

Revised Appendix E

Geotechnical Evaluation



REPORT

PRELIMINARY GEOTECHNICAL EVALUATION
LOS ANGELES COUNTY MUSEUM OF ART
5905 WILSHIRE BOULEVARD
LOS ANGELES, CALIFORNIA 90036

PREPARED FOR:
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AECOM PROJECT No. 60506707

AUGUST 24, 2018

R E P O R T
P R E L I M I N A R Y G E O T E C H N I C A L E V A L U A T I O N

LACMA BUILDING FOR THE PERMANENT COLLECTION PROJECT
LOS ANGELES COUNTY MUSEUM OF ART
LOS ANGELES, CALIFORNIA

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SECTION 1 INTRODUCTION

1.1 GENERAL

This report presents the information and conclusion of a preliminary geotechnical evaluation of the site's geologic and seismic conditions and the impacts associated with potential geologic and seismic hazards for inclusion in the environmental planning documents for the Los Angeles County Museum of Art (LACMA) Building for the Permanent Collection (Project) within the LACMA Campus in the Miracle Mile vicinity of Los Angeles, California. The location of the Project site relative to the surrounding area is shown on the Vicinity Map, Figure 1.

1.2 PROJECT DESCRIPTION

Subsequent to the publication of the Draft Environmental Impact Report (Draft EIR, dated August 17, 2016), several design changes were made to the Museum Building. The Project includes an approximately 347,500 gross square foot Museum Building, which is a reduction of 40,000 square feet as compared to the Museum Building analyzed in the Draft EIR. The Museum Building would continue to be located on LACMA East and the property on the southeast corner of Wilshire Boulevard and Spaulding Avenue (Spaulding Lot), with a portion spanning Wilshire Boulevard. The Museum Building would replace four buildings within LACMA East collectively comprising approximately 392,871 gross square feet, including the Ahmanson Building, the Hammer Building, the Art of Americas Building, and the Bing Center (which contains the LACMA Café, the Dorothy Brown Auditorium, which provides 116 seats, and the Bing Theater, which provides 600 seats). Overall, the Project would result in a decrease in the square footage of museum operations by approximately 45,371 square feet and a reduction in the maximum theater size from over 716 seats to 300 seats. The Museum Building is still proposed to consist of seven semi-transparent Pavilions that would support an elevated, continuous, transparent main gallery level extending over Wilshire Boulevard to the Spaulding Lot in the same general location as presented in the Draft EIR; although the shape and location of each Pavilion within the Museum Building has changed slightly (see revised Conceptual Site Plan at Ground Level on Figure 2). The Pavilion for Japanese Art within LACMA East is not a part of the Project Site and would remain. The Project design would also enhance the outdoor experience by including new outdoor landscaped plazas, public programming and educational spaces, sculpture gardens, and native and drought tolerant vegetation that would be integrated with the Museum Building and existing uses within Hancock Park.

In addition, the Project continues to include a proposed new parking facility providing approximately 260 parking spaces to be located southwest of the intersection of Ogden Drive and Wilshire Boulevard on three contiguous parcels owned by Museum Associates (the "Ogden Lot"). All parking spaces currently on the Spaulding Lot would be relocated to this new parking facility (the "Ogden Parking Structure"). The Museum Building and the Ogden Parking Structure together comprise the Project.

While the Project is expected to begin construction during the third or fourth quarter of 2019, a year after what was originally analyzed, the Project is still anticipated to be completed in 2023.

1.3 PURPOSE AND SCOPE OF WORK

AECOM prepared this preliminary geotechnical evaluation report as a supporting document for inclusion to the environmental planning documents. The purpose of this preliminary geotechnical evaluation is to assess the geologic and seismic conditions at the subject site and develop preliminary conclusions regarding potential geologic and seismic impacts associated with the Project. Our work was performed in accordance with the California Environmental Quality Act (CEQA) guidelines (2014); Environmental Checklist Form, Appendix G; and Table 1 below presents a brief summary of the Project's potential impacts based on Section VI - Geology and Soils of Appendix G. Where applicable, recommendations to mitigate any identified potential geologic and seismic hazards are also provided in Section 5.

Table 1 - SUMMARY OF POTENTIAL GEOLOGIC/SEISMIC IMPACTS/HAZARDS

CEQA Checklist Questions	Impact Potential			
	Potentially Significance Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:			×	
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.			×	
ii) Strong seismic ground shaking?		×		
iii) Seismic-related ground failure, including liquefaction?			×	
iv) Landslides?				×
b) Result in substantial soil erosion or the loss of topsoil?			×	
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?			×	
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?		×		
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?				×

Our geotechnical evaluation was based on review of readily available geologic and seismic data, published geotechnical literature relevant to the subject site, and our own data from current and past geotechnical investigations performed at the subject site. More specifically, our scope of work included the following:

- Review of readily available aerial photographs, topographic and geologic maps, published geotechnical literature, geologic and seismic data, soil data, groundwater data, and the geologic/geotechnical data obtained during recent and previous geotechnical investigations in the vicinity and near-vicinity of the subject site.
- Review of geotechnical aspects of the current preliminary Project schemes and documents pertaining to the subject site.
- Compilation and analysis of existing geotechnical data pertaining to the subject site.
- Assessment of the general geologic conditions and seismic hazards affecting the area and evaluation of their potential impacts on the Project.
- Preparation of a preliminary geotechnical evaluation report to present the results of our study, as well as our conclusions regarding the Project's geologic and seismic impacts, and recommendations to address/mitigate the impacts to be included in the environmental planning documents.

The above scope of work was performed following the applicable State of California (CEQA, 2016) and local County/City of Los Angeles guidelines, as well as the Project specific requirements. A review of the regulatory requirements for the Project is included for the City of Los Angeles and County of Los Angeles, both of which have jurisdiction over the portions of the Project. County of Los Angeles is the Lead Agency and City of Los Angeles is the Responsible Agency under CEQA. The proposed Museum Building will be under the permitting jurisdiction of the County of Los Angeles and the proposed Ogden Parking Structure will be under the permitting jurisdiction of the City of Los Angeles.

SECTION 2 FIELD INVESTIGATION AND LABORATORY TESTING

AECOM performed the site-specific soil investigation in late 2015 for the completion of the Design Development (DD) Phase of the proposed Phase III Transformation Project (Project) at the Los Angeles County Museum of Art (LACMA). The geotechnical investigation included reviewing available geotechnical and geologic data, as-built information, and performing subsurface explorations. Geotechnical laboratory testing was conducted on selected soil samples collected during the field exploration program.

2.1 REVIEW OF EXISTING DATA

Available geologic and geotechnical documents reviewed during the current investigation are listed in Section 6. Pertinent information from these documents was incorporated into the preparation of this report. Relevant field data and previous studies within the project vicinity are attached in Appendix A.

2.2 GEOTECHNICAL FIELD EXPLORATIONS

The field investigation program consisted of four (4) borings and four (4) seismic cone penetration tests (SCPTs) performed for the proposed Building for the Permanent Collection. The soil borings were completed at the site using hollow-stem auger and mud-rotary drilling techniques between October 15 and November 20, 2015, at the locations as shown on the Conceptual Site Plan, Figure 2. The boring depths ranged from 87.5 feet to a maximum boring depth of 121.5 feet below the ground surface (bgs). The boring depths were selected to extend below the anticipated load influence depths and to investigate liquefaction potential/seismic-induced settlements. A summary of the soil boring operations is provided in Table 2. Details of the field investigation, including sampling procedures, boring logs, and disposal of investigation-derived wastes (IDW) are presented in more details in Appendix B.

Table 2 - SUMMARY OF SOIL BORINGS AND SCPTs

LOCATION	BORING/ SCPT NUMBER	APPROXIMATE COORDINATES			APPROXIMATE DEPTH (feet)	APPROXIMATE BOTTOM ELEVATION (feet MSL)
		NORTHING ¹ (meter)	EASTING ¹ (meter)	SURFACE ELEVATION ² (feet MSL)		
Proposed Building for the Permanent Collection	B-15-1	562389.161	1966985.611	175.2	121.5	53.7
	B-15-2	562545.397	1967032.325	171.2	87.5	83.7
	B-15-3	562490.083	1966990.586	168.5	88.5	80.0
	B-15-4	562622.409	1966898.741	169.8	121.5	48.3
	SCPT-15-1/ 1A ³	562432.171	1967055.925	179.2	39.70 / 59.71	139.2
	SCPT-15-2/ 2A ³	562597.865	1966938.349	180.4	38.39 / 37.73	141.7
	SCPT-15-3/ 3A ³	562633.393	1966929.244	174.5	40.03 / 45.28	134.1
	SCPT-15-4	562518.248	1966868.828	165.5	40.85	124.3
Notes: 1. Approximate locations. Northing and easting based on California Zone 05, NAD83. 2. Based on topographic map; MSL = mean sea level. 3. Due to refusal at original SCPT location, second SCPT was performed at approximate 3 feet away and therefore, the second CPT was also considered at the planned SCPT location.						

Upon completion of drilling and sampling, Borings B-15-3 and B-15-4 were converted to groundwater monitoring wells in conformance with the Non-Production Wells Permit from the Los Angeles County Department of Public Health Drinking Water Program.

SCPTs were advanced on October 5 and November 13, 2015, with a truck-mounted rig, and seismic cone readings were taken at various depths. The SCPTs were advanced in general accordance with ASTM D5778 standard using an electronic cone penetrometer. The approximate SCPT locations are shown on Figure 2. The SCPT extended to maximum depths of approximately 37 to 59 feet bgs. Shear wave velocity measurements were taken between elevations 175.3 and 129.6 feet at 5-foot intervals except in SCPT-15-1A between elevations 139.2 and 119.2 feet where the measurements were taken at 10-foot intervals. The details of the SCPT including test records and interpretations are included in Appendix C.

2.3 GEOTECHNICAL LABORATORY TESTING

Geotechnical soil samples obtained from the borings were carefully sealed and packaged in the field to reduce moisture loss and disturbance. The samples were delivered to the appropriate testing laboratories, where they were further examined and classified. Laboratory testing was performed on selected samples to confirm (and to modify if necessary) the visual classification of the soils based on the field identification. Geotechnical tests performed included:

- Soil classification (ASTM D2487/D2488);
- Moisture content (ASTM D2216);
- In-situ density test (ASTM D2937);
- Wash analysis (ASTM D1140);
- Atterberg limits (ASTM D4318);
- Compaction test (ASTM D1557);
- Consolidation test (ASTM D2435);
- Direct shear test (ASTM D3080);
- Consolidated undrained (CU) triaxial compression test (ASTM D4767);
- Expansion index (ASTM D4829);
- R-value (ASTM D2844);
- Corrosivity test (California Test Method [CTM] 417, 422, and 643); and
- Tar (asphalt) content test (CTM 382).

A description of the laboratory testing and the test results are presented in Appendix D of this report. For ease of reference, test results of moisture, in-situ density, fines content of soils tested, and Atterberg limits are also shown on the Logs of Boring in Appendix B.

SECTION 3 SITE CONDITIONS

The Project site includes portions of LACMA East (which currently contains the Ahmanson Building, Art of the Americas Building, Hammer Building, and Bing Theater), Spaulding Lot, the separated Ogden Lot, and a small portion of LACMA West associated with the proposed cooling towers (refer to Figure 2). Unless noted otherwise, the description of site condition presented herein applies to all 4 portions of the Project site.

3.1 GEOLOGY

3.1.1 Regional Geology

The Project site is located in the northernmost part of the Peninsular Ranges geomorphic province near the boundary of the Transverse Ranges geomorphic province. The Peninsular Range province is characterized by northwest-southeast trending alignments of mountain ranges and hills with intervening basins reflecting the influence of northwest trending major fault zones controlling the geologic structure of the region. A broad sediment-filled trough generally referred to as the Los Angeles Basin characterizes the northern portion of the Peninsular Ranges province.

The Project site is located in the central portion of the Los Angeles Basin. The Los Angeles Basin is an alluvial plain of low relief and was created by tectonic subsidence and subsequent deposition of sediments from ancestral streams from erosion along the flanks of the local mountains since the Pliocene time. Within this portion of the basin, thick accumulations of Quaternary age, non-marine to shallow marine deposits overlie marine Tertiary age sediments.

3.1.2 Site Geology

The Project site is part of the La Brea Plain consisting of broad south-dipping gently sloping topography that has been uplifted and slightly dissected consisting of upper Pleistocene-age alluvial deposits. The regional geologic map indicates the Project site is underlain by slightly elevated/dissected generally late Quaternary age older alluvium (map symbol - Qae) as shown on the Site Geologic Map, Figure 3 (Dibblee, 1991). Older alluvial deposits (also shown as symbol Qal on the Geologic Cross-Sections), including nonmarine terrace deposits, are exposed in uplifted areas around the margins of the Los Angeles Basin. The Lakewood Formation (symbol Qlw on the Geologic Cross-Sections) is generally non-marine and similar to the overlying alluvial deposits. The Lakewood Formation is underlain by dense to very dense consolidated lower Pleistocene-age shallow marine deposits referred to as the San Pedro Formation (symbol Qsp on the Geologic Cross-Sections). The San Pedro Formation sediments were deposited on the underlying Pliocene age sedimentary bedrock of the Fernando Formation (Symbol Tf on the Geologic Cross-Sections).

The Project site consists of crude oil deposits that originated from structural traps created by folding and faulting of bedrock. These structural traps exist in the form of anticlinal folds and fault blocks where crude oil migrated to the surface along bedrock shears and joints, and especially laterally along permeable beds (sands) within the Lakewood and San Pedro formations. During migration toward the surface, crude oil tends to lose its volatile constituents producing a viscous tar. There are several oil and gas fields located adjacent to the Project site including the South Salt Lake and Salt Lake oil fields.

3.1.3 Existing Site Development and Surface Conditions

LACMA moved to its Wilshire Boulevard campus in 1965, initially with Ahmanson Building, Hammer Building and Bing Theater. After that, LACMA added several structures including the Art of the Americas Building, the Pavilion for Japanese Art, Resnick Pavilion, and Broad Contemporary Art Museum. The Project site currently contains the Ahmanson Building, Art of the Americas Building, Hammer Building, and Bing Theater with concrete pavement and landscape surrounding on the north of Wilshire Boulevard, and a separated asphalt-concrete paved parking lot (Spaulding Lot) on the south of Wilshire Boulevard as shown on Figure 2, Plot Plan. The aforementioned existing 1965 buildings were supported on shallow foundations over fill soils placed on an area mat foundation approximately 2 to 3 feet underneath. The general topography of the Project site is relatively level with the existing ground elevations of the Project site ranging from approximately 165 to 180 feet above mean sea level (MSL).

3.1.4 Subsurface Conditions

Artificial Fill (af)

Artificial fill was encountered in some of the subsurface explorations at the LACMA East and the Spaulding Lot up to 9 feet below ground surface (bgs). This fill thickness could vary between the subsurface exploration locations. The fill consists of sandy silt and sandy/silty clay with few rootlets, asphalt, and brick fragments. There are also localized archaeological excavation pits backfill between 15 to 20 feet deep at LACMA East but exact locations are unknown. Other miscellaneous fills such as backfills for utility lines and storm drain facilities should also exist at LACMA East and the Spaulding Lot. The fills directly beneath foundation of existing buildings were not investigated.

There was a previous 23-foot deep shored excavation covering most of Ogden Lot for a previously proposed 2-level subterranean parking structure. The shoring was installed in 2005 and consisted of soldier piles, lagging, tiebacks (east perimeter), and raker bracing (north, west, and south perimeters); however, the shored excavation was abandoned and was backfilled between 2009 and 2010. Backfills on the Ogden Lot consists of silty/clayey sand and sandy clay and is considered as secondary structural fill which may be only used for supporting the floor slabs and pavement sections.

Alluvium (Qal) & Lakewood Formation (Qlw)

Alluvium and the Lakewood Formation are exposed at the surface of the Project site and at depths ranging from 12 to 16 feet bgs to a maximum thickness of approximately 40 feet. Alluvium consisted primarily of dense to stiff clayey sand, sandy clay and clay. The Lakewood Formation thickness is variable and some of its lithology is derived from erosion of the underlying San Pedro Formation and its deposition controlled by the ancestral streams that drained from the canyons on the south flank of the Santa Monica Mountains and Elysian Hills. Changes in lithology are frequent. The Lakewood Formation consisted of medium dense fine to medium-grained silty sand and sand with trace fine gravels interbedded with discontinuous flood plain fine-grained sediments consisting of clayey silt, lean clay, and sandy clay. The upward migration of natural hydrocarbons originating from petroleum reservoirs within the underlying bedrock permeated and impacted the sandy deposits of the Lakewood Formation in the form of varying amounts of tar.

San Pedro Formation (Qsp)

The San Pedro Formation unconformably underlies the Lakewood Formation and consists of dense to very dense silty sand, sand, sand with silt, and varying amounts of fine gravel. The depth to the San Pedro formation varies from approximately 17 feet bgs to a maximum of 25 feet bgs. Our geotechnical exploration indicated some samples were impacted with varying amounts of tar contents between 11 and 19 percent, except one sample has higher tar content of 81.6 percent in accordance with CTM 382.

Fernando Formation (Tf)

The entire Project site is underlain by marine sedimentary bedrock of Tertiary age known as the Fernando Formation (Dibblee, 1991). The depth to the Fernando Formation contact ranges from 56 to 78 feet in recent AECOM soil explorations. The unit, as encountered in exploratory borings drilled, is soil-like in consistency. The Fernando Formation was characterized by a transition to dark brown to black very fine sandy silt, clayey silt with fine sand, lean clay, and very fine sandy clay. Recent AECOM geotechnical exploration indicated some samples were impacted with varying amounts of tar content up to 10 percent.

The subsurface conditions underneath the proposed building are presented on Geologic Cross Sections A-A' to C-C', Figure 4 to Figure 6.

3.2 GROUNDWATER

The Project site is located within the Hollywood Sub-basin which underlies the northeastern Coastal Plain of Los Angeles Groundwater Basin (California Department of Water Resources [DWR], Bulletin 118, updated in 2004). The principal freshwater-bearing sediments of the Hollywood Sub-basin include the Holocene-age alluvial deposits, the upper Pleistocene-age Lakewood Formation, and the lower Pleistocene-age San Pedro Formation at depth (DWR, 1961).

According to the Seismic Hazard Zone Report 026 for the Hollywood 7.5-Minute Quadrangle, the historically highest groundwater is on the order of 10 feet or shallower below existing grade, Figure 7 (California Geologic Survey [CGS], formerly California Division of Mines and Geology [CDMG], 1998). In addition, groundwater data collected from available geotechnical investigations near/at the vicinity of Project site indicates groundwater level is variable between 1 to 14 feet bgs, which corresponds to approximate elevations 152 to 171 feet above mean sea level (MSL). The data also indicates the trend of groundwater flowing is from east to west matches with historically highest ground water contours by CGS. We concluded that the shallow groundwater was induced and impacted by adjacent La Brea tar pits which the surface level of water is observed to be at an elevation of approximately 175 feet above MSL.

AECOM installed two groundwater monitoring wells at borings B-15-3 and B-15-4 with water level data loggers as part of the recent geotechnical investigation program at the locations as shown on Figure 2. The groundwater monitoring data collected between January 2016 and June 2017 are presented on Figure 8. Generally, the monitoring data matched the historically highest ground water level by CGS.

The variations in groundwater depths could be the result of seasonal fluctuations and rainfall. For conservatism, we anticipate the design groundwater level should be assumed at Elevation 165 feet mean sea level (MSL) for westernmost towers (Service Towers A and B), cooling tower, and Ogden Lot; and at Elevation 167 feet MSL for the remaining art tower structures.

Due to the presence of tar in the subsurface soils, contaminated groundwater may be encountered when performing temporary excavations for the proposed basement and foundation constructions. Therefore, all the groundwater from any planned temporary dewatering at the Project site shall be chemically analyzed in order to determine the appropriate treatment and/or disposal methods during construction. No permanent dewatering is anticipated for the Project.

SECTION 4 GEOLOGICAL AND SEISMIC HAZARDS EVALUATION

Similar to Section 3, the following discussion applies to all 4 portions (LACMA East, Spaulding Lot, Ogden Lot, and the cooling tower) of the Project site, unless noted otherwise.

4.1 GENERAL

Geological and seismic hazards are those hazards that could impact a site due to the surrounding geologic and seismic conditions. Geological hazards include expansive/compressible soils, corrosive soils, oil wells, tar sands, methane gas, subsidence, and erosion. Seismic hazards include phenomena that occur during an earthquake such as surface fault rupture, ground shaking, liquefaction, seismic-induced landslide/mudflow, flooding, and tsunamis/seiches. The potential impact of those hazards to the Project site has been assessed and is summarized in the following sections. Our assessment of these hazards was based on guidelines established by California Geological Survey (CGS; formerly California Division of Mines and Geology [CDMG]) as outlined in its Special Publication 117A (2008). Mitigations to any identified hazards at the Project site are discussed in Section 5.

4.2 GEOLOGICAL HAZARDS

4.2.1 Expansive Soil

Based on the data of available soil investigation, the clay soils encountered within the artificial fill and alluvium are subject to expansion and shrinkage resulting from changes in the moisture content. Volumetric change of expansive soil may cause excessive cracking and heaving of lightly loaded structures with shallow foundations, concrete slabs-on-grade, or pavements supported on these materials. Tests performed previously on samples of the clays at LACMA East site from previous geotechnical investigations (VB&B, 2005, Law/Crandall, 1995, and The J. Byer Group, 2002) and our current study indicate the fine-grained clayey artificial fill and alluvial deposits have a medium to high expansion potential. These materials are expected below the Project site and therefore, the potential for swelling from expansive soil does exist and will have an impact to lightly loaded foundation elements and concrete flatwork.

4.2.2 Compressible Soil

Artificial fill and near-surface alluvial deposits may be compressible, particularly with the addition of water. Where present, these materials may be subject to load-induced settlement and are not suitable for support of foundations, slabs-on-grade, paving or new compacted fills. The thicknesses of artificial fill and alluvium are varying across the Project site based on available soil explorations, resulting in a potential for settlement or differential settlement if any new loads imposed on the fill and surface alluvium.

As mentioned in Section 1.2 above, a base isolation system will be incorporated as part of the Museum Building's seismic design provisions according to the current design scheme proposed at the LACMA East and Spaulding Lot. Based on our geotechnical investigation for the building; we currently anticipate the new Museum Building will be supported on deep foundation systems, embedded into the underlying dense/stiff San Pedro and Fernando Formations. In addition, we also anticipate the existing secondary

structural fill at Ogden Lot will be completely removed for the planned 2-level of subterranean parking structure which may be supported on deep foundation. Therefore, the potential for building settlement from the potentially compressible existing fill and near-surface alluvium is unlikely.

4.2.3 Corrosive Soils

Based on the available results of laboratory tests from our previous and current investigations within LACMA campus, the top 11 feet of surface soils are severely corrosive to corrosive to metals, and moderate corrosive to concrete. Detailed information is provided in Soil Corrosivity Report prepared by Project X Corrosion Engineers on February 18, 2016, which is included in Appendix D.

4.2.4 Oil Wells

Based on the District 1 Map 118 presented on the California Division of Oil, Gas and Geothermal Resources (DOGGR) website, the Project site is located within the limits of the Salt Lake Oil Field as shown in Figure 9. The well locations shown are generally considered approximate. There are two (2) oil wells in the immediate vicinity of the Project site. These wells include the Mars Oil Co. 'Masselin' 1 and the Wilshire Oil Producers Co. 2.

1. Wilshire Oil Producers Co. 2 is located approximately 90 feet south of Project site
2. Mars Oil Co. 'Masselin' 1 is located approximately 300 feet southeast of Project site

According to the DOGGR's records, both wells are plugged and abandoned. There are no active or abandoned oil/gas wells shown within the Project site. The likelihood of encountering an abandoned oil/gas well during construction is low. However, the DOGGR well locations are approximate and locations errors are possible. Although the likelihood of encountering an abandoned oil well is low, mitigation is recommended in the event an oil well is encountered.

4.2.5 Tar Sands

Based on the previous and our current geotechnical investigations performed near/at the vicinity of Project site, the tar sands material with light to heavy hydrocarbon odor was encountered at depths between 10 feet bgs and the bottom of each subsurface geotechnical boring primarily within the San Pedro Formation and the underlying Fernando Formation bedrock.

ASTM standard for determining tar content on soil samples was not available, and therefore, CTM 382 standard - Determination of Asphalt Content of Bituminous Mixtures by the Ignition Method, was adopted and used. Based on the results of laboratory testing, the finer grained sandy lean clay/silt such as alluvium, Lakewood and Fernando Formation have less than 10 percent of tar content, and the more sandy and coarse-grained San Pedro Formation has higher 11 to 18 percent of tar content, with one sample reaching a tar content as high as 81.6 percent. Compared the tar content results from previous investigation along the Wilshire Boulevard for Los Angeles County Metropolitan Transportation Authority (MTA) Westside Subway Extension Project, our test results are similar which shows impacted sand has 10 to 20 percent of tar.

We anticipate soils excavated within the top 10 feet (and above groundwater level) of the Project site would contain lesser amount of natural oil or tar. Spoils resulting from excavations for basement and

foundation that extend more than 10 feet bgs or below groundwater could contain natural oil or tar. Excavation spoils will likely require chemical analyses for offsite disposal characterization. If the excavation spoil is characterized as non-hazardous, it can be disposed of at a treatment, disposal, and storage facility (TDSF). However, if the spoil is characterized as hazardous, it will have to be disposed at a hazardous waste facility.

4.2.6 Methane

Methane is a naturally occurring gas associated with the decomposition of organic materials. In high-enough concentrations between 50,000 parts per million (ppm) and 150,000 ppm by volume in the presence of oxygen, methane can be considered as an explosion hazard.

The Project site is located within an area delineated by the City of Los Angeles (2004) as a ‘Methane Zone’ or zones with high potential for seepage of methane gas as indicated on Figure 10. Methane Specialists recently performed a methane investigation at the LACMA East (portion of the Project site) by shallow/deep monitoring probe sets up to 20-foot deep, and results indicated the elevated concentration of methane exceeding 12,500 ppm by volume which is resulted in a Level V design level as the most stringent “active” methane mitigation based on City of Los Angeles’s Methane Mitigation ordinance. According to the methane report, the same design level shall be elected to design the structures on the Spaulding Lot, Ogden Lot, and cooling tower.

4.2.7 Subsidence

Historic ground subsidence related to fluid withdrawal has been documented within the vicinity of the Project site. This subsidence has been primarily attributed to oil production from the petroleum reservoirs underlying the general area. While continued subsidence related to these activities may occur, the relatively small magnitude of subsidence distributed over a broad area should not adversely affect the proposed construction.

4.2.8 Sedimentation / Erosion

The Project is not anticipated to result in significant impacts associated with sedimentation or erosion. Grading, excavation, and other earth-moving activities could potentially result in erosion and sedimentation during construction. For grading performed in the “rainy season”, generally October to April, provisions will need to be made to control erosion. Construction activities should be performed in accordance with the requirements of the County and City of Los Angeles Building Codes, as well as those of the Regional Water Quality Control Board through the City’s Department of Public Works, Bureau of Sanitation, Watershed Protection Division.

4.2.9 Hydro-Collapse Potential

At dry, natural state, soils with collapse potential possess stiffness and high apparent shear strength; but upon wetting, they could exhibit a significant decrease in volume (collapsing, hydroconsolidation, hydrocompression). Such soils, which exhibit this phenomenon at fairly low stresses, are called collapsible soils. Collapsible soils are generally characterized by their loose structure of bulky shaped grains, often in the silt to fine sand size with a small amount of clay. There may be only slight cementing

agents such as calcium carbonate, salts and dried clay, with combinations being common. Geologic materials with collapse potential consist of aeolian, fine alluvial fan deposits, mud flows, flash flood deposits, loosely placed fills, and some types of residual soils (Jennings and Knight, 1975).

Due to the groundwater present at relatively shallow depths as mentioned in Section 3.2, we estimate the potential of hydro-collapse is low. In addition, the slight swelling potential shown at inundation of the consolidation test and the medium expansion from the expansion index test both indicated the remote potential for hydro-collapse.

4.3 SEISMIC HAZARDS

4.3.1 Surface Fault Rupture

The Alquist-Priolo Earthquake Fault Zoning Act is a state law that regulates development projects near active faults to mitigate the hazard of surface fault rupture. CGS defines an active fault as one that has had surface displacement within Holocene time (about the last 11,000 years), and a sufficiently active fault as one that has evidenced of surface displacement along one or more of its segments or branches (CDMG, 1997). The CGS considers a fault to be well defined if its trace is clearly detectable as a physical feature at or just below the ground surface.

As in most of Southern California, the site is located in a seismically active area. Based on our review of the map of Earthquake Zones of Required Investigation for the Hollywood Quadrangle (Figure 11), the site is not located within an Alquist-Priolo (A-P) Earthquake Fault Zone as defined by the State of California (Hart and Bryant, 2007). The closest A-P-zoned faults to the project site is the Hollywood Fault located approximately 2.2 miles (3.5 kilometers) to the northwest and the Newport-Inglewood fault zone which is located approximately 2.5 miles (4 kilometers) to the southwest.

There are no active faults delineated by CGS that have been recognized as crossing or projecting toward the Project site (Hart and Bryant, 2007). Surface fault rupture is considered unlikely at the site.

4.3.2 Seismic Ground Shaking

Strong ground motion occurs as energy is released during an earthquake. The intensity of ground motion is dependent upon the distance to the fault rupture, the earthquake magnitude, and the geologic conditions underlying and surrounding the site. Seismic ground shaking will induce kinematic and inertia loads to the proposed structures for the Project.

The Los Angeles Basin, as well as most of Southern California, is located within a complex zone of faults and folds resulting from compressional forces occurring along a bend within the boundary between the Pacific and North American tectonic plates. Numerous generally east-west to northwest trending faults have formed as a result of these north-south compressional forces acting within this area. The Regional Fault Map, as shown on Figure 12, includes the location of active and potentially active faults, within the general vicinity of the site. Most of the larger earthquakes have been associated with larger faults that have been mapped at the ground surface. A number of moderate to large earthquakes in the region have also occurred on deep-seated buried thrust faults in this geological complex region of Southern California. The most recent significant earthquake was the magnitude 6.7 Northridge earthquake, which occurred on

a shallowly south-dipping thrust fault that underlies much of the San Fernando Valley. The characteristics of the nearby faults are summarized in Table 3. Several major faults within the near vicinity of the Project site are characterized by a combination of blind thrusting, right-lateral strike-slip, and reverse faulting and are described in more details in the following subsections.

San Vicente Fault

The San Vicente fault is a west-striking, north-dipping, roughly 9-km-long reverse fault in the northern Los Angeles basin (e.g., Wright, 1991; Schneider et al., 1996). This blind fault does not extend to the ground surface and has no geomorphic expression. Thus, information regarding the fault's location, geometry, slip history, and magnitude potential come from subsurface data, primarily an extensive set of oil-well data.

Tsutsumi (1996) suggests that the Santa Monica and San Vicente faults initiated in Miocene time as a continuous left-oblique normal fault. With the onset of compressional and transpressional tectonics in early Pliocene time, these and other faults in the Los Angeles basin were reactivated in a reverse or reverse-oblique sense. Many Pliocene structures became inactive by the middle Pleistocene, and deformation in the middle to late Pleistocene is taken up by new active structures. Well data suggest that reverse slip on the western portion of the San Vicente fault (south of the San Vicente oil field) persisted through early Pliocene time (Hummon, 1994; Tsutsumi, 1996; Dolan et al., 1997). Evidence for reverse slip on the eastern portion of the San Vicente fault nearer the LACMA site (north of the Las Cienegas oil field) is either lacking (Tsutsumi, 1996) or suggests only a relatively small amount of reverse separation (Dolan et al., 1997). Tsutsumi (1996) interprets that reverse faulting on the San Vicente fault ceased by sometime around 3.5 million years before present.

These observations indicate that the San Vicente fault may not be a "Quaternary-active structure" (i.e., a fault that had evidence of movement in the past 1.6 million years). In fact, documentation for the Uniform California Earthquake Rupture Forecast model version 3 (UCERF3), indicates that the San Vicente fault likely will be removed as a seismic source from future versions of the model (Field et al., 2013).

Even if the San Vicente fault is Quaternary-active, its magnitude potential, and thus coseismic displacement, is limited. In the UCERF3 model, the San Vicente fault is 8.8 km long, and extends from 17 km depth upward to 1.6 km below the ground surface, with an average dip of 66° north (Field et al., 2013). Given this geometry, and using the average of the three empirical magnitude-scaling relationships for rupture area used in UCERF3 (i.e., Hanks and Bakun, 2008; "EllsworthB" [WGCEP, 2003]; and Shaw, 2009), yields a moment magnitude (M) of 6.2 for the San Vicente fault. Using this magnitude and the magnitude-displacement regressions of Wells and Coppersmith (1994) for all slip types yields 0.3 m (average) to 0.4 m (maximum) coseismic displacement. However, these displacement estimates were calculated for slip on the fault plane, which at its shallowest is approximately 1.6 km below the ground surface. Coseismic deformation of the ground surface, if any, would be a small fraction of this amount and would be distributed as folding or tilting of the ground surface over a broad area above the surface projection of the fault plane. The fact that there is no geomorphic expression of the San Vicente fault in the landscape is consistent with very minor to no coseismic deformation in the Quaternary Period.

Santa Monica Fault

The onshore extension of the Malibu Coast Fault has been designated as the Santa Monica Fault. The fault is buried under unconsolidated alluvial sediments and is not exposed anywhere at the ground surface and has been located based on well logs, fault trenches, and geophysical data. For this reason, the precise location of the fault is not known. The Santa Monica Fault is an oblique/left-lateral fault which exhibits pronounced near-surface strain which has caused development of a series of near-vertical, left-lateral strike slip faults and a near-surface blind thrust. Work performed in 1992 and 1993 by James F. Dolan and Kerry Sieh for the Caltech Seismological Laboratory consisted of fault trenching, geomorphic mapping and paleoseismologic analysis. The results of their studies indicate that at least three surface-rupturing earthquakes have occurred on one of the fault strands during the past 12,000 to 15,000 years. The predicted recurrence interval is approximately 4,000 to 5,000 years. Researchers consider the Santa Monica Fault to be active.

Elysian Park Thrust

The Elysian Park Thrust consists of a series of shallowly north and northeast-dipping blind thrusts that extend from Orange County through downtown Los Angeles and westward beneath the Santa Monica Mountains. The thrust system is not exposed at the surface but is buried under the unconsolidated alluvial sediments of the Los Angeles Basin. These subsurface thrust faults are capped and structurally reflected at the surface known as the Elysian Park anticline. Recent studies suggest that the fault experiences an average slip rate of 1.5mm/year and is capable of producing a Magnitude 6.7 earthquake.

Newport-Inglewood Fault Zone

The Newport-Inglewood Fault Zone (NIFZ) is about 75 km and consists of a series of right lateral strike-slip faults that trends northwest-southeast forming an alignment of hills from Newport Mesa to Cheviot Hills along the western side of the Los Angeles Basin. The NIFZ is characterized at the surface by a belt of domal hills and mesas formed by the folding and faulting of thick sequences of Pleistocene age sediments and Tertiary age sedimentary rocks (Barrows, 1974). The fault was the source of the 1933 Long Beach earthquake (M_w 6.4). The recurrence interval is estimated on the order of a thousand years or more (Freeman et al., 1992; Shlemon et al., 1995; Grant et al., 1997). The slip rate on the Newport-Inglewood fault is not fully constrained but appears to be approximately 0.5 to 1 mm/year in the north, and increasing to 0.5 to 1.5 mm/year in the south (USGS, 2015).

Table 3 - MAJOR FAULT CHARACTERIZATION IN THE PROJECT VICINITY

FAULT	APPROXIMATE DISTANCE ¹ (kilometers)	APPROXIMATE DISTANCE ¹ (miles)	TYPE OF FAULT ²	MAXIMUM EARTHQUAKE MAGNITUDE ³ (Mw)
San Vicente	0.2	0.1	Blind Thrust	6.17
Santa Monica	2.1	1.3	Reverse	6.63
North Salt Lake	2.4	1.5	Reverse	5.82
Elysian Park	3.1	1.9	Thrust	6.72
Newport-Inglewood	3.7	2.3	Strike Slip	6.99
Puente Hills	4.0	2.5	Blind Thrust	6.92
Hollywood	4.3	2.6	Reverse/ Strike Slip Component	6.54
Raymond	14.2	8.8	Reverse Oblique	6.55
Malibu Coast	16.0	10.0	Reverse	6.48
Verdugo	16.3	10.1	Reverse	6.75
Anacapa-Dume	18.7	11.6	Reverse	7.05
Northridge Hills	20.5	12.8	Reverse	6.86
Palos Verdes	21.4	13.3	Strike Slip	7.15
Sierra Madre	22.6	14.0	Reverse	7.01
Mission Hills	22.8	14.2	Reverse	6.37
Compton	25.1	15.6	Blind Thrust	7.29
Santa Susana	27.1	16.9	Thrust	6.73
Northridge	27.5	17.1	Blind Thrust	6.74
Redondo Canyon	28.1	17.5	Reverse	6.49
San Gabriel	28.2	17.5	Strike Slip	7.08
Whittier	29.9	18.5	Reverse-Oblique	6.83
Notes:				
1. Distance to fault, R_x , which is defined as the perpendicular distance from the site to the surface projection of the top of fault.				
2. Fault characterization based on Field et al., 2013.				
3. The maximum earthquake magnitude is estimated using the Leonard 2010 magnitude-area scaling relations.				
4. Fault data based on Uniform California Earthquake Rupture Forecast, Version 3 (Field et al., 2013).				

4.3.3 Liquefaction and Seismically-Induced Settlement

Liquefaction is a phenomenon whereby saturated, granular soils lose their inherent shear strength due to excess pore water pressure build-up, such as that generated during repeated cyclic loading from an earthquake. A low relative density and loose consistency of the granular materials, shallow ground-water table, long duration and high acceleration of seismic shaking are some of the factors favorable to cause liquefaction.

According to the Earthquake Zones of Required Investigation Map (Figure 11), the Project site is not located within the liquefaction zone area. However, the further site-specific liquefaction analyses were performed following the procedures recommended by Seed et al (2003) to assess any potential impact assuming the design groundwater at 1 and 7 feet bgs, with peak ground acceleration (PGA_M) of 0.93 and the corresponding moment magnitude of 6.625.

Based on the results of the liquefaction analyses, the potential of liquefaction and liquefaction-induced settlement are not expected to occur due to the soil below the groundwater level consisting predominately of fine-grained soils and dense to very dense, tar-impregnated sands with low liquefaction-susceptibility.

Therefore, the potential for liquefaction as well as seismically-induced settlement is considered remote at the Project site. Results of liquefaction analyses are presented in Appendix E.

Since the groundwater was present at relatively shallow depths and soil above the groundwater level also consist predominately of fine-grained soils, dry sand settlement due to ground shaking is also considered remote at the Project site.

4.3.4 Earthquake-Induced Landslide / Mudflow

Hazards associated with seismic-induced slope instability include landslides and mudflows. According to the Earthquake Zones of Required Investigation Map (Figure 11), the Project site is not located within areas designated by the state geologist where previous occurrence of landslide movement or local topographic, geological, geotechnical and subsurface conditions indicate a potential for permanent ground displacement to the event that mitigation would be required. The Project site is located in a relatively flat, low-lying sediment-filled plain. The potential for slope stability hazards at the Project site is negligible.

4.3.5 Earthquake-Induced Flooding

According to City of Los Angeles Safety Element Department of City Planning Los Angeles, 1996, (100-Year & 500-Year Flood Plains, Exhibit F), the Project site is not located within either 100-Year or 500-Year flood plain areas. Therefore, the possibility of flooding at the project site is very minimal. However, the project civil engineer should verify the flooding potential.

According to City of Los Angeles Safety Element (Department of City Planning, Los Angeles, 1996), Inundation & Tsunami Hazard Areas, Exhibit G, the Project site is located within a potential dam inundation area from the nearest body of water known as the Hollywood Reservoir. However, the reservoir is located approximately 4 miles toward the northeast and as such, hazards related to flood inundation are considered low to the Project Site.

4.3.6 Tsunamis / Seiches

The Project Site is located approximately 8.5 miles from the Pacific Ocean shoreline. According to City of Los Angeles Safety Element (Department of City Planning, Los Angeles, 1996), Inundation & Tsunami Hazard Areas, Exhibit G, the Project site is not located within the potential tsunami hazard area. Therefore, tsunamis are not considered a significant hazard to the Project Site. Large bodies of uncovered water such as reservoirs, lakes or ponds are not located adjacent to the Project site; therefore seiches are not considered a hazard.

SECTION 5 RECOMMENDATIONS TO HAZARDS

Recommendations to mitigate the potential geologic and seismic hazards as mentioned before are presented in following sections. Based on the latest structural studies, we understand that a deep foundation supporting the mat slab had been selected for the proposed Museum Building and maybe also for Ogden Parking Structure. The mitigation measures will be incorporated into the final geotechnical design for the Project.

Geotechnical observation and testing during the implementation of the mitigation will be required during the foundation construction, earthwork/grading, and any other geotechnical-related construction activities as means of ensuring impact risks if any, can be reduced to less than significant impact.

5.1 EXPANSIVE SOIL

The clay soils encountered within the artificial fill and alluvium are subject to expansion and shrinkage resulting from changes in the moisture content. Volumetric change of expansive soil may cause excessive cracking and heaving of lightly loaded structures with shallow foundations, concrete slabs-on-grade, or pavements supported on these materials. Tests performed indicate the fine-grained clayey artificial fill and alluvial deposits have a medium to high expansion potential. These materials are expected below the Project site and therefore, the potential for swelling from expansive soil do exist and will have an impact to lightly loaded foundation elements and concrete flatwork.

However, the potential impacts due to expansive soils could be reduced to low levels with incorporation of techniques such as over-excavation and replacement with non-expansive soil, soil treatment, moisture management, and/or specific structural design for expansive soil conditions developed during design of the Project. In addition, geotechnical observation and Expansion Index of soil testing per ASTM D4829 conducting during construction should be implemented to ensure the impact risk due to expansive soil is less than significant once the aforementioned mitigation is incorporated.

5.2 CORROSIVE SOILS

Mitigation of corrosive soil conditions may involve the use of concrete resistant to sulfate exposure. Corrosion protection for metals may be needed for underground foundations or structures in areas where corrosive groundwater or soil could potentially cause deterioration. Typical mitigation techniques include epoxy and metallic protective coatings, the use of alternative (corrosion resistant) materials, and selection of the appropriate type of cement and water/cement ratio. Further details regarding corrosion protection are provided in Soil Corrosivity Report prepared by Project X Corrosion Engineers dated February 18, 2016, which is included in Appendix D. Therefore, the impact due to corrosive soil can be mitigated and the impact risk can be reduced to less than significant with proper reinforced concrete design. The reinforced concrete design will be performed following the latest Building Code during the design phase, and will be reviewed and approved by the governing agency.

5.3 OIL WELLS

Although the likelihood is low, should any known or previously undiscovered oil production wells be encountered on the Project Site during construction activities, the Applicant or construction manager

should halt work in the immediate area and notify DOGGR and the City of Los Angeles Fire Department immediately. Any such wells should be abandoned or re-abandoned in accordance with the requirements of DOGGR and the Los Angeles Fire Department.

5.4 TAR SANDS

Excavation spoils especially sandy soils from below 10 feet deep or below groundwater will likely contain hydrocarbon from natural oil and tar at the LACMA East and Spaulding Lot. These soils will require chemical analyses for offsite disposal characterization. Although more than 20 feet thick of fill was placed at Ogden Lot to backfill a previous shored excavation in 2010, the tar may have penetrated upward into this backfill soils and reach to the shallow depth. If the excavation spoils is characterized as non-hazardous, the Investigation-Derived Waste (IDW) can be disposed of at a treatment, disposal, and storage facility (TDSF). However, if the IDW is characterized as hazardous, the IDW will have to be disposed at a hazardous waste facility.

5.5 METHANE

AECOM recommends full mitigation for methane hazard during the design and construction phases of the Project in accordance with City of Los Angeles' Methane Mitigation ordinance for all 4 portions of the Project site (LACMA East, Spaulding Lot, Ogden Lot, and cooling tower at LACMA West). Detailed information of design approach and construction controls/precautions are provided in the Methane Report (Methane Specialists, July 2016).

5.6 CONTAMINATED GROUNDWATER

No permanent dewatering is anticipated as part of the Project. Temporary dewatering could be required for basement and foundation excavations during the construction period and could consist of sumps and/or trenches, pumped wells or vacuum well points. Due to the presence of the natural oil and tar in the subsurface soils, contaminated groundwater may be encountered when performing temporary construction dewatering. For temporary dewatering at the Project site, the groundwater will have to be chemically analyzed in order to determine the appropriate treatment and/or disposal methods.

5.7 SEISMIC GROUND SHAKING

Mitigation of the potential impacts of seismic ground shaking can be achieved through appropriate ground motion analysis and Project structural design. Site-specific ground motion based on the latest seismic design standard had been developed by Lettis Consultants International (LCI) and AECOM, and is provided to Skidmore, Owens, and Merrill (SOM) for Project structural design. Base isolation systems supported on piles will be used for the proposed museum structure. This appropriate structural design and mitigation techniques would reduce the impacts related to seismic ground shaking to comply with the building code requirements.

5.8 FIELD INFILTRATION CHARACTERISTICS

In accordance with the Guideline for Design, Investigation, and Reporting - Low Impact Development (LID) Stormwater Infiltration (GS200.1) by County of Los Angeles, Department of Public Works

(LACDPW), Geotechnical and Materials Engineering Division (GMED), the invert of stormwater infiltration shall be at least 10 feet above the groundwater elevation. With the shallow groundwater encountered during the recent investigations and monitoring programs, it is concluded that infiltration is not a feasible mitigation measure for LID. The aforementioned LACDPW GMED guideline applies to LACMA East and Spaulding Lot, while a similar restriction per Information Bulletin / Public - Building Code (P/BC) 2017-118 by City of Los Angeles Department of Building and Safety applies to the separated Ogden Lot.

Due to the shallow groundwater, the Project Site portions (LACMA East, Spaulding Lot, Ogden Lot, and cooling tower at LACMA West) are not considered suitable for stormwater infiltration. Other mitigation measures should be utilized for LID, considering the site near-surface soils with potentially high tar content.

Since the proposed structures will be designed considering shallow groundwater (i.e., retaining structure with hydrostatic pressure, foundation capacities based on effective unit weight, etc.), adverse impact due to incidental infiltration, if any, is considered remote. Therefore, it is our opinion that biofiltration system can be used for the Project from geotechnical standpoint.

5.9 SETTLEMENT DUE TO DEWATERING

Temporary dewatering during construction will change the groundwater conditions and the reduction of pore pressure will change the effective stress within soils. However, the magnitude of construction dewatering induced settlement, if any, is highly dependent on the drawdown shapes from the water extraction point(s), and the location and type of the foundations to be impacted for the adjacent existing improvements.

We noted that currently MTA Purple Line project has been implementing temporary dewatering for the Wilshire/Fairfax station construction and there has not been adverse impact on the adjacent existing improvements reported related to the construction. Considering the scale of excavation and the associated construction dewatering for LACMA Project which is smaller than the aforementioned MTA project, it is unlikely the significant settlement will be occurred at the adjacent existing buildings during the temporary construction dewatering.

The instrumentation program during construction shall be implemented to monitor any potential impact due to dewatering as part of the mitigation measures. Periodic monument survey on selected ground features and critical locations adjacent to neighboring properties shall be performed. In addition, groundwater monitoring wells with water level loggers should be installed at locations adjacent to the property lines to monitor the groundwater level continuously. If such monitoring should detect any unanticipated issues, construction dewatering shall be temporarily halted and the issues shall be addressed and corrected immediately. Therefore, the impact risk due to dewatering can be mitigated to less than significant impact.

SECTION 6 REFERENCE

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SECTION 7 LIMITATIONS

AECOM has evaluated the geotechnical conditions and potential geologic and seismic hazards at the Project site by reviewing readily available geotechnical data, and performing a site reconnaissance to provide a preliminary geotechnical report which can be utilized in the preparation of environmental documents for the project.

Geotechnical engineering and the geologic sciences are characterized by uncertainty. Professional judgments presented herein are based partly on our understanding of the proposed construction, and partly on our general experience. Our engineering work and judgments rendered meet current professional standards; we do not guarantee the performance of the Project in any respect.

- o0o -

It has been a pleasure to assist you with this Project. We look forward to being of further assistance as construction begins. Should you have any questions regarding this report, please contact us.

Very truly yours,

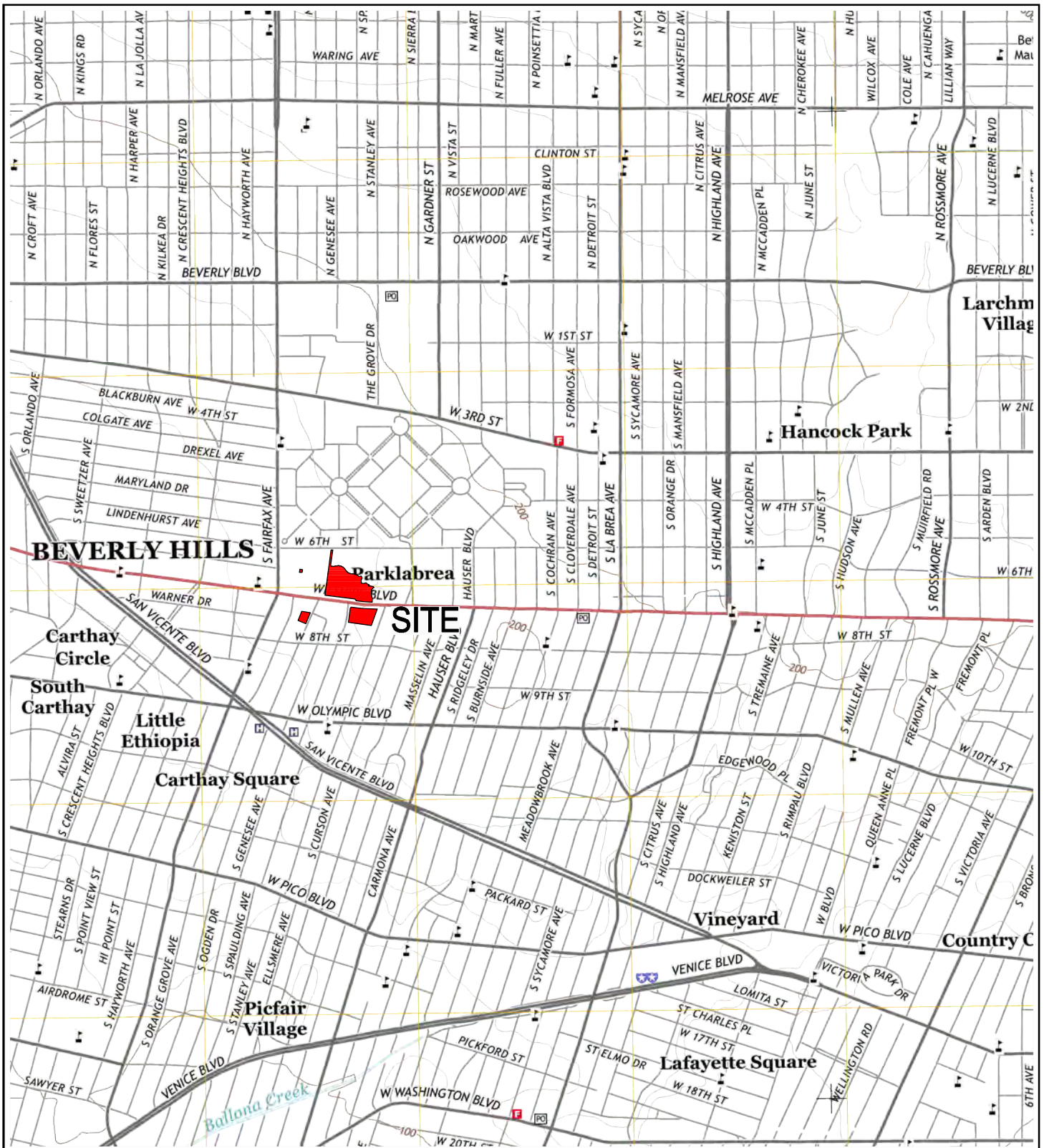
AECOM

S. Neville Su, P.E., G.E.
Geotechnical Task Leader

Joseph P. Gratzner, P.G., C.E.G.
Project Engineering Geologist

Reviewed by:

C. Garry Lay, P.E., G.E.
Principal Engineer/Vice President

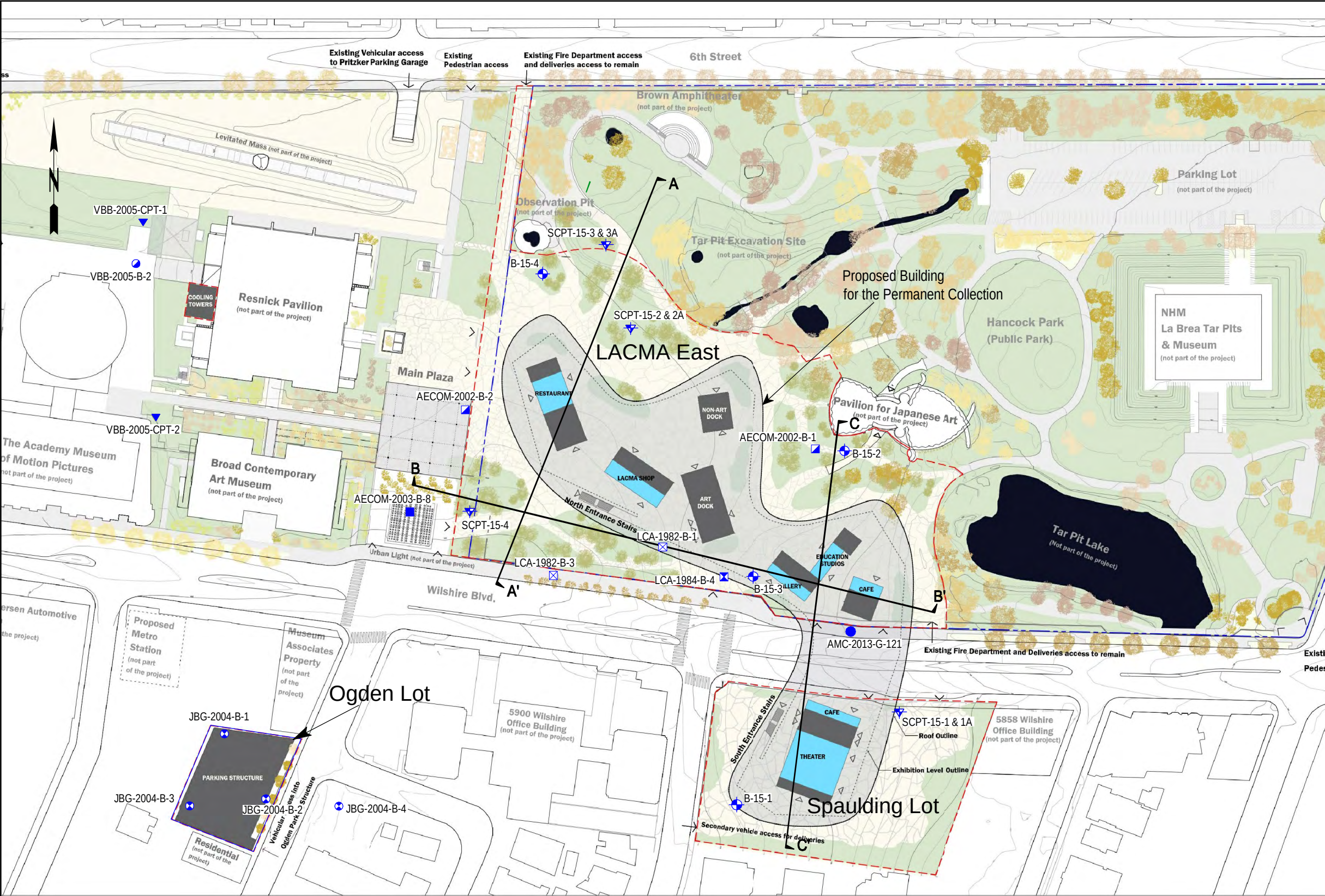


VICINITY MAP

LACMA Building for the Permanent Collection Project
 Los Angeles County Museum of Art
 5905 Wilshire Boulevard, Los Angeles, CA 90036

AECOM

FIGURE 1



LEGEND

- LCA-1982-B-3 Leroy Crandall (dated 3/9/1982) Boring Location & Number
- LCA-1984-B-4 Leroy Crandall (dated 5/3/1984) Boring Location & Number
- AECOM-2002-B-2 AECOM (dated 8/2/2002) Boring Location & Number
- AECOM-2003-B-8 AECOM (dated 11/12/2003) Boring Location & Number
- JBG-2004-B-4 J. Byer Group (dated 3/22/2004) Boring Location & Number
- VBB-2005-B-2 Van Beveren & Butelo (dated 1/27/2005) Boring Location & Number
- VBB-2005-CPT-2 Van Beveren & Butelo (dated 1/27/2005) CPT Location & Number
- AMC-2013-G-121 AMEC (dated 5/22/2013) Boring Location & Number
- B-15-4 Current AECOM Boring Location & Number
- SCPT-15-4 Current AECOM SCPT Location & Number
- Geologic Cross Sections

KEY

Project Boundary Line

Hancock Park

Pedestrian Site Access Points

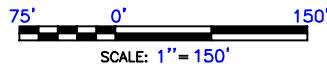
Vehicular Site Access Points

Building Access Points

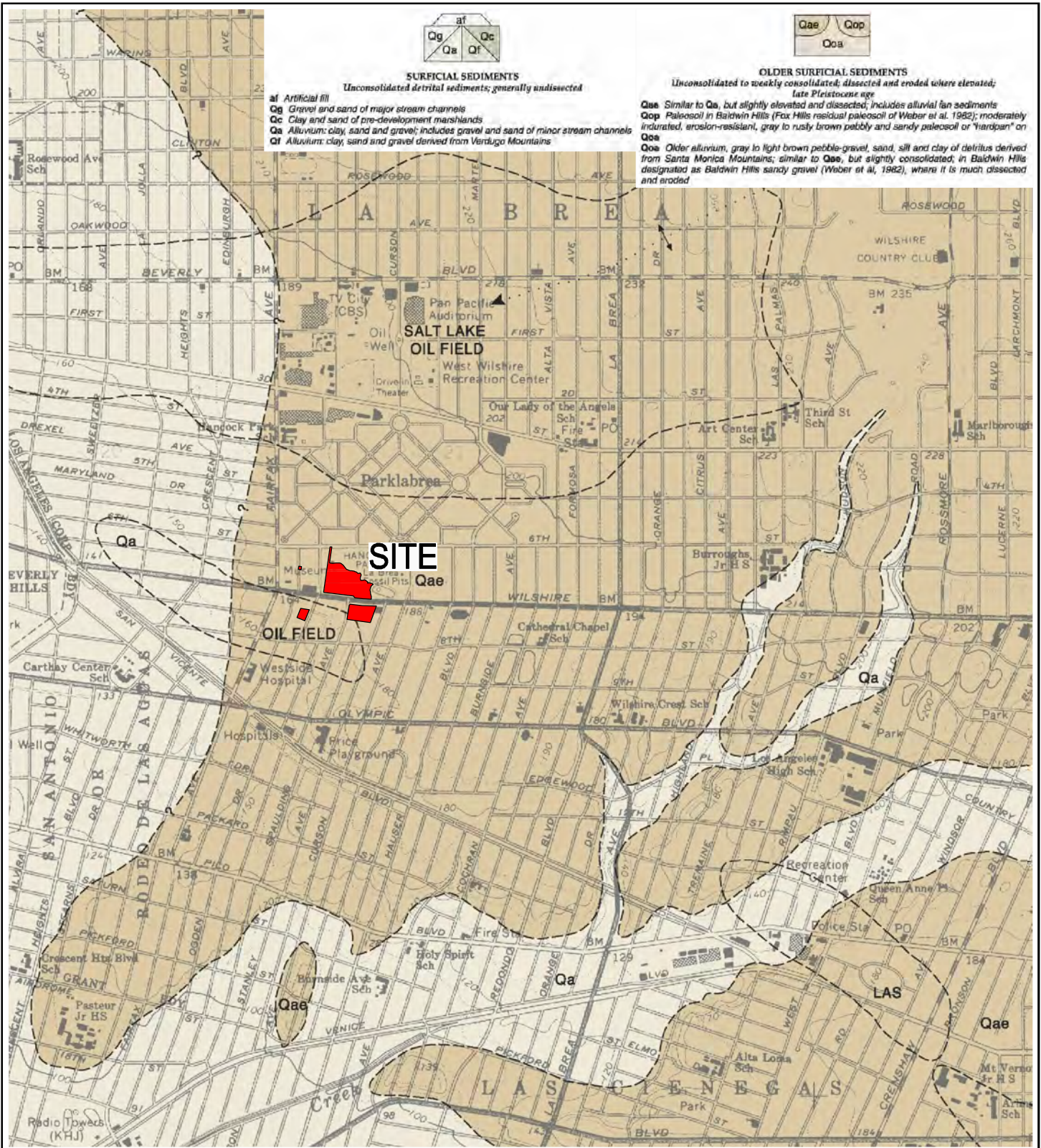
Public Program

Back of House Program

CONCEPTUAL SITE PLAN AT GROUND FLOOR
LACMA Building for the Permanent Collection Project
Los Angeles County Museum of Art
5905 Wilshire Boulevard, Los Angeles, CA 90036



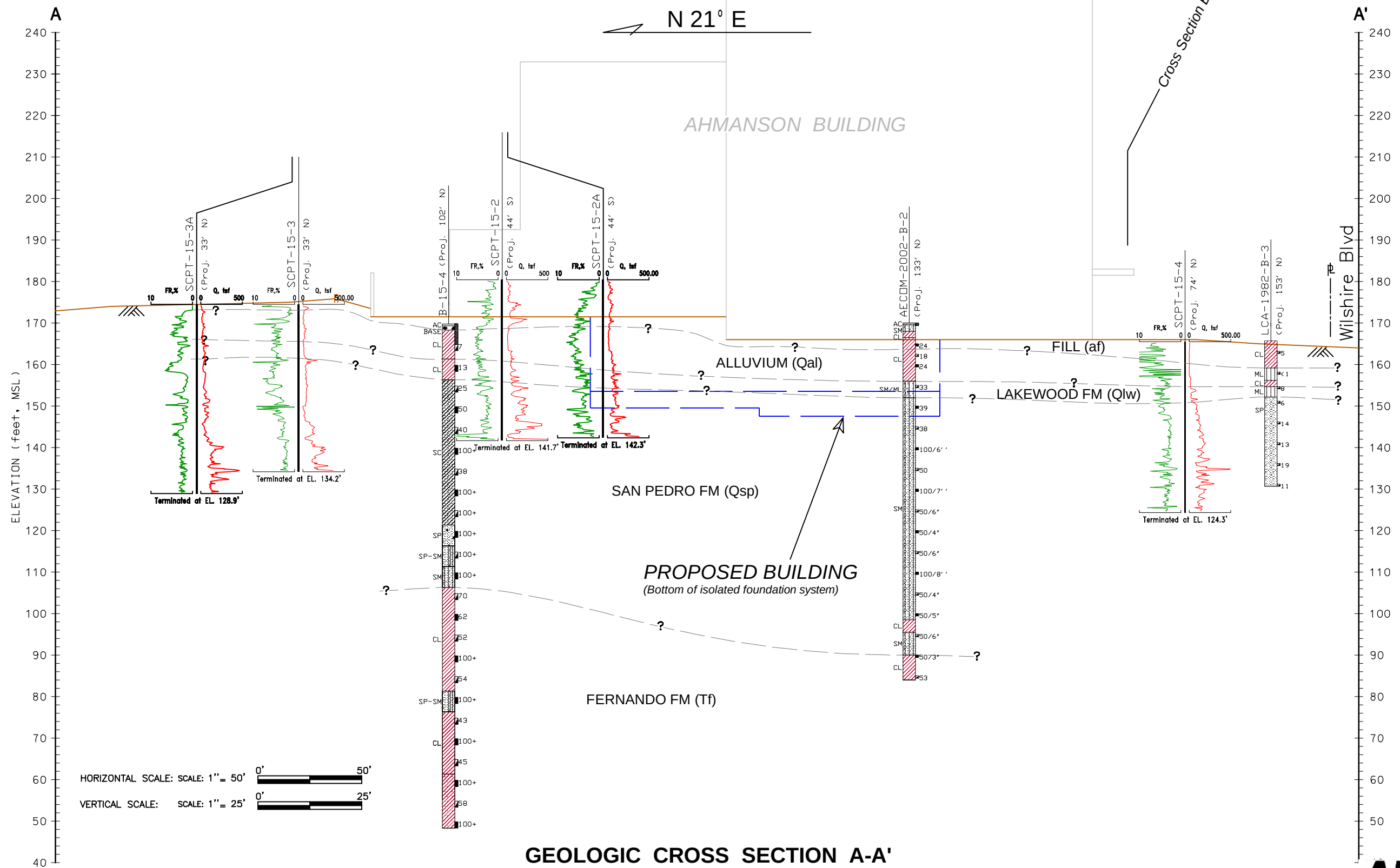
Reference: Conceptual Site Plan at Ground Level, provided by Craig Lawson & Co. LLC.



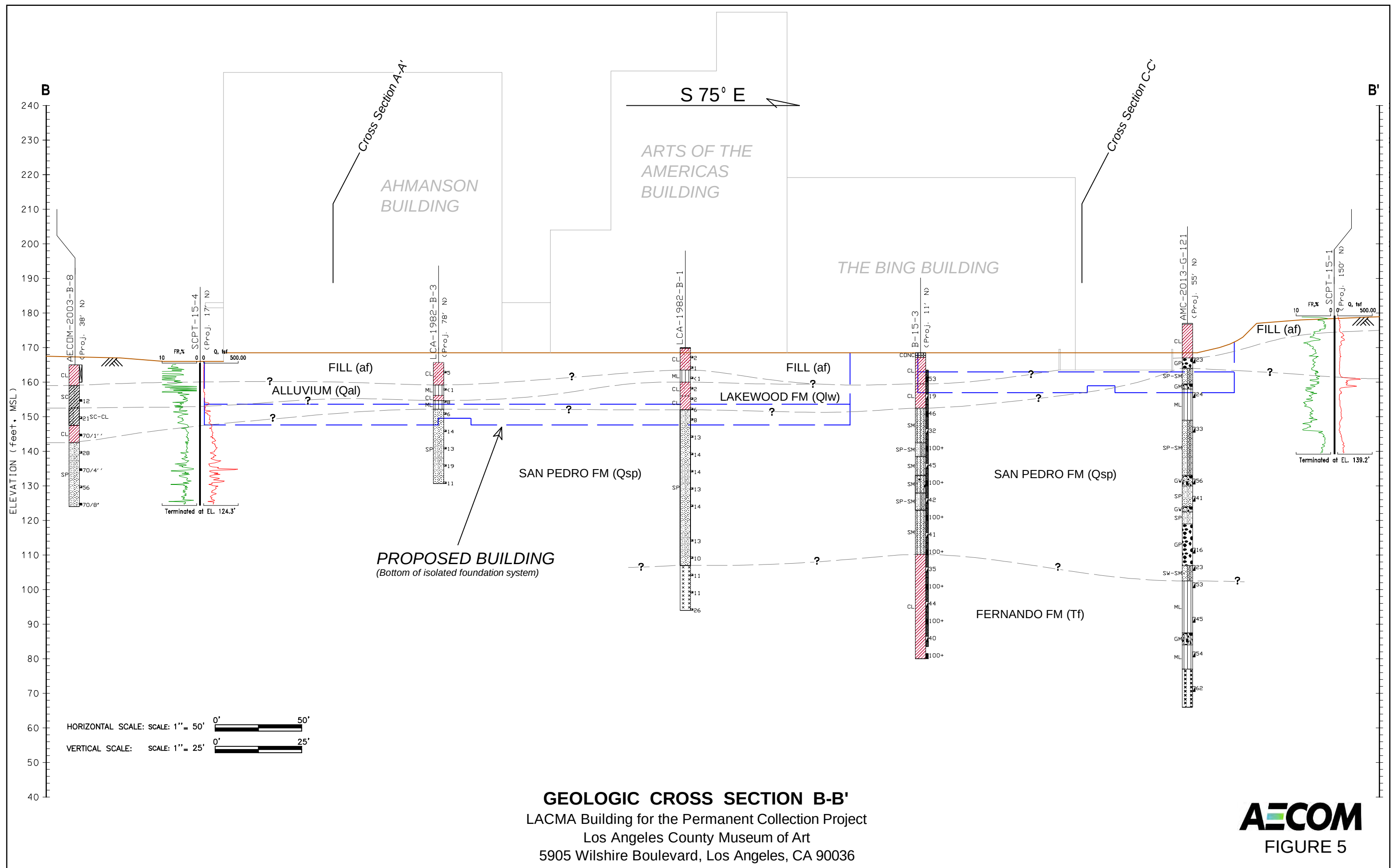
SITE GEOLOGIC MAP

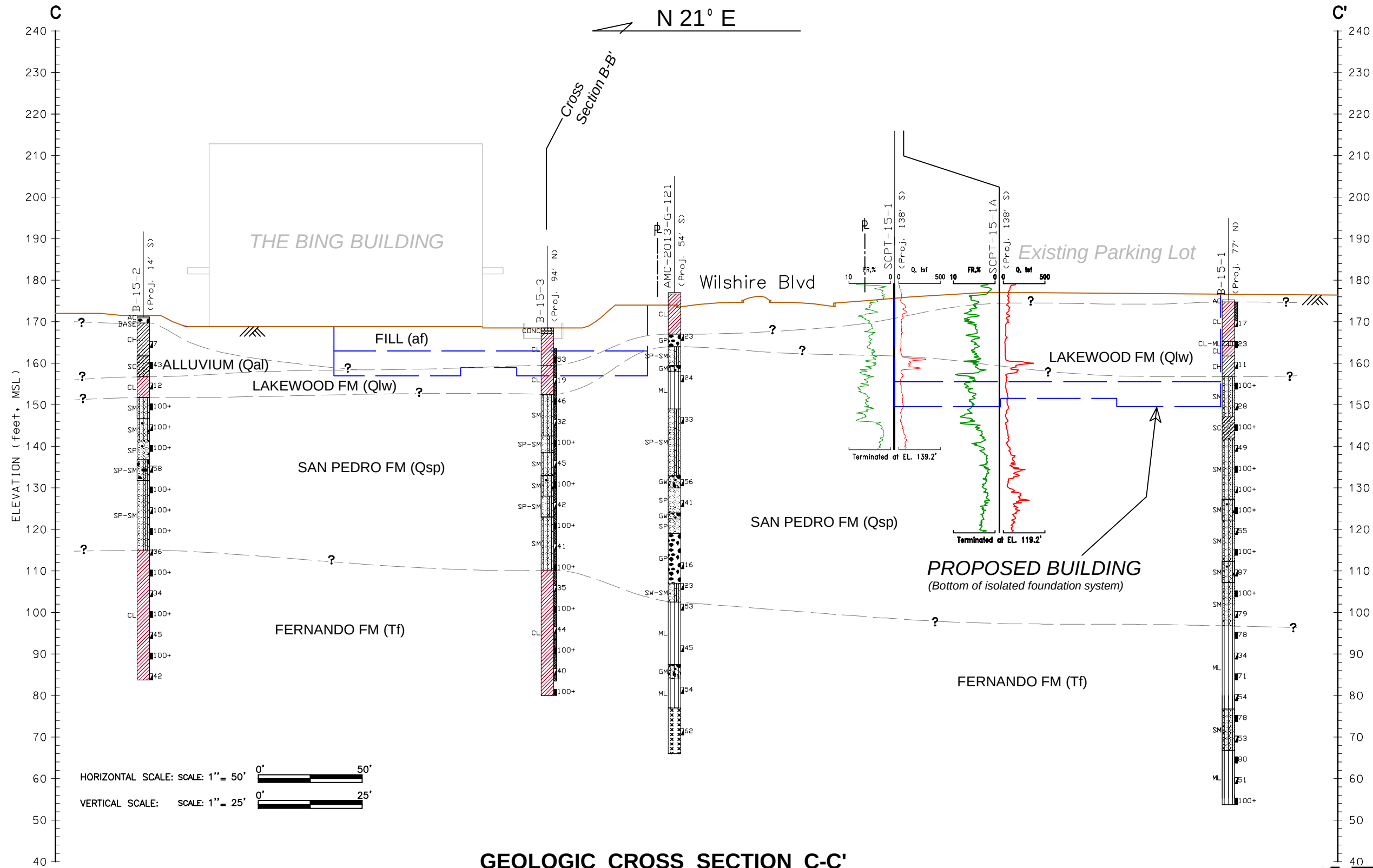
LACMA Building for the Permanent Collection Project
Los Angeles County Museum of Art
5905 Wilshire Boulevard, Los Angeles, CA 90036

AECOM
FIGURE 3



GEOLOGIC CROSS SECTION A-A'
 LACMA Building for the Permanent Collection Project
 Los Angeles County Museum of Art
 5905 Wilshire Boulevard, Los Angeles, CA 90036

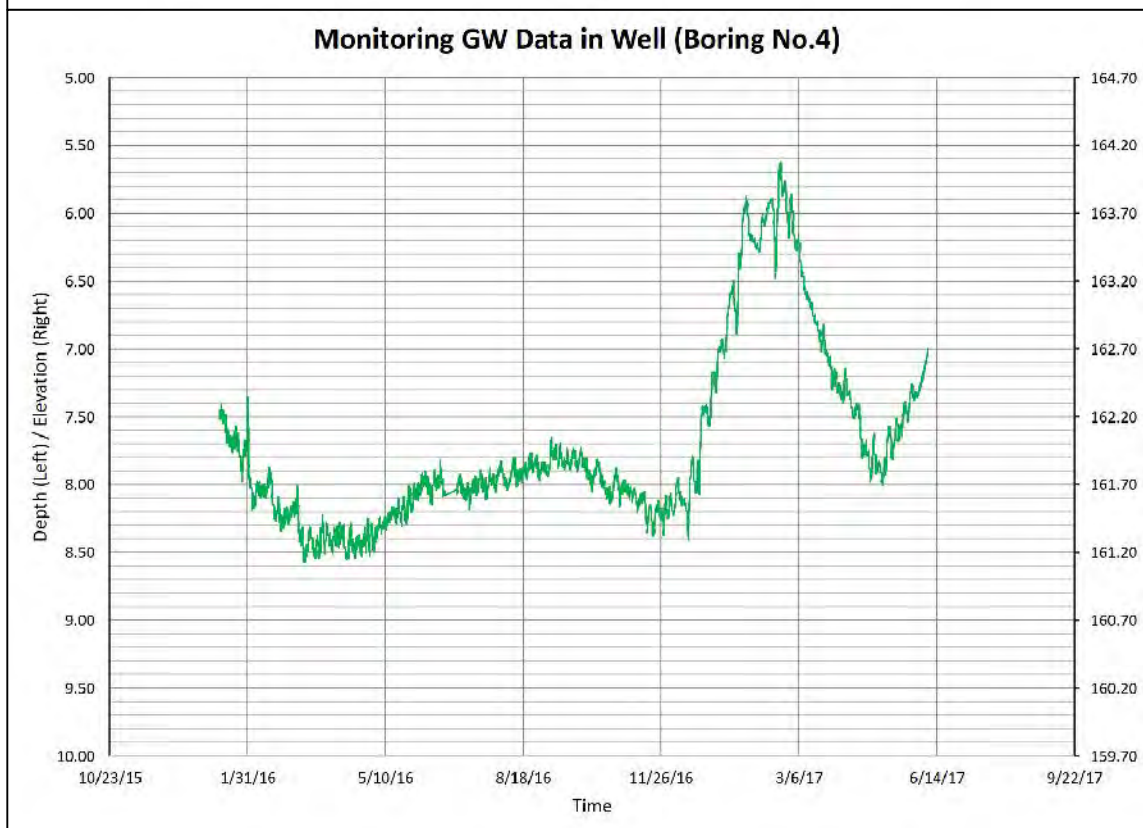
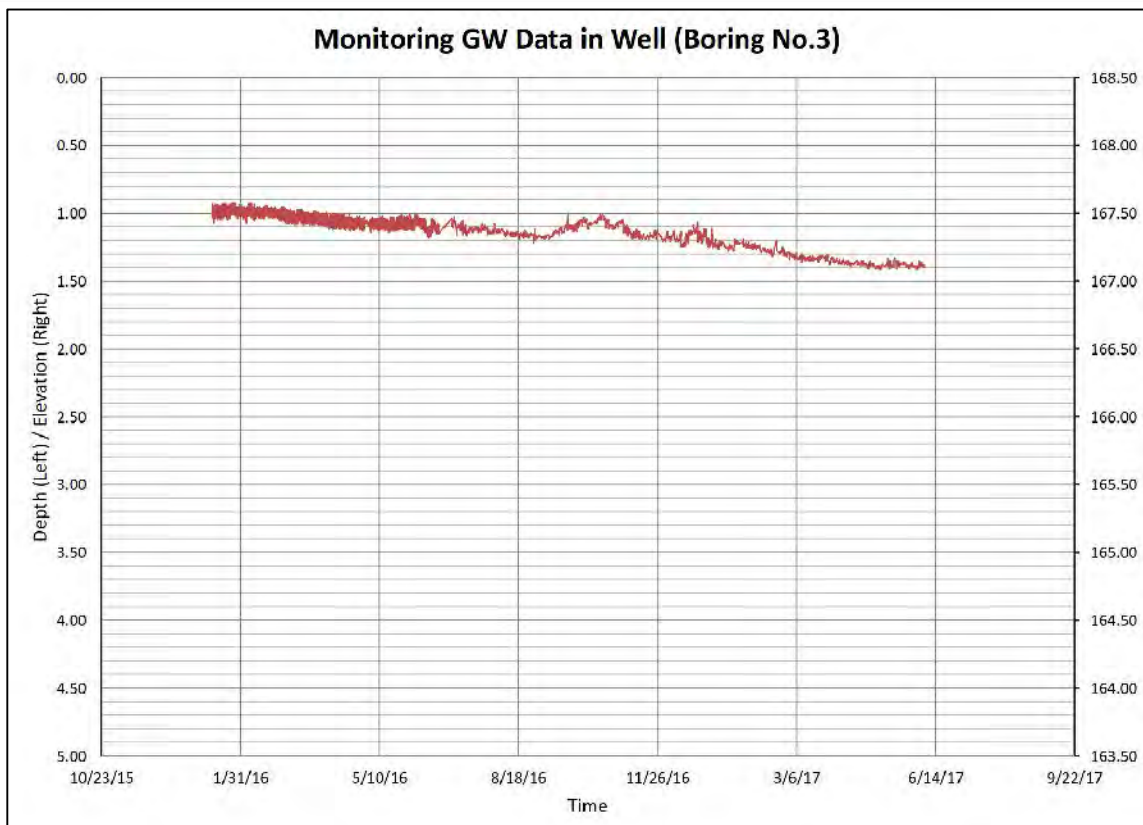




GEOLOGIC CROSS SECTION C-C'
 LACMA Building for the Permanent Collection Project
 Los Angeles County Museum of Art
 5905 Wilshire Boulevard, Los Angeles, CA 90036

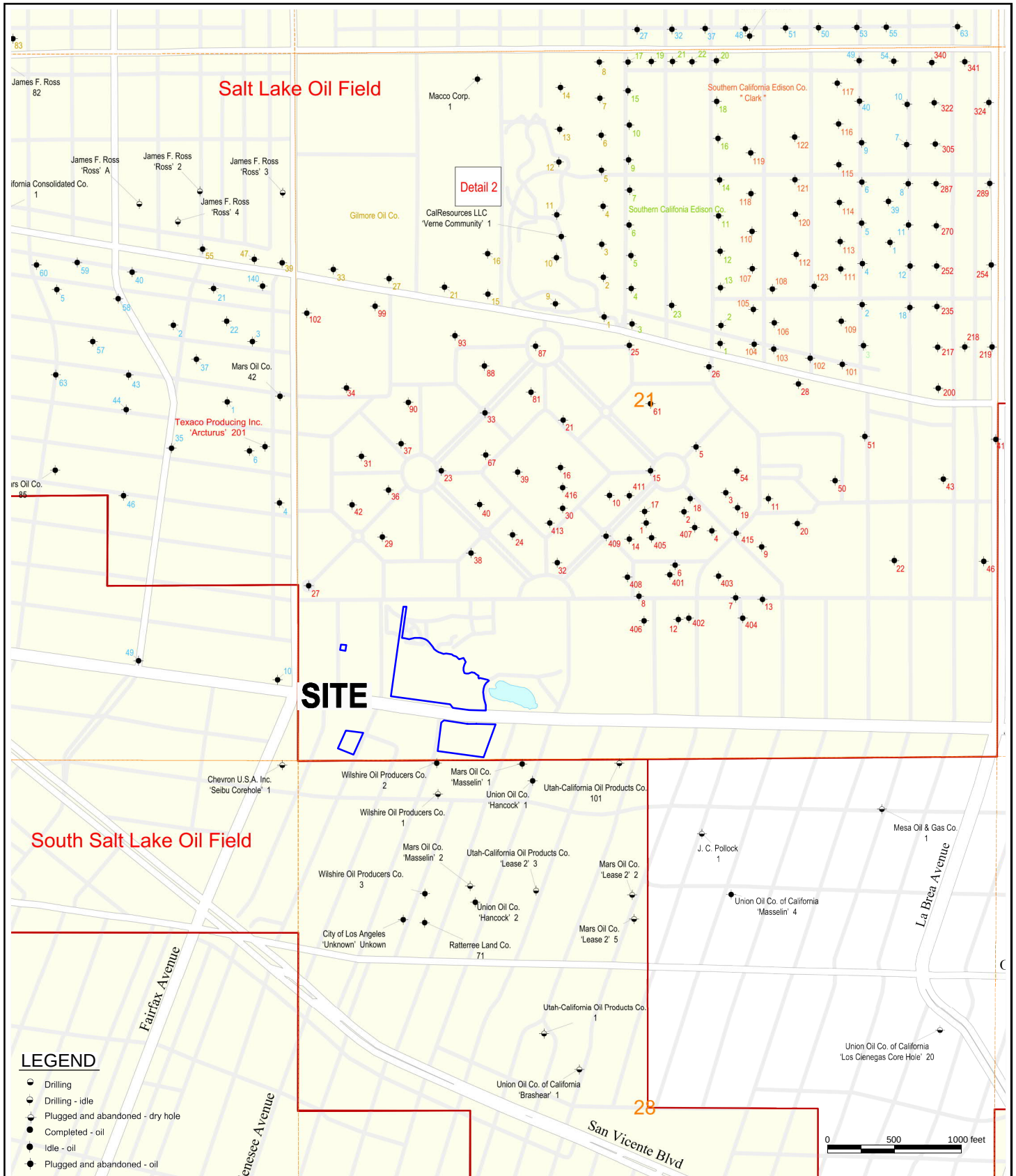


HISTORICALLY HIGHEST GROUND WATER
LACMA Building for the Permanent Collection Project
Los Angeles County Museum of Art
5905 Wilshire Boulevard, Los Angeles, CA 90036

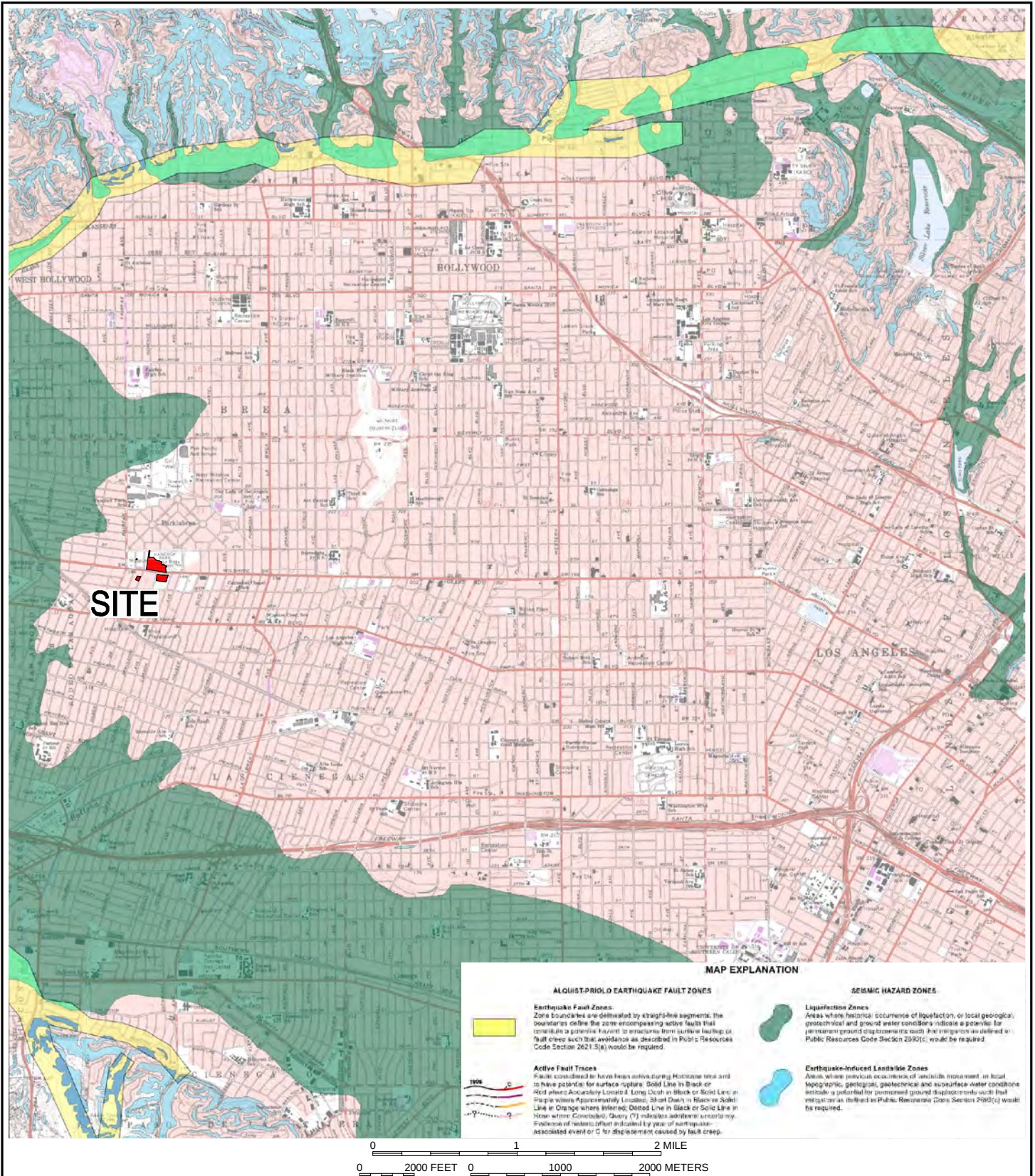


GROUNDWATER MONITORING DATA

LACMA Building for the Permanent Collection Project
Los Angeles County Museum of Art
5905 Wilshire Boulevard, Los Angeles, CA 90036



OIL, GAS & GEOTHERMAL MAP
 LACMA Building for the Permanent Collection Project
 Los Angeles County Museum of Art
 5905 Wilshire Boulevard, Los Angeles, CA 90036

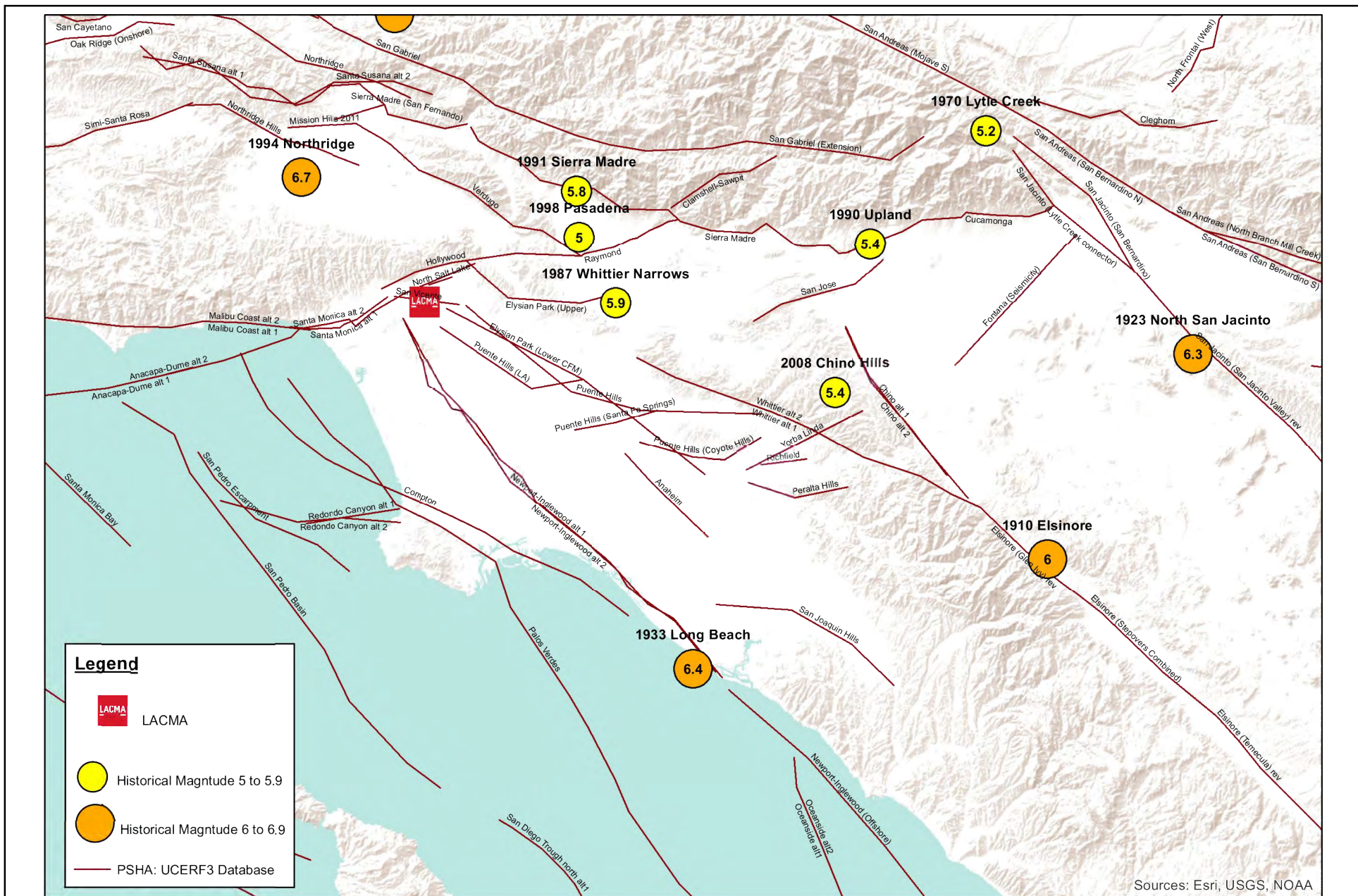


EARTHQUAKE ZONES OF REQUIRED INVESTIGATION

LACMA Building for the Permanent Collection Project
Los Angeles County Museum of Art
5905 Wilshire Boulevard, Los Angeles, CA 90036

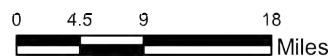
AECOM

FIGURE 11



REGIONAL FAULT MAP

LACMA Building for the Permanent Collection Project
 Los Angeles County Museum of Art
 5905 Wilshire Boulevard, Los Angeles, CA 90036



170.0***

CL	4" Concrete Slab FILL - SANDY CLAY - streaks of asphalt, some gravel, black and grey Pieces of tile
ML	SANDY SILT - some Clay, dark greyish-brown
CL	SANDY CLAY - dark greyish-brown
CL	SILTY CLAY - grey and brown Streaks of asphalt Petroleum odor
SP	SAND - IMPREGNATED WITH ASPHALT - fine, black

* Liquids that are evaporated at 105°C.

** Within the asphaltic soils, the dry densities include the weight of soil and non-volatile asphalt.

*** Elevations refer to datum of reference drawing; see Plate 1 for location and elevation of bench mark.

▽ Indicates surface of firm soils.

Some gravel

- * Liquids that are evaporated at 105°C.
- ** Within the asphaltic soils, the dry densities include the weight of soil and non-volatile asphalt.
- *** Elevations refer to datum of reference drawing; see Plate 1 for location and elevation of bench mark.

▽ Indicates surface of firm soils.

Some gravel

(CONTINUED ON FOLLOWING PLATE)

LOG OF BORING

LEROY CRANDALL AND ASSOCIATES

NOTE THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREIN APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

Form 123 JOB # 81396 DATE 12/18/81 DR JOHN C F MD WP CHKD *MD* fm

BORING I (CONTINUED)

DATE DRILLED December 14, 1981
EQUIPMENT USED 5"-Diameter Rotary Wash

LCA-1982-B-1

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

ELEVATION (ft.)	DEPTH (ft.)	VOLATILE LIQUIDS (% of dry wt.)	DRY DENSITY (lb./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC
		5.1	114	13	
125	45	7.5	115	14	
120	50				
115	55	6.2	110	13	
110	60	13.3	104	10	
105	65	27.1	79	11	
100	70	26.0	87	11	
95	75	14.5	98	26	
90	80				

About 20% gravel

Less gravel

About 10% gravel

Coarse Sand, about 20% gravel

SILTSTONE - weathered, streaks of asphalt, dark greyish-brown

NOTE: Drilling mud used in drilling process. Mud removed to 25' at completion of drilling. Water level measured at about 6½' 3 days after completion of drilling.

LOG OF BORING

Form 123 JOB A-81396 DATE 12/18/81 DR JOHN C E. W.P. CHKO

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

ELEVATION (ft)	DEPTH (ft)	VOLATILE LIQUIDS (% of dry wt)	DRY DENSITY (lbs/cu ft)	DRIVE ENERGY (ft-lbs/bl)	SAMPLE LOC
165		11.4	115	5	CL
	5				
160		33.3	86	<1	ML
	10				
155		20.9	105	8	ML
	15	10.3	116	6	SP
150					
	20	8.6	125	14	
145					
	25	7.7	119	13	
140					
	30	5.4	118	19	
135					
	35	5.9	119	11	

NOTE:

Drilling mud used in drilling process. Mud removed to 20' at completion of drilling. Water level measured at 6½' 2 days after completion of drilling.

BORING 3

DATE DRILLED December 15, 1981
EQUIPMENT USED 5"-Diameter Rotary Wash

LCA-1982-B-3

ELEVATION 165.7

FILL - SANDY CLAY - about 20% gravel, some cobbles, brown and grey
Pieces of concrete and brick
CLAYEY SILT - some Sand, black
SILTY CLAY - streaks of asphalt, grey
SANDY SILT - some Clay, streaks of asphalt, dark brown
SAND - IMPREGNATED WITH ASPHALT - fine, dark grey to black
Some fines
Some gravel

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

ELEVATION (ft.)	DEPTH (ft.)	VOLATILE LIQUIDS (% of dry wt.) *	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.) **	SAMPLE LOC.
165		30.9	100	< 1	CL
	5				
		19.6	108	2	CL
160		16.8	99	10	ML
	10				
		19.1	103	3	CL
155					
	15	17.2	99	7	
		7.0	116	11	SP
150					
	20	6.5	119	11	
145					
	25	7.3	116	14	
140					
	30	6.5	124	19	
135					
	35	4.2	116	19	
130					
	40				

BORING 4

DATE DRILLED: April 12, 1984

EQUIPMENT USED: 5"-Diameter Rotary Wash

LCA-1984-B-4

ELEVATION 168.3***

FILL - SILTY CLAY - few gravel, roots, dark grey

Exposed sewer pipe (moved boring 5' south)

SILTY CLAY (POSSIBLY FILL) - dark grey

SANDY SILT - streaks of asphalt, dark grey

SILTY CLAY - streaks of asphalt, dark grey

Some fine Sand

SAND - IMPREGNATED WITH ASPHALT - fine, black

NOTE: Drilling mud used in drilling process. Mud removed at completion of drilling. Water level measured at 4' 12 days after removal of mud.

* Liquids that are evaporated at 105°C.

** Within the asphaltic soils, the dry densities include the weight of soil and non-volatile asphalt.

*** Elevations refer to datum of reference drawing; see Plate 1 for location and elevation of bench mark.

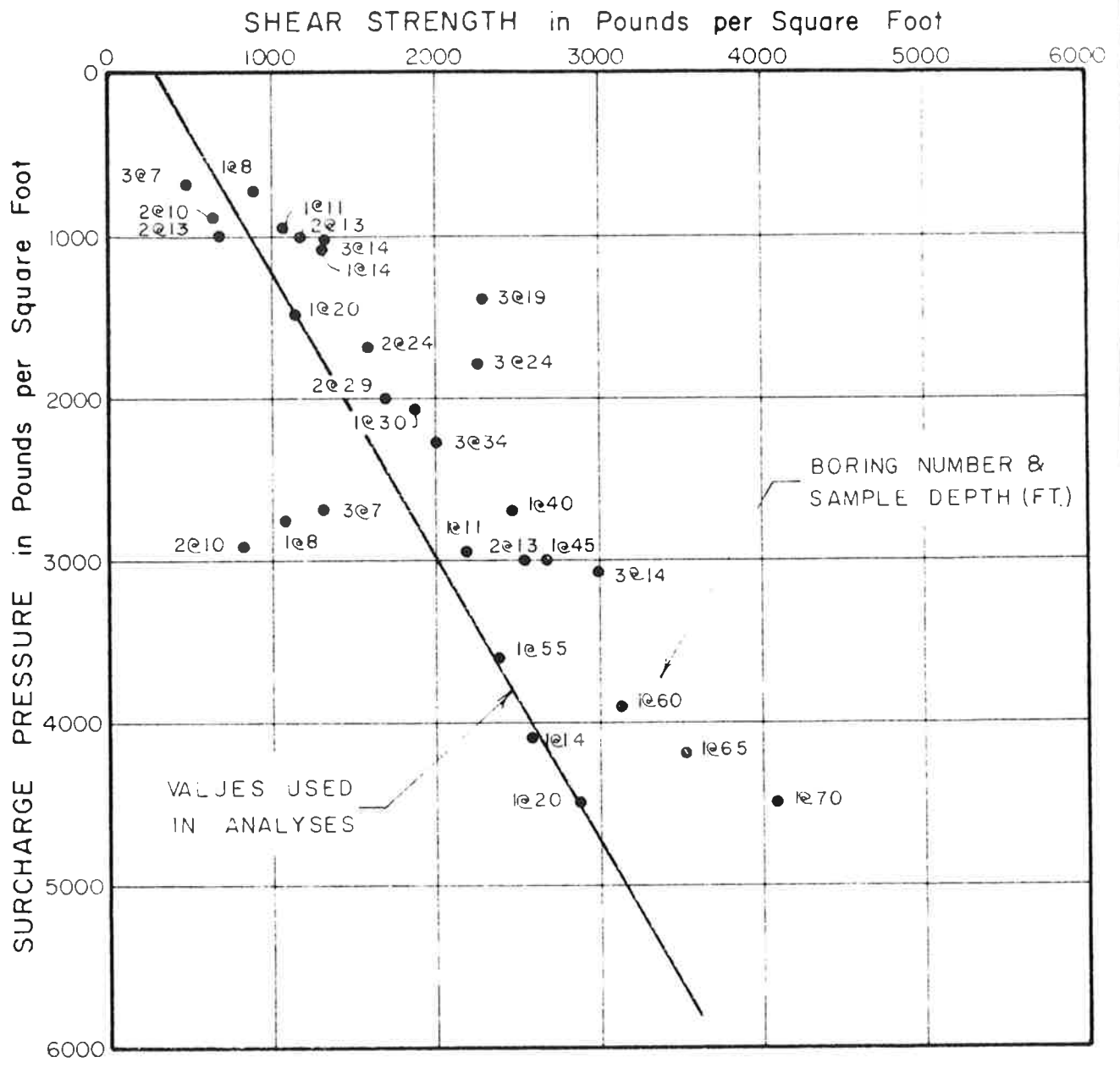
∇ Indicates surface of firm soils.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE 2

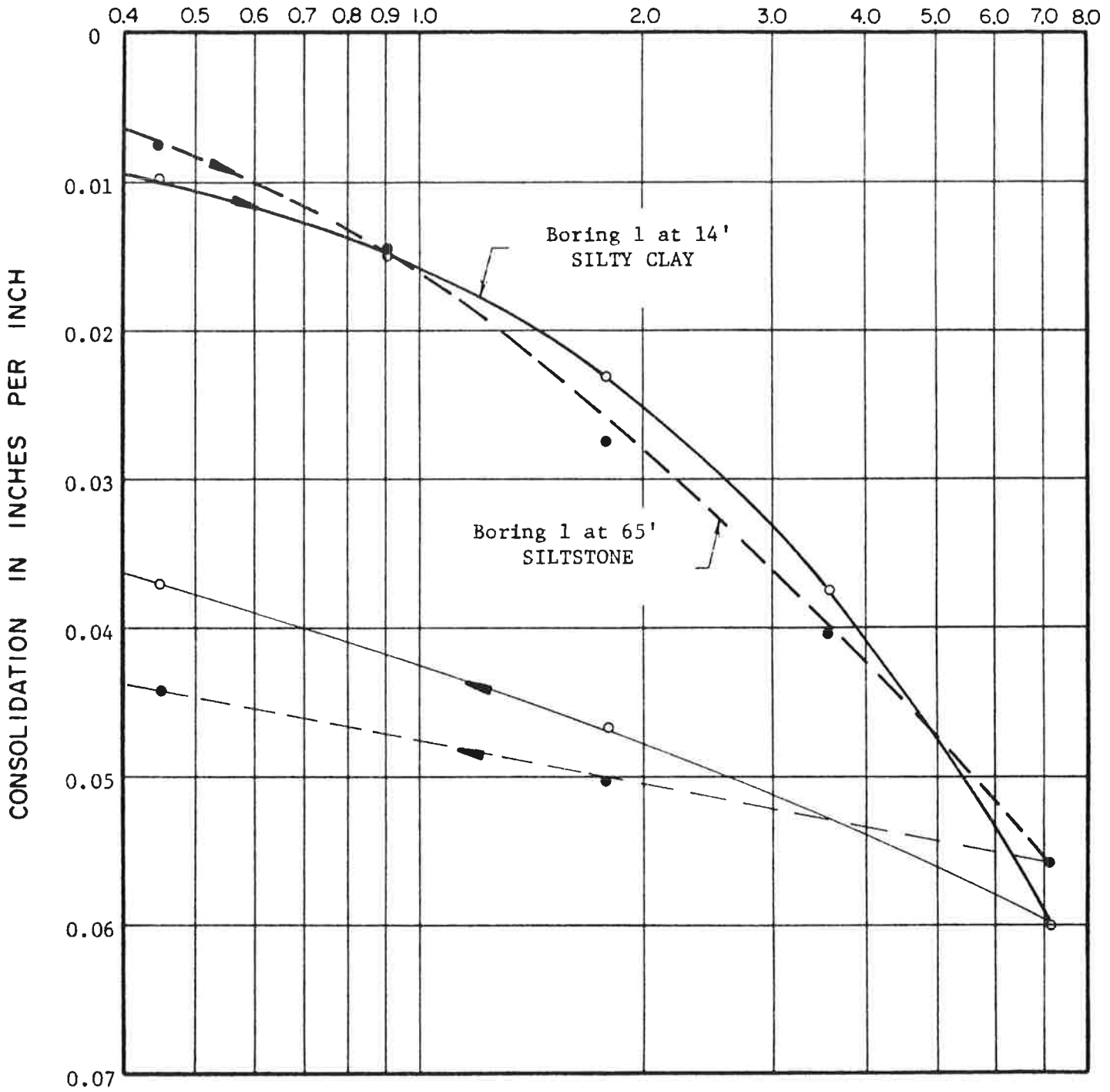
DATE 1/11/82 DR JOHN O.E. CHKD



NOTE: All samples tested at field moisture content.

DIRECT SHEAR TEST DATA

LOAD IN KIPS PER SQUARE FOOT

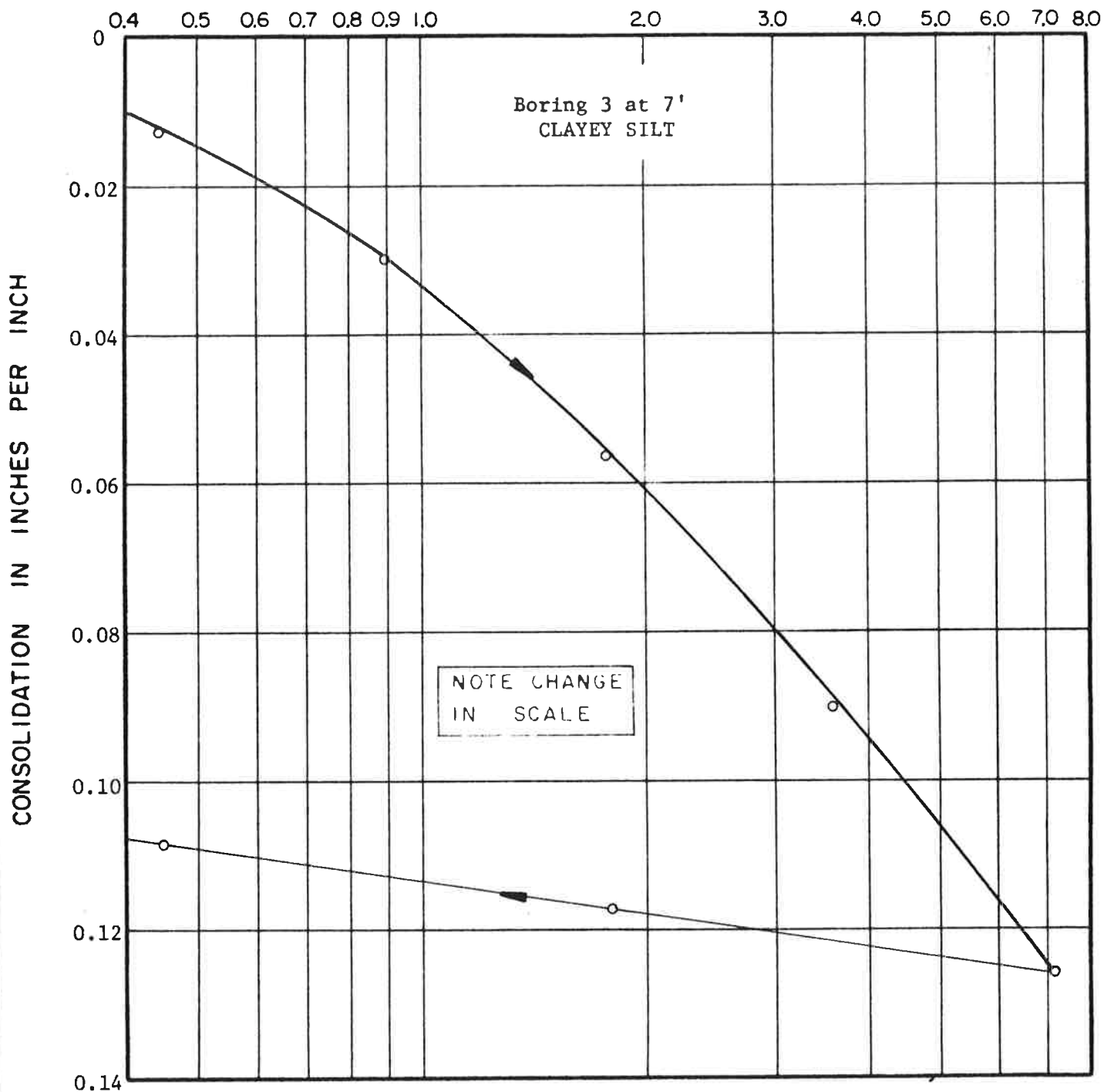


NOTE: Samples tested at field moisture content.

CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

LOAD IN KIPS PER SQUARE FOOT



NOTE: Sample tested at field moisture content.

CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-4.3

Boring B-1

Sheet 1 of 2

Date(s) Drilled	07/17/02	Logged By	Joe Gratzner	Boring B-1 Sheet 1 of 2
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	8-inch O.D.	
Drill Rig Type	B61	Hammer Data	140 lbs, 30-inch drop	
Sampling Method(s)	SPT, Dames & Moore Type-U, Bulk			Job Number 59401607.00001
Approximate Groundwater Depth and Date Measured	Groundwater at 50 feet below the existing ground surface			Total Depth Drilled (ft) 51.5
Comments	Groundwater was measured immediately after completion of the boring on the same day			Approximate Ground Surface Elevation(ft) 170 feet MSL

Elevation (ft)	Depth (ft)	SAMPLES	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
170	0	☒ BK-1		SC	4-inch thick Asphaltic Concrete Pavement			
		■ 1			FILL Clayey SAND dark brown, stiff, moist, fine			CORR -200(48)
	5	☒ 2		CL	ALLUVIUM Sandy to silty CLAY greenish-gray, soft to firm, moist, fine			
		■ 3			Grades mottled greenish-gray and dark brown, stiff with more sand	26	94	DSCD CON Slight hydrocarbon odor
160	10	☒ 4		CL	CLAY dark brown, very stiff, moist, with interlayered fine sand			
		■ 5		SP	SAND dark gray, dense, moist, fine, with tar, sticky			Hydrocarbon odor
	15							
		■ 6			Grades dark brown to black, very dense			
150	20							
		■ 7			Grades black, with trace gravel			
	25							
		☒ 8			Grades with interlayered clay, sticky			
140	30							
		■ 9			Grades wet, with less clay			
	35							
	40							

This log is part of the report prepared by URS for this project and should be read together with the report. This summary applies only at the location of the exploration and at the time of drilling or excavation. Subsurface conditions may differ at other locations and may change at this location with time. Data presented are a simplification of actual conditions encountered.

LOG OF BORING
PROPOSED REPLACEMENT MUSEUM PROJECT
LOS ANGELES, CALIFORNIA
FOR: LAC MUSEUM OF ARTS



FIGURE 5

LOS ANGELES, CALIFORNIA
FOR: LAC MUSEUM OF ARTS

Boring B-1
Sheet 2 of 2

Elevation (ft)	Depth (ft)	SAMPLES		Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
		Type Number	Blows per foot						
138	40	10	505'		SP	SAND black, very dense, moist, fine to medium, with tar, sticky			
	45	11	756'						
120	50	12	59		ML	Grades fine to coarse			
	55								
110	60								
	65								
100	70								
	75								
90	80								
	85								
80	90								

Boring B-2

Sheet 1 of 2

Date(s) Drilled	07/24/02	Logged By	Jeff Pyska	Boring B-2 Sheet 1 of 2
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	8-inch O.D.	
Drill Rig Type	B61	Hammer Data	140 lbs, 30-inch drop	
Sampling Method(s)	SPT, Dames & Moore Type-U, Bulk			Job Number 59401607.00001
Approximate Groundwater Depth and Date Measured	Groundwater at 22 feet below the existing ground surface			Total Depth Drilled (ft) 86.0
Comments	Groundwater was measured immediately after completion of the boring on the same day			Approximate Ground Surface Elevation(ft) 170 feet MSL

Elevation (ft)	Depth (ft)	SAMPLES	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
170	0	■ BK-1		SM	5-inch thick Asphaltic Concrete Pavement			
				CL	FILL: Silty SAND brown, moist, fine to coarse, with fine to coarse gravel			CORR
	5	■ 1		CL	CLAY dark gray and black, slightly moist, with roots and trace bricks, concrete pieces, and ceramic pieces	26	97	-200 (64) DSCD CON
		■ 2			ALLUVIUM: Sandy to silty CLAY olive-gray, soft to firm, moist, fine, with some black tar deposits Grades olive-brown Grades white, chalky Grades bluish-gray, stiff Grades with tar deposits			Slight hydrocarbon odor
160	10	■ 3						
	15	■ 4		SMML	Silty SAND and Sandy SILT dark brown and gray, dense, moist, fine, with tar deposits			Slight hydrocarbon odor
	20	■ 5		SM	Silty SAND dark gray and black, dense, wet, fine, with more tar			
150	25	■ 6						
	30	■ 7			Grades black, very dense, very sticky			
140	35	■ 8			Grades with trace fine gravel			
	40							

This log is part of the report prepared by URS for this project and should be read together with the report. This summary applies only at the location of the exploration and at the time of drilling or excavation. Subsurface conditions may differ at other locations and may change at this location with time. Data presented are a simplification of actual conditions encountered.

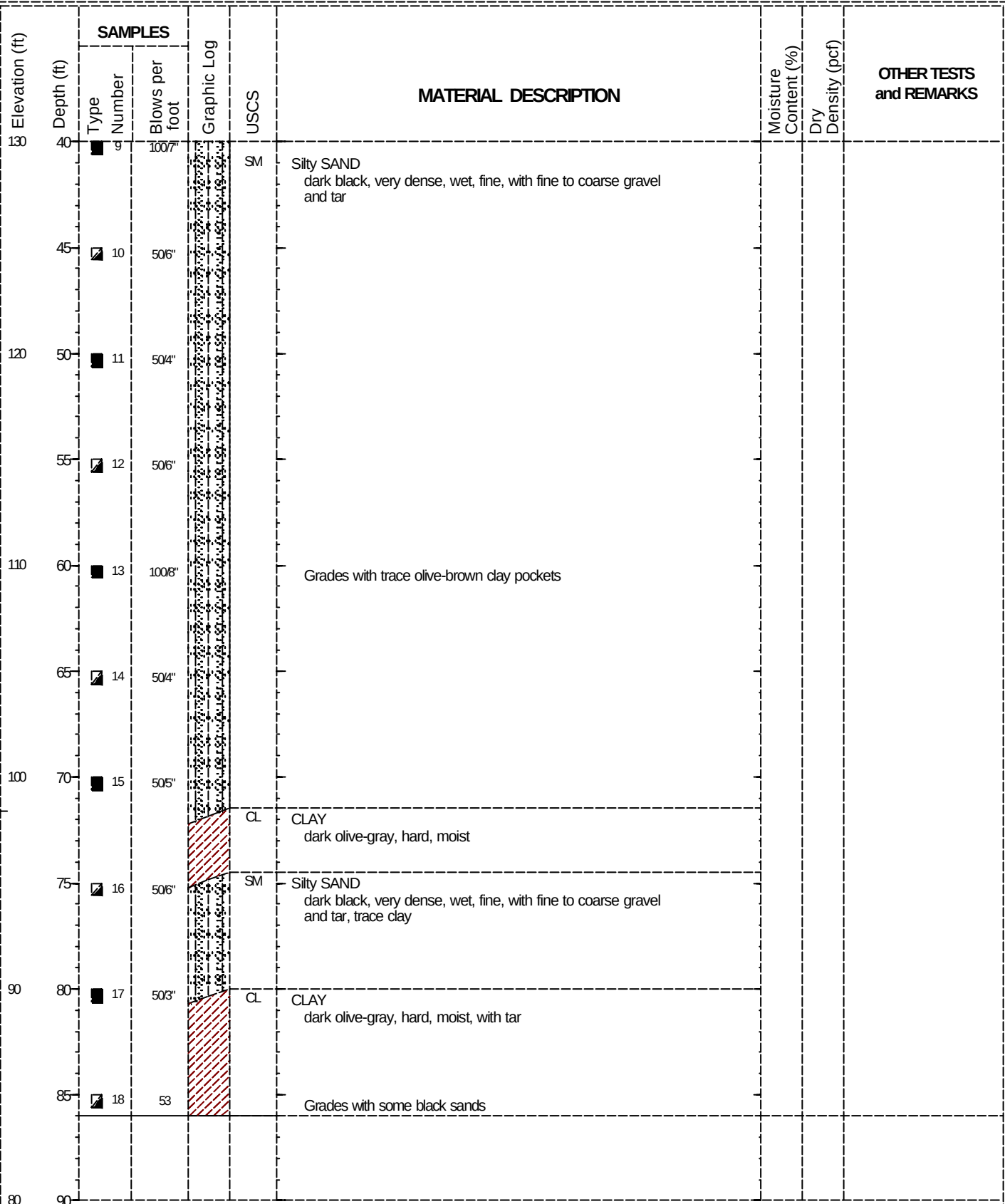
LOG OF BORING
PROPOSED REPLACEMENT MUSEUM PROJECT
LOS ANGELES, CALIFORNIA
FOR: LAC MUSEUM OF ARTS



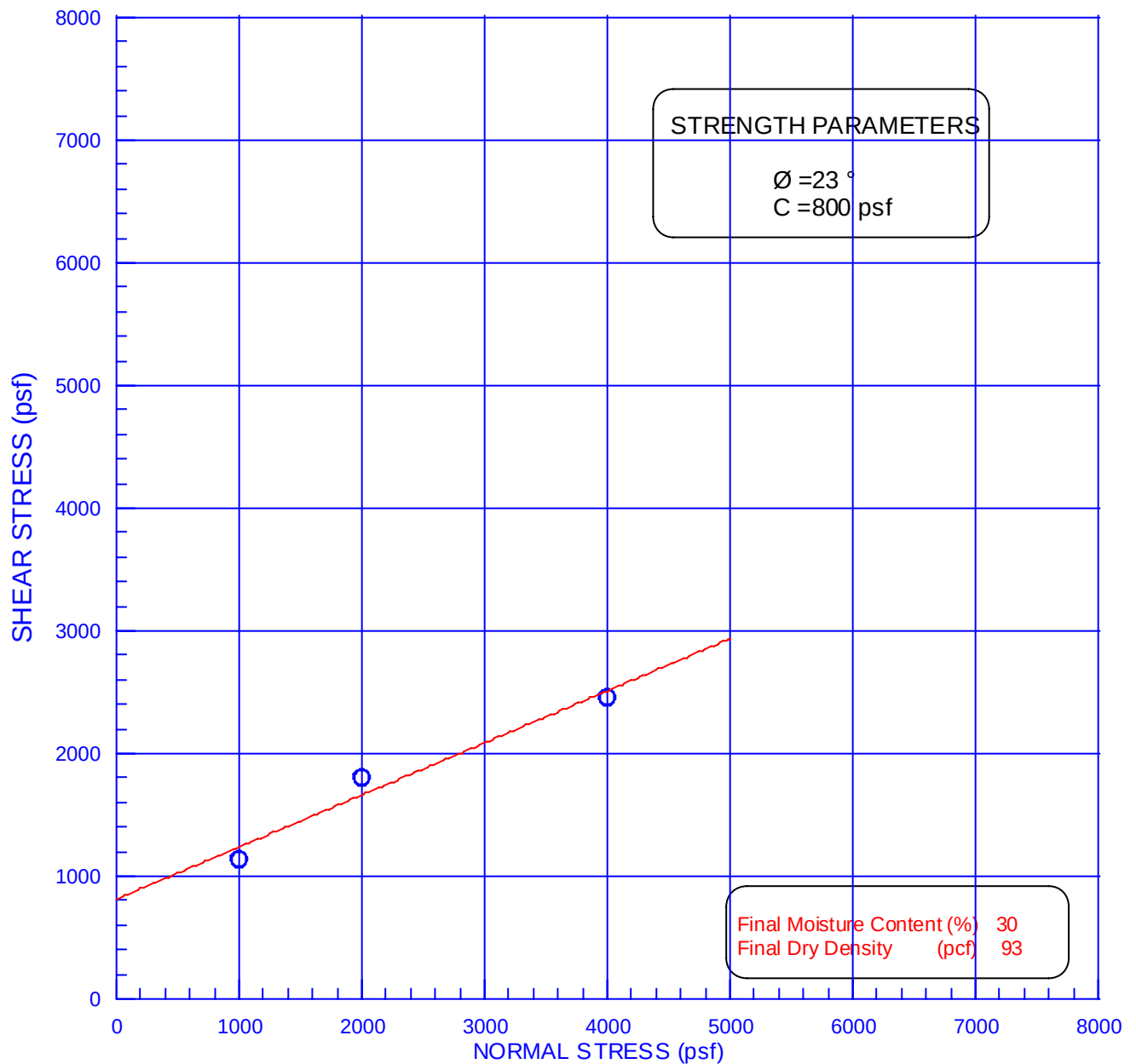
FIGURE 6

LOS ANGELES, CALIFORNIA
FOR: LAC MUSEUM OF ARTS

Boring B-2
Sheet 2 of 2



Report: DMG4; Project File: G:\NESA\PROJECTS\MUSEUM\LACMA.GPJ; Data Template: DMLA.GDT Printed: 9/5/02



BORING NO.	SAMPLE NO.	DEPTH (ft)	STRAIN RATE (in/min)	NORMAL STRESS (psf)	SHEAR STRESS (psf)
B-1	3	7.5	0.005	1000	1140
				2000	1800
				4000	2460

Sample Description: Mottled greenish-gray and dark brown sandy to silty CLAY(CL)

DIRECT SHEAR TEST RESULTS

CONSOLIDATED DRAINED

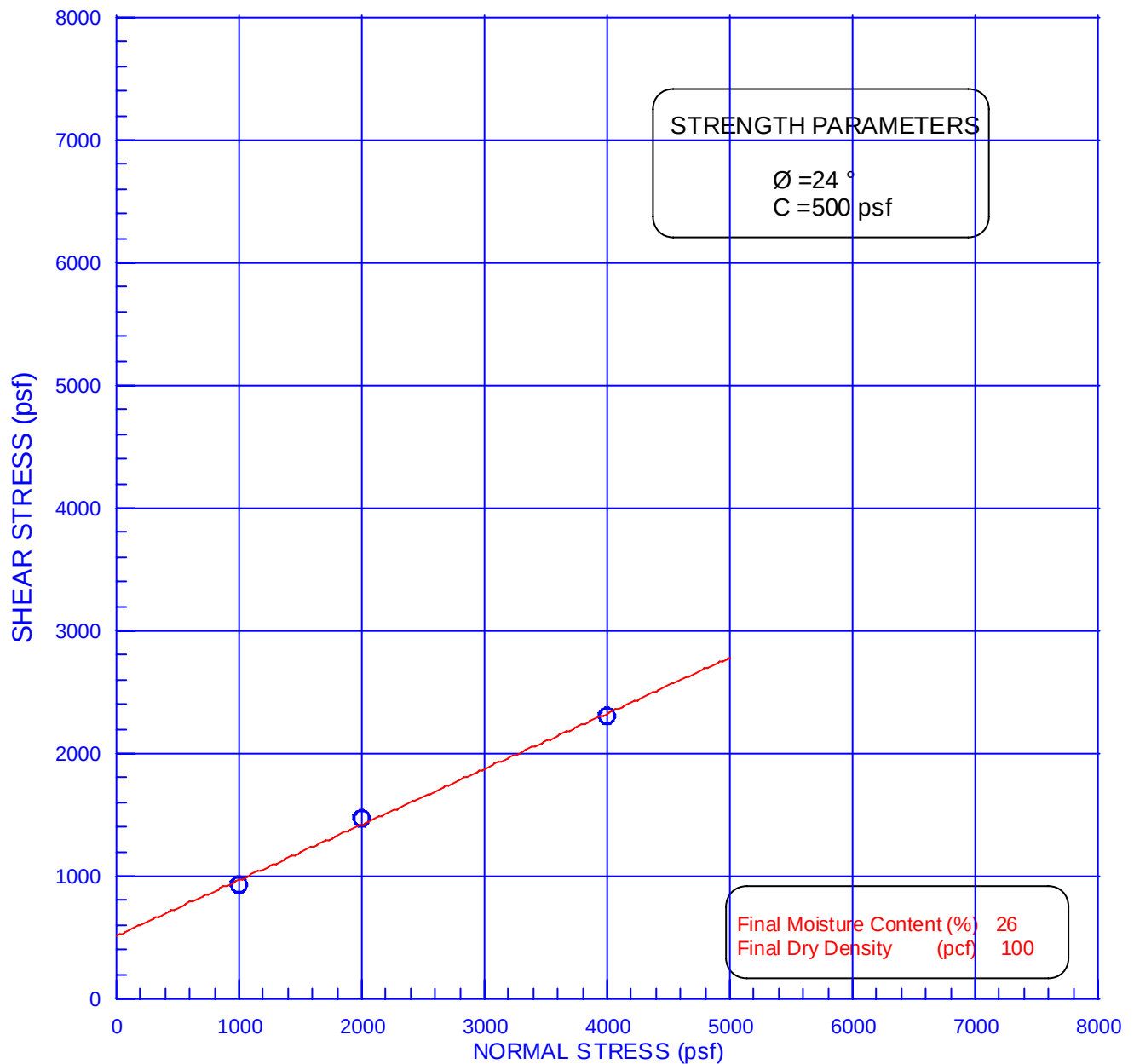
ASTM D 3080

PROPOSED REPLACEMENT MUSEUM PROJECT

5905 WILSHIRE BOULEVARD
 LOS ANGELES, CALIFORNIA
 FOR LAC MUSEUM OF ARTS



FIGURE 7



BORING NO.	SAMPLE NO.	DEPTH (ft)	STRAIN RATE (in/min)	NORMAL STRESS (psf)	SHEAR STRESS (psf)
B-2	1	5	0.005	1000	924
				2000	1476
				4000	2304

Sample Description: Olive-gray sandy to silty CLAY(CL)

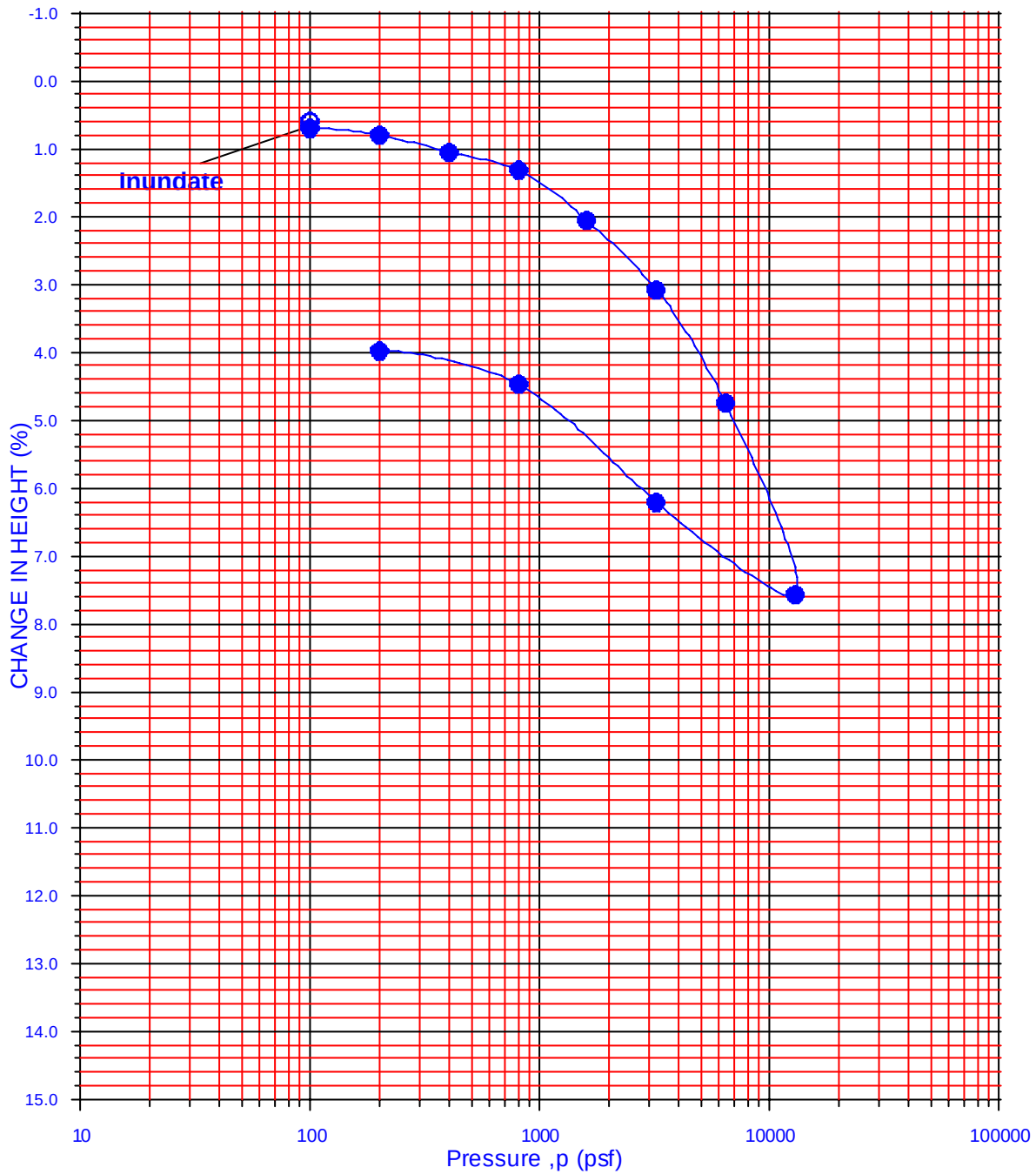
DIRECT SHEAR TEST RESULTS

CONSOLIDATED DRAINED
 ASTM D 3080

PROPOSED REPLACEMENT MUSEUM PROJECT
 5905 WILSHIRE BOULEVARD
 LOS ANGELES, CALIFORNIA
 FOR LAC MUSEUM OF ARTS



FIGURE 8



BORING NO.	SAMPLE NO.	DEPTH (ft.)	MOISTURE CONTENT (%) Initial / Final	DRY DENSITY (pcf) Initial / Final	VOID RATIO Initial / Final	DEGREE OF SATURATION (%) Initial / Final
B-1	3	7.5	26 / 27	94 / 98	0.80 / 0.73	90 / 100

SOIL DESCRIPTION: Mottled greenish-gray and dark brown sandy to silty CLAY (CL)

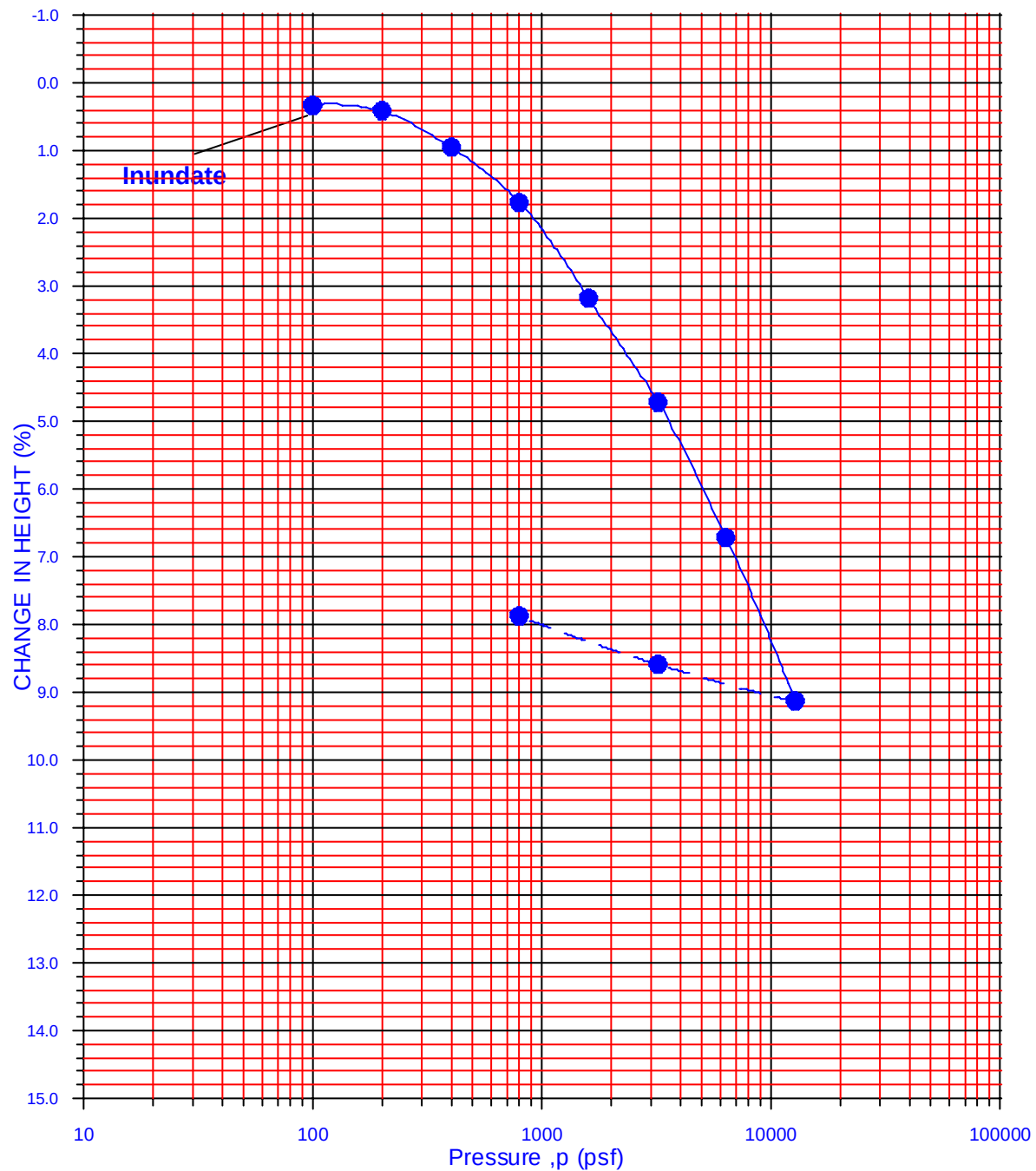
§ Assumed Specific Gravity = 2.70

ONE-DIMENSIONAL CONSOLIDATION
(ASTM D2435)

PROPOSED REPLACEMENT MUSEUM PROJECT
5905 WILSHIRE BOULEVARD
LOS ANGELES, CALIFORNIA
FOR LAC MUSEUM OF ARTS



FIGURE 9



BORING NO.	SAMPLE NO.	DEPTH (ft.)	MOISTURE CONTENT (%) Initial / Final	DRY DENSITY (pcf) Initial / Final	VOID RATIO Initial / Final	DEGREE OF SATURATION (%) Initial / Final
B-2	1	5	26 / 23	97 / 105	0.75 / 0.61	95 / 100

SOIL DESCRIPTION: Olive-gray sandy to silty CLAY (CL)

§ Assumed Specific Gravity = 2.70

ONE-DIMENSIONAL CONSOLIDATION
(ASTM D2435)

PROPOSED REPLACEMENT MUSEUM PROJECT
5905 WILSHIRE BOULEVARD
LOS ANGELES, CALIFORNIA
FOR LAC MUSEUM OF ARTS



FIGURE 10

TABLE 1
CORROSIVITY TEST RESULTS

Resistivity Test and PH: California Test Methods 532 and 643

Sulfate Content: California Test Method 417

Chloride Content: California Test Method 422

Project Name : La Brea Tarpits

Location: LOS ANGELES, CA.

Project No. 59-00212043.01

Tested By : [MY](#)

Date: 8/5/2002

Data Input By: MF

[illegible]

Boring B-8

Sheet 1 of 2

Date(s) Drilled	10/15/03	Logged By	Joe Gratzner	Boring B-8 Sheet 1 of 2
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	8-inch O.D.	
Drill Rig Type	B61	Hammer Data	140 lbs, 30-inch drop	
Sampling Method(s)	SPT, Dames & Moore Type-U, Bulk			Job Number 29401607.00002
Approximate Groundwater Depth and Date Measured	Perched groundwater at 18 feet below the existing ground surface			Total Depth Drilled (ft) 41.0
Comments				Approximate Ground Surface Elevation(ft) 165 feet MSL

Elevation (ft)	Depth (ft)	SAMPLES Type Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
0	0	BK-1			CL	FILL Sandy CLAY dark brown, moist, fine Grades light brown			
160	5				SC	ALLUVIUM Clayey SAND mottled reddish-brown and brown, loose, moist, fine to medium, with trace hydrocarbon like materials			
	10	1	12				19		-200 (38) CON
	15	2	21		SC-CL	Interbedded layers of Clayey SAND and Sandy CLAY brown to black, medium dense to very stiff, moist, fine			
	20	3	70 1"		CL	CLAY dark brown, hard, moist	22	94	Trace oil odor
	25	4	28		SP	SAND dark brown to black, dense, moist, fine, sticky	6		Hydrocarbon odor and stain
	30	5	70 4"			Grades very dense and noticed oil deposits	11	104	
130	35	6	56				5		
40									

This log is part of the report prepared by URS for this project and should be read together with the report. This summary applies only at the location of the exploration and at the time of drilling or excavation. Subsurface conditions may differ at other locations and may change at this location with time. Data presented are a simplification of actual conditions encountered.

LOG OF BORING
PROPOSED BROAD CONTEMPORARY ART MUSEUM
LOS ANGELES, CALIFORNIA

FOR: LAC MUSEUM OF ARTS

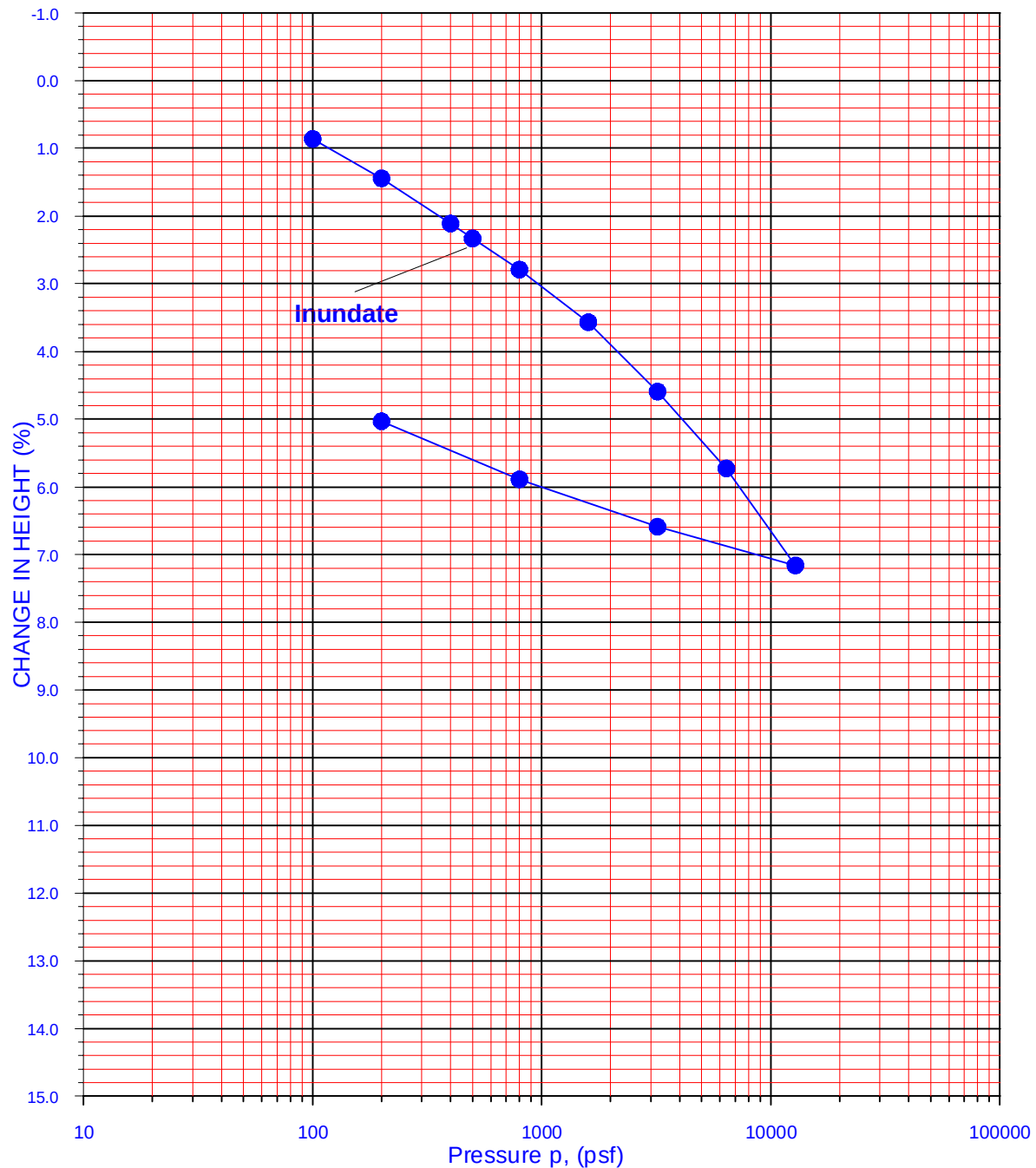
FIGURE 12



LOS ANGELES, CALIFORNIA
FOR: LAC MUSEUM OF ARTS

Boring B-8
Sheet 2 of 2

Elevation (ft)	Depth (ft)	SAMPLES		Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
		Type Number	Blows per foot						
40	40	7	708			Grades very dense			
120	45								
	50								
110	55								
	60								
100	65								
	70								
90	75								
	80								
80	85								
	90								



BORING NO.	SAMPLE NO.	DEPTH (ft.)	MOISTURE CONTENT (%) Initial / Final	DRY DENSITY (pcf) Initial / Final	DEGREE OF SATURATION (%) Initial / Final
B-8	1	10	12 / 16	112 / 119	67 / 100

Sample Description: Mottled reddish-brown and brown clayey SAND (SC)

ONE-DIMENSIONAL CONSOLIDATION
(ASTM D2435)

PROPOSED BROAD CONTEMPORARY ART MUSEUM
LOS ANGELES, CALIFORNIA
FOR LAC MUSEUM OF ARTS



FIGURE A-8

Project No: JB 19042-H

Client: PATRIOT HOMES

Location: 6006 Wilshire Boulevard, Los Angeles

Log of Boring 1

By: MH

The J. Byer Group, Inc.
 1461 E. Chevy Chase Dr., Suite 200
 Glendale, CA 91206
 (818) 549-9959

SUBSURFACE PROFILE

Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density (pcf)	% Saturation	Remarks
163	0	Ground Surface								
		FILL:								
162	1	Silty Sand to Sand, orange-gray, moist, medium dense, coarse gravel		SM	SS					
		ALLUVIUM:								
161	2	Silty Sand, dark orange-gray, very moist, medium dense								
160	3	Sandy Clay, dark orange-brown, moist, medium firm		CL						
159	4									
158	5	Silty Clay, orange-brown, moist, medium firm		CH						
157	6									
156	7									
155	8									
154	9									
153	10	Clayey Sand, mottled light red, orange, and yellow-green, moist, medium dense to dense, medium to coarse sand		CL/CH	R	9 9 15	17.4	108.1	84.2	
152	11									
151	12	Silty Clay, yellow-green, moist, firm		CH						
150	13									
149	14									
148	15									
147	16									
146	17									
145	18									
144	19									
143	20									

Surface: Asphalt

Drill Method: Hollow-Stem Auger Drill Rig

Drill Date: 2-19-02

Size: 8 Inch

Elevation: 163 Feet

Sheet: 1 of 3

1020400300515998

Project No: JB 19042-H

Client: PATRIOT HOMES

Location: 6006 Wilshire Boulevard, Los Angeles

Log of Boring 1

By: MH

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Suite 200
Glendale, CA 91206
(818) 549-9959

SUBSURFACE PROFILE										
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density (pcf)	% Saturation	Remarks
142	21	Sandy to Clayey Silt to Clayey Sand, green gray, moist, medium dense, firm, fine to medium sand		ML/MH	R	9	25.0	100.4	99.5	
						15				
						15				
141	22									
140	23									
139	24									
138	25	Silty Clay to fine Sandy Silt, dark greenish-gray, slightly moist to moist, firm		CH/MH	R	4	23.7	106.0	108.7	
						15				
						17				
137	26									
136	27									
135	28									
134	29									
133	30	Clayey Silt, light to dark green gray with dark gray to black mottling, slightly moist, firm, some tar, some fine sand		MH	R	11	20.7	101.5	84.9	
						13				
						19				
132	31									
131	32									
130	33									
129	34									
128	35	Silty Sand, dark gray to black, moist, dense, fine to medium sand, tar, saturated		SM	R	10	7.7	112.8	42.2	
						17				
						17				
127	36									
126	37									
125	38									
124	39									
123	40									

Surface: Asphalt

Drill Method: Hollow-Stem Auger Drill Rig

Drill Date: 2-19-02

Size: 8 Inch

Elevation: 163 Feet

Sheet: 2 of 3

1020409300515998

Project No: JB 19042-H

Client: PATRIOT HOMES

Location: 6006 Wilshire Boulevard, Los Angeles

Log of Boring 1

By: MH

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Suite 200
Glendale, CA 91206
(818) 549-9959

SUBSURFACE PROFILE

Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density (pcf)	% Saturation	Remarks
122	41			---	R	12 19 23	3.2	112.4	17.1	
121	42									
120	43									
119	44									
118	45	Silty Sand with thin layers of dark gray-brown Sandy Silt		SM	R	11 13 19	4.5	119.2	26.9	
117	46									
116	47									
115	48									
114	49									
113	50			SM	R	8 17 21	4.7	107.1	22.2	
112	51	End at 51 Feet; No Water; No Caving; Fill to 1 Foot.								
111	52	Heavy tar saturation from 35 feet								
110	53									
109	54									
108	55									
107	56									
106	57									
105	58									
104	59									
103	60									

Surface: Asphalt

Drill Method: Hollow-Stem Auger Drill Rig

Drill Date: 2-19-02

Size: 8 Inch

Elevation: 163 Feet

Sheet: 3 of 3

1020409200515998

Project No: JB 19042-H

Client: PATRIOT HOMES

Location: 6006 Wilshire Boulevard, Los Angeles

Log of Boring 2

By: MH

The J. Byer Group, Inc.
 1461 E. Chevy Chase Dr., Suite 200
 Glendale, CA 91206
 (818) 549-9959

SUBSURFACE PROFILE										
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density (pcf)	% Saturation	Remarks
163	0	Ground Surface FILL:								
162	1	ALLUVIUM:								
161	2	Silty Clay, dark brown, moist, moderately firm, some sand		CH	SS					
160	3									
159	4									
158	5	mottled dark brown to beige, slightly moist, firm		CA	R	7 12 22	18.5	109.3	92.0	
157	6									
156	7									
155	8	Clayey to Gravelly Sand, mottled brown, yellow and beige, moist, dense, coarse to very coarse sand, gravel to 1 inch diameter		SC	R	9 13 13	9.9	116.4	59.8	
154	9									
153	10									
152	11									
151	12									
150	13									
149	14									
148	15	Sandy Clay, mottled yellow, orange and gray, very moist, firm, some Silty Clay		CL/CH	R	13 15 19	22.2	102.4	93.0	
147	16									
146	17									
145	18									
144	19									
143	20									

Surface: Asphalt

Drill Method: Hollow-Stem Auger Drill Rig

Drill Date: 2-19-02

Size: 8 Inch

Elevation: 163 Feet

Sheet: 1 of 2

1020409200515998

Project No: JB 19042-H

Client: PATRIOT HOMES

Location: 6006 Wilshire Boulevard, Los Angeles

Log of Boring 2

By: MH

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Suite 200
Glendale, CA 91206
(818) 549-9959

SUBSURFACE PROFILE

Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density (pcf)	% Saturation	Remarks
142	21	Clayey to very fine Sandy Silt, greenish gray, slightly moist, firm		ML/MH	R	9 15 23	23.7	99.2	91.7	
141	22									
140	23									
139	24									
138	25	Silty Clay, dark blue-gray, moist, firm, some tar		CL	R	11 20 21	23.2	92.9	77.1	
137	26									
136	27									
135	28									
134	29									
133	30	Silty medium to coarse sand, dark gray to black, slightly moist, dense, tar saturated		SM	R	11 20 27	7.9	106.3	36.6	
132	31									
131	32									
130	33									
129	34									
128	35			SM	R	12 22 29	---	---	---	No Recovery
127	36	End at 36 Feet; No Water; No Caving; Fill to 1 Foot.								
126	37									
125	38									
124	39									
123	40									

Surface: Asphalt

Drill Method: Hollow-Stem Auger Drill Rig

Drill Date: 2-19-02

Size: 8 Inch

Elevation: 163 Feet

Sheet: 2 of 2

1020409200515998

Project No: JB 19042-H

Client: PATRIOT HOMES

Location: 6006 Wilshire Boulevard, Los Angeles

Log of Boring 3

By: MH

The J. Byer Group, Inc.
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Glendale, CA 91206
(818) 549-9959

SUBSURFACE PROFILE

Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density (pcf)	% Saturation	Remarks
0	0	Ground Surface								
		FILL:								
-1	1	Silty to Clayey Sand, dark gray, moist to very moist, loose, brick and concrete fragments								
-2	2									
-3	3									
-4	4									
-5	5	ALLUVIUM:		CL	R	21 34 40				
-6	6	Sandy Clay, brown to dark brown, moist, moderately firm								
-7	7									
-8	8									
-9	9									
-10	10	Clayey Sand, mottled tan and brown, moist to very moist, dense		SC	R	14 14 16	6.4	89.3	19.6	
-11	11									
-12	12									
-13	13									
-14	14									
-15	15	Silt, black, dry to slightly moist, hard, tar saturated, dry		ML	R	10 21 50+				
-16	16									
-17	17									
-18	18									
-19	19									
-20	20									

Surface:

Drill Method: Hollow-Stem Auger Drill Rig

Drill Date: 2-19-02

Size: 8 Inch

Elevation: 163 Feet

Sheet: 1 of 2

1020409200515998

Project No: JB 19042-H

Client: PATRIOT HOMES

Location: 6006 Wilshire Boulevard, Los Angeles

Log of Boring 3

By: MH

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Suite 200
Glendale, CA 91206
(818) 549-9959

SUBSURFACE PROFILE

Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density (pcf)	% Saturation	Remarks
-21	21	Silty to Sandy Clay, black, slightly moist, firm, tar saturated		CL	R	18 36 52				
-22	22									
-23	23									
-24	24									
-25	25	Silty Sand with clay, black, slightly moist, dense, tar saturated		SM	R	23 50-6"	9.9	103.5	42.4	
-26	26									
-27	27									
-28	28									
-29	29									
-30	30			SM	R	26 50-3"				No Recovery
-31	31	End at 31 Feet; No Water; No Caving; Fill to 5 Feet.								
-32	32									
-33	33									
-34	34									
-35	35									
-36	36									
-37	37									
-38	38									
-39	39									
-40	40									

Surface:

Drill Method: Hollow-Stem Auger Drill Rig

Drill Date: 2-19-02

Size: 8 Inch

Elevation: 163 Feet

Sheet: 2 of 2

1010409200515998

Project No: JB 19042-H

Client: PATRIOT HOMES

Location: Adj. to 732 South Ogder Dr, Los Angeles

Log of Boring 4

By: MH

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Suite 200
Glendale, CA 91206
(818) 549-9959

SUBSURFACE PROFILE										
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density (pcf)	% Saturation	Remarks
163.5	0	Ground Surface								
		FILL:								
	1	Silty Sand, dark orange-brown, moist, medium dense								
162	2	ALLUVIUM:								
161		Silty Clay, mottled dark gray-brown, moist to very moist, moderately firm		CL/CA	SS					
160	3									
159	4									
158	5			CL/CA	R	9 13 13	15.3	113.5	85.1	
157	6									
156	7									
155	8									
154	9									
153	10	Clayey Silt to Sandy Gravelly Clay, dark brown to mottled tan, gray and brown, moist, firm		ML/CL	R	4 20 23	11.4	114.5	65.4	
152	11									
151	12									
150	13									
149	14									
148	15	Sandy Clay, mottled tan and brown, moist to very moist, firm, dense		CL	R	12 14 25	14.8	100.9	59.6	
147	16									
146	17									
145	18									
144	19									
	20									

Surface: 4 Inches Asphalt

Drill Method: Hollow-Stem Auger Drill Rig

Drill Date: 2-19-02

Size: 8 Inch

Elevation: 163.5 Feet

Sheet: 1 of 2

102040200515998

Project No: JB 19042-H

Client: PATRIOT HOMES

Location: Adj. to 732 South Ogder Dr, Los Angeles

Log of Boring 4

By: MH

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Suite 200
Glendale, CA 91206
(818) 549-9959

SUBSURFACE PROFILE

Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density (pcf)	% Saturation	Remarks
143	21	Sandy to Clayey Silt, dark gray-green, moist, firm	/	ML/MH	R	11 13 18	21.6	94.5	74.5	
142	22		/							
141	23		/							
140	24		/							
139	25	Silty Clay, dark gray-green, moist, firm	///	CL/CH	R	12 16 22				
138	26	End at 26 Feet; No Water; No Caving; Fill to 1 Foot.								
137	27									
136	28									
135	29									
134	30									
133	31									
132	32									
131	33									
130	34									
129	35									
128	36									
127	37									
126	38									
125	39									
124	40									

Surface: 4 Inches Asphalt

Drill Method: Hollow-Stem Auger Drill Rig

Drill Date: 2-19-02

Size: 8 Inch

Elevation: 163.5 Feet

Sheet: 2 of 2

1020409200515998

THE J. BYER GROUP, INC.

A GEOTECHNICAL CONSULTING FIRM

1461 E. CHEVY CHASE DRIVE, SUITE 200 GLENDALE, CA 91206

(818) 549-9959 Tel

(818) 543-3747 FAX

SHEAR DIAGRAM

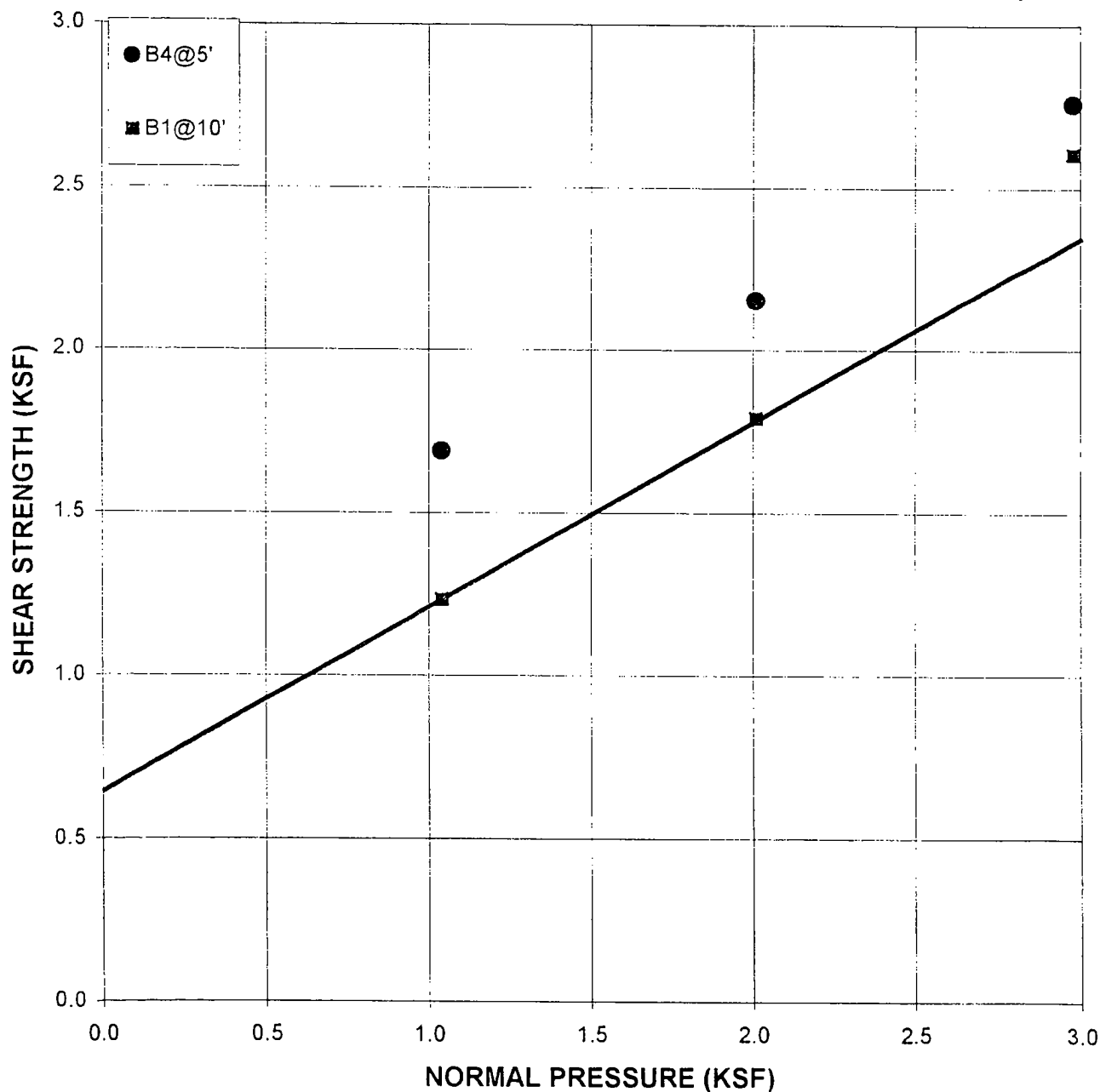
JB: 19042-H CONSULT JWB
CLIENT: Patriot Homes - Wilshire

EARTH MATERIAL: Alluvium

Phi Angle = 30 degrees
Cohesion = 630 psf

Average Moisture Content 18.2%
Average Dry Density (pcf) 110.8
Percent Saturation 98.7%

DIRECT SHEAR TEST - ASTM D-3080 (ULTIMATE VALUES)



THE J. BYER GROUP, INC.

A GEOTECHNICAL CONSULTING FIRM

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CONSOLIDATION DIAGRAM #1

JB: 19042-H CONSULTANT MH

CLIENT: Patriot Homes - Wilshire

Earth Material: Alluvium

Sample Location: B2@5'

Dry Weight (pcf): 109.3

Initial Moisture: 18.5%

Initial Saturation: 92.0%

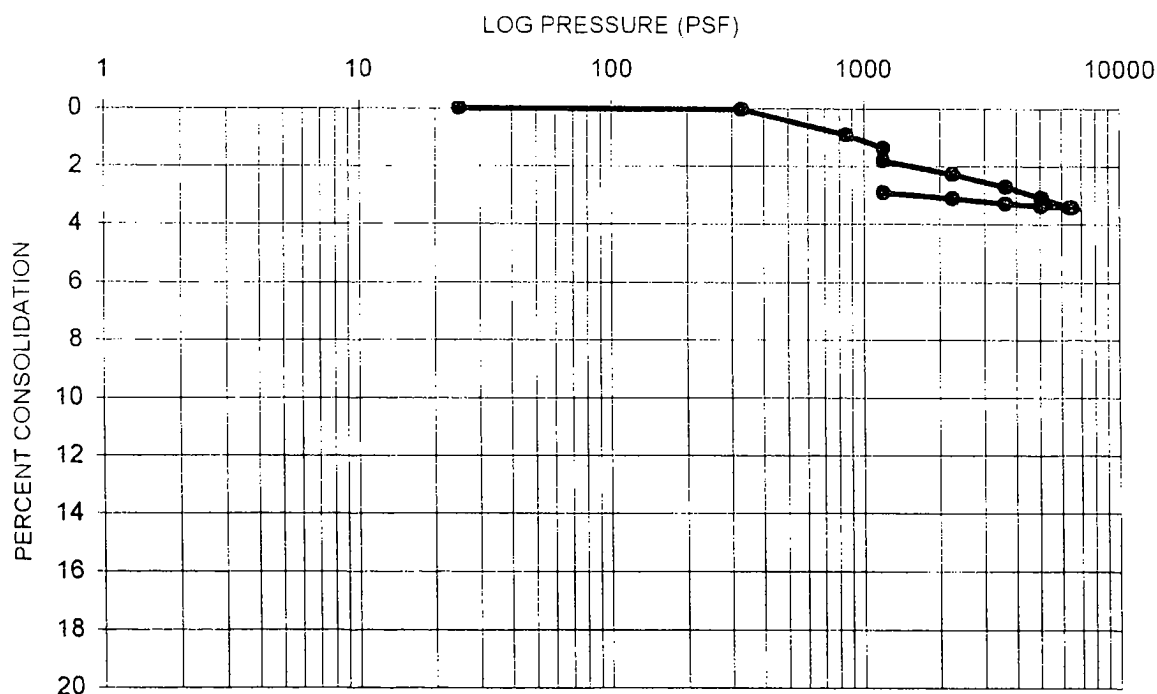
Specific Gravity: 2.70

Initial Void Ratio: 0.54

Water Added At (psf): 1203.0

Consolidation Coef. (Cc): 0.0398

CONSOLIDATION DIAGRAM PERCENT CONSOLIDATION



THE J. BYER GROUP, INC.

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CONSOLIDATION DIAGRAM #2

JB: 19042-H CONSULTANT MH

CLIENT: Patriot Homes - Wilshire

Earth Material: Alluvium

Sample Location: B2@8'

Dry Weight (pcf): 116.4

Initial Moisture: 9.9%

Initial Saturation: 59.8%

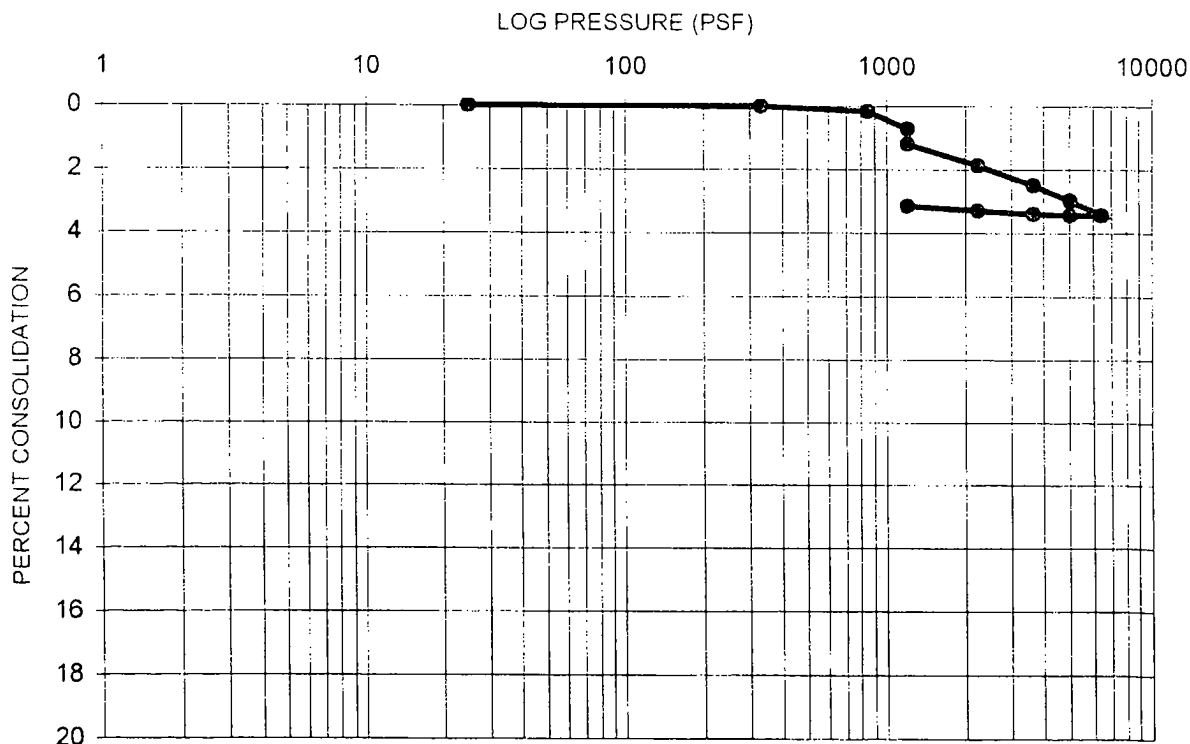
Specific Gravity: 2.70

Initial Void Ratio: 0.45

Water Added At (psf): 1203.0

Consolidation Coef. (Cc): 0.0515

CONSOLIDATION DIAGRAM PERCENT CONSOLIDATION



THE J. BYER GROUP, INC.

A GEOTECHNICAL CONSULTING FIRM

1461 E. CHEVY CHASE DRIVE, GLENDALE, CA 91206

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CONSOLIDATION DIAGRAM #3

JB: 19042-H CONSULTANT MH

CLIENT: Patriot Homes - Wilshire

Earth Material: Alluvium

Sample Location: B4@10'

Dry Weight (pcf): 114.5

Initial Moisture: 11.4%

Initial Saturation: 65.4%

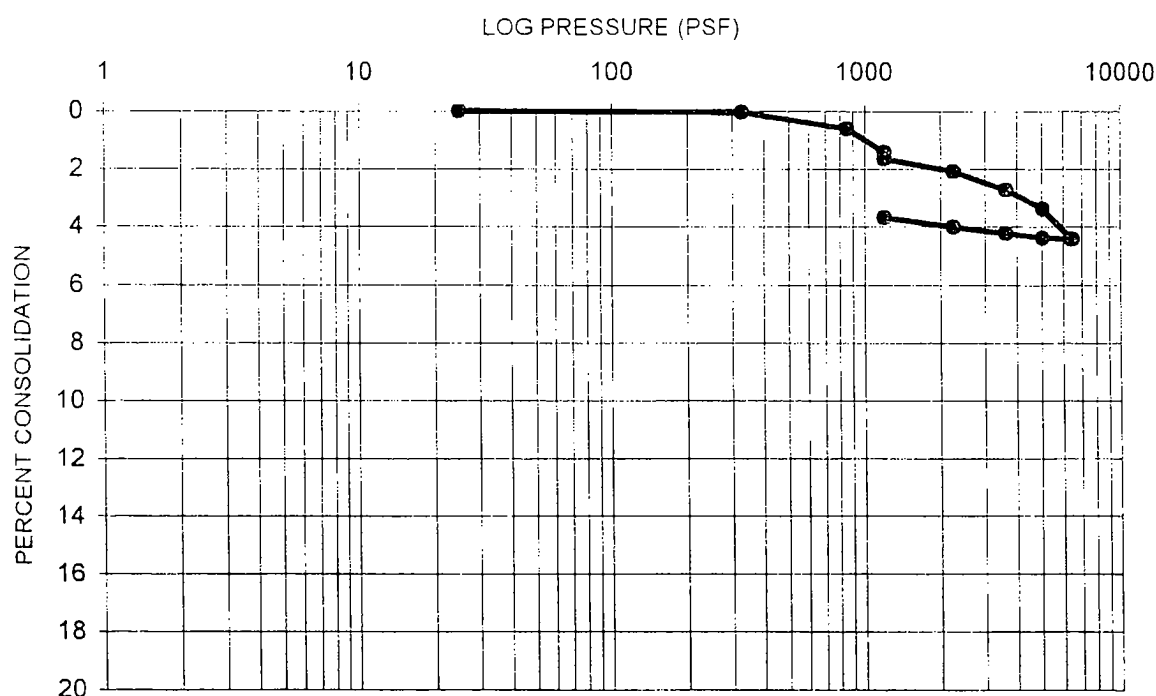
Specific Gravity: 2.70

Initial Void Ratio: 0.47

Water Added At (psf): 1203.0

Consolidation Coef. (Cc): 0.0825

CONSOLIDATION DIAGRAM PERCENT CONSOLIDATION



THE J. BYER GROUP, INC.

A GEOTECHNICAL CONSULTING FIRM

1461 E. CHEVY CHASE DRIVE, GLENDALE, CA 91206

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FAX: (818) 543-3747

CONSOLIDATION DIAGRAM #4

JB: 19042-H CONSULTANT MH

CLIENT: Patriot Homes - Wilshire

Earth Material: Alluvium

Sample Location: B2@15'

Dry Weight (pcf): 102.4

Initial Moisture: 22.2%

Initial Saturation: 93.0%

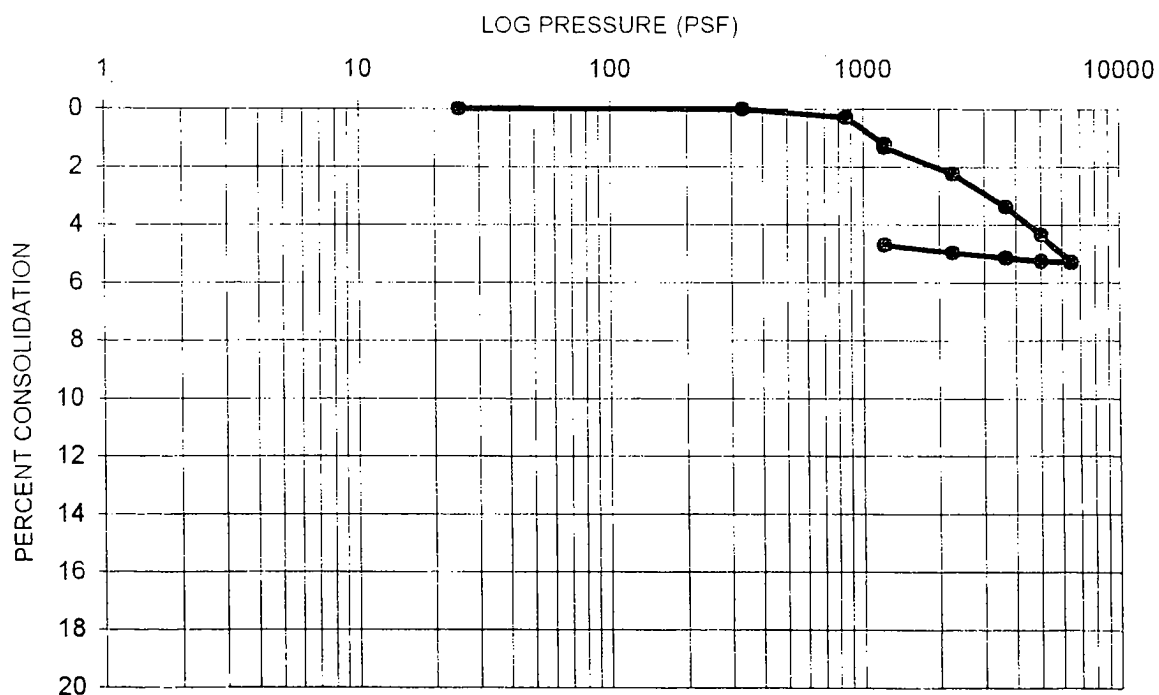
Specific Gravity: 2.70

Initial Void Ratio: 0.64

Water Added At (psf): 1216.0

Consolidation Coef. (Cc): 0.1161

CONSOLIDATION DIAGRAM PERCENT CONSOLIDATION



THE J. BYER GROUP, INC.

A GEOTECHNICAL CONSULTING FIRM

1461 E. CHEVY CHASE DRIVE, GLENDALE, CA 91206

(818) 549-9959

FAX: (818) 543-3747

CONSOLIDATION DIAGRAM #5

JB: 19042-H CONSULTANT: MH

CLIENT: Patriot Homes - Wilshire

Earth Material: Alluvium

Sample Location: B1@20'

Dry Weight (pcf): 100.4

Initial Moisture: 25.0%

Initial Saturation: 99.5%

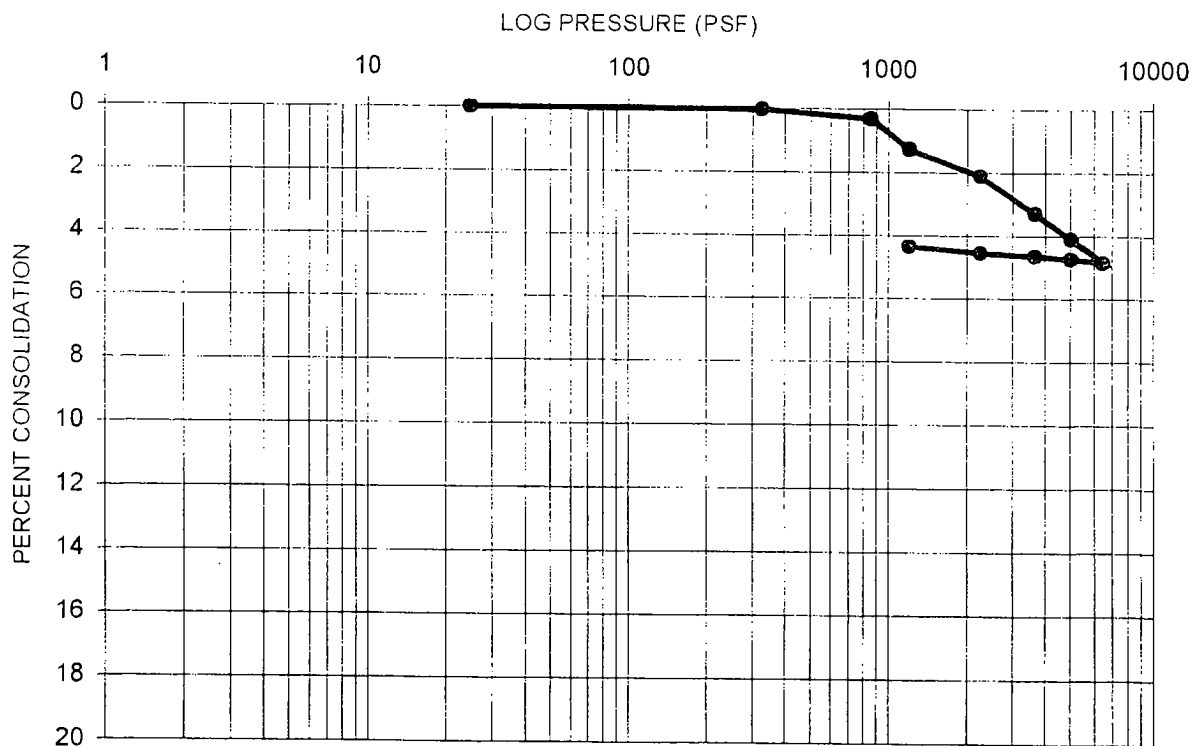
Specific Gravity: 2.70

Initial Void Ratio: 0.68

Water Added At (psf): 1206.0

Consolidation Coef. (Cc): 0.1020

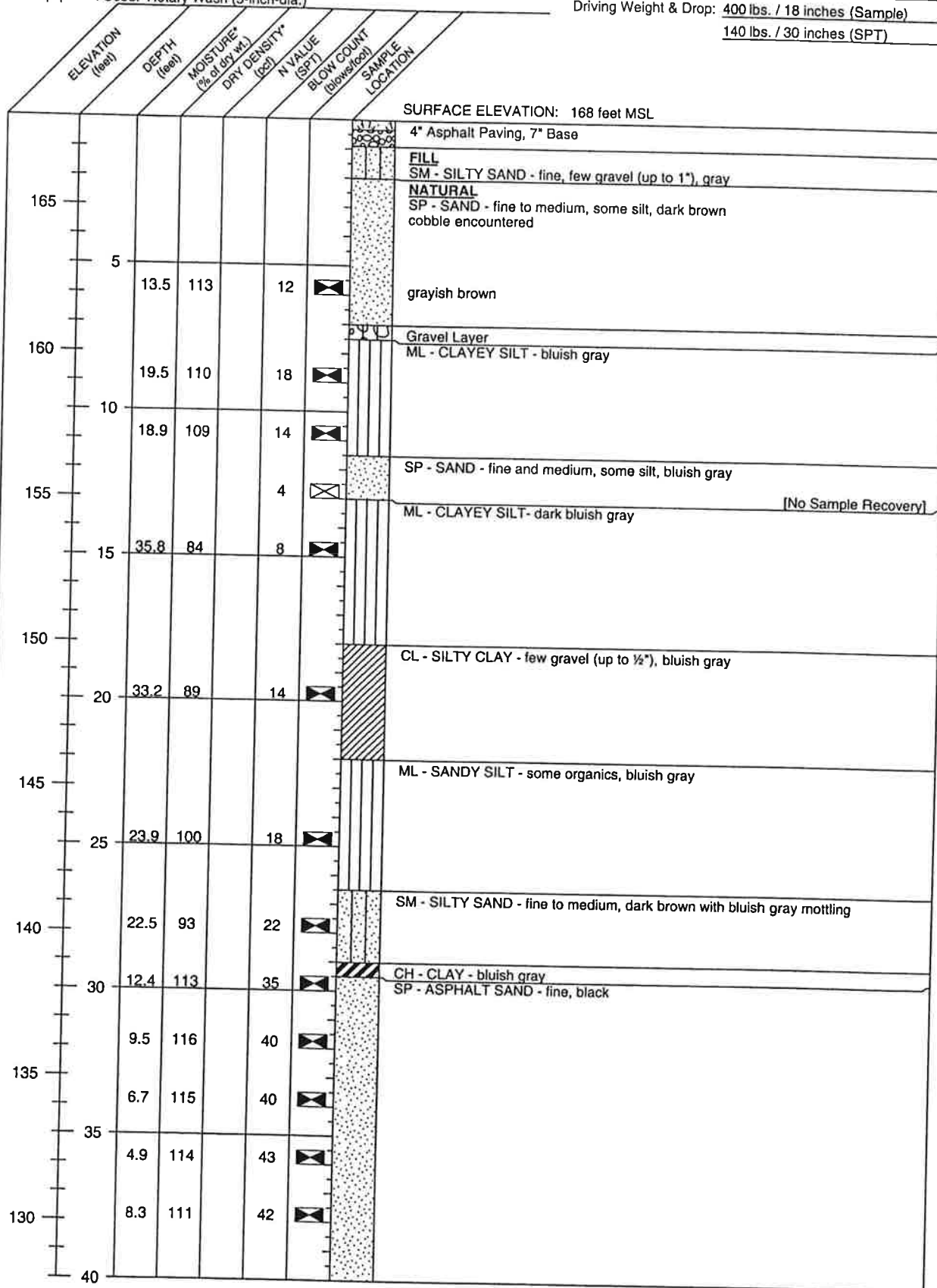
CONSOLIDATION DIAGRAM PERCENT CONSOLIDATION



BORING 2 VBB-2005-B-2

Date Drilled: August 20, 2004
Equipment Used: Rotary Wash (5-inch-dia.)

Depth to Water: 10.6 feet three days after drilling
Driving Weight & Drop: 400 lbs. / 18 inches (Sample)
140 lbs. / 30 inches (SPT)



- * MOISTURE = VOLATILE LIQUIDS
- ** DRY DENSITIES INCLUDE THE WEIGHT OF SOIL AND NON-VOLATILE ASPHALT

LOG OF BORING



FIGURE A-1.2a

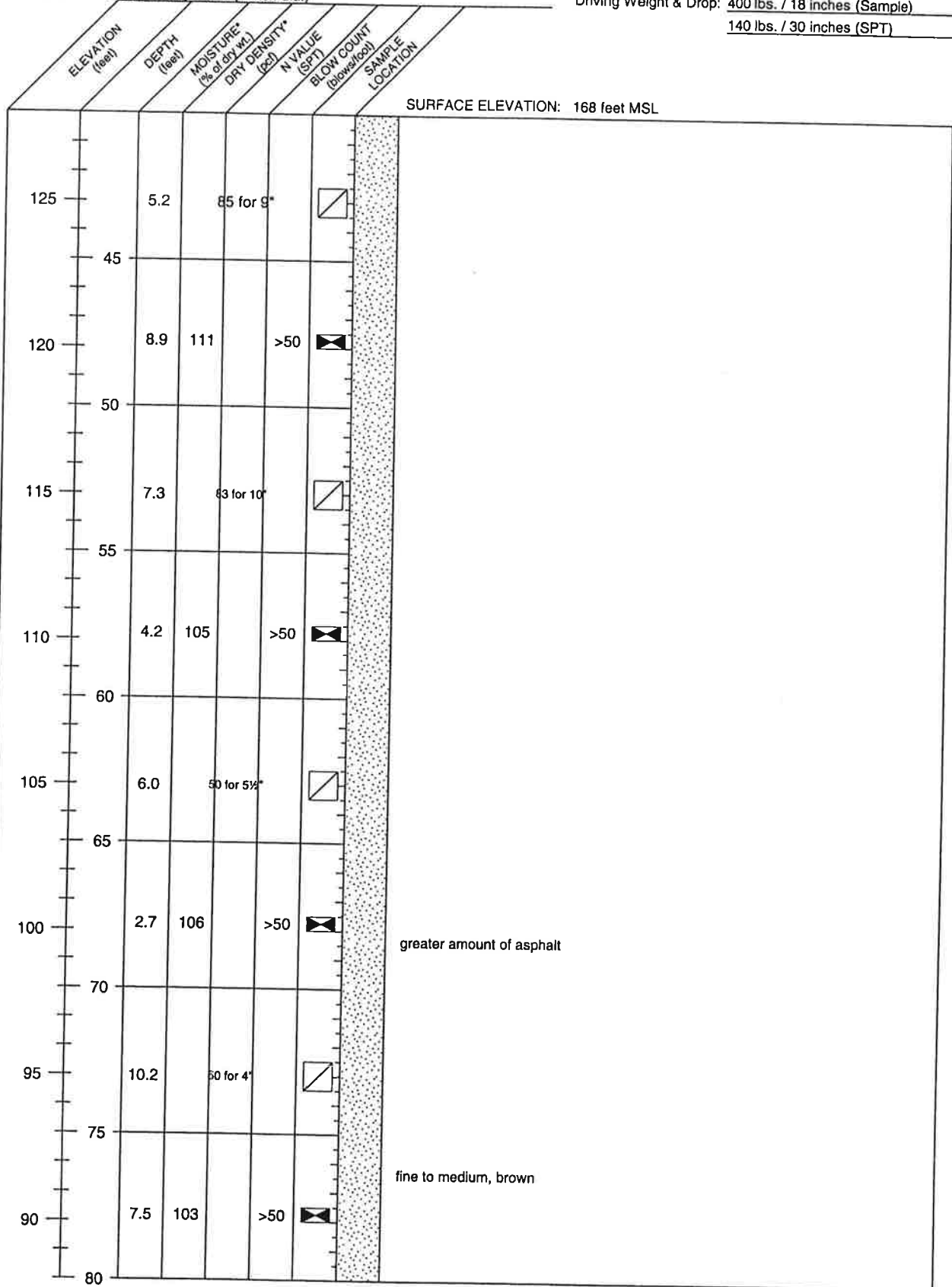
Job No: 04-053 By: FA Date: 9-3-2004 Checked: 9-15-04 [LOG FOR FIELD: 04-053.GPJ]
The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

BORING 2 (Continued)

VBB-2005-B-2

Date Drilled: August 23, 2004
Equipment Used: Rotary Wash (5-inch-dia.)

Depth to Water: 10.6 feet three days after drilling
Driving Weight & Drop: 400 lbs. / 18 inches (Sample)
140 lbs. / 30 inches (SPT)



(Continued on next page)

- * MOISTURE = VOLATILE LIQUIDS
- ** DRY DENSITIES INCLUDE THE WEIGHT OF SOIL AND NON-VOLATILE ASPHALT

LOG OF BORING



FIGURE A-1.2b

Job No: 04-053 By: FA Date: 9-3-2004 Checked: VB Printed: 9-15-04 LOG FOR FIELD: 04-053 GP-1
The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated.
It is not warranted to be representative of subsurface conditions at other locations and times.

BORING 2 (Continued)

VBB-2005-B-2

Date Drilled: August 23, 2004
Equipment Used: Rotary Wash (5-inch-dia.)

Depth to Water: 10.6 feet three days after drilling
Driving Weight & Drop: 400 lbs. / 18 inches (Sample)
140 lbs. / 30 inches (SPT)

ELEVATION (feet)	DEPTH (feet)	MOISTURE* (% of dry wt.)	DRY DENSITY* (pcf)	N VALUE (SPT)	BLOW COUNT (blows/foot)	SAMPLE LOCATION
SURFACE ELEVATION: 168 feet MSL						
85	21.5	79 for 10"				ML - SANDY SILT - micaceous, slightly plastic, few shells, no asphalt, dark gray
85						
80	14.7	104		>50		some dark brown mottling
90						
75	26.2	84				strong hydrocarbon odor
95						
70	17.9	100		>45		
100						END OF BORING AT 100 FEET.
65						Notes:
105						1) Fill to 2 feet.
60						2) Groundwater measured at a depth of 10.6 feet, 3 days after completion of drilling.
110						3) Installed two-inch-diameter PVC casing to permit future groundwater monitoring. Casing bottom covered with cap and sealed. Drilling mud removed before well construction.
55						4) Boring covered with traffic cover. Soil cuttings and drilling mud placed in barrels.
115						
50						
120						

* MOISTURE = VOLATILE LIQUIDS

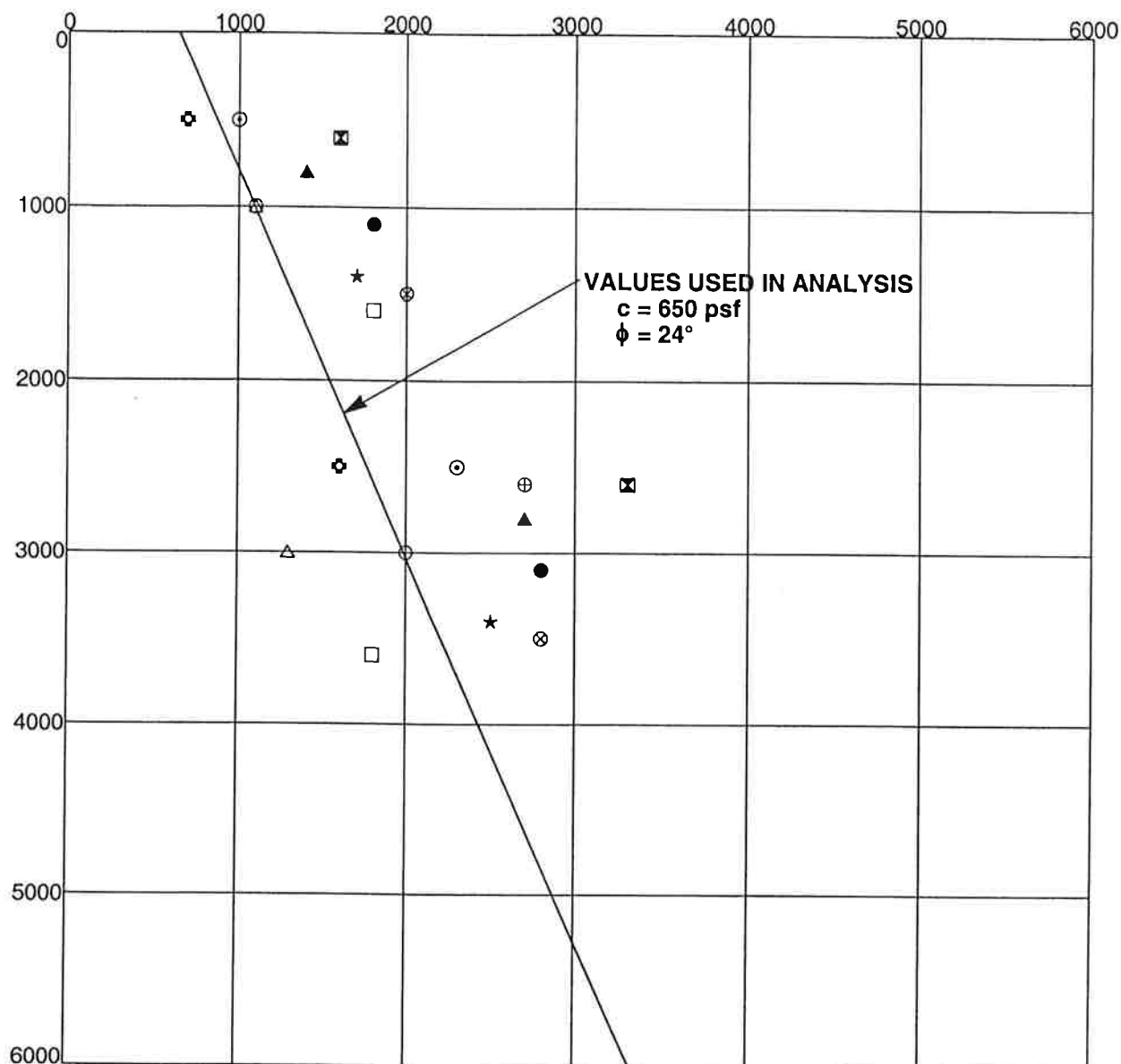
** DRY DENSITIES INCLUDE THE WEIGHT OF SOIL AND NON-VOLATILE ASPHALT

LOG OF BORING



FIGURE A-1.2c

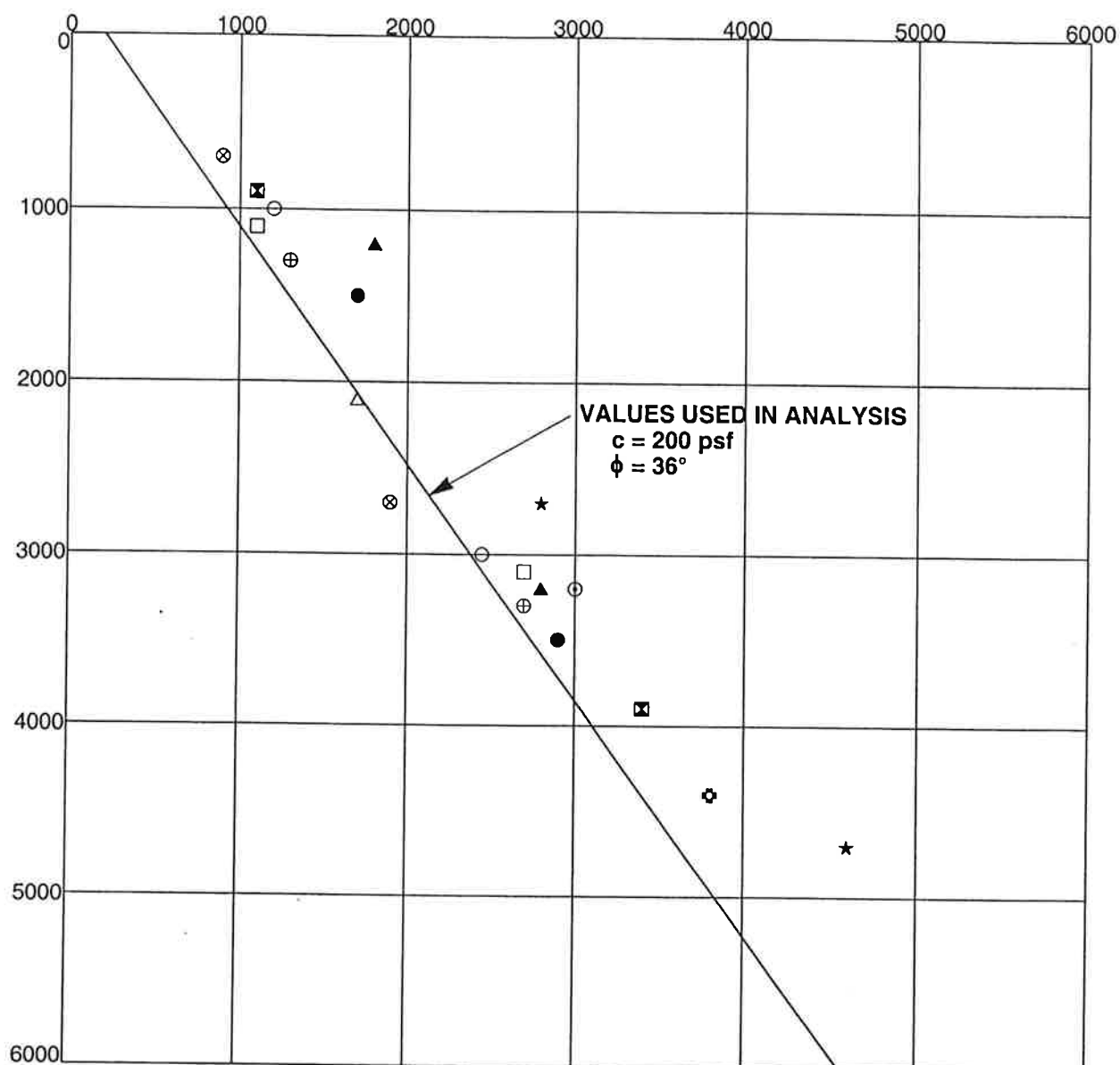
Job No: 04-053
By: FA
Date: 9-3-2004
Checked: VBB
Printed: 9-15-04 LOG FOR FIELD: 04-053.GPJ
The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.



NOTE: *** indicates sample was soaked to near saturation prior to testing.

Specimen Identification		Classification	c	ϕ	
●	Boring 1 at 11 feet	SILTY CLAY	1250	27	
⊠	Boring 1 at 26 feet	CLAYEY SILT	1090	40	*
▲	Boring 2 at 8½ feet	CLAYEY SILT	880	33	*
★	Boring 2 at 14½ feet	CLAYEY SILT	1140	22	
⊙	Boring 2 at 24½ feet	SANDY SILT	675	33	
⊕	Boring 3 at 5½ feet	CLAYEY SAND	475	24	*
○	Boring 3 at 11½ feet	SILTY SAND	650	24	
△	Boring 4 at 10 feet	CLAY	1000	6	*
⊗	Boring 4 at 15 feet	CLAY	1400	22	
⊕	Boring 5 at 6½ feet	SAND/SILTY SAND			
□	Boring 5 at 16 feet	CLAY	1800	0	*

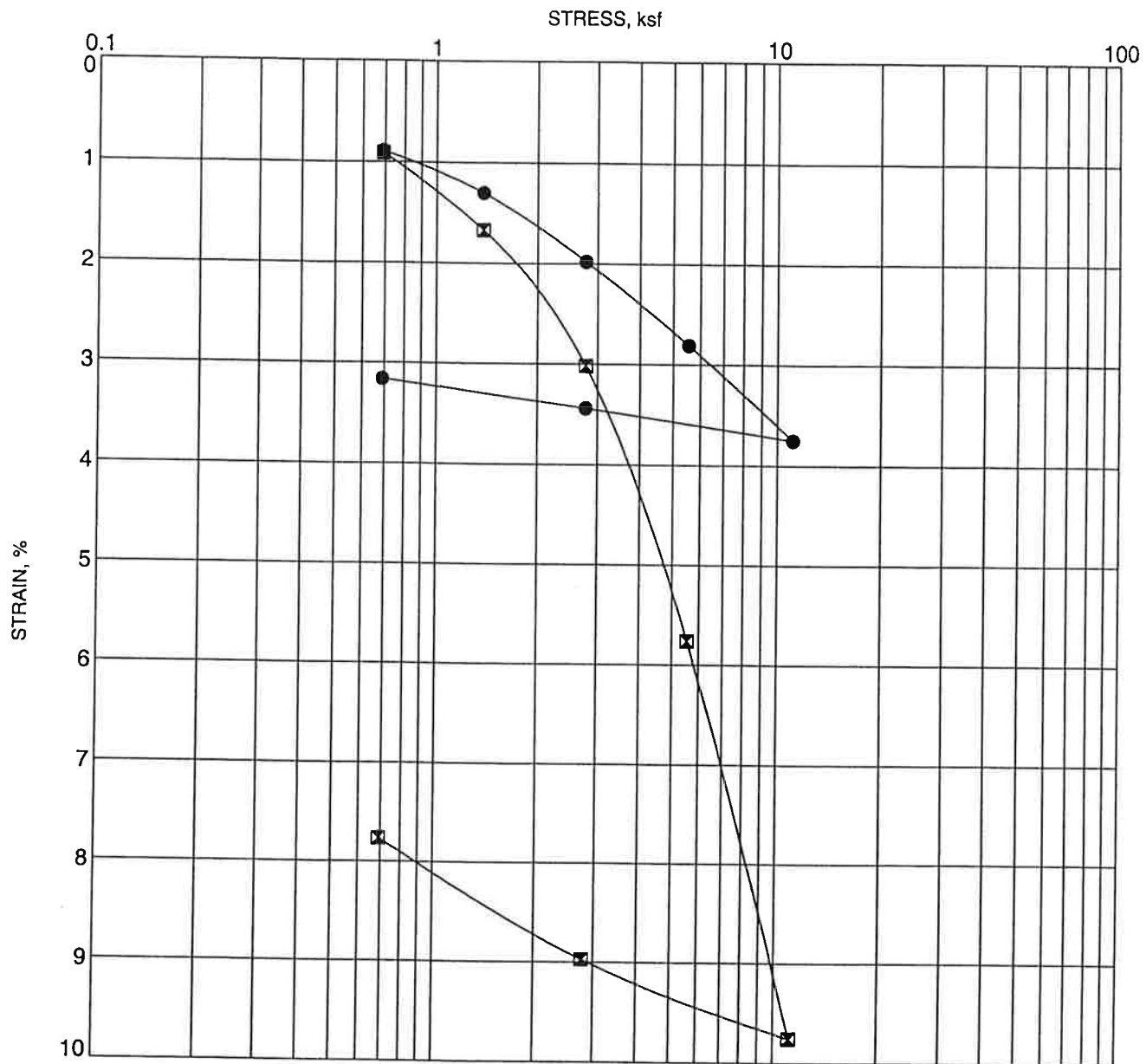
DIRECT SHEAR TEST DATA (UPPER SOILS)



NOTE: *** indicates sample was soaked to near saturation prior to testing.

Specimen Identification		Classification	c	ϕ
●	Boring 1 at 34½ feet	ASPHALT SAND	800	31
⊠	Boring 1 at 38½ feet	ASPHALT SAND	410	37
▲	Boring 2 at 31½ feet	ASPHALT SAND	1200	27
★	Boring 2 at 47½ feet	ASPHALT SAND	370	42
⊙	Boring 2 at 77½ feet	ASPHALT SAND		
⊕	Boring 2 at 97½ feet	ASPHALT SAND		
○	Boring 3 at 30½ feet	ASPHALT SAND	575	32
△	Boring 3 at 60½ feet	ASPHALT SAND		
⊗	Boring 4 at 27 feet	ASPHALT SAND	550	27
⊕	Boring 4 at 33½ feet	ASPHALT SAND	390	35
□	Boring 5 at 30½ feet	ASPHALT SAND	220	39

DIRECT SHEAR TEST DATA (ASPHALT SAND)



NOTE: Samples were tested at field moisture content.

Specimen Identification		Classification
●	Boring 2 at 35½ feet	ASPHALT SAND
⊠	Boring 3 at 5½ feet	CLAYEY SAND

CONSOLIDATION TEST DATA

Engineer : J. VANBEVEREN
Date : 08:19:04 09:41



Engineer : J.VANBEVEREN
Date : 08:19:04 13:33



THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		G-121
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 516+36, Rt 14 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										5/16/2011 - 5/18/2011	4-7/8 inches	177 feet
										GROUND-WATER READINGS		
										Drilling mud bailed. Ground-water level measured at 14 feet below the ground surface.		
175										4-inch thick Asphalt Concrete over 7-inch Portland Cement Concrete FILL [Afi] SANDY LEAN CLAY - moist, brown, fine to medium sand, occasional fine gravel		
5												
170			0.0	24.5	90	Push		☒		More gravel		
10										LAKEWOOD FORMATION [Qlwl]		
165		23	0.0	29.0	-		3	☒	GP	POORLY GRADED GRAVEL with SAND - medium dense, wet, olive brown to bluish gray with light brown mottled, fine, fine to coarse sand, gravel (up to 3/4 inch in size)		
15										SAN PEDRO FORMATION [Qspl]		
160			0.0	18.0	77	18		☒	SP-SM	▼ POORLY GRADED SAND with SILT - medium dense, moist, black to dark brown, fine-grained		
20										SILTY GRAVEL with SAND - wet, dark reddish brown, fine to coarse sand		
155		24	0.0	13.6	-		59	☒	ML	TAR IMPACTED SOILS SANDY SILT - very stiff, moist, black, fine sand, some medium to coarse, occasional gravel (up to 3/8 inch in size), slightly infused tar		
25										Becomes medium stiff, wet, dark brown		
150			0.0	29.3	84	7		☒				
30										POORLY GRADED SAND with SILT - dense, moist, black, fine to medium-grained, moderately infused tar		
145		33	0.0	12.1	-			☒	SP-SM			
35										Becomes loose, fine-grained, trace medium		
140			0.0	6.9	101	10	7	☒				
40												

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: HTY
Prepared/Date: YN 6/20/2011
Checked/Date: LT/RM 9/21/2011MTA Westside Subway Extension
Los Angeles, CaliforniaLOG OF BORING
Project No.: 4953-10-1561 Figure: A-2.18a

LA METRO PB-TUNNEL ZONE SA70131 GEOTECHINTWLIBRARY MACTEC JUNE2011.GLB
G:\PROJECT_DIRECTORIES\4953\2010\101561_METRO_WESTSIDE_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOGNEW TEMPLATE - MARCH 14, 2011\4953-10-1561_(120-139).GPI 10/18/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

DRILLING COMPANY/DRILLING EQUIPMENT										BORING NO.
C & L Drilling / Mayhew 1000										G-121 (Continued)
DRILLING METHOD					BOREHOLE LOCATION					
Rotary Wash					Sta 516+36, Rt 14 feet					
DATES DRILLED					HOLE DIAMETER					GROUND EL.
5/16/2011 - 5/18/2011					4-7/8 inches					177 feet
GROUND-WATER READINGS										
Drilling mud bailed. Ground-water level measured at 14 feet below the ground surface.										
ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	
135									PMT	
45		56	0.0	8.0	-			☒		GW
130										
50		41	0.0	10.2	-			☒		SP
125										
55				-	-	13		☒		GW
120										SP
60				-	-	15		☒		GP
65		16	0.0	3.4	-		2	☒		
70		23	0.0	6.8	-		8	☒		SW-SM
75		53	0.0	25.5	-			☒		ML
80										
Tunnel										
CLAYEY GRAVEL with SAND - very dense, moist, black, fine to coarse gravel, moderately infused tar										
POORLY GRADED SAND - dense, moist, dark brown, fine to medium-grained, saturated with tar										
WELL GRADED GRAVEL with SAND - wet, black, fine to coarse gravel, saturated with tar										
POORLY GRADED SAND - medium dense, moist, black, fine to medium-grained, trace gravel, saturated with tar										
POORLY GRADED GRAVEL with SAND - medium dense, wet, black, fine to coarse, fine sand										
Becomes fine (up to 3/4 inch in size), coarse sand, some fine to coarse sand										
WELL GRADED SAND with SILT and GRAVEL - medium dense, moist, fine to coarse-grained, fine gravel (up to 1/2 inch in size)										
SILT with SAND - hard, moist, dark brown, fine sand, moderately infused tar										

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: HTY
Prepared/Date: YN 6/20/2011
Checked/Date: LT/RM 9/21/2011

MTA Westside Subway Extension
Los Angeles, California

amec

LOG OF BORING
Project No.: 4953-10-1561 Figure: A-2.18b

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

DRILLING COMPANY/DRILLING EQUIPMENT										BORING NO.
C & L Drilling / Mayhew 1000										G-121 (Continued)
DRILLING METHOD					BOREHOLE LOCATION					
Rotary Wash					Sta 516+36, Rt 14 feet					GROUND EL. 177 feet
DATES DRILLED					HOLE DIAMETER					
5/16/2011 - 5/18/2011					4-7/8 inches					
GROUND-WATER READINGS										
Drilling mud bailed. Ground-water level measured at 14 feet below the ground surface.										
ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	
			0.0	21.5	91	18	77	☒		Becomes very stiff, fine grained, some medium
95										
85		45	0.0	22.2	-			☒		Becomes hard
90										Trace gravel
90			0.0	21.4	-	21		☒	GM	SILTY GRAVEL with SAND - medium dense, wet, dark brown, fine gravel (up to 3/4 inch in size), fine to coarse sand, moderately infused tar, (sample disturbed)
85									ML	GRAVELLY SILT with SAND - hard, wet, dark brown, fine to coarse sand, fine gravel (up to 3/4 inch in size), slightly infused tar
95		54	0.0	23.5	-		33	☒		
80										
100			0.0	14.0	-	17		☒		FERNANDO FORMATION [Tf] SILTSTONE - very stiff to hard (Sample disturbed)
75										
105		62	0.0	24.8	-			☒		More sand
70										
110			0.0	22.3	88	21		☒		Less sand
65										END OF BORING AT 111 FEET
115										NOTES: Hand augered upper 5 feet to avoid damage to utilities. Borehole grouted with cement-bentonite slurry and patched with asphalt concrete. "N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches
60										*Number of blows required to drive the Crandall Sampler 12 inches using a 380 pound hammer falling 18 inches
120										**Photo Ionization Detector used for OVA readings Downhole Test: PMT = Pressuremeter

Field Tech: HTY
Prepared/Date: YN 6/20/2011
Checked/Date: LT/RM 9/21/2011MTA Westside Subway Extension
Los Angeles, CaliforniaLOG OF BORING
Project No.: 4953-10-1561 Figure: A-2.18c

Table 5-2: Summary of Geotechnical Laboratory Test Results (ACE, PE and Adv. PE Phases) (continued)

Boring No.	Sample Depth (ft)	Sample Type	USCS Group Symbol	Geologic Formation	Raw Blow Count (blows/ft)	Equivalent SPT Blow Count (blows/ft)	Moisture Content (%)	Dry Density (pcf)	Grain Size			Atterberg Limits			Expansion /Collapse (%)	Specific Gravity	Corrosion				Compression Indices		Tar Content (%)	Void Ratio	NTNU Soil Abrasion Index	Direct Shear		Poisson's Ratio	Triaxial Consolidated-Undrained		Unconfined Compression Strength (psi)
									Gravel (%)	Sand (%)	Fines (%)	LL (%)	PL (%)	PI (%)			pH	Sulfate (ppm)	Chloride (ppm)	Minimum Resistivity (ohm-cm)	C _c	C _r				Cohesion (psf)	Friction Angle (degrees)		Cohesion (psf)	Friction Angle (degrees)	
G-119	40.5	SPT	SM/SP-SM	Qsp	28	-	11.3	-																							
	45.5	CR	SP-SM	Qsp	47	-	2.7	111																0.49							
	50.5	SPT	SP-SM	Qsp	52	-	6.6	-	1	87	12											17									
	55.5	CR	SP-SM	Qsp	63	-	3.0	105															0.57								
	60.5	SPT	SP-SM	Qsp	50	-	7.4	-	21	71	8				2.68							15									
	65.5	CR	SP-SM	Qsp	70	-	6.5	90						0.35									0.84								
	70.5	SPT	Siltstone	Tf	42	-	21.4	-																							
	75.5	CR	Siltstone	Tf	38	-	25.6	84	0	28	72	NP	NP	NP	0.07	2.63					0.1194	0.00973	18	0.95		2000	20				
	80.5	SPT	Siltstone	Tf	52	-	21.0	-																							
	85.5	CR	Siltstone	Tf	50	-	18.8	85														18	0.95								
	90.5	SPT	Siltstone	Tf	35	-	23.4	-																							
	95.5	CR	Siltstone	Tf	49	-	21.1	87	0	22	78	NP	NP	NP		2.65						19	0.90		1400	19					
	100.5	SPT	Siltstone	Tf	36	-	21.5	-																							
	105.5	CR	Siltstone	Tf	55	-	18.0	89	0	32	68	NP	NP	NP	-0.45					0.1945	0.01945	17	0.86								
G-121	5.5	CR	CL	Fill	Push	-	24.5	90															0.83								
	10.5	SPT	GP	Qlw	23	-	29.0	-	65	32	3											16									
	15.5	CR	SP-SM	Qsp	18	-	18.0	77															1.15								
	20.5	SPT	ML	Qsp	24	-	13.6	-	0	41	59	NP	NP	NP								17									
	25.5	CR	ML	Qsp	7	-	29.3	84															0.97								
	30.5	SPT	SP-SM	Qsp	33	-	12.1	-																							
	35.5	CR	SP-SM	Qsp	10	-	6.9	101	0	93	7			0.56	2.63					0.0825	0.00972	17	0.62		0	25					
	45.5	SPT	GW	Qsp	56	-	8.0	-																							
	50.5	SPT	SP	Qsp	41	-	10.2	-																							
	55.5	CR	SP	Qsp	13	-	-	-																							
	60.5	CR	GP	Qsp	15	-	-	-																							
	65.5	SPT	GP	Qsp	16	-	3.4	-	55	43	2											2									
	70.5	SPT	SW-SM	Qsp	23	-	6.8	-	38	54	8											4									
	75.5	SPT	ML	Qsp	53	-	25.5	-									9	3590	1274	2040											
	80.5	CR	ML	Qsp	18	-	21.5	91	0	23	77	NP	NP	NP	0.06	2.77					0.1155	0.01072	19	0.90		1450	30				
	85.5	SPT	ML	Qsp	45	-	22.2	-									4	2149	942	2240											
	95.5	SPT	SM	Qsp	54	-	23.5	-	34	33	33											11									
	100.5	CR	Siltstone	Tf	17	-	14.0	-																							
	105.5	SPT	Siltstone	Tf	62	-	24.8	-																							
	110.5	CR	Siltstone	Tf	21	-	22.3	88															0.87								
S-104	8-9	-	SM	Qlw	-	-	7.9	-	2	83	15																				
	12.5-13.5	-	ML	Qlw	-	-	18.8	-																							
	17-18	-	CH	Qlw	-	-	31.3	-				79	19	60																	
	23-24	-	CL-ML	Qsp	-	-	31.6	-	3	32	65																				
	30-31	-	CL-ML	Qsp	-	-	18.1	-																							
	35-36	-	SC	Qsp	-	-	18.6	-	26	27	47	45	13	32																	
	39.5-40.5	-	SM	Qsp	-	-	17.7	-	0	74	26																				
	44.5-45	-	CL-ML	Qsp	-	-	22.7	-	9	16	76																				
	47-48	-	CL-ML	Qsp	-	-	25.3	-							2.66	8	1199	11	480												

This appendix describes the geotechnical boring program conducted by AECOM for the proposed Building for the Permanent Collection at the Los Angeles Museum of Art (LACMA) located at 5905 Wilshire Boulevard, Los Angeles, California for LACMA Facility Planning Department. The exploratory boring locations were first marked in the field and checked through Underground Services Alert (USA) for clearance of potential conflicts with underground utilities. When necessary, the marked locations were adjusted in order to avoid encountering underground utilities.

Our original exploratory boring/SCPT program was initiated on October 5, 2015 and completed on November 20, 2015 under the supervision of an AECOM engineer.

Subsurface exploration included drilling and sampling 4 borings to depths ranging between 87.5 to 121.5 feet bgs and 4 SCPT soundings to depths ranging between 37.7 to 59.7 feet bgs. Detail of field exploration is summarized in the following table. Borings B-15-1 and B-15-2 were backfilled with bentonite slurry and chips, and the surrounding ground surface was reinstated following borehole completion. Borings B-15-3 and B-15-4 were converted to groundwater monitoring well after complete of drilling and sampling. The locations of the borings/SCPT are shown on Figure 2.

Boring	Performed Date	Drilling Company	Drilling Method	Drilling Rig
B-15-1	10/22/15-10/23/15	Gregg Drilling	Rotary Wash	Mobile B-53
B-15-2	11/20/15	2R Drilling	Hollow Stem Auger	CME 75
B-15-3	11/2/15-11/3/15	2R Drilling	Hollow Stem Auger	CME 75 (Limited Access)
B-15-4	10/15/15-10/16/15	Gregg Drilling	Rotary Wash	Mobile B-53
SCPT-15-1 & 1A	10/5/15	Middle Earth Geo Testing	--	CPT Rig
SCPT-15-2 & 2A	11/13/15			
SCPT-15-3 & 3A	11/13/15			
SCPT-15-4	10/5/15			

AECOM geotechnical representative maintained field boring logs and visually classified the soils according to the Unified Soil Classification System (USCS). The logs were prepared based on USCS for formational material because the like-sandy soil behavior for San Pedro and Fernando Formation. The boring logs and other pertinent information are presented in following pages. When subsurface conditions permitted, relatively undisturbed samples were recovered with the California Soil Sampler (with 2.42-inch I.D.). Standard Penetration Testing (SPT) and testing with the California Soil Sampler were performed in the subsurface soils using a 140-pound automatic-tripped hammer with a 30-inch drop. The number of blows required to drive the sampler was recorded at 6-inch intervals for each sample taken. SPT was performed in accordance with ASTM D1586 procedures. The total number of blows required to drive the sampler the last 12 inches is recorded on the boring logs presented in this Appendix.

Geotechnical samples obtained in the field were carefully sealed and packaged to reduce moisture loss and disturbance and were transported to our laboratory for further testing.

The blow count for the final 12 inches of sampler penetration is commonly referred to as the "N-value". This value generally reflects the resistance to penetration of the soil at the sample depth. The degree of relative density of granular soils and the degree of consistency of cohesive soils are generally described on the boring logs according to the conventional correlation presented in the following table.

The relative density and consistency descriptions on the attached boring log are based on unadjusted blow counts recorded in the field. These numbers are considered useful in providing an estimate of the relative density or consistency of soils. The relative density and consistency descriptions on the log may deviate from the correlation for a number of reasons, including reliance on other test results or the engineer's judgment based on manual manipulation of the sample.

Granular Soils		Cohesive Soils	
SPT Blow Count	Description	SPT Blow Count	Description
< 4	Very Loose	< 2	Very Soft
5 – 10	Loose	2 – 4	Soft
11 – 30	Medium Dense	5 – 8	Firm
31 – 50	Dense	9 – 15	Stiff
> 50	Very Dense	16 - 30	Very Stiff
		> 30	Hard

It is widely accepted that the above-listed SPT blow count correlation is overly simplistic. For most applications in non-gravelly soils, the blow count is usually adjusted for the effective vertical pressure at the sampling depth and for other sampling system parameters such as the efficiency of the sampling system and/or sampling techniques used. In gravelly soils, it is recognized that the blow counts are higher than would be expected in non-gravelly soils of similar density or consistency. This occurs because the sampler tends to push larger gravel clasts ahead of it. The area of the gravel clast may be significantly greater than that of the sampler, causing increased resistance and higher blow counts.

The blow count obtained from nonstandard penetration tests using a California Soil Sampler, N , may be converted to standard blow count, N_{60} , by the relationship between SPT values and hammer ratios [$R_s = f(\text{inner/outer diameter of sampler, weight of hammer, and height of drop})$] (Fang, 1991). In this project using a 140-pound hammer and 30-inch drop, N_{60} is equivalent to approximately $0.5 \times N$ for the sampler in sandy soils and $0.6 \times N$ in cohesive soils.

Analytical test results for investigation derived waste (IDW) disposal were included at the end of the appendix. Based on the test results, IDW was removed from the Project site and disposed of as non-hazardous materials by our sub-contractor American Integrated Services.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
		HIGHLY ORGANIC SOILS			PT

NOTE: Dual symbols are used to indicate gravels or sand with 5-12% fines and soils with fines classifying as CL-ML. Symbols separated by a slash indicate borderline soil classifications.

Other Material Symbols



Concrete



Asphalt

Sampler and Symbol Descriptions



California sample



Standard Penetration Test



No Recovery



Bulk sample



Approximate depth of perched water or groundwater

Note: Number of blows required to advance driven sample 12" (or length noted) is recorded; blow count recorded for seating interval (initial 6" of drive) is indicated by an asterisk.

Laboratory and Field Test Abbreviations

CBR	California Bearing Ratio Test
COL	Collapse Potential test (test result in parentheses)
COMP	Compaction test
CON	Consolidation test
CORR	Corrosivity test
DSCD	Consolidated drained direct shear test (normal pressure and shear strength results shown)
EI	Expansion Index test (test result in parentheses)
PP	Pocket Penetrometer test
R-Value	Resistance Value test
SA	Sieve Analysis (-200 result in parentheses)
SE	Sand Equivalent test (test result in parentheses)
TXCU	Triaxial Compression Test, Consolidated Undrained
-200	Percent passing #200 sieve (test result in parentheses)

KEY TO LOG OF BORING
LACMA Phase III Transformation Project
5905 Wilshire Blvd, Los Angeles, CA
FOR: Los Angeles County Museum of Art

Date(s) Drilled		10/22/15-10/23/15		Logged By		ALC		Boring B-15-1 Sheet 1 of 4							
Drilling Method		Rotary Wash		Drill Bit Size		3-7/8" tricone bit									
Drill Rig Type		D20		Hammer Data		140 lbs, 30-inch drop									
Sampling Method(s)		Bulk, SPT, MC						Job Number		60440464					
Approximate Groundwater Depth and Date Measured		Not measured						Total Depth Drilled (ft)		121.5					
Coordinate System				Location (ft and/or °)		Lat. 34.06191 Long. -118.35762		Approximate Ground Surface Elevation (ft)		175.2					
Elevation (ft)	SAMPLES				Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS	
	Depth (ft)	Type	Number	Blows per foot											Blows per 6 inches
0		BLK-1				AC	5-inch thick Asphalt								
						CL	LAKEWOOD FORMATION [Qlw] Sandy Lean CLAY stiff to very stiff, black to very dark grayish green, moist, medium plasticity, fine- to medium-grained sand, trace fine gravel, with some calcium deposits								
170	5	1	17	5											
				8											
				9											
10		2	23	6		CL-ML	Silty CLAY very stiff, light olive gray, moist, medium plasticity	22	99						
				10											
				13		CL	Sandy Lean CLAY very stiff, dark grayish green, moist, few white coarse-grained sand							Tar Content (2.5%)	
160	15	3	11	3		CH	Fat CLAY stiff, mottled yellowish brown, very dark grayish green and grayish green, moist, high plasticity, trace fine gravel, trace oxide stains								
				5											
				6											
20		4	100+	44		SM	SAN PEDRO FORMATION [Qsp] Silty SAND very dense, olive gray, slightly moist, tar cementation, blocky, fine to coarse grained								
				50/5"											
150	25	5	28	10			dense, black, moist, fine to medium grained, with tar, hydrocarbon odor, with some pockets of clay	4						Tar Content (18.5%)	
				11											
				17											
30						SC	Clayey SAND very dense, black, moist, fine grained, heavy tar impacted								

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LOG OF BORING

LACMA Phase III Transformation Project
5905 Wilshire Blvd, Los Angeles, CA
FOR: Los Angeles County Museum of Art

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Elevation (ft)	Depth (ft)	SAMPLES				USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS
		Type	Number	Blows per foot	Blows per 6 inches									
30			6	100+	16 30 50/4"	SC	Clayey SAND(continued)							
140	35		7	49	20 29 20	SM	Silty SAND very dense, black, moist, fine to medium grained, with hydrocarbon odor							
40			8	100+	25 50/4"		heavy tar saturated, strong hydrocarbon odor	1	118					TXCU
130	45		9	100+	27 34 50/5"		trace to few subrounded to rounded fine gravel	2						Tar Content (17.4%)
50			10	100+	31 50/5"	SM	Silty SAND with GRAVEL very dense, black, moist, fine to medium grained, some subrounded to rounded gravel, tar saturated	20	96					
120	55		11	55	14 25 30	SM	Silty SAND very dense, black, fine to medium grained, trace fine subrounded gravel, with silt interbeds, trace shell off white fragments up to 1/4-inch							
60			12	100+	36 50/2"		tar saturated, clayey sand thin interbeds							
110	65		13	87	20 40 47	SM	Silty SAND with GRAVEL very dense, black, moist, fine to medium grained, little fine gravel, tar saturated	1						Tar Content (16.3%)

LOG OF BORING

LACMA Phase III Transformation Project

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Elevation (ft)	Depth (ft)	SAMPLES			Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS
		Type	Number	Blows per foot	Blows per 6 inches									
	70		14	100+	38 50/5"	SM SM	Silty SAND with GRAVEL (continued) Silty SAND very dense, black, moist, fine to medium grained, tar saturated	18	94					
	75		15	79	15 34 45		little shell fragments							
	80		16	78	18 31 47	ML	FERNANDO FORMATION [Tf] Sandy SILT very dense, black, moist, low plasticity, fine grained sand, hydrocarbon odor							
	85		17	34	8 14 20			14						Tar Content (9.8%)
	90		18	71	12 24 47		very dark brown, strong hydrocarbon odor, massive	19	87					
	95		19	54	11 24 30									
	100		20	78	17 30 48	SM	Silty SAND very dense, black, moist, very fine grained, with mica, contains tar							
	105													

LOG OF BORING

LACMA Phase III Transformation Project

Elevation (ft)	Depth (ft)	SAMPLES				Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS
		Type	Number	Blows per foot	Blows per 6 inches										
-70	105		21	53	11 21 32		SM	Silty SAND(continued)							
-110	110		22	80	16 30 50		ML	Sandy SILT very dense, dark brown, moist, little tar veins							
-115	115		23	51	11 22 29										
-120	120		24	100+	19 33 50/5"			tar cemented							
-125	125							Bottom of boring at 121.5 feet bgs. Boring backfilled with cement bentonite grout.							
-130	130														
-135	135														
-140	140														

LOG OF BORING

LACMA Phase III Transformation Project

Date(s) Drilled		11/20/15		Logged By		ALC		Boring B-15-2 Sheet 1 of 3						
Drilling Method		Hollow Stem Auger		Drill Bit Size		7-1/2" bullet bit								
Drill Rig Type		CME 75		Hammer Data		140 lbs, 30-inch drop								
Sampling Method(s)		Bulk, SPT, MC						Job Number		60440464				
Approximate Groundwater Depth and Date Measured		No groundwater encountered						Total Depth Drilled (ft)		87.5				
Coordinate System				Location (ft and/or °)		Lat. 34.06332 Long. -118.35712		Approximate Ground Surface Elevation (ft)		171.2				
Elevation (ft)	SAMPLES				Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS
	Depth (ft)	Type	Number	Blows per foot										
0						AG BASE	4-inch thick Asphalt							
170						CH	14-inch thick Base							
							ALLUVIUM [Qal] Sandy Fat CLAY medium stiff to stiff, greenish gray mottled with dark brown, moist, high plasticity, some fine to coarse SAND, bedded with 5-inch thin layer of Sandy Lean CLAY, dark brown, moist, fine-grained sand							
5		1	7	234				28		54	56	36		
10						SC	Clayey SAND dense, dark grayish brown to very dark brown, moist, low to medium plasticity	20	81	40	46	19		DSCD, CORR, CON
160		2	43	161924										
15						CL	LAKEWOOD FORMATION [Qlw] Sandy Lean CLAY stiff to very stiff, very dark brown, moist, some fine SAND, low to medium plasticity, with tar veins	19		65				Tar Content (6.1%)
20		3	12	248										
150						SM	SAN PEDRO FORMATION [Qsp] Silty SAND very dense, black, slightly moist, fine to medium, with tar, strong hydrocarbon odor	13	98					TXCU
25		4	100+	244850/2"										
30						SM	Silty SAND with GRAVEL very dense, black mottled with olive, slightly moist, little fine subangular GRAVEL, bedded with 2-inch thin layer of bluish gray SILT	4						Tar Content (11.4%)
		5	100+	334150/4"										

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LOG OF BORING

LACMA Phase III Transformation Project
5905 Wilshire Blvd, Los Angeles, CA
FOR: Los Angeles County Museum of Art

Elevation (ft)	Depth (ft)	SAMPLES				USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS
		Type	Number	Blows per foot	Blows per 6 inches									
140	30		6	100+	49 50/4"	SP	Poorly graded SAND with GRAVEL very dense, black, slightly moist, fine to medium, little coarse sand, little fine gravel, trace of coarse subrounded to rounded gravel, strong hydrocarbon odor							
35			7	58	14 24 34	SP-SM	Poorly graded SAND with SILT and GRAVEL very dense, black, slightly moist, fine to medium, little coarse, little fine subrounded gravel, strong hydrocarbon odor	2						Tar Content (17.5%)
130	40		8	100+	32 50/5"	SP-SM	Poorly graded SAND with SILT very dense, black, moist, fine to medium grained, trace fine subangular gravel, trace shell fragments	3	121					TXCU
45			9	100+	32 50/4"		some coarse grained, few fine angular gravel							
120	50		10	100+	32 48 50/5"		fine SAND, trace coarse, trace fine angular gravel							
55			11	36	12 15 21	CL	little shell fragments FERNANDO FORMATION [Tf] Lean CLAY hard, very dark grayish brown, moist, medium plasticity, few tar veins	21						Tar Content (14.9%)
110	60		12	100+	50/5"		dark brown, few fine sand	21	98					
65			13	34	9 12 22		very dark grayish brown, light hydrocarbon odor							

LOG OF BORING

LACMA Phase III Transformation Project

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Elevation (ft)	Depth (ft)	SAMPLES			Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS
		Type	Number	Blows per foot	Blows per 6 inches									
						CL	Lean CLAY (continued)							
	70													
	100		14	100+	20 50/5"		very dark grayish brown mottled with dark olive brown, some tar veins, strong hydrocarbon odor							
	75		15	45	10 19 26		very dark grayish brown, trace tar veins	20						Tar Content (10.6%)
	80													
	90		16	100+	21 50/5"		no tar veins	14	95					
	85		17	42	10 17 25		very dark brown, trace tar veins							
	90						Bottom of boring at 87.5 feet bgs. No groundwater was encountered during drilling. Boring backfilled with cement bentonite grout.							
	80													
	95													
	100													
	70													
	105													

LOG OF BORING

LACMA Phase III Transformation Project

Date(s) Drilled		11/2/15-11/3/15		Logged By		ALC		Boring B-15-3 Sheet 1 of 3					
Drilling Method		Hollow Stem Auger		Drill Bit Size		7-1/2" bullet bit							
Drill Rig Type		CME 75 (Limited Access)		Hammer Data		140 lbs, 30-inch drop							
Sampling Method(s)		Bulk, SPT, MC						Job Number		60440464			
Approximate Groundwater Depth and Date Measured		Groundwater encountered approximately at 30' bgs.						Total Depth Drilled (ft)		88.5			
Coordinate System				Location (ft and/or °)		Lat. 34.06282 Long. -118.35757		Approximate Ground Surface Elevation (ft)		168.5			

Elevation (ft)	Depth (ft)	SAMPLES			Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS
		Type	Number	Blows per foot										
0						CONC	16-inch thick Concrete							
						CL	ARTIFICIAL FILL [af] Sandy Lean CLAY very stiff to hard, black, moist, low to medium plasticity, very fine grained sand							
5		BLK-1	1	53	33 29 24									El (79)
10			2	19	4 9 10	CL	LAKEWOOD FORMATION [Qlw] Sandy Lean CLAY very stiff, very dark brown, medium plasticity, with little tar along fractures							
15		BLK-2	3	46	13 19 27	SM	SAN PEDRO FORMATION [Qsp] Silty SAND dense, black, moist, fine- to medium grained	3	121					TXCU
20			4	32	11 13 19		fine- to medium-grained sand, increase in tar	2						Tar Content (14.1%)
25		BLK-3	5	100+	22 50/6"	SP-SM	Poorly graded SAND with SILT very dense, black, moist, medium-grained sand, trace subrounded gravel	4	118					TXCU
30														

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LOG OF BORING

LACMA Phase III Transformation Project
5905 Wilshire Blvd, Los Angeles, CA
FOR: Los Angeles County Museum of Art

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Elevation (ft)	Depth (ft)	SAMPLES				USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS
		Type	Number	Blows per foot	Blows per 6 inches									
30			6	45	15 17 28	SM	Silty SAND very dense, balck, moist, with three 1-inch layers of fine subrounded to rounded gravel, trace of well lenses	5						Tar Content (14.6%)
		BLK-4												
			7	100+	29 49 50/3"	SM	Silty SAND with GRAVEL very dense, black, moist, fine to medium grained, little fine gravel, with tar, strong hydrocarbon odor	20	74					TXCU Tar Content (81.6%)
-130														
			8	42	15 19 23	SP-SM	Poorly graded SAND with SILT very dense, black, moist, trace of shell fragments	4						Tar Content (16.8%)
		BLK-5												
			9	100+	42 50/3"	SM	Silty SAND black, moist, fine to medium grained, with pockets of clay, trace subrounded coarse gravel							
-120														
			10	41	14 18 23		no clay, no gravel							
		BLK-6												
			11	100+	26 52/6"		little coarse grained sand	11	98					
-110														
			12	35	9 15 20	CL	FERNANDO FORMATION [Tf] Lean CLAY hard, dark brown, moist, low to medium plasticity	20						Tar Content (15.9%)
		BLK-7												
			13	100+	20									

LOG OF BORING

LACMA Phase III Transformation Project

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Elevation (ft)	Depth (ft)	SAMPLES				USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS
		Type	Number	Blows per foot	Blows per 6 inches									
-100					58/6"	CL	Lean CLAY (continued)							
	70		14	44	10 17 27		top 6-inches with spots of tar along fractures							
	75	BLK-8												
			15	100+	30 50/4.5"		trace of tar along fractures	18	91					
-90														
	80		16	40	10 16 24		tar along fractures	18						Tar Content (10.8%)
	85													
			17	100+	25 52/6"									
-80														
	90						Bottom of boring at 88.5 feet bgs. Borehole was backfilled with cement bentonite grout to 59 feet bgs, and was converted to groundwater monitoring well.							
	95													
-70														
	100													
	105													

LOG OF BORING

LACMA Phase III Transformation Project

Date(s) Drilled 10/15/15-10/16/15		Logged By ALC		Boring B-15-4 Sheet 1 of 4										
Drilling Method Rotary Wash		Drill Bit Size 3-7/8" tricone bit												
Drill Rig Type D20		Hammer Data 140 lbs, 30-inch drop												
Sampling Method(s) Bulk, SPT, MC				Job Number 60440464										
Approximate Groundwater Depth and Date Measured Not measured				Total Depth Drilled (ft) 121.5										
Coordinate System		Location (ft and/or °) Lat. 34.06401 Long. -118.35857		Approximate Ground Surface Elevation (ft) 169.8										
Elevation (ft)	SAMPLES				Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS
	Depth (ft)	Type	Number	Blows per foot										
0	Blk-1				AC BASE	6-inch thick ASPHALT								EI (64), R-Value
					CL	12-inch thick BASE								
						ALLUVIUM [Qal] Lean CLAY stiff, black, moist, medium plasticity, few coarse grained sand, with little calcification and organics								
5	1	7	1 3 4											PP = 1.5 tsf DSCD Tar Content (3.8%)
					CL	LAKEWOOD FORMATION [Qlw] Sandy Lean CLAY stiff, mottled black and olive, moist, very fine-grained sand, with silt, medium plasticity	25	89						
-160	2	13	2 4 9											
15	3	25	6 9 16		SC	SAN PEDRO FORMATION [Qsp] Clayey SAND dense, black with very dark grayish green mottles, moist, fine to medium grained, with tar, hydrocarbon odor								TXCU
						very dark grayish green, medium- to coarse-grained sand, increase in tar	10	118						
-150	4	50	23 23 27											
25	5	40	4 7 33			very dense								
-140														
30														

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LOG OF BORING

LACMA Phase III Transformation Project
5905 Wilshire Blvd, Los Angeles, CA
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Elevation (ft)	Depth (ft)	SAMPLES				USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS
		Type	Number	Blows per foot	Blows per 6 inches									
30			6	100+	23 50/4"	SC	Clayey SAND (continued) black, little tar	13						Tar Content (16.2%)
35			7	38	17 15 23		dense, medium grained, with tar, little coarse sand, hydrocarbon odor							
130	40		8	100+	37 50/4"		very dense	12	92					
45			9	100+	39 50/4"		increase in sand							
120	50		10	100+	33 50/2"	SP	Poorly graded SAND with GRAVEL very dense, black, moist, medium-grained sand, some fine angular gravel, increase in tar	3						Tar Content (13.8%)
55			11	100+	28 50/6"	SP-SM	Poorly graded SAND with SILT very dense, black, moist, fine to medium grained	9						Tar Content (17.9%)
110	60		12	100+	44 50/3"	SM	Silty SAND very dense, black, moist	19	85					
65			13	70	29 27 43	CL	FERNANDO FORMATION [Tf] Sandy Lean CLAY hard, very dark grayish green, moist, medium plasticity, fine-grained sand with little coarse-grained sand, trace of fine angular gravel, with mottled white sand pockets							

LOG OF BORING

LACMA Phase III Transformation Project

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Elevation (ft)	Depth (ft)	SAMPLES				USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS
		Type	Number	Blows per foot	Blows per 6 inches									
100	70		14	62	16 23 39	CL	very dark brown	28	80					PP > 4.5 tsf Tar Content (9.9%) DSCD
75	75		15	52	8 19 33		with tar along fractures							
90	80		16	100+	16 35 50/4"		decrease in tar	15	85					
85	85		17	54	10 21 33	SP-SM	Poorly graded SAND with SILT very dense, black, moist, fine-grained sand, with strong hydrocarbon odor							PP > 4.5 tsf
80	90		18	100+	23 50/5"									
95	95		19	43	11 19 24	CL	Lean CLAY very dark grayish brown, moist, medium plasticity, with little tar along fractures							
70	100		20	100+	38 48 50/5"		No recovery							
105														

LOG OF BORING

LACMA Phase III Transformation Project

Report: DMG4; Project File: R:\PROJECTS\ENV\LEGACY\GTNEVILLE\PROJECT\LACMA\BORINGS\BORING LOGS REV.GPJ; Data Template: URS HSA LOGS 2010.GDT Printed: 10/20/16

Elevation (ft)	Depth (ft)	SAMPLES				USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	PID Reading (ppm)	OTHER TESTS AND REMARKS
		Type	Number	Blows per foot	Blows per 6 inches									
105			21	45	12 17 28		CL							
							Lean CLAY (continued)							
-60	110		22	100+	21 50/6"		CL							PP > 4.5 tsf
							Sandy Lean CLAY hard, black, moist, very fine-grained sand, heavy tar							
115			23	58	12 24 34									
-50	120		24	100+	44 50/2"									
							No recovery							
							Bottom of boring at 121.5 feet bgs. Boring was backfilled with cement bentonite grout to 32 feet bgs, and was reamed to 8-inch diameter between existing ground and 32 feet bgs by hollow stem auger to convert to groundwater monitoring well.							
125														
-40	130													
135														
-30	140													

LOG OF BORING

LACMA Phase III Transformation Project

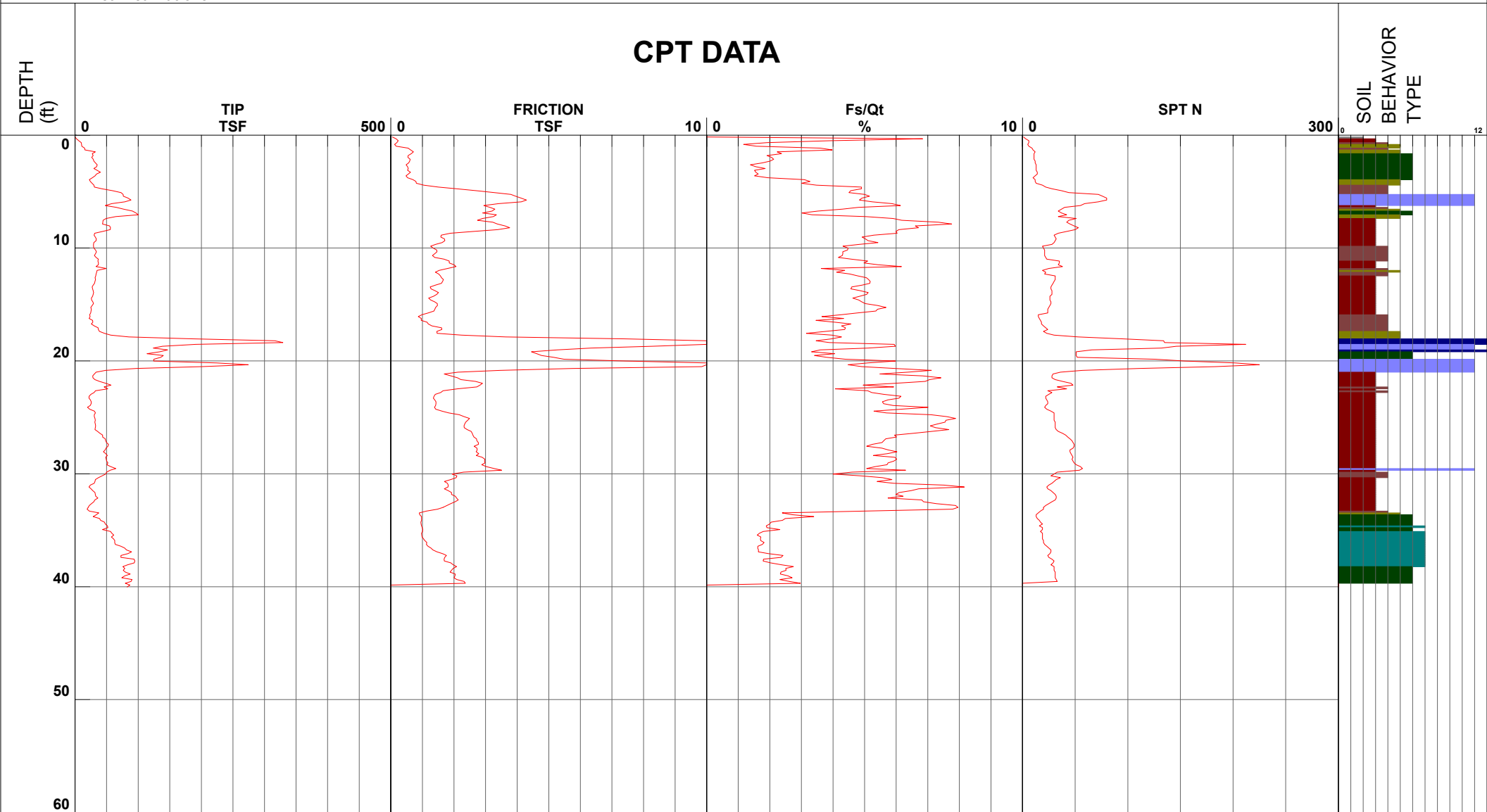


AECOM

Project LACMA Phase III Transformation Project Operator RC-DG
Job Number 60440464 Cone Number DDG1333
Hole Number S-CPT-01 Date and Time 10/5/2015 8:15:04 AM
EST GW Depth During Test 8.00 ft

Filename SDF(233).cpt
GPS
Maximum Depth 40.03 ft

Net Area Ratio .8



- | | | | |
|----------------------------|-------------------------------|------------------------------|----------------------------------|
| 1 - sensitive fine grained | 4 - silty clay to clay | 7 - silty sand to sandy silt | 10 - gravelly sand to sand |
| 2 - organic material | 5 - clayey silt to silty clay | 8 - sand to silty sand | 11 - very stiff fine grained (*) |
| 3 - clay | 6 - sandy silt to clayey silt | 9 - sand | 12 - sand to clayey sand (*) |

Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

LACMA Phase III Transformation Project

Project ID: AECOM
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CPT Date: 10/5/2015 8:15:04 AM
GW During Test: 8 ft

Page: 1
Sounding ID: S-CPT-01
Project No: 60440464
Cone/Rig: DDG1333

Depth ft	qc PS	qc1n PS	q1ncs PS	qt PS	slv Stss tsf	pore prss (psi)	Frct Rto %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic SBT	Ik SBT Index	Nk -	Vol Strn %	Cycl SStn %
0.33	2.4	3.9	-	2.4	0.2	0.1	6.9	2	Organic SOILS - Peats	100	1.0	2	4	-	-	0.3	9.9	95	3.54	10	N/A	N/A
0.49	6.0	9.6	-	6.0	0.2	0.0	3.9	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	64	3.08	15	N/A	N/A
0.66	9.9	15.8	-	9.9	0.2	-0.1	1.9	4	clay SILT to silty CLAY	115	2.0	5	8	-	-	0.7	9.9	42	2.72	15	N/A	N/A
0.82	10.5	16.8	54.9	10.5	0.1	-0.1	1.2	4	clay SILT to silty CLAY	115	2.0	5	8	-	-	0.7	9.9	35	2.59	15	N/A	N/A
0.98	10.7	17.2	-	10.7	0.2	0.0	1.6	4	clay SILT to silty CLAY	115	2.0	5	9	-	-	0.8	9.9	38	2.65	15	N/A	N/A
1.15	15.2	24.3	-	15.2	0.5	0.0	3.6	4	clay SILT to silty CLAY	115	2.0	8	12	-	-	1.1	9.9	43	2.74	15	N/A	N/A
1.31	15.8	25.4	-	15.8	0.6	0.0	4.0	4	clay SILT to silty CLAY	115	2.0	8	13	-	-	1.1	9.9	43	2.76	15	N/A	N/A
1.48	32.1	51.5	110.6	32.1	0.7	0.0	2.2	5	silty SAND to sandy SILT	120	4.0	8	13	45	47	-	-	25	2.36	16	N/A	N/A
1.64	27.3	43.8	106.5	27.3	0.6	0.0	2.4	5	silty SAND to sandy SILT	120	4.0	7	11	40	46	-	-	28	2.43	16	N/A	N/A
1.80	28.7	46.0	97.8	28.7	0.5	0.1	1.9	5	silty SAND to sandy SILT	120	4.0	7	12	41	46	-	-	24	2.35	16	N/A	N/A
1.97	26.4	42.3	97.8	26.4	0.5	0.1	2.1	5	silty SAND to sandy SILT	120	4.0	7	11	39	45	-	-	26	2.40	16	N/A	N/A
2.13	29.0	46.4	103.3	29.0	0.6	0.1	2.1	5	silty SAND to sandy SILT	120	4.0	7	12	42	45	-	-	26	2.38	16	N/A	N/A
2.30	29.8	47.8	101.9	29.8	0.6	0.0	2.0	5	silty SAND to sandy SILT	120	4.0	7	12	43	45	-	-	25	2.35	16	N/A	N/A
2.46	32.2	51.6	99.1	32.2	0.6	0.0	1.8	5	silty SAND to sandy SILT	120	4.0	8	13	45	45	-	-	22	2.29	16	N/A	N/A
2.62	35.1	56.3	93.2	35.1	0.5	0.1	1.4	5	silty SAND to sandy SILT	120	4.0	9	14	48	45	-	-	19	2.19	16	N/A	N/A
2.79	34.3	55.0	96.7	34.3	0.5	0.0	1.6	5	silty SAND to sandy SILT	120	4.0	9	14	47	44	-	-	20	2.24	16	N/A	N/A
2.95	29.8	47.8	98.2	29.8	0.6	-0.1	1.9	5	silty SAND to sandy SILT	120	4.0	7	12	43	43	-	-	24	2.33	16	N/A	N/A
3.12	35.0	56.1	96.5	35.0	0.5	0.0	1.5	5	silty SAND to sandy SILT	120	4.0	9	14	48	44	-	-	20	2.22	16	N/A	N/A
3.28	40.1	64.3	104.6	40.1	0.6	0.0	1.6	5	silty SAND to sandy SILT	120	4.0	10	16	52	44	-	-	18	2.18	16	N/A	N/A
3.45	34.0	54.6	98.5	34.0	0.6	-0.2	1.6	5	silty SAND to sandy SILT	120	4.0	9	14	47	43	-	-	21	2.25	16	N/A	N/A
3.61	31.8	51.0	92.5	31.8	0.5	-0.3	1.5	5	silty SAND to sandy SILT	120	4.0	8	13	45	43	-	-	21	2.25	16	N/A	N/A
3.77	27.4	44.0	97.1	27.4	0.5	-0.3	2.0	5	silty SAND to sandy SILT	120	4.0	7	11	40	42	-	-	25	2.37	16	N/A	N/A
3.94	22.7	36.4	114.4	22.7	0.7	-0.5	3.1	4	clay SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	34	2.57	15	N/A	N/A
4.10	24.3	38.9	121.1	24.3	0.8	-0.4	3.3	4	clay SILT to silty CLAY	115	2.0	12	19	-	-	1.7	9.9	34	2.56	15	N/A	N/A
4.27	27.0	43.2	120.7	26.9	0.8	-0.3	3.0	4	clay SILT to silty CLAY	115	2.0	13	22	-	-	1.9	9.9	31	2.50	15	N/A	N/A
4.43	30.0	48.0	136.8	29.9	1.0	-0.4	3.5	4	clay SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	31	2.52	15	N/A	N/A
4.59	30.8	49.4	-	30.8	1.5	-0.8	4.9	4	clay SILT to silty CLAY	115	2.0	15	25	-	-	2.2	9.9	36	2.61	15	N/A	N/A
4.76	42.5	68.2	195.5	42.5	2.1	-1.0	4.9	4	clay SILT to silty CLAY	115	2.0	21	34	-	-	3.0	9.9	32	2.52	15	N/A	N/A
4.92	59.4	95.3	220.9	59.4	2.7	-0.5	4.6	9	very stiff fine SOIL	120	2.0	30	48	65	44	-	-	26	2.40	30	N/A	N/A
5.09	72.8	116.7	244.4	72.8	3.3	-0.4	4.5	9	very stiff fine SOIL	120	2.0	36	58	72	45	-	-	24	2.34	30	N/A	N/A
5.25	76.0	122.0	266.8	76.0	3.8	-0.4	5.0	9	very stiff fine SOIL	120	2.0	38	61	74	45	-	-	25	2.37	30	N/A	N/A
5.41	76.6	122.8	273.0	76.6	3.9	0.0	5.2	9	very stiff fine SOIL	120	2.0	38	61	74	45	-	-	25	2.38	30	N/A	N/A
5.58	84.0	134.6	279.2	84.0	4.1	0.5	4.9	9	very stiff fine SOIL	120	2.0	42	67	77	45	-	-	24	2.34	30	N/A	N/A
5.74	88.7	142.3	285.6	88.7	4.3	0.3	4.9	9	very stiff fine SOIL	120	2.0	44	71	79	45	-	-	23	2.32	30	N/A	N/A
5.91	78.9	126.5	280.5	78.9	4.1	0.7	5.3	9	very stiff fine SOIL	120	2.0	39	63	75	45	-	-	25	2.38	30	N/A	N/A
6.07	58.2	93.3	255.7	58.2	3.4	0.4	5.9	9	very stiff fine SOIL	120	2.0	29	47	65	43	-	-	30	2.49	30	N/A	N/A
6.23	48.0	77.0	238.7	48.0	2.9	1.8	6.2	9	very stiff fine SOIL	120	2.0	24	39	58	42	-	-	34	2.56	30	N/A	N/A
6.40	65.3	103.5	238.5	65.3	3.1	2.3	4.8	9	very stiff fine SOIL	120	2.0	33	52	68	43	-	-	26	2.40	30	N/A	N/A
6.56	76.8	120.2	241.8	76.8	3.3	1.6	4.3	9	very stiff fine SOIL	120	2.0	38	60	73	44	-	-	23	2.32	30	N/A	N/A
6.73	90.9	140.6	237.6	91.0	3.2	1.7	3.5	8	stiff SAND to clay SAND	115	1.0	91	100	-	-	6.0	9.9	19	2.21	16	N/A	N/A
6.89	96.5	147.4	226.7	96.6	2.9	1.1	3.0	5	silty SAND to sandy SILT	120	4.0	24	37	80	45	-	-	17	2.14	16	N/A	N/A
7.05	100.3	151.4	241.9	100.4	3.3	0.9	3.3	5	silty SAND to sandy SILT	120	4.0	25	38	81	45	-	-	18	2.17	16	N/A	N/A
7.22	64.5	96.3	236.3	64.6	3.2	1.4	5.1	9	very stiff fine SOIL	120	2.0	32	48	66	43	-	-	28	2.43	30	N/A	N/A
7.38	49.2	72.6	226.5	49.3	2.9	4.1	6.0	9	very stiff fine SOIL	120	2.0	25	36	56	41	-	-	34	2.57	30	N/A	N/A
7.55	44.5	71.3	231.4	44.5	2.7	3.4	6.2	9	very stiff fine SOIL	120	2.0	22	36	56	41	-	-	35	2.59	30	N/A	N/A
7.71	44.0	70.6	-	44.1	3.2	3.9	7.4	9	very stiff fine SOIL	120	2.0	22	35	56	40	-	-	38	2.65	30	N/A	N/A
7.87	43.5	69.7	-	43.5	3.4	3.7	7.8	9	very stiff fine SOIL	120	2.0	22	35	55	40	-	-	39	2.67	30	N/A	N/A
8.04	54.7	77.7	251.5	54.8	3.6	2.1	6.7	9	very stiff fine SOIL	120	2.0	27	39	59	41	-	-	35	2.59	30	0.00	0.0
8.20	56.1	79.3	256.7	56.2	3.8	1.7	6.8	9	very stiff fine SOIL	120	2.0	28	40	59	41	-	-	35	2.59	30	0.00	0.0
8.37	55.6	78.2	239.7	55.7	3.4	2.0	6.1	9	very stiff fine SOIL	120	2.0	28	39	59	41	-	-	33	2.56	30	0.00	0.0
8.53	43.7	70.0	225.4	43.7	2.6	1.9	6.1	9	very stiff fine SOIL	120	2.0	22	35	55	40	-	-	34	2.58	30	0.00	0.0
8.69	31.2	50.1	-	31.3	1.9	2.8	6.1	3	silty CLAY to CLAY	115	1.5	21	33	-	-	2.2	9.9	39	2.68	15	-	-
8.86	30.2	48.4	-	30.2	1.6	3.2	5.4	3	silty CLAY to CLAY	115	1.5	20	32	-	-	2.1	9.9	38	2.65	15	-	-
9.02	32.1	51.5	-	32.2	1.6	2.9	5.0	4	clay SILT to silty CLAY	115	2.0	16	26	-	-	2.2	9.9	36	2.61	15	-	-
9.19	33.8	53.9	-	33.8	1.7	2.9	5.1	4	clay SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	35	2.60	15	-	-
9.35	33.5	53.7	-	33.5	1.7	2.7	5.2	4	clay SILT to silty CLAY	115	2.0	17	27	-	-	2.3	9.9	36	2.61	15	-	-
9.51	29.9	48.0	-	30.0	1.6	2.6	5.3	3	silty CLAY to CLAY	115	1.5	20	32	-	-	2.1	9.9	38	2.66	15	-	-
9.68	29.3	47.1	-	29.4	1.4	2.8	4.9	4	clay SILT to silty CLAY	115	2.0	15	24	-	-	2.0	9.9	37	2.63	15	-	-
9.84	29.3	45.6	-	29.3	1.3	2.8	4.4	4	clay SILT to silty CLAY	115	2.0	15	23	-	-	2.0	9.9	36	2.60	15	-	-
10.01	29.9	48.0	-	30.0	1.3	3.1	4.6	4	clay SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	35	2.60	15	-	-
10.17	32.6	50.2	162.5	32.6	1.5	2.9	4.5	4	clay SILT to silty CLAY	115	2.0	16	25	-	-	2.3	9.9	35	2.58	15	0.00	0.0
10.34	33.9	52.0	161.7	34.0	1.5	3.1	4.4	4	clay SILT to silty CLAY	115	2.0	17	26	-	-	2.4	9.9	34	2.56	15	0.00	0.0
10.50	32.4	49.3	158.2	32.4	1.4	3.0	4.4	4	clay SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	34	2.58	15	0.14	0.2
10.66	30.7	46.5	154.1	30.8	1.3	3.1	4.4	4	clay SILT to silty CLAY	115	2.0	15	23	-	-	2.1	9.9	35	2.60	15	0.17	0.2
10.83	33.4	50.3	156.5	33.4	1.4	3.3	4.2	4	clay SILT to silty CLAY	115	2.0	17	25	-	-	2.3	9.9	34	2.56	15	0.16	0.2
10.99	36.8	55.1	171.9	36.9	1.7	3.4	4.7	4	clay													

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Project No: 60440464
Cone/Rig: DDG1333

Depth ft	qc PS	qc1n PS	q1ncs PS	qt PS	Slv Stss tsf	pore prss (psi)	Frct Rato	* Mat Typ	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic SBT	* Ic Indx	* Nk -	* Vol Strn %	* Cycl SStn %
15.58	25.5	38.1	-	25.6	1.4	6.5	5.6	3	silty CLAY to CLAY	115	1.5	17	25	-	-	1.8 9.9	42 2.74	15	-	-		
15.75	24.8	36.9	-	25.0	1.2	6.5	4.9	3	silty CLAY to CLAY	115	1.5	17	25	-	-	1.7 9.9	41 2.71	15	-	-		
15.91	23.1	34.2	-	23.3	1.0	6.9	4.4	4	clay SILT to silty CLAY	115	2.0	12	17	-	-	1.6 9.9	41 2.70	15	-	-		
16.08	23.9	35.1	-	24.0	0.9	6.8	3.8	4	clay SILT to silty CLAY	115	2.0	12	18	-	-	1.6 9.9	38 2.65	15	-	-		
16.24	22.3	32.5	-	22.4	1.0	7.0	4.5	3	silty CLAY to CLAY	115	1.5	15	22	-	-	1.5 9.9	42 2.73	15	-	-		
16.40	27.8	35.5	-	28.0	1.0	7.7	3.6	4	clay SILT to silty CLAY	115	2.0	14	18	-	-	1.9 9.9	37 2.63	15	-	-		
16.57	28.3	40.7	-	28.4	1.1	7.8	4.2	4	clay SILT to silty CLAY	115	2.0	14	20	-	-	1.9 9.9	37 2.63	15	-	-		
16.73	25.9	37.1	-	26.1	1.2	7.9	4.7	3	silty CLAY to CLAY	115	1.5	17	25	-	-	1.8 9.9	40 2.70	15	-	-		
16.90	30.5	43.4	-	30.6	1.3	8.7	4.4	4	clay SILT to silty CLAY	115	2.0	15	22	-	-	2.1 9.9	37 2.62	15	-	-		
17.06	36.6	45.8	-	36.7	1.6	8.7	4.5	4	clay SILT to silty CLAY	115	2.0	18	23	-	-	2.5 9.9	36 2.61	15	-	-		
17.23	36.9	46.1	-	37.1	1.6	9.0	4.5	4	clay SILT to silty CLAY	115	2.0	18	23	-	-	2.6 9.9	36 2.61	15	-	-		
17.39	38.8	44.5	141.1	39.0	1.5	10.1	3.9	4	clay SILT to silty CLAY	115	2.0	19	22	-	-	2.7 9.9	34 2.57	15	0.74	49.9		
17.55	46.5	53.2	137.5	46.7	1.5	12.4	3.2	4	clay SILT to silty CLAY	115	2.0	23	27	-	-	3.2 9.9	29 2.46	15	0.95	24.4		
17.72	56.5	64.5	170.2	56.8	2.2	15.4	4.0	4	clay SILT to silty CLAY	115	2.0	28	32	-	-	3.9 9.9	30 2.47	15	0.00	0.0		
17.88	85.3	97.0	216.1	85.5	3.6	12.9	4.3	9	very stiff fine SOIL	120	2.0	43	49	66	41	-	26 2.38	30	0.00	0.0		
18.05	186.9	211.9	329.2	187.8	7.4	47.6	4.0	8	stiff SAND to clay SAND	115	1.0	100	100	-	-	12.3 9.9	17 2.15	16	0.00	0.0		
18.21	316.4	357.8	458.6	320.7	11.0	218.9	3.5	8	stiff SAND to clay SAND	115	1.0	100	100	-	-	20.9 9.9	13 1.99	16	0.00	0.0		
18.37	329.1	371.1	494.0	335.1	12.8	301.8	3.9	8	stiff SAND to clay SAND	115	1.0	100	100	-	-	21.8 9.9	14 2.02	16	0.00	0.0		
18.54	191.1	214.9	417.9	193.0	11.3	96.7	6.0	9	very stiff fine SOIL	120	2.0	96	100	92	45	-	22 2.30	30	0.00	0.0		
18.70	138.4	155.1	343.9	139.2	8.3	39.1	6.0	9	very stiff fine SOIL	120	2.0	69	78	81	44	-	25 2.38	30	0.00	0.0		
18.87	124.0	138.6	292.1	126.3	6.3	113.8	5.2	9	very stiff fine SOIL	120	2.0	62	69	78	43	-	24 2.35	30	0.00	0.0		
19.03	146.6	163.2	264.5	150.1	5.3	179.7	3.6	8	stiff SAND to clay SAND	115	1.0	100	100	-	-	9.7 9.9	18 2.18	16	0.00	0.0		
19.19	134.1	148.9	239.8	136.6	4.5	129.7	3.3	5	silty SAND to sandy SILT	120	4.0	34	37	80	43	-	18 2.18	16	0.00	0.0		
19.36	114.0	126.2	241.8	117.3	4.6	169.2	4.1	9	very stiff fine SOIL	120	2.0	57	63	75	43	-	22 2.29	30	0.00	0.0		
19.52	139.8	154.4	248.6	145.3	4.8	275.9	3.4	8	stiff SAND to clay SAND	115	1.0	100	100	-	-	9.2 9.9	18 2.18	16	0.00	0.0		
19.69	135.7	149.3	257.5	140.0	5.2	221.8	3.8	8	stiff SAND to clay SAND	115	1.0	100	100	-	-	8.9 9.9	20 2.22	16	0.00	0.0		
19.85	124.8	137.0	265.3	127.9	5.5	156.0	4.4	9	very stiff fine SOIL	120	2.0	62	69	77	43	-	22 2.30	30	0.00	0.0		
20.01	124.6	136.3	319.5	128.8	7.4	216.5	6.0	9	very stiff fine SOIL	120	2.0	62	68	77	43	-	27 2.41	30	0.00	0.0		
20.18	224.2	244.6	415.6	230.6	11.4	328.6	5.1	9	very stiff fine SOIL	120	2.0	100	100	95	46	-	19 2.21	30	0.00	0.0		
20.34	274.3	298.4	446.4	276.5	12.3	110.3	4.5	9	very stiff fine SOIL	120	2.0	100	100	95	47	-	16 2.12	30	0.00	0.0		
20.51	200.2	217.1	376.2	200.8	9.8	31.4	4.9	9	very stiff fine SOIL	120	2.0	100	100	93	45	-	20 2.23	30	0.00	0.0		
20.67	97.0	104.9	276.4	97.0	5.8	2.9	6.0	9	very stiff fine SOIL	120	2.0	48	52	69	41	-	29 2.47	30	0.00	0.0		
20.83	48.7	60.0	-	48.7	3.5	-0.2	7.3	3	silty CLAY to CLAY	115	1.5	32	40	-	-	3.4 9.9	40 2.69	15	-	-		
21.00	33.4	41.0	-	33.5	2.1	2.2	6.6	3	silty CLAY to CLAY	115	1.5	22	27	-	-	2.3 9.9	44 2.77	15	-	-		
21.16	30.8	37.6	-	30.8	1.7	1.2	5.7	3	silty CLAY to CLAY	115	1.5	21	25	-	-	2.1 9.9	43 2.75	15	-	-		
21.33	27.9	33.8	-	27.9	1.9	1.4	7.2	3	silty CLAY to CLAY	115	1.5	19	23	-	-	1.9 9.9	49 2.85	15	-	-		
21.49	28.5	34.3	-	28.5	2.1	1.2	7.8	3	silty CLAY to CLAY	115	1.5	19	23	-	-	2.0 9.9	50 2.88	15	-	-		
21.65	31.4	37.7	-	31.4	2.2	1.3	7.4	3	silty CLAY to CLAY	115	1.5	21	25	-	-	2.2 9.9	48 2.83	15	-	-		
21.82	38.7	46.3	-	38.8	2.7	1.6	7.2	3	silty CLAY to CLAY	115	1.5	26	31	-	-	2.7 9.9	44 2.76	15	-	-		
21.98	48.7	57.9	-	48.7	2.9	2.0	6.1	3	silty CLAY to CLAY	115	1.5	32	39	-	-	3.4 9.9	37 2.64	15	-	-		
22.15	57.0	60.2	188.9	57.0	2.8	2.5	5.1	4	clay SILT to silty CLAY	115	2.0	28	30	-	-	4.0 9.9	34 2.57	15	0.00	0.0		
22.31	46.0	54.1	-	46.1	2.7	2.2	6.1	3	silty CLAY to CLAY	115	1.5	31	36	-	-	3.2 9.9	38 2.66	15	-	-		
22.47	51.8	54.5	161.2	51.9	2.1	3.1	4.2	4	clay SILT to silty CLAY	115	2.0	26	27	-	-	3.6 9.9	32 2.54	15	0.00	0.0		
22.64	32.5	37.8	-	32.5	1.7	2.1	5.3	3	silty CLAY to CLAY	115	1.5	22	25	-	-	2.2 9.9	42 2.73	15	-	-		
22.80	30.2	35.0	-	30.3	1.6	2.5	5.5	3	silty CLAY to CLAY	115	1.5	20	23	-	-	2.1 9.9	44 2.76	15	-	-		
22.97	25.1	28.9	-	25.1	1.4	1.8	5.9	3	silty CLAY to CLAY	115	1.5	17	19	-	-	1.7 9.9	49 2.85	15	-	-		
23.13	22.3	25.5	-	22.3	1.4	2.0	6.5	3	silty CLAY to CLAY	115	1.5	15	17	-	-	1.5 7.9	53 2.92	15	-	-		
23.30	22.1	25.2	-	22.2	1.3	1.9	6.5	3	silty CLAY to CLAY	115	1.5	15	17	-	-	1.5 7.8	53 2.92	15	-	-		
23.46	24.2	27.5	-	24.3	1.4	1.9	6.1	3	silty CLAY to CLAY	115	1.5	16	18	-	-	1.6 8.6	50 2.87	15	-	-		
23.62	25.7	29.1	-	25.7	1.4	1.9	5.9	3	silty CLAY to CLAY	115	1.5	17	19	-	-	1.8 9.1	49 2.84	15	-	-		
23.79	25.5	28.7	-	25.5	1.4	1.8	5.9	3	silty CLAY to CLAY	115	1.5	17	19	-	-	1.7 8.9	49 2.85	15	-	-		
23.95	24.0	26.9	-	24.1	1.4	1.8	6.3	3	silty CLAY to CLAY	115	1.5	16	18	-	-	1.6 8.4	51 2.89	15	-	-		
24.12	19.7	22.0	-	19.8	1.4	1.5	7.5	3	silty CLAY to CLAY	115	1.5	13	15	-	-	1.3 6.7	59 3.01	15	-	-		
24.28	23.2	25.7	-	23.2	1.4	1.7	6.5	3	silty CLAY to CLAY	115	1.5	15	17	-	-	1.6 8.0	53 2.92	15	-	-		
24.44	30.6	33.7	-	30.6	1.6	1.8	5.6	3	silty CLAY to CLAY	115	1.5	20	22	-	-	2.1 9.9	45 2.78	15	-	-		
24.61	32.3	35.5	-	32.3	1.8	1.9	6.0	3	silty CLAY to CLAY	115	1.5	22	24	-	-	2.2 9.9	45 2.78	15	-	-		
24.77	30.5	33.4	-	30.6	2.2	2.1	7.5	3	silty CLAY to CLAY	115	1.5	20	22	-	-	2.1 9.9	50 2.87	15	-	-		
24.94	30.5	33.2	-	30.6	2.3	2.0	8.0	3	silty CLAY to CLAY	115	1.5	20	22	-	-	2.1 9.9	52 2.90	15	-	-		
25.10	31.6	34.2	-	31.6	2.5	2.4	8.3	3	silty CLAY to CLAY	115	1.5	21	23	-	-	2.2 9.9	52 2.90	15	-	-		
25.26	32.1	34.6	-	32.2	2.4	2.5	7.9	3	silty CLAY to CLAY	115	1.5	21	23	-	-	2.2 9.9	51 2.88	15	-	-		
25.43	31.4	33.7	-	31.5	2.4	2.6	7.9	3	silty CLAY to CLAY	115	1.5	21	22	-	-	2.2 9.9	51 2.89	15	-	-		
25.59	32.1	34.3	-	32.1	2.3	2.8	7.6	3	silty CLAY to CLAY	115	1.5	21	23	-	-	2.2 9.9	50 2.87	15	-	-		
25.76	32.7	34.8	-	32.8	2.3	3.0	7.4	3	silty CLAY to CLAY	115	1.5	22	23	-	-	2.2 9.9	49 2.86	15	-	-		
25.92	32.1	33.9	-	32.1	2.3	3.0	7.6	3	silty CLAY to CLAY	115	1.5	21	23	-	-	2.2 9.9	50 2.87	15	-	-		
26.08	31.5	33.2	-	31.6	2.4	3.1	8.1	3	silty CLAY to CLAY	115	1.5	21	22	-	-	2.2 9.9	52 2.90	15	-	-		
26.25	35.6	37.4	-	35.7	2.5	3.2	7.4	3	silty CLAY to CLAY	115	1.5	24	25	-	-	2.5 9.9	48 2.84	15	-	-		
26.41	39.4	41.1	-	39.4	2.6	3.2	6.8	3	silty CLAY to CLAY	115	1.5	26	27	-	-	2.7 9.9	45 2.78	15	-	-		
26.58	43.7	45.4	-	43.7	2.6	3.3	6.2	3	silty CLAY to CLAY	115	1.5	29	3									

LACMA Phase III Transformation Project

Project ID: AECOM
Data File: SDF(233).cpt
CPT Date: 10/5/2015 8:15:04 AM
GW During Test: 8 ft

Page: 3
Sounding ID: S-CPT-01
Project No: 60440464
Cone/Rig: DDG1333

Depth ft	qc PS tsf	* qc1n PS -	* q1ncs PS -	* qt PS tsf	slv Stss tsf	pore prss (psi)	Frct Rat %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* Ic SBT Indx	* Nk -	* Vol Strn %	* Cycl SStn %
31.01	24.2	22.4	-	24.4	1.8	7.3	8.1	3	silty CLAY to CLAY	115	1.5	16	15	-	-	1.6	6.9	60	3.03	15	-	-
31.17	22.2	20.5	-	22.3	1.8	7.7	8.9	3	silty CLAY to CLAY	115	1.5	15	14	-	-	1.5	6.2	64	3.09	15	-	-
31.33	25.2	23.2	-	25.4	1.7	7.6	7.2	3	silty CLAY to CLAY	115	1.5	17	15	-	-	1.7	7.1	57	2.98	15	-	-
31.50	28.0	25.7	-	28.2	1.8	7.4	6.9	3	silty CLAY to CLAY	115	1.5	19	17	-	-	1.9	7.9	54	2.94	15	-	-
31.66	31.5	28.7	-	31.6	1.9	7.5	6.5	3	silty CLAY to CLAY	115	1.5	21	19	-	-	2.1	8.9	51	2.88	15	-	-
31.83	32.1	29.2	-	32.2	1.9	7.5	6.4	3	silty CLAY to CLAY	115	1.5	21	19	-	-	2.2	9.1	50	2.87	15	-	-
31.99	32.8	29.7	-	33.0	2.0	7.9	6.6	3	silty CLAY to CLAY	115	1.5	22	20	-	-	2.2	9.3	50	2.87	15	-	-
32.15	36.2	32.7	-	36.4	2.1	7.8	6.1	3	silty CLAY to CLAY	115	1.5	24	22	-	-	2.5	9.9	47	2.81	15	-	-
32.32	31.3	28.1	-	31.5	2.1	7.9	7.2	3	silty CLAY to CLAY	115	1.5	21	19	-	-	2.1	8.7	53	2.92	15	-	-
32.48	29.7	26.5	-	29.8	2.0	8.0	7.3	3	silty CLAY to CLAY	115	1.5	20	18	-	-	2.0	8.2	55	2.94	15	-	-
32.65	26.1	23.2	-	26.2	1.9	8.1	7.8	3	silty CLAY to CLAY	115	1.5	17	15	-	-	1.8	7.1	59	3.01	15	-	-
32.81	22.6	20.1	-	22.7	1.8	7.9	8.6	3	silty CLAY to CLAY	115	1.5	15	13	-	-	1.5	6.1	64	3.08	15	-	-
32.97	20.8	18.4	-	20.9	1.7	7.7	8.8	3	silty CLAY to CLAY	115	1.5	14	12	-	-	1.4	5.6	67	3.12	15	-	-
33.14	19.0	16.8	-	19.2	1.5	7.5	8.7	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	5.0	69	3.15	15	-	-
33.30	22.7	19.9	-	22.8	1.1	8.4	5.4	3	silty CLAY to CLAY	115	1.5	15	13	-	-	1.5	6.0	55	2.95	15	-	-
33.47	37.6	34.2	102.5	37.8	0.9	7.9	2.5	4	clay SILT to silty CLAY	115	2.0	19	17	-	-	2.6	9.9	33	2.54	15	2.29	51.2
33.63	33.7	29.4	-	33.9	0.9	7.9	2.9	4	clay SILT to silty CLAY	115	2.0	17	15	-	-	2.3	9.1	37	2.63	15	-	-
33.79	28.6	24.9	-	28.8	1.0	8.9	3.6	4	clay SILT to silty CLAY	115	2.0	14	12	-	-	1.9	7.6	44	2.76	15	-	-
33.96	39.0	35.2	105.6	39.2	1.0	9.8	2.6	4	clay SILT to silty CLAY	115	2.0	20	18	-	-	2.7	9.9	33	2.54	15	2.23	51.2
34.12	40.6	36.6	105.0	40.8	1.0	9.9	2.5	4	clay SILT to silty CLAY	115	2.0	20	18	-	-	2.8	9.9	32	2.52	15	2.25	51.2
34.29	46.6	41.9	101.4	46.8	1.0	10.0	2.1	5	silty SAND to sandy SILT	120	4.0	12	10	38	35	-	-	27	2.43	16	2.31	51.2
34.45	48.1	43.2	101.2	48.3	1.0	10.0	2.1	5	silty SAND to sandy SILT	120	4.0	12	11	39	35	-	-	27	2.41	16	2.31	51.2
34.61	51.5	46.1	101.1	51.7	1.0	10.1	2.0	5	silty SAND to sandy SILT	120	4.0	13	12	41	36	-	-	25	2.37	16	2.32	48.7
34.78	52.1	46.6	101.9	52.3	1.0	9.9	2.0	5	silty SAND to sandy SILT	120	4.0	13	12	42	36	-	-	25	2.37	16	2.30	48.1
34.94	43.6	38.9	105.4	43.8	1.0	10.2	2.4	4	clay SILT to silty CLAY	115	2.0	22	19	-	-	3.0	9.9	30	2.49	15	2.24	51.2
35.11	56.2	50.1	101.8	56.4	1.0	10.6	1.9	5	silty SAND to sandy SILT	120	4.0	14	13	44	36	-	-	23	2.33	16	2.30	44.1
35.27	58.3	51.9	100.0	58.5	1.0	10.6	1.7	5	silty SAND to sandy SILT	120	4.0	15	13	45	36	-	-	22	2.29	16	2.34	42.1
35.43	61.3	54.4	100.2	61.5	1.0	10.5	1.7	5	silty SAND to sandy SILT	120	4.0	15	14	47	37	-	-	21	2.26	16	2.33	39.4
35.60	57.7	51.1	100.7	57.9	1.0	10.6	1.8	5	silty SAND to sandy SILT	120	4.0	14	13	45	36	-	-	23	2.31	16	2.32	42.9
35.76	61.0	53.9	102.5	61.2	1.0	10.6	1.8	5	silty SAND to sandy SILT	120	4.0	15	13	47	37	-	-	22	2.28	16	2.29	39.9
35.93	63.0	55.6	104.1	63.2	1.1	8.8	1.8	5	silty SAND to sandy SILT	120	4.0	16	14	48	37	-	-	22	2.28	16	2.26	38.2
36.09	62.8	55.3	106.9	62.9	1.1	8.9	1.9	5	silty SAND to sandy SILT	120	4.0	16	14	47	37	-	-	22	2.30	16	2.21	38.5
36.26	63.9	56.2	106.1	64.1	1.1	8.4	1.8	5	silty SAND to sandy SILT	120	4.0	16	14	48	37	-	-	22	2.28	16	2.23	37.6
36.42	72.6	63.7	108.3	72.7	1.2	7.8	1.7	5	silty SAND to sandy SILT	120	4.0	18	16	52	38	-	-	19	2.21	16	2.19	31.7
36.58	78.5	68.7	112.3	78.6	1.3	7.0	1.7	5	silty SAND to sandy SILT	120	4.0	20	17	55	38	-	-	19	2.19	16	2.13	28.8
36.75	81.4	71.1	114.9	81.5	1.3	7.2	1.7	5	silty SAND to sandy SILT	120	4.0	20	18	56	38	-	-	18	2.18	16	2.09	27.5
36.91	89.4	78.0	120.5	89.6	1.5	7.3	1.7	5	silty SAND to sandy SILT	120	4.0	22	19	59	39	-	-	17	2.15	16	2.00	24.1
37.08	83.6	72.8	125.7	83.8	1.6	7.3	2.0	5	silty SAND to sandy SILT	120	4.0	21	18	57	38	-	-	20	2.22	16	1.87	26.7
37.24	72.8	63.3	130.2	73.0	1.8	7.5	2.5	5	silty SAND to sandy SILT	120	4.0	18	16	52	37	-	-	24	2.33	16	1.70	31.0
37.40	72.6	63.0	128.3	72.8	1.7	7.8	2.4	5	silty SAND to sandy SILT	120	4.0	18	16	52	37	-	-	24	2.33	16	1.77	31.7
37.57	93.5	81.0	128.0	93.7	1.7	7.8	1.8	5	silty SAND to sandy SILT	120	4.0	23	20	60	39	-	-	18	2.16	16	1.79	21.4
37.73	94.7	81.8	128.3	94.9	1.7	7.8	1.8	5	silty SAND to sandy SILT	120	4.0	24	20	60	39	-	-	18	2.16	16	1.78	20.6
37.90	93.7	80.8	134.5	93.9	1.9	7.8	2.1	5	silty SAND to sandy SILT	120	4.0	23	20	60	39	-	-	19	2.20	16	1.49	13.5
38.06	83.2	71.6	136.5	83.4	2.0	7.9	2.4	5	silty SAND to sandy SILT	120	4.0	21	18	56	38	-	-	22	2.29	16	1.38	15.9
38.22	75.8	65.1	141.0	76.0	2.1	8.5	2.8	5	silty SAND to sandy SILT	120	4.0	19	16	53	38	-	-	25	2.36	16	1.14	12.2
38.39	79.0	67.7	136.7	79.2	2.0	8.3	2.6	5	silty SAND to sandy SILT	120	4.0	20	17	54	38	-	-	23	2.32	16	1.37	17.5
38.55	76.4	65.4	134.9	76.6	1.9	8.4	2.6	5	silty SAND to sandy SILT	120	4.0	19	16	53	38	-	-	24	2.33	16	1.46	22.4
38.72	79.9	68.2	132.9	80.0	1.9	8.4	2.4	5	silty SAND to sandy SILT	120	4.0	20	17	54	38	-	-	22	2.30	16	1.57	25.0
38.88	87.4	74.6	138.0	87.6	2.0	8.3	2.4	5	silty SAND to sandy SILT	120	4.0	22	19	57	38	-	-	21	2.27	16	1.31	12.8
39.04	79.0	67.2	138.2	79.1	2.0	8.2	2.6	5	silty SAND to sandy SILT	120	4.0	20	17	54	38	-	-	24	2.33	16	1.29	15.3
39.21	74.0	62.9	137.8	74.1	2.0	8.7	2.8	5	silty SAND to sandy SILT	120	4.0	18	16	52	37	-	-	25	2.37	16	1.31	17.8
39.37	90.2	76.5	139.3	90.4	2.1	8.8	2.4	5	silty SAND to sandy SILT	120	4.0	23	19	58	38	-	-	21	2.26	16	1.25	10.9
39.54	88.6	75.0	146.8	88.7	2.3	8.8	2.7	5	silty SAND to sandy SILT	120	4.0	22	19	58	38	-	-	23	2.30	16	0.87	6.1
39.70	79.5	67.2	149.1	79.7	2.4	9.1	3.1	5	silty SAND to sandy SILT	120	4.0	20	17	54	38	-	-	25	2.38	16	0.75	5.5

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

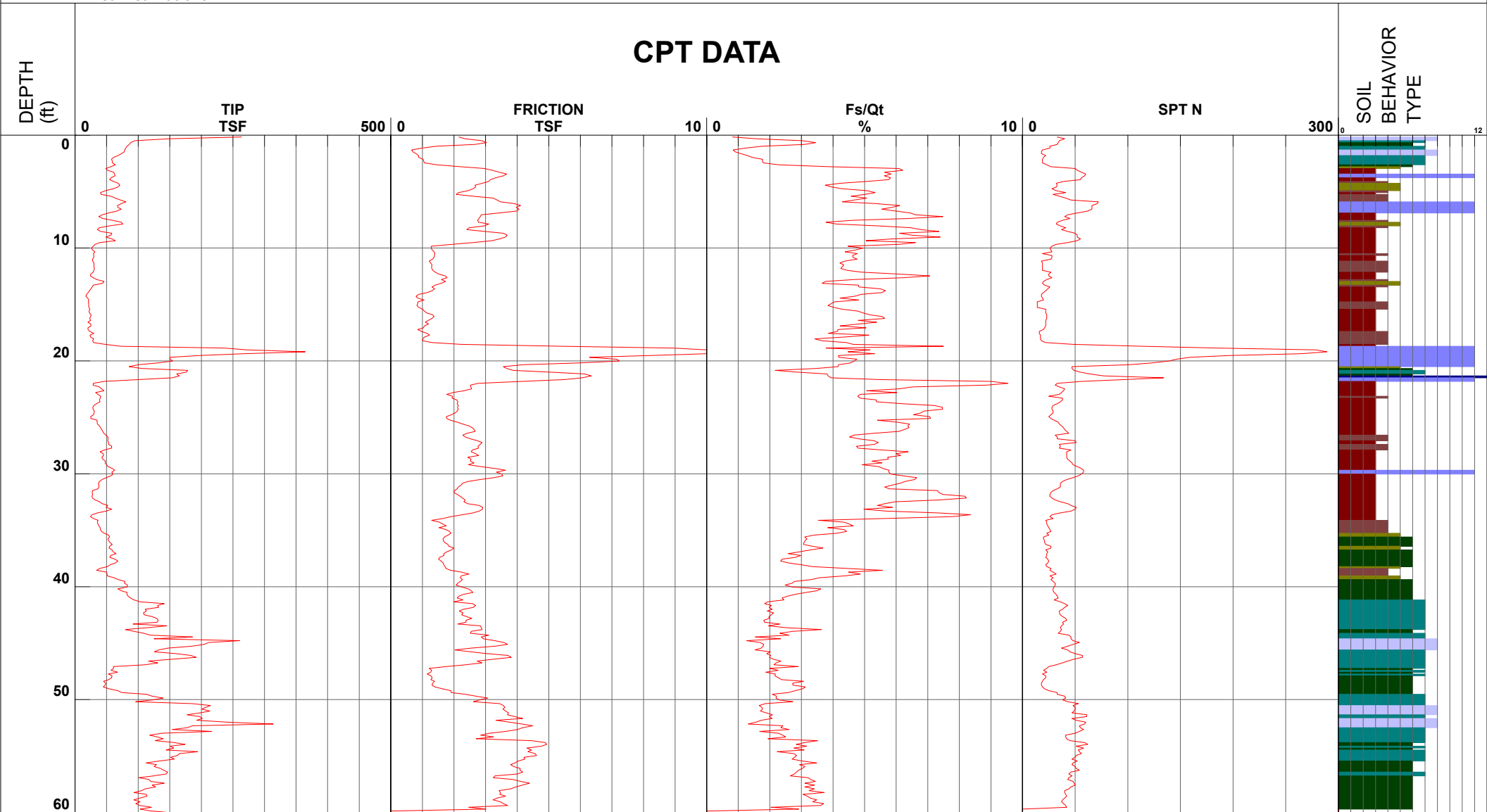


AECOM

Project LACMA Phase III Transformation Project Operator RC-DG
Job Number 60440464 Cone Number DDG1333
Hole Number S-CPT-01A Date and Time 10/5/2015 9:16:49 AM
EST GW Depth During Test 8.00 ft

Filename SDF(234).cpt
GPS
Maximum Depth 60.04 ft

Net Area Ratio .8



- | | | | |
|----------------------------|-------------------------------|------------------------------|----------------------------------|
| 1 - sensitive fine grained | 4 - silty clay to clay | 7 - silty sand to sandy silt | 10 - gravelly sand to sand |
| 2 - organic material | 5 - clayey silt to silty clay | 8 - sand to silty sand | 11 - very stiff fine grained (*) |
| 3 - clay | 6 - sandy silt to clayey silt | 9 - sand | 12 - sand to clayey sand (*) |

Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

LACMA Phase III Transformation Project

Project ID: AECOM
Data File: SDF(234).cpt
CPT Date: 10/5/2015 9:16:49 AM
GW During Test: 8 ft

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Sounding ID: S-CPT-01A
Project No: 60440464
Cone/Rig: DDG1333

Depth ft	qc PS	qc1n PS	q1ncs PS	qt PS	slv Stss tsf	pore prss (psi)	Frct Rto %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Ic SBT Index	Nk -	Vol Strn %	Cycl SStn %
0.33	148.1	237.6	261.8	148.1	2.4	0.2	1.6	6	clean SAND to silty SAND	125	5.0	30	48	95	48	-	-	8	1.79	16	N/A	N/A
0.49	94.9	152.3	231.5	94.9	2.9	0.7	3.0	5	silty SAND to sandy SILT	120	4.0	24	38	81	48	-	-	17	2.13	16	N/A	N/A
0.66	88.0	141.1	234.6	87.9	3.0	-0.3	3.4	5	silty SAND to sandy SILT	120	4.0	22	35	78	48	-	-	19	2.20	16	N/A	N/A
0.82	85.8	137.7	219.5	85.8	2.7	-0.3	3.1	5	silty SAND to sandy SILT	120	4.0	21	34	78	48	-	-	18	2.17	16	N/A	N/A
0.98	82.4	132.2	170.5	82.4	1.4	-0.3	1.8	6	clean SAND to silty SAND	125	5.0	16	26	76	48	-	-	13	1.99	16	N/A	N/A
1.15	80.3	128.7	151.3	80.3	1.0	-0.6	1.2	6	clean SAND to silty SAND	125	5.0	16	26	75	48	-	-	10	1.89	16	N/A	N/A
1.31	78.7	126.2	138.3	78.7	0.7	-0.7	0.8	6	clean SAND to silty SAND	125	5.0	16	25	75	48	-	-	8	1.79	16	N/A	N/A
1.48	77.9	125.0	137.9	77.9	0.7	-0.6	0.9	6	clean SAND to silty SAND	125	5.0	16	25	74	48	-	-	8	1.81	16	N/A	N/A
1.64	73.5	117.9	138.0	73.5	0.8	-0.7	1.1	6	clean SAND to silty SAND	125	5.0	15	24	72	48	-	-	10	1.88	16	N/A	N/A
1.80	68.1	109.2	135.9	68.1	0.9	-0.6	1.3	6	clean SAND to silty SAND	125	5.0	14	22	70	48	-	-	12	1.95	16	N/A	N/A
1.97	61.3	98.3	130.6	61.3	0.9	-0.6	1.4	6	clean SAND to silty SAND	125	5.0	12	20	66	48	-	-	14	2.02	16	N/A	N/A
2.13	57.9	92.8	135.3	57.9	1.0	-0.5	1.8	5	silty SAND to sandy SILT	120	4.0	14	23	65	48	-	-	16	2.10	16	N/A	N/A
2.30	59.1	94.7	136.7	59.1	1.0	-0.7	1.8	5	silty SAND to sandy SILT	120	4.0	15	24	65	47	-	-	16	2.09	16	N/A	N/A
2.46	59.2	94.9	137.9	59.2	1.1	-0.6	1.8	5	silty SAND to sandy SILT	120	4.0	15	24	65	47	-	-	16	2.10	16	N/A	N/A
2.62	63.8	102.3	159.2	63.8	1.5	-0.7	2.3	5	silty SAND to sandy SILT	120	4.0	16	26	68	47	-	-	17	2.15	16	N/A	N/A
2.79	56.8	91.0	196.1	56.7	2.2	-0.8	3.9	4	clay SILT to silty CLAY	115	2.0	28	46	-	-	4.0	9.9	25	2.36	15	N/A	N/A
2.95	48.7	78.1	238.3	48.7	3.0	-0.6	6.1	9	very stiff fine SOIL	120	2.0	24	39	59	45	-	-	33	2.55	30	N/A	N/A
3.12	51.7	83.0	248.8	51.7	3.2	-0.3	6.2	9	very stiff fine SOIL	120	2.0	26	41	61	45	-	-	33	2.54	30	N/A	N/A
3.28	61.0	97.9	254.7	61.0	3.4	-0.4	5.7	9	very stiff fine SOIL	120	2.0	31	49	66	46	-	-	29	2.47	30	N/A	N/A
3.45	62.9	100.8	264.8	62.9	3.7	-0.5	5.9	9	very stiff fine SOIL	120	2.0	31	50	67	46	-	-	29	2.47	30	N/A	N/A
3.61	63.3	101.6	259.7	63.3	3.6	-0.4	5.6	9	very stiff fine SOIL	120	2.0	32	51	68	46	-	-	29	2.46	30	N/A	N/A
3.77	57.1	91.6	251.5	57.1	3.3	-0.4	5.8	9	very stiff fine SOIL	120	2.0	29	46	64	45	-	-	30	2.50	30	N/A	N/A
3.94	54.7	87.7	244.3	54.7	3.2	-0.5	5.8	9	very stiff fine SOIL	120	2.0	27	44	63	45	-	-	31	2.50	30	N/A	N/A
4.10	61.1	98.1	238.8	61.1	3.1	-0.5	5.1	9	very stiff fine SOIL	120	2.0	31	49	66	45	-	-	28	2.43	30	N/A	N/A
4.27	68.4	109.6	227.8	68.4	2.9	-0.6	4.3	9	very stiff fine SOIL	120	2.0	34	55	70	45	-	-	24	2.34	30	N/A	N/A
4.43	71.0	113.9	217.2	71.0	2.7	-0.7	3.8	5	silty SAND to sandy SILT	120	4.0	18	28	71	45	-	-	22	2.29	16	N/A	N/A
4.59	67.6	108.4	218.3	67.5	2.7	-0.7	4.0	9	very stiff fine SOIL	120	2.0	34	54	70	45	-	-	23	2.32	30	N/A	N/A
4.76	60.5	97.0	215.2	60.5	2.6	-0.7	4.3	9	very stiff fine SOIL	120	2.0	30	48	66	44	-	-	25	2.38	30	N/A	N/A
4.92	48.2	77.2	212.3	48.1	2.4	-0.7	5.1	4	clay SILT to silty CLAY	115	2.0	24	39	-	-	3.4	9.9	31	2.50	15	N/A	N/A
5.09	40.3	64.6	200.7	40.3	2.1	-0.8	5.4	4	clay SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	34	2.56	15	N/A	N/A
5.25	41.4	66.4	195.8	41.4	2.1	-0.9	5.0	4	clay SILT to silty CLAY	115	2.0	21	33	-	-	2.9	9.9	32	2.53	15	N/A	N/A
5.41	56.8	91.1	216.4	56.8	2.6	-0.8	4.6	9	very stiff fine SOIL	120	2.0	28	46	64	43	-	-	27	2.42	30	N/A	N/A
5.58	64.0	102.6	245.2	64.0	3.2	-0.6	5.1	9	very stiff fine SOIL	120	2.0	32	51	68	44	-	-	27	2.42	30	N/A	N/A
5.74	72.1	115.6	248.6	72.1	3.4	-0.5	4.7	9	very stiff fine SOIL	120	2.0	36	58	72	44	-	-	25	2.36	30	N/A	N/A
5.91	80.8	129.5	252.3	80.8	3.5	-0.6	4.3	9	very stiff fine SOIL	120	2.0	40	65	76	45	-	-	23	2.30	30	N/A	N/A
6.07	73.1	117.2	272.8	73.1	3.9	-0.5	5.4	9	very stiff fine SOIL	120	2.0	37	59	72	44	-	-	27	2.40	30	N/A	N/A
6.23	67.2	106.5	281.4	67.2	4.1	-0.4	6.1	9	very stiff fine SOIL	120	2.0	34	53	69	43	-	-	30	2.47	30	N/A	N/A
6.40	67.8	106.0	273.4	67.8	4.0	-0.3	5.9	9	very stiff fine SOIL	120	2.0	34	53	69	43	-	-	29	2.46	30	N/A	N/A
6.56	73.1	113.0	273.2	73.1	4.1	-0.3	5.6	9	very stiff fine SOIL	120	2.0	37	56	71	44	-	-	27	2.43	30	N/A	N/A
6.73	66.4	101.3	270.8	66.4	4.0	-0.3	6.0	9	very stiff fine SOIL	120	2.0	33	51	67	43	-	-	30	2.48	30	N/A	N/A
6.89	53.2	80.2	251.4	53.2	3.4	-0.2	6.5	9	very stiff fine SOIL	120	2.0	27	40	60	42	-	-	34	2.57	30	N/A	N/A
7.05	43.3	69.4	-	43.3	2.9	-0.4	6.7	9	very stiff fine SOIL	120	2.0	22	35	55	41	-	-	36	2.62	30	N/A	N/A
7.22	37.9	60.8	-	37.9	2.8	-0.6	7.6	9	very stiff fine SOIL	120	2.0	19	30	51	40	-	-	40	2.70	30	N/A	N/A
7.38	43.7	70.0	-	43.7	2.8	-0.4	6.5	9	very stiff fine SOIL	120	2.0	22	35	55	40	-	-	35	2.60	30	N/A	N/A
7.55	59.4	85.5	211.6	59.4	2.7	-0.2	4.7	4	clay SILT to silty CLAY	115	2.0	30	43	-	-	4.2	9.9	28	2.44	15	N/A	N/A
7.71	73.6	105.0	208.7	73.6	2.8	-0.6	3.8	5	silty SAND to sandy SILT	120	4.0	18	26	69	43	-	-	23	2.31	16	N/A	N/A
7.87	75.7	106.8	220.9	75.7	3.1	-0.5	4.1	9	very stiff fine SOIL	120	2.0	38	53	69	43	-	-	24	2.34	30	N/A	N/A
8.04	54.1	76.0	220.8	54.1	3.0	-0.9	5.5	9	very stiff fine SOIL	120	2.0	27	38	58	41	-	-	32	2.53	30	0.00	0.0
8.20	38.4	61.6	-	38.4	2.5	-0.6	6.5	3	silty CLAY to CLAY	115	1.5	26	41	-	-	2.7	9.9	38	2.64	15	-	-
8.37	35.5	56.9	-	35.5	2.4	-0.3	6.9	3	silty CLAY to CLAY	115	1.5	24	38	-	-	2.5	9.9	40	2.68	15	-	-
8.53	40.5	64.9	-	40.5	3.0	-0.2	7.4	9	very stiff fine SOIL	120	2.0	20	32	53	39	-	-	39	2.67	30	-	-
8.69	58.3	80.4	243.6	58.3	3.6	-0.5	6.2	9	very stiff fine SOIL	120	2.0	29	40	60	41	-	-	33	2.55	30	0.00	0.0
8.86	56.7	77.8	249.2	56.7	3.7	-1.1	6.6	9	very stiff fine SOIL	120	2.0	28	39	59	41	-	-	34	2.58	30	0.00	0.0
9.02	49.1	78.7	-	49.1	3.6	-1.4	7.5	9	very stiff fine SOIL	120	2.0	25	39	59	40	-	-	36	2.62	30	-	-
9.19	58.5	79.6	236.9	58.5	3.4	-0.9	5.9	9	very stiff fine SOIL	120	2.0	29	40	59	41	-	-	32	2.54	30	0.00	0.0
9.35	63.6	86.0	224.0	63.6	3.2	-1.2	5.1	9	very stiff fine SOIL	120	2.0	32	43	62	42	-	-	29	2.47	30	0.00	0.0
9.51	39.3	63.0	-	39.3	2.6	-1.9	6.7	9	very stiff fine SOIL	120	2.0	20	32	52	39	-	-	38	2.65	30	-	-
9.68	31.8	51.0	-	31.8	1.9	-1.3	6.2	3	silty CLAY to CLAY	115	1.5	21	34	-	-	2.2	9.9	39	2.68	15	-	-
9.84	28.7	46.0	-	28.7	1.3	-1.3	4.6	4	clay SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	36	2.61	15	-	-
10.01	25.9	41.5	-	25.8	1.3	-1.2	5.1	3	silty CLAY to CLAY	115	1.5	17	28	-	-	1.8	9.9	39	2.68	15	-	-
10.17	27.9	44.8	-	27.9	1.3	-0.4	4.8	4	clay SILT to silty CLAY	115	2.0	14	22	-	-	1.9	9.9	37	2.64	15	-	-
10.34	31.3	47.3	156.8	31.3	1.4	-0.4	4.5	4	clay SILT to silty CLAY	115	2.0	16	24	-	-	2.2	9.9	35	2.60	15	0.15	0.2
10.50	29.2	46.9	-	29.2	1.4	-0.3	4.9	4	clay SILT to silty CLAY	115	2.0	15	23	-	-	2.0	9.9	37	2.63	15	-	-
10.66	29.9	48.0	-	29.9	1.4	-0.2	4.7	4	clay SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	36	2.61	15	-	-
10.83	29.5	47.4	-	29.5	1.4	-0.2	4.7	4	clay SILT to silty CLAY	115	2.0	15	24	-	-	2.0	9.9	36	2.62	15	-	-
10.99	27.7	44.5	-	27.7	1.3	-0.2	4.9	4	clay SILT to silty CLAY	115	2.0	14										

LACMA Phase III Transformation Project

Project ID: AECOM
Data File: SDF(234).cpt
CPT Date: 10/5/2015 9:16:49 AM
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Sounding ID: S-CPT-01A
Project No: 60440464
Cone/Rig: DDG1333

Depth ft	qc PS	qc1n PS	q1ncs PS	qt PS	slv Stss tsf	pore prss (psi)	Frct Rto %	Mat Typ Zon	Material Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr %	OCR -	Fin Ic SBT	IC SBT Index	Nk -	Vol Strn %	Cycl SStn %
15.58	22.2	32.6	-	22.1	1.1	-3.6	5.0	3	silty CLAY to CLAY	115	1.5	15	22	-	-	1.5	9.9	43	2.75	15	-	-
15.75	22.9	33.4	-	22.8	1.1	-3.5	5.2	3	silty CLAY to CLAY	115	1.5	15	22	-	-	1.6	9.9	44	2.76	15	-	-
15.91	25.6	37.1	-	25.5	1.3	-3.5	5.4	3	silty CLAY to CLAY	115	1.5	17	25	-	-	1.8	9.9	42	2.73	15	-	-
16.08	24.7	35.6	-	24.6	1.4	-3.5	5.8	3	silty CLAY to CLAY	115	1.5	16	24	-	-	1.7	9.9	44	2.77	15	-	-
16.24	23.1	33.1	-	23.0	1.3	-3.5	5.9	3	silty CLAY to CLAY	115	1.5	15	22	-	-	1.6	9.9	46	2.80	15	-	-
16.40	24.8	35.3	-	24.7	1.2	-3.5	5.0	3	silty CLAY to CLAY	115	1.5	17	24	-	-	1.7	9.9	42	2.73	15	-	-
16.57	20.3	28.8	-	20.2	1.1	-3.5	5.7	3	silty CLAY to CLAY	115	1.5	14	19	-	-	1.4	9.0	48	2.83	15	-	-
16.73	24.8	34.9	-	24.7	1.2	-3.4	5.0	3	silty CLAY to CLAY	115	1.5	17	23	-	-	1.7	9.9	42	2.73	15	-	-
16.90	25.2	35.3	-	25.1	1.1	-3.5	4.4	4	clay SILT to silty CLAY	115	2.0	13	18	-	-	1.7	9.9	40	2.69	15	-	-
17.06	20.5	28.5	-	20.4	1.0	-3.3	5.3	3	silty CLAY to CLAY	115	1.5	14	19	-	-	1.4	9.0	47	2.82	15	-	-
17.23	20.6	28.4	-	20.5	0.9	-3.3	4.4	3	silty CLAY to CLAY	115	1.5	14	19	-	-	1.4	8.9	44	2.76	15	-	-
17.39	23.3	32.0	-	23.2	1.0	-3.1	4.3	4	clay SILT to silty CLAY	115	2.0	12	16	-	-	1.6	9.9	41	2.72	15	-	-
17.55	29.9	40.8	-	29.8	1.2	-3.1	4.0	4	clay SILT to silty CLAY	115	2.0	15	20	-	-	2.1	9.9	36	2.61	15	-	-
17.72	23.8	32.3	-	23.7	1.2	-3.3	5.4	3	silty CLAY to CLAY	115	1.5	16	22	-	-	1.6	9.9	45	2.78	15	-	-
17.88	24.3	32.8	-	24.3	1.1	-3.3	4.6	3	silty CLAY to CLAY	115	1.5	16	22	-	-	1.7	9.9	42	2.73	15	-	-
18.05	29.6	35.7	-	29.5	1.0	-3.1	3.6	4	clay SILT to silty CLAY	115	2.0	15	18	-	-	2.0	9.9	36	2.62	15	-	-
18.21	27.7	37.0	-	27.7	1.0	-3.1	3.8	4	clay SILT to silty CLAY	115	2.0	14	19	-	-	1.9	9.9	37	2.63	15	-	-
18.37	29.5	39.2	-	29.4	1.3	-2.9	4.6	4	clay SILT to silty CLAY	115	2.0	15	20	-	-	2.0	9.9	39	2.67	15	-	-
18.54	47.9	53.4	171.9	47.9	2.2	-2.1	4.7	4	clay SILT to silty CLAY	115	2.0	24	27	-	-	3.3	9.9	34	2.58	15	0.00	0.0
18.70	72.5	86.2	-	72.4	5.4	-2.1	7.6	9	very stiff fine SOIL	120	2.0	36	43	62	40	-	-	36	2.61	30	-	-
18.87	237.1	262.9	375.1	237.0	9.0	-2.4	3.8	8	stiff SAND to clay SAND	115	1.0	100	100	-	-	15.7	9.9	15	2.08	16	0.00	0.0
19.03	272.5	301.4	484.5	272.5	14.1	1.8	5.2	9	very stiff fine SOIL	120	2.0	100	100	95	47	-	-	18	2.18	30	0.00	0.0
19.19	364.4	401.8	559.4	364.5	16.3	7.7	4.5	9	very stiff fine SOIL	120	2.0	100	100	95	48	-	-	15	2.06	30	0.00	0.0
19.36	268.1	294.7	484.3	268.2	14.3	5.5	5.3	9	very stiff fine SOIL	120	2.0	100	100	95	47	-	-	19	2.19	30	0.00	0.0
19.52	197.2	216.1	342.9	197.3	8.2	6.2	4.2	9	very stiff fine SOIL	120	2.0	99	100	92	45	-	-	18	2.17	30	0.00	0.0
19.69	150.3	164.2	287.6	150.5	6.3	12.0	4.2	9	very stiff fine SOIL	120	2.0	75	82	83	44	-	-	20	2.23	30	0.00	0.0
19.85	150.6	164.1	309.3	150.9	7.2	15.5	4.8	9	very stiff fine SOIL	120	2.0	75	82	83	44	-	-	22	2.28	30	0.00	0.0
20.01	154.8	168.1	310.5	155.0	7.2	13.9	4.7	9	very stiff fine SOIL	120	2.0	77	84	84	44	-	-	21	2.27	30	0.00	0.0
20.18	130.8	141.7	276.4	131.0	6.0	9.5	4.6	9	very stiff fine SOIL	120	2.0	65	71	79	43	-	-	23	2.30	30	0.00	0.0
20.34	99.9	107.8	225.8	100.0	4.2	9.8	4.2	9	very stiff fine SOIL	120	2.0	50	54	69	42	-	-	24	2.34	30	0.00	0.0
20.51	85.6	92.2	207.7	85.8	3.6	9.8	4.2	4	clay SILT to silty CLAY	115	2.0	43	46	-	-	6.0	9.9	26	2.39	15	0.00	0.0
20.67	105.7	113.5	209.3	105.9	3.7	10.5	3.5	5	silty SAND to sandy SILT	120	4.0	26	28	71	42	-	-	21	2.27	16	0.00	0.0
20.83	178.3	190.9	239.5	178.5	3.9	13.3	2.2	6	clean SAND to silty SAND	125	5.0	36	38	88	44	-	-	12	1.96	16	0.00	0.0
21.00	176.0	187.8	262.3	176.3	5.1	16.9	2.9	5	silty SAND to sandy SILT	120	4.0	44	47	88	44	-	-	15	2.07	16	0.00	0.0
21.16	161.0	171.4	281.2	161.3	6.1	14.1	3.8	8	stiff SAND to clay SAND	115	1.0	100	100	-	-	10.6	9.9	19	2.19	16	0.00	0.0
21.33	165.0	175.2	286.4	165.3	6.3	14.7	3.9	8	stiff SAND to clay SAND	115	1.0	100	100	-	-	10.9	9.9	19	2.19	16	0.00	0.0
21.49	154.0	163.1	277.2	154.3	6.1	12.6	4.0	8	stiff SAND to clay SAND	115	1.0	100	100	-	-	10.1	9.9	19	2.21	16	0.00	0.0
21.65	99.8	105.4	263.7	100.0	5.5	10.6	5.6	9	very stiff fine SOIL	120	2.0	50	53	69	41	-	-	28	2.44	30	0.00	0.0
21.82	46.1	54.2	-	46.2	4.1	5.9	9.3	3	silty CLAY to CLAY	115	1.5	31	36	-	-	3.2	9.9	46	2.80	15	-	-
21.98	29.1	34.0	-	29.2	2.8	4.6	10.0	3	silty CLAY to CLAY	115	1.5	19	23	-	-	2.0	9.9	56	2.96	15	-	-
22.15	28.5	33.2	-	28.6	2.5	5.7	9.3	3	silty CLAY to CLAY	115	1.5	19	22	-	-	2.0	9.9	55	2.94	15	-	-
22.31	38.9	45.0	-	39.0	2.5	6.5	6.7	3	silty CLAY to CLAY	115	1.5	26	30	-	-	2.7	9.9	43	2.75	15	-	-
22.47	42.0	48.4	-	42.1	2.6	6.6	6.3	3	silty CLAY to CLAY	115	1.5	28	32	-	-	2.9	9.9	41	2.70	15	-	-
22.64	45.6	52.3	-	45.7	2.3	6.4	5.2	4	clay SILT to silty CLAY	115	2.0	23	26	-	-	3.2	9.9	36	2.62	15	-	-
22.80	32.7	37.4	-	32.9	2.0	6.4	6.3	3	silty CLAY to CLAY	115	1.5	22	25	-	-	2.3	9.9	45	2.78	15	-	-
22.97	36.5	41.4	-	36.6	1.8	6.7	5.0	3	silty CLAY to CLAY	115	1.5	24	28	-	-	2.5	9.9	39	2.68	15	-	-
23.13	40.8	46.1	-	40.9	2.0	6.7	4.9	4	clay SILT to silty CLAY	115	2.0	20	23	-	-	2.8	9.9	37	2.64	15	-	-
23.30	40.0	45.0	-	40.1	1.9	6.6	5.0	4	clay SILT to silty CLAY	115	2.0	20	22	-	-	2.8	9.9	38	2.66	15	-	-
23.46	38.8	43.4	-	38.9	2.1	6.8	5.6	3	silty CLAY to CLAY	115	1.5	26	29	-	-	2.7	9.9	40	2.70	15	-	-
23.62	39.5	44.0	-	39.7	2.1	6.7	5.6	3	silty CLAY to CLAY	115	1.5	26	29	-	-	2.7	9.9	40	2.69	15	-	-
23.79	34.0	37.7	-	34.1	2.1	6.1	6.4	3	silty CLAY to CLAY	115	1.5	23	25	-	-	2.3	9.9	45	2.79	15	-	-
23.95	29.7	32.7	-	29.8	2.1	6.0	7.6	3	silty CLAY to CLAY	115	1.5	20	22	-	-	2.0	9.9	51	2.88	15	-	-
24.12	28.3	31.0	-	28.4	2.1	6.0	7.9	3	silty CLAY to CLAY	115	1.5	19	21	-	-	1.9	9.7	53	2.91	15	-	-
24.28	28.6	31.2	-	28.7	2.1	5.8	7.9	3	silty CLAY to CLAY	115	1.5	19	21	-	-	2.0	9.8	53	2.91	15	-	-
24.44	30.6	33.3	-	30.7	2.1	5.8	7.2	3	silty CLAY to CLAY	115	1.5	20	22	-	-	2.1	9.9	50	2.86	15	-	-
24.61	30.0	32.5	-	30.1	2.0	5.7	7.1	3	silty CLAY to CLAY	115	1.5	20	22	-	-	2.1	9.9	50	2.87	15	-	-
24.77	29.4	31.7	-	29.5	1.9	5.6	6.9	3	silty CLAY to CLAY	115	1.5	20	21	-	-	2.0	9.9	50	2.86	15	-	-
24.94	24.9	26.7	-	25.0	1.8	5.0	7.5	3	silty CLAY to CLAY	115	1.5	17	18	-	-	1.7	8.3	55	2.95	15	-	-
25.10	25.0	26.7	-	25.1	1.8	4.7	7.5	3	silty CLAY to CLAY	115	1.5	17	18	-	-	1.7	8.3	55	2.95	15	-	-
25.26	35.0	37.2	-	35.1	1.9	5.2	5.6	3	silty CLAY to CLAY	115	1.5	23	25	-	-	2.4	9.9	43	2.75	15	-	-
25.43	34.9	36.9	-	35.0	2.1	5.2	6.3	3	silty CLAY to CLAY	115	1.5	23	25	-	-	2.4	9.9	45	2.79	15	-	-
25.59	35.5	37.4	-	35.6	2.3	5.3	6.7	3	silty CLAY to CLAY	115	1.5	24	25	-	-	2.4	9.9	46	2.80	15	-	-
25.76	38.8	40.6	-	38.9	2.5	5.4	6.6	3	silty CLAY to CLAY	115	1.5	26	27	-	-	2.7	9.9	45	2.77	15	-	-
25.92	40.2	42.0	-	40.3	2.6	5.5	6.7	3	silty CLAY to CLAY	115	1.5	27	28	-	-	2.8	9.9	44	2.77	15	-	-
26.08	42.2	43.8	-	42.3	2.6	5.7	6.5	3	silty CLAY to CLAY	115	1.5	28	29	-	-	2.9	9.9	43	2.74	15	-	-
26.25	43.8	45.3	-	43.9	2.7	5.7																

LACMA Phase III Transformation Project

Project ID: AECOM
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Sounding ID: S-CPT-01A
Project No: 60440464
Cone/Rig: DDG1333

Depth ft	qc PS	qc1n PS	q1ncs PS	qt PS	Slv Stss	pore prss	Frct Ratio	Mat Typ	Material Description	Unit Wght	Qc to N	SPT R-N	SPT R-N1	Rel Den	Ftn Ang	Und Shr	OCR	Fin Ic	* Ic SBT	* Nk	* Vol Strn	* Cycl SStn
ft	tsf	-	-	tsf	tsf	(psi)	%	Zon	Behavior	pcf	N	60%	60%	%	deg	tsf	-	-	Indx	-	%	%
31.01	37.9	34.7	-	38.0	2.2	7.1	6.2	3	silty CLAY to CLAY	115	1.5	25	23	-	-	2.6	9.9	46	2.80	15	-	-
31.17	37.9	34.6	-	38.0	2.1	6.8	5.9	3	silty CLAY to CLAY	115	1.5	25	23	-	-	2.6	9.9	45	2.79	15	-	-
31.33	36.4	33.1	-	36.5	2.1	6.6	6.1	3	silty CLAY to CLAY	115	1.5	24	22	-	-	2.5	9.9	47	2.81	15	-	-
31.50	27.6	25.0	-	27.7	2.0	5.9	7.8	3	silty CLAY to CLAY	115	1.5	18	17	-	-	1.9	7.7	57	2.98	15	-	-
31.66	27.1	24.4	-	27.2	2.0	5.9	7.9	3	silty CLAY to CLAY	115	1.5	18	16	-	-	1.8	7.5	58	2.99	15	-	-
31.83	28.1	25.3	-	28.3	2.1	5.9	8.0	3	silty CLAY to CLAY	115	1.5	19	17	-	-	1.9	7.8	57	2.98	15	-	-
31.99	26.8	24.0	-	26.9	2.2	5.9	8.8	3	silty CLAY to CLAY	115	1.5	18	16	-	-	1.8	7.4	61	3.03	15	-	-
32.15	27.6	24.6	-	27.7	2.3	5.9	8.8	3	silty CLAY to CLAY	115	1.5	18	16	-	-	1.9	7.6	60	3.02	15	-	-
32.32	32.0	28.4	-	32.1	2.4	6.0	7.8	3	silty CLAY to CLAY	115	1.5	21	19	-	-	2.2	8.8	55	2.94	15	-	-
32.48	38.7	34.2	-	38.8	2.3	6.2	6.3	3	silty CLAY to CLAY	115	1.5	26	23	-	-	2.7	9.9	47	2.81	15	-	-
32.65	43.1	38.0	-	43.2	2.4	6.4	5.9	3	silty CLAY to CLAY	115	1.5	29	25	-	-	3.0	9.9	44	2.76	15	-	-
32.81	51.8	45.5	-	52.0	2.8	6.5	5.6	3	silty CLAY to CLAY	115	1.5	35	30	-	-	3.6	9.9	40	2.69	15	-	-
32.97	49.3	43.1	-	49.4	2.9	6.1	6.1	3	silty CLAY to CLAY	115	1.5	33	29	-	-	3.4	9.9	42	2.73	15	-	-
33.14	58.4	50.9	-	58.6	2.9	6.8	5.1	4	clay SILT to silty CLAY	115	2.0	29	25	-	-	4.0	9.9	37	2.62	15	-	-
33.30	49.3	42.8	-	49.4	2.8	6.8	5.9	3	silty CLAY to CLAY	115	1.5	33	29	-	-	3.4	9.9	42	2.72	15	-	-
33.47	35.6	30.8	-	35.7	2.6	6.5	7.7	3	silty CLAY to CLAY	115	1.5	24	21	-	-	2.4	9.6	53	2.91	15	-	-
33.63	27.2	23.4	-	27.3	2.3	6.1	9.0	3	silty CLAY to CLAY	115	1.5	18	16	-	-	1.8	7.2	62	3.05	15	-	-
33.79	24.5	21.0	-	24.6	1.9	6.2	8.5	3	silty CLAY to CLAY	115	1.5	16	14	-	-	1.7	6.4	63	3.06	15	-	-
33.96	29.3	25.1	-	29.4	1.6	6.3	6.0	3	silty CLAY to CLAY	115	1.5	20	17	-	-	2.0	7.7	52	2.90	15	-	-
34.12	36.5	31.1	-	36.6	1.3	6.0	3.7	4	clay SILT to silty CLAY	115	2.0	18	16	-	-	2.5	9.7	40	2.69	15	-	-
34.29	35.4	30.0	-	35.5	1.5	5.9	4.6	3	silty CLAY to CLAY	115	1.5	24	20	-	-	2.4	9.4	44	2.76	15	-	-
34.45	36.5	30.9	-	36.6	1.6	6.0	4.8	3	silty CLAY to CLAY	115	1.5	24	21	-	-	2.5	9.6	44	2.76	15	-	-
34.61	37.8	31.9	-	37.9	1.8	6.1	4.9	3	silty CLAY to CLAY	115	1.5	25	21	-	-	2.6	9.9	44	2.76	15	-	-
34.78	39.8	33.4	-	39.9	1.5	6.1	4.0	4	clay SILT to silty CLAY	115	2.0	20	17	-	-	2.7	9.9	40	2.69	15	-	-
34.94	40.1	33.6	-	40.2	1.7	6.1	4.6	3	silty CLAY to CLAY	115	1.5	27	22	-	-	2.7	9.9	42	2.72	15	-	-
35.11	42.0	35.0	-	42.1	1.9	6.3	4.7	3	silty CLAY to CLAY	115	1.5	28	23	-	-	2.9	9.9	41	2.71	15	-	-
35.27	46.4	38.5	-	46.5	1.9	6.4	4.3	4	clay SILT to silty CLAY	115	2.0	23	19	-	-	3.2	9.9	38	2.66	15	-	-
35.43	53.2	47.0	138.6	53.3	1.8	6.5	3.5	4	clay SILT to silty CLAY	115	2.0	27	24	-	-	3.7	9.9	32	2.53	15	1.24	43.9
35.60	54.7	48.3	133.0	54.8	1.7	6.5	3.2	4	clay SILT to silty CLAY	115	2.0	27	24	-	-	3.8	9.9	31	2.50	15	1.53	44.9
35.76	52.1	45.9	132.2	52.2	1.7	6.6	3.3	4	clay SILT to silty CLAY	115	2.0	26	23	-	-	3.6	9.9	32	2.52	15	1.57	48.8
35.93	53.3	46.8	132.0	53.4	1.7	6.6	3.2	4	clay SILT to silty CLAY	115	2.0	27	23	-	-	3.7	9.9	31	2.51	15	1.58	47.7
36.09	55.4	48.6	132.9	55.5	1.7	6.6	3.2	4	clay SILT to silty CLAY	115	2.0	28	24	-	-	3.8	9.9	30	2.49	15	1.54	44.5
36.26	58.9	51.6	135.7	59.1	1.8	6.7	3.2	4	clay SILT to silty CLAY	115	2.0	29	26	-	-	4.1	9.9	29	2.47	15	1.39	36.5
36.42	55.0	48.1	138.5	55.1	1.8	6.7	3.5	4	clay SILT to silty CLAY	115	2.0	28	24	-	-	3.8	9.9	32	2.52	15	1.25	41.4
36.58	54.0	47.1	145.2	54.1	2.0	6.8	3.8	4	clay SILT to silty CLAY	115	2.0	27	24	-	-	3.7	9.9	33	2.56	15	0.90	41.9
36.75	58.6	51.1	140.4	58.8	1.9	6.9	3.4	4	clay SILT to silty CLAY	115	2.0	29	26	-	-	4.1	9.9	31	2.50	15	1.15	33.2
36.91	60.5	52.6	133.5	60.6	1.8	6.9	3.0	4	clay SILT to silty CLAY	115	2.0	30	26	-	-	4.2	9.9	29	2.45	15	1.51	38.2
37.08	64.9	56.4	124.8	65.1	1.7	6.8	2.7	5	silty SAND to sandy SILT	120	4.0	16	14	48	37	-	-	26	2.39	16	1.76	37.4
37.24	56.5	49.0	131.0	56.7	1.7	6.9	3.1	4	clay SILT to silty CLAY	115	2.0	28	24	-	-	3.9	9.9	30	2.48	15	1.64	45.3
37.40	55.1	47.7	125.6	55.3	1.5	6.9	2.9	4	clay SILT to silty CLAY	115	2.0	28	24	-	-	3.8	9.9	29	2.47	15	1.86	46.8
37.57	63.2	54.6	121.6	63.4	1.5	7.0	2.5	5	silty SAND to sandy SILT	120	4.0	16	14	47	37	-	-	26	2.38	16	1.98	39.2
37.73	67.7	58.4	123.9	67.9	1.6	7.0	2.4	5	silty SAND to sandy SILT	120	4.0	17	15	49	37	-	-	24	2.35	16	1.92	35.4
37.90	64.2	55.2	127.2	64.3	1.7	6.9	2.7	5	silty SAND to sandy SILT	120	4.0	16	14	47	37	-	-	26	2.40	16	1.81	38.5
38.06	55.8	47.9	130.8	55.9	1.7	6.8	3.1	4	clay SILT to silty CLAY	115	2.0	28	24	-	-	3.9	9.9	30	2.49	15	1.65	46.6
38.22	51.4	44.1	134.2	51.6	1.7	6.8	3.5	4	clay SILT to silty CLAY	115	2.0	26	22	-	-	3.5	9.9	33	2.55	15	1.47	51.2
38.39	39.4	30.6	-	39.6	1.7	6.7	4.7	3	silty CLAY to CLAY	115	1.5	26	20	-	-	2.7	9.5	44	2.76	15	-	-
38.55	34.0	26.3	-	34.1	1.9	6.8	6.0	3	silty CLAY to CLAY	115	1.5	23	18	-	-	2.3	8.1	51	2.88	15	-	-
38.72	49.8	38.4	-	50.0	2.2	6.9	4.7	3	silty CLAY to CLAY	115	1.5	33	26	-	-	3.4	9.9	40	2.69	15	-	-
38.88	50.9	39.1	-	51.0	2.5	6.9	5.1	3	silty CLAY to CLAY	115	1.5	34	26	-	-	3.5	9.9	41	2.70	15	-	-
39.04	50.9	39.0	-	51.0	2.2	7.0	4.6	4	clay SILT to silty CLAY	115	2.0	25	19	-	-	3.5	9.9	39	2.67	15	-	-
39.21	61.6	52.3	148.8	61.8	2.2	7.1	3.7	4	clay SILT to silty CLAY	115	2.0	31	26	-	-	4.3	9.9	31	2.51	15	0.74	25.8
39.37	68.4	58.0	148.8	68.6	2.3	7.2	3.4	4	clay SILT to silty CLAY	115	2.0	34	29	-	-	4.7	9.9	29	2.46	15	0.75	10.5
39.54	79.0	66.9	143.7	79.2	2.2	7.3	2.9	5	silty SAND to sandy SILT	120	4.0	20	17	54	38	-	-	25	2.36	16	1.01	9.2
39.70	78.5	66.3	140.9	78.6	2.1	7.2	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	53	38	-	-	24	2.35	16	1.15	12.1
39.86	83.1	70.0	138.3	83.2	2.1	7.4	2.6	5	silty SAND to sandy SILT	120	4.0	21	18	55	38	-	-	23	2.31	16	1.29	14.2
40.03	82.6	69.5	144.4	82.8	2.2	7.4	2.8	5	silty SAND to sandy SILT	120	4.0	21	17	55	38	-	-	24	2.34	16	0.98	8.2
40.19	67.9	57.1	155.3	68.1	2.5	7.1	3.7	4	clay SILT to silty CLAY	115	2.0	34	29	-	-	4.7	9.9	30	2.49	15	0.50	3.0
40.36	73.0	61.2	156.9	73.2	2.5	7.5	3.6	4	clay SILT to silty CLAY	115	2.0	37	31	-	-	5.1	9.9	29	2.46	15	0.46	2.7
40.52	82.6	69.2	155.8	82.8	2.6	7.7	3.2	4	clay SILT to silty CLAY	115	2.0	41	35	-	-	5.7	9.9	26	2.39	15	0.50	3.0
40.68	82.1	68.6	145.7	82.3	2.3	8.0	2.9	5	silty SAND to sandy SILT	120	4.0	21	17	55	38	-	-	24	2.35	16	0.92	7.4
40.85	84.2	70.3	140.7	84.3	2.2	8.2	2.6	5	silty SAND to sandy SILT	120	4.0	21	18	55	38	-	-	23	2.32	16	1.17	11.4
41.01	88.0	73.3	138.6	88.2	2.1	8.3	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	57	38	-	-	22	2.28	16	1.28	12.7
41.18	93.5	77.7	144.3	93.6	2.3	8.2	2.5	5	silty SAND to sandy SILT	120	4.0	23	19	59	38	-	-	21	2.27	16	1.00	7.2
41.34	103.1	85.6	135.9	103.3	2.0	8.4	2.0	5	silty SAND to sandy SILT	120	4.0	26	21	6								

LACMA Phase III Transformation Project

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Project No: 60440464
Cone/Rig: DDG1333

Depth ft	qc PS	qc1n PS	q1ncs PS	qt PS	slv tsf	pore prss (psi)	Frct Rto %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic SBT %	Ic SBT %	Nk -	Vol Strn %	Cycl SStn %
46.43	155.8	122.9	174.6	156.0	3.3	11.0	2.1	5	silty SAND to sandy SILT	120	4.0	39	31	74	41	-	-	15	2.08	16	0.00	0.0
46.59	116.4	91.7	154.3	116.6	2.7	11.8	2.4	5	silty SAND to sandy SILT	120	4.0	29	23	64	39	-	-	19	2.21	16	0.57	3.3
46.75	131.0	103.0	159.9	131.3	2.9	12.3	2.2	5	silty SAND to sandy SILT	120	4.0	33	26	68	40	-	-	17	2.15	16	0.41	2.4
46.92	111.2	87.3	143.7	111.3	2.4	9.6	2.2	5	silty SAND to sandy SILT	120	4.0	28	22	63	39	-	-	19	2.19	16	1.03	6.5
47.08	60.8	47.6	128.6	61.0	1.8	10.8	3.0	4	clay SILT to silty CLAY	115	2.0	30	24	-	-	4.2	9.9	30	2.49	15	1.73	46.9
47.25	61.1	47.8	106.0	61.3	1.2	11.3	2.1	5	silty SAND to sandy SILT	120	4.0	15	12	43	35	-	-	25	2.38	16	2.23	46.7
47.41	57.1	44.6	110.3	57.3	1.3	11.2	2.4	5	silty SAND to sandy SILT	120	4.0	14	11	40	35	-	-	28	2.44	16	2.16	50.6
47.57	67.5	52.7	106.9	67.7	1.3	10.1	1.9	5	silty SAND to sandy SILT	120	4.0	17	13	46	36	-	-	23	2.32	16	2.21	41.2
47.74	52.9	41.2	105.2	53.1	1.1	10.1	2.3	5	silty SAND to sandy SILT	120	4.0	13	10	38	34	-	-	29	2.45	16	2.24	51.2
47.90	58.7	45.6	108.7	58.9	1.3	10.3	2.3	5	silty SAND to sandy SILT	120	4.0	15	11	41	35	-	-	27	2.42	16	2.18	49.3
48.07	57.8	44.9	110.7	58.0	1.3	10.6	2.4	5	silty SAND to sandy SILT	120	4.0	14	11	41	35	-	-	28	2.44	16	2.15	50.3
48.23	53.5	41.5	110.2	53.7	1.3	10.1	2.5	4	clay SILT to silty CLAY	115	2.0	27	21	-	-	3.7	9.9	30	2.48	15	2.16	51.2
48.39	45.1	28.7	-	45.3	1.4	10.1	3.3	4	clay SILT to silty CLAY	115	2.0	23	14	-	-	3.1	8.9	39	2.68	15	-	-
48.56	48.7	30.9	-	48.9	1.3	10.3	2.9	4	clay SILT to silty CLAY	115	2.0	24	15	-	-	3.3	9.6	36	2.62	15	-	-
48.72	47.7	30.2	-	47.9	1.3	10.1	2.9	4	clay SILT to silty CLAY	115	2.0	24	15	-	-	3.3	9.4	37	2.63	15	-	-
48.89	44.7	28.2	-	44.9	1.4	10.1	3.3	4	clay SILT to silty CLAY	115	2.0	22	14	-	-	3.0	8.7	40	2.69	15	-	-
49.05	53.5	33.6	-	53.7	1.6	10.4	3.2	4	clay SILT to silty CLAY	115	2.0	27	17	-	-	3.7	9.9	36	2.62	15	-	-
49.22	67.7	52.1	130.8	67.9	1.9	10.5	2.9	4	clay SILT to silty CLAY	115	2.0	34	26	-	-	4.7	9.9	28	2.45	15	1.61	41.7
49.38	74.2	57.0	129.7	74.4	1.9	10.5	2.7	5	silty SAND to sandy SILT	120	4.0	19	14	48	36	-	-	26	2.39	16	1.69	36.8
49.54	113.1	86.8	141.7	113.3	2.3	10.5	2.1	5	silty SAND to sandy SILT	120	4.0	28	22	62	39	-	-	19	2.19	16	1.12	7.3
49.71	122.0	93.4	151.7	122.2	2.7	11.3	2.3	5	silty SAND to sandy SILT	120	4.0	30	23	65	39	-	-	18	2.18	16	0.66	3.7
49.87	139.4	106.6	163.1	139.6	3.1	10.9	2.2	5	silty SAND to sandy SILT	120	4.0	35	27	69	40	-	-	17	2.14	16	0.00	0.0
50.04	123.3	94.2	154.7	123.5	2.8	9.5	2.3	5	silty SAND to sandy SILT	120	4.0	31	24	65	39	-	-	19	2.19	16	0.55	3.1
50.20	95.9	73.2	148.8	96.2	2.6	10.9	2.8	5	silty SAND to sandy SILT	120	4.0	24	18	57	38	-	-	23	2.33	16	0.74	5.0
50.36	185.4	141.2	183.5	185.6	3.4	11.6	1.9	5	silty SAND to sandy SILT	120	4.0	46	35	78	41	-	-	13	2.00	16	0.00	0.0
50.53	214.4	163.1	197.1	214.7	3.6	10.6	1.7	6	clean SAND to silty SAND	125	5.0	43	33	83	42	-	-	11	1.92	16	0.00	0.0
50.69	207.1	157.2	194.5	207.3	3.6	10.5	1.8	6	clean SAND to silty SAND	125	5.0	41	31	82	42	-	-	12	1.95	16	0.00	0.0
50.86	200.6	152.1	190.6	200.8	3.6	10.5	1.8	6	clean SAND to silty SAND	125	5.0	40	30	81	42	-	-	12	1.96	16	0.00	0.0
51.02	213.6	161.7	197.1	213.8	3.6	10.6	1.7	6	clean SAND to silty SAND	125	5.0	43	32	83	42	-	-	11	1.93	16	0.00	0.0
51.18	198.1	149.7	192.1	198.3	3.7	11.0	1.9	6	clean SAND to silty SAND	125	5.0	40	30	80	41	-	-	13	1.99	16	0.00	0.0
51.35	177.5	134.0	184.2	177.8	3.7	11.4	2.1	5	silty SAND to sandy SILT	120	4.0	44	33	77	41	-	-	14	2.05	16	0.00	0.0
51.51	197.3	148.6	194.5	197.5	3.9	11.4	2.0	5	silty SAND to sandy SILT	120	4.0	49	37	80	41	-	-	13	2.01	16	0.00	0.0
51.68	201.5	151.6	200.1	201.7	4.2	11.3	2.1	5	silty SAND to sandy SILT	120	4.0	50	38	81	42	-	-	13	2.02	16	0.00	0.0
51.84	192.7	144.8	182.6	193.0	3.3	12.2	1.8	6	clean SAND to silty SAND	125	5.0	39	29	79	41	-	-	12	1.97	16	0.00	0.0
52.00	241.5	181.2	210.3	241.7	3.8	11.5	1.6	6	clean SAND to silty SAND	125	5.0	48	36	87	42	-	-	10	1.87	16	0.00	0.0
52.17	313.8	235.0	250.2	314.0	4.1	9.8	1.3	6	clean SAND to silty SAND	125	5.0	63	47	95	44	-	-	7	1.74	16	0.00	0.0
52.33	186.1	139.1	200.1	186.3	4.5	15.0	2.5	5	silty SAND to sandy SILT	120	4.0	47	35	78	41	-	-	16	2.09	16	0.00	0.0
52.50	177.6	132.6	191.9	177.9	4.2	15.8	2.4	5	silty SAND to sandy SILT	120	4.0	44	33	76	41	-	-	16	2.10	16	0.00	0.0
52.66	154.1	114.9	183.9	154.4	4.0	17.4	2.7	5	silty SAND to sandy SILT	120	4.0	39	29	72	40	-	-	18	2.17	16	0.00	0.0
52.82	216.7	161.3	196.1	216.9	3.6	13.0	1.7	6	clean SAND to silty SAND	125	5.0	43	32	83	42	-	-	11	1.93	16	0.00	0.0
52.99	137.9	102.6	161.8	138.2	3.1	15.9	2.3	5	silty SAND to sandy SILT	120	4.0	34	26	68	39	-	-	18	2.16	16	0.00	0.0
53.15	118.3	87.8	152.8	118.6	2.8	19.3	2.5	5	silty SAND to sandy SILT	120	4.0	30	22	63	38	-	-	20	2.23	16	0.59	3.4
53.32	130.2	96.6	163.6	130.6	3.3	19.6	2.6	5	silty SAND to sandy SILT	120	4.0	33	24	66	39	-	-	19	2.21	16	0.00	0.0
53.48	139.6	103.3	152.2	139.9	2.7	18.9	2.0	5	silty SAND to sandy SILT	120	4.0	35	26	68	39	-	-	16	2.11	16	0.64	3.4
53.64	126.9	93.8	182.4	127.2	4.5	18.9	3.6	5	silty SAND to sandy SILT	120	4.0	32	23	65	39	-	-	24	2.33	16	0.00	0.0
53.81	157.4	116.3	201.8	157.8	4.9	19.5	3.2	5	silty SAND to sandy SILT	120	4.0	39	29	72	40	-	-	20	2.23	16	0.00	0.0
53.97	174.3	128.6	204.4	174.7	4.9	17.5	2.9	5	silty SAND to sandy SILT	120	4.0	44	32	75	41	-	-	18	2.17	16	0.00	0.0
54.14	150.7	111.0	198.6	151.0	4.8	17.5	3.2	5	silty SAND to sandy SILT	120	4.0	38	28	70	40	-	-	21	2.25	16	0.00	0.0
54.30	156.2	114.9	189.1	156.5	4.3	18.6	2.8	5	silty SAND to sandy SILT	120	4.0	39	29	72	40	-	-	19	2.19	16	0.00	0.0
54.46	144.3	106.0	191.1	144.6	4.5	17.9	3.2	5	silty SAND to sandy SILT	120	4.0	36	26	69	39	-	-	21	2.25	16	0.00	0.0
54.63	194.3	142.5	197.2	194.6	4.3	15.1	2.3	5	silty SAND to sandy SILT	120	4.0	49	36	79	41	-	-	15	2.06	16	0.00	0.0
54.79	165.5	121.2	195.1	165.9	4.6	18.8	2.8	5	silty SAND to sandy SILT	120	4.0	41	30	73	40	-	-	18	2.18	16	0.00	0.0
54.96	162.2	118.6	195.4	162.5	4.6	16.2	2.9	5	silty SAND to sandy SILT	120	4.0	41	30	73	40	-	-	19	2.19	16	0.00	0.0
55.12	151.6	110.8	185.8	152.0	4.2	19.4	2.8	5	silty SAND to sandy SILT	120	4.0	38	28	70	40	-	-	19	2.20	16	0.00	0.0
55.28	157.1	114.6	186.9	157.4	4.2	17.7	2.8	5	silty SAND to sandy SILT	120	4.0	39	29	71	40	-	-	18	2.18	16	0.00	0.0
55.45	133.2	97.1	180.7	133.6	4.0	17.4	3.1	5	silty SAND to sandy SILT	120	4.0	33	24	66	39	-	-	21	2.27	16	0.00	0.0
55.61	112.9	82.1	179.7	113.2	3.9	17.3	3.6	4	clay SILT to silty CLAY	115	2.0	56	41	-	-	7.9	9.9	25	2.37	15	0.00	0.0
55.78	129.0	93.8	174.9	129.4	3.8	17.8	3.0	5	silty SAND to sandy SILT	120	4.0	32	23	65	39	-	-	22	2.27	16	0.00	0.0
55.94	125.2	90.8	177.2	125.5	3.9	17.2	3.2	5	silty SAND to sandy SILT	120	4.0	31	23	64	39	-	-	23	2.30	16	0.00	0.0
56.11	135.4	98.2	181.8	135.8	4.1	16.9	3.1	5	silty SAND to sandy SILT	120	4.0	34	25	66	39	-	-	21	2.27	16	0.00	0.0
56.27	140.5	101.7	181.5	140.8	4.1	17.9	3.0	5	silty SAND to sandy SILT	120	4.0	35	25	68	39	-	-	21	2.25	16	0.00	0.0
56.43	146.8	106.1	183.6	147.1	4.2	18.5	2.9	5	silty SAND to sandy SILT	120	4.0	37	27	69	39	-	-	20	2.22	16	0.00	0.0
56.60	144.3	104.2	179.6	144.7	4.0	18.7	2.8	5	silty SAND to sandy SILT													



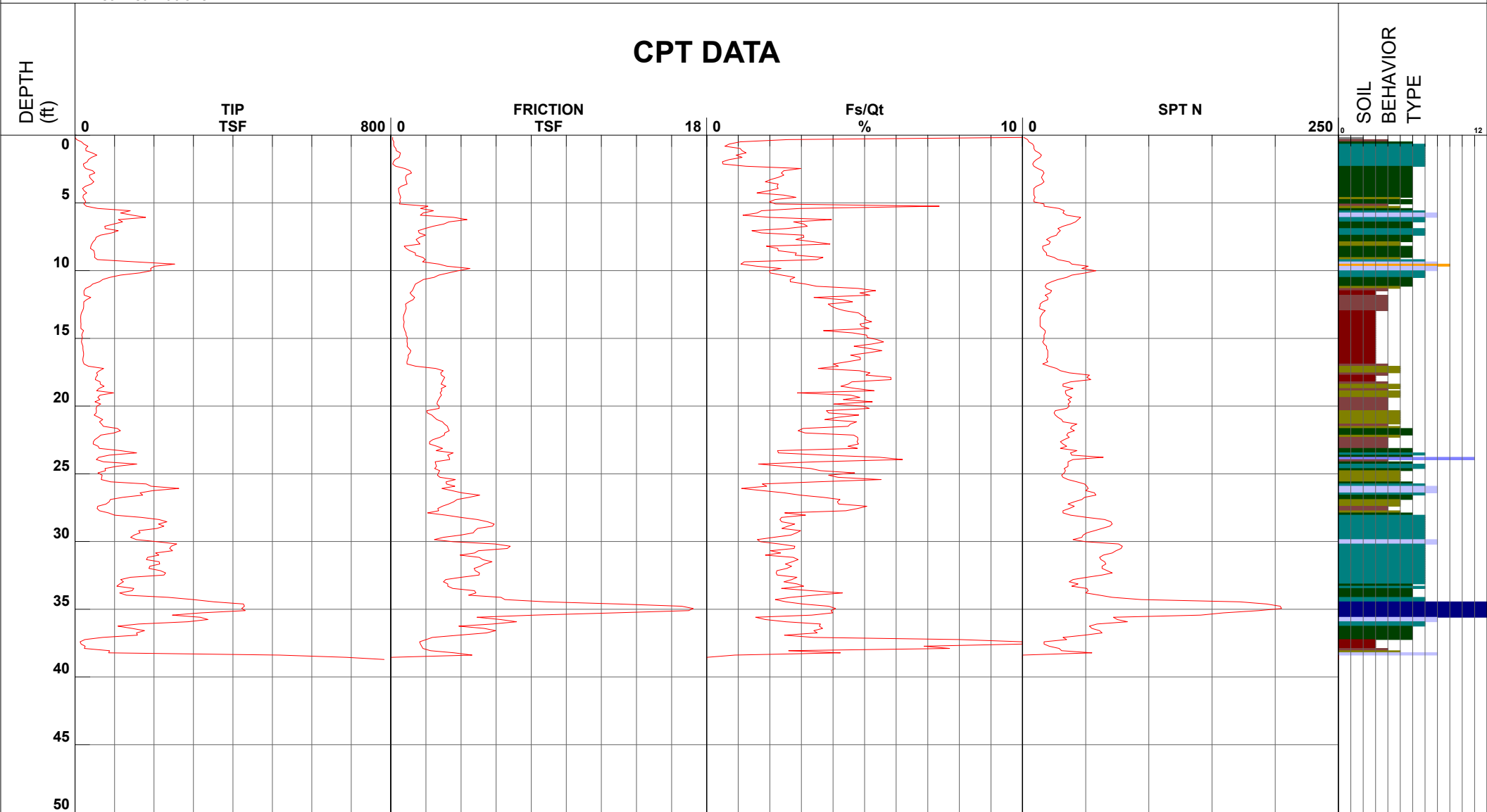
AECOM

Project LACMA Phase III
Job Number 60440464
Hole Number S-CPT-2
EST GW Depth During Test

Operator DG-RC
Cone Number DDG1268
Date and Time 11/13/2015 8:26:49 AM
14.00 ft

Filename SDF(414).cpt
GPS
Maximum Depth 38.71 ft

Net Area Ratio .8



- | | | | |
|------------------------------|---------------------------------|--------------------------------|------------------------------------|
| ■ 1 - sensitive fine grained | ■ 4 - silty clay to clay | ■ 7 - silty sand to sandy silt | ■ 10 - gravelly sand to sand |
| ■ 2 - organic material | ■ 5 - clayey silt to silty clay | ■ 8 - sand to silty sand | ■ 11 - very stiff fine grained (*) |
| ■ 3 - clay | ■ 6 - sandy silt to clayey silt | ■ 9 - sand | ■ 12 - sand to clayey sand (*) |

Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

LACMA Phase III

Project ID: AECOM
Data File: SDF(414).cpt
CPT Date: 11/13/2015 8:26:49 AM
GW During Test: 14 ft

Page: 1
Sounding ID: S-CPT-2
Project No: 60440464
Cone/Rig: DDG1268

Depth ft	qc tsf	qncs PS	* qt PS	Slv Stss tsf	pore prss (psi)	Frct Rat %	* Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* Ic SBDT	* Nk -	* Vol Strn	* Cycl SStn %
0.33	4.0	-	4.0	0.1	0.1	2.6	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	9.9	67	3.12	15	N/A	N/A
0.49	16.2	60.5	16.2	0.2	0.1	1.1	5	silty SAND to sandy SILT	120	4.0	4	6	22	48	-	-	27	2.41	16	N/A	N/A
0.66	22.5	59.5	22.5	0.2	-0.1	0.7	5	silty SAND to sandy SILT	120	4.0	6	9	33	48	-	-	19	2.19	16	N/A	N/A
0.82	32.7	68.7	32.7	0.2	0.3	0.6	6	clean SAND to silty SAND	125	5.0	7	10	46	48	-	-	13	2.01	16	N/A	N/A
0.98	27.2	74.3	27.2	0.3	0.1	1.1	5	silty SAND to sandy SILT	120	4.0	7	11	40	48	-	-	19	2.21	16	N/A	N/A
1.15	27.6	76.5	27.6	0.3	-0.1	1.1	5	silty SAND to sandy SILT	120	4.0	7	11	40	47	-	-	20	2.22	16	N/A	N/A
1.31	43.6	100.8	43.6	0.5	0.1	1.3	5	silty SAND to sandy SILT	120	4.0	11	17	55	48	-	-	16	2.09	16	N/A	N/A
1.48	55.4	108.5	55.4	0.5	0.4	0.9	6	clean SAND to silty SAND	125	5.0	11	18	63	48	-	-	11	1.93	16	N/A	N/A
1.64	41.9	95.1	41.9	0.5	1.4	1.1	5	silty SAND to sandy SILT	120	4.0	10	17	54	47	-	-	15	2.08	16	N/A	N/A
1.80	34.1	74.0	34.1	0.2	0.6	0.7	6	clean SAND to silty SAND	125	5.0	7	11	47	46	-	-	14	2.04	16	N/A	N/A
1.97	31.3	64.9	31.3	0.2	0.7	0.5	6	clean SAND to silty SAND	125	5.0	6	10	44	45	-	-	13	2.00	16	N/A	N/A
2.13	21.1	53.1	21.1	0.1	0.7	0.5	5	silty SAND to sandy SILT	120	4.0	5	8	31	43	-	-	18	2.16	16	N/A	N/A
2.30	22.4	73.2	22.4	0.3	0.8	1.3	5	silty SAND to sandy SILT	120	4.0	6	9	33	43	-	-	24	2.33	16	N/A	N/A
2.46	27.0	119.8	27.0	0.8	0.8	3.0	4	clay SILT to silty CLAY	115	2.0	14	22	-	-	1.9	9.9	31	2.50	15	N/A	N/A
2.62	45.0	135.6	45.0	1.1	1.4	2.4	5	silty SAND to sandy SILT	120	4.0	11	18	56	46	-	-	22	2.28	16	N/A	N/A
2.79	50.1	141.3	50.1	1.2	1.5	2.4	5	silty SAND to sandy SILT	120	4.0	13	20	60	46	-	-	20	2.24	16	N/A	N/A
2.95	36.7	123.3	36.7	0.9	1.9	2.5	5	silty SAND to sandy SILT	120	4.0	9	15	49	44	-	-	24	2.34	16	N/A	N/A
3.12	37.2	119.3	37.2	0.8	0.9	2.3	5	silty SAND to sandy SILT	120	4.0	9	15	50	44	-	-	23	2.32	16	N/A	N/A
3.28	42.4	120.4	42.4	0.9	1.4	2.0	5	silty SAND to sandy SILT	120	4.0	11	17	54	44	-	-	20	2.24	16	N/A	N/A
3.45	47.9	123.7	47.9	0.9	1.8	1.9	5	silty SAND to sandy SILT	120	4.0	12	19	58	45	-	-	18	2.18	16	N/A	N/A
3.61	41.1	125.4	41.1	0.9	1.8	2.3	5	silty SAND to sandy SILT	120	4.0	10	16	53	44	-	-	22	2.29	16	N/A	N/A
3.77	26.4	102.5	26.5	0.6	1.6	2.2	5	silty SAND to sandy SILT	120	4.0	7	11	39	41	-	-	27	2.43	16	N/A	N/A
3.94	19.1	91.3	19.1	0.4	1.7	2.3	4	clay SILT to silty CLAY	115	2.0	10	15	-	-	1.3	9.9	33	2.54	15	N/A	N/A
4.10	22.9	91.1	22.9	0.4	1.9	2.0	5	silty SAND to sandy SILT	120	4.0	6	9	34	40	-	-	28	2.44	16	N/A	N/A
4.27	29.7	91.7	29.7	0.5	2.3	1.6	5	silty SAND to sandy SILT	120	4.0	7	12	42	41	-	-	22	2.29	16	N/A	N/A
4.43	21.2	98.6	21.3	0.5	2.4	2.5	4	clay SILT to silty CLAY	115	2.0	11	17	-	-	1.5	9.9	32	2.52	15	N/A	N/A
4.59	19.9	104.0	20.0	0.6	2.1	2.9	4	clay SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	35	2.59	15	N/A	N/A
4.76	23.7	97.0	23.8	0.5	2.1	2.2	5	silty SAND to sandy SILT	120	4.0	6	10	35	40	-	-	29	2.45	16	N/A	N/A
4.92	27.2	98.2	27.3	0.5	2.8	2.0	5	silty SAND to sandy SILT	120	4.0	7	11	40	40	-	-	26	2.38	16	N/A	N/A
5.09	22.4	95.3	22.4	0.5	1.9	2.2	5	silty SAND to sandy SILT	120	4.0	6	9	33	39	-	-	30	2.48	16	N/A	N/A
5.25	28.8	-	28.8	2.1	2.4	7.4	3	silty CLAY to CLAY	115	1.5	19	31	-	-	2.0	9.9	44	2.77	15	N/A	N/A
5.41	57.8	170.5	57.8	1.7	1.2	3.0	5	silty SAND to sandy SILT	120	4.0	14	23	64	43	-	-	21	2.26	16	N/A	N/A
5.58	140.0	255.4	140.1	2.4	2.0	1.7	6	clean SAND to silty SAND	125	5.0	28	45	94	47	-	-	9	1.84	16	N/A	N/A
5.74	115.3	214.2	115.4	1.8	1.2	1.6	6	clean SAND to silty SAND	125	5.0	23	37	87	46	-	-	10	1.87	16	N/A	N/A
5.91	146.6	242.1	146.7	1.7	3.1	1.1	6	clean SAND to silty SAND	125	5.0	29	47	95	47	-	-	6	1.69	16	N/A	N/A
6.07	179.0	323.9	179.0	3.6	1.2	2.0	6	clean SAND to silty SAND	125	5.0	36	57	95	48	-	-	9	1.83	16	N/A	N/A
6.23	109.9	288.8	110.0	4.3	3.2	4.0	8	stiff SAND to clay SAND	115	1.0	100	100	-	-	7.3	9.9	19	2.20	16	N/A	N/A
6.40	120.3	257.7	120.3	3.3	1.1	2.8	5	silty SAND to sandy SILT	120	4.0	30	47	88	46	-	-	14	2.05	16	N/A	N/A
6.56	98.4	233.7	98.4	3.0	1.2	3.1	5	silty SAND to sandy SILT	120	4.0	25	38	81	45	-	-	17	2.14	16	N/A	N/A
6.73	75.5	200.9	75.5	2.4	1.6	3.2	5	silty SAND to sandy SILT	120	4.0	19	29	72	44	-	-	20	2.23	16	N/A	N/A
6.89	76.5	180.3	76.6	1.9	3.2	2.6	5	silty SAND to sandy SILT	120	4.0	19	29	72	44	-	-	17	2.15	16	N/A	N/A
7.05	109.6	189.5	109.6	1.6	1.6	1.4	6	clean SAND to silty SAND	125	5.0	22	33	83	45	-	-	10	1.87	16	N/A	N/A
7.22	93.2	175.0	93.2	1.6	1.7	1.7	6	clean SAND to silty SAND	125	5.0	19	28	78	44	-	-	12	1.98	16	N/A	N/A
7.38	64.4	175.5	64.5	2.0	2.4	3.1	5	silty SAND to sandy SILT	120	4.0	16	23	65	42	-	-	22	2.27	16	N/A	N/A
7.55	53.3	158.9	53.4	1.6	2.8	3.1	5	silty SAND to sandy SILT	120	4.0	13	19	58	41	-	-	24	2.33	16	N/A	N/A
7.71	51.3	148.1	51.3	1.4	3.0	2.8	5	silty SAND to sandy SILT	120	4.0	13	18	57	41	-	-	23	2.32	16	N/A	N/A
7.87	45.8	154.4	45.9	1.6	1.8	3.4	4	clay SILT to silty CLAY	115	2.0	23	32	-	-	3.2	9.9	27	2.42	15	N/A	N/A
8.04	42.5	161.1	42.5	1.7	1.9	4.0	4	clay SILT to silty CLAY	115	2.0	21	30	-	-	3.0	9.9	30	2.49	15	N/A	N/A
8.20	40.2	106.8	40.2	0.8	1.2	1.9	5	silty SAND to sandy SILT	120	4.0	10	14	48	39	-	-	22	2.29	16	N/A	N/A
8.37	38.9	114.2	38.9	0.9	0.7	2.3	5	silty SAND to sandy SILT	120	4.0	10	13	46	39	-	-	25	2.36	16	N/A	N/A
8.53	48.1	125.4	48.2	1.1	2.5	2.3	5	silty SAND to sandy SILT	120	4.0	12	16	53	40	-	-	22	2.29	16	N/A	N/A
8.69	49.1	141.6	49.1	1.4	0.7	2.9	5	silty SAND to sandy SILT	120	4.0	12	17	53	40	-	-	25	2.36	16	N/A	N/A
8.86	50.2	141.5	50.3	1.4	1.4	2.8	5	silty SAND to sandy SILT	120	4.0	13	17	54	40	-	-	24	2.35	16	N/A	N/A
9.02	49.7	163.1	49.7	1.8	0.8	3.7	4	clay SILT to silty CLAY	115	2.0	25	33	-	-	3.5	9.9	28	2.44	15	N/A	N/A
9.19	56.5	167.2	56.6	2.0	0.6	3.5	4	clay SILT to silty CLAY	115	2.0	28	37	-	-	4.0	9.9	26	2.39	15	N/A	N/A
9.35	152.4	212.1	152.5	1.8	1.9	1.2	6	clean SAND to silty SAND	125	5.0	30	40	90	45	-	-	7	1.75	16	N/A	N/A
9.51	252.5	324.9	252.6	2.7	1.0	1.1	6	clean SAND to silty SAND	125	5.0	51	65	95	48	-	-	5	1.58	16	N/A	N/A
9.68	201.8	279.9	201.8	3.2	1.5	1.6	6	clean SAND to silty SAND	125	5.0	40	51	95	47	-	-	8	1.77	16	N/A	N/A
9.84	191.3	294.5	191.4	4.5	2.2	2.4	6	clean SAND to silty SAND	125	5.0	38	48	95	46	-	-	11	1.93	16	N/A	N/A
10.01	192.7	280.5	192.7	3.8	1.8	2.0	6	clean SAND to silty SAND	125	5.0	39	48	95	46	-	-	10	1.87	16	N/A	N/A
10.17	164.6	246.2	164.6	3.3	-0.4	2.0	6	clean SAND to silty SAND	125	5.0	33	41	91	45	-	-	11	1.92	16	N/A	N/A
10.34	114.7	199.5	114.7	2.7	0.2	2.4	5	silty SAND to sandy SILT	120	4.0	29	35	78	44	-	-	15	2.08	16	N/A	N/A
10.50	88.3	181.0	88.3	2.5	0.6	2.8	5	silty SAND to sandy SILT	120	4.0	22	27	70	42	-	-	19	2.20	16	N/A	N/A
10.66	70.2	154.7	70.2	1.9	0.1	2.7	5	silty SAND to sandy SILT	120	4.0	18	21	62	41	-	-	21	2.26	16	N/A	N/A
10.83	61.9	144.9	62.0	1.6	0.3	2.7	5	silty SAND to sandy SILT	120	4.0	15	19	57	40	-	-	22	2.30	16	N/A	N/A
10.99	44.8	136.1	44.8	1.4	0.5	3.2	4	clay SILT to silty CLAY	115	2.0	22	27	-	-	3.1	9.9	29	2.45	15	N/A	N/A
11.16	38.5	135.3	38.6	1.3	0.7	3.5	4	clay SILT to silty CLAY	115	2.0	19	23	-	-	2.7	9.9	32	2.54	15	N/A	N/A
11.32	26.9	-	26.9	1.3	0.7	4.9	3	silty CLAY to CLAY	115	1.5	18	26	-	-	1.9	9.9	40	2.68	15	N/A	N/A
11.48	22.9	-	22.9	1.2	0.7	5.5	3	silty CLAY to CLAY	115	1.5	15	22	-	-							

LACMA Phase III

Project ID: AECOM
Data File: SDF(414).cpt
CPT Date: 11/13/2015 8:26:49 AM
GW During Test: 14 ft

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Sounding ID: S-CPT-2
Project No: 60440464
Cone/Rig: DDG1268

Depth ft	qc PS	qncs PS	* qt PS	Slv Stss tsf	pore prss (psi)	Frct Rat %	* Mat Typ	* Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* Ic SBT Index	* Nk -	* Vol Strn %	* Cycl SStn %
15.58	19.9	-	19.9	0.9	-1.4	4.9	3	silty	CLAY to CLAY	115	1.5	13	15	-	-	1.3	7.2	50	2.86	15	-	-
15.75	20.1	-	20.1	1.0	-1.4	5.4	3	silty	CLAY to CLAY	115	1.5	13	15	-	-	1.4	7.2	51	2.89	15	-	-
15.91	20.5	-	20.5	1.1	-1.4	5.8	3	silty	CLAY to CLAY	115	1.5	14	16	-	-	1.4	7.3	52	2.91	15	-	-
16.08	21.6	-	21.6	1.1	-1.4	5.3	3	silty	CLAY to CLAY	115	1.5	14	16	-	-	1.5	7.7	50	2.86	15	-	-
16.24	21.6	-	21.6	1.0	-1.3	4.8	3	silty	CLAY to CLAY	115	1.5	14	16	-	-	1.5	7.6	48	2.84	15	-	-
16.40	20.6	-	20.6	1.0	-1.3	5.1	3	silty	CLAY to CLAY	115	1.5	14	15	-	-	1.4	7.2	50	2.87	15	-	-
16.57	19.7	-	19.7	1.0	-1.2	5.1	3	silty	CLAY to CLAY	115	1.5	13	15	-	-	1.3	6.9	51	2.89	15	-	-
16.73	20.6	-	20.5	0.9	-1.2	4.7	3	silty	CLAY to CLAY	115	1.5	14	15	-	-	1.4	7.1	49	2.85	15	-	-
16.90	22.9	-	22.9	0.9	-1.1	4.2	3	silty	CLAY to CLAY	115	1.5	15	17	-	-	1.6	8.0	45	2.78	15	-	-
17.06	33.8	-	33.8	1.4	-0.8	4.3	4	clay	SILT to silty CLAY	115	2.0	17	19	-	-	2.3	9.9	39	2.66	15	-	-
17.23	72.6	168.8	72.6	2.6	0.0	3.6	4	clay	SILT to silty CLAY	115	2.0	36	37	-	-	5.1	9.9	26	2.39	15	0.00	0.0
17.39	61.7	188.2	61.7	3.0	-0.4	4.9	4	clay	SILT to silty CLAY	115	2.0	31	31	-	-	4.3	9.9	33	2.55	15	0.00	0.0
17.55	55.0	188.0	55.0	2.8	-0.1	5.3	4	clay	SILT to silty CLAY	115	2.0	27	29	-	-	3.8	9.9	35	2.60	15	0.00	0.0
17.72	57.1	186.0	57.1	2.9	-0.5	5.1	4	clay	SILT to silty CLAY	115	2.0	29	29	-	-	4.0	9.9	35	2.58	15	0.00	0.0
17.88	52.7	-	52.7	3.1	-0.3	5.9	3	silty	CLAY to CLAY	115	1.5	35	38	-	-	3.7	9.9	37	2.64	15	-	-
18.05	51.3	-	51.3	3.0	-0.4	6.0	3	silty	CLAY to CLAY	115	1.5	34	36	-	-	3.6	9.9	38	2.65	15	-	-
18.21	63.8	184.4	63.8	2.9	-0.1	4.7	4	clay	SILT to silty CLAY	115	2.0	32	32	-	-	4.4	9.9	32	2.52	15	0.00	0.0
18.37	63.9	181.7	63.9	2.9	-0.1	4.6	4	clay	SILT to silty CLAY	115	2.0	32	32	-	-	4.4	9.9	31	2.52	15	0.00	0.0
18.54	73.7	187.8	73.7	3.1	-0.1	4.3	4	clay	SILT to silty CLAY	115	2.0	37	37	-	-	5.1	9.9	29	2.46	15	0.00	0.0
18.70	60.9	182.9	60.9	2.9	0.1	4.8	4	clay	SILT to silty CLAY	115	2.0	30	30	-	-	4.2	9.9	33	2.55	15	0.00	0.0
18.87	54.7	-	54.7	2.9	0.4	5.4	4	clay	SILT to silty CLAY	115	2.0	27	29	-	-	3.8	9.9	36	2.60	15	-	-
19.03	97.8	173.2	97.8	2.8	0.3	2.9	5	silty	SAND to sandy SILT	120	4.0	24	24	66	41	-	-	21	2.25	16	0.00	0.0
19.19	63.4	182.0	63.4	2.9	0.6	4.6	4	clay	SILT to silty CLAY	115	2.0	32	31	-	-	4.4	9.9	32	2.53	15	0.00	0.0
19.36	57.6	180.8	57.6	2.8	1.1	4.9	4	clay	SILT to silty CLAY	115	2.0	29	28	-	-	4.0	9.9	34	2.58	15	0.00	0.0
19.52	63.0	175.7	63.1	2.7	1.8	4.4	4	clay	SILT to silty CLAY	115	2.0	32	31	-	-	4.4	9.9	31	2.51	15	0.00	0.0
19.69	50.6	-	50.6	2.7	2.3	5.4	4	clay	SILT to silty CLAY	115	2.0	25	26	-	-	3.5	9.9	37	2.63	15	-	-
19.85	65.3	170.9	65.3	2.6	2.4	4.1	4	clay	SILT to silty CLAY	115	2.0	33	32	-	-	4.5	9.9	30	2.48	15	0.00	0.0
20.01	55.4	179.6	55.4	2.7	2.4	5.1	4	clay	SILT to silty CLAY	115	2.0	28	27	-	-	3.8	9.9	35	2.60	15	0.00	0.0
20.18	53.4	-	53.4	2.7	2.5	5.3	4	clay	SILT to silty CLAY	115	2.0	27	27	-	-	3.7	9.9	36	2.61	15	-	-
20.34	54.2	151.8	54.2	2.1	2.6	3.9	4	clay	SILT to silty CLAY	115	2.0	27	26	-	-	3.8	9.9	32	2.52	15	0.20	0.5
20.51	53.8	152.8	53.8	2.1	2.8	3.9	4	clay	SILT to silty CLAY	115	2.0	27	26	-	-	3.7	9.9	32	2.53	15	0.19	0.4
20.67	48.6	-	48.4	2.3	-6.6	4.9	4	clay	SILT to silty CLAY	115	2.0	24	24	-	-	3.4	9.9	37	2.63	15	-	-
20.83	59.7	166.4	59.6	2.5	-6.5	4.2	4	clay	SILT to silty CLAY	115	2.0	30	29	-	-	4.1	9.9	32	2.52	15	0.00	0.0
21.00	70.2	168.1	70.1	2.6	-6.5	3.8	4	clay	SILT to silty CLAY	115	2.0	35	34	-	-	4.9	9.9	28	2.44	15	0.00	0.0
21.16	62.1	182.9	62.0	2.9	-6.4	4.8	4	clay	SILT to silty CLAY	115	2.0	31	30	-	-	4.3	9.9	33	2.56	15	0.00	0.0
21.33	67.2	184.7	67.1	3.1	-6.4	4.6	4	clay	SILT to silty CLAY	115	2.0	34	32	-	-	4.7	9.9	32	2.52	15	0.00	0.0
21.49	72.1	188.6	72.0	3.2	-6.4	4.6	4	clay	SILT to silty CLAY	115	2.0	36	35	-	-	5.0	9.9	30	2.49	15	0.00	0.0
21.65	107.1	184.4	107.0	3.3	-6.3	3.1	5	silty	SAND to sandy SILT	120	4.0	27	26	68	41	-	-	21	2.25	16	0.00	0.0
21.82	115.1	186.8	115.0	3.3	-6.3	2.9	5	silty	SAND to sandy SILT	120	4.0	29	27	70	41	-	-	19	2.21	16	0.00	0.0
21.98	98.5	178.0	98.4	3.1	-6.3	3.2	5	silty	SAND to sandy SILT	120	4.0	25	23	65	40	-	-	22	2.28	16	0.00	0.0
22.15	65.5	184.2	65.4	3.0	-6.1	4.7	4	clay	SILT to silty CLAY	115	2.0	33	31	-	-	4.6	9.9	32	2.54	15	0.00	0.0
22.31	58.5	177.9	58.4	2.8	-6.1	4.9	4	clay	SILT to silty CLAY	115	2.0	29	28	-	-	4.1	9.9	34	2.58	15	0.00	0.0
22.47	50.2	-	50.0	2.4	-6.0	4.9	4	clay	SILT to silty CLAY	115	2.0	25	24	-	-	3.5	9.9	37	2.63	15	-	-
22.64	46.6	-	46.2	2.2	-6.0	4.9	4	clay	SILT to silty CLAY	115	2.0	23	22	-	-	3.2	9.9	38	2.65	15	-	-
22.80	45.9	-	45.8	2.2	-5.9	5.0	4	clay	SILT to silty CLAY	115	2.0	23	22	-	-	3.2	9.9	38	2.66	15	-	-
22.97	58.6	170.7	58.5	2.6	-5.9	4.6	4	clay	SILT to silty CLAY	115	2.0	29	28	-	-	4.1	9.9	34	2.56	15	0.00	0.0
23.13	61.7	181.2	61.5	2.9	-5.9	4.9	4	clay	SILT to silty CLAY	115	2.0	31	29	-	-	4.3	9.9	34	2.57	15	0.00	0.0
23.30	115.3	164.4	115.2	3.6	-5.9	2.3	5	silty	SAND to sandy SILT	120	4.0	29	27	69	41	-	-	17	2.14	16	0.00	0.0
23.46	156.2	200.4	156.1	3.5	-6.0	2.3	5	silty	SAND to sandy SILT	120	4.0	39	36	79	42	-	-	14	2.05	16	0.00	0.0
23.62	86.7	182.9	86.6	3.2	-6.0	3.8	4	clay	SILT to silty CLAY	115	2.0	43	40	-	-	6.1	9.9	26	2.39	15	0.00	0.0
23.79	60.7	-	60.6	3.3	-6.0	5.6	4	clay	SILT to silty CLAY	115	2.0	30	28	-	-	4.2	9.9	37	2.62	15	-	-
23.95	54.0	-	53.9	3.4	-5.9	6.4	3	silty	CLAY to CLAY	115	1.5	36	33	-	-	3.7	9.9	41	2.70	15	-	-
24.12	72.2	161.2	72.1	2.5	-5.9	3.6	4	clay	SILT to silty CLAY	115	2.0	36	33	-	-	5.0	9.9	27	2.42	15	0.00	0.0
24.28	156.4	178.7	156.3	2.6	-5.6	1.6	6	clean	SAND to silty SAND	125	5.0	31	29	79	42	-	-	12	1.95	16	0.00	0.0
24.44	106.0	161.8	105.9	2.6	-5.2	2.5	5	silty	SAND to sandy SILT	120	4.0	26	24	66	40	-	-	19	2.20	16	0.00	0.0
24.61	75.9	159.2	75.8	2.5	-5.2	3.4	4	clay	SILT to silty CLAY	115	2.0	38	35	-	-	5.3	9.9	26	2.39	15	0.17	0.6
24.77	77.3	168.6	77.2	2.8	-5.2	3.7	4	clay	SILT to silty CLAY	115	2.0	39	36	-	-	5.4	9.9	27	2.41	15	0.00	0.0
24.94	57.9	173.0	57.8	2.7	-5.0	4.8	4	clay	SILT to silty CLAY	115	2.0	29	27	-	-	4.0	9.9	35	2.59	15	0.00	0.0
25.10	68.7	166.1	68.6	2.7	-5.5	3.9	4	clay	SILT to silty CLAY	115	2.0	34	31	-	-	4.8	9.9	30	2.47	15	0.00	0.0
25.26	67.5	172.0	67.4	2.8	-5.5	4.3	4	clay	SILT to silty CLAY	115	2.0	34	31	-	-	4.7	9.9	31	2.50	15	0.00	0.0
25.43	66.7	-	66.5	3.7	-5.5	5.6	4	clay	SILT to silty CLAY	115	2.0	33	29	-	-	4.6	9.9	36	2.61	15	-	-
25.59	90.1	177.6	90.0	3.2	-5.5	3.6	4	clay	SILT to silty CLAY	115	2.0	45	41	-	-	6.3	9.9	25	2.36	15	0.00	0.0
25.76	180.3	200.3	180.2	3.2	-5.4	1.8	6	clean	SAND to silty SAND	125	5.0	36	33	83	43	-	-	11	1.94	16	0.00	0.0
25.92	192.3	214.7	192.2	3.7	-5.1	1.9	6	clean	SAND to silty SAND	125	5.0	38	35	85	43	-	-	11	1.94	16	0.00	0.0
26.08	263.4	242.9	263.3	2.9	-4.9	1.1	6	clean	SAND to silty SAND	125	5.0	53	48	95	45	-	-	6	1.67	16	0.00	0.0

LACMA Phase III

Project ID: AECOM
Data File: SDF(414).cpt
CPT Date: 11/13/2015 8:26:49 AM
GW During Test: 14 ft

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Sounding ID: S-CPT-2
Project No: 60440464
Cone/Rig: DD61268

	qc	q1ncs	qt	Slv	pore	Frct	Mat		Material	Unit	Qc	SPT	SPT	Rel	Ftn	Und	OCR	Fin	Ic	Nk	Vol	Cycl
Depth	PS	PS	PS	Stss	prss	Ratio	Typ	Zon	Behavior	Wght	to	R-N	R-N1	Den	Ang	Shr	-	Ic	SBT	-	Strn	SStn
ft	tsf	-	tsf	tsf	(psi)	%			Description	pcf	N	60%	60%	%	deg	tsf	-	%	Indx	-	%	%
31.01	212.4	219.9	212.4	3.9	1.1	1.9	6	clean	SAND to silty SAND	125	5.0	42	36	87	43	-	-	11	1.93	16	0.00	0.0
31.17	183.9	227.1	184.0	5.0	1.2	2.8	5	silty	SAND to sandy SILT	120	4.0	46	39	82	42	-	-	16	2.10	16	0.00	0.0
31.33	180.9	229.9	180.9	5.2	0.8	2.9	5	silty	SAND to sandy SILT	120	4.0	45	38	81	42	-	-	16	2.12	16	0.00	0.0
31.50	213.0	249.3	213.0	5.8	0.8	2.7	5	silty	SAND to sandy SILT	120	4.0	53	45	87	43	-	-	15	2.06	16	0.00	0.0
31.66	214.4	242.3	214.5	5.3	0.9	2.5	5	silty	SAND to sandy SILT	120	4.0	54	45	87	43	-	-	14	2.03	16	0.00	0.0
31.83	189.6	228.8	189.6	5.1	0.8	2.7	5	silty	SAND to sandy SILT	120	4.0	47	40	83	42	-	-	15	2.08	16	0.00	0.0
31.99	187.1	221.3	187.1	4.7	1.4	2.6	5	silty	SAND to sandy SILT	120	4.0	47	39	82	42	-	-	15	2.07	16	0.00	0.0
32.15	216.0	233.1	216.0	4.8	1.2	2.2	5	silty	SAND to sandy SILT	120	4.0	54	45	87	43	-	-	13	1.99	16	0.00	0.0
32.32	229.4	242.6	229.4	5.0	1.0	2.2	6	clean	SAND to silty SAND	125	5.0	46	39	89	43	-	-	12	1.97	16	0.00	0.0
32.48	225.4	240.2	225.4	5.0	0.8	2.3	5	silty	SAND to sandy SILT	120	4.0	56	47	88	43	-	-	12	1.98	16	0.00	0.0
32.65	140.2	193.7	140.3	4.0	0.9	2.9	5	silty	SAND to sandy SILT	120	4.0	35	29	72	41	-	-	19	2.19	16	0.00	0.0
32.81	115.9	169.0	115.9	3.1	1.2	2.7	5	silty	SAND to sandy SILT	120	4.0	29	24	66	40	-	-	20	2.23	16	0.00	0.0
32.97	122.4	166.2	122.4	3.0	1.1	2.5	5	silty	SAND to sandy SILT	120	4.0	31	26	68	40	-	-	18	2.18	16	0.00	0.0
33.14	113.5	171.8	113.5	3.2	1.0	2.9	5	silty	SAND to sandy SILT	120	4.0	28	24	65	40	-	-	21	2.26	16	0.00	0.0
33.30	105.8	171.7	105.8	3.2	1.1	3.1	5	silty	SAND to sandy SILT	120	4.0	26	22	63	39	-	-	23	2.30	16	0.00	0.0
33.47	149.2	183.6	149.2	3.5	1.1	2.4	5	silty	SAND to sandy SILT	120	4.0	37	31	74	41	-	-	16	2.11	16	0.00	0.0
33.63	144.5	210.5	144.5	4.8	1.0	3.3	5	silty	SAND to sandy SILT	120	4.0	36	30	73	41	-	-	20	2.24	16	0.00	0.0
33.79	112.9	214.1	112.9	4.9	0.9	4.4	4	clay	SILT to silty CLAY	115	2.0	56	47	-	7.9 9.9	26	2.39	15	0.00	0.0		
33.96	130.4	201.7	130.5	4.4	1.1	3.5	5	silty	SAND to sandy SILT	120	4.0	33	27	69	40	-	-	22	2.28	16	0.00	0.0
34.12	235.6	260.9	235.6	6.3	0.7	2.7	5	silty	SAND to sandy SILT	120	4.0	59	49	89	43	-	-	14	2.03	16	0.00	0.0
34.29	299.6	292.6	299.6	6.5	1.7	2.2	6	clean	SAND to silty SAND	125	5.0	60	49	95	44	-	-	10	1.90	16	0.00	0.0
34.45	351.9	347.3	352.0	8.9	4.5	2.5	8	stiff	SAND to clay SAND	115	1.0	100	100	-	23.2 9.9	11	1.91	16	0.00	0.0		
34.61	426.6	430.6	426.7	13.0	4.4	3.1	8	stiff	SAND to clay SAND	115	1.0	100	100	-	28.2 9.9	11	1.94	16	0.00	0.0		
34.78	429.2	472.7	429.2	16.6	3.7	3.9	8	stiff	SAND to clay SAND	115	1.0	100	100	-	28.3 9.9	14	2.03	16	0.00	0.0		
34.94	422.2	477.4	422.3	17.2	3.9	4.1	8	stiff	SAND to clay SAND	115	1.0	100	100	-	27.9 9.9	15	2.06	16	0.00	0.0		
35.11	431.2	477.2	431.2	17.0	3.4	4.0	8	stiff	SAND to clay SAND	115	1.0	100	100	-	28.5 9.9	14	2.04	16	0.00	0.0		
35.27	319.2	382.5	319.3	12.7	5.3	4.0	8	stiff	SAND to clay SAND	115	1.0	100	100	-	21.1 9.9	16	2.11	16	0.00	0.0		
35.43	246.6	292.8	246.7	8.2	7.4	3.4	8	stiff	SAND to clay SAND	115	1.0	100	100	-	16.2 9.9	16	2.10	16	0.00	0.0		
35.60	317.3	279.5	317.6	4.9	16.0	1.6	6	clean	SAND to silty SAND	125	5.0	63	52	95	45	-	-	7	1.77	16	0.00	0.0
35.76	336.9	305.7	337.2	6.2	17.3	1.9	6	clean	SAND to silty SAND	125	5.0	67	55	95	45	-	-	8	1.82	16	0.00	0.0
35.93	285.7	291.0	286.0	7.2	15.9	2.5	6	clean	SAND to silty SAND	125	5.0	57	46	95	44	-	-	12	1.96	16	0.00	0.0
36.09	161.1	231.5	161.4	5.8	13.4	3.6	8	stiff	SAND to clay SAND	115	1.0	100	100	-	10.6 9.9	20	2.24	16	0.00	0.0		
36.26	108.7	186.4	108.9	3.9	12.6	3.6	4	clay	SILT to silty CLAY	115	2.0	54	44	-	7.6 9.9	24	2.35	15	0.00	0.0		
36.42	144.8	219.9	145.0	5.3	10.1	3.7	5	silty	SAND to sandy SILT	120	4.0	36	29	72	41	-	-	22	2.28	16	0.00	0.0
36.58	176.2	236.0	176.4	6.0	9.1	3.4	5	silty	SAND to sandy SILT	120	4.0	44	35	79	42	-	-	19	2.20	16	0.00	0.0
36.75	155.8	223.0	156.0	5.5	9.9	3.6	5	silty	SAND to sandy SILT	120	4.0	39	31	74	41	-	-	20	2.24	16	0.00	0.0
36.91	158.0	189.5	158.2	3.9	9.5	2.5	5	silty	SAND to sandy SILT	120	4.0	40	32	75	41	-	-	16	2.12	16	0.00	0.0
37.08	70.0	147.9	70.2	2.4	8.0	3.5	4	clay	SILT to silty CLAY	115	2.0	35	28	-	4.8 9.9	30	2.47	15	0.54	3.1		
37.24	25.3	-	25.4	2.0	7.4	8.8	3	silty	CLAY to CLAY	115	1.5	17	11	-	1.7 5.2	68	3.14	15	-	-		
37.40	12.7	-	12.9	1.6	7.0	9.9	2	Organic	SOILS - Peats	100	1.0	13	9	-	1.2 2.4	92	3.43	10	-	-		
37.57	15.6	-	15.7	1.7	7.0	9.9	3	silty	CLAY to CLAY	115	1.5	10	7	-	1.0 3.0	85	3.35	15	-	-		
37.73	25.6	-	25.8	1.8	7.1	7.5	3	silty	CLAY to CLAY	115	1.5	17	11	-	1.7 5.2	65	3.09	15	-	-		
37.90	23.8	-	23.9	1.8	6.9	8.5	3	silty	CLAY to CLAY	115	1.5	16	11	-	1.6 4.8	70	3.15	15	-	-		
38.06	87.2	140.3	87.3	2.3	6.7	2.7	5	silty	SAND to sandy SILT	120	4.0	22	17	55	37	-	-	23	2.32	16	0.93	6.7
38.22	85.4	182.7	85.6	3.6	6.4	4.3	4	clay	SILT to silty CLAY	115	2.0	43	34	-	5.9 9.9	30	2.49	15	0.00	0.0		
38.39	518.4	410.7	518.5	4.6	5.4	0.9	6	clean	SAND to silty SAND	125	5.0	100	82	95	47	-	-	5	1.45	16	0.00	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing



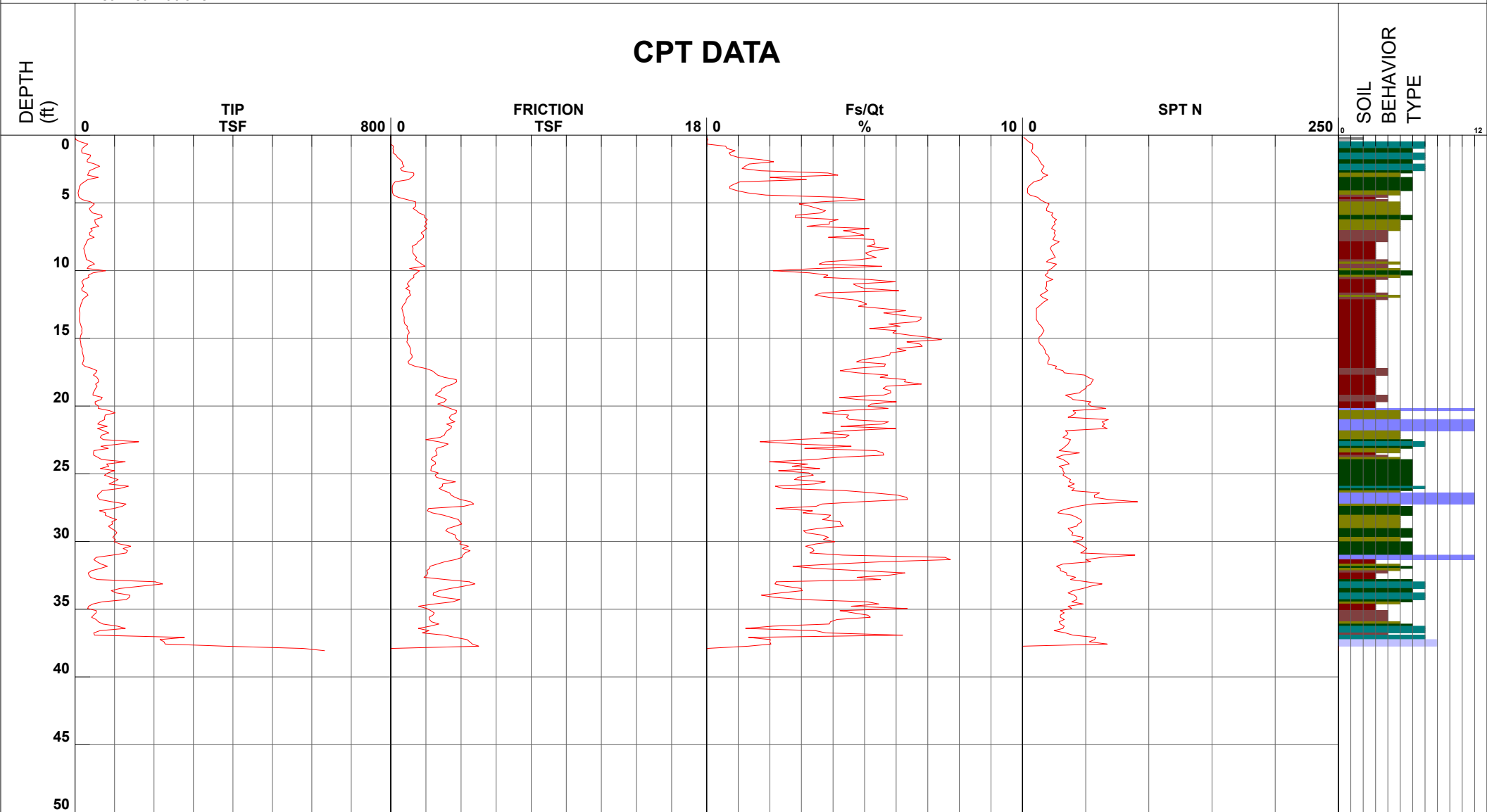
AECOM

Project LACMA Phase III
Job Number 60440464
Hole Number S-CPT-2A
EST GW Depth During Test

Operator DG-RC
Cone Number DDG1268
Date and Time 11/13/2015 10:18:55 AM
14.00 ft

Filename SDF(415).cpt
GPS
Maximum Depth 38.06 ft

Net Area Ratio .8



- | | | | |
|----------------------------|-------------------------------|------------------------------|----------------------------------|
| 1 - sensitive fine grained | 4 - silty clay to clay | 7 - silty sand to sandy silt | 10 - gravelly sand to sand |
| 2 - organic material | 5 - clayey silt to silty clay | 8 - sand to silty sand | 11 - very stiff fine grained (*) |
| 3 - clay | 6 - sandy silt to clayey silt | 9 - sand | 12 - sand to clayey sand (*) |

Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

LACMA Phase III

Project ID: AECOM
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CPT Date: 11/13/2015 10:18:55 AM
GW During Test: 14 ft

Page: 1
Sounding ID: S-CPT-2A
Project No: 60440464
Cone/Rig: DDG1268

Depth ft	qc tsf	qncs PS	* qt PS	Slv Stss tsf	pore prss (psi)	Frct Rto %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* Ic SBDT	* Nk -	* Vol Strn	* Cycl SStn %
0.33	2.1	-	2.1	0.0	0.0	0.1	1	sensitive fine SOIL	115	2.0	1	2	-	-	0.2	9.9	55	2.95	15	N/A	N/A
0.49	13.8	34.0	13.8	0.0	0.0	0.1	5	silty SAND to sandy SILT	120	4.0	3	6	17	48	-	-	17	2.14	16	N/A	N/A
0.66	32.5	56.6	32.5	0.0	0.0	0.1	6	clean SAND to silty SAND	125	5.0	6	10	45	48	-	-	8	1.77	16	N/A	N/A
0.82	25.0	59.7	25.0	0.2	0.1	0.6	5	silty SAND to sandy SILT	120	4.0	6	10	37	48	-	-	16	2.12	16	N/A	N/A
0.98	18.2	52.8	18.2	0.1	0.1	0.6	5	silty SAND to sandy SILT	120	4.0	5	7	26	46	-	-	21	2.26	16	N/A	N/A
1.15	16.6	57.4	16.6	0.1	0.2	0.9	5	silty SAND to sandy SILT	120	4.0	4	7	23	45	-	-	25	2.36	16	N/A	N/A
1.31	17.9	54.3	17.9	0.1	0.1	0.7	5	silty SAND to sandy SILT	120	4.0	4	7	26	45	-	-	22	2.28	16	N/A	N/A
1.48	39.8	82.7	39.8	0.3	0.4	0.8	6	clean SAND to silty SAND	125	5.0	8	13	52	48	-	-	13	2.00	16	N/A	N/A
1.64	37.9	86.7	37.9	0.4	0.3	1.0	5	silty SAND to sandy SILT	120	4.0	9	15	51	47	-	-	15	2.08	16	N/A	N/A
1.80	31.3	96.8	31.3	0.5	0.4	1.7	5	silty SAND to sandy SILT	120	4.0	8	13	44	46	-	-	22	2.29	16	N/A	N/A
1.97	30.4	105.5	30.4	0.6	0.5	2.1	5	silty SAND to sandy SILT	120	4.0	8	12	43	45	-	-	25	2.36	16	N/A	N/A
2.13	49.7	111.9	49.7	0.7	0.7	1.4	5	silty SAND to sandy SILT	120	4.0	12	20	60	47	-	-	15	2.07	16	N/A	N/A
2.30	62.2	125.7	62.2	0.8	0.7	1.2	6	clean SAND to silty SAND	125	5.0	12	20	67	48	-	-	12	1.97	16	N/A	N/A
2.46	49.1	104.8	49.1	0.5	0.7	1.1	6	clean SAND to silty SAND	125	5.0	10	16	59	46	-	-	14	2.02	16	N/A	N/A
2.62	36.6	104.1	36.6	0.6	0.7	1.7	5	silty SAND to sandy SILT	120	4.0	9	15	49	45	-	-	20	2.24	16	N/A	N/A
2.79	34.2	152.7	34.2	1.3	0.6	3.9	4	clay SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	31	2.50	15	N/A	N/A
2.95	31.7	154.6	31.7	1.3	0.8	4.2	4	clay SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	33	2.55	15	N/A	N/A
3.12	58.8	143.6	58.8	1.2	0.7	2.0	5	silty SAND to sandy SILT	120	4.0	15	24	65	46	-	-	17	2.14	16	N/A	N/A
3.28	31.8	132.7	31.9	1.0	0.9	3.2	4	clay SILT to silty CLAY	115	2.0	16	26	-	-	2.2	9.9	29	2.47	15	N/A	N/A
3.45	24.0	70.7	24.0	0.3	0.9	1.1	5	silty SAND to sandy SILT	120	4.0	6	10	36	41	-	-	21	2.26	16	N/A	N/A
3.61	15.7	56.3	15.7	0.1	0.9	0.9	5	silty SAND to sandy SILT	120	4.0	4	6	21	39	-	-	26	2.38	16	N/A	N/A
3.77	11.4	48.0	11.4	0.1	0.9	0.7	5	silty SAND to sandy SILT	120	4.0	3	5	11	37	-	-	30	2.47	16	N/A	N/A
3.94	10.8	47.4	10.8	0.1	0.9	0.7	5	silty SAND to sandy SILT	120	4.0	3	4	9	36	-	-	30	2.50	16	N/A	N/A
4.10	9.3	-	9.3	0.1	0.9	1.0	4	clay SILT to silty CLAY	115	2.0	5	7	-	-	0.6	9.9	36	2.61	15	N/A	N/A
4.27	7.9	-	7.9	0.1	0.8	1.4	4	clay SILT to silty CLAY	115	2.0	4	6	-	-	0.5	9.9	43	2.74	15	N/A	N/A
4.43	8.8	-	8.8	0.2	0.8	1.9	4	clay SILT to silty CLAY	115	2.0	4	7	-	-	0.6	9.9	45	2.78	15	N/A	N/A
4.59	10.1	-	10.2	0.4	0.9	4.4	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	54	2.93	15	N/A	N/A
4.76	18.3	-	18.4	0.9	1.0	5.1	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	45	2.78	15	N/A	N/A
4.92	39.0	157.6	39.0	1.4	0.9	3.7	4	clay SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	28	2.45	15	N/A	N/A
5.09	48.6	155.5	48.7	1.4	1.0	2.9	5	silty SAND to sandy SILT	120	4.0	12	19	59	43	-	-	23	2.31	16	N/A	N/A
5.25	43.4	156.1	43.4	1.4	0.9	3.3	4	clay SILT to silty CLAY	115	2.0	22	35	-	-	3.0	9.9	26	2.38	15	N/A	N/A
5.41	36.1	149.5	36.2	1.3	1.0	3.5	4	clay SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	29	2.46	15	N/A	N/A
5.58	39.0	160.9	39.0	1.5	1.0	3.8	4	clay SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	29	2.46	15	N/A	N/A
5.74	44.6	167.2	44.6	1.6	1.0	3.6	4	clay SILT to silty CLAY	115	2.0	22	36	-	-	3.1	9.9	27	2.41	15	N/A	N/A
5.91	67.9	182.4	67.9	1.9	1.2	2.8	5	silty SAND to sandy SILT	120	4.0	17	27	70	44	-	-	19	2.20	16	N/A	N/A
6.07	68.7	183.1	68.7	1.9	1.3	2.8	5	silty SAND to sandy SILT	120	4.0	17	28	70	44	-	-	19	2.20	16	N/A	N/A
6.23	50.1	192.1	50.2	2.1	1.4	4.2	4	clay SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	27	2.42	15	N/A	N/A
6.40	50.7	184.4	50.7	2.0	1.4	3.9	4	clay SILT to silty CLAY	115	2.0	25	40	-	-	3.6	9.9	26	2.40	15	N/A	N/A
6.56	52.7	186.9	52.7	2.0	1.7	3.9	4	clay SILT to silty CLAY	115	2.0	26	41	-	-	3.7	9.9	26	2.39	15	N/A	N/A
6.73	60.2	177.6	60.2	1.9	1.4	3.2	5	silty SAND to sandy SILT	120	4.0	15	23	65	43	-	-	22	2.29	16	N/A	N/A
6.89	39.8	191.0	39.8	2.0	1.7	5.2	4	clay SILT to silty CLAY	115	2.0	20	30	-	-	2.8	9.9	34	2.57	15	N/A	N/A
7.05	43.8	179.2	43.8	1.9	1.7	4.4	4	clay SILT to silty CLAY	115	2.0	22	33	-	-	3.1	9.9	30	2.49	15	N/A	N/A
7.22	36.7	173.3	36.7	1.7	1.8	4.8	4	clay SILT to silty CLAY	115	2.0	18	27	-	-	2.6	9.9	34	2.57	15	N/A	N/A
7.38	37.4	179.3	37.5	1.9	1.8	5.0	4	clay SILT to silty CLAY	115	2.0	19	28	-	-	2.6	9.9	35	2.59	15	N/A	N/A
7.55	48.5	173.0	48.5	1.9	1.7	3.9	4	clay SILT to silty CLAY	115	2.0	24	35	-	-	3.4	9.9	28	2.43	15	N/A	N/A
7.71	32.7	-	32.7	1.7	1.6	5.4	4	clay SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	37	2.62	15	N/A	N/A
7.87	29.2	-	29.3	1.5	1.7	5.4	3	silty CLAY to CLAY	115	1.5	19	31	-	-	2.0	9.9	38	2.66	15	N/A	N/A
8.04	27.5	-	27.5	1.5	1.7	5.4	3	silty CLAY to CLAY	115	1.5	18	29	-	-	1.9	9.9	39	2.68	15	N/A	N/A
8.20	23.9	-	24.0	1.2	1.6	5.2	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	41	2.71	15	N/A	N/A
8.37	22.0	-	22.0	1.3	1.6	5.9	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.5	9.9	44	2.77	15	N/A	N/A
8.53	23.7	-	23.7	1.2	1.4	5.4	3	silty CLAY to CLAY	115	1.5	16	25	-	-	1.6	9.9	42	2.72	15	N/A	N/A
8.69	25.0	-	25.0	1.3	1.3	5.1	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.7	9.9	40	2.69	15	N/A	N/A
8.86	26.3	-	26.3	1.4	1.3	5.2	3	silty CLAY to CLAY	115	1.5	18	28	-	-	1.8	9.9	40	2.68	15	N/A	N/A
9.02	27.5	-	27.5	1.5	1.3	5.5	3	silty CLAY to CLAY	115	1.5	18	29	-	-	1.9	9.9	40	2.68	15	N/A	N/A
9.19	28.7	-	28.7	1.4	1.4	4.9	4	clay SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	37	2.64	15	N/A	N/A
9.35	42.0	152.4	42.1	1.6	1.4	3.8	4	clay SILT to silty CLAY	115	2.0	21	28	-	-	2.9	9.9	31	2.50	15	N/A	N/A
9.51	49.5	158.5	49.5	1.8	1.3	3.6	4	clay SILT to silty CLAY	115	2.0	25	32	-	-	3.5	9.9	28	2.44	15	N/A	N/A
9.68	35.2	-	35.2	2.0	1.3	5.6	4	clay SILT to silty CLAY	115	2.0	18	28	-	-	2.4	9.9	36	2.62	15	N/A	N/A
9.84	30.8	127.3	30.9	1.1	1.4	3.5	4	clay SILT to silty CLAY	115	2.0	15	20	-	-	2.1	9.9	35	2.58	15	N/A	N/A
10.01	77.3	150.6	77.3	1.6	1.5	2.1	5	silty SAND to sandy SILT	120	4.0	19	25	66	42	-	-	17	2.14	16	N/A	N/A
10.17	45.4	143.1	45.4	1.5	1.1	3.3	4	clay SILT to silty CLAY	115	2.0	23	29	-	-	3.2	9.9	28	2.45	15	N/A	N/A
10.34	34.1	138.5	34.1	1.3	1.3	3.9	4	clay SILT to silty CLAY	115	2.0	17	21	-	-	2.4	9.9	35	2.59	15	N/A	N/A
10.50	35.5	137.8	35.6	1.3	1.2	3.8	4	clay SILT to silty CLAY	115	2.0	18	22	-	-	2.5	9.9	34	2.57	15	N/A	N/A
10.66	22.0	-	22.1	1.1	1.2	5.3	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.5	9.9	43	2.74	15	N/A	N/A
10.83	17.1	-	17.1	1.0	1.3	6.2	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	8.6	51	2.88	15	N/A	N/A
10.99	20.2	-	20.2	0.9	1.3	4.8	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	43	2.75	15	N/A	N/A
11.16	22.1	-	22.2	1.1	1.3	4.9	3	silty CLAY to CLAY	115	1.5	15	23	-	-	1.5	9.9	42	2.73	15	N/A	N/A
11.32	16.9	-	16.9	0.8	1.2	5.2	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	8.1	48	2.84	15	N/A	N/A
11.48	17.8	-	17.8	1.1	1.3	6.3	3	silty CLAY to CLAY	115	1.5	12	18	-	-	1.2	8.4					

LACMA Phase III

Project ID: AECOM
Data File: SDF(415).cpt
CPT Date: 11/13/2015 10:18:55 AM
GW During Test: 14 ft

Page: 2
Sounding ID: S-CPT-2A
Project No: 60440464
Cone/Rig: DDG1268

Depth ft	qc PS tsf	qncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Rat %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr %	OCR -	* Fin Ic %	* Ic SBT Index	* Nk -	* Vol Strn %	* Cycl SStn %
15.58	15.6	-	15.6	1.1	0.9	7.2	3	silty CLAY to CLAY	115	1.5	10	12	-	-	1.0	5.6	62	3.05	15	-	-
15.75	18.5	-	18.5	1.1	0.9	6.3	3	silty CLAY to CLAY	115	1.5	12	14	-	-	1.2	6.7	56	2.96	15	-	-
15.91	17.8	-	17.8	1.1	0.9	6.7	3	silty CLAY to CLAY	115	1.5	12	14	-	-	1.2	6.4	58	2.99	15	-	-
16.08	19.2	-	19.2	1.1	0.9	6.1	3	silty CLAY to CLAY	115	1.5	13	15	-	-	1.3	6.9	54	2.94	15	-	-
16.24	20.7	-	20.7	1.2	0.9	6.1	3	silty CLAY to CLAY	115	1.5	14	16	-	-	1.4	7.5	53	2.91	15	-	-
16.40	22.4	-	22.4	1.2	1.0	5.7	3	silty CLAY to CLAY	115	1.5	15	17	-	-	1.5	8.0	50	2.87	15	-	-
16.57	22.3	-	22.3	1.1	0.9	5.2	3	silty CLAY to CLAY	115	1.5	15	17	-	-	1.5	8.0	49	2.84	15	-	-
16.73	20.5	-	20.5	1.0	1.0	5.0	3	silty CLAY to CLAY	115	1.5	14	15	-	-	1.4	7.3	50	2.86	15	-	-
16.90	18.4	-	18.4	1.0	1.0	6.0	3	silty CLAY to CLAY	115	1.5	12	14	-	-	1.2	6.5	56	2.96	15	-	-
17.06	24.4	-	24.4	1.4	1.1	5.9	3	silty CLAY to CLAY	115	1.5	16	18	-	-	1.7	8.6	49	2.86	15	-	-
17.23	42.5	-	42.5	2.0	1.2	4.8	4	clay SILT to silty CLAY	115	2.0	21	24	-	-	2.9	9.9	36	2.62	15	-	-
17.39	55.7	166.6	55.7	2.4	1.5	4.3	4	clay SILT to silty CLAY	115	2.0	28	28	-	-	3.9	9.9	32	2.53	15	0.00	0.0
17.55	52.5	174.6	52.6	2.5	1.7	4.9	4	clay SILT to silty CLAY	115	2.0	26	27	-	-	3.6	9.9	35	2.59	15	0.00	0.0
17.72	46.6	-	46.6	2.7	1.7	5.9	3	silty CLAY to CLAY	115	1.5	31	34	-	-	3.2	9.9	39	2.66	15	-	-
17.88	55.5	-	55.5	3.1	1.7	5.6	4	clay SILT to silty CLAY	115	2.0	28	29	-	-	3.9	9.9	36	2.61	15	-	-
18.05	59.3	-	59.3	3.7	1.8	6.4	9	very stiff fine SOIL	120	2.0	30	32	52	38	-	-	37	2.63	30	-	-
18.21	59.8	-	59.8	3.7	1.8	6.4	9	very stiff fine SOIL	120	2.0	30	32	53	38	-	-	36	2.62	30	-	-
18.37	52.0	-	52.1	3.5	1.9	6.9	3	silty CLAY to CLAY	115	1.5	35	37	-	-	3.6	9.9	40	2.69	15	-	-
18.54	55.8	-	55.8	3.2	2.0	5.8	4	clay SILT to silty CLAY	115	2.0	28	30	-	-	3.9	9.9	36	2.61	15	-	-
18.70	52.1	-	52.1	2.9	2.1	5.7	3	silty CLAY to CLAY	115	1.5	35	37	-	-	3.6	9.9	37	2.63	15	-	-
18.87	49.3	-	49.4	2.9	2.1	6.0	3	silty CLAY to CLAY	115	1.5	33	35	-	-	3.4	9.9	38	2.66	15	-	-
19.03	46.0	-	46.0	2.7	2.1	6.0	3	silty CLAY to CLAY	115	1.5	31	32	-	-	3.2	9.9	40	2.68	15	-	-
19.19	45.3	-	45.4	2.5	2.3	5.7	3	silty CLAY to CLAY	115	1.5	30	32	-	-	3.1	9.9	39	2.68	15	-	-
19.36	69.1	180.9	69.2	2.9	2.3	4.3	4	clay SILT to silty CLAY	115	2.0	35	34	-	-	4.8	9.9	29	2.47	15	0.00	0.0
19.52	65.9	191.6	66.0	3.2	2.1	4.9	4	clay SILT to silty CLAY	115	2.0	33	33	-	-	4.6	9.9	32	2.53	15	0.00	0.0
19.69	50.9	-	51.0	3.1	2.4	6.1	3	silty CLAY to CLAY	115	1.5	34	35	-	-	3.5	9.9	39	2.67	15	-	-
19.85	51.3	-	51.4	2.7	2.5	5.3	4	clay SILT to silty CLAY	115	2.0	26	26	-	-	3.6	9.9	36	2.62	15	-	-
20.01	59.7	189.6	59.7	3.0	2.4	5.2	4	clay SILT to silty CLAY	115	2.0	30	29	-	-	4.1	9.9	35	2.58	15	0.00	0.0
20.18	58.9	-	58.9	3.4	2.1	5.9	4	clay SILT to silty CLAY	115	2.0	29	30	-	-	4.1	9.9	36	2.62	15	-	-
20.34	87.8	203.3	87.9	3.7	2.2	4.3	4	clay SILT to silty CLAY	115	2.0	44	43	-	-	6.1	9.9	27	2.41	15	0.00	0.0
20.51	101.4	200.3	101.4	3.7	2.2	3.7	5	silty SAND to sandy SILT	120	4.0	25	25	67	41	-	-	23	2.32	16	0.00	0.0
20.67	76.7	196.2	76.7	3.4	2.3	4.6	4	clay SILT to silty CLAY	115	2.0	38	37	-	-	5.3	9.9	29	2.47	15	0.00	0.0
20.83	75.2	192.5	75.2	3.3	2.2	4.5	4	clay SILT to silty CLAY	115	2.0	38	37	-	-	5.2	9.9	29	2.47	15	0.00	0.0
21.00	75.3	194.8	75.3	3.4	2.4	4.6	4	clay SILT to silty CLAY	115	2.0	38	37	-	-	5.2	9.9	30	2.48	15	0.00	0.0
21.16	63.6	-	63.6	3.7	2.4	5.9	4	clay SILT to silty CLAY	115	2.0	32	32	-	-	4.4	9.9	35	2.60	15	-	-
21.33	57.3	-	57.4	3.2	2.5	5.7	4	clay SILT to silty CLAY	115	2.0	29	28	-	-	4.0	9.9	36	2.62	15	-	-
21.49	81.6	194.5	81.7	3.5	2.5	4.3	4	clay SILT to silty CLAY	115	2.0	41	39	-	-	5.7	9.9	28	2.44	15	0.00	0.0
21.65	57.2	-	57.2	3.4	2.6	6.1	3	silty CLAY to CLAY	115	1.5	38	37	-	-	4.0	9.9	38	2.65	15	-	-
21.82	72.4	188.1	72.5	3.2	2.5	4.5	4	clay SILT to silty CLAY	115	2.0	36	35	-	-	5.0	9.9	30	2.49	15	0.00	0.0
21.98	85.9	180.8	86.0	3.1	2.7	3.7	4	clay SILT to silty CLAY	115	2.0	43	41	-	-	6.0	9.9	25	2.37	15	0.00	0.0
22.15	67.7	184.2	67.8	3.1	2.9	4.6	4	clay SILT to silty CLAY	115	2.0	34	32	-	-	4.7	9.9	31	2.51	15	0.00	0.0
22.31	64.1	176.8	64.1	2.8	2.9	4.5	4	clay SILT to silty CLAY	115	2.0	32	31	-	-	4.5	9.9	32	2.52	15	0.00	0.0
22.47	71.4	143.5	71.4	2.0	3.1	2.8	5	silty SAND to sandy SILT	120	4.0	18	17	54	38	-	-	24	2.35	16	0.38	1.9
22.64	161.4	188.5	161.4	2.7	3.0	1.7	6	clean SAND to silty SAND	125	5.0	32	31	81	43	-	-	11	1.94	16	0.00	0.0
22.80	113.1	184.3	113.2	3.3	2.4	2.9	5	silty SAND to sandy SILT	120	4.0	28	27	69	41	-	-	20	2.22	16	0.00	0.0
22.97	65.7	182.5	65.8	3.0	2.6	4.7	4	clay SILT to silty CLAY	115	2.0	33	31	-	-	4.6	9.9	32	2.53	15	0.00	0.0
23.13	84.1	163.4	84.2	2.6	2.7	3.2	5	silty SAND to sandy SILT	120	4.0	21	20	59	39	-	-	24	2.33	16	0.00	0.0
23.30	47.6	-	47.6	2.6	2.4	5.5	3	silty CLAY to CLAY	115	1.5	32	30	-	-	3.3	9.9	40	2.68	15	-	-
23.46	46.8	-	46.9	2.6	2.5	5.7	3	silty CLAY to CLAY	115	1.5	31	29	-	-	3.2	9.9	41	2.70	15	-	-
23.62	47.0	-	47.1	2.6	2.5	5.8	3	silty CLAY to CLAY	115	1.5	31	29	-	-	3.2	9.9	41	2.70	15	-	-
23.79	57.5	161.8	57.6	2.4	2.6	4.2	4	clay SILT to silty CLAY	115	2.0	29	27	-	-	4.0	9.9	33	2.54	15	0.00	0.0
23.95	67.5	154.7	67.6	2.3	2.6	3.5	4	clay SILT to silty CLAY	115	2.0	34	32	-	-	4.7	9.9	28	2.43	15	0.20	0.7
24.12	127.2	166.2	127.2	2.5	2.5	2.0	5	silty SAND to sandy SILT	120	4.0	32	30	73	41	-	-	15	2.07	16	0.00	0.0
24.28	79.9	161.1	79.9	2.6	2.5	3.3	5	silty SAND to sandy SILT	120	4.0	20	19	57	39	-	-	25	2.36	16	0.00	0.0
24.44	85.7	152.3	85.7	2.3	2.5	2.8	5	silty SAND to sandy SILT	120	4.0	21	20	59	39	-	-	22	2.29	16	0.24	1.2
24.61	64.2	155.3	64.2	2.3	2.7	3.7	4	clay SILT to silty CLAY	115	2.0	32	30	-	-	4.5	9.9	29	2.47	15	0.20	0.7
24.77	100.1	151.6	100.2	2.3	2.4	2.3	5	silty SAND to sandy SILT	120	4.0	25	23	64	40	-	-	19	2.19	16	0.26	1.5
24.94	83.5	165.0	83.6	2.7	2.4	3.3	5	silty SAND to sandy SILT	120	4.0	21	19	58	39	-	-	25	2.36	16	0.00	0.0
25.10	74.8	160.4	74.9	2.5	2.2	3.4	4	clay SILT to silty CLAY	115	2.0	37	34	-	-	5.2	9.9	27	2.40	15	0.00	0.0
25.26	90.1	160.9	90.2	2.6	2.3	2.9	5	silty SAND to sandy SILT	120	4.0	23	21	61	39	-	-	22	2.30	16	0.00	0.0
25.43	109.3	174.4	109.3	3.0	2.2	2.8	5	silty SAND to sandy SILT	120	4.0	27	25	67	40	-	-	20	2.23	16	0.00	0.0
25.59	97.9	193.1	97.9	3.7	2.2	3.8	4	clay SILT to silty CLAY	115	2.0	49	45	-	-	6.8	9.9	25	2.36	15	0.00	0.0
25.76	86.3	172.2	86.4	3.0	2.5	3.5	4	clay SILT to silty CLAY	115	2.0	43	39	-	-	6.0	9.9	25	2.37	15	0.00	0.0
25.92	135.3	176.6	135.3	2.9	2.2	2.2	5	silty SAND to sandy SILT	120	4.0	34	31	74	41	-	-	15	2.09	16	0.00	0.0
26.08	113.5	166.0	113.5	2.8	2.3	2.5	5	silty SAND to sandy SILT	120	4.0	28	26	68	40	-	-	18	2.17	16	0.00	0.0
26.25	69.1	178.3	69.2	3.0	2.3	4.5	4	clay SILT to silty CLAY	115	2.0	35	31	-	-	4.8	9.9	31	2.51	15	0.00	0.0
26.41	63.6	-	63.6	3.3	2.4	5.4	4	clay SILT to silty CLAY	115	2.0	32	28	-	-	4.4	9.9	36	2.61	15	-	-
26.58	56.8	-	56.9	3.4	2.5	6.2	3	silty CLAY to CLAY													

LACMA Phase III

Project ID: AECOM
Data File: SDF(415).cpt
CPT Date: 11/13/2015 10:18:55 AM
GW During Test: 14 ft

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Sounding ID: S-CPT-2A
Project No: 60440464
Cone/Rig: DD61268

Depth ft	qc PS tsf	q _{inc} PS tsf	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* SBT Index	* Nk -	* Vol Strn %	* Cycl SStn %
31.01	95.1	200.7	95.2	4.1	2.4	4.4	4	clay SILT to silty CLAY	115	2.0	48	41	-	-	6.6	9.9	28	2.43	15	0.00	0.0
31.17	53.7	-	53.8	4.1	2.4	7.8	3	silty CLAY to CLAY	115	1.5	36	28	-	-	3.7	9.9	47	2.82	15	-	-
31.33	47.6	-	47.6	3.7	2.5	8.0	3	silty CLAY to CLAY	115	1.5	32	25	-	-	3.3	9.9	50	2.86	15	-	-
31.50	55.4	-	55.4	3.1	2.6	5.7	3	silty CLAY to CLAY	115	1.5	37	29	-	-	3.8	9.9	41	2.71	15	-	-
31.66	65.9	163.4	65.9	2.7	2.6	4.2	4	clay SILT to silty CLAY	115	2.0	33	28	-	-	4.6	9.9	32	2.53	15	0.00	0.0
31.83	82.1	144.5	82.2	2.2	2.4	2.8	5	silty SAND to sandy SILT	120	4.0	21	18	55	38	-	-	24	2.33	16	0.62	3.8
31.99	64.3	147.5	64.3	2.2	2.3	3.5	4	clay SILT to silty CLAY	115	2.0	32	27	-	-	4.5	9.9	30	2.48	15	0.50	2.7
32.15	42.2	-	42.3	2.0	2.3	5.1	3	silty CLAY to CLAY	115	1.5	28	22	-	-	2.9	9.9	44	2.76	15	-	-
32.32	33.7	-	33.8	2.1	2.4	6.6	3	silty CLAY to CLAY	115	1.5	22	17	-	-	2.3	8.0	53	2.92	15	-	-
32.48	35.1	-	35.1	2.0	2.3	6.1	3	silty CLAY to CLAY	115	1.5	23	18	-	-	2.4	8.3	51	2.88	15	-	-
32.65	39.6	-	39.6	1.9	2.3	5.0	3	silty CLAY to CLAY	115	1.5	26	20	-	-	2.7	9.4	45	2.78	15	-	-
32.81	56.5	-	56.5	3.1	2.3	5.7	3	silty CLAY to CLAY	115	1.5	38	29	-	-	3.9	9.9	41	2.71	15	-	-
32.97	203.1	222.4	203.1	4.5	2.2	2.2	5	silty SAND to sandy SILT	120	4.0	51	43	85	43	-	-	13	2.00	16	0.00	0.0
33.14	222.0	235.6	222.0	4.8	2.4	2.2	6	clean SAND to silty SAND	125	5.0	44	37	88	43	-	-	12	1.97	16	0.00	0.0
33.30	166.9	202.9	167.0	4.1	3.3	2.5	5	silty SAND to sandy SILT	120	4.0	42	35	78	42	-	-	16	2.10	16	0.00	0.0
33.47	114.2	176.9	114.4	3.4	5.9	3.0	5	silty SAND to sandy SILT	120	4.0	29	24	66	40	-	-	21	2.27	16	0.00	0.0
33.63	91.5	159.3	91.6	2.8	5.5	3.1	5	silty SAND to sandy SILT	120	4.0	23	19	58	38	-	-	24	2.34	16	0.25	1.3
33.79	104.5	149.0	104.6	2.4	5.8	2.4	5	silty SAND to sandy SILT	120	4.0	26	22	63	39	-	-	20	2.22	16	0.51	2.8
33.96	138.9	156.3	139.0	2.4	5.9	1.8	5	silty SAND to sandy SILT	120	4.0	35	29	72	41	-	-	14	2.03	16	0.33	2.1
34.12	137.4	167.9	137.6	3.0	5.9	2.2	5	silty SAND to sandy SILT	120	4.0	34	29	71	41	-	-	16	2.11	16	0.00	0.0
34.29	129.9	190.1	130.0	3.9	4.6	3.1	5	silty SAND to sandy SILT	120	4.0	32	27	70	40	-	-	20	2.24	16	0.00	0.0
34.45	69.0	-	69.1	3.5	4.3	5.2	4	clay SILT to silty CLAY	115	2.0	35	25	-	-	4.8	9.9	37	2.63	15	-	-
34.61	45.5	-	45.6	2.5	4.1	5.7	3	silty CLAY to CLAY	115	1.5	30	22	-	-	3.1	9.9	45	2.79	15	-	-
34.78	34.4	-	34.4	1.6	4.1	4.9	3	silty CLAY to CLAY	115	1.5	23	17	-	-	2.3	7.7	48	2.84	15	-	-
34.94	32.2	-	32.3	2.0	4.1	6.8	3	silty CLAY to CLAY	115	1.5	21	16	-	-	2.2	7.2	56	2.96	15	-	-
35.11	54.0	-	54.1	2.3	3.7	4.4	4	clay SILT to silty CLAY	115	2.0	27	19	-	-	3.7	9.9	38	2.66	15	-	-
35.27	53.3	-	53.4	2.5	3.6	4.8	3	silty CLAY to CLAY	115	1.5	36	26	-	-	3.7	9.9	40	2.69	15	-	-
35.43	47.0	-	47.1	2.4	3.6	5.3	3	silty CLAY to CLAY	115	1.5	31	22	-	-	3.2	9.9	44	2.76	15	-	-
35.60	42.2	-	42.2	2.2	3.6	5.4	3	silty CLAY to CLAY	115	1.5	28	20	-	-	2.9	9.5	46	2.81	15	-	-
35.76	53.5	-	53.6	2.2	3.6	4.3	4	clay SILT to silty CLAY	115	2.0	27	19	-	-	3.7	9.9	38	2.66	15	-	-
35.93	59.1	-	59.1	2.3	3.4	4.1	4	clay SILT to silty CLAY	115	2.0	30	21	-	-	4.1	9.9	36	2.61	15	-	-
36.09	70.5	161.8	70.6	2.7	3.4	4.0	4	clay SILT to silty CLAY	115	2.0	35	29	-	-	4.9	9.9	31	2.51	15	0.00	0.0
36.26	107.2	142.0	107.3	2.2	2.8	2.1	5	silty SAND to sandy SILT	120	4.0	27	22	63	39	-	-	18	2.18	16	0.85	4.7
36.42	127.5	130.9	127.5	1.6	2.2	1.3	6	clean SAND to silty SAND	125	5.0	25	21	68	40	-	-	12	1.97	16	1.48	7.8
36.58	63.2	144.1	63.2	2.2	2.5	3.6	4	clay SILT to silty CLAY	115	2.0	32	26	-	-	4.4	9.9	31	2.51	15	0.68	27.8
36.75	47.4	-	47.4	1.8	2.8	4.0	4	clay SILT to silty CLAY	115	2.0	24	17	-	-	3.2	9.9	39	2.68	15	-	-
36.91	49.5	-	49.5	3.1	3.3	6.5	3	silty CLAY to CLAY	115	1.5	33	23	-	-	3.4	9.9	47	2.82	15	-	-
37.08	277.5	241.0	277.5	3.7	2.8	1.3	6	clean SAND to silty SAND	125	5.0	55	45	94	44	-	-	7	1.75	16	0.00	0.0
37.24	215.1	218.6	215.2	4.3	3.6	2.0	6	clean SAND to silty SAND	125	5.0	43	35	85	43	-	-	12	1.97	16	0.00	0.0
37.40	225.5	225.4	225.7	4.5	5.6	2.0	6	clean SAND to silty SAND	125	5.0	45	36	87	43	-	-	12	1.95	16	0.00	0.0
37.57	228.3	228.6	228.4	4.6	5.7	2.1	6	clean SAND to silty SAND	125	5.0	46	37	87	43	-	-	12	1.95	16	0.00	0.0
37.73	380.3	310.3	380.4	5.0	5.7	1.3	6	clean SAND to silty SAND	125	5.0	76	61	95	45	-	-	5	1.67	16	0.00	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing



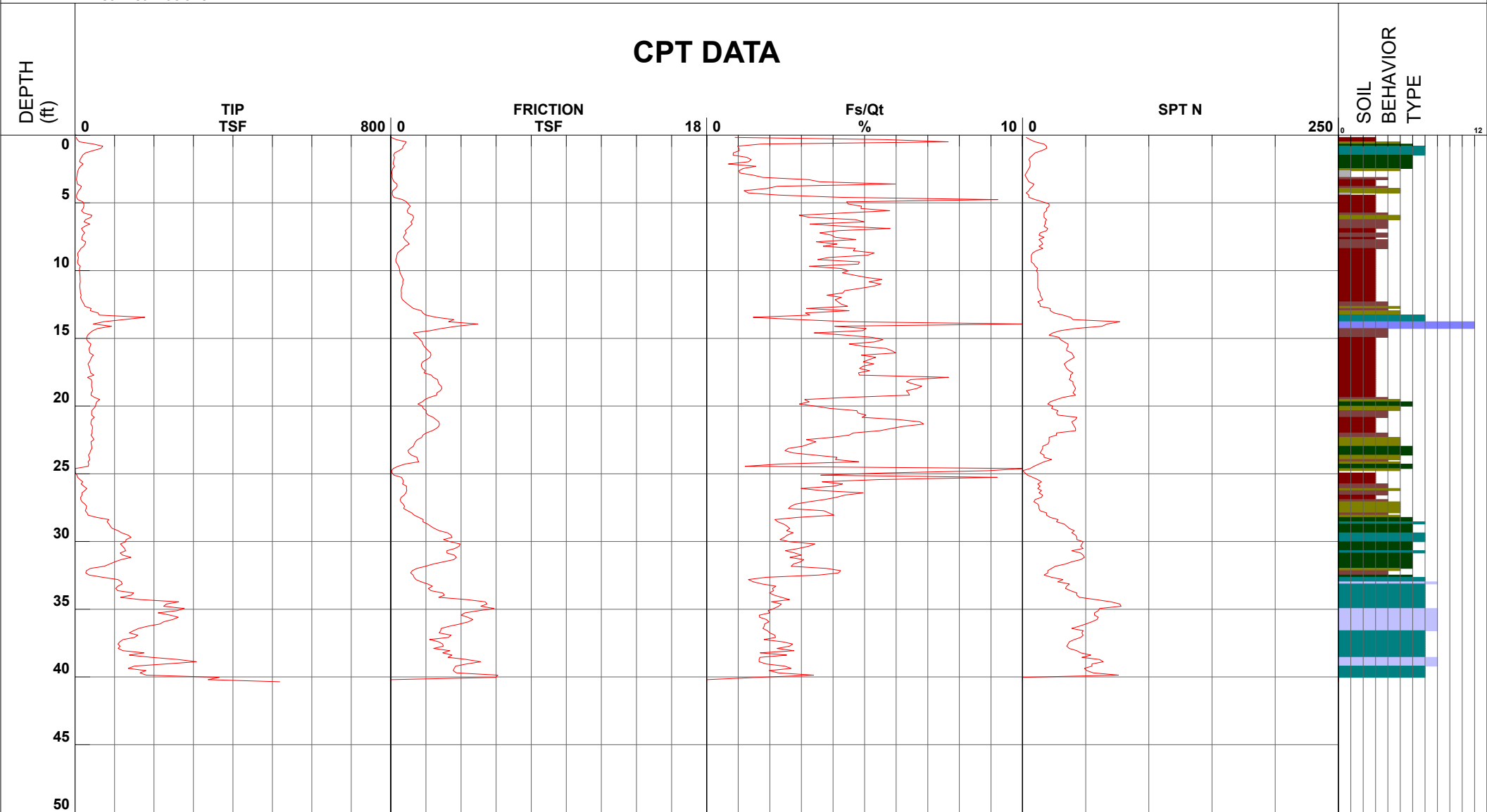
AECOM

Project LACMA Phase III
Job Number 60440464
Hole Number S-CPT-3
EST GW Depth During Test

Operator DG-RC
Cone Number DDG1268
Date and Time 11/13/2015 12:52:58 PM
14.00 ft

Filename SDF(416).cpt
GPS
Maximum Depth 40.35 ft

Net Area Ratio .8



- | | | | |
|------------------------------|---------------------------------|--------------------------------|------------------------------------|
| ■ 1 - sensitive fine grained | ■ 4 - silty clay to clay | ■ 7 - silty sand to sandy silt | ■ 10 - gravelly sand to sand |
| ■ 2 - organic material | ■ 5 - clayey silt to silty clay | ■ 8 - sand to silty sand | ■ 11 - very stiff fine grained (*) |
| ■ 3 - clay | ■ 6 - sandy silt to clayey silt | ■ 9 - sand | ■ 12 - sand to clayey sand (*) |

Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

LACMA Phase III

Project ID: AECOM
Data File: SDF(416).cpt
CPT Date: 11/13/2015 12:52:58 PM
GW During Test: 14 ft

Page: 1
Sounding ID: S-CPT-3
Project No: 60440464
Cone/Rig: DDG1268

Depth ft	qc PS tsf	qncs PS	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	* Ic SBT	* Nk -	* Vol Strn	* Cycl SStn %
0.33	5.4	-	5.4	0.3	0.0	5.7	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	74	3.21	15	N/A	N/A
0.49	11.5	-	11.5	0.9	0.0	7.7	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	9.9	62	3.05	15	N/A	N/A
0.66	47.2	118.2	47.2	0.8	0.0	1.7	5	silty SAND to sandy SILT	120	4.0	12	19	58	48	-	-	18	2.15	16	N/A	N/A
0.82	70.7	131.1	70.7	0.7	0.2	1.0	6	clean SAND to silty SAND	125	5.0	14	23	71	48	-	-	10	1.86	16	N/A	N/A
0.98	65.3	124.8	65.3	0.7	0.3	1.0	6	clean SAND to silty SAND	125	5.0	13	21	69	48	-	-	10	1.90	16	N/A	N/A
1.15	44.9	96.6	44.9	0.5	0.1	1.0	6	clean SAND to silty SAND	125	5.0	9	14	56	48	-	-	14	2.03	16	N/A	N/A
1.31	26.7	68.1	26.7	0.2	0.1	0.8	5	silty SAND to sandy SILT	120	4.0	7	11	39	46	-	-	18	2.17	16	N/A	N/A
1.48	19.5	59.3	19.5	0.2	0.1	0.8	5	silty SAND to sandy SILT	120	4.0	5	8	29	44	-	-	22	2.28	16	N/A	N/A
1.64	16.3	65.7	16.3	0.2	0.1	1.3	5	silty SAND to sandy SILT	120	4.0	4	7	23	43	-	-	28	2.45	16	N/A	N/A
1.80	12.8	63.4	12.8	0.2	0.1	1.4	4	clay SILT to silty CLAY	115	2.0	6	10	-	-	0.9	9.9	33	2.56	15	N/A	N/A
1.97	11.7	60.3	11.7	0.2	0.1	1.3	4	clay SILT to silty CLAY	115	2.0	6	9	-	-	0.8	9.9	34	2.58	15	N/A	N/A
2.13	20.5	56.8	20.5	0.1	0.2	0.7	5	silty SAND to sandy SILT	120	4.0	5	8	30	43	-	-	20	2.22	16	N/A	N/A
2.30	14.0	68.3	14.0	0.2	0.1	1.6	4	clay SILT to silty CLAY	115	2.0	7	11	-	-	1.0	9.9	33	2.55	15	N/A	N/A
2.46	9.7	-	9.7	0.1	0.1	1.2	4	clay SILT to silty CLAY	115	2.0	5	8	-	-	0.7	9.9	36	2.62	15	N/A	N/A
2.62	7.5	-	7.5	0.1	0.1	1.0	4	clay SILT to silty CLAY	115	2.0	4	6	-	-	0.5	9.9	41	2.70	15	N/A	N/A
2.79	5.8	-	5.8	0.1	0.1	1.1	4	clay SILT to silty CLAY	115	2.0	3	5	-	-	0.4	9.9	46	2.81	15	N/A	N/A
2.95	5.3	-	5.3	0.1	0.1	1.5	4	clay SILT to silty CLAY	115	2.0	3	4	-	-	0.4	9.7	53	2.92	15	N/A	N/A
3.12	4.3	-	4.3	0.1	0.1	1.9	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	7.4	61	3.04	15	N/A	N/A
3.28	3.7	-	3.7	0.1	0.1	3.4	3	silty CLAY to CLAY	115	1.5	2	4	-	-	0.2	6.0	76	3.24	15	N/A	N/A
3.45	5.3	-	5.3	0.2	0.1	3.7	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	8.3	67	3.12	15	N/A	N/A
3.61	5.9	-	5.9	0.4	0.1	6.2	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	8.9	74	3.22	15	N/A	N/A
3.77	16.1	85.5	16.1	0.4	0.1	2.3	4	clay SILT to silty CLAY	115	2.0	8	13	-	-	1.1	9.9	35	2.60	15	N/A	N/A
3.94	14.1	-	14.1	0.3	0.1	1.9	4	clay SILT to silty CLAY	115	2.0	7	11	-	-	1.0	9.9	36	2.60	15	N/A	N/A
4.10	9.1	-	9.1	0.1	0.1	1.2	4	clay SILT to silty CLAY	115	2.0	5	7	-	-	0.6	9.9	38	2.66	15	N/A	N/A
4.27	6.1	-	6.1	0.1	0.1	1.4	4	clay SILT to silty CLAY	115	2.0	3	5	-	-	0.4	7.7	49	2.84	15	N/A	N/A
4.43	4.1	-	4.1	0.1	0.1	2.4	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	4.9	67	3.12	15	N/A	N/A
4.59	4.1	-	4.1	0.2	0.1	4.5	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	4.7	79	3.27	15	N/A	N/A
4.76	7.2	-	7.2	0.7	0.1	9.6	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	8.2	79	3.28	15	N/A	N/A
4.92	20.0	-	20.0	0.9	0.1	4.5	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	41	2.72	15	N/A	N/A
5.09	22.3	-	22.3	1.0	0.6	4.5	4	clay SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	40	2.69	15	N/A	N/A
5.25	22.6	-	22.6	1.1	0.7	5.0	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	41	2.71	15	N/A	N/A
5.41	20.5	-	20.5	1.0	0.7	5.0	3	silty CLAY to CLAY	115	1.5	14	22	-	-	1.4	9.9	43	2.74	15	N/A	N/A
5.58	16.2	-	16.2	0.9	0.7	5.9	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	50	2.87	15	N/A	N/A
5.74	22.6	-	22.6	1.0	0.8	4.4	4	clay SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	39	2.67	15	N/A	N/A
5.91	42.5	145.7	42.5	1.2	0.8	3.0	5	silty SAND to sandy SILT	120	4.0	11	17	54	42	-	-	25	2.36	16	N/A	N/A
6.07	39.9	150.2	39.9	1.3	0.8	3.3	4	clay SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	27	2.41	15	N/A	N/A
6.23	26.6	-	26.7	1.3	1.0	4.8	4	clay SILT to silty CLAY	115	2.0	13	21	-	-	1.9	9.9	38	2.65	15	N/A	N/A
6.40	22.8	-	22.8	1.1	1.1	5.1	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	41	2.71	15	N/A	N/A
6.56	37.2	144.6	37.3	1.2	1.0	3.3	4	clay SILT to silty CLAY	115	2.0	19	29	-	-	2.6	9.9	28	2.44	15	N/A	N/A
6.73	25.0	-	25.0	1.1	1.0	4.4	4	clay SILT to silty CLAY	115	2.0	12	20	-	-	1.7	9.9	38	2.64	15	N/A	N/A
6.89	16.3	-	16.4	0.9	1.2	6.0	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	50	2.87	15	N/A	N/A
7.05	19.8	-	19.8	0.8	1.2	4.2	4	clay SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	41	2.71	15	N/A	N/A
7.22	24.4	128.8	24.5	0.9	1.3	3.6	4	clay SILT to silty CLAY	115	2.0	12	20	-	-	1.7	9.9	35	2.59	15	N/A	N/A
7.38	19.7	-	19.7	0.8	1.3	4.0	4	clay SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	40	2.69	15	N/A	N/A
7.55	17.6	-	17.7	0.7	1.3	4.2	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	43	2.74	15	N/A	N/A
7.71	17.0	-	17.0	0.8	1.3	4.9	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	46	2.80	15	N/A	N/A
7.87	27.2	126.3	27.2	0.9	1.2	3.5	4	clay SILT to silty CLAY	115	2.0	14	19	-	-	1.9	9.9	35	2.59	15	N/A	N/A
8.04	25.5	-	25.5	1.1	1.2	4.2	4	clay SILT to silty CLAY	115	2.0	13	20	-	-	1.8	9.9	37	2.62	15	N/A	N/A
8.20	22.2	-	22.2	0.8	1.1	3.8	4	clay SILT to silty CLAY	115	2.0	11	18	-	-	1.5	9.9	37	2.64	15	N/A	N/A
8.37	15.0	-	15.1	0.7	1.1	4.9	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	48	2.84	15	N/A	N/A
8.53	11.4	-	11.4	0.5	1.0	4.9	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	7.3	54	2.93	15	N/A	N/A
8.69	7.2	-	7.2	0.4	1.0	5.7	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	4.4	68	3.14	15	N/A	N/A
8.86	6.8	-	6.8	0.3	1.0	5.5	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.4	4.1	69	3.15	15	N/A	N/A
9.02	8.5	-	8.5	0.3	1.0	4.1	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	5.0	58	2.99	15	N/A	N/A
9.19	8.0	-	8.0	0.3	1.0	3.8	3	silty CLAY to CLAY	115	1.5	5	9	-	-	0.5	4.6	58	2.99	15	N/A	N/A
9.35	6.1	-	6.1	0.3	1.0	5.3	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	3.4	72	3.18	15	N/A	N/A
9.51	7.7	-	7.7	0.4	1.0	5.2	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	4.3	65	3.09	15	N/A	N/A
9.68	13.6	-	13.6	0.4	1.0	3.4	4	clay SILT to silty CLAY	115	2.0	7	11	-	-	0.9	7.6	44	2.77	15	N/A	N/A
9.84	11.5	-	11.5	0.5	1.0	4.5	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	6.3	53	2.91	15	N/A	N/A
10.01	11.4	-	11.4	0.5	0.9	4.7	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	6.1	54	2.93	15	N/A	N/A
10.17	12.2	-	12.2	0.5	0.8	4.5	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	6.5	51	2.89	15	N/A	N/A
10.34	12.6	-	12.6	0.6	0.8	4.9	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	6.6	52	2.90	15	N/A	N/A
10.50	12.9	-	12.9	0.7	0.8	5.3	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	6.7	53	2.92	15	N/A	N/A
10.66	12.8	-	12.8	0.7	0.8	5.8	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	6.5	55	2.95	15	N/A	N/A
10.83	13.3	-	13.3	0.7	0.8	5.4	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	6.6	53	2.92	15	N/A	N/A
10.99	12.4	-	12.4	0.7	0.8	5.8	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	6.1	56	2.97	15	N/A	N/A
11.16	12.2	-	12.2	0.6	0.8	5.6	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	5.9	56	2.96	15	N/A	N/A
11.32	12.5	-	12.5	0.6	0.8	5.1	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	6.0	54	2.94	15	N/A	N/A
11.48	13.5	-	13.5	0.6	0.8	4.6	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	6.4	51	2.88	15	N/A	N/A
11.65	13.9	-	13.9	0.6	0.8	4.5	3	silty CLAY to CLAY	115	1.5	9	14									

LACMA Phase III

Project ID: AECOM
Data File: SDF(416).cpt
CPT Date: 11/13/2015 12:52:58 PM
GW During Test: 14 ft

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Sounding ID: S-CPT-3
Project No: 60440464
Cone/Rig: DDG1268

Depth ft	qc PS tsf	qncs PS	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr	OCR -	* Fin Ic %	* Ic SBT Index	* Nk -	* Vol Strn %	* Cycl SStn %
15.58	38.4	-	38.4	1.9	-1.9	5.1	4	clay SILT to silty CLAY	115	2.0	19	23	-	-	2.7	9.9	38	2.65	15	-	-
15.75	35.5	-	35.4	2.0	-1.9	5.8	3	silty CLAY to CLAY	115	1.5	24	28	-	-	2.4	9.9	42	2.72	15	-	-
15.91	36.3	-	36.2	2.1	-1.9	6.0	3	silty CLAY to CLAY	115	1.5	24	28	-	-	2.5	9.9	42	2.73	15	-	-
16.08	37.9	-	37.8	2.3	-1.8	6.1	3	silty CLAY to CLAY	115	1.5	25	29	-	-	2.6	9.9	42	2.72	15	-	-
16.24	46.7	-	46.6	2.3	-1.8	5.0	4	clay SILT to silty CLAY	115	2.0	23	25	-	-	3.2	9.9	36	2.61	15	-	-
16.40	41.7	-	41.7	2.2	-1.7	5.5	3	silty CLAY to CLAY	115	1.5	28	32	-	-	2.9	9.9	38	2.66	15	-	-
16.57	39.7	-	39.7	2.0	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	26	30	-	-	2.7	9.9	39	2.67	15	-	-
16.73	36.6	-	36.5	1.8	-1.7	5.1	3	silty CLAY to CLAY	115	1.5	24	28	-	-	2.5	9.9	39	2.68	15	-	-
16.90	32.9	-	32.9	1.7	-1.7	5.5	3	silty CLAY to CLAY	115	1.5	22	25	-	-	2.3	9.9	42	2.74	15	-	-
17.06	35.2	-	35.2	1.7	-1.7	5.1	3	silty CLAY to CLAY	115	1.5	23	26	-	-	2.4	9.9	40	2.70	15	-	-
17.23	37.2	-	37.2	1.8	-1.7	5.0	3	silty CLAY to CLAY	115	1.5	25	28	-	-	2.6	9.9	39	2.67	15	-	-
17.39	38.2	-	38.2	2.0	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	25	28	-	-	2.6	9.9	40	2.69	15	-	-
17.55	39.4	-	39.4	1.9	-1.7	4.9	4	clay SILT to silty CLAY	115	2.0	20	22	-	-	2.7	9.9	38	2.66	15	-	-
17.72	47.8	-	47.8	2.3	-1.7	4.9	4	clay SILT to silty CLAY	115	2.0	24	25	-	-	3.3	9.9	36	2.61	15	-	-
17.88	31.6	-	31.5	2.4	-1.7	7.9	3	silty CLAY to CLAY	115	1.5	21	23	-	-	2.2	9.9	51	2.88	15	-	-
18.05	41.3	-	41.2	2.7	-1.7	6.6	3	silty CLAY to CLAY	115	1.5	28	30	-	-	2.9	9.9	43	2.74	15	-	-
18.21	42.6	-	42.5	2.7	-1.7	6.5	3	silty CLAY to CLAY	115	1.5	28	31	-	-	2.9	9.9	42	2.73	15	-	-
18.37	41.9	-	41.9	2.7	-1.7	6.7	3	silty CLAY to CLAY	115	1.5	28	30	-	-	2.9	9.9	43	2.74	15	-	-
18.54	42.2	-	42.2	2.9	-1.7	7.0	3	silty CLAY to CLAY	115	1.5	28	30	-	-	2.9	9.9	43	2.75	15	-	-
18.70	43.8	-	43.7	2.9	-1.6	6.8	3	silty CLAY to CLAY	115	1.5	29	31	-	-	3.0	9.9	42	2.74	15	-	-
18.87	44.5	-	44.5	2.8	-1.6	6.5	3	silty CLAY to CLAY	115	1.5	30	32	-	-	3.1	9.9	41	2.72	15	-	-
19.03	41.0	-	41.0	2.6	-1.6	6.6	3	silty CLAY to CLAY	115	1.5	27	29	-	-	2.8	9.9	43	2.75	15	-	-
19.19	40.7	-	40.7	2.6	-1.5	6.6	3	silty CLAY to CLAY	115	1.5	27	29	-	-	2.8	9.9	43	2.75	15	-	-
19.36	49.2	161.7	49.2	2.2	-1.5	4.6	4	clay SILT to silty CLAY	115	2.0	25	25	-	-	3.4	9.9	35	2.60	15	0.00	0.0
19.52	62.6	145.6	62.6	1.9	-1.4	3.2	4	clay SILT to silty CLAY	115	2.0	31	31	-	-	4.4	9.9	27	2.41	15	0.27	1.0
19.69	55.1	141.2	55.1	1.8	-1.4	3.3	4	clay SILT to silty CLAY	115	2.0	28	27	-	-	3.8	9.9	29	2.46	15	0.37	1.4
19.85	52.8	131.1	52.8	1.5	-1.4	3.0	4	clay SILT to silty CLAY	115	2.0	26	26	-	-	3.7	9.9	28	2.45	15	0.76	25.4
20.01	52.1	142.5	52.1	1.8	-1.3	3.5	4	clay SILT to silty CLAY	115	2.0	26	26	-	-	3.6	9.9	31	2.50	15	0.34	1.2
20.18	47.4	146.7	47.3	1.8	-1.5	4.0	4	clay SILT to silty CLAY	115	2.0	24	23	-	-	3.3	9.9	34	2.57	15	0.26	0.6
20.34	42.5	-	42.4	2.0	-1.5	4.9	4	clay SILT to silty CLAY	115	2.0	21	22	-	-	2.9	9.9	38	2.65	15	-	-
20.51	42.0	-	42.0	2.0	-1.5	4.9	4	clay SILT to silty CLAY	115	2.0	21	21	-	-	2.9	9.9	38	2.66	15	-	-
20.67	42.2	-	42.2	2.1	-1.5	5.2	3	silty CLAY to CLAY	115	1.5	28	29	-	-	2.9	9.9	39	2.68	15	-	-
20.83	49.0	-	49.0	2.4	-1.5	5.0	4	clay SILT to silty CLAY	115	2.0	24	25	-	-	3.4	9.9	37	2.62	15	-	-
21.00	42.3	-	42.3	2.6	-1.5	6.3	3	silty CLAY to CLAY	115	1.5	28	28	-	-	2.9	9.9	43	2.74	15	-	-
21.16	40.5	-	40.4	2.7	-1.4	7.0	3	silty CLAY to CLAY	115	1.5	27	27	-	-	2.8	9.9	45	2.79	15	-	-
21.33	40.3	-	40.3	2.8	-1.4	7.1	3	silty CLAY to CLAY	115	1.5	27	27	-	-	2.8	9.9	46	2.80	15	-	-
21.49	43.9	-	43.9	2.7	-1.4	6.4	3	silty CLAY to CLAY	115	1.5	29	29	-	-	3.0	9.9	43	2.74	15	-	-
21.65	44.3	-	44.3	2.6	-1.4	6.0	3	silty CLAY to CLAY	115	1.5	30	29	-	-	3.1	9.9	41	2.72	15	-	-
21.82	43.1	-	43.0	2.4	-1.3	5.6	3	silty CLAY to CLAY	115	1.5	29	28	-	-	3.0	9.9	41	2.71	15	-	-
21.98	43.6	-	43.5	2.0	-1.3	4.8	4	clay SILT to silty CLAY	115	2.0	22	21	-	-	3.0	9.9	38	2.65	15	-	-
22.15	40.6	-	40.6	1.8	-1.3	4.7	4	clay SILT to silty CLAY	115	2.0	20	20	-	-	2.8	9.9	39	2.67	15	-	-
22.31	44.5	-	44.4	1.8	-1.2	4.1	4	clay SILT to silty CLAY	115	2.0	22	22	-	-	3.1	9.9	35	2.60	15	-	-
22.47	48.1	129.9	48.1	1.5	-1.2	3.2	4	clay SILT to silty CLAY	115	2.0	24	23	-	-	3.3	9.9	31	2.51	15	1.01	45.3
22.64	40.5	127.7	40.4	1.4	-1.2	3.6	4	clay SILT to silty CLAY	115	2.0	20	19	-	-	2.8	9.9	35	2.60	15	1.15	51.2
22.80	41.1	124.2	41.1	1.3	-1.2	3.4	4	clay SILT to silty CLAY	115	2.0	21	20	-	-	2.8	9.9	34	2.57	15	1.38	51.2
22.97	42.3	120.7	42.3	1.3	-1.2	3.1	4	clay SILT to silty CLAY	115	2.0	21	20	-	-	2.9	9.9	33	2.54	15	1.61	51.2
23.13	42.8	111.3	42.7	1.1	-1.3	2.7	4	clay SILT to silty CLAY	115	2.0	21	20	-	-	2.9	9.9	30	2.50	15	2.12	51.2
23.30	39.4	105.6	39.3	1.0	-1.2	2.6	4	clay SILT to silty CLAY	115	2.0	20	19	-	-	2.7	9.9	31	2.51	15	2.23	51.2
23.46	37.6	109.3	37.6	1.0	-1.2	2.8	4	clay SILT to silty CLAY	115	2.0	19	18	-	-	2.6	9.9	33	2.56	15	2.17	51.2
23.62	34.1	-	34.1	1.2	-1.3	3.6	4	clay SILT to silty CLAY	115	2.0	17	16	-	-	2.3	9.9	38	2.66	15	-	-
23.79	36.0	-	36.0	1.5	-1.3	4.3	4	clay SILT to silty CLAY	115	2.0	18	17	-	-	2.5	9.9	40	2.70	15	-	-
23.95	37.2	-	37.2	1.5	-1.3	4.2	4	clay SILT to silty CLAY	115	2.0	19	17	-	-	2.6	9.9	40	2.68	15	-	-
24.12	33.0	-	33.0	1.6	-1.3	5.0	3	silty CLAY to CLAY	115	1.5	22	20	-	-	2.3	9.7	45	2.78	15	-	-
24.28	34.8	97.6	34.8	0.8	-1.3	2.4	4	clay SILT to silty CLAY	115	2.0	17	16	-	-	2.4	9.9	33	2.54	15	2.38	51.2
24.44	33.5	71.4	33.5	0.4	-1.3	1.3	5	silty SAND to sandy SILT	120	4.0	8	8	29	34	-	-	26	2.39	16	3.08	51.2
24.61	1.1	-	1.1	0.1	-1.9	0.1	1	sensitive fine SOIL	115	2.0	1	0	-	-	0.0	0.1	95	3.48	15	-	-
24.77	1.1	-	1.1	0.0	-1.9	0.1	1	sensitive fine SOIL	115	2.0	1	0	-	-	0.0	0.1	95	3.48	15	-	-
24.94	1.3	-	1.3	0.1	-1.9	0.1	1	sensitive fine SOIL	115	2.0	1	1	-	-	0.0	0.1	95	3.48	15	-	-
25.10	5.0	-	5.1	0.2	5.3	5.1	3	silty CLAY to CLAY	115	1.5	3	3	-	-	0.3	1.1	95	3.53	15	-	-
25.26	6.6	-	6.7	0.6	5.1	9.9	2	Organic SOILS - Peats	100	1.0	7	6	-	-	0.6	1.5	95	3.58	10	-	-
25.43	12.6	-	12.7	0.7	5.3	6.1	3	silty CLAY to CLAY	115	1.5	8	8	-	-	0.8	3.3	72	3.18	15	-	-
25.59	19.7	-	19.7	0.7	4.1	4.0	3	silty CLAY to CLAY	115	1.5	13	12	-	-	1.3	5.4	52	2.90	15	-	-
25.76	15.4	-	15.5	0.7	3.8	4.8	3	silty CLAY to CLAY	115	1.5	10	9	-	-	1.0	4.1	61	3.04	15	-	-
25.92	22.3	-	22.4	0.9	3.9	4.3	3	silty CLAY to CLAY	115	1.5	15	13	-	-	1.5	6.1	51	2.88	15	-	-
26.08	29.9	-	29.9	0.9	3.6	3.1	4	clay SILT to silty CLAY	115	2.0	15	13	-	-	2.0	8.3	40	2.69	15	-	-
26.25	24.9	-	24.9	0.9	3.5	3.9	3	silty CLAY to CLAY	115	1.5	17	15	-	-	1.7	6.8	47	2.81	15	-	-
26.41	17.3	-	17.4	0.9	3.6	5.4	3	silty CLAY to CLAY	115	1.5	12	10	-	-	1.1	4.6	61	3.04	15	-	-
26.58	17.5	-	17.6	0.8	3.6	4.8	3	silty CLAY to CLAY	115	1.5	12	10	-	-	1.2	4.6	59	3.00	15	-	-
26.74	14.3	-	14.4	0.6	3.6	4.6	3	silty CLAY to CLAY	115	1.5	10	8	-	-	0.9	3.7	63	3.07	15	-	-
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LACMA Phase III

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Cone/Rig: DDG1268

							*		*									*						
Depth	qc	q1ncs	qt	Slv	pore	Frct	Mat		Material		Unit	Qc	SPT	SPT	Rel	Ftn	Und	OCR	Fin	Ic	Nk	Vol	Cycl	
ft	PS	PS	PS	Stss	prss	Ratio	Typ		Behavior	Description	Wght	to	R-N	R-N1	Den	Ang	Shr	-	Ic	SBT	-	Strn	SStn	
	tsf	-	tsf	tsf	(psi)	%	Zon				pcf	N	60%	60%	%	deg	tsf	-	-	Indx	-	%	%	
31.01	120.8	185.3	120.9	3.6	6.7	3.0	5	silty	SAND	to sandy	SILT	120	4.0	30	26	68	40	-	-	20	2.24	16	0.00	0.0
31.17	141.9	190.9	142.0	3.7	6.5	2.7	5	silty	SAND	to sandy	SILT	120	4.0	35	31	74	41	-	-	17	2.15	16	0.00	0.0
31.33	116.9	184.1	117.0	3.6	6.6	3.1	5	silty	SAND	to sandy	SILT	120	4.0	29	25	67	40	-	-	21	2.26	16	0.00	0.0
31.50	101.3	168.1	101.4	3.0	6.5	3.0	5	silty	SAND	to sandy	SILT	120	4.0	25	22	62	39	-	-	22	2.29	16	0.00	0.0
31.66	88.1	150.1	88.2	2.4	6.4	2.8	5	silty	SAND	to sandy	SILT	120	4.0	22	19	58	38	-	-	23	2.31	16	0.43	2.4
31.83	74.0	136.7	74.2	2.0	6.2	2.7	5	silty	SAND	to sandy	SILT	120	4.0	19	16	52	37	-	-	25	2.36	16	1.03	8.6
31.99	39.3	-	39.4	1.5	5.7	4.0	4	clayey	SILT	to silty	CLAY	115	2.0	20	15	-	-	2.7 9.6	41	2.71	15	-	-	
32.15	28.9	-	29.0	1.2	5.3	4.5	3	silty	CLAY	to CLAY		115	1.5	19	15	-	-	1.9 6.9	49	2.85	15	-	-	
32.32	27.1	-	27.2	1.1	5.1	4.5	3	silty	CLAY	to CLAY		115	1.5	18	14	-	-	1.8 6.4	50	2.88	15	-	-	
32.48	35.6	-	35.7	1.3	5.0	3.8	4	clayey	SILT	to silty	CLAY	115	2.0	18	14	-	-	2.4 8.5	42	2.73	15	-	-	
32.65	70.5	112.0	70.6	1.3	4.9	1.9	5	silty	SAND	to sandy	SILT	120	4.0	18	15	50	37	-	-	22	2.27	16	2.13	34.0
32.81	108.6	122.9	108.7	1.4	4.7	1.3	6	clean	SAND	to silty	SAND	125	5.0	22	18	64	39	-	-	14	2.03	16	1.85	14.5
32.97	117.2	133.7	117.3	1.7	4.8	1.5	5	silty	SAND	to sandy	SILT	120	4.0	29	25	67	40	-	-	14	2.03	16	1.26	6.6
33.14	119.6	143.6	119.7	2.1	4.7	1.8	5	silty	SAND	to sandy	SILT	120	4.0	30	25	67	40	-	-	15	2.08	16	0.73	3.7
33.30	108.4	148.4	108.5	2.4	5.1	2.2	5	silty	SAND	to sandy	SILT	120	4.0	27	23	64	39	-	-	18	2.18	16	0.53	2.9
33.47	102.9	141.0	103.0	2.1	5.2	2.1	5	silty	SAND	to sandy	SILT	120	4.0	26	22	62	39	-	-	18	2.18	16	0.86	4.7
33.63	108.5	145.8	108.6	2.3	5.5	2.2	5	silty	SAND	to sandy	SILT	120	4.0	27	23	64	39	-	-	18	2.17	16	0.62	3.4
33.79	148.7	172.2	148.8	3.0	5.3	2.0	5	silty	SAND	to sandy	SILT	120	4.0	37	31	74	41	-	-	15	2.06	16	0.00	0.0
33.96	142.5	172.1	142.6	3.1	5.4	2.2	5	silty	SAND	to sandy	SILT	120	4.0	36	30	73	41	-	-	16	2.09	16	0.00	0.0
34.12	115.3	158.4	115.4	2.7	5.7	2.4	5	silty	SAND	to sandy	SILT	120	4.0	29	24	66	40	-	-	19	2.19	16	0.28	1.7
34.29	164.9	205.0	165.1	4.3	6.5	2.7	5	silty	SAND	to sandy	SILT	120	4.0	41	34	78	42	-	-	16	2.12	16	0.00	0.0
34.45	262.7	261.7	262.9	5.4	5.9	2.1	6	clean	SAND	to silty	SAND	125	5.0	53	44	93	44	-	-	11	1.91	16	0.00	0.0
34.61	231.8	248.4	231.9	5.5	6.3	2.4	5	silty	SAND	to sandy	SILT	120	4.0	58	48	89	43	-	-	13	1.99	16	0.00	0.0
34.78	224.7	239.4	224.8	5.1	7.6	2.3	5	silty	SAND	to sandy	SILT	120	4.0	56	47	88	43	-	-	13	1.99	16	0.00	0.0
34.94	276.7	274.5	276.9	5.9	7.5	2.1	6	clean	SAND	to silty	SAND	125	5.0	55	46	94	44	-	-	11	1.91	16	0.00	0.0
35.11	258.7	253.4	258.8	5.0	6.8	2.0	6	clean	SAND	to silty	SAND	125	5.0	52	43	92	44	-	-	10	1.90	16	0.00	0.0
35.27	210.7	217.9	210.9	4.2	7.9	2.0	6	clean	SAND	to silty	SAND	125	5.0	42	35	85	43	-	-	12	1.96	16	0.00	0.0
35.43	241.2	229.5	241.3	4.0	8.2	1.7	6	clean	SAND	to silty	SAND	125	5.0	48	40	90	43	-	-	10	1.86	16	0.00	0.0
35.60	261.8	245.2	262.0	4.4	8.5	1.7	6	clean	SAND	to silty	SAND	125	5.0	52	43	92	44	-	-	9	1.84	16	0.00	0.0
35.76	247.4	241.3	247.6	4.7	8.5	1.9	6	clean	SAND	to silty	SAND	125	5.0	49	41	90	43	-	-	10	1.90	16	0.00	0.0
35.93	224.7	226.4	224.8	4.4	8.6	2.0	6	clean	SAND	to silty	SAND	125	5.0	45	37	87	43	-	-	11	1.94	16	0.00	0.0
36.09	214.6	213.7	214.7	3.9	8.5	1.9	6	clean	SAND	to silty	SAND	125	5.0	43	35	86	43	-	-	11	1.93	16	0.00	0.0
36.26	184.4	190.5	184.6	3.4	8.7	1.8	6	clean	SAND	to silty	SAND	125	5.0	37	30	80	42	-	-	12	1.97	16	0.00	0.0
36.42	161.2	171.6	161.3	2.9	8.8	1.8	5	silty	SAND	to sandy	SILT	120	4.0	40	33	76	41	-	-	13	2.01	16	0.00	0.0
36.58	148.1	166.1	148.3	2.8	8.7	1.9	5	silty	SAND	to sandy	SILT	120	4.0	37	30	73	41	-	-	14	2.06	16	0.00	0.0
36.75	137.5	160.8	137.7	2.8	8.7	2.0	5	silty	SAND	to sandy	SILT	120	4.0	34	28	71	40	-	-	16	2.09	16	0.00	0.0
36.91	159.4	181.7	159.6	3.4	8.7	2.2	5	silty	SAND	to sandy	SILT	120	4.0	40	32	75	41	-	-	15	2.07	16	0.00	0.0
37.08	150.9	175.9	151.0	3.3	8.2	2.2	5	silty	SAND	to sandy	SILT	120	4.0	38	31	74	41	-	-	16	2.09	16	0.00	0.0
37.24	121.7	143.3	121.9	2.2	8.3	1.8	5	silty	SAND	to sandy	SILT	120	4.0	30	25	66	40	-	-	16	2.10	16	0.82	4.2
37.40	113.3	155.2	113.5	2.7	8.3	2.5	5	silty	SAND	to sandy	SILT	120	4.0	28	23	64	39	-	-	19	2.21	16	0.37	2.1
37.57	108.7	161.1	108.8	3.0	7.7	2.8	5	silty	SAND	to sandy	SILT	120	4.0	27	22	63	39	-	-	21	2.26	16	0.00	0.0
37.73	114.2	162.0	114.4	3.0	7.7	2.7	5	silty	SAND	to sandy	SILT	120	4.0	29	23	64	39	-	-	20	2.24	16	0.00	0.0
37.90	109.4	146.5	109.5	2.4	7.6	2.3	5	silty	SAND	to sandy	SILT	120	4.0	27	22	63	39	-	-	19	2.20	16	0.64	3.6
38.06	121.6	171.9	121.8	3.4	7.7	2.8	5	silty	SAND	to sandy	SILT	120	4.0	30	24	66	39	-	-	20	2.24	16	0.00	0.0
38.22	174.8	176.6	175.0	3.0	7.0	1.7	6	clean	SAND	to silty	SAND	125	5.0	35	28	78	41	-	-	12	1.97	16	0.00	0.0
38.39	137.5	176.0	137.6	3.5	7.8	2.6	5	silty	SAND	to sandy	SILT	120	4.0	34	27	70	40	-	-	18	2.17	16	0.00	0.0
38.55	193.6	189.7	193.7	3.3	7.8	1.7	6	clean	SAND	to silty	SAND	125	5.0	39	31	81	42	-	-	11	1.94	16	0.00	0.0
38.72	260.8	237.5	261.0	4.3	7.8	1.7	6	clean	SAND	to silty	SAND	125	5.0	52	42	91	43	-	-	9	1.85	16	0.00	0.0
38.88	307.8	271.7	307.9	5.1	6.8	1.7	6	clean	SAND	to silty	SAND	125	5.0	62	49	95	44	-	-	8	1.81	16	0.00	0.0
39.04	228.7	221.1	228.8	4.3	6.4	1.9	6	clean	SAND	to silty	SAND	125	5.0	46	36	87	43	-	-	11	1.93	16	0.00	0.0
39.21	149.7	182.2	149.9	3.7	8.2	2.5	5	silty	SAND	to sandy	SILT	120	4.0	37	30	73	40	-	-	17	2.14	16	0.00	0.0
39.37	134.9	177.7	135.1	3.6	8.5	2.7	5	silty	SAND	to sandy	SILT	120	4.0	34	27	69	40	-	-	19	2.20	16	0.00	0.0
39.54	179.8	187.7	180.0	3.6	8.5	2.0	5	silty	SAND	to sandy	SILT	120	4.0	45	35	79	41	-	-	13	2.02	16	0.00	0.0
39.70	164.7	186.0	164.9	3.7	8.4	2.3	5	silty	SAND	to sandy	SILT	120	4.0	41	32	76	41	-	-	15	2.09	16	0.00	0.0
39.86	180.5	235.9	180.6	6.1	8.8	3.4	5	silty	SAND	to sandy	SILT	120	4.0	45	36	79	41	-	-	19	2.20	16	0.00	0.0
40.03	365.2	309.5	365.3	6.0	7.4	1.7	6	clean	SAND	to silty	SAND	125	5.0	73	57	95	45	-	-	7	1.76	16	0.00	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing



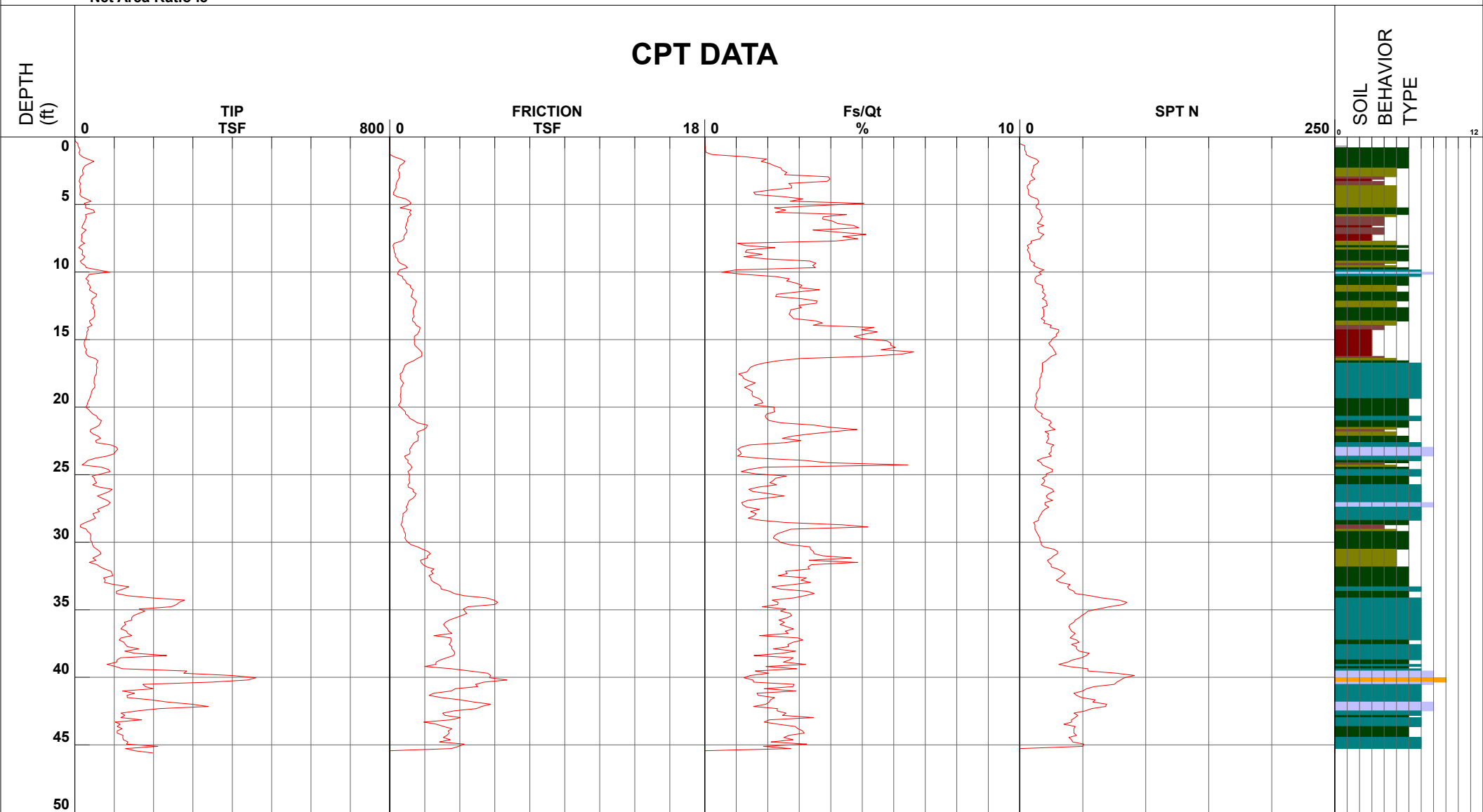
AECOM

Project LACMA Phase III
Job Number 60440464
Hole Number S-CPT-3A
EST GW Depth During Test

Operator DG-RC
Cone Number DDG1268
Date and Time 11/13/2015 1:35:08 PM
14.00 ft

Filename SDF(417).cpt
GPS
Maximum Depth 45.60 ft

Net Area Ratio .8



- | | | | |
|----------------------------|-------------------------------|------------------------------|----------------------------------|
| 1 - sensitive fine grained | 4 - silty clay to clay | 7 - silty sand to sandy silt | 10 - gravelly sand to sand |
| 2 - organic material | 5 - clayey silt to silty clay | 8 - sand to silty sand | 11 - very stiff fine grained (*) |
| 3 - clay | 6 - sandy silt to clayey silt | 9 - sand | 12 - sand to clayey sand (*) |

Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

LACMA Phase III

Project ID: AECOM
Data File: SDF(417).cpt
CPT Date: 11/13/2015 1:35:08 PM
GW During Test: 14 ft

Page: 1
Sounding ID: S-CPT-3A
Project No: 60440464
Cone/Rig: DDG1268

Depth ft	qc PS	qncs PS	* qt PS	Slv Stss tsf	pore prss (psi)	Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* Ic SBDT	* Nk -	* Vol Strn	* Cycl SStn %
0.33	1.5	-	1.5	0.0	0.0	0.1	1	sensitive fine SOIL	115	2.0	1	1	-	-	0.1	9.9	66	3.11	15	N/A	N/A
0.49	7.7	28.2	7.7	0.0	0.0	0.1	5	silty SAND to sandy SILT	120	4.0	2	3	5	45	-	-	26	2.40	16	N/A	N/A
0.66	8.3	28.8	8.3	0.0	0.0	0.1	5	silty SAND to sandy SILT	120	4.0	2	3	5	44	-	-	25	2.36	16	N/A	N/A
0.82	10.8	31.1	10.8	0.0	0.0	0.1	5	silty SAND to sandy SILT	120	4.0	3	4	9	45	-	-	21	2.25	16	N/A	N/A
0.98	13.4	33.6	13.4	0.0	-0.1	0.1	5	silty SAND to sandy SILT	120	4.0	3	5	16	45	-	-	18	2.16	16	N/A	N/A
1.15	10.8	31.2	10.8	0.0	-0.1	0.1	5	silty SAND to sandy SILT	120	4.0	3	4	9	43	-	-	21	2.25	16	N/A	N/A
1.31	12.3	35.9	12.3	0.0	0.0	0.2	5	silty SAND to sandy SILT	120	4.0	3	5	14	43	-	-	21	2.26	16	N/A	N/A
1.48	19.0	69.8	19.0	0.2	-0.2	1.3	5	silty SAND to sandy SILT	120	4.0	5	8	28	44	-	-	26	2.39	16	N/A	N/A
1.64	32.6	104.5	32.6	0.6	-0.2	2.0	5	silty SAND to sandy SILT	120	4.0	8	13	46	46	-	-	23	2.32	16	N/A	N/A
1.80	48.5	122.6	48.5	0.9	-0.2	1.8	5	silty SAND to sandy SILT	120	4.0	12	19	59	48	-	-	18	2.16	16	N/A	N/A
1.97	37.2	113.6	37.2	0.8	-0.2	2.1	5	silty SAND to sandy SILT	120	4.0	9	15	50	46	-	-	22	2.29	16	N/A	N/A
2.13	26.1	101.0	26.1	0.6	-0.2	2.2	5	silty SAND to sandy SILT	120	4.0	7	10	38	44	-	-	27	2.42	16	N/A	N/A
2.30	22.2	99.1	22.1	0.5	-0.1	2.4	4	clay SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	31	2.50	15	N/A	N/A
2.46	19.4	95.2	19.4	0.5	-0.2	2.5	4	clay SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	33	2.55	15	N/A	N/A
2.62	20.6	100.2	20.6	0.5	-0.2	2.6	4	clay SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	33	2.55	15	N/A	N/A
2.79	20.9	99.5	20.9	0.5	-0.2	2.5	4	clay SILT to silty CLAY	115	2.0	10	17	-	-	1.5	9.9	32	2.54	15	N/A	N/A
2.95	14.3	-	14.3	0.6	-0.2	4.0	3	silty CLAY to CLAY	115	1.5	10	15	-	-	1.0	9.9	45	2.79	15	N/A	N/A
3.12	12.8	-	12.8	0.5	-0.2	4.0	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	48	2.83	15	N/A	N/A
3.28	10.9	-	10.9	0.4	-0.1	4.0	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	51	2.88	15	N/A	N/A
3.45	14.5	-	14.5	0.4	-0.1	2.7	4	clay SILT to silty CLAY	115	2.0	7	12	-	-	1.0	9.9	39	2.68	15	N/A	N/A
3.61	12.8	-	12.8	0.4	0.7	2.8	4	clay SILT to silty CLAY	115	2.0	6	10	-	-	0.9	9.9	42	2.73	15	N/A	N/A
3.77	13.1	-	13.1	0.4	1.8	2.8	4	clay SILT to silty CLAY	115	2.0	7	10	-	-	0.9	9.9	42	2.73	15	N/A	N/A
3.94	14.2	-	14.3	0.3	2.5	2.1	4	clay SILT to silty CLAY	115	2.0	7	11	-	-	1.0	9.9	36	2.62	15	N/A	N/A
4.10	14.0	68.9	14.1	0.2	2.4	1.6	4	clay SILT to silty CLAY	115	2.0	7	11	-	-	1.0	9.9	33	2.56	15	N/A	N/A
4.27	12.6	-	12.7	0.2	2.4	1.6	4	clay SILT to silty CLAY	115	2.0	6	10	-	-	0.9	9.9	36	2.60	15	N/A	N/A
4.43	17.0	-	17.1	0.4	2.4	2.5	4	clay SILT to silty CLAY	115	2.0	9	14	-	-	1.2	9.9	36	2.61	15	N/A	N/A
4.59	29.4	127.8	29.4	0.9	2.7	3.1	4	clay SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	30	2.49	15	N/A	N/A
4.76	41.4	138.0	41.4	1.1	3.3	2.7	5	silty SAND to sandy SILT	120	4.0	10	17	53	43	-	-	24	2.34	16	N/A	N/A
4.92	24.1	-	24.2	1.2	3.3	5.1	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	40	2.70	15	N/A	N/A
5.09	27.6	135.3	27.7	1.0	3.5	3.7	4	clay SILT to silty CLAY	115	2.0	14	22	-	-	1.9	9.9	33	2.55	15	N/A	N/A
5.25	27.2	103.6	27.2	0.6	3.6	2.2	5	silty SAND to sandy SILT	120	4.0	7	11	40	40	-	-	27	2.42	16	N/A	N/A
5.41	47.4	143.5	47.3	1.2	-3.2	2.6	5	silty SAND to sandy SILT	120	4.0	12	19	58	43	-	-	22	2.28	16	N/A	N/A
5.58	50.2	138.5	50.1	1.1	-6.1	2.3	5	silty SAND to sandy SILT	120	4.0	13	20	60	43	-	-	20	2.22	16	N/A	N/A
5.74	27.1	-	26.9	1.2	-5.9	4.6	4	clay SILT to silty CLAY	115	2.0	14	22	-	-	1.9	9.9	37	2.63	15	N/A	N/A
5.91	28.5	140.4	28.4	1.1	-5.7	3.8	4	clay SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	33	2.56	15	N/A	N/A
6.07	27.5	137.8	27.4	1.0	-5.6	3.8	4	clay SILT to silty CLAY	115	2.0	14	22	-	-	1.9	9.9	34	2.57	15	N/A	N/A
6.23	25.3	-	25.2	1.0	-5.6	4.1	4	clay SILT to silty CLAY	115	2.0	13	20	-	-	1.8	9.9	36	2.62	15	N/A	N/A
6.40	22.8	-	22.7	1.0	-5.5	4.3	4	clay SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	38	2.66	15	N/A	N/A
6.56	19.8	-	19.7	0.9	-5.5	4.8	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	43	2.74	15	N/A	N/A
6.73	18.0	-	17.9	0.9	-5.4	5.0	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	45	2.79	15	N/A	N/A
6.89	28.6	131.3	28.5	1.0	-5.4	3.5	4	clay SILT to silty CLAY	115	2.0	14	22	-	-	2.0	9.9	33	2.54	15	N/A	N/A
7.05	23.0	-	22.8	1.0	-5.4	4.3	4	clay SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	39	2.66	15	N/A	N/A
7.22	17.0	-	16.9	0.9	-5.4	5.2	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	47	2.82	15	N/A	N/A
7.38	18.3	-	18.2	0.8	-5.3	4.5	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	43	2.75	15	N/A	N/A
7.55	17.0	-	16.9	0.8	-5.3	5.0	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	46	2.80	15	N/A	N/A
7.71	16.2	-	16.1	0.7	-5.2	4.3	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	45	2.77	15	N/A	N/A
7.87	24.6	68.3	24.5	0.3	-5.2	1.1	5	silty SAND to sandy SILT	120	4.0	6	9	33	37	-	-	22	2.30	16	N/A	N/A
8.04	14.7	63.0	14.6	0.2	-5.3	1.3	5	silty SAND to sandy SILT	120	4.0	4	5	15	34	-	-	33	2.55	16	N/A	N/A
8.20	9.6	-	9.5	0.2	-5.0	2.4	4	clay SILT to silty CLAY	115	2.0	5	8	-	-	0.6	6.3	46	2.80	15	N/A	N/A
8.37	18.8	68.5	18.8	0.3	-4.3	1.4	5	silty SAND to sandy SILT	120	4.0	5	7	23	35	-	-	29	2.47	16	N/A	N/A
8.53	19.9	68.5	19.8	0.3	-4.2	1.3	5	silty SAND to sandy SILT	120	4.0	5	7	24	35	-	-	28	2.44	16	N/A	N/A
8.69	18.1	77.5	18.0	0.3	-4.2	1.9	4	clay SILT to silty CLAY	115	2.0	9	12	-	-	1.2	9.9	34	2.57	15	N/A	N/A
8.86	25.2	72.6	25.1	0.3	-4.1	1.3	5	silty SAND to sandy SILT	120	4.0	6	8	31	36	-	-	25	2.35	16	N/A	N/A
9.02	22.4	85.2	22.3	0.4	-4.1	2.0	4	clay SILT to silty CLAY	115	2.0	11	15	-	-	1.5	9.9	31	2.51	15	N/A	N/A
9.19	14.0	-	13.9	0.5	-4.1	3.5	4	clay SILT to silty CLAY	115	2.0	7	11	-	-	0.9	8.3	44	2.77	15	N/A	N/A
9.35	17.1	-	17.0	0.6	-4.1	3.6	4	clay SILT to silty CLAY	115	2.0	9	14	-	-	1.2	9.9	41	2.71	15	N/A	N/A
9.51	26.2	125.8	26.1	0.9	-4.1	3.5	4	clay SILT to silty CLAY	115	2.0	13	19	-	-	1.8	9.9	35	2.59	15	N/A	N/A
9.68	28.8	131.7	28.7	1.0	-4.0	3.6	4	clay SILT to silty CLAY	115	2.0	14	21	-	-	2.0	9.9	34	2.57	15	N/A	N/A
9.84	57.7	97.8	57.7	0.6	-4.1	1.0	6	clean SAND to silty SAND	125	5.0	12	15	57	41	-	-	13	2.02	16	N/A	N/A
10.01	89.7	118.7	89.7	0.5	-3.8	0.5	6	clean SAND to silty SAND	125	5.0	18	23	71	43	-	-	6	1.71	16	N/A	N/A
10.17	36.9	81.8	37.2	0.5	14.1	1.2	5	silty SAND to sandy SILT	120	4.0	9	12	42	38	-	-	20	2.24	16	N/A	N/A
10.34	32.8	102.4	33.1	0.7	13.4	2.3	5	silty SAND to sandy SILT	120	4.0	8	10	38	37	-	-	28	2.44	16	N/A	N/A
10.50	28.2	105.9	28.4	0.8	13.2	2.7	4	clay SILT to silty CLAY	115	2.0	14	17	-	-	1.9	9.9	33	2.55	15	N/A	N/A
10.66	34.9	112.7	35.2	0.9	13.0	2.6	4	clay SILT to silty CLAY	115	2.0	17	21	-	-	2.4	9.9	29	2.47	15	N/A	N/A
10.83	32.2	115.4	32.5	0.9	11.8	3.0	4	clay SILT to silty CLAY	115	2.0	16	20	-	-	2.2	9.9	32	2.53	15	N/A	N/A
10.99	38.0	126.9	38.2	1.2	11.6	3.1	4	clay SILT to silty CLAY	115	2.0	19	23	-	-	2.6	9.9	31	2.50	15	N/A	N/A
11.16	39.6	126.9	39.8	1.2	11.2	3.1	4	clay SILT to silty CLAY	115	2.0	20	24	-	-	2.8	9.9	30	2.48	15	N/A	N/A
11.32	36.9	136.6	37.1	1.3	11.2	3.7	4	clay SILT to silty CLAY	115	2.0	18	22	-	-	2.6	9.9	34	2.56	15	N/A	N/A
11.48	44.6	130.4	44.8	1.3	11.2	3.0	4	clay SILT to silty CLAY	115	2.0	22	26	-	-	3.1	9.9	28				

LACMA Phase III

Project ID: AECOM
Data File: SDF(417).cpt
CPT Date: 11/13/2015 1:35:08 PM
GW During Test: 14 ft

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Sounding ID: S-CPT-3A
Project No: 60440464
Cone/Rig: DDG1268

Depth ft	qc PS	qncs PS	* qt PS	Slv Stss tsf	pore prss (psi)	Frct Ratio	* Mat Typ	* Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr	OCR -	Fin Ic %	* Ic SBDT	* Nk -	* Vol Strn %	* Cycl SStn %
15.58	25.8	-	26.0	1.6	8.5	6.3	3	silty	CLAY to CLAY	115	1.5	17	20	-	-	1.8	9.6	49	2.85	15	-	-
15.75	30.3	-	30.4	1.7	8.4	5.8	3	silty	CLAY to CLAY	115	1.5	20	23	-	-	2.1	9.9	44	2.77	15	-	-
15.91	27.3	-	27.4	1.8	8.5	6.9	3	silty	CLAY to CLAY	115	1.5	18	21	-	-	1.9	9.9	50	2.86	15	-	-
16.08	29.4	-	29.6	1.8	8.5	6.5	3	silty	CLAY to CLAY	115	1.5	20	23	-	-	2.0	9.9	47	2.82	15	-	-
16.24	35.1	-	35.2	1.8	8.5	5.3	3	silty	CLAY to CLAY	115	1.5	23	27	-	-	2.4	9.9	41	2.70	15	-	-
16.40	51.4	134.6	51.6	1.6	8.4	3.1	4	clay	SILT to silty CLAY	115	2.0	26	27	-	-	3.6	9.9	28	2.45	15	0.42	1.7
16.57	58.7	123.5	58.9	1.4	8.4	2.4	5	silty	SAND to sandy SILT	120	4.0	15	15	50	38	-	-	24	2.33	16	1.00	6.4
16.73	56.4	109.4	56.5	1.1	8.4	1.9	5	silty	SAND to sandy SILT	120	4.0	14	15	49	38	-	-	22	2.28	16	2.03	32.1
16.90	54.5	100.0	54.7	0.9	8.4	1.6	5	silty	SAND to sandy SILT	120	4.0	14	14	48	38	-	-	21	2.25	16	2.34	37.8
17.06	56.4	97.4	56.6	0.8	8.4	1.5	5	silty	SAND to sandy SILT	120	4.0	14	14	49	38	-	-	19	2.21	16	2.39	35.9
17.23	55.2	94.9	55.4	0.8	8.4	1.4	5	silty	SAND to sandy SILT	120	4.0	14	14	48	38	-	-	19	2.21	16	2.44	37.3
17.39	55.2	93.1	55.3	0.7	8.5	1.4	5	silty	SAND to sandy SILT	120	4.0	14	14	48	38	-	-	19	2.20	16	2.48	37.5
17.55	54.4	85.4	54.6	0.6	8.5	1.1	5	silty	SAND to sandy SILT	120	4.0	14	14	47	38	-	-	17	2.15	16	2.66	38.4
17.72	51.2	86.0	51.4	0.6	8.5	1.2	5	silty	SAND to sandy SILT	120	4.0	13	13	45	37	-	-	19	2.20	16	2.64	42.0
17.88	49.4	85.2	49.5	0.6	8.4	1.3	5	silty	SAND to sandy SILT	120	4.0	12	12	44	37	-	-	20	2.22	16	2.66	44.2
18.05	49.0	89.0	49.2	0.7	8.5	1.4	5	silty	SAND to sandy SILT	120	4.0	12	12	44	37	-	-	21	2.25	16	2.57	44.8
18.21	48.7	94.6	48.9	0.8	8.5	1.6	5	silty	SAND to sandy SILT	120	4.0	12	12	43	37	-	-	22	2.29	16	2.45	45.3
18.37	51.2	91.7	51.4	0.7	8.4	1.5	5	silty	SAND to sandy SILT	120	4.0	13	13	45	37	-	-	21	2.24	16	2.51	42.6
18.54	50.7	86.9	50.9	0.6	8.4	1.3	5	silty	SAND to sandy SILT	120	4.0	13	13	45	37	-	-	20	2.22	16	2.62	43.3
18.70	45.3	86.4	45.4	0.6	8.4	1.4	5	silty	SAND to sandy SILT	120	4.0	11	11	41	36	-	-	22	2.29	16	2.63	49.8
18.87	42.3	86.7	42.5	0.6	8.4	1.6	5	silty	SAND to sandy SILT	120	4.0	11	11	39	36	-	-	24	2.33	16	2.63	51.2
19.03	41.6	85.7	41.8	0.6	8.4	1.5	5	silty	SAND to sandy SILT	120	4.0	10	10	38	36	-	-	24	2.34	16	2.65	51.2
19.19	39.7	84.8	39.9	0.6	8.4	1.6	5	silty	SAND to sandy SILT	120	4.0	10	10	36	35	-	-	25	2.36	16	2.68	51.2
19.36	37.5	87.5	37.6	0.6	8.4	1.8	5	silty	SAND to sandy SILT	120	4.0	9	9	34	35	-	-	27	2.41	16	2.61	51.2
19.52	35.0	87.4	35.2	0.6	8.4	1.9	5	silty	SAND to sandy SILT	120	4.0	9	9	32	35	-	-	29	2.45	16	2.61	51.2
19.69	32.7	86.3	32.9	0.6	8.4	1.9	5	silty	SAND to sandy SILT	120	4.0	8	8	30	34	-	-	30	2.48	16	2.64	51.2
19.85	31.2	79.0	31.3	0.5	8.4	1.6	5	silty	SAND to sandy SILT	120	4.0	8	8	28	34	-	-	29	2.46	16	2.84	51.2
20.01	28.2	89.7	28.3	0.6	8.4	2.3	4	clay	SILT to silty CLAY	115	2.0	14	14	-	-	1.9	9.1	35	2.59	15	2.56	51.2
20.18	34.6	95.6	34.8	0.8	8.1	2.3	4	clay	SILT to silty CLAY	115	2.0	17	17	-	-	2.4	9.9	31	2.51	15	2.42	51.2
20.34	39.9	101.3	40.1	0.9	8.2	2.3	5	silty	SAND to sandy SILT	120	4.0	10	10	36	35	-	-	29	2.47	16	2.31	51.2
20.51	45.8	100.3	45.9	0.9	8.2	2.0	5	silty	SAND to sandy SILT	120	4.0	11	11	40	36	-	-	26	2.39	16	2.33	50.7
20.67	55.5	107.0	55.7	1.1	8.3	2.0	5	silty	SAND to sandy SILT	120	4.0	14	13	47	37	-	-	23	2.31	16	2.21	39.9
20.83	58.1	110.0	58.2	1.1	8.4	2.0	5	silty	SAND to sandy SILT	120	4.0	15	14	48	37	-	-	23	2.30	16	2.15	37.5
21.00	67.5	120.5	67.7	1.4	8.6	2.1	5	silty	SAND to sandy SILT	120	4.0	17	16	53	38	-	-	21	2.27	16	1.53	14.6
21.16	65.1	128.2	65.3	1.6	8.6	2.5	5	silty	SAND to sandy SILT	120	4.0	16	16	52	38	-	-	24	2.33	16	1.03	7.1
21.33	61.9	152.1	62.1	2.1	8.7	3.5	4	clay	SILT to silty CLAY	115	2.0	31	30	-	-	4.3	9.9	29	2.46	15	0.20	0.6
21.49	53.0	154.0	53.1	2.1	8.8	4.1	4	clay	SILT to silty CLAY	115	2.0	26	25	-	-	3.7	9.9	33	2.55	15	0.19	0.4
21.65	40.3	-	40.5	1.9	9.1	5.0	3	silty	CLAY to CLAY	115	1.5	27	26	-	-	2.8	9.9	40	2.69	15	-	-
21.82	39.4	-	39.5	1.6	9.4	4.2	4	clay	SILT to silty CLAY	115	2.0	20	19	-	-	2.7	9.9	38	2.65	15	-	-
21.98	46.1	131.7	46.3	1.5	9.6	3.4	4	clay	SILT to silty CLAY	115	2.0	23	22	-	-	3.2	9.9	33	2.54	15	0.85	51.2
22.15	59.0	131.7	59.2	1.6	9.5	2.9	5	silty	SAND to sandy SILT	120	4.0	15	14	48	37	-	-	27	2.41	16	0.86	15.2
22.31	65.3	128.9	65.5	1.6	9.4	2.5	5	silty	SAND to sandy SILT	120	4.0	16	16	51	38	-	-	24	2.34	16	1.05	7.6
22.47	53.0	132.1	53.2	1.6	9.6	3.1	4	clay	SILT to silty CLAY	115	2.0	27	25	-	-	3.7	9.9	29	2.47	15	0.85	31.7
22.64	54.5	121.0	54.7	1.4	9.7	2.6	5	silty	SAND to sandy SILT	120	4.0	14	13	45	37	-	-	27	2.41	16	1.57	34.7
22.80	92.2	120.9	92.4	1.3	9.3	1.4	5	silty	SAND to sandy SILT	120	4.0	23	22	62	40	-	-	15	2.06	16	1.59	9.4
22.97	105.9	124.5	106.1	1.2	9.2	1.2	6	clean	SAND to silty SAND	125	5.0	21	20	67	40	-	-	12	1.96	16	1.37	6.3
23.13	108.8	123.8	109.0	1.1	9.2	1.1	6	clean	SAND to silty SAND	125	5.0	22	20	68	41	-	-	11	1.92	16	1.42	6.4
23.30	103.5	121.4	103.7	1.2	9.3	1.1	6	clean	SAND to silty SAND	125	5.0	21	19	66	40	-	-	12	1.96	16	1.58	8.1
23.46	99.3	118.9	99.5	1.2	9.2	1.2	6	clean	SAND to silty SAND	125	5.0	20	19	65	40	-	-	13	1.99	16	1.75	10.3
23.62	82.0	101.6	82.2	0.9	9.2	1.1	6	clean	SAND to silty SAND	125	5.0	16	15	58	39	-	-	14	2.02	16	2.31	24.8
23.79	51.9	97.7	52.1	0.9	9.2	1.8	5	silty	SAND to sandy SILT	120	4.0	13	12	43	36	-	-	23	2.32	16	2.38	46.2
23.95	33.0	-	33.2	1.1	9.0	3.3	4	clay	SILT to silty CLAY	115	2.0	17	15	-	-	2.3	9.5	38	2.66	15	-	-
24.12	26.6	-	26.7	1.0	9.1	4.1	3	silty	CLAY to CLAY	115	1.5	18	16	-	-	1.8	7.5	46	2.80	15	-	-
24.28	18.4	-	18.6	1.2	9.1	7.0	3	silty	CLAY to CLAY	115	1.5	12	11	-	-	1.2	5.1	64	3.08	15	-	-
24.44	67.5	113.2	67.7	1.3	8.9	1.9	5	silty	SAND to sandy SILT	120	4.0	17	16	51	38	-	-	21	2.26	16	2.08	32.3
24.61	85.5	113.5	85.7	1.2	9.0	1.4	5	silty	SAND to sandy SILT	120	4.0	21	20	59	39	-	-	16	2.09	16	2.07	22.3
24.77	89.7	110.0	89.9	1.0	9.1	1.2	6	clean	SAND to silty SAND	125	5.0	18	16	61	39	-	-	14	2.03	16	2.16	22.1
24.94	68.0	106.1	68.1	1.1	9.1	1.6	5	silty	SAND to sandy SILT	120	4.0	17	16	51	38	-	-	19	2.21	16	2.23	32.5
25.10	43.8	111.4	43.9	1.1	8.9	2.7	4	clay	SILT to silty CLAY	115	2.0	22	20	-	-	3.0	9.9	31	2.50	15	2.13	51.2
25.26	49.7	108.3	49.8	1.1	9.0	2.3	5	silty	SAND to sandy SILT	120	4.0	12	11	41	36	-	-	27	2.42	16	2.19	49.7
25.43	50.9	107.4	51.1	1.1	8.9	2.2	5	silty	SAND to sandy SILT	120	4.0	13	12	42	36	-	-	26	2.40	16	2.20	48.4
25.59	55.3	108.3	55.5	1.1	8.8	2.1	5	silty	SAND to sandy SILT	120	4.0	14	13	44	36	-	-	25	2.36	16	2.19	43.8
25.76	45.5	105.4	45.7	1.0	8.9	2.4	5	silty	SAND to sandy SILT	120	4.0	11	10	38	35	-	-	29	2.46	16	2.24	51.2
25.92	62.0	103.7	62.2	1.1	9.1	1.7	5	silty	SAND to sandy SILT	120	4.0	16	14	48	37	-	-	21	2.27	16	2.27	37.6
26.08	95.1	119.8	95.2	1.3	8.8	1.4	5	silty	SAND to sandy SILT	120	4.0	24	21	62	39							

LACMA Phase III

Project ID: AECOM
 Data File: SDF(417).cpt
 CPT Date: 11/13/2015 1:35:08 PM
 GW During Test: 14 ft

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 Sounding ID: S-CPT-3A
 Project No: 60440464
 Cone/Rig: DDG1268

Depth ft	qc PSF	qncs PS	* qt PS	Slv Stss tsf	pore prss (psi)	Frct Rato	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR %	* Fin Ic SBT	* Ic Indx	* Nk -	* Vol Strn	* Cycl SStn %
31.01	57.7	147.9	57.8	2.2	9.1	3.9	4	clay SILT to silty CLAY	115	2.0	29	25	-	-	4.0	9.9	33	2.54	15	0.47	2.1
31.17	46.0	-	46.2	2.1	9.1	4.8	3	silty CLAY to CLAY	115	1.5	31	24	-	-	3.2	9.9	41	2.72	15	-	-
31.33	53.2	133.7	53.4	1.8	9.1	3.4	4	clay SILT to silty CLAY	115	2.0	27	23	-	-	3.7	9.9	32	2.53	15	1.16	47.7
31.50	36.8	-	36.9	1.8	9.1	5.1	3	silty CLAY to CLAY	115	1.5	25	19	-	-	2.5	8.8	47	2.81	15	-	-
31.66	56.2	138.2	56.4	1.9	9.0	3.5	4	clay SILT to silty CLAY	115	2.0	28	24	-	-	3.9	9.9	32	2.52	15	0.91	39.7
31.83	64.6	143.4	64.8	2.1	8.9	3.4	4	clay SILT to silty CLAY	115	2.0	32	27	-	-	4.5	9.9	29	2.47	15	0.65	17.7
31.99	76.0	154.7	76.2	2.5	9.0	3.4	4	clay SILT to silty CLAY	115	2.0	38	32	-	-	5.3	9.9	27	2.42	15	0.32	1.5
32.15	91.8	146.8	91.9	2.4	8.7	2.6	5	silty SAND to sandy SILT	120	4.0	23	19	59	38	-	-	22	2.28	16	0.56	3.1
32.32	94.7	150.6	94.9	2.5	9.0	2.7	5	silty SAND to sandy SILT	120	4.0	24	20	60	39	-	-	22	2.28	16	0.43	2.4
32.48	96.1	143.2	96.3	2.2	9.0	2.4	5	silty SAND to sandy SILT	120	4.0	24	20	60	39	-	-	20	2.24	16	0.71	4.1
32.65	73.1	149.2	73.3	2.4	9.2	3.3	4	clay SILT to silty CLAY	115	2.0	37	31	-	-	5.1	9.9	28	2.43	15	0.46	2.6
32.81	77.3	148.3	77.5	2.4	9.3	3.1	4	clay SILT to silty CLAY	115	2.0	39	32	-	-	5.4	9.9	26	2.39	15	0.50	2.8
32.97	75.3	154.4	75.5	2.5	9.5	3.4	4	clay SILT to silty CLAY	115	2.0	38	32	-	-	5.2	9.9	28	2.43	15	0.33	1.6
33.14	99.3	159.1	99.4	2.8	9.7	2.9	5	silty SAND to sandy SILT	120	4.0	25	21	61	39	-	-	22	2.29	16	0.26	1.4
33.30	137.2	167.4	137.4	2.9	10.3	2.2	5	silty SAND to sandy SILT	120	4.0	34	29	71	41	-	-	16	2.10	16	0.00	0.0
33.47	122.7	164.4	123.0	2.9	10.8	2.4	5	silty SAND to sandy SILT	120	4.0	31	26	68	40	-	-	18	2.17	16	0.00	0.0
33.63	105.6	176.8	105.8	3.4	10.8	3.3	5	silty SAND to sandy SILT	120	4.0	26	22	63	39	-	-	23	2.32	16	0.00	0.0
33.79	105.7	183.6	105.9	3.7	10.9	3.5	5	silty SAND to sandy SILT	120	4.0	26	22	63	39	-	-	24	2.34	16	0.00	0.0
33.96	134.7	198.1	134.9	4.3	10.8	3.2	5	silty SAND to sandy SILT	120	4.0	34	28	71	40	-	-	20	2.24	16	0.00	0.0
34.12	195.2	235.1	195.5	5.5	11.4	2.9	5	silty SAND to sandy SILT	120	4.0	49	40	83	42	-	-	16	2.10	16	0.00	0.0
34.29	278.5	275.7	278.7	6.0	12.3	2.2	6	clean SAND to silty SAND	125	5.0	56	46	95	44	-	-	11	1.91	16	0.00	0.0
34.45	264.9	271.6	265.1	6.2	13.4	2.3	6	clean SAND to silty SAND	125	5.0	53	44	93	44	-	-	12	1.95	16	0.00	0.0
34.61	258.4	265.8	258.7	6.0	13.8	2.3	6	clean SAND to silty SAND	125	5.0	52	43	92	44	-	-	12	1.96	16	0.00	0.0
34.78	244.4	237.1	244.7	4.5	13.8	1.8	6	clean SAND to silty SAND	125	5.0	49	40	90	43	-	-	10	1.89	16	0.00	0.0
34.94	163.8	200.1	164.1	4.2	14.2	2.6	5	silty SAND to sandy SILT	120	4.0	41	34	77	41	-	-	16	2.12	16	0.00	0.0
35.11	177.8	205.3	178.0	4.3	13.6	2.4	5	silty SAND to sandy SILT	120	4.0	44	36	79	42	-	-	15	2.07	16	0.00	0.0
35.27	162.6	203.5	162.9	4.4	14.2	2.7	5	silty SAND to sandy SILT	120	4.0	41	33	76	41	-	-	17	2.14	16	0.00	0.0
35.43	149.0	194.3	149.3	4.1	14.1	2.8	5	silty SAND to sandy SILT	120	4.0	37	30	73	41	-	-	18	2.17	16	0.00	0.0
35.60	144.3	185.7	144.6	3.8	14.0	2.6	5	silty SAND to sandy SILT	120	4.0	36	29	72	41	-	-	18	2.16	16	0.00	0.0
35.76	145.1	177.7	145.4	3.4	13.8	2.4	5	silty SAND to sandy SILT	120	4.0	36	30	72	41	-	-	17	2.13	16	0.00	0.0
35.93	125.8	168.8	126.1	3.2	13.7	2.6	5	silty SAND to sandy SILT	120	4.0	31	26	68	40	-	-	19	2.19	16	0.00	0.0
36.09	128.8	166.5	129.1	3.1	13.9	2.4	5	silty SAND to sandy SILT	120	4.0	32	26	68	40	-	-	18	2.17	16	0.00	0.0
36.26	122.1	167.7	122.4	3.2	13.8	2.6	5	silty SAND to sandy SILT	120	4.0	31	25	67	40	-	-	19	2.21	16	0.00	0.0
36.42	117.2	170.7	117.5	3.3	13.8	2.9	5	silty SAND to sandy SILT	120	4.0	29	24	65	39	-	-	21	2.25	16	0.00	0.0
36.58	131.3	173.1	131.6	3.4	13.8	2.6	5	silty SAND to sandy SILT	120	4.0	33	26	69	40	-	-	19	2.19	16	0.00	0.0
36.75	134.2	178.1	134.5	3.6	13.9	2.7	5	silty SAND to sandy SILT	120	4.0	34	27	70	40	-	-	19	2.19	16	0.00	0.0
36.91	145.1	157.2	145.4	2.5	13.7	1.8	5	silty SAND to sandy SILT	120	4.0	36	29	72	40	-	-	14	2.03	16	0.34	2.1
37.08	117.8	174.9	118.1	3.5	13.9	3.0	5	silty SAND to sandy SILT	120	4.0	29	24	65	39	-	-	21	2.27	16	0.00	0.0
37.24	112.7	175.5	113.0	3.5	13.3	3.2	5	silty SAND to sandy SILT	120	4.0	28	23	64	39	-	-	22	2.30	16	0.00	0.0
37.40	124.4	174.9	124.7	3.5	13.3	2.9	5	silty SAND to sandy SILT	120	4.0	31	25	67	40	-	-	20	2.23	16	0.00	0.0
37.57	128.6	172.8	128.8	3.4	13.4	2.7	5	silty SAND to sandy SILT	120	4.0	32	26	68	40	-	-	19	2.21	16	0.00	0.0
37.73	133.5	177.0	133.8	3.5	13.4	2.7	5	silty SAND to sandy SILT	120	4.0	33	27	69	40	-	-	19	2.20	16	0.00	0.0
37.90	162.9	183.0	163.2	3.5	13.2	2.2	5	silty SAND to sandy SILT	120	4.0	41	32	76	41	-	-	15	2.07	16	0.00	0.0
38.06	127.0	178.9	127.3	3.7	13.4	2.9	5	silty SAND to sandy SILT	120	4.0	32	25	67	40	-	-	20	2.24	16	0.00	0.0
38.22	151.9	183.5	152.1	3.7	13.6	2.5	5	silty SAND to sandy SILT	120	4.0	38	30	73	41	-	-	17	2.13	16	0.00	0.0
38.39	233.3	213.6	233.6	3.6	11.5	1.6	6	clean SAND to silty SAND	125	5.0	47	37	87	43	-	-	9	1.86	16	0.00	0.0
38.55	116.1	167.9	116.3	3.3	12.1	2.9	5	silty SAND to sandy SILT	120	4.0	29	23	64	39	-	-	21	2.26	16	0.00	0.0
38.72	107.4	157.8	107.7	2.9	13.2	2.8	5	silty SAND to sandy SILT	120	4.0	27	21	62	39	-	-	21	2.27	16	0.31	1.7
38.88	106.2	151.0	106.5	2.7	13.6	2.6	5	silty SAND to sandy SILT	120	4.0	27	21	61	39	-	-	21	2.25	16	0.49	2.7
39.04	82.1	152.6	82.4	2.6	13.5	3.3	4	clay SILT to silty CLAY	115	2.0	41	32	-	-	5.7	9.9	27	2.41	15	0.41	2.2
39.21	103.1	132.2	103.4	2.0	13.6	2.0	5	silty SAND to sandy SILT	120	4.0	26	20	60	38	-	-	18	2.18	16	1.40	10.5
39.37	120.9	174.1	121.1	3.5	13.6	3.0	5	silty SAND to sandy SILT	120	4.0	30	24	65	39	-	-	21	2.26	16	0.00	0.0
39.54	284.5	250.0	284.8	4.6	12.6	1.6	6	clean SAND to silty SAND	125	5.0	57	45	93	44	-	-	9	1.82	16	0.00	0.0
39.70	276.8	258.9	277.0	5.6	12.8	2.0	6	clean SAND to silty SAND	125	5.0	55	43	93	44	-	-	11	1.91	16	0.00	0.0
39.86	398.0	321.8	398.3	5.8	13.0	1.5	6	clean SAND to silty SAND	125	5.0	80	62	95	45	-	-	6	1.69	16	0.00	0.0
40.03	460.0	358.9	460.3	5.7	12.7	1.2	6	clean SAND to silty SAND	125	5.0	92	72	95	46	-	-	5	1.60	16	0.00	0.0
40.19	439.1	352.7	439.3	6.7	11.8	1.5	6	clean SAND to silty SAND	125	5.0	88	68	95	46	-	-	6	1.69	16	0.00	0.0
40.36	347.5	290.6	347.7	5.4	11.7	1.6	6	clean SAND to silty SAND	125	5.0	69	54	95	45	-	-	7	1.76	16	0.00	0.0
40.52	172.8	209.2	173.1	4.9	12.6	2.9	5	silty SAND to sandy SILT	120	4.0	43	34	77	41	-	-	17	2.15	16	0.00	0.0
40.68	179.6	212.8	179.8	5.0	14.9	2.8	5	silty SAND to sandy SILT	120	4.0	45	35	78	41	-	-	17	2.14	16	0.00	0.0
40.85	198.7	195.6	199.0	3.7	14.3	1.9	6	clean SAND to silty SAND	125	5.0	40	31	81	42	-	-	12	1.98	16	0.00	0.0
41.01	121.2	172.4	121.5	3.5	14.7	3.0	5	silty SAND to sandy SILT	120	4.0	30	23	65	39	-	-	21	2.26	16	0.00	0.0
41.18	151.8	155.2	152.1	2.5	15.0	1.7	5	silty SAND to sandy SILT	120	4.0	38	29	72	40	-	-	13	2.02	16	0.41	2.5
41.34	132.8	143.3	133.1	2.2	14.8	1.7	5	silty SAND to sandy SILT	120	4.0	33	26	68	40	-	-	15	2.07	16	0.86	4.3
41.50	133.4	159.5	133.7	3.0	15.0	2.3	5	silty SAND to sandy SILT	120	4.0	33	26	68	40	-	-	17	2.15	16	0.31	1.9
41.67	194.3	197.9	194.6	4.0	14.2	2.1	5	silty SAND to sandy SILT	120	4.											

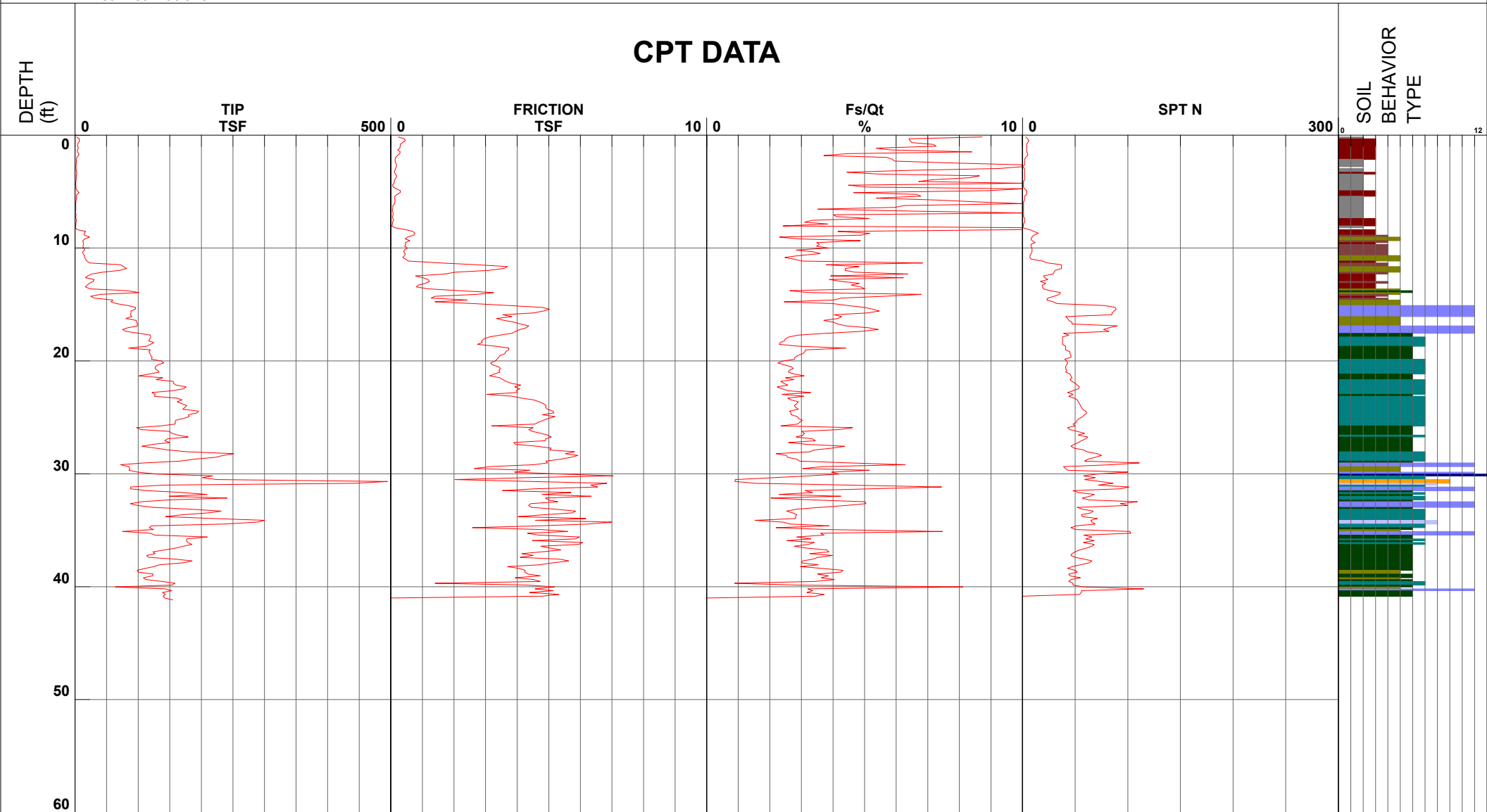


AECOM

Project LACMA Phase III Transformation Project Operator RC-DG
Job Number 60440464 Cone Number DDG1333
Hole Number S-CPT-04 Date and Time 10/5/2015 1:08:05 PM
EST GW Depth During Test 23.00 ft

Filename SDF(235).cpt
GPS
Maximum Depth 41.17 ft

Net Area Ratio .8



- | | | | |
|----------------------------|-------------------------------|------------------------------|----------------------------------|
| 1 - sensitive fine grained | 4 - silty clay to clay | 7 - silty sand to sandy silt | 10 - gravelly sand to sand |
| 2 - organic material | 5 - clayey silt to silty clay | 8 - sand to silty sand | 11 - very stiff fine grained (*) |
| 3 - clay | 6 - sandy silt to clayey silt | 9 - sand | 12 - sand to clayey sand (*) |

Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

LACMA Phase III Transformation Project

Project ID: AECOM
Data File: SDF(235).cpt
CPT Date: 10/5/2015 1:08:05 PM
GW During Test: 23 ft

Page: 1
Sounding ID: S-CPT-04
Project No: 60440464
Cone/Rig: DDG1333

Depth ft	qc PS	qc1n PS	q1ncs PS	qt PS	slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr %	OCR -	Fin Ic SBT	* Ic % Indx	* Nk -	* Vol Strn %	* Cycl SStn %
0.33	6.7	10.7	-	6.7	0.4	0.1	6.4	3	silty CLAY to CLAY	115	1.5	4	7	-	-	0.5	9.9	71	3.17	15	N/A	N/A
0.49	7.1	11.4	-	7.1	0.5	0.1	6.5	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	70	3.16	15	N/A	N/A
0.66	5.6	9.1	-	5.7	0.4	0.1	6.5	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	76	3.24	15	N/A	N/A
0.82	4.2	6.7	-	4.2	0.3	0.0	7.3	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	9.9	87	3.37	15	N/A	N/A
0.98	4.1	6.6	-	4.1	0.3	0.0	7.4	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	9.9	88	3.38	15	N/A	N/A
1.15	5.3	8.5	-	5.3	0.3	0.0	5.4	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	74	3.21	15	N/A	N/A
1.31	3.8	6.1	-	3.8	0.2	0.0	5.9	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	9.9	86	3.35	15	N/A	N/A
1.48	3.6	5.7	-	3.6	0.3	0.0	8.6	2	Organic SOILS - Peats	100	1.0	4	6	-	-	0.4	9.9	95	3.47	10	N/A	N/A
1.64	6.2	10.0	-	6.2	0.3	0.1	4.5	3	silty CLAY to CLAY	115	1.5	4	7	-	-	0.4	9.9	66	3.11	15	N/A	N/A
1.80	5.5	8.9	-	5.5	0.2	0.3	3.8	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	66	3.10	15	N/A	N/A
1.97	2.8	4.5	-	2.8	0.2	0.3	5.9	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	7.9	95	3.47	15	N/A	N/A
2.13	2.3	3.6	-	2.3	0.1	0.3	6.2	2	Organic SOILS - Peats	100	1.0	2	4	-	-	0.2	5.9	95	3.56	10	N/A	N/A
2.30	2.3	3.7	-	2.3	0.1	0.2	6.3	2	Organic SOILS - Peats	100	1.0	2	4	-	-	0.2	5.7	95	3.55	10	N/A	N/A
2.46	2.0	3.3	-	2.0	0.2	0.3	8.2	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.2	4.6	95	3.67	10	N/A	N/A
2.62	1.8	2.9	-	1.8	0.2	0.2	9.9	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.2	3.8	95	3.76	10	N/A	N/A
2.79	1.6	2.5	-	1.6	0.2	0.2	9.9	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.2	3.1	95	3.82	10	N/A	N/A
2.95	1.6	2.6	-	1.7	0.2	0.2	9.9	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.2	3.0	95	3.81	10	N/A	N/A
3.12	2.0	3.2	-	2.0	0.1	0.3	7.1	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.2	3.6	95	3.64	10	N/A	N/A
3.28	2.5	3.9	-	2.5	0.1	0.3	4.8	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	4.2	95	3.47	15	N/A	N/A
3.45	2.7	4.3	-	2.7	0.1	0.2	5.9	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	4.4	95	3.49	15	N/A	N/A
3.61	2.1	3.4	-	2.1	0.2	0.3	9.5	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.2	3.2	95	3.70	10	N/A	N/A
3.77	2.0	3.2	-	2.0	0.2	0.3	9.3	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.2	2.9	95	3.73	10	N/A	N/A
3.94	1.7	2.8	-	1.7	0.1	0.4	8.2	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.2	2.4	95	3.75	10	N/A	N/A
4.10	1.6	2.6	-	1.6	0.1	0.4	7.8	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.1	2.1	95	3.76	10	N/A	N/A
4.27	1.0	1.6	-	1.0	0.1	0.4	9.9	2	Organic SOILS - Peats	100	1.0	1	2	-	-	0.1	1.1	95	4.04	10	N/A	N/A
4.43	1.2	2.0	-	1.2	0.1	0.4	5.6	2	Organic SOILS - Peats	100	1.0	1	2	-	-	0.1	1.4	95	3.82	10	N/A	N/A
4.59	1.6	2.6	-	1.6	0.1	0.4	6.0	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.1	1.8	95	3.71	10	N/A	N/A
4.76	1.6	2.6	-	1.6	0.2	0.4	9.9	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.1	1.7	95	3.84	10	N/A	N/A
4.92	3.4	5.5	-	3.4	0.3	0.3	9.6	2	Organic SOILS - Peats	100	1.0	3	5	-	-	0.3	4.0	95	3.54	10	N/A	N/A
5.09	6.4	10.3	-	6.4	0.3	0.6	4.9	3	silty CLAY to CLAY	115	1.5	4	7	-	-	0.4	7.5	67	3.13	15	N/A	N/A
5.25	3.1	4.9	-	3.1	0.2	1.0	7.3	2	Organic SOILS - Peats	100	1.0	3	5	-	-	0.3	3.3	95	3.51	10	N/A	N/A
5.41	1.9	3.0	-	1.9	0.1	0.8	8.0	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.2	1.8	95	3.72	10	N/A	N/A
5.58	2.3	3.7	-	2.4	0.1	0.6	6.2	2	Organic SOILS - Peats	100	1.0	2	4	-	-	0.2	2.3	95	3.57	10	N/A	N/A
5.74	1.8	2.9	-	1.8	0.1	0.5	8.7	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.2	1.7	95	3.76	10	N/A	N/A
5.91	1.5	2.5	-	1.6	0.1	0.5	9.9	2	Organic SOILS - Peats	100	1.0	2	2	-	-	0.1	1.3	95	3.87	10	N/A	N/A
6.07	1.1	1.8	-	1.2	0.1	0.5	9.9	2	Organic SOILS - Peats	100	1.0	1	2	-	-	0.1	0.8	95	4.02	10	N/A	N/A
6.23	1.0	1.6	-	1.0	0.1	0.4	9.3	2	Organic SOILS - Peats	100	1.0	1	2	-	-	0.1	0.7	95	4.07	10	N/A	N/A
6.40	1.2	1.9	-	1.2	0.1	0.4	8.4	2	Organic SOILS - Peats	100	1.0	1	2	-	-	0.1	0.8	95	3.98	10	N/A	N/A
6.56	1.5	2.5	-	1.5	0.1	0.3	4.5	2	Organic SOILS - Peats	100	1.0	2	2	-	-	0.1	1.1	95	3.70	10	N/A	N/A
6.73	1.1	1.1	-	1.1	0.0	0.3	9.9	2	Organic SOILS - Peats	100	1.0	1	1	-	-	0.1	0.7	95	4.32	10	N/A	N/A
6.89	1.1	1.0	-	1.1	0.1	0.3	9.9	2	Organic SOILS - Peats	100	1.0	1	1	-	-	0.1	0.7	95	4.44	10	N/A	N/A
7.05	1.8	2.9	-	1.8	0.1	0.2	5.1	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.2	1.3	95	3.66	10	N/A	N/A
7.22	1.2	1.9	-	1.2	0.0	0.3	6.0	2	Organic SOILS - Peats	100	1.0	1	2	-	-	0.1	0.7	95	3.90	10	N/A	N/A
7.38	1.3	2.2	-	1.3	0.1	0.3	7.2	2	Organic SOILS - Peats	100	1.0	1	2	-	-	0.1	0.8	95	3.89	10	N/A	N/A
7.55	2.6	4.1	-	2.6	0.1	0.2	4.0	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	1.8	94	3.45	15	N/A	N/A
7.71	1.6	2.5	-	1.6	0.0	0.3	4.2	2	Organic SOILS - Peats	100	1.0	2	3	-	-	0.1	1.0	95	3.69	10	N/A	N/A
7.87	1.5	2.4	-	1.5	0.1	0.3	5.3	2	Organic SOILS - Peats	100	1.0	1	2	-	-	0.1	0.9	95	3.77	10	N/A	N/A
8.04	1.3	2.1	-	1.3	0.0	-0.1	3.6	2	Organic SOILS - Peats	100	1.0	1	2	-	-	0.1	0.7	95	3.76	10	N/A	N/A
8.20	1.1	0.7	-	1.1	0.1	1.1	0.1	1	sensitive fine SOIL	115	2.0	1	0	-	-	0.0	0.5	95	3.48	15	N/A	N/A
8.37	3.5	5.6	-	3.5	0.5	1.2	9.9	2	Organic SOILS - Peats	100	1.0	4	6	-	-	0.3	2.3	95	3.55	10	N/A	N/A
8.53	16.8	27.0	-	16.9	0.7	1.1	4.3	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	44	2.76	15	N/A	N/A
8.69	14.7	23.7	-	14.8	0.8	1.7	5.3	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	50	2.87	15	N/A	N/A
8.86	14.8	23.8	-	14.9	0.7	2.1	5.0	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	49	2.85	15	N/A	N/A
9.02	23.0	32.4	95.1	23.1	0.5	2.2	2.4	4	clay SILT to silty CLAY	115	2.0	12	16	-	-	1.6	9.9	32	2.53	15	N/A	N/A
9.19	15.8	25.3	-	15.8	0.5	2.1	3.0	4	clay SILT to silty CLAY	115	2.0	8	13	-	-	1.1	9.9	40	2.68	15	N/A	N/A
9.35	12.4	19.8	-	12.4	0.6	2.3	5.1	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	7.9	53	2.92	15	N/A	N/A
9.51	13.3	21.3	-	13.3	0.5	2.4	3.6	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	8.4	46	2.80	15	N/A	N/A
9.68	13.3	21.3	-	13.3	0.5	2.7	3.7	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	8.2	46	2.80	15	N/A	N/A
9.84	12.5	20.1	-	12.6	0.4	2.7	3.6	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	7.6	47	2.82	15	N/A	N/A
10.01	13.7	21.9	-	13.7	0.5	2.8	4.0	3	silty CLAY to CLAY	115	1.5	9	15	-	-	0.9	8.2	47	2.82	15	N/A	N/A
10.17	15.1	24.3	-	15.2	0.4	2.8	2.9	4	clay SILT to silty CLAY	115	2.0	8	12	-	-	1.0	8.9	40	2.70	15	N/A	N/A
10.34	12.2	19.6	-	12.2	0.4	2.9	3.5	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	7.0	47	2.82	15	N/A	N/A
10.50	12.6	20.3	-	12.7	0.5	2.9	3.8	3	silty CLAY to CLAY	115	1.5	8	14	-	-	0.9	7.1	48	2.83	15	N/A	N/A
10.66	15.0	24.0	-	15.0	0.4	3.0	3.0	4	clay SILT to silty CLAY	115	2.0	7	12	-	-	1.0	8.3	41	2.71	15	N/A	N/A
10.83	15.3	24.5	-	15.3	0.4	3.0	2.6	4	clay SILT to silty CLAY	115	2.0	8	12	-	-	1.0	8.4	38	2.66	15	N/A	N/A
10.99	16.6	26.6	-	16.7	0.5	3.1	2.9	4	clay SILT to silty CLAY	115	2.0	8	13	-	-	1.1	9.0	38	2.66	15	N/A	N/A
11.16	18.8	30.2	-	18.9	0.6	3.2	3.1	4	clay SILT to silty CLAY	115	2.0	9	15	-	-	1.3	9.9	37	2.64	15	N/A	N/A
11.32	23.2	37.2	-	23.2	1.6																	

LACMA Phase III Transformation Project

Project ID: AECOM
Data File: SDF(235).cpt
CPT Date: 10/5/2015 1:08:05 PM
GW During Test: 23 ft

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Sounding ID: S-CPT-04
Project No: 60440464
Cone/Rig: DDG1333

Depth ft	qc PS	qc1n PS	q1ncs PS	qt PS	slv Stss tsf	pore prss (psi)	Frct Rto %	Mat Typ zon	Material Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic SBT	Ic Index	Nk -	Vol Strn %	Cycl SStn
15.58	88.4	92.8	244.8	88.4	4.8	-0.2	5.5	9	very stiff fine SOIL	120	2.0	44	46	65	41	-	-	30	2.47	30	N/A	N/A
15.75	88.8	92.7	233.9	88.8	4.5	-1.0	5.1	9	very stiff fine SOIL	120	2.0	44	46	64	41	-	-	28	2.45	30	N/A	N/A
15.91	87.9	91.2	202.1	87.9	3.5	-1.1	4.1	4	clay SILT to silty CLAY	115	2.0	44	46	-	-	6.2	9.9	25	2.38	15	N/A	N/A
16.08	89.9	92.8	210.6	89.9	3.8	-0.8	4.3	4	clay SILT to silty CLAY	115	2.0	45	46	-	-	6.3	9.9	26	2.39	15	N/A	N/A
16.24	80.7	82.8	195.9	80.7	3.4	-1.0	4.2	4	clay SILT to silty CLAY	115	2.0	40	41	-	-	5.6	9.9	27	2.41	15	N/A	N/A
16.40	97.0	99.1	200.7	96.9	3.6	-1.0	3.7	5	silty SAND to sandy SILT	120	4.0	24	25	67	41	-	-	23	2.32	16	N/A	N/A
16.57	97.5	99.0	210.1	97.4	3.9	-1.0	4.0	4	clay SILT to silty CLAY	115	2.0	49	50	-	-	6.8	9.9	24	2.35	15	N/A	N/A
16.73	98.9	99.9	215.3	98.8	4.1	-1.1	4.2	9	very stiff fine SOIL	120	2.0	49	50	67	41	-	-	25	2.36	30	N/A	N/A
16.90	98.8	99.3	222.8	98.8	4.4	-0.9	4.5	9	very stiff fine SOIL	120	2.0	49	50	67	41	-	-	26	2.38	30	N/A	N/A
17.06	83.5	83.6	223.5	83.5	4.3	-0.5	5.2	9	very stiff fine SOIL	120	2.0	42	42	61	40	-	-	30	2.48	30	N/A	N/A
17.23	75.3	74.9	219.7	75.3	4.1	-0.6	5.5	9	very stiff fine SOIL	120	2.0	38	37	57	39	-	-	32	2.53	30	N/A	N/A
17.39	81.0	80.2	212.4	81.0	3.9	-0.6	4.9	4	clay SILT to silty CLAY	115	2.0	40	40	-	-	5.7	9.9	30	2.48	15	N/A	N/A
17.55	101.8	100.3	203.9	101.8	3.8	-0.6	3.8	5	silty SAND to sandy SILT	120	4.0	25	25	67	41	-	-	23	2.33	16	N/A	N/A
17.72	119.4	117.0	193.5	119.3	3.5	-0.8	2.9	5	silty SAND to sandy SILT	120	4.0	30	29	72	42	-	-	19	2.19	16	N/A	N/A
17.88	119.9	117.0	184.0	119.9	3.1	-1.0	2.6	5	silty SAND to sandy SILT	120	4.0	30	29	72	42	-	-	18	2.16	16	N/A	N/A
18.05	118.4	114.9	178.4	118.4	3.0	-1.0	2.5	5	silty SAND to sandy SILT	120	4.0	30	29	72	41	-	-	17	2.15	16	N/A	N/A
18.21	116.6	112.6	175.5	116.6	2.9	-1.0	2.5	5	silty SAND to sandy SILT	120	4.0	29	28	71	41	-	-	17	2.15	16	N/A	N/A
18.37	124.5	119.7	177.6	124.5	2.9	-1.1	2.3	5	silty SAND to sandy SILT	120	4.0	31	30	73	42	-	-	16	2.12	16	N/A	N/A
18.54	119.4	114.2	171.6	119.4	2.7	-1.0	2.3	5	silty SAND to sandy SILT	120	4.0	30	29	71	41	-	-	17	2.13	16	N/A	N/A
18.70	113.1	107.7	186.1	113.1	3.3	-1.0	3.0	5	silty SAND to sandy SILT	120	4.0	28	27	69	41	-	-	20	2.22	16	N/A	N/A
18.87	84.8	80.4	200.0	84.8	3.7	-0.5	4.5	4	clay SILT to silty CLAY	115	2.0	42	40	-	-	5.9	9.9	28	2.44	15	N/A	N/A
19.03	119.2	112.5	196.6	119.2	3.7	-1.0	3.2	5	silty SAND to sandy SILT	120	4.0	30	28	71	41	-	-	20	2.23	16	N/A	N/A
19.19	117.0	109.9	193.3	117.0	3.6	-0.7	3.1	5	silty SAND to sandy SILT	120	4.0	29	27	70	41	-	-	20	2.24	16	N/A	N/A
19.36	118.7	111.0	192.3	118.7	3.6	-0.8	3.1	5	silty SAND to sandy SILT	120	4.0	30	28	70	41	-	-	20	2.23	16	N/A	N/A
19.52	119.9	111.5	187.9	119.8	3.5	-0.9	2.9	5	silty SAND to sandy SILT	120	4.0	30	28	71	41	-	-	19	2.21	16	N/A	N/A
19.69	122.2	113.2	186.5	122.2	3.4	-0.9	2.8	5	silty SAND to sandy SILT	120	4.0	31	28	71	41	-	-	19	2.19	16	N/A	N/A
19.85	121.0	111.6	184.5	121.0	3.4	-0.9	2.8	5	silty SAND to sandy SILT	120	4.0	30	28	71	41	-	-	19	2.19	16	N/A	N/A
20.01	136.9	125.7	186.1	136.8	3.3	-0.8	2.4	5	silty SAND to sandy SILT	120	4.0	34	31	75	42	-	-	16	2.11	16	N/A	N/A
20.18	140.3	128.2	183.3	140.2	3.2	-1.0	2.3	5	silty SAND to sandy SILT	120	4.0	35	32	75	42	-	-	15	2.09	16	N/A	N/A
20.34	131.6	119.8	181.4	131.6	3.2	-0.7	2.5	5	silty SAND to sandy SILT	120	4.0	33	30	73	41	-	-	17	2.13	16	N/A	N/A
20.51	127.4	115.4	184.7	127.4	3.4	-0.8	2.7	5	silty SAND to sandy SILT	120	4.0	32	29	72	41	-	-	18	2.17	16	N/A	N/A
20.67	126.6	114.2	186.0	126.6	3.5	-0.8	2.8	5	silty SAND to sandy SILT	120	4.0	32	29	71	41	-	-	18	2.18	16	N/A	N/A
20.83	130.7	117.5	184.9	130.7	3.4	-0.6	2.6	5	silty SAND to sandy SILT	120	4.0	33	29	72	41	-	-	18	2.16	16	N/A	N/A
21.00	133.3	119.3	185.8	133.3	3.5	-0.8	2.6	5	silty SAND to sandy SILT	120	4.0	33	30	73	41	-	-	17	2.15	16	N/A	N/A
21.16	118.2	105.3	178.1	118.1	3.3	-0.8	2.8	5	silty SAND to sandy SILT	120	4.0	30	26	69	40	-	-	19	2.21	16	N/A	N/A
21.33	101.4	90.0	173.1	101.4	3.1	-0.2	3.1	5	silty SAND to sandy SILT	120	4.0	25	23	64	40	-	-	22	2.29	16	N/A	N/A
21.49	138.5	122.4	185.6	138.4	3.5	-0.6	2.5	5	silty SAND to sandy SILT	120	4.0	35	31	74	41	-	-	17	2.13	16	N/A	N/A
21.65	128.5	113.1	185.4	128.5	3.5	-0.6	2.8	5	silty SAND to sandy SILT	120	4.0	32	28	71	41	-	-	19	2.19	16	N/A	N/A
21.82	155.3	136.1	193.8	155.2	3.6	-0.6	2.4	5	silty SAND to sandy SILT	120	4.0	39	34	77	42	-	-	15	2.08	16	N/A	N/A
21.98	156.3	136.5	197.2	156.3	3.8	-0.7	2.5	5	silty SAND to sandy SILT	120	4.0	39	34	77	42	-	-	16	2.09	16	N/A	N/A
22.15	160.1	139.3	204.1	160.1	4.1	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	40	35	78	42	-	-	16	2.11	16	N/A	N/A
22.31	175.8	152.3	205.1	175.8	3.9	-0.4	2.2	5	silty SAND to sandy SILT	120	4.0	44	38	81	42	-	-	14	2.03	16	N/A	N/A
22.47	171.9	148.3	206.2	171.9	4.1	-0.6	2.4	5	silty SAND to sandy SILT	120	4.0	43	37	80	42	-	-	15	2.06	16	N/A	N/A
22.64	153.8	132.2	197.9	153.8	4.0	-0.7	2.6	5	silty SAND to sandy SILT	120	4.0	38	33	76	41	-	-	17	2.12	16	N/A	N/A
22.80	121.9	104.4	193.9	121.9	4.0	-0.4	3.3	5	silty SAND to sandy SILT	120	4.0	30	26	68	40	-	-	21	2.27	16	N/A	N/A
22.97	127.1	108.5	169.2	127.2	3.0	0.2	2.4	5	silty SAND to sandy SILT	120	4.0	32	27	70	40	-	-	17	2.15	16	N/A	N/A
23.13	125.8	107.1	189.6	125.8	3.9	0.0	3.1	5	silty SAND to sandy SILT	120	4.0	31	27	69	40	-	-	20	2.24	16	0.00	0.00
23.30	161.3	137.1	202.0	161.3	4.1	0.3	2.6	5	silty SAND to sandy SILT	120	4.0	40	34	77	42	-	-	16	2.11	16	0.00	0.00
23.46	169.3	143.6	211.8	169.3	4.5	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	42	36	79	42	-	-	16	2.11	16	0.00	0.00
23.62	161.8	137.1	213.3	161.8	4.7	0.1	2.9	5	silty SAND to sandy SILT	120	4.0	40	34	77	42	-	-	17	2.15	16	0.00	0.00
23.79	169.3	143.1	217.6	169.3	4.8	0.2	2.9	5	silty SAND to sandy SILT	120	4.0	42	36	79	42	-	-	17	2.13	16	0.00	0.00
23.95	177.0	149.4	221.0	177.0	4.9	0.4	2.8	5	silty SAND to sandy SILT	120	4.0	44	37	80	42	-	-	16	2.11	16	0.00	0.00
24.12	173.9	146.5	219.6	174.0	4.9	0.2	2.8	5	silty SAND to sandy SILT	120	4.0	43	37	80	42	-	-	17	2.12	16	0.00	0.00
24.28	170.6	143.5	219.6	170.6	5.0	0.4	2.9	5	silty SAND to sandy SILT	120	4.0	43	36	79	42	-	-	17	2.14	16	0.00	0.00
24.44	195.6	164.2	229.9	195.6	5.1	0.2	2.6	5	silty SAND to sandy SILT	120	4.0	49	41	83	42	-	-	15	2.07	16	0.00	0.00
24.61	193.2	161.9	229.4	193.2	5.2	0.3	2.7	5	silty SAND to sandy SILT	120	4.0	48	40	83	42	-	-	15	2.08	16	0.00	0.00
24.77	179.7	150.3	218.3	179.7	4.8	0.6	2.7	5	silty SAND to sandy SILT	120	4.0	45	38	80	42	-	-	16	2.10	16	0.00	0.00
24.94	180.7	150.9	225.9	180.7	5.2	0.9	2.9	5	silty SAND to sandy SILT	120	4.0	45	38	81	42	-	-	16	2.12	16	0.00	0.00
25.10	171.7	143.1	219.3	171.7	5.0	0.9	2.9	5	silty SAND to sandy SILT	120	4.0	43	36	79	42	-	-	17	2.14	16	0.00	0.00
25.26	159.5	132.8	213.7	159.6	4.8	1.4	3.1	5	silty SAND to sandy SILT	120	4.0	40	33	76	41	-	-	18	2.18	16	0.00	0.00
25.43	158.5	131.7	209.8	158.6	4.7	1.7	3.0	5	silty SAND to sandy SILT	120	4.0	40	33	76	41	-	-	18	2.17	16	0.00	0.00
25.59	158.7	131.6	207.4	158.7	4.6	1.6	2.9	5	silty SAND to sandy SILT	120	4.0	40	33	76	41	-	-	18	2.16	16	0.00	0.00
25.76	135.6	112.2	171.7	135.6	3.2	1.5	2.4	5	silty SAND to sandy SILT	120	4.0	34	28	71	40	-	-	17	2.14	16	0.00	0.00
25.92	97.5	80.6	206.7	97.6	4.5	1.4	4.7	4	clay SILT to silty CLAY	115	2.0	49	40	-	-							

LACMA Phase III Transformation Project

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Cone/Rig: DDG1333

Depth ft	qc PS	qc1n PS	q1ncs PS	qt PS	Slv Stss tsf	pore prss (psi)	Frct Rto %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	* Rel %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* Ic SBT Indx	* Nk -	* Vol Strn %	* Cycl SStn %
31.01	140.8	110.7	239.3	140.9	6.3	5.2	4.6	9	very stiff fine SOIL	120	2.0	70	55	70	40	-	-	25	2.36	30	0.00	0.0
31.17	88.0	57.5	-	88.3	6.5	11.6	7.6	3	silty CLAY to CLAY	115	1.5	59	38	-	-	6.1	9.9	41	2.71	15	-	-
31.33	87.7	68.8	207.0	88.0	4.6	13.9	5.3	4	clay SILT to silty CLAY	115	2.0	44	34	-	-	6.1	9.9	33	2.55	15	0.00	0.0
31.50	113.4	88.8	173.5	113.7	3.5	14.0	3.2	5	silty SAND to sandy SILT	120	4.0	28	22	63	39	-	-	23	2.30	16	0.00	0.0
31.66	170.3	133.1	225.1	170.6	5.7	14.6	3.4	5	silty SAND to sandy SILT	120	4.0	43	33	76	41	-	-	19	2.21	16	0.00	0.0
31.83	209.0	163.1	217.6	209.3	4.8	14.9	2.3	5	silty SAND to sandy SILT	120	4.0	52	41	83	42	-	-	14	2.03	16	0.00	0.0
31.99	149.4	116.4	237.8	149.7	6.3	16.6	4.3	9	very stiff fine SOIL	120	2.0	75	58	72	40	-	-	24	2.33	30	0.00	0.0
32.15	240.7	187.3	231.5	241.0	4.9	15.3	2.1	6	clean SAND to silty SAND	125	5.0	48	37	88	43	-	-	12	1.95	16	0.00	0.0
32.32	147.2	114.3	207.6	147.4	5.0	13.8	3.4	5	silty SAND to sandy SILT	120	4.0	37	29	71	40	-	-	21	2.26	16	0.00	0.0
32.48	105.3	81.7	219.6	105.6	5.3	16.9	5.1	9	very stiff fine SOIL	120	2.0	53	41	60	38	-	-	30	2.48	30	0.00	0.0
32.65	87.8	68.0	202.1	88.1	4.4	17.2	5.2	4	clay SILT to silty CLAY	115	2.0	44	34	-	-	6.1	9.9	32	2.54	15	0.00	0.0
32.81	98.9	76.5	196.9	99.2	4.4	17.1	4.5	4	clay SILT to silty CLAY	115	2.0	49	38	-	-	6.9	9.9	29	2.46	15	0.00	0.0
32.97	124.4	96.0	195.1	124.7	4.5	17.1	3.6	5	silty SAND to sandy SILT	120	4.0	31	24	66	39	-	-	23	2.32	16	0.00	0.0
33.14	182.3	140.6	215.5	182.6	5.2	17.8	2.9	5	silty SAND to sandy SILT	120	4.0	46	35	78	41	-	-	17	2.14	16	0.00	0.0
33.30	231.5	178.2	240.3	231.8	5.9	17.0	2.5	5	silty SAND to sandy SILT	120	4.0	58	45	86	42	-	-	14	2.03	16	0.00	0.0
33.47	211.0	162.2	231.8	211.3	5.7	17.7	2.7	5	silty SAND to sandy SILT	120	4.0	53	41	83	42	-	-	15	2.09	16	0.00	0.0
33.63	170.9	131.3	206.7	171.3	4.9	18.5	2.9	5	silty SAND to sandy SILT	120	4.0	43	33	76	41	-	-	18	2.16	16	0.00	0.0
33.79	143.4	110.0	184.7	143.8	4.0	19.1	2.8	5	silty SAND to sandy SILT	120	4.0	36	27	70	40	-	-	19	2.21	16	0.00	0.0
33.96	219.3	167.9	240.7	219.7	6.2	19.2	2.8	5	silty SAND to sandy SILT	120	4.0	55	42	84	42	-	-	15	2.09	16	0.00	0.0
34.12	300.4	229.6	252.9	300.6	4.6	15.0	1.5	6	clean SAND to silty SAND	125	5.0	60	46	94	44	-	-	8	1.79	16	0.00	0.0
34.29	288.3	220.0	276.6	288.7	7.0	21.6	2.4	6	clean SAND to silty SAND	125	5.0	58	44	93	43	-	-	12	1.97	16	0.00	0.0
34.45	236.0	179.9	246.3	236.3	6.3	14.9	2.7	5	silty SAND to sandy SILT	120	4.0	59	45	86	42	-	-	14	2.05	16	0.00	0.0
34.61	120.8	91.9	199.6	121.1	4.7	16.8	3.9	4	clay SILT to silty CLAY	115	2.0	60	46	-	-	8.4	9.9	25	2.36	15	0.00	0.0
34.78	117.5	89.3	146.6	117.9	2.6	18.5	2.2	5	silty SAND to sandy SILT	120	4.0	29	22	63	39	-	-	19	2.19	16	0.37	2.0
34.94	124.3	94.3	200.6	124.7	4.8	18.6	3.9	4	clay SILT to silty CLAY	115	2.0	62	47	-	-	8.7	9.9	24	2.35	15	0.00	0.0
35.11	75.0	45.6	-	75.4	5.6	18.9	7.7	3	silty CLAY to CLAY	115	1.5	50	30	-	-	5.2	9.9	45	2.78	15	-	-
35.27	119.9	90.7	190.4	120.3	4.3	19.5	3.7	4	clay SILT to silty CLAY	115	2.0	60	45	-	-	8.4	9.9	24	2.34	15	0.00	0.0
35.43	126.1	95.3	198.3	126.5	4.7	18.9	3.8	4	clay SILT to silty CLAY	115	2.0	63	48	-	-	8.8	9.9	24	2.34	15	0.00	0.0
35.60	209.4	158.1	232.6	209.8	6.0	19.0	2.9	5	silty SAND to sandy SILT	120	4.0	52	40	82	42	-	-	16	2.11	16	0.00	0.0
35.76	177.1	133.5	223.9	177.5	5.8	19.2	3.3	5	silty SAND to sandy SILT	120	4.0	44	33	77	41	-	-	19	2.20	16	0.00	0.0
35.93	176.4	132.8	197.6	176.8	4.5	20.0	2.6	5	silty SAND to sandy SILT	120	4.0	44	33	76	41	-	-	16	2.12	16	0.00	0.0
36.09	178.3	134.0	228.3	178.7	6.1	20.8	3.4	5	silty SAND to sandy SILT	120	4.0	45	34	77	41	-	-	19	2.21	16	0.00	0.0
36.26	185.2	139.0	226.5	185.6	5.9	21.6	3.2	5	silty SAND to sandy SILT	120	4.0	46	35	78	41	-	-	18	2.18	16	0.00	0.0
36.42	171.2	128.3	201.2	171.6	4.7	22.3	2.8	5	silty SAND to sandy SILT	120	4.0	43	32	75	41	-	-	18	2.16	16	0.00	0.0
36.58	160.4	120.1	205.3	160.9	5.0	22.7	3.2	5	silty SAND to sandy SILT	120	4.0	40	30	73	40	-	-	20	2.22	16	0.00	0.0
36.75	141.8	106.0	212.5	142.2	5.4	22.5	3.9	5	silty SAND to sandy SILT	120	4.0	35	26	69	40	-	-	23	2.32	16	0.00	0.0
36.91	123.4	92.1	199.7	123.8	4.8	22.5	3.9	4	clay SILT to silty CLAY	115	2.0	62	46	-	-	8.6	9.9	25	2.36	15	0.00	0.0
37.08	126.8	94.5	184.2	127.2	4.1	22.4	3.3	5	silty SAND to sandy SILT	120	4.0	32	24	65	39	-	-	23	2.30	16	0.00	0.0
37.24	113.3	84.3	194.4	113.7	4.5	22.4	4.1	4	clay SILT to silty CLAY	115	2.0	57	42	-	-	7.9	9.9	26	2.40	15	0.00	0.0
37.40	116.6	86.7	183.6	117.0	4.1	22.4	3.6	4	clay SILT to silty CLAY	115	2.0	58	43	-	-	8.1	9.9	24	2.35	15	0.00	0.0
37.57	159.8	118.6	211.1	160.2	5.4	22.8	3.4	5	silty SAND to sandy SILT	120	4.0	40	30	73	40	-	-	20	2.24	16	0.00	0.0
37.73	185.5	137.5	219.0	185.9	5.6	23.3	3.1	5	silty SAND to sandy SILT	120	4.0	46	34	78	41	-	-	18	2.17	16	0.00	0.0
37.90	170.5	126.3	206.8	171.0	5.1	23.8	3.0	5	silty SAND to sandy SILT	120	4.0	43	32	75	40	-	-	19	2.19	16	0.00	0.0
38.06	133.8	98.9	196.6	134.2	4.7	23.7	3.6	5	silty SAND to sandy SILT	120	4.0	33	25	67	39	-	-	23	2.31	16	0.00	0.0
38.22	124.6	92.0	172.6	125.1	3.7	23.6	3.0	5	silty SAND to sandy SILT	120	4.0	31	23	64	39	-	-	22	2.28	16	0.00	0.0
38.39	111.3	82.0	182.6	111.7	4.1	23.5	3.7	4	clay SILT to silty CLAY	115	2.0	56	41	-	-	7.7	9.9	26	2.38	15	0.00	0.0
38.55	98.6	72.6	190.2	99.0	4.3	23.3	4.4	4	clay SILT to silty CLAY	115	2.0	49	36	-	-	6.8	9.9	29	2.47	15	0.00	0.0
38.72	100.0	73.6	189.4	100.5	4.2	23.2	4.3	4	clay SILT to silty CLAY	115	2.0	50	37	-	-	6.9	9.9	29	2.46	15	0.00	0.0
38.88	123.6	90.8	187.7	124.1	4.3	23.2	3.6	5	silty SAND to sandy SILT	120	4.0	31	23	64	39	-	-	24	2.34	16	0.00	0.0
39.04	122.7	90.0	197.2	123.2	4.7	23.0	3.9	4	clay SILT to silty CLAY	115	2.0	61	45	-	-	8.5	9.9	25	2.37	15	0.00	0.0
39.21	108.4	79.4	179.4	108.9	3.9	23.2	3.7	4	clay SILT to silty CLAY	115	2.0	54	40	-	-	7.5	9.9	26	2.39	15	0.00	0.0
39.37	111.8	81.8	193.5	112.3	4.5	23.4	4.1	4	clay SILT to silty CLAY	115	2.0	56	41	-	-	7.8	9.9	27	2.41	15	0.00	0.0
39.54	138.1	100.9	195.6	138.5	4.7	23.7	3.5	5	silty SAND to sandy SILT	120	4.0	35	25	67	39	-	-	22	2.30	16	0.00	0.0
39.70	158.3	115.6	131.1	158.8	1.4	24.3	0.9	6	clean SAND to silty SAND	125	5.0	32	23	72	40	-	-	9	1.84	16	1.24	5.2
39.86	153.5	111.9	186.9	154.0	4.3	24.3	2.9	5	silty SAND to sandy SILT	120	4.0	38	28	71	40	-	-	19	2.20	16	0.00	0.0
40.03	63.9	35.9	-	64.4	5.2	24.4	8.4	3	silty CLAY to CLAY	115	1.5	43	24	-	-	4.4	9.9	51	2.89	15	-	-
40.19	142.7	103.8	191.5	143.2	4.6	24.5	3.3	5	silty SAND to sandy SILT	120	4.0	36	26	68	39	-	-	21	2.27	16	0.00	0.0
40.36	153.4	111.4	204.1	153.8	5.1	24.2	3.4	5	silty SAND to sandy SILT	120	4.0	38	28	71	40	-	-	21	2.26	16	0.00	0.0
40.52	138.5	100.5	187.3	139.0	4.4	24.7	3.2	5	silty SAND to sandy SILT	120	4.0	35	25	67	39	-	-	22	2.27	16	0.00	0.0
40.68	143.2	103.7	207.7	143.7	5.3	24.8	3.8	5	silty SAND to sandy SILT	120	4.0	36	26	68	39	-	-	23	2.32	16	0.00	0.0
40.85	139.4	100.9	195.7	139.9	4.8	24.7	3.5	5	silty SAND to sandy SILT	120	4.0	35	25	67	39	-	-	22	2.30	16	0.00	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Geotechnical soil samples obtained from the borings were carefully packaged in the field to reduce moisture loss and disturbance. The samples were subsequently delivered to our laboratory where they were further examined and classified. Selected representative samples were tested to evaluate moisture content, in-situ dry density, grain-size distribution, plasticity index, shear strength, corrosivity, and R-value. Tests discussed below were performed in accordance with the latest American Society of Testing and Materials (ASTM) and California Test (CT) standards.

Moisture Content and In-situ Density Tests (ASTM D2216 and D2937)

The moisture content and in-situ density tests were performed on selected soil samples obtained from the borings. Moisture content and in-situ density tests were performed in accordance with ASTM Test Method D2216 and D2937, respectively. The test results are presented on the logs of borings in Appendix B.

Wash Analyses (ASTM D1140)

Percent passing No. 200 sieve tests were performed on selected soils samples obtained from the borings. There tests were performed in accordance with ASTM Test Method D1140 to aid in classification of the soils and to help in evaluating the liquefaction potential of the soils. Test results are presented on the logs of boring in Appendix B.

Atterberg Limits Tests (ASTM D4318)

Atterberg Limits tests were performed to aid in classification and to evaluate the plasticity characteristics of fine-grained materials encountered in the borings. The tests were performed in accordance with ASTM Test Method D4318. The results of this test are presented in this appendix and also on the logs of borings in Appendix B.

Direct Shear Test (ASTM D3080)

One consolidated-drained (saturated) direct shear test was performed on a selected undisturbed sample to evaluate shear-strength parameters of the on-site soils. The direct-shear test was performed in accordance with ASTM Test Method D3080.

Consolidation Test (ASTM D2435)

Consolidation tests were performed to determine the magnitude and rate of volume decrease that a laterally confined soil specimen undergoes when subjected to different vertical pressures. The tests were performed in accordance with ASTM Test Method D2435.

Consolidated Undrained Triaxial Compression Test (ASTM D4767)

Consolidated undrained triaxial compression tests were performed on selected undisturbed samples to evaluate shear-strength parameters of the on-site tar sand. Selected soil samples were delivered to AP Engineering and Testing, Inc. (AP) in Pomona, California to perform the triaxial compression test in accordance with ASTM Test Method D4767.

Expansion Index (ASTM D4829)

Expansion index (EI) tests were performed on selected samples to evaluate expansion characteristics of the soils. The test was performed in accordance with ASTM D4829.

Compaction Test (ASTM D1557)

A compaction test was performed on a representative bulk sample of the near-surface soils in order to evaluate compaction characteristics of the soils. The test was performed in accordance with ASTM Test Method D1557.

Corrosivity Tests (CTM 417, 422, and 643)

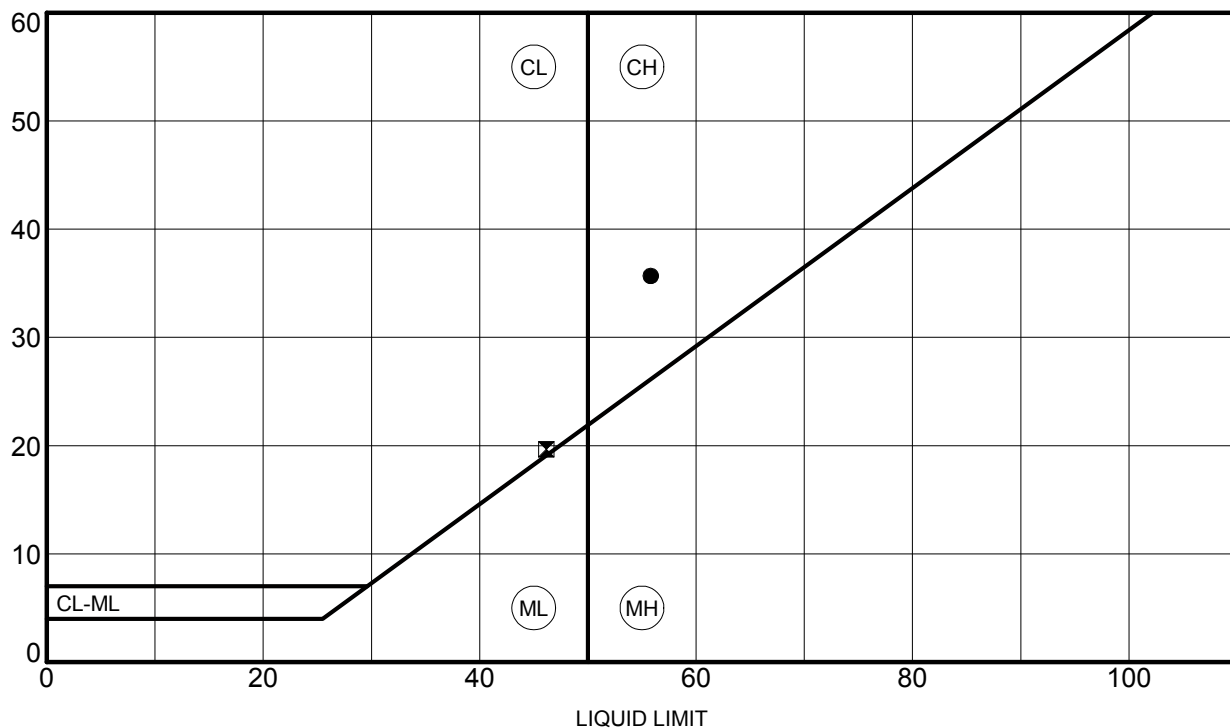
Selected representative samples obtained from the borings were tested for corrosion. The subject soil samples were processed with the U.S. Standard No. 8 Sieve and tested for pH (CTM 643), Sulfate Ion Content (CTM 417), Chloride Ion Content (CTM 422), and resistivity (CTM 643).

R-Value (ASTM D2844)

An R-value test was performed on a bulk sample of near-surface soils to obtain pavement design parameters. The test was performed by AP in accordance with ASTM Test Method D2844.

Tar (Asphalt) Content Test (CTM 382)

Tar (asphalt) content tests were performed on selected samples to determine the tar (asphalt) binder content. The test was performed in accordance with CTM 382. The results of this test are presented on the logs of borings in Appendix B.

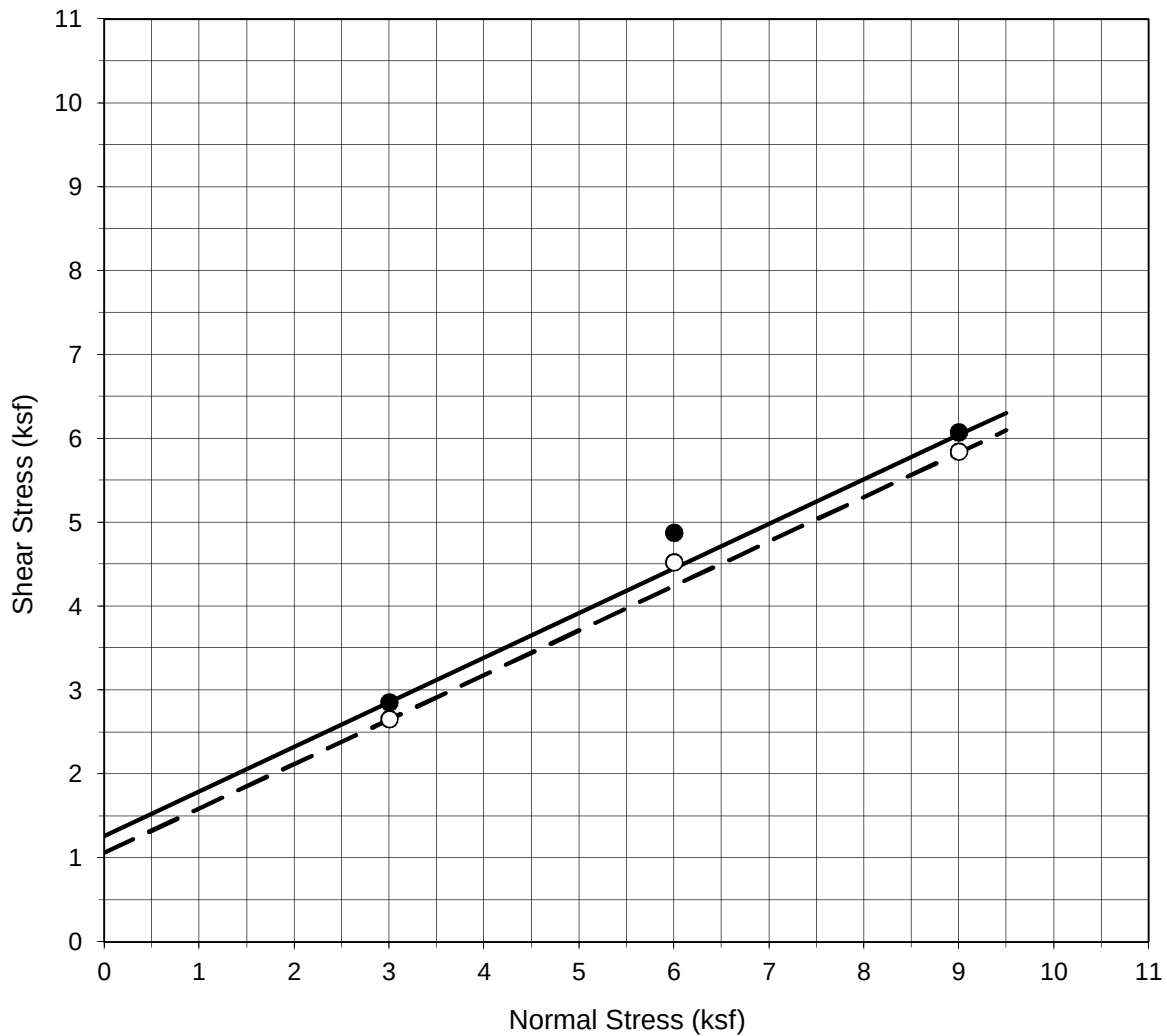
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ATTERBERG LIMITS' RESULTS

Project: LACMA Phase III Transformation Project

Location: 5905 Wilshire Blvd, Los Angeles, CA

Number: 60440464



SAMPLE	SAMPLE NO.	DEPTH (ft)	STRAIN RATE (in/min)	NORMAL STRESS (ksf)	PEAK STRESS (ksf)	ULTIMATE STRESS (ksf)
B-15-2	2B	11	0.005	3.000	2.856	2.652
				6.000	4.872	4.524
				9.000	6.072	5.844

Sample Description: Clayey SAND (SC)

Sample Type: Undisturbed

Test Condition: Saturated

Initial Dry Density: 99 pcf

Moisture Content: (before) 21% (after) 25 %

INTERPRETED STRENGTH DATA	PEAK	ULTIMATE
COHESION (psf)	1250	1050
FRICTION ANGLE (deg)	28 °	28 °

DIRECT SHEAR TEST RESULTS

CONSOLIDATED DRAINED

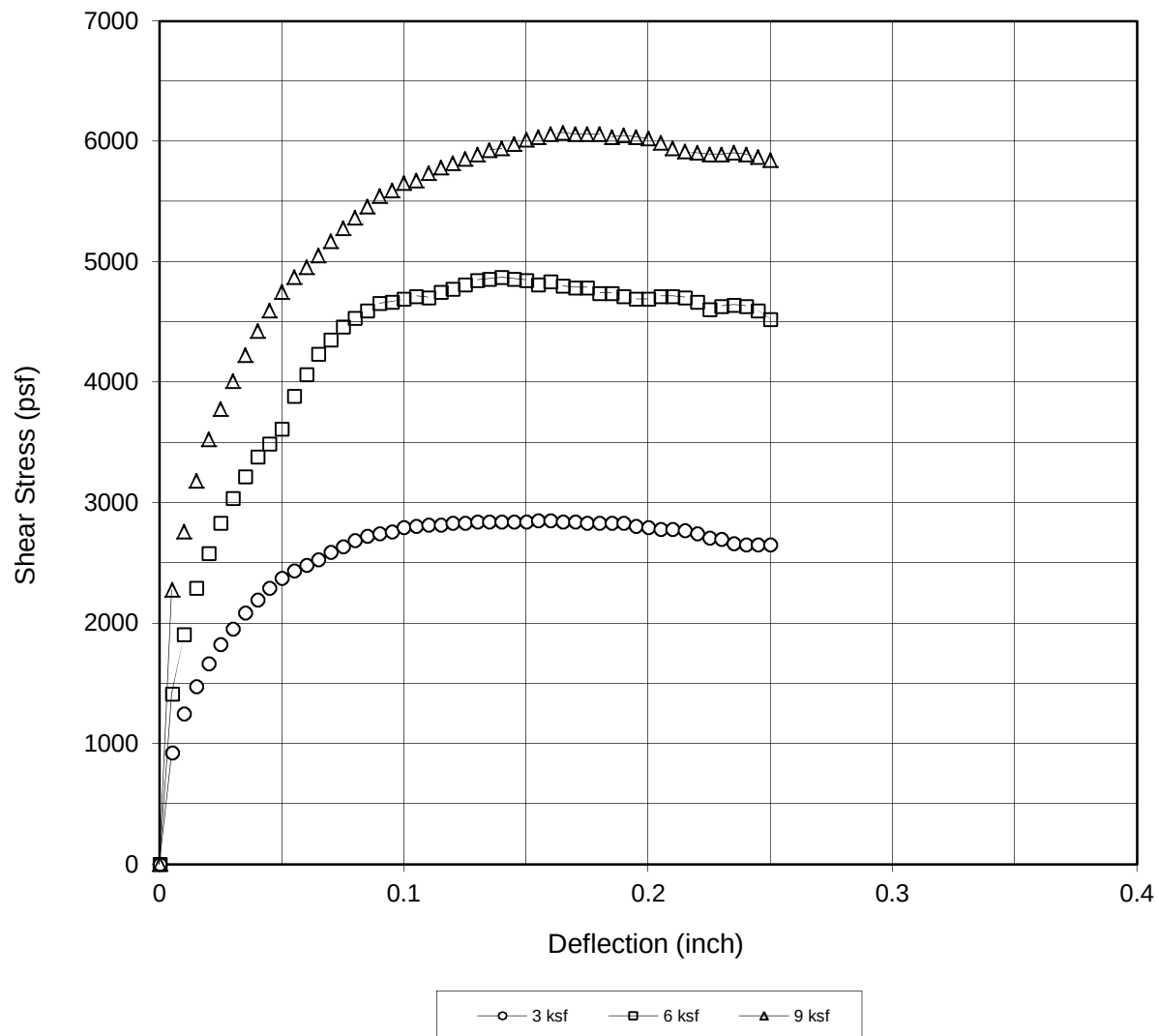
ASTM D3080

Phase III Transformation Project

Los Angeles County Museum of Art

5905 Wilshire Boulevard, Los Angeles, California





BORING NO.	SAMPLE NO.	DEPTH (ft)	STRAIN RATE (in/min)	NORMAL STRESS (psf)	PEAK STRESS (psf)	ULTIMATE STRESS (psf)
B-15-2	2B	11	0.005	3000	2856	2652
				6000	4872	4524
				9000	6072	5844

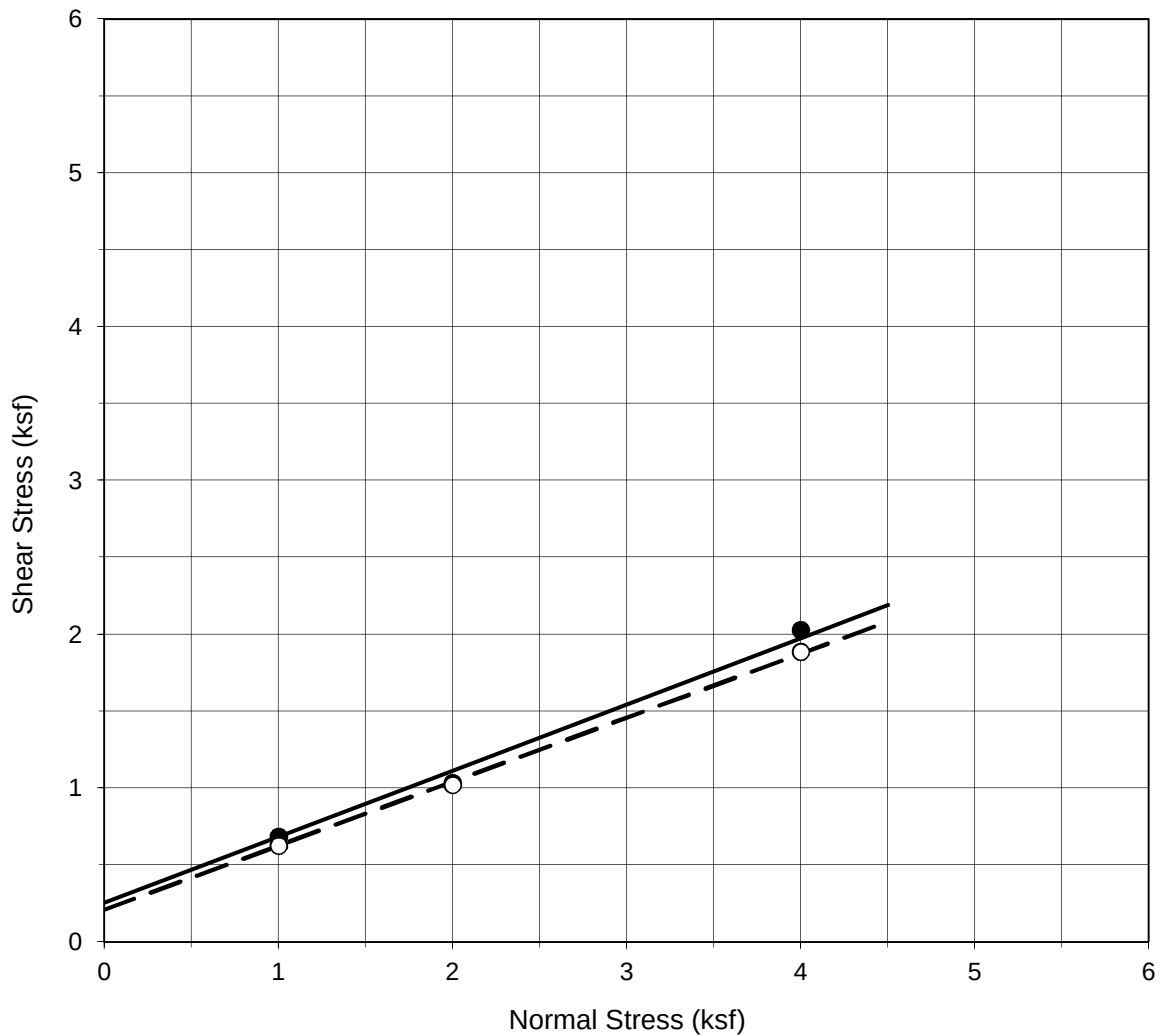
Sample Description: Clayey SAND (SC)

Sample Type: Saturated

SHEAR STRESS VS DISPLACEMENT

DIRECT SHEAR TEST RESULTS
CONSOLIDATED DRAINED
ASTM D3080

Phase III Transformation Project
Los Angeles County Museum of Art
5905 Wilshire Boulevard, Los Angeles, California



SAMPLE	SAMPLE NO.	DEPTH (ft)	STRAIN RATE (in/min)	NORMAL STRESS (ksf)	PEAK STRESS (ksf)	ULTIMATE STRESS (ksf)
B-15-4	2B	11	0.002	1.000	0.684	0.624
				2.000	1.032	1.020
				4.000	2.028	1.884

Sample Description: Sandy Lean CLAY (CL)

Sample Type: Undisturbed

Test Condition: Saturated

Initial Dry Density: 89 pcf

Moisture Content: (before) 25% (after) 32 %

INTERPRETED STRENGTH DATA	PEAK	ULTIMATE
COHESION (psf)	250	200
FRICTION ANGLE (deg)	23 °	23 °

DIRECT SHEAR TEST RESULTS

CONSOLIDATED DRAINED

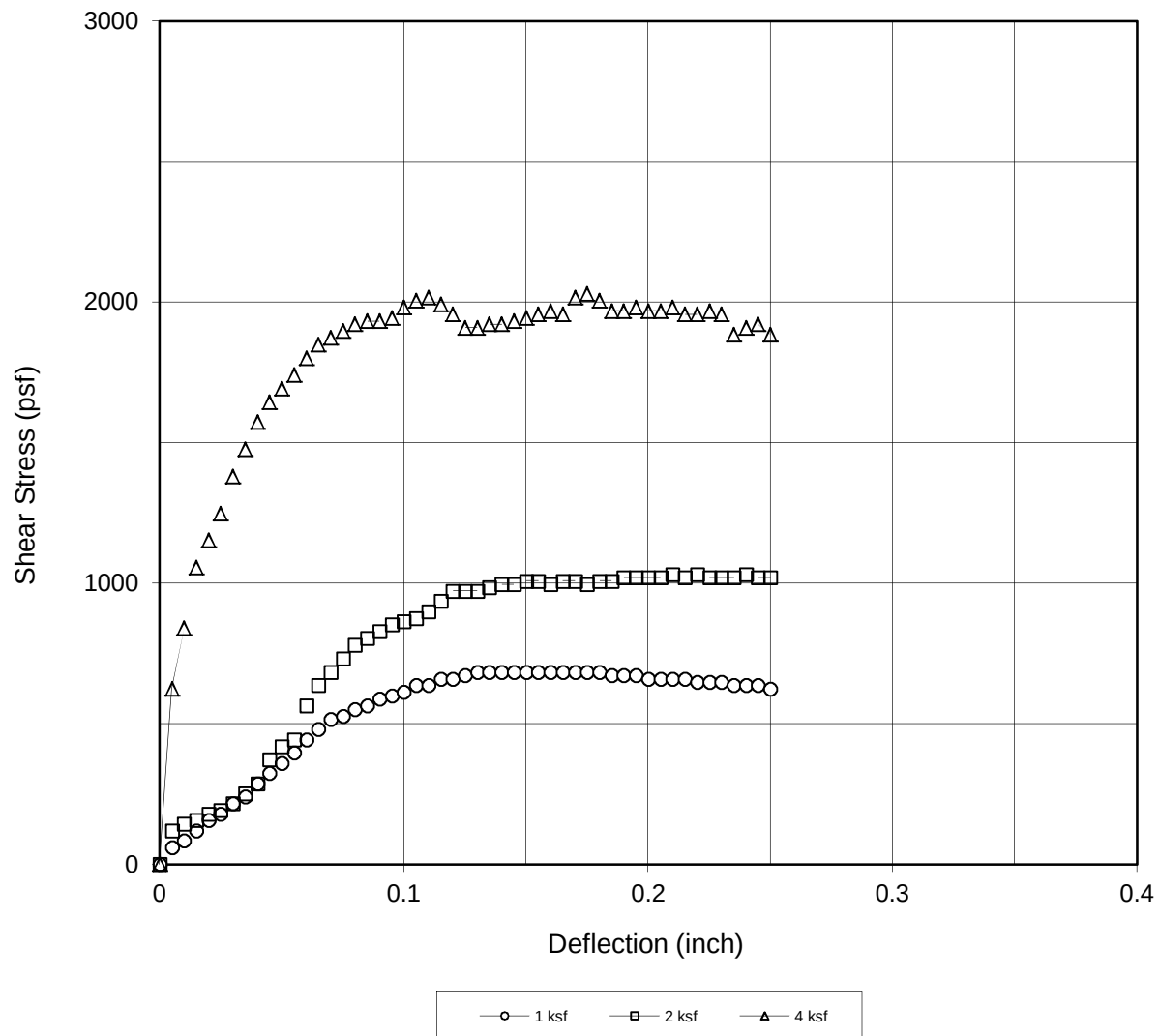
ASTM D3080

Phase III Transformation Project

Los Angeles County Museum of Art

5905 Wilshire Boulevard, Los Angeles, California





BORING NO.	SAMPLE NO.	DEPTH (ft)	STRAIN RATE (in/min)	NORMAL STRESS (psf)	PEAK STRESS (psf)	ULTIMATE STRESS (psf)
B-15-4	2B	11	0.002	1000	684	624
				2000	1032	1020
				4000	2028	1884

Sample Description: Sandy Lean CLAY (CL)

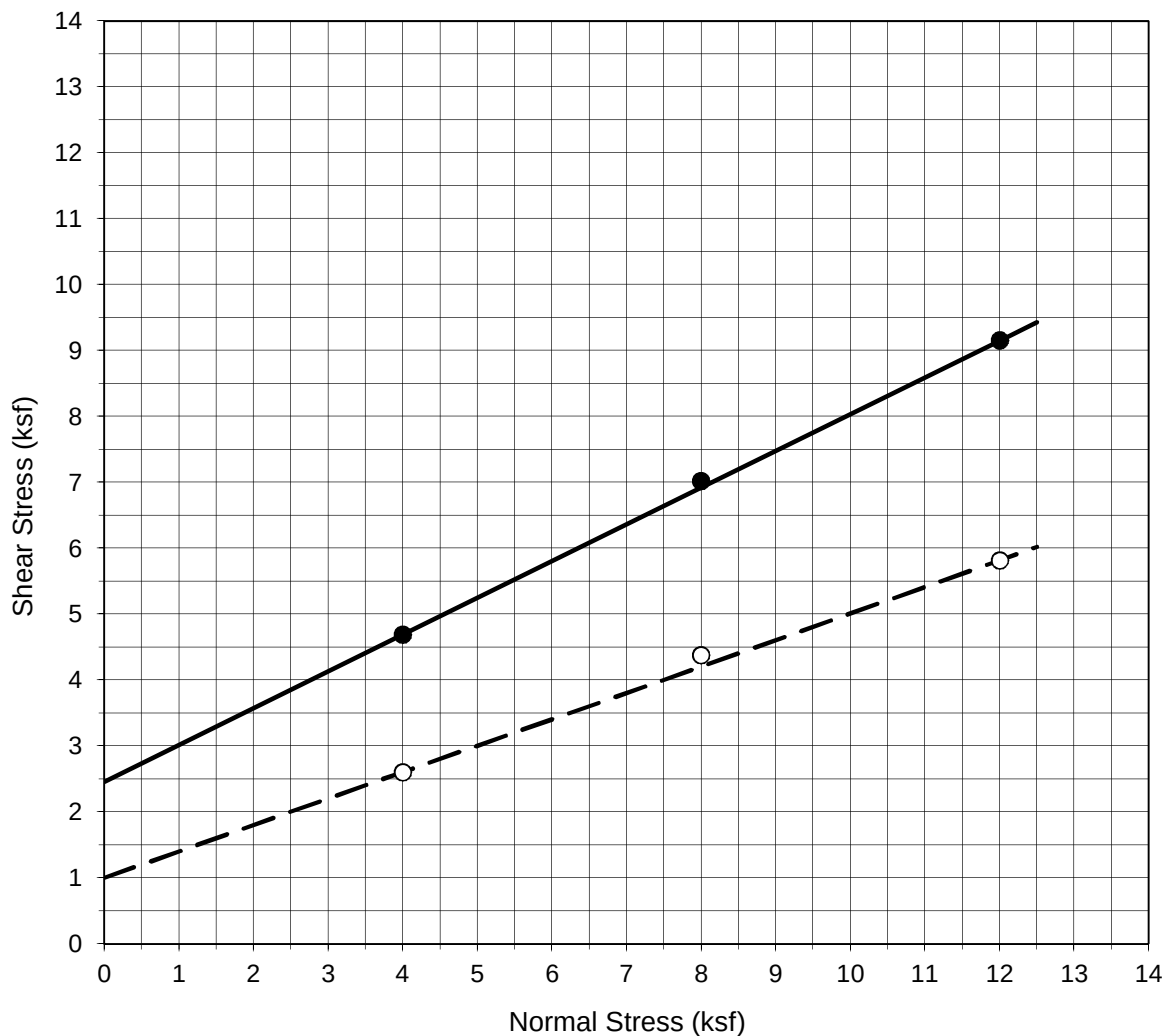
Sample Type: Saturated

SHEAR STRESS VS DISPLACEMENT

DIRECT SHEAR TEST RESULTS
CONSOLIDATED DRAINED
ASTM D3080

Phase III Transformation Project
Los Angeles County Museum of Art
5905 Wilshire Boulevard, Los Angeles, California





SAMPLE	SAMPLE NO.	DEPTH (ft)	STRAIN RATE (in/min)	NORMAL STRESS (ksf)	PEAK STRESS (ksf)	ULTIMATE STRESS (ksf)
B-15-4	14B	71	0.002	4.000	4.692	2.604
				8.000	7.020	4.376
				12.000	9.155	5.820

Sample Description: CLAY (CL)

Sample Type: Undisturbed

Test Condition: Saturated

Initial Dry Density: 80 pcf

Moisture Content: (before) 28% (after) 37 %

INTERPRETED STRENGTH DATA	PEAK	ULTIMATE
COHESION (psf)	2450	1000
FRICTION ANGLE (deg)	29 °	22 °

DIRECT SHEAR TEST RESULTS

CONSOLIDATED DRAINED

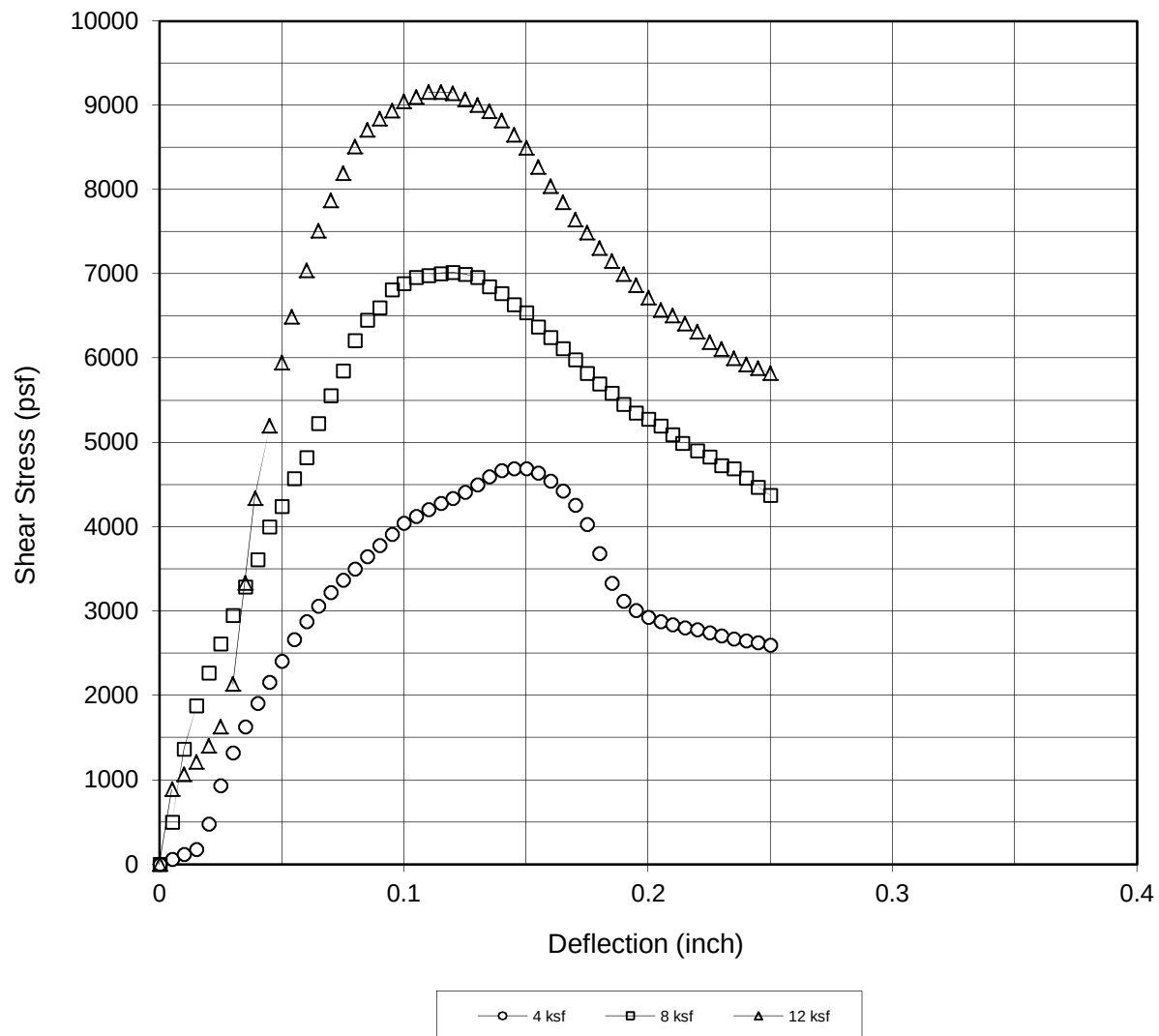
ASTM D3080

Phase III Transformation Project

Los Angeles County Museum of Art

5905 Wilshire Boulevard, Los Angeles, California





BORING NO.	SAMPLE NO.	DEPTH (ft)	STRAIN RATE (in/min)	NORMAL STRESS (psf)	PEAK STRESS (psf)	ULTIMATE STRESS (psf)
B-15-4	14B	71	0.002	4000	4692	2604
				8000	7020	4376
				12000	9155	5820

Sample Description: CLAY (CL)

Sample Type: Saturated

SHEAR STRESS VS DISPLACEMENT

DIRECT SHEAR TEST RESULTS
CONSOLIDATED DRAINED
ASTM D3080

Phase III Transformation Project
Los Angeles County Museum of Art
5905 Wilshire Boulevard, Los Angeles, California



CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	LACMA	Tested by:	ST	Date:	09-30-16
Project No.:	N/A	Input Data by:	JP	Date:	10-06-16
Boring No.:	B-15-1	Reviewed by:	AP	Date:	10-07-16
Sample No.:	8	Sample Description:	Tar Sand		
Depth (ft.):	40				
Sample Type:	Mod Cal	Confining Pressure =	5,000 psf		

Diameter (in)	2.375	2.377	2.376	Avg. =	2.376
Height (in)	6.011	6.011	6.011	Avg. =	6.011

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in ²)	4.434	4.373
Moisture Content (%)	1.40	3.57
Wet Weight (gms)	836.85	999.09
Dry Weight (gms)	825.26	969.64
Container Weight (gms)	0.00	144.38
Density and Saturation		
Wet Weight (gms)	836.85	
Container Weight (gms)	0.00	
Wet Density (pcf)	119.6	
Dry Density (pcf)	118.0	
Initial Void Ratio	0.428	
% Water Saturation	8.9	

Assumed Specific Gravity = 2.70

Back Pressure Saturation

B Value (%) = [96](#)

Consolidation

Cell Pressure (psi) =	84.7	Initial Burette Ht.(cm)=	60.9
Back Pressure(psi) =	50.0	Final Burette Ht.(cm)=	53.5
Eff. Consol. Stress (psi) =	34.7	Final Height (in)=	5.992
Induced OCR =	1.0	Initial Volume (cu.in)=	26.652
Change in Ht. of Specimen (in) =	0.0195	Final Volume (cu.in) =	26.200

Shear

Rate of Deformation (in/min)=	0.004	At Failure	
Time to 50% primary Consolidation (min) =	15	Deviator Stress (ksf) =	29.76
Failure Mode: Shear Failure		Eff. Minor Principal stress (ksf) =	12.07
		Eff. Major Principal stress (ksf) =	41.83
		Axial Strain (%) =	12.27

**AP Engineering and Testing, Inc.**

DBE | MBE | SBE

2607 Pomona Boulevard | Pomona, CA 91768

t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com**CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT**

Project Name: LACMA
 Project No.: N/A
 Boring No.: B-15-1
 Sample No.: 8
 Depth (ft.): 40
 Sample Type: Mod Cal
 Sample Description: Tar Sand

Cell Pressure: 84.7 psi
 Back Pressure : 50.0 psi
 Consolidation Pressure : 34.7 psi
 Initial Sample Height: 6.011 in
 Initial Area of Sample: 4.434 sq. in.
 Final Sample Ht.* (L): 5.992 in
 Final Sample Area (A)*: 4.373 sq. in.
 Induced OCR= 1.0

Cell Pressure	Load	Axial Deformation	Back Pressure	Deviator Stress	Axial Strain	Pore Pressure Change	Shear Stress q'	Normal Stress p'
(psi)	(lbs)	(in)	(psi)	(S1-S3) (ksf)	(%)	(ksf)	(S1-S3)/2 (ksf)	(S1'+S3')/2 (ksf)
84.7	0	0.000	50.0	0.00	0.00	0.00	0.00	5.00
84.7	83	0.006	55.2	2.73	0.10	0.75	1.37	5.61
84.7	100	0.012	57.3	3.29	0.20	1.05	1.64	5.59
84.7	112	0.016	58.9	3.68	0.27	1.29	1.84	5.55
84.7	123	0.024	60.3	4.03	0.40	1.48	2.02	5.53
84.7	131	0.030	61.2	4.29	0.50	1.62	2.15	5.52
84.7	140	0.036	62.1	4.58	0.60	1.74	2.29	5.54
84.7	148	0.042	62.7	4.84	0.70	1.83	2.42	5.59
84.7	156	0.048	63.1	5.10	0.80	1.89	2.55	5.65
84.7	164	0.054	63.4	5.35	0.90	1.93	2.68	5.75
84.7	173	0.060	63.5	5.64	1.00	1.94	2.82	5.87
84.7	216	0.090	62.6	7.01	1.50	1.81	3.50	6.69
84.7	258	0.120	60.4	8.33	2.00	1.49	4.16	7.67
84.7	345	0.183	54.3	11.01	3.05	0.62	5.51	9.88
84.7	416	0.228	48.9	13.18	3.80	-0.16	6.59	11.75
84.7	486	0.276	43.3	15.27	4.60	-0.96	7.63	13.59
84.7	558	0.321	37.7	17.39	5.36	-1.78	8.70	15.47
84.7	628	0.368	32.2	19.41	6.14	-2.56	9.71	17.26
84.7	697	0.414	26.6	21.37	6.91	-3.37	10.68	19.05
84.7	766	0.459	21.3	23.29	7.66	-4.13	11.65	20.78
84.7	826	0.506	15.9	24.90	8.44	-4.90	12.45	22.35
84.7	887	0.552	10.9	26.52	9.21	-5.63	13.26	23.89
84.7	941	0.596	6.5	27.90	9.95	-6.27	13.95	25.22
84.7	983	0.644	3.0	28.89	10.75	-6.78	14.45	26.22
84.7	1016	0.688	1.3	29.62	11.48	-7.01	14.81	26.81
84.7	1030	0.735	0.9	29.76	12.27	-7.07	14.88	26.95
84.7	1030	0.782	0.7	29.49	13.06	-7.09	14.74	26.83
84.7	1010	0.828	1.2	28.67	13.81	-7.03	14.33	26.36
84.7	976	0.875	2.6	27.45	14.60	-6.83	13.72	25.55
84.7	945	0.922	4.3	26.33	15.39	-6.58	13.16	24.74
84.7	936	0.967	5.9	25.85	16.14	-6.35	12.92	24.27
84.7	929	1.016	7.4	25.41	16.95	-6.13	12.70	23.83
84.7	932	1.062	8.7	25.25	17.72	-5.95	12.63	23.58
84.7	938	1.108	9.7	25.18	18.49	-5.80	12.59	23.39
84.7	935	1.155	10.7	24.85	19.28	-5.66	12.43	23.08
84.7	944	1.200	11.6	24.86	20.03	-5.53	12.43	22.96

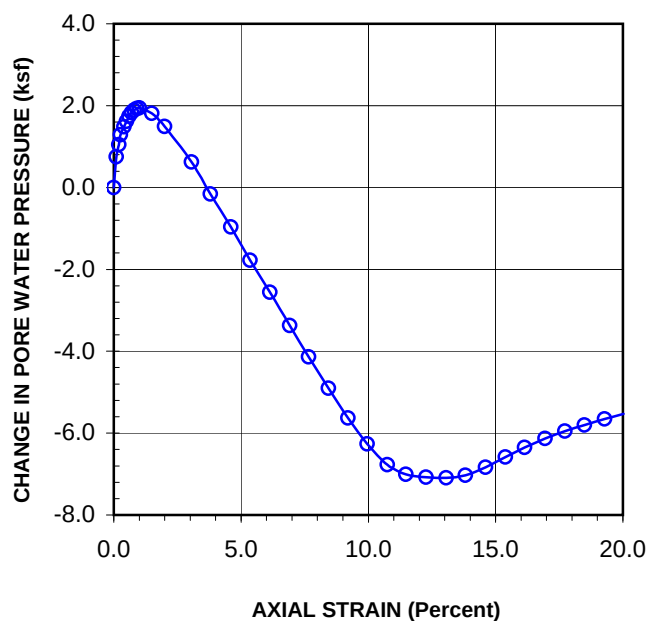
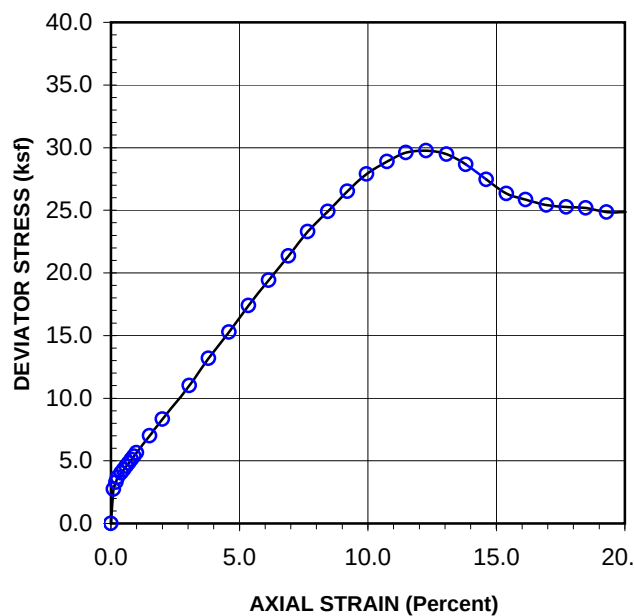


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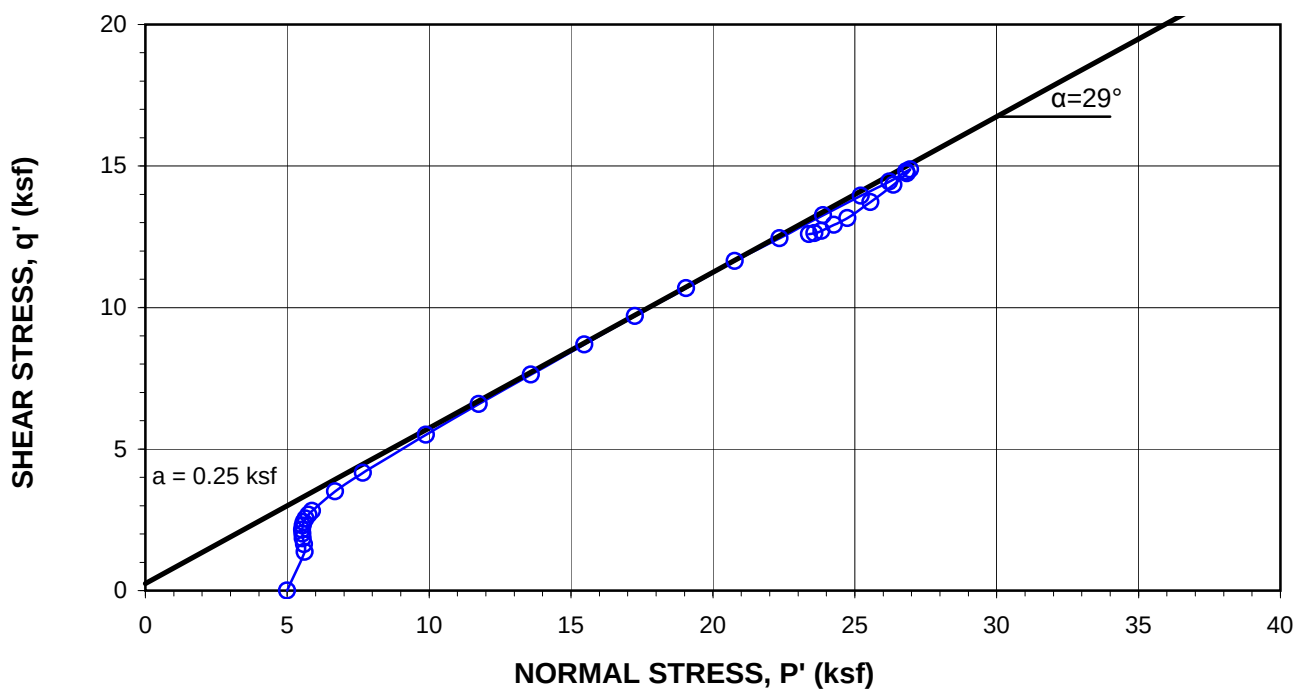
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Legend:

—○— Confining Pressure = 5,000 psf



Project Name: LACMA
Project No.: N/A
Boring No.: B-15-1
Sample No.: 8
Depth (ft.): 40

Sample Type: Mod Cal
Sample Description: Tar Sand
Dry Unit Weight (pcf): 118.0
Initial Moisture Content (%): 1.4
Confining Pressure: 5,000 psf

CU TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT
ASTM D 4767



CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	LACMA	Tested by:	ST	Date:	09-29-16
Project No.:	N/A	Input Data by:	JP	Date:	10-06-16
Boring No.:	B-15-2	Reviewed by:	AP	Date:	10-07-16
Sample No.:	4B	Sample Description:	Tar Sand		
Depth (ft.):	21.5				
Sample Type:	Mod Cal	Confining Pressure =	3,000 psf		

Diameter (in)	<u>2.400</u>	<u>2.400</u>	<u>2.400</u>	Avg. =	2.400
Height (in)	<u>4.851</u>	<u>4.851</u>	<u>4.851</u>	Avg. =	4.851

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in ²)	4.524	4.511
Moisture Content (%)	12.71	16.29
Wet Weight (gms)	636.46	799.32
Dry Weight (gms)	564.71	707.35
Container Weight (gms)	0.00	142.64
Density and Saturation		
Wet Weight (gms)	636.46	
Container Weight (gms)	0.00	
Wet Density (pcf)	110.5	
Dry Density (pcf)	98.0	
Initial Void Ratio	0.719	
% Water Saturation	47.7	

Assumed Specific Gravity = 2.70

Back Pressure Saturation

B Value (%) = 95

Consolidation

Cell Pressure (psi) =	60.8	Initial Burette Ht.(cm)=	60.9
Back Pressure(psi) =	40.0	Final Burette Ht.(cm)=	53.1
Eff. Consol. Stress (psi) =	20.8	Final Height (in)=	4.760
Induced OCR =	1.0	Initial Volume (cu.in)=	21.945
Change in Ht. of Specimen (in) =	0.0914	Final Volume (cu.in) =	21.470

Shear

Rate of Deformation (in/min)=	0.004	At Failure	
Time to 50% primary Consolidation (min) =	15	Deviator Stress (ksf) =	11.10
Failure Mode: Bulging Failure		Eff. Minor Principal stress (ksf) =	3.89
		Eff. Major Principal stress (ksf) =	14.98
		Axial Strain (%) =	17.62

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Project Name: LACMA
Project No.: N/A
Boring No.: B-15-2
Sample No.: 4B
Depth (ft.): 21.5
Sample Type: Mod Cal
Sample Description: Tar Sand

Cell Pressure: 60.8 psi
Back Pressure : 40.0 psi
Consolidation Pressure : 20.8 psi
Initial Sample Height: 4.851 in
Initial Area of Sample: 4.524 sq. in.
Final Sample Ht.* (L): 4.760 in
Final Sample Area (A)*: 4.511 sq. in.
Induced OCR= 1.0

Cell Pressure	Load	Axial Deformation	Back Pressure	Deviator Stress	Axial Strain	Pore Pressure Change	Shear Stress q' (S1-S3)/2	Normal Stress p' (S1'+S3')/2
(psi)	(lbs)	(in)	(psi)	(ksf) (S1-S3)	(%)	(ksf)	(ksf)	(ksf)
60.8	0	0.000	40.0	0.00	0.00	0.00	0.00	3.00
60.8	58	0.006	44.0	1.85	0.13	0.57	0.92	3.35
60.8	68	0.012	46.8	2.17	0.25	0.97	1.08	3.10
60.8	73	0.016	49.3	2.32	0.34	1.34	1.16	2.82
60.8	78	0.024	50.8	2.48	0.50	1.56	1.24	2.68
60.8	82	0.030	51.9	2.60	0.63	1.72	1.30	2.58
60.8	86	0.036	52.7	2.72	0.76	1.82	1.36	2.53
60.8	90	0.042	53.3	2.85	0.88	1.91	1.42	2.51
60.8	94	0.048	53.7	2.97	1.01	1.97	1.49	2.51
60.8	98	0.054	54.0	3.09	1.13	2.02	1.55	2.53
60.8	102	0.060	54.2	3.22	1.26	2.04	1.61	2.56
60.8	125	0.090	54.2	3.91	1.89	2.05	1.96	2.91
60.8	149	0.120	53.5	4.64	2.52	1.95	2.32	3.37
60.8	206	0.185	50.7	6.32	3.90	1.54	3.16	4.62
60.8	243	0.231	48.3	7.38	4.84	1.19	3.69	5.50
60.8	276	0.278	45.9	8.30	5.85	0.85	4.15	6.29
60.8	304	0.322	43.7	9.05	6.75	0.53	4.52	6.99
60.8	324	0.370	41.8	9.54	7.77	0.26	4.77	7.50
60.8	344	0.417	40.3	10.02	8.75	0.04	5.01	7.97
60.8	358	0.462	39.0	10.32	9.70	-0.15	5.16	8.30
60.8	369	0.511	37.8	10.52	10.74	-0.31	5.26	8.57
60.8	382	0.557	36.9	10.77	11.70	-0.44	5.38	8.82
60.8	389	0.604	36.1	10.84	12.69	-0.56	5.42	8.98
60.8	397	0.652	35.4	10.94	13.70	-0.66	5.47	9.13
60.8	406	0.697	34.9	11.06	14.65	-0.73	5.53	9.26
60.8	410	0.746	34.5	11.04	15.66	-0.80	5.52	9.31
60.8	416	0.793	34.1	11.07	16.67	-0.86	5.53	9.38
60.8	422	0.839	33.8	11.10	17.62	-0.89	5.55	9.44
60.8	425	0.887	33.5	11.04	18.64	-0.94	5.52	9.46
60.8	432	0.933	33.2	11.09	19.61	-0.99	5.54	9.53
60.8	435	0.980	33.0	11.03	20.59	-1.01	5.51	9.52
60.8	440	1.029	32.6	11.01	21.61	-1.06	5.51	9.56

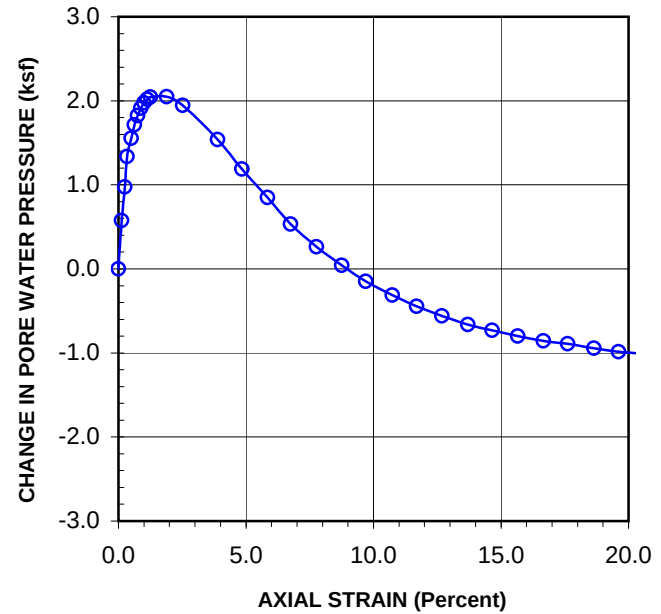
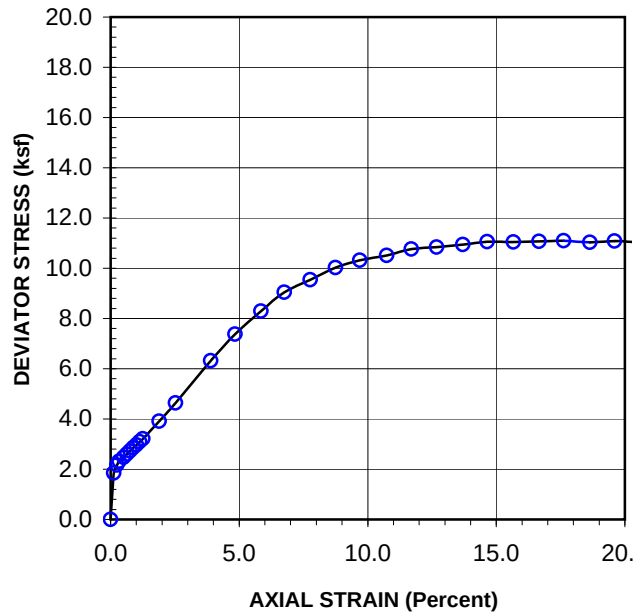


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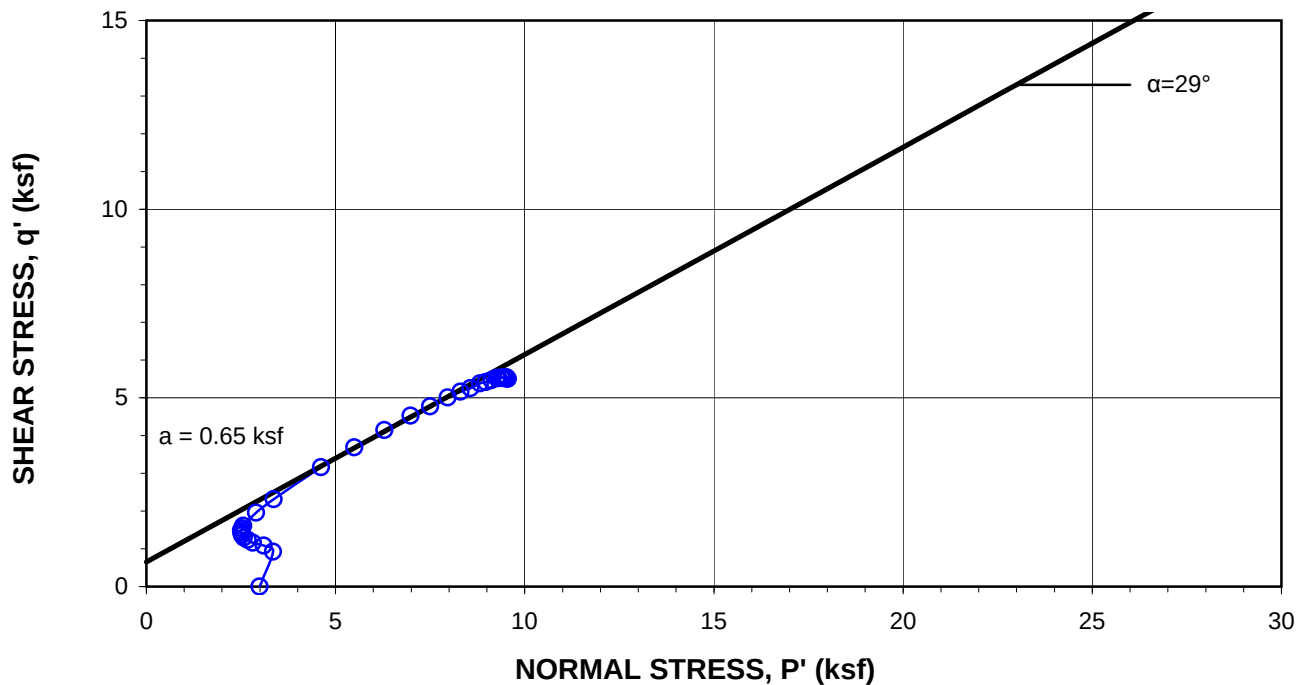
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Legend:

—○— Confining Pressure = 3,000 psf



Project Name: LACMA
Project No.: N/A
Boring No.: B-15-2
Sample No.: 4B
Depth (ft.): 21.5

Sample Type: Mod Cal
Sample Description: Tar Sand
Dry Unit Weight (pcf): 98.0
Initial Moisture Content (%): 12.7
Confining Pressure: 3,000 psf

CU TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT
ASTM D 4767

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Test Procedure: ASTM D 4767

Project Name:	LACMA	Tested by:	ST	Date:	09-30-16
Project No.:	N/A	Input Data by:	JP	Date:	10-06-16
Boring No.:	B-15-2	Reviewed by:	AP	Date:	10-07-16
Sample No.:	8A	Sample Description:	Tar Sand		
Depth (ft.):	42				
Sample Type:	Mod Cal	Confining Pressure =	5,500 psf		

Diameter (in)	2.397	2.397	2.397	Avg. =	2.397
Height (in)	5.463	5.463	5.463	Avg. =	5.463

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in ²)	4.513	4.470
Moisture Content (%)	2.88	5.66
Wet Weight (gms)	806.01	979.51
Dry Weight (gms)	783.48	935.15
Container Weight (gms)	0.00	151.67
Density and Saturation		
Wet Weight (gms)	806.01	
Container Weight (gms)	0.00	
Wet Density (pcf)	124.6	
Dry Density (pcf)	121.1	
Initial Void Ratio	0.392	
% Water Saturation	19.8	

Assumed Specific Gravity = 2.70

Back Pressure SaturationB Value (%) = [96](#)**Consolidation**

Cell Pressure (psi) =	78.2	Initial Burette Ht.(cm)=	61.6
Back Pressure(psi) =	40.0	Final Burette Ht.(cm)=	53.5
Eff. Consol. Stress (psi) =	38.2	Final Height (in)=	5.405
Induced OCR =	1.0	Initial Volume (cu.in)=	24.652
Change in Ht. of Specimen (in) =	0.0582	Final Volume (cu.in) =	24.158

ShearAt Failure

Rate of Deformation (in/min)=	0.004	Deviator Stress (ksf) =	21.91
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	8.92
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	30.83
		Axial Strain (%) =	22.20

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Project Name: LACMA
Project No.: N/A
Boring No.: B-15-2
Sample No.: 8A
Depth (ft.): 42
Sample Type: Mod Cal
Sample Description: Tar Sand

Cell Pressure: 78.2 psi
Back Pressure : 40.0 psi
Consolidation Pressure : 38.2 psi
Initial Sample Height: 5.463 in
Initial Area of Sample: 4.513 sq. in.
Final Sample Ht.* (L): 5.405 in
Final Sample Area (A)*: 4.470 sq. in.
Induced OCR= 1.0

Cell Pressure	Load	Axial Deformation	Back Pressure	Deviator Stress	Axial Strain	Pore Pressure Change	Shear Stress q'	Normal Stress p'
(psi)	(lbs)	(in)	(psi)	(S1-S3) (ksf)	(%)	(ksf)	(S1-S3)/2 (ksf)	(S1'+S3')/2 (ksf)
78.2	0	0.000	40.0	0.00	0.00	0.00	0.00	5.50
78.2	59	0.006	49.3	1.90	0.11	1.33	0.95	5.12
78.2	84	0.012	54.7	2.70	0.22	2.11	1.35	4.74
78.2	100	0.016	57.9	3.21	0.30	2.57	1.61	4.54
78.2	102	0.024	60.1	3.27	0.44	2.89	1.64	4.25
78.2	103	0.030	61.7	3.30	0.56	3.12	1.65	4.03
78.2	104	0.036	62.6	3.33	0.67	3.26	1.66	3.91
78.2	105	0.044	63.6	3.36	0.81	3.40	1.68	3.78
78.2	119	0.090	65.4	3.77	1.66	3.66	1.89	3.72
78.2	143	0.140	64.7	4.49	2.60	3.56	2.24	4.19
78.2	170	0.186	63.2	5.29	3.43	3.35	2.64	4.80
78.2	200	0.234	61.3	6.16	4.32	3.07	3.08	5.51
78.2	235	0.283	59.2	7.17	5.24	2.76	3.59	6.33
78.2	271	0.328	56.9	8.20	6.08	2.43	4.10	7.17
78.2	309	0.378	54.3	9.26	7.00	2.05	4.63	8.08
78.2	350	0.426	51.5	10.39	7.88	1.66	5.19	9.04
78.2	389	0.471	48.8	11.44	8.72	1.27	5.72	9.95
78.2	432	0.521	45.9	12.58	9.63	0.84	6.29	10.95
78.2	473	0.566	43.0	13.64	10.48	0.42	6.82	11.90
78.2	512	0.614	40.1	14.62	11.35	0.01	7.31	12.80
78.2	552	0.662	37.2	15.61	12.24	-0.41	7.80	13.71
78.2	587	0.706	34.5	16.44	13.06	-0.79	8.22	14.51
78.2	623	0.754	31.9	17.27	13.95	-1.16	8.64	15.30
78.2	659	0.800	29.5	18.09	14.81	-1.51	9.04	16.06
78.2	687	0.845	27.3	18.67	15.63	-1.82	9.34	16.66
78.2	717	0.893	25.3	19.28	16.52	-2.12	9.64	17.27
78.2	745	0.938	23.6	19.84	17.35	-2.37	9.92	17.79
78.2	769	0.984	22.0	20.27	18.20	-2.60	10.13	18.23
78.2	796	1.031	20.4	20.75	19.08	-2.82	10.38	18.70
78.2	819	1.075	19.2	21.14	19.89	-3.00	10.57	19.07
78.2	839	1.123	18.0	21.41	20.78	-3.17	10.71	19.38
78.2	863	1.170	16.8	21.78	21.65	-3.34	10.89	19.73
78.2	874	1.200	16.2	21.91	22.20	-3.42	10.95	19.88

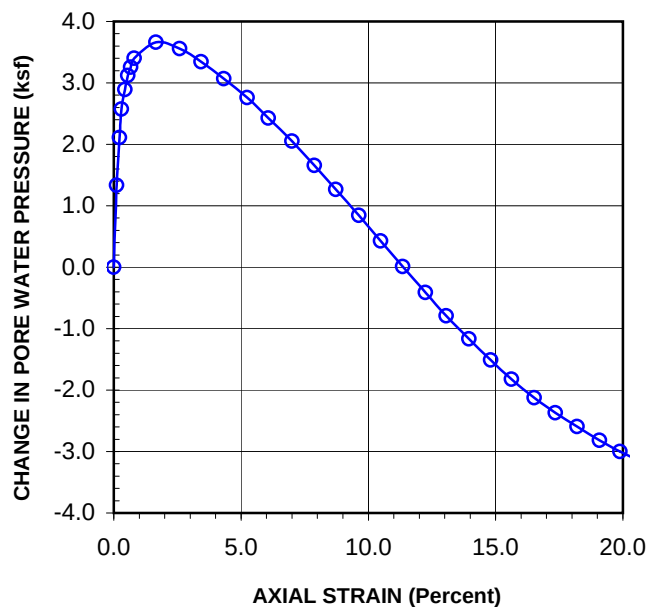
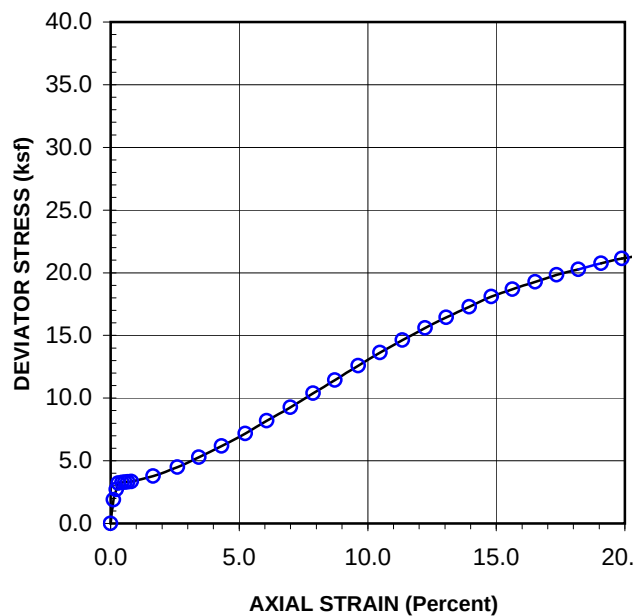


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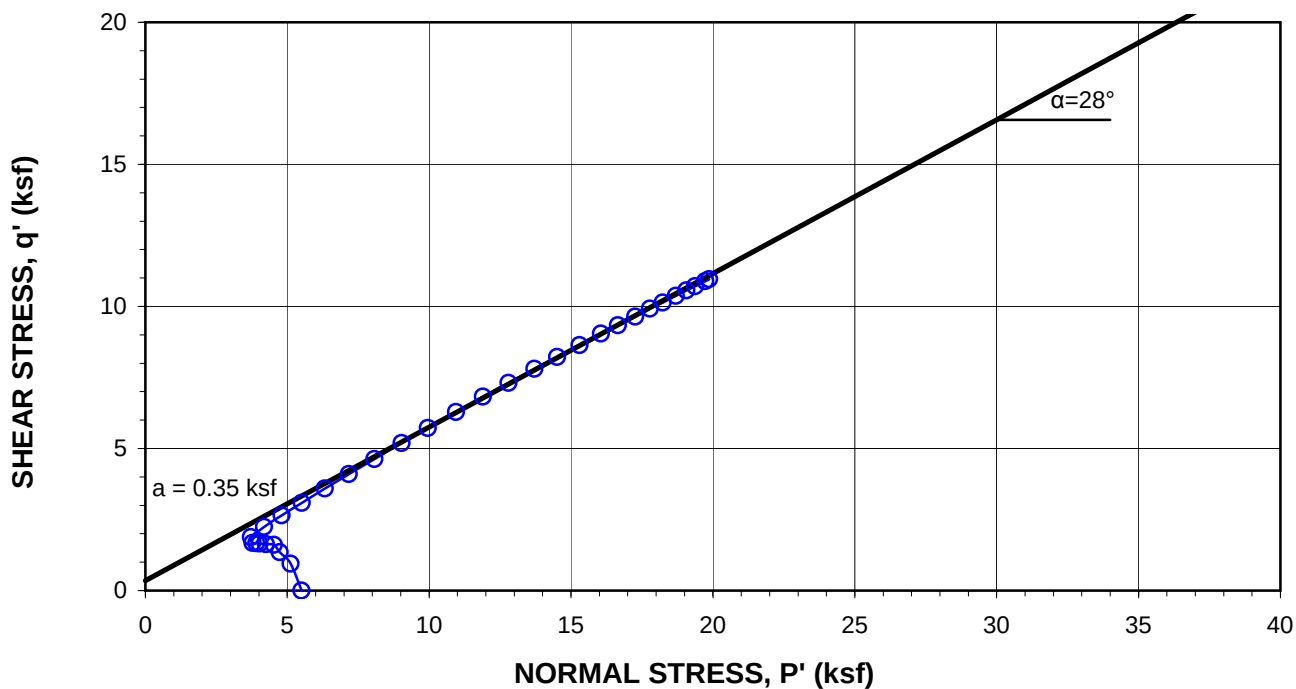
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Legend:

—○— Confining Pressure = 5,500 psf



Project Name: LACMA
Project No.: N/A
Boring No.: B-15-2
Sample No.: 8A
Depth (ft.): 42

Sample Type: Mod Cal
Sample Description: Tar Sand
Dry Unit Weight (pcf): 121.1
Initial Moisture Content (%): 2.9
Confining Pressure: 5,500 psf

CU TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT
ASTM D 4767



CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	LACMA	Tested by:	ST	Date:	09-30-16
Project No.:	N/A	Input Data by:	JP	Date:	10-06-16
Boring No.:	B-15-3	Reviewed by:	AP	Date:	10-07-16
Sample No.:	3B	Sample Description:	Tar Sand		
Depth (ft.):	18				
Sample Type:	Mod Cal	Confining Pressure =	2,500 psf		

Diameter (in)	2.407	2.407	2.407	Avg. =	2.407
Height (in)	5.840	5.840	5.840	Avg. =	5.840

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in ²)	4.550	4.540
Moisture Content (%)	3.06	7.07
Wet Weight (gms)	866.92	1049.64
Dry Weight (gms)	841.17	990.16
Container Weight (gms)	0.00	148.99
Density and Saturation		
Wet Weight (gms)	866.92	
Container Weight (gms)	0.00	
Wet Density (pcf)	124.3	
Dry Density (pcf)	120.6	
Initial Void Ratio	0.397	
% Water Saturation	20.8	

Assumed Specific Gravity = 2.70

Back Pressure Saturation

B Value (%) = [96](#)

Consolidation

Cell Pressure (psi) =	57.4	Initial Burette Ht.(cm)=	68.4
Back Pressure(psi) =	40.0	Final Burette Ht.(cm)=	65.1
Eff. Consol. Stress (psi) =	17.4	Final Height (in)=	5.809
Induced OCR =	1.0	Initial Volume (cu.in)=	26.574
Change in Ht. of Specimen (in) =	0.0310	Final Volume (cu.in) =	26.373

Shear

Rate of Deformation (in/min)=	0.004	At Failure	
Time to 50% primary Consolidation (min) =	15	Deviator Stress (ksf) =	20.94
Failure Mode: Bulging Failure		Eff. Minor Principal stress (ksf) =	7.35
		Eff. Major Principal stress (ksf) =	28.28
		Axial Strain (%) =	11.76

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Project Name: LACMA
Project No.: N/A
Boring No.: B-15-3
Sample No.: 3B
Depth (ft.): 18
Sample Type: Mod Cal
Sample Description: Tar Sand

Cell Pressure: 57.4 psi
Back Pressure : 40.0 psi
Consolidation Pressure : 17.4 psi
Initial Sample Height: 5.840 in
Initial Area of Sample: 4.550 sq. in.
Final Sample Ht.* (L): 5.809 in
Final Sample Area (A)*: 4.540 sq. in.
Induced OCR= 1.0

Cell Pressure	Load	Axial Deformation	Back Pressure	Deviator Stress	Axial Strain	Pore Pressure Change	Shear Stress q'	Normal Stress p'
(psi)	(lbs)	(in)	(psi)	(S1-S3) (ksf)	(%)	(ksf)	(S1-S3)/2 (ksf)	(S1'+S3')/2 (ksf)
57.4	0	0.000	40.0	0.00	0.00	0.00	0.00	2.51
57.4	62	0.006	44.1	1.96	0.10	0.60	0.98	2.89
57.4	77	0.012	45.6	2.44	0.21	0.81	1.22	2.92
57.4	90	0.016	46.4	2.85	0.28	0.92	1.42	3.01
57.4	102	0.024	46.7	3.22	0.41	0.96	1.61	3.16
57.4	113	0.030	46.7	3.57	0.52	0.96	1.78	3.33
57.4	127	0.036	46.4	4.00	0.62	0.93	2.00	3.58
57.4	139	0.042	46.1	4.38	0.72	0.88	2.19	3.81
57.4	153	0.048	45.7	4.81	0.83	0.82	2.41	4.09
57.4	167	0.054	45.2	5.25	0.93	0.74	2.62	4.39
57.4	182	0.060	44.5	5.71	1.03	0.65	2.86	4.71
57.4	260	0.090	40.0	8.12	1.55	-0.01	4.06	6.57
57.4	328	0.120	35.2	10.19	2.07	-0.69	5.09	8.29
57.4	455	0.176	25.3	13.99	3.03	-2.12	7.00	11.62
57.4	536	0.219	18.7	16.36	3.78	-3.07	8.18	13.75
57.4	600	0.268	13.6	18.15	4.62	-3.80	9.08	15.38
57.4	645	0.313	10.8	19.36	5.38	-4.21	9.68	16.39
57.4	671	0.359	9.3	19.97	6.17	-4.42	9.98	16.91
57.4	691	0.406	8.4	20.38	7.00	-4.54	10.19	17.24
57.4	705	0.450	8.0	20.63	7.75	-4.61	10.31	17.43
57.4	715	0.499	7.5	20.73	8.58	-4.68	10.37	17.55
57.4	725	0.545	7.1	20.84	9.38	-4.74	10.42	17.66
57.4	734	0.589	6.9	20.92	10.14	-4.77	10.46	17.74
57.4	741	0.638	6.6	20.92	10.99	-4.81	10.46	17.78
57.4	748	0.683	6.4	20.94	11.76	-4.84	10.47	17.81
57.4	753	0.729	6.2	20.89	12.55	-4.87	10.44	17.82
57.4	759	0.777	6.0	20.85	13.38	-4.90	10.43	17.83
57.4	764	0.822	5.9	20.81	14.14	-4.91	10.40	17.82
57.4	769	0.869	5.7	20.74	14.95	-4.94	10.37	17.82
57.4	773	0.916	5.4	20.65	15.76	-4.99	10.33	17.82
57.4	778	0.960	5.4	20.60	16.52	-4.98	10.30	17.79
57.4	782	1.009	5.3	20.50	17.36	-4.99	10.25	17.75
57.4	787	1.054	5.2	20.43	18.15	-5.02	10.22	17.74
57.4	789	1.100	5.0	20.29	18.94	-5.04	10.14	17.69
57.4	794	1.148	5.0	20.21	19.77	-5.04	10.10	17.65
57.4	799	1.200	4.9	20.11	20.66	-5.06	10.05	17.62

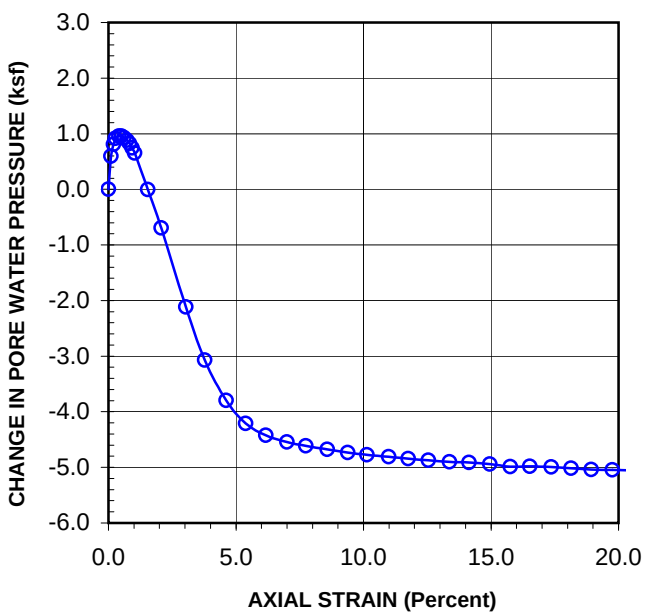
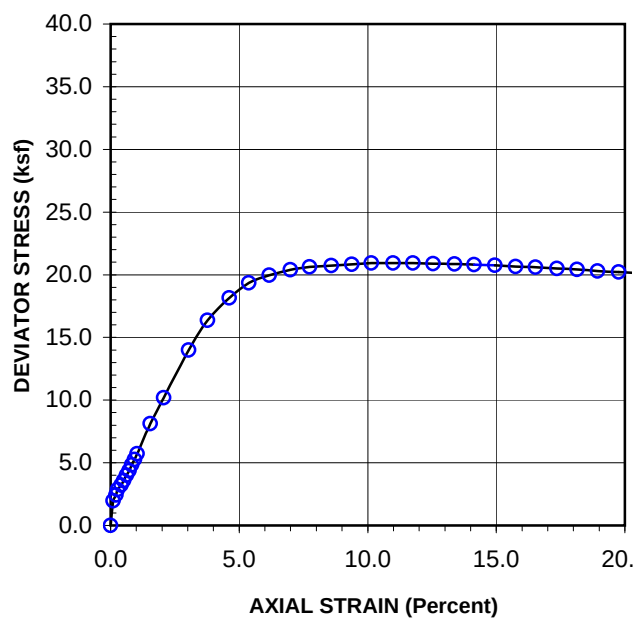


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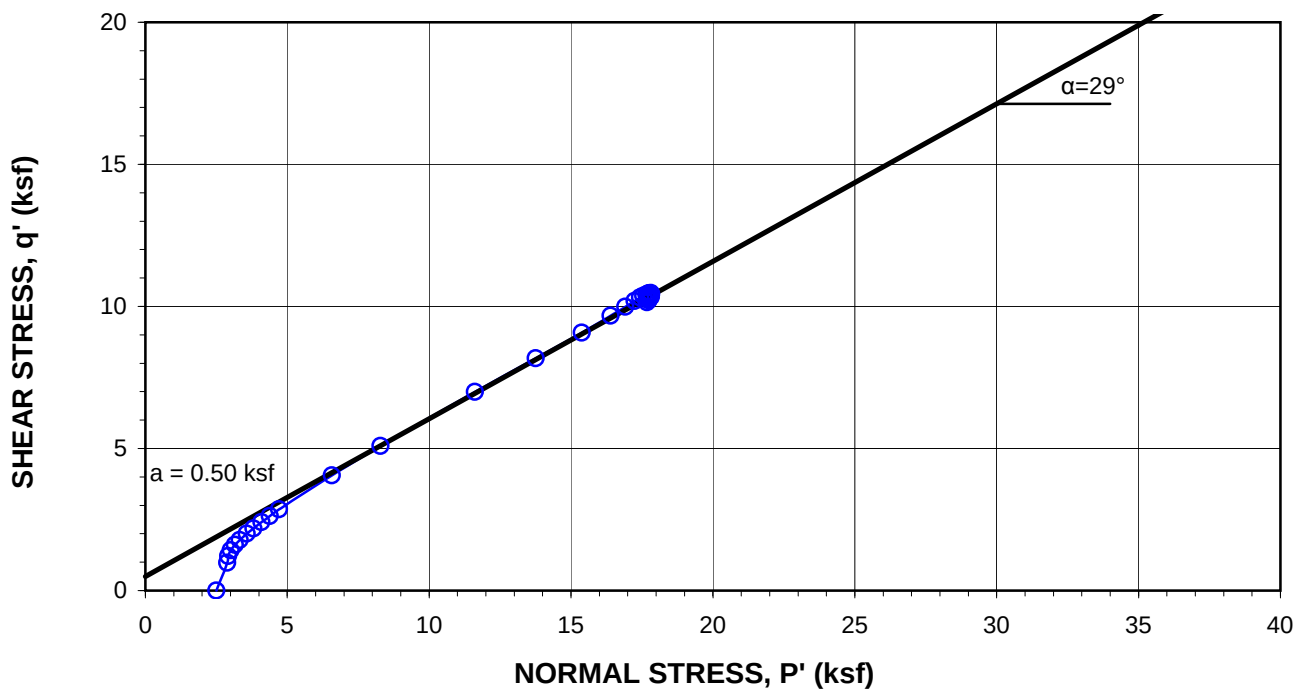
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Legend:

—○— Confining Pressure = 2,500 psf



Project Name: LACMA
Project No.: N/A
Boring No.: B-15-3
Sample No.: 3B
Depth (ft.): 18

Sample Type: Mod Cal
Sample Description: Tar Sand
Dry Unit Weight (pcf): 120.6
Initial Moisture Content (%): 3.1
Confining Pressure: 2,500 psf

CU TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT
ASTM D 4767



CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	LACMA	Tested by:	ST	Date:	10-10-16
Project No.:	N/A	Input Data by:	JP	Date:	10-11-16
Boring No.:	B-15-3	Reviewed by:	AP	Date:	10-12-16
Sample No.:	5B	Sample Description:	Tar Sand		
Depth (ft.):	28				
Sample Type:	Mod Cal	Confining Pressure =	3,500 psf		

Diameter (in)	2.400	2.404	2.402	Avg. =	2.402
Height (in)	5.720	5.725	5.731	Avg. =	5.725

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in ²)	4.531	4.450
Moisture Content (%)	3.97	5.92
Wet Weight (gms)	831.81	1001.05
Dry Weight (gms)	800.02	953.69
Container Weight (gms)	0.00	153.67
Density and Saturation		
Wet Weight (gms)	831.81	
Container Weight (gms)	0.00	
Wet Density (pcf)	122.1	
Dry Density (pcf)	117.5	
Initial Void Ratio	0.434	
% Water Saturation	24.7	

Assumed Specific Gravity = 2.70

Back Pressure Saturation

B Value (%) = [94](#)

Consolidation

Cell Pressure (psi) =	84.3	Initial Burette Ht.(cm)=	68.0
Back Pressure(psi) =	60.0	Final Burette Ht.(cm)=	57.2
Eff. Consol. Stress (psi) =	24.3	Final Height (in)=	5.683
Induced OCR =	1.0	Initial Volume (cu.in)=	25.944
Change in Ht. of Specimen (in) =	0.0428	Final Volume (cu.in) =	25.285

Shear

Rate of Deformation (in/min)=	0.004	At Failure	
Time to 50% primary Consolidation (min) =	15	Deviator Stress (ksf) =	24.50
Failure Mode: Bulging Failure		Eff. Minor Principal stress (ksf) =	6.91
		Eff. Major Principal stress (ksf) =	31.41
		Axial Strain (%) =	19.72

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	LACMA	Cell Pressure:	84.3 psi
Project No.:	N/A	Back Pressure :	60.0 psi
Boring No.:	B-15-3	Consolidation Pressure :	24.3 psi
Sample No.:	5B	Initial Sample Height:	5.725 in
Depth (ft.):	28	Initial Area of Sample:	4.531 sq. in.
Sample Type:	Mod Cal	Final Sample Ht.* (L):	5.683 in
Sample Description:	Tar Sand	Final Sample Area (A)*:	4.450 sq. in.
		Induced OCR=	1.0

Cell Pressure	Load	Axial Deformation	Back Pressure	Deviator Stress	Axial Strain	Pore Pressure Change	Shear Stress	Normal Stress
(psi)	(lbs)	(in)	(psi)	(S1-S3) (ksf)	(%)	(ksf)	q' (S1-S3)/2 (ksf)	p' (S1'+S3')/2 (ksf)
84.3	0	0.000	60.0	0.00	0.00	0.00	0.00	3.50
84.3	56	0.006	63.9	1.81	0.11	0.55	0.91	3.85
84.3	66	0.012	64.4	2.13	0.21	0.64	1.07	3.93
84.3	72	0.016	65.4	2.32	0.28	0.77	1.16	3.89
84.3	77	0.024	66.2	2.48	0.42	0.90	1.24	3.84
84.3	82	0.030	67.0	2.64	0.53	1.00	1.32	3.82
84.3	86	0.036	67.6	2.77	0.63	1.09	1.38	3.79
84.3	90	0.042	68.0	2.89	0.74	1.15	1.45	3.79
84.3	95	0.048	68.4	3.05	0.84	1.21	1.52	3.81
84.3	101	0.054	68.7	3.24	0.95	1.26	1.62	3.86
84.3	106	0.060	68.9	3.39	1.06	1.29	1.70	3.91
84.3	133	0.090	69.1	4.24	1.58	1.32	2.12	4.30
84.3	160	0.120	68.6	5.07	2.11	1.24	2.53	4.79
84.3	181	0.141	68.1	5.71	2.49	1.16	2.86	5.20
84.3	230	0.187	66.3	7.20	3.29	0.90	3.60	6.20
84.3	281	0.235	64.3	8.72	4.13	0.62	4.36	7.24
84.3	335	0.283	61.7	10.30	4.98	0.25	5.15	8.40
84.3	386	0.329	59.0	11.77	5.79	-0.14	5.88	9.52
84.3	439	0.377	56.6	13.26	6.64	-0.49	6.63	10.62
84.3	492	0.425	53.2	14.73	7.48	-0.98	7.37	11.85
84.3	541	0.470	49.8	16.06	8.27	-1.47	8.03	13.00
84.3	592	0.519	47.7	17.41	9.13	-1.78	8.70	13.98
84.3	638	0.565	46.3	18.59	9.94	-1.97	9.30	14.77
84.3	683	0.611	43.2	19.73	10.76	-2.42	9.86	15.78
84.3	727	0.659	41.5	20.80	11.60	-2.66	10.40	16.56
84.3	763	0.704	39.8	21.63	12.39	-2.91	10.82	17.23
84.3	798	0.751	38.3	22.41	13.22	-3.13	11.21	17.83
84.3	828	0.798	37.8	23.03	14.05	-3.19	11.52	18.21
84.3	851	0.843	37.3	23.45	14.83	-3.27	11.73	18.50
84.3	875	0.891	37.0	23.88	15.67	-3.31	11.94	18.75
84.3	890	0.936	36.8	24.06	16.48	-3.34	12.03	18.87
84.3	905	0.982	36.7	24.23	17.28	-3.36	12.11	18.97
84.3	920	1.030	36.7	24.38	18.12	-3.36	12.19	19.05
84.3	928	1.074	36.3	24.36	18.90	-3.41	12.18	19.09
84.3	943	1.121	36.3	24.50	19.72	-3.41	12.25	19.16

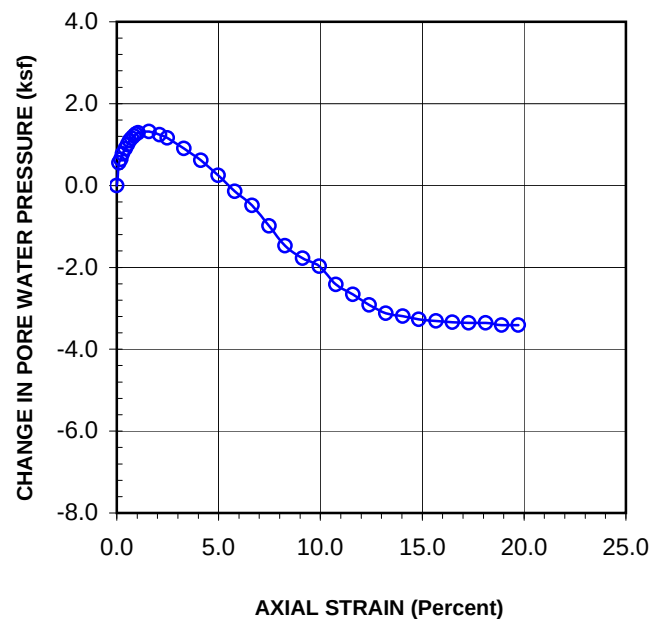
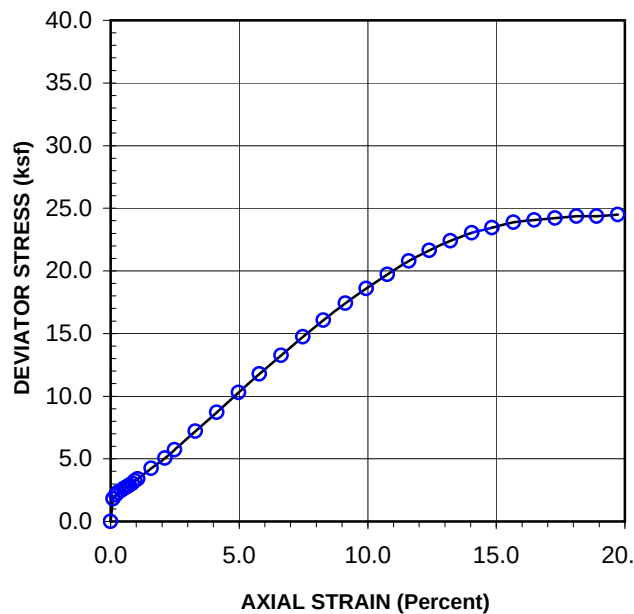


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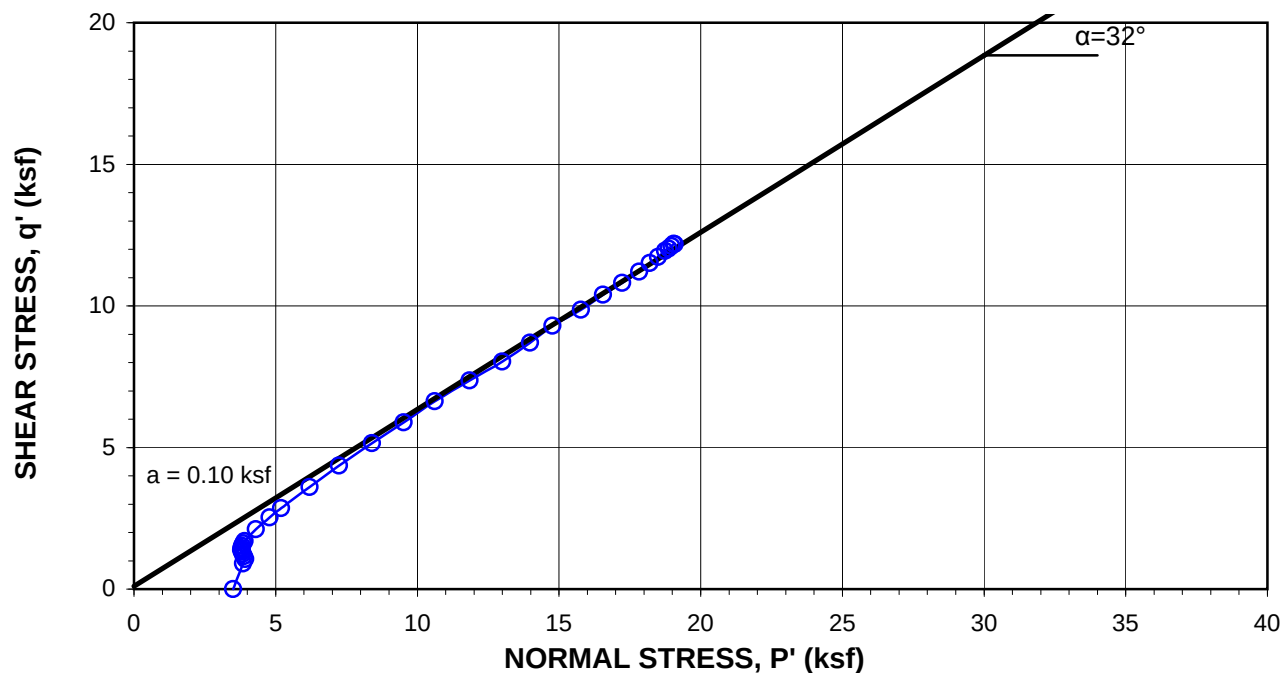
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Legend:

—○— Confining Pressure = 3,500 psf



Project Name: LACMA
Project No.: N/A
Boring No.: B-15-3
Sample No.: 5B
Depth (ft.): 28

Sample Type: Mod Cal
Sample Description: Tar Sand
Dry Unit Weight (pcf): 117.5
Initial Moisture Content (%): 4.0
Confining Pressure: 3,500 psf

CU TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT
ASTM D 4767

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Test Procedure: ASTM D 4767

Project Name:	LACMA	Tested by:	ST	Date:	10-05-16
Project No.:	N/A	Input Data by:	JP	Date:	10-06-16
Boring No.:	B-15-3	Reviewed by:	AP	Date:	10-07-16
Sample No.:	7B	Sample Description:	Tar Sand		
Depth (ft.):	38				
Sample Type:	Mod Cal	Confining Pressure =	5,000 psf		

Diameter (in)	2.421	2.421	2.421	Avg. =	2.421
Height (in)	6.002	6.002	6.002	Avg. =	6.002

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in ²)	4.603	4.549
Moisture Content (%)	20.04	21.08
Wet Weight (gms)	644.59	804.60
Dry Weight (gms)	536.96	691.43
Container Weight (gms)	0.00	154.47
Density and Saturation		
Wet Weight (gms)	644.59	
Container Weight (gms)	0.00	
Wet Density (pcf)	88.9	
Dry Density (pcf)	74.0	
Initial Void Ratio	1.276	
% Water Saturation	42.4	

Assumed Specific Gravity = 2.70

Back Pressure SaturationB Value (%) = [98](#)**Consolidation**

Cell Pressure (psi) =	74.7	Initial Burette Ht.(cm)=	72.4
Back Pressure(psi) =	40.0	Final Burette Ht.(cm)=	61.4
Eff. Consol. Stress (psi) =	34.7	Final Height (in)=	5.927
Induced OCR =	1.0	Initial Volume (cu.in)=	27.630
Change in Ht. of Specimen (in) =	0.0751	Final Volume (cu.in) =	26.959

ShearAt Failure

Rate of Deformation (in/min)=	0.004	Deviator Stress (ksf) =	11.33
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	6.09
Failure Mode: Shear Failure		Eff. Major Principal stress (ksf) =	17.41
		Axial Strain (%) =	15.41

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	LACMA	Cell Pressure:	74.7 psi
Project No.:	N/A	Back Pressure :	40.0 psi
Boring No.:	B-15-3	Consolidation Pressure :	34.7 psi
Sample No.:	7B	Initial Sample Height:	6.002 in
Depth (ft.):	38	Initial Area of Sample:	4.603 sq. in.
Sample Type:	Mod Cal	Final Sample Ht.* (L):	5.927 in
Sample Description:	Tar Sand	Final Sample Area (A)*:	4.549 sq. in.
		Induced OCR=	1.0

Cell Pressure	Load	Axial Deformation	Back Pressure	Deviator Stress	Axial Strain	Pore Pressure Change	Shear Stress	Normal Stress
(psi)	(lbs)	(in)	(psi)	(S1-S3) (ksf)	(%)	(ksf)	q' (S1-S3)/2 (ksf)	p' (S1'+S3')/2 (ksf)
74.7	0	0.000	40.0	0.00	0.00	0.00	0.00	5.00
74.7	51	0.006	44.6	1.61	0.10	0.66	0.81	5.14
74.7	81	0.012	47.7	2.56	0.20	1.11	1.28	5.17
74.7	101	0.016	49.6	3.19	0.27	1.39	1.59	5.21
74.7	118	0.024	51.2	3.72	0.40	1.61	1.86	5.25
74.7	129	0.030	52.1	4.06	0.51	1.74	2.03	5.29
74.7	139	0.036	52.8	4.37	0.61	1.84	2.19	5.35
74.7	149	0.042	53.2	4.68	0.71	1.91	2.34	5.43
74.7	157	0.048	53.6	4.93	0.81	1.95	2.47	5.51
74.7	164	0.054	53.8	5.14	0.91	1.99	2.57	5.58
74.7	173	0.060	54.0	5.42	1.01	2.01	2.71	5.70
74.7	205	0.090	53.6	6.39	1.52	1.96	3.20	6.23
74.7	226	0.120	52.5	7.01	2.02	1.79	3.51	6.71
74.7	267	0.194	49.0	8.18	3.27	1.29	4.09	7.80
74.7	290	0.242	46.9	8.81	4.08	0.99	4.40	8.41
74.7	310	0.291	45.1	9.33	4.91	0.73	4.67	8.93
74.7	327	0.339	43.4	9.76	5.72	0.49	4.88	9.38
74.7	340	0.387	42.1	10.06	6.53	0.30	5.03	9.73
74.7	354	0.435	40.8	10.38	7.34	0.12	5.19	10.07
74.7	365	0.482	39.7	10.62	8.14	-0.04	5.31	10.34
74.7	375	0.531	38.7	10.81	8.95	-0.18	5.40	10.58
74.7	385	0.579	37.8	11.00	9.76	-0.32	5.50	10.82
74.7	391	0.626	36.9	11.07	10.56	-0.45	5.54	10.98
74.7	397	0.674	36.1	11.14	11.38	-0.57	5.57	11.13
74.7	402	0.722	35.3	11.18	12.18	-0.67	5.59	11.26
74.7	407	0.770	34.6	11.21	12.99	-0.77	5.61	11.38
74.7	414	0.817	34.0	11.30	13.78	-0.87	5.65	11.52
74.7	418	0.865	33.1	11.30	14.59	-0.99	5.65	11.64
74.7	423	0.913	32.4	11.33	15.41	-1.09	5.66	11.75
74.7	427	0.960	31.8	11.33	16.20	-1.18	5.66	11.84
74.7	428	1.008	31.1	11.25	17.01	-1.29	5.62	11.91
74.7	429	1.056	30.4	11.16	17.82	-1.38	5.58	11.96
74.7	428	1.104	29.7	11.03	18.63	-1.48	5.51	11.99
74.7	427	1.152	29.1	10.89	19.44	-1.57	5.45	12.01
74.7	424	1.200	28.6	10.71	20.25	-1.64	5.35	11.99

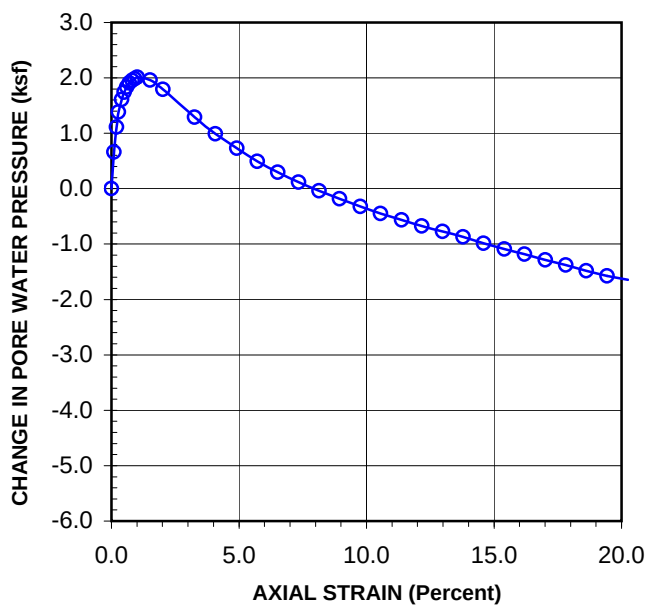
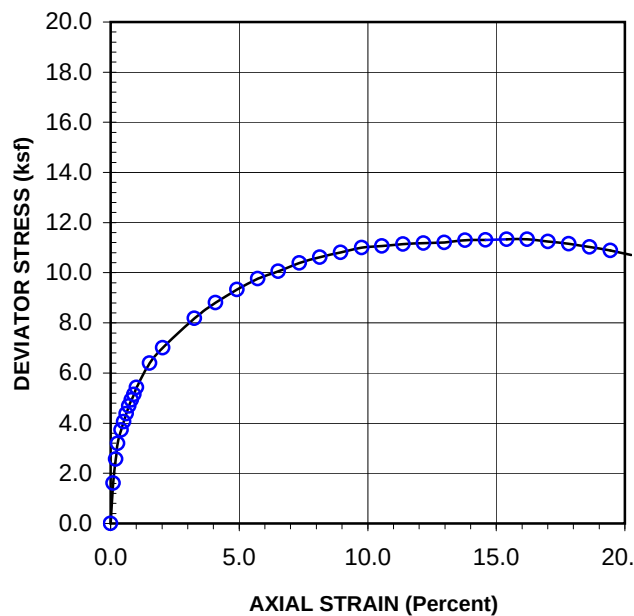


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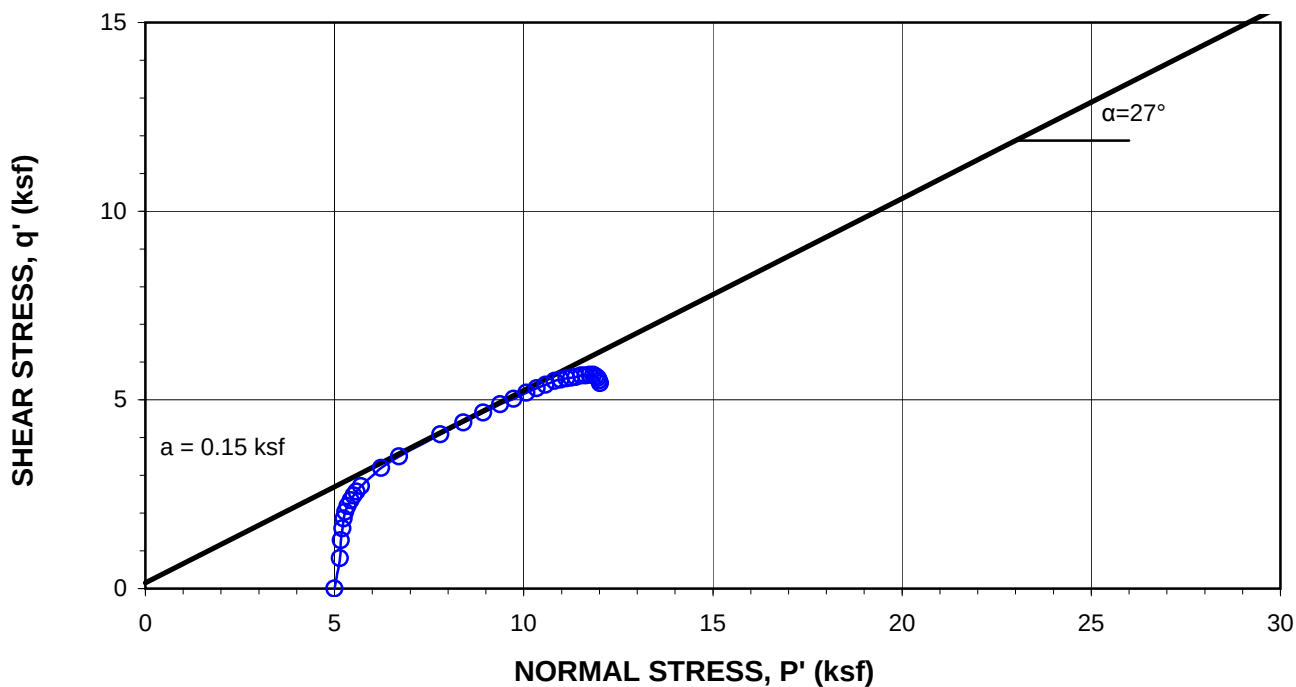
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Legend:

—○— Confining Pressure = 5,000 psf



Project Name: LACMA
Project No.: N/A
Boring No.: B-15-3
Sample No.: 7B
Depth (ft.): 38

Sample Type: Mod Cal
Sample Description: Tar Sand
Dry Unit Weight (pcf): 74.0
Initial Moisture Content (%): 20.0
Confining Pressure: 5,000 psf

CU TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT
ASTM D 4767



CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	LACMA	Tested by:	ST	Date:	10-10-16
Project No.:	N/A	Input Data by:	JP	Date:	10-11-16
Boring No.:	B-15-4	Reviewed by:	AP	Date:	10-12-16
Sample No.:	4B	Sample Description:	Tar Sand		
Depth (ft.):	20				
Sample Type:	Mod Cal	Confining Pressure =	2,500 psf		

Diameter (in)	2.403	2.405	2.406	Avg. =	2.405
Height (in)	5.868	5.860	5.859	Avg. =	5.862

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in ²)	4.542	4.517
Moisture Content (%)	9.82	11.67
Wet Weight (gms)	901.70	1065.87
Dry Weight (gms)	821.08	970.01
Container Weight (gms)	0.00	148.93
Density and Saturation		
Wet Weight (gms)	901.70	
Container Weight (gms)	0.00	
Wet Density (pcf)	129.0	
Dry Density (pcf)	117.5	
Initial Void Ratio	0.434	
% Water Saturation	61.1	

Assumed Specific Gravity = 2.70

Back Pressure Saturation

B Value (%) = [95](#)

Consolidation

Cell Pressure (psi) =	57.4	Initial Burette Ht.(cm)=	44.1
Back Pressure(psi) =	40.0	Final Burette Ht.(cm)=	39.4
Eff. Consol. Stress (psi) =	17.4	Final Height (in)=	5.831
Induced OCR =	1.0	Initial Volume (cu.in)=	26.624
Change in Ht. of Specimen (in) =	0.0313	Final Volume (cu.in) =	26.337

Shear

Rate of Deformation (in/min)=	0.004	At Failure	
Time to 50% primary Consolidation (min) =	15	Deviator Stress (ksf) =	14.63
Failure Mode: Bulging Failure		Eff. Minor Principal stress (ksf) =	4.84
		Eff. Major Principal stress (ksf) =	19.47
		Axial Strain (%) =	19.36

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Project Name: LACMA
Project No.: N/A
Boring No.: B-15-4
Sample No.: 4B
Depth (ft.): 20
Sample Type: Mod Cal
Sample Description: Tar Sand

Cell Pressure: 57.4 psi
Back Pressure : 40.0 psi
Consolidation Pressure : 17.4 psi
Initial Sample Height: 5.862 in
Initial Area of Sample: 4.542 sq. in.
Final Sample Ht.* (L): 5.831 in
Final Sample Area (A)*: 4.517 sq. in.
Induced OCR= 1.0

Cell Pressure	Load	Axial Deformation	Back Pressure	Deviator Stress	Axial Strain	Pore Pressure Change	Shear Stress q'	Normal Stress p'
(psi)	(lbs)	(in)	(psi)	(S1-S3) (ksf)	(%)	(ksf)	(S1-S3)/2 (ksf)	(S1'+S3')/2 (ksf)
57.4	0	0.000	40.0	0.00	0.00	0.00	0.00	2.51
57.4	56	0.006	43.9	1.78	0.10	0.56	0.89	2.84
57.4	77	0.012	45.8	2.45	0.21	0.84	1.22	2.89
57.4	89	0.016	46.8	2.83	0.27	0.98	1.41	2.94
57.4	102	0.024	47.6	3.24	0.41	1.09	1.62	3.03
57.4	113	0.030	48.0	3.58	0.51	1.15	1.79	3.15
57.4	125	0.036	48.2	3.96	0.62	1.18	1.98	3.31
57.4	139	0.042	48.3	4.40	0.72	1.19	2.20	3.52
57.4	150	0.048	48.2	4.74	0.82	1.18	2.37	3.70
57.4	161	0.054	47.9	5.09	0.93	1.14	2.54	3.90
57.4	173	0.060	47.7	5.46	1.03	1.10	2.73	4.13
57.4	220	0.090	45.4	6.91	1.54	0.77	3.45	5.18
57.4	252	0.120	43.1	7.87	2.06	0.44	3.93	6.00
57.4	307	0.185	39.2	9.48	3.18	-0.11	4.74	7.36
57.4	335	0.230	37.1	10.26	3.95	-0.42	5.13	8.05
57.4	361	0.280	35.4	10.96	4.79	-0.67	5.48	8.65
57.4	384	0.326	33.9	11.56	5.58	-0.87	5.78	9.16
57.4	402	0.373	32.6	12.00	6.40	-1.07	6.00	9.57
57.4	421	0.421	31.7	12.45	7.22	-1.19	6.23	9.92
57.4	436	0.467	30.6	12.79	8.00	-1.35	6.39	10.25
57.4	448	0.515	29.8	13.02	8.83	-1.46	6.51	10.48
57.4	462	0.561	29.2	13.31	9.63	-1.56	6.66	10.72
57.4	474	0.608	28.5	13.54	10.43	-1.65	6.77	10.93
57.4	484	0.656	27.9	13.70	11.24	-1.74	6.85	11.10
57.4	496	0.702	27.3	13.91	12.03	-1.83	6.96	11.29
57.4	506	0.749	26.7	14.06	12.85	-1.92	7.03	11.45
57.4	516	0.797	26.2	14.20	13.67	-1.99	7.10	11.60
57.4	526	0.843	25.7	14.34	14.46	-2.06	7.17	11.74
57.4	533	0.892	25.2	14.39	15.30	-2.13	7.20	11.83
57.4	541	0.939	24.8	14.47	16.09	-2.19	7.24	11.93
57.4	548	0.986	24.5	14.52	16.91	-2.23	7.26	11.99
57.4	555	1.034	24.3	14.56	17.74	-2.26	7.28	12.04
57.4	562	1.080	24.0	14.60	18.53	-2.30	7.30	12.11
57.4	569	1.129	23.8	14.63	19.36	-2.33	7.31	12.15
57.4	568	1.200	23.8	14.38	20.58	-2.33	7.19	12.03

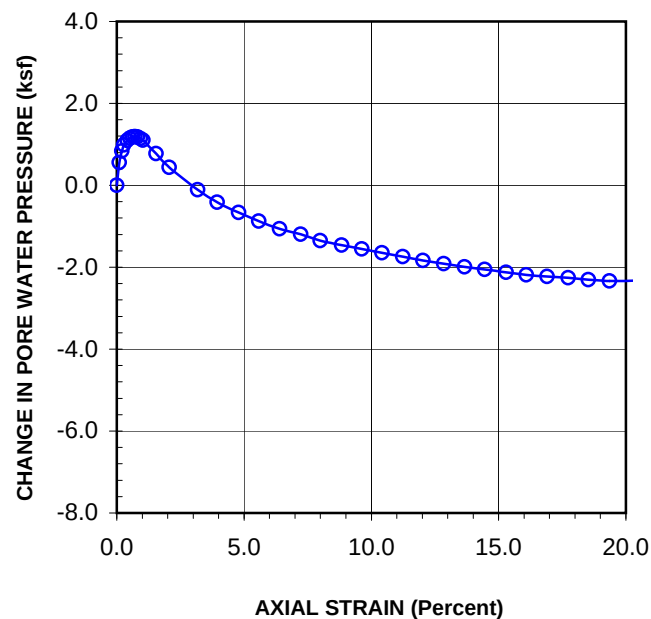
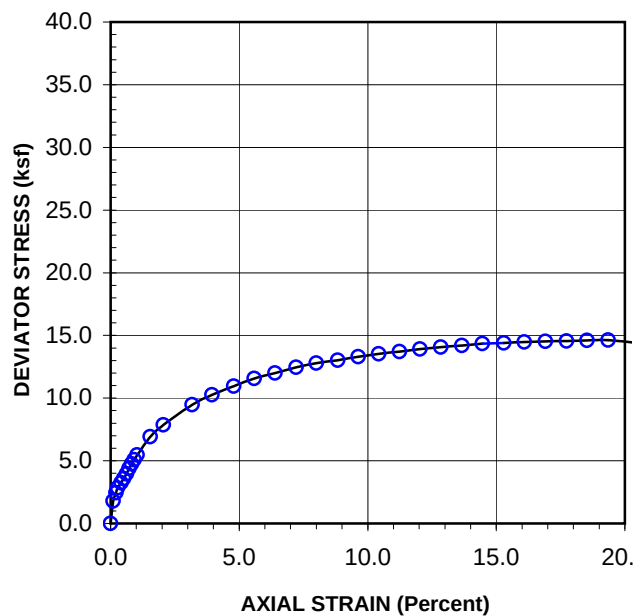


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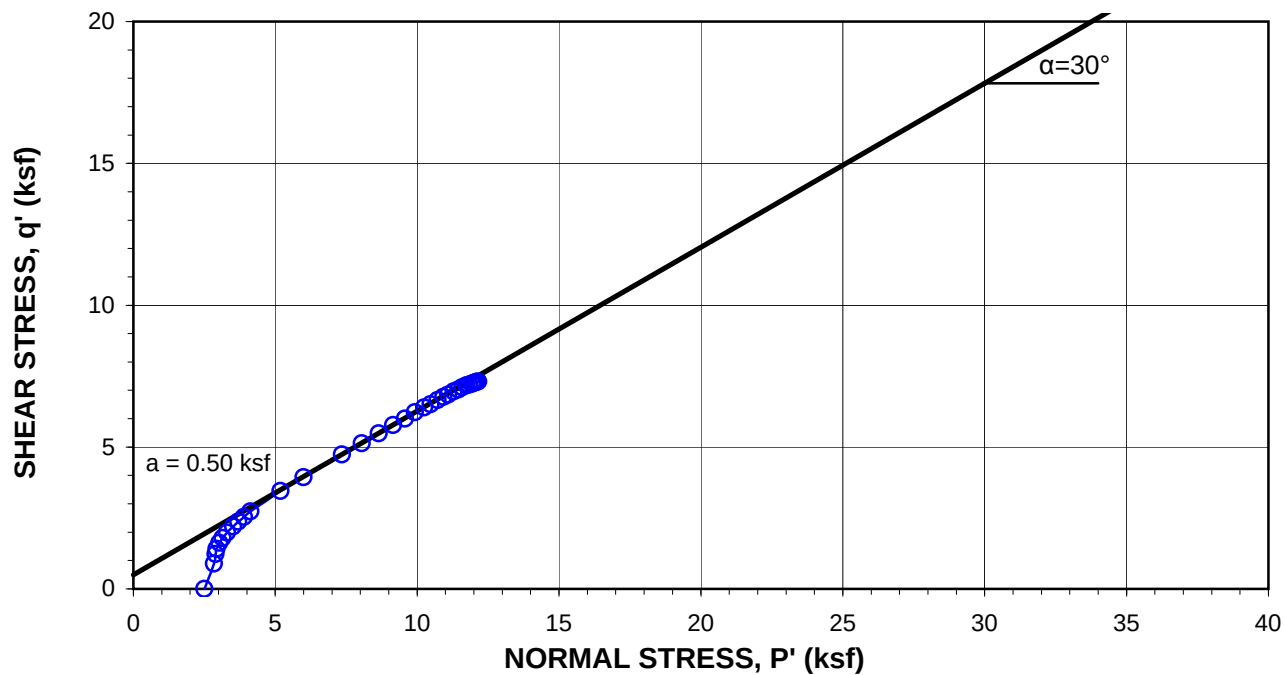
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Legend:

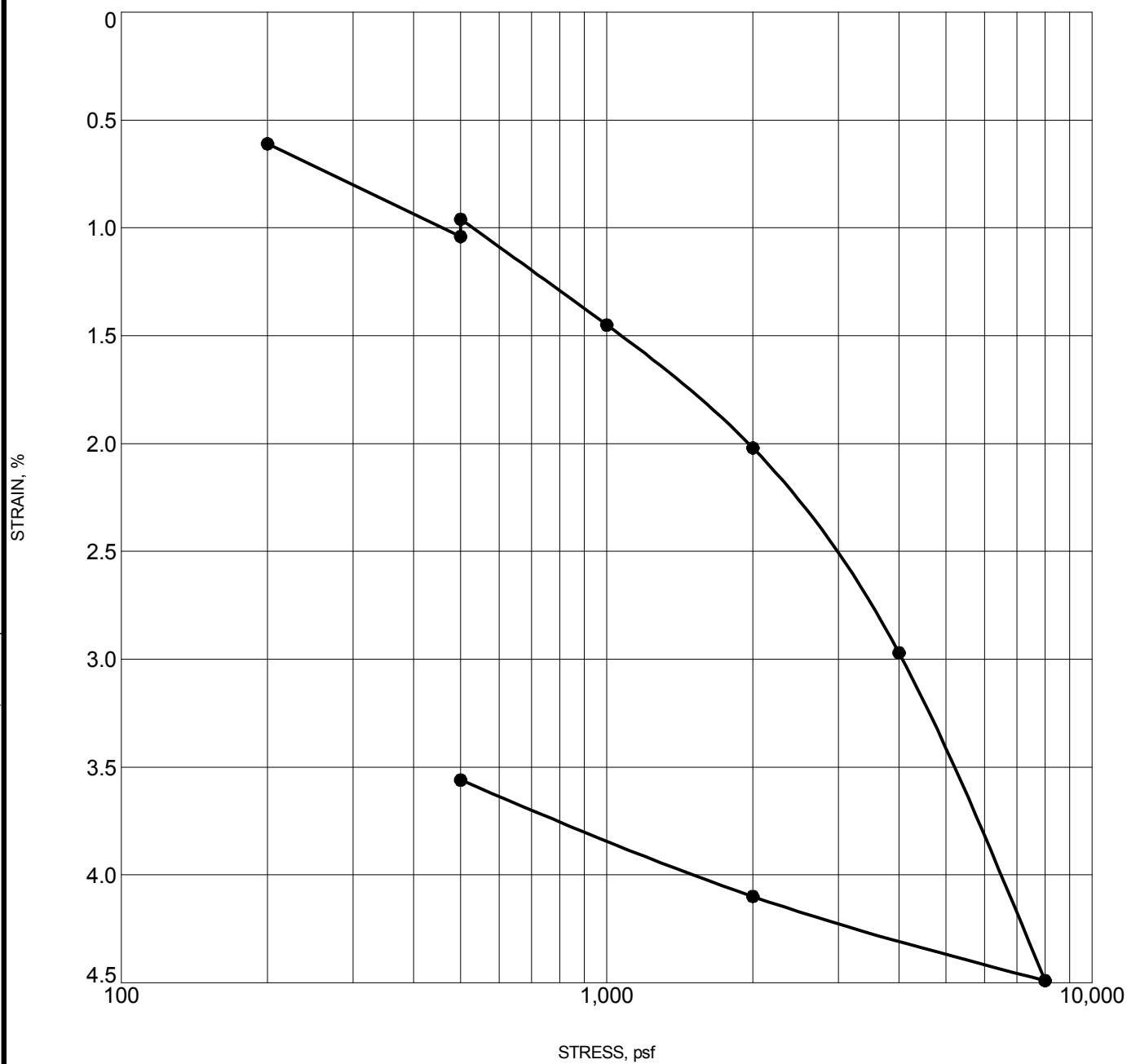
—○— Confining Pressure = 2,500 psf



Project Name: LACMA
Project No.: N/A
Boring No.: B-15-4
Sample No.: 4B
Depth (ft.): 20

Sample Type: Mod Cal
Sample Description: Tar Sand
Dry Unit Weight (pcf): 117.5
Initial Moisture Content (%): 9.8
Confining Pressure: 2,500 psf

CU TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT
ASTM D 4767



Specimen Identification			Classification	γ_d	MC%
●	B-15-2	11.0	Clayey SAND (SC)	90	21

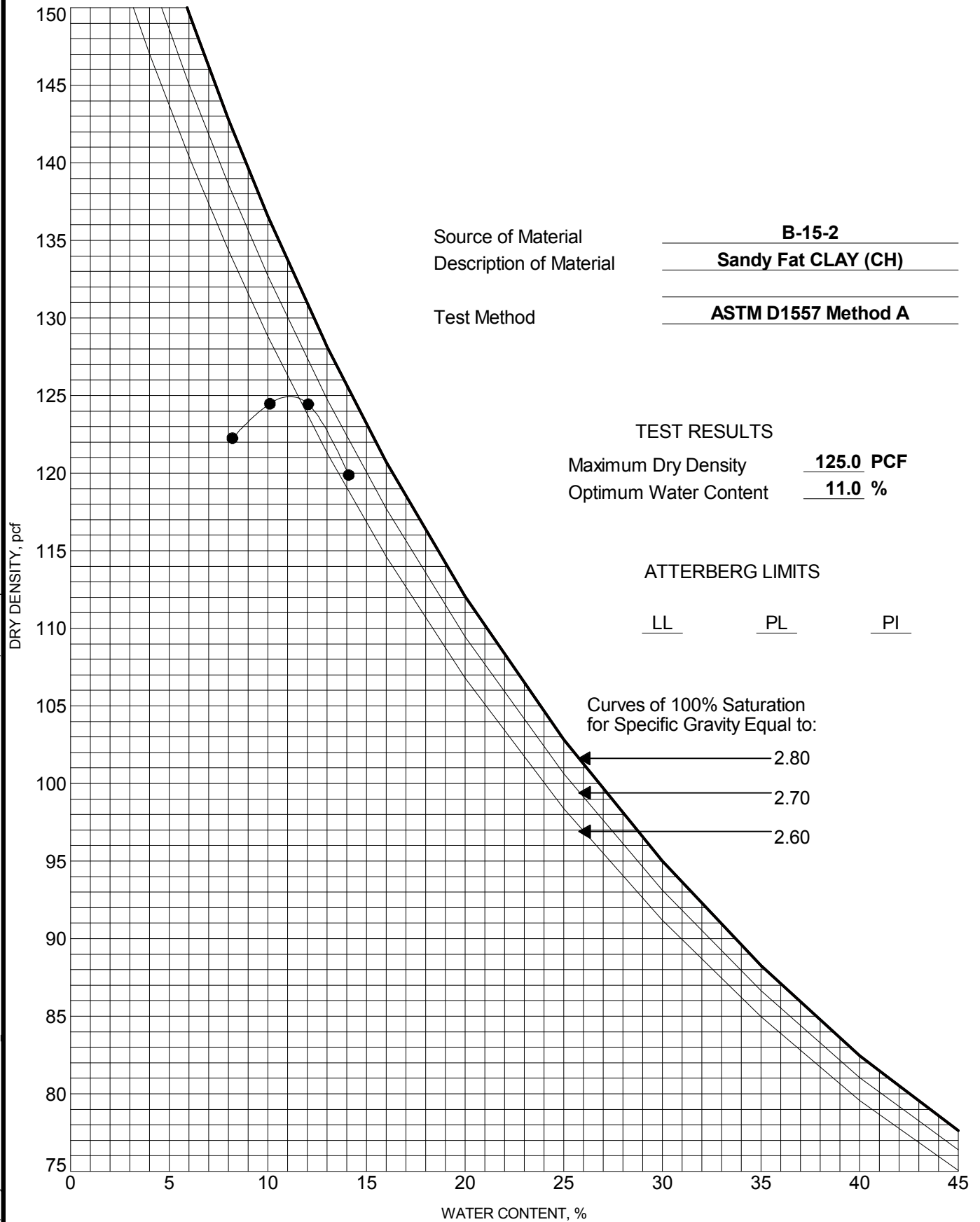


CONSOLIDATION TEST

Project: LACMA Phase III Transformation Project

Location: 5905 Wilshire Blvd, Los Angeles, CA

Number: 60440464



Project: LACMA Phase III Transformation Project

Location: 5905 Wilshire Blvd, Los Angeles, CA

Number: 60440464

**AP Engineering and Testing, Inc.**

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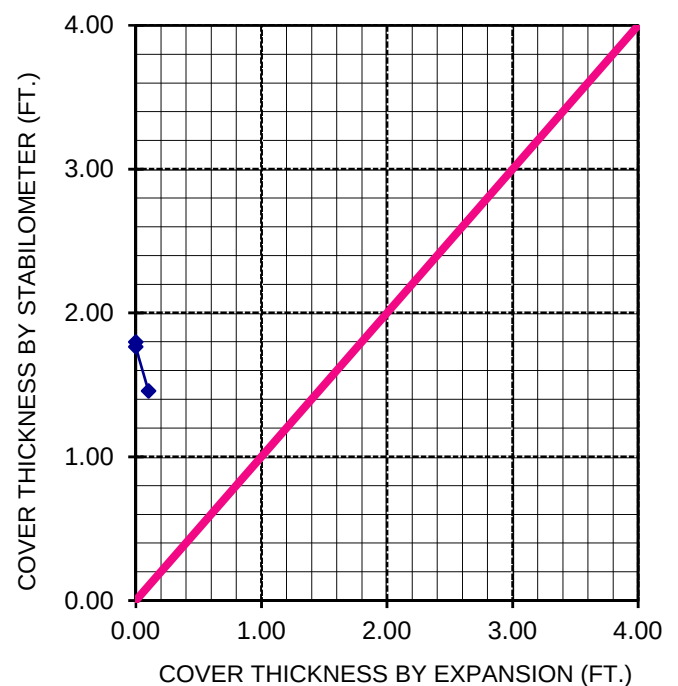
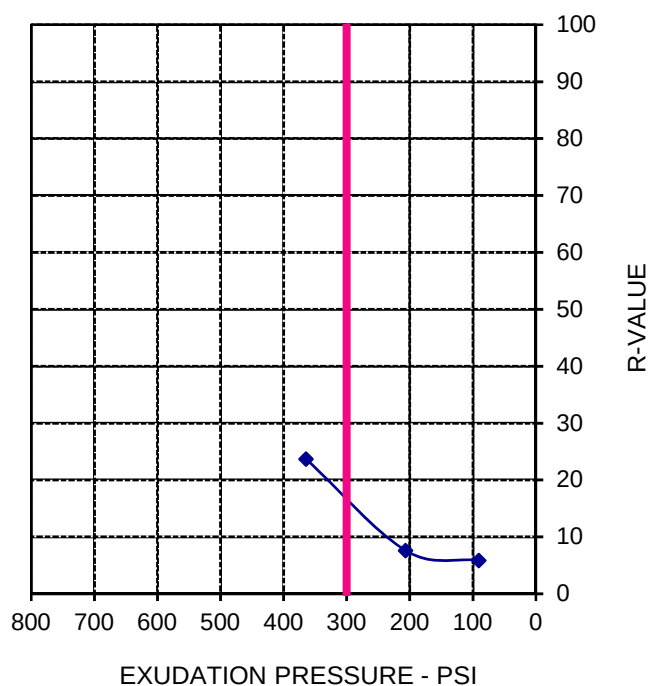
2607 Pomona Boulevard | Pomona, CA 91768

t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com**R-VALUE TEST DATA**

ASTM D2844

Project Name: LACMATested By: ST Date: 10/19/16Project Number: 60440464Computed By: KM Date: 10/20/16Boring No.: B-15-4Checked By: AP Date: 10/21/16Sample No.: BK-1 Depth (ft.): 0-5Location: N/ASoil Description: Clay

Mold Number	G	I	H		R-VALUE	By Exudation:	17
Water Added, g	0	-19	-36			By Expansion:	*N/A
Compact Moisture(%)	19.6	17.5	15.5			At Equilibrium:	17
Compaction Gage Pressure, psi	50	75	110			(by Exudation)	
Exudation Pressure, psi	90	207	365		Remarks	Gf = 1.34, and 1.4 % Retained on the ¾" *Not Applicable	
Sample Height, Inches	2.5	2.5	2.5				
Gross Weight Mold, g	2867	2859	2819				
Tare Weight Mold, g	1828	1837	1819				
Net Sample Weight, g	1039	1021	1000				
Expansion, inchesx10 ⁻⁴	0	0	3				
Stability 2,000 (160 psi)	65/145	62/142	45/115				
Turns Displacement	4.16	3.84	3.15				
R-Value Uncorrected	6	8	24				
R-Value Corrected	6	8	24				
Dry Density, pcf	105.2	105.4	104.8				
Traffic Index	8.0	8.0	8.0				
G.E. by Stability	1.80	1.76	1.46				
G.E. by Expansion	0.00	0.00	0.10				





EXPANSION INDEX OF SOILS

ASTM D4829-11

Project Name : LACMA Tested By : ADC Date: 10/17/16
 Project No. : 60440464 Data Input By: ADC Date: 10/18/16
 Boring No.: B-15-3 Checked By: _____ Date: _____
 Sample No. : BK-1 Depth (ft.) : 5-15
 Visual Sample Description: Sandy CLAY (CH)

MOLDED SPECIMEN	BEFORE TEST		AFTER TEST
	Conventional Oven	Microwave Oven	Conventional Oven
Specimen Diameter (in.)	4.01		4.01
Specimen Height (in.)	1.0000		1.0786
Wt. Comp. Soil + Mold (gm.)	544.47		595.68
Wt. of Mold (gm.)	207.36		207.36
Specific Gravity	2.70		2.70
Container No.	A99		PP-9
Wet Wt. of Soil + Cont. (gm.)	275.34		502.59
Dry Wt. of Soil + Cont. (gm.)	241.42		409.53
Wt. of Container (gm.)	49.83		120.05
Moisture Content (%)	17.7%		32.1%
Wet Density (pcf)	101.6		108.5
Dry Density (pcf)	86.3		82.1
Void Ratio	0.661		0.557
Total Porosity	0.398		0.358
Pore Volume (cc)	82.4		79.9
Degree of Saturation (%) [S meas] [50% ± 2%]	50%		83%

SPECIMEN INUNDATION

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

DATE	TIME	PRESSURE (PSI)	ELAPSED TIME	DIAL READING
10/17/16	17:26	1.0	0	----
	17:36	1.0	10	0.1579
ADD DISTILLED WATER TO THE SPECIMEN				
	17:50			0.1582
10/18/16	14:42			0.2150
	15:46			0.2189
10/19/16	09:31			0.2364
	10:31			0.2365

Expansion Index [EI meas] =
$$\frac{(\text{Final Rdg} - \text{Initial Rdg}) \times 1000}{\text{Initial Thickness}}$$

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CLASSIFICATION OF A POTENTIALLY EXPANSIVE SOIL

Expansion Index, EI	Potential Index
0-20	Very Low
21-51	Low
51-90	Medium
91-130	High
> 130	Very High



EXPANSION INDEX OF SOILS

ASTM D4829-11

Project Name : LACMA Tested By : ADC Date: 10/17/16
 Project No. : 60440464 Data Input By: ADC Date: 10/18/16
 Boring No.: B-15-4 Checked By: _____ Date: _____
 Sample No. : BK-1 Depth (ft.) : 0-5
 Visual Sample Description: CLAY with Sand (CH)

MOLDED SPECIMEN	BEFORE TEST		AFTER TEST
	Conventional Oven	Microwave Oven	Conventional Oven
Specimen Diameter (in.)	4.01		4.01
Specimen Height (in.)	1.0000		1.0640
Wt. Comp. Soil + Mold (gm.)	593.44		626.17
Wt. of Mold (gm.)	206.94		206.94
Specific Gravity	2.70		2.70
Container No.	18		C-6
Wet Wt. of Soil + Cont. (gm.)	265.02		540.28
Dry Wt. of Soil + Cont. (gm.)	243.10		466.38
Wt. of Container (gm.)	52.87		122.33
Moisture Content (%)	11.5%		21.5%
Wet Density (pcf)	116.5		118.7
Dry Density (pcf)	104.4		97.8
Void Ratio	0.448		0.421
Total Porosity	0.309		0.297
Pore Volume (cc)	64.0		65.3
Degree of Saturation (%) [S meas] [50% ± 2%]	51%		80%

SPECIMEN INUNDATION

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

DATE	TIME	PRESSURE (PSI)	ELAPSED TIME	DIAL READING
10/17/16	16:57	1.0	0	----
	17:07	1.0	10	0.2571
ADD DISTILLED WATER TO THE SPECIMEN				
	17:27			0.2719
	17:50			0.2787
10/18/16	14:42			0.3195
	15:46			0.3198
10/19/16	09:31			0.3211

Expansion Index [EI meas] =
$$\frac{(\text{Final Rdg} - \text{Initial Rdg}) \times 1000}{\text{Initial Thickness}}$$

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CLASSIFICATION OF A POTENTIALLY EXPANSIVE SOIL

Expansion Index, EI	Potential Index
0-20	Very Low
21-51	Low
51-90	Medium
91-130	High
> 130	Very High

**AP Engineering and Testing, Inc.**

DBE | MBE | SBE

2607 Pomona Boulevard | Pomona, CA 91768

t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com**CTM 382****DETERMINATION OF ASPHALT CONTENT OF BITUMINOUS MIXTURES BY
IGNITION METHOD**

Client Name:	<u>AECOM/URS</u>	Prepared By :	<u>ST</u>	Date:	<u>10/17/16</u>
Project Name:	<u>LACMA</u>	Tested By:	<u>ST</u>	Date:	<u>10/17/16</u>
Project Number:	<u>60440484</u>	Checked By:	<u>AP</u>	Date:	<u>10/18/16</u>
AP Lab Number:	<u>16-0938</u>				

Boring No.:	<u>B-15-3</u>	Type of Mixture:	<u>N/A</u>
Sample No.:	<u>7B</u>	Size of Sample:	<u>N/A</u>
Depth (ft.):	<u>38</u>	Asphalt Grade:	<u>N/A</u>
Soil Description:	<u>Tar Sand</u>	Asphalt Content:	<u>N/A</u>

TEST DATA

Mass of basket (Me)	3045.5
Mass of basket and sample before ignition at 110 Co (M1)	3573.2
Mass of basket and sample in ignition (+/- 5 of M1)	3572.2
Mass of basket and sample after ignition at 110 Co (M2)	3336.1
Mass of Tar Sand at 110 Co (M1-Me)	527.7
Mass of Tar by ignition (M1-M2)	237.1
Mass of Sand (M2-Me)	290.6
Percent Tar Content Uncorrected (%)	81.59%
Oven Correction Factor (%)	N/A
Moisture Content CTM 370 (%)	N/A
Percent Tar Content by Weight (%) per Total Dry Weight of Soil	81.59%

Note: Tar Content = $[(M1-M2)/(M2-Me)] \times 100$ Tar Content by Wt per
Total Dry Wt of Soil:**81.59%**



LACMA Phase III Soil Corrosivity Report

February 18, 2016

PREPARED FOR:

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RATNAM.THARMENDIRA@AECOM.COM

Client Job Number: 60440464
Project X Job Number: S160217A



EXECUTIVE SUMMARY

The scope of this soil evaluation is limited to a determination of soil corrosivity and general corrosion control recommendations for materials commonly used in construction. The recommendations outlined herein are not a substitute for any design documents previously prepared for the purpose of construction. Soil sample data was provided by AECOM in the report: Soilcor dated February 11, 2016.

- **Number of soil samples:** 3
- **Sample depths ranged from:** 0- 35 feet
- **Water Table Depth:** deeper than 40 feet
- **Soil sample collection locations:**
- **Samples were tested for the following:** As-Received Resistivity; Saturated Resistivity; Sulfate; Chloride; Nitrate; Ammonia; REDOX; pH.

The chart below describes the corrosivity of these samples to general construction materials

Test Item	Worst Result	Ferrous Alloys	Concrete	Copper Alloys	Aluminum Alloys	Zinc
Unsaturated Soil Resistivity (ohm-cm)	4,600	Corrosive	Non Factor	Corrosive	Corrosive	Corrosive
Saturated Soil Resistivity (ohm-cm)	1,300	Highly Corrosive	Non Factor	Highly Corrosive	Highly Corrosive	Highly Corrosive
pH	6.6/7.9	Corrosive	Not Corrosive	Negligible	Negligible	Negligible
Chlorides (mg/kg)	3,050	Highly Corrosive	Highly Corrosive	Corrosive	Highly Corrosive	Highly Corrosive
Sulfates (mg/kg)	18,350	Very Corrosive	Severe	Highly Corrosive	Highly Corrosive	Highly Corrosive
Ammonia (mg/L)	1.7	Non Factor	Non Factor	Negligible	Non Factor	Non Factor
Nitrates (mg/L)	2.4	Negligible	Negligible	Negligible	Non Factor	Non Factor
Redox (mV)	79	Corrosive	Corrosive	Corrosive	Corrosive	Corrosive

Per NACE soil corrosivity standards, this soil is considered Highly Corrosive.

In general, the corrosion behavior of structural steel in soil can be divided into two categories: (1) Corrosion in disturbed soil, and (2) Corrosion in undisturbed soil. Disturbed soil is soil in which digging, backfilling, or other soil upheaval has taken place. Oxygen is introduced into the soil as a natural consequence of soil disturbance in the presence of air.

The corrosion rate of steel in disturbed soil is influenced by a number of corrosion-related parameters. These include soil resistivity, pH, chloride content, sulfate content, sulfide ion content, soil moisture, and oxygen content within the soil. Measurement of these parameters can give an indication of the corrosivity of a soil.



ESTIMATED LIFE OF GALVANIZED STEEL

The estimated life of a load supporting structural beam is assumed to have an allowable material loss of 25% before reaching its minimum strength requirement. Posts, H piles and W piles are assumed to corrode from two sides at the thinnest section such as the web of a I beam.

Material	Estimated Life of Galvanized Coating [Years to Total Consumption] ^{1,2}	Estimated life of Steel Substrate max 25% loss [Years]	Total Life [Years]	Galvanized Coating Thickness (mils) per ASTM A123 Table 2 Coating Grades
W6x8.5 Web Grade 75	1.8	5.8	7.6	3
W6x8.5 Web Grade 100	2.4	5.8	8.2	4
W6X12 Web Grade 75	1.8	7.9	9.7	3
W6X16 Web Grade 75	1.8	8.9	10.7	3
W6X25 Web Grade 75	1.8	11.0	12.8	3
Round Post Class 55	1.2	4.3	5.5	2
Round Post Class 75	1.8	4.3	6.1	3
Round Post Class 100	2.4	4.3	6.7	4

Expected Corrosion Rate of Steel and Zinc in disturbed soil

Expected Corrosion Rate for Steel = 3.64 mils/year for one sided attack

Expected Corrosion Rate for Zinc = 1.68 mils/year for one sided attack.

Note: 1 mil = 0.001 inch

Per California Test Method 643: Years to perforation of corrugated galvanized steel culverts

- 14.3 Years to Perforation for a 18 gage metal culvert
- 18.6 Years to Perforation for a 16 gage metal culvert
- 22.9 Years to Perforation for a 14 gage metal culvert
- 31.5 Years to Perforation for a 12 gage metal culvert
- 40.0 Years to Perforation for a 10 gage metal culvert
- 48.6 Years to Perforation for a 8 gage metal culvert

¹ King Nomograph for Galv coating, King, 1977

² Soil-Corrosion studies 1946 and 1948: Copper Alloys, Lead, and Zinc, Melvin Romanoff, National Bureau of Standards, Research Paper RP2077, 1950



The following recommendations are based on the soil conditions lab results previously listed. Unless otherwise indicated, these recommendations apply to the entire site or alignment and 35 foot depth.

FERROUS METALS

Sulfates, which is aggressive to copper and ferrous metals, was detected in high concentrations. The positive redox potential measured on the sample indicates oxidizing conditions in which anaerobic, sulfide-producing bacteria which are deleterious to copper alloys, are inactive.

Helical Anchors

Due to the nature of helical anchor installation, the soils just above the anchor are considered disturbed but the soil in which the helix lies is considered undisturbed. The region of disturbed soil above the anchor helix has increased availability of oxygen and the potential for corrosion, so it may become necessary to protect steel in this region from corrosion.³

Steel Piles

Steel piles are most susceptible to corrosion in disturbed soil where oxygen is available. Further, a dissimilar environment corrosion cell would exist between the steel embedded in concrete, such as pile caps and the steel in the soil. In the cell, the steel in the soil is the anode (corroding metal), and the steel in concrete is the cathode (protected metal). This cell can be minimized by coating the part of the steel piles that will be embedded in concrete to prevent contact with concrete and reinforcing steel.

Piles driven into soils without disturbing soils will avoid oxygen introduction and low corrosion rates unless there is a probability for corrosive anaerobic bacteria. Galvanized steel's zinc coating can provide significant protection for driven piles. To extend the life of piles, one can increase zinc coating thickness, use sacrificial metal, or provide a combination of coatings and cathodic protection. Corrosion has been observed to be extremely localized even at and below underground water tables. Pit depths of this magnitude do not have an appreciable effect on the strength or useful life of piling structures because the reduction in pile cross section is not significant.⁴ Pitting is of more importance to pipes transporting liquids or gases which should not be leaked into the ground.

Due to the conditions found at this site, the following recommendations are recommended to achieve a 25 year life.

- Sacrificial metal
or

³ Pacific Housing Systems White Paper, Dr. Thomas Bragg, 2008,

⁴ Melvin Romanoff, Corrosion of Steel Pilings in Soils, National Bureau of Standards Monograph 58, pg 20.



- Concrete coated steel piles with minimum 2 inch Type V coating or
- Coat portion of piles that will be underground with abrasion resistant epoxy coating such as 3M Scotchkote 323, or PowercreteDD, or equivalent. After installation of coated piles, a current requirement test and structure to soil potential survey should be performed to determine if the coating is providing adequate corrosion protection. If not, installation of a cathodic protection system should be installed. Use of epoxy coating in conjunction with a cathodic protection system will greatly reduce anode materials needed and CP system cost.

Expected Corrosion Rate of Steel and Zinc in Undisturbed soil

Expected Corrosion Rate for Steel = 1.00 mils/year for one sided attack

Expected Corrosion Rate for Zinc = 1.68 mils/year for one sided attack.

Note: 1 mil = 0.001 inch

All Steel Piles

After driving, cutoff, and welding any steel to be welded to the piles, coat exposed steel in the piles and bare steel welded to the piles to prevent pile/concrete contact and to prevent electrical contact between the piles and bare steel such as reinforcing steel and anchor bolts. Abrasive blast and use at least 8 mils dry film thickness of polyurethane or coal tar epoxy intended for underground use or coat with mastic such as Polyken 900 12-mil tape wrap with a 1027 primer or equivalent. Irregular shaped surfaces that can't be coated with the tape wrap can be coated with wax tape per AWWA C217. The coating should be allowed to cure at least hard enough to prevent damage by the placement of reinforcing steel and concrete before those materials are placed.

Steel pipe pile interiors may be protected by filling them with concrete or hermetically sealing the ends.

Underground Fuel Storage Tanks and Piping

Underground fuel tanks must be protected in accordance with California Underground Storage Tank Regulations dated 1994, issued by the State Water Resources Control Board. It requires that underground storage tanks used for storage of motor vehicle fuel shall be composed of fiberglass-reinforced plastic, cathodically protected steel, or steel clad with fiberglass-reinforced plastic. Consult the Regulations for complete construction requirements.

California Underground Storage Tank Regulations, 1994 states: "All corrodible underground piping, if in direct contact with backfill material, shall be protected against corrosion. Piping constructed of fiberglass-reinforced plastic, steel with cathodic protection, or steel isolated from direct contact with backfill, fulfills this corrosion protection requirement. Cathodic protection shall meet the requirements of section 2635(a)(2)."



Steel Pipe

Implement *all* the following measures:

Underground steel pipe with rubber gasketed, mechanical, grooved end, or other nonconductive type joints should be bonded for electrical continuity. Electrical continuity is necessary for corrosion monitoring and cathodic protection.

Install corrosion monitoring test stations to facilitate corrosion monitoring and the application of cathodic protection:

- a) At each end of the pipeline or 1,200 ft spacing.
- b) At each end of any casings and isolation joints.
- c) Other locations as necessary so the interval between test stations does not exceed 1,200 feet.

To prevent dissimilar metal corrosion cells and to facilitate the application of cathodic protection, electrically isolate each buried steel pipeline per NACE Standard SP0286 from:

- a) Dissimilar metals.
- b) Dissimilarly coated piping (cement-mortar vs. dielectric).
- c) Above ground steel pipe.
- d) All existing piping.

Choose one of the following corrosion control options:

OPTION 1

A. Apply a suitable dielectric coating intended for underground use such as:

- Polyurethane per AWWA C222 *or*
- Extruded polyethylene per AWWA C215 *or*
- A tape coating system per AWWA C214 *or*
- Hot applied coal tar enamel per AWWA C203 *or*
- Fusion bonded epoxy per AWWA C213.

B. Apply cathodic protection to steel piping as per NACE Standard SP0169.

NOTE: Some steel piping systems, such as for oil, gas, and high-pressure piping systems, have special corrosion and cathodic protection requirements that must be evaluated for each specific application.

Iron Pipe

Implement *all* the following measures:

1. Electrically insulate underground iron pipe from dissimilar metals and from above ground iron pipe with insulating joints per NACE Standard SP0286.
2. Bond all nonconductive type joints for electrical continuity. Electrical continuity is necessary for corrosion monitoring and cathodic protection.



3. Install corrosion monitoring test stations to facilitate corrosion monitoring and the application of cathodic protection:
 - a) At each end of the pipeline or 1,200 ft spacing.
 - b) At each end of any casings and isolation joints.
 - c) Other locations as necessary so the interval between test stations does not exceed 1,200 feet.
4. Choose one of the following corrosion control options:

OPTION 1

- a. Apply a suitable coating intended for underground use such as:
 - a) Polyethylene encasement per AWWA C105; *or*
 - b) Epoxy coating; *or*
 - c) Polyurethane; *or*
 - d) Wax tape.

NOTE: The thin factory-applied asphaltic coating applied to ductile iron pipe for transportation and aesthetic purposes does not constitute a corrosion control coating.

- b. Apply cathodic protection to cast and ductile iron piping as per NACE Standard SP0169.

CONCRETE

High concentrations of sulfate can react with components in concrete to cause degradation and reduced strength in a mechanism known as sulfate attack. Under current accepted standards of practice, the reported chemical values for soluble sulfate exposure per Table 19-A-4 of the 2010 CBC were found to be Severe.

For Severe sulfate concentrations in soil, protect concrete structures and pipe from sulfate attack, 0.2 to 2.0 water soluble sulfate (SO_4) in soil, percent by weight (2000-20,000 mg/kg). Use Type V cement, a maximum water/cement ratio of 0.45, and minimum strength of 4,500 psi per applicable code.^{1,2,3,4}

Chloride is particularly corrosive to ferrous metals, and in the higher concentrations chloride can overcome the corrosion inhibiting effect of concrete on reinforcing steel. The highest level of chloride found in these samples was 1,830 mg/kg.

2. Chloride levels were measured at levels⁵ where additional protective measures are required for concrete. Protect steel and iron embedded in concrete structures and pipe from chloride attack. This applies to such items as reinforcing steel and anchor bolts but not post-tensioning strands and anchors. The protection could be one of the following:
 - a. Protective Concrete - A concrete mix designed to protect embedded steel and iron that should be based on the following parameters: 1) a chloride content of 1,830

⁵ Design Manual 303: Concrete Cylinder Pipe. Ameron. p.65



ppm in the soil; 2) the desired service life; and 3) concrete cover. We recommend the use of a high strength concrete (4500 psi) to protect rebar and hardware. Provide 3 inches minimum concrete cover for rebar, and for a high quality underlayment such as 15 mil Stego which needs to have sand above and below to protect against punctures.⁶

- b. Waterproof Concrete - Waterproofing for concrete could be a gravel capillary break under the concrete, a waterproof membrane, and/or a liquid applied waterproof barrier coating such as CETCO Liquid Boot®. Visqueen, similar rolled barriers, or bentonite-based membranes are not viable waterproofing systems, from a corrosion standpoint.
- c. Coat Embedded Metal - A coating for embedded steel and iron could be an epoxy coating applied to the metal. Purple fusion bonded epoxy (FBE) (ASTM A934) intended for prefabricated reinforcing steel reinforcing steel is suitable. The green flexible FBE (ASTM A775) is not recommended.
- d. Cathodic Protection - Cathodic protection is most practical for pipelines and must be designed for each application. The amount of cathodic protection current needed can be minimized by coating the steel or iron.

Post Tensioning Slabs: Unbonded Single-Stranded Tendons and Anchors

The proper sealing of stressing holes is of utmost importance in PT Systems. Cut off excess strand 1/2" to 3/4" back in the hole. Coat or paint exposed anchorage, grippers, and stub of strands with "Rust-o-leum" or equal. After tendons have been coated, the concrete contractor shall dry pack blockouts within ten (10) days. A non-shrink, non-metallic, non-porous moisture-insensitive grout (Master EMACO S 488 or equivalent), or epoxy grout shall be used for this purpose. If an encapsulated post-tension system is used, regular non-shrink grout can be used.

1. Soil with chloride levels above 350 ppm is considered an aggressive environment for post-tensioning strands and anchors. Therefore, due to the high chloride levels found on-site, protect post-tensioning strands and anchors against corrosion in this aggressive (corrosive) environment. Implement *all* the following measures:^{7,8,9}
 - a. Completely encapsulate the tendon and anchor with polyethylene to create a watertight seal.
 - b. Add grease caps to the ends to provide extra protection against corrosion due to high chloride concentrations.
 - c. All components exposed to the job site should be protected within one working day after their exposure during installation.
 - d. Ensure the minimum concrete cover over the tendon tail is 1-inch, or greater if required by the applicable building code.

⁶ *Standard Requirements for Design of Shallow PT Concrete Foundations on Expansive soil*

⁷ *Post-Tensioning Manual, sixth edition. Post-Tensioning Institute (PTI), Phoenix, AZ, 2006.*

⁸ *Specification for Unbonded Single Strand Tendons. Post-Tensioning Institute (PTI), Phoenix, AZ, 2000.*

⁹ *ACI 423.6-01: Specification for Unbonded Single Strand Tendons. American Concrete Institute (ACI), 2001*



- e. Caps and sleeves should be installed within one working day after the cutting of the tendon tails and acceptance of the elongation records by the engineer.
- f. Inspect the following to ensure the encapsulated system is completely watertight:
 - i. Sheathing: Verify that all damaged areas, including pin-holes, are repaired.
 - ii. Stressing tails: After removal, ensure they are cut to a length for proper installation of P/T coating filled end caps.
 - iii. End caps: Ensure proper installation before patching the pocket former recesses.
 - iv. Patching: Ensure the patch is of an approved material and mix design, and installed void-free.
- g. Limit the access of direct runoff onto the anchorage area by designing proper drainage.
- h. Provide at least 2 inches of space between finish grade and the anchorage area, or more if required by applicable building codes.

Pre-cast Concrete Piles

- 1. It is assumed that prestressed concrete piles will contain about 8 sacks of type V cement per cubic yard of concrete, a water/cement ratio not exceeding 0.45, and 2 inches of concrete cover. No further corrosion control measures are required for such piles. Soil samples from the expected depth of a pile should be tested for proper recommendation.
- 2. If ground water is present, solid steel lifting lugs are recommended to prevent ground water from wicking into the pile interior. If wire rope lifting lugs are used, they should be carefully drilled out 1.5 inches deep and the hole filled with epoxy.

Steel Reinforced Cast in Place Concrete Piles

- 1. Protect steel reinforced cast-in-place and cast-in-drilled-hole concrete piles the same way as concrete structures mentioned under the concrete structures section in this report.

COPPER ALLOYS

The lowest pH for this area was measured to be 6.6. Soil with a pH less than 5.5 is considered aggressive to copper.

Ammonium and nitrate were detected in low concentrations. The concentrations are not high enough to be deleterious to copper.

Bare Copper Grounding Wire

It is assumed that corrosion will occur at all sides of the bare wire, thus the corrosion rate is calculated as a two sided attack determining the time it takes for the corrosion from two sides to



meet at the center of the wire. The estimated life of bare copper wire for this site is the following:¹⁰

Size (AWG)	Diameter (mils)	Est. Time to penetration (Yrs)
14	64.1	35.6
13	72	40.0
12	80.8	44.9
11	90.7	50.4
10	101.9	56.6
9	114.4	63.6
8	128.5	71.4
7	144.3	80.2
6	162	90.0
5	181.9	101.1
4	204.3	113.5
3	229.4	127.4
2	257.6	143.1
1	289.3	160.7

If the bare copper wire is being used as a grounding wire connected to less noble metals such as galvanized steel or carbon steel, as is the situation at this site, the less noble metals will provide additional cathodic protection to the copper reducing the corrosion rate of the copper.

Copper Tubing

Implement *all* the following measures:

1. Place cold water copper tubing in an 8-mil polyethylene sleeve or encase in double 4-mil thick polyethylene sleeves and bed and backfill with clean sand at least 2 inches thick surrounding the tubing. Clean sand should have a minimum resistivity of no less than 3000 ohm-cm, and a pH of 6.0–8.0. Copper tubing for cold water can also be treated the same as for hot water.
2. Hot water tubing may be subject to a higher corrosion rate. Protect hot copper tubing by one of the following measures:
 - a. Preventing soil contact. Soil contact may be prevented by placing the tubing above ground or encasing the tubing with PVC pipe with solvent-welded joints.
or
 - b. Applying cathodic protection per NACE Standard SP0169. The amount of cathodic protection current needed can be minimized by coating the tubing.

¹⁰ Soil-Corrosion studies 1946 and 1948: Copper Alloys, Lead, and Zinc, Melvin Romanoff, National Bureau of Standards, Research Paper RP2077, 1950



ALUMINUM ALLOYS

Soil with a pH greater than 8.5 or lower than 4 may be aggressive to aluminum. Conditions at this site are safe for aluminum. Aluminum Corrosion resistance is very good between pH of 4 and 9. Aluminum derives its corrosion resistance from its oxide layer which needs oxygen to regenerate if damaged. Thus aluminum is not good for deep soil applications.

High chloride concentrations can also cause pitting in aluminum such as those found in the soils on this site. Direct burial of aluminum into soil or in concrete is not recommended.

Avoid connection of aluminum to dissimilar metals in soil or water as aluminum is more likely to sacrifice itself in the corrosion reaction due to its low nobility in the galvanic series. Use of electrical insulations between dissimilar metals will prevent galvanic corrosion.

OTHER

Plastic and Vitrified Clay Pipe

No special precautions are required for plastic and vitrified clay piping placed underground from a corrosion viewpoint.

Protect all metallic fittings and valves with wax tape per AWWA C217 or epoxy.

All Pipe

On all pipes, appurtenances, and fittings not protected by cathodic protection, coat bare metal such as valves, bolts, flange joints, joint harnesses, and flexible couplings with wax tape per AWWA C217 after assembly.

Where metallic pipelines penetrate concrete structures such as building floors, vault walls, and thrust blocks use plastic sleeves, rubber seals, or other dielectric material to prevent pipe contact with the concrete and reinforcing steel.

CLOSURE

In addition to soils chemistry and resistivity, another contributing influence to the corrosion of buried metallic structures is stray electrical currents. These electrical currents flowing through the earth originate from buried electrical systems, grounding of electrical systems in residences and commercial buildings and from high voltage overhead power grids. Therefore, it is imperative that the application of protective wraps and/or coatings be properly applied and inspected.

It is the responsibility of the builder and/or contractor to closely monitor the installation of such materials requiring protection in order to assure that the protective wraps or coatings are not damaged.



The recommendations outlined herein are in conformance with current accepted standards of practice that meet or exceed the provisions of the Uniform Building Code (UBC), the International Building Code (IBC), the American Concrete Institute (ACI), National Association of Corrosion Engineers (NACE International), Post-Tensioning Institute Guide Specifications and State of California Department of Transportation, Standard Specifications, American Water Works Association (AWWA) and the Ductile Iron Pipe Research Association (DIPRA).

Our services have been performed with the usual thoroughness and competence of the engineering profession. No other warranty or representation, either expressed or implied, is included or intended.

Please call if you have any questions.

Respectfully Submitted,

Eddie Hernandez, M.Sc., P.E.
Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
California No. M37102
ehernandez@projectxcorrosion.com





SOIL ANALYSIS LAB RESULTS

Client: AECOM
Job Name: LACMA Phase III
Client Job Number: 60440464
Project X Job Number: S160217A
February 18, 2016

Sample ID	Bore# / Description	Method	ASTM G57	ASTM G57	ASTM D516			ASTM D512B			HACH 835		HACH 830		SM 2580-B	ASTM G51
		Depth	As-Rec'd Resistivity	Min-Resistivity	Sulfates			Chlorides			Nitrate		Ammonia		Redox (mV)	pH
		(ft)	(Ohm-cm)	(Ohm-cm)	(mg/L)	(mg/kg)	(wt%)	(mg/L)	(mg/kg)	(wt%)	(mg/L)	(mg/kg)	(mg/L)	(mg/kg)		
1	B-1	5	4,600	1,300	240	1,200	0.120	10	50	0.005	2.4	12.0	1.7	8.5	79	7.9
2	B-2	20	41,000	4,400	3,670	18,350	1.835	30	150	0.015	1.3	6.5	0.1	0.5	130	6.6
3	B-3	35	20,000	1,900	1,970	9,850	0.985	610	3,050	0.305	1.6	8.0	0.1	0.5	123	7.1

Unk = Unknown

NT = Not Tested

ND = Not Detected

mg/kg = milligrams per kilogram (parts per million) of dry soil weight

mg/L - milligrams per liter of liquid volume

Chemical Analysis performed on 1:5 Soil-To-Water extract

Please call if you have any questions.

Respectfully Submitted,

Eddie Hernandez, M.Sc., P.E.
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NACE Corrosion Technologist #16592
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CORROSION BASICS

Corrosion is a natural process whereby metals return to their natural state by releasing energy stored during processing. Metals are generally most stable when in the form of their naturally occurring ores. For example, iron ore, which is used to produce various steel alloys, is essentially a form of iron oxide (rust). Energy in the form of heat and mechanical work is added to these stable ores to produce many different refined alloys. This energy is gradually dissipated, as the metal alloys tend to revert back to its naturally occurring basic ore. In the specific case of iron, the byproduct of the corrosion is the compound commonly referred to as rust. The process is similar for most all metals.

Corrosion of metals in water or soil is electrochemical corrosion. Any electrochemical corrosion reaction can be broken down into four essential components as seen in Figure 2.

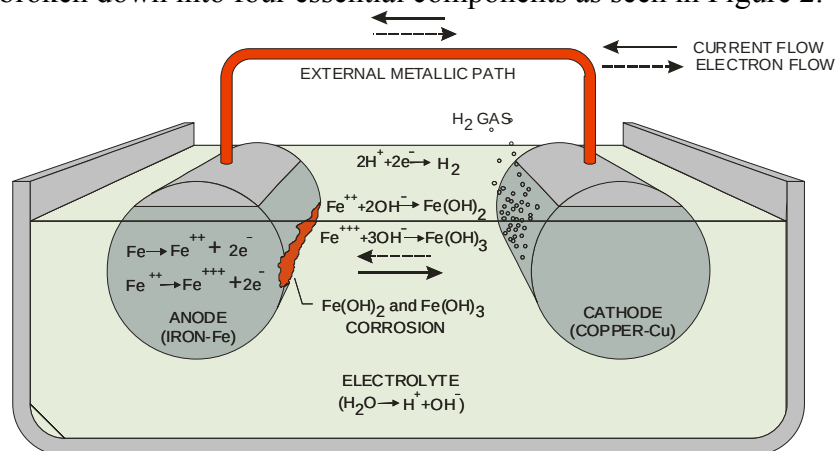


Figure 2 - Corrosion cell diagram

All of the following four components must be present for a corrosion reaction to proceed:

- Cathode (or cathodic area), the electrode of an electrochemical cell at which reduction is the principal reaction. Electrons flow toward the cathode in the external circuit.
- Anode (or anodic area), the electrode of an electrochemical cell at which oxidation occurs. Electrons flow away from the anode in the external circuit. Corrosion usually occurs and metal ions enter the solution at the anode, destroying the anode.
- Electrolyte, a chemical substance containing ions that migrate in an electric field. This substance is capable of transmitting electricity such as water.
- A metallic path electrically connecting the anode and cathode or anodic and cathodic areas. For example, the steel in a pipeline serves as a conductive path linking cathodic and anodic areas together.

These four components form a corrosion cell that is driven by the potential energy difference between the anode (more active; less noble metal) and cathode (more noble; less active metal). The anode is at a higher energy level and corrodes as it releases energy to the cathode via electrochemical reactions and current flow between the anode and cathode. This hierarchy is shown in the figure below known as the galvanic series named after Luigi Galvani whose experiments with electricity and muscles led Alessandro Volta to discover the reactions between dissimilar metals leading to the early battery.

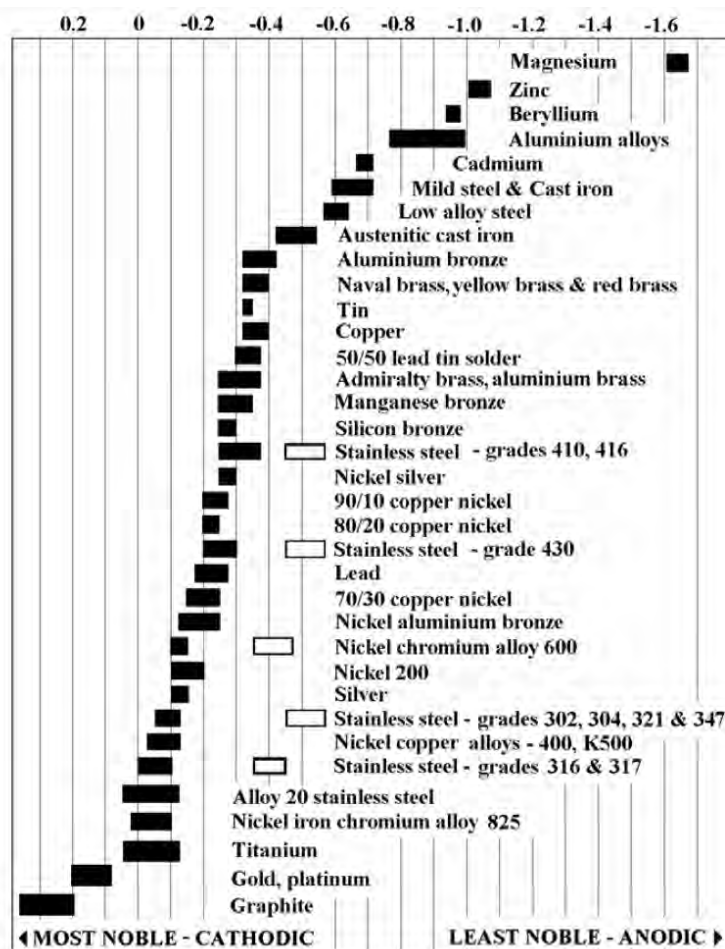


Figure 3 Galvanic Series

A common flashlight battery demonstrates the process of zinc corrosion and the resulting electricity generated. This was also shown in a Breaking Bad episode in which Mr. White & Jesse charged their dead battery in the middle of the desert using zinc coated nuts and bolts and copper materials. In the battery shown in Figure 4, all four components required for a corrosion reaction are present as follows:

- The carbon rod is the cathode.
- The zinc casing is the anode.
- The paste inside the battery is the conductive electrolyte.
- The external wire (with a switch and light bulb) is the electrically metallic path linking the anode and cathode.



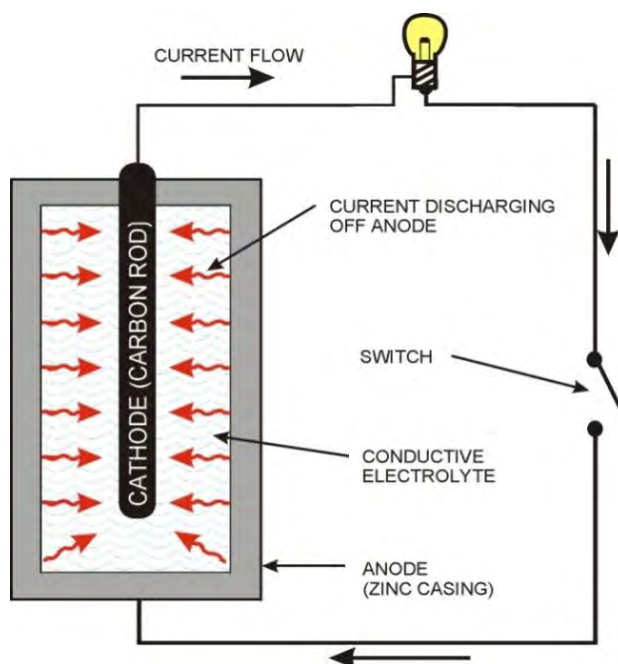


Figure 4 - Battery Circuit

In this example, the zinc casing serves as the anode and is slowly oxidized. With time, the zinc will be sufficiently corroded to the point that it can no longer contain the paste inside. This explains why old batteries develop leaks. If the switch is opened or the external wire is removed, the battery would not have all four corrosion cell components, and it would not generate electricity from zinc corrosion. The rate of corrosion can also depend on the surface area of the anode and the cathode. If the surface area of the cathode is much larger than the surface area of the anode, the corrosion rate of the anode will be faster. If the surface area of the anode is much larger than the surface area of the cathode, the corrosion rate will be slower. This is why pipelines are electrically isolated using insulating flanges, monolithic insulators, nylon bushings, and dielectric unions as shown in Figure 5, at strategic locations.

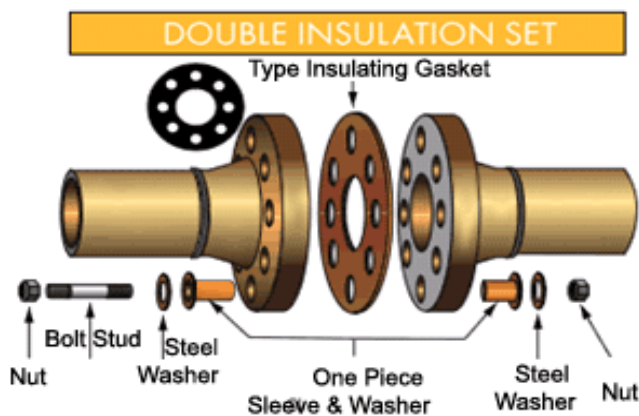


Figure 5 - Electrical Isolation kit



A galvanic corrosion scenario that occurs frequently in water distribution systems is the combination of a brass valve with an iron or steel pipe, as shown in Figure 6.

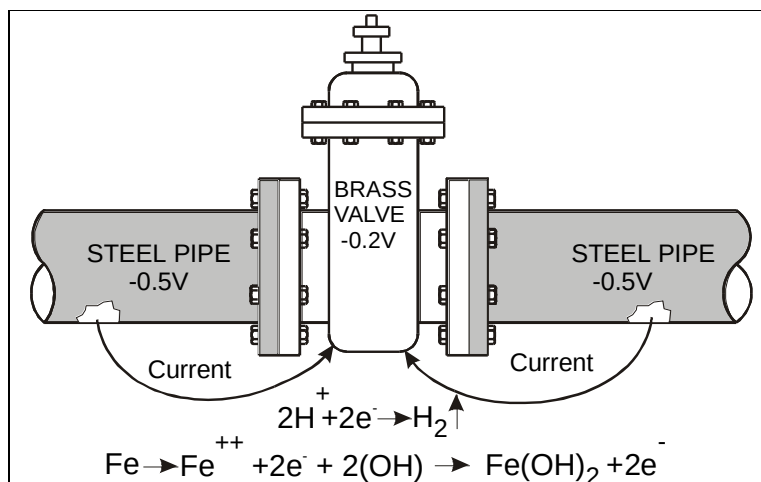


Figure 6 - Common Waterline galvanic corrosion cell

A new steel pipe has a natural energy potential or voltage of -0.5 to -0.8 Volts. A brass valve has a natural energy potential or voltage of approximately -0.2 Volts. This difference in voltage sets up a galvanic corrosion cell, essentially creating a battery in the soil.

In cases of external corrosion, corrosion cells can also be accidentally created when electricians ground electrical systems to nearby piping such as in Figure 7.

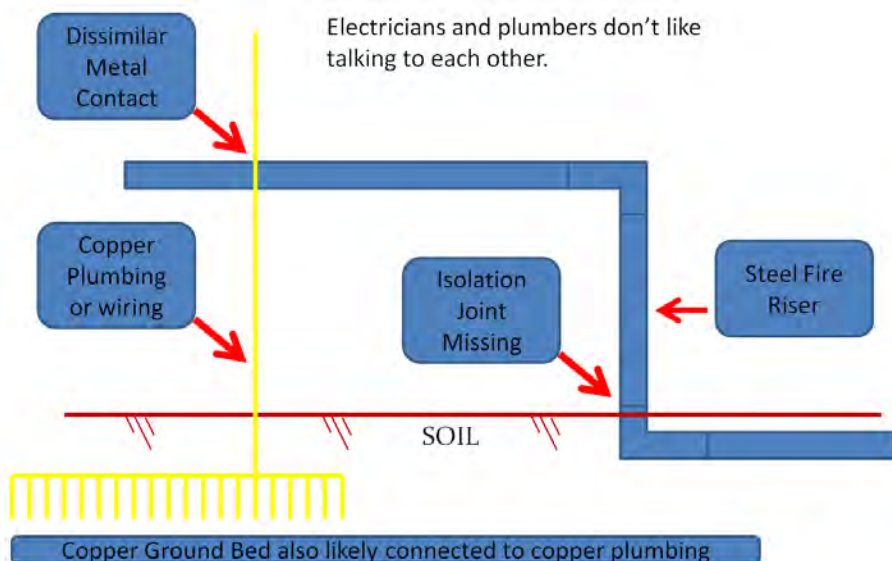


Figure 7 - Electrical grounding connecting dissimilar metals

The metal with the higher voltage, the steel, gives up ions due to the potential difference and the steel pipe corrodes. In contrast, the bronze valve is protected from corrosion by its interaction with the steel pipe. The same can occur if a steel pipe becomes electrically continuous to a



copper grounding system or plumbing system whose surface area is much greater than that of the steel pipe.

Another common mistake is to mix stainless steel nuts and bolts with galvanized carbon steel. The stainless steel typically has the same nobility as copper and will cause accelerated corrosion of the galvanized steel at its point of contact.

If dissimilar metal connections underground or underwater cannot be avoided, use of isolation joint kits or an epoxy coating covering at least a square foot of the area around the bolt is recommended.

The eternal question from corrosion engineers to electricians is : Why don't electricians run grounding wires to ground rods or meshes instead of piggy-backing on water lines, gas lines, or fire lines, shorting di-electric unions (which were installed for a reason) and in the case of gas lines, potentially shorting a cathodic protection system putting the system's corrosion protection system in jeopardy? Why don't electricians just install their own grounding system?

SOIL CORROSIVITY

A major factor in determining soil corrosivity is electrical resistivity. The electrical resistivity of a soil is a measure of its resistance to the flow of electrical current. Corrosion of buried metal is an electrochemical process in which the amount of metal loss due to corrosion is directly proportional to the flow of electrical current (DC) from the metal into the soil. Corrosion currents, following Ohm's Law, are inversely proportional to soil resistivity. Lower electrical resistivities result from higher moisture and soluble salt contents and indicate corrosive soil.

A correlation between electrical resistivity and corrosivity toward ferrous metals is:¹¹

<u>Soil Resistivity</u> <u>in ohm-centimeters</u>	<u>Corrosivity Category</u>
Greater than 10,000	Mildly Corrosive
2,000 to 10,000	Moderately Corrosive
1,000 to 2,000	Corrosive
0 to 1,000	Severely Corrosive

Other soil characteristics that may influence corrosivity towards metals are pH, soluble salt content, soil types, aeration, corrosive bacteria, anaerobic conditions, and site drainage.

INTERNAL CORROSION

The factors involved in interior corrosion depend on the interior liquid's corrosivity. These factors are pH, temperature, stagnation time, corrosive bacteria (MIC), biofilms, galvanic corrosion cells, crevices, liquid material compatibility, and liquid chemistry. Corrosive bacteria are found in both soils and water but more prone to cause damage in stagnant areas such as

¹¹ Romanoff, Melvin. *Underground Corrosion*, NBS Circular 579. Reprinted by NACE. Houston, TX, 1989, pp. 166–167.



crevices or the underside of a pipe in contact with soil. The bacteria themselves do not eat the metal but their by-products cause chemical reactions creating corrosive environments.

Corrosion programs normally pay for themselves



LIQUEFACTION POTENTIAL EVALUATION

The liquefaction potential evaluation was performed based on the approaches recommended by Seed et al. (2003) for a unified and consistent framework to evaluate liquefaction. The standard procedure generally followed using standard penetration test (SPT) data was adopted in the liquefaction analyses for this Project to estimate the cyclic shear stress ratio (CSR) and cyclic resistance ratio (CRR). The simplified procedure is summarized in Seed et al. (2003). This approach meets the requirements of the California Geological Survey (CGS) Special Publication 117A (2008). The simplified liquefaction evaluation procedure involves the following basic steps:

- a. An estimate is made of the cyclic shear stress ratio (CSR) caused by given earthquake ground motions at different depths using a simplified approach. The intensity of ground shaking, the duration of shaking, general site conditions and the variations of induced shear stresses with depth are incorporated into the evaluation.
- b. An estimate is then made of the cyclic resistance ratio (CRR), indicative of the liquefaction resistance of the site subsurface soils due to the magnitude of shaking. Recommendations were provided to estimate CRR from shear wave velocity data.
- c. The procedure can provide a deterministic index, namely a factor of safety (FS), comparing the CRR and CSR to evaluate the potential zone of liquefaction in the soil deposit. The FS against liquefaction is defined as $FS = CRR/CSR$. Potential zones of liquefaction correspond to soil layers where FS is less than 1. In addition to the FS, the procedure can provide a probabilistic evaluation for liquefaction potential.

SEISMIC SETTLEMENT

The seismic settlement evaluation for the granular materials above the groundwater level was based on the approach recommended by Tokimatsu and Seed (1987), which is based on the standard penetration test result (SPT-N value) and the relative density. The simplified evaluation procedure involves the following three basic steps:

- a. Maximum shear modulus (G_{max}) is determined based on soil condition using SPT-N value and its corresponding mean effective pressure (σ'_m). Similar to the procedure presented by Youd and Idriss (2001) that summarized the National Center for Earthquake Engineering Research (NCEER) and National Science Foundation (NSF) workshops for liquefaction evaluation, corrected SPT-N values, $(N_1)_{60}$, are then calculated. With the given σ'_m and $(N_1)_{60}$, G_{max} can be obtained using the approximation by Ohta and Goto (1976).
- b. Using the criteria recommended by Tokimatsu and Seed (1987) with the shear modulus and cyclic shear strain relationship by Ishibashi and Zhang (1993), shear strain can be found with a given ground acceleration for any known soil condition.
- c. With any given shear strain and relative density, which can be approximated based on Kulhawy and Mayne (1990), normal strain can be obtained using either Silver and Seed (1971) or Tokimatsu and Seed (1987). Seismically-induced settlement per layer above groundwater level can be calculated using the normal strain with the proper scale factor for design earthquake magnitude.

ANALYSES

Calculations for liquefaction potential evaluations were based on a peak ground acceleration and corresponding moment magnitude. The design groundwater level was assumed at elevation of +167 feet above MSL. In addition, the seismic settlement of sandy soils located above the groundwater levels due to the design level earthquake events was also calculated. All the calculations are presented at the end of this appendix.



SHEET	1	OF	1
PROJECT	60506707		
DATE	5/15/2018		
COMPUTED BY	K. CHANG		
CHECKED BY	N. SU		

PROJECT: LACMA Building for Permanent Collection Project

SUBJECT: LIQUEFACTION POTENTIAL EVALUATION

Reference: Seed, et.al., 2003, Recent Advances in Soil Liquefaction Engineering: A Unified and Consistent Framework
FAT CLAYS (CH) and ELASTIC SILTS (MH) not considered in analyses

Soil Unit Weight (pcf)	=	120
Energy Ratio (%)	=	80
Design Probability in decimals	=	0.15
Peak Ground Acceleration (g)	=	0.93
Earthquake Magnitude	=	6.625

BORING	DEPTH	SPT-N	SOIL CLASSIF.	PERCENT FINES P200	DEPTH TO WATER DURING DRILLING (feet)	BOREHOLE DIAMETER (inches)	SAMPLE TYPE	LINER USED	DESIGN WATER LEVEL IN DEPTH (feet)	LIQUEFIABLE FINE-GRAINED SOILS	AVERAGE SHEAR WAVE VELOCITY AT UPPER 40 FEET (feet/sec)	TOTAL PRESSURE (ksf)	EFFECTIVE PRESSURE (ksf)	DEPTH FACTOR Cn	ENERGY FACTOR Ce=ER/60	BORING DIAMETER FACTOR Cb	ROD FACTOR Cr	SAMPLER FACTOR Cs	NOR. PENETR. N1	MODIFIED PENETR. (N1)60	FINES CORRECTION CFINES	PENETR. RESIST. (N1)60CS	SHEAR MASS PARTICIPATION FACTOR fd	STD DEVIATION FOR fd	EFFECTIVE PRESSURE DURING LIQUEFACTION (ksf)	IN-SITU CYCLIC STRESS RATIO CSReq	DWFd	Ks	ADJUSTED CYCLIC STRESS RATIO CSR*	CYCLIC RESISTANCE RATIO CRR	PROBABILITY OF LIQUEFACTION (%)	FACTOR OF SAFETY	VOLUM. STRAIN (%)	LAYER THICKNESS (feet)	SETTLE LAYER (in)	SETTLE TOTAL (in)
(No.)	(feet)	(bpf)										(ksf)	(ksf)	Cn	Ce=ER/60	Cb	Cr	Cs	N1	(N1)60	CFINES	(N1)60CS	fd	σfd	(ksf)	CSReq	DWFd	Ks	CSR*	CRR	(%)		(%)	(feet)	(in)	(in)
B-15-1	5	17	CL		1	4	SPT	NO	1	NO	900	0.60	0.35	1.70	1.33	1.00	0.75	1.10	29	32	1.0	32	1.00	0.03	0.35	1.034	1.33	1.50	0.520	0.766	0	non-liquefiable		13		
B-15-1	15	11	CH		1	4	SPT	NO	1	NO	900	1.80	0.93	1.47	1.33	1.00	0.85	1.10	16	20	1.0	20	1.00	0.07	0.93	1.170	1.33	1.39	0.634	0.244	0	non-liquefiable		5		
B-15-1	25	28	SM		1	4	SPT	NO	1		900	3.00	1.50	1.15	1.33	1.00	0.95	1.20	32	49	1.0	49	0.99	0.11	1.50	1.191	1.33	1.15	0.783	1.875	0	>1.2		10		
B-15-1	35	49	SM		1	4	SPT	NO	1		900	4.20	2.08	0.98	1.33	1.00	1.00	1.20	48	77	1.0	77	0.96	0.15	2.08	1.177	1.33	1.01	0.881	13.816	0	>1.2		10		
B-15-1	45	100	SM		1	4	SPT	NO	1		900	5.40	2.65	0.87	1.33	1.00	1.00	1.20	87	139	1.0	139	0.91	0.17	2.65	1.125	1.33	0.91	0.928	1353.988	0	>1.2		10		
B-15-1	55	55	SM		1	4	SPT	NO	1		900	6.60	3.23	0.79	1.33	1.00	1.00	1.20	43	69	1.0	69	0.84	0.17	3.23	1.040	1.33	0.92	0.854	6.875	0	>1.2		10		0.0
B-15-2	6	7	CH	54.0	1	8	SPT	NO	1	NO	900	0.72	0.41	1.70	1.33	1.15	0.75	1.10	12	15	1.3	19	1.00	0.03	0.41	1.066	1.33	1.50	0.536	0.327	0	non-liquefiable		9		
B-15-2	16	12	CL	65.0	1	8	SPT	NO	1	NO	900	1.92	0.98	1.43	1.33	1.15	0.85	1.10	17	25	1.2	30	1.00	0.08	0.98	1.174	1.33	1.36	0.651	0.687	0	non-liquefiable		10		
B-15-2	26	100	SM		1	8	SPT	NO	1		900	3.12	1.56	1.13	1.33	1.15	0.95	1.20	113	198	1.0	198	0.99	0.11	1.56	1.191	1.33	1.13	0.795	132025.669	0	>1.2		10		
B-15-2	36	58	SP-SM		1	8	SPT	NO	1		900	4.32	2.14	0.97	1.33	1.15	1.00	1.20	56	103	1.0	103	0.96	0.15	2.14	1.173	1.33	1.00	0.888	99.206	0	>1.2		10		
B-15-2	46	100	SP-SM		1	8	SPT	NO	1		900	5.52	2.71	0.86	1.33	1.15	1.00	1.20	86	158	1.0	158	0.91	0.17	2.71	1.117	1.33	0.91	0.930	5658.053	0	>1.2		15		
B-15-2	56	36	CL		1	8	SPT	NO	1	NO	900	6.72	3.29	0.78	1.33	1.15	1.00	1.20	28	52	1.0	52	0.83	0.17	3.29	1.032	1.33	0.84	0.927	1.828	0	non-liquefiable		1		0.0
B-15-3	12	19	CL		1	8	SPT	NO	1	NO	900	1.44	0.75	1.63	1.33	1.15	0.80	1.10	31	42	1.0	42	1.00	0.06	0.75	1.152	1.33	1.50	0.579	1.309	0	non-liquefiable		16		
B-15-3	22	32	SM		1	8	SPT	NO	1		900	2.64	1.33	1.23	1.33	1.15	0.95	1.20	39	69	1.0	69	0.99	0.10	1.33	1.189	1.33	1.20	0.744	8.386	0	>1.2		10		
B-15-3	32	45	SM		1	8	SPT	NO	1		900	3.84	1.91	1.02	1.33	1.15	0.95	1.20	46	81	1.0	81	0.97	0.14	1.91	1.185	1.33	1.04	0.856	18.654	0	>1.2		10		
B-15-3	42	42	SP-SM		1	8	SPT	NO	1		900	5.04	2.48	0.90	1.33	1.15	1.00	1.20	38	69	1.0	69	0.93	0.17	2.48	1.145	1.33	0.94	0.920	7.473	0	>1.2		10		
B-15-3	52	41	SM		1	8	SPT	NO	1		900	6.24	3.06	0.81	1.33	1.15	1.00	1.20	33	61	1.0	61	0.87	0.17	3.06	1.067	1.33	0.86	0.932	3.764	0	>1.2		12		0.0
B-15-4	5	7	CL		7	4	SPT	NO	7	NO	900	0.60	0.60	1.70	1.33	1.00	0.75	1.10	12	13	1.0	13	1.00	0.03	0.60	0.604	1.33	1.29	0.354	0.162	0	non-liquefiable		13		
B-15-4	15	25	SC		7	4	SPT	NO	7		900	1.80	1.30	1.24	1.33	1.00	0.85	1.20	31	42	1.0	42	1.00	0.07	1.30	0.833	1.33	1.21	0.517	1.159	0	>1.2		10		
B-15-4	25	40	SC		7	4	SPT	NO	7		900	3.00	1.88	1.03	1.33	1.00	0.95	1.20	41	63	1.0	63	0.99	0.11	1.88	0.953	1.33	1.05	0.685	4.915	0	>1.2		10		
B-15-4	35	38	SC		7	4	SPT	NO	7		900	4.20	2.45	0.90	1.33	1.00	1.00	1.20	34	55	1.0	55	0.96	0.15	2.45	0.997	1.33	0.94	0.797	2.529	0	>1.2		10		
B-15-4	45	100	SC		7	4	SPT	NO	7		900	5.40	3.03	0.81	1.33	1.00	1.00	1.20	81	130	1.0	130	0.91	0.17	3.03	0.986	1.33	0.87	0.858	670.797	0	>1.2		5		
B-15-4	55	100	SP-SM		7	4	SPT	NO	7		900	6.60	3.60	0.74	1.33	1.00	1.00	1.20	74	119	1.0	119	0.84	0.17	3.60	0.932	1.33	0.81	0.870	283.253	0	>1.2		10		0.0

C. GARRY LAY, PE, GE

VICE PRESIDENT/PRINCIPAL GEOTECHNICAL ENGINEER

AREAS OF EXPERTISE

Geotechnical Engineering
Project Management

EDUCATION

BS/Civil Engineering/1974/
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MS/Civil Engineering/1977/
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LICENSES/REGISTRATIONS

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1997/Geotechnical Engineer
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YEARS OF EXPERIENCE

With Firm	22
With Other Firms	17

PROFESSIONAL ASSOCIATIONS

American Society of Civil Engineers
International Society of Soil Mechanics
and Foundation Engineers
Society of American Military Engineers

PUBLICATIONS

Co-Author, 1993, Geogrid
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American Regional Conference on
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Technology Award.
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Geogrid Reinforced Slope on
Compressible Foundation,
Proceedings, The 28th Symposium on
Engineering Geology and
Geotechnical Engineering, Boise,
Idaho, April 1992.

SUMMARY

Mr. Lay has 39 years of professional practice in geotechnical engineering and project management. He is the Manager of the AECOM Geotechnical Department in Los Angeles Metro Region, California. A few building projects representing Mr. Lay's experience are listed below.

EXPERIENCE

Principal Geotechnical Engineer for Mixed-use High-rise Development, South Park, Downtown Los Angeles, California. The development consists of a 30-story residential tower, 6-story commercial and parking podium over a 6-level subterranean parking structure located at the southwest intersection of 11th Street and Hill Street. The above- and below-ground structures will be of reinforced concrete construction. The project design firm is Skidmore, Owens & Merrill. The geotechnical investigation to support the design has begun in April 2015 and expected to be completed by mid-June 2015.

Principal Geotechnical Engineer for One-Archer Lane, Honolulu, Hawaii. The development consists of a 33-story residential tower, 8-story commercial and parking podium over a one-level subterranean parking structure located at the 801 S. King Street in Honolulu, Hawaii. Geotechnical investigation was performed to develop design parameters for shoring system, dewatering, and a single concrete mat footing with tie-down anchors. The mat footing was designed to bear on a layer of hard coralline rock. The use of mat foundation for this high-rise building without a shallow subterranean structure is a first in Hawaii. The mat foundation design provides substantial costs savings over conventional piles or drilled shafts foundation systems. Also provided geotechnical inspection and testing services during the construction phase of the project.

Principal Geotechnical Engineer for Ala Moana Shopping Center Renovation Project in Honolulu, Hawaii. A major renovation added a new level to the center portion of the largest shopping center in Hawaii. This required strengthening of the existing foundation for both vertical and horizontal earthquake forces. The original foundation for the shopping center consisted of single driven octagonal prestressed concrete piles bearing on a very dense coralline reef formation at a depth of about 25 to 30 feet below the existing ground surface. One hundred and fifty-nine (159) 90 kips capacity micro-piles were selected to support the new building loads. The piles were installed inside the existing structure using short-masted, electric, rotary drills coring through the overburden soils into the coral.

Project Geotechnical Engineer for Four Seasons Hotel Los Angeles at Beverly Hills, California. This project was a 35-story hotel with a four-level subterranean parking garage located at 300 S. Doheny Drive, Los Angeles. The subterranean excavation was supported on all sides by over

250 soldier piles with two levels of anchored tiebacks.

Principal Geotechnical Engineer, Caltrans District 7 Headquarters, Office Building Replacement, Los Angeles, California. This 13-story project is located in downtown Los Angeles. The project included geotechnical engineering, hazardous waste and surveying deliverables. This work was being prepared as part of the preliminary engineering and scoping document in support of a subsequent design-build project delivery.

Principal Geotechnical Consultant responsible for geotechnical engineering and geological services for design and construction phases to the following medical-related facilities in southern California:

- **Martin Luther King Jr. Multi-Service Ambulatory Care Center**, Los Angeles, California (Senate Bill 1953 Seismic Retrofits and new constructions for Multi-Service Ambulatory Care Center building, Ancillary building, Central Plant, and Pedestrian Tunnel, 2001 - present).
- **Olive View – UCLA Medical Center**, Sylmar, California (new constructions for Emergency Services/Acute Care Unit Expansion building, psychiatric Urgent Care Center and Day Care Facility, 2005 – 2008).
- **Harbor - UCLA Medical Center**, Los Angeles, California (Senate Bill Seismic Retrofits and Make Ready/Site Preparation, 2002-2010).
- **LAC+USC Medical Center Replacement Project**, Los Angeles, California (new construction of a 600-bed replacement hospital, 1998 – 2008).
- **High Desert Health System Multi-Service Ambulatory Care Center**, Lancaster, California (21 acres land development for a new hospital facility, 2007).
- **Rady Children's Hospital**, San Diego, California (new Acute Care Pavilion and Pedestrian Bridge, 2005 - 2009).
- **Palomar Medical Center West**, Escondido, California (40 acres land development for a new hospital facility, 2005 – 2012).
- **Tripler Army Medical Center**, Pacific Regional Medical Command, United States Army, Honolulu, Hawaii (new buildings and improvement projects in 1997 - 1998).

Principal Geotechnical Engineer, Los Angeles Municipal Court, West San Fernando Valley Branch Courthouse Project in Chatsworth, California. The project included the construction of a four-story with one-level basement courthouse building that contains ten municipal courtrooms with unfinished space for additional six courtrooms. In 1999, URS performed a geotechnical review, investigation, and seismic design evaluation for the County of Los Angeles Department of Public Works on this project. URS evaluated several foundation schemes to mitigate the deep soft soils (in excess of 30 feet deep) problem at the site and selected the option of removal/recompaction so that the courthouse building can be supported on conventional shallow spread footings. Design recommendations for shorings and tieback supported anchors to allow deep excavation at the site. The construction phase of the project began in 2000 and was completed in 2002. URS provided geotechnical

construction monitoring services for the development team.

Principal consultant responsible for geotechnical services to support the FAA's structural seismic upgrade/retrofit program implemented at six municipal airports in western United States: Van Nuys and Palo Alto Airports in California, Olympia and Spokane Airports in Washington, Las Vegas Airport in Nevada, and Kenai Airport in Alaska. Geotechnical investigations were performed at these four airports in accordance with Federal Emergency Management Agency (FEMA) guidelines for the seismic evaluations of the Air Traffic Control Towers and Base buildings. Our services included field exploration/sampling, laboratory testing, and engineering analyses to develop seismic design parameters based on FEMA-178 NEHRP procedures and to derive geotechnical recommendations for foundation strengthening where necessary to resist lateral seismic forces and/or mitigate liquefaction related hazards.

Project Manager for the FAA Traffic Control Facility Expansion project at the Honolulu International Airport, Hawaii. Managed the geotechnical investigation for a 55,000 square feet expansion building being constructed adjacent to the Air Traffic Control Tower. Provided geotechnical recommendations for the design of driven pile foundation system to support the new building located in an area of very soft lagoonal deposits.

Project Manager for the new 12-story Federal Detention Facility proposed by the Federal Bureau of Prisons being constructed at the premise of the Honolulu International Airport, Hawaii. Responsible for the geotechnical investigation and developed criteria for designing drilled shafts, mat and spread footings to mitigate excessive differential settlements.

Principal Geotechnical Engineer for the 2009/2010 and 2013/2014 Dodger Stadium Improvements. The improvements included removing both home and visitor's dugouts, field level baseline seats, field level box seats and constructing new subterranean facilities blow including a new conditioning facility, batting practice tunnel rooms, expansion of clubhouse and a new restaurant. After initial demolition, temporary excavations up to 30 feet deep including underpinning of existing columns of stadium structure were required. The temporary excavation support schemes involved a combination of soil nail system, shoring with cantilevered soldier piles, and shoring with soldier piles supported by anchored tiebacks.

Principal Engineer for On-call Geotechnical Services Contract for Los Angeles Unified School District and Project Manager for On-call Geotechnical Services Contracts for Beverly Hills Unified School District, and Los Angeles Community College District. Responsible for conducting geotechnical investigations and preparation of geotechnical reports to present design parameters and recommendations for over 20 new school buildings and related facilities within the past 24 months.

NEVILLE SHIHWEI SU, PE, GE

ASSOCIATE ENGINEER

AREAS OF EXPERTISE

Geotechnical engineering in building/infrastructure/highway/railroad/bridge/airport/port and harbor; deep foundation design and construction; seismic retrofit evaluation; geotechnical numerical modeling

EDUCATION

MS/1999/Structural Engineering and Geomechanics/Stanford University

BS/1994/Civil Engineering/National Taiwan University

LICENSES/REGISTRATIONS

2014/Registered Civil Engineer/AZ/No. 57144

2006/Registered Geotechnical Engineer/CA/No. GE2696

2001/Registered Civil Engineer/CA/No. C61639

URS Certified Project Manager

YEARS OF EXPERIENCE

With Firm 7

With Other Firms 10

SUMMARY

Mr. Su is a licensed Professional and Geotechnical Engineer with 17 years of experience in geotechnical engineering, foundation design, soil-structure-interaction, ground motion evaluation, and ground improvements for various new and seismic retrofit projects. He has extensive experience in building, infrastructure, highway, railroad, airport, and facility projects throughout California.

EXPERIENCE

Geotechnical Task Leader, Harbor UCLA Medical Center Master Plan Implementation with LACDPW (PW 13942), Torrance, CA, County of Los Angeles, 2015 to present: Geotechnical engineer and manager for the multiple-year campus improvement program. The proposed improvements included new inpatient and outpatient facilities, new central plants and utility tunnels, parking structures, and associated site civil work. The project components are regulated by both Los Angeles County Department of Public Works, Building and Safety and the California Office of Statewide Health Planning and Development (OSHPD). Mr. Su provided geotechnical engineering supports to the master plan implementation program team and worked with executive architects to prepare the scoping documents for the up-coming projects.

Geotechnical Task Leader, Martin Luther King Jr. Multi-Services Ambulatory Care Center with LACDPW (PW 13099/13456), Willowbrook, CA, County of Los Angeles, 2009 to 2014: He is the geotechnical task leader for the most recent phase of the project including two building retrofits (Medical Record Building and Central Plant Phase 1), two new buildings (MACC Building and Ancillary Building), two tunnels, and associated civil improvements for the campus reconfiguration and hospital upgrade projects. Mr. Su is also in charge of the construction monitoring for the geotechnical components during construction including piling, earthwork, utility trenching, and other substructure improvements.

Geotechnical Task Leader, Century Aero Club Project, Van Nuys Airport, Van Nuys, CA, Castle & Cooke Aviation Services, Inc., 2011-2013: Geotechnical Engineer in charge of the two-acre paved ramp for aircraft parking, an approximately 1,500 square-foot customer service building for the proposed fixed based operator (FBO) facilities, and the associated civil site improvements (fence wall, drainage/stormwater management, utilities, etc.). Mr. Su assisted the civil designer to complete the aircraft parking design and supported the geotechnical design documents during permitting process. He also supervised the geotechnical related operation during construction and provided final document for project approval by the City of Los Angeles.

Project Geotechnical Manager, Million Air - San Bernardino, FBO Facilities, San Bernardino International Airport, San Bernardino, CA,

Norton Development Company, 2007-2008: Project Geotechnical Manager for proposed FBO facility improvements consisting of four buildings: a new hangar with an attached single story office, a two-story FBO building, a two-story customs/office building southwest of the proposed FBO building, and a two-story office building attached to an existing hangar. Mr. Su directed the field investigation, performed the engineering analyses and prepared the geotechnical investigation report.

Project Geotechnical Manager, Passenger Terminal Improvements, San Bernardino International Airport, San Bernardino, CA, San Bernardino International Airport Authority, 2007: Project Geotechnical Manager for passenger terminal improvements including interior improvements to existing passenger terminal (Building 673), construction of a new two-story concourse extending from Building 673, and a new canopy along North Leland Norton Way west of Building 673. Mr. Su oversaw the field investigation and laboratory programs, directed the engineering evaluation, and prepared geotechnical engineering investigation report to support the design phase of the project.

Project Geotechnical Manager, San Bernardino Valley Municipal Water District Administration Building, San Bernardino, CA, San Bernardino Valley Municipal Water District, 2003-2004: Project Geotechnical Engineer for geotechnical services of the proposed administration building for the water agency. Project was initially started for the liquefaction mitigation study for an existing former post office building and mitigation options were provided. With the possible dewatering mitigation scheme, a thorough 3-dimensional groundwater modeling was then performed to evaluate the dewatering impact to the adjacent area. Finally, the mitigation option was abandoned and the recommendations for a new 26,300-square-foot building supported on shallow foundation on stone-column-improved ground were provided. Construction documents were prepared for the bidding purpose. Mr. Su directed the field investigation program, performed the numerical modeling and engineering analysis, and prepared geotechnical investigation reports and construction documents.

Project Geotechnical Manager, Los Angeles County Fire Station No. 108, Santa Clarita, CA, Sapphos Environmental, Inc., 2004: Project geotechnical manager for a new fire station consisting of a two-story fire station structure, a garage, and an outdoor parking. Both preliminary and design-level recommendations were provided. Mr. Su directed the field investigation, performed the engineering analysis, and prepared the geotechnical reports.

Project Geotechnical Engineer, Inland Empire Traffic Management Center, Fontana, CA, Caltrans, 2003-2004: Project Geotechnical Engineer for an essential service facility. The foundation system consisted of shallow foundations supporting a base isolation system. Geotechnical services provided included a complete geological/seismic review and developing seismic design criteria. Mr. Su directed the field investigation, performed the engineering analysis, and prepared the preliminary geotechnical report. The Division of State Architect reviewed the project.

JOSEPH P. GRATZER, PG, CEG

PROJECT ENGINEERING GEOLOGIST

AREAS OF EXPERTISE

Engineering Geology
Construction Monitoring

EDUCATION

BS/1993/Earth Science/
California State University, Northridge

LICENSES/REGISTRATIONS

Professional Geologist, California, No.
8308

Engineering Geologist, California, No.
2498

YEARS OF EXPERIENCE

With Firm	20
With Other Firms	2

PROFESSIONAL ASSOCIATIONS

Association of Engineering and
Environmental Geologists
Inland Geological Society

TRAINING AND CERTIFICATIONS

Troxler Nuclear Density Gauge
40-hour HAZWOPER

SUMMARY

Mr. Gratzner has 22 Years of experience in engineering geology hazard assessment, and geologic exploration for URS including projects for Los Angeles, Department of Public Works, Los Angeles Department of Water and Power, County of Los Angeles Sanitation District, and Metropolitan Water District. As a geologist Mr. Gratzner has performed various field investigations, aerial photo reviews, soils inspection, site assessment and report preparation in variety of projects including tunnel construction, dam sites, landslide repair, pipeline alignments, reservoir foundations, and landfill expansion.

EXPERIENCE

Senior Geologist, Proposed New Biomedical Laboratory Building, Pasadena, CA, HMRI, 2007: Conducted subsurface field exploration and site characterization for a proposed two-story laboratory research medical building. Provided review of site-specific and regional geologic and seismic conditions.

Senior Geologist, Proposed Parking Garage, Malibu, CA, City of Malibu, 2008: Conducted inspection of cast-in-place pile installation and subsurface geologic site characterization and geologic mapping for a proposed parking garage in the Malibu Hills. Provided review of site-specific and regional geologic and seismic conditions.

Senior Geologist, Queen of Heaven Cemetery Mausoleum No. 2, Rowland Heights, CA, Los Angeles Archdiocese, 2007: Conducted subsurface field exploration, geologic mapping, and site characterization for a proposed slab-on-grade one-story mausoleum complex along bedrock foundation. Provided review of site-specific and regional geologic and seismic conditions.

Senior Geologist, San Fernando Mission Cemetery Mausoleum Complex, Mission Hills, CA, Los Angeles Archdiocese, 2007: Conducted subsurface field exploration, geologic mapping, and site characterization for a proposed slab-on-grade one-story mausoleum complex. Provided review of site-specific and regional geologic and seismic conditions.

Staff Geologist, Bluffs Slope Stabilization Project, Santa Monica, CA, City of Santa Monica, 2003: Performed the subsurface geotechnical investigation including down-hole surveys, geologic mapping of the bluffs, installation and monitoring of groundwater monitoring wells, and observation and logging of construction of horizontal drains into the bluffs.

Staff Geologist, East Central Interceptor Sewer (ECIS) Project, Los Angeles, CA, City of Los Angeles, Department of Public Works, Bureau of Engineering, 2006: Performed geotechnical and geologic investigation along proposed 11-mile alignment including logging of rock core samples

Staff Geologist, Diemer Filtration Plant Treatment Upgrade and Expansion Project, Yorba Linda, County of Los Angeles Sanitation District, CA, Metropolitan Water District, 2002: Performed geologic investigation for geotechnical and seismic investigations. The project included the construction of a new membrane building, a membrane feed pump station and a pretreatment basin, Yard Pipeline, a 4 MG water storage reservoir and a new 18 inch 3500 feet long pipeline. Performed geologic mapping of south slope face for slope stability survey. Performed down-hole logging to determine slope stability and subsurface structure.

Senior Geologist, Stone Canyon Water Quality Improvement Bypass Tunnel, City of Los Angeles, CA, Los Angeles Department of Water and Power, 2005: Conducted geologic mapping and rock core sampling and logging within the Santa Monica Mountains for a 1 ½ mile ten-foot diameter pipeline alignment. Conducted visual logging and recording of sidewall geology within tunnel.

Staff Geologist, Hollywood Reservoir Landslide Repair, City of Los Angeles, CA, Los Angeles Department of Water and Power, 2005: Performed geologic mapping of landslide below a 500,000-gallon steel reservoir. Performed down-hole logging within slide mass to determine slope stability and subsurface conditions. Prepared geologic sections and regional geology sections of the report. Reviewed aerial photos to determine if there was geomorphic evidence of an ancient landslide.

Senior Geologist, Olive View Medical Center, Sylmar, CA, Los Angeles County Department of Public Works, 2007: Performed geologic mapping of 120 feet of fault trench to determine recent fault activity. Performed logging of test pits to investigate the practicality of trench locations. Placed trenches based on Pleistocene alluvium depth and orientation of street cracks southeast of the site. Reviewed aerial photos to determine if any geomorphic evidence suggestive of faulting.

Staff Geologist, Power Plant No. 1, City of Los Angeles, CA, Los Angeles Department of Water and Power, 2005: Performed geologic mapping of 120 feet of exposed cut slope face where a minor slope failure occurred in highly fractured and jointed shaly claystone in the San Gabriel Mountains. Interpreted that heavy rains infiltrated the joints and fractures causing failure of weathered bedrock.

Senior Geologist, Dodger Stadium, Los Angeles, CA, 2007: Evaluated slope stability and subsurface conditions along the right field parking lot of sloped area for proposed cooling tower. Drilled and sampled bucket auger boring to 50 feet. Logged down-hole. Interpreted subsurface structure. Prepared site geology and regional geology sections of report.

Proposed Communication Tower Development, Rowland Heights, CA, Verizon Communications, 2007: Performed geologic mapping of adjacent outcrops. Reviewed aerial photos. Logged down-hole 6 bucket-

auger borings from to 51 feet to view subsurface structure of the proposed site and aid in the evaluation of slope stability.