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Peralta Community College District c/o Swinerton
260 Townsend Street
San Francisco, California 94107

September 9, 2020

Dear Mr. Krill,

In accordance with your request, Fugro has performed a preliminary geotechnical site assessment for the proposed new utility building project located within the Laney College campus in Oakland, California. The approximate extent of the project is shown on the attached Site Plan (**Plate 1**). This report summarizes our review results of the available geologic and geotechnical information of the site vicinity, the anticipated geologic hazards potentials in the area, and preliminary design recommendations for the project. Our preliminary geotechnical information, opinions, and recommendations provided in this report are meant to aid in the initial project design and construction planning and will need to be updated based the results of our ongoing project detailed site geotechnical investigation. The detailed site geotechnical investigation report will be prepared under a sperate cover.

Project Description

Base on the preliminary project information, the proposed project consists of constructing a new utility building and a new underground utility corridor between the new utility building and the existing Building F. It is our understanding that the project will be subjected to review by DSA (Division of the State Architect) and CGS (California Geological Survey).

As shown on the Site Plan (**Plate 1**), The project site is bounded by 7th Street on the southwest, Buildings E and F on the northeast, and existing campus access roads and parking on northwest and southeast. The new utility building site is currently vacant. The new utility corridor alignment is within the existing paved drive aisle and parking. As part of the project, the existing cooling tower structure and associated facilities located between Building E and the new Library Learning Resource Center (LRC) building will be demolished. Fugro is currently providing geotechnical consultation services for design of the LRC project, which is located to the southeast of the new utility building project.

The new utility building will be about 18-1/2 to 30 feet wide, 106 feet long, and has a total building footprint of about 2,600 square feet. The building will be used to house generator, transformer, and cooling tower equipment, and for storage. The building will be about 13 feet high and be constructed at approximately the existing grade, except for the portion of the cooling tower room that has a bottom slab at about 6 feet below grade. The details about the other planned new utilities are to be determined. No raising of the existing site grade is anticipated for the project.

Site Subsurface Conditions

As part of our assessment, Fugro reviewed relevant geotechnical, geologic, and seismic data, as well as results of previous subsurface explorations and laboratory testing performed in the vicinity of the project site. The previous geotechnical reports we reviewed include:

- Woodward-Clyde-Sherard and Associates, May 1, 1967. Peralta College – Chinatown General Neighborhood Renewal Area (GNRA), WCS No. 11032.
- Fugro, March 27, 2002. Geotechnical Investigation, New Art Building at Laney College, Fugro No. 1430.001.
- Fugro, March 29, 2005. Geotechnical Study and Geologic Hazard Evaluation, Laney College Art Building, Fugro No. 1430.005.
- Geotechnical Engineering Inc., March 20, 2006. Additions to Building A & Chiller Room Adjacent to Building B, Laney College, GEI No. 41357.
- Fugro, August 25, 2006. Geologic Hazards Evaluation, Laney College Building A Renovation, Fugro No. 1430.008.
- Terraphase Engineering, May 31, 2012. Geotechnical Design Report, Proposed Laney College Building Efficiency for a Sustainable Tomorrow (BEST), Terraphase No. 0034-001-003.
- Fugro, February 28, 2020. Geotechnical Investigation and Geologic Hazards Evaluation, Laney College Library Learning Resource Center, Fugro No. 04.72190021.

The approximate locations of the previous subsurface explorations are shown on the Site Plan (**Plate 1**). Logs of these previous explorations and laboratory testing results are included in **Appendix A** for reference.

According to the available information, the new utility building site is located near the western edge of the natural outlet channel of Lake Merritt, which had been dramatically reduced in width with developments of the region after 1860s. The proposed project site is most likely underlain by a layer of historical undocumented fill that contains various amounts of concrete, brick, and wood debris. In addition, highly compressible Holocene estuarine mud, which is known locally as Young Bay Mud, may also exist below the southeastern portion of the new utility building site and below the new utility corridor alignment.

Due to the lack of available subsurface soil data within the site, the thickness and extent of the fill and Young Bay Mud layers cannot be determined at this moment. However, based on our experience with adjacent LRC project site, we estimate the proposed project site could be blanketed by a historical fill layer of up to about 8 to 10 feet thick. Where exists, the underlying Young Bay Mud layer may extend to a maximum depth of about 30 feet as suggested by the previous Cone Penetration Test (CPT) within the existing handicap parking lot at the northwest end of the LRC site. The Young Bay Mud layer likely reduces in thickness in the areas toward the northwest. Some thin loose to medium dense sand lenses may also exist within the Young Bay Mud layer. Below the fills and Young Bay Mud layers, medium dense to very dense sands and stiff to hard clays were previously encountered in the area to the maximum depth explored of about 76-1/2 feet (or Elevation of about -60 feet).

Based on the previous CPT pore pressure dissipation tests at selected depths, the groundwater table at the LRC site was estimated to be at depths of about 5 to 18 feet (Elevations of about 0 to +9 feet). In addition, groundwater was reportedly encountered at 2002-CPT-2 location at a depth of about 11 feet (Elevation about +8 feet). The previous borings (2002-EB-1 through 2002-EB-3) also reportedly encountered groundwater at depths of about 15 to 45 feet (Elevations of about +5 to -27 feet). It should be noted that these borings might not have been left open for a sufficient period of time to establish equilibrium groundwater conditions. Fluctuations in the groundwater level could occur due to change in seasons, variations in rainfall, tidal effects, and other factors. According to CGS Seismic Hazard Zone report for the Oakland West Quadrangle (2003), historically high groundwater in the site region had been reported at a depth of about 10 feet.

A design groundwater Elevation of +8 feet was previously recommended for the LRC site, which generally corresponds to both the top elevation of Young Bay Mud layer within the area and the top elevation of the adjacent Lake Merritt Channel bank. We expect the groundwater table to be at a similar depth below the new utility building site.

The above preliminary information about the site subsurface conditions are to be updated based on the results of our ongoing project detailed site geotechnical investigation, which includes new borings and CPTs at the new utility building location and along the new utility corridor alignment.

Site Geologic Hazards Potentials

Based on our review of available geotechnical, geologic, and seismic data within the vicinity of the site, and our experience with adjacent LRC project, it is our opinion that the major geologic hazards at the site include soil liquefaction and compressible soils.

Soil Liquefaction

The results of our previous liquefaction evaluations of the site region generally indicated the saturated, loose to medium dense sand layers of various thicknesses located both above and within the Young Bay Mud layer have a high potential for liquefying when they are subjected to a Maximum Considered Earthquake (MCE) event. The majority of these sand layers were encountered by borings and CPTs in the area within depths of about 30 to 40 feet (above Elevation of about -15 feet). We estimated that the MCE induced liquefaction in these sand layers would result in residual volumetric strains varying from about

1 to 4 percent and total ground surface settlements (without reduction associated with the depth of occurrence) ranging from as little as 1 inch to up to about 6-1/2 inches. Our preliminary settlement estimate for the new utility building site is up to about 3 inches based on data extrapolation. However, the new utility building site most likely has a low potential to be impacted by Lake Merritt Channel bank failures if soil liquefaction and lateral spreading occur at the site region during major earthquake events.

The site and any new improvements not supported on deep foundations may experience total areal ground surface settlements on the order of about 1 to 3 inches. Underground pipelines (gas lines, sanitary sewers, water services, etc.) should be properly designed to compensate for the settlement caused by the liquefaction of the underlying supporting soils. Where deep foundation system is used, the deep foundation should be designed to resist downdrag loads that would be imposed upon the foundations due to soil liquefaction. Consideration should also be given to using flexible pipe connections to mitigate potential damage from the estimated potential liquefaction-induced settlement of 3 inches at locations where the pipes are connected to pile-supported structures.

It should be noted that after a major liquefaction event, phenomena such as sand boils, ground cracking, and differential movement of overlying improvements such as roadways and utilities may be observed and may require repair. Alternatively, soil liquefaction ground improvement options that involve densification, drainage, reinforcement, mixing, or replacement of the liquefiable soils can be used to mitigate the site liquefaction.

Compressible Soils

The site is most likely blanketed by historical sandy or clayey fills that extend to about 8 to 10 feet deep. Most of these fills were derived from the historical filling of the natural Lake Merritt outlet channel between 1860s and 1940s, and the later development of the Laney College campus in 1960s. These fills are heterogenous and may locally contain various amounts of concrete, brick, and wood debris. These historical fills were most likely not compacted to the current acceptable geotechnical engineering standards and are potentially compressible.

Below the surficial fill layer, where exists, the underlying Young Bay Mud layer may extend to a maximum depth of about 30 feet. The Young Bay Mud layer likely reduces in thickness in the areas toward the northwest. This slightly over-consolidated to normally consolidated Young Bay Mud is very soft to soft, has a high moisture content and a low shear strength, and is highly compressible. Under additional new loads, such as weights of the new fills and structures, the Young Bay Mud will consolidate while the induced excess pore water pressures are dissipating, which may cause detrimental total and differential settlements to the imposing structures and improvements.

We estimate the primary consolidation settlement due to the historical fills placed prior to 1960s at the site should have been completed. Additional settlements from recent fill placement (if any) may be still ongoing. We recommend any available previous grading and construction records be forwarded to us for further review.

No raising of the existing site grade is anticipated for the project. If new fills will be placed to raise the existing grade, we anticipate that additional settlement will occur in the future. Our preliminary assessment indicates that for every foot of new fills that will be placed, it would induce an additional ultimate settlement of about 1 to 3 inches over the next 10 to 30 years in the area where the Bay Mud layer exists. This additional settlement will also likely affect the integrity of the existing and/or new utility lines. In addition, this settlement will also cause downdrag forces to pile-supported structures.

Preliminary Project Design Recommendations

Based on our preliminary site assessment, we conclude that special design and construction considerations will be required for the site grading, backfill of existing structure removal, pipeline trench backfill, and new building foundations to mitigate the potential geologic hazards at the site. It is also our opinion that the proposed new utility building can be potentially founded on either deep or shallow foundation systems depending on the actual site subsurface soil conditions.

Site Grading and Pipeline Trench Backfill

In order to reduce soil consolidation, we recommend the proposed project site grading activities and backfill for new underground pipelines be designed so "zero net load" will be imposed on the underlying Young Bay Mud. A "zero net load" condition can be achieved by over-excavating the fills (and possibly a portion of the Young Bay Mud if necessary) and backfilling the excavation with lightweight fill or concrete materials. Lightweight fills or cellular concrete materials should also be used to backfill the removal excavation of the existing cooling tower structure and associated facilities. The combination of weight of new fills, dead plus live load bearing capacity of the new structures, and weight of new lightweight fill or concrete materials should not exceed the weight of the soils and structures removed.

Deep Foundation

Deep foundation systems had been historically used to support existing buildings within the most area of the Laney College campus where Young Bay Mud exists. We note that 70- to 110-foot long, 14-inch square, precast, pre-stressed concrete driven piles were used to support the existing Art Building (built in 2005) that is located adjacent to the Lake Merritt Channel. Furthermore, the new Building Efficiency for a Sustainable Tomorrow (BEST) Center built in 2016 is also reportedly supported by 95- to 105-foot long, 14-inch square, precast, pre-stressed concrete driven piles. At the LRC project, we also recommended the LRC building be supported on precast pre-stressed concrete driven piles that extend to a depth of at least 70 feet (or to a pile tip Elevation of -50 feet) to transfer bearing loads to the sand and clay layers below the Young Bay Mud layer.

For planning purpose, we preliminarily recommend the proposed new utility building be supported on a deep foundation system that also extends to a depth of at least 70 feet (or to a pile tip Elevation of -50 feet) to transfer bearing loads to the competent soil layers below the Young Bay Mud layer. The soil bearing within the surficial historical fill layer and the Young Bay Mud layer should be ignored in the foundation design. The design minimum length of the piles may be shortened if the actual Young Bay Mud layer is thinner or is not present below the site. The deep foundation should also be designed to resist downdrag loads that would be imposed upon the foundations due to soil liquefaction. The ground floor of the building should be structurally supported by the deep foundation system.

Shallow Foundation

Depending on the actual site subsurface soil conditions, a shallow foundation system (such as a structural mat slab) may be feasible for the new utility building provided the existing 8 to 10 feet thick of surficial undocumented fills can be completely removed and replaced with properly compacted engineered fills. The excavated fills and soils, besides debris and Young Bay Mud, can be re-used and re-compacted as engineered fills if they meet the project fill requirements. Where Young Bay Mud exists, all or part of the replacement excavation should be backfilled with lightweight fill or concrete materials so “zero net load” will be imposed on the underlying Young Bay Mud. The actual depth and lateral extent of the soil replacement should be determined based on the actual site subsurface soil conditions and the design new building and improvement loads.

The shallow foundation will also need to be designed to resist the potential liquefaction induced ground settlement. For planning purpose, we preliminarily recommend the shallow foundation system be designed to resist 3 inches of total ground settlement with 1-1/2 inches of differential settlement between typical building column spacing (or a distance of about 30 feet).

Closing

Our preliminary geotechnical information, opinions, and recommendations provided in this report are meant to aid in the initial project design and construction planning and will need to be updated based the results of our ongoing project detailed site geotechnical investigation. The detailed site geotechnical investigation report will be prepared under a sperate cover.

Our conclusions and recommendations are solely professional opinions and were made in accordance with generally accepted local and current geotechnical engineering principles and practices. We make no warranty, either express or implied. Should you have any questions or require additional information, please contact us.

Sincerely,

Taiming Chen, PE, GE
Associate Engineer

Ronald L. Bajuniemi, PE, GE
Principal Consultant

Document Control

Document Information

Project Title	Laney College New Utility Building
Document Title	Preliminary Geotechnical Site Assessment
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Issue Number	01
Issue Status	Final

Client Information

Client	Peralta Community College District c/o Swinerton
Client Address	260 Townsend Street, San Francisco, CA 94107
Client Contact	Bill Krill

Revision History

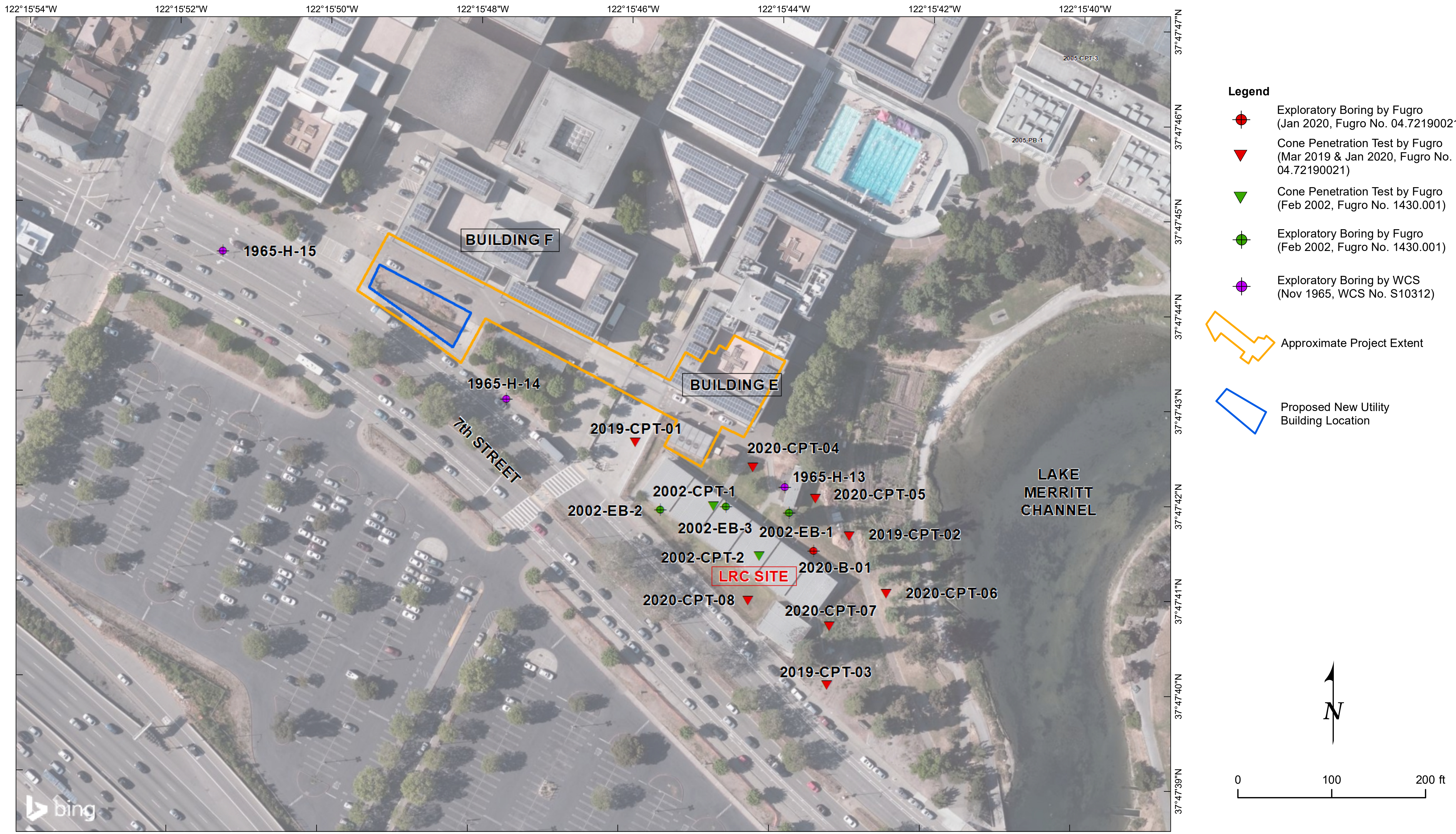
Issue	Date	Status	Comments on Content	Prepared By	Checked By	Approved By
01	September 9, 2020	Final	For Preliminary Design Use	TC	TC/RLB	RLB

Project Team

Initials	Name	Role
TC	Taiming Chen, PE, GE	Associate Engineer
RLB	Ronald L. Bajuniemi, PE, GE	Principal Consultant

List of Plates

Title	Plate No.
Site Plan	1



Aerial imagery from Bing Maps.

Plate 1: Site Plan

Appendix A

Previous Field Exploration Logs

and Lab Testing Results

FUGRO

CLASSIFICATION AND MATERIAL SYMBOLS

MAJOR DIVISIONS PER ASTM D2488-06			MAJOR GROUP NAMES AND MATERIAL SYMBOLS	
COARSE-GRAINED SOILS More than 50% retained on the No. 200 sieve	GRAVELS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	Clean gravels less than 5% fines	GW	Well-Graded GRAVEL
			GP	Poorly Graded GRAVEL
		Gravels with more than 12% fines	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SANDS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	Clean sand less than 5% fines	SW	Well-Graded SAND
			SP	Poorly Graded SAND
		Sands with more than 12% fines	SM	SILTY SAND
			SC	CLAYEY SAND
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve	SILTS AND CLAYS Liquid Limit Less than 50%		ML	SILT
			CL	Lean CLAY
			OL	ORGANIC SILT
	SILTS AND CLAYS Liquid Limit Greater than 50%		MH	Elastic SILT
			CH	Fat CLAY
			OH	ORGANIC CLAY
HIGHLY ORGANIC SOILS			PT	Peat or Highly Organic Soils

Notes:
Classification of soils on the boring logs is in general accordance with ASTM D2488, or D2487 if appropriate laboratory data are available.
The geologic formation is noted in bold font at the top of interpreted interval on the boring logs.

OTHER MATERIAL SYMBOLS

- Debris or Mixed Fill
- Pavement with Aggregate Base

SAMPLER TYPE

SPT (Driven) 1-3/8" ID 2" OD	Modified California (Driven) 2-3/8" ID 3" OD	Modified California (Driven) 1-7/8" ID 2-1/2" OD
Shelby Tube (Pushed) 2-7/8" ID 3" OD	Pitcher Barrel (Rotary-cut) 2-7/8" ID	Osterberg (Piston) 2-7/8" ID
101 Geobarrel (Rotary-cut) 2-7/8" ID	Rock Core (Rotary-cut) See log for size	Vibracore (Vibrated) See log for size
Push-core (Pushed) See log for size	Collected from Auger	Other See log for details

Note: Refer to text of report for additional details or other sampler types.

BLOW COUNT

Number of blows required to drive sampler each of three 6-in. intervals, as measured in the field (uncorrected). An SPT hammer (140 lb., falling 30-in.) was used unless otherwise noted on the boring log. For example:

Blow Count	Description
5 7 8	5, 7, and 8 blows for first, second, and third interval, respectively.
35 50/3"	35 blows for the first interval. 50 blows for the first 3 inches of the second interval. Lack of third value implies that driving was stopped 3 inches into the second interval.
WOH WOH 5	"WOH" indicates that the weight of the hammer was sufficient to advance the sampler over the first two intervals. 5 blows were required to advance the sampler over the third interval.

N-VALUE

The N-Value represents the blowcount for the last 12 inches of the sample drive if three 6-inch intervals were driven. N-value presented is independant of impact energy. If 50 hammer blows were insufficient to drive through either the second or the third interval, the total number of blows and total length driven are reported (excluding the first interval). "ref" (refusal) indicates that 50 blows were insufficient to drive through the first 6-inch interval.

Parenthesis indicate that an approximate correction has been applied for non-SPT drive samplers. For example, a factor of 0.63 is commonly used to adjust blow counts obtained using a 3-inch outside diameter modified California sampler to correspond to Standard Peneteration Test.

UNDRAINED SHEAR STRENGTH

A value of undrained shear strength is reported. The value is followed by a letter code indicating the type of test that was performed, as follows:

U - Unconfined Compression
Q - Unconsolidated Undrained Triaxial
T - Torvane
P - Pocket Penetrometer
M - Miniature Vane
F - Field Vane
R - R-value

OTHER TESTS

Field or laboratory tests without a dedicated column on the boring log are reported in the Other Tests column. A letter code is used to indicate the type of test. For certain tests, a value representing the test result is also provided. Typical letter codes are as follows. Additional codes may be used. Refer to the report text and the laboratory testing results for additional information.

k - Permeability (cm/s)
Consol - Consolidation
Gs - Specific Gravity
MA - Particle Size Analysis
EI - Expansion Index
OVM - Organic Vapor Meter

WATER LEVEL SYMBOLS

- Initial water level
- Final water level
- Seepage encountered

INCREASING MOISTURE CONTENT

Dry
Moist
Wet

CONSISTENCY OF COHESIVE SOIL

CONSISTENCY	UNDRAINED SHEAR STRENGTH (KIPS PER SQUARE FOOT)
Very Soft	< 0.25
Soft	0.25 to 0.50
Medium Stiff	0.50 to 1.0
Stiff	1.0 to 2.0
Very Stiff	2.0 to 4.0
Hard	> 4.0

Note: In absence of test data, consistency has been estimated based on manual observation.

APPARENT DENSITY OF COHESIONLESS SOIL

APPARENT DENSITY	N-VALUE
Very Loose	0 to 4
Loose	5 to 9
Medium Dense	10 to 29
Dense	30 to 49
Very Dense	> 49

TERMS AND SYMBOLS USED ON BORING LOGS

PLATE A-1

Peralta Community College District
Project No. 04.72190021

DEPTH, ft	MATERIAL SYMBOL	SAMPLER TYPE	BLOW COUNT OR PRESSURE, psi	N VALUE OR RQD%	RECOVERY	LOCATION: N 37.795163+/- E 122.262754+/- WGS84 SURFACE EL: 18.0 ft +/- (rel. NAVD88 datum) MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
						FILL: 0 TO 6 FEET SILTY SAND (SM): loose to medium dense, light brown, dry, fine-grained, silty							
5						Change color to mottled gray brown , trace coarse-grained, few gravel (fine, subangular to subrounded), few brick fragments and organics							
						NOTES: 1. Terms and symbols defined on Plate A-1.							

BORING DEPTH: 6.0 ft
BACKFILL: Cement Grout
DEPTH TO WATER: Not Encountered
FIELDWORK DATE: March 29, 2019
DRILLING METHOD: 3-in dia Hand Auger

HAMMER TYPE: N/A
RIG TYPE: N/A
DRILLED BY: Fugro
LOGGED BY: F De Paola
CHECKED BY: T Chen

LOG OF BORING NO. 2019-CPT-01
Laney College Library Learning Resource Center
Oakland, California

FUGRO

LOCATION:
N 37.794900+/- E 122.261959+/- WGS84
SURFACE EL: 14.1 ft +/- (rel. NAVD88 datum)

DEPTH, ft	MATERIAL SYMBOL	SAMPLER TYPE	BLOW COUNT OR PRESSURE, psi	N VALUE OR RQD%	RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
						FILL: 0 TO 6 FEET SILTY SAND with GRAVEL (SM): medium dense, light gray, dry, fine- to medium-grained, trace coarse-grained, silty, with gravel (fine to coarse, subangular to subrounded)							
						PEAT (PT): very soft to soft, black, dry, with organic odor.		55					
5						Fat CLAY (CH): soft, gray, moist, trace sand (fine-grained), trace small shell fragments, few organics, with strong organic odor		58					

NOTES:
1. Terms and symbols defined on Plate A-1.

BORING DEPTH: 6.0 ft
BACKFILL: Cement Grout
DEPTH TO WATER: Not Encountered
FIELDWORK DATE: March 29, 2019
DRILLING METHOD: 3-in dia Hand Auger

HAMMER TYPE: N/A
RIG TYPE: N/A
DRILLED BY: Fugro
LOGGED BY: F De Paola
CHECKED BY: T Chen

LOG OF BORING NO. 2019-CPT-02
Laney College Library Learning Resource Center
Oakland, California

Peralta Community College District
Project No. 04.72190021

FUGRO

LOCATION:
N 37.794463+/- E 122.262030+/- WGS84
SURFACE EL: 16.3 ft +/- (rel. NAVD88 datum)

DEPTH, ft	MATERIAL SYMBOL	SAMPLER TYPE	BLOW COUNT OR PRESSURE, psi	N VALUE OR RQD%	RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
						FILL: 0 TO 6 FEET							
						Lean CLAY with GRAVEL (CL): soft to medium stiff, mottled gray brown, dry, with gravel (fine to coarse, subangular to rounded), few sand (fine- to coarse-grained)							
						CLAYEY GRAVEL with SAND (GC): loose, mottled gray brown, dry to moist, fine to coarse, subangular to rounded, clayey, with sand (fine- to coarse-grained)		13	20				
5						CLAYEY SAND (SC): loose to medium dense, dark brown, moist, fine- to coarse-grained, clayey , few gravel (fine, subangular to subrounded)							
						NOTES: 1. Terms and symbols defined on Plate A-1.							

BORING DEPTH: 5.0 ft
BACKFILL: Cement Grout
DEPTH TO WATER: Not Encountered
FIELDWORK DATE: March 29, 2019
DRILLING METHOD: 3-in dia Hand Auger

HAMMER TYPE: N/A
RIG TYPE: N/A
DRILLED BY: Fugro
LOGGED BY: F De Paola
CHECKED BY: T Chen

LOG OF BORING NO. 2019-CPT-03
Laney College Library Learning Resource Center
Oakland, California

LOCATION:

N 37.794856+/- E 122.262089+/- WGS88
SURFACE EL: 17.5 ft +/- (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLER TYPE	BLOW COUNT OR PRESSURE, psi	N VALUE OR RQD%	RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
15							**FILL: 0 TO 19.5 FEET** SILTY SAND with GRAVEL (SM): loose to medium dense, brown, dry, fine- to medium-grained, trace coarse-grained, silty, with gravel (fine to coarse, angular to subangular)							
			S1	18 17 13	(19)	14"/18"	SILTY GRAVEL with SAND (GM): medium dense, mottled gray brown, dry, fine to coarse, angular to subrounded, sandy (fine- to coarse-grained), silty, trace clay							
	5		S3	50	ref	6"/6"	with rock fragments up to 2", dry to moist at 5'							
10			S4	2 2 2	4	18"/18"	Fat CLAY with SAND (CH): medium stiff, mottled black green dark gray, dry, with sand (fine- to coarse-grained), trace organics, trace glass fragments, with organic odor							
	10		S5	14 10 5	(9)	18"/18"	SILTY SAND with GRAVEL (SM): medium dense, mottled brown gray, dry, fine- to coarse-grained, silty, with gravel (fine to coarse, angular to subangular), a large brick fragment at 11'	91	24	21				MA
5			S6	3 3 5	8	16"/18"	with abundant wood chips at 12' to 13', trace glass fragments, moist below 12.5'							
	15		S7	5 6 19	(16)	18"/18"	Poorly-graded SAND with SILT and GRAVEL (SP-SM): medium dense, mottled brown gray, moist, fine- to coarse-grained, with silt, with abundant wood chips, with brick and glass fragments, trace clay chunks	95	26	6				MA Organic = 5%
0			S8	10 4 5	9	16"/18"	samll rock fragments at 16.5' to 17'		82					Organic = 21.2%
							ORGANIC CLAY with SAND (OH): soft to medium stiff, mottled brown dark gray, moist, with peat, with sand (fine- to coarse-grained), trace gravel (fine, angular to subangular), few wood chips							
	20		S9	3 3 2	5	10"/18"	**NATIVE: 19.5 TO 76.5 FEET** Fat CLAY (CH): medium stiff, gray, moist, trace wood chips		53					Organic = 6.6%
-5														
	25		S10	50 psi 100 psi		30"/30"	very soft to soft, trace wood chips	52	83					Consol
-10														
	30		S11	5 13 9	(14)	18"/18"	soft to medium stiff, trace sand (fine-grained), trace rootlets, a 2" rock fragment at 30'	69	58	93	73	43	0.5 Q	MA
							Poorly-graded SAND with SILT (SP-SM): medium dense, gray, wet, fine- to medium-grained, with silt, trace small shell fragments	94	27	8				MA
-15														
	35						3" rock fragment at 35'							
			S12	100 psi		30"/30"	Fat CLAY (CH): soft to medium stiff, gray, moist							
-20														

Continued

BORING DEPTH: 76.5 ft
BACKFILL: Cement Grout
DEPTH TO WATER: Not Estabilished
FIELDWORK DATE: January 7, 2020
DRILLING METHOD: 4-in. dia. Solid Stem Auger/Rotary Wash

HAMMER TYPE: Automatic Trip
RIG TYPE: CME 75 Track
DRILLED BY: Geo-Ex
LOGGED BY: T Chen
CHECKED BY: A Johan

LOG OF BORING NO. 2020-B-01
Laney College Library Learning Resource Center
Oakland, California

LOCATION:

N 37.794856+/- E 122.262089+/- WGS84
SURFACE EL: 17.5 ft +/- (rel. NAVD88 datum)

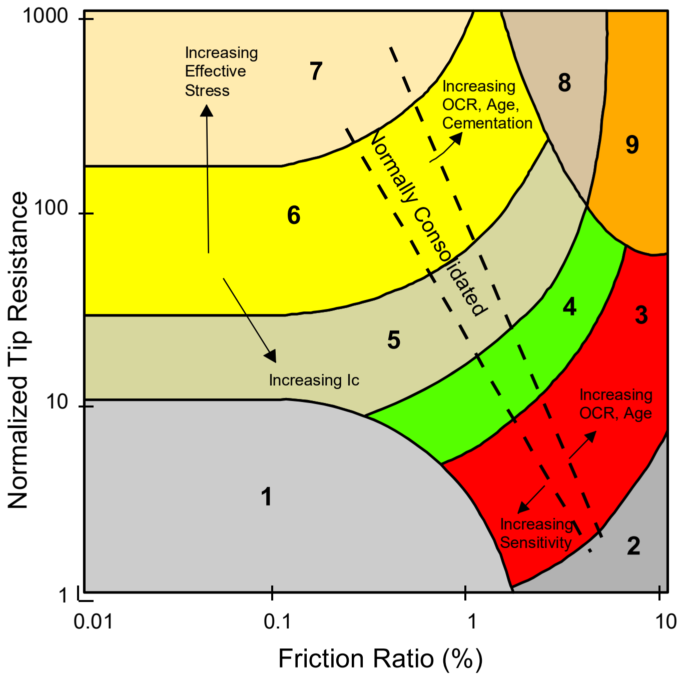
ELEVATION, ft	DEPTH, ft	SAMPLER TYPE	BLOW COUNT OR PRESSURE, psi	N VALUE OR RQD%	RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
-25		S13	0 2 6	(5)	18"/18"	medium stiff	59	71				0.7 Q	
	45	S14	200 psi 650 psi		0"/15"	SILTY SAND (SM): medium dense to dense, gray, wet, fine- to medium-grained, silty							
-30	50	S15	26 24 14	(24)	18"/18"		112	18	16				MA
-35						SANDY Lean CLAY (CL): very stiff, mottled gray yellowish brown, moist, sandy (fine- to medium-grained)							
						SILTY SAND (SM): dense to very dense, gray, wet, fine- to medium-grained, silty, trace shell fragments							
	55	S16	49 50/4"	(32)/4"	10"/10"		116	17	17				MA
-40						very dense, fine- to medium-grained, with coarse-grained, with silt, few gravel (fine, angular to subangular)							
-45	60												
	65	S17	35 50	(32)/6"	12"/12"			19	19				
-50	70					Lean CLAY (CL): very stiff to hard, light brown, moist							
-55	75	S18	7 10 11	21	18"/18"			37					

NOTES:
1. Terms and symbols defined on Plate A-1.

FCLP STANDARD LOG W:\PROJECTS\LOCATION-72\2019\04.72190021 LANEY COLLEGE LIBRARY LEARNING RESOURCE CENTER\06_FIELD_AND_LAB\06_BORINGS\01 GINT\LANEY COLLEGE - 2020 BORING.GPJ OGEM_LIB_2019_10_31_TC.GLB 2/5/20 02:30 p

LOG OF BORING NO. 2020-B-01
Laney College Library Learning Resource Center
Oakland, California

CPT CORRELATION CHART
(Robertson 1990)



Zone	Soil Behavior Type
1	Sensitive Fine-grained
2	Peats
3	Silty Clay to Clay
4	Clayey Silt to Silty Clay
5	Silty Sand to Sandy Silt
6	Clean Sand to Silty Sand
7	Gravelly Sand to Dense Sand
8	Very Stiff Sand to Clayey Sand*
9	Very Stiff Fine-Grained*

*heavily overconsolidated or cemented

KEY TO CPT INTERPRETATION

PLATE A-7

W:\Projects\Location-72\2019\04.72190021 Laney College Library Learning Resource Center\08_GIS\01_Explorations\CPT\2019\Processed\MXD\CPTproc_WB19C_Key.mxd, 4/30/2019, A.Ramirez

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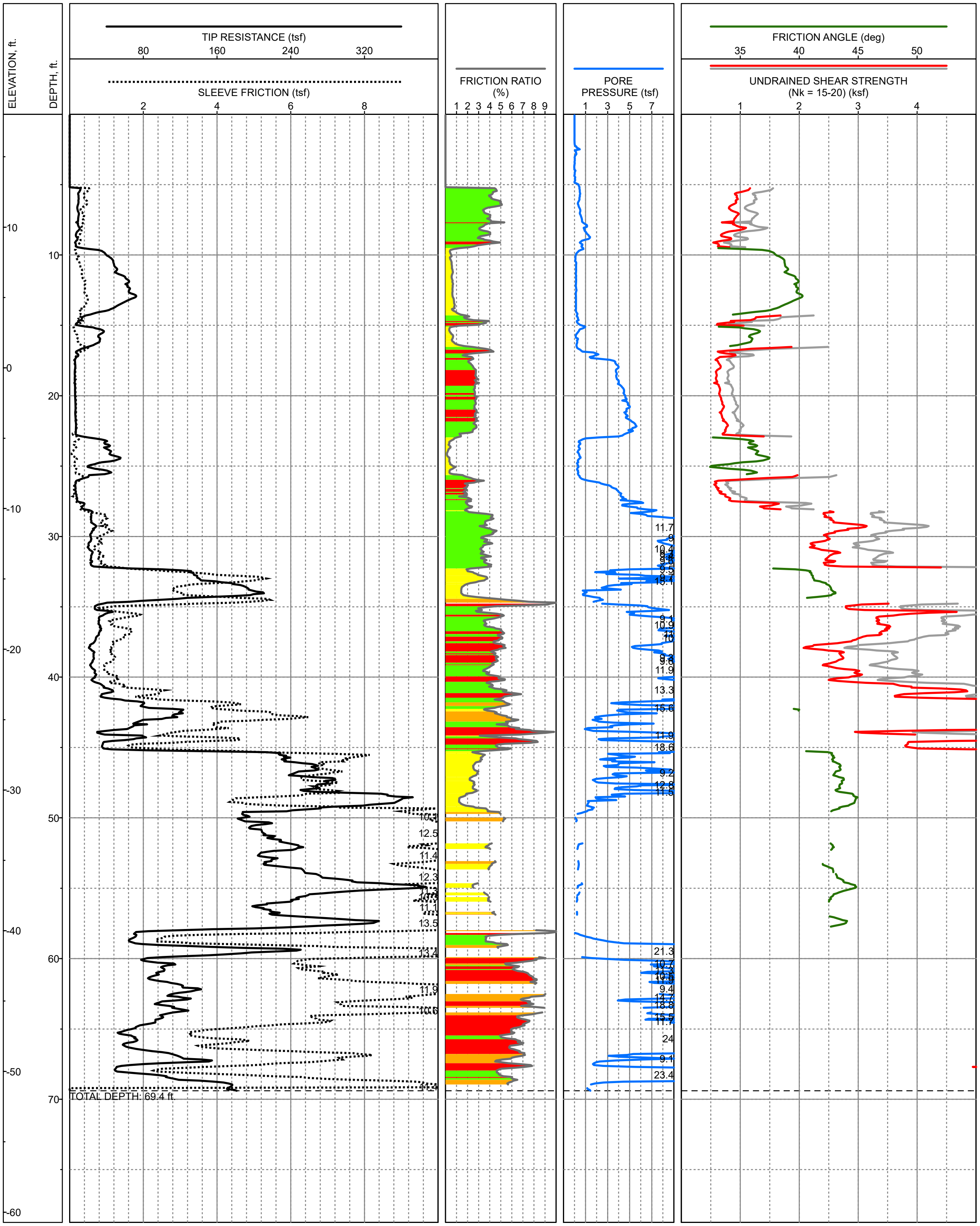
LANEY COLLEGE LIBRARY LEARNING RESOURCE CENTER
OAKLAND, CALIFORNIA



LOCATION: E6,052,365, N2,116,794, NAD83 SP CA Z3 FT
SURFACE EL: 18ft +/-
COMPLETION DEPTH: 69.4ft
TESTDATE: 3/29/2019

EXPLORATION METHOD: CPT
PERFORMED BY: FUGRO
REVIEWED BY: T.CHEN
CONE AREA RATIO: 0.59

LOG OF 2019-CPT-01

PLATE A-8

W:\Projects\Location-72\2019\04.72190021 Laney College Library Learning Resource Center\08_GIS\01_Explorations\CPT\2019\Logs\2019_04-30_Logs_SuFr\MXD\CPTlogs_WB19C_SuFr,4/30/2019,A.Ramirez

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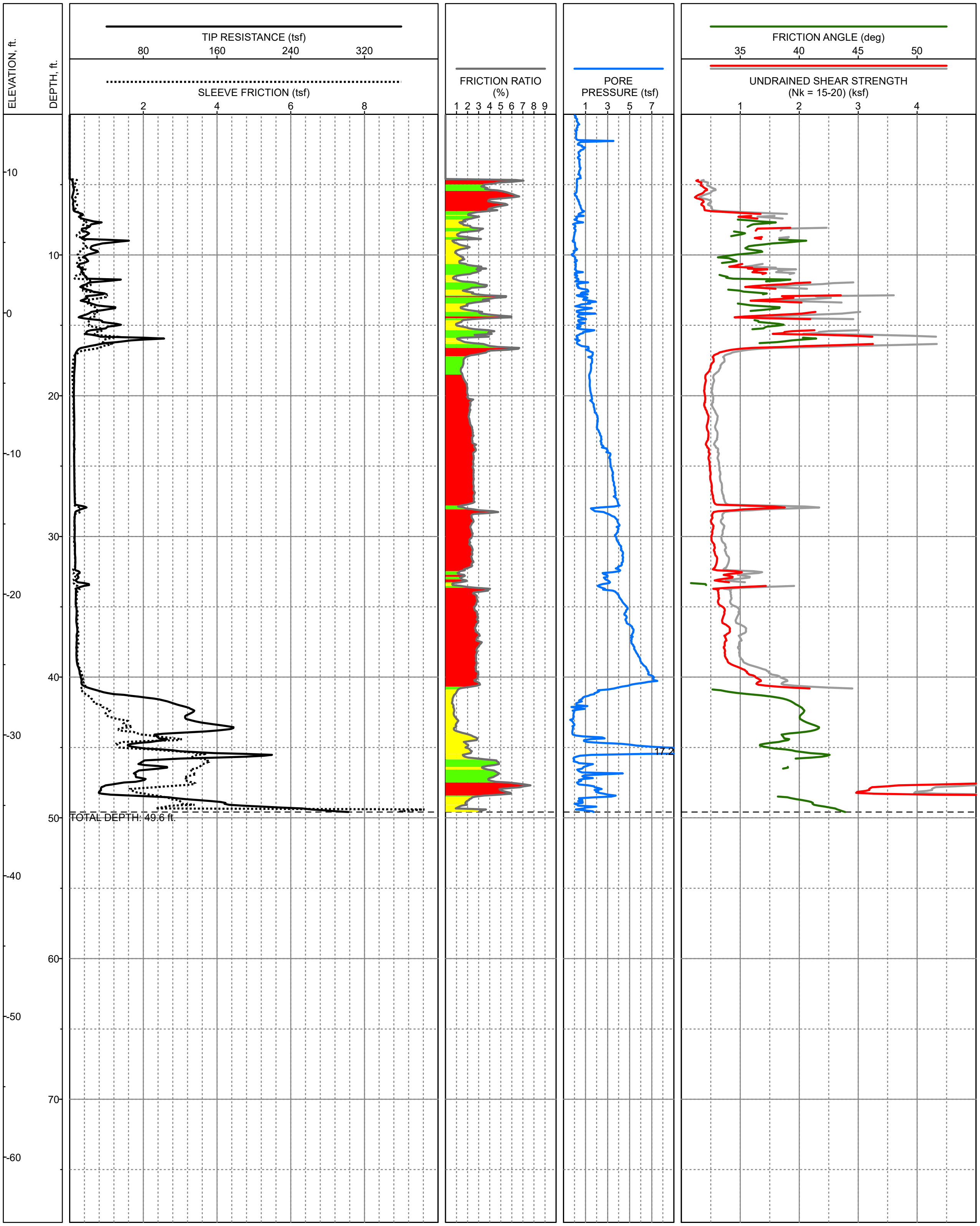
LANEY COLLEGE LIBRARY LEARNING RESOURCE CENTER
OAKLAND, CALIFORNIA

FUGRO



LOCATION: E6,052,593, N2,116,694, NAD83 SP CA Z3 FT
SURFACE EL: 14ft +/-
COMPLETION DEPTH: 49.6ft
TESTDATE: 3/29/2019

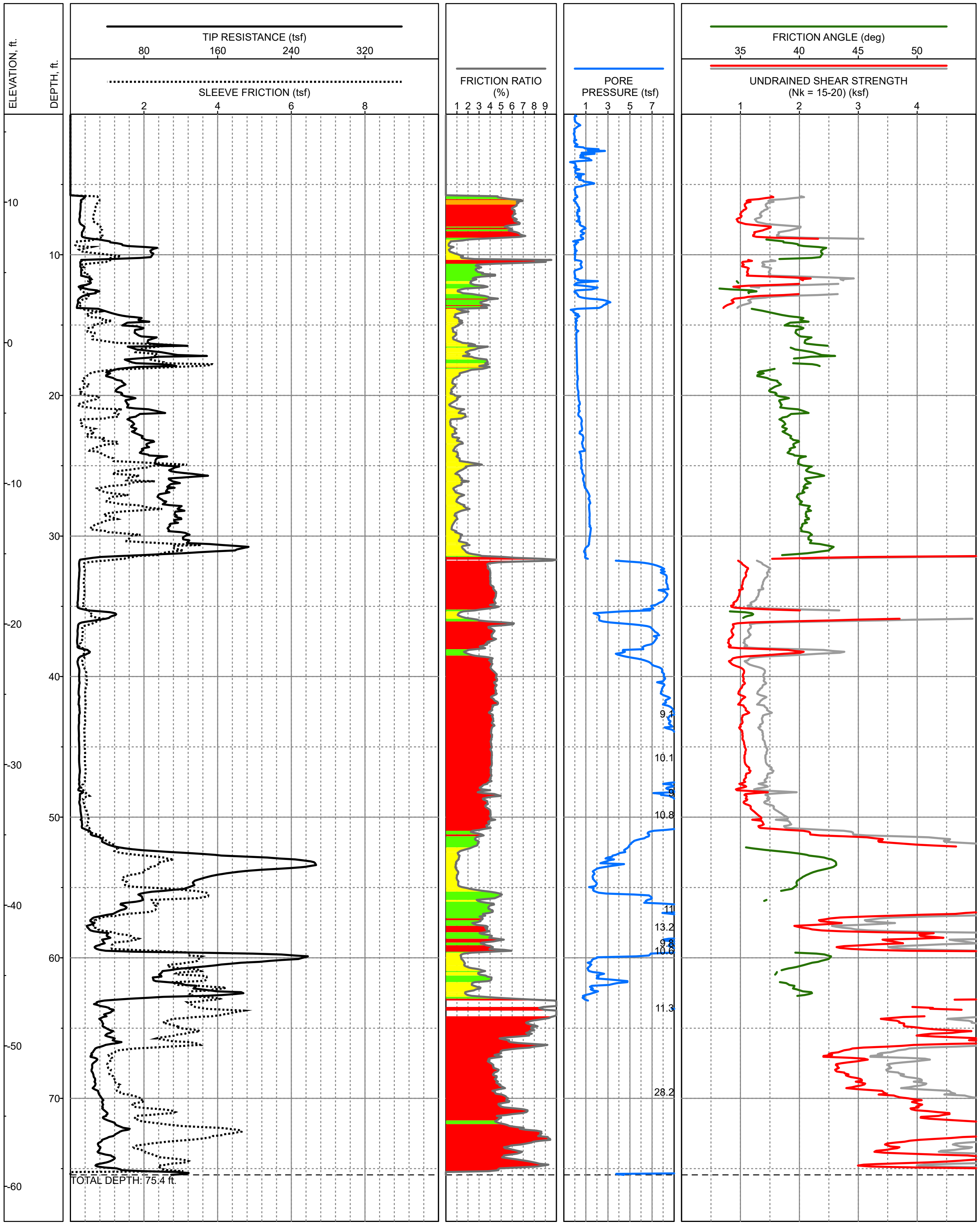
EXPLORATION METHOD: CPT
PERFORMED BY: FUGRO
REVIEWED BY: T.CHEN
CONE AREA RATIO: 0.59

LOG OF 2019-CPT-02

PLATE A-9

W:\Projects\Location-72\2019\04.72190021 Laney College Library Learning Resource Center\08_GIS\01_Explorations\CPT\2019\Logs\2019_04-30_Logs_SuFr\MXD\CPTlogs_WB19C_SuFr,4/30/2019,A.Ramirez

PERALTA COMMUNITY COLLEGE DISTRICT
LANEY COLLEGE LIBRARY LEARNING RESOURCE CENTER
OAKLAND, CALIFORNIA



LOCATION: E6,052,570, N2,116,535, NAD83 SP CA Z3 FT
SURFACE EL: 16ft +/-
COMPLETION DEPTH: 75.4ft
TESTDATE: 3/29/2019

EXPLORATION METHOD: CPT
PERFORMED BY: FUGRO
REVIEWED BY: T.CHEN
CONE AREA RATIO: 0.59

LOG OF 2019-CPT-03

PLATE A-10

W:\Projects\Location-72\2019\04.72190021 Laney College Library Learning Resource Center\08_GIS\01_Explorations\CPT\2019\Logs\2019_04-30_Logs_SuFr\MXD\CPTlogs_WB19C_SuFr,4/30/2019,A.Ramirez

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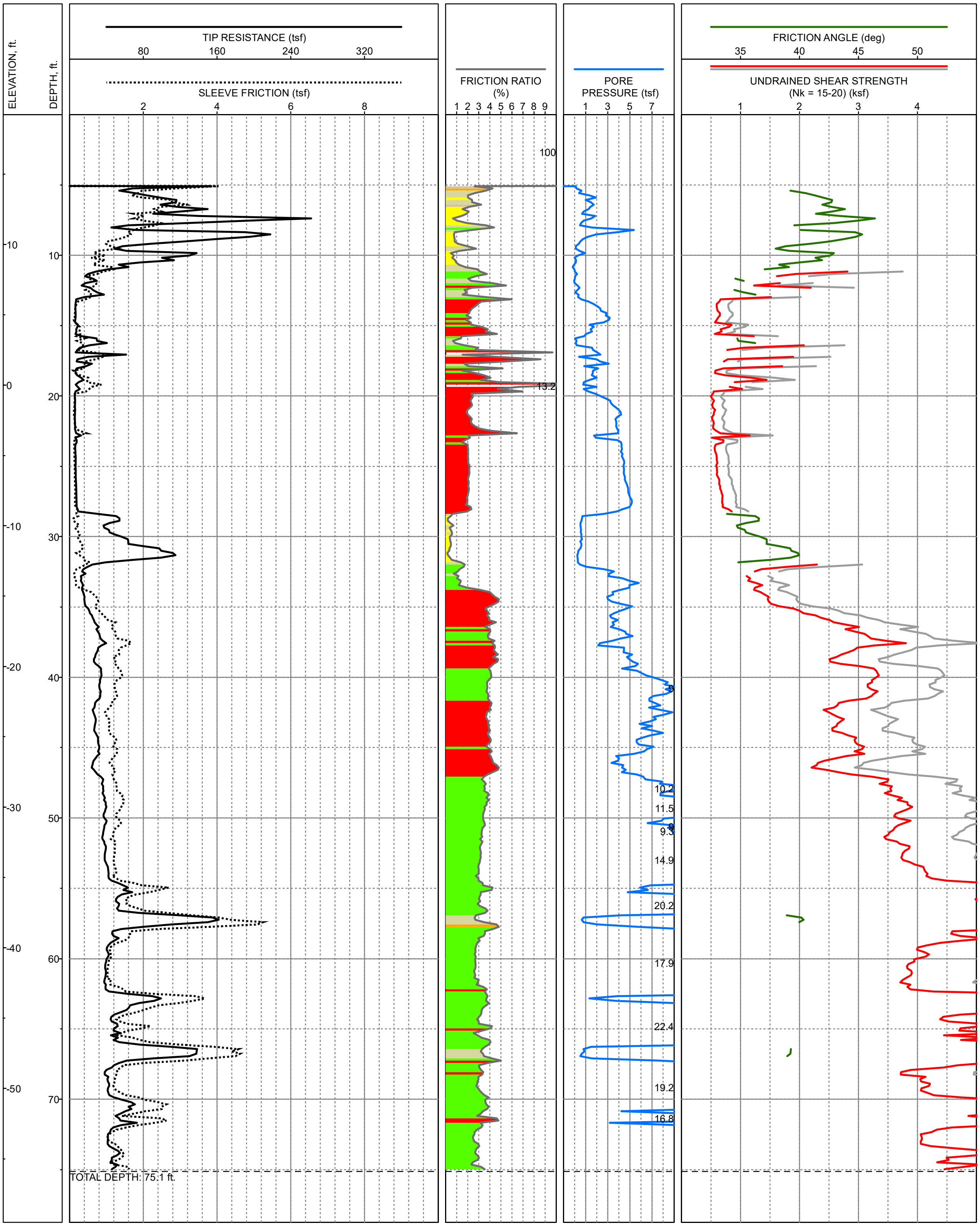
OAKLAND, CALIFORNIA



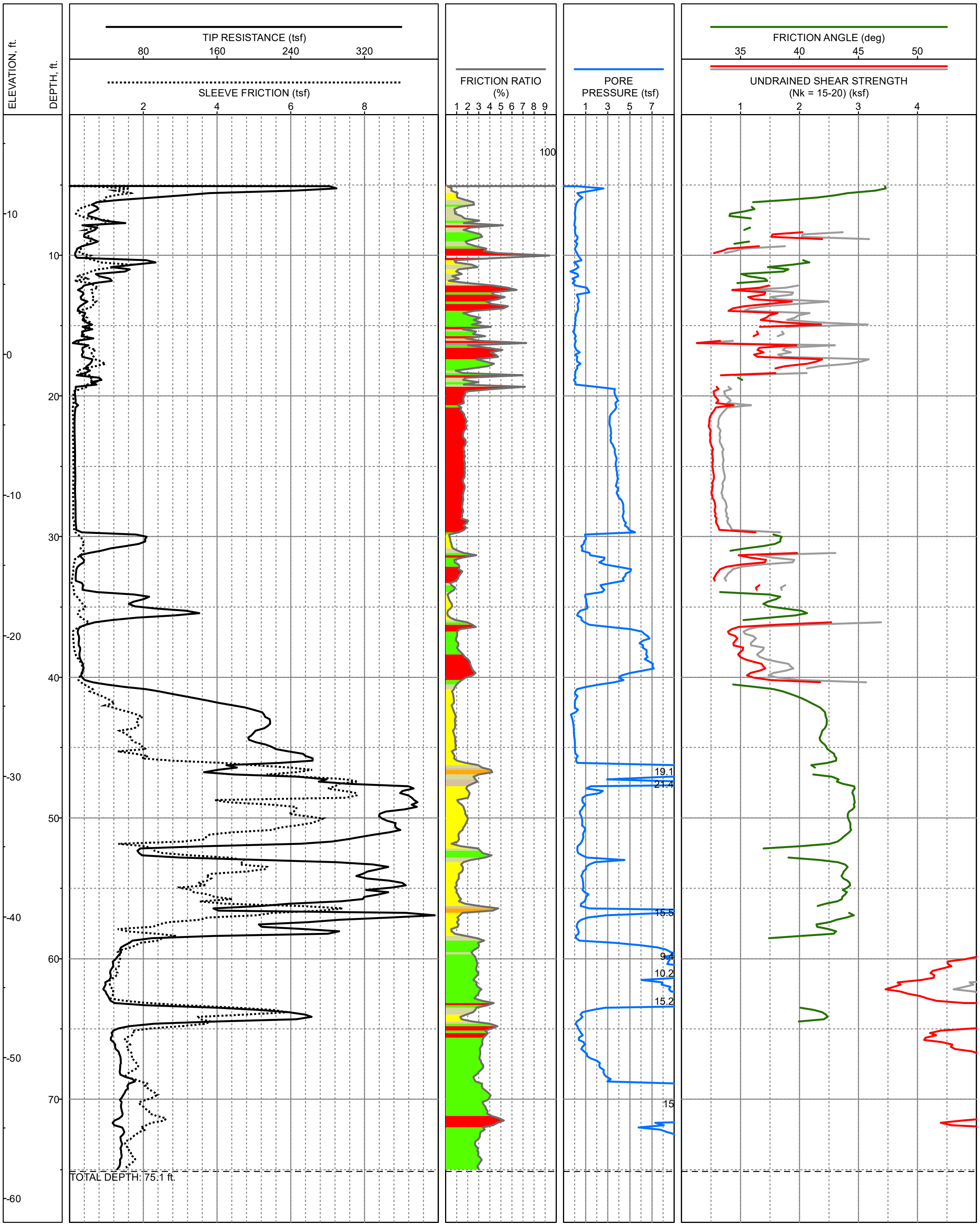
LOCATION: E6,052,487, N2,116,769, NAD83 SP CA Z3 FT
SURFACE EL: 19.2ft
COMPLETION DEPTH: 75.1ft
TESTDATE: 1/3/2020

EXPLORATION METHOD: CPT
PERFORMED BY: FUGRO
REVIEWED BY: T.CHEN
CONE AREA RATIO: 0.80

LOG OF 2020-CPT-04

PLATE A-11

PERALTA COMMUNITY COLLEGE DISTRICT
LANEY COLLEGE LIBRARY LEARNING RESOURCE CENTER
OAKLAND, CALIFORNIA



LOCATION: E6,052,553, N2,116,736, NAD83 SP CA Z3 FT
SURFACE EL: 17.1ft
COMPLETION DEPTH: 75.1ft
TESTDATE: 1/3/2020

EXPLORATION METHOD: CPT
PERFORMED BY: FUGRO
REVIEWED BY: T.CHEN
CONE AREA RATIO: 0.80

LOG OF 2020-CPT-05

PLATE A-12

PERALTA COMMUNITY COLLEGE DISTRICT
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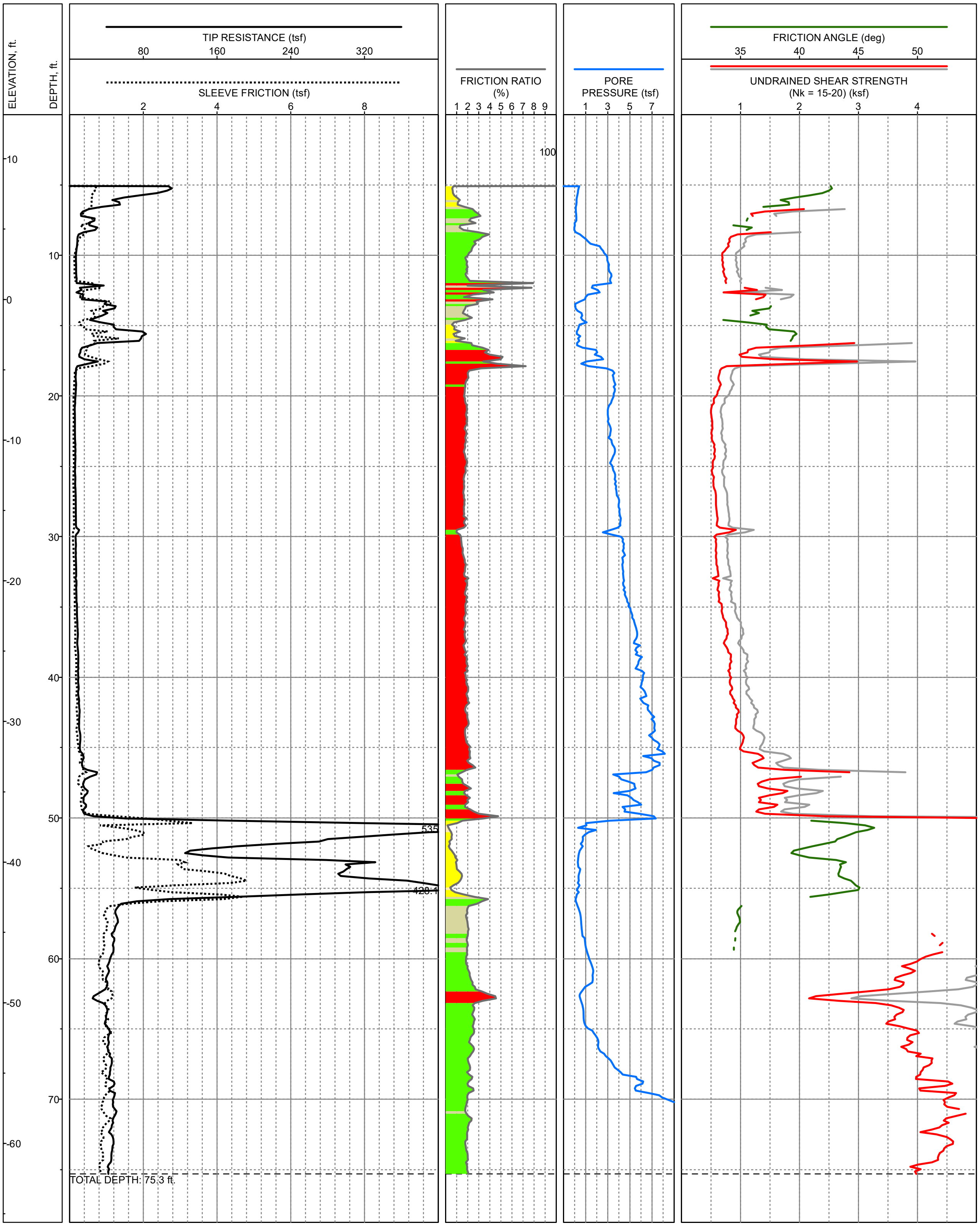
OAKLAND, CALIFORNIA



LOCATION: E6,052,629, N2,116,634, NAD83 SP CA Z3 FT
SURFACE EL: 13.1ft
COMPLETION DEPTH: 75.3ft
TESTDATE: 1/3/2020

EXPLORATION METHOD: CPT
PERFORMED BY: FUGRO
REVIEWED BY: T.CHEN
CONE AREA RATIO: 0.80

LOG OF 2020-CPT-06

PLATE A-13

Fugro Document No. 04.72190021

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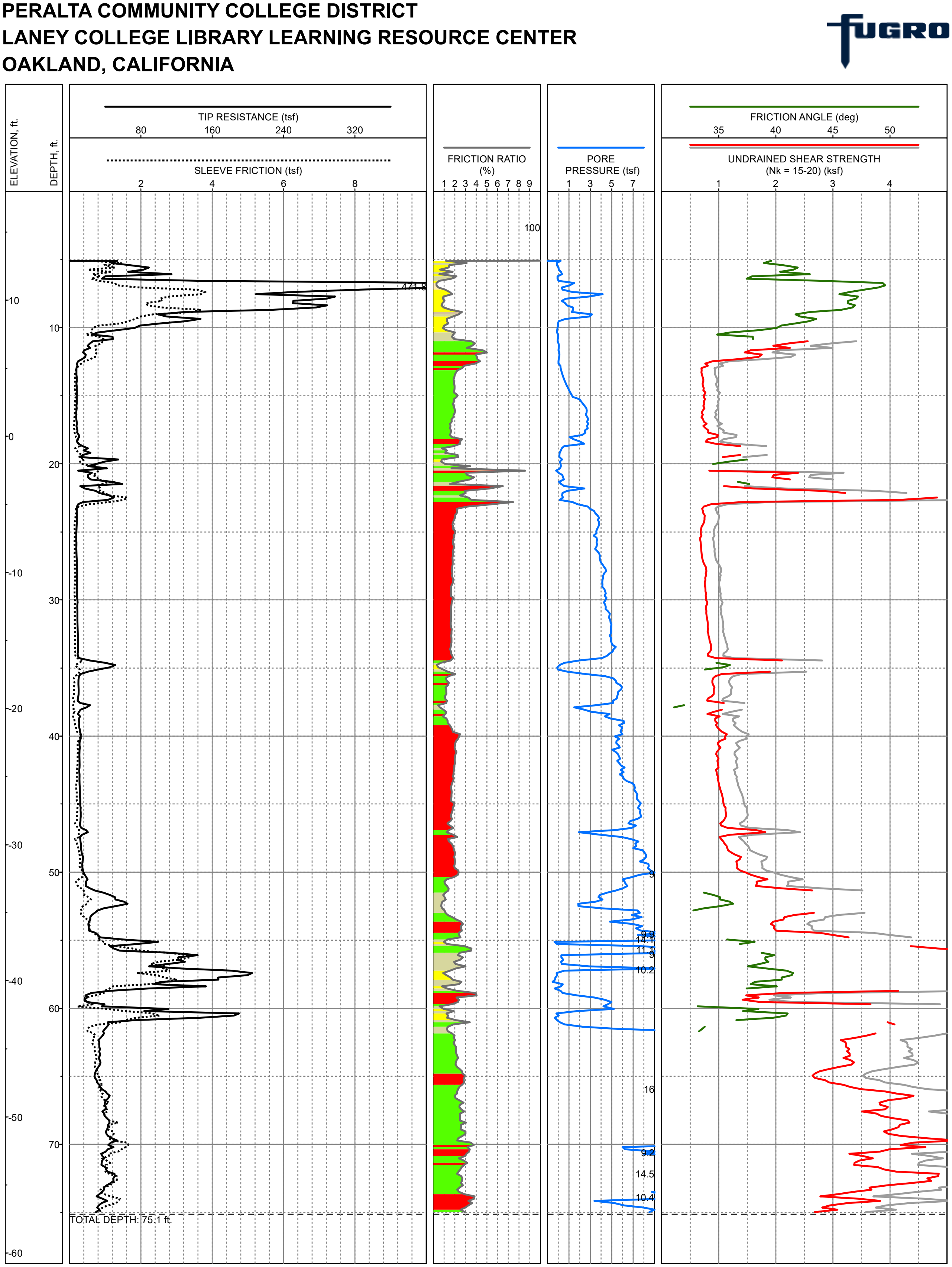
PERALTA COMMUNITY COLLEGE DISTRICT
LANEY COLLEGE LIBRARY LEARNING RESOURCE CENTER
OAKLAND, CALIFORNIA



LOCATION: E6,052,568, N2,116,600, NAD83 SP CA Z3 FT
SURFACE EL: 18.0ft
COMPLETION DEPTH: 75.1ft
TESTDATE: 1/3/2020

EXPLORATION METHOD: CPT
PERFORMED BY: FUGRO
REVIEWED BY: T.CHEN
CONE AREA RATIO: 0.80

LOG OF 2020-CPT-07

PLATE A-14

Fugro Document No. 04.72190021

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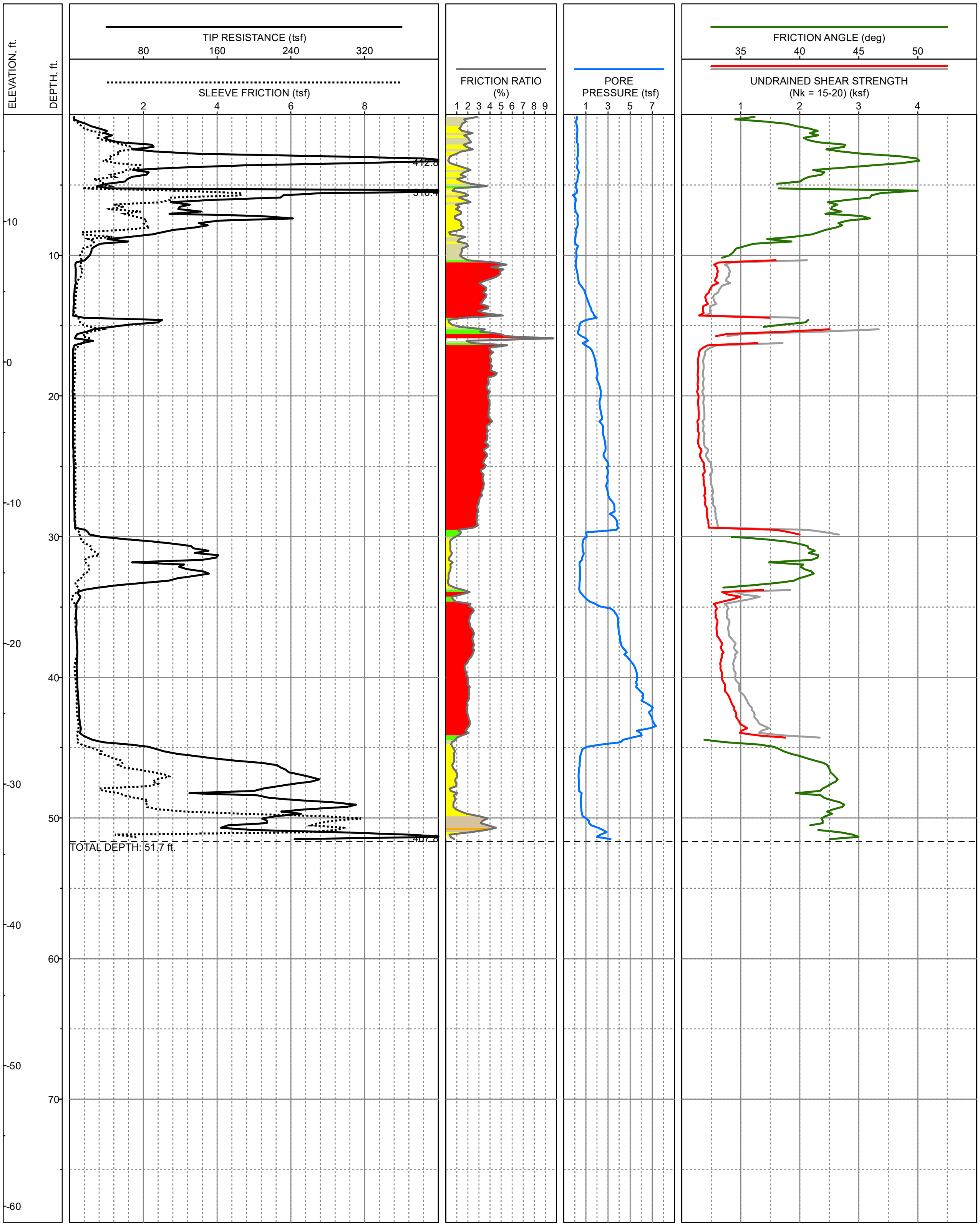
PERALTA COMMUNITY COLLEGE DISTRICT
LANEY COLLEGE LIBRARY LEARNING RESOURCE CENTER
OAKLAND, CALIFORNIA



LOCATION: E6,052,481, N2,116,627, NAD83 SP CA Z3 FT
SURFACE EL: 17.6ft
COMPLETION DEPTH: 51.7ft
TESTDATE: 1/2/2020

EXPLORATION METHOD: CPT
PERFORMED BY: FUGRO
REVIEWED BY: T.CHEN
CONE AREA RATIO: 0.80

LOG OF 2020-CPT-08

PLATE A-15

Fugro Document No. 04.72190021

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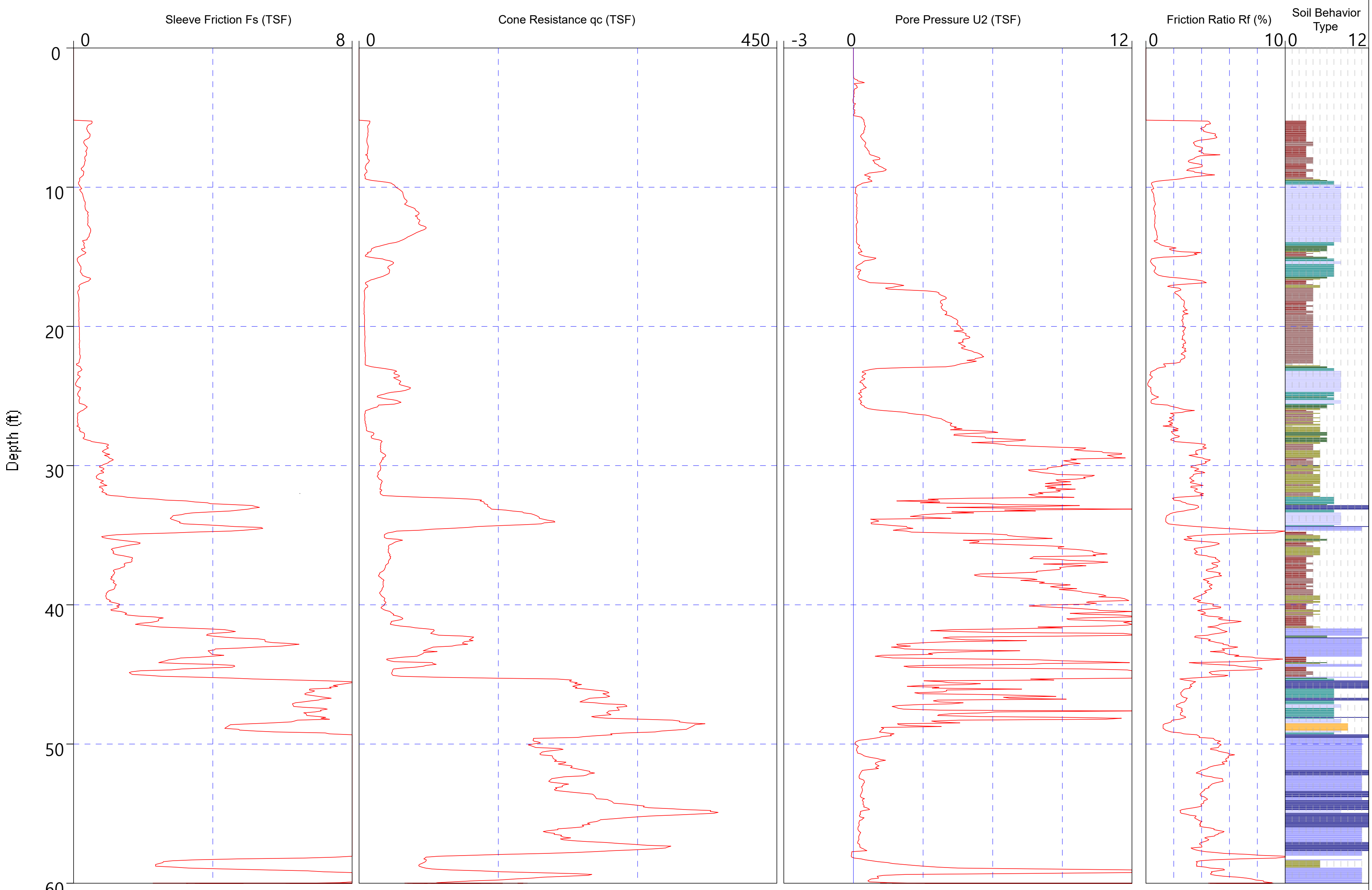
Job Number: 04.72190021
Operator: Daniel Garza
Location: Oakland, CA

CPT Number: CPT-01
Date: 29-Mar-2019
Elevation: 0.00

Coordinates: 37.795163 -122.262754
Cone Number: CP15-CF75PB7SN2-P1E1 2598



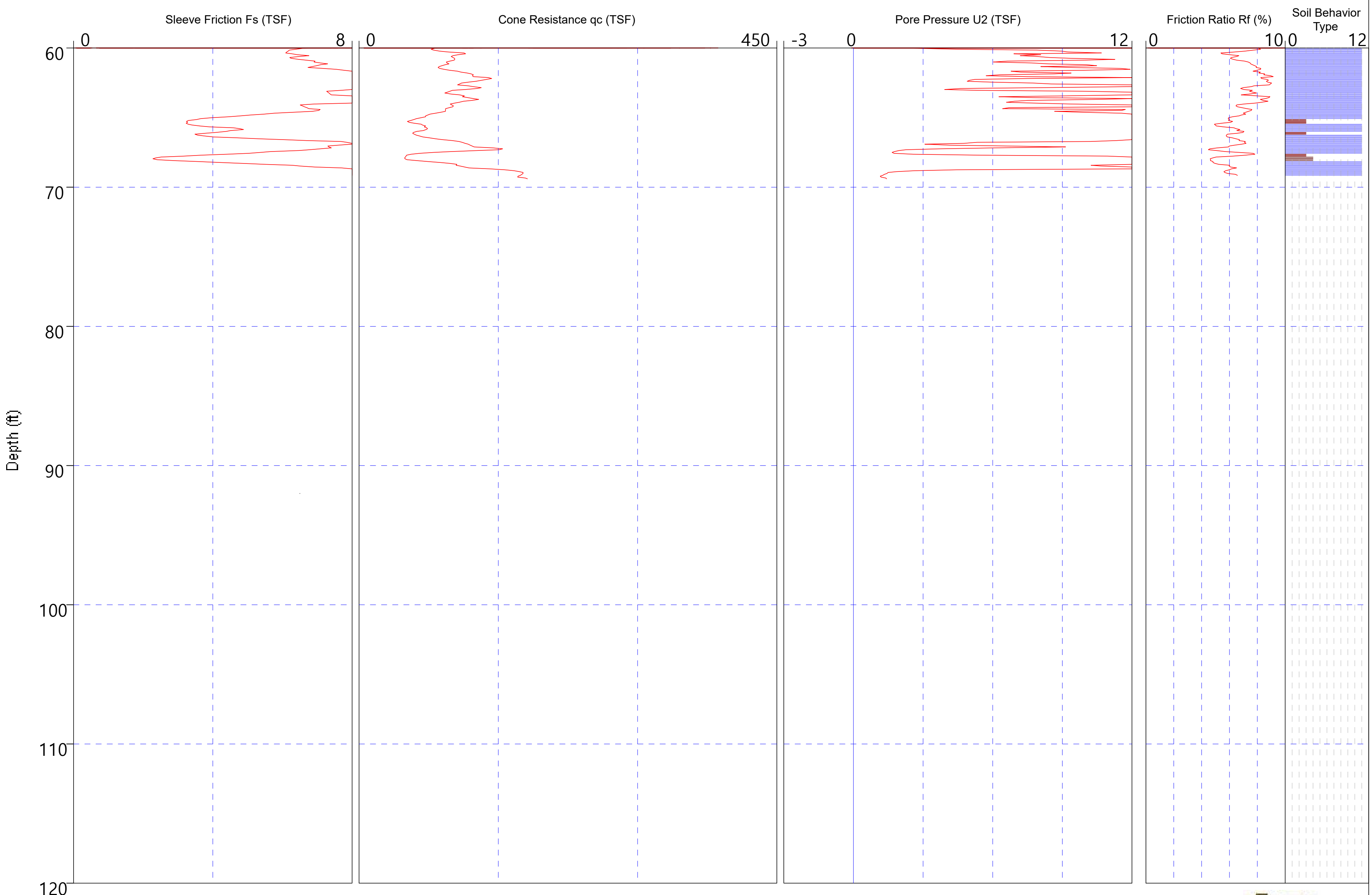
(1) sensitive fine grained (OL-CH)
(2) organic material (OL-OH)
(3) clay (CH)
(4) silty clay to clay (CL-CH)
(5) clayey silt to silty clay (MH-CL)
(6) sandy silt to clayey silt (ML-MH)
(7) silty sand to sandy silt (SM-ML)
(8) sand to silty sand (SM-SP)
(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.72190021
Operator: Daniel Garza
Location: Oakland, CA

CPT Number: CPT-01
Date: 29-Mar-2019
Elevation: 0.00

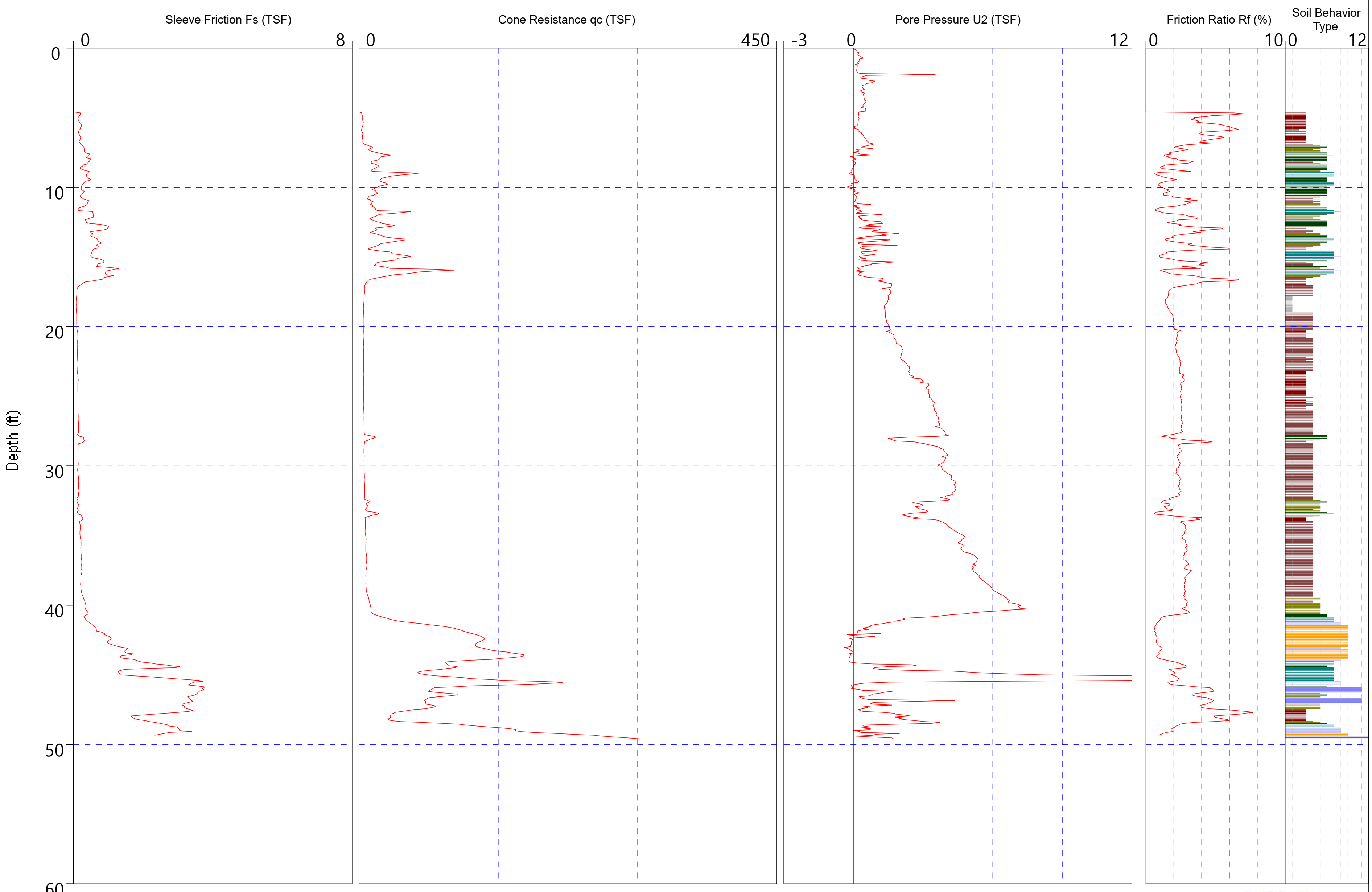
Coordinates: 37.795163 -122.262754
Cone Number: CP15-CF75PB7SN2-P1E1 2598



(1) sensitive fine grained (OL-CH)
(2) organic material (OL-OH)
(3) clay (CH)
(4) silty clay to clay (CL-CH)
(5) clayey silt to silty clay (MH-CL)
(6) sandy silt to clayey silt (ML-MH)
(7) silty sand to sandy silt (SM-ML)
(8) sand to silty sand (SM-SP)
(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number:	04.72190021	**CPT Number:**	CPT-02	**Coordinates:**	37.794900 -122.261959
Operator:	Daniel Garza	**Date:**	29-Mar-2019	**Cone Number:**	CP15-CF75PB7SN2-P1E1 2598
Location:	Oakland, CA	**Elevation:**	0.00		



(1) sensitive fine grained (OL-CH)
(2) organic material (OL-OH)
(3) clay (CH)
(4) silty clay to clay (CL-CH)
(5) clayey silt to silty clay (MH-CL)
(6) sandy silt to clayey silt (ML-MH)
(7) silty sand to sandy silt (SM-ML)
(8) sand to silty sand (SM-SP)
(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

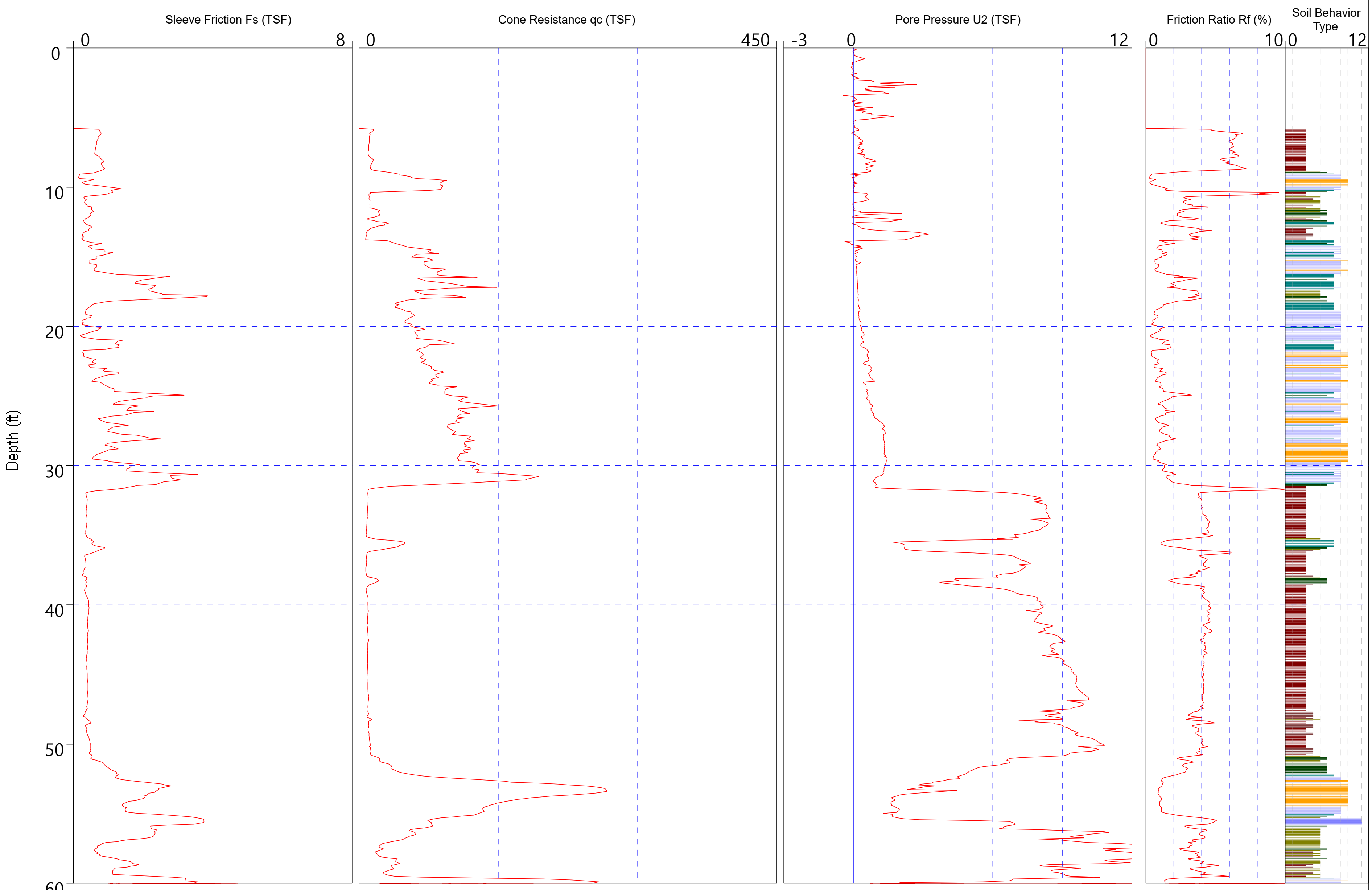
FUGRO

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.72190021
Operator: Daniel Garza
Location: Oakland, CA

CPT Number: CPT-03
Date: 29-Mar-2019
Elevation: 0.00

Coordinates: 37.794463 -122.262030
Cone Number: CP15-CF75PB7SN2-P1E1 2598



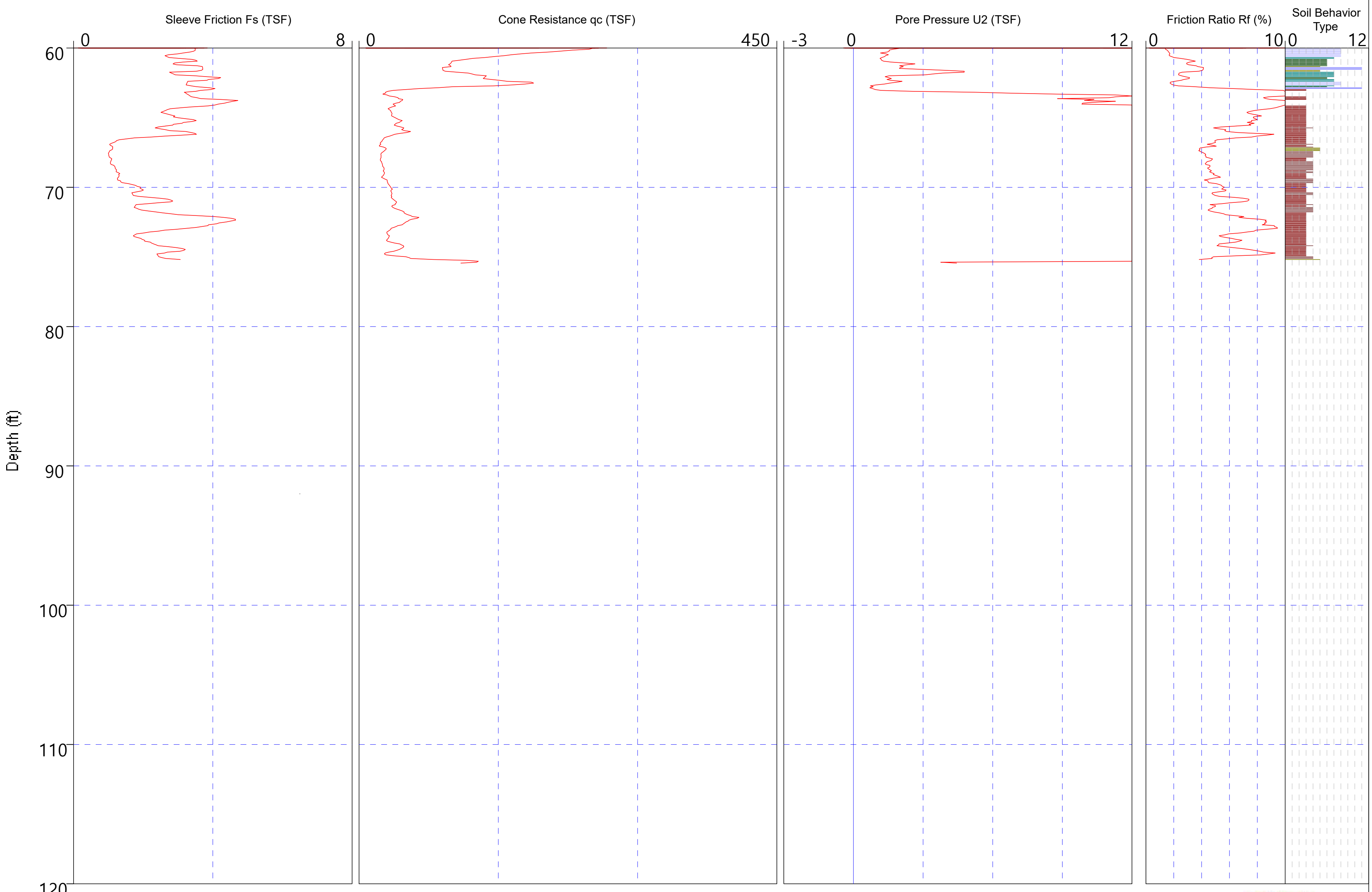
(1) sensitive fine grained (OL-CH)
(2) organic material (OL-OH)
(3) clay (CH)
(4) silty clay to clay (CL-CH)
(5) clayey silt to silty clay (MH-CL)
(6) sandy silt to clayey silt (ML-MH)
(7) silty sand to sandy silt (SM-ML)
(8) sand to silty sand (SM-SP)
(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.72190021
Operator: Daniel Garza
Location: Oakland, CA

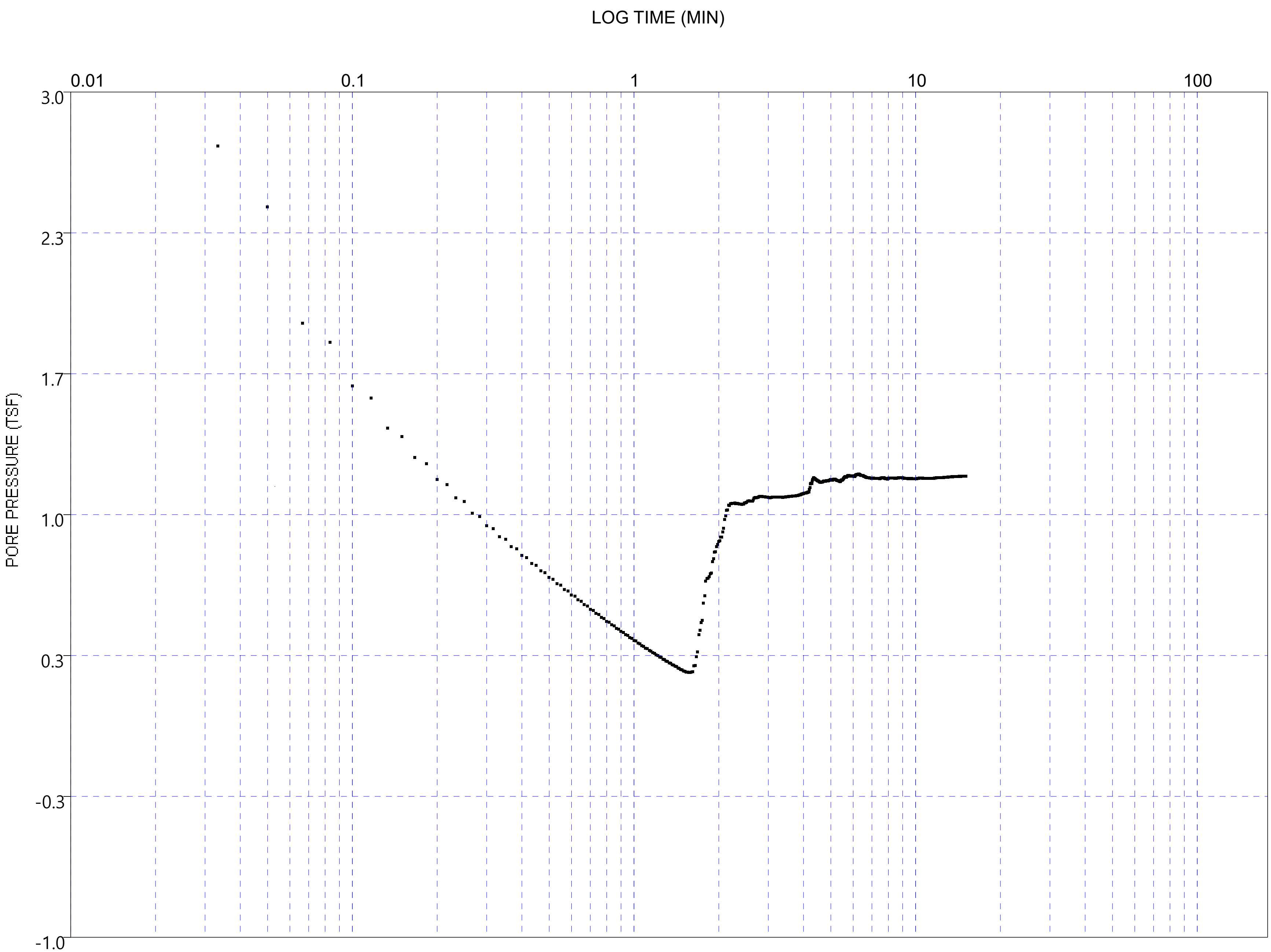
CPT Number: CPT-03
Date: 29-Mar-2019
Elevation: 0.00

Coordinates: 37.794463 -122.262030
Cone Number: CP15-CF75PB7SN2-P1E1 2598



(1) sensitive fine grained (OL-CH)
(2) organic material (OL-OH)
(3) clay (CH)
(4) silty clay to clay (CL-CH)
(5) clayey silt to silty clay (MH-CL)
(6) sandy silt to clayey silt (ML-MH)
(7) silty sand to sandy silt (SM-ML)
(8) sand to silty sand (SM-SP)
(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented



DISSIPATION TEST

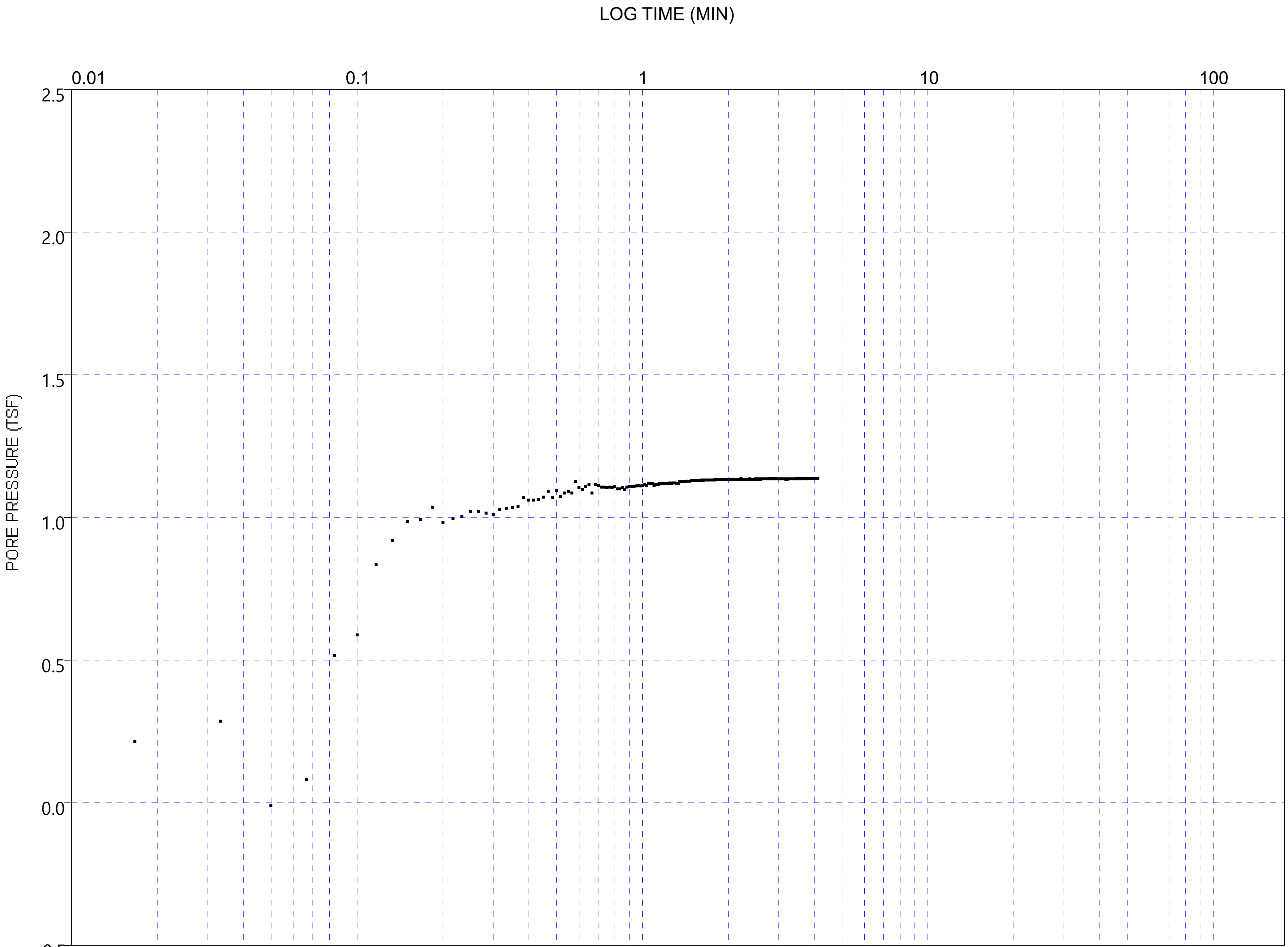
CPT Number: CPT-01

Job Number: 04.72190021

Depth: 48.77

Date: 29-Mar-2019

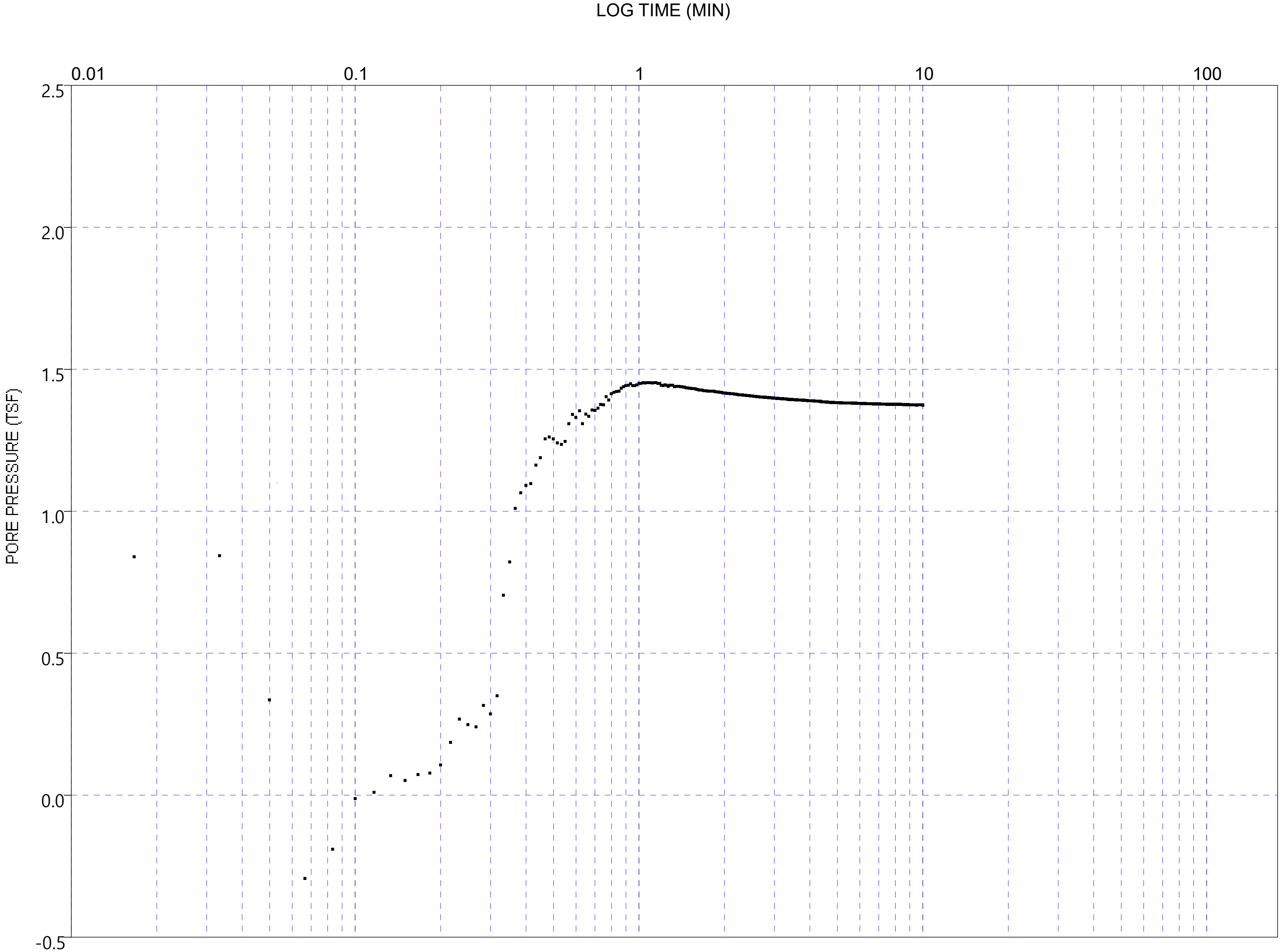
FUGRO Consultants, Inc.



DISSIPATION TEST

CPT Number: CPT-02
Job Number: 04.72190021

Depth: 42.02
Date: 29-Mar-2019



DISSIPATION TEST

CPT Number: CPT-02

Job Number: 04.72190021

Depth: 49.33

Date: 29-Mar-2019

GREGG DRILLING, LLC.
GEOTECHNICAL AND ENVIRONMENTAL INVESTIGATION SERVICES

January 7, 2020

Fugro
Attn: Reza Rahimnejad

Subject: CPT Site Investigation
Laney College
Oakland, California
GREGG Project Number: D2205001

Dear Mr. Rahimnejad:

The following report presents the results of GREGG Drilling Cone Penetration Test investigation for the above referenced site. The following testing services were performed:

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☒
3	Seismic Cone Penetration Tests	(SCPTU)	☒
4	UVOST Laser Induced Fluorescence	(UVOST)	☐
5	Groundwater Sampling	(GWS)	☐
6	Soil Sampling	(SS)	☐
7	Vapor Sampling	(VS)	☐
8	Pressuremeter Testing	(PMT)	☐
9	Vane Shear Testing	(VST)	☐
10	Dilatometer Testing	(DMT)	☐

A list of reference papers providing additional background on the specific tests conducted is provided in the bibliography following the text of the report. If you would like a copy of any of these publications or should you have any questions or comments regarding the contents of this report, please do not hesitate to contact me at 714-863-0988.

Sincerely,
Gregg Drilling, LLC.

CPT Reports Team
Gregg Drilling, LLC.

2726 Walnut Ave. • Signal Hill, California 90755 • (562) 427-6899 • FAX (562) 427-3314
950 Howe Road. • Martinez, California 94553 • (925) 313-5800 • FAX (925) 313-0302
www.greggdrilling.com

Cone Penetration Test Sounding Summary

-Table 1-

CPT Sounding Identification	Date	Termination Depth (feet)	Depth of Groundwater Samples (feet)	Depth of Soil Samples (feet)	Depth of Pore Pressure Dissipation Tests (feet)
CPT-04	01/03/2020	75.13	-	-	31.3
CPT-05	01/03/2020	75.13	-	-	41.2
CPT-06	01/03/2020	75.30	-	-	-
SCPT-07	01/03/2020	75.13	-	-	57.6
CPT-08	01/02/2020	51.67	-	-	51.7

Bibliography

Lunne, T., Robertson, P.K. and Powell, J.J.M., "Cone Penetration Testing in Geotechnical Practice" E & FN Spon. ISBN 0 419 23750, 1997

Roberston, P.K., "Soil Classification using the Cone Penetration Test", Canadian Geotechnical Journal, Vol. 27, 1990 pp. 151-158.

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Robertson, P.K., R.G. Campanella, D. Gillespie and A. Rice, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8, 1986
pp. 791-803.

Robertson, P.K., Sully, J., Woeller, D.J., Lunne, T., Powell, J.J.M., and Gillespie, D.J., "Guidelines for Estimating Consolidation Parameters in Soils from Piezocone Tests", Canadian Geotechnical Journal, Vol. 29, No. 4, August 1992, pp. 539-550.

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Campanella, R.G. and I. Weemees, "Development and Use of An Electrical Resistivity Cone for Groundwater Contamination Studies", Canadian Geotechnical Journal, Vol. 27 No. 5, 1990 pp. 557-567.

DeGroot, D.J. and A.J. Lutenegger, "Reliability of Soil Gas Sampling and Characterization Techniques", International Site Characterization Conference - Atlanta, 1998.

Woeller, D.J., P.K. Robertson, T.J. Boyd and Dave Thomas, "Detection of Polyaromatic Hydrocarbon Contaminants Using the UVIF-CPT", 53rd Canadian Geotechnical Conference Montreal, QC October pp. 733-739, 2000.

Zemo, D.A., T.A. Delfino, J.D. Gallinatti, V.A. Baker and L.R. Hilpert, "Field Comparison of Analytical Results from Discrete-Depth Groundwater Samplers" BAT EnviroProbe and QED HydroPunch, Sixth national Outdoor Action Conference, Las Vegas, Nevada Proceedings, 1992, pp 299-312.

Copies of ASTM Standards are available through www.astm.org

Cone Penetration Testing Procedure (CPT)

Gregg Drilling carries out all Cone Penetration Tests (CPT) using an integrated electronic cone system, *Figure CPT*.

The cone takes measurements of tip resistance (q_c), sleeve resistance (f_s), and penetration pore water pressure (u_2). Measurements are taken at either 2.5 or 5 cm intervals during penetration to provide a nearly continuous profile. CPT data reduction and basic interpretation is performed in real time facilitating on-site decision making. The above mentioned parameters are stored electronically for further analysis and reference. All CPT soundings are performed in accordance with revised ASTM standards (D 5778-12).

The 5mm thick porous plastic filter element is located directly behind the cone tip in the u_2 location. A new saturated filter element is used on each sounding to measure both penetration pore pressures as well as measurements during a dissipation test (*PPDT*). Prior to each test, the filter element is fully saturated with oil under vacuum pressure to improve accuracy.

When the sounding is completed, the test hole is backfilled according to client specifications. If grouting is used, the procedure generally consists of pushing a hollow tremie pipe with a "knock out" plug to the termination depth of the CPT hole. Grout is then pumped under pressure as the tremie pipe is pulled from the hole. Disruption or further contamination to the site is therefore minimized.

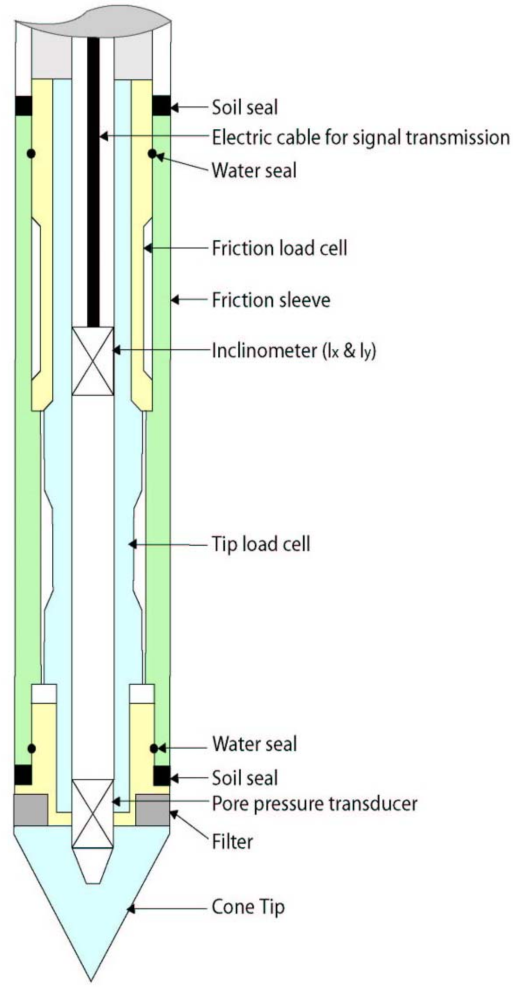


Figure CPT

Gregg 15cm^2 Standard Cone Specifications

Dimensions	
Cone base area	15 cm^2
Sleeve surface area	225 cm^2
Cone net area ratio	0.80
Specifications	
Cone load cell	
Full scale range	180 kN (20 tons)
Overload capacity	150%
Full scale tip stress	120 MPa (1,200 tsf)
Repeatability	120 kPa (1.2 tsf)
Sleeve load cell	
Full scale range	31 kN (3.5 tons)
Overload capacity	150%
Full scale sleeve stress	1,400 kPa (15 tsf)
Repeatability	1.4 kPa (0.015 tsf)
Pore pressure transducer	
Full scale range	7,000 kPa (1,000 psi)
Overload capacity	150%
Repeatability	7 kPa (1 psi)

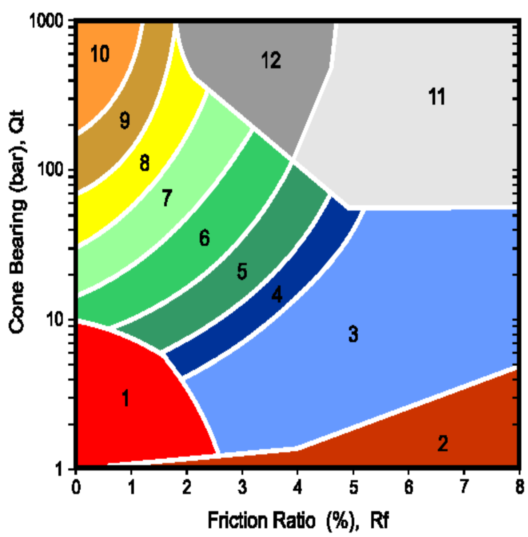
Note: The repeatability during field use will depend somewhat on ground conditions, abrasion, maintenance and zero load stability.

Cone Penetration Test Data & Interpretation

The Cone Penetration Test (CPT) data collected are presented in graphical and electronic form in the report. The plots include interpreted Soil Behavior Type (SBT) based on the charts described by Robertson (1990). Typical plots display SBT based on the non-normalized charts of Robertson et al (1986). For CPT soundings deeper than 30m, we recommend the use of the normalized charts of Robertson (1990) which can be displayed as SBTn, upon request. The report also includes spreadsheet output of computer calculations of basic interpretation in terms of SBT and SBTn and various geotechnical parameters using current published correlations based on the comprehensive review by Lunne, Robertson and Powell (1997), as well as recent updates by Professor Robertson (Guide to Cone Penetration Testing, 2015). The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg Drilling & Testing Inc. does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software. Some interpretation methods require input of the groundwater level to calculate vertical effective stress. An estimate of the in-situ groundwater level has been made based on field observations and/or CPT results, but should be verified by the user.

A summary of locations and depths is available in Table 1. Note that all penetration depths referenced in the data are with respect to the existing ground surface.

Note that it is not always possible to clearly identify a soil type based solely on q_t, f_s, and u_2. In these situations, experience, judgment, and an assessment of the pore pressure dissipation data should be used to infer the correct soil behavior type.



ZONE		SBT
1		Sensitive, fine grained
2		Organic materials
3		Clay
4		Silty clay to clay
5		Clayey silt to silty clay
6		Sandy silt to clayey silt
7		Silty sand to sandy silt
8		Sand to silty sand
9		Sand
10		Gravely sand to sand
11		Very stiff fine grained*
12		Sand to clayey sand*

*over consolidated or cemented

Figure SBT (After Robertson et al., 1986) – Note: Colors may vary slightly compared to plots

Cone Penetration Test (CPT) Interpretation

Gregg uses a proprietary CPT interpretation and plotting software. The software takes the CPT data and performs basic interpretation in terms of soil behavior type (SBT) and various geotechnical parameters using current published empirical correlations based on the comprehensive review by Lunne, Robertson and Powell (1997). The interpretation is presented in tabular format using MS Excel. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software.

The following provides a summary of the methods used for the interpretation. Many of the empirical correlations to estimate geotechnical parameters have constants that have a range of values depending on soil type, geologic origin and other factors. The software uses 'default' values that have been selected to provide, in general, conservatively low estimates of the various geotechnical parameters.

Input:

1 Units for display (Imperial or metric) (atm. pressure, p_a = 0.96 tsf or 0.1 MPa)
2 Depth interval to average results (ft or m). Data are collected at either 0.02 or 0.05m and can be averaged every 1, 3 or 5 intervals.
3 Elevation of ground surface (ft or m)
4 Depth to water table, z_w (ft or m) – input required
5 Net area ratio for cone, a (default to 0.80)
6 Relative Density constant, C_{Dr} (default to 350)
7 Young's modulus number for sands, α (default to 5)
8 Small strain shear modulus number
   a. for sands, S_G (default to 180 for SBT_n 5, 6, 7)
   b. for clays, C_G (default to 50 for SBT_n 1, 2, 3 & 4)
9 Undrained shear strength cone factor for clays, N_{kt} (default to 15)
10 Over Consolidation ratio number, k_{ocr} (default to 0.3)
11 Unit weight of water, (default to γ_w = 62.4 lb/ft^3 or 9.81 kN/m^3)

Column

1 Depth, z, (m) – CPT data is collected in meters
2 Depth (ft)
3 Cone resistance, q_c (tsf or MPa)
4 Sleeve resistance, f_s (tsf or MPa)
5 Penetration pore pressure, u (psi or MPa), measured behind the cone (i.e. u_2)
6 Other – any additional data
7 Total cone resistance, q_t (tsf or MPa) $q_t = q_c + u\,(1-a)$

8	Friction Ratio, R_f (%)	$R_f = (f_s/q_t) \times 100\%$
9	Soil Behavior Type (non-normalized), SBT	see note
10	Unit weight, γ (pcf or kN/m^3)	based on SBT, see note
11	Total overburden stress, σ_v (tsf)	$\sigma_{vo} = \sigma\ z$
12	In-situ pore pressure, u_o (tsf)	$u_o = \gamma_w (z - z_w)$
13	Effective overburden stress, σ'_{vo} (tsf)	$\sigma'_{vo} = \sigma_{vo} - u_o$
14	Normalized cone resistance, Q_{t1}	$Q_{t1} = (q_t - \sigma_{vo}) / \sigma'_{vo}$
15	Normalized friction ratio, F_r (%)	$F_r = f_s / (q_t - \sigma_{vo}) \times 100\%$
16	Normalized Pore Pressure ratio, B_q	$B_q = u - u_o / (q_t - \sigma_{vo})$
17	Soil Behavior Type (normalized), SBT_n	see note
18	SBT_n Index, I_c	see note
19	Normalized Cone resistance, Q_{tn} (n varies with I_c)	see note
20	Estimated permeability, k_{SBT} (cm/sec or ft/sec)	see note
21	Equivalent SPT N_{60}, blows/ft	see note
22	Equivalent SPT $(N_1)_{60}$ blows/ft	see note
23	Estimated Relative Density, D_r, (%)	see note
24	Estimated Friction Angle, ϕ', (degrees)	see note
25	Estimated Young's modulus, E_s (tsf)	see note
26	Estimated small strain Shear modulus, Go (tsf)	see note
27	Estimated Undrained shear strength, s_u (tsf)	see note
28	Estimated Undrained strength ratio	s_u/σ_v'
29	Estimated Over Consolidation ratio, OCR	see note

Notes:

1 Soil Behavior Type (non-normalized), SBT (Lunne et al., 1997 and table below)

2 Unit weight, γ either constant at 119 pcf or based on Non-normalized SBT (Lunne et al., 1997 and table below)

3 Soil Behavior Type (Normalized), SBT_n Lunne et al. (1997)

4 SBT_n Index, I_c $I_c = ((3.47 - \log Q_{t1})^2 + (\log F_r + 1.22)^2)^{0.5}$

5 Normalized Cone resistance, Q_{tn} (n varies with Ic)

$Q_{tn} = ((q_t - \sigma_{vo})/pa)\ (pa/(\sigma'_{vo})^n$ and recalculate I_c, then iterate:

When $I_c < 1.64$, n = 0.5 (clean sand)
When $I_c > 3.30$, n = 1.0 (clays)
When $1.64 < I_c < 3.30$, $n = (I_c - 1.64)0.3 + 0.5$
Iterate until the change in n, $\Delta n < 0.01$

6 Estimated permeability, k_{SBT} based on Normalized SBT_n (Lunne et al., 1997 and table below)

7 Equivalent SPT N_{60}, blows/ft Lunne et al. (1997)

$$\frac{(q_t/p_a)}{N_{60}} = 8.5\left(1 - \frac{I_c}{4.6}\right)$$

8 Equivalent SPT $(N_1)_{60}$ blows/ft $(N_1)_{60} = N_{60}\,C_N$,
where $C_N = (pa/\sigma'_{vo})^{0.5}$

9 Relative Density, D_r, (%) $D_r^2 = Q_{tn} / C_{Dr}$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

10 Friction Angle, φ', (degrees) $\tan\phi' = \frac{1}{2.68}\left[\log\left(\frac{q_c}{\sigma'_{vo}}\right) + 0.29\right]$

Only SBT_n 5, 6, 7 & 8 *Show'N/A' in zones 1, 2, 3, 4 & 9*

11 Young's modulus, E_s $E_s = \alpha\, q_t$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

12 Small strain shear modulus, Go

a. $G_o = S_G\,(q_t\ \sigma'_{vo}\ pa)^{1/3}$ *For SBT_n 5, 6, 7*

b. $G_o = C_G\, q_t$ *For SBT_n 1, 2, 3& 4*

Show 'N/A' in zones 8 & 9

13 Undrained shear strength, s_u $s_u = (q_t - \sigma_{vo}) / N_{kt}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

14 Over Consolidation ratio, OCR $OCR = k_{ocr}\, Q_{t1}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

The following updated and simplified SBT descriptions have been used in the software:

SBT Zones		**SBT_n Zones**	
1	sensitive fine grained	1	sensitive fine grained
2	organic soil	2	organic soil
3	clay	3	clay
4	clay & silty clay	4	clay & silty clay
5	clay & silty clay		
6	sandy silt & clayey silt		

7	silty sand & sandy silt	5	silty sand & sandy silt
8	sand & silty sand	6	sand & silty sand
9	sand		
10	sand	7	sand
11	very dense/stiff soil*	8	very dense/stiff soil*
12	very dense/stiff soil*	9	very dense/stiff soil*

*heavily overconsolidated and/or cemented

Track when soils fall with zones of same description and print that description (i.e. if soils fall only within SBT zones 4 & 5, print 'clays & silty clays')

Estimated Permeability (see Lunne et al., 1997)

SBT_n	Permeability (ft/sec)	(m/sec)
1	$3x\ 10^{-8}$	$1x\ 10^{-8}$
2	$3x\ 10^{-7}$	$1x\ 10^{-7}$
3	$1x\ 10^{-9}$	$3x\ 10^{-10}$
4	$3x\ 10^{-8}$	$1x\ 10^{-8}$
5	$3x\ 10^{-6}$	$1x\ 10^{-6}$
6	$3x\ 10^{-4}$	$1x\ 10^{-4}$
7	$3x\ 10^{-2}$	$1x\ 10^{-2}$
8	$3x\ 10^{-6}$	$1x\ 10^{-6}$
9	$1x\ 10^{-8}$	$3x\ 10^{-9}$

Estimated Unit Weight (see Lunne et al., 1997)

SBT	Approximate Unit Weight (lb/ft^3)	(kN/m^3)
1	111.4	17.5
2	79.6	12.5
3	111.4	17.5
4	114.6	18.0
5	114.6	18.0
6	114.6	18.0
7	117.8	18.5
8	120.9	19.0
9	124.1	19.5
10	127.3	20.0
11	130.5	20.5
12	120.9	19.0

Pore Pressure Dissipation Tests (PPDT)

Pore Pressure Dissipation Tests (PPDT's) conducted at various intervals can be used to measure equilibrium water pressure (at the time of the CPT). If conditions are hydrostatic, the equilibrium water pressure can be used to determine the approximate depth of the ground water table. A PPDT is conducted when penetration is halted at specific intervals determined by the field representative. The variation of the penetration pore pressure (*u)* with time is measured behind the tip of the cone and recorded.

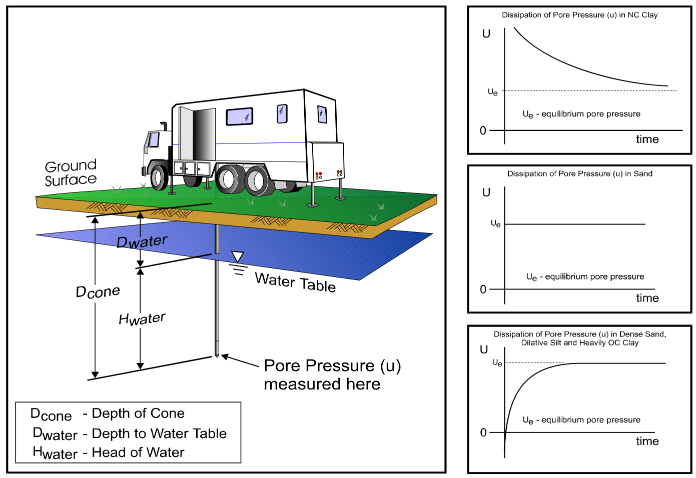
Pore pressure dissipation data can be interpreted to provide estimates of:

- Equilibrium piezometric pressure
- Phreatic Surface
- In situ horizontal coefficient of consolidation (c_h)
- In situ horizontal coefficient of permeability (k_h)

In order to correctly interpret the equilibrium piezometric pressure and/or the phreatic surface, the pore pressure must be monitored until it reaches equilibrium, *Figure PPDT*. This time is commonly referred to as t_{100}, the point at which 100% of the excess pore pressure has dissipated.

A complete reference on pore pressure dissipation tests is presented by Robertson et al. 1992 and Lunne et al. 1997.

A summary of the pore pressure dissipation tests are summarized in Table 1.



Water Table Calculation

$$D_{water} = D_{cone} - H_{water}$$

where $H_{water} = U_e$ (depth units)

Useful Conversion Factors: 1psi = 0.704m = 2.31 feet (water)
1tsf = 0.958 bar = 13.9 psi
1m = 3.28 feet

Figure PPDT

Seismic Cone Penetration Testing (SCPT)

Seismic Cone Penetration Testing (SCPT) can be conducted at various intervals during the Cone Penetration Test. Shear wave velocity (Vs) can then be calculated over a specified interval with depth. A small interval for seismic testing, such as 1-1.5m (3-5ft) allows for a detailed look at the shear wave profile with depth. Conversely, a larger interval such as 3-6m (10-20ft) allows for a more average shear wave velocity to be calculated. Gregg's cones have a horizontally active geophone located 0.2m (0.66ft) behind the tip.

To conduct the seismic shear wave test, the penetration of the cone is stopped and the rods are decoupled from the rig. An automatic hammer is triggered to send a shear wave into the soil. The distance from the source to the cone is calculated knowing the total depth of the cone and the horizontal offset distance between the source and the cone. To calculate an interval velocity, a minimum of two tests must be performed at two different depths. The arrival times between the two wave traces are compared to obtain the difference in time (Δt). The difference in depth is calculated (Δd) and velocity can be determined using the simple equation: v = Δd/Δt

Multiple wave traces can be recorded at the same depth to improve quality of the data.

A complete reference on seismic cone penetration tests is presented by Robertson et al. 1986 and Lunne et al. 1997.

A summary the shear wave velocities, arrival times and wave traces are provided with the report.

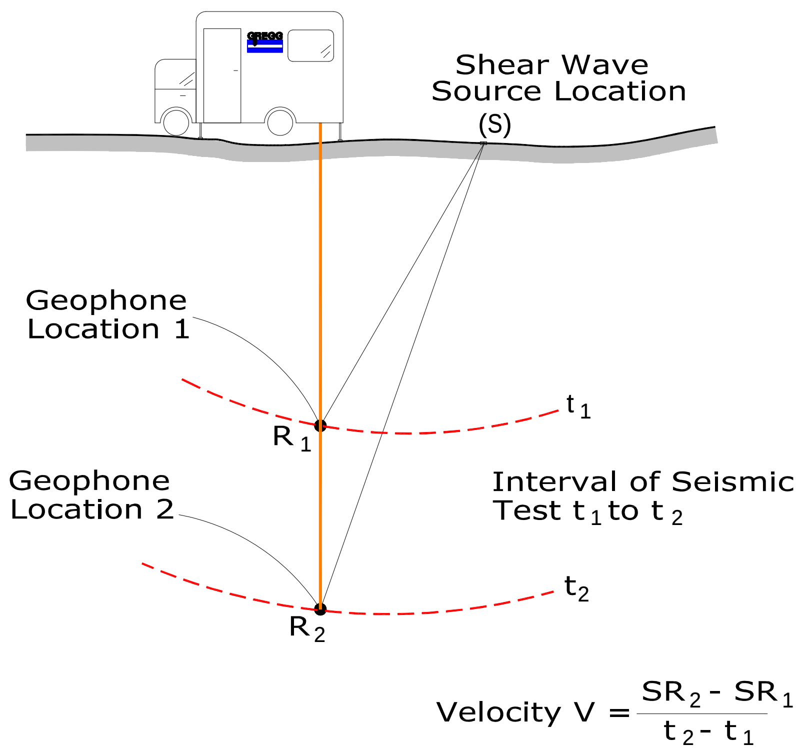


Figure SCPT

Groundwater Sampling

Gregg Drilling & Testing, Inc. conducts groundwater sampling using a sampler as shown in *Figure GWS*. The groundwater sampler has a retrievable stainless steel or disposable PVC screen with steel drop off tip. This allows for samples to be taken at multiple depth intervals within the same sounding location. In areas of slower water recharge, provisions may be made to set temporary PVC well screens during sampling to allow the pushing equipment to advance to the next sample location while the groundwater is allowed to infiltrate.

The groundwater sampler operates by advancing 44.5mm (1¾ inch) hollow push rods with the filter tip in a closed configuration to the base of the desired sampling interval. Once at the desired sample depth, the push rods are retracted; exposing the encased filter screen and allowing groundwater to infiltrate hydrostatically from the formation into the inlet screen. A small diameter bailer (approximately ½ or ¾ inch) is lowered through the push rods into the screen section for sample collection. The number of downhole trips with the bailer and time necessary to complete the sample collection at each depth interval is a function of sampling protocols, volume requirements, and the yield characteristics and storage capacity of the formation. Upon completion of sample collection, the push rods and sampler, with the exception of the PVC screen and steel drop off tip are retrieved to the ground surface, decontaminated and prepared for the next sampling event.

For a detailed reference on direct push groundwater sampling, refer to Zemo et. al., 1992.

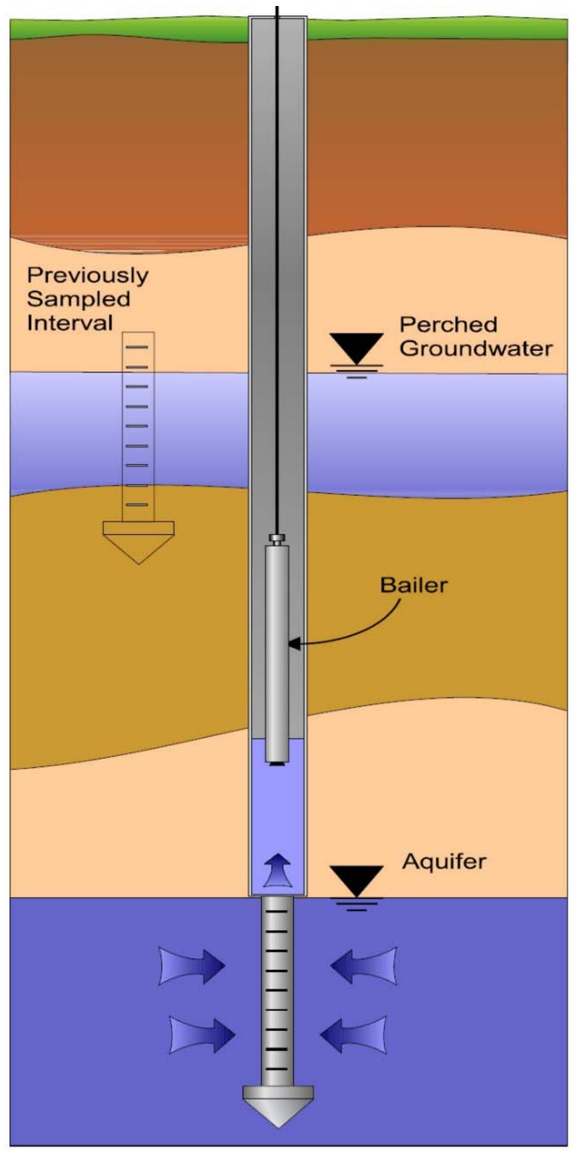


Figure GWS

Soil Sampling

Gregg Drilling & Testing, Inc. uses a piston-type push-in sampler to obtain small soil samples without generating any soil cuttings, *Figure SS*. Two different types of samplers (12 and 18 inch) are used depending on the soil type and density. The soil sampler is initially pushed in a "closed" position to the desired sampling interval using the CPT pushing equipment. Keeping the sampler closed minimizes the potential of cross contamination. The inner tip of the sampler is then retracted leaving a hollow soil sampler with inner 1¼" diameter sample tubes. The hollow sampler is then pushed in a locked "open" position to collect a soil sample. The filled sampler and push rods are then retrieved to the ground surface. Because the soil enters the sampler at a constant rate, the opportunity for 100% recovery is increased. For environmental analysis, the soil sample tube ends are sealed with Teflon and plastic caps. Often, a longer "split tube" can be used for geotechnical sampling.

For a detailed reference on direct push soil sampling, refer to Robertson et al, 1998.

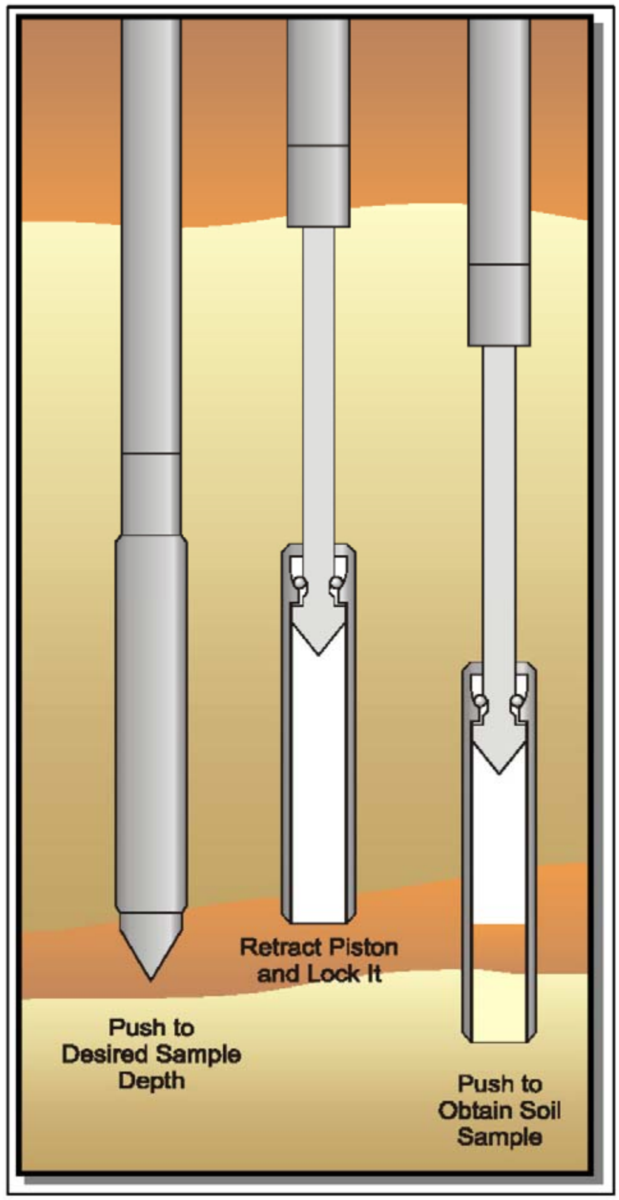


Figure SS

Gregg Drilling, LLC
www.greggdrilling.com

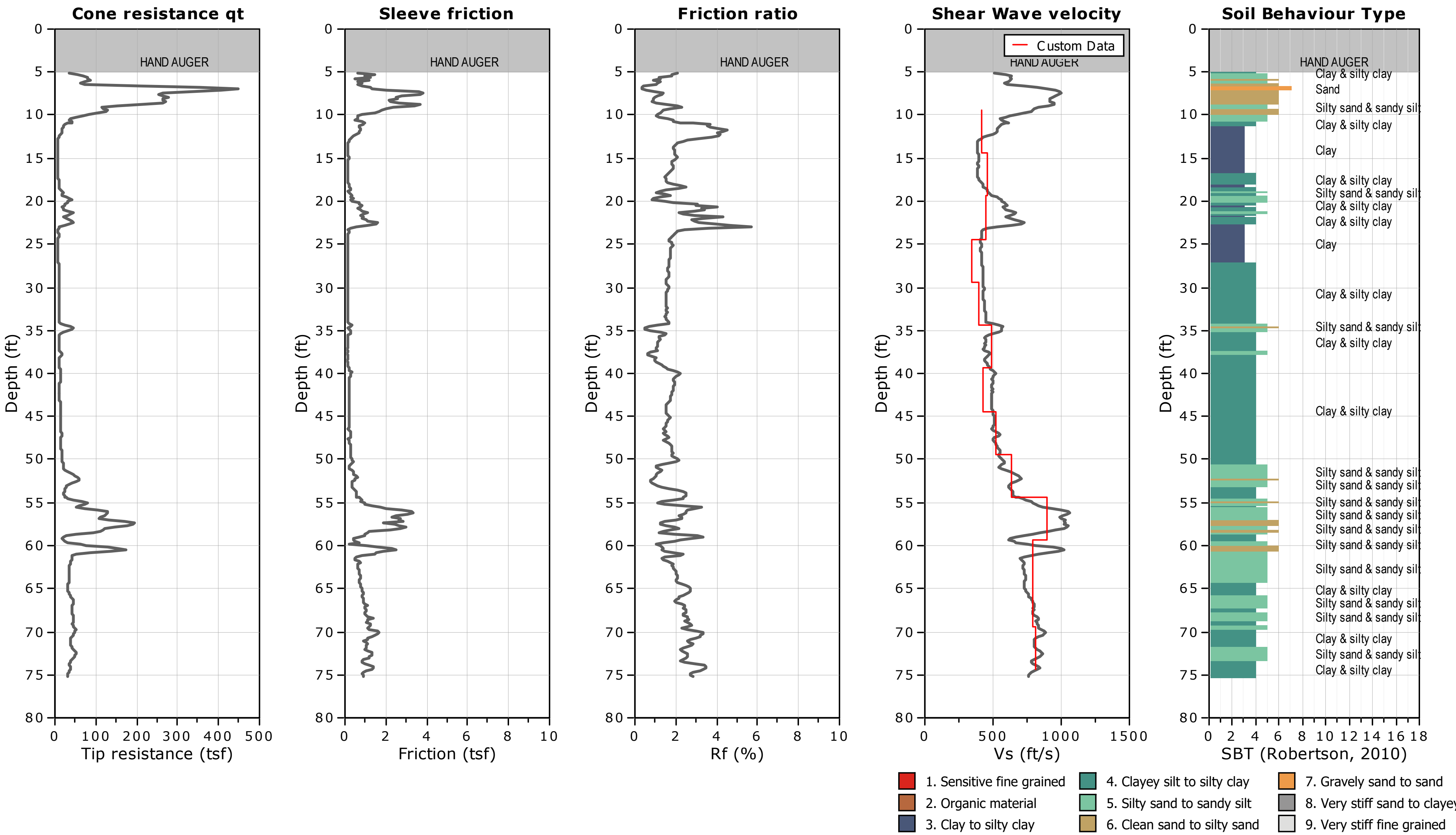
CPT: SCPT-07

CLIENT: FUGRO

SITE: LANEY COLLEGE, OAKLAND, CA

FIELD REP: REZA RAHIMNEJAD

Total depth: 75.13 ft, Date: 1/3/2020



Gregg Drilling, LLC
www.greggdrilling.com

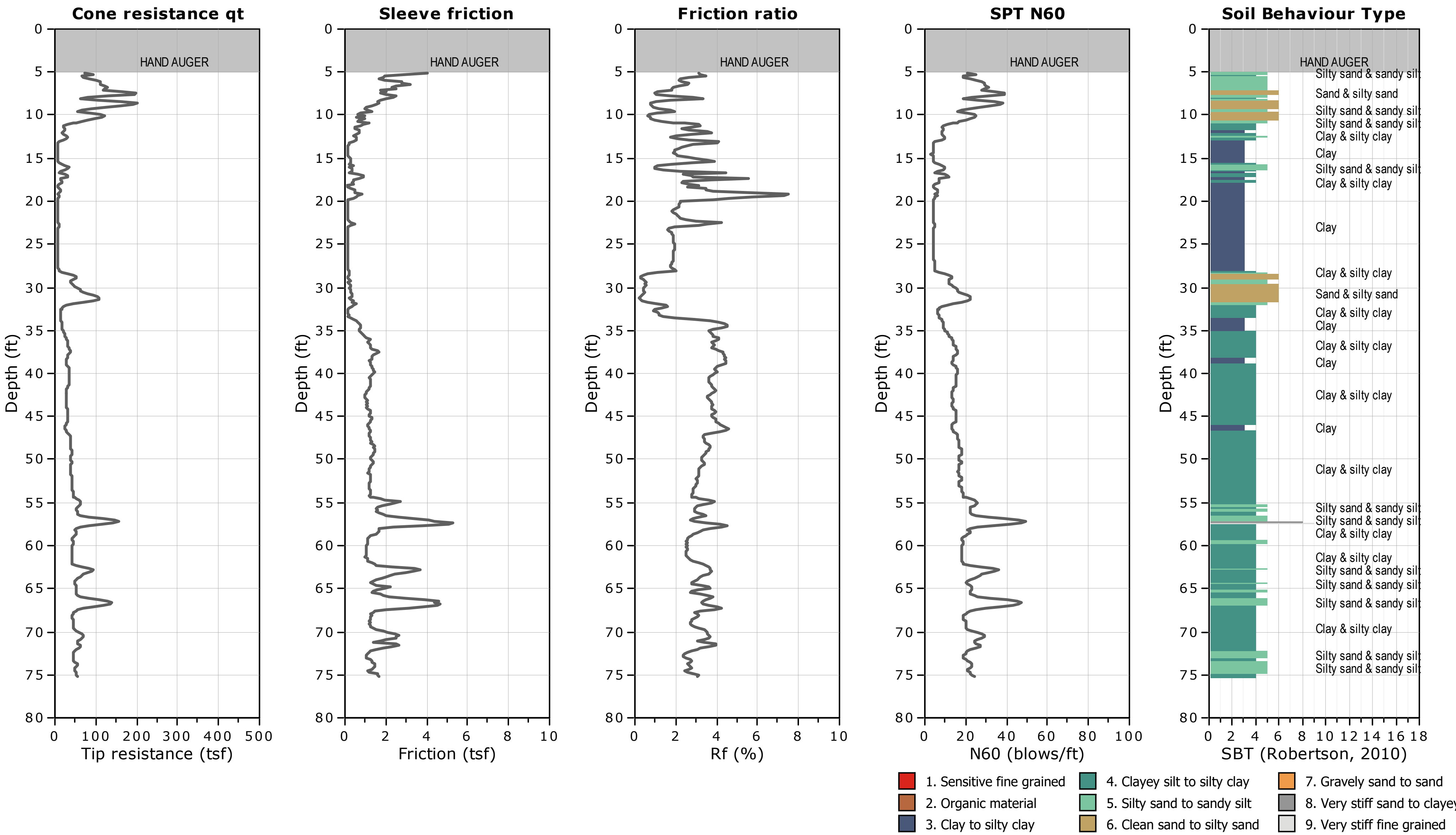
CPT: CPT-04

CLIENT: FUGRO

SITE: LANEY COLLEGE, OAKLAND, CA

FIELD REP: REZA RAHIMNEJAD

Total depth: 75.13 ft, Date: 1/3/2020

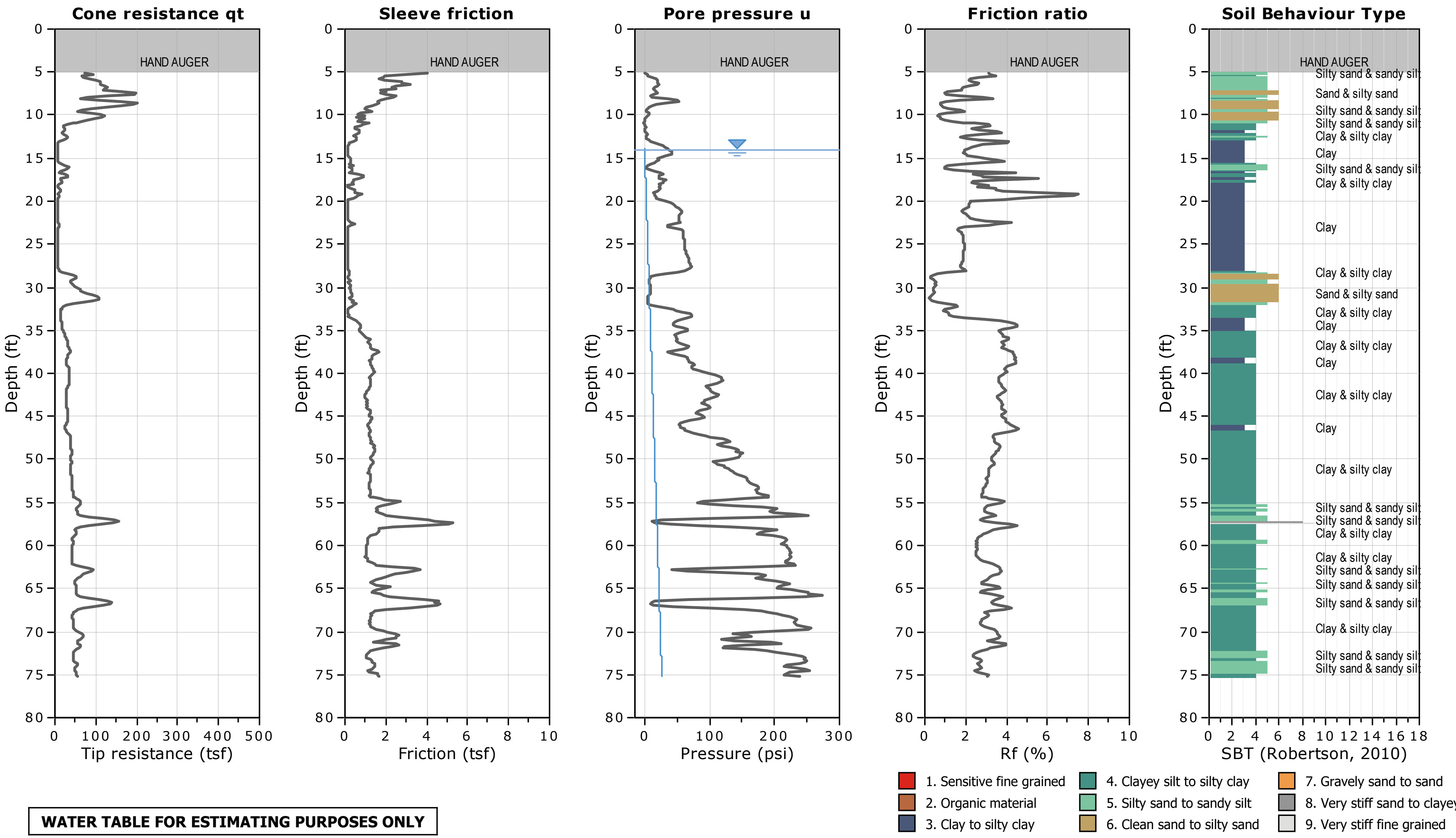


Gregg Drilling, LLC
www.greggdrilling.com

CPT: CPT-04

CLIENT: FUGRO
SITE: LANEY COLLEGE, OAKLAND, CA

FIELD REP: REZA RAHIMNEJAD
Total depth: 75.13 ft, Date: 1/3/2020



WATER TABLE FOR ESTIMATING PURPOSES ONLY

Gregg Drilling, LLC
www.greggdrilling.com

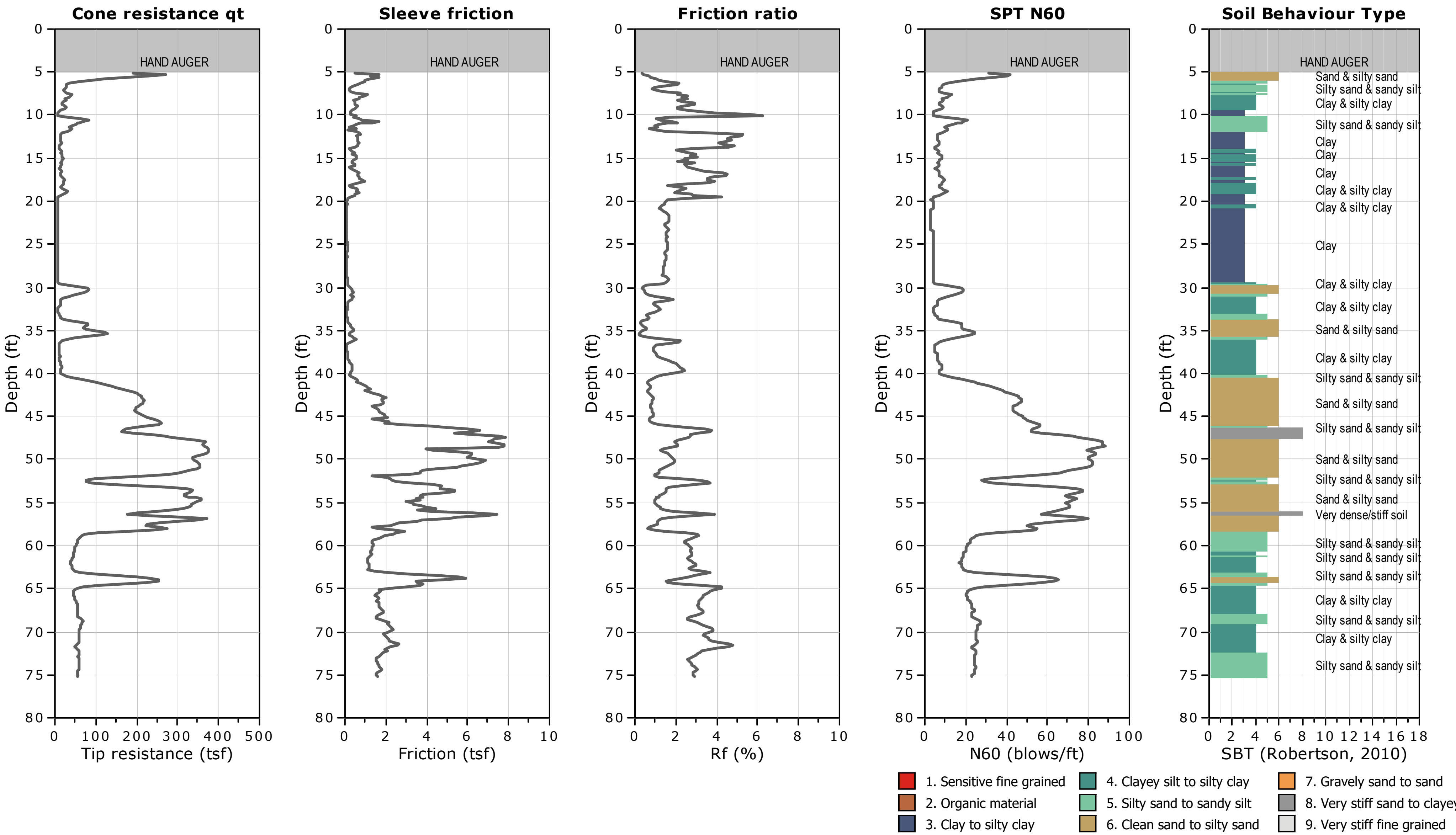
CPT: CPT-05

CLIENT: FUGRO

SITE: LANEY COLLEGE, OAKLAND, CA

FIELD REP: REZA RAHIMNEJAD

Total depth: 75.13 ft, Date: 1/3/2020



Gregg Drilling, LLC
www.greggdrilling.com

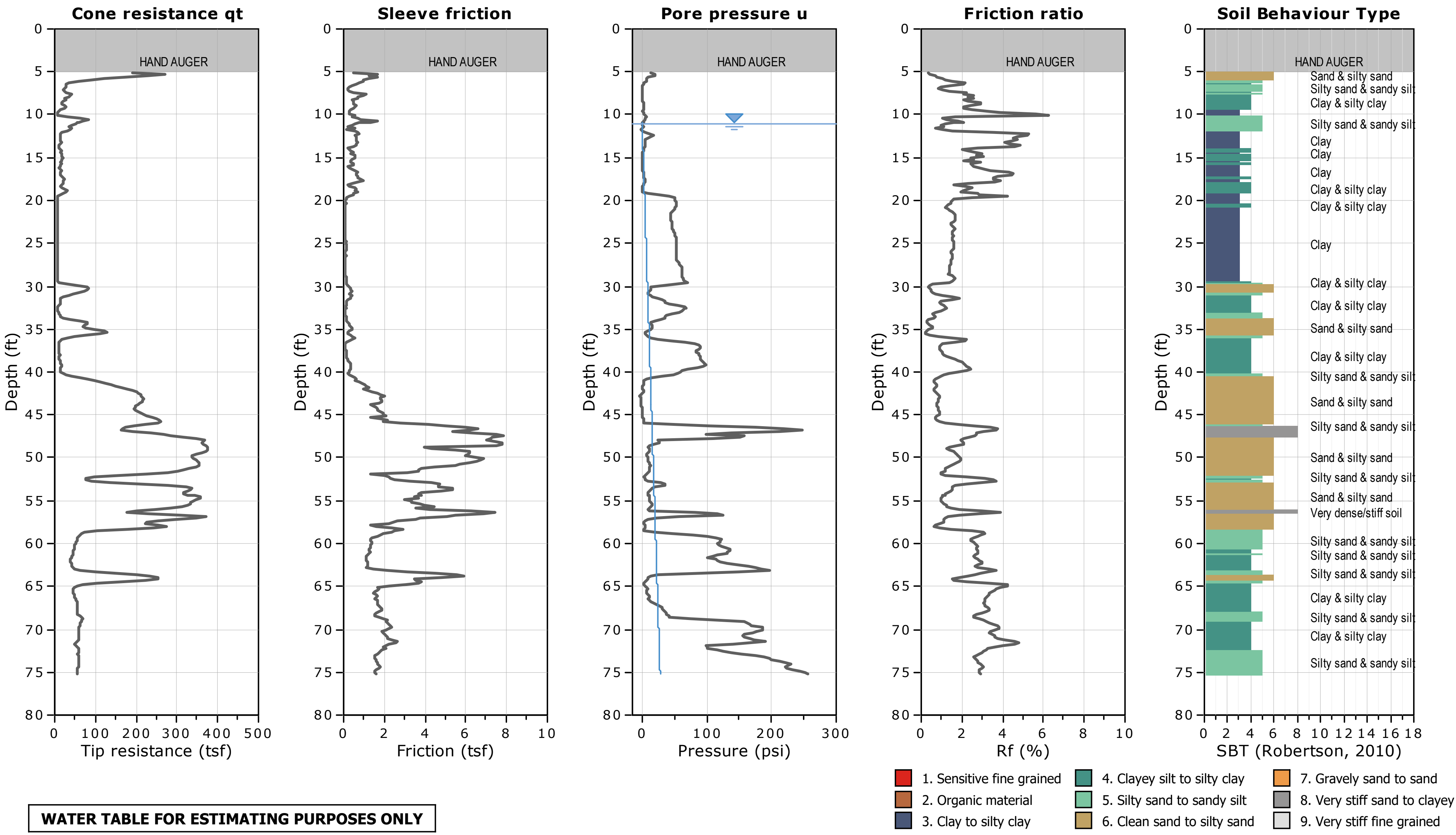
CPT: CPT-05

CLIENT: FUGRO

SITE: LANEY COLLEGE, OAKLAND, CA

FIELD REP: REZA RAHIMNEJAD

Total depth: 75.13 ft, Date: 1/3/2020



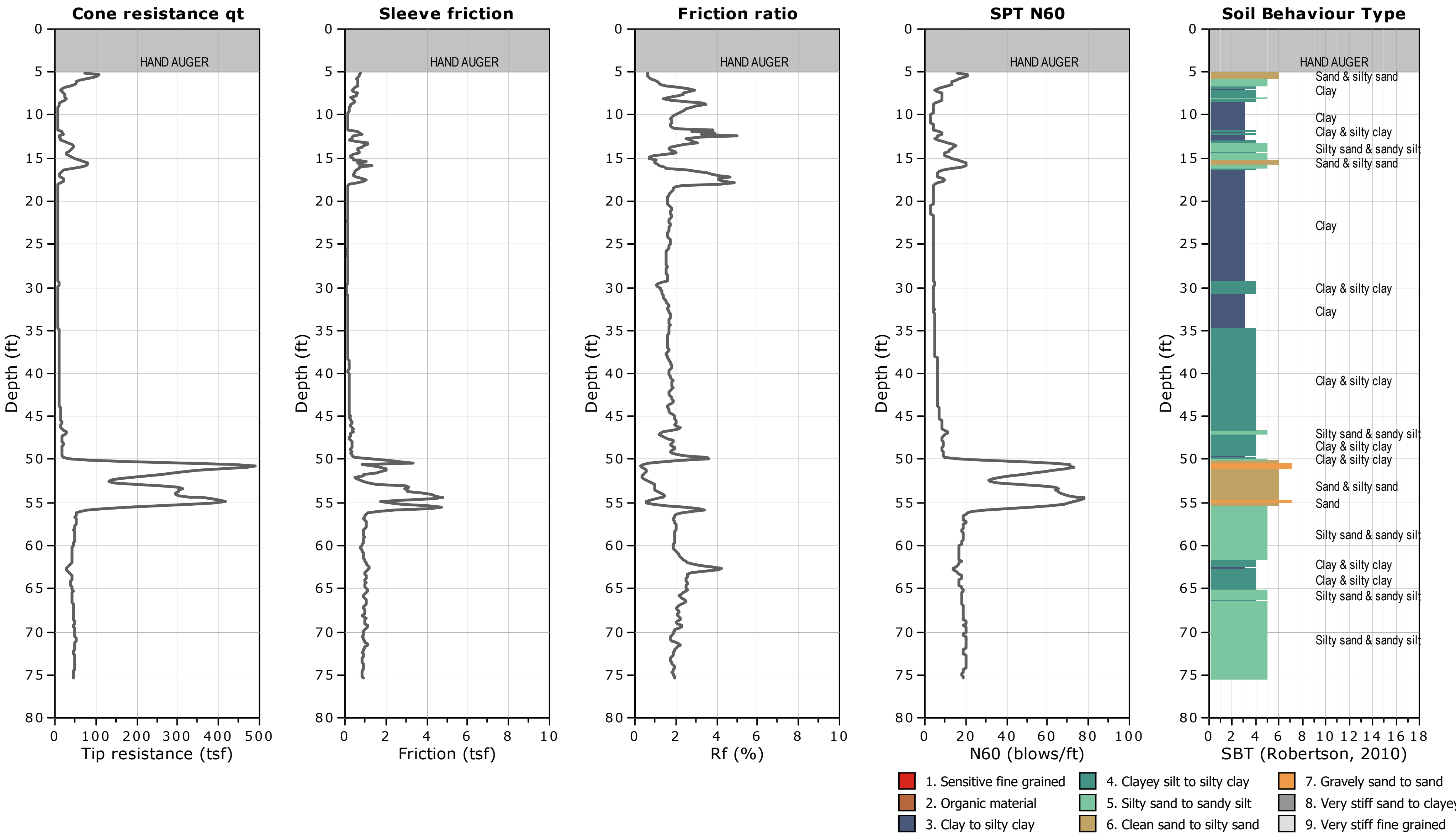
WATER TABLE FOR ESTIMATING PURPOSES ONLY

Gregg Drilling, LLC
www.greggdrilling.com

CPT: CPT-06

CLIENT: FUGRO
SITE: LANEY COLLEGE, OAKLAND, CA

FIELD REP: REZA RAHIMNEJAD
Total depth: 75.30 ft, Date: 1/3/2020

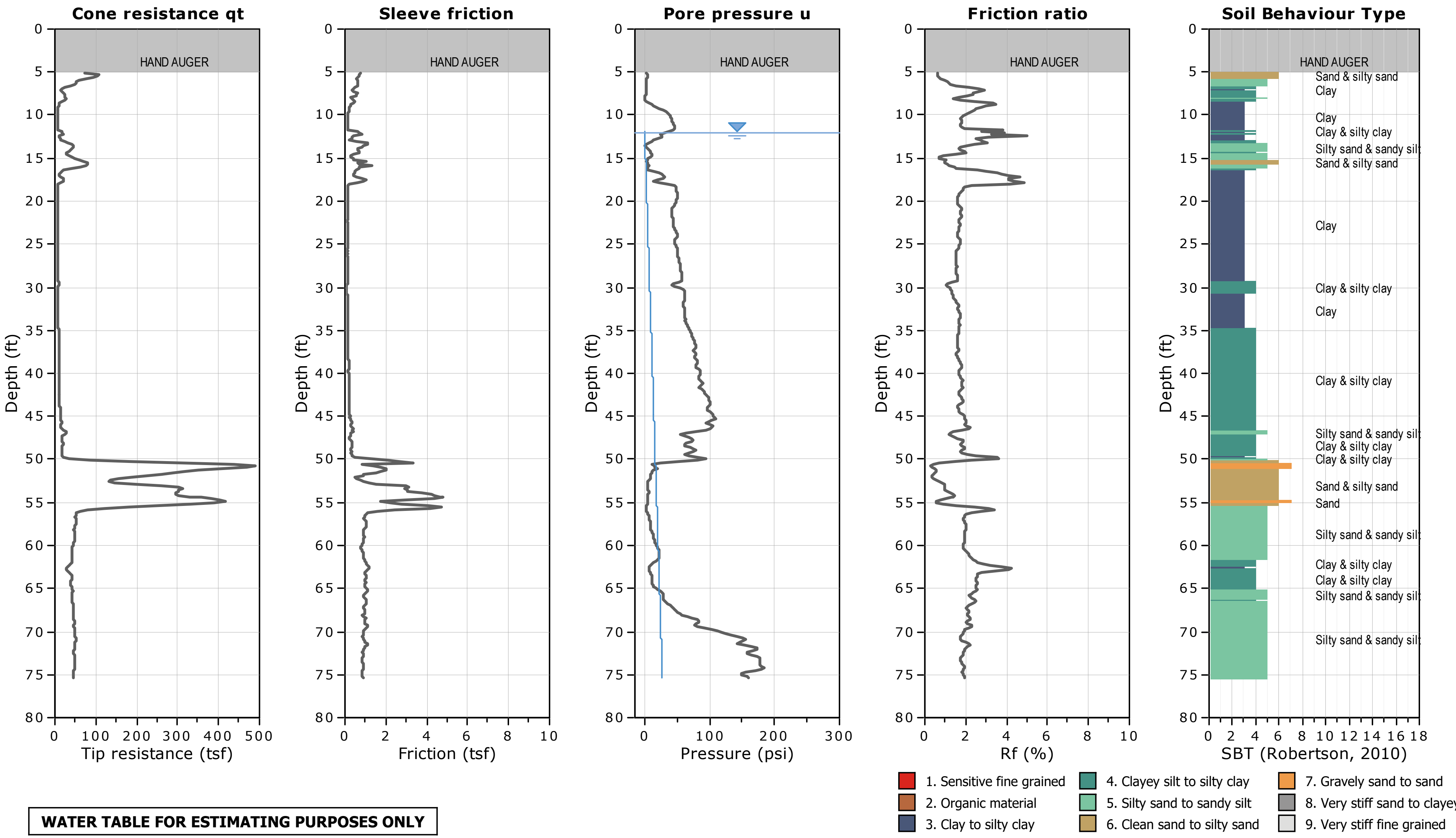


Gregg Drilling, LLC
www.greggdrilling.com

CPT: CPT-06

CLIENT: FUGRO
SITE: LANEY COLLEGE, OAKLAND, CA

FIELD REP: REZA RAHIMNEJAD
Total depth: 75.30 ft, Date: 1/3/2020



WATER TABLE FOR ESTIMATING PURPOSES ONLY

Gregg Drilling, LLC
www.greggdrilling.com

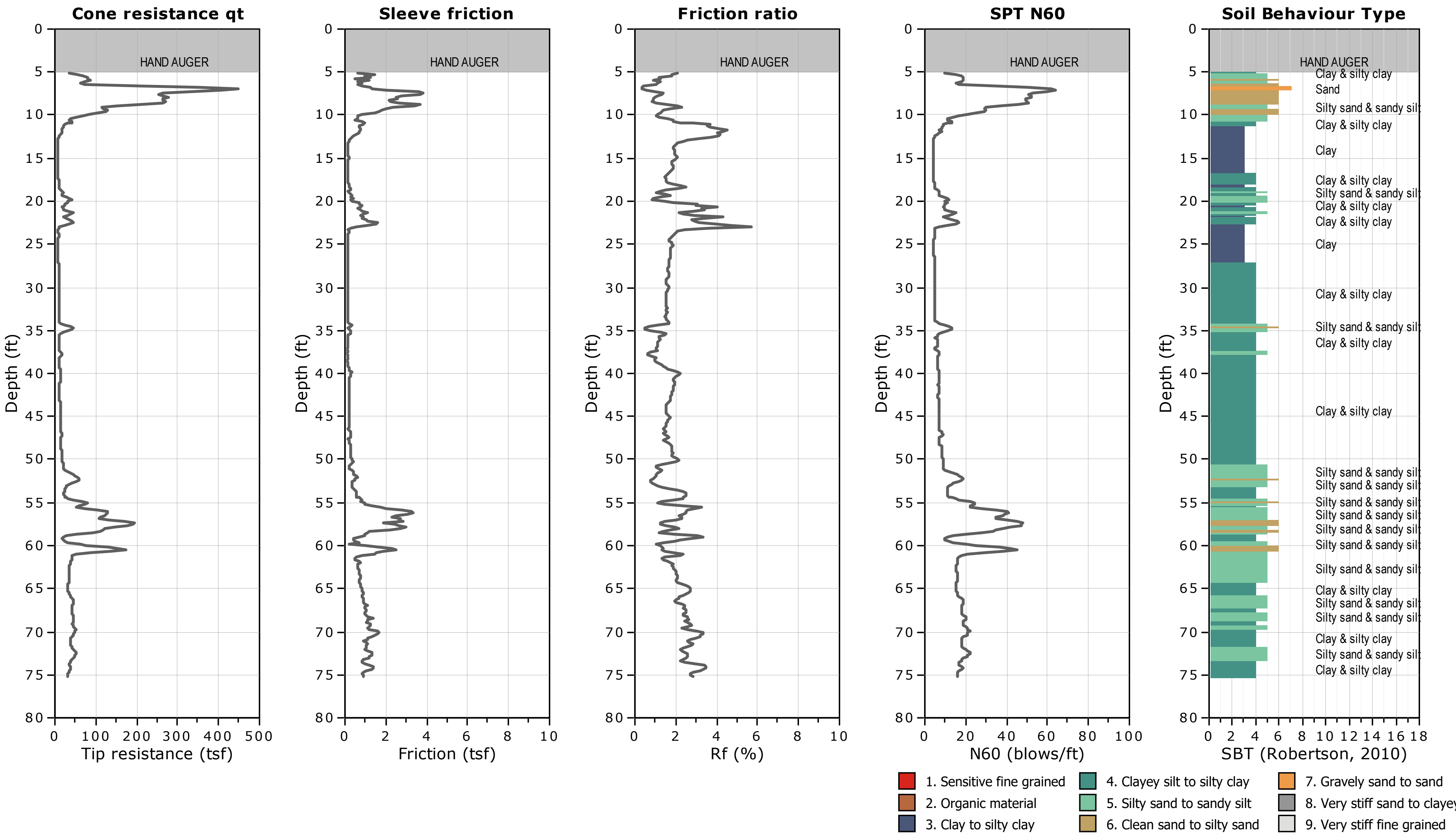
CPT: SCPT-07

CLIENT: FUGRO

SITE: LANEY COLLEGE, OAKLAND, CA

FIELD REP: REZA RAHIMNEJAD

Total depth: 75.13 ft, Date: 1/3/2020

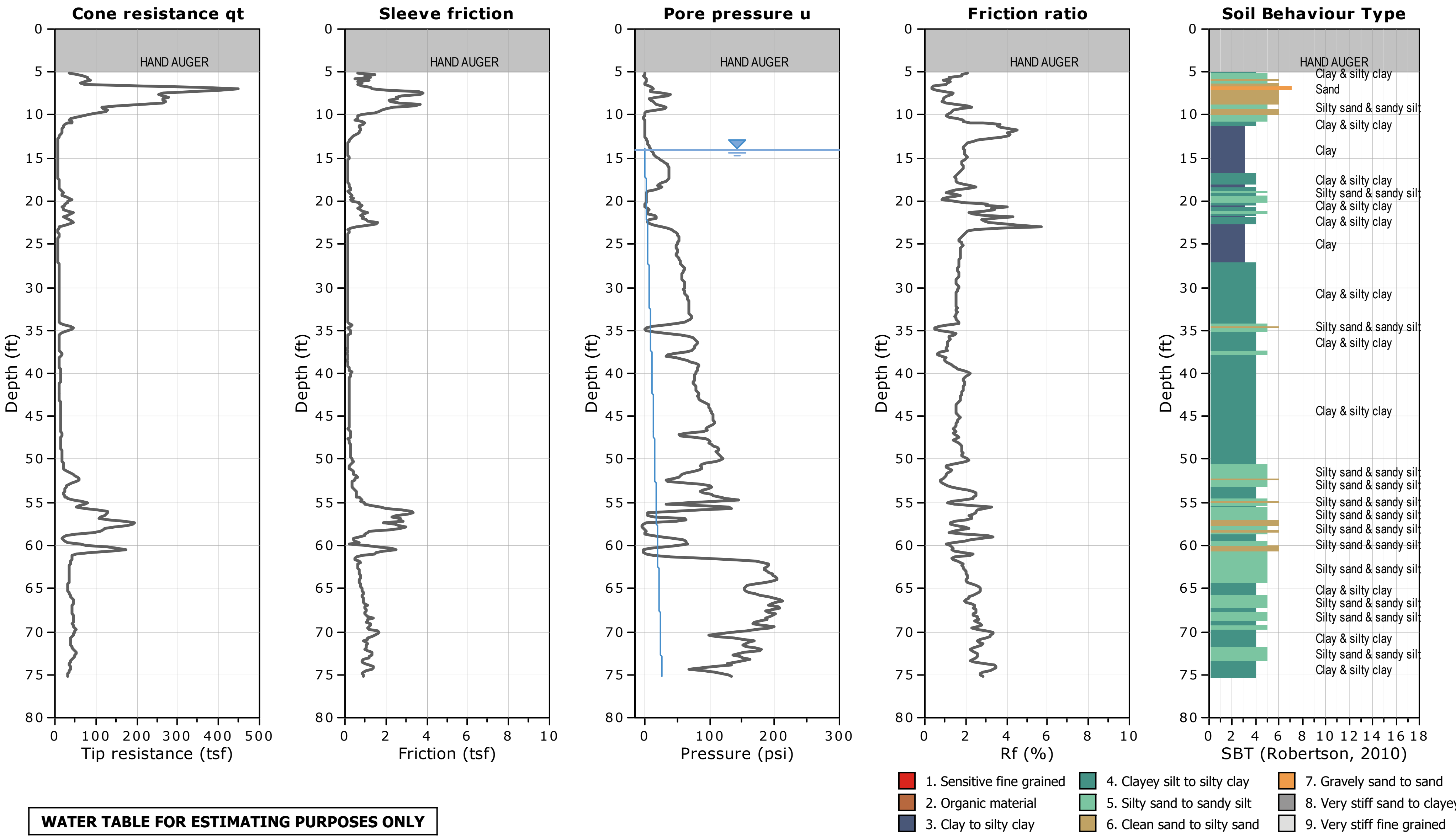


Gregg Drilling, LLC
www.greggdrilling.com

CPT: SCPT-07

CLIENT: FUGRO
SITE: LANEY COLLEGE, OAKLAND, CA

FIELD REP: REZA RAHIMNEJAD
Total depth: 75.13 ft, Date: 1/3/2020



WATER TABLE FOR ESTIMATING PURPOSES ONLY

Gregg Drilling, LLC
www.greggdrilling.com

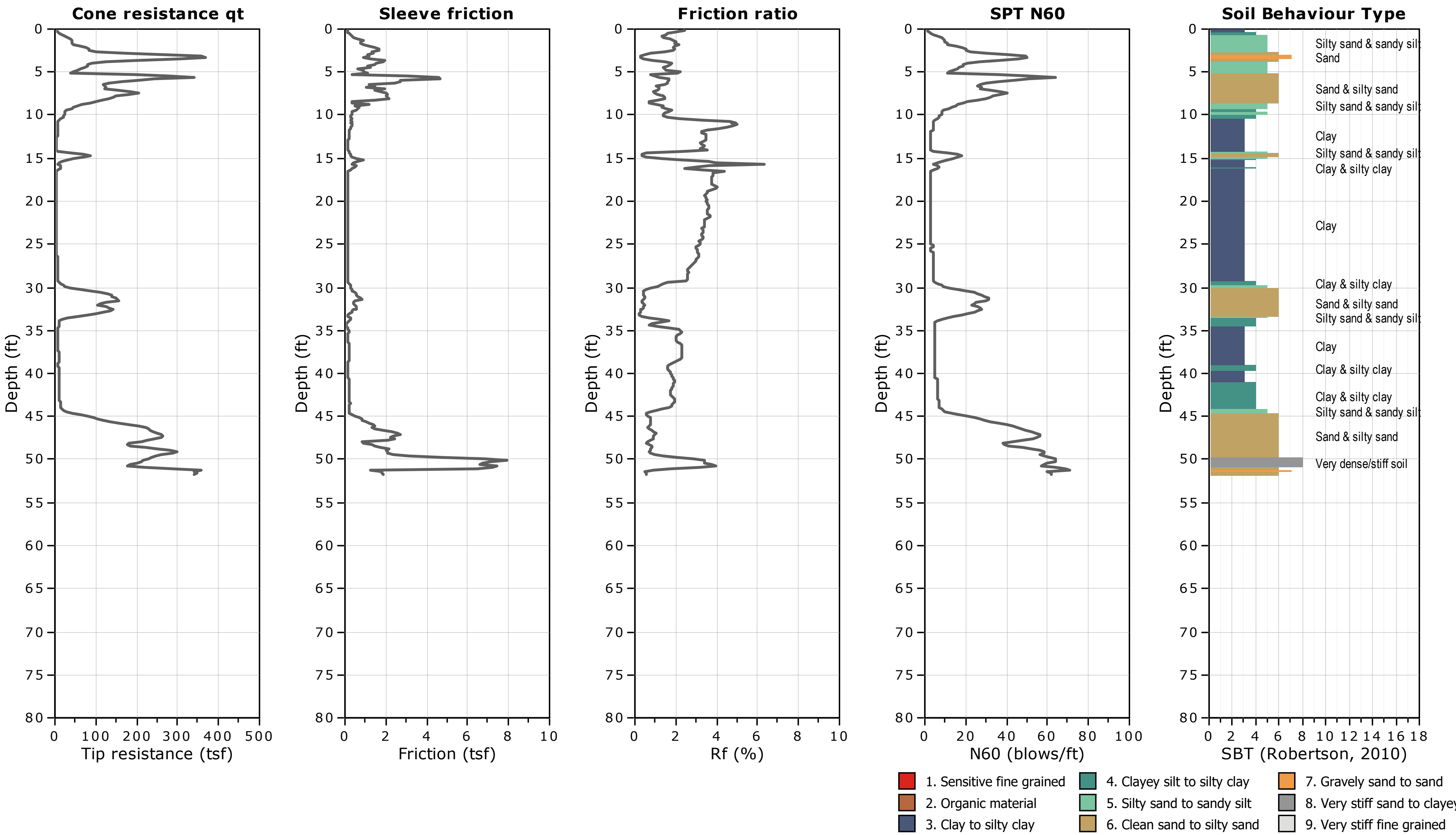
CPT: CPT-08

CLIENT: FUGRO

SITE: LANEY COLLEGE, OAKLAND, CA

FIELD REP: REZA RAHIMNEJAD

Total depth: 51.67 ft, Date: 1/2/2020



GREGG

Gregg Drilling, LLC
www.greggdrilling.com

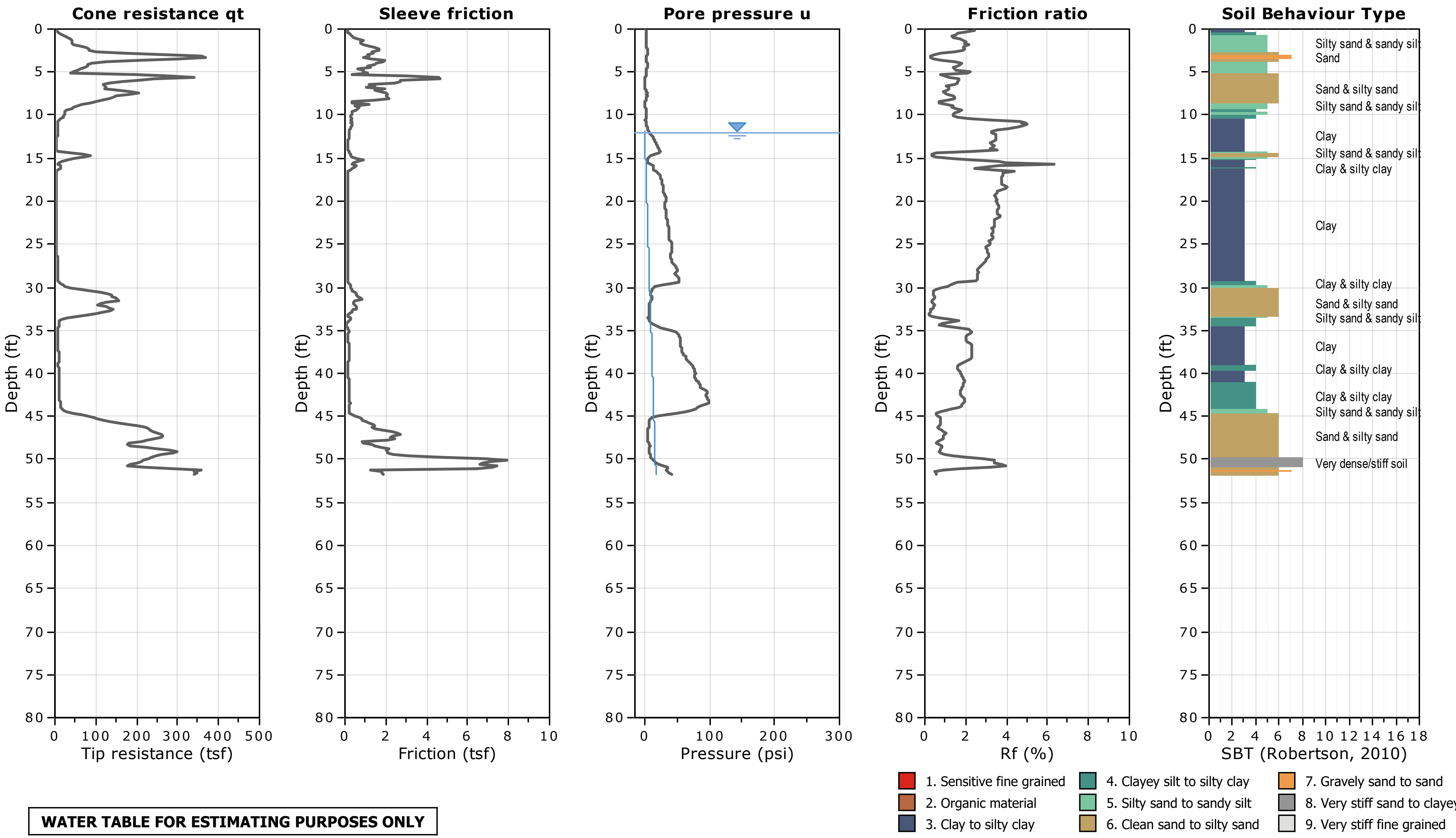
CPT: CPT-08

CLIENT: FUGRO

SITE: LANEY COLLEGE, OAKLAND, CA

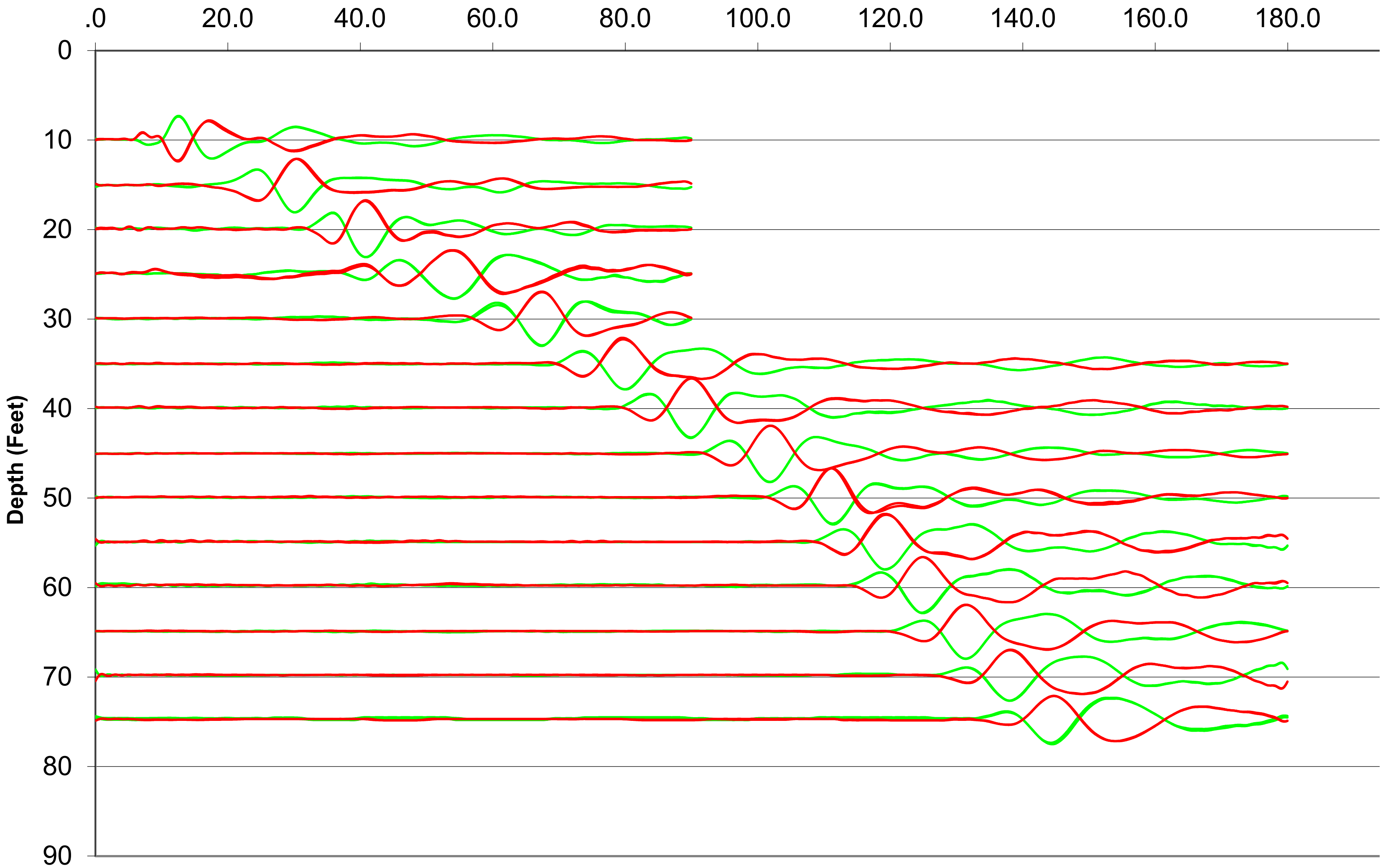
FIELD REP: REZA RAHIMNEJAD

Total depth: 51.67 ft, Date: 1/2/2020



WATER TABLE FOR ESTIMATING PURPOSES ONLY

Waveforms for Sounding SCPT-07



Shear Wave Velocity Calculations

Laney College

SCPT-07

Geophone Offset: 0.66 Feet
Source Offset: 1.67 Feet

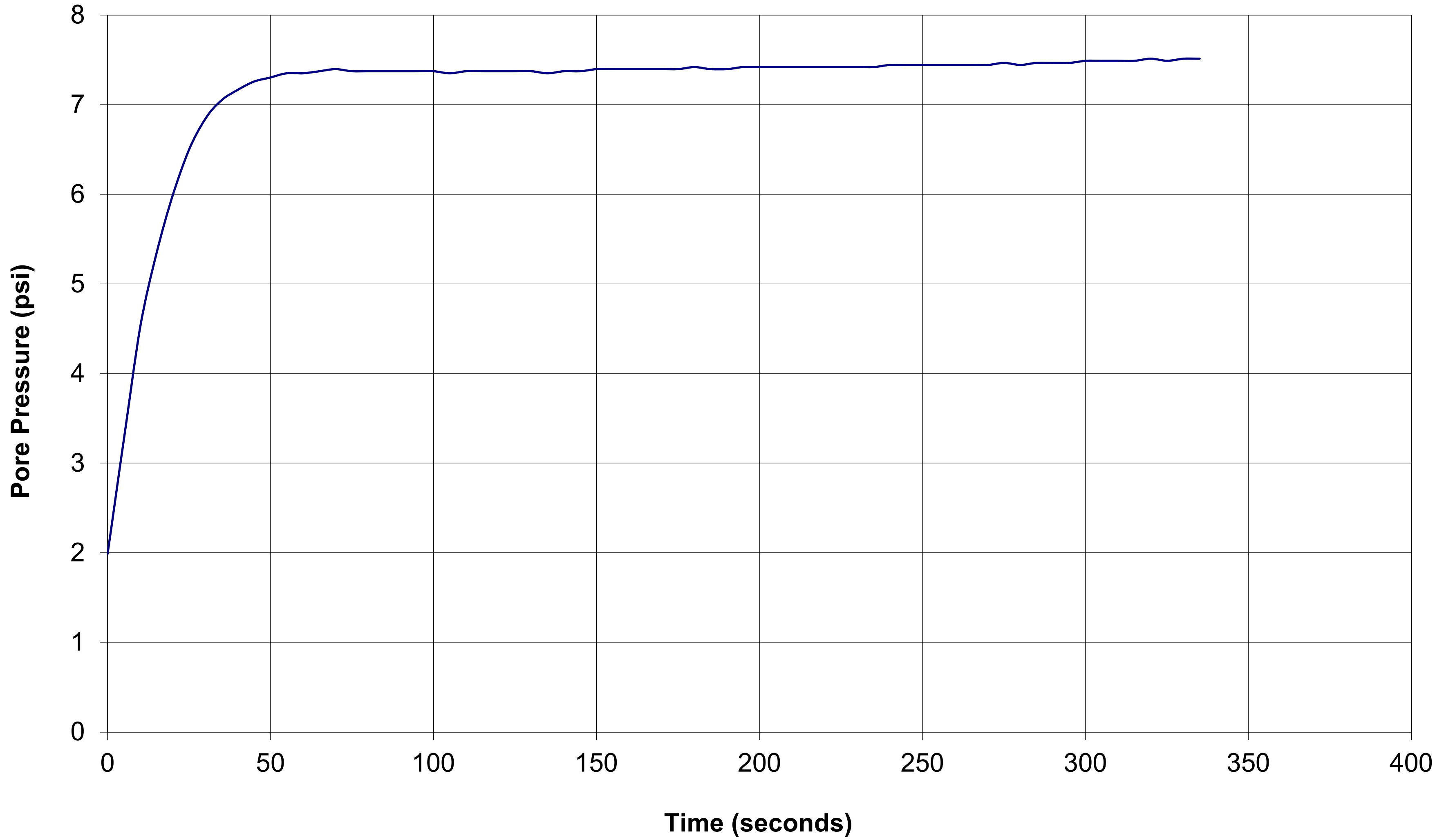
01/03/20

Test Depth (Feet)	Geophone Depth (Feet)	Waveform Ray Path (Feet)	Incremental Distance (Feet)	Characteristic Arrival Time (ms)	Incremental Time Interval (ms)	Interval Velocity (Ft/Sec)	Interval Depth (Feet)
10.01	9.35	9.49	9.49	14.8000			
15.09	14.43	14.53	5.03	27.0000	12.2000	412.6	11.89
20.01	19.35	19.42	4.90	37.7000	10.7000	457.7	16.89
25.10	24.44	24.50	5.07	49.0500	11.3500	446.7	21.90
30.02	29.36	29.41	4.91	63.5000	14.4500	339.9	26.90
35.10	34.44	34.49	5.08	76.2500	12.7500	398.3	31.90
40.03	39.37	39.40	4.92	86.2000	9.9500	494.1	36.91
45.11	44.45	44.48	5.08	98.1500	11.9500	425.2	41.91
50.03	49.37	49.40	4.92	107.6500	9.5000	517.7	46.91
55.12	54.46	54.48	5.08	115.6000	7.9500	639.3	51.92
60.04	59.38	59.40	4.92	121.1000	5.5000	894.4	56.92
65.12	64.46	64.49	5.08	127.5500	6.4500	788.1	61.92
70.05	69.39	69.41	4.92	133.8000	6.2500	787.2	66.93
75.13	74.47	74.49	5.08	140.0500	6.2500	813.4	71.93

GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

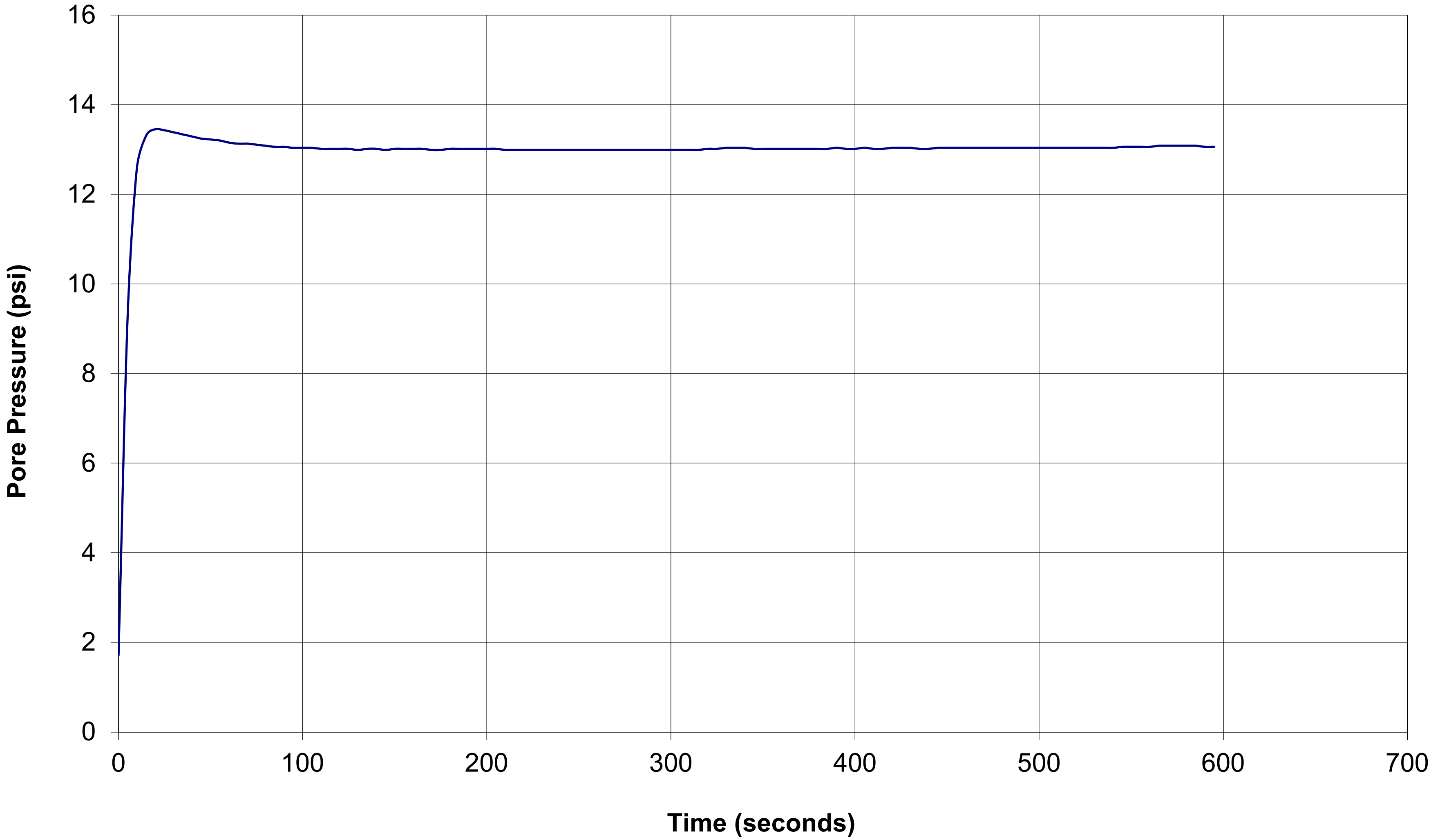
Sounding: CPT-04
Depth (ft): 31.33
Site: Laney College
Engineer: Reza Rahimnejad



GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

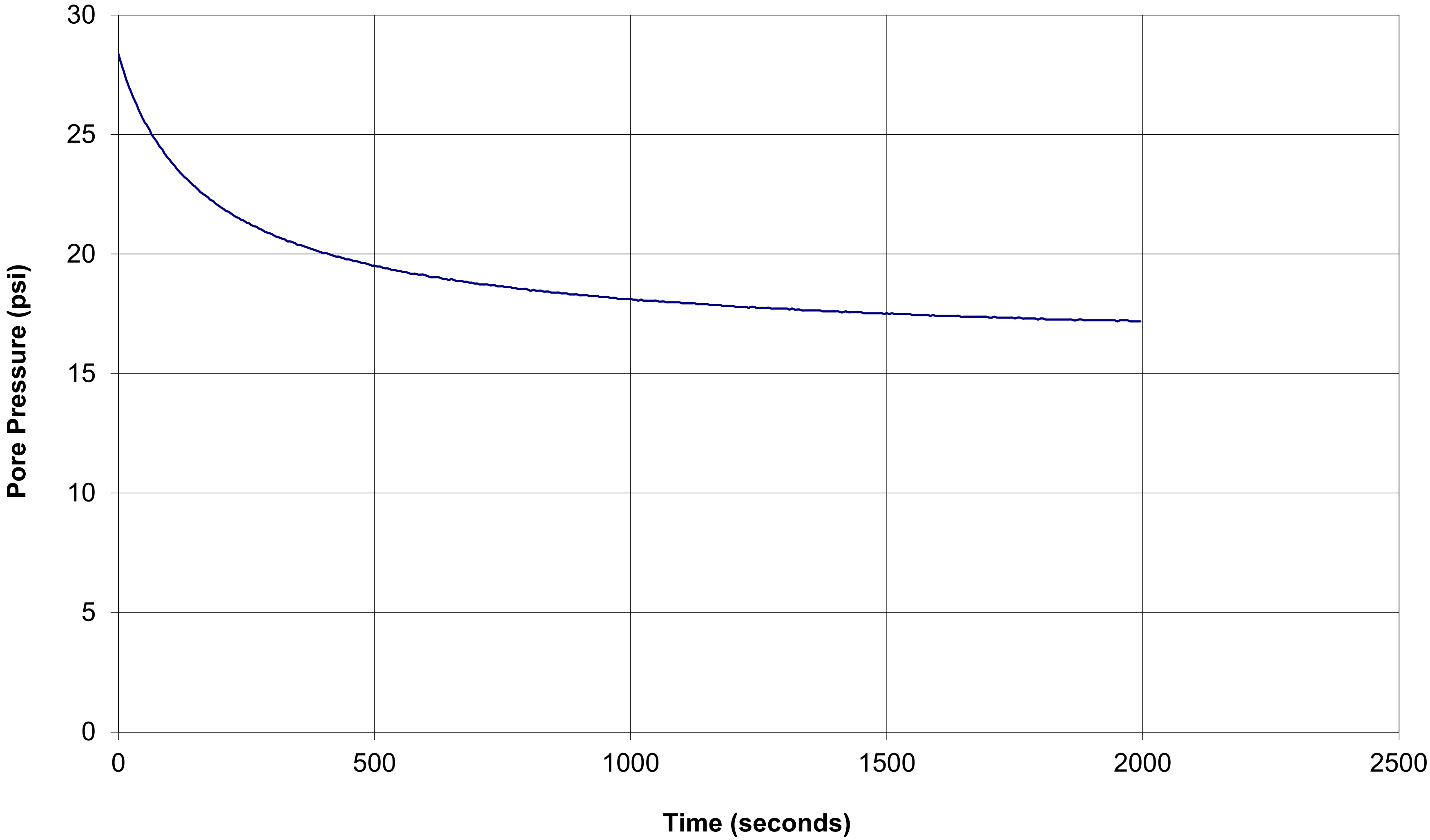
Sounding: CPT-05
Depth (ft): 41.17
Site: Laney College
Engineer: Reza Rahimnejad



GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

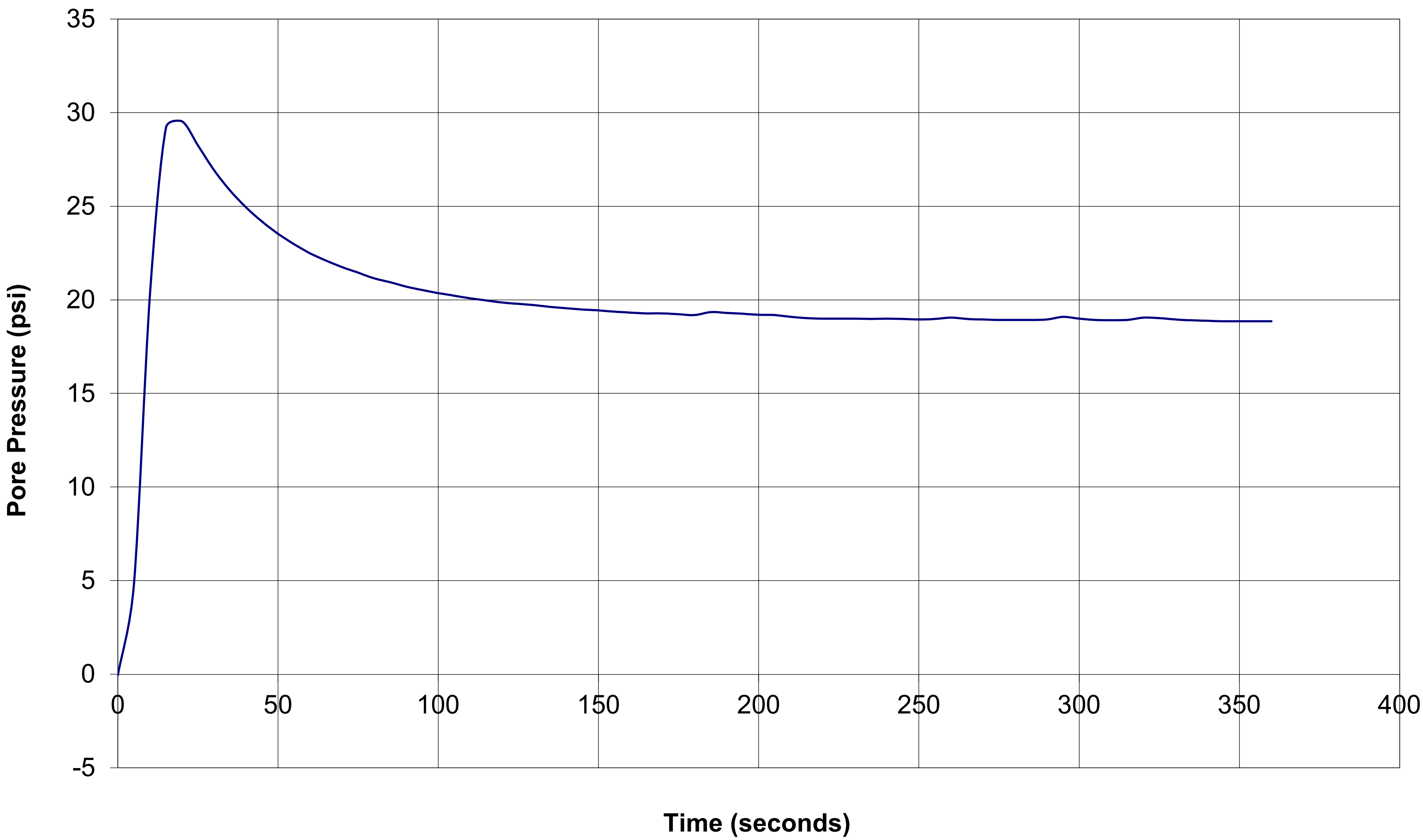
Sounding: CPT-08
Depth (ft): 51.67
Site: Laney College
Engineer: Reza Rahimnejad



GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

Sounding: SCPT-07
Depth (ft): 57.58
Site: Laney College
Engineer: Reza Rahimnejad



Peralta Community College District
Project No. 04.72190021

DRILL HOLE	DEPTH, ft	SAMPLE NUMBER	MATERIAL DESCRIPTION	UWW pcf	UDW pcf	MC%	FINES %	ATTERBURG LIMITS LL	PI	COMPACTION TEST MAX DD pcf	OPT MC %	DIRECT SHEAR C ksf	PHI deg	COMPRESSIVE STRENGTH TESTS Qu, ksf	S_u (Cell Prs.) ksf	CORROSIVITY TESTS R	pH	Cl	SO_4	R-VALUE	EXPANSION INDEX	ORGANIC CONTENT (%)	TEST LISTING
2019-CPT-01	2.5	S1	SILTY SAND (SM)													6400	7.59	N.D.	22				Co
2019-CPT-02	4.5	S2	PEAT (PT)			55																	M
2019-CPT-02	5.5	S3	Fat CLAY (CH)			58																	M
2019-CPT-03	4.0	S1	CLAYEY SAND (SC)			13	20									2600	7.97	N.D.	16				M, FC, Co
2020-B-01	11.0	S5	SILTY SAND with GRAVEL (SM)	112	91	24	21																T, M, S
2020-B-01	16.0	S7	Poorly-graded SAND with SILT (SP-SM)	119	95	26	6															5	T, M, O, S
2020-B-01	17.0	S8	ORGANIC CLAY with SAND (OH)			82																21.2	M, O
2020-B-01	21.0	S9	Fat CLAY (CH)			53																6.6	M, O
2020-B-01	27.0	S10	Fat CLAY (CH)	95	52	83																	T, M, C
2020-B-01	30.0	S11	Fat CLAY (CH)	109	69	58	93	73	43						0.48(2.2)								T, M, A, S, Q
2020-B-01	31.0	S11	Poorly-graded SAND with SILT (SP-SM)	120	94	27	8																T, M, S
2020-B-01	40.5	S13	Fat CLAY (CH)	101	59	71									0.73(2.6)								T, M, Q
2020-B-01	51.0	S15	SILTY SAND (SM)	132	112	18	16																T, M, S
2020-B-01	55.0	S16	SILTY SAND (SM)	135	116	17	17																T, M, S
2020-B-01	66.0	S17	SILTY SAND (SM)			19	19																M, FC
2020-B-01	76.0	S18	Lean CLAY (CL)			37																	M

Classification Tests
UWW = Unit Wet Weight
UDW = Unit Dry Weight
MC = Moisture Content
Fines = % Passing #200 Sieve
LL = Liquid Limit
PI = Plasticity Index

Direct Shear Test
C = Assigned Cohesion, ksf
PHI = Assigned Friction Angle, degrees

Compaction Test
MAX DD = Maximum Dry Density
OPT MC = Optimum Moisture Content

Compressive Strength Tests
Qu = Unconfined Compression
Su = Undrained Shear Strength
u = Unconsolidated Undrained
p = Pocket Penetrometer
t = Torvane
m = Miniature Vane

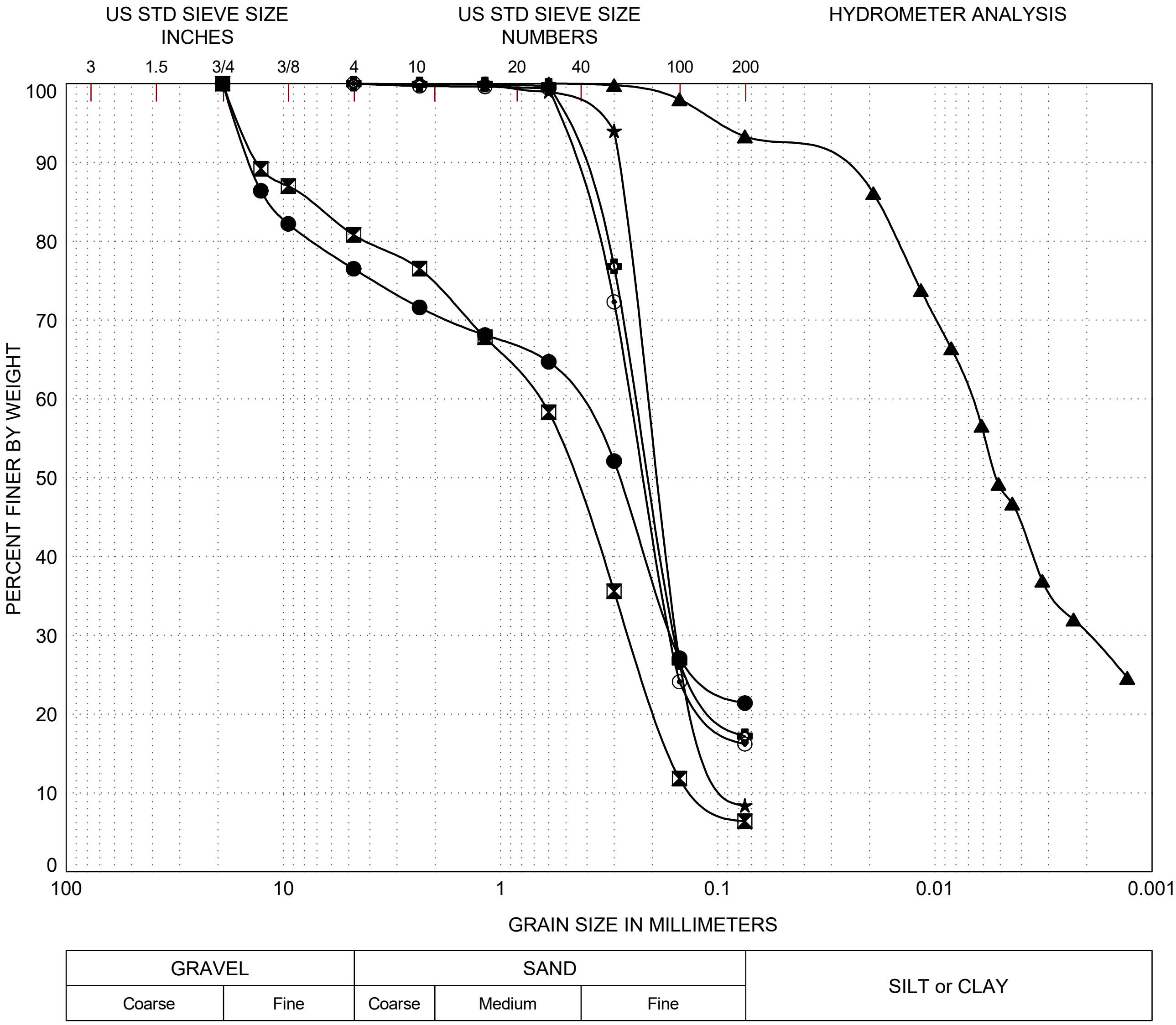
Corrosivity Tests
R = Resistivity, ohm-cm
pH = pH
Cl = Chloride, ppm
SO_4 = Sulfate, ppm

Test Listing Abbreviations
M = Moisture Content
T = Total & Dry Unit Weight
S = Sieve Analysis
FC = % Passing #200 Sieve
H = Hydrometer Analysis
A = Atterberg Limits
P = Compaction Test
D = Direct Shear Test
C = Consolidation Test
Co = Corrosivity Tests
CU = CU Triaxial
U = UU Triaxial
R = R-Value
SE = Sand Equivelant
O = Organic Content

SUMMARY OF LABORATORY TEST RESULTS

Laney College Library Learning Resource Center
Oakland, California

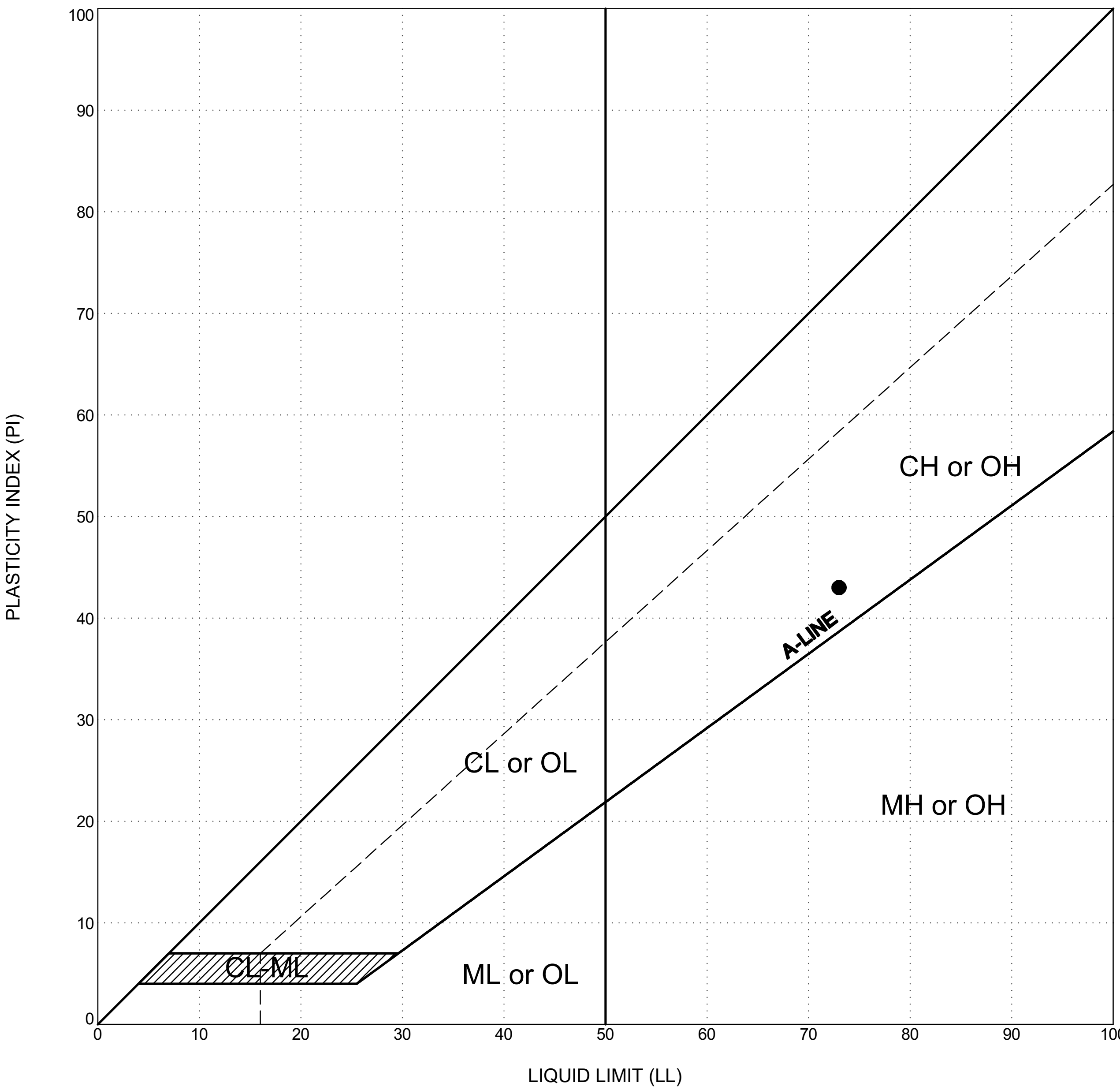
PLATE B-1



LEGEND (location)	(depth,ft)	CLASSIFICATION	Cc	Cu	D10	D30	D60
● 2020-B-01	11.0	SILTY SAND with GRAVEL (SM)				0.16	0.46
⊠ 2020-B-01	16.0	Poorly-graded SAND with SILT (SP-SM)	0.8	5.7	0.12	0.25	0.68
▲ 2020-B-01	30.0	Fat CLAY (CH)				0.00	0.01
★ 2020-B-01	31.0	Poorly-graded SAND with SILT (SP-SM)	1.4	2.7	0.08	0.16	0.21
⊙ 2020-B-01	51.0	SILTY SAND (SM)				0.16	0.25
✪ 2020-B-01	55.0	SILTY SAND (SM)				0.16	0.24

GRAIN SIZE CURVES
Laney College Library Learning Resource Center
Oakland, California

PLATE B-2



		ATTERBERG LIMITS TEST RESULTS		
LEGEND location / depth, ft	CLASSIFICATION	LIQUID LIMIT(LL)	PLASTIC LIMIT(PL)	PLASTICITY INDEX (PI)
● 2020-B-01 / 30.0	Fat CLAY (CH)	73	30	43

PLASTICITY CHART
Laney College Library Learning Resource Center
Oakland, California

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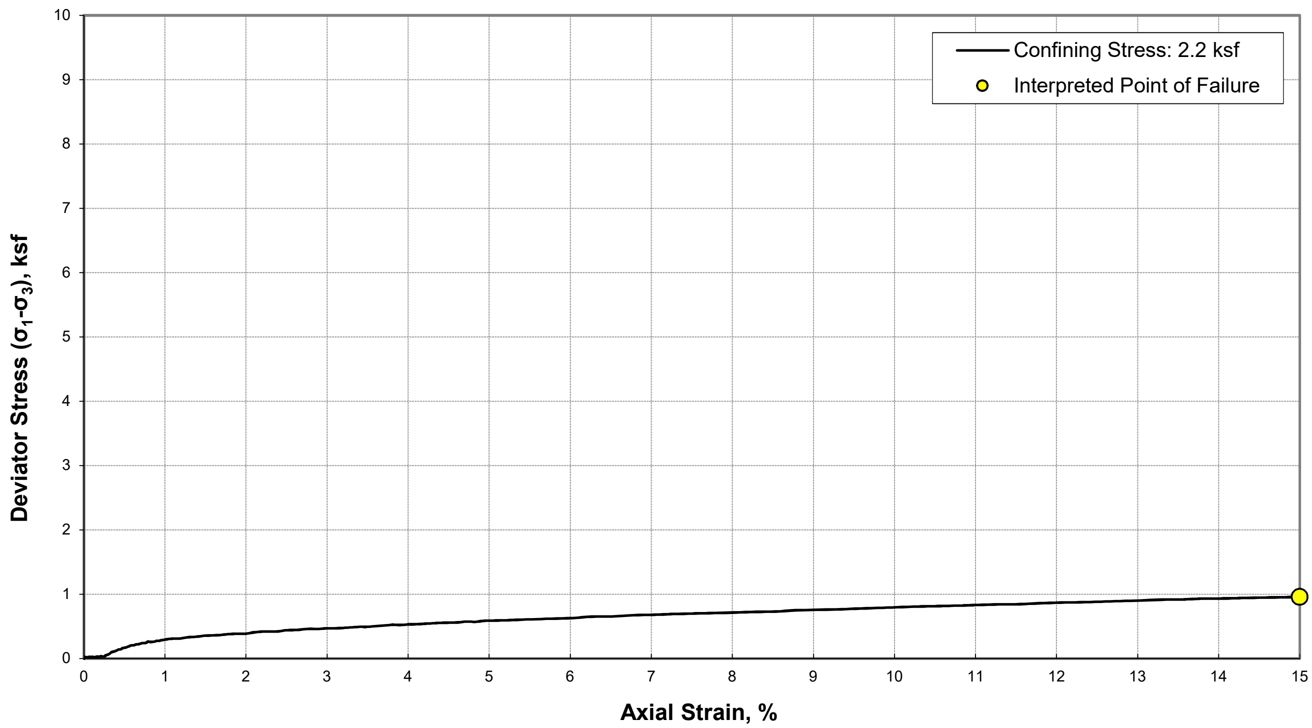


SAMPLE ID		
	Boring Number:	B-01
	Sample Number:	S11
	Sample Depth:	30.0 ft
	USCS Classification:	Fat CLAY (CH): olive gray

SAMPLE PROPERTIES		
	Water Content, %	58.3%
	Dry Unit Weight, pcf	68.7
	Diameter, in	2.39
	Height, in	5.60

SAMPLE IMAGES

CLASSIFICATION

Sieve Size	% Passing	Other Parameters	
3/8-in. (9.5mm)	---	Liquid Limit	---
#4 (4.75mm)	---	Plastic Limit	---
#16 (1.18mm)	---	Plasticity Index	---
#30 (0.6mm)	---	Estimated Gs	2.65
#100 (0.150mm)	---	S_u from T_v, ksf	---
#200 (0.075mm)	---	S_u from PP, ksf	---

TEST SUMMARY

Maximum Deviator Stress, ksf	0.96
Undrained Shear Strength, ksf	0.48
Axial Strain at Failure, %	15.0
Strain Rate, %/min	1.0
Cell Pressure, ksf	2.2
Tested By:	JB
Date Tested:	1/20/20

REMARKS

Test Method: ASTM 2850

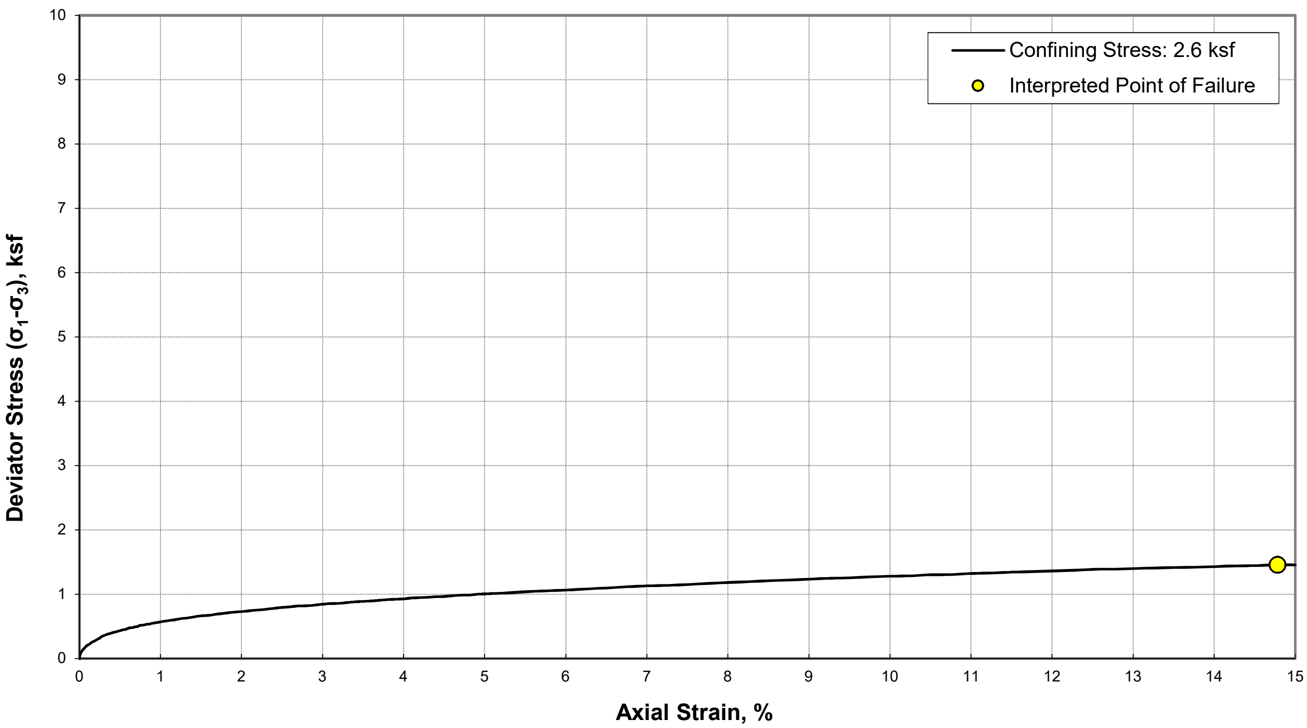
Note presence of approximate 2" sized gravel in upper portion of UU test sample.

UNCONSOLIDATED, UNDRAINED TRIAXIAL TEST

Laney College Library Learning Resource Center

Oakland, California

FUGRO



SAMPLE ID	
Boring Number:	B-01
Sample Number:	S13
Sample Depth:	40.5 ft
USCS Classification:	Fat CLAY (CH): olive gray

SAMPLE PROPERTIES	
Water Content, %	71.3%
Dry Unit Weight, pcf	59.1
Diameter, in	2.39
Height, in	5.79

SAMPLE IMAGES

CLASSIFICATION

Sieve Size	% Passing	Other Parameters	
3/8-in. (9.5mm)	---	Liquid Limit	---
#4 (4.75mm)	---	Plastic Limit	---
#16 (1.18mm)	---	Plasticity Index	---
#30 (0.6mm)	---	Estimated Gs	2.65
#100 (0.150mm)	---	S_u from T_v, ksf	---
#200 (0.075mm)	---	S_u from PP, ksf	---

TEST SUMMARY	
Maximum Deviator Stress, ksf	1.46
Undrained Shear Strength, ksf	0.73
Axial Strain at Failure, %	14.8
Strain Rate, %/min	1.0
Cell Pressure, ksf	2.6
Tested By:	JB
Date Tested:	1/20/20

REMARKS

Test Method: ASTM 2850

UNCONSOLIDATED, UNDRAINED TRIAXIAL TEST

Laney College Library Learning Resource Center

Oakland, California

SUMMARY OF LABORATORY TEST RESULTS

Project: Laney College Library Learning Resource Center
Address: Oakland, California
Owner: Peralta Community College District

Job Number: 04.72190021
Date: 1/28/2020
Lab ID: 10044

Source:
Location Sampled: B-01, Laney College Library
Date Sampled: N/A
Sample By: N/A
Test Methods: ASTM D2974

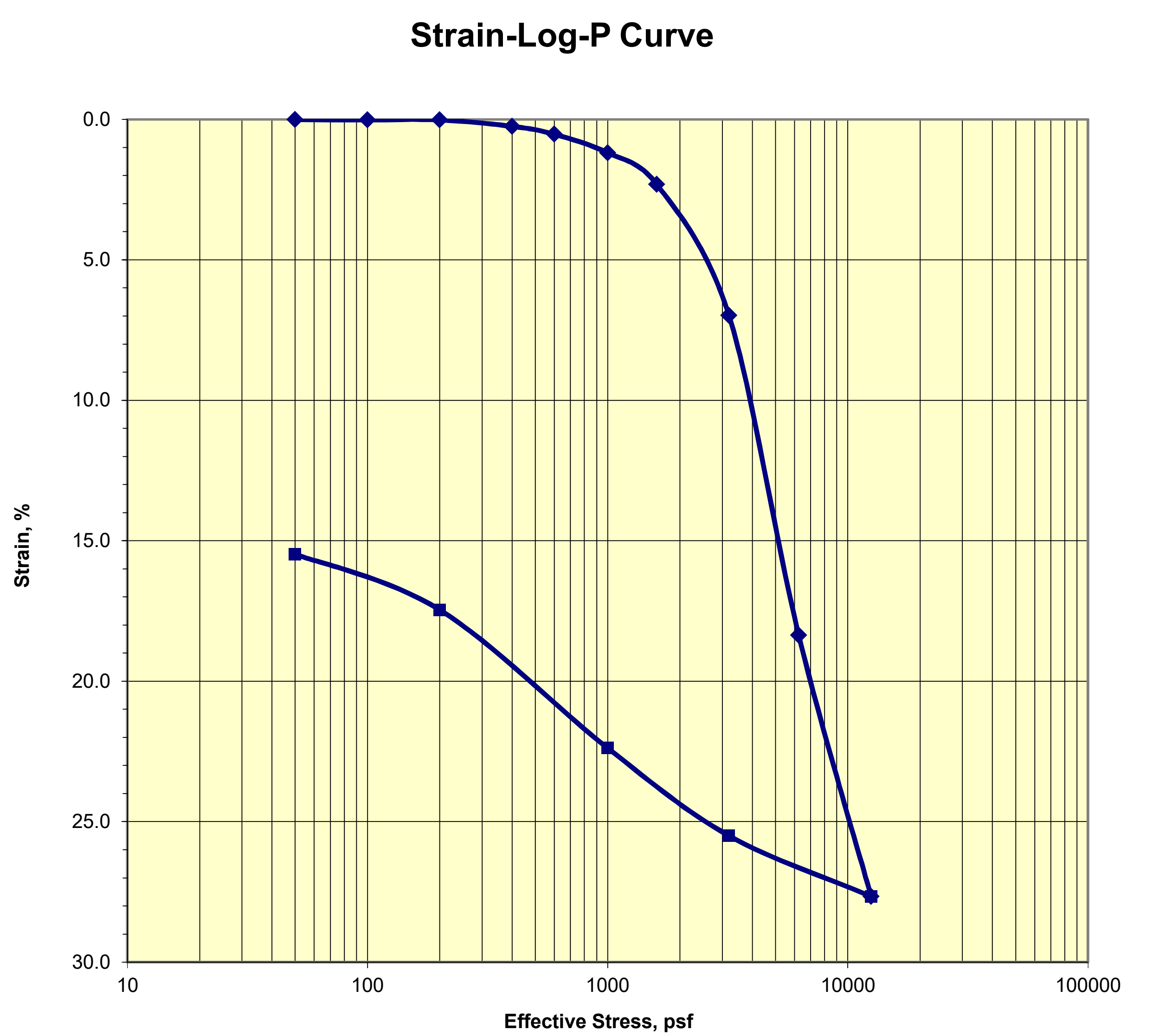
Sample No.	Depth (ft)	Sample Description	Water Content (%)	Ash Content (%)	Organic Content (%)
B-01	16	Poorly Graded SAND with SILT (SP - SM)	25.9	95.0	5.0
B-01	17	Organic CLAY with SAND (OH)	82.5	78.8	21.2
B-01	21	Fat CLAY (CH)	53.4	93.4	6.6

Remarks: None

Distribution:

Consolidation Test
ASTM D2435

Job No.:	446-303	**Boring:**	B-01	**Run By:**	MD
Client:	Fugro USA Land, Inc.	**Sample:**		**Reduced:**	PJ
Project:	04.72190021	**Depth, ft.:**	25-27.5(Tip-3")	**Checked:**	PJ/DC
Soil Type:	Greenish Gray CLAY (Bay Mud)			**Date:**	2/4/2020



Assumed Gs 2.75	**Initial**	**Final**
Moisture %:	82.9	65.6
Dry Density, pcf:	51.8	61.2
Void Ratio:	2.316	1.804
% Saturation:	98.4	100.0

Remarks:

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

10 April 2019

Job No. 1904058
Cust. No. 11608

Mr. Franco A. DePaola
Fugro Consultants, Inc.
1777 Botelho Drive, Suite 262
Walnut Creek, CA 94596

Subject: Project No.: 04.72190021
Project Name: Laney College, 900 Fallon St., Oakland, CA
Corrosivity Analysis – ASTM Test Methods with Brief Evaluation

Dear Mr. DePaola:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on April 05, 2019. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurements, both samples are classified as "moderately corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations reflect none detected with a reporting limit of 15 mg/kg.

The sulfate ion concentrations are 16 & 22 mg/kg and are determined to be insufficient to damage reinforced concrete structures and cement mortar-coated steel at these locations.

The pH of the soils are 7.59 & 7.97, which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potentials are 270 & 280-mV. These samples are indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

PLATE B-8

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: Fugro West, Inc.
Client's Project No.: 04.72190021
Client's Project Name: Laney College, 900 Fallon St., Oakland, CA
Date Sampled: 29-Mar-19
Date Received: 5-Apr-19
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 11-Apr-2019

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)*
1904058-001	CPT-03 @ 4' - 5' (S-3)	270	7.97	-	2,600	-	N.D.	16
1904058-002	CPT-01 @ 2.5' - 3' (S-1)	280	7.59	-	6,400	-	N.D.	22

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	9-Apr-2019	9-Apr-2019	-	5-Apr-2019	-	9-Apr-2019	9-Apr-2019

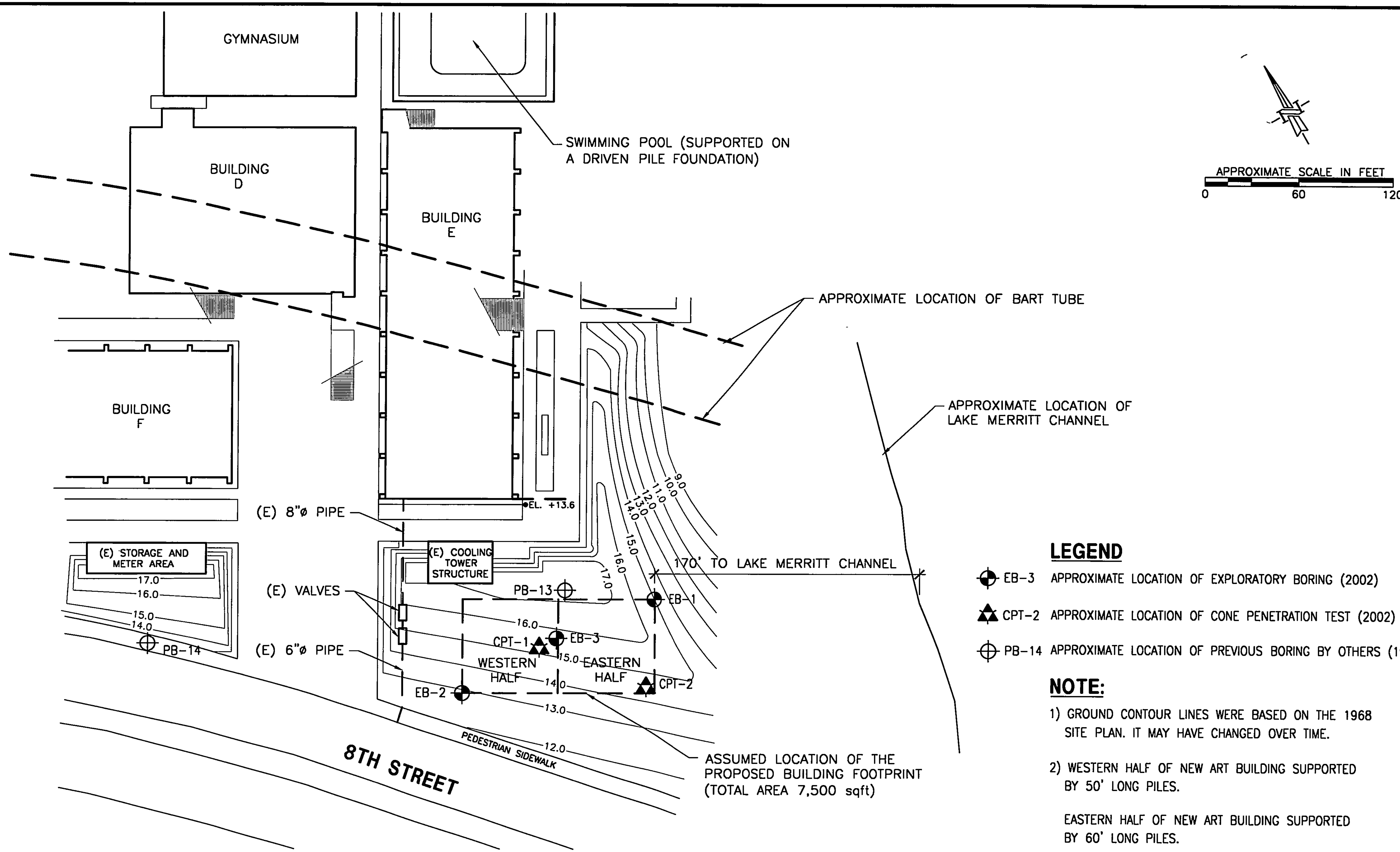
* Results Reported on "As Received" Basis

N.D. - None Detected

Cheryl McMillen
Laboratory Director

PLATE B-9

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



LEGEND

EB-3 APPROXIMATE LOCATION OF EXPLORATORY BORING (2002)

CPT-2 APPROXIMATE LOCATION OF CONE PENETRATION TEST (2002)

PB-14 APPROXIMATE LOCATION OF PREVIOUS BORING BY OTHERS (1968)

NOTE:

1) GROUND CONTOUR LINES WERE BASED ON THE 1968 SITE PLAN. IT MAY HAVE CHANGED OVER TIME.

2) WESTERN HALF OF NEW ART BUILDING SUPPORTED BY 50' LONG PILES.

EASTERN HALF OF NEW ART BUILDING SUPPORTED BY 60' LONG PILES.

FUGRO

FUGRO WEST INC.
425 Roland Way.
Oakland, California. 94621
Tel:(510)568-4001 Fax:(510)568-2205

DRAWN BY:	ROC
PREP'D BY:	NS
APP'D BY:	SR
SCALE:	1" = 60'
DATE:	25FEB02
DWG FILE:	1430.001-01

SITE PLAN

NEW ART BUILDING AT LANEY COLLEGE
OAKLAND, CALIFORNIA

FIGURE
1
PROJECT No.
1430.001

K:\Projects\1430.001\1430.001-01.dwg, 14:38 27MAR02 PLOTTED BY: ROcedlaigh

DRILL RIG	**Mobile B-61, HSA**	SURFACE ELEVATION	**14.4 Feet**	LOGGED BY	**NS**
DEPTH TO GROUND WATER	**15 feet**	BORING DIAMETER	**8-inch**	DATE DRILLED	**2/26/02**

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT(%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)	OTHER TESTS
FILL: CLAY (CL), dark brown, mottled, sandy (fine- to medium-grained), some silt, damp	Firm								
FILL: SAND (SM/SC), brown, mottled, fine- to coarse-grained, silty, some clay, trace gravel and shell fragment, damp	Medium Dense				19				
					13				
			5		21	16	116		PP = 2.5
grades to gray-brown at 6 feet									
					49	11	126		% of Passing #200 Sieve = 24
			10						
grades to blue-gray-brown, some silt at 10 feet									
BAY MUD: CLAY (CH), black, some sand (fine- to coarse-grained), some silt, mild hydrocarbon odor, trace wood fragment, moist									
	Firm				9				No Recovery
			15			▼			
grades to wet at 16 feet	Soft								
					6	▽			No Recovery
					21				See Note 7
			20						
strong hydrocarbon odor, with high amount of wood fragment, metal pieces, and other debris at 20 feet									
grades to blue-gray, silty below 23 feet	Firm								
					9	77	54		PP = 0.5
			25						
					8	74	56	1.1	PP = 1.0

425 Roland Way
Oakland, CA 94621

EXPLORATORY BORING LOG

NEW ART BUILDING AT LANEY COLLEGE
Oakland, CA

PROJECT NO.	DATE	BORING NO.
1430.001	**February, 2002**	**EB-1**

DRILL RIG	Mobile B-61, HSA	SURFACE ELEVATION	14.4 Feet	LOGGED BY	NS
DEPTH TO GROUND WATER	15 feet	BORING DIAMETER	8-inch	DATE DRILLED	2/26/02

DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT(%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)	OTHER TESTS
BAY MUD: CLAY (CH), continued									
SAND (SM), dark green-gray, fine-grained, silty, some clay, trace shell fragment, wet	Loose				10	22	102		PP = 3.0
			35						
BAY MUD: CLAY (CH), blue-gray, silty, trace sand (fine- to medium-grained), wet	Firm				9	76	55	0.4*	PP = 1.5, See Note 8
			40						
SAND (SM/SC), blue-gray, fine- to medium-grained, silty, with clay, trace shell fragment, wet	Medium Dense				32	16	112		
			45						
	Very Dense				83/9"				
			50						
	Dense				37				
			55						
	Very Dense				63				

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EXPLORATORY BORING LOG

NEW ART BUILDING AT LANEY COLLEGE
Oakland, CA

PROJECT NO.	DATE	BORING NO.
1430.001	**February, 2002**	**EB-1**

DRILL RIG	Mobile B-61, HSA	SURFACE ELEVATION	14.4 Feet	LOGGED BY	NS
DEPTH TO GROUND WATER	15 feet	BORING DIAMETER	8-inch	DATE DRILLED	2/26/02

DESCRIPTION AND CLASSIFICATION			DEPTH	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT(%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)	OTHER TESTS
DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE	(FEET)						
SAND (SM/SC), continued grades to blue-gray-brown, trace gravel at 60 feet grades to brown, clayey below 63 feet	Dense								
			65	X	61	22	105	2.3	% of Passing #200 Sieve = 43 PP = 4.0
			70	X	67				PP = 4.5
			75	X	73				PP = 2.5

Bottom of Boring = 75 Feet

Notes:

1. The stratification lines represent the approximate boundaries between material types and the transition may be gradual.
2. For an explanation of penetration resistance values, see first page of Appendix A.
3. A 140-lb safety hammer falling 30 inches was used to drive the sampler.
4. Ground water was encountered originally at depth of about 17 feet, and at depth of about 15 feet two hours later.
5. The borehole was backfilled with lean cement immediately upon completion of the drilling.
6. PP = Pocket Penetrometer Reading (tsf).
7. High value of blow count is due to localized encountering metal, brick, and/or concrete debris.
8. Low shear strength was probably caused by severe sample disturbance.

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EXPLORATORY BORING LOG

NEW ART BUILDING AT LANEY COLLEGE
Oakland, CA

PROJECT NO.	DATE	BORING NO.
1430.001	February, 2002	EB-1

DRILL RIG	**Mobile B-61, HSA**	SURFACE ELEVATION	**12.8 Feet**	LOGGED BY	**NS**
DEPTH TO GROUND WATER	**45 feet**	BORING DIAMETER	**8-inch**	DATE DRILLED	**2/26/02**

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT(%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)	OTHER TESTS
FILL: CLAY (CL), dark brown, mottled, sandy (fine- to medium-grained), some silt, damp	Firm								
FILL: SAND (SM), brown, fine- to coarse-grained, silty, trace clay and gravel, damp	Medium Dense				15	13	110	1.3	PP = 2.0
					23				
	Loose		5		10				
grades to black, gravelly (subangular to subrounded) at 6 feet									
BAY MUD: CLAY (CH), blue-gray, silty, trace sand (fine- to coarse-grained) and wood fragmentl, moist	Soft				3				PP = 0.5
			10						
	Very Soft				2	50	74	0.2	PP < 0.5
			15						
grades to mottled shades of black-brown, trace shell fragment at 15 feet									
grades to dark gray-brown, mild hydrocarbon odor at 18 feet	Soft				4	78	54	0.3	PP = 0.5
			20						
					4				PP = 1.5

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Oakland, CA 94621

EXPLORATORY BORING LOG

NEW ART BUILDING AT LANEY COLLEGE
Oakland, CA

PROJECT NO.	DATE	BORING NO.
1430.001	**February, 2002**	**EB-2**

DRILL RIG	Mobile B-61, HSA	SURFACE ELEVATION	12.8 Feet	LOGGED BY	NS
DEPTH TO GROUND WATER	45 feet	BORING DIAMETER	8-inch	DATE DRILLED	2/26/02

DESCRIPTION AND CLASSIFICATION			DEPTH	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT(%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)	OTHER
DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE	(FEET)						TESTS
BAY MUD: CLAY (CH), continued	Soft								
grades to gravelly (rounded to subrounded),wet at 28 feet									
CLAY (CL/GC), blue-gray, gravelly, some silt and sand, wet	Hard		30		57	17	114	9.1	
SAND (SP/SM), light brown, medium- to coarse-grained, trace gravel (subangular to subrounded) and silt, wet	Dense				37				
			35						
			40		32				% of Passing #200 Sieve = 19 between 29 feet to 59 feet
			45		32	▼			
					37				

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Oakland, CA 94621

EXPLORATORY BORING LOG

NEW ART BUILDING AT LANEY COLLEGE
Oakland, CA

PROJECT NO.	DATE	BORING NO.
1430.001	February, 2002	EB-2

DRILL RIG	**Mobile B-61, HSA**	SURFACE ELEVATION	**12.8 Feet**	LOGGED BY	**NS**
DEPTH TO GROUND WATER	**45 feet**	BORING DIAMETER	**8-inch**	DATE DRILLED	**2/26/02**

DESCRIPTION AND CLASSIFICATION			DEPTH	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT(%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)	OTHER TESTS
DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE	(FEET)						
SAND (SP/SM), continued	Dense								
			55						
CLAY (CL), olive-brown, silty, with sand (fine- to medium-grained), wet	Hard				67	21	109	12.3	PP = 4.5
			60						
			65						
grades to dark gray at 69 feet					76				
			70						

Bottom of Boring = 70 Feet
Notes:
1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.
2. For an explanation of penetration resistance values, see first page of Appendix A.
3. A 140-lb safety hammer falling 30 inches was used to drive the sampler.
4. Ground water was apparently encountered at depth of 45 feet at the time of drilling.
5. The borehole was backfilled with lean cement immediately upon completion of the drilling.
6. PP = Pocket Penetrometer Reading (tsf).

FUGRO
425 Roland Way
Oakland, CA 94621

EXPLORATORY BORING LOG

NEW ART BUILDING AT LANEY COLLEGE
Oakland, CA

PROJECT NO.	DATE	BORING NO.
1430.001	**February, 2002**	**EB-2**

DRILL RIG	**Mobile B-61, HSA**	SURFACE ELEVATION	**14.3 Feet**	LOGGED BY	**NS**
DEPTH TO GROUND WATER	**20 feet**	BORING DIAMETER	**8-inch**	DATE DRILLED	**2/26/02**

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT(%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)	OTHER TESTS
FILL: CLAY (CL), dark brown, mottled, sandy (fine- to medium-grained), some silt, damp	Firm								
FILL: SAND (SM), dary gray-brown, mottled shades of green, fine- to coarse-grained, silty, some clay, trace gravel (subangular to subrounded), trace brick pieces, damp	Medium Dense		5	X	33	15	119	3.2	% of Passing #200 Sieve = 42
hard drilling due to encountering concrete or brick chunk			10	X	50/4"				No Recovery
BAY MUD: CLAY (CH), black, mottled shades of blue-gray, silty, mild hydrocarbon odor, moist	Very Soft		15						
			20	X	1	∇			PP < 0.5
			25						

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EXPLORATORY BORING LOG

NEW ART BUILDING AT LANEY COLLEGE
Oakland, CA

PROJECT NO.	DATE	BORING NO.
1430.001	**February, 2002**	**EB-3**

DRILL RIG	Mobile B-61, HSA	SURFACE ELEVATION	14.3 Feet	LOGGED BY	NS
DEPTH TO GROUND WATER	20 feet	BORING DIAMETER	8-inch	DATE DRILLED	2/26/02

DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT(%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)	OTHER TESTS
BAY MUD: CLAY (CH), continued	Very Soft								
SAND (SM - SC), dark gray, medium- to coarse-grained, with silt, strong hydrocarbon odor, trace shell fragment, wet	Loose to medium dense				18				No Recovery
			30		8				
			35						
CLAY (CL), blue-gray, silty, with sand (fine- to coarse-grained), trace gravel, wet	Very Stiff				44	18	112	2.6	
			40						
SAND (SM - SC), dark brown, mottled shades of green, fine- to coarse-grained, clayey, some silt, trace gravel, wet	Dense								
			45						
					52				
			50						

Bottom of Boring = 50 Feet

Notes:

1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.
2. For an explanation of penetration resistance values, see first page of Appendix A.
3. A 140-lb safety hammer falling 30 inches was used to drive the sampler.
4. Ground water was encountered originally at depth of about 20 feet at the time of drilling.
5. The borehole was backfilled with lean cement immediately upon completion of the drilling.
6. PP = Pocket Penetrometer Reading (tsf).

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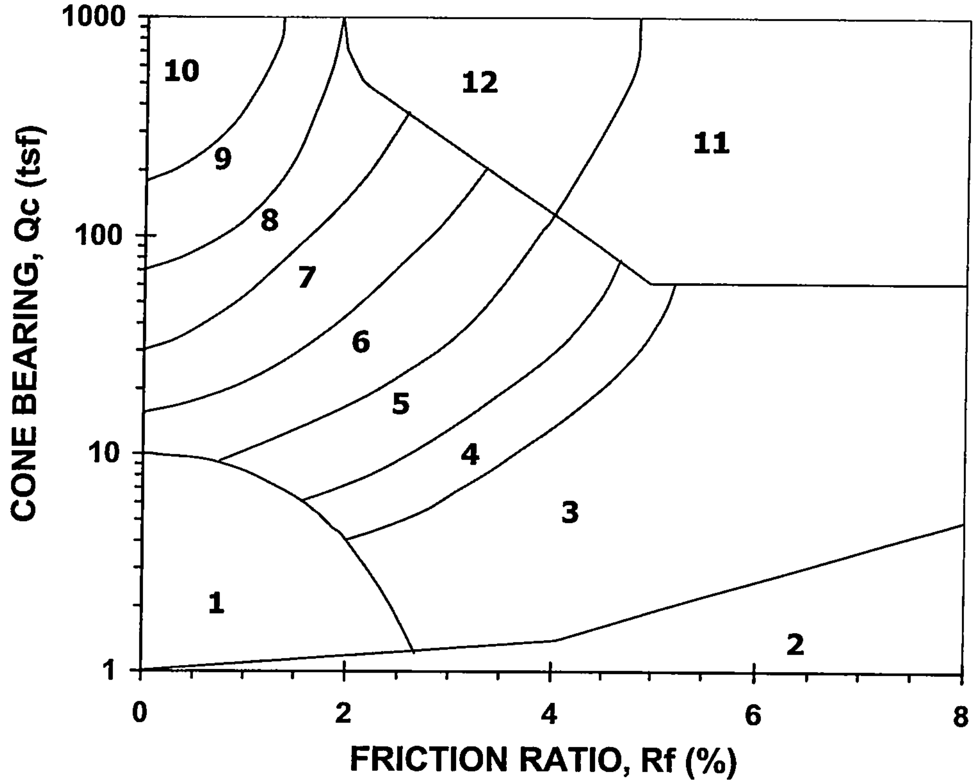
EXPLORATORY BORING LOG

NEW ART BUILDING AT LANEY COLLEGE
Oakland, CA

PROJECT NO.	DATE	BORING NO.
1430.001	**February, 2002**	**EB-3**

SIMPLIFIED SOIL BEHAVIOR TYPE CLASSIFICATION FOR STANDARD ELECTRONIC CONE PENETROMETER



ZONE	Qc/N[1]	Su Factor (Nk)[2]	SOIL BEHAVIOR TYPE[1]
1	2		Sensitive Fine Grained
2	1	for Zones 1 to 6	Organic Material
3	1	10 for Qc <= 9 tsf	CLAY
4	1.5	12 for Qc = 9 to 12 tsf	Silty CLAY to CLAY
5	2	15 for Qc > 12 tsf	Clayey SILT to Silty CLAY
6	2.5		Sandy SILT to Clayey SILT
7	3	---	Silty SAND to Sandy SILT
8	4	---	SAND to Silty SAND
9	5	---	SAND
10	6	---	Gravelly SAND to SAND
11	1	15	Very Stiff Fine Grained (*)
12	2	---	SAND to Clayey SAND (*)

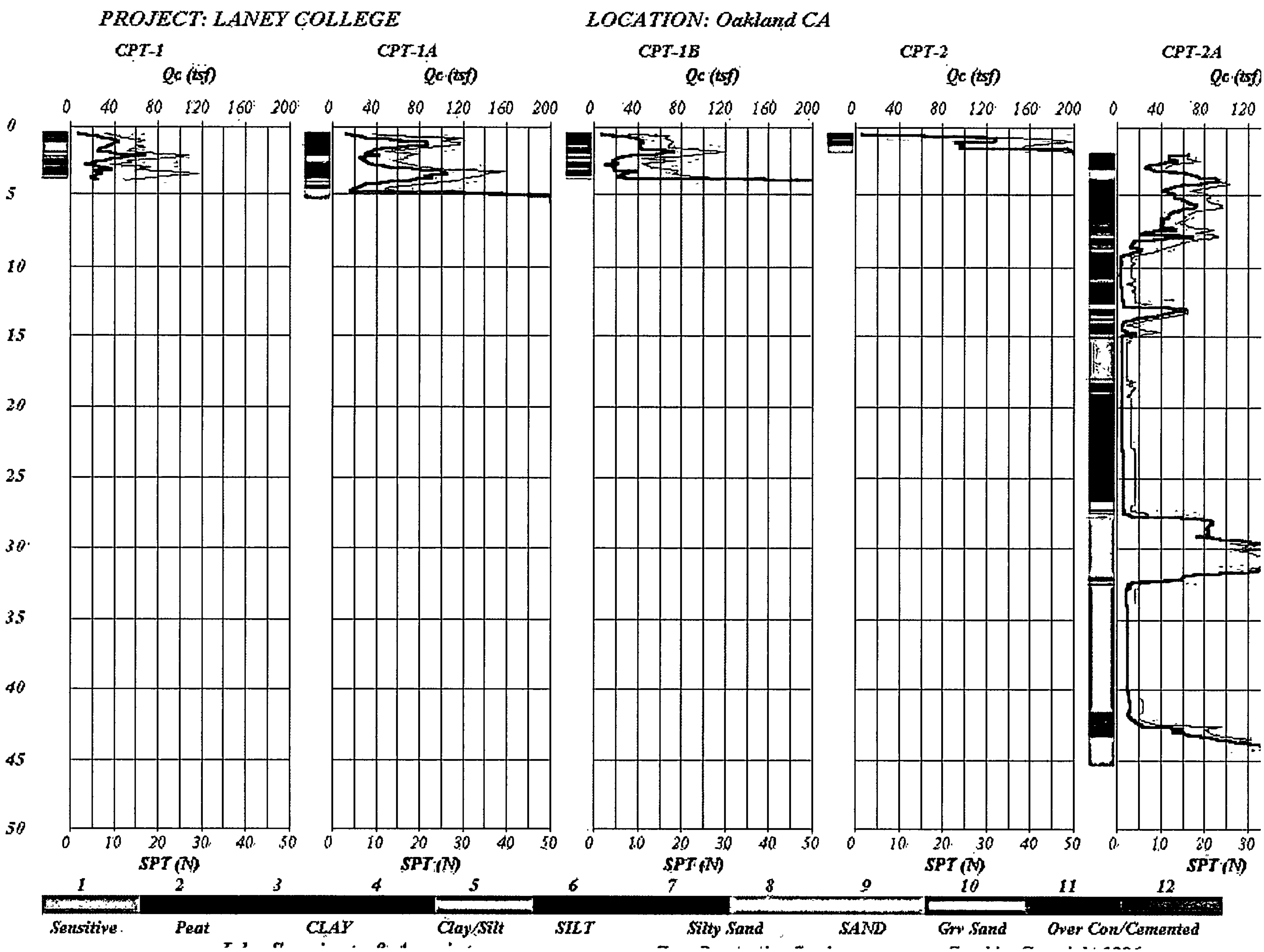
(*) Overconsolidated or Cemented

Qc = Tip Bearing
Fs = Sleeve Friction
Rf = Fs/Qc*100 = Friction Ratio

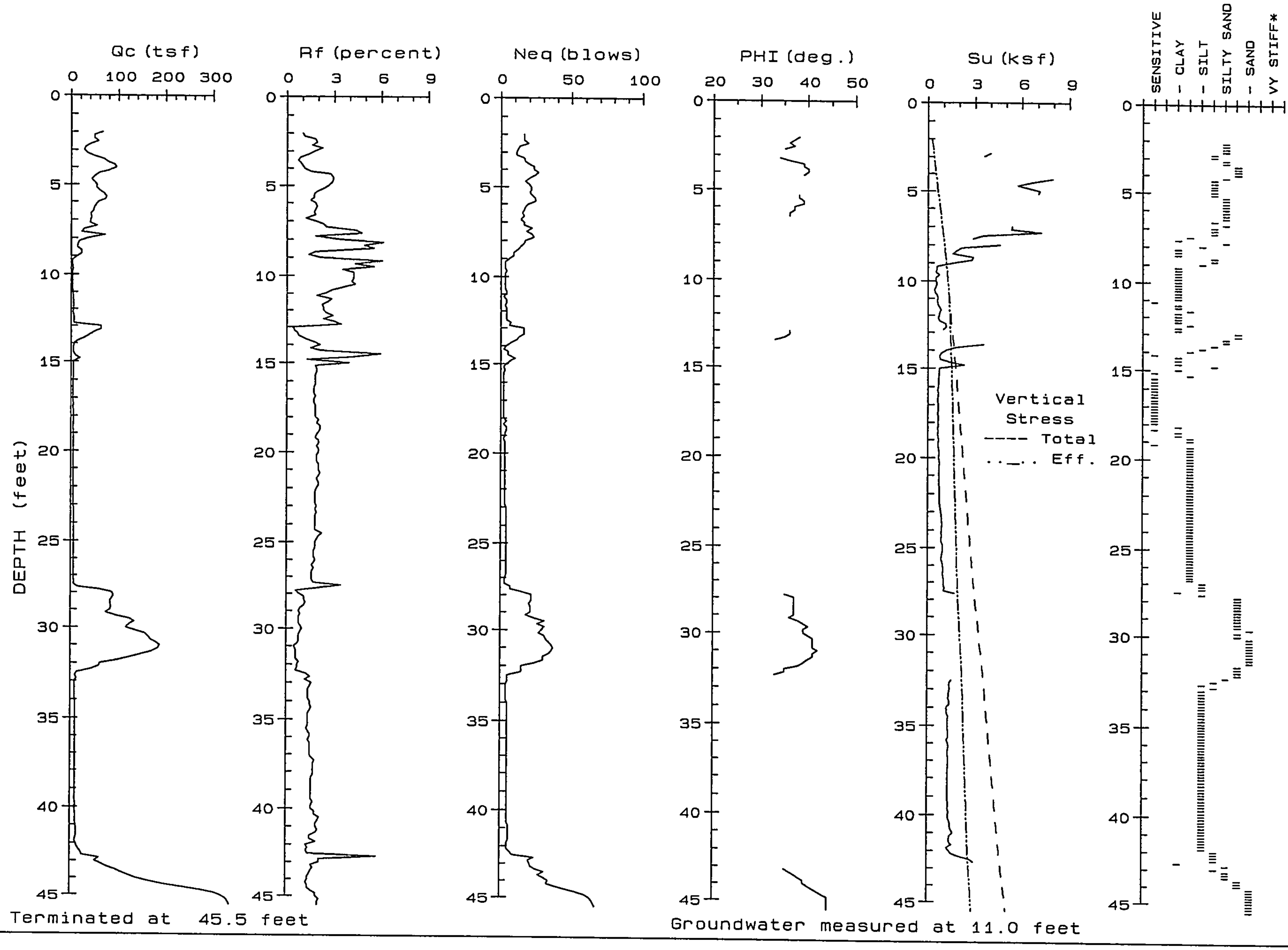
References: [1]Robertson, 1986, Olsen, 1988
[2]Bonaparte & Mitchell, 1979 (young bay mud Qc <= 9)
[2]Estimated from local experience (fine grained soils Qc > 9)

Note: Testing performed in accordance with ASTM D3441

John Sarmiento & Associates
Cone Penetrometer Testing Services



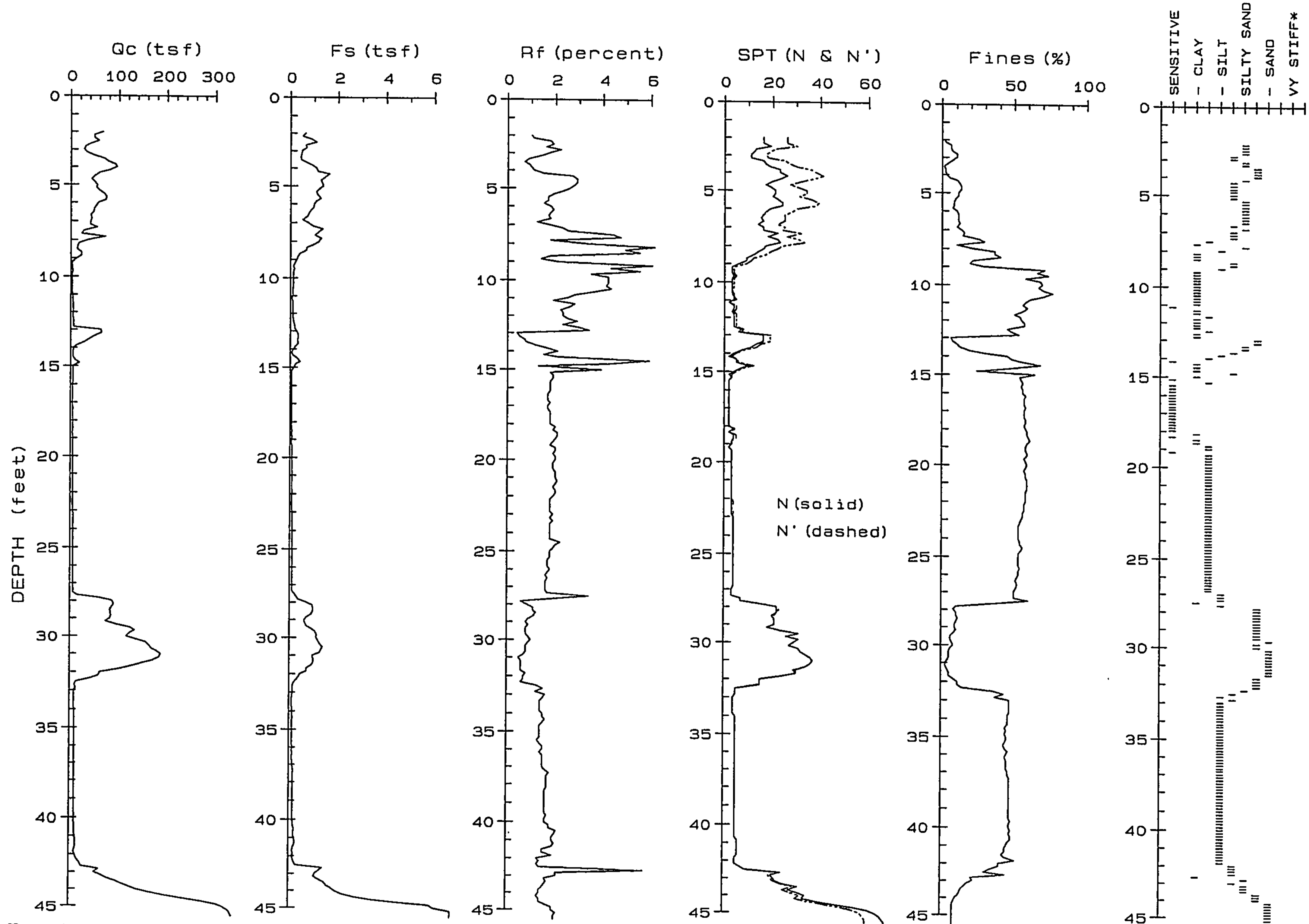
RESULTS OF CONE PENETROMETER TESTS (CPTs)



PROJECT: LANEY COLLEGE
LOCATION: Oakland CA
PROJ. NO.: 21127-G1 (MWH-37)

CPT NO.: CPT-2A
DATE : 02-26-2002

John Sarmiento & Associates
Cone Penetration Testing Service



Terminated at 45.5 feet

Groundwater measured at 11.0 feet

PROJECT: LANEY COLLEGE
LOCATION: Oakland CA
PROJ. NO.: 21127-G1 (MWH-37)

CPT NO.: CPT-2A
DATE : 02-26-2002

John Sarmiento & Associates
Cone Penetration Testing Service

PROJECT: LANEY COLLEGE
LOCATION: Oakland CA
PROJ. NO.: 21127-G1(MWH-37)

CPT NO.: CPT-2A
DATE : 02-26-2002
Groundwater measured at 11.0 feet

DEPTH (feet)	Qc (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT (N')	TotHzStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
2.00	65.31	0.633	1.0	16	26	0.25	38	----	SAND to Silty SAND	"
2.50	55.84	1.069	1.9	19	30	0.31	37	----	Silty SAND to Sandy SILT	130-140
3.00	26.84	0.490	1.8	11	17	0.37	----	3.55	Sandy SILT to Clayey SILT	120-130
3.50	68.70	0.451	0.7	17	27	0.43	39	----	SAND to Silty SAND	"
4.00	93.79	1.068	1.1	23	38	0.50	40	----	"	"
4.50	49.78	1.437	2.9	20	32	0.56	----	6.60	Sandy SILT to Clayey SILT	130-140
5.00	53.17	1.359	2.6	21	34	0.63	----	7.05	"	"
5.50	67.05	1.135	1.7	22	36	0.70	38	----	Silty SAND to Sandy SILT	"
6.00	56.26	0.986	1.8	19	30	0.77	37	----	"	"
6.50	46.38	0.771	1.7	15	25	0.83	36	----	"	"
7.00	40.32	0.739	1.8	16	25	0.90	----	5.32	Sandy SILT to Clayey SILT	"
7.50	26.43	1.166	4.4	18	26	0.97	----	3.46	Silty CLAY to CLAY	"
8.00	34.45	1.180	3.4	17	24	1.03	----	4.52	Clayey SILT to Silty CLAY	"
8.50	12.15	0.668	5.5	12	17	1.10	----	1.55	CLAY	120-130
9.00	12.82	0.270	2.1	6	9	1.16	----	1.63	Clayey SILT to Silty CLAY	110-120
9.50	3.06	0.167	5.5	3	4	1.20	----	0.49	CLAY	90-100
10.00	3.14	0.131	4.2	3	4	1.25	----	0.50	"	"
10.50	2.67	0.114	4.3	3	3	1.30	----	0.40	"	"
11.00	3.82	0.096	2.5	4	5	1.35	----	0.63	"	"
11.50	4.21	0.110	2.6	4	5	1.39	----	0.70	"	"
12.00	4.25	0.097	2.3	4	5	1.44	----	0.71	"	"
12.50	6.40	0.149	2.3	4	5	1.49	----	1.13	Silty CLAY to CLAY	"
13.00	62.43	0.258	0.4	16	19	1.54	36	----	SAND to Silty SAND	120-130
13.50	38.26	0.318	0.8	13	15	1.60	33	----	Silty SAND to Sandy SILT	110-120
14.00	6.53	0.139	2.1	4	5	1.66	----	1.14	Silty CLAY to CLAY	90-100
14.50	4.72	0.276	5.9	5	6	1.70	----	0.77	CLAY	100-110
15.00	4.41	0.172	3.9	4	5	1.76	----	0.71	"	90-100
15.50	4.27	0.080	1.9	2	2	1.81	----	0.67	Sensitive Fine Grained	"
16.00	4.19	0.075	1.8	2	2	1.85	----	0.65	"	"
16.50	4.13	0.072	1.7	2	2	1.90	----	0.64	"	85-90
17.00	4.17	0.072	1.7	2	2	1.94	----	0.64	"	"
17.50	4.17	0.075	1.8	2	2	1.99	----	0.63	"	90-100
18.00	4.24	0.076	1.8	2	2	2.04	----	0.64	"	"
18.50	4.23	0.090	2.1	4	5	2.08	----	0.64	CLAY	"
19.00	4.39	0.085	1.9	3	3	2.13	----	0.67	Silty CLAY to CLAY	"
19.50	4.45	0.089	2.0	3	3	2.18	----	0.67	"	"
20.00	4.47	0.089	2.0	3	3	2.23	----	0.67	"	"
20.50	4.70	0.091	1.9	3	3	2.27	----	0.71	"	"
21.00	4.68	0.093	2.0	3	3	2.32	----	0.70	"	"
21.50	4.74	0.092	1.9	3	3	2.37	----	0.71	"	"
22.00	4.80	0.093	1.9	3	3	2.42	----	0.72	"	"
22.50	4.86	0.089	1.8	3	3	2.46	----	0.73	"	"
23.00	5.38	0.100	1.9	4	4	2.51	----	0.82	"	"
23.50	5.77	0.106	1.8	4	4	2.56	----	0.90	"	"
24.00	5.81	0.104	1.8	4	4	2.61	----	0.90	"	"
24.50	5.73	0.125	2.2	4	4	2.65	----	0.88	"	"
25.00	5.95	0.108	1.8	4	4	2.70	----	0.92	"	"
25.50	5.87	0.102	1.7	4	4	2.75	----	0.90	"	"
26.00	6.01	0.109	1.8	4	4	2.80	----	0.92	"	"
26.50	6.11	0.102	1.7	4	4	2.84	----	0.94	"	"
27.00	6.52	0.105	1.6	3	3	2.89	----	1.02	Clayey SILT to Silty CLAY	"
27.50	6.50	0.224	3.4	7	7	2.94	----	1.01	CLAY	100-110
28.00	86.18	0.708	0.8	22	22	3.00	37	----	SAND to Silty SAND	120-130
28.50	81.76	0.985	1.2	20	21	3.06	37	----	"	"
29.00	82.38	0.631	0.8	21	21	3.13	37	----	"	"
29.50	122.59	0.928	0.8	31	31	3.19	39	----	"	"
30.00	116.31	1.119	1.0	29	29	3.25	39	----	"	"
30.50	161.98	1.367	0.8	32	32	3.31	41	----	SAND	"
31.00	185.64	0.963	0.5	37	37	3.38	42	----	"	"
31.50	147.89	0.941	0.6	30	29	3.44	40	----	"	"
32.00	61.40	0.446	0.7	15	15	3.50	35	----	SAND to Silty SAND	"
32.50	13.03	0.172	1.3	5	5	3.56	----	1.50	Sandy SILT to Clayey SILT	100-110
33.00	8.97	0.147	1.6	4	4	3.61	----	1.43	Clayey SILT to Silty CLAY	"
33.50	8.49	0.122	1.4	4	4	3.66	----	1.33	"	90-100
34.00	9.09	0.134	1.5	5	5	3.71	----	1.21	"	"

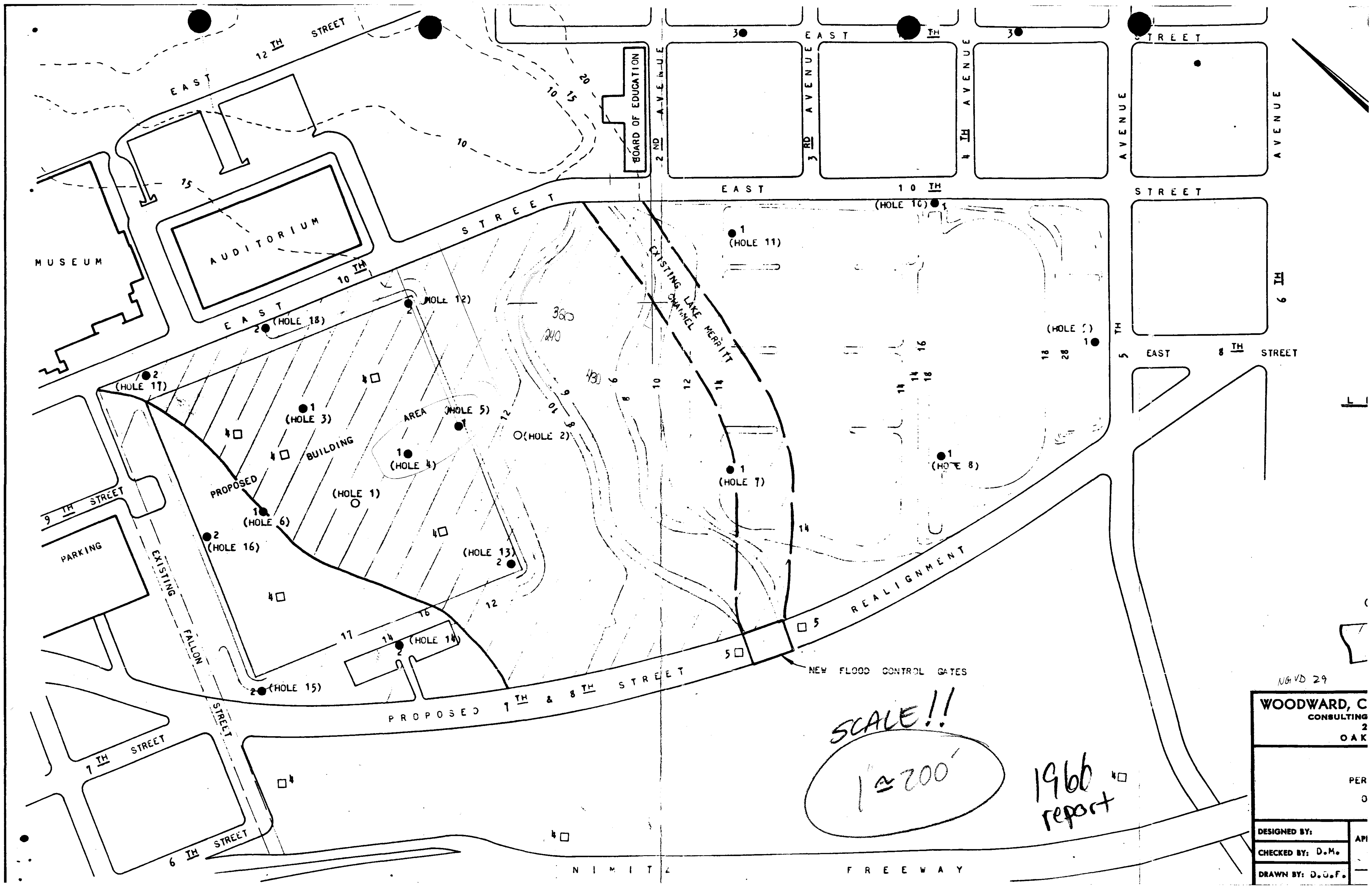
PROJECT: LANEY COLLEGE
LOCATION: Oakland CA
PROJ. NO.: 21127-G1(MWH-37)

CPT NO.: CPT-2A
DATE : 02-26-2002
Groundwater measured at 11.0 feet

DEPTH (feet)	Qc (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT (N')	TotHzStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
34.50	9.78	0.143	1.5	5	5	3.75	----	1.32	"	"
35.00	9.60	0.138	1.4	5	5	3.80	----	1.28	"	"
35.50	9.93	0.126	1.3	5	5	3.85	----	1.33	"	"
36.00	9.83	0.147	1.5	5	5	3.90	----	1.31	"	100-110
36.50	9.82	0.144	1.5	5	5	3.95	----	1.31	"	90-100
37.00	9.93	0.153	1.5	5	5	4.00	----	1.32	"	100-110
37.50	9.82	0.168	1.7	5	5	4.05	----	1.30	"	"
38.00	9.79	0.163	1.7	5	5	4.10	----	1.29	"	"
38.50	9.87	0.161	1.6	5	5	4.16	----	1.30	"	"
39.00	9.87	0.161	1.6	5	5	4.21	----	1.29	"	"
39.50	10.14	0.167	1.6	5	5	4.26	----	1.33	"	"
40.00	10.14	0.165	1.6	5	5	4.31	----	1.33	"	"
40.50	10.91	0.227	2.1	5	5	4.37	----	1.46	"	"
41.00	11.94	0.232	1.9	6	6	4.42	----	1.62	"	"
41.50	12.51	0.191	1.5	6	6	4.48	----	1.37	"	"
42.00	12.66	0.161	1.3	5	5	4.53	----	1.39	Sandy SILT to Clayey SILT	"
42.50	22.52	0.304	1.4	9	9	4.58	----	2.70	"	110-120
43.00	52.04	1.108	2.1	21	20	4.65	----	6.63	"	130-140
43.50	92.46	1.483	1.6	31	29	4.72	37	----	Silty SAND to Sandy SILT	"
44.00	137.71	1.911	1.4	34	32	4.78	39	----	SAND to Silty SAND	"
44.50	232.01	3.349	1.4	46	42	4.85	42	----	SAND	"
45.00	314.60	5.980	1.9	63	57	4.92	44	----	"	"
45.50	332.90	6.687	2.0	67	59	4.99	44	----	"	"

DEPTH = Sampling interval (2 inches)
Qc = Tip bearing resistance
Fs = Sleeve friction resistance
Rf = Tip/Sleeve ratio
SPT = Equivalent Standard Penetration Test*
TotStr = Total Stress using est. density**
Phi = Soil friction angle*
Su = Undrained Soil Strength* (Nk=10 for Qc<9 tsf) (Nk=12 for Qc=9 to 12 tsf) (Nk=15 for Qc>12 tsf)

References: * Robertson and Campanella, 1988
** Olsen, 1989 *** Durgunoglu & Mitchell, 1975



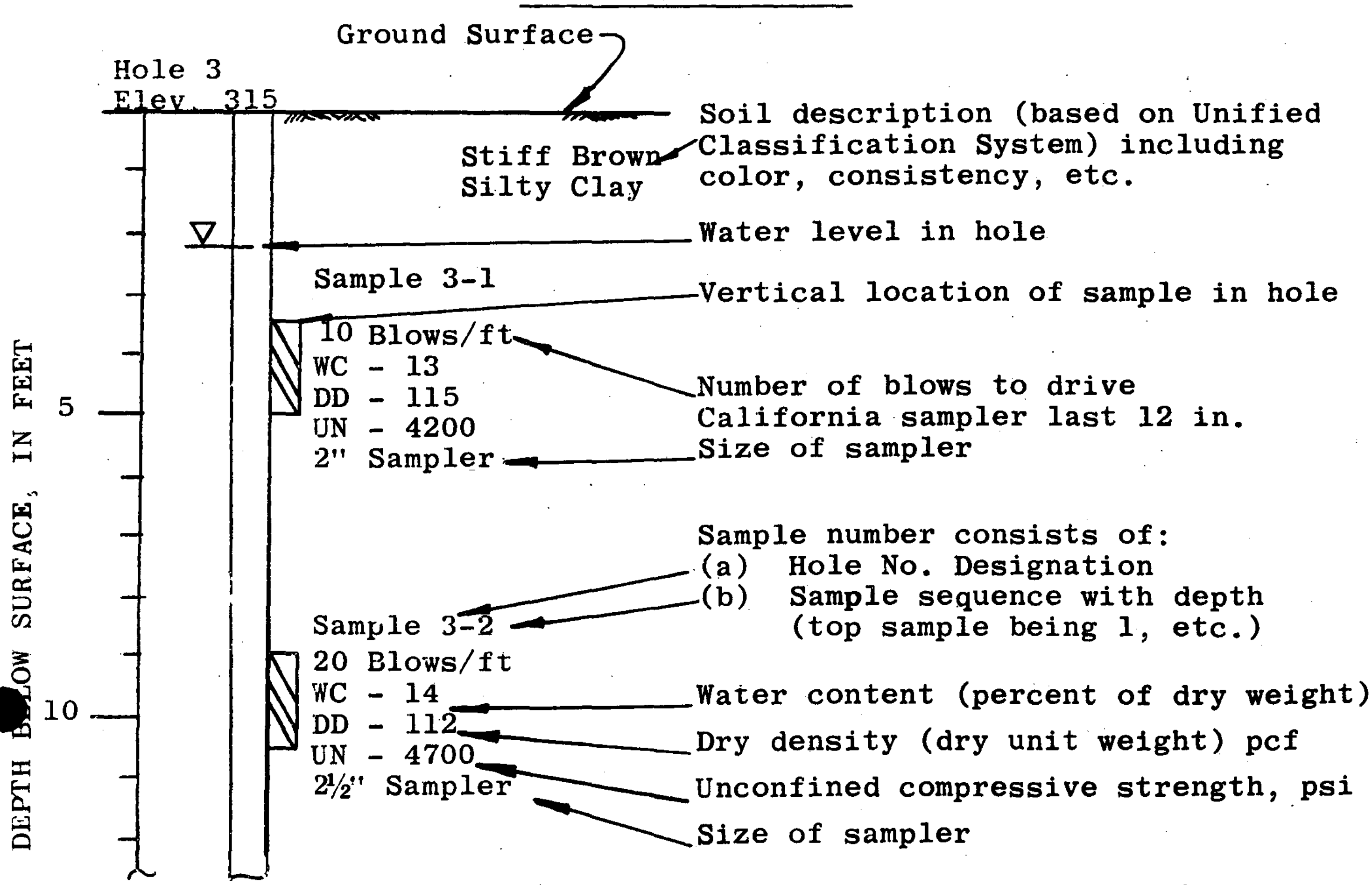
EAST 12 TH STREET
MUSEUM
AUDITORIUM
BOARD OF EDUCATION
EAST 10 TH STREET
2 ND AVENUE
3 RD AVENUE
4 TH AVENUE
AVENUE
EAST 8 TH STREET
EXISTING LAKE MERRITT CHANNEL
PROPOSED BUILDING AREA
(HOLE 1)
(HOLE 2)
(HOLE 3)
(HOLE 4)
(HOLE 5)
(HOLE 6)
(HOLE 7)
(HOLE 8)
(HOLE 11)
(HOLE 12)
(HOLE 13)
(HOLE 14)
(HOLE 15)
(HOLE 16)
(HOLE 17)
(HOLE 18)
9 TH STREET
PARKING
EXISTING FALLON STREET
PROPOSED 7 TH & 8 TH STREET REALIGNMENT
NEW FLOOD CONTROL GATES
7 TH STREET
6 TH STREET
NIMITZ FREEWAY
SCALE!!
1" ≈ 200'
1966 report
NGVD 29
WOODWARD, C
CONSULTING
OAK
PER
DESIGNED BY:
CHECKED BY: D.M.
DRAWN BY: D.G.F.

A P P E N D I X

NOTES ON FIELD INVESTIGATION

1. Borings were advanced with a 6-in. diameter continuous flight power auger and by wash boring.
2. The Engineering Geologist were M. Conant, R. Russell and C. Taylor
3. In-place samples of the soils were obtained with either drive samplers or Shelby tube samplers. The size of sampler used is indicated at the sample location on the logs of borings.
   a) The 2-in. sampler measures 2-in. I.D. and 2½-in. O.D.. Thin brass liners are enclosed in the sampler. The sampler is driven 18-in. into the soil at the bottom of the holes with a 140 lb. hammer falling 30 in.
   b) The 2½-in. sampler measures 2½-in. I.D. and 2¾-in. O.D. and also contains brass liners. This sampler is driven 24-in. into the soil with a 140 lb. hammer falling 30 in.
   c) Shelby tube samplers are thin-walled brass tubes, measuring either 2.8 or 3.2 I.D., and are pushed into the soil by hydraulic mechanism. Loss of the sample is prevented by either a fixed piston in the Osterberg type sampler or by ball check valve in the open type sampler.
4. When the sampler was withdrawn from the test holes, the brass tubes containing the soils samples were removed, carefully sealed to preserve the natural moisture content, and returned to the laboratory for testing.
5. Classifications are based on the Unified Classification System and are made in the field by our Engineer or Geologist. Classifications of in-place samples are verified by an examination by the Staff Engineer.

KEY TO BORING LOGS



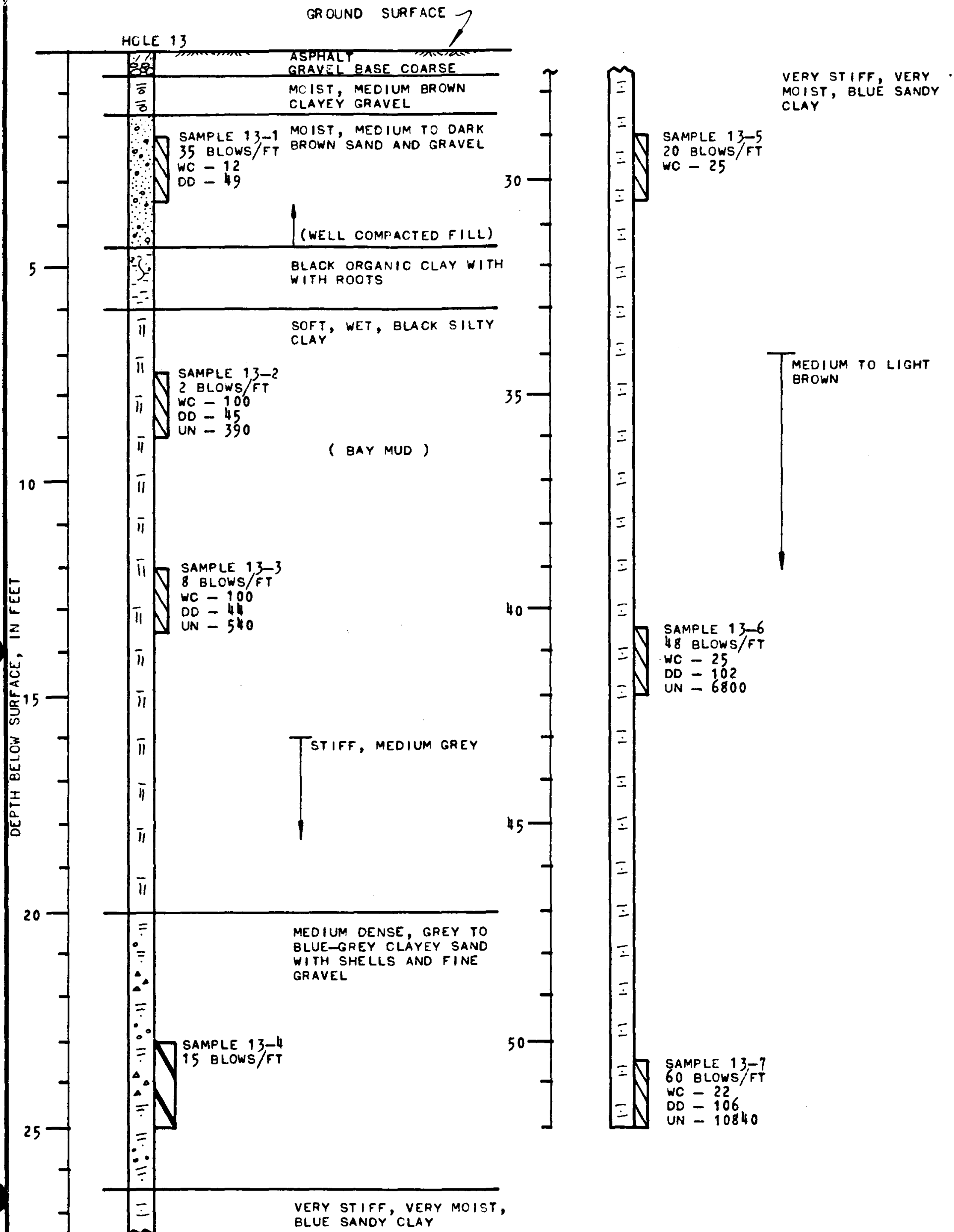


FIG. 20 - LOGS OF BORINGS

WOODWARD-CLYDE-SHERARD & ASSOCIATES

Consulting Soil and Foundation Engineers

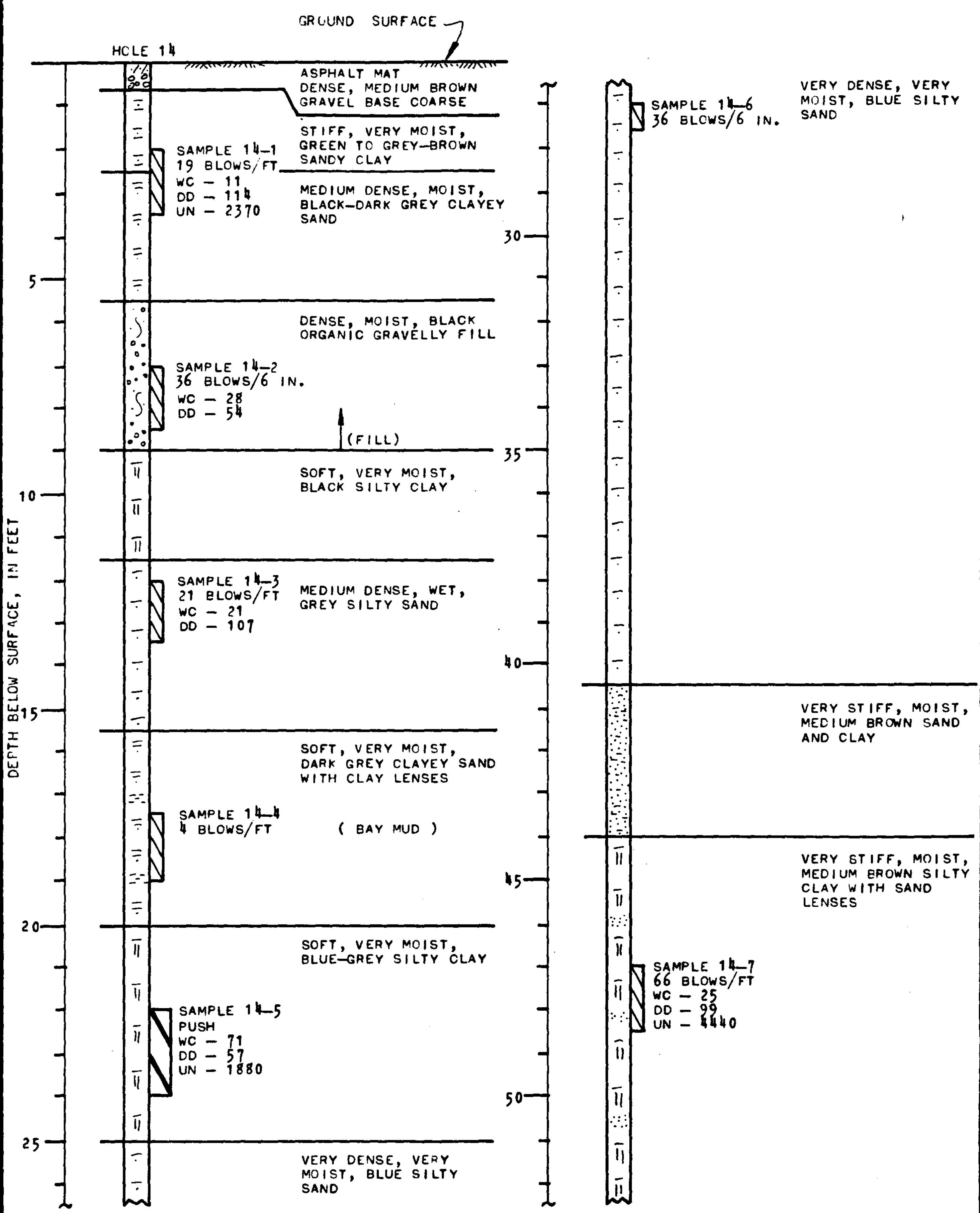


FIG. 21 — LOGS OF BORINGS

WOODWARD-CLYDE-SHERARD & ASSOCIATES
Consulting Soil and Foundation Engineers

HOLE 14 (CONT'D)

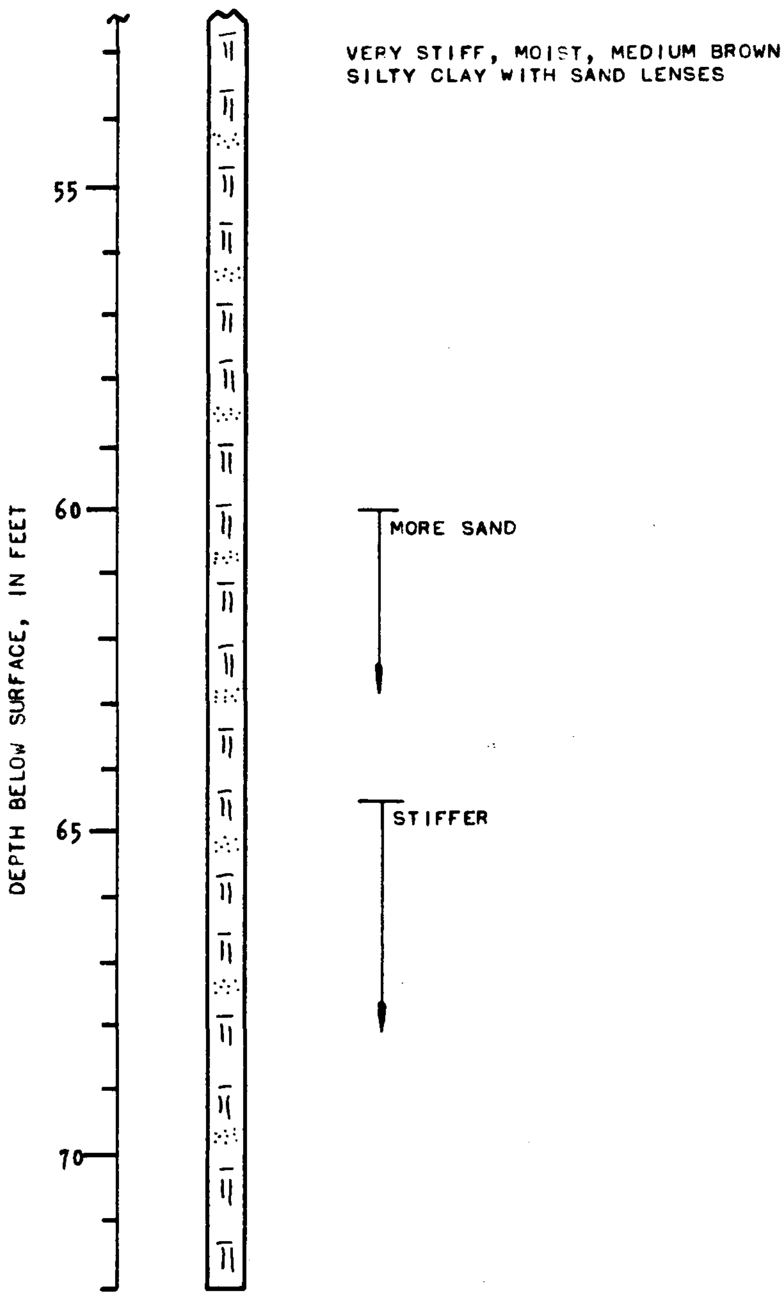


FIG. 22 — LOGS OF BORINGS

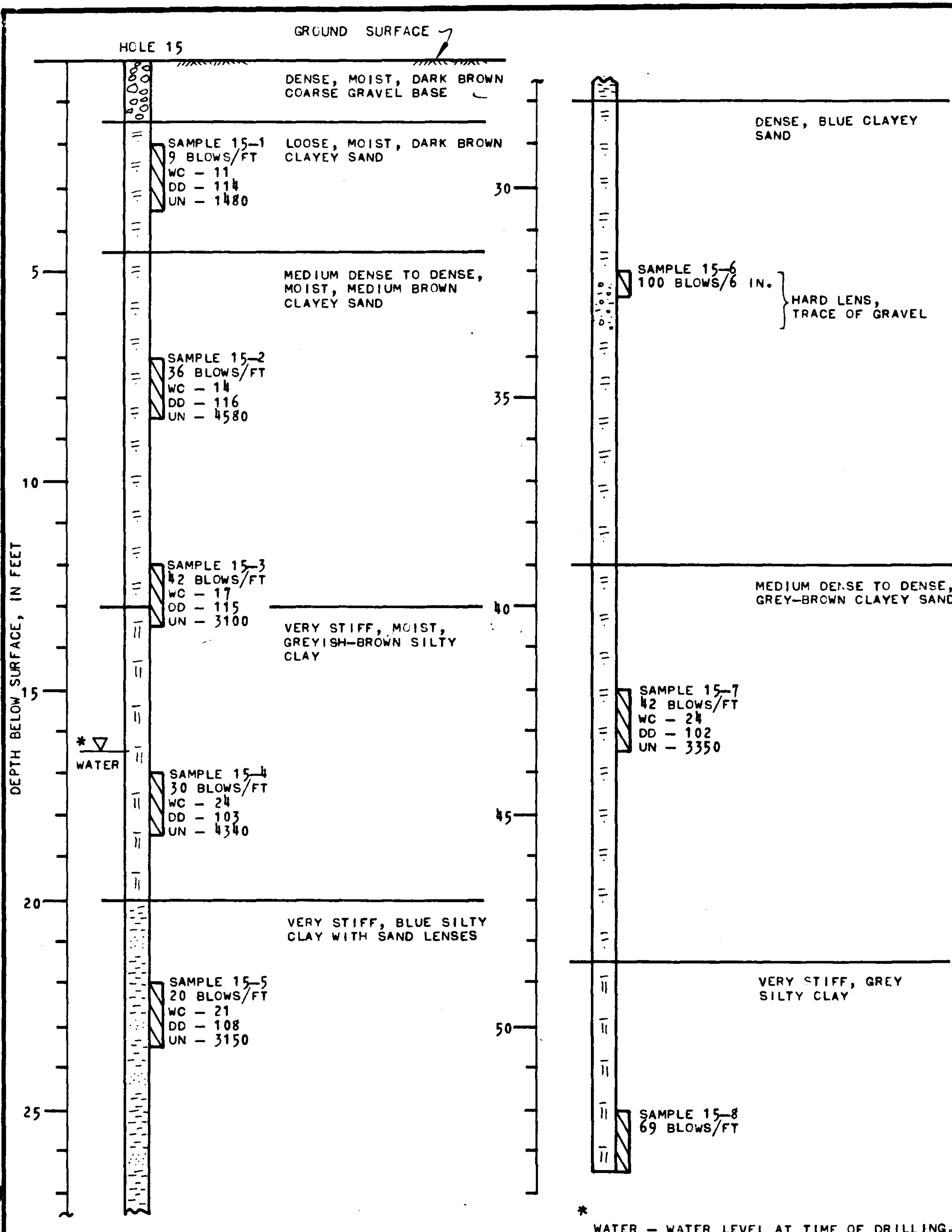
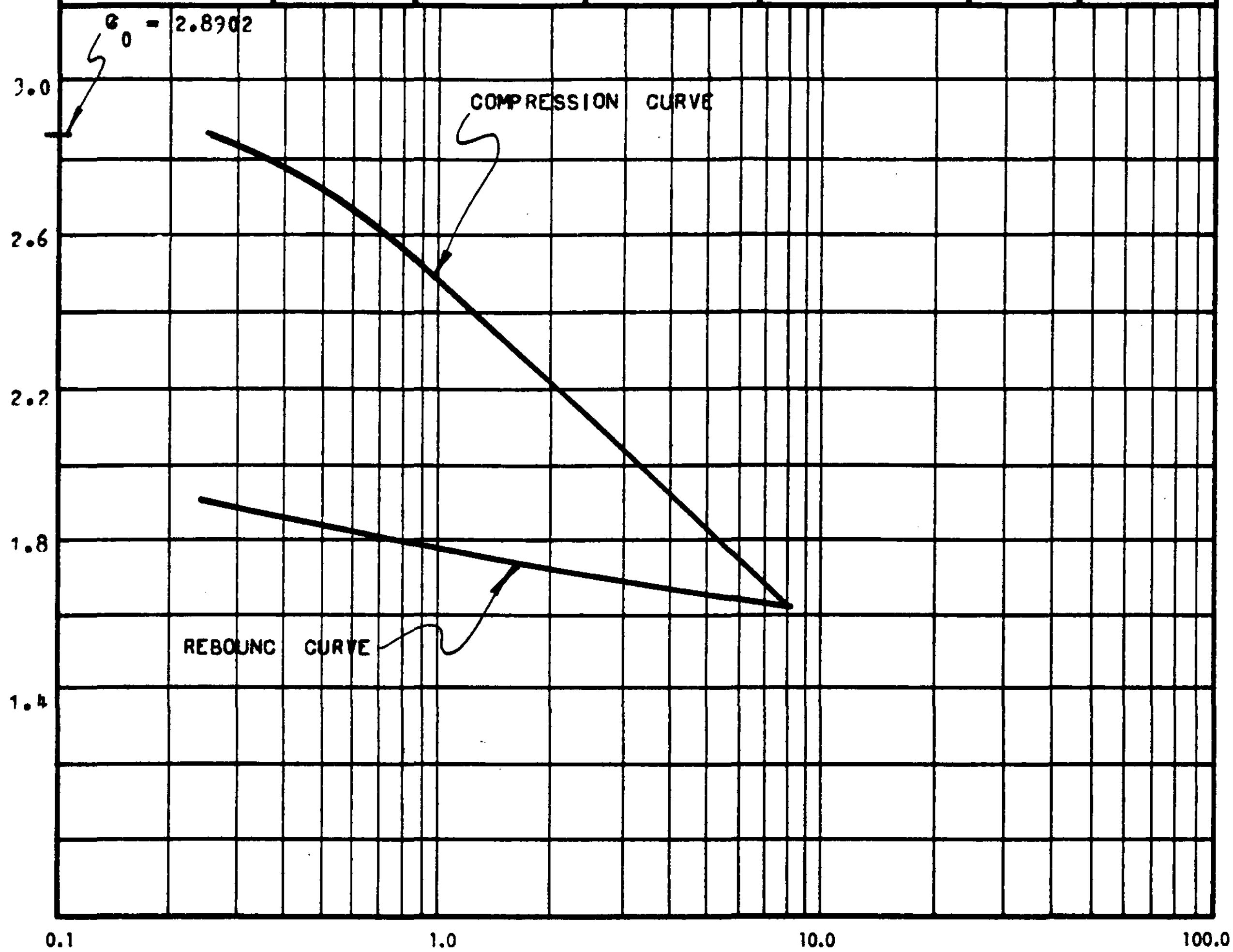


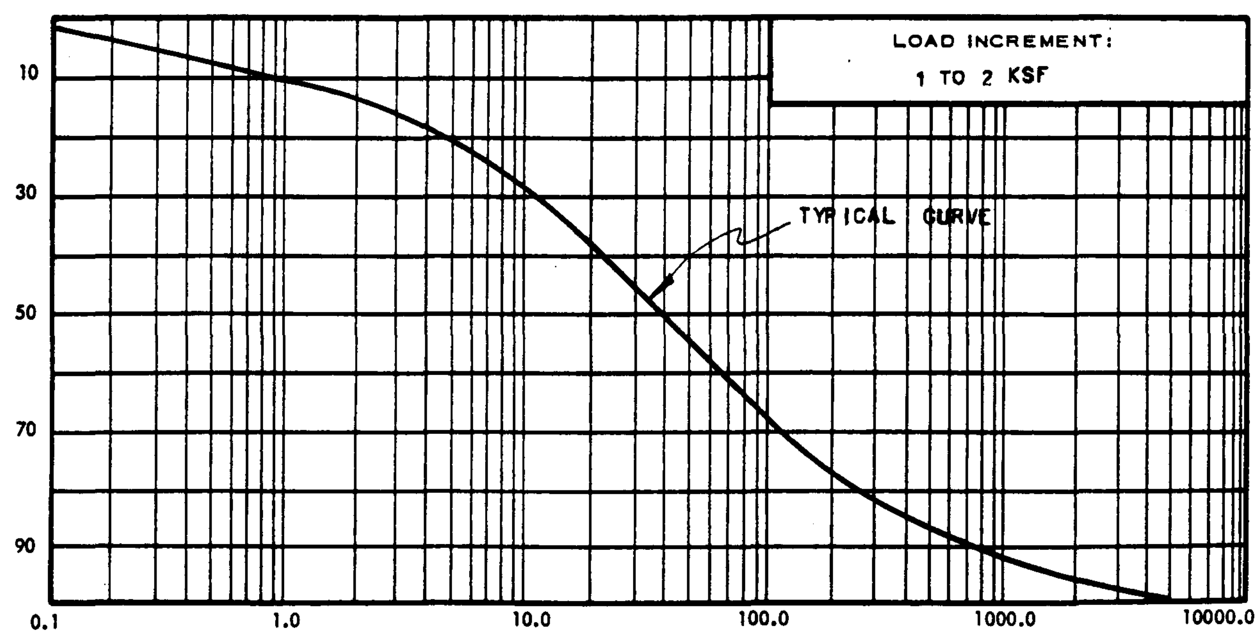
FIG. 23 — LOGS OF BORINGS

WOODWARD-CLYDE-SHERARD & ASSOCIATES

Consulting Soil and Foundation Engineers

SAMPLE NO.	SUMMARY OF TEST RESULTS					
13-3-9	SPECIFIC GRAVITY	MOISTURE CONTENT, (%)	DRY DENSITY, (PCF)	PERCENT OF SATURATION, (%)	HEIGHT (IN.)	DIAMETER (IN.)
INITIAL	2.75	102.24	44.10	97.28	.8981	1.94
FINAL		68.96	53.17	99.81	.6694	





CONSOLIDATION TEST

FIG. 26