Geotechnical Data Report

Corte Madera Creek Levee Evaluation
Marin County, California

SUBMITTED TO:

Marin County Flood Control and Water Conservation District
Mr. Felix Meneau, PE
Zone Engineer
3501 Civic Center Drive, Suite 304
San Rafael, CA 94903
FMeneau@marincounty.org

October 28, 2019

A3GEO

October 28, 2019

Marin County Flood Control and Water Conservation District
Mr. Felix Meneau, PE
Zone Engineer
Department of Public Works
3501 Civic Center Drive, Suite 304
San Rafael, CA 94903
FMeneau@marincounty.org

RE: FINAL Geotechnical Data Report (GDR)
Corte Madera Levee Evaluation
Marin County, California

Dear Mr. Meneau:

The attached Geotechnical Data Report (GDR) presents the final deliverable of A3GEO's Geotechnical Investigation Task (Task 3) for the Corte Madera Levee Evaluation Project. This work has been conducted in accordance with the Professional Services Agreement between Marin County Flood Control and Water Conservation District and A3GEO dated 9 January 2018.

This GDR summarizes the data collected during A3GEO'S subsurface exploration and laboratory testing program for the project and includes historic and recent geotechnical data compiled from selected existing borings, Cone Penetration Tests (CPTs) and laboratory test results within the vicinity of the identified potential flood barrier alignments.

The data presented in this report was developed in accordance with generally-accepted geotechnical and engineering principles and practices at the time that the report was prepared. Should you have questions about this Geotechnical Data Report, please do not hesitate to call.

Yours very truly,

A3GEO, Inc.

Sarah Khosravani, PE
Project Engineer
(650) 338-7205

Dona Mann, PE, GE
Principal Engineer
(415) 425-0247

TABLE OF CONTENTS

Attachments:

Figure 1 – Boring/CPT Location Map

Appendix A – Existing Borings, CPTs and Laboratory Data
Appendix B – ConeTec CPT Report
Appendix C – Direct Push Logs
Appendix D – Laboratory Test Data Sheets

1. INTRODUCTION

This Geotechnical Data Report (GDR) is the final deliverable of Task 3, Geotechnical Investigation, for the Corte Madera Creek Levee Evaluation Project (Project).

This GDR summarizes the data collected during A3GEO'S subsurface exploration and laboratory testing program for the Project and includes historic and recent geotechnical data compiled from selected existing borings, Cone Penetration Tests (CPTs) and laboratory test results within the vicinity of the potential flood barrier alignments (Figure 1).

2. EXISTING SUBSURFACE EXPLORATIONS AND LABORATORY TESTS

As part of Task 3, we reviewed a variety of available geotechnical and environmental reports prepared by various Consultants for projects along Corte Madera Creek from the end of the concrete channel to the San Francisco Bay. A list of these reports and the outcome of our review are summarized in our "Existing Conditions Technical Memorandum" dated October 4, 2019. As part of our existing data review, we developed a GIS database, which includes all relevant geotechnical investigation logs (borings and CPTs) from the reviewed reports. The developed GIS database was submitted to Marin County on July 5, 2018.

For the purpose of this GDR, our Geotechnical Engineer (GE) selected the most relevant existing geotechnical borings and CPTs within the approved study area (refer to A3GEO's Subsurface Exploration Plan dated August 10, 2018 for additional information). Figure 1 presents the locations of the selected existing borings and CPTs. On Figure 1, each boring/CPT is identified by a reference ID which includes: the name of the boring/CPT as indicated in the original report (listed in Section 5, References); abbreviated name of the Consultant who prepared the report; and the report's year (e.g., B-4, Fugro, 2007). The corresponding boring logs, CPT logs, and laboratory test results are compiled in Appendix A, grouped by report.

3. A3GEO SUBSURFACE EXPLORATION (THIS STUDY)

On December 18, 2018, A3GEO advanced four Cone Penetration Tests (CPTs) to refusal at the locations shown on Figure 1 and collected continuous direct push core samples at selected locations through the existing levee and underlying fill material.

3.01 Field Investigation Preparation

Prior to our field investigation we:

- Developed a "Subsurface Exploration Plan", describing the details our field investigation and Laboratory program, dated August 10, 2018.
- Developed a "Drilling Program Plan for USACE", dated September 12, 2018, in order to obtain US Armey Corps of Engineers (USACE) District Levee Safety Officer (LSO) approval for our proposed subsurface exploration per USACE regulation No. ER 1110-1-1807.
- Developed a pedestrian/bike traffic control plan and submitted to City of Larkspur.
- Obtained Marin County drilling permit and City of Larkspur encroachment permit.
- Coordinated with Marin County, City of Larkspur and College of Marin to obtain access to CPT locations.
- Marked the CPT locations in the field and notified Underground Service Alert (USA).
- Subcontracted to GeoTech Utility Locating LLC, of Moraga, California, a private utility locating company, to screen each CPT location for underground utilities.

- Developed a field health and safety plan and coordinated with our subcontractor, California Push Technologies, Inc./ConeTec (ConeTec) of San Leandro, California.
- Conducted a site visit three days prior to the field investigation to assess the condition of the access roads to CPT locations (during rainy weather) and posted a few signs at the access road entrances to inform pedestrian/bike traffic of the upcoming field activities.
- Placed pedestrian/bike traffic control signs prior to starting the field activities on the day of the field investigation (December 18, 2018). The signs were removed upon completion of the field investigation on the same day.

Our Subsurface Exploration Plan dated August 10, 2018 identified six CPTs along the existing levee (right bank); however, due to time limitations in the field, only four CPTs were completed. Our Geotechnical Engineer (GE) reviewed the collected samples and CPT results and has concluded that the data collected provides sufficient information to meet the objectives of this study.

3.02 Cone Penetration Testing and Direct Push Sampling

Four CPTs were advanced to refusal by ConeTec of San Leandro, California. The locations of the CPTs are presented on Figure 1. CPT-1 was advanced on the bike/pedestrian path behind the Edgewater Place apartment complex in Larkspur, California; CPT-2, CPT-4 and CPT-6 were advanced on the existing levee (right bank) along Corte Madera Creek.

The CPTs were advanced using a track CPT rig (Geoprobe 6622CPT) equipped with a 15 cm^2 instrumented cone. Pore-water dissipation tests were performed in CPT-1, CPT-4 and CPT-6. ConeTec's report, Appendix B, includes: 1) additional information about the equipment and procedures used during the investigation, and 2) plots of measured cone tip resistance (q_t), sleeve friction (f_s), pore water pressure (u) and geotechnical material descriptions based on soil behavior type (SBT) (Robertson, 2009).

Continuous direct push core samples were collected at CPT-2 and CPT-4 through the existing levee and fill material to depths of 13 and 14 feet, respectively. Our licensed engineer (PE) was present on site to oversee the field operations, determine sampling depths and collect samples. Upon completion of the field exploration, all holes were backfilled with Type II Portland cement grout in accordance with the USACE approved Drilling Program Plan and Marin County permit requirements. Table 1 presents a summary of our subsurface exploration.

Table 1 – Summary of A3GEO's Subsurface Exploration

CPT Name	Approximate Location*		Depth (ft)	Estimated Groundwater Depth (ft)**	Direct Push Samples
	Latitude	Longitude			
CPT-1	37.942507	-122.538414	94.2	8.2	---
CPT-2	37.94606	-122.539193	65.5	---	Collected
CPT-4	37.947132	-122.540969	72.3	5.8	Collected
CPT-6	37.948156	-122.544808	79.8	6.3	---

* CPT locations were determined by measuring from existing site features and should be considered approximate. Latitude/Longitude coordinates were recorded from Google Earth.
** The estimated groundwater depths are based on pore pressure dissipation tests results.

After transporting the direct push core samples to A3GEO's laboratory, our licensed engineer (PE) reviewed and visually classified the collected samples in accordance with ASTM 2488 which is based on the Unified Soil Classification System (USCS), selected samples for geotechnical laboratory testing and prepared logs of subsurface materials encountered. The logs were subsequently revised and finalized based on the collected CPT data and laboratory test results. The logs are presented in Appendix C, preceded by a Key to Exploratory Boring Logs that describes the USCS and the symbols used on the logs. Ground surface elevations shown on the logs were estimated from CLE Engineering, Inc.'s 2014 survey data in NAVD88 datum (CLE, 2014).

In general, the CPTs encountered 6 to 16 feet of variable, loose to medium dense, clayey/sandy/gravelly material which we interpret as fill over 35 to 50 feet of predominantly soft, compressible clay over 10 to 20 feet of stiff to very stiff silty and clayey soils over dense to very dense sand.

It should be noted that the collected CPT data and direct push logs in this report represent the condition of the subsurface materials at the CPT locations at the time of field investigation. The passage of time may result in changes in the subsurface conditions.

3.03 Geotechnical Laboratory Testing

Our geotechnical laboratory testing program was directed toward a quantitative and qualitative evaluation of the physical properties of the soils through the existing levee and fill material. The following geotechnical laboratory tests were performed on the collected samples:

- Atterberg Limits by ASTM D-4318.
- Sieve analysis by ASTM D-422.
- Moisture content by ASTM D-2216.

The preceding tests were conducted in general accordance with the current edition of the referenced ASTM standards at the time the tests were performed. The results of the tests are presented on the direct push logs presented in Appendix C at the appropriate sample depths. The laboratory test data sheets are included in Appendix D. Table 2 presents a summary of our laboratory test results.

Table 2 –Laboratory Test Results

Sample Collected at	Sample Depth (ft)	USCS* Soil Classification	Water Content (%)	Sieve		Atterberg	
				%>#4	%<#200	LL**	PI***
CPT-2	0-1.0	SC	5.4	35	17		
CPT-2	1.0-2.0	SC	16.2	13	40		
CPT-2	2.0-4.0	SC	8.9	24	34		
CPT-2	4.0-6.0	SC	9.6				
CPT-2	6.5-9.0	SC	20	24	33	32	14
CPT-2	9.0-10.0	GC	13.7	51	19		
CPT-2	10.0-12.0	GM	8.8				
CPT-2	12.0-13.0	GM	14.9	47	17		
CPT-4	0-1.0	SC	5.1	32	16		
CPT-4	1.0-2.0	CL	12.1				
CPT-4	2.0-3.0	SC	5.5	31	24		
CPT-4	3.0-4.0	SC	8.4	28	31		
CPT-4	4.0-5.5	SC	10	33	29		
CPT-4	5.5-6.0	SC	7.3				
CPT-4	6.0-7.0	SC	16.6	33	25		
CPT-4	7.0-10.0	SC	15.1	36	15		
CPT-4	10.0-12.0	CH	72.8			53	26
CPT-4	12.0-14.0	CH	88.8			75	42

* Soil classifications are based on the Unified Soil Classification System (USCS).
** LL: Liquid Limit.
*** PI: Plasticity Index.

4. LIMITATIONS

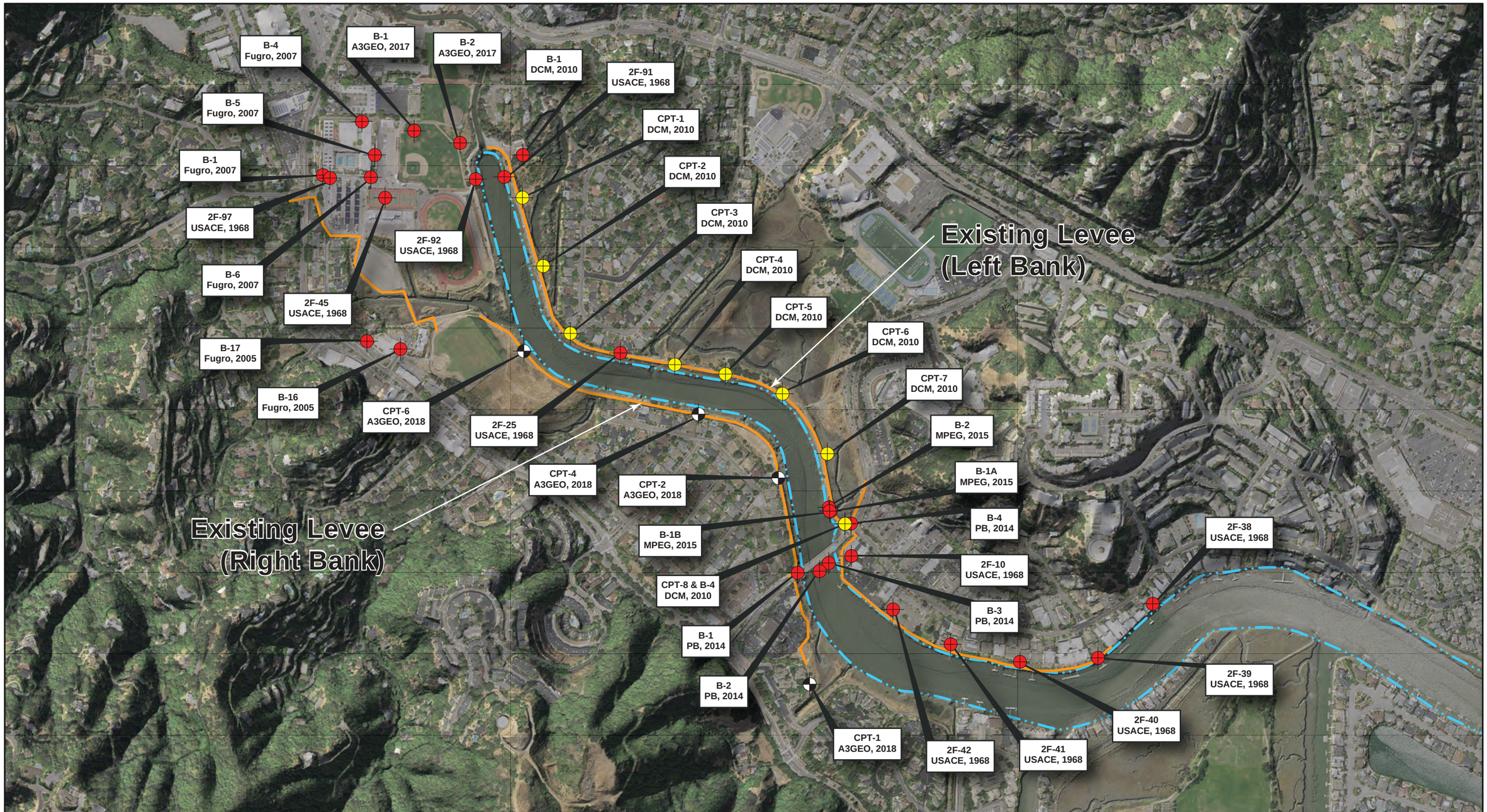
This data report has been prepared for the exclusive use of Marin County Flood Control and Water Conservation District and their Consultants. The data and interpretations presented in this report were developed in accordance with generally-accepted geotechnical and engineering geologic principles and practices. No other warranty, expressed or implied, is made. The findings of this report are valid as of the present date. However, the passing of time will likely change the conditions due to natural processes or the works of man. In addition, due to legislation or the broadening of knowledge, changes in applicable or appropriate standards will occur. Accordingly, this report should not be relied upon after a period of three years without being reviewed by this office.

The scope of this investigation was limited to aspects of the Project that are geotechnical and/or geologic in nature. The scope of our investigation did not include an environmental assessment or investigation for the presence of hazardous, toxic, or corrosive materials on, below, or around the site.

Our subsurface exploration was based on identified data gaps and potential improvement locations. The data collected will be used to develop conceptual remedial alternatives. Additional investigations will be required for future design-level studies.

5. REFERENCES

1. A3GEO, Inc., 2019, “Existing Conditions Technical Memorandum, Corte Madera Creek Levee Evaluation, Marin County, California”, dated October 4, 2019.
2. A3GEO, Inc., 2018, “Subsurface Exploration Plan Memorandum, Corte Madera Creek Levee Evaluation, Marin County, California”, dated August 10, 2018.
3. A3GEO, Inc., 2017, “Draft Geotechnical Investigation Report, Maintenance & Operations (M&O) Complex; College of Marin, Kentfield Campus; Marin County, California”, dated July 21, 2017.
4. CLE Engineering Inc., 2014, “Corte Madera Creek – Hydrographic Surveys, Marin County, California”, dated July 2014.
5. DCM GeoEngineers, 2010, “Geotechnical Investigation Report, Sanitary District No.1 of Marin County Kentfield Force Main Replacement Project, Marin County, California”, dated February 2010
6. Fugro West, Inc., 2007, “Geologic Hazards Evaluation and Geotechnical Study, Diamond Physical Education Complex Renovation, College of Marin, Kentfield, California,” dated February 16, 2007.
7. Fugro West, Inc., 2005, “Baseline Geologic Hazards Study, College of Marin, California”, dated December 15, 2005.
8. Miller Pacific Engineering Group, 2015, “Geotechnical Investigation Report, Creekside Marsh Culvert Replacement, Kentfield, California”, dated May 6, 2015.
9. Parsons Brinckerhoff, 2014, “Final Foundation Report, Bon Air Road Bridge Replacement Project, City of Larkspur, California”, dated May 2014.
10. Robertson, P.K., 2009, “Interpretation of cone penetration tests – a unified approach”, Canadian Geotechnical Journal, Volume 46: 1337-1355, dated 2009.
11. US Army Corps of Engineers (USACE), 1968, “Log of Exploration Holes, Corte Madera Creek Channel Improvements, Marin County, California”, dated April 10, 1968.
12. US Army Corps of Engineers (USACE), “Drilling in Earth Embankment Dams and Levees, Regulation No. ER 1110-1-1807”, dated December 31, 2014.



(SCALE IN FEET)

0 600 1200

Date: 1/31/2019

LEGEND

- A3GEO 2018 CPT's (This Study)
- Selected Existing Borings
- Selected Existing CPT's
- 2017 Corte Madera Creek
- Location of Potential Flood Barriers

CONSULTANTS NAMES (ABBREVIATIONS)

A3GEO	A3GEO Inc.
DCM	DCM GeoEngineers
Fugro	Fugro West Inc.
MPEG	Miller Pacific Engineering Group
PB	Parsons Brinckerhoff
USACE	US Army Corp of Engineers

CORTE MADERA CREEK LEVEE EVALUATION Project No. 1158-1A
MARIN COUNTY, CALIFORNIA

BORING/CPT LOCATION MAP

A3GEO

FIGURE 1

APPENDIX A

Existing Borings, CPTs and Laboratory Data

A3GEO Inc., 2017

A3GEO, Inc.
1331 7th Street; Unit E
Berkeley, CA 94710
Telephone: 510-705-1664

BORING NUMBER B-1

CLIENT College of Marin
PROJECT NAME Kentfield M&O Building
PROJECT NUMBER 1106-8A
PROJECT LOCATION Kentfield, CA
DATE STARTED 5/1/17 **COMPLETED** 5/1/17
GROUND ELEVATION 8 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Gregg Drilling and Testing, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 6.50 ft / Elev 1.50 ft
LOGGED BY JV **CHECKED BY** DKM
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	ADJUSTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	% RECOVERED	OTHER LAB TESTS / NOTES
0		POORLY-GRADED SAND (SP) - brown, loose, fine to medium grained, trace subrounded gravel, moist [FILL]	GB						
5		▽ SILT (ML) - brown, medium stiff, with silt, no sand or gravel, thin rootlets, moist	MC	4	0.75	95	28		
10		Fat Clay (CH) - dark gray, soft, some fine sand, with silt, wet	MC	4	0				
15		Sandy Lean Clay (CL) - gray, fine sand, medium stiff, wet	ST			98	27		Consolidation Test TXUU: c = 652psf PI = 13 LL=33
20		- grayish brown, medium stiff to stiff, moderate plasticity	MC	8	1.0				
25			ST		0.75	99	26		Consolidation Test TXUU: c = 1,370psf PI = 22 LL=46
30		- increase plasticity, decrease sand	MC	8	0.75				
35		- silty sand lens							

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A3GEO, Inc.
1331 7th Street; Unit E
Berkeley, CA 94710
Telephone: 510-705-1664

BORING NUMBER B-1

CLIENT College of Marin
PROJECT NAME Kentfield M&O Building
PROJECT NUMBER 1106-8A
PROJECT LOCATION Kentfield, CA
DATE STARTED 5/1/17 **COMPLETED** 5/1/17
GROUND ELEVATION 8 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Gregg Drilling and Testing, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 6.50 ft / Elev 1.50 ft
LOGGED BY JV **CHECKED BY** DKM
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	ADJUSTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	% RECOVERED	OTHER LAB TESTS / NOTES
35		Sandy Lean Clay (CL) - grayish brown, fine sand, medium stiff to stiff, wet							
40									
45		- decrease plasticity, increase sand, with silt - increase stiffness - fine to medium grained sandy clay at bottom of sample	ST		>4.5				

Bottom of borehole at 47.5 feet.
1. Stratification lines represent the approximate boundaries between material types. Transistions may be gradual.
2. Blow counts shown here for MC samples have been adjusted to SPT values by multiplying field blow counts by a factor of 0.63.
3. Groundwater measured at 6.5' at time of drilling.
4. Hole was backfilled immediately after drilling.

A3GEO, Inc.
1331 7th Street; Unit E
Berkeley, CA 94710
Telephone: 510-705-1664

BORING NUMBER B-2

CLIENT College of Marin
PROJECT NAME Kentfield M&O Building
PROJECT NUMBER 1106-8A
PROJECT LOCATION Kentfield, CA
DATE STARTED 5/1/17 **COMPLETED** 5/1/17
GROUND ELEVATION 8 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Gregg Drilling and Testing, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY JV **CHECKED BY** DKM
AT END OF DRILLING 6.00 ft / Elev 2.00 ft
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	ADJUSTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	% RECOVERED	OTHER LAB TESTS / NOTES
0		CLAYEY SAND (SC) - brown/gray, loose, with gravel, moist [FILL]	GB						
5		SANDY LEAN CLAY (CL) - gray, medium stiff, fine grained sand, with silt, moist to wet							
10									
15									
20									
25									
30									
35									

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A3GEO, Inc.
1331 7th Street; Unit E
Berkeley, CA 94710
Telephone: 510-705-1664

BORING NUMBER B-2

CLIENT College of Marin
PROJECT NAME Kentfield M&O Building
PROJECT NUMBER 1106-8A
PROJECT LOCATION Kentfield, CA
DATE STARTED 5/1/17 **COMPLETED** 5/1/17
GROUND ELEVATION 8 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Gregg Drilling and Testing, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY JV **CHECKED BY** DKM
AT END OF DRILLING 6.00 ft / Elev 2.00 ft
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	ADJUSTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	% RECOVERED	OTHER LAB TESTS / NOTES
35		SANDY LEAN CLAY (CL) - gray, medium stiff, fine grained sand, with silt, moist to wet *(continued)*	ST		0.75				1,000 psi down pressure
		- medium stiff to stiff			1.5				
		- increase sand, decrease plasticity, wet							
40									
45									
50									
55									
60		POORLY-GRADED SAND (SP) - gray, medium dense, medium to coarse grained, trace silt, wet	MC	18	1.0				
		SANDY LEAN CLAY (CL) - brownish gray, stiff, very fine grained sand, with silt, moderate plasticity, wet							

Bottom of borehole at 61.5 feet.

1. Stratification lines represent the approximate boundaries between material types. Transistions may be gradual.
2. Blow counts shown here for MC samples have been adjusted to SPT values by multiplying field blow counts by a factor of 0.63.
3. Groundwater measured at 6' after drilling.
4. Hole was backfilled immediately after drilling.

B. HILLEBRANDT SOILS TESTING, INC.

29 Sugarloaf Terrace, Alamo, CA 94507 - Tel: (510) 409-2916 - Fax: (925) 891-9267 - Email: soiltesting@aol.com

LAB RESULTS SUMMARY FORM

Project Number: 1106-8A **Project Name:** Kentfield M & O Building **Results Due By:**
Requested By: DKM **Request Date:** 6/6/2017 **Throw Samples Out On:**

					Atterberg			-200			Compaction				
Boring #	Sample Depth (feet)	Dry Density (pcf)	Moisture Content (%)	UC Shear Strength (psf)	Liquid Limit	Plastic Limit	Plasicity Index	Passing #4 Sieve (%)	Passing #40 sieve (%)	Passing #200 sieve (%)	Maximum Dry Density (pcf)	Optimum Moisture (%)	Pocket Penetrometer (tsf)	Torvane (tsf)	Remarks
B-1	0.0 - 3.0		11.5					85	73	18					
B-1	10.5 - 11.0	87	37.5	370	35	20	15								

B. HILLEBRANDT SOILS TESTING, INC.

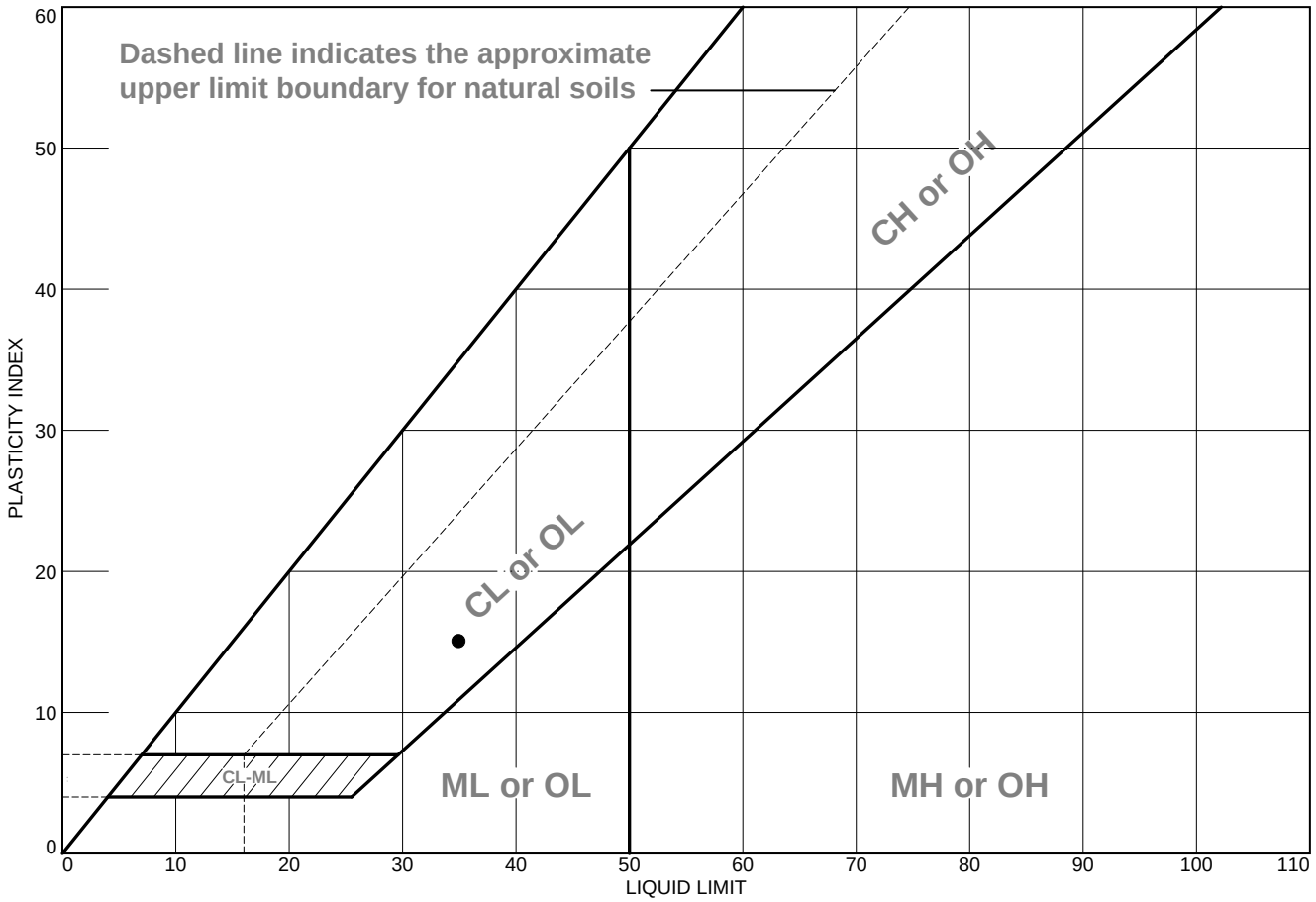
29 Sugarloaf Terrace, Alamo, CA 94507 - Tel: (510) 409-2916 - Fax: (925) 891-9267 - Email: soiltesting@aol.com

MOISTURE CONTENT WORKSHEET

Job #: 1106-8A
Job Name: Kentfield M & O Building
Date: 6/6/2017
Tested by: B. Hillebrandt

Additional Tests:	-200								
Boring #:	B-1								
Depth:	0.0 - 3.0'								
Sample Description:	Brown silty SAND with gravel								
Can #:	326								
Wet Sample + can	347.9								
Dry Sample + can	316.0								
Weight can	39.1								
Weight water	31.9								
Weight Dry Sample	276.9								
WATER CONTENT (%)	**11.5%**								

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark gray fat CLAY	35	20	15			

Project No. 1106-8A **Client:** A3Geo

Project: Kentfield M & O Building

●**Source of Sample:** B-1 **Depth:** 10.5'

Remarks:

B. HILLEBRANDT SOILS TESTING, INC.
+1 510-409-2816
SoilTesting@aol.com

Figure

Tested By: BH

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay

MATERIAL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-1		0.0 - 3.0'	Brown silty SAND with gravel	

B. HILLEBRANDT SOILS TESTING, INC.
+1 510-409-2816
SoilTesting@aol.com

Client: A3Geo
Project: Kentfield M & O Building
Project No.: 1106-8A **Figure**

Tested By: BH

GRAIN SIZE DISTRIBUTION TEST DATA

6/13/2017

Client: A3Geo
Project: Kentfield M & O Building
Project Number: 1106-8A
Location: B-1
Depth: 0.0 - 3.0'
Material Description: Brown silty SAND with gravel
Tested by: BH

Sieve Test Data

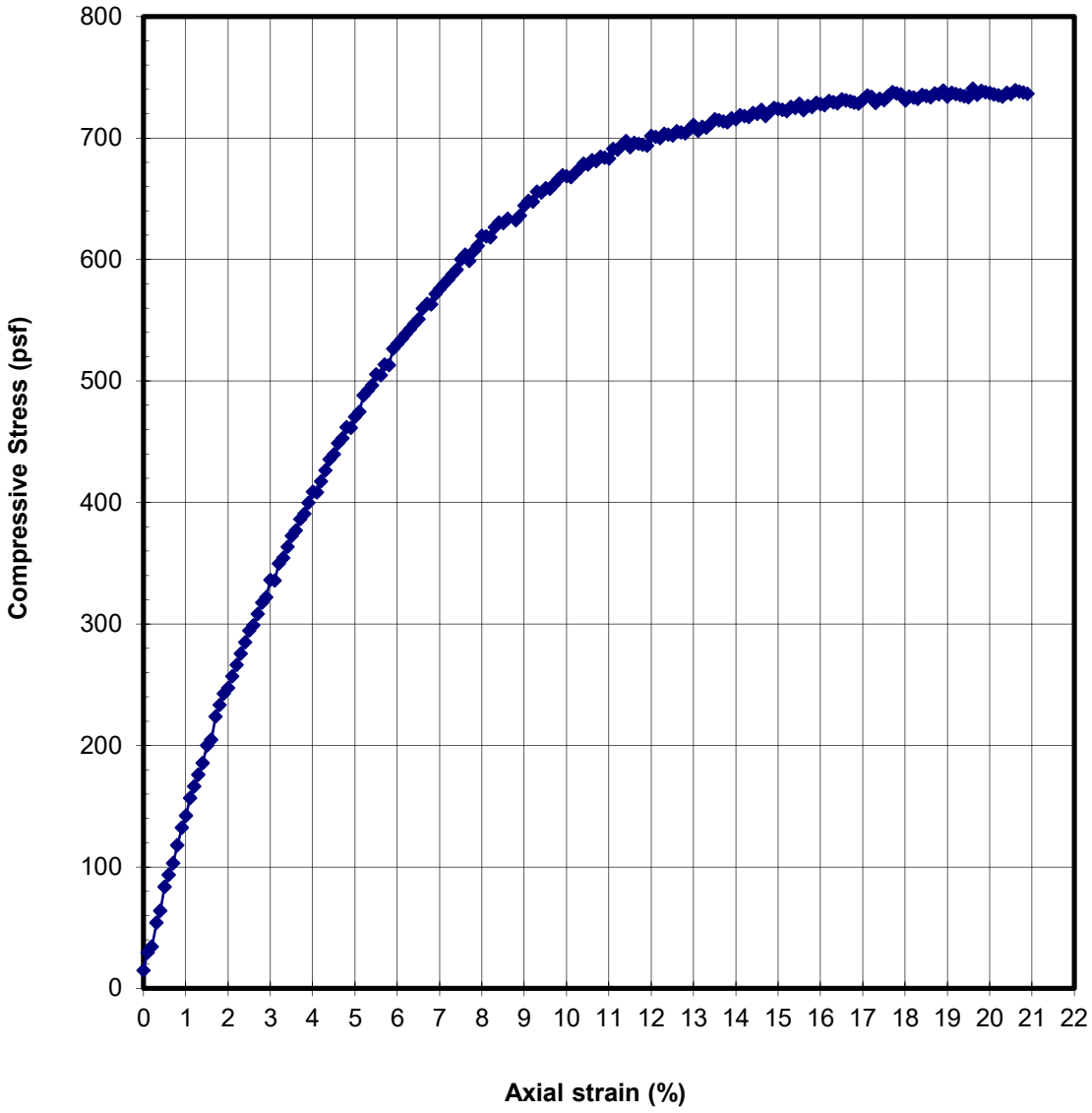
Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
316.00	39.10	0.00	3"	0.00	100.0
			#4	41.45	85.0
			#40	75.64	72.7
			#200	228.12	17.6

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	9.9	5.1	15.0	4.5	7.8	55.1	67.4			17.6

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
			0.0799	0.1043	0.1373	0.1838	0.2537	1.8029	4.7223	18.6463	39.3488

Fineness Modulus
2.02



Sampler Type: Mod Cal		Shear Strength:	370 psf
Diameter (in): 2.39	Height (in): 4.92	Strain at Failure:	19.6%
Moisture Content:	37.5 %	Confining Pressure:	n/a
Dry Density:	87.3 pcf	Strain Rate:	1%/min
Source: B-1 at 10.5 feet			
Description: Dark gray CLAY			

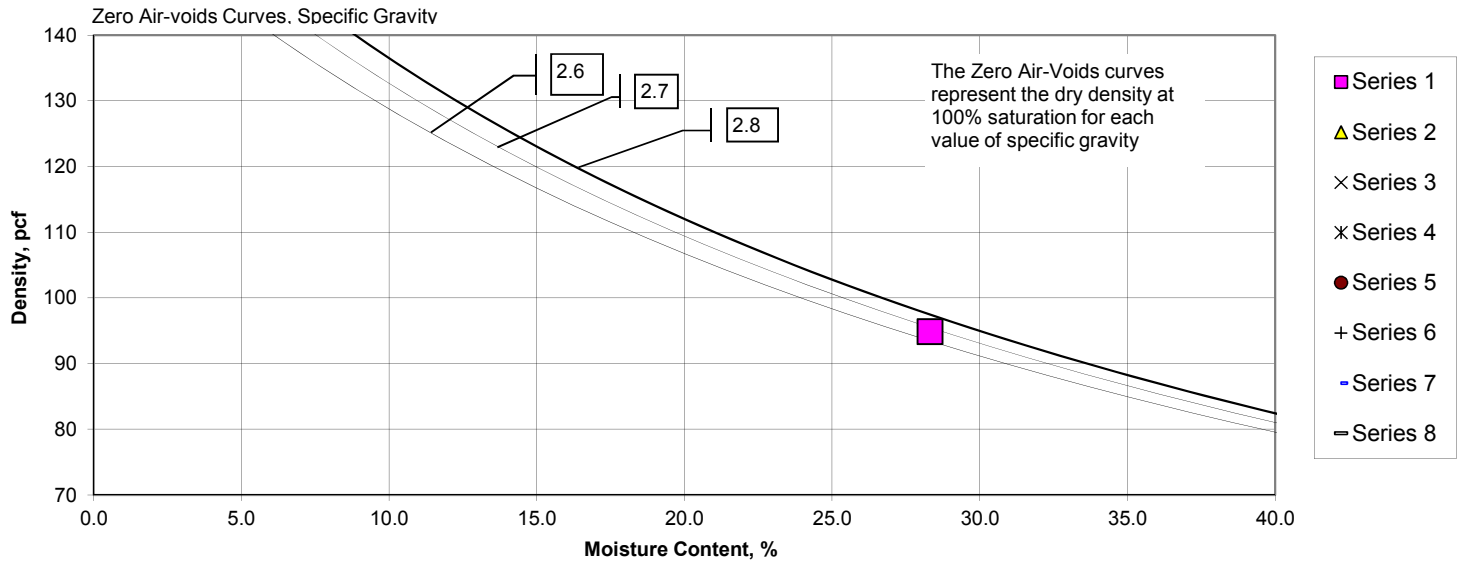
KENTFIELD M & O BUILDING	**UNCONFINED COMPRESSION TEST**			
B. HILLEBRANDT SOILS TESTING, INC	Date: 06/09/17	Project No. 1106-8A	Figure	

Moisture-Density-Porosity Report
Cooper Testing Labs, Inc. (ASTM D7263b)

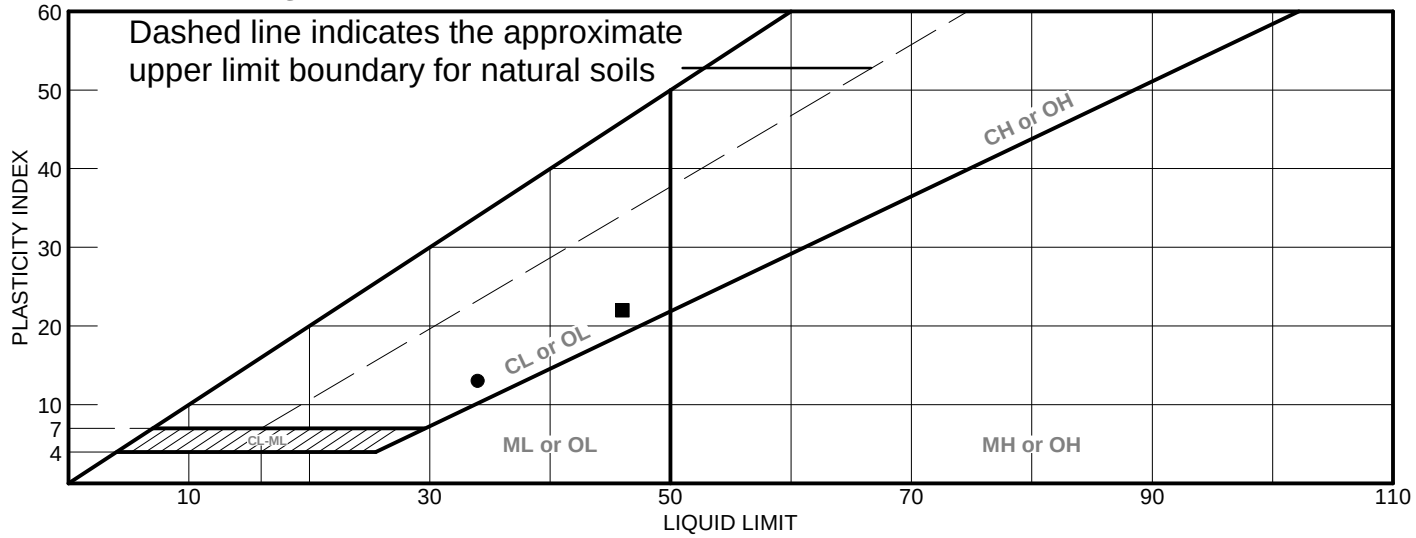
CTL Job No:	748-029	**Project No.**	1106-8A	**By:**	RU
Client:	A3GEO	**Date:**	05/12/17		
Project Name:	COM Kentfield; M&O Building	**Remarks:**			

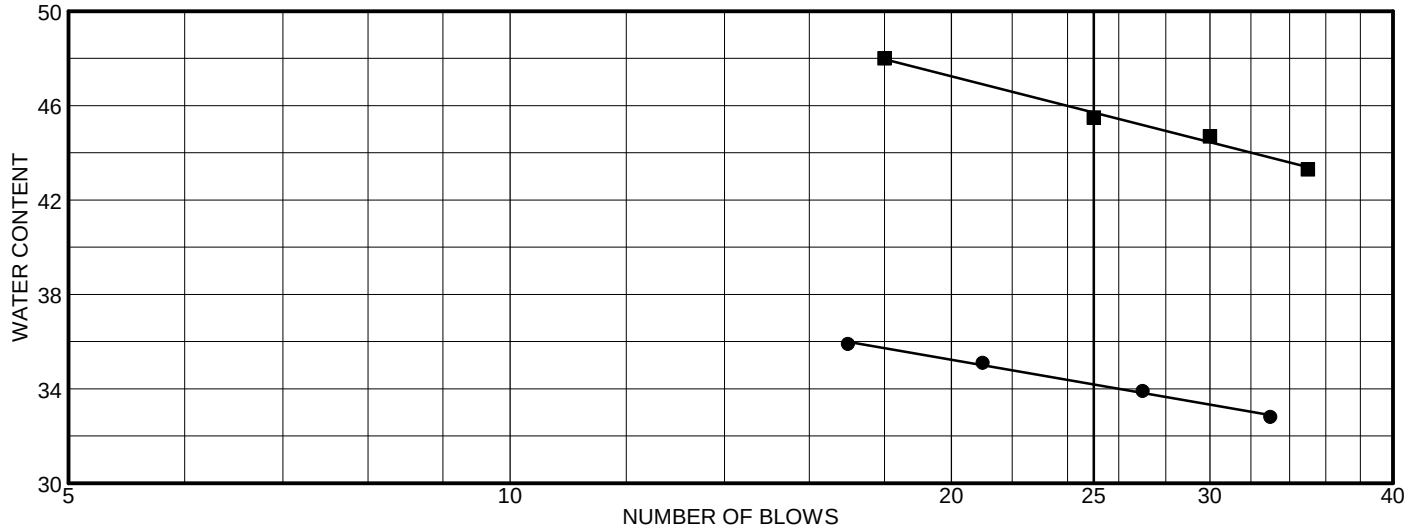
Boring:	B1							
Sample:								
Depth, ft:	5.5-6							
Visual Description:	Dark Gray SILT							
Actual G_s								
Assumed G_s	2.70							
Moisture, %	28.3							
Wet Unit wt, pcf	121.7							
Dry Unit wt, pcf	94.8							
Dry Bulk Dens.pb, (g/cc)	1.52							
Saturation, %	98.1							
Total Porosity, %	43.8							
Volumetric Water Cont,Θw,%	43.0							
Volumetric Air Cont., Θa,%	0.8							
Void Ratio	0.78							
Series	1	2	3	4	5	6	7	8

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.



LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Very Dark Greenish Gray Sandy Lean CLAY	34	21	13			
■	Gray Sandy Lean CLAY	46	24	22			

Project No. 748-029 **Client:** A3GEO

Project: COM Kentfield; M&O Building - 1106-8A

● **Source:** B1 **Elev./Depth:** 15-18(Tip-4")

■ **Source:** B1 **Elev./Depth:** 25-27(Tip-4")

Remarks:

●

■

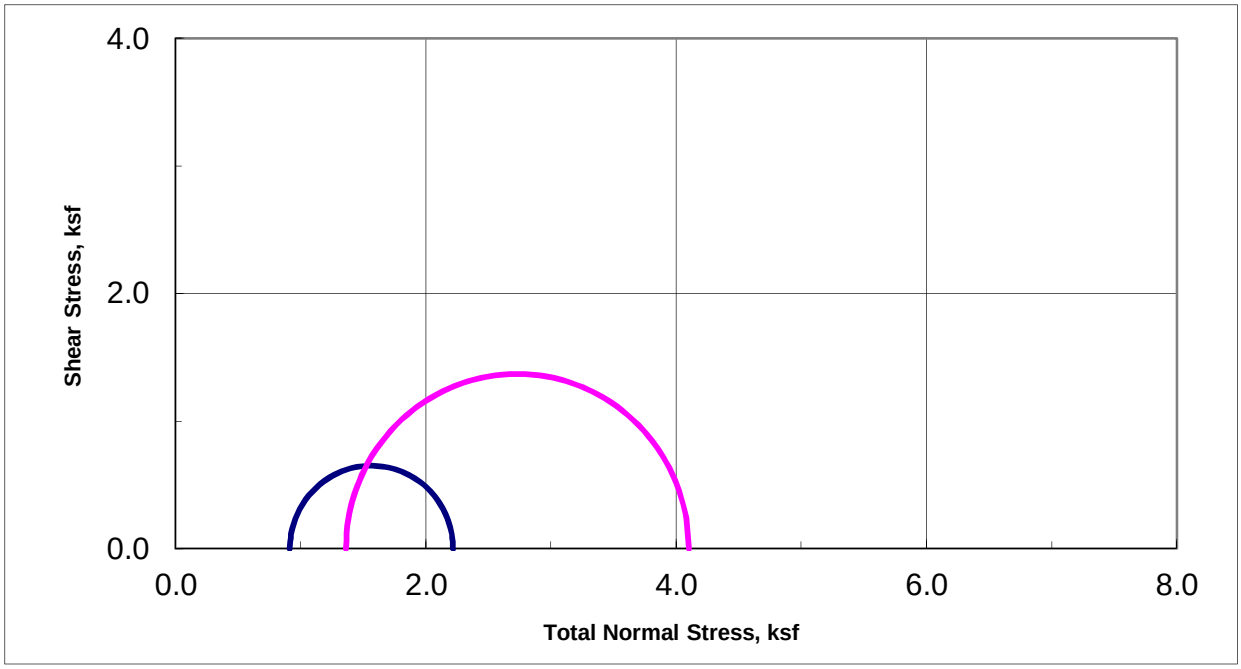
LIQUID AND PLASTIC LIMITS TEST REPORT

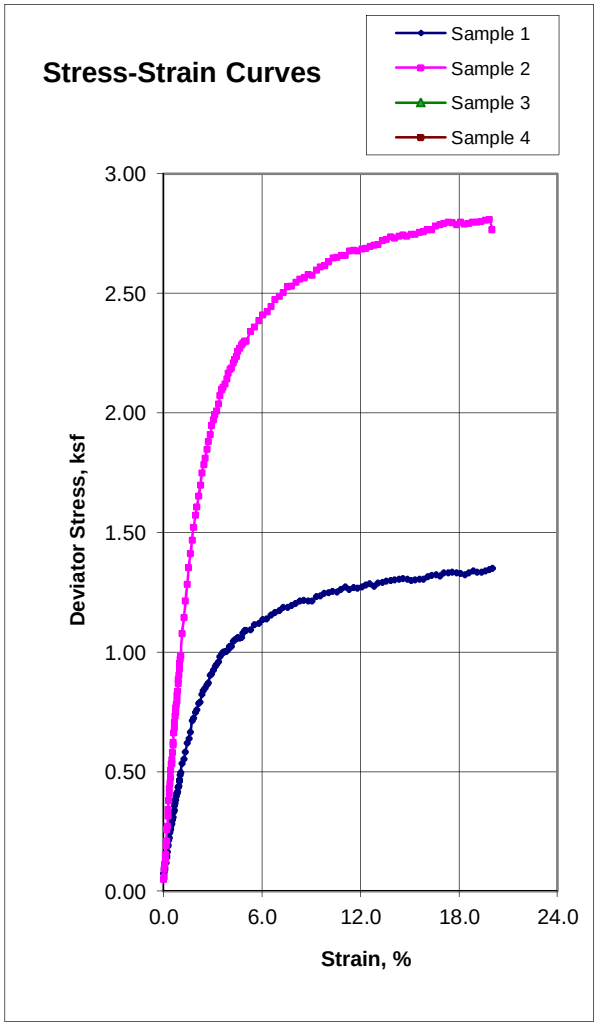
COOPER TESTING LABORATORY

Figure

Cooper Testing Labs, Inc.
937 Commercial Street
Palo Alto, CA 94303

Unconsolidated-Undrained Triaxial Test
ASTM D2850





Sample Data				
	1	2	3	4
Moisture %	26.7	26.1		
Dry Den,pcf	97.5	98.8		
Void Ratio	0.729	0.706		
Saturation %	98.9	99.8		
Height in	6.01	6.00		
Diameter in	2.86	2.87		
Cell psi	6.3	9.5		
Strain %	15.00	15.00		
Deviator, ksf	1.304	2.740		
Rate %/min	1.00	1.00		
in/min	0.060	0.060		
Job No.:	**748-029**			
Client:	**A3GEO**			
Project:	**1106-8A**			
Boring:	B1	B1		
Sample:				
Depth ft:	15-18(Tip-5")	25(Tip-5")		

Visual Soil Description	
Sample #	
1	Very DarkGreenish Gray Sandy Lean CLAY
2	Gray Sandy Lean CLAY
3	
4	

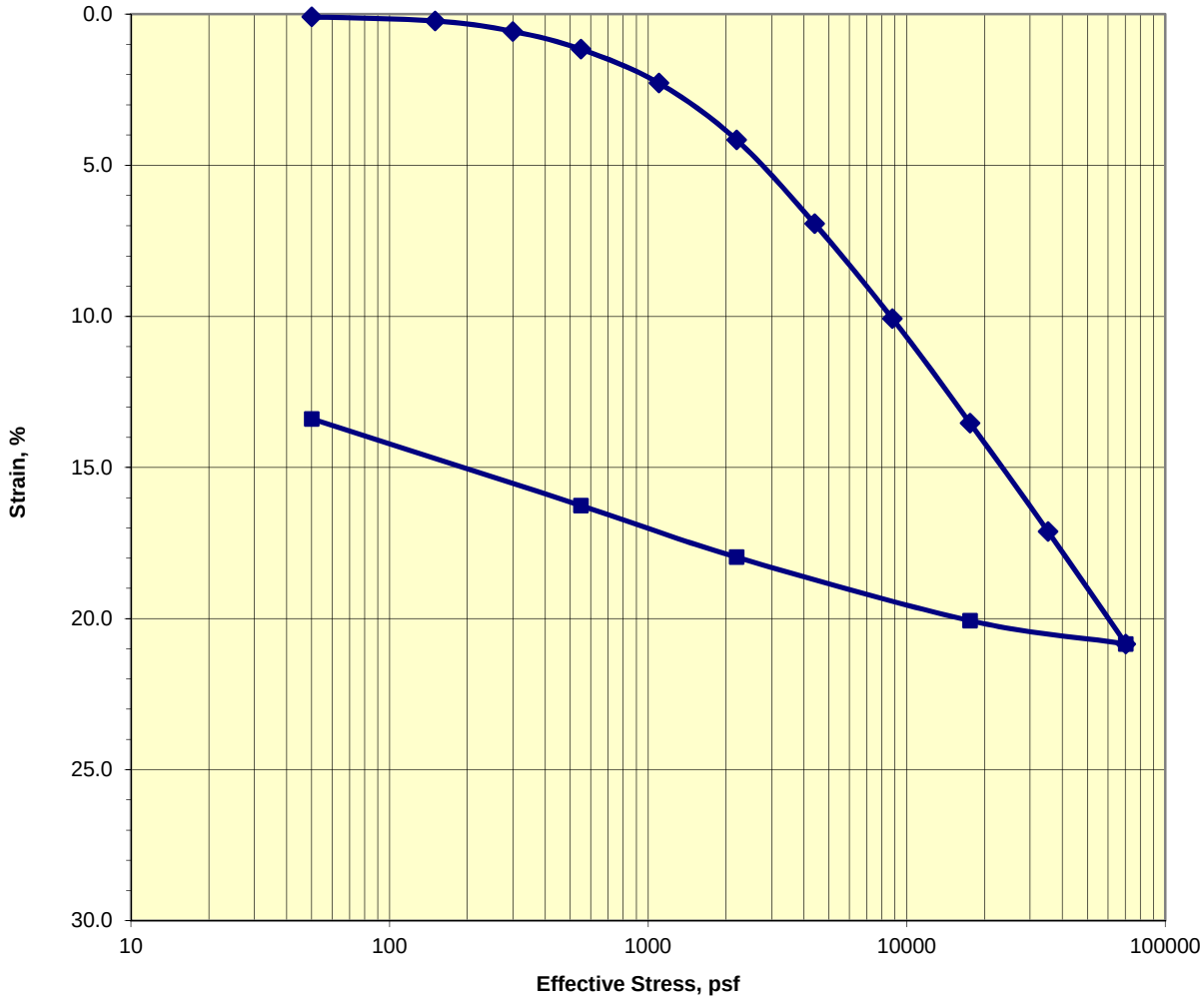
Remarks:

Note: Strengths are picked at the peak deviator stress or 15% strain which ever occurs first per ASTM D2850.

Consolidation Test
ASTM D2435

Job No.:	748-029	**Boring:**	B1	**Run By:**	MD
Client:	A3GEO	**Sample:**		**Reduced:**	PJ
Project:	1106-8A	**Depth, ft.:**	15-18(Tip-3")	**Checked:**	PJ/DC
Soil Type:	Very Dark Greenish Gray Sandy Lean CLAY			**Date:**	5/25/2017

Strain-Log-P Curve



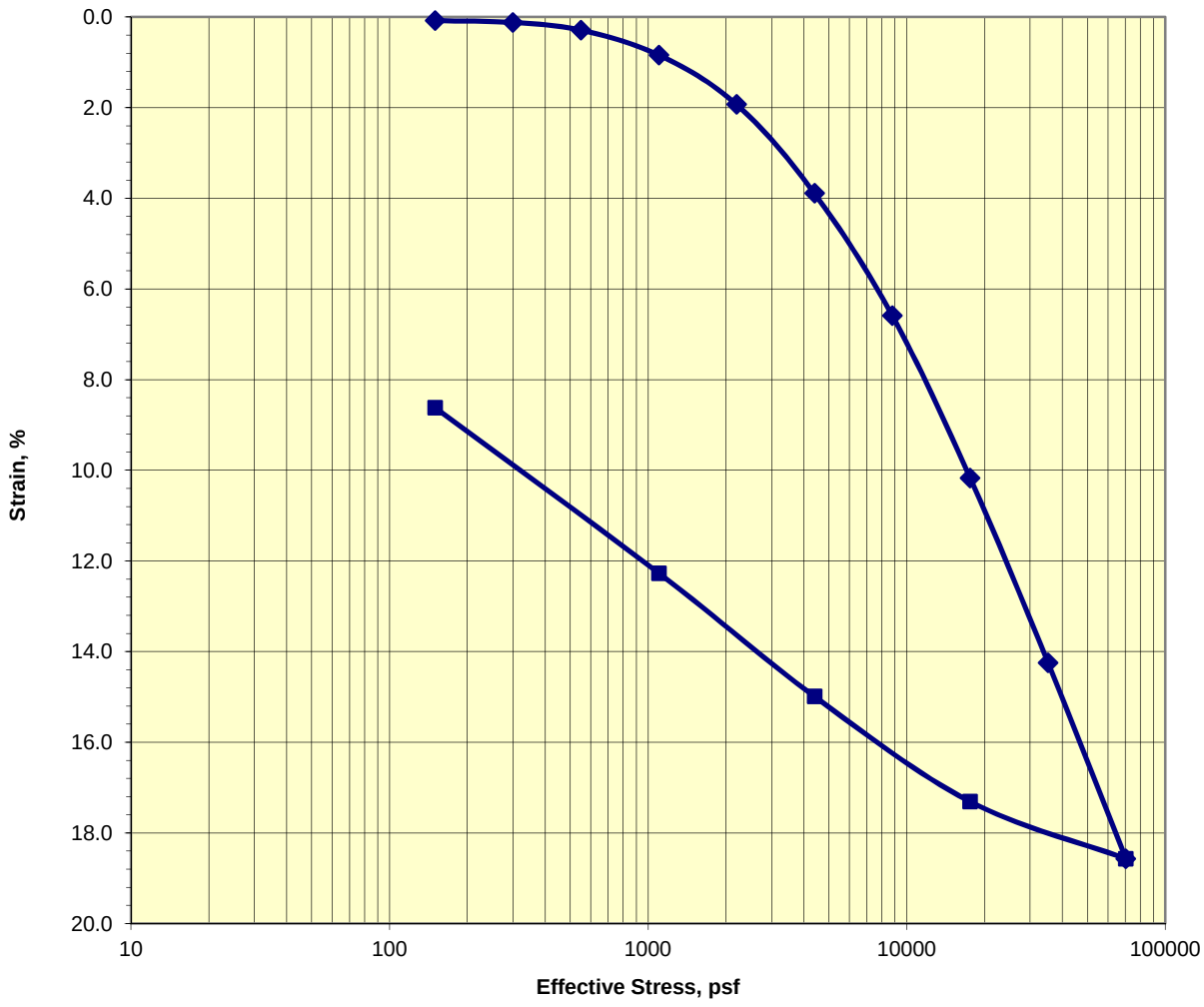
Assumed Gs 2.75	Initial	Final
Moisture %:	28.5	20.8
Dry Density, pcf:	94.8	109.3
Void Ratio:	0.811	0.571
% Saturation:	96.4	100.0

Remarks:

Consolidation Test
ASTM D2435

Job No.:	748-029	**Boring:**	B1	**Run By:**	MD
Client:	A3Geo, Inc.	**Sample:**		**Reduced:**	PJ
Project:	COM Kentfield; M&O Building	**Depth, ft.:**	25-27	**Checked:**	PJ/DC
Soil Type:	Gray Sandy Lean CLAY			**Date:**	5/23/2017

Strain-Log-P Curve



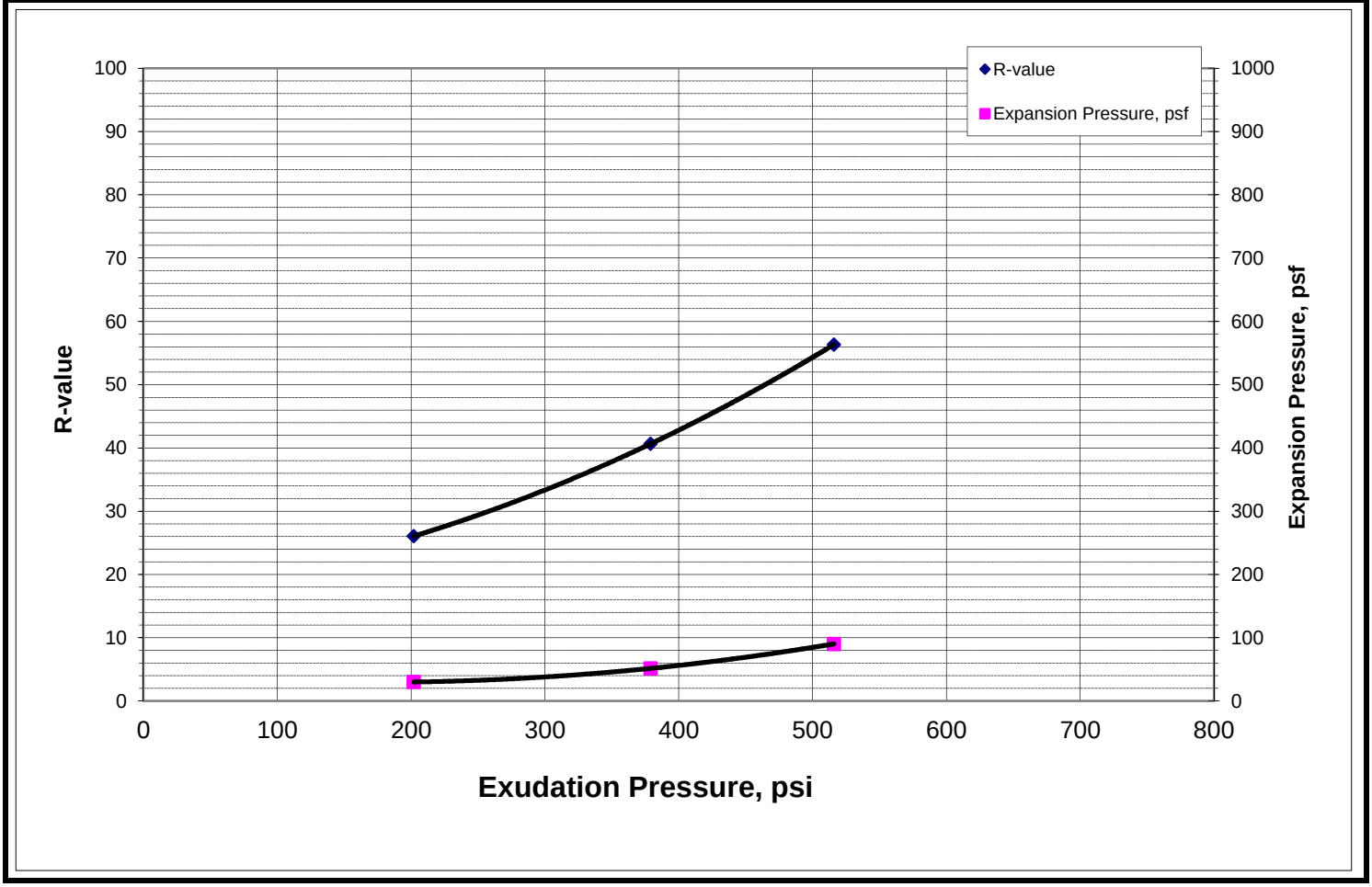
Assumed Gs 2.75	Initial	Final
Moisture %:	29.2	24.3
Dry Density, pcf:	94.6	103.0
Void Ratio:	0.815	0.667
% Saturation:	98.4	100.0

Remarks:

R-value Test Report (Caltrans 301)

Job No.:	748-030	**Date:**	05/12/17	**Initial Moisture,**	8.9
Client:	A3GEO	**Tested**	PJ	**R-value**	**33**
Project:	1106-9A	**Reduced**	RU		
Sample	B-3 @ 0-2'	**Checked**	DC	**Expansion Pressure**	**40** psf
Soil Type:	Brown Clayey SAND				

Specimen Number	A	B	C	D	**Remarks:**
Exudation Pressure, psi	516	202	379		
Prepaired Weight, grams	1200	1200	1200		
Final Water Added, grams/cc	38	50	44		
Weight of Soil & Mold, grams	3150	3193	3203		
Weight of Mold, grams	2099	2090	2098		
Height After Compaction, in.	2.37	2.49	2.59		
Moisture Content, %	12.3	13.4	12.9		
Dry Density, pcf	119.7	118.4	114.6		
Expansion Pressure, psf	90	30	52		
Stabilometer @ 1000					
Stabilometer @ 2000	44	100	78		
Turns Displacement	4.46	4.22	4.20		
R-value	56	26	41		



Corrosivity Tests Summary

CTL # 748-029 **Date:** 5/15/2017 **Tested By:** PJ **Checked:** PJ

Client: A3GEO, Inc. **Project:** COM Kentfield; M&O Building **Proj. No:** 1106-8A

Remarks:

Sample Location or ID			Resistivity @ 15.5 °C (Ohm-cm)			Chloride	Sulfate		pH	ORP (Redox)		Sulfide	Moisture	Soil Visual Description
			As Rec.	Min	Sat.	mg/kg	mg/kg	%				Qualitative	At Test	
						Dry Wt.	Dry Wt.	Dry Wt.		E_H (mv)	At Test	by Lead	%	
Boring	Sample, No.	Depth, ft.	ASTM G57	Cal 643	ASTM G57	ASTM D4327	ASTM D4327	ASTM D4327	ASTM G51	ASTM G200	Temp °C	Acetate Paper	ASTM D2216	
B1	-	5.5-6	-	-	381	1,885	22	0.0022	6.7	104	21	-	28.3	Dark Gray SILT

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LOG OF BORING B-1 ①

LOCATION: See Figure I-1

④ BORING SURFACE ELEVATION: 10'

④ EXISTING FORCEMAIN INVERT ELEVATION: 6'

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	GROUNDWATER ③	DESCRIPTION ②	MOISTURE	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (> #4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (< #200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH k.s.f.	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
	1				**SILTY LEAN CLAY WITH SAND (CL/ML) TO SILTY SAND (SM) - FILL** - yellowish brown - few to little clay - nonplastic - moist										
5						10									
	2		4		**FAT CLAY (CH) and ORGANIC CLAY (OH) - YOUNG BAY MUD** - very dark gray - some silt, few to little sand - trace to few peat - high plasticity - very soft to soft - moist to wet	71	58						1.03		
10	3		3												
	4		2					55	26		11	89			
													FINES 49% Silt 40% Clay		
15	5		pushed												
						30	94								
	6		8		**LEAN CLAY (CL) and ORGANIC CLAY (OL/OH) - BAY MUD** - dark greenish gray with dark gray brown mottling - some silt, few sand - trace peat - medium to high plasticity - medium stiff - wet	32	91							300	15°
	7		10								7	93			
20	8		6		**CONSOLIDATION TEST** **SAMPLE 5 (15-1/2 ft)** C_C = 0.26 e_O = 0.835 Preconsolidation Pressure = 2.7 ksf			40	17				FINES 46% Silt 47% Clay		
	9		9		**FAT CLAY (CH) - BAY MUD** - dark greenish gray with variegated olive brown - few silt, trace sand - high plasticity - soft to medium stiff - wet	31	101						1.22		
25	10		10												
	11		4		**CONTINUED ON FIGURE B-1 (2 OF 2) AT 27 FEET**										

NOTES
① Drilled 9/23/08 using a Mobile B24 drill rig, 5" diameter solid stem augers, and a 30" drop by 140 lb. cathead sampling hammer.
② See report text in Section I and figures in Appendices A and C for definitions, lab test results, and additional soil descriptions.
③ Free groundwater level measured in boring at depth of 17 feet after drilling. Static groundwater depth is unknown.
④ Approximated from existing forcemain plans (Nute, 1972) and September 2008 Mark Thomas & Company survey.
⑤ Projected existing 36" forcemain pipeline.

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BROWN & CALDWELL
Sanitary District No. 1 of Marin County
Kentfield Forcemain Replacement Project
Marin County, CA
LOG OF BORING B-1

FIGURE
B-1
(1 of 2)

LOG OF BORING B-1 CONT'D ①

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	GROUNDWATER	DESCRIPTION	MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (> #4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (< #200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH k.s.f.	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
	11		4		**CONTINUED FROM FIGURE B-1 (1 OF 2) AT 27 FEET**										
30					**FAT CLAY (CH) - BAY MUD** - dark greenish gray with variegated olive brown - few silt, trace sand - high plasticity - soft to medium stiff - wet										
	12		7			25									
35					**FAT CLAY (CH) - BAY MUD** - dark greenish gray - few silt, trace sand - high plasticity - stiff - wet										
	13		12			25									
40					**BOTTOM OF BORING AT 40 FEET**										
45															
50															

NOTES

① see notes on Figure B-1 (1 of 2).

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BROWN & CALDWELL
Sanitary District No. 1 of Marin County
Kentfield Forcemain Replacement Project
Marin County, California
LOG OF BORING B-1 CONT'D

FIGURE
B-1
(2 of 2)

LOG OF BORING B-4 ①

LOCATION: See Plate I-1

④ BORING SURFACE ELEVATION: 8'

④ EXISTING FORCEMAIN INVERT ELEVATION: 2 to 6'

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	GROUNDWATER ③	DESCRIPTION ②	MOISTURE	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (> #4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (< #200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH k.s.f.	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
5	1				**SANDY LEAN CLAY (CL) TO CLAYEY SAND WITH GRAVEL (SC) - FILL** - olive brown - medium plasticity fines - wet					18	45	37			
	2			▼				40	18						
	3		pushed		**ORGANIC CLAY (OH) and FAT CLAY (CH) - YOUNG BAY MUD**	57	68						0.82		
10	4		2		- dark greenish gray - few silt, trace sand - trace to few peat, and sulfur odor - high plasticity			127	79						
	5		pushed			95	48							270	12°
15	6		1		- very soft - wet										
	7		1		**SILTY SAND (SM) from 18½' to 19½'** - nonplastic - very loose - wet					20	70	10			
20					**BOTTOM OF BORING AT 20 FEET**										
25															

CONSOLIDATION TEST
SAMPLE 5 (13 ft)
$C_C = 0.92$
$e_o = 2.71$
Preconsolidation Pressure = 0.84 ksf

NOTES
① Drilled 9/23/08 using a Mobile B24 drill rig, 5" diameter solid stem augers, and a 30" drop by 140 lb. cathead sampling hammer.
② See report text in Section I and figures in Appendices A and C for definitions, lab test results, and additional soil descriptions.
③ Free groundwater level measured in boring at depth of 5 feet after drilling. Static groundwater depth is unknown.
④ Approximated from existing forcemain plans (Nute, 1972) and September 2008 Mark Thomas & Company survey.
⑤ Projected existing 36" forcemain pipeline where invert elevation = El. 2'.

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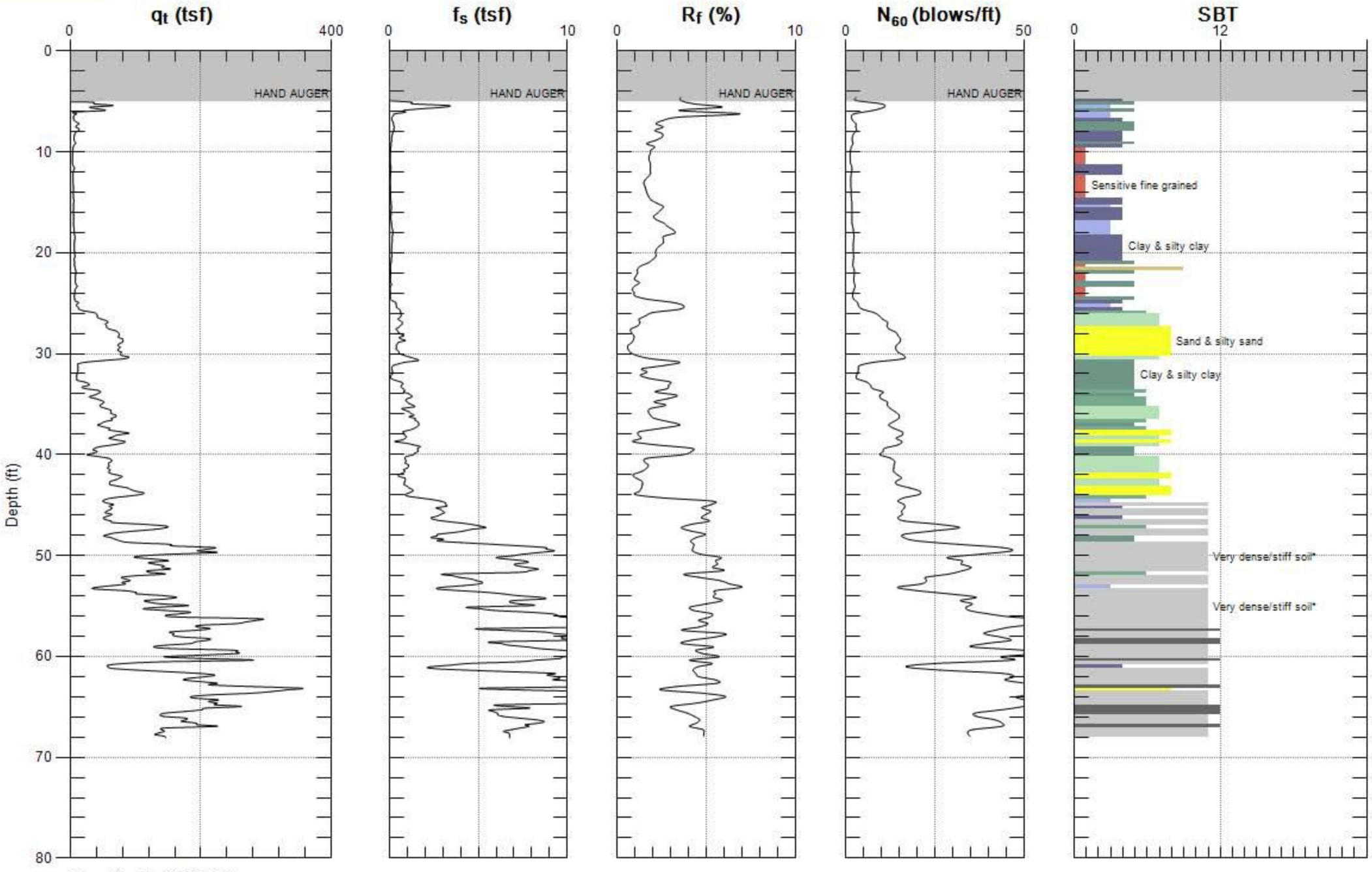
FILE NO. 18174-001-00 | JANUARY 2010

BROWN & CALDWELL
Sanitary District No. 1 of Marin County
Kentfield Forcemain Replacement Project
Marin County, California
LOG OF BORING B-4

FIGURE
B-4

DCM/GEOENGINEERS

Site: KENTFIELD FORCE
Sounding: CPT-01
Engineer: D.NEILSON
Date: 2009-12-01 12:39

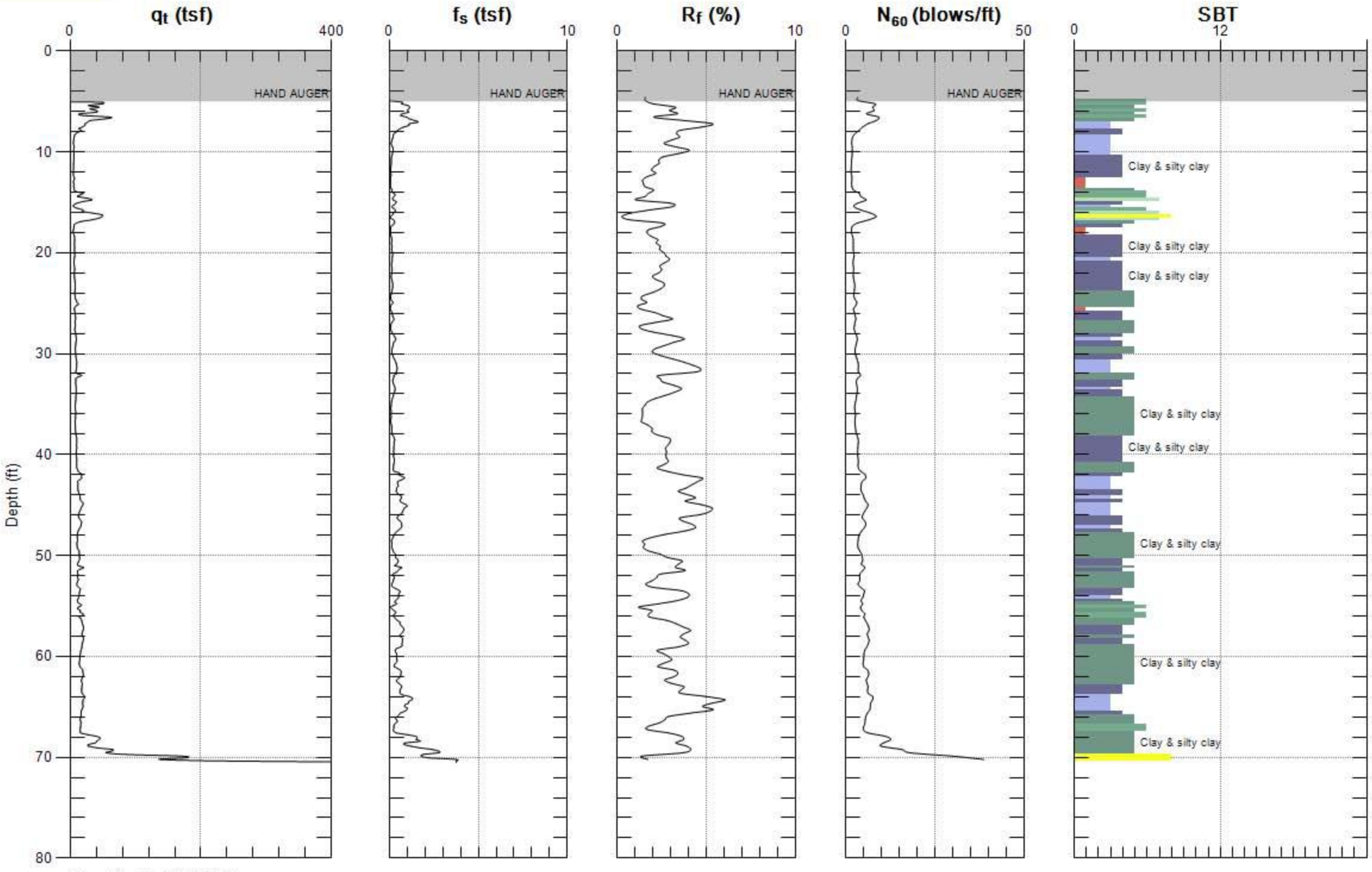


Max. Depth: 68.077 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

DCM/GEOENGINEERS

Site: KENTFIELD FORCE
Sounding: CPT-02
Engineer: D.NEILSON
Date: 2009-12-01 11:02

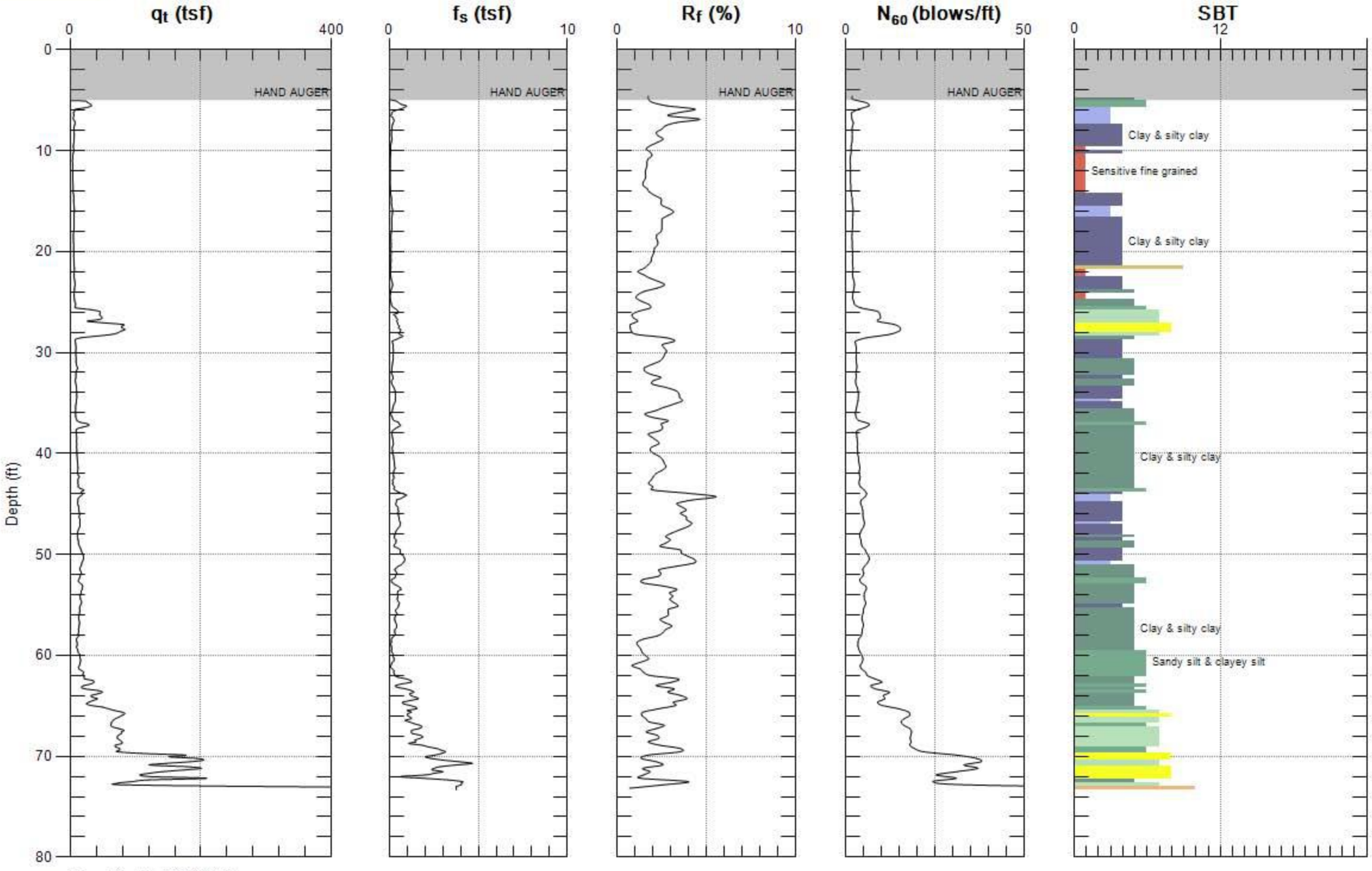


Max. Depth: 70.538 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

DCM/GEOENGINEERS

Site: KENTFIELD FORCE
Sounding: CPT-03
Engineer: D.NEILSON
Date: 2009-12-01 09:21

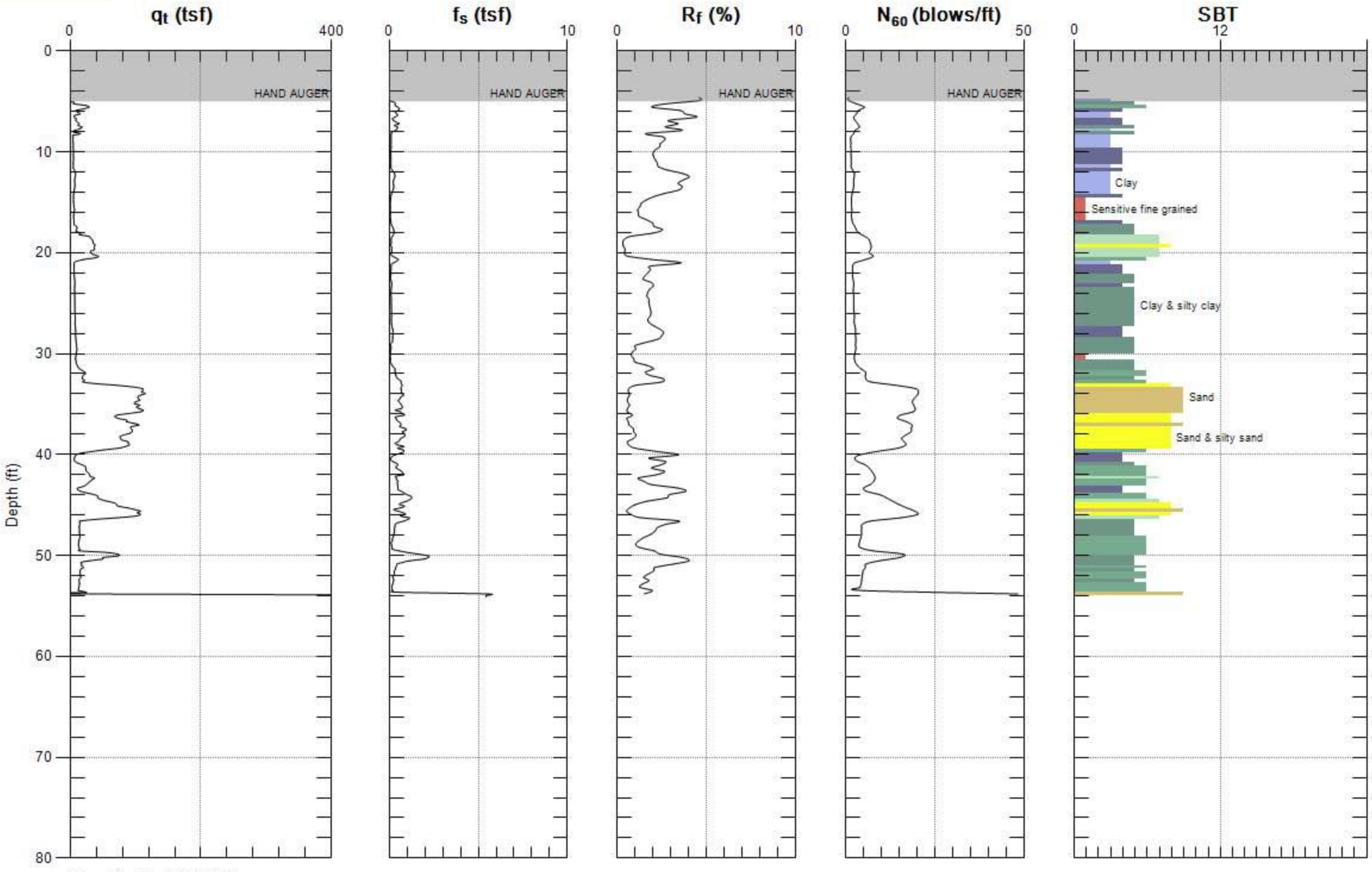


Max. Depth: 73.327 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

DCM/GEOENGINEERS

Site: KENTFIELD FORCE
Sounding: CPT-04
Engineer: D.NEILSON
Date: 2009-12-01 07:45

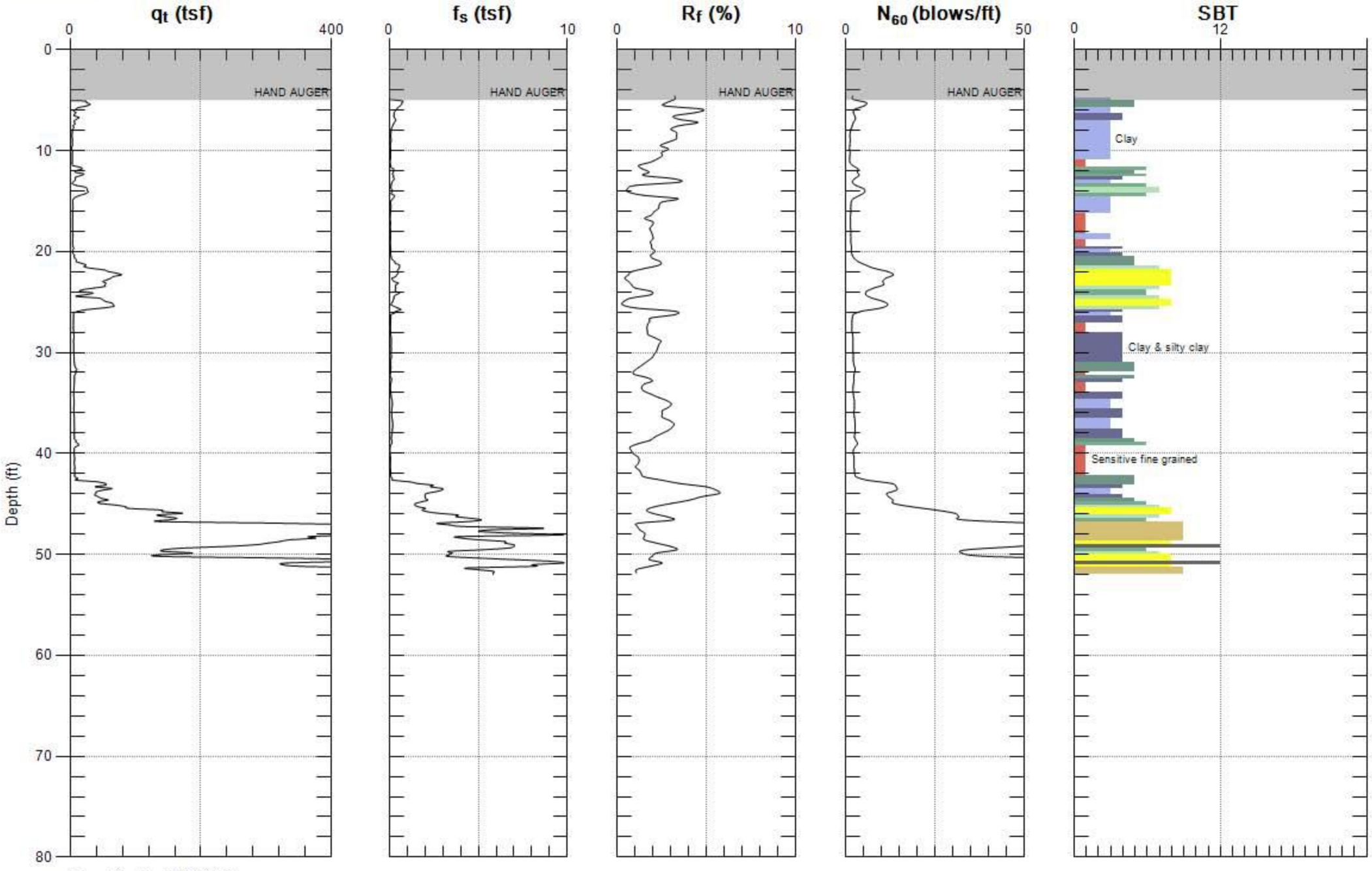


Max. Depth: 54.134 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

DCM/GEOENGINEERS

Site: KENTFIELD FORCE
Sounding: CPT-05
Engineer: D.NEILSON
Date: 2009-11-30 02:26

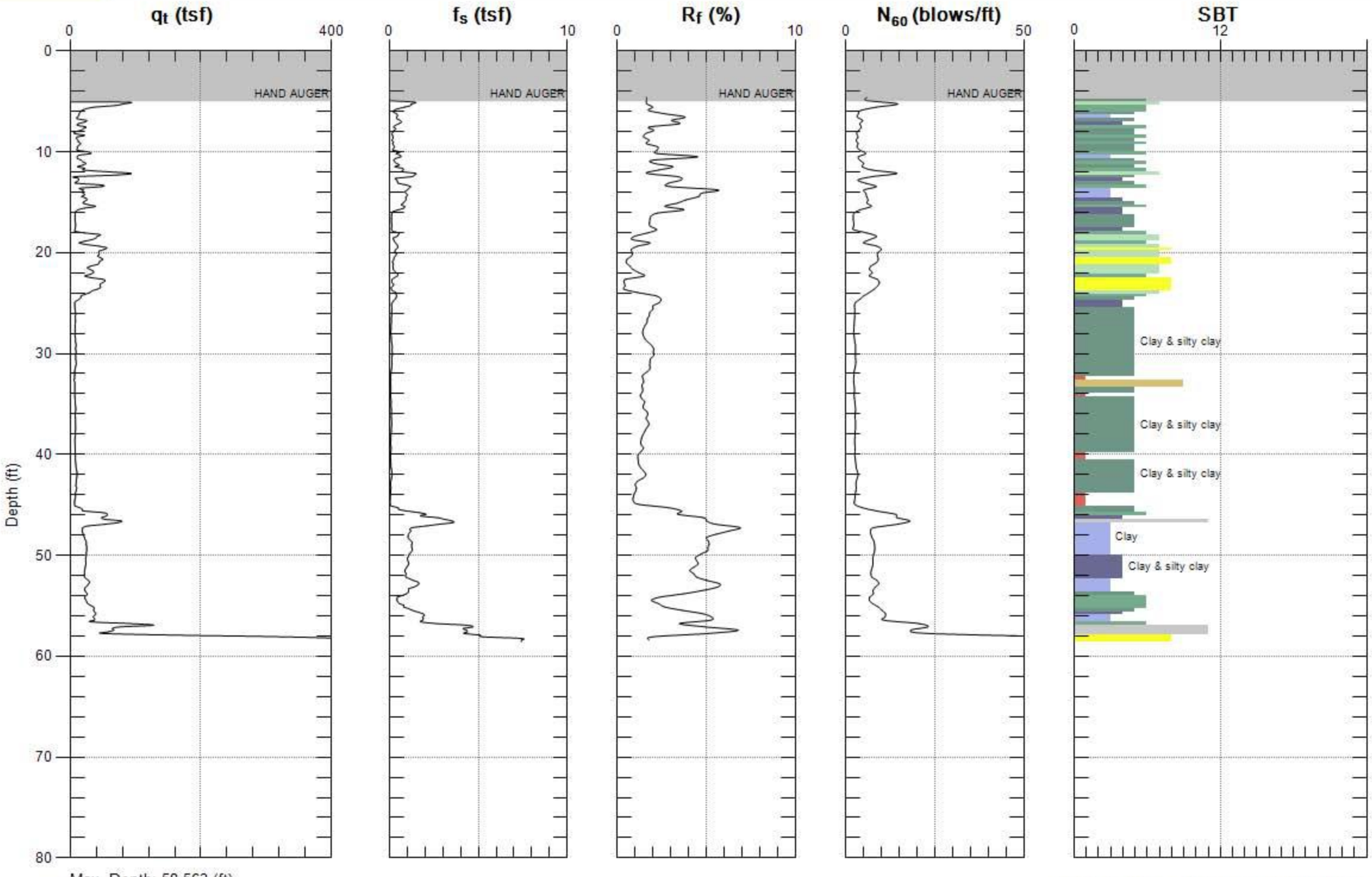


Max. Depth: 52.001 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

DCM/GEOENGINEERS

Site: KENTFIELD FORCE
Sounding: CPT-06
Engineer: D.NEILSON
Date: 2009-11-30 01:00

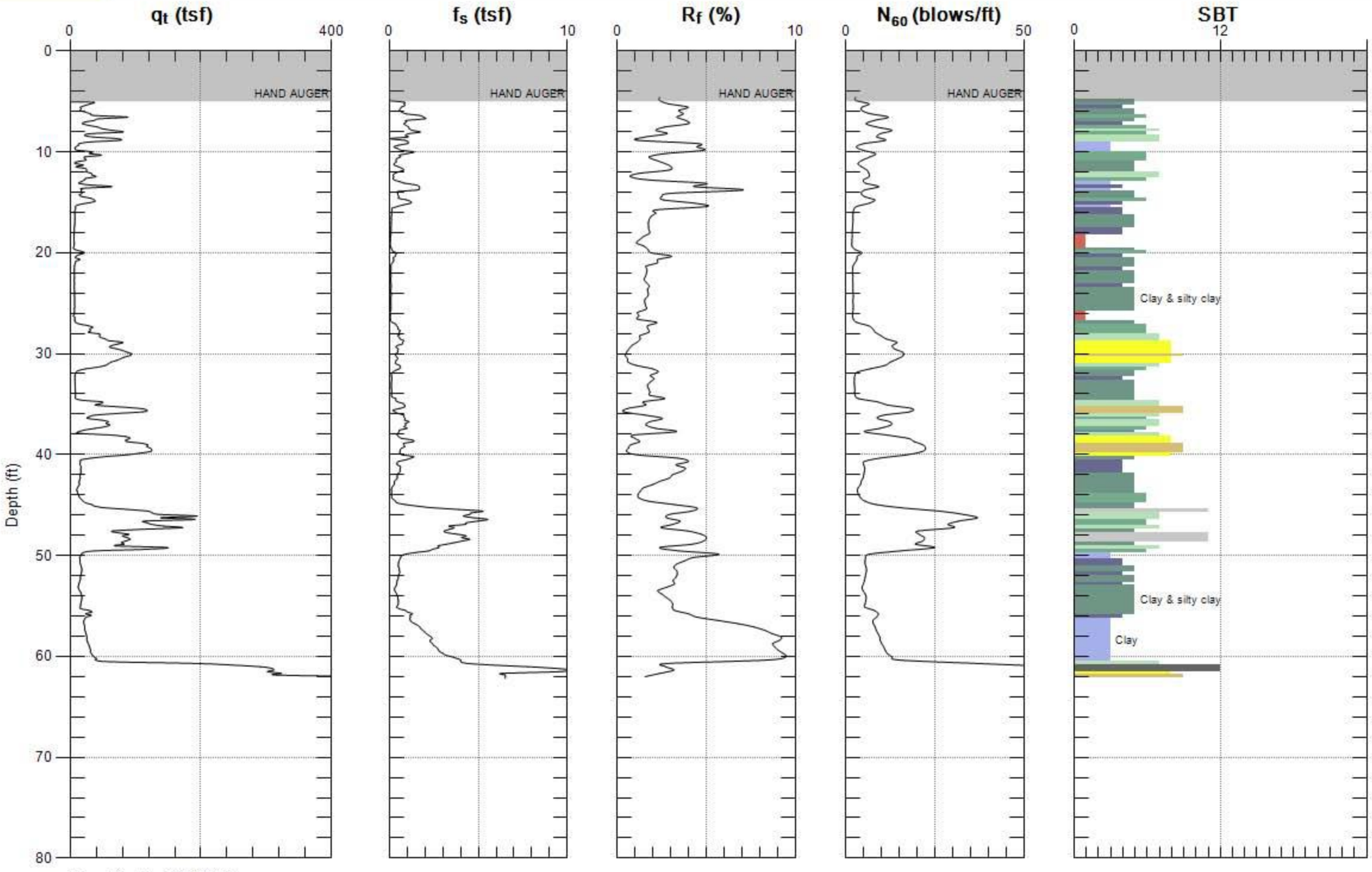


Max. Depth: 58.563 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

DCM/GEOENGINEERS

Site: KENTFIELD FORCE
Sounding: CPT-07
Engineer: D.NEILSON
Date: 2009-12-01 02:44

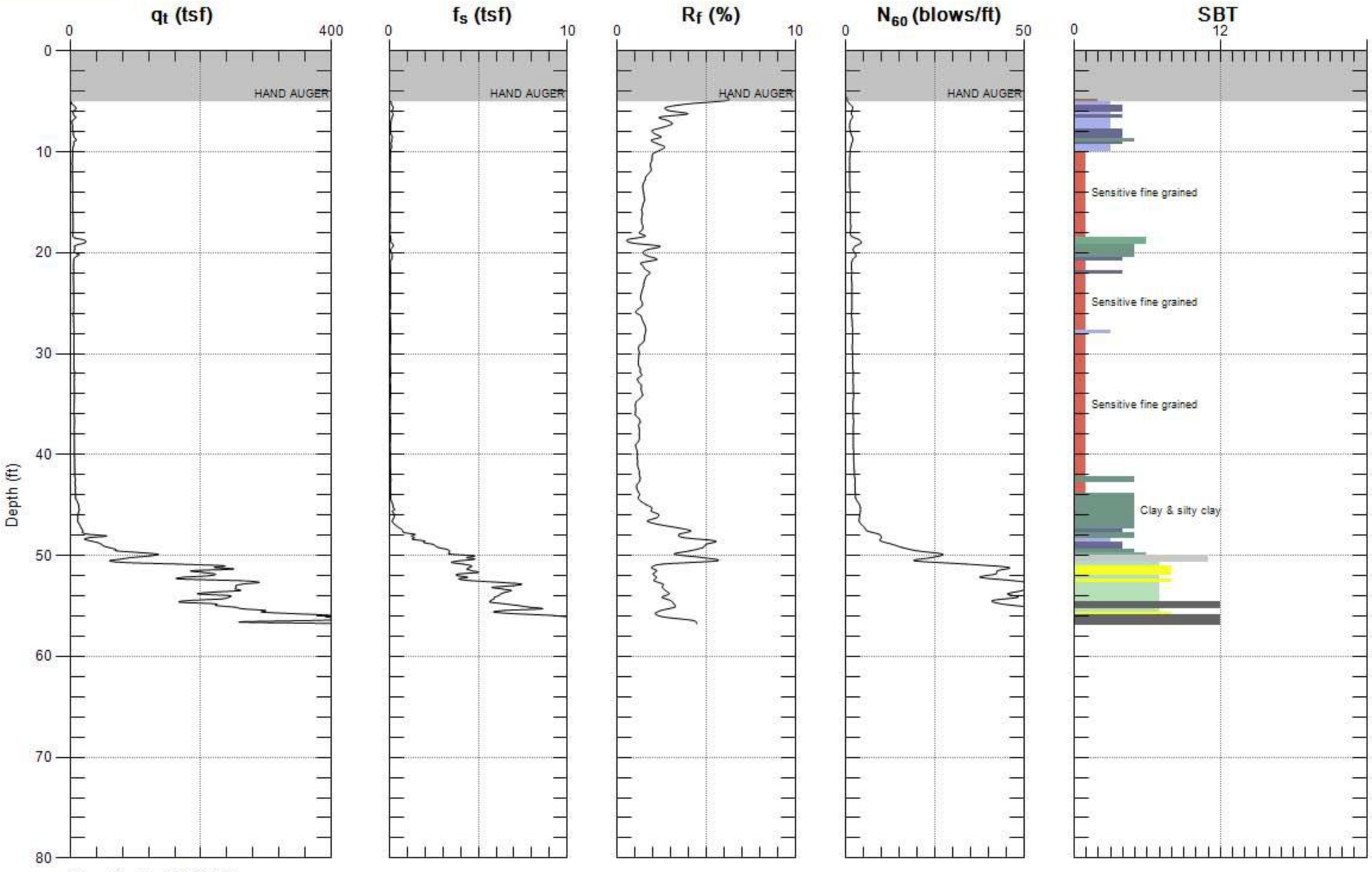


Max. Depth: 62.172 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

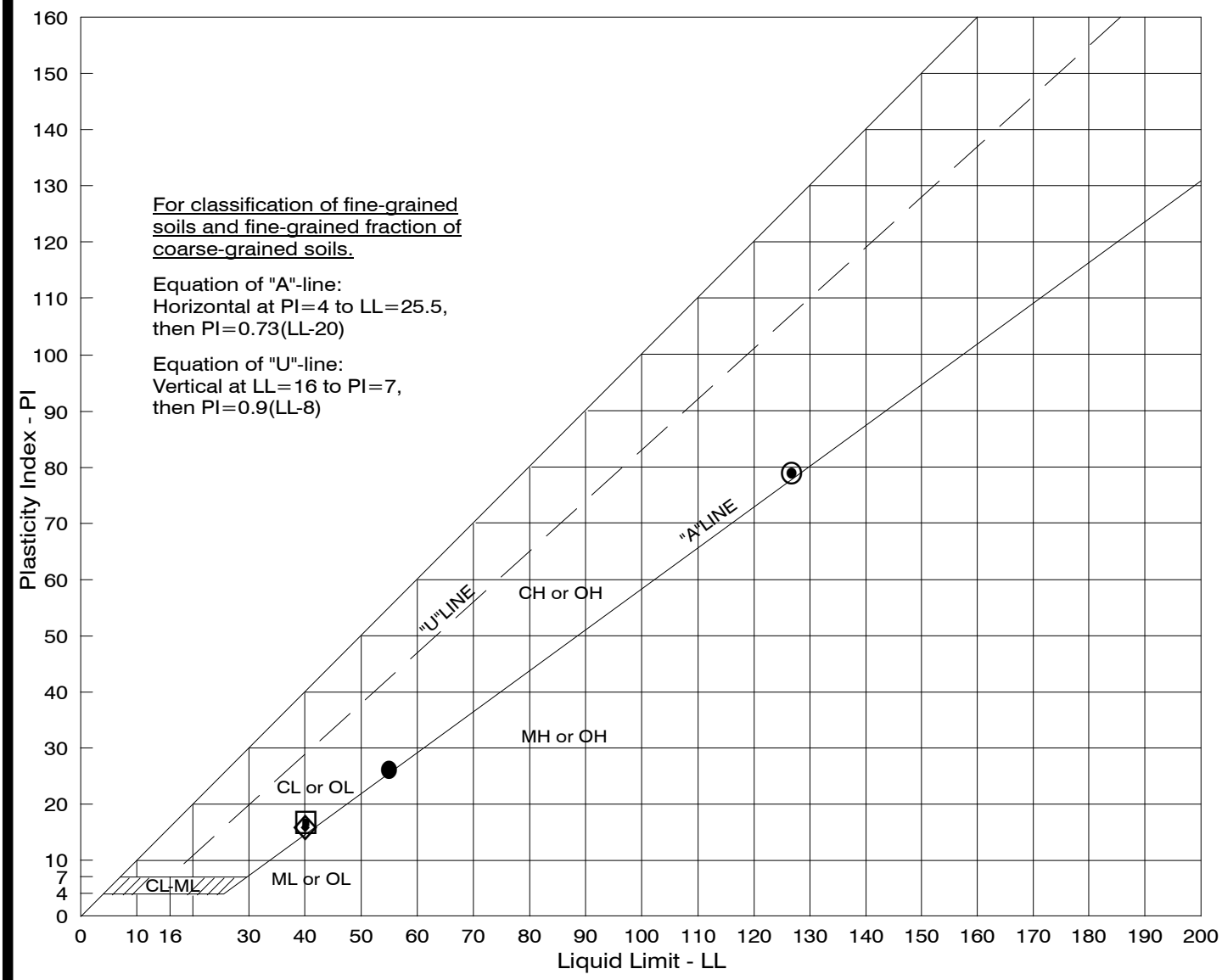
DCM/GEOENGINEERS

Site: KENTFIELD FORCE
Sounding: CPT-08
Engineer: D.NEILSON
Date: 2009-11-30 09:55



Max. Depth: 56.923 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)



TEST SYMBOL	BORING SAMPLE NO.	DEPTH (ft)	LIQUID LIMIT - LL	PLASTICITY INDEX - PI	RATIO①	GROUP ② SYMBOL
●	B-1-4	11-13	55	26	0.8	CH
◈	B-1-8	19½-21½	40	17	0.88	CL
⊡	B-4-2	5-6	40	18	not run	CL
◉	B-4-4	9-10½	127	79	0.35	OH

① If ratio of Liquid Limit (oven dried) to Liquid Limit (not dried) is less than 0.75, specimen classifies as organic
② Classification of fines < 0.425mm

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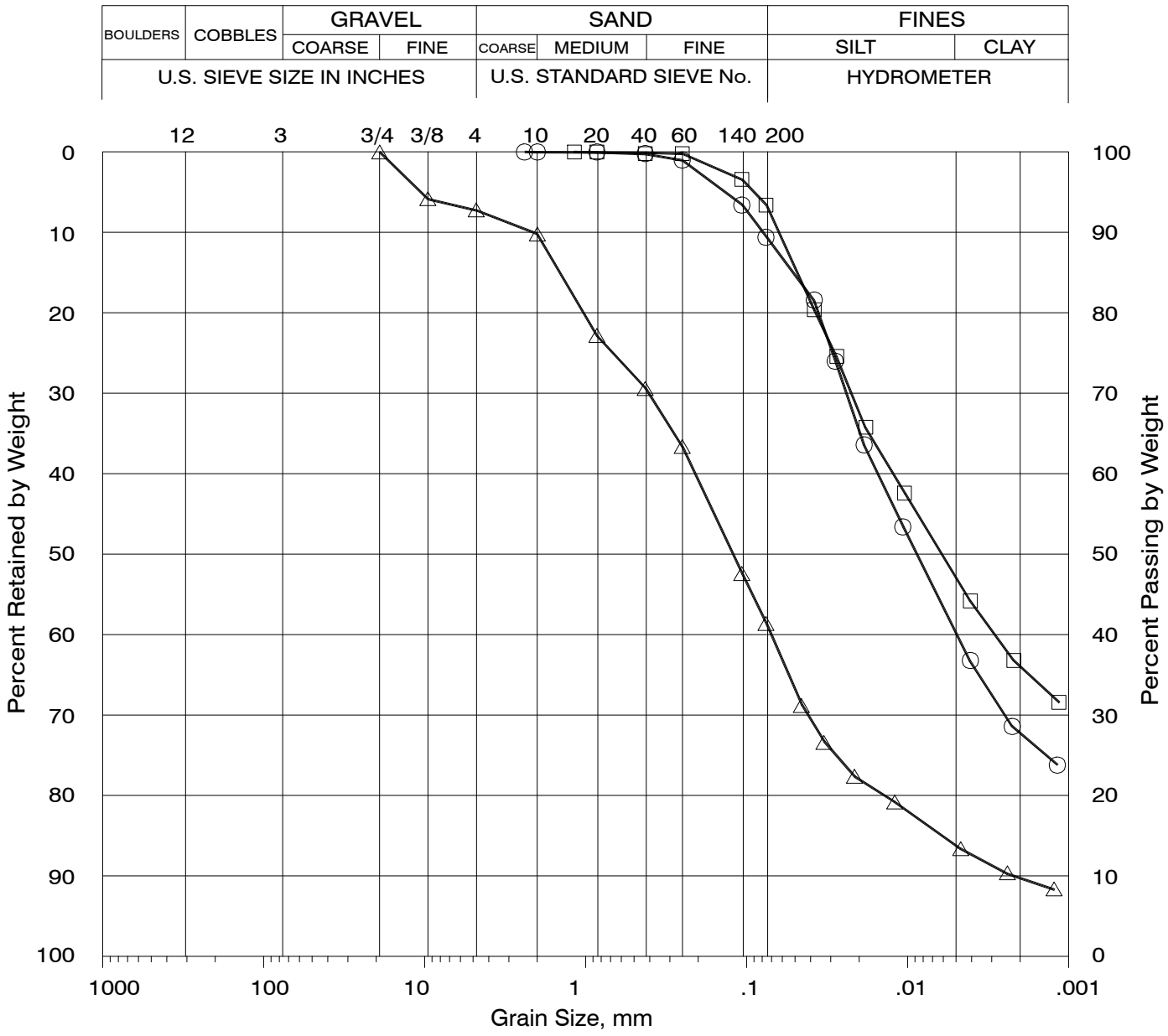
BROWN & CALDWELL
Sanitary District No. 1 of Marin County
Kentfield Forcemain Replacement Project
Marin County, California
PLASTICITY INDEX

FIGURE
C-1



TEST SYMBOL	BORING SAMPLE NO.	DEPTH (feet)
○	B-1-4	11-13
□	B-1-7	18-19½
△	B-2-5	17-18½

NOTE: The largest particle (grain) size that could have been sampled from our borings by our sample barrels is a function of the inside diameter of the sample barrels used (see Figure A-1). Therefore, there may be larger particles (e.g., coarse gravel, cobbles or boulders) in the soils sampled than reflected on the boring logs and grain size distribution curves provided in this report.

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FILE NO. 18174-001-00 | JANUARY 2010

BROWN & CALDWELL

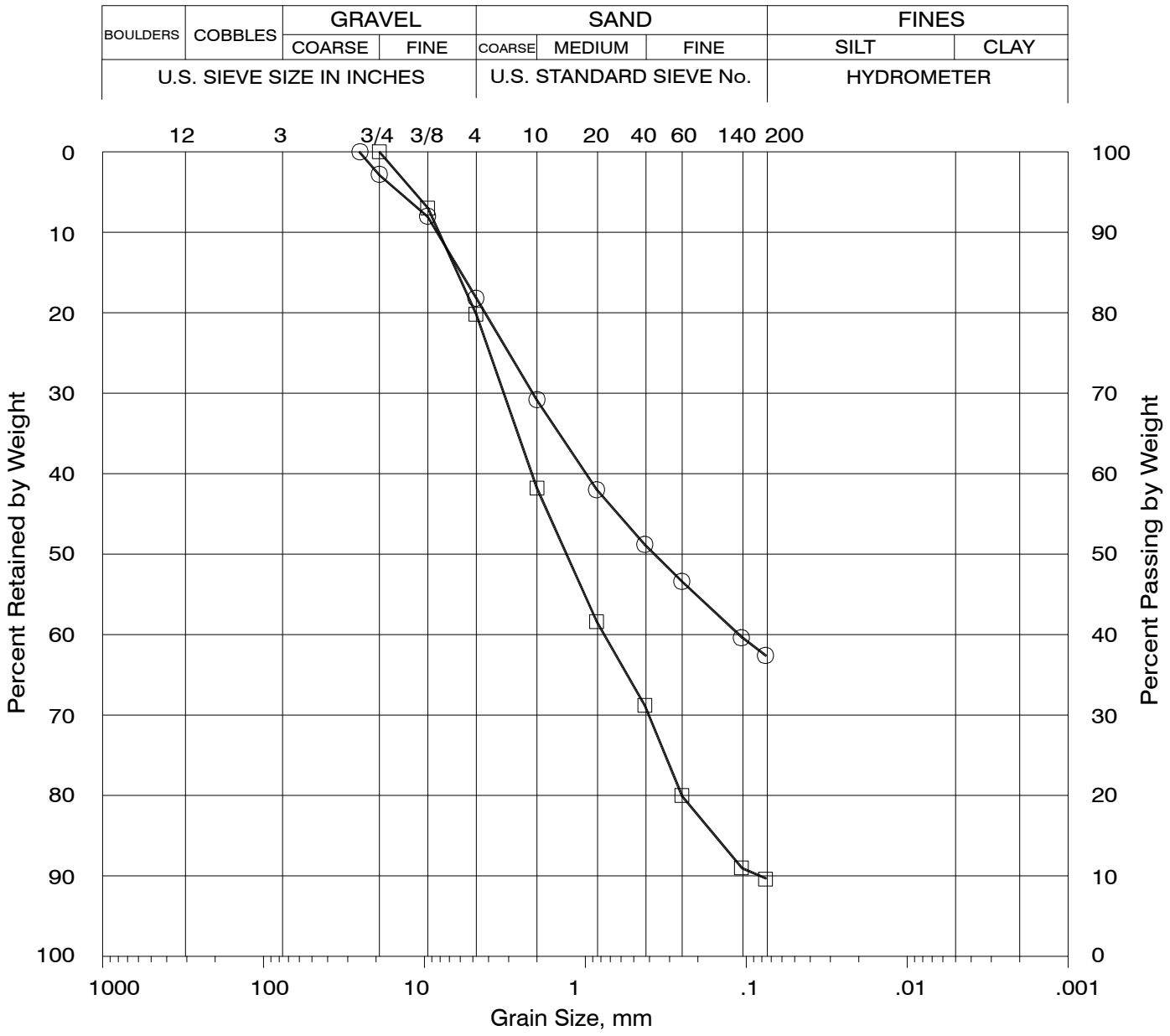
Sanitary District No. 1 of Marin County
Kentfield Forcemain Replacement Project
Marin County, California

GRAIN SIZE ANALYSIS

FIGURE

C-2

(1 of 2)



TEST SYMBOL	BORING SAMPLE NO.	DEPTH (feet)
○	B-4-1	2-3
□	B-4-7	18½-19½

NOTE: The largest particle (grain) size that could have been sampled from our borings by our sample barrels is a function of the inside diameter of the sample barrels used (see Figure A-1). Therefore, there may be larger particles (e.g., coarse gravel, cobbles or boulders) in the soils sampled than reflected on the boring logs and grain size distribution curves provided in this report.

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FILE NO. 18174-001-00 | JANUARY 2010

BROWN & CALDWELL

Sanitary District No. 1 of Marin County
Kentfield Forcemain Replacement Project
Marin County, California

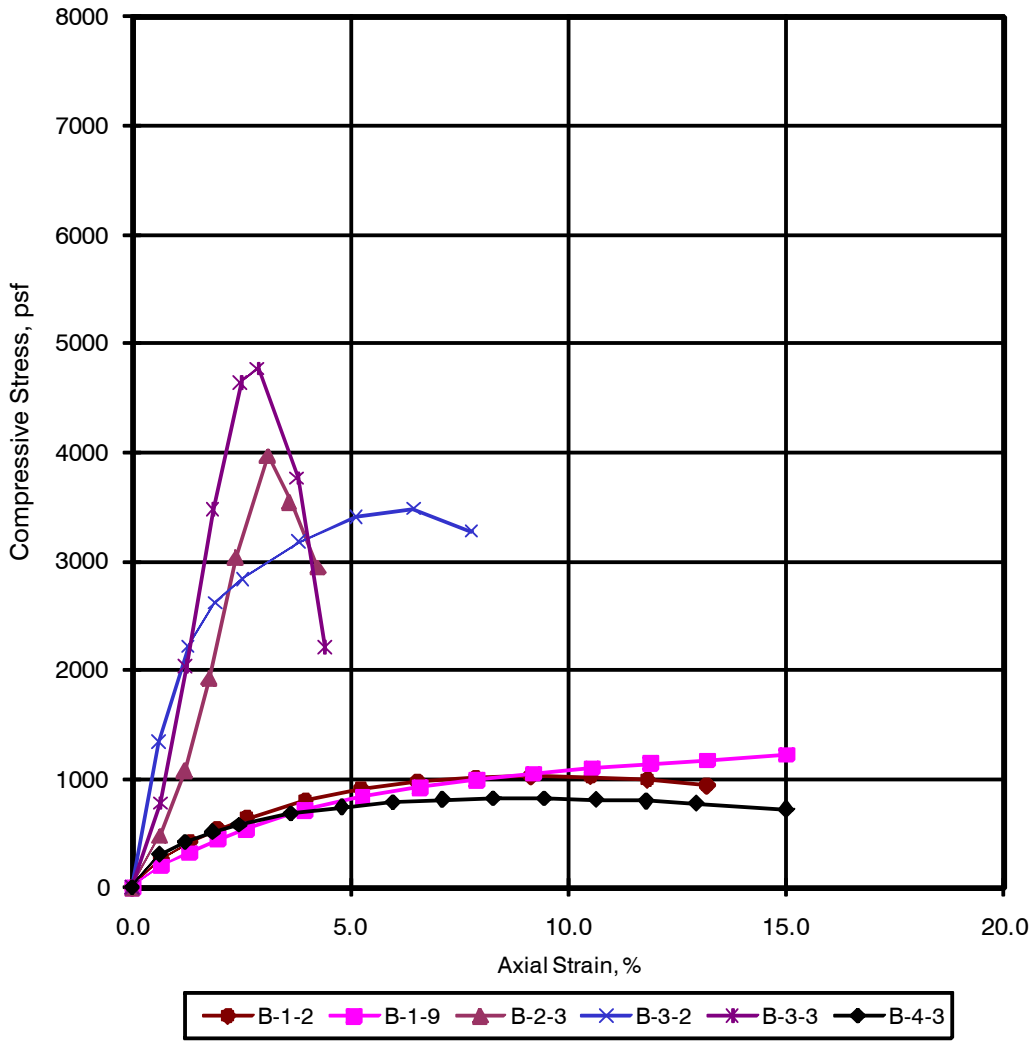
GRAIN SIZE ANALYSIS

FIGURE

C-2

(2 of 2)

UNCONFINED COMPRESSION TEST



BORING SAMPLE NO.	B-1-2	B-1-9	B-2-3	B-3-2	B-3-3	B-4-3
MAXIMUM UNCONFINED STRESS, psf	1026	1222	3965	3479	4762	824
% STRAIN @ PEAK STRESS	9.2	15.0	3.1	6.5	2.9	8.3
DEPTH, ft.	9-9½	24-24½	11-11½	6-6½	11-11½	8-8½
WATER CONTENT, %	71	31	13	25	14	57
DRY DENSITY, pcf	58	101	118	98	122	68
SATURATION, %	100	100	83	93	96	100

Maximum Unconfined Stress cut-off = 15% strain
Average Strain Rate = 0.07 in/min.

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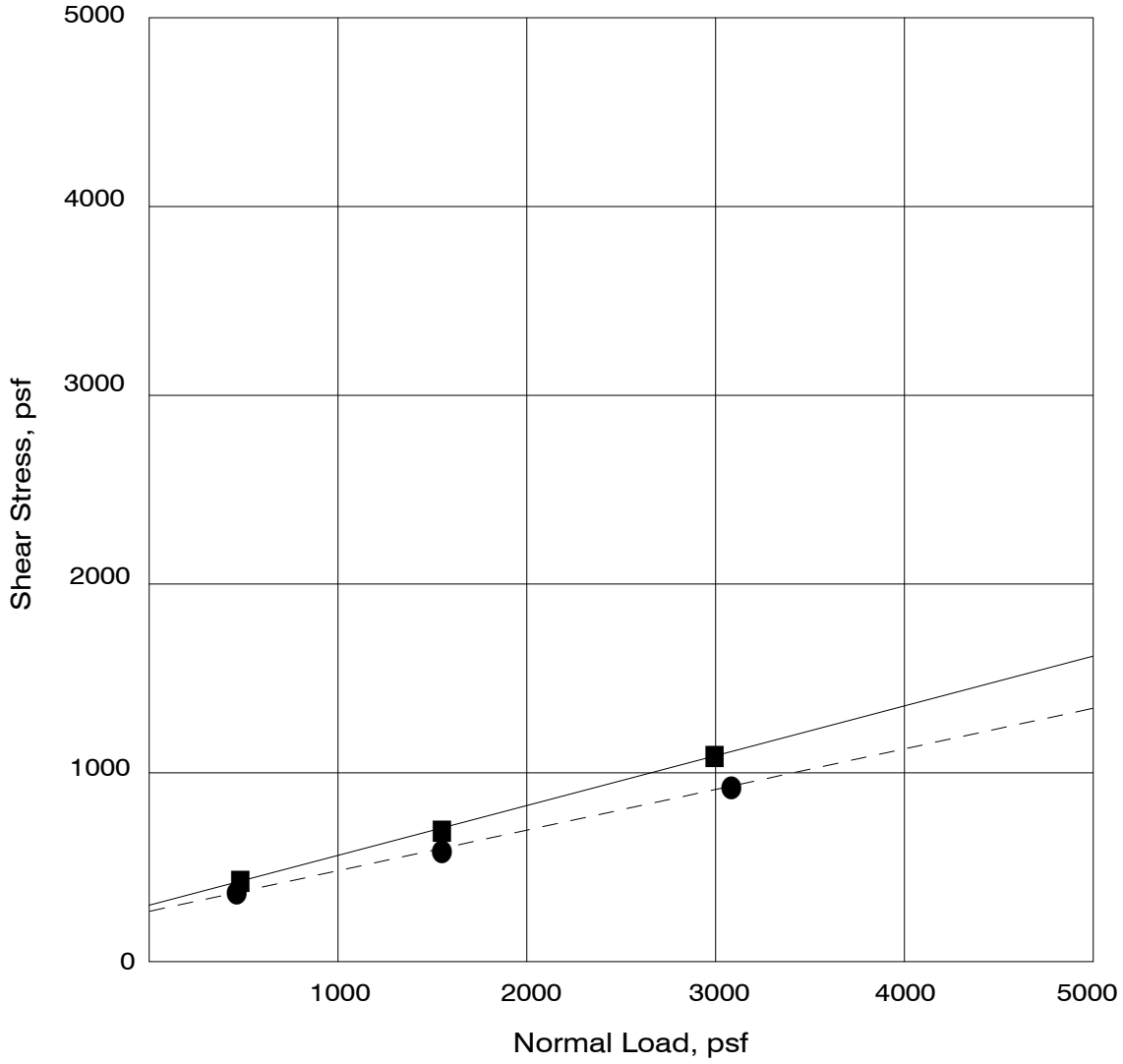
FILE NO. 18174-001-00 | JANUARY 2010

BROWN & CALDWELL
Sanitary District No. 1 of Marin County
Kentfield Forcemain Replacement Project
Marin County, California
UNCONFINED COMPRESSION

FIGURE
C-3



TEST SYMBOL	GRAPH LINE	BORING SAMPLE NO.	DEPTH (ft)	COHESION (p.s.f.)	INTERNAL FRICTION ANGLE (degrees)	AVE. DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	
						BEFORE TEST	AFTER TEST
■	———	B-1-6	17½-18	300	15	91/32	93/30
●	– – – –	B-4-5	12½-13	270	12	48/95	52/82

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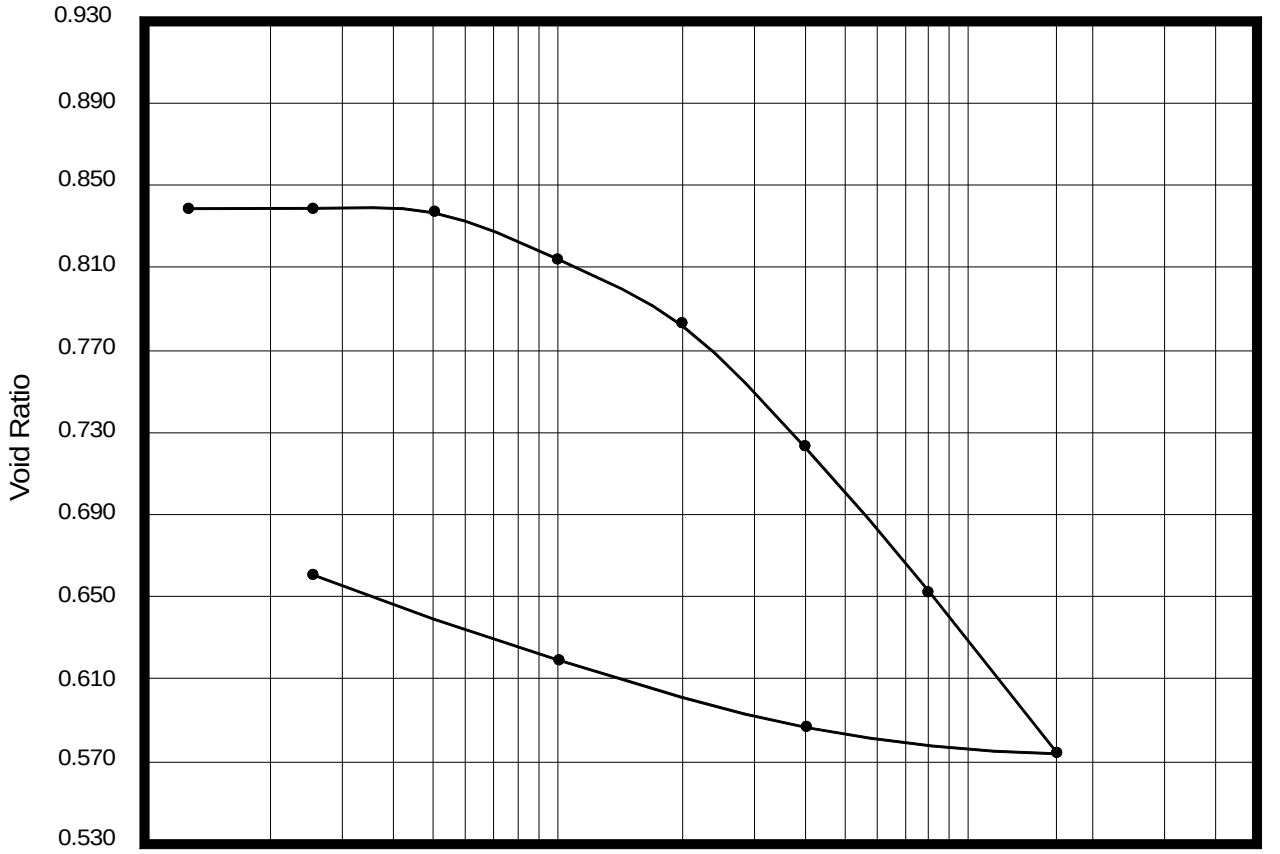
BROWN & CALDWELL

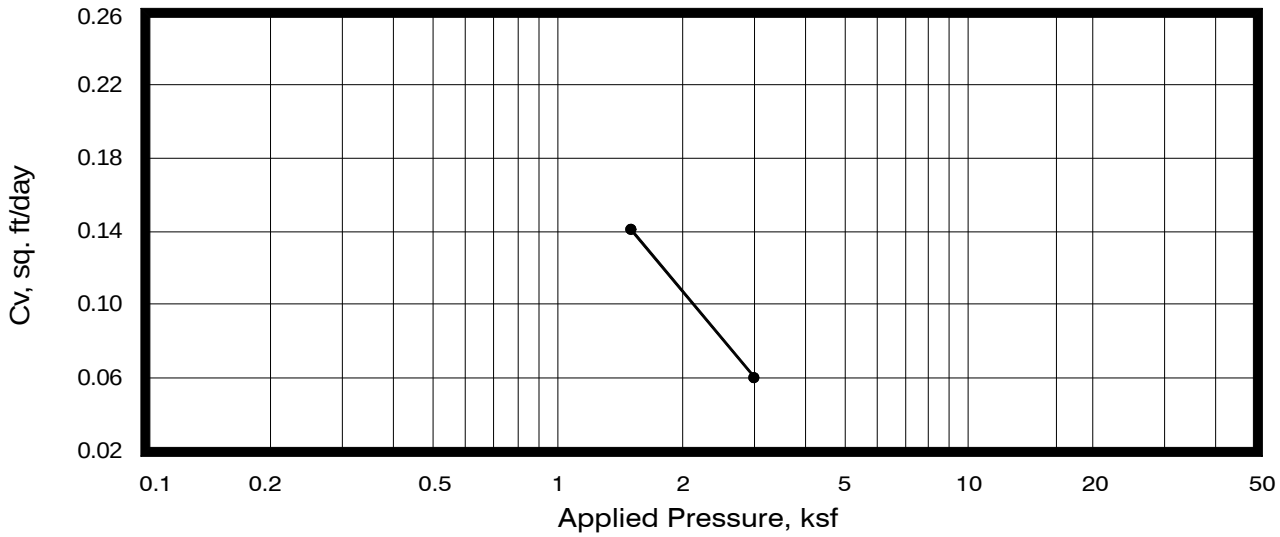
Sanitary District No. 1 of Marin County
Kentfield Forcemain Replacement Project
Marin County, California

DIRECT SHEAR

FIGURE

C-4





TEST SYMBOL	BORING SAMPLE NO.	DEPTH (ft)	BEFORE TEST CONDITIONS			PRE-CONSOLIDATION PRESSURE (ksf)	C_r	C_c	e_o
			SATURATION (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)				
—●—	B-1-5	15½	96	30	94	2.70	0.05	0.26	0.835

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BROWN & CALDWELL

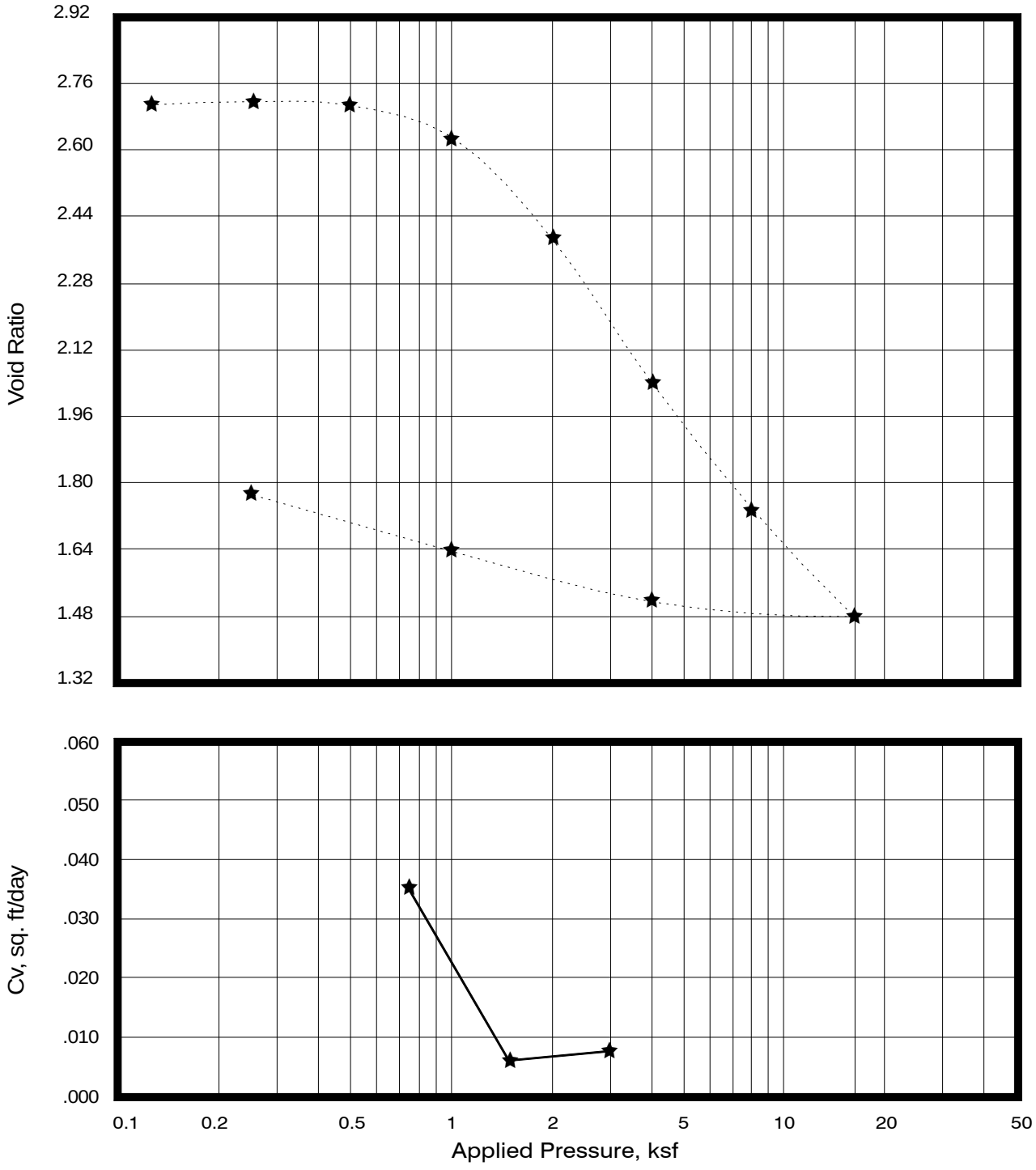
Sanitary District No. 1 of Marin County
Kentfield Forcemain Replacement Project
Marin County, California

CONSOLIDATION

FIGURE

C-5

(1 of 2)



TEST SYMBOL	BORING SAMPLE NO.	DEPTH (ft)	BEFORE TEST CONDITIONS			PRE-CONSOLIDATION PRESSURE (ksf)	C_r	C_c	e_o
			SATURATION (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)				
★	B-4-5	13	93	94	47	0.84	0.16	0.92	2.710

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FILE NO. 18174-001-00 | JANUARY 2010

BROWN & CALDWELL
Sanitary District No. 1 of Marin County
Kentfield Forcemain Replacement Project
Marin County, California
CONSOLIDATION

FIGURE
C-5
(2 of 2)

Fugro West Inc., 2007

Project No. 1715.001

LOCATION: Southwest corner of PE Complex N 2,175,388 E 5,971,190

SURFACE EL: 10.5 ft +/- (rel. MSL datum)

DEPTH, ft	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
	1			Asphalt Concrete Pavement: 2 inches thick Aggregate Base: 3 inches thick							
	2		(24)	FILL: Clayey GRAVEL (GC): medium dense, brown to gray, dry, fine and coarse, angular to subangular, with organics, woodchips and rootlets, and iron stains, some sandstone clasts		13		31	15		
	3				113	14					
	4		(20)								
	5										
	6		3	- soft greenish gray clay lense with some fine, subangular gravel between 3.5 to 4 feet							
5				CLAY (CL/CH): soft to firm, dark gray to greenish gray, wet, plastic, trace sand (locally known as Bay Mud)							
	7				91	31				141.5 U	
	8		(12)	- grades to dark gray with shell fragments							
	9										
10				Fat CLAY (CH): stiff, gray with brown mottling, plastic							
	10		(17)								
	11										
15											
	12		5	- becomes firm							
	13		(12)								
20	14										
	15		13	- grades to brown with gray mottling, with coarse-grained sand, trace gravel (subangular,							

Continued

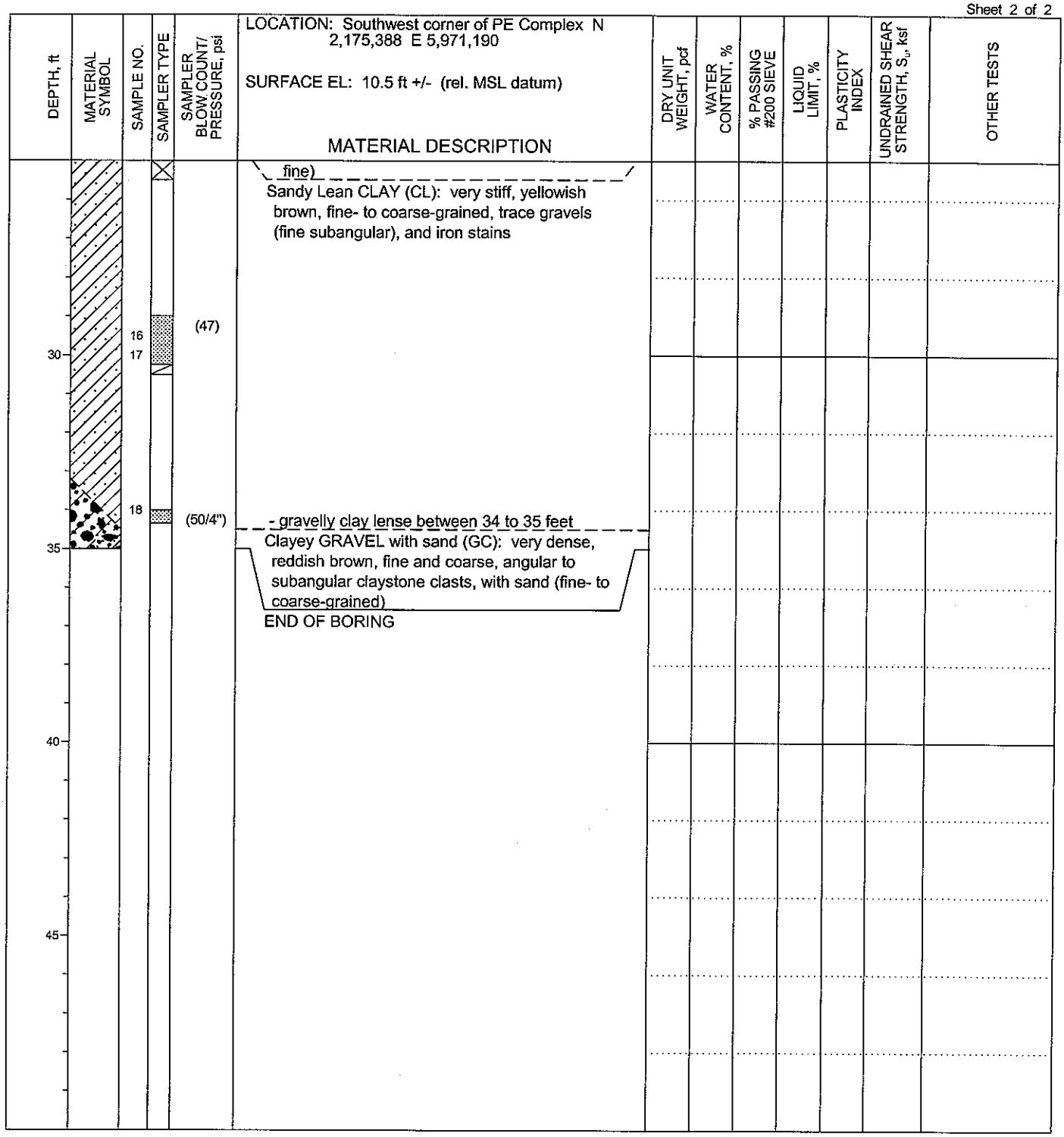
BORING DEPTH: 35.0 ft
DEPTH TO WATER: 7.5 ft
BACKFILL: Portland Cement Grout
COMPLETION DATE: December 1, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 4.875-in. dia. Rotary Wash
HAMMER TYPE: Automatic Trip, 140 lb
RIG TYPE: Failing 500
DRILLED BY: Pitcher Drilling,
LOGGED BY: S Giannakos

LOG OF BORING NO. B-1

Diamond Physical Education Complex, College of Marin
Kentfield, California

Project No. 1715.001



BORING DEPTH: 35.0 ft
DEPTH TO WATER: 7.5 ft
BACKFILL: Portland Cement Grout
COMPLETION DATE: December 1, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 4.875-in. dia. Rotary Wash
HAMMER TYPE: Automatic Trip, 140 lb
RIG TYPE: Failing 500
DRILLED BY: Pitcher Drilling,
LOGGED BY: S Giannakos

LOG OF BORING NO. B-1

Diamond Physical Education Complex, College of Marin
Kentfield, California

LOCATION: Northeast corner of Gymnasium N 2,175,725 E 5,971,431

SURFACE EL: 13.0 ft +/- (rel. MSL datum)

DEPTH, ft	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
	1			Asphalt Concrete Pavement: 2 inches thick Aggregate Base: 6 inches thick							
	2		(32)	FILL: Clayey GRAVEL (GC): medium dense, gray, dry, fine, angular to subangular, with organics, woodchips and rootlets, and iron stains, some sandstone clasts	120	11					
	3										
	4		23								
	5		(22)		112	10					
5	6			- becomes gray with brown mottling at 4.5 feet - soft light brown clay lense with some fine, subangular gravel between 5 to 6 feet - soft greenish gray clay lense with some fine, subangular gravel between 6 to 7 feet							
	7		(3)	Fat CLAY (CH): very soft to soft, dark gray, wet, trace fine-grained sand (locally known as Bay Mud)							
10	8				73	48				301.8 U	
	9				79	42					
15											
	10		4	Fat CLAY (CH): soft to firm, greenish gray, wet, silty, fine subangular gravel							
20											
	11		(16)	Well-graded GRAVEL with clay (GW-GC): medium dense, olive brown, wet, fine and coarse, subrounded-to- subangular, some sand			9				

Continued

BORING DEPTH: 55.7 ft
DEPTH TO WATER: Not Encountered
BACKFILL: Portland Cement Grout
COMPLETION DATE: December 2, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 4.875-in. dia. Rotary Wash
HAMMER TYPE: Automatic Trip, 140 lb
RIG TYPE: Failing 500
DRILLED BY: Pitcher Drilling,
LOGGED BY: S Giannakos

LOG OF BORING NO. B-4

Diamond Physical Education Complex, College of Marin
Kentfield, California

LOCATION: Northeast corner of Gymnasium N 2,175,725 E 5,971,431

SURFACE EL: 13.0 ft +/- (rel. MSL datum)

DEPTH, ft	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
	12			(fine- and coarse-grained), some clay							
	13		6	Fat CLAY (CH): firm, olive gray, wet, silty							
30											
	14		(24)	Poorly-graded GRAVEL with clay and sand (GP-GC): medium dense, brown, wet, fine, subangular to subrounded, some sand (fine- to coarse-grained), trace clay			13				
35	15										
	16		18	Clayey SAND with gravel (SC): medium dense, brown to gray, wet, fine- to coarse-grained, some gravel (fine, subangular to subrounded), some clay							
	17		12								
	18		18								
	18						29				
45			6								
	19		(18)	Sandy Fat CLAY with gravel (CH): firm to stiff, gray, wet, some sand (fine to coarse-grained), trace gravel (fine, subangular)							
	20			Clayey GRAVEL with sand (GC): very dense, gray, wet, fine and coarse, angular to							

Continued

BORING DEPTH: 55.7 ft
DEPTH TO WATER: Not Encountered
BACKFILL: Portland Cement Grout
COMPLETION DATE: December 2, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 4.875-in. dia. Rotary Wash
HAMMER TYPE: Automatic Trip, 140 lb
RIG TYPE: Failing 500
DRILLED BY: Pitcher Drilling,
LOGGED BY: S Giannakos

LOG OF BORING NO. B-4

Diamond Physical Education Complex, College of Marin
Kentfield, California

DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	LOCATION: Northeast corner of Gymnasium N 2,175,725 E 5,971,431 SURFACE EL: 13.0 ft +/- (rel. MSL datum) MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
		21		50/3"	subangular claystone clasts, some sand (fine- to coarse-grained), with clay							
55		22		65/8"								
					END OF BORING							
60												
65												
70												

BORING DEPTH: 55.7 ft
DEPTH TO WATER: Not Encountered
BACKFILL: Portland Cement Grout
COMPLETION DATE: December 2, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 4.875-in. dia. Rotary Wash
HAMMER TYPE: Automatic Trip, 140 lb
RIG TYPE: Failing 500
DRILLED BY: Pitcher Drilling,
LOGGED BY: S Giannakos

LOG OF BORING NO. B-4

Diamond Physical Education Complex, College of Marin
Kentfield, California

LOCATION: East side of PE Complex N 2,175,516 E 5,971,513

SURFACE EL: 9.5 ft +/- (rel. MSL datum)

DEPTH, ft	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
	1		(8)	FILL: Lean CLAY with sand (CL): firm, dark brown, moist, very fine grained sand, trace gravels and roots (Fill)		22		40	20		
	2										
	3		22								
	4		(24)	FILL: Clayey GRAVEL (GC): medium dense, yellowish brown, dry, angular to subangular, coarse, trace of organics, sandstone clasts							
5	5										
	6		19	- clay pocket between 5 to 6 feet							
				Fat CLAY (CH): soft, dark gray, wet, silty, trace fine-grained sand (locally known as Bay Mud) ▽							
10	7				56	72				350.5 U	
				Fat CLAY (CH): soft to firm, greenish gray, silty, trace gravel (fine, subangular)							
15	8		4								
20	9		(25)	Well-graded GRAVEL (GW): medium dense, gray, fine, subrounded to subangular, with fine- to medium-grained sand							
	10										

Continued

BORING DEPTH: 61.5 ft
DEPTH TO WATER: 8.5 ft
BACKFILL: Portland Cement Grout
COMPLETION DATE: December 2, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 4.875-in. dia. Rotary Wash
HAMMER TYPE: Rope and Cathead, 140 lb
RIG TYPE: Failing 1500
DRILLED BY: Pitcher Drilling,
LOGGED BY: K Gupta

LOG OF BORING NO. B-5

Diamond Physical Education Complex, College of Marin
Kentfield, California

LOCATION: East side of PE Complex N 2,175,516 E 5,971,513

SURFACE EL: 9.5 ft +/- (rel. MSL datum)

DEPTH, ft	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
	11		23	Clayey GRAVEL with sand (GC): medium dense, brownish gray, fine, subangular to subrounded, some fine- to coarse-grained sand, some clay			17				
	11										
30	12		26	- trace silt at 31 feet							
	13		27								
35	14		(37)								
	15			- grades to sandy gravel at 39.5 feet							
40	16		24	Well-graded GRAVEL (GW): medium dense, gray, fine, subrounded to subangular, with fine-grained sand							
				Fat CLAY (CH): stiff to very stiff, brown, trace fine-grained sand							
45	17		18								
	18		(18)								
	19				106	23					

Continued

BORING DEPTH: 61.5 ft
DEPTH TO WATER: 8.5 ft
BACKFILL: Portland Cement Grout
COMPLETION DATE: December 2, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 4.875-in. dia. Rotary Wash
HAMMER TYPE: Rope and Cathead, 140 lb
RIG TYPE: Failing 1500
DRILLED BY: Pitcher Drilling,
LOGGED BY: K Gupta

LOG OF BORING NO. B-5

Diamond Physical Education Complex, College of Marin
Kentfield, California

LOCATION: East side of PE Complex N 2,175,516 E 5,971,513

SURFACE EL: 9.5 ft +/- (rel. MSL datum)

DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
		20		(22)	Fat CLAY with gravel (CH): stiff, grayish brown, silty, trace gravel (fine, subrounded to subangular)							
		21										
55		22		11								
		23			Sandy SILT (ML): stiff, brownish gray, fine-grained sand							
					Clayey GRAVEL with sand (GC): very dense, gray with orange mottling, wet, fine and coarse, angular to subangular claystone clasts, some sand (fine- to coarse-grained), with clay							
60		24		(59)								
		25			END OF BORING							
65												
70												

BORING DEPTH: 61.5 ft
DEPTH TO WATER: 8.5 ft
BACKFILL: Portland Cement Grout
COMPLETION DATE: December 2, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 4.875-in. dia. Rotary Wash
HAMMER TYPE: Rope and Cathead, 140 lb
RIG TYPE: Failing 1500
DRILLED BY: Pitcher Drilling,
LOGGED BY: K Gupta

LOG OF BORING NO. B-5

Diamond Physical Education Complex, College of Marin
Kentfield, California

LOCATION: SE corner of PE Complex N 2,175,376 E 5,971,488

SURFACE EL: 10.0 ft +/- (rel. MSL datum)

DEPTH, ft	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
	1			Asphalt Concrete Pavement: 2 inches thick Aggregate Base: 4 inches thick							
	2		(33)	Clayey GRAVEL with sand (GC): medium dense, yellowish brown, dry, angular to subangular, coarse, trace of organics, sandstone clasts	125	9					
	3										
	4		16								
			(14)	- clay pocket between 4 to 5.5 feet							
5	5										
				CLAY (CL/CH): soft to firm, dark gray to greenish gray, wet, plastic, trace sand, rootlets at between 5 to 8 feet (locally known as Bay Mud)							
	6			▽	73	48					
10											
15	7		(7)	Sandy Fat CLAY with gravel (CH): soft to firm, gray with brown mottlings, silty, some fine-grained sand, trace gravel (fine, subangular)	103	24				359.2 U	
	8										
	9		(10)								
20	10			- grades to clayey sand	104	22					
	11		5	Fat CLAY with sand (CH): firm, gray, with fine-grained sand							

Continued

BORING DEPTH: 66.5 ft
DEPTH TO WATER: 8.0 ft
BACKFILL: Portland Cement Grout
COMPLETION DATE: December 2, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 4.875-in. dia. Rotary Wash
HAMMER TYPE: Automatic Trip, 140 lb
RIG TYPE: Failing 500
DRILLED BY: Pitcher Drilling,
LOGGED BY: S Giannakos

LOG OF BORING NO. B-6

Diamond Physical Education Complex, College of Marin
Kentfield, California

LOCATION: SE corner of PE Complex N 2,175,376 E 5,971,488

SURFACE EL: 10.0 ft +/- (rel. MSL datum)

DEPTH, ft	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
			(13)	- becomes olive gray, trace silt between 27 to 29 feet							
30	12		8	- grades to stiff							
35	13 14		(21)	- with gray sand seams							
40	15 16		(26)	- with brown sand seams, grades to very stiff	108	22				899.8 U	
				- grades to brown, trace coarse-grained sand							
45	17 18		(27)	Sandy Fat CLAY (CH): very stiff, yellowish brown, oxidised trace of organics	107	22					

Continued

BORING DEPTH: 66.5 ft
DEPTH TO WATER: 8.0 ft
BACKFILL: Portland Cement Grout
COMPLETION DATE: December 2, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 4.875-in. dia. Rotary Wash
HAMMER TYPE: Automatic Trip, 140 lb
RIG TYPE: Failing 500
DRILLED BY: Pitcher Drilling,
LOGGED BY: S Giannakos

LOG OF BORING NO. B-6

Diamond Physical Education Complex, College of Marin
Kentfield, California

LOCATION: SE corner of PE Complex N 2,175,376 E 5,971,488

SURFACE EL: 10.0 ft +/- (rel. MSL datum)

DEPTH, ft	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
	19		22								
				Gravelly Fat CLAY (CH): very stiff, dark brown, with gravel (fine, subangular to subrounded)							
55	20		(25)	Fat CLAY with sand (CH): very stiff, gray with orange brown mottlings, trace gravels (fine, subangular to subrounded)	101	27				704.3 U	
	21				101	26					
60	22		42	Clayey SAND with gravel (SC): dense, brown, fine- to medium-grained sand, some gravel (fine, subangular to subrounded)							
65	23		54	- grades to clayey gravel (GC) with sand, very dense, orange brown							
				END OF BORING							
70											

BORING DEPTH: 66.5 ft
DEPTH TO WATER: 8.0 ft
BACKFILL: Portland Cement Grout
COMPLETION DATE: December 2, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 4.875-in. dia. Rotary Wash
HAMMER TYPE: Automatic Trip, 140 lb
RIG TYPE: Failing 500
DRILLED BY: Pitcher Drilling,
LOGGED BY: S Giannakos

LOG OF BORING NO. B-6

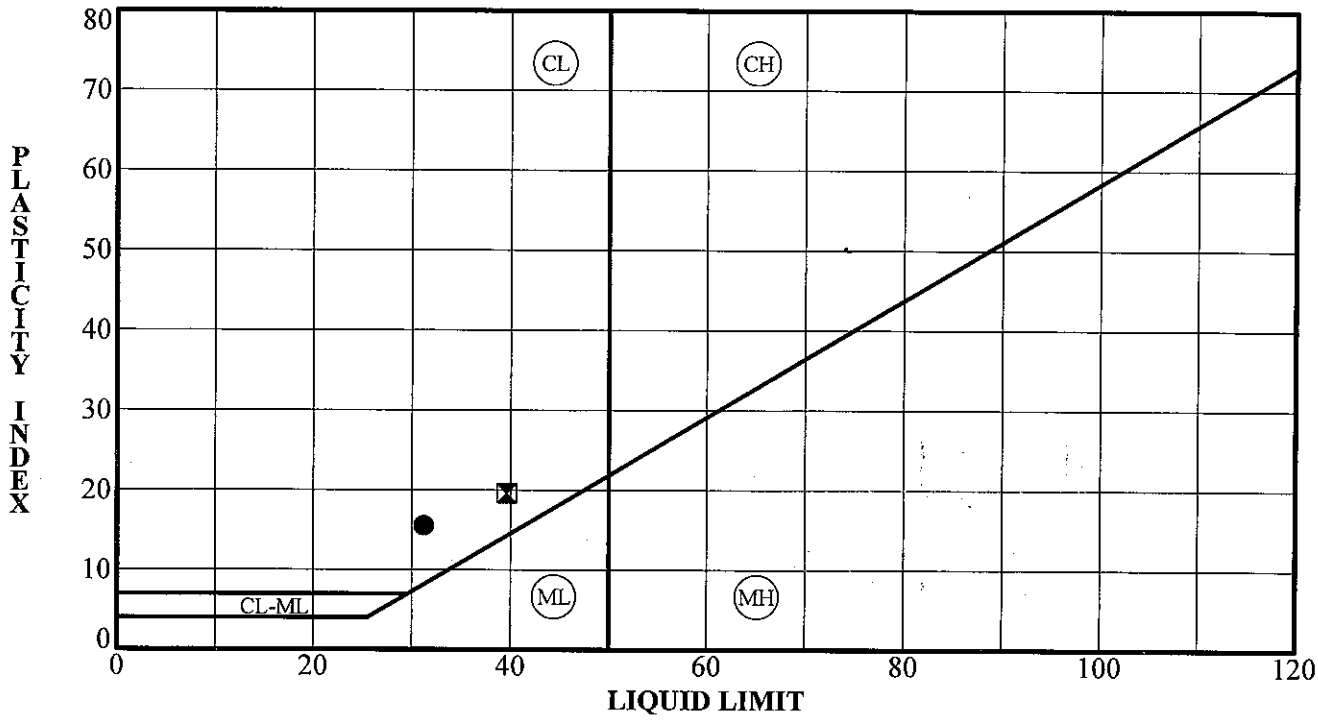
Diamond Physical Education Complex, College of Marin
Kentfield, California

Consolidation tests were performed on two relatively undisturbed samples of the subsurface clays to assist in evaluating the compressibility characteristics of these materials. The consolidation tests were performed in accordance with ASTM Test Designation D-2438-70. The results of the consolidation tests are presented graphically on Figures B-4 and B-5.

Two resistance R- value tests were performed on representative samples of the surface soils onsite to provide data for pavement design. The tests were performed in accordance with California Test Method 301-F and indicated measured R-values of 18 and 26 at an exudation pressure of 300 pounds per square inch. The results of the tests are presented below:

RESULTS OF R-VALUE TESTS

Description of Material	Dry Density (pcf)	Water Content (%)	Exudation Pressure (psi)	Expansion Pressure (psf)	R-Value
Brown Sandy CLAY (CL) B-1 @ 0' – 5'	114.1	16.2	223	140	24
	115.0	15.7	294	170	26
	118.3	15.2	469	319	27
R-Value = 26 at Exudation pressure of 300 psi					
Brown lean CLAY with sand (CL) B-4 @ 0' – 5'	117.7	15.1	207	57	16
	119.4	14.6	310	61	19
	118.7	14.1	342	148	23
R-Value = 18 at Exudation pressure of 300 psi					



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	B-1	1.5	31	16	-0.157	13		CL
⧓	B-5	1.0	40	20	0.090	22		CL

FUGRO

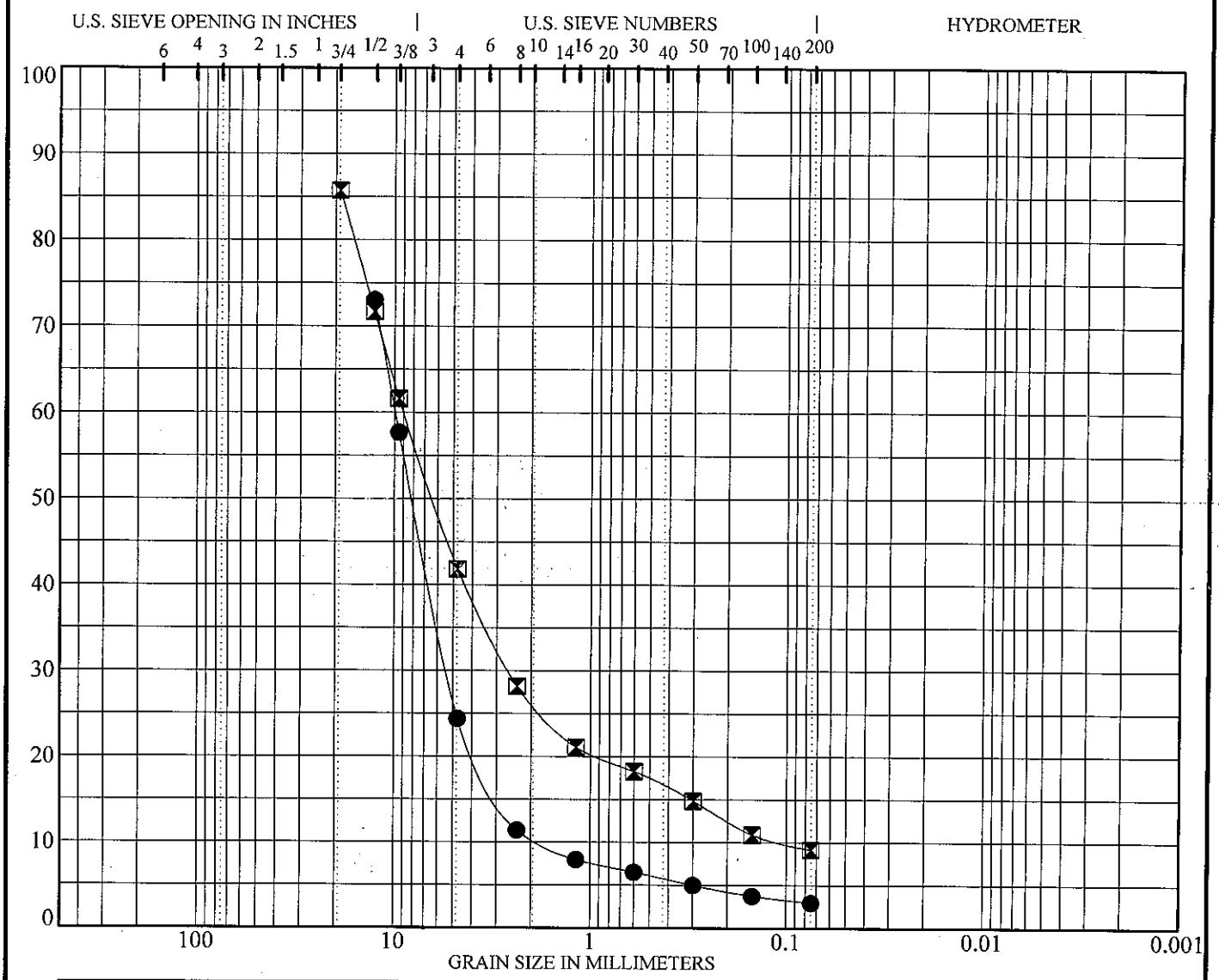
PREP'D BY:
APP'D BY:
DATE: 2/7/07
DWG FILE:

PLASTICITY CHART AND DATA

DIAMOND PHYSICAL EDUCATION COMPLEX
Kentfield, California

FIGURE
B--1
PROJECT No
1715.001

ATTERBERG 1715.001_KG.GPJ VERSION-012505.GDT 2/7/07



PERCENT PASSING BY WEIGHT

Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	B-2	20.5	3	24		
⊠	B-4	24.5	9	42	Gray GRAVEL with clay and sand	GW-GC

FUGRO

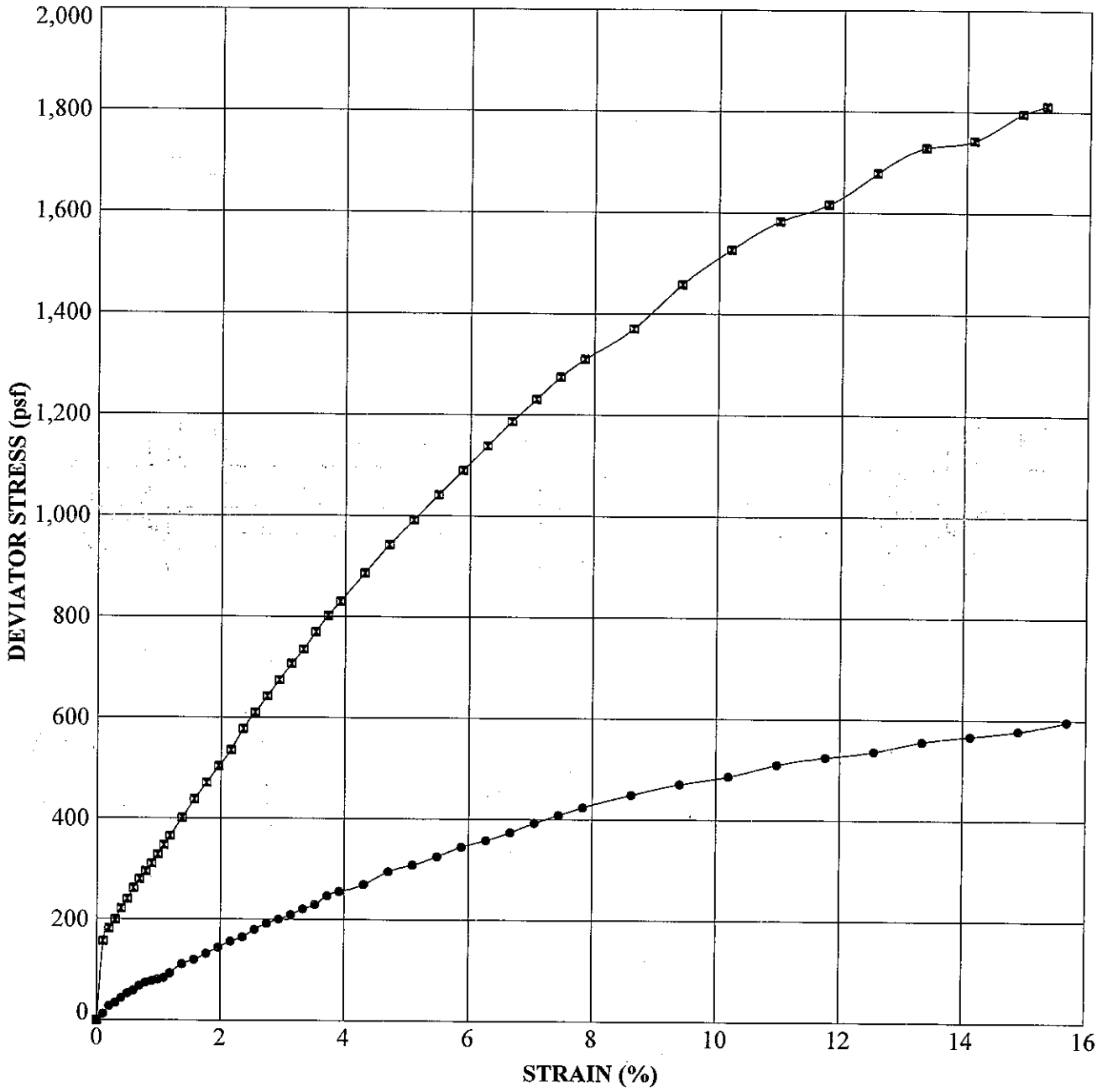
PREP'D BY:
APP'D BY:
DATE: 2/7/07
DWG FILE:

GRADATION TEST DATA

DIAMOND PHYSICAL EDUCATION COMPLEX
Kentfield, California

FIGURE
B--2
PROJECT No.
1715.001

GRADATION_B 1715.001 KG.GPJ STD.GDT 2/7/07



Key Symbol	Boring	Depth (Feet)	Sample Description (USCS)	Dry Density (pcf)	Water Content (%)	Peak Deviator Stress (psf)	Strain (%)
●	B-3	25.5	Gray brown sandy CLAY (CL)	93.7	29.4	580	15.0
⊠	B-6	41.0	Brown sandy CLAY (CL)	107.7	21.5	1800	15.0

FUGRO

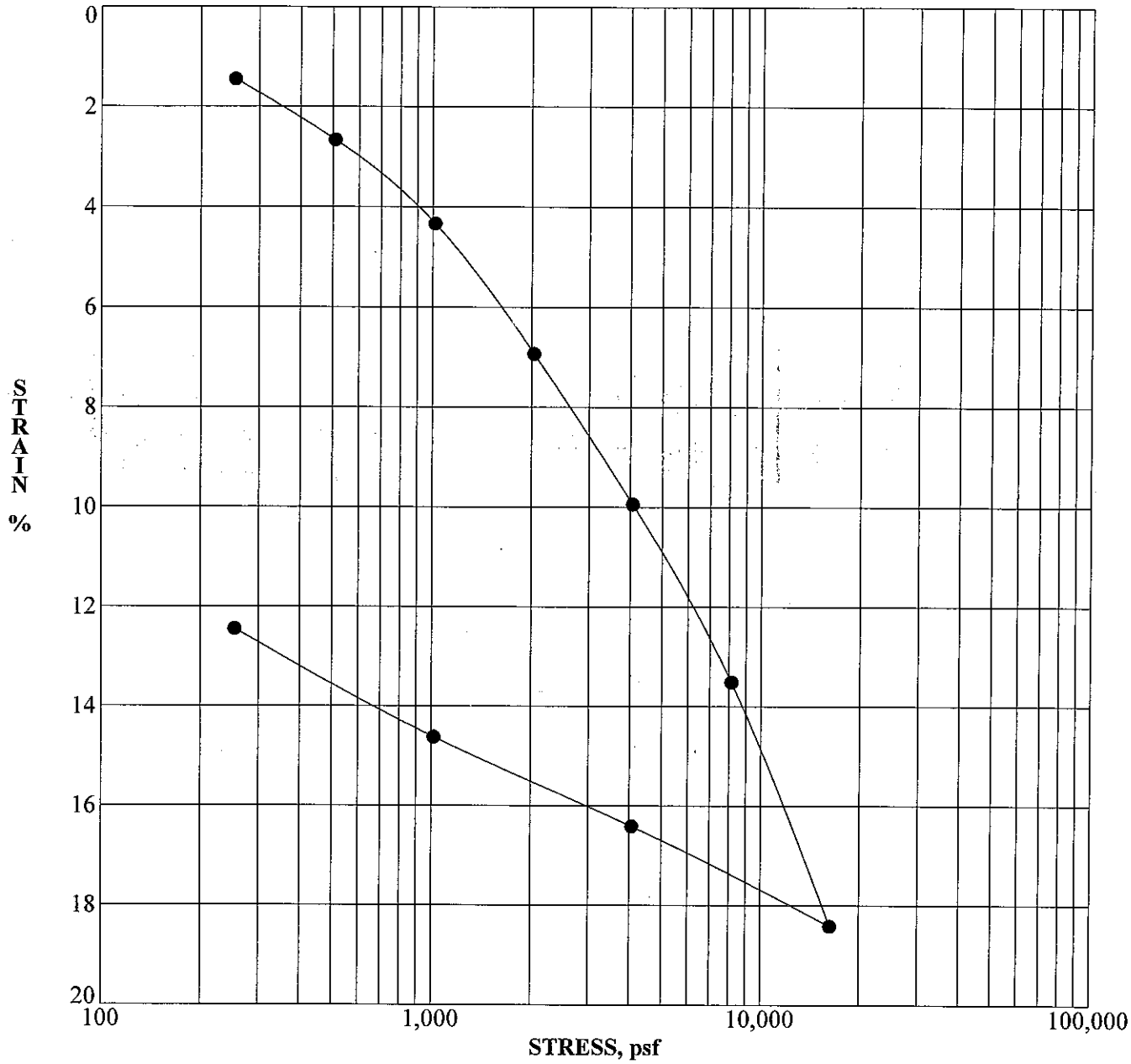
PREP'D BY:
APP'D BY:
DATE: 2/7/07
DWG FILE:

TRIAXIAL COMPRESSION TEST DATA

DIAMOND PHYSICAL EDUCATION COMPLEX
Kentfield, California

FIGURE
B--3
PROJECT No.
1715.001

TRIAXIAL 1715.001 KG.GPJ STD.GDT 2/7/07



Key Symbol	Boring No.	Depth (Feet)	Water Content (%)		Dry Density (pcf)		Void Ratio		Saturation (%)		Max. Past Pressure (psf)	Compr. Index,Cec	Recompr. Index,Cer
			Initial	Final	Initial	Final	Initial	Final	Initial	Final			
●	B-4	12.0	42.2	32.3	78.9	90.1	1.135	0.870	100.4	100.3			

FUGRO

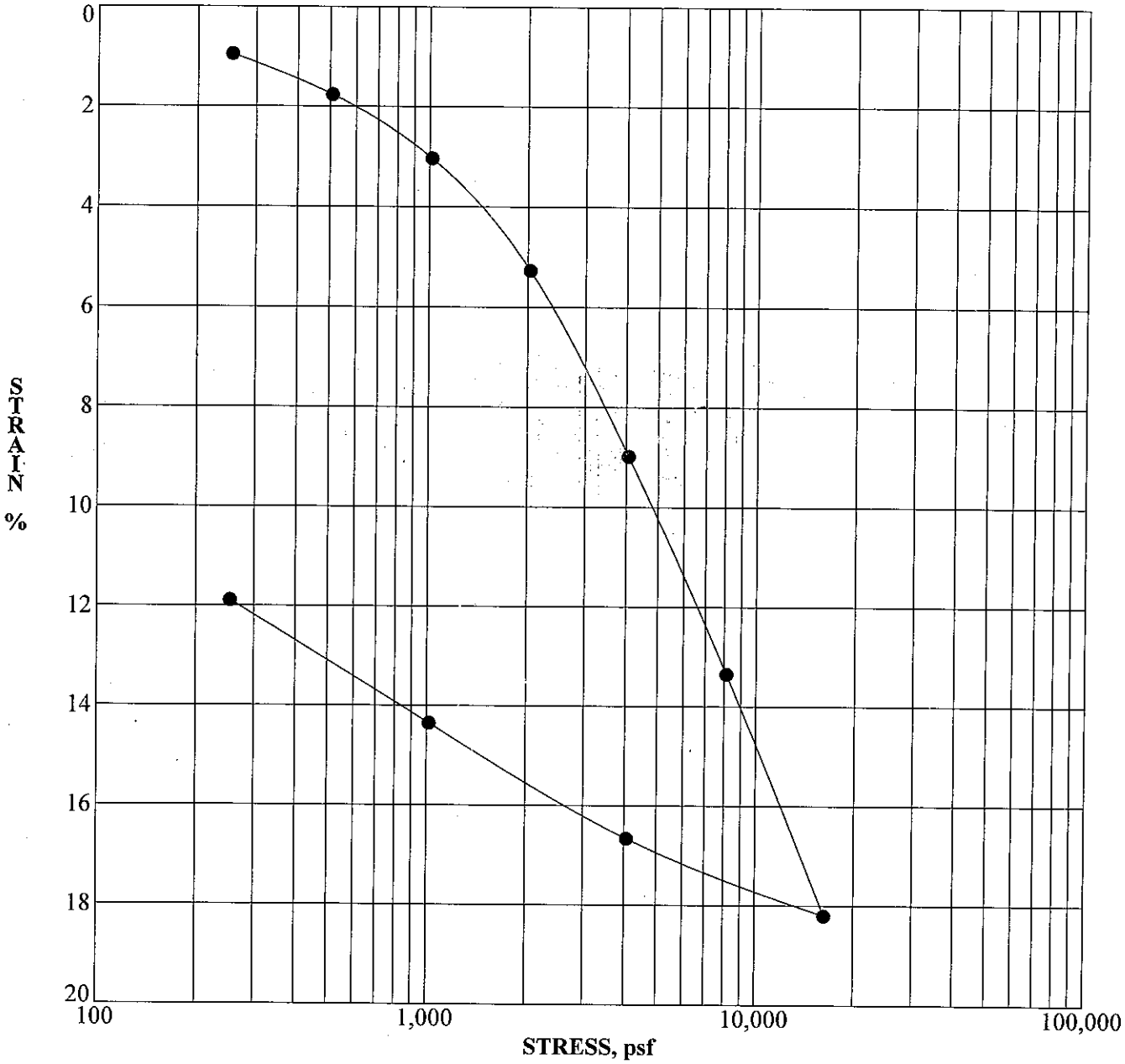
PREP'D BY:
APP'D BY:
DATE: 2/7/07
DWG FILE:

CONSOLIDATION TEST RESULTS

DIAMOND PHYSICAL EDUCATION COMPLEX
Kentfield, California

FIGURE
B--4
PROJECT No.
1715.001

CONSOL_STRAIN 1715-001B V012505.GPJ STD.GDT 2/7/07



Key Symbol	Boring No.	Depth (Feet)	Water Content (%)		Dry Density (pcf)		Void Ratio		Saturation (%)		Max. Past Pressure (psf)	Compr. Index,Cec	Recompr. Index,Cer
			Initial	Final	Initial	Final	Initial	Final	Initial	Final			
●	B-6	10.5	48.2	38.6	72.8	82.6	1.314	1.040	99.0	100.1			

FUGRO

PREP'D BY:
APP'D BY:
DATE: 2/7/07
DWG FILE:

CONSOLIDATION TEST RESULTS

DIAMOND PHYSICAL EDUCATION COMPLEX
Kentfield, California

FIGURE
B--5
PROJECT No.
1715.001

CONSOL_STRAIN 1715-001B_V012505.GPJ STD.GDT 2/7/07

California State Certified Laboratory No.2153

CERCO analytical, inc.

3942-A Valley Avenue
Pleasanton, CA 94566-4715
925.462.2771 • Fax: 925.462.2775
www.cercoanalytical.com

Client: Fugro West, Inc.
Client's Project No.: 1715.001
Client's Project Name: College of Marin
Date Sampled: Not Indicated
Date Received: 13-Dec-06
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 21-Dec-2006

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
0612096-001	B-1 @ 3-3.5'	410	7.6	-	1,800	-	22	23
0612096-002	B-3 @ 2.5-4'	400	6.4	-	7,400	-	N.D.	N.D.

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Detection Limit:	-	-	10	-	50	15	15
Date Analyzed:	15-Dec-2006	18-Dec-2006	-	15-Dec-2006	-	18-Dec-2006	18-Dec-2006

Cheryl McMillen
Laboratory Director

* Results Reported on "As Received" Basis

N.D. - None Detected

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

Fugro West Inc., 2005

Project No. 1715.001

LOCATION: Larkspur Annex, next to greenhouse

SURFACE EL: 9.0 ft +/- 0.5 (rel. MSL datum)

DEPTH, ft	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
	1			Clayey SAND with gravel (SC): very dense, brown, dry to moist, fine- to medium-grained, coarse, subangular gravel (FILL)			41				MA
	2		(50/4")		113	10					
5	3		50/3"								
				Fat CLAY (CH): very soft, gray, moist, trace of organics (marsh deposits)							
	4		(2)								
10	5				55	75				0.2 U 4.0 T	
15	6		(6)	- grades soft at 15 feet	85	37					
	7				70	52				0.1 U 3.0 T	
				▽							
20	8		(21)	Well-graded GRAVEL with clay and sand (GW-GC): medium dense, gray, wet, fine and coarse, subangular, fine- to coarse-grained sand	123	14	21				
	9										
25	10		50/1"	SANDSTONE: brown, dry, fine-grained							

BORING DEPTH: 25.5 ft
DEPTH TO WATER: 19.0 ft
BACKFILL: Portland cement capped with concrete
COMPLETION DATE: November 2, 2005
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 7-in. dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip, 140 lb
RIG TYPE: DR 10K
DRILLED BY: Clear Heart Drilling, Pablo
LOGGED BY: L Al Atik

LOG OF BORING NO. B-16

College of Marin, Marin County, Kentfield Campus
Kentfield, California

LOCATION: Larkspur Annex, next to Magnolia Avenue

SURFACE EL: 10.1 ft +/- 0.5 (rel. MSL datum)

DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
					Asphalt Concrete (3 inches)							
		1		(11)	Clayey SAND (SC): medium dense, brown, moist, medium-grained, trace of gravel and organics (FILL)			40				
		2				103	19					
		3		2	Fat CLAY (CH): soft, greenish gray, moist, trace of organics (marsh deposits)						3.0 P	
5												
					Lean CLAY with sand (CL): very stiff, orangish brown, moist, fine-grained sand (marsh deposits)							
10		4				~~105~~	~~21~~					
		5		(31)		107	22				4.7 U +4.5 P	
					▽							
15		6		(26)		86	38					
		7			Fat CLAY (CH): very stiff, greenish gray, moist, with a trace of organics (marsh deposits)	81	41				1.6 U 3.8 P	
					CLAYSTONE: gray, dry, moderate weathering, trace of fine-grained sand							
20		8		50/3"								

BORING DEPTH: 20.5 ft
DEPTH TO WATER: 14.0 ft
BACKFILL: Portland cement capped with concrete
COMPLETION DATE: November 2, 2005
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 7-in. dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip, 140 lb
RIG TYPE: DR 10K
DRILLED BY: Clear Heart Drilling, Pablo
LOGGED BY: L Al Atik

LOG OF BORING NO. B-17

College of Marin, Marin County, Kentfield Campus
Kentfield, California

Miller Pacific Engineering Group, 2015

BORING 1A

EQUIPMENT: Portable Hydraulic Drill Rig with 4.0-inch Solid Flight Auger
DATE: 3/30/15
ELEVATION: 8.5 - Feet*
*REFERENCE: Stetson Engineering Inc., 2015.

OTHER TEST DATA	OTHER TEST DATA	UNDRAINED SHEAR STRENGTH psf (1)	BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT pcf (2)	DEPTH meters / feet	SAMPLE	SYMBOL (3)	
			30	10.3	124	0 – 0			Silty SAND with Gravel (SM) Brown, dry to moist, medium dense, ~50-55% fine to medium grained sand, ~25-30% round to angular gravels. [Fill]
			20	9.8	128	1 – 5			Clayey SAND with Gravel (SC) Medium to dark grey, moist, dense, ~50-55% fine to medium grained sand, ~25-30% round to angular gravels to 1" Ø. [Fill] At 4.5 feet auger grinding, hole moved 2' down slope to avoid possible utility.
						2 – 10			Boring terminated at 4.5 feet. No groundwater encountered during exploration.
						3 – 15			
						4 – 20			
						5 –			
						6 –			

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m^3 = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

Miller Pacific
ENGINEERING GROUP

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

FILE: 960.103 BL.dwg

BORING LOG

Stetson - Creekside Marsh Culvert
Kentfield, California

Drawn
Checked

Project No. 960.103 Date: 3/30/15

A-2
FIGURE

BORING 1B

EQUIPMENT: Portable Hydraulic Drill Rig with 4.0-inch Solid Flight Auger
DATE: 3/30/15
ELEVATION: 7.5 - Feet*
*REFERENCE: Stetson Engineering Inc., 2015.

OTHER TEST DATA	OTHER TEST DATA	UNDRAINED SHEAR STRENGTH psf (1)	BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT pcf (2)	DEPTH meters / feet	SAMPLE	SYMBOL (3)	
						0 / 0			Silty SAND with Gravel (SM) Brown, dry to moist, medium dense, ~50-55% fine to medium grained sand, ~25-30% round to angular gravels. [Fill]
			14	9.8	128	1			Sandy CLAY with Gravel (CL) Dark brown, moist, stiff, ~65-70% medium plasticity clay, ~25-30% fine to medium grained sand, ~10-15% round to angular gravels to 1" Ø. [Fill]
						5			
		250 UC	4	18.4	113	2			Silty CLAY (CH) Dark gray, wet, soft, high plasticity. [Alluvium / Bay Mud]
	P200 33.2		5	44.3	74	3 / 10			Clayey SAND (SC) Dark gray, saturated, loose, ~65-70% fine to medium grained sand, ~30-35% medium to high plasticity clay. [Alluvium] Grades with lenses of poorly graded, medium grained sand. Between 12.5 and 13 feet grades medium to coarse grained sand lens (SP).
			11	18.6	112	4			
						15			
			2	21.1		5			Silty CLAY (CH) Grey, moist to wet, very soft, high plasticity. [Bay Mud]
									Boring terminated at 16.5 feet. Groundwater measured at 5.0 feet 30 minutes after drilling.
						6 / 20			

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m^3 = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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FILE: 960.103 BL.dwg

BORING LOG

Stetson - Creekside Marsh Culvert
Kentfield, California

Project No. 960.103 Date: 3/30/15

Drawn
Checked

A-3
FIGURE

BORING 2

EQUIPMENT: Portable Hydraulic Drill Rig with 4.0-inch Solid Flight Auger
DATE: 3/30/15
ELEVATION: 7.5 - Feet*
*REFERENCE: Stetson Engineering Inc., 2015.

OTHER TEST DATA	OTHER TEST DATA	UNDRAINED SHEAR STRENGTH psf (1)	BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT pcf (2)	DEPTH meters / feet	SAMPLE	SYMBOL (3)	
		900 UC	15	8.6	125	0 / 0			Clayey SAND with Gravel (SC) Brown, dry, loose, ~60-65% fine to medium grained sand, ~25-30% low plasticity clay, angular to rounded gravels to 1" Ø. [Fill]
			7			1 / 5			Sandy CLAY with Gravel (CL) Dark gray, moist, medium stiff, ~65-70% medium to high plasticity clay, ~10-15% fine to coarse grained sand, trace angular to rounded gravels to 1" Ø. [Fill]
			7	12.1	103				
			8	16.0		2			
			3	21.6					Sandy CLAY(CH) Gray with orange and brown, wet, very soft, ~55-60% medium to high plasticity clay, ~35-40% fine to medium grained sand, ~5-10% sub-rounded to rounded gravels to 1/4" Ø. [Alluvium]
				38.2	85				
		225 UC	7	25.0	99	3 / 10			SAND (SP) Gray, saturated, loose, ~90-95% medium grained sand, ~5-10% medium plasticity clay. [Alluvium]
						4 / 15			Boring terminated at 10.5 feet. Groundwater measured at 8.0 feet 30 minutes after drilling.
						5			
						6 / 20			

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m^3 = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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FILE: 960.103 BL.dwg

BORING LOG

Stetson - Creekside Marsh Culvert
Kentfield, California

Project No. 960.103 Date: 3/30/15

Drawn
Checked

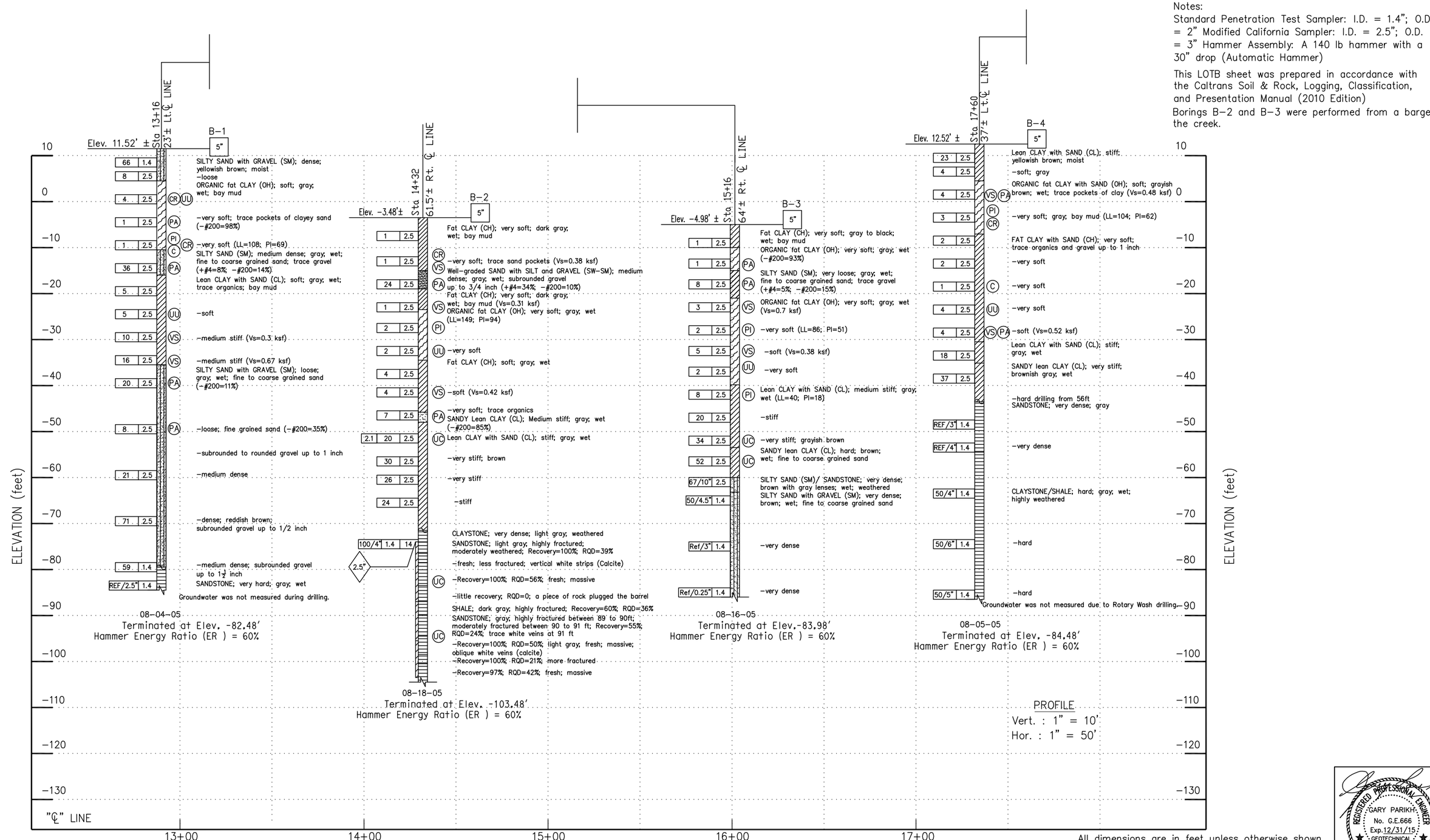
A-4
FIGURE

Parsons Brinckerhoff, 2014

Notes:
Standard Penetration Test Sampler: I.D. = 1.4"; O.D. = 2" Modified California Sampler: I.D. = 2.5"; O.D. = 3" Hammer Assembly: A 140 lb hammer with a 30" drop (Automatic Hammer)

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock, Logging, Classification, and Presentation Manual (2010 Edition)

Borings B-2 and B-3 were performed from a barge in the creek.



All dimensions are in feet unless otherwise shown

100% NOT FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
GARY PARIKH
No. G.E.666
Exp.12/31/15
GEOTECHNICAL
STATE OF CALIFORNIA

REVISIONS						
NO.	DESCRIPTION	DATE	DESIGNED	DRAWN	CHECKED	

SCALE: H: ____ V: ____

1" — ON ORIGINAL SCALE DRAWING ADJUST SCALED DIMENSIONS IF THIS DOES NOT SCALE AT 1"

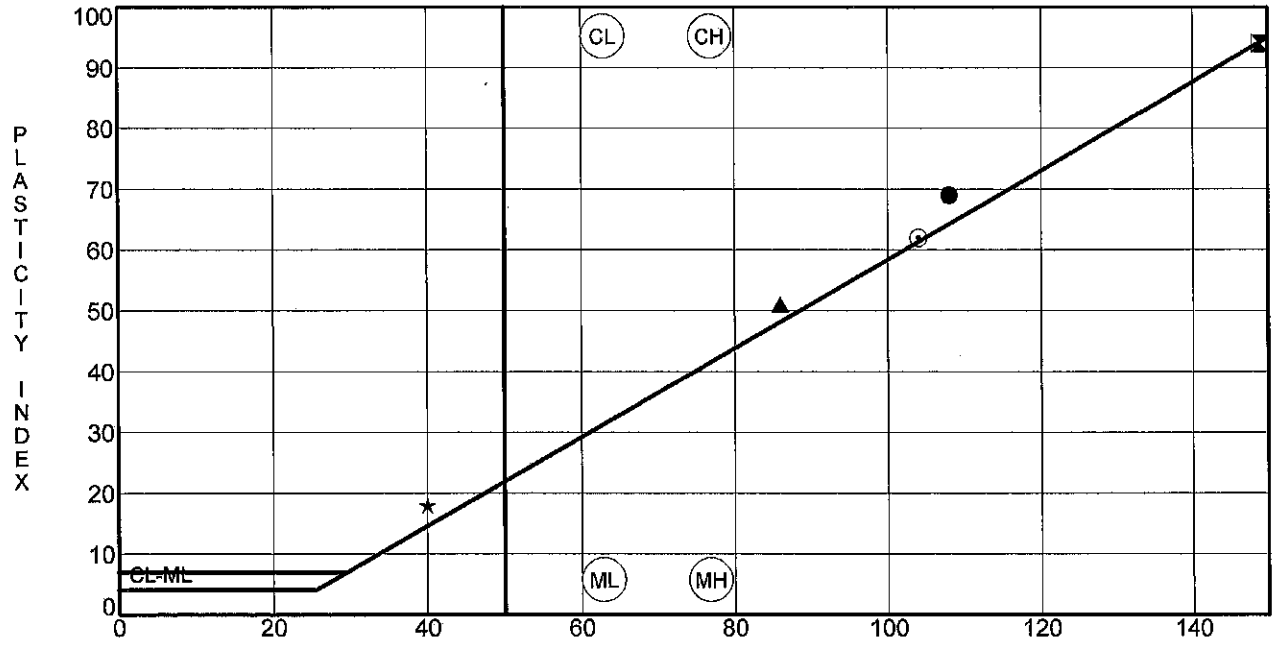
CITY OF LARKSPUR
DEPARTMENT OF PUBLIC WORKS

DRAWN BY: O. GOUTHIER DATE: 9/28/12
DESIGNED BY: D. WANG R.C.E. NO. 52911 DATE: 9/28/12
CHECKED BY: G. PARIKH R.G.E. NO. 666 DATE: 9/28/12

PARSONS BRINCKERHOFF
2329 Gateway Oaks Drive
SACRAMENTO, CALIFORNIA 95833
Tele: 916-567-2500
Fax 916-925-3517

PROJECT PLANS FOR:
BON AIR ROAD BRIDGE REPLACEMENT
LOG OF TEST BORINGS 2 OF 2

DRAWING S-36
SHEET 90 OF 90



PLASTICITY

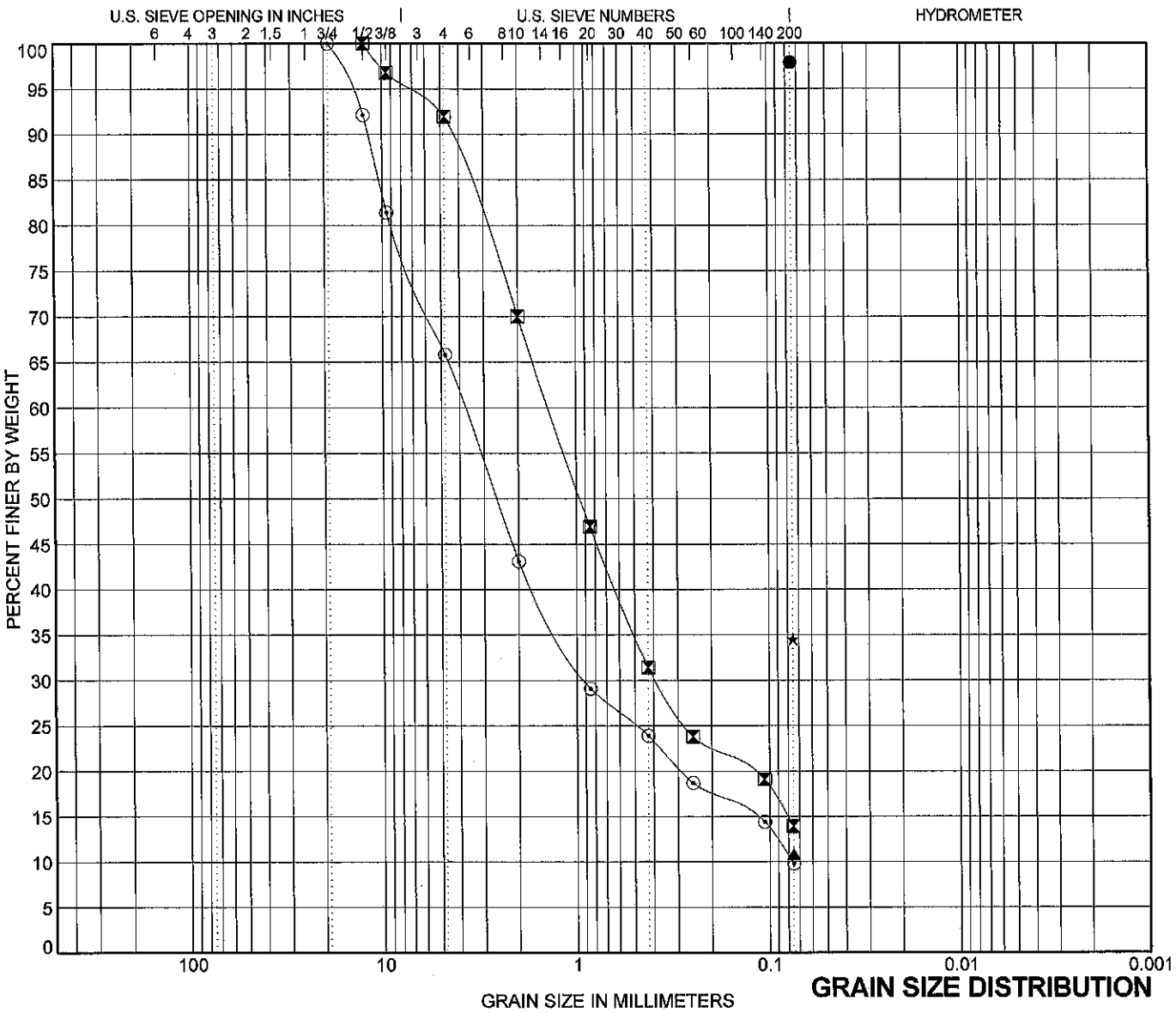
	BOREHOLE	SAMPLE #	DEPTH	LL	PL	PI	Fines	Classification
●	B-1	5	20.0	108	39	69		ORGANIC FAT CLAY (OH)
⧓	B-2	5	23.0	149	55	94		ORGANIC clay
▲	B-3	5	22.0	86	35	51		ORGANIC CLAY (OH)
★	B-3	8	36.0	40	22	18		LEAN CLAY WITH SAND (CL)
⊙	B-4	4	15.0	104	42	62		ORGANIC lean CLAY with SAND

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

BON AIR ROAD BRIDGE
CITY OF LARKSPUR, CALIFORNIA

JOB NO: 2005-119.BON

PLATE NO: B-2



GRAIN SIZE DISTRIBUTION

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING	SAMPLE #	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-1	4	15.0	ORGANIC FAT CLAY (OH)					
⊠	B-1	6	25.0	SILTY SAND (SM)					
▲	B-1	11	50.0	SILTY SAND WITH GRAVEL (SM)					
★	B-1	12	60.0	SILTY SAND WITH GRAVEL (SM)					
⊙	B-2	3	13.5	Well-graded SAND with SILT and GRAVEL				2.78	50.02

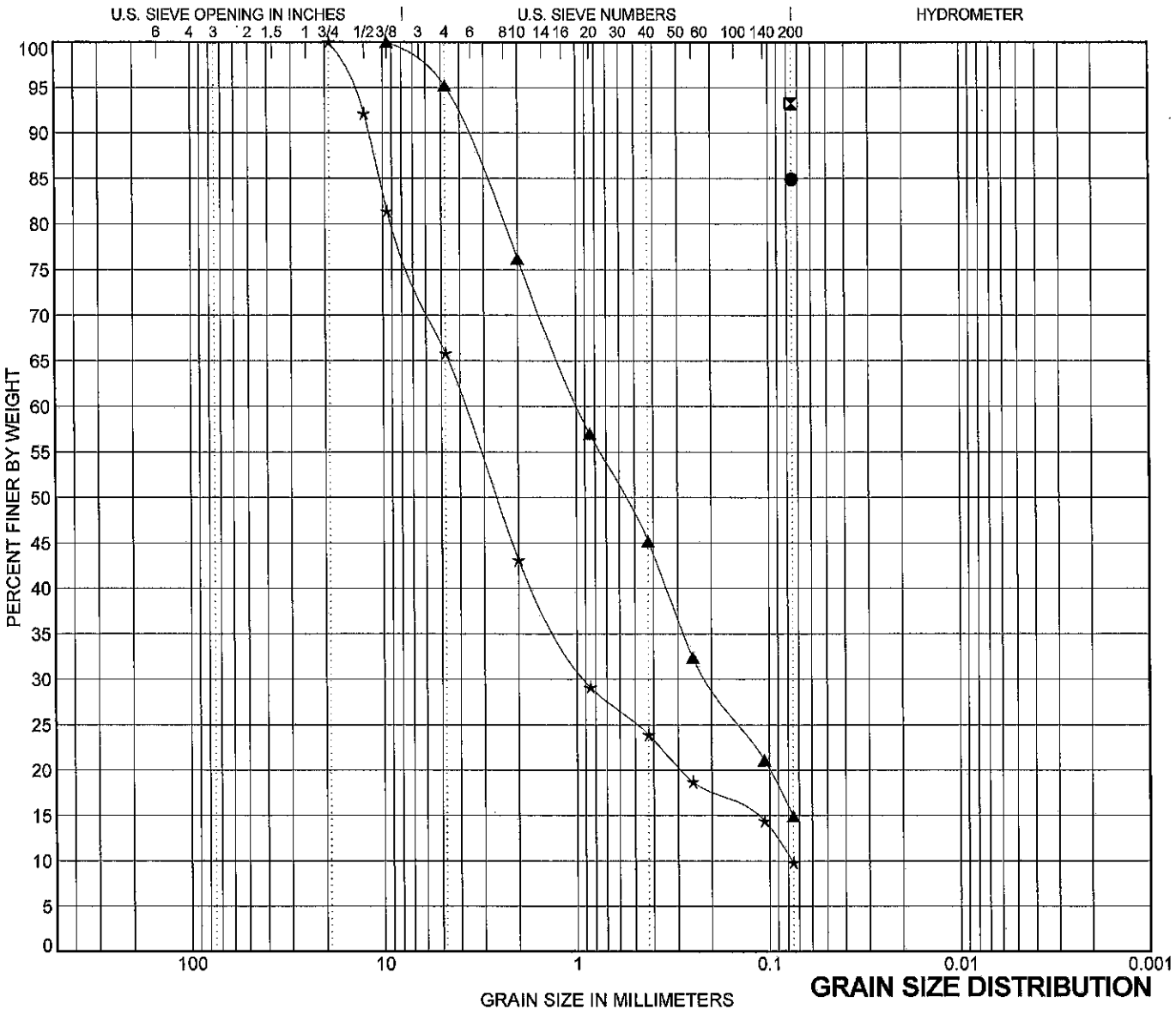
	BORING	SAMPLE #	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	4	15.0	0.075						97.9	
⊠	B-1	6	25.0	12.5	1.381	0.385		8.1	78.0	13.9	
▲	B-1	11	50.0	0.075						10.8	
★	B-1	12	60.0	0.075						34.5	
⊙	B-2	3	13.5	19	3.808	0.898	0.076	34.2	56.0	9.8	

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

BON AIR ROAD BRIDGE
CITY OF LARKSPUR, CALIFORNIA

JOB NO: 2005-119.BON

PLATE NO: B-3A



GRAIN SIZE DISTRIBUTION

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING	SAMPLE #	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-2	9	42.0	SANDY lean CLAY					
⊠	B-3	2	7.5	ORGANIC CLAY (OH)					
▲	B-3	3	12.0	SILTY SAND (SM)					
★	B-4	3	10.0	ORGANIC lean CLAY with SAND				2.78	50.02
⊙	B-4	9	40.0	Fat CLAY with SAND					

	BORING	SAMPLE #	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-2	9	42.0	0.075						84.9	
⊠	B-3	2	7.5	0.075						93.2	
▲	B-3	3	12.0	9.5	0.972	0.208		4.8	80.3	14.9	
★	B-4	3	10.0	19	3.808	0.898	0.076	34.2	56.0	9.8	
⊙	B-4	9	40.0	0.075						84.9	

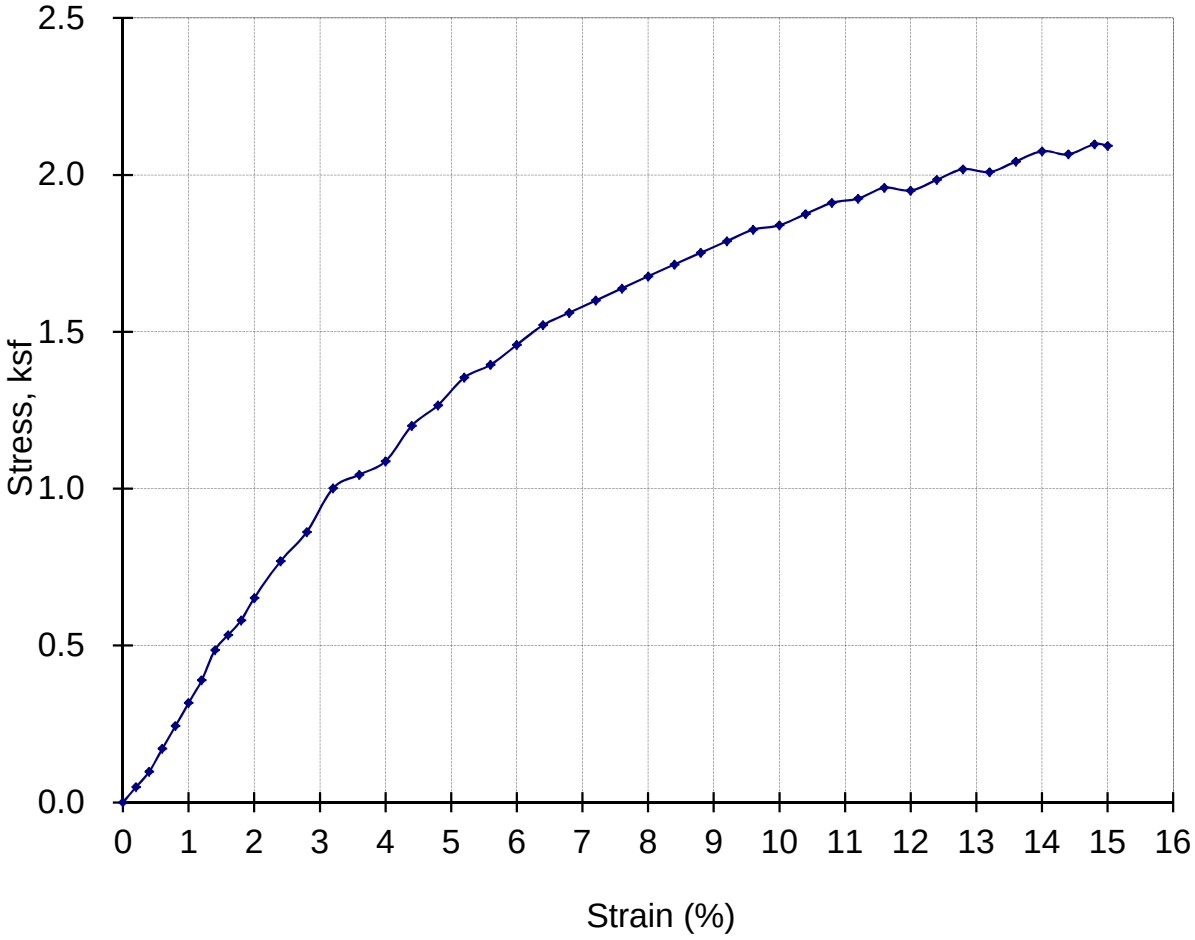
PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

BON AIR ROAD BRIDGE
CITY OF LARKSPUR, CALIFORNIA

JOB NO: 2005-119.BON

PLATE NO: B-3B

UNCONFINED COMPRESSION TEST



Boring No.: B-2

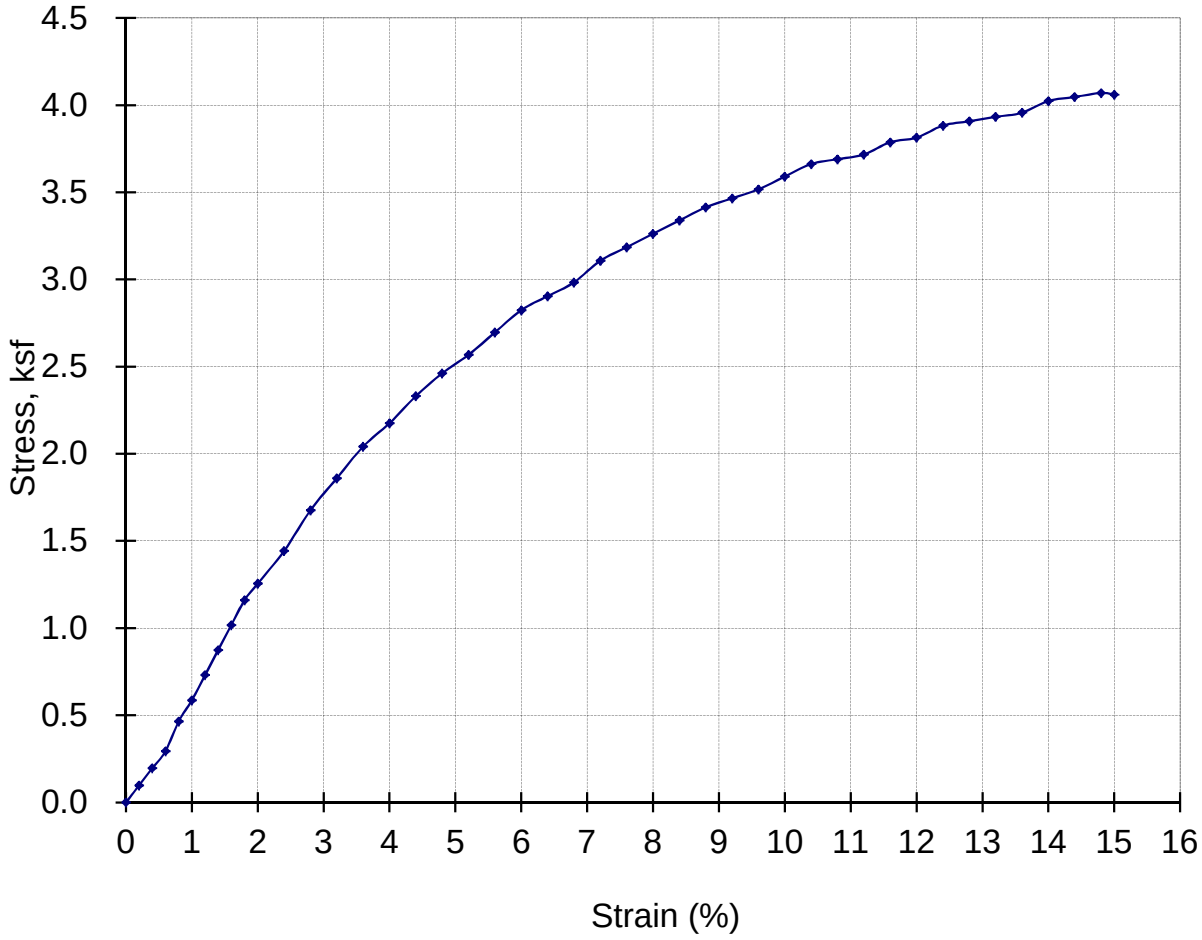
Sample No. : 10 **Maximum Strength (ksf)** 2.10

Depth (feet): 47 **Strain @ Failure (%):** 15.00

Material Description:
Stiff, Lean Clay

PARIKH CONSULTANTS, INC. **GEOTECHNICAL CONSULTANTS** **MATERIALS TESTING**	**BON AIR BRIDGE REPLACEMENT** **CITY OF LARKSPUR, CALIFORNIA**	
	JOB NO.: 2005-119.BON	**PLATE NO.:**

UNCONFINED COMPRESSION TEST



Boring No.: B-3

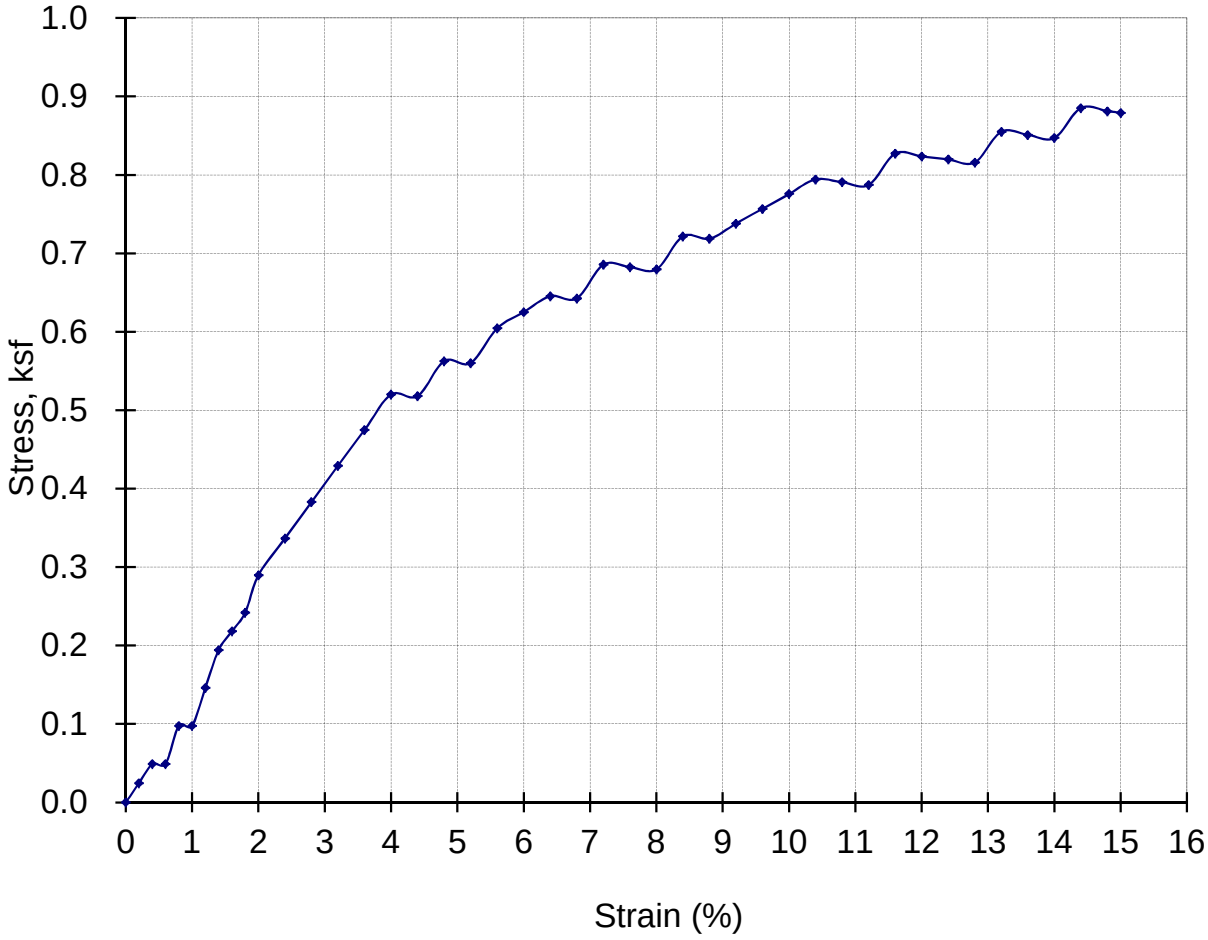
Sample No. : 10 **Maximum Strength (ksf):** 4.10

Depth (feet): 46 **Strain @ Failure (%):** 15.00

Material Description:
Stiff, Lean Clay

PARIKH CONSULTANTS, INC. **GEOTECHNICAL CONSULTANTS** **MATERIALS TESTING**	**BON AIR BRIDGE REPLACEMENT** **CITY OF LARKSPUR, CALIFORNIA**	
	JOB NO.: 2005-119.BON	**PLATE NO.:**

UNCONFINED COMPRESSION TEST



Boring No.: B-3

Sample No. : 11 **Maximum Strength (ksf):** 0.90

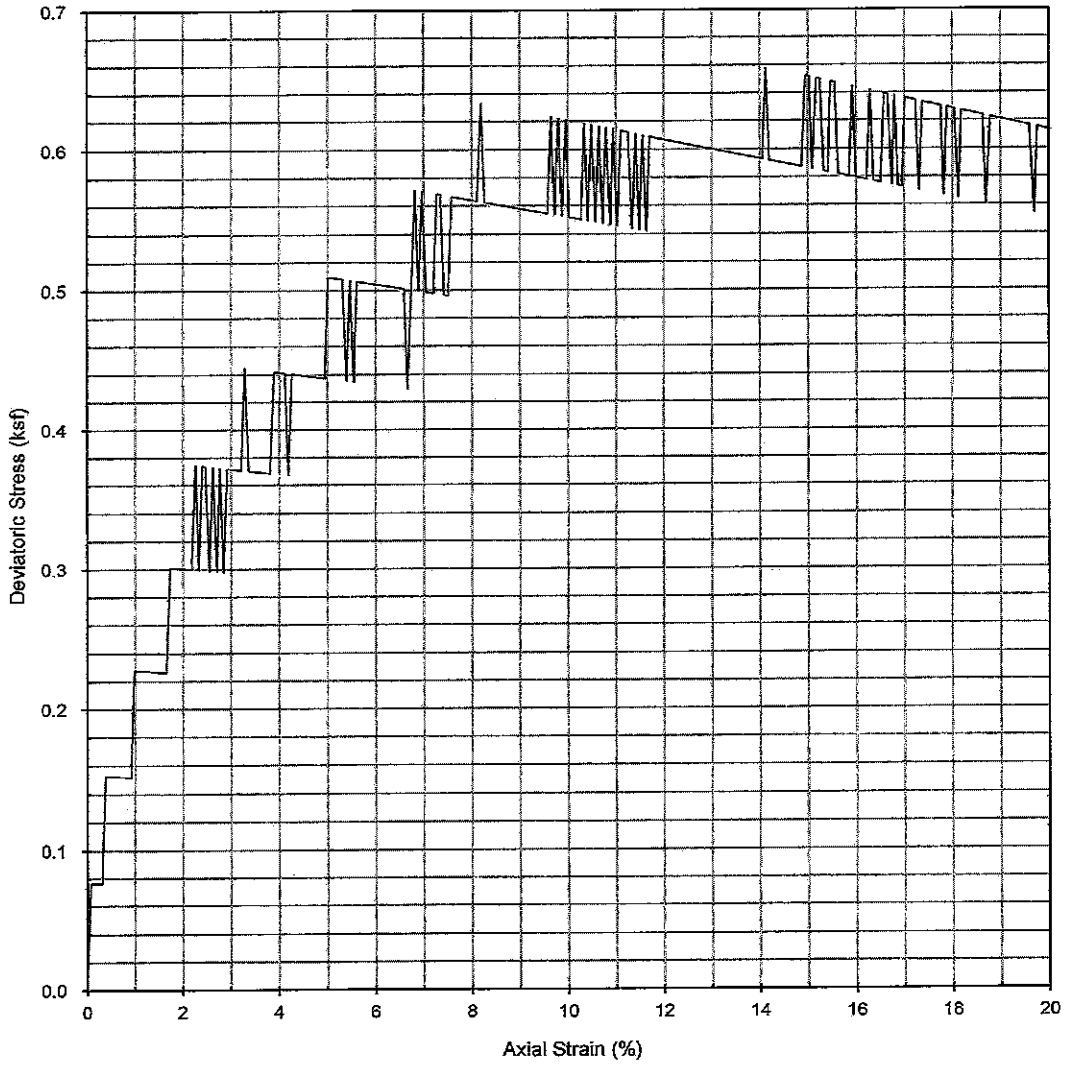
Depth (feet): 50.5 **Strain @ Failure (%):** 15.00

Material Description:
Stiff, Lean Clay

PARIKH CONSULTANTS, INC. **GEOTECHNICAL CONSULTANTS** **MATERIALS TESTING**	**BON AIR BRIDGE REPLACEMENT** **CITY OF LARKSPUR, CALIFORNIA**	
	JOB NO.: 2005-119.BON	**PLATE NO.:**

UNCONSOLIDATED UNDRAINED COMPRESSION TEST

Stress vs. Strain



Boring No.	B1
Sample No.	3
Elev. or Depth (ft)	10'
Soil Description	Organic clay, gray

Height of Sample (inch)	5
Initial Diameter (inch)	2.416
% Moisture	90.3
Dry Density (pcf)	46.6
Cell Pressure (ksf)	0.576
Maximum Strength (ksf)	0.66
Strain @ Failure (%)	14.1

Date: 8/24/2005

File Name: U-B1-03

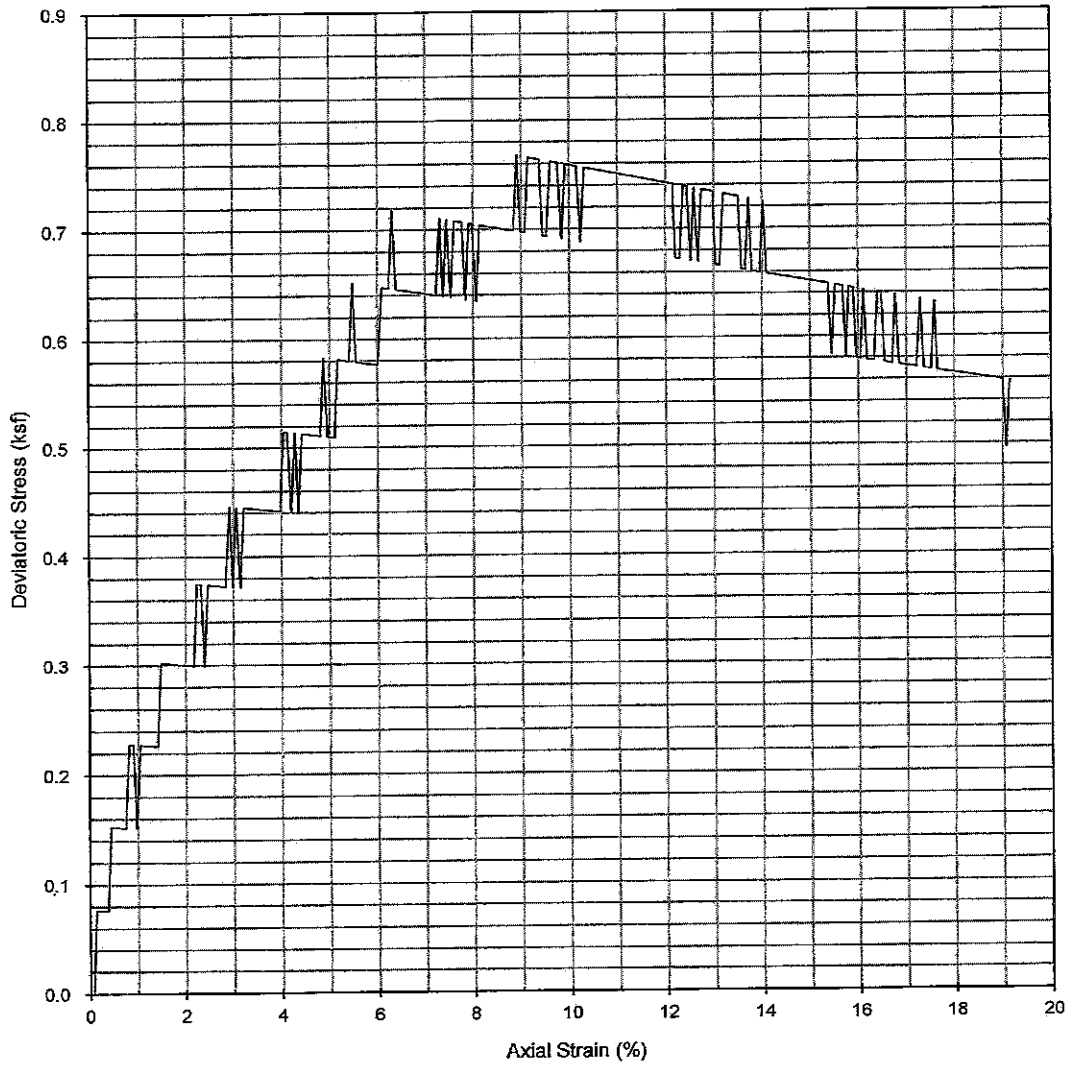
PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

BON AIR ROAD BRIDGE

JOB NO.: 205119.BON

UNCONSOLIDATED UNDRAINED COMPRESSION TEST

Stress vs. Strain



Boring No.	B1
Sample No.	8
Elev. or Depth (ft)	35'
Soil Description	Organic clay, gray

Height of Sample (inch)	5
Initial Diameter (inch)	2.416
% Moisture	59.7
Dry Density (pcf)	62.9
Cell Pressure (ksf)	1.728
Maximum Strength (ksf)	0.77
Strain @ Failure (%)	8.4

Date: 8/24/2005

File Name: U-B1-08

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

BON AIR ROAD BRODGE

JOB NO.: 205119.BON

Corporate Offices
Materials Laboratory
1300 Space Park Way
Mountain View, California 94043-1343
Telephone: (650) 967-6982
Facsimile: (650) 967-6955

DCI

DYNAMIC CONSULTANTS, INC.
Testing & Inspection Services

Branch Office
Watsonville, California

September 1, 2005/br

Parikh Consultants, Inc.
356 South Milpitas Blvd.
Milpitas, California 95035

DCI No.: 5103-M02
Lab No.: 5M-531908

Attention: Prav Dayah

PROJECT: BON AIR ROAD BRIDGE, NO. 205119.BON

SUBJECT: Rock Core Test Results

Two (2) 2.45' diameter rock cores were submitted to our laboratory by your representative on August 29, 2005 and were tested for determination of unconfined compressive strength in accordance with ASTM D2938.

SUMMARY OF TEST RESULTS:

Unconfined Compressive Strength – ASTM D-2938

Core No. 1 - B2 @ 79' to 80' UCS: 6,670 psi

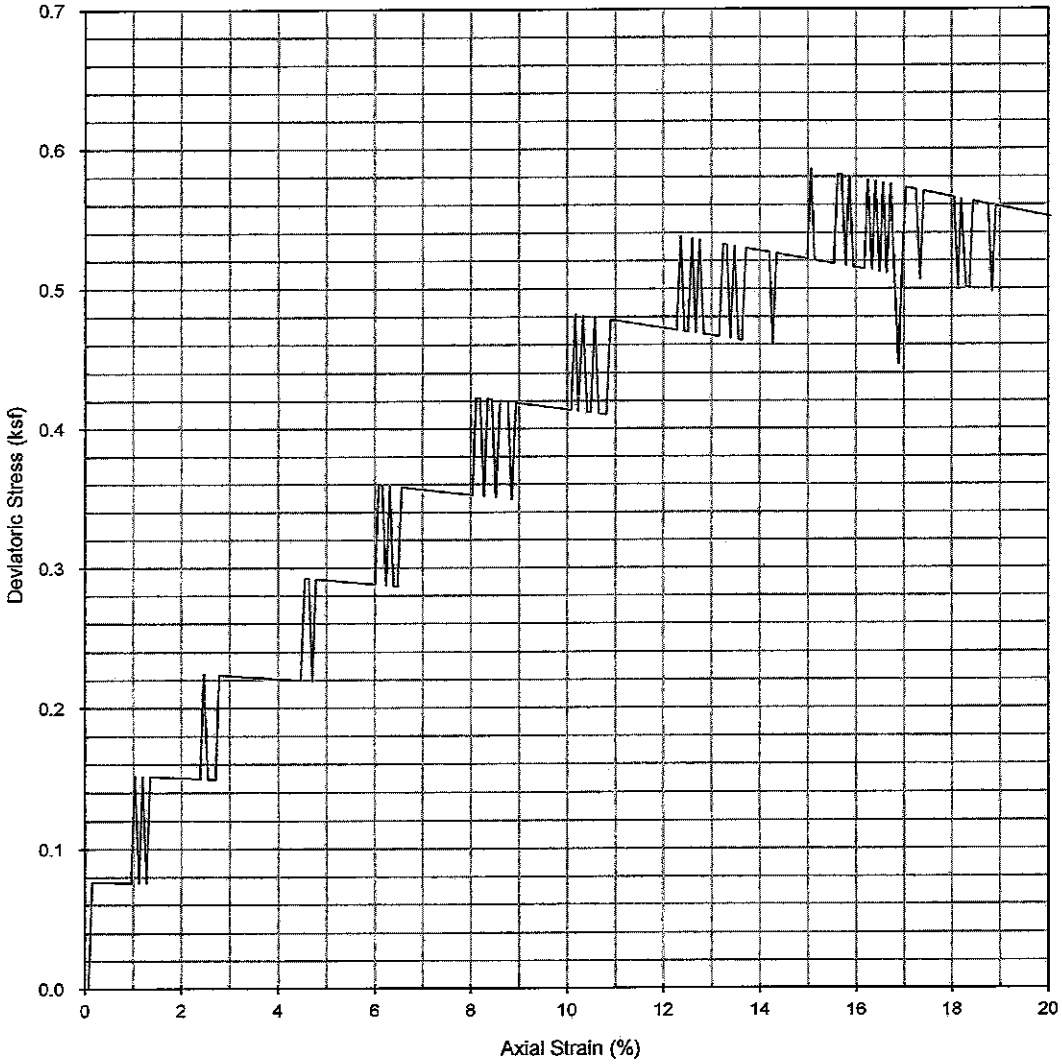
Core No. 2 - B2 @ 91' to 92' UCS: 8,010 psi

Respectfully submitted,
DYNAMIC CONSULTANTS, INC.

Bill Rodriguez
Laboratory Supervisor
1c:

UNCONSOLIDATED UNDRAINED COMPRESSION TEST

Stress vs. Strain



Boring No.	B2
Sample No.	6
Elev. or Depth (ft)	28'
Soil Description	Organic clay, gray

Height of Sample (inch)	5
Initial Diameter (inch)	2.416
% Moisture	79.1
Dry Density (pcf)	52.4
Cell Pressure (ksf)	1.584
Maximum Strength (ksf)	0.59
Strain @ Failure (%)	15.0

Date: 9/6/2005

File Name: U-B2-06

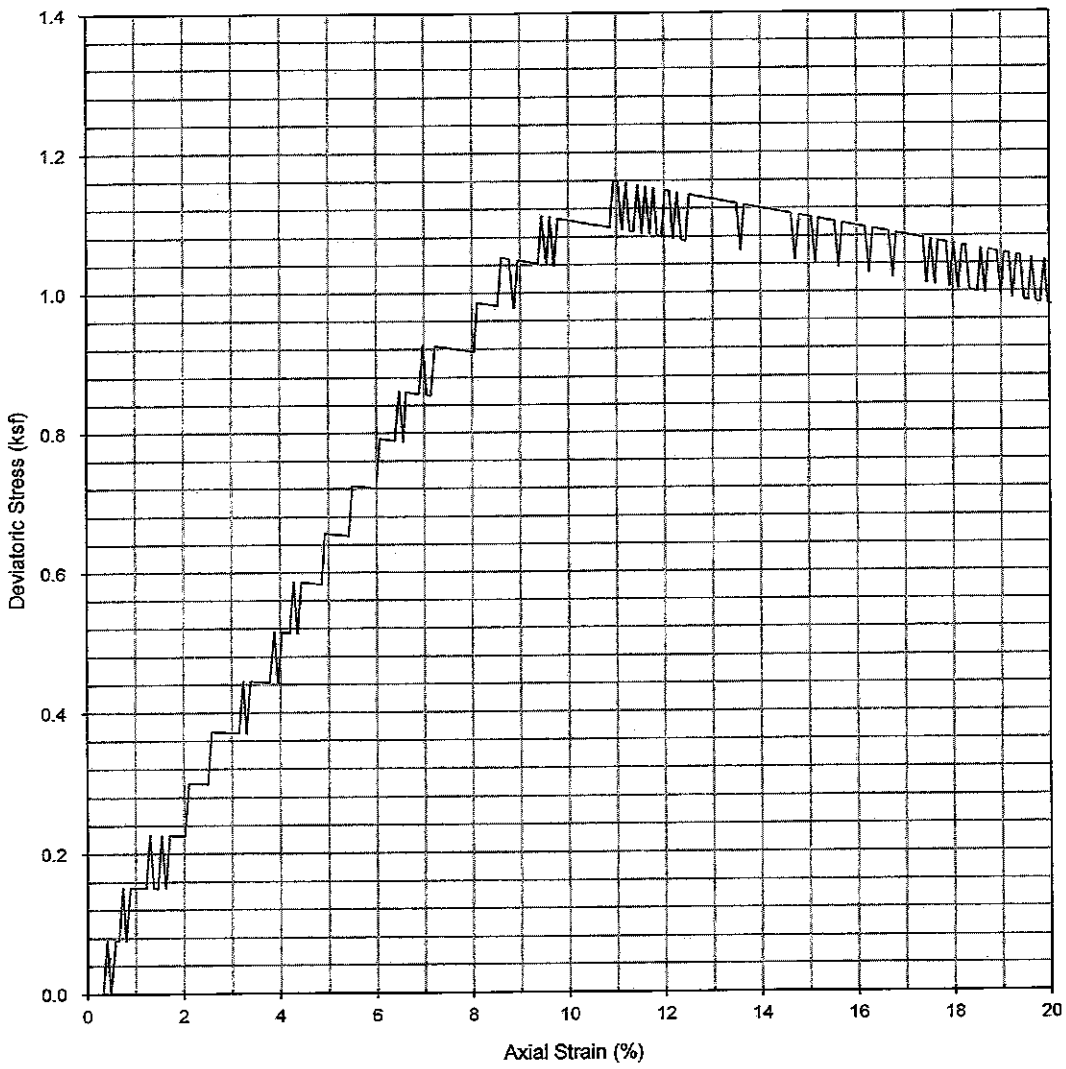
PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

BON AIR ROAD BRIDGE

JOB NO.: 205119.BON

UNCONSOLIDATED UNDRAINED COMPRESSION TEST

Stress vs. Strain



Boring No.	B3
Sample No.	7
Elev. or Depth (ft)	31'
Soil Description	Organic clay, dark brown

Height of Sample (inch)	5
Initial Diameter (inch)	2.416
% Moisture	74.8
Dry Density (pcf)	62.5
Cell Pressure (ksf)	1.728
Maximum Strength (ksf)	1.16
Strain @ Failure (%)	11.0

Date: 9/6/2005

File Name: U-B3-07

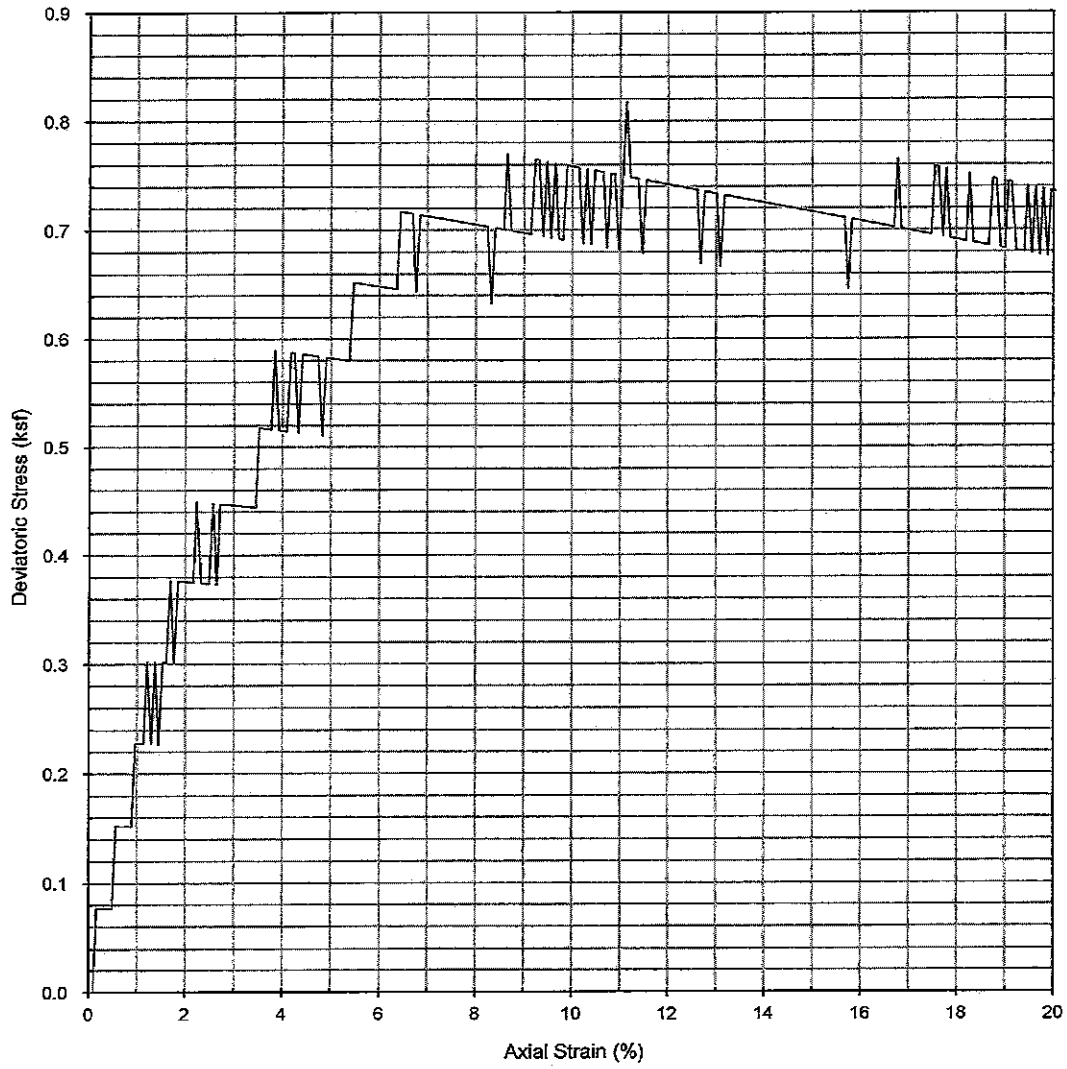
PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

BON AIR ROAD BRIDGE

JOB NO.: 205119.BON

UNCONSOLIDATED UNDRAINED COMPRESSION TEST

Stress vs. Strain



Boring No.	B4
Sample No.	8
Elev. or Depth (ft)	35'
Soil Description	Lean clay, reddish brown

Height of Sample (inch)	5
Initial Diameter (inch)	2.416
% Moisture	89.1
Dry Density (pcf)	48.3
Cell Pressure (ksf)	2.016
Maximum Strength (ksf)	0.82
Strain @ Failure (%)	10.6

Date: 8/24/2005

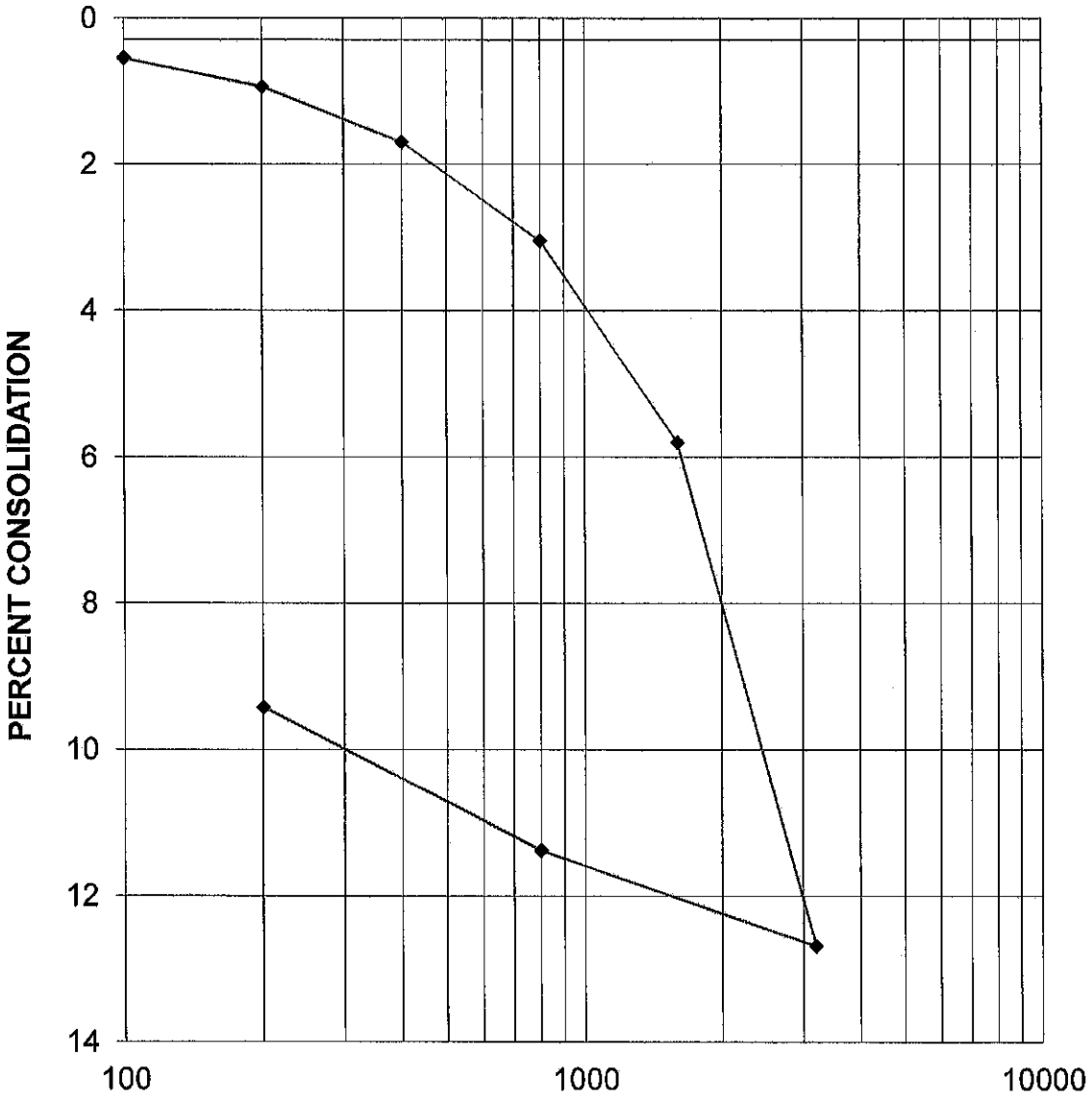
File Name: U-B4-08

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

BON AIR ROAD BRIDGE

JOB NO.: 205119.BON

CONSOLIDATION TEST RESULTS



	MOISTURE CONTENT %	DRY DENSITY PCF	HEIGHT (INCHES)	DIAMETER (INCHES)
INITIAL	89.4	49.9	1.0000	2.416
FINAL	77.8	55.1	0.9058	2.416

BORING NO.	B1	SAMPLE NO.	5	ELEV. OR DEPTH	20'
DESCRIPTION	Organic clay, gray				

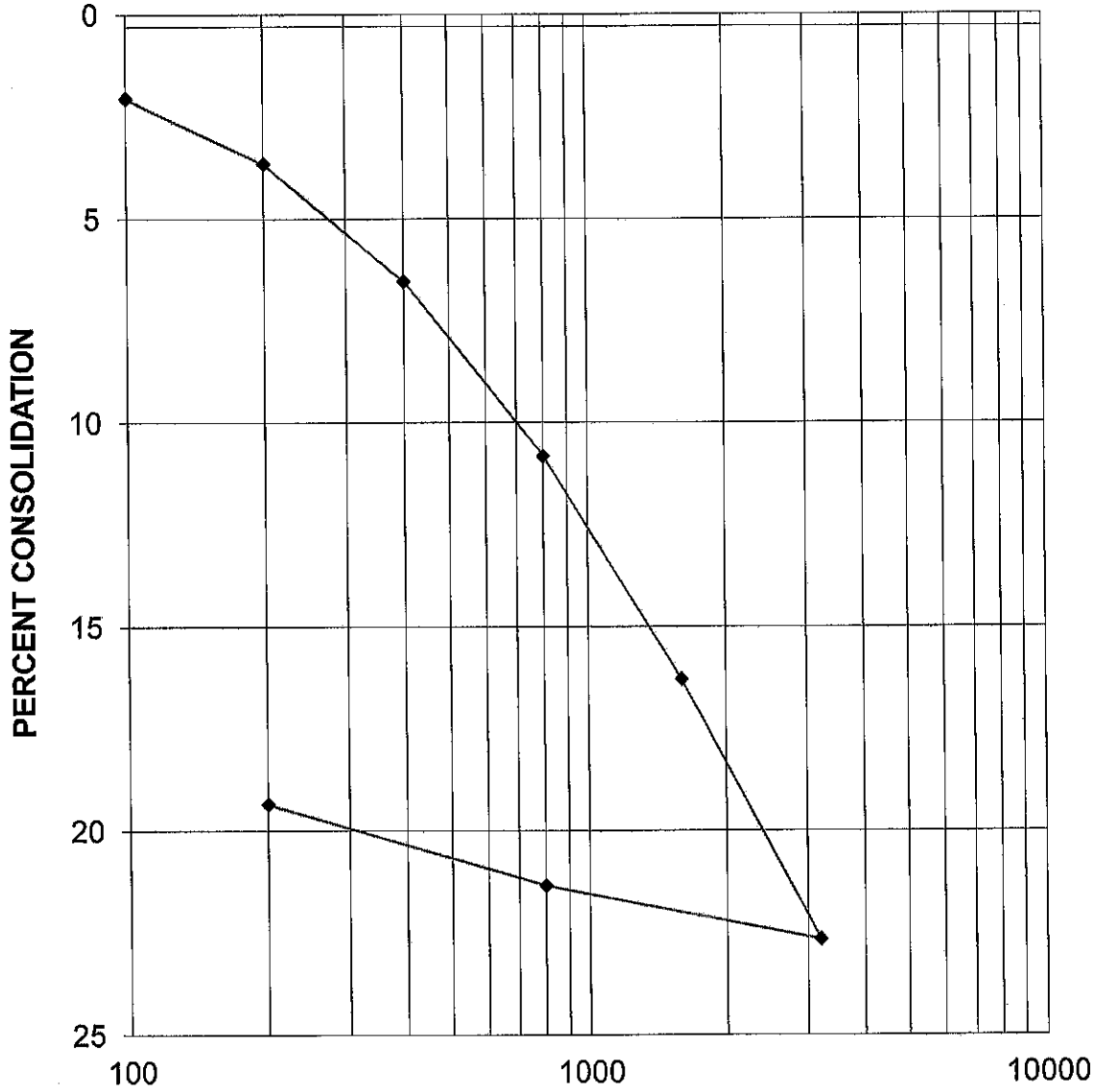
PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

Bon Air Road Bridge
WOOD RODGERS, INC.

DATE	JOB NO:
8/30/2005	205119.BON

Reported by: Prav Dayah

CONSOLIDATION TEST RESULTS



	MOISTURE CONTENT %	DRY DENSITY PCF	HEIGHT (INCHES)	DIAMETER (INCHES)
INITIAL	83.8	52.5	1.0000	2.416
FINAL	62.0	65.2	0.8065	2.416

BORING NO.	B4	SAMPLE NO.	7	ELEV. OR DEPTH	30'
DESCRIPTION	Organic clay, gray				

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

Bon Air Road Bridge
WOOD RODGERS, INC.

DATE	JOB NO:
8/30/2005	205119.BON

Reported by: Prav Dayah

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 09/02/2005
Date Submitted 08/30/2005

To: Prav Dayah
Parikh Consultants, Inc.
356 S. Milpitas Blvd.
Milpitas, Ca 95035

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 205119.BON/BONAIR BR Site ID : B1 #3 @ 10'.
Thank you for your business.

* For future reference to this analysis please use SUN # 45719-90430.

EVALUATION FOR SOIL CORROSION

Soil pH	7.57		
Minimum Resistivity	0.09	ohm-cm (x1000)	
Chloride	4905.2 ppm	00.49052	%
Sulfate	371.3 ppm	00.03713	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 09/02/2005
Date Submitted 08/30/2005

To: Prav Dayah
Parikh Consultants, Inc.
356 S. Milpitas Blvd.
Milpitas, Ca 95035

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 205119.BON/BONAIR BR Site ID : B1 #5 @ 20'.
Thank you for your business.

* For future reference to this analysis please use SUN # 45719-90429.

EVALUATION FOR SOIL CORROSION

Soil pH	7.78	
Minimum Resistivity	0.04 ohm-cm (x1000)	
Chloride	10538.4 ppm	00.05380 %
Sulfate	373.0 ppm	00.03730 %

METHODS
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 09/09/2005
Date Submitted 09/02/2005

To: Prav Dayah
Parikh Consultants, Inc.
356 S. Milpitas Blvd.
Milpitas, Ca 95035

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 205119.BON/BONAIR RD Site ID : B-2 #2 @ 8.5'.
Thank you for your business.

* For future reference to this analysis please use SUN # 45743-90499.

EVALUATION FOR SOIL CORROSION

Soil pH	7.72		
Minimum Resistivity	0.05	ohm-cm (x1000)	
Chloride	9632.7 ppm	00.96327	%
Sulfate	802.4 ppm	00.08024	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 09/02/2005
Date Submitted 08/30/2005

To: Prav Dayah
Parikh Consultants, Inc.
356 S. Milpitas Blvd.
Milpitas, Ca 95035

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 205119.BON/BONAIR BR Site ID : B4 #4 @ 15'.
Thank you for your business.

* For future reference to this analysis please use SUN # 45719-90431.

EVALUATION FOR SOIL CORROSION

Soil pH	7.44	
Minimum Resistivity	0.06 ohm-cm (x1000)	
Chloride	7457.9 ppm	00.74579 %
Sulfate	526.7 ppm	00.05267 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

US Army Corps of Engineers (USACE), 1968

BELOW BON AIR ROAD BRIDGE

2F-38
El. 9.9
1 June 1965

Depth
0' SM — Clayey Sand, tan, w/some fine gravel, damp, loose, fine sand, fill mat'l.
2' CH — Clay, (organic), mottled brown & gray, moist, soft, fat. W=98
Sa.13, Fi.81, LL-80, PI-48, W=68
5' CH — Silty Clay, (organic), gray, very wet, very soft, organics partially decayed, (Bay Mud).
7' CH — Clay, (organic), gray, very wet, soft, organics partially decayed. W=104
W=110
15' CH — Clay, gray, very wet, very soft.
Sa.1, Fi.99, LL-113, PI-73, W=106
19' CH — Sandy Clay, gray, w/some shell fragments, very wet, very soft, fine sand. W=63
C.B. 21' CH — Clay, gray, very wet, very soft, w/an occas. shell fragment. W=95
25'

2F-39
El. 8.0
1 June 1965

Depth
0' CL — Clay, gray, damp, fat, (Bay Mud), fill material.
0.8 Sa. 92, Fi.58, LL-44, PI-22, W. 32
Clayey Sand, tan, w/some fine gravel, moist, loose, fine sand, fill material.
3' CH — Clay, (organic), tan & gray, wet, soft, organics partially decayed. W=74
6' CH — Clay, (organic), dark gray, very wet, very soft, highly organic, organics partially decayed. W=97
W=86
14' CH — Clay, gray, very wet, very soft, w/some shell fragments, (Bay Mud). W=100
15' CH — Sandy Clay, dark gray, very wet, very soft, fine sand, w/shell fragments. W=72
C.B. 20'
Sa.48, Fi.52, LL-39, PI-19, W=42
CL
25'

2F-40
El. 8.1
1 June 1965

Depth
0' CL — Sandy Silt, tan, damp, firm, fine sand, fill. W=21
2' CL — Clay, tan & gray, moist, firm, w/some fine sand & fine gravel, fill. W=35
4' CH — Clay, gray, very wet, very soft, (Bay Mud). W=70
6' CH — Clay, (highly organic), dark gray, w/some fine sand, very wet, very soft, organics partially decayed. W=81
11' CH — Clay, gray, very wet, very soft. W=114
16' CH — Clay, gray, very wet, very soft, w/some fine sand & shell fragments. W=80
C.B. 19' CH — Sandy Clay, dark gray, very wet, very soft, fine sand.
Sa.29, Fi.71, LL-63, PI-41, W=68
25'

2F-41
El. 7.0
2 June 1965

Depth
0' CL — Sandy Silt, tan, damp, loose, fine sand, fill. W=18
1.5' CH — Clay, mottled brown & gray, w/some sand & organic matter, fill mat'l. W=47
4' CH — Clay, gray, very wet, very soft, (Bay Mud). W=67
5.5' OH — Clay, (organic), gray, very wet, very soft, highly organic, organics partially decayed.
Sa.1, Fi.99, W=200.0=24
9' CH — Clay, gray, very wet, very soft. W=116
W=98
C.B. 19' SC — Sandy Clay, gray, very wet, very soft, w/some shell fragments, fine sand. W=45
23.5' CH — Silty Clay, gray, wet, very soft, w/partially decayed pieces of wood. W=90
25'

2F-42
El. 8.4
2 June 1965

Depth
0' CH — Sandy Silt, tan, w/gray clay, damp, firm, fill.
Sa.20, Fi.80, LL-53, PI-25, W=37
4' CH — Clay, gray, w/some organics, moist, firm, (Bay Mud), fill mat'l. W=64.4
5.5' CH — Sandy Clay & Clay layers, gray, moist, firm, fine sand, layers to 2" thick. W=60
6.5' CH — Clay, (highly organic), wet, soft, organics partially decayed, original ground. W=85
less organics w/depth.
11.5' CH — Clay, gray, very wet, very soft, w/some shell fragments.
Sa.1, Fi.99, LL-120, PI-81, W=110
17' CH — Sandy Clay, gray, w/some shell fragments, very wet, very soft, fine sand.
W=69
C.B. 22' SC
Gr.13, Sa.47, Fi.40, LL-36, PI-17, W=33
25'

BELOW BON AIR ROAD BRIDGE | ABOVE BON AIR ROAD BRIDGE

2F-10
El. 6.0
30 Nov. 1959

Depth
0' CL — Silt, tan, damp, loose.
1.5' OH — Clay, blue-gray & brown, moist, firm, (Bay Mud).
3.5' CH — Clay, blue-gray, moist, soft, thickly matted w/ decaying vegetation, some reddish brown organic stains.
Sa.7, Fi.93, LL-102, PI-59, G=2.71, O=11.4
OH — Clay, black & dark gray, very wet, soft, thickly matted w/decayed vegetation, (Bay Mud).
8.5' CH — Clay, blue-gray, very wet, very soft, some decayed vegetation, (Bay Mud).
C.B.
20' CL — Sandy Clay, blue-gray, very wet, soft, fine sand.
21.3' CH — Clay, blue-gray, very wet, very soft. (Bay Mud)
25'

2F-10
Continued:

Depth
25' CH — Same matl from 21.3' to 47.8'.
Sa.5, Fi.35, LL-57, PI-57, G=2.76
47' — Sandy Clay, blue-gray, soft, sand mostly med. grained.
52' — Sandstone, dark green, moist, fine grained, some small mica flakes, decomposed.
53' — Sandstone, dark green, damp, med. hard, fine grained, some small mica flakes.

2F-20
El. 3.5 234' Lt. ℄
10 May 1965

Depth
0' CH — Clay, (organic), mottled brown & gray, wet, soft, fat.
2' CH — Clay, (organic), gray, wet, very soft, almost peat.
4' CH — Clay, gray, wet, very soft.
Sa.1, Fi.99, LL-141, PI-98, W=140
Becoming softer w/depth (soupy).
9' CH
13' — No sample – feels like coarse sand & small gravels.
C.B.
16' — No sample - drills like soft clay.
16.8' — Unable to hand auger thru coarse sand.

2F-21
El. 3.6 · 170' Lt. ℄
10 May 1965

Depth
0' CH — Clay, (organic), mottled brown & gray, wet, soft.
2' CH — Clay, (organic), gray, very wet, very soft, almost like peat.
5.3' CH — Clay, gray, very wet, very soft.
6' CH — Becoming softer & soupy w/depth.
Fi.100, LL-133, PI-93, W=133
10' CH
Sa.2, Fi.96, LL-119, PI-80, W=122
C.B.
16' — No sample – drills like coarse sand & small gravels.
18' — Clay, gray, wet, soft, (soupy).
20'

2F-26
El. 4.6 50' Lt. ℄
12 May 1965

Depth
0' — Silt, brown, damp, loose, becoming moist w/depth.
2.5' — Silt, mottled brown-rust & gray, wet, loose.
4' CH — Sandy Silt, gray, very wet, soft, fine sand, w/some organics.
Sa.12, Fi.88, LL-69, PI-42, W=62
7' SM — Silty Sand, gray, very wet, loose, fine sand.
8.5' SC — Clayey Sand, gray, wet, loose, fine sand.
13.5' CL — Sandy Clay, gray, wet, firm, fine sand, w/some organic matter.
C.B.
18' — No Sample – drills like firm clayey sand, w/some gravel.
20'

THIS PRINT REDUCED HALF SIZE

Notes and Legend are shown on Sheets 30 and 31

SYMBOL	DESCRIPTION	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

DRAWN BY: GH
TRACED BY:
CHECKED BY: H.D.
SUBMITTED: H. Glumer, CHIEF, LEVEE AND CHANNEL SEC.
APPROVAL RECOMMENDED: CHIEF OF BRANCH (DESIGN)
APPROVED: E. A. Petty, CHIEF, ENGINEERING DIVISION
DATE: 10 APRIL 1968

MARIN COUNTY CALIFORNIA
CORTE MADERA CREEK
CHANNEL IMPROVEMENTS
UNIT NO. 2
LOGS OF 2F EXPLORATION HOLES
STATION 251+00 TO STATION 298+00

PREPARED UNDER THE DIRECTION OF
FRANK C. BOERGER
COLONEL, C.E., DISTRICT ENGINEER

SCALE: As Shown
JOB No.
DRAWING NUMBER
SHEET 33 | 80 | 45 | 7

2F-25

El. 4.2 20' Lt. ℄

12 May 1965

Silt, brown, damp, loose, becoming moist w/depth. wet @ 2.0'.

Silt, mottled brown-rust & gray, very wet, soft. W=38

Sandy Silt, gray, very wet, loose, fine sand. W=38

Silty Sand, gray, very wet, loose, fine sand.

Silty Sandy Gravel, very wet, loose, gravel to ½" max., sand is fine & medium.

Refusal with hand auger.

2F-23

El. 4.1 25' Lt. ℄

11 May 1965

Silt, tan, damp, loose, w/some very fine sand, becoming moist w/depth.

Sandy Silt, (organic), mottled brown & rust brown, very wet, soft, very fine sand.

Clayey Silt, (organic), very wet, very soft.

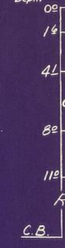
Sa. 3, Fi. 51, LL-47, PI-22, W=78

Silty Sandy Gravel, gray, wet, dense, gravel well graded to ¾".

2F-24

El. 4.3 300' Rt. ℄

11 May 1965



Silt, tan, damp, loose, becoming moist w/depth.

Sandy Silt, (organic), brown & rust brown, very wet.

Silty Clay, (organic), gray, moist, soft, almost like peat. W=126

Silty Gravelly Sand, gray, wet, firm, sand mostly fine, gravel ½" max..

Refusal with hand auger

2F-47

El. 5.4 300' Rt. ℄

7 June 1965

Gravelly Sandy Clay, brown, damp, firm, becoming moist w/depth, fill mat'l. wet below 2.0' W=17

Clay, (highly organic), dark gray, wet, soft, organics partially decayed. W=43

Clay, gray & brown, wet, soft, w/many organics, (peaty). W=153

Clay, gray, very wet, very soft, w/some organic matter. W=40

Sa. 30, Fi. 70, LL-23, PI-12, W=24

Sandy Clay, gray, wet, soft, very fine sand.

Gravelly Sandy Clay, gray, wet, soft, fine sand, gravel mostly ½".

Sandy Silty Clay, gray, very wet, very soft, fine sand. W=23

2F-54

El. 5 ± 125' Lt. ℄

21 Sept 1965

Silt, light brown, w/some sand, dry, soft.

Silty Clay, brown, damp, soft, wood fragments. W=30

Silty Sandy Clay, brown, moist, soft to very soft.

Sandy Clay, brown & dark gray, wet, very soft, fine sand, occ. organic fragment.

Sandy Clay, (organic), dark gray to black, wet, soft to very soft, occ. gravel to ¼". W=55

Silty Sand, brown, very wet, very fine sand.

Clayey Gravel, very wet, gravel from ¼" to ⅜", occ. to ½" size.

Refusal with hand auger

2F-56

El. 5± 3' Rt. ℄

22 Sept 1965

Silty Clay, reddish brown, damp, soft.

Silty Clay, reddish brown & gray, mottled, damp, soft, occ. roots.

Clay, (fat), gray, moist, soft, many organic fragments. W=79

Clay, (fat), gray, moist, soft, less organics. Sa. 2, Fi. 98, LL-67, PI-38, W=61

Clay, (fat), gray, moist, soft, No organics. W=44

Clay, (fat), mottled reddish brown & gray-green, wet, stiff, w/some sand. W=26

Sandy Clay, gray-green, wet, stiff, fine sand, fat. W=23

Clay, dark gray, wet, very stiff to stiff, fat. W=29

2F-55

El. 6± 115' Rt. ℄

22 Sept 1965

Silty Clay, reddish-brown, dry, loose.

Silt, gray-green, damp, loose, small amount of lean clay.

Silty Clay, dark gray-green, moist, soft.

Clayey Silt, mottled reddish brown & gray-green, damp, soft. W=44 W=97

Clay, dark greenish gray, organic, moist, soft, fat.

Clay, dark gray, moist, soft to firm, fat. Sa. 5, Fi. 95, LL-46, PI-23, W=39

Clay, dark gray & gray brown, mottled, moist, stiff, fat. W=36

W=25

2F-15

El. 6± 80' Rt. ℄

18 Feb 1960

Sand, brown, wet, dense, very fine to fine.

Silt, w/lenses of fine sand, brown, wet, many decayed leaves & roots, occ. small gravel.

Silt, brown, wet, soft, w/some fine lenses of lean clay & fine sand. Sa. 5, Fi. 95, LL-34, PI-36

Silt & Clay, thin layers, brown & gray w/rust brown stains, wet, firm.

Sandy Silt, blue-gray w/brown stains, wet, soft, fine sand, some decayed vegetation.

Clay, blue-gray, w/some fine sand, very wet, soft.

Clay, dark gray, wet, firm, fat, very small amount of fine sand.

Clay, brown & gray streaked, wet, very stiff, w/small amount of sand and an occ. piece of small gravel.

Sandy Clay, gray & brown streaked, wet, stiff, fat, fine to coarse sand Sa. 31, Fi. 69, LL-31, PI-12

Clay, brown & gray streaked, wet, very stiff, fat, w/a small amount of fine sand.

Clay, gray w/brown streaks, wet, stiff, fat.

Sandy Clay, dark gray, wet, stiff, fat, fine sand. Sa. 41, Fi. 59, LL-31, PI-13, G-2.74

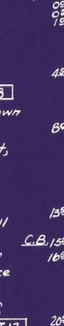
Clayey Sand, dark gray, wet, dense, fine sand.

Sandy Clay, light gray to brown, wet, stiff, very fine sand.

2F-52

El. 6.5 20' Lt. ℄

9 June 1965



Gravel, crushed 1½" max..

Gravelly Clay, firm, fill mat'l.

Silt, tan, damp, firm, w/some fine sand. W=10

Gravelly Sand, tan, damp, firm, sand is fine to med, gravel to ½" max. very wet @ 7.5'. Gr. 13, Sa. 73, Fi. 14, NP

Sandy Gravel, tan, very wet, med. dense, well-graded to 1".

Sandy Gravel, gray, w/some clay, very wet, med. dense, well graded to 1" Gr. 60, Sa. 26, Fi. 14, LL-37, PI-13

Sandy Clayey Gravel, gray, wet, med. dense, gravel fairly well graded to 1½".

Clay, gray, wet, stiff, fat. W=31

Sandy Clay, gray, wet, stiff, fat, fine sand. W=23

Clay, gray, w/some fine sand, wet, stiff, fat. W=26

Sandy Gravelly Clay, gray, wet, firm, sand & gravel fairly well graded to 1" max. W=22

2F-8

El. 8± 40' Rt. ℄

20 Nov 1953

Silt, tan, damp, firm, many small roots.

Silty Sandy Gravel, light brown, damp, dense, sand mostly fine, gravel well graded, angular, broken sandstone.

Clay, light brown, moist, firm, some small pieces of broken sandstone, small roots. Gr. 35, Sa. 26, Fi. 29, LL-32, PI-11

Clayey Sandy Gravel, brown, moist, gravel well graded to 1½" max., sand well graded fine to coarse.

Clay, dark brown, moist, lean, w/a few small roots.

Clayey Sand, brown, wet to very wet, fine sand, occ. ¼" lense of clay. Sa. 40, Fi. 59, LL-38, PI-15

Sandy Clay, dark gray, very wet, soft, very fine sand, some small roots.

Clayey Sandy Gravel, greenish-gray, very wet, loose, sand well graded, gravel well graded to 1" subrounded, an occ. 0.1" layer stiffer than above.

Clayey Sandy Gravel, brown, very wet, loose, gravel well graded to 1" max., subrounded, sand well graded.

Notes and Legend are shown on Sheets 30 and 31

THIS PRINT REDUCED HALF SIZE

SYMBOL	DESCRIPTION	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

DRAWN BY: GH
TRACED BY:
CHECKED BY: H.D.
SUBMITTED: J.L. Morrison, CHIEF, LEVEE AND HYDRAULIC SEC.

MARIN COUNTY CALIFORNIA
CORTE MADERA CREEK
CHANNEL IMPROVEMENTS
UNIT NO. 2
LOGS OF 2F EXPLORATION HOLES
STATION 298+00 TO STATION 325+00

APPROVAL RECOMMENDED: Chief of Section (DESIGN) — APPROVED: Colonel, C.E., District Engineer — DATE: 10 APRIL 1962

PREPARED UNDER THE DIRECTION OF
FRANK C. BOERGER
COLONEL, C.E., DISTRICT ENGINEER

SCALE: As shown JOB No.

DRAWING NUMBER
SHEET 34 | 80 | 45 | 7

2F-91
El. 3.0 10' Rt. ℄
10 Nov 1965

Depth		
0.0	CL	Sandy Clay, brown, moist, firm, med. clay, low % peat, w/some grass roots. W=36
3.3	CH	Clay, gray, w/approx. 30% peat, wet, soft, coarse fibers are tan & brown. W=94
6.5	CH	Silty Clay, gray, w/some organics & fibers, wet, soft, (Bay Mud). Sa.2, Fi.98, LL-117, PI-76, W=108
C.B. 12.0	CH	Clay, gray, w/some organic material, wet, firm, med. clay. W=37
14.0	CL	Sandy Clay, mottled gray & rust, wet, stiff, med. clay. W=26
17.5	SC	Clayey Sand, rusty gray, wet, med. dense, fine sand. Gr.1, Sa.52, Fi.47, LL-25, PI-9, W=24
19.0	CL	Sandy Clay, gray, wet, firm. W=26
22.0	CH	Clayey Sand, greenish-gray, wet, med. dense, fine to med. grained. Sa.24, Fi.76, LL-27, PI-9, W=28
26.5	CL	Clay, dark gray, wet, stiff, fat. W=30
26.9	GRAVEL	Sandy Clay, gray, w/green spots throughout, some organic matter, moist, stiff. W=22
		Silty Sandy Gravel, gray, wet, loose, gravel to 1" max.. W=17
32.0	SC	Clayey Gravelly Sand, gray, wet, dense, gravel to 1" max.. W=20
37.0		Change @ 37.0'

2F-91
Continued:

Depth		
37.0	CL	Sandy Clay, gray w/some gravels, wet, soft, fine sand. W=27
40.0	CH	W=26.8
41.0	CH	Clay, mottled gray & brown, moist, very stiff, fat. W=28
		Same mat'l except now stiff @ 46.0'.
46.0	CL	Sa.8, Fi.92, LL-35, PI-14, W=27
49.0	CH	Same mat'l, very stiff again @ 49.0'. W=25
52.0	SC	Gravelly Sandy Clay, grayish-brown, wet, stiff, gravel to 1" max.. W=76
55.0	CL	Sandy Clay, mottled rust & gray, moist, stiff, med. clay. W=21
57.0	SC	Clayey Gravelly Sand, mottled rust & gray, wet, dense, rounded gravels up to 2" dia., poorly graded. W=18
59.0	GRAVEL	W=23
61.0	CL	Clayey Gravelly Sand, gray w/rust spots, moist, very dense, gravel to 2" max.. same mat'l @ 61.0' except it's now hard, w/color change to tan w/gray streaks. W=18
65.0	SC	Sandy Gravel, gray, (Sandstone - weathered & fragmented), hard. W=15
67.0		Refusal with 20" bucket auger

2F-92
El. 7.0 5' Lt. ℄
11 Nov 1965

Depth		
0.0	CH	Gravelly Sandy Clay, w/large boulders & chunks of concrete, moist, dense fill.
3.0	CH	Clay, gray, w/humus & roots & coarse fibers of peat, wet, soft. W=38
8.0	CH	Silty Clay, gray, w/some black organics, wet, soft, (Bay Mud). W=76
C.B. 12.0	CH	Clay, gray, wet, stiff, fat. W=34
17.0	CL	Sandy Clay, gray & rust mottled, wet, stiff, med. clay. W=27
20.0	CL	Clayey Sand, rusty gray, wet, loose. W=24
22.0	CL	Clay, dark gray, moist, stiff, fat. Sa.4, Fi.96, LL-38, PI-16, W=30
26.0		Change @ 26.0!

2F-92
Continued:

Depth		
26.0	CL	Sandy Clay, dark gray, wet, firm, fine sand. W=22
27.5	GC	Silty Sandy Gravel, dark gray, wet, loose, fine sand. W=21
34.0	SC	Clayey Gravelly Sand, dark gray, wet, dense, gravel to 1" max.. W=21
37.0	GP-GM	Sandy Gravel, w/some clay, dark gray, wet, dense, gravel to 1" max.. W=14
43.0	CH	Clay, w/some gravels, mottled gray & brown, moist, very stiff, fat. W=25
45.0	CL	Sandy Clay, w/occ. gravel to 1" max., brown-mottled w/rust, tan & gray spots & streaks, moist, stiff. W=21
47.0	CL	Gravelly Sandy Clay, (Sandstone), dark gray-brown, moist, very hard, fragments of S.S. gravel pieces throughout to ¾" max.. W=17
50.0		Refusal with 20" bucket Auger.

2F-46
El. 8.7 on ℄
4 June 1965

Depth		
0.0	CH	Sandy Clay, reddish-brown & tan, damp, hard, fill mat'l. W=15
2.5	CH	Gravelly Sandy Clay, gray, moist, sand & gravel poorly graded to 1½", fill mat'l.
3.6	GC	Gr.33, Sa.21, Fi.46, LL-41, PI-18
4.9	GC	Gravelly Sandy Clay, brown, wet, soft, sand & gravel poorly graded to 2" max, fill mat'l.
6.2	CH	Clay, (organic), dark gray, very wet, very soft, organics partially decayed, (Bay Mud). W=66
C.B. 11.5	CH	Clay, dark gray, very wet, very soft, fat. W=47
17.0	CL	Silty Clay, gray, very wet, very soft. W=29
22.0	CL	medium stiff @ 22.0' Sa.21, Fi.79, LL-37, PI-18, W=27
23.0	CL	Sandy Clay, gray, very wet, soft, fine sand. W=28
24.5	GC	Sandy Gravelly Clay, gray, wet, firm, well graded to 1½".
26.0	CL	Clay, gray, wet, fat. W=29
31.5	CL	Silty Clay, gray, w/some very fine sand, wet. Sa.27, Fi.75, LL-28, PI-11, W=22
34.0		

2F-46
Continued:

Depth		
34.0	CL	Sandy Clay, gray, wet, soft, very fine sand. W=22
39.0	SC	
45.0	SC-SM	Gr.15, Sa.51, Fi.34, LL-22, PI-7
47.5	GC	Gravelly Sandy Clay, gray, wet, gravel well graded to ¾" max, sand is fine to coarse.
49.0	CL	Clayey Sandy Gravel, gray, wet, firm, gravel well graded to 2½".
53.5	GP-GC	Silty Sandy Clay, gray, wet, soft, w/some decayed wood, fine sand. W=31
		Sandy Gravel, tan, w/some clay, wet, firm, well graded gravel to 2" max.. less clay and gray color below 550'; w/an occasional thin streak of fine sand.
65.0	GC-GM	Gr.67, Sa.20, Fi.13, LL-24, PI-7
68.0	SC	Clayey Sand, gray, w/hard gray, sandstone fragments, more rocks & harder w/depth.
69.0		Refusal with 22" bucket auger

2F-93
El. 5.5 on ℄
11 Nov 1965

Depth		
0.0	CH	Gravel, Clay, Sand, & wood, random fill material, moist, dense. W=43
5.5	CH	
C.B. 7.0	OH	Silty Clay, dark gray & brown, w/peat & humus, wet, soft. Sa.2, Fi.38, LL-183, PI-121, W=138.0=17
11.0	CH	Clay, gray, wet, soft, med. clay. W=39
20.0	SC	Sand, gray, wet, med. dense, fine to med. grained, fairly clean. W=41
22.0	SP-SM	Sandy Gravel, gray, w/some clay, wet, med. dense, well graded to 1" max.. W=18
25.5	CL	Silty Clay, gray & tan mottled, moist, stiff, med. clay. W=28
27.0	SC	Clayey Sand, brownish-tan, wet, med. dense, fine sand. W=22
29.0	CL	Clay, gray, moist, stiff, fat. Sa.5, Fi.95, LL-46, PI-23, W=33
38.0	SC	Sandy Clay, gray, moist, stiff, fine to med. grained sand. W=19
42.0		

2F-94
El. 8.5 on ℄
16 Nov 1965

Depth		
0.0		Grass lawn & brown top soil.
0.2		Gravelly Sandy Clay, tan, moist, firm, (fill).
		Gravelly Clay, tan & brown, w/wood chunks, moist, firm, fill.
7.5	CH	Clay, gray, w/peat & humus, wet, soft, (organic). W=164
C.B. 13.0	CH	Clay, gray, w/low % peat, moist, firm. W=31
14.5	CL	Clay, tan & gray, mottled, moist & stiff. W=27
16.0	CL	Sandy Clay, tan & gray, mottled, moist, firm. W=22
18.5	CL	Silty Clay, tan & gray, mottled, moist, firm. W=29
21.0	CL	Clayey Sand, gray, wet, med dense, fine grained sand. W=22
22.5	SC	Sandy Gravel, gray, wet, med. dense, 1" max.. W=22
26.2	SM	Silty Sand, gray, wet, loose, fine grained. W=31
30.0	SP-SM	Silty Sandy Gravel, tan, wet, dense, to 1½" max.. W=20
32.0	SM	Gravelly Sand, tan-gray & rust layers, w/silt, wet, dense. W=19
33.0	SM	Silty Sandy Gravel, tannish gray, wet, dense, gravel to ½" max. size. W=21
37.0	SM	W=17
40.0		

2F-45
El. 8± 160' Rt ℄
4 June 1965

Depth		
0.0	SC	Sandy Gravelly Clay, tan, damp, firm, gravel well graded to 1", fill. W=21
3.2	CL	Clay, brown & gray, w/some sand, moist, firm.
4.0	CL	Sandy Clay, tan & brown, wet soft, fine sand, fill. Gr.15, Sa.31, Fi.34, LL-30, PI-8, W=30
6.8	CL	Clayey Silt gray, wet, soft, w/some organic stains, (Bay Mud). W=41
7.4	CL	Clay, gray, wet, soft, w/partially decayed organics. W=44
C.B. 8.5	CH	
13.0	CL	Sandy Gravelly Clay, mottled grays, wet, firm, sand & gravel are angular. Gr.12, Sa.28, Fi.60, LL-32, PI-12
16.0	CL	Clay, mottled brown & gray, wet, stiff, fat. W=37
19.5	CL	Sandy Clay, gray, wet, soft, fine sand. W=29
23.0	CL	Gravelly Sandy Clay, gray, wet, stiff, fat, gravel to ¾", fragmental, angular. Gr.5, Sa.25, Fi.70, LL-31, PI-11
27.0	GC	Clayey Sandy Gravel, gray, wet, firm, well-graded to 1".
29.5	CL	Sandy Clay, tan & gray, w/some small gravels, wet, stiff. W=20
33.0	CL	Clay, tan & gray, w/some silt, wet, stiff. W=24
37.0	GC	Clayey Sandy Gravel, tan, wet, dense, gravel well graded to ¾", subrounded.
42.0	SC	an occasional 2" layer of clay below 420'.
44.0	SC	Sandy Clay, tan, w/some small gravel, wet, soft, fine sand, becoming stiffer w/depth.
46.5		

2F-45
Continued:

Depth		
46.5	CL-ML	Sandy Clay, tan, w/some small gravel, wet, very stiff, fine sand. Gr.2, Sa.38, Fi.60, LL-26, PI-7
50.0	SC	Sandy Clay, dark gray, wet, firm, fine sand, w/some small gravel W=23
55.0	CL	one 5" rounded cobble @ 53.5'. Gr.1, Sa.27, Fi.72, LL-28, PI-10, W=23
59.0	GC	Clayey Sandy Gravel, tan & gray, wet, dense, gravel subrounded to rounded, fairly well graded to 1½".
63.0	SC	Gravelly Sandy Clay, blue-gray, wet, stiff, gravel poorly graded to 3", sand poorly graded fine to coarse, w/an occ. cobble, sub-angular.
66.5	GC	Clayey Sandy Gravel, dark tan, wet, dense, fairly well graded to 2", sub-angular to subrounded.
70.0		

THIS PRINT REDUCED HALF SIZE

Notes and Legend are shown on Sheets 30 and 31

SYMBOL	DESCRIPTION	DATE	APPROVAL
	REVISIONS		

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

DRAWN BY: GH
TRACED BY:
CHECKED BY: H.D.
SUBMITTED: CHIEF, LEVEE AND CHANNEL BR.
APPROVAL RECOMMENDED: CHIEF OF DIVISION (DESIGN)
APPROVED: CHIEF OF ENGINEERS
DATE: 10 APRIL 1968

MARIN COUNTY CALIFORNIA

CORTE MADERA CREEK CHANNEL IMPROVEMENTS UNIT NO. 2

LOGS OF 2F EXPLORATION HOLES
TAMALPAIS CREEK
STATION 0+00 TO STATION

PREPARED UNDER THE DIRECTION OF
FRANK C. BOERGER
COLONEL, C.E., DISTRICT ENGINEER

SCALE: AS SHOWN JOB No.
DRAWING NUMBER
SHEET 36 | 80 | 45 | 7

2F-95

El. 9.0 10' Lt. ℄

16 Nov 1965

Depth		
0.0		Grass lawn & brown top soil.
0.5	CL	Gravelly Clay, tan & brown, moist, firm.
8.0	CH	Clay, dark gray, w/peat & humus, wet, soft. (Bay Mud).
C.B.		Sa.1, Fi.99, LL-72, PI-40, W= 53
12.5	CH	Clay, tan & gray, moist, stiff, fat. W= 31
14.5	CL	Sandy Clay, tan & gray, wet, firm, fine sand. W= 27
16.0	CH	Clay, tan & gray, moist, firm, fat. W= 33
21.5	CL	Sandy Clay, gray, wet, soft, fine sand. Sa.30, Fi.70, LL-33, PI-16, W= 23
24.0	CH	Clay, tan & gray, moist, stiff, fat. W= 27
27.0	SC	Clayey Sandy Gravel, tannish-gray, wet, dense, 1" max. size. W= 22
28.5	CH	Clay, gray, wet, stiff, fat. W= 31
32.0	CL	Clay, tan & gray, mottled, moist, stiff. W= 24
35.0		

2F-96

El. 9.0 on ℄

17 Nov 1965

Depth		
0.0		Gravelly Sandy Clay, tan, moist, firm, fill mat'l.
5.0	CL	Sandy Silty Clay, gray, wet, soft. W= 36
7.5	CH	Clay, dark gray, w/peat & humus, wet, soft, (Bay Mud). Sa.1, Fi.99, LL-58, PI-30, W= 48
C.B. 10.0		Clay, tan & gray, mottled, moist, stiff, fat. Sa.1, Fi.99, LL-60, PI-35, W= 31
15.0	CL	Gravelly Sandy Clay, tan, rust & gray, mottled, wet, firm, gravel to 3/4" max.. W= 28
16.5	CL	Clay, mottled rust & gray, w/some sand, moist, stiff, fat. Sa.17, Fi.83, LL-41, PI-19, W= 33
18.5	CH	Clay, dark gray, moist, stiff, fat. W= 30
22.0	GP-GC	Gravelly Sandy Clay, mottled rust, tan & gray, moist, stiff, high % gravels to 1 1/2" size, angular sandstone fragments. W= 16
25.0	CL	Gravelly Sandy Clay, brown, wet, soft, gravel to 1/2" max. Gr.15, Sa.32, Fi.53, LL-23, PI-8, W= 19
29.0	CL	Clayey Gravelly Sand, mottled rust, gray & tan, wet, dense, 10% gravels to 1 1/2" max., smaller gravels @ 30.0'. W= 20
32.5	CL	probable weathered sandstone @ 31.0'.
33.0		W= 18

2F-97

El. 6.0 on ℄

17 Nov 1965

Depth		
0.0		Gravelly Sandy Clay, tan, moist, dense, fill mat'l.
3.0	CL	Silty Clay, gray, w/peat & humus, wet, firm, (Bay Mud). W= 34
5.0	CH	Clay, dark gray-black, wet, soft, (organic). (Bay Mud). W= 47
C.B. 8.0		Clay, mottled tan & gray, moist, very stiff, fat. W= 33
13.0	CL	Sandy Clay, mottled tan & gray, wet, firm, med. clay, very fine sand. W= 27
15.0	CH	Clay, mottled tan & gray, moist, stiff, fat. W= 30
18.0	CL	Clay, grayish-green, w/some sand & gravel, moist, stiff, fat. W= 37
19.5	SC	Clayey Gravelly Sand, green, wet, dense, gravel to 3/4" max.. W= 25
22.5	CL	Sandy Silty Clay, green-mottled w/rust & tan flakes, wet, firm, some gravels to 1/2". Gr.6, Sa.21, Fi.67, LL-39, PI-16, W= 20
25.0	SM	Clayey Silty Sand, brown & gray, wet, med. dense, w/rotted trees & decomposed humus. W= 31
26.5	CH	
28.5	CL	Sandy Silty Clay, brown, wet, firm, w/black decomposed humus & tree remains. W= 75
30.0	SC	Sandy Clay, bright green, moist, very stiff. W= 22
34.0	SC	Clayey Sand, bright green, moist, w/gravels to 1/2" size & weathered sandstone fragments to 3/4" size. W= 36
39.0	GC	Clayey Gravelly Sand, mottled tan, rust, gray & green, moist, dense. W= 77
40.8		Gr.58, Sa.17, Fi.25, LL-31, PI-13, W= 12

2F-44

El. 6.3 25' Rt. ℄

3 June 1965

Depth		
0.0	GC	Sandy Gravelly Clay, tan, damp, firm, gravel well graded to 3/4", Fill mat'l.
2.5	CL	Silty Clay, brown, moist, firm. W= 25
4.5	CH	Clay, mottled brown & gray, moist, soft. W= 40
C.B. 7.0		Clay, brown w/some gray, moist, stiff, fat. W= 31
11.0	CL	Clay, mottled brown & gray, moist, stiff, w/some fine sand. Sa.6, Fi.94, LL-47, PI-23, W= 28
14.5	CL	Clay, gray, moist, stiff, fat, w/some silt. W= 33
17.0	CH	Clay, dark gray, moist, stiff. W= 30
20.0		

2F-28

El. 9± 15' Lt. ℄

13 May 1965

Depth		
0.0	CL	Sandy Clay, dark tan, moist, firm, w/some small gravel.
1.3	CL	Silt, brown, moist, firm, w/some fine sand & an occ. piece of gravel, few tree roots.
3.6	CL	
4.5	CH	Sandy Gravelly Clay, damp, firm, sand & gravel fairly well graded to 3/4".
5.5	SC	
C.B. 6.2	CL	Clay, gray, wet, soft, fat. W= 35
7.6	CL	Clayey Sandy Gravel, brown, wet, firm, well graded to 3/4". W= 37
10.5		Clay, brownish-gray, wet, stiff, fat, some fine sand, stiffer w/depth. W= 30

Refusal with hand auger.

2F-27

El. 10± 20' Lt. ℄

12 May 1965

Depth		
0.0	SC	Gravelly Sandy Silt, brown, damp, firm, fine sand, gravels to 3/4" max..
1.3	CL	Gravelly Sandy Clay, brown, moist, firm, fine sand, gravel to 1" max..
3.7	CL	Sa.16, Fi.82, LL-36, PI-21, W= 34
4.8		Sandy Clay, brown, very wet, soft, fine sand.
5.5	GC	Gr.30, Sa.28, Fi.42, LL-31, PI-12, W= 22
C.B. 6.3		Clayey Sandy Gravel, brown, very wet, loose, poorly graded to 3/4".
	CH	W= 23
9.5		Clay, grayish brown, wet, very stiff, few small gravels.
11.0	CL	Clay, tan, moist, very stiff, w/some sand & gravel.
		Sa.23, Fi.77, LL-42, PI-23, W= 21

Refusal with hand auger.

Notes and Legend are shown on Sheets 30 and 31

THIS PRINT REDUCED HALF SIZE

SYMBOL	DESCRIPTION	DATE	APPROVAL
	REVISIONS		

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

DRAWN BY: GH
TRACED BY:
CHECKED BY: H.D.
SUBMITTED: Chief, Engineering Division

MARIN COUNTY CALIFORNIA

CORTE MADERA CREEK
CHANNEL IMPROVEMENTS
UNIT NO. 2

LOGS OF 2F EXPLORATION HOLES
TAMALPAIS CREEK
STATION 7+30 TO STATION 16+00

APPROVAL RECOM. RENDED: Chief of Design (DESIGN)
APPROVED: Col. C.E. District Engineer
DATE: 10 APRIL 1968

PREPARED UNDER THE DIRECTION OF
FRANK C. BOERGER
COLONEL, C.E., DISTRICT ENGINEER

SCALE: AS SHOWN
JOB No.
DRAWING NUMBER
SHEET 37 | 80 | 45 | 7

APPENDIX B

ConeTec CPT Report

PRESENTATION OF SITE INVESTIGATION RESULTS

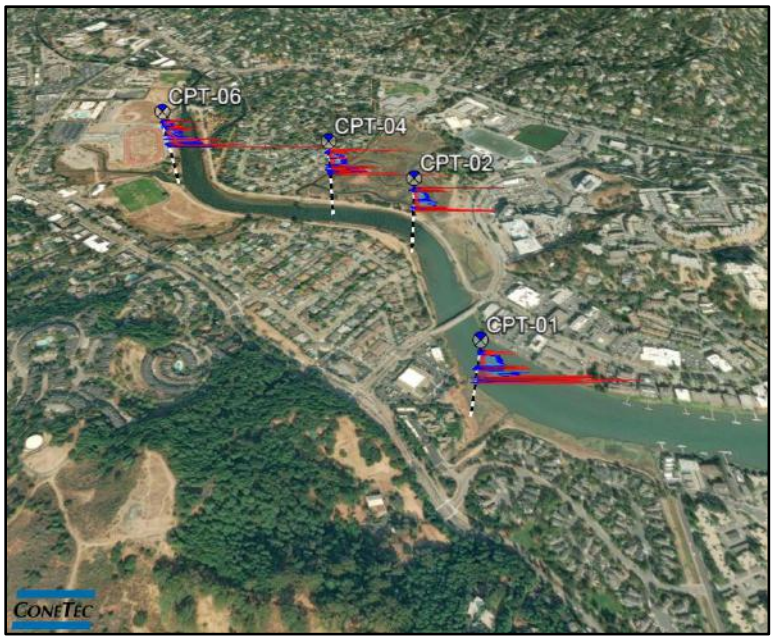
Corte Madera Levee Evaluation

Prepared for:

A3GEO Inc.

CPT Inc. Job No: 18-56207

Project Start Date: 18-Dec-2018
Project End Date: 18-Dec-2018
Report Date: 19-Dec-2018



Prepared by:

California Push Technologies Inc.
820 Aladdin Avenue
San Leandro, CA 94577

Tel: (510) 357-3677

Email: cpt@cptinc.com
www.cptinc.com

CALIFORNIA PUSH TECHNOLOGIES INCORPORATED
CONETEC

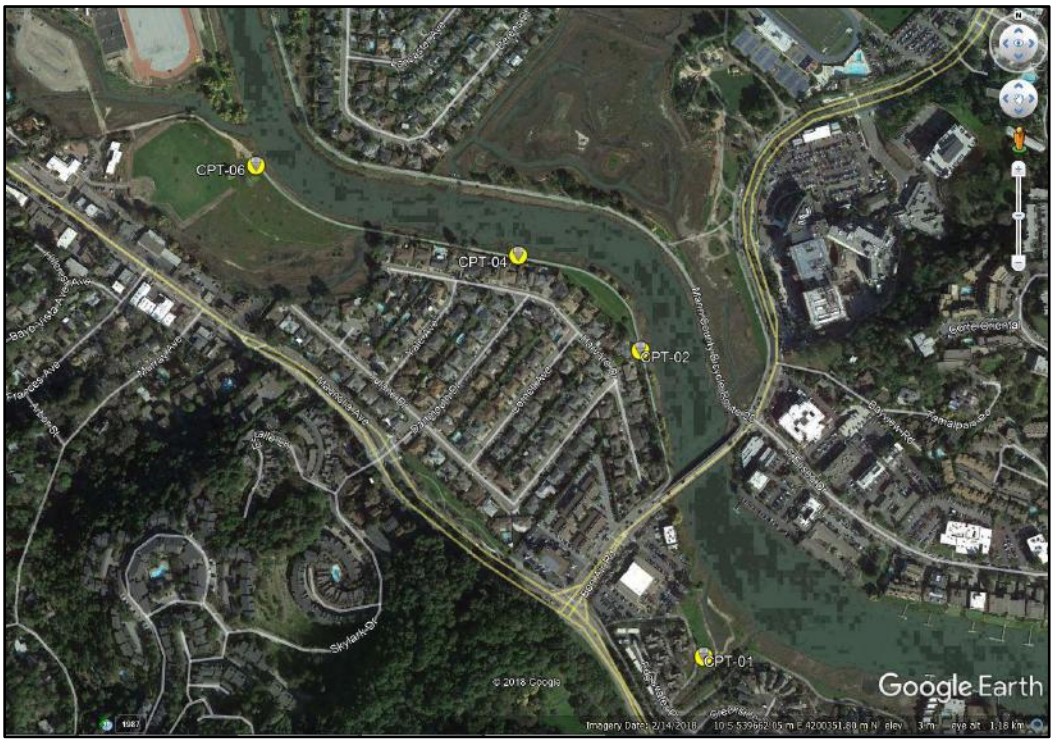
Introduction

The enclosed report presents the results of the site investigation program conducted by CPT Inc. for A3GEO Inc. at the Corte Madera Levee, North of Corte Madera, CA. The program consisted of four cone penetration tests (CPT)

Project Information

Project	
Client	A3GEO Inc.
Project	Corte Madera Levee Evaluation
CPT Inc. project number	18-56207

A map from Google Earth including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
CPT track rig (Geoprobe 6622CPT)	20 ton rig cylinder	CPT

Coordinates		
Test Type	Collection Method	EPSG Reference
CPT	Consumer grade GPS	32610

Cone Penetration Test (CPT)	
Depth reference	Depths are referenced to the existing ground surface at the time of each test.
Tip and sleeve data offset	0.1 meter This has been accounted for in the CPT data files.
Additional plots	Standard Plots with Expanded Scales, Advanced Plots with Ic, Su(Nkt), Phi and N1(60)Ic, as well as, Soil Behavior Type (SBT) Scatter Plots have been included in the data release package.
Additional comments	Soil samples were collected at CPT-02 from 0 to 13 ft and at CPT-04 from 0 to 14 ft.

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm^2)	Sleeve Area (cm^2)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
391:T1500F15U500	391	15	225	1500	15	500
Cone 391 was used for all CPT soundings.						

CPT Calculated Parameters	
Additional information	The Normalized Soil Behavior Type Chart based on Q_{tn} (SBT Qtn) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPT parameters have been generated and are provided in Excel format files in the release folder. The CPT parameter calculations are based on values of corrected tip resistance (q_t) sleeve friction (f_s), and pore pressure (u_2). Effective stresses are calculated based on unit weights that have been assigned to the individual soil behavior type zones and the assumed equilibrium pore pressure profile. Soils were classified as either drained or undrained based on the Q_{tn} Normalized Soil Behavior Type Chart (Robertson, 2009). Calculations for both drained and undrained parameters were included for materials that classified as silt mixtures – clayey silt to silty clay (zone 4).

Limitations

This report has been prepared for the exclusive use of A3GEO Inc. (Client) for the project titled “Corte Madera Levee Evaluation ”. The report’s contents may not be relied upon by any other party without the express written permission of CPT Inc. CPT Inc. has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to CPT Inc. by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

Cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd., a subsidiary of ConeTec.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first appendix. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

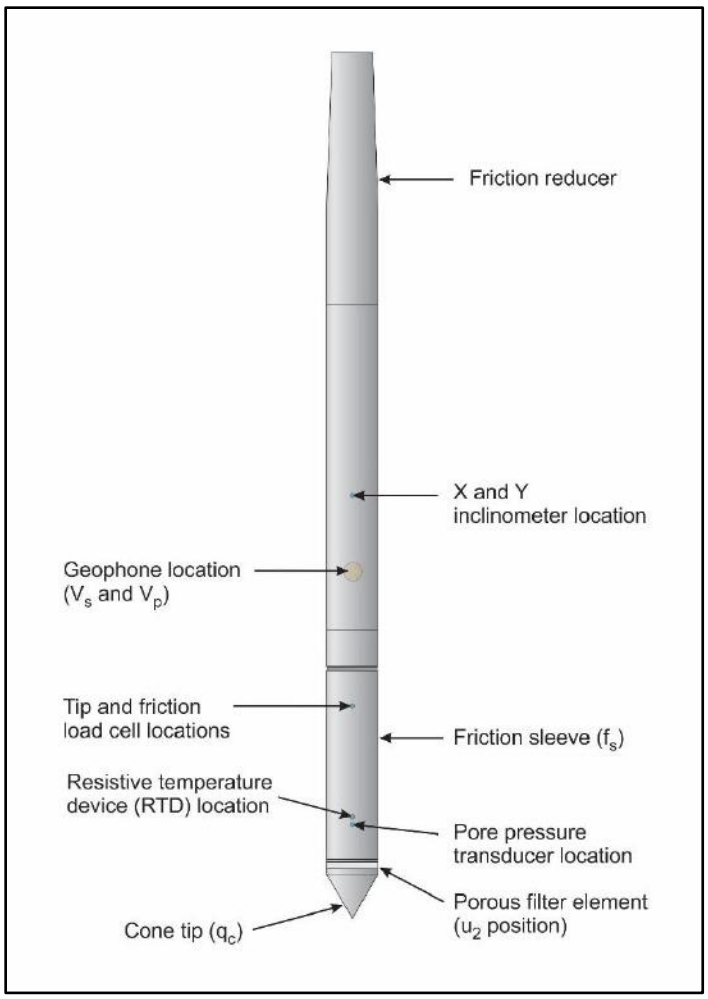


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording interval is 2.5 cm; custom recording intervals are possible.

The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson et al. (1986) and Robertson (1990, 2009). It should be noted that it is not always possible to accurately identify a soil behavior based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al. (1986):

$$q_t = q_c + (1\text{-}a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of files with calculated geotechnical parameters were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the methods used is also included in the data release folder.

For additional information on CPTu interpretations and calculated geotechnical parameters, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

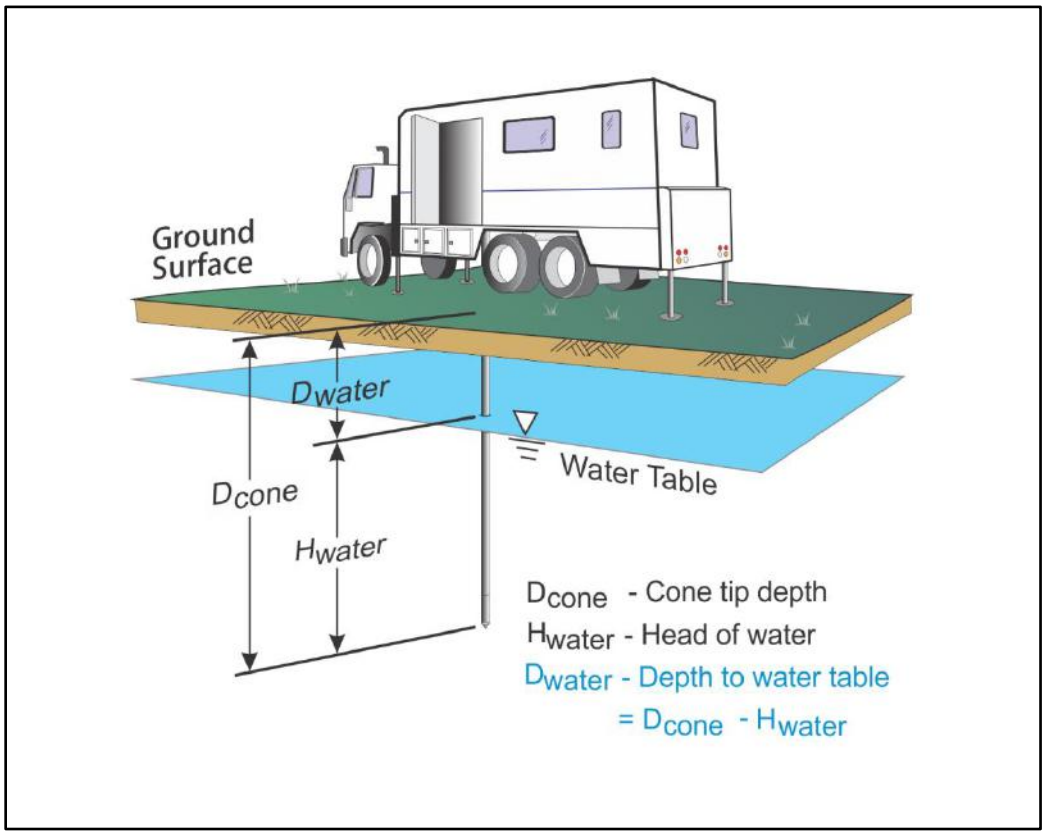


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

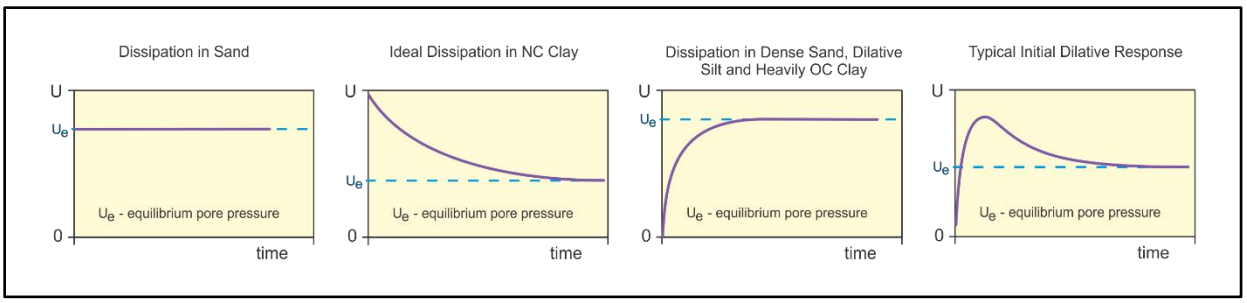


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve in Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100}. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100}. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

T* is the dimensionless time factor (Table Time Factor)
a is the radius of the cone
I_r is the rigidity index
t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby (1991))

Degree of Dissipation (%)	20	30	40	50	60	70	80
T* (u_2)	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50}, dissipation tests must be taken to a pressure less than u_{50}. The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100}. To estimate u_{50}, both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby (1991)), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50}. In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r, the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50}, other methods should be applied to confirm the results for c_h.

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM, West Conshohocken, US.

Burns, S.E. and Mayne, P.W., 1998, "Monotonic and dilatory pore pressure decay during piezocone tests", Canadian Geotechnical Journal 26 (4): 1063-1073.

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Jones, G.A. and Van Zyl, D.J.A., 1981, "The piezometer probe: a useful investigation tool", Proceedings, 10th International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, "Cone Penetration Testing in Geotechnical Practice", Blackie Academic and Professional.

Mayne, P.W., 2013, "Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests", Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420.

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Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27: 151-158.

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Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., Sully, J.P., Woeller, D.J., Lunne, T., Powell, J.J.M. and Gillespie, D.G., 1992, "Estimating coefficient of consolidation from piezocone tests", Canadian Geotechnical Journal, 29(4): 551-557.

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, "An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils", Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", Geotechnique, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Standard Cone Penetration Test Plots with Expanded Scales
- Advanced Cone Penetration Test Plots with Ic, Su(Nkt), Phi and N1(60)Ic
- Soil Behavior Type (SBT) Scatter Plots
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and Standard Cone Penetration Test Plots

CONETEC

Job No:	18-56207
Client:	A3GEO Inc.
Project:	Corte Madera Levee Evaluation
Start Date:	18-Dec-2018
End Date:	18-Dec-2018

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Northing[2] (m)	Easting (m)	Refer to Notation Number
CPT-01	18-56207_CP01	18-Dec-2018	391:T1500F15U500	8.2	94.16	4199540	540567	
CPT-02	18-56207_CP02	18-Dec-2018	391:T1500F15U500	5.8	65.53	4199928	540487	3
CPT-04	18-56207_CP04	18-Dec-2018	391:T1500F15U500	5.8	72.34	4200051	540328	
CPT-06	18-56207_CP06	18-Dec-2018	391:T1500F15U500	6.3	79.81	4200167	539984	

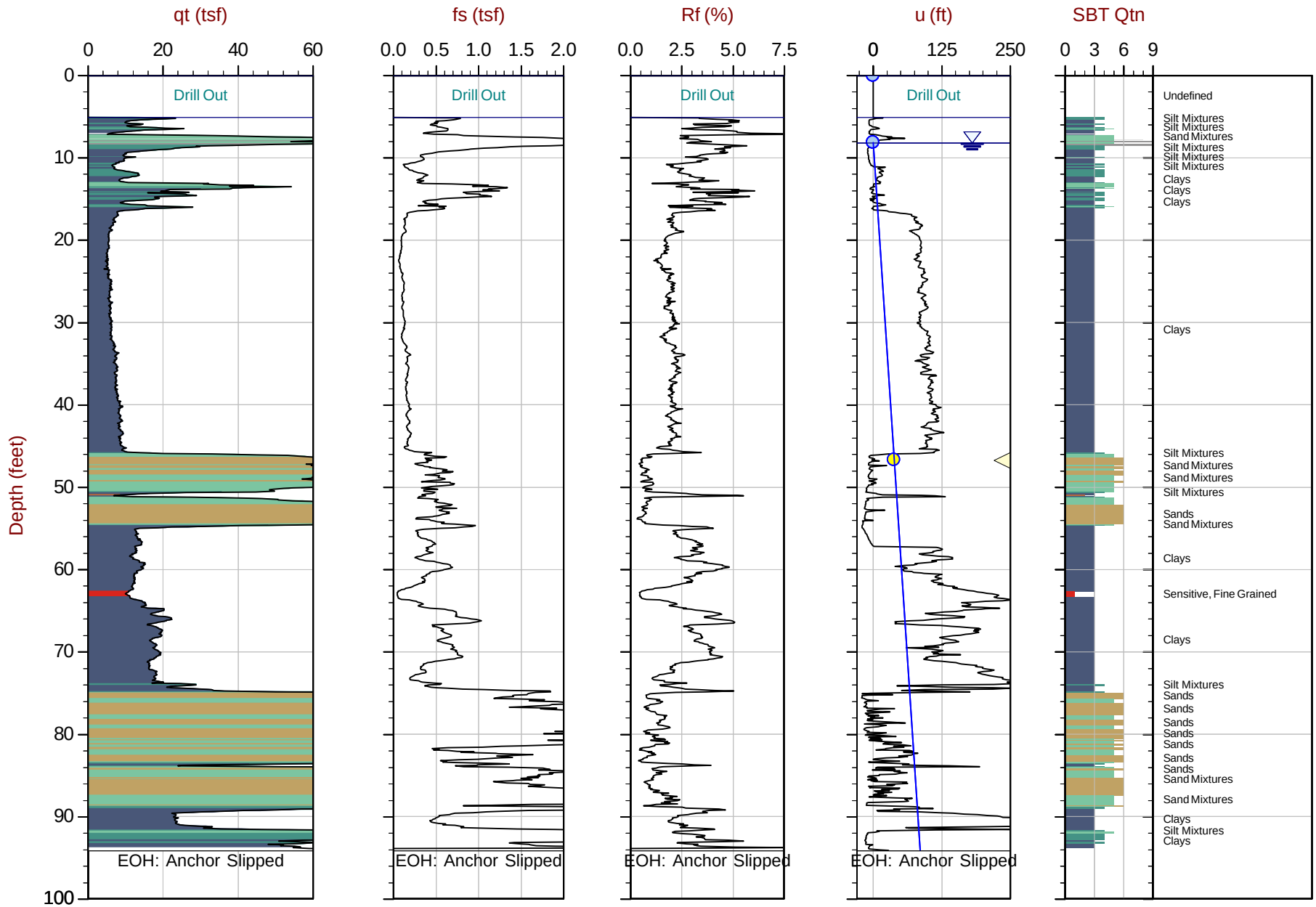
1. The assumed phreatic surface was based on pore pressure dissipation tests, unless otherwise noted. Hydrostatic conditions were assumed for the calculated parameters.
2. Coordinates were acquired using consumer grade GPS equipment in datum: WGS84 / UTM Zone 10 North.
3. The assumed phreatic surface is based on an adjacent CPT.

CONETEC

A3GEO

Job No: 18-56207
Date: 2018-12-18 08:15
Site: Corte Madera Levee Evaluation

Sounding: CPT-01
Cone: 391:T1500F15U500



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Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item:

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Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4199540m E: 540567m
Page No: 1 of 1

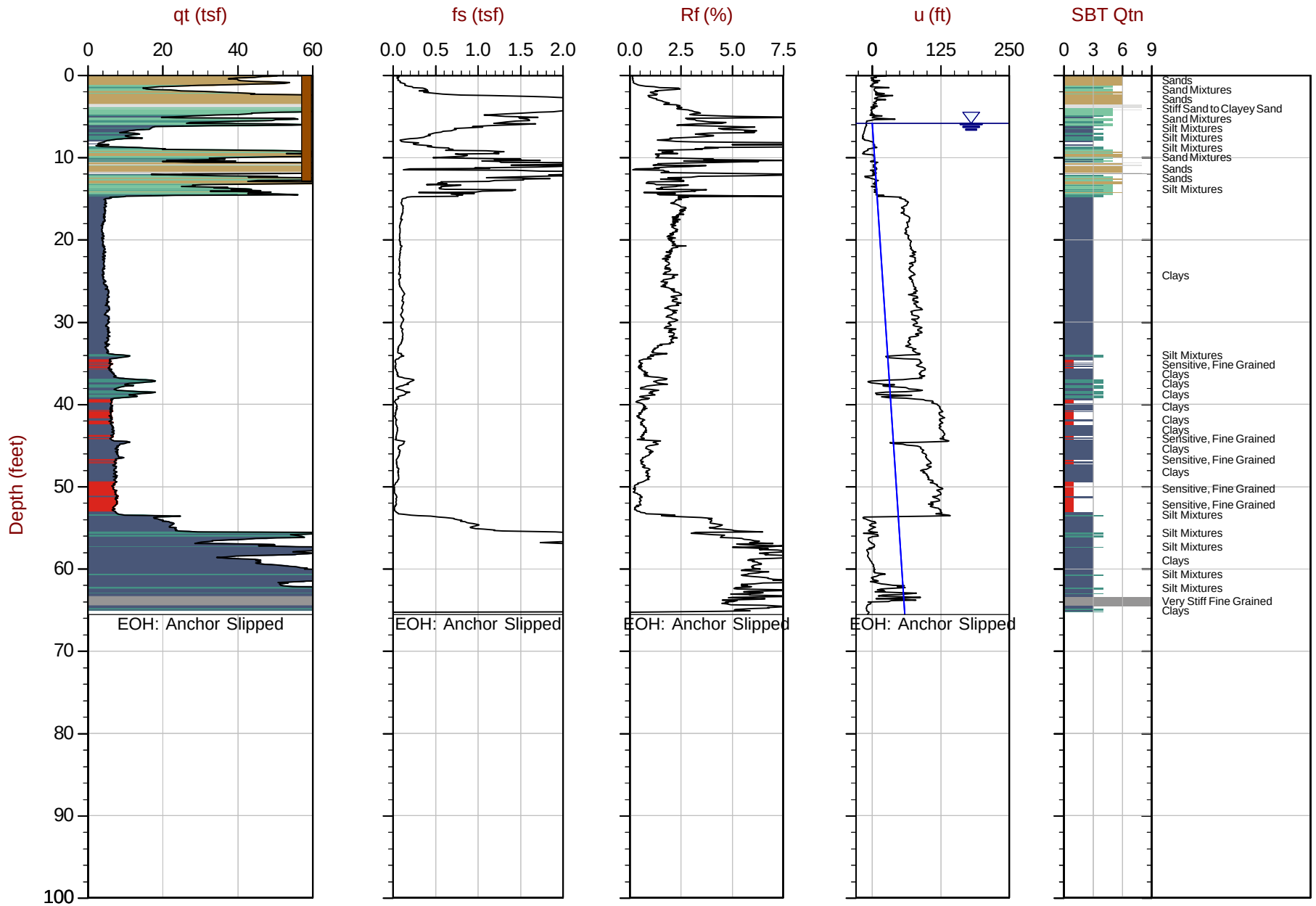
Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line
Soil Sample

CONETEC

A3GEO

Job No: 18-56207
Date: 2018-12-18 15:24
Site: Corte Madera Levee Evaluation

Sounding: CPT-02
Cone: 391:T1500F15U500



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Avg Int: Every Point
Overplot Item:

File: 18-56207_CP02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4199928m E: 540487m
Page No: 1 of 1

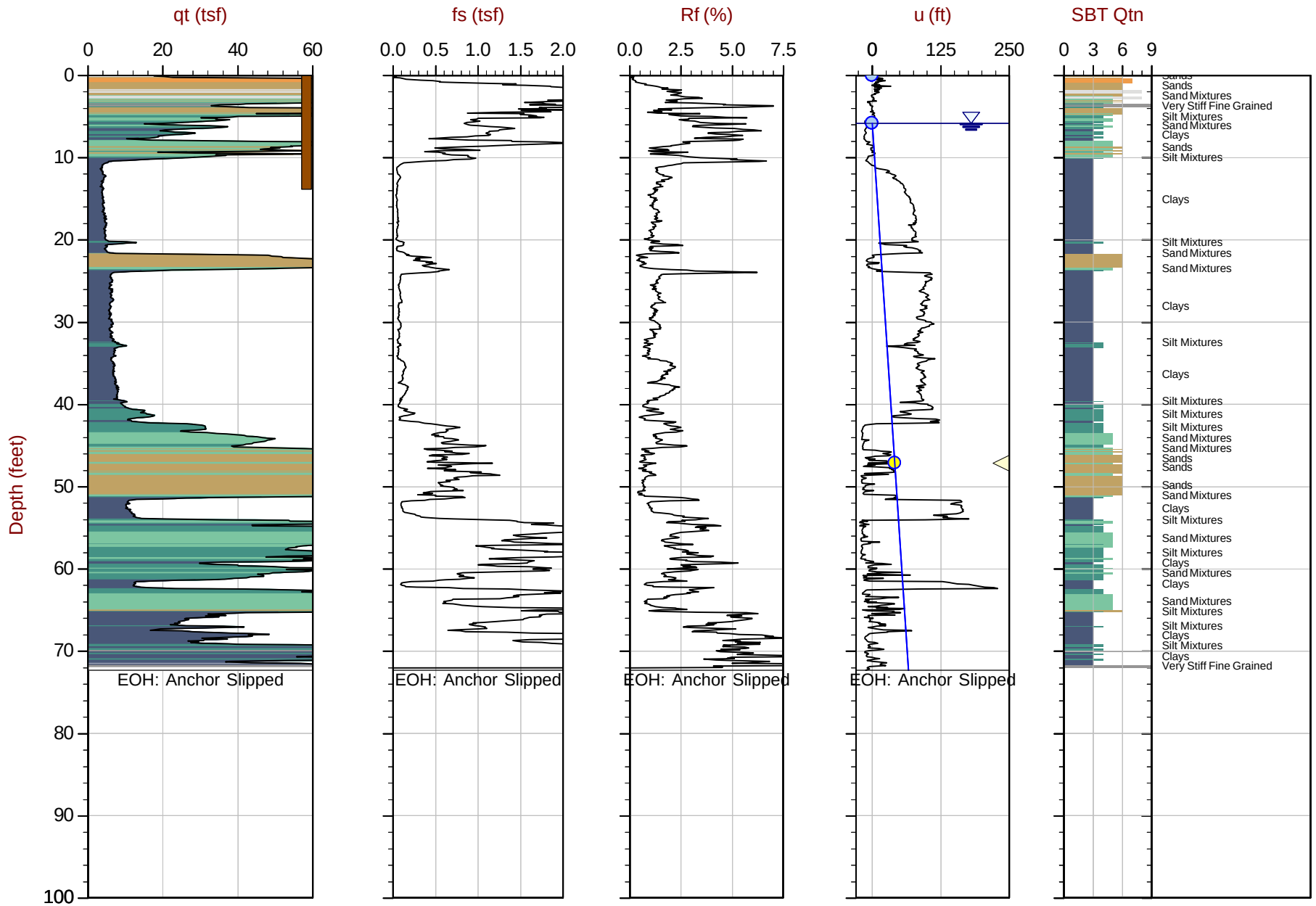
Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line
Soil Sample

CONETEC

A3GEO

Job No: 18-56207
Date: 2018-12-18 13:46
Site: Corte Madera Levee Evaluation

Sounding: CPT-04
Cone: 391:T1500F15U500



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Avg Int: Every Point
Overplot Item:

File: 18-56207_CP04.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4200051m E: 540328m
Page No: 1 of 1

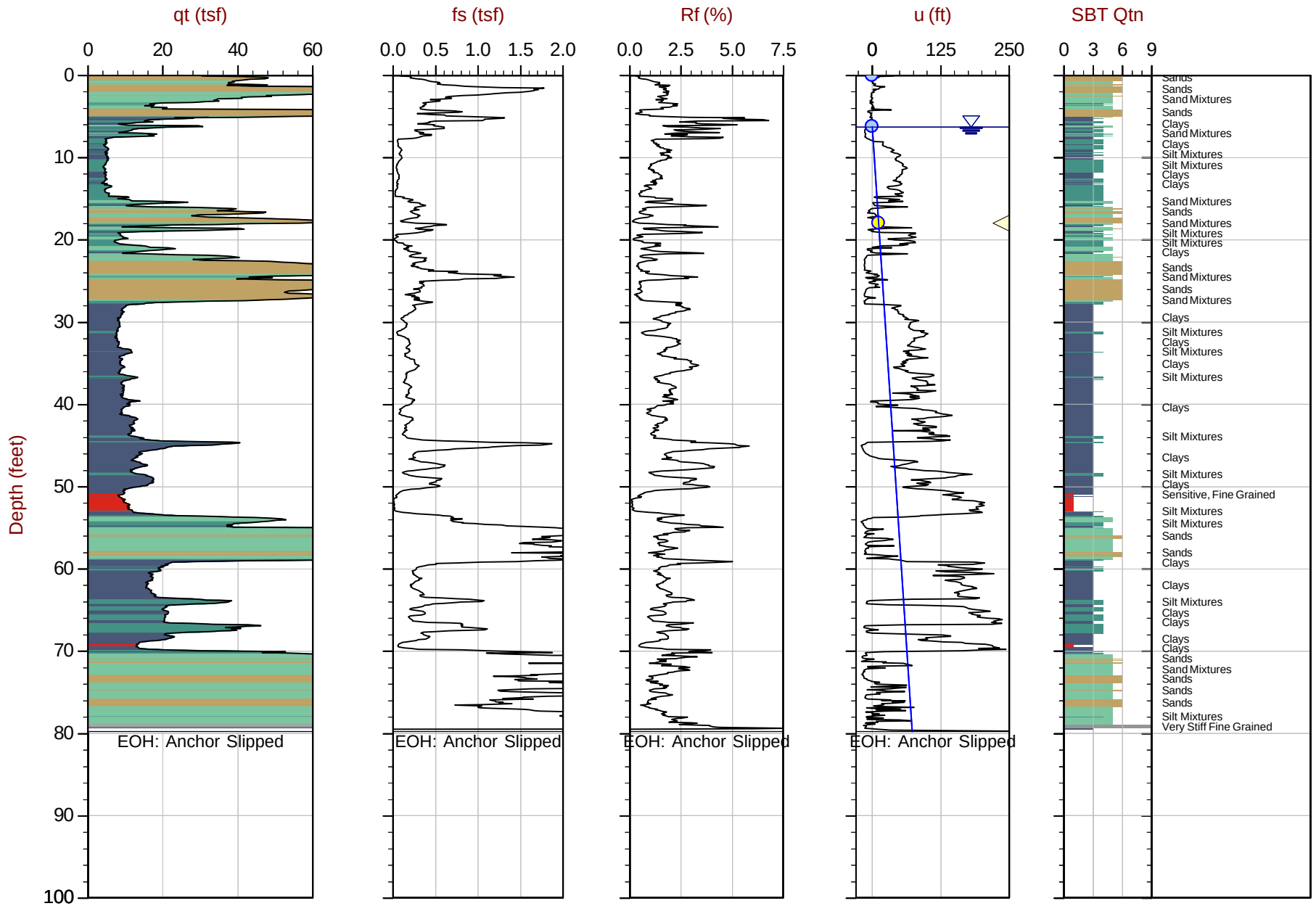
Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line
Soil Sample

CONETEC

A3GEO

Job No: 18-56207
Date: 2018-12-18 11:41
Site: Corte Madera Levee Evaluation

Sounding: CPT-06
Cone: 391:T1500F15U500



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Overplot Item:

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SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4200167m E: 539984m
Page No: 1 of 1

Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line
Soil Sample

Standard Cone Penetration Test Plots with Expanded Scales

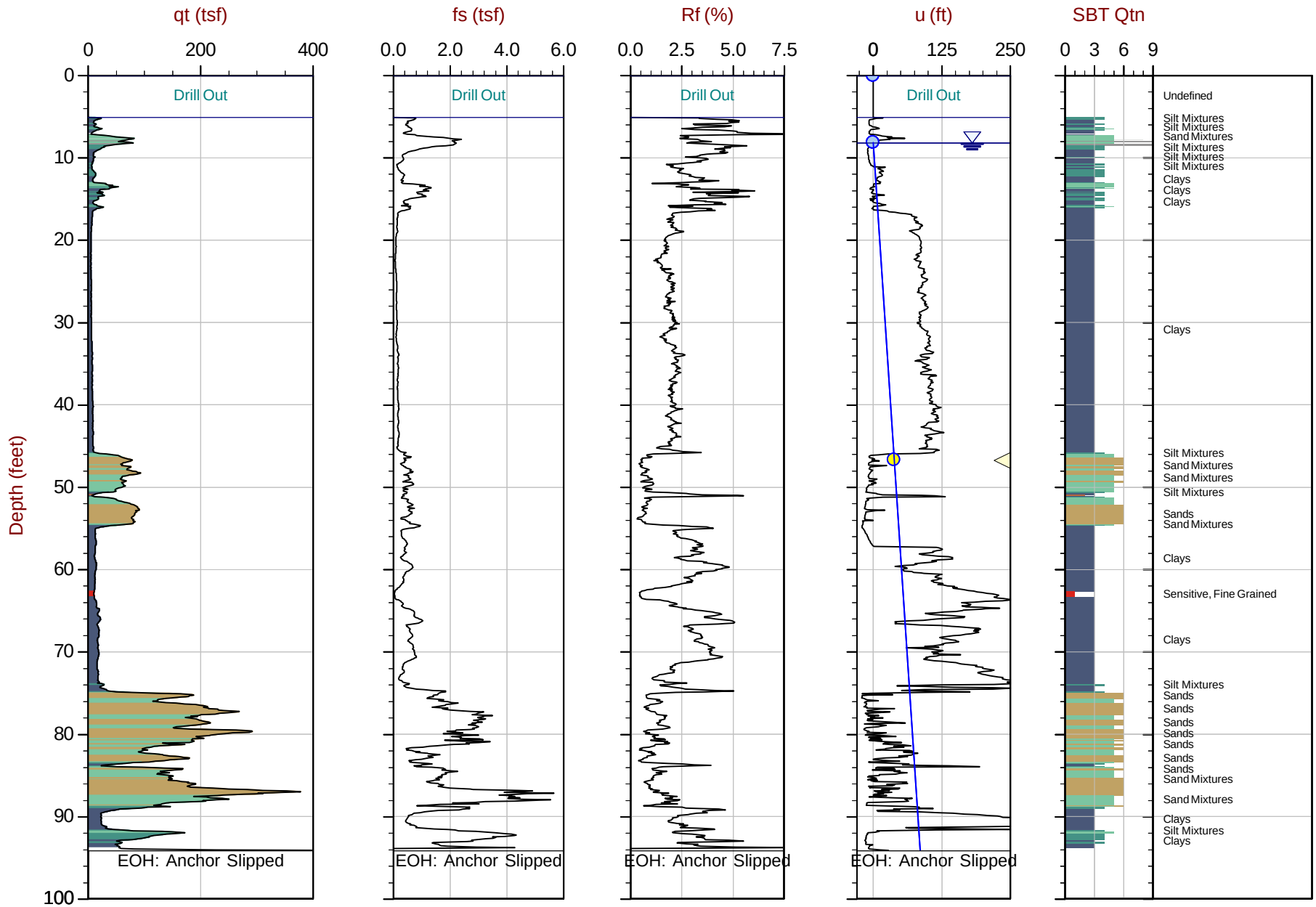
CONETEC

CONETEC

A3GEO

Job No: 18-56207
Date: 2018-12-18 08:15
Site: Corte Madera Levee Evaluation

Sounding: CPT-01
Cone: 391:T1500F15U500



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SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4199540m E: 540567m
Page No: 1 of 1

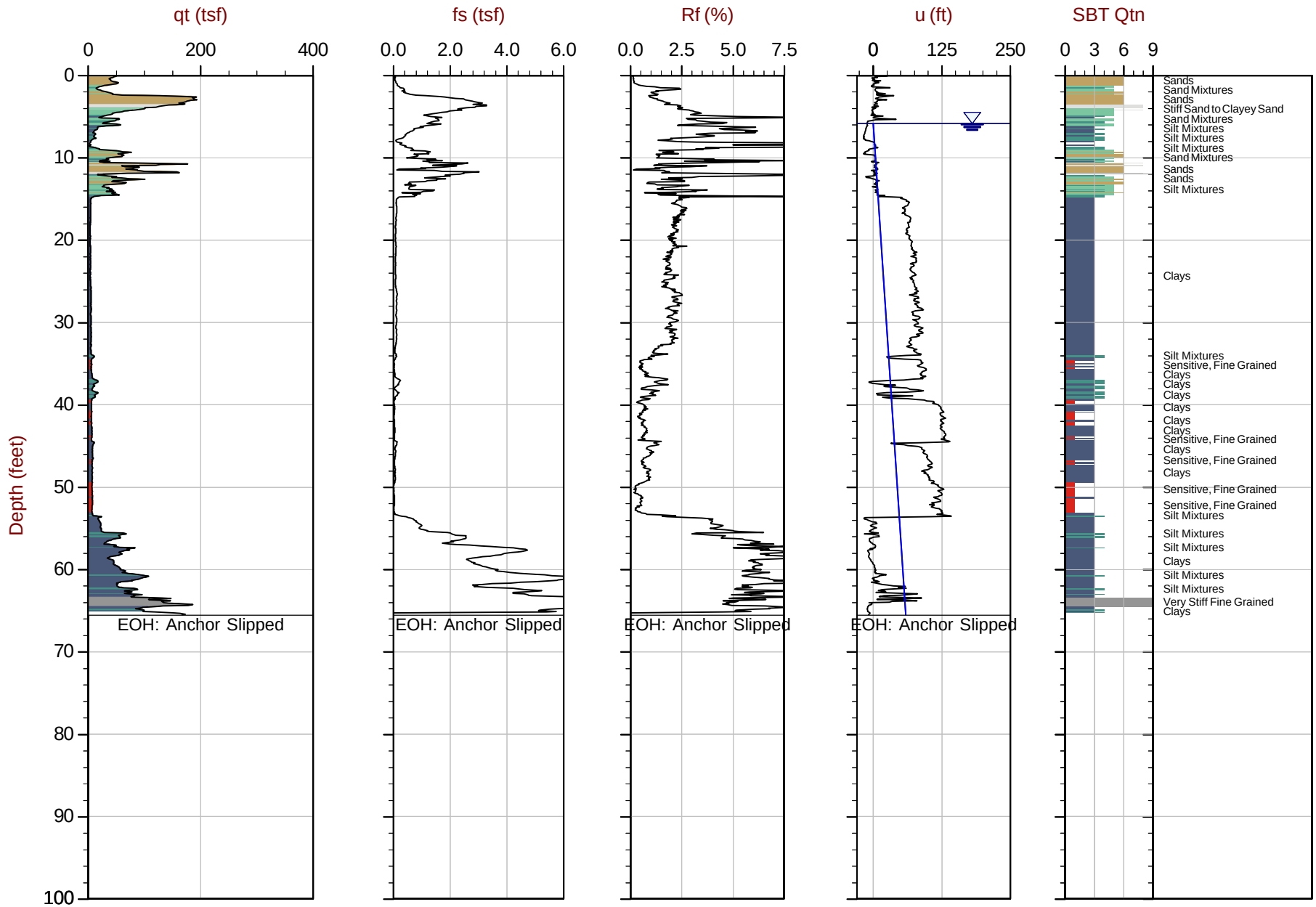
Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line

CONETEC

A3GEO

Job No: 18-56207
Date: 2018-12-18 15:24
Site: Corte Madera Levee Evaluation

Sounding: CPT-02
Cone: 391:T1500F15U500



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Avg Int: Every Point
Overplot Item:

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SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4199928m E: 540487m
Page No: 1 of 1

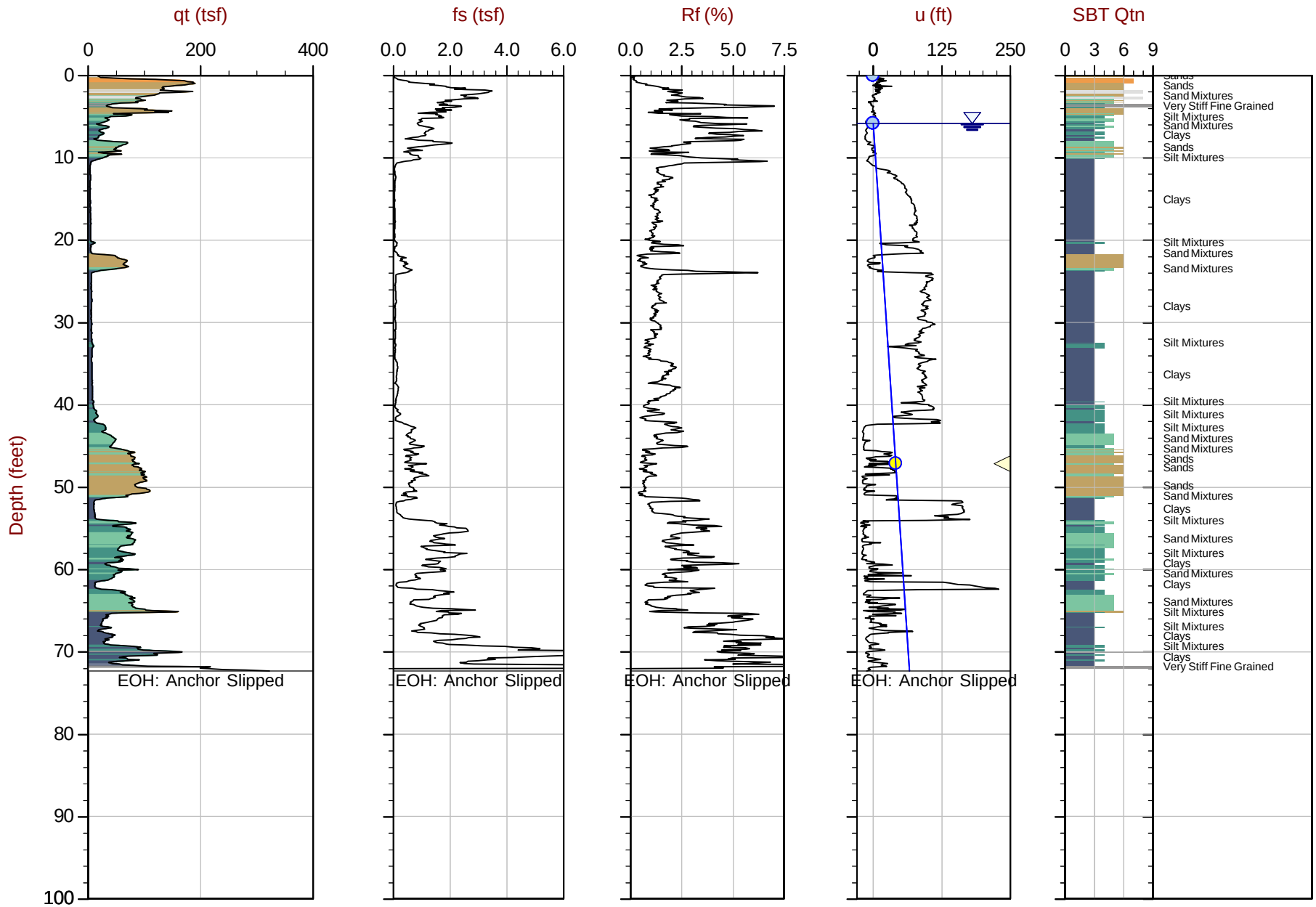
Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line

CONETEC

A3GEO

Job No: 18-56207
Date: 2018-12-18 13:46
Site: Corte Madera Levee Evaluation

Sounding: CPT-04
Cone: 391:T1500F15U500



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Avg Int: Every Point
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SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4200051m E: 540328m
Page No: 1 of 1

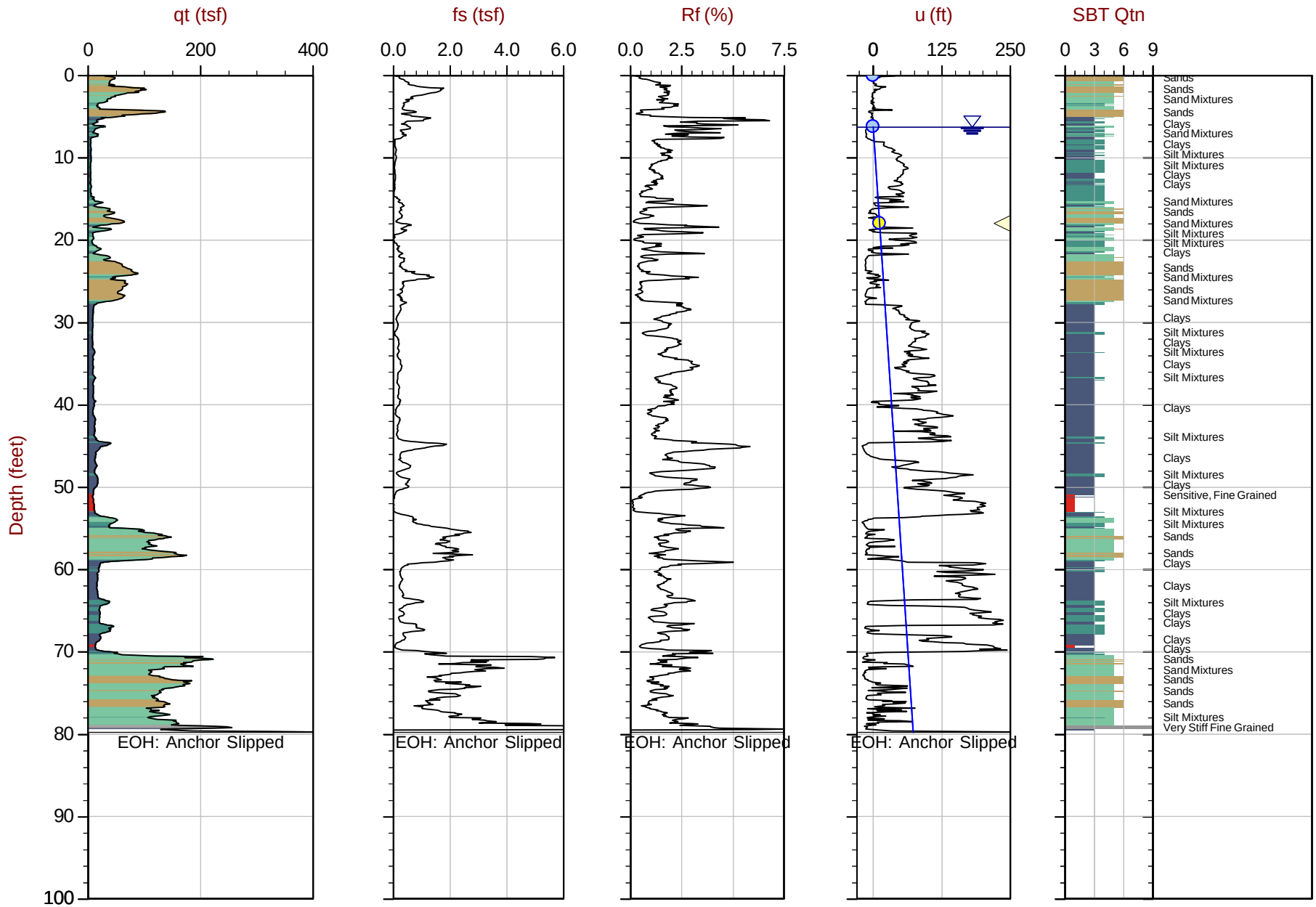
Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line

CONETEC

A3GEO

Job No: 18-56207
Date: 2018-12-18 11:41
Site: Corte Madera Levee Evaluation

Sounding: CPT-06
Cone: 391:T1500F15U500



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Avg Int: Every Point
Overplot Item:

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Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4200167m E: 539984m
Page No: 1 of 1

Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line

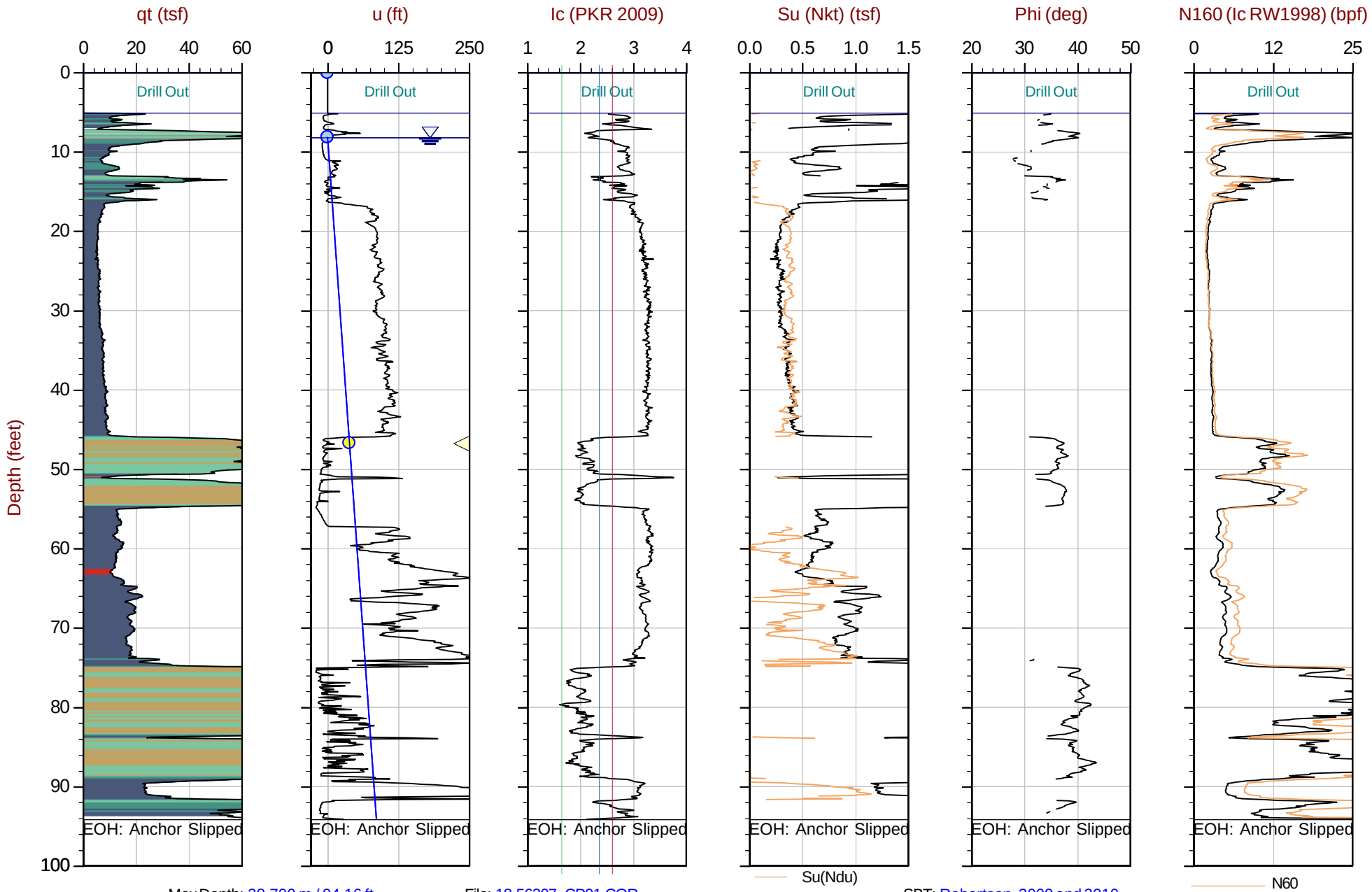
Advanced Cone Penetration Test Plots with Ic, Su(Nkt), Phi and N1(60)Ic

CONETEC

A3GEO

Job No: 18-56207
Date: 2018-12-18 08:15
Site: Corte Madera Levee Evaluation

Sounding: CPT-01
Cone: 391:T1500F15U500



Max Depth: 28.700 m / 94.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item:
Assumed Ueq
Ueq

File: 18-56207_CP01.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved

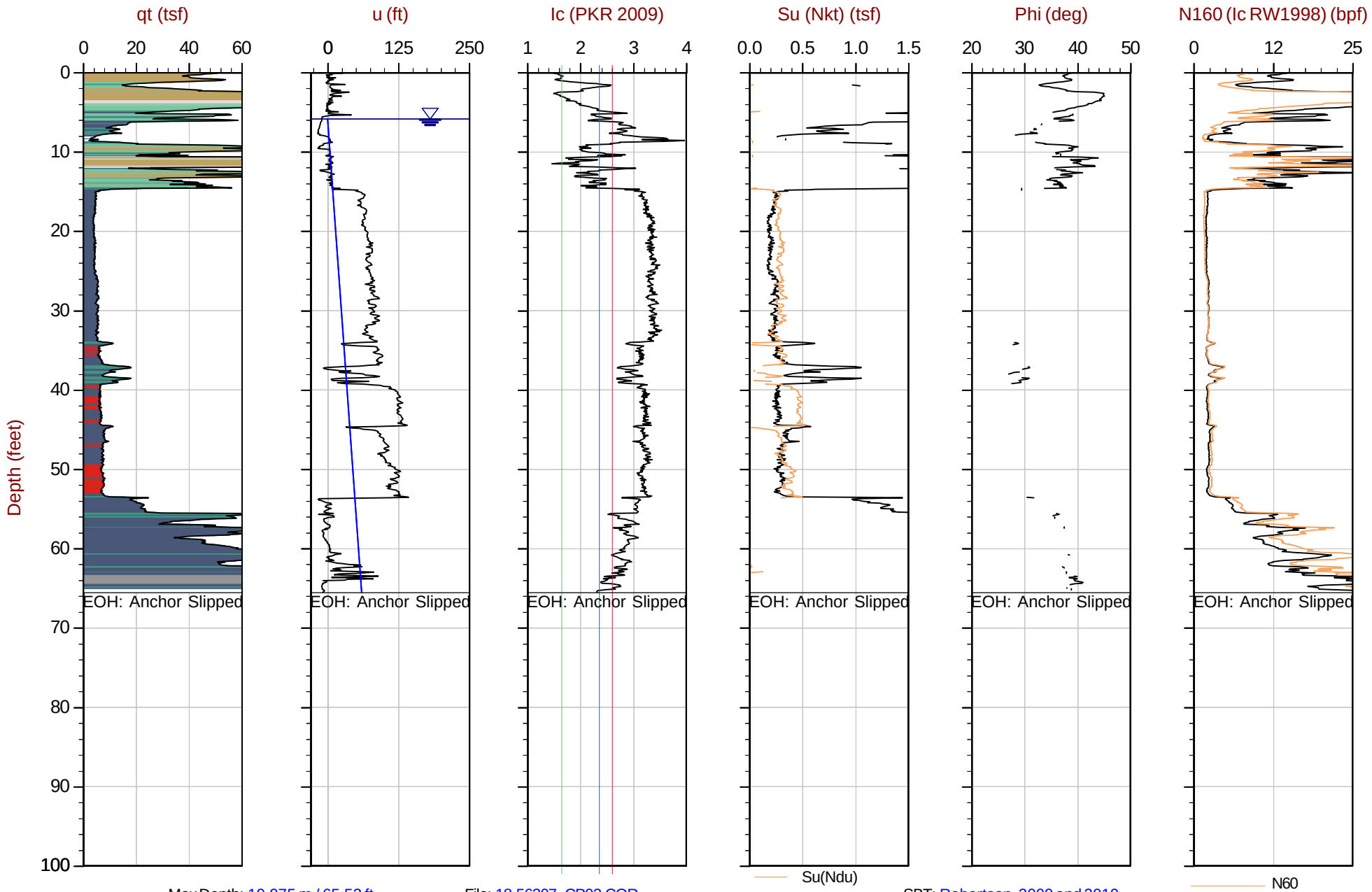
SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4199540m E: 540567m
Page No: 1 of 1
Hydrostatic Line
Soil Sample

CONETEC

A3GEO

Job No: 18-56207
Date: 2018-12-18 15:24
Site: Corte Madera Levee Evaluation

Sounding: CPT-02
Cone: 391:T1500F15U500



Max Depth: 19.975 m / 65.53 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item:
Assumed Ueq
Ueq

File: 18-56207_CP02.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved

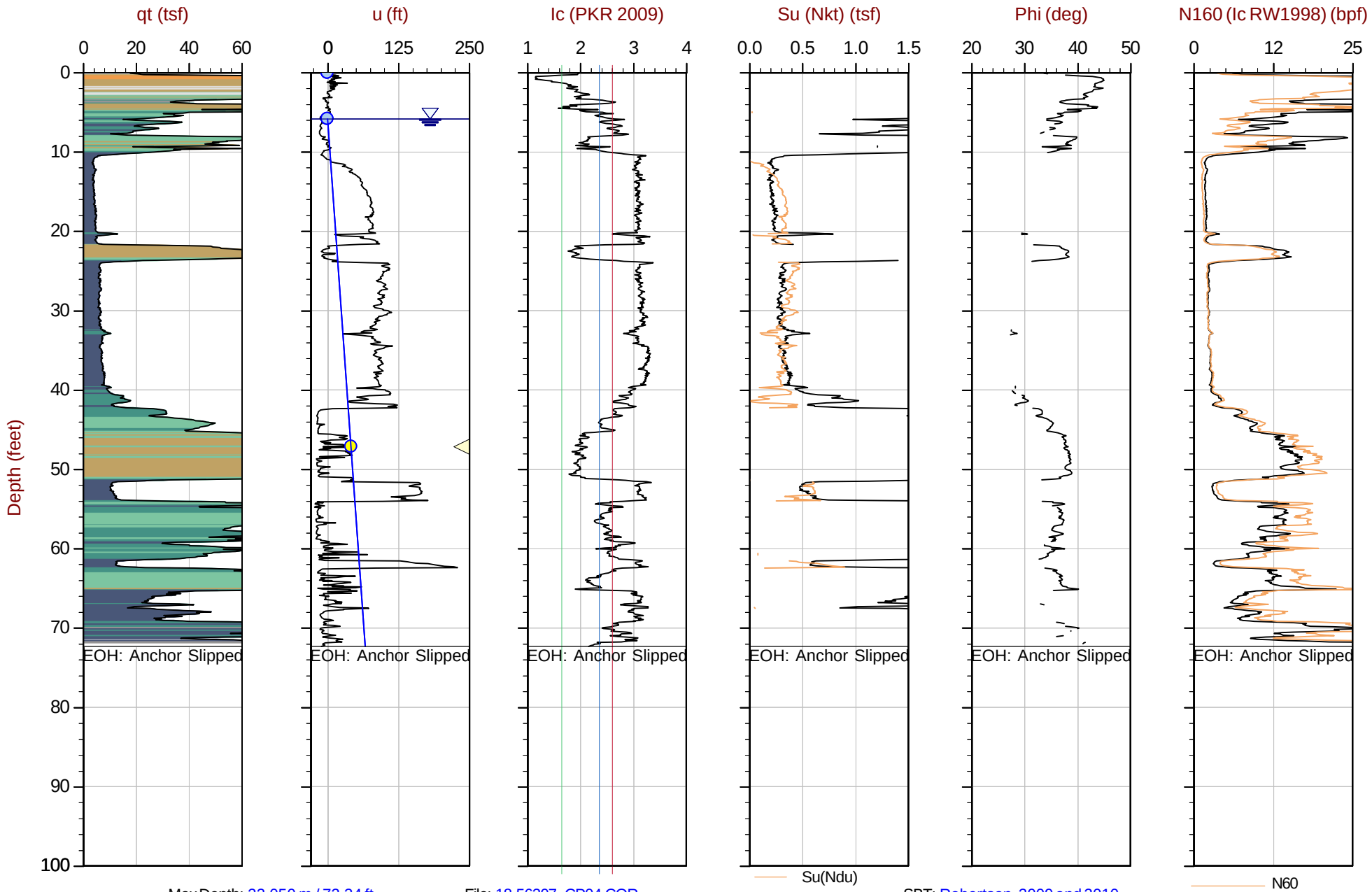
SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4199928m E: 540487m
Page No: 1 of 1
Hydrostatic Line
Soil Sample

CONETEC

A3GEO

Job No: 18-56207
Date: 2018-12-18 13:46
Site: Corte Madera Levee Evaluation

Sounding: CPT-04
Cone: 391:T1500F15U500



Max Depth: 22.050 m / 72.34 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item:

File: 18-56207_CP04.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4200051m E: 540328m
Page No: 1 of 1

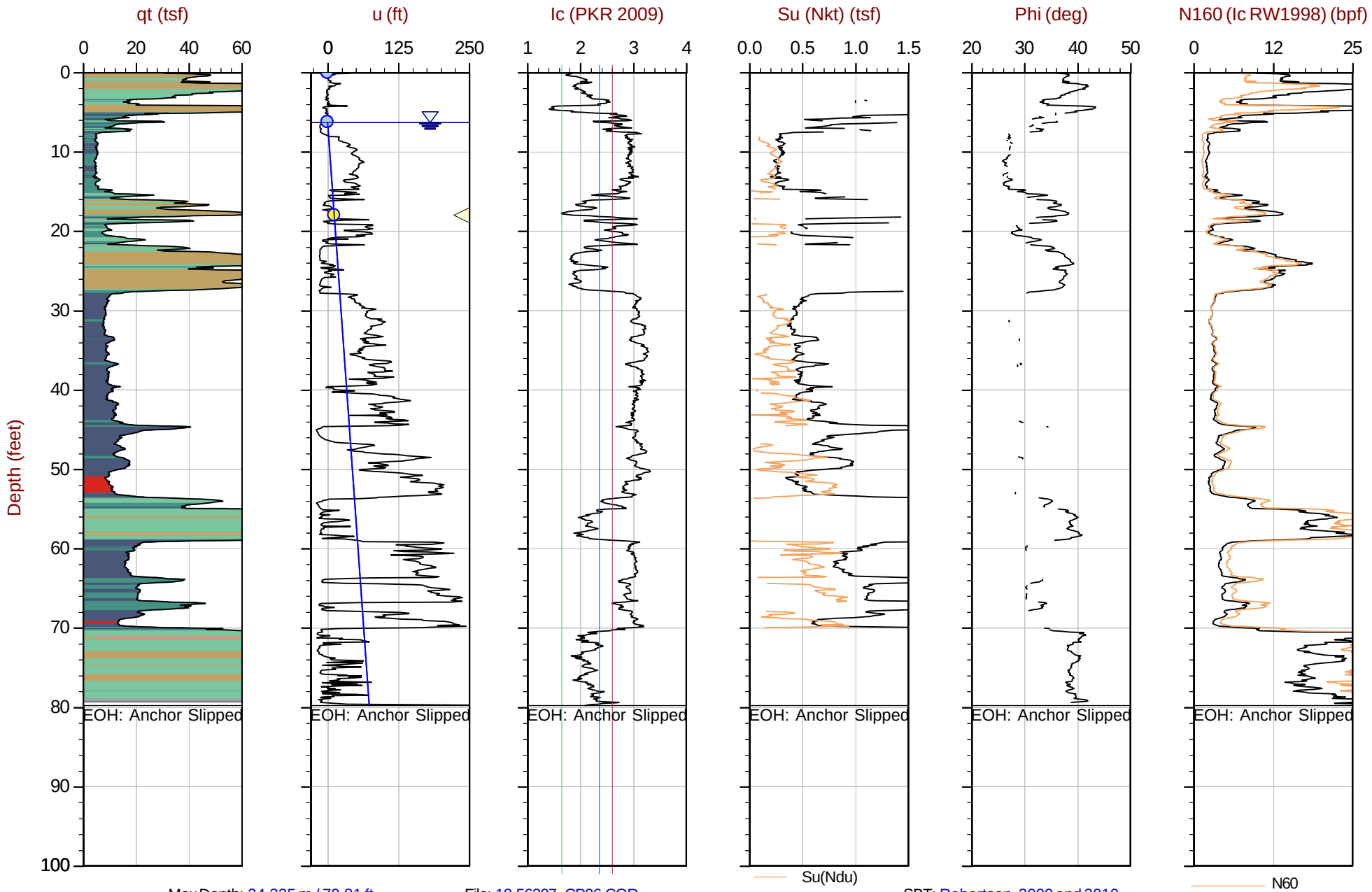
Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line
Soil Sample

CONETEC

A3GEO

Job No: 18-56207
Date: 2018-12-18 11:41
Site: Corte Madera Levee Evaluation

Sounding: CPT-06
Cone: 391:T1500F15U500



Max Depth: 24.325 m / 79.81 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item:
Assumed Ueq
Ueq

File: 18-56207_CP06.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4200167m E: 539984m
Page No: 1 of 1
Hydrostatic Line
Soil Sample

Soil Behavior Type (SBT) Scatter Plots

CONETEC

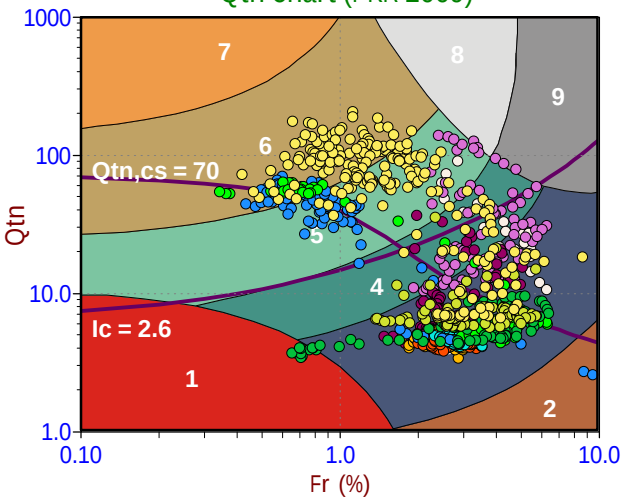
CONETEC

A3GEO

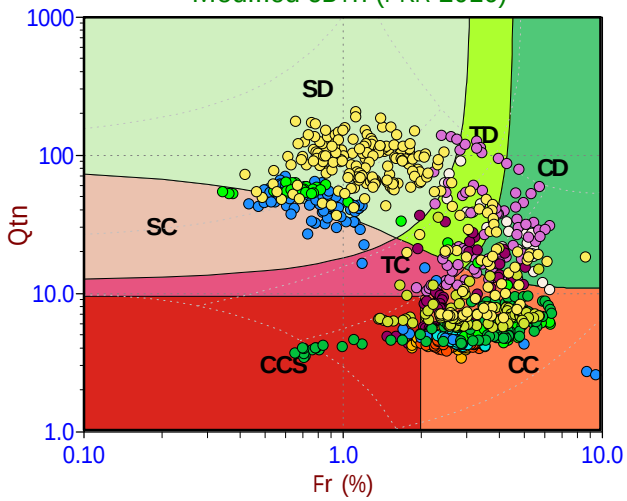
Job No: 18-56207
Date: 2018-12-18 08:15
Site: Corte Madera Levee Evaluation

Sounding: CPT-01
Cone: 391:T1500F15U500

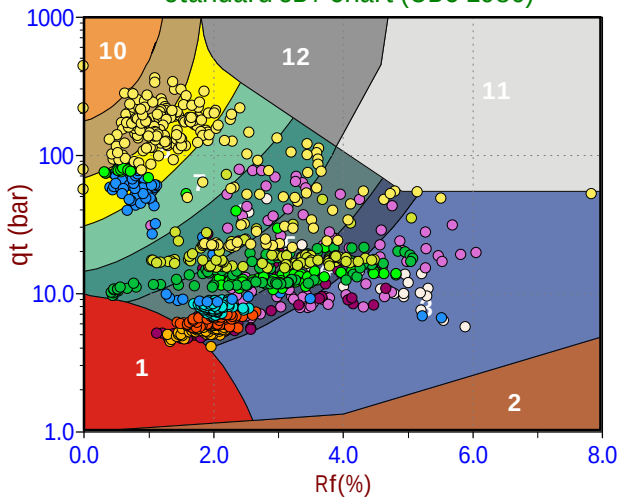
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

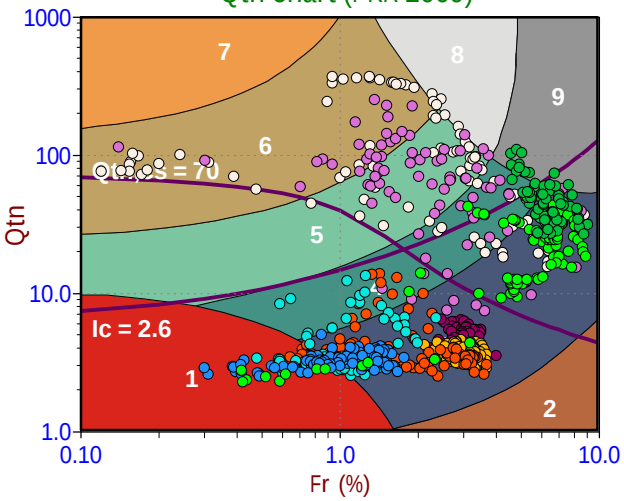
CONETEC

A3GEO

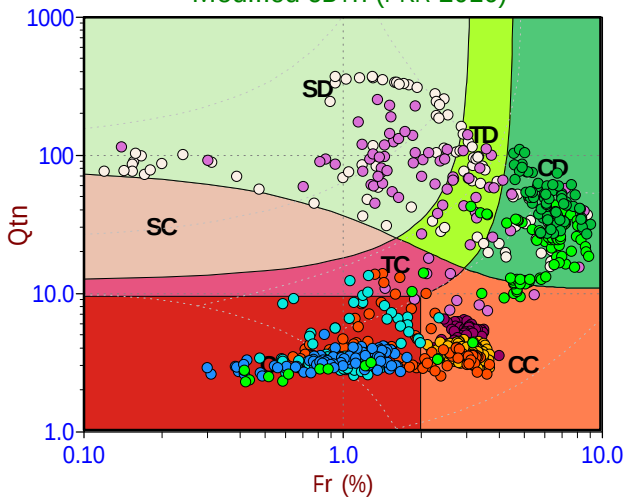
Job No: 18-56207
Date: 2018-12-18 15:24
Site: Corte Madera Levee Evaluation

Sounding: CPT-02
Cone: 391:T1500F15U500

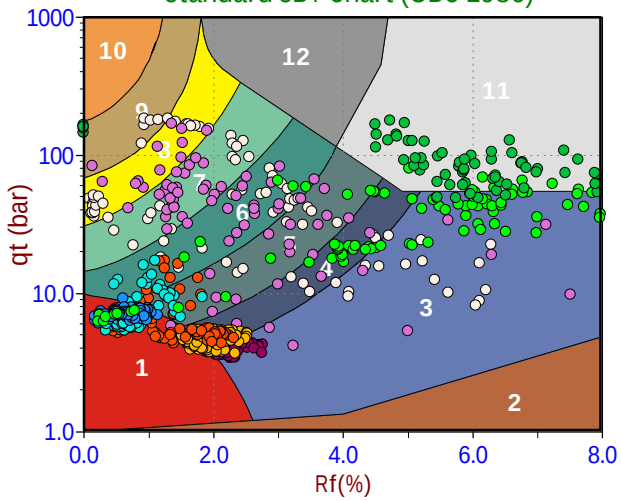
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

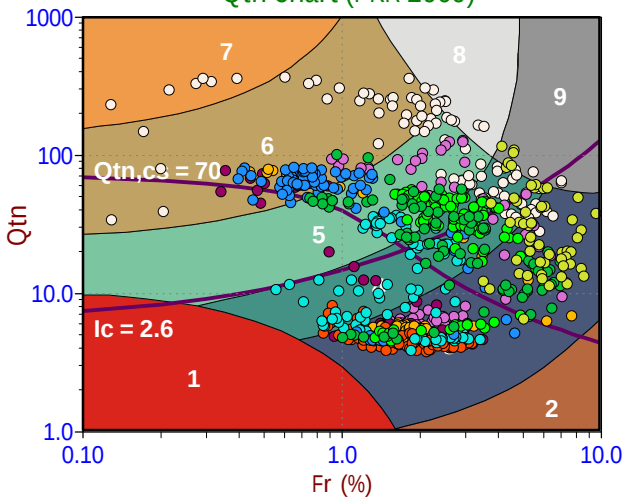
CONETEC

A3GEO

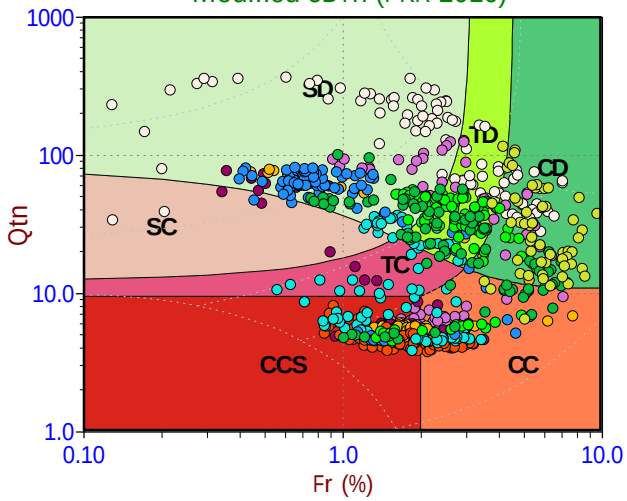
Job No: 18-56207
Date: 2018-12-18 13:46
Site: Corte Madera Levee Evaluation

Sounding: CPT-04
Cone: 391:T1500F15U500

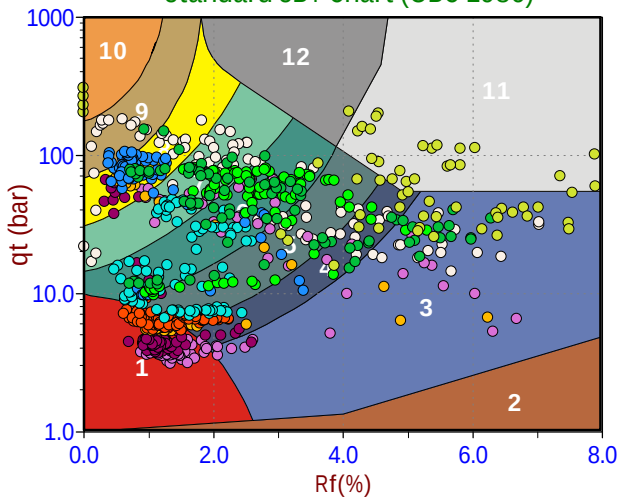
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

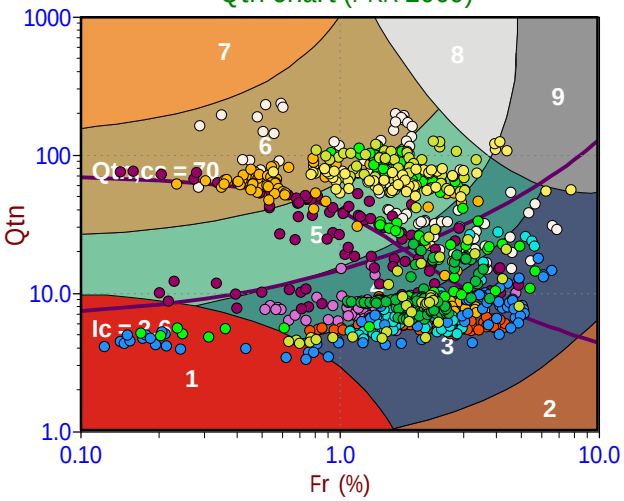
CONETEC

A3GEO

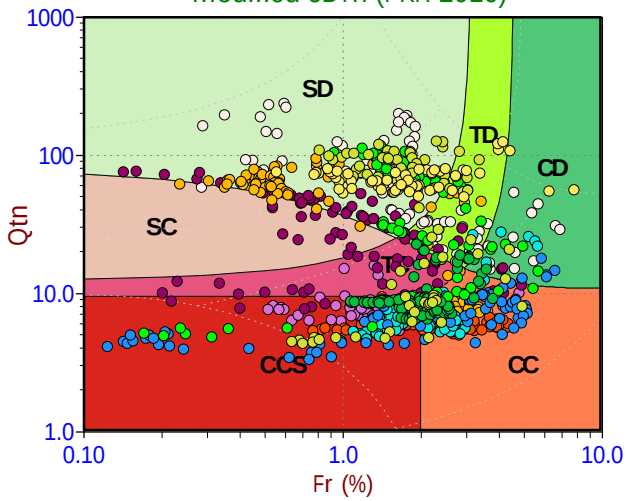
Job No: 18-56207
Date: 2018-12-18 11:41
Site: Corte Madera Levee Evaluation

Sounding: CPT-06
Cone: 391:T1500F15U500

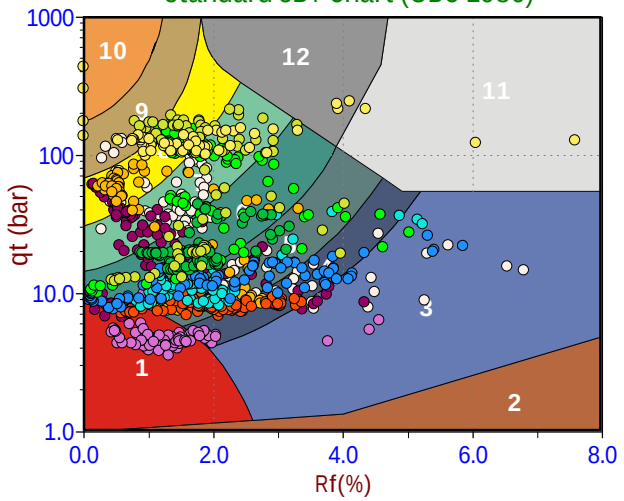
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Pore Pressure Dissipation Summary and
Pore Pressure Dissipation Plots

Job No:	18-56207
Client:	A3GEO Inc.
Project:	Corte Madera Levee Evaluation
Start Date:	18-Dec-2018
End Date:	18-Dec-2018

CPTu PORE PRESSURE DISSIPATION SUMMARY

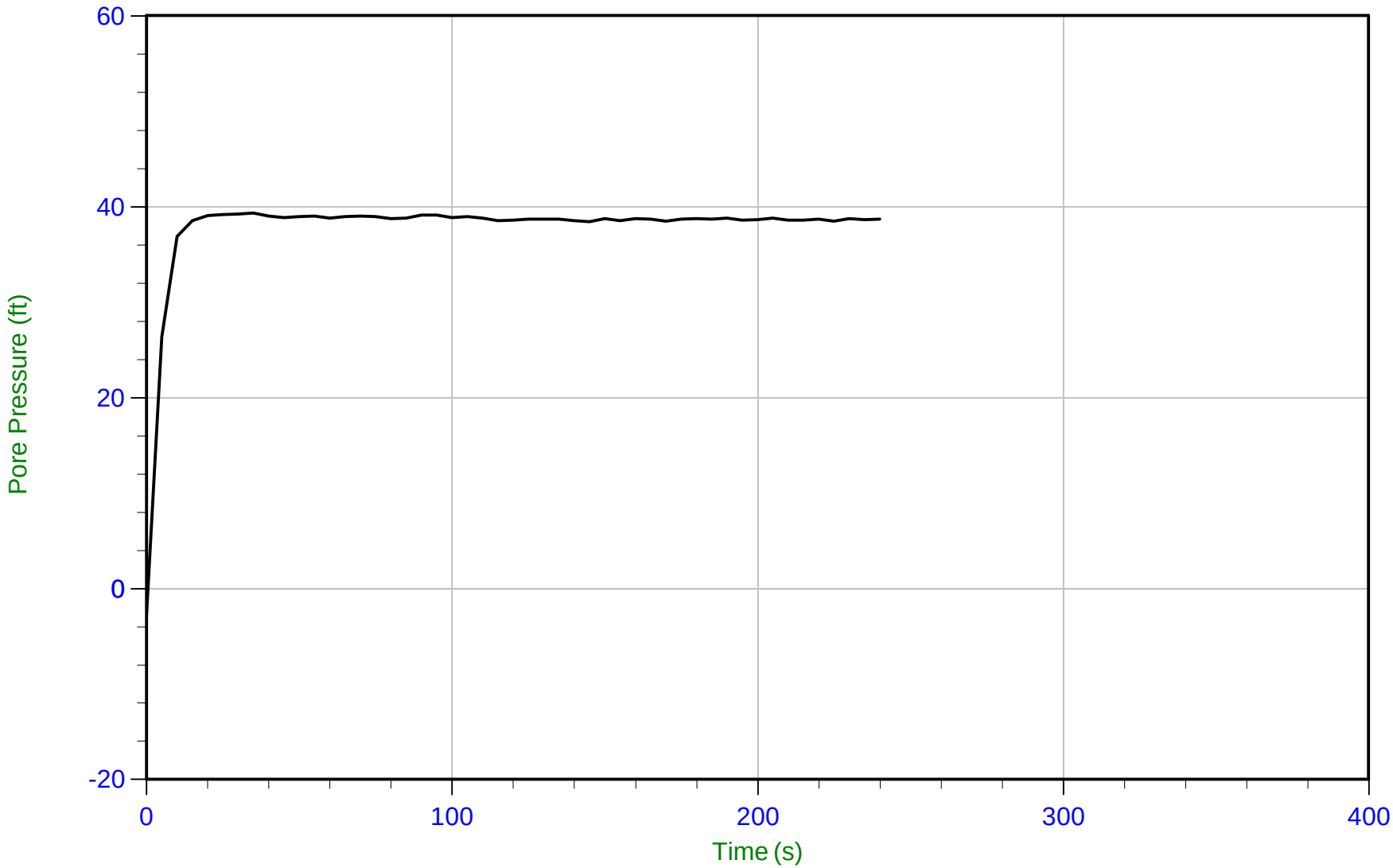
Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)
CPT-01	18-56207_CP01	15	240	46.75	38.6	8.2
CPT-04	18-56207_CP04	15	220	47.16	41.3	5.8
CPT-06	18-56207_CP06	15	135	17.96	11.7	6.2

CONETEC

A3GEO

Job No: 18-56207
Date: 12/18/2018 08:15
Site: Corte Madera Levee Evaluation

Sounding: CPT-01
Cone: 391:T1500F15U500 Area=15 cm²



Trace Summary:

Filename: 18-56207_CP01.PPF
Depth: 14.250 m / 46.751 ft
Duration: 240.0 s

U Min: -2.7 ft
U Max: 39.3 ft

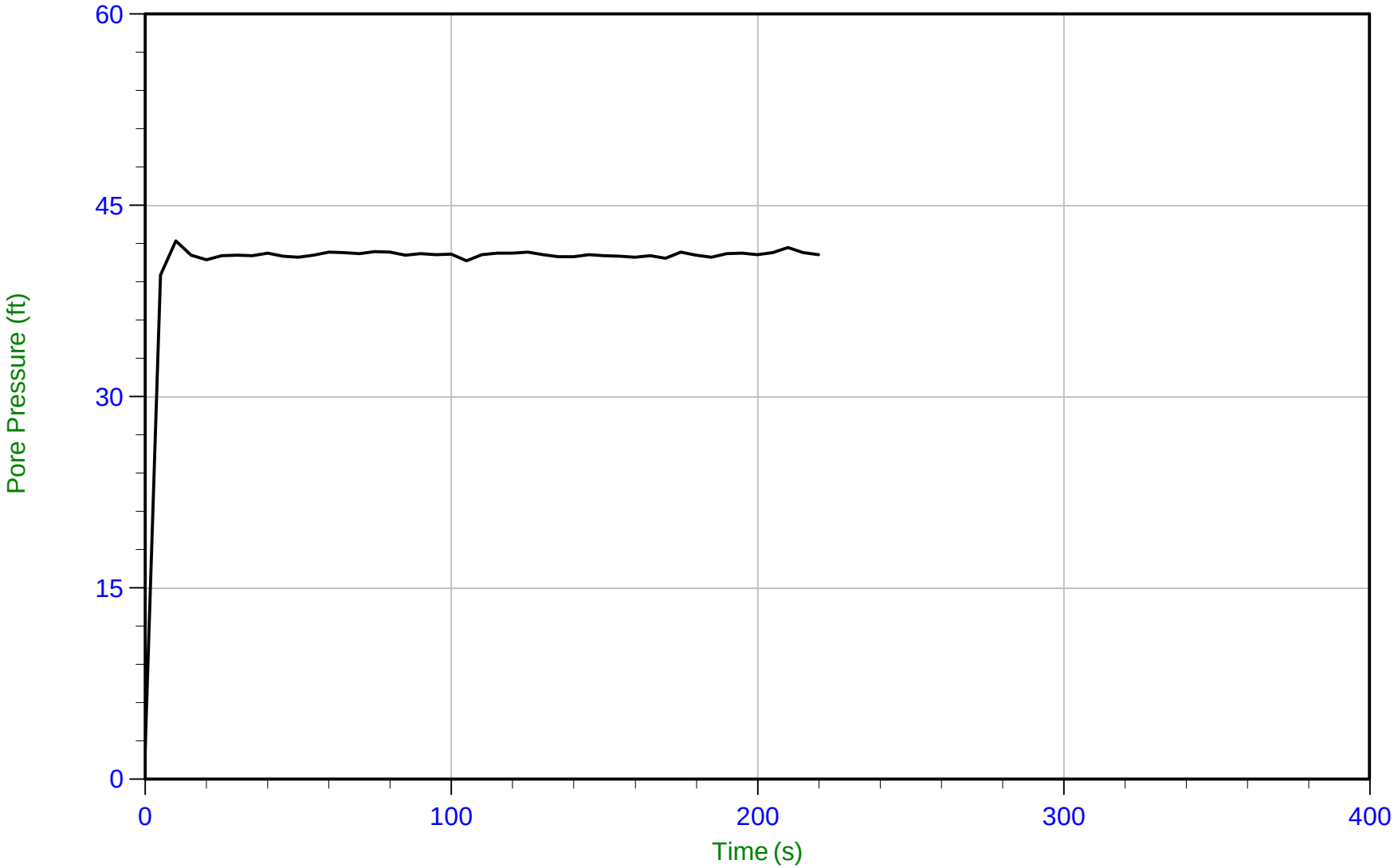
WT: 2.492 m / 8.176 ft
Ueq: 38.6 ft

CONETEC

A3GEO

Job No: 18-56207
Date: 12/18/2018 13:46
Site: Corte Madera Levee Evaluation

Sounding: CPT-04
Cone: 391:T1500F15U500 Area=15 cm²



Trace Summary:

Filename: 18-56207_CP04.PPF
Depth: 14.375 m / 47.162 ft
Duration: 220.0 s

U Min: 2.4 ft
U Max: 42.2 ft

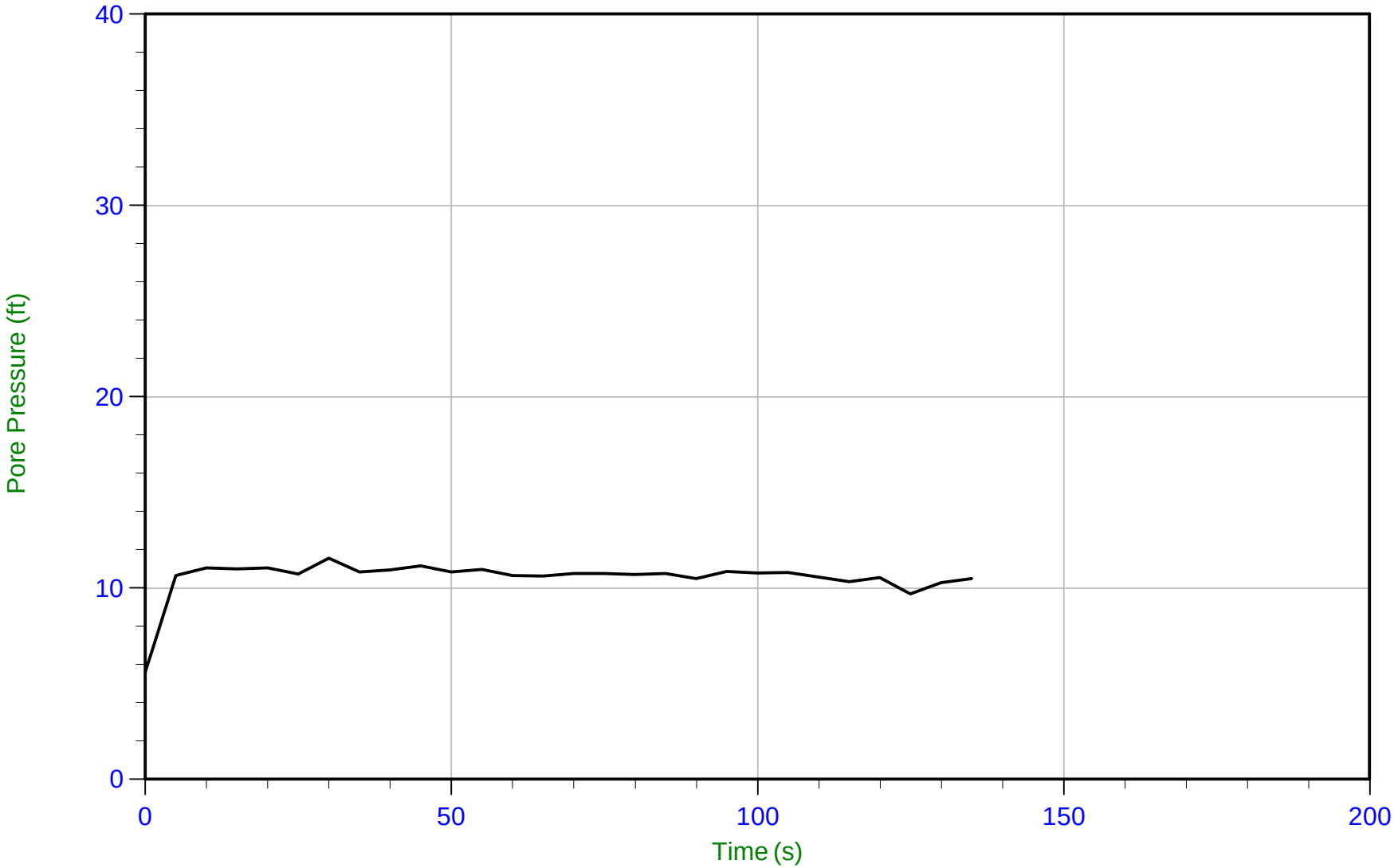
WT: 1.775 m / 5.823 ft
Ueq: 41.3 ft

CONETEC

A3GEO

Job No: 18-56207
Date: 12/18/2018 11:41
Site: Corte Madera Levee Evaluation

Sounding: CPT-06
Cone: 391:T1500F15U500 Area=15 cm²



Trace Summary:

Filename: 18-56207_CP06.PPF
Depth: 5.475 m / 17.962 ft
Duration: 135.0 s

U Min: 5.6 ft
U Max: 11.6 ft

WT: 1.904 m / 6.247 ft
Ueq: 11.7 ft

APPENDIX C

Direct Push Logs

A3GEO

UNIFIED SOIL CLASSIFICATION CHART

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS: more than 50% retained on No. 200 sieve	COARSE GRAINED SOILS: 50% or more of coarse fraction on No. 4 sieve	CLEAN GRAVELS	GW	Well graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH SAND	GM	Silty gravels and gravel-sand-silt mixtures
			GC	Clayey gravels and gravel-sand-clay mixtures
	SANDS: more than 50% passing on No. 4 sieve	CLEAN SANDS	SW	Well graded sands and gravelly sand, little or no fines
			SP	Poorly graded sands and gravelly sand, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS: 50% or more passing No. 200 sieve	SILTS AND CLAY: Liquid Limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays or low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAY: Liquid Limit 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic clays
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS			PT	Peat, muck, and other highly organic soils

BOUNDARY CLASSIFICATION AND GRAIN SIZES

SILT OR CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

U.S. Standard Sieve Sizes	No. 200 0.075 mm	No. 40 0.425 mm	No. 10 2 mm	No. 4 3/16"	3/4"	3"	12"

SYMBOLS

Modified California (MC) Sampler (3" O.D.)	Direct Push Core (DP)	No Recovery (NR)
Standard Penetration Test: SPT (2" O.D.)	Pitcher Tube (PT) ShelbyTube (ST)	Water Levels At time of drilling At end of drilling After drilling

ABBREVIATIONS

Item	Meaning
LL	Liquid Limit (%) (ASTM D 4318)
PI	Plasticity Index (%) (ASTM D 4318)
-200	Passing No. 200 (%) (ASTM D 1140)
TXICU	Laboratory consolidated undrained triaxial test of undrained shear strength (psf) (ASTM D 4767)
UC	Laboratory unconfined compression test (ASTM D 2166)
psf/tsf	pounds per square foot / tons per square foot
psi	pounds per square inch
OD	Outside Diameter
RQD	Rock-quality designation

NOTES

1. Stratification lines represent the approximate boundaries between material types and the transitions may be gradual.
2. Modified California (MC) blow counts were adjusted by multiplying field blow counts by a factor of 0.63.
3. Recorded blow counts have not been adjusted for hammer energy.

A3GEO

KEY TO EXPLORATORY BORING LOGS

A3GEO, Inc.
1331 Seventh Ave, Suite E
Berkeley, CA, 94710
Telephone: 510-705-1664

Direct Push at CPT-2

CLIENT County of Marin
PROJECT NAME Corte Madera Levee Evaluation
PROJECT NUMBER 1158-1A
PROJECT LOCATION Marin County, CA
DATE STARTED 12/18/18 **COMPLETED** 12/18/18
GROUND ELEVATION 11.1 ft **HOLE SIZE** 1.75"
DRILLING CONTRACTOR ConeTec
GROUND WATER LEVELS:
DRILLING METHOD Direct Push
AT TIME OF DRILLING Not Measured
LOGGED BY SK **CHECKED BY** DKM
AT END OF DRILLING Not Measured
NOTES
AFTER DRILLING Not Measured

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	ADJUSTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	RECOVERY % (RQD)	OTHER LAB TESTS / NOTES
0.0		**CLAYEY SAND WITH GRAVEL (SC)**- grayish brown, fine to coarse sand, fine to medium gravel up to ½-inch in diameter, moist [FILL]					5		Gravel: 35% Sand: 48% -#200: 17%
		CLAYEY SAND (SC)- yellowish brown, predominantly fine sand, trace of coarse sand, subrounded to sunangular gravel up to ½-inch in diameter, few reddish oxidation mottles, moist [FILL]	DP				16	67	Gravel: 13% Sand: 47% -#200: 40%
2.5		**CLAYEY SAND WITH GRAVEL (SC)**- brown, fine to coarse sand, fine to coarse gravel up to 1-inch in diameter, subrounded to subangular gravel, weak cementation, low plasticity fines, moist [FILL]					9		Gravel: 24% Sand: 42% -#200: 34%
5.0		gravel up to 1½-inch in diameter	DP				10	73	
7.5		grayish brown mottled with orange oxidation, predominantly fine sand, some medium to coarse sand, gravel up to ½-inch in diameter, low plasticity fines, wet	DP				20	54	Gravel: 24% Sand: 43% -#200: 33% LL=32, PI=14
10.0		**CLAYEY GRAVEL WITH SAND (GC)**- dark gray, fine to coarse sand, fine to coarse gravel, high plasticity fines [FILL]					14		Gravel: 51% Sand: 30% -#200: 19%

(Continued Next Page)

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Berkeley, CA, 94710
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Direct Push at CPT-2

CLIENT County of Marin
PROJECT NAME Corte Madera Levee Evaluation
PROJECT NUMBER 1158-1A
PROJECT LOCATION Marin County, CA
DATE STARTED 12/18/18 **COMPLETED** 12/18/18
GROUND ELEVATION 11.1 ft **HOLE SIZE** 1.75"
DRILLING CONTRACTOR ConeTec
GROUND WATER LEVELS:
DRILLING METHOD Direct Push
AT TIME OF DRILLING Not Measured
LOGGED BY SK **CHECKED BY** DKM
AT END OF DRILLING Not Measured
NOTES
AFTER DRILLING Not Measured

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	ADJUSTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	RECOVERY % (RQD)	OTHER LAB TESTS / NOTES
10.0		**SILTY GRAVEL WITH SAND (GM)**- light brown, fine to coarse sand, fine to coarse angular gravel, wet [FILL]	DP				9	72	
12.5		gray, increase in fine content					15		Gravel: 47% Sand: 36% -#200: 17%
15.0		**FAT CLAY (CH)**- dark gray, soft, high plasticity, wet [BAYMUD]							Layer boundary estimated according to collected CPT data.

Bottom of sampling hole at 13.0 feet.
1. Stratification lines represent the approximate boundaries between material types and the transitions may be gradual.
2. Ground surface elevation is approximate. Ground surface elevations reference NAVD88 Datum.
3. Groundwater was not measured in the hole during or after direct push sampling.
4. The hole was backfilled with type II cement grout upon completion of direct push sampling.
5. Baymud depth is recorded from the corresponding CPT log (CPT-2).

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Telephone: 510-705-1664

Direct Push at CPT-4

CLIENT County of Marin
PROJECT NAME Corte Madera Levee Evaluation
PROJECT NUMBER 1158-1A
PROJECT LOCATION Marin County, CA
DATE STARTED 12/18/18 **COMPLETED** 12/18/18
GROUND ELEVATION 11.3 ft **HOLE SIZE** 1.75"
DRILLING CONTRACTOR ConeTec
GROUND WATER LEVELS:
DRILLING METHOD Direct Push
AT TIME OF DRILLING Not Measured
LOGGED BY SK **CHECKED BY** DKM
AT END OF DRILLING Not Measured
NOTES
AFTER DRILLING Not Measured

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	ADJUSTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	RECOVERY % (RQD)	OTHER LAB TESTS / NOTES
0.0		**CLAYEY SAND WITH GRAVEL (SC)**- dark gray, fine to coarse sand, fine to coarse gravel up to 1 inch in diameter, moist [FILL]					5		Gravel: 32% Sand: 52% -#200: 16%
		SANDY LEAN CLAY WITH GRAVEL (CL)- brown, fine to medium sand, fine gravel, low plasticity, moist [FILL]	DP				12	100	
2.5		**CLAYEY SAND WITH GRAVEL (SC)**- dark gray, fine to coarse sand, subrounded to subangular gravel up to 1 inch in diameter, low plasticity fines, moist [FILL]					6		Gravel: 31% Sand: 45% -#200: 24%
		brown					8		Gravel: 28% Sand: 41% -#200: 31%
			DP					63	
5.0		dark brown, medium plasticity fines					10		Gravel: 33% Sand: 38% -#200: 29%
							7		
							17		Gravel: 33% Sand: 42% -#200: 25%
7.5		**SILTY SAND WITH GRAVEL (SC)**- gray to grayish brown, fine to coarse sand, angular gravel up to 1 inch in diameter, wet [FILL]							
			DP					52	
							15		Gravel: 36% Sand: 49% -#200: 15%
10.0									

(Continued Next Page)

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Berkeley, CA, 94710
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Direct Push at CPT-4

CLIENT County of Marin
PROJECT NAME Corte Madera Levee Evaluation
PROJECT NUMBER 1158-1A
PROJECT LOCATION Marin County, CA
DATE STARTED 12/18/18 **COMPLETED** 12/18/18
GROUND ELEVATION 11.3 ft **HOLE SIZE** 1.75"
DRILLING CONTRACTOR ConeTec
GROUND WATER LEVELS:
DRILLING METHOD Direct Push
AT TIME OF DRILLING Not Measured
LOGGED BY SK **CHECKED BY** DKM
AT END OF DRILLING Not Measured
NOTES
AFTER DRILLING Not Measured

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	ADJUSTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	RECOVERY % (RQD)	OTHER LAB TESTS / NOTES
10.0		**FAT CLAY (CH)**- dark gray, soft, high plasticity, wet [BAYMUD]							
							73		LL=53, PI=26
			DP					75	
12.5									
							89		LL=75, PI=42

Bottom of sampling hole at 14.0 feet.
1. Stratification lines represent the approximate boundaries between material types and the transitions may be gradual.
2. Ground surface elevation is approximate. Ground surface elevations reference NAVD88 Datum.
3. Groundwater was not measured in the hole during or after direct push sampling.
4. The hole was backfilled with type II cement grout upon completion of direct push sampling.

APPENDIX D

Laboratory Test Data Sheets

B. HILLEBRANDT SOILS TESTING, INC.

29 Sugarloaf Terrace, Alamo, CA 94507 - Tel: (510) 409-2916 - Fax: (925) 891-9267 - Email: soiltesting@aol.com

LAB RESULTS SUMMARY FORM

Project Number: 1158-1A **Project Name:** Corte Madera Levee Evaluation **Results Due By:**
Requested By: DM **Request Date:** 12/21/18 **Throw Samples Out On:**

					Atterberg			-200			Compaction				
Boring #	Sample Depth (feet)	Dry Density (pcf)	Moisture Content (%)	TxUU Shear Strength (psf)	Liquid Limit	Plastic Limit	Plasicity Index	Passing #4 Sieve (%)	Passing #40 sieve (%)	Passing #200 sieve (%)	Maximum Dry Density (pcf)	Optimum Moisture (%)	Pocket Penetrometer (tsf)	Torvane (tsf)	Remarks
CPT-2	0.0 - 1.0		5.4					65	30	17					
CPT-2	1.0 - 2.0		16.2					87	58	40					
CPT-2	2.0 - 4.0		8.9					76	57	34					
CPT-2	4.0 - 6.0		9.6												
CPT-2	6.5 - 9.0		20.0		32	18	14	76	48	33					
CPT-2	9.0 - 10.0		13.7					49	29	19					
CPT-2	10.0 - 12.0		8.8												
CPT-2	12.0 - 14.0		14.9					53	26	17					
CPT-4	0.0 - 1.0		5.1					68	33	16					
CPT-4	1.0 - 2.0		12.1												
CPT-4	2.0 - 3.0		5.5					69	39	24					
CPT-4	3.0 - 4.0		8.4					72	45	31					
CPT-4	4.0 - 5.5		10.0					67	43	29					
CPT-4	5.5 - 6.0		7.3												
CPT-4	6.0 - 7.0		16.6					67	38	25					
CPT-4	7.0 - 10.0		15.1					64	26	15					
CPT-4	10.0 - 12.0		72.8		53	27	26								
CPT-4	12.0 - 14.0		88.8		75	33	42								

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MOISTURE CONTENT WORKSHEET

Job #: 1158-1A
Job Name: Corte Madera Levee Evaluation
Date: 12/21/18
Tested by: B. Hillebrandt

Additional Tests:	FS	FS	FS		PI, FS	FS		FS	FS
Boring #:	CPT-2	CPT-2	CPT-2	CPT-2	CPT-2	CPT-2	CPT-2	CPT-2	CPT-4
Depth:	0.0 - 1.0	1.0 - 2.0	2.0 - 4.0	4.0 - 6.0	6.5 - 9.0	9.0 - 10.0	10 0 - 12.0	12.0 - 14.0	0.0 - 1.0
Sample Description:	Gray clayey SAND with gravel	Dark yellowish brown clayey SAND	Brown clayey SAND with gravel	Dark brown sandy CLAY with gravel	Yellowish brown clayey SAND with gravel	Brownish gray clayey GRAVEL withsand	Dark olive brown gravelly SAND	Olive brown clayey GRAVEL with sand	Grayish brown clayey SAND with gravel
Can #:	383	342	364	402	326	422	346	603	610
Wet Sample + can	259.1	245.2	310.8	269.4	306.4	310.8	233.7	291.0	220.8
Dry Sample + can	247.6	216.7	288.3	248.7	261.8	277.2	217.9	257.6	211.7
Weight can	33.0	40.4	34.3	33.3	38.4	32.3	38.9	33.8	34.3
Weight water	11.5	28.5	22.5	20.7	44.6	33.6	15.8	33.4	9.1
Weight Dry Sample	214.6	176.3	254	215.4	223.4	244.9	179	223.8	177.4
WATER CONTENT (%)	**5.4%**	**16.2%**	**8.9%**	**9.6%**	**20.0%**	**13.7%**	**8.8%**	**14.9%**	**5.1%**

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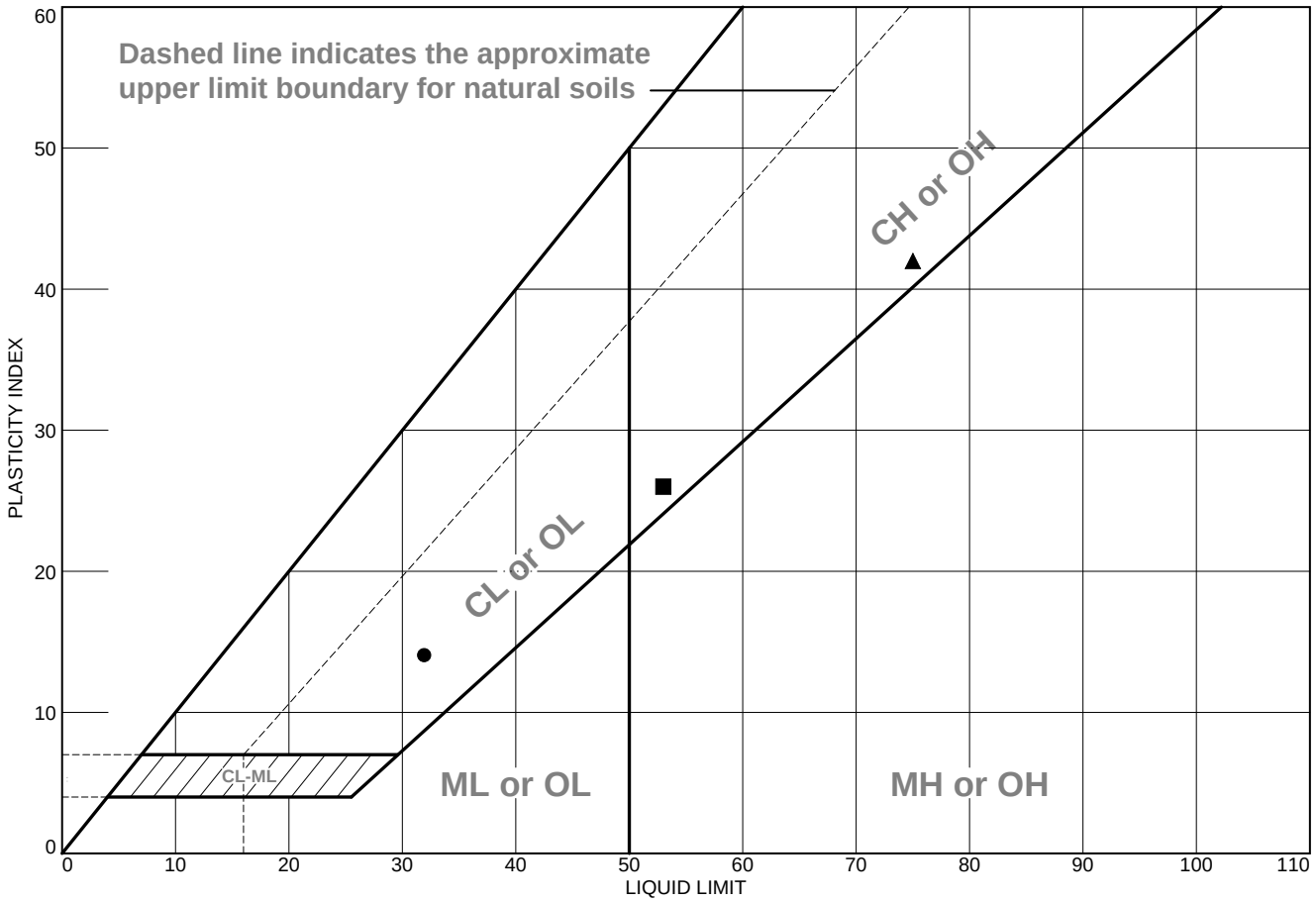
MOISTURE CONTENT WORKSHEET

Job #: 1158-1A
Job Name: Corte Madera Levee Evaluation
Date: 12/21/18
Tested by: B. Hillebrandt

Additional Tests:		FS	FS	FS		FS	FS		
Boring #:	CPT-4	CPT-4	CPT-4	CPT-4	CPT-4	CPT-4	CPT-4	CPT-4	CPT-4
Depth:	1.0 - 2.0	2.0 - 3.0	3.0 - 4.0	4.0 - 5.5	5.5 - 6.0	6.0 - 7.0	7.0 - 10.0	10.0 - 12.0	12.0 - 14.0
Sample Description:	Brown clayey SAND	Brownish gray clayey SAND with gravel	Brownish gray clayey SAND with gravel	Brownish gray clayey SAND with gravel	Olive gray clayey SAND	Olive brown clayey SAND with gravel	Greenish gray clayey SAND with gravel	Dark brownish gray fat CLAY with organics	Gray fat CLAY with organics
Can #:	333	348	352	323	378	343	315	363	400
Wet Sample + can	220.9	251.9	278.2	284.9	176.4	285.9	379.0	216.2	154.4
Dry Sample + can	201.3	240.7	259.2	262.5	166.7	250.5	334.4	139.0	97.3
Weight can	39.2	38.7	34.0	37.7	33.1	37.6	38.2	33.0	33.0
Weight water	19.6	11.2	19	22.4	9.7	35.4	44.6	77.2	57.1
Weight Dry Sample	162.1	202	225.2	224.8	133.6	212.9	296.2	106	64.3
WATER CONTENT (%)	**12.1%**	**5.5%**	**8.4%**	**10.0%**	**7.3%**	**16.6%**	**15.1%**	**72.8%**	**88.8%**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Yellowish brown clayey SAND with gravel	32	18	14	48.1	33.4	SC
■	Dark brownish gray fat CLAY with organics	53	27	26			CH
▲	Gray fat CLAY with organics	75	33	42			CH

Project No. 1158-1A **Client:** A3Geo

Project: Corte Madera Levee Evaluation

●**Source of Sample:** CPT-2 **Depth:** 6.5 - 9.0' **Sample Number:** 6

■**Source of Sample:** CPT-4 **Depth:** 10.0 - 12.0' **Sample Number:** 9

▲**Source of Sample:** CPT-4 **Depth:** 12.0 - 14.0' **Sample Number:** 10

Remarks:

B. HILLEBRANDT SOILS TESTING, INC.
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SoilTesting@aol.com

Figure

Tested By: BH

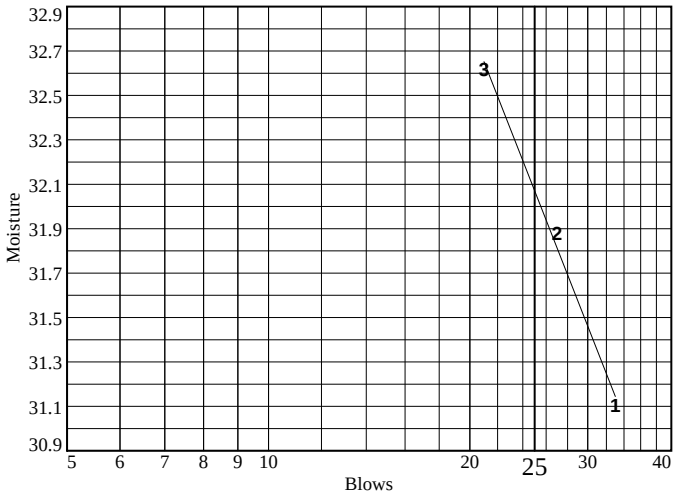
LIQUID AND PLASTIC LIMIT TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-2
Depth: 6.5 - 9.0' **Sample Number:** 6
Material Description: Yellowish brown clayey SAND with gravel
%<#40: 48.1 **%<#200:** 33.4 **USCS:** SC **AASHTO:** A-2-6(1)
Tested by: BH

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	26.78	26.71	28.04			
Dry+Tare	23.10	22.98	23.91			
Tare	11.27	11.28	11.25			
# Blows	33	27	21			
Moisture	31.1	31.9	32.6			



Liquid Limit= 32
Plastic Limit= 18
Plasticity Index= 14
Natural Moisture= 20.0
Liquidity Index= 0.1

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	20.11	17.38			
Dry+Tare	18.671	16.44			
Tare	11.11	11.16			
Moisture	19.0	17.8			

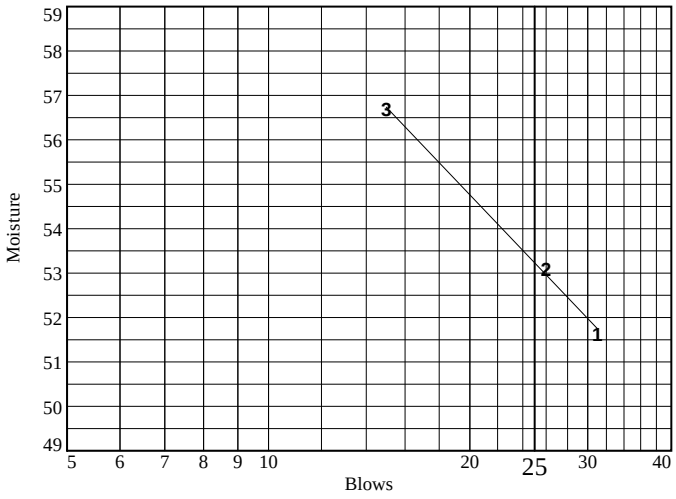
LIQUID AND PLASTIC LIMIT TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-4
Depth: 10.0 - 12.0' **Sample Number:** 9
Material Description: Dark brownish gray fat CLAY with organics
USCS: CH
Tested by: BH

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	25.16	27.04	28.60			
Dry+Tare	20.45	21.57	22.34			
Tare	11.33	11.27	11.30			
# Blows	31	26	15			
Moisture	51.6	53.1	56.7			



Liquid Limit= 53
Plastic Limit= 27
Plasticity Index= 26
Natural Moisture= 72.8
Liquidity Index= 1.8

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	17.90	17.22			
Dry+Tare	16.44	15.96			
Tare	11.20	11.16			
Moisture	27.9	26.2			

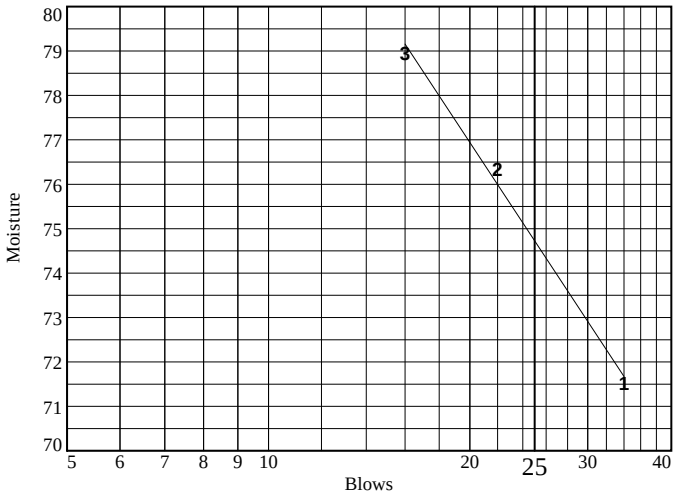
LIQUID AND PLASTIC LIMIT TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-4
Depth: 12.0 - 14.0' **Sample Number:** 10
Material Description: Gray fat CLAY with organics
USCS: CH
Tested by: BH

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	28.47	26.39	28.18			
Dry+Tare	21.31	19.84	20.75			
Tare	11.30	11.26	11.34			
# Blows	34	22	16			
Moisture	71.5	76.3	79.0			

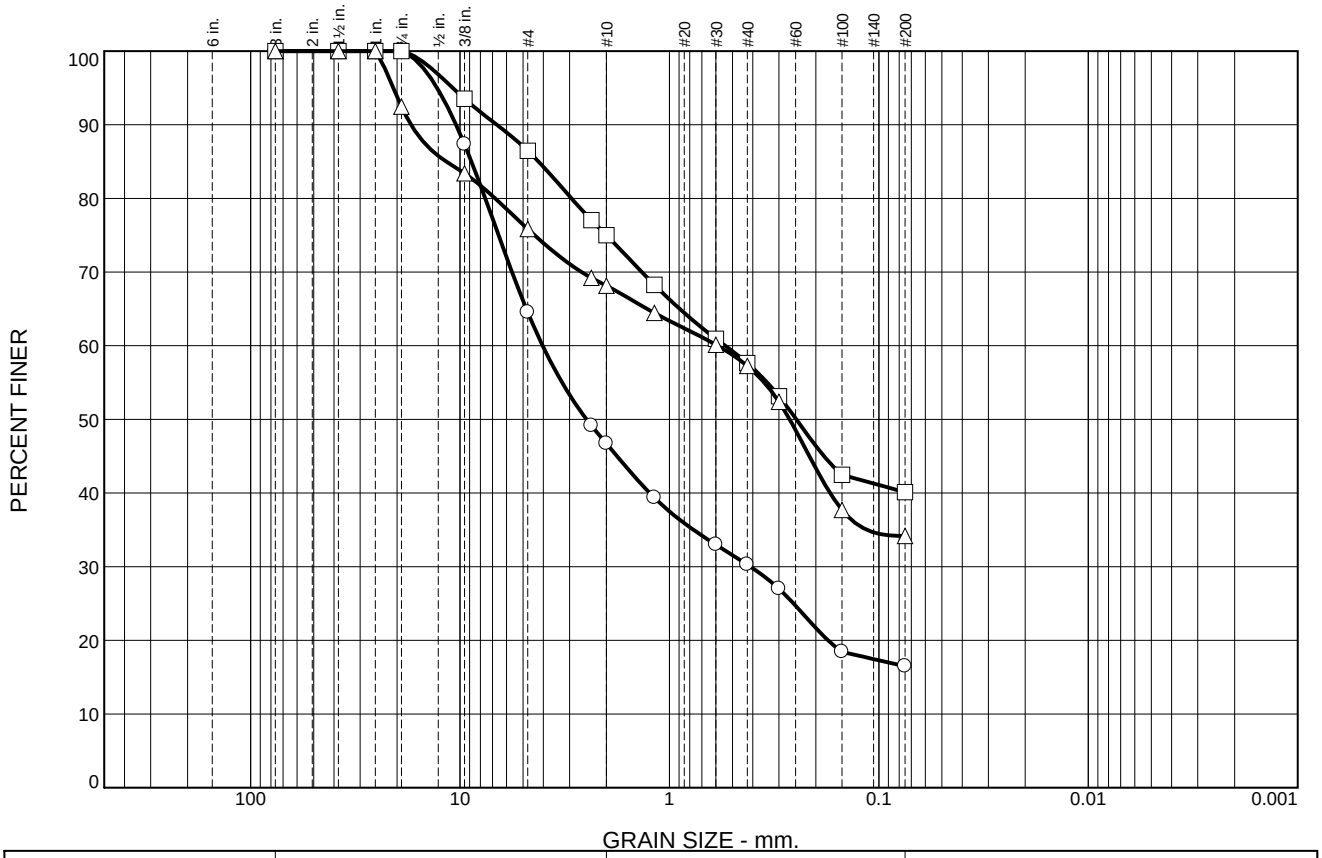


Liquid Limit= 75
Plastic Limit= 33
Plasticity Index= 42
Natural Moisture= 88.8
Liquidity Index= 1.3

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	17.10	17.52			
Dry+Tare	15.69	15.97			
Tare	11.32	11.34			
Moisture	32.3	33.5			

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay

MATERIAL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	CPT-2	1	0.0 - 1.0'	Gray clayey SAND with gravel	SC
□	CPT-2	2	1.0 - 2.0'	Dark yellowish brown clayey SAND	SC
△	CPT-2	3	2.0 - 4.0'	Brown clayey SAND with gravel	SC

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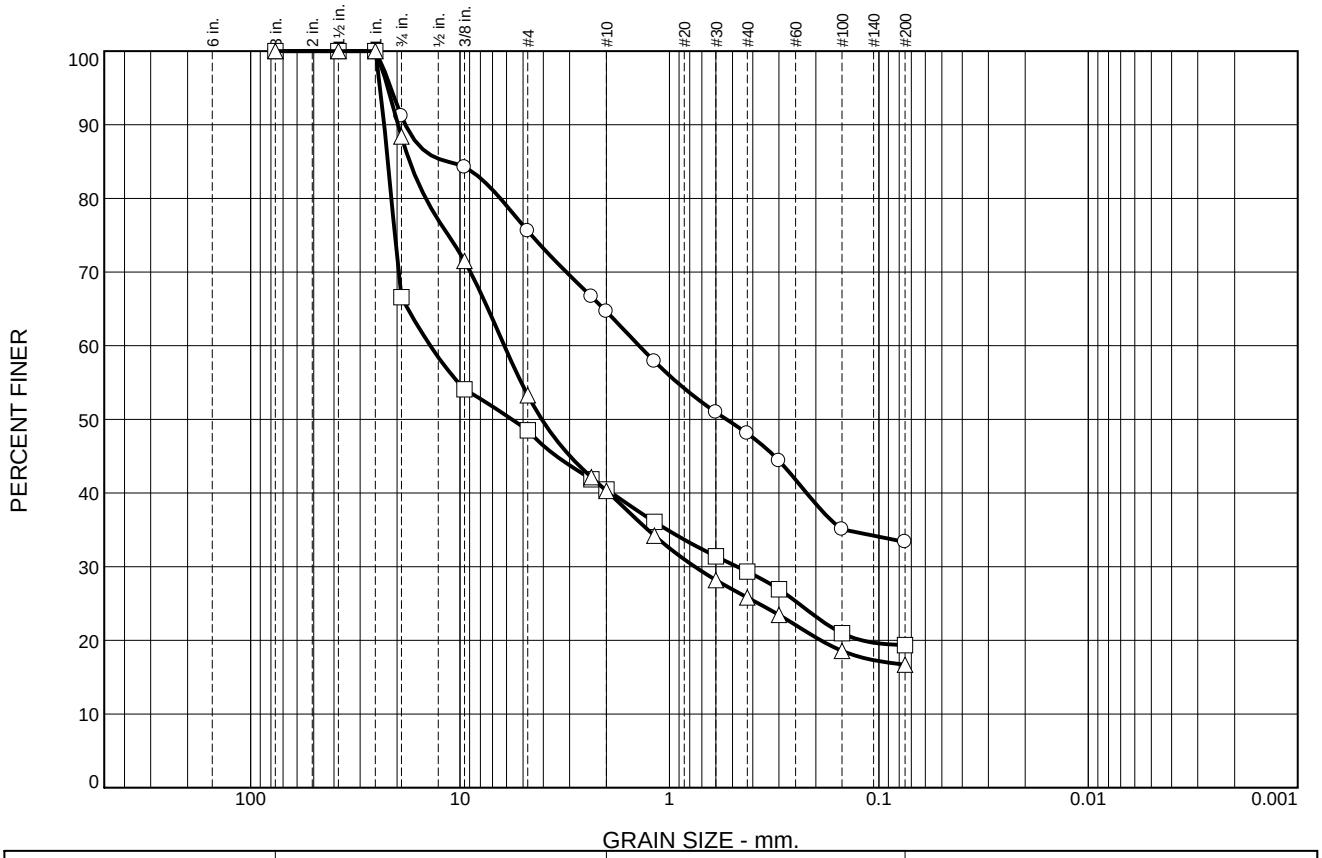
Client: A3Geo
Project: Corte Madera Levee Evaluation
Project No.: 1158-1A **Figure**

Tested By: BH

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay

MATERIAL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	CPT-2	6	6.5 - 9.0'	Yellowish brown clayey SAND with gravel	SC
□	CPT-2	7	9.0 - 10.0'	Brownish gray clayey GRAVEL with sand	GC
△	CPT-2	9	12.0 - 14.0'	Olive brown clayey GRAVEL with sand	GC

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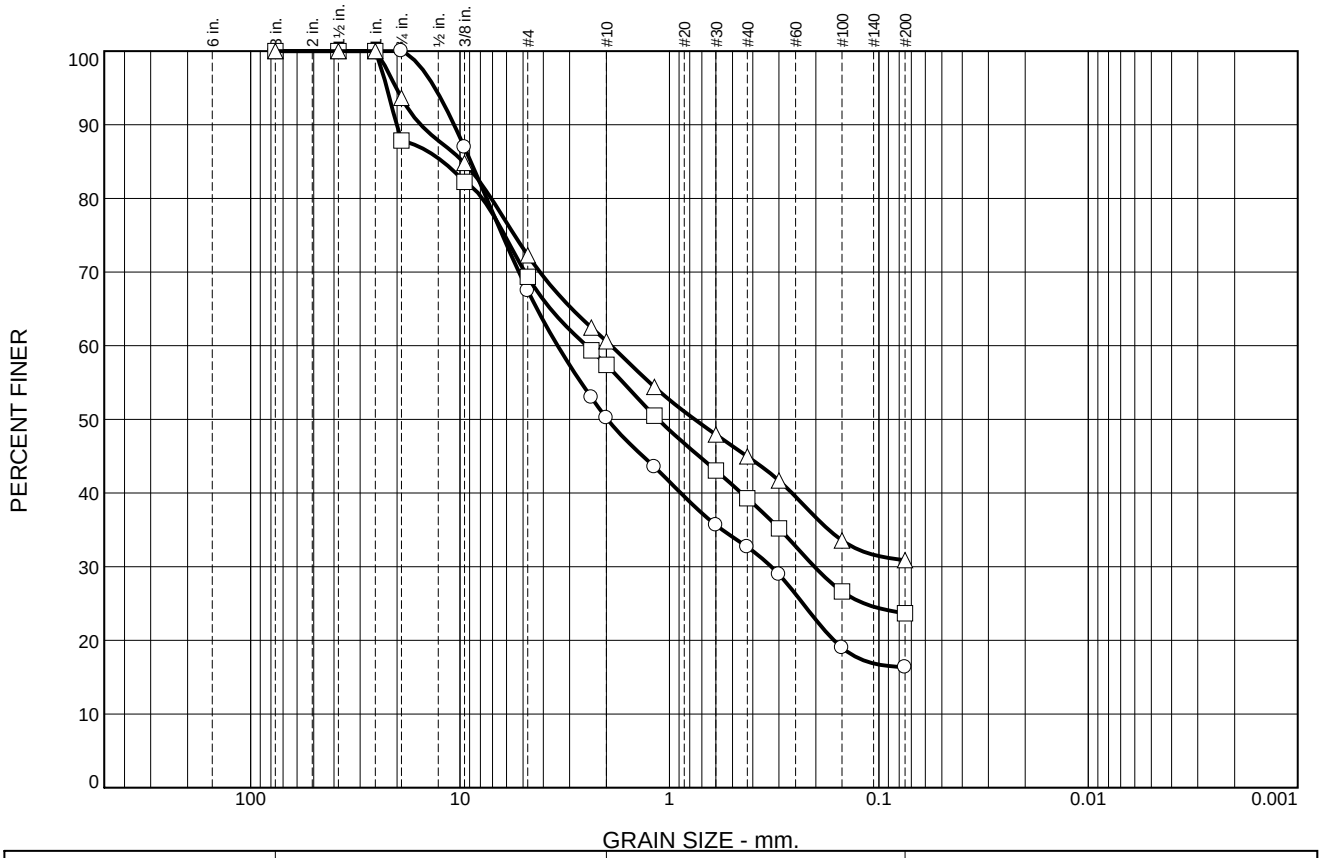
Client: A3Geo
Project: Corte Madera Levee Evaluation
Project No.: 1158-1A **Figure**

Tested By: BH

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay

MATERIAL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	CPT-4	1	0.0 - 1.0'	Grayish brown clayey SAND with gravel	SC
□	CPT-4	3	2.0 - 3.0'	Brownish gray clayey SAND with gravel	SC
△	CPT-4	4	3.0 - 4.0'	Brownish gray clayey SAND with gravel	SC

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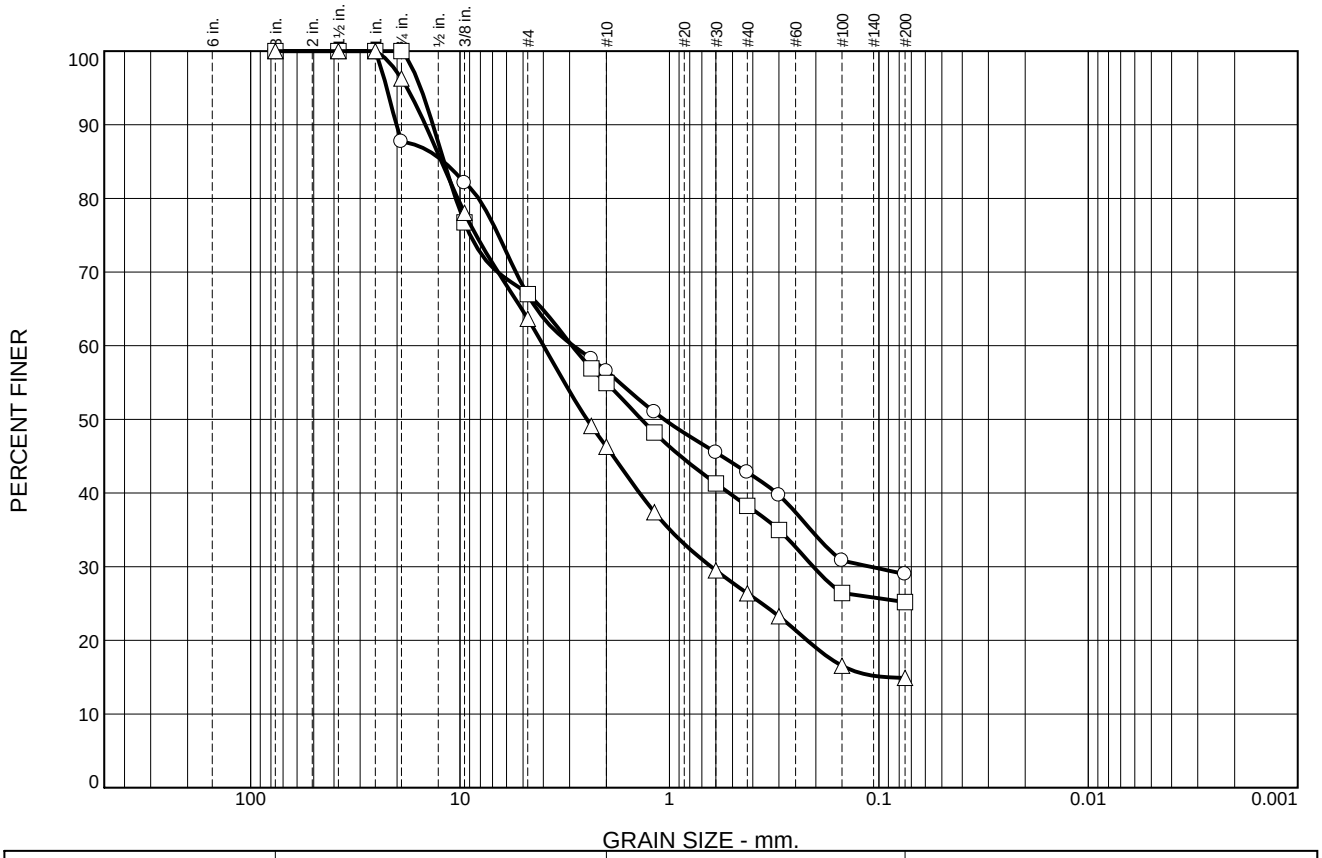
Client: A3Geo
Project: Corte Madera Levee Evaluation
Project No.: 1158-1A **Figure**

Tested By: BH

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay

MATERIAL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	CPT-4	5	4.0 - 5.5'	Brownish gray clayey SAND with gravel	SC
□	CPT-4	7	6.0 - 7.0'	Olive brown clayey SAND with gravel	SC
△	CPT-4	8	7.0 - 10.0'	Greenish gray clayey SAND with gravel	

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Client: A3Geo
Project: Corte Madera Levee Evaluation
Project No.: 1158-1A **Figure**

Tested By: BH

GRAIN SIZE DISTRIBUTION TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-2
Depth: 0.0 - 1.0' **Sample Number:** 1
Material Description: Gray clayey SAND with gravel
USCS: SC
Tested by: BH

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
247.60	33.00	0.00	3"	0.00	100.0
			1.5"	0.00	100.0
			1"	0.00	100.0
			3/4"	0.00	100.0
			3/8"	27.15	87.3
			#4	76.12	64.5
			#8	109.11	49.2
			#10	114.36	46.7
			#16	130.13	39.4
			#30	143.81	33.0
			#40	149.64	30.3
			#50	156.64	27.0
			#100	175.04	18.4
			#200	179.24	16.5

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0.0	53.3	16.4	13.8	30.2			16.5

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
			0.1749	0.4112	1.2423	2.4884	4.0335	7.5772	8.8241	10.4516	12.8696

Fineness Modulus
3.81

GRAIN SIZE DISTRIBUTION TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-2
Depth: 1.0 - 2.0' **Sample Number:** 2
Material Description: Dark yellowish brown clayey SAND
USCS: SC
Tested by: BH

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
216.70	40.40	0.00	3"	0.00	100.0
			1.5"	0.00	100.0
			1"	0.00	100.0
			3/4"	0.00	100.0
			3/8"	11.40	93.5
			#4	23.86	86.5
			#8	40.45	77.1
			#10	44.06	75.0
			#16	55.95	68.3
			#30	68.85	60.9
			#40	74.67	57.6
			#50	82.62	53.1
			#100	101.41	42.5
			#200	105.57	40.1

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0.0	25.0	17.4	17.5	34.9			40.1

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
						0.2478	0.5415	2.9363	4.2201	6.6773	10.8319

Fineness Modulus
2.18

GRAIN SIZE DISTRIBUTION TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-2
Depth: 2.0 - 4.0' **Sample Number:** 3
Material Description: Brown clayey SAND with gravel
USCS: SC
Tested by: BH

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
288.30	34.30	0.00	3"	0.00	100.0
			1.5"	0.00	100.0
			1"	0.00	100.0
			3/4"	19.15	92.5
			3/8"	42.15	83.4
			#4	61.35	75.8
			#8	78.20	69.2
			#10	80.92	68.1
			#16	90.30	64.4
			#30	101.27	60.1
			#40	108.57	57.3
			#50	120.94	52.4
			#100	158.23	37.7
			#200	167.19	34.2

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0.0	31.9	10.8	23.1	33.9			34.2

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
					0.1710	0.2667	0.5890	6.7956	11.6313	17.1405	20.8299

Fineness Modulus
2.64

GRAIN SIZE DISTRIBUTION TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-2
Depth: 6.5 - 9.0' **Sample Number:** 6
Material Description: Yellowish brown clayey SAND with gravel
USCS: SC
Tested by: BH

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
261.80	38.40	0.00	3"	0.00	100.0
			1.5"	0.00	100.0
			1"	0.00	100.0
			3/4"	19.72	91.2
			3/8"	35.22	84.2
			#4	54.55	75.6
			#8	74.46	66.7
			#10	78.99	64.6
			#16	94.09	57.9
			#30	109.56	51.0
			#40	115.96	48.1
			#50	124.25	44.4
			#100	145.05	35.1
			#200	148.89	33.4

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0.0	35.4	16.5	14.7	31.2			33.4

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
					0.2213	0.5342	1.3965	6.4225	11.4739	18.2391	21.4142

Fineness Modulus
2.94

GRAIN SIZE DISTRIBUTION TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-2
Depth: 9.0 - 10.0' **Sample Number:** 7
Material Description: Brownish gray clayey GRAVEL with sand
USCS: GC
Tested by: BH

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
277.20	32.30	0.00	3"	0.00	100.0
			1.5"	0.00	100.0
			1"	0.00	100.0
			3/4"	81.81	66.6
			3/8"	112.45	54.1
			#4	126.09	48.5
			#8	142.38	41.9
			#10	145.75	40.5
			#16	156.51	36.1
			#30	167.98	31.4
			#40	173.06	29.3
			#50	178.93	26.9
			#100	193.54	21.0
			#200	197.51	19.4

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0.0	59.5	11.2	9.9	21.1			19.4

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
			0.1208	0.4746	1.8886	5.6498	13.8669	21.2734	22.1108	23.0151	24.0529

Fineness Modulus
4.74

GRAIN SIZE DISTRIBUTION TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-2
Depth: 12.0 - 14.0' **Sample Number:** 9
Material Description: Olive brown clayey GRAVEL with sand
USCS: GC
Tested by: BH

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
257.60	33.80	0.00	3"	0.00	100.0
			1.5"	0.00	100.0
			1"	0.00	100.0
			3/4"	25.96	88.4
			3/8"	63.76	71.5
			#4	104.57	53.3
			#8	129.48	42.1
			#10	133.62	40.3
			#16	147.23	34.2
			#30	160.73	28.2
			#40	166.02	25.8
			#50	171.31	23.5
			#100	182.24	18.6
			#200	186.43	16.7

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0.0	59.7	14.5	9.1	23.6			16.7

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
			0.1893	0.7574	1.9487	4.0704	6.1451	14.5817	17.4008	19.7742	22.1041

Fineness Modulus
4.40

GRAIN SIZE DISTRIBUTION TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-4
Depth: 0.0 - 1.0' **Sample Number:** 1
Material Description: Grayish brown clayey SAND with gravel
USCS: SC
Tested by: BH

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
211.70	34.30	0.00	3"	0.00	100.0
			1.5"	0.00	100.0
			1"	0.00	100.0
			3/4"	0.00	100.0
			3/8"	23.18	86.9
			#4	57.69	67.5
			#8	83.42	53.0
			#10	88.37	50.2
			#16	100.15	43.5
			#30	114.15	35.7
			#40	119.44	32.7
			#50	126.06	28.9
			#100	143.69	19.0
			#200	148.38	16.4

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0.0	49.8	17.5	16.3	33.8			16.4

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
			0.1639	0.3265	0.8827	1.9761	3.4192	7.4641	8.8877	10.6752	13.1816

Fineness Modulus
3.65

GRAIN SIZE DISTRIBUTION TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-4
Depth: 2.0 - 3.0' **Sample Number:** 3
Material Description: Brownish gray clayey SAND with gravel
USCS: SC
Tested by: BH

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
240.70	38.70	0.00	3"	0.00	100.0
			1.5"	0.00	100.0
			1"	0.00	100.0
			3/4"	24.54	87.9
			3/8"	35.86	82.2
			#4	61.91	69.4
			#8	82.06	59.4
			#10	86.05	57.4
			#16	99.98	50.5
			#30	115.02	43.1
			#40	122.64	39.3
			#50	130.90	35.2
			#100	148.20	26.6
			#200	154.17	23.7

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0.0	42.6	18.1	15.6	33.7			23.7

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
				0.2030	0.4531	1.1325	2.4908	7.8254	12.1010	20.0692	22.3453

Fineness Modulus
3.46

GRAIN SIZE DISTRIBUTION TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-4
Depth: 3.0 - 4.0' **Sample Number:** 4
Material Description: Brownish gray clayey SAND with gravel
USCS: SC
Tested by: BH

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
259.20	34.00	0.00	3"	0.00	100.0
			1.5"	0.00	100.0
			1"	0.00	100.0
			3/4"	14.29	93.7
			3/8"	34.20	84.8
			#4	62.44	72.3
			#8	84.53	62.5
			#10	88.72	60.6
			#16	102.69	54.4
			#30	117.24	47.9
			#40	123.92	45.0
			#50	131.31	41.7
			#100	149.62	33.6
			#200	155.64	30.9

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0.0	39.4	15.6	14.1	29.7			30.9

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
					0.2599	0.7578	1.8980	7.0996	9.6644	15.4102	20.1753

Fineness Modulus
3.09

GRAIN SIZE DISTRIBUTION TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-4
Depth: 4.0 - 5.5' **Sample Number:** 5
Material Description: Brownish gray clayey SAND with gravel
USCS: SC
Tested by: BH

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
262.50	37.70	0.00	3"	0.00	100.0
			1.5"	0.00	100.0
			1"	0.00	100.0
			3/4"	27.67	87.7
			3/8"	40.27	82.1
			#4	74.45	66.9
			#8	93.95	58.2
			#10	97.68	56.5
			#16	110.17	51.0
			#30	122.51	45.5
			#40	128.57	42.8
			#50	135.55	39.7
			#100	155.50	30.8
			#200	159.64	29.0

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0.0	43.5	13.7	13.8	27.5			29.0

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
				0.1099	0.3083	1.0595	2.8777	8.1491	11.9859	20.1351	22.3851

Fineness Modulus
3.38

GRAIN SIZE DISTRIBUTION TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-4
Depth: 6.0 - 7.0' **Sample Number:** 7
Material Description: Olive brown clayey SAND with gravel
USCS: SC
Tested by: BH

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
250.50	37.60	0.00	3"	0.00	100.0
			1.5"	0.00	100.0
			1"	0.00	100.0
			3/4"	0.00	100.0
			3/8"	49.51	76.7
			#4	70.25	67.0
			#8	91.71	56.9
			#10	95.93	54.9
			#16	110.26	48.2
			#30	124.96	41.3
			#40	131.44	38.3
			#50	138.42	35.0
			#100	156.63	26.4
			#200	159.25	25.2

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0.0	45.1	16.6	13.1	29.7			25.2

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
				0.2056	0.5187	1.3602	2.9193	10.4921	11.9210	13.4785	15.4234

Fineness Modulus
3.48

GRAIN SIZE DISTRIBUTION TEST DATA

12/31/2018

Client: A3Geo
Project: Corte Madera Levee Evaluation
Project Number: 1158-1A
Location: CPT-4
Depth: 7.0 - 10.0' **Sample Number:** 8
Material Description: Greenish gray clayey SAND with gravel
Tested by: BH

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
334.40	38.20	0.00	3"	0.00	100.0
			1.5"	0.00	100.0
			1"	0.00	100.0
			3/4"	11.03	96.3
			3/8"	65.01	78.1
			#4	107.65	63.7
			#8	150.73	49.1
			#10	159.10	46.3
			#16	185.43	37.4
			#30	208.82	29.5
			#40	218.02	26.4
			#50	227.28	23.3
			#100	247.18	16.5
			#200	252.06	14.9

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0.0	53.7	19.9	11.5	31.4			14.9

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
		0.0918	0.2199	0.6323	1.3889	2.4773	3.9929	10.2610	12.2638	14.6458	17.9091

Fineness Modulus
4.06