APPENDIX C

GEOTECHNICAL ENGINEERING REPORT

Geotechnical Engineering Report

El Segundo Data Center Addition
El Segundo, Los Angeles County, California
September 1, 2021
Terracon Project No. 60215198

Prepared for:
serverfarm
El Segundo, California

Prepared by:
Terracon Consultants, Inc.
Tustin, California

September 1, 2021

serverfarm
444 N. Nash Street
El Segundo, California 90245

Attn: Mr. Sam Brown
P: (314) 813-1489
E: sam@sfrdc.com

Re: Geotechnical Engineering Report
El Segundo Data Center Addition
444 N Nash Street
El Segundo, Los Angeles County, California
Terracon Project No. 60215198

Dear Mr. Brown:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P60215198 dated July 23, 2021. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Ellie Nezhad

Ellie Nezhad, P.E.(TX)
Senior Staff Engineer

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APR review provided by F. Fred Buhamdan, P.E.

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REPORT TOPICS

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the Terracon GeoReport logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Geotechnical Engineering Report

El Segundo Data Center Addition
444 N Nash Street
El Segundo, Los Angeles County, California
Terracon Project No. 60215198
September 1, 2021

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed data center addition to be located at 444 N Nash Street in El Segundo, Los Angeles County, California. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Infiltration Design and Considerations
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per CBC
- Pavement design and construction

The geotechnical engineering Scope of Services for this project included the advancement of four test borings to depths ranging from approximately 26½ to 51½ feet below existing site grades and three cone penetration test soundings (CPTs) to depths ranging from approximately 34 to 50 feet below existing site grades. Three of the borings were used for percolation testing.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration.

Item	Description
Parcel Information	The project is located at 444 N Nash Street in El Segundo, Los Angeles County, California. Approximate coordinates for the center of the site are 33.9217°N, 118.3864°W.

Item	Description
Existing Improvements	The site is currently developed with an approximately 112,000 SF Data Center building situated in the center of the property. A concrete access driveway borders the building. A substation is located in the southeast corner of the site.
Current Ground Cover	Concrete driveways and parking areas. North of the existing building there is an area of asphalt concrete pavement. The border of the site is landscaped with grasses and shrubs.
Existing Topography	The site is relatively flat and has an approximate elevation ranging between 100 feet and 104 feet above mean sea level.

PROJECT DESCRIPTION

Item	Description
Provided Documents	Terracon was provided the following report: ■ Report of Geotechnical Investigation, Proposed T5-LA Data Center, 444 North Nash Street, El Segundo, California prepared by AMEC, Inc. dated September 8th, 2011.
Proposed Structures	The project includes the construction of a two-story building addition along the north side of the existing building. The addition is anticipated to match the height of the existing building, but the overall additional square footage is unknown at this time. Furthermore, ancillary electrical equipment is planned in the south area of the site.
Construction	■ Reinforced concrete superstructure and masonry walls supported on 18 to 30-inch diameter auger cast piles. ■ Electrical equipment supported on mat foundation system.
Finished Floor Elevation	Assumed to be within one foot of existing grade.
Maximum Loads[1]	■ Interior Columns: 884 kips ■ Exterior Columns: 442 kips ■ Walls: 5.2 kips per linear foot (klf) ■ Slabs: 575 pounds per square foot (psf) plus weight of slab
Grading	Minimal cut/fill – assumed to be less than one foot
Infiltration Systems	It is our assumption that infiltration systems are anticipated onsite. The location, type, and depth of these systems was not provided at the time of preparation of this report. Based on subsurface information, the site is underlain by fill and clayey soils in the upper 6½ feet. In our experience these soils will not be conducive to infiltration of stormwater. Based on this, our experience, and given the footprint of the building, deep drywell systems are anticipated.
Pavements	It is our understanding that new pavements will be constructed and are included in this project.

Item	Description
Traffic Loading (assumed)	We assume both rigid (concrete) and flexible (asphalt) pavement sections should be considered. Anticipated traffic is as follows: ■ Automobile Parking Area: Traffic Index of 4.5 ■ Driving Lanes: Traffic Index of 5.5

1. Provided by the client.

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction. The following table provides our geotechnical characterization.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation, foundation options and pavement options. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/Density
Surface	7 to 8½ inches thickness	Concrete	N/A
	5 to 6 inches thickness	Aggregate Base	
1	4 to 6½	Fill (SM and SP-SM)	Loose to medium dense
2	10 [1]	SM	Loose
3	15 to 20	CL	Stiff to very stiff
4	51.5	SM, SP, SP-SM	Medium dense to very dense

1. Encountered in Boring B-1

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Lab Results

Laboratory tests were conducted on selected soil samples and the test results are presented in the **Exploration Results** section and on the boring logs. Atterberg limit test results indicate that the on-site soils generally have low to medium plasticity. A consolidation test indicates that the sandy fil materials encountered at an approximate depth of 2½ to 4 feet bgs have a low collapse potential when saturated under normal footing loads of 2,000 psf. A direct shear test performed on a sample taken at boring B-3 at a depth of 2½ feet bgs indicates the soil tested has a cohesion of approximately 560 psf and effective friction angle of 35°.

Thermal Resistivity Testing

Terracon subcontracted Geotherm USA to perform the laboratory thermal resistivity testing on a soil sample obtained from B-1 at an approximate depth 1 to 2½ feet bgs. To estimate thermal properties of the soils, the sample from B-1 was remolded to 90 percent relative compaction and moisture conditioned to the optimum moisture content as determined by ASTM Standard D1557. Thermal testing was performed in accordance with the IEEE Standard (IEEE-442).

We recommend that the thermal resistivity results be discussed with an electrical design team to determine the influence on underground equipment and backfill materials. The laboratory thermal resistivity test results will be issued in a separate letter.

Groundwater

Groundwater was not observed in the borings while drilling, or for the short duration the boring remained open. These observations represent groundwater conditions at the time of the field exploration and may not be indicative of other times, or at other locations.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

According to data collected from the Los Angeles County Public Works Water Data Library for the State of California from well number 1318E, located ½ mile south of the site, the highest groundwater elevation level, between October 12, 1988 and October 17, 2008, was recorded at greater than 100 feet bgs. [1]

SEISMIC CONSIDERATIONS

The 2019 California Building Code (CBC) Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool. This web-based software application calculates seismic design parameters in accordance with ASCE 7-16, and 2019 CBC. The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than or equal 0.2.

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[1] *Groundwater elevation was obtained from a monitoring well (well id: 3S14W18C01) located at a distance of approximately ½ mile south of the project site (www.dpw.lacounty.gov/general/wells#).*

However, Section 11.4.8 of ASCE 7-16 includes an exception from such analysis for specific structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) states that "In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites." Based on our understanding of the proposed structures, it is our assumption that the exception in Section 11.4.8 applies to the proposed structure. However, the structural engineer should verify the applicability of this exception.

Based on this exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

Description	Value
2019 California Building Code Site Classification (CBC) [1]	D [2]
Site Latitude (°N)	33.9217
Site Longitude (°W)	118.3864
S_s Spectral Acceleration for a 0.2-Second Period	1.85
S_1 Spectral Acceleration for a 1-Second Period	0.651
F_a Site Coefficient for a 0.2-Second Period	1.0
F_v Site Coefficient for a 1-Second Period	1.7

1. Seismic site classification in general accordance with the *2019 California Building Code*.
2. The 2019 California Building Code (CBC) requires a site soil profile determination extending to a depth of 100 feet for seismic site classification. The current scope does not include the required 100-foot soil profile determination. Borings and CPTs were extended to a maximum depth of 51½ feet, and this seismic site class definition considers that similar or denser soils continue below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be required to confirm the conditions below the current depth of exploration.

Typically, a site-specific ground motion study will generate less conservative coefficients and acceleration values which may reduce construction costs. We recommend consulting with a structural engineer to evaluate the need for such study and its potential impact on construction costs. Terracon should be contacted if a site-specific ground motion study is desired.

Faulting and Estimated Ground Motions

The site is located in southern California, which is a seismically active area. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. As calculated using the USGS Unified Hazard Tool, the Newport-Inglewood fault, which is considered to have the most significant effect at the site from a design standpoint, has a maximum credible earthquake magnitude of 6.71 and is located approximately 5.7 kilometers from the site.

Based on the USGS Design Maps Summary Report, using the American Society of Civil Engineers (ASCE 7-16) standard, the peak ground acceleration (PGA_M) at the project site is expected to be 0.877 g. Based on the USGS Unified Hazard Tool, the project site has a mode magnitude of 6.34. Furthermore, the site is not located within an Alquist-Priolo Earthquake Fault Zone based on our review of the State Fault Hazard Maps.[2]

LIQUEFACTION

Liquefaction is a mode of ground failure that results from the generation of high pore water pressures during earthquake ground shaking, causing loss of shear strength. Liquefaction is typically a hazard where loose sandy soils exist below groundwater. The California Geological Survey (CGS) has designated certain areas as potential liquefaction hazard zones. These are areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the presence of a relatively shallow water table.

The project site is not located within a liquefaction hazard zone as designated by the CGS. Based on CGS maps and the anticipated depth to groundwater, liquefaction hazard potential at the site is considered low. Other geologic hazards related to liquefaction, such as lateral spreading, are therefore also considered low.

DRY SEISMIC SETTLEMENT ANALYSIS

The dry seismic settlement analysis for the site was performed in general accordance with the DMG Special Publication 117. The seismic settlement analysis utilized the software “LiquefyPro” by CivilTech Software and boring B-1. A Peak Ground Acceleration (PGA) of 0.88 g and the mean magnitude of 6.3 for the project site were used. Calculations utilized the historical high groundwater depth based on the available data. Settlement analysis used the Ishihara/Yoshimine method and the fines percentage were corrected for liquefaction using the Stark/Olson method.

Based on calculation results, seismically induced settlement of unsaturated sands is estimated to be between ½ and ¾ inches. Differential seismic settlement is anticipated to be less than ½ of an inch. The detailed analysis and results are attached to this report in **Supporting Documents** section of the **Appendix**.

CORROSIVITY

The table below lists the results of laboratory soluble sulfate, soluble chloride, electrical resistivity, and pH testing. The values may be used to estimate potential corrosive characteristics of the on-

[2] California Geological Survey (CGS), https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/.

site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary						
Boring	**Sample Depth (ft)**	**Soil Description**	**Soluble Sulfate (%)**	**Chlorides (ppm)**	**Electrical Resistivity (Ω-cm)**	**pH**
B-4	0-2.5	Silty Sand	0.0489	121	1,800	7.3

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations when classified in accordance with Table 19.3.1.1 of the ACI Design Manual. Concrete should be designed in accordance with the exposure class S0 provisions of the ACI Design Manual, Section 318, Chapter 19.

STORMWATER MANAGEMENT

Three (3) in-situ percolation tests were performed to approximate depths of 15 to 25 feet or 20 to 30 feet bgs. A 2-inch thick layer of gravel was placed in the bottom of each boring after the borings were drilled to investigate the soil profile. A 3-inch diameter perforated pipe was installed on top of the gravel layer in each boring. Gravel was used to backfill between the perforated pipes and the boring sidewall. The borings were then filled with water for a pre-soak period of 24 hours. Testing began after a pre-soak period. At the beginning of the test, the pipes were refilled with water and readings were taken at standardized time intervals. Percolation rates are provided in the following table:

TEST RESULTS				
Test Location (depth, feet bgs)	**Soil Classification**	**Slowest Measured Percolation Rate (in/hr.)**	**Correlated Infiltration Rate[1] (in/hr.)**	**Water Head (in)**
B-1 (15 to 25 ft)	Sandy Lean Clay	>500	54	102
B-2 (15 to 25 ft)	Silty Sand	>500	56	18
B-4 (20 to 30 ft)	Silty Sand	>500	>100	84

1. If proposed infiltration system will mainly rely on vertical downward seepage, the correlated infiltration rates should be used.

The field test results are not intended to be design rates. They represent the result of our tests, at the depths and locations indicated, as described above. The design rate should be determined by the designer by applying an appropriate factor of safety. Based on the County of Los Angeles

Department of Public Works GS200.2 document, the following reduction factors are recommended:

LA County Reduction Factor	Value
RF_t	2
RF_v	1
RF_s	2
RF, Total Reduction Factor $RF=RF_t x RF_v x RF_s$	4

With time, the bottoms of infiltration systems tend to plug with organics, sediments, and other debris. Long term maintenance will likely be required to remove these deleterious materials to help reduce decreases in actual percolation rates.

The percolation tests were performed with clear water, whereas the storm water will likely not be clear, but may contain organics, fines, and grease/oil. The presence of these deleterious materials will tend to decrease the rate that water percolates from the infiltration systems. Design of the storm water infiltration systems should account for the presence of these materials and should incorporate structures/devices to remove these deleterious materials.

Based on the soils encountered in our borings, we expect the percolation rates of the soils could be different than measured in the field due to variations in fines and gravel content. The design elevation and size of the proposed infiltration system should account for this expected variability in infiltration rates.

Infiltration testing should be performed after construction of the infiltration system to verify the design infiltration rates. It should be noted that siltation and vegetation growth along with other factors may affect the infiltration rates of the infiltration areas. The actual infiltration rate may vary from the values reported here. Infiltration systems should be located a minimum of 10 feet from any existing or proposed foundation system.

GEOTECHNICAL OVERVIEW

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

The proposed building addition may be supported on auger cast piles with conventional slab on grade floors. The proposed exterior equipment pad may be supported on a shallow mat foundation.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration Results** section), engineering analyses, and our current understanding of the proposed project.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

The following recommendations include site preparation, excavation, subgrade preparation and placement of engineered fills on the project. The recommendations presented for design and construction of earth supported elements including foundations, slabs, and pavements are contingent upon following the recommendations outlined in this section.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

Site Preparation

Strip and remove existing vegetation and pavements and other deleterious materials from proposed building and pavement areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. The site should be initially graded to create a relatively level surface to receive fill and provide for a relatively uniform thickness of fill beneath proposed building structures.

Our explorations indicate the site has approximately 4 to 6½ feet of fill material across the site. The fill soils consist of silty sand with trace gravel. Terracon does not have any documentation to show if the fill placement or grading operations were inspected and if fill compaction was tested. However, the field penetration test results and the in-situ dry density laboratory results for borings within the proposed footprint of the structural additions indicate that the fill materials encountered have received good compaction efforts during construction.

Although no evidence of utilities, or underground facilities such as septic tanks, cesspools, basements, and utilities was observed during the site reconnaissance, such features could be encountered during construction. If unexpected fills, utilities, or underground facilities are encountered, such features should be removed, and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Subgrade Preparation

We recommend that the fill materials in the area of the equipment pad foundation be removed and recompacted to a minimum depth of 2 feet below bottom of proposed foundations. Considering that the proposed building addition will be supported on deep foundations, fill materials below the building addition interior slab on-grade should be removed to a depth of 2 feet below bottom of slab. Fill materials encountered on site may be re-used as engineered fill provided any deleterious materials are removed.

Exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of 10 inches, moisture conditioned, and compacted per the compaction requirements in this report.

Areas of exterior slabs and pavement should be scarified to a minimum depth of 10 inches, moisture conditioned, and compacted per the compaction requirements in this report. However, it should be noted there is an inherent risk for the owner to support pavements and flatwork over existing fill materials. Also, compressible fill or unsuitable material may exist within or buried by the fill which may not be discovered during construction. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill.

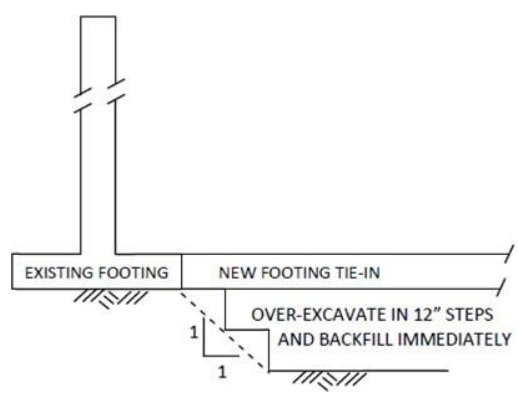
Based upon the subsurface conditions determined from the geotechnical exploration, subgrade soils exposed during construction are anticipated to be relatively workable. However, the workability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying.

Excavation

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

The bottom of excavations should be thoroughly cleaned of loose soils and disturbed materials prior to backfill placement and/or construction.

If new foundations are constructed adjacent to the existing foundations, there is a risk that the bearing material could become undermined and/or overstressed due to overlapping stresses. Provisions should be made during construction to prevent undermining or disturbing the soils supporting the existing foundations. Excavations should not extend below an imaginary 1H:1V inclined plane projecting below the bottom edge of any adjacent existing foundations as shown in the figure to the right.



Maintaining a sufficient clear distance between new and existing foundations will reduce the potential for increased bearing stresses and additional foundation settlement. Connections between the existing building and the new addition should allow for some differential movement.

Onsite soils partially consist of cohesionless sandy soils. Such soils have the tendency to cave and slough during excavations. Therefore, formwork may be needed for some foundation excavations.

Individual contractors are responsible for designing and constructing stable, temporary excavations. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

Fill Materials and Placement

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than 6 inches in size. Pea gravel or other similar non-cementatious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Clean on-site sandy soils and fill materials or approved imported materials may be used as fill material for the following:

- general site grading
- foundation areas
- interior floor slab areas
- foundation backfill
- pavement areas

Existing fill materials are underlain by lean clay soils with expected expansion potential. Such materials should not be used in structural areas but may be blended with sandy soils such that the resulting materials conform with the low volume change materials specifications provided in this report.

Imported soils for use as fill material within proposed building and structure areas should conform to low volume change materials as indicated in the following specifications:

Gradation	**Percent Finer by Weight (ASTM C 136)**
3”	100
No. 4 Sieve	50-100
No. 200 Sieve	10-40

- Liquid Limit .... 30 (max)
- Plasticity Index .... 15 (max)
- Maximum expansion index* .... 20 (max)

*ASTM D 4829

The contractor shall notify the Geotechnical Engineer of import sources sufficiently ahead of their use so that the sources can be observed and approved as to the physical characteristic of the import material. For all import material, the contractor shall also submit current verified reports from a recognized analytical laboratory indicating that the import has a "not applicable" (Class S0) potential for sulfate attack based upon current ACI criteria and is "mildly corrosive" to ferrous metal and copper. The reports shall be accompanied by a written statement from the contractor that the laboratory test results are representative of all import material that will be brought to the job.

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed 10 inches loose thickness.

Compaction Requirements

Recommended compaction and moisture content criteria for engineered fill materials are as follows:

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement	Range of Moisture Contents for Compaction Above Optimum	
		Minimum	Maximum
Onsite sandy soil/fill materials or approved imported fill soils:			
Beneath foundations:	90%	0%	+4%
Beneath slabs:	90%	0%	+4%
Utility trenches (pavement and structural areas)*:	90%	0%	+4%
On-site native soils			
Beneath asphalt pavements:	95%	+2%	+5%
Beneath concrete pavements:	95%	+2%	+5%
Utility trenches (Landscape areas):	90%	+2%	+5%
Exterior Slabs:	90%	+2%	+5%
Miscellaneous backfill:	90%	+2%	+5%
Aggregate base (beneath pavements):	95%	0%	+4%

* Upper 12 inches should be compacted to 95% within pavement and structural areas. Low-volume change imported soils should be used in structural areas.

Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building or pavements should be sealed or eliminated. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately 5 percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

We recommend a minimum horizontal setback distance of 10 feet from the perimeter of any building and the high-water elevation of the nearest storm-water infiltration system. Roof drainage should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving. Sprinkler systems and landscaped irrigation should not be installed within 5 feet of foundation walls.

Utility Trenches

It is anticipated that the on-site soils and fill materials will provide suitable support for underground utilities and piping that may be installed. Any soft and/or unsuitable material encountered at the bottom of excavations should be removed and be replaced with an adequate bedding material. A non-expansive granular material with a sand equivalent greater than 30 should be used for bedding and shading of utilities, unless allowed or specified otherwise by the utility manufacturer.

On-site materials are considered suitable for backfill of utility and pipe trenches from one foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances. Imported low volume change soils should be used for trench backfill in structural areas.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the gradation and expansion index requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab and pavement construction.

We recommend that the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically November through April) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork operations may require additional mitigative measures beyond that which would be expected during the drier summer and fall months. This could include diversion of surface runoff around exposed soils and draining of ponded water on the site. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic.

Construction Observation and Testing

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation, proof-rolling, placement and compaction of controlled compacted fills, backfilling of excavations to the completed subgrade.

The exposed subgrade and each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. One density and water content test for every 50 linear feet of compacted utility trench backfill. This testing frequency criteria may be adjusted during construction as specified by the geotechnical engineer of record.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event that unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

DESCRIPTION	RECOMENDATION
Foundation Type	Mat foundation for exterior equipment pad
Bearing Material[1]	Engineered fill extending to a minimum depth of 3 feet below the bottom of foundations.
Allowable Bearing Pressure[5]	■ 2,400 psf for foundation widths up to 10 feet ■ 1,500 psf for foundation widths up to 20 feet ■ 1,200 psf for foundation widths up to 30 feet ■ 1,100 psf for foundation widths up to 40 feet
Modulus of Subgrade Reaction, k_{v1}[2]**, for a small loaded area (1 Sq. ft or less)**	200 pci
Modulus Correction Factor	$k_v = k_{v1} [(B+1)/2B]^2$
Minimum Embedment Depth Below Finished Grade	12 inches

DESCRIPTION	RECOMENDATION
Total Estimated Static Settlement[3,4]	1 inch

1. Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in the Earthwork.
2. k_{v1} values should be reduced to account for dimensional effects of large loaded areas, where k_v is the corrected modulus value and B is the mat width in feet
3. Settlement calculations were performed utilizing Westergaard and Hough's methods[3] to estimate the static settlement for the assumed foundation dimensions.
4. Differential settlements are estimated to be 50% of total static settlement.
5. Bearing pressures for various foundation widths were based on allowable settlement tolerance of 1 inch.

Finished grade is defined as the lowest adjacent grade within five feet of the foundation for perimeter (or exterior) footings.

The allowable foundation bearing pressure applies to dead loads plus design live load conditions. The design bearing pressure may be increased by one-third when considering total loads that include wind or seismic conditions. The weight of the foundation concrete below grade may be neglected in dead load computations.

Foundations should be reinforced as necessary to reduce the potential for distress caused by differential foundation movement. Foundation excavations should be observed by the geotechnical engineer. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

DEEP FOUNDATIONS

The proposed building addition may be supported on auger cast piles. Design recommendations for foundations for the proposed structure and related structural elements are presented in the following paragraphs.

Auger Cast Pile Design Recommendations

Total required embedment of the piles should be determined by the structural engineer based on structural loading and parameters provided in this report.

The allowable end bearing and side friction components of resistance were evaluated and are presented in the graphs provided in the **Supporting Documents** section of this report. The allowable total downward capacity is based on a factor of safety of 2.5 for side resistance and 3.0 for end bearing. The depth below ground surface indicated in the attached graphs is referenced from the existing ground surface at the site at the time of the field exploration. The upper 2 feet of

[3] FHWA Geotechnical Engineering Circular No. 6 – Shallow Foundations, FHWA-SA-02-054.

soil was ignored in our analysis to account for disturbance around the pile near the ground surface. The capacity presented is based on a minimum pile spacing of 3 pile diameters. Allowable tension capacity may be taken as 60 percent of the allowable Side Resistance capacity shown in the graph, plus the weight of the pile. The anticipated vertical deflection (settlement) at the pile top under allowable compressive service loads is estimated to be less than 0.5 inch.

The required depths of pile embedment should also be determined for design lateral loads and overturning moments to determine the most critical design condition. We anticipate that lateral load analyses of the pile foundations will be performed by the project designer/structural engineer based on the subsurface data presented in this report. In order to aid in the foundation analyses, Terracon has developed a soil profile for use in the computer program LPILE and GROUP produced by Ensoft, Inc. The soil profile is provided in the **Supporting Documents** section of this report.

If piles are spaced closer than 6 pile diameters, the group reduction factors provided in the following table should be applied to reduce pile lateral capacity.

Lateral Capacity Reduction Factors for Group Effects			
Pile Center-to-Center Spacing (in the direction of loading)	**Group Efficiency Factor (P-Multiplier)**		
	Row 1	**Row 2**	**Row 3 and higher**
3 x Pile Diameter (B)	0.75	0.55	0.40
5 B	1.00	0.85	0.70
6 B	1.00	1.00	1.00

It should be noted that the load capacities provided herein are based on the stresses induced in the supporting soils. The structural capacity of the shafts should be checked to assure that they can safely accommodate the combined stresses induced by axial and lateral forces. Furthermore, the response of the auger cast piles to lateral loads is dependent upon the soil/structure interaction as well as the shaft's actual diameter, length, stiffness and "fixity" (fixed or free-head condition). The lateral load design parameters are valid within the elastic range of the soil.

Auger Cast Pile Construction Considerations

An auger-cast pile is formed by drilling to an appropriate predetermined depth with a continuous-flight, hollow-stem auger. Cement grout is then pumped down the stem of the auger under high pressure as the auger is withdrawn. Reinforcing should be lowered into the unset concrete column to provide lateral and/or tension capabilities. The actual volume of grout required to fill an auger-cast pile borehole should be no less than 115 percent of the nominal pile volume. Reinforcement should be installed as soon after the auger has been withdrawn as possible. Steel reinforcement cages should extend the full length of the augur cast piles, with spacers and centralizers employed to ensure proper alignment.

Drilling to design depths should be possible with conventional single flight power augers. However, due to the presence of very dense materials at the site (based on refusal during cone penetration testing), consideration should be given to obtaining a unit price for difficult excavation in the contract documents for the project. Because auger-cast piles are drilled, obstacles such as concrete or rocks in the subsurface can cause difficult installation conditions. If obstacles are encountered during drilling, the piles may require relocation at the time of construction.

Only competent drilling contractors with experience in the installation of auger-cast piles in similar soil and ground-water conditions should be considered for the pile construction. We recommend a minimum spacing for all piles of three-pile diameters center to center. Adjacent piles, which are located within five-pile diameters of each other, should be allowed to set for at least 18 hours prior to drilling the second pile.

We recommend that all pile installations be observed on a full-time basis by an experienced geotechnical engineer in order to evaluate that the soils encountered are consistent with the recommended design parameters. If the subsurface soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

FLOOR SLABS

DESCRIPTION	RECOMMENDATION
Interior floor system	Slab-on-grade concrete
Floor slab support	Engineered fill extending to a minimum depth of 2 feet below the bottom of floor slabs..
Subbase	Minimum 4-inches of Aggregate Base
Modulus of subgrade reaction[1]	160 pounds per square inch per inch (psi/in) (The modulus was obtained based on estimates obtained from NAVFAC 7.1 design charts). This value is for a small loaded area (1 Sq. ft or less) such as for forklift wheel loads or point loads and should be adjusted for larger loaded areas.
Modulus of subgrade reaction for racking posts with up to 40 kip loads	80 psi/in (The modulus was obtained based on engineered fill, aggregate sub-base)
Modulus Correction Factor[1]	$k_v = k_{v1} [(B+1)/2B)]^2$

1. k_{v1} values should be reduced to account for dimensional effects of large loaded areas, where k_v is the corrected modulus value and B is the mat width in feet.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

PAVEMENTS

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

Pavement Design Parameters

An estimated design R-Value was used to calculate the asphalt concrete pavement thickness sections and the Portland cement concrete pavement sections. R-value testing should be completed prior to pavement construction to verify the design R-value.

Assuming the pavement subgrades will be prepared as recommended within this report, the following pavement sections should be considered minimums for this project for the traffic indices assumed in the table below. As more specific traffic information becomes available, we should be contacted to reevaluate the pavement calculations.

Pavement Section Thicknesses

The following table provides options for AC and PCC Sections:

	Recommended Pavement Section Thickness (inches) [1]	
	Light (Automobile) Parking Assumed Traffic Index (TI) = 4.5	**On-site Driveways and Delivery Areas Assumed TI = 5.5**
Section I Portland Cement Concrete	5.0-inches PCC over 4-inches Class II Aggregate Base	6.0-inches PCC over 4-inches Class II Aggregate Base

	Recommended Pavement Section Thickness (inches) [1]	
	Light (Automobile) Parking Assumed Traffic Index (TI) = 4.5	**On-site Driveways and Delivery Areas Assumed TI = 5.5**
(600 psi Flexural Strength)		
Section II Asphaltic Concrete	3-inches AC over 5-inches Class II Aggregate Base	3-inches AC over 7-inches Class II Aggregate Base

1. All materials should meet the CALTRANS Standard Specifications for Highway Construction.

These pavement sections are considered minimal sections based upon the expected traffic and the existing subgrade conditions. However, they are expected to function with periodic maintenance and overlays if good drainage is provided and maintained.

Subsequent to clearing, grubbing, and removal of topsoil, subgrade soils beneath all pavements should be scarified, moisture conditioned, and compacted to a minimum depth of 10 inches. All materials should meet the CALTRANS Standard Specifications for Highway Construction. Aggregate base materials should meet the gradation and quality requirement of Class 2 Aggregate Base (¾ inch maximum) in Caltrans Standard Specifications, latest edition, Sections 25 through 29.

All concrete for rigid pavements should have a minimum flexural strength of 600 psi (4,250 psi Compressive Strength) and be placed with a maximum slump of four inches. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

Preventative maintenance should be planned and provided for through an on-going pavement management program in order to enhance future pavement performance. Preventative maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment.

Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

Pavement Construction Considerations

Materials and construction of pavements for the project should be in accordance with the requirements and specifications of the State of California Department of Transportation, or other approved local governing specifications.

Base course or pavement materials should not be placed when the surface is wet. Surface drainage should be provided away from the edge of paved areas to minimize lateral moisture transmission into the subgrade.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. The findings and recommendations presented in this report were prepared in a manner consistent with the standards of care and skill ordinarily exercised by members of its profession completing similar studies and practicing under similar conditions in the geographic vicinity and at the time these services have been performed. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Advancement Technique	Quantity	Depth (feet)	Location
Hollow Stem Auger Boring	4	26½ to 51½ feet	General site area
Cone Penetration Test (CPT)	3	34 to 50 feet	

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet). If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted drill rig using continuous hollow stem flight augers. Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. Soil sampling was performed using split-barrel sampling procedures. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon is driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. A 2.5-inch O.D. split-barrel Modified California sampling spoon with 2.0-inch I.D. tube lined sampler was also used for sampling. The Modified California split-barrel sampling procedures are similar to standard split spoon sampling procedure; however, blow counts are typically recorded for 6-inch intervals for a total of 12 inches of penetration. The samples were placed in appropriate containers, taken to our soil laboratory for testing, and classified by a geotechnical engineer. In addition, we observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion. Pavements were patched with cold-mix asphalt and/or pre-mixed concrete, as appropriate.

For the cone penetrometer testing, the CPT rig hydraulically pushes an instrumented cone through the soil while nearly continuous readings are recorded to a portable computer. The cone is equipped with electronic load cells to measure tip resistance and sleeve resistance and a pressure transducer to measure the generated ambient pore pressure. The face of the cone has an apex angle of 60° and an area of 15 cm^2. Digital Data representing the tip resistance, friction resistance, pore water pressure, and probe inclination angle are recorded about every 2 centimeters while advancing through the ground at a rate between 1½ and 2½ centimeters per second. These measurements are correlated to various soil properties used for geotechnical design. No soil samples are gathered through this subsurface investigation technique. CPT testing was conducted in general accordance with ASTM D5778 "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils."

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D7263 Standard Test Methods for Laboratory Determination of Dry Density (Unit Weight) of Soil Specimens
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM C136 Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing
- ASTM D4546 Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading
- ASTM D3080 Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions
- ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
- ASTM D5334 Standard Test Method for Determination of Thermal Conductivity of Soil and Soft Rock by Thermal Needle Probe Procedure
- Corrosivity Testing will include pH, chlorides, sulfates, sulfides, and electrical lab resistivity

The laboratory testing program included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

EXPLORATION PLAN

El Segundo Data Center ■ El Segundo, CA
August 26, 2021 ■ Terracon Project No. 60215198

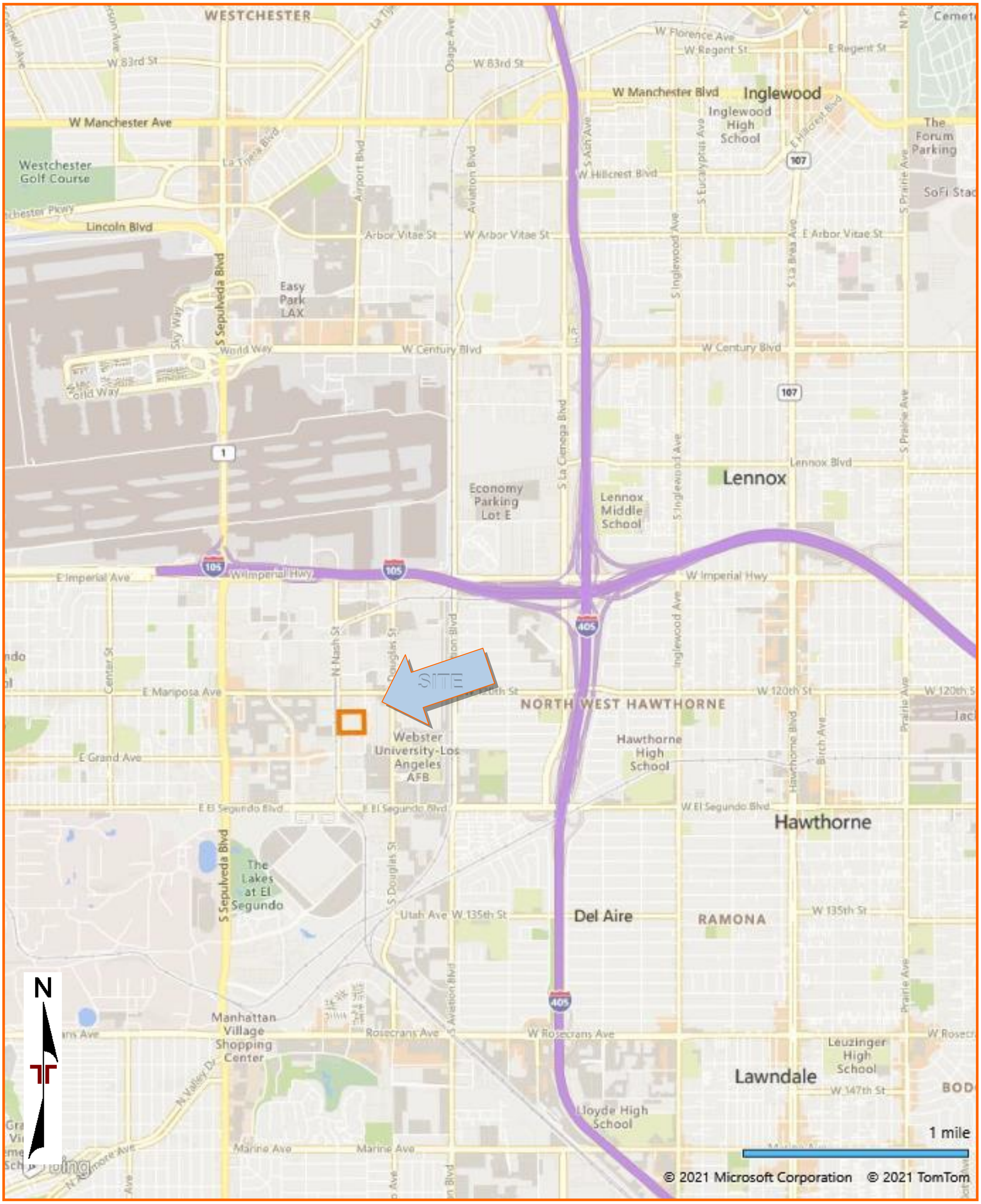


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

El Segundo Data Center ■ El Segundo, CA

August 31, 2021 ■ Terracon Project No. 60215198

Terracon GeoReport

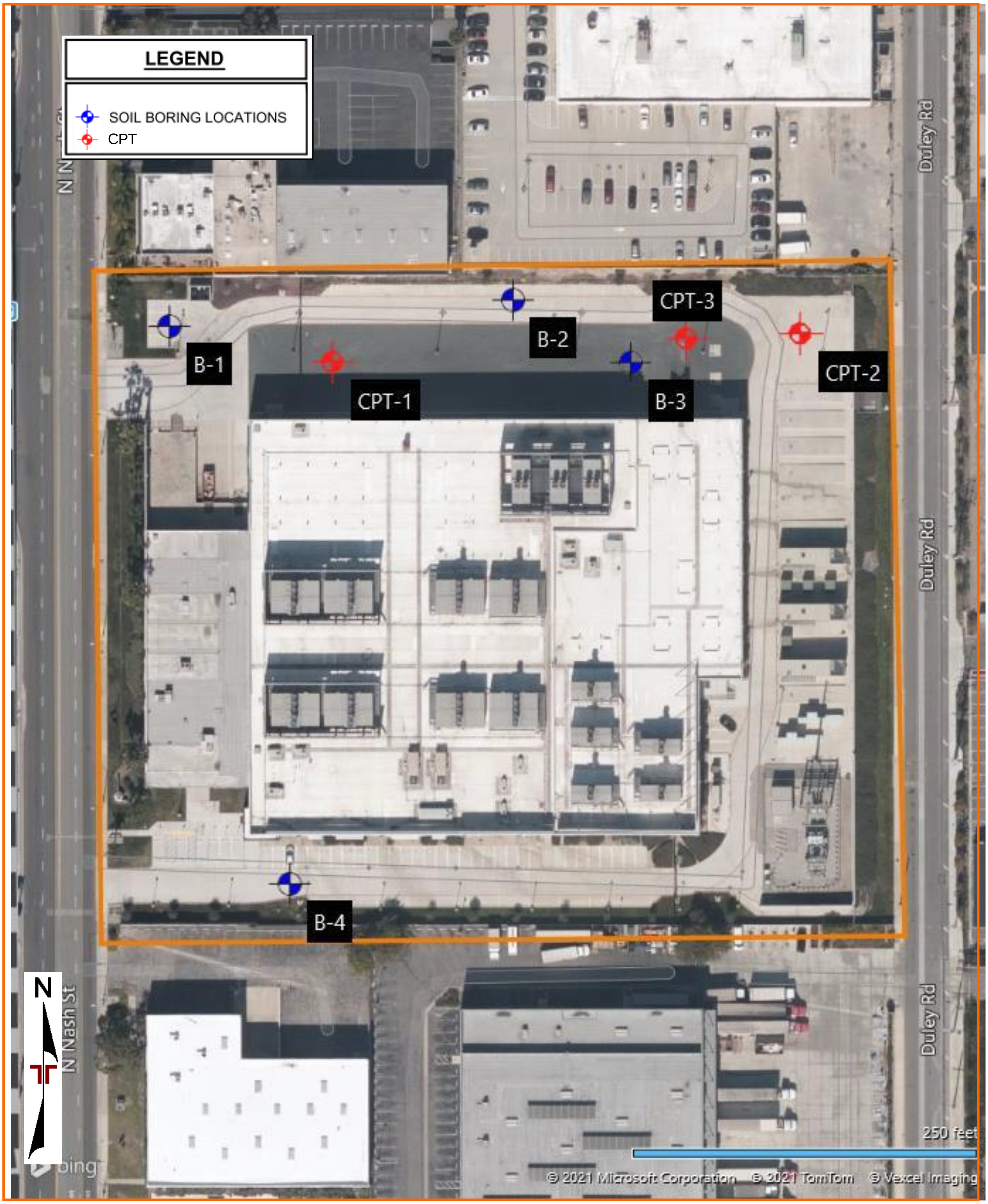


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

BORING LOG NO. B-1

PROJECT: El Segundo DC

CLIENT: Serverfarm LLC
Dover, DE

SITE: 444 Nash Street
El Segundo, CA

LOCATION See Exploration Plan

Latitude: 33.9223° Longitude: -118.387°

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.6	**CONCRETE**, 7 inches of thickness											
1.0	**AGGREGATE BASE COURSE**, 5 inches											
	FILL - POORLY GRADED SAND WITH SILT (SP-SM) trace gravel, grayish brown, loose				4-5-6				11	100	NP	10
4.0	**SILTY SAND (SM)**, brown, loose	5			3-4-5				14	113		
7.0	**SANDY LEAN CLAY (CL)**, brown, very stiff				5-6-8				21	105		
	gray	10			2-6-13				18	109		56
		15			4-12-17 N=29							
20.0	**SILTY SAND (SM)**, light tan to light brown, medium dense, native	20			3-8-15 N=23							
26.5	dense	25			5-17-28 N=45							

Boring Terminated at 26.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started:	Boring Completed: 08-13-2021
Drill Rig: CME-75	Driller: JEFF
Project No.: 60215198	

BORING LOG NO. B-2

PROJECT: El Segundo DC

CLIENT: Serverfarm LLC
Dover, DE

SITE: 444 Nash Street
El Segundo, CA

LOCATION See Exploration Plan

Latitude: 33.9224° Longitude: -118.386°

Depth	Material Description	Sample Type	Field Test Results	Test Type	Compressive Strength (tsf)	Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
0.7	**CONCRETE**, 8.5 inches of thickness									
1.2	**AGGREGATE BASE COURSE**, 6 inches									
	FILL - SILTY SAND (SM), brown to dark brown									
	loose		3-5-10				14	118		
6.5	trace gravel, medium dense		5-11-16				10	121		
	LEAN CLAY (CL), brown to black, stiff		3-6-10				25	100		
15.0			3-6-12				20	107		80
	SILTY SAND (SM), light brown, medium dense		3-6-8 N=14				15		NP	42
			6-15-25 N=40							
25.0	brown									
26.5	**POORLY GRADED SAND WITH SILT (SP-SM)**, trace gravel, light brown to tan, very dense		9-24-28 N=52							
	Boring Terminated at 26.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started:	Boring Completed: 08-13-2021
Drill Rig: CME-75	Driller: JEFF
Project No.: 60215198	

BORING LOG NO. B-3

PROJECT: El Segundo DC

CLIENT: Serverfarm LLC
Dover, DE

SITE: 444 Nash Street
El Segundo, CA

LOCATION See Exploration Plan

Latitude: 33.9223° Longitude: -118.386°

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - SILTY SAND (SM), brown											
	medium dense				5-16-15				11	120		
5.0	**LEAN CLAY (CL)**, brown to dark brown, stiff	5			4-5-8				23	101		
					3-7-11				22	104	48-25-23	76
		10			5-4-9				14	118		
15.0	**POORLY GRADED SAND (SP)**, brown, loose to dense	15			3-6-7 N=13							
		20			4-11-19 N=30				3			2
	trace gravel, light tan to brown	25			7-11-19 N=30							
		30			7-13-23 N=36							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started:	Boring Completed: 08-13-2021
Drill Rig: CME-75	Driller: JEFF
Project No.: 60215198	

BORING LOG NO. B-3

PROJECT: El Segundo DC

CLIENT: Serverfarm LLC
Dover, DE

SITE: 444 Nash Street
El Segundo, CA

LOCATION See Exploration Plan

Latitude: 33.9223° Longitude: -118.386°

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND (SP), brown, loose to dense *(continued)*											
		35		SPT	6-13-21 N=34				1			1
		40		SPT	6-21-39 N=60							
45.0	**SILTY SAND (SM)**, light brown to light tan, very dense	45		SPT	12-27-45 N=72							
51.5		50		SPT	9-17-38 N=55							
	Boring Terminated at 51.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started:	Boring Completed: 08-13-2021
Drill Rig: CME-75	Driller: JEFF
Project No.: 60215198	

BORING LOG NO. B-4

PROJECT: El Segundo DC

CLIENT: Serverfarm LLC
Dover, DE

SITE: 444 Nash Street
El Segundo, CA

LOCATION See Exploration Plan

Latitude: 33.9212° Longitude: -118.387°

DEPTH	MATERIAL DESCRIPTION	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.6	**CONCRETE**, 7.5 inches of thickness							
1.0	**AGGREGATE BASE COURSE**, 5 inches							
	FILL - SILTY SAND (SM), brown trace gravel, medium dense			11-26-28	9	125		
6.0	loose	5		8-6-9	11	115		
	LEAN CLAY (CL), dark brown to black very stiff			3-7-11	21	104	48-28-20	75
10.0	**SILTY CLAYEY SAND (SC-SM)**, light brown, loose to medium dense	10		5-7-11				
		15		3-8-14 N=22				
20.0	**SILTY SAND (SM)**, brown, medium dense	20		4-9-14 N=23				
25.0	Cobbles at 24 feet							
	POORLY GRADED SAND WITH SILT (SP-SM), trace cobbles, tan to light orange, dense	25		25-50				
30.0	**SILTY SAND (SM)**, tan to light brown, dense	30		7-16-22 N=38				
31.5	***Boring Terminated at 31.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

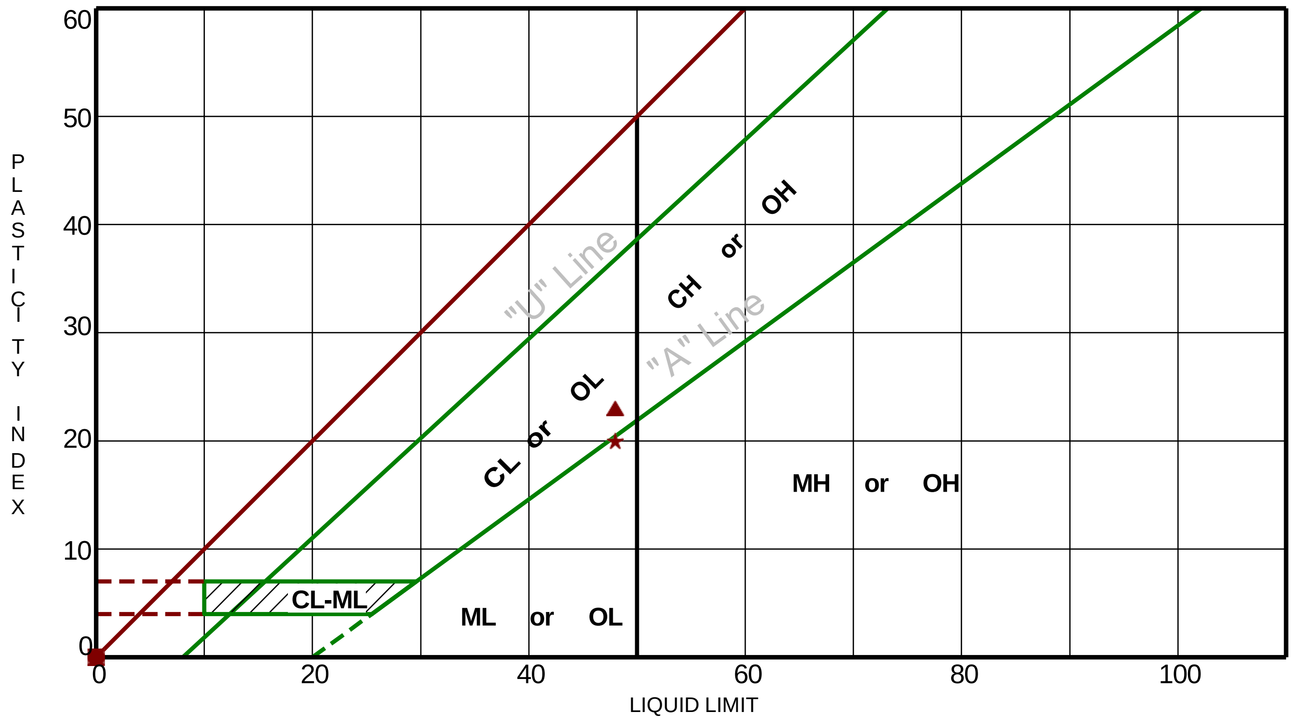
Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started:	Boring Completed: 08-13-2021
Drill Rig: CME-75	Driller: JEFF
Project No.: 60215198	

ATTERBERG LIMITS RESULTS

ASTM D4318



	Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
●	B-1	2.5 - 4	NP	NP	NP	10.3	SP-SM	POORLY GRADED SAND WITH SILT
⊠	B-2	15 - 16.5	NP	NP	NP	41.5	SM	SILTY SAND
▲	B-3	7.5 - 9	48	25	23	75.9	CL	LEAN CLAY
★	B-4	7.5 - 9	48	28	20	74.7	CL	LEAN CLAY

PROJECT: El Segundo DC

SITE: 444 Nash Street
El Segundo, CA

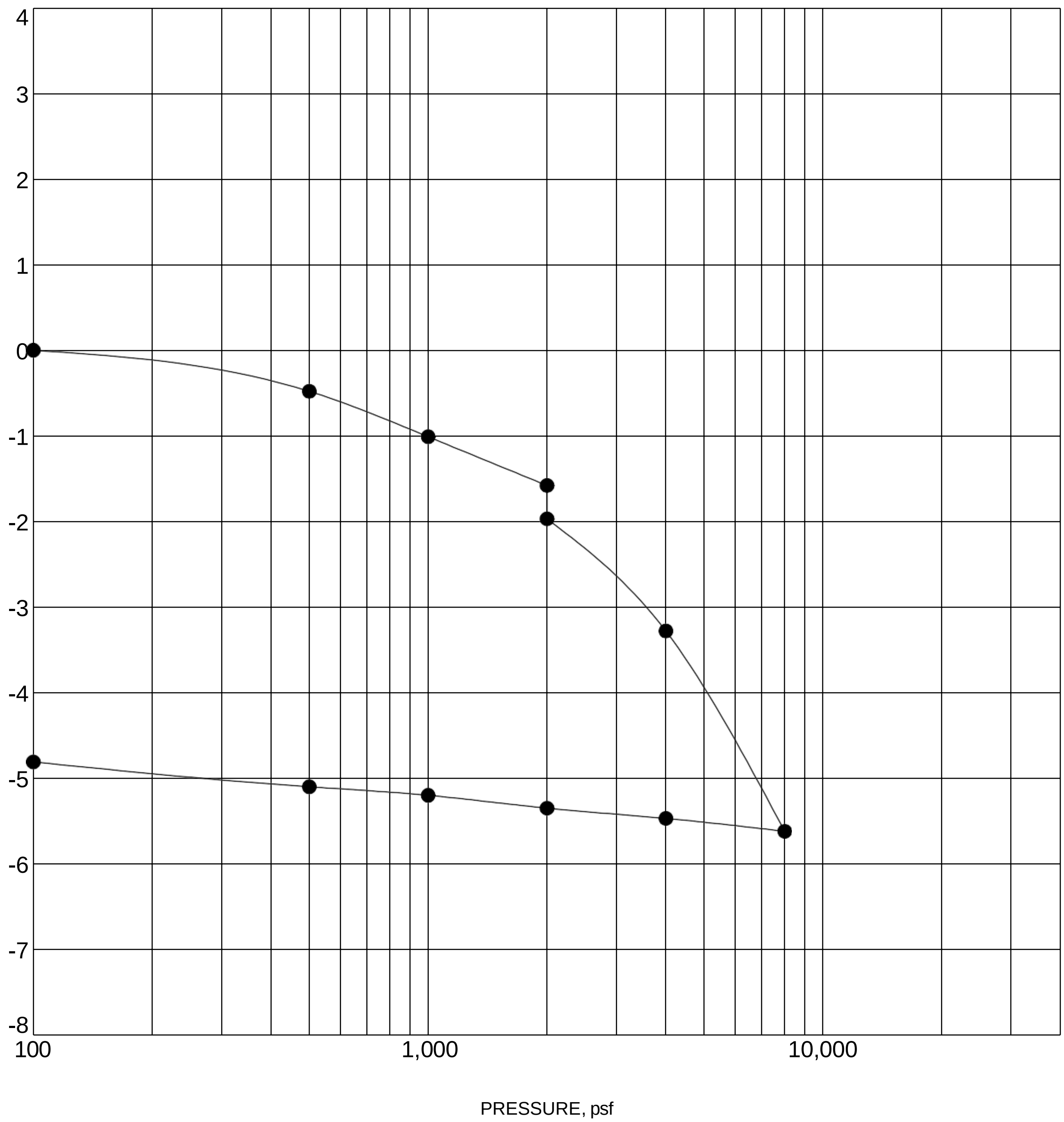
Terracon
1421 Edinger Ave, Ste C
Tustin, CA

PROJECT NUMBER: 60215198

CLIENT: Serverfarm LLC
Dover, DE

SWELL CONSOLIDATION TEST

ASTM D4546

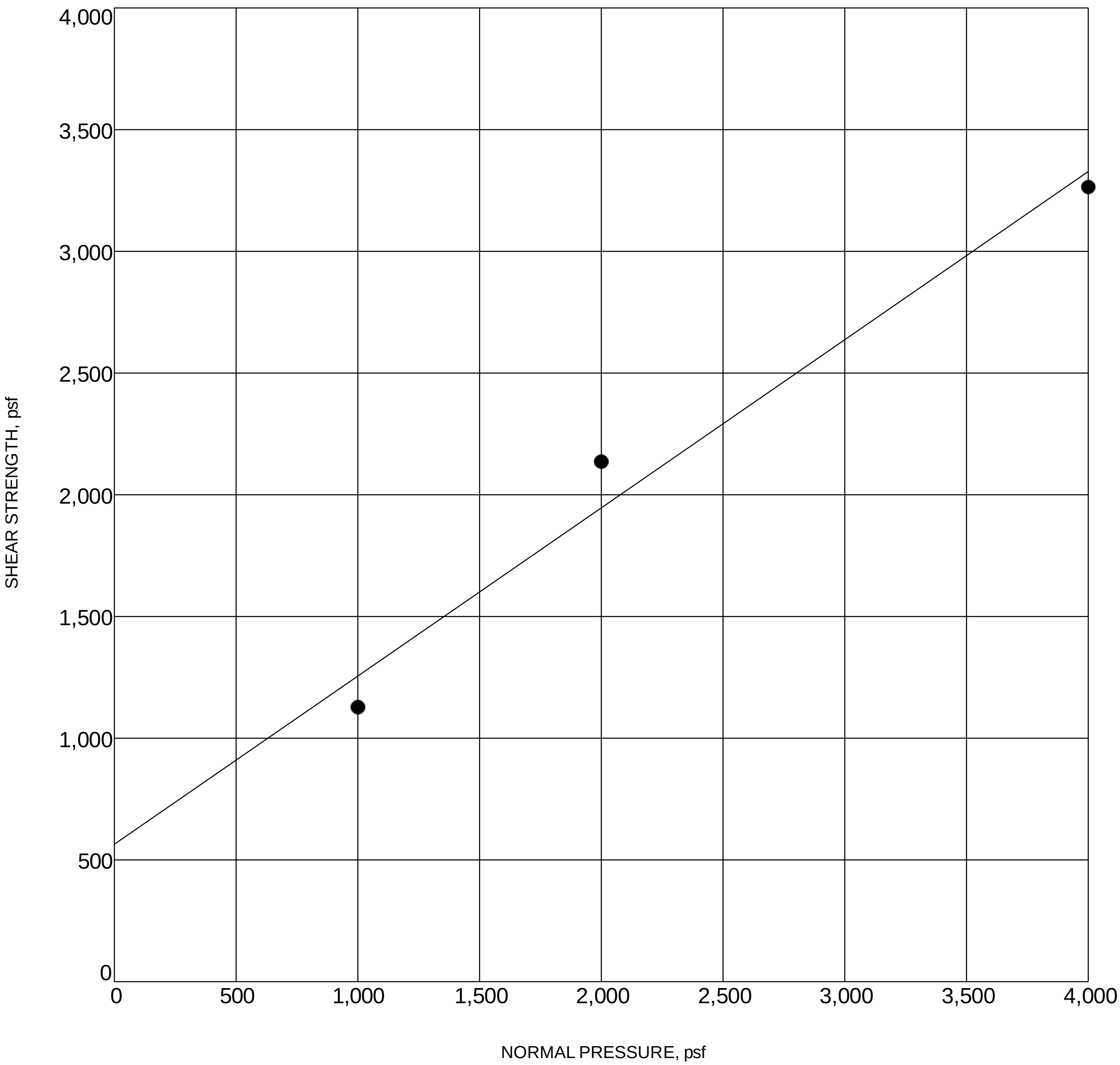


Specimen Identification		Classification	γ_d, pcf	WC, %
●	B-1 2.5 - 4 ft	POORLY GRADED SAND WITH SILT	100	11

NOTES: Water added at 2,000 psf

PROJECT: El Segundo DC	Terracon 1421 Edinger Ave, Ste C Tustin, CA	PROJECT NUMBER: 60215198
SITE: 444 Nash Street El Segundo, CA		CLIENT: Serverfarm LLC Dover, DE
		EXHIBIT: B-1

DIRECT SHEAR TEST ASTM D3080



	Specimen Identification		Classification	γ_d, pcf	WC,%	c, psf	ϕ°
●	B-3	2.5ft	Silty Sand (SM)	120	11	564	35

PROJECT: El Segundo DC

PROJECT NUMBER: 60215198

SITE: 444 Nash Street
El Segundo, CA

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

CLIENT: Serverfarm LLC
Dover, DE

SUMMARY

OF

CONE PENETRATION TEST DATA

Project:

El Segundo Data Center
El Segundo, Ca
August 13, 2021

Prepared for:

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Prepared by:

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www.kehoetesting.com

TABLE OF CONTENTS

SUMMARY

OF

CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the El Segundo Data Center project located in El Segundo, California. The work was performed by Kehoe Testing & Engineering (KTE) on August 13, 2021. The scope of work was performed as directed by Terracon Consultants, Inc. personnel.

2. SUMMARY OF FIELD WORK

The fieldwork consisted of performing CPT soundings at three locations to determine the soil lithology. A summary is provided in **TABLE 2.1**.

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
CPT-1	34	Refusal
CPT-2	50	
CPT-3	41	Refusal

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

The CPT soundings were carried out by **KTE** using an integrated electronic cone system manufactured by Vertek. The CPT soundings were performed in accordance with ASTM standards (D5778). The cone penetrometers were pushed using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone and recorded the following parameters at approximately 2.5 cm depth intervals:

- Cone Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed

At location CPT-3, shear wave measurements were obtained at various depths. The shear wave is generated using an air-actuated hammer, which is located inside the front jack of the CPT rig. The cone has a triaxial geophone, which recorded the shear wave signal generated by the air hammer.

The above parameters were recorded and viewed in real time using a laptop computer. Data is stored at the KTE office for up to 2 years for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

The Cone Penetration Test data is presented in graphical form in the attached Appendix. These plots were generated using the CPeT-IT program. Penetration depths are referenced to ground surface. The soil behavior type on the CPT plots is derived from the attached CPT SBT plot (Robertson, "Interpretation of Cone Penetration Test…", 2009) and presents major soil lithologic changes. The stratigraphic interpretation is based on relationships between cone resistance (qc), sleeve friction (fs), and penetration pore pressure (u). The friction ratio (Rf), which is sleeve friction divided by cone resistance, is a calculated parameter that is used along with cone resistance to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone resistance and generate excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little (or negative) excess pore water pressures.

The CPT data files have also been provided. These files can be imported in CPeT-IT (software by GeoLogismiki) and other programs to calculate various geotechnical parameters.

It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. In these situations, experience, judgement and an assessment of the pore pressure data should be used to infer the soil behavior type.

If you have any questions regarding this information, please do not hesitate to call our office at (714) 901-7270.

Sincerely,

KEHOE TESTING & ENGINEERING

Steven P. Kehoe
President

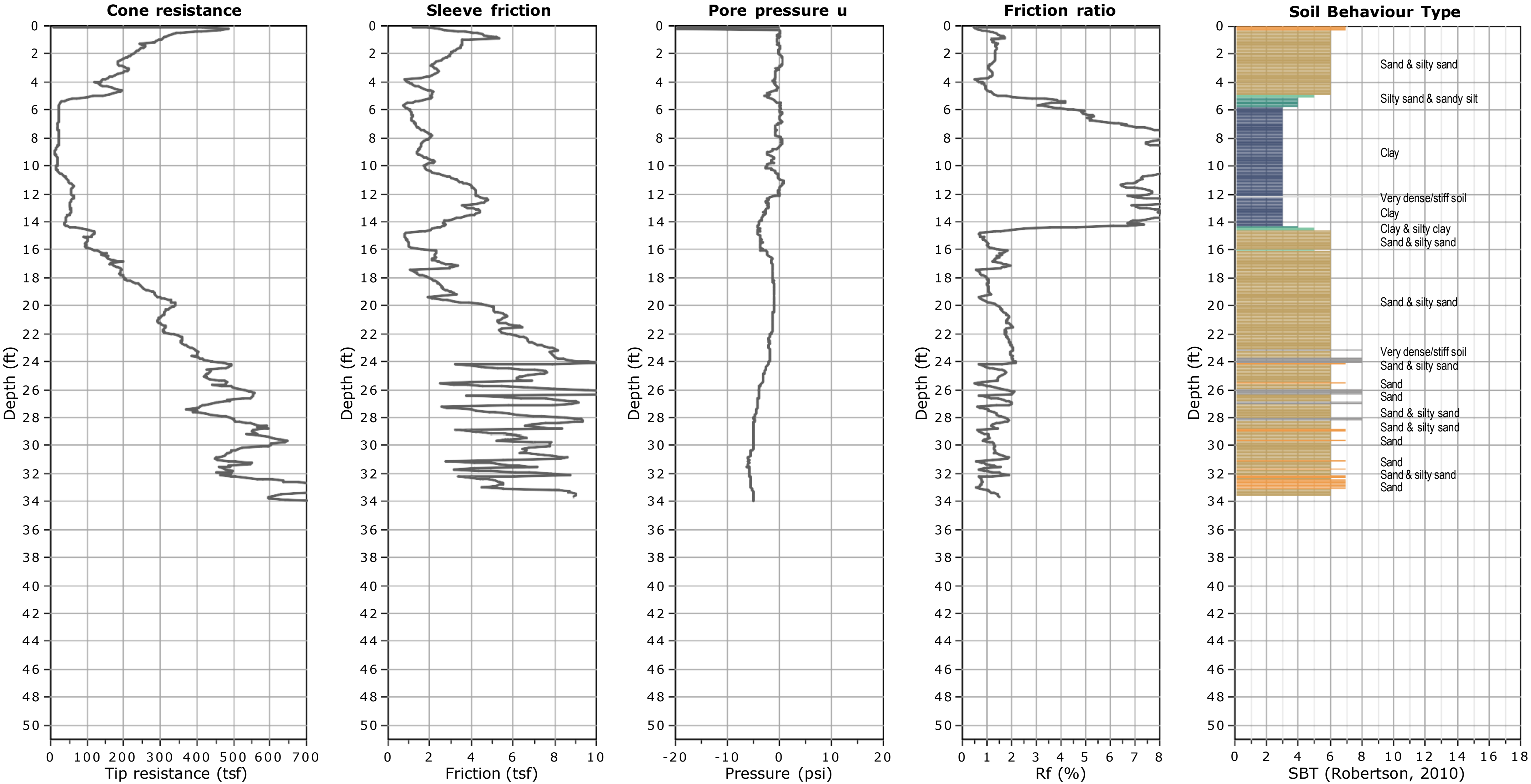
08/17/21-hh-3216

APPENDIX

Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: Terracon Consultants / El Segundo Data Center **CPT-1**

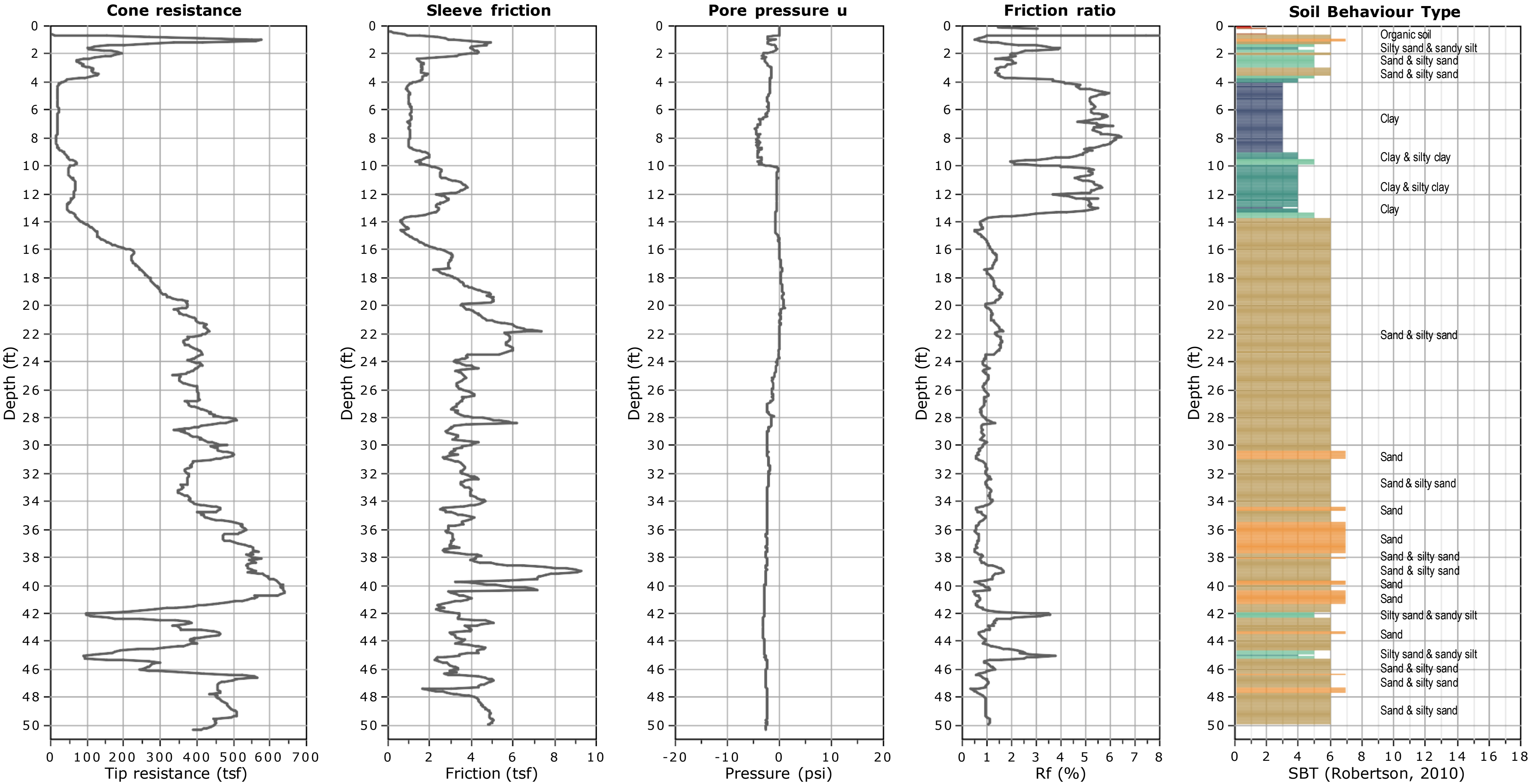
Location: El Segundo, CA Total depth: 34.00 ft, Date: 8/13/2021



Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: Terracon Consultants / El Segundo Data Center
Location: El Segundo, CA

CPT-2
Total depth: 50.36 ft, Date: 8/13/2021



Kehoe Testing and Engineering
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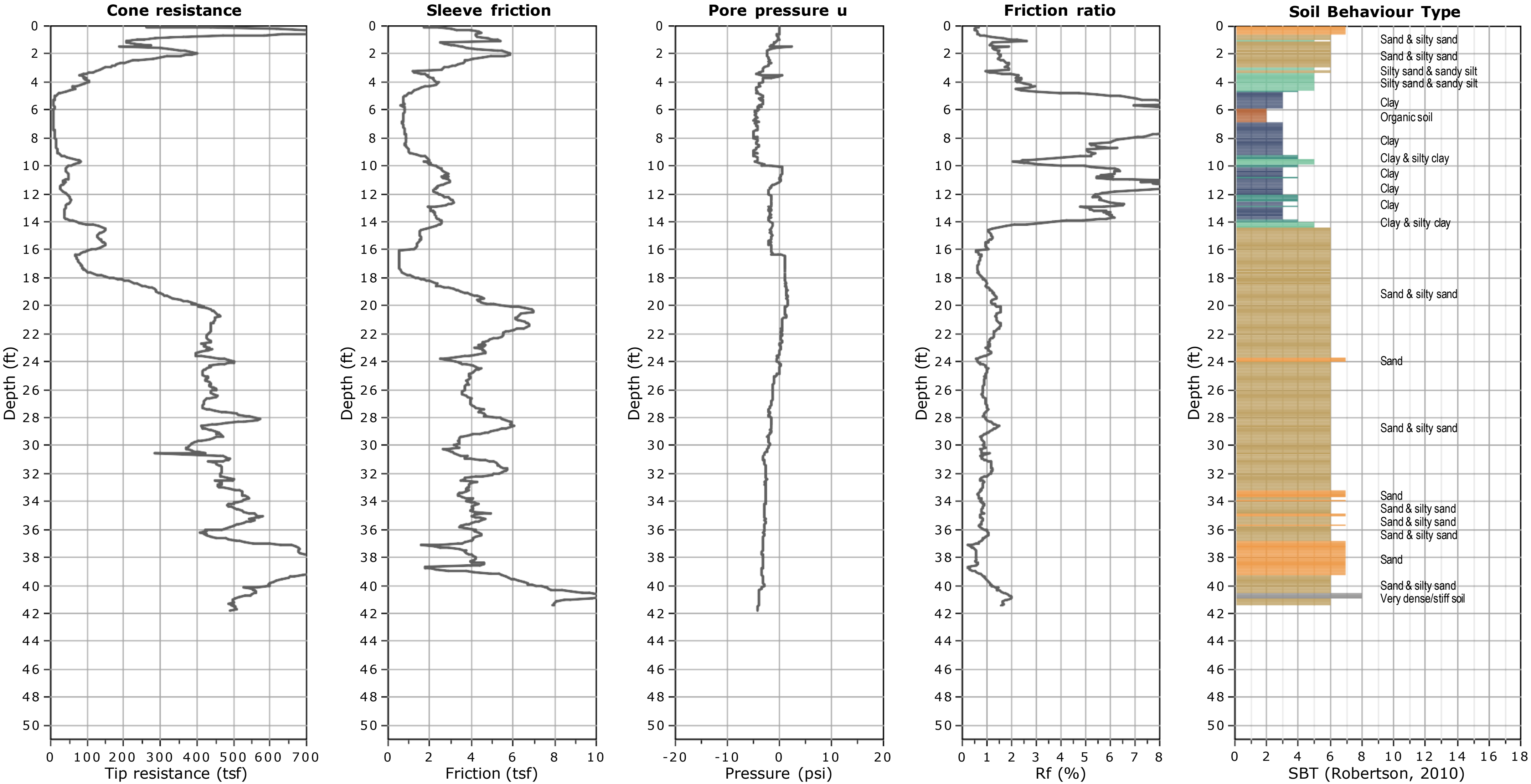
www.kehoetesting.com

Project: **Terracon Consultants / El Segundo Data Center** **CPT-3**

Location: **El Segundo, CA** Total depth: 41.80 ft, Date: 8/13/2021



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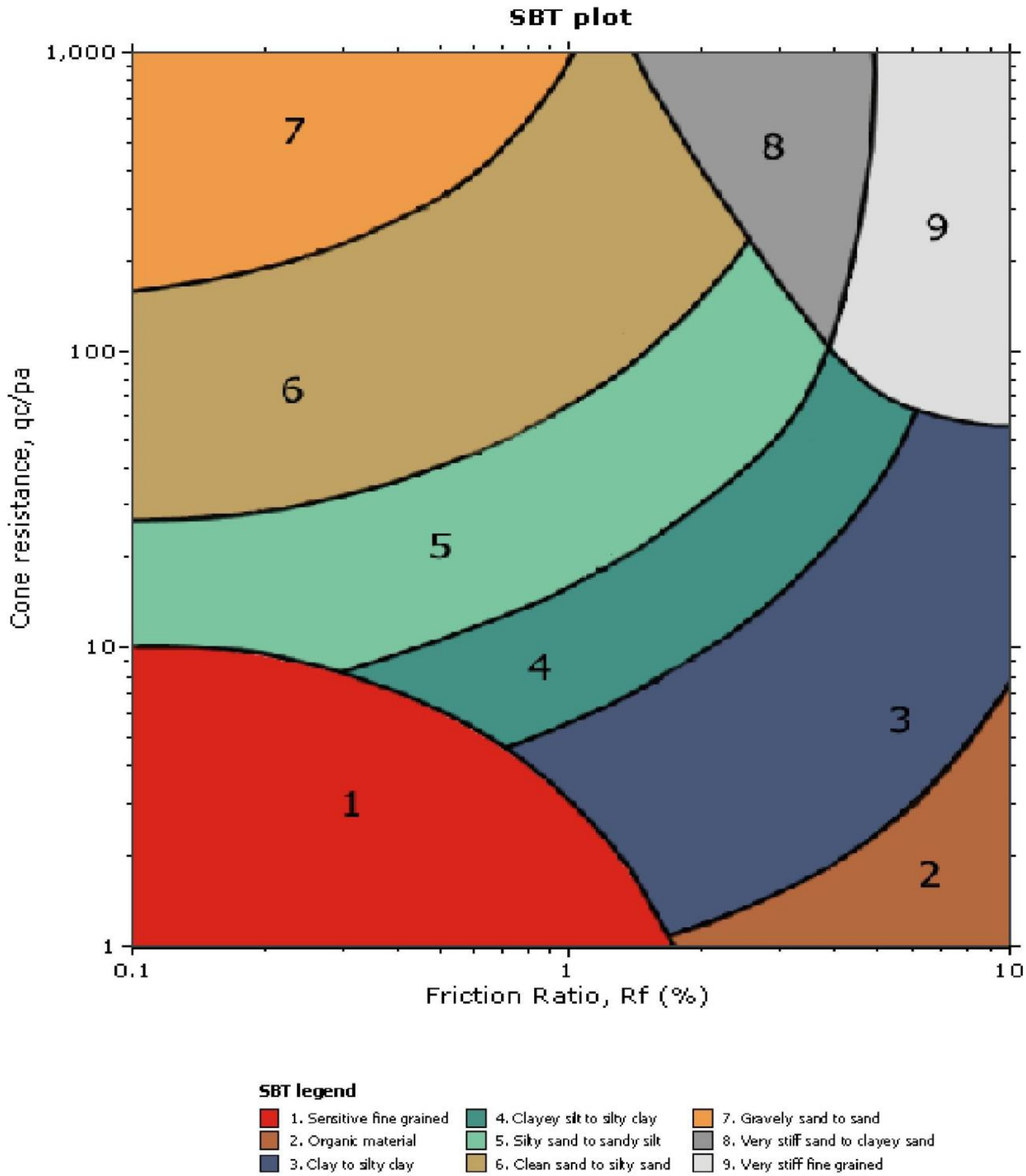


Terracon Consultants
El Segundo Data Center
El Segundo, CA

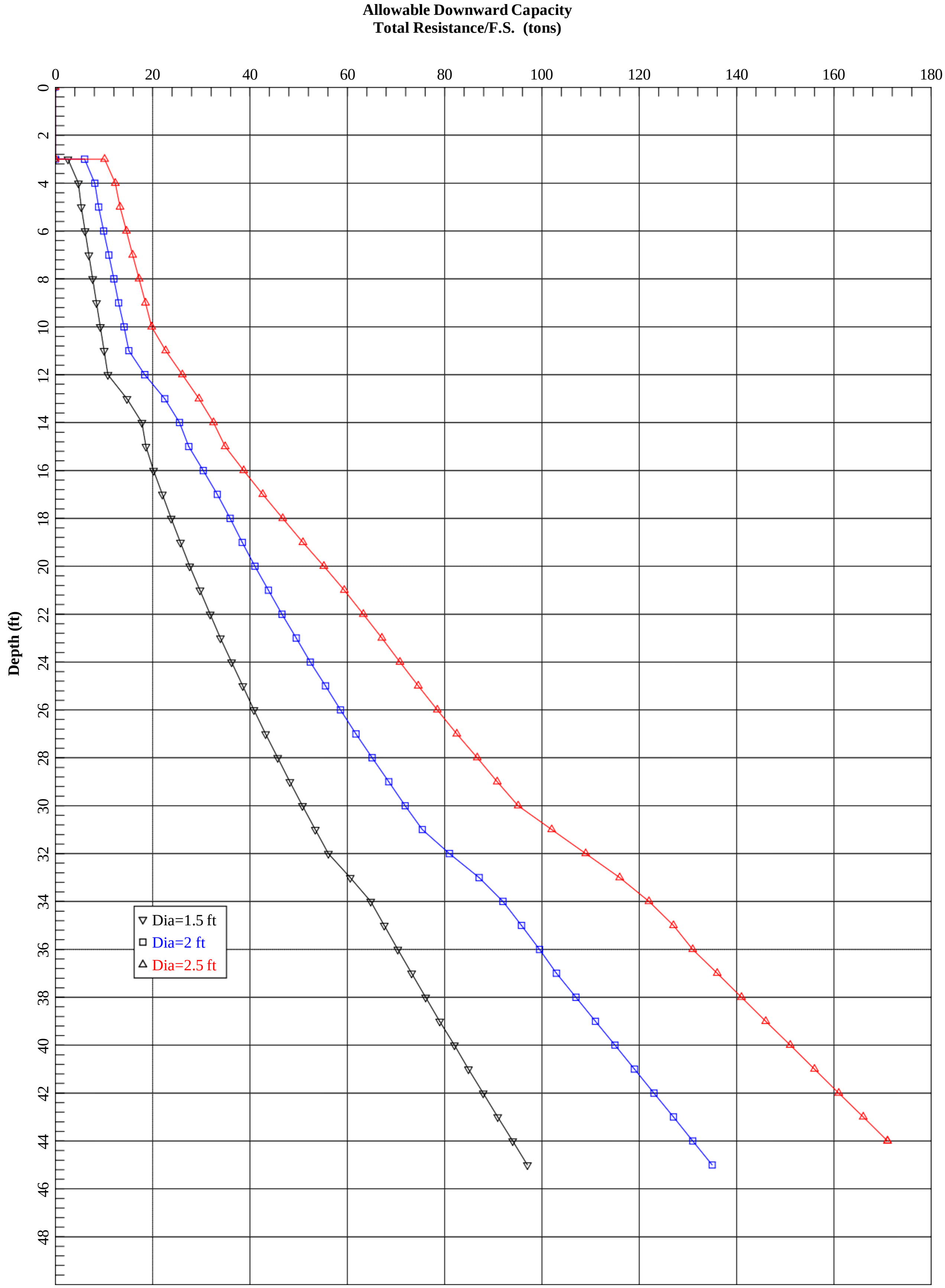
CPT Shear Wave Measurements

Location	Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
CPT-3	11.02	10.02	10.22	14.88	687	
	20.01	19.01	19.11	28.04	682	676
	30.54	29.54	29.61	36.40	813	1255
	40.09	39.09	39.14	44.20	886	1222

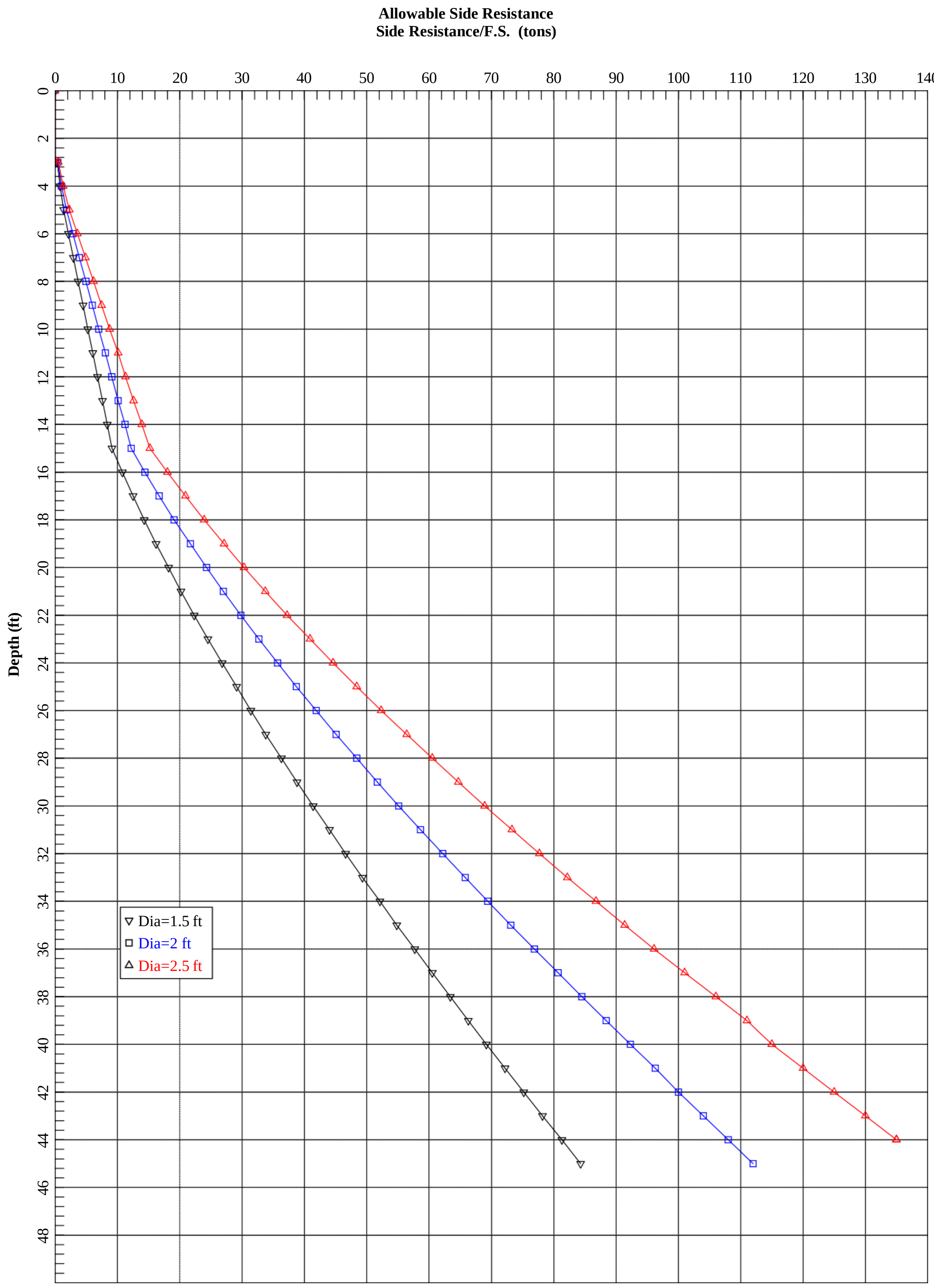
Shear Wave Source Offset - 2 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

SUPPORTING INFORMATION



Allowable Downward Capacity
Total Resistance/F.S. (tons)
0
20
40
60
80
100
120
140
160
180
Depth (ft)
Dia=1.5 ft
Dia=2 ft
Dia=2.5 ft



Allowable tension capacity may be taken as 60 percent of the allowable Side Resistance capacity shown in the graph, plus the weight of the pile.

LPILE (v2019) Recommended Engineering Properties of Soils				
Top Depth Bottom Depth	Effective Unit Weight (pcf)	L-PILE/ GROUP Soil Type	Internal Angle of Friction (Degrees)	Cohesion (psf)
2 5	115	Sand	30	--
5 15	120	Stiff Clay w/o free water	--	1500
15 35	125	Sand	36	--
35 50	125	Sand	38	--

Use LPILE default values for K and ε_{50} values

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

El Segundo DC ■ El Segundo, CA

Terracon Project No. 60215198

Terracon GeoReport

SAMPLING

Auger Cuttings

Modified Dames & Moore Ring Sampler

Standard Penetration Test

WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Cave In Encountered

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

N	**Standard Penetration Test Resistance (Blows/Ft.)**
(HP)	**Hand Penetrometer**
(T)	**Torvane**
(DCP)	**Dynamic Cone Penetrometer**
UC	**Unconfined Compressive Strength**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.