Geotechnical Report

Proposed Wake Avenue Apartments
NEC Spears Avenue and 6th Street
El Centro, California

Prepared for:

Chelsea Investment Corporation
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February 2022

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February 11, 2022

Mr. Dave Davis
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Geotechnical Report
Proposed Wake Avenue Apartments
NEC Spears Avenue and 6th Street
El Centro, California
LCI Report No. LE21248

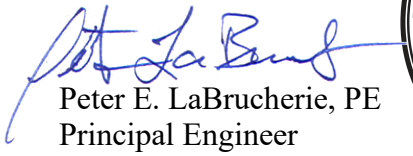
Dear Mr. Davis:

This geotechnical report is provided for design and construction of the proposed Wake Avenue Apartments located at the northeast corner of Spears Avenue and 6th Street in southern El Centro, California. Our geotechnical exploration was conducted in response to your request for our services. The enclosed report describes our soil engineering site evaluation and presents our professional opinions regarding geotechnical conditions at the site to be considered in the design and construction of the project.

Based on the geotechnical conditions encountered at the points of exploration, the project site appears suitable for the proposed construction provided the professional opinions contained in this report are considered in the design and construction of this project.

We appreciate the opportunity to provide our findings and professional opinions regarding geotechnical conditions at the site. Please provide our office with a set of the foundation plans and civil plans for review to insure that the geotechnical site constraints have been included in the design documents. If you have any questions or comments regarding our findings, please call our office at (760) 370-3000.

Respectfully Submitted,
Landmark Consultants, Inc.



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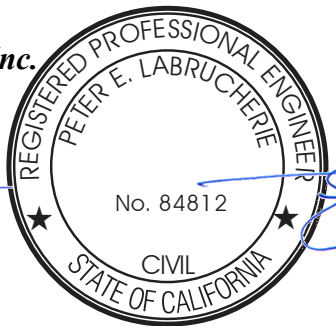

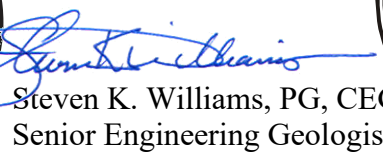

Steven K. Williams, PG, CEG
Senior Engineering Geologist

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EXECUTIVE SUMMARY

This executive summary presents ***selected*** elements of our findings and professional opinions. This summary ***may not*** present all details needed for the proper application of our findings and professional opinions. Our findings, professional opinions, and application options are ***best related through reading the full report***, and are best evaluated with the active participation of the engineer of record who developed them. The findings of this study are summarized below:

- Clay soils (CL) of medium to high expansion (EI = 70 to 110) predominate the near surface soils at the project site.

- Foundation designs should mitigate expansive soil conditions by either the removal and replacement of the upper 3.0 feet of clay soils with non-expansive soil or design of foundations to resist expansive forces, such as flat plate structural mats, grade-beam stiffened floor slabs, or post-tensioned floor slabs. A combination of the methods described above may also be used.

- Design soil bearing pressure = 1,500 psf with standard increases allowed by the California Building Code. Differential movement of 1.0 to 1.5 inches can be expected for slab on grade foundations placed on clay soils.

- The risk of liquefaction induced settlement is low. Liquefaction may occur in isolated silt and sand layers encountered at depths of 13 to 50 feet below ground surface. Potential liquefaction induced settlements of 1½ to 2 inches have been estimated for the project site. There is a very low risk of ground rupture and/or sand boil formation should liquefaction occur.

- The native soils are aggressive to concrete and steel. Concrete mixes for concrete placed in contact with native soils shall have a maximum water cement ratio of 0.45 and a minimum compressive strength of 4,500 psi (minimum of 6 sacks Type V cement per cubic yard). All concrete should be thoroughly vibrated to remove rock pockets and minimize air voids.

- All reinforcing bars, anchor bolts and hold down bolts shall have a minimum concrete cover of 4.0 inches unless epoxy coated (ASTM D3963/A934). Hold-down straps at the foundation perimeter and pressurized water lines below or within the foundations are not allowed.

- Pavement structural sections should be designed for clay subgrade soils (R-Value = 5) and an appropriate Traffic Index (TI) selected by the civil designer.

Section 1
INTRODUCTION

1.1 Project Description

This report presents the findings of our geotechnical exploration and soil testing for the proposed Wake Avenue Apartments located at the northeast corner of Spears Avenue and 6th Street in southern El Centro, California (See Vicinity Map, Plate A-1). The proposed development will consist of . A site plan for the proposed development was not made available to us at the time that this report was prepared.

The apartment buildings are planned to consist of slabs-on-grade foundations and wood-frame construction. Footing loads at exterior bearing walls are estimated at 1 to 5 kips per lineal foot. Column loads are estimated to range from 5 to 30 kips. If structural loads exceed those stated above, we should be notified so we may evaluate their impact on foundation settlement and bearing capacity. Site development will include building pad preparation, underground utility installation including trench backfill, concrete foundation construction, parking lot construction, and concrete driveway and sidewalk placement.

1.2 Purpose and Scope of Work

The purpose of this geotechnical study was to investigate the subsurface soil at selected locations within the site for evaluation of physical/engineering properties and liquefaction potential during seismic events. Professional opinions were developed from field and laboratory test data and are provided in this report regarding geotechnical conditions at this site and the effect on design and construction. The scope of our services consisted of the following:

- Field exploration and in-situ testing of the site soils at selected locations and depths.
- Laboratory testing for physical and/or chemical properties of selected samples.
- Review of the available literature and publications pertaining to local geology, faulting, and seismicity.
- Engineering analysis and evaluation of the data collected.
- Preparation of this report presenting our findings and professional opinions regarding the geotechnical aspects of project design and construction.

This report addresses the following geotechnical parameters:

- Subsurface soil and groundwater conditions
- Site geology, regional faulting and seismicity, near source factors, and site seismic accelerations
- Liquefaction potential and its mitigation
- Expansive soil and methods of mitigation
- Aggressive soil conditions to metals and concrete

Professional opinions with regard to the above parameters are provided for the following:

- Site grading and earthwork
- Building pad and foundation subgrade preparation
- Allowable soil bearing pressures and estimated settlements
- Concrete slabs-on-grade
- Lateral earth pressures
- Excavation conditions and buried utility installations
- Mitigation of the potential effects of salt concentrations in native soil to concrete mixes and steel reinforcement
- Seismic design parameters
- Pavement structural sections

Our scope of work for this report did not include an evaluation of the site for the presence of environmentally hazardous materials or conditions, storm water infiltration, groundwater mounding, or landscape suitability of the soil.

1.3 Authorization

Mr. Jim Andersen with Chelsea Investment Corporation provided authorization by written agreement to proceed with our work on December 20, 2021. We conducted our work in general accordance with our written proposal dated October 8, 2021.

Section 2
METHODS OF INVESTIGATION

2.1 Field Exploration

Subsurface exploration was performed on January 11, 2022 using Kehoe Testing and Engineering, Inc. of Huntington Beach, California to advance eight (8) electric cone penetrometer (CPT) soundings to approximate depths of 25 to 50 feet below existing ground surface. The soundings were made at the locations shown on the Site and Exploration Plan (Plate A-2). The approximate sounding locations were established in the field and plotted on the site map by sighting to discernible site features. Shallow (4-foot deep) hand auger borings (3-inch diameter) were made adjacent to the CPT soundings in order to obtain near surface soil samples for laboratory analysis.

CPT soundings provide a continuous profile of the soil stratigraphy with readings every 2.5cm (1 inch) in depth. Direct sampling for visual and physical confirmation of soil properties has been used by our firm to establish direct correlations with CPT exploration in this geographical region.

The CPT exploration was conducted by hydraulically advancing an instrumented 15cm^2 conical probe into the ground at a rate of 2cm per second using a 30-ton truck as a reaction mass. An electronic data acquisition system recorded a nearly continuous log of the resistance of the soil against the cone tip (Qc) and soil friction against the cone sleeve (Fs) as the probe was advanced. Empirical relationships (Robertson and Campanella, 1989) were then applied to the data to give a continuous profile of the soil stratigraphy. Interpretation of CPT data provides correlations for SPT blow count, phi (ϕ) angle (soil friction angle), undrained shear strength (S_u) of clays and over-consolidation ratio (OCR). These correlations may then be used to evaluate vertical and lateral soil bearing capacities and consolidation characteristics of the subsurface soil.

Interpretive logs of the CPT soundings are presented on Plates B-1 through B-8 in Appendix B. A key to the interpretation of CPT soundings is presented on Plate B-9. The stratification lines shown on the subsurface logs represent the approximate boundaries between the various strata. However, the transition from one stratum to another may be gradual over some range of depth.

2.2 Laboratory Testing

Laboratory tests were conducted on selected bulk soil samples obtained from hand auger borings made adjacent to the CPT locations to aid in classification and evaluation of selected engineering properties of the near surface soils. The tests were conducted in general conformance to the procedures of the American Society for Testing and Materials (ASTM) or other standardized methods as referenced below. The laboratory testing program consisted of the following tests:

- Plasticity Index (ASTM D4318)
- Particle Size Analyses (ASTM D6913/D7928)
- Moisture-Density Relationship (ASTM D1557)
- R Value (CAL 301)
- Chemical Analyses (soluble sulfates & chlorides, pH, and resistivity) (Caltrans Methods)

The laboratory test results are presented in Appendix C. Engineering parameters of soil strength, compressibility and relative density utilized for developing design criteria provided within this report were either extrapolated from correlations with the subsurface CPT data or from data obtained from the field and laboratory testing program.

Section 3
DISCUSSION

3.1 Site Conditions

The project site is vacant, flat-lying with scattered dry brush and weeds covering the site. The site was previously an agricultural field which has been fallow for approximately 30 years. The project site is rectangular in plan view, elongate in the east-west direction. The site is bounded on the west by 6th Street and the south by a vacant parcel. Americas Best Value Inn & Suites and a vacant lot form the northern property boundary. Vacant lots and State Hwy 86 (South 4th Street) are located to the east. Adjacent properties are flat-lying and are approximately at the same elevation with this site.

The project site lies at an elevation of approximately 35 feet below mean sea level (MSL) (El. 965 local datum) in the Imperial Valley region of the California low desert. The surrounding properties lie on terrain which is flat (planar), part of a large agricultural valley, which was previously an ancient lake bed covered with fresh water to an elevation of 43± feet above MSL. Annual rainfall in this arid region is less than 3 inches per year with four months of average summertime temperatures above 100 °F. Winter temperatures are mild, seldom reaching freezing.

3.2 Geologic Setting

The project site is located in the Salton Trough region of the Colorado Desert physiographic province of southeastern California. The Salton Trough is a topographic and geologic structural depression resulting extending from the San Gorgonio Pass to the Gulf of California (Norris & Webb, 1990). The Salton Trough is bounded on the northeast by the San Andreas fault and Chocolate Mountains and the southwest by the Peninsular Range and faults of the San Jacinto Fault Zone. The Salton Trough represents the northward extension of the Gulf of California, containing both marine and non-marine sediments deposited since the Miocene Epoch (Morton, 1977). Tectonic activity that formed the trough continues at a high rate as evidenced by deformed young sedimentary deposits and high levels of seismicity. Figure 1 shows the location of the site in relation to regional faults and physiographic features.

The Imperial Valley is directly underlain by lacustrine deposits, which consist of interbedded lenticular and tabular silt, sand, and clay. The Late Pleistocene to Holocene (present) lake deposits are probably less than 100 feet thick and derived from periodic flooding of the Colorado River which intermittently formed a fresh water lake (Lake Cahuilla). Older deposits consist of Miocene to Pleistocene non-marine and marine sediments deposited during intrusions of the Gulf of California. Basement rock consisting of Mesozoic granite and Paleozoic metamorphic rocks are estimated to exist at depths between 15,000 - 20,000 feet.

3.3 Subsurface Soil

The USDA Natural Resources Conservation Service "Web Soil Survey" website indicates that surficial deposits at the project site consist predominantly of silty clay loams overlying fine sands of the Imperial soil group (see Plate A-3). These loams are formed in sediment and alluvium of mixed origin (Colorado River overflows and fresh-water lake-bed sediments).

The subsurface soils encountered during the field exploration conducted on January 11, 2022 consist of stiff silty clays to a depth of 18 to 20 feet below ground surface. Medium dense to dense silty sands with minor interbeds of silt and clay extend from 20 feet to 50 feet, the maximum depth of exploration. The subsurface logs (Plates B-1 through B-8) depict the stratigraphic relationships of the subsurface soil encountered at the boring locations. Variations in subsurface stratigraphy may occur between the points of exploration. The stratification lines shown on the subsurface log represent the approximate boundaries between the various strata. However, the transition from one stratum to another may be gradual over some range of depth.

The native surface clays likely exhibit moderate to high swell potential (Expansion Index, EI = 70 to 110) when correlated to Plasticity Index tests (ASTM D4318) performed on the native soils.

The clay is expansive when wetted and can shrink with moisture loss (drying). Development of building foundations and concrete flatwork should include provisions for mitigating potential swelling forces and reduction in soil strength, which can occur from saturation of the soil. Causes for soil saturation include landscape irrigation, broken utility lines, or capillary rise in moisture upon sealing the ground surface to evaporation. Moisture losses can occur with lack of landscape watering, close proximity of structures to downslopes and root system moisture extraction from deep rooted shrubs and trees placed near the foundations.

The design structural engineer (foundations) should consider the effects of non-uniform moisture conditions around the entire foundation when selecting design criteria for the foundations. Typical measures used for multi-family residential projects to remediate expansive soil include:

- Moisture conditioning subgrade soils to a minimum of 5% above optimum moisture (ASTM D1557) within the drying zone of surface soils.
- Design of foundations that are resistant to shrink/swell forces of silt/clay soil.
- A combination of the methods described above

3.4 Groundwater

Groundwater was not noted in the CPT soundings, but is typically encountered at approximately 8 to 10 feet below ground surface in the vicinity of the project site. There is uncertainty in the accuracy of short-term water level measurements, particularly in fine-grained soil. Groundwater levels may fluctuate with precipitation, irrigation of adjacent properties, site landscape watering, drainage, and site grading. The referenced groundwater level should not be interpreted to represent an accurate or permanent condition.

Subsurface agricultural tile drainage pipelines (4-inch diameter plastic or clay perforated pipelines encapsulated by sand/gravel envelope) exist at a depth of 5.5 to 6.5 feet below this site and have been used to remove salts accumulating from agricultural irrigation and crop production. Abandoning and plugging the subsurface drainage pipelines can allow groundwater levels to rise variably across the site. Cutting the subsurface tile drain pipelines with utility trenches will likely result in some localized trench flooding. Base line collectors should be crushed in-place and trench backfill compacted (85-90%). The 4-inch lateral pipeline drains are not required to be removed or crushed in-place. The pipelines should be plugged at street crossings.

3.5 Faulting

The project site is located in the seismically active Imperial Valley of southern California with numerous mapped faults of the San Andreas Fault System traversing the region. The San Andreas Fault System is comprised of the San Andreas, San Jacinto, and Elsinore Fault Zones in southern California.

The Imperial fault represents a transition from the more continuous San Andreas fault to a more nearly echelon pattern characteristic of the faults under the Gulf of California. We have performed a computer-aided search of known faults or seismic zones that lie within a 36-mile radius of the project site (Table 1).

A fault map illustrating known active faults relative to the site is presented on Figure 1, *Regional Fault Map*. Figure 2 shows the project site in relation to local faults. The criterion for fault classification adopted by the California Geological Survey defines Earthquake Fault Zones along Holocene-active or pre-Holocene faults (CGS, 2022b). Earthquake Fault Zones are regulatory zones that address the hazard of surface fault rupture. A Holocene-active fault is one that has ruptured during Holocene time (within the last 11,700 years). A pre-Holocene fault is a fault that has not ruptured in the last 11,700 years. Pre-Holocene faults may still be capable of surface rupture in the future, but are not regulated by the Alquist-Priolo Act (AP).

Review of the current Earthquake Fault Zone maps (CGS, 2022a) indicates that the nearest zoned fault is the Superstition Hills fault located approximately 4.6 miles northwest of the project site and the Imperial fault located approximately 5.4 miles northeast of the project site.

3.6 General Ground Motion Analysis

The project site is considered likely to be subjected to moderate to strong ground motion from earthquakes in the region. Ground motions are dependent primarily on the earthquake magnitude and distance to the seismogenic (rupture) zone. Acceleration magnitudes also are dependent upon attenuation by rock and soil deposits, direction of rupture and type of fault; therefore, ground motions may vary considerably in the same general area.

2019 CBC General Ground Motion Parameters: The California Building Code (CBC) requires that a site-specific ground motion hazard analysis be performed in accordance with ASCE 7-16 Section 11.4.8 for structures on Site Class D and E sites with S_1 greater than or equal to 0.2 and Site Class E sites with S_s greater than or equal to 1.0. **This project site has been classified as Site Class D and has a S_1 value of 0.6, which would require a site-specific ground motion hazard analysis**. However, ASCE 7-16 Section 11.4.8 provides three exceptions which permit the use of conservative values of design parameters for certain conditions for Site Class D and E sites in lieu of a site specific hazard analysis.

The exceptions are:

- Exception 1: Structures on Site Class E sites with S_s greater than or equal to 1.0, provided the site coefficient F_a is taken as equal to that of Site Class C.
- Exception 2: Structures on Site Class D sites with S_1 greater than or equal to 0.2, provided the value of the seismic response coefficient C_s is determined by Equations 12.8-2 for values of $T \leq 1.5T_S$ and taken as equal to 1.5 times the value computed in accordance with either Equation 12.8-3 for $T_L \geq T > 1.5T_S$ or Equation 12.8-4 for $T > T_L$.
- Exception 3: Structures on Site Class E sites with S_1 greater than or equal to 0.2, provided that T is less than or equal to T_S and the equivalent static force procedure is used for design.

Based on our understanding of the proposed development, the seismic design parameters presented in Table 2 were calculated assuming that one of the exceptions listed above applies to the proposed structures at this site. **However, the structural engineer should verify that one of the exceptions is applicable to the proposed structures.** If none of the exceptions apply, our office should be consulted to perform a site-specific ground motion hazard analysis.

The 2019 CBC general ground motion parameters are based on the Risk-Targeted Maximum Considered Earthquake (MCE_R). The Structural Engineers Association of California (SEAOC) and Office of Statewide Health Planning and Development (OSHPD) Seismic Design Maps Web Application (SEAOC, 2022) was used to obtain the site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters. Design spectral response acceleration parameters are defined as the earthquake ground motions that are two-thirds (2/3) of the corresponding MCE_R ground motions. The Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration adjusted for soil site class effects (PGA_M) value to be used for liquefaction and seismic settlement analysis in accordance with 2019 CBC Section 1803.5.12 ($PGA_M = F_{PGA}*PGA$) is estimated at 0.59g for the project site. **Design earthquake ground motion parameters are provided in Table 2.**

3.7 Seismic and Other Hazards

- **Groundshaking.** The primary seismic hazard at the project site is the potential for strong groundshaking during earthquakes along the Imperial, Brawley, and Superstition Hills faults.
- **Surface Rupture.** The California Geological Survey (2022b) has established Earthquake Fault Zones in accordance with the 1972 Alquist-Priolo Earthquake Fault Zone Act.

The Earthquake Fault Zones consists of boundary zones surrounding well defined, active faults or fault segments. The project site does not lie within a currently mapped A-P Earthquake Fault Zone; therefore, surface fault rupture is considered to be low at the project site.

- **Liquefaction and lateral spreading.** Liquefaction is a potential design consideration because of underlying saturated sandy substrata. Although the Imperial Valley has not yet been evaluated for seismic hazards by the California Geological Survey seismic hazards zonation program, liquefaction is well documented in the Imperial Valley after strong seismic events (McCrink, et al, 2011 and Rymer et al, 2011). The potential for liquefaction at the site is discussed in more detail in Section 3.8. Liquefaction induced lateral spreading is not expected to occur at this site due to the planar topography.

Other Potential Geologic Hazards.

- **Landsliding.** The hazard of landsliding is unlikely due to the regional planar topography. No ancient landslides are shown on geologic maps, aerial photographs and topographic maps of the region and no indications of landslides were observed during our site investigation.
- **Volcanic hazards.** The site is not located proximal to any known volcanically active area and the risk of volcanic hazards is considered low. Obsidian Butte and Red Hill, located at the south end of the Salton Sea approximately 27 miles north of the project site, are small remnants of volcanic domes. The domes erupted about 1,800 to 2,500 years ago (Wright et al, 2015). The subsurface brine fluids around the domes have a high heat flow and are currently being utilized to produce geothermal energy.
- **Tsunamis and seiches.** Tsunamis are giant ocean waves created by strong underwater seismic events, asteroid impact, or large landslides. Seiches are large waves generated in enclosed bodies of water in response to strong ground shaking. The site is not located near any large bodies of water, so the threat of tsunami, seiches, or other seismically-induced flooding is considered unlikely.
- **Flooding.** Based on our review of FEMA (2008) FIRM Panel 06025C1725C which encompasses the project site, the project site is located in Flood Zone X, an area determined to be outside the 0.2% annual chance (500-year) floodplain.
- **Collapsible soils.** Collapsible soil generally consists of dry, loose, low-density material that have the potential collapse and compact (decrease in volume) when subjected to the addition of water or excessive loading. Soils found to be most susceptible to collapse include loess (fine grained wind-blown soils), young alluvium fan deposits in semi-arid to arid climates, debris flow deposits and residual soil deposits.

Due to the cohesive nature of the subsurface soils and shallow groundwater, the potential for hydro-collapse of the subsurface soils at this project site is considered very low.

- **Expansive soils.** In general, much of the near surface soils in the Imperial Valley consist of silty clays and clays which are moderate to highly expansive. The expansive soil conditions are discussed in more detail in Section 3.3.

3.8 Liquefaction

Liquefaction occurs when granular soils below the water table are subjected to vibratory motions, such as those produced by earthquakes. With strong ground shaking, the pore water pressure increases as the soil tends to reduce in volume. If the increase in pore water pressure is sufficient to reduce the vertical effective stress (suspending the soil particles in water), the soil strength decreases and the soil behaves as a liquid (similar to quicksand). Liquefaction can produce excessive settlement, ground rupture, lateral spreading, or failure of shallow bearing foundations.

Four conditions are generally required for liquefaction to occur:

(1) the soil must be saturated (relatively shallow groundwater);
(2) the soil must be loosely packed (low to medium relative density);
(3) the soil must be relatively cohesionless (not clayey); and
(4) groundshaking of sufficient intensity must occur to function as a trigger mechanism.

All of these conditions exist to some degree at this site.

Methods of Analysis: The computer program CLiq (Version 2.2.0.32, Geologismiki, 2017) was utilized for liquefaction assessment at the project site. The estimated settlements have been adjusted for transition zones between layers. Computer printouts of the liquefaction analyses are provided in Appendix E.

The liquefaction potential at surrounding sites was evaluated using the 2014 Boulanger and Idriss (B&I) method (Boulanger and Idriss, 2014). The B&I method utilizes CPT cone readings from site exploration and earthquake magnitude/PGA estimates from the seismic hazard analysis. The resistance to liquefaction is plotted on a chart of cyclic shear stress ratio (CSR) versus a corrected tip pressures $Q_{tn,cs}$.

The analysis was performed using a PGA_M value of 0.59g was used in the analysis with an 8-foot groundwater depth and a threshold factor of safety (FS) of 1.3.

The fines content of the liquefiable sands and silts increases their liquefaction resistance in that more ground motion cycles are required to fully develop the increased pore pressures. The CPT tip pressures (Qc) were adjusted to an equivalent clean sand pressure ($Q_{tn,cs}$) in accordance with NCEER (1997).

The soils encountered at the points of exploration included saturated silts and silty sands that could liquefy during a Maximum Considered Earthquake. Liquefaction can occur within several isolated silt and sand layers between depths of 13 to 50 feet. The likely triggering mechanism for liquefaction appears to be strong groundshaking associated with the rupture of the _____ fault. The analysis is summarized in the table below.

Summary of Liquefaction Analysis

Boring Location	Depth To First Liquefiable Zone (ft)	Potential Induced Settlement (in)
CPT-1	22.5	2
CPT-4	14.5	2
CPT-7	13	1½
CPT-8	14.5	1½

Liquefaction Induced Settlements: ***Based on empirical relationships, total induced settlements are estimated to be about 1½ to 2 inches should liquefaction occur.*** Differential settlement is estimated at be one-half of the total potential settlement (Martin and Lew, 1999). Accordingly, there is a potential for ¾ to 1 inch of liquefaction induced differential settlement at the project site. The differential settlement based on seismic settlements is estimated at 1 inch over a distance of 100 feet.

Because of the depth of the liquefiable layer, the 13-foot thick non-liquefiable clay layer will likely act as a bridge over the liquefiable layer resulting in a fairly uniform ground surface settlement; therefore, wide area subsidence of the soil overburden would be the expected effect of liquefaction rather than bearing capacity failure of the proposed structures.

Liquefaction Induced Ground Failure: Based on research from Ishihara (1985) and Youd and Garris (1995) small ground fissure or sand boil formation is unlikely because of the thickness of the overlying unliquefiable soil. Sand boils are conical piles of sand derived from the upward flow of groundwater caused by excess porewater pressures created during strong ground shaking. Sand boils are not inherently damaging by themselves, but are an indication that liquefaction occurred at depth (Jones, 2003). Liquefaction induced lateral spreading is not expected to occur at this site due to the planar topography. According to Youd (2005), if the liquefiable layer lies at a depth greater that about twice the height of a free face, lateral spread is not likely to develop. No slopes or free faces occur at this site except for the shallow retention basin, which depths are substantially above the first liquefiable layer.

Mitigation: Ground improvement or deep foundation mitigation is not required at this project site. The differential settlement caused by liquefaction is estimated at approximately ¾ to 1 inch. The designer should utilize foundation designs which mitigate the liquefaction induced settlement.

Because of the potential for differential settlement due to liquefaction, the designer should consider the following options for design of the structure:

1) Foundations that use grade-beam footings to tie floor slabs and isolated columns to continuous footings (conventional or post-tensioned).

2) Structural flat-plate mats, either conventionally reinforced or tied with post-tensioned tendons.

These alternatives reduce the potential effects of liquefaction-induced settlements by making the structures more able to withstand differential settlement.

Section 4
DESIGN CRITERIA

4.1 Site Preparation

Preconstruction Meeting: A preconstruction conference should be held at the site prior to the beginning of grading operations with, as a minimum, the owner's representative, grading contractor and geotechnical engineer in attendance.

Clearing and Grubbing: All surface improvements, debris or vegetation including grass, trees, and weeds on the site at the time of construction should be removed from the construction area. Root balls should be completely excavated. Organic strippings should be stockpiled and not used as engineered fill. All trash, construction debris, concrete slabs, old pavement, landfill, contaminated soil, and buried obstructions such as old foundations and utility lines exposed during rough grading should be traced to the limits of the foreign material by the grading contractor and removed under our supervision. Any excavations resulting from site clearing should be sloped to a bowl shape to the lowest depth of disturbance and backfilled under the observation of the geotechnical engineer's representative.

Mass Grading: Prior to placing any fills, the surface 3.5 feet of soil should be prewetted (minimum of 20% moisture content). Subsequent to prewetting, the surface 12 inches of soil ***in areas planned for fill soil placement*** should be removed, the exposed surface uniformly moisture conditioned to a depth of 8 inches by discing and wetting to a minimum of optimum plus 5% and recompacted to 85% to 90% of ASTM D1557 maximum density. The surface soils are loose with 2 to 4 inches of "fluff" on the surface, as indicated by wheel load depressions. Prior to placing any fills, the surface 12 inches of soil should be removed, the exposed surface uniformly moisture conditioned to a depth of 8 inches by discing and wetting to a minimum of optimum plus 5% and recompacted to 85% to 90% of ASTM D1557 maximum density. Onsite native clays placed as engineered fill should be uniformly moisture conditioned by discing and wetting or drying to optimum plus 5 to 10% and compacted in 6 inch maximum lifts to 85% to 90% relative compaction. Clods shall be reduced by discing to a maximum dimension of 1.0 inch prior to being placed as fill.

The site is underlain by tile drain lines at a depth of approximately 5.5 to 6.0 feet below ground surface. Tile lines should be cut and plugged at the street crossings. The pipelines are likely full of water and may temporarily flood excavations if not capped promptly. Base lines (6 to 8 inch

diameter) should be located and crushed in-place with the backfill compacted to a minimum 90% of ASTM D1557 maximum density.

Street Subgrade Preparation: The native clay soils in street areas should be removed and recompacted to 12 inches below the design subgrade elevation. If dry soils are encountered at 12 inches below the design subgrade elevation, an additional 12 inches of native soil shall be uniformly moisture conditioned to 4 to 8% above optimum moisture content. Engineered fill in street areas should be uniformly moisture conditioned to a minimum of 4% above optimum moisture, placed in layers not more than 6 inches in thickness and mechanically compacted to a minimum of 90% of the ASTM D1557 maximum dry density.

Building Pad Preparation for Foundations Placed on Native Clay Soils: The existing soils within the building pad/foundation areas should be overexcavated to a minimum depth of 36 inches below the existing natural surface grade or 24 inches below the deepest footing (whichever is deeper) and should extend at least five (5) feet beyond all exterior wall/column lines (including concreted areas adjacent to the building). Exposed subgrade should be scarified to a depth of 8 inches, uniformly moisture conditioned to 5 to 10% above optimum moisture content and recompacted to 85 to 90% of the maximum density determined in accordance with ASTM D1557 methods.

Prior to over-excavation of the surface soil, deep moisture penetration may be achieved by bordering the site and applying multiple floodings or by sprinkler application to allow water to permeate to a minimum depth of 3.5 feet (20% minimum moisture content) below existing natural surface. Extended drying periods may be required when utilizing this method of pre-saturation.

The native soil is suitable for use as engineered fill provided it is free from concentrations of organic matter or other deleterious material. The fill soil should be uniformly moisture conditioned by discing and watering to the limits specified above, placed in maximum 8-inch lifts (loose), and compacted to the limits specified above. Clay soil should not be overcompacted because highly compacted soil will result in increased swelling. Imported fill soil (for foundations designed for expansive soil conditions) should have a Plasticity Index less than 25 and sulfates (SO_4) less than 4,000 ppm.

Sidewalk and Concrete Hardscape Areas: In areas other than the building pad which are to receive sidewalks or area concrete slabs, the ground surface should be presaturated (20% minimum moisture content) to a minimum depth of 24 inches and then scarified to 8 inches, moisture conditioned to a minimum of 5% over optimum, and recompacted to 85-90% of ASTM D1557 maximum density just prior to concrete placement.

Moisture Control and Drainage: The moisture condition of the building pad should be maintained during trenching and utility installation until concrete is placed or should be rewetted by use of multiple applications of water with sprinklers before initiating delayed construction.

Adequate site drainage is essential to future performance of the project. Infiltration of excess irrigation water and stormwaters can adversely affect the performance of the subsurface soil at the site. Positive drainage should be maintained away from all structures (5% for 10 feet minimum across unpaved areas) to prevent ponding and subsequent saturation of the native clay soil. Swales or stormwater catch basins and drainage piping may be used to divert water away from the foundation when obstructions or property lines prohibit 10 feet of horizontal distance. Drainage swales within 10 feet of the foundation should have a minimum slope of 2% (California Building Code Section 1804.4). Gutters and downspouts should be used as a means to convey water away from foundations. If landscape irrigation is allowed next to the building, drip irrigation systems or lined planter boxes should be used. The subgrade soil around the entire foundation should be maintained in a moist, but not saturated state, and not allowed to dry out. The owner/developer should consider utilizing drip irrigation systems around the entire building perimeter to maintain soil moisture. Site managers should be advised of the importance of such systems. Drainage should be maintained without ponding. Trees should be set back from foundations a minimum of 20 feet from the foundation.

Observation and Density Testing: All site preparation and fill placement should be continuously observed and tested by a representative of a qualified geotechnical engineering firm. Full-time observation services during the excavation and scarification process is necessary to detect undesirable materials or conditions and soft areas that may be encountered in the construction area. The geotechnical firm that provides observation and testing during construction shall assume the responsibility of "*geotechnical engineer of record*" and, as such, shall perform additional tests and investigation as necessary to satisfy themselves as to the site conditions and the geotechnical parameters for site development.

Auxiliary Structures Foundation Preparation: Auxiliary structures such as free standing or retaining walls should have footings extended to a minimum of 30 inches below grade. The existing soil beneath the structure foundation prepared in the manner described for the building pad except the preparation needed only to extend 18 inches below and beyond the footing.

4.2 Foundations and Settlements

Expansive Soil Engineered Building Pad: For foundations placed on an engineered building pad consisting of native clay soils, shallow spread or continuous footings are suitable to support the buildings provided they are structurally tied with grade-beams to continuous perimeter wall footings to resist differential movement associated with expansive soils and potential soil liquefaction at depth. A minimum of 12 inches of compacted fill should exist beneath the footings. Continuous wall footings should have a minimum depth of 24 inches and minimum width of 12 inches. Spread footings should have a minimum dimension of 24 inches and should be structurally tied to perimeter footings or grade beams. Concrete reinforcement and sizing for all footings should be provided by the structural engineer.

The foundations may be designed using an allowable soil bearing pressure of 1,500 psf for compacted native clay soil. The allowable soil pressure may be increased by 20% for each foot of embedment depth of the footings in excess of 18 inches and by one-third for short term loads induced by winds or seismic events. The maximum allowable soil pressure at increased embedment depths shall not exceed 3,000 psf (clays).

Resistance to horizontal loads will be developed by passive earth pressure on the sides of footings and frictional resistance developed along the bases of footings and concrete slabs. Passive resistance to lateral earth pressure may be calculated using an equivalent fluid pressure of 250 pcf to resist lateral loadings. The top one foot of embedment should not be considered in computing passive resistance unless the adjacent area is confined by a slab or pavement. An allowable friction coefficient of 0.25 may also be used at the base of the footings to resist lateral loading.

Flat plate structural mats, grade-beam reinforced foundations, or post tensioned reinforced foundations may be used to mitigate expansive soil heave and/or liquefaction related movement.

- Flat Plate Structural Mats: Flat plate structural mats may be used to mitigate expansive soils at the project site. The structural mat shall have a double mat of steel (minimum No. 4's @ 12 inches O.C. each way – top and bottom) and a minimum thickness of 10 inches. Mat edges shall have a minimum edge footing of 12 inches width and 24 inches depth (below the building pad surface). Mats may be designed by CBC Chapter 18, Section 1808.6.2 methods (*WRI/CRSI Design of Slab-on-Ground Foundations*).

  Structural mats may be designed for a modulus of subgrade reaction (Ks) of 50 pci when placed on compacted clay or a subgrade modulus of 250 [300] pci when placed on 2.5 [3.0] feet of granular fill. Mats shall overlay 2 inches of sand and a 10-mil polyethylene vapor retarder. The building support pad shall be moisture conditioned and recompacted as specified in Section 4.1 of this report.

- Grade-beam Reinforced Foundations: Specific soil data for structures with grade-beam reinforced foundations placed on the native clays are presented below in accordance with the design method given in CBC Chapter 18 Section 1808.6.2 (*WRI/CRSI Design of Slab-on-Ground Foundations*):

  Weighted Plasticity Index (PI) = 30
  Slope Coefficient (C_s) = 1.0
  Strength Coefficient (C_o) = 0.8
  Climatic Rating (C_w) = 15
  Effective PI = 24
  Maximum Grade-beam Spacing = 20 feet

  Exterior footings shall be founded a minimum of 24 inches below the surface of the building support pad on a layer of properly prepared and compacted native soil as described in Section 4.1. Interior footings shall have a minimum embedment depth of 12 inches.

- Post-tensioned Slabs: If post-tensioned slabs are considered for this project, the following basic (minimum) soil criteria should be used in accordance with CBC Chapter 18 Section 1808.6.2 (*PTI 10.5 Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive Soils*). ***The design engineer may consider other site conditions that may warrant more conservative design values.***

Atterberg Limits:		
Liquid Limit	46	
Plasticity Limit	16	
Plasticity Index	30	
Fines Content (<#200 sieve)	95	
% finer than 2μ	47	
Fabric Factor	1	
Thornthwaite Moisture Index	-40	
Maximum Edge Moisture Variation Distance, e_m		Center: 8.0 ft. Edge: 4.1 ft.
Differential Soil Movement, y_m		Center: 0.28 in. Edge: 1.48 in.
Bearing Capacity:		1,500 psf
Maximum Allowable Slab Deflection		Center: L/480 Edge: L/720

Clamping devices and end anchors for post-tensioned tendons are susceptible to corrosion from aggressive soil and landscape water conditions. Therefore, a fully encapsulated tendon and positive end seal system is required. Torched-off ends of cables are only allowed if the flame heat does not distort the end seal for the cable clamping devices. Grease caps must form a complete seal to the cup. Apply a bonding agent to the recessed pocket area and fill with polymer modified non-shrink grout.

All exterior footings for post-tensioned slabs should be embedded a minimum of 24 inches below the building support pad or lowest adjacent final grade, whichever is deeper. Minimum embedment depth of interior slab stiffening elements for post-tensioned slabs should be at least 12 inches into the building support pad to account for variable environmental conditions. Interior and exterior embedment depths listed herein are minimum depths and greater depths/widths may be required by the structural engineer/designer and should be sufficient to limit differential movement to L/480 for center lift and L/720 for edge lift to comply with the current standards.

Settlements: Foundation movement under the estimated static (non-seismic) loadings and static site conditions are estimated to not exceed 1 inch with differential movement of about two-thirds of total movement for the loading assumptions stated above when the subgrade preparation guidelines given above are followed. Seismically induced liquefaction settlement of the surrounding land mass and structure may be on the order of 1½ to 2 inches (total) and ¾ to 1 inch (differential).

4.3 Slabs-On-Grade

Structural Concrete: Structural concrete slabs are those slabs (foundations) that underlie structures or patio covers (shades). These slabs that are placed over native clay soil should be designed in accordance with Chapter 18 of the 2019 CBC and shall be a minimum of 5 inches thick due to expansive soil conditions. Concrete floor slabs shall be monolithically placed with the footings (no cold joints).

American Concrete Institute (ACI) guidelines (ACI 302.1R-15 Chapter 5, Section 5.2.3) provide recommendations regarding the use of moisture barriers beneath concrete slabs. The concrete floor slabs should be underlain by a 10-mil polyethylene vapor retarder that works as a capillary break to reduce moisture migration into the slab section. All laps and seams should be overlapped 6-inches or as recommended by the manufacturer. The vapor retarder should be protected from puncture. The joints and penetrations should be sealed with the manufacturer's recommended adhesive, pressure-sensitive tape, or both. The vapor retarder should extend a minimum of 12 inches into the footing excavations. The vapor retarder should be covered by 4 inches of clean sand (Sand Equivalent SE>30).

Placing sand over the vapor retarder may increase moisture transmission through the slab, because it provides a reservoir for bleed water from the concrete to collect. The sand placed over the vapor retarder may also move and mound prior to concrete placement, resulting in an irregular slab thickness. For areas with moisture sensitive flooring materials, ACI recommends that concrete slabs be placed without a sand cover directly over the vapor retarder, provided that the concrete mix uses a low-water cement ratio and concrete curing methods are employed to compensate for release of bleed water through the top of the slab. The vapor retarder should have a minimum thickness of 15-mil (Stego-Wrap or equivalent).

Structural concrete slab reinforcement should consist of chaired rebar slab reinforcement (minimum of No. 3 bars at 16-inch centers, both horizontal directions) placed at slab mid-height to resist potential swell forces and cracking. Slab thickness and steel reinforcement are minimums only and should be verified by the structural engineer/designer knowing the actual project loadings. All steel components of the foundation system should be protected from corrosion by maintaining a 4-inch minimum concrete cover of densely consolidated concrete at footings (by use of a vibrator). The construction joint between the foundation and any mowstrips/sidewalks placed adjacent to foundations should be sealed with a polyurethane based non-hardening sealant to prevent moisture migration between the joint. Epoxy coated embedded steel components (ASTM D3963/A934) or permanent waterproofing membranes placed at the exterior footing sidewall may also be used to mitigate the corrosion potential of concrete placed in contact with native soil.

Control joints should be provided in all concrete slabs-on-grade at a maximum spacing (in feet) of 2 to 3 times the slab thickness (in inches) as recommended by American Concrete Institute (ACI) guidelines. All joints should form approximately square patterns to reduce randomly oriented contraction cracks. Contraction joints in the slabs should be tooled at the time of the pour or sawcut (¼ of slab depth) within 6 to 8 hours of concrete placement. Construction (cold) joints in foundations and area flatwork should either be thickened butt-joints with dowels or a thickened keyed-joint designed to resist vertical deflection at the joint. All joints in flatwork should be sealed to prevent moisture, vermin, or foreign material intrusion. Precautions should be taken to prevent curling of slabs in this arid desert region (refer to ACI guidelines).

Non-structural Concrete: All non-structural independent flatwork (sidewalks and uncovered patios) shall be a minimum of 4 inches thick and should be placed on a minimum of 2 inches of concrete sand or aggregate base, dowelled to the perimeter foundations where adjacent to the building to prevent separation and sloped 2% (sidewalks) or 1 to 2% (patios) away from the building. Patio slabs with shade structures shall have a perimeter footing (18-inch embedment depth) and shall have interior grade beams (12-inch minimum embedment depth) at 15 feet on center. Planters that trap water between sidewalks and foundations are not allowed.

A minimum of 24 inches of moisture conditioned (5% minimum above optimum) and 8 inches of compacted subgrade (85 to 90%) should underlie all independent flatwork. Flatwork which contains steel reinforcing (except wire mesh) should be underlain by a 10-mil (minimum) polyethylene separation sheet and at least a 2-inch sand cover.

All flatwork should be jointed in square patterns and at irregularities in shape at a maximum spacing of 8 feet or the least width of the sidewalk.

4.4 Shade Structure Foundations

Shallow spread footings or individual concrete short drilled piers are suitable to support the shade canopy structures.

Drilled pier foundation: Individual short piers should be adequate to support the shade canopy structure. Non-constrained and constrained design parameters are provided below.

Non-constrained: Embedment depth for short piers to resist lateral loads where no-constraint is provided at ground surface may be designed using the following formula per 2019 CBC Section 1807.3.2.1:

$$d = 0.5A\,[1 + (1+4.36h/A)^{1/2}] \qquad \text{(Equation 18-1)}$$

where:

- $A = 2.34P/S_1b$
- b = Pier diameter in feet
- d = Embedment depth in feet (but not over 12 feet for purpose of computing lateral pressure)
- h = Distance in feet from ground surface to point of application of "P"
- P = Applied lateral force in pounds
- S_1 = Allowable lateral soil bearing pressure (basic value of 100 psf/f (see 2019 CBC Table 1806.2). Isolated piers that are not adversely affected by a 0.5 inch motion at the ground surface due to short-term lateral loads are permitted to be designed using lateral soil bearing pressures equal to two times the basic soil bearing value.

The short pier foundations may be designed using an allowable soil bearing pressure of 1,500 psf for the native soils and a cohesion of 130 psf for the native clay soil. The cohesion value shall be multiplied by the contact area, as limited by Section 1806.3 of the 2019 CBC. Uplift capacity may be determined by using ⅔ of the cohesion value.

The short pier foundations may be designed using an allowable soil bearing pressure of 1,500 psf for the native soils and a coefficient of friction of 0.25 for the native sand soils. The coefficient of friction may be multiplied by the dead load, as limited by Section 1806.3 of the 2019 CBC.

The uplift capacity may be may be defined as the sum of the frictional resistance of the soils against the concrete pile plus the weight of the pile as follows:

$$P_{all} = (K_{HT}*P_o*\text{Tan}\ \delta*\pi*D*H)/FS + W_{p,}$$

Incorporating the soil conditions at the site and applying a Safety Factor of 3 it may be expressed as,

$$P_{all} = 16DH^2 + Wp$$

where:

P_{all} = Allowable Uplift Capacity in pounds
D = Diameter of the pile in feet
H = Depth of embedment below ground surface in feet (to a maximum of 14 feet)
W_p = Weight of the pile in pounds

Constrained: The following formula (2019 CBC Section 1807.3.2.2) shall be used to determine the depth of embedment required to resist lateral loads where lateral constrain is provided at the ground surface, such as by rigid floor or pavement.

$$d = \sqrt{(4.25Ph / S_3b)} \text{ or alternatively, } d = \sqrt{(4.25Mg / S_3b)}$$

where:

b = Pier diameter in feet.
d = Embedment depth in feet (but not over 12 feet for purpose of computing lateral pressure).
h = Distance in feet from ground surface to point of application of "P".
P = Applied lateral force in pounds.
S_3 = Allowable lateral soil bearing pressure (basic value of 100 psf, see 2019 CBC Table 1806.2) based on a depth equal to the depth of embedment in psf. This value may be doubled where ½ inch deflection at ground surface is allowed due to short-term lateral loads.
Mg = Moment in the post at grade in ft-lb.

The vertical and uplift load capacities may be determined as noted for the unconstrained case.

4.5 Concrete Mixes and Corrosivity

Selected chemical analyses for corrosivity were conducted on bulk samples of the near surface soil from the project site (Appendix C). The native soils were found to have S2 (severe) levels of sulfate ion concentration (6,200 to 7,900 ppm). Sulfate ions in high concentrations can attack the cementitious material in concrete, causing weakening of the cement matrix and eventual deterioration by raveling.

The following table provides American Concrete Institute (ACI) recommended cement types, water-cement ratio and minimum compressive strengths for concrete in contact with soils:

Concrete Mix Design Criteria due to Soluble Sulfate Exposure

Sulfate Exposure Class	Water-soluble Sulfate (SO_4) in soil, ppm	Cement Type	Maximum Water-Cement Ratio by weight	Minimum Strength f'c (psi)
S0	0-1,000	–	–	–
S1	1,000-2,000	II	0.50	4,000
S2	2,000-20,000	V	0.45	4,500
S3 – Option 1	Over 20,000	V (plus Pozzolon)	0.45	4,500
S3 – Option 2	Over 20,000	V	0.40	5,000

Note: From ACI 318-19 Table 19.3.1.1 and Table 19.3.2.1

A minimum of 6.25 sacks per cubic yard of concrete (4,500 psi) of Type V Portland Cement with a maximum water/cement ratio of 0.45 (by weight) should be used for concrete placed in contact with native soil on this project (sitework including sidewalks, hardscape, and foundations). Admixtures may be required to allow placement of this low water/cement ratio concrete. Thorough concrete consolidation and hard trowel finishes should be used due to the aggressive soil exposure.

The native soil has very severe levels of chloride ion concentration (4,360 to 7,540 ppm). Chloride ions can cause corrosion of reinforcing steel, anchor bolts and other buried metallic conduits. Resistivity determinations on the soil indicate very potential for metal loss because of electrochemical corrosion processes. Mitigation of the corrosion of steel can be achieved by using steel pipes coated with epoxy corrosion inhibitors, asphaltic and epoxy coatings, cathodic protection or by encapsulating the portion of the pipe lying above groundwater with a minimum of 4 inches of densely consolidated concrete. ***No metallic water pipes or conduits should be placed below foundations.***

Foundation designs shall ***provide a minimum concrete cover of four (4)*** inches around steel reinforcing or embedded components (anchor bolts, etc.) exposed to native soil or landscape water (to 18 inches above grade).

If the 4-inch concrete edge distance cannot be achieved, all embedded steel components (anchor bolts, etc.) shall be epoxy coated for corrosion protection (in accordance with ASTM D3963/A934) or a corrosion inhibitor and a permanent waterproofing membrane shall be placed along the exterior face of the exterior footings. ***Hold-down straps should not be used at foundation edges due to corrosion of metal at its protrusion from the slab edge.*** Additionally, the concrete should be thoroughly vibrated at footings during placement to decrease the permeability of the concrete.

Exterior foundation faces exposed to native soils (without adjacent mowstrips, sidewalks, or patios) should be coated with a permanent waterproofing membrane to prevent salt migration into concrete.

Copper water piping (except for trap primers) should not be placed under floor slabs. All copper piping within 18 inches of ground surface shall be sleeved or wrapped with two layers of 10 mil plumbers tape or sleeved with PVC piping to prevent contact with soil. The trap primer pipe shall be completely encapsulated in a PVC sleeve and Type K copper should be utilized if polyethylene tubing cannot be used. Pressurized waterlines are not allowed under the floor slab. Fire protection piping (risers) should be placed outside of the building foundation.

Landmark does not practice corrosion engineering. We recommend that a qualified corrosion engineer evaluate the corrosion potential on metal construction materials and concrete at the site to obtain final design recommendations.

4.6 Excavations

All site excavations should conform to CalOSHA requirements for Type B soil. The contractor is solely responsible for the safety of workers entering trenches. Temporary excavations with depths of 4 feet or less may be cut nearly vertical for short duration. Excavations deeper than 4 feet will require shoring or slope inclinations in conformance to CAL/OSHA regulations for Type B soil. Surcharge loads of stockpiled soil or construction materials should be set back from the top of the slope a minimum distance equal to the height of the slope. All permanent slopes should not be steeper than 3:1 to reduce wind and rain erosion. Protected slopes with ground cover may be as steep as 2:1. However, maintenance with motorized equipment may not be possible at this inclination.

4.7 Utility Trench Backfill

Utility Trench Backfill: Prior to placement of utility bedding, the exposed subgrade at the bottom of trench excavations should be examined for soft, loose, or unstable soil. Loose materials at trench bottoms resulting from excavation disturbance should be removed to firm material. If extensive soft or unstable areas are encountered, these areas should be over-excavated to a depth of at least 2 feet or to a firm base and be replaced with additional bedding material.

Backfill Materials: Pipe zone backfill (i.e., material beneath and in the immediate vicinity of the pipe) should consist of a 4 to 8 inch bed of ⅜-inch crushed rock, sand/cement slurry (3 sack cement factor), and/or crusher fines (sand) extending to a minimum of 12 inches above the top of pipe. If crushed rock is used for pipe zone backfill for utilities, the crushed rock material should be completed surrounded by a non-woven filter fabric such as Mirafi 140N or equivalent. The filter fabric shall cover the trench bottom, sidewalls and over the top of the crushed rock. The filter fabric is recommended to inhibit the migration of fine material into void spaces in the crushed rock which may create the potential for sinkholes or depressions to develop at the ground surface.

Pipe bedding should be in accordance with pipe manufacturer's recommendations. Recommendations provided above for pipe zone backfill are minimum requirements only. More stringent material specifications may be required to fulfill local codes and/or bedding requirements for specific types of pipes. On-site soil free of debris, vegetation, and other deleterious matter may be suitable for use as utility trench backfill above pipezone, but may be difficult to uniformly maintain at specified moistures and compact to the specified densities. Native backfill should only be placed and compacted after encapsulating buried pipes with suitable bedding and pipe envelope material.

Compaction Criteria: Mechanical compaction is recommended; ponding or jetting should not be allowed, especially in areas supporting structural loads or beneath concrete slabs supported-on-grade, pavements, or other improvements. All trench backfill should be placed and compacted in accordance with recommendations provided above for engineered fill.

The pipe zone material (crusher fines, sand) shall be compacted to a minimum of 95% of ASTM D1557 maximum density. Pipe deflection should be checked to not exceed 2% of pipe diameter. Native clay/silt soils may be used to backfill the remainder of the trench.

Soils used for trench backfill shall be placed in maximum 6 inch lifts (loose), compacted to a minimum of 90% of ASTM D1557 maximum density at a minimum of 4% above optimum moisture.

Imported granular material is acceptable for backfill of utility trenches. Granular trench backfill used in building pad areas should be plugged with a solid (no clods or voids) 2-foot width of native clay soils at each end of the building foundation to prevent landscape water migration into the trench below the building.

Backfill soil of utility trenches within paved areas should be uniformly moisture conditioned to a minimum of 4% above optimum moisture, placed in layers not more than 6 inches in thickness and mechanically compacted to a minimum of 90% of the ASTM D1557 maximum dry density, except that the top 12 inches shall be compacted to 95% (if granular trench backfill).

4.8 Seismic Design

This site is located in the seismically active southern California area and the site structures are subject to strong ground shaking due to potential fault movements along the Brawley, Superstition Hills, and Imperial faults. Engineered design and earthquake-resistant construction are the common solutions to increase safety and development of seismic areas. Designs should comply with the latest edition of the CBC for Site Class D using the seismic coefficients given in Section 3.6 and Table 2 of this report.

4.9 Pavements

Pavements should be designed according to the 2020 Caltrans Highway Design Manual or other acceptable methods. Traffic indices were not provided by the project engineer or owner; therefore, we have provided structural sections for several traffic indices for comparative evaluation. The public agency or design engineer should decide the appropriate traffic index for the site. Maintenance of proper drainage is necessary to prolong the service life of the pavements.

Based on the current Caltrans method, an R-value of 5 for the subgrade soil and assumed traffic indices, the following table provides our estimates for asphaltic concrete (AC) and Portland Cement Concrete (PCC) pavement sections.

Pavement Structural Sections

R-Value of Subgrade Soil - 5 (estimated) Design Method - Caltrans 2020

Traffic Index	Flexible Pavements		Rigid (PCC) Pavements	
	Asphaltic Concrete Thickness (in.)	Aggregate Base Thickness (in.)	Concrete Thickness (in.)	Aggregate Base Thickness (in.)
4.0	3.0	6.5	5.0	6.0
5.0	3.0	10.0	5.5	6.0
6.0	4.0	11.5	6.0	8.0
6.5	4.0	14.0	7.0	8.0

Notes:

1) Asphaltic concrete shall be Caltrans, Type A HMA (Hot Mix Asphalt), ¾ inch maximum (½ inch maximum for parking areas), with PG70-10 asphalt concrete, compacted to a minimum of 95% of the Hveem density (CAL 308) or a minimum of 92% of the Maximum Theoretical Density (ASTM D2041).
2) Aggregate base shall conform to Caltrans Class 2 (¾ in. maximum), compacted to a minimum of 95% of ASTM D1557 maximum dry density.
3) Place pavements on 12 inches of moisture conditioned (minimum 4% above optimum if clays) native clay soil compacted to a minimum of 90% (95% if sand subgrade) of the maximum dry density determined by ASTM D1557. Prewetting of subgrade soils (to 3.5 feet) may be required depending on moisture of subgrade at time of aggregate base placement.
4) Portland cement concrete for pavements should have Type V cement, a minimum compressive strength of 4,500 psi at 28 days, and a maximum water-cement ratio of 0.45.
5) Typical Street Classifications (Imperial County).
   - Parking Areas: TI = 4.0
   - Cul-de-Sacs: TI = 5.0
   - Local Streets: TI = 6.0
   - Minor Collectors: TI = 6.5 (trash truck areas)

Section 5
LIMITATIONS AND ADDITIONAL SERVICES

5.1 Limitations

The findings and professional opinions within this report are based on current information regarding the proposed Wake Avenue Apartments located at the northeast corner of Spears Avenue and 6th Street in southern El Centro, California. The conclusions and professional opinions of this report are invalid if:

- Structural loads change from those stated or the structures are relocated.
- The Additional Services section of this report is not followed.
- This report is used for adjacent or other property.
- Changes of grade or groundwater occur between the issuance of this report and construction other than those anticipated in this report.
- Any other change that materially alters the project from that proposed at the time this report was prepared.

This report was prepared according to the generally accepted *geotechnical engineering standards of practice* that existed in Imperial County at the time the report was prepared. No express or implied warranties are made in connection with our services.

Findings and professional opinions in this report are based on selected points of field exploration, geologic literature, limited laboratory testing, and our understanding of the proposed project. Our analysis of data and professional opinions presented herein are based on the assumption that soil conditions do not vary significantly from those found at specific exploratory locations. Variations in soil conditions can exist between and beyond the exploration points or groundwater elevations may change. The nature and extend of such variations may not become evident until, during or after construction. If variations are detected, we should immediately be notified as these conditions may require additional studies, consultation, and possible design revisions.

Environmental or hazardous materials evaluations were not performed by Landmark for this project. Landmark will assume no responsibility or liability whatsoever for any claim, damage, or injury which results from pre-existing hazardous materials being encountered or present on the project site, or from the discovery of such hazardous materials.

The client has responsibility to see that all parties to the project including designer, contractor, and subcontractor are made aware of this entire report within a reasonable time from its issuance. This report should be considered invalid for periods after two years from the date of report issuance without a review of the validity of the findings and professional opinions by our firm, because of potential changes in the Geotechnical Engineering Standards of Practice. This report is based upon government regulations in effect at the time of preparation of this report. Future changes or modifications to these regulations may require modification of this report. Land or facility use, on and off-site conditions, regulations, design criteria, procedures, or other factors may change over time, which may require additional work. Any party other than the client who wishes to use this report shall notify Landmark of such intended use. Based on the intended use of the report, Landmark may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Landmark from any liability resulting from the use of this report by any unauthorized party and client agrees to defend, indemnify, and hold Landmark harmless from any claim or liability associated with such unauthorized use or non-compliance.

This report contains information that may be useful in the preparation of contract specifications. However, the report is not worded is such a manner that we recommend its use as a construction specification document without proper modification. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.

5.2 Plan Review

Landmark Consultants, Inc. should be retained during development of design and construction documents to check that the geotechnical professional opinions are appropriate for the proposed project and that the geotechnical professional opinions are properly interpreted and incorporated into the documents. Landmark should have the opportunity to review the final design plans and specifications for the project prior to the issuance of such for bidding.

Governmental agencies may require review of the plans by the geotechnical engineer of record for compliance to the geotechnical report.

5.3 Additional Services

We recommend that Landmark Consultant be retained to provide the tests and observations services during construction. *The geotechnical engineering firm providing such tests and observations shall become the geotechnical engineer of record and assume responsibility for the project.*

Landmark Consultants, Inc. professional opinions for this site are, to a high degree, dependent upon appropriate quality control of subgrade preparation, fill placement, and foundation construction. Accordingly, the findings and professional opinions in this report are made contingent upon the opportunity for Landmark Consultants to observe grading operations and foundation excavations for the proposed construction.

If parties other than Landmark Consultants, Inc. are engaged to provide observation and testing services during construction, such parties must be notified that they will be required to assume complete responsibility as the geotechnical engineer of record for the geotechnical phase of the project by concurring with the professional opinions in this report and/or by providing alternative professional guidance.

Additional information concerning the scope and cost of these services can be obtained from our office.

Section 6
REFERENCES

American Concrete Institute (ACI), 2015, ACI Manual of Concrete Practice 302.1R-15.

American Concrete Institute (ACI), 2019, ACI Manual of Concrete Practice 318-19.

American Society of Civil Engineers (ASCE), 2016, Minimum Design Loads for Buildings and Other Structures: ASCE Standard 7-16.

Boulanger, R. W., and Idriss, I. M., 2014, CPT and SPT Based Liquefaction Triggering Procedures, Report UCD/CGM-14/01, Department of Civil and Environmental Engineering, University of California, Davis, CA, 138 p.

Bryant, W. A. and Hart, E. W., 2007, Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zone Maps: California Geologic Survey, Special Publication 42, 42 p.

California Building Standards Commission, 2021, 2019 California Building Code. California Code of Regulations, Title 24, Part 2, Vol. 2 of 2.

Caltrans, 2020, Highway Design Manual.

California Division of Mines and Geology (CDMG), 1996, California Fault Parameters: available at http://www.consrv.ca.gov/dmg/shezp/fltindex.html.

California Geological Survey (CGS), 2008, Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117A, 98p.

California Geological Survey (CGS), 2022a, Fault Activity Map of California https://maps.conservation.ca.gov/cgs/fam/.

California Geological Survey (CGS), 2022b, Alquist-Priolo Earthquake Fault Zone Maps. http://maps.conservation.ca.gov/cgs/informationwarehouse/index.html?map=regulatorymaps

Geologismiki, 2017, CLiq Computer Program, www.geologismiki.gr

Federal Emergency Management Agency (FEMA), 2008, Flood Insurance Rate Map (FIRM), Imperial County, California and Incorporated Areas. Dated September 26, 2008.

Idriss, I. M. and Boulanger, R. W., 2008, Soil liquefaction during earthquakes. Monograph MNO-12. Earthquake Engineering Research Institute, Oakland, CA. 261 p.

Ishihara, K. (1985), Stability of natural deposits during earthquakes, Proc. 11th Int. Conf. On Soil Mech. And Found. Engrg., Vol. 1, A. A. Balkema, Rotterdam, The Netherlands, 321-376.

Jenkins, O. P., 1962, Geologic Map of California, San Diego – El Centro Sheet, 1:250,000 scale, California Division of Mines and Geology.

Jennings, C. W., 1994, Fault Activity Map of California and Adjacent Areas: California Division of Mines and Geology, DMG Geologic Map No. 6.

Jones, A. L., 2003, An Analytical Model and Application for Ground Surface Effects from Liquefaction, PhD. Dissertation, University of Washington, 362 p.

Martin, G. R. and Lew, M., 1999, Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction Hazards in California. 63 p.

McCrink, T. P., Pridmore, C. L., Tinsley, J. C., Sickler, R. R., Brandenberg, S. J., and Stewart, J. P., 2011, Liquefaction and Other Ground Failures in Imperial County, California, from the April 4, 2010, El Mayor—Cucapah Earthquake, CGS Special Report 220, USGS Open File Report 2011-1071, 84 p.

Morton, P. K., 1977, Geology and mineral resources of Imperial County, California: California Division of Mines and Geology, County Report No. 7, 104 p.

National Center for Earthquake Engineering Research (NCEER), 1997, Proceedings of the NCEER Workshop on Liquefaction Resistance of Soils. Salt Lake City, Utah, NCEER Technical Report NCEER-97-0022.

Norris and Webb, 1990, Geology of California, 2nd Edition, John Wiley and Sons.

Post-Tensioning Institute (PTI), 2007a, Standard Requirements for Analysis of Shallow Concrete Foundations on Expansive Soils (3rd Edition).

Post-Tensioning Institute (PTI), 2007b, Standard Requirements for Design of Shallow Post-Tensioned Concrete Foundations on Expansive Soils (2nd Edition).

Robertson, P. K., 2014, Seismic liquefaction CPT-based methods: EERI 1st Workshop on Geotechnical Earthquake Engineering – Liquefaction Evaluation, Mapping, Simulation and Mitigation. UC San Diego Campus, 10/12/2014.

Rymer, M.J., Treiman, J.A., Kendrick, K.J., Lienkaemper, J.J., Weldon, R.J., Bilham, R., Wei, M., Fielding, E.J., Hernandez, J.L., Olson, B.P.E., Irvine, P.J., Knepprath, N., Sickler, R.R., Tong, .X., and Siem, M.E., 2011, Triggered surface slips in southern California associated with the 2010 El Mayor-Cucapah, Baja California, Mexico, earthquake: U.S. Geological Survey Open-File Report 2010-1333 and California Geological Survey Special Report 221, 62 p., available at http://pubs.usgs.gov/of/2010/1333/

Structural Engineers Association of California (SEAOC), 2022, Seismic Design Maps Web Application, available at https://seismicmaps.org/

Tokimatsu, K., and Seed, H. B., 1987, "Evaluation of settlements in sands due to earthquake shaking," J. Geotechnical Eng., ASCE 113(GT8), 861–78.

U.S. Geological Survey (USGS), 1990, The San Andreas Fault System, California, Professional Paper 1515.

USDA Natural Resources Conservation Service, 2021, Web Soil Survey Website. https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Wallace, R.E., 1990, The San Andreas Fault System, California, U.S. Geological Survey Professional Paper 1515, 283p.

Wire Reinforcement Institute (WRI/CRSI), 2003, Design of Slab-on-Ground Foundations, Tech Facts TF 700-R-03, 23 p.

Wright, H. M., J. A. Vazquez, D. E. Champion, A. T. Calvert, M. T. Mangan, M. Stelten, K. M. Cooper, C. Herzig, and A. Schriener Jr.,2015, Episodic Holocene eruption of the Salton Buttes rhyolites, California, from paleomagnetic, U-Th, and Ar/Ar dating, Geochem. Geophys. Geosyst., 16, 1198–1210, doi:10.1002/2015GC005714.

Youd, T. L., 2005, Liquefaction-induced flow, lateral spread, and ground oscillation, GSA Abstracts with Programs, Vol. 37, No. 7, p. 252.

Youd, T. L. and Garris, C. T., 1995, Liquefaction induced ground surface disruption: ASCE Geotechnical Journal, Vol. 121, No. 11.

Youd, T. L. and Wieczorek, G. F., 1982, Liquefaction and secondary ground failure, *in* The Imperial Valley California Earthquake of October 15, 1979: USGS Professional Paper 1254, p. 223-246.

Youd, T. L., Idriss, I. M., Andrus, R. D., Arango, I., Castro, G., Christian, J. T., Dobry, R., Liam Finn,W. D., Harder, L. F., Jr., Hynes, M. E., Ishihara, K., Koester, J. P., Laio, S. S. C., Marcuson, III,W. F., Martin, G. R., Mitchell, J. K., Moriwaki, Y., Power, M. S., Robertson, P. K., Seed, R. B., Stokoe, II, K. H., 2001, "Liquefaction resistance of soils: Summary report from the 1996 NCEER and 1998 NCEER/NSF workshops on evaluation of liquefaction resistance of soils," Journal Geotechnical and Geoenvironmental Engineering, Volume 127 No. 10 pp. 817–833.

TABLES

Table 1
Summary of Characteristics of Closest Known Active Faults

Fault Name	Approximate Distance (miles)	Approximate Distance (km)	Maximum Moment Magnitude (Mw)	Fault Length (km)	Slip Rate (mm/yr)
Superstition Hills	4.6	7.4	6.6	23 ± 2	4 ± 2
Imperial	5.4	8.6	7	62 ± 6	20 ± 5
Brawley *	6.3	10.0			
Rico *	9.2	14.7			
Unnamed 2*	9.4	15.1			
Superstition Mountain	11.0	17.7	6.6	24 ± 2	5 ± 3
Unnamed 1*	11.2	18.0			
Yuha*	12.9	20.7			
Borrego (Mexico)*	15.9	25.5			
Shell Beds	16.1	25.7			
Yuha Well *	16.4	26.3			
Laguna Salada	17.0	27.1	7	67 ± 7	3.5 ± 1.5
Cerro Prieto *	19.2	30.7			
Vista de Anza*	19.8	31.6			
Pescadores (Mexico)*	21.0	33.6			
Painted Gorge Wash*	21.7	34.7			
Cucapah (Mexico)*	22.3	35.7			
Ocotillo*	24.1	38.6			
Elmore Ranch	24.7	39.6	6.6	29 ± 3	1 ± 0.5
Elsinore - Coyote Mountain	27.7	44.3	6.8	39 ± 4	4 ± 2
San Jacinto - Borrego	30.5	48.8	6.6	29 ± 3	4 ± 2
Algodones *	35.9	57.5			

* Note: Faults not included in CGS database.

Table 2
2019 California Building Code (CBC) and ASCE 7-16 Seismic Parameters

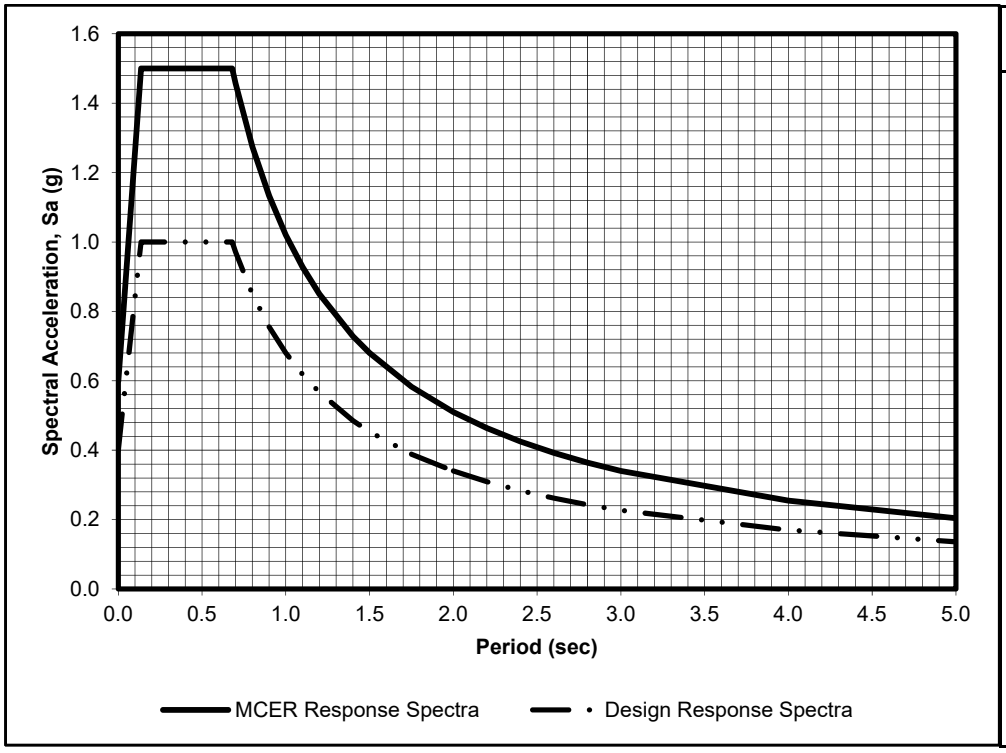
		ASCE 7-16 Reference
Soil Site Class:	**D**	Table 20.3-1
Latitude:	32.7697 N	
Longitude:	-115.5550 W	
Risk Category:	II	
Seismic Design Category:	D	

Maximum Considered Earthquake (MCE) Ground Motion

Mapped MCE_R Short Period Spectral Response	S_s	1.500 g	ASCE Figure 22-1	
Mapped MCE_R 1 second Spectral Response	S_1	0.600 g	ASCE Figure 22-2	
Short Period (0.2 s) Site Coefficient	F_a	1.00	ASCE Table 11.4-1	
Long Period (1.0 s) Site Coefficient	F_v	1.70	ASCE Table 11.4-2	
MCE_R Spectral Response Acceleration Parameter (0.2 s)	S_{MS}	1.500 g	= Fa * S_s	ASCE Equation 11.4-1
MCE_R Spectral Response Acceleration Parameter (1.0 s)	S_{M1}	1.020 g	= Fv * S_1	ASCE Equation 11.4-2

Design Earthquake Ground Motion

Design Spectral Response Acceleration Parameter (0.2 s)	S_{DS}	1.000 g	= 2/3*S_{MS}	ASCE Equation 11.4-3
Design Spectral Response Acceleration Parameter (1.0 s)	S_{D1}	0.680 g	= 2/3*S_{M1}	ASCE Equation 11.4-4
Risk Coefficient at Short Periods (less than 0.2 s)	C_{RS}	0.959		ASCE Figure 22-17
Risk Coefficient at Long Periods (greater than 1.0 s)	C_{R1}	0.931		ASCE Figure 22-18
	T_L	8.00 sec		ASCE Figure 22-12
	T_O	0.14 sec	=0.2*S_{D1}/S_{DS}	
	T_S	0.68 sec	=S_{D1}/S_{DS}	
Peak Ground Acceleration	PGA_M	0.59 g		ASCE Equation 11.8-1



Period T (sec)	Sa (g)	MCE_R Sa (g)
0.00	0.40	0.60
0.14	1.00	1.50
0.68	1.00	1.50
0.70	0.97	1.46
0.80	0.85	1.28
0.90	0.76	1.13
1.00	0.68	1.02
1.10	0.62	0.93
1.20	0.57	0.85
1.20	0.57	0.85
1.40	0.49	0.73
1.50	0.45	0.68
1.75	0.39	0.58
2.00	0.34	0.51
2.20	0.31	0.46
2.40	0.28	0.43
2.60	0.26	0.39
2.80	0.24	0.36
3.00	0.23	0.34
4.00	0.17	0.26
5.00	0.14	0.20

FIGURES

Source: California Geological Survey 2010 Fault Activity Map of California
http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html#

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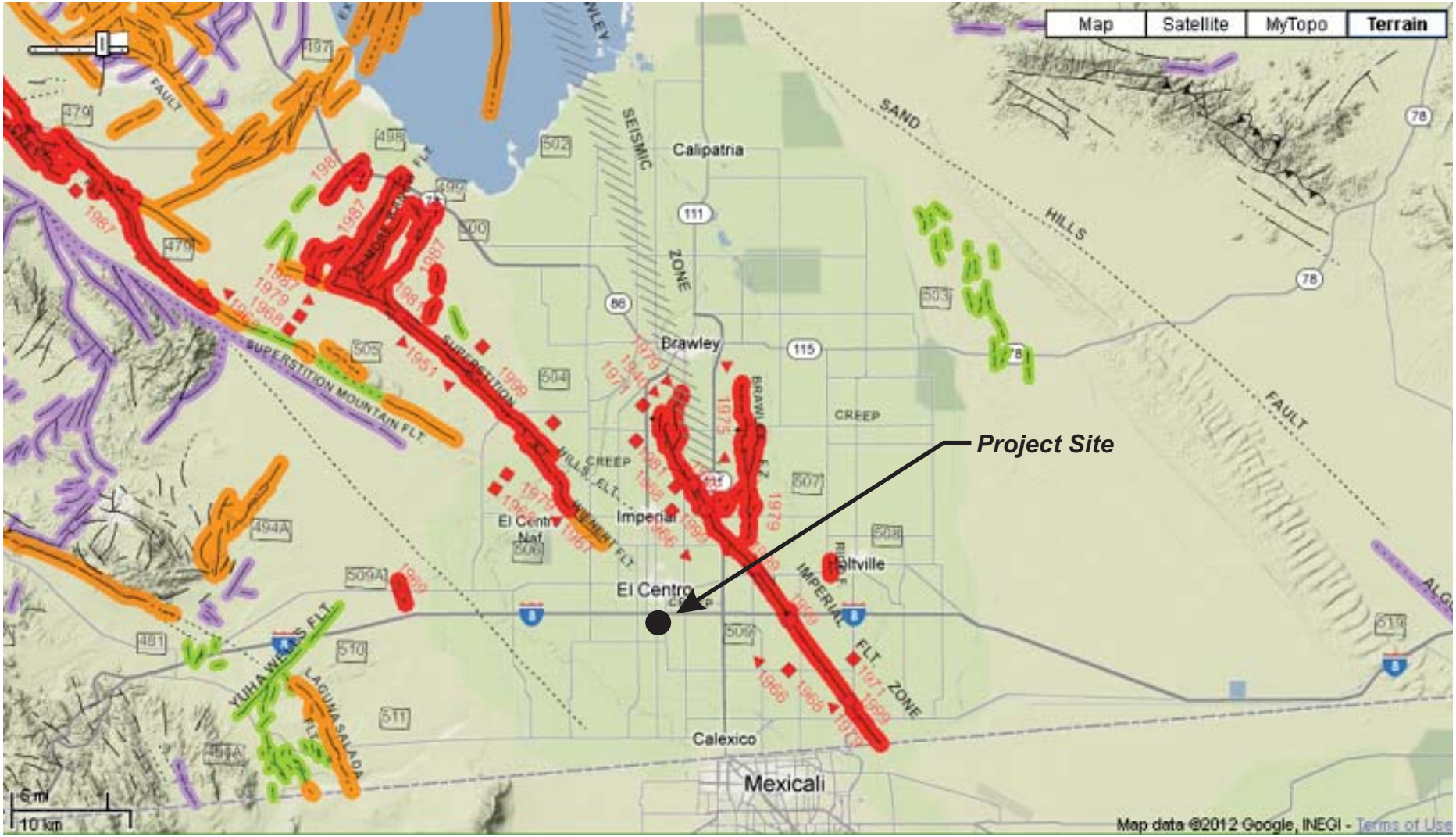
Regional Fault Map

Figure 1



Source: California Geological Survey 2010 Fault Activity Map of California
http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html#

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Map of Local Faults

Figure 2

EXPLANATION

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain. Concealed faults in the Great Valley are based on maps of selected subsurface horizons, so locations shown are approximate and may indicate structural trend only. All offshore faults based on seismic reflection profile records are shown as solid lines where well defined, dashed where inferred, queried where uncertain.

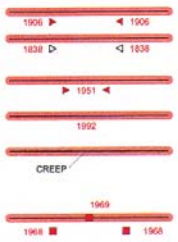
FAULT CLASSIFICATION COLOR CODE
(Indicating Recency of Movement)

Fault along which historic (last 200 years) displacement has occurred and is associated with one or more of the following:

(a) a recorded earthquake with surface rupture. (Also included are some well-defined surface breaks caused by ground shaking during earthquakes, e.g. extensive ground breakage, not on the White Wolf fault, caused by the Arvin-Tehachapi earthquake of 1952). The date of the associated earthquake is indicated. Where repeated surface ruptures on the same fault have occurred, only the date of the latest movement may be indicated, especially if earlier reports are not well documented as to location of ground breaks.

(b) fault creep slippage - slow ground displacement usually without accompanying earthquakes.

(c) displaced survey lines.



A triangle to the right or left of the date indicates termination point of observed surface displacement. Solid red triangle indicates known location of rupture termination point. Open black triangle indicates uncertain or estimated location of rupture termination point.

Date bracketed by triangles indicates local fault break.

No triangle by date indicates an intermediate point along fault break.

Fault that exhibits fault creep slippage. Hachures indicate linear extent of fault creep. Annotation (creep with leader) indicates representative locations where fault creep has been observed and recorded.

Square on fault indicates where fault creep slippage has occured that has been triggered by an earthquake on some other fault. Date of causative earthquake indicated. Squares to right and left of date indicate terminal points between which triggered creep slippage has occurred (creep either continuous or intermittent between these end points).

Holocene fault displacement (during past 11,700 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting.

Late Quaternary fault displacement (during past 700,000 years). Geomorphic evidence similar to that described for Holocene faults except features are less distinct. Faulting may be younger, but lack of younger overlying deposits precludes more accurate age classification.

Quaternary fault (age undifferentiated). Most faults of this category show evidence of displacement sometime during the past 1.6 million years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. Unnumbered Quaternary faults were based on Fault Map of California, 1975. See Bulletin 201, Appendix D for source data.

Pre-Quaternary fault (older that 1.6 million years) or fault without recognized Quaternary displacement. Some faults are shown in this category because the source of mapping used was of reconnaissnce nature, or was not done with the object of dating fault displacements. Faults in this category are not necessarily inactive.

ADDITIONAL FAULT SYMBOLS

Bar and ball on downthrown side (relative or apparent).

Arrows along fault indicate relative or apparent direction of lateral movement.

Arrow on fault indicates direction of dip.

Low angle fault (barbs on upper plate). Fault surface generally dips less than 45° but locally may have been subsequently steepened. On offshore faults, barbs simply indicate a reverse fault regardless of steepness of dip.

OTHER SYMBOLS

Numbers refer to annotations listed in the appendices of the accompanying report. Annotations include fault name, age of fault displacement, and pertinent references including Earthquake Fault Zone maps where a fault has been zoned by the Alquist-Priolo Earthquake Fault Zoning Act. This Act requires the State Geologist to delineate zones to encompass faults with Holocene displacement.

Structural discontinuity (offshore) separating differing Neogene structural domains. May indicate discontinuities between basement rocks.

Brawley Seismic Zone, a linear zone of seismicity locally up to 10 km wide associated with the releasing step between the Imperial and San Andreas faults.

Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION	
						ON LAND	OFFSHORE
Quaternary	Late Quaternary	Historic				Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene	200			Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
		Pleistocene	11,700			Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
	Early Quaternary		700,000			Undivided Quaternary faults - most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary			1,600,000*			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.
			4.5 billion (Age of Earth)				

* Quaternary now recognized as extending to 2.6 Ma (Walker and Geissman, 2009). Quaternary faults in this map were established using the previous 1.6 Ma criterion.

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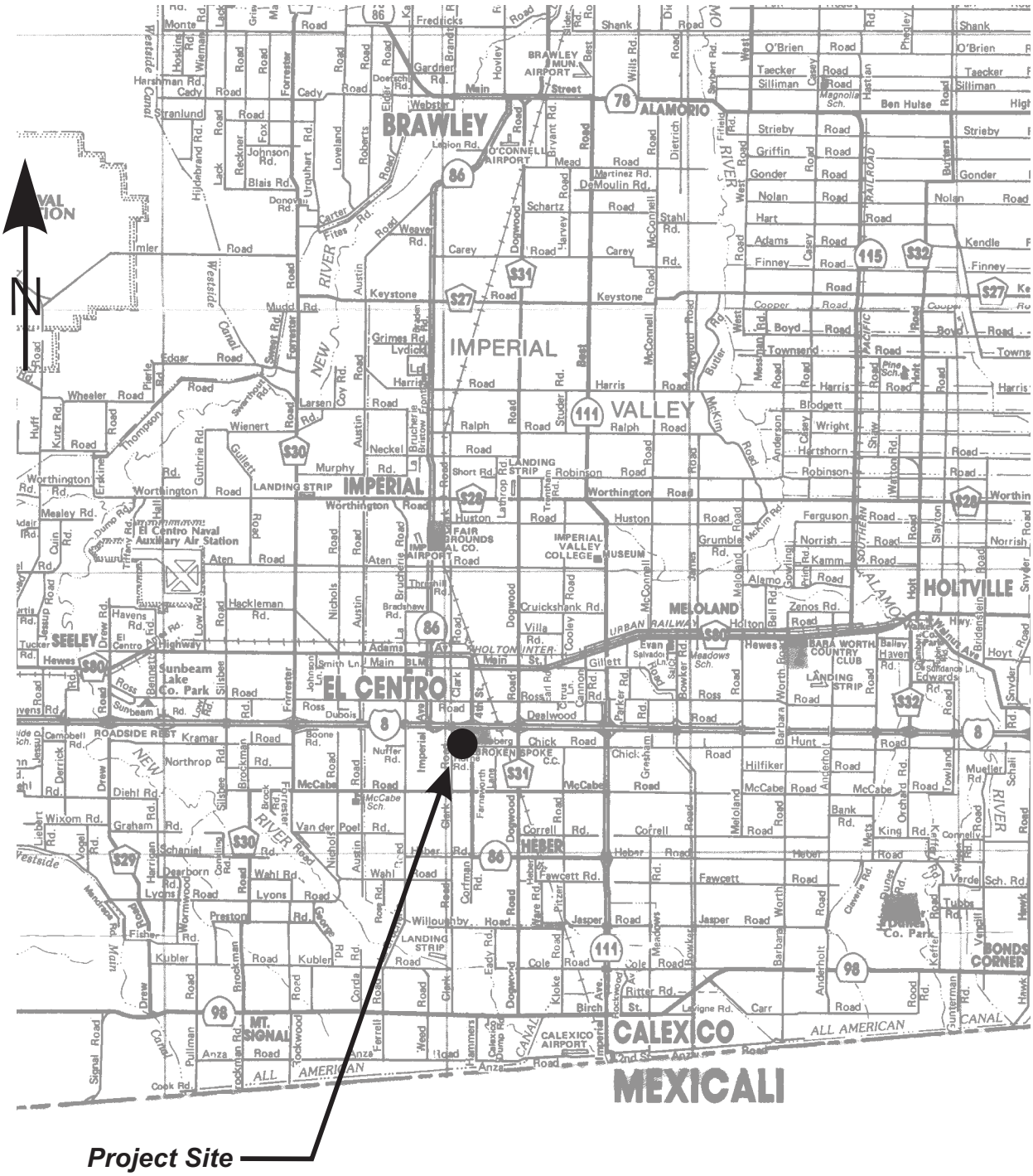
Fault Map Legend

Figure 3

APPENDIX A



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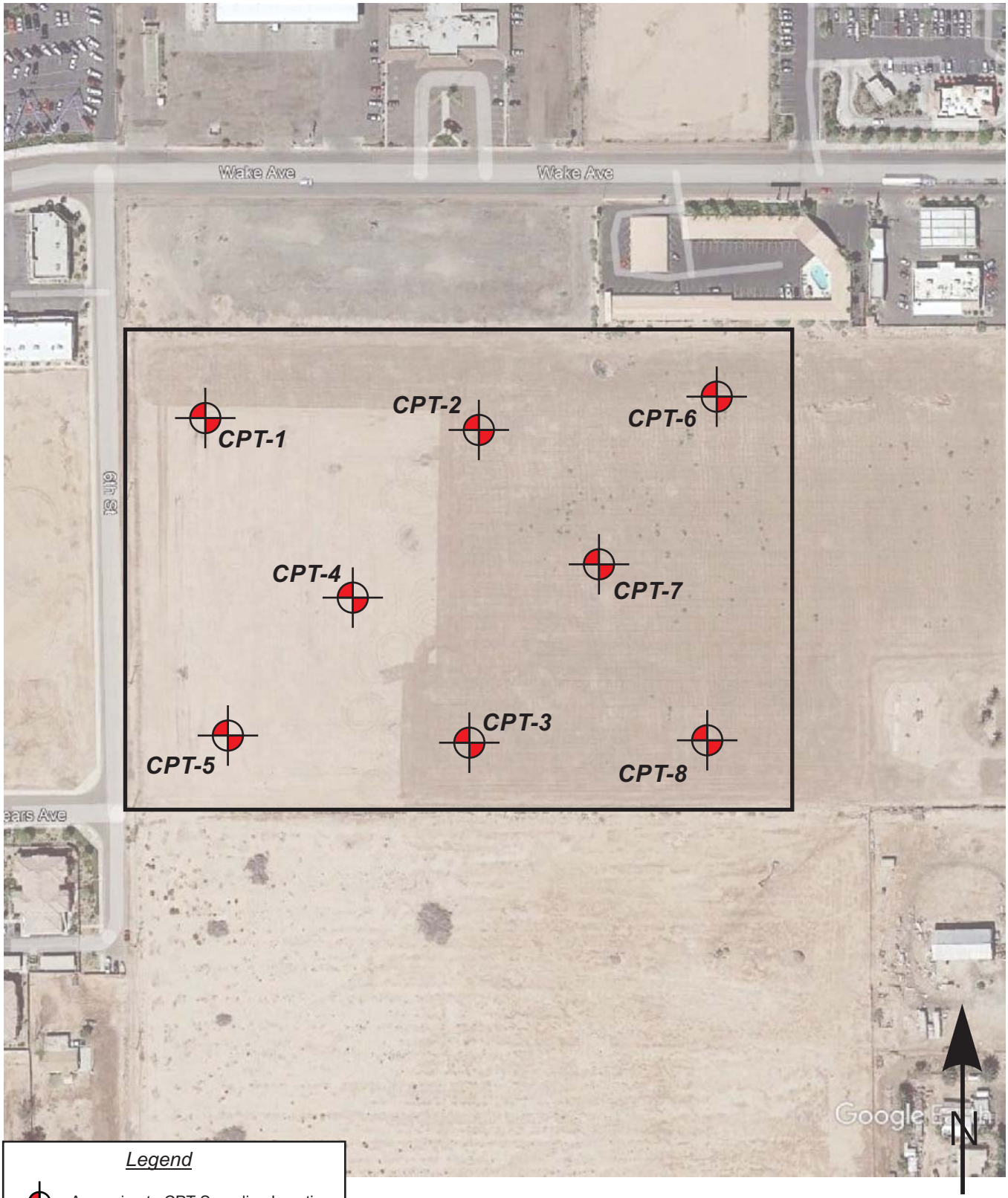
Vicinity Map

Plate A-1



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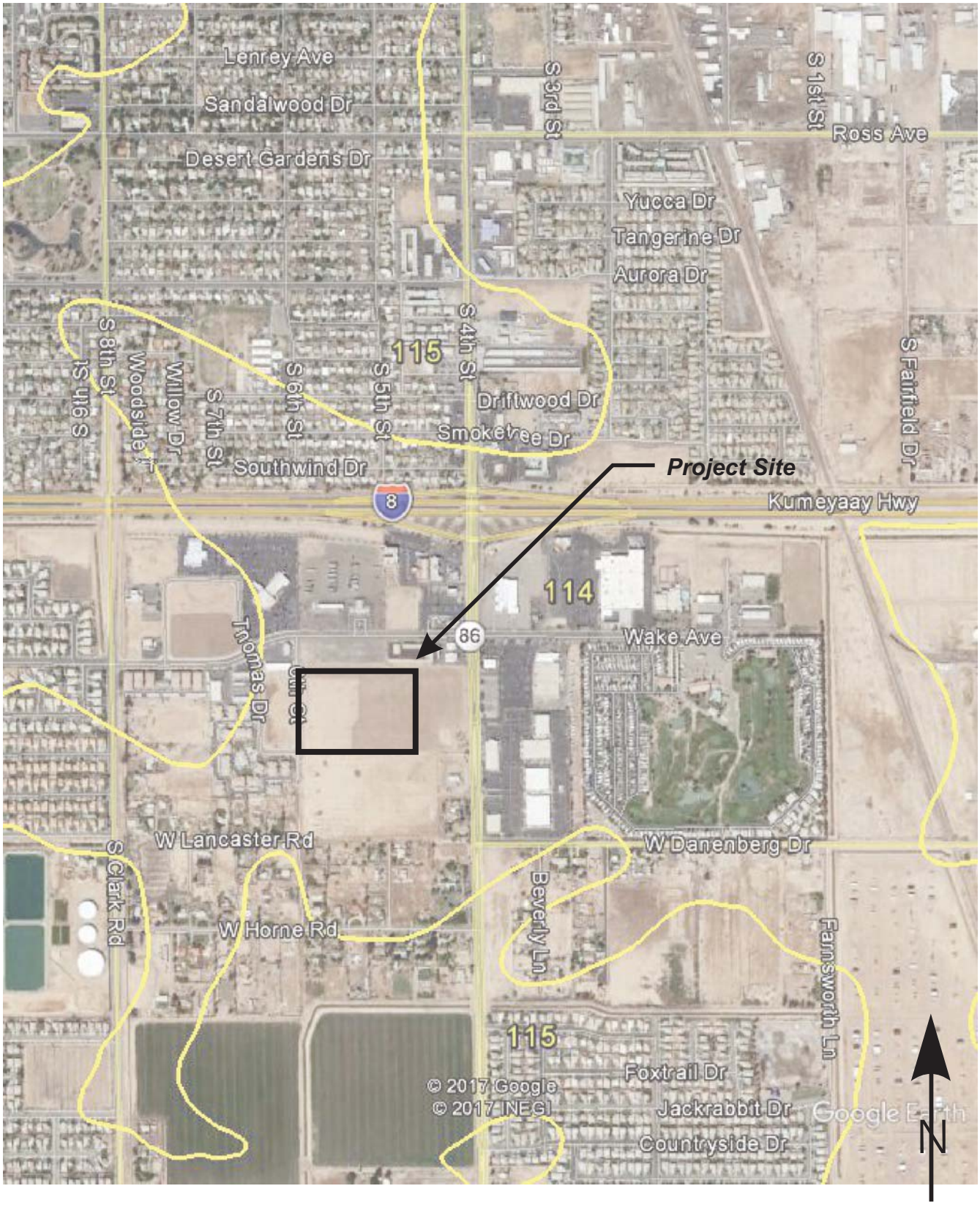
Site and Exploration Map

Plate
A-2



LANDMARK Geo-Engineers and Geologists Project No.: LE21248	Soil Survey Map	Plate A-3

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Imperial County, California, Imperial Valley Area
Survey Area Data: Version 13, Sep 15, 2021

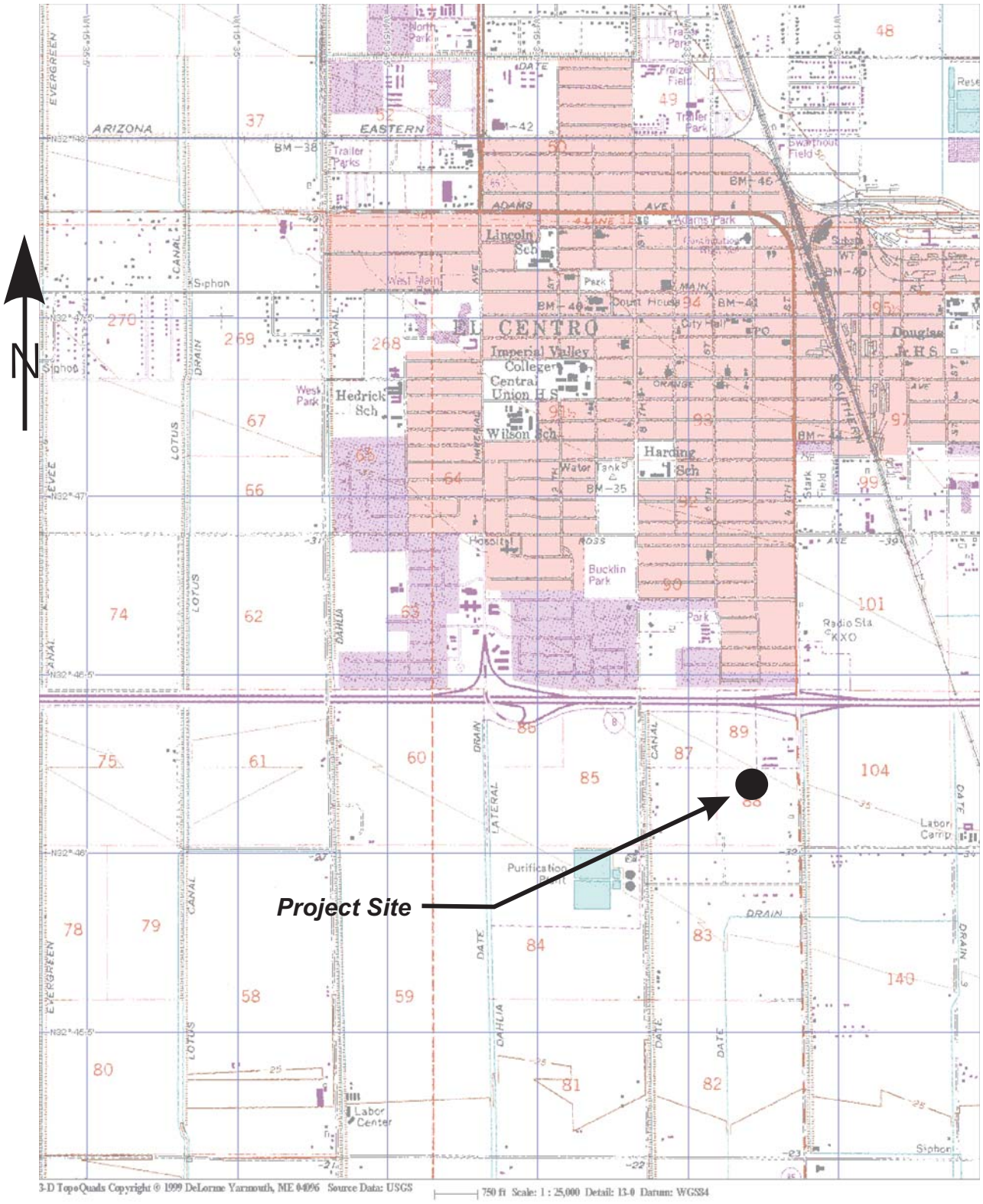
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 15, 2016—Oct 23, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
114	Imperial silty clay, wet	67.0	99.9%
115	Imperial-Glenbar silty clay loams, wet, 0 to 2 percent slopes	0.0	0.1%
Totals for Area of Interest		**67.1**	**100.0%**



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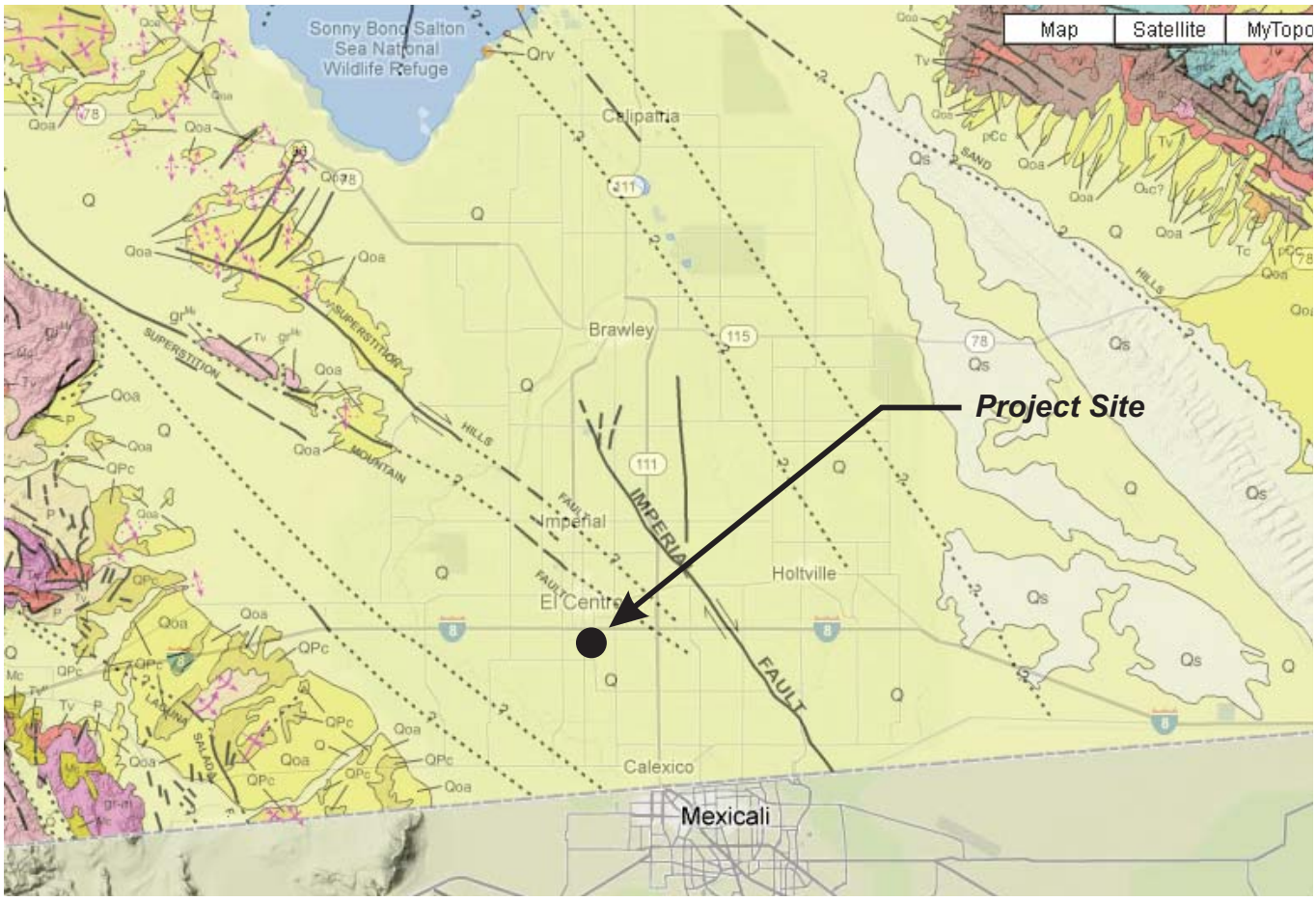
Topographic Map

Plate A-4



GEOLOGIC LEGEND

Quaternary Deposits
- Qs
- Q
- Qls
- Qg
- Qoa
- QPc

Quaternary Volcanic Rocks
- Qrv, Qrv^{p}
- Qv, Qv^{p}

Tertiary Sedimentary Rocks
- Tc
- P
- M, Mc
- Os, Osc
- E, Ec
- Ep

Tertiary Volcanic Rocks
- Tv, Tv^{p}
- Ti

Tertiary Plutonic Rocks
- gr^{Ox}

Mesozoic Sedimentary and Metasedimentary Rocks
- TK
- K
- Ku
- Kl
- KJf, KJf$_m$, KJf$_s$
- J
- Tr
- sch
- ls

Mesozoic Mixed Rocks
- gr-m

Mesozoic Metavolcanic Rocks
- Mzv
- mv

Mesozoic Plutonic Rocks
- gr^{Mz}
- um
- gb
- gr

Paleozoic Sedimentary and Metasedimentary Rocks
- Pz
- Pm
- C
- D
- SO
- €

Paleozoic Mixed Rocks
- m

Paleozoic Metavolcanic Rocks
- Pzv

Paleozoic Plutonic Rocks
- gr^{Pz}

Pre-Cambrian Rocks
- pC
- pCc
- gr^{pC}

SYMBOLS

Geologic boundary

Fault traces - solid where well located, dashed where approximately located or inferred, dotted where concealed, and queried where continuation or existence is uncertain. Ball and bar on downthrown side (relative or apparent). Arrows indicate direction of lateral movement (relative or apparent).

Thrust fault (barbs on upper plate).

Regional strike and dip of stratified rocks.

Regional strike and dip of stratified rocks (overturned).

Anticlinal fold.

Synclinal fold.

Monoclinal fold.

N

Site Location
Lat N 32.7697 Long: W -115.5550

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Regional Geologic Map

Plate A-5

APPENDIX B

CLIENT: Chelsea Investment Corp.
PROJECT: Wake Avenue Apartments - El Centro, CA

CONE PENETROMETER: Kehoe Testing & Engineering Truck Mounted Electric Cone with 30 ton reaction weight

LOCATION: See Site and Boring Location Plan

DATE: 1/11/2022

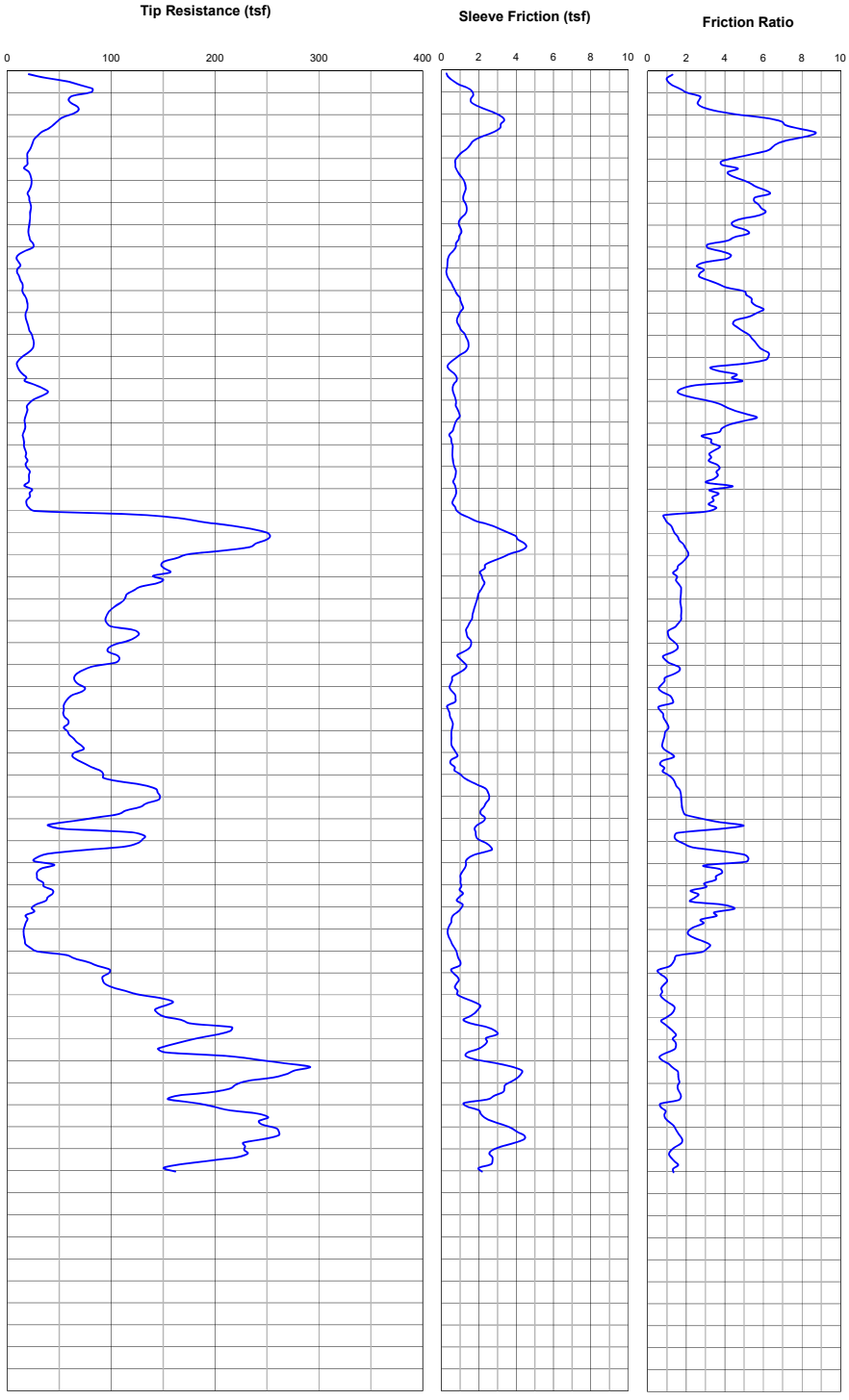
CONE SOUNDING DATA CPT-1

INTERPRETED SOIL PROFILE
From Robertson and Campanella (1989

GROUND ELEVATION +/-

DEPTH			
	Silty Sand to Sandy Silt	SM/ML	very dense
	Sandy Silt to Clayey Silt	ML	very dense
	Clay	CL/CH	hard
	Clay	" "	very stiff
5	Silty Clay to Clay	CL	very stiff
	Clay	CL/CH	very stiff
	Clay	" "	very stiff
	Silty Clay to Clay	CL	very stiff
	Silty Clay to Clay	" "	stiff
10	Silty Clay to Clay	" "	stiff
	Clay	CL/CH	very stiff
	Clay	" "	very stiff
	Clay	" "	very stiff
	Clay	" "	stiff
15	Sandy Silt to Clayey Silt	ML	medium dense
	Clay	CL/CH	very stiff
	Silty Clay to Clay	CL	stiff
	Clayey Silt to Silty Clay	ML/CL	very stiff
	Clayey Silt to Silty Clay	" "	very stiff
20	Clayey Silt to Silty Clay	" "	very stiff
	Sand	SP	very dense
	Sand to Silty Sand	SP/SM	very dense
	Sand to Silty Sand	" "	dense
	Sand to Silty Sand	" "	dense
25	Silty Sand to Sandy Silt	SM/ML	dense
	Sand to Silty Sand	SP/SM	dense
	Sand to Silty Sand	" "	dense
	Sand to Silty Sand	" "	medium dense
	Sand to Silty Sand	" "	medium dense
30	Silty Sand to Sandy Silt	SM/ML	medium dense
	Sand to Silty Sand	SP/SM	medium dense
	Sand to Silty Sand	" "	medium dense
	Sand to Silty Sand	" "	dense
	Silty Sand to Sandy Silt	SM/ML	dense
	Sandy Silt to Clayey Silt	ML	medium dense
35	Clayey Silt to Silty Clay	ML/CL	hard
	Clayey Silt to Silty Clay	" "	very stiff
	Clayey Silt to Silty Clay	" "	hard
	Clayey Silt to Silty Clay	" "	very stiff
	Clayey Silt to Silty Clay	" "	very stiff
40	Sand to Silty Sand	SP/SM	medium dense
	Sand to Silty Sand	" "	medium dense
	Sand to Silty Sand	" "	dense
	Sand	SP	dense
	Sand	" "	dense
45	Sand	" "	very dense
	Sand to Silty Sand	SP/SM	dense
	Sand	SP	very dense
	Sand to Silty Sand	SP/SM	very dense
	Sand to Silty Sand	" "	dense
50			
55			

END OF SOUNDING AT 50 ft.



Project No.		PLATE
LE21248	LANDMARK Geo-Engineers and Geologists	B-1

LANDMARK CONSULTANTS, INC.
CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989, refer to Key to CPT logs)

Project: Wake Avenue Apartments - El Centro, CA **Project No:** LE21248 **Date:** 1/11/2022

CONE SOUNDING: CPT-1
Est. GWT (ft): 8
Phi Correlation: **0** 0-Schm(78),1-R&C(83),2-PHT(74)

Base Depth (m)	Base Depth (ft)	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	SPT N(60)	Norm. Qc1n	Est. % Fines	Rel. Dens. Dr (%)	**Nk:** Phi (deg.)	**17** Su (tsf)	OCR
0.15	0.5	38.31	1.12	Silty Sand to Sandy Silt	SM/ML	very dense	115	9	72.4	30	106	43		
0.30	1.0	77.37	1.68	Silty Sand to Sandy Silt	SM/ML	very dense	115	17	146.3	25	110	43		
0.45	1.5	61.00	2.66	Sandy Silt to Clayey Silt	ML	very dense	115	17	115.3	40	96	41		
0.60	2.0	66.18	3.64	Clayey Silt to Silty Clay	ML/CL	hard	120	26		45			3.89	>10
0.75	2.5	48.55	6.74	Clay	CL/CH	hard	125	39		70			2.85	>10
0.93	3.0	34.10	8.30	Clay	CL/CH	very stiff	125	27		85			2.00	>10
1.08	3.5	24.45	6.88	Clay	CL/CH	very stiff	125	20		90			1.43	>10
1.23	4.0	19.92	5.42	Clay	CL/CH	very stiff	125	16		85			1.16	>10
1.38	4.5	18.16	4.12	Silty Clay to Clay	CL	very stiff	125	10		80			1.05	>10
1.53	5.0	21.90	4.44	Silty Clay to Clay	CL	very stiff	125	13		80			1.27	>10
1.68	5.5	21.66	5.83	Clay	CL/CH	very stiff	125	17		85			1.26	>10
1.83	6.0	21.49	5.62	Clay	CL/CH	very stiff	125	17		85			1.24	>10
1.98	6.5	22.22	5.92	Clay	CL/CH	very stiff	125	18		85			1.28	>10
2.13	7.0	21.37	4.56	Clay	CL/CH	very stiff	125	17		80			1.23	>10
2.28	7.5	20.58	4.94	Clay	CL/CH	very stiff	125	16		85			1.18	>10
2.45	8.0	23.82	3.46	Clayey Silt to Silty Clay	ML/CL	very stiff	120	10		70			1.37	>10
2.60	8.5	12.04	4.10	Clay	CL/CH	stiff	125	10		95			0.68	>10
2.75	9.0	10.97	2.80	Silty Clay to Clay	CL	stiff	125	6		90			0.62	>10
2.90	9.5	11.06	2.86	Silty Clay to Clay	CL	stiff	125	6		90			0.62	>10
3.05	10.0	14.52	4.27	Clay	CL/CH	stiff	125	12		95			0.82	>10
3.20	10.5	17.60	5.30	Clay	CL/CH	very stiff	125	14		95			1.00	>10
3.35	11.0	18.86	5.76	Clay	CL/CH	very stiff	125	15		95			1.08	>10
3.50	11.5	18.20	4.75	Clay	CL/CH	very stiff	125	15		95			1.04	>10
3.65	12.0	21.65	4.94	Clay	CL/CH	very stiff	125	17		90			1.24	>10
3.80	12.5	25.01	5.56	Clay	CL/CH	very stiff	125	20		90			1.44	>10
3.95	13.0	20.11	6.14	Clay	CL/CH	very stiff	125	16		100			1.15	>10
4.13	13.5	10.21	4.83	Clay	CL/CH	stiff	125	8		100			0.56	5.00
4.28	14.0	14.71	4.20	Clay	CL/CH	stiff	125	12		100			0.83	9.00
4.43	14.5	25.61	3.04	Clayey Silt to Silty Clay	ML/CL	very stiff	120	10		75			1.47	>10
4.58	15.0	33.03	2.14	Sandy Silt to Clayey Silt	ML	medium dense	115	9	38.6	55	44	34		
4.73	15.5	19.86	4.05	Silty Clay to Clay	CL	very stiff	125	11		90			1.13	>10
4.88	16.0	17.25	4.96	Clay	CL/CH	stiff	125	14		100			0.97	>10
5.03	16.5	15.93	3.45	Silty Clay to Clay	CL	stiff	125	9		100			0.89	>10
5.18	17.0	15.84	3.45	Silty Clay to Clay	CL	stiff	125	9		100			0.89	>10
5.33	17.5	17.57	3.33	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		95			0.99	>10
5.48	18.0	18.57	3.50	Silty Clay to Clay	CL	very stiff	125	11		95			1.05	>10
5.65	18.5	21.07	3.54	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		90			1.19	>10
5.80	19.0	20.14	3.56	Silty Clay to Clay	CL	very stiff	125	12		95			1.14	>10
5.95	19.5	20.58	3.49	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		95			1.16	>10
6.10	20.0	21.68	3.26	Clayey Silt to Silty Clay	ML/CL	very stiff	120	9		90			1.23	>10
6.25	20.5	159.27	0.92	Sand	SP	dense	110	25	167.5	15	88	40		
6.40	21.0	233.18	1.31	Sand	SP	very dense	110	36	243.5	15	99	42		
6.55	21.5	247.14	1.68	Sand to Silty Sand	SP/SM	very dense	115	45	256.2	20	100	42		
6.70	22.0	204.77	2.04	Sand to Silty Sand	SP/SM	very dense	115	37	210.7	25	94	41		
6.85	22.5	154.24	1.79	Sand to Silty Sand	SP/SM	dense	115	28	157.6	25	86	40		
7.00	23.0	149.55	1.46	Sand to Silty Sand	SP/SM	dense	115	27	151.7	25	85	40		
7.18	23.5	140.85	1.60	Sand to Silty Sand	SP/SM	dense	115	26	141.8	25	83	40		
7.33	24.0	116.81	1.72	Silty Sand to Sandy Silt	SM/ML	dense	115	26	116.8	30	77	39		
7.48	24.5	106.00	1.72	Silty Sand to Sandy Silt	SM/ML	dense	115	24	105.3	35	74	38		
7.63	25.0	95.82	1.74	Silty Sand to Sandy Silt	SM/ML	dense	115	21	94.5	35	71	38		
7.78	25.5	105.94	1.36	Sand to Silty Sand	SP/SM	dense	115	19	103.8	30	74	38		
7.93	26.0	121.96	1.18	Sand to Silty Sand	SP/SM	dense	115	22	118.7	25	78	39		
8.08	26.5	100.79	1.29	Sand to Silty Sand	SP/SM	dense	115	18	97.5	30	72	38		
8.23	27.0	98.39	1.22	Sand to Silty Sand	SP/SM	dense	115	18	94.5	30	71	38		
8.38	27.5	68.35	1.31	Silty Sand to Sandy Silt	SM/ML	medium dense	115	15	65.2	40	60	36		
8.53	28.0	69.39	0.72	Sand to Silty Sand	SP/SM	medium dense	115	13	65.8	30	60	36		
8.68	28.5	64.23	1.07	Silty Sand to Sandy Silt	SM/ML	medium dense	115	14	60.6	40	58	36		
8.85	29.0	54.73	0.84	Sand to Silty Sand	SP/SM	medium dense	115	10	51.3	40	53	35		
9.00	29.5	55.75	0.85	Sand to Silty Sand	SP/SM	medium dense	115	10	51.9	40	53	35		
9.15	30.0	56.85	1.01	Silty Sand to Sandy Silt	SM/ML	medium dense	115	13	52.6	40	54	35		
9.30	30.5	63.29	0.83	Sand to Silty Sand	SP/SM	medium dense	115	12	58.2	35	57	36		
9.45	31.0	69.61	0.95	Sand to Silty Sand	SP/SM	medium dense	115	13	63.7	35	59	36		
9.60	31.5	68.23	0.92	Sand to Silty Sand	SP/SM	medium dense	115	12	62.1	35	58	36		
9.75	32.0	87.87	0.91	Sand to Silty Sand	SP/SM	medium dense	115	16	79.5	30	66	37		
9.90	32.5	111.60	1.40	Sand to Silty Sand	SP/SM	dense	115	20	100.4	30	73	38		
10.05	33.0	144.88	1.70	Sand to Silty Sand	SP/SM	dense	115	26	129.6	30	80	39		
10.20	33.5	135.73	1.76	Silty Sand to Sandy Silt	SM/ML	dense	115	30	120.7	35	78	39		
10.38	34.0	101.60	2.19	Silty Sand to Sandy Silt	SM/ML	medium dense	115	23	89.9	45	69	38		
10.53	34.5	50.16	4.05	Clayey Silt to Silty Clay	ML/CL	hard	120	20		80			2.88	>10
10.68	35.0	127.18	1.48	Sand to Silty Sand	SP/SM	dense	115	23	111.2	30	76	39		
10.83	35.5	103.11	2.66	Sandy Silt to Clayey Silt	ML	medium dense	115	29	89.7	50	69	38		
10.98	36.0	30.83	5.11	Clay	CL/CH	very stiff	125	25		100			1.74	>10
11.13	36.5	33.89	3.51	Clayey Silt to Silty Clay	ML/CL	very stiff	120	14		90			1.92	>10
11.28	37.0	32.90	3.16	Clayey Silt to Silty Clay	ML/CL	very stiff	120	13		90			1.86	>10
11.43	37.5	41.92	2.43	Sandy Silt to Clayey Silt	ML	medium dense	115	12	35.7	75	42	34		
11.58	38.0	29.35	3.59	Clayey Silt to Silty Clay	ML/CL	very stiff	120	12		100			1.65	>10
11.73	38.5	20.96	3.26	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		100			1.15	9.00

LANDMARK CONSULTANTS, INC.
CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989, refer to Key to CPT logs)

Project: Wake Avenue Apartments - El Centro, CA **Project No:** LE21248 **Date:** 1/11/2022

CONE SOUNDING: CPT-1
Est. GWT (ft): 8
Phi Correlation: **0** 0-Schm(78),1-R&C(83),2-PHT(74)

Base Depth (m)	Base Depth (ft)	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	SPT N(60)	Norm. Qc1n	Est. % Fines	Rel. Dens. Dr (%)	**Nk:** Phi (deg.)	**17** Su (tsf)	OCR
11.88	39.0	16.72	2.49	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.90	5.88
12.05	39.5	16.22	2.45	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.87	5.53
12.20	40.0	22.63	3.04	Clayey Silt to Silty Clay	ML/CL	very stiff	120	9		100			1.25	>10
12.35	40.5	66.37	1.40	Silty Sand to Sandy Silt	SM/ML	medium dense	115	15	54.7	50	55	36		
12.50	41.0	94.25	0.76	Sand to Silty Sand	SP/SM	medium dense	115	17	77.3	30	65	37		
12.65	41.5	92.58	0.92	Sand to Silty Sand	SP/SM	medium dense	115	17	75.6	35	64	37		
12.80	42.0	114.02	0.71	Sand	SP	dense	110	18	92.7	25	70	38		
12.95	42.5	153.36	1.09	Sand to Silty Sand	SP/SM	dense	115	28	124.1	25	79	39		
13.10	43.0	145.63	1.22	Sand to Silty Sand	SP/SM	dense	115	26	117.3	30	77	39		
13.25	43.5	186.70	0.91	Sand	SP	dense	110	29	149.8	20	84	40		
13.40	44.0	200.56	1.37	Sand to Silty Sand	SP/SM	dense	115	36	160.2	25	86	40		
13.58	44.5	156.75	1.43	Sand to Silty Sand	SP/SM	dense	115	29	124.7	30	79	39		
13.73	45.0	201.35	0.77	Sand	SP	dense	110	31	159.5	20	86	40		
13.88	45.5	278.37	1.32	Sand	SP	very dense	110	43	219.6	20	96	41		
14.03	46.0	250.81	1.61	Sand to Silty Sand	SP/SM	very dense	115	46	197.1	25	93	41		
14.18	46.5	210.27	1.60	Sand to Silty Sand	SP/SM	dense	115	38	164.5	30	87	40		
14.33	47.0	174.23	1.17	Sand to Silty Sand	SP/SM	dense	115	32	135.7	25	82	39		
14.48	47.5	235.54	0.90	Sand	SP	very dense	110	36	182.8	20	90	41		
14.63	48.0	248.77	1.30	Sand	SP	very dense	110	38	192.3	20	92	41		
14.78	48.5	256.50	1.68	Sand to Silty Sand	SP/SM	very dense	115	47	197.5	25	93	41		
14.93	49.0	228.03	1.45	Sand to Silty Sand	SP/SM	dense	115	41	174.8	25	89	40		
15.10	49.5	216.12	1.24	Sand	SP	dense	110	33	165.1	25	87	40		
15.25	50.0	159.68	1.42	Sand to Silty Sand	SP/SM	dense	115	29	121.5	30	78	39		

CLIENT: Chelsea Investment Corp.
PROJECT: Wake Avenue Apartments - El Centro, CA

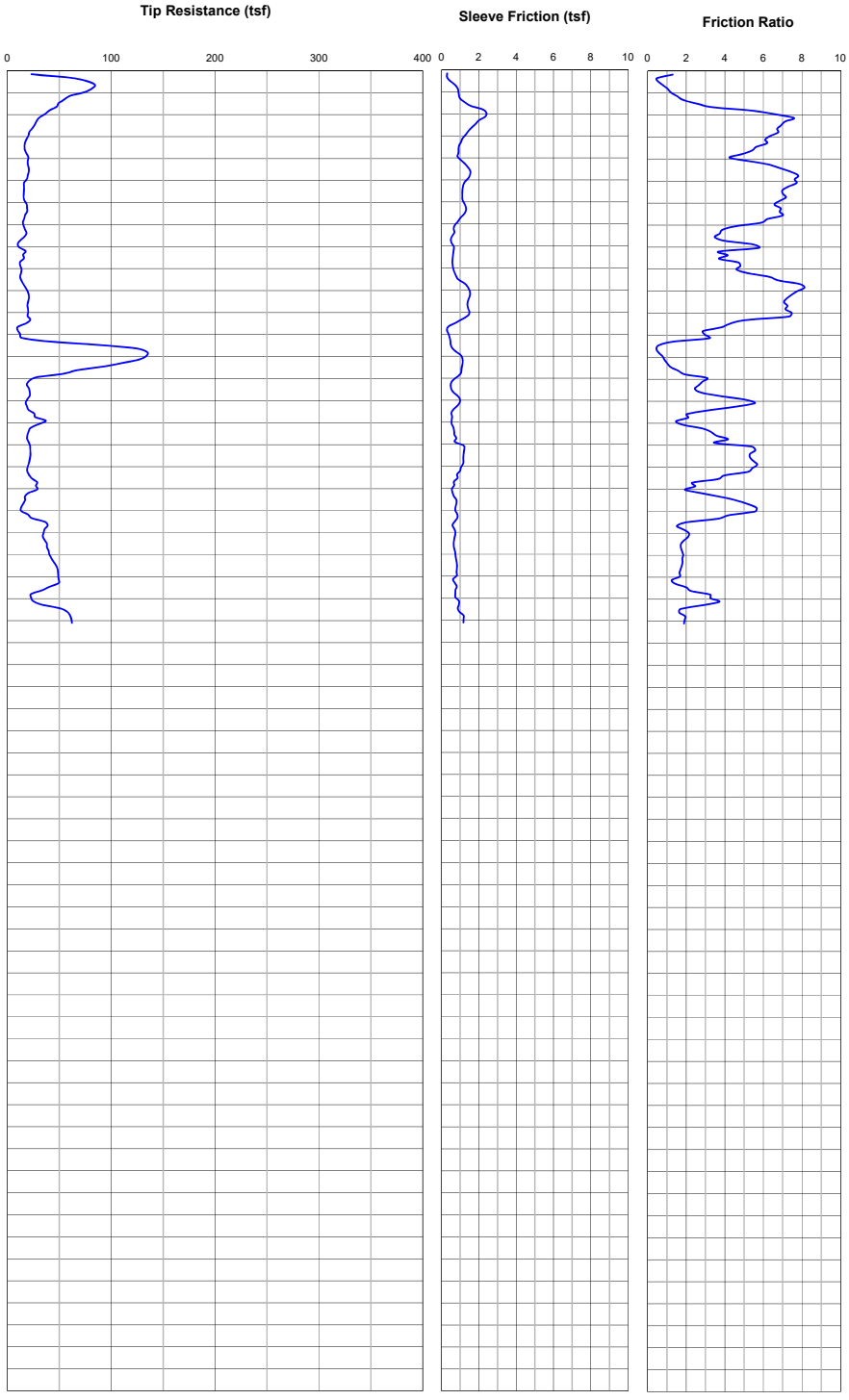
CONE PENETROMETER: Kehoe Testing & Engineering Truck Mounted Electric Cone with 30 ton reaction weight

LOCATION: See Site and Boring Location Plan

DATE: 1/11/2022

CONE SOUNDING DATA CPT-2

DEPTH	INTERPRETED SOIL PROFILE From Robertson and Campanella (1989		
	GROUND ELEVATION +/-		
	Sand to Silty Sand	SP/SM	very dense
	Clayey Silt to Silty Clay	ML/CL	hard
	Clay	CL/CH	very stiff
	Clay	" "	very stiff
5	Clay	" "	very stiff
	Clay	" "	stiff
	Clay	" "	stiff
	Clay	" "	stiff
	Clay	" "	stiff
10	Clay	" "	stiff
	Clay	" "	very stiff
	Clay	" "	stiff
	Sand to Silty Sand	SP/SM	dense
	Silty Sand to Sandy Silt	SM/ML	dense
15	Clayey Silt to Silty Clay	ML/CL	very stiff
	Clayey Silt to Silty Clay	" "	very stiff
	Silty Clay to Clay	CL	very stiff
	Clay	CL/CH	very stiff
	Clayey Silt to Silty Clay	ML/CL	very stiff
20	Clay	CL/CH	stiff
	Sandy Silt to Clayey Silt	ML	loose
	Sandy Silt to Clayey Silt	" "	medium dense
	Silty Sand to Sandy Silt	SM/ML	medium dense
	Sandy Silt to Clayey Silt	ML	medium dense
25	Sandy Silt to Clayey Silt	" "	medium dense



END OF SOUNDING AT 25 ft.

Project No.		PLATE
LE21248	LANDMARK Geo-Engineers and Geologists	B-2

LANDMARK CONSULTANTS, INC.

CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989, refer to Key to CPT logs)

Project: Wake Avenue Apartments - El Centro, CA **Project No:** LE21248 **Date:** 1/11/2022

CONE SOUNDING: CPT-2

Est. GWT (ft): 8

Phi Correlation: **0** 0-Schm(78),1-R&C(83),2-PHT(74)

Base Depth (m)	Base Depth (ft)	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	SPT N(60)	Norm. Qc1n	Est. % Fines	Rel. Dens. Dr (%)	**Nk:** Phi (deg.)	**17** Su (tsf)	OCR
0.15	0.5	54.05	0.78	Sand to Silty Sand	SP/SM	very dense	115	10	102.2	20	116	44		
0.30	1.0	79.92	1.03	Sand to Silty Sand	SP/SM	very dense	115	15	151.1	20	111	44		
0.45	1.5	54.80	1.96	Silty Sand to Sandy Silt	SM/ML	very dense	115	12	103.6	35	93	41		
0.60	2.0	41.50	5.13	Clay	CL/CH	hard	125	33		65			2.44	>10
0.75	2.5	28.39	7.21	Clay	CL/CH	very stiff	125	23		85			1.66	>10
0.93	3.0	21.79	6.61	Clay	CL/CH	very stiff	125	17		90			1.27	>10
1.08	3.5	17.29	5.97	Clay	CL/CH	very stiff	125	14		95			1.01	>10
1.23	4.0	18.49	4.86	Clay	CL/CH	very stiff	125	15		85			1.07	>10
1.38	4.5	19.93	6.19	Clay	CL/CH	very stiff	125	16		90			1.16	>10
1.53	5.0	19.68	7.64	Clay	CL/CH	very stiff	125	16		100			1.14	>10
1.68	5.5	15.99	7.26	Clay	CL/CH	stiff	125	13		100			0.92	>10
1.83	6.0	16.85	6.86	Clay	CL/CH	stiff	125	13		100			0.97	>10
1.98	6.5	18.33	6.91	Clay	CL/CH	very stiff	125	15		100			1.06	>10
2.13	7.0	15.59	5.55	Clay	CL/CH	stiff	125	12		95			0.89	>10
2.28	7.5	17.23	3.69	Silty Clay to Clay	CL	stiff	125	10		80			0.99	>10
2.45	8.0	11.35	5.06	Clay	CL/CH	stiff	125	9		100			0.64	>10
2.60	8.5	16.19	3.84	Silty Clay to Clay	CL	stiff	125	9		85			0.92	>10
2.75	9.0	12.73	4.70	Clay	CL/CH	stiff	125	10		100			0.72	>10
2.90	9.5	12.86	6.10	Clay	CL/CH	stiff	125	10		100			0.73	>10
3.05	10.0	17.20	7.93	Clay	CL/CH	stiff	125	14		100			0.98	>10
3.20	10.5	20.40	7.25	Clay	CL/CH	very stiff	125	16		100			1.17	>10
3.35	11.0	19.68	7.29	Clay	CL/CH	very stiff	125	16		100			1.12	>10
3.50	11.5	19.87	5.54	Clay	CL/CH	very stiff	125	16		95			1.13	>10
3.65	12.0	10.80	3.22	Silty Clay to Clay	CL	stiff	125	6		100			0.60	8.14
3.80	12.5	46.34	1.67	Silty Sand to Sandy Silt	SM/ML	medium dense	115	10	57.4	40	56	36		
3.95	13.0	131.24	0.60	Sand	SP	dense	110	20	160.9	10	87	40		
4.13	13.5	110.23	1.03	Sand to Silty Sand	SP/SM	dense	115	20	133.8	20	81	39		
4.28	14.0	49.45	2.19	Sandy Silt to Clayey Silt	ML	medium dense	115	14	59.4	45	57	36		
4.43	14.5	20.06	2.65	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		75			1.14	>10
4.58	15.0	20.82	3.83	Silty Clay to Clay	CL	very stiff	125	12		90			1.18	>10
4.73	15.5	18.96	4.40	Clay	CL/CH	very stiff	125	15		95			1.07	>10
4.88	16.0	29.81	1.86	Sandy Silt to Clayey Silt	ML	medium dense	115	9	34.3	60	41	34		
5.03	16.5	20.66	3.24	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		85			1.17	>10
5.18	17.0	20.47	4.34	Silty Clay to Clay	CL	very stiff	125	12		95			1.16	>10
5.33	17.5	22.04	5.40	Clay	CL/CH	very stiff	125	18		100			1.25	>10
5.48	18.0	20.34	5.53	Clay	CL/CH	very stiff	125	16		100			1.15	>10
5.65	18.5	21.16	4.28	Silty Clay to Clay	CL	very stiff	125	12		95			1.20	>10
5.80	19.0	28.30	2.24	Sandy Silt to Clayey Silt	ML	loose	115	8	30.7	70	38	33		
5.95	19.5	18.11	3.80	Silty Clay to Clay	CL	very stiff	125	10		100			1.02	>10
6.10	20.0	13.93	5.49	Clay	CL/CH	stiff	125	11		100			0.77	5.53
6.25	20.5	26.51	3.28	Clayey Silt to Silty Clay	ML/CL	very stiff	120	11		80			1.51	>10
6.40	21.0	36.54	1.84	Sandy Silt to Clayey Silt	ML	medium dense	115	10	38.2	55	44	34		
6.55	21.5	35.91	1.90	Sandy Silt to Clayey Silt	ML	medium dense	115	10	37.3	60	43	34		
6.70	22.0	39.37	1.78	Sandy Silt to Clayey Silt	ML	medium dense	115	11	40.6	55	46	34		
6.85	22.5	44.42	1.79	Silty Sand to Sandy Silt	SM/ML	medium dense	115	10	45.5	55	49	35		
7.00	23.0	48.61	1.68	Silty Sand to Sandy Silt	SM/ML	medium dense	115	11	49.4	50	52	35		
7.18	23.5	46.47	1.56	Silty Sand to Sandy Silt	SM/ML	medium dense	115	10	46.9	50	50	35		
7.33	24.0	26.27	2.91	Clayey Silt to Silty Clay	ML/CL	very stiff	120	11		85			1.49	>10
7.48	24.5	36.57	2.73	Sandy Silt to Clayey Silt	ML	medium dense	115	10	36.4	70	43	34		
7.63	25.0	59.96	1.84	Silty Sand to Sandy Silt	SM/ML	medium dense	115	13	59.2	45	57	36		

CLIENT: Chelsea Investment Corp.
PROJECT: Wake Avenue Apartments - El Centro, CA

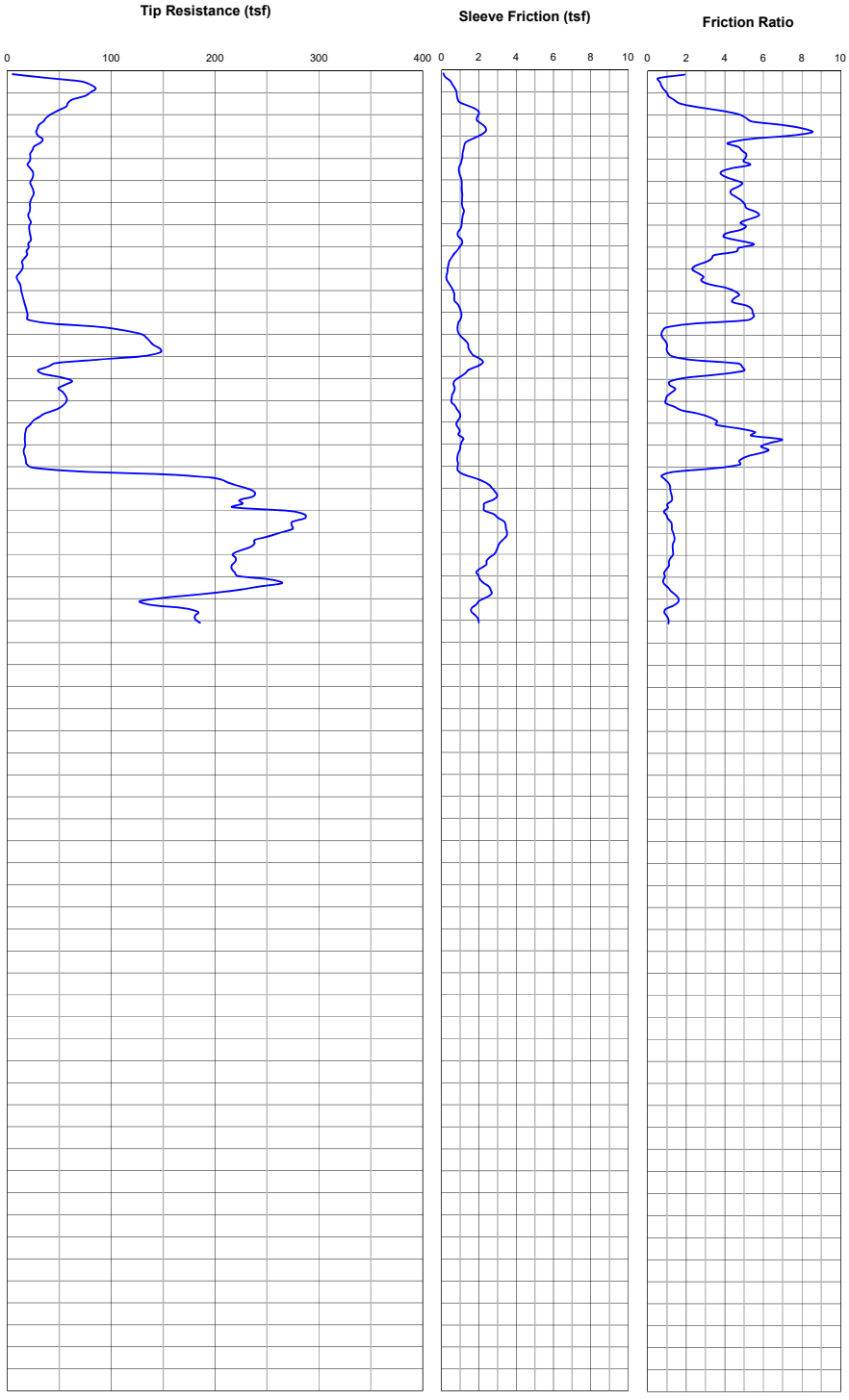
CONE PENETROMETER: Kehoe Testing & Engineering Truck Mounted Electric Cone with 30 ton reaction weight

LOCATION: See Site and Boring Location Plan

DATE: 1/11/2022

CONE SOUNDING DATA CPT-3

DEPTH	INTERPRETED SOIL PROFILE From Robertson and Campanella (1989		
	GROUND ELEVATION +/-		
	Sand to Silty Sand	SP/SM	very dense
	Sandy Silt to Clayey Silt	ML	very dense
	Clay	CL/CH	very stiff
	Clay	" "	very stiff
5	Silty Clay to Clay	CL	very stiff
	Clay	CL/CH	very stiff
	Clay	" "	very stiff
	Clay	" "	very stiff
	Clayey Silt to Silty Clay	ML/CL	stiff
10	Silty Clay to Clay	CL	stiff
	Clay	CL/CH	stiff
	Sandy Silt to Clayey Silt	ML	medium dense
	Sand	SP	dense
	Clayey Silt to Silty Clay	ML/CL	hard
15	Silty Sand to Sandy Silt	SM/ML	medium dense
	Sandy Silt to Clayey Silt	ML	medium dense
	Clay	CL/CH	stiff
	Clay	" "	very stiff
	Sand	SP	very dense
20	Sand	" "	very dense
	Sand	" "	very dense
	Sand	" "	very dense
	Sand	" "	very dense
	Sand	" "	very dense
25	Sand	" "	dense



END OF SOUNDING AT 25 ft.

Project No.		PLATE
LE21248	LANDMARK Geo-Engineers and Geologists	B-3

LANDMARK CONSULTANTS, INC.

CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989, refer to Key to CPT logs)

Project: Wake Avenue Apartments - El Centro, CA **Project No:** LE21248 **Date:** 1/11/2022

CONE SOUNDING: CPT-3

Est. GWT (ft): 8

Phi Correlation: **0** 0-Schm(78),1-R&C(83),2-PHT(74)

Base Depth (m)	Base Depth (ft)	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	SPT N(60)	Norm. Qc1n	Est. % Fines	Rel. Dens. Dr (%)	**Nk:** Phi (deg.)	**17** Su (tsf)	OCR
0.15	0.5	37.79	1.03	Silty Sand to Sandy Silt	SM/ML	very dense	115	8	71.4	30	106	43		
0.30	1.0	81.90	0.84	Sand to Silty Sand	SP/SM	very dense	115	15	154.8	15	112	44		
0.45	1.5	65.26	1.38	Silty Sand to Sandy Silt	SM/ML	very dense	115	15	123.4	25	98	42		
0.60	2.0	49.37	3.71	Clayey Silt to Silty Clay	ML/CL	hard	120	20		50			2.90	>10
0.75	2.5	34.36	5.87	Clay	CL/CH	hard	125	27		75			2.01	>10
0.93	3.0	28.76	7.93	Clay	CL/CH	very stiff	125	23		90			1.68	>10
1.08	3.5	30.52	4.62	Silty Clay to Clay	CL	very stiff	125	17		70			1.78	>10
1.23	4.0	22.75	5.02	Clay	CL/CH	very stiff	125	18		80			1.32	>10
1.38	4.5	20.95	4.86	Clay	CL/CH	very stiff	125	17		80			1.22	>10
1.53	5.0	24.36	4.03	Silty Clay to Clay	CL	very stiff	125	14		70			1.42	>10
1.68	5.5	23.83	4.57	Clay	CL/CH	very stiff	125	19		75			1.38	>10
1.83	6.0	22.69	4.85	Clay	CL/CH	very stiff	125	18		80			1.31	>10
1.98	6.5	21.11	5.50	Clay	CL/CH	very stiff	125	17		85			1.22	>10
2.13	7.0	21.58	5.07	Clay	CL/CH	very stiff	125	17		85			1.25	>10
2.28	7.5	21.65	4.27	Silty Clay to Clay	CL	very stiff	125	12		75			1.25	>10
2.45	8.0	21.05	5.00	Clay	CL/CH	very stiff	125	17		85			1.21	>10
2.60	8.5	17.94	3.79	Silty Clay to Clay	CL	very stiff	125	10		80			1.03	>10
2.75	9.0	14.38	2.58	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		80			0.82	>10
2.90	9.5	10.22	2.76	Silty Clay to Clay	CL	stiff	125	6		95			0.57	9.79
3.05	10.0	12.71	3.90	Clay	CL/CH	stiff	125	10		95			0.72	>10
3.20	10.5	15.17	4.54	Clay	CL/CH	stiff	125	12		95			0.86	>10
3.35	11.0	18.14	5.33	Clay	CL/CH	very stiff	125	15		95			1.03	>10
3.50	11.5	26.15	4.32	Silty Clay to Clay	CL	very stiff	125	15		80			1.50	>10
3.65	12.0	109.91	0.82	Sand to Silty Sand	SP/SM	dense	115	20	138.1	15	82	39		
3.80	12.5	137.25	0.92	Sand	SP	dense	110	21	170.7	15	88	40		
3.95	13.0	142.72	1.10	Sand to Silty Sand	SP/SM	dense	115	26	175.7	15	89	40		
4.13	13.5	59.25	3.96	Clayey Silt to Silty Clay	ML/CL	hard	120	24		55			3.45	>10
4.28	14.0	38.51	3.55	Clayey Silt to Silty Clay	ML/CL	hard	120	15		65			2.23	>10
4.43	14.5	55.76	1.24	Silty Sand to Sandy Silt	SM/ML	medium dense	115	12	66.5	35	60	36		
4.58	15.0	55.44	1.07	Silty Sand to Sandy Silt	SM/ML	medium dense	115	12	65.4	30	60	36		
4.73	15.5	51.57	1.37	Silty Sand to Sandy Silt	SM/ML	medium dense	115	11	60.3	35	58	36		
4.88	16.0	28.32	3.29	Clayey Silt to Silty Clay	ML/CL	very stiff	120	11		75			1.62	>10
5.03	16.5	17.62	5.23	Clay	CL/CH	stiff	125	14		100			0.99	>10
5.18	17.0	16.99	6.39	Clay	CL/CH	stiff	125	14		100			0.96	9.79
5.33	17.5	16.25	5.66	Clay	CL/CH	stiff	125	13		100			0.91	8.56
5.48	18.0	20.17	4.35	Clay	CL/CH	very stiff	125	16		100			1.14	>10
5.65	18.5	143.10	0.99	Sand	SP	dense	110	22	157.4	15	86	40		
5.80	19.0	222.14	1.13	Sand	SP	very dense	110	34	242.5	15	99	42		
5.95	19.5	232.77	1.24	Sand	SP	very dense	110	36	252.2	15	100	42		
6.10	20.0	238.59	0.97	Sand	SP	very dense	110	37	256.7	10	100	42		
6.25	20.5	282.42	1.08	Sand	SP	very dense	110	43	301.6	10	105	43		
6.40	21.0	270.41	1.28	Sand	SP	very dense	110	42	286.7	15	104	43		
6.55	21.5	242.72	1.36	Sand to Silty Sand	SP/SM	very dense	115	44	255.5	15	100	42		
6.70	22.0	224.82	1.31	Sand	SP	very dense	110	35	234.9	15	98	42		
6.85	22.5	218.49	1.13	Sand	SP	very dense	110	34	226.7	15	97	42		
7.00	23.0	218.90	0.91	Sand	SP	very dense	110	34	225.6	10	97	42		
7.18	23.5	253.10	0.90	Sand	SP	very dense	110	39	259.2	10	101	42		
7.33	24.0	186.61	1.41	Sand to Silty Sand	SP/SM	very dense	115	34	189.8	20	91	41		
7.48	24.5	145.53	1.29	Sand to Silty Sand	SP/SM	dense	115	26	146.9	20	84	40		
7.63	25.0	181.77	0.99	Sand	SP	very dense	110	28	182.3	15	90	41		

CLIENT: Chelsea Investment Corp.
PROJECT: Wake Avenue Apartments - El Centro, CA

CONE PENETROMETER: Kehoe Testing & Engineering Truck Mounted Electric Cone with 30 ton reaction weight

LOCATION: See Site and Boring Location Plan

DATE: 1/11/2022

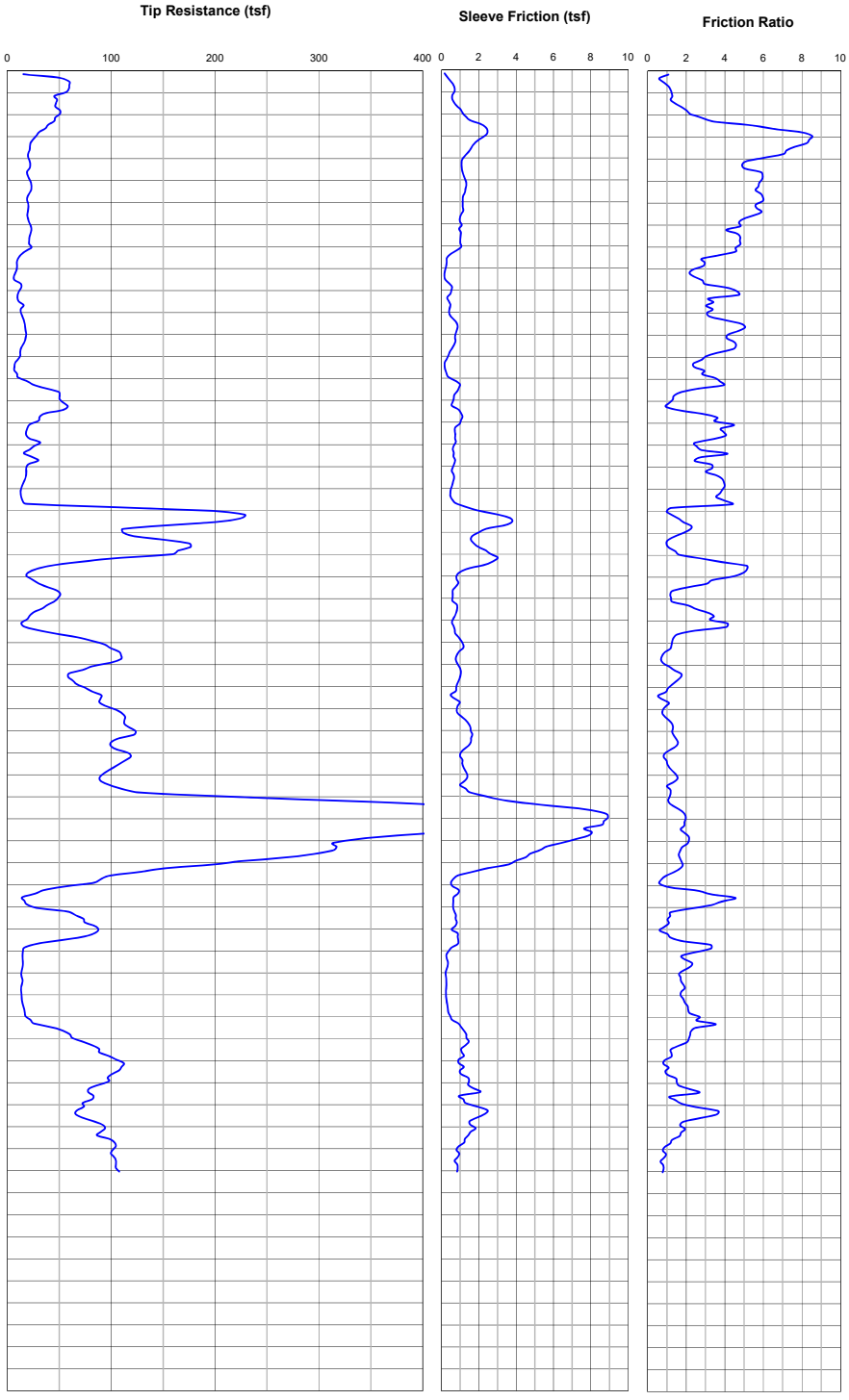
CONE SOUNDING DATA CPT-4

INTERPRETED SOIL PROFILE
From Robertson and Campanella (1989

GROUND ELEVATION +/-

DEPTH			
	Silty Sand to Sandy Silt	SM/ML	very dense
	Silty Sand to Sandy Silt	" "	dense
	Clay	CL/CH	hard
	Clay	" "	very stiff
5	Clay	" "	very stiff
	Clay	" "	very stiff
	Clay	" "	very stiff
	Clay	" "	very stiff
	Silty Clay to Clay	CL	stiff
10	Silty Clay to Clay	" "	stiff
	Silty Clay to Clay	" "	stiff
	Clay	CL/CH	stiff
	Clay	" "	stiff
	Silty Clay to Clay	CL	firm
15	Sandy Silt to Clayey Silt	ML	medium dense
	Sandy Silt to Clayey Silt	" "	medium dense
	Clayey Silt to Silty Clay	ML/CL	very stiff
	Clayey Silt to Silty Clay	" "	very stiff
	Silty Clay to Clay	CL	stiff
20	Sandy Silt to Clayey Silt	ML	medium dense
	Sand to Silty Sand	SP/SM	very dense
	Sand to Silty Sand	" "	dense
	Clayey Silt to Silty Clay	ML/CL	hard
	Sandy Silt to Clayey Silt	ML	medium dense
25	Sandy Silt to Clayey Silt	" "	loose
	Sandy Silt to Clayey Silt	" "	medium dense
	Sand to Silty Sand	SP/SM	dense
	Silty Sand to Sandy Silt	SM/ML	medium dense
	Sand to Silty Sand	SP/SM	medium dense
30	Sand to Silty Sand	" "	dense
	Sand to Silty Sand	" "	dense
	Sand to Silty Sand	" "	dense
	Sand to Silty Sand	" "	dense
	Sand	SP	very dense
35	Sand to Silty Sand	SP/SM	very dense
	Sand to Silty Sand	" "	very dense
	Sand to Silty Sand	" "	dense
	Clayey Silt to Silty Clay	ML/CL	very stiff
	Sand to Silty Sand	SP/SM	medium dense
40	Sandy Silt to Clayey Silt	ML	medium dense
	Clayey Silt to Silty Clay	ML/CL	stiff
	Clayey Silt to Silty Clay	" "	stiff
	Clayey Silt to Silty Clay	" "	stiff
	Sandy Silt to Clayey Silt	ML	medium dense
45	Sand to Silty Sand	SP/SM	medium dense
	Sand to Silty Sand	" "	medium dense
	Silty Sand to Sandy Silt	SM/ML	medium dense
	Sandy Silt to Clayey Silt	ML	medium dense
	Sand to Silty Sand	SP/SM	medium dense
50	Sand to Silty Sand	" "	medium dense
55			

END OF SOUNDING AT 50 ft.



Project No.		PLATE
LE21248	LANDMARK Geo-Engineers and Geologists	B-4

LANDMARK CONSULTANTS, INC.

CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989, refer to Key to CPT logs)

Project: Wake Avenue Apartments - El Centro, CA **Project No:** LE21248 **Date:** 1/11/2022

CONE SOUNDING: CPT-4

Est. GWT (ft): 8

Phi Correlation: **0** 0-Schm(78),1-R&C(83),2-PHT(74)

Base Depth (m)	Base Depth (ft)	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	SPT N(60)	Norm. Qc1n	Est. % Fines	Rel. Dens. Dr (%)	**Nk:** Phi (deg.)	**17** Su (tsf)	OCR
0.15	0.5	41.74	0.83	Silty Sand to Sandy Silt	SM/ML	very dense	115	9	78.9	25	108	43		
0.30	1.0	58.40	1.15	Silty Sand to Sandy Silt	SM/ML	very dense	115	13	110.4	25	102	42		
0.45	1.5	46.65	1.30	Silty Sand to Sandy Silt	SM/ML	dense	115	10	88.2	30	88	40		
0.60	2.0	49.13	2.01	Sandy Silt to Clayey Silt	ML	dense	115	14	92.9	40	85	40		
0.75	2.5	43.50	3.87	Clayey Silt to Silty Clay	ML/CL	hard	120	17		55			2.55	>10
0.93	3.0	31.81	7.68	Clay	CL/CH	very stiff	125	25		85			1.86	>10
1.08	3.5	23.04	8.08	Clay	CL/CH	very stiff	125	18		95			1.34	>10
1.23	4.0	20.46	6.77	Clay	CL/CH	very stiff	125	16		95			1.19	>10
1.38	4.5	21.60	5.01	Clay	CL/CH	very stiff	125	17		80			1.26	>10
1.53	5.0	19.80	5.92	Clay	CL/CH	very stiff	125	16		90			1.15	>10
1.68	5.5	22.49	5.75	Clay	CL/CH	very stiff	125	18		85			1.30	>10
1.83	6.0	19.49	5.85	Clay	CL/CH	very stiff	125	16		90			1.13	>10
1.98	6.5	19.65	5.69	Clay	CL/CH	very stiff	125	16		90			1.13	>10
2.13	7.0	21.09	4.82	Clay	CL/CH	very stiff	125	17		80			1.22	>10
2.28	7.5	22.27	4.50	Clay	CL/CH	very stiff	125	18		80			1.28	>10
2.45	8.0	21.72	4.71	Clay	CL/CH	very stiff	125	17		80			1.25	>10
2.60	8.5	13.67	3.70	Silty Clay to Clay	CL	stiff	125	8		90			0.78	>10
2.75	9.0	9.15	2.73	Silty Clay to Clay	CL	stiff	125	5		95			0.51	8.27
2.90	9.5	6.95	2.48	Silty Clay to Clay	CL	firm	125	4		100			0.38	4.89
3.05	10.0	12.54	3.91	Clay	CL/CH	stiff	125	10		100			0.71	>10
3.20	10.5	10.28	3.77	Clay	CL/CH	stiff	125	8		100			0.57	6.54
3.35	11.0	13.88	3.16	Silty Clay to Clay	CL	stiff	125	8		90			0.78	>10
3.50	11.5	15.53	4.03	Silty Clay to Clay	CL	stiff	125	9		95			0.88	>10
3.65	12.0	17.57	4.64	Clay	CL/CH	stiff	125	14		95			1.00	>10
3.80	12.5	16.38	4.39	Clay	CL/CH	stiff	125	13		95			0.93	>10
3.95	13.0	12.57	3.71	Silty Clay to Clay	CL	stiff	125	7		100			0.70	>10
4.13	13.5	8.14	2.53	Silty Clay to Clay	CL	firm	125	5		100			0.44	4.47
4.28	14.0	8.71	3.09	Silty Clay to Clay	CL	firm	125	5		100			0.47	4.78
4.43	14.5	26.66	3.43	Clayey Silt to Silty Clay	ML/CL	very stiff	120	11		75			1.53	>10
4.58	15.0	49.96	1.45	Silty Sand to Sandy Silt	SM/ML	medium dense	115	11	58.5	40	57	36		
4.73	15.5	55.23	1.24	Silty Sand to Sandy Silt	SM/ML	medium dense	115	12	64.0	35	59	36		
4.88	16.0	29.59	3.62	Clayey Silt to Silty Clay	ML/CL	very stiff	120	12		75			1.70	>10
5.03	16.5	18.55	3.93	Silty Clay to Clay	CL	very stiff	125	11		95			1.05	>10
5.18	17.0	26.37	2.77	Clayey Silt to Silty Clay	ML/CL	very stiff	120	11		75			1.51	>10
5.33	17.5	20.24	3.22	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		90			1.15	>10
5.48	18.0	22.85	3.03	Clayey Silt to Silty Clay	ML/CL	very stiff	120	9		80			1.30	>10
5.65	18.5	17.84	3.49	Silty Clay to Clay	CL	very stiff	125	10		95			1.00	>10
5.80	19.0	14.30	3.94	Silty Clay to Clay	CL	stiff	125	8		100			0.79	8.00
5.95	19.5	13.49	3.77	Silty Clay to Clay	CL	stiff	125	8		100			0.74	6.88
6.10	20.0	107.79	2.20	Silty Sand to Sandy Silt	SM/ML	dense	115	24	114.6	35	77	39		
6.25	20.5	218.84	1.59	Sand to Silty Sand	SP/SM	very dense	115	40	230.9	20	97	42		
6.40	21.0	124.95	2.09	Silty Sand to Sandy Silt	SM/ML	dense	115	28	130.8	30	80	39		
6.55	21.5	149.62	1.13	Sand to Silty Sand	SP/SM	dense	115	27	155.4	20	86	40		
6.70	22.0	166.53	1.39	Sand to Silty Sand	SP/SM	dense	115	30	171.7	20	88	40		
6.85	22.5	75.28	3.92	Clayey Silt to Silty Clay	ML/CL	hard	120	30		60			4.38	>10
7.00	23.0	22.38	4.83	Clay	CL/CH	very stiff	125	18		100			1.26	>10
7.18	23.5	30.49	2.82	Clayey Silt to Silty Clay	ML/CL	very stiff	120	12		75			1.74	>10
7.33	24.0	49.13	1.22	Silty Sand to Sandy Silt	SM/ML	medium dense	115	11	49.1	45	51	35		
7.48	24.5	39.33	1.96	Sandy Silt to Clayey Silt	ML	medium dense	115	11	39.0	60	45	34		
7.63	25.0	22.07	3.27	Clayey Silt to Silty Clay	ML/CL	very stiff	120	9		95			1.24	>10
7.78	25.5	19.39	3.56	Silty Clay to Clay	CL	very stiff	125	11		100			1.08	9.79
7.93	26.0	65.41	1.39	Silty Sand to Sandy Silt	SM/ML	medium dense	115	15	63.5	40	59	36		
8.08	26.5	102.50	1.01	Sand to Silty Sand	SP/SM	dense	115	19	98.9	25	72	38		
8.23	27.0	97.16	0.88	Sand to Silty Sand	SP/SM	dense	115	18	93.1	25	70	38		
8.38	27.5	63.62	1.61	Silty Sand to Sandy Silt	SM/ML	medium dense	115	14	60.6	45	58	36		
8.53	28.0	68.34	1.26	Silty Sand to Sandy Silt	SM/ML	medium dense	115	15	64.7	40	60	36		
8.68	28.5	87.17	0.74	Sand to Silty Sand	SP/SM	medium dense	115	16	82.0	25	67	37		
8.85	29.0	95.61	0.94	Sand to Silty Sand	SP/SM	medium dense	115	17	89.4	25	69	38		
9.00	29.5	112.06	0.95	Sand to Silty Sand	SP/SM	dense	115	20	104.1	25	74	38		
9.15	30.0	117.94	1.29	Sand to Silty Sand	SP/SM	dense	115	21	108.9	30	75	39		
9.30	30.5	109.67	1.47	Sand to Silty Sand	SP/SM	dense	115	20	100.7	35	73	38		
9.45	31.0	106.75	1.18	Sand to Silty Sand	SP/SM	dense	115	19	97.4	30	72	38		
9.60	31.5	113.76	0.95	Sand to Silty Sand	SP/SM	dense	115	21	103.2	25	73	38		
9.75	32.0	96.91	1.32	Sand to Silty Sand	SP/SM	medium dense	115	18	87.5	35	69	38		
9.90	32.5	92.79	1.29	Sand to Silty Sand	SP/SM	medium dense	115	17	83.3	35	67	37		
10.05	33.0	146.36	1.17	Sand to Silty Sand	SP/SM	dense	115	27	130.6	25	80	39		
10.20	33.5	371.17	1.24	Sand	SP	very dense	110	57	329.5	15	108	43		
10.38	34.0	454.31	1.90	Sand to Silty Sand	SP/SM	very dense	115	83	401.2	20	114	44		
10.53	34.5	451.83	1.84	Sand to Silty Sand	SP/SM	very dense	115	82	396.9	15	113	44		
10.68	35.0	375.00	2.06	Sand to Silty Sand	SP/SM	very dense	115	68	327.6	20	108	43		
10.83	35.5	314.69	1.84	Sand to Silty Sand	SP/SM	very dense	115	57	273.5	20	102	42		
10.98	36.0	263.04	1.68	Sand to Silty Sand	SP/SM	very dense	115	48	227.4	25	97	42		
11.13	36.5	143.53	1.42	Sand to Silty Sand	SP/SM	dense	115	26	123.4	30	79	39		
11.28	37.0	76.41	0.79	Sand to Silty Sand	SP/SM	medium dense	115	14	65.4	35	60	36		
11.43	37.5	25.62	3.47	Clayey Silt to Silty Clay	ML/CL	very stiff	120	10		100			1.43	>10
11.58	38.0	21.25	3.11	Clayey Silt to Silty Clay	ML/CL	very stiff	120	9		100			1.17	9.59
11.73	38.5	65.73	1.13	Silty Sand to Sandy Silt	SM/ML	medium dense	115	15	55.4	45	55	36		

LANDMARK CONSULTANTS, INC.

CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989, refer to Key to CPT logs)

Project: Wake Avenue Apartments - El Centro, CA **Project No:** LE21248 **Date:** 1/11/2022

CONE SOUNDING: CPT-4

Est. GWT (ft): 8

Phi Correlation: **0** 0-Schm(78),1-R&C(83),2-PHT(74)

Base Depth (m)	Base Depth (ft)	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	SPT N(60)	Norm. Qc1n	Est. % Fines	Rel. Dens. Dr (%)	**Nk:** Phi (deg.)	**17** Su (tsf)	OCR
11.88	39.0	82.20	0.86	Sand to Silty Sand	SP/SM	medium dense	115	15	68.9	35	61	37		
12.05	39.5	68.46	1.35	Silty Sand to Sandy Silt	SM/ML	medium dense	115	15	57.1	45	56	36		
12.20	40.0	19.27	3.02	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		100			1.05	7.27
12.35	40.5	14.71	1.99	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.78	4.57
12.50	41.0	14.09	1.92	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.75	4.18
12.65	41.5	14.15	1.76	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.75	4.09
12.80	42.0	13.36	1.80	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.70	3.74
12.95	42.5	14.43	1.95	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.76	4.09
13.10	43.0	16.82	2.34	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.90	5.21
13.25	43.5	30.15	2.85	Clayey Silt to Silty Clay	ML/CL	very stiff	120	12		95			1.69	>10
13.40	44.0	58.72	2.19	Sandy Silt to Clayey Silt	ML	medium dense	115	17	46.8	65	50	35		
13.58	44.5	80.66	1.60	Silty Sand to Sandy Silt	SM/ML	medium dense	115	18	64.0	50	59	36		
13.73	45.0	97.07	1.11	Sand to Silty Sand	SP/SM	medium dense	115	18	76.7	35	65	37		
13.88	45.5	109.86	0.94	Sand to Silty Sand	SP/SM	medium dense	115	20	86.4	30	68	38		
14.03	46.0	98.35	1.34	Sand to Silty Sand	SP/SM	medium dense	115	18	77.1	40	65	37		
14.18	46.5	81.48	2.16	Silty Sand to Sandy Silt	SM/ML	medium dense	115	18	63.6	55	59	36		
14.33	47.0	77.64	1.74	Silty Sand to Sandy Silt	SM/ML	medium dense	115	17	60.3	50	58	36		
14.48	47.5	68.06	3.31	Sandy Silt to Clayey Silt	ML	medium dense	115	19	52.6	70	54	35		
14.63	48.0	89.21	1.82	Silty Sand to Sandy Silt	SM/ML	medium dense	115	20	68.7	50	61	37		
14.78	48.5	91.60	1.55	Silty Sand to Sandy Silt	SM/ML	medium dense	115	20	70.3	45	62	37		
14.93	49.0	103.04	0.95	Sand to Silty Sand	SP/SM	medium dense	115	19	78.7	35	65	37		
15.10	49.5	102.38	0.82	Sand to Silty Sand	SP/SM	medium dense	115	19	77.9	35	65	37		
15.25	50.0	105.56	0.80	Sand to Silty Sand	SP/SM	medium dense	115	19	80.0	30	66	37		

CLIENT: Chelsea Investment Corp.
PROJECT: Wake Avenue Apartments - El Centro, CA

CONE PENETROMETER: Kehoe Testing & Engineering Truck Mounted Electric Cone with 30 ton reaction weight

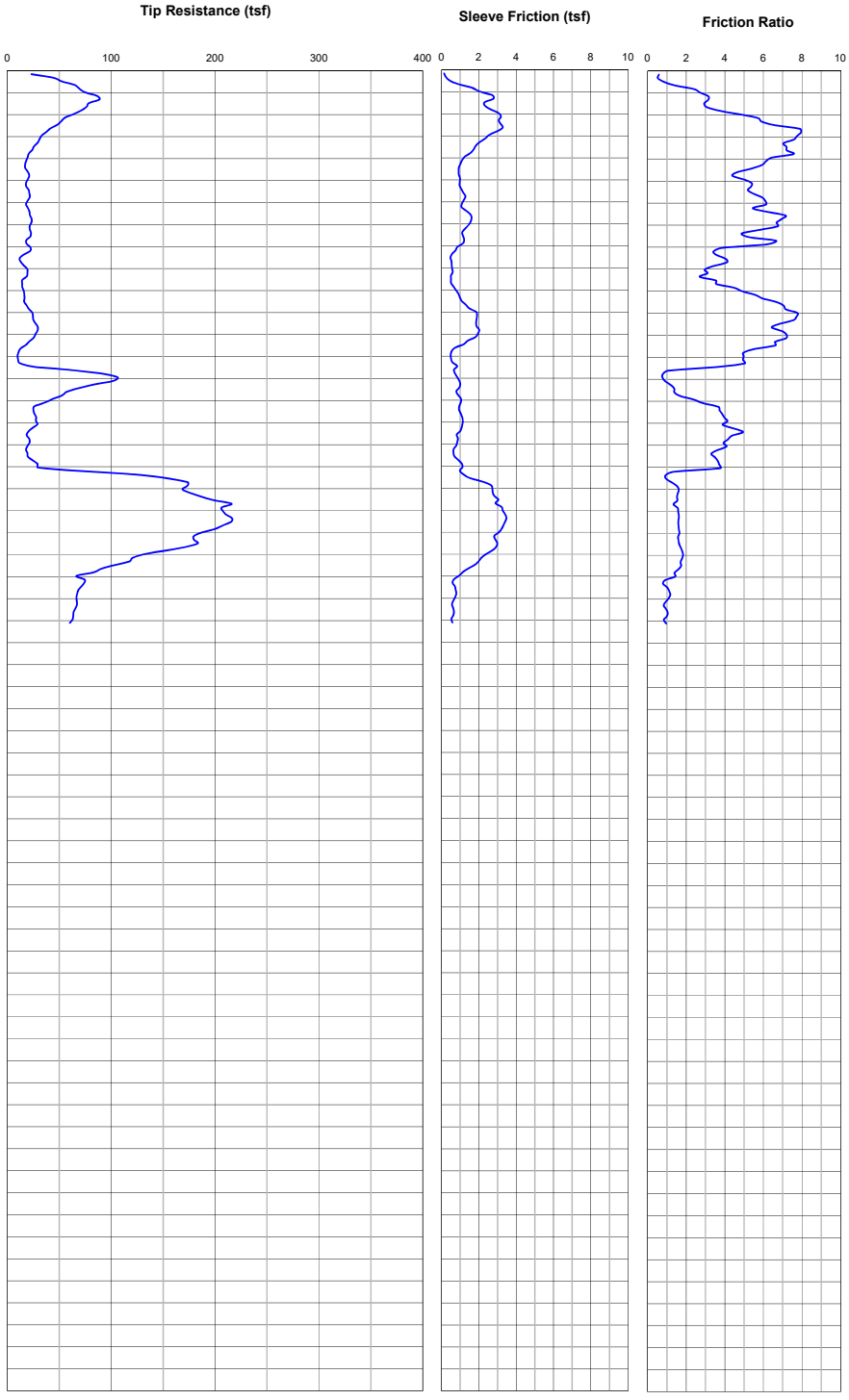
LOCATION: See Site and Boring Location Plan

DATE: 1/11/2022

CONE SOUNDING DATA CPT-5

DEPTH	INTERPRETED SOIL PROFILE From Robertson and Campanella (1989		
	GROUND ELEVATION +/-		
	Silty Sand to Sandy Silt	SM/ML	very dense
	Sandy Silt to Clayey Silt	ML	very dense
	Clay	CL/CH	hard
	Clay	" "	very stiff
5	Clay	" "	very stiff
	Clay	" "	very stiff
	Clay	" "	very stiff
	Clay	" "	very stiff
10	Silty Clay to Clay	CL	stiff
	Silty Clay to Clay	" "	stiff
	Clay	CL/CH	very stiff
	Clay	" "	very stiff
	Clay	" "	stiff
15	Sandy Silt to Clayey Silt	ML	medium dense
	Silty Sand to Sandy Silt	SM/ML	medium dense
	Clayey Silt to Silty Clay	ML/CL	very stiff
	Silty Clay to Clay	CL	very stiff
	Clayey Silt to Silty Clay	ML/CL	very stiff
	Sand to Silty Sand	SP/SM	dense
20	Sand to Silty Sand	" "	very dense
	Sand to Silty Sand	" "	very dense
	Sand to Silty Sand	" "	dense
	Silty Sand to Sandy Silt	SM/ML	dense
	Sand to Silty Sand	SP/SM	medium dense
25	Sand to Silty Sand	" "	medium dense

END OF SOUNDING AT 25 ft.



Project No.		PLATE
LE21248	LANDMARK Geo-Engineers and Geologists	B-5

LANDMARK CONSULTANTS, INC.

CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989, refer to Key to CPT logs)

Project: Wake Avenue Apartments - El Centro, CA **Project No:** LE21248 **Date:** 1/11/2022

CONE SOUNDING: CPT-5

Est. GWT (ft): 8

Phi Correlation: **0** 0-Schm(78),1-R&C(83),2-PHT(74)

Base Depth (m)	Base Depth (ft)	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	SPT N(60)	Norm. Qc1n	Est. % Fines	Rel. Dens. Dr (%)	**Nk:** Phi (deg.)	**17** Su (tsf)	OCR
0.15	0.5	40.00	0.65	Silty Sand to Sandy Silt	SM/ML	very dense	115	9	75.6	25	107	43		
0.30	1.0	69.60	2.18	Silty Sand to Sandy Silt	SM/ML	very dense	115	15	131.6	35	107	43		
0.45	1.5	84.50	3.07	Sandy Silt to Clayey Silt	ML	very dense	115	24	159.7	35	106	43		
0.60	2.0	70.64	3.85	Clayey Silt to Silty Clay	ML/CL	hard	120	28		45			4.15	>10
0.75	2.5	51.89	6.07	Clay	CL/CH	hard	125	42		65			3.04	>10
0.93	3.0	37.33	7.86	Clay	CL/CH	hard	125	30		80			2.19	>10
1.08	3.5	28.53	7.27	Clay	CL/CH	very stiff	125	23		85			1.67	>10
1.23	4.0	21.32	7.07	Clay	CL/CH	very stiff	125	17		95			1.24	>10
1.38	4.5	17.42	5.82	Clay	CL/CH	very stiff	125	14		95			1.01	>10
1.53	5.0	20.19	4.67	Clay	CL/CH	very stiff	125	16		80			1.17	>10
1.68	5.5	19.41	5.36	Clay	CL/CH	very stiff	125	16		90			1.12	>10
1.83	6.0	19.72	6.05	Clay	CL/CH	very stiff	125	16		90			1.14	>10
1.98	6.5	20.82	6.27	Clay	CL/CH	very stiff	125	17		90			1.20	>10
2.13	7.0	22.67	6.79	Clay	CL/CH	very stiff	125	18		90			1.31	>10
2.28	7.5	22.11	5.30	Clay	CL/CH	very stiff	125	18		85			1.27	>10
2.45	8.0	19.69	5.57	Clay	CL/CH	very stiff	125	16		90			1.13	>10
2.60	8.5	16.38	3.68	Silty Clay to Clay	CL	stiff	125	9		80			0.93	>10
2.75	9.0	15.98	3.50	Silty Clay to Clay	CL	stiff	125	9		85			0.91	>10
2.90	9.5	17.44	3.12	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		80			0.99	>10
3.05	10.0	14.78	4.31	Clay	CL/CH	stiff	125	12		95			0.84	>10
3.20	10.5	16.29	6.08	Clay	CL/CH	stiff	125	13		100			0.93	>10
3.35	11.0	20.95	7.33	Clay	CL/CH	very stiff	125	17		100			1.20	>10
3.50	11.5	25.50	7.38	Clay	CL/CH	very stiff	125	20		95			1.47	>10
3.65	12.0	28.46	6.86	Clay	CL/CH	very stiff	125	23		90			1.64	>10
3.80	12.5	21.45	6.80	Clay	CL/CH	very stiff	125	17		100			1.23	>10
3.95	13.0	11.07	5.16	Clay	CL/CH	stiff	125	9		100			0.61	6.00
4.13	13.5	15.25	4.50	Clay	CL/CH	stiff	125	12		100			0.86	>10
4.28	14.0	87.12	0.87	Sand to Silty Sand	SP/SM	dense	115	16	104.2	20	74	38		
4.43	14.5	84.28	1.17	Sand to Silty Sand	SP/SM	dense	115	15	99.8	25	72	38		
4.58	15.0	51.01	1.82	Silty Sand to Sandy Silt	SM/ML	medium dense	115	11	59.8	40	57	36		
4.73	15.5	29.01	3.42	Clayey Silt to Silty Clay	ML/CL	very stiff	120	12		75			1.67	>10
4.88	16.0	27.51	3.97	Silty Clay to Clay	CL	very stiff	125	16		80			1.58	>10
5.03	16.5	20.98	4.60	Clay	CL/CH	very stiff	125	17		95			1.19	>10
5.18	17.0	20.60	4.06	Silty Clay to Clay	CL	very stiff	125	12		95			1.17	>10
5.33	17.5	19.03	3.47	Silty Clay to Clay	CL	very stiff	125	11		90			1.07	>10
5.48	18.0	27.80	3.71	Clayey Silt to Silty Clay	ML/CL	very stiff	120	11		80			1.59	>10
5.65	18.5	118.97	1.07	Sand to Silty Sand	SP/SM	dense	115	22	130.0	20	80	39		
5.80	19.0	171.84	1.47	Sand to Silty Sand	SP/SM	very dense	115	31	186.2	20	91	41		
5.95	19.5	186.90	1.54	Sand to Silty Sand	SP/SM	very dense	115	34	200.9	20	93	41		
6.10	20.0	209.92	1.49	Sand to Silty Sand	SP/SM	very dense	115	38	223.9	20	96	41		
6.25	20.5	214.10	1.60	Sand to Silty Sand	SP/SM	very dense	115	39	226.5	20	97	42		
6.40	21.0	198.01	1.62	Sand to Silty Sand	SP/SM	very dense	115	36	207.9	20	94	41		
6.55	21.5	180.83	1.60	Sand to Silty Sand	SP/SM	very dense	115	33	188.4	20	91	41		
6.70	22.0	151.33	1.78	Sand to Silty Sand	SP/SM	dense	115	28	156.5	25	86	40		
6.85	22.5	113.66	1.74	Silty Sand to Sandy Silt	SM/ML	dense	115	25	116.7	30	77	39		
7.00	23.0	80.01	1.47	Silty Sand to Sandy Silt	SM/ML	medium dense	115	18	81.5	35	66	37		
7.18	23.5	73.03	0.91	Sand to Silty Sand	SP/SM	medium dense	115	13	73.9	30	64	37		
7.33	24.0	67.27	1.13	Sand to Silty Sand	SP/SM	medium dense	115	12	67.6	35	61	37		
7.48	24.5	66.45	0.91	Sand to Silty Sand	SP/SM	medium dense	115	12	66.3	30	60	36		
7.63	25.0	63.34	0.96	Sand to Silty Sand	SP/SM	medium dense	115	12	62.8	35	59	36		

CLIENT: Chelsea Investment Corp.
PROJECT: Wake Avenue Apartments - El Centro, CA

CONE PENETROMETER: Kehoe Testing & Engineering Truck Mounted Electric Cone with 30 ton reaction weight

LOCATION: See Site and Boring Location Plan

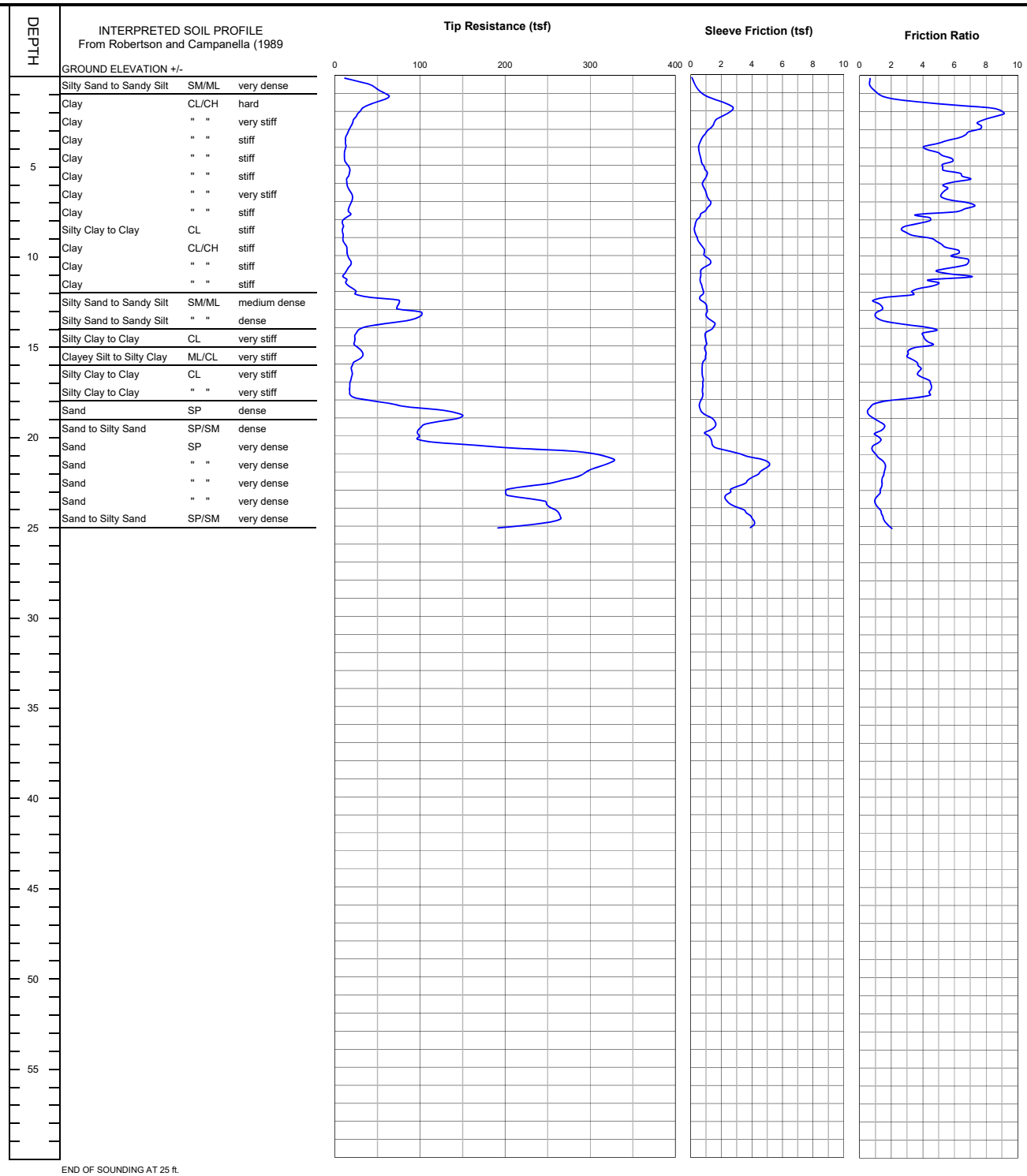
DATE: 1/11/2022

CONE SOUNDING DATA CPT-6

INTERPRETED SOIL PROFILE
From Robertson and Campanella (1989

GROUND ELEVATION +/-

Silty Sand to Sandy Silt	SM/ML	very dense
Clay	CL/CH	hard
Clay	" "	very stiff
Clay	" "	stiff
Clay	" "	stiff
Clay	" "	stiff
Clay	" "	very stiff
Clay	" "	stiff
Silty Clay to Clay	CL	stiff
Clay	CL/CH	stiff
Clay	" "	stiff
Clay	" "	stiff
Silty Sand to Sandy Silt	SM/ML	medium dense
Silty Sand to Sandy Silt	" "	dense
Silty Clay to Clay	CL	very stiff
Clayey Silt to Silty Clay	ML/CL	very stiff
Silty Clay to Clay	CL	very stiff
Silty Clay to Clay	" "	very stiff
Sand	SP	dense
Sand to Silty Sand	SP/SM	dense
Sand	SP	very dense
Sand	" "	very dense
Sand	" "	very dense
Sand	" "	very dense
Sand to Silty Sand	SP/SM	very dense



END OF SOUNDING AT 25 ft.

Project No.		PLATE
LE21248	LANDMARK Geo-Engineers and Geologists	B-6

LANDMARK CONSULTANTS, INC.

CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989, refer to Key to CPT logs)

Project: Wake Avenue Apartments - El Centro, CA **Project No:** LE21248 **Date:** 1/11/2022

CONE SOUNDING: CPT-6

Est. GWT (ft): 8

Phi Correlation: **0** 0-Schm(78),1-R&C(83),2-PHT(74)

Base Depth (m)	Base Depth (ft)	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	SPT N(60)	Norm. Qc1n	Est. % Fines	Rel. Dens. Dr (%)	**Nk:** Phi (deg.)	**17** Su (tsf)	OCR
0.15	0.5	25.78	0.64	Silty Sand to Sandy Silt	SM/ML	very dense	115	6	48.7	35	94	41		
0.30	1.0	51.93	0.93	Silty Sand to Sandy Silt	SM/ML	very dense	115	12	98.2	25	99	42		
0.45	1.5	57.65	2.55	Sandy Silt to Clayey Silt	ML	very dense	115	16	109.0	40	94	41		
0.60	2.0	34.26	7.82	Clay	CL/CH	hard	125	27		85			2.01	>10
0.75	2.5	24.42	8.46	Clay	CL/CH	very stiff	125	20		95			1.43	>10
0.93	3.0	19.08	7.59	Clay	CL/CH	very stiff	125	15		100			1.11	>10
1.08	3.5	14.08	6.64	Clay	CL/CH	stiff	125	11		100			0.82	>10
1.23	4.0	12.51	4.82	Clay	CL/CH	stiff	125	10		100			0.72	>10
1.38	4.5	11.44	4.82	Clay	CL/CH	stiff	125	9		100			0.66	>10
1.53	5.0	12.26	5.65	Clay	CL/CH	stiff	125	10		100			0.70	>10
1.68	5.5	16.79	5.85	Clay	CL/CH	stiff	125	13		95			0.97	>10
1.83	6.0	13.99	6.07	Clay	CL/CH	stiff	125	11		100			0.80	>10
1.98	6.5	17.38	5.37	Clay	CL/CH	very stiff	125	14		90			1.00	>10
2.13	7.0	20.02	5.92	Clay	CL/CH	very stiff	125	16		90			1.15	>10
2.28	7.5	16.41	6.69	Clay	CL/CH	stiff	125	13		100			0.94	>10
2.45	8.0	13.86	4.14	Clay	CL/CH	stiff	125	11		90			0.79	>10
2.60	8.5	9.15	3.05	Silty Clay to Clay	CL	stiff	125	5		100			0.51	8.70
2.75	9.0	9.30	3.61	Clay	CL/CH	stiff	125	7		100			0.52	6.43
2.90	9.5	11.66	5.16	Clay	CL/CH	stiff	125	9		100			0.66	9.00
3.05	10.0	14.46	6.10	Clay	CL/CH	stiff	125	12		100			0.82	>10
3.20	10.5	18.04	6.81	Clay	CL/CH	very stiff	125	14		100			1.03	>10
3.35	11.0	13.70	5.41	Clay	CL/CH	stiff	125	11		100			0.77	>10
3.50	11.5	11.91	5.50	Clay	CL/CH	stiff	125	10		100			0.67	7.56
3.65	12.0	20.15	3.89	Silty Clay to Clay	CL	very stiff	125	12		85			1.15	>10
3.80	12.5	46.18	1.92	Silty Sand to Sandy Silt	SM/ML	medium dense	115	10	57.2	45	56	36		
3.95	13.0	74.03	1.35	Silty Sand to Sandy Silt	SM/ML	medium dense	115	16	90.7	30	70	38		
4.13	13.5	99.80	1.06	Sand to Silty Sand	SP/SM	dense	115	18	121.0	20	78	39		
4.28	14.0	59.13	2.84	Sandy Silt to Clayey Silt	ML	medium dense	115	17	71.0	50	62	37		
4.43	14.5	25.53	4.31	Silty Clay to Clay	CL	very stiff	125	15		85			1.46	>10
4.58	15.0	23.01	4.36	Silty Clay to Clay	CL	very stiff	125	13		90			1.31	>10
4.73	15.5	30.08	3.18	Clayey Silt to Silty Clay	ML/CL	very stiff	120	12		70			1.73	>10
4.88	16.0	25.82	3.43	Clayey Silt to Silty Clay	ML/CL	very stiff	120	10		80			1.48	>10
5.03	16.5	19.77	3.77	Silty Clay to Clay	CL	very stiff	125	11		90			1.12	>10
5.18	17.0	18.52	4.29	Clay	CL/CH	very stiff	125	15		100			1.05	>10
5.33	17.5	17.32	4.48	Clay	CL/CH	stiff	125	14		100			0.97	9.39
5.48	18.0	28.01	3.09	Clayey Silt to Silty Clay	ML/CL	very stiff	120	11		75			1.60	>10
5.65	18.5	89.49	0.69	Sand to Silty Sand	SP/SM	dense	115	16	97.9	20	72	38		
5.80	19.0	145.41	0.71	Sand	SP	dense	110	22	157.8	15	86	40		
5.95	19.5	109.55	1.46	Sand to Silty Sand	SP/SM	dense	115	20	117.9	25	77	39		
6.10	20.0	97.98	1.15	Sand to Silty Sand	SP/SM	dense	115	18	104.6	25	74	38		
6.25	20.5	124.73	1.14	Sand to Silty Sand	SP/SM	dense	115	23	132.2	20	81	39		
6.40	21.0	263.86	0.89	Sand	SP	very dense	110	41	277.5	10	103	42		
6.55	21.5	323.83	1.39	Sand	SP	very dense	110	50	338.3	15	108	43		
6.70	22.0	303.96	1.60	Sand to Silty Sand	SP/SM	very dense	115	55	315.2	15	106	43		
6.85	22.5	278.97	1.45	Sand to Silty Sand	SP/SM	very dense	115	51	287.2	15	104	43		
7.00	23.0	225.31	1.37	Sand to Silty Sand	SP/SM	very dense	115	41	230.2	15	97	42		
7.18	23.5	209.68	1.14	Sand	SP	very dense	110	32	212.8	15	95	41		
7.33	24.0	249.43	1.06	Sand	SP	very dense	110	38	251.5	15	100	42		
7.48	24.5	262.44	1.40	Sand	SP	very dense	110	40	263.0	15	101	42		
7.63	25.0	248.36	1.66	Sand to Silty Sand	SP/SM	very dense	115	45	247.2	20	99	42		

CLIENT: Chelsea Investment Corp.
PROJECT: Wake Avenue Apartments - El Centro, CA

CONE PENETROMETER: Kehoe Testing & Engineering Truck Mounted Electric Cone with 30 ton reaction weight

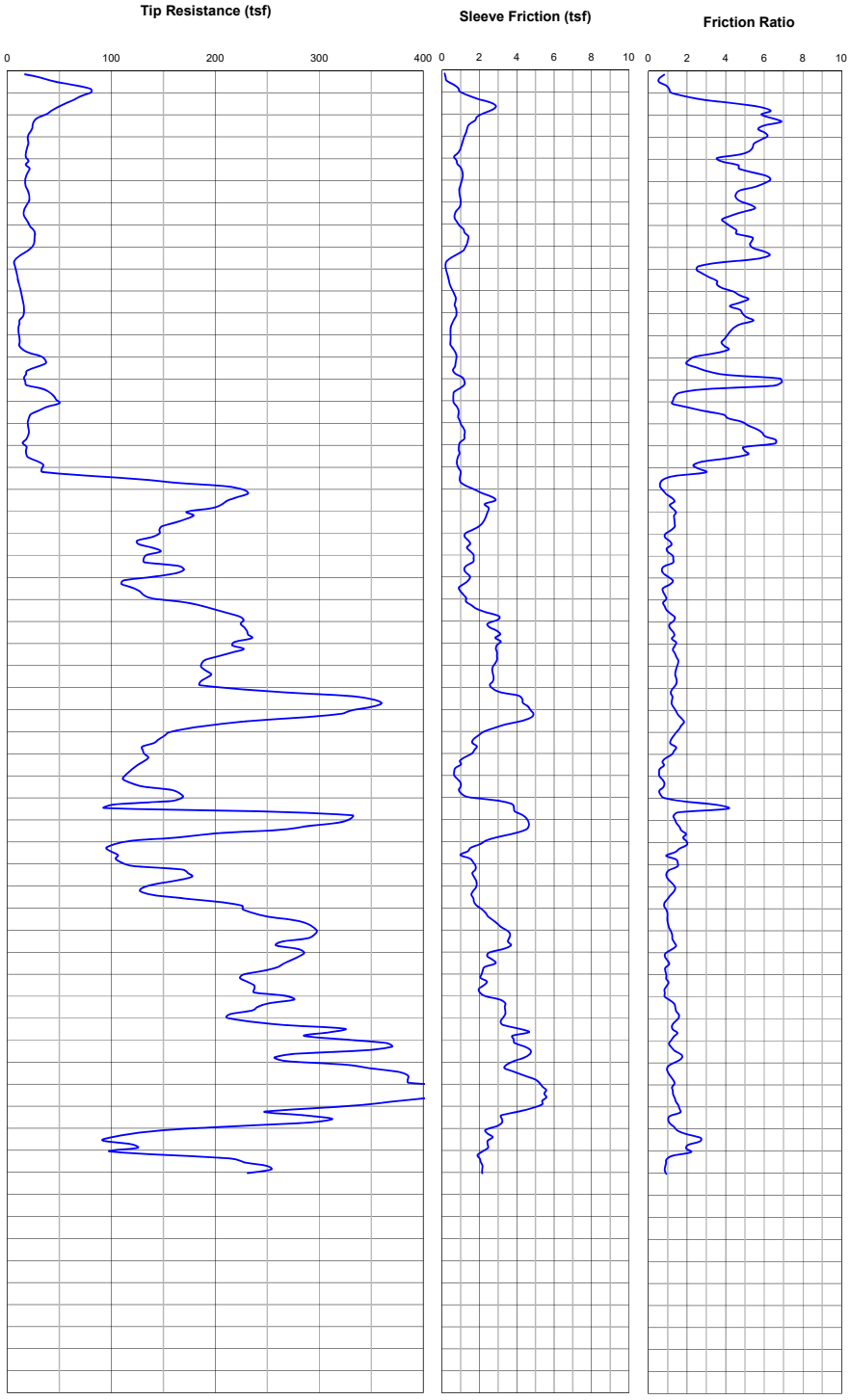
LOCATION: See Site and Boring Location Plan

DATE: 1/11/2022

CONE SOUNDING DATA CPT-7

DEPTH	INTERPRETED SOIL PROFILE From Robertson and Campanella (1989		
	GROUND ELEVATION +/-		
	Sand to Silty Sand	SP/SM	very dense
	Silty Clay to Clay	CL	hard
	Clay	CL/CH	very stiff
	Clay	" "	very stiff
5	Clay	" "	very stiff
	Clay	" "	very stiff
	Clay	" "	very stiff
	Clay	" "	very stiff
	Clay	" "	stiff
10	Silty Clay to Clay	CL	stiff
	Clay	CL/CH	stiff
	Clay	" "	stiff
	Silty Clay to Clay	CL	stiff
	Clayey Silt to Silty Clay	ML/CL	very stiff
15	Clayey Silt to Silty Clay	" "	very stiff
	Clayey Silt to Silty Clay	" "	very stiff
	Clay	CL/CH	very stiff
	Clayey Silt to Silty Clay	ML/CL	very stiff
	Sand to Silty Sand	SP/SM	dense
20	Sand	SP	very dense
	Sand to Silty Sand	SP/SM	dense
	Sand to Silty Sand	" "	dense
	Sand	SP	dense
	Sand to Silty Sand	SP/SM	dense
25	Sand	SP	very dense
	Sand	" "	very dense
	Sand to Silty Sand	SP/SM	very dense
	Sand to Silty Sand	" "	very dense
	Sand	SP	very dense
30	Sand to Silty Sand	SP/SM	very dense
	Sand to Silty Sand	" "	dense
	Sand	SP	dense
	Sand	" "	dense
	Silty Sand to Sandy Silt	SM/ML	very dense
	Sand to Silty Sand	SP/SM	very dense
35	Sand to Silty Sand	" "	medium dense
	Sand to Silty Sand	" "	dense
	Sand	SP	dense
	Sand	" "	very dense
	Sand	" "	very dense
40	Sand	" "	very dense
	Sand	" "	very dense
	Sand to Silty Sand	SP/SM	very dense
	Sand	SP	very dense
	Sand	" "	very dense
45	Sand	" "	very dense
	Sand	" "	very dense
	Sand	" "	very dense
	Silty Sand to Sandy Silt	SM/ML	medium dense
	Sand	SP	dense
50			
55			

END OF SOUNDING AT 50 ft.



Project No.		PLATE
LE21248	LANDMARK Geo-Engineers and Geologists	B-7

LANDMARK CONSULTANTS, INC.

CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989, refer to Key to CPT logs)

Project: Wake Avenue Apartments - El Centro, CA **Project No:** LE21248 **Date:** 1/11/2022

CONE SOUNDING: CPT-7

Est. GWT (ft): 8

Phi Correlation: **0** 0-Schm(78),1-R&C(83),2-PHT(74)

Base Depth (m)	Base Depth (ft)	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	SPT N(60)	Norm. Qc1n	Est. % Fines	Rel. Dens. Dr (%)	**Nk:** Phi (deg.)	**17** Su (tsf)	OCR
0.15	0.5	31.82	0.64	Silty Sand to Sandy Silt	SM/ML	very dense	115	7	60.2	30	100	42		
0.30	1.0	74.93	1.06	Sand to Silty Sand	SP/SM	very dense	115	14	141.6	20	110	43		
0.45	1.5	63.86	3.16	Sandy Silt to Clayey Silt	ML	very dense	115	18	120.7	45	97	42		
0.60	2.0	43.20	6.01	Clay	CL/CH	hard	125	35		70			2.54	>10
0.75	2.5	26.35	6.43	Clay	CL/CH	very stiff	125	21		85			1.54	>10
0.93	3.0	21.82	5.96	Clay	CL/CH	very stiff	125	17		90			1.27	>10
1.08	3.5	19.68	5.57	Clay	CL/CH	very stiff	125	16		90			1.15	>10
1.23	4.0	17.98	4.55	Clay	CL/CH	very stiff	125	14		85			1.04	>10
1.38	4.5	19.75	4.38	Clay	CL/CH	very stiff	125	16		80			1.15	>10
1.53	5.0	18.42	5.95	Clay	CL/CH	very stiff	125	15		95			1.07	>10
1.68	5.5	18.70	5.20	Clay	CL/CH	very stiff	125	15		90			1.08	>10
1.83	6.0	20.25	4.86	Clay	CL/CH	very stiff	125	16		85			1.17	>10
1.98	6.5	16.13	4.88	Clay	CL/CH	stiff	125	13		90			0.93	>10
2.13	7.0	19.78	4.03	Silty Clay to Clay	CL	very stiff	125	11		80			1.14	>10
2.28	7.5	25.88	4.84	Clay	CL/CH	very stiff	125	21		75			1.50	>10
2.45	8.0	24.75	5.35	Clay	CL/CH	very stiff	125	20		80			1.43	>10
2.60	8.5	13.20	5.95	Clay	CL/CH	stiff	125	11		100			0.75	>10
2.75	9.0	7.23	2.89	Silty Clay to Clay	CL	firm	125	4		100			0.40	5.42
2.90	9.5	9.59	3.17	Silty Clay to Clay	CL	stiff	125	5		100			0.53	8.41
3.05	10.0	12.07	3.93	Clay	CL/CH	stiff	125	10		100			0.68	9.19
3.20	10.5	14.37	4.88	Clay	CL/CH	stiff	125	11		100			0.81	>10
3.35	11.0	15.88	4.61	Clay	CL/CH	stiff	125	13		95			0.90	>10
3.50	11.5	12.73	5.09	Clay	CL/CH	stiff	125	10		100			0.71	8.56
3.65	12.0	10.79	4.25	Clay	CL/CH	stiff	125	9		100			0.60	6.21
3.80	12.5	11.63	3.89	Clay	CL/CH	stiff	125	9		100			0.65	6.65
3.95	13.0	22.23	3.34	Clayey Silt to Silty Clay	ML/CL	very stiff	120	9		80			1.27	>10
4.13	13.5	33.49	2.19	Sandy Silt to Clayey Silt	ML	medium dense	115	10	40.5	55	46	34		
4.28	14.0	17.58	4.63	Clay	CL/CH	stiff	125	14		100			1.00	>10
4.43	14.5	23.14	5.42	Clay	CL/CH	very stiff	125	19		95			1.32	>10
4.58	15.0	44.02	1.41	Silty Sand to Sandy Silt	SM/ML	medium dense	115	10	51.5	40	53	35		
4.73	15.5	39.43	2.06	Sandy Silt to Clayey Silt	ML	medium dense	115	11	45.7	50	49	35		
4.88	16.0	20.71	4.50	Clay	CL/CH	very stiff	125	17		95			1.18	>10
5.03	16.5	20.28	5.85	Clay	CL/CH	very stiff	125	16		100			1.15	>10
5.18	17.0	17.01	6.02	Clay	CL/CH	stiff	125	14		100			0.96	9.39
5.33	17.5	18.68	4.78	Clay	CL/CH	very stiff	125	15		100			1.05	>10
5.48	18.0	32.10	2.58	Sandy Silt to Clayey Silt	ML	medium dense	115	9	35.3	65	42	34		
5.65	18.5	78.29	1.67	Silty Sand to Sandy Silt	SM/ML	medium dense	115	17	85.5	35	68	37		
5.80	19.0	200.57	0.66	Sand	SP	very dense	110	31	217.3	10	95	41		
5.95	19.5	221.19	1.16	Sand	SP	very dense	110	34	237.8	15	98	42		
6.10	20.0	191.98	1.27	Sand to Silty Sand	SP/SM	very dense	115	35	204.9	15	94	41		
6.25	20.5	170.88	1.34	Sand to Silty Sand	SP/SM	dense	115	31	180.9	20	90	41		
6.40	21.0	147.11	1.13	Sand to Silty Sand	SP/SM	dense	115	27	154.6	20	85	40		
6.55	21.5	130.11	1.06	Sand to Silty Sand	SP/SM	dense	115	24	135.7	20	81	39		
6.70	22.0	140.39	1.07	Sand to Silty Sand	SP/SM	dense	115	26	145.3	20	84	40		
6.85	22.5	142.51	1.12	Sand to Silty Sand	SP/SM	dense	115	26	146.4	20	84	40		
7.00	23.0	157.67	0.85	Sand	SP	dense	110	24	160.8	15	87	40		
7.18	23.5	113.85	1.04	Sand to Silty Sand	SP/SM	dense	115	21	115.3	25	77	39		
7.33	24.0	132.31	0.85	Sand	SP	dense	110	20	133.1	20	81	39		
7.48	24.5	184.63	0.85	Sand	SP	very dense	110	28	184.6	15	91	41		
7.63	25.0	220.56	1.27	Sand	SP	very dense	110	34	219.2	15	96	41		
7.78	25.5	227.49	1.15	Sand	SP	very dense	110	35	224.7	15	96	41		
7.93	26.0	228.42	1.33	Sand	SP	very dense	110	35	224.2	15	96	41		
8.08	26.5	215.51	1.36	Sand to Silty Sand	SP/SM	very dense	115	39	210.2	20	94	41		
8.23	27.0	187.90	1.51	Sand to Silty Sand	SP/SM	very dense	115	34	182.1	20	90	41		
8.38	27.5	192.80	1.41	Sand to Silty Sand	SP/SM	very dense	115	35	185.6	20	91	41		
8.53	28.0	197.04	1.36	Sand to Silty Sand	SP/SM	very dense	115	36	188.5	20	91	41		
8.68	28.5	316.27	1.21	Sand	SP	very dense	110	49	300.7	15	105	43		
8.85	29.0	346.92	1.32	Sand	SP	very dense	110	53	328.0	15	108	43		
9.00	29.5	276.03	1.70	Sand to Silty Sand	SP/SM	very dense	115	50	259.4	20	101	42		
9.15	30.0	175.38	1.57	Sand to Silty Sand	SP/SM	dense	115	32	163.8	25	87	40		
9.30	30.5	145.83	1.20	Sand to Silty Sand	SP/SM	dense	115	27	135.4	25	81	39		
9.45	31.0	130.55	1.32	Sand to Silty Sand	SP/SM	dense	115	24	120.5	25	78	39		
9.60	31.5	130.92	0.81	Sand	SP	dense	110	20	120.2	20	78	39		
9.75	32.0	117.03	0.57	Sand	SP	dense	110	18	106.9	20	74	38		
9.90	32.5	119.67	0.78	Sand	SP	dense	110	18	108.7	20	75	38		
10.05	33.0	164.34	0.66	Sand	SP	dense	110	25	148.5	15	84	40		
10.20	33.5	118.35	3.22	Sandy Silt to Clayey Silt	ML	dense	115	34	106.4	50	74	38		
10.38	34.0	305.14	1.40	Sand	SP	very dense	110	47	272.8	15	102	42		
10.53	34.5	290.46	1.59	Sand to Silty Sand	SP/SM	very dense	115	53	258.3	20	101	42		
10.68	35.0	163.24	1.91	Silty Sand to Sandy Silt	SM/ML	dense	115	36	144.4	30	83	40		
10.83	35.5	99.26	1.66	Silty Sand to Sandy Silt	SM/ML	medium dense	115	22	87.3	40	68	38		
10.98	36.0	106.58	1.29	Sand to Silty Sand	SP/SM	dense	115	19	93.3	35	70	38		
11.13	36.5	159.76	1.11	Sand	SP	dense	110	25	139.1	25	82	40		
11.28	37.0	145.57	1.27	Sand to Silty Sand	SP/SM	dense	115	26	126.1	25	79	39		
11.43	37.5	145.45	1.14	Sand to Silty Sand	SP/SM	dense	115	26	125.3	25	79	39		
11.58	38.0	218.93	0.86	Sand	SP	very dense	110	34	187.7	15	91	41		
11.73	38.5	253.73	0.98	Sand	SP	very dense	110	39	216.6	15	95	41		

LANDMARK CONSULTANTS, INC.
CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989, refer to Key to CPT logs)

Project: Wake Avenue Apartments - El Centro, CA **Project No:** LE21248 **Date:** 1/11/2022

CONE SOUNDING: CPT-7
Est. GWT (ft): 8
Phi Correlation: **0** 0-Schm(78),1-R&C(83),2-PHT(74)

Base Depth (m)	Base Depth (ft)	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	SPT N(60)	Norm. Qc1n	Est. % Fines	Rel. Dens. Dr (%)	**Nk:** Phi (deg.)	**17** Su (tsf)	OCR
11.88	39.0	293.47	1.09	Sand	SP	very dense	110	45	249.4	15	99	42		
12.05	39.5	282.47	1.27	Sand	SP	very dense	110	43	238.9	20	98	42		
12.20	40.0	274.61	1.16	Sand	SP	very dense	110	42	231.3	15	97	42		
12.35	40.5	273.35	0.98	Sand	SP	very dense	110	42	229.2	15	97	42		
12.50	41.0	244.65	0.90	Sand	SP	very dense	110	38	204.2	15	94	41		
12.65	41.5	230.37	0.97	Sand	SP	very dense	110	35	191.4	15	92	41		
12.80	42.0	247.88	0.84	Sand	SP	very dense	110	38	205.1	15	94	41		
12.95	42.5	256.09	1.29	Sand	SP	very dense	110	39	211.0	20	95	41		
13.10	43.0	220.22	1.52	Sand to Silty Sand	SP/SM	dense	115	40	180.6	25	90	41		
13.25	43.5	273.83	1.28	Sand	SP	very dense	110	42	223.6	20	96	41		
13.40	44.0	306.33	1.34	Sand	SP	very dense	110	47	249.1	20	99	42		
13.58	44.5	359.97	1.21	Sand	SP	very dense	110	55	291.5	15	104	43		
13.73	45.0	266.81	1.62	Sand to Silty Sand	SP/SM	very dense	115	49	215.1	25	95	41		
13.88	45.5	350.35	1.02	Sand	SP	very dense	110	54	281.3	15	103	42		
14.03	46.0	385.39	1.26	Sand	SP	very dense	110	59	308.2	15	106	43		
14.18	46.5	435.68	1.26	Sand	SP	very dense	110	67	347.0	15	109	43		
14.33	47.0	357.93	1.49	Sand	SP	very dense	110	55	283.9	20	103	42		
14.48	47.5	281.72	1.26	Sand	SP	very dense	110	43	222.6	20	96	41		
14.63	48.0	221.69	1.31	Sand	SP	dense	110	34	174.5	25	89	40		
14.78	48.5	105.14	2.45	Silty Sand to Sandy Silt	SM/ML	medium dense	115	23	82.4	50	67	37		
14.93	49.0	114.29	2.07	Silty Sand to Sandy Silt	SM/ML	medium dense	115	25	89.2	45	69	38		
15.10	49.5	199.59	1.02	Sand	SP	dense	110	31	155.2	20	85	40		
15.25	50.0	244.87	0.88	Sand	SP	very dense	110	38	189.6	15	91	41		

CLIENT: Chelsea Investment Corp.
PROJECT: Wake Avenue Apartments - El Centro, CA

CONE PENETROMETER: Kehoe Testing & Engineering Truck Mounted Electric Cone with 30 ton reaction weight

LOCATION: See Site and Boring Location Plan

DATE: 1/11/2022

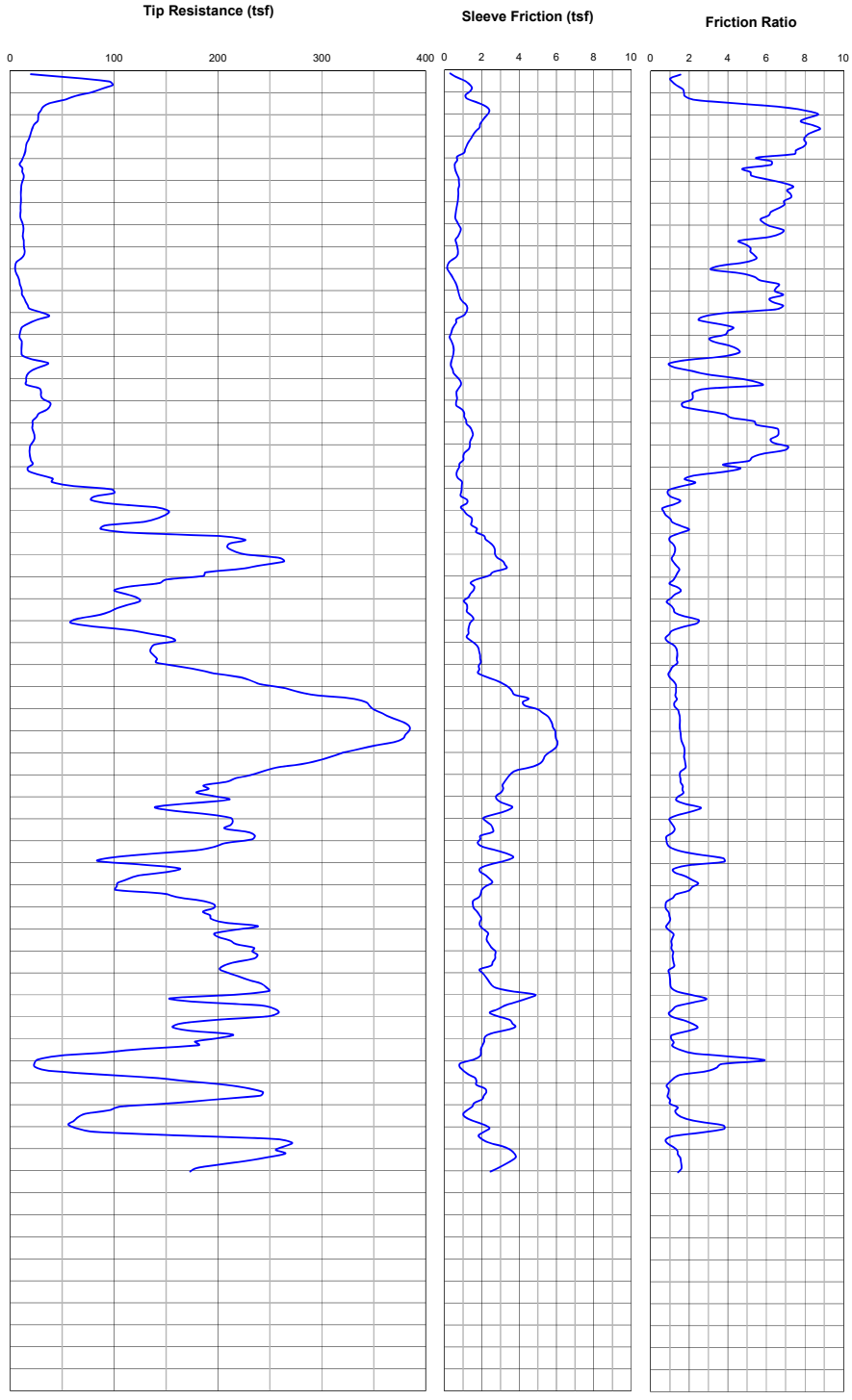
CONE SOUNDING DATA CPT-8

INTERPRETED SOIL PROFILE
From Robertson and Campanella (1989

GROUND ELEVATION +/-

DEPTH			
	Silty Sand to Sandy Silt	SM/ML	very dense
	Clay	CL/CH	hard
	Clay	" "	very stiff
	Clay	" "	stiff
5	Clay	" "	stiff
	Clay	" "	stiff
	Clay	" "	stiff
	Clay	" "	stiff
	Clay	" "	firm
10	Clay	" "	firm
	Clay	" "	stiff
	Clayey Silt to Silty Clay	ML/CL	very stiff
	Clay	CL/CH	stiff
	Sandy Silt to Clayey Silt	ML	loose
15	Clayey Silt to Silty Clay	ML/CL	very stiff
	Clayey Silt to Silty Clay	" "	very stiff
	Clay	CL/CH	very stiff
	Clay	" "	very stiff
	Sandy Silt to Clayey Silt	ML	medium dense
20	Sand to Silty Sand	SP/SM	dense
	Sand to Silty Sand	" "	dense
	Sand	SP	very dense
	Sand	" "	very dense
	Sand to Silty Sand	SP/SM	dense
25	Sand to Silty Sand	" "	dense
	Sand to Silty Sand	" "	dense
	Sand to Silty Sand	" "	dense
	Sand	SP	very dense
	Sand	" "	very dense
30	Sand	" "	very dense
	Sand to Silty Sand	SP/SM	very dense
	Sand to Silty Sand	" "	very dense
	Sand to Silty Sand	" "	dense
	Sand to Silty Sand	" "	dense
	Sand	SP	very dense
35	Silty Sand to Sandy Silt	SM/ML	dense
	Silty Sand to Sandy Silt	" "	dense
	Sand	SP	dense
	Sand	" "	dense
	Sand	" "	very dense
40	Sand	" "	very dense
	Sand	" "	very dense
	Sand to Silty Sand	SP/SM	very dense
	Sand to Silty Sand	" "	dense
	Silty Sand to Sandy Silt	SM/ML	medium dense
45	Silty Sand to Sandy Silt	" "	medium dense
	Sand	SP	dense
	Sandy Silt to Clayey Silt	ML	medium dense
	Sand	SP	dense
	Sand to Silty Sand	SP/SM	dense
50			
55			

END OF SOUNDING AT 50 ft.



Project No.		PLATE
LE21248	LANDMARK Geo-Engineers and Geologists	B-8

LANDMARK CONSULTANTS, INC.

CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989, refer to Key to CPT logs)

Project: Wake Avenue Apartments - El Centro, CA **Project No:** LE21248 **Date:** 1/11/2022

CONE SOUNDING: CPT-8

Est. GWT (ft): 8 Phi Correlation: **0** 0-Schm(78),1-R&C(83),2-PHT(74)

Base Depth (m)	Base Depth (ft)	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	SPT N(60)	Norm. Qc1n	Est. % Fines	Rel. Dens. Dr (%)	**Nk:** Phi (deg.)	**17** Su (tsf)	OCR
0.15	0.5	58.77	1.24	Silty Sand to Sandy Silt	SM/ML	very dense	115	13	111.1	25	119	45		
0.30	1.0	88.57	1.58	Silty Sand to Sandy Silt	SM/ML	very dense	115	20	167.4	25	114	44		
0.45	1.5	51.50	2.87	Sandy Silt to Clayey Silt	ML	very dense	115	15	97.4	45	91	41		
0.60	2.0	29.53	7.87	Clay	CL/CH	very stiff	125	24		90			1.73	>10
0.75	2.5	25.31	8.11	Clay	CL/CH	very stiff	125	20		95			1.48	>10
0.93	3.0	20.15	8.39	Clay	CL/CH	very stiff	125	16		100			1.18	>10
1.08	3.5	16.32	7.97	Clay	CL/CH	stiff	125	13		100			0.95	>10
1.23	4.0	13.68	6.82	Clay	CL/CH	stiff	125	11		100			0.79	>10
1.38	4.5	10.50	5.76	Clay	CL/CH	stiff	125	8		100			0.60	>10
1.53	5.0	12.36	5.48	Clay	CL/CH	stiff	125	10		100			0.71	>10
1.68	5.5	10.61	7.15	Clay	CL/CH	stiff	125	8		100			0.61	>10
1.83	6.0	10.19	7.05	Clay	CL/CH	stiff	125	8		100			0.58	>10
1.98	6.5	9.81	6.33	Clay	CL/CH	stiff	125	8		100			0.55	>10
2.13	7.0	11.29	5.92	Clay	CL/CH	stiff	125	9		100			0.64	>10
2.28	7.5	12.35	6.57	Clay	CL/CH	stiff	125	10		100			0.70	>10
2.45	8.0	13.05	4.89	Clay	CL/CH	stiff	125	10		100			0.74	>10
2.60	8.5	12.64	5.34	Clay	CL/CH	stiff	125	10		100			0.71	>10
2.75	9.0	5.19	3.84	Clay	CL/CH	firm	125	4		100			0.28	2.65
2.90	9.5	7.10	5.24	Clay	CL/CH	firm	125	6		100			0.39	3.91
3.05	10.0	10.19	6.54	Clay	CL/CH	stiff	125	8		100			0.57	6.65
3.20	10.5	13.11	6.46	Clay	CL/CH	stiff	125	10		100			0.74	>10
3.35	11.0	21.85	5.77	Clay	CL/CH	very stiff	125	17		90			1.25	>10
3.50	11.5	27.11	2.90	Clayey Silt to Silty Clay	ML/CL	very stiff	120	11		65			1.56	>10
3.65	12.0	10.25	4.05	Clay	CL/CH	stiff	125	8		100			0.57	5.65
3.80	12.5	10.31	3.46	Silty Clay to Clay	CL	stiff	125	6		100			0.57	7.13
3.95	13.0	11.19	4.31	Clay	CL/CH	stiff	125	9		100			0.62	6.10
4.13	13.5	29.05	1.36	Sandy Silt to Clayey Silt	ML	medium dense	115	8	35.1	50	42	34		
4.28	14.0	17.83	3.12	Clayey Silt to Silty Clay	ML/CL	very stiff	120	7		85			1.01	>10
4.43	14.5	19.50	4.67	Clay	CL/CH	very stiff	125	16		95			1.11	>10
4.58	15.0	30.25	2.17	Sandy Silt to Clayey Silt	ML	medium dense	115	9	35.4	60	42	34		
4.73	15.5	37.04	2.01	Sandy Silt to Clayey Silt	ML	medium dense	115	11	43.0	55	48	35		
4.88	16.0	24.01	4.71	Clay	CL/CH	very stiff	125	19		90			1.37	>10
5.03	16.5	22.20	6.59	Clay	CL/CH	very stiff	125	18		100			1.26	>10
5.18	17.0	21.29	6.57	Clay	CL/CH	very stiff	125	17		100			1.21	>10
5.33	17.5	18.77	6.01	Clay	CL/CH	very stiff	125	15		100			1.06	>10
5.48	18.0	19.46	4.50	Clay	CL/CH	very stiff	125	16		100			1.10	>10
5.65	18.5	28.93	2.61	Sandy Silt to Clayey Silt	ML	loose	115	8	31.6	70	38	33		
5.80	19.0	65.24	1.62	Silty Sand to Sandy Silt	SM/ML	medium dense	115	14	70.6	40	62	37		
5.95	19.5	86.31	1.17	Sand to Silty Sand	SP/SM	dense	115	16	92.6	25	70	38		
6.10	20.0	130.45	0.84	Sand	SP	dense	110	20	138.9	15	82	40		
6.25	20.5	140.14	0.98	Sand	SP	dense	110	22	148.2	20	84	40		
6.40	21.0	97.55	1.69	Silty Sand to Sandy Silt	SM/ML	dense	115	22	102.4	30	73	38		
6.55	21.5	214.12	1.06	Sand	SP	very dense	110	33	223.2	15	96	41		
6.70	22.0	216.35	1.24	Sand	SP	very dense	110	33	224.0	15	96	41		
6.85	22.5	254.90	1.20	Sand	SP	very dense	110	39	262.1	15	101	42		
7.00	23.0	198.96	1.39	Sand to Silty Sand	SP/SM	very dense	115	36	203.2	20	93	41		
7.18	23.5	135.51	1.18	Sand to Silty Sand	SP/SM	dense	115	25	137.4	20	82	39		
7.33	24.0	111.08	1.29	Sand to Silty Sand	SP/SM	dense	115	20	111.8	25	76	39		
7.48	24.5	113.44	1.02	Sand to Silty Sand	SP/SM	dense	115	21	113.4	25	76	39		
7.63	25.0	79.80	1.83	Silty Sand to Sandy Silt	SM/ML	medium dense	115	18	79.2	40	66	37		
7.78	25.5	84.23	1.71	Silty Sand to Sandy Silt	SM/ML	medium dense	115	19	83.1	40	67	37		
7.93	26.0	148.72	0.87	Sand	SP	dense	110	23	145.7	15	84	40		
8.08	26.5	136.94	1.32	Sand to Silty Sand	SP/SM	dense	115	25	133.3	25	81	39		
8.23	27.0	147.68	1.29	Sand to Silty Sand	SP/SM	dense	115	27	142.8	25	83	40		
8.38	27.5	199.31	0.98	Sand	SP	very dense	110	31	191.6	15	92	41		
8.53	28.0	245.18	1.27	Sand	SP	very dense	110	38	234.3	15	98	42		
8.68	28.5	299.86	1.32	Sand	SP	very dense	110	46	285.0	15	103	42		
8.85	29.0	346.19	1.30	Sand	SP	very dense	110	53	327.1	15	107	43		
9.00	29.5	365.48	1.50	Sand	SP	very dense	110	56	343.4	15	109	43		
9.15	30.0	383.37	1.52	Sand	SP	very dense	110	59	358.3	15	110	43		
9.30	30.5	376.26	1.59	Sand to Silty Sand	SP/SM	very dense	115	68	349.6	15	109	43		
9.45	31.0	335.23	1.74	Sand to Silty Sand	SP/SM	very dense	115	61	309.6	20	106	43		
9.60	31.5	297.18	1.77	Sand to Silty Sand	SP/SM	very dense	115	54	272.9	20	102	42		
9.75	32.0	245.43	1.62	Sand to Silty Sand	SP/SM	very dense	115	45	224.0	20	96	41		
9.90	32.5	204.12	1.59	Sand to Silty Sand	SP/SM	very dense	115	37	185.3	25	91	41		
10.05	33.0	188.74	1.59	Sand to Silty Sand	SP/SM	dense	115	34	170.3	25	88	40		
10.20	33.5	174.19	1.92	Sand to Silty Sand	SP/SM	dense	115	32	156.3	30	86	40		
10.38	34.0	185.79	1.54	Sand to Silty Sand	SP/SM	dense	115	34	165.8	25	87	40		
10.53	34.5	211.00	1.15	Sand	SP	very dense	110	32	187.3	20	91	41		
10.68	35.0	232.60	0.92	Sand	SP	very dense	110	36	205.5	15	94	41		
10.83	35.5	194.53	1.13	Sand	SP	dense	110	30	171.0	20	88	40		
10.98	36.0	105.61	3.36	Sandy Silt to Clayey Silt	ML	dense	115	30	92.4	55	70	38		
11.13	36.5	141.35	1.53	Sand to Silty Sand	SP/SM	dense	115	26	123.0	30	79	39		
11.28	37.0	106.43	2.26	Silty Sand to Sandy Silt	SM/ML	dense	115	24	92.1	45	70	38		
11.43	37.5	136.42	1.48	Sand to Silty Sand	SP/SM	dense	115	25	117.4	30	77	39		
11.58	38.0	192.29	0.80	Sand	SP	dense	110	30	164.7	15	87	40		
11.73	38.5	190.41	0.98	Sand	SP	dense	110	29	162.4	20	87	40		

LANDMARK CONSULTANTS, INC.
CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989, refer to Key to CPT logs)

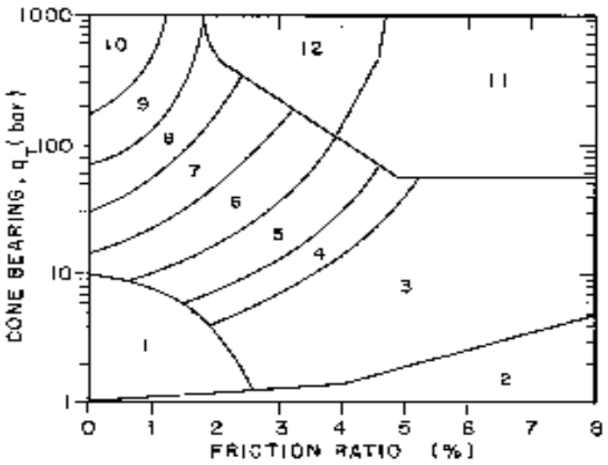
Project: Wake Avenue Apartments - El Centro, CA **Project No:** LE21248 **Date:** 1/11/2022

CONE SOUNDING: CPT-8
Est. GWT (ft): 8
Phi Correlation: **0** 0-Schm(78),1-R&C(83),2-PHT(74)

Base Depth (m)	Base Depth (ft)	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	SPT N(60)	Norm. Qc1n	Est. % Fines	Rel. Dens. Dr (%)	**Nk:** Phi (deg.)	**17** Su (tsf)	OCR
11.88	39.0	220.40	0.90	Sand	SP	very dense	110	34	187.1	15	91	41		
12.05	39.5	202.83	1.13	Sand	SP	dense	110	31	171.4	20	88	40		
12.20	40.0	228.30	1.12	Sand	SP	very dense	110	35	192.1	20	92	41		
12.35	40.5	229.68	1.16	Sand	SP	very dense	110	35	192.4	20	92	41		
12.50	41.0	205.78	1.04	Sand	SP	dense	110	32	171.6	20	88	40		
12.65	41.5	230.94	1.01	Sand	SP	very dense	110	36	191.7	20	92	41		
12.80	42.0	237.51	1.58	Sand to Silty Sand	SP/SM	very dense	115	43	196.3	25	92	41		
12.95	42.5	191.98	2.13	Silty Sand to Sandy Silt	SM/ML	dense	115	43	157.9	35	86	40		
13.10	43.0	253.92	1.07	Sand	SP	very dense	110	39	208.0	20	94	41		
13.25	43.5	172.49	2.14	Silty Sand to Sandy Silt	SM/ML	dense	115	38	140.6	35	83	40		
13.40	44.0	195.88	1.33	Sand to Silty Sand	SP/SM	dense	115	36	159.0	25	86	40		
13.58	44.5	162.77	1.28	Sand to Silty Sand	SP/SM	dense	115	30	131.5	30	81	39		
13.73	45.0	54.08	4.11	Clayey Silt to Silty Clay	ML/CL	hard	120	22		85			3.09	>10
13.88	45.5	27.26	3.34	Clayey Silt to Silty Clay	ML/CL	very stiff	120	11		100			1.52	>10
14.03	46.0	129.48	1.24	Sand to Silty Sand	SP/SM	dense	115	24	103.1	30	73	38		
14.18	46.5	227.13	0.90	Sand	SP	dense	110	35	180.1	20	90	41		
14.33	47.0	176.25	1.07	Sand	SP	dense	110	27	139.2	25	82	40		
14.48	47.5	77.60	1.47	Silty Sand to Sandy Silt	SM/ML	medium dense	115	17	61.1	50	58	36		
14.63	48.0	60.21	3.37	Sandy Silt to Clayey Silt	ML	medium dense	115	17	47.2	75	50	35		
14.78	48.5	166.51	1.51	Sand to Silty Sand	SP/SM	dense	115	30	129.9	30	80	39		
14.93	49.0	263.70	1.15	Sand	SP	very dense	110	41	204.9	20	94	41		
15.10	49.5	247.35	1.51	Sand to Silty Sand	SP/SM	very dense	115	45	191.4	25	92	41		
15.25	50.0	185.41	1.54	Sand to Silty Sand	SP/SM	dense	115	34	142.9	30	83	40		

Simplified Soil Classification Chart

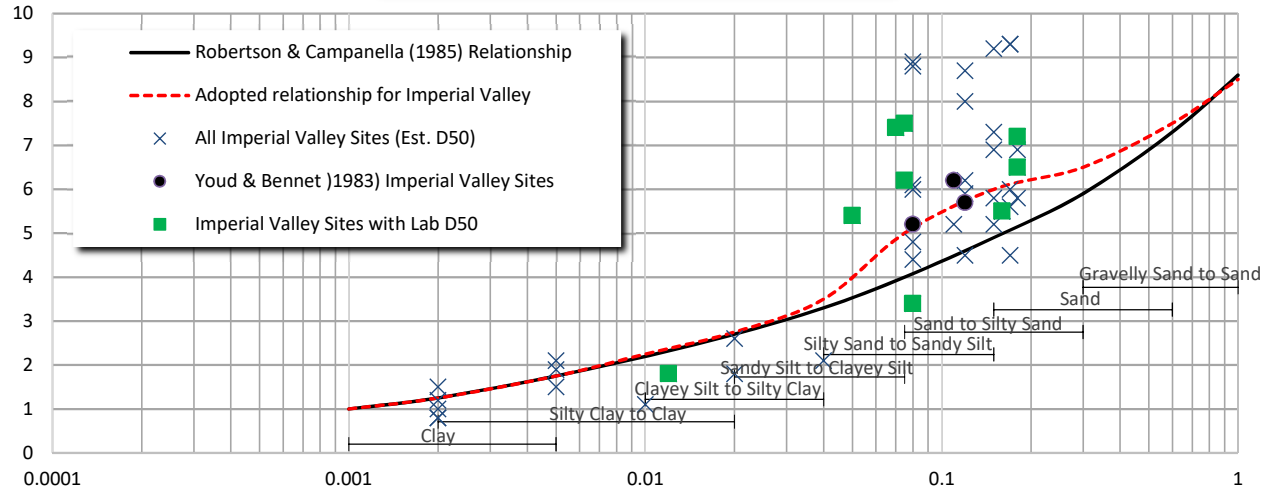
After Robertson & Campanella (1989)



Geotechnical Parameters from CPT Data:

Equivalent SPT N(60) blow count = Qc/(Qc/N Ratio)
N1(60) = Cn*N(60) Normalized SPT blow count
Cn = 1/(p'o)^0.5 < 1.6 max. from Liao & Whitman (1986)
p'o = effective overburden pressure (tsf) using unit densities given below and estimated groundwater table.
Dr = Relative density (%) from Jamiolkowski et. al. (1986) relationship
= -98 +68*log(Qc/p'o^0.5) where Qc, p'o in tonne/sqm
Note: 1 tonne/sqm = 0.1024 tsf, 1 bar =1.0443 tsf
Phi = Friction Angle estimated from either:
1. Roberton & Campanella (1983) chart:
Phi = 5.3 + 24*(log(Qc/p'o))+3(log(Qc/p'o))^2
2. Peck, Hansen & Thornburn (1974) N-Phi Correlation
3. Schmertman (1978) chart [Phi = 28+0.14*Dr for fine uniform sands]
Su = undrained shear strength (tsf)
= (Qc-p'o)/Nk where Nk varies from 10 to 22, 17 for OC clays
OCR = Overconsolidation Ratio estimated from Schmertman (1978) chart using Su/p'o ratio and estimated normal consolidated Su/p'o

Variation of Qc/N Ratio with Grain Size



Note: Assumed Properties and Adopted Qc/N Ratio based on correlations from Imperial Valley, California soils

Table of Soil Types and Assumed Properties

Zone	Soil Classification	UCS	Density (pcf)	R&C Qc/N	Adopted Qc/N	Est. PI	Fines (%)	D50 (mm)
1	Sensitive fine grained	ML	120	2	2	NP-15	65-100	0.02
2	Organic Material	OL/OH	120	1	1	--	--	--
3	Clay	CL/CH	125	1	1.25	25-40+	90-100	0.002
4	Silty Clay to Clay	CL	125	1.5	2	15-40	90-100	0.01
5	Clayey Silt to Silty Clay	ML/CL	120	2	2.75	25-May	90-100	0.02
6	Sandy Silt to Clayey Silt	ML	115	2.5	3.5	NP-10	65-100	0.04
7	Silty Sand to Sandy Silt	SM/ML	115	3	5	NP	35-75	0.075
8	Sand to Silty Sand	SP/SM	115	4	6	NP	May-35	0.15
9	Sand	SP	110	5	6.5	NP	0-5	0.3
10	Gravelly Sand to Sand	SW	115	6	7.5	NP	0-5	0.6
11	Overconsolidated Soil	--	120	1	1	NP	90-100	0.01
12	Sand to Clayey Sand	SP/SC	115	2	2	NP-5	--	---

Su (tsf)	Consistency
0-0.13	very soft
0.13-.25	soft
0.25-0.5	firm
0.5-1.0	stiff
1.0-2.0	very stiff
>2.0	hard
Dr (%)	**Relative Density**
0-15	very loose
15-35	loose
35-65	medium dense
65-85	dense
>85	very dense

LANDMARK
Geo-Engineers and Geologists

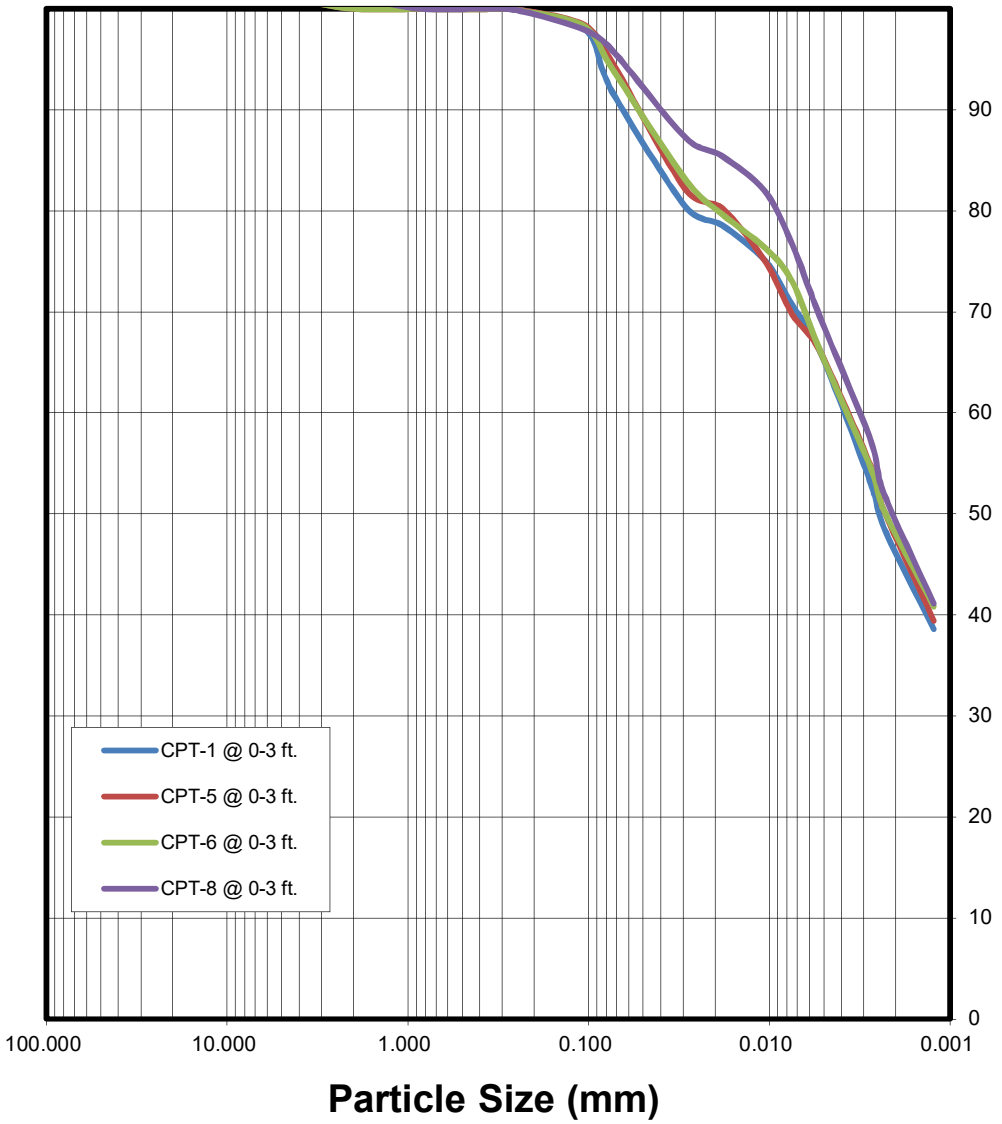
Project No: LE21248

Key to CPT Interpretation of Logs

Plate B-9

APPENDIX C

SIEVE ANALYSIS					HYDROMETER ANALYSIS
Gravel		Sand			Silt and Clay Fraction
Coarse	Fine	Coarse	Medium	Fine	



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Project No.: LE21248

Grain Size Analysis

Plate C-1

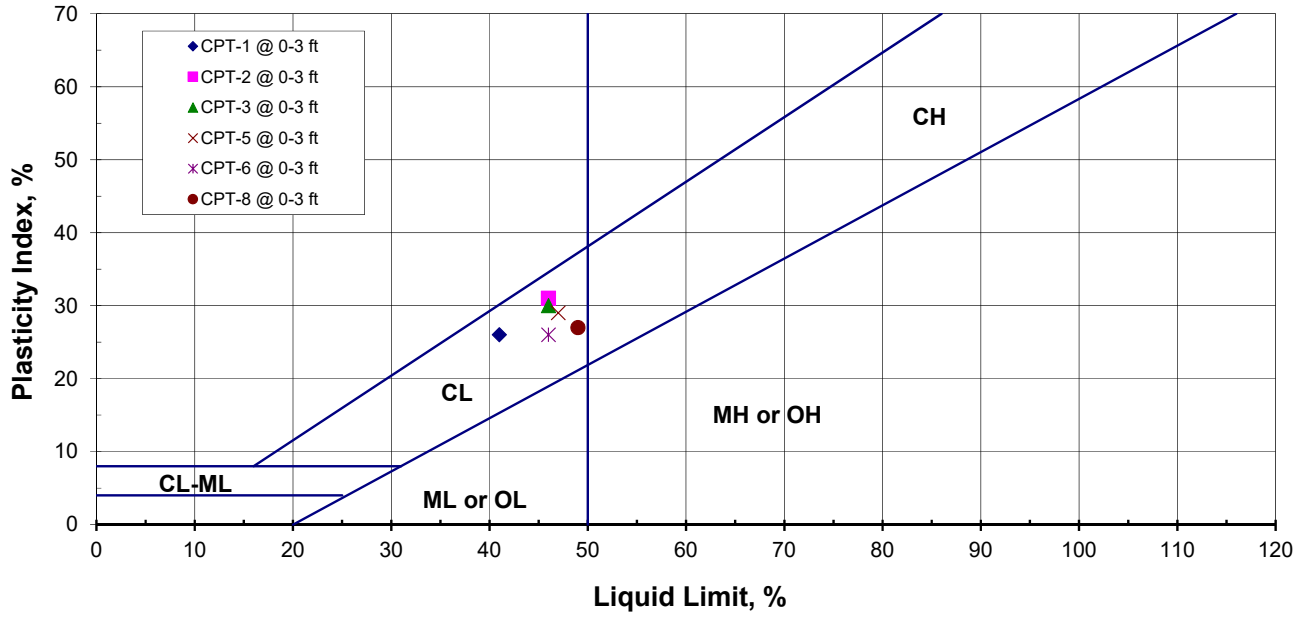
LANDMARK CONSULTANTS, INC.

CLIENT: Chelsea Investment Corp.
PROJECT: Wake Avenue Apartments - El Centro, CA
JOB No.: LE21248
DATE: 01/31/22

ATTERBERG LIMITS (ASTM D4318)

Sample Location	Sample Depth (ft)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	USCS Classification
CPT-1	0-3	41	15	26	CL
CPT-2	0-3	46	15	31	CL
CPT-3	0-3	46	16	30	CL
CPT-5	0-3	47	18	29	CL
CPT-6	0-3	46	20	26	CL
CPT-8	0-3	49	22	27	CL

PLASTICITY CHART



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Project No.: LE21248

Atterberg Limits Test Results

Plate C-2

LANDMARK CONSULTANTS, INC.

CLIENT: Chelsea Investment Corp.
PROJECT: Wake Avenue Apartments - El Centro, CA
JOB No.: LE21248
DATE: 01/31/22

CHEMICAL ANALYSIS

Boring: / **Sample Depth, ft:**	CPT-1 0-3	CPT-5 0-3	CPT-6 0-3	CPT-8 0-3	**Caltrans Method**
pH:	7.9	8.0	7.9	7.8	**643**
Electrical Conductivity (mmhos):	--	--	--	--	**424**
Resistivity (ohm-cm):	120	110	100	80	**643**
Chloride (Cl), ppm:	4,360	4,600	4,960	7,540	**422**
Sulfate (SO4), ppm:	6,786	6,209	6,890	7,890	**417**

General Guidelines for Soil Corrosivity

Material Affected	Chemical Agent	Range of Values	Degree of Corrosivity
Concrete	Soluble Sulfates (ppm)	0 - 1,000	Low
		1,000 - 2,000	Moderate
		2,000 - 20,000	Severe
		> 20,000	Very Severe
Normal Grade Steel	Soluble Chlorides (ppm)	0 - 200	Low
		200 - 700	Moderate
		700 - 1,500	Severe
		> 1,500	Very Severe
Normal Grade Steel	Resistivity (ohm-cm)	1 - 1,000	Very Severe
		1,000 - 2,000	Severe
		2,000 - 10,000	Moderate
		> 10,000	Low

LANDMARK Geo-Engineers and Geologists

Project No.: LE21248

Selected Chemical Test Results

Plate C-3

LANDMARK CONSULTANTS, INC.

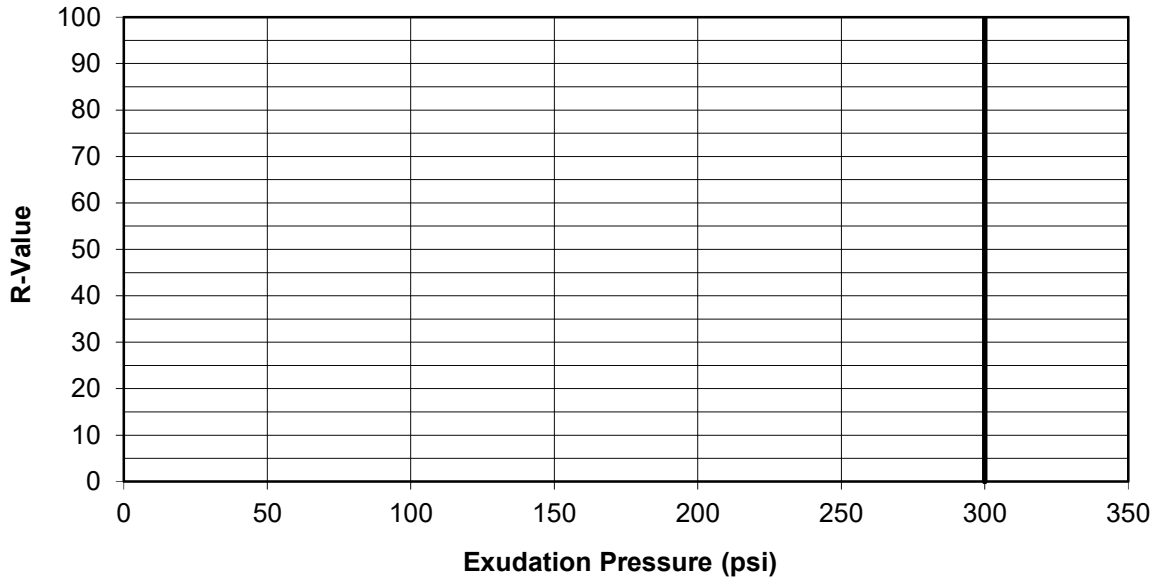
Client: Chelsea Investment Corp.
Project: Wake Avenue Apartments -- El Centro, CA
Project No.: LE21248
Date: 1/31/2022 **Lab No.:** _____

R-Value By Exudation Pressure (ASTM D2844/CAL 301)

Description: Silty Clay (CL)
Sample Location: CPT-7
Sample Depth: 0-3 ft.

Sample	A	B	C
Moisture Content, %:	18.0%	17.0%	16.0%
Dry Density, pcf:	108.1	109.8	112.4
Compaction foot pressure, psi:	200	200	200
Specimen Height, in.:	2.57	2.58	2.52
Stabilometer, Ph @ 1000 lb:			
Stabilometer, Ph @ 2000 lb:			
Displacement:			
Expansion pressure, psf:			
Exudation pressure, psi:			
Equilibrum R Value:			

R-Value <5



LANDMARK Geo-Engineers and Geologists

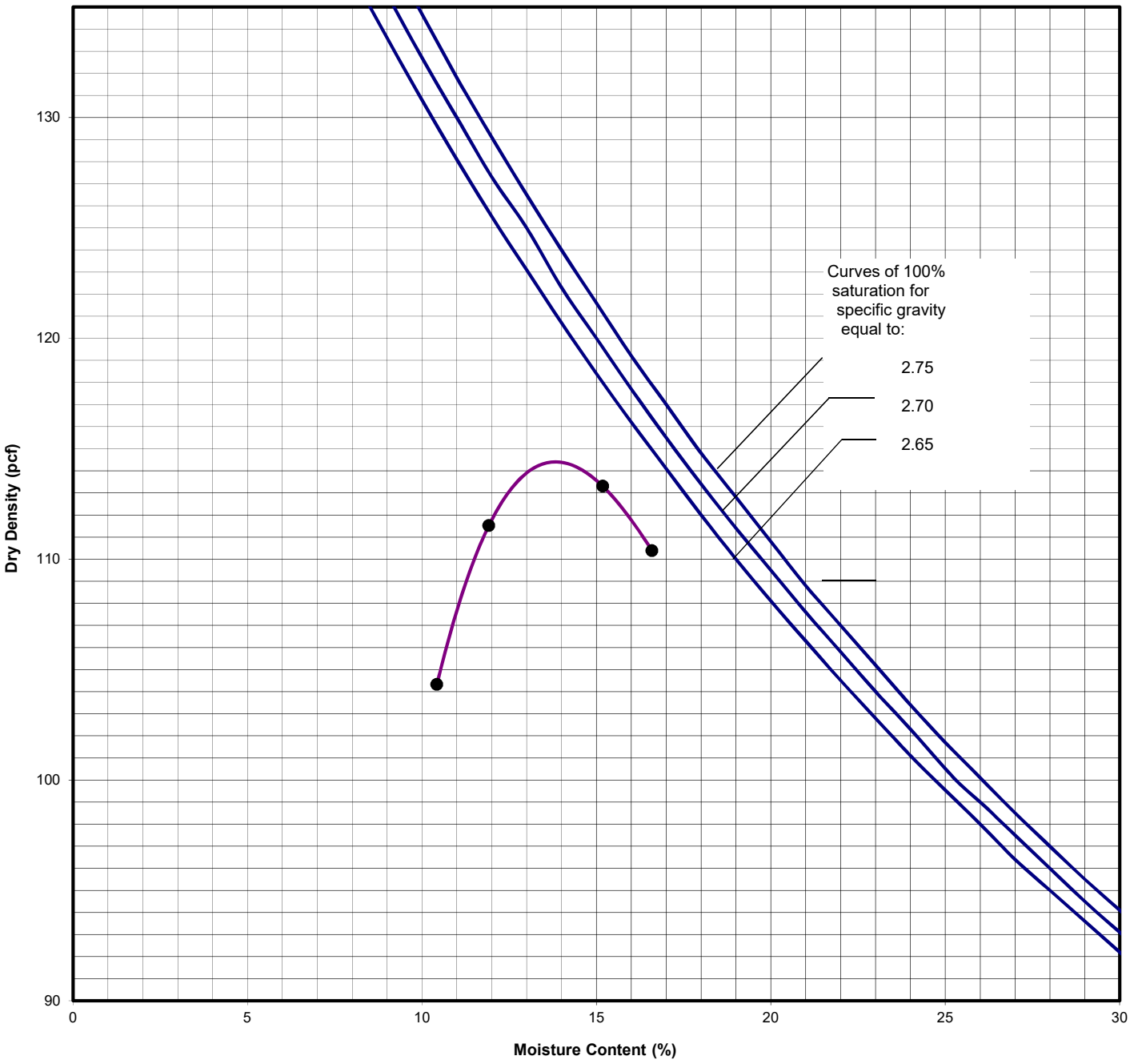
Project No.: LE21248

R-Value Test

Plate C-4

Client: Chelsea Investment Corp.
Project: Wake Avenue Apartments - El Centro, CA
Project No.: LE21248
Date: 1/25/2022
Lab. No.: EC22-5

Soil Description: Silty Clay (CL)
Sample Location: CPT-4 @ 0-3 ft.
Test Method: ASTM D-1557-A
Maximum Dry Density (pcf): **114.4**
Optimum Moisture Content (%): **13.9**



LANDMARK
Geo-Engineers and Geologists

Project No.: LE21248

Moisture Density Relationship

Plate C-5

APPENDIX D

Landmark Consultants, Inc.
780 N. 4th Street
El Centro, CA 92243

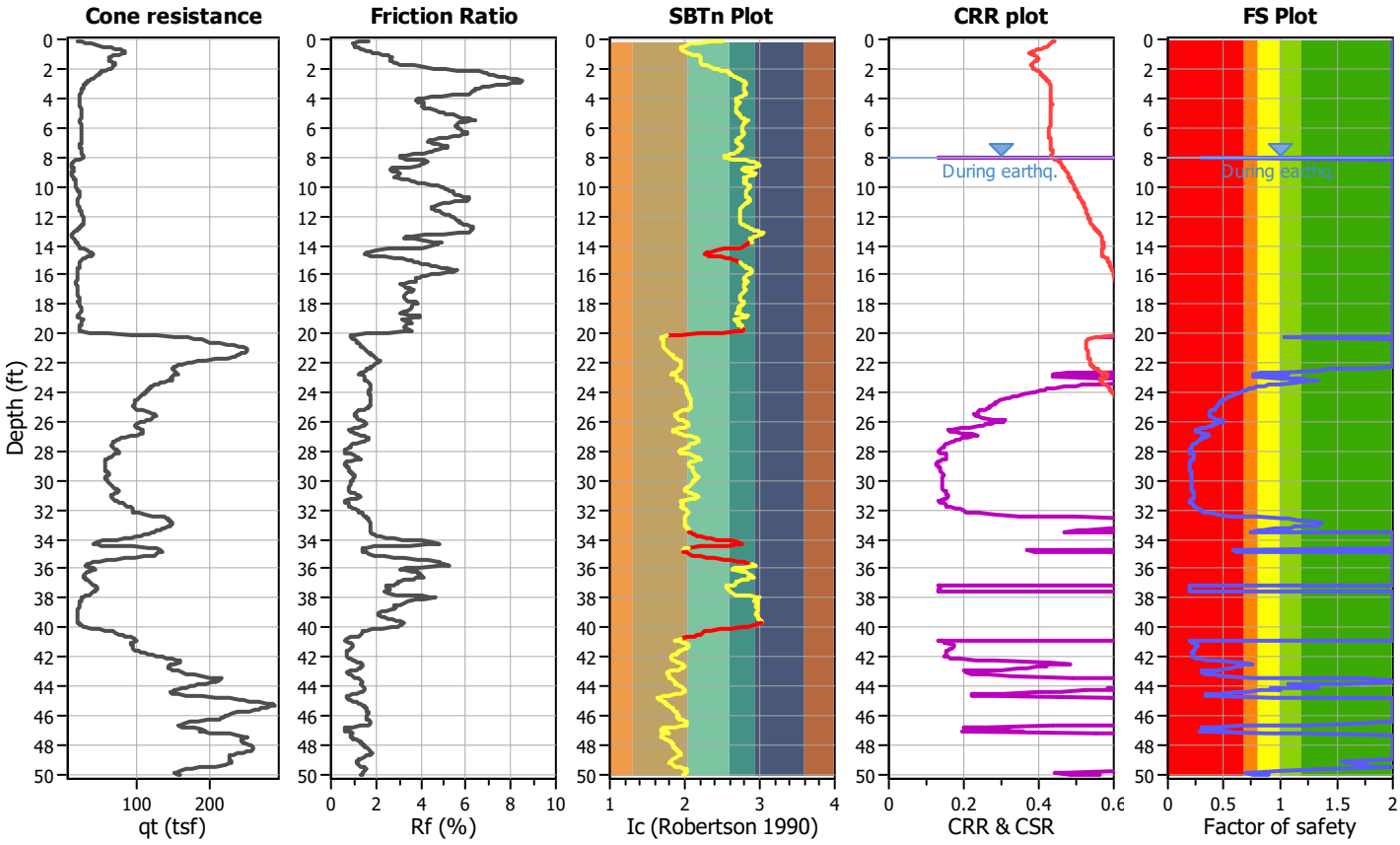
LIQUEFACTION ANALYSIS REPORT

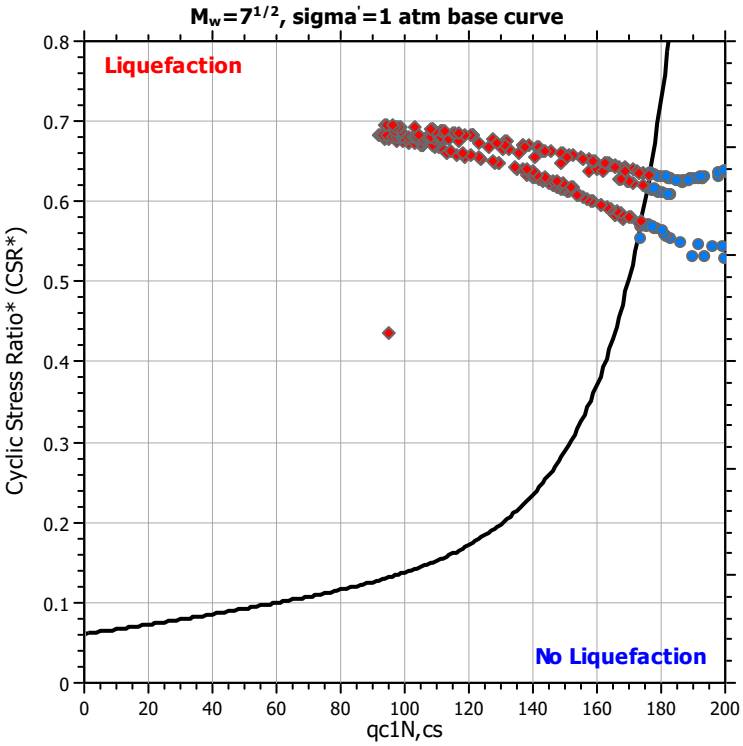
Project title : Wake Avenue Apartments **Location : El Centro, CA**

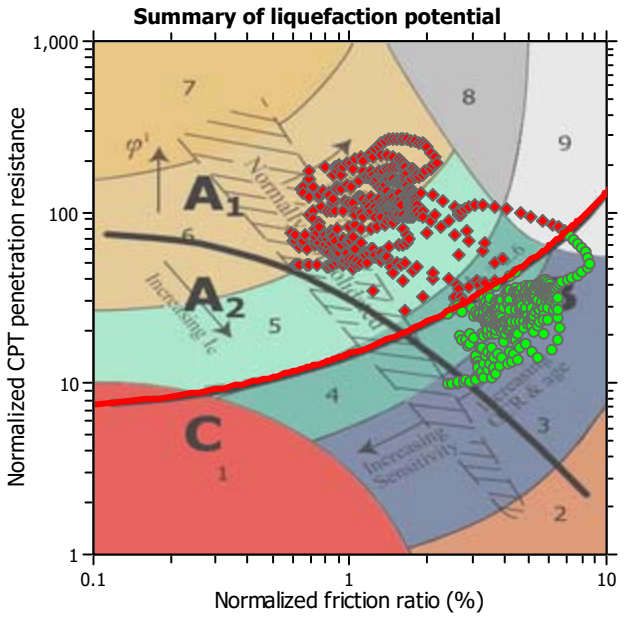
CPT file : CPT-1

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

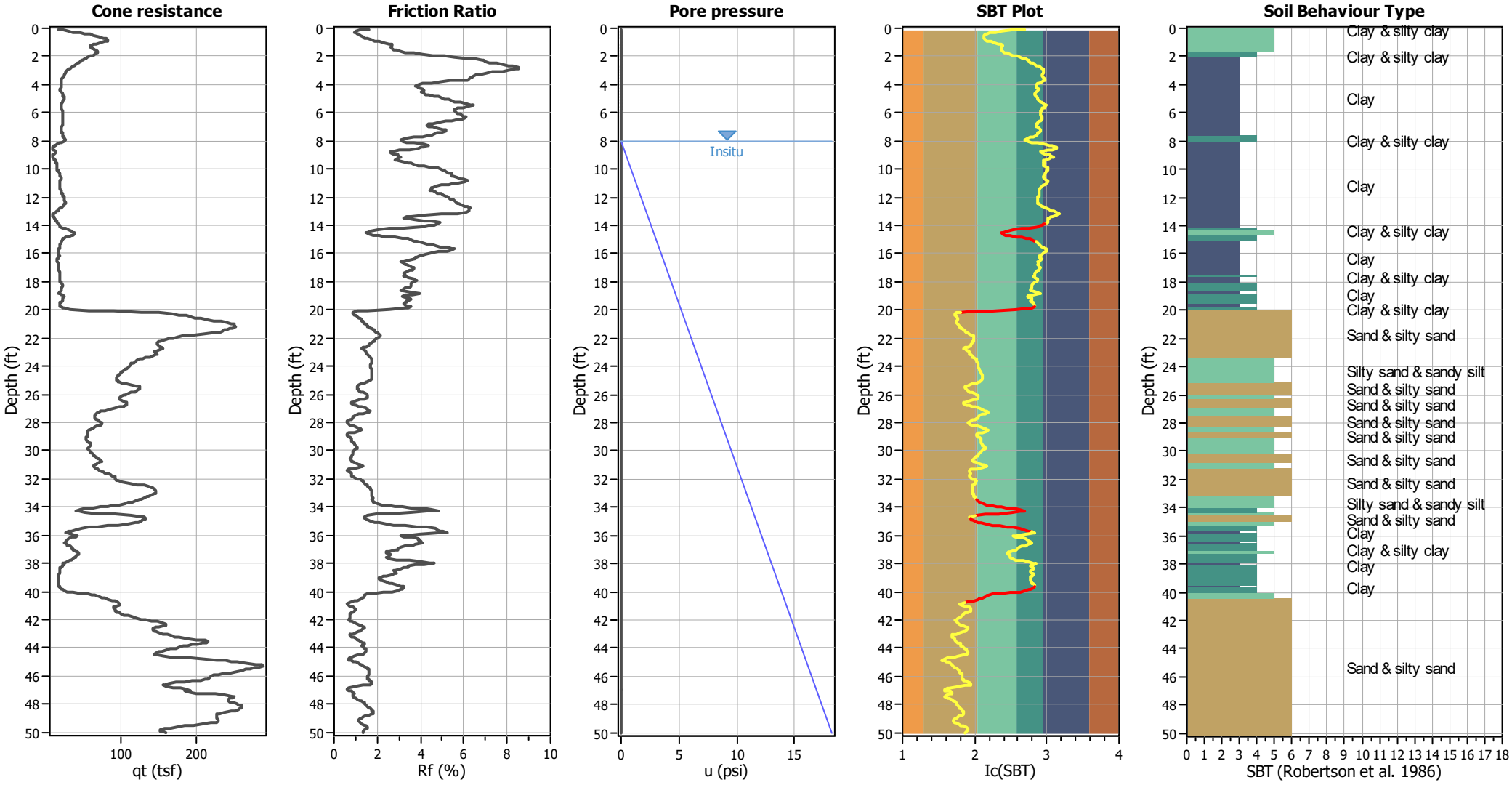






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



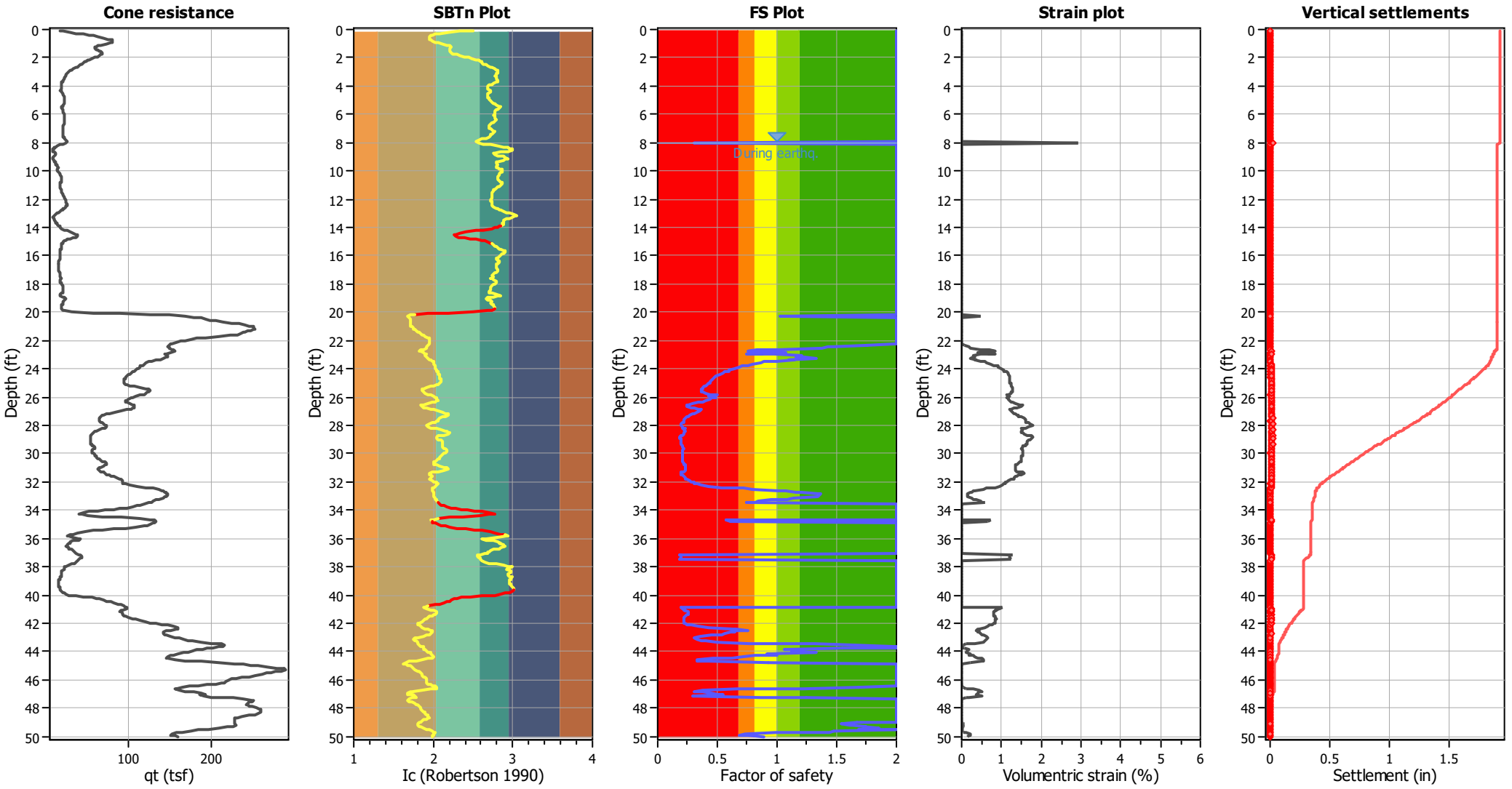
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement due to soil liquefaction ::

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
8.01	94.94	0.30	2.93	0.86	0.02	8.10	29.89	2.00	0.00	0.86	0.00
8.16	23.99	2.00	0.00	0.86	0.00	8.20	21.23	2.00	0.00	0.86	0.00
8.29	17.66	2.00	0.00	0.86	0.00	8.35	15.52	2.00	0.00	0.86	0.00
8.44	13.77	2.00	0.00	0.86	0.00	8.48	12.83	2.00	0.00	0.86	0.00
8.55	12.14	2.00	0.00	0.86	0.00	8.64	12.64	2.00	0.00	0.85	0.00
8.69	15.55	2.00	0.00	0.85	0.00	8.74	16.84	2.00	0.00	0.85	0.00
8.80	18.00	2.00	0.00	0.85	0.00	8.88	17.18	2.00	0.00	0.85	0.00
8.94	15.06	2.00	0.00	0.85	0.00	8.99	13.86	2.00	0.00	0.85	0.00
9.07	11.73	2.00	0.00	0.85	0.00	9.14	13.54	2.00	0.00	0.85	0.00
9.19	11.43	2.00	0.00	0.84	0.00	9.25	13.25	2.00	0.00	0.84	0.00
9.33	16.22	2.00	0.00	0.84	0.00	9.39	17.36	2.00	0.00	0.84	0.00
9.48	17.44	2.00	0.00	0.84	0.00	9.54	17.41	2.00	0.00	0.84	0.00
9.58	18.66	2.00	0.00	0.84	0.00	9.65	20.14	2.00	0.00	0.84	0.00
9.73	20.85	2.00	0.00	0.84	0.00	9.81	20.56	2.00	0.00	0.83	0.00
9.88	19.89	2.00	0.00	0.83	0.00	9.91	19.87	2.00	0.00	0.83	0.00
9.98	19.83	2.00	0.00	0.83	0.00	10.05	21.03	2.00	0.00	0.83	0.00
10.12	21.74	2.00	0.00	0.83	0.00	10.18	22.69	2.00	0.00	0.83	0.00
10.27	23.87	2.00	0.00	0.83	0.00	10.32	24.56	2.00	0.00	0.83	0.00
10.37	24.90	2.00	0.00	0.82	0.00	10.47	25.44	2.00	0.00	0.82	0.00
10.51	25.65	2.00	0.00	0.82	0.00	10.58	26.22	2.00	0.00	0.82	0.00
10.67	26.15	2.00	0.00	0.82	0.00	10.70	26.13	2.00	0.00	0.82	0.00
10.77	25.70	2.00	0.00	0.82	0.00	10.83	22.79	2.00	0.00	0.82	0.00
10.91	23.22	2.00	0.00	0.82	0.00	10.97	23.79	2.00	0.00	0.81	0.00
11.03	23.16	2.00	0.00	0.81	0.00	11.12	23.11	2.00	0.00	0.81	0.00
11.16	23.09	2.00	0.00	0.81	0.00	11.27	23.75	2.00	0.00	0.81	0.00
11.31	24.10	2.00	0.00	0.81	0.00	11.37	24.54	2.00	0.00	0.81	0.00
11.46	25.07	2.00	0.00	0.81	0.00	11.50	25.41	2.00	0.00	0.81	0.00
11.56	25.97	2.00	0.00	0.80	0.00	11.63	26.74	2.00	0.00	0.80	0.00
11.71	27.27	2.00	0.00	0.80	0.00	11.76	27.47	2.00	0.00	0.80	0.00
11.86	28.46	2.00	0.00	0.80	0.00	11.90	29.01	2.00	0.00	0.80	0.00
11.96	30.11	2.00	0.00	0.80	0.00	12.04	30.98	2.00	0.00	0.80	0.00
12.10	31.16	2.00	0.00	0.79	0.00	12.15	31.35	2.00	0.00	0.79	0.00
12.24	31.74	2.00	0.00	0.79	0.00	12.30	32.26	2.00	0.00	0.79	0.00
12.35	32.33	2.00	0.00	0.79	0.00	12.45	32.14	2.00	0.00	0.79	0.00
12.50	31.88	2.00	0.00	0.79	0.00	12.55	30.70	2.00	0.00	0.79	0.00
12.64	28.93	2.00	0.00	0.79	0.00	12.70	27.16	2.00	0.00	0.78	0.00
12.75	26.22	2.00	0.00	0.78	0.00	12.81	23.87	2.00	0.00	0.78	0.00
12.89	22.21	2.00	0.00	0.78	0.00	12.95	19.75	2.00	0.00	0.78	0.00
12.99	17.98	2.00	0.00	0.78	0.00	13.06	15.13	2.00	0.00	0.78	0.00
13.14	12.87	2.00	0.00	0.78	0.00	13.21	11.78	2.00	0.00	0.78	0.00
13.29	11.89	2.00	0.00	0.77	0.00	13.33	11.99	2.00	0.00	0.77	0.00
13.39	12.46	2.00	0.00	0.77	0.00	13.48	13.26	2.00	0.00	0.77	0.00
13.53	13.72	2.00	0.00	0.77	0.00	13.59	14.64	2.00	0.00	0.77	0.00
13.66	16.01	2.00	0.00	0.77	0.00	13.74	18.06	2.00	0.00	0.77	0.00
13.78	19.19	2.00	0.00	0.77	0.00	13.86	17.79	2.00	0.00	0.77	0.00
13.93	22.77	2.00	0.00	0.76	0.00	13.98	21.85	2.00	0.00	0.76	0.00
14.04	20.81	2.00	0.00	0.76	0.00	14.14	24.94	2.00	0.00	0.76	0.00
14.19	24.96	2.00	0.00	0.76	0.00	14.25	90.92	2.00	0.00	0.76	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
14.34	94.55	2.00	0.00	0.76	0.00	14.41	97.85	2.00	0.00	0.76	0.00
14.48	100.61	2.00	0.00	0.75	0.00	14.53	101.50	2.00	0.00	0.75	0.00
14.59	103.14	2.00	0.00	0.75	0.00	14.68	100.37	2.00	0.00	0.75	0.00
14.71	99.04	2.00	0.00	0.75	0.00	14.78	94.24	2.00	0.00	0.75	0.00
14.86	90.55	2.00	0.00	0.75	0.00	14.93	28.98	2.00	0.00	0.75	0.00
14.97	27.95	2.00	0.00	0.75	0.00	15.03	26.04	2.00	0.00	0.75	0.00
15.10	24.46	2.00	0.00	0.74	0.00	15.17	23.75	2.00	0.00	0.74	0.00
15.23	22.72	2.00	0.00	0.74	0.00	15.29	23.23	2.00	0.00	0.74	0.00
15.37	23.31	2.00	0.00	0.74	0.00	15.43	22.84	2.00	0.00	0.74	0.00
15.52	22.02	2.00	0.00	0.74	0.00	15.57	21.99	2.00	0.00	0.74	0.00
15.62	20.64	2.00	0.00	0.74	0.00	15.69	20.61	2.00	0.00	0.73	0.00
15.77	19.81	2.00	0.00	0.73	0.00	15.82	19.79	2.00	0.00	0.73	0.00
15.88	19.77	2.00	0.00	0.73	0.00	15.97	19.74	2.00	0.00	0.73	0.00
16.02	20.37	2.00	0.00	0.73	0.00	16.11	20.45	2.00	0.00	0.73	0.00
16.16	20.76	2.00	0.00	0.73	0.00	16.23	20.41	2.00	0.00	0.73	0.00
16.31	19.39	2.00	0.00	0.72	0.00	16.36	18.93	2.00	0.00	0.72	0.00
16.41	18.04	2.00	0.00	0.72	0.00	16.49	17.47	2.00	0.00	0.72	0.00
16.56	17.45	2.00	0.00	0.72	0.00	16.62	17.32	2.00	0.00	0.72	0.00
16.71	18.38	2.00	0.00	0.72	0.00	16.75	18.69	2.00	0.00	0.72	0.00
16.81	18.89	2.00	0.00	0.72	0.00	16.91	19.07	2.00	0.00	0.71	0.00
16.96	19.05	2.00	0.00	0.71	0.00	17.01	18.70	2.00	0.00	0.71	0.00
17.06	18.79	2.00	0.00	0.71	0.00	17.14	19.41	2.00	0.00	0.71	0.00
17.21	19.92	2.00	0.00	0.71	0.00	17.26	20.65	2.00	0.00	0.71	0.00
17.36	21.05	2.00	0.00	0.71	0.00	17.40	21.03	2.00	0.00	0.71	0.00
17.45	20.38	2.00	0.00	0.70	0.00	17.56	21.29	2.00	0.00	0.70	0.00
17.61	22.44	2.00	0.00	0.70	0.00	17.65	22.42	2.00	0.00	0.70	0.00
17.76	20.26	2.00	0.00	0.70	0.00	17.80	20.24	2.00	0.00	0.70	0.00
17.88	20.21	2.00	0.00	0.70	0.00	17.95	21.02	2.00	0.00	0.70	0.00
17.99	21.54	2.00	0.00	0.70	0.00	18.05	22.68	2.00	0.00	0.69	0.00
18.14	23.80	2.00	0.00	0.69	0.00	18.18	24.62	2.00	0.00	0.69	0.00
18.25	25.01	2.00	0.00	0.69	0.00	18.31	23.62	2.00	0.00	0.69	0.00
18.39	23.73	2.00	0.00	0.69	0.00	18.45	23.71	2.00	0.00	0.69	0.00
18.54	23.83	2.00	0.00	0.69	0.00	18.59	23.71	2.00	0.00	0.68	0.00
18.64	23.05	2.00	0.00	0.68	0.00	18.74	19.25	2.00	0.00	0.68	0.00
18.79	18.49	2.00	0.00	0.68	0.00	18.84	18.48	2.00	0.00	0.68	0.00
18.92	24.07	2.00	0.00	0.68	0.00	18.99	26.64	2.00	0.00	0.68	0.00
19.04	26.72	2.00	0.00	0.68	0.00	19.10	26.58	2.00	0.00	0.68	0.00
19.18	23.97	2.00	0.00	0.67	0.00	19.25	23.52	2.00	0.00	0.67	0.00
19.32	24.32	2.00	0.00	0.67	0.00	19.38	24.19	2.00	0.00	0.67	0.00
19.43	22.83	2.00	0.00	0.67	0.00	19.49	20.74	2.00	0.00	0.67	0.00
19.58	20.50	2.00	0.00	0.67	0.00	19.63	20.48	2.00	0.00	0.67	0.00
19.73	20.25	2.00	0.00	0.67	0.00	19.77	21.67	2.00	0.00	0.66	0.00
19.83	22.56	2.00	0.00	0.66	0.00	19.88	26.12	2.00	0.00	0.66	0.00
19.97	86.66	2.00	0.00	0.66	0.00	20.03	103.35	2.00	0.00	0.66	0.00
20.12	136.95	2.00	0.00	0.66	0.00	20.16	133.59	2.00	0.00	0.66	0.00
20.22	165.63	2.00	0.00	0.66	0.00	20.28	173.51	1.03	0.47	0.66	0.00
20.38	189.77	2.00	0.00	0.65	0.00	20.42	193.58	2.00	0.00	0.65	0.00
20.52	200.07	2.00	0.00	0.65	0.00	20.57	206.01	2.00	0.00	0.65	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
20.61	209.81	2.00	0.00	0.65	0.00	20.67	219.13	2.00	0.00	0.65	0.00
20.76	229.58	2.00	0.00	0.65	0.00	20.82	239.17	2.00	0.00	0.65	0.00
20.87	243.33	2.00	0.00	0.65	0.00	20.97	252.26	2.00	0.00	0.64	0.00
21.02	253.19	2.00	0.00	0.64	0.00	21.09	254.00	2.00	0.00	0.64	0.00
21.16	254.00	2.00	0.00	0.64	0.00	21.20	253.45	2.00	0.00	0.64	0.00
21.26	251.17	2.00	0.00	0.64	0.00	21.35	248.34	2.00	0.00	0.64	0.00
21.41	247.09	2.00	0.00	0.64	0.00	21.46	249.42	2.00	0.00	0.64	0.00
21.56	249.36	2.00	0.00	0.63	0.00	21.61	250.96	2.00	0.00	0.63	0.00
21.66	253.56	2.00	0.00	0.63	0.00	21.76	240.31	2.00	0.00	0.63	0.00
21.82	232.29	2.00	0.00	0.63	0.00	21.85	230.21	2.00	0.00	0.63	0.00
21.95	219.88	2.00	0.00	0.63	0.00	22.00	215.67	2.00	0.00	0.63	0.00
22.05	208.15	2.00	0.00	0.63	0.00	22.15	199.24	2.00	0.00	0.62	0.00
22.20	196.25	2.00	0.00	0.62	0.00	22.25	192.09	2.00	0.00	0.62	0.00
22.35	186.54	1.75	0.07	0.62	0.00	22.39	182.88	1.48	0.17	0.62	0.00
22.45	182.06	1.42	0.19	0.62	0.00	22.54	181.27	1.37	0.21	0.62	0.00
22.60	173.86	1.01	0.46	0.62	0.00	22.65	168.35	0.83	0.70	0.62	0.00
22.73	165.61	0.75	0.84	0.61	0.01	22.80	167.67	0.81	0.73	0.61	0.01
22.84	175.37	1.07	0.41	0.61	0.00	22.93	165.58	0.75	0.84	0.61	0.01
22.99	173.17	0.98	0.49	0.61	0.00	23.04	178.34	1.20	0.31	0.61	0.00
23.15	177.36	1.16	0.34	0.61	0.00	23.19	178.74	1.22	0.29	0.61	0.00
23.24	180.77	1.33	0.23	0.61	0.00	23.34	176.13	1.10	0.38	0.60	0.00
23.38	177.33	1.15	0.34	0.60	0.00	23.44	173.79	1.00	0.46	0.60	0.00
23.51	170.64	0.89	0.59	0.60	0.01	23.57	169.89	0.86	0.62	0.60	0.00
23.64	167.61	0.80	0.73	0.60	0.01	23.73	166.00	0.75	0.81	0.60	0.01
23.79	164.36	0.71	0.89	0.60	0.01	23.83	163.96	0.70	0.90	0.60	0.00
23.89	162.96	0.68	0.93	0.60	0.01	23.98	161.53	0.65	0.97	0.59	0.01
24.03	161.26	0.65	0.98	0.59	0.01	24.13	158.75	0.60	1.06	0.59	0.01
24.15	158.43	0.59	1.08	0.59	0.00	24.23	156.86	0.57	1.13	0.59	0.01
24.32	155.78	0.55	1.17	0.59	0.01	24.38	154.33	0.53	1.18	0.59	0.01
24.42	154.03	0.52	1.18	0.59	0.01	24.53	151.14	0.48	1.20	0.58	0.02
24.56	150.77	0.48	1.20	0.58	0.01	24.62	150.10	0.47	1.21	0.58	0.01
24.68	149.45	0.46	1.21	0.58	0.01	24.74	149.01	0.46	1.21	0.58	0.01
24.82	148.14	0.45	1.22	0.58	0.01	24.87	147.36	0.44	1.22	0.58	0.01
24.97	147.10	0.44	1.22	0.58	0.01	25.01	146.27	0.43	1.23	0.58	0.01
25.08	145.33	0.42	1.24	0.57	0.01	25.16	144.86	0.41	1.24	0.57	0.01
25.21	143.15	0.40	1.25	0.57	0.01	25.26	142.02	0.39	1.26	0.57	0.01
25.36	140.07	0.37	1.28	0.57	0.01	25.42	140.17	0.37	1.28	0.57	0.01
25.47	138.43	0.36	1.29	0.57	0.01	25.57	139.31	0.37	1.28	0.57	0.02
25.61	139.87	0.37	1.27	0.57	0.01	25.67	140.72	0.38	1.26	0.56	0.01
25.76	143.18	0.40	1.23	0.56	0.01	25.81	148.16	0.44	1.18	0.56	0.01
25.86	152.77	0.50	1.14	0.56	0.01	25.95	146.53	0.43	1.19	0.56	0.01
26.00	152.10	0.49	1.14	0.56	0.01	26.07	149.22	0.46	1.17	0.56	0.01
26.15	147.37	0.44	1.18	0.56	0.01	26.20	144.53	0.41	1.20	0.56	0.01
26.25	143.81	0.40	1.21	0.56	0.01	26.32	141.28	0.38	1.23	0.55	0.01
26.39	135.24	0.34	1.29	0.55	0.01	26.46	128.23	0.30	1.36	0.55	0.01
26.54	118.63	0.26	1.48	0.55	0.01	26.59	113.16	0.24	1.55	0.55	0.01
26.69	116.32	0.25	1.50	0.55	0.02	26.73	123.46	0.28	1.41	0.55	0.01
26.80	129.50	0.30	1.33	0.55	0.01	26.84	136.90	0.35	1.25	0.55	0.01

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
26.91	140.01	0.37	1.22	0.54	0.01	26.98	138.42	0.36	1.23	0.54	0.01
27.05	134.22	0.33	1.27	0.54	0.01	27.13	129.27	0.30	1.32	0.54	0.01
27.18	127.48	0.29	1.34	0.54	0.01	27.24	123.26	0.27	1.39	0.54	0.01
27.33	120.56	0.26	1.42	0.54	0.01	27.38	118.36	0.25	1.44	0.54	0.01
27.43	114.46	0.24	1.49	0.54	0.01	27.53	109.16	0.23	1.57	0.53	0.02
27.58	105.53	0.22	1.62	0.53	0.01	27.67	105.41	0.22	1.62	0.53	0.02
27.70	105.66	0.22	1.61	0.53	0.01	27.78	104.97	0.22	1.62	0.53	0.02
27.83	101.28	0.21	1.68	0.53	0.01	27.92	97.74	0.20	1.73	0.53	0.02
27.97	94.02	0.19	1.80	0.53	0.01	28.03	94.99	0.19	1.78	0.52	0.01
28.10	99.12	0.20	1.70	0.52	0.02	28.17	103.39	0.21	1.62	0.52	0.01
28.22	110.56	0.23	1.51	0.52	0.01	28.33	108.85	0.22	1.53	0.52	0.02
28.37	111.28	0.23	1.49	0.52	0.01	28.44	110.18	0.23	1.51	0.52	0.01
28.51	109.14	0.22	1.52	0.52	0.01	28.57	108.75	0.22	1.52	0.52	0.01
28.62	105.20	0.21	1.57	0.52	0.01	28.71	100.92	0.20	1.63	0.51	0.02
28.75	94.63	0.19	1.74	0.51	0.01	28.82	92.18	0.19	1.78	0.51	0.01
28.91	92.75	0.19	1.77	0.51	0.02	28.96	93.37	0.19	1.75	0.51	0.01
29.01	94.62	0.19	1.73	0.51	0.01	29.08	96.11	0.19	1.70	0.51	0.02
29.16	97.79	0.20	1.66	0.51	0.02	29.21	97.78	0.20	1.66	0.50	0.01
29.31	98.97	0.20	1.63	0.50	0.02	29.36	99.18	0.20	1.63	0.50	0.01
29.41	101.09	0.20	1.59	0.50	0.01	29.49	103.66	0.21	1.55	0.50	0.02
29.56	105.16	0.21	1.52	0.50	0.01	29.60	106.10	0.22	1.51	0.50	0.01
29.68	105.80	0.21	1.51	0.50	0.01	29.75	104.36	0.21	1.52	0.50	0.01
29.82	102.42	0.21	1.55	0.49	0.01	29.90	103.31	0.21	1.53	0.49	0.01
29.92	102.93	0.21	1.54	0.49	0.00	30.00	103.13	0.21	1.53	0.49	0.01
30.08	103.20	0.21	1.52	0.49	0.02	30.14	103.01	0.21	1.52	0.49	0.01
30.19	103.45	0.21	1.52	0.49	0.01	30.25	103.44	0.21	1.51	0.49	0.01
30.34	104.38	0.21	1.49	0.49	0.02	30.39	103.71	0.21	1.50	0.48	0.01
30.45	103.88	0.21	1.50	0.48	0.01	30.54	103.90	0.21	1.49	0.48	0.02
30.61	105.07	0.21	1.47	0.48	0.01	30.69	106.65	0.22	1.44	0.48	0.01
30.73	109.08	0.22	1.41	0.48	0.01	30.79	111.77	0.23	1.37	0.48	0.01
30.86	111.76	0.23	1.37	0.48	0.01	30.94	111.44	0.23	1.37	0.48	0.01
30.98	112.41	0.23	1.35	0.47	0.01	31.05	111.83	0.23	1.36	0.47	0.01
31.13	112.14	0.23	1.35	0.47	0.01	31.19	110.84	0.23	1.36	0.47	0.01
31.27	107.66	0.22	1.40	0.47	0.01	31.33	98.62	0.20	1.53	0.47	0.01
31.38	96.69	0.19	1.56	0.47	0.01	31.47	98.95	0.20	1.52	0.47	0.02
31.53	104.20	0.21	1.43	0.47	0.01	31.57	108.25	0.22	1.38	0.46	0.01
31.63	110.60	0.23	1.34	0.46	0.01	31.72	111.29	0.23	1.33	0.46	0.02
31.78	113.48	0.23	1.30	0.46	0.01	31.83	116.76	0.24	1.26	0.46	0.01
31.91	122.91	0.27	1.19	0.46	0.01	31.98	126.35	0.28	1.15	0.46	0.01
32.05	130.45	0.30	1.11	0.46	0.01	32.15	132.26	0.31	1.09	0.46	0.01
32.16	135.49	0.33	1.06	0.45	0.00	32.24	140.83	0.36	1.01	0.45	0.01
32.30	148.63	0.43	0.95	0.45	0.01	32.39	157.35	0.54	0.85	0.45	0.01
32.44	166.60	0.72	0.62	0.45	0.00	32.49	169.31	0.79	0.54	0.45	0.00
32.59	176.12	1.02	0.33	0.45	0.00	32.64	177.51	1.07	0.29	0.45	0.00
32.69	179.49	1.16	0.24	0.45	0.00	32.78	180.47	1.21	0.22	0.44	0.00
32.84	182.75	1.34	0.16	0.44	0.00	32.89	183.30	1.37	0.15	0.44	0.00
32.97	183.06	1.36	0.16	0.44	0.00	33.04	182.81	1.34	0.16	0.44	0.00
33.07	182.81	1.34	0.16	0.44	0.00	33.18	178.78	1.13	0.25	0.44	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
33.23	177.92	1.09	0.27	0.44	0.00	33.30	174.53	0.95	0.36	0.44	0.00
33.38	171.32	0.84	0.46	0.43	0.00	33.41	170.21	0.81	0.50	0.43	0.00
33.48	167.61	0.74	0.58	0.43	0.00	33.56	164.41	2.00	0.00	0.43	0.00
33.63	159.89	2.00	0.00	0.43	0.00	33.67	158.38	2.00	0.00	0.43	0.00
33.73	157.42	2.00	0.00	0.43	0.00	33.83	149.99	2.00	0.00	0.43	0.00
33.89	144.01	2.00	0.00	0.43	0.00	33.93	141.16	2.00	0.00	0.43	0.00
34.00	131.04	2.00	0.00	0.42	0.00	34.08	118.63	2.00	0.00	0.42	0.00
34.12	48.16	2.00	0.00	0.42	0.00	34.22	36.31	2.00	0.00	0.42	0.00
34.27	34.02	2.00	0.00	0.42	0.00	34.33	34.16	2.00	0.00	0.42	0.00
34.42	108.15	2.00	0.00	0.42	0.00	34.45	117.04	2.00	0.00	0.42	0.00
34.52	144.57	2.00	0.00	0.41	0.00	34.59	159.86	2.00	0.00	0.41	0.00
34.66	160.81	2.00	0.00	0.41	0.00	34.74	159.76	0.58	0.72	0.41	0.01
34.82	161.88	0.61	0.66	0.41	0.01	34.85	163.84	2.00	0.00	0.41	0.00
34.91	164.48	2.00	0.00	0.41	0.00	34.99	163.96	2.00	0.00	0.41	0.00
35.08	170.85	2.00	0.00	0.41	0.00	35.14	166.90	2.00	0.00	0.40	0.00
35.18	165.63	2.00	0.00	0.40	0.00	35.28	152.73	2.00	0.00	0.40	0.00
35.33	136.91	2.00	0.00	0.40	0.00	35.38	129.39	2.00	0.00	0.40	0.00
35.44	48.21	2.00	0.00	0.40	0.00	35.52	39.35	2.00	0.00	0.40	0.00
35.58	33.12	2.00	0.00	0.40	0.00	35.67	29.05	2.00	0.00	0.40	0.00
35.73	24.35	2.00	0.00	0.39	0.00	35.78	22.38	2.00	0.00	0.39	0.00
35.85	21.79	2.00	0.00	0.39	0.00	35.93	26.49	2.00	0.00	0.39	0.00
35.98	36.31	2.00	0.00	0.39	0.00	36.03	38.76	2.00	0.00	0.39	0.00
36.10	34.04	2.00	0.00	0.39	0.00	36.18	28.29	2.00	0.00	0.39	0.00
36.27	24.35	2.00	0.00	0.39	0.00	36.32	24.83	2.00	0.00	0.38	0.00
36.37	24.40	2.00	0.00	0.38	0.00	36.42	23.58	2.00	0.00	0.38	0.00
36.52	18.62	2.00	0.00	0.38	0.00	36.56	24.11	2.00	0.00	0.38	0.00
36.66	20.51	2.00	0.00	0.38	0.00	36.72	24.62	2.00	0.00	0.38	0.00
36.76	26.31	2.00	0.00	0.38	0.00	36.85	28.31	2.00	0.00	0.38	0.00
36.91	29.18	2.00	0.00	0.37	0.00	36.95	29.40	2.00	0.00	0.37	0.00
37.01	29.62	2.00	0.00	0.37	0.00	37.10	31.70	2.00	0.00	0.37	0.00
37.16	93.80	0.19	1.27	0.37	0.01	37.21	97.55	0.19	1.22	0.37	0.01
37.29	98.59	0.20	1.20	0.37	0.01	37.36	97.86	0.19	1.20	0.37	0.01
37.40	96.69	0.19	1.22	0.37	0.01	37.50	94.25	0.19	1.24	0.36	0.01
37.56	32.66	2.00	0.00	0.36	0.00	37.62	31.18	2.00	0.00	0.36	0.00
37.70	30.92	2.00	0.00	0.36	0.00	37.75	28.57	2.00	0.00	0.36	0.00
37.80	26.64	2.00	0.00	0.36	0.00	37.88	23.10	2.00	0.00	0.36	0.00
37.95	19.50	2.00	0.00	0.36	0.00	38.00	19.49	2.00	0.00	0.36	0.00
38.06	17.33	2.00	0.00	0.35	0.00	38.13	21.44	2.00	0.00	0.35	0.00
38.22	17.30	2.00	0.00	0.35	0.00	38.27	16.03	2.00	0.00	0.35	0.00
38.33	14.52	2.00	0.00	0.35	0.00	38.43	16.00	2.00	0.00	0.35	0.00
38.48	15.05	2.00	0.00	0.35	0.00	38.52	15.98	2.00	0.00	0.35	0.00
38.60	16.05	2.00	0.00	0.35	0.00	38.67	14.63	2.00	0.00	0.34	0.00
38.71	14.15	2.00	0.00	0.34	0.00	38.82	13.66	2.00	0.00	0.34	0.00
38.86	13.66	2.00	0.00	0.34	0.00	38.92	13.26	2.00	0.00	0.34	0.00
39.01	12.78	2.00	0.00	0.34	0.00	39.04	12.77	2.00	0.00	0.34	0.00
39.11	12.61	2.00	0.00	0.34	0.00	39.19	12.83	2.00	0.00	0.34	0.00
39.26	13.06	2.00	0.00	0.33	0.00	39.31	13.05	2.00	0.00	0.33	0.00
39.41	13.43	2.00	0.00	0.33	0.00	39.45	13.58	2.00	0.00	0.33	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
39.51	13.73	2.00	0.00	0.33	0.00	39.60	14.02	2.00	0.00	0.33	0.00
39.64	14.17	2.00	0.00	0.33	0.00	39.71	14.93	2.00	0.00	0.33	0.00
39.79	16.55	2.00	0.00	0.33	0.00	39.86	17.94	2.00	0.00	0.32	0.00
39.91	19.25	2.00	0.00	0.32	0.00	40.00	23.14	2.00	0.00	0.32	0.00
40.05	27.90	2.00	0.00	0.32	0.00	40.10	98.36	2.00	0.00	0.32	0.00
40.19	105.40	2.00	0.00	0.32	0.00	40.26	109.99	2.00	0.00	0.32	0.00
40.30	110.80	2.00	0.00	0.32	0.00	40.36	114.52	2.00	0.00	0.32	0.00
40.45	118.61	2.00	0.00	0.31	0.00	40.49	119.10	2.00	0.00	0.31	0.00
40.59	123.42	2.00	0.00	0.31	0.00	40.63	120.90	2.00	0.00	0.31	0.00
40.69	119.09	2.00	0.00	0.31	0.00	40.76	108.91	2.00	0.00	0.31	0.00
40.84	98.82	2.00	0.00	0.31	0.00	40.89	96.42	0.19	1.02	0.31	0.01
40.95	103.40	0.21	0.95	0.31	0.01	41.04	115.21	0.24	0.84	0.30	0.01
41.08	108.57	0.22	0.90	0.30	0.01	41.15	121.17	0.26	0.80	0.30	0.01
41.23	121.16	0.26	0.79	0.30	0.01	41.29	121.42	0.26	0.79	0.30	0.01
41.36	120.69	0.25	0.79	0.30	0.01	41.43	119.04	0.25	0.80	0.30	0.01
41.49	115.80	0.24	0.82	0.30	0.01	41.54	112.07	0.23	0.84	0.30	0.01
41.63	111.05	0.22	0.85	0.29	0.01	41.67	108.74	0.22	0.87	0.29	0.00
41.73	111.66	0.23	0.84	0.29	0.01	41.83	111.23	0.22	0.84	0.29	0.01
41.88	109.65	0.22	0.85	0.29	0.01	41.96	107.95	0.22	0.86	0.29	0.01
42.03	112.51	0.23	0.82	0.29	0.01	42.07	116.94	0.24	0.78	0.29	0.00
42.13	127.60	0.28	0.71	0.29	0.01	42.20	138.92	0.34	0.64	0.28	0.01
42.27	149.18	0.43	0.59	0.28	0.01	42.37	163.74	0.64	0.43	0.28	0.00
42.42	164.54	0.66	0.42	0.28	0.00	42.47	168.76	0.75	0.36	0.28	0.00
42.55	163.06	0.63	0.43	0.28	0.00	42.62	164.22	0.65	0.41	0.28	0.00
42.66	162.24	0.61	0.44	0.28	0.00	42.77	159.54	0.56	0.48	0.28	0.01
42.80	157.53	0.53	0.52	0.27	0.00	42.86	151.36	0.45	0.56	0.27	0.00
42.92	141.13	0.36	0.61	0.27	0.00	42.98	131.41	0.30	0.65	0.27	0.01
43.06	131.92	0.30	0.65	0.27	0.01	43.13	137.18	0.33	0.62	0.27	0.01
43.21	141.82	0.36	0.59	0.27	0.01	43.24	145.75	0.40	0.57	0.27	0.00
43.32	155.20	0.50	0.53	0.27	0.00	43.40	169.22	0.77	0.33	0.26	0.00
43.46	183.16	1.32	0.10	0.26	0.00	43.51	188.48	1.68	0.04	0.26	0.00
43.60	192.13	1.99	0.00	0.26	0.00	43.66	198.01	2.00	0.00	0.26	0.00
43.73	193.14	2.00	0.00	0.26	0.00	43.80	186.63	1.54	0.06	0.26	0.00
43.85	178.00	1.06	0.17	0.26	0.00	43.90	180.03	1.15	0.14	0.26	0.00
44.00	179.41	1.12	0.15	0.25	0.00	44.04	182.43	1.28	0.11	0.25	0.00
44.10	183.37	1.33	0.10	0.25	0.00	44.18	174.18	0.92	0.23	0.25	0.00
44.25	176.58	1.00	0.19	0.25	0.00	44.30	171.27	0.82	0.28	0.25	0.00
44.40	167.00	0.71	0.34	0.25	0.00	44.44	162.81	0.62	0.39	0.25	0.00
44.50	152.31	0.46	0.50	0.25	0.00	44.58	136.89	0.33	0.56	0.24	0.01
44.65	137.27	0.33	0.56	0.24	0.00	44.70	148.64	0.42	0.51	0.24	0.00
44.76	174.49	0.93	0.21	0.24	0.00	44.84	192.87	2.00	0.00	0.24	0.00
44.90	200.64	2.00	0.00	0.24	0.00	44.99	207.85	2.00	0.00	0.24	0.00
45.02	212.39	2.00	0.00	0.24	0.00	45.09	225.18	2.00	0.00	0.24	0.00
45.18	239.13	2.00	0.00	0.23	0.00	45.24	248.28	2.00	0.00	0.23	0.00
45.29	249.38	2.00	0.00	0.23	0.00	45.36	246.21	2.00	0.00	0.23	0.00
45.44	242.42	2.00	0.00	0.23	0.00	45.51	242.07	2.00	0.00	0.23	0.00
45.54	242.29	2.00	0.00	0.23	0.00	45.63	240.24	2.00	0.00	0.23	0.00
45.69	236.25	2.00	0.00	0.23	0.00	45.77	232.03	2.00	0.00	0.22	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
45.80	231.63	2.00	0.00	0.22	0.00	45.88	224.76	2.00	0.00	0.22	0.00
45.94	220.00	2.00	0.00	0.22	0.00	46.03	216.24	2.00	0.00	0.22	0.00
46.08	215.59	2.00	0.00	0.22	0.00	46.17	213.33	2.00	0.00	0.22	0.00
46.23	214.52	2.00	0.00	0.22	0.00	46.28	213.94	2.00	0.00	0.22	0.00
46.33	209.79	2.00	0.00	0.21	0.00	46.43	201.61	2.00	0.00	0.21	0.00
46.47	198.99	2.00	0.00	0.21	0.00	46.54	188.63	1.68	0.03	0.21	0.00
46.62	181.37	1.22	0.10	0.21	0.00	46.68	165.36	0.67	0.30	0.21	0.00
46.77	143.29	0.38	0.45	0.21	0.00	46.82	131.44	0.30	0.50	0.21	0.00
46.87	143.71	0.38	0.45	0.21	0.00	46.97	150.86	0.45	0.42	0.20	0.01
47.02	155.58	0.51	0.40	0.20	0.00	47.07	158.71	0.55	0.36	0.20	0.00
47.12	128.82	0.29	0.50	0.20	0.00	47.22	172.81	0.87	0.20	0.20	0.00
47.26	181.71	1.24	0.09	0.20	0.00	47.33	198.43	2.00	0.00	0.20	0.00
47.42	208.26	2.00	0.00	0.20	0.00	47.47	208.27	2.00	0.00	0.20	0.00
47.52	206.53	2.00	0.00	0.19	0.00	47.59	200.72	2.00	0.00	0.19	0.00
47.66	198.03	2.00	0.00	0.19	0.00	47.75	202.03	2.00	0.00	0.19	0.00
47.81	203.37	2.00	0.00	0.19	0.00	47.86	208.71	2.00	0.00	0.19	0.00
47.92	215.27	2.00	0.00	0.19	0.00	48.00	220.14	2.00	0.00	0.19	0.00
48.06	226.38	2.00	0.00	0.19	0.00	48.11	230.65	2.00	0.00	0.18	0.00
48.17	236.81	2.00	0.00	0.18	0.00	48.25	242.77	2.00	0.00	0.18	0.00
48.32	249.29	2.00	0.00	0.18	0.00	48.40	249.71	2.00	0.00	0.18	0.00
48.45	251.55	2.00	0.00	0.18	0.00	48.50	247.63	2.00	0.00	0.18	0.00
48.58	242.81	2.00	0.00	0.18	0.00	48.65	235.05	2.00	0.00	0.18	0.00
48.70	229.97	2.00	0.00	0.17	0.00	48.75	221.91	2.00	0.00	0.17	0.00
48.85	212.44	2.00	0.00	0.17	0.00	48.91	200.30	2.00	0.00	0.17	0.00
48.99	193.98	2.00	0.00	0.17	0.00	49.03	188.43	1.67	0.03	0.17	0.00
49.10	186.61	1.54	0.04	0.17	0.00	49.17	187.60	1.61	0.03	0.17	0.00
49.25	187.95	1.63	0.03	0.17	0.00	49.29	189.38	1.74	0.02	0.16	0.00
49.34	189.25	1.73	0.02	0.16	0.00	49.44	190.65	1.85	0.01	0.16	0.00
49.51	188.61	1.68	0.02	0.16	0.00	49.54	192.48	2.00	0.00	0.16	0.00
49.62	185.72	1.48	0.04	0.16	0.00	49.67	185.16	1.44	0.05	0.16	0.00
49.74	176.25	0.99	0.12	0.16	0.00	49.84	167.90	0.74	0.20	0.16	0.00
49.89	165.75	0.69	0.22	0.15	0.00	49.97	168.87	0.76	0.19	0.15	0.00
50.03	173.29	0.89	0.15	0.15	0.00						

Total estimated settlement: 1.93

Abbreviations

$Q_{tn,cs}$:	Equivalent clean sand normalized cone resistance
FS:	Factor of safety against liquefaction
e_v (%):	Post-liquefaction volumentric strain
DF:	e_v depth weighting factor
Settlement:	Calculated settlement

Landmark Consultants, Inc.
780 N. 4th Street
El Centro, CA 92243

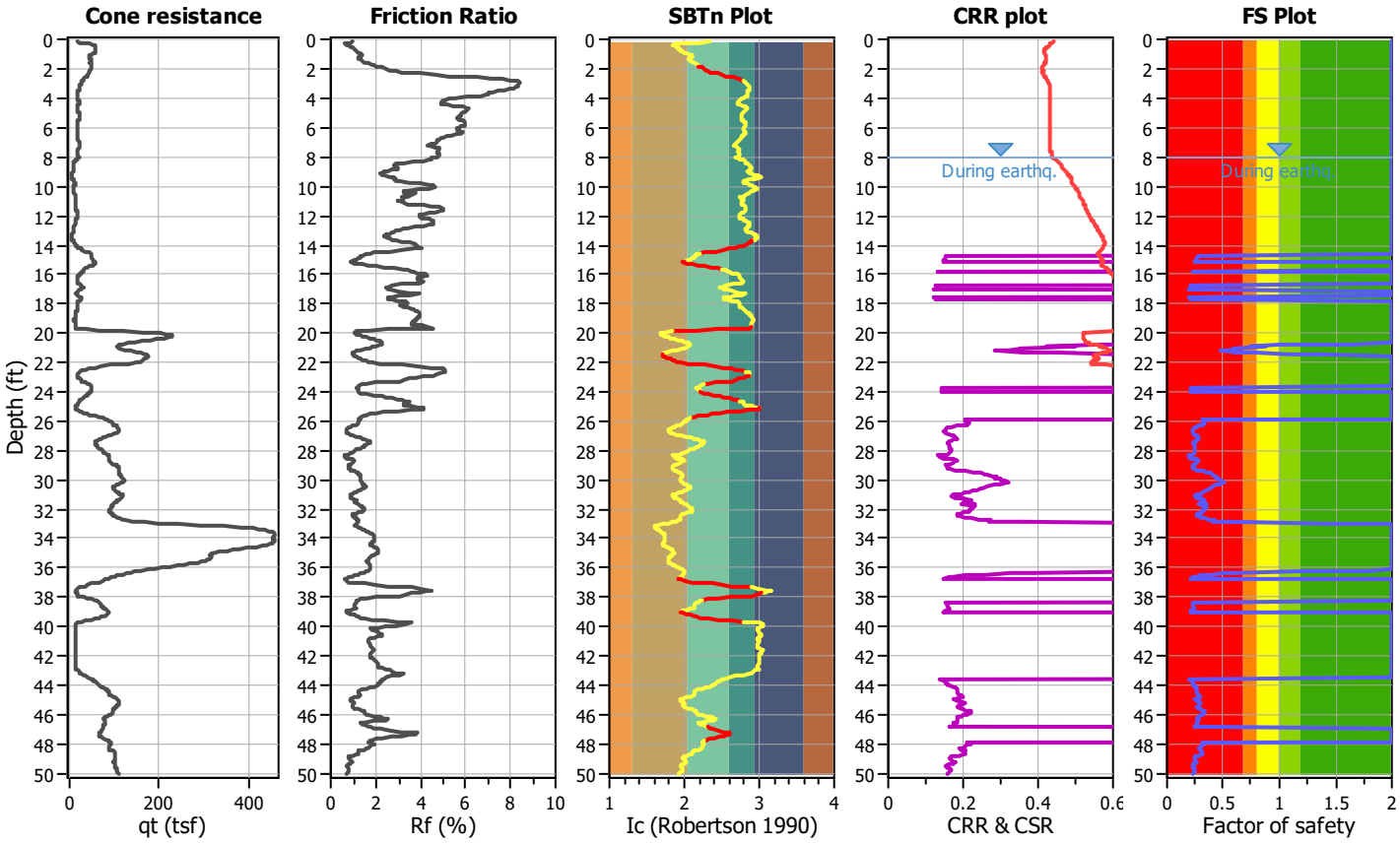
LIQUEFACTION ANALYSIS REPORT

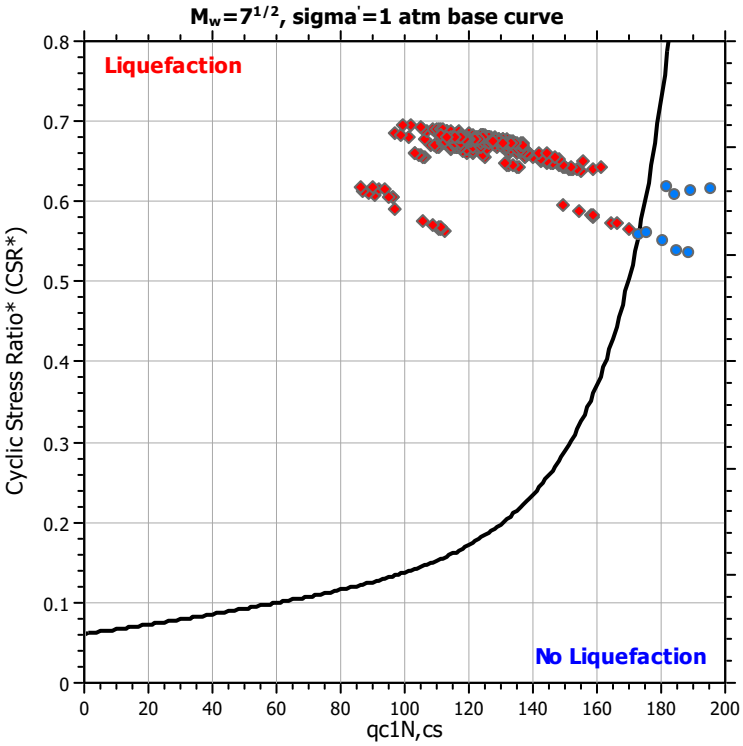
Project title : Wake Avenue Apartments **Location : El Centro, CA**

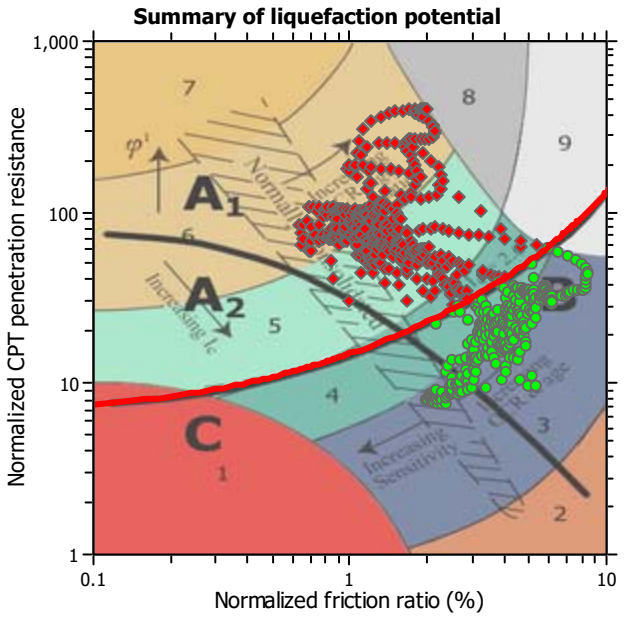
CPT file : CPT-4

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

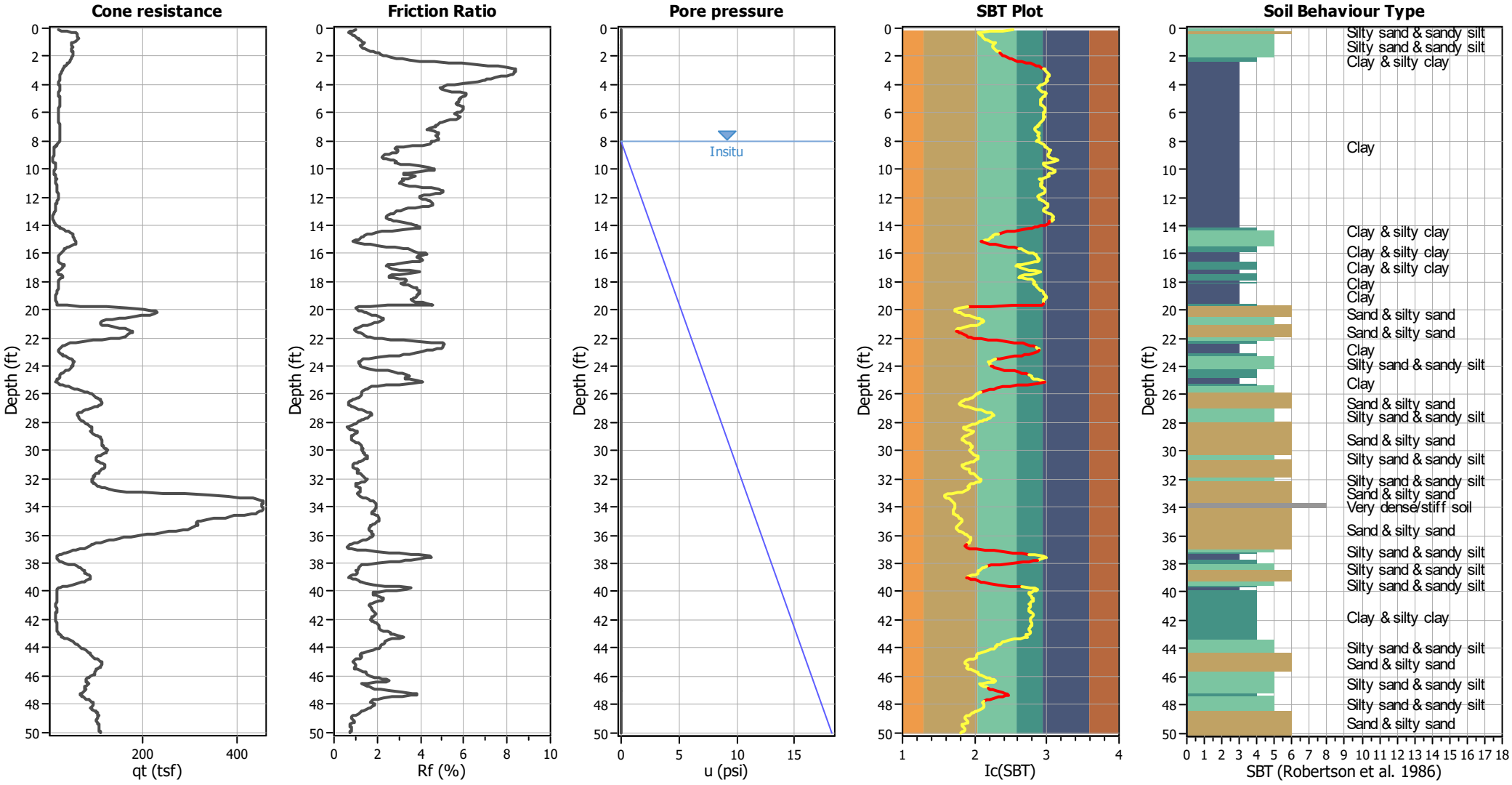






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



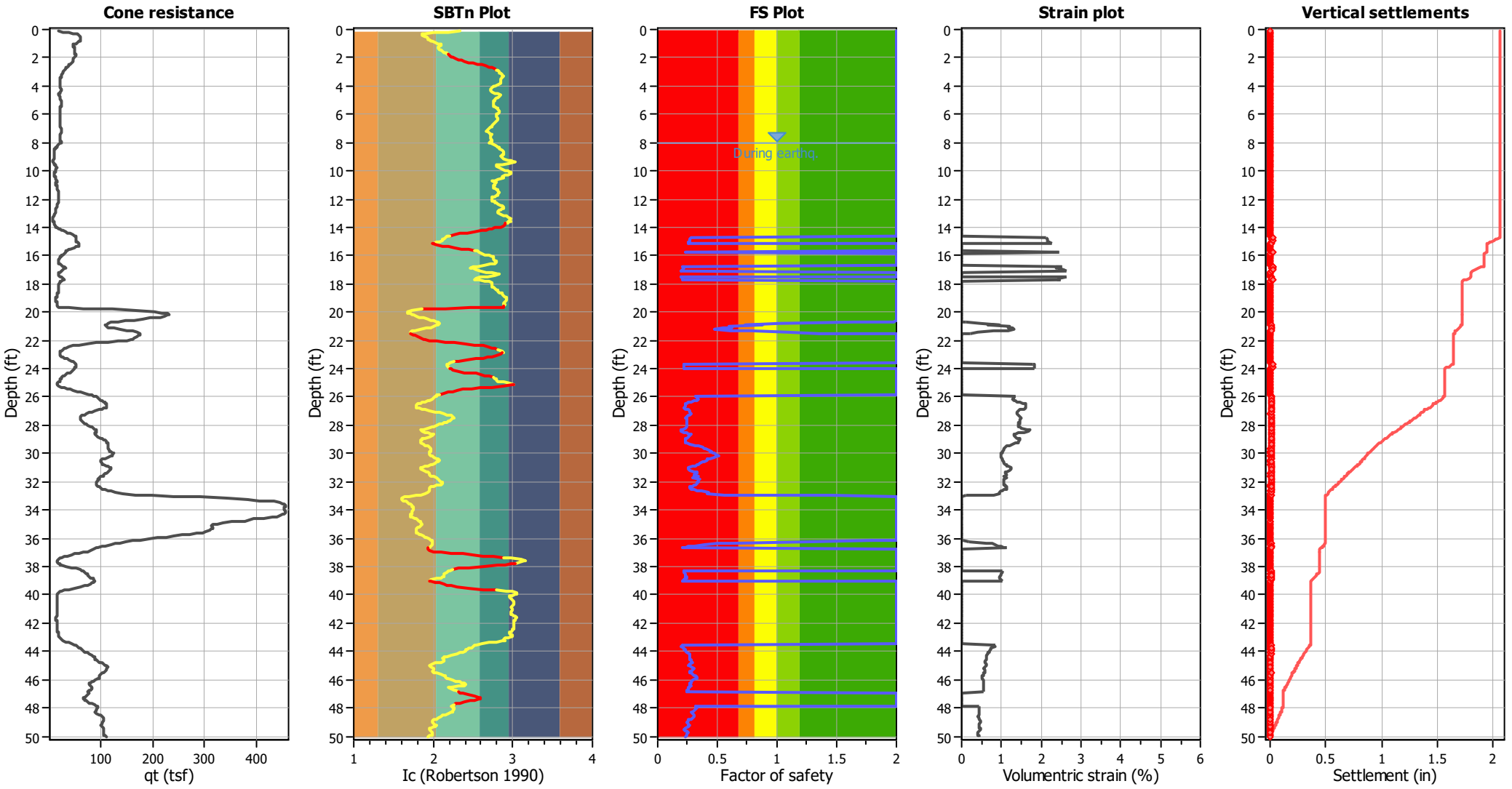
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement due to soil liquefaction ::

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
8.03	32.95	2.00	0.00	0.86	0.00	8.08	32.28	2.00	0.00	0.86	0.00
8.18	25.25	2.00	0.00	0.86	0.00	8.22	23.03	2.00	0.00	0.86	0.00
8.29	20.13	2.00	0.00	0.86	0.00	8.33	18.94	2.00	0.00	0.86	0.00
8.41	16.80	2.00	0.00	0.86	0.00	8.48	15.33	2.00	0.00	0.86	0.00
8.58	13.82	2.00	0.00	0.85	0.00	8.63	13.41	2.00	0.00	0.85	0.00
8.67	13.39	2.00	0.00	0.85	0.00	8.77	13.36	2.00	0.00	0.85	0.00
8.81	13.47	2.00	0.00	0.85	0.00	8.87	13.19	2.00	0.00	0.85	0.00
8.96	13.17	2.00	0.00	0.85	0.00	9.00	13.16	2.00	0.00	0.85	0.00
9.07	12.35	2.00	0.00	0.85	0.00	9.14	11.25	2.00	0.00	0.85	0.00
9.22	10.44	2.00	0.00	0.84	0.00	9.27	9.49	2.00	0.00	0.84	0.00
9.32	9.21	2.00	0.00	0.84	0.00	9.41	8.79	2.00	0.00	0.84	0.00
9.45	9.85	2.00	0.00	0.84	0.00	9.56	14.95	2.00	0.00	0.84	0.00
9.59	16.12	2.00	0.00	0.84	0.00	9.66	18.01	2.00	0.00	0.84	0.00
9.72	18.87	2.00	0.00	0.84	0.00	9.81	18.93	2.00	0.00	0.83	0.00
9.85	18.79	2.00	0.00	0.83	0.00	9.96	16.95	2.00	0.00	0.83	0.00
10.00	16.04	2.00	0.00	0.83	0.00	10.05	15.38	2.00	0.00	0.83	0.00
10.11	14.08	2.00	0.00	0.83	0.00	10.20	12.64	2.00	0.00	0.83	0.00
10.25	12.75	2.00	0.00	0.83	0.00	10.33	13.63	2.00	0.00	0.82	0.00
10.40	14.76	2.00	0.00	0.82	0.00	10.45	15.51	2.00	0.00	0.82	0.00
10.51	16.74	2.00	0.00	0.82	0.00	10.57	15.34	2.00	0.00	0.82	0.00
10.66	21.42	2.00	0.00	0.82	0.00	10.70	20.43	2.00	0.00	0.82	0.00
10.78	17.90	2.00	0.00	0.82	0.00	10.84	17.81	2.00	0.00	0.82	0.00
10.94	17.78	2.00	0.00	0.81	0.00	10.99	17.69	2.00	0.00	0.81	0.00
11.03	18.18	2.00	0.00	0.81	0.00	11.14	19.47	2.00	0.00	0.81	0.00
11.18	19.95	2.00	0.00	0.81	0.00	11.24	20.90	2.00	0.00	0.81	0.00
11.29	21.10	2.00	0.00	0.81	0.00	11.36	21.68	2.00	0.00	0.81	0.00
11.44	22.23	2.00	0.00	0.81	0.00	11.50	22.55	2.00	0.00	0.81	0.00
11.58	22.62	2.00	0.00	0.80	0.00	11.62	22.73	2.00	0.00	0.80	0.00
11.69	22.94	2.00	0.00	0.80	0.00	11.75	23.26	2.00	0.00	0.80	0.00
11.83	23.58	2.00	0.00	0.80	0.00	11.88	23.92	2.00	0.00	0.80	0.00
11.98	24.22	2.00	0.00	0.80	0.00	12.03	24.07	2.00	0.00	0.80	0.00
12.13	23.07	2.00	0.00	0.79	0.00	12.18	22.80	2.00	0.00	0.79	0.00
12.23	22.41	2.00	0.00	0.79	0.00	12.27	21.91	2.00	0.00	0.79	0.00
12.36	20.67	2.00	0.00	0.79	0.00	12.42	19.57	2.00	0.00	0.79	0.00
12.50	18.21	2.00	0.00	0.79	0.00	12.57	17.47	2.00	0.00	0.79	0.00
12.62	17.09	2.00	0.00	0.79	0.00	12.68	16.71	2.00	0.00	0.79	0.00
12.75	16.20	2.00	0.00	0.78	0.00	12.80	16.19	2.00	0.00	0.78	0.00
12.87	16.17	2.00	0.00	0.78	0.00	12.93	16.15	2.00	0.00	0.78	0.00
13.01	15.41	2.00	0.00	0.78	0.00	13.09	13.34	2.00	0.00	0.78	0.00
13.16	11.76	2.00	0.00	0.78	0.00	13.21	11.01	2.00	0.00	0.78	0.00
13.27	9.67	2.00	0.00	0.78	0.00	13.36	9.04	2.00	0.00	0.77	0.00
13.39	9.03	2.00	0.00	0.77	0.00	13.46	9.40	2.00	0.00	0.77	0.00
13.54	10.23	2.00	0.00	0.77	0.00	13.59	8.64	2.00	0.00	0.77	0.00
13.66	11.40	2.00	0.00	0.77	0.00	13.72	12.11	2.00	0.00	0.77	0.00
13.81	12.56	2.00	0.00	0.77	0.00	13.86	13.14	2.00	0.00	0.77	0.00
13.96	17.35	2.00	0.00	0.76	0.00	14.00	19.44	2.00	0.00	0.76	0.00
14.06	23.68	2.00	0.00	0.76	0.00	14.13	26.83	2.00	0.00	0.76	0.00
14.20	29.16	2.00	0.00	0.76	0.00	14.25	30.83	2.00	0.00	0.76	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
14.31	96.82	2.00	0.00	0.76	0.00	14.40	104.70	2.00	0.00	0.76	0.00
14.44	106.85	2.00	0.00	0.76	0.00	14.51	112.22	2.00	0.00	0.75	0.00
14.59	115.38	2.00	0.00	0.75	0.00	14.65	114.44	2.00	0.00	0.75	0.00
14.74	112.75	0.28	2.13	0.75	0.03	14.80	111.55	0.27	2.15	0.75	0.01
14.85	110.84	0.27	2.16	0.75	0.01	14.93	110.58	0.27	2.16	0.75	0.02
14.99	111.16	0.27	2.15	0.75	0.02	15.03	108.49	0.26	2.20	0.75	0.01
15.10	105.62	0.25	2.26	0.74	0.02	15.19	105.54	2.00	0.00	0.74	0.00
15.23	113.19	2.00	0.00	0.74	0.00	15.33	117.01	2.00	0.00	0.74	0.00
15.39	119.15	2.00	0.00	0.74	0.00	15.43	114.79	2.00	0.00	0.74	0.00
15.53	107.10	2.00	0.00	0.74	0.00	15.58	102.75	2.00	0.00	0.74	0.00
15.62	101.25	2.00	0.00	0.74	0.00	15.69	97.88	2.00	0.00	0.73	0.00
15.78	96.76	0.23	2.43	0.73	0.03	15.83	35.76	2.00	0.00	0.73	0.00
15.92	30.18	2.00	0.00	0.73	0.00	15.96	28.72	2.00	0.00	0.73	0.00
16.03	26.06	2.00	0.00	0.73	0.00	16.11	24.70	2.00	0.00	0.73	0.00
16.17	23.57	2.00	0.00	0.73	0.00	16.21	23.22	2.00	0.00	0.73	0.00
16.28	22.42	2.00	0.00	0.72	0.00	16.37	21.73	2.00	0.00	0.72	0.00
16.42	21.48	2.00	0.00	0.72	0.00	16.51	21.22	2.00	0.00	0.72	0.00
16.55	21.75	2.00	0.00	0.72	0.00	16.61	23.80	2.00	0.00	0.72	0.00
16.68	25.75	2.00	0.00	0.72	0.00	16.75	90.57	0.21	2.54	0.72	0.02
16.83	96.08	0.22	2.39	0.71	0.02	16.87	96.17	0.22	2.39	0.71	0.01
16.94	94.71	0.22	2.42	0.71	0.02	17.04	88.91	0.20	2.57	0.71	0.03
17.08	87.09	0.20	2.62	0.71	0.01	17.15	25.19	2.00	0.00	0.71	0.00
17.23	20.92	2.00	0.00	0.71	0.00	17.27	19.26	2.00	0.00	0.71	0.00
17.33	18.70	2.00	0.00	0.71	0.00	17.42	19.55	2.00	0.00	0.70	0.00
17.48	23.52	2.00	0.00	0.70	0.00	17.53	86.03	0.20	2.63	0.70	0.01
17.59	92.15	0.21	2.45	0.70	0.02	17.67	93.91	0.21	2.40	0.70	0.03
17.72	90.05	0.20	2.50	0.70	0.01	17.82	25.40	2.00	0.00	0.70	0.00
17.86	23.88	2.00	0.00	0.70	0.00	17.92	22.36	2.00	0.00	0.70	0.00
18.01	21.14	2.00	0.00	0.69	0.00	18.08	21.06	2.00	0.00	0.69	0.00
18.12	21.04	2.00	0.00	0.69	0.00	18.22	20.96	2.00	0.00	0.69	0.00
18.27	20.93	2.00	0.00	0.69	0.00	18.32	20.80	2.00	0.00	0.69	0.00
18.41	20.33	2.00	0.00	0.69	0.00	18.46	20.21	2.00	0.00	0.69	0.00
18.51	19.98	2.00	0.00	0.69	0.00	18.60	19.10	2.00	0.00	0.68	0.00
18.66	18.01	2.00	0.00	0.68	0.00	18.70	17.25	2.00	0.00	0.68	0.00
18.80	16.80	2.00	0.00	0.68	0.00	18.84	16.46	2.00	0.00	0.68	0.00
18.90	15.91	2.00	0.00	0.68	0.00	18.99	14.83	2.00	0.00	0.68	0.00
19.04	14.60	2.00	0.00	0.68	0.00	19.11	14.58	2.00	0.00	0.68	0.00
19.20	14.66	2.00	0.00	0.67	0.00	19.25	15.07	2.00	0.00	0.67	0.00
19.29	15.17	2.00	0.00	0.67	0.00	19.39	15.77	2.00	0.00	0.67	0.00
19.44	15.97	2.00	0.00	0.67	0.00	19.49	16.38	2.00	0.00	0.67	0.00
19.59	17.70	2.00	0.00	0.67	0.00	19.64	19.78	2.00	0.00	0.67	0.00
19.69	74.42	2.00	0.00	0.67	0.00	19.77	135.45	2.00	0.00	0.66	0.00
19.82	128.25	2.00	0.00	0.66	0.00	19.92	193.83	2.00	0.00	0.66	0.00
19.95	207.62	2.00	0.00	0.66	0.00	20.07	230.69	2.00	0.00	0.66	0.00
20.11	235.33	2.00	0.00	0.66	0.00	20.18	238.63	2.00	0.00	0.66	0.00
20.21	237.74	2.00	0.00	0.66	0.00	20.30	232.76	2.00	0.00	0.66	0.00
20.36	227.21	2.00	0.00	0.65	0.00	20.41	233.99	2.00	0.00	0.65	0.00
20.51	216.93	2.00	0.00	0.65	0.00	20.56	217.25	2.00	0.00	0.65	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
20.61	212.57	2.00	0.00	0.65	0.00	20.70	188.63	1.97	0.01	0.65	0.00
20.75	184.75	1.64	0.11	0.65	0.00	20.81	173.23	1.01	0.49	0.65	0.00
20.89	164.18	0.73	0.94	0.65	0.01	20.94	169.69	0.88	0.64	0.65	0.00
21.00	157.81	0.60	1.20	0.64	0.01	21.07	158.82	0.62	1.15	0.64	0.01
21.15	154.67	0.55	1.29	0.64	0.01	21.20	149.59	0.48	1.33	0.64	0.01
21.30	158.47	0.61	1.16	0.64	0.01	21.34	166.25	0.78	0.81	0.64	0.00
21.39	175.41	1.09	0.41	0.64	0.00	21.48	180.78	1.36	0.23	0.64	0.00
21.55	182.83	2.00	0.00	0.63	0.00	21.59	181.61	2.00	0.00	0.63	0.00
21.66	178.03	2.00	0.00	0.63	0.00	21.74	176.29	2.00	0.00	0.63	0.00
21.82	179.70	2.00	0.00	0.63	0.00	21.89	184.91	2.00	0.00	0.63	0.00
21.93	192.35	2.00	0.00	0.63	0.00	21.98	198.60	2.00	0.00	0.63	0.00
22.08	194.89	2.00	0.00	0.63	0.00	22.13	174.65	2.00	0.00	0.62	0.00
22.18	166.08	2.00	0.00	0.62	0.00	22.27	142.21	2.00	0.00	0.62	0.00
22.33	120.48	2.00	0.00	0.62	0.00	22.38	47.44	2.00	0.00	0.62	0.00
22.48	36.38	2.00	0.00	0.62	0.00	22.52	33.83	2.00	0.00	0.62	0.00
22.58	29.91	2.00	0.00	0.62	0.00	22.67	25.77	2.00	0.00	0.62	0.00
22.72	22.62	2.00	0.00	0.61	0.00	22.77	21.33	2.00	0.00	0.61	0.00
22.86	20.91	2.00	0.00	0.61	0.00	22.90	19.33	2.00	0.00	0.61	0.00
22.98	19.60	2.00	0.00	0.61	0.00	23.04	22.31	2.00	0.00	0.61	0.00
23.12	25.20	2.00	0.00	0.61	0.00	23.18	27.22	2.00	0.00	0.61	0.00
23.27	30.67	2.00	0.00	0.61	0.00	23.30	92.94	2.00	0.00	0.61	0.00
23.37	97.98	2.00	0.00	0.60	0.00	23.47	101.06	2.00	0.00	0.60	0.00
23.52	102.55	2.00	0.00	0.60	0.00	23.57	102.58	2.00	0.00	0.60	0.00
23.67	106.14	0.22	1.81	0.60	0.02	23.71	105.91	0.22	1.81	0.60	0.01
23.77	104.69	0.22	1.83	0.60	0.01	23.86	104.55	0.22	1.83	0.60	0.02
23.91	103.42	0.22	1.85	0.59	0.01	23.96	103.30	0.22	1.85	0.59	0.01
24.03	102.17	2.00	0.00	0.59	0.00	24.11	101.48	2.00	0.00	0.59	0.00
24.15	102.86	2.00	0.00	0.59	0.00	24.25	97.79	2.00	0.00	0.59	0.00
24.30	97.28	2.00	0.00	0.59	0.00	24.35	93.99	2.00	0.00	0.59	0.00
24.45	90.69	2.00	0.00	0.59	0.00	24.51	27.61	2.00	0.00	0.58	0.00
24.55	26.16	2.00	0.00	0.58	0.00	24.63	23.37	2.00	0.00	0.58	0.00
24.70	21.83	2.00	0.00	0.58	0.00	24.74	21.90	2.00	0.00	0.58	0.00
24.81	21.60	2.00	0.00	0.58	0.00	24.89	19.38	2.00	0.00	0.58	0.00
24.95	17.45	2.00	0.00	0.58	0.00	25.04	14.10	2.00	0.00	0.58	0.00
25.08	13.71	2.00	0.00	0.57	0.00	25.14	14.65	2.00	0.00	0.57	0.00
25.23	16.16	2.00	0.00	0.57	0.00	25.29	22.96	2.00	0.00	0.57	0.00
25.35	87.98	2.00	0.00	0.57	0.00	25.44	94.02	2.00	0.00	0.57	0.00
25.48	97.11	2.00	0.00	0.57	0.00	25.55	104.43	2.00	0.00	0.57	0.00
25.63	110.81	2.00	0.00	0.57	0.00	25.67	112.52	2.00	0.00	0.56	0.00
25.73	119.36	2.00	0.00	0.56	0.00	25.80	127.09	2.00	0.00	0.56	0.00
25.89	128.34	2.00	0.00	0.56	0.00	25.94	132.11	0.32	1.34	0.56	0.01
25.99	132.81	0.32	1.33	0.56	0.01	26.07	135.19	0.33	1.30	0.56	0.01
26.13	135.64	0.34	1.29	0.56	0.01	26.23	133.61	0.32	1.31	0.56	0.02
26.28	131.16	0.31	1.34	0.55	0.01	26.33	124.89	0.28	1.41	0.55	0.01
26.39	119.50	0.26	1.47	0.55	0.01	26.47	114.44	0.24	1.54	0.55	0.02
26.51	110.55	0.23	1.59	0.55	0.01	26.58	109.72	0.23	1.60	0.55	0.01
26.64	109.57	0.23	1.60	0.55	0.01	26.73	108.43	0.22	1.62	0.55	0.02
26.79	109.12	0.22	1.60	0.55	0.01	26.88	109.62	0.23	1.59	0.54	0.02

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
26.92	117.95	0.25	1.47	0.54	0.01	26.97	121.09	0.26	1.43	0.54	0.01
27.07	123.94	0.27	1.39	0.54	0.02	27.13	123.57	0.27	1.39	0.54	0.01
27.17	124.56	0.28	1.38	0.54	0.01	27.25	121.38	0.26	1.41	0.54	0.01
27.32	119.10	0.26	1.44	0.54	0.01	27.39	115.56	0.24	1.48	0.54	0.01
27.47	113.45	0.24	1.51	0.53	0.01	27.51	114.49	0.24	1.49	0.53	0.01
27.58	116.43	0.25	1.46	0.53	0.01	27.66	117.17	0.25	1.45	0.53	0.01
27.70	116.36	0.25	1.46	0.53	0.01	27.76	116.23	0.24	1.45	0.53	0.01
27.84	117.19	0.25	1.44	0.53	0.01	27.90	116.37	0.24	1.45	0.53	0.01
27.96	117.66	0.25	1.43	0.53	0.01	28.03	117.67	0.25	1.42	0.52	0.01
28.10	116.79	0.25	1.43	0.52	0.01	28.15	115.31	0.24	1.45	0.52	0.01
28.25	112.09	0.23	1.49	0.52	0.02	28.29	101.52	0.20	1.65	0.52	0.01
28.35	96.87	0.20	1.72	0.52	0.01	28.44	98.57	0.20	1.69	0.52	0.02
28.50	106.04	0.21	1.56	0.52	0.01	28.55	114.97	0.24	1.43	0.52	0.01
28.61	121.16	0.26	1.35	0.52	0.01	28.68	125.48	0.28	1.30	0.51	0.01
28.77	122.51	0.27	1.33	0.51	0.01	28.83	121.45	0.26	1.34	0.51	0.01
28.93	115.68	0.24	1.41	0.51	0.02	28.97	112.61	0.23	1.45	0.51	0.01
29.02	111.23	0.23	1.46	0.51	0.01	29.08	112.16	0.23	1.45	0.51	0.01
29.16	112.68	0.23	1.44	0.51	0.01	29.20	112.81	0.23	1.43	0.51	0.01
29.27	117.28	0.25	1.37	0.50	0.01	29.36	124.03	0.27	1.29	0.50	0.01
29.42	132.59	0.31	1.19	0.50	0.01	29.49	137.57	0.34	1.14	0.50	0.01
29.56	142.34	0.38	1.10	0.50	0.01	29.62	144.59	0.40	1.08	0.50	0.01
29.67	145.59	0.41	1.07	0.50	0.01	29.75	148.13	0.43	1.04	0.50	0.01
29.81	149.77	0.45	1.03	0.49	0.01	29.86	149.10	0.44	1.03	0.49	0.01
29.96	151.31	0.46	1.01	0.49	0.01	30.01	151.80	0.47	1.01	0.49	0.01
30.10	152.80	0.48	1.00	0.49	0.01	30.12	154.72	0.51	0.98	0.49	0.00
30.20	153.80	0.49	0.98	0.49	0.01	30.26	151.88	0.47	1.00	0.49	0.01
30.34	149.59	0.44	1.01	0.49	0.01	30.40	146.18	0.41	1.04	0.48	0.01
30.45	146.13	0.41	1.03	0.48	0.01	30.55	144.22	0.39	1.05	0.48	0.01
30.60	142.56	0.38	1.06	0.48	0.01	30.68	140.12	0.36	1.08	0.48	0.01
30.75	138.26	0.35	1.09	0.48	0.01	30.79	135.02	0.32	1.12	0.48	0.01
30.85	132.81	0.31	1.13	0.48	0.01	30.93	128.71	0.29	1.17	0.48	0.01
30.98	121.58	0.26	1.24	0.47	0.01	31.04	120.51	0.26	1.25	0.47	0.01
31.14	119.81	0.25	1.26	0.47	0.01	31.19	123.51	0.27	1.21	0.47	0.01
31.26	130.70	0.30	1.14	0.47	0.01	31.34	135.60	0.33	1.09	0.47	0.01
31.37	136.31	0.33	1.08	0.47	0.00	31.44	133.30	0.31	1.11	0.47	0.01
31.52	131.18	0.30	1.12	0.47	0.01	31.59	131.91	0.31	1.11	0.46	0.01
31.63	138.69	0.35	1.05	0.46	0.01	31.72	128.38	0.29	1.14	0.46	0.01
31.78	138.96	0.35	1.04	0.46	0.01	31.84	138.50	0.35	1.05	0.46	0.01
31.91	138.38	0.34	1.04	0.46	0.01	31.98	137.14	0.34	1.05	0.46	0.01
32.04	136.91	0.33	1.05	0.46	0.01	32.09	135.34	0.32	1.06	0.46	0.01
32.18	134.99	0.32	1.06	0.45	0.01	32.22	130.82	0.30	1.10	0.45	0.01
32.33	129.84	0.29	1.10	0.45	0.01	32.37	124.80	0.27	1.15	0.45	0.01
32.43	124.64	0.27	1.15	0.45	0.01	32.51	126.32	0.28	1.13	0.45	0.01
32.58	131.80	0.30	1.07	0.45	0.01	32.62	136.49	0.33	1.03	0.45	0.01
32.68	142.02	0.37	0.98	0.45	0.01	32.77	147.93	0.42	0.94	0.44	0.01
32.82	146.66	0.41	0.94	0.44	0.01	32.92	158.75	0.56	0.80	0.44	0.01
32.97	184.60	1.45	0.13	0.44	0.00	33.02	209.52	2.00	0.00	0.44	0.00
33.09	254.00	2.00	0.00	0.44	0.00	33.17	254.00	2.00	0.00	0.44	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
33.23	254.00	2.00	0.00	0.44	0.00	33.32	254.00	2.00	0.00	0.44	0.00
33.36	254.00	2.00	0.00	0.43	0.00	33.41	254.00	2.00	0.00	0.43	0.00
33.50	254.00	2.00	0.00	0.43	0.00	33.56	254.00	2.00	0.00	0.43	0.00
33.61	254.00	2.00	0.00	0.43	0.00	33.67	254.00	2.00	0.00	0.43	0.00
33.75	254.00	2.00	0.00	0.43	0.00	33.82	254.00	2.00	0.00	0.43	0.00
33.90	254.00	2.00	0.00	0.43	0.00	33.94	254.00	2.00	0.00	0.42	0.00
34.01	254.00	2.00	0.00	0.42	0.00	34.09	254.00	2.00	0.00	0.42	0.00
34.15	254.00	2.00	0.00	0.42	0.00	34.20	254.00	2.00	0.00	0.42	0.00
34.26	254.00	2.00	0.00	0.42	0.00	34.34	254.00	2.00	0.00	0.42	0.00
34.39	254.00	2.00	0.00	0.42	0.00	34.49	254.00	2.00	0.00	0.42	0.00
34.52	254.00	2.00	0.00	0.41	0.00	34.59	254.00	2.00	0.00	0.41	0.00
34.65	254.00	2.00	0.00	0.41	0.00	34.76	254.00	2.00	0.00	0.41	0.00
34.80	254.00	2.00	0.00	0.41	0.00	34.86	254.00	2.00	0.00	0.41	0.00
34.91	254.00	2.00	0.00	0.41	0.00	35.00	254.00	2.00	0.00	0.41	0.00
35.05	254.00	2.00	0.00	0.41	0.00	35.14	254.00	2.00	0.00	0.40	0.00
35.17	254.00	2.00	0.00	0.40	0.00	35.24	254.00	2.00	0.00	0.40	0.00
35.32	254.00	2.00	0.00	0.40	0.00	35.37	254.00	2.00	0.00	0.40	0.00
35.44	254.00	2.00	0.00	0.40	0.00	35.54	254.00	2.00	0.00	0.40	0.00
35.58	254.00	2.00	0.00	0.40	0.00	35.63	254.00	2.00	0.00	0.40	0.00
35.70	250.25	2.00	0.00	0.39	0.00	35.78	243.66	2.00	0.00	0.39	0.00
35.84	240.78	2.00	0.00	0.39	0.00	35.92	232.28	2.00	0.00	0.39	0.00
35.98	221.86	2.00	0.00	0.39	0.00	36.03	219.88	2.00	0.00	0.39	0.00
36.13	195.56	2.00	0.00	0.39	0.00	36.18	189.55	1.80	0.03	0.39	0.00
36.22	181.58	1.25	0.17	0.39	0.00	36.32	161.53	0.60	0.63	0.38	0.01
36.38	155.33	0.51	0.76	0.38	0.00	36.43	144.65	0.39	0.83	0.38	0.01
36.51	132.37	0.31	0.91	0.38	0.01	36.58	120.94	0.26	1.00	0.38	0.01
36.63	114.83	0.24	1.06	0.38	0.01	36.70	106.75	0.21	1.14	0.38	0.01
36.78	99.92	2.00	0.00	0.38	0.00	36.82	102.75	2.00	0.00	0.38	0.00
36.92	99.94	2.00	0.00	0.37	0.00	36.96	105.51	2.00	0.00	0.37	0.00
37.03	101.42	2.00	0.00	0.37	0.00	37.08	97.56	2.00	0.00	0.37	0.00
37.16	97.94	2.00	0.00	0.37	0.00	37.23	30.12	2.00	0.00	0.37	0.00
37.30	22.59	2.00	0.00	0.37	0.00	37.35	22.59	2.00	0.00	0.37	0.00
37.41	16.32	2.00	0.00	0.37	0.00	37.50	13.12	2.00	0.00	0.36	0.00
37.56	11.92	2.00	0.00	0.36	0.00	37.60	11.92	2.00	0.00	0.36	0.00
37.67	13.65	2.00	0.00	0.36	0.00	37.75	14.43	2.00	0.00	0.36	0.00
37.80	15.62	2.00	0.00	0.36	0.00	37.90	17.90	2.00	0.00	0.36	0.00
37.94	19.08	2.00	0.00	0.36	0.00	37.99	23.84	2.00	0.00	0.36	0.00
38.07	93.95	2.00	0.00	0.35	0.00	38.14	103.08	2.00	0.00	0.35	0.00
38.19	104.53	2.00	0.00	0.35	0.00	38.26	108.68	2.00	0.00	0.35	0.00
38.34	109.46	0.22	1.02	0.35	0.01	38.40	110.93	0.22	1.01	0.35	0.01
38.49	113.05	0.23	0.98	0.35	0.01	38.53	113.00	0.23	0.98	0.35	0.01
38.64	113.60	0.23	0.97	0.35	0.01	38.67	114.54	0.23	0.96	0.34	0.00
38.73	116.91	0.24	0.94	0.34	0.01	38.78	116.06	0.24	0.94	0.34	0.01
38.87	114.88	0.23	0.95	0.34	0.01	38.93	108.70	0.22	1.00	0.34	0.01
38.98	105.46	0.21	1.03	0.34	0.01	39.07	109.11	2.00	0.00	0.34	0.00
39.13	115.60	2.00	0.00	0.34	0.00	39.18	119.14	2.00	0.00	0.34	0.00
39.26	118.75	2.00	0.00	0.33	0.00	39.33	114.89	2.00	0.00	0.33	0.00
39.38	114.09	2.00	0.00	0.33	0.00	39.45	108.80	2.00	0.00	0.33	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
39.52	100.24	2.00	0.00	0.33	0.00	39.60	30.05	2.00	0.00	0.33	0.00
39.67	21.76	2.00	0.00	0.33	0.00	39.71	19.02	2.00	0.00	0.33	0.00
39.77	15.41	2.00	0.00	0.33	0.00	39.86	13.15	2.00	0.00	0.32	0.00
39.92	12.13	2.00	0.00	0.32	0.00	39.97	12.13	2.00	0.00	0.32	0.00
40.05	12.12	2.00	0.00	0.32	0.00	40.10	12.04	2.00	0.00	0.32	0.00
40.16	11.80	2.00	0.00	0.32	0.00	40.26	11.79	2.00	0.00	0.32	0.00
40.31	11.79	2.00	0.00	0.32	0.00	40.38	12.16	2.00	0.00	0.32	0.00
40.46	12.00	2.00	0.00	0.31	0.00	40.50	11.99	2.00	0.00	0.31	0.00
40.60	11.75	2.00	0.00	0.31	0.00	40.64	11.90	2.00	0.00	0.31	0.00
40.70	11.59	2.00	0.00	0.31	0.00	40.79	11.35	2.00	0.00	0.31	0.00
40.85	11.26	2.00	0.00	0.31	0.00	40.89	11.11	2.00	0.00	0.31	0.00
40.98	10.64	2.00	0.00	0.31	0.00	41.04	10.86	2.00	0.00	0.30	0.00
41.08	10.93	2.00	0.00	0.30	0.00	41.19	11.46	2.00	0.00	0.30	0.00
41.23	11.61	2.00	0.00	0.30	0.00	41.29	11.68	2.00	0.00	0.30	0.00
41.37	11.67	2.00	0.00	0.30	0.00	41.43	11.58	2.00	0.00	0.30	0.00
41.48	11.28	2.00	0.00	0.30	0.00	41.55	10.73	2.00	0.00	0.30	0.00
41.63	10.50	2.00	0.00	0.29	0.00	41.67	10.50	2.00	0.00	0.29	0.00
41.78	10.49	2.00	0.00	0.29	0.00	41.82	10.56	2.00	0.00	0.29	0.00
41.88	10.78	2.00	0.00	0.29	0.00	41.97	10.77	2.00	0.00	0.29	0.00
42.01	10.84	2.00	0.00	0.29	0.00	42.07	10.91	2.00	0.00	0.29	0.00
42.13	10.98	2.00	0.00	0.29	0.00	42.22	11.21	2.00	0.00	0.28	0.00
42.26	11.27	2.00	0.00	0.28	0.00	42.37	11.49	2.00	0.00	0.28	0.00
42.42	11.71	2.00	0.00	0.28	0.00	42.47	12.00	2.00	0.00	0.28	0.00
42.56	12.45	2.00	0.00	0.28	0.00	42.60	12.75	2.00	0.00	0.28	0.00
42.67	13.04	2.00	0.00	0.28	0.00	42.73	13.27	2.00	0.00	0.28	0.00
42.81	13.26	2.00	0.00	0.27	0.00	42.89	13.17	2.00	0.00	0.27	0.00
42.96	13.84	2.00	0.00	0.27	0.00	43.00	14.96	2.00	0.00	0.27	0.00
43.06	17.61	2.00	0.00	0.27	0.00	43.15	18.74	2.00	0.00	0.27	0.00
43.20	19.64	2.00	0.00	0.27	0.00	43.25	20.24	2.00	0.00	0.27	0.00
43.35	24.50	2.00	0.00	0.27	0.00	43.40	27.93	2.00	0.00	0.26	0.00
43.45	34.09	2.00	0.00	0.26	0.00	43.54	102.05	0.20	0.82	0.26	0.01
43.60	105.03	0.21	0.80	0.26	0.01	43.64	99.40	0.20	0.84	0.26	0.00
43.75	110.72	0.22	0.75	0.26	0.01	43.79	110.22	0.22	0.75	0.26	0.00
43.86	111.15	0.22	0.74	0.26	0.01	43.90	112.09	0.23	0.73	0.26	0.00
43.98	114.33	0.23	0.71	0.25	0.01	44.04	116.95	0.24	0.69	0.25	0.01
44.10	119.91	0.25	0.67	0.25	0.00	44.19	123.46	0.26	0.65	0.25	0.01
44.26	124.90	0.27	0.64	0.25	0.01	44.34	125.60	0.27	0.63	0.25	0.01
44.39	124.51	0.27	0.63	0.25	0.00	44.44	124.68	0.27	0.63	0.25	0.00
44.51	124.53	0.27	0.63	0.25	0.01	44.58	125.35	0.27	0.62	0.24	0.01
44.63	126.63	0.28	0.61	0.24	0.00	44.69	128.25	0.28	0.60	0.24	0.00
44.78	130.52	0.29	0.58	0.24	0.01	44.83	129.11	0.29	0.59	0.24	0.00
44.88	123.51	0.26	0.62	0.24	0.00	44.97	121.00	0.25	0.63	0.24	0.01
45.03	124.31	0.27	0.61	0.24	0.00	45.12	128.10	0.28	0.58	0.24	0.01
45.16	132.26	0.30	0.56	0.23	0.00	45.23	131.60	0.30	0.56	0.23	0.00
45.32	129.29	0.29	0.57	0.23	0.01	45.37	126.34	0.28	0.58	0.23	0.00
45.42	126.11	0.27	0.58	0.23	0.00	45.52	125.12	0.27	0.58	0.23	0.01
45.56	128.20	0.28	0.56	0.23	0.00	45.62	131.41	0.30	0.55	0.23	0.00
45.71	133.10	0.31	0.53	0.23	0.01	45.74	134.76	0.32	0.53	0.22	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
45.81	136.42	0.33	0.52	0.22	0.00	45.88	136.88	0.33	0.51	0.22	0.00
45.96	133.86	0.31	0.52	0.22	0.00	46.03	130.43	0.29	0.53	0.22	0.00
46.11	128.19	0.28	0.54	0.22	0.01	46.15	127.86	0.28	0.54	0.22	0.00
46.21	126.23	0.27	0.55	0.22	0.00	46.29	124.62	0.27	0.55	0.22	0.01
46.36	125.74	0.27	0.54	0.21	0.00	46.40	126.13	0.27	0.54	0.21	0.00
46.46	125.97	0.27	0.54	0.21	0.00	46.55	124.58	0.27	0.54	0.21	0.01
46.59	122.11	0.26	0.55	0.21	0.00	46.65	122.25	0.26	0.54	0.21	0.00
46.75	122.20	0.26	0.54	0.21	0.01	46.79	117.56	0.24	0.56	0.21	0.00
46.87	117.32	0.24	0.56	0.21	0.01	46.94	123.74	2.00	0.00	0.20	0.00
47.01	123.92	2.00	0.00	0.20	0.00	47.08	122.73	2.00	0.00	0.20	0.00
47.16	119.87	2.00	0.00	0.20	0.00	47.22	118.73	2.00	0.00	0.20	0.00
47.26	115.96	2.00	0.00	0.20	0.00	47.33	119.22	2.00	0.00	0.20	0.00
47.41	116.49	2.00	0.00	0.20	0.00	47.45	117.90	2.00	0.00	0.20	0.00
47.51	120.54	2.00	0.00	0.19	0.00	47.58	120.32	2.00	0.00	0.19	0.00
47.65	124.25	2.00	0.00	0.19	0.00	47.71	125.76	2.00	0.00	0.19	0.00
47.81	132.34	2.00	0.00	0.19	0.00	47.85	132.75	2.00	0.00	0.19	0.00
47.91	134.52	0.32	0.44	0.19	0.00	48.00	136.18	0.33	0.43	0.19	0.00
48.04	136.74	0.33	0.43	0.19	0.00	48.10	134.31	0.32	0.43	0.18	0.00
48.17	131.76	0.30	0.44	0.18	0.00	48.25	130.16	0.29	0.44	0.18	0.00
48.32	126.66	0.28	0.45	0.18	0.00	48.39	129.51	0.29	0.44	0.18	0.00
48.45	132.22	0.30	0.43	0.18	0.00	48.49	131.36	0.30	0.43	0.18	0.00
48.57	132.89	0.31	0.42	0.18	0.00	48.64	132.81	0.31	0.42	0.18	0.00
48.69	130.53	0.30	0.42	0.17	0.00	48.79	127.46	0.28	0.43	0.17	0.01
48.83	122.60	0.26	0.45	0.17	0.00	48.89	119.39	0.25	0.46	0.17	0.00
48.97	116.64	0.24	0.47	0.17	0.00	49.04	117.06	0.24	0.46	0.17	0.00
49.10	119.63	0.25	0.45	0.17	0.00	49.18	121.75	0.26	0.44	0.17	0.00
49.23	122.83	0.26	0.43	0.17	0.00	49.29	121.81	0.26	0.43	0.16	0.00
49.38	119.90	0.25	0.43	0.16	0.00	49.43	114.71	0.24	0.45	0.16	0.00
49.48	111.39	0.23	0.46	0.16	0.00	49.55	111.08	0.23	0.46	0.16	0.00
49.63	114.21	0.23	0.44	0.16	0.00	49.67	116.93	0.24	0.43	0.16	0.00
49.77	119.63	0.25	0.42	0.16	0.00	49.82	118.55	0.25	0.42	0.16	0.00
49.90	117.32	0.24	0.42	0.15	0.00	49.96	115.67	0.24	0.42	0.15	0.00
50.05	113.40	0.23	0.43	0.15	0.00						

Total estimated settlement: 2.06

Abbreviations

$Q_{tn,cs}$: Equivalent clean sand normalized cone resistance
FS: Factor of safety against liquefaction
e_v (%): Post-liquefaction volumentric strain
DF: e_v depth weighting factor
Settlement: Calculated settlement

Landmark Consultants, Inc.
780 N. 4th Street
El Centro, CA 92243

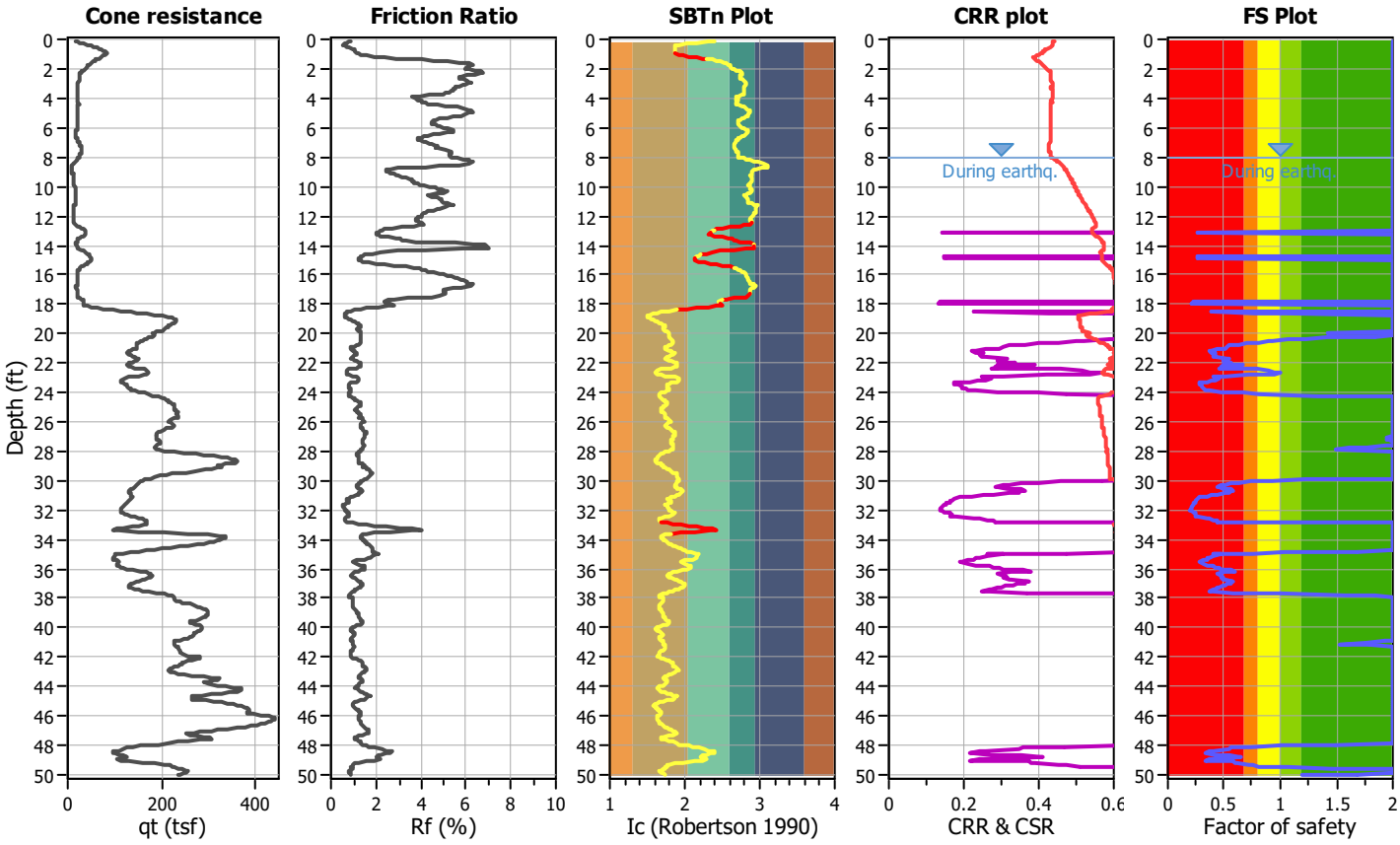
LIQUEFACTION ANALYSIS REPORT

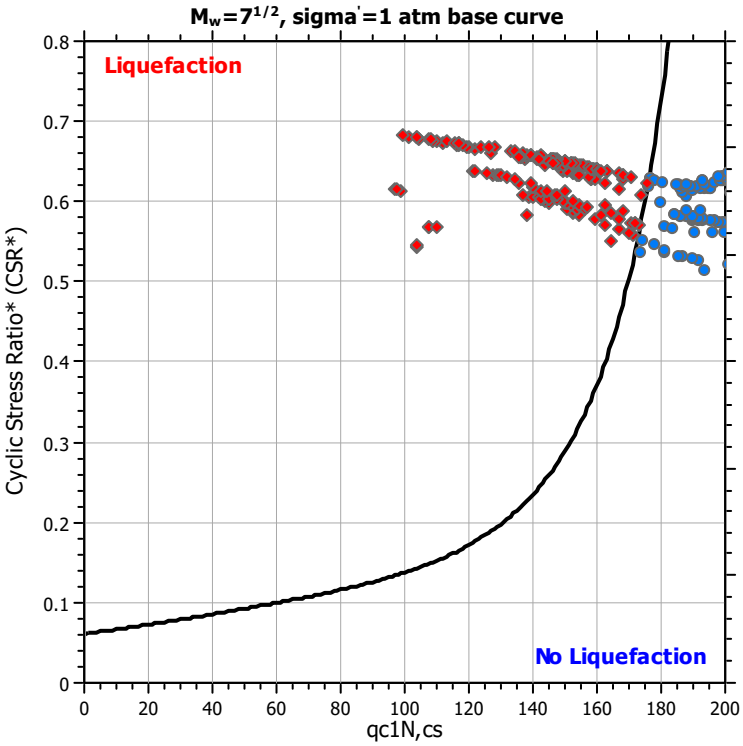
Project title : Wake Avenue Apartments **Location : El Centro, CA**

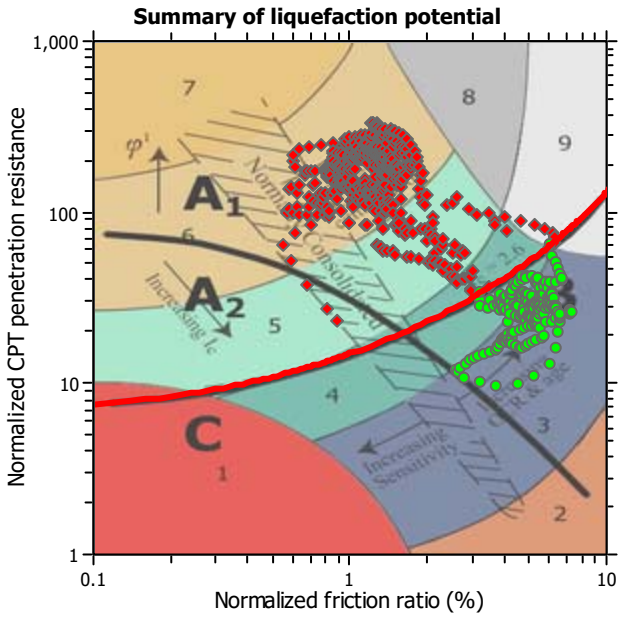
CPT file : CPT-7

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

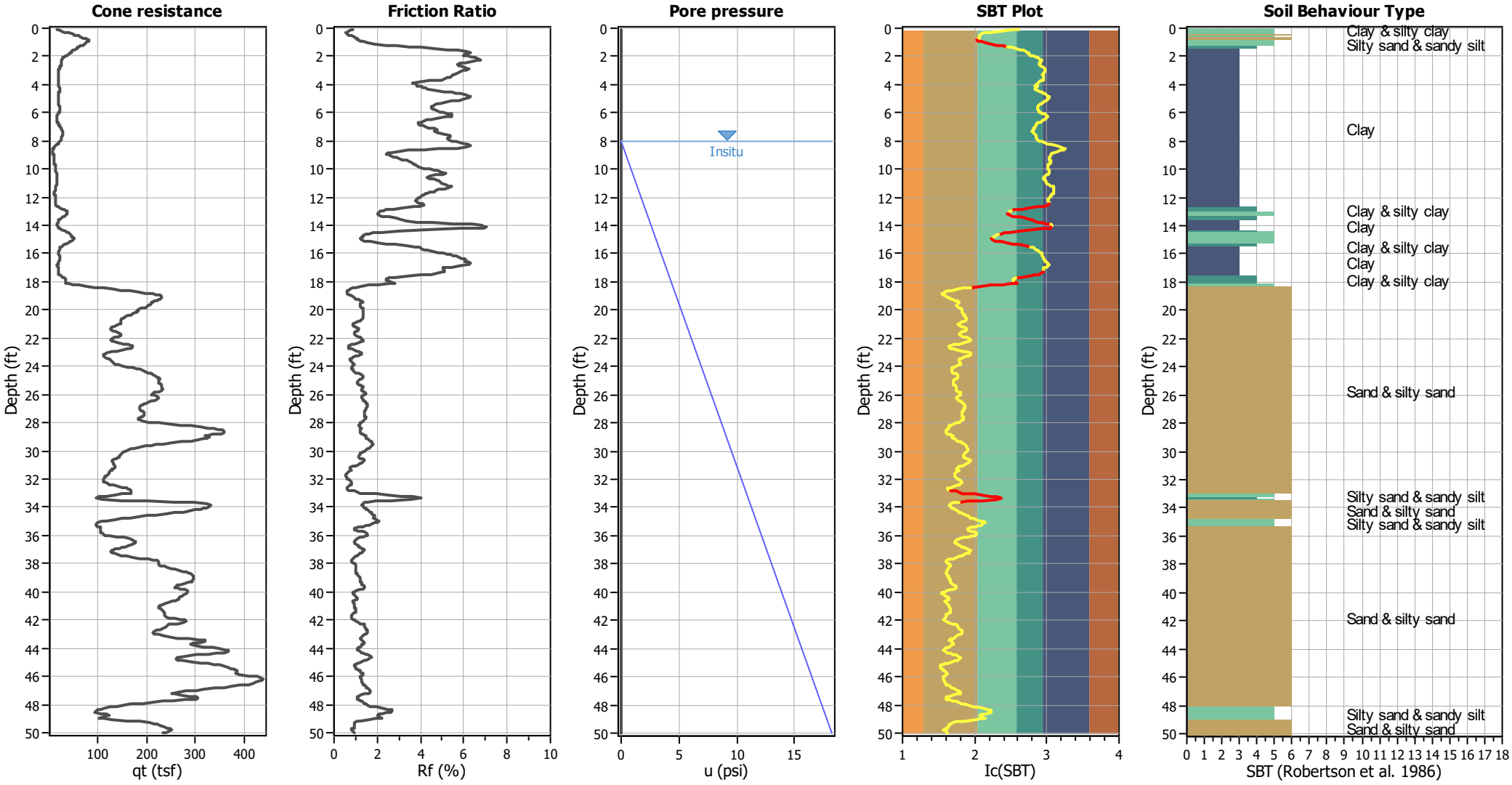






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



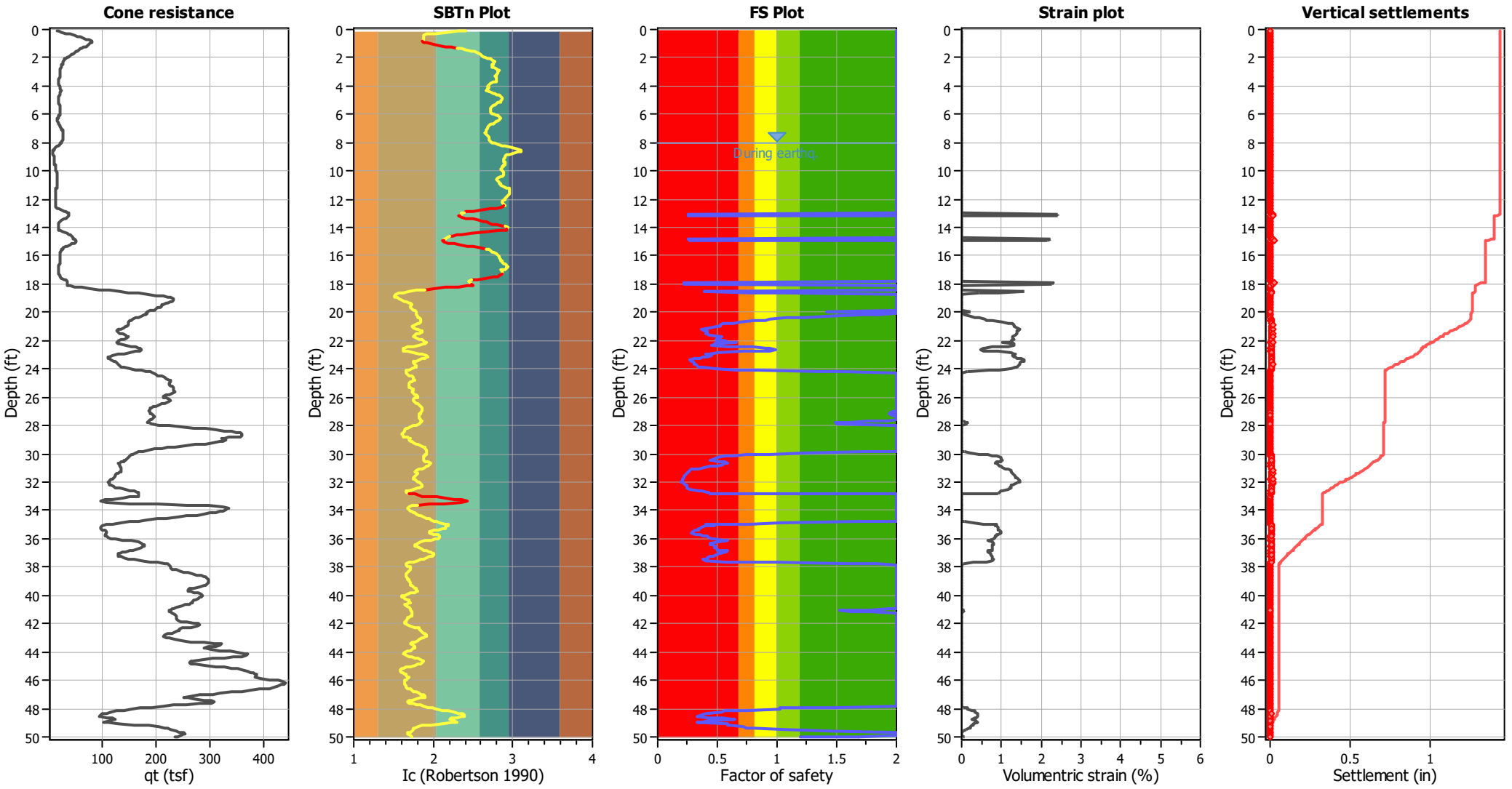
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement due to soil liquefaction ::

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
8.02	32.52	2.00	0.00	0.86	0.00	8.08	31.19	2.00	0.00	0.86	0.00
8.17	26.69	2.00	0.00	0.86	0.00	8.21	25.37	2.00	0.00	0.86	0.00
8.27	22.88	2.00	0.00	0.86	0.00	8.35	18.53	2.00	0.00	0.86	0.00
8.42	14.82	2.00	0.00	0.86	0.00	8.51	12.25	2.00	0.00	0.86	0.00
8.57	10.34	2.00	0.00	0.85	0.00	8.65	9.65	2.00	0.00	0.85	0.00
8.67	9.50	2.00	0.00	0.85	0.00	8.74	9.90	2.00	0.00	0.85	0.00
8.81	10.56	2.00	0.00	0.85	0.00	8.89	11.34	2.00	0.00	0.85	0.00
8.96	11.74	2.00	0.00	0.85	0.00	9.00	11.85	2.00	0.00	0.85	0.00
9.06	12.24	2.00	0.00	0.85	0.00	9.15	12.88	2.00	0.00	0.84	0.00
9.20	13.52	2.00	0.00	0.84	0.00	9.25	13.77	2.00	0.00	0.84	0.00
9.33	14.13	2.00	0.00	0.84	0.00	9.40	14.10	2.00	0.00	0.84	0.00
9.47	14.46	2.00	0.00	0.84	0.00	9.55	14.96	2.00	0.00	0.84	0.00
9.59	15.07	2.00	0.00	0.84	0.00	9.65	15.83	2.00	0.00	0.84	0.00
9.72	15.93	2.00	0.00	0.84	0.00	9.79	17.19	2.00	0.00	0.83	0.00
9.88	17.78	2.00	0.00	0.83	0.00	9.94	18.13	2.00	0.00	0.83	0.00
9.98	18.11	2.00	0.00	0.83	0.00	10.08	18.94	2.00	0.00	0.83	0.00
10.12	19.18	2.00	0.00	0.83	0.00	10.19	19.39	2.00	0.00	0.83	0.00
10.27	19.35	2.00	0.00	0.83	0.00	10.33	19.69	2.00	0.00	0.82	0.00
10.38	19.92	2.00	0.00	0.82	0.00	10.44	20.77	2.00	0.00	0.82	0.00
10.52	21.11	2.00	0.00	0.82	0.00	10.58	21.82	2.00	0.00	0.82	0.00
10.67	22.01	2.00	0.00	0.82	0.00	10.73	21.73	2.00	0.00	0.82	0.00
10.78	21.58	2.00	0.00	0.82	0.00	10.83	21.55	2.00	0.00	0.82	0.00
10.91	21.51	2.00	0.00	0.82	0.00	10.96	21.48	2.00	0.00	0.81	0.00
11.05	20.82	2.00	0.00	0.81	0.00	11.09	20.17	2.00	0.00	0.81	0.00
11.20	17.67	2.00	0.00	0.81	0.00	11.25	17.03	2.00	0.00	0.81	0.00
11.30	15.89	2.00	0.00	0.81	0.00	11.38	15.73	2.00	0.00	0.81	0.00
11.45	15.71	2.00	0.00	0.81	0.00	11.50	15.07	2.00	0.00	0.81	0.00
11.59	14.43	2.00	0.00	0.80	0.00	11.64	14.41	2.00	0.00	0.80	0.00
11.69	14.39	2.00	0.00	0.80	0.00	11.77	14.37	2.00	0.00	0.80	0.00
11.84	14.71	2.00	0.00	0.80	0.00	11.88	14.83	2.00	0.00	0.80	0.00
11.99	15.28	2.00	0.00	0.80	0.00	12.01	15.40	2.00	0.00	0.80	0.00
12.09	15.49	2.00	0.00	0.80	0.00	12.18	16.06	2.00	0.00	0.79	0.00
12.24	16.05	2.00	0.00	0.79	0.00	12.28	15.80	2.00	0.00	0.79	0.00
12.34	15.15	2.00	0.00	0.79	0.00	12.43	15.12	2.00	0.00	0.79	0.00
12.47	15.11	2.00	0.00	0.79	0.00	12.58	17.37	2.00	0.00	0.79	0.00
12.62	18.56	2.00	0.00	0.79	0.00	12.68	22.69	2.00	0.00	0.79	0.00
12.75	26.32	2.00	0.00	0.78	0.00	12.82	96.03	2.00	0.00	0.78	0.00
12.88	99.59	2.00	0.00	0.78	0.00	12.97	102.75	2.00	0.00	0.78	0.00
13.01	102.04	2.00	0.00	0.78	0.00	13.08	103.55	0.26	2.41	0.78	0.02
13.15	103.81	0.26	2.40	0.78	0.02	13.22	104.11	2.00	0.00	0.78	0.00
13.26	104.15	2.00	0.00	0.78	0.00	13.36	96.00	2.00	0.00	0.77	0.00
13.40	93.79	2.00	0.00	0.77	0.00	13.47	87.59	2.00	0.00	0.77	0.00
13.56	25.60	2.00	0.00	0.77	0.00	13.62	24.07	2.00	0.00	0.77	0.00
13.66	23.46	2.00	0.00	0.77	0.00	13.76	22.59	2.00	0.00	0.77	0.00
13.80	22.32	2.00	0.00	0.77	0.00	13.86	21.35	2.00	0.00	0.77	0.00
13.93	20.16	2.00	0.00	0.76	0.00	13.99	21.16	2.00	0.00	0.76	0.00
14.06	21.70	2.00	0.00	0.76	0.00	14.14	21.54	2.00	0.00	0.76	0.00
14.18	21.41	2.00	0.00	0.76	0.00	14.24	22.99	2.00	0.00	0.76	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
14.31	30.75	2.00	0.00	0.76	0.00	14.39	101.81	2.00	0.00	0.76	0.00
14.49	105.85	2.00	0.00	0.75	0.00	14.53	104.86	2.00	0.00	0.75	0.00
14.59	104.56	2.00	0.00	0.75	0.00	14.64	106.29	2.00	0.00	0.75	0.00
14.72	106.67	2.00	0.00	0.75	0.00	14.78	107.28	0.26	2.24	0.75	0.02
14.83	107.29	0.26	2.24	0.75	0.01	14.93	110.07	0.27	2.17	0.75	0.03
14.98	110.50	2.00	0.00	0.75	0.00	15.03	111.26	2.00	0.00	0.75	0.00
15.13	107.70	2.00	0.00	0.74	0.00	15.18	106.86	2.00	0.00	0.74	0.00
15.25	103.26	2.00	0.00	0.74	0.00	15.29	101.13	2.00	0.00	0.74	0.00
15.37	96.13	2.00	0.00	0.74	0.00	15.42	91.68	2.00	0.00	0.74	0.00
15.51	28.36	2.00	0.00	0.74	0.00	15.56	27.43	2.00	0.00	0.74	0.00
15.66	25.51	2.00	0.00	0.73	0.00	15.71	25.15	2.00	0.00	0.73	0.00
15.77	23.91	2.00	0.00	0.73	0.00	15.84	23.65	2.00	0.00	0.73	0.00
15.91	23.60	2.00	0.00	0.73	0.00	16.00	23.56	2.00	0.00	0.73	0.00
16.01	23.55	2.00	0.00	0.73	0.00	16.10	24.05	2.00	0.00	0.73	0.00
16.15	24.02	2.00	0.00	0.73	0.00	16.21	24.31	2.00	0.00	0.73	0.00
16.30	24.82	2.00	0.00	0.72	0.00	16.35	24.67	2.00	0.00	0.72	0.00
16.41	24.32	2.00	0.00	0.72	0.00	16.49	23.62	2.00	0.00	0.72	0.00
16.55	23.37	2.00	0.00	0.72	0.00	16.60	22.70	2.00	0.00	0.72	0.00
16.67	21.37	2.00	0.00	0.72	0.00	16.75	20.35	2.00	0.00	0.72	0.00
16.80	21.35	2.00	0.00	0.72	0.00	16.89	17.35	2.00	0.00	0.71	0.00
16.94	21.36	2.00	0.00	0.71	0.00	17.02	21.65	2.00	0.00	0.71	0.00
17.09	20.98	2.00	0.00	0.71	0.00	17.14	20.96	2.00	0.00	0.71	0.00
17.19	20.93	2.00	0.00	0.71	0.00	17.28	21.11	2.00	0.00	0.71	0.00
17.33	21.19	2.00	0.00	0.71	0.00	17.42	21.69	2.00	0.00	0.70	0.00
17.49	22.95	2.00	0.00	0.70	0.00	17.53	23.37	2.00	0.00	0.70	0.00
17.59	27.08	2.00	0.00	0.70	0.00	17.68	92.52	2.00	0.00	0.70	0.00
17.74	97.57	2.00	0.00	0.70	0.00	17.78	96.81	2.00	0.00	0.70	0.00
17.87	98.77	0.22	2.27	0.70	0.02	17.92	97.03	0.22	2.31	0.70	0.01
18.00	97.70	0.22	2.29	0.69	0.02	18.08	97.95	2.00	0.00	0.69	0.00
18.12	96.54	2.00	0.00	0.69	0.00	18.22	114.71	2.00	0.00	0.69	0.00
18.26	119.25	2.00	0.00	0.69	0.00	18.32	127.60	2.00	0.00	0.69	0.00
18.40	123.66	2.00	0.00	0.69	0.00	18.47	127.12	2.00	0.00	0.69	0.00
18.51	138.40	0.39	1.56	0.69	0.01	18.61	164.57	0.77	0.91	0.68	0.01
18.66	173.87	1.07	0.45	0.68	0.00	18.71	193.95	2.00	0.00	0.68	0.00
18.80	213.61	2.00	0.00	0.68	0.00	18.84	221.13	2.00	0.00	0.68	0.00
18.91	230.32	2.00	0.00	0.68	0.00	18.99	236.39	2.00	0.00	0.68	0.00
19.05	239.63	2.00	0.00	0.68	0.00	19.09	239.43	2.00	0.00	0.68	0.00
19.20	236.08	2.00	0.00	0.67	0.00	19.24	233.75	2.00	0.00	0.67	0.00
19.31	228.90	2.00	0.00	0.67	0.00	19.38	224.73	2.00	0.00	0.67	0.00
19.45	220.93	2.00	0.00	0.67	0.00	19.50	219.19	2.00	0.00	0.67	0.00
19.56	216.49	2.00	0.00	0.67	0.00	19.64	213.92	2.00	0.00	0.67	0.00
19.70	210.41	2.00	0.00	0.67	0.00	19.79	206.73	2.00	0.00	0.66	0.00
19.82	204.74	2.00	0.00	0.66	0.00	19.88	201.06	2.00	0.00	0.66	0.00
19.95	181.10	1.42	0.21	0.66	0.00	20.03	192.14	2.00	0.00	0.66	0.00
20.10	189.77	2.00	0.00	0.66	0.00	20.18	186.99	1.85	0.04	0.66	0.00
20.22	185.53	1.73	0.08	0.66	0.00	20.28	181.34	1.42	0.20	0.66	0.00
20.37	177.94	1.23	0.31	0.65	0.00	20.42	174.52	1.07	0.44	0.65	0.00
20.51	170.95	0.93	0.58	0.65	0.01	20.55	169.89	0.90	0.63	0.65	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
20.62	166.75	0.80	0.78	0.65	0.01	20.68	162.44	0.70	1.03	0.65	0.01
20.76	159.11	0.63	1.15	0.65	0.01	20.81	154.51	0.55	1.30	0.65	0.01
20.91	152.71	0.52	1.31	0.65	0.02	20.96	152.52	0.52	1.31	0.64	0.01
21.01	150.93	0.50	1.33	0.64	0.01	21.08	145.21	0.44	1.38	0.64	0.01
21.16	138.86	0.38	1.45	0.64	0.01	21.23	136.98	0.36	1.47	0.64	0.01
21.30	139.79	0.39	1.44	0.64	0.01	21.35	143.47	0.42	1.39	0.64	0.01
21.41	143.12	0.41	1.39	0.64	0.01	21.50	141.90	0.40	1.40	0.64	0.02
21.55	142.78	0.41	1.39	0.63	0.01	21.60	144.89	0.43	1.37	0.63	0.01
21.70	153.43	0.53	1.28	0.63	0.02	21.75	153.89	0.54	1.27	0.63	0.01
21.80	152.12	0.51	1.29	0.63	0.01	21.88	150.15	0.49	1.30	0.63	0.01
21.95	151.80	0.51	1.29	0.63	0.01	22.00	156.10	0.57	1.24	0.63	0.01
22.09	150.43	0.49	1.29	0.63	0.02	22.13	161.55	0.66	1.02	0.62	0.00
22.19	149.56	0.48	1.30	0.62	0.01	22.28	154.37	0.54	1.25	0.62	0.01
22.31	147.31	0.45	1.32	0.62	0.01	22.39	157.12	0.58	1.18	0.62	0.01
22.44	167.17	0.79	0.76	0.62	0.01	22.53	170.62	0.90	0.59	0.62	0.01
22.58	171.98	0.94	0.54	0.62	0.00	22.68	173.41	0.99	0.48	0.62	0.01
22.73	171.94	0.94	0.54	0.61	0.00	22.78	164.44	0.72	0.91	0.61	0.01
22.86	152.21	0.51	1.25	0.61	0.01	22.90	146.69	0.44	1.30	0.61	0.01
22.97	142.80	0.40	1.34	0.61	0.01	23.04	147.58	0.45	1.29	0.61	0.01
23.12	144.39	0.42	1.32	0.61	0.01	23.19	140.18	0.38	1.36	0.61	0.01
23.26	135.83	0.35	1.41	0.61	0.01	23.30	127.45	0.30	1.51	0.61	0.01
23.36	121.33	0.27	1.58	0.60	0.01	23.43	121.92	0.28	1.57	0.60	0.01
23.50	125.88	0.29	1.52	0.60	0.01	23.57	128.52	0.31	1.48	0.60	0.01
23.65	129.22	0.31	1.47	0.60	0.01	23.69	129.76	0.31	1.46	0.60	0.01
23.76	132.08	0.32	1.43	0.60	0.01	23.84	134.17	0.34	1.40	0.60	0.01
23.90	139.43	0.37	1.34	0.59	0.01	23.99	149.79	0.47	1.23	0.59	0.01
24.05	162.24	0.66	0.95	0.59	0.01	24.09	168.05	0.80	0.70	0.59	0.00
24.19	181.14	1.34	0.22	0.59	0.00	24.23	184.03	1.52	0.14	0.59	0.00
24.30	190.46	2.00	0.00	0.59	0.00	24.37	195.98	2.00	0.00	0.59	0.00
24.44	200.13	2.00	0.00	0.59	0.00	24.49	202.82	2.00	0.00	0.58	0.00
24.54	207.36	2.00	0.00	0.58	0.00	24.63	210.56	2.00	0.00	0.58	0.00
24.69	211.51	2.00	0.00	0.58	0.00	24.77	218.32	2.00	0.00	0.58	0.00
24.84	222.08	2.00	0.00	0.58	0.00	24.88	221.79	2.00	0.00	0.58	0.00
24.94	219.06	2.00	0.00	0.58	0.00	25.02	218.73	2.00	0.00	0.58	0.00
25.09	218.59	2.00	0.00	0.57	0.00	25.17	218.25	2.00	0.00	0.57	0.00
25.23	221.52	2.00	0.00	0.57	0.00	25.28	226.59	2.00	0.00	0.57	0.00
25.37	225.94	2.00	0.00	0.57	0.00	25.43	223.48	2.00	0.00	0.57	0.00
25.47	222.75	2.00	0.00	0.57	0.00	25.54	224.28	2.00	0.00	0.57	0.00
25.61	226.80	2.00	0.00	0.57	0.00	25.67	227.39	2.00	0.00	0.56	0.00
25.77	221.79	2.00	0.00	0.56	0.00	25.80	217.70	2.00	0.00	0.56	0.00
25.86	212.64	2.00	0.00	0.56	0.00	25.96	202.76	2.00	0.00	0.56	0.00
26.01	205.56	2.00	0.00	0.56	0.00	26.06	209.05	2.00	0.00	0.56	0.00
26.14	214.59	2.00	0.00	0.56	0.00	26.21	218.82	2.00	0.00	0.56	0.00
26.26	217.89	2.00	0.00	0.55	0.00	26.36	213.24	2.00	0.00	0.55	0.00
26.41	207.36	2.00	0.00	0.55	0.00	26.46	204.59	2.00	0.00	0.55	0.00
26.54	199.82	2.00	0.00	0.55	0.00	26.60	198.22	2.00	0.00	0.55	0.00
26.64	199.57	2.00	0.00	0.55	0.00	26.71	198.17	2.00	0.00	0.55	0.00
26.78	197.17	2.00	0.00	0.55	0.00	26.85	195.37	2.00	0.00	0.54	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
26.94	193.42	2.00	0.00	0.54	0.00	27.00	191.83	2.00	0.00	0.54	0.00
27.04	189.93	1.95	0.01	0.54	0.00	27.14	190.60	2.00	0.00	0.54	0.00
27.18	189.94	1.94	0.01	0.54	0.00	27.24	190.18	1.97	0.01	0.54	0.00
27.33	192.54	2.00	0.00	0.54	0.00	27.39	192.09	2.00	0.00	0.54	0.00
27.44	193.28	2.00	0.00	0.53	0.00	27.54	191.28	2.00	0.00	0.53	0.00
27.58	192.14	2.00	0.00	0.53	0.00	27.64	189.79	1.92	0.02	0.53	0.00
27.73	188.04	1.77	0.05	0.53	0.00	27.77	186.00	1.61	0.10	0.53	0.00
27.83	184.27	1.49	0.14	0.53	0.00	27.90	184.39	1.49	0.14	0.53	0.00
27.98	190.28	1.96	0.01	0.53	0.00	28.04	208.19	2.00	0.00	0.52	0.00
28.13	236.53	2.00	0.00	0.52	0.00	28.17	252.12	2.00	0.00	0.52	0.00
28.23	254.00	2.00	0.00	0.52	0.00	28.31	254.00	2.00	0.00	0.52	0.00
28.38	254.00	2.00	0.00	0.52	0.00	28.41	254.00	2.00	0.00	0.52	0.00
28.52	254.00	2.00	0.00	0.52	0.00	28.55	254.00	2.00	0.00	0.52	0.00
28.63	254.00	2.00	0.00	0.51	0.00	28.70	254.00	2.00	0.00	0.51	0.00
28.76	254.00	2.00	0.00	0.51	0.00	28.81	254.00	2.00	0.00	0.51	0.00
28.89	254.00	2.00	0.00	0.51	0.00	28.95	254.00	2.00	0.00	0.51	0.00
29.03	254.00	2.00	0.00	0.51	0.00	29.10	254.00	2.00	0.00	0.51	0.00
29.14	254.00	2.00	0.00	0.51	0.00	29.20	254.00	2.00	0.00	0.51	0.00
29.28	254.00	2.00	0.00	0.50	0.00	29.34	254.00	2.00	0.00	0.50	0.00
29.44	244.57	2.00	0.00	0.50	0.00	29.50	236.68	2.00	0.00	0.50	0.00
29.54	234.35	2.00	0.00	0.50	0.00	29.60	223.08	2.00	0.00	0.50	0.00
29.68	213.39	2.00	0.00	0.50	0.00	29.75	202.60	2.00	0.00	0.50	0.00
29.83	192.25	2.00	0.00	0.49	0.00	29.87	188.05	1.74	0.06	0.49	0.00
29.93	180.23	1.23	0.23	0.49	0.00	30.01	173.53	0.94	0.43	0.49	0.00
30.09	167.11	0.74	0.66	0.49	0.01	30.13	162.40	0.64	0.78	0.49	0.00
30.19	158.33	0.57	0.89	0.49	0.01	30.27	154.10	0.50	0.98	0.49	0.01
30.32	152.34	0.48	0.99	0.49	0.01	30.42	149.07	0.44	1.01	0.48	0.01
30.47	150.46	0.46	1.00	0.48	0.01	30.52	153.82	0.50	0.97	0.48	0.01
30.61	158.14	0.56	0.88	0.48	0.01	30.68	159.27	0.58	0.85	0.48	0.01
30.71	157.66	0.55	0.90	0.48	0.00	30.82	157.51	0.55	0.90	0.48	0.01
30.86	154.33	0.51	0.96	0.48	0.00	30.92	148.54	0.44	1.00	0.48	0.01
31.02	143.85	0.39	1.03	0.47	0.01	31.06	137.29	0.34	1.09	0.47	0.01
31.11	127.12	0.29	1.18	0.47	0.01	31.21	121.90	0.26	1.23	0.47	0.02
31.26	120.27	0.26	1.25	0.47	0.01	31.31	119.23	0.25	1.25	0.47	0.01
31.40	116.70	0.25	1.28	0.47	0.01	31.43	115.96	0.24	1.29	0.47	0.01
31.50	111.72	0.23	1.33	0.47	0.01	31.58	109.77	0.22	1.36	0.46	0.01
31.65	108.53	0.22	1.37	0.46	0.01	31.69	107.70	0.22	1.38	0.46	0.01
31.80	104.54	0.21	1.42	0.46	0.02	31.83	103.65	0.21	1.43	0.46	0.00
31.90	101.42	0.20	1.46	0.46	0.01	31.99	99.44	0.20	1.48	0.46	0.02
32.04	103.88	0.21	1.41	0.46	0.01	32.13	107.86	0.22	1.35	0.46	0.01
32.19	113.38	0.23	1.28	0.45	0.01	32.23	115.35	0.24	1.26	0.45	0.01
32.29	116.60	0.24	1.24	0.45	0.01	32.37	118.12	0.25	1.22	0.45	0.01
32.42	116.67	0.24	1.23	0.45	0.01	32.48	123.89	0.27	1.15	0.45	0.01
32.59	138.00	0.34	1.02	0.45	0.01	32.62	141.60	0.37	0.99	0.45	0.00
32.69	146.04	0.41	0.95	0.45	0.01	32.77	148.44	0.43	0.93	0.44	0.01
32.82	149.14	0.44	0.93	0.44	0.01	32.88	150.80	2.00	0.00	0.44	0.00
32.98	162.98	2.00	0.00	0.44	0.00	33.03	186.22	2.00	0.00	0.44	0.00
33.08	201.64	2.00	0.00	0.44	0.00	33.17	181.14	2.00	0.00	0.44	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
33.22	177.15	2.00	0.00	0.44	0.00	33.27	162.43	2.00	0.00	0.44	0.00
33.36	149.77	2.00	0.00	0.43	0.00	33.42	151.27	2.00	0.00	0.43	0.00
33.51	190.31	2.00	0.00	0.43	0.00	33.56	240.64	2.00	0.00	0.43	0.00
33.60	232.27	2.00	0.00	0.43	0.00	33.67	254.00	2.00	0.00	0.43	0.00
33.77	254.00	2.00	0.00	0.43	0.00	33.81	254.00	2.00	0.00	0.43	0.00
33.87	254.00	2.00	0.00	0.43	0.00	33.95	254.00	2.00	0.00	0.42	0.00
34.02	254.00	2.00	0.00	0.42	0.00	34.06	254.00	2.00	0.00	0.42	0.00
34.15	254.00	2.00	0.00	0.42	0.00	34.21	254.00	2.00	0.00	0.42	0.00
34.28	254.00	2.00	0.00	0.42	0.00	34.35	251.95	2.00	0.00	0.42	0.00
34.39	252.97	2.00	0.00	0.42	0.00	34.50	234.21	2.00	0.00	0.42	0.00
34.54	237.02	2.00	0.00	0.41	0.00	34.60	222.64	2.00	0.00	0.41	0.00
34.68	208.21	2.00	0.00	0.41	0.00	34.73	201.93	2.00	0.00	0.41	0.00
34.80	187.83	1.68	0.06	0.41	0.00	34.87	176.48	1.03	0.29	0.41	0.00
34.94	168.17	0.76	0.53	0.41	0.00	34.99	145.33	0.40	0.88	0.41	0.01
35.04	152.61	0.48	0.83	0.41	0.01	35.12	145.60	0.40	0.87	0.40	0.01
35.19	141.22	0.37	0.90	0.40	0.01	35.27	139.63	0.35	0.90	0.40	0.01
35.32	137.98	0.34	0.91	0.40	0.01	35.37	136.84	0.34	0.92	0.40	0.01
35.45	133.39	0.31	0.94	0.40	0.01	35.52	128.35	0.29	0.98	0.40	0.01
35.59	126.41	0.28	1.00	0.40	0.01	35.67	134.22	0.32	0.93	0.40	0.01
35.75	139.58	0.35	0.89	0.39	0.01	35.76	143.27	0.38	0.86	0.39	0.00
35.85	146.46	0.41	0.84	0.39	0.01	35.89	148.18	0.43	0.82	0.39	0.00
35.98	150.64	0.45	0.81	0.39	0.01	36.04	152.42	0.47	0.79	0.39	0.01
36.11	158.84	0.56	0.70	0.39	0.01	36.16	160.55	0.59	0.66	0.39	0.00
36.24	155.35	0.51	0.77	0.39	0.01	36.29	149.75	0.44	0.80	0.38	0.00
36.39	149.98	0.44	0.80	0.38	0.01	36.45	152.00	0.47	0.78	0.38	0.01
36.50	153.06	0.48	0.77	0.38	0.00	36.56	153.56	0.49	0.77	0.38	0.01
36.64	152.63	0.47	0.77	0.38	0.01	36.70	154.25	0.50	0.76	0.38	0.01
36.79	154.93	0.50	0.75	0.38	0.01	36.82	160.06	0.58	0.65	0.38	0.00
36.89	159.23	0.57	0.66	0.37	0.01	36.96	158.99	0.56	0.67	0.37	0.01
37.04	156.79	0.53	0.72	0.37	0.01	37.08	155.74	0.51	0.74	0.37	0.00
37.19	153.34	0.48	0.75	0.37	0.01	37.23	151.57	0.46	0.76	0.37	0.00
37.29	149.76	0.44	0.77	0.37	0.01	37.37	147.21	0.42	0.78	0.37	0.01
37.43	146.66	0.41	0.78	0.37	0.01	37.48	142.21	0.37	0.80	0.36	0.00
37.53	146.36	0.41	0.78	0.36	0.01	37.62	159.92	0.58	0.63	0.36	0.01
37.68	175.92	1.00	0.27	0.36	0.00	37.77	186.67	1.58	0.07	0.36	0.00
37.80	190.13	1.85	0.02	0.36	0.00	37.87	194.93	2.00	0.00	0.36	0.00
37.94	193.89	2.00	0.00	0.36	0.00	38.00	195.41	2.00	0.00	0.36	0.00
38.08	192.73	2.00	0.00	0.35	0.00	38.14	195.86	2.00	0.00	0.35	0.00
38.21	204.09	2.00	0.00	0.35	0.00	38.29	212.60	2.00	0.00	0.35	0.00
38.34	216.49	2.00	0.00	0.35	0.00	38.39	224.47	2.00	0.00	0.35	0.00
38.49	232.93	2.00	0.00	0.35	0.00	38.54	240.60	2.00	0.00	0.35	0.00
38.62	247.27	2.00	0.00	0.35	0.00	38.69	252.80	2.00	0.00	0.34	0.00
38.72	254.00	2.00	0.00	0.34	0.00	38.79	254.00	2.00	0.00	0.34	0.00
38.88	254.00	2.00	0.00	0.34	0.00	38.94	254.00	2.00	0.00	0.34	0.00
38.98	254.00	2.00	0.00	0.34	0.00	39.05	254.00	2.00	0.00	0.34	0.00
39.12	254.00	2.00	0.00	0.34	0.00	39.18	254.00	2.00	0.00	0.34	0.00
39.27	254.00	2.00	0.00	0.33	0.00	39.30	252.22	2.00	0.00	0.33	0.00
39.37	244.64	2.00	0.00	0.33	0.00	39.48	231.07	2.00	0.00	0.33	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
39.52	227.47	2.00	0.00	0.33	0.00	39.60	223.45	2.00	0.00	0.33	0.00
39.67	225.12	2.00	0.00	0.33	0.00	39.70	226.99	2.00	0.00	0.33	0.00
39.77	232.97	2.00	0.00	0.33	0.00	39.85	242.44	2.00	0.00	0.32	0.00
39.92	247.25	2.00	0.00	0.32	0.00	40.00	247.46	2.00	0.00	0.32	0.00
40.03	246.97	2.00	0.00	0.32	0.00	40.11	245.38	2.00	0.00	0.32	0.00
40.17	242.59	2.00	0.00	0.32	0.00	40.25	238.41	2.00	0.00	0.32	0.00
40.30	235.49	2.00	0.00	0.32	0.00	40.36	230.73	2.00	0.00	0.32	0.00
40.44	228.11	2.00	0.00	0.31	0.00	40.51	227.98	2.00	0.00	0.31	0.00
40.58	226.88	2.00	0.00	0.31	0.00	40.66	222.04	2.00	0.00	0.31	0.00
40.69	218.19	2.00	0.00	0.31	0.00	40.76	209.50	2.00	0.00	0.31	0.00
40.85	200.29	2.00	0.00	0.31	0.00	40.90	193.48	2.00	0.00	0.31	0.00
40.95	191.32	1.94	0.01	0.31	0.00	41.03	189.43	1.77	0.03	0.30	0.00
41.10	186.02	1.52	0.07	0.30	0.00	41.15	187.50	1.62	0.05	0.30	0.00
41.21	189.59	1.79	0.03	0.30	0.00	41.28	193.48	2.00	0.00	0.30	0.00
41.35	196.68	2.00	0.00	0.30	0.00	41.43	198.83	2.00	0.00	0.30	0.00
41.50	199.42	2.00	0.00	0.30	0.00	41.55	198.82	2.00	0.00	0.30	0.00
41.61	199.68	2.00	0.00	0.29	0.00	41.68	199.48	2.00	0.00	0.29	0.00
41.75	199.02	2.00	0.00	0.29	0.00	41.84	203.96	2.00	0.00	0.29	0.00
41.90	219.38	2.00	0.00	0.29	0.00	41.93	228.47	2.00	0.00	0.29	0.00
42.00	241.22	2.00	0.00	0.29	0.00	42.08	242.26	2.00	0.00	0.29	0.00
42.15	234.61	2.00	0.00	0.29	0.00	42.24	223.09	2.00	0.00	0.28	0.00
42.29	213.90	2.00	0.00	0.28	0.00	42.34	214.28	2.00	0.00	0.28	0.00
42.40	211.56	2.00	0.00	0.28	0.00	42.48	211.49	2.00	0.00	0.28	0.00
42.53	213.19	2.00	0.00	0.28	0.00	42.62	213.50	2.00	0.00	0.28	0.00
42.68	211.67	2.00	0.00	0.28	0.00	42.73	214.98	2.00	0.00	0.28	0.00
42.81	211.54	2.00	0.00	0.27	0.00	42.88	210.40	2.00	0.00	0.27	0.00
42.91	205.76	2.00	0.00	0.27	0.00	43.02	205.37	2.00	0.00	0.27	0.00
43.06	200.39	2.00	0.00	0.27	0.00	43.12	200.71	2.00	0.00	0.27	0.00
43.19	206.01	2.00	0.00	0.27	0.00	43.27	223.18	2.00	0.00	0.27	0.00
43.32	236.74	2.00	0.00	0.27	0.00	43.41	254.00	2.00	0.00	0.26	0.00
43.45	254.00	2.00	0.00	0.26	0.00	43.52	254.00	2.00	0.00	0.26	0.00
43.61	254.00	2.00	0.00	0.26	0.00	43.66	249.51	2.00	0.00	0.26	0.00
43.71	244.21	2.00	0.00	0.26	0.00	43.77	240.71	2.00	0.00	0.26	0.00
43.84	252.48	2.00	0.00	0.26	0.00	43.91	254.00	2.00	0.00	0.26	0.00
43.97	254.00	2.00	0.00	0.25	0.00	44.06	254.00	2.00	0.00	0.25	0.00
44.10	254.00	2.00	0.00	0.25	0.00	44.17	254.00	2.00	0.00	0.25	0.00
44.24	254.00	2.00	0.00	0.25	0.00	44.31	254.00	2.00	0.00	0.25	0.00
44.38	254.00	2.00	0.00	0.25	0.00	44.46	254.00	2.00	0.00	0.25	0.00
44.49	254.00	2.00	0.00	0.25	0.00	44.60	248.45	2.00	0.00	0.24	0.00
44.64	253.68	2.00	0.00	0.24	0.00	44.71	239.16	2.00	0.00	0.24	0.00
44.79	244.88	2.00	0.00	0.24	0.00	44.85	227.46	2.00	0.00	0.24	0.00
44.89	226.60	2.00	0.00	0.24	0.00	44.95	245.44	2.00	0.00	0.24	0.00
45.03	254.00	2.00	0.00	0.24	0.00	45.09	254.00	2.00	0.00	0.24	0.00
45.18	254.00	2.00	0.00	0.23	0.00	45.22	254.00	2.00	0.00	0.23	0.00
45.29	254.00	2.00	0.00	0.23	0.00	45.36	254.00	2.00	0.00	0.23	0.00
45.43	254.00	2.00	0.00	0.23	0.00	45.48	254.00	2.00	0.00	0.23	0.00
45.54	254.00	2.00	0.00	0.23	0.00	45.62	254.00	2.00	0.00	0.23	0.00
45.67	254.00	2.00	0.00	0.23	0.00	45.76	254.00	2.00	0.00	0.22	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
45.83	254.00	2.00	0.00	0.22	0.00	45.88	254.00	2.00	0.00	0.22	0.00
45.97	254.00	2.00	0.00	0.22	0.00	46.02	254.00	2.00	0.00	0.22	0.00
46.08	254.00	2.00	0.00	0.22	0.00	46.16	254.00	2.00	0.00	0.22	0.00
46.20	254.00	2.00	0.00	0.22	0.00	46.27	254.00	2.00	0.00	0.22	0.00
46.34	254.00	2.00	0.00	0.21	0.00	46.42	254.00	2.00	0.00	0.21	0.00
46.49	254.00	2.00	0.00	0.21	0.00	46.56	254.00	2.00	0.00	0.21	0.00
46.61	254.00	2.00	0.00	0.21	0.00	46.66	254.00	2.00	0.00	0.21	0.00
46.74	254.00	2.00	0.00	0.21	0.00	46.81	254.00	2.00	0.00	0.21	0.00
46.86	254.00	2.00	0.00	0.21	0.00	46.92	254.00	2.00	0.00	0.20	0.00
47.01	254.00	2.00	0.00	0.20	0.00	47.06	254.00	2.00	0.00	0.20	0.00
47.14	233.63	2.00	0.00	0.20	0.00	47.20	232.37	2.00	0.00	0.20	0.00
47.27	218.13	2.00	0.00	0.20	0.00	47.35	223.34	2.00	0.00	0.20	0.00
47.40	234.89	2.00	0.00	0.20	0.00	47.45	254.00	2.00	0.00	0.20	0.00
47.54	254.00	2.00	0.00	0.19	0.00	47.60	249.79	2.00	0.00	0.19	0.00
47.64	238.63	2.00	0.00	0.19	0.00	47.75	199.21	2.00	0.00	0.19	0.00
47.78	199.37	2.00	0.00	0.19	0.00	47.84	201.65	2.00	0.00	0.19	0.00
47.94	185.69	1.49	0.05	0.19	0.00	47.99	176.87	1.03	0.13	0.19	0.00
48.04	176.70	1.02	0.13	0.19	0.00	48.12	167.83	0.74	0.24	0.18	0.00
48.19	158.62	0.56	0.33	0.18	0.00	48.23	157.60	0.54	0.34	0.18	0.00
48.33	145.01	0.40	0.39	0.18	0.00	48.38	144.89	0.40	0.39	0.18	0.00
48.45	141.51	0.37	0.40	0.18	0.00	48.52	136.01	0.33	0.41	0.18	0.00
48.57	136.42	0.34	0.41	0.18	0.00	48.63	147.51	0.42	0.37	0.18	0.00
48.69	157.93	0.55	0.32	0.17	0.00	48.78	162.98	0.63	0.27	0.17	0.00
48.82	163.27	0.64	0.27	0.17	0.00	48.92	146.52	0.41	0.36	0.17	0.00
48.96	141.57	0.37	0.38	0.17	0.00	49.02	135.68	0.33	0.39	0.17	0.00
49.09	160.13	0.58	0.29	0.17	0.00	49.15	160.45	0.59	0.28	0.17	0.00
49.22	161.46	0.61	0.27	0.17	0.00	49.32	166.80	0.72	0.22	0.16	0.00
49.36	168.09	0.75	0.21	0.16	0.00	49.42	170.44	0.81	0.19	0.16	0.00
49.50	178.06	1.08	0.10	0.16	0.00	49.57	185.15	1.45	0.05	0.16	0.00
49.65	193.23	2.00	0.00	0.16	0.00	49.68	198.03	2.00	0.00	0.16	0.00
49.76	203.93	2.00	0.00	0.16	0.00	49.82	201.50	2.00	0.00	0.16	0.00
49.89	193.13	2.00	0.00	0.15	0.00	49.96	188.38	1.68	0.02	0.15	0.00
50.01	180.51	1.19	0.08	0.15	0.00						

Total estimated settlement: 1.44

Abbreviations

$Q_{tn,cs}$:	Equivalent clean sand normalized cone resistance
FS:	Factor of safety against liquefaction
e_v (%):	Post-liquefaction volumentric strain
DF:	e_v depth weighting factor
Settlement:	Calculated settlement

Landmark Consultants, Inc.
780 N. 4th Street
El Centro, CA 92243

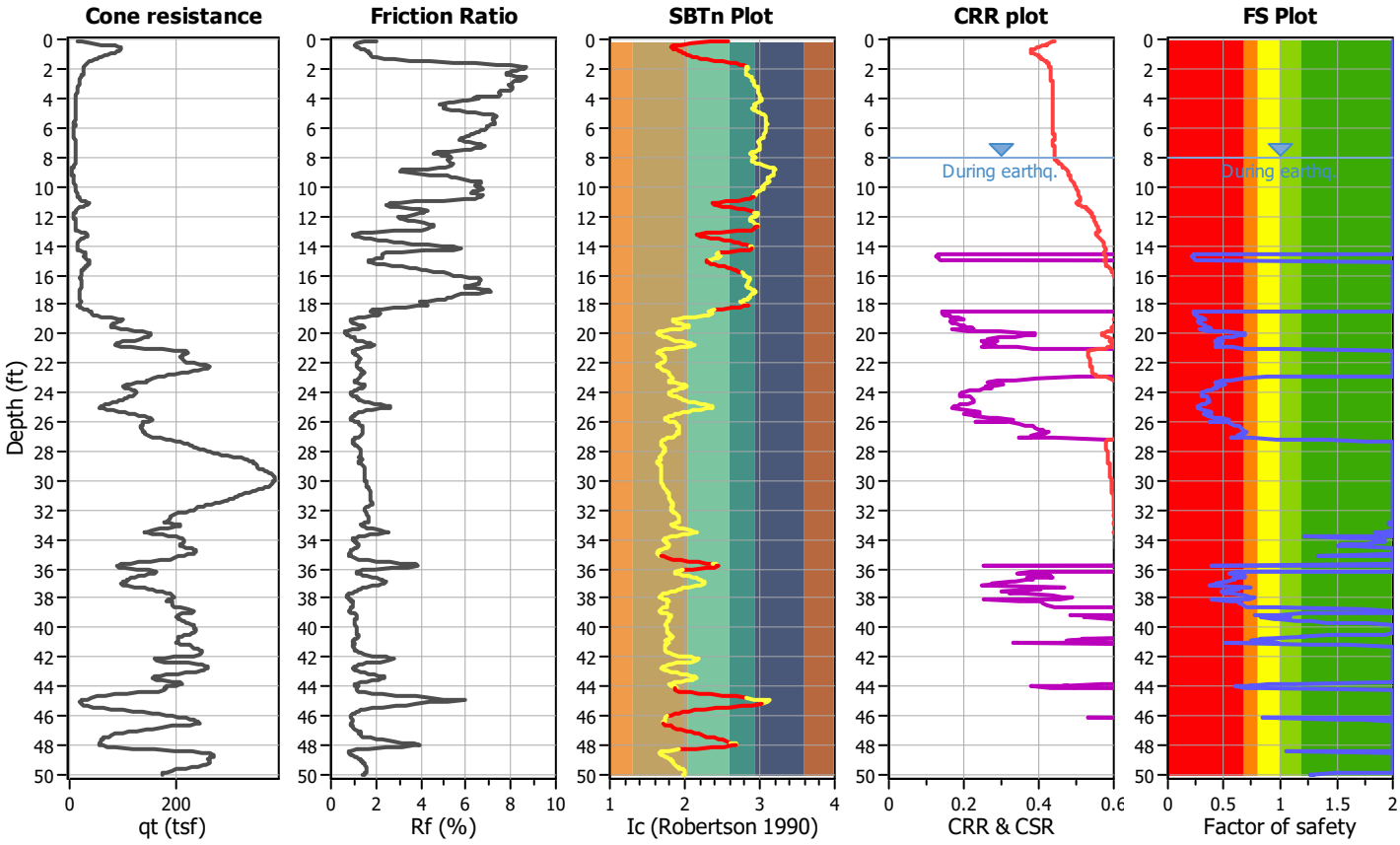
LIQUEFACTION ANALYSIS REPORT

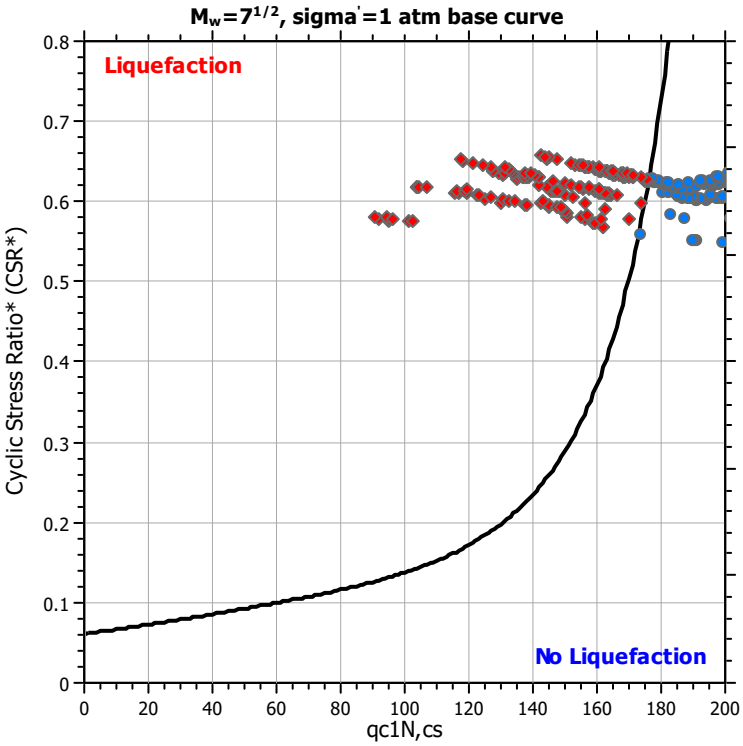
Project title : Wake Avenue Apartments **Location : El Centro, CA**

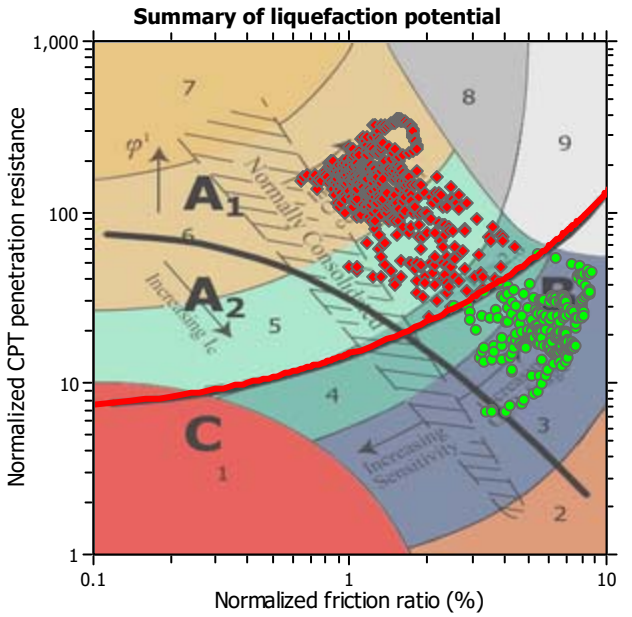
CPT file : CPT-8

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

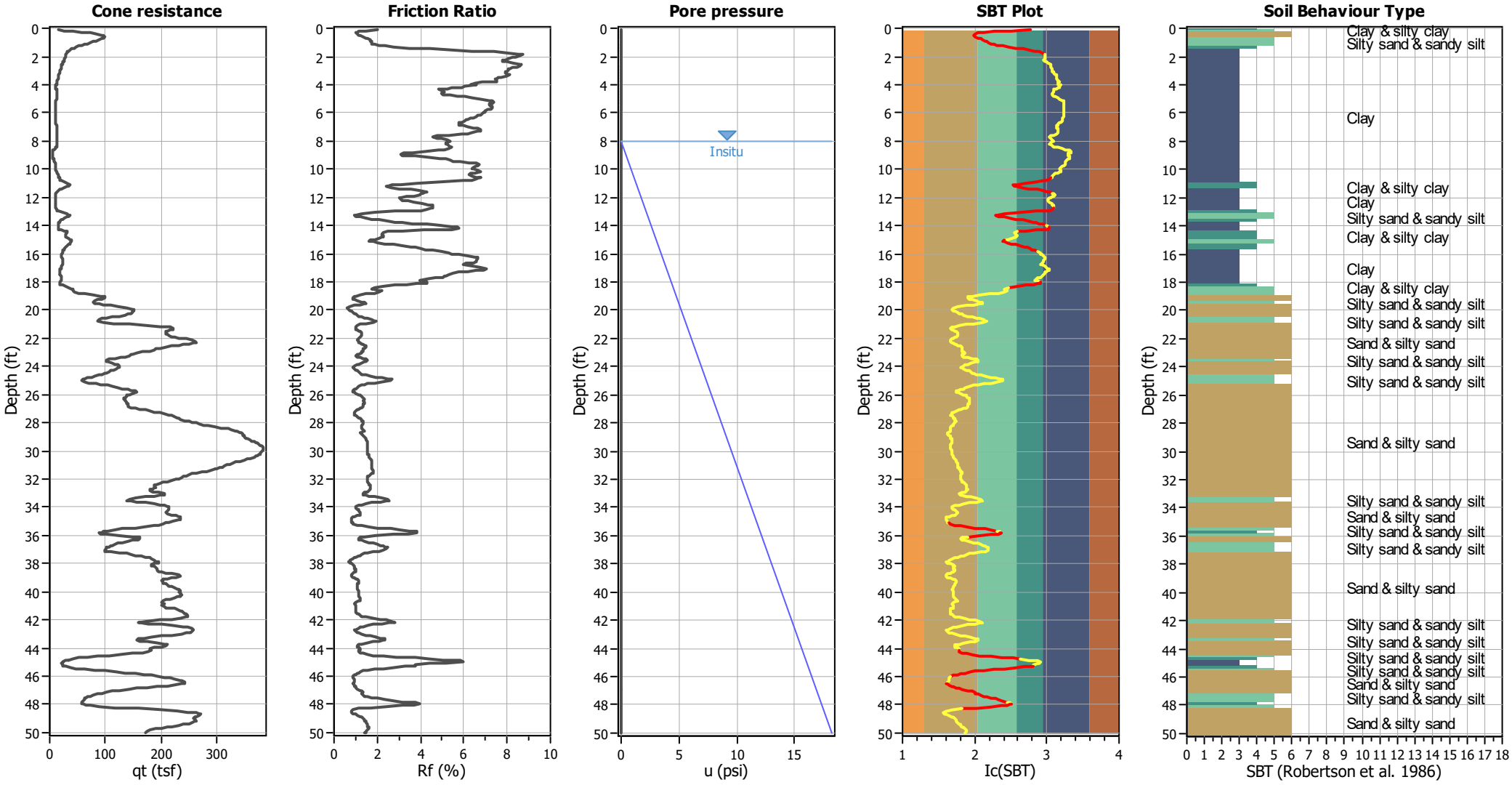






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



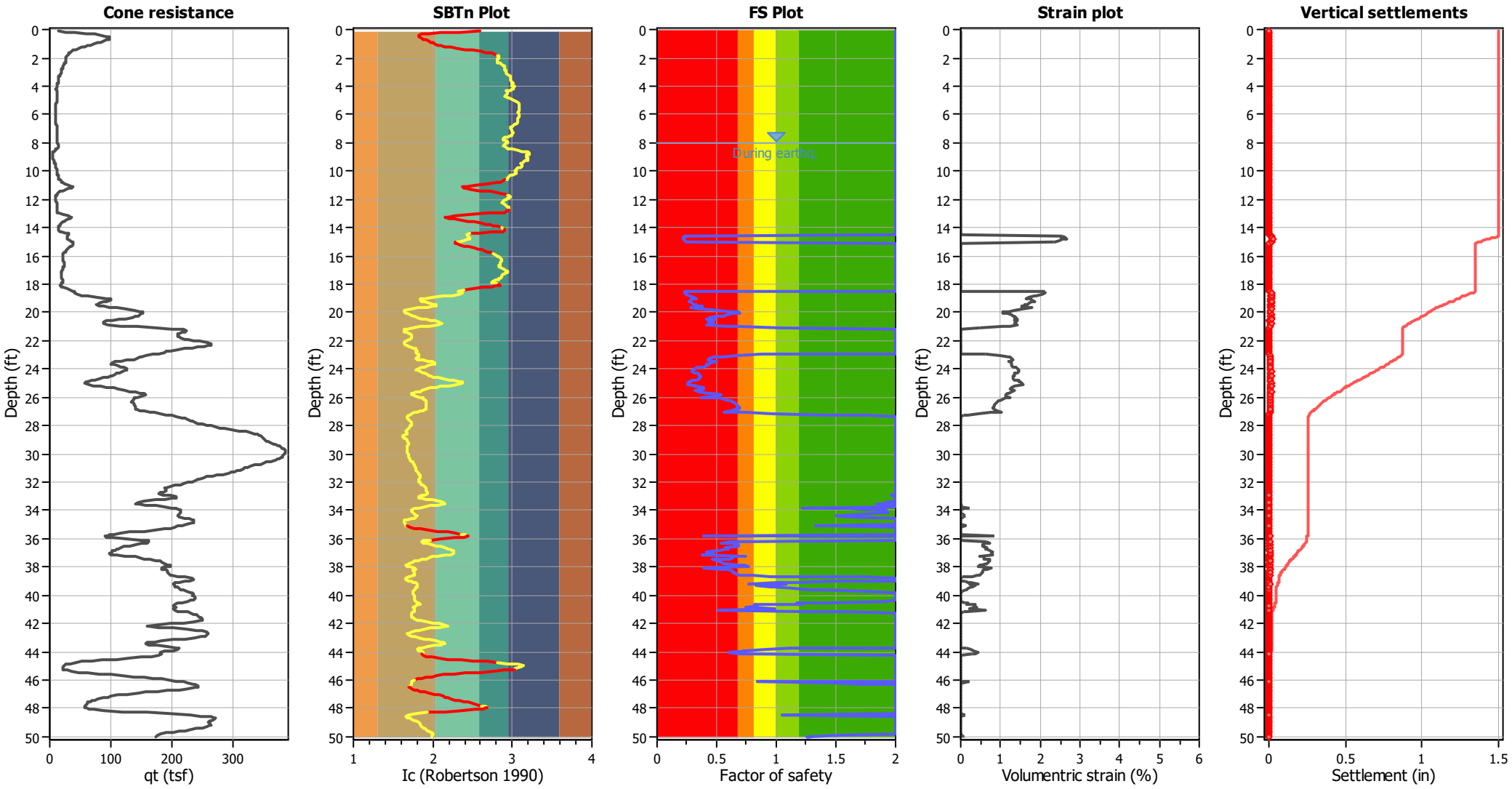
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement due to soil liquefaction ::

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
8.01	19.52	2.00	0.00	0.86	0.00	8.08	20.41	2.00	0.00	0.86	0.00
8.18	20.35	2.00	0.00	0.86	0.00	8.23	20.32	2.00	0.00	0.86	0.00
8.28	19.49	2.00	0.00	0.86	0.00	8.38	18.52	2.00	0.00	0.86	0.00
8.40	17.70	2.00	0.00	0.86	0.00	8.47	15.82	2.00	0.00	0.86	0.00
8.55	13.13	2.00	0.00	0.86	0.00	8.62	10.26	2.00	0.00	0.85	0.00
8.67	9.02	2.00	0.00	0.85	0.00	8.77	7.07	2.00	0.00	0.85	0.00
8.82	7.20	2.00	0.00	0.85	0.00	8.87	7.06	2.00	0.00	0.85	0.00
8.97	7.04	2.00	0.00	0.85	0.00	9.00	7.04	2.00	0.00	0.85	0.00
9.06	7.44	2.00	0.00	0.85	0.00	9.16	8.10	2.00	0.00	0.84	0.00
9.21	8.91	2.00	0.00	0.84	0.00	9.26	9.57	2.00	0.00	0.84	0.00
9.32	10.62	2.00	0.00	0.84	0.00	9.41	11.80	2.00	0.00	0.84	0.00
9.46	12.44	2.00	0.00	0.84	0.00	9.55	12.55	2.00	0.00	0.84	0.00
9.59	12.66	2.00	0.00	0.84	0.00	9.66	13.04	2.00	0.00	0.84	0.00
9.74	13.79	2.00	0.00	0.83	0.00	9.81	14.67	2.00	0.00	0.83	0.00
9.85	15.04	2.00	0.00	0.83	0.00	9.95	15.90	2.00	0.00	0.83	0.00
9.99	15.88	2.00	0.00	0.83	0.00	10.06	15.85	2.00	0.00	0.83	0.00
10.14	15.82	2.00	0.00	0.83	0.00	10.20	16.19	2.00	0.00	0.83	0.00
10.25	16.92	2.00	0.00	0.83	0.00	10.31	18.53	2.00	0.00	0.83	0.00
10.39	19.62	2.00	0.00	0.82	0.00	10.47	20.46	2.00	0.00	0.82	0.00
10.54	21.17	2.00	0.00	0.82	0.00	10.58	21.76	2.00	0.00	0.82	0.00
10.64	22.96	2.00	0.00	0.82	0.00	10.72	24.38	2.00	0.00	0.82	0.00
10.76	25.45	2.00	0.00	0.82	0.00	10.83	27.24	2.00	0.00	0.82	0.00
10.91	30.69	2.00	0.00	0.82	0.00	10.98	100.93	2.00	0.00	0.81	0.00
11.07	111.84	2.00	0.00	0.81	0.00	11.09	108.86	2.00	0.00	0.81	0.00
11.17	104.82	2.00	0.00	0.81	0.00	11.24	99.86	2.00	0.00	0.81	0.00
11.30	93.03	2.00	0.00	0.81	0.00	11.39	85.06	2.00	0.00	0.81	0.00
11.43	24.12	2.00	0.00	0.81	0.00	11.54	18.58	2.00	0.00	0.80	0.00
11.58	17.44	2.00	0.00	0.80	0.00	11.64	15.69	2.00	0.00	0.80	0.00
11.73	14.18	2.00	0.00	0.80	0.00	11.77	13.55	2.00	0.00	0.80	0.00
11.83	12.53	2.00	0.00	0.80	0.00	11.88	12.40	2.00	0.00	0.80	0.00
11.98	12.12	2.00	0.00	0.80	0.00	12.03	12.11	2.00	0.00	0.80	0.00
12.08	12.10	2.00	0.00	0.80	0.00	12.18	14.05	2.00	0.00	0.79	0.00
12.23	14.29	2.00	0.00	0.79	0.00	12.27	14.76	2.00	0.00	0.79	0.00
12.35	14.60	2.00	0.00	0.79	0.00	12.42	14.57	2.00	0.00	0.79	0.00
12.52	14.54	2.00	0.00	0.79	0.00	12.57	14.52	2.00	0.00	0.79	0.00
12.61	14.39	2.00	0.00	0.79	0.00	12.71	13.98	2.00	0.00	0.78	0.00
12.76	14.21	2.00	0.00	0.78	0.00	12.83	14.93	2.00	0.00	0.78	0.00
12.91	15.50	2.00	0.00	0.78	0.00	12.94	15.74	2.00	0.00	0.78	0.00
13.01	16.59	2.00	0.00	0.78	0.00	13.08	83.86	2.00	0.00	0.78	0.00
13.16	94.97	2.00	0.00	0.78	0.00	13.23	97.28	2.00	0.00	0.78	0.00
13.31	93.83	2.00	0.00	0.77	0.00	13.33	93.58	2.00	0.00	0.77	0.00
13.41	90.93	2.00	0.00	0.77	0.00	13.49	88.79	2.00	0.00	0.77	0.00
13.56	85.74	2.00	0.00	0.77	0.00	13.60	84.52	2.00	0.00	0.77	0.00
13.67	23.62	2.00	0.00	0.77	0.00	13.75	21.59	2.00	0.00	0.77	0.00
13.79	21.55	2.00	0.00	0.77	0.00	13.85	20.12	2.00	0.00	0.77	0.00
13.93	19.61	2.00	0.00	0.76	0.00	13.98	19.16	2.00	0.00	0.76	0.00
14.04	19.55	2.00	0.00	0.76	0.00	14.13	19.15	2.00	0.00	0.76	0.00
14.20	19.47	2.00	0.00	0.76	0.00	14.27	19.56	2.00	0.00	0.76	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
14.31	20.95	2.00	0.00	0.76	0.00	14.42	94.76	2.00	0.00	0.76	0.00
14.45	97.10	2.00	0.00	0.76	0.00	14.52	97.40	2.00	0.00	0.75	0.00
14.59	94.80	0.23	2.55	0.75	0.02	14.67	92.08	0.22	2.62	0.75	0.02
14.71	95.12	0.23	2.54	0.75	0.01	14.77	90.77	0.22	2.66	0.75	0.02
14.85	94.43	0.23	2.55	0.75	0.03	14.90	96.28	0.23	2.50	0.75	0.01
14.96	100.96	0.24	2.37	0.75	0.02	15.03	102.76	0.24	2.33	0.75	0.02
15.11	102.66	2.00	0.00	0.74	0.00	15.16	102.76	2.00	0.00	0.74	0.00
15.26	102.14	2.00	0.00	0.74	0.00	15.29	103.10	2.00	0.00	0.74	0.00
15.36	102.00	2.00	0.00	0.74	0.00	15.44	97.89	2.00	0.00	0.74	0.00
15.49	96.87	2.00	0.00	0.74	0.00	15.58	33.19	2.00	0.00	0.74	0.00
15.65	31.38	2.00	0.00	0.73	0.00	15.70	30.47	2.00	0.00	0.73	0.00
15.76	28.57	2.00	0.00	0.73	0.00	15.85	26.64	2.00	0.00	0.73	0.00
15.90	26.06	2.00	0.00	0.73	0.00	15.99	26.10	2.00	0.00	0.73	0.00
16.03	25.98	2.00	0.00	0.73	0.00	16.08	25.84	2.00	0.00	0.73	0.00
16.19	25.44	2.00	0.00	0.73	0.00	16.24	25.30	2.00	0.00	0.72	0.00
16.29	25.16	2.00	0.00	0.72	0.00	16.37	26.53	2.00	0.00	0.72	0.00
16.44	27.04	2.00	0.00	0.72	0.00	16.50	27.54	2.00	0.00	0.72	0.00
16.54	27.52	2.00	0.00	0.72	0.00	16.62	27.47	2.00	0.00	0.72	0.00
16.68	27.55	2.00	0.00	0.72	0.00	16.76	27.07	2.00	0.00	0.72	0.00
16.82	26.40	2.00	0.00	0.72	0.00	16.88	25.27	2.00	0.00	0.71	0.00
16.95	23.94	2.00	0.00	0.71	0.00	17.02	22.61	2.00	0.00	0.71	0.00
17.07	22.20	2.00	0.00	0.71	0.00	17.14	22.01	2.00	0.00	0.71	0.00
17.23	21.76	2.00	0.00	0.71	0.00	17.28	21.73	2.00	0.00	0.71	0.00
17.33	21.72	2.00	0.00	0.71	0.00	17.41	21.68	2.00	0.00	0.70	0.00
17.47	22.41	2.00	0.00	0.70	0.00	17.57	22.58	2.00	0.00	0.70	0.00
17.62	23.09	2.00	0.00	0.70	0.00	17.66	23.18	2.00	0.00	0.70	0.00
17.73	24.23	2.00	0.00	0.70	0.00	17.81	25.68	2.00	0.00	0.70	0.00
17.87	25.01	2.00	0.00	0.70	0.00	17.91	23.40	2.00	0.00	0.70	0.00
18.01	19.61	2.00	0.00	0.69	0.00	18.06	19.80	2.00	0.00	0.69	0.00
18.11	20.75	2.00	0.00	0.69	0.00	18.21	22.00	2.00	0.00	0.69	0.00
18.26	23.07	2.00	0.00	0.69	0.00	18.31	90.80	2.00	0.00	0.69	0.00
18.41	96.55	2.00	0.00	0.69	0.00	18.47	103.82	2.00	0.00	0.69	0.00
18.51	103.63	0.23	2.13	0.69	0.01	18.59	103.55	0.23	2.12	0.68	0.02
18.65	104.16	0.23	2.11	0.68	0.02	18.72	106.95	0.24	2.05	0.68	0.02
18.80	115.35	0.26	1.89	0.68	0.02	18.84	116.76	0.27	1.86	0.68	0.01
18.91	124.70	0.30	1.73	0.68	0.01	18.99	130.09	0.33	1.65	0.68	0.02
19.05	122.24	0.29	1.76	0.68	0.01	19.10	119.18	0.28	1.81	0.68	0.01
19.20	116.23	0.27	1.85	0.67	0.02	19.24	118.81	0.28	1.81	0.67	0.01
19.33	123.39	0.29	1.73	0.67	0.02	19.39	126.72	0.31	1.68	0.67	0.01
19.43	130.40	0.33	1.63	0.67	0.01	19.50	132.45	0.34	1.60	0.67	0.01
19.58	137.26	0.37	1.53	0.67	0.01	19.64	137.94	0.38	1.52	0.67	0.01
19.69	119.47	0.28	1.78	0.67	0.01	19.78	134.12	0.35	1.56	0.66	0.02
19.84	150.88	0.51	1.37	0.66	0.01	19.92	158.74	0.63	1.19	0.66	0.01
19.98	161.77	0.69	1.07	0.66	0.01	20.03	161.86	0.69	1.07	0.66	0.01
20.08	159.13	0.63	1.17	0.66	0.01	20.18	156.48	0.59	1.28	0.66	0.01
20.23	155.25	0.57	1.31	0.66	0.01	20.28	150.72	0.50	1.35	0.66	0.01
20.38	145.29	0.44	1.41	0.65	0.02	20.42	150.09	0.49	1.36	0.65	0.01
20.52	142.74	0.41	1.43	0.65	0.02	20.54	148.88	0.48	1.36	0.65	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
20.62	143.97	0.42	1.41	0.65	0.01	20.67	144.98	0.43	1.40	0.65	0.01
20.77	147.59	0.46	1.37	0.65	0.02	20.82	148.88	0.48	1.35	0.65	0.01
20.87	142.87	0.41	1.42	0.65	0.01	20.96	156.81	0.58	1.24	0.64	0.01
21.02	161.11	0.66	1.07	0.64	0.01	21.06	173.70	1.02	0.47	0.64	0.00
21.16	209.63	2.00	0.00	0.64	0.00	21.21	227.24	2.00	0.00	0.64	0.00
21.26	230.17	2.00	0.00	0.64	0.00	21.36	224.00	2.00	0.00	0.64	0.00
21.41	220.54	2.00	0.00	0.64	0.00	21.47	215.35	2.00	0.00	0.64	0.00
21.54	213.08	2.00	0.00	0.63	0.00	21.60	212.67	2.00	0.00	0.63	0.00
21.66	212.42	2.00	0.00	0.63	0.00	21.75	213.90	2.00	0.00	0.63	0.00
21.80	217.38	2.00	0.00	0.63	0.00	21.90	221.35	2.00	0.00	0.63	0.00
21.95	227.78	2.00	0.00	0.63	0.00	21.99	232.88	2.00	0.00	0.63	0.00
22.05	245.41	2.00	0.00	0.63	0.00	22.12	254.00	2.00	0.00	0.63	0.00
22.20	254.00	2.00	0.00	0.62	0.00	22.28	254.00	2.00	0.00	0.62	0.00
22.31	254.00	2.00	0.00	0.62	0.00	22.39	252.03	2.00	0.00	0.62	0.00
22.46	242.04	2.00	0.00	0.62	0.00	22.54	230.40	2.00	0.00	0.62	0.00
22.58	223.79	2.00	0.00	0.62	0.00	22.64	211.13	2.00	0.00	0.62	0.00
22.73	199.59	2.00	0.00	0.61	0.00	22.78	191.06	2.00	0.00	0.61	0.00
22.84	190.39	2.00	0.00	0.61	0.00	22.91	189.98	2.00	0.00	0.61	0.00
22.97	170.15	0.88	0.61	0.61	0.00	23.07	162.36	0.67	0.97	0.61	0.01
23.12	156.19	0.56	1.19	0.61	0.01	23.18	149.95	0.47	1.26	0.61	0.01
23.27	146.16	0.43	1.29	0.61	0.01	23.30	145.58	0.43	1.30	0.61	0.01
23.37	146.97	0.44	1.28	0.60	0.01	23.46	148.07	0.45	1.27	0.60	0.01
23.50	152.57	0.51	1.22	0.60	0.01	23.56	147.88	0.45	1.27	0.60	0.01
23.64	144.51	0.42	1.30	0.60	0.01	23.71	147.47	0.44	1.27	0.60	0.01
23.76	144.22	0.41	1.30	0.60	0.01	23.85	141.72	0.39	1.32	0.60	0.01
23.90	135.23	0.34	1.39	0.59	0.01	23.95	130.84	0.32	1.44	0.59	0.01
24.03	129.15	0.31	1.45	0.59	0.01	24.10	127.26	0.30	1.47	0.59	0.01
24.18	127.55	0.30	1.47	0.59	0.01	24.25	131.13	0.32	1.42	0.59	0.01
24.29	135.90	0.35	1.36	0.59	0.01	24.34	136.74	0.35	1.35	0.59	0.01
24.44	136.72	0.35	1.35	0.59	0.02	24.48	138.26	0.36	1.33	0.59	0.01
24.54	138.07	0.36	1.33	0.58	0.01	24.62	138.64	0.36	1.32	0.58	0.01
24.69	137.45	0.35	1.33	0.58	0.01	24.77	133.97	0.33	1.37	0.58	0.01
24.84	126.58	0.29	1.45	0.58	0.01	24.88	124.56	0.28	1.47	0.58	0.01
24.95	121.17	0.27	1.52	0.58	0.01	25.03	118.31	0.26	1.55	0.58	0.02
25.08	117.71	0.26	1.56	0.57	0.01	25.18	132.86	0.32	1.36	0.57	0.02
25.22	132.32	0.32	1.37	0.57	0.01	25.28	141.79	0.39	1.26	0.57	0.01
25.33	138.43	0.36	1.30	0.57	0.01	25.40	141.81	0.39	1.26	0.57	0.01
25.48	131.07	0.31	1.37	0.57	0.01	25.57	140.82	0.38	1.26	0.57	0.01
25.61	137.54	0.35	1.29	0.57	0.01	25.67	146.26	0.42	1.21	0.56	0.01
25.72	150.25	0.47	1.17	0.56	0.01	25.80	155.71	0.54	1.12	0.56	0.01
25.87	154.94	0.53	1.12	0.56	0.01	25.93	152.10	0.49	1.15	0.56	0.01
25.99	139.56	0.37	1.26	0.56	0.01	26.05	154.61	0.52	1.12	0.56	0.01
26.12	157.39	0.56	1.05	0.56	0.01	26.20	159.13	0.59	0.99	0.56	0.01
26.27	160.62	0.62	0.94	0.55	0.01	26.32	161.32	0.63	0.91	0.55	0.01
26.38	161.81	0.64	0.90	0.55	0.01	26.46	162.69	0.66	0.87	0.55	0.01
26.52	163.27	0.67	0.85	0.55	0.01	26.60	163.76	0.68	0.83	0.55	0.01
26.65	163.35	0.67	0.84	0.55	0.01	26.71	164.54	0.70	0.81	0.55	0.01
26.81	163.88	0.68	0.83	0.55	0.01	26.86	162.68	0.66	0.86	0.54	0.01

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
26.92	160.71	0.62	0.92	0.54	0.01	27.01	160.90	0.62	0.91	0.54	0.01
27.05	157.77	0.57	1.01	0.54	0.01	27.11	166.05	0.73	0.76	0.54	0.00
27.17	174.00	0.97	0.44	0.54	0.00	27.25	183.05	1.41	0.17	0.54	0.00
27.30	187.79	1.75	0.06	0.54	0.00	27.40	201.62	2.00	0.00	0.54	0.00
27.44	205.47	2.00	0.00	0.54	0.00	27.49	210.79	2.00	0.00	0.53	0.00
27.58	215.69	2.00	0.00	0.53	0.00	27.65	219.38	2.00	0.00	0.53	0.00
27.69	220.53	2.00	0.00	0.53	0.00	27.80	225.39	2.00	0.00	0.53	0.00
27.84	229.21	2.00	0.00	0.53	0.00	27.90	238.08	2.00	0.00	0.53	0.00
27.99	245.64	2.00	0.00	0.53	0.00	28.02	249.66	2.00	0.00	0.53	0.00
28.09	254.00	2.00	0.00	0.52	0.00	28.16	254.00	2.00	0.00	0.52	0.00
28.23	254.00	2.00	0.00	0.52	0.00	28.28	254.00	2.00	0.00	0.52	0.00
28.38	254.00	2.00	0.00	0.52	0.00	28.43	254.00	2.00	0.00	0.52	0.00
28.53	254.00	2.00	0.00	0.52	0.00	28.56	254.00	2.00	0.00	0.52	0.00
28.63	254.00	2.00	0.00	0.51	0.00	28.68	254.00	2.00	0.00	0.51	0.00
28.75	254.00	2.00	0.00	0.51	0.00	28.82	254.00	2.00	0.00	0.51	0.00
28.87	254.00	2.00	0.00	0.51	0.00	28.94	254.00	2.00	0.00	0.51	0.00
29.01	254.00	2.00	0.00	0.51	0.00	29.07	254.00	2.00	0.00	0.51	0.00
29.17	254.00	2.00	0.00	0.51	0.00	29.22	254.00	2.00	0.00	0.50	0.00
29.29	254.00	2.00	0.00	0.50	0.00	29.37	254.00	2.00	0.00	0.50	0.00
29.42	254.00	2.00	0.00	0.50	0.00	29.47	254.00	2.00	0.00	0.50	0.00
29.55	254.00	2.00	0.00	0.50	0.00	29.62	254.00	2.00	0.00	0.50	0.00
29.66	254.00	2.00	0.00	0.50	0.00	29.77	254.00	2.00	0.00	0.50	0.00
29.80	254.00	2.00	0.00	0.49	0.00	29.87	254.00	2.00	0.00	0.49	0.00
29.95	254.00	2.00	0.00	0.49	0.00	30.00	254.00	2.00	0.00	0.49	0.00
30.06	254.00	2.00	0.00	0.49	0.00	30.14	254.00	2.00	0.00	0.49	0.00
30.20	254.00	2.00	0.00	0.49	0.00	30.25	254.00	2.00	0.00	0.49	0.00
30.35	254.00	2.00	0.00	0.49	0.00	30.39	254.00	2.00	0.00	0.48	0.00
30.45	254.00	2.00	0.00	0.48	0.00	30.54	254.00	2.00	0.00	0.48	0.00
30.60	254.00	2.00	0.00	0.48	0.00	30.65	254.00	2.00	0.00	0.48	0.00
30.74	254.00	2.00	0.00	0.48	0.00	30.80	254.00	2.00	0.00	0.48	0.00
30.88	254.00	2.00	0.00	0.48	0.00	30.94	254.00	2.00	0.00	0.48	0.00
30.98	254.00	2.00	0.00	0.47	0.00	31.05	254.00	2.00	0.00	0.47	0.00
31.13	254.00	2.00	0.00	0.47	0.00	31.19	254.00	2.00	0.00	0.47	0.00
31.24	254.00	2.00	0.00	0.47	0.00	31.30	254.00	2.00	0.00	0.47	0.00
31.38	254.00	2.00	0.00	0.47	0.00	31.44	254.00	2.00	0.00	0.47	0.00
31.53	254.00	2.00	0.00	0.47	0.00	31.59	254.00	2.00	0.00	0.46	0.00
31.63	250.80	2.00	0.00	0.46	0.00	31.71	239.25	2.00	0.00	0.46	0.00
31.78	230.13	2.00	0.00	0.46	0.00	31.83	227.02	2.00	0.00	0.46	0.00
31.90	223.31	2.00	0.00	0.46	0.00	31.97	220.50	2.00	0.00	0.46	0.00
32.02	216.93	2.00	0.00	0.46	0.00	32.11	210.82	2.00	0.00	0.46	0.00
32.18	209.96	2.00	0.00	0.45	0.00	32.23	210.88	2.00	0.00	0.45	0.00
32.33	202.29	2.00	0.00	0.45	0.00	32.37	203.96	2.00	0.00	0.45	0.00
32.42	201.97	2.00	0.00	0.45	0.00	32.52	205.75	2.00	0.00	0.45	0.00
32.58	204.94	2.00	0.00	0.45	0.00	32.62	206.87	2.00	0.00	0.45	0.00
32.69	204.69	2.00	0.00	0.45	0.00	32.77	199.36	2.00	0.00	0.44	0.00
32.81	194.51	2.00	0.00	0.44	0.00	32.88	191.00	1.97	0.01	0.44	0.00
32.96	191.04	1.97	0.01	0.44	0.00	33.02	197.86	2.00	0.00	0.44	0.00
33.12	197.26	2.00	0.00	0.44	0.00	33.16	194.96	2.00	0.00	0.44	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
33.21	204.57	2.00	0.00	0.44	0.00	33.27	204.67	2.00	0.00	0.44	0.00
33.36	199.40	2.00	0.00	0.43	0.00	33.46	190.52	1.92	0.01	0.43	0.00
33.50	192.77	2.00	0.00	0.43	0.00	33.54	189.67	1.84	0.03	0.43	0.00
33.62	199.44	2.00	0.00	0.43	0.00	33.69	202.47	2.00	0.00	0.43	0.00
33.76	195.33	2.00	0.00	0.43	0.00	33.80	180.48	1.21	0.21	0.43	0.00
33.90	186.78	1.61	0.08	0.43	0.00	33.95	188.92	1.77	0.04	0.42	0.00
34.00	190.50	1.91	0.02	0.42	0.00	34.09	190.68	1.92	0.01	0.42	0.00
34.13	190.79	1.93	0.01	0.42	0.00	34.19	190.25	1.88	0.02	0.42	0.00
34.27	188.68	1.75	0.05	0.42	0.00	34.35	185.86	1.54	0.09	0.42	0.00
34.39	185.34	1.50	0.10	0.42	0.00	34.46	187.05	1.62	0.07	0.42	0.00
34.54	195.31	2.00	0.00	0.41	0.00	34.59	204.30	2.00	0.00	0.41	0.00
34.69	208.37	2.00	0.00	0.41	0.00	34.72	209.47	2.00	0.00	0.41	0.00
34.78	210.41	2.00	0.00	0.41	0.00	34.87	209.56	2.00	0.00	0.41	0.00
34.93	206.26	2.00	0.00	0.41	0.00	34.98	203.34	2.00	0.00	0.41	0.00
35.06	182.62	1.33	0.16	0.41	0.00	35.14	184.69	1.45	0.11	0.40	0.00
35.18	181.29	2.00	0.00	0.40	0.00	35.25	172.70	2.00	0.00	0.40	0.00
35.32	174.05	2.00	0.00	0.40	0.00	35.37	201.46	2.00	0.00	0.40	0.00
35.47	186.52	2.00	0.00	0.40	0.00	35.51	187.17	2.00	0.00	0.40	0.00
35.62	165.35	2.00	0.00	0.40	0.00	35.66	162.27	2.00	0.00	0.40	0.00
35.70	156.32	2.00	0.00	0.39	0.00	35.76	144.27	0.39	0.85	0.39	0.01
35.84	155.69	2.00	0.00	0.39	0.00	35.91	139.71	2.00	0.00	0.39	0.00
35.96	148.45	2.00	0.00	0.39	0.00	36.03	171.00	2.00	0.00	0.39	0.00
36.11	177.88	2.00	0.00	0.39	0.00	36.16	161.83	2.00	0.00	0.39	0.00
36.26	160.80	0.60	0.65	0.39	0.01	36.31	157.12	0.54	0.73	0.38	0.00
36.36	164.17	0.66	0.57	0.38	0.00	36.44	165.23	0.68	0.55	0.38	0.01
36.50	163.62	0.65	0.58	0.38	0.00	36.55	165.35	0.69	0.55	0.38	0.00
36.65	159.84	0.58	0.66	0.38	0.01	36.69	161.13	0.60	0.63	0.38	0.00
36.75	159.60	0.57	0.66	0.38	0.00	36.85	156.41	0.52	0.73	0.38	0.01
36.88	155.01	0.51	0.75	0.37	0.00	36.95	147.65	0.42	0.79	0.37	0.01
37.04	153.18	0.48	0.75	0.37	0.01	37.10	142.23	0.37	0.82	0.37	0.01
37.14	144.71	0.39	0.80	0.37	0.00	37.24	167.84	0.74	0.49	0.37	0.01
37.29	162.62	0.63	0.58	0.37	0.00	37.34	162.82	0.63	0.58	0.37	0.00
37.43	161.46	0.61	0.60	0.37	0.01	37.47	151.89	0.47	0.75	0.36	0.00
37.58	156.27	0.52	0.71	0.36	0.01	37.60	154.30	0.50	0.73	0.36	0.00
37.68	157.43	0.54	0.68	0.36	0.01	37.73	158.55	0.56	0.65	0.36	0.00
37.83	165.39	0.68	0.52	0.36	0.01	37.88	167.56	0.74	0.48	0.36	0.00
37.93	169.03	0.77	0.45	0.36	0.00	38.01	167.08	0.72	0.48	0.36	0.00
38.07	143.76	0.38	0.77	0.35	0.01	38.16	157.72	0.54	0.66	0.35	0.01
38.23	160.81	0.59	0.59	0.35	0.00	38.26	162.83	0.63	0.55	0.35	0.00
38.37	163.28	0.64	0.54	0.35	0.01	38.40	163.35	0.64	0.54	0.35	0.00
38.47	164.25	0.66	0.52	0.35	0.00	38.57	165.83	0.69	0.49	0.35	0.01
38.62	170.28	0.81	0.40	0.35	0.00	38.65	174.89	0.96	0.29	0.34	0.00
38.73	188.82	1.73	0.04	0.34	0.00	38.81	202.61	2.00	0.00	0.34	0.00
38.86	204.98	2.00	0.00	0.34	0.00	38.96	196.48	2.00	0.00	0.34	0.00
39.02	185.20	1.47	0.09	0.34	0.00	39.06	180.36	1.19	0.17	0.34	0.00
39.11	175.95	0.99	0.26	0.34	0.00	39.21	168.80	0.77	0.43	0.34	0.00
39.26	178.15	1.08	0.21	0.33	0.00	39.31	171.00	0.83	0.37	0.33	0.00
39.40	174.65	0.95	0.28	0.33	0.00	39.45	175.76	0.99	0.26	0.33	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
39.50	179.54	1.15	0.18	0.33	0.00	39.60	182.18	1.28	0.14	0.33	0.00
39.65	184.34	1.41	0.10	0.33	0.00	39.73	189.07	1.75	0.04	0.33	0.00
39.80	196.56	2.00	0.00	0.33	0.00	39.84	199.74	2.00	0.00	0.32	0.00
39.90	200.61	2.00	0.00	0.32	0.00	39.99	198.17	2.00	0.00	0.32	0.00
40.03	197.93	2.00	0.00	0.32	0.00	40.14	202.61	2.00	0.00	0.32	0.00
40.20	202.30	2.00	0.00	0.32	0.00	40.24	201.37	2.00	0.00	0.32	0.00
40.33	199.09	2.00	0.00	0.32	0.00	40.36	197.21	2.00	0.00	0.32	0.00
40.44	191.22	1.93	0.01	0.31	0.00	40.51	184.80	1.44	0.09	0.31	0.00
40.58	180.08	1.17	0.17	0.31	0.00	40.63	180.99	1.22	0.15	0.31	0.00
40.69	170.76	0.82	0.35	0.31	0.00	40.78	171.48	0.84	0.33	0.31	0.00
40.83	167.95	0.74	0.40	0.31	0.00	40.88	170.41	0.81	0.35	0.31	0.00
40.98	175.88	0.99	0.24	0.31	0.00	41.02	155.82	0.51	0.61	0.30	0.00
41.12	181.43	1.24	0.14	0.30	0.00	41.16	184.48	1.42	0.09	0.30	0.00
41.21	186.83	1.58	0.06	0.30	0.00	41.31	193.54	2.00	0.00	0.30	0.00
41.36	198.36	2.00	0.00	0.30	0.00	41.41	200.47	2.00	0.00	0.30	0.00
41.48	204.03	2.00	0.00	0.30	0.00	41.56	206.19	2.00	0.00	0.30	0.00
41.62	207.93	2.00	0.00	0.29	0.00	41.71	210.47	2.00	0.00	0.29	0.00
41.74	212.76	2.00	0.00	0.29	0.00	41.81	226.53	2.00	0.00	0.29	0.00
41.90	244.68	2.00	0.00	0.29	0.00	41.96	244.12	2.00	0.00	0.29	0.00
42.00	243.14	2.00	0.00	0.29	0.00	42.06	218.45	2.00	0.00	0.29	0.00
42.15	200.44	2.00	0.00	0.29	0.00	42.22	196.38	2.00	0.00	0.28	0.00
42.30	216.97	2.00	0.00	0.28	0.00	42.34	217.69	2.00	0.00	0.28	0.00
42.40	220.01	2.00	0.00	0.28	0.00	42.48	210.76	2.00	0.00	0.28	0.00
42.55	211.30	2.00	0.00	0.28	0.00	42.59	214.21	2.00	0.00	0.28	0.00
42.66	218.87	2.00	0.00	0.28	0.00	42.74	219.71	2.00	0.00	0.28	0.00
42.79	217.05	2.00	0.00	0.27	0.00	42.88	211.34	2.00	0.00	0.27	0.00
42.92	207.67	2.00	0.00	0.27	0.00	42.99	203.58	2.00	0.00	0.27	0.00
43.07	213.39	2.00	0.00	0.27	0.00	43.13	208.91	2.00	0.00	0.27	0.00
43.18	214.84	2.00	0.00	0.27	0.00	43.28	199.05	2.00	0.00	0.27	0.00
43.33	199.97	2.00	0.00	0.27	0.00	43.39	197.12	2.00	0.00	0.26	0.00
43.48	195.37	2.00	0.00	0.26	0.00	43.52	192.95	2.00	0.00	0.26	0.00
43.58	199.03	2.00	0.00	0.26	0.00	43.64	201.28	2.00	0.00	0.26	0.00
43.73	192.41	2.00	0.00	0.26	0.00	43.77	179.13	1.12	0.15	0.26	0.00
43.85	173.53	0.90	0.24	0.26	0.00	43.92	167.29	0.72	0.34	0.26	0.00
43.97	168.37	0.75	0.33	0.25	0.00	44.04	160.90	0.59	0.42	0.25	0.00
44.12	165.31	0.68	0.36	0.25	0.00	44.17	169.52	0.78	0.31	0.25	0.00
44.25	167.35	2.00	0.00	0.25	0.00	44.32	162.49	2.00	0.00	0.25	0.00
44.36	168.35	2.00	0.00	0.25	0.00	44.43	158.97	2.00	0.00	0.25	0.00
44.51	143.12	2.00	0.00	0.25	0.00	44.56	138.09	2.00	0.00	0.24	0.00
44.66	109.49	2.00	0.00	0.24	0.00	44.70	39.68	2.00	0.00	0.24	0.00
44.77	33.82	2.00	0.00	0.24	0.00	44.85	24.01	2.00	0.00	0.24	0.00
44.91	19.76	2.00	0.00	0.24	0.00	44.96	17.08	2.00	0.00	0.24	0.00
45.03	15.34	2.00	0.00	0.24	0.00	45.10	17.34	2.00	0.00	0.24	0.00
45.15	13.53	2.00	0.00	0.23	0.00	45.25	17.61	2.00	0.00	0.23	0.00
45.30	17.59	2.00	0.00	0.23	0.00	45.35	26.13	2.00	0.00	0.23	0.00
45.44	97.52	2.00	0.00	0.23	0.00	45.47	104.74	2.00	0.00	0.23	0.00
45.55	121.40	2.00	0.00	0.23	0.00	45.61	133.82	2.00	0.00	0.23	0.00
45.69	143.67	2.00	0.00	0.23	0.00	45.75	149.93	2.00	0.00	0.22	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

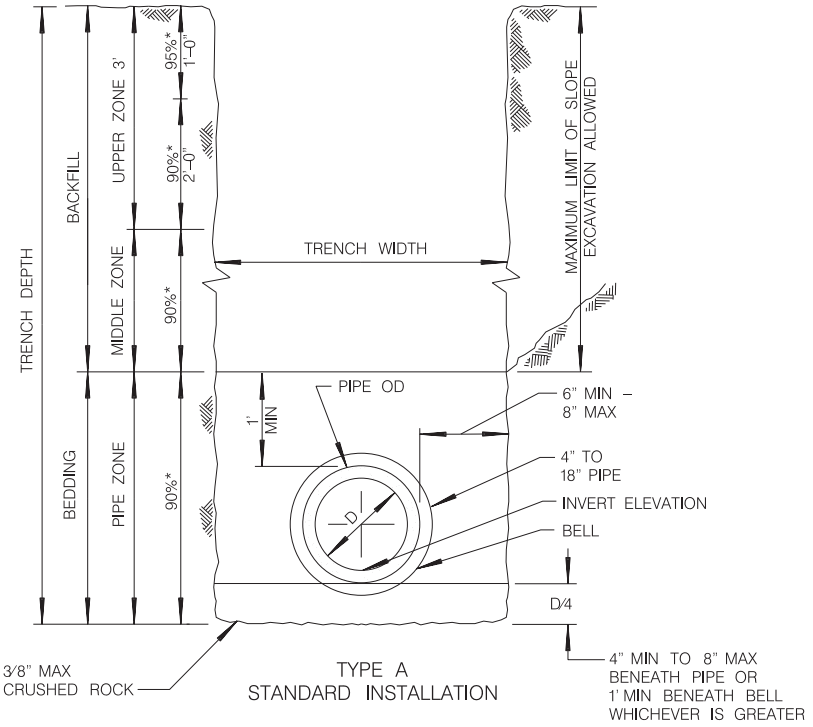
Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
45.84	151.76	2.00	0.00	0.22	0.00	45.90	150.41	2.00	0.00	0.22	0.00
45.94	143.83	2.00	0.00	0.22	0.00	46.03	153.68	2.00	0.00	0.22	0.00
46.09	165.81	2.00	0.00	0.22	0.00	46.13	171.54	0.84	0.23	0.22	0.00
46.23	185.89	1.50	0.05	0.22	0.00	46.27	188.94	1.72	0.03	0.22	0.00
46.33	193.18	2.00	0.00	0.21	0.00	46.42	197.56	2.00	0.00	0.21	0.00
46.48	198.36	2.00	0.00	0.21	0.00	46.53	194.89	2.00	0.00	0.21	0.00
46.60	182.59	2.00	0.00	0.21	0.00	46.67	166.21	2.00	0.00	0.21	0.00
46.72	160.45	2.00	0.00	0.21	0.00	46.83	142.62	2.00	0.00	0.21	0.00
46.87	148.66	2.00	0.00	0.21	0.00	46.93	147.89	2.00	0.00	0.20	0.00
47.02	149.15	2.00	0.00	0.20	0.00	47.05	134.04	2.00	0.00	0.20	0.00
47.17	132.87	2.00	0.00	0.20	0.00	47.19	129.13	2.00	0.00	0.20	0.00
47.26	122.36	2.00	0.00	0.20	0.00	47.33	116.73	2.00	0.00	0.20	0.00
47.40	112.71	2.00	0.00	0.20	0.00	47.46	111.83	2.00	0.00	0.20	0.00
47.51	109.37	2.00	0.00	0.19	0.00	47.58	108.22	2.00	0.00	0.19	0.00
47.65	108.60	2.00	0.00	0.19	0.00	47.71	109.39	2.00	0.00	0.19	0.00
47.80	42.95	2.00	0.00	0.19	0.00	47.85	41.84	2.00	0.00	0.19	0.00
47.93	42.79	2.00	0.00	0.19	0.00	48.00	45.00	2.00	0.00	0.19	0.00
48.04	47.81	2.00	0.00	0.19	0.00	48.10	118.57	2.00	0.00	0.18	0.00
48.17	125.23	2.00	0.00	0.18	0.00	48.25	144.14	2.00	0.00	0.18	0.00
48.31	160.59	2.00	0.00	0.18	0.00	48.39	163.06	2.00	0.00	0.18	0.00
48.43	177.54	1.05	0.12	0.18	0.00	48.54	206.83	2.00	0.00	0.18	0.00
48.58	212.92	2.00	0.00	0.18	0.00	48.64	220.51	2.00	0.00	0.18	0.00
48.72	222.43	2.00	0.00	0.17	0.00	48.79	218.07	2.00	0.00	0.17	0.00
48.83	213.82	2.00	0.00	0.17	0.00	48.89	207.48	2.00	0.00	0.17	0.00
48.98	219.32	2.00	0.00	0.17	0.00	49.03	213.42	2.00	0.00	0.17	0.00
49.12	224.53	2.00	0.00	0.17	0.00	49.19	225.92	2.00	0.00	0.17	0.00
49.23	228.81	2.00	0.00	0.17	0.00	49.33	229.32	2.00	0.00	0.16	0.00
49.37	227.33	2.00	0.00	0.16	0.00	49.42	229.41	2.00	0.00	0.16	0.00
49.53	219.12	2.00	0.00	0.16	0.00	49.57	218.95	2.00	0.00	0.16	0.00
49.63	211.32	2.00	0.00	0.16	0.00	49.68	210.46	2.00	0.00	0.16	0.00
49.75	201.23	2.00	0.00	0.16	0.00	49.82	192.53	2.00	0.00	0.16	0.00
49.89	185.71	1.49	0.04	0.15	0.00	49.96	181.89	1.26	0.07	0.15	0.00
50.01	182.61	1.30	0.06	0.15	0.00						

Total estimated settlement: 1.50

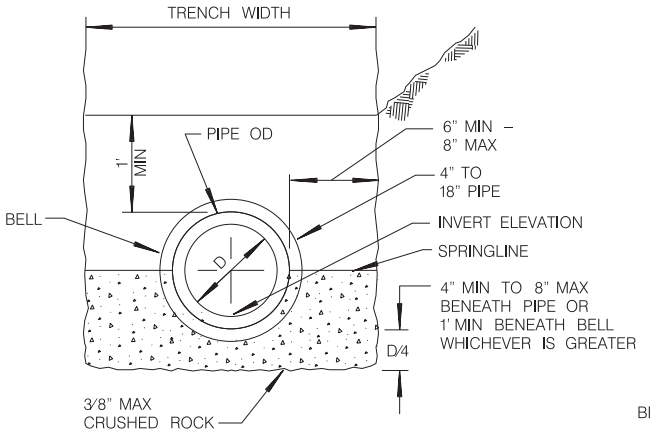
Abbreviations

$Q_{tn,cs}$:	Equivalent clean sand normalized cone resistance
FS:	Factor of safety against liquefaction
e_v (%):	Post-liquefaction volumentric strain
DF:	e_v depth weighting factor
Settlement:	Calculated settlement

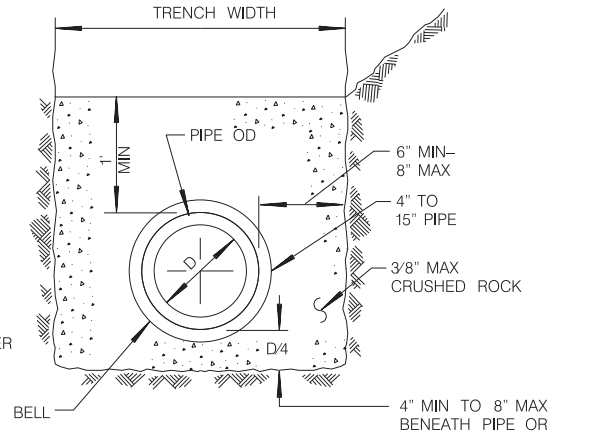
APPENDIX E



TYPE A
STANDARD INSTALLATION



TYPE B
ROCK TO SPRINGLINE



TYPE C
ROCK ENVELOPE

NOTES

1. FOR TRENCH RESURFACING IN IMPROVED STREETS, SEE STANDARD DRAWINGS SDG–107 AND SDG–108.
2. (*) INDICATES MINIMUM RELATIVE COMPACTION.
3. MINIMUM DEPTH OF COVER FROM THE TOP OF PIPE TO FINISH GRADE FOR PVC SDR 35 SEWER MAIN SHALL BE 5'. FOR SHALLOWER DEPTH, SPECIAL DESIGN IS REQUIRED. SEE SDS–101.
4. SEE TYPE A INSTALLATION FOR DETAILS NOT SHOWN FOR TYPES B AND C.
5. FOR PIPE SIZE ENCASEMENT LARGER THAN 15", MAXIMUM SIDE WALL CLEARANCE SHALL BE 12" OR AS SHOWN ON THE PLANS.
6. 6" METAL TAPE SHALL BE INSTALLED ABOVE PIPE 4" BELOW TRENCH CAP AND 12" BELOW FINISH GRADE IN UNIMPROVED STREETS.
7. 1' SAND CUSHION OR A 6" MINIMUM SAND CUSHION WITH 1" NEOPRENE PAD SHALL BE PLACED FOR CROSSINGS UTILITIES WHEN VERTICAL CLEARANCE IS 1' OR LESS. THE NEOPRENE PAD SHALL BE PLACED ON THE MOST FRAGILE UTILITY.

From: City of San Diego Standard Drawing SDS-110 (2016)

LANDMARK Geo-Engineers and Geologists **Project No.: LE21248**	**Pipe Bedding and Trench Backfill Recommendations**	**Plate E-1**