FOR CONTRACT NO.: 12-0G9404

INFORMATION HANDOUT

MATERIALS INFORMATION

Aerially Deposited Lead Investigation Report,
I-5 Soundwalls at El Camino Real,
San Clemente, California
June 6, 2008

Foundation Report for Proposed Soundwall Nos. 83,93,55-203 and 101 on Soundbound Interstate 5 near El Camino Real, City of San Clemente, California
September 23, 2008

Materials Report For Proposed Soundwalls
On Southbound Interstate 5 Near El Camino Real,
City of San Clemente, California
December 3, 2008

ROUTE: 12-Ora-5

AERIALLY DEPOSITED LEAD INVESTIGATION REPORT, I-5 SOUNDWALLS AT EL CAMINO REAL, SAN CLEMENTE, CALIFORNIA

Prepared For:

RMC, INC.
6 Hutton Centre Drive, Suite 1270
Santa Ana, California 92707

Project No. 602171-001

June 6, 2008
Revised August 15, 2005

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

June 6, 2008
(Revised August 15, 2005)

Project No. 602171-001

To: RMC, Inc.
6 Hutton Centre Drive, Suite 1270
Santa Ana, California 92707

Attention: Mr. Jamal Salman, P.E.

Subject: Aerially Deposited Lead Investigation Report, I-5 Soundwalls at El Camino Real, San Clemente, California

INTRODUCTION

Leighton Consulting, Inc. (Leighton) is pleased to present this report summarizing an aerially deposited lead (ADL) investigation conducted within the California Department of Transportation (Caltrans) right-of-way associated with the proposed I-5 Soundwalls at El Camino Real, San Clemente, California. This report has been revised to incorporate the review comments by Caltrans dated July 18, 2008. A copy of the review comments is attached.

ADL is the result of tetra ethyl lead, which was added to gasoline for many years to prevent engine knocking. The lead was present in the vehicle exhaust emissions and is sometimes found in the near-surface soils adjacent to major thoroughfares at concentrations that cause the soils to require special handling.

This investigation was conducted to determine if the soil must be considered a hazardous waste or if it can be reused at the site in accordance with the Department of Toxic Substances Control (DTSC) Variance (Variance) issued for management of soils containing ADL in Caltrans rights-of-way. This Variance was issued on September 22, 2000, and was modified in a letter dated July 28, 2006.

17781 Cowan ▪ Irvine, CA 92614-6009
949.253.9836 ▪ Fax 949.250.1114 ▪ www.leightonconsulting.com

Comments on the work plan were received in memorandum from Reza Aurasteh, Chief Environmental Engineering District 12 to Kamran Mazhar, Chief Design Branch F dated March 23, 2008. After discussions with Mr. Aurasteh and Paul Chang of his staff, the appropriate comments were incorporated in the final work plan issued to the field personnel.

BACKGROUND

The proposed soundwalls will be located along southbound I-5 at El Camino Real in San Clemente. The investigation was conducted to assess to what extent lead-impacted soil may be present at the site in order to determine the appropriate disposition of soils that will be disturbed during construction of the soundwalls.

PRE-FIELD ACTIVITIES

Health and Safety Plan

Leighton prepared a Health and Safety Plan (HSP) for the ADL soil sampling to be performed at the site. The HSP is in compliance with Cal-OSHA Title 8 Sections 5192 and 5196 and signed by a Certified Industrial Hygienist.

Work Plan

Leighton prepared a Work Plan for the ADL investigation. The work plan described the field activities and included a sampling and analysis plan. Comments on the Work Plan were received in memorandum from Reza Aurasteh, Chief, Environmental Engineering District 12 to Kamran Mazhar, Chief, Design Branch F, dated March 28, 2008. After discussions with Mr. Aurasteh and Paul Chang of his staff, the appropriate comments were incorporated in the final Work Plan issued to the field personnel.

Underground Utility Clearance/Encroachment Permit

This investigation was coordinated with the geotechnical exploration. Utility clearances, permits, and traffic control were provided as part of the geotechnical work discussed in a separate report.

INVESTIGATION

On April 22 and 23, 2008, Leighton's personnel observed and directed the placement of 6 hand-auger borings (Figures 1 and 2) within the existing Caltrans right of way to a maximum depth of 4 feet below ground surface (bgs) according to the following table:

Table 1 – Boring Locations and Sampling Depths

Boring No.	Location	Sampling Depths (ft bgs)	Planned Depth of Excavation (ft)
HA-1	On ramp Southbound I-5 Soundwall	0.5 and 1.5	4
HA-2	On ramp Southbound I-5 Soundwall	0.5	4
HA-3	On ramp Southbound I-5 Soundwall	0.5, 1.5, 3, and 4	4
HA-4	On ramp Southbound I-5 Soundwall	0.5, 1.5, 3, and 4	4
HA-5	Southbound I-5 Soundwall	0.5, 1.5, 3, and 4	4
HA-6	Southbound I-5 Soundwall	0.5, 1.5, 3, and 4	4

Notes: Rocky conditions and refusal were encountered at HA-1 and HA-2. An attempt was made at each location to advance another boring approximately three feet from the proposed location but refusal was again encountered at both locations. Samples were collected at the indicated depths before refusal was encountered.

The soil samples were placed in laboratory supplied glass jars, placed in an ice-cooled chest for temporary storage, and transported to TestAmerica in Irvine, California, a State of California Certified laboratory for analysis as described below. Sampling equipment was decontaminated between boreholes by washing in a solution of trisodium phosphate and water, rinsing with potable water, and final rinsing with de-ionized water, then allowed to air-dry. Chain-of-custody protocol was followed throughout all phases of the sample handling process.

A Trimble GeoXH was used to determine the coordinates of each boring. The coordinates, based on the NAD 83 Zone 6 datum, are listed in Table 2.

Table 2 - Boring Coordinates

Boring No.	X-Value	Y-Value
HA-1	6148091.4595	2098582.8870
HA-2	6148218.5051	2098275.2288
HA-3	6148441.9551	2097839.9370
HA-4	6148573.1307	2097565.5144
HA-5	6147912.6083	2098987.2187
HA-6	6148410.0755	2098015.4009

Laboratory Analysis

Twenty one soil samples (nineteen samples and two duplicates) were analyzed by the laboratory for total lead concentration by EPA Method 6010b.

Four soil samples were also analyzed for soil pH by EPA Method 9045c.

RESULTS

Lead was reported above the detection limit in all of the twenty one soil samples collected at this site. The soil samples exhibited lead concentrations ranging from 4.7 milligrams per kilogram (mg/kg) (HA-3 at 3 feet) to 170 mg/kg (HA-5 at 0.5 feet). These concentrations are below the California Code of Regulation (CCR), Title 22 waste disposal criterion for lead.

Two of the samples, HA-5 at 0.5 feet and 1.5 feet contained lead at concentrations equal to or greater than ten times both the Soluble Threshold Limit Concentration (STLC) and the Toxicity Characteristic Leaching Procedure (TCLP) for lead, 5 milligrams per liter (mg/l). Therefore, in accordance with the DTSC Variance (Variance) for management of ADL issued for soil in Caltrans rights of way it was necessary to perform the STLC Waste Extraction Test (STLC-WET) and the TCLP analyses on these samples.

The results of the STLC-WET and the TCLP analyses for the sample collected at HA-5 at 0.5 feet were 7.7 mg/l and 0.28 mg/l, respectively. The results of the STLC-WET and the TCLP analyses for the sample collected at HA-5 at 1.5 feet were 4.1 mg/l and 0.12 mg/l, respectively.

The results of the analyses of the sample collected at HA-5 at 1.5 feet were less than 5.0 mg/l and no further analyses were necessary. In accordance with the Variance, the result of the STLC-WET analysis for the sample collected at HA-5 at 0.5 feet required that sample to be subjected to the STLC-WET analysis using deionized water. The reported concentration of lead for that analysis is 0.10 mg/l.

Results of the pH analysis ranged from 6.65 (HA-3 at 3 feet) to 8.07 (HA-6 at 1.5 feet).

Results of the laboratory analysis for soil samples are summarized in Table 3. Copies of the laboratory reports and chain of custody are included in Appendix B.

Statistical Analysis

Leighton evaluated the results of the soil sample analyses to determine the mean and confidence intervals for lead in soil in accordance with SW-846, Chapter 9. This evaluation was conducted to determine if the soil would be considered a hazardous waste if excavated or if it could be reused at the Site in accordance with the Variance for management of soils containing ADL issued to Caltrans. The Variance uses the mean concentrations and 90% and 95% upper confidence limits (UCLs) of the data to determine the appropriate disposition of the soil.

Duplicate sample were collected at two locations resulting in 21 values for 19 sampling locations. In order to have the number of samples equal the number of sampling locations for the statistical analysis, the average of the duplicate samples was used for the locations where duplicate samples were collected.

The mean of the sample analysis data of 19 samples for total lead is 32.1 mg/kg and the variance is 1389.24 mg/kg. Since the mean is significantly less than the variance of the sample set, the data was normalized by dividing each value by the highest concentration, 170 mg/kg, and then transformed using the arcsine transformation. The 90% and 95% total lead UCLs were calculated using transformed data and determined to be 54.20 mg/kg and 59.28 mg/kg, respectively. A summary of the laboratory results for lead and the statistical analysis is presented on Table 3.

Two of the samples were required to be analyzed by both the STLC-WET procedure and the TCLP procedure and one sample was required to be analyzed by the STLC-WET analysis using deionized water. These sample sets were too small to have a meaningful statistical analysis performed on them.

Table 3:
Laboratory Results and Statistical Analysis for Aerially Deposited Lead, I-5 Soundwall at El Camino Real

Boring Number	Depth (feet bgs)	Sample Identification	Sample Date	Total Lead (mg/kg)		Normalized Data	Transformed Data (Arcsin)	WET STLC Citric Acid (mg/L)	WET STLC Deionized Water (mg/L)	TCLP (mg/L)	pH
				Laboratory Results	Duplicates Averaged						
HA-1	0.5	IRD2053- 01	04/23/08	**17**	**17**	0.100000	0.100167421	NR	NR	NR	
	1.5	02	04/23/08	**26**	**26**	0.152941	0.153543783	NR	NR	NR	**6.97**
HA-2	0.5	03	04/23/08	**18**	**17**	0.100000	0.100167421	NR	NR	NR	
	0.5	04	04/23/08	**16**				NR	NR	NR	
HA-3	0.5	05	04/23/08	**9.1**	**9.1**	0.053529	0.053555009	NR	NR	NR	
	1.5	06	04/23/08	**17**	**17**	0.100000	0.100167421	NR	NR	NR	**6.77**
	3	07	04/23/08	**4.7**	**4.7**	0.027647	0.027650582	NR	NR	NR	
	4	08	04/23/08	**9.0**	**9.0**	0.052941	0.052965938	NR	NR	NR	
HA-4	0.5	09	04/23/08	**42**	**42**	0.247059	0.249643807	NR	NR	NR	
	1.5	10	04/23/08	**26**	**26**	0.152941	0.153543783	NR	NR	NR	
	3	11	04/23/08	**7.2**	**6.35**	0.037353	0.037361633	NR	NR	NR	
	3	12	04/23/08	**5.5**				NR	NR	NR	**6.65**
	4	13	04/23/08	**4.8**	**4.8**	0.028235	0.028239047	NR	NR	NR	
HA-5	0.5	14	04/23/08	**170**	**170**	1.000000	1.570796327	**7.7**	**0.10**	**0.28**	
	1.5	15	04/23/08	**66**	**66**	0.388235	0.398715908	**4.1**	NR	**0.12**	
	3	16	04/23/08	**47**	**47**	0.276471	0.280119599	NR	NR	NR	
	4	17	04/23/08	**15**	**15**	0.088235	0.088350189	NR	NR	NR	
HA-6	0.5	18	04/22/08	**37**	**37**	0.217647	0.219403087	NR	NR	NR	
	1.5	19	04/22/08	**40**	**40**	0.235294	0.237521171	NR	NR	NR	**8.07**
	3	20	04/22/08	**36**	**36**	0.211765	0.213380265	NR	NR	NR	
	4	21	04/22/08	**20**	**20**	0.117647	0.117920152	NR	NR	NR	

Data Analysis	Total Lead	STLC Citric
Number of Samples, n	19	2
Mean (Average), x	32.10	5.9
Std Deviation of sample set, s	37.27	2.55
Variance of sample set, s^2	1389.24	6.48
need to normalize (by highest conc.) and transform data. Assume a Negative Binomial Distribution		
mean of normalized data	0.189	
mean of transformed data	0.220	
Std Dev of transformed data	0.342	
Std Dev of mean of transformed data	0.078	
Variance of transformed data	0.117	
90% CL on transformed data	0.104	
90% UCL on transformed data	0.325	
reverse transformation for 90% UCL	54.20	

Table 3:
Laboratory Results and Statistical Analysis for Aerially Deposited Lead, I-5 Soundwall at El Camino Real

Data Analysis	Total Lead	STLC Citric
Variance ok		
95% CL on transformed data	0.136	
95% UCL on transformed data	0.356	
reverse transformation for 95% UCL	59.28	
Assume a Normal Distribution		
t value (90% UCL)	1.33	
Std Dev of mean data	8.55	
90% UCL on data	43.48	
t value (95% UCL)	1.73	
95% UCL on data	46.93	

mg/kg = Milligrams per Kilogram
mg/L = Milligrams per Liter
TCLP = Toxicity Characteristic Leaching Procedure
STLC = Soluble Threshold Limit Concentrations
NR = Analysis not required
NA= No data available
CI = Confidence Interval
UCL = Upper Confidence Level

Std Dev of mean = $s / n^{1/2}$
reverse transformation for %UCL = sin(%UCL)*170

Normal Distribution:

% UCL of mean data = $x + t_{a,n-1} * s / n^{1/2}$
t= t distribution (Gilbert 1987)
a= (1 - %UCL)

CONCLUSIONS

Based on the information gathered during our investigation, Leighton concludes that with respect to the ADL:

- For soil represented by the sample collected from HA-5 at 0.5 feet:

  The 90% and 95% total lead UCLs of 54.20 mg/kg and 59.28 mg/kg, respectively, show that the concentrations of aerially deposited lead are less than 1,000 mg/kg. The sample had a STLC WET Citric Acid test result of lead of 7.7 mg/L. Since this concentration exceeds 5.0 mg/L, according to the terms of the Variance this soil is classified as hazardous and must be covered with a minimum of one foot clean soil if re-used. If this soil is excavated and transported off-site additional laboratory analysis is required for waste classification. However, since this sample was located beyond the limits of the new soundwalls, ADL is not expected to be an issue for the proposed construction.

- For soil represented by the other samples:

  The concentrations of lead are less than 1,000 mg/kg, and the concentrations are also less than 10 times the values of the STLC and TCLP. Therefore, these soils can be classified as non-hazardous by California and Resource Conservation and Recovery Act (RCRA) standards.

Leighton appreciates this opportunity to be of service. Should you have any questions regarding this work plan, please contact the undersigned at (949) 681-4254.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

Charles R. Mazowiecki, PE
Senior Project Engineer

CRM/DJC/lr

Attachments: Caltrans' Review Comments dated August 12, 2008
Figure 1 – Boring Location Map
Appendix A – References
Appendix B – Laboratory Results and Chain of Custody

Distribution: (2) Addressee
(2) Environmental Engineering Branch, California Department of Transportation
Attention: Mr. Paul Chang

Memorandum

To : **Kamran Mazhar, Chief**
Design Branch F

Date : August 12, 2008

File No. : I-5/El Camino Real
12349-0G9400

From : Environmental Engineering Branch
DEPARTMENT OF TRANSPORTATION, District 12

Subject : **AERIALLY DEPOSITED LEAD (ADL) INVESTIGATION REPORT FOR Sound Wall Project at I-5 and El Camino Real in San Clemente**

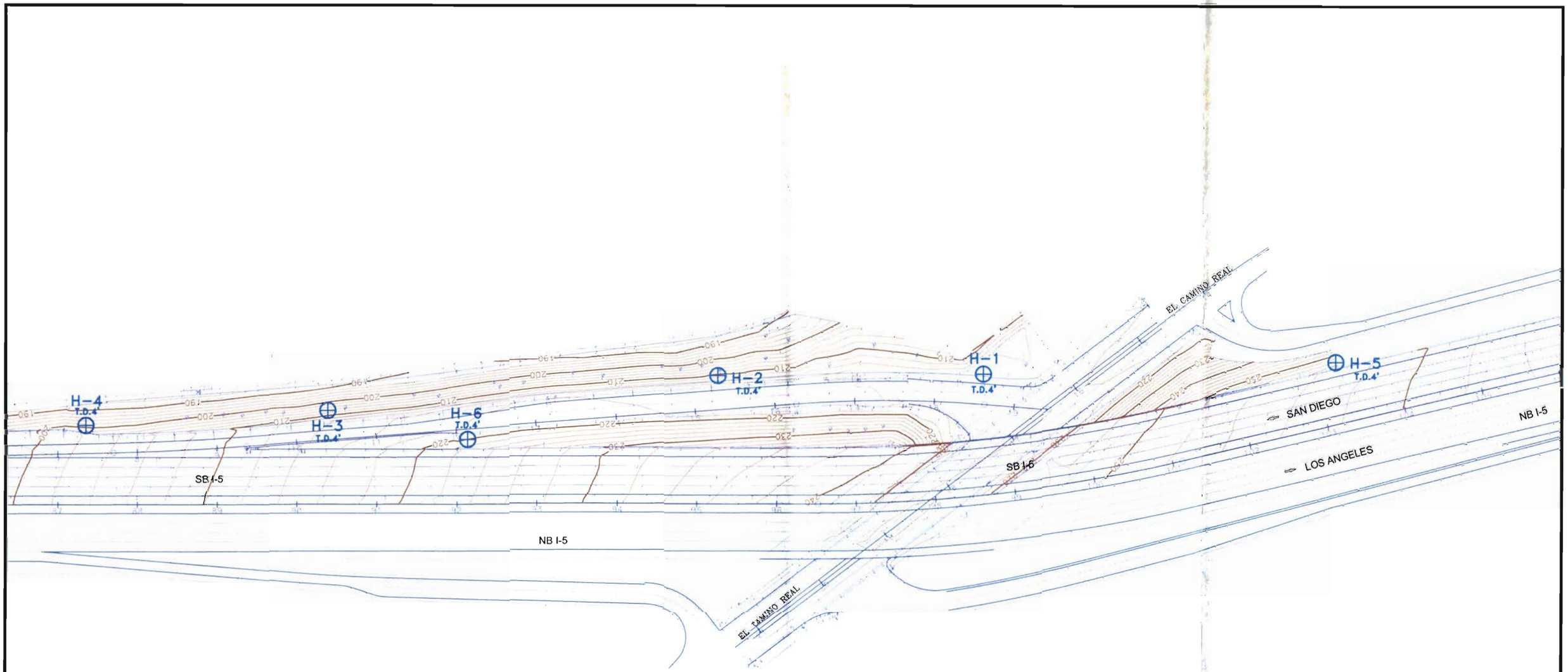
Environmental Engineering Branch reviewed the Aerially Deposited Lead (ADL) Investigation Report dated June 6, 2008 and has the following comments:

The ADL Report identified that the soil near HA-5 as Type Y1 hazardous Soil. If the soil is excavated and reused, it must be covered with a minimum of one foot clean soil. However, Boring HA-5 shown on Figure 1 is beyond the end of the proposed Sound Wall. If the end of wall shown on Figure 1 is accurate, this project has no ADL issue, and this fact should be indicated in the report. Otherwise, please provide earth work plan to show the proposed excavation, and indicate the location of Boring HA-5, and submit it for our review.

If you have further questions, please call Mr. Paul Chang of my staff at (949) 756-7814.

R. Aurasteh

REZA AURASTEH, Chief
Environmental Engineering



LEGEND

H-6 ⊕ T.D.4' — APPROXIMATE LOCATION OF ADL HAND AUGER BORING WITH TOTAL DEPTH

N

0 120 240
SCALE FEET

Figure 1

BORING LOCATION MAP

INTERSTATE 5 SOUNDWALLS AT EL CAMINO REAL
CITY OF SAN CLEMENTE, CALIFORNIA

Proj: 602171-001	Scale: 1"=120'	Date: 6/08	
Eng./Geol. DJC/ELB	Drafted By: BQT	CP By: BQT	

P:\DRAFTING\602171\001\OF_2008-06-06\FIGURE1-BORING.DWG (06-20-08 3:52:57PM) Plotted by: vnguyen

Leighton

APPENDIX A

REFERENCES

California Department of Transportation (Caltrans), 2004, Standard Environmental Reference, Volume 1: Guidance for Compliance, Chapter 10: Hazardous Waste, updated June 18.

Leighton Consulting, Inc., 2008, Work Plan for Aerially Deposited Lead Investigation Interstate 5 Soundwalls at El Camino, San Clemente, California, dated April 17, 2008.

Leighton Consulting, Inc., 2008, Site Specific Health and Safety Plan for Interstate 5 Soundwalls at El Camino Real, San Clemente-Aerial Deposited Lead Survey, dated April 15, 2008.

United States Environmental Protection Agency, SW-846, Chapter Nine, 3rd Edition, 1986.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Avenue Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

LABORATORY REPORT

Prepared For: Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project: CalTrans
602171001

Sampled: 04/22/08-04/23/08
Received: 04/23/08
Issued: 05/02/08 09:17

NELAP #01108CA California ELAP#1197 CSDLAC #10256

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the applicable certifications as noted. All soil samples are reported on a wet weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the sole use of TestAmerica and its client. This report shall not be reproduced, except in full, without written permission from TestAmerica. The Chain(s) of Custody, 2 pages, are included and are an integral part of this report.
This entire report was reviewed and approved for release.

CASE NARRATIVE

SAMPLE RECEIPT: Samples were received intact, at 10°C, on ice and with chain of custody documentation.

HOLDING TIMES: Not all holding times were met. Results were qualified where the sample analysis did not occur within method specified holding time requirements.

PRESERVATION: Samples requiring preservation were verified prior to sample analysis.

QA/QC CRITERIA: All analyses met method criteria, except as noted in the report with data qualifiers.

COMMENTS: No significant observations were made.

SUBCONTRACTED: No analyses were subcontracted to an outside laboratory.

LABORATORY ID	CLIENT ID	MATRIX
IRD2053-01	HA-1-.5	Soil
IRD2053-02	HA-1-1.5	Soil
IRD2053-03	HA-2-.5	Soil
IRD2053-04	DUP I	Soil
IRD2053-05	HA-3-.5	Soil
IRD2053-06	HA-3-1.5	Soil
IRD2053-07	HA-3-3	Soil
IRD2053-08	HA-3-4	Soil
IRD2053-09	HA-4-.5	Soil
IRD2053-10	HA-4-1.5	Soil
IRD2053-11	HA-4-3	Soil

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Avenue Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/22/08-04/23/08
Received: 04/23/08

LABORATORY ID	CLIENT ID	MATRIX
IRD2053-12	DUP 2	Soil
IRD2053-13	HA-4-4	Soil
IRD2053-14	HA-5-.5	Soil
IRD2053-15	HA-5-1.5	Soil
IRD2053-16	HA-5-3	Soil
IRD2053-17	HA-5-4	Soil
IRD2053-18	HA-6-.5	Soil
IRD2053-19	HA-6-1.5	Soil
IRD2053-20	HA-6-3	Soil
IRD2053-21	HA-6-4	Soil

Reviewed By:

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue. Suite 100, Irvine, CA 92614 (949) 261-1022 Fax.(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/22/08-04/23/08
Received: 04/23/08

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IRD2053-01 (HA-1-.5 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**17**	1	4/24/2008	4/25/2008	
Sample ID: IRD2053-02 (HA-1-1.5 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**26**	0.995	4/24/2008	4/25/2008	
Sample ID: IRD2053-03 (HA-2-.5 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**18**	0.995	4/24/2008	4/25/2008	
Sample ID: IRD2053-04 (DUP I - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**16**	1.01	4/24/2008	4/25/2008	
Sample ID: IRD2053-05 (HA-3-.5 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**9.1**	0.995	4/24/2008	4/25/2008	
Sample ID: IRD2053-06 (HA-3-1.5 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**17**	1.01	4/24/2008	4/25/2008	
Sample ID: IRD2053-07 (HA-3-3 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**4.7**	1.01	4/24/2008	4/25/2008	
Sample ID: IRD2053-08 (HA-3-4 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**9.0**	1.01	4/24/2008	4/25/2008	
Sample ID: IRD2053-09 (HA-4-.5 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**42**	0.995	4/24/2008	4/25/2008	
Sample ID: IRD2053-10 (HA-4-1.5 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**26**	0.995	4/24/2008	4/25/2008	

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/22/08-04/23/08
Received: 04/23/08

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IRD2053-11 (HA-4-3 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**7.2**	1	4/24/2008	4/25/2008	
Sample ID: IRD2053-12 (DUP 2 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**5.5**	1.01	4/24/2008	4/25/2008	
Sample ID: IRD2053-13 (HA-4-4 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**4.8**	0.995	4/24/2008	4/25/2008	
Sample ID: IRD2053-14 (HA-5-.5 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**170**	0.995	4/24/2008	4/25/2008	
Sample ID: IRD2053-15 (HA-5-1.5 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**66**	0.995	4/24/2008	4/25/2008	
Sample ID: IRD2053-16 (HA-5-3 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**47**	1.01	4/24/2008	4/25/2008	
Sample ID: IRD2053-17 (HA-5-4 - Soil)				**Sampled: 04/23/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**15**	0.995	4/24/2008	4/25/2008	
Sample ID: IRD2053-18 (HA-6-.5 - Soil)				**Sampled: 04/22/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**37**	0.995	4/24/2008	4/25/2008	
Sample ID: IRD2053-19 (HA-6-1.5 - Soil)				**Sampled: 04/22/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**40**	1	4/24/2008	4/25/2008	
Sample ID: IRD2053-20 (HA-6-3 - Soil)				**Sampled: 04/22/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D24103	2.0	**36**	0.995	4/24/2008	4/25/2008	

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/22/08-04/23/08
Received: 04/23/08

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IRD2053-21 (HA-6-4 - Soil)				**Sampled: 04/22/08**				
Reporting Units: mg/kg								
Lead	EPA 6010B	8D28080	2.0	**20**	1.01	4/28/2008	4/28/2008	

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue. Suite 100. Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/22/08-04/23/08
Received: 04/23/08

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IRD2053-02 (HA-1-1.5 - Soil)				**Sampled: 04/23/08**				
Reporting Units: pH Units								
pH	EPA 9045C	8D24113	0.100	**6.97**	1	4/24/2008	4/24/2008	HFT
Sample ID: IRD2053-06 (HA-3-1.5 - Soil)				**Sampled: 04/23/08**				
Reporting Units: pH Units								
pH	EPA 9045C	8D24113	0.100	**6.77**	1	4/24/2008	4/24/2008	HFT
Sample ID: IRD2053-12 (DUP 2 - Soil)				**Sampled: 04/23/08**				
Reporting Units: pH Units								
pH	EPA 9045C	8D24113	0.100	**6.65**	1	4/24/2008	4/24/2008	HFT
Sample ID: IRD2053-19 (HA-6-1.5 - Soil)				**Sampled: 04/22/08**				
Reporting Units: pH Units								
pH	EPA 9045C	8D24113	0.100	**8.07**	1	4/24/2008	4/24/2008	HFT

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/22/08-04/23/08
Received: 04/23/08

METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 8D24103 Extracted: 04/24/08										
Blank Analyzed: 04/25/2008 (8D24103-BLK1)										
Lead	ND	2.0	mg/kg							
LCS Analyzed: 04/25/2008 (8D24103-BS1)										
Lead	46.8	2.0	mg/kg	50.0		94	80-120			
Matrix Spike Analyzed: 04/25/2008 (8D24103-MS1)					**Source: IRD2053-01**					
Lead	61.5	2.0	mg/kg	50.0	16.9	89	75-125			
Matrix Spike Dup Analyzed: 04/25/2008 (8D24103-MSD1)					**Source: IRD2053-01**					
Lead	63.7	2.0	mg/kg	50.0	16.9	94	75-125	4	20	
Batch: 8D28080 Extracted: 04/28/08										
Blank Analyzed: 04/28/2008 (8D28080-BLK1)										
Lead	ND	2.0	mg/kg							
LCS Analyzed: 04/28/2008 (8D28080-BS1)										
Lead	46.2	2.0	mg/kg	50.0		92	80-120			
Matrix Spike Analyzed: 04/28/2008 (8D28080-MS1)					**Source: IRD2304-01**					
Lead	44.2	2.0	mg/kg	50.0	1.52	85	75-125			
Matrix Spike Dup Analyzed: 04/28/2008 (8D28080-MSD1)					**Source: IRD2304-01**					
Lead	44.0	2.0	mg/kg	50.0	1.52	85	75-125	0	20	

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue Suite 100, Irvine, CA 92614 (949) 261-1022 Fax (949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/22/08-04/23/08
Received: 04/23/08

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 8D24113 Extracted: 04/24/08										
Duplicate Analyzed: 04/24/2008 (8D24113-DUP1)					**Source: IRD2053-02**					
pH	7.00	0.100	pH Units		6.97			0	5	*HFT*
Duplicate Analyzed: 04/24/2008 (8D24113-DUP2)					**Source: IRD2085-07**					
pH	8.51	0.100	pH Units		8.48			0	5	*HFT*

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Avenue. Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/22/08-04/23/08
Received: 04/23/08

DATA QUALIFIERS AND DEFINITIONS

HFT The holding time for this test is immediate. It was analyzed in the laboratory as soon as possible after receipt.

ND Analyte NOT DETECTED at or above the reporting limit or MDL, if MDL is specified.

RPD Relative Percent Difference

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Avenue Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/22/08-04/23/08
Received: 04/23/08

Certification Summary

TestAmerica Irvine

Method	Matrix	Nelac	California
EPA 6010B	Soil	X	X
EPA 9045C	Soil	X	X

Nevada and NELAP provide analyte specific accreditations. Analyte specific information for TestAmerica may be obtained by contacting the laboratory or visiting our website at www.testamericainc.com

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

CHAIN OF CUSTODY FORM

1014 E. Cooley Dr., Suite A, Colton, CA 92324 (909) 370-4667 FAX (909) 370-1046
[illegible] South 51st St., Suite B-120, Phoenix, AZ 85044 (480) 785-0043 FAX (480) 785-0851
2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

IRD2053

Page 1 of 2

Client Name/Address: CT
17[illegible]
Irvine, CA 92614

Project/PO Number: [illegible]

Project Manager: Charles Mazaniec

Phone Number: 949-250-1421

Sampler: MDW/BRT

Fax Number: 949-250-1114

Analysis Required

Sample Description	Sample Matrix	Container Type	# of Cont.	Sampling Date	Sampling Time	Preservatives	EPA 6010B Lead	* EPA 1311	* WET citric acid	* WET DI water	TPH					Special Instructions
HA-1-.5	S	Jar	1	4-23-08	929	None	X									* samples analyzed
HA-1-1.5					1015						X					between 50mg/kg
HA-2-.5					1037											and 1000mg/kg
DUP1					1042											shall be analyzed
HA-3-.5					1157											by (WET)
HA-3-1.5					1210						X					citric acid
HA-3-3					1224											* samples analyzed
HA-3-4					1230											≥ 5mg/L by WET
HA-4-.5					1252											citric acid shall
HA-4-1.5					1305											be analyzed (WET
HA-4-3					1316											DI water and by
DUP2					1318						X					EPA 1311, samples
HA-4-4					1326											greater than 1000 mg/k
HA-5-.5	↓	↓	↓	↓	0045	↓	↓									analyze 1311

0.C. 4/24/08 9:50

Relinquished By:	Date/Time:	Received By:	Date/Time:
[signature]	4-23-08 1445		
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received in Lab By: [signature]	Date/Time: 4/23/08 14:45

Turnaround Time: (Check)
same day ____ 72 hours ____
24 hours ____ 5 days ____
48 hours ____ normal ✓

Sample Integrity: (Check) 12.1/10.1
intact X on ice ____

Note: By relinquishing samples to TestAmerica, client agrees to pay for the services requested on this chain of custody form and any additional analyses performed on this project. Payment for services is due within 30 days from the date of invoice. Sample(s) will be disposed of after 30 days.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

CHAIN OF CUSTODY FORM

1014 E. Cooley Dr., Suite A, Colton, CA 92324 (909) 370-4667 FAX (909) 370-1046
Suite B-120, Phoenix, AZ 85044 (480) 785-0043 FAX (480) 785-0851
2520 E. Sunset Rd #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

Client Name/Address: LCI, 1781 ..., Irvine, CA 92614

Project/PO Number: [illegible]

Project Manager: Charles Marzocchi

Phone Number: 949-250-1421

Sampler: [illegible]/MDW

Fax Number: 949-250-1114

Analysis Required:

Sample Description	Sample Matrix	Container Type	# of Cont.	Sampling Date	Sampling Time	Preservatives	EPA 6010B Lead	(WET) citric acid	WET > UI [illegible]	EPA 1311	pH					Special Instructions
HA-5-1.5	S	jar	1	4-23-08	0051	None	X									
HA-5-3					0055											see instructions
HA-5-4					0059											from page one
HA-6-.5				4-22-08	1120											Also call PM
HA-6-1.5					1135						X					
HA-6-3					1155											
HA-6-4					1159											

Relinquished By:	Date/Time:	Received By:	Date/Time:
[signature]	4-23-08 1445		
		Received in Lab By: [signature]	4/23/08 14:45

Turnaround Time: (Check)
same day ___ 72 hours ___
24 hours ___ 5 days ___
48 hours ___ normal ✓

Sample Integrity: (Check)
intact X on ice 12.1/10.

Note: By relinquishing samples to TestAmerica, client agrees to pay for the services requested on this chain of custody form and any additional analyses performed on this project. Payment for services is due within 30 days from the date of invoice. Sample(s) will be disposed of after 30 days.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

LABORATORY REPORT

Prepared For: Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project: CalTrans
602171001

Sampled: 04/23/08
Received: 04/23/08
Issued: 05/12/08 16:52

NELAP #01108CA California ELAP#1197 CSDLAC #10256

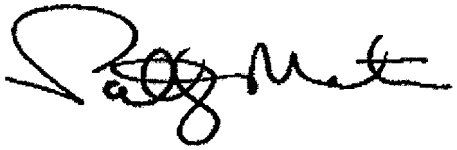
The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the applicable certifications as noted. All soil samples are reported on a wet weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the sole use of TestAmerica and its client. This report shall not be reproduced, except in full, without written permission from TestAmerica. The Chain(s) of Custody, 2 pages, are included and are an integral part of this report.
This entire report was reviewed and approved for release.

CASE NARRATIVE

SAMPLE RECEIPT:	Samples were received intact, at 10°C, on ice and with chain of custody documentation.
HOLDING TIMES:	Not all holding times were met. Results were qualified where the sample analysis did not occur within method specified holding time requirements.
PRESERVATION:	Samples requiring preservation were verified prior to sample analysis.
QA/QC CRITERIA:	All analyses met method criteria, except as noted in the report with data qualifiers.
COMMENTS:	No significant observations were made.
SUBCONTRACTED:	No analyses were subcontracted to an outside laboratory.
ADDITIONAL INFORMATION:	Only the additional STLC and TCLP Lead results, for tests requested 5/2/08, are included in this report.

LABORATORY ID	CLIENT ID	MATRIX
IRD2053-14	HA-5-.5	Soil
IRD2053-15	HA-5-1.5	Soil

Reviewed By:



TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

TCLP METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	TCLP Limit	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IRD2053-14 (HA-5-.5 - Soil)									
Reporting Units: mg/l									
Lead	6010B-TCLP	8E05102	0.10	**0.28**	1	5.0	5/5/2008	5/7/2008	
Sample ID: IRD2053-15 (HA-5-1.5 - Soil)									
Reporting Units: mg/l									
Lead	6010B-TCLP	8E05102	0.10	**0.12**	1	5.0	5/5/2008	5/7/2008	

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

STLC METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	STLC Limit	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IRD2053-14 (HA-5-.5 - Soil)									
Reporting Units: mg/l									
Lead	6010B-STLC	8E05087	0.10	**7.7**	1	5.0	5/5/2008	5/5/2008	
Sample ID: IRD2053-15 (HA-5-1.5 - Soil)									
Reporting Units: mg/l									
Lead	6010B-STLC	8E05087	0.10	**4.1**	1	5.0	5/5/2008	5/5/2008	

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

WASTE EXTRACTION TEST (STLC) - Metals/Inorganics

Analyte	Method	Batch	Extraction Start Date	Extraction End Date	Data Qualifiers
Sample ID: IRD2053-14 (HA-5-.5 - Soil)					
Extraction	STLC-Met	8E03035	5/3/2008	5/5/2008	
Sample ID: IRD2053-15 (HA-5-1.5 - Soil)					
Extraction	STLC-Met	8E03035	5/3/2008	5/5/2008	

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

TCLP EXTRACTION - Metals

Analyte	Method	Batch	Extraction Start Date	Extraction End Date	Data Qualifiers
Sample ID: IRD2053-14 (HA-5-.5 - Soil)					
Extraction	EPA 1311-Met	8E04022	5/4/2008	5/5/2008	
Sample ID: IRD2053-15 (HA-5-1.5 - Soil)					
Extraction	EPA 1311-Met	8E04022	5/4/2008	5/5/2008	

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue. Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

METHOD BLANK/QC DATA

TCLP METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 8E05102 Extracted: 05/05/08										
Blank Analyzed: 05/07/2008 (8E05102-BLK1)										
Lead	ND	0.10	mg/l							
LCS Analyzed: 05/07/2008 (8E05102-BS1)										
Lead	2.05	0.10	mg/l	2.00		102	80-120			
Matrix Spike Analyzed: 05/07/2008 (8E05102-MS1)					**Source: IRE0167-01**					
Lead	1.96	0.10	mg/l	2.00	ND	98	75-125			

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

METHOD BLANK/QC DATA

STLC METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 8E05087 Extracted: 05/05/08										
Blank Analyzed: 05/05/2008 (8E05087-BLK1)										
Lead	ND	0.10	mg/l							
LCS Analyzed: 05/05/2008 (8E05087-BS1)										
Lead	21.0	0.10	mg/l	20.0		105	80-120			
Matrix Spike Analyzed: 05/05/2008 (8E05087-MS1)					**Source: IRD1923-01**					
Lead	23.7	0.20	mg/l	20.0	1.89	109	75-125			
Matrix Spike Dup Analyzed: 05/05/2008 (8E05087-MSD1)					**Source: IRD1923-01**					
Lead	21.2	0.20	mg/l	20.0	1.89	97	75-125	11	20	

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

DATA QUALIFIERS AND DEFINITIONS

ND Analyte NOT DETECTED at or above the reporting limit or MDL, if MDL is specified.

RPD Relative Percent Difference

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans
602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

Certification Summary

TestAmerica Irvine

Method	Matrix	Nelac	California
6010B-STLC	Soil	X	X
6010B-TCLP	Soil	X	X
EPA 1311-Met	Soil	X	X
STLC-Met	Soil	X	X

Nevada and NELAP provide analyte specific accreditations. Analyte specific information for TestAmerica may be obtained by contacting the laboratory or visiting our website at www.testamericainc.com

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

CHAIN OF CUSTODY FORM

1014 E. Cooley Dr., Suite A, Colton, CA 92324 (909) 370-4667 FAX (909) 370-1046
[illegible] South 51st St., Suite B-120, Phoenix, AZ 85044 (480) 785-0043 FAX (480) 785-0851
2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

IRD2053

Page 1 of 2

Client Name/Address: [illegible] CI
[illegible] of Irvine
Irvine, CA 92614

Project/PO Number: [illegible]

Project Manager: Charles Mazaheri

Phone Number: 949-250-1421

Sampler: MDW/BRT

Fax Number: 949-250-1114

Analysis Required

Sample Description	Sample Matrix	Container Type	# of Cont.	Sampling Date	Sampling Time	Preservatives	EPA 6010B Lead	* EPA 1311	* LUFT citric acid	* WET CI	pH				Special Instructions
HA-1-.5	S	Jar	1	4-23-08	929	None	X								* samples analyzed
HA-1-1.5					1015						X				between 50mg/kg
HA-2-.5					1037										and 1000mg/kg
DUP1					1042										shall be analyzed
HA-3-.5					1157										by (WET)
HA-3-1.5					1210						X				citric acid
HA-3-3					1224										* samples analyzed
HA-3-4					1230										≥ 5mg/L by WET
HA-4-.5					1252										citric acid shall
HA-4-1.5					1305										be analyzed (WET
HA-4-3					1316										DI water and by
DUP2					1318						X				EPA 1311, samples
HA-4-4					1326										greater than 1000 mg/k
HA-5-.5					0045										analyze 1311

0.0 4/24/08 9:50

8 DAY TAT

Relinquished By:	Date/Time:	Received By:	Date/Time:	Turnaround Time: (Check)	
	4-23-08 1445			same day ____	72 hours ____
Relinquished By:	Date/Time:	Received By:	Date/Time:	24 hours ____	5 days ____
				48 hours ____	normal ✓
Relinquished By:	Date/Time:	Received in Lab By:	Date/Time:	Sample Integrity: (Check)	
			4/23/08 14:45	intact X	on ice 12.1/10.1

Note: By relinquishing samples to TestAmerica, client agrees to pay for the services requested on this chain of custody form and any additional analyses performed on this project. Payment for services is due within 30 days from the date of invoice. Sample(s) will be disposed of after 30 days.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

LABORATORY REPORT

Prepared For: Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project: CalTrans
602171001

Sampled: 04/23/08
Received: 04/23/08
Issued: 05/29/08 18:00

NELAP #01108CA California ELAP#1197 CSDLAC #10256

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the applicable certifications as noted. All soil samples are reported on a wet weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the sole use of TestAmerica and its client. This report shall not be reproduced, except in full, without written permission from TestAmerica. The Chain(s) of Custody, 2 pages, are included and are an integral part of this report.
This entire report was reviewed and approved for release.

CASE NARRATIVE

SAMPLE RECEIPT:	Samples were received intact, at 10°C, on ice and with chain of custody documentation.
HOLDING TIMES:	Not all holding times were met. Results were qualified where the sample analysis did not occur within method specified holding time requirements.
PRESERVATION:	Samples requiring preservation were verified prior to sample analysis.
QA/QC CRITERIA:	All analyses met method criteria, except as noted in the report with data qualifiers.
COMMENTS:	STLC-DI WET test is a STLC extraction performed using deionized water instead of STLC buffer solution.
SUBCONTRACTED:	No analyses were subcontracted to an outside laboratory.
ADDITIONAL INFORMATION:	Only the additional STLC-DI WET Lead results, for tests requested 5/13/08, are included in this report.

LABORATORY ID	CLIENT ID	MATRIX
IRD2053-14	HA-5-.5	Soil

Reviewed By:

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

CHAIN OF CUSTODY FORM

1014 E. Cooley Dr., Suite A, Colton, CA 92324 (909) 370-4667 FAX (909) 370-1046
[illegible] South First St., Suite B-120, Phoenix, AZ 85044 (480) 785-0043 FAX (480) 785-0851
2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

Client Name / Address: LCI, [illegible], Irvine, CA [illegible]

Project / PO Number: [illegible]

Project Manager: Charles Mazowski

Phone Number: 949-250-[illegible]

Sampler: [illegible] / MDW

Fax Number: 949-250-1114

Analysis Required

Sample Description	Sample Matrix	Container Type	# of Cont.	Sampling Date	Sampling Time	Preservatives	EPA 6010 Lead	(WET) citric acid	(WET) DI water	EPA 1311	pH	Special Instructions
HA-5-1.5	S	jar	1	4-23-08	0051	None	X					
HA-5-3	S	jar	1	4-23-08	0055	None	X					see instructions
HA-5-4	S	jar	1	4-23-08	0059	None	X					from page one
HA-6-.5	S	jar	1	4-22-08	1120	None	X					Also call PM
HA-6-1.5	S	jar	1	4-22-08	1135	None	X				X	
HA-6-3	S	jar	1	4-22-08	1155	None	X					
HA-6-4	S	jar	1	4-22-08	1159	None	X					

Relinquished By: [signature] Date / Time: 4-23-08 1445

Received By: Date / Time:

Relinquished By: Date / Time:

Received By: Date / Time:

Relinquished By: Date / Time:

Received in Lab By: [signature] Date / Time: 4/23/08 14:45

Turnaround Time: (Check)
same day ____ 72 hours ____
24 hours ____ 5 days ____
48 hours ____ normal ✓

Sample Integrity: (Check)
intact X on ice 12.1/10.

Note: By relinquishing samples to TestAmerica, client agrees to pay for the services requested on this chain of custody form and any additional analyses performed on this project. Payment for services is due within 30 days from the date of invoice. Sample(s) will be disposed of after 30 days.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue. Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

STLC METALS (DI WET)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IRD2053-14 (HA-5-.5 - Soil)								
Reporting Units: mg/l								
Lead	6010B-DI WET	8E16111	0.0050	**0.10**	1	5/16/2008	5/22/2008	

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax (949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

WASTE EXTRACTION TEST (DI Water) - INORGANICS

Analyte	Method	Batch	Extraction Start Date	Extraction End Date	Data Qualifiers
Sample ID: IRD2053-14 (HA-5-.5 - Soil)					
Extraction	STLC-Wet	8E13108	5/13/2008	5/15/2008	

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite I40
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

METHOD BLANK/QC DATA

WASTE EXTRACTION TEST (DI Water) - INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 8E13108 Extracted: 05/13/08										
Blank Analyzed: 05/15/2008 (8E13108-BLK1)										
Extraction	ND	1.0	N/A							

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Avenue. Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

METHOD BLANK/QC DATA

STLC METALS (DI WET)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 8E16111 Extracted: 05/16/08										
Blank Analyzed: 05/22/2008 (8E16111-BLK1)										
Lead	ND	0.0050	mg/l							
LCS Analyzed: 05/22/2008 (8E16111-BS1)										
Lead	0.856	0.0050	mg/l	1.00		86	80-120			
Matrix Spike Analyzed: 05/22/2008 (8E16111-MS1)					**Source: IRD2053-14**					
Lead	0.910	0.0050	mg/l	1.00	0.101	81	75-125			
Matrix Spike Dup Analyzed: 05/22/2008 (8E16111-MSD1)					**Source: IRD2053-14**					
Lead	0.877	0.0050	mg/l	1.00	0.101	78	75-125	4	20	

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

DATA QUALIFIERS AND DEFINITIONS

ND Analyte NOT DETECTED at or above the reporting limit or MDL, if MDL is specified.

RPD Relative Percent Difference

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Avenue, Suite 100, Irvine, CA 92614 (949) 261-1022 Fax:(949) 260-3297

Leighton Consulting, Inc.
17781 Cowan, Suite 140
Irvine, CA 92614
Attention: Charles Mazowiecki

Project ID: CalTrans 602171001
Report Number: IRD2053

Sampled: 04/23/08
Received: 04/23/08

Certification Summary

TestAmerica Irvine

Method	Matrix	Nelac	California
6010B-DI WET	Soil	X	X
STLC-Wet	Soil		

Nevada and NELAP provide analyte specific accreditations. Analyte specific information for TestAmerica may be obtained by contacting the laboratory or visiting our website at www.testamericainc.com

TestAmerica Irvine

Patty Mata
Project Manager

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

CHAIN OF CUSTODY FORM

1014 E. Cooley Dr., Suite A, Colton, CA 92324 (909) 370-4667 FAX (909) 370-1046
[illegible] South 51st St. Suite B-120, Phoenix AZ 85044 (480) 785-0043 FAX (480) 785-0851
2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

IRD2053

Page 1 of 2

Client Name/Address: CT
17[illegible]
Irvine, CA 92614

Project/PO Number: [illegible]

Project Manager: Charles Mazaniec

Phone Number: 949-250-1421

Sampler: MDW/BRT

Fax Number: 949-250-1114

Analysis Required

Sample Description	Sample Matrix	Container Type	# of Cont.	Sampling Date	Sampling Time	Preservatives	EPA 6010B Lead	* EPA 1311	* WET citric acid	* WET CA initial	pH					Special Instructions
HA-1-.5	S	Jar	1	4-23-08	929	None	X									* samples analyzed
HA-1-1.5					1015						X					between 50mg/kg
HA-2-.5					1037											and 1000mg/kg
DUP1					1042											shall be analyzed
HA-3-.5					1157											by (~~WET~~ WET)
HA-3-1.5					1210						X					citric acid
HA-3-3					1224											▲ samples analyzed
HA-3-4					1230											≥ 5mg/L by WET
HA-4-.5					1252											citric acid shall
HA-4-1.5					1305											be analyzed (WET
HA-4-3					1316											DI water and by
DUP2					1318						X					EPA 1311, samples
HA-4-4					1326											greater than 1000 mg/k
HA-5-.5	↓	↓	↓	↓	0045	↓	↓									analyze 1311

4/24/08 9:50

Relinquished By:	Date/Time:	Received By:	Date/Time:
[signature]	4-23-08 1445		
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received in Lab By: [signature]	Date/Time: 4/23/08 14:45

Turnaround Time: (Check)
same day ____ 72 hours ____
24 hours ____ 5 days ____
48 hours ____ normal ✓

Sample Integrity: (Check) 12.1/10.1
intact X on ice ____

Note: By relinquishing samples to TestAmerica, client agrees to pay for the services requested on this chain of custody form and any additional analyses performed on this project. Payment for services is due within 30 days from the date of invoice. Sample(s) will be disposed of after 30 days.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

CHAIN OF CUSTODY FORM

1014 E. Cooley Dr. Suite A, Colton, CA 92324 (909) 370-4667 FAX (909) 370-1046
4765 South 51st St. Suite B-120, Phoenix, AZ 85044 (480) 785-0043 FAX (480) 785-0851
2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

Page 1 of 2

Client Name/Address:
LCJ
1701 Langley
Irvine, CA 92614

Project/PO Number:
[illegible]

Project Manager:
Cinder Mazzeo

Phone Number:
949-250-1414

Sampler: JCT/MDW

Fax Number:
949-250-1114

Analysis Required

Sample Description	Sample Matrix	Container Type	# of Cont.	Sampling Date	Sampling Time	Preservatives	EPA 6020 Lead	* (WET) citric acid	* (WET) DI Leach	EPA 8011	pH				Special Instructions
HA-5-1.5	S	jar	1	4-23-08	0051	None	X								
HA-5-3					0055										see instructions
HA-5-4					0059										from page one
HA-6-.5				4-22-08	1120										Also call PM
HA-6-1.5					1135						X				
HA-6-3					1155										
HA-6-4					1159										

Relinquished By:	Date/Time:	Received By:	Date/Time:	Turnaround Time: (Check)	
	4-23-08 1145			same day ____	72 hours ____
Relinquished By:	Date/Time:	Received By:	Date/Time:	24 hours ____	5 days ____
				48 hours ____	normal ✓
Relinquished By:	Date/Time:	Received in Lab By:	Date/Time:	Sample Integrity: (Check)	
			4/23/08 14:45	intact X	on ice 12.1/10.1

Note: By relinquishing samples to TestAmerica, client agrees to pay for the services requested on this chain of custody form and any additional analyses performed on this project. Payment for services is due within 30 days from the date of invoice. Sample(s) will be disposed of after 30 days.

FOUNDATION REPORT FOR PROPOSED SOUNDWALL NOS. 83, 93, 55-203 AND 101 ON SOUTHBOUND INTERSTATE 5 NEAR EL CAMINO REAL, CITY OF SAN CLEMENTE, CALIFORNIA

CALTRANS DISTRICT 12, ORANGE COUNTY, INTERSTATE 5,
MILE POST: 1.30 TO 1.70, EA 0G9401

Prepared for:

RMC, INC
6 Hutton Center Drive, Suite 1270
Santa Ana, California 92707

Project No. 602171-001

September 23, 2008
(Revised November 6, 2008)

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

September 23, 2008
(Revised November 6, 2008)

Project No. 602171-001

To: RMC, Inc.
6 Hutton Centre Drive, Suite 1270
Santa Ana, California 92707

Attention: Mr. Jamal Salman, P.E.

Subject: Foundation Report for Proposed Soundwall Nos. 83, 93, 55-203 and 101 on Southbound Interstate 5 near El Camino Real, City of San Clemente, California

In response to your request, Leighton Consulting, Inc. (Leighton) has performed a geotechnical exploration for four proposed soundwalls on southbound Interstate 5 (I-5) near El Camino Real. The length, type and location of the soundwalls are as follows:

- Soundwall No. 83: 1,595 feet long masonry block wall to be located along the southbound I-5 on-ramp at El Camino Real.
- Soundwall No. 93: 394 feet long masonry block wall to be located along the southbound shoulder of I-5, south of El Camino Real undercrossing.
- Soundwall No. 55-203: 397 feet long, light weight paraglass wall to be located along the southbound shoulder of I-5, spanning over El Camino Real undercrossing.
- Soundwall No. 101: 88 feet long masonry block wall to be located along the southbound shoulder of I-5, north of El Camino Real undercrossing.

The purpose of our study was to evaluate the subsurface conditions at the project site and to provide geotechnical recommendations for design and construction of the foundations of the proposed soundwalls. This report summarizes the results of our geotechnical exploration and presents our geotechnical recommendations. A draft version of this report was issued on June 6, 2008. The report was revised on September 23, 2008, to incorporate review comments from

17781 Cowan ■ Irvine, CA 92614-6009
949.253.9836 ■ Fax 949.250.1114 ■ www.leightonconsulting.com

RMC and Caltrans and design changes by the design team. Additional review comments were received from Caltrans (see Appendix C) and Sections 4.4 and 5.2 of this report have been revised to incorporate the review comments.

If you have any questions regarding this report, please do not hesitate to contact this office. We appreciate this opportunity to be of service.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

Tae Kuk Kim, PE 69316
Project Engineer

Djan Chandra, PE, GE 2376
Senior Principal Engineer

TK/DJC/lr

Distribution: (4) Addressee

Leighton

TABLE OF CONTENTS

Section			Page
1.0	INTRODUCTION		1
	1.1	Project Description	1
	1.2	Purpose and Scope	2
2.0	GEOTECHNICAL FIELD AND LABORATORY INVESTIGATIONS		4
	2.1	Subsurface Exploration	4
	2.2	Geotechnical Laboratory Testing	4
3.0	GEOTECHNICAL FINDINGS		6
	3.1	Geologic Setting	6
	3.2	Subsurface Earth Materials	6
	3.3	Groundwater	8
	3.4	Engineering Properties of Subsurface Materials	9
		3.4.1 Shear Strength	9
		3.4.2 Corrosion Potential	9
		3.4.3 Expansion Potential	10
		3.4.4 Collapse Potential	10
	3.5	Faulting and Seismicity	10
	3.6	Seismic Hazards	11
		3.6.1 Fault Rupture	11
		3.6.2 Liquefaction	11
		3.6.3 Seismically Induced Settlement	11
		3.6.4 Seismic Slope Stability	12
		3.6.5 Tsunami and Seiches	12
4.0	GEOTECHNICAL AND FOUNDATION DESIGN RECOMMENDATIONS		13
	4.1	Response Spectra	13
	4.2	As-Built Foundation Data	13
	4.3	Foundation Recommendations	16
		4.3.1 Retaining Wall Foundation behind Abutment 4	16
		4.3.2 SW No. 83	17
		4.3.3 SW Nos. 93 and 101	17

TABLE OF CONTENTS (Continued)

Section Page

4.4 Lateral Earth Pressure and Tieback Design Parameters 18

5.0 CONSTRUCTION CONSIDERATIONS 20

5.1 Removal of Existing Foundations 20
5.2 CIDH Pile Construction 20
5.3 Groundwater Control 21
5.4 Temporary Excavations 21
5.5 Earthwork 21
5.6 Additional Geotechnical Services 22

6.0 REFERENCES 23

APPENDICES

Appendix A– Laboratory Test Results
Appendix B– Engineering Calculations
Appendix C– Responses to Caltrans Review Comments

LIST OF ILLUSTRATIONS AND TABLES

Figure 1 – Site Location Map Rear of Text
Figure 2 – Log of Test Borings Rear of Text
Figure 3 – Horizontal Response Spectra Rear of Text

Table 1 - Exsiting Pavement Sections Page 6
Table 2 - Generalized Soil Profile for I-5 Mainline Page 8
Table 3 - Generalized Soil Profile for Southbound On-Ramp Page 8
Table 4 - As-Built Bridge Foundation Data, El Camino Real Undercrossing Page 14
Table 5 - As-Built Bridge Foundation Data, El Camino Real Undercrossing Widening Page 15
Table 6 - As-Built Foundation Data, Retaining Wall at Abutment 4 Page 16

1.0 INTRODUCTION

1.1 Project Description

The project site is located along southbound I-5 near El Camino Real in the city of San Clemente, California. It extends from 1,396 feet south of El Camino Real undercrossing (I-5 Station 82+74) to 131 feet north of El Camino Real undercrossing (I-5 Station 102+40). The location of the project site is shown in Figure 1. The project consists of removal of a portion of an existing soundwall and construction of four new soundwalls, namely Soundwall No. 83 (SW No. 83), Soundwall No. 93 (SW No. 93), Soundwall No. 55-203 (SW No. 55-203) and Soundwall No. 101 (SW No. 101).

SW No. 83 is to be located on the southbound I-5 on-ramp at El Camino Real. The soundwall will be an approximately 1,595-foot long, extending from the southbound I-5 Station 82+74 to southbound On-Ramp Station 18+65. SW No. 83 will consist of 11 to 13 feet high masonry block soundwall on top of a concrete barrier. The southern portion of the wall, approximately 240 feet long, will be supported on a retaining wall with a maximum height of 8 feet. The retaining wall will be supported on a spread footing. The rest of the soundwall will be supported on Cast-In-Drilled-Hole (CIDH) piles. A 436-foot long segment of an existing soundwall (SW No. 15) located at the south end of the project will be removed and replaced with the proposed SW No. 83. The southern portion of the existing soundwall, approximately 138 feet long, consists of 5½-foot high wall on 6 to 8 feet high retaining wall (RW No 77-L). The retaining wall is supported on a shallow foundation with a footing width of 6 feet 2 inches to 7 feet 6 inches. The northern portion of the existing soundwall, approximately 298 feet long, consists of 3½- to 5½- foot high wall supported on 15-inch-diameter, 10 feet long CIDH piles.

SW No. 93 is to be located along the southbound shoulder of I-5, south of El Camino Real undercrossing (Bridge No. 55-203). It will be approximately 394 feet long, extending from I-5 Station 93+65 (approximately 370 feet south of El Camino Real) to I-5 Station 97+52. SW No. 93 will consist of 11 feet high masonry block soundwall on a concrete barrier, supported on CIDH piles.

SW No. 55-203 is located along the southbound shoulder of I-5, spanning over El Camino Real undercrossing. It is approximately 397 feet long, extending from I-5 Station 97+43 to I-5 Station 101+52. Based on the provided information, we understand that SW No. 55-203 will consist of 11 feet high, light weight paraglass soundwall (Paraglas Soundstop TL4). The existing southbound deck slab of El Camino Real

undercrossing will be widened by approximately 6 inches to accommodate the proposed soundwall and the existing concrete barrier will be replaced with Type 736 (Mod) concrete barrier.

SW No. 101 is to be located along the southbound shoulder of I-5, north of El Camino Real undercrossing. It is approximately 88 feet long, extending from the north end of El Camino Real undercrossing (I-5 Station 101+52) to the 88 feet north of El Camino Real (I-5 Station 102+40). SW No. 101 will consist of 11 feet high masonry block soundwall on a concrete barrier, supported on CIDH piles.

Based on the structure type selection report (Athalye, 2008) and information from the structural engineer, modifications to the existing undercrossing foundation are not required due to the relatively light weight of the paraglass soundwall system. However, the existing retaining wall behind Abutment 4 (north abutment) will require a tieback system to support the lateral load from the proposed paraglass soundwall.

Based on the type selection report (Athalye, 2008), the existing El Camino Real undercrossing (Bridge No. 55-203) was constructed in 1954 and consisted of two separate structures (northbound and southbound) supported on two abutments and two piers. The bridges were then widened on both sides and joined to form one structure in 1976. The steel plate girders of the original structures were strengthened by external prestressing to meet the permitted truck loading in 1991. The as-built elevations of the bridge range from 240 to 250 feet above mean sea level (msl) from south to north. The current elevation of El Camino Real is approximately 215 feet.

1.2 Purpose and Scope

The purpose of our geotechnical exploration was to evaluate the subsurface conditions with respect to the proposed project and to provide geotechnical recommendations for design and construction. Our scope of services included the following tasks:

- *Literature Review*: We reviewed various documents pertinent to the project site including as-built Log of Test Borings (LOTBs) prepared by Caltrans for the existing Bridge No. 55-203 and SW No. 15/ Retaining Wall No 77-L. The as-built LOTBs are presented on Figure 2 (Sheets 7 through 9). A list of references used in preparation of this report is presented in Section 6.0.

- *Site Reconnaissance:* We performed a site reconnaissance to visually evaluate the accessibility of the site for drilling equipment and locate and mark the proposed boring locations.
- *Subsurface Exploration*: We performed a subsurface exploration that consisted of drilling, logging and sampling of six hollow-stem auger borings to a maximum depth of 51½ feet below ground surface. The boring logs are included on Figure 2 (Sheets 3 through 6) - Log of Test Borings (LOTBs).
- *Seismic Analysis*: Based upon the encountered subsurface conditions and regional seismicity of the area, we performed ground motion analysis for the project site for use in structural analysis and design.
- *Geotechnical Design and Analysis*: Geotechnical analysis was performed on the collected data to develop recommendations for design and construction. Results of the analysis are included in Appendix B.
- *Report Preparation*: Relevant geotechnical data were compiled in this report along with our findings and recommendations for the proposed project.

2.0 GEOTECHNICAL FIELD AND LABORATORY INVESTIGATIONS

2.1 Subsurface Exploration

Our field exploration consisted of advancing six 8-inch diameter hollow-stem borings to a maximum depth of 51½ feet below the current grade. Borings LB-1 and LB-2 are located along the southbound of I-5 near Abutment 4 (north abutment) and Abutment 1 (south abutment) of the El Camino Real undercrossing, respectively. Boring LB-3 is located at approximately 460 feet south of El Camino Real undercrossing and Borings LB-4 through LB-6 are located along the west side of I-5 southbound on-ramp at El Camino Real. The approximate location of these borings is shown on Figure 2.

Standard Penetration Test (SPT) was performed within the hollow-stem borings using a 140-pound automatic hammer falling freely for 30 inches. The samplers were driven for a total penetration of 18 inches and the blow counts were recorded for the last 12 inches of penetration. Relatively undisturbed samples were collected from the borings using the Modified California Ring sampler. The field sampling procedures were conducted in accordance with ASTM Standard Specifications D1586 and D3550 for SPT and split-barrel sampling of soil. In addition to driven samples, representative bulk soil samples were also collected from the borings.

The test borings were logged in the field by a member of our technical staff. Each soil sample collected was reviewed and described in accordance with the Unified Soil Classification System. The samples were sealed and packaged for transportation to our laboratory. After completion of drilling, the borings were backfilled with soil/cutting, tamped and capped with rapid set concrete. Geotechnical logs of the borings are included on Figure 2.

2.2 Geotechnical Laboratory Testing

Laboratory tests were performed on representative soil samples to determine the geotechnical engineering properties of subsurface materials. The following laboratory tests were performed:

- In-situ moisture content and density;
- Grain-size distribution;
- Percent passing No. 200 sieve;

- Direct shear;
- Consolidation; and
- Corrosivity (soluble sulfate contents, chloride, pH, and resistivity).

All laboratory tests, except corrosivity tests, were performed in general accordance with ASTM procedures. The corrosivity tests were performed in accordance with Caltrans procedures. Results of the laboratory tests are presented in Appendix A. The results of in-situ moisture and density tests are shown on Figure 2 - Log of Test Borings (LOTBs).

3.0 GEOTECHNICAL FINDINGS

3.1 Geologic Setting

The project site is characterized by rolling hills and canyons with marine terraces that border the Pacific Ocean. The site lies within the foothills of the southern Santa Ana Mountains, which is within the Peninsular Ranges Geomorphic Province of southern California. The province is bounded on the northeast by the Elsinore Fault and the south by the offshore southern extension of the Newport-Inglewood Fault Zone. Exposed in the area between the two north-west trending right-lateral strike-slip faults is a sequence of mostly west dipping rocks. A relatively thin section of flat lying Quaternary terrace deposits occur near the coastline, adjacent to drainages, and at isolated localities in the upland area.

3.2 Subsurface Earth Materials

The pavement sections encountered in our borings on the southbound shoulder of I-5 consisted of 6 to 12 inches of asphalt concrete with generally no aggregate base. A 12-inch thick layer of aggregate base was encountered in Boring LB-6. The pavement sections on the southbound on-ramp consist of 13 to 14 inches of asphalt concrete over 0 to 4 inches of aggregate base. The existing pavement sections encountered in our borings are shown in Table 1.

Table 1 – Existing Pavement Sections

Boring No.	I-5 Station No.	Location of Boring	Existing Pavement Section
LB-1	103+00	Southbound I-5 Shoulder	6 inches of AC
LB-2	96+00	Southbound I-5 Shoulder	12 inches of AC
LB-3	92+50	Southbound I-5 Shoulder	11 inches of AC
LB-4	94+50	Southbound I-5 On-Ramp	13 inches of AC over 4 inches of AB
LB-5	91+75	Southbound I-5 On-Ramp	14 inches of AC
LB-6	87+20	Southbound I-5 Shoulder	6 inches of AC over 12 inches of AB

Based on the available borings, the subsurface conditions along the I-5 mainline and along the southbound on-ramp were found to be slightly different. The subsurface profile along I-5 mainline generally consists of loose to dense silty sand with gravel within the upper approximately 20 feet and loose to medium dense silty sand and very stiff sandy clay from 20 to 25 feet below grade. The soils below 25 feet to 50 feet consist of medium dense to very dense silty sand and sandy silt. Light brown fine-grained sandstone was encountered at approximately 10 to 15 feet below El Camino Real street level (approximately 50 feet below the freeway level).

The subsurface profile along southbound on-ramp generally consists of medium dense to dense clayey sand and gravelly sand within the upper approximately 5 feet and loose to very dense gravelly clayey sand with isolated stiff silty clayey layer from 5 to 15 feet below grade. The soils below 15 feet to 25 feet consist of stiff to very stiff sandy clay with varying amount of silt. The soils below 25 feet to 30 feet consist of medium dense silty clayey sand and soils below 30 feet to the maximum depth explored consist of firm to very stiff silty clay and clayey silt with varying content of sand.

Based on the available as-built plan (Caltrans, 1957), the pre-existing topography at El Camino Real undercrossing area sloped gently downward to the southwest from elevations of 220 to 210 feet above mean sea level (msl). The pre-existing elevations of the areas at Abutments 1 and 4 varied from 210 to 215 feet msl. The current as-built elevations of Abutments 1 and 4 of El Camino Real undercrossing are approximately 240 feet to 250 feet, respectively. Based on the available as-built plan (Caltrans, 1957), up to 30 feet and 35 feet of approach embankment fills were placed behind Abutments 1 and 4, respectively.

We have performed direct shear tests on representative samples collected from our borings. The cohesion intercept (c) and friction angle (ϕ) representing the effective shear strength of the soils were found to range from 50 to 300 psf and 30 to 42 degrees, respectively. The test results are presented in Appendix A. Based on these test results, SPT blowcounts and soil types, the shear strength parameters and unit weights selected for design are presented in Tables 2 and 3.

Table 2 – Generalized Soil Profile for I-5 Mainline

Depth below Existing Grade[1] (feet)	Generalized Soil Type	Total Unit Weight (pcf)	Friction angle[2] (degrees)	Cohesion[2] (psf)
0 to 20	Silty Sand with gravel	125	33	-
20 to 25	Silty Sand/ Sandy Clay	120	33	-
25 to 40	Silty Sand/ Sandy Silt	115	32	-
40 to 50	Silty Sand / Sandy Silt	120	34	-
50 to 70	Sandstone	120	36	-

(1) Freeway level; cut-off elevation of Abutments 1 and 4 are at approximately 10 to 12 feet below the existing grade, respectively, and cut-off elevations of Pier 2 and 3 are approximately 30 feet and 40 feet below the existing grade, respectively.

(2) Based on SPT blow counts of subsurface soil (NAFVAC, 1988) and Laboratory test results

Table 3 – Generalized Soil Profile for Southbound On-Ramp

Depth below Existing Grade[1] (feet)	Generalized Soil Type	Total Unit Weight (pcf)	Friction angle[2] (degrees)	Cohesion[2] (psf)
0 to 5	Clayey Sand/ Gravelly Sand	120	34	
5 to 15	Gravelly Clayey Sand/ Silty Clay	120	32	
15 to 25	Sandy Clay/ Clayey Silt	120	-	1,500
25 to 30	Silty Sand / Clayey Sand	120	32	
30 to 35	Sandy Clay/ Silty Clay	115	-	600

(1) Freeway level

(2) Based on SPT blow counts of subsurface soil (NAFVAC, 1988) and Laboratory test results

3.3 Groundwater

Groundwater was not encountered during our field exploration. Groundwater was encountered in Boring B-2A by others in 1954, at a depth of 29 feet below the existing street level (elevation of approximately 184½ feet). The boring was located near Pier 3 of El Camino Real undercrossing. The historically high groundwater table at the El

Camino Real street level is deeper than 10 feet below the ground surface (CDMG, 2002). The freeway is approximately 25 to 35 feet higher than El Camino Real. Considering the topography difference and information from the LOTBs, the historically high groundwater table is estimated to be on the order of 35 feet below the existing freeway grade.

3.4 Engineering Properties of Subsurface Materials

Engineering properties of the subsurface materials were modeled based on results of geotechnical field and laboratory tests performed during our exploration. Results of these laboratory tests that are applicable to the proposed project are presented in Appendix A. These test results are briefly discussed below:

3.4.1 Shear Strength

Based on direct shear test results, the cohesion intercept (c) and friction angle (ϕ) representing the effective ultimate shear strength for the on-site soils ranges from 50 to 300 psf and 30 to 42 degrees, respectively. The shear strength parameters used for design are presented in Tables 2 and 3.

3.4.2 Corrosion Potential

Representative samples of the subsurface soils were subjected to analytical testing to evaluate the potential for corrosion to concrete and ferrous metals. The test results are included in Appendix A and indicate the tested soils exhibited sulfate concentration of 72 to 291 parts per million (ppm), minimum resistivity of 374 to 1,070 ohm-cm, chloride concentration of 43 to 695 ppm, and pH level of 7.5 to 7.8. Caltrans specifications define a corrosive soil as a material in which any of the conditions exist: a chloride content greater than 500 ppm; soluble sulfate content greater than 2,000 ppm; a minimum resistivity less than 1,000 ohm-cm; or a pH of 5.5 or less. Based on the guidelines established by Caltrans, the subsurface soils at the soundwall locations are considered corrosive to steel in direct contact with the soils and reinforcing steel for structural concrete. The foundation for the soundwalls should be designed to have adequate concrete cover for reinforcing steel based on Caltrans Bridge Design Specification (Caltrans, 2004). Corrosion mitigation measure for the Tieback anchors should be performed in accordance with the Caltrans Corrosion Guidelines (Caltrans, 2003)

3.4.3 Expansion Potential

Laboratory tests performed on near-surface samples indicated that the clay materials exposed near the existing grade level possess low expansion potential when tested in accordance with ASTM D 4829 (see Appendix A).

3.4.4 Collapse Potential

Laboratory tests performed on samples near the proposed foundation level indicated that the sandy materials have minor collapse potential upon inundation. The test result of the sample from Boring LB-4 at 7.5 feet indicated that the sandy soil has high collapse potential upon inundation. However, based on the relatively high blow counts and moisture content, the soil does not appear to have the characteristics of collapsible soil. Therefore, it is our opinion that the sample could be disturbed during sampling and the test result was disregarded.

3.5 Faulting and Seismicity

Our review of available in-house literature indicates that there are no known active or potentially active faults that have been mapped at the site, and the site is not located within an Alquist-Priolo Earthquake Fault Zone (Hart and Bryant, 1999). The principal seismic hazard that could affect the site is ground shaking resulting from an earthquake occurring along one of several major active or potentially active faults in southern California. Based on the latest fault database (California Geological Survey, 2002), the closest active faults that could affect the site are the Newport-Inglewood (Offshore), San Joaquin Hills, Coronado Bank, and Elsinore-Glen Ivy faults located approximately 4.5 miles, 12.0 miles, 20.9 miles, and 21.4 miles, respectively, from the site. Other known regional active faults that could affect the site include the Elsinore Glen Ivy-Temecula and Palos Verdes faults.

We have performed seismic analysis for the site using the deterministic methodology of the Caltrans Seismic Design Criteria (2006b). Per Caltrans Seismic Hazard Map (Mualchin, 1996), the nearest faults to the site are Newport-Inglewood-Rose Canyon, Palos Verdes Hills-Coronado Bank, and Whittier-Elsinore faults. The Newport-Inglewood-Rose Canyon fault, which is the nearest fault to the site at a distance of 4.5 miles, is capable of generating a maximum capable earthquake (MCE) magnitude of 7.0. Caltrans Seismic Hazard Map shows that the design peak bedrock acceleration at the site

is 0.40g (Mualchin, 1992). The peak site accelerations due to maximum events on the nearest fault zone calculated using the attenuation relationship by Sadigh et al. (1997) is on the order of 0.44g. As such, for the design of structures using Caltrans method, if applicable, the design peak bedrock acceleration should be assumed to be 0.5g.

3.6 Seismic Hazards

3.6.1 Fault Rupture

Based on available literature and reports, no known active faults are known to traverse the project site, and the site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone. As such, the principal seismic hazard that could affect the site is ground shaking resulting from an earthquake occurring along one of several major active or potentially active faults in the region as discussed in Section 3.5.

3.6.2 Liquefaction

Liquefaction is the loss of soil strength or stiffness due to a buildup of pore-water pressure during ground shaking. Liquefaction is associated primarily with loose (low density), saturated, fine- to medium-grained, cohesionless soils. Effects of liquefaction can include sand boils, excessive settlement, bearing capacity failures, and lateral spreading.

The project site is not located in an area that has been identified by the State of California as being potentially susceptible to liquefaction as shown on the Seismic Hazards Zones Map for the San Clemente Quadrangle (CDMG, 2002). Based on the relative density characteristics of the materials encountered during field exploration and the absence of groundwater, the potential of liquefaction at this site is considered low.

3.6.3 Seismically Induced Settlement

Seismically-induced settlement consists of dry dynamic settlement (above groundwater) and liquefaction-induced settlement (below groundwater). This settlement occurs primarily within loose to moderately dense sandy soil due to reduction in volume during and shortly after an earthquake event. The seismically-

induced settlement at the site is estimated to be on the order of 0.1 inch. Based on the results of our analysis, it is our opinion that the potential for seismically-induced settlement at the site will be low and, therefore, the potential for different settlement of the soundwalls is expected to be minor.

3.6.4 Seismic Slope Stability

According to the California Seismic Hazard Zone Map (CDMG, 2002) for the San Clemente Quadrangle, a portion of the west-facing, descending slope along the southbound on-ramp may be susceptible to earthquake-induced landsliding. The as-built plan (Caltrans, 1957) indicates that the slope is an approach fill slope placed during the construction of El Camino Real undercrossing. Based on the site geology and review of boring logs and LOTBs, subsurface materials along the western slope of the southbound on-ramp possess moderate to high strength. We have performed slope stability analysis of the abutment area at the El Camino Real using Simplified Janbu's method. For pseudo-static analysis, a horizontal seismic coefficient of 0.15g was used. Our analysis indicates that the slope has a global factor of safety greater than 1.5 for pseudo-static conditions. Based on this site-specific subsurface information and analysis, the potential for seismically-induced slope failure is considered low.

3.6.5 Tsunami and Seiches

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Tsunamis are waves generated in large bodies of water by fault displacement or major ground movement. Based on the inland location of the site, seiches and tsunami risks at the site are considered negligible.

4.0 GEOTECHNICAL AND FOUNDATION DESIGN RECOMMENDATIONS

Based upon our evaluation of the soils and geologic information, we conclude that the proposed project is feasible from a geotechnical standpoint, provided that the recommendations presented in this report are properly incorporated in the design and construction of the project. The recommendations in this report are considered minimum and may be superseded by more stringent requirements of the structural engineer and/or the governing agencies. Leighton should be notified, in a timely manner, of changes in the project plans that might impact recommendations in this report.

4.1 Response Spectra

Caltrans design ARS curve was developed by modifying standard elastic response spectra curve (Figure B.8 of Caltrans, 2006b) for soil profile Type D, earthquake magnitude 7.25±0.25 and peak bedrock acceleration of 0.5g to account for near surface effects. The soil profile designation of Type D was considered to be appropriate for the project location based upon the relative density of the subsurface profile as indicated by field testing (SPT N-values). The near source modification consisted of increasing the spectral acceleration values by 20 percent for periods greater than 1 second and increasing the spectral acceleration values by 0 to 20 percent based on linear interpolation for periods ranging from 0.5 to 1 second. The response spectra curve and the digitized values for the site are provided on Figure 3.

4.2 As-Built Foundation Data

The as-built elevations of the bridge range from 240 to 250 feet above mean sea level (msl) from south to north. The corresponding elevation of El Camino Real is approximately 215 feet msl. A copy of the as-built LOTB sheets is presented in Figure 2. Based on the as-built plans for the El Camino Real undercrossing (Caltrans, 1957 and 1979a), we have summarized the as-built foundation types and characteristics in Tables 4 through 6. The nominal resistance shown in the tables was calculated using the computer program SHAFT. The computer printouts are included in Appendix B.

Table 4 – As-Built Bridge Foundation Data
El Camino Real Undercrossing (Caltrans, 1957)

Structure[1]	Pile Size and Type	Pile Cutoff Elevation (feet msl)	Pile Tip Elevation (feet msl)	Nominal Resistance (kips)[2], [3]	Allowable Capacity (kips)[4]
Abutment 1	16-Inch Diameter CIDH Pile[5]	230.0	180.0	335	-
Pier 2	16-Inch Diameter CIDH Pile[6]	210.0	180.0	192[7]	-
Pier 3	16-Inch Diameter CIDH Pile[6]	210.0	185.0	152[7]	-
Abutment 4	16-Inch Diameter CIDH Pile[5]	238.0	185.0	369	-

[1] Elevations of freeway are approximately 240 feet at Abutment 1 and 250 feet at Abutment 4, and elevation of El Camino Real street level is approximately 215 feet.

[2] The upper 20 feet of pile capacity within the existing fill was ignored.

[3] A minimum factor of safety of 2.0 should be applied to calculate the allowable capacity.

[4] Design load of 45 tons (90 kips).

[5] One row of alternating straight and 1:4 battered CIDH piles; 14 piles total with a minimum pile spacing of 9 times the diameter of pile.

[6] 2 by 2 pile groups with pile spacing of 2.25 times the diameter of pile.

[7] A group reduction factor of 0.8 was applied to the pile capacity.

Table 5 – As-Built Bridge Foundation Data
El Camino Real Undercrossing Widening (Caltrans, 1979a)

Structure[1]	Pile Size and Type	Pile Cutoff Elevation (feet msl)	Pile Tip Elevation (feet msl)	Nominal Resistance (kips)[2], [3]	Allowable Capacity (kips)
Abutment 1	16-Inch Diameter CIDH Pile[4]	230	185.0	275	-[6]
Pier 2	16-Inch Diameter CIDH Pile[5]	210[7] 207[8]	185.0 179.0	152[9] 240	-[7] -[8]
Pier 3	16-Inch Diameter CIDH Pile[5]	210[7] 207[8]	185.0 179.0	152[9] 240	-[7] -[8]
Abutment 4	16-Inch Diameter CIDH Pile[4]	238.0	185.0	369	-[6]

[1] Elevations of freeway are approximately 240 feet at Abutment 1 and 250 feet at Abutment 4, and elevation of El Camino Real street level is approximately 215 feet.

[2] The upper 20 feet of pile capacity within the existing fill was ignored.

[3] A minimum factor of safety of 2.0 should be applied to calculate the allowable capacity.

[4] One row of pile; pile spacing was not available.

[5] At the eastern and western portions of widening: 2 by 2 pile groups with pile spacing of 2.25 times the diameter of pile; at the centerline of I-5: 2 by 2 pile group with pile spacing of 3 and 5.25 times and the diameter of pile.

[6] Design load of 45 tons (90 kips).

[7] At the western and eastern portions of widening; design load of 45 tons (90 kips).

[8] At middle portion of widening; design load of 70 tons (140 kips).

[9] A group reduction factor of 0.8 was applied to the pile capacity.

Table 6 – As-Built Foundation Data
Retaining Wall at Abutment 4 (Caltrans, 1979a)

Wall Height (feet) [1]	Footing Width	Elevation of Footing Bottom (feet msl)	Allowable Bearing Capacity[2] (ksf)	Nominal Bearing Resistance[3] (ksf)
4	3 feet 2 inches	244	1.6	7.9
6	4 feet 2 inches	242	1.9	7.8
8	5 feet 2 inches	240	2.2	8.0
10	6 feet 2 inches	238	2.5	8.0

[1] Retaining wall is located behind the western portion of Abutment 4 and height of retaining wall decreases from 10 feet to 4 feet as it moves away from Abutment 4.

[2] Based on Caltrans 1976 Standard Drawing for Retaining Wall Type 1 H = 4 feet to 30 feet, File No. XS-3-46, Toe pressures for 2 feet level surcharge (Caltrans, 1976).

[3] Nominal Bearing Capacity was calculated for the retaining wall on sloping ground and a factor of safety of 3.0 should be applied to calculate the allowable bearing capacity.

4.3 Foundation Recommendations

4.3.1 Retaining Wall Foundation behind Abutment 4

We understand that the existing retaining wall behind Abutment 4 is a standard Type 1 retaining wall and will support the proposed light weight paraglass soundwall (SW No. 55-203) and the concrete barrier. Based on the information collected from our borings, the subsurface soils at the foundation level of the existing retaining wall are expected to consist of loose to medium dense silty sand. According to the as-built plan (Caltrans, 1979a) and Caltrans 1976 standard drawing for Type 1 retaining wall (Caltrans, 1976), the existing retaining wall was designed to have allowable bearing capacities of 1.6 ksf to 2.5 ksf with 2 feet of level surcharge of 240 pcf (see Table 6). The calculated nominal bearing resistance of the existing retaining wall ranges from 7.8 ksf to 8.0 ksf and are summarized in the Table 6. A minimum factor of 3.0 should be applied to calculate the allowable bearing capacity.

Based on the information provided by the structural engineer and the structure type selection report, modifications to the existing undercrossing foundation and retaining wall foundation are not required due to the relatively light paraglass soundwall. A tieback system, however, will be added to the retaining wall to support the additional lateral load from the proposed soundwall.

4.3.2 SW No. 83

The southern portion of SW No. 83, approximately 240 feet long, will be supported on a retaining wall with a maximum height of 8 feet and on a spread footing. The rest of the wall will be supported on CIDH piles. Based on the information collected from our borings, the subsurface soils at the foundation level for the new retaining wall are expected to generally consist of medium dense to dense gravelly clayey sand and stiff silty clay.

From the geotechnical data, it appears feasible to support the new retaining wall on a shallow foundation system and the new soundwall on CIDH piles.

The ultimate bearing capacity of the soils is estimated to exceed 5.5 ksf and the retaining wall may, therefore, be designed per Caltrans XS sheet number 14-220e. Traffic surcharge of 240 pcf should be considered in the retaining wall design. The retaining wall should be provided with a subdrain system in accordance with Caltrans Standard Plan sheet number B3-8.

The pile spacing and diameter for the portion of soundwall on CIDH piles should be designed per Caltrans Standard Plan B-15-8. A soil friction angle value (ϕ) of 30 degrees and Case 2 (level ground on one side and sloping ground on the opposite side) may be used.

4.3.3 SW Nos. 93 and 101

Based on the information collected from our borings, the subsurface soils at the foundation levels for the new soundwalls are expected to generally consist of loose to dense silty sand with gravel.

From the geotechnical data, it appears feasible to support the new soundwalls on CIDH piles. The pile spacing and diameter for the soundwalls should be designed per Caltrans Standard Plan B-15-8. A soil friction angle value (ϕ) of 30 degrees

and Case 2 (level ground on one side and sloping ground on the opposite side) may be used.

4.4 Lateral Earth Pressure and Tieback Design Parameters

A lateral "equivalent-fluid" earth pressure of 37 pcf for an active condition may be used for retaining wall design. This value does not contain an appreciable factor of safety, so the structural engineer should apply the applicable factors of safety and/or load factors during design. A soil unit weight of 125 pcf may be assumed for calculating the actual weight of the soil. In addition to the above lateral pressures from retained earth, lateral pressures from other superimposed loads, such as those from adjacent structures or vehicles, should be added per the Section 6 of the Caltrans Trenching and Shoring Manual.

Resistance to lateral loads can be provided by friction acting at the base of the foundation and by passive earth pressure and should be calculated in accordance with Section 5.6.4 of Bridge Design Specifications (Caltrans, 2004). A coefficient of friction of 0.35 may be used to calculate the frictional resistance. For a 1:2 (vertical:horizontal) sloping condition that exists for the proposed soundwalls, a passive lateral equivalent fluid pressure of 160 psf per foot of depth up to a maximum of 1,200 psf may be used for sides of the foundation poured against competent native soil. Not more than 50 percent of the available passive earth pressure should be considered in the calculation of the lateral load resistance. Additionally, the lateral passive resistance is taken into account only if it is ensured that the soil against embedded structures will remain intact with time.

For seismic loading, an inverted triangular pressure distribution of 22 pcf (equivalent fluid pressure) may be used in addition to the static earth pressures. These seismic earth pressures may be assumed to act at 0.6H from the bottom of the wall and are applicable for both cantilever and braced conditions. Forces resulting from wall inertia effects are expected to be relatively minor for non-gravity walls and may be ignored in estimating the seismic lateral earth pressure.

Based on the plan provided by the structural engineer, the proposed tieback system consists of one row of tieback with 9- to 13-foot horizontal spacing. Each tieback will have the capacity of 25 kips with installation angle of 20 degree from the horizontal. Unbonded and bonded lengths of tieback shown on the plan are 15 feet and 30 feet, respectively.

The soils parameters presented in Table 2 and a friction coefficient of 0.35 between soils and concrete may be used for design of the tieback system. The anchored portion of the tieback should extend into competent material at least 5 feet beyond the critical active failure surface or H/5, where H is the height of the retaining wall, whichever is longer. The minimum unbonded length should be 15 feet. The tieback anchors should be installed at a minimum spacing of three times the diameter of the bond zone or 5 feet, whichever is greater. The preferred installation angle is between 5 and 20 degrees from horizontal to facilitate tendon installation and grouting, and to avoid application of excessive vertical loads that could induce downward movement of the wall.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Removal of Existing Foundations

The northern portion of the existing soundwall (SW No. 15) will be removed and replaced with a new soundwall (SW No. 83) supported on retaining wall or CIDH piles. Based on the as-built plan (Caltrans, 1979b), the southern portion of the soundwall is on a retaining wall (RW No. 77-L) that is supported on a shallow foundation. The northern portion of the existing soundwall does not sit on a retaining wall but is supported on 15-inch diameter, approximately 10 feet long CIDH piles. The existing shallow foundation should be removed prior to construction of the new soundwall. Additionally, the existing CIDH piles should be removed to at least 2 foot below the foundation level and replaced with sand/cement slurry or properly compacted fill. The remnants of the existing piles may create significant construction difficulties with the installation of new piles. Based upon the actual as-built conditions exposed in the field after demolition, some adjustment in planned pile locations may be necessary to ensure adequate clearance from existing piles. The minimum clearance between proposed and existing piles is recommended to be at least 1 foot, but field conditions should be considered in the final determination of pile locations. In addition to the potential for pile offset, drilling difficulties may be encountered where new piles are planned to be located in close proximity to existing piles where the as-built orientation of the existing piles are not plumb.

5.2 CIDH Pile Construction

CIDH piles will be constructed using the conventional soil augering equipment and technique to advance the drilled hole and remove soil cuttings. The drilling operations are recommended to be observed and evaluated by a representative of the geotechnical engineer to allow further evaluation of the actual subsurface conditions. It is anticipated that the construction of CIDH piles for the proposed developments would be feasible using the dry construction method in accordance with the Caltrans Standard Specifications. In the event that the boreholes cannot be maintained open due to the presence of caving sand and/or perched groundwater conditions, temporary casing may be employed to facilitate the construction of the CIDH piles. The installation/removal of temporary casing for borehole stability should be in accordance with the Caltrans Standard Specifications to reduce the potential for adversely affecting the frictional resistance of the soils and thereby reduce the load capacity of the piles.

To maintain a relatively clean hole and to achieve high quality CIDH pile construction, it is recommended that the entire construction operation including drilling of the CIDH pile, lowering of the reinforcing cage, and the concrete placement, be carried out consecutively in the same day. We further recommend that the use of a drop chute or a tremie pipe with pump concrete are to be considered to avoid concrete segregation during CIDH pile construction.

5.3 Groundwater Control

Based on the current and previous field explorations, groundwater levels are expected to be below the depths of construction. Localized perched groundwater may exist at shallower depths on a seasonal basis.

5.4 Temporary Excavations

Excavations for footings and pile caps or other appurtenant structures that are 5 feet or deeper should be laid back or shored in accordance with OSHA requirements before personnel are allowed to enter. For temporary excavations greater than 5 feet in depth that cannot be adequately sloped for stability, some form of temporary external support will be required. In consideration of the type of construction, the most practical method is expected to be excavation bracing. The lateral earth pressure for this type of shoring is estimated as 25H pcf where H is the depth of excavation and the resulting lateral pressure distribution is rectangular pressure. This above lateral pressure is only appropriate for level backfill and a dewatered condition behind the shoring. Shoring should also be designed to resist lateral surcharge from adjacent vehicular traffic, construction equipment, and existing structures.

5.5 Earthwork

Onsite soils to be used as compacted structural fill should be free of organic material and/or construction debris. Any imported fill soil should be approved by the geotechnical engineer prior to placement as fill. Fill soils should be placed in loose lifts not exceeding 8 inches for structural fill placement, moisture-conditioned as necessary to within three percent above optimum, and compacted to a minimum of 90 percent of the maximum density as determined by Caltrans Test 216. Crushed aggregate base should be

compacted to a minimum of 95 percent relative compaction. Subgrade within a depth of 30 inches below the finished grade should also be compacted to at least 95 percent relative compaction.

5.6 Additional Geotechnical Services

The proposed construction involves various activities that would require geotechnical observation and testing. These include:

- Placement of compacted fill;
- CIDH pile installation for soundwalls
- Footing excavation for retaining wall; and
- Backfill of retaining wall.

These and other soils related activities should be observed and tested by a qualified representative of the geotechnical engineer.

Geotechnical recommendations presented in this report are based on the conditions encountered at the test boring locations and information gained from review of as-built plans as well as our understanding of the current project plan. Our recommendations should be revised, as necessary, based on the actual soil condition and any modification of the current plans, and incorporated into the final design plans and specifications. Conclusions and recommendations presented in this report should be reviewed and verified by the geotechnical engineer during site construction and revised accordingly, if exposed geotechnical conditions vary from our current understanding and interpretations.

6.0 REFERENCES

Athalye Consulting Engineering Services, Inc., 2008, Draft Structure Type Selection Report, I-5/ El Camino Real UC (Br. No 55-0203) Soundwall Addition, 12-ORA-5, PM 1.10/1.70, EA 0G-9401, CU 12, dated April 16, 2008.

California Department of Transportation (Caltrans), 1990, "Memo to Designers 5-12".

_____, 1957, As-Built Plans for El Camino Real Undercrossing, Caltrans Contract No 58-7VC10 and Document No 70002057

_____, 1979a, As-Built Plans for El Camino Real Undercrossing (Widening), Caltrans WO 105271 and CU 07209

_____, 1979b, As-Built Plans for Soundwall No. 15 & Retaining Wall No. 77-L, Caltrans WO 105271 and CU 07209

_____, 2003, Corrosion Guidelines, Version 1.0, September 2003.

_____, 2004, "Bridge Design Specifications", September 2004.

_____, 2006a, "Standard Specification", May 2006.

_____, 2006b, "Seismic Design Criteria," Version 1.3, February 2006.

_____, 2006c, " Highway Design Manual", revised on September 1, 2006.

California Division of Mines and Geology (CDMG), 2002, Seismic Hazard Zone Report for the San Clemente 7.5-Minute Quadrangle, Orange County, California, Seismic Hazard Zone Report 062.

_____, 2002, Seismic Hazard Zone Map for the San Clemente Quadrangle, June 21, 2002.

Cao, T., Bryant, W.A., Rowshandel, B., Branum, D., and Wills, C.J., 2003, The Revised 2002 California Probabilistic Seismic Hazard Maps, dated June 2003, 11p. Accessible at http://www.consrv.ca.gov/cgs/rghm/psha/index.htm

Hart, E.W. and Bryant, W.A., 1999, Fault Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps: California Division of Mines and Geology, Special Publications 42, 38p.

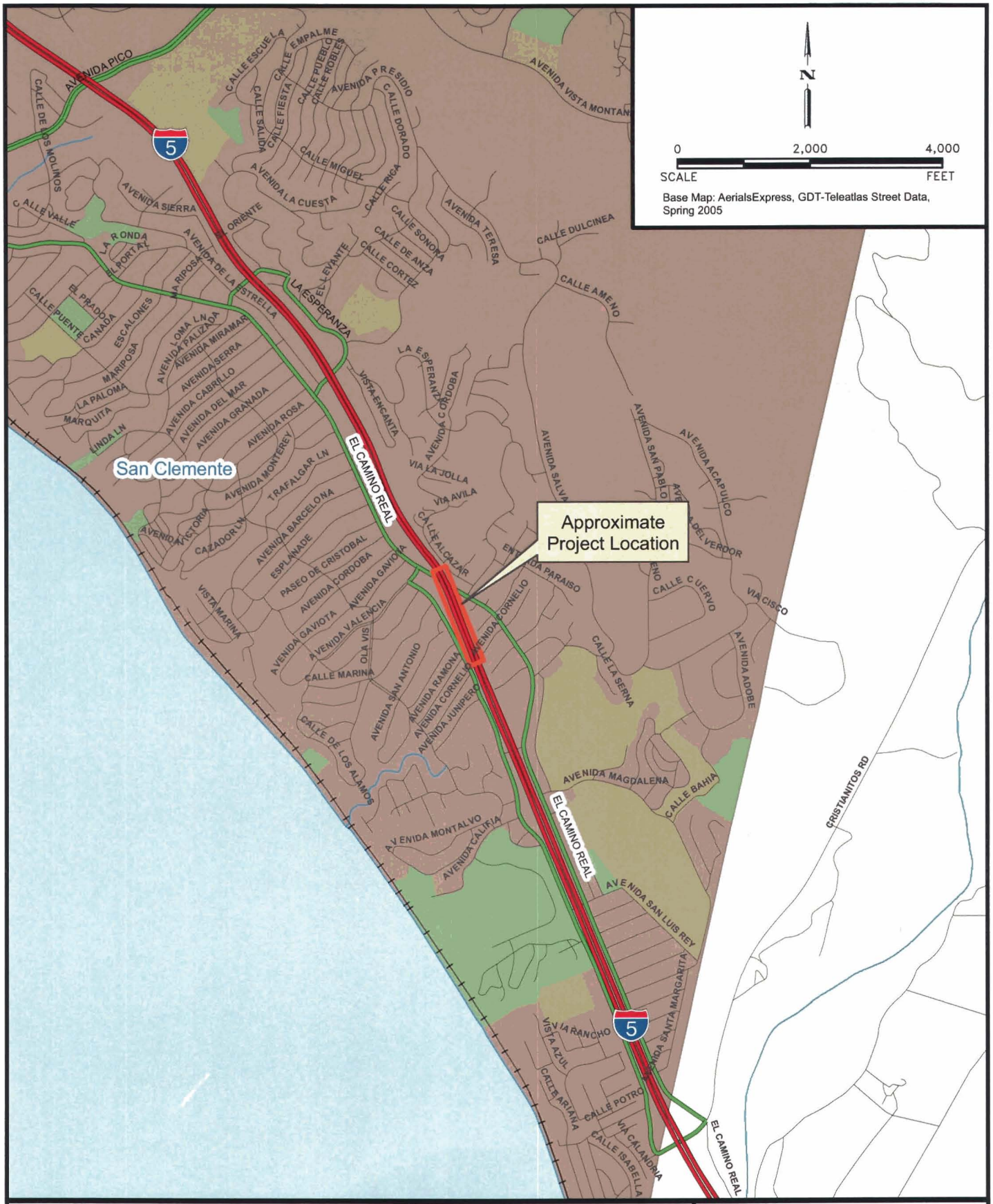
Mualchin, L., 1996, California Seismic Hazard Map

Mualchin, L., and Jones, A.L., 1992, Peak Acceleration from Maximum Credible Earthquakes in California: California Department of Conservation, Division of Mines and Geology Open-File Report 92-01.

O'Neill, M.W., and Reese, L.C., 1999, Drilled Shafts: Construction Procedures and Design Methods prepared for U.S. Department of Transportation, Federal Highway Administration, Office of Infrastructure, Washington D.C., 1999

NAVFAC 1986, Foundations and Earth Structures, Department of the Navy, Naval Facilities Engineering Command, DM7.2, p.7.2-60, May 1986.

Sadigh, K., Chang C.-Y., Egan, J.A., Makdisi, F., Youngs, R.R., 1997, Attenuation Relationships for Shallow Crustal Earthquakes Based on California Strong Motion Data: Seismological Research Letters, Volume 68, No. 1, pp.180-189.



I-5 and El Camino Real Soundwall
City of San Clemente, California

SITE LOCATION MAP

Project No.
602171-001

Date
June 2008

Figure 1

\\GIS\Administration\ArcGISTemplates\NEW_GDT_SiteLocationMap.mxd

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

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	Ora	5	1.30/1.70		

REGISTERED PROFESSIONAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — DIAN CHANDRA — No. 2376 — Exp. 6/30/09 — GEOTECHNICAL — STATE OF CALIFORNIA

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 SOUTH MAIN STREET
ORANGE, CA 92863

LEIGHTON CONSULTING INC.
17781 COWAN
IRVINE, CA 92614

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

CONSISTENCY OF COHESIVE SOILS

Description	Unconfined Compressive Strength (tsf)	Pocket Penetrometer Measurement (tsf)	Torvane Measurement (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 to 0.50	0.25 to 0.50	0.12 to 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 to 1.0	0.50 to 1.0	0.25 to 0.50	Penetrated several inches by thumb with moderate effort
Stiff	1 to 2	1 to 2	0.50 to 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2 to 4	2 to 4	1.0 to 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

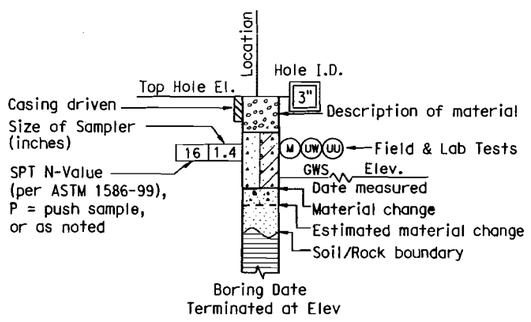
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (1-inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

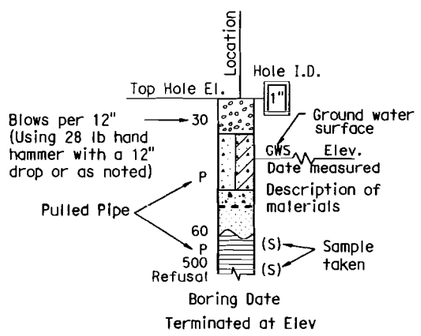
Note: Size in inches.

PLASTICITY OF FINE-GRAINED SOILS

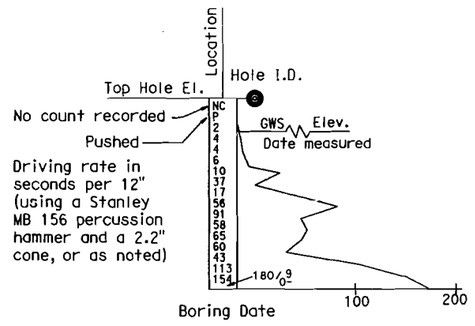
Description	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



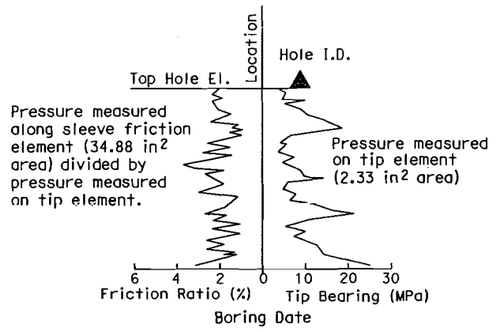
DRY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

FIGURE 2 (SHEET 1 OF 9)

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	SOIL LEGEND
PREPARED BY	BUU TRAN		DESIGN BRANCH	POST MILE 1.30/1.70	LOG OF TEST BORINGS 1 OF 9
CHECKED BY	T. KIM		CU 12231 EA 0G9401	DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES / SHEET / OF

GS LOTB SOIL LEGEND

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

FILE => P:\Drafting\602171\001\of_2008-05-26\Figure-2_sheet-1of9.dgn

USERNAME => bruce

DATE PLOTTED => 9/11/2008

TIME PLOTTED => 3:08:18 PM

I-136(18) I-0806(5)

FED. ROAD DIV. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	CAL.			120	123

DIST.	COUNTY	ROUTE	POST MILE	SHEET NO.	TOTAL SHEETS
VII	Ora	5	SCIe	10	13

OFFICE OF STRUCTURE FOUNDATIONS-ENGINEERING SERVICES CENTER

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, licence number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. It does not attest to the accuracy or validity of the information contained in the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	MILE POST-TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	5	1.30/1.70		

REGISTERED ENGINEER-GEOTECHNICAL

I-5/EL CAMINO REAL SOUNDWALL

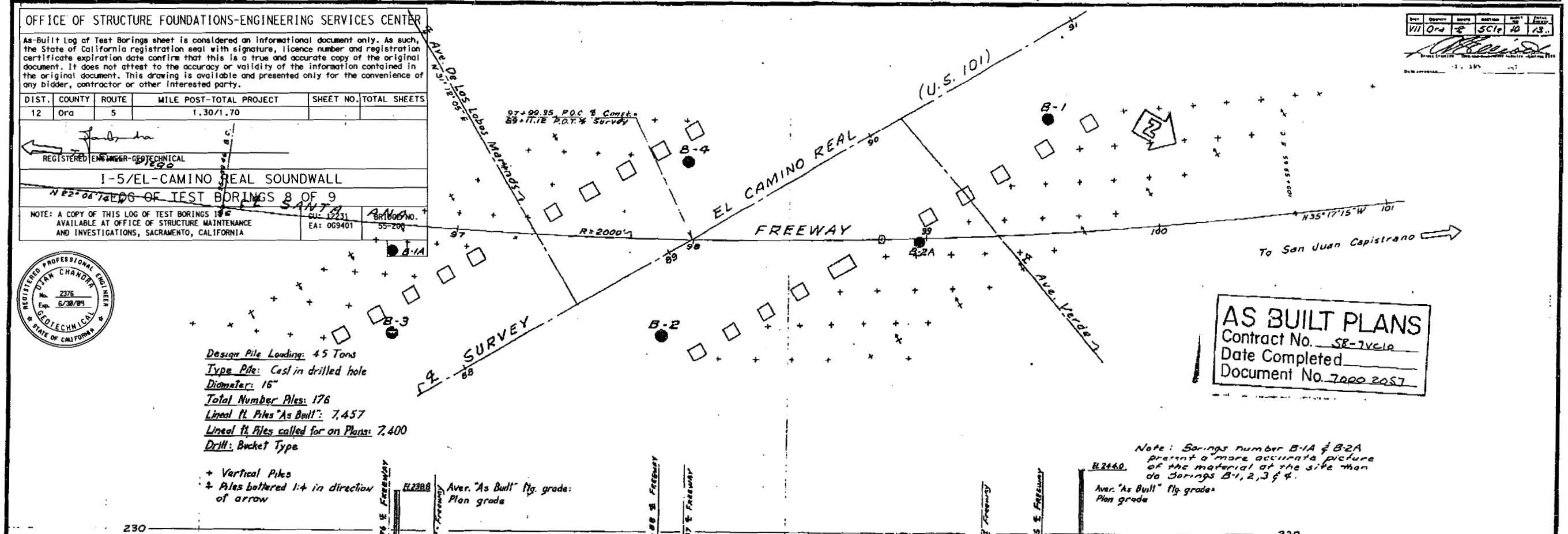
LOGS OF TEST BORINGS 8 OF 9

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

CU: 12231
EA: 069401

BRIDGE NO. 55-209

REGISTERED PROFESSIONAL ENGINEER — DEAN CHANDER — No. 2376 — Exp. 6/30/89 — GEOTECHNICAL — STATE OF CALIFORNIA

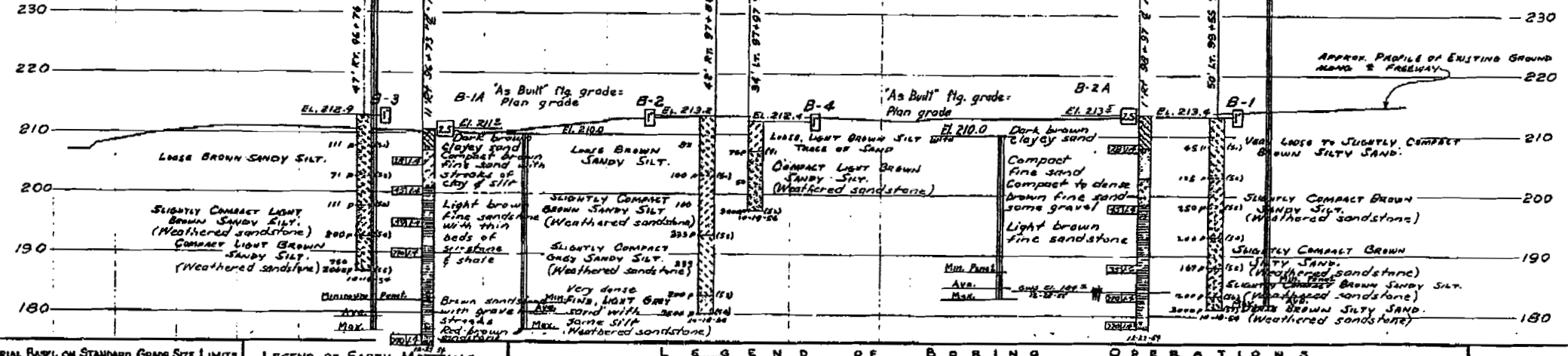


AS BUILT PLANS
Contract No. 58-7VC10
Date Completed
Document No. 7000 2057

Design Pile Loading: 45 Tons
Type Pile: Cast in drilled hole
Diameter: 16"
Total Number Piles: 176
Lineal ft. Piles "As Built": 7,457
Lineal ft. Piles called for on Plans: 7,400
Drill: Bucket Type

+ Vertical Piles
‡ Piles battered 1:4 in direction of arrow

Note: Borings number B-1A & B-2A present a more accurate picture of the material at the site than do Borings B-1, 2, 3 & 4.



AS BUILT
℄ 58-7VC10-FI
ENGR. J. L. Burnside
Sept 17, 1958

B.M. #10-SCIe-54
L & T. in P.C.C. Curb & side 101 Hwy., 105' N of Inter. Ave. Verde & 101 Hwy.
Elev. 213.34 Destroyed

B.M. #11-SCIe-54
L & T. in P.C.C. Curb & Side Ave Santiago, 118' E. Hwy 101.
Elev. 204.82

Test Borings By Bridge Dept.

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

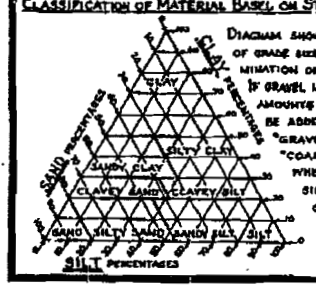


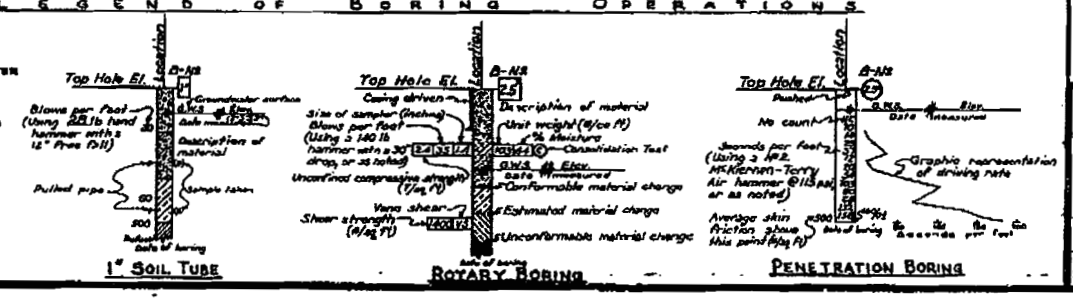
Diagram showing the basis for estimates of grade size distribution used in determination of class names. If gravel is present in appreciable amounts the term "gravelly" may be added to the class name, viz. "gravelly sand." The terms "coarse", "medium" and "fine" when used to describe sand, silt and gravel refer to standard grade size limits.

LEGEND OF EARTH MATERIALS

- Gravel
- Sand
- Silty
- Clay
- Sandy Clay or Clayey Sand
- Sandy Silt or Silty Sand
- Silty Clay or Clayey Silty
- Peat and/or Organic Matter
- Fill Material
- Igneous Rock
- Sedimentary Rock
- Metamorphic Rock

LEGEND OF BORING OPERATIONS

- Plan of any boring
- Penetrometer
- 2½" Cone Penetrometer
- Sampler boring (dry)
- Rotary boring (wet)
- Auger boring (dry)
- Jet boring
- Core boring
- Test pit



NOTES

The contractor's attention is directed to Section 2, Article (c) of the Standard Specifications and to the Special Provision accompanying this set of plans.

Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

EL CAMINO REAL U.C.

LOG OF TEST BORINGS

SCALE Horiz. 1"=20' Vert. 1"=10'	BRIDGE 55-203	FILE E-55	DRAWING C-3719-10

3719 ℄ 28

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 4/21/[illegible] SIGNATURE [illegible] TITLE [illegible]

BRIDGE DEPARTMENT

120

CALTRANS DESIGN ARS SPECTRUM — **Figure No. 3**

Project:	I-5/El Camino Real Soundwalls	Calculation by: TK	Date: 5/22/2008
Project Number:	602171-001		
Location:	San Clemente	Reviewed by: DJC	Date: 5/22/2008

SEISMIC DESIGN CRITERIA, JUNE 2006 - VERSION 1.4

Seismic Parameters

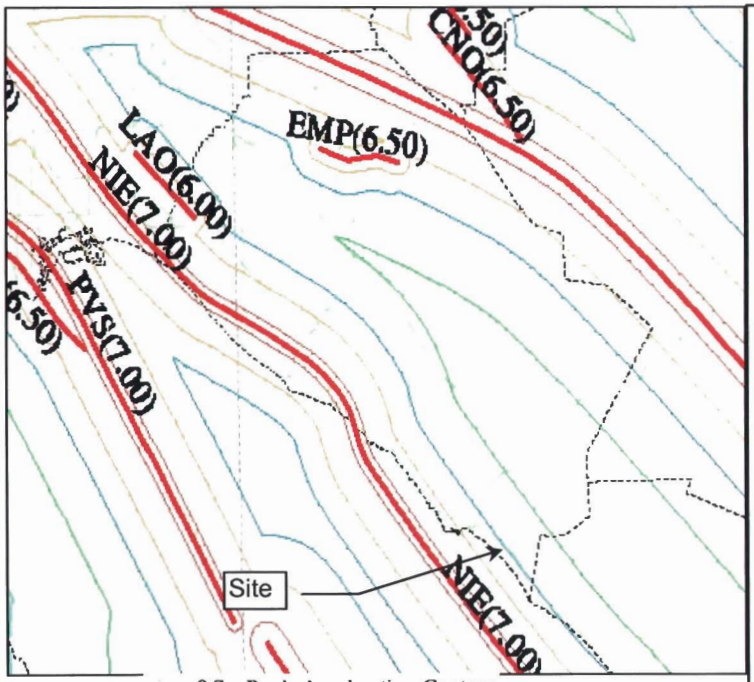
	Nearest Fault	NIE	NEWPORT- INGLEWOOD-ROSE CANYON/E
	Fundamental Period of Vibration	NA	second
PBA	Peak Bedrock Acceleration	0.40	*g*
M_w	Magnitude	7	
r_{rup}	Distance to Rupture Plane	7.3	*km*
S	NEHRP Soil Type	D	*Firm soil*
	Fault Type:	ST	*Strike-Slip fault*
	Verification Calculation		
	Sadigh et al. (1993, 1997)	0.44	*g*

Adjustment of Standard Curve

For preliminary design of structures within 15 km of an active fault:

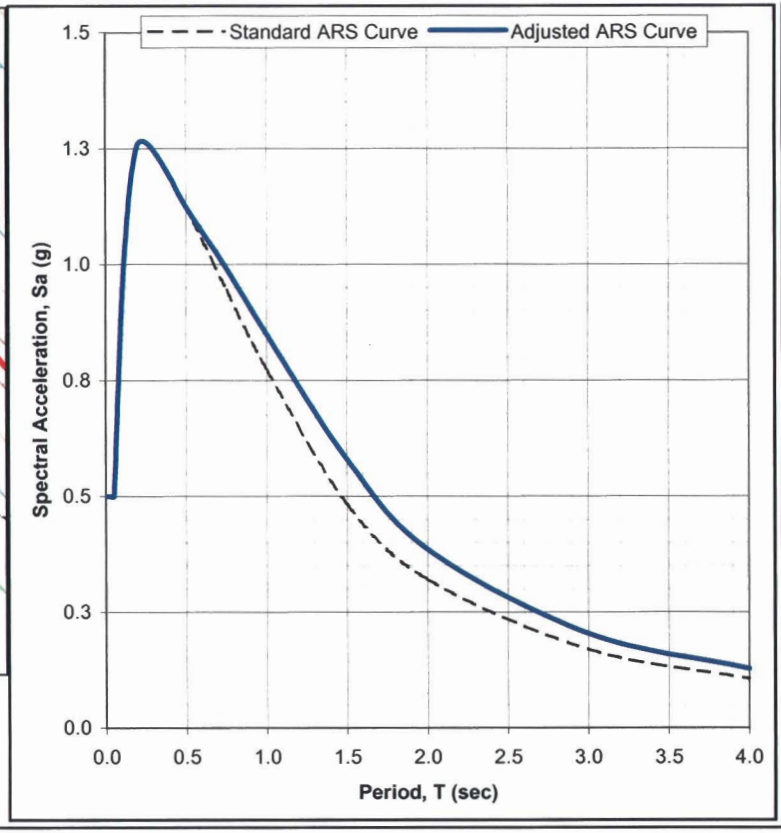
- No increase in Sa for T ≤ 0.5 second
- Increase Sa values 20% for T ≥ 1.0 second
- Linear interpolate for 0.5 ≤ T ≤ 1.0 second

- Fundamental Period of Vibration T≥1.5 second on deep soil site
  - Increase Sa values 20% for T ≥ 1.5 second
  - Linear interpolate for 0.5 ≤ T ≤ 1.5 second



Legend:

- 0.7g Peak Acceleration Contour
- 0.6g Peak Acceleration Contour
- 0.5g Peak Acceleration Contour
- 0.4g Peak Acceleration Contour
- 0.3g Peak Acceleration Contour
- 0.2g Peak Acceleration Contour
- 0.1g Peak Acceleration Contour
- Special Seismic Source (SSS)
- Faults with Fault Codes (MCE)



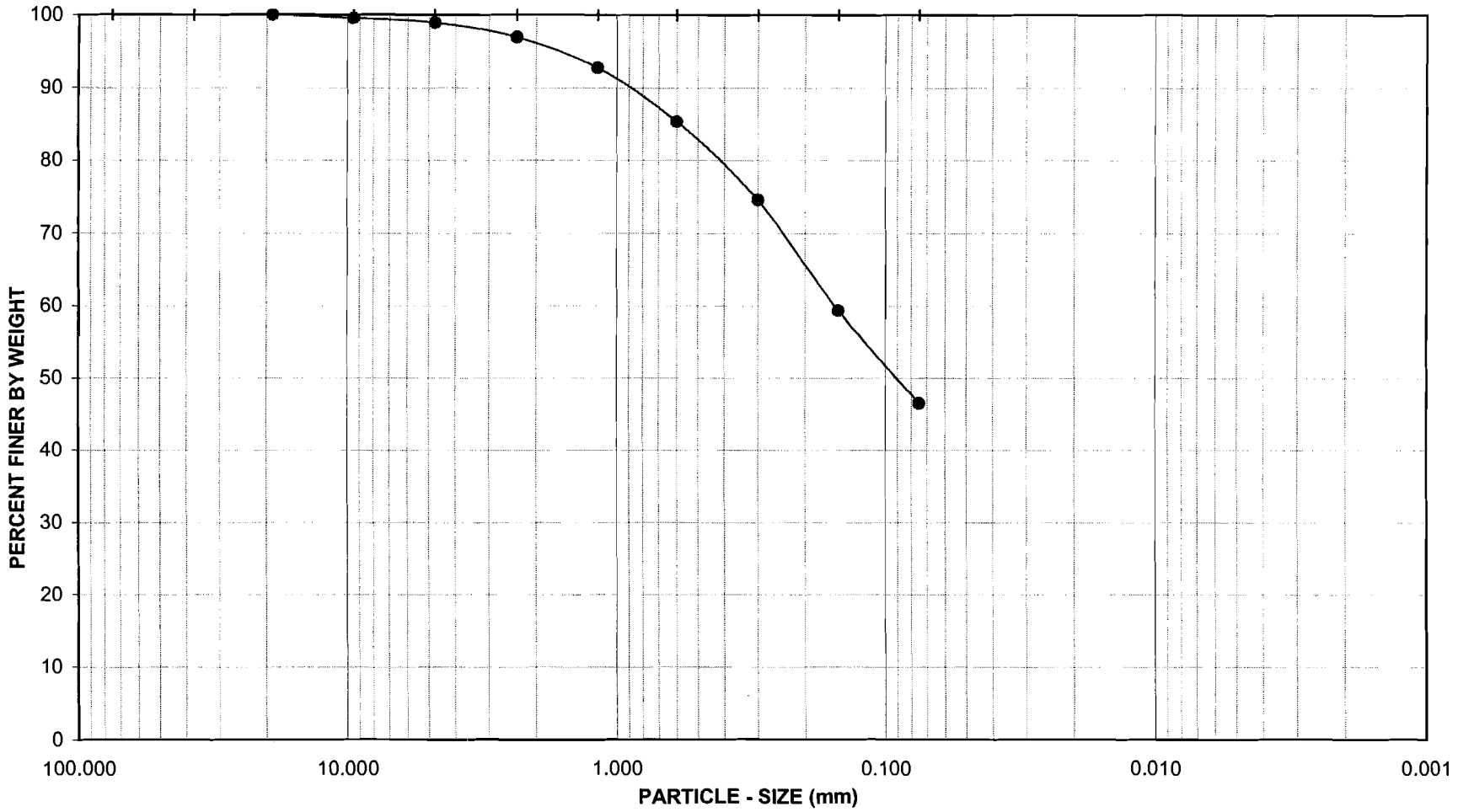
PERIOD T (s)	STANDARD ARS CURVE Sa (g)	ADJUSTED ARS CURVE Sa (g)
0.01	0.500	0.500
0.02	0.500	0.500
0.03	0.500	0.500
0.05	0.500	0.500
0.08	0.719	0.719
0.10	0.919	0.919
0.12	1.037	1.037
0.15	1.156	1.156
0.17	1.209	1.209
0.20	1.259	1.259
0.24	1.266	1.266
0.30	1.247	1.247
0.40	1.190	1.190
0.50	1.125	1.125
0.75	0.944	0.991
1.00	0.772	0.849
1.50	0.484	0.581
2.00	0.321	0.386
3.00	0.170	0.204
4.00	0.106	0.128

APPENDIX A

GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

U.S. STANDARD SIEVE OPENING | U.S. STANDARD SIEVE NUMBER | HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: I-15 / El Camino Real Sound Wall

Project No.: 602171-001

Exploration No.: LB-5 Sample No.: Bag-1

Depth (feet): 0-5 Soil Type : SC

Soil Identification: Olive brown clayey sand (SC)

GR:SA:FI : (%) 1 : 52 : 47

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

Jun-08

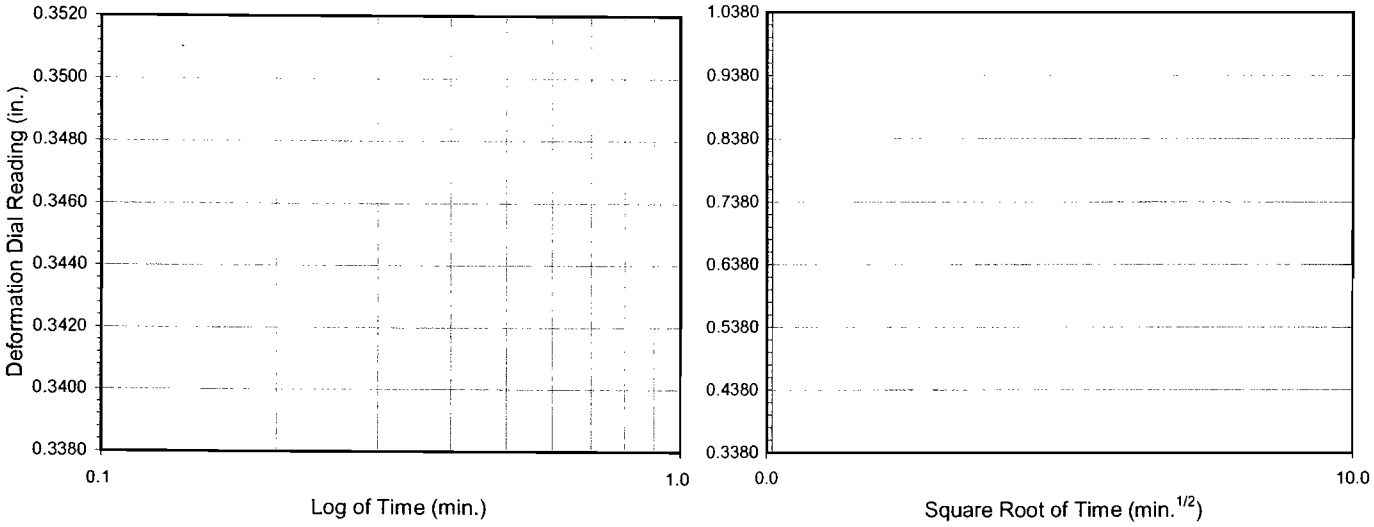
Boring No.	LB-5	LB-5						
Sample No.	S-3	S-4						
Depth (ft.)	25	30						
Sample Type	SPT	SPT						
Soil Identification	Olive brown clayey sand (SC)	Olive brown sandy clay (CL)						
Moisture Correction								
Wet Weight of Soil + Container (g)	0.00	0.00						
Dry Weight of Soil + Container (g)	0.00	0.00						
Weight of Container (g)	1.00	1.00						
Moisture Content (%)	0.00	0.00						
Sample Dry Weight Determination								
Weight of Sample + Container (g)	650.80	627.50						
Weight of Container (g)	108.40	110.20						
Weight of Dry Sample (g)	542.40	517.30						
Container No.:								
After Wash								
Method (A or B)	B	B						
Dry Weight of Sample + Cont. (g)	427.10	306.90						
Weight of Container (g)	108.40	110.20						
Dry Weight of Sample (g)	318.70	196.70						
% Passing No. 200 Sieve	**41.2**	**62.0**						
% Retained No. 200 Sieve	58.8	38.0						

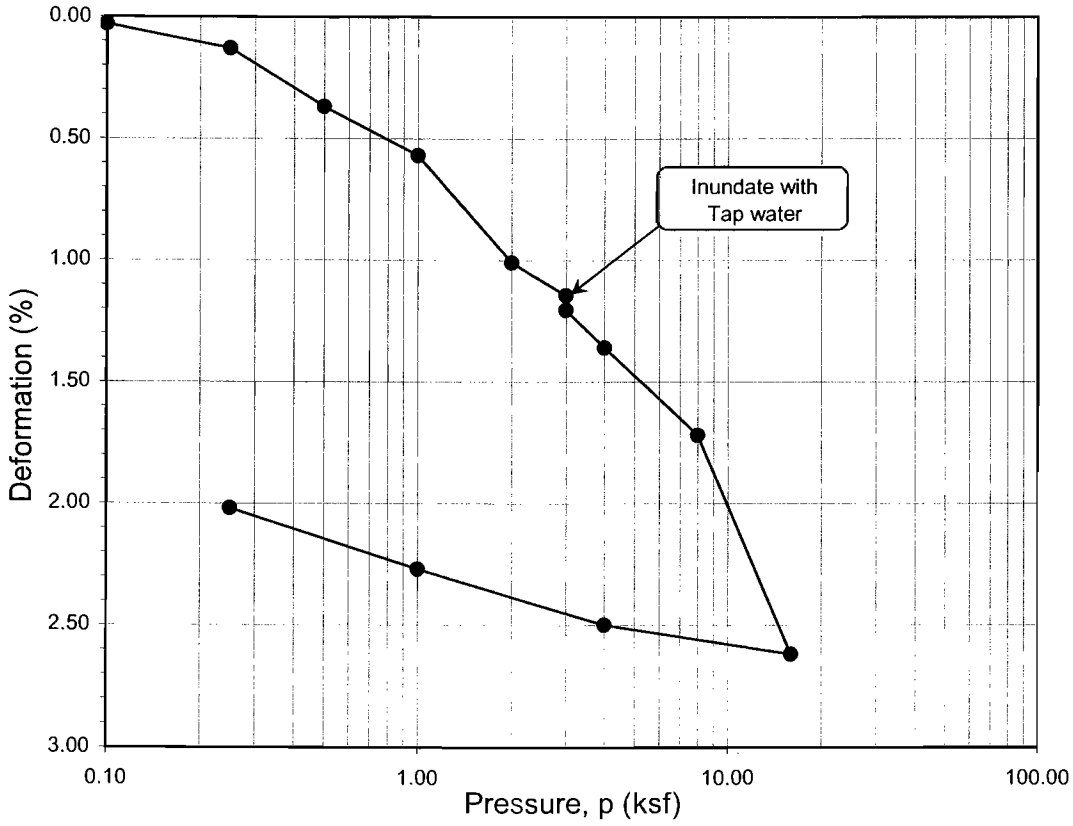
Leighton

PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name: I-5 / El Camino Real Sound Wall
Project No.: 602171-001
Client Name: LCI / Irvine
Tested By: G. Bathala Date: 05/01/08

No Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-1	**R-2**	**5.0**	**9.5**	**9.9**	**125.1**	**126.6**	**0.347**	**0.320**	**74**	**81**

Soil Identification: Dark brown silty sand (SM)

Leighton

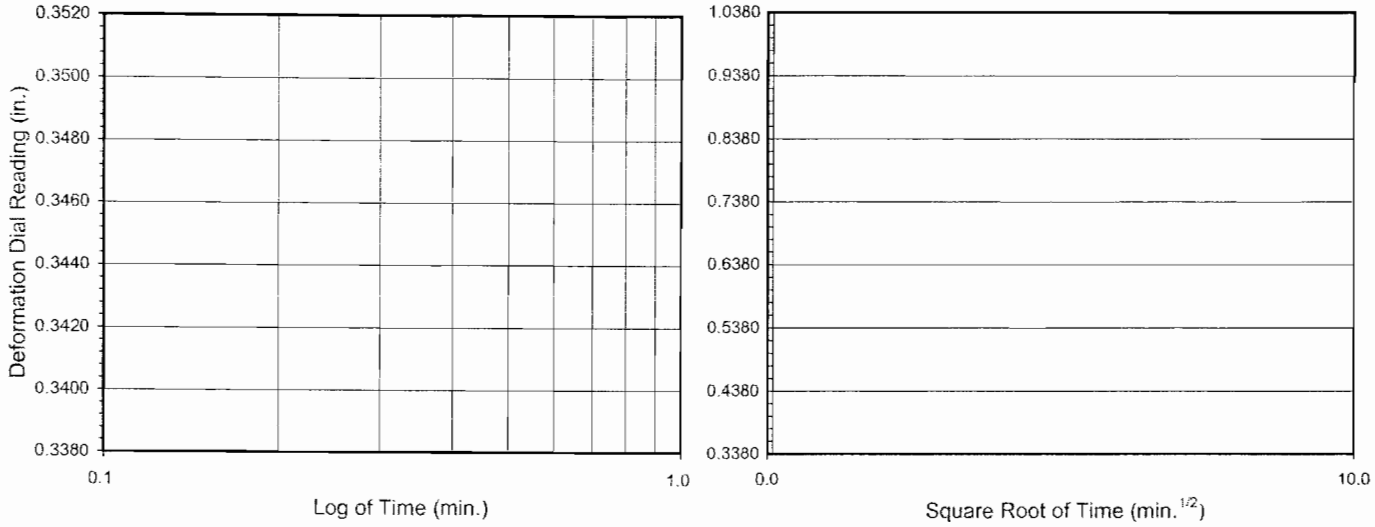
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
(ASTM D 2435)

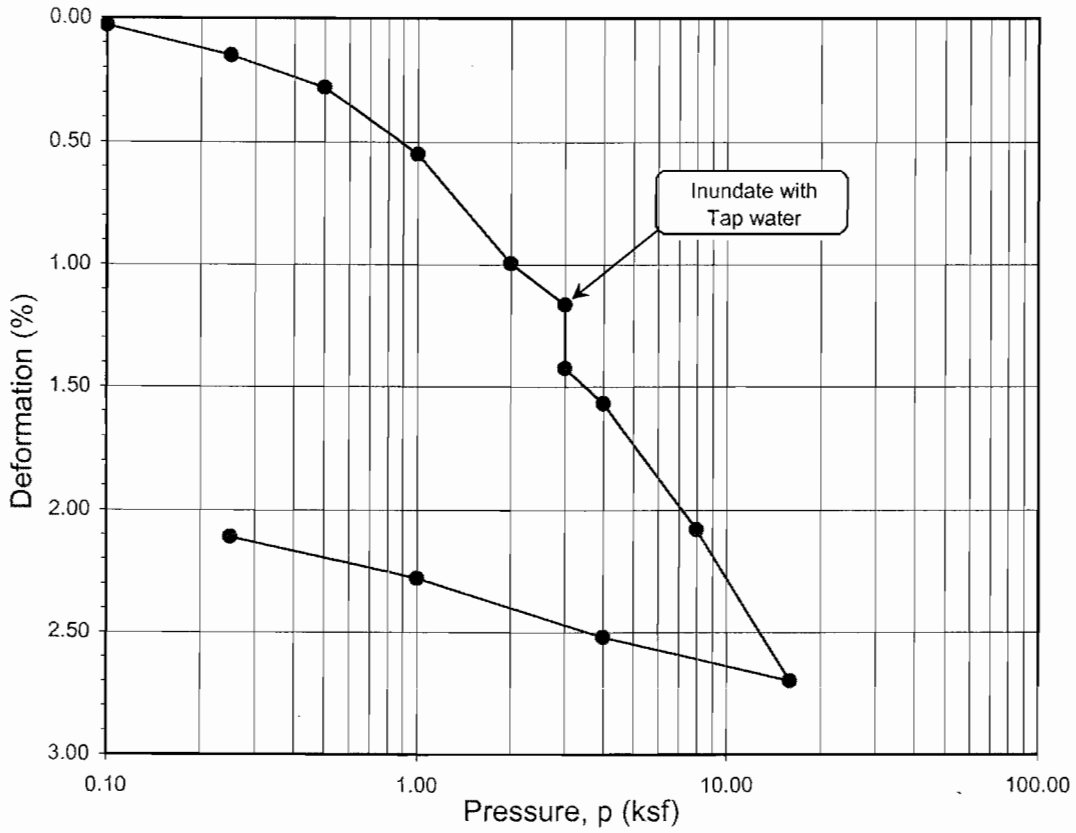
Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08

No Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-3	**R-2**	**5.0**	**9.1**	**8.3**	**131.6**	**135.1**	**0.281**	**0.254**	**87**	**90**

Soil Identification: Dark grayish brown silty sand (SM)

Leighton

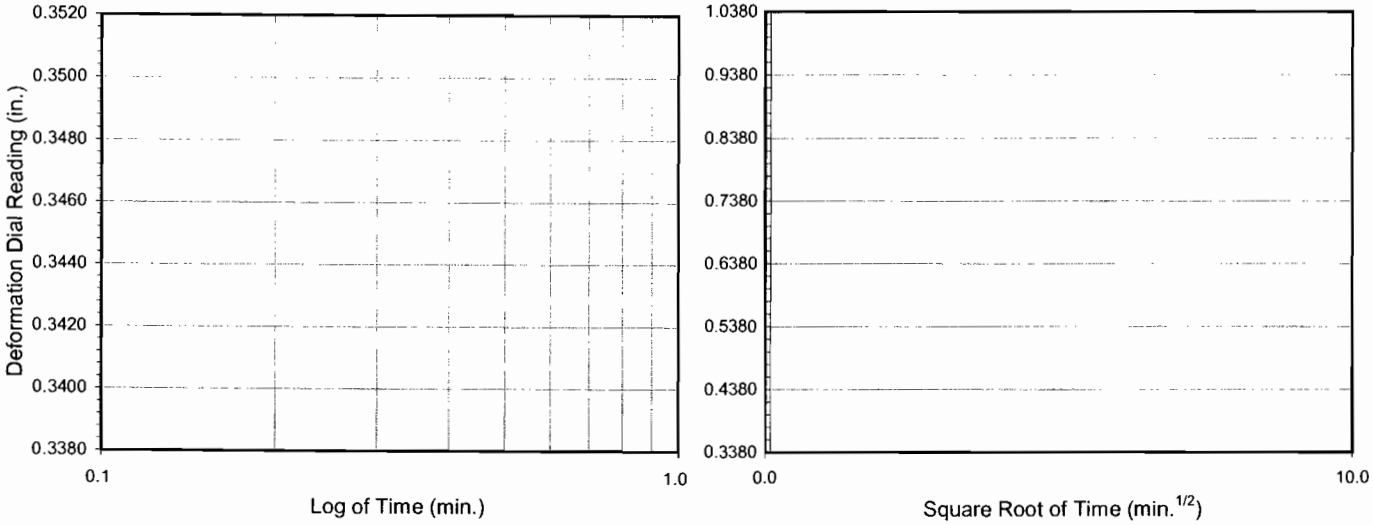
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
(ASTM D 2435)

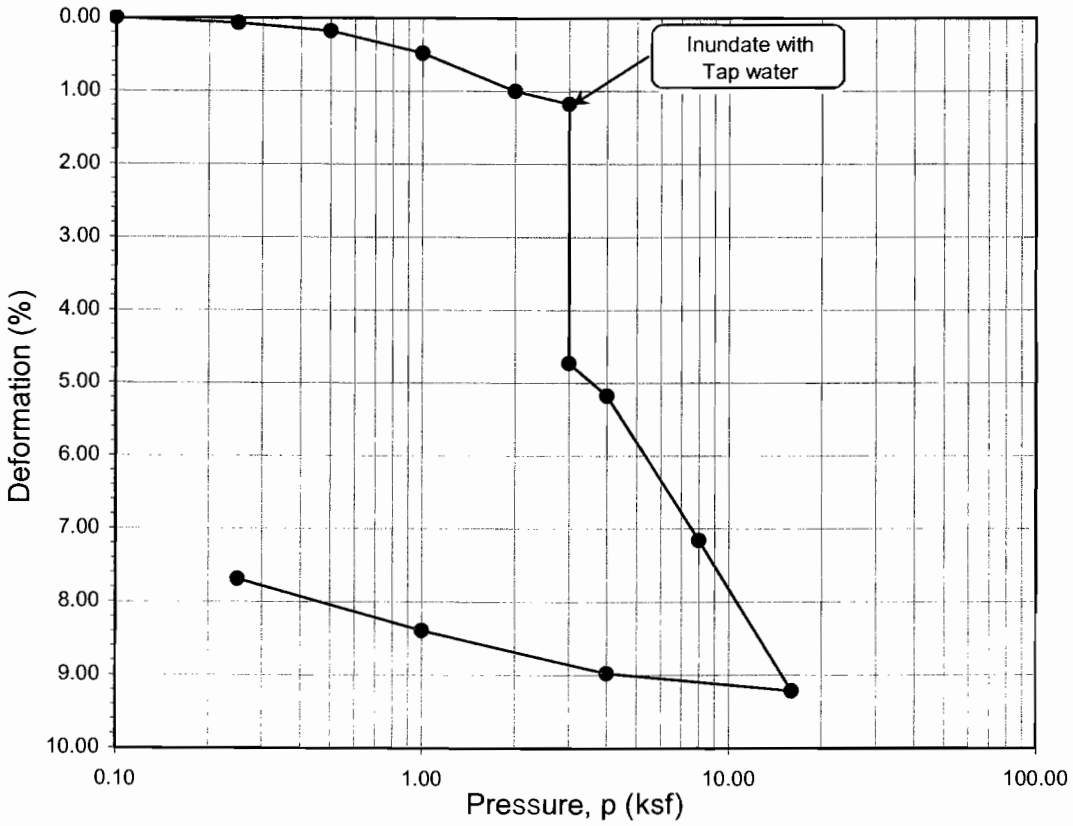
Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08

No Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-4	**R-3**	**7.5**	**6.7**	**13.6**	**113.0**	**121.2**	**0.492**	**0.377**	**37**	**94**

Soil Identification: Olive light brown Clayey Sand (SC) with gravel

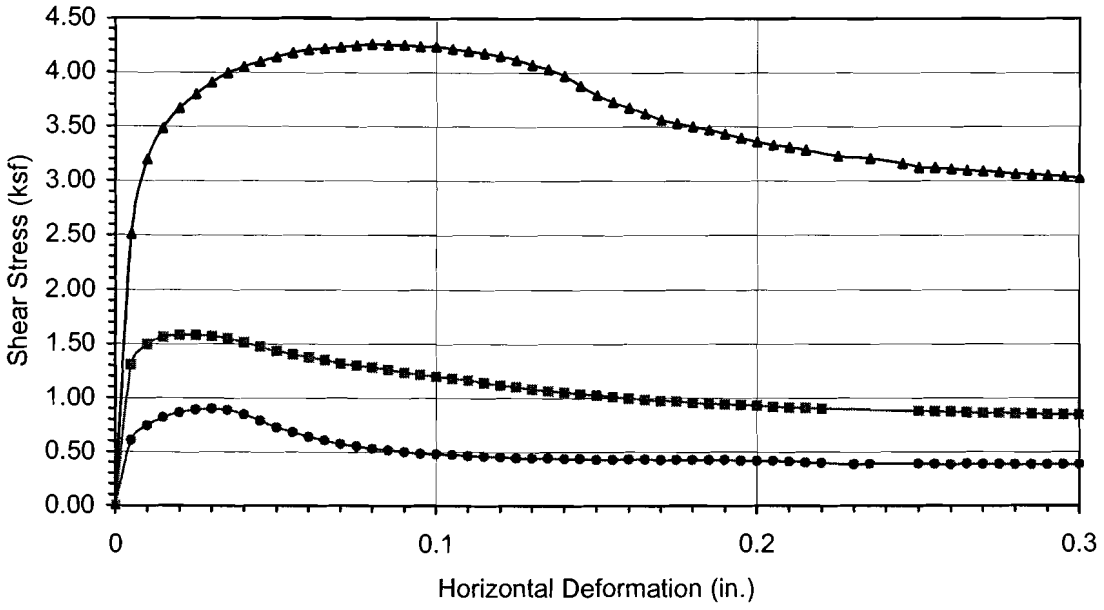
Leighton

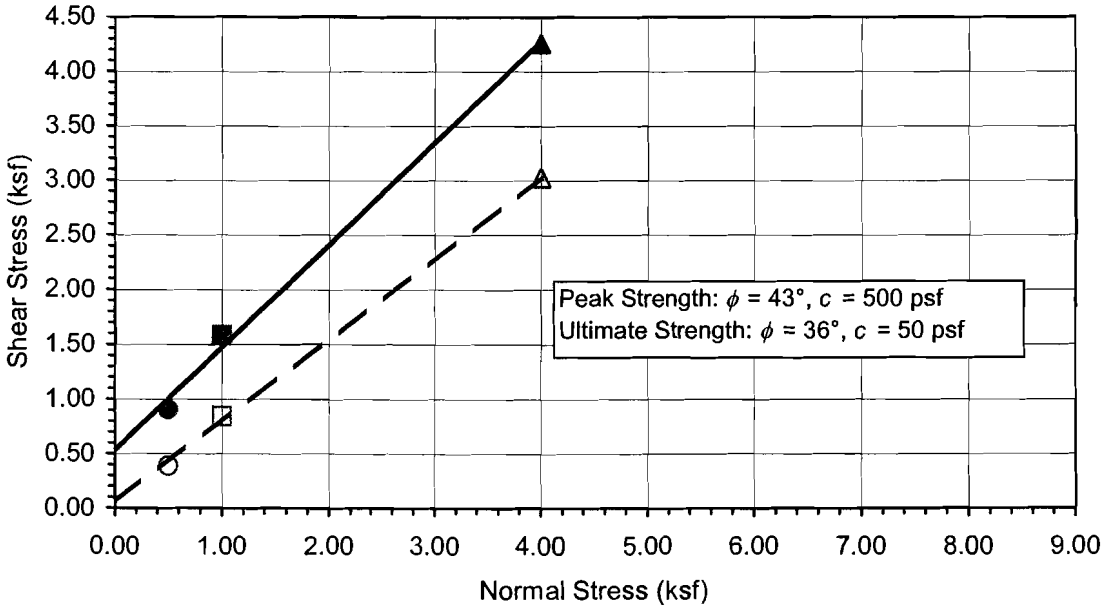
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
(ASTM D 2435)

Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08





Boring No.	**LB-1**
Sample No.	**R-4**
Depth (ft)	**20**
Sample Type: Drive	
Soil Identification: Dark brown sandy lean clay s(CL)	

Normal Stress (kip/ft²)	0.500	1.000	4.000
Peak Shear Stress (kip/ft²)	● 0.899	■ 1.581	▲ 4.260
Shear Stress @ End of Test (ksf)	○ 0.384	□ 0.843	△ 3.027
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	14.93	14.93	14.93
Dry Density (pcf)	109.7	110.7	114.4
Saturation (%)	75.1	77.1	85.2
Soil Height Before Shearing (in.)	1.0024	0.9990	0.9890
Final Moisture Content (%)	17.5	18.3	16.2

Leighton

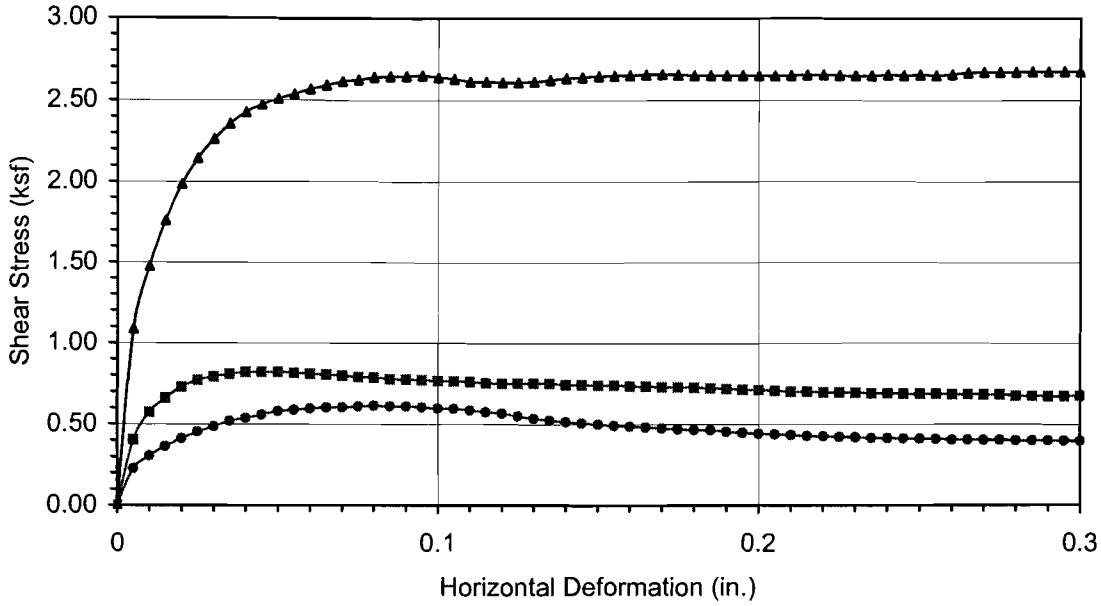
DIRECT SHEAR TEST RESULTS
Consolidated Undrained

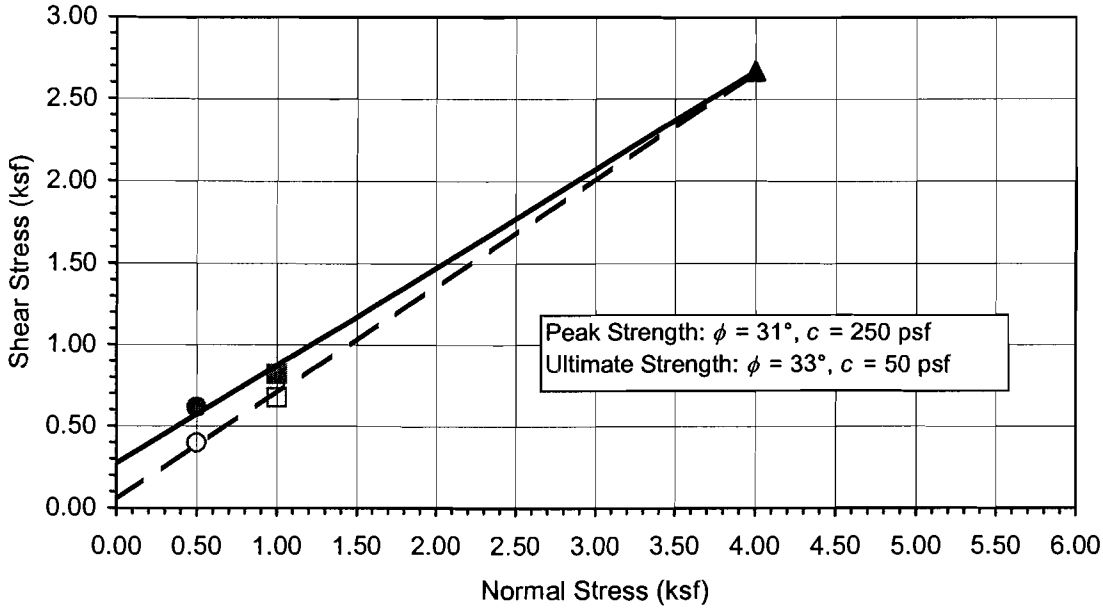
Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08

DS B-1 R-4





Boring No.	**LB-2**
Sample No.	**R-6**
Depth (ft)	**35**
Sample Type: Drive	
Soil Identification: Dark brown silty sand (SM)	

Normal Stress (kip/ft²)	0.500	1.000	4.000
Peak Shear Stress (kip/ft²)	● 0.613	■ 0.820	▲ 2.673
Shear Stress @ End of Test (ksf)	○ 0.396	□ 0.675	△ 2.670
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	9.62	9.62	9.62
Dry Density (pcf)	104.6	106.5	107.8
Saturation (%)	42.4	44.5	46.1
Soil Height Before Shearing (in.)	0.9940	0.9926	0.9744
Final Moisture Content (%)	15.4	14.7	14.4

Leighton

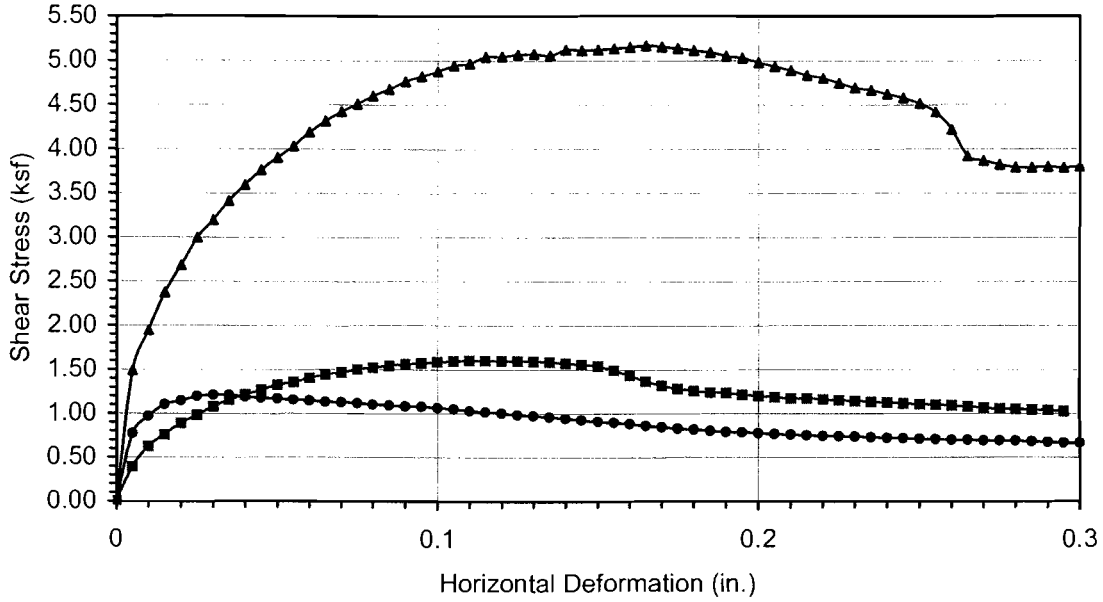
DIRECT SHEAR TEST RESULTS
Consolidated Undrained

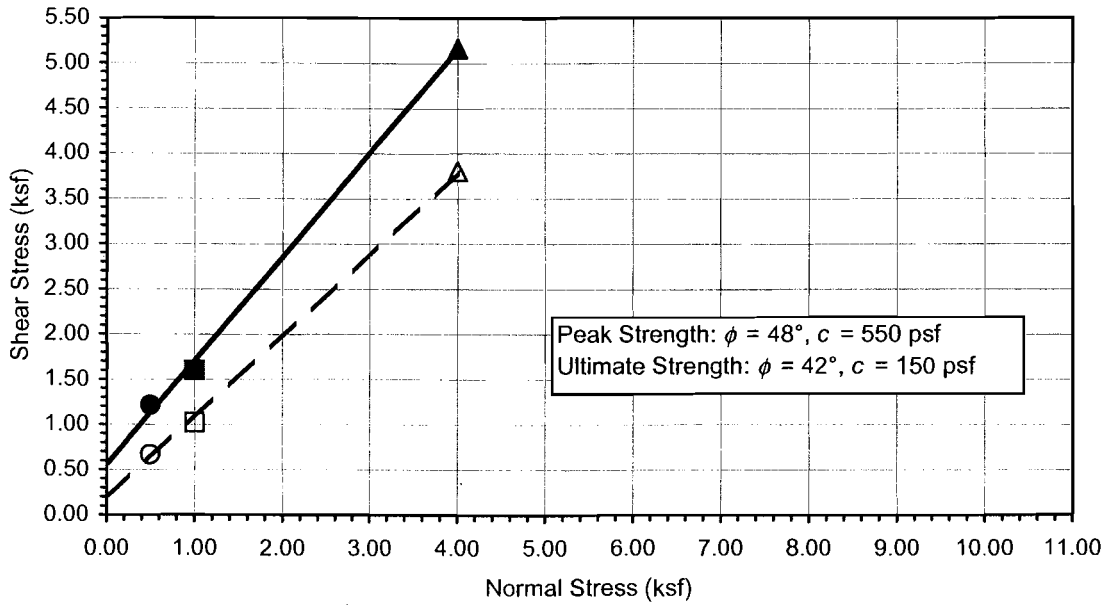
Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08

DS B-2 R-6





Boring No.	**LB-4**
Sample No.	**R-4**
Depth (ft)	**15**
Sample Type: Drive	
Soil Identification: Brown sandy lean clay s(CL)	

Normal Stress (kip/ft²)	0.500	1.000	4.000
Peak Shear Stress (kip/ft²)	● 1.212	■ 1.602	▲ 5.167
Shear Stress @ End of Test (ksf)	○ 0.666	□ 1.024	△ 3.804
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	7.52	7.52	7.52
Dry Density (pcf)	125.7	122.4	126.3
Saturation (%)	59.6	53.9	60.7
Soil Height Before Shearing (in.)	1.0300	1.0000	0.9917
Final Moisture Content (%)	17.0	15.0	13.9

Leighton

DIRECT SHEAR TEST RESULTS

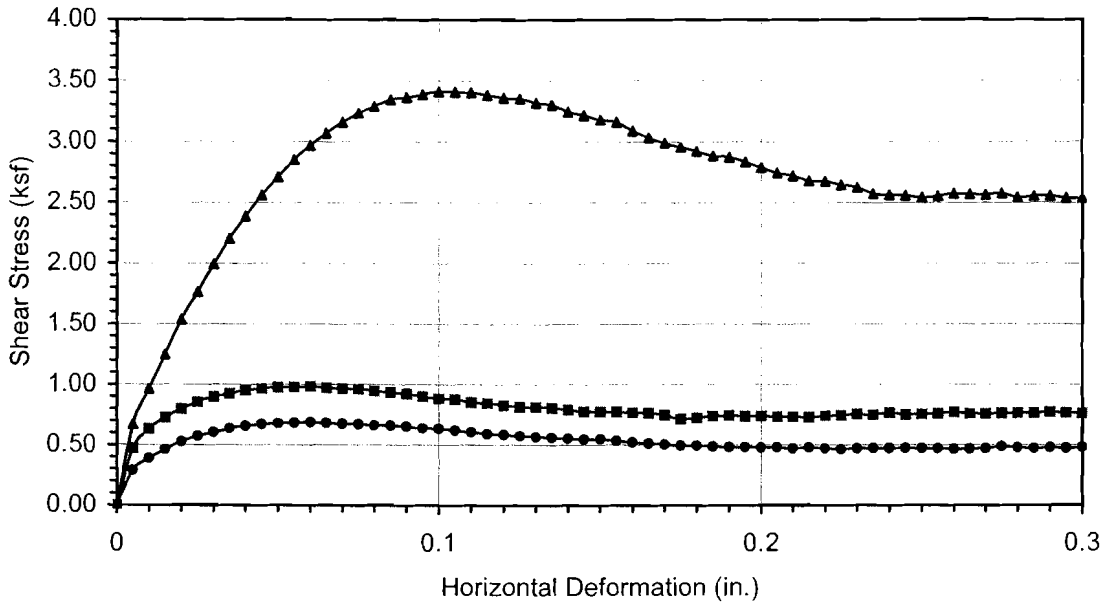
Consolidated Undrained

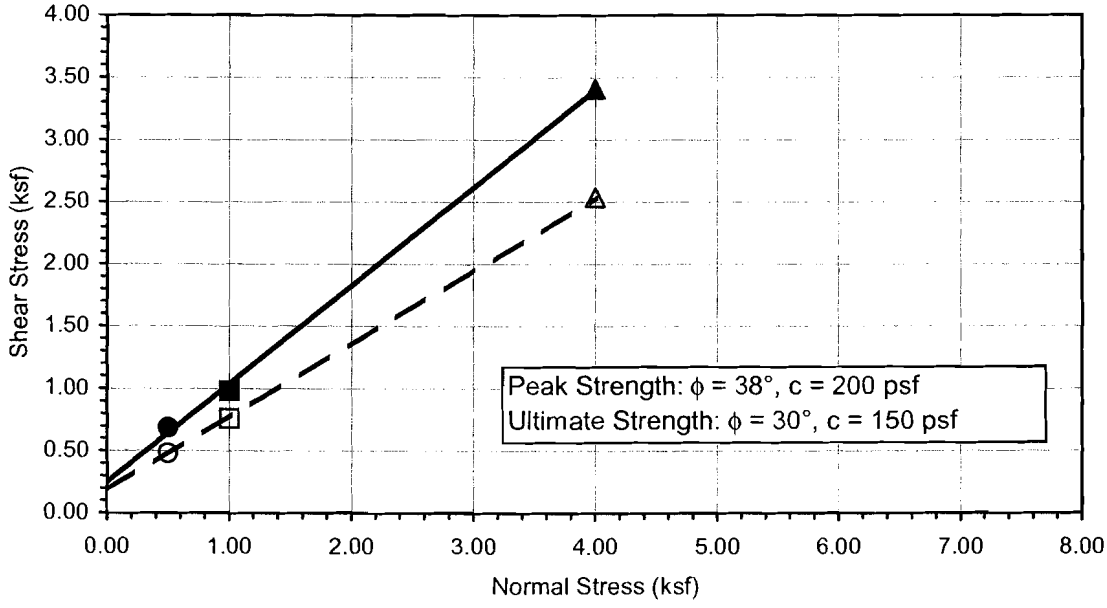
Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08

DS B-4 R-4





Boring No.	**LB-5**
Sample No.	**R-3**
Depth (ft)	**10**
Sample Type: Drive	
Soil Identification: Yellowish brown poorly graded sand with clay (SP-SC)	

Normal Stress (kip/ft²)	0.500	1.000	4.000
Peak Shear Stress (kip/ft²)	● 0.685	■ 0.981	▲ 3.408
Shear Stress @ End of Test (ksf)	○ 0.478	□ 0.758	△ 2.537
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	7.81	7.81	7.81
Dry Density (pcf)	114.2	116.1	119.2
Saturation (%)	44.4	46.7	51.0
Soil Height Before Shearing (in.)	0.9980	0.9894	0.9855
Final Moisture Content (%)	15.1	14.0	13.7

Leighton

DIRECT SHEAR TEST RESULTS

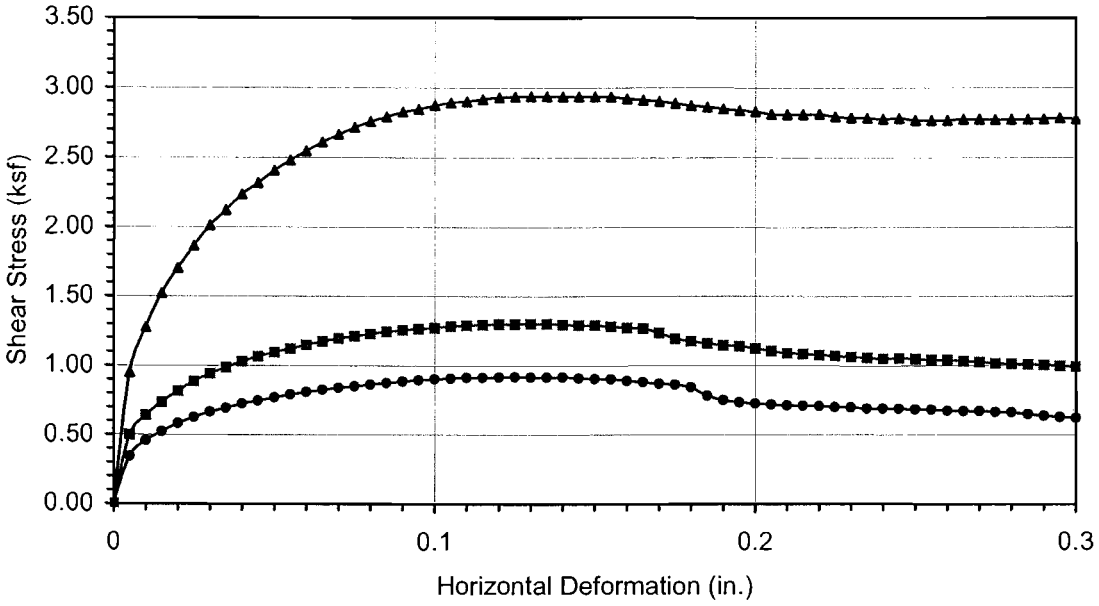
Consolidated Undrained

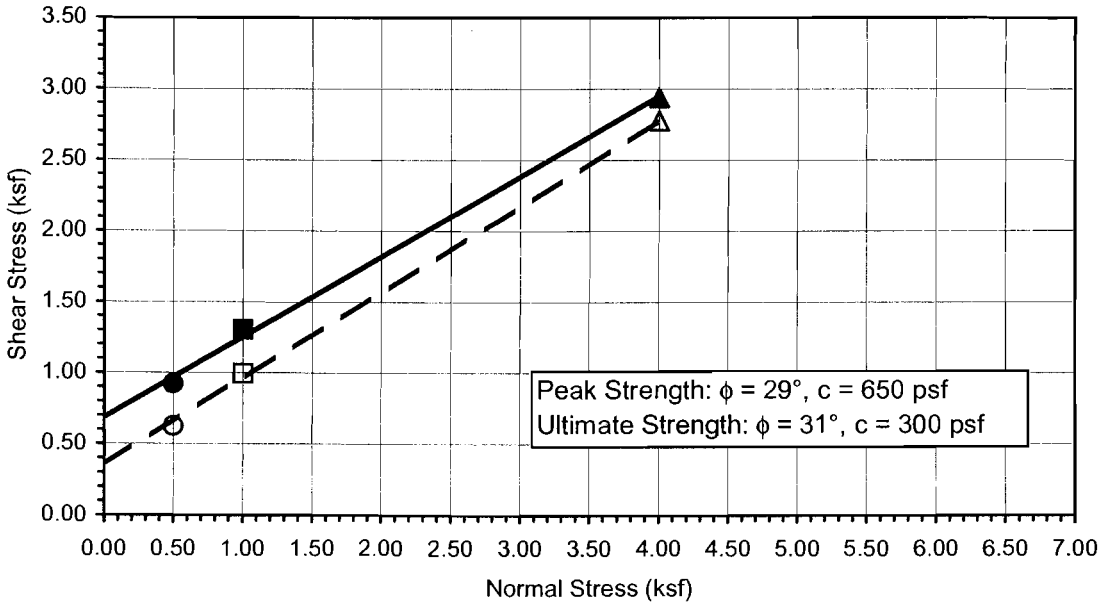
Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08

DS B-5 R-3





Boring No.	**LB-6**
Sample No.	**R-3**
Depth (ft)	**7.5**
Sample Type: Drive	
Soil Identification: Gray clayey sand (SC)	

Normal Stress (kip/ft²)	0.500	1.000	4.000
Peak Shear Stress (kip/ft²)	● 0.920	■ 1.304	▲ 2.940
Shear Stress @ End of Test (ksf)	○ 0.622	□ 0.993	△ 2.777
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	17.29	17.29	17.29
Dry Density (pcf)	110.6	111.4	110.5
Saturation (%)	89.0	90.9	88.8
Soil Height Before Shearing (in.)	0.9943	0.9893	0.9692
Final Moisture Content (%)	18.7	16.3	15.8

Leighton

DIRECT SHEAR TEST RESULTS
Consolidated Undrained

Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08

DS B-6 R-3

Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	I-5 / El Camino Real Sound Wall	Tested By:	G. Berdy	Date:	05/08/08
Project No. :	602171-001	Checked By:	LF	Date:	06/02/08
Boring No.:	LB-5	Depth (ft.)	0-5		
Sample No. :	Bag-1				
Soil Identification:	Olive brown clayey sand (SC)				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN		Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(in.)	1.0000	1.0235
Wt. Comp. Soil + Mold	(g)	601.90	447.50
Wt. of Mold	(g)	190.30	0.00
Specific Gravity (Assumed)		2.70	2.70
Container No.		O	O
Wet Wt. of Soil + Cont.	(g)	831.10	637.80
Dry Wt. of Soil + Cont.	(g)	766.00	569.70
Wt. of Container	(g)	0.00	190.30
Moisture Content	(%)	8.50	17.95
Wet Density	(pcf)	124.2	131.9
Dry Density	(pcf)	114.4	111.8
Void Ratio		0.473	0.508
Total Porosity		0.321	0.337
Pore Volume	(cc)	66.5	71.3
Degree of Saturation (%) [S_{meas}]		**48.5**	95.5

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
05/08/08	14:16	1.0	0	0.2035
05/08/08	14:26	1.0	10	0.2030
Add Distilled Water to the Specimen				
05/08/08	14:47	1.0	21	0.2205
05/09/08	6:07	1.0	941	0.2270
05/09/08	7:15	1.0	1009	0.2270

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**24**

Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

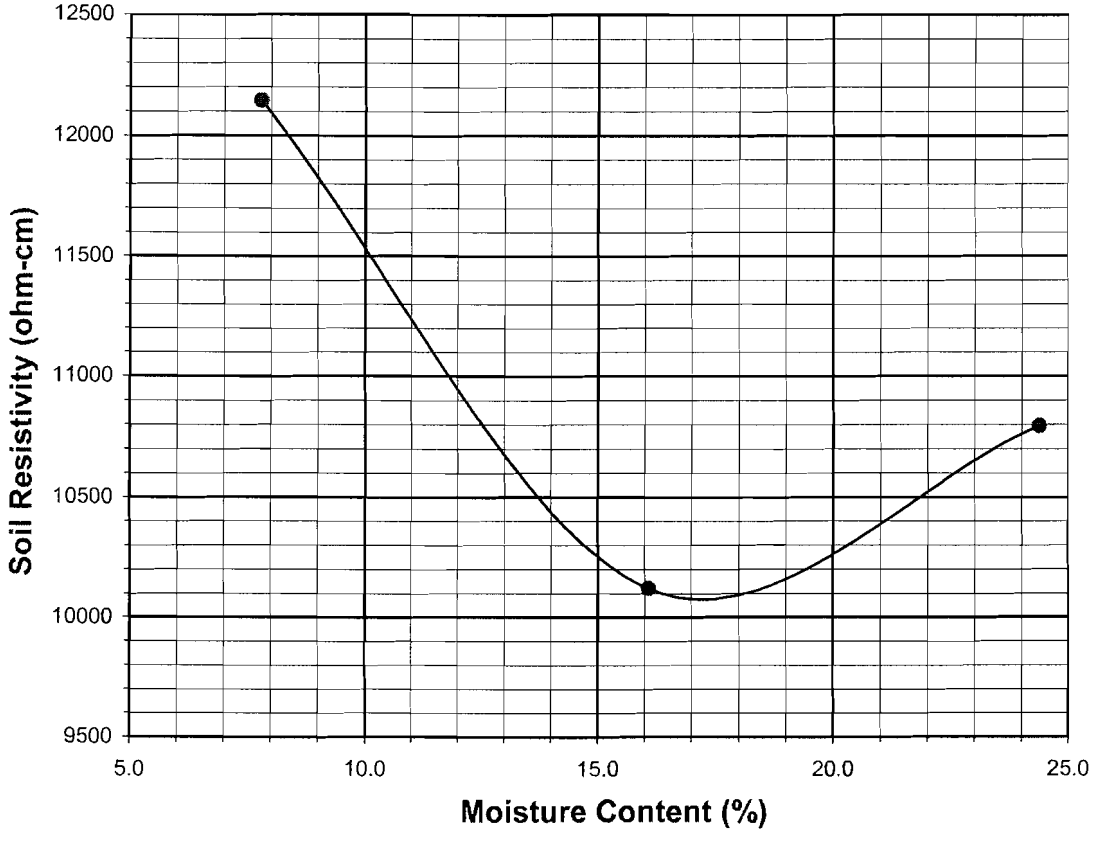
Project Name: I-5 / El Camino Real Sound Wall
Project No. : 602171-001
Boring No.: LB-1
Sample No. : Bag-1
Soil Identification: SM

Tested By : V. Juliano Date: 05/03/08
Data Input By: J. Ward Date: 05/09/08
Depth (ft.) : 0-5

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	0	7.80	1800	12143
2	100	16.09	1500	10119
3	200	24.38	1600	10794
4				
5				

Moisture Content (%) (MCi)	7.80
Wet Wt. of Soil + Cont. (g)	201.75
Dry Wt. of Soil + Cont. (g)	191.20
Wt. of Container (g)	55.90
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
1070	**17.2**	**98**	**43**	**7.80**	**22.3**



Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

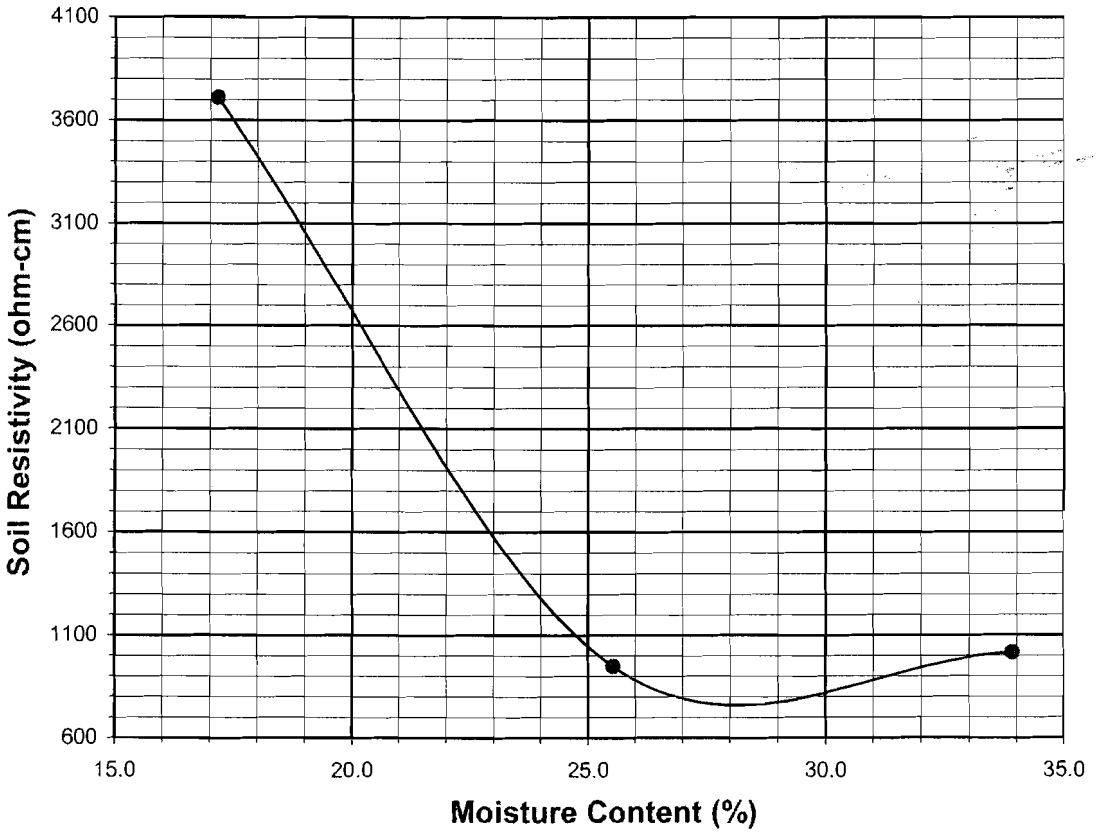
Project Name: I-5 / El Camino Real Sound Wall
Project No. : 602171-001
Boring No.: LB-3
Sample No. : Bag-1
Soil Identification: SM

Tested By : V. Juliano Date: 05/03/08
Data Input By: J. Ward Date: 05/09/08
Depth (ft.) : 0-5

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	17.17	550	3710
2	200	25.54	140	944
3	300	33.91	150	1012
4				
5				

Moisture Content (%) (MCi)	8.80
Wet Wt. of Soil + Cont. (g)	210.93
Dry Wt. of Soil + Cont. (g)	199.41
Wt. of Container (g)	68.57
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
750	**28.0**	**72**	**66**	**7.66**	**22.1**



Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

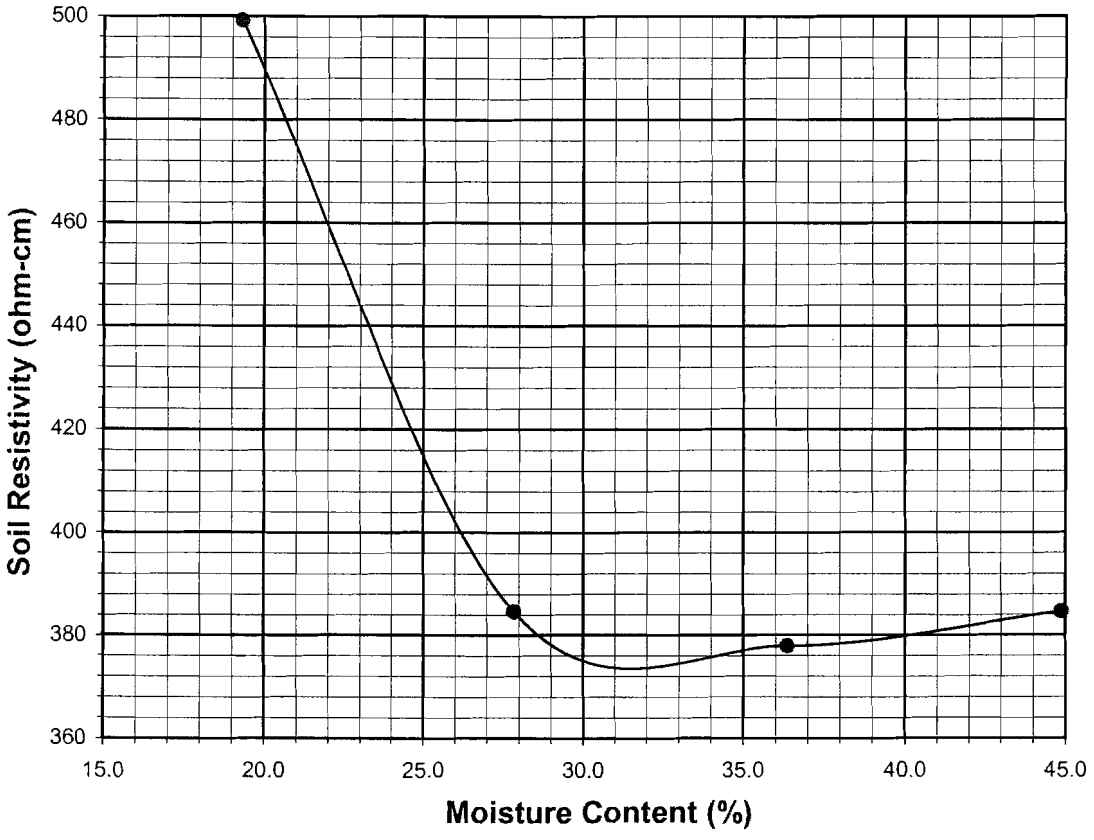
Project Name: I-5 / El Camino Real Sound Wall
Project No. : 602171-001
Boring No.: LB-5
Sample No. : Bag-1
Soil Identification: SC

Tested By : V. Juliano Date: 05/03/08
Data Input By: J. Ward Date: 05/09/08
Depth (ft.) : 0-5

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	19.32	74	499
2	200	27.85	57	385
3	300	36.37	56	378
4	400	44.89	57	385
5				

Moisture Content (%) (MCi)	10.80
Wet Wt. of Soil + Cont. (g)	155.09
Dry Wt. of Soil + Cont. (g)	145.35
Wt. of Container (g)	55.17
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
374	**31.5**	**291**	**695**	**7.50**	**22.1**



Leighton

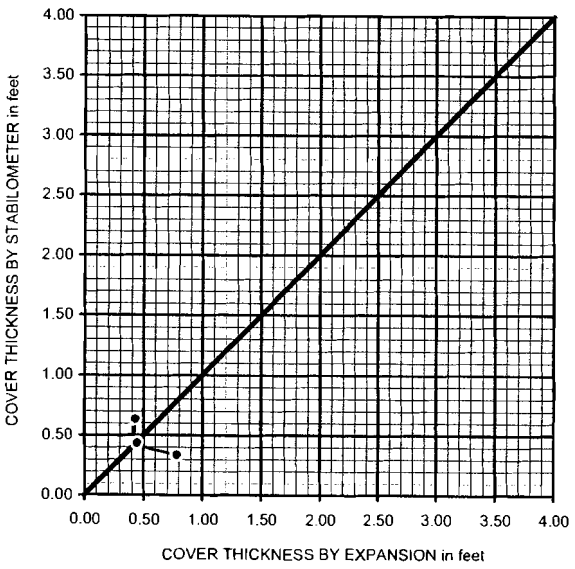
R-VALUE TEST RESULTS

PROJECT NAME:	I-5/El Camino Real Sound Wall	PROJECT NUMBER:	602171-001
SAMPLE NUMBER:	Bag-1	SAMPLE LOCATION:	B-3 @ 0-5'
SAMPLE DESCRIPTION:	SM	TECHNICIAN:	SCF
		DATE COMPLETED	6/2/2008

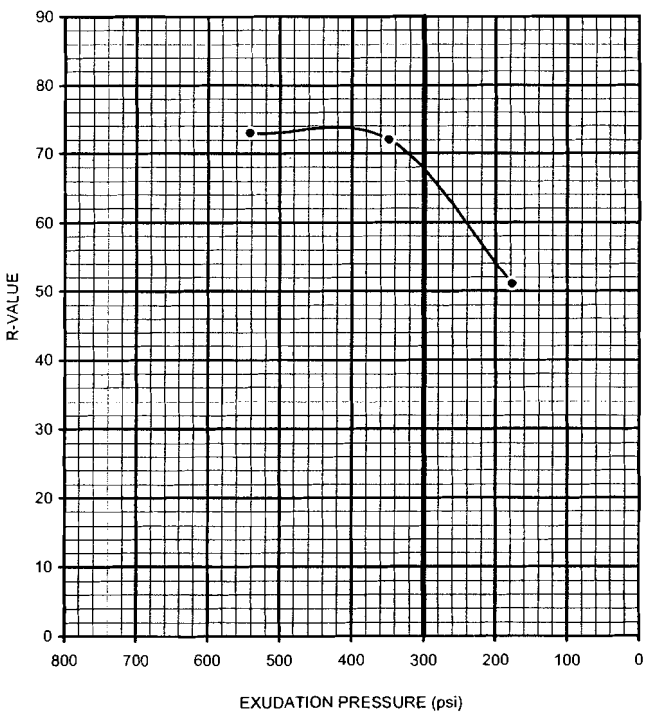
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	9.2	9.6	10.1
HEIGHT OF SAMPLE, Inches	2.41	2.48	2.44
DRY DENSITY, pcf	126.3	125.1	125.9
COMPACTOR PRESSURE, psi	200	135	70
EXUDATION PRESSURE, psi	542	348	177
EXPANSION, Inches x 10exp-4	19	13	10
STABILITY Ph 2,000 lbs (160 psi)	30	32	59
TURNS DISPLACEMENT	3.72	3.81	4.02
R-VALUE UNCORRECTED	74	72	52
R-VALUE CORRECTED	73	72	51

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.43	0.45	0.78
EXPANSION PRESSURE THICKNESS, ft.	0.63	0.43	0.33

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	73
R-VALUE BY EXUDATION:	68
EQUILIBRIUM R-VALUE:	68

Leighton

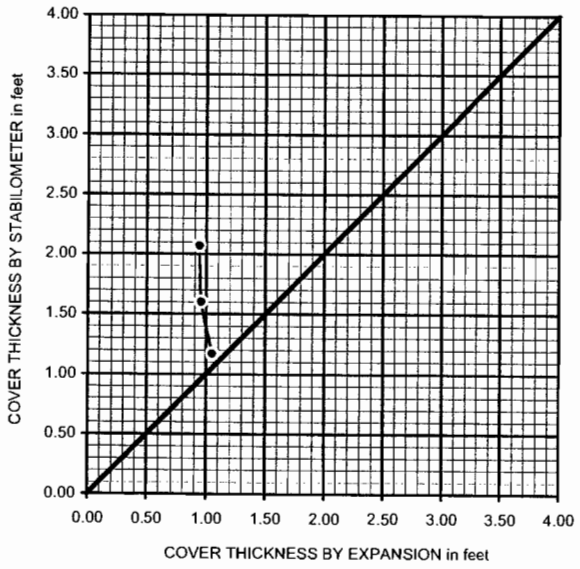
R-VALUE TEST RESULTS

PROJECT NAME:	I-5/El Camino Real Sound Wall	PROJECT NUMBER:	602171-001
SAMPLE NUMBER:	Bag-1	SAMPLE LOCATION:	B-5 @ 0-5'
SAMPLE DESCRIPTION:	SC	TECHNICIAN:	SCF
		DATE COMPLETED	6/2/2008

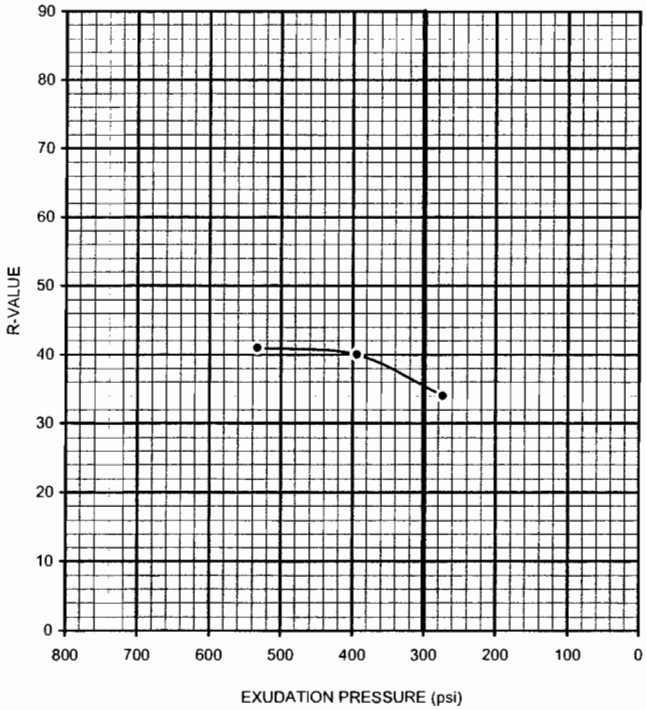
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	12.4	12.9	13.3
HEIGHT OF SAMPLE, Inches	2.39	2.47	2.49
DRY DENSITY, pcf	124.5	121.5	120.1
COMPACTOR PRESSURE, psi	120	80	50
EXUDATION PRESSURE, psi	533	394	273
EXPANSION, Inches x 10exp-4	62	48	35
STABILITY Ph 2,000 lbs (160 psi)	87	92	100
TURNS DISPLACEMENT	2.76	2.81	2.97
R-VALUE UNCORRECTED	43	40	34
R-VALUE CORRECTED	41	40	34

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.94	0.96	1.06
EXPANSION PRESSURE THICKNESS, ft.	2.07	1.60	1.17

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	33
R-VALUE BY EXUDATION:	36
EQUILIBRIUM R-VALUE:	33

APPENDIX B

VERTICALLY LOADED DRILLED SHAFT ANALYSIS PROGRAM SHAFT
VERSION 5.0 (C) COPYRIGHT ENSOFT,INC. 1989,1995,1998,2001,2003

I-5/El Camino Real, 16-inch dia. CIDH pile for Abutment 1 and 4

PROPOSED DEPTH = 55.0 FT

NUMBER OF LAYERS = 5

WATER TABLE DEPTH = 40.0 FT.

FACTOR OF SAFETY APPLIED TO THE TOTAL ULTIMATE CAPACITY = 2.00

FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE CAPACITY = 2.00

SOIL INFORMATION

LAYER NO 1----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.120E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.330E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.000E+00

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.120E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.330E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.500E+01

LAYER NO 2----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.120E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.330E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.500E+01

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.107E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.330E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.100E+02

LAYER NO 3----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.107E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.320E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.115E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.100E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.825E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.320E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.115E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.250E+02

LAYER NO 4----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.825E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.340E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.250E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.701E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.340E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00

SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.350E+02

LAYER NO 5----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.701E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.360E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.350E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.454E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.360E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.600E+02

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	= 1.300	FT.
DIAMETER OF BASE	= 1.300	FT.
END OF STEM TO BASE	= 0.000	FT.
ANGLE OF BELL	= 0.000	DEG.
IGNORED TOP PORTION	= 20.000	FT.
IGNORED BOTTOM PORTION	= 0.000	FT.
AREA OF ONE PERCENT STEEL	= 1.912	SQ.IN.
ELASTIC MODULUS, Ec	= 0.380E+07	LB/SQ IN
VOLUME OF UNDERREAM	= 0.000	CU.YDS.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (FOR UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
QBD = TOTAL ALLOWABLE LOAD USING A FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE RESISTANCE;
QDN = TOTAL ALLOWABLE LOAD USING FACTORS OF SAFETY APPLIED TO THE ULTIMATE SIDE RESISTANCE AND THE ULTIMATE BASE RESISTANCE.

LENGTH (FEET)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	QBD (TONS)	QDN (TONS)	QU/VOLUME (TONS/CU.YDS)
21.0	1.03	4.35	7.08	11.43	7.89	5.71	11.07
22.0	1.08	8.83	7.08	15.91	12.37	7.95	14.71
23.0	1.13	13.43	7.08	20.51	16.97	10.26	18.14
24.0	1.18	18.16	14.16	32.32	25.24	16.16	27.39
25.0	1.23	23.00	14.16	37.16	30.08	18.58	30.24
26.0	1.28	27.97	14.16	42.13	35.05	21.06	32.96
27.0	1.33	33.05	14.16	47.21	40.13	23.60	35.56
28.0	1.38	38.24	14.16	52.40	45.32	26.20	38.06
29.0	1.43	43.53	14.16	57.70	50.61	28.85	40.46
30.0	1.47	48.93	14.16	63.09	56.01	31.55	42.78
31.0	1.52	54.43	14.16	68.59	61.51	34.29	45.00
32.0	1.57	60.01	14.16	74.17	67.09	37.09	47.15
33.0	1.62	65.69	14.16	79.85	72.77	39.92	49.21
34.0	1.67	71.44	21.24	92.69	82.07	46.34	55.45
35.0	1.72	77.28	21.24	98.52	87.90	49.26	57.25
36.0	1.77	83.19	21.24	104.44	93.81	52.22	59.00
37.0	1.82	89.18	21.24	110.42	99.80	55.21	60.70
38.0	1.87	95.22	21.24	116.47	105.85	58.23	62.34
39.0	1.92	101.34	21.24	122.58	111.96	61.29	63.93
40.0	1.97	107.50	21.24	128.75	118.13	64.37	65.47
41.0	2.02	113.65	21.24	134.89	124.27	67.45	66.92
42.0	2.06	119.76	21.24	141.01	130.38	70.50	68.28
43.0	2.11	125.85	21.24	147.09	136.47	73.55	69.57
44.0	2.16	131.91	21.24	153.15	142.53	76.57	70.79
45.0	2.21	137.93	21.24	159.17	148.55	79.59	71.94
46.0	2.26	143.92	21.24	165.17	154.54	82.58	73.03
47.0	2.31	149.88	21.24	171.12	160.50	85.56	74.05
48.0	2.36	155.80	21.24	177.05	166.43	88.52	75.02
49.0	2.41	161.69	21.24	182.93	172.31	91.47	75.93
50.0	2.46	167.54	21.24	188.78	178.16	94.39	76.79
51.0	2.51	173.35	21.24	194.59	183.97	97.30	77.60
52.0	2.56	179.12	21.24	200.36	189.74	100.18	78.37
53.0	2.61	184.85	21.24	206.09	195.47	103.05	79.09
54.0	2.65	190.53	21.24	211.78	201.16	105.89	79.77
55.0	2.70	196.18	21.24	217.42	206.80	108.71	80.40

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.1403E+01	0.1244E-02	0.4766E-02	0.1000E-03
0.1460E+02	0.1276E-01	0.4766E-01	0.1000E-02
0.3636E+02	0.3222E-01	0.1191E+00	0.2500E-02
0.6688E+02	0.6226E-01	0.2383E+00	0.5000E-02
0.9050E+02	0.8847E-01	0.3574E+00	0.7500E-02
0.1094E+03	0.1113E+00	0.4766E+00	0.1000E-01
0.1700E+03	0.1999E+00	0.1191E+01	0.2500E-01
0.2055E+03	0.2733E+00	0.2383E+01	0.5000E-01
0.2212E+03	0.3212E+00	0.3574E+01	0.7500E-01
0.2287E+03	0.3579E+00	0.4736E+01	0.1000E+00
0.2375E+03	0.5234E+00	0.1064E+02	0.2500E+00
0.2426E+03	0.7829E+00	0.1616E+02	0.5000E+00
0.2470E+03	0.1041E+01	0.2101E+02	0.7500E+00
0.2498E+03	0.1297E+01	0.2426E+02	0.1000E+01
0.2556E+03	0.1868E+01	0.3101E+02	0.1560E+01

VERTICALLY LOADED DRILLED SHAFT ANALYSIS PROGRAM SHAFT
VERSION 5.0 (C) COPYRIGHT ENSOFT,INC. 1989,1995,1998,2001,2003

I-5/El Camino Real UC 16-inch dia. CIDH pile, Piers 45 tons, Cutoff 5'bsg

PROPOSED DEPTH = 35.0 FT

NUMBER OF LAYERS = 3

WATER TABLE DEPTH = 25.0 FT.

FACTOR OF SAFETY APPLIED TO THE TOTAL ULTIMATE CAPACITY = 2.00

FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE CAPACITY = 2.00

SOIL INFORMATION

LAYER NO 1----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.120E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.320E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.115E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.000E+00

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.107E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.320E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.115E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.100E+02

LAYER NO 2----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.107E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.340E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.100E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.896E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.340E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.200E+02

LAYER NO 3----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.896E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.360E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.200E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.646E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.360E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.400E+02

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	= 1.300	FT.
DIAMETER OF BASE	= 1.300	FT.
END OF STEM TO BASE	= 0.000	FT.
ANGLE OF BELL	= 0.000	DEG.
IGNORED TOP PORTION	= 5.000	FT.
IGNORED BOTTOM PORTION	= 0.000	FT.
AREA OF ONE PERCENT STEEL	= 1.912	SQ.IN.
ELASTIC MODULUS, Ec	= 0.380E+07	LB/SQ IN
VOLUME OF UNDERREAM	= 0.000	CU.YDS.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (FOR UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
QBD = TOTAL ALLOWABLE LOAD USING A FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE RESISTANCE;
QDN = TOTAL ALLOWABLE LOAD USING FACTORS OF SAFETY APPLIED TO THE ULTIMATE SIDE RESISTANCE AND THE ULTIMATE BASE RESISTANCE.

LENGTH (FEET)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	QBD (TONS)	QDN (TONS)	QU/VOLUME (TONS/CU.YDS)
6.0	0.29	1.65	4.36	6.01	3.83	3.00	20.36
7.0	0.34	3.53	4.90	8.43	5.98	4.21	24.49
8.0	0.39	5.63	5.45	11.07	8.35	5.54	28.16
9.0	0.44	7.94	11.98	19.93	13.93	9.96	45.03
10.0	0.49	10.46	13.07	23.53	17.00	11.77	47.87
11.0	0.54	13.19	14.16	27.35	20.27	13.68	50.58
12.0	0.59	16.12	14.16	30.28	23.20	15.14	51.33
13.0	0.64	19.25	14.16	33.41	26.33	16.70	52.27
14.0	0.69	22.56	14.16	36.72	29.64	18.36	53.35
15.0	0.74	26.05	14.16	40.21	33.13	20.11	54.53
16.0	0.79	29.72	14.16	43.88	36.80	21.94	55.78
17.0	0.84	33.55	14.16	47.71	40.63	23.86	57.09
18.0	0.88	37.55	14.16	51.71	44.63	25.85	58.43
19.0	0.93	41.70	21.24	62.94	52.32	31.47	67.38
20.0	0.98	46.00	21.24	67.24	56.62	33.62	68.38
21.0	1.03	50.46	21.24	71.70	61.08	35.85	69.44
22.0	1.08	55.06	21.24	76.30	65.68	38.15	70.54
23.0	1.13	59.80	21.24	81.05	70.42	40.52	71.67
24.0	1.18	64.68	21.24	85.93	75.31	42.96	72.82
25.0	1.23	69.70	21.24	90.94	80.32	45.47	73.98
26.0	1.28	74.73	21.24	95.97	85.35	47.99	75.08
27.0	1.33	79.79	21.24	101.03	90.41	50.52	76.11
28.0	1.38	84.86	21.24	106.11	95.48	53.05	77.07
29.0	1.43	89.95	21.24	111.20	100.58	55.60	77.99
30.0	1.47	95.06	21.24	116.30	105.68	58.15	78.85
31.0	1.52	100.18	21.24	121.43	110.80	60.71	79.67
32.0	1.57	105.32	21.24	126.56	115.94	63.28	80.44
33.0	1.62	110.46	21.24	131.70	121.08	65.85	81.17
34.0	1.67	115.61	21.24	136.85	126.23	68.43	81.87
35.0	1.72	120.77	21.24	142.01	131.39	71.00	82.52

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.3897E+00	0.3481E-03	0.4766E-02	0.1000E-03
0.3897E+01	0.3481E-02	0.4766E-01	0.1000E-02
0.9862E+01	0.8744E-02	0.1191E+00	0.2500E-02
0.1988E+02	0.1759E-01	0.2383E+00	0.5000E-02
0.2952E+02	0.2636E-01	0.3574E+00	0.7500E-02
0.3847E+02	0.3487E-01	0.4766E+00	0.1000E-01
0.7461E+02	0.7617E-01	0.1191E+01	0.2500E-01
0.1002E+03	0.1215E+00	0.2383E+01	0.5000E-01
0.1128E+03	0.1570E+00	0.3574E+01	0.7500E-01
0.1193E+03	0.1879E+00	0.4736E+01	0.1000E+00
0.1280E+03	0.3472E+00	0.1064E+02	0.2500E+00
0.1332E+03	0.6035E+00	0.1616E+02	0.5000E+00
0.1379E+03	0.8589E+00	0.2101E+02	0.7500E+00
0.1409E+03	0.1112E+01	0.2426E+02	0.1000E+01
0.1471E+03	0.1680E+01	0.3101E+02	0.1560E+01

VERTICALLY LOADED DRILLED SHAFT ANALYSIS PROGRAM SHAFT
VERSION 5.0 (C) COPYRIGHT ENSOFT,INC. 1989,1995,1998,2001,2003

I-5/El Camino Real UC 16-inch dia. CIDH pile, Piers 70 tons, Cutoff 8'bs

PROPOSED DEPTH = 40.0 FT

NUMBER OF LAYERS = 3

WATER TABLE DEPTH = 25.0 FT.

FACTOR OF SAFETY APPLIED TO THE TOTAL ULTIMATE CAPACITY = 2.00
FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE CAPACITY = 2.00

SOIL INFORMATION

LAYER NO 1----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.120E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.320E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.115E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.000E+00

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.107E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.320E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.115E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.100E+02

LAYER NO 2----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.107E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.340E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.100E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.896E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.340E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.200E+02

LAYER NO 3----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.896E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.360E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.200E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.594E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.360E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.450E+02

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	= 1.300	FT.
DIAMETER OF BASE	= 1.300	FT.
END OF STEM TO BASE	= 0.000	FT.
ANGLE OF BELL	= 0.000	DEG.
IGNORED TOP PORTION	= 8.000	FT.
IGNORED BOTTOM PORTION	= 0.000	FT.
AREA OF ONE PERCENT STEEL	= 1.912	SQ.IN.
ELASTIC MODULUS, Ec	= 0.380E+07	LB/SQ IN
VOLUME OF UNDERREAM	= 0.000	CU.YDS.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (FOR UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
QBD = TOTAL ALLOWABLE LOAD USING A FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE RESISTANCE;
QDN = TOTAL ALLOWABLE LOAD USING FACTORS OF SAFETY APPLIED TO THE ULTIMATE SIDE RESISTANCE AND THE ULTIMATE BASE RESISTANCE.

LENGTH (FEET)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	QBD (TONS)	QDN (TONS)	QU/VOLUME (TONS/CU.YDS)
9.0	0.44	2.31	11.98	14.30	8.31	7.15	32.31
10.0	0.49	4.83	13.07	17.91	11.37	8.95	36.42
11.0	0.54	7.56	14.16	21.73	14.65	10.86	40.17
12.0	0.59	10.49	14.16	24.66	17.58	12.33	41.79
13.0	0.64	13.62	14.16	27.78	20.70	13.89	43.46
14.0	0.69	16.93	14.16	31.09	24.01	15.55	45.17
15.0	0.74	20.42	14.16	34.59	27.50	17.29	46.90
16.0	0.79	24.09	14.16	38.25	31.17	19.13	48.63
17.0	0.84	27.92	14.16	42.09	35.01	21.04	50.35
18.0	0.88	31.92	14.16	46.08	39.00	23.04	52.07
19.0	0.93	36.07	21.24	57.31	46.69	28.66	61.35
20.0	0.98	40.37	21.24	61.62	50.99	30.81	62.66
21.0	1.03	44.83	21.24	66.07	55.45	33.04	63.99
22.0	1.08	49.43	21.24	70.67	60.05	35.34	65.34
23.0	1.13	54.18	21.24	75.42	64.80	37.71	66.69
24.0	1.18	59.06	21.24	80.30	69.68	40.15	68.05
25.0	1.23	64.07	21.24	85.31	74.69	42.66	69.41
26.0	1.28	69.10	21.24	90.35	79.73	45.17	70.68
27.0	1.33	74.16	21.24	95.40	84.78	47.70	71.87
28.0	1.38	79.23	21.24	100.48	89.86	50.24	72.99
29.0	1.43	84.33	21.24	105.57	94.95	52.78	74.04
30.0	1.47	89.43	21.24	110.68	100.06	55.34	75.04
31.0	1.52	94.56	21.24	115.80	105.18	57.90	75.97
32.0	1.57	99.69	21.24	120.93	110.31	60.47	76.86
33.0	1.62	104.83	21.24	126.07	115.45	63.04	77.70
34.0	1.67	109.98	21.24	131.22	120.60	65.61	78.50
35.0	1.72	115.14	21.24	136.38	125.76	68.19	79.25
36.0	1.77	120.30	21.24	141.54	130.92	70.77	79.97
37.0	1.82	125.47	21.24	146.71	136.09	73.36	80.65
38.0	1.87	130.64	21.24	151.88	141.26	75.94	81.29
39.0	1.92	135.80	21.24	157.05	146.42	78.52	81.90
40.0	1.97	140.97	21.24	162.21	151.59	81.11	82.48

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.5332E+00	0.4662E-03	0.4766E-02	0.1000E-03
0.5343E+01	0.4664E-02	0.4766E-01	0.1000E-02
0.1362E+02	0.1179E-01	0.1191E+00	0.2500E-02
0.2724E+02	0.2367E-01	0.2383E+00	0.5000E-02
0.3986E+02	0.3524E-01	0.3574E+00	0.7500E-02
0.5126E+02	0.4630E-01	0.4766E+00	0.1000E-01
0.9400E+02	0.9678E-01	0.1191E+01	0.2500E-01

0.1227E+03	0.1480E+00	0.2383E+01	0.5000E-01
0.1364E+03	0.1863E+00	0.3574E+01	0.7500E-01
0.1432E+03	0.2185E+00	0.4736E+01	0.1000E+00
0.1519E+03	0.3793E+00	0.1064E+02	0.2500E+00
0.1572E+03	0.6364E+00	0.1616E+02	0.5000E+00
0.1617E+03	0.8926E+00	0.2101E+02	0.7500E+00
0.1647E+03	0.1147E+01	0.2426E+02	0.1000E+01
0.1709E+03	0.1715E+01	0.3101E+02	0.1560E+01

Lateral load Calculation

ϕ (degree)	**33**
γ (pcf)	**125.0**
Individual Pile	**No**
Factor of Safety	**1.0**

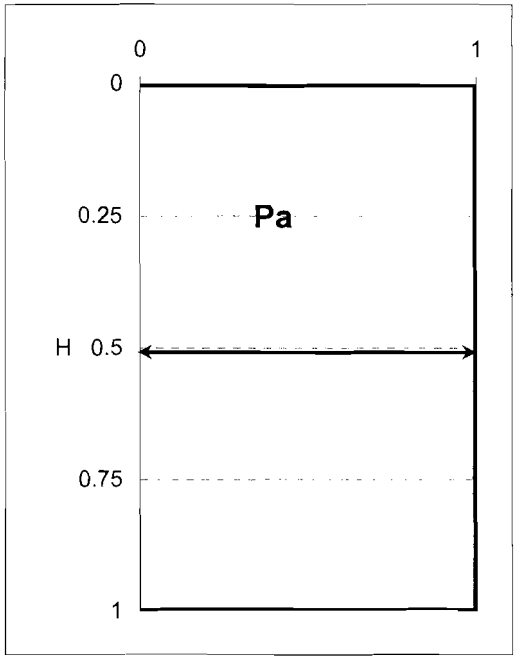
	Level Backfill	Both Back and Front slope	
H, Horizontal		**2**	
V, Vertical		1	
Friction resistance	0.43		
K_p	3.39	1.29	
K_0	0.46	0.68	
K_a	0.29	0.44	
P_p (pcf)	**424.0**	**161.1**	
P_0 (pcf)	**56.9**	**85.4**	
P_a (pcf)	**36.9**	**55.3**	

Tempory Excavation - Braced Cut

1	2	3	
Sand	Soft & Medium Clay	Stiff Clay	

Soil Type: **1**

Soil Pressure (psf): **24.0**



Assummption: Wall friction (δ) auumed to be 0.
Passive Pressure: Rankine Theory
Active Pressure: Rankine Theory for Level Backfill, slope backfill from NAVFAC DM 7.02 Ch3.
At rest condition: empirical relationship by Jaky 1944

Jaky, J., 1944, The Coefficient of Earth Pressure at Rest," Journal of the Society of Hungarian Architects and Engineers, Vol 7, 355-358

NAVFAC Figure 33, Passive pressure distribution for solider piles, p7.2-112

LATERAL EARTH PRESSURES-STATIC CONDITION
I-5/ EL CAMINO REAL
SAN CLEMENTE, CALIFORNIA

PROJECT NAME :	I-5/EL CAMINO REAL
PROJECT NO:	602171-001
DESIGNED BY:	TK
CHECKED BY:	DJC
DATE:	5/30/2008

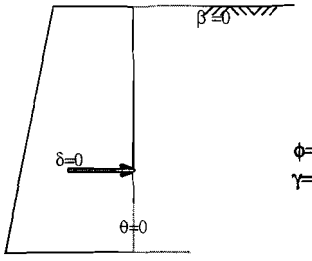
Figure B1

INPUT DATA

Condition:..... Horizontal Soil Layer (MCE)

ϕ, Soil friction (deg)	33.0
δ, Friction angle between soil and concrete wall (deg)	0.0
β, Backfill slope angle (deg)	0.0
θ, Angle of wall slope with vertical wall	0.0
γ, Wet unit weight of the soil (pcf)	125
PeakHorizontal Acceleration	0.5
k_h, Horizontal acceleration coefficient	0.25
k_v, Vertical acceleration coefficient	0.00
$\psi = \tan^{-1}(k_h/(1-k_v))$	14.0 deg

CONFIGURATION



OUTPUT

a) At Rest condition

1. Coeff of **Earth Pressure at Rest, Ko**:..... **0.46**
   Equivalent Fluid Pressure..... 57 psf/ft

Rankine Solution (For vertical wall only, θ = 0, assuming no wall friction, δ = 0, and upward backfill only, β>0)

1. Coeff of **Active Earth Pressure, K_A**:..... **0.29**
   Equivalent Fluid Pressure..... 36.9 psf/ft
   USE 37 psf/ft

$$K_A^{RANKINE} = \frac{\cos\beta - \sqrt{\cos^2\beta - \cos^2\phi}}{\cos\beta + \sqrt{\cos^2\beta - \cos^2\phi}}$$

2. Coeff of **Passive Earth Pressure, K_p**:.....**3.39**
   Equivalent Fluid Pressure..... 424.0 psf/ft
   USE 424 psf/ft

$$K_P^{RANKINE} = \frac{\cos\beta + \sqrt{\cos^2\beta - \cos^2\phi}}{\cos\beta - \sqrt{\cos^2\beta - \cos^2\phi}}$$

3. Coeff of **Seismic & Static Active Earth Pressure, K_{AE}**:..... **0.47**...
   Equivalent Fluid Pressure..... 58 psf/ft

$$K_{AE} = \frac{\cos^2(\phi - \theta - \psi)}{\cos\psi\cos^2\theta\cos(\delta + \theta + \psi)\left[1 + \sqrt{\frac{\sin(\delta+\phi)\sin(\phi-\beta-\psi)}{\cos(\delta+\theta+\psi)\cos(\beta-\theta)}}\right]^2}$$

4. **Seismic Active Earth Pressure**
   Equivalent Fluid Pressure: 58 psf/ft- 37 psf/ft= 21.3 psf/ft
   USE 22 psf/ft

Ref:
1. Steven L. Kramer, "Geotechnical Earthquake Engineering". Prince Hall. 1996.
2. Donald P. Coutu. "Foundation Design. Principles and Design". Prince Hall. 1994.

LATERAL EARTH PRESSURES
SEISMIC CONDITION LEVEL GROUND
EL CAMINO REAL SOUNWALLS
SAN CLEMENTE, CALIFORNIA

PROJECT NAME : EL CAMINO REAL
PROJECT NUMBER : 602171-001
DESIGNED BY: TK
CHECKED BY: DJC

Figure B2

```
**********
*        *
*  E Q F A U L T  *
*        *
*  Version 3.00  *
*        *
**********
```

DETERMINISTIC ESTIMATION OF
PEAK ACCELERATION FROM DIGITIZED FAULTS

JOB NUMBER: 602171-001

DATE: 09-19-2008

JOB NAME: El Camino Real SW

CALCULATION NAME: Test Run Analysis

FAULT-DATA-FILE NAME: C:\Program Files\EQFAULT1\CGSFLTE.DAT

SITE COORDINATES:
SITE LATITUDE: 33.4183
SITE LONGITUDE: 117.6037

SEARCH RADIUS: 100 mi

ATTENUATION RELATION: 20) Sadigh et al. (1997) Horiz. - Soil
UNCERTAINTY (M=Median, S=Sigma): M Number of Sigmas: 0.0
DISTANCE MEASURE: clodis
SCOND: 0
Basement Depth: 5.00 km Campbell SSR: Campbell SHR:
COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: C:\Program Files\EQFAULT1\CGSFLTE.DAT

MINIMUM DEPTH VALUE (km): 0.0

EQFAULT SUMMARY

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT: MAXIMUM EARTHQUAKE MAG.(Mw)	PEAK SITE ACCEL. g	EST. SITE INTENSITY MOD.MERC.
NEWPORT-INGLEWOOD (Offshore)	4.5(7.3)	7.1	0.378	IX
SAN JOAQUIN HILLS	12.0(19.3)	6.6	0.224	IX
CORONADO BANK	20.9(33.7)	7.6	0.179	VIII
ELSINORE (GLEN IVY)	21.4(34.4)	6.8	0.112	VII
ELSINORE (TEMECULA)	21.4(34.5)	6.8	0.111	VII
PALOS VERDES	21.5(34.6)	7.3	0.149	VIII
NEWPORT-INGLEWOOD (L.A.Basin)	22.6(36.4)	7.1	0.127	VIII
ROSE CANYON	22.9(36.9)	7.2	0.132	VIII
CHINO-CENTRAL AVE. (Elsinore)	27.3(43.9)	6.7	0.102	VII
WHITTIER	30.1(48.5)	6.8	0.076	VII
ELSINORE (JULIAN)	34.2(55.0)	7.1	0.081	VII
PUENTE HILLS BLIND THRUST	38.4(61.8)	7.1	0.090	VII
SAN JACINTO-SAN JACINTO VALLEY	44.0(70.8)	6.9	0.051	VI
SAN JACINTO-ANZA	45.4(73.1)	7.2	0.061	VI
SAN JOSE	45.7(73.6)	6.4	0.042	VI
SAN JACINTO-SAN BERNARDINO	46.5(74.8)	6.7	0.041	V
SIERRA MADRE	49.3(79.4)	7.2	0.071	VI
CUCAMONGA	49.4(79.5)	6.9	0.056	VI
UPPER ELYSIAN PARK BLIND THRUST	53.3(85.7)	6.4	0.034	V
SAN ANDREAS - SB-Coach. M-1b-2	55.1(88.6)	7.7	0.070	VI
SAN ANDREAS - San Bernardino M-1	55.1(88.6)	7.5	0.060	VI
SAN ANDREAS - Whole M-1a	55.1(88.6)	8.0	0.086	VII
SAN ANDREAS - SB-Coach. M-2b	55.1(88.6)	7.7	0.070	VI
RAYMOND	56.0(90.2)	6.5	0.034	V
CLAMSHELL-SAWPIT	57.2(92.1)	6.5	0.033	V
VERDUGO	58.6(94.3)	6.9	0.045	VI
HOLLYWOOD	60.4(97.2)	6.4	0.028	V
SAN ANDREAS - 1857 Rupture M-2a	60.5(97.4)	7.8	0.067	VI
SAN ANDREAS - Mojave M-1c-3	60.5(97.4)	7.4	0.049	VI
SAN ANDREAS - Cho-Moj M-1b-1	60.5(97.4)	7.8	0.067	VI
CLEGHORN	61.2(98.5)	6.5	0.023	IV
EARTHQUAKE VALLEY	61.2(98.5)	6.5	0.023	IV
NORTH FRONTAL FAULT ZONE (West)	61.4(98.8)	7.2	0.053	VI
SAN JACINTO-COYOTE CREEK	63.3(101.8)	6.6	0.024	V
SANTA MONICA	64.7(104.1)	6.6	0.030	V
PINTO MOUNTAIN	67.3(108.3)	7.2	0.037	V
MALIBU COAST	68.3(109.9)	6.7	0.031	V
SIERRA MADRE (San Fernando)	71.5(115.1)	6.7	0.029	V
NORTH FRONTAL FAULT ZONE (East)	72.3(116.4)	6.7	0.028	V
NORTHRIDGE (E. Oak Ridge)	72.8(117.1)	7.0	0.036	V

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT: MAXIMUM EARTHQUAKE MAG.(Mw)	PEAK SITE ACCEL. g	EST. SITE INTENSITY MOD.MERC.
SAN GABRIEL	73.4(118.1)	7.2	0.033	V
ANACAPA-DUME	74.1(119.2)	7.5	0.053	VI
SAN ANDREAS - Coachella M-1c-5	74.1(119.2)	7.2	0.032	V
ELSINORE (COYOTE MOUNTAIN)	78.2(125.8)	6.8	0.021	IV
HELENDALE - S. LOCKHARDT	78.2(125.9)	7.3	0.032	V
BURNT MTN.	78.5(126.4)	6.5	0.016	IV
SANTA SUSANA	81.0(130.4)	6.7	0.024	IV
EUREKA PEAK	81.8(131.7)	6.4	0.014	IV
SAN JACINTO - BORREGO	82.7(133.1)	6.6	0.016	IV
LANDERS	85.1(137.0)	7.3	0.029	V
LENWOOD-LOCKHART-OLD WOMAN SPRGS	85.4(137.5)	7.5	0.034	V
HOLSER	86.5(139.2)	6.5	0.018	IV
SIMI-SANTA ROSA	87.6(140.9)	7.0	0.027	V
JOHNSON VALLEY (Northern)	90.5(145.6)	6.7	0.016	IV
OAK RIDGE (Onshore)	91.5(147.2)	7.0	0.026	V
EMERSON So. - COPPER MTN.	95.5(153.7)	7.0	0.019	IV
SAN CAYETANO	97.0(156.1)	7.0	0.024	IV

****

-END OF SEARCH- 57 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE NEWPORT-INGLEWOOD (Offshore) FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 4.5 MILES (7.3 km) AWAY.

LARGEST MAXIMUM-EARTHQUAKE SITE ACCELERATION: 0.3780 g

Seismic Induced Dry Settlement

Project Number: 602171-001
Project Name: I-5/EL CAMINO REAL SOUNDWALL
Boring Number: LB-4
Location: SAN CLEMENTE, CALIFORNIA
Date of Analysis: 8/18/2008
Ground Elevation (feet): 220
Ground water, During Sampling, feet bsg: Not Encountered
Ground water, Historic High, feet bsg: 55
hole dia.(in.) 8
ER%: 80
C_E 1.3
Probabilistic M_W 7
Probabilistic a_{max} (g) 0.44
MSF 1.19 $MSF = 10^{2.24}/M_w^{2.56}$

$$r_d = \frac{\text{Stress Reduction Coefficient}}{(1-0.4113*z0.5+0.04052*z+0.001753*z1.5)/(1-0.4177*z0.5+0.05729*z-0.006205*z1.5+0.00121*z2)}$$

C_B = 1.15

Sample depth (ft)	Top of Layer (feet)	Bottom of Layer (feet)	Depth to Midlayer (m)	Sampler Type	N (blow/ft)	N (blows/ft)	N_{60}	unit wt.(pcf)	σ_v psf	σ_v' psf	C_N	Rod length(m)	C_R	Cs, Youd 2001	$(N_1)_{60}$	Fines % Used in Analysis	α	B	$(N_1)_{60CS}$	soil type
3.0	0.0	5.0	0.9	CD	49	29	39	115	345	345	1.7	1.9	0.75	1	57.5	15	2.498	1.05	62.7	SW
7.5	7.5	10.0	2.3	CD	61	37	49	120	874	874	1.5	3.3	0.80	1	67.9	15	2.498	1.05	73.7	SC
10.0	10.0	15.0	3.0	SPT	58	58	77	120	1,174	1,174	1.3	4.0	0.85	1.2	118.4	15	2.498	1.05	126.6	SC
25.0	25.0	30.0	7.6	CD	41	25	33	121	2,981	2,981	0.8	8.6	0.95	1	29.4	15	2.498	1.05	33.3	SC
30.0	30.0	35.0	9.1	CD	48	29	38	119	3,581	3,581	0.7	10.1	1.00	1	33.0	15	2.498	1.05	37.1	SC

Layer Number	interval (ft.)		Thickness (ft)	r_d	Dry Settlement Pradel, 1998	soil type
1	0.0	5.0	5.0	0.9950	0.00	SW
2	7.5	10.0	2.5	0.9846	0.00	SC
3	10.0	15.0	5.0	0.9791	0.00	SC
4	25.0	30.0	5.0	0.9418	0.00	SC
5	30.0	35.0	5.0	0.9206	0.00	SC

earthquake-induced settlement of unsaturated soils: **0.00** inches

Seismic Induced Dry Settlement

Project Number: 602171-001
Project Name: I-5/EL CAMINO REAL SOUNDWALL
Boring Number: LB-5
Location: SAN CLEMENTE, CALIFORNIA
Date of Analysis: 8/18/2008

Ground Elevation (feet): 217
Ground water, During Sampling, feet bsg: Not Encountered
Ground water, Historic High, feet bsg: 55
hole dia.(in.): 8
ER%: 80
C_E: 1.3
Probabilistic M_W: 7
Probabilistic a_{max} (g): 0.44

MSF: 1.19 $MSF = 10^{2.24}/M_w^{2.56}$

Stress Reduction Coefficient

$$r_d = \frac{(1-0.4113*z0.5+0.04052*z+0.001753*z1.5)}{(1-0.4177*z0.5+0.05729*z-0.006205*z1.5+0.00121*z2)}$$

C_B = 1.15

Sample depth (ft)	Top of Layer (feet)	Bottom of Layer (feet)	Depth to Midlayer (m)	Sampler Type	N (blow/ft)	N (blows/ft)	N_{60}	unit wt.(pcf)	σ_v psf	σ_v' psf	C_N	Rod length(m)	C_R	Cs, Youd 2001	$(N_1)_{60}$	Fines % Used in Analysis	α	B	$(N_1)_{60CS}$	soil type
3.0	0.0	5.0	0.9	CD	26	16	21	128	384	384	1.7	1.9	0.75	1	30.5	15	2.498	1.05	34.5	SC
5.0	5.0	7.5	1.5	CD	19	11	15	106	618	618	1.7	2.5	0.75	1	22.3	5	0.000	1.00	22.3	SP
7.5	7.5	10.0	2.3	SPT	23	23	31	125	907	907	1.5	3.3	0.80	1.2	50.3	15	2.498	1.05	55.2	SC
10.0	10.0	15.0	3.0	CD	42	25	34	125	1,219	1,219	1.3	4.0	0.85	1	42.1	15	2.498	1.05	46.6	SC
15.0	15.0	20.0	4.6	SPT	26	26	35	125	1,844	1,844	1.0	5.6	0.85	1.2	42.3	15	2.498	1.05	46.9	SC
25.0	25.0	30.0	7.6	SPT	12	12	16	125	3,094	3,094	0.8	8.6	0.95	1.2	16.9	15	2.498	1.05	20.2	SC

Layer Number	interval (ft.)		Thickness (ft)	r_d	Dry Settlement Pradel, 1998	soil type
1	0.0	5.0	5.0	0.9950	0.00	SC
2	5.0	7.5	2.5	0.9902	0.02	SP
3	7.5	10.0	2.5	0.9846	0.00	SC
4	10.0	15.0	5.0	0.9791	0.00	SC
5	15.0	20.0	5.0	0.9686	0.00	SC
6	25.0	30.0	5.0	0.9418	0.09	SC
	earthquake-induced settlement of unsaturated soils:				0.11	inches

Seismic Induced Dry Settlement

Project Number: **602171-001**
Project Name: **I-5/EL CAMINO REAL SOUNDWALL**
Boring Number: **LB-6**
Location: **SAN CLEMENTE, CALIFORNIA**
Date of Analysis: **8/18/2008**
Ground Elevation (feet): **201**

Ground water, During Sampling, feet bsg: **Not Encountered**

Ground water, Historic High, feet bsg: **55**
hole dia.(in.) **8**
ER%: **80**
C_E 1.3
Probabilistic M_W **7**
Probabilistic a_{max} (g) **0.44**

MSF 1.19 $MSF = 10^{2.24}/M_w^{2.56}$

Stress Reduction Coefficient

$$r_d = \frac{(1-0.4113*z0.5+0.04052*z+0.001753*z1.5)}{(1-0.4177*z0.5+0.05729*z-0.006205*z1.5+0.00121*z2)}$$

C_B = 1.15

Sample depth (ft)	Top of Layer (feet)	Bottom of Layer (feet)	Depth to Midlayer (m)	Sampler Type	N (blow/ft)	N (blows/ft)	N_{60}	unit wt.(pcf)	σ_v psf	σ_v' psf	C_N	Rod length(m)	C_R	Cs, Youd 2001	$(N_1)_{60}$	Fines % Used in Analysis	α	B	$(N_1)_{60CS}$	soil type
3.0	0.0	5.0	0.9	CD	20	12	16	118	354	354	1.7	1.9	0.75	1	23.5	15	2.498	1.05	27.1	SC
5.0	7.5	7.5	1.5	CD	39	23	31	121	593	593	1.7	2.5	0.75	1	45.7	15	2.498	1.05	50.4	SC
7.5	10.0	10.0	2.3	CD	17	10	14	130	907	907	1.5	3.3	0.80	1	18.6	15	2.498	1.05	22.0	SC
10.0	10.0	15.0	3.0	SPT	9	9	12	130	1,232	1,232	1.3	4.0	0.85	1.2	17.9	15	2.498	1.05	21.3	SC

Layer Number	interval (ft.)		Thickness (ft)	r_d	Dry Settlement Pradel, 1998	soil type
1	0.0	5.0	5.0	0.9950	0.02	SC
2	7.5	7.5	0.0	0.9902	0.00	SC
3	10.0	10.0	0.0	0.9846	0.00	SC
4	10.0	15.0	5.0	0.9791	0.06	SC

earthquake-induced settlement of unsaturated soils: **0.08** inches

P.N: 602171-001/El Camino Real Sound Wall/Psuedostatic

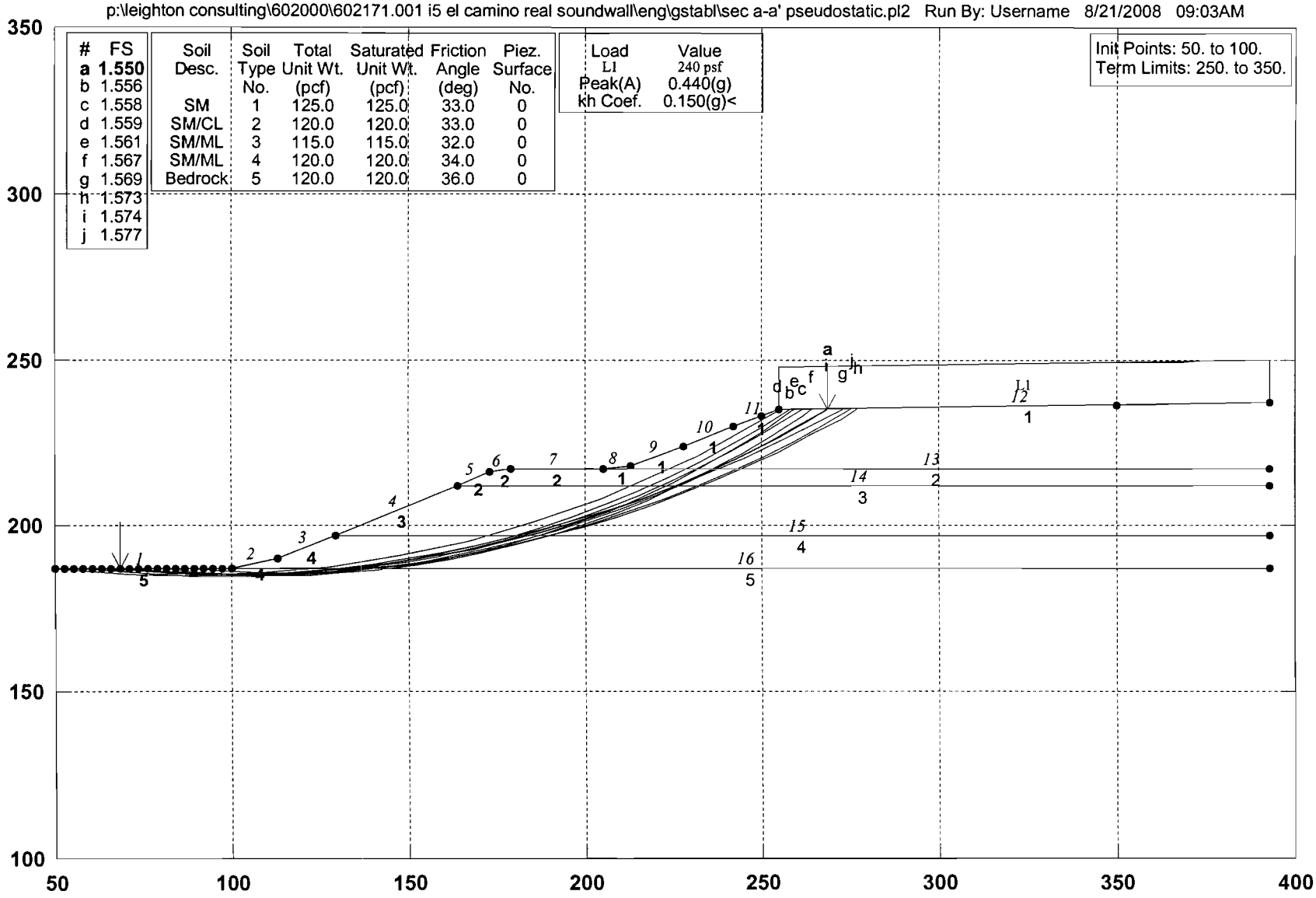
p:\leighton consulting\602000\602171.001 i5 el camino real soundwall\eng\gstabl\sec a-a' pseudostatic.pl2 Run By: Username 8/21/2008 09:03AM

#	FS
a	**1.550**
b	1.556
c	1.558
d	1.559
e	1.561
f	1.567
g	1.569
h	1.573
i	1.574
j	1.577

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Piez. Surface No.
SM	1	125.0	125.0	33.0	0
SM/CL	2	120.0	120.0	33.0	0
SM/ML	3	115.0	115.0	32.0	0
SM/ML	4	120.0	120.0	34.0	0
Bedrock	5	120.0	120.0	36.0	0

Load	Value
L1	240 psf
Peak(A)	0.440(g)
kh Coef.	0.150(g)<

Init Points: 50. to 100.
Term Limits: 250. to 350.



GSTABL7 v.2 FSmin=1.550

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
(All Rights Reserved-Unauthorized Use Prohibited)

****
SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
****

Analysis Run Date: 8/18/2008
Time of Run: 03:42PM
Run By: Username
Input Data Filename: P:\Leighton Consulting\602000\602171.001 I5 El Camino Real Soundwall\ENG\GSTABL\sec a-a' pseudostatic.in
Output Filename: P:\Leighton Consulting\602000\602171.001 I5 El Camino Real Soundwall\ENG\GSTABL\sec a-a' pseudostatic.OUT
Unit System: English

Plotted Output Filename: P:\Leighton Consulting\602000\602171.001 I5 El Camino Real Soundwall\ENG\GSTABL\sec a-a' pseudostatic.PLT

PROBLEM DESCRIPTION: P.N: 602171-001/El Camino Real Sound Wall/Section A-A'/Psuedostatic

BOUNDARY COORDINATES

12 Top Boundaries
16 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	50.00	187.00	100.00	187.00	5
2	100.00	187.00	113.00	190.00	4
3	113.00	190.00	129.50	197.00	4
4	129.50	197.00	164.00	212.00	3
5	164.00	212.00	173.00	216.00	2
6	173.00	216.00	179.00	217.00	2
7	179.00	217.00	205.00	217.00	2
8	205.00	217.00	213.00	218.00	1
9	213.00	218.00	228.00	224.00	1
10	228.00	224.00	242.00	230.00	1
11	242.00	230.00	255.00	235.00	1
12	255.00	235.00	393.00	237.00	1
13	205.00	217.00	393.00	217.00	2
14	164.00	212.00	393.00	212.00	3
15	129.50	197.00	393.00	197.00	4
16	100.00	187.00	393.00	187.00	5

User Specified Y-Origin = 100.00(ft)

Default X-Plus Value = 0.00(ft)

Default Y-Plus Value = 0.00(ft)

1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	0.0	33.0	0.00	0.0	0
2	120.0	120.0	0.0	33.0	0.00	0.0	0
3	115.0	115.0	0.0	32.0	0.00	0.0	0
4	120.0	120.0	0.0	34.0	0.00	0.0	0
5	120.0	120.0	0.0	36.0	0.00	0.0	0

1

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	255.00	393.00	240.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

Specified Peak Ground Acceleration Coefficient (A) = 0.440(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)

Specified Seismic Pore-Pressure Factor = 0.000

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

Janbus Empirical Coef. is being used for the case of c & phi both > 0
3000 Trial Surfaces Have Been Generated.

150 Surface(s) Initiate(s) From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = 50.00(ft)
and X = 100.00(ft)

Each Surface Terminates Between X = 250.00(ft)
and X = 350.00(ft)

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 0.00(ft)

10.00(ft) Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Simplified Janbu Method * *

Total Number of Trial Surfaces Attempted = 3000

Number of Trial Surfaces With Valid FS = 3000

Statistical Data On All Valid FS Values:
FS Max = 2.709 FS Min = 1.550 FS Ave = 2.181
Standard Deviation = 0.251 Coefficient of Variation = 11.52 %

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.421	187.000
2	78.381	186.111
3	88.365	185.546
4	98.363	185.307
5	108.362	185.393
6	118.354	185.805
7	128.327	186.542
8	138.270	187.603
9	148.174	188.988
10	158.027	190.694
11	167.820	192.720
12	177.541	195.064
13	187.181	197.723
14	196.730	200.694
15	206.176	203.975
16	215.511	207.562
17	224.724	211.450
18	233.805	215.637
19	242.745	220.117
20	251.535	224.886
21	260.165	229.938
22	268.510	235.196

Factor of Safety
*** 1.550 ***

Individual data on the 36 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.0	531.5	0.0	0.0	0.	0.	79.7	0.0	0.0
2	10.0	1403.8	0.0	0.0	0.	0.	210.6	0.0	0.0
3	10.0	1887.8	0.0	0.0	0.	0.	283.2	0.0	0.0
4	1.6	331.3	0.0	0.0	0.	0.	49.7	0.0	0.0
5	8.4	2616.9	0.0	0.0	0.	0.	392.5	0.0	0.0
6	4.6	2212.9	0.0	0.0	0.	0.	331.9	0.0	0.0
7	5.4	3495.6	0.0	0.0	0.	0.	524.3	0.0	0.0
8	10.0	9829.1	0.0	0.0	0.	0.	1474.4	0.0	0.0
9	1.2	1428.8	0.0	0.0	0.	0.	214.3	0.0	0.0
10	3.1	4047.5	0.0	0.0	0.	0.	607.1	0.0	0.0
11	5.7	8257.2	0.0	0.0	0.	0.	1238.6	0.0	0.0
12	9.9	17139.8	0.0	0.0	0.	0.	2571.0	0.0	0.0
13	9.9	20092.4	0.0	0.0	0.	0.	3013.9	0.0	0.0
14	6.0	13488.3	0.0	0.0	0.	0.	2023.2	0.0	0.0
15	3.8	9121.2	0.0	0.0	0.	0.	1368.2	0.0	0.0
16	5.2	12979.3	0.0	0.0	0.	0.	1946.9	0.0	0.0
17	4.5	11573.2	0.0	0.0	0.	0.	1736.0	0.0	0.0
18	1.5	3674.1	0.0	0.0	0.	0.	551.1	0.0	0.0
19	5.6	13441.6	0.0	0.0	0.	0.	2016.2	0.0	0.0
20	2.6	5982.7	0.0	0.0	0.	0.	897.4	0.0	0.0
21	9.5	19774.8	0.0	0.0	0.	0.	2966.2	0.0	0.0
22	8.3	14349.3	0.0	0.0	0.	0.	2152.4	0.0	0.0
23	1.2	1829.4	0.0	0.0	0.	0.	274.4	0.0	0.0
24	6.8	9852.4	0.0	0.0	0.	0.	1477.9	0.0	0.0
25	2.5	3398.6	0.0	0.0	0.	0.	509.8	0.0	0.0
26	9.2	12600.3	0.0	0.0	0.	0.	1890.0	0.0	0.0
27	1.2	1636.8	0.0	0.0	0.	0.	245.5	0.0	0.0
28	2.1	2845.1	0.0	0.0	0.	0.	426.8	0.0	0.0
29	5.8	7863.9	0.0	0.0	0.	0.	1179.6	0.0	0.0
30	2.7	3647.1	0.0	0.0	0.	0.	547.1	0.0	0.0
31	5.5	7154.7	0.0	0.0	0.	0.	1073.2	0.0	0.0
32	0.7	951.7	0.0	0.0	0.	0.	142.8	0.0	0.0
33	8.8	10411.3	0.0	0.0	0.	0.	1561.7	0.0	0.0
34	3.5	3652.7	0.0	0.0	0.	0.	547.9	0.0	0.0
35	5.2	4268.6	0.0	0.0	0.	0.	640.3	0.0	1239.6
36	8.3	2679.4	0.0	0.0	0.	0.	401.9	0.0	2002.9

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.421	187.000
2	78.373	186.023
3	88.354	185.409
4	98.351	185.159
5	108.351	185.274
6	118.339	185.754
7	128.303	186.597
8	138.231	187.802
9	148.107	189.369
10	157.920	191.295
11	167.656	193.577
12	177.302	196.212
13	186.847	199.197
14	196.275	202.528
15	205.577	206.201
16	214.738	210.210
17	223.747	214.550
18	232.591	219.216
19	241.260	224.201
20	249.742	229.499
21	257.935	235.043

Factor of Safety
*** 1.556 ***

1

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.421	187.000
2	78.368	185.976
3	88.346	185.309
4	98.341	185.002
5	108.341	185.053
6	118.333	185.463
7	128.303	186.232
8	138.240	187.359
9	148.129	188.841
10	157.959	190.678
11	167.717	192.866
12	177.390	195.403
13	186.965	198.286
14	196.431	201.511
15	205.774	205.074
16	214.984	208.970
17	224.048	213.194
18	232.955	217.741
19	241.692	222.604
20	250.250	227.779
21	258.616	233.257
22	261.207	235.090

Factor of Safety
*** 1.558 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.895	187.000
2	67.851	186.070
3	77.834	185.476
4	87.830	185.220
5	97.830	185.300
6	107.821	185.718
7	117.793	186.473
8	127.733	187.564
9	137.631	188.989
10	147.475	190.747
11	157.255	192.837
12	166.958	195.255
13	176.574	197.998
14	186.092	201.065
15	195.502	204.451
16	204.791	208.152
17	213.951	212.165
18	222.970	216.484
19	231.838	221.105
20	240.546	226.023
21	249.082	231.231
22	254.554	234.828

Factor of Safety
*** 1.559 ***

1

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.474	187.000
2	99.434	186.114
3	109.424	185.654
4	119.424	185.621
5	129.416	186.015
6	139.382	186.836
7	149.304	188.081
8	159.164	189.749
9	168.944	191.836
10	178.626	194.340
11	188.192	197.254
12	197.624	200.574
13	206.907	204.294
14	216.022	208.406
15	224.953	212.904
16	233.684	217.780
17	242.199	223.024
18	250.482	228.626
19	258.518	234.578
20	259.114	235.060

Factor of Safety
*** 1.561 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.579	187.000
2	91.521	185.929
3	101.499	185.254
4	111.495	184.977
5	121.494	185.097
6	131.481	185.615
7	141.439	186.529
8	151.353	187.839
9	161.206	189.543
10	170.985	191.636
11	180.672	194.117
12	190.253	196.982
13	199.713	200.225
14	209.036	203.842
15	218.207	207.827
16	227.213	212.173
17	236.039	216.874
18	244.672	221.923
19	253.096	227.310
20	261.300	233.029
21	264.074	235.132

Factor of Safety
*** 1.567 ***

1

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.000	187.000
2	59.956	186.063
3	69.934	185.402
4	79.927	185.017
5	89.926	184.909
6	99.925	185.077
7	109.915	185.522
8	119.889	186.243
9	129.839	187.239
10	139.758	188.511
11	149.638	190.056
12	159.471	191.874
13	169.251	193.963
14	178.968	196.321
15	188.617	198.948
16	198.190	201.840
17	207.679	204.997
18	217.077	208.414
19	226.377	212.090
20	235.571	216.022
21	244.654	220.206
22	253.617	224.640
23	262.454	229.320
24	271.158	234.243
25	272.843	235.259

Factor of Safety
*** 1.569 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.053	187.000
2	81.013	186.107
3	90.996	185.524
4	100.992	185.251
5	110.992	185.288
6	120.986	185.635
7	130.964	186.293
8	140.917	187.259
9	150.836	188.534
10	160.710	190.116
11	170.530	192.004
12	180.287	194.196
13	189.971	196.689
14	199.573	199.482
15	209.084	202.571
16	218.494	205.954
17	227.795	209.627
18	236.978	213.587
19	246.033	217.830
20	254.952	222.352
21	263.727	227.149
22	272.348	232.216
23	277.278	235.323

Factor of Safety
*** 1.573 ***

1

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	63.158	187.000
2	73.095	185.882
3	83.064	185.097
4	93.054	184.644
5	103.053	184.525
6	113.051	184.740
7	123.036	185.288
8	132.997	186.169
9	142.923	187.382
10	152.803	188.925
11	162.627	190.798
12	172.382	192.997
13	182.058	195.520
14	191.645	198.365
15	201.132	201.528
16	210.508	205.005
17	219.762	208.794
18	228.885	212.889
19	237.866	217.287
20	246.696	221.981
21	255.364	226.968
22	263.861	232.241
23	268.280	235.192

Factor of Safety
*** 1.574 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.789	187.000
2	75.741	186.016
3	85.718	185.341
4	95.711	184.975
5	105.711	184.919
6	115.708	185.173
7	125.692	185.737
8	135.654	186.609
9	145.584	187.790
10	155.473	189.278
11	165.311	191.072
12	175.088	193.169
13	184.796	195.569
14	194.425	198.268
15	203.965	201.264
16	213.409	204.554
17	222.745	208.136
18	231.967	212.005
19	241.064	216.157
20	250.028	220.590
21	258.850	225.298
22	267.522	230.277
23	275.673	235.300

Factor of Safety
*** 1.577 ***

**** END OF GSTABL7 OUTPUT ****

SOIL PROPERTIES

Unit weight:	125 pcf
Cohesion:	0 psf
Friction angle:	33.0 deg
Sloping angle, beta	26.6 deg
Water Level (below FG)	50.0 ft

FOUNDATION (Continuous Strip)

Factor of safety:	1.0
Width of foundation, B	6.17 ft
Depth below adj. grade, D	3.0 ft
Hori. dis. from footing, b	0.0 ft
Height of the slope, H :	34.0 ft

b/B:	0.00
D/B:	0.49
b/H	0.00
Ns:	

Allowable Bearing Pressure, $Q_a = (c\ N_{cq} + 0.5\ \gamma'\ B\ N_{\gamma q})/\ FS$

Condition	Nominal Bearing Capacity	Footing Dimension (B , D in feet)	N_{cq}	$N_{\gamma q}$
Foundation on face of slope	**8,094 psf**	B=6.2ft; D=3.0ft	5.2	21

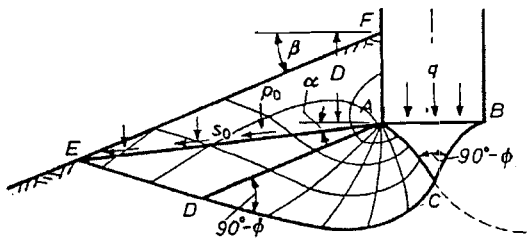


Fig. 1 Plastic zones near rough strip foundation on face of slope (foundation failure)

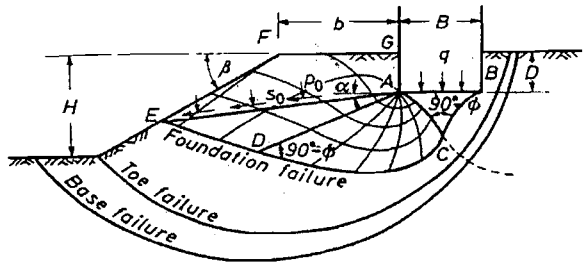


Fig. 4 Plastic zones and slip surfaces near rough strip foundation on top of slope

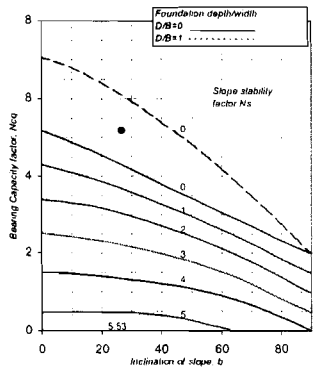


Fig 2

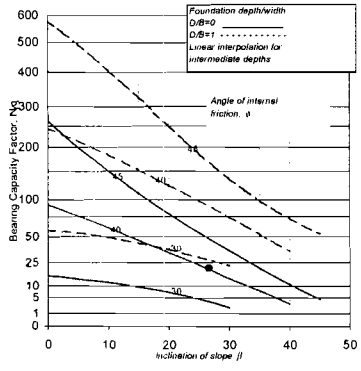


Fig 3

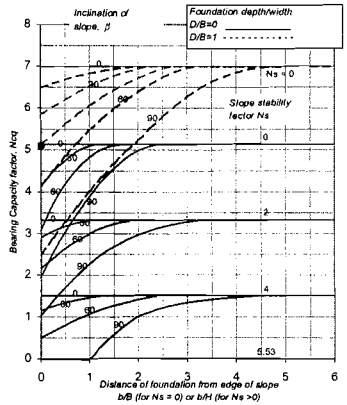


Fig 5

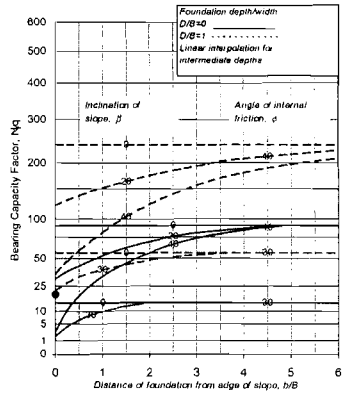


Fig 6

Ref:
1. Meyerhof, 1957, The Ultimate Bearing Capacity of Foundations on Slopes, Fourth International Conference on Soil Mechanics and Foundation Engineering, London, Proceedings, Vol 1, pp. 384-386
2. NAFAC (1986), "Design Manual 7.02", Foundations & Earth Structures, United State Department of the Navy, Naval Facilities Engineering Command, Washington, USA, pp 7.2-135 and 136.

Leighton

Project No. 602171-001 Date: 5/28/08

BEARING CAPACITY OF SHALLOW FOUNDATION ON SLOPING GROUND
HEIGHT OF RETAINING WALL = 10 FEET
EXISTING RETAINING WALL BEHIND OF ABUTMENT 4 OF I-5/ EL CAMINO REAL UNDERCROSSING
SAN CLEMENTE, CALIFORNIA

Figure

B3

SOIL PROPERTIES

Unit weight:..... 125 pcf
Cohesion:..... 0 psf
Friction angle:..... 33.0 deg
Sloping angle, beta..... 26.6 deg
Water Level (below FG)..... 50.0 ft

FOUNDATION (Continuous Strip)

Factor of safety:..... 1.0
Width of foundation, B..... 5.17 ft
Depth below adj. grade, D..... 3.0 ft
Hori. dis. from footing, b..... 0.0 ft
Height of the slope, H :..... 34.0 ft

b/B:	0.00
D/B:	0.58
b/H:	0.00
Ns:	

Allowable Bearing Pressure, $Q_a = (c\ N_{cq} + 0.5\ \gamma'\ B\ N_{\gamma q})/\ FS$

Condition	Nominal Bearing Capacity	Footing Dimension (B , D in feet)	N_{cq}	$N_{\gamma q}$
Foundation on face of slope	**8,073 psf**	B=5.2ft; D=3.0ft	5.3	25

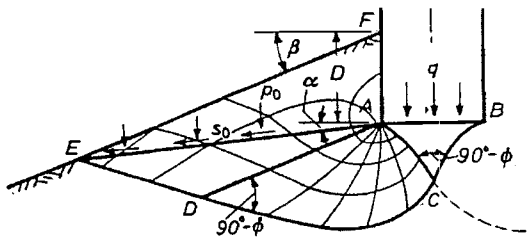


Fig. 1 Plastic zones near rough strip foundation on face of slope (foundation failure)

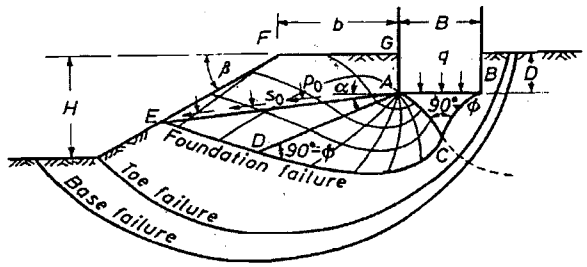


Fig. 4 Plastic zones and slip surfaces near rough strip foundation on top of slope

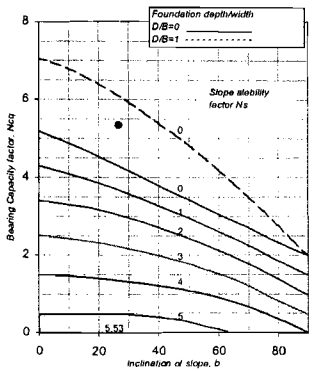


Fig 2

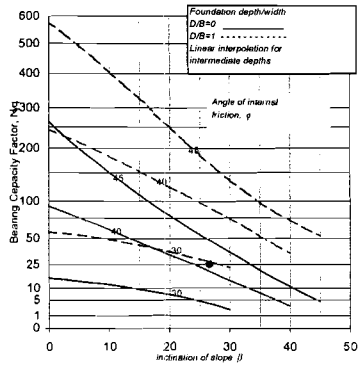


Fig 3

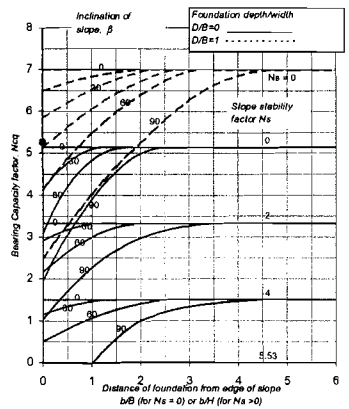


Fig 5

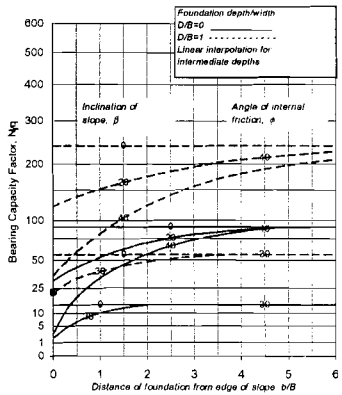


Fig 6

Ref:
1. Meyerhof, 1957, The Ultimate Bearing Capacity of Foundations on Slopes, Fourth International Conference on Soil Mechanics and Foundation Engineering, London, Proceedings Vol 1, pp 384-386.
2. NAFAC (1986), "Design Manual 7.02", Foundations & Earth Structures, United State Department of the Navy, Naval Facilities Engineering Command, Washington, USA, pp 7.2-133 and 136.

Leighton

Project No. 602171-001 Date: 5/28/08

BEARING CAPACITY OF SHALLOW FOUNDATION ON SLOPING GROUND
HEIGHT OF RETAINING WALL = 8 FEET
EXISTING RETAINING WALL BEHIND OF ABUTMENT 4 OF I-5/ EL CAMINO REAL UNDERCROSSING
SAN CLEMENTE, CALIFORNIA

Figure
B4

SOIL PROPERTIES

Unit weight:..... 125 pcf
Cohesion:..... 0 psf
Friction angle:..... 33.0 deg
Sloping angle, beta..... 26.6 deg
Water Level (below FG)..... 50.0 ft

FOUNDATION (Continuous Strip)

Factor of safety:..... ...1.0
Width of foundation, B.....4.17 ft
Depth below adj. grade, D..... 3.0 ft
Hori. dis. from footing, b..... .0.0 ft
Height of the slope, H :..... 34.0 ft

b/B:	0.00
D/B:	0.72
b/H:	0.00
Ns:	

Allowable Bearing Pressure, $Q_a = (c\ N_{cq} + 0.5\ \gamma'\ B\ N_{\gamma q})/\ FS$

Condition	Nominal Bearing Capacity	Footing Dimension (B , D in feet)	N_{cq}	$N_{\gamma q}$
Foundation on face of slope	**7,813 psf**	B=4.2ft; D=3.0ft	5.6	30

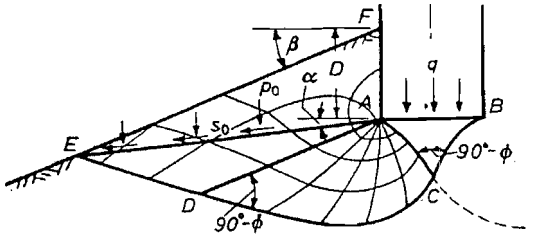


Fig. 1 Plastic zones near rough strip foundation on face of slope (foundation failure)

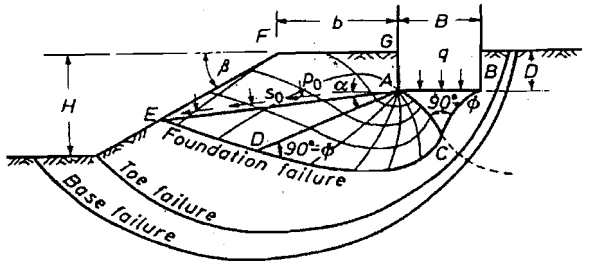


Fig. 4 Plastic zones and slip surfaces near rough strip foundation on top of slope

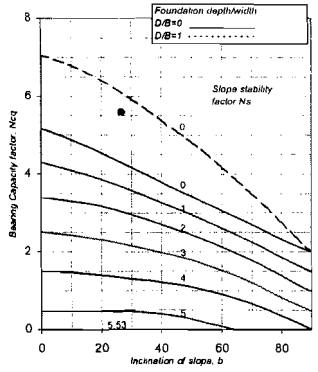


Fig 2

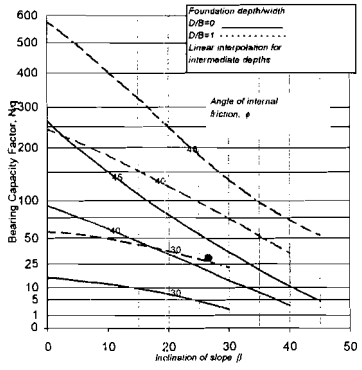


Fig 3

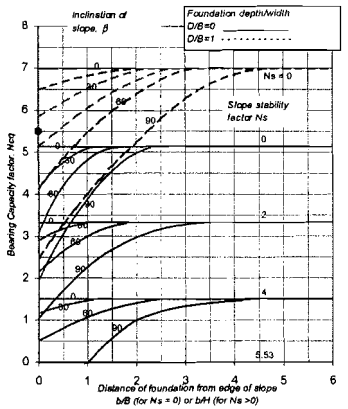


Fig 5

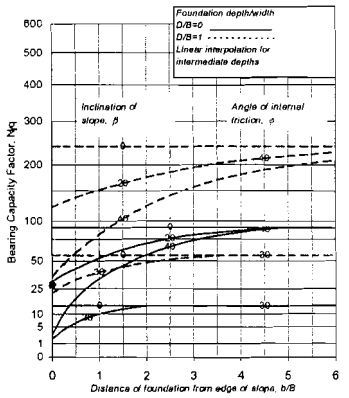


Fig 6

Ref:
1. Meyerhof, 1957, The Ultimate Bearing Capacity of Foundations on Slopes, Fourth International Conference on Soil Mechanics and Foundation Engineering, London, Proceedings, Vol 1, pp. 384-386.
2. NAFAC (1986), "Design Manual 7.02", Foundations & Earth Structures, United State Department of the Navy, Naval Facilities Engineering Command, Washington, USA, pp 7.2-135 and 136.

Leighton

Project No. 602171-001 Date: 5/28/08

BEARING CAPACITY OF SHALLOW FOUNDATION ON SLOPING GROUND
HEIGHT OF RETAINING WALL = 6 FEET
EXISTING RETAINING WALL BEHIND OF ABUTMENT 4 OF I-5/ EL CAMINO REAL UNDERCROSSING
SAN CLEMENTE, CALIFORNIA

Figure **B5**

SOIL PROPERTIES

Unit weight:..... 125 pcf
Cohesion:..... 0 psf
Friction angle:..... 33.0 deg
Sloping angle, beta..... 26.6 deg
Water Level (below FG)..... 50.0 ft

FOUNDATION (Continuous Strip)

Factor of safety:..... ...1.0
Width of foundation, B.....4.17 ft
Depth below adj. grade, D..... 3.0 ft
Hori. dis. from footing, b..... .0.0 ft
Height of the slope, H :..... 34.0 ft

b/B:..... 0.00
D/B:..... ..0.72
b/H..... 0.00
Ns:.....

Allowable Bearing Pressure, $Q_a = (c\ N_{cq} + 0.5\ \gamma'\ B\ N_{\gamma q})/\ FS$

Condition	Nominal Bearing Capacity	Footing Dimension (B , D in feet)	N_{cq}	$N_{\gamma q}$
Foundation on face of slope	**7,813 psf**	B=4.2ft; D=3.0ft	5.6	30

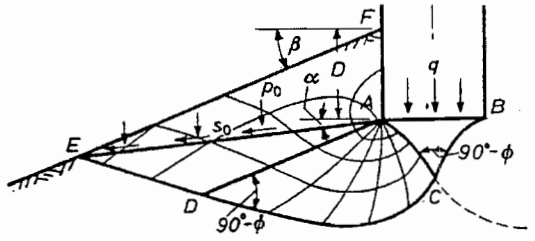


Fig. 1 Plastic zones near rough strip foundation on face of slope (foundation failure)

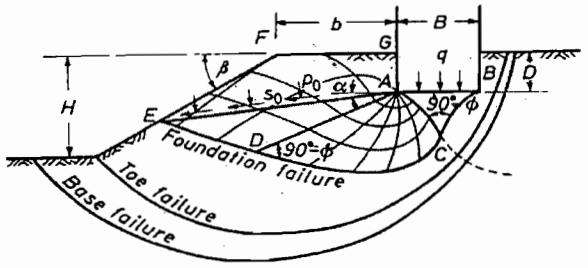


Fig. 4 Plastic zones and slip surfaces near rough strip foundation on top of slope

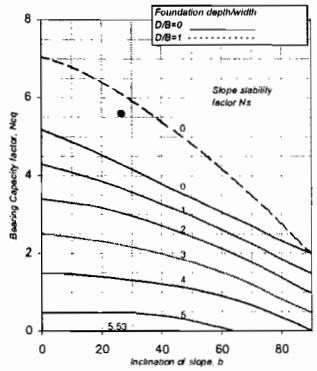


Fig 2

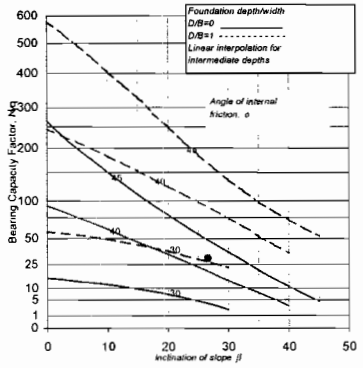


Fig 3

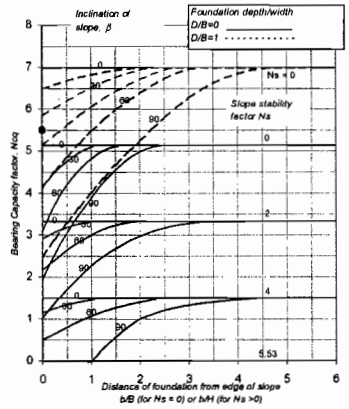


Fig 5

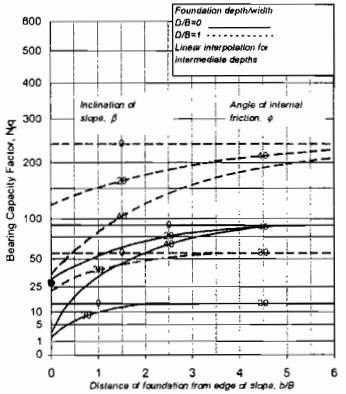


Fig 6

Ref
1. Meyerhof, 1957, The Ultimate Bearing Capacity of Foundations on Slopes, Fourth International Conference on Soil Mechanics and Foundation Engineering, London, Proceedings, Vol 1, pp. 384-386.
2. NAFAC (1986), "Design Manual 7.02", Foundations & Earth Structures, United State Department of the Navy, Naval Facilities Engineering Command Washington, USA, pp 7.2-135 and 136.

Leighton

Project No. 602171-001 Date: 5/28/08

BEARING CAPACITY OF SHALLOW FOUNDATION ON SLOPING GROUND
HEIGHT OF RETAINING WALL = 4 FEET
EXISTING RETAINING WALL BEHIND OF ABUTMENT 4 OF I-5/ EL CAMINO REAL UNDERCROSSING
SAN CLEMENTE, CALIFORNIA

Figure
B6

SOIL PROPERTIES

Unit weight:..... 120 pcf
Cohesion:..... 0 psf
Friction angle:..... 32.0 deg
Sloping angle, beta..... 26.6 deg
Water Level (below FG..... 50.0 ft

FOUNDATION (Continuous Strip)

Factor of safety:..... 1.0
Width of foundation, B..... 8.00 ft
Depth below adj. grade, D..... 2.5 ft
Hori. dis. from footing, b..... 0.0 ft
Height of the slope, H :..... 26.0 ft

b/B:..... 0.00
D/B:..... 0.31
b/H..... 0.00
Ns:.....

Allowable Bearing Pressure, $Q_a = (c\ N_{cq} + 0.5\ \gamma'\ B\ N_{\gamma q})/\ FS$

Condition	Ultimate Bearing Capacity	Footing Dimension (B , D in feet)	N_{cq}	$N_{\gamma q}$
Foundation on face of slope	**6,240 psf**	B=8.0ft; D=2.5ft	4.9	13

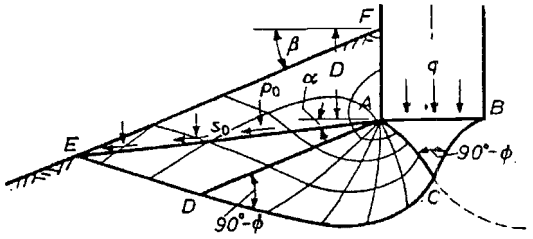


Fig. 1 Plastic zones near rough strip foundation on face of slope (foundation failure)

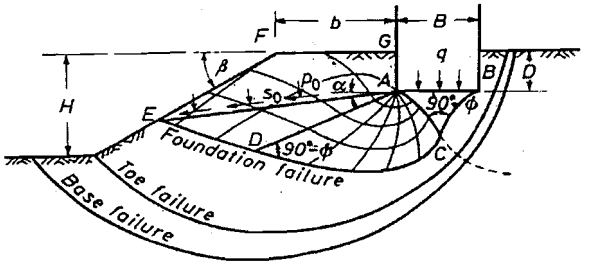


Fig. 4 Plastic zones and slip surfaces near rough strip foundation on top of slope

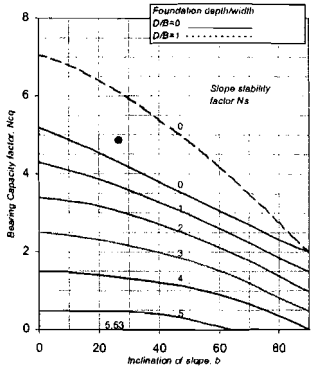


Fig 2

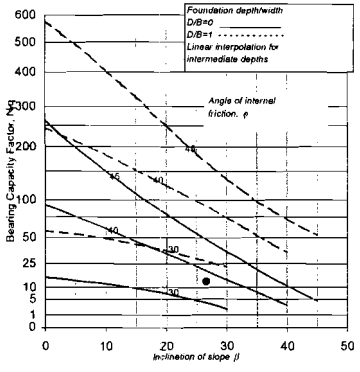


Fig 3

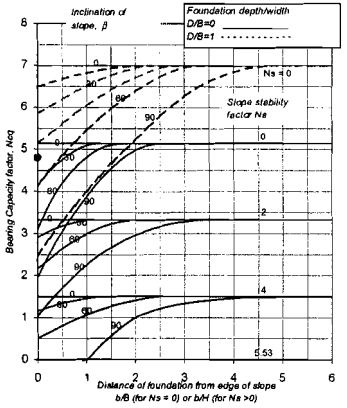


Fig 5

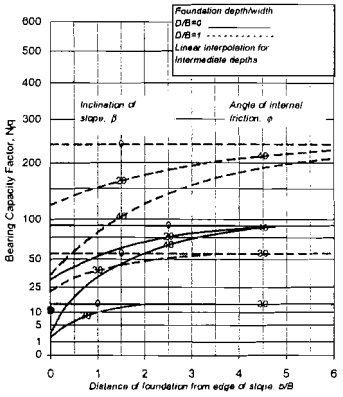


Fig 6

Ref:
1. Meyerhof, 1957, The Ultimate Bearing Capacity of Foundations on Slopes, Fourth International Conference on Soil Mechanics and Foundation Engineering, London, Proceedings, Vol 1, pp. 384-386.
2. NAFAC (1986), "Design Manual 7.02", Foundations & Earth Structures, United State Department of the Navy, Naval Facilities Engineering Command, Washington, USA, pp 7.2-135 and 136.

Leighton

Project No. 602171-001 Date: 9/2/08

BEARING CAPACITY OF SHALLOW FOUNDATION ON SLOPING GROUND
14 FEET HIGH SOUNDWALL ON MAXIMUM HEIGH OF 8 FEET OF RETAINING WALL
I-5/ EL CAMINO REAL SOUNDWALL
SAN CLEMENTE, CALIFORNIA

Figure
B7

APPENDIX C

I-5 EL CAMINO REAL SOUNDWALL PROJECT
RESPONSE TO REVIEW COMMENTS

Review of Consultant's Foundation Report: Draft Foundation Report for Proposed Soundwall Nos. 83, 93, 93A and 101 on Southbound Interstate 5 Near El Camino Real, City of San Clemente, California, dated July 16, 2008.

LINE NO.	REPORT PAGE NO.	CALTRANS REVIEWER	COMMENTS	RESPONSE
1	9	Jie Huang	On Page 9, per Section 7.1 of the latest Corrosion Guidelines (Caltrans, 2003), corrosion mitigation measures for tieback anchors are required regardless of the on-site corrosion test results. It should be addressed in the report.	We will revise our report to address this.
2	10	Jie Huang	On Page 10, please use the latest database, i.e. California Geological Survey's 2002 fault database, to develop the Section of Faulting and Seismicity.	We have used the latest fault CGS database for our analysis. We will indicate this in our report.
3	12	Jie Huang	On Page 12, Section 3.6.3, it was stated that the seismic-induced settlement was estimated to be small and did not need to be considered in design. However, the differential settlement should be estimated. Since a portion of Soundwall 83 will be seated on retaining wall supported by footing and the rest of it will be supported by CIDH piles, there is possibility that intolerable differential settlement will develop between these two portions of the soundwall during an earthquake event. It is better is examine it based on the seismic parameters obtained and provide the results.	Based on our analysis, seismic-induced dry settlement is estimated to be on the order of 0.11 inches or less. The analysis results are attached and we will include this in our report.
4	12	Jie Huang	On Page 12, Section 3.6.4, please base the seismic slope stability on analysis using the subsurface information obtained in the report.	The factor of safety for seismic slope stability was calculated to be 1.5. The analysis results are attached and will be included in our report.
5	17	Jie Huang	On Page 17, please check whether the ultimate bearing capacity 4.6 ksf is responding to an appropriate wall height. 4.6 ksf is for wall of height 6 feet without haunch. However, for SW No. 83, the wall height may go as high as 8 feet. This should be addressed appropriately.	We will revise our report to incorporate this.
6	18	Jie Huang	On page 18, the last sentence in Paragraph 2 of Section 4.4 needs to be reconsidered. Even though soil against bedded structure can remain intact with time, per Section 5.6.4 of Bridge Design Specifications (Caltrans, 2004), only 50% or less of the available passive resistance may be used. The passive lateral pressure must be calculated based on this criterion.	We will revise our report to incorporate this.
7	Figure 2 LOTB	Jie Huang	For the Logs of Test Borings (Sheet 3 to 6 of Figure 2), please correct the soil description and soil consistency. These must	As indicated in our LOTB, blow count of 61 shown on LB-1 is from California ring sampler, not SPT sampler. As such,

I-5 EL CAMINO REAL SOUNDWALL PROJECT
RESPONSE TO REVIEW COMMENTS

Review of Consultant's Foundation Report: Draft Foundation Report for Proposed Soundwall Nos. 83, 93, 93A and 101 on Southbound Interstate 5 Near El Camino Real, City of San Clemente, California, dated July 16, 2008.

LINE NO.	REPORT PAGE NO.	CALTRANS REVIEWER	COMMENTS	RESPONSE
			conform to the Soil and Rock Logging, Classification, and Presentation Manual (Caltrans, 2007), especially Section 2.4. For example in LOTB of LB-1, the top layer of SPT blow count 61 is described as "dense". However, according to Caltrans' manual, it should be described as "very dense".	the consistency of "dense" is correct.
			In LOTB5 of LB-5, "firm" is used to describe the consistency of clay, however, according to the manual "medium stiff' should be used.	We will revise our LOTB to incorporate this.
			Bench mark information should be used on the LOTBs per Pg 55 of the manual.	The bench mark information is now available and we will include that on our LOTB.
8	Appendix A	Jie Huang	On the Second page of Appendix A, the soil identification: "silty, clayey sand (SC-SM)" and "sandy silty clays (CL-ML)" are not consistent with Caltrans' logging manual (Caltrans, 2007). Please correct per the Caltrans logging manual.	We will revise our report to incorporate this.
9	Direct Shear Test B-6 R-3	Jie Huang	On Page DS B-6 R-3, please correct the typo "cayey" in "Gray cayey sand (SC)".	We will revise this to Clayey Sand.
10	Appendix B Lateral Pressure	Jie Huang	On the second page of lateral earth pressure calculation in Appendix B, the equivalent fluid pressure for passive earth pressure was calculated to be 424.0 psf/ft. However, 360 psf/ft is used. Please justify it.	We will revise it to say 424 psf/ft.

State of California

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: Mr. Kamran Mazhar, Chief
Design Branch F

Date: October 27, 2008

File: 12-ORA-05-PM 1.3/1.7
12-OG9401
Soundwall Nos. 83, 93, 55-203 and 101

Attn: Kamran Mazhar

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

Subject: 2nd Review of Consultant's Foundation Report: Foundation Report for Proposed Soundwall Nos. 83, 93, 55-203 and 101 on Southbound Interstate 5 Near El Camino Real, City of San Clemente, California, dated September 23, 2008.

We have conducted a second review of the "Foundation Report for Proposed Soundwall Nos. 83, 93, 55-203 and 101 on Southbound Interstate 5 Near El Camino Real, City of San Clemente, California," prepared by Leighton Consulting Inc., dated September 23, 2008. Our first review was provided in memorandum dated August 12th, 2008. Our comments on this report are given below.

1. On page 18, Comment#8 of our review memorandum for the draft foundation dated August 12th is not accommodated appropriately in this foundation report. Please refer to Section 5.6.4 of Bridge Design Specifications (Caltrans, 2004) for more information.

2. On Page 20, in Section 5.2 - CIDH Pile Construction, please be advised once wet construction method is employed, the minimum diameter of CIDH piles will be 24 inches (Guidelines for Structures Foundation Reports, Section 3.9.2, 2006; Memo to Designers, Section 3-1, 2006). If the wet method is used, the referred Caltrans Standard Plan B-15-8 cannot be used. It needs to be clarified herein.

If you have any questions or comments, please contact Jie Huang at 213-620-2367.

Prepared by: Date: 10/27/2008

Supervised by: Date: 10/27/08

Jie Huang, Ph.D.
Transportation Engineer
Office of Geotechnical Design - South 1
Branch B

Sam Sukiasian, G.E.
Senior Transportation Engineer, Branch Chief
Office of Geotechnical Design- South 1
Branch B

REGISTERED PROFESSIONAL ENGINEER
SAMUEL G. SUKIASIAN
No. GE2681
Exp. 6-30-10
GEOTECHNICAL
STATE OF CALIFORNIA

cc: **OGDS1 – Los Angeles File**
OGDS1 - Sacramento File (MS-5)
GS – SAC File (MS-5)

REFERENCES

Caltrans, Bridge Design Specifications, August, 2004.
Caltrans, Guidelines for Structures Foundation Reports, March, 2006.
Caltrans, Memo to Designers, October, 2006.

I-5 EL CAMINO REAL SOUNDWALL PROJECT
RESPONSE TO REVIEW COMMENTS

2nd Review of Consultant's Foundation Report: Foundation Report for Proposed Soundwall Nos. 83, 93, 55-203 and 101 on Southbound Interstate 5 Near El Camino Real, City of San Clemente, California, dated September 23, 2008.

LINE NO.	REPORT PAGE NO.	CALTRANS REVIEWER	COMMENTS	RESPONSE
1	18	Jie Huang	On page 18, Comment#8 of our review memorandum for the draft foundation dated August 12th is not accommodated appropriately in this foundation report. Please refer to Section 5.6.4 of Bridge Design Specifications (Caltrans, 2004) for more information.	We will revise our report to incorporate this (maximum 50 percent of available passive pressure).
2	20	Jie Huang	On Page 20, in Section 5.2 - CIDH Pile Construction, please be advised once wet construction method is employed, the minimum diameter of CIDH piles will be 24 inches (Guidelines for Structures Foundation Reports, Section 3.9.2, 2006; Memo to Designers, Section 3-1, 2006). If the wet method is used, the referred Caltrans Standard Plan B-15-8 cannot be used. It needs to be clarified herein.	We will delete the wet method (drilling slurry) for borehole stability.

MATERIALS REPORT FOR PROPOSED SOUNDWALLS ON SOUTHBOUND INTERSTATE 5 NEAR EL CAMINO REAL, CITY OF SAN CLEMENTE, CALIFORNIA

Prepared for:

RMC, INC

6 Hutton Center Drive, Suite 1270
Santa Ana, California 92707

Project No. 602171-001

December 3, 2008

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

December 3, 2008

Project No. 602171-001

To: RMC, Inc.
6 Hutton Centre Drive, Suite 1270
Santa Ana, California 92707

Attention: Mr. Jamal Salman, P.E.

Subject: Materials Report for Proposed Soundwalls on Southbound Interstate 5 near El Camino Real, City of San Clemente, California

In response to your request, Leighton Consulting, Inc. (Leighton) has performed a geotechnical exploration for four proposed soundwalls on southbound Interstate 5 (I-5) near El Camino Real. As part of the soundwall construction, the existing shoulders on I-5 and the southbound El Camino Real on-ramp will be partially replaced and/or widened. This report addresses the materials conditions and issues described in Topic 114 of the California Department of Transportation (Caltrans) Highway Design Manual. A draft version of this report was issued on September 16, 2008. This report has been revised to incorporate the design changes by the design team and review comments from Caltrans.

It is our professional opinion that the site can be developed as planned from a geotechnical perspective, provided the recommendations presented in this report are incorporated into design and construction. If you have any questions regarding this report, please do not hesitate to contact this office. We appreciate this opportunity to be of service.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

Tae Kuk Kim, PE 69316
Project Engineer

Djan Chandra, PE, GE 2376
Senior Principal Engineer

TK/DJC/lr

Distribution: (3) Addressee

17781 Cowan ■ Irvine, CA 92614-6009
949.253.9836 ■ Fax 949.250.1114 ■ www.leightonconsulting.com

TABLE OF CONTENTS

Section			Page
1.0	GENERAL		1
	1.1	Purpose and Scope	1
	1.2	Project Location and Description	1
	1.3	Land Use and Terrain	4
	1.4	Climatic Conditions	4
	1.5	Limitations	4
2.0	GEOTECHNICAL FIELD AND LABORATORY INVESTIGATIONS		6
	2.1	Subsurface Exploration	6
	2.2	Laboratory Testing	7
3.0	SUBSURFACE CONDITIONS AND SEISMIC HAZARDS		8
	3.1	Regional and Site Geology	8
	3.2	Subsurface Earth Material	8
	3.3	Groundwater	9
	3.4	Engineering Properties of Subsurface Materials	10
	3.4.1	Shear Strength	10
	3.4.2	Collapsible Potential	10
	3.4.3	Expansion Potential	10
	3.4.4	Corrosivity of Soils	10
4.0	GEOTECHNICAL ANALYSES AND DESIGN		11
	4.1	Corrosion Potential	11
	4.2	Pavement Design	12
	4.2.1	Traffic Indices	12
	4.2.2	R-Values	12
	4.2.3	Recommended Minimum Pavement Sections	12
	4.2.4	Pavement Materials and Compaction	13
	4.2.5	Material Sources	13
	4.3	Slope Stability	14
5.0	CONSTRUCTION CONSIDERATIONS		15
	5.1	Construction Advisories	15
	5.2	Construction Considerations that Influence Specification	15

TABLE OF CONTENTS (Cont'd)

Section Page

5.3 Pre-Construction Survey and Construction Monitoring 15
5.4 Differing Site Conditions 16

6.0 EARTHWORK RECOMMENDATIONS AND SPECIFICATIONS 17

6.1 Grading and Earthwork 17
6.2 Clearing and Grubbing 17
6.3 Remedial Grading 17
6.4 Materials Specifications 17
6.5 Subgrade Compaction 18
6.6 Geotechnical Observation 18

7.0 REFERENCES 19

Appendices

Appendix A – Geotechnical Boring Logs
Appendix B – Laboratory Test Results
Appendix C – Geotechnical Engineering Analyses
Appendix D – Caltrans Review Comments dated September 3, 2008, and October 7, 2008

LIST OF ILLUSTRATIONS

Figures

Figure 1 – Site Location Map Rear of Text
Figure 2A and 2B – Boring Location Map Rear of Text

1.0 GENERAL

1.1 Purpose and Scope

This report presents the results of our geotechnical exploration for the shoulder improvements associated with the proposed soundwalls on southbound Interstate 5 (I-5) near El Camino Real in the city of San Clemente, California. This work has been performed under subcontract to RMC for the Orange County Transportation Authority (OCTA). Geotechnical recommendations provided herein are based on design information provided by RMC. Recommendations for the soundwall foundations are provided in a separate foundation report.

Our scope of work for this investigation consisted of the following tasks:

- Site reconnaissance, selection of boring locations, and marking of the boring locations at the site.
- Notification of Underground Service Alert (USA) of marked boring locations prior to the commencement of our field exploration and coordination of a drilling contractor.
- Coordination with Caltrans personnel.
- Subsurface exploration consisting of excavation, logging, and sampling of six hollow-stem borings, collection of Standard Penetration Test (SPT), relatively undisturbed ring and bulk soil samples at selected depth intervals from the borings and transporting the samples to our laboratory for testing.
- Laboratory testing of selected samples to evaluate engineering characteristics of the onsite soils.
- Evaluation of collected data and relevant engineering analyses.
- Preparation of this report summarizing our findings, conclusions, and recommendations.

1.2 Project Location and Description

The project site is located along southbound I-5 near El Camino Real in the city of San Clemente, California. It extends from 1,396 feet south of El Camino Real undercrossing (I-5 Station 82+74) to 131 feet north of El Camino Real undercrossing (I-5 Station 102+40). The location of the project site is shown in Figure 1.

The project consists of removal of a portion of an existing soundwall and construction of four new soundwalls, namely Soundwall Nos. 83, 93, 55-0203 and 101. Associated with the soundwall construction, the existing shoulder adjacent to the soundwall locations will be partially replaced and/or widened.

Soundwall No. 83 is to be located on the southbound I-5 on-ramp at El Camino Real. The soundwall will be approximately 1,595 feet long, extending from southbound I-5 Station 82+74 to southbound On-Ramp Station 18+65. Portions of the existing shoulder along the soundwall will be partially removed, widened and cold planed. The detailed description of the proposed project for Soundwall No. 83 is as follows.

From I-5 Stations 81+78 to 84+10, the width of the existing shoulder is 15.5 feet. The entire shoulder will be removed to accommodate construction of the proposed soundwall and replaced with a new pavement section of 0.90 feet of Hot Mixed Asphalt (HMA) over 1.50 feet of Class 2 Aggregate Base (AB) as recommended in the Table 4 of this report. Since the existing shoulder width is standard within this limit, no widening is proposed.

From I-5 Stations 84+10 to 87+80 (I-5 southbound (SB) on-ramp Station 7+70.02), the width of the existing shoulder is also 15.5 feet. The existing concrete barrier and a two-foot strip of the existing shoulder immediately adjacent to the new soundwall will be removed to accommodate construction of the proposed soundwall with concrete barrier. Removed portion of the existing shoulder will be replaced with new pavement section of 0.90 feet of HMA over 1.50 feet of Class 2 AB as recommended in the Table 4 of this report. The remaining portion of the existing shoulder will be cold planed approximately 0.20 feet and replaced with 0.20 feet of HMA to alleviate potential damage caused by the construction activities. Since the existing shoulder width is standard within this limit, no widening is proposed.

From I-5 Station 87+70 (I-5 SB on-ramp Station 7+70.02) to SB on-ramp Station 13+15, the width of the existing on-ramp shoulder ranges from 4 to 6 feet. The existing shoulder will be partially removed and widened to provide a standard 10-foot wide ramp shoulder. The new pavement section for the removed and widened portion of the shoulder will consist of 0.70 feet of HMA over 1.30 feet of Class 2 AB as recommended in Table 4 of this report.

From I-5 SB on-ramp Stations 13+15 to 17+93.73, the width of the existing on-ramp shoulder is 4 feet and the entire existing shoulder will be removed and widened to provide a standard 10-foot wide ramp shoulder. The new pavement section for the

removed and widened portion of the shoulder will consist of 0.70 feet of HMA over 1.30 feet of Class 2 AB as recommended in Table 4 of this report.

From I-5 southbound on-ramp Stations 17+93.73 to 18+65, the currently unpaved area will be paved with 0.25 feet of HMA and used as miscellaneous area. The existing pavement within this limit will remain.

Soundwall No. 93 is to be located along the southbound shoulder of I-5, south of El Camino Real undercrossing (Bridge No. 55-0203). It will be approximately 394 feet long, extending from I-5 Station 93+65 (approximately 370 feet south of El Camino Real) to I-5 Station 97+52. Since the existing shoulder within this limit is standard 10 feet wide, no widening is proposed. A two-foot strip of the existing shoulder immediately adjacent to the new soundwall will be removed to accommodate construction of the proposed soundwall with concrete barrier. Removed portion of the existing shoulder will be replaced with new pavement section of 0.90 feet of HMA over 1.50 feet of Class 2 AB as recommended in the Table 4 of this report. The remaining portion of the existing shoulder will be cold planed approximately 0.20 feet and replaced with 0.20 feet of HMA to alleviate potential damage caused by the construction activities.

Soundwall No. 55-0203 is to be located along the southbound shoulder of I-5, spanning over El Camino Real undercrossing. It is approximately 397 feet long, extending from I-5 Station 97+52 to I-5 Station 101+60. The existing southbound deck slab of El Camino Real undercrossing will be widened by approximately 6 inches to accommodate the proposed soundwall and the existing concrete barrier will be replaced with Type 736 (Mod) concrete barrier.

Soundwall No. 101 is to be located along the southbound shoulder of I-5, north of El Camino Real undercrossing. It is approximately 80 feet long, extending from the north end of El Camino Real undercrossing (I-5 Station 101+60) to approximately 90 feet north of El Camino Real (I-5 Station 102+40). Since the existing shoulder within this limit is standard 10 feet wide, no widening is proposed. A two-foot strip of the existing shoulder immediately adjacent to the new soundwall will be removed to accommodate construction of the proposed soundwall with concrete barrier. Removed portion of the existing shoulder will be replaced with new pavement section of 0.90 feet of HMA over 1.50 feet of Class 2 AB as recommended in the Table 4 of this report. The remaining portion of the existing shoulder will be cold planed approximately 0.20 feet and replaced with 0.20 feet of HMA to alleviate potential damage caused by the construction activities.

1.3 Land Use and Terrain

This portion of I-5 is located in a densely populated urban area surrounded by residential and commercial developments. The proposed improvements will be located within Caltrans right of way.

The terrain in the vicinity of the project slopes gently to the south. The highest ground surface elevation is approximately 256 feet above mean sea level (msl) at the north end of the project and the lowest ground surface elevation is approximately 182 feet (msl) at the south end of the project. The El Camino Real undercrossing is at elevations of 240 to 250 feet and the street level of El Camino Real is at an elevation of approximately 215 feet.

1.4 Climatic Conditions

The climate in the project area is typical of coastal regions in southern California and classifies as Mediterranean because of its 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 the cool winter season, with an annual rate of about 14 inches of rainfall per year (www.weather.com). The temperatures range from an average low of 44 degrees Fahrenheit in December and January to an average high of 79 degrees Fahrenheit in August and September. Snowfall is rare and the project area is considered frost-free. Based on the Caltrans Pavement Climate Regions map (Caltrans, 2005), the site is located within "South Coast" climate region. This type of climate is not expected to significantly affect structural design. As a result, no freeze-thaw recommendations are required.

1.5 Limitations

This report has been prepared for the use of RMC, OCTA and Caltrans for the proposed Soundwall Nos. 83, 93, 55-0203 and 101 and the associated improvements. The report may not be used by others without the written consent of our client and our firm.

The conclusions and recommendations presented in this report have been based upon the generally accepted principles and practices of geotechnical engineering utilized by other competent engineers at this time and place. No other warranty is either expressed or implied.

Additionally, the conclusions and recommendations presented in this report have been based upon the subsurface conditions encountered at discrete and widely spaced locations and at specific intervals below the ground surface. Due to the inherent variance in soil conditions, variability may be encountered during construction. Where encountered during construction, such variances should be brought to our attention to evaluate the impact upon the recommendations presented in this report.

2.0 GEOTECHNICAL FIELD AND LABORATORY INVESTIGATIONS

2.1 Subsurface Exploration

An initial site reconnaissance was performed to mark the proposed boring locations and to evaluate the proposed boring locations with respect to access for drilling equipment and subsurface structures. USA was then notified of the marked locations. We also coordinated with Caltrans personnel during our field exploration.

Our field exploration consisted of advancing six 8-inch diameter hollow-stem borings to a maximum depth of 51½ feet below the current grade. Borings LB-1 and LB-2 are located along the southbound of I-5 near Abutment 4 (north abutment) and Abutment 1 (south abutment) of the El Camino Real undercrossing, respectively. Boring LB-3 is located at approximately 460 feet south of El Camino Real undercrossing and Borings LB-4 through LB-6 are located along the west side of I-5 southbound on-ramp at El Camino Real. The approximate location of these borings is shown on Figure 2A and 2B.

Standard Penetration Test (SPT) was performed within the hollow-stem borings using a 140-pound automatic hammer falling freely for 30 inches. The samplers were driven for a total penetration of 18 inches and the blow counts were recorded for the last 12 inches of penetration. Relatively undisturbed samples were collected from the borings using the Modified California Ring sampler. The field sampling procedures were conducted in accordance with ASTM Standard Specifications D1586 and D3550 for SPT and split-barrel sampling of soil. In addition to driven samples, representative bulk soil samples were also collected from the borings.

The test borings were logged in the field by a member of our technical staff. Each soil sample collected was reviewed and described in accordance with the Unified Soil Classification System. The samples were sealed and packaged for transportation to our laboratory. After completion of drilling, the borings were backfilled with soil/cutting, tamped and capped with rapid set concrete. Geotechnical logs of the borings are included in Appendix A.

Elevation datum for all ground surfaces elevations referenced herein is mean sea level (MSL). Field exploration summary is provided in Table 1.

Table 1 - Field Exploration Summary

Boring No.	I-5 Station No.	Offset[1]	Approximate Ground Surface Elevation (feet, msl)	Exploration Depth (feet)
LB-1	103+00	58 feet Left	256	51.4
LB-2	96+00	58 feet Left	236	51.5
LB-3	92+50	58 feet Left	224	26.5
LB-4	94+50	130 feet Left	220	36.5
LB-5	91+75	100 feet Left	217	36.5
LB-6	87+20	80 feet Left	201	26.5

[1]Offsets were measured from the indicated station line.

2.2 Laboratory Testing

Laboratory tests were performed on representative soil samples to determine the geotechnical engineering properties of subsurface materials. The following laboratory tests were performed:

- In-situ moisture content and density;
- Grain-size distribution;
- Percent passing No. 200 sieve;
- Direct shear;
- Consolidation; and
- Corrosivity (soluble sulfate contents, chloride, pH, and resistivity).

All laboratory tests were performed in general conformance with ASTM or State of California Standard Methods. The results of the in-situ moisture and density tests are presented on our geotechnical boring logs (Appendix A). The results of other laboratory tests are presented in Appendix B of this report.

3.0 SUBSURFACE CONDITIONS

3.1 Regional and Site Geology

The project area is generally characterized by rolling hills and canyons with marine terraces that border the Pacific Ocean. The site lies within the foothills of the southern Santa Ana Mountains, which is within the Peninsular Ranges Geomorphic Province of southern California. The province is bounded on the northeast by the Elsinore Fault and the south by the offshore southern extension of the Newport-Inglewood Fault Zone. Exposed in the area between the two north-west trending right-lateral strike-slip faults is a sequence of mostly west dipping rocks. A relatively thin section of flat lying Quaternary terrace deposits occur near the coastline, adjacent to drainages, and at isolated localities in the upland area.

3.2 Subsurface Earth Material

The pavement sections encountered in our borings on the southbound shoulder of I-5 consisted of 6 to 12 inches of asphalt concrete (AC) with generally no aggregate base (AB). A 12-inch thick layer of aggregate base was encountered in Boring LB-6. The pavement sections on the southbound on-ramp consist of 13 to 14 inches of asphalt concrete over 0 to 4 inches of aggregate base. The existing pavement sections encountered in our borings are shown in Table 2.

Table 2 – Existing Pavement Sections

Boring No.	I-5 Station No.	Location of Boring	Existing Pavement Section
LB-1	103+00	Southbound I-5 Shoulder	6 inches AC
LB-2	96+00	Southbound I-5 Shoulder	12 inches AC
LB-3	92+50	Southbound I-5 Shoulder	11 inches of AC
LB-4	94+50	Southbound I-5 On-Ramp	13 inches AC over 4 inches AB
LB-5	91+75	Southbound I-5 On-Ramp	14 inches AC
LB-6	87+20	Southbound I-5 Shoulder	6 inches AC over 12 inches AB

Based on the available borings, the subsurface conditions along the I-5 mainline and along the southbound on-ramp were found to be slightly different. The subsurface profile along I-5 mainline generally consists of loose to dense silty sand with gravel within the upper approximately 20 feet and loose to medium dense silty sand and very stiff sandy clay from 20 to 25 feet below grade. The soils below 25 feet to 50 feet consist of medium dense to very dense silty sand and sandy silt. Light brown fine-grained sandstone was encountered at approximately 10 to 15 feet below El Camino Real street level (approximately 50 feet below the freeway level).

The subsurface profile along southbound on-ramp generally consists of medium dense to dense clayey sand and gravelly sand within the upper approximately 5 feet and loose to very dense gravelly clayey sand with isolated stiff silty clayey layer from 5 feet to 15 feet below grade. The soils below 15 feet to 25 feet consist of stiff to very stiff sandy clay with varying amount of silt. The soils below 25 feet to 30 feet consist of medium dense silty clayey sand and soils below 30 feet to the maximum depth explored consist of firm to very stiff silty clay and clayey silt with varying content of sand.

Based on the available as-built plan (Caltrans, 1957), the pre-existing topography at El Camino Real undercrossing area sloped gently downward to the southwest from elevations of 220 to 210 feet above mean sea level (msl). The pre-existing elevations of the areas at Abutments 1 and 4 varied from 210 to 215 feet msl. The current as-built elevations of Abutments 1 and 4 of El Camino Real undercrossing are approximately 240 feet to 250 feet, respectively. Based on the available as-built plan (Caltrans, 1957), up to 30 feet and 35 feet of approach embankment fills were placed behind Abutments 1 and 4, respectively.

3.3 Groundwater

Groundwater was not encountered during our field exploration. Groundwater was encountered in Boring B-2A by others in 1954, at a depth of 29 feet below the existing street level (elevation of approximately 184½ feet). The boring was located near Pier 3 of El Camino Real undercrossing. The historically high groundwater table at the El Camino Real street level is deeper than 10 feet below the ground surface (CDMG, 2002). The freeway is approximately 25 to 35 feet higher than El Camino Real. Considering the topography difference and information from the LOTBs, the historically high groundwater table is estimated to be on the order of 35 feet below the existing freeway grade.

3.4 Engineering Properties of Subsurface Materials

Engineering properties of the subsurface materials were modeled based on results of geotechnical field and laboratory tests performed during our exploration. Results of these laboratory tests are presented in Appendix B. These test results are briefly discussed below.

3.4.1 Shear Strength

Based on direct shear test results, the cohesion intercept (c) and friction angle (ϕ) representing the effective ultimate shear strength for the on-site soils ranges from 50 to 300 psf and 30 to 42 degrees, respectively. The shear strength test results are presented in Appendix B.

3.4.2 Collapsible Potential

Laboratory tests performed on samples near the proposed foundation level indicated that the sandy materials have minor collapse potential upon inundation. The test result of the sample from Boring LB-4 at 7.5 feet indicated that the sandy soil has high collapse potential upon inundation. However, based on the relatively high blow counts and moisture content, the soil does not appear to have the characteristics of collapsible soil. Therefore, it is our opinion that the sample could be disturbed during sampling and the test result was disregarded.

3.4.3 Expansion Potential

Laboratory tests performed on near-surface samples indicated that the clay materials exposed near the existing grade level possess low expansion potential when tested in accordance with ASTM D 4829 (see Appendix B).

3.4.4 Corrosivity of Soils

Representative samples of the subsurface soils were subjected to analytical testing to evaluate the potential for corrosion to concrete and ferrous metals. The test results are included in Appendix B and indicate the tested soils exhibited sulfate concentration of 72 to 291 parts per million (ppm), minimum resistivity of 374 to 1,070 ohm-cm, chloride concentration of 43 to 695 ppm, and pH level of 7.5 to 7.8.

4.0 GEOTECHNICAL ANALYSES AND DESIGN

Presented in this section are our evaluation of the corrosion potential of the onsite soils and stability of the existing slopes as well as recommendations for pavement structural sections for the project. The geotechnical parameters used in our analyses were selected based on the laboratory test results and field data from the current investigation, and our geotechnical experience with similar material. Since the existing pavements are not planned for rehabilitation, deflection testing was not performed.

4.1 Corrosion Potential

Representative soil samples were tested for pH, sulfate content, chloride content, and minimum resistivity. The results of these tests are summarized in Table 3 and presented in Appendix B.

Table 3 – Summary of Corrosion Test Results

Boring No.	I-5 Station No.	Offset (feet)	Sample Depth (feet)	pH	Minimum Resistivity (Ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
LB-1	103+00	58 ft L	1 to 5	7.80	1,070	43	98
LB-3	92+50	58 ft L	1 to 5	7.66	750	66	72
LB-5	91+75	100 ft L	1 to 5	7.50	374	695	291

Caltrans Corrosion Guidelines Section 5.5 states that a site is considered to be corrosive to foundation elements if one or more of the following conditions exist for the soil and/or water samples taken at the site (Caltrans, 2003):

- Chloride concentration greater than or equal to 500 ppm
- Sulfate concentration greater than or equal to 2,000 ppm
- pH of 5.5 or less

Based on the test results, buried utilities should be designed using the worst-case parameters: pH = 7.50, minimum resistivity = 374 Ohm-cm, chloride content = 695 ppm, and sulfate content = 291 ppm. Using these parameters and Caltrans CULVERT4 program, 8-gage Corrugated Steel Pipe (CSP) or 14-gage CSP with bituminous coating

can be used for a culvert design life of 50 years. Corrugated aluminum or aluminized steel pipe should not be used. Plastic pipe may be used for a service life of 50 years. The computer printouts of the CULVERT4 program are presented in Appendix C.

Type II modified cement may be used for concrete in direct contact with the onsite soils. A minimum 3 inches of concrete cover should be provided over reinforcement in accordance with Caltrans Bridge Design Specification (Caltrans, 2004).

4.2 Pavement Design

4.2.1 Traffic Indices

Based on the information provided by the Caltrans, the following Traffic Indices (TI's) were used for our pavement design.

Southbound I-5 Shoulder 10-year TI =13.5
Southbound I-5 Shoulder 20-year TI =14.0

Southbound I-5 On-Ramp 10-year TI=12.0
Southbound I-5 On-Ramp 20-year TI=12.0

4.2.2 R-Values

During our investigation, two subgrade soil samples with relatively high fines content were selected for R-value testing. The laboratory test results, included in Appendix B, indicate R-value of 33 and 68. We have selected an R-value of 30 for subgrade and 78 for aggregate base for the pavement design. Import material, if required, should have a minimum R-value of 40.

4.2.3 Recommended Minimum Pavement Sections

We have designed the Hot Mix Asphalt (HMA) pavement sections for the shoulder of I-5 mainline and southbound on-ramp using the computer program CalFP Version 1.1 following the Caltrans Highway Design Manual (Caltrans, 2008). The recommended preliminary pavement sections are presented in the following table. Computer printouts of the pavement design are presented in Appendix C.

Table 4 – Hot Mix Asphalt Pavement Section Thickness

TI	Location	HMA over AB (feet)	Full Depth HMA (feet)
12.0	Southbound I-5 on-ramp	0.70 over 1.30	1.65
13.5	Southbound I-5 shoulder (10-yr TI)	0.80 over 1.45	1.90
14.5	Southbound I-5 shoulder (20-yr TI)	0.90 over 1.50	2.05

Notes:
TI = Traffic Index
HMA = Hot Mix Asphalt, Type A
AB = Aggregate Base, Class 2, Minimum design R-value of 78

R-value of the subgrade soils should be verified after completion of grading to finalize the pavement design. Final pavement sections should be in general accordance with the Caltrans standards and should at least match with the existing pavement section shown on Table 2 of this report. Since the existing pavement will be saw cut, the joint between new and existing pavement should be sealed to minimize water intrusion to the subgrade. Asphalt concrete and aggregate base should conform to Caltrans Standard Specifications (Caltrans 2006) Sections 39 and 26-1.02A, respectively.

4.2.4 Pavement Materials and Compaction

All pavement materials shall conform to the latest Caltrans Standard Specifications and Caltrans Highway Design Manual. Subgrade and base compaction shall be in compliance with Section 19-5.03 "Relative Compaction (95 percent)" of Caltrans Standard Specifications and Section 614.6 of Caltrans Highway Design Manual.

4.2.5 Material Sources

Grading for the improvements may require minor fill placement for the ramp area. If import materials are used for the fill placement, the materials within the upper 4 feet of finished grade should have a minimum R-value of 40 and should be non-corrosive and of low expansion. Import material shall be in compliance with Section 19-7.02 of Caltrans Standard Specifications.

Other construction materials such as aggregates, asphalt, and Portland cement should be imported from local commercial sources. No potential sources for import materials have been pre-tested for this project. Prior to import, the materials should be tested and approved by the Geotechnical Engineer and the District Materials Engineer.

4.3 Slope Stability

According to the California Seismic Hazard Zone Map (CDMG, 2002) for the San Clemente Quadrangle, a portion of the west-facing, descending slope along the southbound on-ramp may be susceptible to earthquake-induced landsliding. The as-built plan (Caltrans, 1957) indicates that the slope is an approach fill slope placed during the construction of El Camino Real undercrossing. Based on the site geology and review of boring logs and LOTBs, subsurface materials along the western slope of the southbound on-ramp possess moderate to high strength. We have performed slope stability analysis of this slope using the Simplified Janbu's method. A horizontal seismic coefficient of 0.15g was used for the pseudo-static analysis. Our analysis indicates that the slope has a global factor of safety greater than 1.5 for pseudo-static condition. Based on this site-specific subsurface information and analysis, the potential for seismically-induced slope failure of the slope is considered low. Computer printouts of the slope stability analysis are presented in Appendix C.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Construction Advisories

On-site soils are considered rippable and excavations are feasible with conventional excavation equipment.

5.2 Construction Considerations that Influence Specifications

Cold planing is planned for the existing shoulder adjacent to Soundwall Nos. 83, 93 and 101. A maximum 0.2-foot thick of the existing asphalt concrete will be cold planed and replaced with 0.2-foot thick of HMA, Type A. The cold planing should follow Caltrans Standard Special Provision 15-670.

Storing, proportioning and mixing material shall comply with Section 39-3 of Caltrans Standard Specification and spreading and compacting of the asphalt concrete shall comply with Section 39-6 of Caltrans Standard Specification (Caltrans 2006).

Slopes to receive erosion control should have all loose rocks larger than 2 inches in maximum dimension, roots and other debris on the surface removed and disposed of prior to applying erosion control materials.

The contractor should be aware of water pollution control work as defined in "Section 7-1.01G, Water Pollution" in Caltrans Standard Specifications.

5.3 Pre-Construction Survey and Construction Monitoring

Prior to any site work and excavations, conditions of existing structures and improvements that may be impacted by the construction should be surveyed and photo/video documented. Structures and improvements that are to be left in-place and within a distance equal to the height of excavations, including back cuts for retaining walls, should be surveyed prior to start of construction and monitored during construction.

Final project Plans and Specifications should be reviewed prior to construction to confirm that the full intent of the recommendations presented in this Materials Report have been incorporated. Following review of Plans and Specifications, sufficient and timely

observation during construction should be performed by a qualified geotechnical consultant to correlate findings of the exploration with actual subsurface conditions exposed during construction.

5.4 Differing Site Conditions

Soil and groundwater conditions were observed and interpreted at the exploration locations only. This information was used as the basis of analyses and recommendations provided herein. Conditions may vary between the exploration locations and seasonal fluctuations in the groundwater level may occur due to variations in rainfall and local groundwater management practices. If conditions encountered during construction differ from those described herein, our recommendations may be subject to modification.

6.0 EARTHWORK RECOMMENDATIONS AND SPECIFICATIONS

6.1 Grading and Earthwork

All grading and earthwork activities should be performed in accordance with the applicable portions of Sections 16 and 19 of the latest Caltrans Standard Specifications and the recommendations contained in this report.

6.2 Clearing and Grubbing

Debris, organic material or other unsuitable material should be removed and disposed of in accordance with Sections 16 and 19-2.02 of Caltrans Standard Specifications, or the material can be removed and delivered to an approved sanitary landfill.

6.3 Remedial Grading

After clearing and stripping, loose/soft or wet soils, if encountered, should be removed. The thickness of unsuitable subgrade soils is generally expected to range from 1 to 2 feet; however, locally, deeper removals may be required. The exposed surface should be proof-rolled with loaded heavy equipment. Areas of loose or yielding soils should be overexcavated and recompacted. Soils that cannot be compacted or are otherwise unsuitable for the planned use, should be excavated and disposed from the project site. Soft/loose and wet subgrade conditions may require stabilization using rock and/or geotextiles prior to fill placement.

6.4 Materials Specifications

All engineered fill to be used in this project should be well-graded soils with maximum dimension of 4 inches and less than 50 percent passing the No. 200 sieve, free of organic and other deleterious debris, essentially non-plastic (Liquid Limit less than 30, Plasticity Index less than 12), and an Expansion Index (EI) of less than 51. In general, well-graded mixtures of gravel, sand, and non-plastic silt meeting the above requirements are acceptable for use as general embankment fill.

Structure backfill should conform to Section 19-3.06 of Caltrans Standard Specifications. All structure backfill (including fill placed behind walls) should be placed in thin, loose lifts; moisture-conditioned, and compacted to Caltrans Standard Specifications (Section 19-5.03). Ponding and jetting of structure fill should not be allowed.

Recommended structural pavement materials should conform to the specified provisions in the Caltrans Standard Specifications including grading and quality requirements, shown below:

- Aggregate Base (AB) Class 2 should conform to Sections 26-1.02A of the Standard Specifications.
- HMA for pavement should be Type A and conform to Section 39 of the Standard Specifications. Asphalt concrete specimens should be tested for surface abrasion in accordance with California Test Method 360.

6.5 Subgrade Compaction

Structural pavement sections within Caltrans right-of-way should be compacted to a minimum of 95 percent in accordance with Section 19-5.03 "Relative Compaction (95 Percent)" of Caltrans Standard Specifications and Section 614.6 of the Caltrans Highway Design Manual. This compaction criterion applies in the upper 3 feet of materials below finished grade for the width of the traveled way or widening plus 3 feet on each side within Caltrans right-of-way, or to a depth of 1 foot below top of subgrade for pavement sections outside of Caltrans right-of-way. All materials and placement should conform to Caltrans Standard Specifications and the Caltrans Highway Design Manual.

6.6 Geotechnical Observation

It is recommended that observation and testing be performed by the geotechnical engineer's representative during the following stages of construction:

- Grading operations, including excavations and fill placement;
- Excavations for utility trenches;
- Placement of utility trench bedding and backfill;
- Removal of buried utilities or structures;
- Subgrade preparation and pavement construction; and
- When any unusual conditions are encountered.

7.0 REFERENCES

California Department of Transportation (Caltrans), 2007, Soil & Rock Logging Classification Presentation Manual, Division of Engineering Services, Geotechnical Services, June 2007.

_____, 1957, As-Built Plans for El Camino Real Undercrossing, Caltrans Contract No 58-7VC10 and Document No 70002057.

_____, 2003, Corrosion Guidelines, Version 1.0, September 2003.

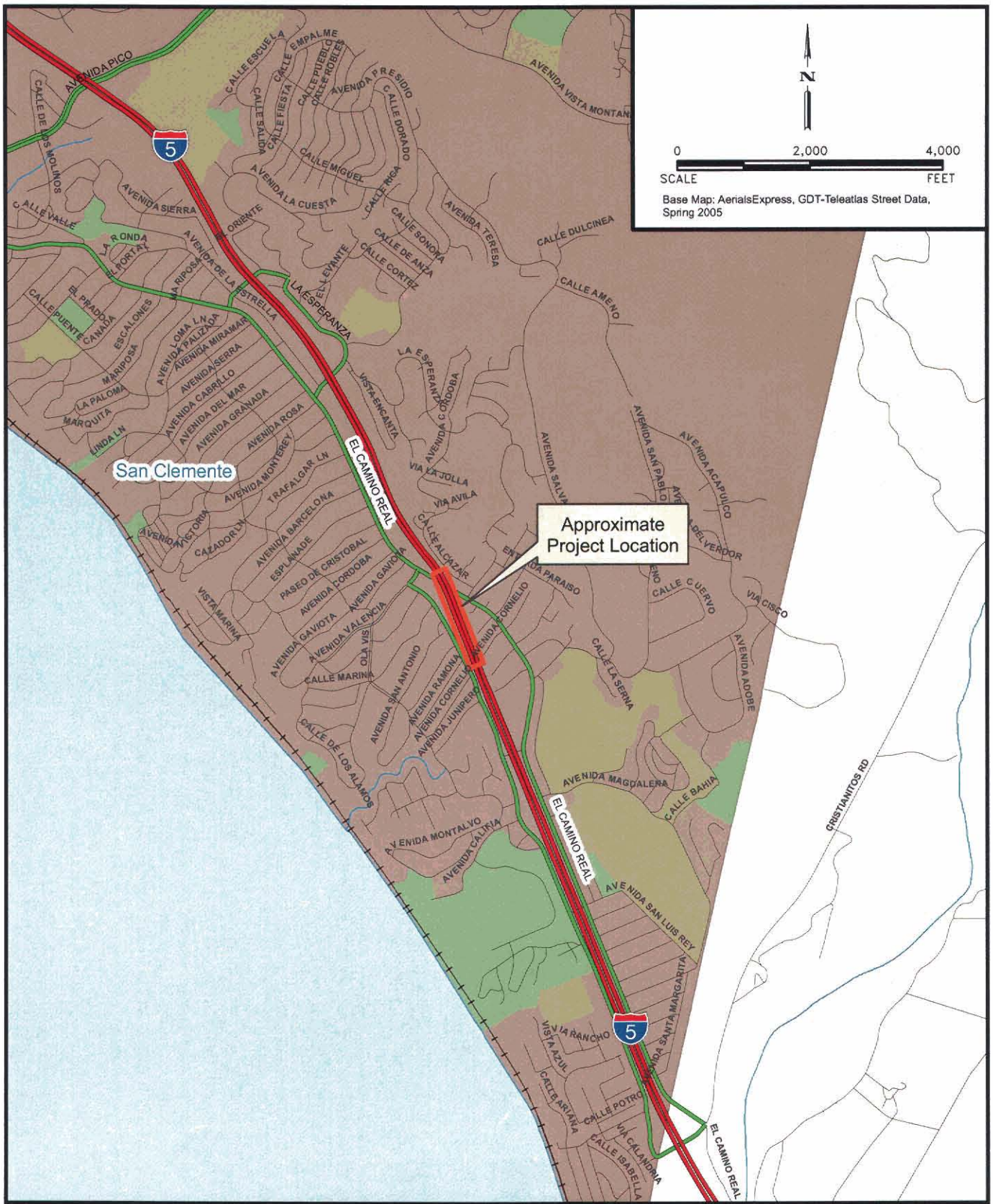
_____, 2004, Bridge Design Specifications, September 2004.

_____, 2006, Standard Specifications, May 2006.

_____, 2008, Highway Design Manual, revised on July 1, 2008.

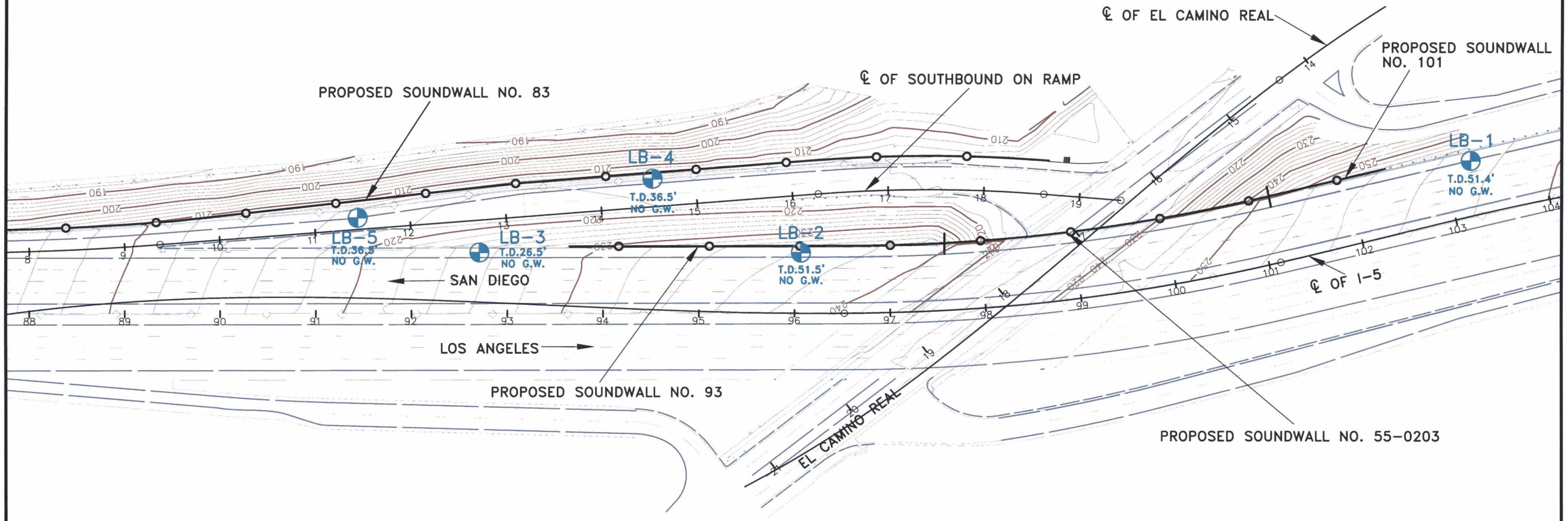
Leighton Consulting, Inc., 2008, DRAFT Foundation Report for Proposed Soundwall Nos. 83, 93, 55-0203 and 101 on Southbound Interstate 5 near El Camino Real, City of San Clemente, California, Project No. 602171-001, dated July 16, 2008.

University of Florida Transportation Research Center, McTrans, CULVERT4 program, Version 4.00, Released on April 16, 1998.



I-5/El Camino Real Soundwalls **City of San Clemente, California**	**SITE LOCATION MAP**	Project No. **602171-001** Date **June 2008** Figure 1

\\GIS\Administration\ArcGISTemplates\NEW_GDT_SiteLocationMap.mxd



LEGEND

LB-6
T.D.26.5'
NO G.W.

APPROXIMATE LOCATION OF HOLLOW STEM AUGER BORING WITH TOTAL DEPTH AND GROUNDWATER

N

0 100 200
SCALE FEET

Figure 2A

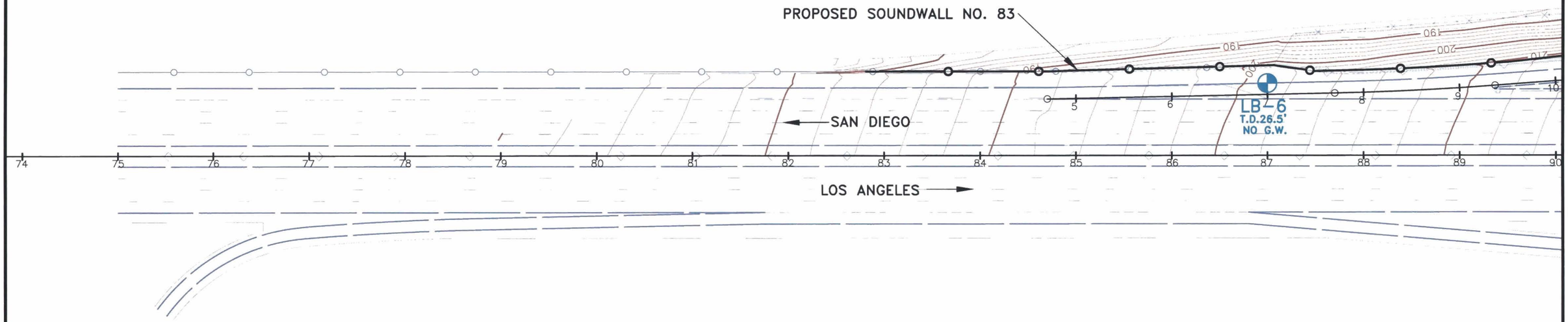
BORING LOCATION MAP

INTERSTATE 5/EL CAMINO REAL SOUNDWALLS
CITY OF SAN CLEMENTE, CALIFORNIA

Proj: 602171-001	Scale: 1"=100'	Date: 9/08
Eng./Geol. DJC/ELB	Drafted By: BQT	CP By: BQT

P:\DRAFTING\602171\001\OF_2008-08-10\FIGURE-2A-B.DWG (12-02-08 3:41:16PM) Plotted by: btran

Leighton



LEGEND

LB-6
T.D.26.5'
NO G.W.

APPROXIMATE LOCATION OF HOLLOW STEM AUGER BORING WITH TOTAL DEPTH AND GROUNDWATER

0 100 200
SCALE FEET

Figure 2B

BORING LOCATION MAP

INTERSTATE 5/EL CAMINO REAL SOUNDWALLS
CITY OF SAN CLEMENTE, CALIFORNIA

Proj: 602171-001	Scale: 1"=100'	Date: 9/08
Eng./Geol. DJC/ELB	Drafted By: BQT	CP By: BQT

P:\DRAFTING\602171\001\OF_2008-08-10\FIGURE-2A-B.DWG (12-02-08 3:40:49PM) Plotted by: btran

Leighton

APPENDIX A

GEOTECHNICAL BORING LOG LB-1

Date 4-23-08 **Sheet** 1 **of** 2

Project I-5/El Camino Real Soundwalls **Project No.** 602171-001

Drilling Co. Martini Drilling, Corporation **Type of Rig** CME-75

Hole Diameter 8-inch **Drive Weight** 140 lbs Auto-Hammer **Drop** 30"

Elevation Top of Hole 256' **Location** See Boring Location Map

Logged By RK

Sampled By RK

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
255	0			Bag-1					6 inches of asphalt concrete.	CR
				R-1	13 23 38	127	10	SM	Silty SAND (SM), dense, brownish grey, moist, medium to coarse grained, predominantly coarse grained.	
250	5			R-2	8 11 26	125	10		medium dense.	CN
				S-1	6 8 10				trace of clay, dark brown.	
245	10			R-3	4 11 22	129	8		yellowish brown to grey.	
240	15			S-2	4 4 3				with clay, loose, light yellowish grey, fine grained.	
235	20			R-4	4 11 19	111	15	ML	Sandy Lean CLAY (CL), very stiff, dark brown, moist.	DS
230	25			S-3	9 15 20			SM/ML	Silty SAND to Sandy SILT (SM/ML), dense, light yellowish grey, moist.	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG LB-1

Date 4-23-08 **Sheet** 2 **of** 2

Project I-5/El Camino Real Soundwalls **Project No.** 602171-001

Drilling Co. Martini Drilling, Corporation **Type of Rig** CME-75

Hole Diameter 8-inch **Drive Weight** 140 lbs Auto-Hammer **Drop** 30"

Elevation Top of Hole 256' **Location** See Boring Location Map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By RK; Sampled By RK)	Type of Tests
225	30			R-5	30 50/3"	123	9	SM	Silty SAND (SM), very dense, yellowish grey, moist, fine grained.	
220	35			S-4	8 13 16			SM/ML	Silty SAND to Sandy SILT (SM/ML), medium dense, yellowish grey, moist, fine grained sand.	
215	40			R-6	19 50/4"	109	15		very dense, grey with reddish white mottling, very moist.	
210	45			S-5	12 15 15				dense	
205	50			R-7	13 31 50/4"	117	9	SM	Silty SAND (SM), very dense, light yellowish grey, moist, fine grained.	
200	55								No free groundwater encountered during drilling. Hole backfilled with soil cuttings and patched with concrete.	
	60									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG LB-2

Date 4-23-08 **Sheet** 1 of 2

Project I-5/El Camino Real Soundwalls **Project No.** 602171-001

Drilling Co. Martini Drilling, Corporation **Type of Rig** CME-75

Hole Diameter 8-inch **Drive Weight** 140 lbs Auto-Hammer **Drop** 30"

Elevation Top of Hole 236' **Location** See Boring Location Map

Logged By RK

Sampled By RK

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
235	0			Bag-1					12 inches of asphalt concrete.	
				R-1	8 11 13	127	8	SM	Silty SAND (SM), medium dense, grey with reddish mottling, moist, fine to coarse grained, predominantly fine grained.	
230	5			R-2	5 7 10	114	18		brownish grey, very moist, fine to medium grained, predominantly medium grained.	
				R-3	12 22 32	119	7		dense, yellowish grey, moist, fine to coarse grained, trace of fine to coarse gravel.	
225	10			S-1	4 7 8					
220	15			R-4	6 13 20	121	10		medium dense, brownish grey, moist, trace of clay.	
215	20			S-2	4 8 5				yellowish brown, fine grained.	
210	25			R-5	7 15 21	116	13		dark grey, very moist, fine to medium grained, trace of clay.	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG LB-2

Date 4-23-08 **Sheet** 2 **of** 2

Project I-5/El Camino Real Soundwalls **Project No.** 602171-001

Drilling Co. Martini Drilling, Corporation **Type of Rig** CME-75

Hole Diameter 8-inch **Drive Weight** 140 lbs Auto-Hammer **Drop** 30"

Elevation Top of Hole 236' **Location** See Boring Location Map

Logged By RK

Sampled By RK

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
205	30			S-3	5 4 6			SM	Silty SAND (SM), loose, yellowish grey, moist.	
200	35			R-6	3 6 15	107	10		dark brown, moist, fine grained.	DS
195	40			S-4	4 7 7				medium dense, light yellowish grey.	
190	45			R-7	4 17 40	112	12		dense.	
185	50			S-5	8 12 12				medium dense.	
180	55								No free groundwater encountered during drilling. Hole backfilled with soil cuttings and patched with concrete.	
	60									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG LB-3

Date 4-23-08 **Sheet** 1 of 1

Project I-5/El Camino Real Soundwalls **Project No.** 602171-001

Drilling Co. Martini Drilling, Corporation **Type of Rig** CME-75

Hole Diameter 8-inch **Drive Weight** 140 lbs Auto-Hammer **Drop** 30"

Elevation Top of Hole 224' **Location** See Boring Location Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By RK; Sampled By RK)	Type of Tests
	0								11 inches of asphalt concrete.	
				Bag-1						CR
220				R-1	50/5"	120	18	SM	Silty SAND (SM), very dense, dark grey, very moist, medium to coarse grained, trace of coarse gravel.	
	5			R-2	6 20 35	132	9		dense, dark greyish brown, moist.	CN
215				S-1	7 9 12				medium dense, grey to dark grey.	
	10			R-3	4 15 25	119	8		fine to medium grained.	
210										
	15			S-2	2 7 7				yellowish olive grey, moist, fine grained, trace of clay.	
205										
	20			R-4	8 14 25	121	13		very moist, fine to coarse grained.	
200										
	25			S-3	2 3 5			ML	SILT (ML) with fine sand, loose, grey to dark grey, moist.	
195									No free groundwater encountered during drilling. Hole backfilled with soil cuttings and patched with concrete.	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG LB-4

Date 4-23-08 **Sheet** 1 of 2

Project I-5/El Camino Real Soundwalls **Project No.** 602171-001

Drilling Co. Martini Drilling, Corporation **Type of Rig** CME-75

Hole Diameter 8-inch **Drive Weight** 140 lbs Auto-Hammer **Drop** 30"

Elevation Top of Hole 220' **Location** See Boring Location Map

Logged By SP

Sampled By SP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
220	0								13 inches of asphalt concrete over 4 inches of base course.	
				Bag-1						
				R-1	19 23 26	108	7	SW	Gravelly SAND (SW), medium dense, olive yellowish brown, moist, fine to coarse grained sand, fine gravel.	
215	5			R-2	12 30 48	126	8	CL	Sandy Lean CLAY to Clayey SAND (CL-SC), hard/ dense, light brown, fine to medium grained sand, trace of fine gravel.	
				R-3	18 23 38	113	7	SC	Clayey SAND (SC) with gravel, dense, olive light brown, moist, medium to coarse grained, fine to coarse gravel.	CN
210	10			S-1	11 25 33				very dense, fine gravel.	
205	15			R-4	13 18 27	122	8	CL	Sandy Lean CLAY (CL), very stiff, brown, moist, fine to coarse grained sand.	DS
200	20			S-2	5 10 12					
195	25			R-5	8 18 23	109	11	SM	Clayey SAND to Sandy Lean CLAY (SC/CL), medium dense/ very stiff, olive yellowish brown, moist, fine grained.	
190	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG LB-4

Date 4-23-08 **Sheet** 2 **of** 2

Project I-5/El Camino Real Soundwalls **Project No.** 602171-001

Drilling Co. Martini Drilling, Corporation **Type of Rig** CME-75

Hole Diameter 8-inch **Drive Weight** 140 lbs Auto-Hammer **Drop** 30"

Elevation Top of Hole 220' **Location** See Boring Location Map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By SP; Sampled By SP)	Type of Tests
190	30			S-3	5 10 11			SM	Clayey SAND (SC), medium dense, olive yellowish brown, moist, fine grained.	
185	35			R-6	7 19 29	105	14	CL-ML	Silty CLAY (CL-ML), very stiff, olive green, very moist.	
									No free groundwater encountered during drilling. Hole backfilled with soil cuttings and patched with concrete.	
180	40									
175	45									
170	50									
165	55									
160	60									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG LB-5

Date 4-23-08 **Sheet** 1 of 2

Project I-5/El Camino Real Soundwalls **Project No.** 602171-001

Drilling Co. Martini Drilling, Corporation **Type of Rig** CME-75

Hole Diameter 8-inch **Drive Weight** 140 lbs Auto-Hammer **Drop** 30"

Elevation Top of Hole 217' **Location** See Boring Location Map

Logged By SP

Sampled By SP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								14 inches of asphalt concrete	
215				Bag-1						CR, EI, SA
				R-1	7 11 15	114	13	SC	Clayey SAND (SC), medium dense, olive brown, moist, medium grained sand.	
	5			R-2	6 9 10	102	4	SP	SAND (SP), medium dense, olive green, moist, fine to medium grained.	
210				S-1	7 10 13			SC	Clayey SAND (SC), medium dense, dark brown, moist, medium grained with interbedded layers of sandy elay and trace of gravel.	
	10			R-3	17 20 22	116	8		with gravel, yellowish brown, fine to coarse gravel.	DS
205										
	15			S-2	14 12 14					
200										
	20			R-4	6 10 16	120	14	CL	Sandy Lean CLAY (CL), stiff, dark greyish brown, very moist, fine grained sand.	
195										
	25			S-3	3 6 6			SC	Clayey SAND (SC), medium dense, olive brown, moist, fine grained.	SA
190										
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG LB-5

Date 4-23-08 **Sheet** 2 **of** 2

Project I-5/El Camino Real Soundwalls **Project No.** 602171-001

Drilling Co. Martini Drilling, Corporation **Type of Rig** CME-75

Hole Diameter 8-inch **Drive Weight** 140 lbs Auto-Hammer **Drop** 30"

Elevation Top of Hole 217' **Location** See Boring Location Map

Logged By SP

Sampled By SP

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
185	30			S-4	3 2 3			CL	Sandy Lean CLAY (CL), firm, olive brown, moist, fine grained sand.	SA
	35			S-5	8 10 12			CL-ML	Silty CLAY to Clayey SILT (CL-ML), very stiff, dark brown, moist, trace of fine grained sand.	
180									No free groundwater encountered during drilling. Hole backfilled with soil cuttings and patched with concrete.	
175	40									
170	45									
165	50									
160	55									
	60									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG LB-6

Date 4-23-08 **Sheet** 1 **of** 1

Project I-5/El Camino Real Soundwalls **Project No.** 602171-001

Drilling Co. Martini Drilling, Corporation **Type of Rig** CME-75

Hole Diameter 8-inch **Drive Weight** 140 lbs Auto-Hammer **Drop** 30"

Elevation Top of Hole 201' **Location** See Boring Location Map

Logged By SP

Sampled By SP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
200	0			Bag-1					6 inches of asphalt concrete over 12 inches of base course.	
				R-1	5 9 11	111	7	SC	Clayey SAND (SC), medium dense, dark brown, moist, medium grained.	
195	5			R-2	5 18 21	121	8			
				R-3	7 7 10	111	17		Clayey SAND to Sandy Lean CLAY (SC/CL), loose/ stiff, olive grey, very moist, fine grained.	DS
190	10			S-1	1 5 4			CL SC	Silty CLAY (CL-ML), stiff, orange/ greyish brown, moist. Clayey SAND (SC), loose, light brown, moist, fine grained.	
185	15			R-4	4 11 17	105	18	CL-ML	Silty CLAY (CL-ML), stiff, olive brown, very moist.	
180	20			S-2	4 6 8			CL	Silty CLAY (CL), stiff, yellowish brown, moist.	
175	25			R-5	11 20 24	105	19	CL-ML	with fine grained sand, very stiff, very moist.	
	30								No free groundwater encountered during drilling. Hole backfilled with soil cuttings and patched with conerete.	

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

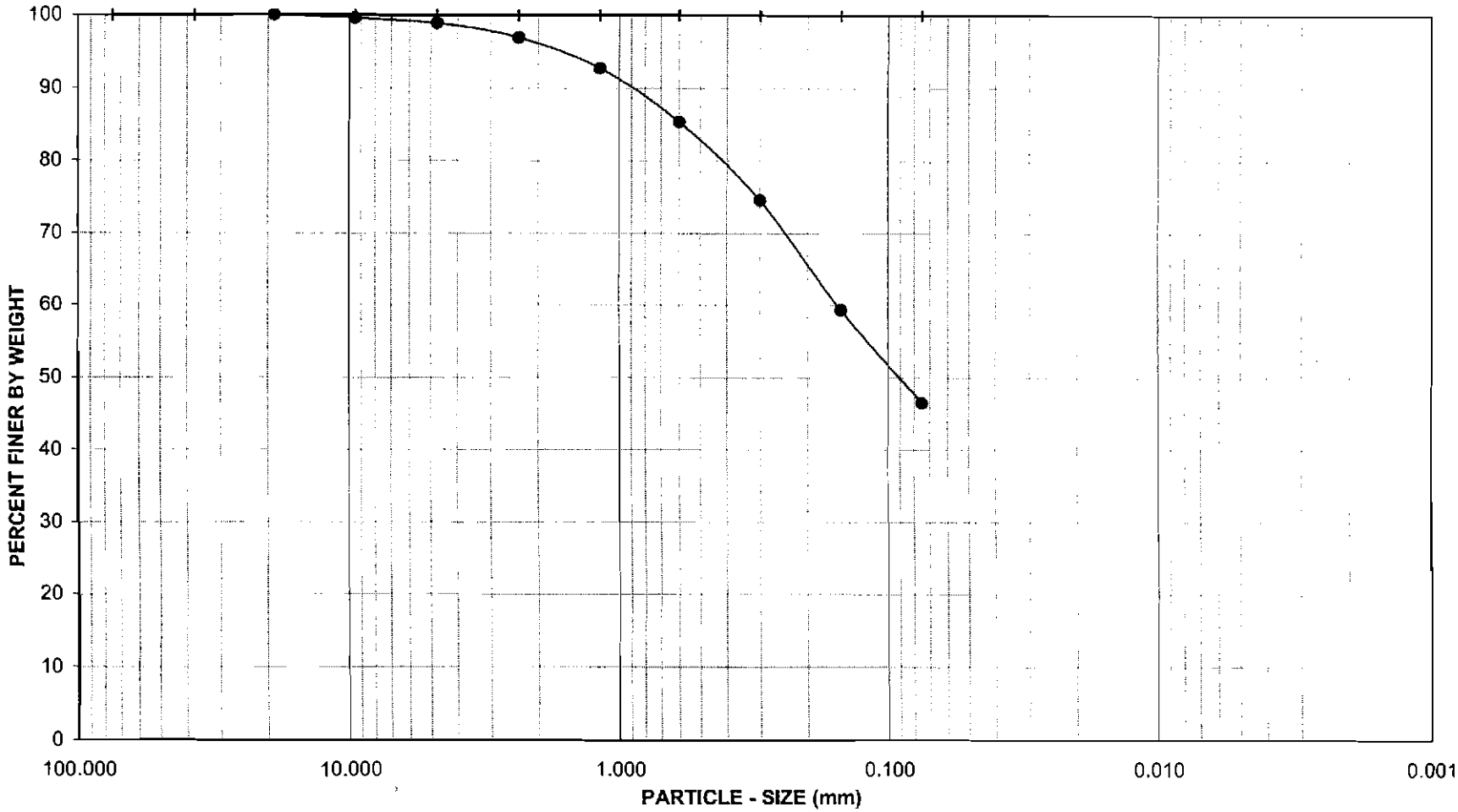
APPENDIX B

GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

U.S. STANDARD SIEVE OPENING: 3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER: #4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: I-15 / El Camino Real Sound Wall

Project No.: 602171-001

Exploration No.: LB-5 Sample No.: Bag-1

Depth (feet): 0-5 Soil Type : SC

Soil Identification: Olive brown clayey sand (SC)

GR:SA:FI : (%) 1 : 52 : 47

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

Jun-08

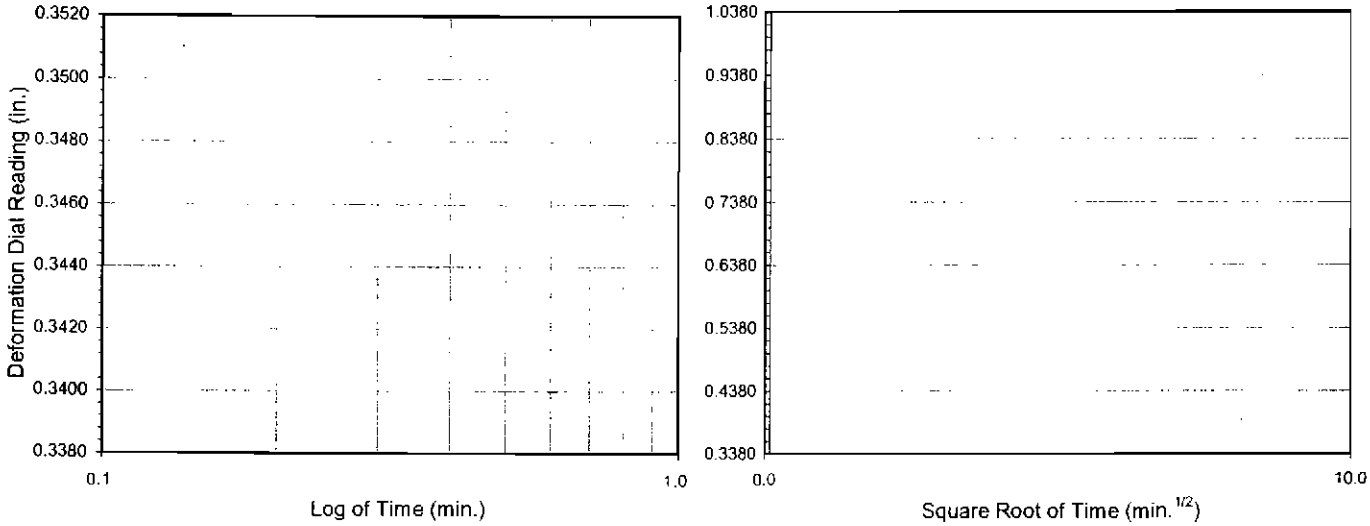
Boring No.	LB-5	LB-5						
Sample No.	S-3	S-4						
Depth (ft.)	25	30						
Sample Type	SPT	SPT						
Soil Identification	Olive brown clayey sand (SC)	Olive brown sandy clay (CL)						
Moisture Correction								
Wet Weight of Soil + Container (g)	0.00	0.00						
Dry Weight of Soil + Container (g)	0.00	0.00						
Weight of Container (g)	1.00	1.00						
Moisture Content (%)	0.00	0.00						
Sample Dry Weight Determination								
Weight of Sample + Container (g)	650.80	627.50						
Weight of Container (g)	108.40	110.20						
Weight of Dry Sample (g)	542.40	517.30						
Container No.:								
After Wash								
Method (A or B)	B	B						
Dry Weight of Sample + Cont. (g)	427.10	306.90						
Weight of Container (g)	108.40	110.20						
Dry Weight of Sample (g)	318.70	196.70						
% Passing No. 200 Sieve	**41.2**	**62.0**						
% Retained No. 200 Sieve	58.8	38.0						

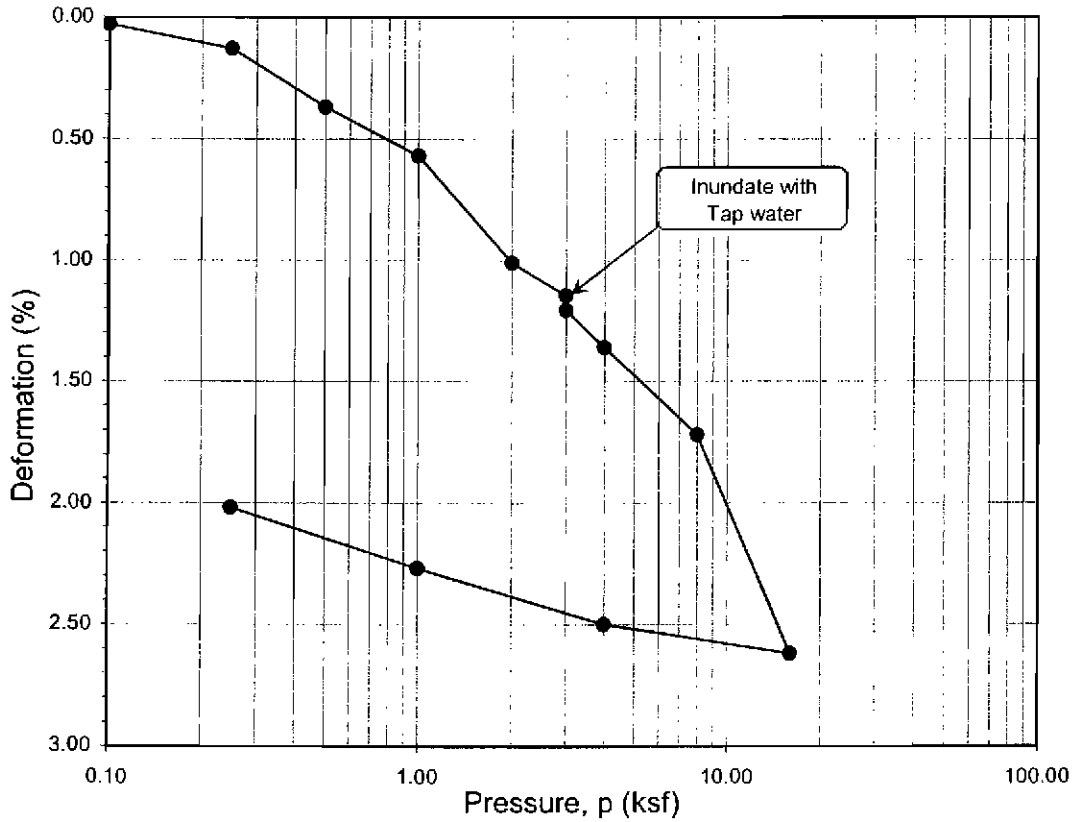
Leighton

PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name: I-5 / El Camino Real Sound Wall
Project No.: 602171-001
Client Name: LCI / Irvine
Tested By: G. Bathala Date: 05/01/08

No Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-1	**R-2**	**5.0**	**9.5**	**9.9**	**125.1**	**126.6**	**0.347**	**0.320**	**74**	**81**

Soil Identification: Dark brown silty sand (SM)

Leighton

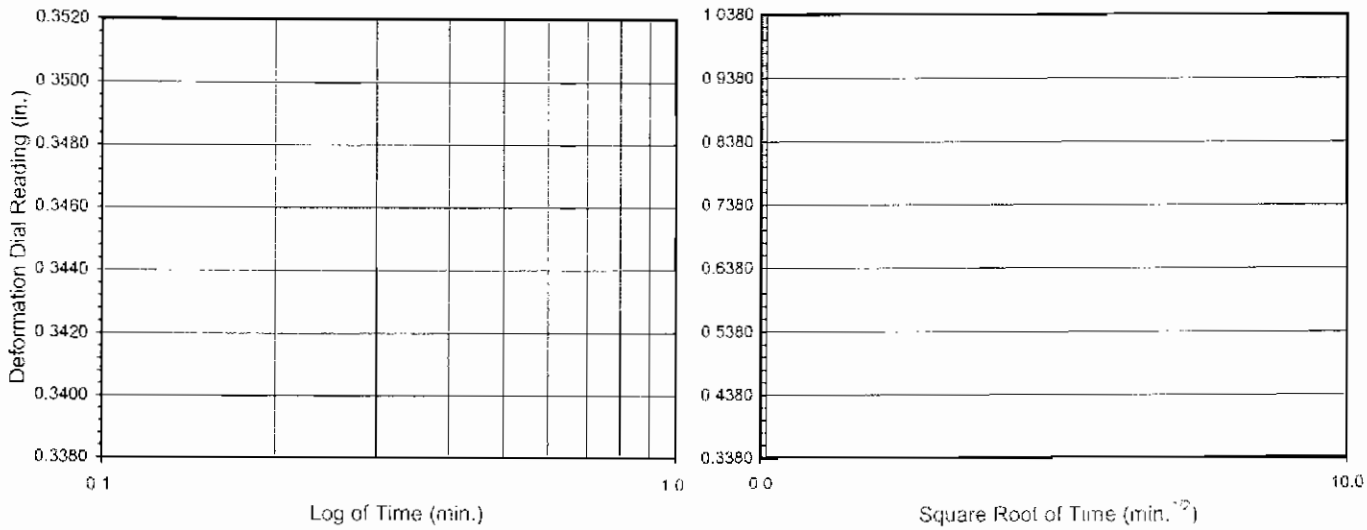
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
(ASTM D 2435)

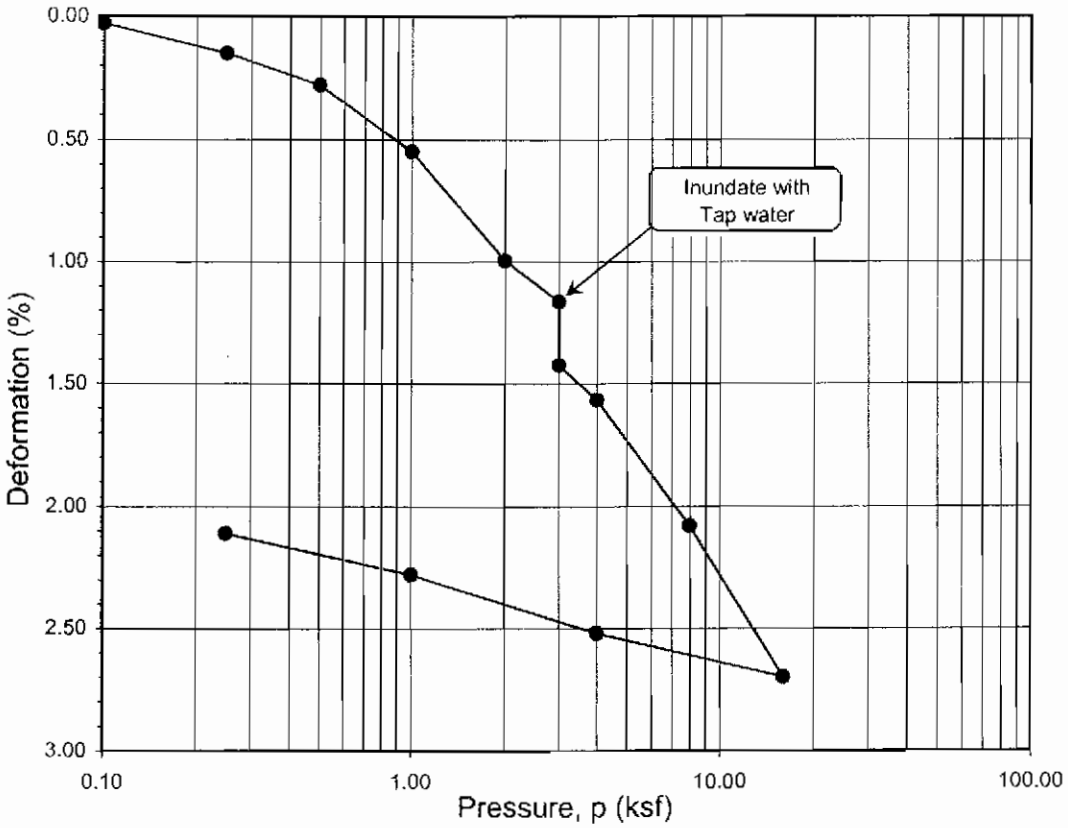
Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08

No Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-3	**R-2**	**5.0**	**9.1**	**8.3**	**131.6**	**135.1**	**0.281**	**0.254**	**87**	**90**

Soil Identification: Dark grayish brown silty sand (SM)

Leighton

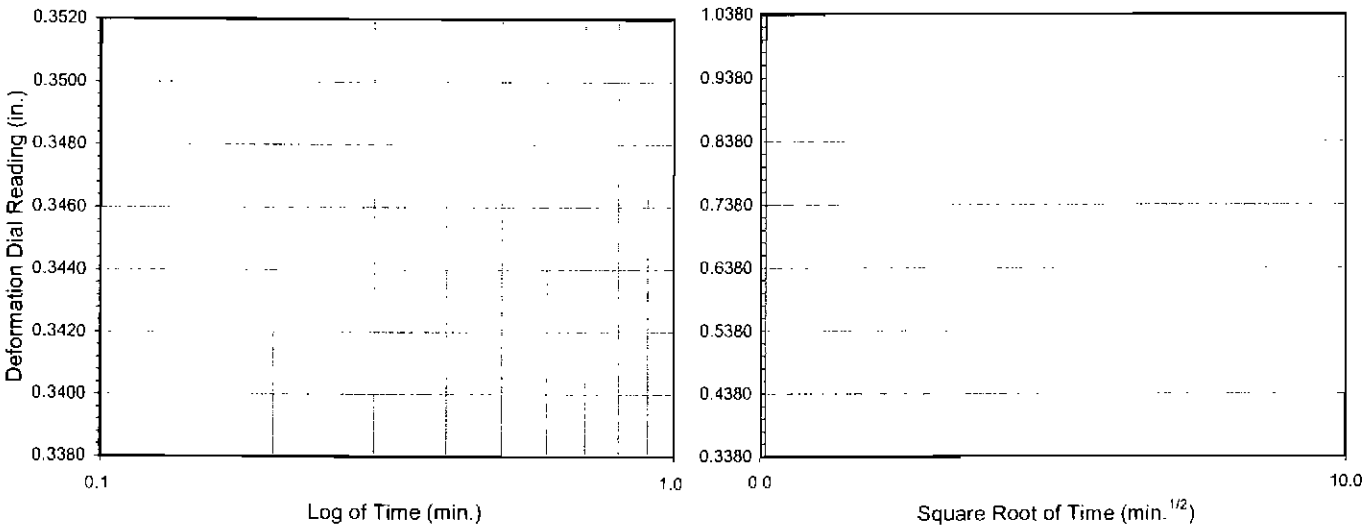
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
(ASTM D 2435)

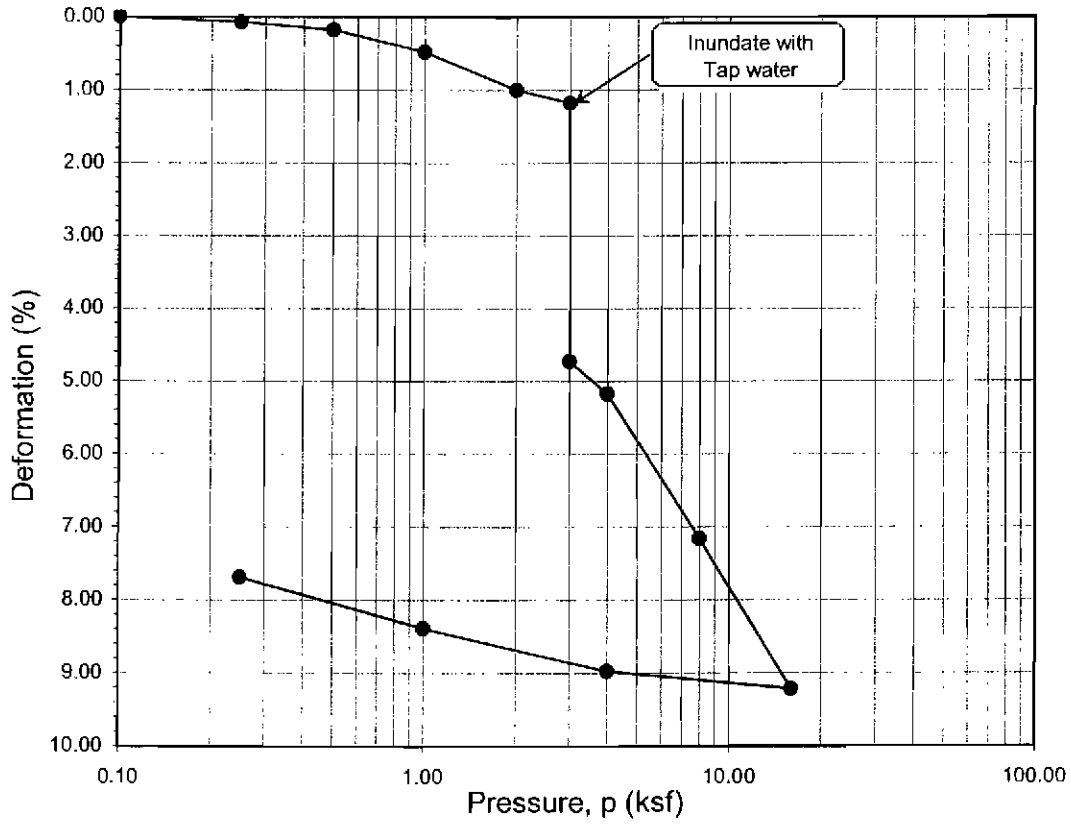
Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08

No Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-4	**R-3**	**7.5**	**6.7**	**13.6**	**113.0**	**121.2**	**0.492**	**0.377**	**37**	**94**

Soil Identification: Olive light brown Clayey Sand (SC) with gravel

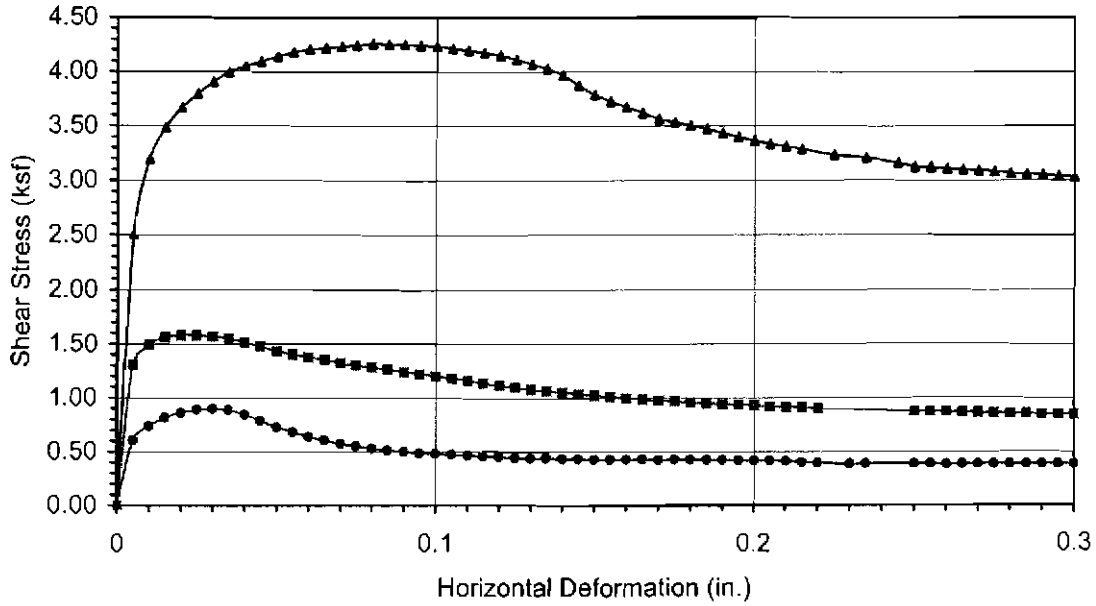
Leighton

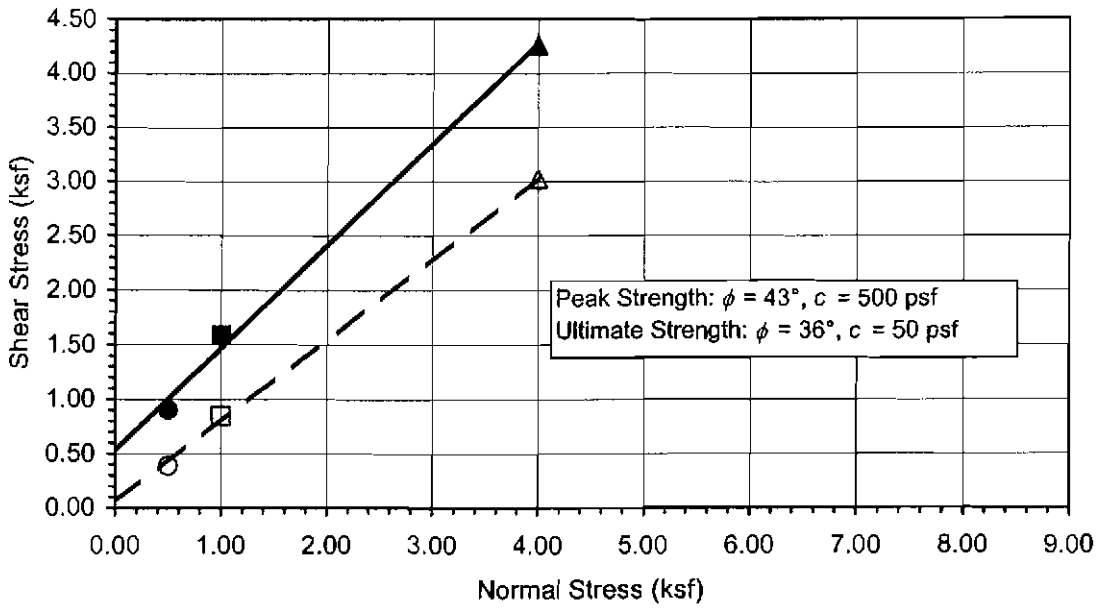
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
(ASTM D 2435)

Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08





Boring No.	**LB-1**
Sample No.	**R-4**
Depth (ft)	**20**
Sample Type: Drive	
Soil Identification: Dark brown sandy lean clay s(CL)	

Normal Stress (kip/ft²)	0.500	1.000	4.000
Peak Shear Stress (kip/ft²)	● 0.899	■ 1.581	▲ 4.260
Shear Stress @ End of Test (ksf)	○ 0.384	□ 0.843	△ 3.027
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	14.93	14.93	14.93
Dry Density (pcf)	109.7	110.7	114.4
Saturation (%)	75.1	77.1	85.2
Soil Height Before Shearing (in.)	1.0024	0.9990	0.9890
Final Moisture Content (%)	17.5	18.3	16.2

Leighton

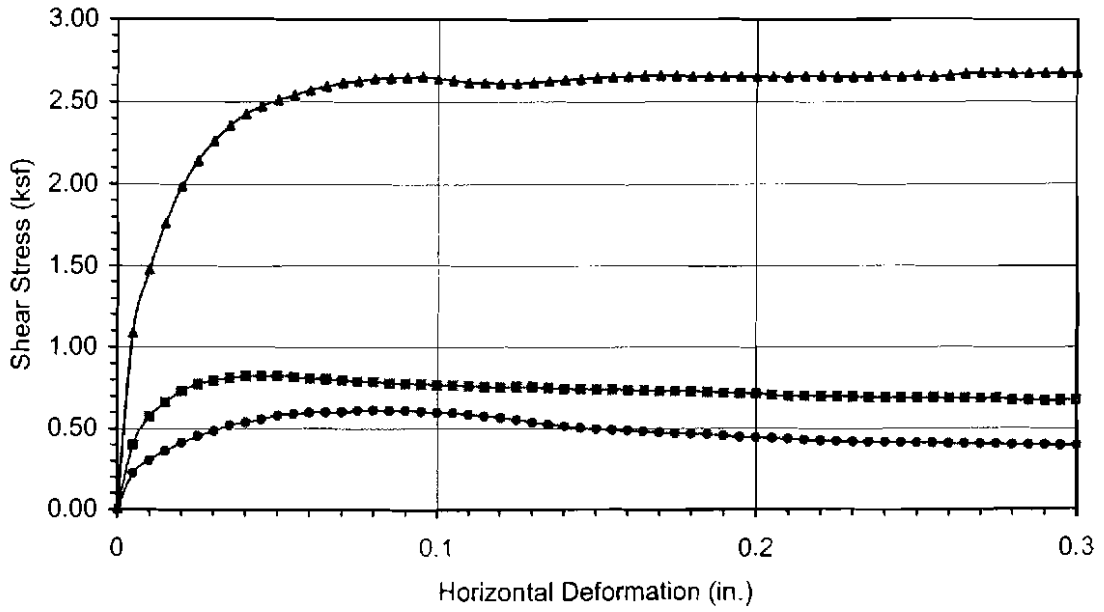
DIRECT SHEAR TEST RESULTS
Consolidated Undrained

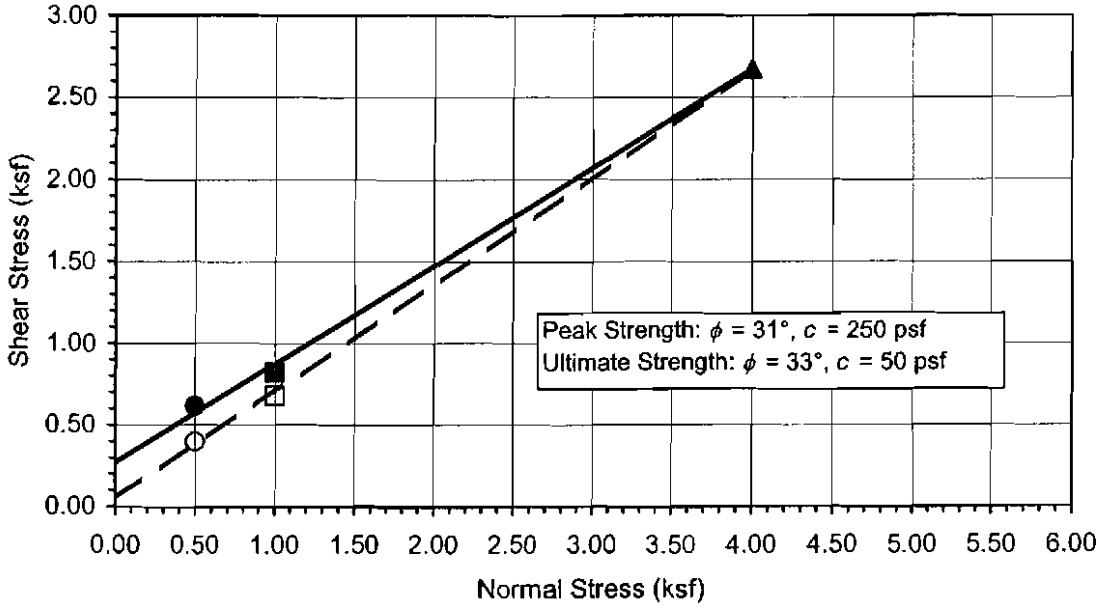
Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08

DS B-1 R-4





Boring No.	**LB-2**
Sample No.	**R-6**
Depth (ft)	**35**
Sample Type: Drive	
Soil Identification: Dark brown silty sand (SM)	

Normal Stress (kip/ft²)	0.500	1.000	4.000
Peak Shear Stress (kip/ft²)	● 0.613	■ 0.820	▲ 2.673
Shear Stress @ End of Test (ksf)	○ 0.396	□ 0.675	△ 2.670
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	9.62	9.62	9.62
Dry Density (pcf)	104.6	106.5	107.8
Saturation (%)	42.4	44.5	46.1
Soil Height Before Shearing (in.)	0.9940	0.9926	0.9744
Final Moisture Content (%)	15.4	14.7	14.4

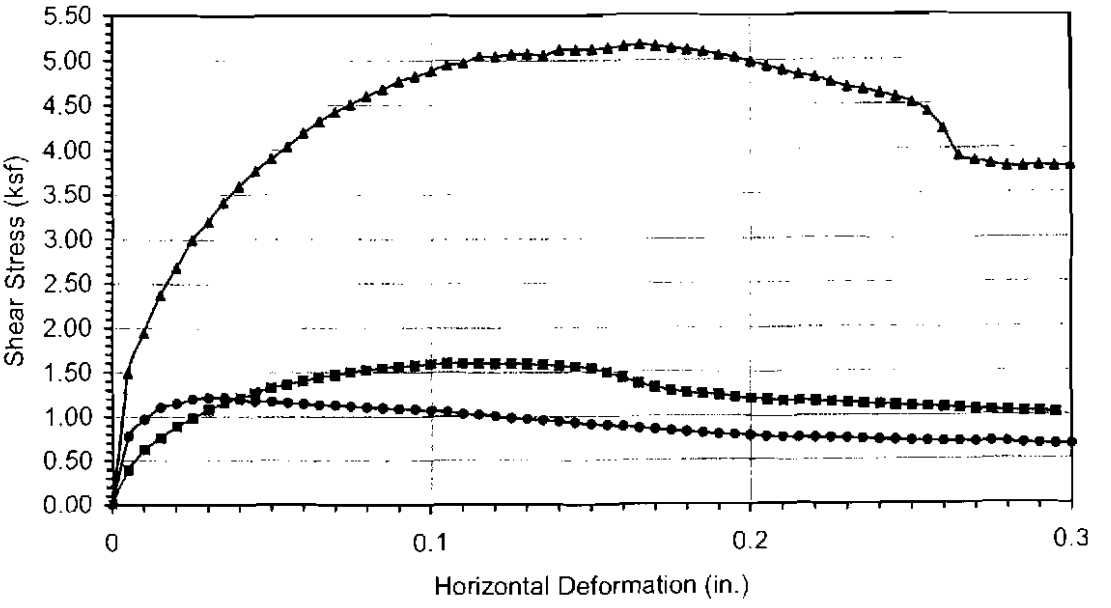
Leighton

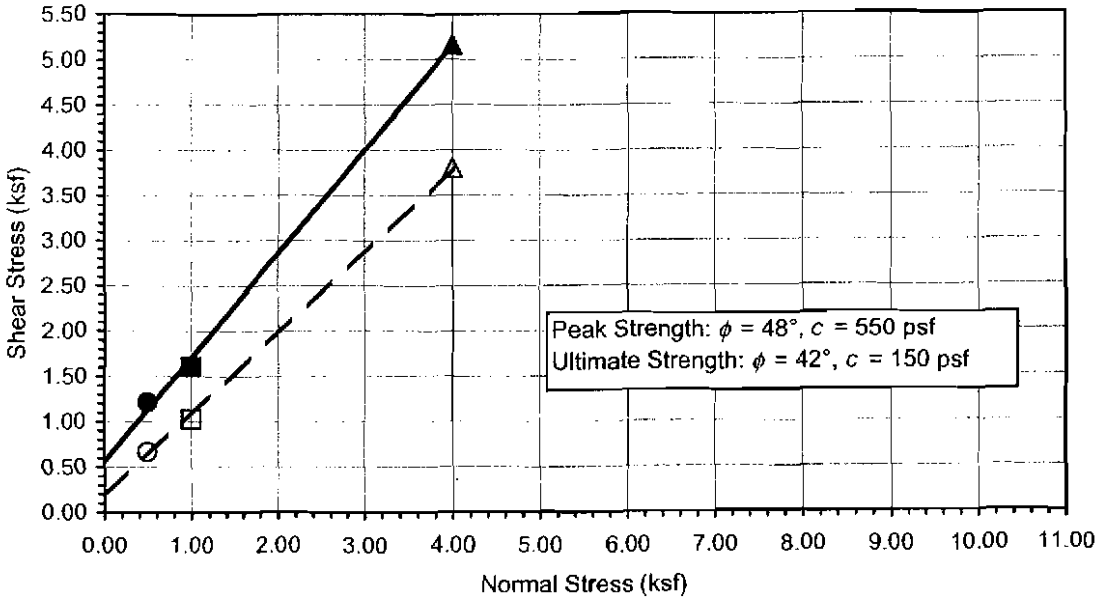
DIRECT SHEAR TEST RESULTS
Consolidated Undrained

Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08





Boring No.	**LB-4**
Sample No.	**R-4**
Depth (ft)	**15**
Sample Type: Drive	
Soil Identification: Brown sandy lean clay s(CL)	

Normal Stress (kip/ft²)	0.500	1.000	4.000
Peak Shear Stress (kip/ft²)	● 1.212	■ 1.602	▲ 5.167
Shear Stress @ End of Test (ksf)	○ 0.666	□ 1.024	△ 3.804
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	7.52	7.52	7.52
Dry Density (pcf)	125.7	122.4	126.3
Saturation (%)	59.6	53.9	60.7
Soil Height Before Shearing (in.)	1.0300	1.0000	0.9917
Final Moisture Content (%)	17.0	15.0	13.9

Leighton

DIRECT SHEAR TEST RESULTS

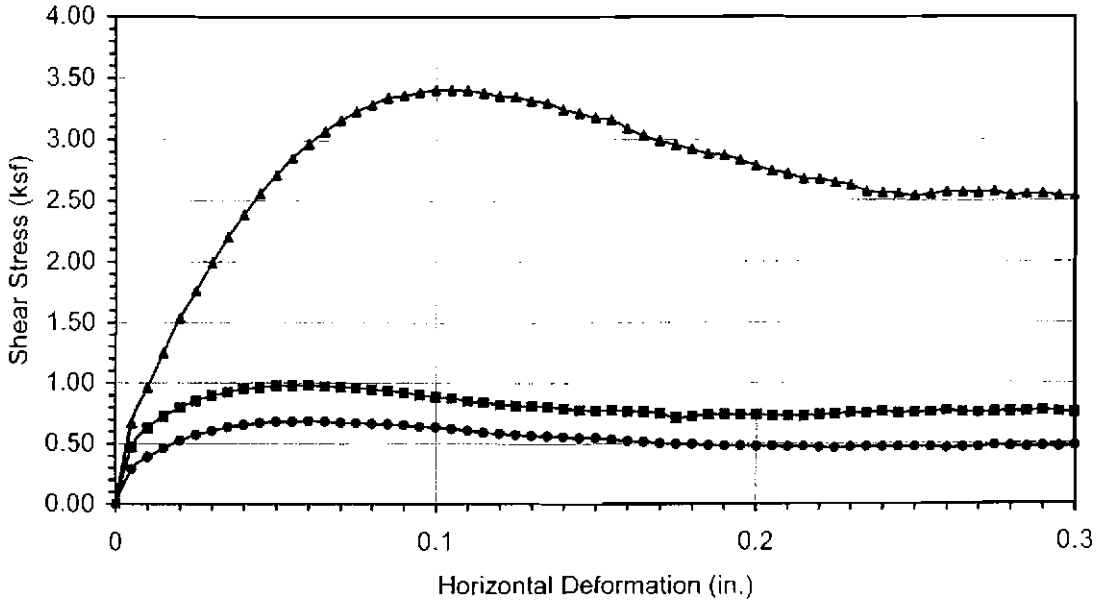
Consolidated Undrained

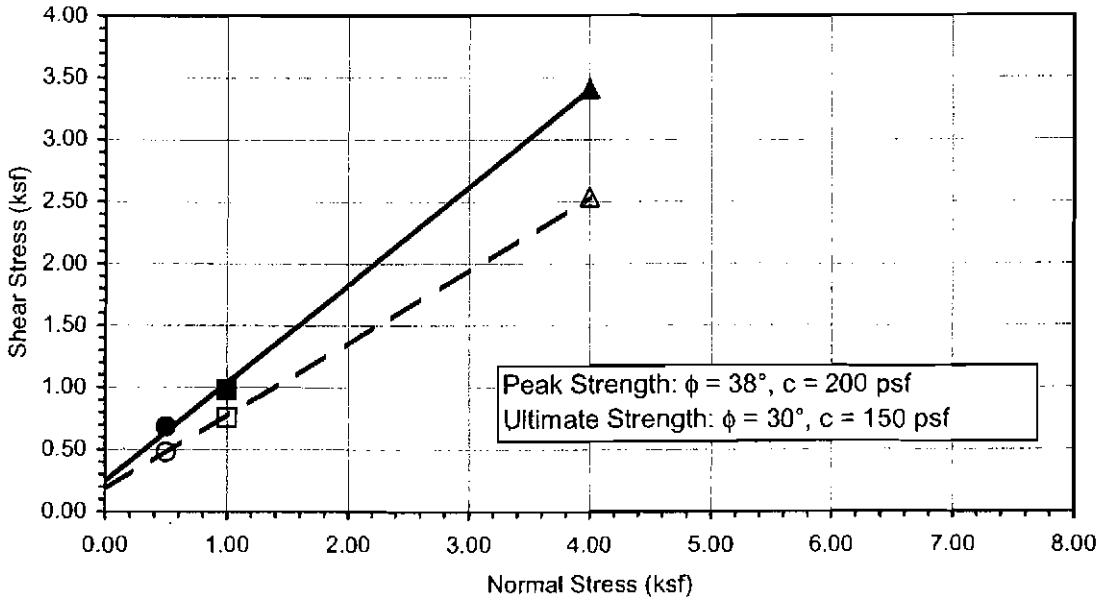
Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08

DS B-4 R-4





Boring No.	**LB-5**
Sample No.	**R-3**
Depth (ft)	**10**
Sample Type: Drive	
Soil Identification: Yellowish brown poorly graded sand with clay (SP-SC)	

Normal Stress (kip/ft²)	0.500	1.000	4.000
Peak Shear Stress (kip/ft²)	● 0.685	■ 0.981	▲ 3.408
Shear Stress @ End of Test (ksf)	○ 0.478	□ 0.758	△ 2.537
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	7.81	7.81	7.81
Dry Density (pcf)	114.2	116.1	119.2
Saturation (%)	44.4	46.7	51.0
Soil Height Before Shearing (in.)	0.9980	0.9894	0.9855
Final Moisture Content (%)	15.1	14.0	13.7

Leighton

DIRECT SHEAR TEST RESULTS

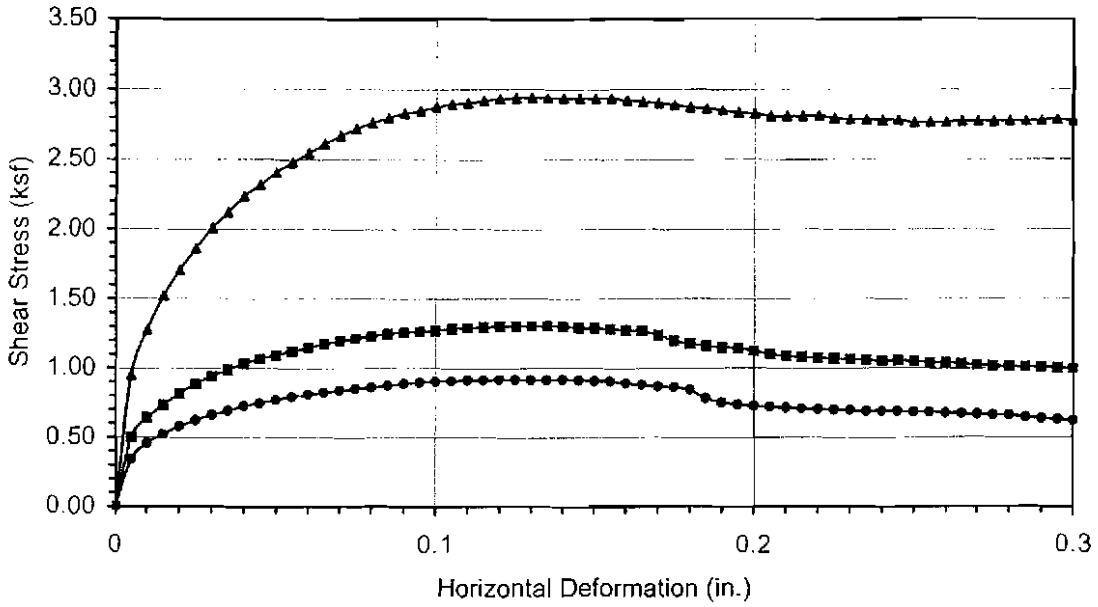
Consolidated Undrained

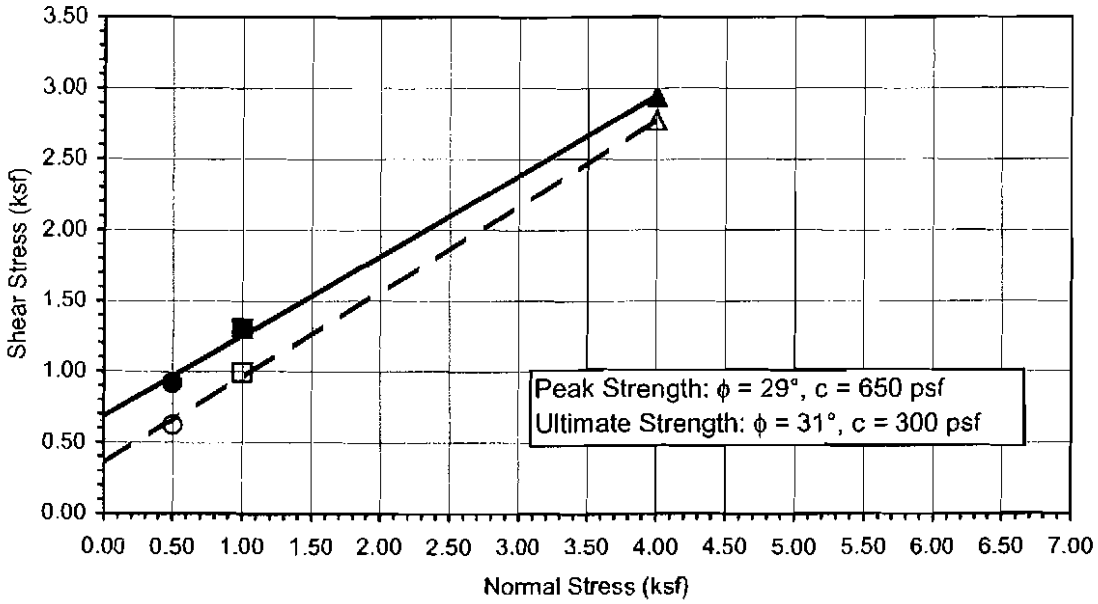
Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08

DS B-5 R-3





Boring No.	**LB-6**
Sample No.	**R-3**
Depth (ft)	**7.5**
Sample Type: Drive	
Soil Identification: Gray clayey sand (SC)	

Normal Stress (kip/ft²)	0.500	1.000	4.000
Peak Shear Stress (kip/ft²)	● 0.920	■ 1.304	▲ 2.940
Shear Stress @ End of Test (ksf)	○ 0.622	□ 0.993	△ 2.777
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	17.29	17.29	17.29
Dry Density (pcf)	110.6	111.4	110.5
Saturation (%)	89.0	90.9	88.8
Soil Height Before Shearing (in.)	0.9943	0.9893	0.9692
Final Moisture Content (%)	18.7	16.3	15.8

Leighton

DIRECT SHEAR TEST RESULTS

Consolidated Undrained

Project No.: 602171-001

I-5 / El Camino Real Sound Wall

05-08

DS B-6 R-3

Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	I-5 / El Camino Real Sound Wall	Tested By:	G. Berdy	Date:	05/08/08
Project No. :	602171-001	Checked By:	LF	Date:	06/02/08
Boring No.:	LB-5	Depth (ft.)	0-5		
Sample No. :	Bag-1				
Soil Identification:	Olive brown clayey sand (SC)				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN		Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(in.)	1.0000	1.0235
Wt. Comp. Soil + Mold	(g)	601.90	447.50
Wt. of Mold	(g)	190.30	0.00
Specific Gravity (Assumed)		2.70	2.70
Container No.		O	O
Wet Wt. of Soil + Cont.	(g)	831.10	637.80
Dry Wt. of Soil + Cont.	(g)	766.00	569.70
Wt. of Container	(g)	0.00	190.30
Moisture Content	(%)	8.50	17.95
Wet Density	(pcf)	124.2	131.9
Dry Density	(pcf)	114.4	111.8
Void Ratio		0.473	0.508
Total Porosity		0.321	0.337
Pore Volume	(cc)	66.5	71.3
Degree of Saturation (%) [S_{meas}]		**48.5**	95.5

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
05/08/08	14:16	1.0	0	0.2035
05/08/08	14:26	1.0	10	0.2030
Add Distilled Water to the Specimen				
05/08/08	14:47	1.0	21	0.2205
05/09/08	6:07	1.0	941	0.2270
05/09/08	7:15	1.0	1009	0.2270

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**24**

Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

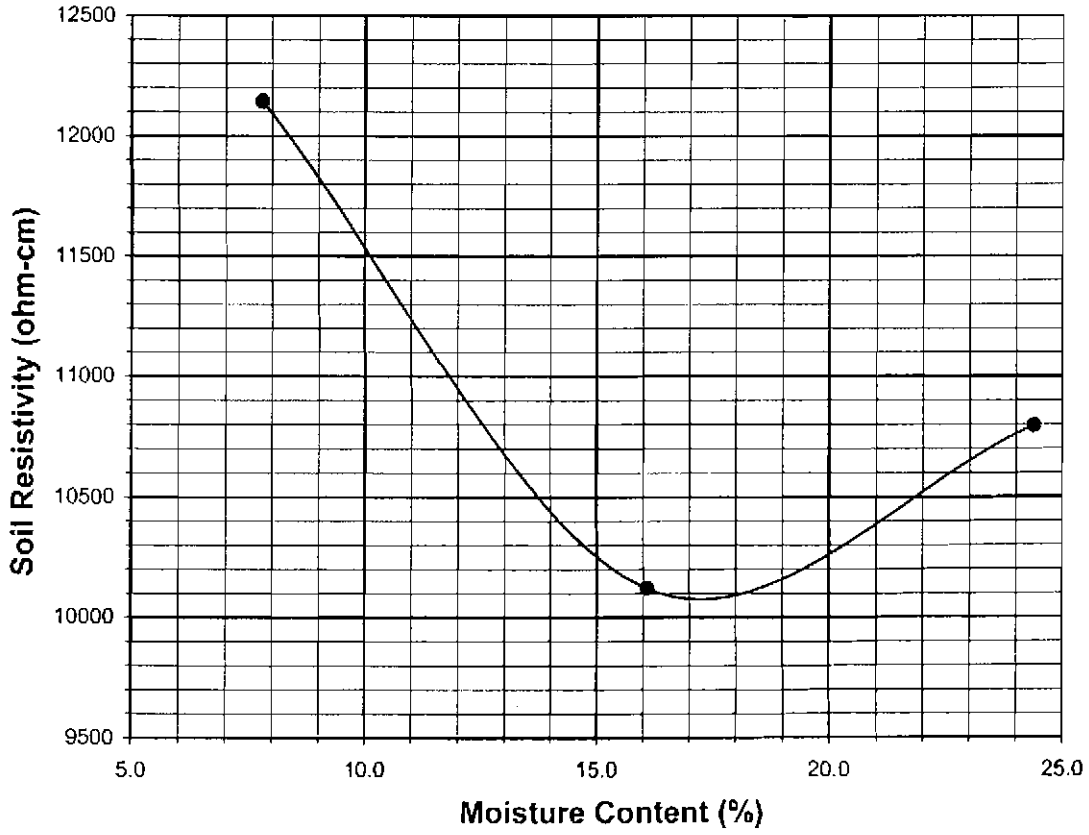
Project Name: I-5 / El Camino Real Sound Wall
Project No. : 602171-001
Boring No.: LB-1
Sample No. : Bag-1
Soil Identification: SM

Tested By : V. Juliano Date: 05/03/08
Data Input By: J. Ward Date: 05/09/08
Depth (ft.) : 0-5

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	0	7.80	1800	12143
2	100	16.09	1500	10119
3	200	24.38	1600	10794
4				
5				

Moisture Content (%) (MCi)	7.80
Wet Wt. of Soil + Cont. (g)	201.75
Dry Wt. of Soil + Cont. (g)	191.20
Wt. of Container (g)	55.90
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
1070	**17.2**	**98**	**43**	**7.80**	**22.3**



Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

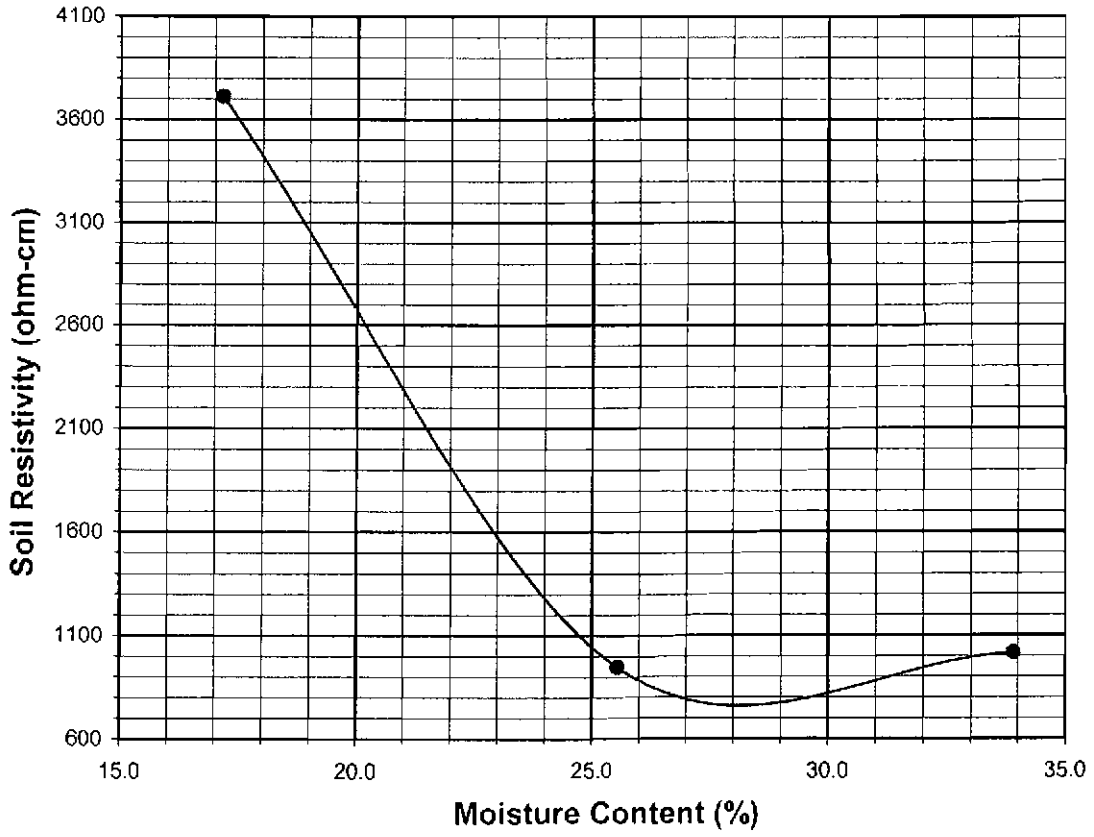
Project Name: I-5 / El Camino Real Sound Wall
Project No. : 602171-001
Boring No.: LB-3
Sample No. : Bag-1
Soil Identification: SM

Tested By : V. Juliano Date: 05/03/08
Data Input By: J. Ward Date: 05/09/08
Depth (ft.) : 0-5

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	17.17	550	3710
2	200	25.54	140	944
3	300	33.91	150	1012
4				
5				

Moisture Content (%) (MCi)	8.80
Wet Wt. of Soil + Cont. (g)	210.93
Dry Wt. of Soil + Cont. (g)	199.41
Wt. of Container (g)	68.57
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
750	**28.0**	**72**	**66**	**7.66**	**22.1**



Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

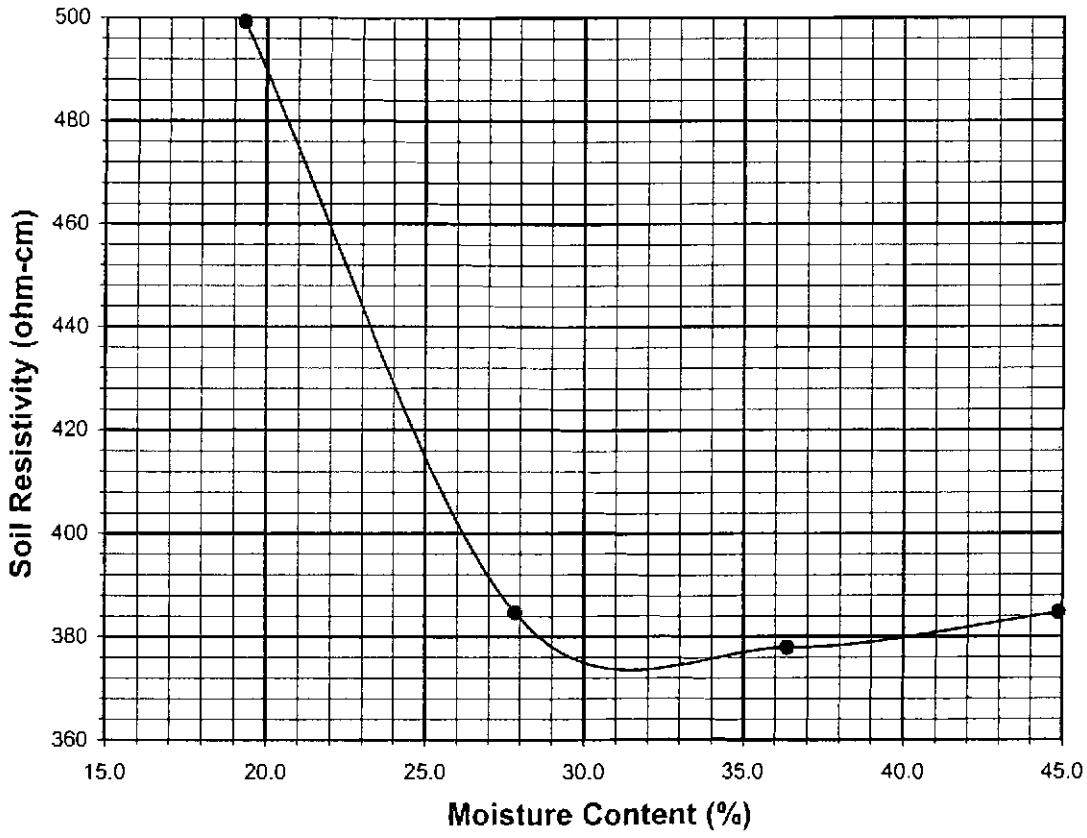
Project Name: I-5 / El Camino Real Sound Wall
Project No. : 602171-001
Boring No.: LB-5
Sample No. : Bag-1
Soil Identification: SC

Tested By : V. Juliano Date: 05/03/08
Data Input By: J. Ward Date: 05/09/08
Depth (ft.) : 0-5

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	19.32	74	499
2	200	27.85	57	385
3	300	36.37	56	378
4	400	44.89	57	385
5				

Moisture Content (%) (MCi)	10.80
Wet Wt. of Soil + Cont. (g)	155.09
Dry Wt. of Soil + Cont. (g)	145.35
Wt. of Container (g)	55.17
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
374	**31.5**	**291**	**695**	**7.50**	**22.1**



Leighton

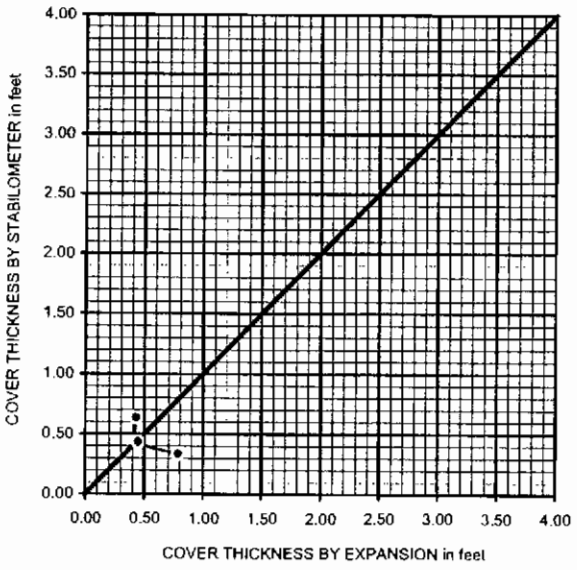
R-VALUE TEST RESULTS

PROJECT NAME:	I-5/El Camino Real Sound Wall	PROJECT NUMBER:	602171-001
SAMPLE NUMBER:	Bag-1	SAMPLE LOCATION:	B-3 @ 0-5'
SAMPLE DESCRIPTION:	SM	TECHNICIAN:	SCF
		DATE COMPLETED	6/2/2008

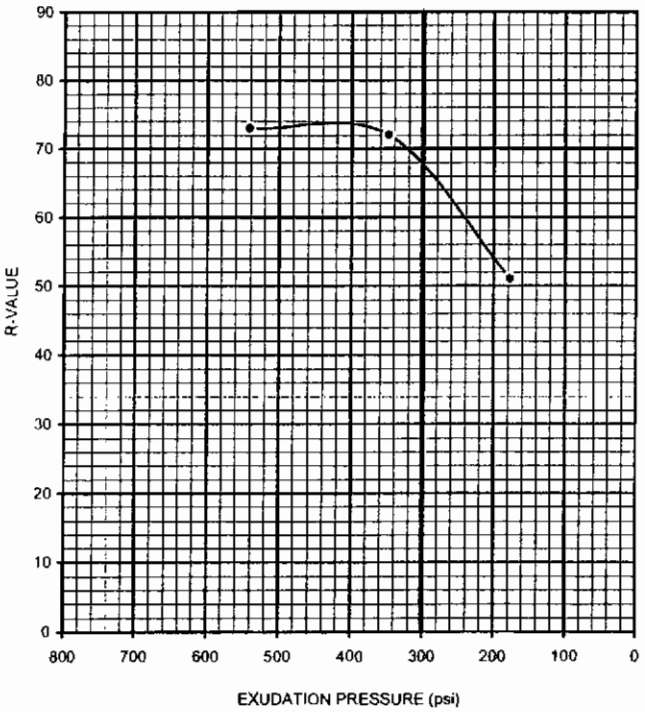
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	9.2	9.6	10.1
HEIGHT OF SAMPLE, Inches	2.41	2.48	2.44
DRY DENSITY, pcf	126.3	125.1	125.9
COMPACTOR PRESSURE, psi	200	135	70
EXUDATION PRESSURE, psi	542	348	177
EXPANSION, Inches x 10exp-4	19	13	10
STABILITY Ph 2,000 lbs (160 psi)	30	32	59
TURNS DISPLACEMENT	3.72	3.81	4.02
R-VALUE UNCORRECTED	74	72	52
R-VALUE CORRECTED	73	72	51

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.43	0.45	0.78
EXPANSION PRESSURE THICKNESS, ft.	0.63	0.43	0.33

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	73
R-VALUE BY EXUDATION:	68
EQUILIBRIUM R-VALUE:	68

Leighton

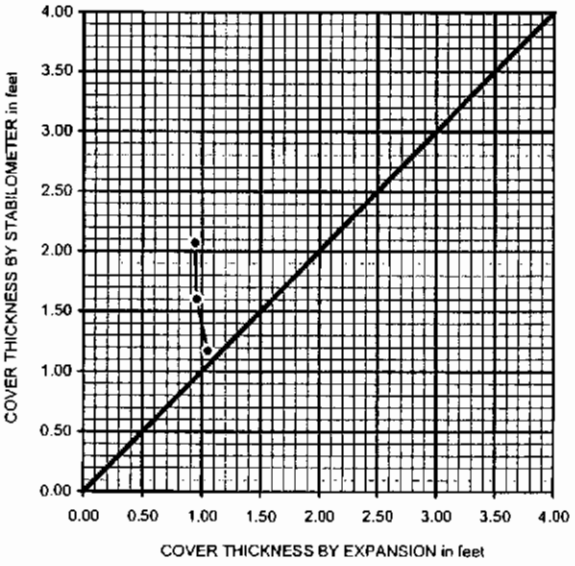
R-VALUE TEST RESULTS

PROJECT NAME:	I-5/El Camino Real Sound Wall	PROJECT NUMBER:	602171-001
SAMPLE NUMBER:	Bag-1	SAMPLE LOCATION:	B-5 @ 0-5'
SAMPLE DESCRIPTION:	SC	TECHNICIAN:	SCF
		DATE COMPLETED	6/2/2008

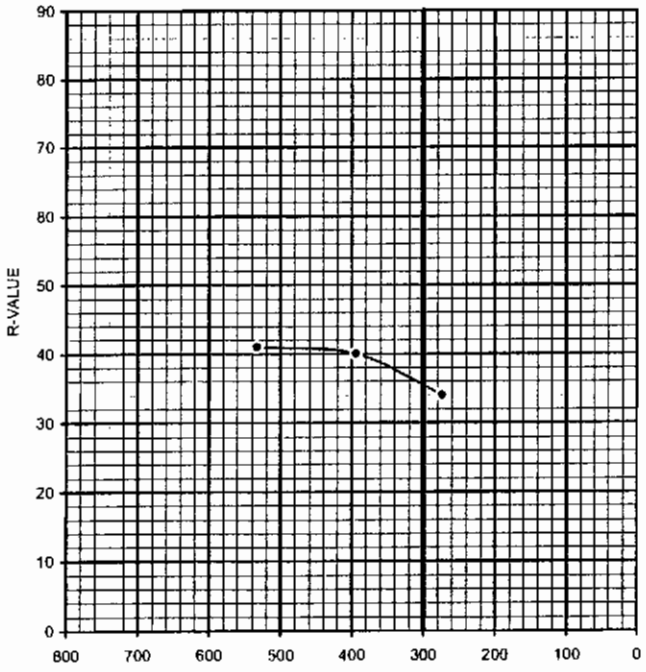
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	12.4	12.9	13.3
HEIGHT OF SAMPLE, Inches	2.39	2.47	2.49
DRY DENSITY, pcf	124.5	121.5	120.1
COMPACTOR PRESSURE, psi	120	80	50
EXUDATION PRESSURE, psi	533	394	273
EXPANSION, Inches x 10exp-4	62	48	35
STABILITY Ph 2,000 lbs (160 psi)	87	92	100
TURNS DISPLACEMENT	2.76	2.81	2.97
R-VALUE UNCORRECTED	43	40	34
R-VALUE CORRECTED	41	40	34

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.94	0.96	1.06
EXPANSION PRESSURE THICKNESS, ft.	2.07	1.60	1.17

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	33
R-VALUE BY EXUDATION:	36
EQUILIBRIUM R-VALUE:	33

APPENDIX C

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...12-ORA-5-1.3/1.7

PROJECT ACCOUNT NO.12-0G9401

SAMPLE LOCATION....91+75/100 FT LEFT

TEST SAMPLE NO.....LB-5

OPERATOR.....TK

TEST DATE.....5/3/08

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 7.5 , WATER pH = 0.0 , SOIL pH = 7.5

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 374 , WATER = 0 , SOIL = 374

CHLORIDES, PPM... 695 , SULFATES, PPM... 291

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& in	GALV. 2 oz	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	0.052	16	24	31	41	66
16	0.064	21	29	36	46	71
14	0.079	26	34	41	51	76
12	0.109	36	44	51	61	86
10	0.138	46	54	61	71	96
08	0.168	56	64	71	81	106

FLOW VEL. <5 fps WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (0.052 in) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN MAY BE ADVERSELY
AFFECTED BY CHLORIDES. RECOMMENDED DESIGN IS:

FOR CHLORIDE RESISTANT RCP, ESTIMATED SERVICE LIFE, YEARS = 42
USING CEMENT CONTENT, sk/cy, C = 6
USING CONCRETE COVER, in, S = 2
USING TOTAL MIX WATER, % BY VOL., W = 15

FOR SULFATE RESISTANT CONCRETE AND RCP
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPECS. 90-1.01

A CORRUGATED ALUMINUM PIPE, CAP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

CALFP Ver. 1.1

Unit System = E

Title: I-5/El Camino Real/ Shoulder
Traffic Index (TI) = 12.0
R.Value of Subgrade (Native Soil) = 30
Required GE = 0002.69 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.84 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	01.64	00.16	00.15	01.64	00.25
00.20	01.64	00.33	00.25	01.64	00.41
00.30	01.64	00.49	00.35	01.64	00.57
00.40	01.64	00.66	00.45	01.64	00.74
00.50	01.64	00.82	00.55	01.66	00.91
00.60	01.70	01.02	00.65	01.75	01.14
00.70	01.79	01.25	00.75	01.84	01.38
00.80	01.88	01.50	00.85	01.91	01.62
00.90	01.95	01.76	00.95	01.99	01.89
01.00	02.02	02.02	01.05	02.05	02.15
01.10	02.09	02.30	01.15	02.12	02.44
01.20	02.15	02.58	01.25	02.18	02.73
01.30	02.21	02.87	01.35	02.23	03.01
01.40	02.26	03.16	01.45	02.29	03.32
01.50	02.31	03.47	01.55	02.34	03.63
01.60	02.36	03.78	01.65	02.39	03.94

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0001.65 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.60	00.00	01.50	00.00	00.00	-00.02	0000.00	01.70
00.65	00.00	01.40	00.00	00.00	-00.01	0000.00	01.75
00.70	00.00	01.30	00.00	00.00	-00.00	0000.00	01.79
00.75	00.00	01.20	00.00	00.00	00.01	0000.00	01.84
00.80	00.00	01.10	00.00	00.00	00.03	0000.00	01.88
00.85	00.00	00.95	00.00	00.00	-00.02	0000.00	01.91
00.90	00.00	00.85	00.00	00.00	00.00	0000.00	01.95
00.95	00.00	00.70	00.00	00.00	-00.03	0000.00	01.99
01.00	00.00	00.60	00.00	00.00	-00.01	0000.00	02.02
01.05	00.00	00.50	00.00	00.00	00.01	0000.00	02.05
01.10	00.00	00.35	00.00	00.00	-00.00	0000.00	02.09
01.15	00.00	00.35	00.00	00.00	00.14	0000.00	02.12
01.20	00.00	00.35	00.00	00.00	00.28	0000.00	02.15

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: I-5/El Camino Real/Mainline
Traffic Index (TI) = 13.5
R.Value of Subgrade (Native Soil) = 30
Required GE = 0003.02 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.95 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	01.54	00.15	00.15	01.54	00.23
00.20	01.54	00.31	00.25	01.54	00.39
00.30	01.54	00.46	00.35	01.54	00.54
00.40	01.54	00.62	00.45	01.54	00.69
00.50	01.54	00.77	00.55	01.56	00.86
00.60	01.61	00.97	00.65	01.65	01.07
00.70	01.69	01.18	00.75	01.73	01.30
00.80	01.77	01.42	00.85	01.80	01.53
00.90	01.84	01.66	00.95	01.87	01.78
01.00	01.91	01.91	01.05	01.94	02.04
01.10	01.97	02.17	01.15	02.00	02.30
01.20	02.02	02.42	01.25	02.05	02.56
01.30	02.08	02.70	01.35	02.11	02.85
01.40	02.13	02.98	01.45	02.16	03.13
01.50	02.18	03.27	01.55	02.20	03.41
01.60	02.23	03.57	01.65	02.25	03.71
01.70	02.27	03.86	01.75	02.30	04.03
01.80	02.32	04.18	01.85	02.34	04.33
01.90	02.36	04.48	01.95	02.38	04.64

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0001.90 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.70	00.00	01.65	00.00	00.00	-00.03	0000.00	01.69
00.75	00.00	01.55	00.00	00.00	-00.02	0000.00	01.73
00.80	00.00	01.45	00.00	00.00	-00.01	0000.00	01.77
00.85	00.00	01.35	00.00	00.00	-00.01	0000.00	01.80
00.90	00.00	01.25	00.00	00.00	00.01	0000.00	01.84
00.95	00.00	01.15	00.00	00.00	00.02	0000.00	01.87
01.00	00.00	01.00	00.00	00.00	-00.01	0000.00	01.91
01.05	00.00	00.90	00.00	00.00	00.00	0000.00	01.94
01.10	00.00	00.80	00.00	00.00	00.02	0000.00	01.97
01.15	00.00	00.65	00.00	00.00	-00.01	0000.00	02.00
01.20	00.00	00.55	00.00	00.00	00.01	0000.00	02.02
01.25	00.00	00.40	00.00	00.00	-00.02	0000.00	02.05
01.30	00.00	00.35	00.00	00.00	00.07	0000.00	02.08

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: I-5/ El Camino Real/ Mainline
Traffic Index (TI) = 14.5
R.Value of Subgrade (Native Soil) = 30
Required GE = 0003.25 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0001.02 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	01.49	00.15	00.15	01.49	00.22
00.20	01.49	00.30	00.25	01.49	00.37
00.30	01.49	00.45	00.35	01.49	00.52
00.40	01.49	00.60	00.45	01.49	00.67
00.50	01.49	00.75	00.55	01.51	00.83
00.60	01.55	00.93	00.65	01.59	01.03
00.70	01.63	01.14	00.75	01.67	01.25
00.80	01.71	01.37	00.85	01.74	01.48
00.90	01.77	01.59	00.95	01.81	01.72
01.00	01.84	01.84	01.05	01.87	01.96
01.10	01.90	02.09	01.15	01.93	02.22
01.20	01.95	02.34	01.25	01.98	02.48
01.30	02.01	02.61	01.35	02.03	02.74
01.40	02.06	02.88	01.45	02.08	03.02
01.50	02.10	03.15	01.55	02.13	03.30
01.60	02.15	03.44	01.65	02.17	03.58
01.70	02.19	03.72	01.75	02.22	03.89
01.80	02.24	04.03	01.85	02.26	04.18
01.90	02.28	04.33	01.95	02.30	04.49
02.00	02.32	04.64	02.05	02.34	04.80

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0002.05 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.75	00.00	01.80	00.00	00.00	-00.02	0000.00	01.67
00.80	00.00	01.70	00.00	00.00	-00.01	0000.00	01.71
00.85	00.00	01.60	00.00	00.00	-00.01	0000.00	01.74
00.90	00.00	01.50	00.00	00.00	-00.00	0000.00	01.77
00.95	00.00	01.40	00.00	00.00	00.01	0000.00	01.81
01.00	00.00	01.30	00.00	00.00	00.02	0000.00	01.84
01.05	00.00	01.15	00.00	00.00	-00.02	0000.00	01.87
01.10	00.00	01.05	00.00	00.00	-00.00	0000.00	01.90
01.15	00.00	00.95	00.00	00.00	00.02	0000.00	01.93
01.20	00.00	00.85	00.00	00.00	00.03	0000.00	01.95
01.25	00.00	00.70	00.00	00.00	-00.00	0000.00	01.98
01.30	00.00	00.60	00.00	00.00	00.03	0000.00	02.01
01.35	00.00	00.45	00.00	00.00	-00.01	0000.00	02.03

***** FINISH *****

P.N: 602171-001/El Camino Real Sound Wall/Psuedostatic

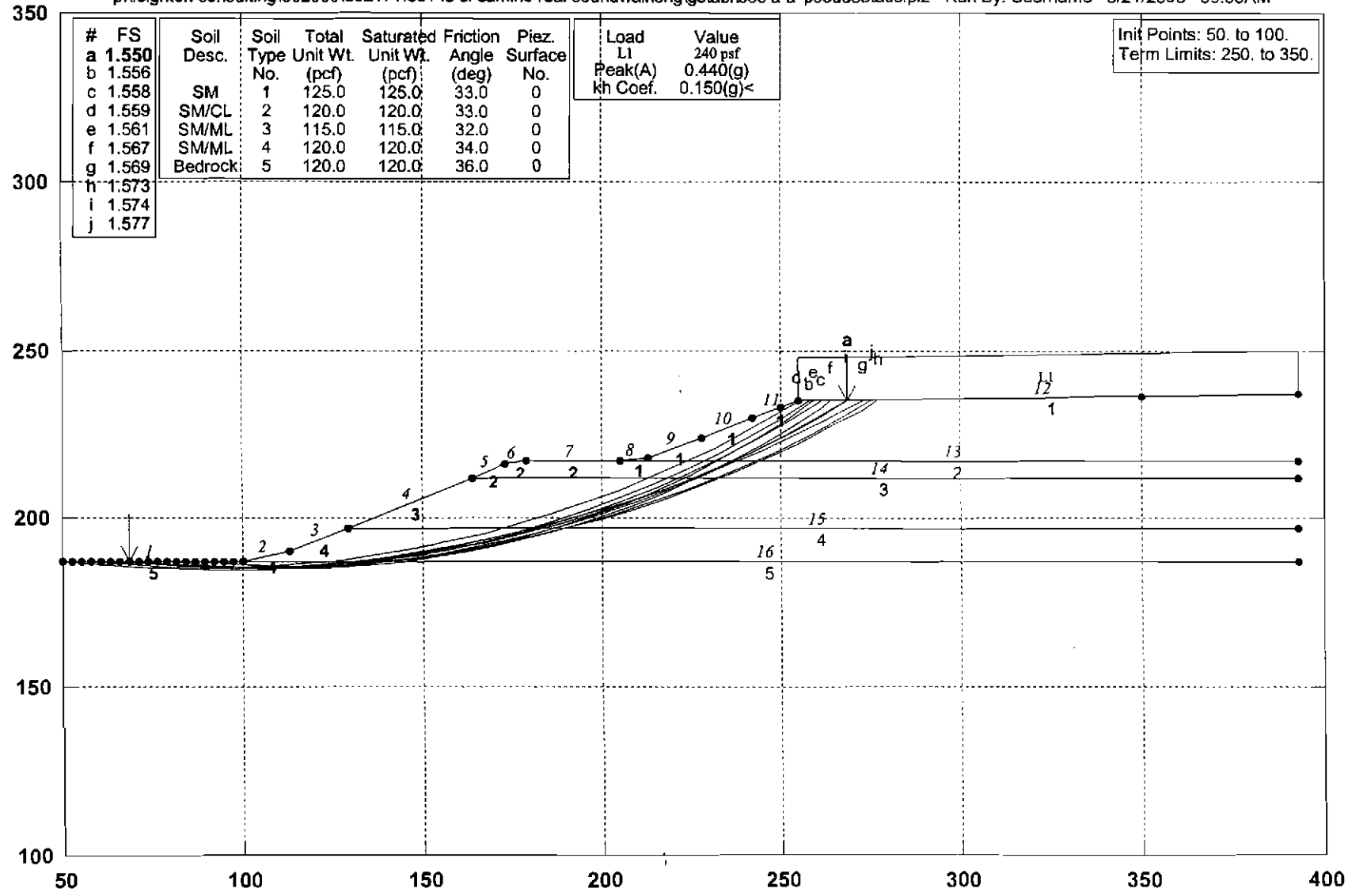
p:\leighton consulting\602000\602171.001 i5 el camino real soundwall\eng\gstabl\sec a-a' pseudostatic.pl2 Run By: Username 8/21/2008 09:03AM

#	FS
a	**1.550**
b	1.556
c	1.558
d	1.559
e	1.561
f	1.567
g	1.569
h	1.573
i	1.574
j	1.577

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Piez. Surface No.
SM	1	125.0	125.0	33.0	0
SM/CL	2	120.0	120.0	33.0	0
SM/ML	3	115.0	115.0	32.0	0
SM/ML	4	120.0	120.0	34.0	0
Bedrock	5	120.0	120.0	36.0	0

Load	Value
L1	240 psf
Peak(A)	0.440(g)
kh Coef.	0.150(g)<

Init Points: 50. to 100.
Term Limits: 250. to 350.



GSTABL7 v.2 FSmin=1.550

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
(All Rights Reserved-Unauthorized Use Prohibited)

****
SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
****

Analysis Run Date: 8/18/2008
Time of Run: 03:42PM
Run By: Username
Input Data Filename: P:\Leighton Consulting\602000\602171.001 IS El Camino Real Soundwall\ENG\GSTABL\sec a-a' pseudostatic.in
Output Filename: P:\Leighton Consulting\602000\602171.001 IS El Camino Real Soundwall\ENG\GSTABL\sec a-a' pseudostatic.OUT
Unit System: English

Plotted Output Filename: P:\Leighton Consulting\602000\602171.001 IS El Camino Real Soundwall\ENG\GSTABL\sec a-a' pseudostatic.PLT

PROBLEM DESCRIPTION: P.N: 602171-001/El Camino Real Sound Wall/Section A-A'/Psuedostatic

BOUNDARY COORDINATES

12 Top Boundaries
16 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	50.00	187.00	100.00	187.00	5
2	100.00	187.00	113.00	190.00	4
3	113.00	190.00	129.50	197.00	4
4	129.50	197.00	164.00	212.00	3
5	164.00	212.00	173.00	216.00	2
6	173.00	216.00	179.00	217.00	2
7	179.00	217.00	205.00	217.00	2
8	205.00	217.00	213.00	218.00	1
9	213.00	218.00	228.00	224.00	1
10	228.00	224.00	242.00	230.00	1
11	242.00	230.00	255.00	235.00	1
12	255.00	235.00	393.00	237.00	1
13	205.00	217.00	393.00	217.00	2
14	164.00	212.00	393.00	212.00	3
15	129.50	197.00	393.00	197.00	4
16	100.00	187.00	393.00	187.00	5

User Specified Y-Origin = 100.00(ft)

Defsult X-Plus Value = 0.00(ft)

Default Y-Plus Value = 0.00(ft)

1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	0.0	33.0	0.00	0.0	0
2	120.0	120.0	0.0	33.0	0.00	0.0	0
3	115.0	115.0	0.0	32.0	0.00	0.0	0
4	120.0	120.0	0.0	34.0	0.00	0.0	0
5	120.0	120.0	0.0	36.0	0.00	0.0	0

1

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	255.00	393.00	240.0	0.0

NOTE - Intensity is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

Specified Peak Ground Acceleration Coefficient (A) = 0.440(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)

Specified Seismic Pore-Pressure Factor = 0.000

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

Janbus Empirical Coef. is being used for the case of c & phi both > 0
3000 Trial Surfaces Have Been Generated.

150 Surface(s) Initiate(s) From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = 50.00(ft)
and X = 100.00(ft)

Each Surface Terminates Between X = 250.00(ft)
and X = 350.00(ft)

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 0.00(ft)

10.00(ft) Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Simplified Janbu Method * *

Total Number of Trial Surfaces Attempted = 3000

Number of Trial Surfaces With Valid FS = 3000

Statistical Data On All Valid FS Values:
FS Max = 2.709 FS Min = 1.550 FS Ave = 2.181
Standard Deviation = 0.251 Coefficient of Variation = 11.52 %

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.421	187.000
2	78.381	186.111
3	88.365	185.546
4	98.363	185.307
5	108.362	185.393
6	118.354	185.805
7	128.327	186.542
8	138.270	187.603
9	148.174	188.988
10	158.027	190.694
11	167.820	192.720
12	177.541	195.064
13	187.181	197.723
14	196.730	200.694
15	206.176	203.975
16	215.511	207.562
17	224.724	211.450
18	233.805	215.637
19	242.745	220.117
20	251.535	224.886
21	260.165	229.938
22	268.510	235.196

Factor of Safety
*** 1.550 ***

Individual data on the 36 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.0	531.5	0.0	0.0	0.	0.	79.7	0.0	0.0
2	10.0	1403.8	0.0	0.0	0.	0.	210.6	0.0	0.0
3	10.0	1887.8	0.0	0.0	0.	0.	283.2	0.0	0.0
4	1.6	331.3	0.0	0.0	0.	0.	49.7	0.0	0.0
5	8.4	2616.9	0.0	0.0	0.	0.	392.5	0.0	0.0
6	4.6	2212.9	0.0	0.0	0.	0.	331.9	0.0	0.0
7	5.4	3495.6	0.0	0.0	0.	0.	524.3	0.0	0.0
8	10.0	9829.1	0.0	0.0	0.	0.	1474.4	0.0	0.0
9	1.2	1428.8	0.0	0.0	0.	0.	214.3	0.0	0.0
10	3.1	4047.5	0.0	0.0	0.	0.	607.1	0.0	0.0
11	5.7	8257.2	0.0	0.0	0.	0.	1238.6	0.0	0.0
12	9.9	17139.8	0.0	0.0	0.	0.	2571.0	0.0	0.0
13	9.9	20092.4	0.0	0.0	0.	0.	3013.9	0.0	0.0
14	6.0	13488.3	0.0	0.0	0.	0.	2023.2	0.0	0.0
15	3.8	9121.2	0.0	0.0	0.	0.	1368.2	0.0	0.0
16	5.2	12979.3	0.0	0.0	0.	0.	1946.9	0.0	0.0
17	4.5	11573.2	0.0	0.0	0.	0.	1736.0	0.0	0.0
18	1.5	3674.1	0.0	0.0	0.	0.	551.1	0.0	0.0
19	5.6	13441.6	0.0	0.0	0.	0.	2016.2	0.0	0.0
20	2.6	5982.7	0.0	0.0	0.	0.	897.4	0.0	0.0
21	9.5	19774.8	0.0	0.0	0.	0.	2966.2	0.0	0.0
22	8.3	14349.3	0.0	0.0	0.	0.	2152.4	0.0	0.0
23	1.2	1829.4	0.0	0.0	0.	0.	274.4	0.0	0.0
24	6.8	9852.4	0.0	0.0	0.	0.	1477.9	0.0	0.0
25	2.5	3398.6	0.0	0.0	0.	0.	509.8	0.0	0.0
26	9.2	12600.3	0.0	0.0	0.	0.	1890.0	0.0	0.0
27	1.2	1636.8	0.0	0.0	0.	0.	245.5	0.0	0.0
28	2.1	2845.1	0.0	0.0	0.	0.	426.8	0.0	0.0
29	5.8	7863.9	0.0	0.0	0.	0.	1179.6	0.0	0.0
30	2.7	3647.1	0.0	0.0	0.	0.	547.1	0.0	0.0
31	5.5	7154.7	0.0	0.0	0.	0.	1073.2	0.0	0.0
32	0.7	951.7	0.0	0.0	0.	0.	142.8	0.0	0.0
33	8.8	10411.3	0.0	0.0	0.	0.	1561.7	0.0	0.0
34	3.5	3652.7	0.0	0.0	0.	0.	547.9	0.0	0.0
35	5.2	4268.6	0.0	0.0	0.	0.	640.3	0.0	1239.6
36	8.3	2679.4	0.0	0.0	0.	0.	401.9	0.0	2002.9

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.421	187.000
2	78.373	186.023
3	88.354	185.409
4	98.351	185.159
5	108.351	185.274
6	118.339	185.754
7	128.303	186.997
8	138.231	187.802
9	148.107	189.369
10	157.920	191.295
11	167.656	193.577
12	177.302	196.212
13	186.847	199.197
14	196.275	202.528
15	205.577	206.201
16	214.738	210.210
17	223.747	214.550
18	232.591	219.216
19	241.260	224.201
20	249.742	229.499
21	257.935	235.043

Factor of Safety
*** 1.556 ***

1

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.421	187.000
2	78.368	185.976
3	88.346	185.309
4	98.341	185.002
5	108.341	185.093
6	118.333	185.463
7	128.303	186.232
8	138.240	187.359
9	148.129	188.841
10	157.959	190.678
11	167.717	192.866
12	177.390	195.403
13	186.965	198.286
14	196.431	201.511
15	205.774	205.074
16	214.984	208.970
17	224.048	213.194
18	232.955	217.741
19	241.692	222.604
20	250.250	227.779
21	258.616	233.257
22	261.207	239.090

Factor of Safety
*** 1.558 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.895	187.000
2	67.851	186.070
3	77.834	185.476
4	87.830	185.220
5	97.830	185.300
6	107.821	185.718
7	117.793	186.473
8	127.733	187.564
9	137.631	188.989
10	147.475	190.747
11	157.255	192.837
12	166.958	195.255
13	176.574	197.998
14	186.092	201.065
15	195.502	204.451
16	204.791	208.152
17	213.951	212.165
18	222.970	216.484
19	231.838	221.105
20	240.546	226.023
21	249.082	231.231
22	254.554	234.828

Factor of Safety
*** 1.559 ***

1

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.474	187.000
2	99.434	186.114
3	109.424	185.654
4	119.424	185.621
5	129.416	186.015
6	139.382	186.836
7	149.304	188.081
8	159.164	189.749
9	168.944	191.836
10	178.626	194.340
11	188.192	197.254
12	197.624	200.574
13	206.907	204.294
14	216.022	208.406
15	224.953	212.904
16	233.684	217.780
17	242.199	223.024
18	250.482	228.626
19	258.518	234.578
20	259.114	235.060

Factor of Safety
*** 1.561 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.579	187.000
2	91.521	185.929
3	101.499	185.254
4	111.495	184.977
5	121.494	185.097
6	131.481	185.615
7	141.439	186.529
8	151.353	187.839
9	161.206	189.543
10	170.985	191.636
11	180.672	194.117
12	190.253	196.982
13	199.713	200.225
14	209.036	203.842
15	218.207	207.827
16	227.213	212.173
17	236.039	216.874
18	244.672	221.923
19	253.096	227.310
20	261.300	233.029
21	264.074	235.132

Factor of Safety
*** 1.567 ***

1

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.000	187.000
2	59.956	186.063
3	69.934	185.402
4	79.927	185.017
5	89.926	184.909
6	99.925	185.077
7	109.915	185.522
8	119.889	186.243
9	129.839	187.239
10	139.758	188.511
11	149.638	190.056
12	159.471	191.874
13	169.251	193.963
14	178.968	196.321
15	188.617	198.948
16	198.190	201.840
17	207.679	204.997
18	217.077	208.414
19	226.377	212.090
20	235.571	216.022
21	244.654	220.206
22	253.617	224.640
23	262.454	229.320
24	271.158	234.243
25	272.843	235.259

Factor of Safety
*** 1.569 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.053	187.000
2	81.013	186.107
3	90.996	185.524
4	100.992	185.251
5	110.992	185.288
6	120.986	185.635
7	130.964	186.293
8	140.917	187.259
9	150.836	188.534
10	160.710	190.116
11	170.530	192.004
12	180.287	194.196
13	189.971	196.689
14	199.573	199.482
15	209.084	202.571
16	218.494	205.954
17	227.795	209.627
18	236.978	213.587
19	246.033	217.830
20	254.952	222.352
21	263.727	227.149
22	272.348	232.216
23	277.278	235.323

Factor of Safety
*** 1.573 ***

1

Fallure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	63.158	187.000
2	73.095	185.882
3	83.064	185.097
4	93.054	184.644
5	103.053	184.525
6	113.051	184.740
7	123.036	185.288
8	132.997	186.169
9	142.923	187.382
10	152.803	188.925
11	162.627	190.798
12	172.382	192.997
13	182.058	195.520
14	191.645	198.365
15	201.132	201.528
16	210.508	205.005
17	219.762	208.794
18	228.885	212.889
19	237.866	217.287
20	246.696	221.981
21	255.364	226.968
22	263.861	232.241
23	268.280	235.192

Factor of Safety
*** 1.574 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.789	187.000
2	75.741	186.016
3	85.718	185.341
4	95.711	184.975
5	105.711	184.919
6	115.708	185.173
7	125.692	185.737
8	135.654	186.609
9	145.584	187.790
10	155.473	189.278
11	165.311	191.072
12	175.088	193.169
13	184.796	195.569
14	194.425	198.268
15	203.965	201.264
16	213.409	204.554
17	222.745	208.136
18	231.967	212.005
19	241.064	216.157
20	250.028	220.590
21	258.850	225.298
22	267.522	230.277
23	275.673	235.300

Factor of Safety
*** 1.577 ***

**** END OF GSTABL7 OUTPUT ****

APPENDIX D

State of California Business, Transportation and Housing Agency

Memorandum

To: Kamran Mazhar, Chief
Design Branch F

Date: September 3, 2008

File: 12-ORA-5
PM 1.3-1.7
EA-0G9401

From: **DEPARTMENT OF TRANSPORTATION**
District 12
Materials and Research Branch **Cat:** 441.01

Subject: **Review of Draft Foundation Report for the proposed Soundwalls on SB Interstate 5 near El Camino Real in City of San Clemente, California.**

We have reviewed the above-mentioned report prepared by Leighton Consulting, Inc, dated July 16, 2008, for the above-referenced project in order to evaluate the Pavement Design information and we have the following comments:

1. A Materials Report, which addresses the Pavement Design for all the new pavement sections shown on the Project Plans shall be submitted for our review, as required by Topic 114 of Highway Design Manual (1995). The report shall include the results of field tests and sampling for R-Value, Sieve analysis, Sand Equivalent, Expansion Index, Plasticity Index, Corrosion and Structural Section recommendation and Deflection Study recommendations (as applicable). Structural sections will be calculated based on lowest R-values obtained from sampling and testing of the site-specific native materials and a recent Traffic Index. The Draft Foundation Report for the Soundwalls, which is submitted, is not a Materials Report.

2. A Layout Plan showing the location of all borings shall be included in the Materials Report.

3. Pavement Sections recommended by the new Materials Report shall match the ones recommended on the plans. The existing pavement sections also need to be shown on the Plans.

4. In Table 7, pavement section for the shoulder of SB I-5 for a 10-year design life (TI=13.5, R=30) shall be 0.8 feet HMA over 1.45 feet AB instead of 1.35 feet AB. Please verify and modify.

5. Asphalt Concrete shall be changed to Hot Mix Asphalt in Materials Report, Plans, and Specifications.

6. Site Corrosion test results indicate presence of highly corrosive soils at the project site. Provide results of corrosion study with specific recommendations for corrosion protection.

7. If Cold Planing is planned for the project please provide details with reference to the Standard Special Provisions. The pavement shall be saw-cut to full depth of Cold Planing. The join between the new and existing pavement shall be sealed.

8. Hot Mix Asphalt shall be Type A, and Aggregate Base and Subbase shall be Class 2.

9. Project Specifications and Special Provisions shall be submitted for our review and approval.

10. Any surface water due to runoffs shall be properly drained into the cross-culvert and inlets or catch basins. The impact of a new drainage system on existing drainage shall be considered.

11. The imported borrow materials used for embankment shall have an R-Value of at least 40 (top 1.2m from finished grade) and be non-corrosive, low expansion and free of other deleterious properties that adversely affect all concrete/steel structures. The Imported borrow shall conform to Section 19-7.02 of Caltrans Standard Specifications (July 1999) and be tested prior to placement. Soils within the upper 1.2 meters of finished roadway surface shall have an Expansion Index of less than 51, and a Plasticity Index of less than 12 in order to minimize the expansion of pavement section.

12. The join between the existing pavement and the new pavement shall be sealed. A layer of prime coat to be applied between all bonded and unbounded layers. A layer of tack coat shall be applied to all vertical cut faces and between subsequent AC lifts.

13. Spreading and compacting of the AC shall comply with Section 39-6 of Caltrans Standard Specifications (May 2006). The proportion of aggregate, amount of asphalt binder and the required Asphalt content shall comply with Caltrans Standard Specifications (May 2006).

For further assistant, please contact Mehrdad Mahdavian at (949) 756-4927.

Prepared by:

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

Concurred by:

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

Cc: Frank Lin
Mohammad Sadiq
File

State of California Business, Transportation and Housing Agency

Memorandum

To: Kamran Mazhar, Chief
Design Branch F

Date: October 7, 2008

File: 12-ORA-5
PM 1.3-1.7
EA-0G9401

From: **DEPARTMENT OF TRANSPORTATION**
District 12
Materials and Research Branch **Cat:** 441.01

Subject: **Review of Draft Materials Report and Project Plans for the proposed Soundwalls on SB Interstate 5 near El Camino Real in City of San Clemente, California.**

We have reviewed the above-mentioned report prepared by Leighton Consulting, Inc, dated September 16, 2008, and Project Plans for the above-referenced project in order to evaluate the Pavement Design information and we have the following comments:

1. Site Corrosion test results indicate presence of highly corrosive soils at the project site. Provide specific recommendations for corrosion protection using Culvert Program or Caltrans Corrosion Guidelines.

2. Project Specifications and Special Provisions shall be submitted for our review and approval.

3. Spreading and compacting of the AC shall comply with Section 39-6 of Caltrans Standard Specifications (May 2006). The proportion of aggregate, amount of asphalt binder and the required Asphalt content shall comply with Caltrans Standard Specifications (May 2006). Please add to Construction Consideration, Section 5.2.

4. Pavement Type 3 on Sheet X-4 of Plans shall be changed to Pavement Type 4. Please verify and modify.

5. Please provide a detail explanation for the reason behind reconstructing the shoulder of I-5 in some areas (Sheet X-1 of Plans), and reconstructing only 2-feet in other areas (Sheet X-2 through X-5 of Plans).

6. Please provide the reason for selecting Pavement Type 4 for portions of the I-5 shoulder.

7. Does the existing pavement have any drainage layer or Edge Drain? If so are you placing new edge drain or extending the existing one?

For further assistant, please contact Mehrdad Mahdavian at (949) 756-4927.

Prepared by:

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

Concurred by:

Behdad Baseghi, Ph.D, PE, GE, PMP
Chief, Materials & Research Branch
Division of Projeet Delivery
RCE # 47051

Cc: Frank Lin
Mohammad Sadiq
File