INFORMATION HANDOUT

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MATERIALS INFORMATION

Aerially Deposited Lead (ADL) Investigation Report

Geotechnical Design Report (GDR)

Geotechnical Design Recommendations Report

Materials Letter Report

Ramp Closure Study

Revised Ramp Closure Study

Late pickup Calculations

AERIALLY DEPOSITED LEAD SITE INVESTIGATION
SR-133/I-5 INTERCHANGE
IRVINE, CALIFORNIA
TASK ORDER NO. 12-0L4100-51
EA NO. 0L4100, CONTRACT NO. 12A1139

PREPARED FOR:
State of California
Department of Transportation
District 12, Environmental Engineering
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June 22, 2011
Project No. 207384051

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants

June 22, 2011
Project No. 207384051

Mr. Wayne Chiou
State of California Department of Transportation
District 12, Environmental Engineering
3347 Michelson Drive, Suite 100
Irvine, California 92612-1692

Subject: Aerially Deposited Lead Site Investigation
SR-133/I-5 Interchange
Irvine, California
Task Order No. 12-0L4100-51
EA No. 0L4100
Contract No. 12A1139

Dear Mr. Chiou:

In accordance with the State of California Department of Transportation Contract No. 12A1139, Task Order No. 12-0L4100-51, Ninyo & Moore has conducted an aerially deposited lead investigation at the existing State Route 133 (SR-133) and Interstate 5 (I-5) interchange in the city of Irvine, California.

The following report documents our methodologies, findings, conclusions, and recommendations.

We appreciate the opportunity to be of service to you on this project.

Sincerely,
NINYO & MOORE

Pedro Rodriguez-Mendez
Staff Scientist

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Project Geologist

David I. Shaler, PG
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PRM/BAP/DIS/sc

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AERIALLY DEPOSITED LEAD INVESTIGATION REPORT
Task Order No. 12-0L4100-51
E.A. 0L4100

This report was prepared by the staff of Ninyo & Moore Geotechnical and Environmental Sciences Consultants under the supervision of the Engineer and/or Geologist whose signature appears hereon.

The findings, recommendations, specifications, or professional opinions are presented within the limits described by the client, after being prepared in accordance with generally accepted professional engineering and geologic practice. No warranty is expressed or implied.

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EXECUTIVE SUMMARY

The State of California Department of Transportation (Department) authorized Ninyo & Moore to conduct an aerially deposited lead (ADL) site investigation (SI) for a roadway rehabilitation project that includes roadway excavation of the two connectors and bridges on the northbound and southbound State Route 133 (SR-133) and Interstate 5 (I-5) interchange in the city of Irvine, California (site). Work was conducted in general accordance with the Department Contract No. 12A1139, Task Order No. 12-0L4100-51 (TO 51), dated May 4, 2011. It is our understanding that the Department is performing improvements at the SR-133 and I-5 interchange and the site will be excavated to perform these improvements.

This investigation was performed to evaluate the presence of lead in soil resulting from the combustion of leaded fuel from nearby traffic. Data collected during this investigation were used to develop recommendations for the potential reuse or disposal of soil excavated from the site and to inform the Department of potential health and safety issues concerning the presence of lead in soil for workers at the site during construction activities.

Ninyo & Moore collected 72 soil samples from 18 borings at the site (B1 through B18). None of the 72 samples contained a total lead concentration greater than or equal to 50 milligrams per kilogram (mg/kg) and subsequent analyses for soluble lead were not conducted. Eight samples were analyzed for pH. The maximum pH level was 8.3 and the minimum pH level was 7.3. These levels do not cause a waste to be classified as Resource Conservation and Recovery Act (RCRA) hazardous waste and are greater than the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) lower limit of 5.0.

Our recommendations for soil reuse on site are based on the guidelines set forth by the DTSC Lead Variance issued to the Department on June 30, 2009 (DTSC Variance). Laboratory analytical results for lead were compared to the guidelines of the DTSC Variance for potential reuse of the soil as fill within the Department right-of-way (ROW).

Our recommendations for off-site disposal were based on the comparison of lead concentrations in soil samples to the California Health and Safety Code thresholds and Title 40 Code of Federal Regulations (CFR) 261.24 thresholds.

Based on the analytical results, the on-site reuse and the off-site disposal recommendations are summarized below.

Recommendations for Soil for Reuse by the Department

Soil at the site can be reused on site with the following restrictions:

- Scenario A: soil in the surface layer (surface to 0.5 feet below ground surface [bgs]) is suitable for on-site reuse by the Department with no restrictions based on total and soluble lead concentrations. The remaining soil from the 1.5 to 4-foot layers combined (0.5 to 4 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total and soluble lead concentrations.

- Scenario B: soil in the surface and 1.5-foot layers combined (surface to 1.5 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total and soluble lead concentrations. The remaining soil from the 3 and 4-foot layers combined (1.5 to 4 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total and soluble lead concentrations.

- Scenario C: soil in the surface to 3-foot layers combined (surface to 3 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total and soluble lead concentrations. The remaining soil from the 4-foot layer (3 to 4 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total and soluble lead concentrations.

- Scenario D: soil in the layers combined (surface to 4 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total and soluble lead concentrations.

Recommendations for Soil to be Disposed Off Site

If the Department elects to dispose the soil off site, the following restrictions apply:

- Scenario A: soil in the surface layer (surface to 0.5 feet bgs) is classified as non-hazardous and may disposed off site with no restrictions based on total and soluble lead. The remaining soil from the 1.5- to 4-foot layers combined (0.5 to 4 feet bgs) is also classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead.

- Scenario B: soil in the surface to 1.5-foot layer combined (surface to 1.5 feet bgs) is classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead. The remaining soil from the 3 and 4-foot layers combined (1.5 to 4 feet bgs) also has no restrictions based on total and soluble lead concentrations.

- Scenario C: soil in the surface to 3-foot layers combined (surface to 3 feet bgs) is classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead. The remaining soil from the 4-foot layer (3 to 4-feet bgs) is also classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead.

- Scenario D: soil in the layers combined (surface to 4 feet bgs) is classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead.

The Department should notify the contractors performing the construction activities that elevated concentrations of lead are present in on-site soil. Appropriate health and safety measures should be taken to minimize the potential exposure to lead.

1. INTRODUCTION

The State of California Department of Transportation (Department) authorized Ninyo & Moore to conduct an aerially deposited lead (ADL) site investigation (SI) for a roadway rehabilitation project that includes roadway excavation of the two connectors and bridges on the northbound and southbound State Route 133 (SR-133) and Interstate 5 (I-5) interchange in the city of Irvine, California (site; Figure 1). Work was conducted in general accordance with the Department Contract No. 12A1139, Task Order No. 12-0L4100-51 (TO 51), dated May 4, 2011.

1.1. Project Description and Objective

It is our understanding that the Department will be performing improvements at the SR-133 and I-5 interchange. This report has been prepared by Ninyo & Moore to document the results of a study to evaluate the potential presence of ADL at the site. Eighteen borings were hand augered at the site (Figure 2).

1.2. Scope of Work

Ninyo & Moore performed the tasks described in the following sections.

1.2.1. Prefield Activities

Prefield activities included:

- Preparing a site specific health and safety plan (HSP).
- Marking boring locations at the site.
- Notifying Underground Service Alert (USA) that Ninyo & Moore would be advancing soil borings in the area (USA ticket number A11440795).
- Preparing a project schedule, and coordinating work with subcontractors.

1.2.2. Soil Sampling

Soil sampling was conducted on May 26 and May 27, 2011. Eighteen sampling locations (B1 through B18) were chosen, as shown on Figure 2. One boring at each sampling location was advanced and sampled using a hand auger. Eighteen hand-auger

borings were advanced to a depth of 4 feet below ground surface (bgs) with soil samples collected at ½, 1½, 3, and 4 feet bgs for a total of approximately 72 soil samples.

1.2.3. Laboratory Analysis

Ninyo & Moore submitted the soil samples under chain-of-custody protocol to Advanced Technology Laboratories (ATL) of Signal Hill, California; a laboratory certified by the State of California Department of Health Services Environmental Laboratory Accreditation Program.

1.2.4. Global Positioning System Surveying

Approximate latitude and longitude (North American Datum 83) of sampling locations were recorded with a handheld GPS unit (GeoXT, Trimble). The latitude and longitude data for each boring are presented on Table 1.

1.2.5. Report Preparation

This report was prepared in general accordance with Department Contract No. 12A1139 and TO 51 dated May 4, 2011.

1.3. Previous Site Investigations

Ninyo & Moore has not performed previous investigations at this site. In addition, the Department has not notified Ninyo & Moore of previous investigations performed at the site.

2. BACKGROUND

The Department obtained a variance (V09 HQSCD006) from the California Environmental Protection Agency (Cal-EPA), Department of Toxic Substances Control (DTSC), on June 30, 2009 (DTSC Variance). The DTSC Variance allows for conditional reuse of lead-impacted soil within the Department right-of-way (ROW). Background information regarding the source of ADL and the reuse or disposal of lead-impacted soil is discussed in the following sections.

2.1. Aerially Deposited Lead in Soil

Analyses for lead in soil along highways throughout the state of California have revealed that lead is commonly present along the shoulders of the highways as a result of automobile exhaust containing lead from the combustion of leaded gasoline. Elevated concentrations of lead are commonly found in the upper 2 feet of soil. Lead concentrations in soil are dependent on many variables; but in general, are a function of the age of the highway and the volume of traffic using the highway (DTSC, 2009).

2.2. Hazardous Waste Classification Criteria

Soil that exceeds the following limitations may be classified as hazardous waste with respect to lead concentrations:

- The soil contains more than 1,000 milligrams per kilogram (mg/kg) total lead, exceeding the Total Threshold Limit Concentration (TTLC) for California hazardous waste (Title 22 California Code of Regulations [CCR], Section 66261.24);
- The soil contains more than 5.0 milligrams per liter (mg/l) citric acid-extractable lead, exceeding the Soluble Threshold Limit Concentration (STLC) for California hazardous waste (Title 22 CCR, Section 66261.24);
- The soil contains more than 5.0 mg/l leachable lead using the Toxicity Characteristic Leaching Procedure (TCLP), exceeding the maximum concentration for the toxicity characteristic of the Resource, Conservation, and Recovery Act (RCRA; Title 40 Code of Federal Regulations [CFR] 261.24); or
- The soil pH is less than or equal to 2.0 or greater than or equal to 12.5, which exceeds the limits for the corrosivity characteristic of RCRA hazardous waste (40CFR 261.22) and California hazardous waste (Title 22 CCR, Section 66261.22).

2.3. DTSC Variance

In accordance with the DTSC Variance, soil that is subject to the guidelines presented below may be reused within the Department ROW. A chart presenting the different ADL soil type classifications is included in Appendix A.

2.3.1. Reuse – Condition 1

Soil containing less than 1.5 mg/l extractable lead by the Waste Extraction Test (WET) using de-ionized water as the extractant (WET-DI) and less than or equal to 1,411 mg/kg total lead (United States Environmental Protection Agency [EPA] Method 6010B) may be used as fill in the Department ROW provided the soil is placed a minimum of 5 feet above the maximum level of the water table and covered with at least 1 foot of non-hazardous soil.

2.3.2. Reuse – Condition 2

Soil containing greater than or equal to 1.5 mg/l, but less than 150 mg/l, extractable lead by WET-DI method, or more than 1,411 mg/kg total lead but less than 3,397 mg/kg total lead, may be used as fill in the Department ROW provided the soil is placed a minimum of 5 feet above the maximum level of the water table and protected from infiltration by a paved structure that will be maintained by the Department.

2.3.3. Reuse – Condition 3

Lead-contaminated soil with a pH less than 5.5 but greater than 5.0 shall only be used as fill material under the paved portion of the roadway. Lead-contaminated soil with a pH at or less than 5.0 shall be managed as a hazardous waste.

2.4. Criteria for Disposal of Soil Not Intended for Reuse On Site

If the Department elects to dispose soil within the Department ROW that has been excavated during construction activities, the soil may be classified either as hazardous waste or non-hazardous waste. The distinction is based on the total and soluble lead concentrations compared to the TTLC and STLC criteria. As mentioned in Section 2.2, the TTLC for total lead is 1,000 mg/kg and the STLC for citric acid extractable lead is 5.0 mg/l. Waste containing lead concentrations in excess of or equal to those listed must be disposed at a Class I hazardous waste disposal facility pursuant to State of California regulations.

3. INVESTIGATION METHODS

The investigation activities are described in the following subsections and were conducted in general accordance with the TO that was approved by the Department prior to beginning the field activities.

3.1. Health and Safety Plan (HSP)

A site-specific HSP dated May 25, 2011, was prepared by Ninyo & Moore and submitted to the Department for approval prior to commencing field work.

3.2. Utility Clearance

The boring locations were described to USA during the notification at least 2 working days prior to conducting the soil sampling. USA marked the member utilities known to be in the vicinity of the boring locations.

3.3. Hand-Auger Sampling

The field work was conducted on May 26 and May 27, 2011. The boring locations were approved by the Department Task Order Manager and are shown on the attached Figure 2. Four samples were attempted for collection from each of the four boreholes at depths of ½, 1½, 3, and 4 feet bgs unless refusal was encountered. The depths reached for each boring are presented on Table 1.

Samples were placed into new, 4-ounce glass jars; capped with Teflon-coated plastic lids; labeled; placed in a resealable plastic bag; and stored in a cooler. The sampling equipment was decontaminated between each boring. Soil samples were transferred under chain-of-custody (COC) protocol to ATL within 24 hours of collection. In accordance with the TO, soil sample homogenization was performed in the laboratory.

Hand augering was conducted by Ninyo & Moore personnel.

3.4. Investigative-Derived Wastes

Soil cuttings generated by hand-auger drilling were returned to their corresponding bore-holes after collection of soil samples. Decontamination water was transported to Ninyo & Moore's Irvine office and placed in a drum pending chemical characterization. Based on the analytical result of the decontamination water sample (non-detect), the decontamination water was subsequently disposed in the sanitary sewer.

3.5. Laboratory Analyses

Once the samples were received by ATL, the samples were homogenized and analyzed for the following:

- 72 soil samples were analyzed for total lead using EPA Method 6010B;
- Approximately 10 percent of the soil samples (eight samples) were analyzed for pH using EPA Method 9045; and
- One sample of the decontamination water was analyzed for total lead using EPA Method 6010B.

4. ANALYTICAL RESULTS

The results of this investigation are described in the following subsections. The analytical results of lead and pH are summarized in Table 1, and the sampling locations with their corresponding data are shown on Figures 3 through 6. Laboratory reports and COC records are included in Appendix B.

4.1. Total Lead

Seventy-two samples were analyzed for total lead. The maximum total lead concentration was 8.4 mg/kg. The minimum total lead concentration was less than the laboratory practical quantitation limit of 5.0 mg/kg (Table 1).

The decontamination water sample did not contain a reportable concentration of lead.

4.2. pH

Approximately 10 percent of the samples collected (eight samples) were analyzed for pH. The maximum pH level was 8.3 and the minimum pH level was 7.3. The soil pH values are not characteristic of RCRA hazardous waste and are above the lower limit of 5.0 specified in the DTSC Variance.

5. STATISTICAL EVALUATION

Because no samples contained total lead concentrations in excess of 50 mg/kg, additional testing was not performed and statistical analyses were not performed.

6. CONCLUSIONS

The analyses of the data indicate that lead is not present at the site above background concentrations.

7. RECOMMENDATIONS

Based on the findings of this study, recommendations are summarized on block diagrams in Appendix C and discussed below.

7.1. Recommendations for Soil for Reuse by the Department

Soil at the site can be reused on site with the following restrictions:

- Scenario A: soil in the surface layer (surface to 0.5 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total and soluble lead concentrations. The remaining soil from the 1.5 to 4-foot layers combined (0.5 to 4 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total and soluble lead concentrations.

- Scenario B: soil in the surface and 1.5-foot layers combined (surface to 1.5 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total and soluble lead concentrations. The remaining soil from the 3 and 4-foot layers combined (1.5 to 4 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total and soluble lead concentrations.

8. HEALTH EFFECTS OF LEAD

Concentrations of lead in soil at the site represent a potential threat to the health of site workers performing earthwork activities.

Lead in its element form is a heavy, ductile, soft, gray metal. The permissible exposure limit for lead is 0.05 milligrams per cubic meter (mg/m^3) in air based on an eight-hour time-weighted average. The immediately dangerous to life and health exposure limit is 100 mg/m^3 as established by the National Institute of Occupational Safety and Health. Exposure may produce several symptoms including weakness, eye irritation, facial pallor, pale eyes, lassitude, insomnia, anemia, tremors, malnutrition, constipation, paralysis of the wrists and ankles, abdominal pain, colic, nephropathy, encephalopathy, gingival lead line, hypertension, anorexia, and weight loss. Target organs are the central nervous system, kidneys, eyes, blood, gingival tissue, and the gastrointestinal tract.

Because of the potential hazard from exposure to lead-contaminated soil, a lead HSP should be prepared by a Certified Industrial Hygienist (CIH). In addition, all site workers (earthwork) should have completed a training program meeting the requirements of 29 CFR 1910.120 and 8 CCR 1532.1. The plan developed by the CIH should include a hazard analysis, dust control measures, air monitoring, signage, work practices, emergency response plans, personal protective equipment, decontamination, and documentation.

9. LIMITATIONS

The services outlined in this report have been conducted in a manner generally consistent with current regulatory guidelines. No warranty, expressed or implied, is made regarding the professional opinions presented in this report. Ninyo & Moore's opinions are based on an analysis of observed conditions and on information obtained from third parties. It is likely that variations in soil conditions may exist.

The samples collected and chemically analyzed and the observations made are believed to be representative of the general area evaluated; however, conditions can vary significantly between

sampling locations. The interpretations and opinions contained in this report are based on the results of laboratory tests and analyses intended to detect the presence and measure the concentration of selected chemical or physical constituents in samples collected from the site. The analyses have been conducted by an independent laboratory certified by the State of California to conduct such analyses. Ninyo & Moore has no involvement in, or control over, such analyses and has no means of confirming the accuracy of laboratory results. Ninyo & Moore, therefore, disclaims any responsibility for inaccuracy in such laboratory results.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader wants any additional information, or has questions regarding content, interpretations presented, or completeness of this document. Opinions and judgments expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.

For individuals with sensory disabilities, this document is available in alternate formats upon request. For any questions regarding this document, please call or write Wayne Chiou, Environmental Engineering, 3347 Michelson Drive, Suite 100, Irvine, California 92612-1692. Phone Number (949) 724-2221.

10. REFERENCES

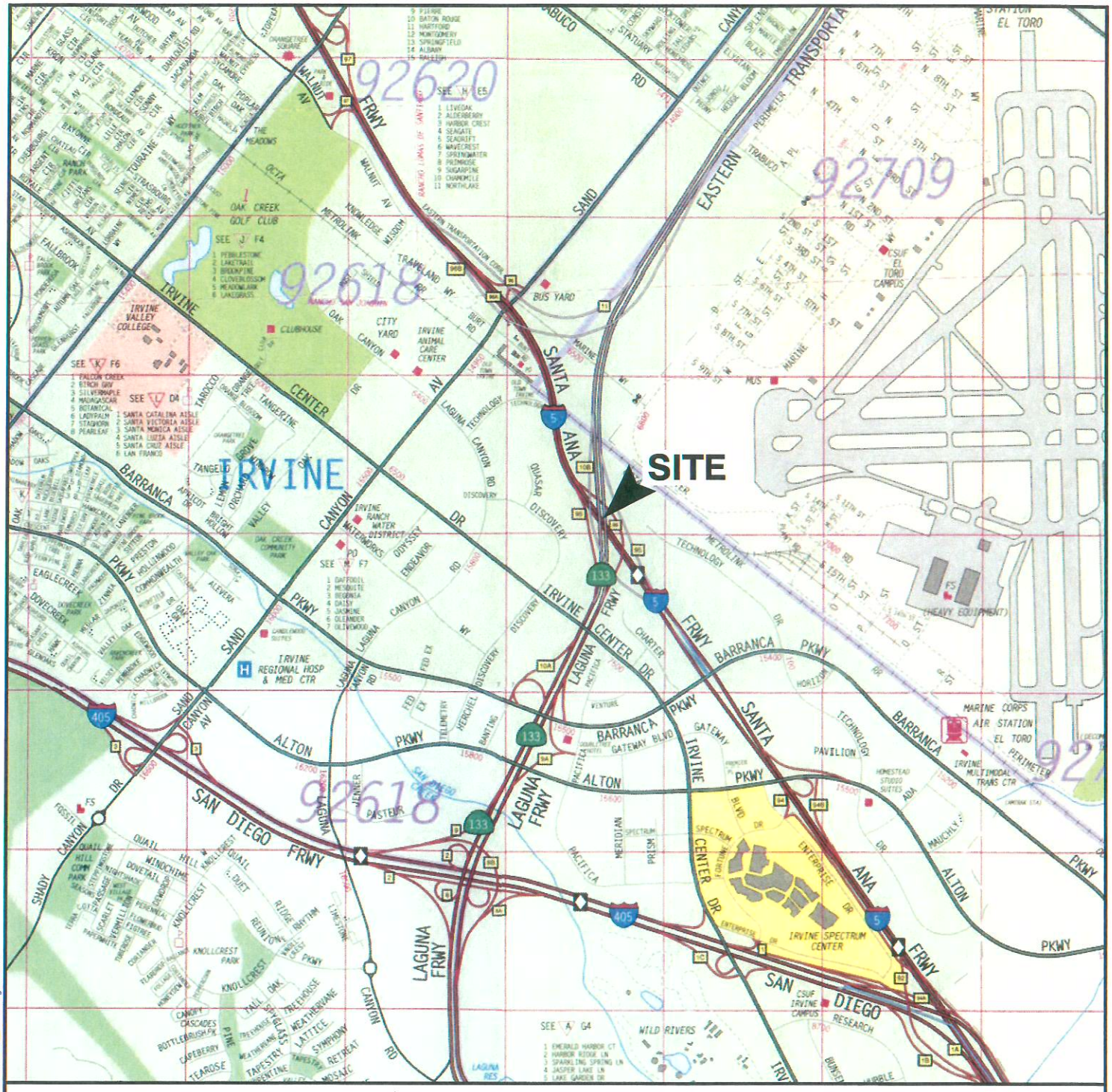
Department of Toxic Substance Control, 2009, Variance (V69HQSCD006), dated June 30.

DTSC, see Department of Toxic Substances Control.

TABLE 1 – SOIL ANALYTICAL RESULTS – AERIALLY DEPOSITED LEAD, pH, AND GPS COORDINATES

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH	Latitude	Longitude
B16-4.0	4.0	5/27/2011	5.8				7.3		
B17-0.5	0.5	5/27/2011	ND<5.0					33.663790572	-117.750999738
B17-1.5	1.5	5/27/2011	ND<5.0						
B17-3	3.0	5/27/2011	ND<5.0						
B17-4	4.0	5/27/2011	ND<5.0						
B18-0.5	0.5	5/27/2011	ND<5.0					33.663414329	-117.750648334
B18-1.5	1.5	5/27/2011	ND<5.0						
B18-3	3.0	5/27/2011	ND<5.0						
B18-4	4.0	5/27/2011	5.3				7.4		
Maximum			8.4	--	--	--	8.3		
Average			6.4	--	--	--	7.8		
Minimum			ND<5.0	--	--	--	7.3		
Regulatory Limits			1411(1)	5(2)	1.5(3)	5(4)	5(5)		
Decontamination Water (mg/l)									
DECON	--	5/27/2011	ND<1.2						

Notes:
mg/kg – milligrams per kilogram
mg/l – milligrams per liter
TTLC – total lead for comparison to the Total Threshold Limit Concentration
WET – Waste Extraction Test
WET-citric – soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit Concentration
WET-DI – soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit Concentration
TCLP – soluble lead by the Toxicity Characteristic Leaching Procedure
ND – not detected above reporting limits presented in Appendix B
1 – Limit specified in addendum to Variance issued by the Department of Toxic Substance Control to Caltrans (DTSC) Variance, September 22, 2000; Addendum, December 2002; Addendum June 2008)
2 – Soluble Threshold Limit Concentration for California Hazardous Waste (California Code of Regulations [CCR] Title 22, Section 66261.24)
3 – Limit Specified by DTSC Variance
4 – Maximum concentration for the TCLP of Resource, Conservation, and Recovery Act (RCRA) hazardous waste (CCR Title 22, Section 66216.24)
5 – Minimum value specified by DTSC variance



REFERENCE: 2007 THOMAS GUIDE FOR LOS ANGELES/ORANGE COUNTIES, STREET GUIDE AND DIRECTORY

SCALE IN FEET

0 2400 4800

N

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Map © Rand McNally, R.L.07-S-129

Ninyo & Moore

PROJECT NO.	DATE
207384051	6/11

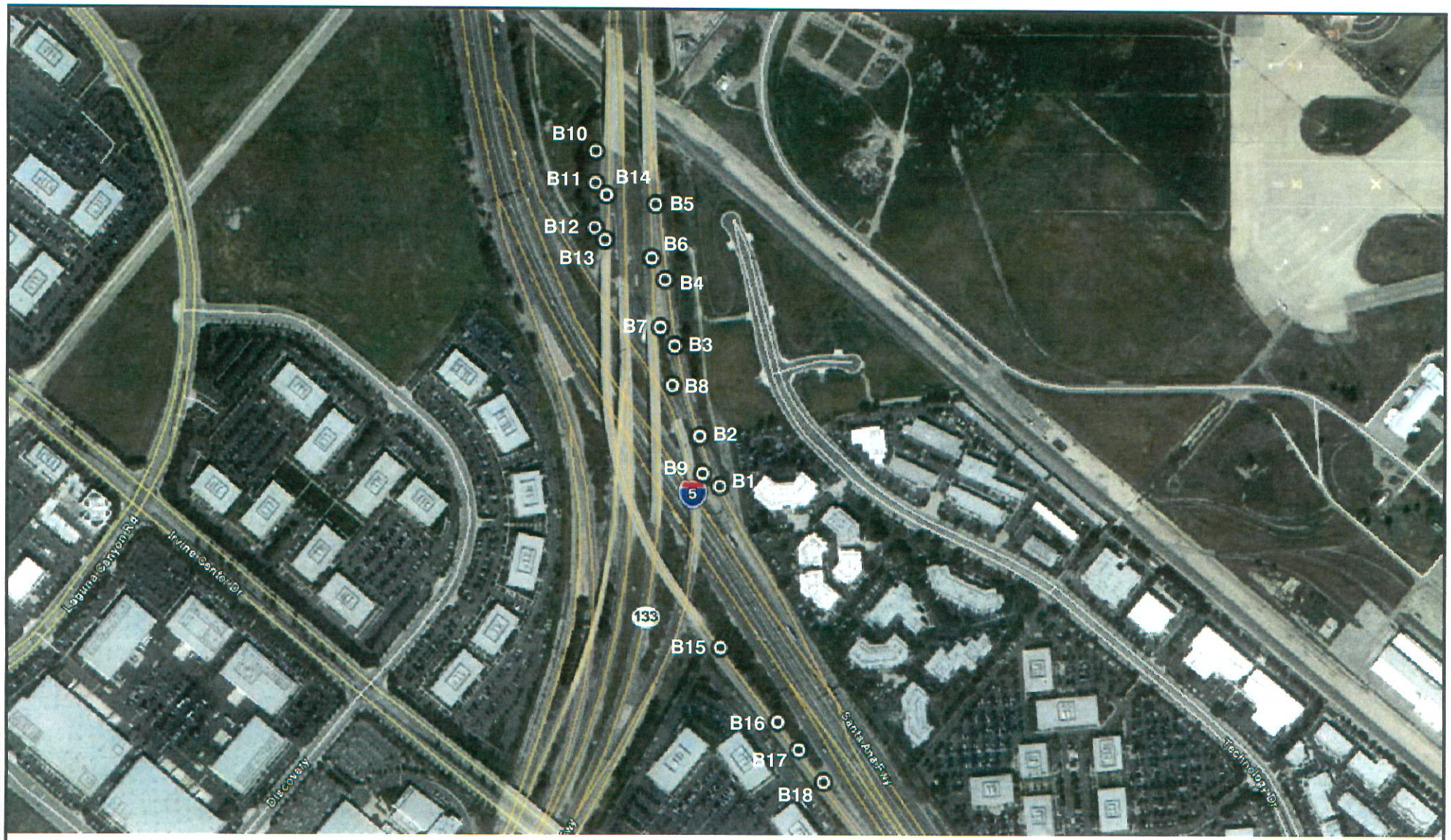
SITE LOCATION

SR-133 AND I-5 NORTHBOUND AND SOUTHBOUND CONNECTORS
IRVINE, CALIFORNIA

FIGURE

1

207384_A6.dwg....GK



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N

SCALE IN FEET

0 600 1,200

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2011.

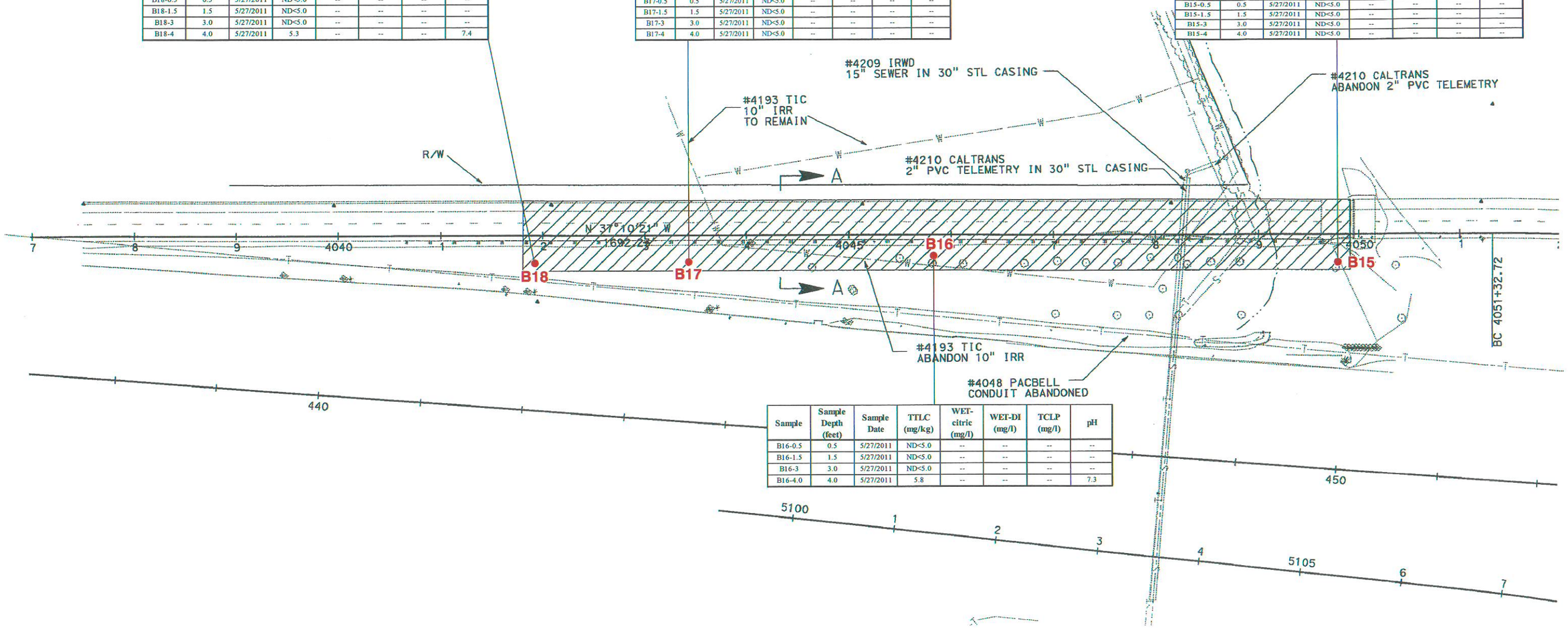
LEGEND	
B10	BORING

Ninyo & Moore		BORING LOCATIONS	FIGURE
PROJECT NO.	DATE	SR-133 AND I-5 NORTHBOUND AND SOUTHBOUND CONNECTORS IRVINE, CALIFORNIA	2
207384051	6/11		

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B18-0.5	0.5	5/27/2011	ND<5.0	--	--	--	--
B18-1.5	1.5	5/27/2011	ND<5.0	--	--	--	--
B18-3	3.0	5/27/2011	ND<5.0	--	--	--	--
B18-4	4.0	5/27/2011	5.3	--	--	--	7.4

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B17-0.5	0.5	5/27/2011	ND<5.0	--	--	--	--
B17-1.5	1.5	5/27/2011	ND<5.0	--	--	--	--
B17-3	3.0	5/27/2011	ND<5.0	--	--	--	--
B17-4	4.0	5/27/2011	ND<5.0	--	--	--	--

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B15-0.5	0.5	5/27/2011	ND<5.0	--	--	--	--
B15-1.5	1.5	5/27/2011	ND<5.0	--	--	--	--
B15-3	3.0	5/27/2011	ND<5.0	--	--	--	--
B15-4	4.0	5/27/2011	ND<5.0	--	--	--	--



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B16-0.5	0.5	5/27/2011	ND<5.0	--	--	--	--
B16-1.5	1.5	5/27/2011	ND<5.0	--	--	--	--
B16-3	3.0	5/27/2011	ND<5.0	--	--	--	--
B16-4.0	4.0	5/27/2011	5.8	--	--	--	7.3

LEGEND

mg/kg	Milligrams per kilogram	WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
mg/l	Milligrams per liter	TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
TTLC	Total Lead for comparison to the Total Threshold Limit Concentration	ND	Not detected above reporting limits presented in Appendix A
WET	Waste Extraction Test	NA	Not analyzed
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit Concentration	B15 ●	Boring

N

SCALE IN FEET

0 100 200

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: CALTRANS, DATED MARCH 15, 2011.

Ninyo & Moore

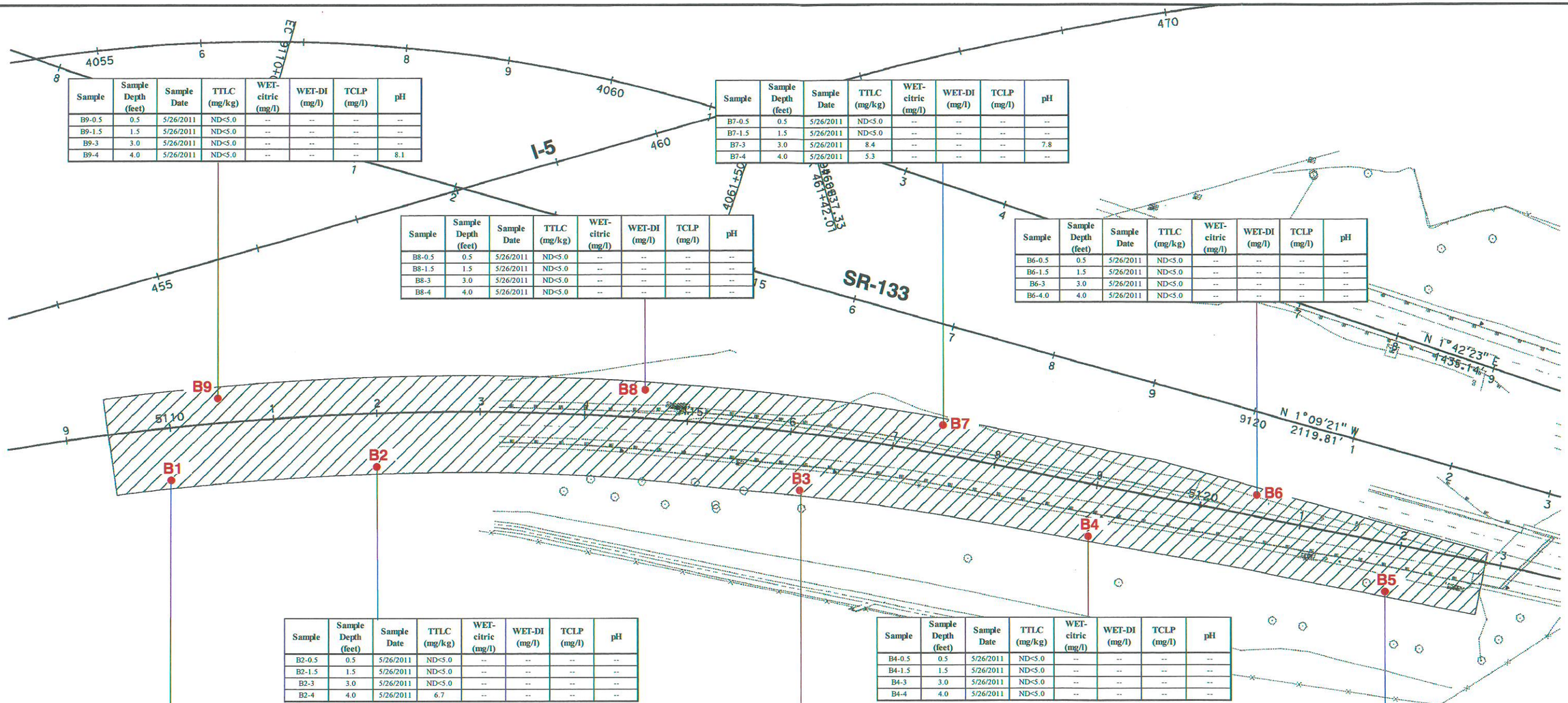
PROJECT NO.	DATE
207384051	6/11

BORING DATA

SR-133 AND I-5 NORTHBOUND AND SOUTHBOUND CONNECTORS
IRVINE, CALIFORNIA

FIGURE

3



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B9-0.5	0.5	5/26/2011	ND<5.0	--	--	--	--
B9-1.5	1.5	5/26/2011	ND<5.0	--	--	--	--
B9-3	3.0	5/26/2011	ND<5.0	--	--	--	--
B9-4	4.0	5/26/2011	ND<5.0	--	--	--	8.1

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B7-0.5	0.5	5/26/2011	ND<5.0	--	--	--	--
B7-1.5	1.5	5/26/2011	ND<5.0	--	--	--	--
B7-3	3.0	5/26/2011	8.4	--	--	--	7.8
B7-4	4.0	5/26/2011	5.3	--	--	--	--

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B8-0.5	0.5	5/26/2011	ND<5.0	--	--	--	--
B8-1.5	1.5	5/26/2011	ND<5.0	--	--	--	--
B8-3	3.0	5/26/2011	ND<5.0	--	--	--	--
B8-4	4.0	5/26/2011	ND<5.0	--	--	--	--

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B6-0.5	0.5	5/26/2011	ND<5.0	--	--	--	--
B6-1.5	1.5	5/26/2011	ND<5.0	--	--	--	--
B6-3	3.0	5/26/2011	ND<5.0	--	--	--	--
B6-4.0	4.0	5/26/2011	ND<5.0	--	--	--	--

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B2-0.5	0.5	5/26/2011	ND<5.0	--	--	--	--
B2-1.5	1.5	5/26/2011	ND<5.0	--	--	--	--
B2-3	3.0	5/26/2011	ND<5.0	--	--	--	--
B2-4	4.0	5/26/2011	6.7	--	--	--	--

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B4-0.5	0.5	5/26/2011	ND<5.0	--	--	--	--
B4-1.5	1.5	5/26/2011	ND<5.0	--	--	--	--
B4-3	3.0	5/26/2011	ND<5.0	--	--	--	--
B4-4	4.0	5/26/2011	ND<5.0	--	--	--	--

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B1-0.5	0.5	5/26/2011	ND<5.0	--	--	--	--
B1-1.5	1.5	5/26/2011	ND<5.0	--	--	--	--
B1-3	3.0	5/26/2011	5.5	--	--	--	--
B1-4	4.0	5/26/2011	6.7	--	--	--	--

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B3-0.5	0.5	5/26/2011	ND<5.0	--	--	--	--
B3-1.5	1.5	5/26/2011	ND<5.0	--	--	--	8.3
B3-3	3.0	5/26/2011	ND<5.0	--	--	--	--
B3-4.0	4.0	5/26/2011	ND<5.0	--	--	--	--

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B5-0.5	0.5	5/26/2011	ND<5.0	--	--	--	8.2
B5-1.5	1.5	5/26/2011	ND<5.0	--	--	--	--
B5-3	3.0	5/26/2011	ND<5.0	--	--	--	--
B5-4	4.0	5/26/2011	ND<5.0	--	--	--	--

SCALE IN FEET

0 100 200

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

LEGEND

mg/kg	Milligrams per kilogram	WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
mg/l	Milligrams per liter	TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
TTLC	Total Lead for comparison to the Total Threshold Limit Concentration	ND	Not detected above reporting limits presented in Appendix A
WET	Waste Extraction Test	NA	Not analyzed
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit Concentration	B1 ●	Boring

REFERENCE: CALTRANS, DATED MARCH 15, 2011.

Ninyo & Moore

PROJECT NO.	DATE
207384051	6/11

BORING DATA

SR-133 AND I-5 NORTHBOUND AND SOUTHBOUND CONNECTORS
IRVINE, CALIFORNIA

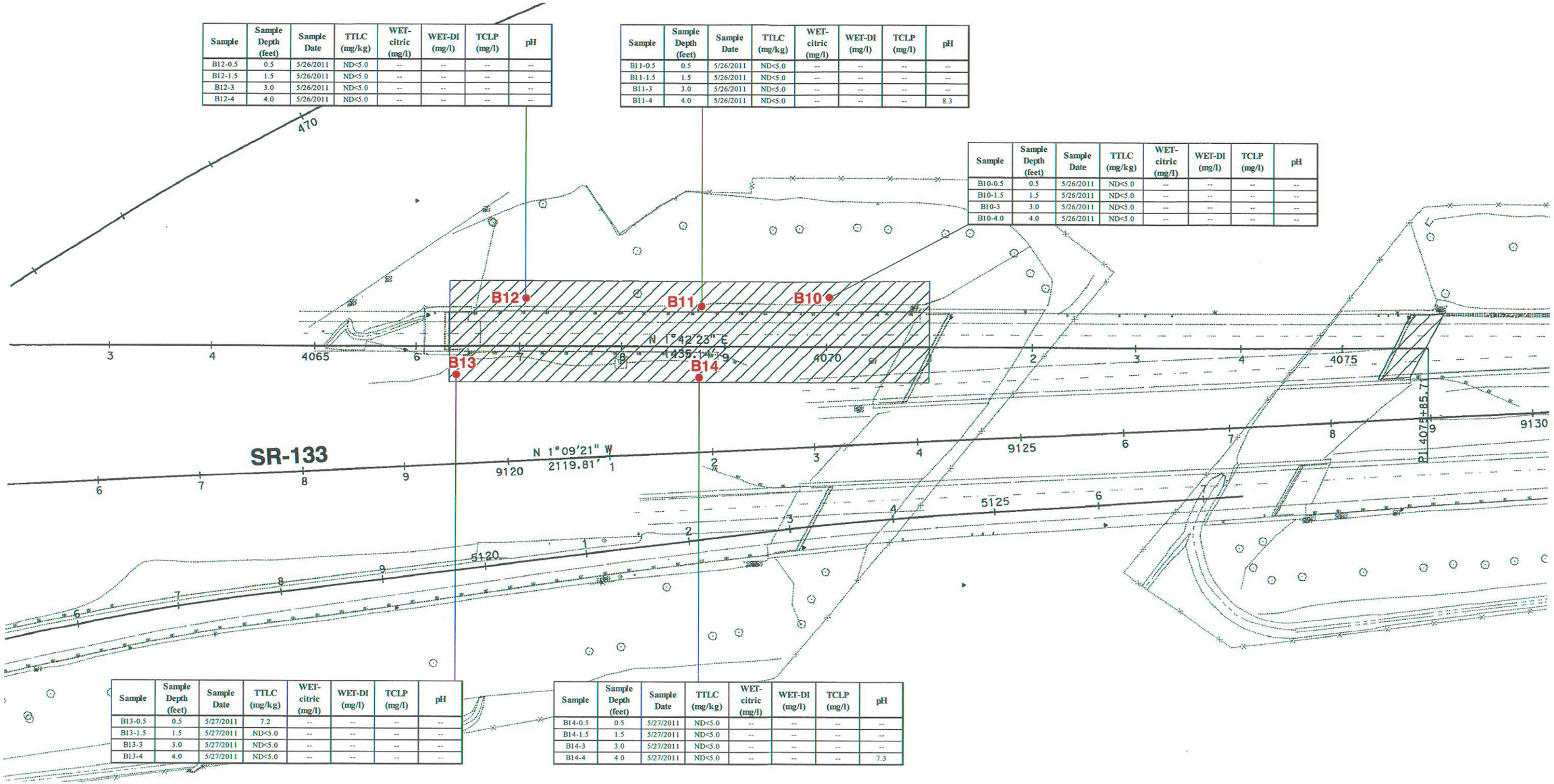
FIGURE

4

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B12-0.5	0.5	5/26/2011	ND<5.0	--	--	--	--
B12-1.5	1.5	5/26/2011	ND<5.0	--	--	--	--
B12-3	3.0	5/26/2011	ND<5.0	--	--	--	--
B12-4	4.0	5/26/2011	ND<5.0	--	--	--	--

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B11-0.5	0.5	5/26/2011	ND<5.0	--	--	--	--
B11-1.5	1.5	5/26/2011	ND<5.0	--	--	--	--
B11-3	3.0	5/26/2011	ND<5.0	--	--	--	--
B11-4	4.0	5/26/2011	ND<5.0	--	--	--	8.3

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B10-0.5	0.5	5/26/2011	ND<5.0	--	--	--	--
B10-1.5	1.5	5/26/2011	ND<5.0	--	--	--	--
B10-3	3.0	5/26/2011	ND<5.0	--	--	--	--
B10-4.0	4.0	5/26/2011	ND<5.0	--	--	--	--



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B13-0.5	0.5	5/27/2011	7.2	--	--	--	--
B13-1.5	1.5	5/27/2011	ND<5.0	--	--	--	--
B13-3	3.0	5/27/2011	ND<5.0	--	--	--	--
B13-4	4.0	5/27/2011	ND<5.0	--	--	--	--

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B14-0.5	0.5	5/27/2011	ND<5.0	--	--	--	--
B14-1.5	1.5	5/27/2011	ND<5.0	--	--	--	--
B14-3	3.0	5/27/2011	ND<5.0	--	--	--	--
B14-4	4.0	5/27/2011	ND<5.0	--	--	--	7.3

LEGEND

mg/kg	Milligrams per kilogram	WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
mg/l	Milligrams per liter	TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
TTLC	Total Lead for comparison to the Total Threshold Limit Concentration	ND	Not detected above reporting limits presented in Appendix A
WET	Waste Extraction Test	NA	Not analyzed
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit Concentration	B10 ●	Boring

N

SCALE IN FEET

0 100 200

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: CALTRANS, DATED MARCH 15, 2011.

Ninyo & Moore

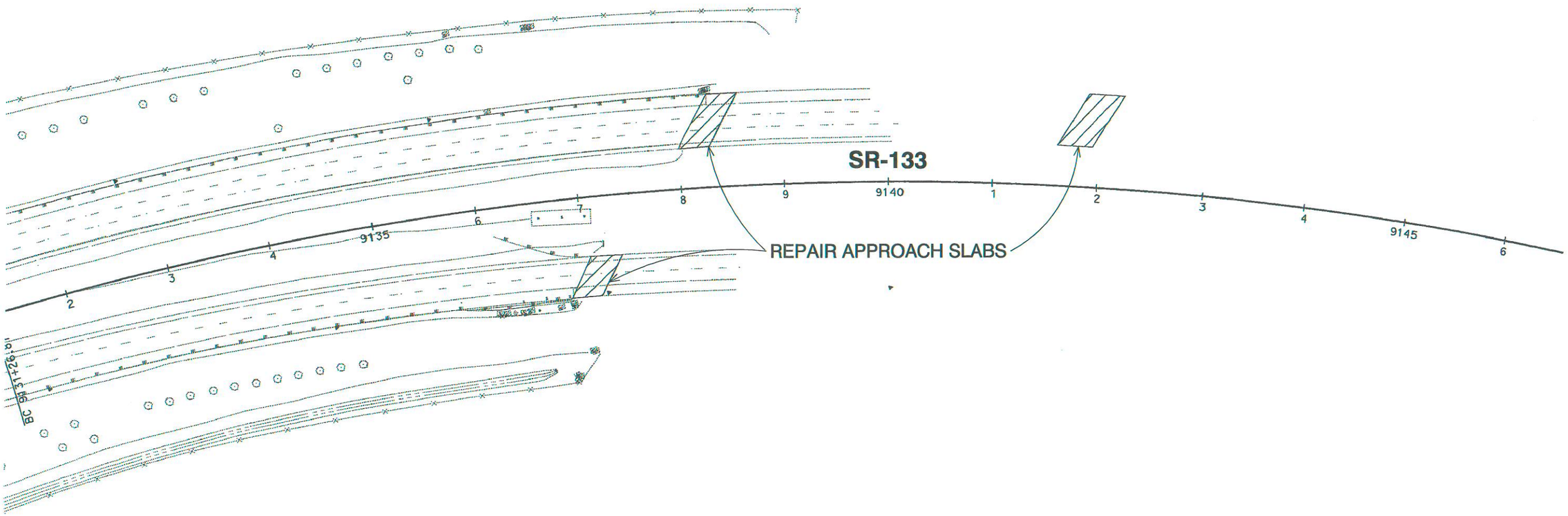
PROJECT NO.	DATE
207384051	6/11

BORING DATA

SR-133 AND I-5 NORTHBOUND AND SOUTHBOUND CONNECTORS
IRVINE, CALIFORNIA

FIGURE

5



SCALE IN FEET

0 100 200

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: CALTRANS, DATED MARCH 15, 2011.

Ninyo & Moore		BORING DATA	FIGURE
PROJECT NO.	DATE	SR-133 AND I-5 NORTHBOUND AND SOUTHBOUND CONNECTORS IRVINE, CALIFORNIA	6
207384051	6/11		

APPENDIX A

AERIALLY DEPOSITED LEAD SOIL MANAGEMENT CHART

AERIALLY DEPOSITED LEAD SOIL MANAGEMENT			
SOLUBLE LEAD (mg/l)	**TOTAL LEAD (mg/kg)**	**SOIL TYPE**	**HANDLING**
CALIFORNIA TESTING			
STLC <5.0	TTLC <1000	X	**Non-hazardous Waste**. Notify and require Lead Compliance Plan for worker safety.
	1000 – 1411 and DI WET < 1.5 mg/l	Y1	**Hazardous Waste. Variance applies** – cover with minimum 1 foot of clean soil.*
	1411 – 3397 and DI WET < 150 mg/l	Y2	**Hazardous Waste. Variance applies** – cover with pavement structure. *
	1000 – 3397 but Surplus	Z2	**Hazardous Waste** - Surplus. Dispose at Class 1 disposal site.
	> 3397 or 1000 – 3397 & DI WET > 150 mg/l	Z2	**Hazardous Waste** – not reusable under Variance. Dispose at Class 1 disposal site.
STLC >5.0	TTLC < 1411 and DI WET < 1.5 mg/l	Y1	**Hazardous Waste. Variance applies** – cover with minimum of 1 foot of clean soil.*
	1411 – 3397 and DI WET < 150 mg/l	Y2	**Hazardous Waste. Variance applies** – cover with pavement structure.*
	< 3397 and DI WET < 150 mg/l but Surplus	Z2	**Hazardous Waste** - Surplus. Dispose at Class 1 disposal site.
	> 3397 or DI WET > 150 mg/l	Z2	**Hazardous Waste** – not reusable under Variance. Dispose at Class 1 disposal site.
FEDERAL TESTING			
TCLP > 5.0 mg/l	N/A	Z3	**RCRA Hazardous Waste** Dispose at Class 1 disposal site as a RCRA waste regardless of TTLC and STLC results.

*Note: For hazardous waste levels of lead - if pH is less than 5.5 soil must be placed under a pavement structure. If pH is less than 5.0 variance can not be used and the soil must be disposed as Z-2 material.

APPENDIX B

LABORATORY REPORTS AND CHAIN-OF-CUSTODY DOCUMENTATION

June 03, 2011

ELAP No.: 1838
NELAP No.: 02107CA
CSDLAC No.: 10196
ORELAP No.: CA300003

Workorder No.: 118086

Beth Padgett
Ninyo & Moore
475 Goddard Suite 200
Irvine, CA 92618

TEL: (949) 678-0842
FAX: (949) 753-7071

RE: EA 0L4100, 207384051

Attention: Beth Padgett

Enclosed are the results for sample(s) received on May 26, 2011 by Advanced Technology Laboratories . The sample(s) are tested for the parameters as indicated in the enclosed chain of custody in accordance with the applicable laboratory certifications.

Thank you for the opportunity to service the needs of your company.

Please feel free to call me at (562)989-4045 if I can be of further assistance to your company.

Sincerely,

for Eddie F. Rodriguez
Laboratory Director

The cover letter is an integral part of this analytical report. This Laboratory Report cannot be reproduced in part or in its entirety without written permission from the client and Advanced Technology Laboratories.

Advanced Technology Laboratories
3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

Advanced Technology Laboratories

Date: 6/3/2011

ANALYTICAL RESULTS

LEAD BY ICP
EPA 6010B

CLIENT:	Ninyo & Moore	**Lab Order:**	118086
Project:	EA 0L4100, 207384051	**Date Received**	5/26/2011 4:20:00 PM
Project No:		**Matrix:**	Soil
Analyte:	Lead	**Analyst:**	SRB

Laboratory ID	Client Sample ID	Results	Units	QC Batch	MDL	PQL	Qual	DF	Date Collected	Date Analyzed
118086-001A	B1-0.5	ND	mg/Kg	73236	0.13	5.0		1	5/26/2011	6/2/2011
118086-002A	B1-1.5	ND	mg/Kg	73236	0.13	5.0		1	5/26/2011	6/2/2011
118086-003A	B1-3.0	5.5	mg/Kg	73236	0.13	5.0		1	5/26/2011	6/2/2011
118086-004A	B1-4.0	6.7	mg/Kg	73236	0.13	5.0		1	5/26/2011	6/2/2011
118086-005A	B2-0.5	ND	mg/Kg	73236	0.13	5.0		1	5/26/2011	6/2/2011
118086-006A	B2-1.5	ND	mg/Kg	73236	0.13	5.0		1	5/26/2011	6/2/2011
118086-007A	B2-3.0	ND	mg/Kg	73236	0.13	5.0		1	5/26/2011	6/2/2011
118086-008A	B2-4.0	6.7	mg/Kg	73236	0.13	5.0		1	5/26/2011	6/2/2011
118086-009A	B3-0.5	ND	mg/Kg	73236	0.13	5.0		1	5/26/2011	6/2/2011
118086-010A	B3-1.5	ND	mg/Kg	73236	0.13	5.0		1	5/26/2011	6/2/2011
118086-011A	B3-3.0	ND	mg/Kg	73236	0.13	5.0		1	5/26/2011	6/2/2011
118086-012A	B3-4.0	ND	mg/Kg	73236	0.13	5.0		1	5/26/2011	6/2/2011
118086-013A	B4-0.5	ND	mg/Kg	73236	0.13	5.0		1	5/26/2011	6/2/2011
118086-014A	B4-1.5	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-015A	B4-3.0	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-016A	B4-4.0	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-017A	B5-0.5	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-018A	B5-1.5	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

Advanced Technology Laboratories

Date: 6/3/2011

ANALYTICAL RESULTS

LEAD BY ICP
EPA 6010B

CLIENT:	Ninyo & Moore	**Lab Order:**	118086
Project:	EA 0L4100, 207384051	**Date Received**	5/26/2011 4:20:00 PM
Project No:		**Matrix:**	Soil
Analyte:	Lead	**Analyst:**	SRB

Laboratory ID	Client Sample ID	Results	Units	QC Batch	MDL	PQL	Qual	DF	Date Collected	Date Analyzed
118086-019A	B5-3.0	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-020A	B5-4.0	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-021A	B6-0.5	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-022A	B6-1.5	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-023A	B6-3.0	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-024A	B6-4.0	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-025A	B7-0.5	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-026A	B7-1.5	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-027A	B7-3.0	8.4	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-028A	B7-4.0	5.3	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-029A	B8-0.5	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-030A	B8-1.5	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-031A	B8-3.0	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-032A	B8-4.0	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-033A	B9-0.5	ND	mg/Kg	73238	0.13	5.0		1	5/26/2011	6/2/2011
118086-034A	B9-1.5	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011
118086-035A	B9-3.0	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011
118086-036A	B9-4.0	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

Advanced Technology Laboratories

Date: 6/3/2011

ANALYTICAL RESULTS

LEAD BY ICP
EPA 6010B

CLIENT: Ninyo & Moore
Project: EA 0L4100, 207384051
Project No:
Analyte: Lead

Lab Order: 118086
Date Received 5/26/2011 4:20:00 PM
Matrix: Soil
Analyst: SRB

Laboratory ID	Client Sample ID	Results	Units	QC Batch	MDL	PQL	Qual	DF	Date Collected	Date Analyzed
118086-037A	B10-0.5	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011
118086-038A	B10-1.5	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011
118086-039A	B10-3.0	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011
118086-040A	B10-4.0	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011
118086-041A	B11-0.5	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011
118086-042A	B11-1.5	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011
118086-043A	B11-3.0	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011
118086-044A	B11-4.0	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011
118086-045A	B12-0.5	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011
118086-046A	B12-1.5	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011
118086-047A	B12-3.0	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011
118086-048A	B12-4.0	ND	mg/Kg	73239	0.13	5.0		1	5/26/2011	6/2/2011

Qualifiers:
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference
- DO Surrogate Diluted Out
- E Value above quantitation range
- ND Not Detected at the Reporting Limit

Results are wet unless otherwise specified

Advanced Technology Laboratories

3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

Advanced Technology Laboratories

Date: 6/3/2011

ANALYTICAL RESULTS

pH
EPA 9045C

CLIENT:	Ninyo & Moore	**Lab Order:**	118086
Project:	EA 0L4100, 207384051	**Date Received**	5/26/2011 4:20:00 PM
Project No:		**Matrix:**	Soil
Analyte:	pH	**Analyst:**	PT

Laboratory ID	Client Sample ID	Results	Units	QC Batch	MDL	PQL	Qual	DF	Date Collected	Date Analyzed
118086-010A	B3-1.5	8.3	pH Units	R133466	0.10	0.10		1	5/26/2011	5/31/2011
118086-017A	B5-0.5	8.2	pH Units	R133466	0.10	0.10		1	5/26/2011	5/31/2011
118086-027A	B7-3.0	7.8	pH Units	R133466	0.10	0.10		1	5/26/2011	5/31/2011
118086-036A	B9-4.0	8.1	pH Units	R133466	0.10	0.10		1	5/26/2011	5/31/2011
118086-044A	B11-4.0	8.3	pH Units	R133466	0.10	0.10		1	5/26/2011	5/31/2011

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

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CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-73236A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **PBS** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179416**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.234	5.0									

Sample ID: **LCS-73236** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **LCSS** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179417**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	267.092	5.0	250.0	0.2343	107	80	120				

Sample ID: **118086-003A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **B1-3.0** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179421**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	5.029	5.0						5.483	8.63	20	

Sample ID: **118086-003A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **B1-3.0** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179422**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	205.785	5.0	250.0	5.483	80.1	34	126				

Sample ID: **MB-73236B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **PBS** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179430**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **118086-013A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **B4-0.5** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179434**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.973	5.0						2.298	0	20	

Sample ID: **118086-013A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **B4-0.5** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179435**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	212.285	5.0	250.0	2.298	84.0	34	126				

Sample ID: **118086-013A-MSD** SampType: **MSD** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **B4-0.5** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179436**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	221.296	5.0	250.0	2.298	87.6	34	126	212.3	4.16	20	

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

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CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-73238A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **PBS** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179495**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Sample ID: **LCS-73238** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **LCSS** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179496**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	268.638	5.0	250.0	0	107	80	120				

Sample ID: **118086-023A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **B6-3.0** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179507**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	1.435	5.0						2.059	0	20	

Sample ID: **118086-023A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **B6-3.0** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179508**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	204.471	5.0	250.0	2.059	81.0	34	126				

Sample ID: **MB-73238B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **PBS** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179509**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **118086-033A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **B9-0.5** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179520**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	3.248	5.0						2.881	0	20	

Sample ID: **118086-033A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **B9-0.5** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179521**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	211.380	5.0	250.0	2.881	83.4	34	126				

Sample ID: **118086-033A-MSD** SampType: **MSD** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **B9-0.5** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179522**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	215.447	5.0	250.0	2.881	85.0	34	126	211.4	1.91	20	

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

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CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-73239A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **PBS** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179667**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Sample ID: **LCS-73239** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **LCSS** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179668**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	266.335	5.0	250.0	0	107	80	120				

Sample ID: **118086-043A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **B11-3.0** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179679**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	3.777	5.0						3.673	0	20	

Sample ID: **118086-043A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **B11-3.0** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179680**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	206.981	5.0	250.0	3.673	81.3	34	126				

Sample ID: **MB-73239B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **PBS** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179681**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **118095-006A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **ZZZZZZ** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179692**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	30.688	5.0						30.53	0.529	20	

Sample ID: **118095-006A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **ZZZZZZ** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179693**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	263.237	5.0	250.0	30.53	93.1	34	126				

Sample ID: **118095-006A-MSD** SampType: **MSD** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **ZZZZZZ** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179694**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	247.936	5.0	250.0	30.53	87.0	34	126	263.2	5.99	20	

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

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CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 9045_S

Sample ID: **118095-037ADUP** SampType: **DUP** TestCode: **9045_S** Units: **pH Units** Prep Date: RunNo: **133466**
Client ID: **ZZZZZZ** Batch ID: **R133466** TestNo: **EPA 9045C** Analysis Date: **5/31/2011** SeqNo: **2177835**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	8.120	0.10						8.130	0.123	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

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CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-73236A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **PBS** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179416**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.234	5.0									

Sample ID: **LCS-73236** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **LCSS** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179417**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	267.092	5.0	250.0	0.2343	107	80	120				

Sample ID: **118086-003A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **B1-3.0** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179421**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	5.029	5.0						5.483	8.63	20	

Sample ID: **118086-003A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **B1-3.0** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179422**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	205.785	5.0	250.0	5.483	80.1	34	126				

Sample ID: **MB-73236B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **PBS** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179430**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **118086-013A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **B4-0.5** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179434**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.973	5.0						2.298	0	20	

Sample ID: **118086-013A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **B4-0.5** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179435**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	212.285	5.0	250.0	2.298	84.0	34	126				

Sample ID: **118086-013A-MSD** SampType: **MSD** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133530**
Client ID: **B4-0.5** Batch ID: **73236** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179436**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	221.296	5.0	250.0	2.298	87.6	34	126	212.3	4.16	20	

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

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CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-73238A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **PBS** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179495**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Sample ID: **LCS-73238** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **LCSS** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179496**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	268.638	5.0	250.0	0	107	80	120				

Sample ID: **118086-023A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **B6-3.0** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179507**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	1.435	5.0						2.059	0	20	

Sample ID: **118086-023A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **B6-3.0** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179508**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	204.471	5.0	250.0	2.059	81.0	34	126				

Sample ID: **MB-73238B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **PBS** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179509**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **118086-033A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **B9-0.5** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179520**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	3.248	5.0						2.881	0	20	

Sample ID: **118086-033A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **B9-0.5** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179521**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	211.380	5.0	250.0	2.881	83.4	34	126				

Sample ID: **118086-033A-MSD** SampType: **MSD** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133531**
Client ID: **B9-0.5** Batch ID: **73238** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179522**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	215.447	5.0	250.0	2.881	85.0	34	126	211.4	1.91	20	

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-73239A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **PBS** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179667**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Sample ID: **LCS-73239** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **LCSS** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179668**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	266.335	5.0	250.0	0	107	80	120				

Sample ID: **118086-043A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **B11-3.0** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179679**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	3.777	5.0						3.673	0	20	

Sample ID: **118086-043A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **B11-3.0** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179680**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	206.981	5.0	250.0	3.673	81.3	34	126				

Sample ID: **MB-73239B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **PBS** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179681**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **118095-006A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **ZZZZZZ** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179692**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	30.688	5.0						30.53	0.529	20	

Sample ID: **118095-006A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **ZZZZZZ** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179693**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	263.237	5.0	250.0	30.53	93.1	34	126				

Sample ID: **118095-006A-MSD** SampType: **MSD** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133542**
Client ID: **ZZZZZZ** Batch ID: **73239** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/2/2011** SeqNo: **2179694**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	247.936	5.0	250.0	30.53	87.0	34	126	263.2	5.99	20	

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Ninyo & Moore
Work Order: 118086
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 9045_S

Sample ID: **118095-037ADUP** SampType: **DUP** TestCode: **9045_S** Units: **pH Units** Prep Date: RunNo: **133466**
Client ID: **ZZZZZZ** Batch ID: **R133466** TestNo: **EPA 9045C** Analysis Date: **5/31/2011** SeqNo: **2177835**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	8.120	0.10						8.130	0.123	20	

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

LABORATORY:	SITE: SR-133 and I-5 NB and SB Connectors	CONSULTANT:
Advanced Technology Laboratories 3275 Walnut Avenue Signal Hill, CA 90807 (562) 989-4045 / fax (562) 989-4040	Irvine, California EA 0L4100 Project Number 207384051	Ninyo & Moore 475 Goddard, Suite 200 Irvine, CA 92618 (949) 753-7070/fax (949) 753-7071

Special Instructions: FAX copy TO BETH PAdgett (949) ~~749~~ 753 7071

Homogonize the samples

If total lead is <1,000 mg/kg, but >/= 50 mg/kg, run STLC WET test (citric acid extraction EPA Method 7000 series)

If STLC WET >/= 5 mg/l, run STLC-DI (DI extraction EPA Method 7000 series)

If total lead is >/=1,000 mg/kg or STLC WET >/=5 mg/l, run TCLP (EPA Method 7000 series for leachable lead)

Samplers Name: Jesus Villanueva

Relinquished by (name/date and time):	Received by (name/date and time):
Jesus Villanueva 5/26/11 ~~1617~~ 1620	Mang 5/26/11 1620
Relinquished by (name/date and time):	Received by (name/date and time):
Relinquished by (name/date and time):	Received by (name/date and time):
Relinquished by (name/date and time):	Received by (name/date and time):

Lab No.	Sample I. D.	Date	Time	Total Lead EPA Method 6010	pH EPA Method 9045	Sample Type	Turn-Around Time	Container Type	HOLD
	ADL1-0.5	5/26/11	0827	X		Soil	Normal	Glass Jar	
	ADL1-1.5		0831	X		Soil	Normal	Glass Jar	
	ADL1-3.0		0836	X		Soil	Normal	Glass Jar	
	ADL1-4.0		0841	X		Soil	Normal	Glass Jar	
	ADL2-0.5		0855	X		Soil	Normal	Glass Jar	
	ADL2-1.5		0859	X		Soil	Normal	Glass Jar	
	ADL2-3.0		0905	X		Soil	Normal	Glass Jar	
	ADL2-4.0		0913	X		Soil	Normal	Glass Jar	
	ADL3-0.5		0940	X		Soil	Normal	Glass Jar	
	ADL3-1.5		0943	X	X	Soil	Normal	Glass Jar	
	ADL3-3.0		0949	X		Soil	Normal	Glass Jar	
	ADL3-4.0		0957	X		Soil	Normal	Glass Jar	
	~~ADL001~~			X		~~Soil~~	~~Normal~~	~~Glass Jar~~	JV
	ADL4-0.5		1012	X		Soil	Normal	Glass Jar	
	ADL4-1.5		1016	X		Soil	Normal	Glass Jar	
	ADL4-3.0		1020	X		Soil	Normal	Glass Jar	
	ADL4-4.0		1025	X		Soil	Normal	Glass Jar	
	ADL5-0.5		1034	X	X	Soil	Normal	Glass Jar	
	ADL5-1.5		1044	X		Soil	Normal	Glass Jar	
	ADL5-3.0		1047	X		Soil	Normal	Glass Jar	
	ADL5-4.0		1050	X		Soil	Normal	Glass Jar	
	~~ADL002~~			X		~~Soil~~	~~Normal~~	~~Glass Jar~~	JV
	ADL6-0.5		1132	X		Soil	Normal	Glass Jar	
	ADL6-1.5		1135	X		Soil	Normal	Glass Jar	
	ADL6-3.0		1139	X		Soil	Normal	Glass Jar	
	ADL6-4.0		1144	X		Soil	Normal	Glass Jar	
	ADL7-0.5		1158	X		Soil	Normal	Glass Jar	
	ADL7-1.5		1203	X		Soil	Normal	Glass Jar	
	ADL7-3.0		1207	X	X	Soil	Normal	Glass Jar	
	ADL7-4.0		1210	X		Soil	Normal	Glass Jar	
	ADL8-0.5		1225	X		Soil	Normal	Glass Jar	
	ADL8-1.5		1232	X		Soil	Normal	Glass Jar	
	ADL8-3.0		1235	X		Soil	Normal	Glass Jar	
	ADL8-4.0		~~1238~~	X		Soil	Normal	Glass Jar	
	~~ADL003~~			X		~~Soil~~	~~Normal~~	~~Glass Jar~~	JV
	ADL9-0.5		1252	X		Soil	Normal	Glass Jar	
	ADL9-1.5		1258	X		Soil	Normal	Glass Jar	
	ADL9-3.0		1302	X		Soil	Normal	Glass Jar	
	ADL9-4.0		1308	X	X	Soil	Normal	Glass Jar	
	~~ADL004~~			X		~~Soil~~	~~Normal~~	~~Glass Jar~~	JV
	ADL10-0.5		1333	X		Soil	Normal	Glass Jar	
	ADL10-1.5		1336	X		Soil	Normal	Glass Jar	
	ADL10-3.0		1340	X		Soil	Normal	Glass Jar	
	ADL10-4.0		1344	X		Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	JS/
						water	Normal	Plastic	

LABORATORY:	SITE: SR-133 and I-5 NB and SB Connectors	CONSULTANT:
Advanced Technology Laboratories 3275 Walnut Avenue Signal Hill, CA 90807 (562) 989-4045 / fax (562) 989-4040	Irvine, California EA 0L4100 Project Number 207384051	Ninyo & Moore 475 Goddard, Suite 200 Irvine, CA 92618 (949) 753-7070/fax (949) 753-7071

Special Instructions:

Homogonize the samples

If total lead is <1,000 mg/kg, but >/= 50 mg/kg, run STLC WET test (citric acid extraction EPA Method 7000 series)

If STLC WET >/= 5 mg/l, run STLC-DI (DI extraction EPA Method 7000 series)

If total lead is >/=1,000 mg/kg or STLC WET >/=5 mg/l, run TCLP (EPA Method 7000 series for leachable lead)

Samplers Name: Jesus Villanueva

Relinquished by (name/date and time):	Received by (name/date and time):
[signature] 5/26/11 1620	[signature] 5/26/11 1620
Relinquished by (name/date and time):	Received by (name/date and time):
Relinquished by (name/date and time):	Received by (name/date and time):
Relinquished by (name/date and time):	Received by (name/date and time):

Lab No.	Sample I. D.	Date	Time	Total Lead EPA Method 6010	pH EPA Method 9045	Sample Type	Turn-Around Time	Container Type	HOLD
	ADL11-0.5	5/26/11	1359	X		Soil	Normal	Glass Jar	
	ADL11-1.5	↓	1402	X		Soil	Normal	Glass Jar	
	ADL11-3.0		1407	X		Soil	Normal	Glass Jar	
	ADL11-4.0		1411	X	X	Soil	Normal	Glass Jar	
	~~ADL005~~			~~X~~		~~Soil~~	~~Normal~~	~~Glass Jar~~	JV
	ADL12-0.5		1422			Soil	Normal	Glass Jar	
	ADL12-1.5		1424			Soil	Normal	Glass Jar	
	ADL12-3.0		1427			Soil	Normal	Glass Jar	
	ADL12-4.0	↓	1429			Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
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						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						water	Normal	Plastic	

June 06, 2011

ELAP No.: 1838
NELAP No.: 02107CA
CSDLAC No.: 10196
ORELAP No.: CA300003

Workorder No.: 118123

Beth Padgett
Ninyo & Moore
475 Goddard Suite 200
Irvine, CA 92618

TEL: (949) 678-0842
FAX: (949) 753-7071

RE: EA 0L4100, 207384051

Attention: Beth Padgett

Enclosed are the results for sample(s) received on May 27, 2011 by Advanced Technology Laboratories . The sample(s) are tested for the parameters as indicated in the enclosed chain of custody in accordance with the applicable laboratory certifications.

Thank you for the opportunity to service the needs of your company.

Please feel free to call me at (562)989-4045 if I can be of further assistance to your company.

Sincerely,

Eddie F. Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and cannot be reproduced in part or in its entirety without written permission from the client and Advanced Technology Laboratories.

Advanced Technology Laboratories
3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

Advanced Technology Laboratories

Date: *06-Jun-11*

CLIENT: Ninyo & Moore
Project: EA 0L4100, 207384051
Lab Order: 118123

CASE NARRATIVE

Analytical Comments for EPA 6010B

Sample 118123-025A, dilution was necessary due to sample matrix.

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

Advanced Technology Laboratories

Date: 6/15/2011

ANALYTICAL RESULTS

LEAD BY ICP
EPA 6010B

CLIENT:	Ninyo & Moore	**Lab Order:**	118123
Project:	EA 0L4100, 207384051	**Date Received**	5/27/2011 6:00:00 PM
Project No:		**Matrix:**	Soil
Analyte:	Lead	**Analyst:**	SRB

Laboratory ID	Client Sample ID	Results	Units	QC Batch	PQL	DF	Date Collected	Date Analyzed
118123-001A	B13-0.5	7.2	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-002A	B13-1.5	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-003A	B13-3.0	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-004A	B13-4.0	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-005A	B14-0.5	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-006A	B14-1.5	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-007A	B14-3.0	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-008A	B14-4.0	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-009A	B15-0.5	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-010A	B15-1.5	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-011A	B15-3.0	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-012A	B15-4.0	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-013A	B16-0.5	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-014A	B16-1.5	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-015A	B16-3.0	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-016A	B16-4.0	5.8	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-017A	B17-0.5	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-018A	B17-1.5	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

Advanced Technology Laboratories

Date: 6/15/2011

ANALYTICAL RESULTS

LEAD BY ICP
EPA 6010B

CLIENT:	Ninyo & Moore	**Lab Order:**	118123
Project:	EA 0L4100, 207384051	**Date Received**	5/27/2011 6:00:00 PM
Project No:		**Matrix:**	Soil
Analyte:	Lead	**Analyst:**	SRB

Laboratory ID	Client Sample ID	Results	Units	QC Batch	PQL	DF	Date Collected	Date Analyzed
118123-019A	B17-3.0	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-020A	B17-4.0	ND	mg/Kg	73258	5.0	1	5/27/2011	6/3/2011
118123-021A	B18-0.5	ND	mg/Kg	73259	5.0	1	5/27/2011	6/3/2011
118123-022A	B18-1.5	ND	mg/Kg	73259	5.0	1	5/27/2011	6/3/2011
118123-023A	B18-3.0	ND	mg/Kg	73259	5.0	1	5/27/2011	6/3/2011
118123-024A	B18-4.0	5.3	mg/Kg	73259	5.0	1	5/27/2011	6/3/2011

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

Advanced Technology Laboratories

Date: 6/15/2011

ANALYTICAL RESULTS

pH
EPA 9045C

CLIENT:	Ninyo & Moore	**Lab Order:**	118123
Project:	EA 0L4100, 207384051	**Date Received**	5/27/2011 6:00:00 PM
Project No:		**Matrix:**	Soil
Analyte:	pH	**Analyst:**	PT

Laboratory ID	Client Sample ID	Results	Units	QC Batch	PQL	DF	Date Collected	Date Analyzed
118123-008A	B14-4.0	7.3	pH Units	R133467	0.10	1	5/27/2011	5/31/2011
118123-016A	B16-4.0	7.3	pH Units	R133467	0.10	1	5/27/2011	5/31/2011
118123-024A	B18-4.0	7.4	pH Units	R133467	0.10	1	5/27/2011	5/31/2011

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

CLIENT: Ninyo & Moore
Work Order: 118123
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-73258A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133571**
Client ID: **PBS** Batch ID: **73258** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180350**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.193	5.0									

Sample ID: **LCS-73258** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133571**
Client ID: **LCSS** Batch ID: **73258** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180351**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	267.989	5.0	250.0	0.1930	107	80	120				

Sample ID: **118123-010A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133571**
Client ID: **B15-1.5** Batch ID: **73258** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180362**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	4.309	5.0						3.425	0	20	

Sample ID: **118123-010A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133571**
Client ID: **B15-1.5** Batch ID: **73258** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180363**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	218.387	5.0	250.0	3.425	86.0	34	126				

Sample ID: **MB-73258B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133571**
Client ID: **PBS** Batch ID: **73258** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180364**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.894	5.0									

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Ninyo & Moore
Work Order: 118123
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **118123-020A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133571**
Client ID: **B17-4.0** Batch ID: **73258** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180375**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.843	5.0						3.315	0	20	

Sample ID: **118123-020A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133571**
Client ID: **B17-4.0** Batch ID: **73258** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180376**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	212.010	5.0	250.0	3.315	83.5	34	126				

Sample ID: **118123-020A-MSD** SampType: **MSD** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133571**
Client ID: **B17-4.0** Batch ID: **73258** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180377**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	204.630	5.0	250.0	3.315	80.5	34	126	212.0	3.54	20	

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Ninyo & Moore
Work Order: 118123
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-73259A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133572**
Client ID: **PBS** Batch ID: **73259** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180378**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Sample ID: **LCS-73259** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133572**
Client ID: **LCSS** Batch ID: **73259** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180379**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	256.459	5.0	250.0	0	103	80	120				

Sample ID: **118126-006A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133572**
Client ID: **ZZZZZZ** Batch ID: **73259** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180390**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	192.540	5.0						201.7	4.65	20	

Sample ID: **118126-006A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133572**
Client ID: **ZZZZZZ** Batch ID: **73259** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180391**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	414.823	5.0	250.0	201.7	85.2	34	126				

Sample ID: **MB-73259B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133572**
Client ID: **PBS** Batch ID: **73259** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180392**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.531	5.0									

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Ninyo & Moore
Work Order: 118123
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **118126-016A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133572**
Client ID: **ZZZZZZ** Batch ID: **73259** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180403**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	18.544	5.0						18.25	1.62	20	

Sample ID: **118126-016A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133572**
Client ID: **ZZZZZZ** Batch ID: **73259** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180404**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	227.881	5.0	250.0	18.25	83.9	34	126				

Sample ID: **118126-016A-MSD** SampType: **MSD** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **6/1/2011** RunNo: **133572**
Client ID: **ZZZZZZ** Batch ID: **73259** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **6/3/2011** SeqNo: **2180405**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	235.668	5.0	250.0	18.25	87.0	34	126	227.9	3.36	20	

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Ninyo & Moore
Work Order: 118123
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_WPB

Sample ID: **LCS-73317** SampType: **LCS** TestCode: **6010_WPB** Units: **mg/L** Prep Date: **6/3/2011** RunNo: **133599**
Client ID: **LCSW** Batch ID: **73317** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **6/3/2011** SeqNo: **2181026**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	1.020	0.25	1.000	0	102	85	115				

Sample ID: **118123-025A-DUP** SampType: **DUP** TestCode: **6010_WPB** Units: **mg/L** Prep Date: **6/3/2011** RunNo: **133599**
Client ID: **DECON** Batch ID: **73317** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **6/3/2011** SeqNo: **2181028**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	1.2						0.004941	0	20	

Sample ID: **MB-73317** SampType: **MBLK** TestCode: **6010_WPB** Units: **mg/L** Prep Date: **6/3/2011** RunNo: **133599**
Client ID: **PBW** Batch ID: **73317** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **6/3/2011** SeqNo: **2181029**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.25									

Sample ID: **118123-025A-MS** SampType: **MS** TestCode: **6010_WPB** Units: **mg/L** Prep Date: **6/3/2011** RunNo: **133599**
Client ID: **DECON** Batch ID: **73317** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **6/3/2011** SeqNo: **2181030**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.654	1.2	2.500	0.004941	106	80	118				

Sample ID: **118123-025A-MSD** SampType: **MSD** TestCode: **6010_WPB** Units: **mg/L** Prep Date: **6/3/2011** RunNo: **133599**
Client ID: **DECON** Batch ID: **73317** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **6/3/2011** SeqNo: **2181031**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.540	1.2	2.500	0.004941	101	80	118	2.654	4.40	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

CLIENT: Ninyo & Moore
Work Order: 118123
Project: EA 0L4100, 207384051

ANALYTICAL QC SUMMARY REPORT

TestCode: 9045_S

Sample ID: **118049-010ADUP** SampType: **DUP** TestCode: **9045_S** Units: **pH Units** Prep Date: RunNo: **133467**
Client ID: **ZZZZZZ** Batch ID: **R133467** TestNo: **EPA 9045C** Analysis Date: **5/31/2011** SeqNo: **2177839**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	6.590	0.10						6.610	0.303	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

LABORATORY:	SITE: SR-133 and I-5 NB and SB Connectors	CONSULTANT:
Advanced Technology Laboratories 3275 Walnut Avenue Signal Hill, CA 90807 (562) 989-4045 / fax (562) 989-4040	Irvine, California EA 0L4100 Project Number 207384051	Ninyo & Moore 475 Goddard, Suite 200 Irvine, CA 92618 (949) 753-7070/fax (949) 753-7071

Special Instructions:

Homogonize the samples

If total lead is <1,000 mg/kg, but >/= 50 mg/kg, run STLC WET test (citric acid extraction EPA Method 7000 series)

If STLC WET >/= 5 mg/l, run STLC-DI (DI extraction EPA Method 7000 series)

If total lead is >/=1,000 mg/kg or STLC WET >/=5 mg/l, run TCLP (EPA Method 7000 series for leachable lead)

Samplers Name: JESUS Villanueva 5/27/11

Relinquished by (name/date and time):	Received by (name/date and time):
5/27/11 1355	5/27/11 1355
Relinquished by (name/date and time): 5/27/11 1800	Received by (name/date and time): FPDWA 5/27/11 1800
Relinquished by (name/date and time):	Received by (name/date and time):
Relinquished by (name/date and time):	Received by (name/date and time):

Lab No.	Sample I. D.	Date	Time	Total Lead EPA Method 6010	pH EPA Method 9045	Sample Type	Turn-Around Time	Container Type	HOLD
	ADL13-0.5	5/27/11	0809	X		Soil	Normal	Glass Jar	
	ADL13-1.5		0813	X		Soil	Normal	Glass Jar	
	ADL13-3.0		0819	X		Soil	Normal	Glass Jar	
	ADL13-4.0		0822	X		Soil	Normal	Glass Jar	
	ADL14-0.5		0834	X		Soil	Normal	Glass Jar	
	ADL14-1.5		0839	X		Soil	Normal	Glass Jar	
	ADL14-3.0		0844	X		Soil	Normal	Glass Jar	
	ADL14-4.0		0848	X	X	Soil	Normal	Glass Jar	
	ADL15-0.5		0935	X		Soil	Normal	Glass Jar	
	ADL15-1.5		0940	X		Soil	Normal	Glass Jar	
	ADL15-3.0		0945	X		Soil	Normal	Glass Jar	
	ADL15-4.0		0948	X		Soil	Normal	Glass Jar	
	ADL16-0.5		1005	X		Soil	Normal	Glass Jar	
	ADL16-1.5		1010	X		Soil	Normal	Glass Jar	
	ADL16-3.0		1030	X		Soil	Normal	Glass Jar	
	ADL16-4.0		1034	X	X	Soil	Normal	Glass Jar	
	ADL17-0.5		1043	X		Soil	Normal	Glass Jar	
	ADL17-1.5		1047	X		Soil	Normal	Glass Jar	
	ADL17-3.0		1050	X		Soil	Normal	Glass Jar	
	ADL17-4.0		1054	X		Soil	Normal	Glass Jar	
	ADL18-0.5		1128	X		Soil	Normal	Glass Jar	
	ADL18-1.5		1132	X		Soil	Normal	Glass Jar	
	ADL18-3.0		1136	X		Soil	Normal	Glass Jar	
	ADL18-4.0		1140	X	X	Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
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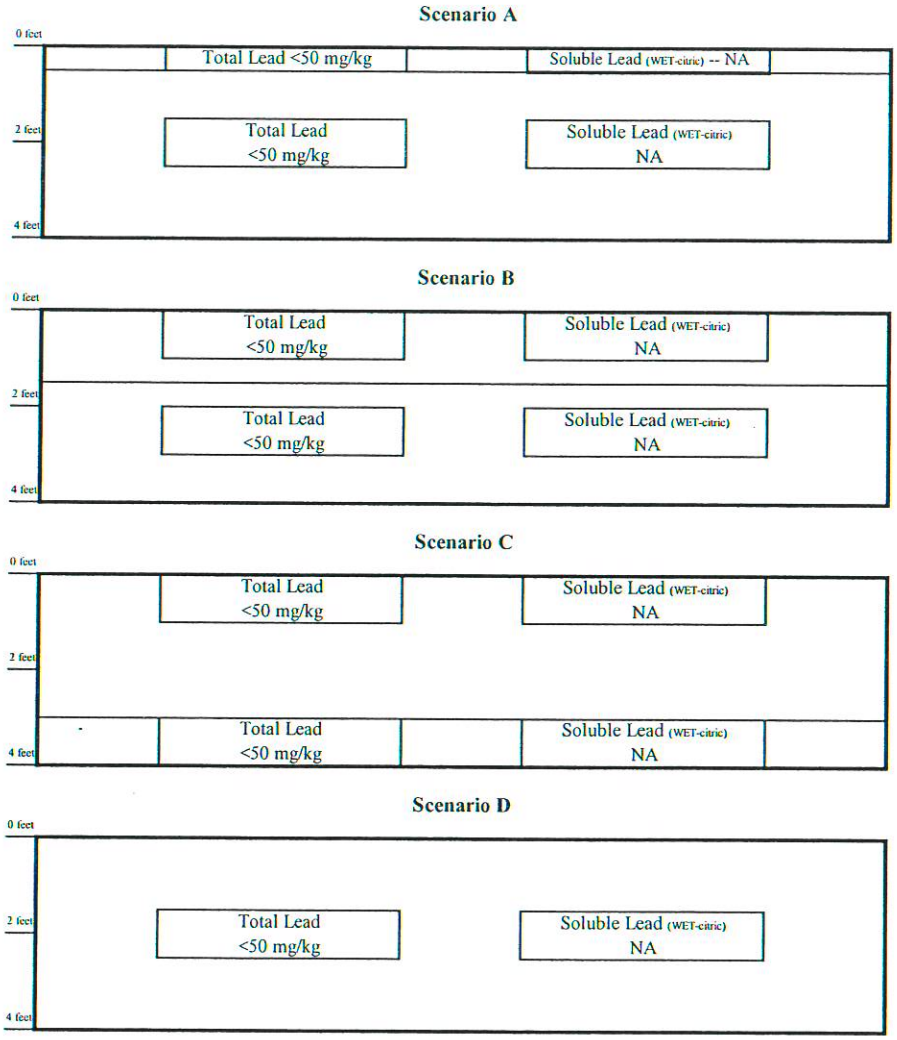
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
	DECON	5/27/11	1200	X		water	Normal	Plastic	

APPENDIX C

BLOCK DIAGRAMS

FIGURE C1 – BLOCK DIAGRAM FOR POTENTIAL DEPARTMENT RIGHT-OF-WAY RE-USE



– Non-hazardous soil with respect to total and soluble lead

– Reuse Condition 1 [Hazardous. Variance applies. Use material on job site. Place a minimum of 5 feet above maximum water table elevation and cover with at least 1 foot of non-hazardous soil]

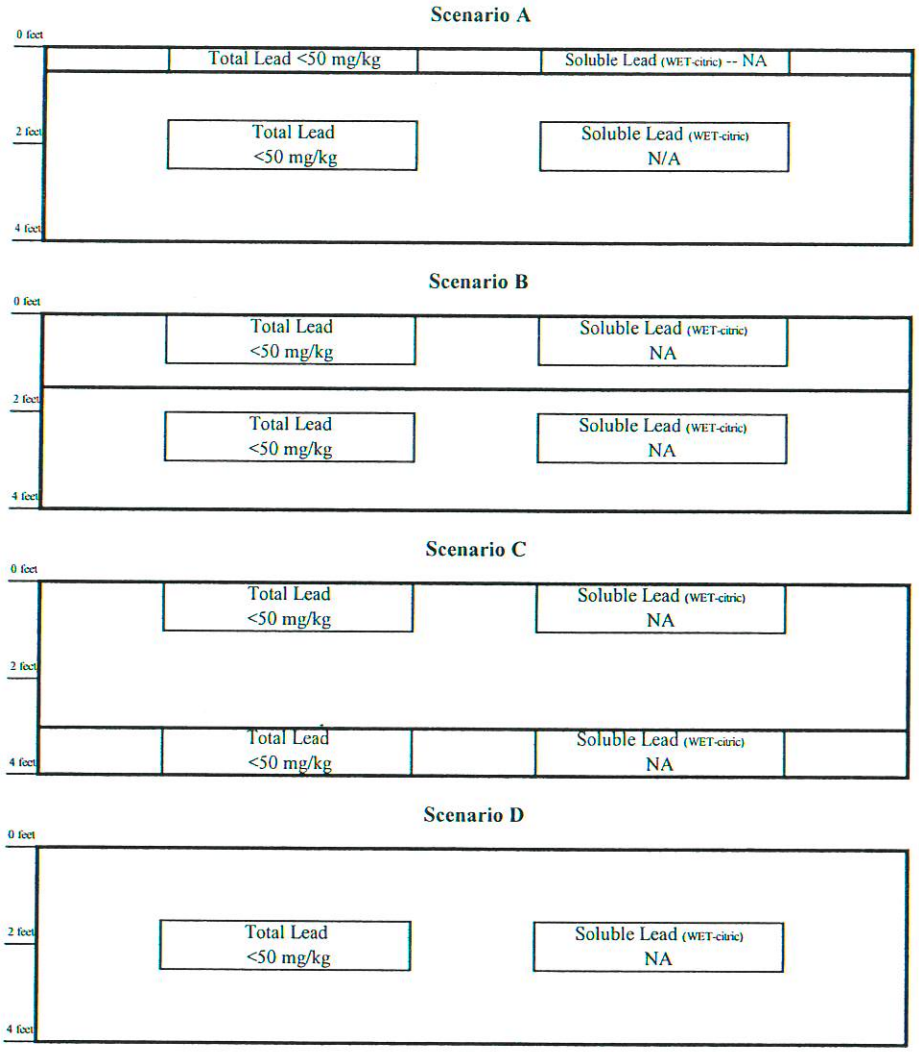
– Reuse Condition 2 [Hazardous. Variance applies. Use material on job site. Place a minimum of 5 feet above maximum water table elevation and protect from infiltration with a pavement structure which will be maintained by the Department]

– Hazardous. Class 1 disposal site, all other Title 22 CCR requirements apply

– Hazardous. Class 1 disposal site RCRA based on the layer having a TCLP value ≥ 5 mg/l

UCL – upper confidence limit
WET-DI – soluble lead using the Waste Extraction Test with deionized water
WET-citric acid – soluble lead using the Waste Extraction Test with citric acid
TCLP – Toxicity Characteristic Leaching Procedure
mg/kg – milligrams per kilogram
mg/l – milligrams per liter
CCR – California Code of Regulations
RCRA – Resource, Conservation, and Recovery Act
NA – not applicable

FIGURE C2 – BLOCK DIAGRAM FOR POTENTIAL DEPARTMENT OFF SITE DISPOSAL



– Non-hazardous soil with respect to total and soluble lead

– Reuse Condition 1 [Hazardous. Variance applies. Use material on job site. Place a minimum of 5 feet above maximum water table elevation and cover with at least 1 foot of non-hazardous soil]

– Reuse Condition 2 [Hazardous. Variance applies. Use material on job site. Place a minimum of 5 feet above maximum water table elevation and protect from infiltration with a pavement structure which will be maintained by the Department]

– Hazardous. Class 1 disposal site, all other Title 22 CCR requirements apply

– Hazardous. Class 1 disposal site RCRA based on the layer having a TCLP value ≥ 5 mg/l

UCL – upper confidence limit
WET-DI – soluble lead using the Waste Extraction Test with deionized water
WET-citric acid – soluble lead using the Waste Extraction Test with citric acid
TCLP – Toxicity Characteristic Leaching Procedure
mg/kg – milligrams per kilogram
mg/l – milligrams per liter
CCR – California Code of Regulations
RCRA – Resource, Conservation, and Recovery Act
NA – not applicable

State of California **Business, Transportation and Housing Agency**

M e m o r a n d u m

Flex your power!
Be energy efficient!

To: MR. SON T NGUYEN, Branch Chief
District 12 Design, Branch E

Date: October 8, 2014

File: 12-ORA-133-PM 9.1/10.05
EA 12-0N1101
Project ID: 1213000116
Embankment Distress Repair
NB and SB 133 and SB I-5
Connectors

Attn: Mr. James A Lai, Project Engineer

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design South-1 Branch C

Subject: Revised Geotechnical Design Report (GDR) for NB I-5/N/B 133 and SB133/SB I-5 Approach and Departure Connectors - Embankment Distress Repair

This Revised Geotechnical Design Report (GDR) replaces the Revised DRAFT GDR dated October 22, 2013 and the original GDR dated October 14, 2013. This Revised Report and the previous Reports were prepared by Geotechnical Design-South 1, Branch C, per the request dated May 28, 2013, for the N/B I-5 to N/B 133, S/B 133 to S/B I-5 Approach and Departure Embankments in the City of Irvine, California, (see Figure 1). This study is based on existing soil boring and Cone Penetration Test (CPT) Data conducted between 2009 and 2012, and the present study in 2013. Laboratory test results from the soil borings were also used for evaluation in this study. This study also provides detailed design recommendations outlined in the Update Assessment Geotechnical Report dated July 23, 2013 for repair of fill embankments under distress. This Revised Preliminary Report includes use of the "SE Line" alignment for Locations 1 and 2 in addition to modifications to the Bridge Numbers and use of the "WN" Alignment for Location 3 added in the October 22, 2013 Revised DRAFT GDR.

1.0 INTRODUCTION

The general site is located in the City of Irvine, Orange County, California. The site is composed of three distinct areas where embankment distress is occurring. The three locations are summarized below in Table 1 and are shown on Figures 2 through 4.

Table 1 – Summary of Distress Locations

Location No.	Description	Route - PM	Reference	Notes
1	S/B 133 to S/B I-5 Approach	133-9.74/9.82	Figure 2	Between Bridge No.'s 55-0773L and 55-771F
2	S/B 133 to S/B I-5 Departure	133-9.09/9.24	Figure 3	South of Bridge No.'s 55-0771F, Abutment 1
3	N/B I-5 to N/B 133	133-9.78/10.05	Figure 4	South of Bridge No. 55-0773R

As discussed in the Assessment Report, the three embankment locations have been experiencing distress within the last 16 years. According to discussions with Maintenance, the distress first appeared soon after completion of the embankments in 1998. The distress consists of tension cracking on the travel ways within the limits provided on Table 1 and shown on Figures 2 through 4. The cracking is primarily parallel to the road way alignment, with vertical and horizontal offsets of generally 1-3 inches. Based on Slope inclinometer (SI) readings taken in the three areas since February 2010, consistent ongoing creeping movement of up to 1.5 inches has been detected at these locations. Furthermore, shear movement has begun to develop in Location 1, near the north abutment of Bridge 55-0771F. According to SI readings, the depth of the movement ranges from 20 to 30 feet below the roadway elevation.

Site investigations including cone penetration test (CPT) soundings and soil borings were performed by our office between December 2009 and February 2010, March 2012, and July 2013. Slope Inclinometers (SI) were also installed to monitor the movement of the embankment slope. Detailed information of our site investigation and monitoring program should be referred to Section 4.0: Exploration and Instrumentation of this report. A summary of laboratory test results of the soil samples taken during the investigation is summarized in Section 5.0.

The purpose of this report is as follows:

- Summarize subsurface geotechnical findings from our investigations.
- Provide an analyses and assessment of the cause of distress based on the findings
- Provide design recommendations for the distress embankments.

2.0 EXISTING CONDITIONS

The existing embankments are generally composed of 20 to 60 feet high earth fill embankments with two travel lanes in addition to the shoulders. The embankment widths are generally 30-40 feet in width with approximately 1.6:1 to 2:1 side slopes. In Location 3, the N/B I-5 to N/B 133 Section, the two lanes merge to one lane for the last 650 feet on the north end. In Location 2, the S/B 133 to S/B I-5 Departure Section, an MSE Wall comprises the embankment on the south (right) side with the embankment slope on the north (left) side. Per as-built plans, the MSE Wall varies in height from 30 feet near station 4042 to about 60 feet at about station 4049 (the stations

are the limits of identified distress). Reinforcement wire mesh lengths are estimated about 0.7 times the height. The travel ways are covered by Asphalt-Concrete surfacing. The slope surfaces are generally covered by vegetation.

The geometry of the affected embankments is summarized in Table 2 below. The height, widths and grade of the embankments are based on the latest plans and cross sections provided by District Design to our office. The existing geometry was also provided in the July 23rd Updated Assessment Report.

Lastly, as shown on Project Plans (dated July 2, 2010) provided to our office, six different station alignments were used in this report. They are as follows: "SB 133", "SE Line", "WN Line", "C/L Rte 5", "ETC Line", "ALN 541" and "ALN 542".

Table 2 – Summary of Embankment Geometry Conditions

Location	Approx. Station Range (1) (3)	Embankment Height Range, ft	Lanes and Widths, affected, ft	Slope Grades (H:V)	Lanes
1	4067+00 to 4071+00	40	20	1.6:1	Right shoulder and Adjacent Lane,
2	4041+60 to 4049+91.6	30-60	5-15 (1)	2:1	Left shoulder and Adjacent Lane (1)
3	5108+70 to 5122+70	25-40	25-36 (2)	2:1	See note 2

Note:(1) Affected width varies from 5-15 feet, depending on the length of the adjacent MSE reinforcement.
(2) Whole 36 foot embankment width affected from stations 5108+70 to 5116+20. From Station 5116+20 to 5122+70 25 feet width affected (Right shoulder and adjacent lane).
(3) Locations 1 and 2 Stations by 'SB 133' alignment, Location 3 by "WN" alignment.

2.1 Observed Distress

Existing damage within the embankments generally consists of tension cracks within the right and left shoulders and adjacent lanes for Locations 1 and 3 and left shoulder and adjacent lane for Location 2. Tension cracking was also observed within the unpaved shoulder area between edge of shoulder and hinge point. In addition, in all three locations there is evidence of slope face slumping about 10-20 feet below the roadway elevation and settlement of the unpaved shoulder. Severe erosion from irrigation sprinklers also seems to have occurred. Damage from gopher holes was also observed within the unpaved embankment shoulder and slope areas.

The tension cracking has caused vertical and/or horizontal offsets which had to be continuously over-laid with AC to provide a safe level surface for public travel. In Location 3, tar crack seal was applied by Maintenance a number of times, however the sealant had been observed to have disappeared into the cracks about a week or two later. In Location 2, the tension cracking appears to be occurring beyond the limits of the MSE reinforcement on the embankment slope side.

Additionally, a 3-4 foot diameter sinkhole about 10 feet deep was observed at about mid-slope within the east facing slope in Location 3. The station of the sinkhole is about 9121+25 (about 124 feet south of the Technology Drive South Abutment. The sinkhole is in line with an inlet on the left N/B shoulder.

3.0 PERTINENT REPORTS AND DOCUMENTS

The following documents were reviewed for this study:

- Caltrans, Updated Assessment Geotechnical Report for NB I-5/NB 133 and SB 133/SB I-5, July 23, 2013;
- Project Alignment and Topographic Plan, dgn file, June 10, 2013.
- Caltrans, Project Plans for Construction, Northbound and Southbound Connectors of Route 133/Interstate I-5 Interchange. Last Revised July 2, 2010.
- Log of Test Boring's NB 5/NB 133 Connector, May 10, 2011.
- Log of Test Boring's S133/ S5 Connector Embankment Distress, May 10, 2011.
- Caltrans, Preliminary Geotechnical Report (PGR) for SB133/SB I-5 connector (Br#55-0771F) embankment distress repair, May 28, 2010.
- Caltrans, MSE Wall Plans, Wall No. R4043, June 3, 2000.

4.0 EXPLORATION AND INSTRUMENTATION

Geotechnical investigations were initiated on December 2009 when five CPT's were conducted, two of them were in the vicinity of the west shoulder of the approach embankment, and the other three were in the vicinity of the east shoulder of the departure embankment. In January 2010 four mud Rotary Soil Borings and three Hollow stem Auger Borings were drilled within the S/B 133 to S/B I-5 Approach and Departure areas with three SI's installed. This was followed in April 2010, by four Hollow Stem Auger borings drilled in the N/B I-5 to N/B 133 Connector (Location 3) with one SI installed. In March 2012, an additional three soil borings all with SI installation were drilled in Location 3 to increase the number of SI's from one to four. The latest investigation, in July 2013, consisted of conducting 57 CPT's within the three Locations. These CPT's were performed to help identify subsurface zones that may need grouting. A summary of the boring and CPT locations is listed in the Boring and CPT Summary Table found in Appendix B.

Soil samples from Mud Rotary or Hollow Stem Auger borings were logged and sampled using either a Standard Penetration Test (SPT) sampler or 2-inch Modified California sampler at 5-foot intervals. The SPT samples were driven using a 140-pound hammer falling freely for 30 inches for a total penetration of 18 inches. The Modified California samplers were pushed 12-inches into the soil to obtain the undisturbed brass-tube samples. The Cone Penetration Test (CPT) is performed by pushing a steel rod fitted with a cone at the tip through the soil. As the rod is pushed tip and side friction resistance is measured and electronically sent to a computer inside the CPT truck. The data is then processed and analyzed for subsurface conditions.

4.1 Slope Inclinometer Monitoring

A total of nine slope inclinometers (SI) were installed to monitor the movement of the three embankment locations currently experiencing distress. A summary of the SI dates of installation, locations and cumulative movements are summarized in Table 3 below. The monitoring data is presented in Appendix C of this report. Locations of the SI's are also shown on Figures 2 through 4.

Table 3 – Summary of Slope Inclinometers

Slope Inclinometer (SI) no.	Date of 1st reading	Location	Station (1)	Offset, ft	Cumulative Movement, inches	Depth, ft
B1 (A-10-001)	5/4/10	3	5121+44	26.4R	1.25	5
B2 (R-10-002)	2/2/10	1	4066+77	36.9L	1	19
B4 (R-10-004)	2/17/10	2	4047+68	6.9R	1.5	Surface
B5 (R-10-005)	2/2/10	2	4045+25	6.9R	0.6	20-25
B6 (A-10-006)	2/17/10	2	447+09	116.5L	0.1	Surface
B7 (A-10-007)	3/2/10	2	444+73	101.9L	0.05	Surface
R-12-009	3/28/12	3	5115+30	25R	0.3	9
R-12-010	3/28/12	3	5117+90	20R	0.6	10
R-12-011	3/28/12	3	5121+50	19R	0.5	Surface

Notes: (1) Stationing based on "SE" Line for Location 1 and 2, except for B6 and B7 which are based on Station "I-5"Alignment. Location 3 SI's are based on "ALN" 541.

Taken regularly since February 2010, movement generally varied from 0.5 to 1.5 inches from the SI's measured for this project. The depth of this movement was observed to vary from near surface up to 20 to 30 feet deep. The movement is identified as generally acting in a creeping fashion. However, as shown in inclinometer No. 2 (B2 in Appendix C), shear movement is developing at a depth of about 20 feet, which can lead to accelerated movement and possibly instability of the embankment. In other SI's the depth of developing movement was about 15-30 feet, which is showing creep behavior. The latest readings, taken in May 2014, indicate that movement has slowed since March 2013 in Location 1 and 2, but has been maintaining a relatively consistent rate of movement in Location 3. The slowing down of movement may be attributed to the lack of rainfall in 2013 and 2014.

5.0 LABORATORY TESTING

Laboratory testing was performed on collected soil samples from the investigation program. The material is representative of the backfill material used for the embankment and native alluvium soil underneath the fill embankment. Laboratory testing included the following; grain size analysis, Atterberg limits, direct shear strength, unconfined compression strength, triaxial shear strength, consolidation, falling head permeability and corrosion. Geotechnical testing was performed in accordance with California Test Methods and/or ASTM procedures as indicated by Table 4. A summary of the laboratory results is included in Appendix D.

Table 4 – Laboratory Test Methods

Test	Standard
Grain Size Analysis	ASTM D 422
Atterberg Limits	AASHTO T 90 & 89
Direct Shear Strength	ASTM D 3080
Unconfined Compression Strength	ASTM D 2166
Triaxial Compression Strength	ASTM D4767
Consolidation	ASTM D 2435
Falling Head Permeability	CTM 220
Corrosion	CTM 643, CTM 422, CTM 417

Composite bulk samples from Boring R-10-002 and A-10-003, located in the S/B 133 to S/B I-5 Approach and Departure areas, were tested for corrosion potential. The results show that the fill soils in these areas are not corrosive. However, due to the highly variable nature of the embankment fill soils encountered. It is recommended that all fill soils to be used for fill placement after excavation (See Section 9.5.2) be tested for Expansion Index and Corrosion Potential

Table 5 – Corrosion Test Results

Boring	Depth (ft)	Minimum Resistivity (Ohm-cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
R-10-002	0-5	1331	6.89	N/A	N/A
A-10-003	21.5-25&36.5-40	1282	6.77	N/A	N/A

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

6.0 REGIONAL GEOLOGY AND SEISMICITY

6.1 Regional geology

The project is located within the Peninsular Ranges geomorphic province in the Los Angeles Basin. A thick sedimentary section underlies the Los Angeles Basin that can be several miles thick. The Peninsular Ranges Province is characterized by northwest-southeast trending mountain ranges and valleys that are parallel to the San Andreas Fault. The site lies north of the San Joaquin Hills and southwest of the Santa Ana Mountains, in the Tustin Plain. Quaternary alluvium has been mapped to underlie the area.

6.2 Seismicity and recommendations

The site is not located within any Alquist-Priolo Earthquake Fault Zone as established by the California Geological Survey; therefore, the risk of surface rupture is low. Based on the Caltrans ARS Online, the controlling faults are the San Joaquin Hills Blind Thrust and the USGS 5% in 50 years probabilistic hazard. The average shear wave velocity of the upper 30 meters (Vs30) is approximately 270 m/sec based on correlations with SPT and CPT data collected during our geotechnical investigation. The Peak Ground Acceleration (PGA) calculated for this site is 0.6g. A summary of the contributing fault parameters as given by ARS Online is shown below. ARS curve data is given in Appendix E. The ARS curve data has been modified for near source effects per the Caltrans Seismic Design Criteria.

Table No. 6 – Fault and Design Ground Motion Parameters

Fault	Fault ID	Type	Dip°	Dip Direction	M_{max}	R_{rup} (km)	R_{JB} (km)	R_x (km)
San Joaquin Hills	7	Reverse	23	SW	6.6	2.24	1.00	1.00
USGS 5%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

7.0 GEOTECHNICAL CONDITIONS

7.1 Site geology

The fill for the embankments varies depending on the location within the project fill limits. Some portions of the fill consist of a maximum of 60 feet of medium stiff to hard silts and clays, and other areas are composed of mostly medium dense to dense sand with some looser zones and silt mixtures with clays with some soft zones and silts encountered near the base and other areas consist a maximum of 40 feet of sandy clays, which are underlain by clayey silty sand. The consistency of clayey soil varied at different locations and elevations. The underlying alluvium consists of predominantly clays and sandy clays with thin layers of silty sand and sand. The alluvium is medium stiff to stiff for clays and dense for sands near the original grade surface, and increases in density with depth.

A more detailed description of the embankment fill and the underlying alluvium at specific locations within the project limits is provided in Section 7.2 Subsurface Conditions.

7.2 Subsurface Conditions

Subsurface soil conditions encountered in the soil borings and CPT's of the following locations is summarized below. Log of Test Borings are included with this report. Soil descriptions in this section were based on results of soil borings and CPT results. For CPT results soils with a tip resistance of 20 tsf or less and a sleeve friction of 1-2 tsf or less may be correlated to soft or sensitive clays which coincide with results from the soil borings and laboratory test results. Also,

based on previous geotechnical investigations using CPT's, zones with tip resistance of 10 to 20 tsf or less and a sleeve resistance of less than 1 tsf may be correlated to very sensitive fine grained soils or soils with voids.

Location 1: S/B 133 to S/B I-5 Approach

According to soil borings and CPT results, the 40 feet of embankment soils at this location consist of generally soft to stiff or very stiff sandy Clays with some clayey sands. According to the CPT results, specifically, the embankment soils from the north end (adjacent to the Technology Drive south abutment) consisted of generally soft to medium stiff sandy Clay fill materials (with tip resistances of 10 to 30 tsf and friction of 0.5 to 2 tsf) to a depth of 20 feet. CPT results showed increasing tip and friction results going to the south. Embankment soils from 20 to 40 feet depth were generally found to be medium stiff to stiff Sandy Clays (with results in the range of 30 to 40 tsf with sleeve resistance of about 2-3 tsf).

The native soils underneath the embankment fill were determined to be interbedded, dense clayey and silty sands and stiff to very stiff clays.

Location 2: S/B 133 to S/B I-5 Departure

Based on soil borings, the 30-60 feet high embankment fill in this location consisted of loose to dense sands and silty sands to the bottom of the fill embankment. CPT results also showed the embankment fill to consist of loose to dense Sands to a depth of 30 feet. Loose zones in the embankment fill were found to generally range from 16-30 feet below the travel way, from station 4043+50 to 4044+75 with a shallower loose zone 10-20 feet deep near Station 4044+90 to 4045+25 (per SE Alignment).

The underlying native soils consisted of soft to very stiff sands lean clays and medium dense clayey sands.

Location 3: N/B I-5 to N/B 133:

Soil characteristics of the embankment fill at this location were found to vary in terms of material type and consistency. 25-40 feet of embankment fill, from about Stations 5108+70 to 5116+20 (per ALN 541 Alignment), was generally composed of loose to medium dense Sands, Silty Sands and clayey sands with a few 2-5 foot thick clayey layers (this area is in Location 3 where there is embankment slope on both sides of the embankment). Based on the CPT results, loose or void zones were generally found in the top 20-30 foot depths within the embankment (These loose zones generally had tip resistances of 10-20 tsf or less and sleeve resistances of 1 or less tsf). North of this area, between Stations 5116+20 and 5122+70 (where the embankment has a slope on the east side only) the 35-40 foot high embankment consisted of mainly soft to stiff Sandy Clays with smaller 5 foot layers of clayey sand (per CPT results, tip resistances of about 20 tsf or less and sleeve friction of about 1 tsf were found in the upper 18 feet).

The native soils underlying this embankment area were found to be highly variable with interbeds of generally medium dense sands to silty sands, stiff to hard sandy clays and elastic silts.

7.3 Ground water

Ground water was not encountered in any of the borings drilled to an elevation of approximately 180 feet. CH2M Hill performed a subsurface investigation in 1990 for the 133/5 Separator and measured ground water at an elevation of approximately 145 feet, which is 70 to 80 feet below the bottom of the project embankments.

8.0 LIQUEFACTION

Based on the groundwater measured in installed wells, and historic groundwater research, See Section 7.3, the embankment soils and upper 50 feet of the underlying native soils were determined to be well above known groundwater elevations in the area. Therefore, liquefaction potential is negligible for this area.

9.0 GEOTECHNICAL ANALYSES AND DESIGN

Geotechnical analysis and design was performed to assess the cause of distress to the three embankment locations outlined in Table 1 of this report and provide detailed recommendations for repair. As discussed in this report, analysis was based on soil borings, CPT, and SI results, obtained for this study. Soil borings and CPT's were located in areas with the most observed surface distress. They were also taken at regularly spaced intervals to obtain a comprehensive subsurface soil profile within the distressed areas. Soil borings were used to provide added subsurface information on different soil type layers. Soil borings and slope inclinometers were installed in various soil borings to determine groundwater conditions and slope movement which would provide a complete picture of the existing soil conditions and help determine the type of analysis needed.

Due to the pattern of the surface distress, soil boring results and creeping or shearing movement observed from SI readings, it was determined that distress was due to poor embankment fill compaction and soil quality. Highly variable soil types within the embankment fill along with low density or relatively soft soils were found within the distress zones. As reflected by blow counts of soil borings and CPT results, these soils exhibited zones of loose granular soils in Locations 2 and the southern part of Location 3. Clayey soils with relatively high moisture contents (18-25%) and low undrained shear strengths (500-1000 psf) were found mostly in embankment fill areas in Locations 1 and the northern part (above Station 5117+50) of Location 3. It is our opinion that zones in the poorly compacted fills; which were found to be sands and clays, resulted in low density sandy zones and soft, clayey zones with high moisture content and low shear strengths, resulted in tension cracking, creep movement and eventual shearing of the embankment slope travel ways.

Native soils underlying the embankment were found to be generally medium dense to dense sands or stiff to hard clays, which suggests that any vertical movement is likely coming from the embankment soils. An exception to this is Location 2 (S/B 133 to S/B I-5 Departure) which showed zones of soft clayey soils underneath the embankment.

Our analysis thus focused on consolidation of the embankment fill and native soils, general identification of low density/void zones within the embankment fill for grouting and slope stability analysis for repaired embankment slopes. Thus, recommendations consist of removal and replacement of the top 10 feet of embankment fill within the travel way and 30 to 35 feet of the side slopes within the three distress locations and replacement with geogrid reinforced select embankment fill and grouting areas identified as weak or void zones within the embankment fill. The following sections discuss our analysis and embankment fill recommendations in detail.

9.1 Soil Parameters

Simplified soil parameters were based on direct shear and unconfined compression test results for cohesive soils, and Standard Penetration Test results (SPT) for cohesionless soils. For design of temporary excavation support systems short term undrained shear strength of cohesive soils may be considered. A summary of soil parameters is given in Table 7 below. Soil parameters were simplified and divided into embankment fill parameters and underlying native soil parameters for each Location. Except for Location 3, where high variation in soil types were presented as two subsections from beginning of the Location on south end to Station 5121+00 and station 5121+00 to the Marine Way Under Crossing South Abutment.

Table 7 – Summary of Soil Parameters

Location (Stationing)	Depth, ft	Soil Type	Total Unit Weight, pcf,	Friction Angle (2)	Undrained Shear Strength, psf
1	0-40 (Embankment fill)	Sandy Clay	125	28 (20)	700 (100)
	40-70 (Native)	Clayey Sand	120	36	0
2	Varies from 20-40 feet deep (Embankment fill) (1)	Silty Sand and Clayey Sand	126	33	0
	Native below Embankment fill	Sandy Clay	120	0	700
3 (up to Station 5121+00)	Varies from 30-38 feet deep (Embankment fill)	Clayey Sand	125	31	600
	Native below Embankment fill	Silty Sand	118	32	0
3 (Station 5121+00 to Marine Way South Abut)	0-38 (Embankment fill)	Sandy Clay	120	0	1200
	Native below Embankment fill (38-53 feet deep)	Silty Sand	118	30	0
3 (Station 5121+00 to Marine Way South Abut)	53 feet+ deep, Native Soils	Sandy Clays	125	0	2000

Notes: (1) For Embankment soils outside of the MSE reinforcement limits.
(2) Residual shear strength parameters in parenthesis. For shoring purposes, non-residual parameters may be used.

9.2 Consolidation analysis

Analysis of settlement was conducted for relatively soft clays found under the embankment at Location 2 (S/B 133 to S/B I-5 Departure). Results revealed that with the added pressure from the weight of grout treatment, the additional consolidation settlement of the treated area would be approximately 1-inch. Locations 1 and 3 were found to have stiff to hard clays interbedded with medium dense sands in the underlying native material, thus the additional settlement from weight of grout treatment in these areas is expected to be negligible. In general, as discussed in our 2010 memo, the clayey soils at Location 2 were determined to be normally consolidated.

The analysis was based on consolidation testing conducted on clay samples obtained from R-10-33, about 50 feet below the travel way elevation, in Location 2. The results of the test are shown in Appendix D of this report.

9.3 Slope stability analyses

As discussed in the 2010 Memo, Slope stability analysis was checked for existing slope conditions for the three Locations. Analysis was performed for static and seismic conditions, with seismic conditions based on a 0.2g pseudostatic coefficient. Initial results, performed in 2010, showed that static and seismic minimum factors of safety of 1.5 and 1.1 respectively were satisfied for

Locations 1 and 2. The seismic case at Location 3 showed a factor of safety of less than one. Analysis was based on slope grades of 2:1 (H:V) for locations 2 and 3 and 1.6:1 (H:V) for Location 1.

However, as mentioned in Section continued creeping movement has begun to show shear at a 20 foot depth in Location 1, thus bringing the existing static slope stability condition to about 1.0. Slope stability of repaired embankments was performed using the Limit equilibrium method with design charts and the Reinforced Soil Slope Program (RSS Version 1.0) see Section 9.5.2 for further discussions.

9.4 Design Recommendations

Based on the results of the soil borings and CPT data, design recommendations for the 3 Locations include in order: (A) Permeation and/or Soil Fracture/Fissure grouting in designated areas (described below and in Table 8) along the travel way (B) removal of the upper 10 feet of embankment material (preferred option) and side slopes as shown on Figures 5 through 13 (vertical limits of side slopes will be 35 feet for Locations 1 and 2 and 30 feet for Location 3), and (C) Replacement and compactions of select geogrid reinforced fill.

9.4.1 Grouting

Grouting will involve treatment of relatively loose or soft soils below the designated excavation limits within the areas of distress. Based on soil type, grouting will involve permeation grouting (for predominantly granular soils) and Soil Fracture/Fissure grouting for clayey soils. The areas to receive grout are summarized in Table 8. These areas where based on soil borings and CPT's performed within the distress areas. The subsequent sections provide more detail of design for the permeation and soil fracture grouting schemes.

According to permeability test results (see Appendix D) fills in Location 1 showed values for identified Sandy Clay of as much as 1.4×10^{-3} cm/sec (1.9 in/hour) which is about equivalent to permeability values of medium to fine sands (Karol 2003). Because clays typically have significantly less permeability value (about 1×10^{-7} cm/sec or less) this would suggest the presence of voids or cracks in the these fills (similar values of permeability's of identified sandy clay fills in Location 3 showed values up to 1.3×10^{-3} cm/sec or 1.8 in/hour).

Based on the previous discussions, Locations 1 and 3 (Sections 3 through 6, Station 5113+00 to Marine Way) where mainly sandy clay was encountered, groutable zones would mainly consist of soil void/fracture grouting. For Location 1, where shear instability is developing, it is recommended that non-pressurized void grouting be conduct to avoid further destabilization, see Figure 5. For Location 2 and 3 (South end to station 5111+30) silty sand was encountered and thus, the grouting would involve a permeation type treatment. Within the embankment area, Figures 5 through 13 show schematic cross sections of proposed grout treatment, see Section 10 for further grouting discussion. The following sections provide detailed design information on

permeation and soil fracture grouting. Additional information on these grouting techniques is provided in Section 10, Construction Considerations.

Table 8 – Grouting Summary

Location /Section	Station (1)	Treatment Depth, ft (2)	Material Type	Lanes to Treat	Tip Resist. tsf	Friction Resistance, tsf	Preferred Treatment Type	Note
1	4068+75 to 4070+10	12-20 (15-20)	CL	RS and Adjacent Lane	15-20	0.5-1	Soil Void filling	Fig 5
2 - Sect 1	4043+25 to 4044+30	17-28 (17-28)	SM	LS and Adjacent Lane (3)	10-20	0.5-1	Permeation (4)	Fig 6
2 - Sect 2	4044+30 to 4044+80	16-30 (16-30)	SM	LS and Adjacent Lane (3)	20	0.5-1	Permeation (4)	Fig 7
2 - Sect 3	4044+95 to 4045+20	10-20 (15-20)	SP	LS and Adjacent Lane (3)	10-30	0.1-0.5	Permeation (4)	Fig 8
3 - Sect 1	5110+86 to 5111+35	22-30 (22-30)	SP-SC	RS and Adjacent Lane	20	1	Permeation	Fig 9
3 - Sect 2	5111+00 to 5111+30	10-30 (15-30)	SM-ML	LS and Adjacent Lane	20-30	1	Permeation	Fig 9
3- Sect 3	5112+60 to 5113+75	10-18 (15-18)	CL/SC	LS and Adjacent Lane	10-20	1	Soil Fracture/ Void filling	Fig 11
3 - Sect 4	5114+50 to 5115+25	12-24 (15-24)	CL/SC	LS and Adjacent Lane	20	1-2	Soil Fracture/ Void filling	Fig 10
3- Sect 5	5118+75 to 5119+50	10-18 (15-18)	SM-ML	RS and Adjacent Lane	20	1	Permeation	Fig 12
3 - Sect 6	5119+70 to 5120+20	10-18 (15 to 18)	CL/SC	RS and Adjacent Lane	20-30	1-2	Soil Fracture/ Void filling	Fig 13

Notes: (1) Stationing Based on SE Line for Locations 1 and 2 and ALN541 for Location 3.
(2) Grouting depths for 15 foot excavation in parenthesis.
(3) Treatment for Location 2 from end of MSE Wall reinforcement to edge of slope. End of reinforcement should be determined and marked in the field before construction.
(4) Void filling may also be used in Location 2 as a second option.

Permeation Grouting

Permeation grouting would involve injecting grout into the identified weak embankment, primarily granular, material zones. The grout would fill voids or pore spaces without displacing the fill material or volume of the material zone. The direct system of grouting is recommended. The station limits, depths of grouting, and material types for the zones, as well as CPT results in these zones is summarized in Table 8 for the three Locations in question. Maximum recommended

grouting pressures in psi/ft of depth, should not exceed 128 psi/100 feet of depth. If a method to detect hydraulic fracturing is used (such as the use of geophysical testing in adjacent boreholes) maximum pressures may be increased to 327 psi/100 feet of depth. Grout injection rates should be between 0.5 to 5 gallons/min. 2-inch diameter sleeve port grout pipes should be used. Generally, their spacing should be 4 feet.

The groutable areas summarized in Table 8 were determined by zones identified in the CPT and boring results with relatively weak tip resistances and sleeve frictions. These zones were also identified as having percentage fines varying between less than 10 to 30-40 percent. According to previous studies on grouting recommendations based on CPT results, criteria of tip resistance of 20-30 tsf or less coupled with sleeve friction of 1-2 tsf or less, along with low SPT blow count values were considered groutable. Some zones, particularly in Location 2 may be marginally groutable based on higher fines content (up to 40 percent). To account for this variability and to help prevent any potential damage to the adjacent MSE wall system, the spacing of grout holes in this area should not exceed 2 feet. Soil Fracture/Grout filling may be used as well in Location 2 as an alternate grout improvement system, if results of the post grout CPT tests with permeation are not satisfactory.

Soil Fracture and Fissure Grouting

Soil Fracture/Fissure grouting would involve injecting cementitious grouts in open fissures and soft clayey soils thus creating a reinforcing grout matrix within the soft clayey embankment soil zones and increasing bearing capacity. Prior to excavation it is recommended that soil fracture grouting be performed within the areas and dimensions summarized in Table 8. The soils to be treated are generally expected to be sandy lean clays with typically 60-70 percent fines. Based on CPT results, the clay soils to be treated typically have a tip resistance of 2-15 tsf and sleeve resistance of 0.2 to 0.8 tsf. 3-inch diameter sleeve port closed end grout pipes should be spaced about 2 feet. The relatively small spacing will provide more control to the grout operation and will also regulate the amount of grout injected into the soil. Furthermore, every grout pipe should be surveyed.

Grout pressures and injection rates should be continuously monitored during the operation. The side slope on the south side of the freeway should continuously be monitored for grout leakage. A verification program using Cone Penetration Test (CPT) Soundings should be implemented to ensure soil strength improvement within the grout zone. Grout pressures should not exceed 128 psi/100 feet of depth.

To aid in the control of flow of grout material, it is recommended that sheet piles be used for temporary shoring at the locations given, see Figures 5 through 13. These sheet piles should be driven before start of the grouting program. Embedment depths of the sheet piles should be determined by the contractor using the earth pressure diagrams in Figures 14 through 16A.

9.4.2 Excavation and Replacement

After grouting has been completed, it is recommended that excavations of the top 10 feet of the toll road embankment be removed along with 30 to 35 feet of side slopes for the repair limits given in Table 2. Depths and vertical limits of removal for the tops of embankments and side slopes are shown in Figures 5 through 13. As shown in the Figures, temporary cantilever steel sheet pile walls may be used to support excavations and allow traffic flow. Earth pressure diagrams shown in Figures 14 through 16 may be used for design of the temporary retaining systems. Design may be based on soil parameters summarized in Section 9.1.

After excavation, geogrid reinforced earth material should be used to rebuild the freeway embankments. The embankment material to be used should be predominantly granular, with a percent of fines less than 35 percent. The material proposed by the contractor should be tested to verify that it meets this specification prior to placement. Geogrid design, shown in Figures 5 through 14 and summarized in Table 9 was based on the limit equilibrium method and a minimum friction angle of 33 degrees. The design was also based on minimal pore pressure development ratio ($u/\gamma z = 0.15$). The geogrid reinforcement should have a minimum long term design strength (LTDS) of 4600 plf (ultimate design strength of 9300 plf). Generally, the primary geogrid width should be constant from the base to the top, except at Location 2, where due to space constraints with MSE reinforcement, the geogrid width may be tapered from the base to the top. Also, in Location 2, to connect the embankment fill with the MSE reinforcement, the geogrid layers should be extended to overlap the reinforcement as shown in Figure 8A. Here as well, the shoring should be placed 5 feet below the top of the travel way elevation to allow for the overlapping of the MSE mesh and geogrid, see Figure 8A.

The Reinforced Soil Slope program (RSS, Version 1.0) was also run to verify the design. Based on the results a minimum factor of safety was achieved for static (1.5) and seismic (1.1) conditions. Seismic analysis was based on a pseudostatic coefficient of 0.2. The results are shown in Appendix F.

Table 9 – Geogrid Design Summary

Location (Limits)	Stationing (1)	Minimum LTDS, plf (2)	Vertical Spacing, ft (3)	Width from HP to shoring, ft (4)	Primary Geogrid Width – Slope base, ft
1 (S/B 133 to S/B I-5 Approach)	4067+00 to 4071+00	4600	5	20	20
2 (S/B 133 to S/B I-5 Departure)	4042+00 to 4049+91.6	4600	5	Varies	20
3 (N/B I-5 to N/B 133)	5108+70 to 5116+50	4600	5	18	20
3 (N/B I-5 to N/B 133)	5116+50 to 5122+70	4600	5	25	20

Notes: (1) Location 1 and 2 based on "SE" Line alignment. Location 3 is based on "WN" Line alignment.
(2) Long Term Design Strength
(3) Vertical spacing for embankment top and side slopes the same.
(4) This width to have geogrid reinforcement as well. For Location 2, this width varies from 5 to 15 feet due to being adjacent to MSE reinforcement. In locations where the base is less than 15 feet, the reinforcement length may be tapered.
(5) Hinge point at top of slope, varies in Location 2.

To reduce the potential for surface erosion secondary geogrid should be placed in the between the primary geogrid layers, as shown in Figures 5 through 13. The geogrid should have a minimum design length of 3 feet from the slope face and minimum LTDS of 3000 plf. The vertical spacing should be a minimum of 2.5 feet (in between the primary geogrid layers). The ends of the geogrid need not be wrapped. In lieu of secondary geogrid, the slope face may be covered with drought tolerant vegetation and erosion control mesh.

9.4.3 Sinkhole Location at Sta. 5121+50 for N/B I-5 to N/B SR-133 Connector (Location 3)

Repair recommendations for the sinkhole at station 5121+50 would consist of checking the condition of the inlet and connected pipe at this station for leakage. After checking the condition of the inlet and pipe system a trench should be excavated around the sinkhole perpendicular to the toll road alignment with either temporary shoring or sloped back at 1:1 grades. The excavated area should be checked for any leakage. If the inlet and pipe system need repair or leakage is observed these should be fixed before backfilling with embankment fill. Geogrid reinforcement recommended for the overall embankment repair should be placed for this trenched area as well. The reinforcement should be continuous across this trench. The earth pressure diagram shown on Figure 15 may be used for shoring design.

9.4.4 Alternative Recommendation for Location 2

As an Alternate recommendation, Location 2 may be repaired by full excavation of the slope side of the embankment down to the toe of the slope. A 4-5 foot keyway would also be constructed to help stabilize the new fill. In this Alternate, grouting would not be included. The finished slope should be re-built to the pre-existing 2:1, as indicated on the surveyed plans. Drought tolerable

vegetation and erosion control measures should be put in place to prevent future erosion of the slope. Backfill requirements would follow the recommendations summarized in Section 9.5. Figure 8A shows recommendations in the form of a detail for typical repairs between Station 4042 to 4049+91.6, which would be used for the MSE Reinforcement and Embankment connection.

9.5 Earthwork

Excavation bottom of the embankment areas should be inspected for loose, soft or remaining void areas. These conditions should be treated by scarifying the top 12-inches of loose or soft material and compacting to 90 percent relative density. Remaining voids should be probed and grouted or for shallow voids backfilled with compacted earth material. Replacement with geogrid reinforced earth material should follow Section 19 of the 2010 Standard Specifications. As stated previously and in addition to the Standard specifications, backfill material should contain less than 35 percent fines and have an Expansion Index (EI) less than 50. In addition to an EI less than 50, embankment fill soils placed within 4 feet of the finished grade should have a Plasticity Index of less than 12 and an R-Value of at least 40 (Per District 12 Pavement and Materials Division). In addition to the recommendations in this report, compaction of embankment materials and embankment construction with geosynthetic placement should follow Sections 19-5 and 19-6 of the 2010 Standard Specifications, respectively. Because of the highly variable soil characteristics of the embankment materials, additional borrow materials should be brought to the site. These may be mixed with on-site materials provided that they be tested for conformance prior to placement.

Side slopes should be excavated at no steeper than 1.2:1 temporary slopes with minimum bench widths of 3 feet. Slopes should be re-built at original grades with geosynthetic reinforcement per design recommendations summarized in Table 9 and shown in Figures 5-13 and the construction should also follow Section 19 of the latest standard specifications.

10.0 CONSTRUCTION CONSIDERATIONS

Grouting

- The permeation and fracture grouting plans should consist of grout pipes equally spaced at the intervals given in this report (See Section 9.4.1). The grid spacing should be confined within the areas summarized in Table 8 of this report by station and lane width. The grout zones to be treated are shown on Figures 5 through 13.

- Every grout pipe should be surveyed and provided on as-built plans.

- A grout verification program should be established in the plans and specifications to insure the effectiveness of the grouting. Post grout CPT's should be conducted at 25 foot spacing within the grout areas. The CPT results should show an increase in tip and friction resistance of at least 60-80 and 50 percent, respectively, of the pre grout CPT results

(conducted in this investigation). If post grout CPT's fail to meet this criteria grouting should be conducted a 2nd time within those specific failed zones and CPT's conducted again within those zones at the same spacing to assess improvement. If CPT's again show no improvement the Resident Engineer should notify our office and present the results of grouting records and CPT results. In areas designated for permeation grouting, soil fracture grouting/void filling may be used as an alternate method.

- Monitoring of the embankment roadway and side slopes should be conducted during grouting. The program should monitor any movement of the roadway elevation within the project limits. If ground movement or grout leakage on the side slopes or within the roadway is determined grouting should be suspended and grout pressures adjusted so that ground movement or leakage does not continue.

- A trial soil fracture grouting program should be implemented by the contractor, prior to beginning any production grouting. Details of the trial grout program should be identical to the details used for the production work. The test area should be monitored for any ground movement. The trial area should be conducted within one of the designated grout areas and its effectiveness verified by a post grout CPT.

- As discussed in Section 9.3 of this report, settlement of about 1-inch is anticipated within the proposed grout zone of Location 2 (identified as Sections 1 through 3 in Table 8). A settlement of about 1-inch is expected to occur about 60 days after grouting is completed. It is recommended that the area be monitored and leveling with asphalt take place to restore a level traveling surface after settlement has occurred.

- All utility in the area should be checked for leakage or breakage after the grout program is completed.

Excavation and Shoring

- All utilities should be marked and relocated as necessary before the start of embankment excavation.

- Temporary slopes during construction may be no steeper than 1:1 (Vertical: Horizontal). If any temporary slopes need to be steeper than 1:1 a temporary shoring system must be used and devised by the Contractor.

- Staged construction may be considered to keep one lane open to traffic. A temporary system to keep one lane open, for Locations 1 through 3, such as soldier piles or sheet piles may be used. Figures 5 through 14 show staged excavations for travel way excavation and limits bounded by stations for Locations 1 through 3.

- For Location 3 (N/B I-5 to N/B 133) where 2nd and 1st stage excavations are adjacent to each other, the geogrid for the two sides should be stitched together. As the fill is placed on the opposite side of the embankment, lagging should be lifted or otherwise removed to access the geogrid behind shoring and stitch both sides together, see Figures 9 through 10. A method to connect both sides of the geogrid together should be devised by the contractor and be submitted for review.

- The top 10 feet of temporary shoring systems, at least, should be removed upon completion of the backfill placement. Sheet piling below 10 feet may be left in place in Locations 1 and 3. The shoring system in Location 2, set 5 feet below the roadway elevation may be left in place.

Slopes

- Re-built slopes should match the surrounding embankment slope grades.

- Landscaping Division should be consulted to revegetate the re-built slope areas. A fiber mesh should be placed initially over the re-built slopes in order to minimize erosion.

- Sprinkler heads should only be placed in areas where the slope face is vegetated. It was observed that high pressure sprinkler heads were previously placed in bare areas of the slope face, thus causing moderate to severe erosion.

MSE Reinforcement

- As shown in Figure 8A, shoring should be placed 5 feet from the top of the travel way to allow access to overlapping of the MSE reinforcement with the geogrid. Shoring on this side may be left in place.

- MSE reinforcement should be inspected for drain rot and repaired accordingly.

- Any inspection rods found within the MSE reinforcement should be removed.

11.0 References

Caltrans, Updated Assessment Geotechnical Report for NB I-5/NB 133 and SB 133/SB I-5, July 23, 2013;

Caltrans, Project Alignment and Topographic Plan, dgn file, June 10, 2013.

Caltrans, Project Plans for Construction, Northbound and Southbound Connectors of Route 133/Interstate I-5 Interchange. Last Revised July 2, 2010.

Caltrans, Log of Test Boring's NB 5/NB 133 Connector, May 10, 2011.

Caltrans, Log of Test Boring's S133/ S5 Connector Embankment Distress, May 10, 2011.

Caltrans, Preliminary Geotechnical Report (PGR) for SB133/SB I-5 connector (Br#55-0771F) Embankment Distress Repair, May 28, 2010.

Karol, Reuben H., Chemical Grouting and Soil Stabilization, Third Edition, Revised 2003.

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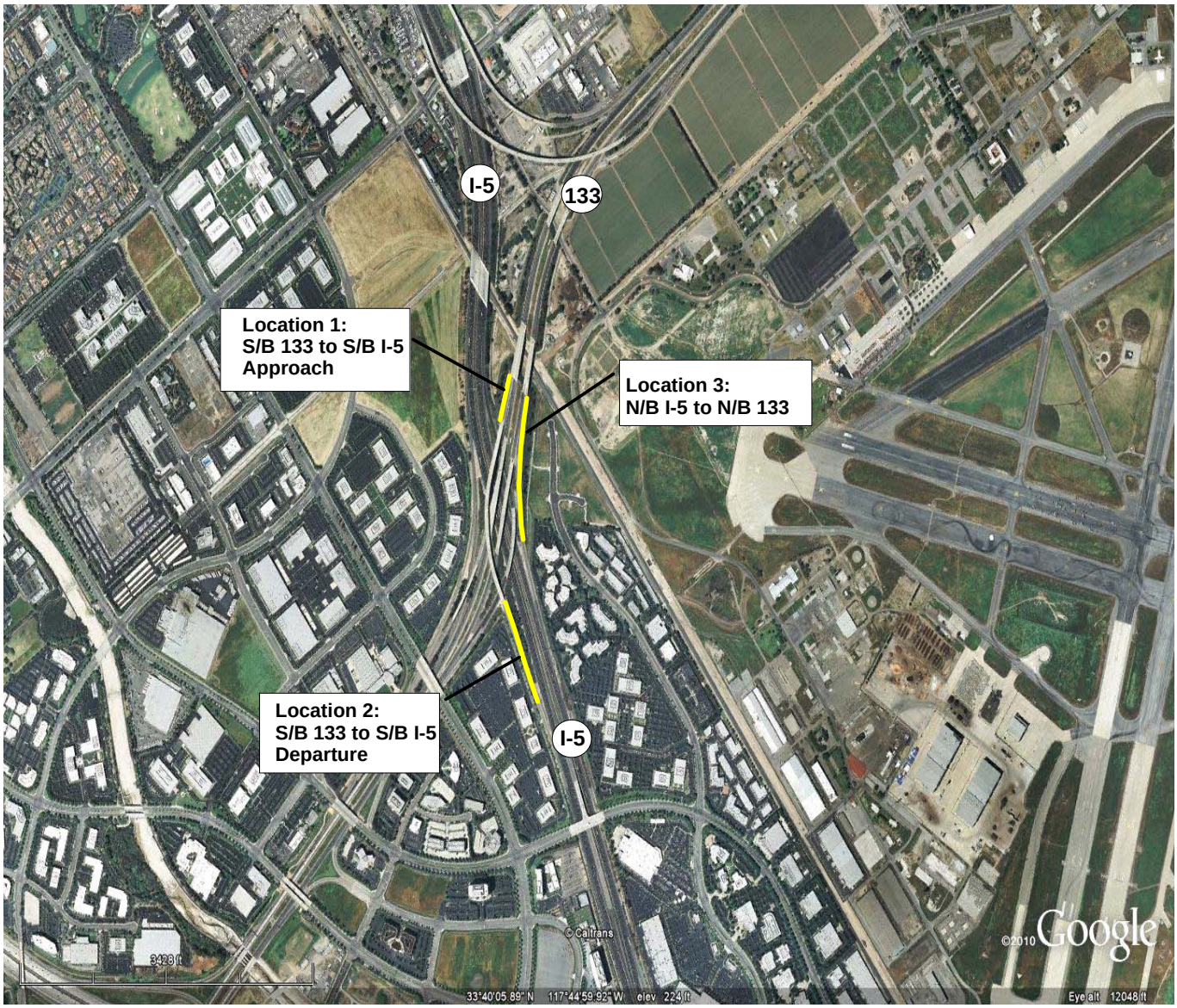
Attachments:

Appendix A – Figures (Site Vicinity Map, Layout Maps, and Cross Sections)
Appendix B – CPT and Boring Summary Table
Appendix C – Slope Monitoring Results
Appendix D – Laboratory Test Results
Appendix E – ARS Curve
Appendix F – Slope Stability Results

Appendix A
Maps and Cross Sections

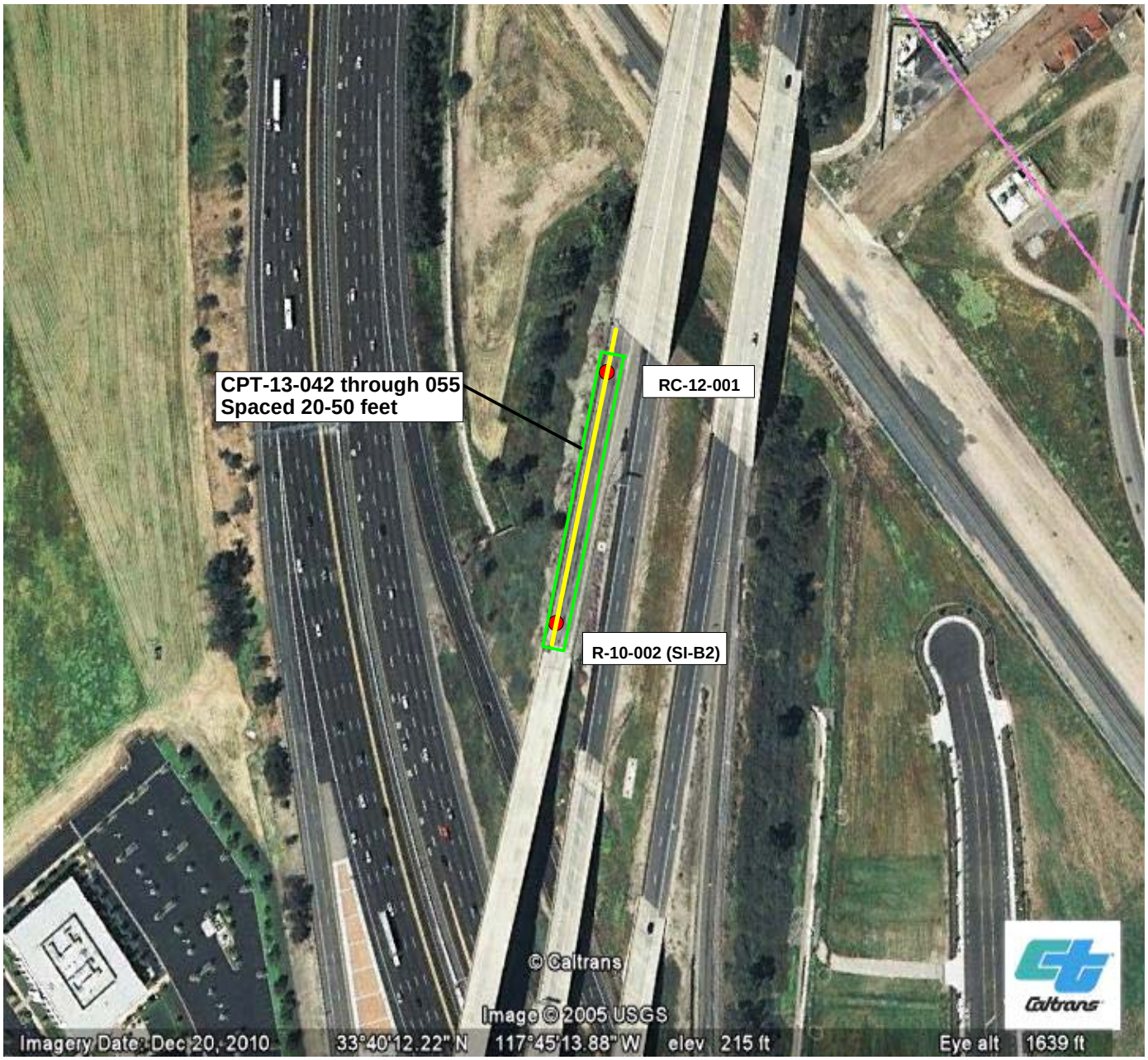


133 - I-5 Interchange
Site Vicinity Map

Legend:

Distress Limits

Figure 1



S/B 133 to S/B I-5 Approach Location
(Location 1)

Legend:

- Distress Limits
- Limits of CPT probes
- RC-10-006 Boring/SI Location

Note: CPT-13-042 through 055 Conducted from North to South -20 to 50 feet apart within Right shoulder or Adjacent Lane

Figure 2

S/B 133 to S/B I-5 Departure Location
(Location 2)

Legend:

Distress Limits

RC-10-006 Boring/SI Location

Figure 3

N/B I-5 to N/B 133 Approach Location
(Location 3)

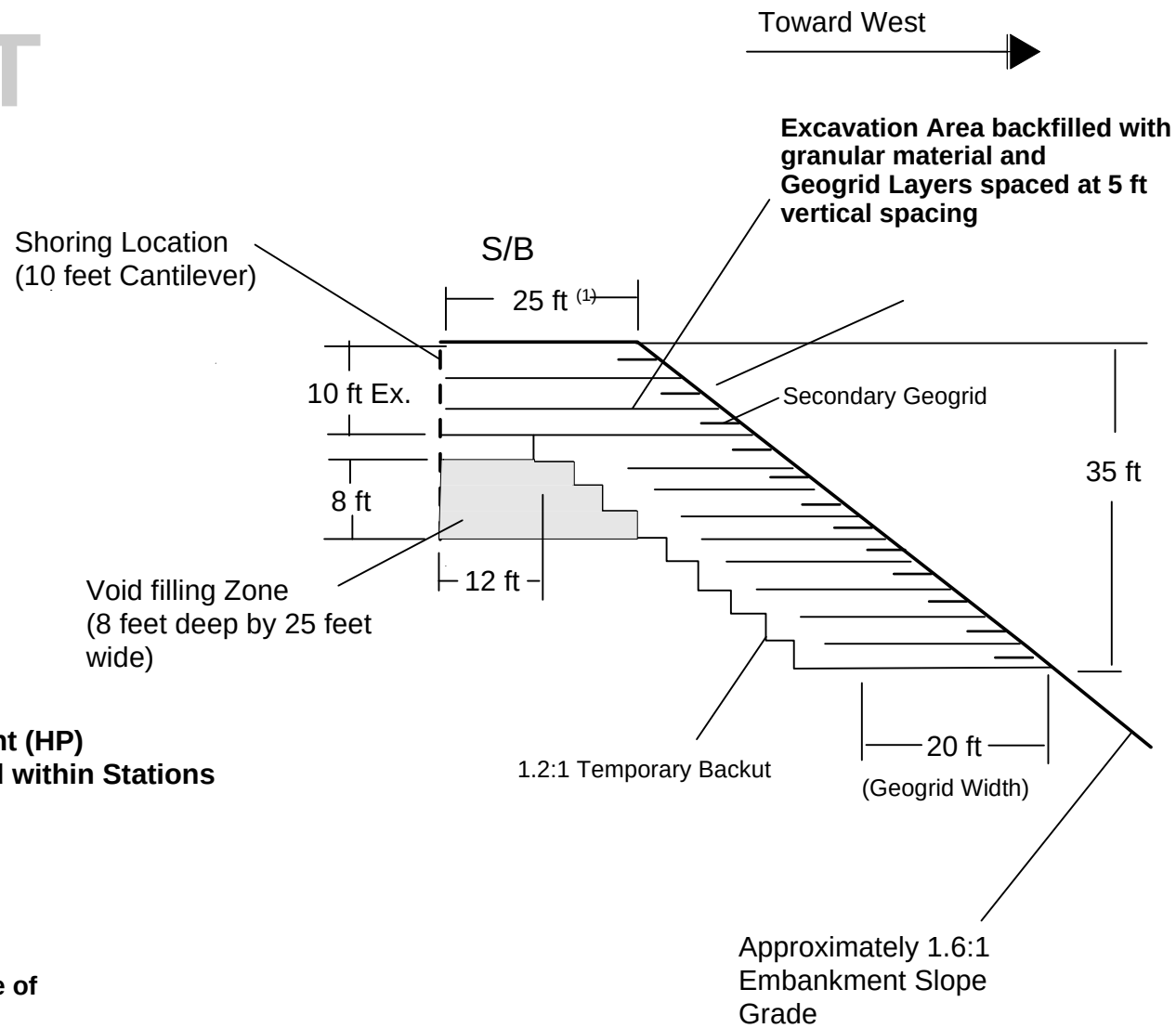
Legend:

- Distress Limits
- Limits of CPT probes
- RC-10-006 Boring/SI Location

Figure 4

Location 1 - S/B 133 to S/BI-5 - Repair Schematic
Station 4067+00 to 4071+00 (SE Line)
Void Filling Zone from 4068+70 to 4070+10

DRAFT

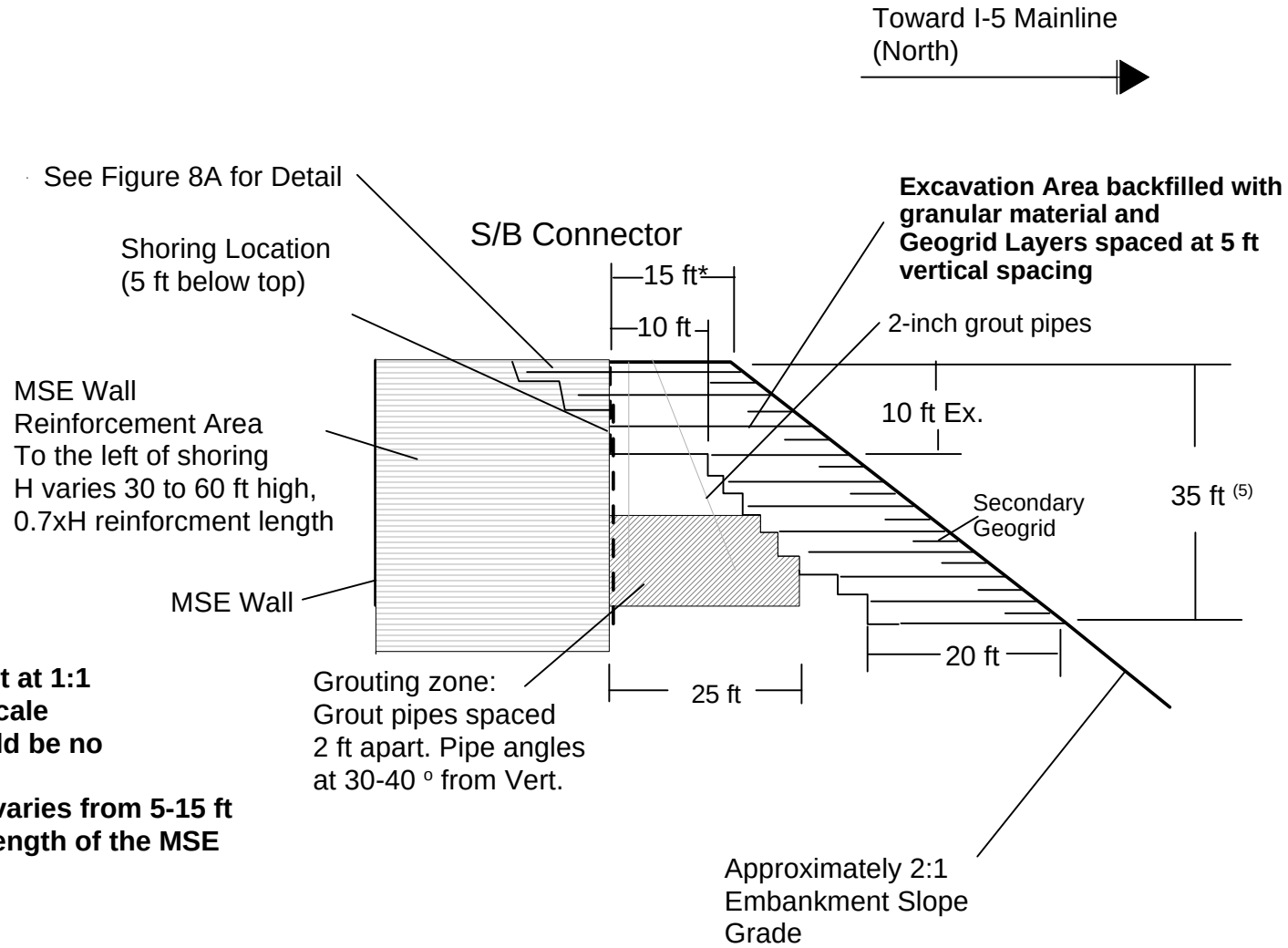


General Notes:
Temporary Back-cut at 1.2:1
Schematic Not to Scale
Benching widths should be no less than 3 feet.
(1) 25 feet from middle of No. 1 and 2 Lanes to hingepoint (HP)
(2) Grouting not recommended within Stations given for Location 1

Geogrid Notes:
(1) Minimum LTDS 4600 plf
(2) Vertical Spacing of 5 feet
(3) Geogrid Width: 20 feet at base of Slope, constant width.
(4) Design based on ϕ = 33 ^{o}

Figure 5

Location 2 Sect 1- S/B 133 to S/BI-5 - Repair Schematic
Station 4043+25 to 4044+30 (SE Line)



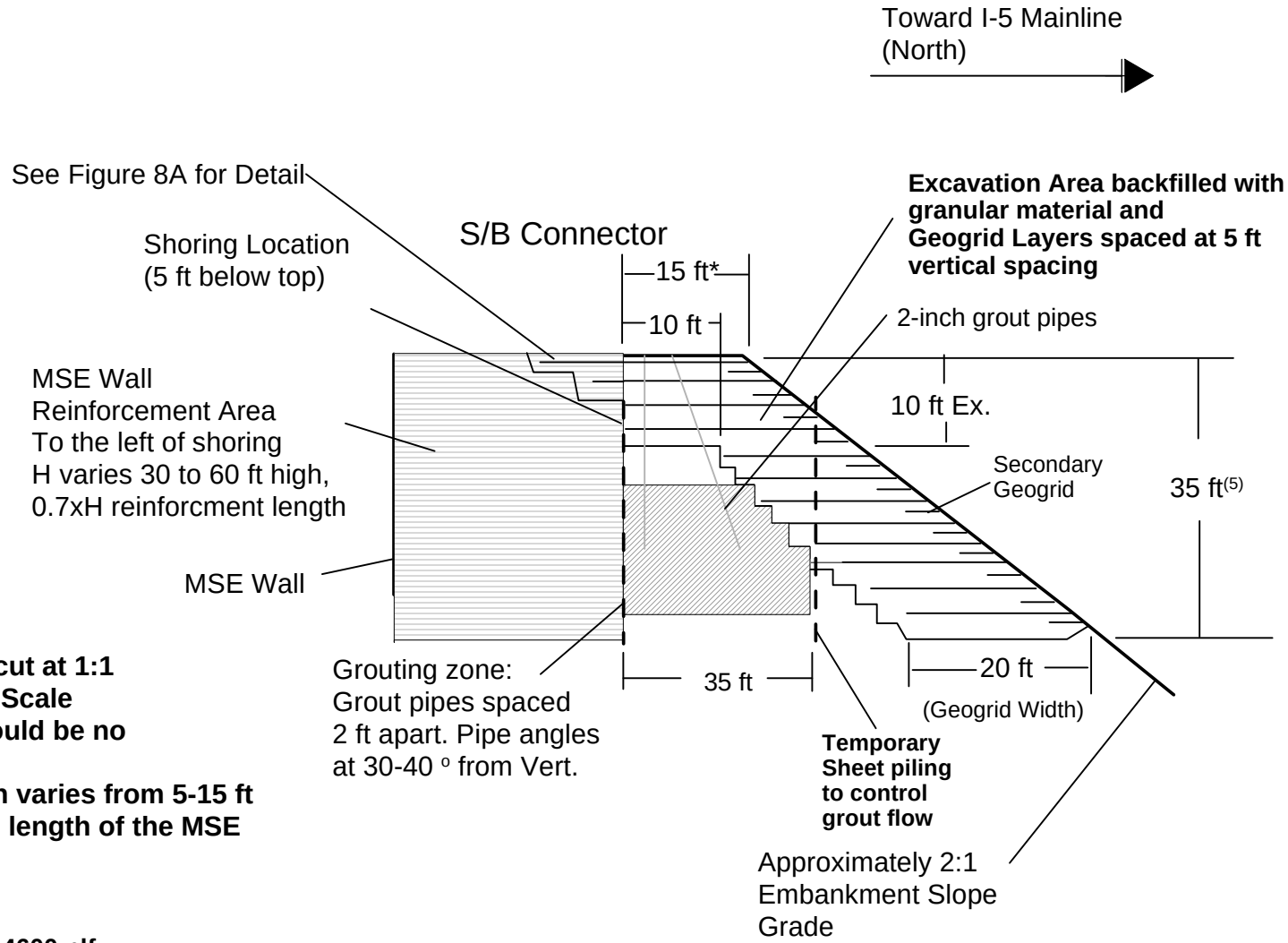
General Notes:
Temporary Back-cut at 1:1
Schematic Not to Scale
Bench widths should be no less than 3 feet.
***Excavation Width varies from 5-15 ft Depending on the length of the MSE Reinforcement**

Geogrid Notes:
(1) Minimum LTDS 4600 plf
(2) Vertical Spacing of 5 feet
(3) Geogrid Width: 20 feet at base of Slope, tapered width to top.
(4) Design based on ϕ = 33 º
(5) minimum 35 feet or to toe of Slope whichever is less.

Grouting Notes:
(1) Grout treatment Depth 17-28 ft
(2) Grout treatment width; 25 ft at base,
(3) Grout treatment: Permeation

Figure 6

Location 2 Sect 2- S/B 133 to S/BI-5 - Repair Schematic
Station 4044+30 to 4044+80 (SE Line)



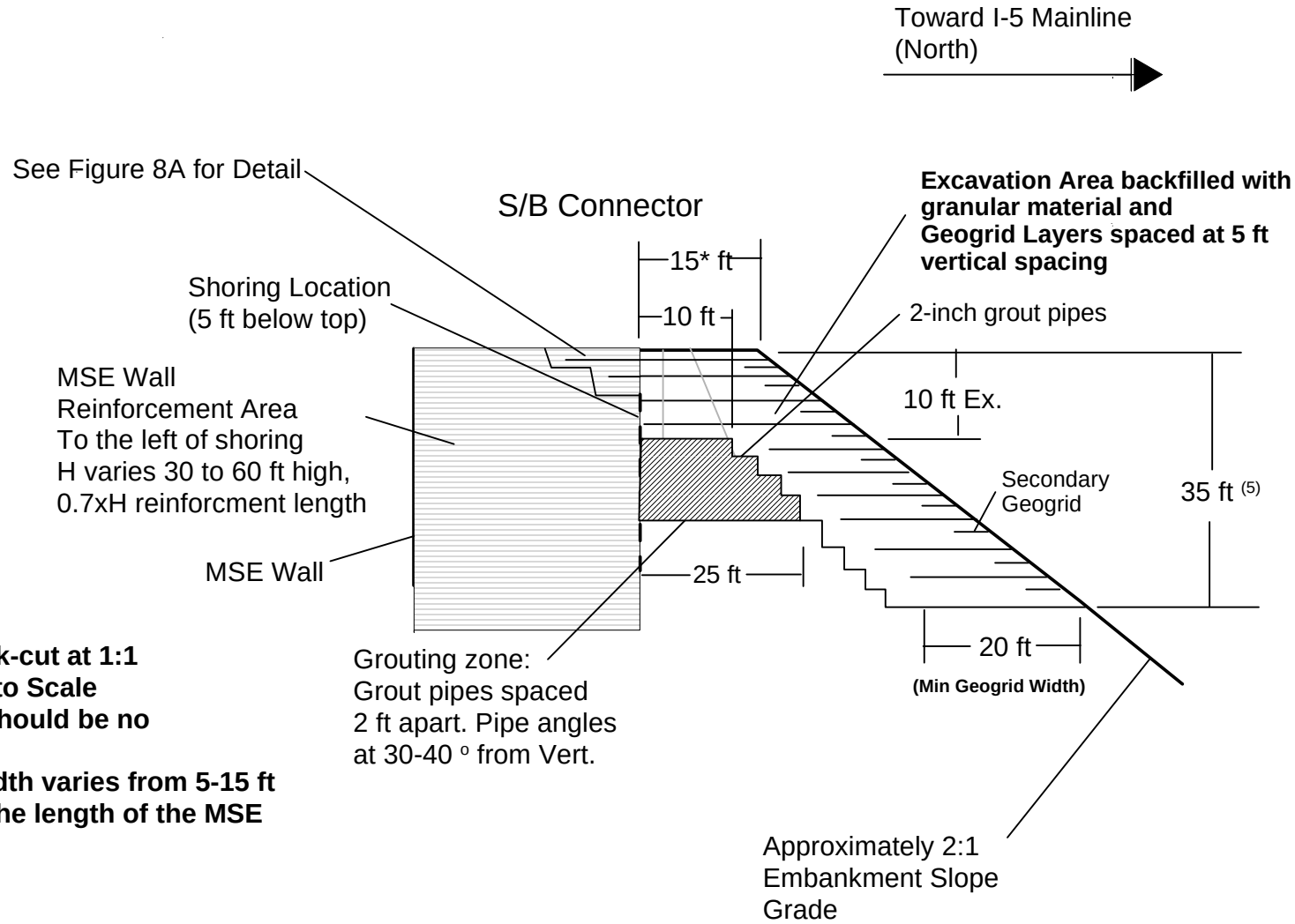
General Notes:
Temporary Back-cut at 1:1
Schematic Not to Scale
Bench widths should be no less than 3 feet.
***Excavation Width varies from 5-15 ft Depending on the length of the MSE Reinforcement**

Geogrid Notes:
(1) Minimum LTDS 4600 plf
(2) Vertical Spacing of 5 feet
(3) Geogrid Width: 20 feet at base of Slope, tapered width to top.
(4) Design based on ϕ = 33 º
(5) minimum 35 feet or to toe of Slope whichever is less.

Grouting Notes:
(1) Grout treatment Depth 16-30 ft
(2) Grout treatment width; 35 ft at base,
(3) Grout treatment: Permeation

Figure 7

Location 2 Sect 3- S/B 133 to S/BI-5 - Repair Schematic
Station 4044+95 to 4045+20 (SE Line)



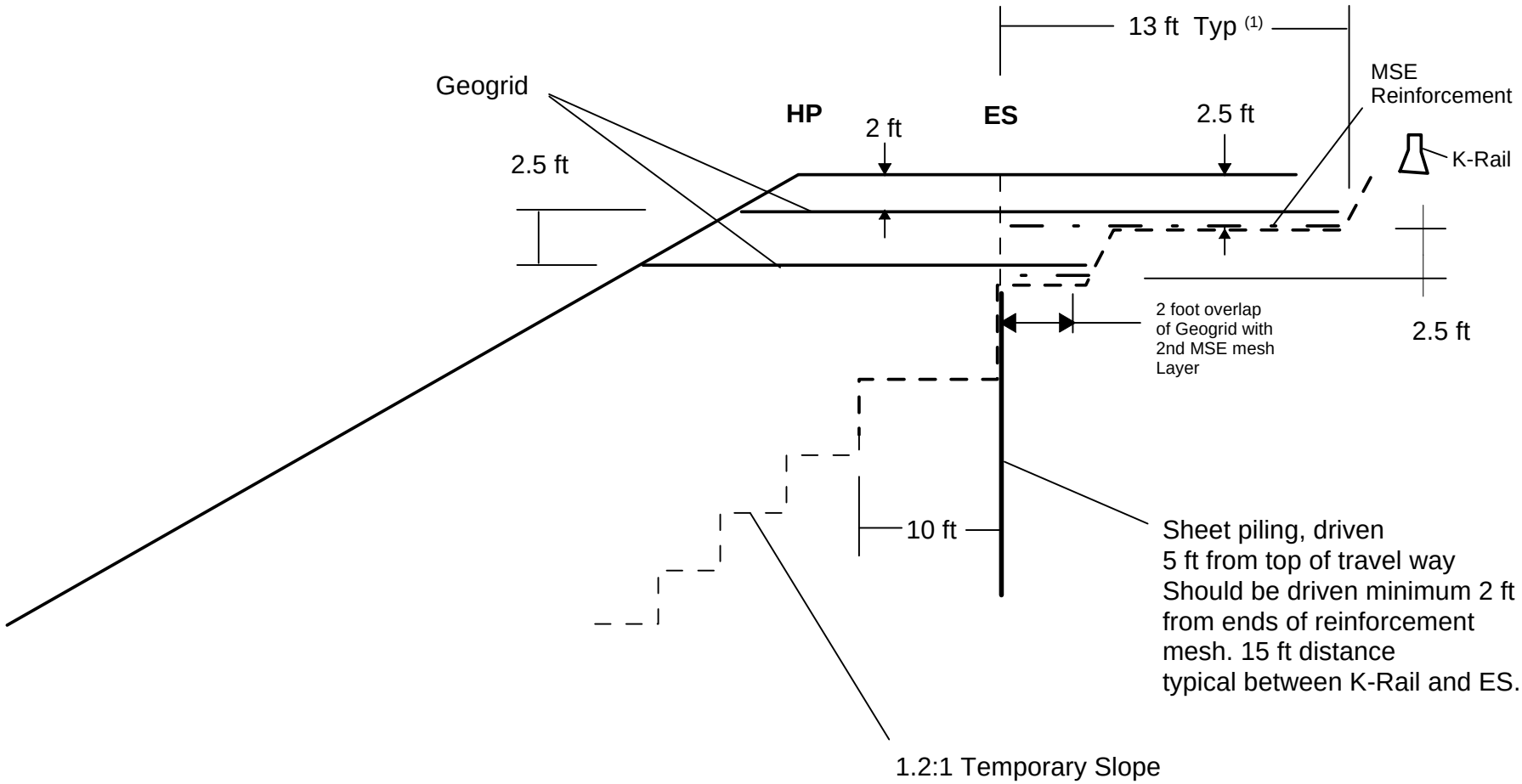
General Notes:
Temporary Back-cut at 1:1
Schematic Not to Scale
Bench widths should be no less than 3 feet.
***Excavation Width varies from 5-15 ft Depending on the length of the MSE Reinforcement**

Geogrid Notes:
(1) Minimum LTDS 4600 plf
(2) Vertical Spacing of 5 feet
(3) Geogrid Width: 20 feet at base of Slope, tapered width to top.
(4) Design based on ϕ = 33 º
(5) Depth of excavation will be minimum 35 feet or to toe of Slope if less than 35 feet.

Grouting Notes:
(1) Grout treatment Depth 10-20 ft
(2) Grout treatment width; 25 ft at base,
(3) Grout treatment: Permeation

Figure 8

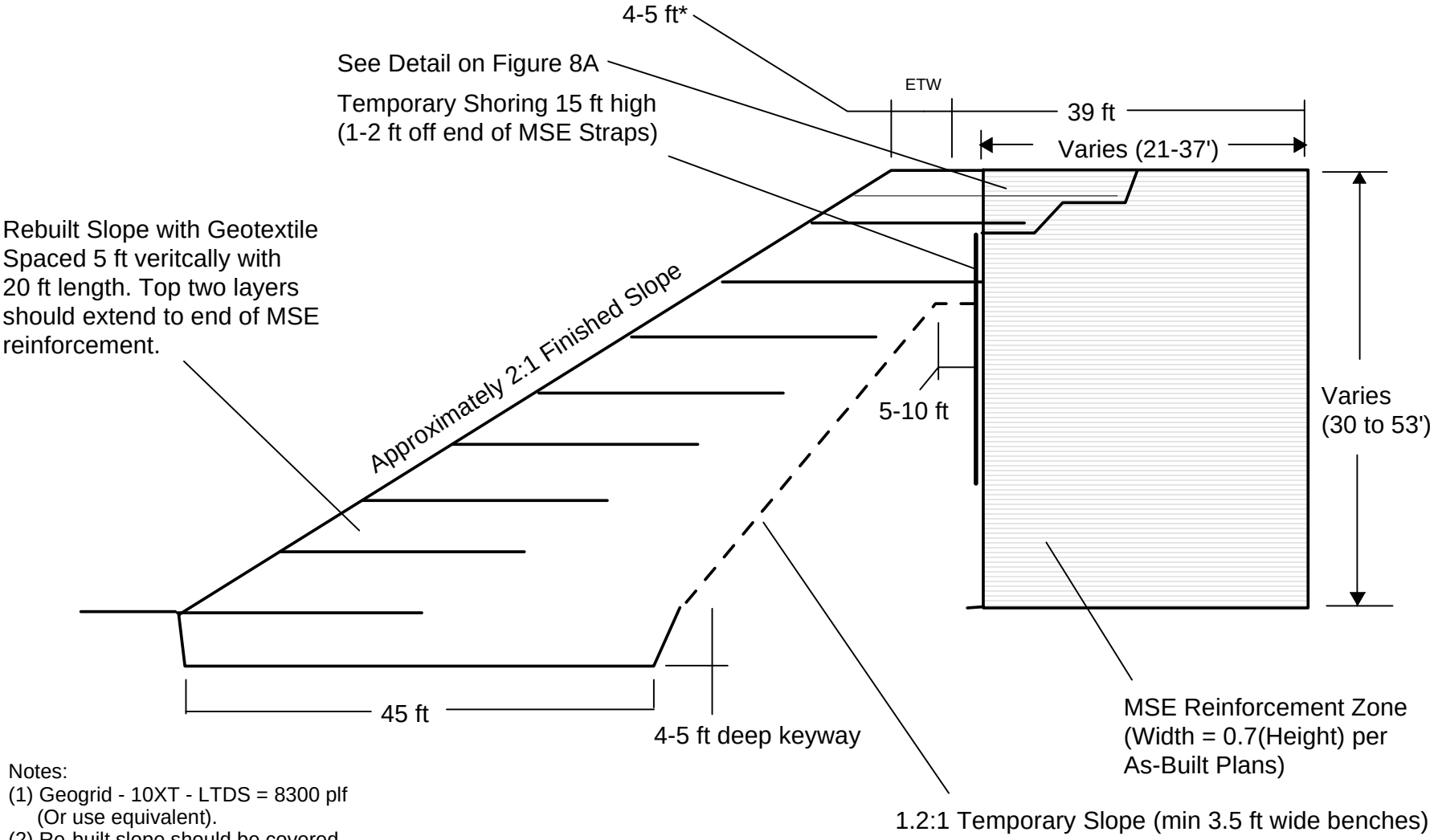
Location 2 Typical Connection Detail for Slope Backfill and MSE Reinforcement



Notes:
(1) 13 foot typical overlap of Mesh and Geogrid for top layer only.

Figure 8A

12-ORA-133-9.1/10.05
Location 2 - Alternate 2 Embankment distress Repair Plan Station between 4042 to 4049+91.6 (SE Line)



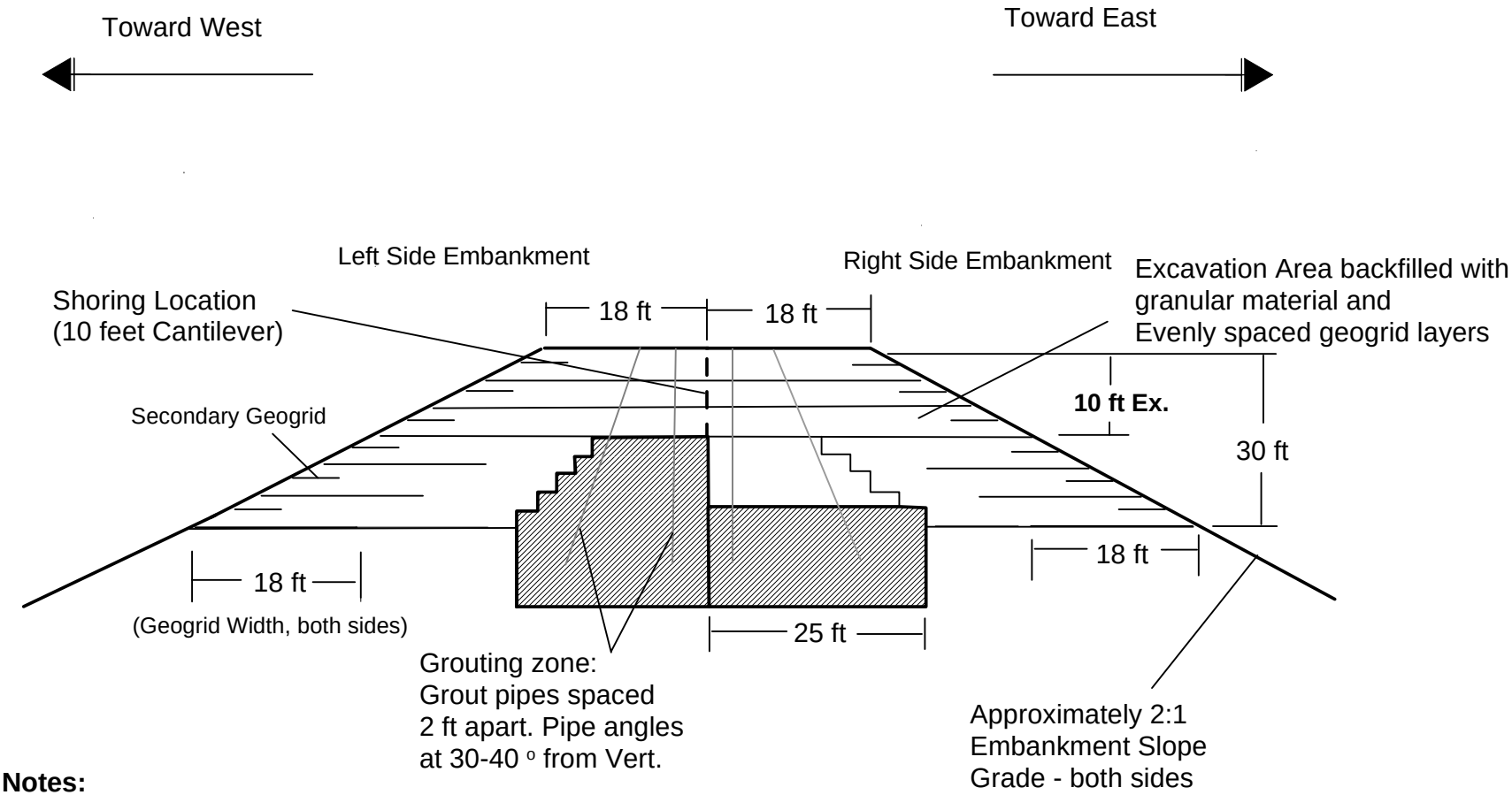
Notes:
(1) Geogrid - 10XT - LTDS = 8300 plf (Or use equivalent).
(2) Re-built slope should be covered with vegetation and wood chips or fiber mesh to prevent erosion.
(3) Backfill will be pre-dominantly granular (60% or more) with an Expansion Index less than 50.

* ETW to outer edge of guard rail: 2 ft.
Outer edge of guard rail to edge of slope: 2-3 ft

Additional Note: height and width of MSE Reinforcement zone varies between station 4042 to 4048+52. Please see next diagram for station 4048+52 to 4049+12.

Figure 8A

Location 3 Sections 1 and 2 - N/B I-5 to N/B133 - Repair Schematic
Station 5110+86 to 5111+35 (ALN 541, Sect 1), Station 5111+00 to 5111+30 ALN 541, Sect 2)



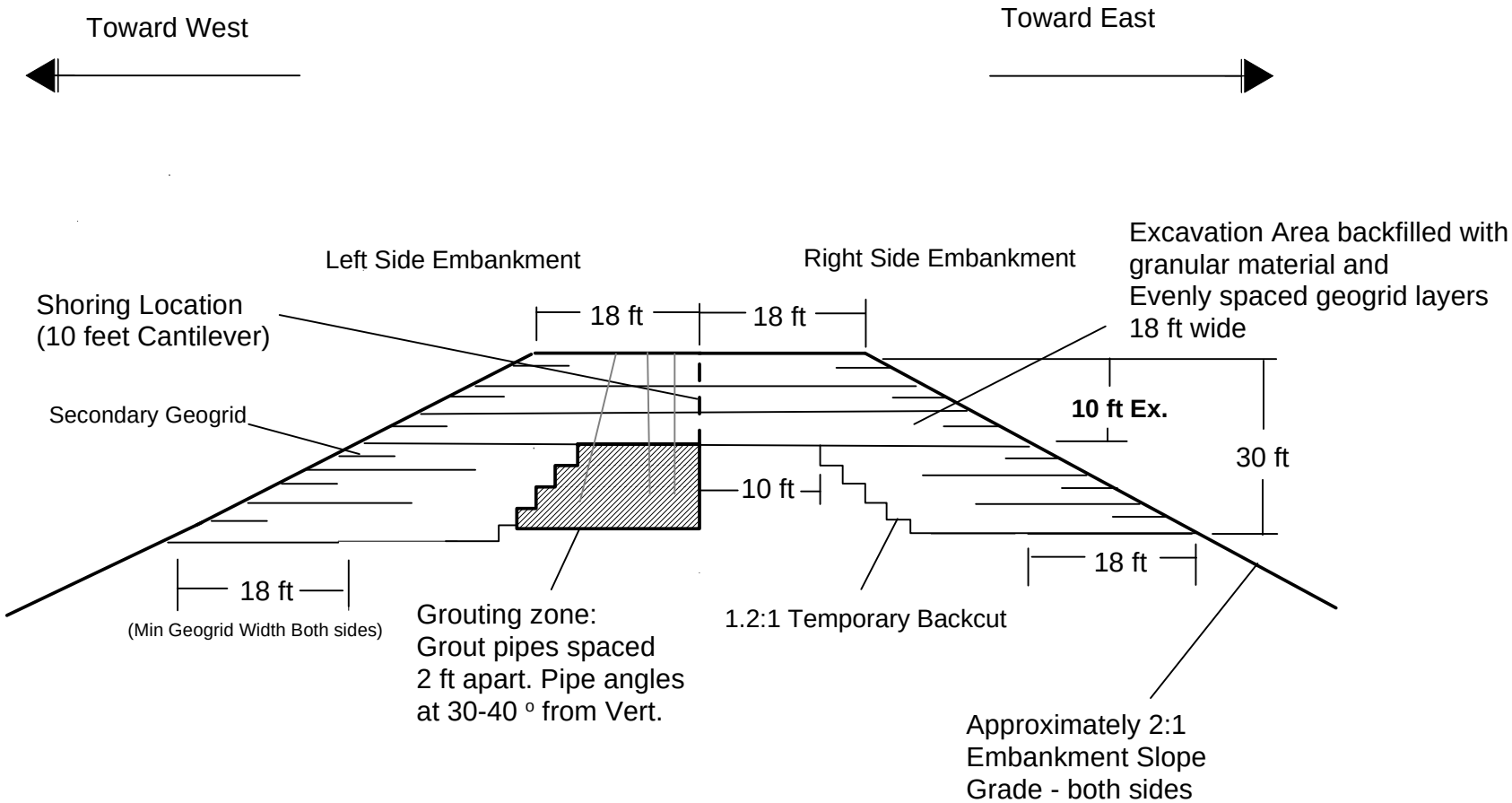
General Notes:
(1)Temporary Back-cut at 1:1
(2)Schematic Not to Scale
(3)Bench widths should be no less than 3 feet.
(4)Left side Embankment Geogrid and Grout recommendations for Station 5111+00 to 5111+30
(5)Right Side Embankment Recommendations for Station 5110+86 to 5111+36

Geogrid Notes:
(1) Minimum LTDS 4600 plf
(2) Vertical Spacing of 5 feet
(3) Geogrid Width: 18 feet at base of Slope, constant width to top.
(4) Design based on ϕ = 33 º

Grouting Notes:
(1) Grout treatment Depth 22-30 ft for Right side and 10-30 feet for Left Side
(2) Grout treatment width; 25 ft at base on both sides 17 feet at top on left side and 25 feet on the right
(3) Grout treatment: Permeation

Figure 9

Location 3 Section 3 - N/B I-5 to N/B133 - Repair Schematic
Station 5112+60 to 5113+75 (ALN 541)



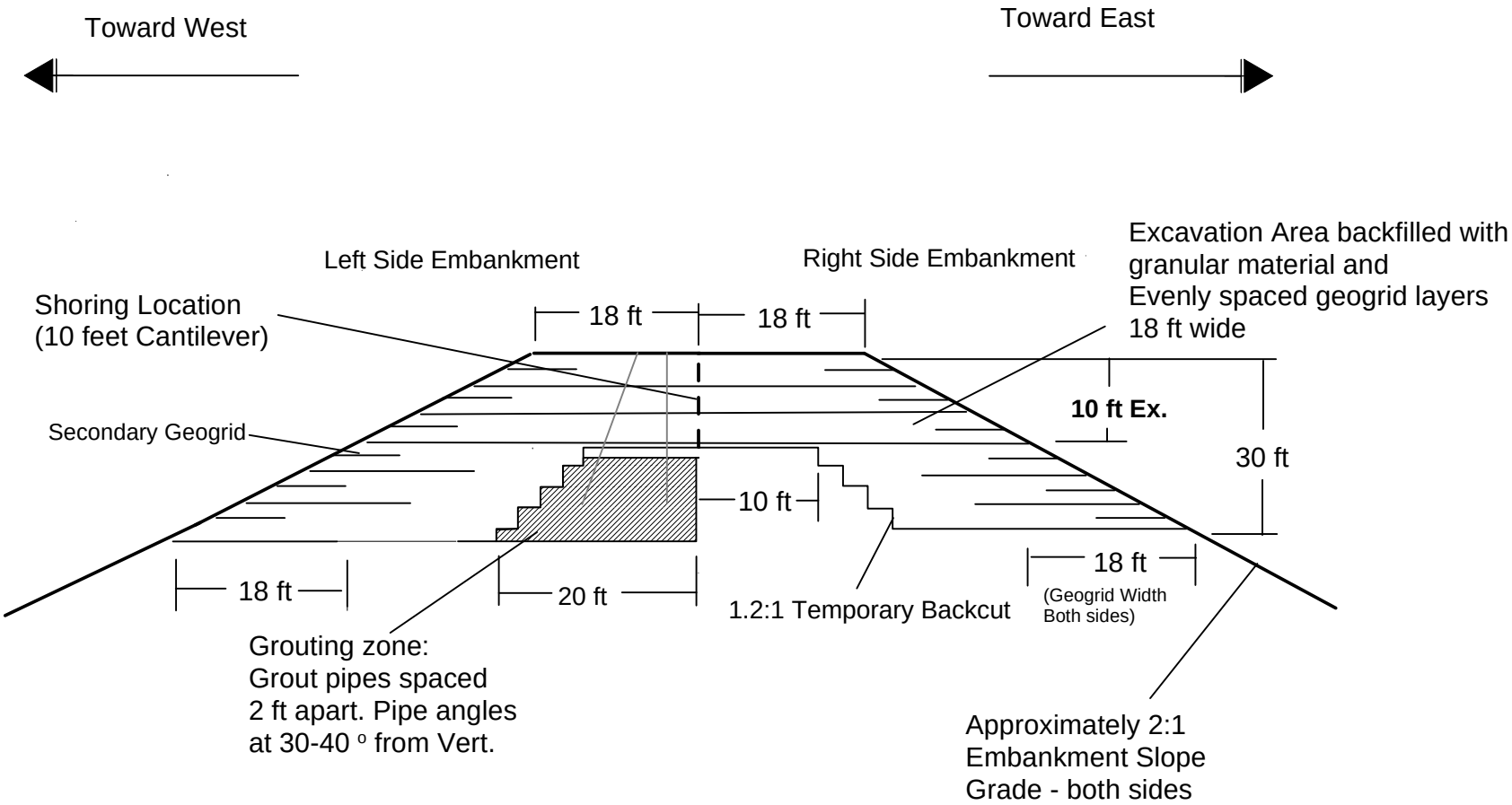
General Notes:
(1)Temporary Back-cut at 1:1
(2)Schematic Not to Scale
(3)Bench widths should be no less than 3 feet.
(4)Left side Embankment Geogrid and Grout recommendations for Station 5112+50 to 5113+00

Geogrid Notes:
(1) Minimum LTDS 4600 plf
(2) Vertical Spacing of 5 feet
(3) Geogrid Width: 18 feet at base of Slope, constant width to top.
(4) Design based on ϕ = 33 º

Grouting Notes:
(1) Grout treatment Depth 10-18 ft
(2) Grout treatment width; 20 ft at base
(3) Grout treatment: Fissure/Voids

Figure 10

Location 3 Section 4 - N/B I-5 to N/B133 - Repair Schematic
Station 5114+50 to 5115+25 (ALN 541)



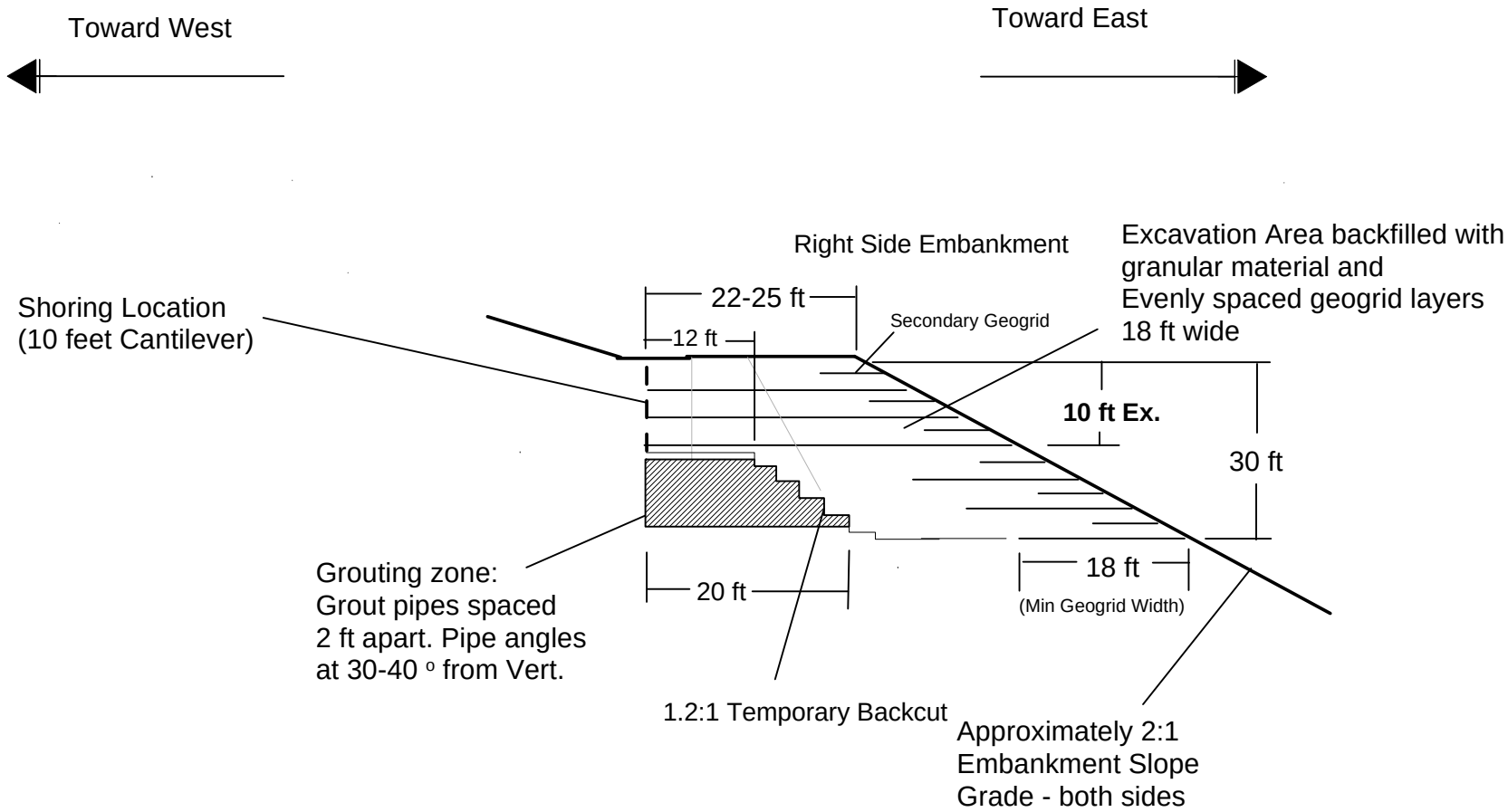
General Notes:
(1)Temporary Back-cut at 1:1
(2)Schematic Not to Scale
(3)Bench widths should be no less than 3 feet.
(4)Left side Embankment Geogrid and Grout recommendations for Station 5113+00 to 5113+90

Geogrid Notes:
(1) Minimum LTDS 4600 plf
(2) Vertical Spacing of 5 feet
(3) Geogrid Width: 18 feet at base of Slope, constant width to top.
(4) Design based on ϕ = 33 º

Grouting Notes:
(1) Grout treatment Depth 12-24 ft
(2) Grout treatment width; 20 ft at base
(3) Grout treatment: Fissure/Voids

Figure 11

Location 3 Section 5 - N/B I-5 to N/B133 - Repair Schematic
Station 5118+75 to 5119+50 (ALN 541)



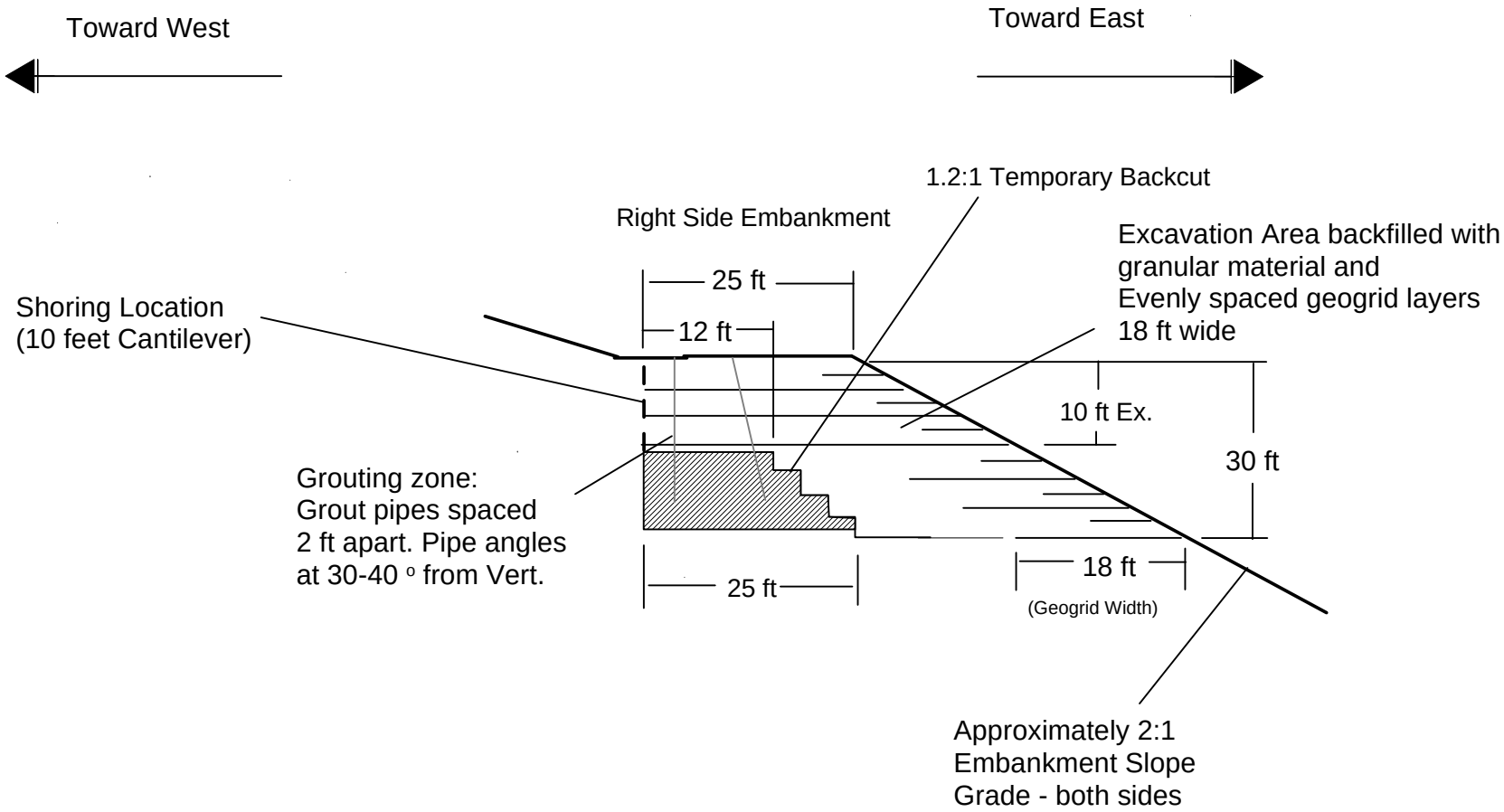
General Notes:
(1)Temporary Back-cut at 1:1
(2)Schematic Not to Scale
(3)Bench widths should be no less than 3 feet.
(4)Left side Embankment Geogrid and Grout recommendations for Station 5113+00 to 5113+90

Geogrid Notes:
(1) Minimum LTDS 4600 plf
(2) Vertical Spacing of 5 feet
(3) Geogrid Width: 18 feet at base of Slope, constant width to top.
(4) Design based on ϕ = 33 º

Grouting Notes:
(1) Grout treatment Depth 12-24 ft
(2) Grout treatment width; 20 ft at base
(3) Grout treatment: Fissure/Voids

Figure 12

Location 3 Section 6 - N/B I-5 to N/B133 - Repair Schematic
Station 5119+70 to 5120+20 (ALN 541)



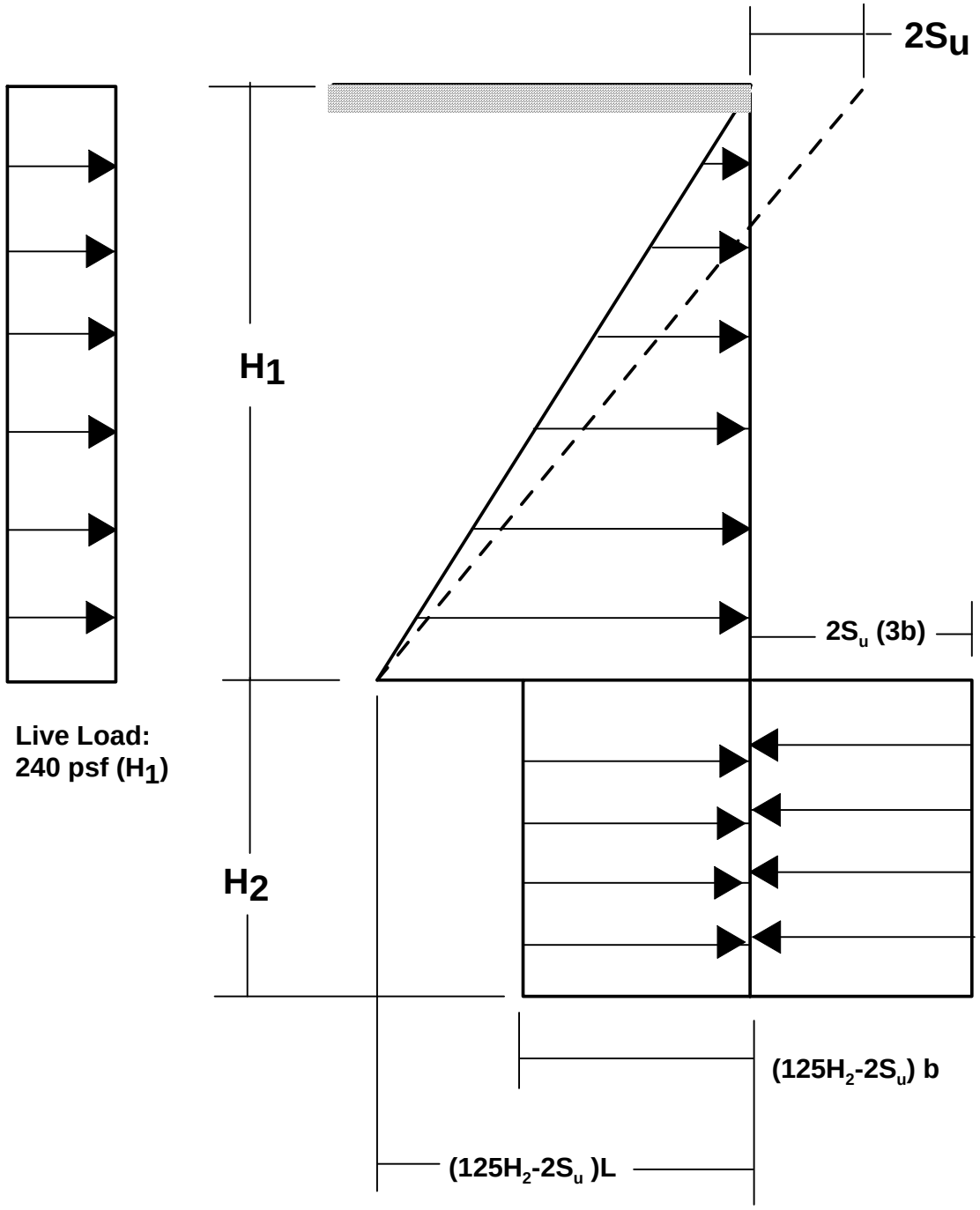
General Notes:
(1)Temporary Back-cut at 1:1
(2)Schematic Not to Scale
(3)Bench widths should be no less than 3 feet.

Geogrid Notes:
(1) Minimum LTDS 4600 plf
(2) Vertical Spacing of 5 feet
(3) Geogrid Width: 18 feet at base of Slope, constant width to top.
(4) Design based on ϕ = 33 º

Grouting Notes:
(1) Grout treatment Depth 10-18 ft
(2) Grout treatment width; 25 ft at base
(3) Grout treatment: Tension Cracks/Voids

Figure 13

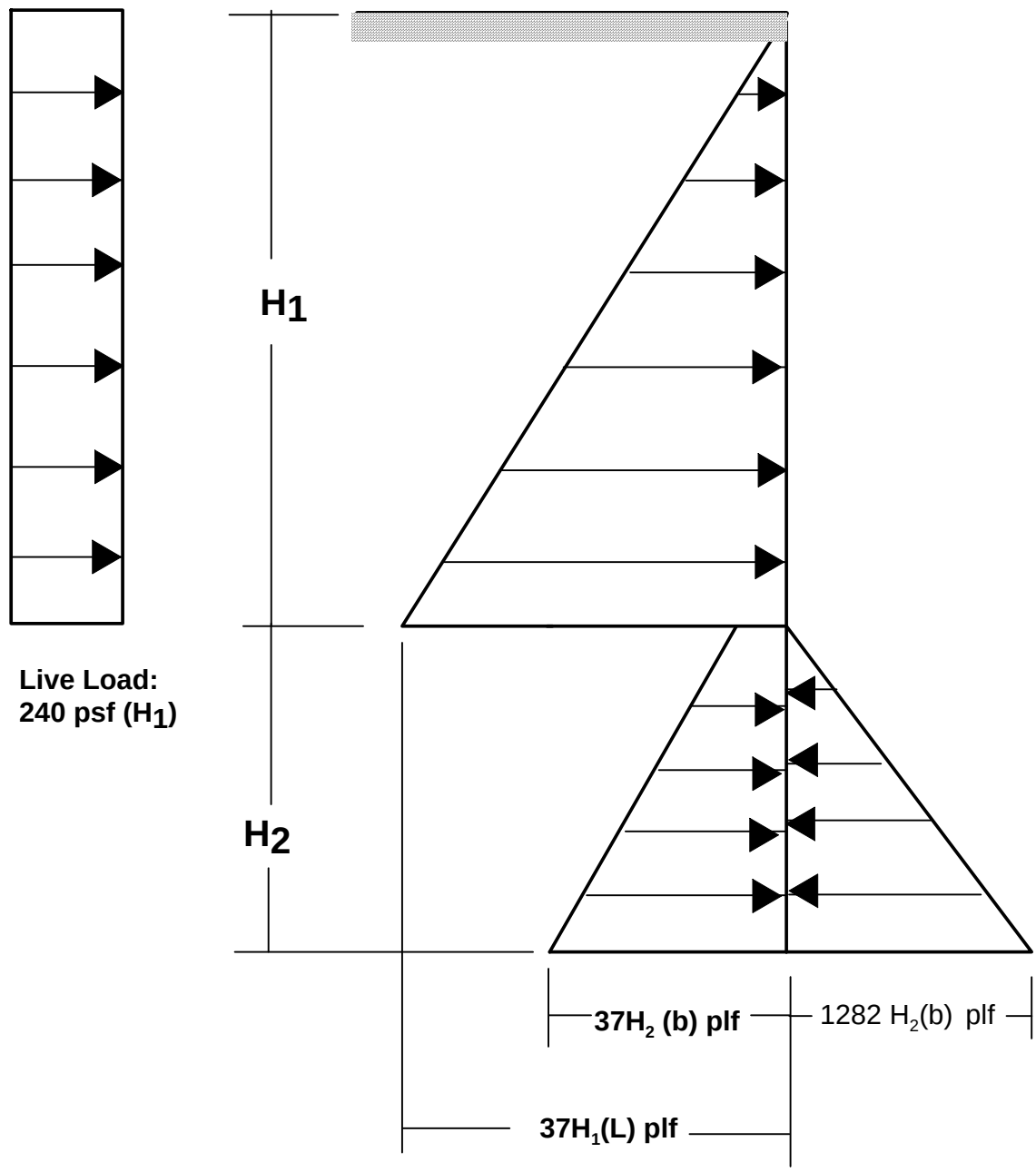
Earth Pressure Diagram for Cantilevered Shoring (Location 1)



Notes:
L = Center to Center spacing (ft)
b = embedded width element (ft)
S_u = 700 psf for Location 1
H_1 = Depth to bottom of excavation (ft)
H_2 = Embedded depth below excavation (ft)
Based on Figure 3.11.5.6-5 (LRFD BDS, Section 3)

Figure 14

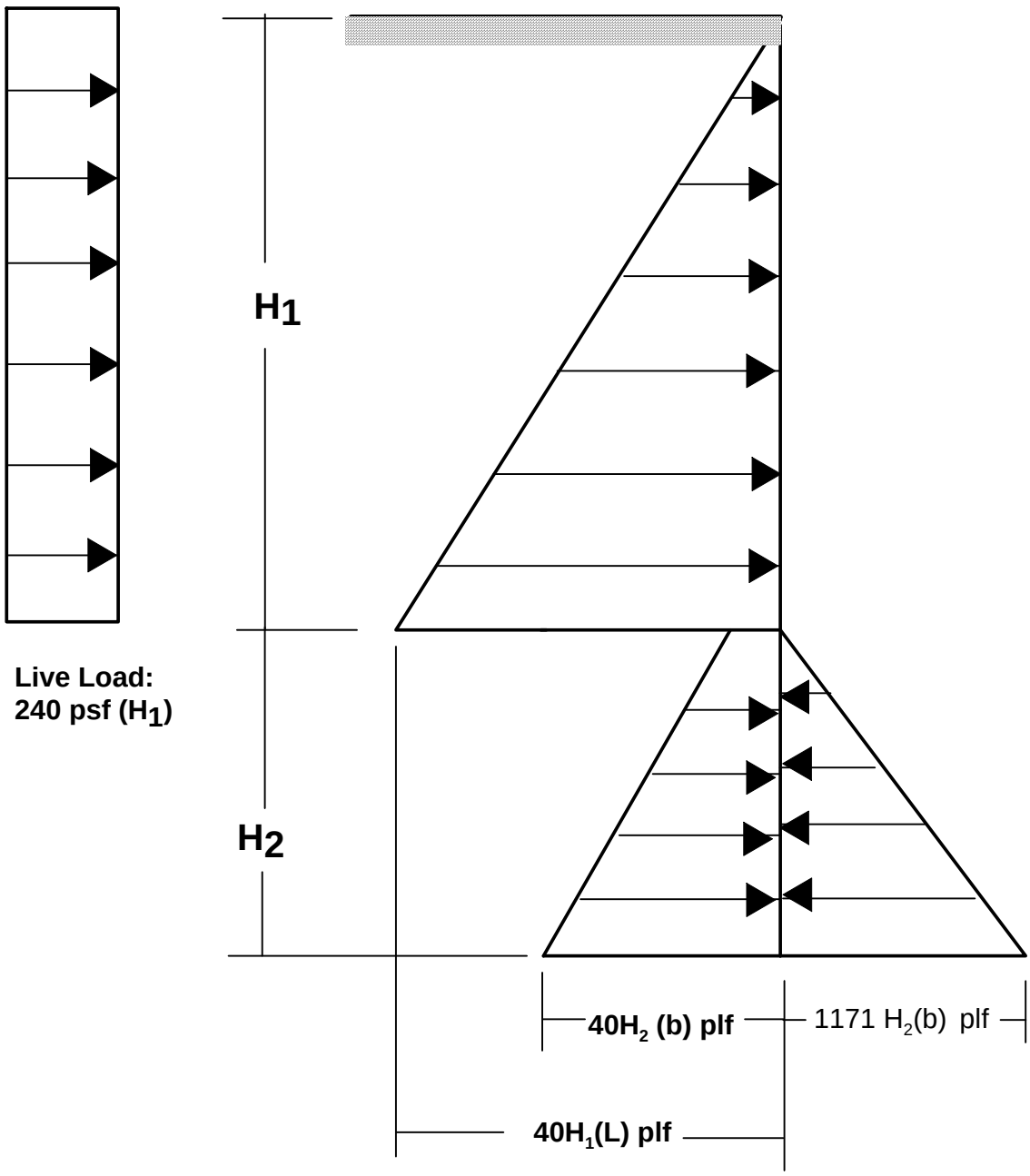
Earth Pressure Diagram for Cantilevered Shoring (Location 2)



Notes:
L = Center to Center spacing (ft)
b = embedded width element (ft)
$\phi = 33^o$ and $\gamma = 126$ pcf for full height of embankment
H_1 = Depth to bottom of excavation (ft)
H_2 = Embedded depth below excavation (ft)
Based on Figure 3.11.5.6-1 (LRFD BDS, Section 3)

Figure 15

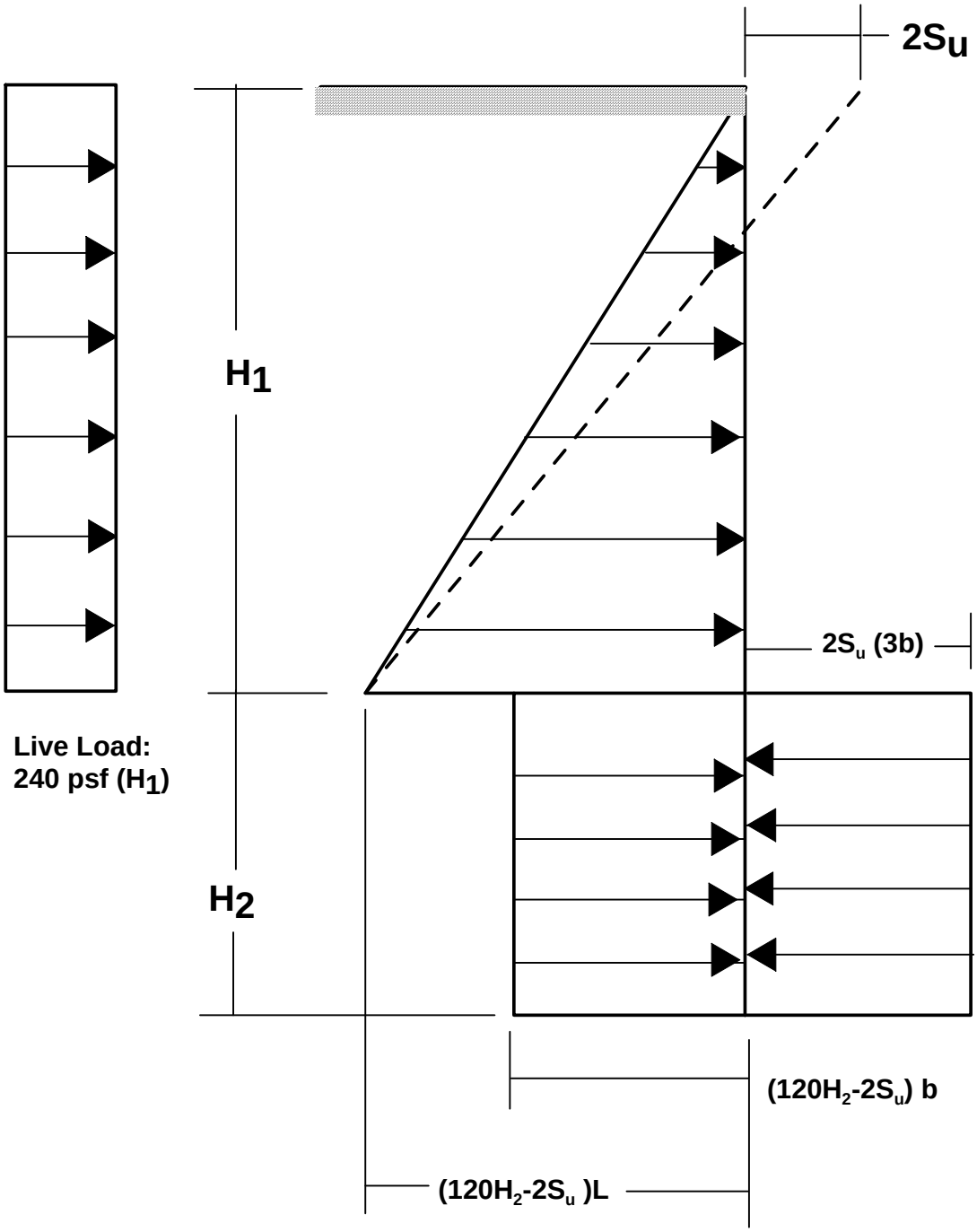
Earth Pressure Diagram for Cantilevered Shoring (Location 3) Station 5108+70 to 5116+20



Notes:
L = Center to Center spacing (ft)
b = embedded width element (ft)
$\phi = 31^o$ and $\gamma = 126$ pcf for full height of embankment
H_1 = Depth to bottom of excavation (ft)
H_2 = Embedded depth below excavation (ft)
Based on Figure 3.11.5.6-1 (LRFD BDS, Section 3)

Figure 16

Earth Pressure Diagram for Cantilevered Shoring (Location 3) Station 5116+20 to 5122+70



Notes:
L = Center to Center spacing (ft)
b = embedded width element (ft)
S_u = 1200 psf for Location 3 (Sta 5121+00 to Marine Way)
H_1 = Depth to bottom of excavation (ft)
H_2 = Embedded depth below excavation (ft)
Based on Figure 3.11.5.6-5 (LRFD BDS, Section 3)

Figure 16A

Appendix B
CPT and Soil Boring Summary Table

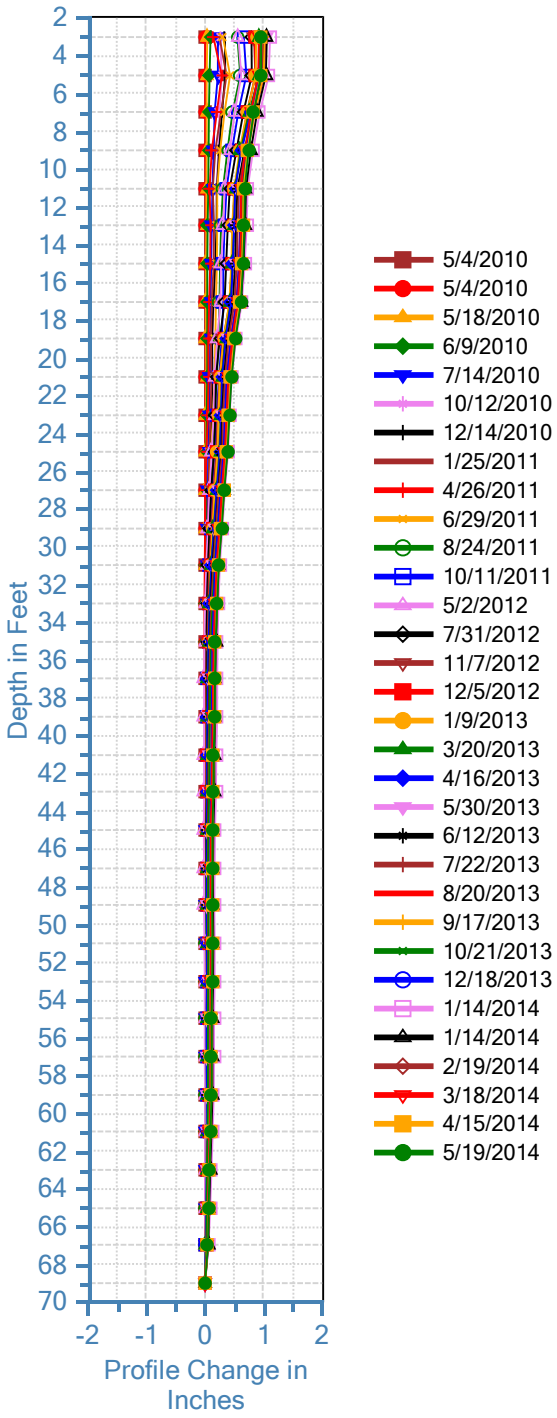
Table - Summary of Borings and CPT's

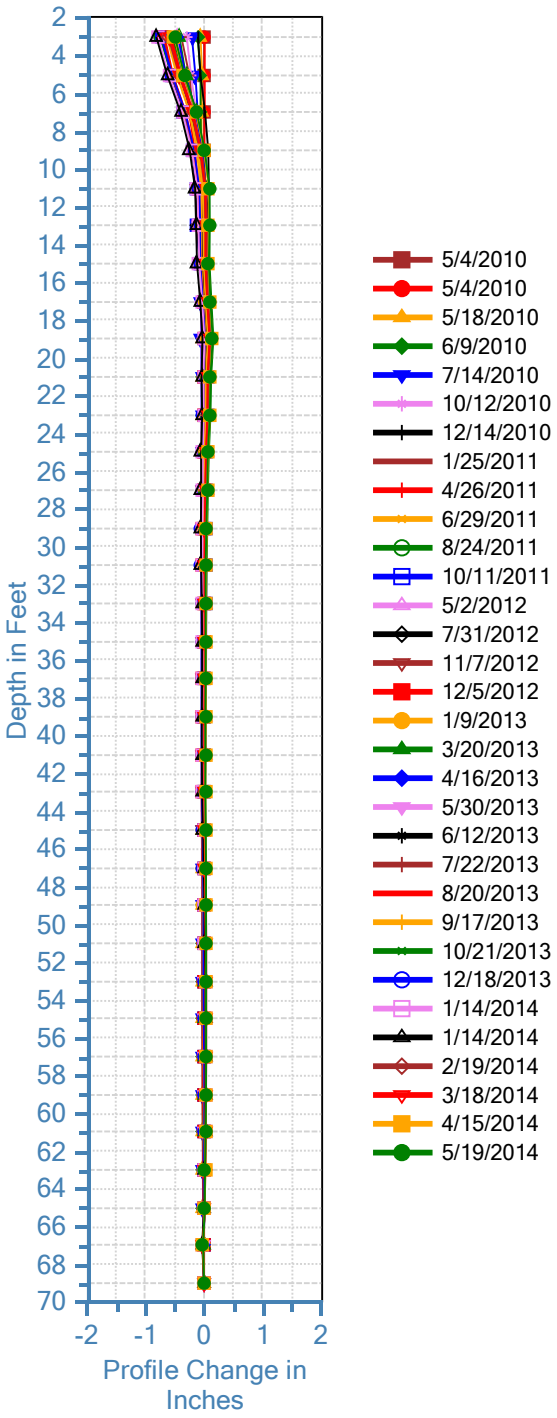
Borings/CPT's	Location	Date Perfomed	Stations	Offset	Elevation, ft	Alignment	Depth Drilled, ft	SI	Notes
CPT-1	1	12/9/2009	4068+78	37.4L	267.6	SB133	67.1		adjacent to R-10-001
CPT-2	1	12/9/2009	4066+76	36.9L	269	SB133	69.1		adjacent to R-10-002
CPT-3	2	12/9/2009	4049+40	8.1R	261.6	SB133	71.1		adjacent to A-10-003 (SB)
CPT-4	2	12/9/2009	4047+68	6.9R	255	SB133	60		adjacent to R-10-004
CPT-5	2	12/9/2009	4045+25	6.9R	248.5	SB133	60		adjacent to R-10-005
R-10-001 (SB)	1	1/26/2010	4066+76	37.4L	269	SE Line	71.5		
R-10-002 (SB)	1	1/26/2010	4068+78	36.9L	267.6	SE Line	71.5	Yes	SI-B2
A-10-003 (SB)	2	2/3/2010	4049+40	8.1R	261.6	SE Line	71.5		
R-10-004 (SB)	2	1/28/2010	4047+68	6.9R	255	SE Line	56.5	Yes	SI-B4
R-10-005 (SB)	2	1/28/2010	4045+25	6.9R	245.8	SE Line	46.5	Yes	SI-B5
A-10-006 (SB)	2	2/4/2010	444+73	101.9L	219.1	C/L Rte 5	31.5	Yes	SI-B6
A-10-007 (SB)	2	2/4/2010	447+09	116.5L	215.3	C/L Rte 5	31.5	Yes	SI-B7
A-10-001 (NB)	3	4/20/2010	5121+44	28.2R	261.9	ALN 541	71.5	Yes	SI-B1
A-10-002 (NB)	3	4/21/2010	5117+79	26.4R	268.3	ALN 541	61.5		
A-10-003 (NB)	3	4/29/2010	5115+36	7.3L	256	ALN 541	61.5		
A-10-004 (NB)	3	4/29/2010	5111+13	25.4R	236.6	ALN 541	61.5		
R-12-009 (NB)	3	3/28/2012	5115+30	25R	256	ALN 541	61.5	Yes	
R-12-010 (NB)	3	3/28/2012	5117+90	20R	268	ALN 541	59.5	Yes	
R-12-011 (NB)	3	3/28/2012	5121+50	19R	269	ALN 541	59.5	Yes	
CPT-13-001	3	6/4/2013	5110+74	22.4R	234.7	ALN 541	19.6		
CPT-13-002	3	6/4/2013	5111+02	22.9R	236.1	ALN 541	50		
CPT-13-003	3	6/4/2013	5111+25	22.6R	237.5	ALN 541	50		
CPT-13-004	3	6/4/2013	5111+46	22.4R	238.6	ALN 541	40		
CPT-13-005	3	6/4/2013	5112+84	22.7R	245.3	ALN 541	27.6		
CPT-13-006	3	6/4/2013	5113+00	23.2R	246.1	ALN 541	43		
CPT-13-007	3	6/5/2013	5113+31	23.7R	247.2	ALN 541	50		
CPT-13-008	3	6/5/2013	5113+57	23.4R	248.2	ALN 541	50		
CPT-13-009	3	6/5/2013	5114+73	24.1R	252.8	ALN 541	41.6		
CPT-13-010	3	6/5/2013	5115+07	24.5R	253.9	ALN 541	41.5		
CPT-13-011	3	6/5/2013	5115+40	24.7R	255.1	ALN 541	48.5		
CPT-13-012	3	7/23/2013	5115+57	24.6R	255.7	ALN 541	42.1		
CPT-13-013	3	7/23/2013	5117+50	20.5R	261.6	ALN 541	38.2		
CPT-13-014	3	7/23/2013	5117+79	20.3R	262.2	ALN 541	42.2		
CPT-13-015	3	7/23/2013	5118+04	20.1R	262.8	ALN 541	41.8		
CPT-13-016	3	7/23/2013	5115+79	24R	256.6	ALN 541	50.5		
CPT-13-017	3	7/23/2013	5118+27	19.6R	263.4	ALN 541	41.9		
CPT-13-018	3	7/23/2013	5118+47	18.8R	264	ALN 541	42		
CPT-13-019	3	7/24/2013	5118+74	18.6R	264.5	ALN 541	42		
CPT-13-020	3	7/24/2013	5119+05	18R	265.2	ALN 541	41.5		
CPT-13-021	3	7/24/2013	5119+32	18.8R	265.5	ALN 541	41.5		
CPT-13-022	3	7/24/2013	5119+59	18.5R	266.2	ALN 541	41.8		
CPT-13-023	3	7/24/2013	5119+85	17.7R	266.4	ALN 541	41.3		
CPT-13-024	3	7/24/2013	5120+01	20.6R	266.5	ALN 541	42.2		
CPT-13-025	3	7/24/2013	5120+39	20R	267	ALN 541	42.5		
CPT-13-026	3	7/24/2013	5120+86	18.5R	267.3	ALN 541	42.4		
CPT-13-027	3	7/25/2013	5110+87	0.2R	236.4	ALN 541	42		
CPT-13-028	3	7/25/2013	5111+13	1.2R	237.8	ALN 541	51.4		
CPT-13-029	3	7/25/2013	5111+48	0.9R	239.6	ALN 541	51.3		
CPT-13-030	3	7/25/2013	5112+83	2.2R	246.4	ALN 541	51.4		
CPT-13-031	3	7/25/2013	5113+11	2.5R	247.6	ALN 541	24.5		
CPT-13-032	3	7/25/2013	5113+36	2.2R	248.5	ALN 541	51.6		
CPT-13-033	3	7/25/2013	5113+61	2.2R	249.6	ALN 541	31.2		
CPT-13-034	3	7/25/2013	5114+71	1.1R	253.4	ALN 541	42		
CPT-13-035	3	7/25/2013	5114+86	0.3L	254	ALN 541	42		
CPT-13-036	3	7/30/2013	5115+16	1.5L	255.4	ALN 541	42.2		
CPT-13-037	3	7/30/2013	5115+09	9.7R	254.7	ALN 541	42.2		
CPT-13-038	3	7/30/2013	5115+32	8.5R	255.6	ALN 541	41.6		

Table - Summary of Borings and CPT's

Borings/CPT's	Location	Date Perfomed	Stations	Offset	Elevation, ft	Alignment	Depth Drilled, ft	SI	Notes
CPT-13-039	3	7/30/2013	5115+57	7.8R	256.6	ALN 541	41.9		
CPT-13-040	3	7/30/2013	5115+43	0.2R	256.4	ALN 541	41.9		
CPT-13-041	3	7/30/2013	5115+68	0.2R	257.4	ALN 541	41.4		
CPT-13-042	1	7/31/2013	4070+24	21.8L	267.7	SE Line	41.9		
CPT-13-043	1	7/31/2013	4070+00	23.2L	267.8	SE Line	41.4		
CPT-13-044	1	7/31/2013	4069+70	21.0L	267.8	SE Line	41.6		
CPT-13-045	1	7/31/2013	4069+49	21.5L	267.8	SE Line	42		
CPT-13-046	1	7/31/2013	4068+96	27.3L	267.7	SE Line	40.7		
CPT-13-047	1	7/31/2013	4063+64	25.4L	268	SE Line	41.1		
CPT-13-048	1	7/31/2013	4068+40	25.6L	268	SE Line	41		
CPT-13-049	1	8/1/2013	4068+15	24.5L	268.2	SE Line	41.7		
CPT-13-050	1	8/1/2013	4067+68	24.8L	268.4	SE Line	41.7		
CPT-13-051	1	8/1/2013	4067+43	25.1L	268.5	SE Line	43.1		
CPT-13-052	1	8/1/2013	4067+25	25.7L	268.7	SE Line	41.8		
CPT-13-053	1	8/1/2013	4066+94	25.6L	268.9	SE Line	41.4		
CPT-13-054	1	8/1/2013	4067+34	19.9L	268.9	SE Line	41.7		
CPT-13-055	1	8/1/2013	4067+06	21.5L	269.1	SE Line	41		
CPT-13-056	2	8/6/2013	4047+76	2.6L	255.0	SE Line	41.6		
CPT-13-057	2	8/6/2013	4047+54	2.9L	254.9	SE Line	41.2		
CPT-13-058	2	8/6/2013	4047+32	1.9L	254.1	SE Line	41.7		
CPT-13-059	2	8/6/2013	4047+11	1.6L	253.4	SE Line	10.4		
CPT-13-060	2	8/6/2013	4045+30	2.5L	246.3	SE Line	42.2		
CPT-13-061	2	8/6/2013	4045+07	2.7L	245.3	SE Line	42		
CPT-13-062	2	8/6/2013	4044+84	2.9L	244.4	SE Line	43.2		
CPT-13-063	2	8/6/2013	4044+62	3.2L	243.5	SE Line	41.5		
CPT-13-064	2	8/7/2013	4044+40	2.7L	242.6	SE Line	42		
CPT-13-065	2	8/7/2013	4044+19	3.0L	241.7	SE Line	41.4		
CPT-13-066	2	8/7/2013	4043+96	2.8L	241	SE Line	41.2		
CPT-13-067	2	8/7/2013	4043+73	2.5L	239.9	SE Line	41.3		

Appendix C
Slope Monitoring Results

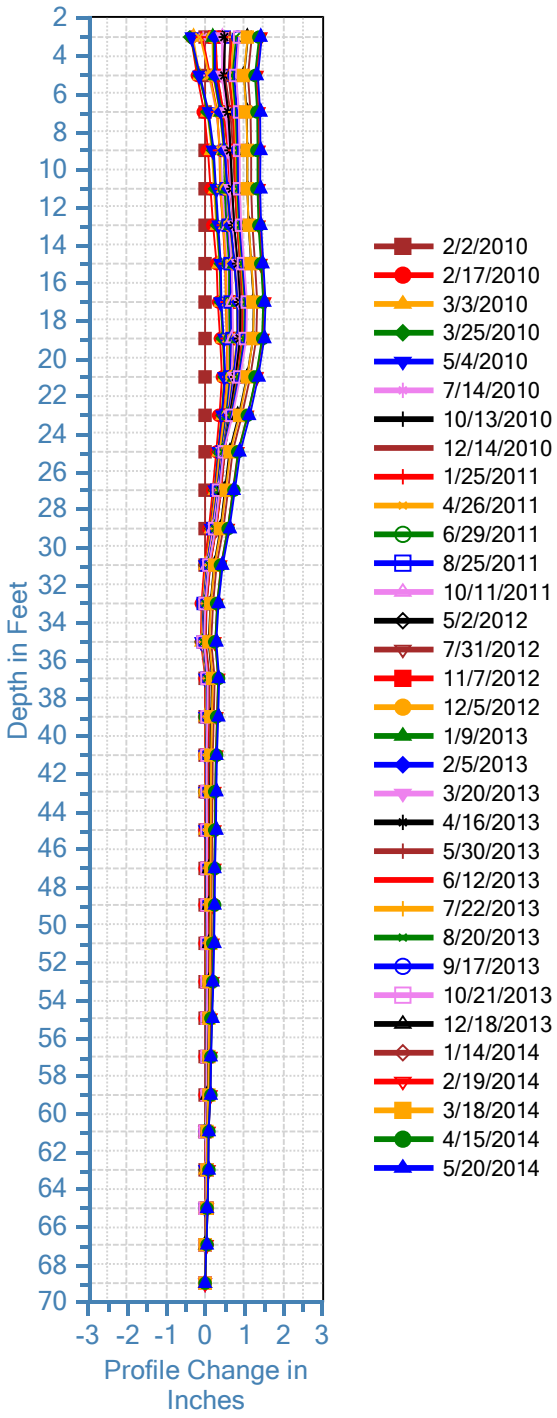


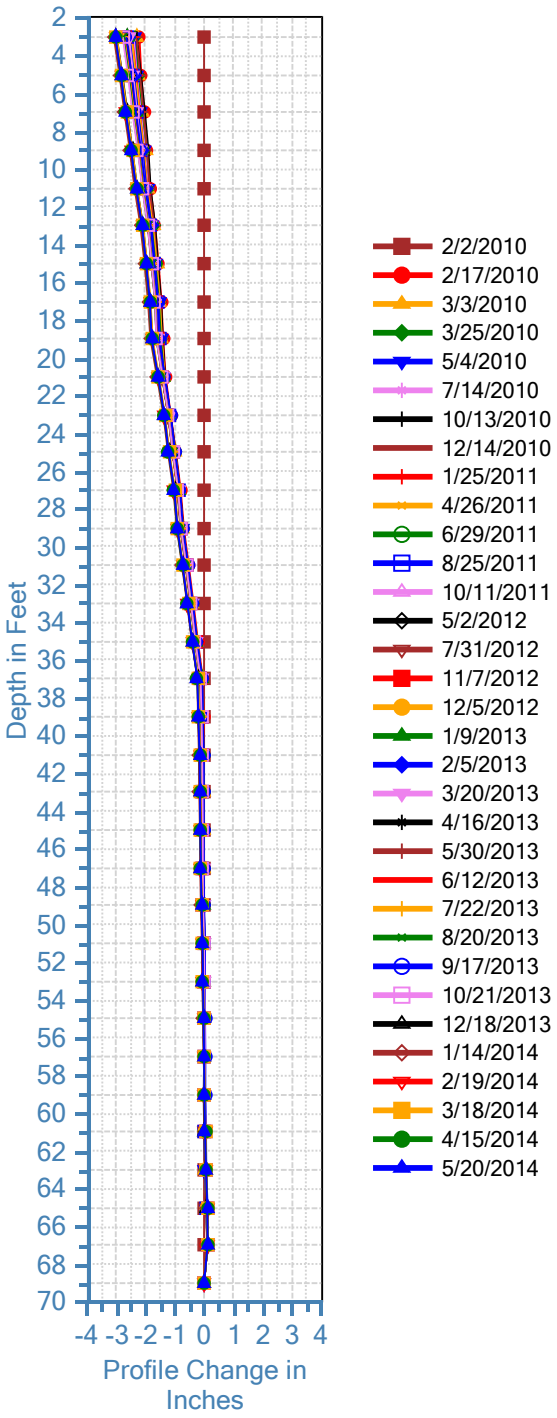


INCLINOMTER RESULTS

12-ORA-HWY 133 P.M. 8.8 - 10.9
Rt 133/I-5 Connector Embankment
E.A. No. 12-111003

Depth of Inclinometer Casing: 70.7 ft
Ao Direction: 82 (Magnetic North)
Location: HWY 133/I-5 PM 8.8-10.9

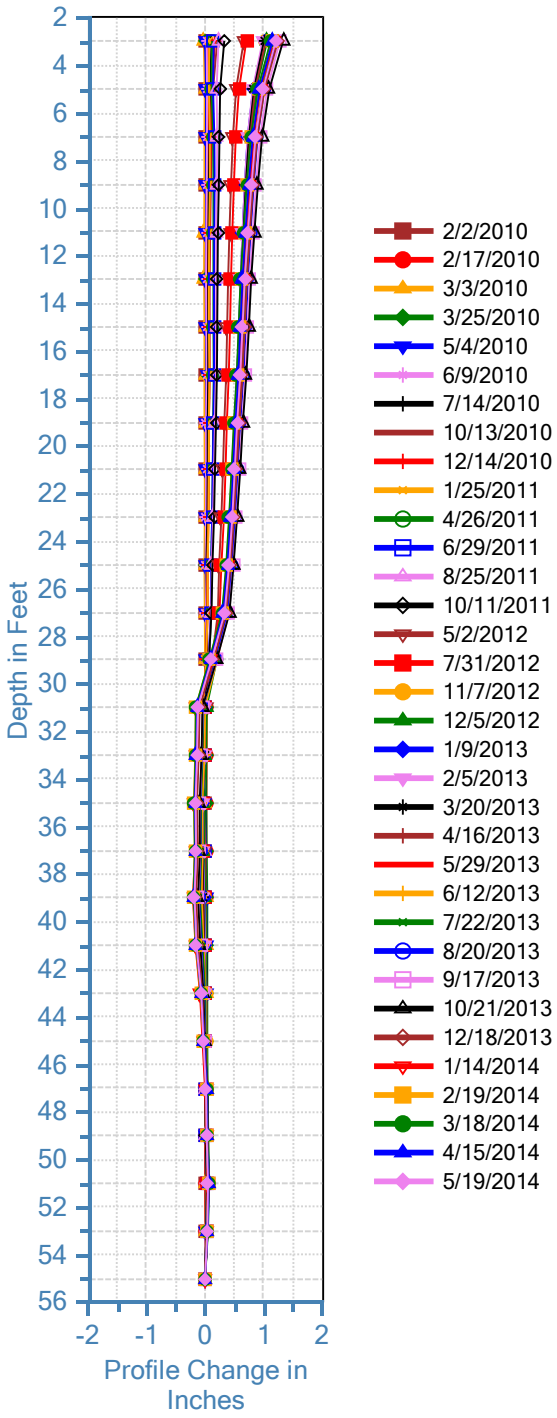


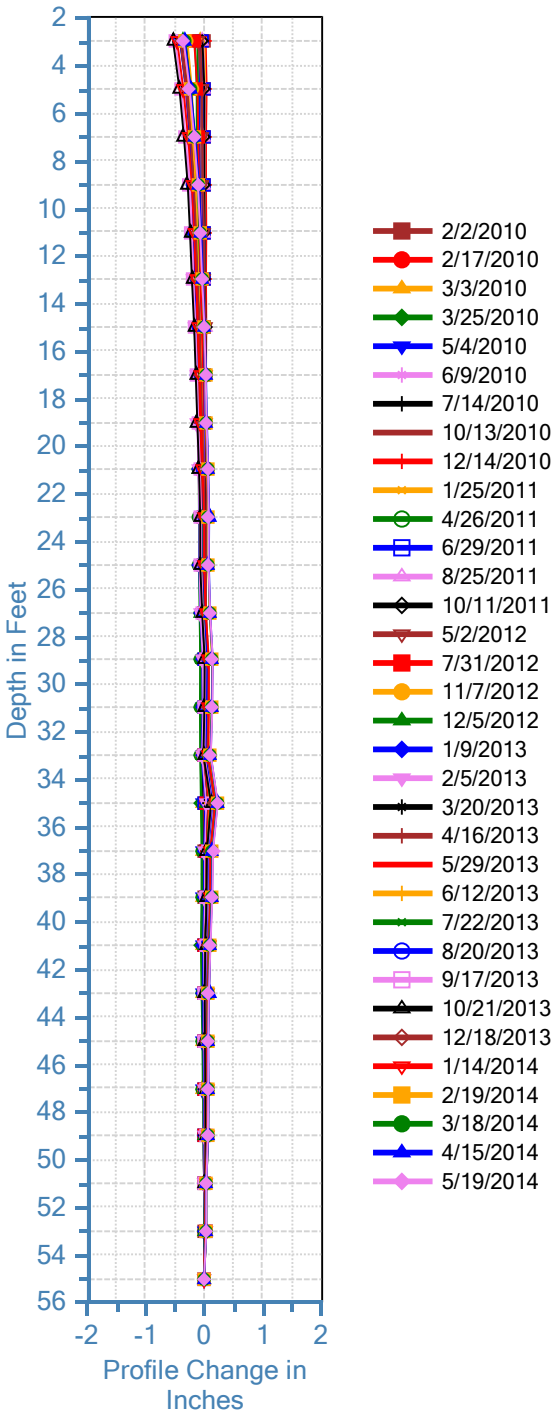


Caltrans

INCLINOMTER RESULTS
12-ORA-HWY 133 P.M. 8.8 - 10.9
Rt 133/I-5 Connector Embankment
E.A. No. 12-111003

Depth of Inclinometer Casing: 69 ft
Ao Direction: 82 (Magnetic North)
Location: HWY 133/I-5 PM 8.8-10.9

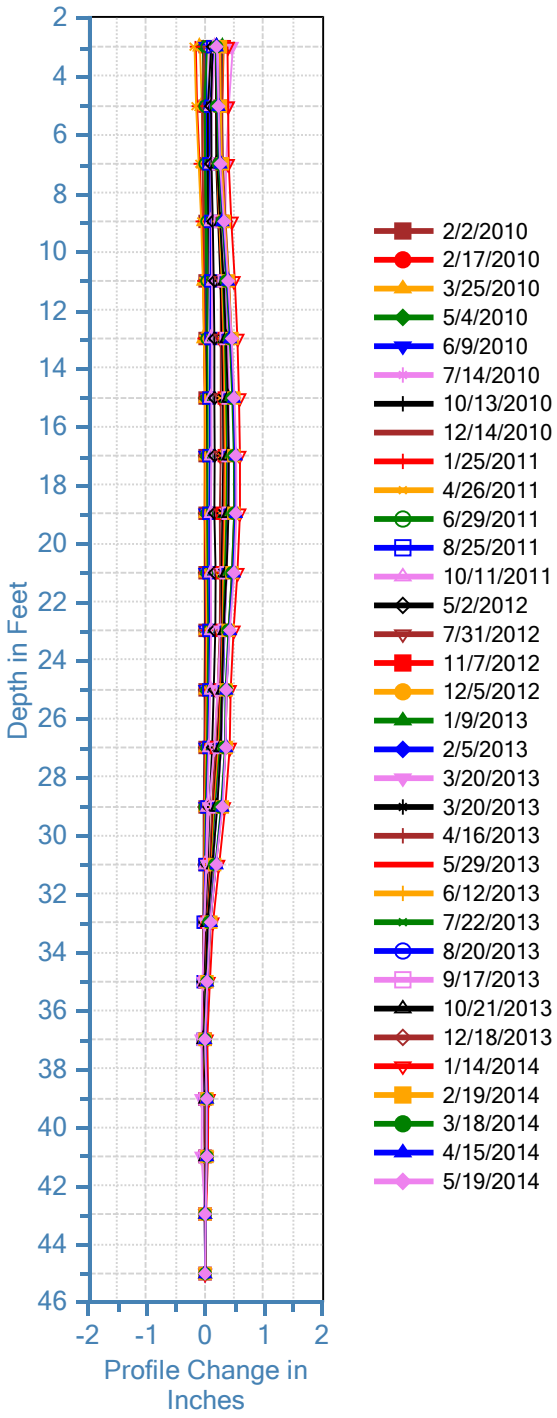


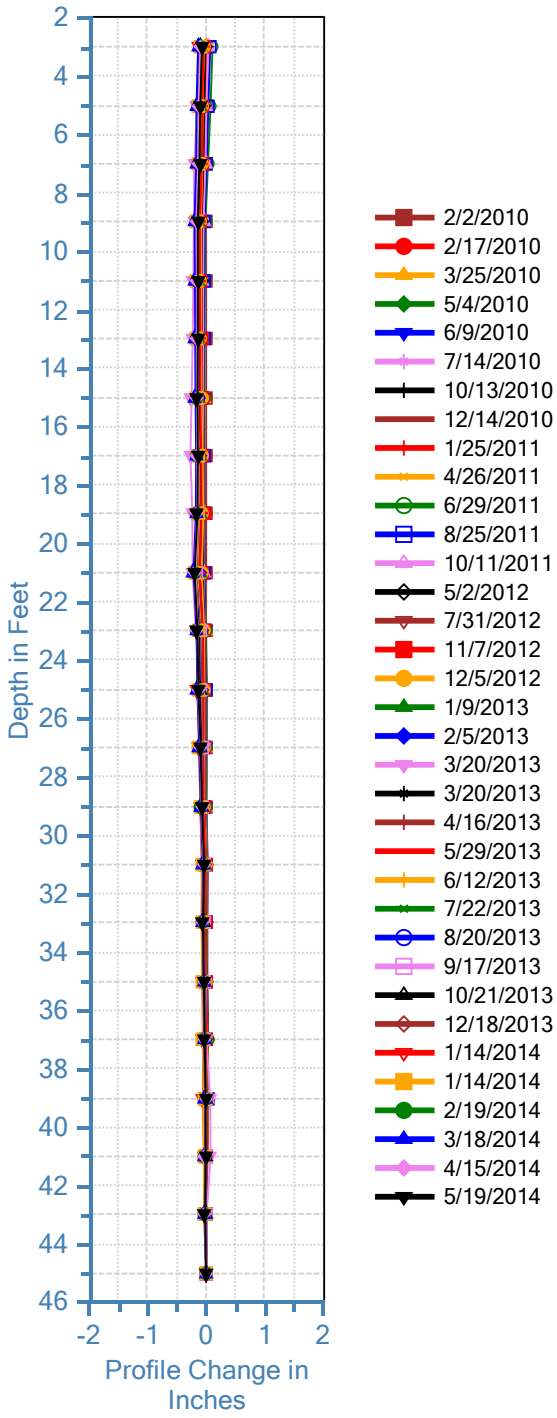


INCLINOMTER RESULTS

12-ORA-HWY 133 P.M. 8.8 - 10.9
Rt 133/I-5 Connector Embankment
E.A. No. 12-111003

Depth of Inclinometer Casing: 55 ft
Ao Direction: 82 (Magnetic North)
Location: HWY 133/I-5 PM 8.8-10.9

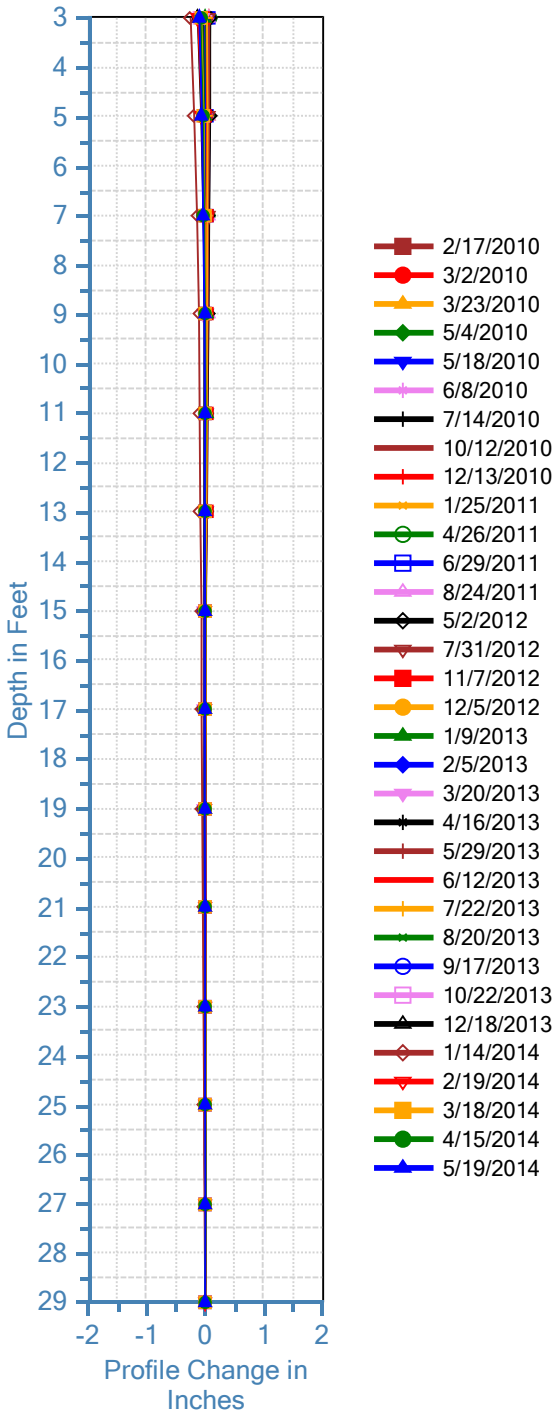


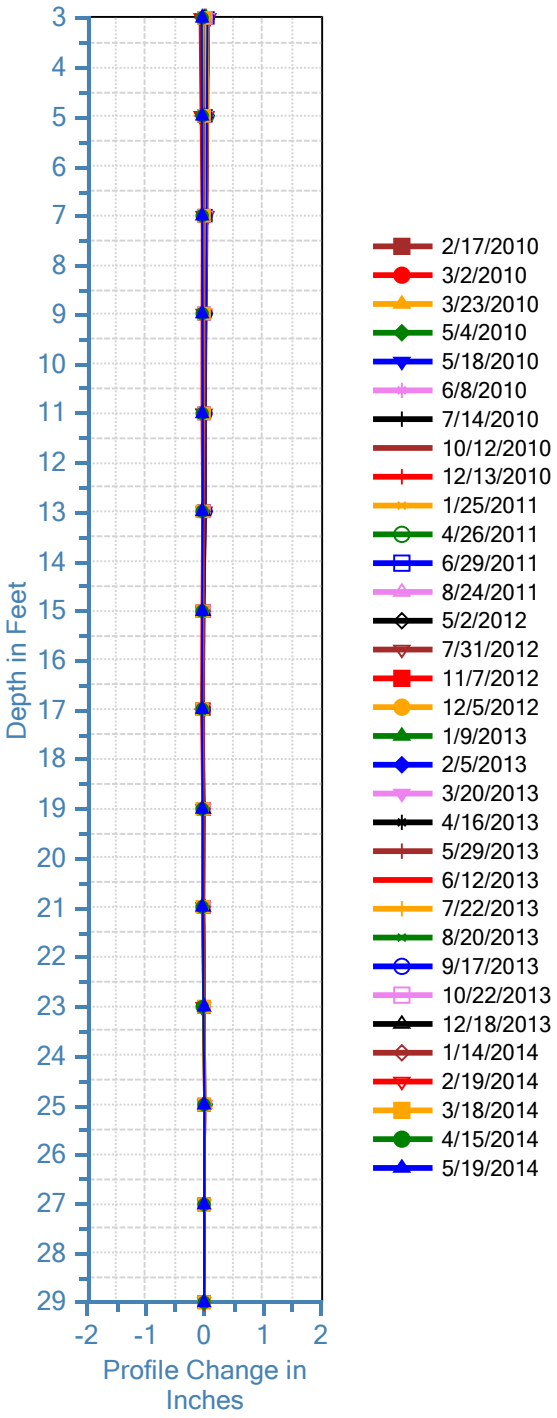


INCLINOMTER RESULTS

12-ORA-HWY 133 P.M. 8.8 - 10.9
Rt 133/I-5 Connector Embankment
E.A. No. 12-111003

Depth of Inclinometer Casing: 45 ft
Ao Direction: 82 (Magnetic North)
Location: HWY 133/I-5 PM 8.8-10.9

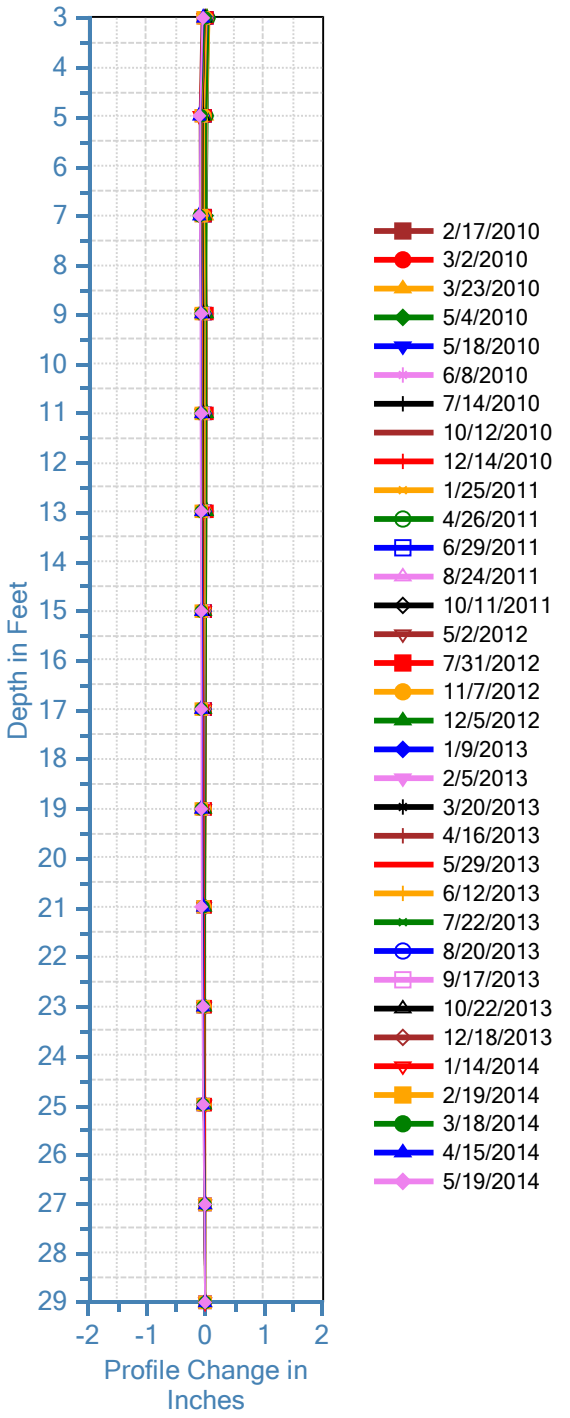


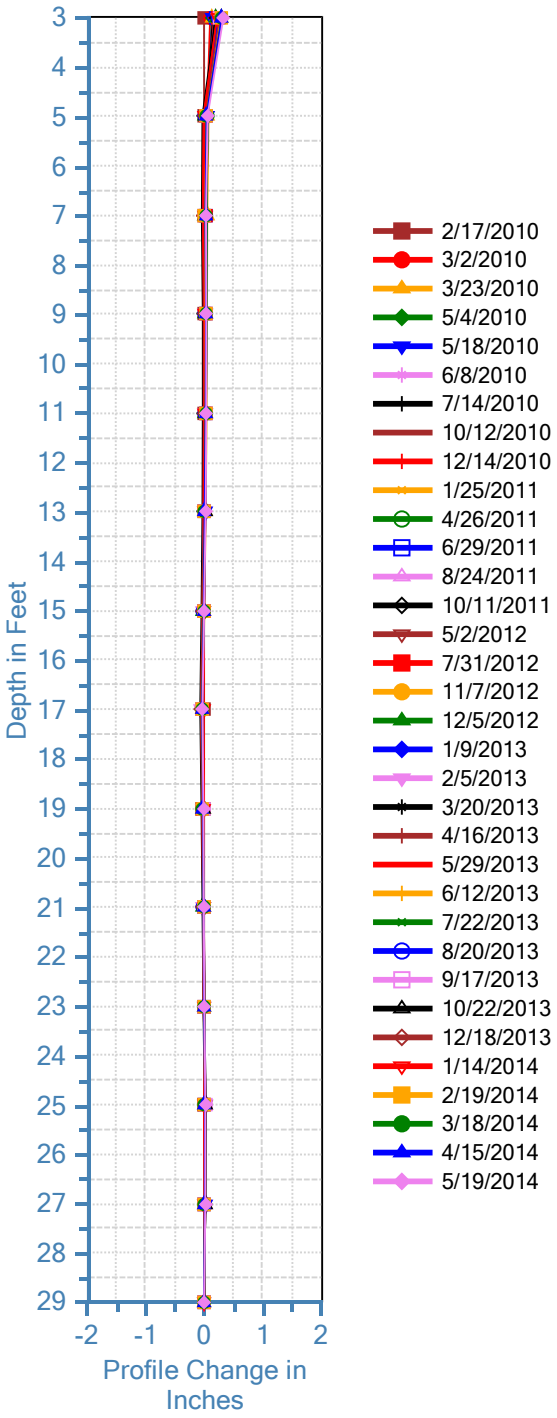


INCLINOMTER RESULTS

12-ORA-HWY 133 P.M. 8.8 - 10.9
Rt 133/I-5 Connector Embankment
E.A. No. 12-111003

Depth of Inclinometer Casing: 29 ft
Ao Direction: 82 (Magnetic North)
Location: HWY 133/I-5 PM 8.8-10.9

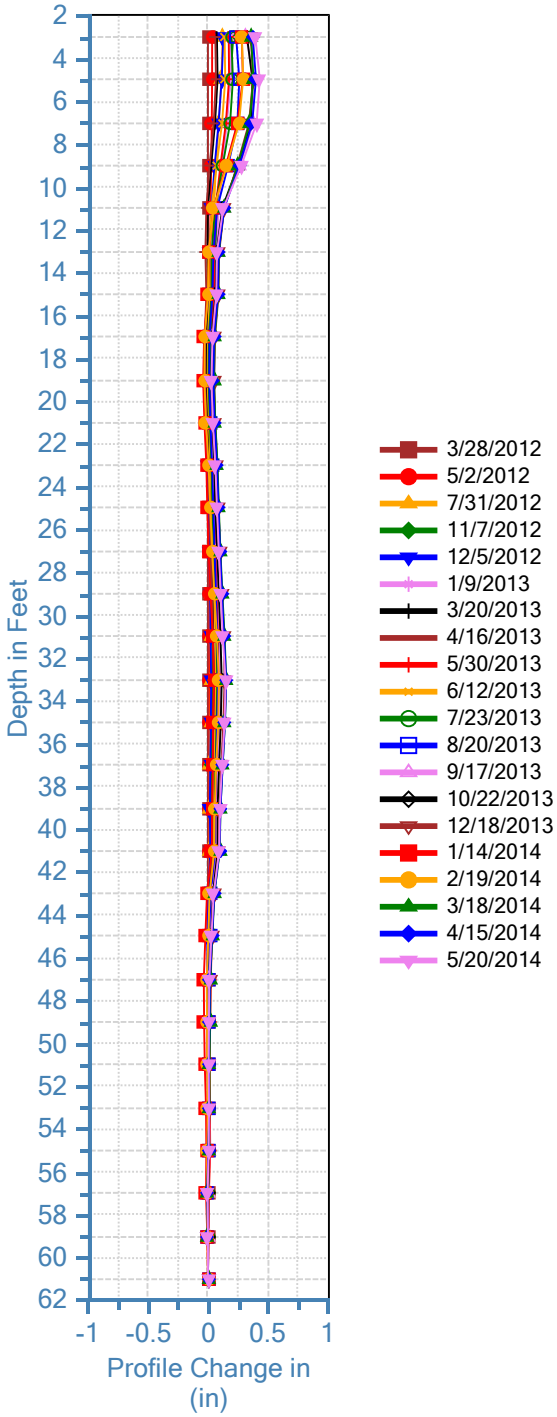


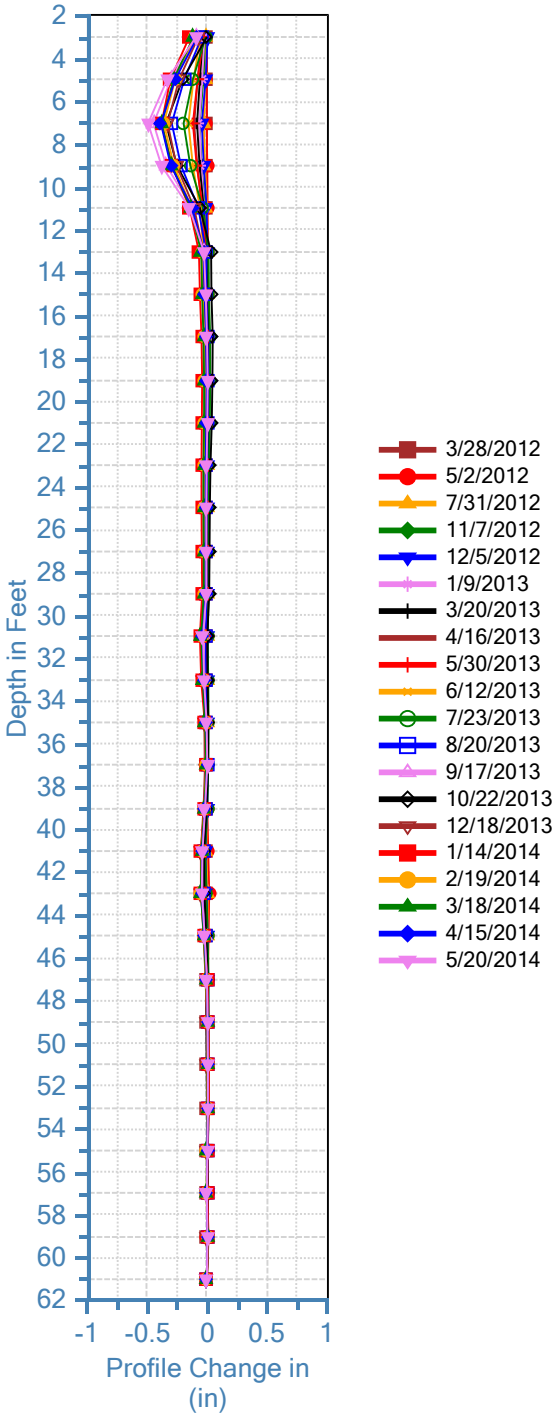


INCLINOMTER RESULTS

12-ORA-HWY 133 P.M. 8.8 - 10.9
Rt 133/I-5 Connector Embankment
E.A. No. 12-111003

Depth of Inclinometer Casing: 29 ft
Ao Direction: 82 (Magnetic North)
Location: HWY 133/I-5 PM 8.8-10.9



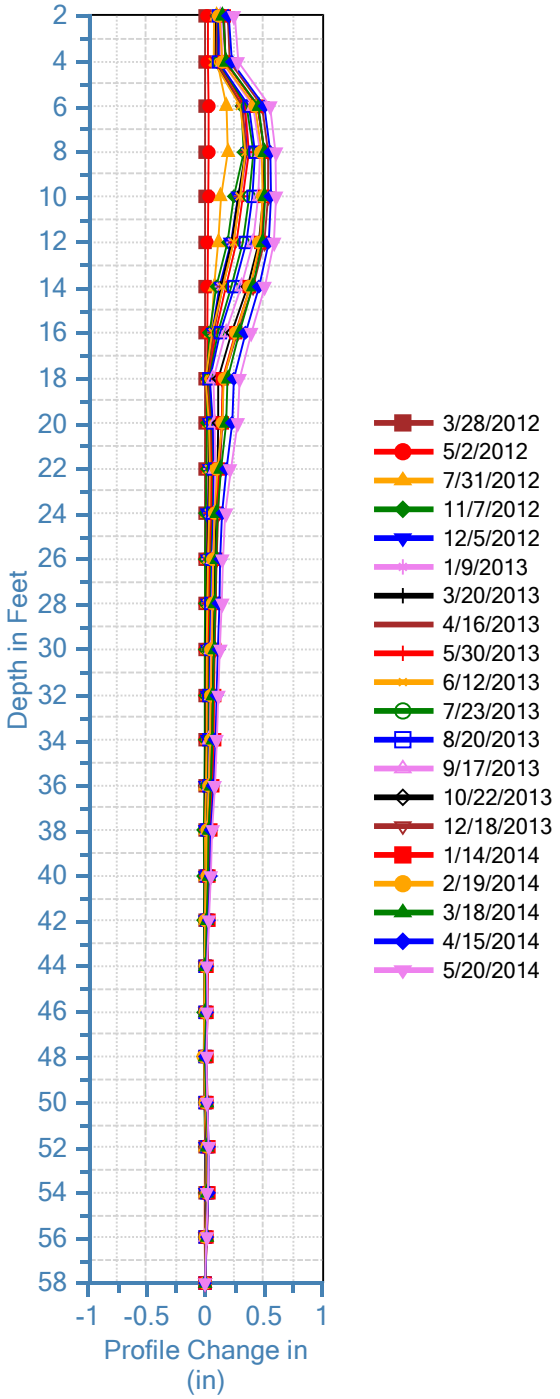


INCLINOMTER RESULTS

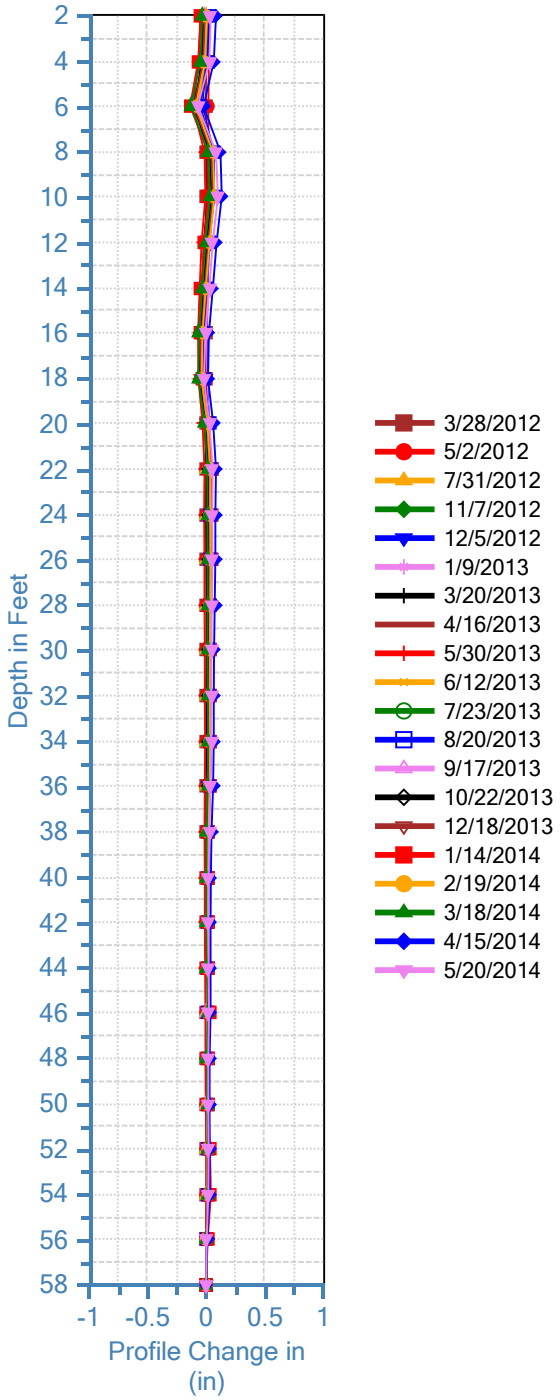
12-ORA-HWY 133 P.M. 8.8 - 10.9
Rt 133/I-5 Connector Embankment
EFIS No. 12-111003

Depth of Inclinometer Casing: 61 ft
Ao Direction: 82 (Magnetic North)
Location: HWY 133/I-5 P.M 8.8-10.9

133 RC1210, A-Axis



133 RC1210, B-Axis



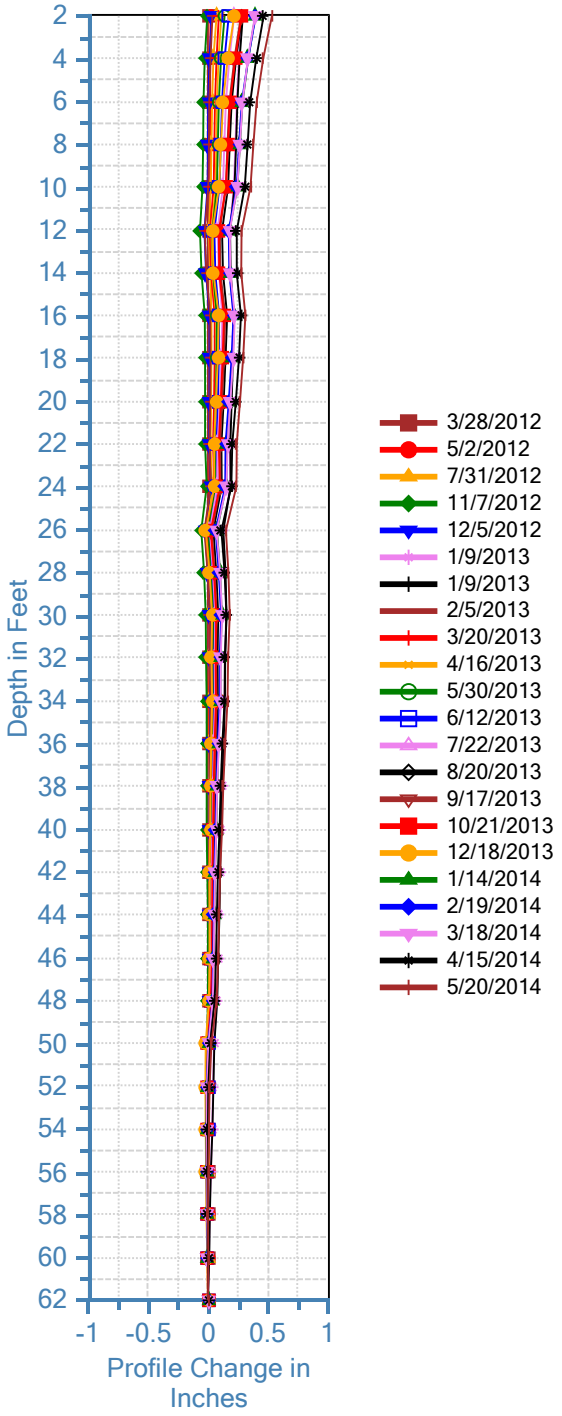
INCLINOMETER RESULTS

Caltrans

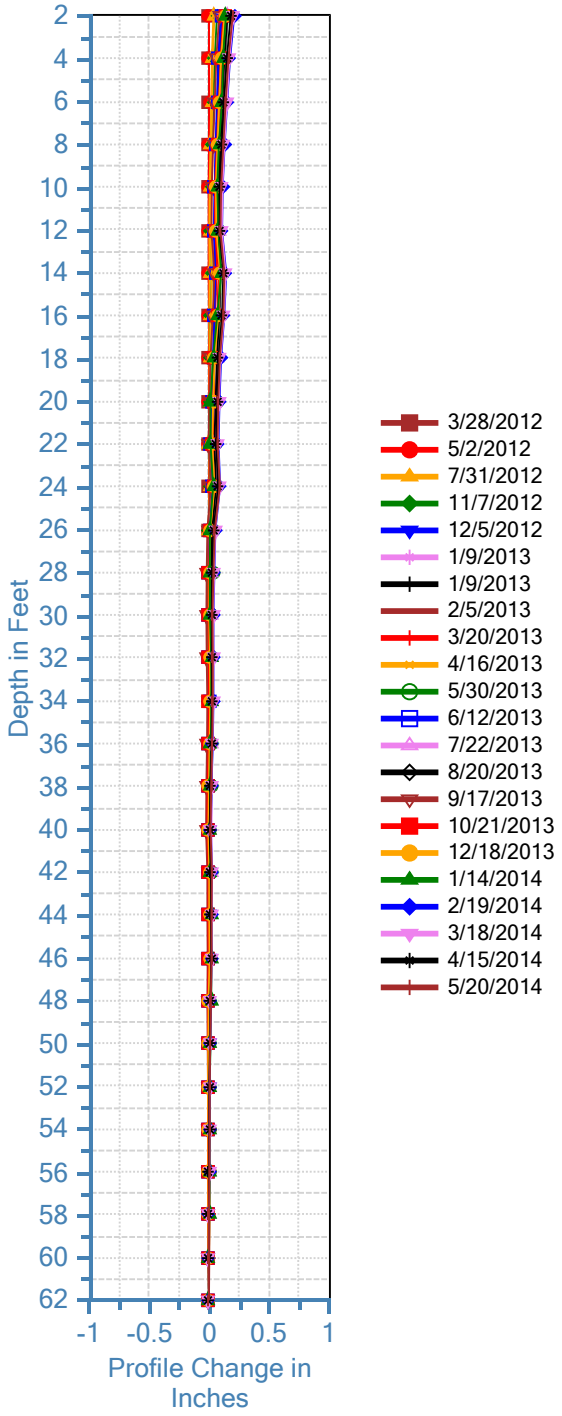
12-ORA-HWY 133 P.M. 8.8 - 10.9
Rt 133/I-5 Connector Embankment
EFIS No. 12-111003

Depth of Inclinometer Casing: 58 ft
Ao Direction: 82 (Magnetic North)
Location: HWY 133/I-5 P.M 8.8 - 10.9

133 RC1211, A-Axis



133 RC1211, B-Axis



INCLINOMTER RESULTS

12-ORA-HWY 133 P.M. 8.8 - 10.9
Rt 133/I-5 Connector Embankment
EFIS No. 12-111003

Depth of Inclinometer Casing: 62 ft
Ao Direction: 82 (Magnetic North)
Location: HWY 133/I-5 PM 8.8-10.9

Appendix D
Laboratory Test Results

Direct Shear Tests

(ASTM D3080)

Boring/ Sample No.	Location	Depth, ft	Soil Description	Initial Dry Density, pcf (1)	Initial Water Content, % (1)	Normal Stress Range, psf	Ultimate Shear Strength Values	
							Friction Angle	Undrained Shear, psf
R-10-002/6	1	30	Sandy Clay/Clayey Sand (fill)	106	17.9	1800-7200	26.6	1140
R-10-001/8	1	40	Clayey Sand	111	16.4	2400-9600	33	432
R-10-004/2	2	10	Sandy Clay (fill)	106	19.2	606-2400	31.6	727
R-10-005/9	2	45	Silty Sand	100	20	2700-10800	37.4	624

Note: (1) Average of three samples.

Consolidated Undrained Triaxial Shear Tests

(ASTM D4767)

Boring/ Sample No.	Location	Depth, ft	Soil Description	Initial Dry Density, pcf (1)	Initial Water Content, % (1)	Effective Confining Stress, psi (1)	Total Stress Strength Parameters	
							Friction angle	Undrained Shear, psf
R-10-001/2	1	10	Sandy Clay	102	22	8.3-21	30	343

Note: (1) Average of two samples.

Unconfined Compression Test Results

(ASTM D2166)

Boring/ Sample No.	Location	Depth, ft	Soil Description	Initial Dry Density, pcf	Initial Water Content, %	Unconfined Compressive Strength, psi	Shear Strength, psf
A-10-001/1	3	5	Sandy Clay (fill)	113	16.1	27.5	1980
A-10-001/4	3	20	Sandy Clay (fill)	114	20.8	46.3	3300
A-10-001/14	3	70	Clay	107	19	43.3	3000
A-10-002/4	3	20	Sandy Clay (fill)	114.5	13.8	91.2	6500
A-10-002/7	3	35	Sandy Clay/Clayey Sand (fill)	122	10.5	68.4	4900
A-10-003/1	3	5	Sandy Clay/Clayey Sand (fill)	111	17.6	16.6	1195
A-10-003/2	3	10	Clayey Sand (fill)	112	17.8	36	2500
A-10-004/1	3	5	Clayey Sand (fill)	116	15.8	13.8	990
R-10-001/3	1	15	Sandy Clay (fill)	102.6	26.5	50.4	3600
R-10-001/6	1	30	Sandy Clay (fill)	110	16.8	21.5	1550
R-10-001/12	1	60	Clayey Sand	115.6	16	59.4	4270
R-10-002/3	1	15	Sandy Clay (fill)	112.5	16.3	53.5	3800
A-10-003/8	2	40	Sandy Clay	107.5	16.3	6.3	450

Notes: Based on Strain Rate of 1%/min.

Falling Head Permeability Results

(CTM 220)

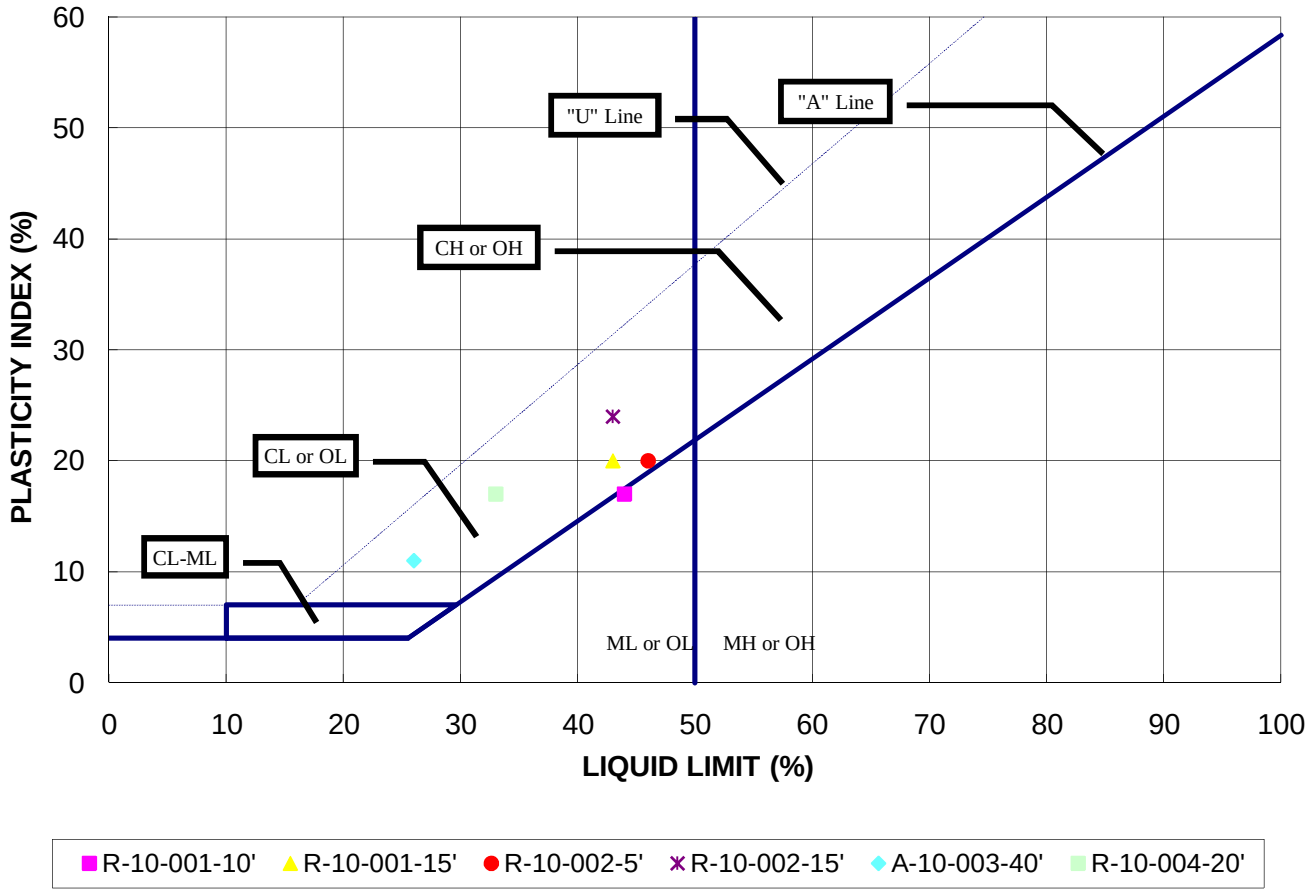
Boring/ Sample No.	Location	Depth, ft	Soil Classification	Dry Unit Weight, pcf	Moisture Content, %	Load, psf	K_{ave} (ft/day)
A-10-001/5	3	25	Sandy Clay (fill)	89.7	20	125	3.59
						250	3.35
						500	3.07
						1000	2.47
						2000	.37
A-10-001/7	3	35	Silty Sand (fill)	115	10.9	125	.00384
						250	.00297
						500	.00255
						1000	.00229
						2000	.00180
A-10-002/4	3	20	Sandy Clay (fill)	109.7	16	125	.0981
						250	.06569
						500	.04705
						1000	.03435
						2000	.02330
R-10-002/3	1	15	Sandy Clay (fill)	97	19.9	125	3.83
						250	2.51
						500	2.85
						1000	2.01
						2000	0.154
A-10-003/8	2	40	Sandy Clay (fill)	100	19.1	125	18.8
						250	18.8
						500	18.7
						1000	18.5
						2000	9.05
R-10-001/3	1	15	Sandy clay (fill)	97.1	23	125	.357
						250	.311
						500	.202
						1000	.0075
						2000	.0002

Falling Head Permeability Results (continued)

(CTM 220)

Boring/ Sample No.	Location	Depth, ft	Soil Classification	Dry Unit Weight, pcf	Moisture Content, %	Load, psf	K_{ave} (ft/day)
R-10-001/6	1	30	Sandy Clay (fill)	101.5	18.6	125	2.262
						250	1.89
						500	.692
						1000	.090
						2000	.008
R-10-001/12	1	60	Silty Sand	110	16.9	125	2.48
						250	2.476
						500	2.383
						1000	1.339
						2000	.026
R-10-002/7	1	35	Sandy Clay (fill)	103.6	19	125	.064
						250	.060
						500	.055
						1000	.0459
						2000	.0095
A-10-003/9	2	45	Sandy Clay	108.3	17.5	125	.0013
						250	.0006
						500	.0003
						1000	.00016
						2000	.00016
R-10-005/7	2	35	Sandy Clay	102.5	20	125	.00375
						250	.00313
						500	.002
						1000	.0007
						2000	.00057

Atterberg Limits Test Results



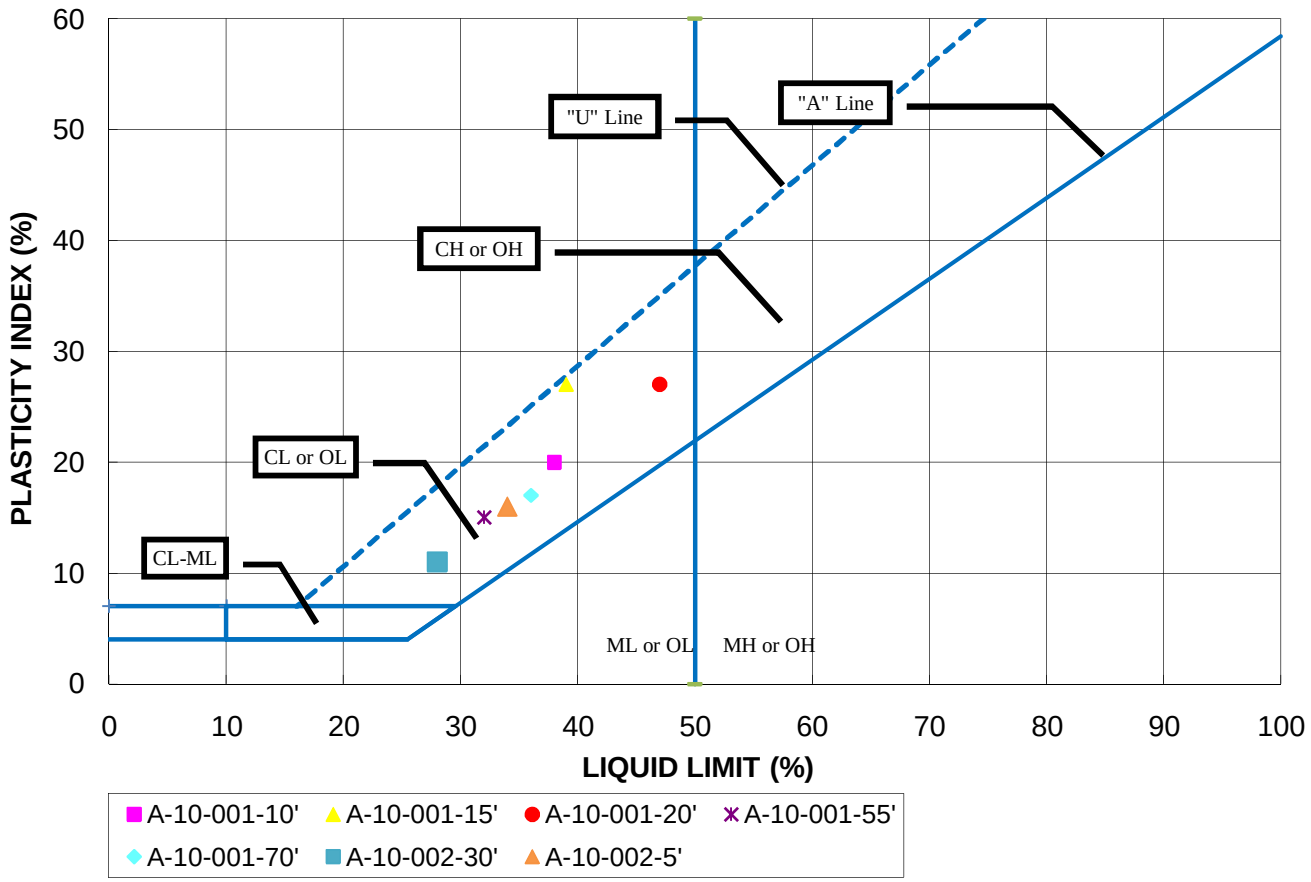
Boring No.	Sample No.	Depth (ft)	LL	PL	PI	Classification
R-10-001 (1)	2	10'	44	17	27	CL/ML
R-10-001 (1)	3	15'	43	25	18	CL
R-10-002 (1)	1	5'	46	20	26	CL
R-10-002 (1)	3	15'	43	24	19	CL
A-10-003 (2)	8	40'	26	11	15	CL
R-10-004 (2)	5	20'	33	17	16	CL

Caltrans

Engineering Services
Division of Geotechnical Services
Office of Geotechnical
Design - South 1
(Location in parenthesis)

Project:	133-I-5 Embankment Repair (Loc 1-2)
EA:	12-0N1100
Dist-Co-Rte-PM:	12-ORA-133-9/10.05

Atterberg Limits Test Results



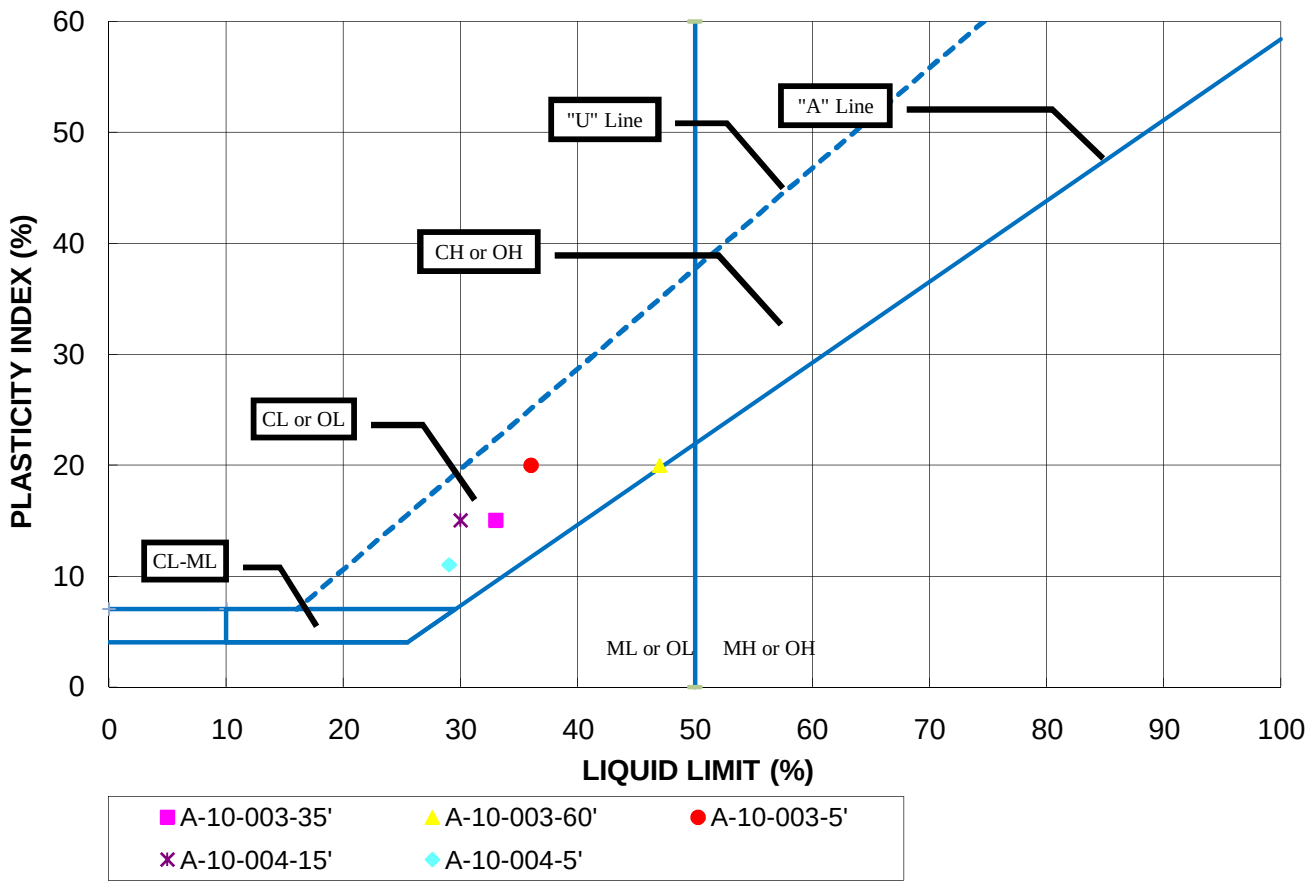
Boring No.	Sample No.	Depth (ft)	LL	PL	PI	Classification
A-10-001 (3)	2	10'	38	20	18	CL
A-10-001 (3)	3	15'	39	21	18	CL
A-10-001 (3)	4	20'	47	27	20	CL/CH
A-10-001 (3)	11	55'	32	15	17	CL
A-10-001 (3)	14	70'	36	17	19	CL
A-10-002 (3)	6	30'	28	11	17	CL
A-10-002 (3)	1	5'	34	16	18	CL

Caltrans

Engineering Services
Division of Geotechnical Services
Office of Geotechnical
Design - South 1
(Location in parenthesis)

Project:	133-I-5 Embankment Repair (Loc 3)
EA:	12-0N1100
Dist-Co-Rte-PM:	12-ORA-133-9/10.05

Atterberg Limits Test Results



Boring No.	Sample No.	Depth (ft)	LL	PL	PI	Classification
A-10-003 (3)	7	35'	33	15	18	CL
A-10-003 (3)	12	60'	47	26	21	CL/ML
A-10-003 (3)	1	5'	36	20	16	CL
A-10-004 (3)	3	15'	30	15	15	CL
A-10-004 (3)	1	5'	29	11	18	CL

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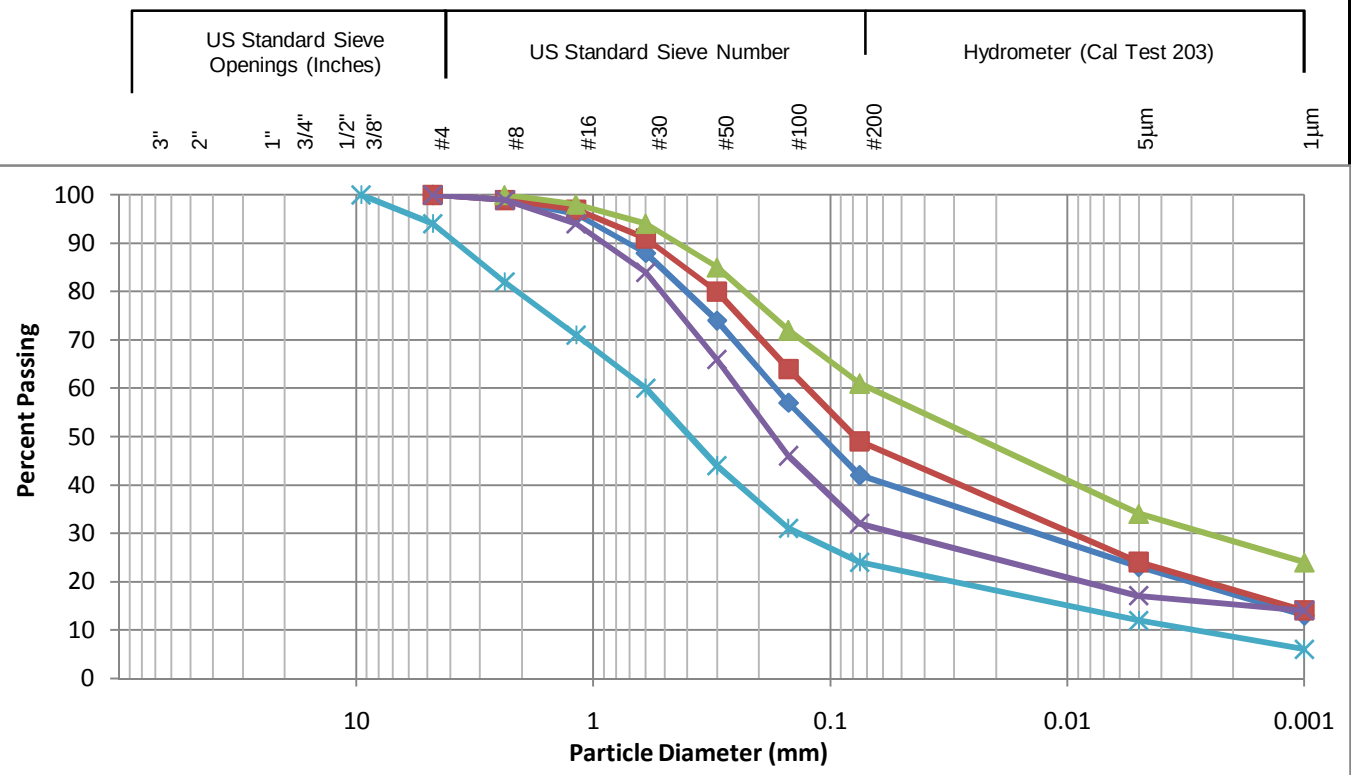
Engineering Services
Division of Geotechnical Services
Office of Geotechnical
Design - South 1
Station 5111 to 5115
(Location in parenthesis)

Project:	133-I-5 Embankment Repair (Loc 3)
EA:	12-0N1100
Dist-Co-Rte-PM:	12-ORA-133-9/10.05

Gradation Analysis Test Results



Sample ID:

- R-10-002 @50'
- R-10-001@40'
- R-10-001@10' (fill)
- R-10-001@60'
- R-10-002@30' (fill)

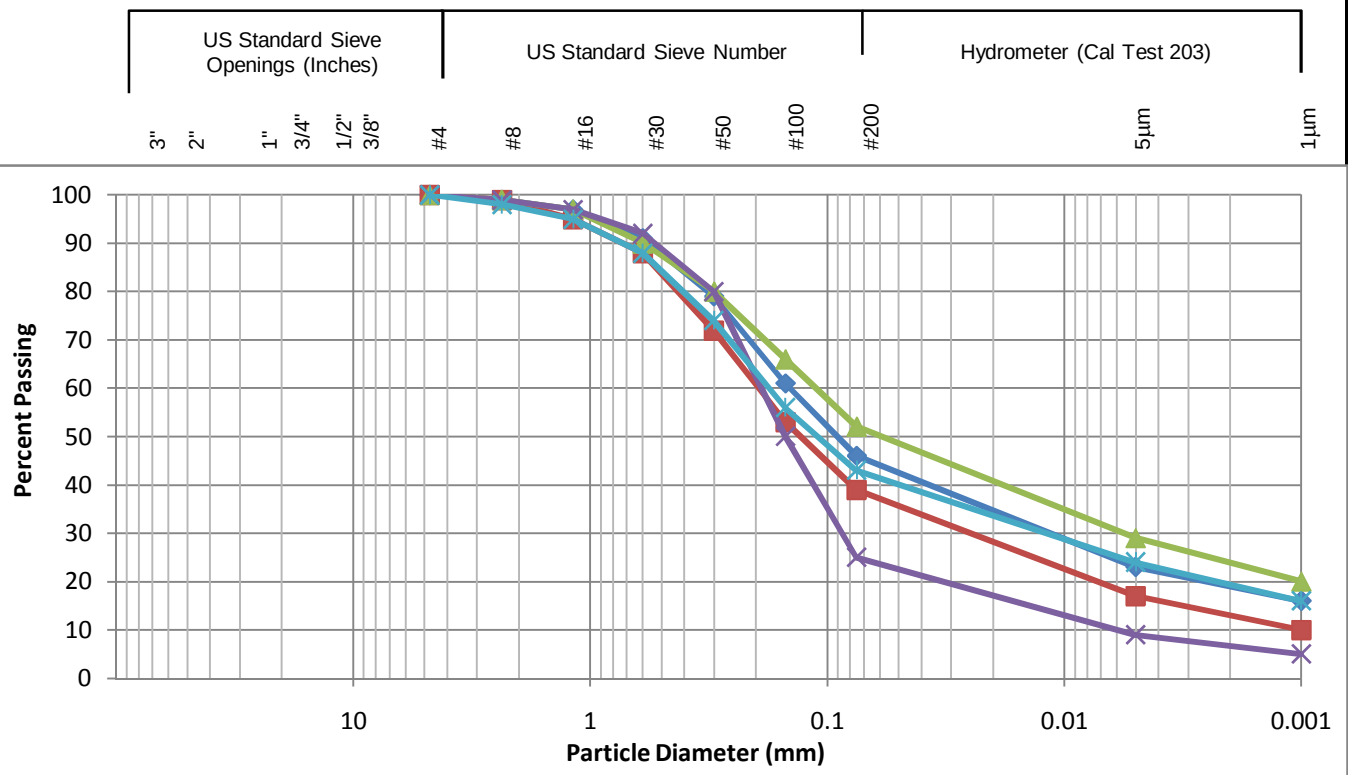
COBBLES	**GRAVELS**		**SANDS**			**SILT**	**CLAY**
	Coarse	Fine	Crse.	Medium	Fine		

Caltrans

Engineering Services
Division of Geotechnical Services
Office of Geotechnical
Design - South 1

Project:	133/I-5 Embankment Distress (Location 1)
EA:	12-0N1100
Dist-Co-Rte-PM:	12-ORA-133-9/10.05

Gradation Analysis Test Results



Sample ID:

- R-10-004 @10'(fill)
- R-10-005@5'(fill)
- R-10-005@25' (fill)
- R-10-005@45'
- R-10-004@25' (fill)

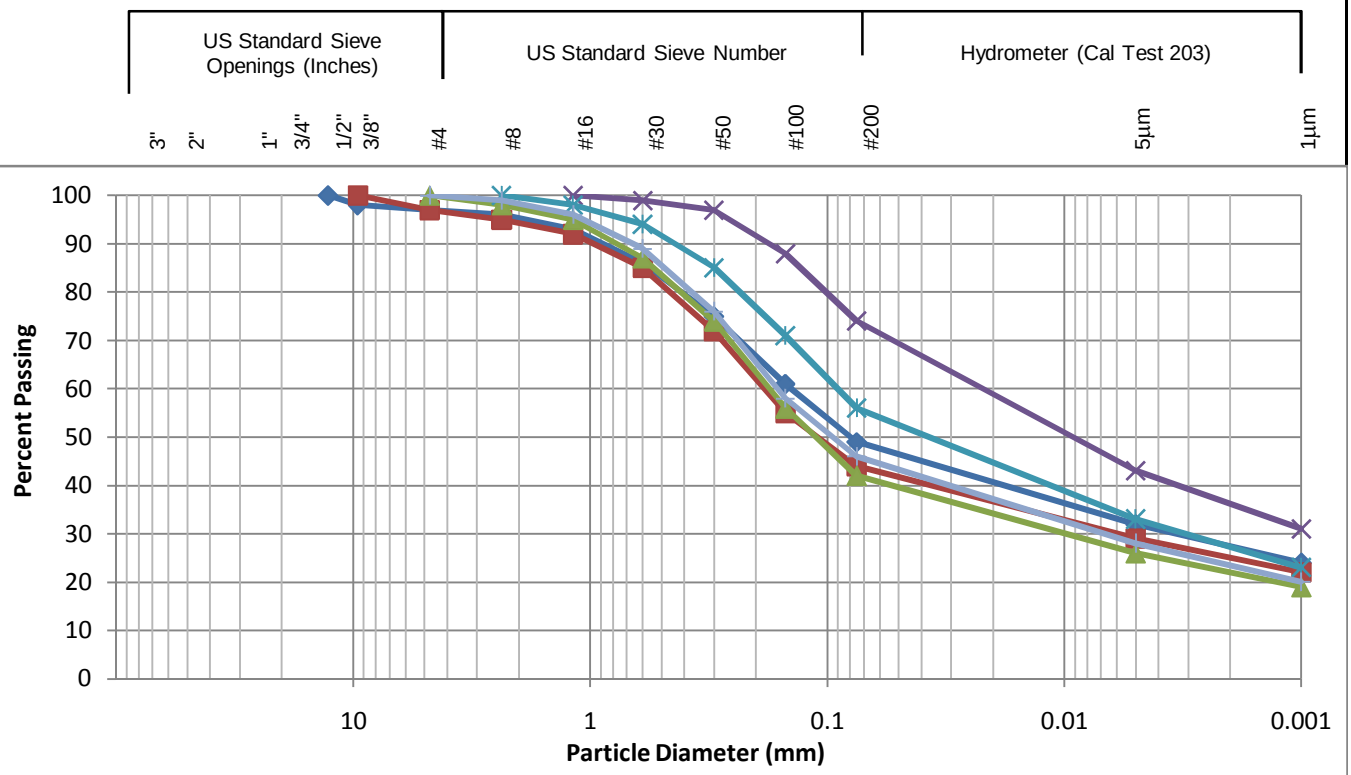
COBBLES	**GRAVELS**		**SANDS**		**SILT**	**CLAY**
	Coarse	Fine	Crse.	Medium	Fine	

Caltrans

Engineering Services
Division of Geotechnical Services
Office of Geotechnical
Design - South 1

Project:	133/I-5 Embankment Distress (Location 2)
EA:	12-0N1100
Dist-Co-Rte-PM:	12-ORA-133-9/10.05

Gradation Analysis Test Results



Sample ID:

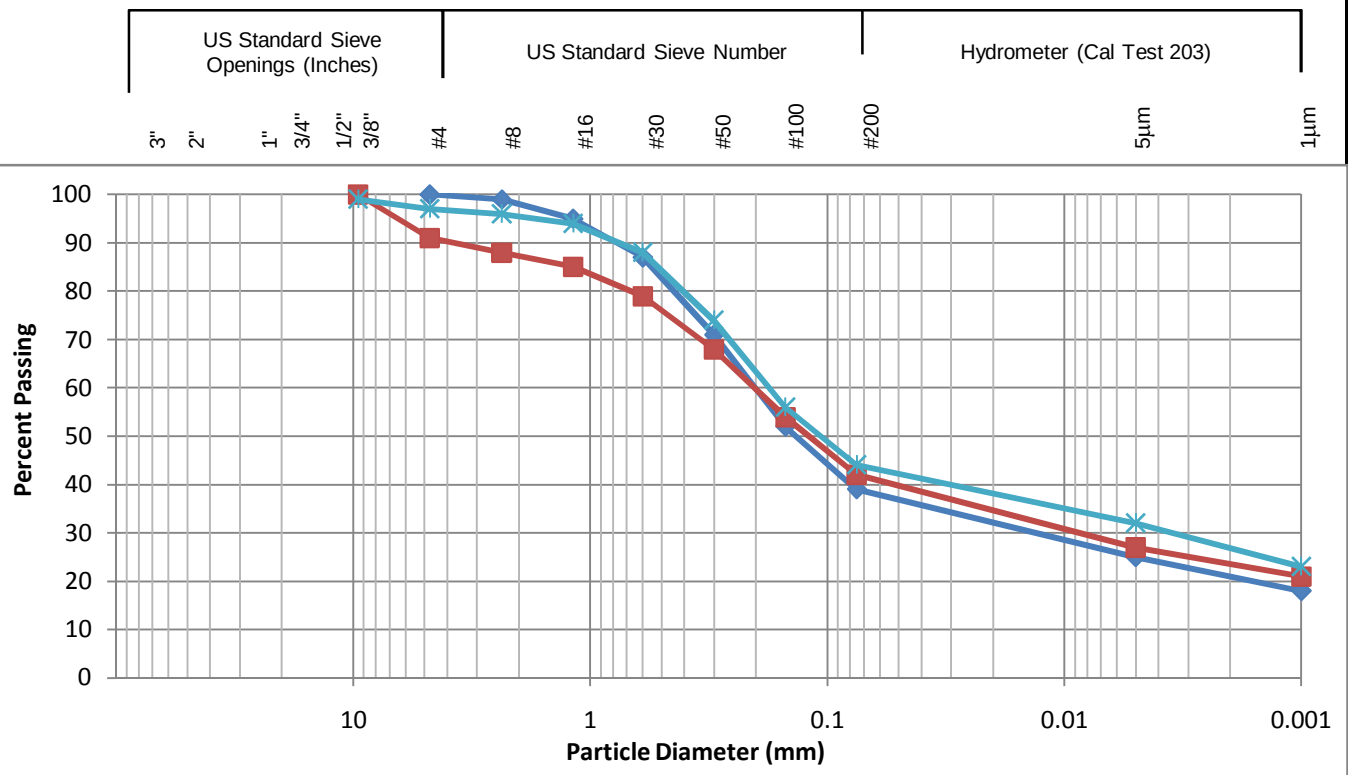
- A-10-003 @5'(fill)
- A-10-003@15'(fill)
- A-10-003@20' (fill)
- A-10-003@60'
- A-10-003@10' (fill)
- A-10-003@35'(fill)

COBBLES	**GRAVELS**	**SANDS**	**SILT**	**CLAY**
	Coarse / Fine	Crse. / Medium / Fine		

Engineering Services
Division of Geotechnical Services
Office of Geotechnical
Design - South 1

Project:	133/I-5 Embankment Distress (Location 3)
EA:	12-0N1100
Dist-Co-Rte-PM:	12-ORA-133-9/10.05

Gradation Analysis Test Results



Sample ID: A-10-004 @5'(fill) | A-10-003@20'(fill) | A-10-004@10' (fill)

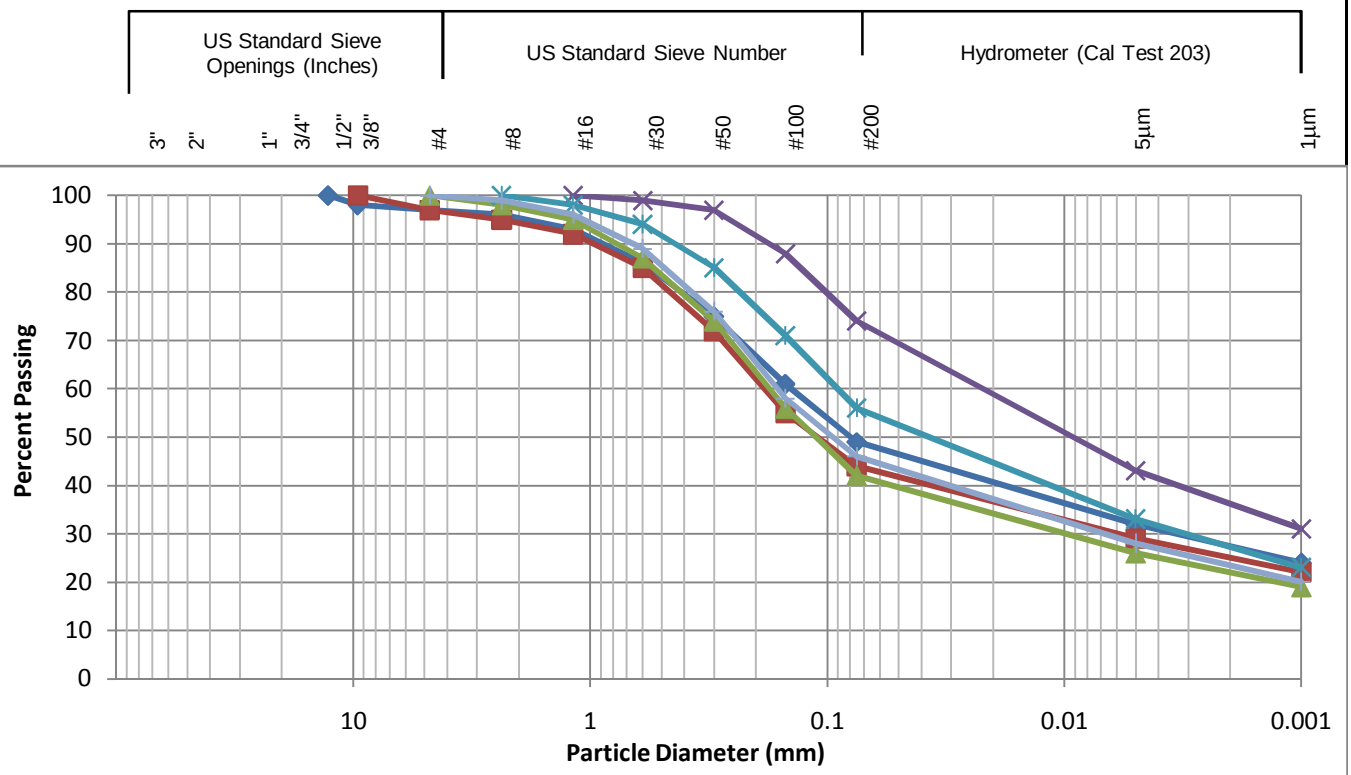
COBBLES	**GRAVELS**	**SANDS**	**SILT**	**CLAY**
	Coarse / Fine	Crse. / Medium / Fine		

Caltrans

Engineering Services
Division of Geotechnical Services
Office of Geotechnical
Design - South 1
Location 3 - Station 5111+13

Project:	133/I-5 Embankment Distress (Location 3)
EA:	12-0N1100
Dist-Co-Rte-PM:	12-ORA-133-9/10.05

Gradation Analysis Test Results



Sample ID:

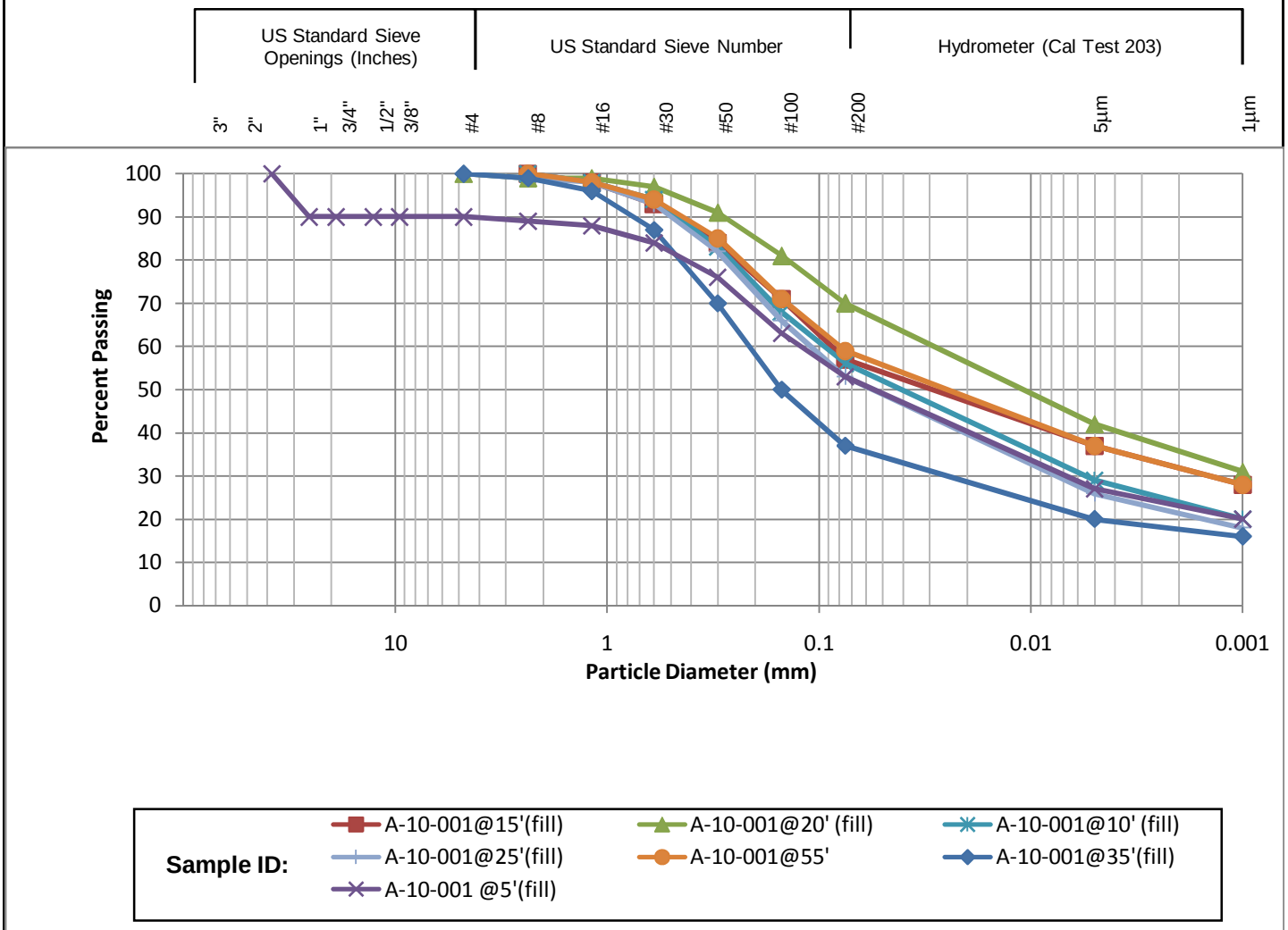
- A-10-003 @5'(fill)
- A-10-003@15'(fill)
- A-10-003@20' (fill)
- A-10-003@60'
- A-10-003@10' (fill)
- A-10-003@35'(fill)

COBBLES	**GRAVELS**	**SANDS**	**SILT**	**CLAY**
	Coarse / Fine	Crse. / Medium / Fine		

Engineering Services
Division of Geotechnical Services
Office of Geotechnical
Design - South 1

Project:	133/I-5 Embankment Distress (Location 3)
EA:	12-0N1100
Dist-Co-Rte-PM:	12-ORA-133-9/10.05

Gradation Analysis Test Results

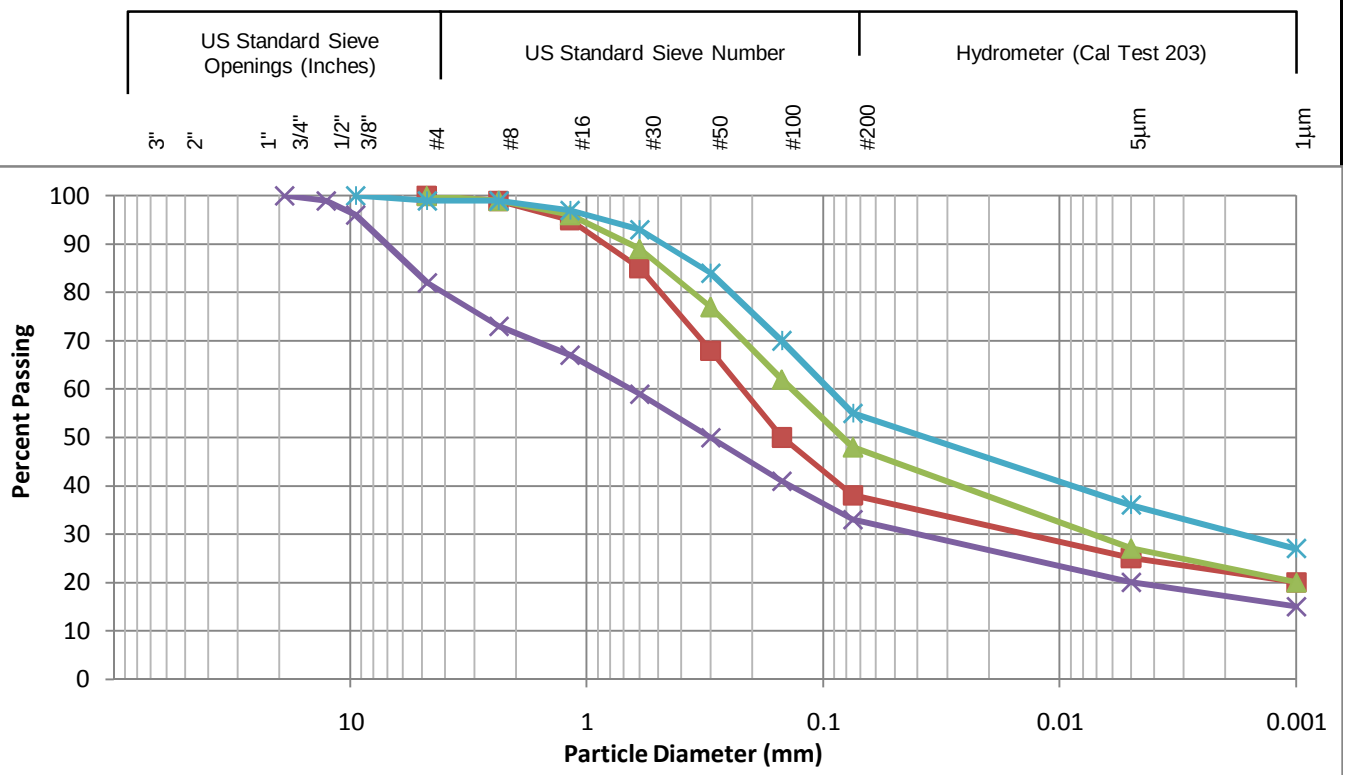


COBBLES	GRAVELS	SANDS	SILT	CLAY
	Coarse / Fine	Crse. / Medium / Fine		

Engineering Services
Division of Geotechnical Services
Office of Geotechnical
Design - South 1
Location 3 - Station 5121+40

Project:	133/I-5 Embankment Distress (Location 3)
EA:	12-0N1100
Dist-Co-Rte-PM:	12-ORA-133-9/10.05

Gradation Analysis Test Results



Sample ID: A-10-002@30'(fill) A-10-002@40' A-10-002@10' (fill) A-10-002 @5'(fill)

COBBLES	**GRAVELS**	**SANDS**	**SILT**	**CLAY**
	Coarse / Fine	Crse. / Medium / Fine		

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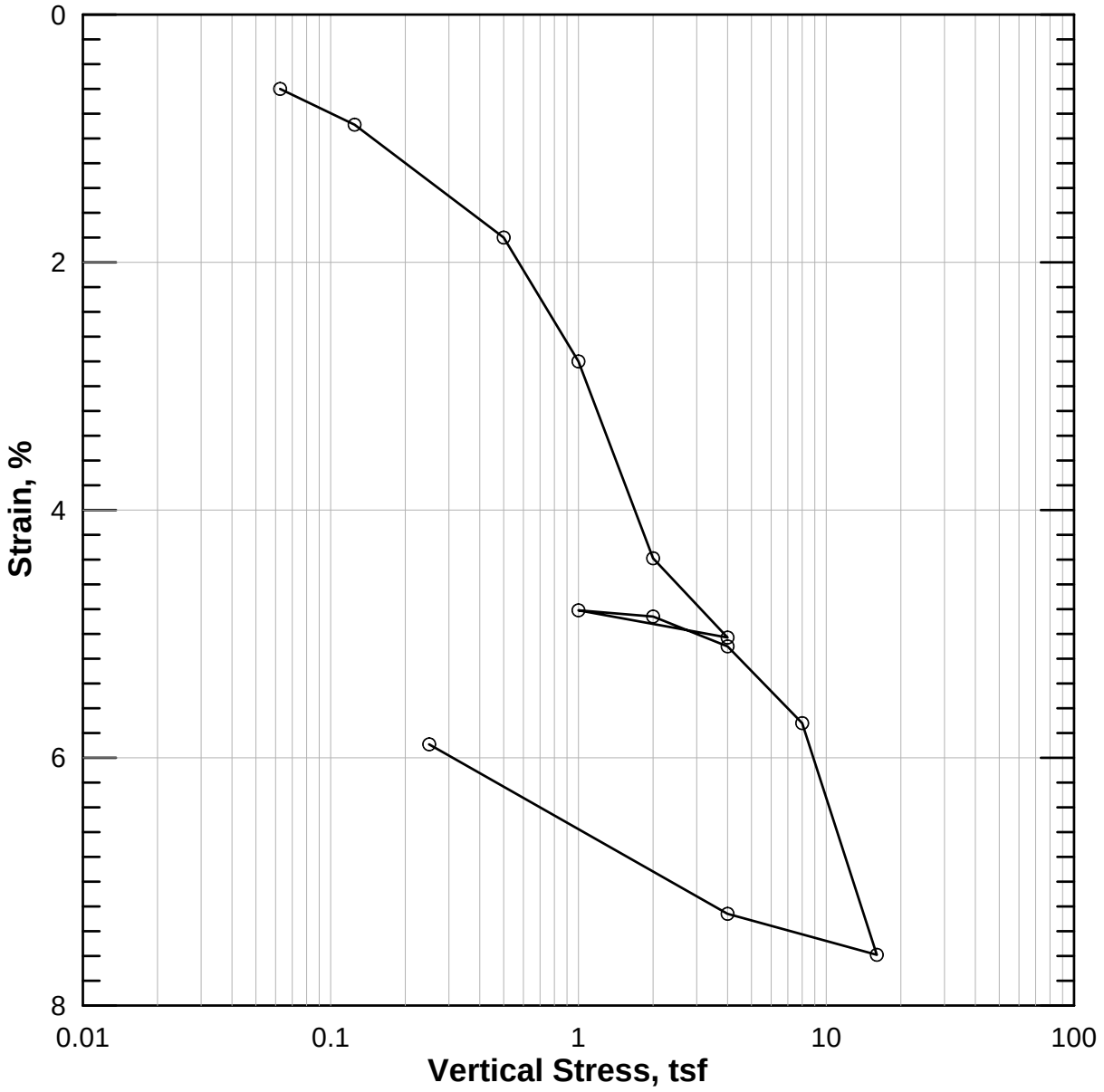
Engineering Services
Division of Geotechnical Services
Office of Geotechnical
Design - South 1
Location 3 - Station 5117+79

Project:	133/I-5 Embankment Distress (Loc 3)
EA:	12-0N1100
Dist-Co-Rte-PM:	12-ORA-133-9/10.05

Consolidation Test Result
(ASTM D2435)



Notes:
Boring/Sample No : A-10-003/10
Depth: 50 feet
Soil Type: Sandy Clay
Location: 2
Average C_v: 10^{-3} in^2/sec

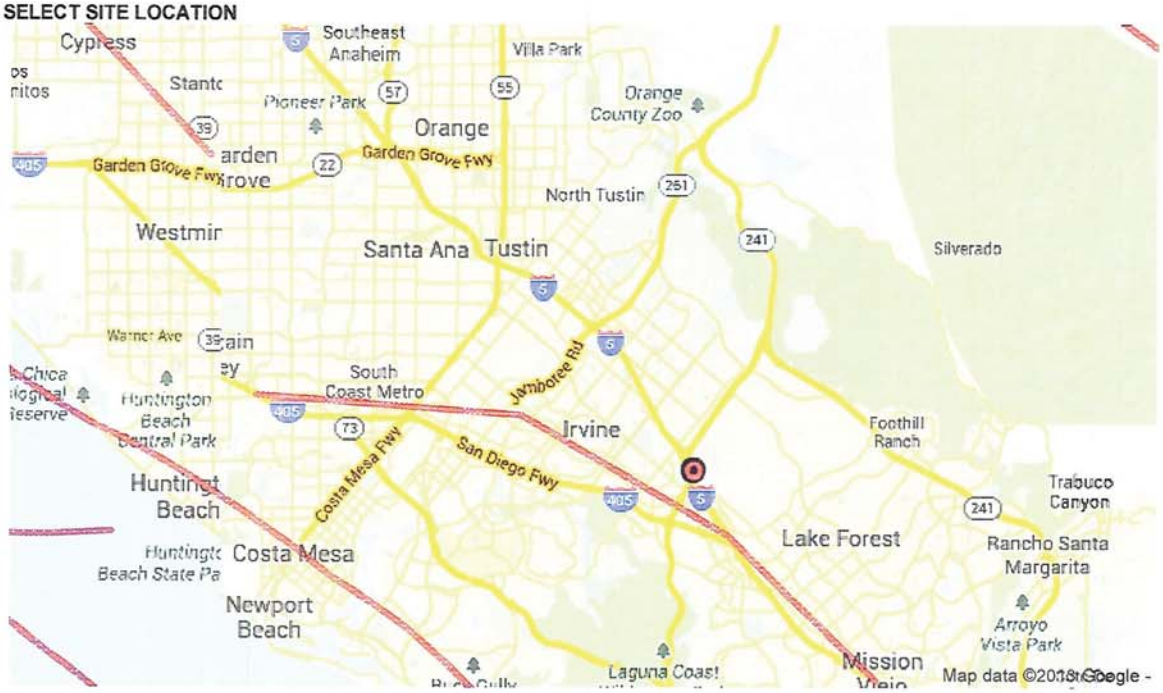
Appendix E
ARS Curve

CALIFORNIA DEPARTMENT OF
TRANSPORTATION

Caltrans ARS Online (v2.2.06)

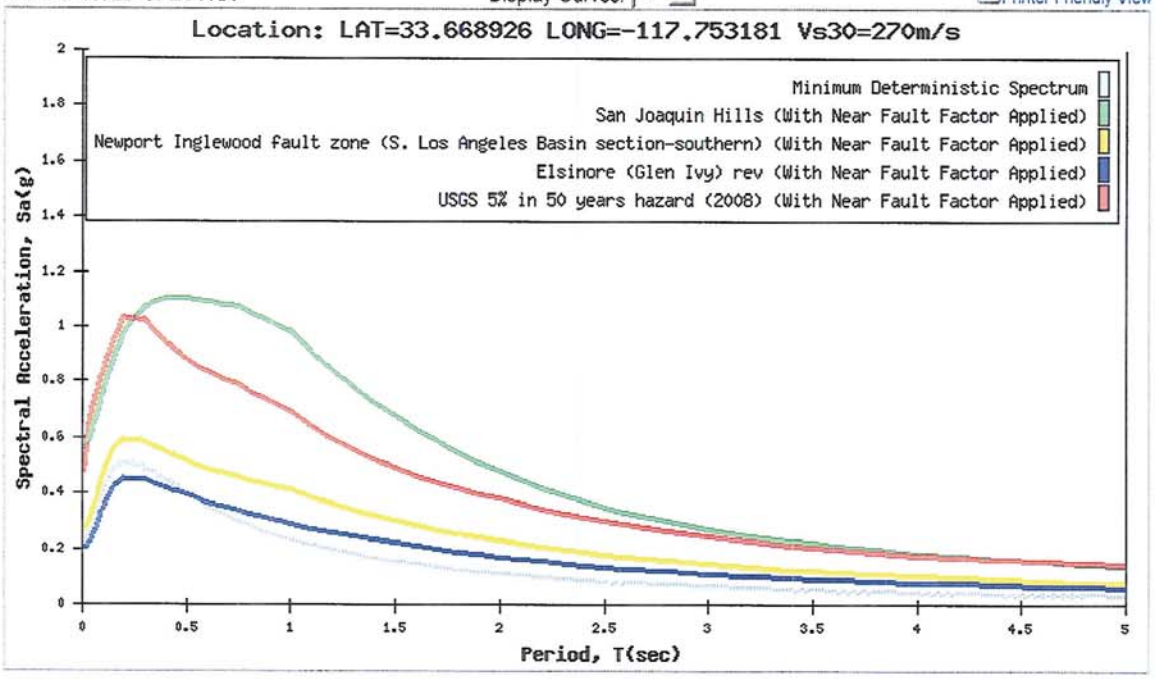
This web-based tool calculates both deterministic and probabilistic acceleration response spectra for any location in California based on criteria provided in *Appendix B of Caltrans Seismic Design Criteria*. More...

SELECT SITE LOCATION



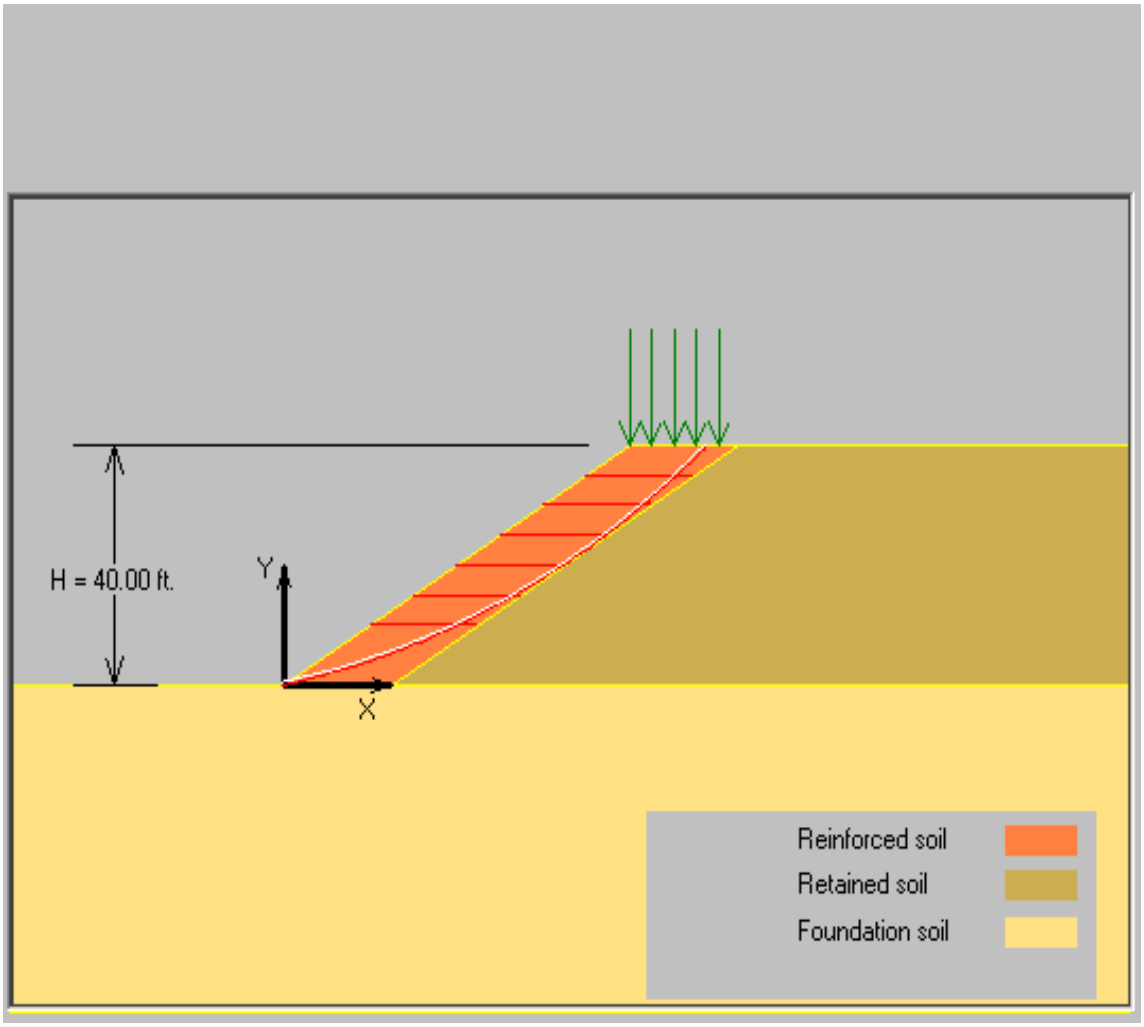
Latitude: 33.66892551 **Longitude:** -117.75318146 ***Vs30:*** 270 m/s Calculate

CALCULATED SPECTRA Display Curves: 3 Printer Friendly View



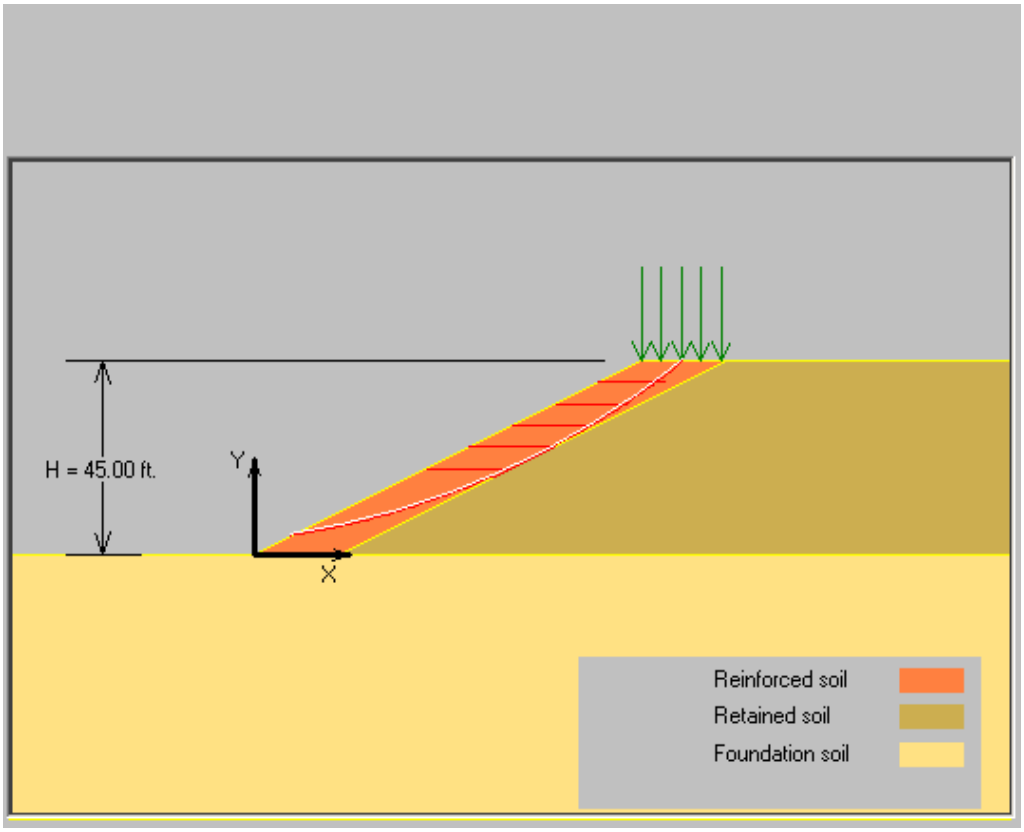
Appendix F
Slope Stability Results
(RSS Version 1.0)

Location 1 - Slope Stability Check



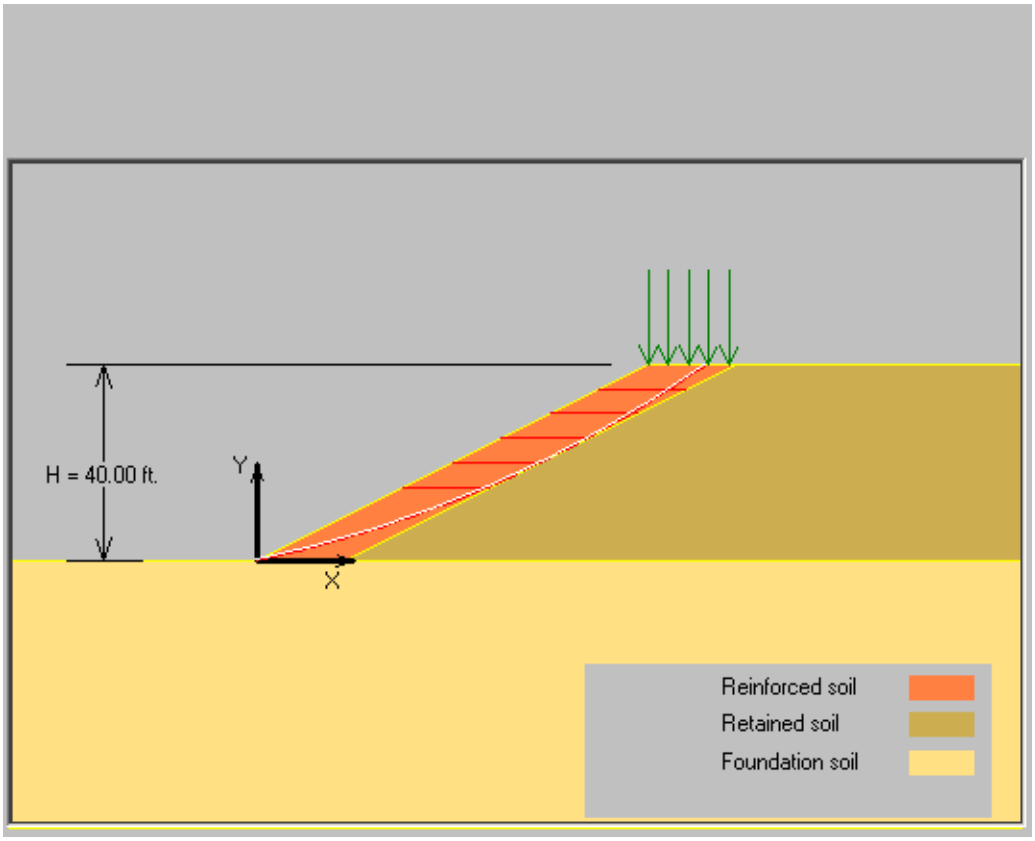
Notes:
Slope Stability Analysis by Bishops Method
Factors of Safety:
Static: 1.45
Seismic: 1.19
Surcharge Used: 240 psf
Reinforced Soil Slope (RSS) Version 1.0

Location 2 - Slope Stability Check



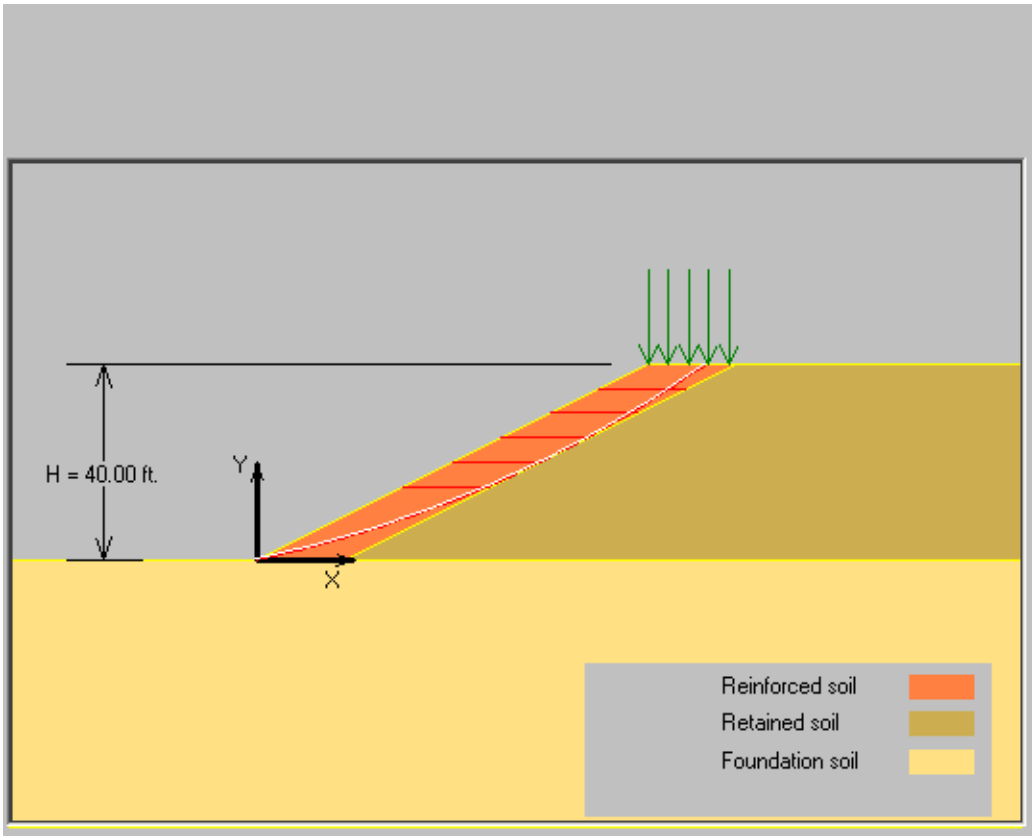
Notes:
Slope Stability Analysis by Bishops Method
Factors of Safety:
Static: 1.46
Seismic: 1.20
Surcharge Used: 240 psf
Reinforced Soil Slope (RSS) Version 1.0

Location 3 (Station 5108+70 to 5116+20)
Slope Stability Check



Notes:
Slope Stability Analysis by Bishops Method
Factors of Safety:
Static: 1.74
Seismic: 1.35
Surcharge Used: 240 psf
Reinforced Soil Slope (RSS) Version 1.0

Location 3 (Station 5116+20 to 5122+70)
Slope Stability Check



Notes:
Slope Stability Analysis by Bishops Method
Factors of Safety:
Static: 1.74
Seismic: 1.35
Surcharge Used: 240 psf
Reinforced Soil Slope (RSS) Version 1.0

State of California **Business, Transportation and Housing Agency**

M e m o r a n d u m

Flex your power!
Be energy efficient!

To: Mr. RAMIN RASHEDI, Branch Chief
Senior Bridge Engineer
Division of Engineering Services

Date: September 2, 2014

File: 12-ORA-133, PM8.8/10.9
EA: 12-0N1101 133/I-5
Abutment Slope Repair
Bridge No.'s 55-659G,
0771F, 0773R/L, 0772L

Attn: Ms. Ubong Inyang

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design South 1
Branch C

Subject: Revised Geotechnical Recommendations Report for 133/I5 Bridge Abutment Slope Repair at Bridge No.'s 55-0659G, 55-0771F (Abut 1 and 11), 55-0772R/L (Abut 1L, 1R, 6L, and 6R), and 55-0773R/L (Abut 1L, 1R, 3L and 3R).

This Revised Report replaces the original Geotechnical Report dated July 31, 2014. That report was prepared upon the request by Division of Structures Design and District 12 Design per the e-mail request dated June 17, 2014 summarizing repair recommendations for slope repair for various bridge abutments within the 133-I-5 Interchange area. The location of the bridge abutments is summarized in Table 1 below and is also shown on Figure 1. The recommendations provided below are based on a site review of the field conditions and review of available as-built and project plans. This revised report provides the latest station locations and abutment numbers of the bridge abutment locations.

Table 1 – Summary of Bridge Abutment Slope Paving Locations

Bridge no.	Abutment No.	Station/Alignment	Sheet Plan No. (1)
55-0659G	1	117+88/Route 133	1 of 5
55-0772L	1L	9110+00/ETC Line	2 of 5
55-0772R	1R	9108+34/ETC Line	2 of 5
55-0772L	6L	9118+00/ETC Line	2 of 5
55-0772R	6R	9116+46/ETC Line	2 of 5
55-0771F	1	4049+91/SE Line	4 of 5
55-0771F	11	4066+32/SE Line	4 of 5
55-0773R	1R	5123+20/WN Line	Technology Dr GP
55-0773L	1L	4071+00/SE Line	Technology Dr GP
55-0773R	3R	9127+10 /ETC Line	Technology Dr GP
55-0773L	3L	4075+55/SE Line	Technology Dr GP

Note: (1) Slope Paving Replacement Plans, Dated 9/30/13.

1.0 OBSERVATIONS AND EXISTING CONDITIONS

The existing slope paving areas listed in Table 1 are shown in Photographs 1 through 12. Generally, the side v-drains adjacent to the abutments and attached to the slope apron are in poor repair. At all eleven bridge locations, one or both sides of the slope apron are significantly cracked with exposed ground underneath. In addition, the concrete surfacing has become uneven (See Photographs 3-8, and 10).

Unpaved areas on the slope surface adjacent to the paved aprons showed signs of erosion. This was observed at locations 55-0659G, 0772 R/L (Abutments 1R, 6L and 6R) 0773 R/L (All four Abutments), and 0771F, Abutment 11 (see Photographs 1-2,5, 7-8, 10-13). Specifically, gutting and soil erosion gullies were observed adjacent to the concrete apron edges (Photograph 7-8, 11). This would allow water runoff to infiltrate underneath the paved aprons and create voids. At bridge 55-0771F Abutment 11, the left side of the paved apron was replaced (see Photograph 12). However, the right side is damaged and covered with soil (Photograph 12). The unpaved areas around the apron also appear to be loose (Photograph 12-13).

2.0 RECOMMENDATIONS FOR REPAIR

The following Table 2 provides a summary of repair recommendations for the eleven bridge abutment locations. Scarification and erosion control recommendations should generally be from 6 feet behind the top of slope to the toe and 6-10 feet on either side, see general sketch on Figure 2.

All subsurface areas exposed from concrete apron removal (Slope Paving) should be excavated a minimum of 12-inches and backfilled and compacted as structure backfill, per Section 19-3.03 of the 2010 Standard Specifications. The soils should be compacted for a depth of 12-inches. All areas outside of the slope paving should be treated as embankment fill and excavated and backfilled per Section 19-6 of the 2010 Standard Specifications.

Table 2 – Summary of Repair Recommendations

Bridge No.	Abutment	**Recommendations for Repair**	
		Apron Repair	Unpaved Slope Repair
55-0659G	1	Replace concrete v-drain (upper Apron), both sides	Scarify 1 foot on both sides of the apron and replace to make level with concrete apron surface. Cover with fiber mesh and vegetate or hydroseed.
55-0772L	1L	Replace concrete v-drain (upper Apron), and lower portion, north side (see Photograph 3).	None recommended.
55-0772R	1R	Replace right side of apron to toe of slope.	Scarify 1 foot on right side of the apron and replace to make level with concrete apron surface. Cover with fiber mesh and vegetate or hydroseed.
55-0772L	6L	Full Apron Replacement. Properly prepare subgrade on upper apron section of Left side to make level surface. See Figure 3.	Scarify 1 foot on both sides of the apron and replace to make level with concrete apron surface. Cover with fiber mesh and vegetate or hydroseed.
55-0772R	6R	Replace both sides of apron to the toe of slope.	Scarify 1 foot on left side of the apron and replace to make level with concrete apron surface. Cover with fiber mesh and vegetate or hydroseed. Right side is ok.
55-0771F	1	Replace both sides of upper apron to 3 feet below abutment (not to toe of slope).	Scarify 1 foot on right side of the apron and replace to make level with concrete apron surface. Cover with fiber mesh and vegetate or hydroseed.
55-0771F	11	Replace concrete v-drain and right side of apron, south side only. North side has previously been replaced.	Scarify 1 foot below apron and on north side and replace to make level with concrete apron surface. Cover with fiber mesh and vegetate or hydroseed. Hydraulics division should be consulted regarding existing drainage path for apron. Dike should be built on south side of apron to prevent soil from covering apron.
55-0773R	1R	Full Apron Replacement. Replace cracked panels of apron along south edge. From top of the slope to toe.	Scarify 1 foot on both sides of the apron and replace to make level with concrete apron surface. Cover with fiber mesh and vegetate or hydroseed.
55-0773R	3R	Full Apron Replacement	Scarify 1 foot on both sides of the apron and replace to make level with concrete apron surface. Cover with fiber mesh and vegetate or hydroseed.
55-0773L	1L	Full Apron Replacement.	Scarify 1 foot on both sides of the apron and replace to make level with concrete apron surface. Cover with fiber mesh and vegetate or hydroseed.
55-0773L	3L	Full Apron Replacement. Make sure to bring left upper apron up to freeway level (previously built too short).	Scarify 1 foot on both sides of the apron and replace to make level with concrete apron surface. Cover with fiber mesh and vegetate or hydroseed.

If you have any questions, please contact Sam Sukiasian at (213) 620-2135 or Ted Liu at 213-620-2136.

Prepared by:

SAM SUKIASIAN, G.E.
Transportation Engineer
Office of Geotechnical Design South 1
Branch B

REGISTERED PROFESSIONAL ENGINEER
SAMUEL G. SUKIASIAN
No. GE2681
Exp. 6-30-16
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STATE OF CALIFORNIA

CHI-TSENG LIU, PhD, P.E., G.E.
Senior Transportation Engineer
Office of Geotechnical Design South 1
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REGISTERED PROFESSIONAL ENGINEER
CHI-TSENG TED LIU
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STATE OF CALIFORNIA

cc. Mike Varipapa, District 12 Project Manager
Jason Yeung, District 12 Maintenance
Son Nguyen, District 12 Design
James Lai, District 12 Design

Attachments:

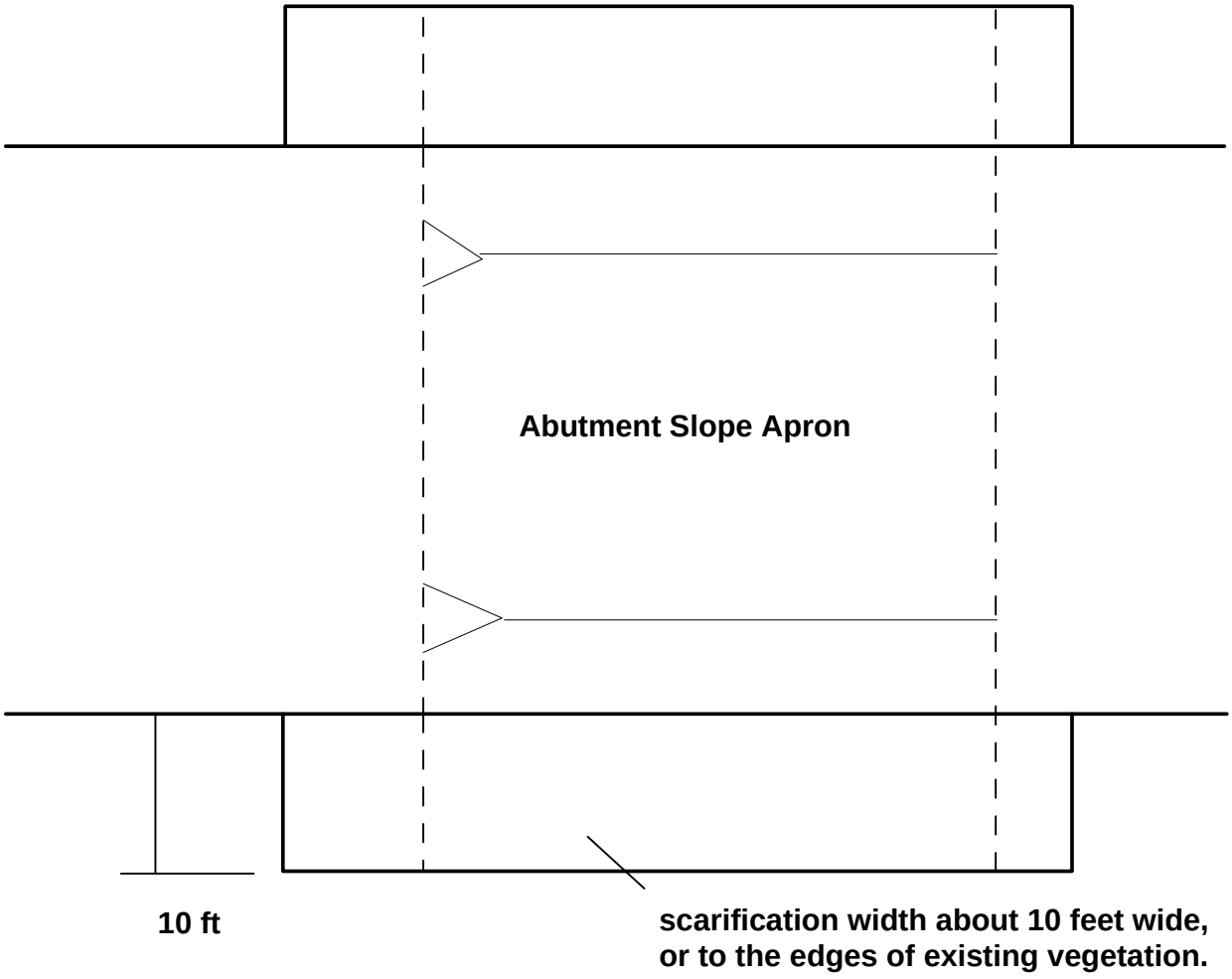
Figures 1-3
Photographs 1-7

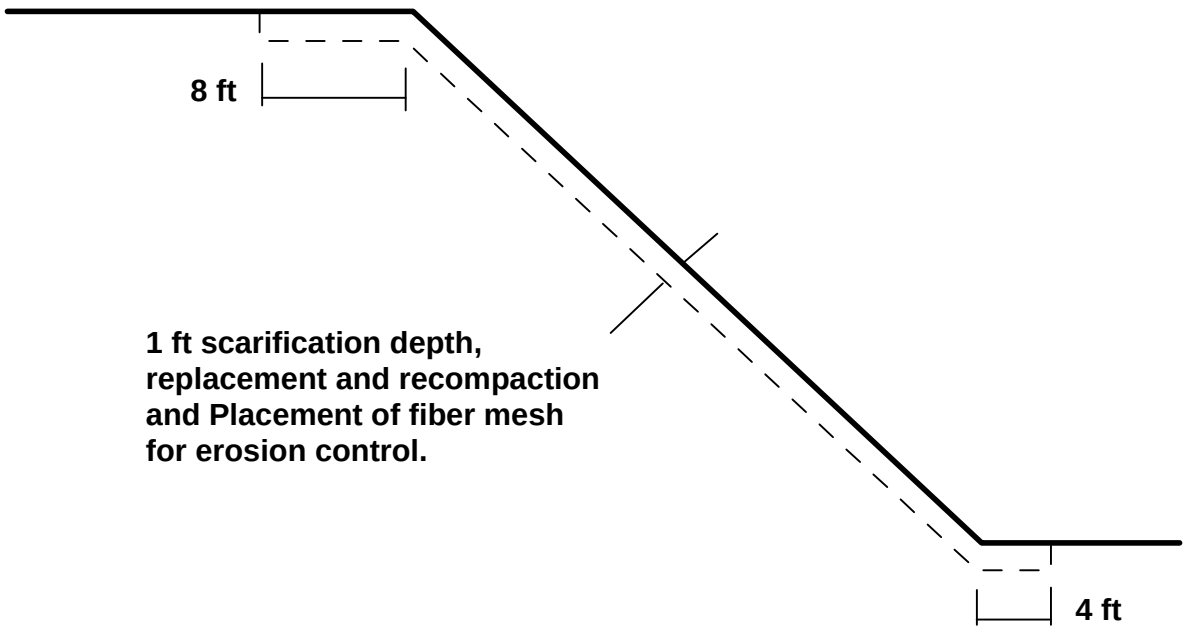
Site Vicinity Map

Legend:

Abutment Slope Repair Locations

Figure 1

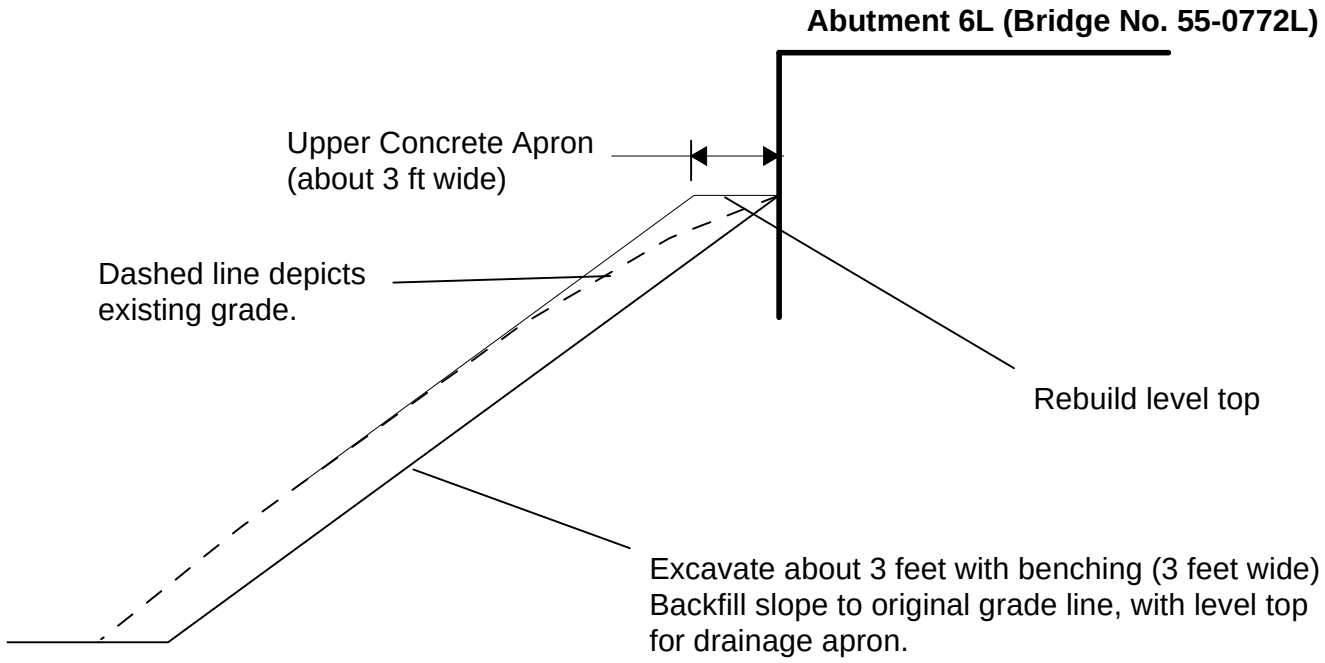




Typical Grading Plan

Figure 2

Grading Plan for Bridge No. 55-0772L - Abutment 6L Left Side



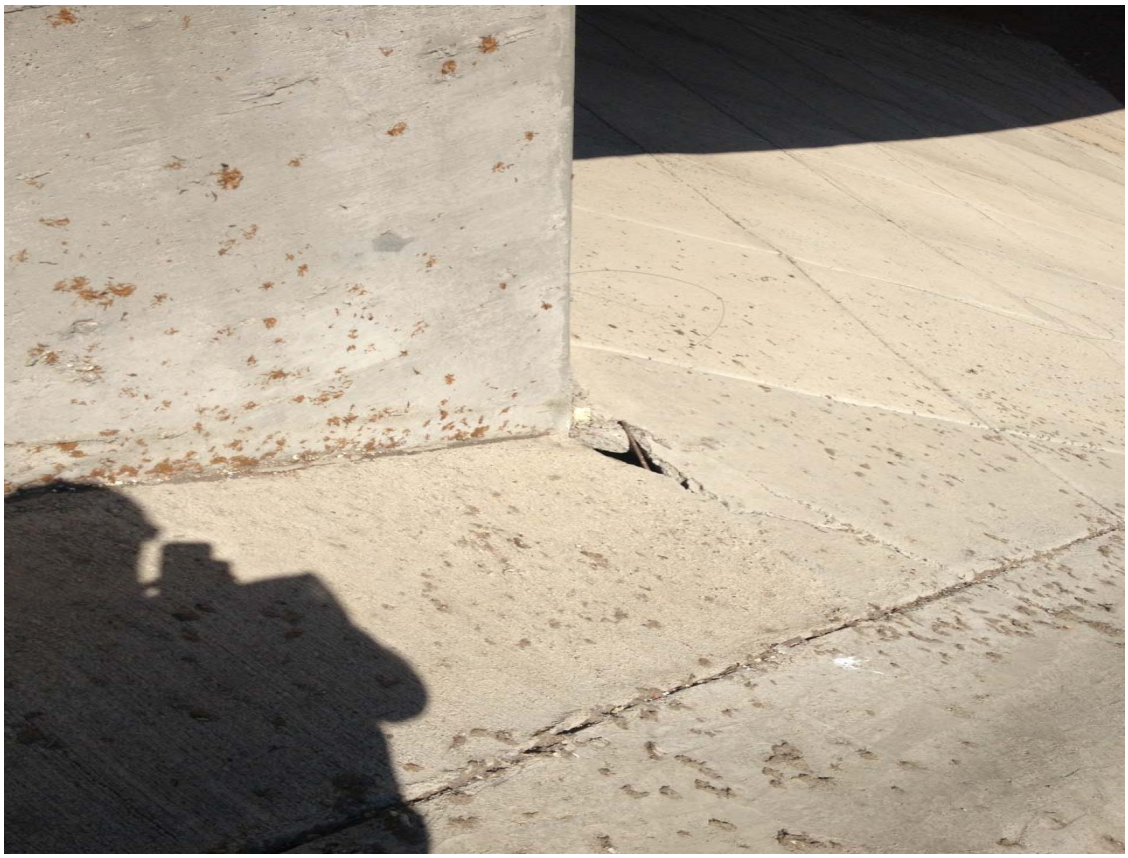
Not to Scale

Figure 3

Photograph 1 –Bridge No. 55-0659G View of Left Unpaved Shoulder

Photograph 2 – Bridge No. 55-0659G. North side of Bridge, upper shoulder.

Photograph 3 – 55-0772L, Abutment 1L. View of north side of upper slope.



Photograph 4 – 55-0772R, Abutment 1R. View of right side of apron with damage shown center.

Photograph 5 – Bridge No. 55-0772L – Abutment 6L. Left side of upper apron separating from abutment.

Photograph 6 – Bridge No. 55-0772L – Abutment 6L. Separation of Apron panels

Photograph 7 – Bridge No. 55-0772R – Abutment 6R. Damage and erosion on left side of apron.

Photograph 8 – Bridge No. 55-0773R – Abutment 1R – Erosion on right side of Abutment.

Photograph 9 – Bridge No. 55-0773L – Abutment 3L – Damaged apron looking toward toe.

Photograph 10 – Bridge No. 55-0773L – Abutment 3L – Upper apron on left side experiencing severe erosion due to unfinished construction.

Photograph 11 – Bridge No. 55-0773R – Abutment 3R, Damage to left side of Apron and adjacent erosion.

Photograph 12 – 55-0771F, Abutment 11. View of Loose Soil Around Apron. Soil is shown encroaching on apron on right side.

Photograph 13 – Bridge No. 55-0771F, Abutment 11. Rebuilt portion of Apron is shown center Left.

State of California
DEPARTMENT OF TRANSPORTATION

California State Transportation Agency

Memorandum

Flex your power!
Be energy efficient!

To: **SON T NGUYEN**
Branch Chief
Design Branch E

Date: November 27, 2013

File: 12-ORA-133
PM 8.8-10.9
EA 0N1100
ID 1213000116

From: **MEHRDAD MAHDAVIAN, P.E.**
Transportation Engineer
Materials & Research Branch

Subject: **Transmittal Letter for Materials Letter Report For Proposed Reconstruction of Distressed Pavements Of NB I-5/NB SR-133 and SB SR-133/SB I-5 Connectors in City Of Irvine, California.**

Attached please find the Materials Letter Report for the above referenced project for your review and file.

If you have any questions, please call Mehrdad Mahdavian at (949) 756-4927.

Prepared by:

Mehrdad Mahdavian, PE
Materials & Research Branch
Division of Project Delivery
RCE # 47566

Concurred by:

Behdad Baseghi, PhD, PE, GE, PMP
Chief, Materials & Research Branch
Division of Project Delivery
RCE # 47051

Cc: Frank Lin
James Lai
File

"Caltrans improves mobility across California"

Memorandum

Flex your power!
Be energy efficient!

To: **SON T NGUYEN**
Branch Chief
Design Branch E

Date: November 27, 2013

File: 12-ORA-133
PM 8.8-10.9
EA 0N1100
ID 1213000116
Materials Letter Report

From: **MEHRDAD MAHDAVIAN, P.E.**
Transportation Engineer
Materials & Research Branch

Subject: **Materials Letter Report For Proposed Reconstruction of Distressed Pavements Of NB I-5/NB SR-133 and SB SR-133/SB I-5 Connectors in City Of Irvine, California.**

In accordance with your request, Materials and Research (M&R) Branch has reviewed the DRAFT-Revised Geotechnical Design Report (GDR) for the above-referenced project in order to provide you with recommendations for pavement structural sections for the proposed improvements.

This report provides pavement design and materials recommendations in accordance with Topic 114 of Highway Design Manual (HDM 2010). There are other issues such as settlement/slope stability of ramp embankment fills, groundwater elevations, etc. that will be addressed by GDR.

1.0 Introduction

State Route 133 (SR-133) is a three lane conventional highway that in some areas becomes a four-lane highway and connects Laguna Beach to City of Irvine where it becomes a Toll Road. Within the project limit, SR-133 becomes a four-lane highway with two lanes in each direction. It carries traffic between the coastal cities from Pacific Coast Highway (PCH) to northern Orange County and Cities of Irvine, Tustin, and Riverside County connecting to I- 405, I-5, and Highway 91.

2.0 Existing Facility

The project area lies within northeastern portion of the City of Irvine and borders with the City of Lake Forest. This project involves two segments of SB SR-133/ I-5 Connector (SE) from Station 4067+00 to Station 4071+00 (Location 1) and from Station 4042+00 to Station 4050+00 (Location2) and one segment of NB I-5/NB SR-133 Connector (WN) from Station 5108+70 to Station 5122+70 (Location 3). The embankments at these three locations have shown signs of distress consisting of tension cracks along the pavement and subsidence and settlement of the embankment fill. A 3-4 feet sinkhole to a depth of about 10 feet has been observed within the east slope of the embankment at Location 3.

3.0 Climatic Conditions

The climate in the project area is typical of coastal region in Southern California and classifies as Mediterranean because of characteristically warm, dry summers and mild winters, with moderate precipitation. The semi-arid Southern California coastal region receives most of its precipitation from moisture-laden air masses that originate in the northern Pacific Ocean, occurring predominantly during cool winter season, with an average annual rate of about 14 inches of rainfall per year (www.weather.com). Snowfall is rare in the project area, which may be considered frost-free. The project site considered to be within "South Coast" climate region based on Caltrans Pavement Climate Region Map (Figure 615.1 of HDM).

4.0 Proposed Project Improvement

A revised Preliminary Geotechnical Design Report (GDR) was prepared and submitted by Office of Geotechnical Design South-1, Branch C on November 15, 2013 for the subject site. Based on their findings and recommendations, the following improvements are proposed for the project:

a) Permeation grouting of embankment fill at each location in accordance to the following schedule:

- At Location 1, the western half of the embankment from depth of 12 to 20 feet.
- At Location 2, the eastern half of the embankment from depth of 10 to 25 feet or more.
- At Location 3, the entire embankment from depth of 10 to more than 25 feet.

b) Removal of embankment fill to a depth of either 10 feet (Option A), or 15 feet (Option B) from the top, as well as side slopes of embankment as shown in layout sheets L-1 through L-3.

c) Replacement of embankment fill with geogrid reinforced granular soil to rebuild the roadway embankment.

d) Removal of existing pavement section from the eastern half of the embankment at Location 1, and the western half of embankment at Location 2.

e) Construction of a new pavement section on top of the embankment at all three locations.

5.0 Terrain and Surface Drainage

The project site is located in an industrial/residential area. The topography of the roadway alignment slopes down gently from north to south. Elevation of the mainline centerline within the project limit ranges from about 218 feet near the railroad bridge to about 216 feet near the centerline of SR-133/I-5 interchange.

6.0 Subsurface and Groundwater Conditions

Since the upper 10-15 feet of the embankment is planned to be removed and replaced with granular fill, no subsurface investigation was conducted by Materials & Research (M&R) Branch. The information and recommendations provided here are based on the data presented in the GDR. Groundwater was not detected in any of borings drilled to elevation of about 180 feet for the GDR. An earlier investigation performed in 1990 for the I-5/SR-133 Separator measured groundwater at approximate elevation of about 145 feet. It is required that groundwater levels be kept a minimum of 5 feet below the pavement structural section.

7.0 Cut and Fill Construction

The proposed reconstruction of the embankment requires imported material. ***All import fills material that is going to be placed within 4 feet of finished grade shall have an R-value of at least 40, a PI of less than 12, and an Expansion Index of less than 50***. It shall be non-corrosive to metals and concrete especially if any underground utilities or structures are planned to be constructed within the embankment.

8.0 Estimate of Settlement

Estimate of settlements for the roadway embankment fill and subsurface soils will be addressed by the GDR. ***All settlements have to be mitigated prior to placement of the pavement structural section.***

9.0 Seismic Considerations

The GDR provides recommendations for seismic design including liquefaction/seismic settlement and lateral spreading (as applicable).

10.0 Earthwork

10.1 General Earthwork Requirements

All earthworks shall conform to requirements of Section 19 of Caltrans 2010 edition of Standard Specifications, and project Special Provisions. Imported borrow may be required for construction of embankments. Source of imported borrow is unknown at this time. Therefore, earthwork factors cannot yet be determined. Compaction of soils shall be conducted in accordance with Section 19-5 of the Caltrans Standard Specifications. Fills placed against existing embankments shall be properly benched into the existing side slopes as described in Section 19-6.03 of the Caltrans Standard Specifications. Existing vegetation on slopes shall be removed and shall not be used as fill material. Any temporary sloping, sheeting and shoring shall be made the Contractor's responsibility. Appropriate measures shall be taken to prevent damage to adjacent structures and utilities. It should be noted that it is the responsibility of the Contractor to oversee the safety of the workers in the field during construction. The Contractor shall conform to all applicable occupational safety and health standards, rules, regulations, and orders established by the State of California.

10.2 Construction Observation and Testing

It is recommended that inspection and testing be performed during the following stages of construction:

- Grading operations, including over excavation and placement of compacted fill.
- Removal of existing shoulders structural sections and Dikes.
- Preparation of pavement subgrade.
- Placement of Pavement sections.
- Excavations for utility trenches (if any).
- When any unusual conditions are encountered.

11.0 Traffic Index

A 20-year Traffic Index (TI) value of 11 and a 40-year TI of 12 for the reconstruction of the NB I-5/NB-SR-133, and SB SR-133/SB I-5 embankments has been recommended by District 12 Traffic Studies Branch on September 11, 2013. A copy of their memo is included as an attachment.

12.0 Summary of Field Investigation and Existing Pavement Sections

Materials and Research Branch did not conduct any field investigation since the GDR recommends removal of the upper 10 to 15 feet of the existing embankment and replacing it with geogrid reinforced granular soil. Field investigation performed by Roadway Geotechnical Branch-South is summarized in the GDR, dated October 22, 2013. Review of the as-built plans show the existing pavement of both connectors to consist of 0.6' of HMA-Type B over 0.25' of ATPB over 0.7' of Class 2 AB. Copies of the As-built plan pertinent to the project are included as an attachment.

13.0 Laboratory Testing

Materials and Research Branch did not conduct any field investigation; therefore, our branch conducted no laboratory testing. The GDR presents a summary of their laboratory testing performed for their investigations.

13.1 Corrosion Testing

Caltrans Bridge Memo to Designers 3-1 (Caltrans, 2000), defines a corrosive environment as one where the soil has electrical resistivity of less than 1000 Ω-cm, sulfate content of greater than 2,000 ppm, chloride content of greater than 500 ppm, or pH of less than 5.5. Two Soil samples tested for GDR showed the existing embankment fill soils to be non-corrosive to metals. However since the embankment is being reconstructed, it is recommended that the import soils used in construction are non-corrosive to metals and concrete.

14.0 Findings, Conclusions and Recommendations

The upper 10-15 feet of the embankment is planned to be removed and replaced with granular fill having an R-value of 40. The following pavement sections for the connector pavements are designed based on a TI of 12 and an R-value of 40. Due to presence of ATPB layer in the existing pavement, we recommend

using Alternative 2 to provide continuous drainage for the existing water in the ATPB layer. However if a cross drain can be provided for the existing ATPB layer then Alternative 1 or 3 are recommended. We also recommend that **same structural section to be used for the shoulder of the connectors in order to compensate for wheel off tracking of heavy trucks on the shoulder area:**

- **Existing Pavement Sections as shown on the As-built**

  0.6' of HMA-Type B over 0.25' of ATPB over 0.7' of Class 2 AB

- **Recommended New Pavement Sections**

NB I-5/NB SR-133 and SB SR-133/SB I-5 Connectors and Shoulders ***(TI_{40}=12, R=40)***

Alternative 1: 0.2' RHMA-G over 0.45' HMA-Type A over 1.05' Class 2 AB or

Alternative 2: 0.2' RHMA-G over 0.45' HMA-Type A over .25' ATPB over 0.75' Class 2 AB or

Alternative 3: 0.2' RHMA-G over 0.95' HMA-Type A over 0.5' Class 2 AS (working table)

If the shoulders are planned to be used as temporary detours they need to be improved for higher traffic volume. We recommend the following pavements sections for shoulders that are being used as detours:

- 1.0' of HMA-Type A over existing embankment or subsurface soils.

15.0 Life Cycle Cost Analysis (LCCA)

LCCA is an analytical technique based on economic principals to evaluate long-term alternative investment options. LCCA studies the life cycle cost for various pavement strategies for new pavements or rehabilitation projects in order to evaluate the long-term alternative investment options for the pavement. LCCA accounts for relevant cost to the agency, owner, operator of the facility, and the roadway user that will occur throughout the life of the pavement. After cost evaluation of various alternatives and based on discussions with HQ Pavement Program Branch, LCCA is not required for this project since the pavement work is short and the cost difference is not significant. A copy of the email documenting the decision is included in Appendix

17.0 Materials Available

Imported borrow may be required for construction of embankments and replacement of unsuitable soils within the project limits. Local sources of construction materials were not investigated in this study. However, materials are available from several commercial suppliers throughout Orange, Los Angeles, Riverside and San Bernardino Counties. Furthermore, the Web Site of Department of Conservation on the Internet contains a current listing of mining operations eligible to sell materials to the State of California. The page can be accessed at: http://www.consrv.ca.gov/omr/index.htm

18.0 Limitations

This report is intended for the use of Caltrans for the proposed reconstruction of distressed pavements Of NB I-5/NB SR-133 and SB SR-133/SB I-5 Connectors in City Of Irvine, California. This report is based on the project as described and the information obtained from the exploratory borings at the approximate locations indicated on the attached plans. The findings and

recommendations contained in this report are based on the results of the field investigation, laboratory tests, and engineering analyses presented in the GDR. In addition, soils and subsurface conditions encountered in the exploratory borings are presumed to be representative of the project site. However, subsurface conditions and characteristics of soils between exploratory borings can vary. The findings reflect an interpretation of the direct evidence obtained. The recommendations presented in this report are based on the assumption that an appropriate level of quality control and quality assurance (inspections and tests) will be provided during construction. District Materials and Research Branch should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Such changes or variations may require a re-evaluation of the recommendations contained in this report.

The data, opinions, and recommendations contained in this report are applicable to the specific design element(s) and location(s), which is (are) the subject of this report. They have no applicability to any other design elements or to any other locations and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of the District Materials and Research Branch.

This report is prepared in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended.

19.0 Recommended Materials Specifications

The following requirements shall be included in the project specifications:

- Rubberized Hot Mixed Asphalt shall be Type G and Hot Mixed Asphalt shall be Type A-3/4 inch.
- Aggregate Base (AB) shall be Class 2 and Aggregate Subbase (AS) shall be Class 3 and follow requirements in sections 26 and 25 of Caltrans Standard Specifications respectively.
- Flexible pavement sections for the shoulder and ramps were designed using the Caltrans computer program "CALFP" (Caltrans, 2008), which was also based on the design method outlined in Chapter 600 of the Highway Design Manual (HDM).
- ***All import fills material that is going to be placed within 4 feet of finished grade shall have an R-value of at least 40, a PI of less than 12, and an Expansion Index of less than 50***. It shall be non-corrosive to metals and concrete especially if any underground utilities or structures are planned to be constructed within the embankment. If the existing native soils within upper 4 feet of finished grade is determined not to meet the above requirements, the existing native soils shall be over-excavated and replaced with imported borrow to meet the imported fill recommendations herein. Borrow materials shall conform to Section 19-7 of Caltrans Standard Specifications (2010).
- Prior to the placement of pavement sections, the subgrade soils shall be compacted in accordance with Section 19-5.03 of Caltrans Standard Specification (2010).
- It is critical that construction and rehabilitation effort be coordinated such that a uniform superior product is delivered.
- All Standard Special Provisions (SSPs) to be included in the project shall be submitted the Materials and Research Branch for review and approval.
- Special attention is required to be given to the following sections of July 2010 Standard Specifications:
    - Section 19: Earthwork;

- Section 25: Aggregate Subbases;
- Section 26: Aggregate Bases;
- Section 28: Concrete Bases;
- Section 39 Hot Mixed Asphalt;
- Section 61: Culvert and Drainage Pipe Joints;
- Section 64: Plastic Pipe;
- Section 65: Concrete Pipe;
- Section 66: Corrugated Metal Pipe;
- Section 68: Subsurface Drains;
- Section 92: Asphalts;
- Section 93: Liquid Asphalts;
- Section 94: Asphaltic Emulsion.

If you have any questions, please call Mehrdad Mahdavian at (949) 756-4927.

Prepared by:

Mehrdad Mahdavian,
Materials & Research Branch
Division of Project Delivery
RCE # 47566

REGISTERED PROFESSIONAL ENGINEER
MEHRDAD MAHDAVIAN
C 47566
Exp. 12-31-15
CIVIL
STATE OF CALIFORNIA

Concurred by:

Behdad Baseghi, PhD, PE, GE, PMP
Chief, Materials & Research Branch
Division of Project Delivery
RCE # 47051

Attachments: Site Location Map
Layout Sheets L-1 through L-3
Copies of As-Built Plans
Copy of Traffic Index Letter
Life Cycle Cost Analysis

Cc: Frank Lin
James Lai
File

Site Location Map

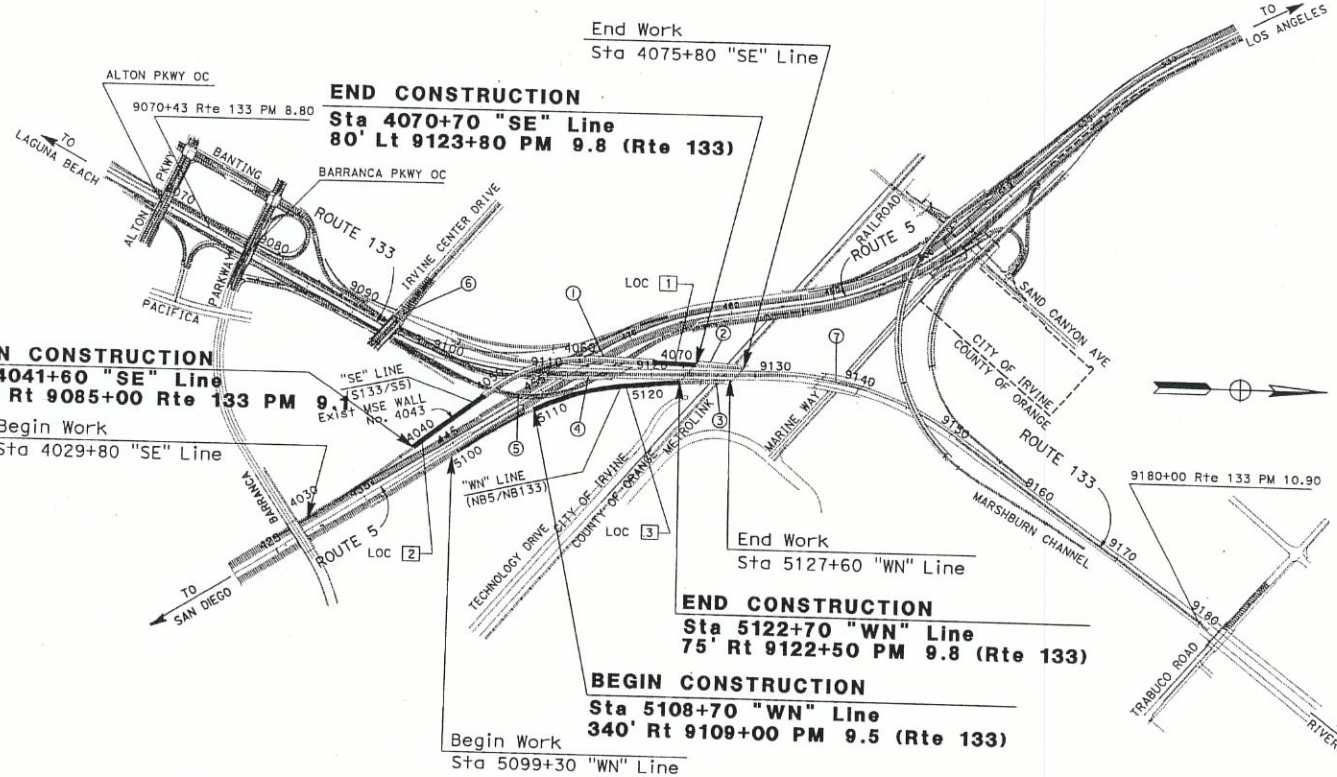
INDEX OF PLANS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON
STATE HIGHWAY
IN ORANGE COUNTY
IN CITY OF IRVINE
ON ROUTE SR-133/INTERSTATE I-5 INTERCHANGE CONNECTORS
FROM IRVINE CENTER DRIVE OC TO MARINE WAY UC

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2010

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	Ora	133	8.80/10.90		



EXISTING STRUCTURES

1. SI33/S5 SEPARATION (CONN) Br No. 55-771F
2. TECHNOLOGY DR UC & OH Br No. 55-773 L
3. TECHNOLOGY DR UC & OH Br No. 55-773 R
4. SI33/5 SEPARATION Br No. 55-772 L
5. NI33/N5 CONNECTOR SEPARATION Br No. 55-659 G
6. IRVINE CENTER DR OC Br No. 55-769 K
7. MARINE WAY UC Br No. 55-774 R/L

PROJECT ENGINEER DATE
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

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

DESIGN ENGINEER JAMES A. LAI
PROJECT MANAGER MIKE VARIPAPA

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

CONTRACT No.	12-0N1104
PROJECT ID	1213000116

DATE PLOTTED => 12-NOV-2013
TIME PLOTTED => 1451

Layout Plans L-1 through L-3

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	Ora	133	8.80/10.90		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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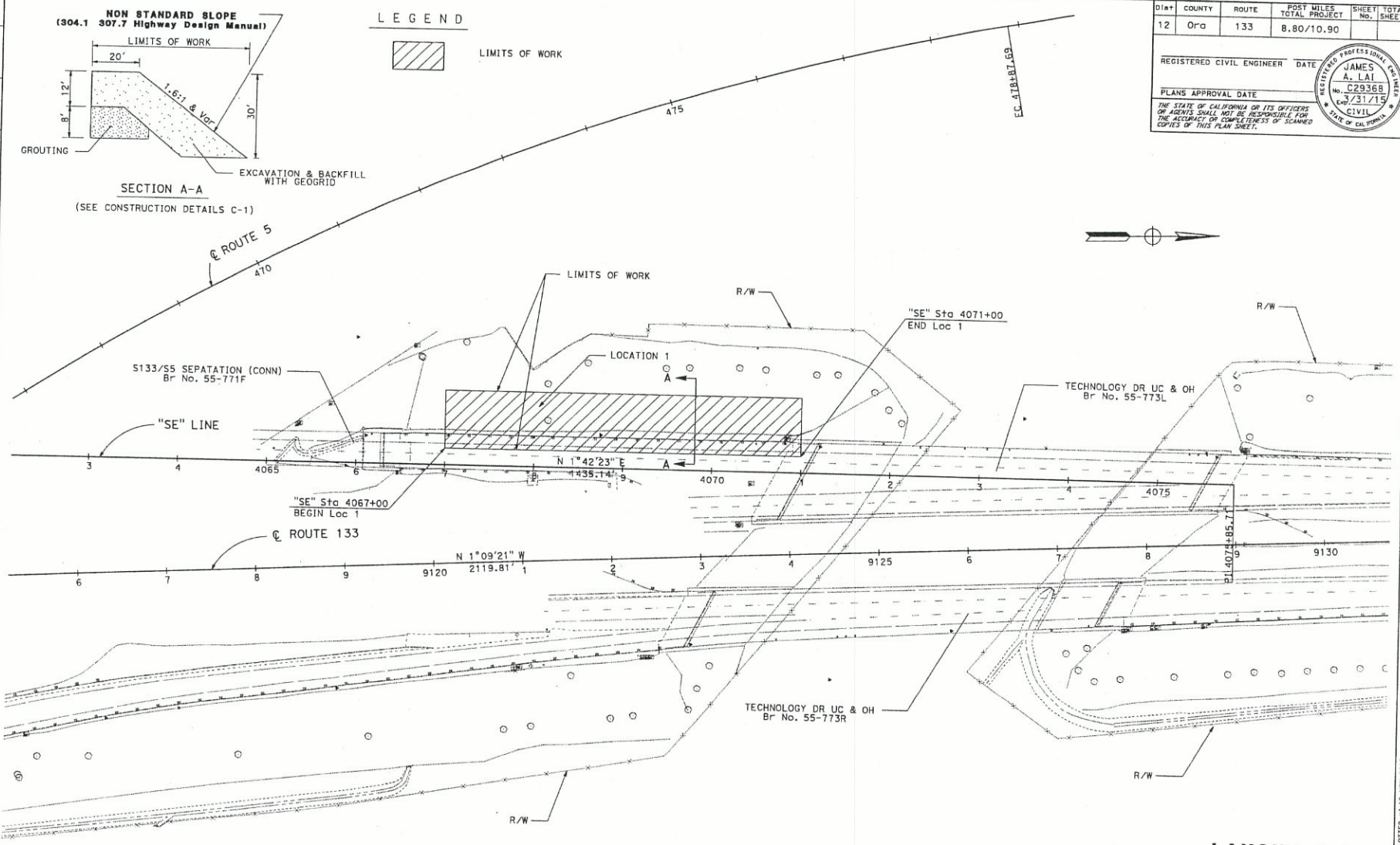
REGISTERED PROFESSIONAL ENGINEER JAMES A. LAI No. C29368 Exp. 3/31/15 CIVIL STATE OF CALIFORNIA



LAYOUT L-1

LOCATION 1

SCALE: 1"=50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

DESIGN

FUNCTIONAL SUPERVISOR

CALCULATED-DESIGNED BY

CHECKED BY

REVISED BY

DATE REVISED

LAST REVISION 00-00-00

DATE PLOTTED => 12-NOV-2013

TIME PLOTTED => 14:51

BORDER LAST REVISED 7/2/2010

USERNAME => s128504

DGN FILE => 1213000116ea001.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 1213000116

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	Ora	133	8.80/10.90		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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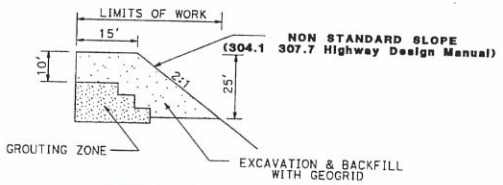
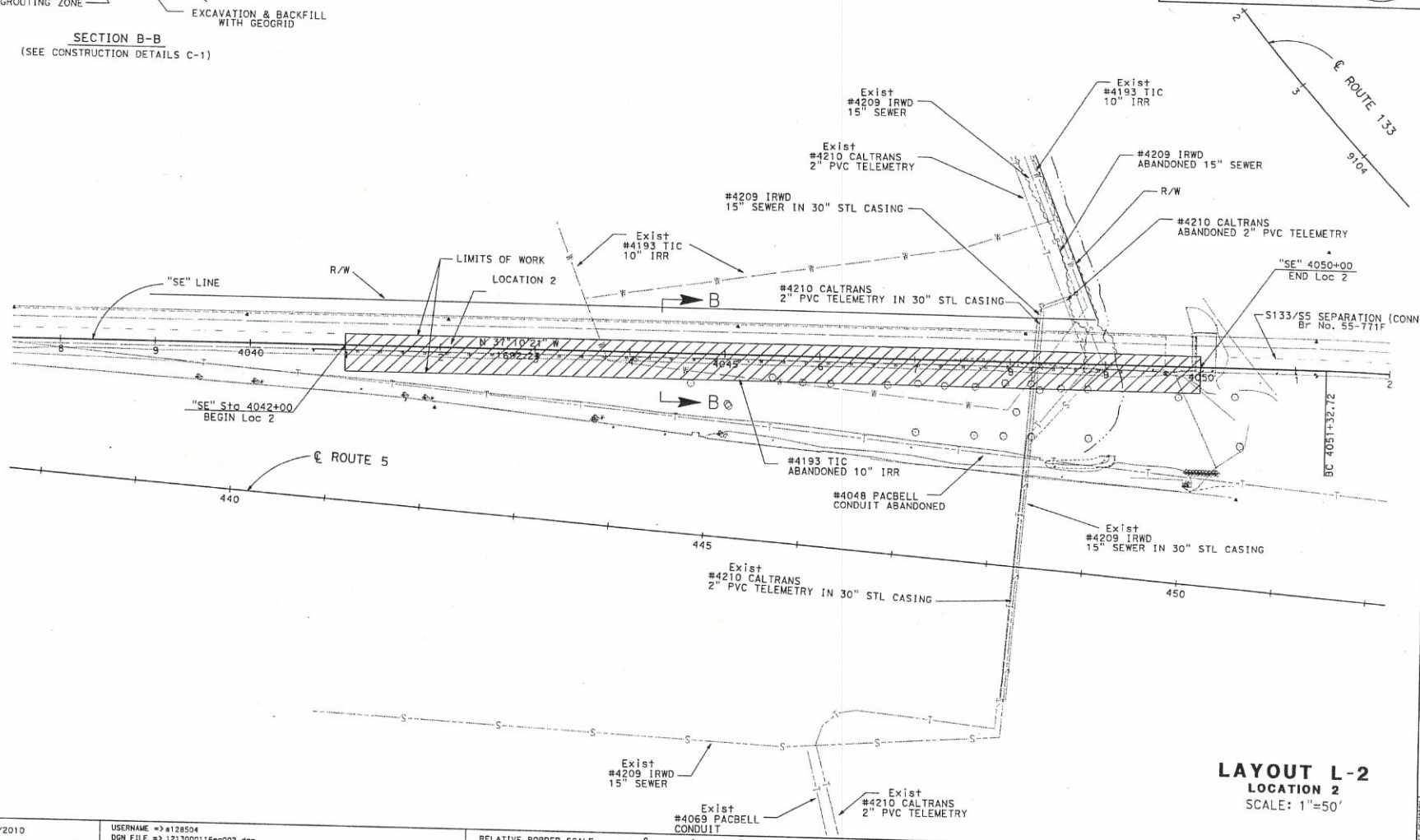
REGISTERED PROFESSIONAL ENGINEER JAMES A. LAI No. C 29368 Exp. 3/31/15 CIVIL STATE OF CALIFORNIA



SECTION B-B
(SEE CONSTRUCTION DETAILS C-1)



LAYOUT L-2
LOCATION 2
SCALE: 1"=50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
DESIGN
FUNCTIONAL SUPERVISOR
CALCULATED-DESIGNED BY
CHECKED BY
REVISED BY
DATE REVISED

LAST REVISION 00-00-00
DATE PLOTTED => 12-NOV-2013
TIME PLOTTED => 14:51

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RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3
UNIT 3000
PROJECT NUMBER & PHASE 1213000116

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	Ora	133	8.80/10.90		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER JAMES A. LAI No. C29368 Exp. 3/31/15 CIVIL STATE OF CALIFORNIA

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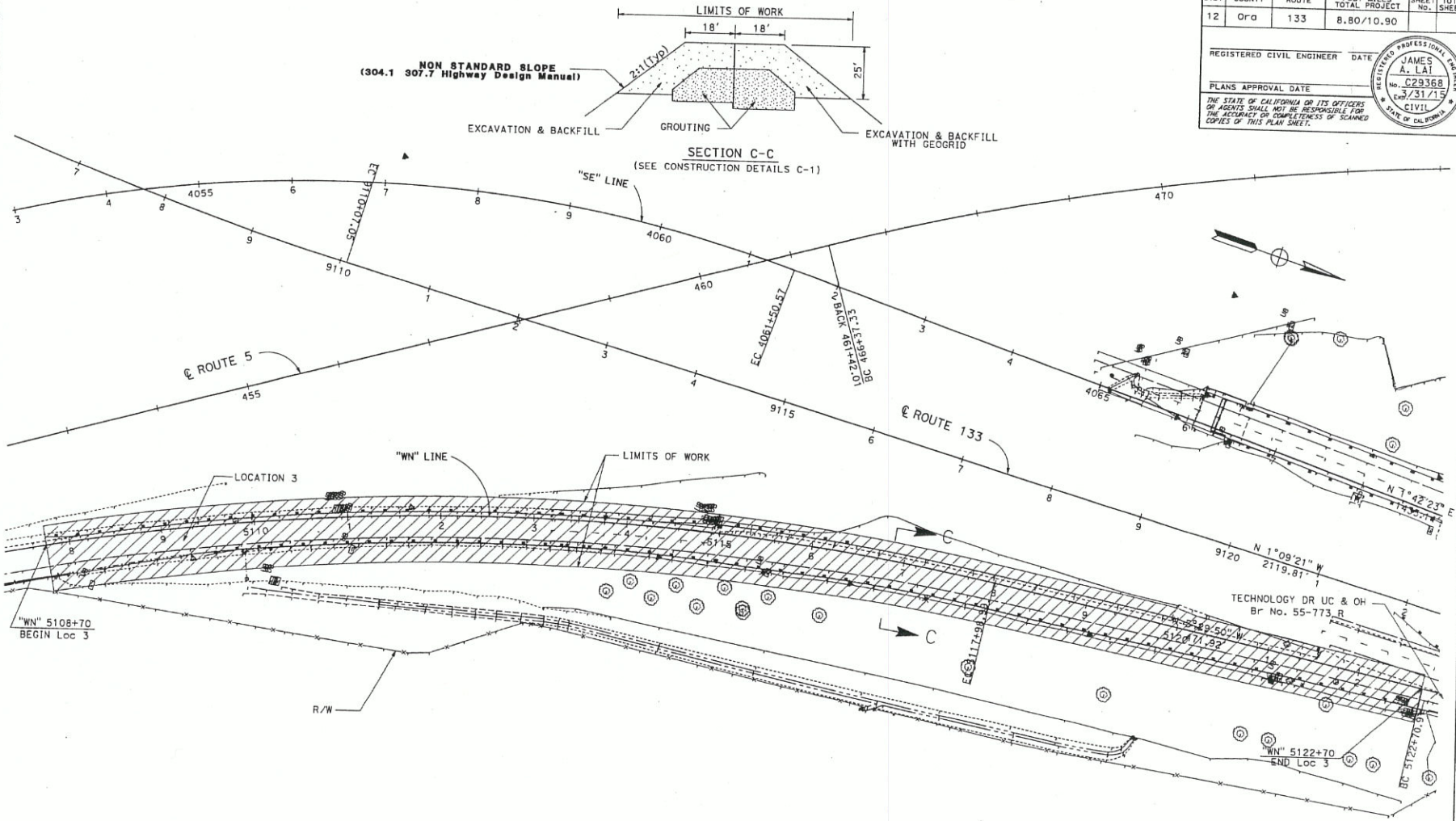

LAYOUT L-3

LOCATION 3

SCALE: 1"=50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

DESIGN

FUNCTIONAL SUPERVISOR

CALCULATED-DESIGNED BY

CHECKED BY

REVISED BY

DATE REVISED

BORDER LAST REVISED 7/2/2010

USERNAME => s128504
DGN FILE => 1213000116eo003.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 3000

PROJECT NUMBER & PHASE 1213000116

LAST REVISION 00-00-00

DATE PLOTTED => 12-NOV-2013
TIME PLOTTED => 14:51

COPIES OF AS-BUILT PLANS

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	133/ 5	8.8-10.9/ 22.5-24.8	17	913

REGISTERED CIVIL ENGINEER

9-15-97
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. PETTIT No. 51099 EXP. 9-30-97 CIVIL STATE OF CALIFORNIA

CH2M HILL
3 HUTTON CENTRE DR., #200
SANTA ANA, CA 92707

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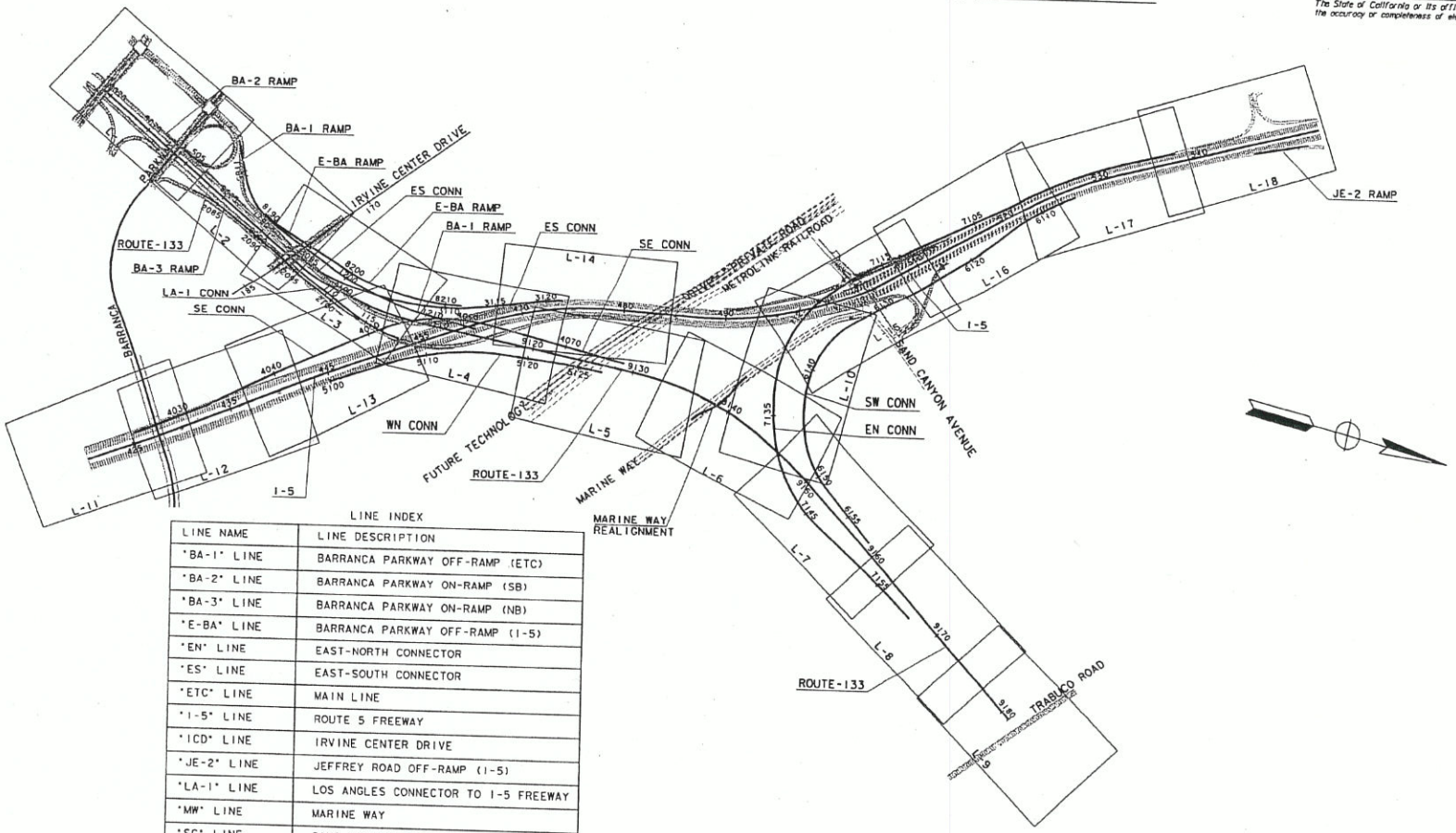
NO AS BUILT CORRECTIONS

AS BUILT

CORRECTIONS BY D.SPARKS
CONTRACT NO. 12-111000
DATE 12-23-98



LINE INDEX

LINE NAME	LINE DESCRIPTION
"BA-1" LINE	BARRANCA PARKWAY OFF-RAMP (ETC)
"BA-2" LINE	BARRANCA PARKWAY ON-RAMP (SB)
"BA-3" LINE	BARRANCA PARKWAY ON-RAMP (NB)
"E-BA" LINE	BARRANCA PARKWAY OFF-RAMP (I-5)
"EN" LINE	EAST-NORTH CONNECTOR
"ES" LINE	EAST-SOUTH CONNECTOR
"ETC" LINE	MAIN LINE
"I-5" LINE	ROUTE 5 FREEWAY
"ICD" LINE	IRVINE CENTER DRIVE
"JE-2" LINE	JEFFREY ROAD OFF-RAMP (I-5)
"LA-1" LINE	LOS ANGLES CONNECTOR TO I-5 FREEWAY
"MW" LINE	MARINE WAY
"SC" LINE	SAND CANYON ROAD
"SC-3" LINE	SAND CANYON ROAD OFF- RAMP (SB)
"SE" LINE	SOUTH-EAST CONNECTOR
"SW" LINE	SOUTH-WEST CONNECTOR
"WN" LINE	WEST- NORTH CONNECTOR

KEY MAP AND LINE INDEX

NO SCALE

K-1

FOR REDUCED PLANS 0 1 2 3

TCU 00000 TEA 11000

TRANSPORTATION CORRIDOR AGENCIES	TOLL ROAD OVERSIGHT	TCA PROJECT MANAGER	CALCULATED/ DESIGNED BY
	AGNES VILLANUEVA	MIKE ENDRES	CHECKED BY
			TP DATE 10/96 REVISED BY
			SP 10/96 DATE REVISED

25-FEB-1997 16:07:46 06index.mst

STRUCTURAL SECTION TYPES

STR SEC	R-VALUE 28	R-VALUE 40	R-VALUE 50
1	0.70' AC (TYPE B) 0.25' ATPB 1.30' AB (CLASS 2)	0.60' AC (TYPE B) 0.25' ATPB 1.05' AB (CLASS 2)	0.60' AC (TYPE B) 0.25' ATPB 0.70' AB (CLASS 2)
2	0.55' AC (TYPE B) 0.25' ATPB 0.85' AB (CLASS 2)	0.45' AC (TYPE B) 0.25' ATPB 0.70' AB (CLASS 2)	0.45' AC (TYPE B) 0.25' ATPB 0.40' AB (CLASS 2)

RFI #102

R-50 SECTIONS USED IN ALL LOCATIONS

R-VALUE 28 SECTION IS THE BASIC SECTION THAT THE CONTRACTOR WILL CONSTRUCT. THE SECTIONS SHOWN FOR R-VALUE 40 AND R-VALUE 50 CAN BE USED GIVEN THE FOLLOWING:

A. THE ACTUAL R-VALUE AND PAVEMENT SECTION WILL BE DETERMINED THROUGH FIELD TESTING OF THE SUBGRADE WITHIN 4' OF THE FINISHED GRADE AS APPROVED BY THE CEM PRIOR TO CONSTRUCTION.

B. CONTRACTOR IS RESTRICTED TO USING NO MORE THAN A TOTAL OF TWO DIFFERENT PAVEMENT SECTIONS FOR STRUCTURAL SECTION 1 WITHIN EACH LEG OF THE CORRIDOR.

C. CONTRACTOR SHALL ENSURE THAT THE DRAINAGE OF THE EDGE DRAIN SYSTEM (IF CALLED FOR) IS CONTINUOUS OR CONVEYED AWAY FROM THE PAVEMENT AT STRUCTURAL SECTION TRANSITIONS.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	133/5	8.8-10.9/22.5-24.8	2	913

REGISTERED CIVIL ENGINEER

9-15-97
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CH2M HILL
3 HUTTON CENTRE DR., #200
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3 0.60' AC (TYPE B)
0.25' ATPB
1.85' AB (CLASS 2)

4 0.75' AC (TYPE B)
~~1.90'~~ 2.40' AB (CLASS 2)
RFI #102

5 0.85' AC (TYPE B)
0.25' ATPB
1.25' AB (CLASS 2)

5A 1.10' AC (TYPE B)
0.25' ATPB
0.80' AB (CLASS 2)

6 0.70' AC (TYPE B)
2.40' AB (CLASS 2)

7 0.35' AC (TYPE B)
0.25' ATPB
1.45' AB (CLASS 2)

8 1.40' AC (TYPE B)
0.25' ATPB
0.35' AB (CLASS 2)

9 0.85' PCC (TYPE B)
0.50' LCB
0.70' AB (CLASS 2)

10 0.70' AC (TYPE B)
0.95' AB (CLASS 2)

11 0.40' AC (TYPE B)
1.55' AB (CLASS 2)

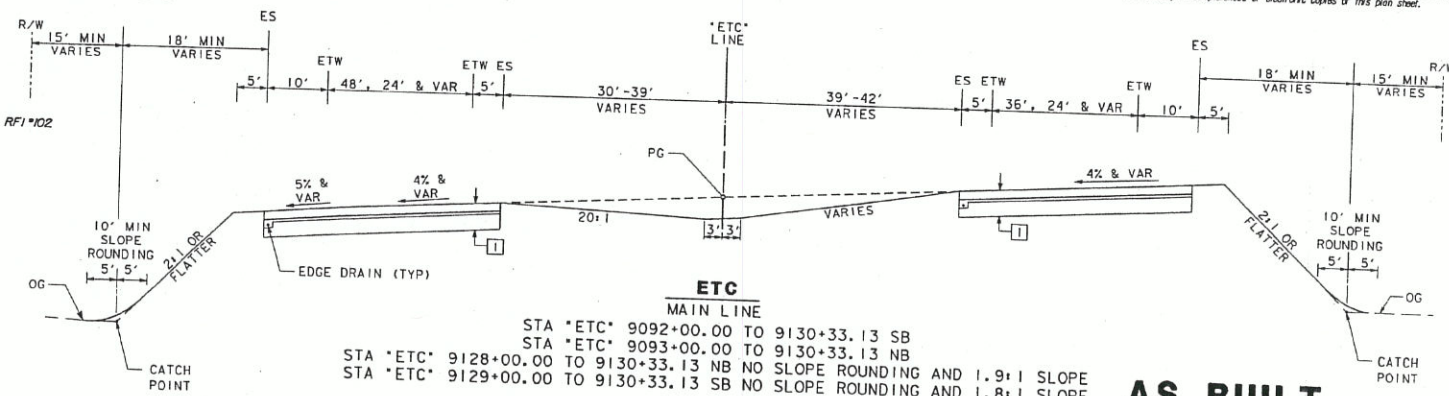
RFI #102

12 0.35' AC (TYPE B)
0.50' AB (CLASS 2)

13 0.15' MIN AC (TYPE B)
RFI #102

14 0.50' AC (TYPE B)
1.95' AB (CLASS 2)

15 0.45' AC (TYPE B)
0.25' ATPB
1.80' AB (CLASS 2)



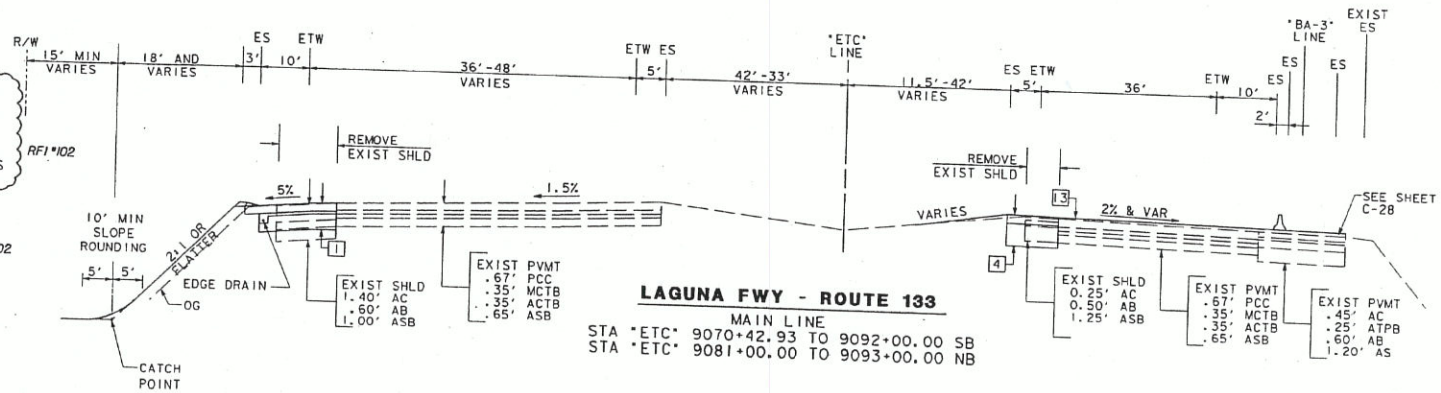
ETC
MAIN LINE

STA "ETC" 9092+00.00 TO 9130+33.13 SB
STA "ETC" 9093+00.00 TO 9130+33.13 NB
STA "ETC" 9128+00.00 TO 9130+33.13 NB NO SLOPE ROUNDING AND 1.9:1 SLOPE
STA "ETC" 9129+00.00 TO 9130+33.13 SB NO SLOPE ROUNDING AND 1.8:1 SLOPE

AS BUILT
CORRECTIONS BY D.SPARKS
CONTRACT NO. 12-111000
DATE 12-23-98

NOTES:

1. FOR SUPERELEVATION REFER TO PROFILE SHEETS.
2. ROADWAY GORE AREAS AND SUPERELEVATION TRANSITION LOCATIONS ARE NOT REPRESENTED BY TYPICAL CROSS-SECTION. RFI #102
3. AXIS OF ROTATION FOR SUPERELEVATION IS LOCATED AT THE PG OF THE ROADWAY SECTION.
4. STRUCTURAL SECTIONS ARE CONTINUOUS FROM STATION TO STATION EXCEPT AT BRIDGES. SEE BRIDGE PLANS FOR BRIDGE DETAILS.
5. 10' MIN SLOPE ROUNDING AT RESTRICTED R/W LOCATIONS ONLY.
6. FOR DIKE DETAILS SEE SHEET X-9. THE TYPICAL DIKE DETAILS SHOWN ON SHEET X-9 APPLY TO ETC MAINLINE AND RAMPS ONLY.
7. FOR LOCATION OF EDGE DRAIN, SEE DRAINAGE PLANS AND CALTRANS STD PLAN D99A. RFI #102
8. DIMENSIONS OF THE STRUCTURAL SECTIONS ARE SUBJECT TO TOLERANCES SPECIFIED IN THE STANDARD SPECIFICATIONS.
9. SUPERELEVATION AS SHOWN OR AS DIRECTED BY THE ENGINEER. RFI #102
10. FOR INSTALLATION OF ASPHALT TREATED PERMEABLE BASE, SEE STANDARD PLAN D99A.
11. EACH PAVEMENT SECTION USED WITHIN A LEG OF THE CORRIDOR SHALL HAVE A MINIMUM LENGTH OF ONE MILE.
12. FOR EDGE DRAIN DETAIL AND FILTER FABRIC DETAIL, SEE SHEET X-9. SEE EDGE DRAIN PLANS FOR LOCATION OF EDGE DRAINS.



LAGUNA FWY - ROUTE 133
MAIN LINE

STA "ETC" 9070+42.93 TO 9092+00.00 SB
STA "ETC" 9081+00.00 TO 9093+00.00 NB

TYPICAL CROSS SECTIONS
NO SCALE

X-1

TRANSPORTATION CORRIDOR AGENCIES

TOLL ROAD OVERSIGHT: AGNES VILLANUEVA

TCA PROJECT MANAGER: MIKE ENDRES

CALCULATED/DESIGNED BY: TP DATE 10/96
CHECKED BY: SP 10/96
REVISED BY / DATE REVISED

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FOR REDUCED PLANS 0 1 2 3

TCU 00000 TEA 111000

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	133/ 5	8.8-10.9/ 22.5-24.8	7	913

Thomas Pettit
REGISTERED CIVIL ENGINEER

9-15-97
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. PETTIT No. 51099 Exp. 9-30-97 CIVIL STATE OF CALIFORNIA

CH2M HILL
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AS BUILT

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CONTRACT NO. 12-111000
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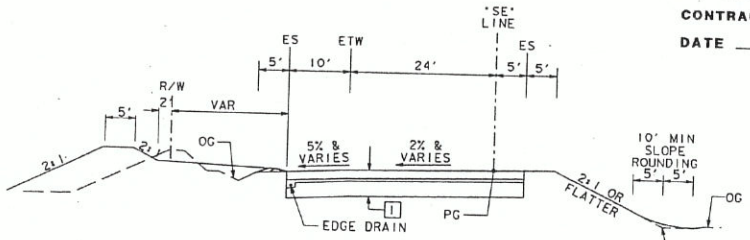
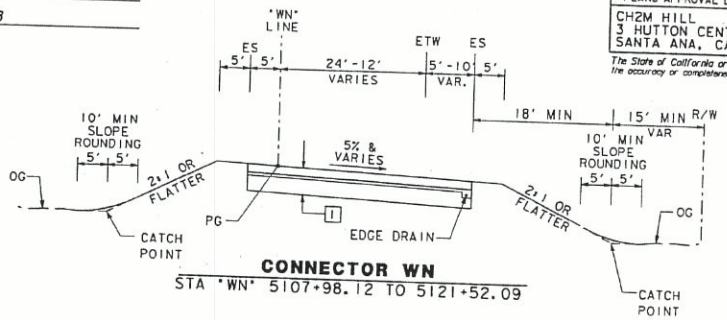
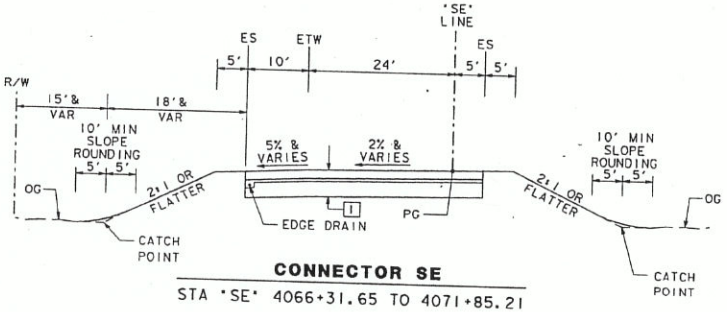


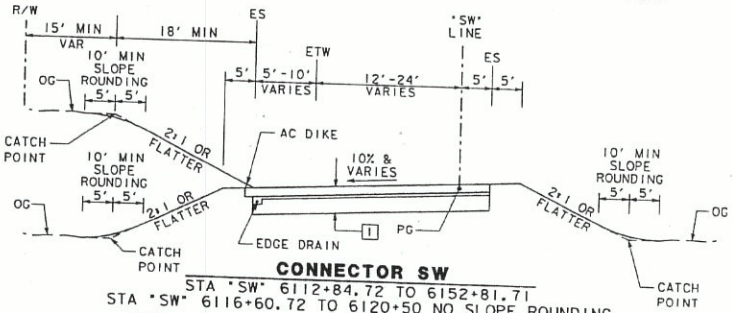
CONNECTOR SE
STA "SE" 4029+80.99 TO 4037+50



CONNECTOR WN
STA "WN" 5107+98.12 TO 5121+52.09

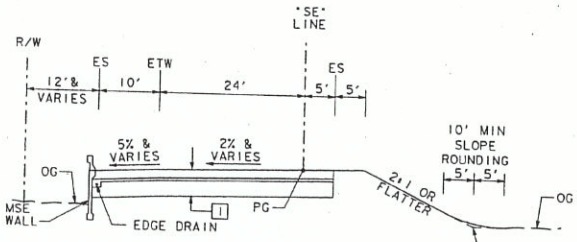


CONNECTOR SE
STA "SE" 4066+31.65 TO 4071+85.21

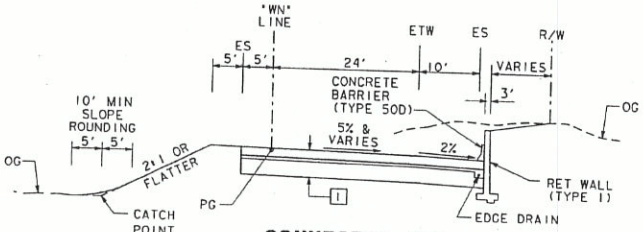


CONNECTOR SW
STA "SW" 6112+84.72 TO 6152+81.71
STA "SW" 6116+60.72 TO 6120+50 NO SLOPE ROUNDING

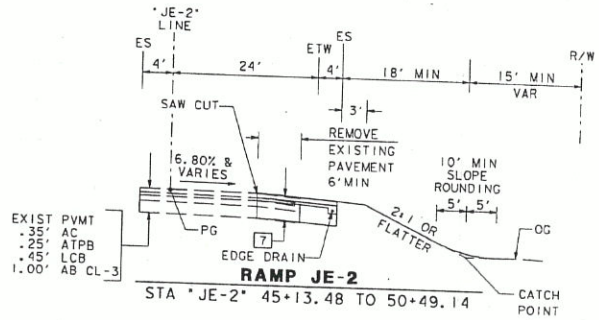
NOTE: FROM STATION 6141+40 TO 6144+85, NO SLOPE ROUNDING & 5' WALK ACCESS TO RIGHT OF WAY.



CONNECTOR SE
STA "SE" 4037+50.00 TO 4049+91.65



CONNECTOR WN
STA "WN" 5103+27.19 TO 5107+98.12



RAMP JE-2
STA "JE-2" 45+13.48 TO 50+49.14

TYPICAL CROSS SECTIONS
NO SCALE

X-6

CALCULATED/ DESIGNED BY	TP	DATE 10/96	REVISED BY	DATE REVISED
CHECKED BY	SP	10/96		

TCA PROJECT MANAGER: MIKE ENDRES
TOLL ROAD OVERSIGHT: AGNES VILLANUEVA
TRANSPORTATION CORRIDOR AGENCIES

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FOR REDUCED PLANS 0 1 2 3

TCD 00000 TEA 00000

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
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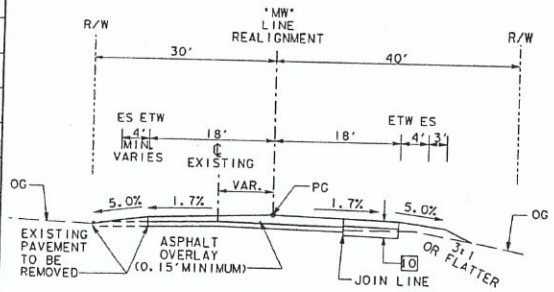
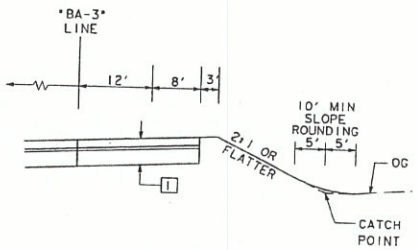
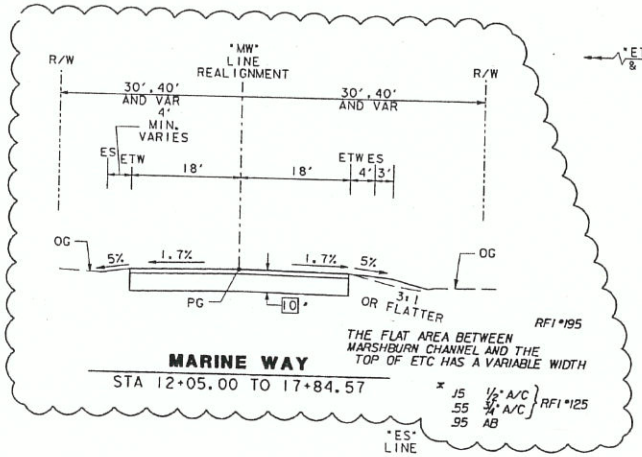


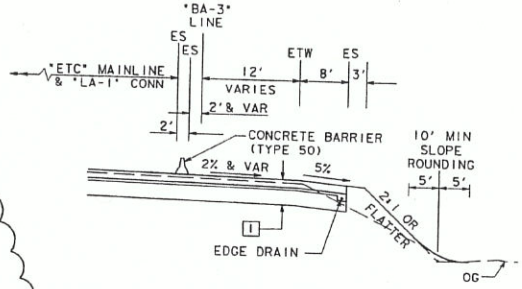
MARINE WAY
STA 17+84.57 TO 19+90.00



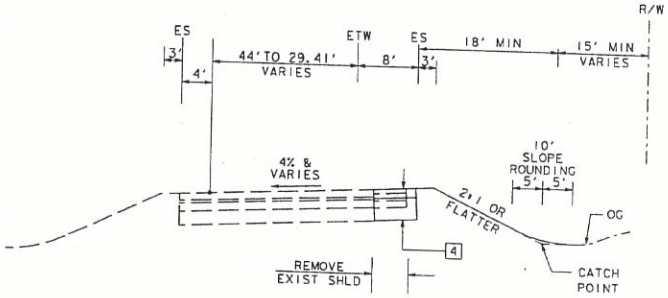
BA-3 RAMP
STA "BA-3" 2098+00.00 TO 2101+20.00



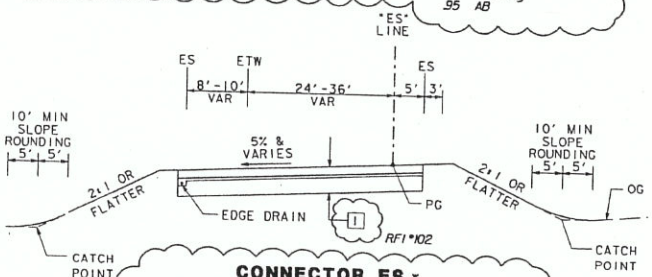
MARINE WAY
STA 12+05.00 TO 17+84.57



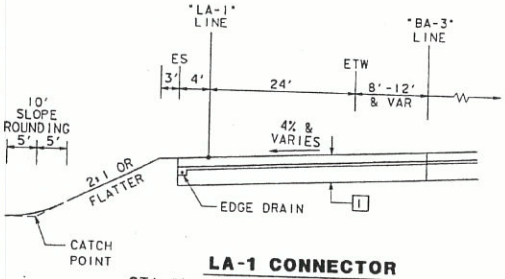
RAMP BA-3
STA "BA-3" 2093+00.00 TO 2098+00.00



LA-1 CONNECTOR
STA "LA-1" 112+00.00 TO 116+65.00



CONNECTOR ES x
STA "ES" 3095+40.00 TO 3121+72.15
x STA ES 3095+50 - 3099+00 TYPE 2 PAVE.SECT AND TEMPORARY RFI #102



LA-1 CONNECTOR
STA "LA-1" 106+44.09 TO 112+00.00

TYPICAL CROSS SECTIONS
NO SCALE

X-8

TP	DATE 10/96	REVISED BY	
SP	10/96	DATE REVISED	
CALCULATED/DESIGNED BY			
CHECKED BY			
TCA PROJECT MANAGER	MIKE ENDRES		
TOLL ROAD OVERSIGHT	AGNES VILLANUEVA		

TRANSPORTATION CORRIDOR AGENCIES

06b08.dlv 16:07:46 25-FEB-1997

FOR REDUCED PLANS 0 1 2 3

TCO 00000 TEA 111000

COPY OF TRAFFIC INDEX (TI) LETTER

State of California

Business, Transportation and Housing Agency

Memorandum

To: Behdad Baseghi, Chief
Materials & Research Branch

Attn: Mehrdad Meddavian

Date: September 11, 2013

File: 12-ORA-133, 8.8/10.9
EA: 12- 0N110

From: **DEPARTMENT OF TRANSPORTATION**
Traffic Studies – District 12

Subject: Traffic Index (TI) Calculations

Per your August 1, 2013 request, we have calculated the 20-year and 40-year design mainline TI values for the above listed project as follow:

Route	Postmile	20-Year TI (100%)	40-Year TI (100%)
133	8.8/10.9	11.0	12.0

Please be advised that 40-Year Growth Factor of 1.28% was provided to us by the Planning Department and Highway Design Manual procedures were used to calculate the above listed TI values.

Should you have any questions, please contact Habib Temori, Traffic Safety Investigator, at (949) 724-2360.

JASON OSMAN, Chief
Traffic Studies Branch

c: File

COPY OF LIFE CYCLE COST ANALYSIS EMAIL

Mahdavian, Mehrdad@DOT

From: Fong, Amy Y@DOT
Sent: Monday, August 19, 2013 9:29 AM
To: Mahdavian, Mehrdad@DOT
Subject: RE: Project Plans for I-5/SR-133 Connector Repair, EA 12-0N110

Thanks for the plans Mehrdad. It was helpful.

Since the pavement work is very short, LCCA is not required for this project. The pavement surface type should match existing.

For future reference, I appreciate if you can keep me inform with the project development (ie. what pavement structure was selected and approximate pavement cost). Perhaps, you can send me a copy of the draft project report when it gets developed. This will be useful information to help streamline LCCA in the future.

Thanks!
Amy Fong
HQ Pavement Program
Cell: 916.508.1641

From: Mahdavian, Mehrdad@DOT
Sent: Friday, August 16, 2013 11:17 AM
To: Fong, Amy Y@DOT
Subject: FW: Project Plans for I-5/SR-133 Connector Repair, EA 12-0N110

Hi Amy: Here are the plans for the project. If you have any question or comment, please do not hesitate to call me.
Thanks

From: Lai, James Anthony@DOT
Sent: Friday, August 16, 2013 10:49 AM
To: Mahdavian, Mehrdad@DOT; Nguyen, Son T@DOT
Cc: Baseghi, Behdad@DOT; Varipapa, Mike A@DOT; Nguyen, Son T@DOT
Subject: RE: Project Plans for I-5/SR-133 Connector Repair, EA 12-0N110

Here are the pdf files.

RAMP CLOSURE STUDY

For the SR-133/I-5 Northbound/Southbound Connector Project

Project Description

This report was prepared to address the impacts of temporarily closing the north and southbound connectors between SR-133 and I-5 in the city of Irvine. These closings are necessary in order to repair and stabilize the roadway and slope embankment. The slope embankment is showing signs of distress (e.g., cracking, differential settlement, cavities) and the pavement is exhibiting tension cracking. The purpose of the proposed project is to fix the deficiencies by removing the pavement structural section and the upper 5 feet of the soil sub-grade. Deep injection grouting will be performed to address the roadway tension cracks. The backfill will be reinforced by a geogrid and the pavement will be reconstructed. The existing MBGR and drainage facilities will also be replaced.

Study Purpose

The purpose of this Ramp Closure Study (RCS) is to evaluate the anticipated effects of closing the connectors on a temporary long-term basis as required by the Caltrans Project Development Procedures Manual, Chapter 8, and in accordance with the Caltrans Standard Environmental Reference. The RCS will evaluate the anticipated project effects on businesses, commuters and other services dependent on access via the connectors and recommend measures to minimize related effects to the community. The closure is anticipated to be approximately 50 working days on the northbound I-5 to SR-133 connector (full closure) and approximately 200 working days for the southbound SR-133 to I-5 connector (one lane closure during the day and full closure at night if necessary).

The existing connectors provide direct access northbound from Interstate 5 to SR-133 (The Eastern Transportation Corridor) and southbound from SR-133 to Interstate 5. SR-133 is three lanes approaching the connectors, which become two lanes and merges with I-5, which consists of five lanes.

A brief description of the project area is as follows:

Land Uses: this area of Irvine is designated research and industrial, community and regional commercial and the Orange County Great Park. The project area is bounded by Planning Area 40 – the Irvine Spectrum 8 to the north; Planning Area 51 – the Orange County Great Park to the east; Planning Area 31 – the Irvine Medical and Science Complex II to the west; and Planning Area 32 – the Irvine Technology Center to the south. There is also land being used for agriculture north of the project area.

Major Activity Centers: The Irvine Spectrum is the major activity center in the vicinity of the project. It is located approximately 1 mile south of the project area on I-5 at the Alton Parkway exit. The Spectrum contains a variety of entertainment establishments, restaurants and retail stores.

Commercial Developments: The land south of the project area is zoned for commercial uses; however, these areas will not be affected by the project as ingress/egress will always be maintained.

Freeway Dependent Businesses: There are no businesses in the project area that are dependent on the freeways.

Study Procedures

The Department *Environmental Handbook, Volume 4, Community Impact Assessment* provides the following guidelines that should be considered in the preparation of ramp closure studies:

- The geographical scope of the Ramp Closure Study should generally be limited to businesses within one half-mile of the ramp unless compelling reasons for a larger study are evident.

- The study should determine the degree to which businesses are dependent on freeway access.

- Mitigation measures such as the use of staging, expediting construction, building temporary ramps and detours, signing, and closely working with businesses should be considered to minimize or avoid the effects on local businesses.

Conclusion

- There are no businesses in the project area that will be impacted by the connector closures.

- Detour routes for all long-term closures have been identified to accommodate access changes lost due to the temporary long-term closures. The detour routes represent a short-term inconvenience, but do not represent a substantial burden to either businesses or the traveling public.

TMP Strategies

Public Information – a public information campaign will disseminate information about the construction activities and its impacts on the transportation system as well as measures the public may employ to avoid anticipated traffic delays during construction.

Brochures/Mailers – PIO decides if we will have these.

Press Releases – PIO decides if we will have these.

Motorist Information Strategies – the following methods will be used to provide motorists with real-time traffic data so they can make driving decisions that will allow them to take alternate routes to avoid the construction area:

Portable Changeable Message Signs (PCMS) – PCMS will be placed at key locations to notify motorists of the connector closures and alternate routes.

Construction Area Signs – roadway guide signs will be installed two weeks prior to construction to notify motorists of upcoming lane closures.

Incident Management – to expeditiously deal with any traffic incidents that occur near the construction zone in order to minimize congestion, the following elements will be implemented:

Construction Zone Enhanced Enforcement Program (COZEEP) – the California Highway Patrol (CHP) will be contracted to provide enforcement services through the construction zone.

Freeway Service Patrol (FSP) – the FSP provides towing services and is available to swiftly remove vehicles from the roadway.

Transportation Management Center (TMC) Support – the TMC will facilitate and monitor traffic and incident information as well as coordinate communication among the construction personnel, CHP, traffic management team, etc..

Construction Strategies – the following measures will be included in the plans and specifications to ensure the contractor reduces construction time, minimizes traffic disruptions and enhances safety:

- Connector Closure Chart
- Construction Staging and Traffic Handling Plans
- Night Work

Alternate Route Strategy – a detour will be employed to route motorists on to alternate highways and adjacent surface streets away from the work zone. The detour plan will be provided in the contract documents during final design.

Coordination Elements:

Emergency Responders – coordination with local jurisdictions and emergency service providers (e.g., CHP, local police, fire, paramedics) will be made during final design to notify them of future lane closures and to identify alternate routes through the project area. The following emergency service providers have been identified to provide services to the area surrounding the project site:

Fire Protection Services:

- Orange County Fire Authority (714) 573-6500

Police Protection Services:

- California Highway Patrol (949) 559-7888
- Irvine Police Department: Sgt. Matt August; (949) 724-7023

Local government: (City/County)

- City Engineer; Mark Carroll; (949) 724-6410
- Orange County Public Works: Road Division Manager; Khalid Bazmi; (714) 245-4575

Transit Operations – Transit agencies will be informed about the temporary connector closures during final design.

- TCA – David Lowe, Director, Design/Construction, (949) 754-3488
- OCTA – Radio Dispatcher, (714) 265-4331

Commercial Vehicle Operations - Commercial vehicle operators will be notified of all planned construction activities and connector closures. Contacts for commercial vehicle operations include:

- California Trucking Association (CTA) in Sacramento, CA; Phone (916) 373-3524

Access Time Analysis: (Checked during peak periods)

Detour from southbound SR-133 to southbound I-405 to I-5 took 4 minutes; 3 miles

Detour from northbound I-5 to Sand Canyon Avenue to Irvine Blvd. to SR-133 took 7 minutes; 3 miles

RAMP CLOSURE STUDY

For the SR-133/I-5 Northbound/Southbound Connector Project

Project Description

This report was prepared to address the impacts of temporarily closing the north and southbound connectors between SR-133 and I-5 in the city of Irvine. These closings are necessary in order to repair and stabilize the roadway and slope embankment. The slope embankment is showing signs of distress (e.g., cracking, differential settlement, cavities) and the pavement is exhibiting tension cracking. The purpose of the proposed project is to fix the deficiencies by removing the pavement structural section and the upper 5 feet of the soil sub-grade. Deep injection grouting will be performed to address the roadway tension cracks. The backfill will be reinforced by a geogrid and the pavement will be reconstructed. The existing MBGR and drainage facilities will also be replaced.

Study Purpose

The purpose of this Ramp Closure Study (RCS) is to evaluate the anticipated effects of closing the connectors on a temporary long-term basis as required by the Caltrans Project Development Procedures Manual, Chapter 8, and in accordance with the Caltrans Standard Environmental Reference. The RCS will evaluate the anticipated project effects on businesses, commuters and other services dependent on access via the connectors and recommend measures to minimize related effects to the community. The closure is anticipated to be approximately 14 months on the northbound I-5 to SR-133 connector (full closure) and approximately 14 months for the southbound SR-133 to I-5 connector (partial closure).

The existing connectors provide direct access northbound from Interstate 5 to SR-133 (The Eastern Transportation Corridor) and southbound from SR-133 to Interstate 5. SR-133 is three lanes approaching the connectors, which become two lanes and merges with I-5, which consists of five lanes.

A brief description of the project area is as follows:

Land Uses: this area of Irvine is designated research and industrial, community and regional commercial and the Orange County Great Park. The project area is bounded by Planning Area 40 – the Irvine Spectrum 8 to the north; Planning Area 51 – the Orange County Great Park to the east; Planning Area 31 – the Irvine Medical and Science Complex II to the west; and Planning Area 32 – the Irvine Technology Center to the south. There is also land being used for agriculture north of the project area.

Major Activity Centers: The Irvine Spectrum is the major activity center in the vicinity of the project. It is located approximately 1 mile south of the project area on I-5 at the Alton Parkway exit. The Spectrum contains a variety of entertainment establishments, restaurants and retail stores.

Commercial Developments: The land south of the project area is zoned for commercial uses; however, these areas will not be affected by the project as ingress/egress will always be maintained.

Freeway Dependent Businesses: There are no businesses in the project area that are dependent on the freeways.

Study Procedures

The Department *Environmental Handbook, Volume 4, Community Impact Assessment* provides the following guidelines that should be considered in the preparation of ramp closure studies:

- The geographical scope of the Ramp Closure Study should generally be limited to businesses within one half-mile of the ramp unless compelling reasons for a larger study are evident.

- The study should determine the degree to which businesses are dependent on freeway access.

- Mitigation measures such as the use of staging, expediting construction, building temporary ramps and detours, signing, and closely working with businesses should be considered to minimize or avoid the effects on local businesses.

Conclusion

- There are no businesses in the project area that will be impacted by the connector closures.

- Detour routes for all long-term closures have been identified to accommodate access changes lost due to the temporary long-term closures. The detour routes represent a temporary inconvenience, but do not represent a substantial burden to either businesses or the traveling public.

TMP Strategies

Public Information – a public information campaign will disseminate information about the construction activities and its impacts on the transportation system as well as measures the public may employ to avoid anticipated traffic delays during construction.

Brochures/Mailers – PIO decides if we will have these.

Press Releases – PIO decides if we will have these.

Motorist Information Strategies – the following methods will be used to provide motorists with real-time traffic data so they can make driving decisions that will allow them to take alternate routes to avoid the construction area:

Portable Changeable Message Signs (PCMS) – PCMS will be placed at key locations to notify motorists of the connector closures and alternate routes.

Construction Area Signs – roadway guide signs will be installed two weeks prior to construction to notify motorists of upcoming lane closures.

Incident Management – to expeditiously deal with any traffic incidents that occur near the construction zone in order to minimize congestion, the following elements will be implemented:

Construction Zone Enhanced Enforcement Program (COZEEP) – the California Highway Patrol (CHP) will be contracted to provide enforcement services through the construction zone.

Freeway Service Patrol (FSP) – the FSP provides towing services and is available to swiftly remove vehicles from the roadway.

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From: Karimi, Mohssen@DOT
To: Ta, Keith Q@DOT
Subject: FW: Concurrence of 12-0N1101 SSP for Liquidated Damages for late closures pick-up
Date: Thursday, April 30, 2015 11:35:31 AM
Attachments: 12-4.03_A07-19-13.docx

Keith

Lets put this as approval for LD.

Mohssen Karimi, MS,PE
Office Engineer
District 12 - Design
3347 Michelson Dr
Irvine CA 92612
www.dot.ca.gov
email: mohssen.karimi@dot.ca.gov
Phone: 949 724-2476

From: Yassa, Nabil@DOT
Sent: Thursday, April 30, 2015 11:24 AM
To: Seyed-Moghaddam, Amir@DOT; Karimi, Mohssen@DOT
Subject: FW: Concurrence of 12-0N1101 SSP for Liquidated Damages for late closures pick-up

FYI

From: Yassa, Nabil@DOT
Sent: Thursday, April 30, 2015 11:22 AM
To: Nguyen, Son T@DOT; Huynh, Khai T@DOT; Varipapa, Mike A@DOT
Cc: Ruiz, Patricia@DOT; Lin, Frank S@DOT
Subject: Concurrence of 12-0N1101 SSP for Liquidated Damages for late closures pick-up

Concurrence is provided by Construction / Constructability Branch of 12-0N1101 SSP for liquidated damages for late closures pick-up.

Nabil Yassa, PE
D12 Construction
724-2882

From: Nguyen, Son T@DOT
Sent: Thursday, April 30, 2015 11:14 AM
To: Yassa, Nabil@DOT; Ruiz, Patricia@DOT
Cc: Karimi, Mohssen@DOT; Ta, Keith Q@DOT; Huynh, Khai T@DOT; Lai, James Anthony@DOT; Seyed-Moghaddam, Amir@DOT; Mohammadi, Essy@DOT; Siddiqui, Adam@DOT
Subject: FW: Liquidated damages for late pick-up EA # 0N1101

Please provide Construction concurrence for this revised SSP.

Thanks,

Son Nguyen
Chief, Design Branch E
District 12 Value Analysis Coordinator
Caltrans District 12 - Division of Capital Programs
3347 Michelson Drive, Suite 100
Irvine, CA 92612
Phone: (949) 724-2138
E-mail: Son.Nguyen@dot.ca.gov

From: Huynh, Khai T@DOT
Sent: Thursday, April 30, 2015 11:11 AM
To: Yassa, Nabil@DOT
Cc: Ruiz, Patricia@DOT; Nguyen, Son T@DOT
Subject: RE: Liquidated damages for late pick-up EA # 0N1101

Thanks Nabil. I will change it to 5 days

From: Yassa, Nabil@DOT
Sent: Thursday, April 30, 2015 11:04 AM
To: Huynh, Khai T@DOT
Cc: Ruiz, Patricia@DOT
Subject: RE: Liquidated damages for late pick-up EA # 0N1101

Khai,
3 days-notice is too short, 5 days is reasonable.

From: Huynh, Khai T@DOT
Sent: Thursday, April 30, 2015 10:50 AM
To: Huynh, Khai T@DOT; Seyed-Moghaddam, Amir@DOT; Yassa, Nabil@DOT; Ruiz, Patricia@DOT
Cc: Nguyen, Son T@DOT; Siddiqui, Adam@DOT; Lai, James Anthony@DOT
Subject: RE: Liquidated dameges for late pick-up EA # 0N1101

Please see attachment for rivised SSP thanks

From: Huynh, Khai T@DOT
Sent: Thursday, April 30, 2015 10:28 AM
To: Seyed-Moghaddam, Amir@DOT; Yassa, Nabil@DOT; Ruiz, Patricia@DOT
Cc: Nguyen, Son T@DOT; Siddiqui, Adam@DOT; Lai, James Anthony@DOT
Subject: RE: Liquidated dameges for late pick-up EA # 0N1101

Hi Patricia,

Route number added per your comment. Please concur. Thanks

Amir,

I added the route number to the SSP.

From: Seyed-Moghaddam, Amir@DOT
Sent: Wednesday, April 29, 2015 12:59 PM
To: Yassa, Nabil@DOT; Ruiz, Patricia@DOT
Cc: Nguyen, Son T@DOT; Siddiqui, Adam@DOT; Lai, James Anthony@DOT; Huynh, Khai T@DOT
Subject: RE: Liquidated dameges for late pick-up EA # 0N1101

Sorry. Here is the attachment.

From: Seyed-Moghaddam, Amir@DOT
Sent: Wednesday, April 29, 2015 12:57 PM
To: Yassa, Nabil@DOT; Ruiz, Patricia@DOT
Cc: Nguyen, Son T@DOT; Siddiqui, Adam@DOT; Lai, James Anthony@DOT; Huynh, Khai T@DOT
Subject: Liquidated dameges for late pick-up EA # 0N1101

Hi Nabil/Patricia,

Attached please find the calculations for late pick-up for this project. Please review and get back to me ASAP. At this time we do not have the traffic counts for all the segments of this project, but with the past experiences and projects, we have come up with these numbers.

Amir Seyed
TMP, South Branch
(949)440-4479