intensely weathered, intensely fractured, soft to moderately soft..												
621.00	14														
	15		METAVOLCANIC ROCK, blue green, slightly to moderately weathered, intensely to moderately fractured, hard..		4			53	0						
619.00	16														
	17				5			100	161	0	174				
617.00	18														
	19														
615.00	20		Bottom of borehole at 20.0 ft bgs												
	21														
613.00	22														
	23														
611.00	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**A-12-106**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
GJF	**2-9-12**	**2-9-12**	**38° 39' 14" / -121° 4' 18"**	**A-12-107**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber				**~637.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			**CME 75**	**4 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
CAL MOD (2.5")			**140 lb**	**80%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Boring backfilled with cement and cuttings				**20.5 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		SILTY GRAVEL (GM); dense to very dense; brown; moist; Fill.												
635.00	2				1	26 50/3"	50/3	100				PP = 3.5			
633.00	4				2	14 18 27	45	100		11	129	PP = 4.5			
631.00	6														
629.00	8														
627.00	10		METAVOLCANIC ROCK, brown, intensely to moderately weathered, moderately to intensely fractured, hard.		3	45 50/3"	50/3	100				PP = 4.5+			CARB 435
625.00	12														
623.00	14														
621.00	16				4	35 50/1"	50/1	100				PP = 4.5+			
619.00	18														Very hard drilling at 17.5 feet bgs
617.00	20					50/4"	REF	0							No recovery
	21		Bottom of borehole at 20.5 ft bgs												
615.00	22														
613.00	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**A-12-107**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	**2-6-12**	**2-6-12**	**38° 39' 11" / -121° 4' 21"**	**A-12-108**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber				**~635.8 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			**CME 75**	**4 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), CAL MOD (2.5")			**140 lb**	**80%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Boring backfilled with cement and cuttings				**15.5 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		SILTY GRAVEL (GM); medium dense; brown; moist.												
633.80	2		METAVOLCANIC ROCK, brown, decomposed, intensely fractured, very soft, moist, (clayey gravel, dense).												
631.80	4														
	5				1	17 21 27	48	100							
629.80	6									13	116	PP = 4.5+			
627.80	8														Easy to moderately hard drilling down to 10 feet
625.80	10		METAVOLCANIC ROCK, grayish green, intensely weathered, intensely fractured, thinlly foliated, moderately soft to moderately hard, moist.		2	12 17 20	37	100							
623.80	12									14	119	PP = 4.5+			
621.80	14														Moderately hard drilling
	15				3	50/2"	REF	100							
619.80	16		Bottom of borehole at 15.5 ft bgs												
617.80	18														
615.80	20														
613.80	22														
611.80	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**A-12-108**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
GJF	**2-9-12**	**2-9-12**	**38° 39' 8" / -121° 4' 24"**	**A-12-109**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber				**~648.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			**CME 75**	**4 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
CAL MOD (2.5")			**140 lb**	**80%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Boring backfilled with cement and cuttings				**15.5 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		SILTY SAND with GRAVEL (SM); very dense; brown; moist; Fill.												
646.00	2				1	22 27 50/4"	77/10	100		9	137	PP = 4.5+			
644.00	4														
	5				2	22 50/3"	50/3	100				PP = 4.5+			
642.00	6														
	7		METAVOLCANIC ROCK, intensely to moderately weathered, intensely fractured, moderately soft to moderately hard..												Hard drilling at 7 feet bgs
640.00	8														
	9														
638.00	10				3	50/3"	REF	100				PP = 4.5+			
	11														
636.00	12														
	13														
634.00	14														
	15				4	50/5"	REF	100							
632.00	16		Bottom of borehole at 15.5 ft bgs												
	17														
630.00	18														
	19														
628.00	20														
	21														
626.00	22														
	23														
624.00	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**A-12-109**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	**2-9-12**	**2-9-12**	**38° 39' 11" / -121° 4' 16"**	**O-12-110**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Monte Rickey				**~613.4 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
NA			**CAT 430 D**	**18" Bucket**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			**NA**	**NA**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING
Backfilled with native material				**5.0 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 with GRAVEL (CL); medium dense; yellowish brown; moist.		B01			100							
611.40	2		METAVOLCANIC ROCK, brown to yellowish brown and greenish gray, intensely to moderately weathered, very intensely fractured, moderately soft to hard, moist.												
609.40	4														
	5		Bottom of borehole at 5.0 ft bgs												Essential excavation refusal at 5.0 feet bgs
607.40	6														
605.40	8														
603.40	10														
601.40	12														
599.40	14														
597.40	16														
595.40	18														
593.40	20														
591.40	22														
589.40	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**O-12-110**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	**2-9-12**	**2-9-12**	**38° 39' 13" / -121° 4' 18"**	**O-12-111**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Monte Rickey				**~632.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
NA			**CAT 430 D**	**18" Bucket**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			**NA**	**NA**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING
Backfilled with native material				**10.5 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		GRAVELLY lean CLAY (CL); loose to medium dense; brown; moist.												
630.00	2														Wire found at 2.5 feet bgs
628.00	4														
626.00	6														
	7														Corrugated pipe encountered at 7 feet bgs
624.00	8		METAVOLCANIC ROCK, mottled brown and yellow brown, decomposed to intensely weathered, very intensely fractured, soft to moderately hard, moist.		B01			100							CR, R
622.00	10														
	11		Bottom of borehole at 10.5 ft bgs												Essential excavation refusal at 10.5 feet
620.00	12														
618.00	14														
616.00	16														
614.00	18														
612.00	20														
610.00	22														
608.00	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**O-12-111**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	**2-9-12**	**2-9-12**	**38° 39' 12" / -121° 4' 18"**	**O-12-112**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Monte Rickey				**~628.5 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
NA			**CAT 430 D**	**18" Bucket**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			**NA**	**NA**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING
Backfilled with native material				**10.0 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 SILTY CLAY (CL-ML); loose; brown; moist; Fill.												
	1		Poorly graded GRAVEL (GP); medium dense; olive gray; moist.												Material is AB
626.50	2		SANDY SILTY CLAY (CL-ML); medium dense to dense; brown; moist.												
	3														
624.50	4														
	5				B01			100							PA, PI, CARB 435
622.50	6														PA, PI
	7		METAVOLCANIC ROCK, mottled brown, reddish brown and yellow brown, decomposed to very intensely weathered, very intensely fractured, thinly foliated, soft to moderately hard, moist.												
620.50	8														
	9														
618.50	10		Bottom of borehole at 10.0 ft bgs												Essential refusal at 10 feet bgs
	11														
616.50	12														
	13														
614.50	14														
	15														
612.50	16														
	17														
610.50	18														
	19														
608.50	20														
	21														
606.50	22														
	23														
604.50	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**O-12-112**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	**2-9-12**	**2-9-12**	**38° 39' 13" / -121° 4' 19"**	**O-12-113**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Monte Rickey				**~634.5 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
NA			**CAT 430 D**	**18" Bucket**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			**NA**	**NA**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING
Backfilled with native material				**16.0 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, CLAYEY SAND with GRAVEL (SC-SM); loose to medium dense; brown; moist; Fill.												
632.50	2														
630.50	4														
628.50	6		ASPHALT AC encountered from 6 to 6.2 feet bgs Fill.												
	7		Poorly graded GRAVEL (GP); medium dense; gray; moist; AB encountered from 6.2 to 7 feet Fill.												Firmer digging below 7 feet
626.50	8		CLAYEY SAND with GRAVEL (SC); medium dense; grayish green; moist; Fill.												Approximately 20% cobbles between 7 to 9 feet
624.50	10				B01			100							PA, PI
622.50	12														
620.50	14														
618.50	16		Bottom of borehole at 16.0 ft bgs												
616.50	18														
614.50	20														
612.50	22														
610.50	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**O-12-113**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	**2-9-12**	**2-9-12**	**38° 39' 10" / -121° 4' 22"**	**O-12-114**
DRILLING CONTRACTOR: **Monte Rickey**			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION: **~642.0 ft**
DRILLING METHOD: **NA**			DRILL RIG: **CAT 430 D**	BOREHOLE DIAMETER: **18" Bucket**
SAMPLER TYPE(S) AND SIZE(S) (ID): **Bulk**			SPT HAMMER TYPE: **NA**	HAMMER EFFICIENCY, ERi: **NA**
BOREHOLE BACKFILL AND COMPLETION: **Backfilled with native material**			GROUNDWATER READINGS: DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: **8.5 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		SILTY GRAVEL with SAND (GM); loose; brown; moist; Fill.												
	1				B01			100							
640.00	2														
	3		ORGANIC SOIL (OL/OH); Fill.												
			Poorly graded GRAVEL (GP); medium dense; gray; moist; Fill.												
638.00	4		CLAYEY GRAVEL (GC); stiff; brown; moist to wet; Fill.												
	5				B02			100							
636.00	6		METAVOLCANIC ROCK, mottled brown, yellowish brown, grayish green, very intensely to intensely weathered, very intensely fractured, moderately soft to moderately hard, moist.												CR, R
634.00	8														
	9		Bottom of borehole at 8.5 ft bgs												
632.00	10														
	11														
630.00	12														
	13														
628.00	14														
	15														
626.00	16														
	17														
624.00	18														
	19														
622.00	20														
	21														
620.00	22														
	23														
618.00	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**O-12-114**
DIST. **03**	COUNTY **ED**	ROUTE **50**	POSTMILE **0.2/1.4**	EA **03-1072.8**
PROJECT OR BRIDGE NAME: **El Dorado SR 50 HOV Lanes Phase 0**				
BRIDGE NUMBER	PREPARED BY **Joe F**		DATE **3-2-12**	SHEET **1 of 1**

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LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	**2-9-12**	**2-9-12**	**38° 39' 8" / -121° 4' 26"**	**O-12-115**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Monte Rickey				**~645.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
NA			**CAT 430 D**	**18" Bucket**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			**NA**	**NA**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING
Backfilled with native material				**8.0 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 GRAVEL (GM); loose; olive brown; moist; Fill.												
	1		ASPHALT Fill. / Poorly graded GRAVEL (GP); loose; brown; moist; Fill.												Aggregate base
643.00	2		METAVOLCANIC ROCK, mottled brown, reddish brown and yellow brown, decomposed to very intensely weathered, very intensely fractured, thinly foliated, soft to moderately hard, moist..		B01			100							R
641.00	4														
639.00	6														
	7														Becomes moderately hard below 7 feet. Rock intensely weathered to moderately weathered.
637.00	8		Bottom of borehole at 8.0 ft bgs												Essential excavation refusal at 8 feet
635.00	10														
633.00	12														
631.00	14														
629.00	16														
627.00	18														
625.00	20														
623.00	22														
621.00	24														

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REPORT TITLE				HOLE ID
BORING RECORD				**O-12-115**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

5 BR - STANDARD LOGS.GPJ BCI 2010 LOG.GLB 3/2/12

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
GJF	**2-9-12**	**2-9-12**	**38° 39' 6.05" / -121° 4' 30.94"**	**O-12-116**
DRILLING CONTRACTOR: **Blackburn Consulting**			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION: **~631.0 ft**
DRILLING METHOD: **NA**			DRILL RIG: **Hand Excavation**	BOREHOLE DIAMETER
SAMPLER TYPE(S) AND SIZE(S) (ID): **Bulk**			SPT HAMMER TYPE: **NA**	HAMMER EFFICIENCY, ERi: **NA**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS: DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: **2.0 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 SILT (ML); soft to medium stiff; brown; moist.												
	1				B01			100							R
629.00	2		Bottom of borehole at 2.0 ft bgs												
627.00	4														
625.00	6														
623.00	8														
621.00	10														
619.00	12														
617.00	14														
615.00	16														
613.00	18														
611.00	20														
609.00	22														
607.00	24														
	25														

5 BR - STANDARD LOGS.GPJ BCI 2010 LOG.GLB 3/2/12

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REPORT TITLE				HOLE ID
BORING RECORD				**O-12-116**
DIST. **03**	COUNTY **ED**	ROUTE **50**	POSTMILE **0.2/1.4**	EA **03-1072.8**
PROJECT OR BRIDGE NAME: **El Dorado SR 50 HOV Lanes Phase 0**				
BRIDGE NUMBER	PREPARED BY **Joe F**		DATE **3-2-12**	SHEET **1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
GJF	**2-9-12**	**2-9-12**	**38° 39' 4.82" / -121° 4' 34.29"**	**O-12-117**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Blackburn Consulting				**~632.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
NA			**Hand Excavation**	
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			**NA**	**NA**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING
				2.0 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); soft to medium stiff; brown; moist.		B01			100							
630.00	2		Bottom of borehole at 2.0 ft bgs												
628.00	4														
626.00	6														
624.00	8														
622.00	10														
620.00	12														
618.00	14														
616.00	16														
614.00	18														
612.00	20														
610.00	22														
608.00	24														
	25														

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REPORT TITLE				HOLE ID
BORING RECORD				**O-12-117**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
GJF	**2-9-12**	**2-9-12**	**38° 39' 3.78" / -121° 4' 37.29"**	**O-12-118**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Blackburn Consulting				**~639.5 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
NA			**Hand Excavation**	
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			**NA**	**NA**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
				2.0 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); soft to medium stiff; brown; moist.		B01			100							
637.50	2		Bottom of borehole at 2.0 ft bgs												
635.50	4														
633.50	6														
631.50	8														
629.50	10														
627.50	12														
625.50	14														
623.50	16														
621.50	18														
619.50	20														
617.50	22														
615.50	24														
	25														

5 BR - STANDARD LOGS.GPJ BCI 2010 LOG.GLB 3/2/12

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REPORT TITLE				HOLE ID
BORING RECORD				**O-12-118**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**ED**	**50**	**0.2/1.4**	**03-1072.8**
PROJECT OR BRIDGE NAME				
El Dorado SR 50 HOV Lanes Phase 0				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Joe F		**3-2-12**	**1 of 1**

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)
- 2.5" Split Spoon Sampler
- 2" Split Spoon 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)

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BORING RECORD LEGEND

COUNTY	ROUTE	POSTMILE
El Dorado	**50**	**0.2/1.4**

PROJECT OR BRIDGE NAME
El Dorado SR 50 HOV Lanes Phase 0

PREPARED BY	DATE	SHEET
Joe F	**3-2-12**	**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.

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BORING RECORD LEGEND

COUNTY	ROUTE	POSTMILE
El Dorado	**50**	**0.2/1.4**

PROJECT OR BRIDGE NAME: **El Dorado SR 50 HOV Lanes Phase 0**

PREPARED BY	DATE	SHEET
Joe F	**3-2-12**	**2 of 3**

ROCK GRAPHIC SYMBOLS


IGNEOUS ROCK


SEDIMENTARY ROCK


METAMORPHIC ROCK

BEDDING SPACING

Descriptor	Thickness or Spacing
Massive	> 10 ft
Very thickly bedded	3 to 10 ft
Thickly bedded	1 to 3 ft
Moderately bedded	3-5/8 inches to 1 ft
Thinly bedded	1-1/4 to 3-5/8 inches
Very thinly bedded	3/8 inch to 1-1/4 inches
Laminated	< 3/8 inch

WEATHERING DESCRIPTORS FOR INTACT ROCK

	Diagnostic Features					
	Chemical Weathering-Discoloration-Oxidation		Mechanical Weathering and Grain Boundary Conditions	Texture and Solutioning		
Descriptor	Body of Rock	Fracture Surfaces		Texture	Solutioning	General Characteristics
Fresh	No discoloration, not oxidized	No discoloration or oxidation	No separation, intact (tight)	No change	No solutioning	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull	Minor to complete discoloration or oxidation of most surfaces	No visible separation, intact (tight)	Preserved	Minor leaching of some soluble minerals may be noted	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty"; feldspar crystals are "cloudy"	All fracture surfaces are discolored or oxidized	Partial separation of boundaries visible	Generally preserved	Soluble minerals may be mostly leached	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in situ disaggregation (refer to grain boundary conditions)	All fracture surfaces are discolored or oxidized; surfaces are friable	Partial separation, rock is friable; in semi-arid conditions, granitics are disaggregated	Altered by chemical disintegration such as via hydration or argillation	Leaching of soluble minerals may be complete	Dull sound when struck with hammer; usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures or veinlets. Rock is significantly weakened.
Decomposed	Discolored of oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay		Complete separation of grain boundaries (disaggregated)	Resembles a soil; partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes".

Note: Combination descriptors (such as "slightly weathered to fresh") are used where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant identifiable zones can be delineated. Only two adjacent descriptors shall be combined. "Very intensely weathered" is the combination descriptor for "decomposed to intensely weathered".

RELATIVE STRENGTH OF INTACT ROCK

Descriptor	Uniaxial Compressive Strength (psi)
Extremely Strong	> 30,000
Very Strong	14,500 - 30,000
Strong	7,000 - 14,500
Medium Strong	3,500 - 7,000
Weak	700 - 3,500
Very Weak	150 - 700
Extremely Weak	< 150

ROCK HARDNESS

Descriptor	Criteria
Extremely Hard	Specimen cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows
Very hard	Specimen cannot be scratched with pocket knife or sharp pick; breaks with repeated heavy hammer blows
Hard	Specimen can be scratched with pocket knife or sharp pick with heavy pressure; heavy hammer blows required to break specimen
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure; breaks with moderate hammer blows
Moderately Soft	Specimen can be grooved 1/6 in. with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blow or heavy hand pressure
Soft	Specimen can be grooved or gouged with pocket knife or sharp pick with light pressure, breaks with light to moderate hand pressure
Very Soft	Specimen can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light hand pressure

CORE RECOVERY CALCULATION (%)

$$\frac{\Sigma \text{ Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}} \times 100$$

RQD CALCULATION (%)

$$\frac{\Sigma \text{ Length of intact core pieces} > 4 \text{ in.}}{\text{Total length of core run (in.)}} \times 100$$

FRACTURE DENSITY

Descriptor	Criteria
Unfractured	No fractures
Very Slightly Fractured	Lengths greater 3 ft
Slightly Fractured	Lengths from 1 to 3 ft, few lengths outside that range
Moderately Fractured	Lengths mostly in range of 4 in. to 1 ft, with most lengths about 8 in.
Intensely Fractured	Lengths average from 1 in. to 4 in. with scattered fragmented intervals with lengths less than 4 in.
Very Intensely Fractured	Mostly chips and fragments with few scattered short core lengths

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BORING RECORD LEGEND

COUNTY	ROUTE	POSTMILE
El Dorado	50	0.2/1.4

PROJECT OR BRIDGE NAME: El Dorado SR 50 HOV Lanes Phase 0

PREPARED BY	DATE	SHEET
Joe F	3-2-12	3 of 3

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
03	ED	50	0.4/1.2		

CERTIFIED ENGINEERING GEOLOGIST — DATE 03/30/12

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST — PATRICK F. FISCHER — No. 1739 — Exp. 1/31/13 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

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BLACKBURN CONSULTING
2491 BOATMAN AVENUE
WEST SACRAMENTO, CA 95691 FILE No. 1072.8

QUINCY ENGINEERING, INC.
3247 RAMOS CIRCLE
SACRAMENTO, CA 95827-2501

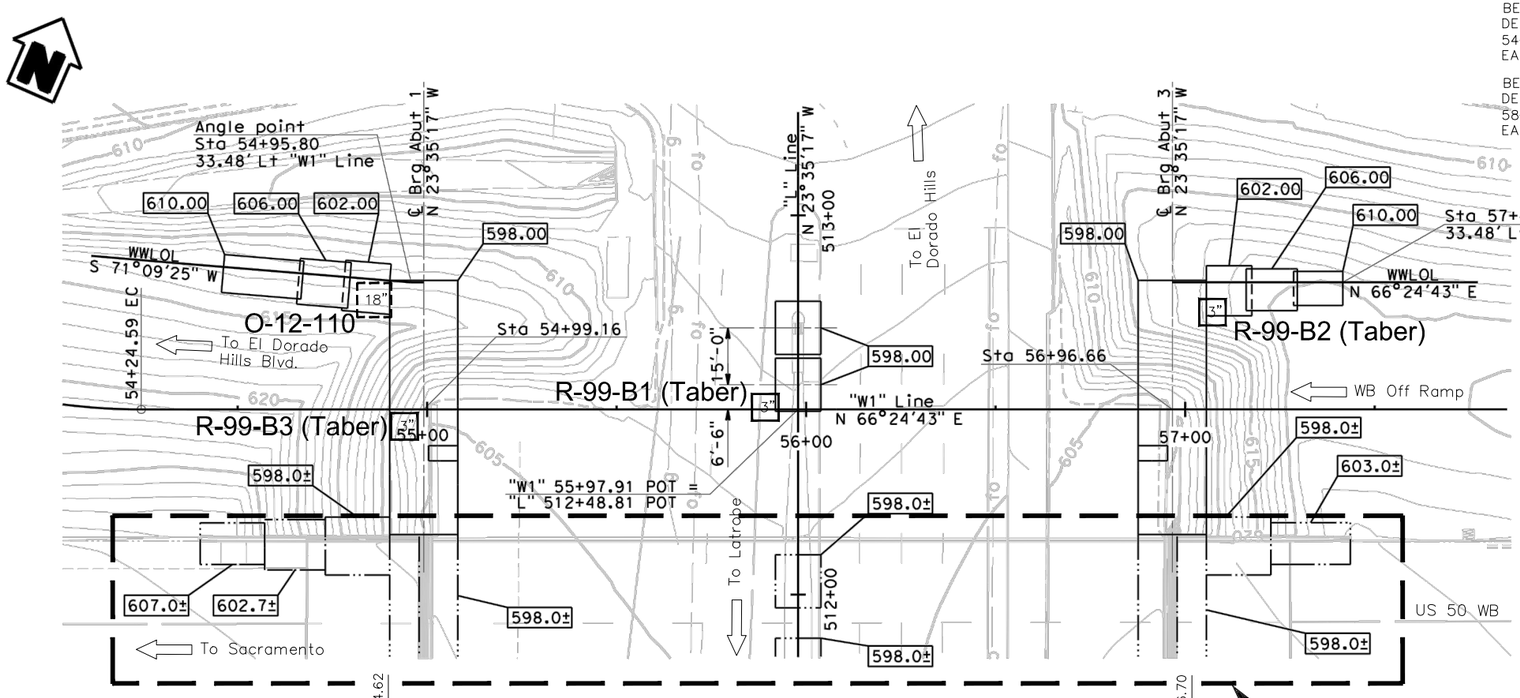
BENCHMARKS

BENCHMARK# 25113 ELEV. 624.68 NAVD 1929
DESCRIPTION: BRASS DISK, 78.24' LT, STATION 54+98.37, "A2" LINE, NORTHING 2000992.20, EASTING 682695.14.

BENCHMARK# 64 ELEV. 618.23 NAVD 1929
DESCRIPTION: MONUMENT, 67.26' RT, STATION 58+96.89, "A2" LINE, NORTHING 2001018.23, EASTING 6827374.58.

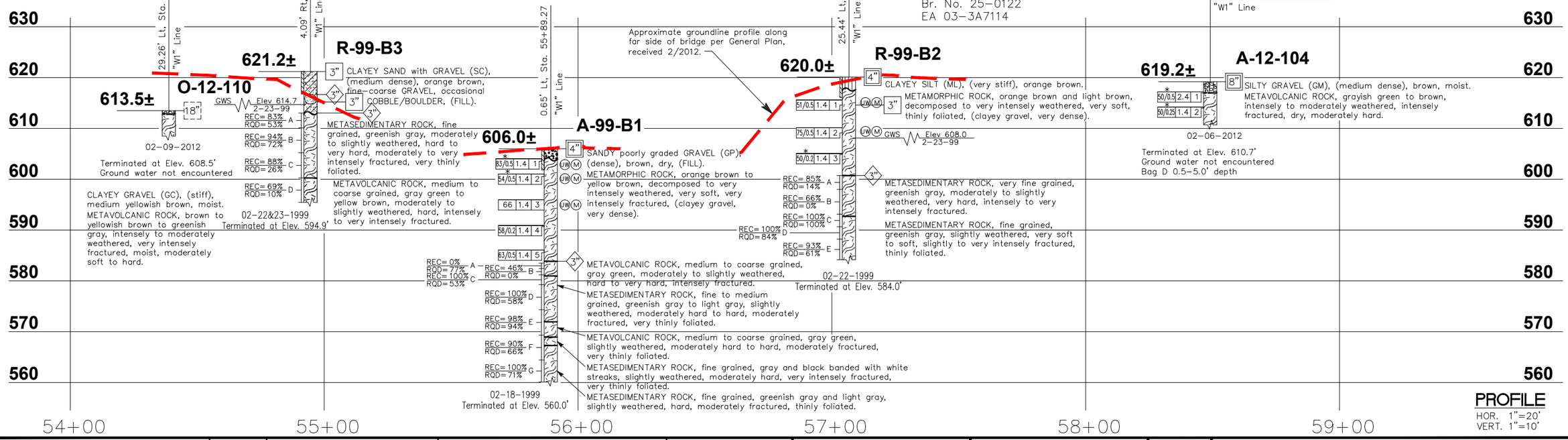
NOTES:

1. 1999 Field classification of soils was in accordance with ASTM D 2488-00 "Description and Identification of Soils (Visual-Manual Procedure)" and 2012 Field classification of soils was in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual 2010. See Log of Test Borings No. 2 and 3, "Soil Legend". 1999 boring logs converted from metric to english.
2. 1999 Rock classification according to Caltrans "Soil & Rock Logging Classification Manual (Field Guide)", August 1996, and Bureau of Reclamation, U.S. Department of the Interior, USBR-5000, "Procedure for Determining Unified Soil Classification", Earth Manual, Part II, Third Edition, 1990.
3. Standard Penetration tests were performed in accordance with ASTM D 1586-99 (1999) and 1586-08 (2012) using a hammer operated with cat-head, rope and pulley with a 30-inch drop (1999) and automated drop system (2012). Drill rods were 1 5/8-inch diameter "A"-rods; sampler was driven with brass liners.
4. "2.4 inch sampler": ID=2.4 inch, OD=2.9 inch. Driven in same manner as SPT ("1.4 inch") sampler.
5. Where indicated by an asterisk (*) the number of blows shown is for only that fraction of the initial 0.5 ft. "seating drive" interval penetrated.
6. If laboratory tests are not shown as being performed, the soil descriptions presented in the LOTB are based solely on the visual practices described in the before mentioned Manuals.
7. The length of each sampled interval is shown graphically on the boring log.
8. Consistency of soils shown in ( ) where estimated.
9. Groundwater surface (GWS) reflect the fluid level in the borings on the specified date. Groundwater surface is subject to seasonal fluctuations and may occur at higher or lower elevations depending on the conditions at any particular time.
10. Electronic media for plan view provided by Quincy Engineering, "Foundation Plan" dated March 2012.
11. Boring elevations are approximate and based on "Topography" received December 2004.
12. The "Log of Test Borings" drawing is included with plans in accordance with Section 2-1.06B of Caltrans "Standard Specifications", 2010.



PLAN
1" = 20'

See Latrobe Road Undercrossing LOTB, 2007. Br. No. 25-0122 EA 03-3A7114



PROFILE
HOR. 1"=20'
VERT. 1"=10'

R. SOWERS DESIGN OVERSIGHT	DRAWN BY	M. ROBERTSON	W. NICHOLS 1999, R. PICKARD 2012 FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	Tim Osterkamp PROJECT ENGINEER	BRIDGE NO. 25-0122K POST MILE 0.9	LATROBE ROAD WB OFF RAMP UC
3/30/12 SIGN OFF DATE	CHECKED BY	R. PICKARD	DATE: FEBRUARY 1999 and FEBRUARY 2012				LOG OF TEST BORINGS 1 OF 4

GS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: X
PROJECT NUMBER & PHASE: 0312000163 CONTRACT NO.: 03-2E5101

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES				SHEET	OF
03/30/12					

FILE => $REQUEST

3/30/2012 1072.8 US 50 Latrobe Road WB Off Ramp LOTB.dwg
USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
03	ED	50	0.4/1.2		

03/30/12
CERTIFIED ENGINEERING GEOLOGIST — DATE

PROFESSIONAL GEOLOGIST — PATRICK F. FISCHER — No. 1739 — Exp. 1/31/13 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

PLANS APPROVAL DATE

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QUINCY ENGINEERING, INC.
3247 RAMOS CIRCLE
SACRAMENTO, CA 95827-2501

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.

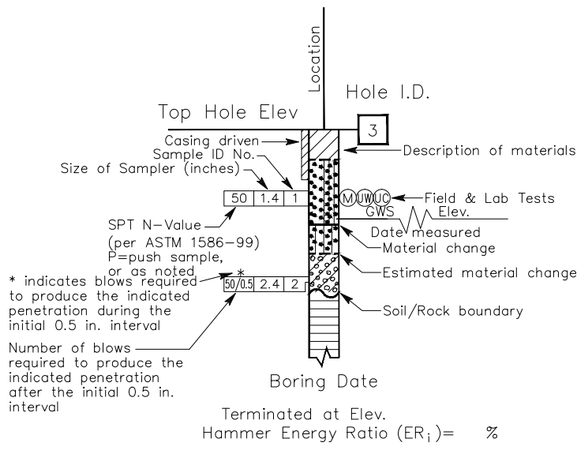
BOREHOLE IDENTIFICATION

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)

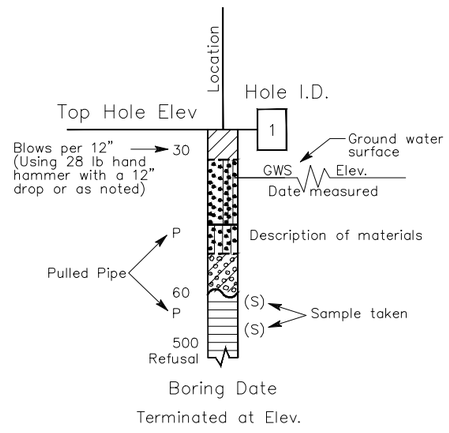
NOTE: Size in inches.

CONSISTENCY OF COHESIVE SOILS

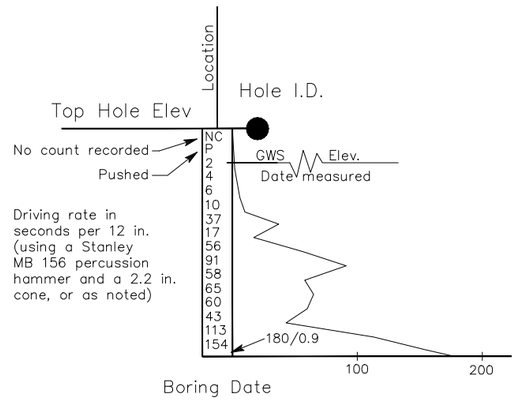
Description	Shear Strength (tsf)	Pocket Penetrometer Measurement, PP, (tsf)	Torvane Measurement, TV, (tsf)	Vane Shear Measurement, VS, (tsf)
Very Soft	Less than 0.12	Less than 0.25	Less than 0.12	Less than 0.12
Soft	0.12 – 0.25	0.25 – 0.50	0.12 – 0.25	0.12 – 0.25
Medium Stiff	0.25 – 0.5	0.50 – 1	0.25 – 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 4	Greater than 4



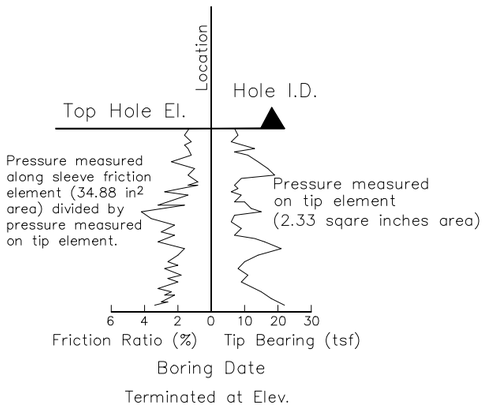
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

LATROBE ROAD WB OFF RAMP UC

LOG OF TEST BORINGS 2 OF 4

R. SOWERS DESIGN OVERSIGHT	DRAWN BY	M. ROBERTSON	W. NICHOLS 1999, R. PICKARD 2012 FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	Tim Osterkamp PROJECT ENGINEER	BRIDGE NO. 25-0122K POST MILE 0.9
3/30/12 SIGN OFF DATE	CHECKED BY	R. PICKARD	DATE: FEBRUARY 1999 and FEBRUARY 2012			

GS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: X
PROJECT NUMBER & PHASE: 0312000163 CONTRACT NO.: 03-2E5101

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES				SHEET	OF
03/30/12					

FILE => $REQUEST

3/30/2012 1072.8 US 50 Latrobe Road WB Off Ramp LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL, (JUNE, 2007)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
03	ED	50	0.4/1.2		

CERTIFIED ENGINEERING GEOLOGIST — 03/30/12 DATE

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST — PATRICK F. FISCHER — No. 1739 — Exp. 1/31/13 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

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BLACKBURN CONSULTING
2491 BOATMAN AVENUE
WEST SACRAMENTO, CA 95691 FILE No. 1072.8

QUINCY ENGINEERING, INC.
3247 RAMOS CIRCLE
SACRAMENTO, CA 95827–2501

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names	Graphic/Symbol	Group Names
GW	Well–graded GRAVEL Well–graded GRAVEL with SAND	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
GP	Poorly–graded GRAVEL Poorly–graded GRAVEL with SAND		
GW–GM	Well–graded GRAVEL with SILT Well–graded GRAVEL with SILT and 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
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	ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with 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	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
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND		
GC–GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL 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
SW	Well–graded SAND Well–graded SAND with GRAVEL		
SP	Poorly–graded SAND Poorly–graded SAND with GRAVEL	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
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)	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
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)	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
SM	SILTY SAND SILTY SAND with GRAVEL		
SC	CLAYEY SAND CLAYEY SAND with GRAVEL	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
SC–SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL		
PT	PEAT	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
	COBBLES COBBLES and BOULDERS BOULDERS		

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
- (PP) Pocket Penetrometer
- (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)
- (TV) Pocket Torvane
- (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 2937)

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60}–Value (Blows / 12 inches)
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	Visable 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
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	Less than 1/300"

R. SOWERS — DESIGN OVERSIGHT
3/30/12 — SIGN OFF DATE

DRAWN BY: M. ROBERTSON
CHECKED BY: R. PICKARD

W. NICHOLS 1999, R. PICKARD 2012 — FIELD INVESTIGATION BY:
DATE: FEBRUARY 1999 and FEBRUARY 2012

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Tim Osterkamp — PROJECT ENGINEER

BRIDGE NO. 25–0122K
POST MILE 0.9

SOIL LEGEND

LATROBE ROAD WB OFF RAMP UC

LOG OF TEST BORINGS 3 OF 4

GS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: X
PROJECT NUMBER & PHASE: 0312000163 CONTRACT NO.: 03–2E5101

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES				SHEET	OF
03/30/12					

FILE => $REQUEST

3/30/2012 1072.8 US 50 Latrobe Road WB Off Ramp LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

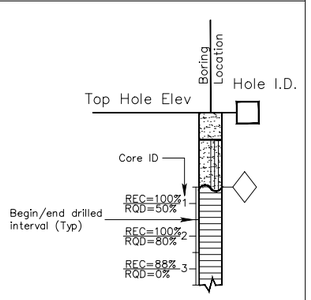
REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces (inches)}}{\text{Total length of core run (inches)}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of the intact core pieces} \geq 4 \text{ inches}}{\text{Total length of core run (inches)}} \times 100\%$$

RQD* Indicates soundness criteria not met.



BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 10'
Very thickly bedded	3 – 10'
Thickly bedded	1 – 3'
Moderately bedded	4" – 1'
Thinly bedded	1" – 4"
Very thinly bedded	1/4" – 1"
Laminated	Less than 1/4"

LEGEND OF ROCK MATERIALS

IGNEOUS ROCK

SEDIMENTARY ROCK

METAMORPHIC ROCK

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
03	ED	50	0.4/1.2		

CERTIFIED ENGINEERING GEOLOGIST — DATE 03/30/12

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST — PATRICK F. FISCHER — No. 1739 — Exp. 1/31/13 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

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2491 BOATMAN AVENUE
WEST SACRAMENTO, CA 95691 FILE No. 1072.8

QUINCY ENGINEERING, INC.
3247 RAMOS CIRCLE
SACRAMENTO, CA 95827–2501

ROCK HARDNESS

Description	Criteria
Extremely Hard	Cannot be scratched with a pocketknife or sharp pick, can only be chipped with repeated heavy hammer blows.
Very Hard	Cannot be scratched with a pocketknife or sharp pick, breaks with repeated heavy hammer blows.
Hard	Can be scratched with a pocketknife or sharp pick with difficulty (heavy pressure). Breaks with heavy hammer blows.
Moderately Hard	Can be scratched with a pocket knife or sharp pick with light or moderate pressure, breaks with moderate hammer blows.
Moderately Soft	Can be grooved 1/16 inch deep with a pocketnife of sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Can be grooved or gouged easily by a pocketknife or sharp pick with light pressure, can be scratched with fingernail, breaks with light to moderate pressure.
Very Soft	Can be readily indented, grooved or gouged with fingernail, or carved with a pocketknife, breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Core lengths greater than 3 ft.
Slightly fractured	Core lengths mostly from 1 to 3 ft.
Moderately fractured	Core lengths mostly from 4 inches to 1 ft.
Intensely fractured	Core lengths mostly from 1 inches to 4 inches.
Very intensely fractured	Mostly chips and fragments.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features					General Characteristics
	Chemical weathering–Discoloration and/or oxidation		Mechanical Weathering–Grain boundary conditions (disaggregation) primarily for granitics and some coarse–grained sediments	Texture and leaching		
	Body of rock	Fracture Surfaces		Texture	Leaching	
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No leaching.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discolorization or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe–Mg minerals are "rusty," feldspar crystals are "cloudy".	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe–Mg minerals are altered to clay to some extent; or chemical alteration produces in–situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe–Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes".

R. SOWERS DESIGN OVERSIGHT 3/30/12 SIGN OFF DATE	DRAWN BY CHECKED BY	M. ROBERTSON R. PICKARD	W. NICHOLS 1999, R. PICKARD 2012 FIELD INVESTIGATION BY: DATE: FEBRUARY 1999 and FEBRUARY 2012	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	Tim Osterkamp PROJECT ENGINEER	BRIDGE NO. 25–0122K POST MILE 0.9

ROCK LEGEND

LATROBE ROAD WB OFF RAMP UC

LOG OF TEST BORINGS 4 OF 4

GS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: X
PROJECT NUMBER & PHASE: 0312000163 CONTRACT NO.: 03–2E5101

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3/30/2012 1072.8 US 50 Latrobe Road WB Off Ramp LOTB.dwg

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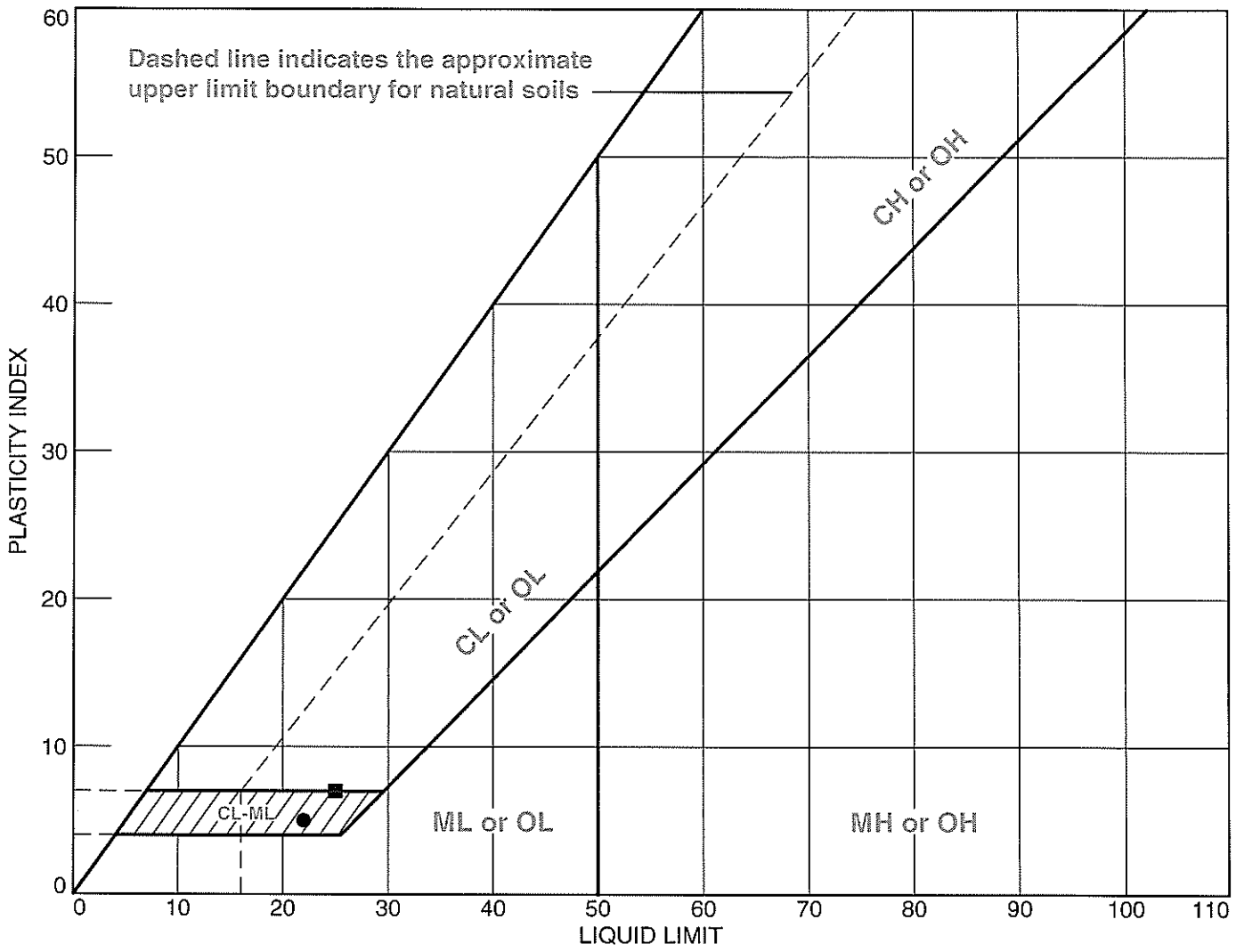
Appendix B

Laboratory Test Results

Laboratory Testing Summary

Exploration I.D.	Sample No.	Depth (feet)	Sample Type	USCS Classification	Moisture Content (%)	Dry Density, γ_{dry} (pcf)	Percent Retained #4	Percent Passing #200	LL	P I	Friction Angle, ϕ	Cohesion, psf, C	Unconfined Compression (psi)	R-Value	Corrosivity			
															pH	Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)
A-12-101	S1	2-3.5	MC	GC	9.4	132												
A-12-101	S2	5-6.5	MC	GC	14.3	105					47.4	0						
A-12-101	S3	10-11.5	MC	GC	17.3	116												
A-12-101	S4	15-15.7	MC	Rock	5.9	122												
A-12-101	B7	0.5-5.0	Bulk	Rock											8.5	2676	6.5	12.0
A-12-102	B5	16.0-16.5	Bulk	SC										21				
A-12-103	S1	2.5-3.75	MC	Rock	12.6	125												
A-12-103	B5	0.5-5.0	Bulk	Rock										28				
A-12-104	S1	2-2.5	MC	Rock	10.1	107												
A-12-104	B3	0.5-5	Bulk	Rock											8.7	2931	4.4	<0.1
A-12-106	S2	4.5-6	MC	GM	6.2	147												
A-12-106	S3	9.5-11	MC	GC	15.2	125												
A-12-106	C5	17-20.0	HQ	Rock		174												
A-12-106	C5	17-20	HQ	Rock									8,360					
A-12-107	S2	5-6.5	MC	GM	11	129												
A-12-107	S4	15-15.58	MC	Rock	13.9	118												
A-12-108	S1	5-6.5	MC	Rock	12.8	116												
A-12-108	S2	10-11.5	MC	Rock	13.6	119												
A-12-109	S1	2-3.33	MC	SM	8.8	137												
O-12-111	B1	8-9.0	Bulk	Rock										32	7.7	3110	29.0	19.0
O-12-112	B1	5-6.0	MC	CL-ML			33.7	56.7	22	17								
O-12-113	B1	10-11.0	Bulk	SC			45.8	25.3	25	18								
O-12-114	B2	5.5-6.5	Bulk	GM										16	7.9	1810	9.6	18.0
O-12-115	B1	2-3.5	Bulk	Rock										16				
O-12-116	B1	0.5-1.5	Bulk	ML										18				

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		A-12-112-B01	5.0'-6.0'		17	22	5	CL-ML
■		A-12-113-B01	10.0'-11.0'		18	25	7	SC-SM

Blackburn Consulting

Auburn, CA

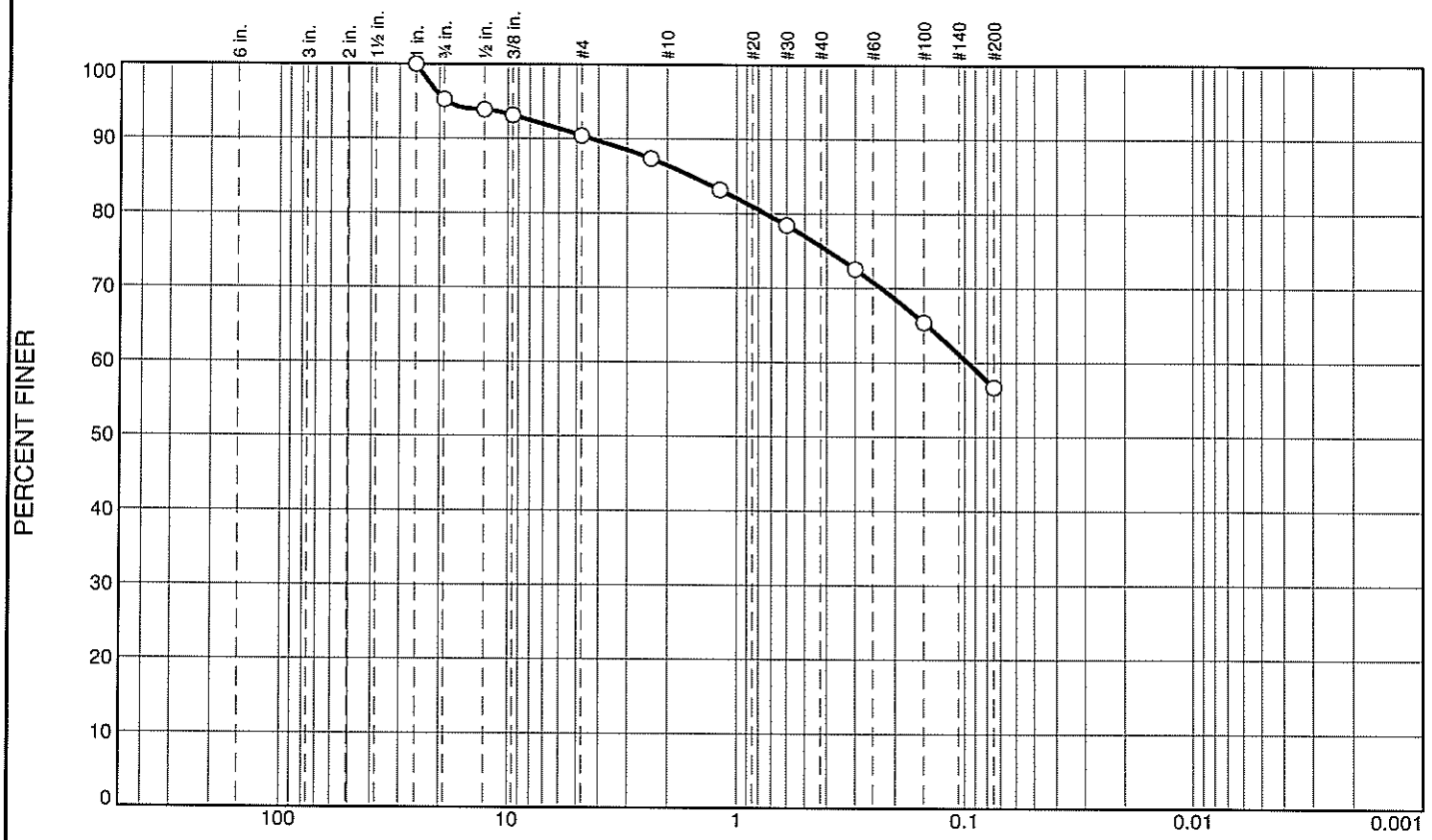
Client: Quincy Engineering, Inc

Project: SR 50 HOV Westbound Ramps

Project No.: 1027.8 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.7	4.9	4.0	10.7	19.0	56.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0"	100.0		
3/4"	95.3		
1/2"	93.9		
3/8"	93.1		
#4	90.4		
#8	87.3		
#16	83.2		
#30	78.4		
#50	72.6		
#100	65.4		
#200	56.7		

* (no specification provided)

Soil Description

Reddish Brown Sandy Silty CLAY

Atterberg Limits

PL= 17 LL= 22 PI= 5

Coefficients

D_{90}= 4.2960 D_{85}= 1.5688 D_{60}= 0.0968
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL-ML AASHTO= A-4(0)

Remarks

Sample Number: A-12-112-B01 **Depth:** 5.0'-6.0'

Date: 2-24-2012

Blackburn Consulting

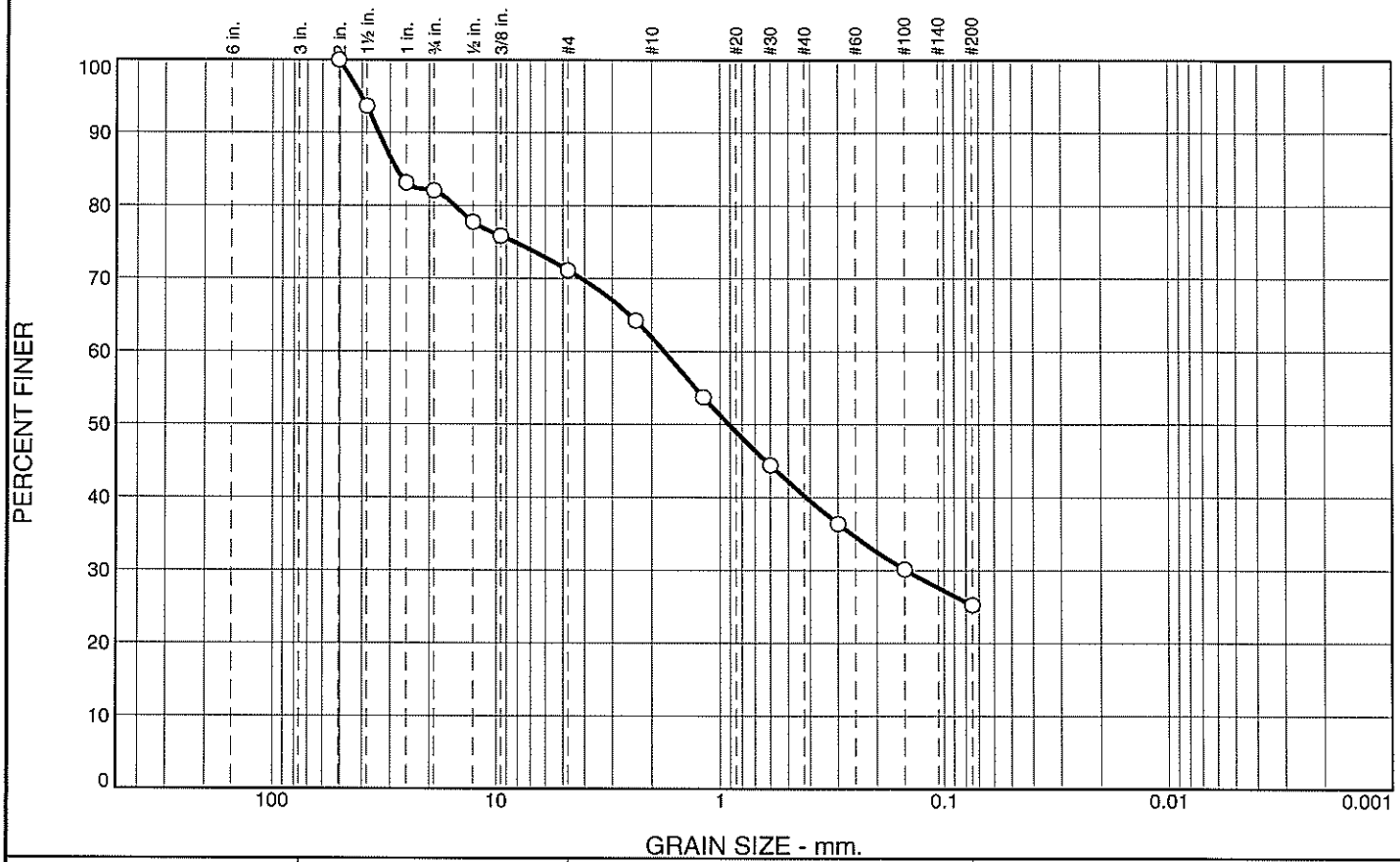
Auburn, CA

Client: Quincy Engineering, Inc
Project: SR 50 HOV Westbound Ramps

Project No: 1027.8 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.0	10.9	9.1	21.7	15.0	25.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2.0"	100.0		
1.5"	93.7		
1.0"	83.1		
3/4"	82.0		
1/2"	77.8		
3/8"	75.9		
#4	71.1		
#8	64.2		
#16	53.7		
#30	44.4		
#50	36.4		
#100	30.1		
#200	25.3		

* (no specification provided)

Soil Description

Light Brown Silty Clayey SAND with Gravel

Atterberg Limits

PL= 18 LL= 25 PI= 7

Coefficients

D_{90}= 33.6487 D_{85}= 28.1393 D_{60}= 1.7575
D_{50}= 0.9131 D_{30}= 0.1474 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Remarks

Sample Number: A-12-113-B01 **Depth:** 10.0'-11.0'

Date: 2-24-2012

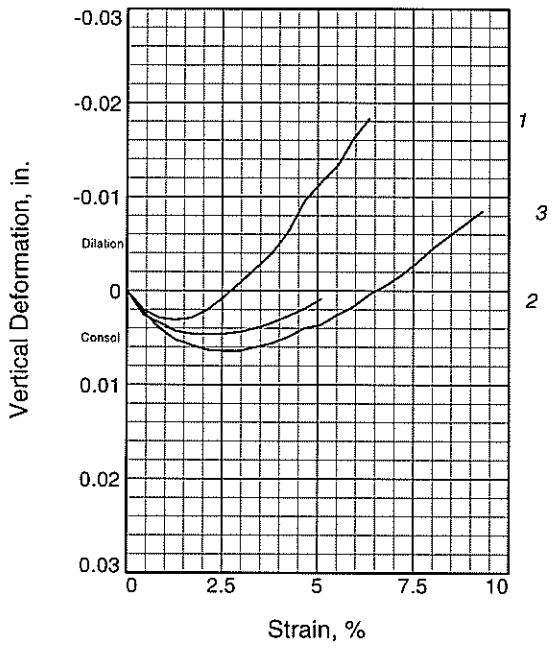
Blackburn Consulting

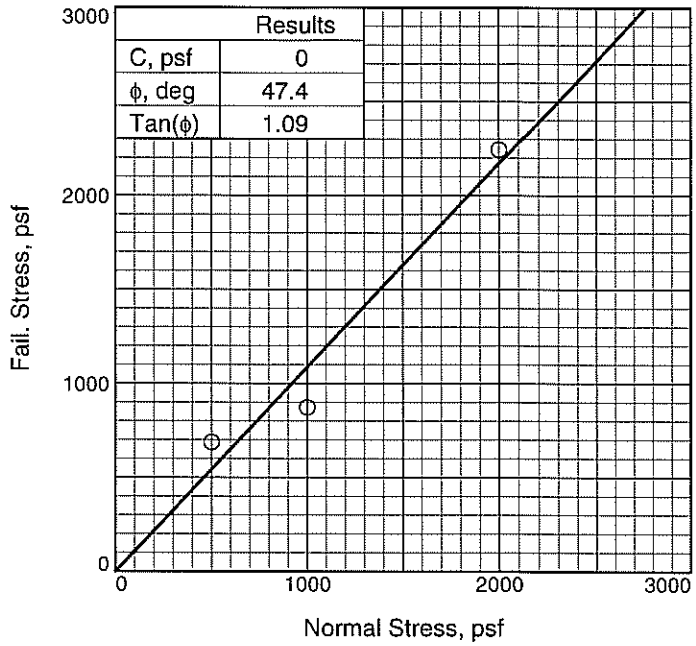
Auburn, CA

Client: Quincy Engineering, Inc
Project: SR 50 HOV Westbound Ramps

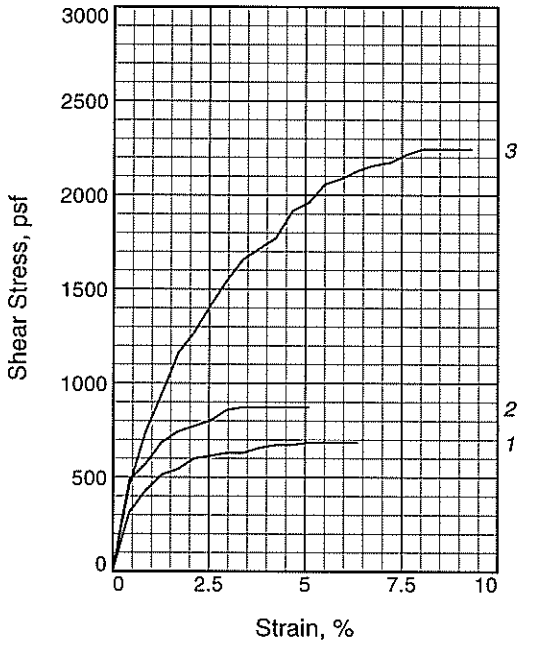
Project No: 1027.8 **Figure**

Tested By: KLC **Checked By:** KLC





Results	
C, psf	0
ϕ, deg	47.4
Tan(ϕ)	1.09



Sample No.		1	2	3
Initial	Water Content, %	13.9	15.8	13.1
	Dry Density, pcf	101.4	106.9	105.7
	Saturation, %	56.8	74.2	59.6
	Void Ratio	0.6617	0.5762	0.5948
	Diameter, in.	2.36	2.36	2.36
	Height, in.	0.94	0.94	0.94
At Test	Water Content, %	23.7	19.8	18.0
	Dry Density, pcf	102.7	109.7	113.4
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6409	0.5360	0.4861
	Diameter, in.	2.36	2.36	2.36
	Height, in.	0.93	0.92	0.88
Normal Stress, psf		500	1000	2000
Fail. Stress, psf		686	872	2244
Strain, %		5.1	3.4	8.0
Ult. Stress, psf				
Strain, %				
Strain rate, in./min.		0.10	0.10	0.10

Sample Type: undisturbed
Description: Brown Clayey Gravel

Assumed Specific Gravity= 2.70
Remarks: Rock fragments in sample
Assumed specific gravity of 2.70

Figure _____

Client: Quincy Engineering, Inc

Project: SR 50 HOV Westbound Ramps

Sample Number: A-12-101-S02 **Depth:** 5.0'-5.5'

Proj. No.: 1027.8 **Date Sampled:**

DIRECT SHEAR TEST REPORT

Blackburn Consulting

Tested By: KLC **Checked By:** KLC

Auburn Office:
11521 Blocker Drive, Suite 110 • Auburn, CA 95603
(530) 887-1494 • Fax (530) 887-1495

blackburn consulting

Modesto Office: (209) 522-6273
West Sacramento Office: (916) 375-8706

Rock Core Compression Test

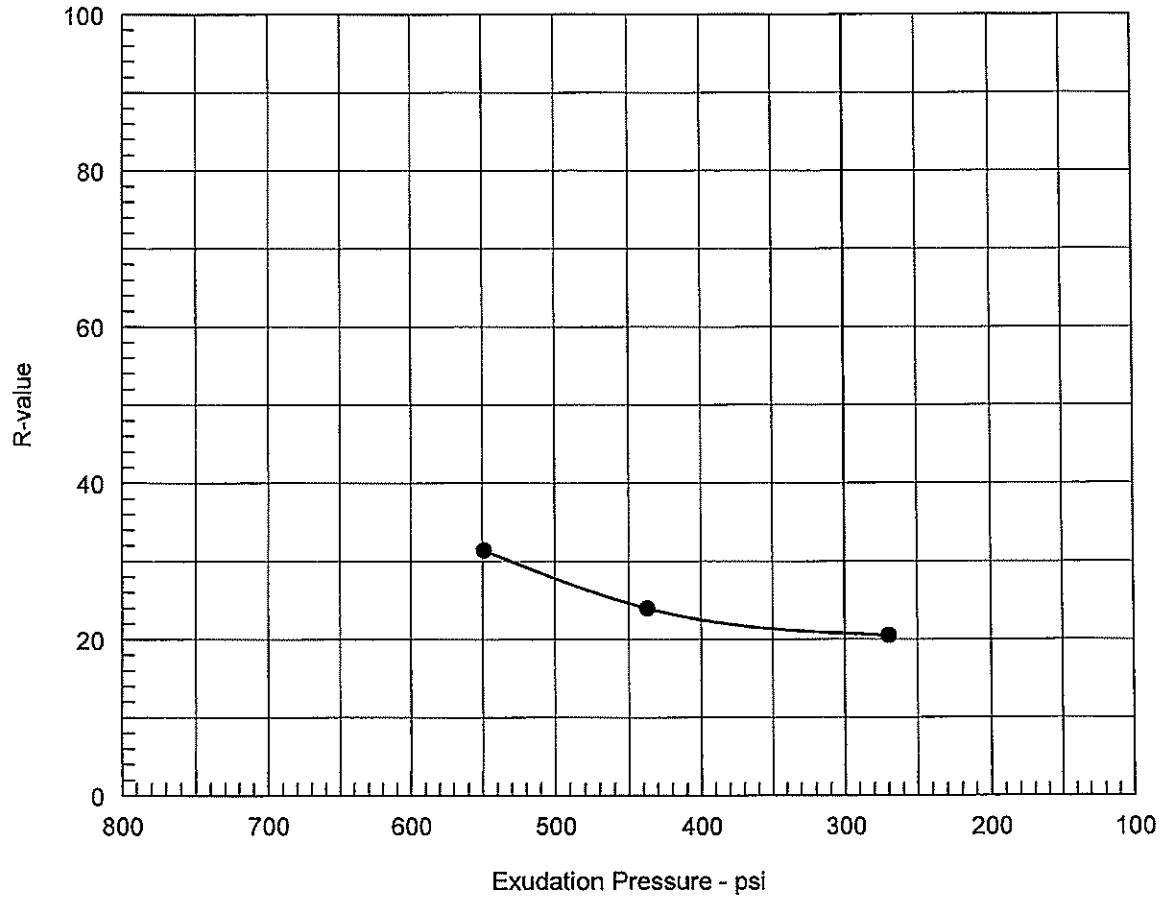
(ASTM D7012)

BCI File No.: 1072.8
Project Name: RT 50 HOV Westbound Ramps

Specimen	Depth (ft)	FINAL TRIM LENGTH (in.)	Trim Length (in.)	ORIGINAL LENGTH	DIAMETER (in.)	AREA (in.^{2})	TOTAL LOAD (lbs.)	COMP STRENGTH (psi)	L/D RATIO	CORR. FACTOR	CORR. COMP. STRENGTH (psi)	WET CORE WEIGHT	UNIT WEIGHT (pcf)
12-106-C05	17.00-18.10	4.940	4.945	16.0"	2.380	4.45	37170	8,360	2.08	1	8360	1002.1	173.7

* L/D ratio does not conform to ASTM standards
Correction factor applies to ASTM D 7012 - 06 and previous. If using ASTM D 7012 - 07 enter "1" in correction factor column

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	8	119.9	15.0	48	95	2.39	549	34	31
2	5	113.3	17.5	31	105	2.53	437	24	24
3	3	109.5	19.6	17	113	2.59	270	19	21

Test Results	Material Description
R-value at 300 psi exudation pressure = 21	SANDY CLAY, dark brown

Project No.: 1072.8

Project: SR 50 HOV Westbound Ramps

Sample Number: A-12-102, B5 **Depth:** 0.5'-5.0'

Date: 2/29/2012

Tested by: MDR/BWM

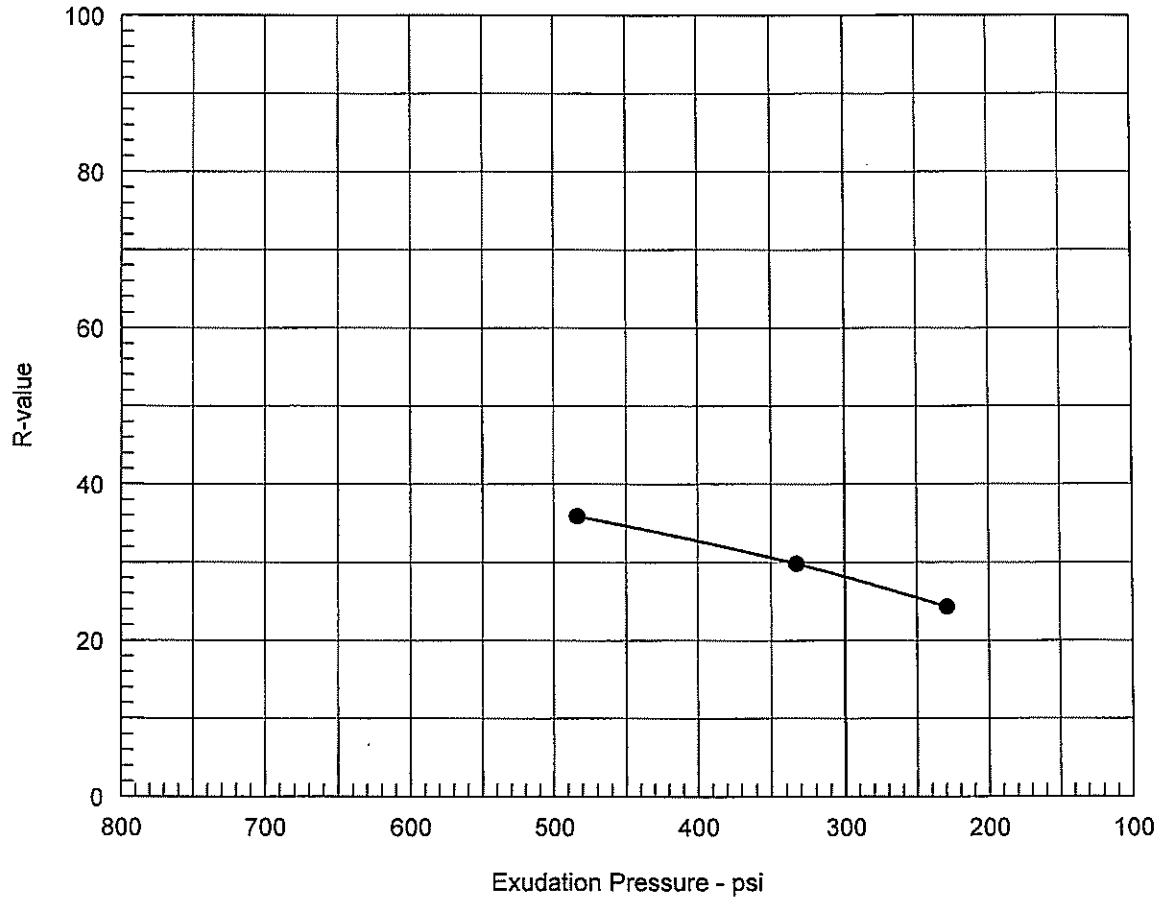
Checked by: MDR

Remarks:
100% of sample passed no. 4 sieve

R-VALUE TEST REPORT

Blackburn Consulting

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	12	122.6	14.8	92	82	2.41	484	38	36
2	7	120.3	15.8	52	90	2.43	333	31	30
3	3	117.8	16.8	4	103	2.53	229	24	24

Test Results	Material Description
R-value at 300 psi exudation pressure = 28	SANDY CLAY, yellowish brown

Project No.: 1072.8

Project: SR 50 HOV Westbound Ramps

Sample Number: A-12-103, B5 **Depth:** 0.5'-5.0'

Date: 2/29/2012

Tested by: MDR/MMW

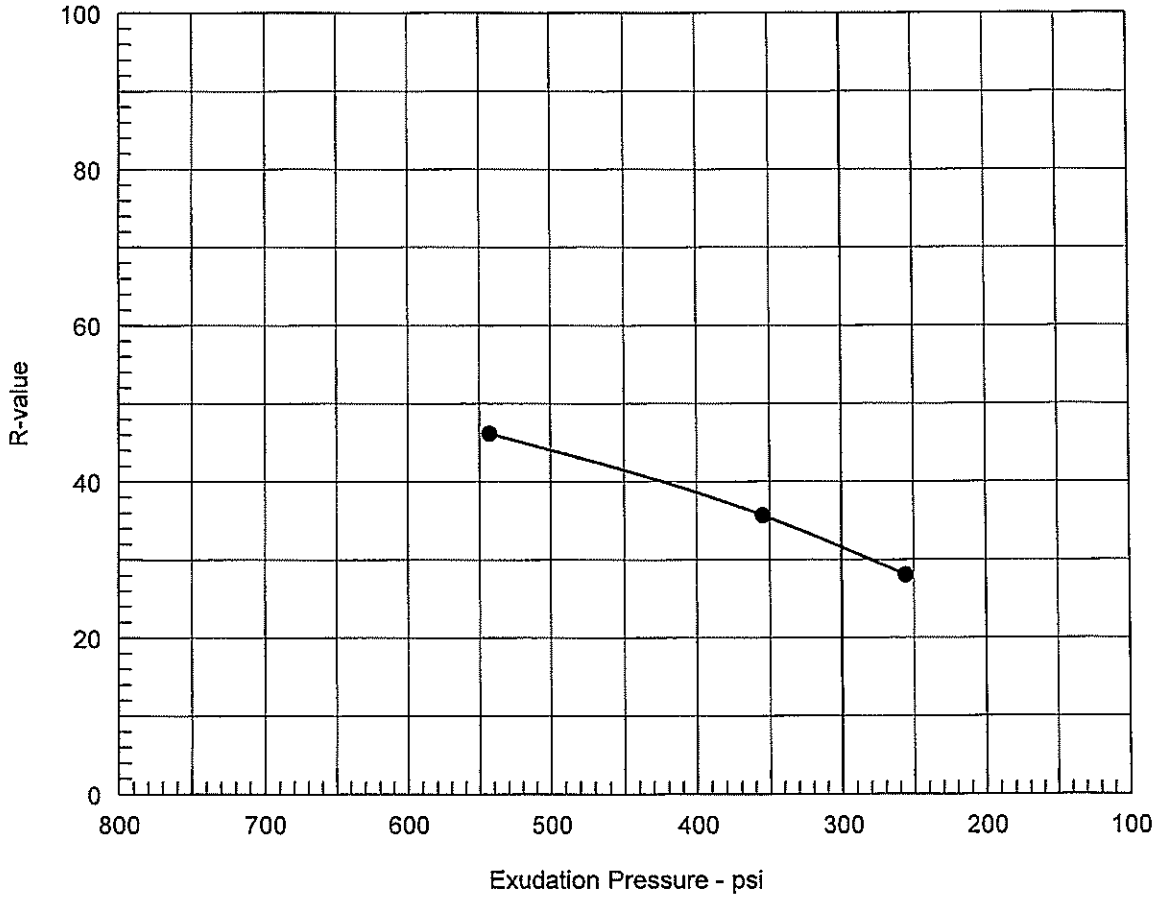
Checked by: MDR

Remarks:
100% of sample passed # 4 sieve

R-VALUE TEST REPORT

Blackburn Consulting

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr
1	10	130.8	11.8	0	70	2.45	543	46	46
2	7	127.6	12.7	0	86	2.49	355	36	36
3	3	126.2	13.6	0	100	2.56	256	27	28

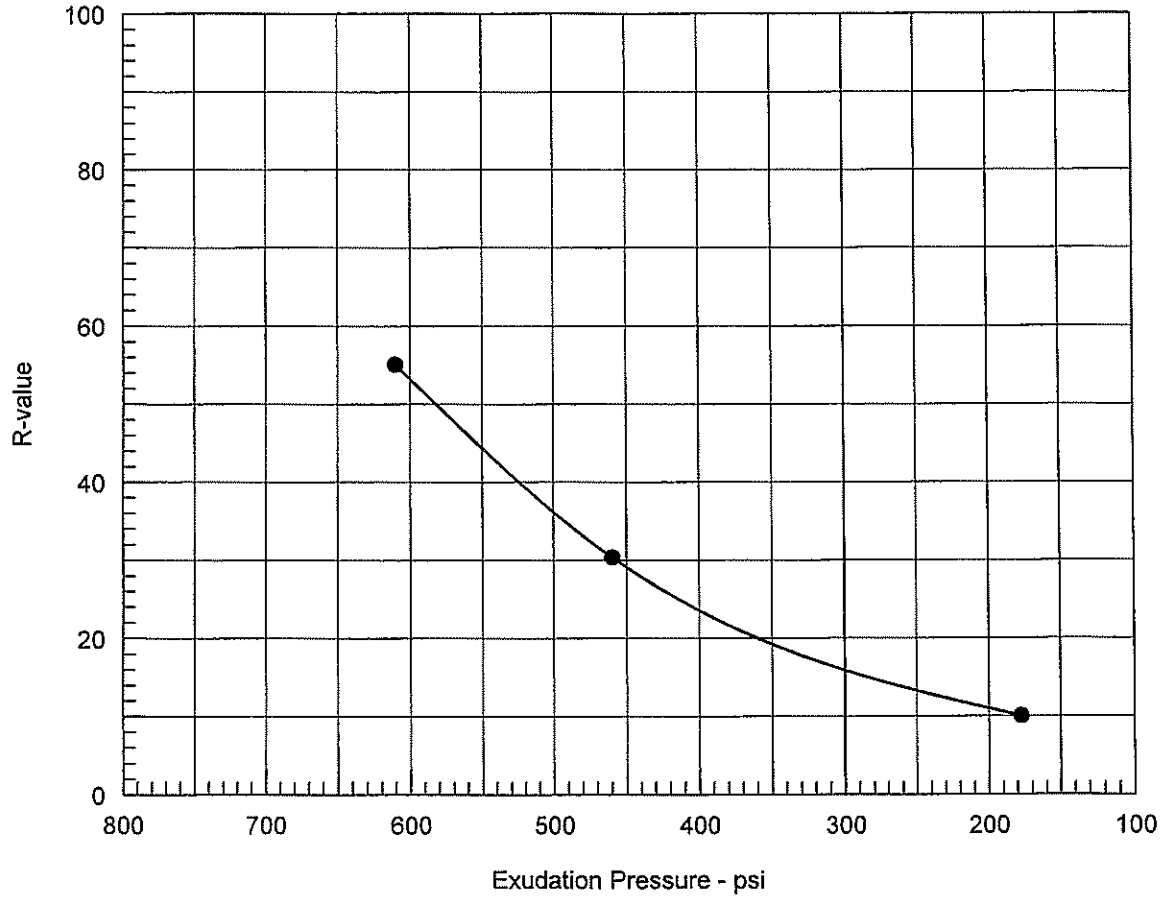
Test Results	Material Description
R-value at 300 psi exudation pressure = 32	GRAVELLY Lean CLAY, dark yellowish brown

Project No.: 1072.8
Project: SR 50 HOV Westbound Ramps
Sample Number: A-12-111, B1 **Depth:** 8.0'-9.0'
Date: 2/29/2012

Tested by: MDR/MMW
Checked by: MDR

Remarks:
40.1% retained on the no. 4 sieve.
Sample batched.

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	12	132.2	10.5	39	61	2.54	610	55	55
2	6	129.2	11.8	31	100	2.58	460	29	30
3	4	126.9	12.7	17	135	2.54	177	10	10

Test Results	Material Description
R-value at 300 psi exudation pressure = 16	CLAYEY GRAVEL with SAND dark yellowish brown

Project No.: 1072.8
Project: SR 50 HOV Westbound Ramps
Sample Number: O-12-114/115, B2/B1 **Depth:** 5.5-6',2-3.5'
Date: 2/29/2012

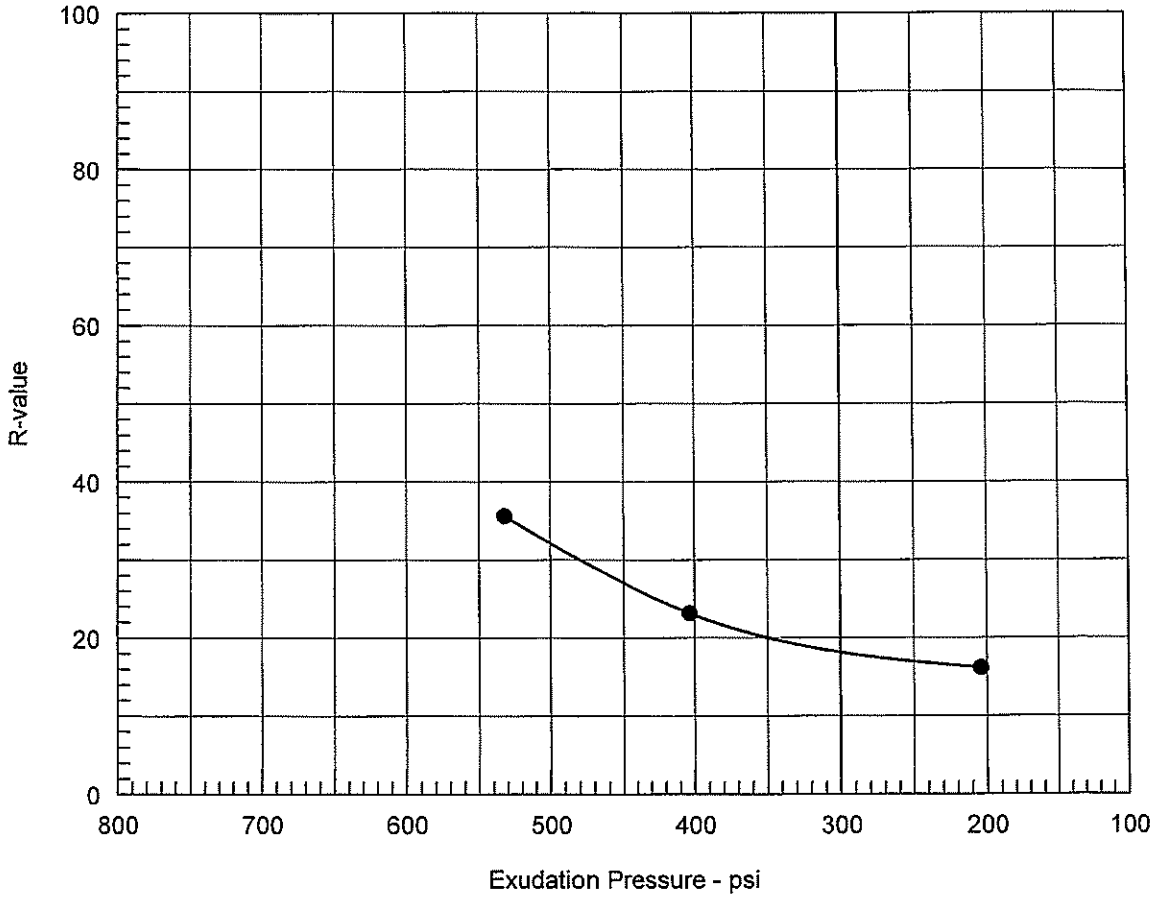
Tested by: MMW
Checked by: MDR

Remarks:
59.7% retained on the no. 4 sieve, sample batched.

R-VALUE TEST REPORT

Blackburn Consulting

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	6	120.4	15.3	70	88	2.60	532	33	36
2	3	115.9	17.1	9	107	2.53	404	23	23
3	2	107.3	21.2	0	122	2.64	204	15	16

Test Results	Material Description
R-value at 300 psi exudation pressure = 18	GRAVELLY Lean CLAY, dark yellowish brown

Project No.: 1072.8

Project: SR 50 HOV Westbound Ramps

Sample Number: A-12-116, B1 **Depth:** 0.5'-1.5'

Date: 2/29/2012

Tested by: MDR/MMW

Checked by: MDR

Remarks:
32.0% retained on No. 4 sieve. Samp
Batched.

MACS Lab, Inc.
431 Crown Point Cir Ste 120
Grass Valley, CA 95945-9531

530-274-1470 or 1-800-MACS LAB

Bulk Asbestos Analysis

Report

CARB Method 435

Blackburn Consulting
11521 Blocker Drive, Ste 110

Auburn CA 95603

Person to contact: Pat Fischer
Contact phone: 530-887-1495
emailed
Sampled by: Rob Pickard
Sampled on: February 9, 2012
Analyzed on: February 21, 2012 at: 06:27
Corresponding invoice number: 224185
Purchase Order Number: 10226
Job Number: 1072.8

Analyst: _____ (signature)
DD

Laboratory manager: _____ (signature)

Job Description: SR 50 HOV Westbound ramps

Lab Sample Number	Client Sample Number and Description	Asbestos detected?	Fibers present	Remarks
LD224185-1	12-107-S03-1	**No**	< 1% Cellulose	Brown weathered rock. Balance of sample is unspecified non-fibrous material.
Weathered rock				
LD224185-2	12-112-B01	**No**	< 1% Cellulose	Red gravel. Balance of sample is unspecified non-fibrous material.
Clayey gravel				

* Chrysotile, Amosite, Crocidolite, Tremolite, Actinolite, and Anthophyllite are asbestos fibers. N.D.=None Detected PC =Point Counted

BSK Associates
Engineers & Laboratories

A2B0662

02/14/2012

Ken Colburn
Blackburn Consulting-West Sacramento
2491 Boatman Ave
West Sacramento, CA 95691

Dear Ken Colburn,

Thank you for selecting BSK Associates for your analytical testing needs. We have prepared this report in response to your request for analytical services. Enclosed are the results of analyses for samples received by the laboratory on 02/09/2012 10:00.

If additional clarification of any information is required, please contact your Client Services Representative, Michelle Harmstead at (800) 877-8310 or (559) 497-2888.

BSK ASSOCIATES

Michelle Harmstead

Michelle Harmstead
Project Manager

1414 Stanislaus Street Fresno, CA 93706 (559) 497-2888 FAX (559) 485-6935 www.bsklabs.com

11521 Blocker Drive, Suite 110
Auburn, CA 95603

blackburn consulting

(530) 887-1494
fax: (530) 887-1495

Minimum Resistivity and pH Test Results

File No.: 1072.8
Date: 2/14/2012

Project Name: SR 50 HOV Westbound Ramps

Sample ID	Minimum Resistivity, Ohm-cm @ 15.5° C	pH
A12-101-B07	2,676	8.45
A12-104-B03	2,931	8.67

Minimum Resistivity and pH performed based on Caltrans Test Method 643

BSK Associates
Engineers & Laboratories

02/14/2012

Case Narrative

Work Order Information

Client Name:	Blackburn Consulting-West Sacramento	**Submitted by:**	Robert
Client Code:	black8706	**Shipped by:**	Walk-In
Work Order:	A2B0662	**COC Number:**	
Project:	1072.8 SR 50 HOV Westbound Ramps	**TAT:**	5
		PO #:	10224

Sample Receipt Conditions

Cooler: **Default Cooler** **Temp. °C:** 16

Containers Intact
COC/Labels Agree
Received with no thermal preservation.
Packing Material - Other
Sample(s) were received in temperature range.
Initial receipt at BSK-FAL

Report Manager
Ken Colburn

Report Format
Final.rpt

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BSK Associates
Engineers & Laboratories

Certificate of Analysis

Ken Colburn
Blackburn Consulting-West Sacramento
2491 Boatman Ave
West Sacramento, CA 95691

Report Issue Date: 02/14/2012 14:27
Received Date: 02/09/2012
Received Time: 10:00

Lab Sample ID: A2B0662-01
Sample Date: 02/06/2012 10:00
Sample Type: Grab
Sampled by: Client
Matrix: Solid

Sample Description: A-12-101-B07

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Chloride, Cal Trans Extract	California Test 422	6.5	3.0	mg/kg	1	A201495	02/13/12	02/13/12	
*Sulfate as SO4, Cal Trans Extract	California Test 417	12	6.0	mg/kg	1	A201495	02/13/12	02/13/12	

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BSK Associates Engineers & Laboratories

Certificate of Analysis

Ken Colburn
Blackburn Consulting-West Sacramento
2491 Boatman Ave
West Sacramento, CA 95691

Report Issue Date: 02/14/2012 14:27
Received Date: 02/09/2012
Received Time: 10:00

Lab Sample ID: A2B0662-02
Sample Date: 02/06/2012 12:00
Sample Type: Grab
Sampled by: Client
Matrix: Solid

Sample Description: A-12-104-B03

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Chloride, Cal Trans Extract	California Test 422	4.4	3.0	mg/kg	1	A201495	02/13/12	02/13/12	
*Sulfate as SO4, Cal Trans Extract	California Test 417	ND	6.0	mg/kg	1	A201495	02/13/12	02/13/12	

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General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A201495				Analyst: AJT		Prepared: 02/13/2012					
Blank (A201495-BLK1)	**California Test 422 - Quality Control**										
Chloride, Cal Trans Extract	ND	3.0	mg/kg							02/13/12	
Sulfate as SO4, Cal Trans Extract	ND	6.0	mg/kg							02/13/12	
Blank Spike (A201495-BS1)	**California Test 422 - Quality Control**										
Chloride, Cal Trans Extract	50	1.0	mg/kg	50		100	90-110			02/13/12	
Sulfate as SO4, Cal Trans Extract	50	2.0	mg/kg	50		100	90-110			02/13/12	
Blank Spike Dup (A201495-BSD1)	**California Test 422 - Quality Control**										
Chloride, Cal Trans Extract	50	1.0	mg/kg	50		100	90-110	0	10	02/13/12	
Sulfate as SO4, Cal Trans Extract	50	2.0	mg/kg	50		100	90-110	0	10	02/13/12	
Matrix Spike (A201495-MS1)	**California Test 422 - Quality Control**					**Source: A2B0662-02**					
Chloride, Cal Trans Extract	320	6.0	mg/kg	300	ND	105	80-120			02/13/12	
Sulfate as SO4, Cal Trans Extract	320	12	mg/kg	300	ND	106	80-120			02/13/12	
Matrix Spike Dup (A201495-MSD1)	**California Test 422 - Quality Control**					**Source: A2B0662-02**					
Chloride, Cal Trans Extract	320	6.0	mg/kg	300	ND	105	80-120	0	10	02/13/12	
Sulfate as SO4, Cal Trans Extract	320	12	mg/kg	300	ND	106	80-120	0	10	02/13/12	

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Engineers & Laboratories

Certificate of Analysis

02/14/2012

Notes:

- The Chain of Custody document and Sample Integrity Sheet are part of the analytical report.
- Any remaining sample(s) for testing will be disposed of one month from the final report date unless other arrangements are made in advance.
- Sample(s) received, prepared, and analyzed within the method specified criteria unless otherwise noted within this report.
- The results relate only to the samples analyzed in accordance with test(s) requested by the client on the Chain of Custody document. Any analytical quality control exceptions to method criteria that are to be considered when evaluating these results have been flagged and are defined in the data qualifiers section.
- All results are expressed on wet weight basis unless otherwise specified.
- All positive results for EPA Methods 504.1, 502.2, and 524.2 require the analysis of a Field Reagent Blank (FRB) to confirm that the results are not a contamination error from field sampling steps. If Field Reagent Blanks were not submitted with the samples, this method requirement has not been performed.
- Results contained in this analytical report must be reproduced in its entirety.
- Samples collected by BSK Analytical Laboratories were collected in accordance with the BSK Sampling and Collection Standard Operating Procedures.
- BSK Analytical Laboratories certifies that the test results contained in this report meet all requirements of the NELAC Standards for applicable certified drinking water chemistry analyses unless qualified or noted in the Case Narrative.
- Analytical data contained in this report may be used for regulatory purposes to meet the requirements of the Federal or State drinking water, wastewater, and hazardous waste programs.
- J-value is equivalent to DNQ (Detected, not quantified) which is a trace value. A trace value is an analyte detected between the MDL and the laboratory reporting limit. This result is of an unknown data quality and is only qualitative (estimated). Baseline noise, calibration curve extrapolation below the lowest calibrator, method blank detections, and integration artifacts can all produce apparent DNQ values, which contribute to the un-reliability of these values.
- (1) - Residual chlorine and pH analysis have a 15 minute holding time for both drinking and waste water samples as defined by the EPA and 40 CFR 136. Waste water and ground water (monitoring well) samples must be field filtered to meet the 15 minute holding time for dissolved metals.
- * - This is not a NELAP accredited analyte.
- Summations of analytes (i.e. Total Trihalomethanes) may appear to add individual amounts incorrectly, due to rounding of analyte values occurring before or after the total value is calculated, as well as rounding of the total value.
- (2) The digestion used to produce this result deviated from EPA 200.2 by excluding hydrochloric acid in order to produce acceptable recoveries for affected metals.
- (2C) Result reported from secondary analytical column.
- RL Multiplier is the factor used to adjust the reporting limit (RL) due to variations in sample preparation procedures and dilutions required for matrix interferences.

Certifications:

State of California - CDPH - ELAP	1180
State of California - CDPH - NELAP	04227CA
State of Nevada - NDEP	CA000792009A
State of Hawaii - DOH	04227CA

Definitions and Flags for Data Qualifiers

mg/L:	Milligrams/Liter (ppm)	M:	Method Detection Limit	MDA:	Min. Detected Activity
mg/Kg:	Milligrams/Kilogram (ppm)	RL:	Reporting Limit	MPN:	Most Probable Number
µg/L:	Micrograms/Liter (ppb)		:DL x Dilution	CFU:	Colony Forming Unit
µg/Kg:	Micrograms/Kilogram (ppb)	ND:	None Detected at RL	Absent:	Less than 1 CFU/100mLs
%:	Percent Recovered (surrogates)	pCi/L:	Picocuries per Liter	Present:	1 or more CFU/100mLs
		NR:	Non-Reportable	RL Mult:	RL Multiplier

BSK Associates
Engineers & Laboratories

567 West Shaw Avenue Suite B
Fresno CA 93704
P 559.497.2880
F 559.497.2886
www.bskassociates.com

February 29, 2012

BSK G10-085-10F
BSK SAMPLE ID: F12-062

Mr. Ken Colburn
Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, California 95603

SUBJECT: Laboratory Testing Results
PO 10225 – SR 50 HOV Westbound Ramps

Dear Mr. Colburn:

BSK Associates (BSK) has performed testing on two (2) soil samples received at our laboratory on February 17, 2012. The samples were identified as follows:

BCI 12-111-B01
BCI 12-114-B02

Testing was performed in accordance with Caltrans Test Methods and consisted of Minimum Resistivity and pH (Caltrans Test Method 643), Sulfate Content (Caltrans Test Method 417), and Chloride Content (Caltrans Test Method 422). The test reports are enclosed.

BSK appreciates the opportunity to be of service to Blackburn Consulting and looks forward to being of service to you in the future. Please call Ken Frank with any questions you may have at (559) 497-2880 ext. 182.

Respectfully,
BSK ASSOCIATES

Kenneth M. Frank, E.I.T.
Staff Engineer

Ashleigh D. Love, P.E.
Project Engineer

Enclosures: Analytical Results (5 pages)
Minimum Resistivity Results (2 pages)

Distribution: Mr. Ken Colburn, Blackburn Consulting (1 original + e-Mail)
BSK (1 original + eCopy)

BSK Associates
Engineers & Laboratories

1415 Tuolumne St.
Fresno, CA 93706
Ph: (559) 497-2868
Fax: (559) 485-6140

MINIMUM RESISTIVITY OF SOILS

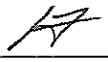
Caltrans Test Method 643

Project Name: BCI - SR 50 HOV Westbound Ramps **Report Date:** 2/21/2012
Project Number: G10-085-10F **Sample Date:** 2/9/2012
Lab Tracking ID: F12-062 **Test Date:** 2/21/2012
Sample Location: 12-111-B01
Sample Description: Silty Sand (SM), light brown, fine to medium grained, trace of clay
Sampled By: Blackburn Consulting **Tested By:** J. Frank

Soil temperature at minimum resistance = 23.3 °C

Total Moisture Added (ml)	Meter Dial Reading	Multiplier Setting	Resistance Measured (ohms)	Resistivity (ohm-cm)
10	2.7	1,000	2,700	3227
15	2.6	1,000	2,600	3107
20	2.7	1,000	2,700	3227
Minimum Resistivity at 15.5°C, Ohm-cm				**3110**

Remarks:

Reviewed by: 

BSK Associates
Engineers & Laboratories

1415 Tuolumne St.
Fresno, CA 93706
Ph: (559) 497-2868
Fax: (559) 485-6140

MINIMUM RESISTIVITY OF SOILS

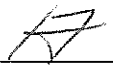
Caltrans Test Method 643

Project Name: BCI - SR 50 HOV Westbound Ramps **Report Date:** 2/21/2012
Project Number: G10-085-10F **Sample Date:** 2/9/2012
Lab Tracking ID: F12-062 **Test Date:** 2/19/2012
Sample Location: 12-114-B02
Sample Description: Silty Sand (SM), light brown, fine to medium grained, trace of clay
Sampled By: Blackburn Consulting **Tested By:** J. Frank

Soil temperature at minimum resistance = 23.8 °C

Total Moisture Added (ml)	Meter Dial Reading	Multiplier Setting	Resistance Measured (ohms)	Resistivity (ohm-cm)
10	2.2	1,000	2,200	2657
15	1.5	1,000	1,500	1811
20	1.5	1,000	1,500	1811
25	1.6	1,000	1,600	1932
Minimum Resistivity at 15.5°C, Ohm-cm				**1810**

Remarks:

Reviewed by: 

BSK Associates Engineers & Laboratories

02/24/2012

Case Narrative

Work Order Information

Client Name:	BSK Associates - Fresno	**Submitted by:**	William B.
Client Code:	BSKAs2880	**Shipped by:**	BSK Employee
Work Order:	A2B1377	**COC Number:**	
Project:	pH, S04, Cl - Nathan Shwiyhat		**TAT:** 5
Client Project:	G1008510F		**PO #:**

Chain of Custody Notes

Date: 02/22/2012
Initials: MJZ
Note: CTM 643 (pH & Resistivity) performed by BSK Materials.

Sample Receipt Conditions

Cooler: **Default Cooler** **Temp. °C:** 18

Containers Intact
COC/Labels Agree
Received with no thermal preservation.
Packing Material - Other
Initial receipt at BSK-FAL

Report Manager
Nathan Shwiyhat

Report Format
Final.rpt

1414 Stanislaus Street Fresno, CA 93706 (559) 497-2888 FAX (559) 485-6935 www.bsklabs.com

BSK Associates Engineers & Laboratories

Certificate of Analysis

Nathan Shwiyhat
BSK Associates - Fresno
567 W Shaw, Suite B
Fresno, CA 93704

Report Issue Date: 02/24/2012 16:03
Received Date: 02/17/2012
Received Time: 14:23

Lab Sample ID: A2B1377-01
Sample Date: 02/09/2012 10:00
Sample Type:

Client Project: G1008510F
Sampled by: Client
Matrix: Solid

Sample Description: 12-111-B01

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Chloride, Cal Trans Extract	California Test 422	29	3.0	mg/kg	1	A201891	02/24/12	02/24/12	
*pH, Cal Trans Extract	California Test 643	7.7		pH Units	1	A201722	02/18/12	02/18/12	
*pH Temperature in °C		19.8							
*Sulfate as SO4, Cal Trans Extract	California Test 417	19	6.0	mg/kg	1	A201891	02/24/12	02/24/12	

BSK Associates
Engineers & Laboratories

Certificate of Analysis

Nathan Shwiyhat
BSK Associates - Fresno
567 W Shaw, Suite B
Fresno, CA 93704

Report Issue Date: 02/24/2012 16:03
Received Date: 02/17/2012
Received Time: 14:23

Lab Sample ID: A2B1377-02
Sample Date: 02/09/2012 14:30
Sample Type:

Client Project: G1008510F
Sampled by: Client
Matrix: Solid

Sample Description: 12-114-B02

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Chloride, Cal Trans Extract	California Test 422	9.6	3.0	mg/kg	1	A201891	02/24/12	02/24/12	
*pH, Cal Trans Extract	California Test 643	7.9		pH Units	1	A201722	02/18/12	02/18/12	
*pH Temperature in °C		19.8							
*Sulfate as SO4, Cal Trans Extract	California Test 417	18	6.0	mg/kg	1	A201891	02/24/12	02/24/12	

BSK Associates Engineers & Laboratories

General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A201722				Analyst: RMJ		Prepared: 02/18/2012					
Duplicate (A201722-DUP1)	**California Test 643 - Quality Control**									**Source: A2B0698-01**	
pH, Cal Trans Extract	8.3		pH Units		8.3			1	20	02/18/12	
Batch: A201891				Analyst: AJT		Prepared: 02/23/2012					
Blank (A201891-BLK1)	**California Test 422 - Quality Control**										
Chloride, Cal Trans Extract	ND	3.0	mg/kg							02/24/12	
Sulfate as SO4, Cal Trans Extract	ND	6.0	mg/kg							02/24/12	
Blank Spike (A201891-BS1)	**California Test 422 - Quality Control**										
Chloride, Cal Trans Extract	54	1.0	mg/kg	50		108	90-110			02/24/12	
Sulfate as SO4, Cal Trans Extract	55	2.0	mg/kg	50		109	90-110			02/24/12	
Blank Spike Dup (A201891-BSD1)	**California Test 422 - Quality Control**										
Chloride, Cal Trans Extract	54	1.0	mg/kg	50		108	90-110	0	10	02/24/12	
Sulfate as SO4, Cal Trans Extract	55	2.0	mg/kg	50		109	90-110	0	10	02/24/12	
Matrix Spike (A201891-MS1)	**California Test 422 - Quality Control**									**Source: A2B1377-02**	
Chloride, Cal Trans Extract	330	6.0	mg/kg	300	9.6	107	80-120			02/24/12	
Sulfate as SO4, Cal Trans Extract	340	12	mg/kg	300	18	108	80-120			02/24/12	
Matrix Spike Dup (A201891-MSD1)	**California Test 422 - Quality Control**									**Source: A2B1377-02**	
Chloride, Cal Trans Extract	330	6.0	mg/kg	300	9.6	107	80-120	0	10	02/24/12	
Sulfate as SO4, Cal Trans Extract	340	12	mg/kg	300	18	108	80-120	0	10	02/24/12	

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Engineers & Laboratories

Certificate of Analysis

02/24/2012

Notes:

- The Chain of Custody document and Sample Integrity Sheet are part of the analytical report.
- Any remaining sample(s) for testing will be disposed of one month from the final report date unless other arrangements are made in advance.
- Sample(s) received, prepared, and analyzed within the method specified criteria unless otherwise noted within this report.
- The results relate only to the samples analyzed in accordance with test(s) requested by the client on the Chain of Custody document. Any analytical quality control exceptions to method criteria that are to be considered when evaluating these results have been flagged and are defined in the data qualifiers section.
- All results are expressed on wet weight basis unless otherwise specified.
- All positive results for EPA Methods 504.1, 502.2, and 524.2 require the analysis of a Field Reagent Blank (FRB) to confirm that the results are not a contamination error from field sampling steps. If Field Reagent Blanks were not submitted with the samples, this method requirement has not been performed.
- Results contained in this analytical report must be reproduced in its entirety.
- Samples collected by BSK Analytical Laboratories were collected in accordance with the BSK Sampling and Collection Standard Operating Procedures.
- BSK Analytical Laboratories certifies that the test results contained in this report meet all requirements of the NELAC Standards for applicable certified drinking water chemistry analyses unless qualified or noted in the Case Narrative.
- Analytical data contained in this report may be used for regulatory purposes to meet the requirements of the Federal or State drinking water, wastewater, and hazardous waste programs.
- J-value is equivalent to DNQ (Detected, not quantified) which is a trace value. A trace value is an analyte detected between the MDL and the laboratory reporting limit. This result is of an unknown data quality and is only qualitative (estimated). Baseline noise, calibration curve extrapolation below the lowest calibrator, method blank detections, and integration artifacts can all produce apparent DNQ values, which contribute to the un-reliability of these values.
- (1) - Residual chlorine and pH analysis have a 15 minute holding time for both drinking and waste water samples as defined by the EPA and 40 CFR 136. Waste water and ground water (monitoring well) samples must be field filtered to meet the 15 minute holding time for dissolved metals.
- * - This is not a NELAP accredited analyte.
- Summations of analytes (i.e. Total Trihalomethanes) may appear to add individual amounts incorrectly, due to rounding of analyte values occurring before or after the total value is calculated, as well as rounding of the total value.
- (2) The digestion used to produce this result deviated from EPA 200.2 by excluding hydrochloric acid in order to produce acceptable recoveries for affected metals.
- (2C) Result reported from secondary analytical column.
- RL Multiplier is the factor used to adjust the reporting limit (RL) due to variations in sample preparation procedures and dilutions required for matrix interferences.

Certifications:

State of California - CDPH - ELAP	1180
State of California - CDPH - NELAP	04227CA
State of Nevada - NDEP	CA000792009A
State of Hawaii - DOH	04227CA

Definitions and Flags for Data Qualifiers

mg/L:	Milligrams/Liter (ppm)	M.	Method Detection Limit	MDA95:	Min. Detected Activity
mg/Kg	Milligrams/Kilogram (ppm)	RL:	Reporting Limit	MPN:	Most Probable Number
µg/L:	Micrograms/Liter (ppb)		:DL x Dilution	CFU:	Colony Forming Unit
µg/Kg:	Micrograms/Kilogram (ppb)	ND:	None Detected at RL	Absent:	Less than 1 CFU/100mLs
%:	Percent Recovered (surrogates)	pCi/L:	Picocuries per Liter	Present:	1 or more CFU/100mLs
		NR:	Non-Reportable	RL Mult:	RL Multiplier

MACS Lab, Inc.
431 Crown Point Cir Ste 120
Grass Valley, CA 95945-9531

530-274-1470 or 1-800-MACS LAB

Bulk Asbestos Analysis

Report

CARB Method 435

Blackburn Consulting
11521 Blocker Drive, Ste 110

Auburn CA 95603

Person to contact: Pat Fischer
Contact phone: 530-887-1495
emailed
Sampled by: Rob Pickard
Sampled on: February 9, 2012
Analyzed on: February 21, 2012 at: 06:27
Corresponding invoice number: 224185
Purchase Order Number: 10226
Job Number: 1072.8

Analyst: _____ (signature)
DD

Laboratory manager: _____ (signature)

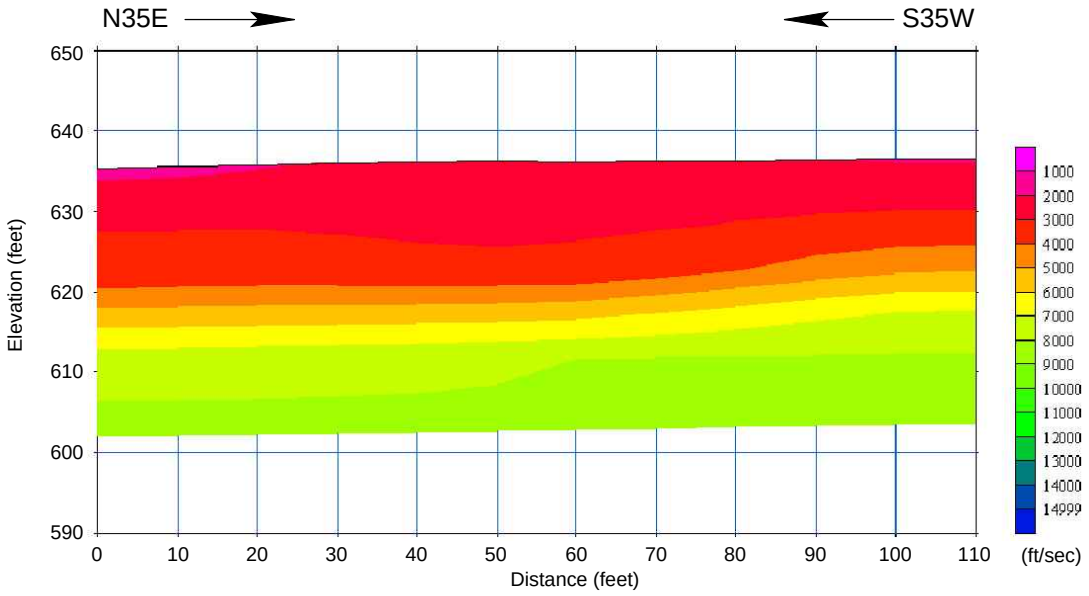
Job Description: SR 50 HOV Westbound ramps

Lab Sample Number	Client Sample Number and Description	Asbestos detected?	Fibers present	Remarks
LD224185-1	12-107-S03-1	**No**	< 1% Cellulose	Brown weathered rock. Balance of sample is unspecified non-fibrous material.
Weathered rock				
LD224185-2	12-112-B01	**No**	< 1% Cellulose	Red gravel. Balance of sample is unspecified non-fibrous material.
Clayey gravel				

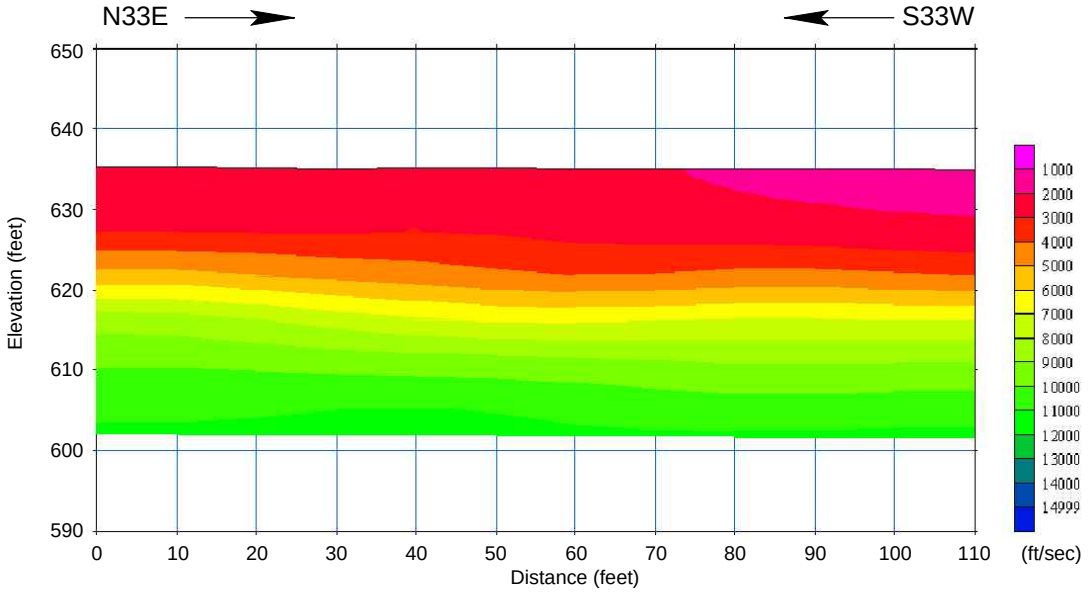
* Chrysotile, Amosite, Crocidolite, Tremolite, Actinolite, and Anthophyllite are asbestos fibers. N.D.=None Detected PC =Point Counted

Appendix C

Seismic Refraction Profiles



SR-01



SR-02

blackburn consulting

11521 Blocker Drive, Ste 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495
www.blackburnconsulting.com

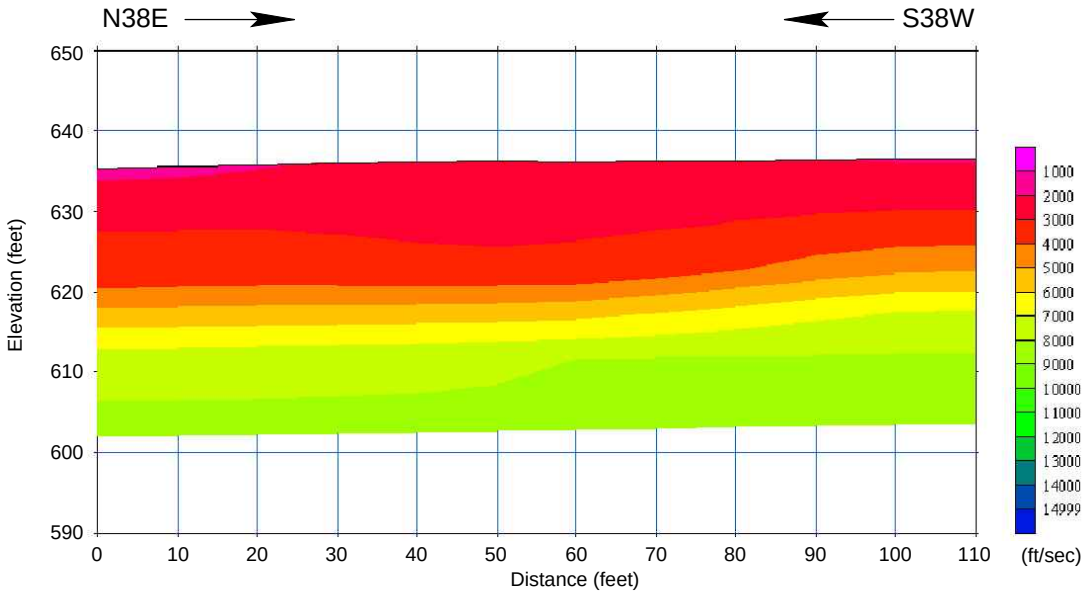
SEISMIC PROFILES

Latrobe Road WB Off Ramp Project
(EA # 03-2E5101)
El Dorado County, California

File No. 1072.8

March 2012

Appendix C



SR-03

blackburn consulting

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SEISMIC PROFILES

Latrobe Road WB Off Ramp Project
(EA # 03-2E5101)
El Dorado County, California

File No. 1072.8

March 2012

Appendix C