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Appendix 5.4A
Preliminary Geotechnical Report, Proposed Morton Bay Geothermal Power Plant, SWC Davis Road and Mc-Donald Road,Calipatria, California

Geotechnical Report

Proposed Morton Bay Geothermal Power Plant
SWC Davis Road and McDonald Road
Calipatria, California

Prepared for:

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October 20, 2022

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Preliminary Geotechnical Investigation
Proposed 147 MW Morton Bay Geothermal Power Plant
SWC Davis and McDonald Roads
Calipatria, California
LCI Report No. LE22197

Dear Mr. Bhangoo:

This preliminary geotechnical report is provided for design and construction of the proposed 147 MW Morton Bay geothermal power plant located at the southwest corner of Davis Road and McDonald Road northwest of Calipatria, California. Our preliminary geotechnical investigation was conducted in response to your request for our services. The enclosed preliminary report describes our soil engineering investigation 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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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 high to very high expansion (EI = 91 to >130) predominate the near surface soils at the project site.

- The upper soils are clays and are not generally acceptable for supporting an onsite sewage disposal system. Advanced wastewater treatment systems will be required to treat and dispose of wastewater generated onsite at the administrative and operations buildings.

- Evaluation of liquefaction potential at the site indicates that 1 to 2.5 foot thick, isolated, interbedded layers of silt and silty sand at a depth between 17.5 to 50 feet may liquefy under seismically induced groundshaking, potentially resulting in an estimated ½ to 1 inch of deep seated settlement. The liquefaction settlement can be mitigated with soil improvement methods that treat soils to 25 feet below ground surface. There is a 17.5-foot layer of non-liquefiable clay soils above any potentially liquefiable soil; therefore, it is unlikely that there will be rapid deformation or punching bearing failures of the surface soils should liquefaction occur.

- In order to reduce settlement in the geothermal plant structures to generally accepted limits, existing soft, compressible clays may be strengthened by soil improvement (soil mixing or replacement with sand/cement) or by use of deep foundation systems like auger cast or driven piles. Pile lengths should be less than 50 feet to avoid penetrating CO_2 gas pockets below the site. Structural mats may also be used to limit movement between groups of process vessels or equipment. These options are discussed in the report.

- The proposed plant site is located adjacent to CO_2 gas mud pots and above a naturally occurring CO_2 gas reservoir. The reservoir is generally located at depths greater than 50 feet. The measured gas pressure obtained from previous investigation adjacent to the geothermal plant site was approximately 15 to 25 psi.

- The site elevation is generally 6.0 feet below the minimum building elevation established by Imperial County (Elevation -220). A perimeter embankment placed higher than elevation -220 or a new flood study will be required.

- The native soil is severely corrosive to metals and contains sufficient sulfates and chlorides to require special concrete mixes (6.5 sack cement factor with a 0.45 maximum water cement ratio and Type V cement) and protection of embedded steel components (5-inch minimum concrete cover) when concrete is placed in contact with native soil. Polypropylene vapor retarders (10 to 15 mil) should be used below all slabs on grade to reduce corrosion potential of steel reinforcement

- All reinforcing bars, anchor bolts and hold down bolts shall have a minimum concrete cover of 5.0 inches and epoxy coated (ASTM D3963/A934). Hold-down straps at the foundation perimeter and pressurized water lines below or within the foundations are not allowed.

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Section 1
INTRODUCTION

1.1 Project Description

This report presents the findings of our preliminary geotechnical investigation for the proposed geothermal power plant located at the southwest corner of Davis Road and McDonald Road northwest of Calipatria, California (See Vicinity Map, Plate A-1). The proposed 147 MW geothermal plant will include a turbine-generator structure, cooling tower, wellhead separators, crystallizer, water tanks, primary and secondary clarifier tanks, control building, office buildings, substation, pipelines and supports, various ancillary structures and associated internal roadways. Raw water ponds and perimeter flood protection embankments are planned to be constructed at the perimeters of the proposed geothermal plant site. Embankment heights are expected to be 5 to 7 feet. No geothermal wills are planned for the plant site. All geothermal fluids will be piped (above ground) to the site. A site plan for the proposed development was provided by the client at the time that this report was prepared.

The non-power generation structures (control rooms, administration buildings, etc.) are planned to consist of slab-on-grade foundations with masonry and steel-frame or panelized tilt-up concrete construction. Expected footing loads are estimated at 1 to 5 kips per lineal foot for the small structures. Expected plant components, cooling tower, clarifiers and turbine/generator columns loads range from 5 to 400 kips. The dimensions for the proposed steel storage tanks were not provided at the time that this report was prepared. The estimated loads imposed at ground surface by the loaded tanks are expected to range from 1,000 to 4,000 pounds per square foot.

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 foundation support pad preparation, underground utility installation, water treatment plant installation, on-site sewage disposal system installation, roadway construction and concrete flatwork placement.

1.2 Purpose and Scope of Work

The purpose of this geotechnical study was to investigate the upper 100 feet of subsurface soil at selected locations within the site for evaluation of physical/engineering properties. From the subsequent field and laboratory data, professional opinions were developed 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, professional opinions, and recommendations for the geotechnical aspects of project design and construction.

This report addresses the following geotechnical issues:

- Subsurface soil and groundwater conditions
- Site geology, regional faulting and seismicity, and site seismic design criteria
- 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 issues are presented for the following:

- Site grading, earthwork and embankment construction
- Building pad and foundation subgrade preparation
- Allowable soil bearing pressures and expected settlements
- Deep foundation alternatives
- Soil improvement alternatives
- 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
- On site sewage disposal system

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

1.3 Authorization

BHE Renewables, LLC provided authorization by Purchase Order No. 160007 to proceed with our work on September 26, 2022. We conducted our work according to our written proposal dated September 12, 2022.

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Section 2
METHODS OF INVESTIGATION

2.1 Field Exploration

Subsurface exploration was performed on September 28, 2022 using Kehoe Testing and Engineering, Inc. of Huntington Beach, California to advance four (4) electric cone penetrometer (CPT) soundings to approximate depths of 50 to 10 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. 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.

Shear wave velocity was determined for the subsurface soils to a depth of 100 feet at CPT-1. Shear wave velocities averaged 591 ft/sec for the upper 100 feet. The site soils have been classified as Site Class E (stiff soil profile).

Additional subsurface exploration was performed on September 28 and 29, 2022 using 2R Drilling of Chino, California to advance three (3) borings to depths of 25 to 75 feet below existing ground surface. The borings were advanced with a truck-mounted, CME 75 drill rig using 8-inch diameter, hollow-stem, continuous-flight augers. The approximate boring locations were established in the field and plotted on the site map by sighting to discernible site features. The boring locations are shown on the Site and Exploration Plan (Plate A-2).

A senior soil technician observed the drilling operations and maintained logs of the soil encountered with sampling depths. Soils were classified during drilling according to the Unified Soil Classification System using the visual-manual procedure in accordance with ASTM D2488. Relatively undisturbed and bulk samples of the subsurface materials were obtained at selected intervals. The relatively undisturbed soil samples were retrieved using a 2-inch outside diameter (OD) split-spoon sampler or a 3-inch OD Modified California Split-Barrel (ring) sampler lined with 6-inch stainless-steel sleeves. In addition, Standard Penetration Tests (SPT) were performed in accordance with ASTM D1586 and ASTM D6066. The samples were obtained by driving the samplers ahead of the auger tip at selected depths using a 140-pound CME automatic hammer with a 30-inch drop. The number of blows required to drive the samplers the last 12 inches of an 18-inch drive depth into the soil is recorded on the boring logs as "blows per foot". Blow counts (N values) reported on the boring logs represent the field blow counts. No corrections have been applied to the blow counts shown on the boring logs for effects of overburden pressure, automatic hammer drive energy, drill rod lengths, liners, and sampler diameter. Pocket penetrometer readings were also obtained to evaluate the stiffness of cohesive soils retrieved from sampler barrels.

After logging and sampling the soil, the exploratory borings were backfilled with the excavated material. The backfill was loosely placed and was not compacted to the requirements specified for engineered fill.

Interpretive logs of the CPT soundings and logs of the borings are presented on Plates B-1 through B-7 in Appendix B. A key to the interpretation of CPT soundings and a key to the test pit logs are presented on Plates B-8 and 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 Field Electrical Resistivity Testing

Wenner 4-pin field resistivity testing was conducted by RF Yeager Engineering of Lakeside, California under sub-contract to Landmark at three (3) locations around the project site in accordance with ASTM G57 standards. Tests were conducted with both a north-south and east-west pin orientations. The tests were conducted at pin spacings of 2.5, 5, 10, 15, 20 and 40 feet. Additionally, two (2) near surface soil samples (upper 3 feet) were obtained for laboratory soil corrosivity testing at the select location. The results of the electrical resistivity and soil corrosivity testing are presented in Appendix G.

2.3 Thermal Resistivity Testing

On-site field soil thermal resistivity testing was conducted by RF Yeager Engineering at two (2) locations located at the northwest and south sides of the substation. The tests were conducted at the same locations where TR-1 and TR-2 soundings were performed. The testing were conducted in accordance with ASTM D5344. A hole was dug (backhoe) at each location to a depth of about 3 feet for each test. The results of the thermal resistivity testing are presented in Appendix G.

2.4 Laboratory Testing

Laboratory tests were conducted on selected bulk (auger cuttings) and relatively undisturbed soil samples obtained from the soil borings to aid in classification and evaluation of selected engineering properties of the site 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)
- Unit Dry Densities (ASTM D2937)
- Moisture Contents (ASTM D2216)
- One Dimensional Consolidation (ASTM D2435)
- Moisture-Density Relationship (ASTM D1557)
- Direct Shear (ASTM D3080)
- Unconfined Compression (ASTM D2166)
- Chemical Analyses (soluble sulfates & chlorides, pH, and resistivity) (Caltrans Methods)

The laboratory test results are presented on the subsurface logs (Appendix B) and in Appendix C.

Engineering parameters of soil strength, compressibility and relative density utilized for developing design criteria provided within this report were obtained from the field and laboratory testing program.

Section 3
DISCUSSION

3.1 Site Conditions

The project site is located at the southwest corner of Davis Road and McDonald Road northwest of Calipatria, California. The project site is located within a depressed area that was likely previously used as ponds (currently dry) for local duck hunting clubs. There is an approximately 2 to 3 foot high berm separating the two ponds. The northern portion of the site surface soils are wet and soft; therefore, this area is not currently accessible for field exploration equipment.

The project area is located adjacent to the Salton Sea (shoreline approximately 2 miles to the west), an inland lake with no outlet. Agricultural wastewater and periodic precipitation supply the majority of the water sustaining the lake.

Adjacent properties are flat-lying and are approximately at the same elevation with this site. Hudson Ranch Geothermal Power plant is located to the west across Davis Road. Additional fresh water pond basins (some are currently dry) are located adjacent to the north, south and west boundaries of the site. A shallow fresh water slough is located between the Salton Sea and the subject site, formed from agricultural irrigation water runoff. Several carbon dioxide (CO_2) gas driven mud volcanoes are sited at the vacant parcel southeast of the project site.

The project site lies at an elevation of approximately 225 to 227 feet below mean sea level (MSL) (El. 773 to 775 local datum) in the Imperial Valley region of the California low desert. ***In general, Imperial County regulations require all structures to be constructed above the Elevation 220 contour or to be protected from flooding by placing berms to the Elevation 220 contour. A site specific flood study may be required by Imperial County.***

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 UC Davis California Soil Resource Lab "SoilWeb Earth" computer application (UC Davis, 2022) for Google Earth 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 September 28 and 29, 2022 consist of approximately 18 feet of near surface fat clays. Medium dense silty sands and silts were encountered from 18 to 22 feet below ground surface. Stiff clays are encountered at a depth of 24 to 50 feet below ground surface. Silty sands (medium dense) extend from 50 to 56 feet. Stiff clays are encountered at a depth of 56 to 72 feet below ground surface.

An 8-foot thick medium dense to dense sand layer is located between 72 to 80 feet below ground surface. Interbedded layers of loose to medium dense silts/silty sands and stiff to very stiff clays were encountered from 80 to 100 feet, the maximum depth of exploration. The subsurface logs (Plates B-1 through B-7) depict the stratigraphic relationships of the various soil types. No CO_2 gas pockets were penetrated during our drilling operations.

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 industrial projects to remediate expansive soil include:

- capping silt/clay soil with a non-expansive sand layer of sufficient thickness to reduce the effects of soil shrink/swell,
- design of foundations that are resistant to shrink/swell forces of silt/clay soil.

3.4 Groundwater

Groundwater was encountered in the borings at about 13 feet at the time of exploration, but may rise with time to approximately 6 to 8 feet below ground surface at this 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, level of Salton Sea, drainage, and site grading. The referenced groundwater level should not be interpreted to represent an accurate or permanent condition.

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 45 mile radius of the project site (Table 1 Appendices).

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 Elmore Ranch fault located approximately 4.9 miles west of the project site.

The project site lies adjacent to the Brawley Seismic Zone (BSZ), a pull-apart basin between the southern terminus of the San Andreas fault and the northern trace of the Imperial fault. The BSZ is composed of numerous cross-cutting high angle normal faults. The BSZ extends northward beyond the termination of the mapped Imperial/Brawley faults to beneath the Salton Sea, where it terminates upon intersecting the San Andreas fault near Bombay Beach. The Brawley Seismic Zone was the source of the 1981 5.9M_W Westmorland earthquake sequence that involved activity on at least seven distinct fault planes within the zone. An earthquake swarm with eleven (11) earthquakes above magnitude 4.0 (the largest being 5.5$M_{w)}$ occurred approximately 2 miles northwest of Brawley, California between August 26-28, 2012. Although there was no evidence of surface rupture associated with this event, numerous structures in Brawley were damaged.

The faults in the Brawley Seismic Zone are considered to be short enough that earthquakes much larger than 6-6.5M_W are unlikely. The California Geological Survey considers the Brawley Seismic Zone to have a maximum magnitude of 6.4Mw, with a very short 24-year average return interval, and a geologic slip rate of 25 mm/year.

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 (ASCE, 2016) 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 (CBC, 2019). **This project site has been classified as Site Class E (Table 3 Appendices) 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 0.61g for the project site. **Design earthquake ground motion parameters are provided in Table 2 (Appendices).**

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. However, this plant site is located in the general alignment of a “Mullet Fault” zone as evidenced by CO_2 mud pots and mud volcanos.
- **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 1 mile west 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 lies adjacent to the Salton Sea, so the threat of seiches or other seismically-induced flooding is considered possible.
- **Flooding.** Based on our review of Federal Emergency Management Agency (FEMA) FIRM Panel 06025C0725C which encompasses the project site, the project site is located in Flood Zone A, an area to be within a special flood hazard area subject to inundation by the 1% annual chance flood (100-year flood) (FEMA, 2008). No base flood elevations have been determined.
- **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.** Surficial soils consist of fat clays which are 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.

<u>Methods of Analysis:</u> 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 D.

The liquefaction potential at the project site was evaluated using the 1997 NCEER Liquefaction Workshop (NCEER, 1997 and Youd, et.al., 2001). The 1997 NCEER methods utilize 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 0.61g 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 8 to 50 feet. The likely triggering mechanism for liquefaction appears to be strong groundshaking associated with the rupture of the San Andreas, Imperial and other nearby faults. 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	18	¾
CPT-2	8.5	¼
CPT-3	20	1
CPT-4	--	0

Liquefaction Induced Settlements: ***Based on empirical relationships, total induced settlements are estimated to be about 1 inch 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 ½ 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 200 feet.

Because of the depth of the liquefiable layer, the 17.5 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.

Section 4
RECOMMENDATIONS

4.1 Site Preparation and Backfill

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 hauled from the site and not used as fill. **Any trash, construction debris, and buried obstructions exposed during rough grading should be traced to the limits of the foreign material by the grading contractor and removed under our supervision.** The two backhoe test pits should be located and backfilled with engineered fill to a depth of 10 feet. Any excavations resulting from site clearing should be dish-shaped to the lowest depth of disturbance and backfilled under the observation of the geotechnical engineer's representative.

Mass Grading: 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 uniformly moisture conditioned by discing and wetting to a minimum of optimum plus 3 to 8% and compacted to a minimum of 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 3 to 8% and compacted in 6 inch maximum lifts to a minimum of 90% relative compaction. Clods shall be reduced by discing to a maximum dimension of ¾ inch prior to being placed as fill.

Building Pad Preparation: The existing surface soil within the administration office, control rooms, and light buildings foundation areas should be removed to 36 inches below the building pad elevation or existing grade (whichever is lower) extending five feet beyond all exterior wall/column lines (including adjacent concreted areas). 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.

It is possible that wet soils will pump under equipment loads. Light earthmoving and compaction equipment should be planned for compacting soil at depth.

An engineered building support pad consisting a minimum of 3.5 feet of granular soil, placed in maximum 8-inch lifts (loose), compacted to a minimum of 95% of ASTM D1557 maximum density at 2% below to 4% above optimum moisture, should be placed below the administration complex buildings and warehouse slabs. If soft conditions are encountered at the bottom of the excavation and subgrade compaction is not achievable, a layer of geotextile stabilization/separation fabric such as Mirafi 600X or equivalent should be placed directly on the bottom of the excavation after fine grading of the subgrade soils. The geotextile stabilization/separation fabric should be placed in accordance to the manufacturer's recommendations.

Imported fill soil shall be non-expansive and should meet the USCS classifications of ML (non-plastic), SM, SP-SM, or SW-SM with a maximum rock size of 3 inches and no less than 5% passing the No. 200 sieve. The geotechnical engineer should approve imported fill soil sources before hauling material to the site. Imported fill should be placed in lifts no greater than 8 inches in loose thickness and compacted to a minimum of 95% of ASTM D1557 maximum dry density at optimum moisture ±2%.

Concrete Hardscape Areas: In areas other than the basin backfill which are to receive housekeeping slabs 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 a minimum of 90% of ASTM D1557 maximum density just prior to concrete placement.

Mat Foundation Subgrade Preparation (Lightly Loaded Structures): The existing surface soil within mat foundations areas should be removed to 12 inches below the mat foundation elevation or existing grade (whichever is lower) extending five feet beyond the mat foundation. Exposed subgrade should be inspected by the geotechnical engineer and if found to be loose, shall be scarified to a depth of 8 inches, uniformly moisture conditioned to 3 to 8% above optimum and recompacted to at least 90% of the maximum density determined in accordance with ASTM D1557 methods.

An engineered support pad consisting of 12 inches of Class 2 aggregate base shall be placed below mat foundations. The aggregate base shall be compacted to a minimum of 95% of ASTM D1557 maximum density at 2% below to 4% above optimum moisture.

Reinforced Structural Fill: Structures that are not sensitive to settlements, not heavy loaded, or that can be economically replaced or repaired such as small tanks, pumps and vessels, can be supported on shallow foundations on reinforced structural fill. Also, some heavy loaded structures that are settlement tolerant may be supported on mat foundation on reinforced structural fill (see Section 4.2 Spread Foundations, Structural Mats and Settlements).

The performance of structural fill with respect to resisting liquefaction failure mechanisms, and reducing static differential settlements can be enhanced by reinforced the structural fill with geogrid geotextile fabrics. Geogrids are polymer grid structures that come in rolls (much like wire mesh). When placed in horizontal layers within the compacted structural fill mass, it provides tensile properties.

Geotextile fabric and geogrid reinforced structural fill will enhance spreading of foundation loads and resist soil rupture resulting in the following benefits:

- Reduced static and differential settlement.
- Reduced transient loads to the compressible clay soils.
- Reduced rupture potential of surface soils, thus allowing higher foundation loadings.

Effectiveness of the geogrids to achieve the above results is dependent on its projection beyond the loaded foundation to create a reinforced mass larger than the loaded area. It is especially effective where several loaded areas or individual spread footings are underlain by the continuously reinforced mass projecting beyond the extremities of the loaded areas.

Excavation for Reinforced Fill: The native soils should be excavated from the designated foundation areas extending 5.0 feet beyond all exterior foundation lines to 3.5 feet below the planned bottom of foundation level. Exposed subgrade should be inspected by the geotechnical engineer and if found to be loose, shall be scarified to a depth of 8 inches, uniformly moisture conditioned to 5 to 10% above optimum and recompacted to 85 to 90% of the maximum density determined in accordance with ASTM D1557 methods. A 6 oz. non-woven separation fabric equivalent to Mirafi 160N or equialent should be placed over the subgrade prior to placing the reinforced structural fill.

If soft conditions are encountered at the bottom of the excavation and subgrade compaction is not achievable, a geotextile separation fabric and geogrid layer should be placed over the graded smooth surface prior to placing the reinforced structural fill. The geotextile shall a 6 oz. non-woven fabric equivalent to Mirafi 160N or equivalent. Geogrids shall be either Tensar TriAx 5 or Greenbook Type S2 biaxial geogrid (ex. Tenax MS330 or equivalent). The geotextile stabilization/separation fabric and the geogrid should be placed in accordance to the manufacturer's recommendations.

Reinforced Structural Fill: Structural fill should consist of crushed Class 2 aggregate base. The first lift of aggregate base should be end dumped and spread in a 1.0 foot thick uniform layer, uniformly moisture conditioned to ±2% of optimum moisture and compacted to a minimum of 90% of ASTM D1557 maximum density. After completion of compacting, a geogrid reinforcing mesh (Tensar BX1100, Tensar TriAx 5 or Greenbook Type S2 biaxial geogrid (ex. Tenax MS330 or equivalent)) should be placed over the first layer of base material lapped at sides/ends (1.0 foot minimum) in conformance to the manufacturer's installation instructions.

A second 1.0 foot thick layer of aggregate base should be end dumped and spread uniformly over the geogrid mesh. This layer may be placed in two lifts, uniformly moisture conditioned to ±2% of optimum moisture and compacted to a minimum of 95% of ASTM D1557 maximum density. After compacting the second layer a geogrid mesh should be placed over the base material and covered the rest with two 0.5 foot thick aggregate base layers compacted to the limits specified above. The last layer should be fine graded to the bottom of mat foundation elevation within a tolerance of ±0.5 inch.

Following completion of concrete placement for the mat foundation, the remaining excavation area against the foundation should be backfilled with aggregate base in 0.5 foot maximum lifts and compacted to a minimum of 95%.

Moisture Control and Drainage: 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. Gutters and downspouts may be considered 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 should be maintained in a moist, but not saturated state, and not allowed to dry out. Drainage should be maintained without ponding. Trees should be set back from foundations equal to their anticipated height.

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 recommendations 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 24 inches below and beyond the footing.

4.2 Shallow Foundations and Settlements

Spread footings: Shallow spread footings and continuous wall footings are suitable to support the structures planned for offices, control rooms and warehouses. Footings shall be founded on 3.0 feet of engineered granular fill as described in Section 4.1. The foundations may be designed using an allowable soil bearing pressure of 2,000 psf. The allowable soil pressure may be increased by one-third for short term loads induced by winds or seismic events. Spread footings placed with 3 feet of reinforced structural fill below the foundation may be loaded to 4,000 psf.

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 300 pcf (for imported sands) 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 0.35 (for imported sands) may also be used at the base of the footings to resist lateral loading.

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 may be on the order of less than 1 inch.

Structural Mat Foundations for Lightly Loaded Structures: Mat foundations for lightly loaded structures (not settlement sensitive) like pumps, small tanks, generators, etc., may be designed using an allowable soil bearing pressure of 1,500 psf when the foundation is supported on 12 inches of compacted Class 2 aggregate base (95% of ASTM D1557 maximum density to ±2% of optimum moisture). The native soils supporting the concrete structural mat and compacted aggregate base shall be moisture conditioned and recompacted as specified in Section 4.1 of this report.

The allowable soil pressure may be increased by one-third for short term loads induced by winds or seismic events. Design criteria for these mat foundations are provided below.

Flat Plate Structural Mats: The structural mat should have a double mat of steel and a minimum thickness of 12 inches. Structural mats may be designed for a modulus of subgrade reaction (Ks) of 100 pci when placed on 12 inches of compacted Class 2 aggregate base.

Settlement estimates (in inches) for lightly loaded structures (500 to 1,500 psf) for different mat dimensions and 12 inches of compacted aggregate base follow:

Settlement Estimates (inches)

Load, psf	Size of Mat (ft.)						
	10 x 10	**10 x 20**	**20 x20**	**20 x 40**	**40 x 40**	**50 x 70**	**70 x 70**
500	0.31	0.50	0.70	0.85	1.05	1.25	0.75
750	0.43	0.70	0.95	1.20	1.50	1.80	1.90
1,000	0.53	0.90	1.25	1.50	1.90	2.25	2.40
1,500	0.71	1.25	1.70	2.05	2.60	3.10	3.30

Differential movements of about two-thirds of total movement are expected for the lightly loaded structures (1,500 psf).

Structural Mat Foundations for Heavy Structures: Heavily loaded structures that are settlement tolerant may be supported on structural concrete mat foundations. The mat shall be founded on the reinforced structural fill which has been properly prepared and compacted as described in Section 4.1 of this report.

Structural mat foundations placed over reinforced structural fill may be designed using an allowable soil bearing pressure of 4,000 psf. The allowable soil pressure may be increased by one-third for short term loads induced by winds or seismic events.

Flat Plate Structural Mats: Structural mats may be designed for a modulus of subgrade reaction (Ks) of 300 pci when placed on 3.0 feet of Class 2 aggregate base material (reinforced structural fill). The structural fill supported pad shall be moisture conditioned and compacted as specified in Section 4.1 of this report.

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. Passive resistance to lateral earth pressure may be calculated using an equivalent fluid pressure of 350 pcf (for aggregate base) 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 0.40 may also be used at the base of the mats with aggregate base subgrade to resist lateral loading.

Settlement estimates (in inches) developed for different footing and mat dimensions supported on 3.0 feet of reinforced structural fill and loaded from 1,000 to 4,000 psf follow:

Settlement Estimates (inches)

Load, psf	Size of Footing or Mat (ft.)							
	10 x 10	**12 x 25**	**20 x 20**	**25 x 30**	**30 x 35**	**50 x 50**	**50 x 75**	**60 x 120**
1,000	0.70	1.05	1.20	1.50	1.70	2.10	2.25	2.40
2,000	1.20	1.85	2.10	2.60	2.90	3.60	3.80	4.10
3,000	1.65	2.45	2.80	3.50	3.85	4.75	5.05	5.40
4,000	2.00	3.00	3.45	4.20	4.65	5.75	6.10	6.50

4.3 Structural Mats Foundations for Cooling Tower

Structural Mat Foundations for Cooling Tower: The relatively light cooling tower structure that covers large area may use soil unloading as a means to control settlement. The general, in-situ soil load is approximately 120 pcf and by removing 3 feet of soil, 360 psf of foundation loading can be offset (e.g. a 500 psf foundation load can be reduced to 140 psf net soil loading).

Soil Improvements and Underlayment: The existing soils underlying the cooling tower should be improved by soil mixing or soil replacement (sand/cement) with approximately 48 inch diameter shafts. The minimum surface area replacement ratio shall be 20 percent. The soil mix formula shall be developed by the specially contractor to provide a minimum strength of 100 psi.

A technique to improve soft and compressible ground condition is through mixing of the subsurface soil with cement (or replacement of the clay with a sand/cement slurry). Soil-cement mixing is accomplished by augering 48-inch diameter holes (20% minimum area replacement ration) to a minimum depth of 25 feet below ground surface and mixing the soil with cement, creating a soil-cement column. The deep soil mixing serves to reduce settlement by replacing the compressible clay soils below the structures with very stiff soil-cement columns, creating a stiffer composite soil matrix. Soil-cement design should be provided by a licensed specialty contractor.

The table below is for preliminary use, complete settlement data will need to be performed by a licensed specialty contractor. It is unlikely that significant differential settlement will occur on foundations supported by improved soil.

Estimated Settlement - 135 ft. x 420 ft. Foundation
Overlaying Soil Mixed Columns

Treatment Depth (ft)	Load (psf)	Settlement Estimates (in)
No Treatment	750	2.0
10	750	1.4
20	750	1.1
30	750	0.9
35	750	0.75

4.4 Clarifier Tank Soil Preparation, Foundations and Settlements

Clarifier tanks that are not sensitive to settlements may be supported by mat foundations bearing on reinforced structural fill or deep soil improvement.

Excavation: The surface soils should be excavated from the foundation area (including 10 feet beyond foundation lines) to 3 feet below the planned tank sump floor bottom elevation (estimated 12 feet below tank finish grade). Sidewalls of the excavation should be sloped back at a minimum of 1(H):1(V).

Perimeter Drain: A minimum 1 ft. deep by 1.5 ft. wide trench can be excavated at the toe of the excavated slope with placement of a 6-inch corrugated drainage pipe (ADS or equal) and drainage filter sock or sand envelope. The filter sand should consist of tile sand as specified for agricultural tile drainage pipelines by the U.S. Soil Conservation Service. Filter sand should be placed to the top of the perimeter drain trench. The purpose of the perimeter drain is to assist in dewatering the excavation and provide porewater pressure relief of groundwater rising to the drainage blanket during strong groundshaking resulting in soil liquefaction. The drainage pipe should be connected to riser pipes or manholes, spread not greater than 100 feet apart.

Drainage Blanket: The bottom of the subexcavation should be covered with a geotextile filter fabric (Mirafi 180N, Supac 8NP, or equivalent) extending over the perimeter drain and lapped at sides/ends in accordance with the manufacturer's installation guidelines (2 ft minimum). The fabric should be placed as the excavation progresses to minimize the time of groundwater intrusion into the subgrade.

A 1.5 foot thick layer of drainage rock (conforming to gradation limits of ASTM C33, Size 57 or 467) should be end dumped onto the filter fabric and spread evenly by excavators or dozers. Upon completing placement of the drainage rock, a small vibratory compactor (walk-behind or equivalent) should be used to densify the crushed rock layer. Following densification of the drainage rock, a second layer of filter fabric should be placed over the rock prior to placement of the reinforced structural engineered fill.

Reinforced Structural Fill: Structural fill should consist of 1.5 ft of crushed aggregate base with 2 geogrid layers as described herein. The first lift of aggregate base should be end dumped and spread in a 0.5 ft. thick uniform layer over the drainage blanket filter fabric before compacting. After the aggregate base has been placed and spread, the base material should be wetted within 2% of optimum moisture and compacted to a minimum of 90% of ASTM D1557 maximum density. After completion of compacting, a geogrid reinforcing mesh (Tensar TX5 Triaxial geogrid or Greenbook Type S2 bi-axial geogrid) should be placed over the first layer of base material and lapped at sides/ends (1 ft. minimum) in conformance with manufacturer's installation instructions.

A second lift of aggregate base should be end dumped and spread in a 1 ft. thick uniform layer over the geogrid. This layer may be placed in two lifts, wetted within 2% of optimum moisture and compacted to a minimum of 95% of ASTM D1557 maximum density. After compacting a second layer of geogrid mesh should be placed over the base material and covered by a 0.5 ft. thick layer of aggregate base that should be compacted to a minimum to a minimum 95% of ASTM D1557 maximum density within 2% of optimum moisture placed over the existing 5 ft. thick reinforced structural fill.

Following completion of the aggregate base reinforced structural fill, the remaining excavation area (from the clarifier sump bottom foundation it to the tank finish grade) may be backfilled with imported fill (sand) placed in lifts no greater than 8 inches in loose thickness and compacted to a minimum of 95% of ASTM D1557 maximum dry density at optimum moisture ±2% to the bottom of the sloped tank foundation.

The imported soils should meet the USCS classifications SM, SP-SM, or SW-SM with a maximum rock size of 3 inches and no less than 5% passing the No. 200 sieve. The geotechnical engineer should approve imported fill soil sources before hauling material to the site. Imported fill should be placed in lifts no greater than 8 inches in loose thickness and compacted to a minimum of 95% of ASTM D1557 maximum dry density at optimum moisture ±2%.

Flat Plate Structural Mats: Structural mats may be used for the steel clarifier tanks and associated catwalk tower and shall have a minimum thickness of 14 inches. Structural mats may be designed for a modulus of subgrade reaction (Ks) of 300 pci when placed on 3 feet of imported fill sand and/or aggregate base as described above.

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 300 pcf to resist lateral loadings. The top one foot of embedment may be considered in computing passive resistance due to the adjacent area being confined by concrete pavement. An allowable friction coefficient of 0.35 may also be used at the base of the slab to resist lateral loading.

The tanks may be designed using an allowable soil bearing pressure of 3,000 pounds per square foot (psf) when placed on the reinforced structural fill as described above. The allowable soil pressure may be increased by one-third for short term loads induced by winds or seismic events. Deep ground improvements may increase the allowable design soil pressures. Bearing values shall be provided by the specialty contractor.

Estimated Clarifier Settlements: The subsurface clays are saturated and overconsolidated in their natural state. Imposed foundations loads can consolidate the soils by reducing the void ratio through pore water expulsion. The amount of vertical settlement that occurs as a result of soil compression varies with applied loads, foundation shape and width.

The tanks should be hydrotested by staged filling with water and held to monitor the settlement and performance of the tank. Settlement readings should be taken until movement, in the opinion of the geotechnical engineer, has sufficiently stabilized.

The settlement measuring methods, loading sequence, and records of settlement should be reviewed by the geotechnical engineer prior to initial loading. Flexible connections such as “Flex-Tend” expansion joints should be used to connect exterior piping with the tank. It may be necessary to readjust piping connections after the loading sequence.

Estimated settlements were calculated using the consolidation and field data test data for the clay strata and Schmertman's analysis for the granular strata using the CPT data correlations. The soils to a depth of the diameter of the tanks (80, 100 and 120 feet) may be significantly stressed to contribute to the overall settlement. The estimated settlement for different assumed diameter tanks with an imposed pressure load of 1,500 and 2,000 psf are as follow:

Settlement Estimates (inches)

Diameter (ft)	Load (psf)	Settlement Estimates (in)
80	1,500	2.4
	2,000	2.9
100	1,500	2.5
	2,000	3.2
120	1,500	2.7
	2,000	3.4

*The settlement estimate is approximate and field measured settlements may be half to twice the value given. Settlements when using deep ground improvement may be reduced from the values given above.

Edge settlements should be about 60% of the estimated center settlements for the tanks. Since the settlements are deep seated, little is gained by further excavation and replacement of compacted granular fill to reduce settlements. The differential settlement from the outer edge to the middle of the tank will result in stretching the bottom of the tanks and any liner placed imparting tensile stresses as the stretching occurs. The fill may be crowned 1 to 2 inches to allow for differential movement between the tank perimeter and center.

Deep Ground Improvement: In lieu of reinforced structural fill as described above, the steel tanks mat foundations may be placed on a deep ground improvement option. Deep ground improvement may be considered to reduce static and liquefaction settlements and to potentially reduce de-watering needs for backfilling the reinforced structural fill section.

4.4 Deep Soil Improvement

The use of soil improvement (soil mixing with cement, stone columns or geopiers) or by the placement of a deep foundation system, like drilled piers or driven piles, is recommend in order to reduce settlement to tolerable limits for settlement sensitive structures.

Structural mat foundations placed over the improved soil (soil mixing with cement, stone columns or geopiers) or placed over a deep foundation system, like piles or drilled piers, are anticipated to be used to support the turbine generator structures, crystallizer and clarifier tanks. Mats should be underlain by 36 inches of crushed aggregate base (reinforced structural fill). The minimum surface area replacement ratio shall be 20 percent.

A. Soil-Cement Mixing

A technique to improve soft and compressible ground condition is through mixing of the subsurface soil with cement. Soil-cement mixing is accomplished by augering 36 to 48-inch diameter holes to a minimum depth of 20 feet below ground surface and mixing the soil with cement, creating a soil-cement column. The deep soil mixing serves to reduce settlement by replacing the compressible clay soils below the structures with very stiff soil-cement columns, creating a stiffer composite soil matrix.

Soil-cement design should be provided by a licensed specialty contractor. The specialty contractor should also provide allowable soil bearing capacity and associated settlement.

The use of soil improvement like soil mixing with cement or soil replacement (sand/cement) may be used to reduce settlement to tolerable limits. The highly plastic native clays were found to not mix well with conventional soil mixing augers (Hudson Ranch 1 Plant site) and imported sands may be required for soil-cement mixing.

Structural mat foundations placed over the improved soil are anticipated to be used to support the various structural elements of the plant. Mats overlaying soil mixed columns should be underlain by 3.0 feet of crushed aggregate base (Caltrans Class 2, 1-½” or ¾” grading).

B. Stone Columns

Stone columns consisting of gravel stones that are placed in underground columns by a vibro-replacement method are effective in mitigating the settlement hazard related to highly compressible soil layers. They have been used frequently in Southern California.

For preliminary design purposes, the stone columns should be extended to a dense, non-compressible layer, spaced on approximately 6-foot on centers, and have an effective diameter of approximately 30-36 inches. The vibro-replacement method densifies the soil around the column. Settlement potential of the soil is greatly reduced by densification, drainage, and increased stiffness of the soil within the treated area. The stone columns should extend to a depth determined by engineering design based on settlement risks, but should, as a minimum, be founded at depths greater than 20 feet.

A 36-inch thick aggregate base layer (reinforced structural fill) should overlie the stone column treated area beneath the foundation to spread transmitted loads to the stone columns.

The above data for stone columns is presented as preliminary information only. A specialty contractor should be consulted for the actual design and construction of stone columns. The specialty contract should also provide allowable soil bearing capacity and associated settlement.

All of the stone column installation operations should be conducted under the observation of the geotechnical engineer's representative.

C. Geopiers (Rammed Piers)

Another technique to improve soft and compressible ground condition is through placement of geopiers. Geopiers are constructed by augering 18 to 36-inch diameter holes to a depth greater than 20 feet below the base of the footings and backfilling the holes with thin lifts of compacted aggregates. Compaction densifies the aggregate and increases lateral stress in the soil matrix. The system serves to reduce settlement by replacing the compressible clay soils below the structures with very stiff aggregate piers, creating a stiffer composite soil matrix.

Geopier design should be provided by a licensed specialty contractor. The specialty contractor should also provide allowable soil bearing capacity and associated settlement. One demonstration pier should be installed with the contractor's standard procedures and then load –tested to determine the soil modulus.

The load testing setup and procedures should be selected by the geopier contractor and submitted for review to the project geotechnical engineer. The demonstration pier should be installed at the foundation grade level. All of the Geopier element installation operations should be conducted under the observation of the geotechnical engineer's representative.

4.5 Deep Foundations

A. Drilled Piers or Auger Cast Piles

Drilled piers or auger cast piles (cast-in-place grout with steel cage reinforcement) have been used successfully to provide deep foundations for heavily loaded and critical elements of geothermal power plants. Capacities for 24, 30 and 36 inch diameter shafts are provided below.

Vertical Capacity: Vertical capacity for 24, 30 and 36 inch diameter shafts are shown on Plate E-1. Capacities for other shaft sizes can be determined in direct proportion to shaft diameters. End bearing and skin friction parameters have been used to determine the allowable shaft capacity. The allowable capacities include a factor of safety of 2.5. The allowable vertical compression capacities may be increased by 33 percent to accommodate temporary loads from wind or seismic forces. The allowable vertical shaft capacities are based on the supporting capacity of the soil. The structural capacity of the piers should be verified by the structural engineer. Drilled pier or auger cast piles which is extended to a minimum depth of 30 feet will mitigate liquefaction settlements to about ¼ inch or less.

Lateral Capacity: The allowable lateral capacity for 24, 30 and 36 inch diameter shafts are given in the Table 8. The allowable horizontal deflection at the shaft head has been assumed to be one-half inch (0.50 inch).

Lateral Capacities – Drilled Piers / Auger Cast Piles

Shaft Diameter (in.)	**24**		**30**		**36**	
Head Condition	Free	Fixed	Free	Fixed	Free	Fixed
Allowable Head Deflection (in.)	0.5	0.5	0.5	0.5	0.5	0.5
Length (ft.)	**30**	**30**	**30**	**30**	**30**	**30**
Lateral Capacity (kips)	23.4	48.5	33.3	67.9	42.8	88
Maximum Moment (foot-kips)	114.2	-300	194.2	-504.2	277.5	-773.3
@Depth from Pier Head (ft.)	9.3	0	11.1	0	12.1	0
Length (ft.)	**40**	**40**	**40**	**40**	**40**	**40**
Lateral Capacity (kips)	23.4	48.5	33.3	69.8	44.3	96.3
Maximum Moment (foot-kips)	114.2	-300	194.2	-518.3	297.5	-830.8
@Depth from Pier Head (ft.)	9.3	0	11.1	0	12.8	0
Length (ft.)	**50**	**50**	**50**	**50**	**50**	**50**
Lateral Capacity (kips)	23.4	48.5	33.3	69.8	44.3	96.4
Maximum Moment (foot-kips)	114.2	-300	194.2	-518.3	297.5	-831.7
@Depth from Pier Head (ft.)	9.3	0	11.1	0	13.0	0

(*) Fixed head is defined when there is no rotation in the pile head (eg. concrete foundation surrounding the pile heads).

<u>Settlement:</u> Total settlements of less than ¼ inch are anticipated for single piles designed according to the preceding recommendations.

<u>Axial Load Group Effect:</u> If pier/pile spacing is a least 2.5 pier/pile diameters center-to-center, no reduction in axial load capacity is considered necessary for group effect.

<u>Uplift Capacity:</u> Pier capacity in tension should be taken as 50% of the compression capacity.

Soil Parameters: Interpretive engineering soil parameters of the subsurface soil for Allpile Computer Program are presented in the table below. Since the subsurface soils at the project site may experience liquefaction settlements at depths between 8.5 to 50 feet below ground surface, a deep foundation system like drilled piers founded at a minimum depth of 30 feet below ground surface is estimated to reduce settlements to approximately ¼ inch or less. The drilled pier foundation vertical and lateral capacities from the resettled loose liquefied soils can be calculated using the following interpretive engineering soil parameters determined using the California Department of Transportation (Caltrans) Geotechnical Manual method for pier foundations subjected to liquefaction:

Soil Strength Parameters

Layer Type	Depth (ft)	Unit Weight (pcf)	Friction Angle (deg)	Cohesion (ksf)	Lateral Soil Modulus, k (pci)	Strain Factor, E50 o Dr (%)
CL-CH	0 to 18	125	0°	0.75	150	1.15
(*) SM	18 to 22	115	30°	0	40	40
CL-ML	22 to 43	120	0°	1.00	225	1.00
(*) ML	43 to 50	115	25°	0	25	30
SM	50 to 56	115	34°	0	50	45
CL-ML	56 to 71	120	0°	1.25	325	0.85
SP-SM	71 to 80	115	36°	0	85	60
ML	80 to 89	120	24°	0.30	110	1.25

(*) Liquefiable soils layers

The drilled pier foundations vertical and lateral capacities from the resettled lose liquefied soils can be calculated using the following values:

- C=0 and $\phi = 30^o$ for coarse-grained liquefied soil (e.g. SW, SP, SM) or,
- C=0 and $\phi = 25^o$ for fine-grained liquefied soil (e.g. ML)

Note: Soil strength parameters obtained from field data and laboratory testing program were modified (reduced) based on our engineering judgment and our previous experience in the general site vicinity.

Installation: The drilled pier shall be placed in conformance to ACI 336 guidelines. Excavation for piers should be inspected by the geotechnical consultant. The bottom of the excavation for piers should be reasonably free of loose or slough material. A tremie pipe should be used to pour concrete from the bottom up and to ensure less than five feet of free fall. All drilled piers extending below groundwater (about 8.0 feet deep) shall be cased to prevent caving or lateral deformation. Steel reinforcement and concrete shall be placed immediately after drilling. Prior to placing any structural steel or concrete, loose soil or slough material should be removed from the bottom of the drilled pier excavation.

B. Driven Piles

Precast, prestressed concrete piles are often used in the corrosive soil environments of the Imperial Valley. Selection of pile type may be based on drivability and cost comparisons. Allowable axial and lateral capacities for a 12x12 and 14x14 precast, prestressed concrete piles embedded to a depth of 30, 40 and 50 feet from the existing ground surface are given in the tables below.

Allowable Axial and Lateral Capacities
Precast, Prestressed Square Concrete Pile

Pile Size (in)	12x12		12x12		12x12	
Specified Tip Depth (ft)	30		40		50	
Allowable Axial Capacity (kips)	37.7		52.5		67.3	
Allowable Deflection (in)	¼		¼		¼	
Head Condition	Free	Fixed	Free	Fixed	Free	Fixed
Allowable Lateral Capacity (kips)	6.4	13.5	6.4	13.5	6.4	13.5
Maximum Moments (kips – foot)	18.7	-48.4	18.7	-48.4	18.7	-48.4
Depth of Maximum Moment (ft)	5.4	0	5.4	0	5.4	0

Allowable Axial and Lateral Capacities
Precast, Prestressed Square Concrete Pile

Pile Size (in)	14x14		14x14		14x14	
Specified Tip Depth (ft)	30		40		50	
Allowable Axial Capacity (kips)	44.8		63.9		81.5	
Allowable Deflection (in)	¼		¼		¼	
Head Condition	Free	Fixed	Free	Fixed	Free	Fixed
Allowable Lateral Capacity (kips)	8.2	17.1	8.2	17.1	8.2	17.1
Maximum Moments (kips – foot)	26.7	-69.4	26.7	-69.4	26.7	-69.4
Depth of Maximum Moment (ft)	6.0	0	6.0	0	6.0	0

(*) Fixed head is defined when there is no rotation in the pile head (eg. concrete foundation surrounding the pile heads).

Recommendations for other pile types and sizes can be made available upon request.

Vertical Capacity: The allowable pile capacities are based on a factor of safety of 3.0. Resistance to uplift may be considered equivalent to 40 percent of the allowable downward vertical capacity.

Lateral Capacity: The allowable lateral capacity of 12 and 14-inch sections are based on a deflection of one-quarter inch at the top of the pile. If greater deflection can be tolerated, lateral load capacity can be increased directly in proportion to a maximum of one inch deflection.

Settlement: Total settlements of less than ½ inch, and differential settlements of less than ¼ inch, are anticipated for single piles designed according to the preceding recommendations. If pile spacing is a least 2.5 pile diameters center-to-center, no reduction in axial load capacity is considered necessary for a group effect.

Pile Driving: Complete documentation of the proposed hammer should be submitted to the geotechnical engineer for approval prior to mobilization. Driving records should be maintained on each pile. The numbers of blows required to drive a pile each foot should be recorded. Driving energy necessary to insure development of full design capacity shall be established after each selection of the pile driver. The geotechnical engineer should observe pile driving and evaluate each pile on a case-by-case basis. Pre-drilling of pilot holes for piles to a depth of half the pile depth will be allowed without reduction in pile capacity.

4.6 Short Drilled Piers for Pipe Rack Supports

Drilled piers for pipe racks supports have been used successfully on geothermal power plants. Recommendations for 24 and 36 inch diameter shafts are below.

Vertical Capacity: Vertical capacity for 24 and 36 inch diameter shafts are presented in Figure E-1. Capacities for other shaft sizes can be determined in direct proportion to shaft diameters. End bearing and skin friction parameters have been used to determine the allowable shaft capacity. The allowable capacities include a factor of safety of 2.5.

The allowable vertical compression capacities may be increased by 33 percent to accommodate temporary loads from wind or seismic forces. The allowable vertical shaft capacities are based on the supporting capacity of the soil. The structural capacity of the piers should be verified by the structural engineer. Due to the short length of these piers (15 feet), liquefaction settlements will not be mitigated.

Settlement: Total settlements of less than ¼ inch are anticipated for single pier designed according to the preceding recommendations.

Axial Load Group Effect: If pier spacing is a least 2.5 pier diameters center-to-center, no reduction in axial load capacity is considered necessary for group effect.

Uplift Capacity: Pier capacity in tension should be taken as 50% of the compression capacity.

Lateral Capacity: The allowable lateral capacity for 24 and 36 inch diameter shafts are given in the table below. The allowable horizontal deflection at the shaft head has been assumed to be one-half inch (0.50 inch). Shear loads were applied one (1) foot above ground surface elevation.

Lateral Capacities – Short Drilled Piers

Shaft Diameter (in.)	**24**		**30**		**36**	
Head Condition	Free	Fixed	Free	Fixed	Free	Fixed
Allowable Head Deflection (in.)	0.5	0.5	0.5	0.5	0.5	0.5
Length (ft.)	**10**	**10**	**10**	**10**	**10**	**10**
Lateral Capacity (kips)	7.4	31.3	8.4	36.2	9.4	40.4
Maximum Moment (foot-kips)	22.6	-205	25.2	-237.5	27.8	-264.2
@Depth from Pier Head (ft.)	4.6	0	4.6	0	4.6	0
Length (ft.)	**15**	**15**	**15**	**15**	**15**	**15**
Lateral Capacity (kips)	13.4	36.5	15.3	52.3	16.8	63.4
Maximum Moment (foot-kips)	56.4	-275	63.8	-468.3	69.3	-588.3
@Depth from Pier Head (ft.)	7.0	0	7.0	0	7.0	0

Installation: The drilled pier shall be placed in conformance to ACI 336 guidelines. Excavation for piers should be inspected by the geotechnical consultant. The bottom of the excavation for piers should be reasonably free of loose or slough material. A tremie pipe should be used to pour concrete from the bottom up and to ensure less than five feet of free fall. All drilled piers extending below groundwater (about 8.0 feet deep) shall be cased to prevent caving or lateral deformation. Steel reinforcement and concrete shall be placed immediately after drilling. Prior to placing any structural steel or concrete, loose soil or slough material should be removed from the bottom of the drilled pier excavation.

4.7 Slabs-On-Grade

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 5.5 inches thick due to expansive soil conditions. Concrete floor slabs shall be monolithically placed with the foundations unless placed on 3.0 feet of granular fill. The concrete slabs should be underlain by a minimum of 4 inches of clean sand (Sand Equivalent SE>30) or aggregate base or may be placed directly on the 3.0-foot thick granular fill pad (if used) that has been moistened to approximately optimum moisture just before the concrete placement. A 10-mil polyethylene vapor retarder, properly lapped and sealed with a 2-inch sand cover and extended a minimum of 12 inches into the footing, should be placed as a capillary break to inhibit moisture migration into the slab section. Concrete slabs may be placed directly over a 15-mil vapor retarder if desired (Stego-Wrap or equivalent).

Concrete slab and flatwork reinforcement should consist of chaired rebar slab reinforcement (minimum of No. 4 bars at 18-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 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).

All independent flatwork (sidewalks, housekeeping slabs) 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 and sloped 2% or more away from the building. A minimum of 24 inches of moisture conditioned (20% moisture content) and 8 inches of compacted subgrade (83 to 87%) and a 10-mil (minimum) polyethylene separation sheet should underlie the flatwork. All flatwork should be jointed in square patterns and at irregularities in shape at a maximum spacing of 10 feet or the least width of the sidewalk.

4.8 Concrete Mixes and Corrosivity

Selected chemical analyses for corrosivity were conducted on bulk samples of the near surface soil from the project site (Appendix G). The native soils were found to have severe levels of sulfate ion concentration (7,220 ppm). Sulfate ions in high concentrations can attack the cementitious material in concrete, causing weakening of the cement matrix and eventual deterioration by raveling.

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	Over 20,000	V (plus Pozzolon)	0.45	4,500

Note: From ACI 318-14 Table 19.3.1.1 and Table 19.3.2.1

Due to exposure to geothermal brine spillage and vent stack steam drift, a minimum of 6.5 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 at the site. Admixtures may be required to allow placement of this low water/cement ratio concrete. Thorough concrete consolidation and hard trowel finishes should be used to reduce moisture penetration.

The native soil has a very severe level of chloride ion concentration (10,470 to 10,890 ppm). Chloride ions can cause corrosion of reinforcing steel, anchor bolts and other buried metallic conduits. Resistivity determinations on the soil indicate very severe 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 5 inches of densely consolidated concrete. ***No metallic pipes or conduits should be placed below foundations.***

Epoxy coatings, cathodic protection and encapsulating steel reinforcing with a minimum of 5 inches of densely consolidated concrete is suggested at this site.

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. Additionally, the concrete should be thoroughly vibrated at footings during placement to decrease the permeability of the concrete.

4.9 Embankment Construction and General Site Fill

Site preparation and embankment construction: All areas to receive new fill for the embankments should be stripped of all vegetation. The surface 12 inches of native soil shall be uniformly moisture conditioned to 3 to 8% above optimum moisture by discing and compacted in 6-inch maximum lifts to a minimum of 90% of ASTM D1557 maximum density.

The embankment slopes may be constructed no steeper than 3:1 (unless lined with concrete or HDPE/PVC sheeting) with a minimum crown width of 15 feet. Embankments should be overbuilt by 6 inches and subsequently cut to the plan line and grade to remove loose material along the slope faces.

Native cohesive soil from the site or adjacent land areas is anticipated to be used as general and embankment fill and as pond liner material. The fill soils should consist of cohesive silty clay (CL) or clay (CH). The clay soils are considered adequate for engineered fill. The general and embankment fill should be pulverized/disced to less than 1.0 inch maximum clod size, uniformly moisture conditioned to 3 to 8% over optimum, placed in 6 inch maximum lifts and compacted to a minimum of 90% of ASTM D1557 maximum density.

4.10 Raw Water Pond Recommendations

Site preparation and embankment construction: All areas to receive new fill for the embankments should be stripped of all vegetation, scarified and compacted for a depth of 12 inches to a minimum of 90% of ASTM D1557 maximum dry density. The embankment slopes may be constructed no steeper than 3:1 (unless lined with concrete or HDPE/PVC sheeting) with a minimum crown width of 15 feet. However, flatter slopes may be considered to retard erosion and permit maintenance. Embankments should be overbuilt by 6 inches and subsequently cut to the plan line and grade to remove loose material along the slope faces.

Cohesive soil from the raw water pond site is anticipated to be used as embankment fill and as pond liner material. The fill soils should consist of cohesive silty clay (CL) or clay (CH). The clay soils excavated from the proposed pond site are considered adequate for engineered embankment fill. The embankment fill should be pulverized/disced to less than ¾ inch maximum clod size, uniformly moisture conditioned to 3 to 8% over optimum, and placed in 6 inch maximum lifts at a minimum of 90% of ASTM D1557 maximum density.

Pond Liner and Slope Protection: The raw water pond is anticipated to be lined with a compacted native clay liner to retard seepage from the sideslopes of the ponds. The liner material should be free from deleterious material such as organic matter, construction debris, rocks, or other debris. The clay liner material should be pulverized/disced to less than ¾ inch maximum clod size, uniformly moisture conditioned to 3-8 percent over optimum, and placed in 6 inch maximum lifts to a minimum of 90% of ASTM D1557 maximum density.

Several options are available for protection of slopes from wave erosion. These consist of synthetic liners, stone riprap, soil cement liner, or concrete lining. Slope protection is suggested along west facing slopes (dominant wind direction). Unlined slopes should be constructed substantially flatter (about 5(H) to 1(V)). All slopes should be lined to a water depth of 5 feet to control vegetation growth at the pond edges. Water depths of at least 8 feet will reduce algae growth in the ponds.

4.11 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.

4.12 Lateral Earth Pressures

Earth retaining structures, such as retaining walls, should be designed to resist the soil pressure imposed by the retained soil mass. Walls with granular drained backfill may be designed for an assumed static earth pressure equivalent to that exerted by a fluid weighing 60 pcf for unrestrained (active) conditions (able to rotate 0.1% of wall height), and 100 pcf for restrained (at-rest) conditions. These values should be verified at the actual wall locations during construction. When applicable (walls retaining more than 6 feet of earth) seismic earth pressure on walls may be assumed to exert a uniform pressure distribution of 7.5H psf against the back of the wall, where H is the height of the backfill. The total seismic load is assumed to act as a point load at 0.6H above the base of the wall.

When applicable (Seismic Design Category D, E or F), retaining wall structures where the backfill is greater than 6 feet high shall be designed in addition to the static loading (active or at-rest condition) with an additional seismic lateral pressure increasing linearly with depth and the resultant acting as a point load at 0.4H above the base of the wall. The term H is the height of the backfill against a retaining wall in feet. The seismic load increment, shall be determined using the following equations for different wall type and backfill conditions:

Basement (restrained) walls with level backfill: $\Delta K_{ae} = \frac{1}{2}\gamma H^2(0.68\ PGA_M/g)$

Cantilever (unrestrained) wall with level backfill: $\Delta K_{ae} = \frac{1}{2}\gamma H^2(0.42\ PGA_M/g)$

Cantilever (unrestrained) wall with sloping backfill*: $\Delta K_{ae} = \frac{1}{2}\gamma H^2(0.70\ PGA_M/g)$

*Applicable for sloping backfill that is no steeper than 2:1 (horizontal:vertical).

Where:

ΔK_{ae} = Seismic Lateral Force (plf) based on seismic pressure
γ = 125 pcf
A PGA_M value of 0.61g has been determined for the project site.
H = Height of retained soil (ft)

Surcharge loads should be considered if loads are applied within a zone between the face of the wall and a plane projected behind the wall 45 degrees upward from the base of the wall. The increase in lateral earth pressure acting uniformly against the back of the wall should be taken as 50% of the surcharge load within this zone. Areas of the retaining wall subjected to traffic loads should be designed for a uniform surcharge load equivalent to two feet of native soil.

Walls should be provided with backdrains to reduce the potential for the buildup of hydrostatic pressure. The drainage system should consist of a composite HDPE drainage panel or a 2-foot wide zone of free draining crushed rock placed adjacent to the wall and extending 2/3 the height of the wall. The gravel should be completely enclosed in an approved filter fabric to separate the gravel and backfill soil. A perforated pipe should be placed perforations down at the base of the permeable material at least six inches below finished floor elevations. The pipe should be sloped to drain to an appropriate outlet that is protected against erosion. Walls should be properly waterproofed. The project geotechnical engineer should approve any alternative drain system.

4.13 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 6 oz. non-woven filter fabric such as Mirafi 160N 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).

4.14 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 Seismic Zone 4 using the seismic coefficients given in Section 3.4 of this report. ***This site lies approximately 2.4 km from a Type B fault (Brawley Seismic Zone) and overlies S_D (stiff) soil***.

4.15 Pavements

Pavements should be designed according to CALTRANS 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 State of California CALTRANS method, and R-value of 5 for the subgrade soil and assumed traffic indices, the following table provides our estimates for asphaltic concrete (AC) pavement sections.

PAVEMENTS 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
8.0	5.0	17.5	8.0	11.0
10.0	5.0	23.5	9.0	13.0
11.0	6.0	26.0	10.0	15.0

Notes:

1) Asphaltic concrete shall be Caltrans, Type B, ¾ inch maximum (½ inch maximum for parking areas), medium grading, compacted to a minimum of 95% of the 75-blow Marshall density (ASTM D1559) or Hveem Density (Cal 366).
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.
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)
   - Cul-de-Sacs: TI = 5.0
   - Local Streets: TI = 6.0
   - Minor Collectors: TI = 6.5 (*) Plant Roadways
   - Major Collectors: TI = 8.0
   - Minor Arterial: TI = 10.0
   - Primary Arterial: TI = 11.0

4.16 Onsite Sewage Disposal System

The onsite soils consist of clays of low permeability, generally with an infiltration rate of 240 minutes per inch or greater. These soils are not suited for conventional leach fields. Advanced wastewater treatment systems will be required for wastewater treatment and onsite disposal.

Section 5
LIMITATIONS AND ADDITIONAL SERVICES

5.1 Limitations

The recommendations and conclusions within this report are based on current information regarding the proposed 147MW Morton Bay geothermal power plant located at the southwest corner of Davis Road and McDonald Road northwest of Calipatria, California. The conclusions and recommendations 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.

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 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.

Idriss, I. M. and Boulanger, R. W., 2010, SPT-base liquefaction triggering procedures. Report UCD/CGM-10-02. Dept. of Civil and Environmental Engineering, University of California – Davis, CA. 259 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.

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).

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.

UC Davis, 2022. California Soil Resource Lab SoilWeb App for Google Earth. https://casoilresource.lawr.ucdavis.edu/

USDA Natural Resources Conservation Service, 2022, Web Soil Survey Website. https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

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., 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.

Zimmerman, R. P., 1981, Soil survey of Imperial County, California, Imperial Valley Area: U.S. Dept. of Agriculture Soil Cons

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)
Elmore Ranch	4.9	7.8	6.6	29 ± 3	1 ± 0.5
Hot Springs *	12.4	19.8			
San Andreas - Coachella	13.1	20.9	7.2	96 ± 10	25 ± 5
Imperial	18.3	29.3	7	62 ± 6	20 ± 5
Brawley *	18.6	29.7			
Superstition Hills	18.7	29.9	6.6	23 ± 2	4 ± 2
Superstition Mountain	22.4	35.9	6.6	24 ± 2	5 ± 3
San Jacinto - Borrego	26.8	42.9	6.6	29 ± 3	4 ± 2
Rico *	28.9	46.3			
Painted Gorge Wash*	29.5	47.2			
San Jacinto - Anza	31.3	50.1	7.2	91 ± 9	12 ± 6
Yuha Well *	33.8	54.1			
Route 247*	33.9	54.3			
Shell Beds	34.3	54.9			
Vista de Anza*	35.5	56.8			
Yuha*	35.8	57.2			
Northern Centinela*	36.5	58.4			
San Jacinto - Coyote Creek	37.2	59.5	6.8	41 ± 4	4 ± 2
Ocotillo*	37.6	60.2			
Laguna Salada	37.9	60.6	7	67 ± 7	3.5 ± 1.5
Elsinore - Coyote Mountain	38.8	62.0	6.8	39 ± 4	4 ± 2
Borrego (Mexico)*	45.0	71.9			

* Note: Faults not included in CGS database.

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

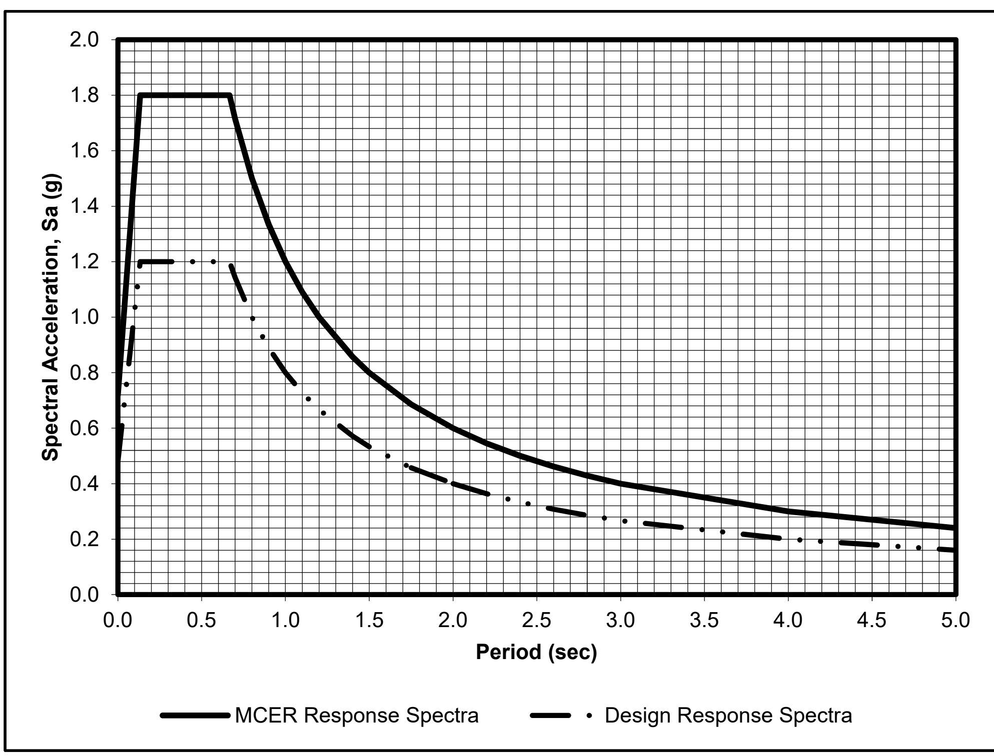
		ASCE 7-16 Reference
Soil Site Class:	**E**	Table 20.3-1
Latitude:	33.2048 N	
Longitude:	-115.5818 W	
Risk Category:	III	
Seismic Design Category:	D	

Maximum Considered Earthquake (MCE) Ground Motion

Mapped MCE_R Short Period Spectral Response	$\mathbf{S_s}$	1.500 g	ASCE Figure 22-1	
Mapped MCE_R 1 second Spectral Response	$\mathbf{S_1}$	0.600 g	ASCE Figure 22-2	
Short Period (0.2 s) Site Coefficient	$\mathbf{F_a}$	1.20	ASCE Table 11.4-1	
Long Period (1.0 s) Site Coefficient	$\mathbf{F_v}$	2.00	ASCE Table 11.4-2	
MCE_R Spectral Response Acceleration Parameter (0.2 s)	$\mathbf{S_{MS}}$	1.800 g	$= Fa * S_s$	ASCE Equation 11.4-1
MCE_R Spectral Response Acceleration Parameter (1.0 s)	$\mathbf{S_{M1}}$	1.200 g	$= Fv * S_1$	ASCE Equation 11.4-2

Design Earthquake Ground Motion

Design Spectral Response Acceleration Parameter (0.2 s)	$\mathbf{S_{DS}}$	1.200 g	$= 2/3*S_{MS}$	ASCE Equation 11.4-3
Design Spectral Response Acceleration Parameter (1.0 s)	$\mathbf{S_{D1}}$	0.800 g	$= 2/3*S_{M1}$	ASCE Equation 11.4-4
Risk Coefficient at Short Periods (less than 0.2 s)	$\mathbf{C_{RS}}$	0.944		ASCE Figure 22-17
Risk Coefficient at Long Periods (greater than 1.0 s)	$\mathbf{C_{R1}}$	0.916		ASCE Figure 22-18
	$\mathbf{T_L}$	8.00 sec		ASCE Figure 22-12
	$\mathbf{T_O}$	0.13 sec	$=0.2*S_{D1}/S_{DS}$	
	$\mathbf{T_S}$	0.67 sec	$=S_{D1}/S_{DS}$	
Peak Ground Acceleration	$\mathbf{PGA_M}$	0.61 g		ASCE Equation 11.8-1



Period T (sec)	Sa (g)	MCE_R Sa (g)
0.00	0.48	0.72
0.13	1.20	1.80
0.67	1.20	1.80
0.70	1.14	1.71
0.80	1.00	1.50
0.90	0.89	1.33
1.00	0.80	1.20
1.10	0.73	1.09
1.20	0.67	1.00
1.20	0.67	1.00
1.40	0.57	0.86
1.50	0.53	0.80
1.75	0.46	0.69
2.00	0.40	0.60
2.20	0.36	0.55
2.40	0.33	0.50
2.60	0.31	0.46
2.80	0.29	0.43
3.00	0.27	0.40
4.00	0.20	0.30
5.00	0.16	0.24

Table 3
Soil Site Class Determination per ASCE 7-10, Section 20.4
Morton Bay Geothermal Plant
LCI Project No. LE22197

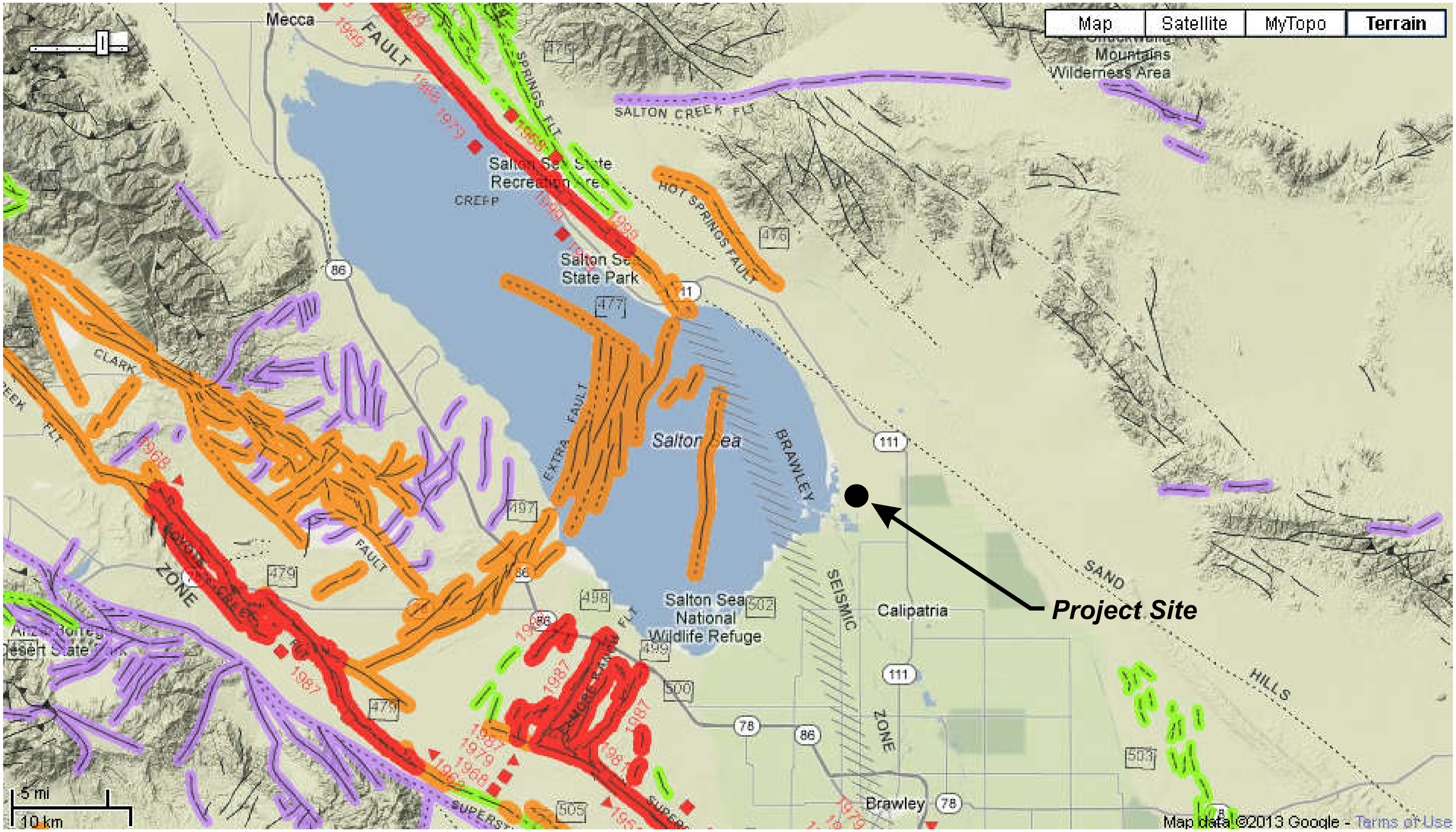
CPT-1

Sample Depth	S-wave Velocity (ft/sec)	di/Ni	Sum di/vsi	Avg. Vs
0				
5.12			0.17	**591**
10.01	380	0.01		
15.29	392	0.01		
20.05	514	0.01		
25.23	559	0.01		
30.02	456	0.01		
35.04	406	0.01		
40.09	530	0.01		
45.6	529	0.01		
50	588	0.01		
55.09	744	0.01		
60.07	750	0.01		
65.09	551	0.01		
70.11	667	0.01		
75.23	812	0.01		
80.02	772	0.01		
85.1	532	0.01		
90.12	515	0.01		
95.11	756	0.01		
100.07	918	0.01		

FIGURES

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

LANDMARK Geo-Engineers and Geologists **Project No.: LE22197**	**Regional Fault Map**	**Figure 1**



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

LANDMARK Geo-Engineers and Geologists

Project No.: LE22197

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	DESCRIPTION: OFFSHORE
Quaternary	Late Quaternary	Historic	0–200			Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
Quaternary	Late Quaternary	Holocene	200–11,700			Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
Quaternary	Late Quaternary	Pleistocene	11,700–700,000			Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
Quaternary	Early Quaternary	Pleistocene	700,000–1,600,000*			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*–4.5 billion (Age of Earth)			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.

* 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.

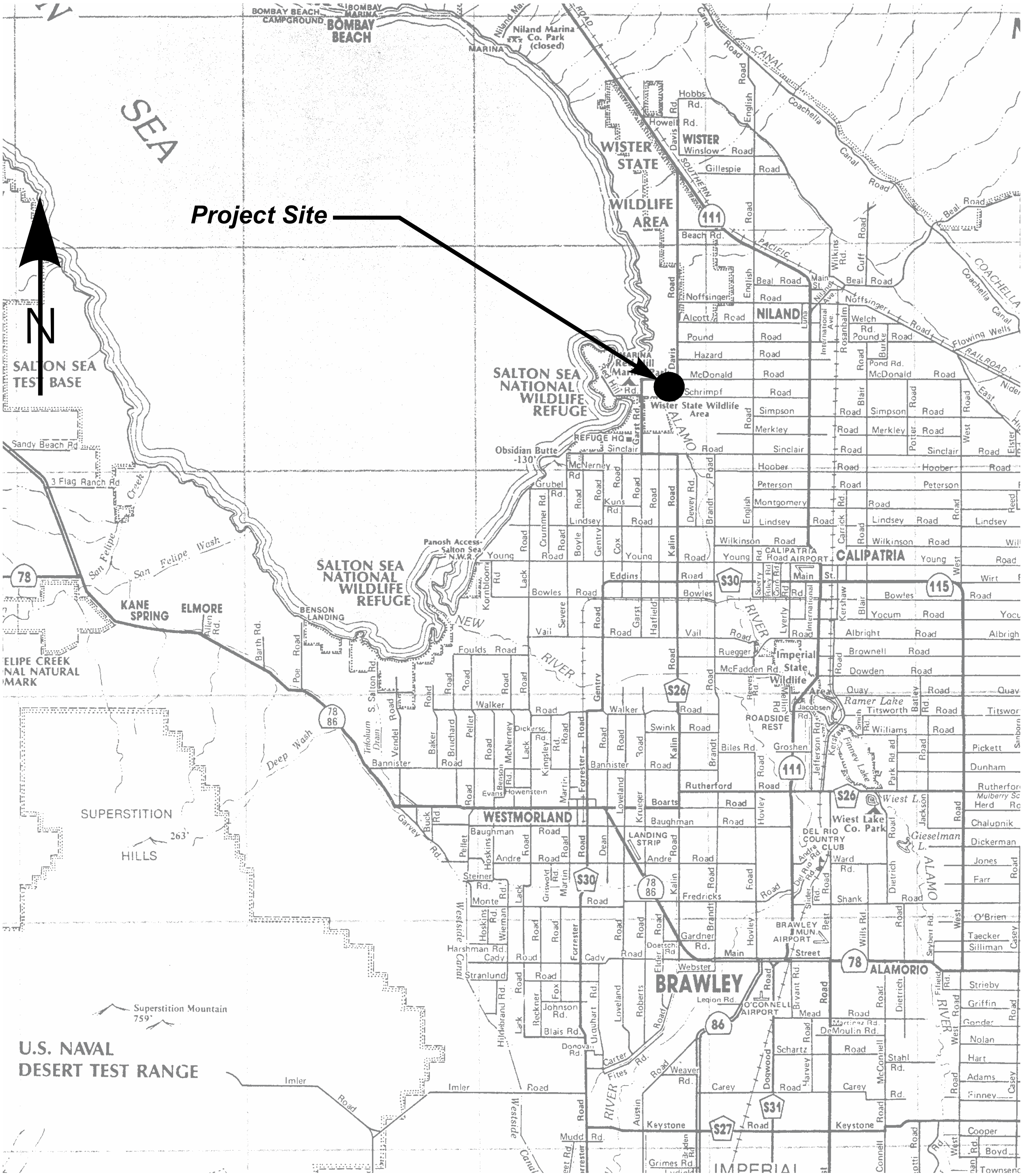
LANDMARK Geo-Engineers and Geologists

Project No.: LE22197

Fault Map Legend

Figure 3

APPENDIX A



![LandMark Geo-Engineers and Geologists]

Project No.: LE22197

Vicinity Map

Plate A-1

LANDMARK
Geo-Engineers and Geologists

Project No.: LE22197

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 14, Sep 1, 2022

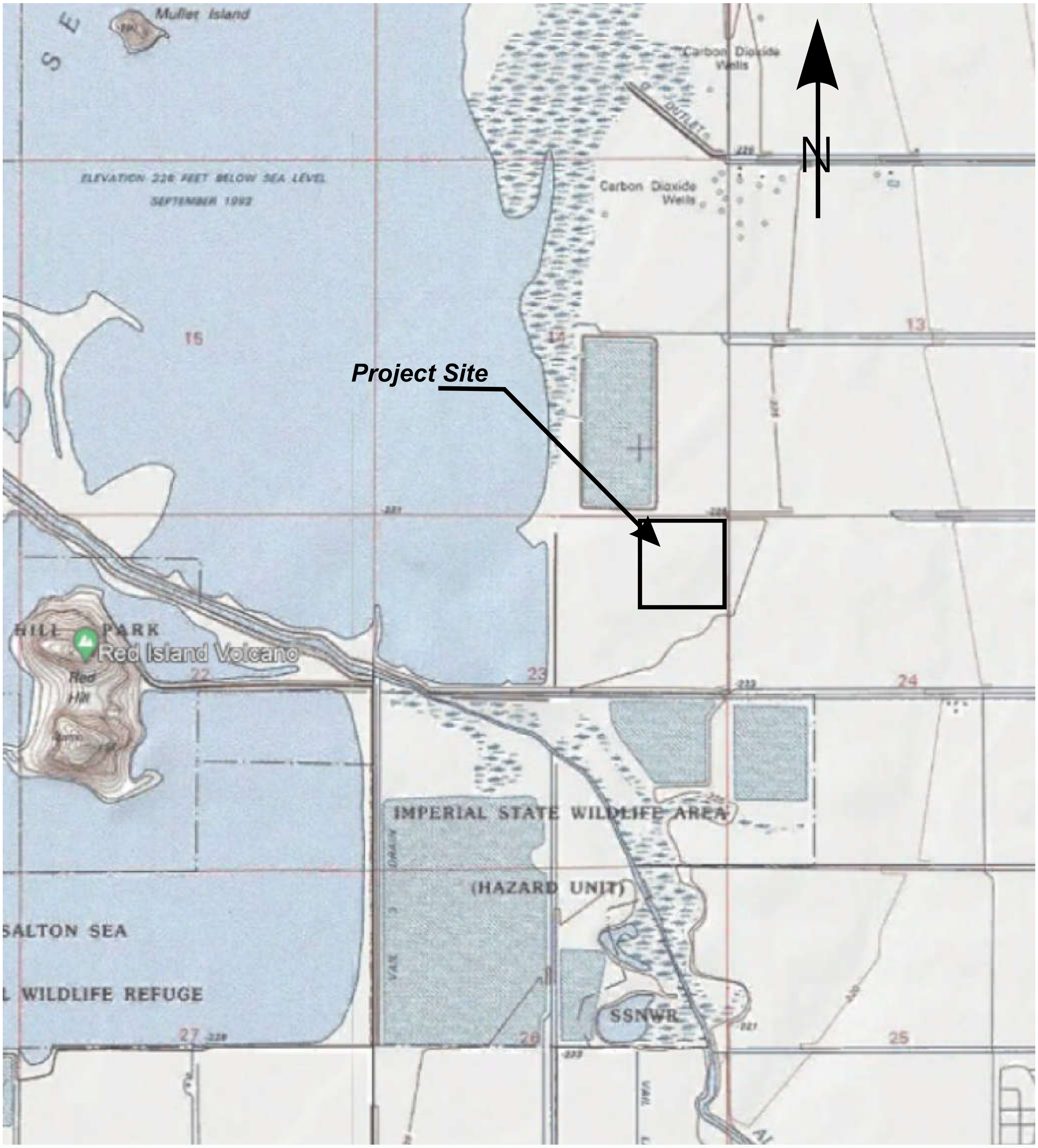
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 6, 2021—May 29, 2021

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
104	Fluvaquents, saline	0.1	0.1%
114	Imperial silty clay, wet	170.3	91.3%
115	Imperial-Glenbar silty clay loams, wet, 0 to 2 percent slopes	14.6	7.8%
122	Meloland very fine sandy loam, wet	1.5	0.8%
Totals for Area of Interest		**186.6**	**100.0%**



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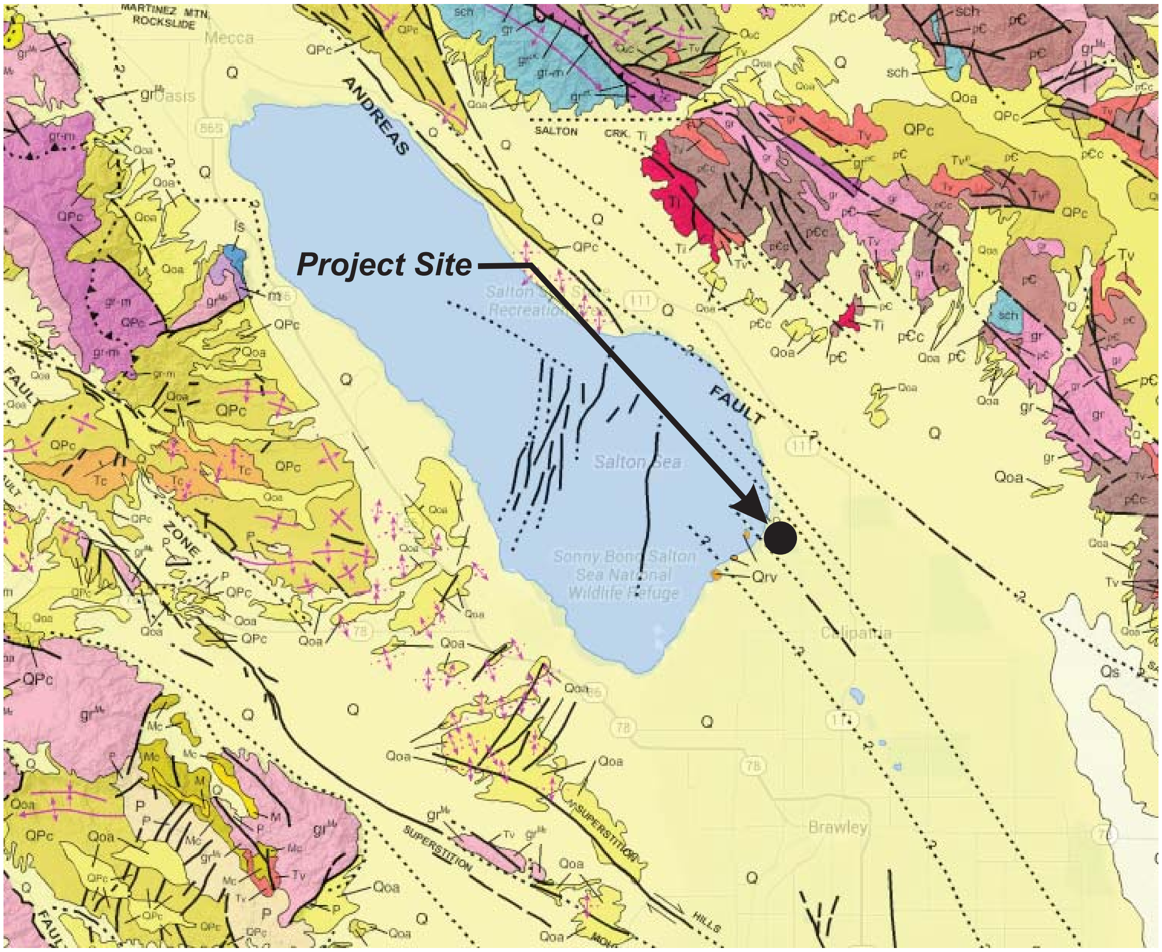
Project No.: LE22197

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, Ø, Øc, E, Ec, Ep

Tertiary Volcanic Rocks: Tv, Tv^p, Ti

Tertiary Plutonic Rocks: gr^Tx

Mesozoic Sedimentary and Metasedimentary Rocks: TK, K, Ku, Kl, KJf, KJf_m, KJf_s, J, T̶R̶, 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, Є

Paleozoic Mixed Rocks: m

Paleozoic Metavolcanic Rocks: Pzv

Paleozoic Plutonic Rocks: gr^Pz

Pre-Cambrian Rocks: pЄ, pЄc, gr^pЄ

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.

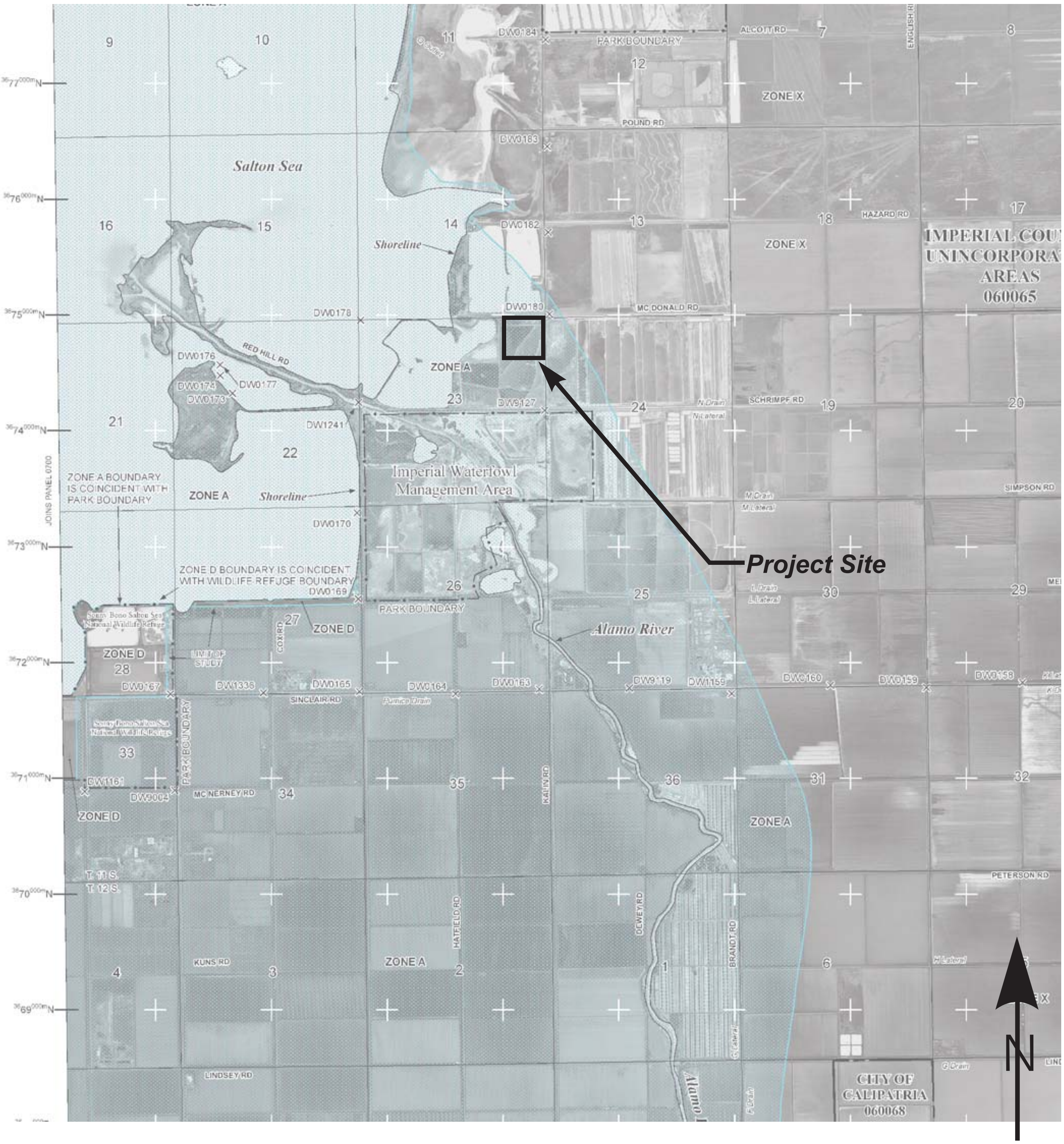
Synclinal fold.

Monoclinal fold.

N

Site Location
Lat: 33.2048 N Long: -115.5818 W

LANDMARK Geo-Engineers and Geologists **Project No.: LE22197**	**Regional Geologic Map**	**Plate A-5**



LANDMARK Geo-Engineers and Geologists Project No.: LE22197	FEMA Flood Map	Plate A-6

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)———(A)	Cross section line
(23)- - - - - -(23)	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
2476000mN	1000-meter Universal Transverse Mercator grid values, zone 11N
600000 FT	5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

APPENDIX B

LOG OF BORING NO. B-1

SHEET 1 OF 1

DEPTH	SAMPLE	USCS CLASS.	BLOW COUNT	POCKET PEN. (tsf)	DESCRIPTION OF MATERIAL	DRY DENSITY (pcf)	MOISTURE CONTENT (% dry wt.)	OTHER TESTS
		CH	17	3.5	CLAY (CH): Brown, very moist to saturated with depth, medium stiff to very stiff, high plasticity.	96.8	26.9	
5			5	1.0			27.4	LL=45% PI=30%
			7	0.75		97.2	29.1	
10			5	1.0			34.4	
15			14	2.0		89.9	33.5	c=0.83 tsf
20		CL-ML	5	0.5	SILTY CLAY-CLAYEY SILT (CL-ML): Gray, saturated, soft to medium stiff.		41.9	
25		ML	5		CLAYEY SILT (ML): Gray, saturated, stiff.	93.9	28.8	% passing #200 = 78% <2μ = 30%
30					Groundwater measured at 13 feet at time of drilling. This is not considered the stabilized groundwater depth as groundwater may rise to a level higher than that measured in borehole.			

DATE DRILLED:	9/28/22	TOTAL DEPTH:	26.5 Feet	DEPTH TO WATER:	13.0 Ft.
LOGGED BY:	P. Santa Cruz	TYPE OF BIT:	Hollow Stem Auger	DIAMETER:	8 in.
SURFACE ELEVATION:	Approximately -227’	HAMMER WT.:	140 lbs.	DROP:	30 in.

PROJECT No. LE22197

LANDMARK Geo-Engineers and Geologists

PLATE B-1

LOG OF BORING NO. B-2

SHEET 1 OF 1

DEPTH	SAMPLE	USCS CLASS.	BLOW COUNT	POCKET PEN. (tsf)	DESCRIPTION OF MATERIAL	DRY DENSITY (pcf)	MOISTURE CONTENT (% dry wt.)	OTHER TESTS
		CH	9	2.0	CLAY (CH): Brown, very moist to saturated with depth, medium stiff to stiff, high plasticity.		28.9	LL=56% PI=37%
5			7	1.0		96.5	26.0	
			2	0	▼		32.1	
10			4	1.0		100.5	29.6	c=0.16 tsf
15			8	2.5			31.1	
20		CL	15	2.0	SILTY CLAY (CL): Brown, saturated, stiff to very stiff, with very fine to fine grained sands.	101.6	21.7	
25		CL-ML	4	0.5	SILTY CLAY-CLAYEY SILT (CL-ML): Gray, saturated, soft.		35.4	% passing #200 = 81%
30					Groundwater measured at 8 feet at time of drilling. This is not considered the stabilized groundwater depth as groundwater may rise to a level higher than that measured in borehole.			

FIELD / LABORATORY

DATE DRILLED: 9/28/22 TOTAL DEPTH: 26.5 Feet DEPTH TO WATER: 8.0 Ft.

LOGGED BY: P. Santa Cruz TYPE OF BIT: Hollow Stem Auger DIAMETER: 8 in.

SURFACE ELEVATION: Approximately -227' HAMMER WT.: 140 lbs. DROP: 30 in.

PROJECT No. LE22197

LANDMARK Geo-Engineers and Geologists

PLATE B-2

LOG OF BORING No. B-3

SHEET 1 OF 1

DEPTH	SAMPLE	USCS CLASS.	BLOW COUNT	POCKET PEN. (tsf)	DESCRIPTION OF MATERIAL	DRY DENSITY (pcf)	MOISTURE CONTENT (% dry wt.)	OTHER TESTS
		CL	5		SILTY CLAY (CL): Brown, wet, medium stiff, medium plasticity.		24.8	% passing #200 = 87% $<2\mu$ = 32%
5		CH	6	1.25	CLAY (CH): Brown, wet, medium stiff, very high plasticity	92.2	28.7	
		CL-ML	push	0	CLAYEY SILT (CL-ML): Brown, wet, very soft/very loose, low plasticity.		32.5	LL=30% PI=8%
10		CH	5	0	CLAY (CH): Brown, wet to saturated, very soft to medium stiff, very high plasticity	89.4	35.5	
15			7	0.75			33.4	% passing #200 = 99% $<2\mu$ = 53%
20		SM	12		SILTY SAND (SM): Lt. brown, saturated, medium dense, fine grained sand	96.2	22.3	% passing #200 = 18% c=0.11 tsf Φ=33°
25		CL	12	2.5	SILTY CLAY (CL): Brown, saturated, stiff, medium plasticity		29.8	
30		CH	8	2.5	CLAY (CH): Brown, saturated, stiff to very stiff, very high plasticity	87.9	33.4	LL=73% PI=52%
35			13	2.5			27.8	
40			18	4.5		96.2	26.5	
45		ML	9		CLAYEY SILT/SILT (ML): Gray, saturated, stiff, low plasticity		28.2	% passing #200 = 99% $<2\mu$ = 27%
50			9			98.7	21.0	Φ=30°
55		ML/SM	push		SANDY SILT/SILTY SAND (ML/SM): Gray, saturated, very loose, fine to very fine grained sand		26.2	% passing #200 = 52% $<2\mu$ = 38%
60								

DATE DRILLED: 9/29/22

LOGGED BY: P. Santa Cruz

SURFACE ELEVATION: Approximately -227'

TOTAL DEPTH: 76.5 Feet

TYPE OF BIT: Hollow Stem Auger

HAMMER WT.: 140 lbs.

DEPTH TO WATER: 8 ft.

DIAMETER: 8 in.

DROP: 30 in.

PROJECT NO. LE22197

LANDMARK
Geo-Engineers and Geologists

PLATE B-3a

LOG OF BORING No. B-3

SHEET 2 OF 2

DEPTH	SAMPLE	USCS CLASS.	BLOW COUNT	POCKET PEN. (tsf)	DESCRIPTION OF MATERIAL	DRY DENSITY (pcf)	MOISTURE CONTENT (% dry wt.)	OTHER TESTS
60			23		SILTY CLAY (CL): Grayish brown, saturated, very stiff, with some fine grain sands.			
65			15	3.5	CLAY (CH): Brown, saturated, very stiff, high plasticity.		27.5	LL=59% PI=41%
70			20	1.75	SILTY CLAY (CL): Gray, saturated, stiff to very stiff, medium to high plasticity.			
75			26		SAND (SP): Gray, saturated, medium dense, fine grained sand some silts.		22.5	% passing #200 = 6%

Groundwater measured at 8 feet at time of drilling. This is not considered the stabilized groundwater depth as groundwater may rise to a level higher than that measured in borehole.

DATE DRILLED: 9/29/22

LOGGED BY: P. Santa Cruz

SURFACE ELEVATION: Approximately -227'

TOTAL DEPTH: 76.5 Feet

TYPE OF BIT: Hollow Stem Auger

HAMMER WT.: 140 lbs.

DEPTH TO WATER: 8 ft.

DIAMETER: 8 in.

DROP: 30 in.

PROJECT NO. LE22197

LANDMARK Geo-Engineers and Geologists

PLATE B-3b

CLIENT:	BHER
PROJECT:	Morton Bay Geothermal - Calipatria, CA
LOCATION:	See Site and Boring Location Plan
CONE PENETROMETER:	Kehoe Testing & Engineering Truck Mounted Electric Cone with 30 ton reaction weight
DATE:	9/28/2022

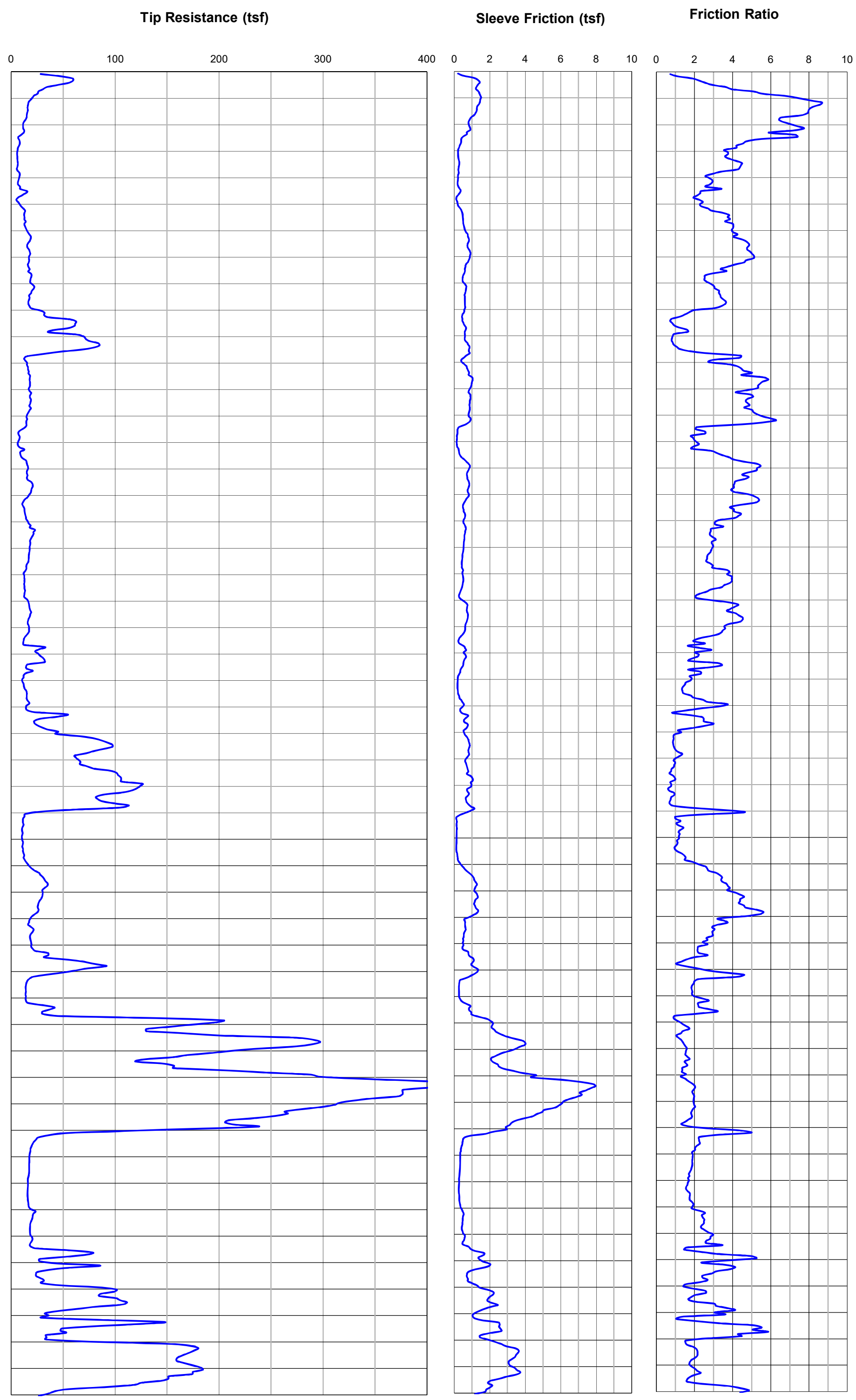
CONE SOUNDING DATA CPT-1

INTERPRETED SOIL PROFILE
From Robertson and Campanella (1989

GROUND ELEVATION +/-

DEPTH			
	Silty Sand to Sandy Sil	SM/ML	very dense
	Clay	CL/CH	very stiff
	Clay	" "	stiff
	Clay	" "	stiff
5	Clay	" "	stiff
	Clay	" "	firm
	Clay	" "	firm
	Clay	" "	firm
	Silty Clay to Clay	CL	firm
10	Silty Clay to Clay	" "	firm
	Silty Clay to Clay	" "	stiff
	Silty Clay to Clay	" "	stiff
	Clay	CL/CH	stiff
	Clay	" "	stiff
15	Clay	" "	stiff
	Clayey Silt to Silty Clay	ML/CL	very stiff
	Clayey Silt to Silty Clay	" "	very stiff
	Clayey Silt to Silty Clay	" "	very stiff
	Silty Sand to Sandy Sil	SM/ML	medium dense
20	Silty Sand to Sandy Sil	" "	medium dense
	Sand to Silty Sand	SP/SM	medium dense
	Clayey Silt to Silty Clay	ML/CL	very stiff
	Clay	CL/CH	stiff
	Clay	" "	stiff
25	Clay	" "	very stiff
	Clay	" "	stiff
	Clay	" "	stiff
	Silty Clay to Clay	CL	firm
	Silty Clay to Clay	" "	firm
30	Clay	CL/CH	stiff
	Clay	" "	stiff
	Silty Clay to Clay	CL	very stiff
	Clay	CL/CH	stiff
	Clay	" "	stiff
35	Clayey Silt to Silty Clay	ML/CL	very stiff
	Clayey Silt to Silty Clay	" "	very stiff
	Clayey Silt to Silty Clay	" "	stiff
	Silty Clay to Clay	CL	stiff
	Silty Clay to Clay	" "	stiff
40	Clayey Silt to Silty Clay	ML/CL	stiff
	Silty Clay to Clay	CL	stiff
	Silty Clay to Clay	" "	stiff
	Clayey Silt to Silty Clay	ML/CL	stiff
	Sandy Silt to Clayey Sil	ML	loose
45	Sandy Silt to Clayey Sil	" "	loose
	Clayey Silt to Silty Clay	ML/CL	stiff
	Sandy Silt to Clayey Sil	ML	very loose
	Clayey Silt to Silty Clay	ML/CL	stiff
	Sandy Silt to Clayey Sil	ML	loose
50	Sandy Silt to Clayey Sil	" "	loose
	Sand to Silty Sand	SP/SM	medium dense
	Sand to Silty Sand	" "	medium dense
	Sand to Silty Sand	" "	medium dense
	Sand to Silty Sand	" "	medium dense
55	Sand to Silty Sand	" "	medium dense
	Silty Sand to Sandy Sil	SM/ML	medium dense
	Clayey Silt to Silty Clay	ML/CL	stiff
	Clayey Silt to Silty Clay	" "	stiff
	Sandy Silt to Clayey Sil	ML	very loose
60	Clayey Silt to Silty Clay	ML/CL	stiff
	Clayey Silt to Silty Clay	" "	very stiff
	Clayey Silt to Silty Clay	" "	very stiff
	Silty Clay to Clay	CL	very stiff
	Clay	CL/CH	very stiff
65	Clayey Silt to Silty Clay	ML/CL	stiff
	Clayey Silt to Silty Clay	" "	stiff
	Sandy Silt to Clayey Sil	ML	loose
	Silty Sand to Sandy Sil	SM/ML	medium dense
	Clayey Silt to Silty Clay	ML/CL	stiff
70	Clayey Silt to Silty Clay	" "	stiff
	Sandy Silt to Clayey Sil	ML	loose
	Sand to Silty Sand	SP/SM	medium dense
	Sand to Silty Sand	" "	dense
	Sand	SP	dense
75	Sand to Silty Sand	SP/SM	dense
	Sand to Silty Sand	" "	dense
	Sand to Silty Sand	" "	very dense
	Sand to Silty Sand	" "	very dense
	Sand to Silty Sand	" "	dense
80	Sand to Silty Sand	" "	dense
	Clayey Silt to Silty Clay	ML/CL	very stiff
	Sandy Silt to Clayey Sil	ML	very loose
	Sandy Silt to Clayey Sil	" "	very loose
	Sandy Silt to Clayey Sil	" "	very loose
85	Sandy Silt to Clayey Sil	" "	very loose
	Sandy Silt to Clayey Sil	" "	very loose
	Clayey Silt to Silty Clay	ML/CL	very stiff
	Clayey Silt to Silty Clay	" "	stiff
	Clayey Silt to Silty Clay	" "	very stiff
90	Clayey Silt to Silty Clay	" "	hard
	Clayey Silt to Silty Clay	" "	hard
	Sandy Silt to Clayey Sil	ML	loose
	Silty Sand to Sandy Sil	SM/ML	medium dense
	Sandy Silt to Clayey Sil	ML	medium dense
95	Sandy Silt to Clayey Sil	" "	medium dense
	Silty Clay to Clay	CL	hard
	Sand to Silty Sand	SP/SM	dense
	Sand to Silty Sand	" "	dense
	Silty Sand to Sandy Sil	SM/ML	medium dense
	Clayey Silt to Silty Clay	ML/CL	hard

END OF SOUNDING AT 100 ft.



Project No.	LANDMARK Geo-Engineers and Geologists	**PLATE**
LE22197		**B-4**

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

Project: Morton Bay Geothermal - Calipatria, CA **Project No:** LE22197 **Date:** 9/28/2022

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	44.71	1.26	Silty Sand to Sandy Silt	SM/ML	very dense	115	10	84.5	30	111	43		
0.30	1.0	53.50	2.60	Sandy Silt to Clayey Silt	ML	very dense	115	15	101.1	40	100	42		
0.45	1.5	30.35	4.25	Silty Clay to Clay	CL	very stiff	125	17		65			1.78	>10
0.60	2.0	22.52	6.56	Clay	CL/CH	very stiff	125	18		90			1.32	>10
0.75	2.5	17.10	8.40	Clay	CL/CH	stiff	125	14		100			1.00	>10
0.93	3.0	15.83	8.07	Clay	CL/CH	stiff	125	13		100			0.92	>10
1.08	3.5	14.99	7.35	Clay	CL/CH	stiff	125	12		100			0.87	>10
1.23	4.0	12.49	6.68	Clay	CL/CH	stiff	125	10		100			0.72	>10
1.38	4.5	11.81	7.42	Clay	CL/CH	stiff	125	9		100			0.68	>10
1.53	5.0	9.47	6.84	Clay	CL/CH	stiff	125	8		100			0.54	>10
1.68	5.5	7.78	4.72	Clay	CL/CH	firm	125	6		100			0.44	>10
1.83	6.0	6.14	3.83	Clay	CL/CH	firm	125	5		100			0.34	5.88
1.98	6.5	5.86	3.71	Clay	CL/CH	firm	125	5		100			0.32	4.68
2.13	7.0	6.23	4.36	Clay	CL/CH	firm	125	5		100			0.34	4.57
2.28	7.5	6.04	4.02	Clay	CL/CH	firm	125	5		100			0.33	3.91
2.45	8.0	7.91	2.77	Silty Clay to Clay	CL	firm	125	5		100			0.44	7.00
2.60	8.5	6.67	2.88	Clay	CL/CH	firm	125	5		100			0.36	3.91
2.75	9.0	10.90	2.78	Silty Clay to Clay	CL	stiff	125	6		90			0.61	>10
2.90	9.5	9.85	2.13	Clayey Silt to Silty Clay	ML/CL	stiff	120	4		90			0.55	>10
3.05	10.0	6.57	2.32	Silty Clay to Clay	CL	firm	125	4		100			0.35	4.18
3.20	10.5	11.59	2.64	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		90			0.65	>10
3.35	11.0	12.65	3.67	Silty Clay to Clay	CL	stiff	125	7		100			0.71	>10
3.50	11.5	13.09	3.82	Silty Clay to Clay	CL	stiff	125	7		100			0.74	>10
3.65	12.0	14.08	4.00	Clay	CL/CH	stiff	125	11		100			0.79	>10
3.80	12.5	17.60	4.10	Silty Clay to Clay	CL	stiff	125	10		90			1.00	>10
3.95	13.0	17.48	4.61	Clay	CL/CH	stiff	125	14		95			0.99	>10
4.13	13.5	16.08	4.80	Clay	CL/CH	stiff	125	13		100			0.91	>10
4.28	14.0	17.79	5.02	Clay	CL/CH	very stiff	125	14		100			1.01	>10
4.43	14.5	17.00	4.79	Clay	CL/CH	stiff	125	14		100			0.96	>10
4.58	15.0	16.85	3.72	Silty Clay to Clay	CL	stiff	125	10		95			0.95	>10
4.73	15.5	18.32	3.06	Clayey Silt to Silty Clay	ML/CL	very stiff	120	7		85			1.04	>10
4.88	16.0	19.00	2.65	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		80			1.07	>10
5.03	16.5	21.13	3.13	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		85			1.20	>10
5.18	17.0	17.98	3.33	Clayey Silt to Silty Clay	ML/CL	very stiff	120	7		95			1.01	>10
5.33	17.5	16.70	3.59	Silty Clay to Clay	CL	stiff	125	10		100			0.94	>10
5.48	18.0	21.81	2.84	Clayey Silt to Silty Clay	ML/CL	very stiff	120	9		80			1.24	>10
5.65	18.5	32.74	1.49	Sandy Silt to Clayey Silt	ML	medium dense	115	9	35.6	55	42	34		
5.80	19.0	60.04	0.79	Sand to Silty Sand	SP/SM	medium dense	115	11	64.8	30	60	36		
5.95	19.5	52.44	1.24	Silty Sand to Sandy Silt	SM/ML	medium dense	115	12	56.1	40	55	36		
6.10	20.0	56.15	1.15	Silty Sand to Sandy Silt	SM/ML	medium dense	115	12	59.6	35	57	36		
6.25	20.5	76.71	0.83	Sand to Silty Sand	SP/SM	medium dense	115	14	80.9	25	66	37		
6.40	21.0	77.36	1.08	Sand to Silty Sand	SP/SM	medium dense	115	14	80.9	30	66	37		
6.55	21.5	30.66	3.01	Clayey Silt to Silty Clay	ML/CL	very stiff	120	12		75			1.75	>10
6.70	22.0	13.71	3.33	Silty Clay to Clay	CL	stiff	125	8		100			0.75	6.21
6.85	22.5	15.80	4.17	Clay	CL/CH	stiff	125	13		100			0.88	5.88
7.00	23.0	17.20	4.68	Clay	CL/CH	stiff	125	14		100			0.96	6.54
7.18	23.5	17.85	5.68	Clay	CL/CH	stiff	125	14		100			0.99	6.76
7.33	24.0	17.60	5.36	Clay	CL/CH	stiff	125	14		100			0.98	6.43
7.48	24.5	18.32	4.61	Clay	CL/CH	very stiff	125	15		100			1.02	6.65
7.63	25.0	18.57	4.84	Clay	CL/CH	very stiff	125	15		100			1.03	6.65
7.78	25.5	18.19	4.76	Clay	CL/CH	very stiff	125	15		100			1.01	6.32
7.93	26.0	16.42	5.11	Clay	CL/CH	stiff	125	13		100			0.91	5.21
8.08	26.5	14.76	5.81	Clay	CL/CH	stiff	125	12		100			0.81	4.28
8.23	27.0	12.18	2.73	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.65	5.31
8.38	27.5	7.38	2.30	Silty Clay to Clay	CL	firm	125	4		100			0.37	1.84
8.53	28.0	7.07	2.02	Silty Clay to Clay	CL	firm	125	4		100			0.35	1.70
8.68	28.5	9.10	2.00	Clayey Silt to Silty Clay	ML/CL	firm	120	4		100			0.47	3.14
8.85	29.0	8.97	3.18	Silty Clay to Clay	CL	firm	125	5		100			0.46	2.34
9.00	29.5	13.27	4.15	Clay	CL/CH	stiff	125	11		100			0.71	3.28
9.15	30.0	15.86	5.34	Clay	CL/CH	stiff	125	13		100			0.87	4.09
9.30	30.5	15.27	4.85	Clay	CL/CH	stiff	125	12		100			0.83	3.74
9.45	31.0	16.79	4.54	Clay	CL/CH	stiff	125	13		100			0.92	4.28
9.60	31.5	20.28	4.07	Silty Clay to Clay	CL	very stiff	125	12		100			1.12	7.41
9.75	32.0	18.29	4.27	Clay	CL/CH	very stiff	125	15		100			1.01	4.68
9.90	32.5	13.43	5.28	Clay	CL/CH	stiff	125	11		100			0.72	3.00
10.05	33.0	11.50	4.46	Clay	CL/CH	stiff	125	9		100			0.60	2.27
10.20	33.5	13.09	4.19	Clay	CL/CH	stiff	125	10		100			0.70	2.73
10.38	34.0	14.77	3.89	Silty Clay to Clay	CL	stiff	125	8		100			0.79	3.91
10.53	34.5	17.76	3.22	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.97	7.13
10.68	35.0	21.90	2.84	Clayey Silt to Silty Clay	ML/CL	very stiff	120	9		100			1.21	>10
10.83	35.5	19.13	2.98	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		100			1.05	7.85
10.98	36.0	18.10	2.94	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.99	7.00
11.13	36.5	17.34	2.83	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.94	6.32
11.28	37.0	16.64	2.64	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.90	5.88
11.43	37.5	14.64	2.91	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.78	4.68
11.58	38.0	12.62	3.75	Silty Clay to Clay	CL	stiff	125	7		100			0.66	2.82
11.73	38.5	12.72	3.95	Clay	CL/CH	stiff	125	10		100			0.67	2.20

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

Project: Morton Bay Geothermal - Calipatria, CA **Project No:** LE22197 **Date:** 9/28/2022

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	12.62	3.62	Silty Clay to Clay	CL	stiff	125	7		100			0.66	2.73
12.05	39.5	12.90	2.60	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.67	3.58
12.20	40.0	14.68	2.35	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.78	4.28
12.35	40.5	17.29	4.07	Silty Clay to Clay	CL	stiff	125	10		100			0.93	4.09
12.50	41.0	18.57	3.91	Silty Clay to Clay	CL	very stiff	125	11		100			1.01	4.47
12.65	41.5	16.92	4.45	Clay	CL/CH	stiff	125	14		100			0.91	3.07
12.80	42.0	16.58	3.91	Silty Clay to Clay	CL	stiff	125	9		100			0.89	3.66
12.95	42.5	16.60	3.49	Silty Clay to Clay	CL	stiff	125	9		100			0.89	3.58
13.10	43.0	12.74	2.61	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.66	3.14
13.25	43.5	18.69	2.05	Sandy Silt to Clayey Silt	ML	very loose	115	5	14.6	100	16	30		
13.40	44.0	25.23	2.39	Sandy Silt to Clayey Silt	ML	loose	115	7	19.6	100	24	31		
13.58	44.5	30.08	2.08	Sandy Silt to Clayey Silt	ML	loose	115	9	23.3	90	29	32		
13.73	45.0	20.72	2.78	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		100			1.13	6.43
13.88	45.5	16.70	2.26	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.89	4.37
14.03	46.0	11.43	1.98	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.58	2.49
14.18	46.5	11.62	1.62	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.59	2.49
14.33	47.0	14.23	1.38	Sandy Silt to Clayey Silt	ML	very loose	115	4	10.8	100	7	29		
14.48	47.5	15.39	2.06	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.81	3.66
14.63	48.0	15.45	3.25	Silty Clay to Clay	CL	stiff	125	9		100			0.81	2.82
14.78	48.5	30.29	1.55	Sandy Silt to Clayey Silt	ML	loose	115	9	22.7	85	29	32		
14.93	49.0	32.36	2.19	Sandy Silt to Clayey Silt	ML	loose	115	9	24.1	90	30	32		
15.10	49.5	25.52	2.68	Clayey Silt to Silty Clay	ML/CL	very stiff	120	10		100			1.40	8.14
15.25	50.0	40.94	1.46	Silty Sand to Sandy Silt	SM/ML	loose	115	9	30.3	70	37	33		
15.40	50.5	76.33	0.92	Sand to Silty Sand	SP/SM	medium dense	115	14	56.2	45	55	36		
15.55	51.0	95.68	0.88	Sand to Silty Sand	SP/SM	medium dense	115	17	70.2	35	62	37		
15.70	51.5	79.70	1.02	Sand to Silty Sand	SP/SM	medium dense	115	14	58.2	45	57	36		
15.85	52.0	62.72	1.20	Silty Sand to Sandy Silt	SM/ML	medium dense	115	14	45.7	55	49	35		
16.00	52.5	68.76	0.95	Sand to Silty Sand	SP/SM	medium dense	115	13	49.9	50	52	35		
16.15	53.0	91.97	0.83	Sand to Silty Sand	SP/SM	medium dense	115	17	66.5	40	60	36		
16.30	53.5	104.64	0.84	Sand to Silty Sand	SP/SM	medium dense	115	19	75.4	35	64	37		
16.45	54.0	118.71	0.83	Sand	SP	medium dense	110	18	85.2	30	68	37		
16.60	54.5	114.97	0.69	Sand	SP	medium dense	110	18	82.3	30	67	37		
16.78	55.0	84.47	0.88	Sand to Silty Sand	SP/SM	medium dense	115	15	60.2	40	58	36		
16.93	55.5	99.58	0.72	Sand to Silty Sand	SP/SM	medium dense	115	18	70.8	35	62	37		
17.08	56.0	61.91	2.18	Sandy Silt to Clayey Silt	ML	medium dense	115	18	43.8	70	48	35		
17.23	56.5	12.46	2.67	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.62	2.20
17.38	57.0	11.50	1.11	Sandy Silt to Clayey Silt	ML	#N/A	115	3	8.1	100	-2	28		
17.53	57.5	10.68	1.26	Clayey Silt to Silty Clay	ML/CL	stiff	120	4		100			0.51	1.70
17.68	58.0	10.41	1.20	Clayey Silt to Silty Clay	ML/CL	firm	120	4		100			0.50	1.56
17.83	58.5	11.00	1.09	Sandy Silt to Clayey Silt	ML	#N/A	115	3	7.6	100	-3	28		
17.98	59.0	11.50	1.01	Sandy Silt to Clayey Silt	ML	#N/A	115	3	8.0	100	-2	28		
18.13	59.5	12.43	1.45	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.61	2.06
18.30	60.0	15.86	1.88	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.82	3.00
18.45	60.5	22.96	2.66	Clayey Silt to Silty Clay	ML/CL	very stiff	120	9		100			1.23	5.21
18.60	61.0	30.07	3.31	Clayey Silt to Silty Clay	ML/CL	very stiff	120	12		100			1.65	8.14
18.75	61.5	34.37	3.51	Clayey Silt to Silty Clay	ML/CL	very stiff	120	14		100			1.90	>10
18.90	62.0	30.78	3.77	Clayey Silt to Silty Clay	ML/CL	very stiff	120	12		100			1.69	8.27
19.05	62.5	29.57	4.37	Silty Clay to Clay	CL	very stiff	125	17		100			1.62	5.53
19.20	63.0	26.39	4.37	Silty Clay to Clay	CL	very stiff	125	15		100			1.43	4.47
19.35	63.5	25.80	4.84	Clay	CL/CH	very stiff	125	21		100			1.39	3.43
19.50	64.0	20.56	5.22	Clay	CL/CH	very stiff	125	16		100			1.09	2.41
19.65	64.5	16.92	3.50	Silty Clay to Clay	CL	stiff	125	10		100			0.87	2.27
19.80	65.0	20.53	3.05	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		100			1.08	3.83
19.98	65.5	18.48	2.94	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.96	3.28
20.13	66.0	19.07	2.58	Clayey Silt to Silty Clay	ML/CL	stiff	120	8		100			0.99	3.43
20.28	66.5	20.94	2.35	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		100			1.10	3.83
20.43	67.0	34.24	2.36	Sandy Silt to Clayey Silt	ML	loose	115	10	22.4	100	28	32		
20.58	67.5	67.64	1.61	Silty Sand to Sandy Silt	SM/ML	medium dense	115	15	44.2	65	48	35		
20.73	68.0	69.57	1.82	Silty Sand to Sandy Silt	SM/ML	medium dense	115	15	45.3	70	49	35		
20.88	68.5	23.68	4.12	Silty Clay to Clay	CL	very stiff	125	14		100			1.26	3.43
21.03	69.0	14.61	2.07	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.73	2.13
21.18	69.5	14.02	1.86	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.69	2.00
21.33	70.0	13.89	1.92	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.68	2.00
21.50	70.5	20.10	2.46	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		100			1.05	3.35
21.65	71.0	36.20	2.41	Sandy Silt to Clayey Silt	ML	loose	115	10	23.1	100	29	32		
21.80	71.5	72.28	2.11	Silty Sand to Sandy Silt	SM/ML	medium dense	115	16	46.0	70	50	35		
21.95	72.0	190.96	1.07	Sand	SP	dense	110	29	121.3	30	78	39		
22.10	72.5	137.19	1.58	Sand to Silty Sand	SP/SM	medium dense	115	25	86.9	45	68	38		
22.25	73.0	214.73	1.25	Sand	SP	dense	110	33	135.7	30	81	39		
22.40	73.5	292.75	1.27	Sand	SP	very dense	110	45	184.5	25	91	41		
22.55	74.0	242.12	1.52	Sand to Silty Sand	SP/SM	dense	115	44	152.2	35	85	40		
22.70	74.5	172.74	1.54	Sand to Silty Sand	SP/SM	dense	115	31	108.3	40	75	38		
22.85	75.0	131.67	1.62	Sand to Silty Sand	SP/SM	medium dense	115	24	82.3	50	67	37		
23.00	75.5	172.36	1.51	Sand to Silty Sand	SP/SM	dense	115	31	107.5	40	75	38		
23.18	76.0	275.96	1.42	Sand	SP	dense	110	42	171.6	30	88	40		
23.33	76.5	387.41	1.48	Sand	SP	very dense	110	60	240.4	25	98	42		
23.48	77.0	400.99	1.95	Sand to Silty Sand	SP/SM	very dense	115	73	248.2	30	99	42		

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

Project: Morton Bay Geothermal - Calipatria, CA **Project No:** LE22197 **Date:** 9/28/2022

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
23.63	77.5	375.24	1.92	Sand to Silty Sand	SP/SM	very dense	115	68	231.6	30	97	42		
23.78	78.0	330.64	1.97	Sand to Silty Sand	SP/SM	very dense	115	60	203.5	30	93	41		
23.93	78.5	287.29	1.97	Sand to Silty Sand	SP/SM	dense	115	52	176.4	35	89	40		
24.08	79.0	252.03	1.85	Sand to Silty Sand	SP/SM	dense	115	46	154.3	35	85	40		
24.23	79.5	209.61	1.68	Sand to Silty Sand	SP/SM	dense	115	38	128.0	40	80	39		
24.38	80.0	173.64	1.90	Sand to Silty Sand	SP/SM	dense	115	32	105.8	45	74	38		
24.53	80.5	37.11	4.19	Silty Clay to Clay	CL	hard	125	21		100			2.03	5.65
24.68	81.0	21.97	2.24	Sandy Silt to Clayey Silt	ML	very loose	115	6	13.3	100	13	30		
24.83	81.5	18.88	2.14	Clayey Silt to Silty Clay	ML/CL	stiff	120	8		100			0.96	2.57
24.98	82.0	17.70	1.94	Sandy Silt to Clayey Silt	ML	very loose	115	5	10.7	100	6	29		
25.13	82.5	17.35	1.89	Sandy Silt to Clayey Silt	ML	very loose	115	5	10.4	100	6	29		
25.28	83.0	17.26	1.88	Sandy Silt to Clayey Silt	ML	very loose	115	5	10.3	100	5	29		
25.43	83.5	16.88	1.76	Sandy Silt to Clayey Silt	ML	very loose	115	5	10.1	100	5	29		
25.58	84.0	15.98	1.70	Sandy Silt to Clayey Silt	ML	very loose	115	5	9.5	100	3	28		
25.73	84.5	15.98	1.62	Sandy Silt to Clayey Silt	ML	very loose	115	5	9.5	100	3	28		
25.88	85.0	15.67	1.66	Sandy Silt to Clayey Silt	ML	very loose	115	4	9.3	100	2	28		
26.03	85.5	16.11	1.75	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.79	1.92
26.17	86.0	17.54	1.91	Sandy Silt to Clayey Silt	ML	very loose	115	5	10.4	100	6	29		
26.32	86.5	21.81	2.22	Sandy Silt to Clayey Silt	ML	very loose	115	6	12.9	100	12	30		
26.47	87.0	19.66	2.44	Clayey Silt to Silty Clay	ML/CL	stiff	120	8		100			1.00	2.49
26.62	87.5	18.13	2.44	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.90	2.20
26.77	88.0	18.23	2.54	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.91	2.20
26.92	88.5	19.94	2.88	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		100			1.01	2.49
27.07	89.0	29.05	2.56	Sandy Silt to Clayey Silt	ML	very loose	115	8	16.9	100	20	31		
27.22	89.5	67.27	2.33	Sandy Silt to Clayey Silt	ML	medium dense	115	19	39.0	85	45	34		
27.37	90.0	32.84	4.66	Silty Clay to Clay	CL	very stiff	125	19		100			1.77	3.91
27.52	90.5	58.82	3.36	Sandy Silt to Clayey Silt	ML	medium dense	115	17	34.0	100	41	34		
27.67	91.0	24.35	3.32	Clayey Silt to Silty Clay	ML/CL	very stiff	120	10		100			1.26	3.28
27.82	91.5	29.82	2.51	Sandy Silt to Clayey Silt	ML	loose	115	9	17.1	100	20	31		
27.97	92.0	76.43	1.75	Silty Sand to Sandy Silt	SM/ML	medium dense	115	17	43.8	75	48	35		
28.12	92.5	89.98	2.36	Silty Sand to Sandy Silt	SM/ML	medium dense	115	20	51.5	75	53	35		
28.27	93.0	105.69	1.84	Silty Sand to Sandy Silt	SM/ML	medium dense	115	23	60.3	65	58	36		
28.42	93.5	83.31	2.72	Sandy Silt to Clayey Silt	ML	medium dense	115	24	47.4	80	50	35		
28.57	94.0	37.45	3.62	Clayey Silt to Silty Clay	ML/CL	hard	120	15		100			2.03	6.21
28.72	94.5	87.15	1.98	Silty Sand to Sandy Silt	SM/ML	medium dense	115	19	49.4	70	52	35		
28.87	95.0	81.90	3.52	Sandy Silt to Clayey Silt	ML	medium dense	115	23	46.3	90	50	35		
29.02	95.5	44.43	5.47	Clay	CL/CH	hard	125	36		100			2.44	4.57
29.17	96.0	46.30	3.80	Clayey Silt to Silty Clay	ML/CL	hard	120	19		100			2.55	8.85
29.32	96.5	167.47	1.57	Sand to Silty Sand	SP/SM	dense	115	30	94.0	45	71	38		
29.47	97.0	171.80	2.07	Silty Sand to Sandy Silt	SM/ML	dense	115	38	96.2	50	71	38		
29.62	97.5	159.99	2.11	Silty Sand to Sandy Silt	SM/ML	medium dense	115	36	89.4	55	69	38		
29.77	98.0	174.76	1.77	Sand to Silty Sand	SP/SM	dense	115	32	97.5	50	72	38		
29.92	98.5	177.63	2.01	Silty Sand to Sandy Silt	SM/ML	dense	115	39	98.9	50	72	38		
30.07	99.0	143.38	1.91	Silty Sand to Sandy Silt	SM/ML	medium dense	115	32	79.6	55	66	37		
30.22	99.5	86.68	2.60	Sandy Silt to Clayey Silt	ML	medium dense	115	25	48.0	80	51	35		
30.37	100.0	34.52	4.54	Silty Clay to Clay	CL	very stiff	125	20		100			1.85	3.74

CLIENT: BHER
PROJECT: Morton Bay Geothermal - Calipatria, CA

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

LOCATION: See Site and Boring Location Plan

DATE: 9/28/2022

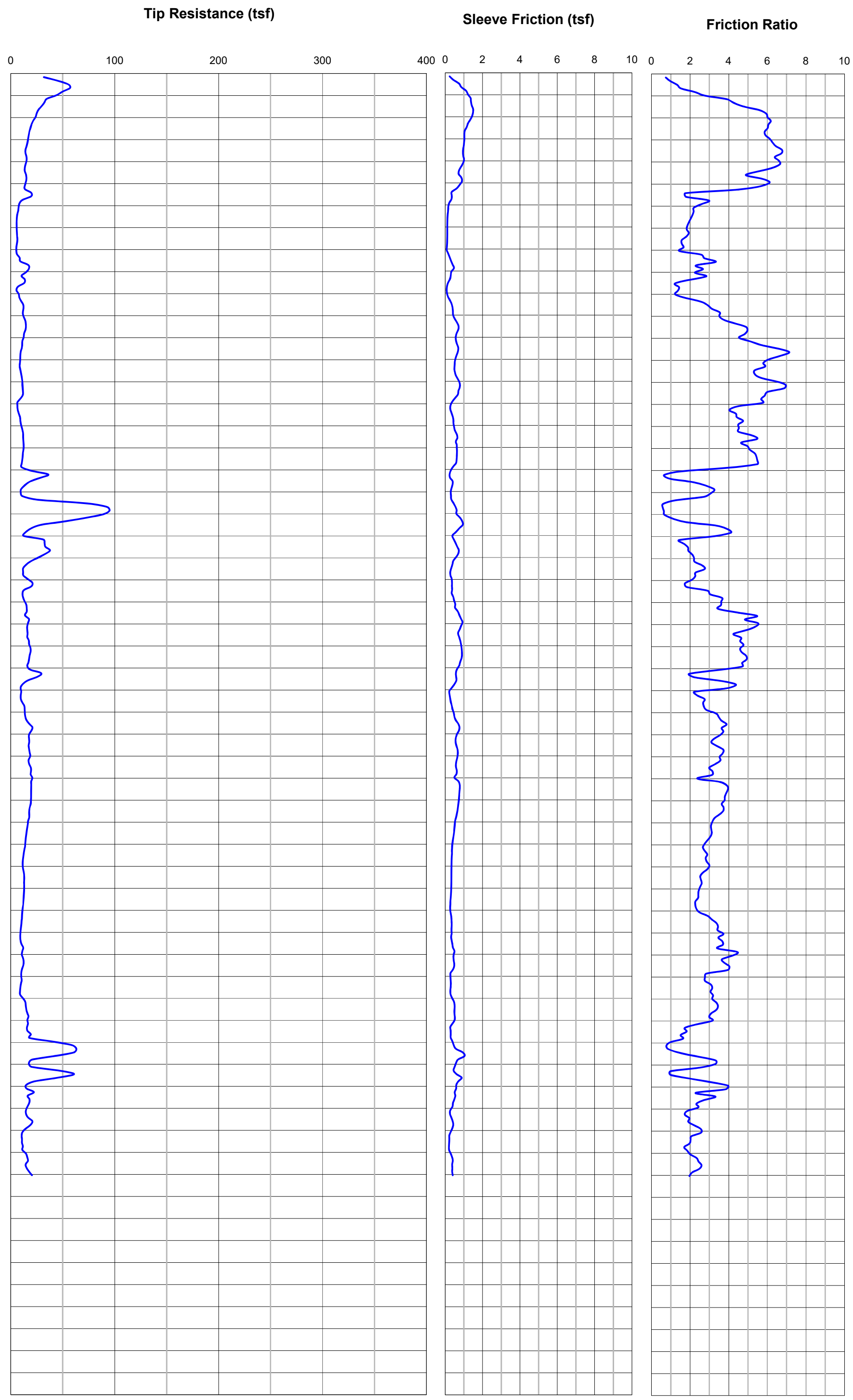
CONE SOUNDING DATA CPT-2

DEPTH

INTERPRETED SOIL PROFILE
From Robertson and Campanella (1989

GROUND ELEVATION +/-

Silty Sand to Sandy Silt	SM/ML	very dense
Clay	CL/CH	very stiff
Clay	" "	very stiff
Clay	" "	stiff
Clay	" "	stiff
Silty Clay to Clay	CL	stiff
Silty Clay to Clay	" "	firm
Sensitive fine grained	ML	firm
Clayey Silt to Silty Clay	ML/CL	stiff
Clayey Silt to Silty Clay	" "	stiff
Silty Clay to Clay	CL	stiff
Clay	CL/CH	stiff
Clay	" "	stiff
Clay	" "	stiff
Clay	" "	stiff
Clay	" "	firm
Clay	" "	stiff
Clay	" "	stiff
Clayey Silt to Silty Clay	ML/CL	very stiff
Sand to Silty Sand	SP/SM	medium dense
Sandy Silt to Clayey Silt	ML	medium dense
Sandy Silt to Clayey Silt	" "	medium dense
Clayey Silt to Silty Clay	ML/CL	stiff
Clayey Silt to Silty Clay	" "	stiff
Clay	CL/CH	stiff
Clay	" "	stiff
Clay	" "	stiff
Clayey Silt to Silty Clay	ML/CL	stiff
Clayey Silt to Silty Clay	" "	stiff
Silty Clay to Clay	CL	stiff
Clayey Silt to Silty Clay	ML/CL	stiff
Clayey Silt to Silty Clay	" "	very stiff
Silty Clay to Clay	CL	very stiff
Clayey Silt to Silty Clay	ML/CL	stiff
Clayey Silt to Silty Clay	" "	stiff
Clayey Silt to Silty Clay	" "	stiff
Clayey Silt to Silty Clay	" "	stiff
Clayey Silt to Silty Clay	" "	stiff
Silty Clay to Clay	CL	stiff
Clay	CL/CH	stiff
Silty Clay to Clay	CL	stiff
Silty Clay to Clay	" "	firm
Silty Clay to Clay	" "	stiff
Sandy Silt to Clayey Silt	ML	very loose
Sandy Silt to Clayey Silt	" "	medium dense
Sandy Silt to Clayey Silt	" "	loose
Clayey Silt to Silty Clay	ML/CL	stiff
Clayey Silt to Silty Clay	" "	stiff
Clayey Silt to Silty Clay	" "	stiff
Clayey Silt to Silty Clay	" "	stiff



END OF SOUNDING AT 50 ft.

Project No.
LE22197

LANDMARK
Geo-Engineers and Geologists

PLATE
B-5

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

Project: Morton Bay Geothermal - Calipatria, CA **Project No:** LE22197 **Date:** 9/28/2022

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	44.14	1.02	Silty Sand to Sandy Silt	SM/ML	very dense	115	10	83.4	30	110	43		
0.30	1.0	50.27	2.18	Sandy Silt to Clayey Silt	ML	very dense	115	14	95.0	40	98	42		
0.45	1.5	32.26	4.31	Silty Clay to Clay	CL	very stiff	125	18		65			1.89	>10
0.60	2.0	25.20	5.85	Clay	CL/CH	very stiff	125	20		80			1.48	>10
0.75	2.5	20.30	6.08	Clay	CL/CH	very stiff	125	16		90			1.19	>10
0.93	3.0	17.29	5.97	Clay	CL/CH	very stiff	125	14		95			1.01	>10
1.08	3.5	15.28	6.49	Clay	CL/CH	stiff	125	12		100			0.89	>10
1.23	4.0	14.81	6.57	Clay	CL/CH	stiff	125	12		100			0.86	>10
1.38	4.5	13.78	6.14	Clay	CL/CH	stiff	125	11		100			0.80	>10
1.53	5.0	14.78	5.58	Clay	CL/CH	stiff	125	12		100			0.85	>10
1.68	5.5	16.57	3.43	Silty Clay to Clay	CL	stiff	125	9		80			0.96	>10
1.83	6.0	8.99	2.59	Silty Clay to Clay	CL	stiff	125	5		95			0.51	>10
1.98	6.5	6.42	2.11	Silty Clay to Clay	CL	firm	125	4		100			0.35	7.00
2.13	7.0	5.67	1.88	Silty Clay to Clay	CL	firm	125	3		100			0.31	5.10
2.28	7.5	6.11	1.77	Silty Clay to Clay	CL	firm	125	3		100			0.33	5.10
2.45	8.0	5.58	1.56	Sensitive fine grained	ML	firm	120	3		100			0.30	6.43
2.60	8.5	7.93	2.88	Silty Clay to Clay	CL	firm	125	5		100			0.44	6.65
2.75	9.0	16.33	2.41	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		70			0.93	>10
2.90	9.5	12.21	2.00	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		80			0.69	>10
3.05	10.0	6.69	1.34	Sensitive fine grained	ML	firm	120	3		95			0.36	7.13
3.20	10.5	10.10	2.41	Clayey Silt to Silty Clay	ML/CL	stiff	120	4		95			0.56	>10
3.35	11.0	11.96	3.40	Silty Clay to Clay	CL	stiff	125	7		100			0.67	>10
3.50	11.5	14.13	4.30	Clay	CL/CH	stiff	125	11		100			0.80	>10
3.65	12.0	13.11	4.78	Clay	CL/CH	stiff	125	10		100			0.74	8.70
3.80	12.5	10.91	5.77	Clay	CL/CH	stiff	125	9		100			0.61	6.10
3.95	13.0	9.30	6.64	Clay	CL/CH	stiff	125	7		100			0.51	4.47
4.13	13.5	8.83	5.68	Clay	CL/CH	firm	125	7		100			0.48	4.00
4.28	14.0	10.51	5.78	Clay	CL/CH	stiff	125	8		100			0.58	5.10
4.43	14.5	11.41	6.61	Clay	CL/CH	stiff	125	9		100			0.63	5.53
4.58	15.0	9.08	5.77	Clay	CL/CH	firm	125	7		100			0.49	3.74
4.73	15.5	6.85	4.28	Clay	CL/CH	firm	125	5		100			0.36	2.41
4.88	16.0	9.58	4.55	Clay	CL/CH	stiff	125	8		100			0.52	3.83
5.03	16.5	11.78	5.05	Clay	CL/CH	stiff	125	9		100			0.65	5.10
5.18	17.0	12.27	4.90	Clay	CL/CH	stiff	125	10		100			0.68	5.21
5.33	17.5	11.41	5.42	Clay	CL/CH	stiff	125	9		100			0.63	4.47
5.48	18.0	13.67	3.64	Silty Clay to Clay	CL	stiff	125	8		100			0.76	7.70
5.65	18.5	27.21	1.25	Sandy Silt to Clayey Silt	ML	loose	115	8	29.6	55	37	33		
5.80	19.0	11.07	3.06	Silty Clay to Clay	CL	stiff	125	6		100			0.60	5.10
5.95	19.5	36.92	1.52	Silty Sand to Sandy Silt	SM/ML	medium dense	115	8	39.4	50	45	34		
6.10	20.0	92.30	0.63	Sand to Silty Sand	SP/SM	dense	115	17	97.8	20	72	38		
6.25	20.5	50.61	2.06	Sandy Silt to Clayey Silt	ML	medium dense	115	14	53.2	50	54	36		
6.40	21.0	15.25	3.73	Silty Clay to Clay	CL	stiff	125	9		100			0.85	7.85
6.55	21.5	32.39	1.66	Sandy Silt to Clayey Silt	ML	medium dense	115	9	33.5	60	40	34		
6.70	22.0	32.42	2.08	Sandy Silt to Clayey Silt	ML	loose	115	9	33.3	65	40	34		
6.85	22.5	15.30	2.54	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.85	>10
7.00	23.0	13.57	2.21	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.74	8.00
7.18	23.5	17.70	2.15	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		90			0.99	>10
7.33	24.0	12.09	3.43	Silty Clay to Clay	CL	stiff	125	7		100			0.65	4.47
7.48	24.5	15.19	3.81	Silty Clay to Clay	CL	stiff	125	9		100			0.84	6.43
7.63	25.0	15.96	5.28	Clay	CL/CH	stiff	125	13		100			0.88	5.21
7.78	25.5	15.95	4.83	Clay	CL/CH	stiff	125	13		100			0.88	5.10
7.93	26.0	16.99	4.67	Clay	CL/CH	stiff	125	14		100			0.94	5.53
8.08	26.5	18.48	4.77	Clay	CL/CH	very stiff	125	15		100			1.03	6.10
8.23	27.0	17.14	4.27	Clay	CL/CH	stiff	125	14		100			0.95	5.31
8.38	27.5	23.84	2.61	Clayey Silt to Silty Clay	ML/CL	very stiff	120	10		90			1.34	>10
8.53	28.0	10.38	3.51	Silty Clay to Clay	CL	stiff	125	6		100			0.55	3.07
8.68	28.5	10.04	2.60	Silty Clay to Clay	CL	stiff	125	6		100			0.53	2.82
8.85	29.0	13.26	2.97	Silty Clay to Clay	CL	stiff	125	8		100			0.71	4.09
9.00	29.5	15.62	3.67	Silty Clay to Clay	CL	stiff	125	9		100			0.85	5.21
9.15	30.0	19.34	3.63	Silty Clay to Clay	CL	very stiff	125	11		100			1.07	7.27
9.30	30.5	17.50	3.25	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.96	8.41
9.45	31.0	18.16	3.65	Silty Clay to Clay	CL	stiff	125	10		100			1.00	6.32
9.60	31.5	17.94	3.29	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.99	8.41
9.75	32.0	19.80	2.89	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		100			1.09	>10
9.90	32.5	19.67	3.83	Silty Clay to Clay	CL	very stiff	125	11		100			1.09	6.76
10.05	33.0	19.53	3.82	Silty Clay to Clay	CL	very stiff	125	11		100			1.08	6.54
10.20	33.5	18.50	3.69	Silty Clay to Clay	CL	very stiff	125	11		100			1.02	5.88
10.38	34.0	17.39	3.30	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.95	7.00
10.53	34.5	15.77	3.10	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.85	5.88
10.68	35.0	14.38	2.91	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.77	5.00
10.83	35.5	13.05	2.77	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.69	4.09
10.98	36.0	11.65	2.89	Silty Clay to Clay	CL	stiff	125	7		100			0.61	2.65
11.13	36.5	12.48	2.67	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.66	3.74
11.28	37.0	12.81	2.52	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.67	3.83
11.43	37.5	12.40	2.37	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.65	3.58
11.58	38.0	11.53	2.36	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.60	3.21
11.73	38.5	10.54	3.13	Silty Clay to Clay	CL	stiff	125	6		100			0.54	2.13

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

Project: Morton Bay Geothermal - Calipatria, CA **Project No:** LE22197 **Date:** 9/28/2022

CONE SOUNDING: CPT-2
Est. GWT (ft): 8
Phi Correlation: **0** 0-Schm(78),1-R&C(83),2-PHT(74)
Nk: **17**

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 (%)	Phi (deg.)	Su (tsf)	OCR
11.88	39.0	9.64	3.53	Clay	CL/CH	firm	125	8		100			0.48	1.43
12.05	39.5	9.58	3.61	Clay	CL/CH	firm	125	8		100			0.48	1.43
12.20	40.0	11.25	4.02	Clay	CL/CH	stiff	125	9		100			0.58	1.77
12.35	40.5	12.12	3.82	Clay	CL/CH	stiff	125	10		100			0.63	1.92
12.50	41.0	10.29	3.18	Silty Clay to Clay	CL	stiff	125	6		100			0.52	1.84
12.65	41.5	9.83	3.00	Silty Clay to Clay	CL	firm	125	6		100			0.49	1.70
12.80	42.0	9.89	3.13	Silty Clay to Clay	CL	firm	125	6		100			0.49	1.70
12.95	42.5	14.41	3.39	Silty Clay to Clay	CL	stiff	125	8		100			0.76	3.00
13.10	43.0	16.27	3.08	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.87	4.57
13.25	43.5	16.05	1.97	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.85	4.37
13.40	44.0	25.91	1.37	Sandy Silt to Clayey Silt	ML	loose	115	7	20.2	85	25	32		
13.58	44.5	60.96	1.07	Silty Sand to Sandy Silt	SM/ML	medium dense	115	14	47.2	50	50	35		
13.73	45.0	26.66	3.02	Clayey Silt to Silty Clay	ML/CL	very stiff	120	11		100			1.47	>10
13.88	45.5	42.12	1.49	Silty Sand to Sandy Silt	SM/ML	loose	115	9	32.3	70	39	33		
14.03	46.0	27.65	2.99	Clayey Silt to Silty Clay	ML/CL	very stiff	120	11		100			1.53	>10
14.18	46.5	17.91	3.14	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.96	4.78
14.33	47.0	16.60	2.33	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.88	4.18
14.48	47.5	17.32	1.87	Sandy Silt to Clayey Silt	ML	very loose	115	5	13.1	100	12	30		
14.63	48.0	15.16	2.45	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.79	3.58
14.78	48.5	10.70	2.02	Clayey Silt to Silty Clay	ML/CL	stiff	120	4		100			0.53	2.06
14.93	49.0	12.46	1.85	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.63	2.57
15.10	49.5	15.56	2.45	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.81	3.58
15.25	50.0	17.73	2.18	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.94	4.28

CLIENT: BHER
PROJECT: Morton Bay Geothermal - Calipatria, CA
LOCATION: See Site and Boring Location Plan

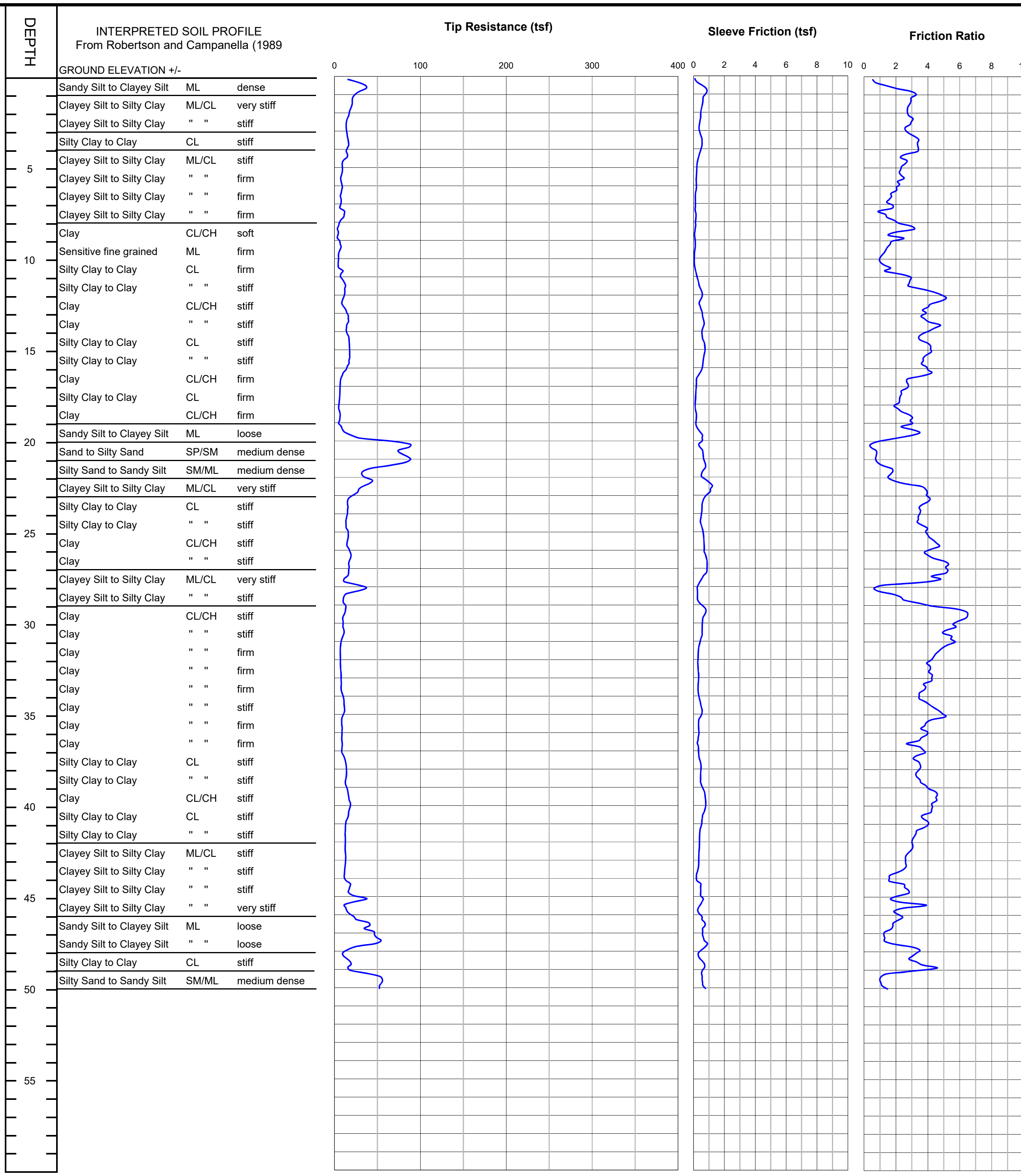
CONE PENETROMETER: Kehoe Testing & Engineering Truck Mounted Electric Cone with 30 ton reaction weight
DATE: 9/28/2022

CONE SOUNDING DATA CPT-3

INTERPRETED SOIL PROFILE
From Robertson and Campanella (1989

GROUND ELEVATION +/-

Sandy Silt to Clayey Silt	ML	dense
Clayey Silt to Silty Clay	ML/CL	very stiff
Clayey Silt to Silty Clay	" "	stiff
Silty Clay to Clay	CL	stiff
Clayey Silt to Silty Clay	ML/CL	stiff
Clayey Silt to Silty Clay	" "	firm
Clayey Silt to Silty Clay	" "	firm
Clayey Silt to Silty Clay	" "	firm
Clay	CL/CH	soft
Sensitive fine grained	ML	firm
Silty Clay to Clay	CL	firm
Silty Clay to Clay	" "	stiff
Clay	CL/CH	stiff
Clay	" "	stiff
Silty Clay to Clay	CL	stiff
Silty Clay to Clay	" "	stiff
Clay	CL/CH	firm
Silty Clay to Clay	CL	firm
Clay	CL/CH	firm
Sandy Silt to Clayey Silt	ML	loose
Sand to Silty Sand	SP/SM	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	stiff
Silty Clay to Clay	" "	stiff
Clay	CL/CH	stiff
Clay	" "	stiff
Clayey Silt to Silty Clay	ML/CL	very stiff
Clayey Silt to Silty Clay	" "	stiff
Clay	CL/CH	stiff
Clay	" "	stiff
Clay	" "	firm
Clay	" "	firm
Clay	" "	firm
Clay	" "	stiff
Clay	" "	firm
Clay	" "	firm
Silty Clay to Clay	CL	stiff
Silty Clay to Clay	" "	stiff
Clay	CL/CH	stiff
Silty Clay to Clay	CL	stiff
Silty Clay to Clay	" "	stiff
Clayey Silt to Silty Clay	ML/CL	stiff
Clayey Silt to Silty Clay	" "	stiff
Clayey Silt to Silty Clay	" "	stiff
Clayey Silt to Silty Clay	" "	very stiff
Sandy Silt to Clayey Silt	ML	loose
Sandy Silt to Clayey Silt	" "	loose
Silty Clay to Clay	CL	stiff
Silty Sand to Sandy Silt	SM/ML	medium dense



END OF SOUNDING AT 50 ft.

Project No.
LE22197

LANDMARK
Geo-Engineers and Geologists

PLATE
B-6

LANDMARK CONSULTANTS, INC.

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

Project: Morton Bay Geothermal - Calipatria, CA | **Project No:** LE22197 | **Date:** 9/28/2022

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	26.51	0.90	Silty Sand to Sandy Silt	SM/ML	very dense	115	6	50.1	35	95	41		
0.30	1.0	30.02	2.80	Clayey Silt to Silty Clay	ML/CL	very stiff	120	12		55			1.76	>10
0.45	1.5	20.89	2.93	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		65			1.22	>10
0.60	2.0	18.52	2.73	Clayey Silt to Silty Clay	ML/CL	very stiff	120	7		70			1.08	>10
0.75	2.5	15.23	2.95	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		75			0.89	>10
0.93	3.0	13.71	2.69	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		80			0.80	>10
1.08	3.5	15.11	3.15	Silty Clay to Clay	CL	stiff	125	9		80			0.88	>10
1.23	4.0	15.88	3.38	Silty Clay to Clay	CL	stiff	125	9		80			0.92	>10
1.38	4.5	14.45	2.73	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		75			0.83	>10
1.53	5.0	9.54	2.55	Silty Clay to Clay	CL	stiff	125	5		90			0.54	>10
1.68	5.5	8.41	2.34	Silty Clay to Clay	CL	firm	125	5		95			0.48	>10
1.83	6.0	8.43	2.12	Clayey Silt to Silty Clay	ML/CL	firm	120	3		90			0.48	>10
1.98	6.5	7.65	1.82	Clayey Silt to Silty Clay	ML/CL	firm	120	3		90			0.43	>10
2.13	7.0	7.49	1.61	Clayey Silt to Silty Clay	ML/CL	firm	120	3		90			0.42	>10
2.28	7.5	9.73	1.33	Clayey Silt to Silty Clay	ML/CL	stiff	120	4		75			0.55	>10
2.45	8.0	7.92	1.85	Clayey Silt to Silty Clay	ML/CL	firm	120	3		90			0.44	>10
2.60	8.5	4.17	2.69	Clay	CL/CH	soft	125	3		100			0.22	2.06
2.75	9.0	4.41	1.92	Silty Clay to Clay	CL	soft	125	3		100			0.23	2.65
2.90	9.5	6.90	1.49	Clayey Silt to Silty Clay	ML/CL	firm	120	3		95			0.38	6.76
3.05	10.0	4.79	1.09	Sensitive fine grained	ML	firm	120	2		100			0.25	4.18
3.20	10.5	4.54	1.32	Sensitive fine grained	ML	soft	120	2		100			0.23	3.66
3.35	11.0	8.14	2.18	Silty Clay to Clay	CL	firm	125	5		100			0.45	5.65
3.50	11.5	11.34	2.83	Silty Clay to Clay	CL	stiff	125	6		95			0.63	>10
3.65	12.0	11.88	4.30	Clay	CL/CH	stiff	125	10		100			0.66	7.56
3.80	12.5	9.35	4.71	Clay	CL/CH	stiff	125	7		100			0.51	4.89
3.95	13.0	12.68	3.86	Clay	CL/CH	stiff	125	10		100			0.71	7.70
4.13	13.5	16.13	3.82	Silty Clay to Clay	CL	stiff	125	9		95			0.91	>10
4.28	14.0	14.02	4.43	Clay	CL/CH	stiff	125	11		100			0.79	8.41
4.43	14.5	16.00	3.53	Silty Clay to Clay	CL	stiff	125	9		95			0.90	>10
4.58	15.0	17.40	4.10	Silty Clay to Clay	CL	stiff	125	10		95			0.98	>10
4.73	15.5	17.65	3.95	Silty Clay to Clay	CL	stiff	125	10		95			1.00	>10
4.88	16.0	15.55	3.81	Silty Clay to Clay	CL	stiff	125	9		100			0.87	>10
5.03	16.5	8.98	3.55	Clay	CL/CH	firm	125	7		100			0.49	3.43
5.18	17.0	6.62	2.72	Silty Clay to Clay	CL	firm	125	4		100			0.35	2.65
5.33	17.5	6.21	2.32	Silty Clay to Clay	CL	firm	125	4		100			0.32	2.34
5.48	18.0	5.41	2.10	Silty Clay to Clay	CL	firm	125	3		100			0.27	1.84
5.65	18.5	5.78	2.44	Silty Clay to Clay	CL	firm	125	3		100			0.29	2.00
5.80	19.0	5.72	2.98	Clay	CL/CH	firm	125	5		100			0.29	1.50
5.95	19.5	9.58	2.95	Silty Clay to Clay	CL	stiff	125	5		100			0.51	3.91
6.10	20.0	38.76	1.87	Sandy Silt to Clayey Silt	ML	medium dense	115	11	41.1	55	46	34		
6.25	20.5	83.14	0.54	Sand to Silty Sand	SP/SM	medium dense	115	15	87.6	20	69	38		
6.40	21.0	83.11	0.76	Sand to Silty Sand	SP/SM	medium dense	115	15	86.9	25	68	38		
6.55	21.5	64.52	1.26	Silty Sand to Sandy Silt	SM/ML	medium dense	115	14	66.9	35	61	36		
6.70	22.0	33.35	1.65	Sandy Silt to Clayey Silt	ML	medium dense	115	10	34.3	60	41	34		
6.85	22.5	39.72	2.65	Sandy Silt to Clayey Silt	ML	medium dense	115	11	40.6	65	46	34		
7.00	23.0	25.80	3.92	Silty Clay to Clay	CL	very stiff	125	15		90			1.46	>10
7.18	23.5	15.73	3.95	Silty Clay to Clay	CL	stiff	125	9		100			0.87	7.13
7.33	24.0	15.35	3.50	Silty Clay to Clay	CL	stiff	125	9		100			0.85	6.76
7.48	24.5	13.74	3.38	Silty Clay to Clay	CL	stiff	125	8		100			0.75	5.42
7.63	25.0	14.30	3.84	Silty Clay to Clay	CL	stiff	125	8		100			0.78	5.65
7.78	25.5	15.76	4.14	Clay	CL/CH	stiff	125	13		100			0.87	5.00
7.93	26.0	15.32	4.49	Clay	CL/CH	stiff	125	12		100			0.84	4.68
8.08	26.5	18.35	4.30	Clay	CL/CH	very stiff	125	15		100			1.02	6.10
8.23	27.0	16.69	5.23	Clay	CL/CH	stiff	125	13		100			0.92	5.10
8.38	27.5	14.39	4.71	Clay	CL/CH	stiff	125	12		100			0.78	3.91
8.53	28.0	24.93	1.85	Sandy Silt to Clayey Silt	ML	loose	115	7	23.4	80	30	32		
8.68	28.5	17.81	1.67	Sandy Silt to Clayey Silt	ML	very loose	115	5	16.6	90	19	31		
8.85	29.0	11.20	3.42	Silty Clay to Clay	CL	stiff	125	6		100			0.59	3.28
9.00	29.5	12.21	6.27	Clay	CL/CH	stiff	125	10		100			0.65	2.91
9.15	30.0	9.85	5.96	Clay	CL/CH	stiff	125	8		100			0.51	2.06
9.30	30.5	10.60	5.29	Clay	CL/CH	stiff	125	8		100			0.56	2.27
9.45	31.0	8.80	5.55	Clay	CL/CH	firm	125	7		100			0.45	1.70
9.60	31.5	6.93	4.95	Clay	CL/CH	firm	125	6		100			0.34	1.14
9.75	32.0	6.84	4.35	Clay	CL/CH	firm	125	5		100			0.33	1.14
9.90	32.5	6.96	4.07	Clay	CL/CH	firm	125	6		100			0.34	1.14
10.05	33.0	7.62	4.19	Clay	CL/CH	firm	125	6		100			0.38	1.25
10.20	33.5	7.77	3.95	Clay	CL/CH	firm	125	6		100			0.38	1.25
10.38	34.0	8.67	3.57	Clay	CL/CH	firm	125	7		100			0.44	1.43
10.53	34.5	10.97	3.81	Clay	CL/CH	stiff	125	9		100			0.57	2.06
10.68	35.0	11.44	4.68	Clay	CL/CH	stiff	125	9		100			0.60	2.13
10.83	35.5	8.70	4.41	Clay	CL/CH	firm	125	7		100			0.43	1.37
10.98	36.0	8.73	3.78	Clay	CL/CH	firm	125	7		100			0.44	1.37
11.13	36.5	8.70	3.41	Clay	CL/CH	firm	125	7		100			0.43	1.37
11.28	37.0	8.64	3.66	Clay	CL/CH	firm	125	7		100			0.43	1.31
11.43	37.5	11.53	3.27	Silty Clay to Clay	CL	stiff	125	7		100			0.60	2.49
11.58	38.0	13.67	3.49	Silty Clay to Clay	CL	stiff	125	8		100			0.72	3.14
11.73	38.5	13.65	3.35	Silty Clay to Clay	CL	stiff	125	8		100			0.72	3.07

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

Project: Morton Bay Geothermal - Calipatria, CA **Project No:** LE22197 **Date:** 9/28/2022

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
11.88	39.0	13.43	3.83	Silty Clay to Clay	CL	stiff	125	8		100			0.71	3.00
12.05	39.5	15.98	4.52	Clay	CL/CH	stiff	125	13		100			0.86	3.00
12.20	40.0	17.99	4.37	Clay	CL/CH	stiff	125	14		100			0.97	3.50
12.35	40.5	16.72	4.02	Silty Clay to Clay	CL	stiff	125	10		100			0.90	3.83
12.50	41.0	14.02	3.90	Silty Clay to Clay	CL	stiff	125	8		100			0.74	3.00
12.65	41.5	12.56	3.45	Silty Clay to Clay	CL	stiff	125	7		100			0.65	2.49
12.80	42.0	12.56	3.07	Silty Clay to Clay	CL	stiff	125	7		100			0.65	2.41
12.95	42.5	12.40	2.99	Silty Clay to Clay	CL	stiff	125	7		100			0.64	2.34
13.10	43.0	12.96	2.63	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.67	3.21
13.25	43.5	12.37	2.58	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.64	3.00
13.40	44.0	11.56	1.77	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.59	2.65
13.58	44.5	16.63	2.22	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.88	4.47
13.73	45.0	18.49	2.55	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.99	5.31
13.88	45.5	24.34	2.63	Clayey Silt to Silty Clay	ML/CL	very stiff	120	10		100			1.34	8.41
14.03	46.0	14.83	2.14	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.78	3.58
14.18	46.5	29.25	2.13	Sandy Silt to Clayey Silt	ML	loose	115	8	22.2	95	28	32		
14.33	47.0	41.98	1.51	Silty Sand to Sandy Silt	SM/ML	loose	115	9	31.8	70	39	33		
14.48	47.5	50.51	1.49	Silty Sand to Sandy Silt	SM/ML	medium dense	115	11	38.0	65	44	34		
14.63	48.0	17.03	3.28	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.90	4.18
14.78	48.5	14.05	3.05	Silty Clay to Clay	CL	stiff	125	8		100			0.73	2.41
14.93	49.0	17.78	3.78	Silty Clay to Clay	CL	stiff	125	10		100			0.95	3.35
15.10	49.5	48.80	1.14	Silty Sand to Sandy Silt	SM/ML	medium dense	115	11	36.1	60	42	34		
15.25	50.0	53.37	1.22	Silty Sand to Sandy Silt	SM/ML	medium dense	115	12	39.4	60	45	34		

CLIENT: BHER
PROJECT: Morton Bay Geothermal - Calipatria, CA
LOCATION: See Site and Boring Location Plan

CONE PENETROMETER: Kehoe Testing & Engineering Truck Mounted Electric Cone with 30 ton reaction weight
DATE: 9/28/2022

CONE SOUNDING DATA CPT-4

DEPTH

INTERPRETED SOIL PROFILE
From Robertson and Campanella (1989

GROUND ELEVATION +/-

Silty Sand to Sandy Silt	SM/ML	very dense
Silty Sand to Sandy Silt	" "	very dense
Silty Clay to Clay	CL	very stiff
Clayey Silt to Silty Clay	ML/CL	very stiff
Clay	CL/CH	firm
Clay	" "	firm
Clay	" "	firm
Clay	" "	stiff
Clay	" "	stiff
Silty Clay to Clay	CL	stiff
Clayey Silt to Silty Clay	ML/CL	firm
Silty Clay to Clay	CL	firm
Clayey Silt to Silty Clay	ML/CL	firm
Clayey Silt to Silty Clay	" "	stiff
Silty Clay to Clay	CL	stiff
Clay	CL/CH	stiff
Clay	" "	stiff
Silty Clay to Clay	CL	firm
Silty Clay to Clay	" "	firm
Silty Clay to Clay	" "	stiff
Silty Clay to Clay	" "	stiff
Silty Clay to Clay	" "	stiff
Clayey Silt to Silty Clay	ML/CL	stiff
Silty Clay to Clay	CL	stiff
Sandy Silt to Clayey Silt	ML	loose
Silty Clay to Clay	CL	stiff
Clayey Silt to Silty Clay	ML/CL	stiff
Clayey Silt to Silty Clay	" "	stiff
Clay	CL/CH	stiff
Sandy Silt to Clayey Silt	ML	loose
Clayey Silt to Silty Clay	ML/CL	very stiff
Silty Clay to Clay	CL	stiff
Clay	CL/CH	very stiff
Clay	" "	very stiff
Silty Clay to Clay	CL	very stiff
Clay	CL/CH	stiff
Silty Clay to Clay	CL	stiff
Clayey Silt to Silty Clay	ML/CL	stiff
Clayey Silt to Silty Clay	" "	stiff
Clayey Silt to Silty Clay	" "	stiff
Clayey Silt to Silty Clay	" "	stiff
Clay	CL/CH	stiff
Clayey Silt to Silty Clay	ML/CL	stiff
Clay	CL/CH	stiff
Silty Clay to Clay	CL	stiff
Clayey Silt to Silty Clay	ML/CL	stiff
Sandy Silt to Clayey Silt	ML	very loose
Sandy Silt to Clayey Silt	" "	loose
Clayey Silt to Silty Clay	ML/CL	stiff
Clayey Silt to Silty Clay	" "	stiff

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55

END OF SOUNDING AT 50 ft.

Project No.
LE22197

LANDMARK
Geo-Engineers and Geologists

PLATE
B-7

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

Project: Morton Bay Geothermal - Calipatria, CA **Project No:** LE22197 **Date:** 9/28/2022

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	55.56	1.08	Silty Sand to Sandy Silt	SM/ML	very dense	115	12	105.0	25	117	44		
0.30	1.0	50.93	2.82	Sandy Silt to Clayey Silt	ML	very dense	115	15	96.3	45	98	42		
0.45	1.5	91.93	2.85	Sandy Silt to Clayey Silt	ML	very dense	115	26	173.8	35	108	43		
0.60	2.0	76.95	2.04	Silty Sand to Sandy Silt	SM/ML	very dense	115	17	145.5	30	98	42		
0.75	2.5	30.86	4.73	Silty Clay to Clay	CL	very stiff	125	18		70			1.81	>10
0.93	3.0	20.41	4.62	Clay	CL/CH	very stiff	125	16		80			1.19	>10
1.08	3.5	33.17	1.73	Sandy Silt to Clayey Silt	ML	medium dense	115	9	62.7	45	63	37		
1.23	4.0	11.76	3.64	Silty Clay to Clay	CL	stiff	125	7		95			0.68	>10
1.38	4.5	9.02	6.32	Clay	CL/CH	stiff	125	7		100			0.52	>10
1.53	5.0	6.00	6.90	Clay	CL/CH	firm	125	5		100			0.34	8.14
1.68	5.5	7.49	6.28	Clay	CL/CH	firm	125	6		100			0.42	>10
1.83	6.0	10.30	6.52	Clay	CL/CH	stiff	125	8		100			0.59	>10
1.98	6.5	8.15	7.32	Clay	CL/CH	firm	125	7		100			0.46	8.56
2.13	7.0	7.56	5.76	Clay	CL/CH	firm	125	6		100			0.42	6.43
2.28	7.5	8.09	5.51	Clay	CL/CH	firm	125	6		100			0.45	6.43
2.45	8.0	9.83	5.61	Clay	CL/CH	stiff	125	8		100			0.55	8.00
2.60	8.5	10.82	6.39	Clay	CL/CH	stiff	125	9		100			0.61	9.00
2.75	9.0	11.42	4.76	Clay	CL/CH	stiff	125	9		100			0.64	9.39
2.90	9.5	10.58	3.70	Clay	CL/CH	stiff	125	8		100			0.59	7.70
3.05	10.0	9.95	2.78	Silty Clay to Clay	CL	stiff	125	6		95			0.55	8.70
3.20	10.5	8.87	2.42	Silty Clay to Clay	CL	firm	125	5		100			0.49	6.65
3.35	11.0	7.47	1.83	Clayey Silt to Silty Clay	ML/CL	firm	120	3		100			0.41	6.54
3.50	11.5	7.25	1.95	Silty Clay to Clay	CL	firm	125	4		100			0.39	4.37
3.65	12.0	8.12	2.33	Silty Clay to Clay	CL	firm	125	5		100			0.44	5.10
3.80	12.5	8.71	1.65	Clayey Silt to Silty Clay	ML/CL	firm	120	3		95			0.48	7.56
3.95	13.0	9.27	1.62	Clayey Silt to Silty Clay	ML/CL	stiff	120	4		95			0.51	8.14
4.13	13.5	9.71	1.43	Clayey Silt to Silty Clay	ML/CL	stiff	120	4		90			0.53	8.41
4.28	14.0	8.71	2.00	Clayey Silt to Silty Clay	ML/CL	firm	120	3		100			0.47	6.65
4.43	14.5	10.51	3.17	Silty Clay to Clay	CL	stiff	125	6		100			0.58	6.43
4.58	15.0	12.10	3.97	Clay	CL/CH	stiff	125	10		100			0.67	6.00
4.73	15.5	11.76	5.08	Clay	CL/CH	stiff	125	9		100			0.65	5.53
4.88	16.0	13.11	3.90	Clay	CL/CH	stiff	125	10		100			0.73	6.43
5.03	16.5	11.39	3.92	Clay	CL/CH	stiff	125	9		100			0.63	4.89
5.18	17.0	9.80	3.45	Clay	CL/CH	stiff	125	8		100			0.53	3.74
5.33	17.5	9.05	3.23	Silty Clay to Clay	CL	firm	125	5		100			0.49	4.09
5.48	18.0	8.46	3.10	Silty Clay to Clay	CL	firm	125	5		100			0.45	3.58
5.65	18.5	8.34	2.81	Silty Clay to Clay	CL	firm	125	5		100			0.44	3.43
5.80	19.0	8.40	2.83	Silty Clay to Clay	CL	firm	125	5		100			0.45	3.35
5.95	19.5	9.74	2.66	Silty Clay to Clay	CL	stiff	125	6		100			0.52	4.00
6.10	20.0	10.05	3.23	Silty Clay to Clay	CL	stiff	125	6		100			0.54	4.09
6.25	20.5	10.89	3.65	Clay	CL/CH	stiff	125	9		100			0.59	3.58
6.40	21.0	12.91	3.20	Silty Clay to Clay	CL	stiff	125	7		100			0.71	5.88
6.55	21.5	12.76	3.52	Silty Clay to Clay	CL	stiff	125	7		100			0.70	5.53
6.70	22.0	14.47	3.61	Silty Clay to Clay	CL	stiff	125	8		100			0.80	6.65
6.85	22.5	12.23	3.04	Silty Clay to Clay	CL	stiff	125	7		100			0.67	4.89
7.00	23.0	14.69	2.81	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.81	9.00
7.18	23.5	14.47	3.57	Silty Clay to Clay	CL	stiff	125	8		100			0.80	6.10
7.33	24.0	9.12	3.88	Clay	CL/CH	firm	125	7		100			0.48	2.34
7.48	24.5	28.34	1.09	Silty Sand to Sandy Silt	SM/ML	loose	115	6	27.8	60	35	33		
7.63	25.0	17.20	0.95	Sandy Silt to Clayey Silt	ML	very loose	115	5	16.8	75	20	31		
7.78	25.5	8.93	2.49	Silty Clay to Clay	CL	firm	125	5		100			0.47	2.65
7.93	26.0	17.58	3.98	Silty Clay to Clay	CL	stiff	125	10		100			0.97	7.56
8.08	26.5	21.21	3.00	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		95			1.19	>10
8.23	27.0	11.36	2.13	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.61	4.68
8.38	27.5	11.76	1.67	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.63	4.89
8.53	28.0	10.27	3.37	Silty Clay to Clay	CL	stiff	125	6		100			0.54	3.00
8.68	28.5	13.60	4.65	Clay	CL/CH	stiff	125	11		100			0.74	3.43
8.85	29.0	10.42	5.03	Clay	CL/CH	stiff	125	8		100			0.55	2.34
9.00	29.5	7.62	3.08	Clay	CL/CH	firm	125	6		100			0.38	1.43
9.15	30.0	46.91	0.76	Silty Sand to Sandy Silt	SM/ML	medium dense	115	10	42.7	40	47	35		
9.30	30.5	30.33	2.29	Sandy Silt to Clayey Silt	ML	loose	115	9	27.4	80	34	33		
9.45	31.0	9.68	3.03	Silty Clay to Clay	CL	stiff	125	6		100			0.50	2.41
9.60	31.5	9.71	2.73	Silty Clay to Clay	CL	stiff	125	6		100			0.50	2.34
9.75	32.0	14.81	3.47	Silty Clay to Clay	CL	stiff	125	8		100			0.80	4.28
9.90	32.5	18.32	4.85	Clay	CL/CH	very stiff	125	15		100			1.01	4.68
10.05	33.0	19.20	4.80	Clay	CL/CH	very stiff	125	15		100			1.06	4.89
10.20	33.5	20.97	4.40	Silty Clay to Clay	CL	very stiff	125	12		100			1.16	7.13
10.38	34.0	20.81	4.61	Clay	CL/CH	very stiff	125	17		100			1.15	5.31
10.53	34.5	20.78	3.74	Silty Clay to Clay	CL	very stiff	125	12		100			1.15	6.76
10.68	35.0	17.30	3.42	Silty Clay to Clay	CL	stiff	125	10		100			0.94	4.89
10.83	35.5	15.93	4.09	Silty Clay to Clay	CL	stiff	125	9		100			0.86	4.18
10.98	36.0	12.35	4.81	Clay	CL/CH	stiff	125	10		100			0.65	2.27
11.13	36.5	13.70	3.82	Silty Clay to Clay	CL	stiff	125	8		100			0.73	3.28
11.28	37.0	17.17	3.52	Silty Clay to Clay	CL	stiff	125	10		100			0.93	4.47
11.43	37.5	17.83	3.47	Silty Clay to Clay	CL	stiff	125	10		100			0.97	4.68
11.58	38.0	18.07	3.12	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.98	6.43
11.73	38.5	17.95	2.86	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.97	6.21

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

Project: Morton Bay Geothermal - Calipatria, CA **Project No:** LE22197 **Date:** 9/28/2022

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	18.01	3.07	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.98	6.21
12.05	39.5	17.61	3.01	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.95	5.88
12.20	40.0	17.52	2.88	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.95	5.65
12.35	40.5	16.61	2.74	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.89	5.10
12.50	41.0	15.18	3.70	Silty Clay to Clay	CL	stiff	125	9		100			0.81	3.28
12.65	41.5	17.23	4.80	Clay	CL/CH	stiff	125	14		100			0.93	3.14
12.80	42.0	19.04	4.16	Silty Clay to Clay	CL	very stiff	125	11		100			1.03	4.47
12.95	42.5	15.90	3.24	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.85	4.47
13.10	43.0	14.22	2.91	Clayey Silt to Silty Clay	ML/CL	stiff	120	6		100			0.75	3.66
13.25	43.5	12.88	4.89	Clay	CL/CH	stiff	125	10		100			0.67	1.92
13.40	44.0	11.14	4.46	Clay	CL/CH	stiff	125	9		100			0.56	1.50
13.58	44.5	10.92	3.75	Clay	CL/CH	stiff	125	9		100			0.55	1.43
13.73	45.0	13.35	3.43	Silty Clay to Clay	CL	stiff	125	8		100			0.69	2.41
13.88	45.5	15.28	3.42	Silty Clay to Clay	CL	stiff	125	9		100			0.80	3.00
14.03	46.0	19.94	2.26	Clayey Silt to Silty Clay	ML/CL	very stiff	120	8		100			1.08	5.76
14.18	46.5	16.46	1.82	Sandy Silt to Clayey Silt	ML	very loose	115	5	12.5	100	11	30		
14.33	47.0	20.06	1.82	Sandy Silt to Clayey Silt	ML	very loose	115	6	15.1	100	17	30		
14.48	47.5	33.45	1.76	Sandy Silt to Clayey Silt	ML	loose	115	10	25.2	85	32	32		
14.63	48.0	18.14	2.17	Clayey Silt to Silty Clay	ML/CL	stiff	120	7		100			0.97	4.68
14.78	48.5	17.89	1.91	Sandy Silt to Clayey Silt	ML	very loose	115	5	13.4	100	13	30		
14.93	49.0	12.79	2.21	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.65	2.73
15.10	49.5	13.63	1.54	Sandy Silt to Clayey Silt	ML	very loose	115	4	10.1	100	5	29		
15.25	50.0	13.21	1.53	Clayey Silt to Silty Clay	ML/CL	stiff	120	5		100			0.67	2.73

DEFINITION OF TERMS

PRIMARY DIVISIONS			SYMBOLS	SECONDARY DIVISIONS
Coarse grained soils More than half of material is larger that No. 200 sieve	**Gravels** More than half of coarse fraction is larger than No. 4 sieve	Clean gravels (less than 5% fines)	**GW**	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels, or gravel-sand mixtures, little or no fines
		Gravel with fines	**GM**	Silty gravels, gravel-sand-silt mixtures, non-plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
	Sands More than half of coarse fraction is smaller than No. 4 sieve	Clean sands (less than 5% fines)	**SW**	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
		Sands with fines	**SM**	Silty sands, sand-silt mixtures, non-plastic fines
			SC	Clayey sands, sand-clay mixtures, plastic fines
Fine grained soils More than half of material is smaller than No. 200 sieve	**Silts and clays** Liquid limit is less than 50%		**ML**	Inorganic silts, clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravely, sandy, or lean clays
			OL	Organic silts and organic clays of low plasticity
	Silts and clays Liquid limit is more than 50%		**MH**	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
Highly organic soils			**PT**	Peat and other highly organic soils

GRAIN SIZES

Silts and Clays	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

200 40 10 4 3/4" 3" 12"

US Standard Series Sieve — Clear Square Openings

Sands, Gravels, etc.	Blows/ft. *
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Clays & Plastic Silts	Strength **	Blows/ft. *
Very Soft	0-0.25	0-2
Soft	0.25-0.5	2-4
Firm	0.5-1.0	4-8
Stiff	1.0-2.0	8-16
Very Stiff	2.0-4.0	16-32
Hard	Over 4.0	Over 32

* Number of blows of 140 lb. hammer falling 30 inches to drive a 2 inch O.D. (1 3/8 in. I.D.) split spoon (ASTM D1586).

** Unconfined compressive strength in tons/s.f. as determined by laboratory testing or approximated by the Standard Penetration Test (ASTM D1586), Pocket Penetrometer, Torvane, or visual observation.

Type of Samples:

Ring Sample — Standard Penetration Test — Shelby Tube — Bulk (Bag) Sample

Drilling Notes:

1. Sampling and Blow Counts
   - Ring Sampler - Number of blows per foot of a 140 lb. hammer falling 30 inches.
   - Standard Penetration Test - Number of blows per foot.
   - Shelby Tube - Three (3) inch nominal diameter tube hydraulically pushed.
2. P. P. = Pocket Penetrometer (tons/s.f.).
3. NR = No recovery.
4. GWT = Ground Water Table observed @ specified time.

LANDMARK Geo-Engineers and Geologists

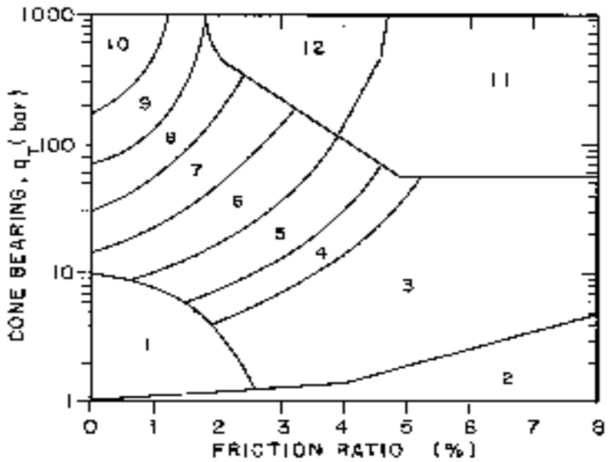
Project No. **LE22197**

Key to Logs

Plate B-8

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:

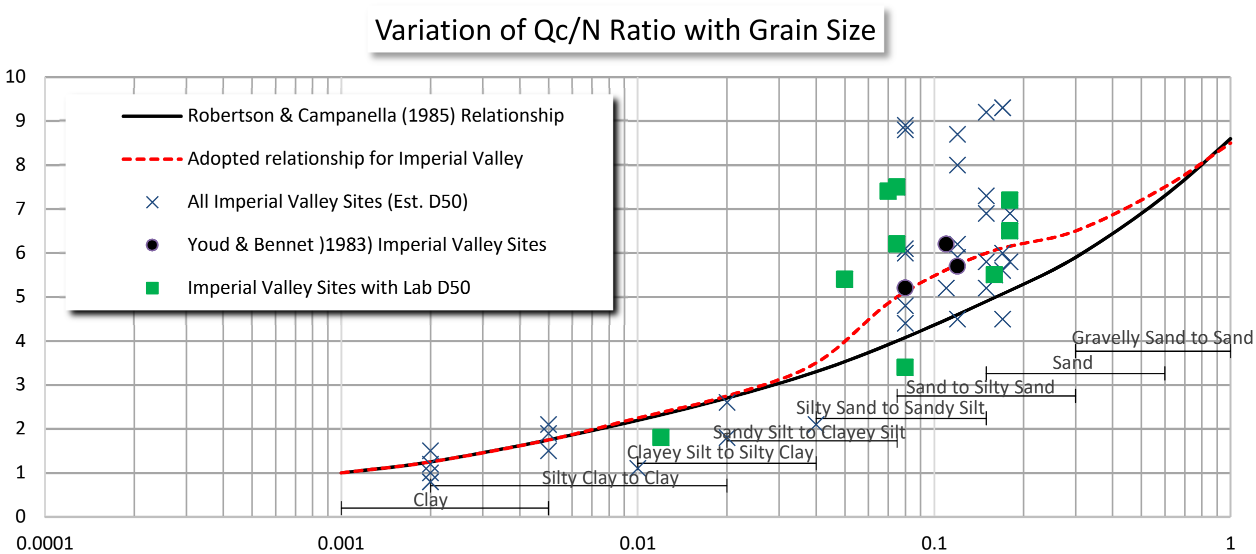
1. Roberton & Campanella (1983) chart:
Phi = 5.3 + 24*(log(Qc/p'o))+3(log(Qc/p'o))^2

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



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

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Geo-Engineers and Geologists

Project No: LE22197

Key to CPT Interpretation of Logs

Plate B-9

APPENDIX C

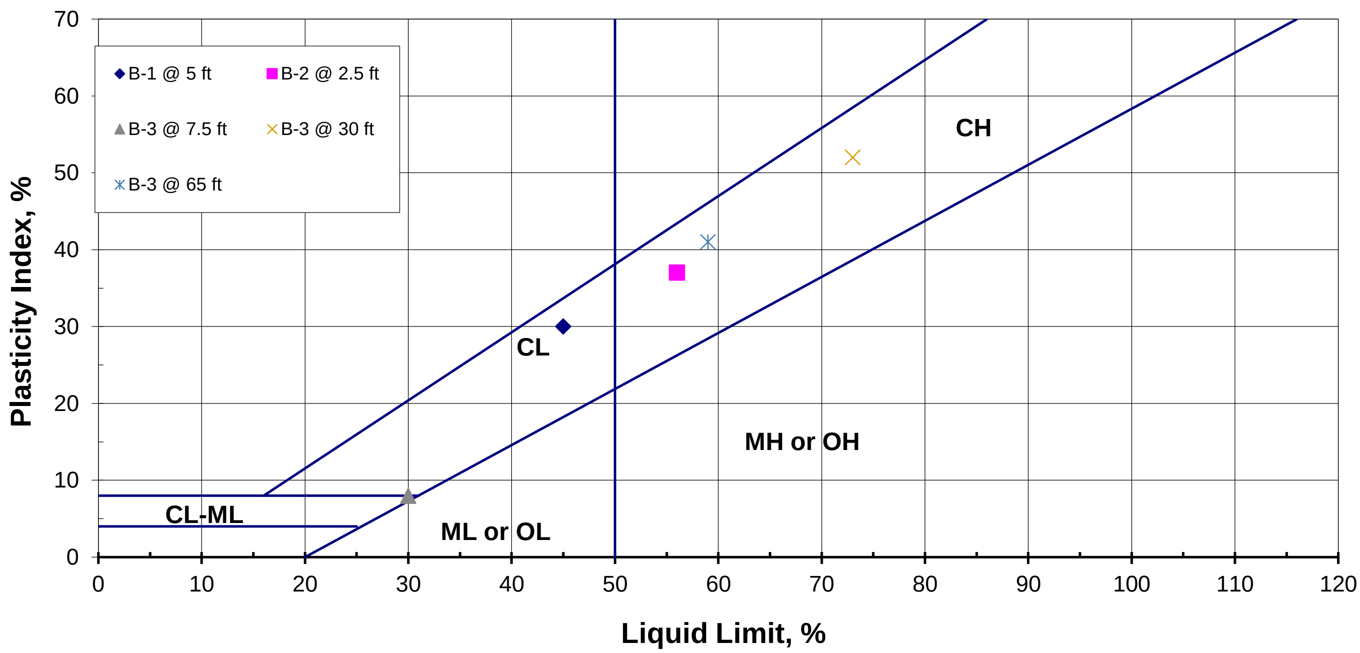
LANDMARK CONSULTANTS, INC.

CLIENT: BHER
PROJECT: Morton Bay Geothermal Plant -- Calipatria, CA
JOB No.: LE22197
DATE: 10/11/22

ATTERBERG LIMITS (ASTM D4318)

Sample Location	Sample Depth (ft)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	USCS Classification
B-1	5	45	15	30	CL
B-2	2.5	56	19	37	CH
B-3	7.5	30	22	8	CL-ML
B-3	30	73	21	52	CH
B-3	65	59	18	41	CH

PLASTICITY CHART



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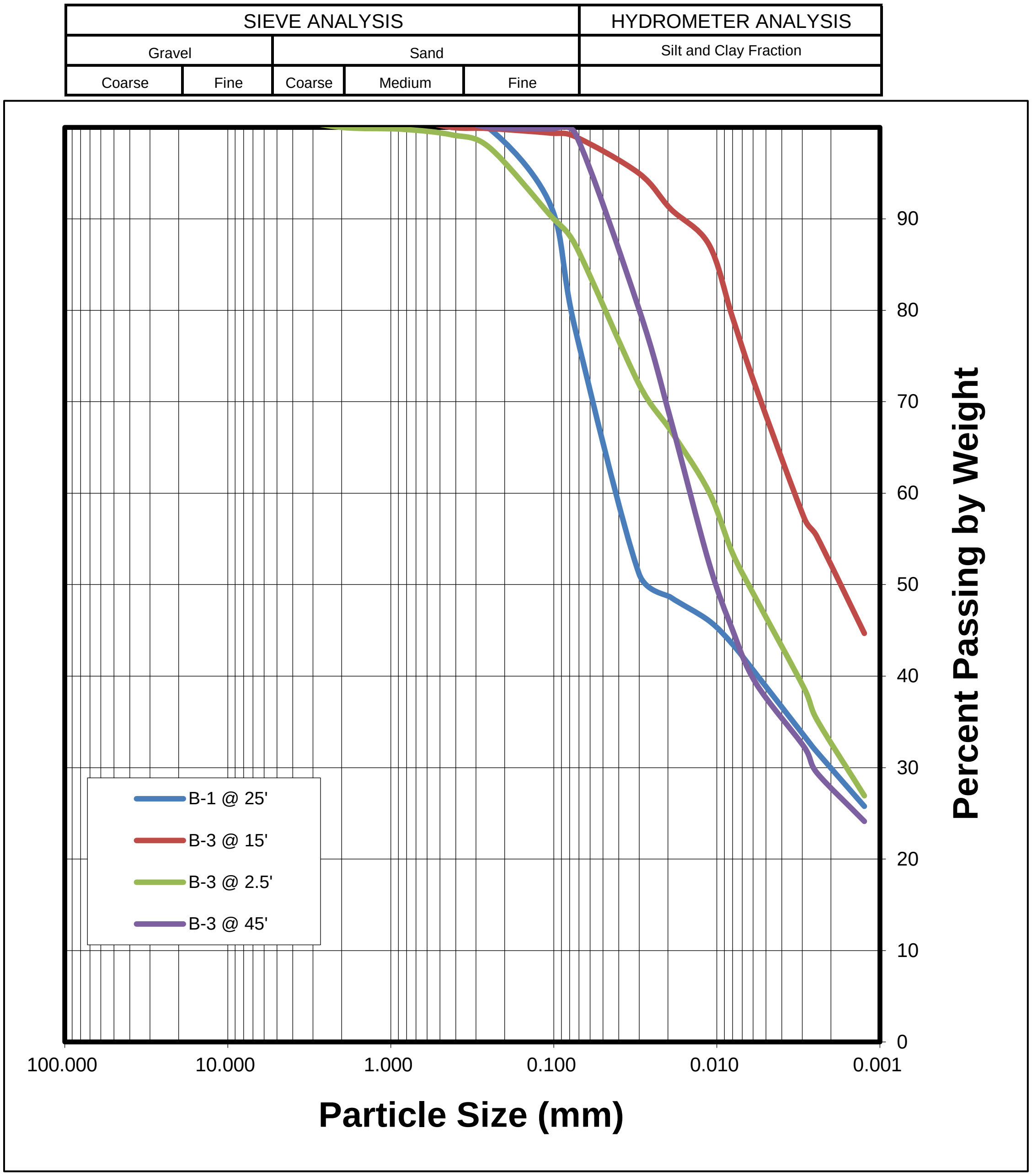
Project No.: LE22197

Atterberg Limits Test Results

Plate C-1



LANDMARK
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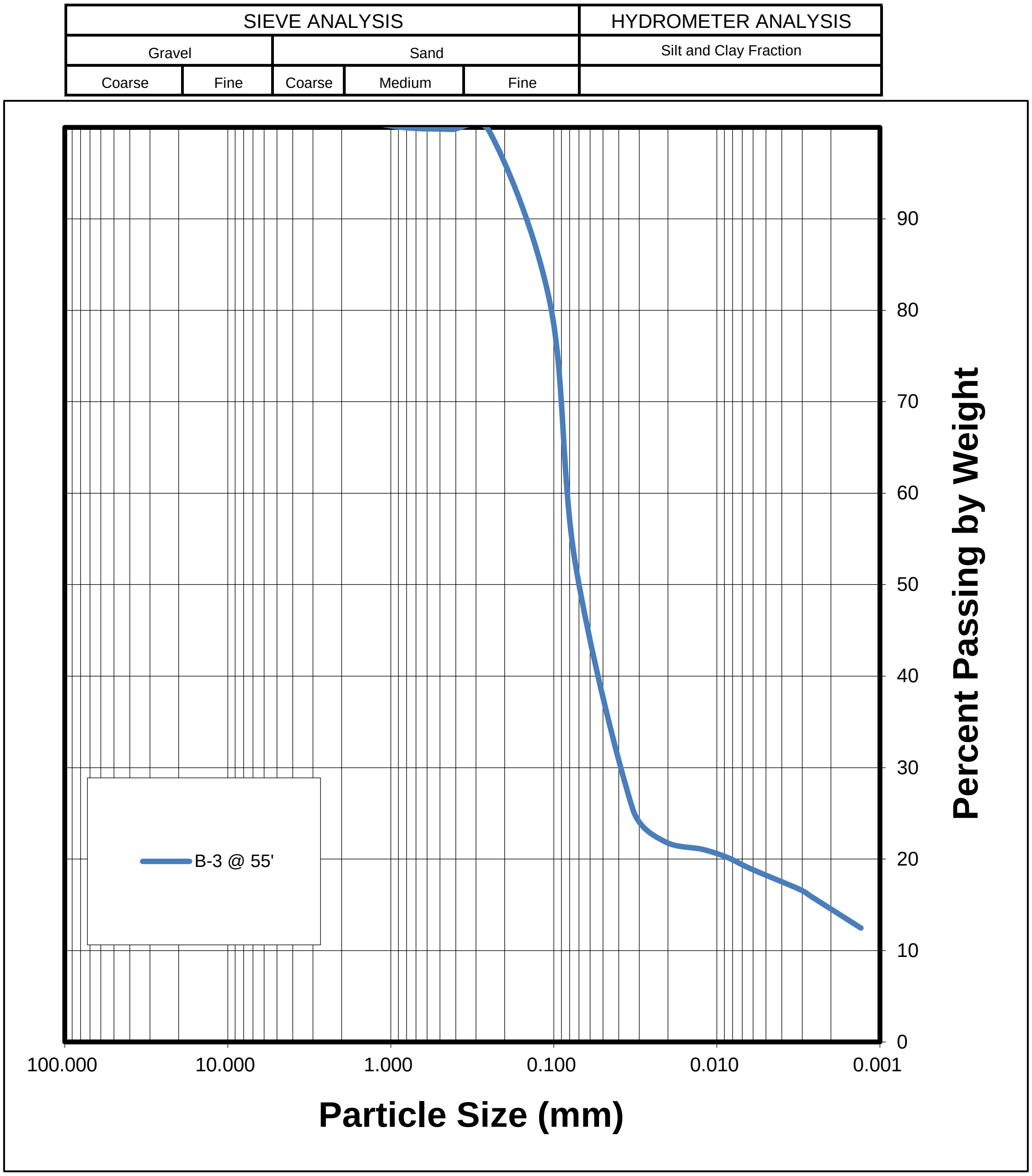
Project No.: LE22198

Grain Size Analysis

Plate C-2



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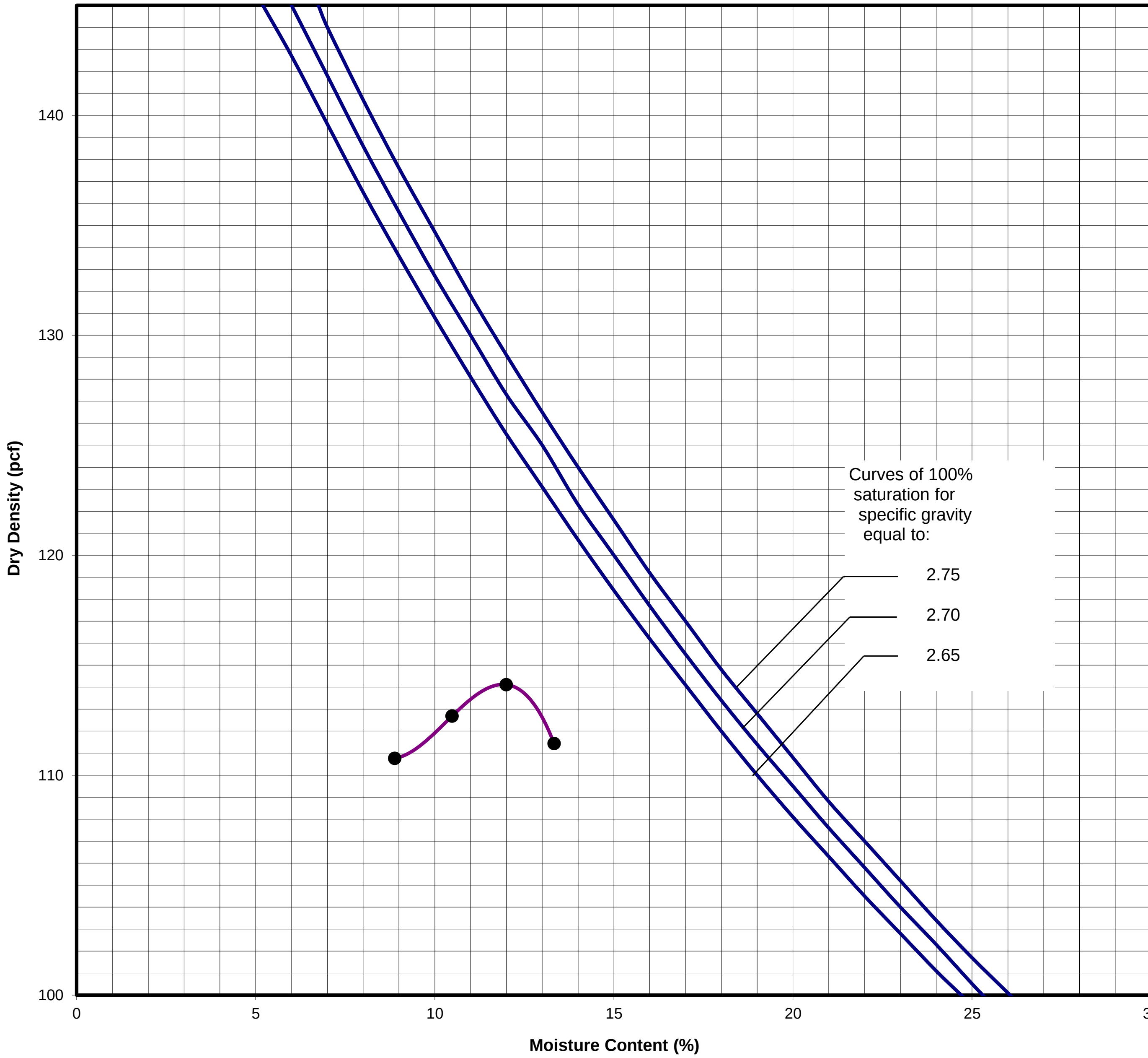
Project No.: LE22198

Grain Size Analysis

Plate C-3

Client:	BHER	**Soil Description:**	Silty Clay (CL)
Project:	Morton Bay Geothermal Plant -- Calipatria, CA	**Sample Location:**	B-1 @ 0-3
Project No.:	LE22197	**Test Method:**	ASTM D1557-A
Date:	10/10/2022	**Maximum Dry Density (pcf):**	**114.1**
Lab. No.:	EC22-623	**Optimum Moisture Content (%):**	**11.9**



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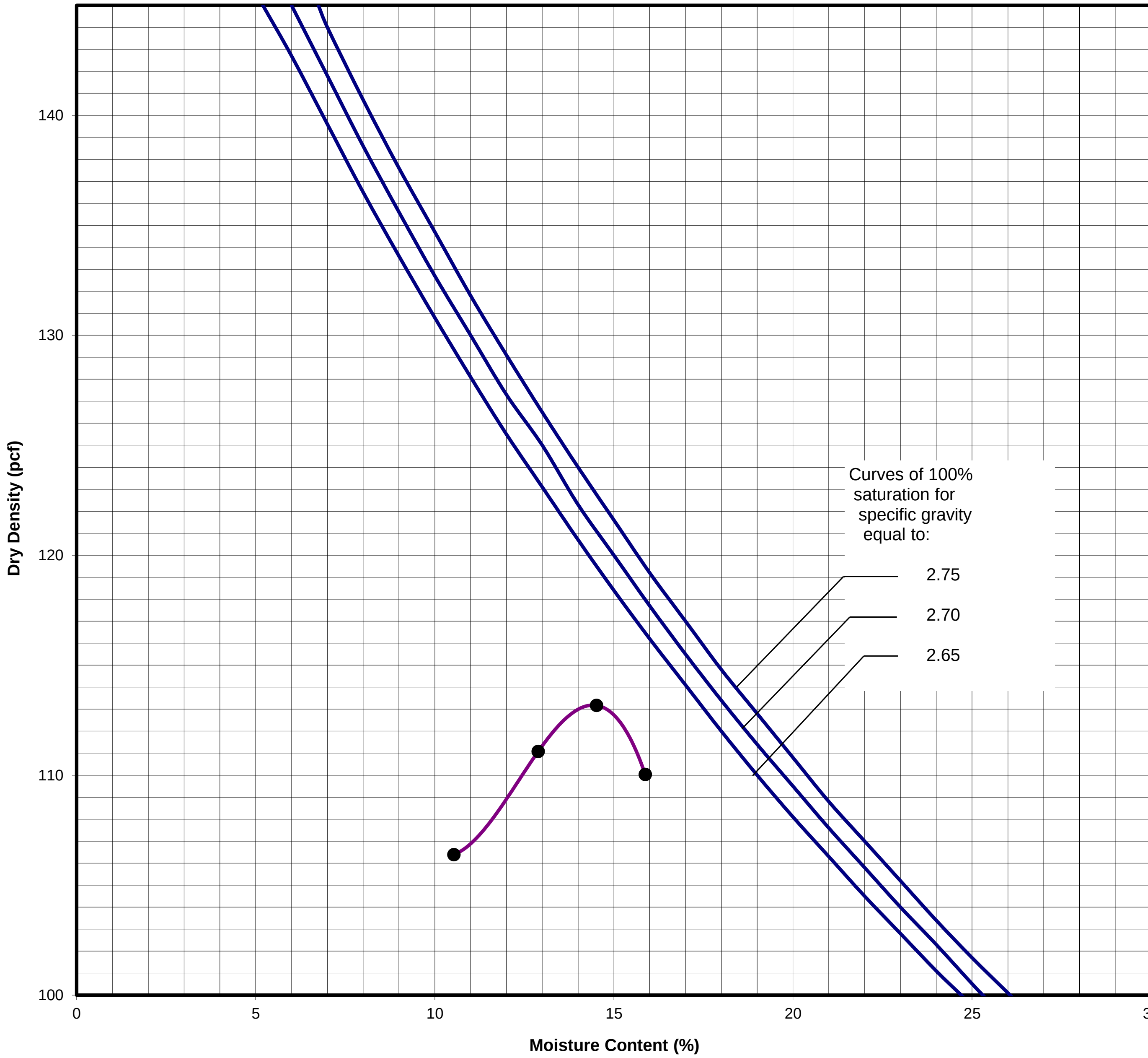
Project No.: LE22197

Moisture Density Relationship

Plate C-4

Client: BHER
Project: Morton Bay Geothermal Plant -- Calipatria, CA
Project No.: LE22197
Date: 10/11/2022
Lab. No.: EC22-624

Soil Description: Silty Clay (CL)
Sample Location: B-2 @ 0-3'
Test Method: ASTM D1557-A
Maximum Dry Density (pcf): **113.2**
Optimum Moisture Content (%): **14.4**



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Project No.: LE22197

Moisture Density Relationship

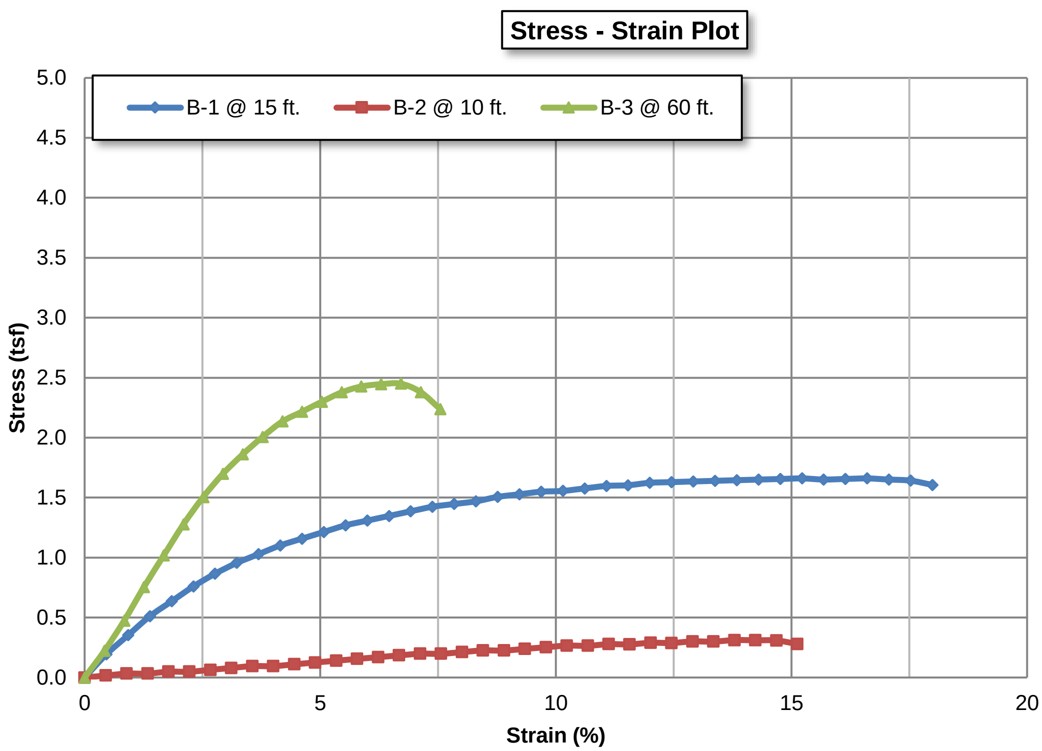
Plate C-5

LANDMARK CONSULTANTS, INC.

CLIENT: BHER
PROJECT: Morton Bay Geothermal Plant -- Calipatria, CA
JOB NO: LE22197
DATE: 10/3/2022

UNCONFINED COMPRESSION TEST (ASTM D2166)

Boring No.	Sample Depth (ft)	Natural Moisture Content (%)	Unit Dry Weight (pcf)	Maximum Compressive Strength (tsf)	Cohesion (tsf)	Failure Strain (%)
B-1	15	33.5	89.9	1.66	0.83	15.2
B-2	10	29.6	100.5	0.31	0.16	13.8
B-3	60	30.7	92.5	2.45	1.22	6.7



LANDMARK Geo-Engineers and Geologists

Project No.: LE22197

Unconfined Compression Test Results

Plate C-7

LANDMARK CONSULTANTS, INC.

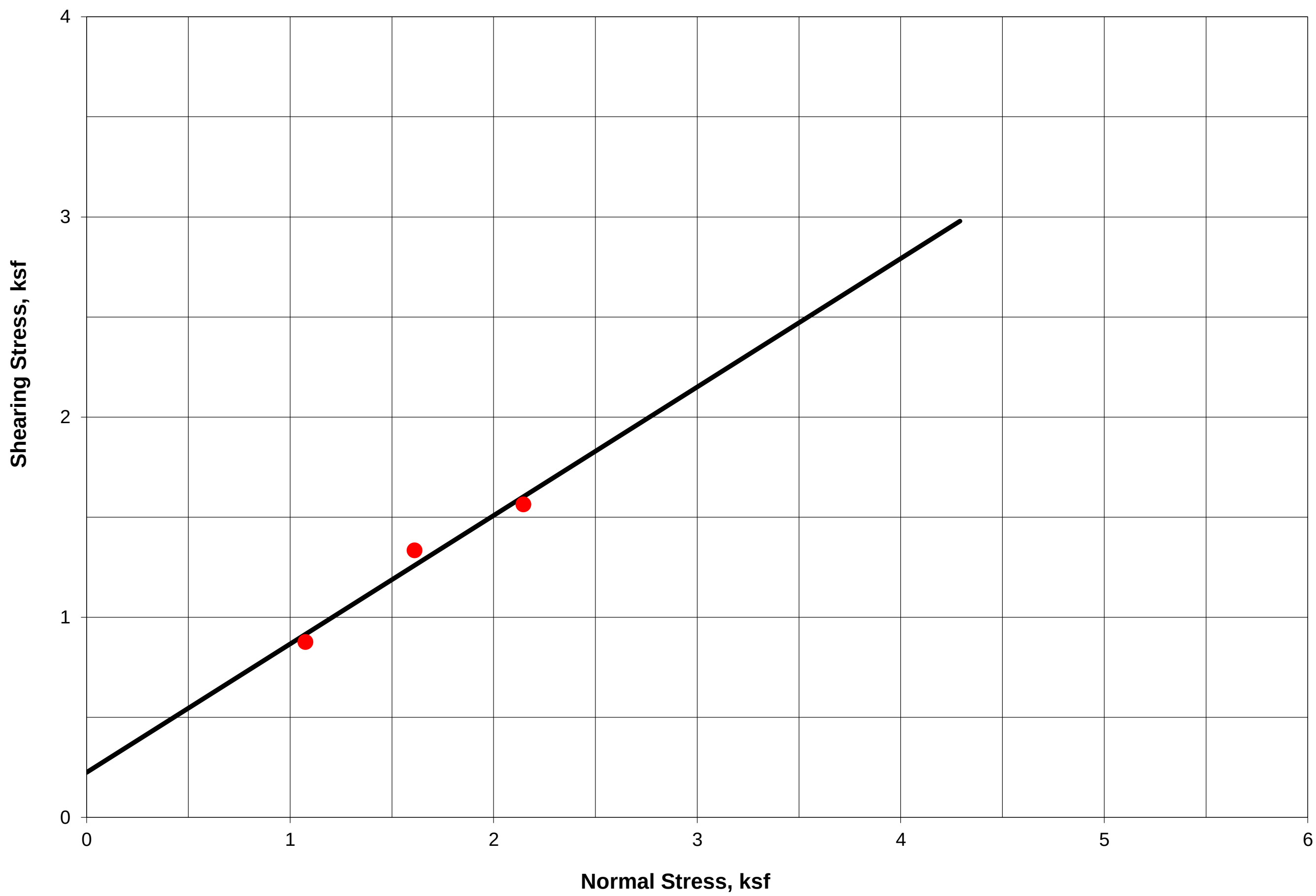
CLIENT: BHER
PROJECT: Morton Bay Geothermal Plant -- Calipatria, CA
PROJECT No: LE22197 **DATE:** 10/5/2022

DIRECT SHEAR TEST - INSITU (ASTM D3080)

SAMPLE LOCATION: B-3 @ 20 ft
SAMPLE DESCRIPTION: Silty Sand (SM)

Angle of Internal Friction: 33º
Cohesion: 0.22 ksf
Initial Dry Density: 96.2 pcf
Initial Moisture Content: 22.3%

DIRECT SHEAR TEST RESULTS



PROJECT No: LE22197

Direct Shear Test Results

Plate C-8

LANDMARK CONSULTANTS, INC.

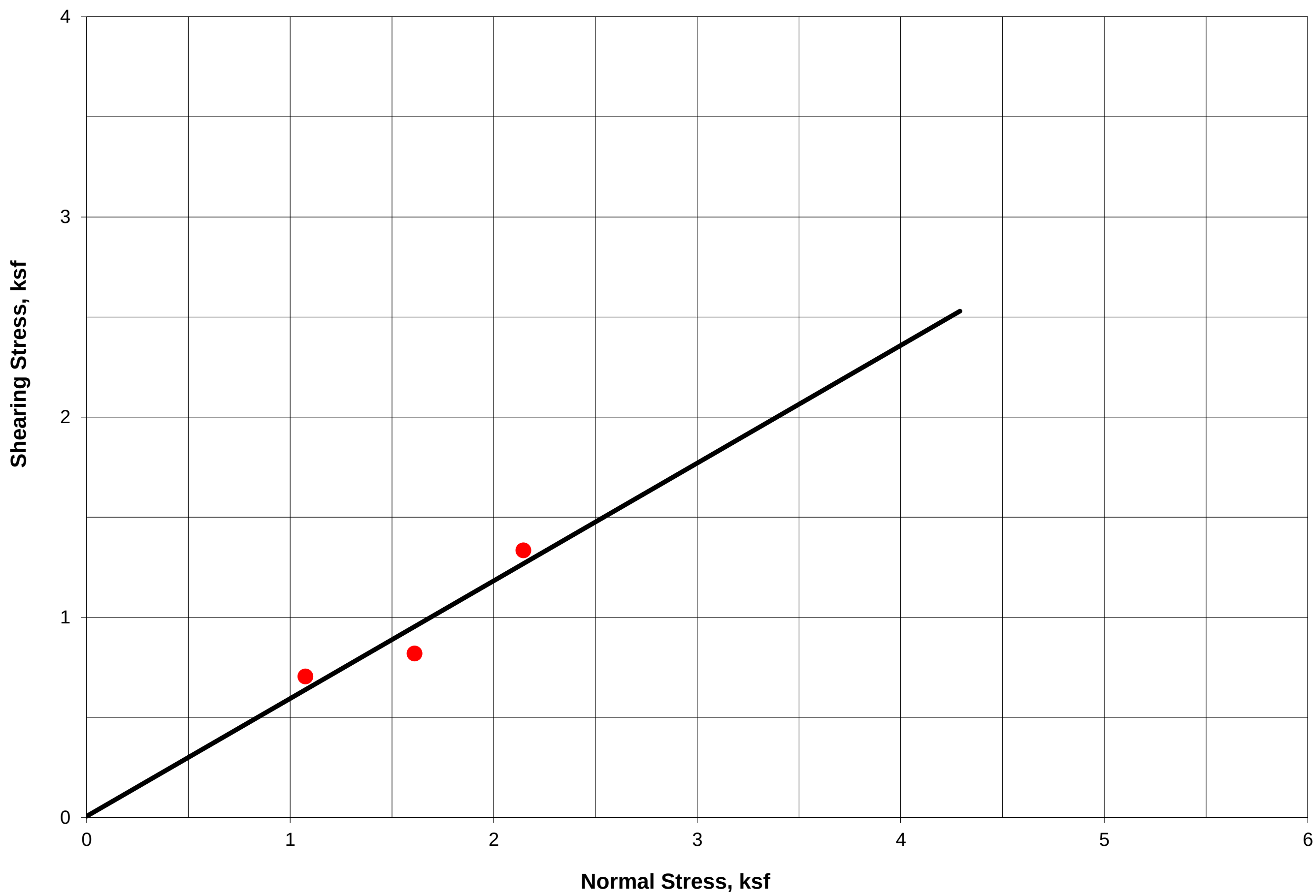
CLIENT: BHER
PROJECT: Morton Bay Geothermal Plant -- Calipatria, CA
PROJECT No: LE22197 **DATE:** 10/5/2022

DIRECT SHEAR TEST - INSITU (ASTM D3080)

SAMPLE LOCATION: B-3 @ 50 ft
SAMPLE DESCRIPTION: Clayey Silt/Silt (ML)

Angle of Internal Friction:	**30º**	**Initial Dry Density:**	**98.7 pcf**
Cohesion:	**0.01 ksf**	**Initial Moisture Content:**	**21%**

DIRECT SHEAR TEST RESULTS



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Geo-Engineers and Geologists
PROJECT No: LE22197

Direct Shear Test Results

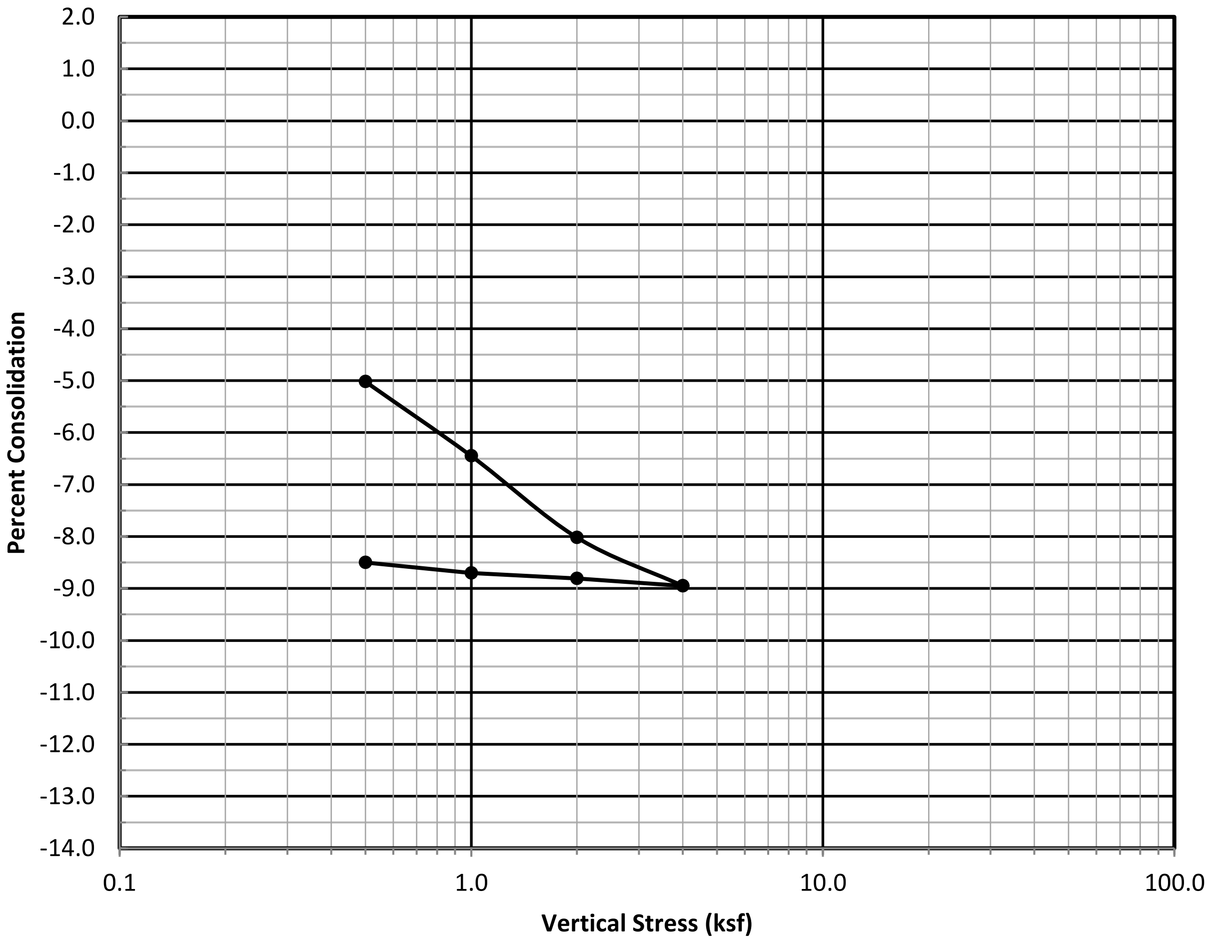
Plate C-9

LANDMARK CONSULTANTS, INC.

CLIENT: BHER
PROJECT: Morton Bay Geothermal Plant -- Calipatria, CA
JOB NO: LE22197
DATE: 10/7/2022

Sample Location: B-3 @ 10 ft.
Soil Type: Silty Clay/Clay (CL-CH)

ONE DIMENSIONAL CONSOLIDATION TEST (ASTM D2435)



Results of Test

				Initial	Final
Overburden Pressure, Po:	1.1 ksf		**Dry Density (pcf):**	89.4	97.9
Preconsol Pressure, Pc:	2.4 ksf		**Water Content (%):**	35.5	28.2
Compression Index, Cc:	0.209		**Void Ratio (e):**	0.920	0.753
Recompression Index, Cr:	0.007		**Saturation (%):**	106.0	102.8

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Project No.: LE22197

One Dimensional Consolidation Test Results

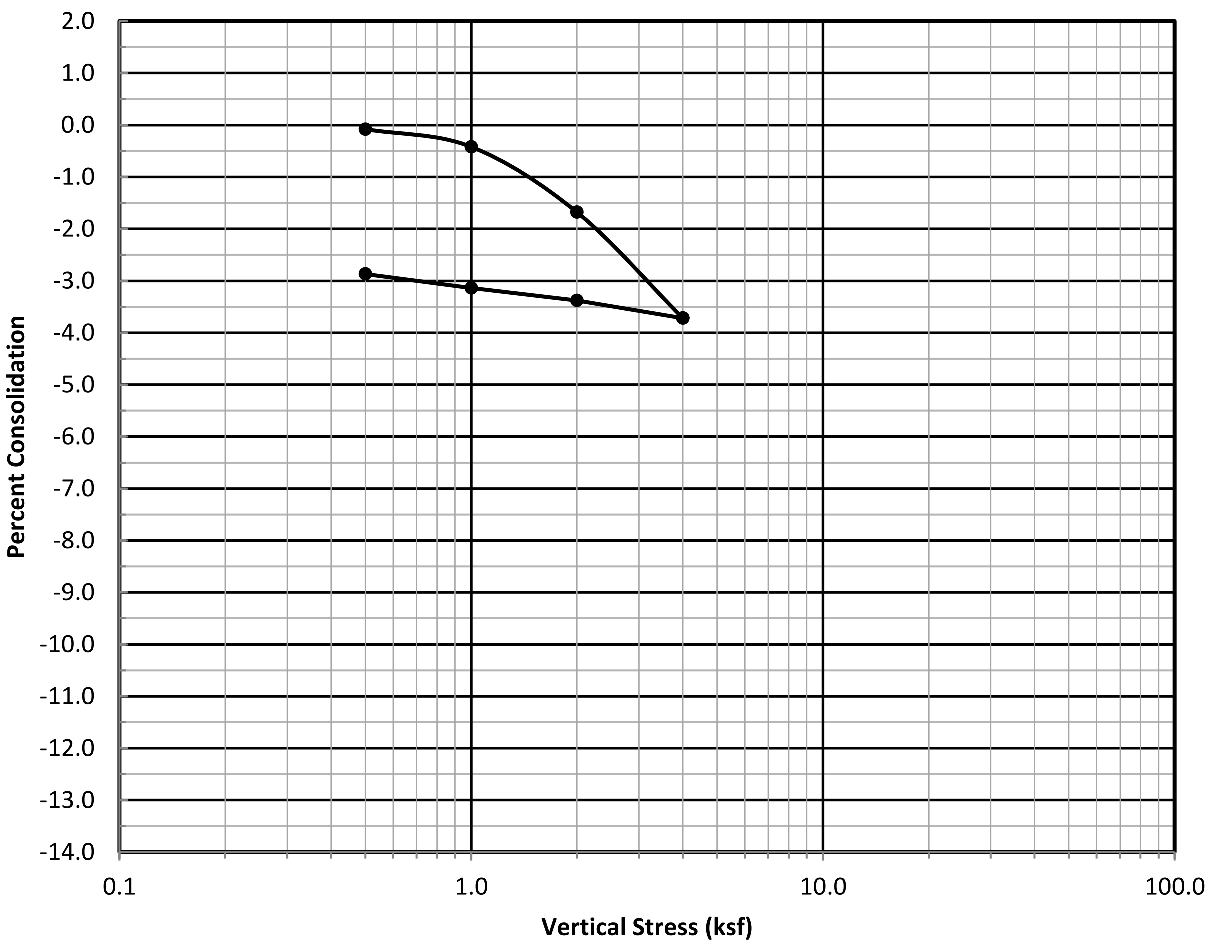
Plate C-10

LANDMARK CONSULTANTS, INC.

CLIENT: BHER
PROJECT: Morton Bay Geothermal Plant -- Calipatria, CA
JOB NO: LE22197
DATE: 10/7/2022

Sample Location: B-3 @ 30 ft.
Soil Type: Fat Clay (CH)

ONE DIMENSIONAL CONSOLIDATION TEST (ASTM D2435)



Results of Test

				Initial	Final
Overburden Pressure, Po:	2.1	ksf	**Dry Density (pcf):**	87.9	91.4
Preconsol Pressure, Pc:	1.8	ksf	**Water Content (%):**	33.4	31.1
Compression Index, Cc:	0.185		**Void Ratio (e):**	0.953	0.877
Recompression Index, Cr:	0.016		**Saturation (%):**	96.3	97.4

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Project No.: LE22197

One Dimensional Consolidation Test Results

Plate C-11

APPENDIX D

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

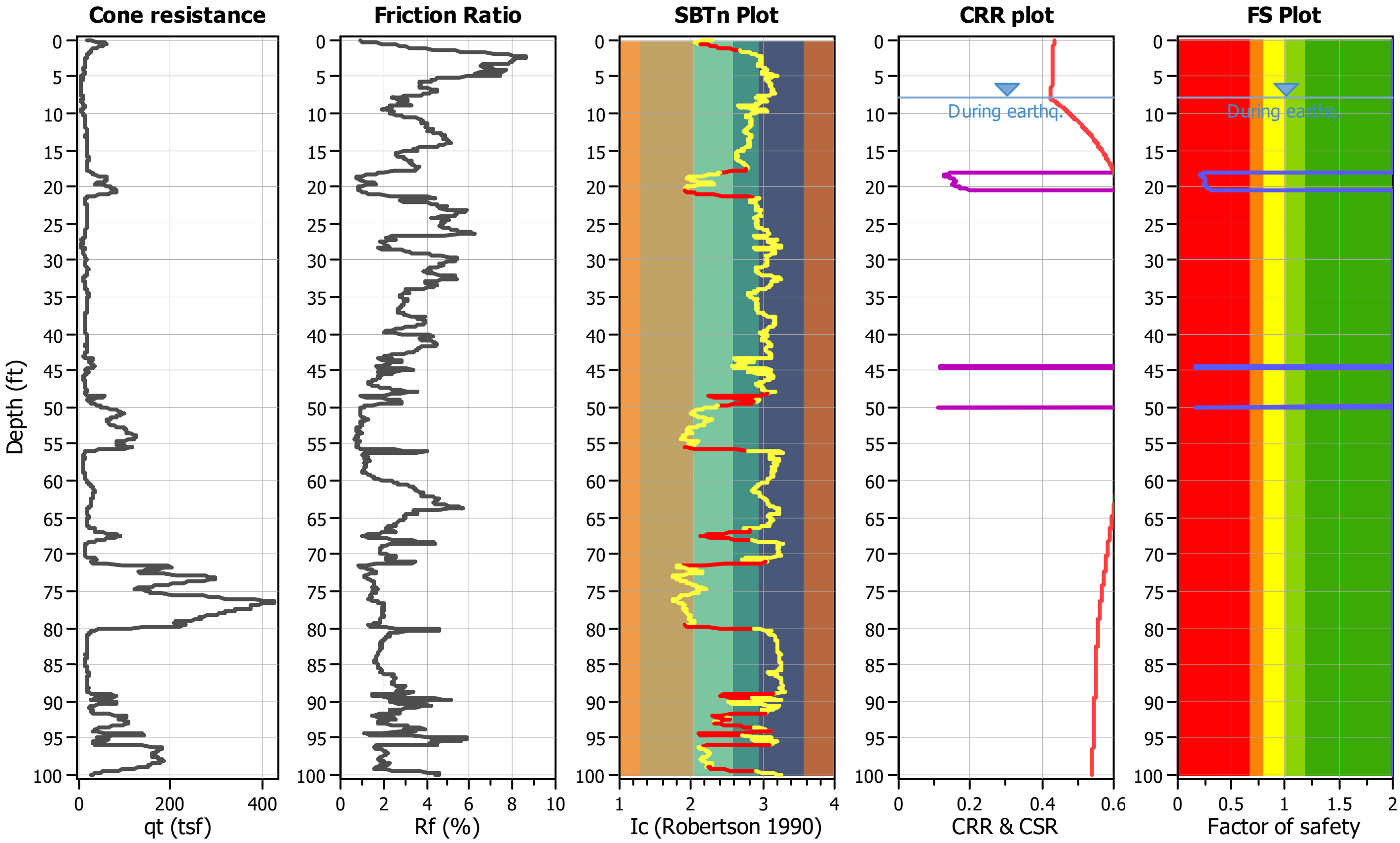
LIQUEFACTION ANALYSIS REPORT

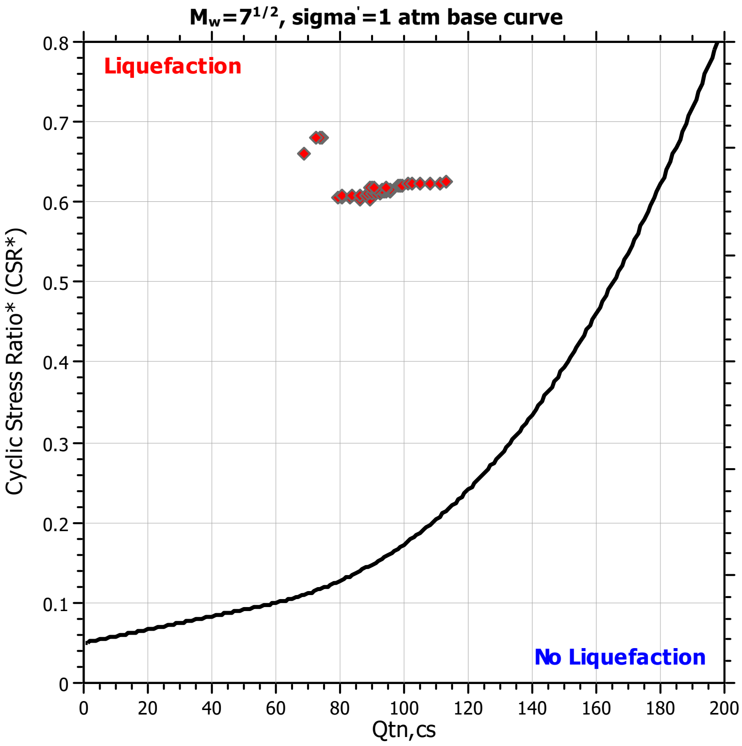
Project title : Morton Bay Geothermal Plant **Location : Calipatria, CA**

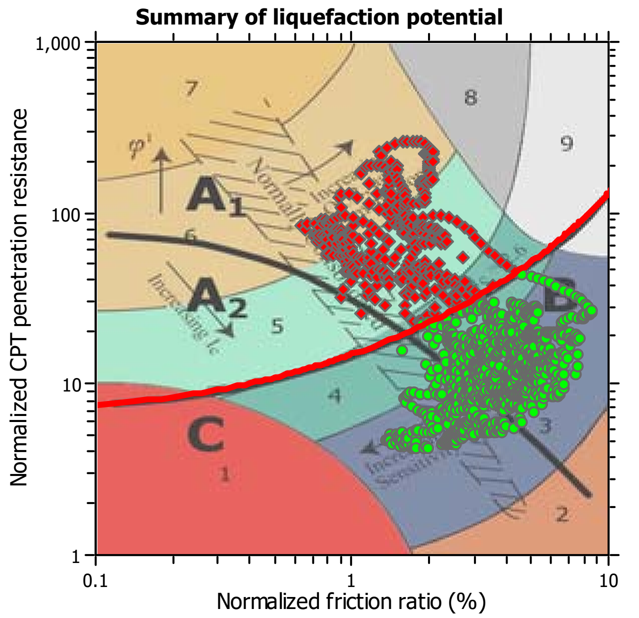
CPT file : CPT-01

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.61	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

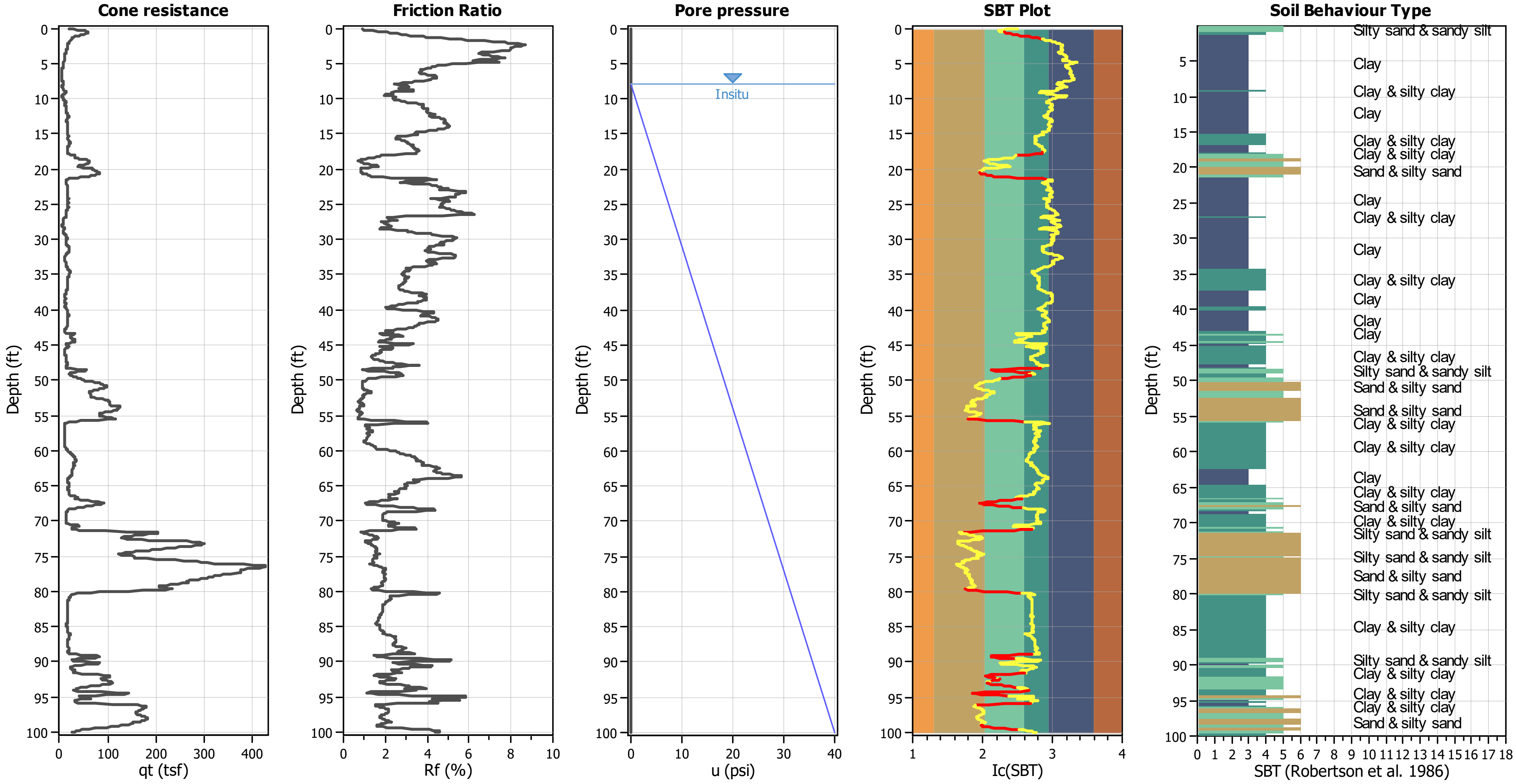






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



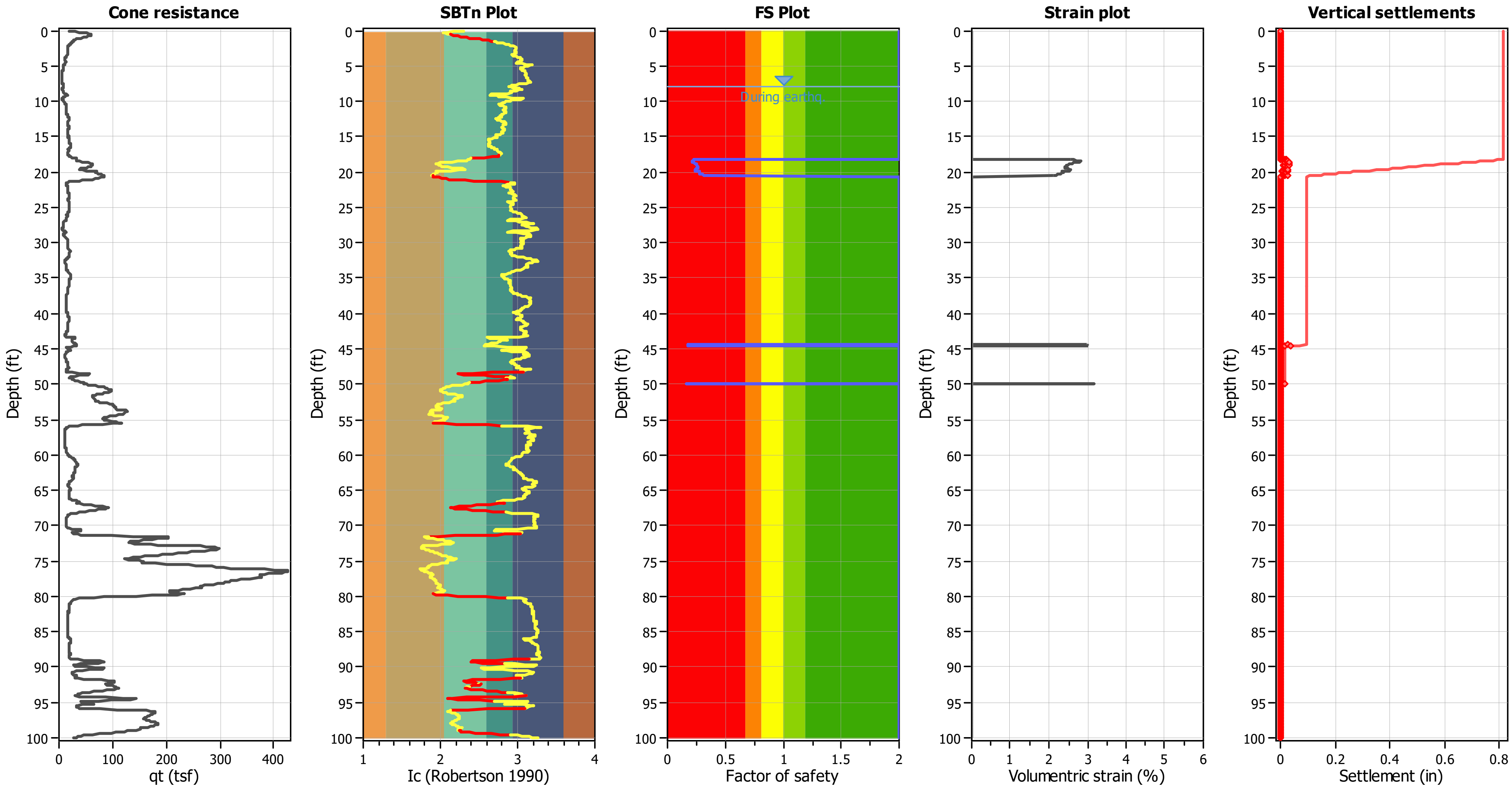
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	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:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

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)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
8.04	69.36	2.00	0.00	1.00	0.00	8.08	69.91	2.00	0.00	1.00	0.00
8.14	69.22	2.00	0.00	1.00	0.00	8.24	68.30	2.00	0.00	1.00	0.00
8.28	67.45	2.00	0.00	1.00	0.00	8.34	67.13	2.00	0.00	1.00	0.00
8.41	67.04	2.00	0.00	1.00	0.00	8.47	68.15	2.00	0.00	1.00	0.00
8.57	69.30	2.00	0.00	1.00	0.00	8.60	70.77	2.00	0.00	1.00	0.00
8.67	72.78	2.00	0.00	1.00	0.00	8.74	76.51	2.00	0.00	1.00	0.00
8.82	81.89	2.00	0.00	1.00	0.00	8.87	86.46	2.00	0.00	1.00	0.00
8.93	87.55	2.00	0.00	1.00	0.00	9.02	85.69	2.00	0.00	1.00	0.00
9.06	82.55	2.00	0.00	1.00	0.00	9.17	80.62	2.00	0.00	1.00	0.00
9.21	78.66	2.00	0.00	1.00	0.00	9.26	75.24	2.00	0.00	1.00	0.00
9.33	69.55	2.00	0.00	1.00	0.00	9.41	62.96	2.00	0.00	1.00	0.00
9.47	58.16	2.00	0.00	1.00	0.00	9.52	55.94	2.00	0.00	1.00	0.00
9.61	55.10	2.00	0.00	1.00	0.00	9.66	56.77	2.00	0.00	1.00	0.00
9.75	59.67	2.00	0.00	1.00	0.00	9.81	63.07	2.00	0.00	1.00	0.00
9.85	65.02	2.00	0.00	1.00	0.00	9.93	66.57	2.00	0.00	1.00	0.00
10.01	67.86	2.00	0.00	1.00	0.00	10.05	69.49	2.00	0.00	1.00	0.00
10.12	72.01	2.00	0.00	1.00	0.00	10.19	75.52	2.00	0.00	1.00	0.00
10.25	79.15	2.00	0.00	1.00	0.00	10.30	83.09	2.00	0.00	1.00	0.00
10.40	86.51	2.00	0.00	1.00	0.00	10.45	89.59	2.00	0.00	1.00	0.00
10.51	92.00	2.00	0.00	1.00	0.00	10.60	93.95	2.00	0.00	1.00	0.00
10.63	95.60	2.00	0.00	1.00	0.00	10.70	97.21	2.00	0.00	1.00	0.00
10.79	98.54	2.00	0.00	1.00	0.00	10.85	99.42	2.00	0.00	1.00	0.00
10.92	99.50	2.00	0.00	1.00	0.00	10.99	99.65	2.00	0.00	1.00	0.00
11.05	100.14	2.00	0.00	1.00	0.00	11.10	100.87	2.00	0.00	1.00	0.00
11.16	101.56	2.00	0.00	1.00	0.00	11.24	101.66	2.00	0.00	1.00	0.00
11.30	101.63	2.00	0.00	1.00	0.00	11.39	101.67	2.00	0.00	1.00	0.00
11.43	102.38	2.00	0.00	1.00	0.00	11.49	103.31	2.00	0.00	1.00	0.00
11.59	104.17	2.00	0.00	1.00	0.00	11.63	104.57	2.00	0.00	1.00	0.00
11.69	105.51	2.00	0.00	1.00	0.00	11.79	106.78	2.00	0.00	1.00	0.00
11.85	108.39	2.00	0.00	1.00	0.00	11.88	109.94	2.00	0.00	1.00	0.00
11.98	111.35	2.00	0.00	1.00	0.00	12.04	112.82	2.00	0.00	1.00	0.00
12.08	114.76	2.00	0.00	1.00	0.00	12.17	117.44	2.00	0.00	1.00	0.00
12.23	120.02	2.00	0.00	1.00	0.00	12.29	121.27	2.00	0.00	1.00	0.00
12.36	121.55	2.00	0.00	1.00	0.00	12.43	121.86	2.00	0.00	1.00	0.00
12.48	122.78	2.00	0.00	1.00	0.00	12.55	124.22	2.00	0.00	1.00	0.00
12.63	125.66	2.00	0.00	1.00	0.00	12.67	126.97	2.00	0.00	1.00	0.00
12.74	127.09	2.00	0.00	1.00	0.00	12.81	126.55	2.00	0.00	1.00	0.00
12.87	125.40	2.00	0.00	1.00	0.00	12.93	124.37	2.00	0.00	1.00	0.00
13.03	123.44	2.00	0.00	1.00	0.00	13.07	122.76	2.00	0.00	1.00	0.00
13.16	122.54	2.00	0.00	1.00	0.00	13.20	122.63	2.00	0.00	1.00	0.00
13.26	123.37	2.00	0.00	1.00	0.00	13.32	125.15	2.00	0.00	1.00	0.00
13.42	127.49	2.00	0.00	1.00	0.00	13.47	129.67	2.00	0.00	1.00	0.00
13.54	131.13	2.00	0.00	1.00	0.00	13.60	132.42	2.00	0.00	1.00	0.00
13.67	133.50	2.00	0.00	1.00	0.00	13.71	134.24	2.00	0.00	1.00	0.00
13.80	134.23	2.00	0.00	1.00	0.00	13.87	133.55	2.00	0.00	1.00	0.00
13.93	132.53	2.00	0.00	1.00	0.00	13.99	131.89	2.00	0.00	1.00	0.00
14.05	131.30	2.00	0.00	1.00	0.00	14.11	130.41	2.00	0.00	1.00	0.00
14.21	128.88	2.00	0.00	1.00	0.00	14.26	126.83	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
14.34	125.00	2.00	0.00	1.00	0.00	14.39	122.79	2.00	0.00	1.00	0.00
14.46	120.00	2.00	0.00	1.00	0.00	14.54	116.71	2.00	0.00	1.00	0.00
14.59	114.02	2.00	0.00	1.00	0.00	14.63	112.05	2.00	0.00	1.00	0.00
14.72	109.79	2.00	0.00	1.00	0.00	14.79	107.71	2.00	0.00	1.00	0.00
14.84	106.46	2.00	0.00	1.00	0.00	14.94	106.17	2.00	0.00	1.00	0.00
14.97	106.69	2.00	0.00	1.00	0.00	15.03	107.32	2.00	0.00	1.00	0.00
15.13	107.85	2.00	0.00	1.00	0.00	15.16	105.80	2.00	0.00	1.00	0.00
15.23	101.26	2.00	0.00	1.00	0.00	15.33	96.65	2.00	0.00	1.00	0.00
15.38	94.18	2.00	0.00	1.00	0.00	15.43	93.76	2.00	0.00	1.00	0.00
15.53	93.16	2.00	0.00	1.00	0.00	15.55	92.50	2.00	0.00	1.00	0.00
15.62	91.87	2.00	0.00	1.00	0.00	15.71	91.57	2.00	0.00	1.00	0.00
15.78	92.21	2.00	0.00	1.00	0.00	15.82	94.55	2.00	0.00	1.00	0.00
15.92	97.14	2.00	0.00	1.00	0.00	15.97	99.78	2.00	0.00	1.00	0.00
16.02	102.21	2.00	0.00	1.00	0.00	16.11	104.34	2.00	0.00	1.00	0.00
16.17	106.15	2.00	0.00	1.00	0.00	16.22	106.86	2.00	0.00	1.00	0.00
16.29	106.91	2.00	0.00	1.00	0.00	16.36	106.52	2.00	0.00	1.00	0.00
16.41	105.93	2.00	0.00	1.00	0.00	16.47	105.98	2.00	0.00	1.00	0.00
16.55	106.16	2.00	0.00	1.00	0.00	16.62	105.93	2.00	0.00	1.00	0.00
16.68	104.34	2.00	0.00	1.00	0.00	16.76	102.71	2.00	0.00	1.00	0.00
16.81	101.72	2.00	0.00	1.00	0.00	16.88	101.92	2.00	0.00	1.00	0.00
16.94	102.44	2.00	0.00	1.00	0.00	17.01	102.98	2.00	0.00	1.00	0.00
17.07	103.25	2.00	0.00	1.00	0.00	17.13	103.35	2.00	0.00	1.00	0.00
17.20	103.24	2.00	0.00	1.00	0.00	17.26	103.62	2.00	0.00	1.00	0.00
17.34	103.73	2.00	0.00	1.00	0.00	17.40	103.96	2.00	0.00	1.00	0.00
17.46	103.62	2.00	0.00	1.00	0.00	17.55	103.03	2.00	0.00	1.00	0.00
17.59	102.75	2.00	0.00	1.00	0.00	17.65	103.18	2.00	0.00	1.00	0.00
17.75	103.71	2.00	0.00	1.00	0.00	17.80	103.32	2.00	0.00	1.00	0.00
17.87	100.45	2.00	0.00	1.00	0.00	17.95	96.00	2.00	0.00	1.00	0.00
18.00	92.47	2.00	0.00	1.00	0.00	18.07	91.05	2.00	0.00	1.00	0.00
18.13	90.44	2.00	0.00	1.00	0.00	18.20	89.07	0.24	2.57	1.00	0.02
18.25	86.40	0.23	2.63	1.00	0.02	18.33	83.06	0.22	2.72	1.00	0.03
18.39	80.36	0.21	2.80	1.00	0.02	18.45	79.60	0.21	2.82	1.00	0.02
18.54	80.83	0.21	2.78	1.00	0.03	18.59	83.75	0.22	2.70	1.00	0.02
18.64	86.06	0.23	2.64	1.00	0.02	18.74	87.87	0.23	2.60	1.00	0.03
18.79	88.97	0.24	2.57	1.00	0.01	18.84	90.19	0.24	2.54	1.00	0.02
18.93	91.55	0.25	2.51	1.00	0.03	18.99	92.39	0.25	2.49	1.00	0.02
19.03	92.95	0.25	2.48	1.00	0.01	19.14	93.55	0.25	2.47	1.00	0.03
19.19	94.44	0.26	2.45	1.00	0.01	19.24	95.32	0.26	2.43	1.00	0.02
19.34	95.45	0.26	2.43	1.00	0.03	19.38	95.44	0.26	2.43	1.00	0.01
19.43	94.29	0.26	2.45	1.00	0.01	19.50	93.13	0.25	2.48	1.00	0.02
19.57	91.39	0.24	2.52	1.00	0.02	19.64	89.99	0.24	2.55	1.00	0.02
19.73	89.34	0.24	2.56	1.00	0.03	19.77	90.74	0.24	2.53	1.00	0.01
19.83	94.39	0.26	2.45	1.00	0.02	19.93	98.13	0.27	2.37	1.00	0.03
19.95	99.54	0.28	2.35	1.00	0.01	20.02	98.86	0.27	2.36	1.00	0.02
20.10	98.85	0.27	2.36	1.00	0.02	20.16	99.37	0.28	2.35	1.00	0.01
20.22	100.94	0.28	2.32	1.00	0.02	20.30	102.50	0.29	2.29	1.00	0.02
20.35	105.21	0.30	2.24	1.00	0.02	20.45	108.30	0.32	2.19	1.00	0.03
20.50	111.26	0.33	2.14	1.00	0.01	20.55	113.26	0.34	2.11	1.00	0.01

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
20.61	114.36	2.00	0.00	1.00	0.00	20.68	114.71	2.00	0.00	1.00	0.00
20.75	113.45	2.00	0.00	1.00	0.00	20.84	111.19	2.00	0.00	1.00	0.00
20.90	108.71	2.00	0.00	1.00	0.00	20.94	106.42	2.00	0.00	1.00	0.00
21.00	103.85	2.00	0.00	1.00	0.00	21.09	101.86	2.00	0.00	1.00	0.00
21.14	102.44	2.00	0.00	1.00	0.00	21.24	105.25	2.00	0.00	1.00	0.00
21.27	109.81	2.00	0.00	1.00	0.00	21.34	112.21	2.00	0.00	1.00	0.00
21.39	111.18	2.00	0.00	1.00	0.00	21.49	106.96	2.00	0.00	1.00	0.00
21.54	100.71	2.00	0.00	1.00	0.00	21.61	95.78	2.00	0.00	1.00	0.00
21.68	90.86	2.00	0.00	1.00	0.00	21.74	86.16	2.00	0.00	1.00	0.00
21.79	82.82	2.00	0.00	1.00	0.00	21.85	81.64	2.00	0.00	1.00	0.00
21.93	82.58	2.00	0.00	1.00	0.00	21.99	86.62	2.00	0.00	1.00	0.00
22.08	91.19	2.00	0.00	1.00	0.00	22.13	96.80	2.00	0.00	1.00	0.00
22.18	100.90	2.00	0.00	1.00	0.00	22.29	103.82	2.00	0.00	1.00	0.00
22.33	105.68	2.00	0.00	1.00	0.00	22.38	107.35	2.00	0.00	1.00	0.00
22.48	108.69	2.00	0.00	1.00	0.00	22.53	109.72	2.00	0.00	1.00	0.00
22.59	110.52	2.00	0.00	1.00	0.00	22.67	111.56	2.00	0.00	1.00	0.00
22.73	112.98	2.00	0.00	1.00	0.00	22.77	114.36	2.00	0.00	1.00	0.00
22.86	113.88	2.00	0.00	1.00	0.00	22.92	112.30	2.00	0.00	1.00	0.00
22.98	114.00	2.00	0.00	1.00	0.00	23.05	118.17	2.00	0.00	1.00	0.00
23.12	123.45	2.00	0.00	1.00	0.00	23.18	125.19	2.00	0.00	1.00	0.00
23.23	125.82	2.00	0.00	1.00	0.00	23.32	125.45	2.00	0.00	1.00	0.00
23.39	124.64	2.00	0.00	1.00	0.00	23.45	123.71	2.00	0.00	1.00	0.00
23.50	122.79	2.00	0.00	1.00	0.00	23.58	121.92	2.00	0.00	1.00	0.00
23.64	121.25	2.00	0.00	1.00	0.00	23.70	120.66	2.00	0.00	1.00	0.00
23.76	119.64	2.00	0.00	1.00	0.00	23.83	118.11	2.00	0.00	1.00	0.00
23.89	116.00	2.00	0.00	1.00	0.00	23.99	114.22	2.00	0.00	1.00	0.00
24.03	112.74	2.00	0.00	1.00	0.00	24.09	111.26	2.00	0.00	1.00	0.00
24.19	109.69	2.00	0.00	1.00	0.00	24.23	108.85	2.00	0.00	1.00	0.00
24.29	110.48	2.00	0.00	1.00	0.00	24.38	112.65	2.00	0.00	1.00	0.00
24.43	114.90	2.00	0.00	1.00	0.00	24.48	115.59	2.00	0.00	1.00	0.00
24.56	115.78	2.00	0.00	1.00	0.00	24.63	115.61	2.00	0.00	1.00	0.00
24.68	115.36	2.00	0.00	1.00	0.00	24.75	115.01	2.00	0.00	1.00	0.00
24.83	114.18	2.00	0.00	1.00	0.00	24.89	113.23	2.00	0.00	1.00	0.00
24.98	112.38	2.00	0.00	1.00	0.00	25.03	112.24	2.00	0.00	1.00	0.00
25.08	111.97	2.00	0.00	1.00	0.00	25.18	111.64	2.00	0.00	1.00	0.00
25.22	111.23	2.00	0.00	1.00	0.00	25.28	111.16	2.00	0.00	1.00	0.00
25.33	111.29	2.00	0.00	1.00	0.00	25.41	111.73	2.00	0.00	1.00	0.00
25.47	112.12	2.00	0.00	1.00	0.00	25.57	112.02	2.00	0.00	1.00	0.00
25.61	111.45	2.00	0.00	1.00	0.00	25.67	110.64	2.00	0.00	1.00	0.00
25.72	109.62	2.00	0.00	1.00	0.00	25.81	108.68	2.00	0.00	1.00	0.00
25.86	107.90	2.00	0.00	1.00	0.00	25.95	107.43	2.00	0.00	1.00	0.00
26.01	107.45	2.00	0.00	1.00	0.00	26.05	109.10	2.00	0.00	1.00	0.00
26.16	111.24	2.00	0.00	1.00	0.00	26.21	113.69	2.00	0.00	1.00	0.00
26.26	114.42	2.00	0.00	1.00	0.00	26.35	114.03	2.00	0.00	1.00	0.00
26.41	112.71	2.00	0.00	1.00	0.00	26.46	110.05	2.00	0.00	1.00	0.00
26.53	105.20	2.00	0.00	1.00	0.00	26.61	98.83	2.00	0.00	1.00	0.00
26.66	89.23	2.00	0.00	1.00	0.00	26.75	80.01	2.00	0.00	1.00	0.00
26.81	70.84	2.00	0.00	1.00	0.00	26.85	66.23	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
26.95	63.13	2.00	0.00	1.00	0.00	26.97	60.37	2.00	0.00	1.00	0.00
27.05	58.38	2.00	0.00	1.00	0.00	27.11	56.21	2.00	0.00	1.00	0.00
27.20	55.23	2.00	0.00	1.00	0.00	27.24	54.87	2.00	0.00	1.00	0.00
27.30	54.33	2.00	0.00	1.00	0.00	27.40	53.43	2.00	0.00	1.00	0.00
27.45	52.28	2.00	0.00	1.00	0.00	27.50	52.04	2.00	0.00	1.00	0.00
27.60	52.04	2.00	0.00	1.00	0.00	27.63	52.20	2.00	0.00	1.00	0.00
27.70	52.13	2.00	0.00	1.00	0.00	27.78	51.55	2.00	0.00	1.00	0.00
27.82	50.70	2.00	0.00	1.00	0.00	27.90	49.96	2.00	0.00	1.00	0.00
27.96	49.16	2.00	0.00	1.00	0.00	28.05	48.98	2.00	0.00	1.00	0.00
28.09	49.09	2.00	0.00	1.00	0.00	28.19	50.02	2.00	0.00	1.00	0.00
28.24	51.31	2.00	0.00	1.00	0.00	28.29	54.40	2.00	0.00	1.00	0.00
28.39	56.89	2.00	0.00	1.00	0.00	28.42	59.40	2.00	0.00	1.00	0.00
28.49	60.88	2.00	0.00	1.00	0.00	28.58	62.30	2.00	0.00	1.00	0.00
28.64	62.94	2.00	0.00	1.00	0.00	28.69	63.65	2.00	0.00	1.00	0.00
28.75	64.24	2.00	0.00	1.00	0.00	28.83	64.25	2.00	0.00	1.00	0.00
28.88	65.16	2.00	0.00	1.00	0.00	28.98	66.67	2.00	0.00	1.00	0.00
29.03	69.39	2.00	0.00	1.00	0.00	29.08	72.71	2.00	0.00	1.00	0.00
29.15	76.73	2.00	0.00	1.00	0.00	29.21	80.77	2.00	0.00	1.00	0.00
29.27	84.83	2.00	0.00	1.00	0.00	29.34	88.91	2.00	0.00	1.00	0.00
29.42	92.76	2.00	0.00	1.00	0.00	29.47	96.64	2.00	0.00	1.00	0.00
29.56	99.62	2.00	0.00	1.00	0.00	29.61	102.09	2.00	0.00	1.00	0.00
29.66	104.27	2.00	0.00	1.00	0.00	29.76	105.96	2.00	0.00	1.00	0.00
29.79	107.44	2.00	0.00	1.00	0.00	29.86	107.33	2.00	0.00	1.00	0.00
29.96	106.51	2.00	0.00	1.00	0.00	30.01	105.30	2.00	0.00	1.00	0.00
30.06	103.72	2.00	0.00	1.00	0.00	30.15	102.01	2.00	0.00	1.00	0.00
30.20	100.17	2.00	0.00	1.00	0.00	30.25	98.78	2.00	0.00	1.00	0.00
30.32	97.59	2.00	0.00	1.00	0.00	30.39	96.87	2.00	0.00	1.00	0.00
30.48	96.44	2.00	0.00	1.00	0.00	30.55	96.42	2.00	0.00	1.00	0.00
30.60	96.80	2.00	0.00	1.00	0.00	30.67	97.25	2.00	0.00	1.00	0.00
30.74	97.73	2.00	0.00	1.00	0.00	30.79	98.12	2.00	0.00	1.00	0.00
30.84	99.06	2.00	0.00	1.00	0.00	30.92	100.12	2.00	0.00	1.00	0.00
30.99	101.23	2.00	0.00	1.00	0.00	31.04	102.05	2.00	0.00	1.00	0.00
31.14	102.49	2.00	0.00	1.00	0.00	31.19	102.71	2.00	0.00	1.00	0.00
31.24	102.84	2.00	0.00	1.00	0.00	31.34	102.68	2.00	0.00	1.00	0.00
31.39	101.90	2.00	0.00	1.00	0.00	31.44	100.18	2.00	0.00	1.00	0.00
31.54	98.52	2.00	0.00	1.00	0.00	31.59	97.61	2.00	0.00	1.00	0.00
31.63	97.49	2.00	0.00	1.00	0.00	31.73	97.61	2.00	0.00	1.00	0.00
31.78	98.32	2.00	0.00	1.00	0.00	31.85	99.53	2.00	0.00	1.00	0.00
31.92	100.63	2.00	0.00	1.00	0.00	31.98	101.10	2.00	0.00	1.00	0.00
32.03	100.77	2.00	0.00	1.00	0.00	32.11	99.89	2.00	0.00	1.00	0.00
32.18	98.45	2.00	0.00	1.00	0.00	32.23	96.09	2.00	0.00	1.00	0.00
32.31	93.10	2.00	0.00	1.00	0.00	32.37	90.25	2.00	0.00	1.00	0.00
32.42	87.58	2.00	0.00	1.00	0.00	32.52	85.46	2.00	0.00	1.00	0.00
32.56	83.58	2.00	0.00	1.00	0.00	32.62	82.29	2.00	0.00	1.00	0.00
32.72	80.87	2.00	0.00	1.00	0.00	32.76	79.46	2.00	0.00	1.00	0.00
32.82	78.95	2.00	0.00	1.00	0.00	32.91	78.88	2.00	0.00	1.00	0.00
32.97	79.11	2.00	0.00	1.00	0.00	33.03	79.92	2.00	0.00	1.00	0.00
33.12	80.71	2.00	0.00	1.00	0.00	33.17	81.70	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
33.22	82.86	2.00	0.00	1.00	0.00	33.30	84.28	2.00	0.00	1.00	0.00
33.37	85.66	2.00	0.00	1.00	0.00	33.42	86.20	2.00	0.00	1.00	0.00
33.47	86.55	2.00	0.00	1.00	0.00	33.56	86.73	2.00	0.00	1.00	0.00
33.61	86.56	2.00	0.00	1.00	0.00	33.72	86.06	2.00	0.00	1.00	0.00
33.74	85.34	2.00	0.00	1.00	0.00	33.81	84.53	2.00	0.00	1.00	0.00
33.86	83.07	2.00	0.00	1.00	0.00	33.95	81.52	2.00	0.00	1.00	0.00
34.00	80.44	2.00	0.00	1.00	0.00	34.06	80.08	2.00	0.00	1.00	0.00
34.16	80.51	2.00	0.00	1.00	0.00	34.19	81.87	2.00	0.00	1.00	0.00
34.26	83.98	2.00	0.00	1.00	0.00	34.35	86.02	2.00	0.00	1.00	0.00
34.40	87.67	2.00	0.00	1.00	0.00	34.45	88.35	2.00	0.00	1.00	0.00
34.55	88.27	2.00	0.00	1.00	0.00	34.61	87.81	2.00	0.00	1.00	0.00
34.65	86.90	2.00	0.00	1.00	0.00	34.75	85.98	2.00	0.00	1.00	0.00
34.80	85.00	2.00	0.00	1.00	0.00	34.85	84.37	2.00	0.00	1.00	0.00
34.94	83.66	2.00	0.00	1.00	0.00	35.00	83.02	2.00	0.00	1.00	0.00
35.04	82.81	2.00	0.00	1.00	0.00	35.11	82.74	2.00	0.00	1.00	0.00
35.19	82.79	2.00	0.00	1.00	0.00	35.25	82.84	2.00	0.00	1.00	0.00
35.34	82.77	2.00	0.00	1.00	0.00	35.40	82.62	2.00	0.00	1.00	0.00
35.46	82.11	2.00	0.00	1.00	0.00	35.53	81.39	2.00	0.00	1.00	0.00
35.60	80.68	2.00	0.00	1.00	0.00	35.65	80.32	2.00	0.00	1.00	0.00
35.72	80.20	2.00	0.00	1.00	0.00	35.78	80.14	2.00	0.00	1.00	0.00
35.84	80.02	2.00	0.00	1.00	0.00	35.90	79.81	2.00	0.00	1.00	0.00
35.97	79.50	2.00	0.00	1.00	0.00	36.04	79.20	2.00	0.00	1.00	0.00
36.09	78.84	2.00	0.00	1.00	0.00	36.18	78.47	2.00	0.00	1.00	0.00
36.23	77.90	2.00	0.00	1.00	0.00	36.33	77.27	2.00	0.00	1.00	0.00
36.39	76.57	2.00	0.00	1.00	0.00	36.43	75.93	2.00	0.00	1.00	0.00
36.49	75.30	2.00	0.00	1.00	0.00	36.58	74.69	2.00	0.00	1.00	0.00
36.63	74.33	2.00	0.00	1.00	0.00	36.69	74.15	2.00	0.00	1.00	0.00
36.77	74.10	2.00	0.00	1.00	0.00	36.83	73.94	2.00	0.00	1.00	0.00
36.89	73.53	2.00	0.00	1.00	0.00	36.96	72.90	2.00	0.00	1.00	0.00
37.03	72.38	2.00	0.00	1.00	0.00	37.08	72.12	2.00	0.00	1.00	0.00
37.16	71.99	2.00	0.00	1.00	0.00	37.22	72.00	2.00	0.00	1.00	0.00
37.28	72.14	2.00	0.00	1.00	0.00	37.38	72.34	2.00	0.00	1.00	0.00
37.41	72.40	2.00	0.00	1.00	0.00	37.48	72.98	2.00	0.00	1.00	0.00
37.58	74.24	2.00	0.00	1.00	0.00	37.63	75.63	2.00	0.00	1.00	0.00
37.67	76.75	2.00	0.00	1.00	0.00	37.77	77.13	2.00	0.00	1.00	0.00
37.82	76.01	2.00	0.00	1.00	0.00	37.87	74.23	2.00	0.00	1.00	0.00
37.97	73.01	2.00	0.00	1.00	0.00	38.02	73.19	2.00	0.00	1.00	0.00
38.06	74.32	2.00	0.00	1.00	0.00	38.16	74.87	2.00	0.00	1.00	0.00
38.19	75.82	2.00	0.00	1.00	0.00	38.27	76.11	2.00	0.00	1.00	0.00
38.36	76.28	2.00	0.00	1.00	0.00	38.42	76.21	2.00	0.00	1.00	0.00
38.46	76.20	2.00	0.00	1.00	0.00	38.52	75.86	2.00	0.00	1.00	0.00
38.61	75.24	2.00	0.00	1.00	0.00	38.66	74.25	2.00	0.00	1.00	0.00
38.74	73.44	2.00	0.00	1.00	0.00	38.81	72.87	2.00	0.00	1.00	0.00
38.87	72.61	2.00	0.00	1.00	0.00	38.94	72.12	2.00	0.00	1.00	0.00
39.00	71.41	2.00	0.00	1.00	0.00	39.06	70.54	2.00	0.00	1.00	0.00
39.11	69.37	2.00	0.00	1.00	0.00	39.18	67.79	2.00	0.00	1.00	0.00
39.26	66.10	2.00	0.00	1.00	0.00	39.31	64.60	2.00	0.00	1.00	0.00
39.38	63.16	2.00	0.00	1.00	0.00	39.45	61.64	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
39.51	60.06	2.00	0.00	1.00	0.00	39.61	58.86	2.00	0.00	1.00	0.00
39.64	58.26	2.00	0.00	1.00	0.00	39.71	58.70	2.00	0.00	1.00	0.00
39.80	60.31	2.00	0.00	1.00	0.00	39.85	62.97	2.00	0.00	1.00	0.00
39.90	67.81	2.00	0.00	1.00	0.00	40.00	72.78	2.00	0.00	1.00	0.00
40.05	77.43	2.00	0.00	1.00	0.00	40.10	80.91	2.00	0.00	1.00	0.00
40.17	84.43	2.00	0.00	1.00	0.00	40.24	87.32	2.00	0.00	1.00	0.00
40.29	89.07	2.00	0.00	1.00	0.00	40.37	89.29	2.00	0.00	1.00	0.00
40.43	88.89	2.00	0.00	1.00	0.00	40.49	88.17	2.00	0.00	1.00	0.00
40.58	87.58	2.00	0.00	1.00	0.00	40.63	87.31	2.00	0.00	1.00	0.00
40.68	87.25	2.00	0.00	1.00	0.00	40.78	87.20	2.00	0.00	1.00	0.00
40.82	87.47	2.00	0.00	1.00	0.00	40.88	88.36	2.00	0.00	1.00	0.00
40.98	89.32	2.00	0.00	1.00	0.00	41.03	90.05	2.00	0.00	1.00	0.00
41.08	90.16	2.00	0.00	1.00	0.00	41.18	90.08	2.00	0.00	1.00	0.00
41.22	89.79	2.00	0.00	1.00	0.00	41.32	89.41	2.00	0.00	1.00	0.00
41.36	88.84	2.00	0.00	1.00	0.00	41.42	88.17	2.00	0.00	1.00	0.00
41.49	87.19	2.00	0.00	1.00	0.00	41.58	86.16	2.00	0.00	1.00	0.00
41.63	85.25	2.00	0.00	1.00	0.00	41.67	84.44	2.00	0.00	1.00	0.00
41.74	83.47	2.00	0.00	1.00	0.00	41.81	82.30	2.00	0.00	1.00	0.00
41.92	81.41	2.00	0.00	1.00	0.00	41.94	81.02	2.00	0.00	1.00	0.00
42.02	81.04	2.00	0.00	1.00	0.00	42.06	81.04	2.00	0.00	1.00	0.00
42.17	80.92	2.00	0.00	1.00	0.00	42.20	80.48	2.00	0.00	1.00	0.00
42.27	79.57	2.00	0.00	1.00	0.00	42.36	78.28	2.00	0.00	1.00	0.00
42.41	76.92	2.00	0.00	1.00	0.00	42.46	74.81	2.00	0.00	1.00	0.00
42.55	72.33	2.00	0.00	1.00	0.00	42.61	69.43	2.00	0.00	1.00	0.00
42.67	66.76	2.00	0.00	1.00	0.00	42.74	63.96	2.00	0.00	1.00	0.00
42.81	61.45	2.00	0.00	1.00	0.00	42.86	58.86	2.00	0.00	1.00	0.00
42.96	56.67	2.00	0.00	1.00	0.00	43.00	54.62	2.00	0.00	1.00	0.00
43.06	54.48	2.00	0.00	1.00	0.00	43.16	55.50	2.00	0.00	1.00	0.00
43.21	57.64	2.00	0.00	1.00	0.00	43.25	62.46	2.00	0.00	1.00	0.00
43.35	67.39	2.00	0.00	1.00	0.00	43.40	70.96	2.00	0.00	1.00	0.00
43.45	72.97	2.00	0.00	1.00	0.00	43.53	75.27	2.00	0.00	1.00	0.00
43.60	78.10	2.00	0.00	1.00	0.00	43.65	80.95	2.00	0.00	1.00	0.00
43.73	82.22	2.00	0.00	1.00	0.00	43.80	81.69	2.00	0.00	1.00	0.00
43.83	78.54	2.00	0.00	1.00	0.00	43.91	76.60	2.00	0.00	1.00	0.00
43.99	75.93	2.00	0.00	1.00	0.00	44.04	77.58	2.00	0.00	1.00	0.00
44.09	79.23	2.00	0.00	1.00	0.00	44.17	80.10	2.00	0.00	1.00	0.00
44.23	79.21	2.00	0.00	1.00	0.00	44.34	77.02	2.00	0.00	1.00	0.00
44.36	75.54	2.00	0.00	1.00	0.00	44.44	74.43	0.17	2.98	1.00	0.03
44.54	73.65	0.17	3.00	1.00	0.04	44.58	72.77	0.17	3.03	1.00	0.02
44.62	73.28	2.00	0.00	1.00	0.00	44.73	73.59	2.00	0.00	1.00	0.00
44.78	73.03	2.00	0.00	1.00	0.00	44.83	72.26	2.00	0.00	1.00	0.00
44.88	71.36	2.00	0.00	1.00	0.00	44.97	70.14	2.00	0.00	1.00	0.00
45.02	68.58	2.00	0.00	1.00	0.00	45.08	66.85	2.00	0.00	1.00	0.00
45.16	64.81	2.00	0.00	1.00	0.00	45.22	62.38	2.00	0.00	1.00	0.00
45.28	61.80	2.00	0.00	1.00	0.00	45.38	61.56	2.00	0.00	1.00	0.00
45.42	61.14	2.00	0.00	1.00	0.00	45.48	59.11	2.00	0.00	1.00	0.00
45.55	56.66	2.00	0.00	1.00	0.00	45.61	54.55	2.00	0.00	1.00	0.00
45.67	52.65	2.00	0.00	1.00	0.00	45.75	51.02	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
45.80	49.81	2.00	0.00	1.00	0.00	45.88	49.20	2.00	0.00	1.00	0.00
45.95	49.14	2.00	0.00	1.00	0.00	46.00	49.21	2.00	0.00	1.00	0.00
46.09	49.28	2.00	0.00	1.00	0.00	46.15	49.15	2.00	0.00	1.00	0.00
46.23	48.88	2.00	0.00	1.00	0.00	46.29	48.54	2.00	0.00	1.00	0.00
46.34	48.48	2.00	0.00	1.00	0.00	46.40	48.29	2.00	0.00	1.00	0.00
46.49	48.12	2.00	0.00	1.00	0.00	46.54	48.05	2.00	0.00	1.00	0.00
46.59	48.39	2.00	0.00	1.00	0.00	46.69	48.89	2.00	0.00	1.00	0.00
46.73	49.54	2.00	0.00	1.00	0.00	46.79	50.11	2.00	0.00	1.00	0.00
46.87	50.61	2.00	0.00	1.00	0.00	46.94	51.00	2.00	0.00	1.00	0.00
47.00	51.73	2.00	0.00	1.00	0.00	47.09	52.63	2.00	0.00	1.00	0.00
47.13	54.14	2.00	0.00	1.00	0.00	47.19	55.35	2.00	0.00	1.00	0.00
47.26	56.24	2.00	0.00	1.00	0.00	47.34	56.80	2.00	0.00	1.00	0.00
47.38	59.04	2.00	0.00	1.00	0.00	47.48	61.88	2.00	0.00	1.00	0.00
47.52	65.09	2.00	0.00	1.00	0.00	47.58	67.15	2.00	0.00	1.00	0.00
47.68	68.63	2.00	0.00	1.00	0.00	47.73	69.86	2.00	0.00	1.00	0.00
47.79	71.28	2.00	0.00	1.00	0.00	47.88	71.89	2.00	0.00	1.00	0.00
47.91	71.27	2.00	0.00	1.00	0.00	47.97	68.56	2.00	0.00	1.00	0.00
48.08	65.50	2.00	0.00	1.00	0.00	48.13	62.66	2.00	0.00	1.00	0.00
48.17	61.24	2.00	0.00	1.00	0.00	48.23	60.47	2.00	0.00	1.00	0.00
48.32	60.48	2.00	0.00	1.00	0.00	48.37	60.37	2.00	0.00	1.00	0.00
48.44	60.85	2.00	0.00	1.00	0.00	48.52	64.41	2.00	0.00	1.00	0.00
48.56	69.39	2.00	0.00	1.00	0.00	48.62	74.22	2.00	0.00	1.00	0.00
48.70	78.88	2.00	0.00	1.00	0.00	48.76	81.25	2.00	0.00	1.00	0.00
48.85	79.87	2.00	0.00	1.00	0.00	48.91	76.98	2.00	0.00	1.00	0.00
48.97	74.76	2.00	0.00	1.00	0.00	49.02	73.86	2.00	0.00	1.00	0.00
49.11	73.60	2.00	0.00	1.00	0.00	49.17	74.12	2.00	0.00	1.00	0.00
49.21	75.89	2.00	0.00	1.00	0.00	49.28	79.18	2.00	0.00	1.00	0.00
49.36	82.11	2.00	0.00	1.00	0.00	49.42	83.46	2.00	0.00	1.00	0.00
49.51	82.46	2.00	0.00	1.00	0.00	49.56	80.22	2.00	0.00	1.00	0.00
49.61	75.94	2.00	0.00	1.00	0.00	49.71	72.35	2.00	0.00	1.00	0.00
49.75	69.23	2.00	0.00	1.00	0.00	49.82	68.41	2.00	0.00	1.00	0.00
49.90	67.93	2.00	0.00	1.00	0.00	49.94	68.52	0.17	3.19	1.00	0.01
50.03	69.60	2.00	0.00	1.00	0.00	50.09	71.10	2.00	0.00	1.00	0.00
50.15	73.35	2.00	0.00	1.00	0.00	50.20	75.67	2.00	0.00	1.00	0.00
50.26	78.39	2.00	0.00	1.00	0.00	50.34	81.29	2.00	0.00	1.00	0.00
50.40	83.87	2.00	0.00	1.00	0.00	50.48	85.74	2.00	0.00	1.00	0.00
50.54	86.95	2.00	0.00	1.00	0.00	50.59	88.03	2.00	0.00	1.00	0.00
50.68	89.29	2.00	0.00	1.00	0.00	50.74	90.83	2.00	0.00	1.00	0.00
50.80	92.15	2.00	0.00	1.00	0.00	50.88	92.96	2.00	0.00	1.00	0.00
50.94	93.07	2.00	0.00	1.00	0.00	50.98	92.04	2.00	0.00	1.00	0.00
51.08	90.10	2.00	0.00	1.00	0.00	51.13	87.83	2.00	0.00	1.00	0.00
51.19	85.80	2.00	0.00	1.00	0.00	51.28	84.32	2.00	0.00	1.00	0.00
51.32	83.20	2.00	0.00	1.00	0.00	51.38	82.47	2.00	0.00	1.00	0.00
51.46	82.02	2.00	0.00	1.00	0.00	51.53	82.19	2.00	0.00	1.00	0.00
51.58	82.14	2.00	0.00	1.00	0.00	51.64	81.39	2.00	0.00	1.00	0.00
51.73	80.01	2.00	0.00	1.00	0.00	51.78	78.20	2.00	0.00	1.00	0.00
51.88	76.82	2.00	0.00	1.00	0.00	51.92	75.57	2.00	0.00	1.00	0.00
51.97	74.83	2.00	0.00	1.00	0.00	52.06	74.02	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
52.12	73.53	2.00	0.00	1.00	0.00	52.17	73.66	2.00	0.00	1.00	0.00
52.26	74.21	2.00	0.00	1.00	0.00	52.32	74.93	2.00	0.00	1.00	0.00
52.38	76.03	2.00	0.00	1.00	0.00	52.47	77.42	2.00	0.00	1.00	0.00
52.52	79.19	2.00	0.00	1.00	0.00	52.56	81.11	2.00	0.00	1.00	0.00
52.66	83.05	2.00	0.00	1.00	0.00	52.71	85.33	2.00	0.00	1.00	0.00
52.78	87.18	2.00	0.00	1.00	0.00	52.87	88.80	2.00	0.00	1.00	0.00
52.90	89.90	2.00	0.00	1.00	0.00	52.98	90.24	2.00	0.00	1.00	0.00
53.06	90.14	2.00	0.00	1.00	0.00	53.11	90.35	2.00	0.00	1.00	0.00
53.17	91.68	2.00	0.00	1.00	0.00	53.26	93.66	2.00	0.00	1.00	0.00
53.30	95.59	2.00	0.00	1.00	0.00	53.36	96.88	2.00	0.00	1.00	0.00
53.46	97.76	2.00	0.00	1.00	0.00	53.49	98.18	2.00	0.00	1.00	0.00
53.56	98.80	2.00	0.00	1.00	0.00	53.65	100.05	2.00	0.00	1.00	0.00
53.70	102.60	2.00	0.00	1.00	0.00	53.75	104.70	2.00	0.00	1.00	0.00
53.84	105.84	2.00	0.00	1.00	0.00	53.88	105.67	2.00	0.00	1.00	0.00
53.95	104.82	2.00	0.00	1.00	0.00	54.05	103.75	2.00	0.00	1.00	0.00
54.09	102.55	2.00	0.00	1.00	0.00	54.14	100.95	2.00	0.00	1.00	0.00
54.25	98.75	2.00	0.00	1.00	0.00	54.30	96.34	2.00	0.00	1.00	0.00
54.35	93.90	2.00	0.00	1.00	0.00	54.41	91.48	2.00	0.00	1.00	0.00
54.49	89.30	2.00	0.00	1.00	0.00	54.54	87.30	2.00	0.00	1.00	0.00
54.60	85.10	2.00	0.00	1.00	0.00	54.68	83.05	2.00	0.00	1.00	0.00
54.73	81.36	2.00	0.00	1.00	0.00	54.80	79.74	2.00	0.00	1.00	0.00
54.90	78.65	2.00	0.00	1.00	0.00	54.94	78.29	2.00	0.00	1.00	0.00
54.99	79.06	2.00	0.00	1.00	0.00	55.06	78.98	2.00	0.00	1.00	0.00
55.13	80.19	2.00	0.00	1.00	0.00	55.19	81.99	2.00	0.00	1.00	0.00
55.27	86.14	2.00	0.00	1.00	0.00	55.34	90.16	2.00	0.00	1.00	0.00
55.40	94.31	2.00	0.00	1.00	0.00	55.49	96.86	2.00	0.00	1.00	0.00
55.52	96.24	2.00	0.00	1.00	0.00	55.58	92.14	2.00	0.00	1.00	0.00
55.65	88.87	2.00	0.00	1.00	0.00	55.73	89.99	2.00	0.00	1.00	0.00
55.78	91.54	2.00	0.00	1.00	0.00	55.88	90.08	2.00	0.00	1.00	0.00
55.92	86.04	2.00	0.00	1.00	0.00	55.97	80.14	2.00	0.00	1.00	0.00
56.06	71.64	2.00	0.00	1.00	0.00	56.13	62.16	2.00	0.00	1.00	0.00
56.17	53.78	2.00	0.00	1.00	0.00	56.27	46.47	2.00	0.00	1.00	0.00
56.31	40.76	2.00	0.00	1.00	0.00	56.38	38.98	2.00	0.00	1.00	0.00
56.45	38.46	2.00	0.00	1.00	0.00	56.52	38.48	2.00	0.00	1.00	0.00
56.57	39.47	2.00	0.00	1.00	0.00	56.67	40.45	2.00	0.00	1.00	0.00
56.71	41.33	2.00	0.00	1.00	0.00	56.76	40.97	2.00	0.00	1.00	0.00
56.85	40.45	2.00	0.00	1.00	0.00	56.92	39.86	2.00	0.00	1.00	0.00
56.96	39.57	2.00	0.00	1.00	0.00	57.02	39.39	2.00	0.00	1.00	0.00
57.11	39.54	2.00	0.00	1.00	0.00	57.16	40.03	2.00	0.00	1.00	0.00
57.22	40.56	2.00	0.00	1.00	0.00	57.31	40.58	2.00	0.00	1.00	0.00
57.36	40.21	2.00	0.00	1.00	0.00	57.46	39.71	2.00	0.00	1.00	0.00
57.49	39.46	2.00	0.00	1.00	0.00	57.56	39.33	2.00	0.00	1.00	0.00
57.64	39.17	2.00	0.00	1.00	0.00	57.70	38.99	2.00	0.00	1.00	0.00
57.76	38.91	2.00	0.00	1.00	0.00	57.85	38.75	2.00	0.00	1.00	0.00
57.90	38.62	2.00	0.00	1.00	0.00	57.96	38.71	2.00	0.00	1.00	0.00
58.01	39.04	2.00	0.00	1.00	0.00	58.10	39.24	2.00	0.00	1.00	0.00
58.15	39.14	2.00	0.00	1.00	0.00	58.25	38.96	2.00	0.00	1.00	0.00
58.30	38.88	2.00	0.00	1.00	0.00	58.35	38.76	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
58.45	38.57	2.00	0.00	1.00	0.00	58.47	38.15	2.00	0.00	1.00	0.00
58.55	37.82	2.00	0.00	1.00	0.00	58.63	37.63	2.00	0.00	1.00	0.00
58.70	37.63	2.00	0.00	1.00	0.00	58.74	37.69	2.00	0.00	1.00	0.00
58.79	37.93	2.00	0.00	1.00	0.00	58.89	38.26	2.00	0.00	1.00	0.00
58.94	38.96	2.00	0.00	1.00	0.00	59.00	40.53	2.00	0.00	1.00	0.00
59.09	41.95	2.00	0.00	1.00	0.00	59.14	43.09	2.00	0.00	1.00	0.00
59.19	43.32	2.00	0.00	1.00	0.00	59.29	43.52	2.00	0.00	1.00	0.00
59.33	44.09	2.00	0.00	1.00	0.00	59.42	44.74	2.00	0.00	1.00	0.00
59.48	45.49	2.00	0.00	1.00	0.00	59.52	46.07	2.00	0.00	1.00	0.00
59.59	46.68	2.00	0.00	1.00	0.00	59.67	47.52	2.00	0.00	1.00	0.00
59.73	49.46	2.00	0.00	1.00	0.00	59.81	51.85	2.00	0.00	1.00	0.00
59.87	54.38	2.00	0.00	1.00	0.00	59.92	56.64	2.00	0.00	1.00	0.00
59.99	58.96	2.00	0.00	1.00	0.00	60.07	61.27	2.00	0.00	1.00	0.00
60.12	63.62	2.00	0.00	1.00	0.00	60.19	66.00	2.00	0.00	1.00	0.00
60.26	68.47	2.00	0.00	1.00	0.00	60.31	70.98	2.00	0.00	1.00	0.00
60.40	73.09	2.00	0.00	1.00	0.00	60.44	75.23	2.00	0.00	1.00	0.00
60.50	77.88	2.00	0.00	1.00	0.00	60.61	80.56	2.00	0.00	1.00	0.00
60.65	83.14	2.00	0.00	1.00	0.00	60.71	84.97	2.00	0.00	1.00	0.00
60.80	86.62	2.00	0.00	1.00	0.00	60.85	88.05	2.00	0.00	1.00	0.00
60.90	89.49	2.00	0.00	1.00	0.00	61.00	90.76	2.00	0.00	1.00	0.00
61.05	91.85	2.00	0.00	1.00	0.00	61.10	92.83	2.00	0.00	1.00	0.00
61.20	93.75	2.00	0.00	1.00	0.00	61.25	94.74	2.00	0.00	1.00	0.00
61.29	95.56	2.00	0.00	1.00	0.00	61.40	96.24	2.00	0.00	1.00	0.00
61.45	96.99	2.00	0.00	1.00	0.00	61.49	96.74	2.00	0.00	1.00	0.00
61.59	95.93	2.00	0.00	1.00	0.00	61.64	94.56	2.00	0.00	1.00	0.00
61.70	93.54	2.00	0.00	1.00	0.00	61.78	92.69	2.00	0.00	1.00	0.00
61.85	92.19	2.00	0.00	1.00	0.00	61.89	91.82	2.00	0.00	1.00	0.00
61.95	92.03	2.00	0.00	1.00	0.00	62.04	92.67	2.00	0.00	1.00	0.00
62.09	93.98	2.00	0.00	1.00	0.00	62.15	95.54	2.00	0.00	1.00	0.00
62.22	96.93	2.00	0.00	1.00	0.00	62.28	97.78	2.00	0.00	1.00	0.00
62.34	98.21	2.00	0.00	1.00	0.00	62.43	98.38	2.00	0.00	1.00	0.00
62.47	97.88	2.00	0.00	1.00	0.00	62.54	96.31	2.00	0.00	1.00	0.00
62.63	94.48	2.00	0.00	1.00	0.00	62.68	92.96	2.00	0.00	1.00	0.00
62.74	92.05	2.00	0.00	1.00	0.00	62.83	91.24	2.00	0.00	1.00	0.00
62.88	90.70	2.00	0.00	1.00	0.00	62.98	90.47	2.00	0.00	1.00	0.00
63.02	90.52	2.00	0.00	1.00	0.00	63.08	91.17	2.00	0.00	1.00	0.00
63.14	92.33	2.00	0.00	1.00	0.00	63.23	93.60	2.00	0.00	1.00	0.00
63.27	94.73	2.00	0.00	1.00	0.00	63.33	95.97	2.00	0.00	1.00	0.00
63.42	97.12	2.00	0.00	1.00	0.00	63.46	97.97	2.00	0.00	1.00	0.00
63.52	97.28	2.00	0.00	1.00	0.00	63.62	95.82	2.00	0.00	1.00	0.00
63.67	93.37	2.00	0.00	1.00	0.00	63.73	90.81	2.00	0.00	1.00	0.00
63.78	87.12	2.00	0.00	1.00	0.00	63.87	83.16	2.00	0.00	1.00	0.00
63.92	78.12	2.00	0.00	1.00	0.00	64.02	73.54	2.00	0.00	1.00	0.00
64.07	69.30	2.00	0.00	1.00	0.00	64.14	67.39	2.00	0.00	1.00	0.00
64.19	67.17	2.00	0.00	1.00	0.00	64.26	67.78	2.00	0.00	1.00	0.00
64.32	68.21	2.00	0.00	1.00	0.00	64.37	68.06	2.00	0.00	1.00	0.00
64.45	67.99	2.00	0.00	1.00	0.00	64.52	68.22	2.00	0.00	1.00	0.00
64.60	68.62	2.00	0.00	1.00	0.00	64.65	68.90	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
64.70	69.33	2.00	0.00	1.00	0.00	64.80	69.78	2.00	0.00	1.00	0.00
64.85	70.25	2.00	0.00	1.00	0.00	64.90	70.23	2.00	0.00	1.00	0.00
64.96	69.50	2.00	0.00	1.00	0.00	65.05	68.26	2.00	0.00	1.00	0.00
65.09	66.85	2.00	0.00	1.00	0.00	65.16	65.76	2.00	0.00	1.00	0.00
65.26	65.15	2.00	0.00	1.00	0.00	65.30	64.84	2.00	0.00	1.00	0.00
65.40	64.18	2.00	0.00	1.00	0.00	65.45	63.23	2.00	0.00	1.00	0.00
65.50	62.62	2.00	0.00	1.00	0.00	65.57	62.74	2.00	0.00	1.00	0.00
65.65	63.26	2.00	0.00	1.00	0.00	65.70	63.57	2.00	0.00	1.00	0.00
65.75	63.26	2.00	0.00	1.00	0.00	65.84	62.70	2.00	0.00	1.00	0.00
65.89	62.10	2.00	0.00	1.00	0.00	65.95	62.40	2.00	0.00	1.00	0.00
66.04	63.04	2.00	0.00	1.00	0.00	66.10	63.37	2.00	0.00	1.00	0.00
66.15	62.70	2.00	0.00	1.00	0.00	66.25	61.83	2.00	0.00	1.00	0.00
66.28	61.93	2.00	0.00	1.00	0.00	66.35	64.60	2.00	0.00	1.00	0.00
66.44	68.48	2.00	0.00	1.00	0.00	66.50	72.38	2.00	0.00	1.00	0.00
66.54	74.92	2.00	0.00	1.00	0.00	66.61	76.37	2.00	0.00	1.00	0.00
66.69	76.80	2.00	0.00	1.00	0.00	66.74	76.78	2.00	0.00	1.00	0.00
66.80	77.44	2.00	0.00	1.00	0.00	66.89	78.95	2.00	0.00	1.00	0.00
66.93	81.38	2.00	0.00	1.00	0.00	67.04	83.00	2.00	0.00	1.00	0.00
67.08	84.66	2.00	0.00	1.00	0.00	67.13	85.17	2.00	0.00	1.00	0.00
67.24	85.32	2.00	0.00	1.00	0.00	67.27	84.39	2.00	0.00	1.00	0.00
67.33	83.57	2.00	0.00	1.00	0.00	67.43	83.40	2.00	0.00	1.00	0.00
67.49	83.65	2.00	0.00	1.00	0.00	67.53	83.09	2.00	0.00	1.00	0.00
67.62	82.33	2.00	0.00	1.00	0.00	67.68	82.82	2.00	0.00	1.00	0.00
67.73	84.94	2.00	0.00	1.00	0.00	67.80	88.53	2.00	0.00	1.00	0.00
67.88	92.07	2.00	0.00	1.00	0.00	67.93	93.92	2.00	0.00	1.00	0.00
68.02	94.28	2.00	0.00	1.00	0.00	68.08	93.40	2.00	0.00	1.00	0.00
68.13	92.17	2.00	0.00	1.00	0.00	68.21	90.17	2.00	0.00	1.00	0.00
68.28	87.86	2.00	0.00	1.00	0.00	68.32	84.70	2.00	0.00	1.00	0.00
68.38	80.12	2.00	0.00	1.00	0.00	68.46	75.06	2.00	0.00	1.00	0.00
68.52	69.28	2.00	0.00	1.00	0.00	68.59	63.61	2.00	0.00	1.00	0.00
68.67	57.76	2.00	0.00	1.00	0.00	68.71	53.76	2.00	0.00	1.00	0.00
68.77	51.34	2.00	0.00	1.00	0.00	68.87	50.02	2.00	0.00	1.00	0.00
68.90	49.10	2.00	0.00	1.00	0.00	68.97	48.41	2.00	0.00	1.00	0.00
69.07	47.88	2.00	0.00	1.00	0.00	69.11	47.56	2.00	0.00	1.00	0.00
69.16	47.55	2.00	0.00	1.00	0.00	69.26	47.50	2.00	0.00	1.00	0.00
69.30	47.46	2.00	0.00	1.00	0.00	69.38	47.47	2.00	0.00	1.00	0.00
69.46	47.53	2.00	0.00	1.00	0.00	69.50	47.58	2.00	0.00	1.00	0.00
69.56	47.47	2.00	0.00	1.00	0.00	69.64	47.33	2.00	0.00	1.00	0.00
69.70	47.26	2.00	0.00	1.00	0.00	69.76	47.39	2.00	0.00	1.00	0.00
69.83	47.60	2.00	0.00	1.00	0.00	69.91	47.91	2.00	0.00	1.00	0.00
69.96	48.89	2.00	0.00	1.00	0.00	70.05	50.13	2.00	0.00	1.00	0.00
70.10	51.40	2.00	0.00	1.00	0.00	70.15	52.58	2.00	0.00	1.00	0.00
70.25	53.70	2.00	0.00	1.00	0.00	70.29	55.64	2.00	0.00	1.00	0.00
70.34	60.61	2.00	0.00	1.00	0.00	70.45	65.35	2.00	0.00	1.00	0.00
70.49	69.82	2.00	0.00	1.00	0.00	70.54	73.59	2.00	0.00	1.00	0.00
70.64	76.69	2.00	0.00	1.00	0.00	70.70	78.21	2.00	0.00	1.00	0.00
70.77	77.58	2.00	0.00	1.00	0.00	70.80	76.01	2.00	0.00	1.00	0.00
70.89	74.43	2.00	0.00	1.00	0.00	70.94	74.30	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
71.01	77.24	2.00	0.00	1.00	0.00	71.07	80.04	2.00	0.00	1.00	0.00
71.14	80.57	2.00	0.00	1.00	0.00	71.22	79.65	2.00	0.00	1.00	0.00
71.28	79.53	2.00	0.00	1.00	0.00	71.33	81.79	2.00	0.00	1.00	0.00
71.44	89.03	2.00	0.00	1.00	0.00	71.48	106.54	2.00	0.00	1.00	0.00
71.53	124.03	2.00	0.00	1.00	0.00	71.59	136.40	2.00	0.00	1.00	0.00
71.67	143.77	2.00	0.00	1.00	0.00	71.73	143.80	2.00	0.00	1.00	0.00
71.83	141.77	2.00	0.00	1.00	0.00	71.86	137.12	2.00	0.00	1.00	0.00
71.94	132.21	2.00	0.00	1.00	0.00	72.03	127.99	2.00	0.00	1.00	0.00
72.08	124.92	2.00	0.00	1.00	0.00	72.13	121.88	2.00	0.00	1.00	0.00
72.20	118.59	2.00	0.00	1.00	0.00	72.28	116.37	2.00	0.00	1.00	0.00
72.32	116.33	2.00	0.00	1.00	0.00	72.39	117.47	2.00	0.00	1.00	0.00
72.47	118.99	2.00	0.00	1.00	0.00	72.52	121.79	2.00	0.00	1.00	0.00
72.61	126.17	2.00	0.00	1.00	0.00	72.66	132.55	2.00	0.00	1.00	0.00
72.71	139.95	2.00	0.00	1.00	0.00	72.77	153.93	2.00	0.00	1.00	0.00
72.87	168.49	2.00	0.00	1.00	0.00	72.91	181.93	2.00	0.00	1.00	0.00
72.97	188.88	2.00	0.00	1.00	0.00	73.06	194.85	2.00	0.00	1.00	0.00
73.12	200.54	2.00	0.00	1.00	0.00	73.17	204.38	2.00	0.00	1.00	0.00
73.26	206.61	2.00	0.00	1.00	0.00	73.31	207.20	2.00	0.00	1.00	0.00
73.36	206.20	2.00	0.00	1.00	0.00	73.45	203.96	2.00	0.00	1.00	0.00
73.51	200.24	2.00	0.00	1.00	0.00	73.56	194.10	2.00	0.00	1.00	0.00
73.66	187.32	2.00	0.00	1.00	0.00	73.71	180.67	2.00	0.00	1.00	0.00
73.76	175.50	2.00	0.00	1.00	0.00	73.84	170.62	2.00	0.00	1.00	0.00
73.90	165.83	2.00	0.00	1.00	0.00	73.96	159.89	2.00	0.00	1.00	0.00
74.06	154.20	2.00	0.00	1.00	0.00	74.11	148.59	2.00	0.00	1.00	0.00
74.15	143.90	2.00	0.00	1.00	0.00	74.24	138.99	2.00	0.00	1.00	0.00
74.30	132.94	2.00	0.00	1.00	0.00	74.35	128.81	2.00	0.00	1.00	0.00
74.41	124.47	2.00	0.00	1.00	0.00	74.49	121.36	2.00	0.00	1.00	0.00
74.54	117.11	2.00	0.00	1.00	0.00	74.61	114.03	2.00	0.00	1.00	0.00
74.69	112.19	2.00	0.00	1.00	0.00	74.74	112.14	2.00	0.00	1.00	0.00
74.84	113.22	2.00	0.00	1.00	0.00	74.89	116.20	2.00	0.00	1.00	0.00
74.94	120.79	2.00	0.00	1.00	0.00	75.04	124.62	2.00	0.00	1.00	0.00
75.08	126.82	2.00	0.00	1.00	0.00	75.14	127.21	2.00	0.00	1.00	0.00
75.23	127.41	2.00	0.00	1.00	0.00	75.28	130.13	2.00	0.00	1.00	0.00
75.34	137.00	2.00	0.00	1.00	0.00	75.43	147.91	2.00	0.00	1.00	0.00
75.48	160.20	2.00	0.00	1.00	0.00	75.53	171.04	2.00	0.00	1.00	0.00
75.63	180.36	2.00	0.00	1.00	0.00	75.67	189.24	2.00	0.00	1.00	0.00
75.73	196.81	2.00	0.00	1.00	0.00	75.80	202.90	2.00	0.00	1.00	0.00
75.86	206.19	2.00	0.00	1.00	0.00	75.92	212.02	2.00	0.00	1.00	0.00
76.02	219.44	2.00	0.00	1.00	0.00	76.08	230.21	2.00	0.00	1.00	0.00
76.12	241.90	2.00	0.00	1.00	0.00	76.20	255.03	2.00	0.00	1.00	0.00
76.27	270.04	2.00	0.00	1.00	0.00	76.32	280.66	2.00	0.00	1.00	0.00
76.39	288.28	2.00	0.00	1.00	0.00	76.45	290.16	2.00	0.00	1.00	0.00
76.52	291.19	2.00	0.00	1.00	0.00	76.59	290.25	2.00	0.00	1.00	0.00
76.65	286.79	2.00	0.00	1.00	0.00	76.71	280.62	2.00	0.00	1.00	0.00
76.78	274.40	2.00	0.00	1.00	0.00	76.86	269.58	2.00	0.00	1.00	0.00
76.90	266.45	2.00	0.00	1.00	0.00	76.97	264.94	2.00	0.00	1.00	0.00
77.04	263.62	2.00	0.00	1.00	0.00	77.11	262.95	2.00	0.00	1.00	0.00
77.19	262.01	2.00	0.00	1.00	0.00	77.27	261.55	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
77.31	261.05	2.00	0.00	1.00	0.00	77.37	259.61	2.00	0.00	1.00	0.00
77.45	251.33	2.00	0.00	1.00	0.00	77.50	246.61	2.00	0.00	1.00	0.00
77.57	241.72	2.00	0.00	1.00	0.00	77.63	240.68	2.00	0.00	1.00	0.00
77.74	235.81	2.00	0.00	1.00	0.00	77.76	231.41	2.00	0.00	1.00	0.00
77.83	228.53	2.00	0.00	1.00	0.00	77.90	225.83	2.00	0.00	1.00	0.00
77.97	223.48	2.00	0.00	1.00	0.00	78.03	221.64	2.00	0.00	1.00	0.00
78.10	219.68	2.00	0.00	1.00	0.00	78.16	217.17	2.00	0.00	1.00	0.00
78.23	213.16	2.00	0.00	1.00	0.00	78.31	208.65	2.00	0.00	1.00	0.00
78.35	203.75	2.00	0.00	1.00	0.00	78.43	198.77	2.00	0.00	1.00	0.00
78.52	194.81	2.00	0.00	1.00	0.00	78.58	192.47	2.00	0.00	1.00	0.00
78.62	192.30	2.00	0.00	1.00	0.00	78.67	192.51	2.00	0.00	1.00	0.00
78.77	191.18	2.00	0.00	1.00	0.00	78.82	188.52	2.00	0.00	1.00	0.00
78.88	183.80	2.00	0.00	1.00	0.00	78.96	179.01	2.00	0.00	1.00	0.00
79.02	172.31	2.00	0.00	1.00	0.00	79.11	166.50	2.00	0.00	1.00	0.00
79.18	161.47	2.00	0.00	1.00	0.00	79.22	158.52	2.00	0.00	1.00	0.00
79.27	155.48	2.00	0.00	1.00	0.00	79.33	152.76	2.00	0.00	1.00	0.00
79.41	151.92	2.00	0.00	1.00	0.00	79.47	153.41	2.00	0.00	1.00	0.00
79.57	156.64	2.00	0.00	1.00	0.00	79.61	159.89	2.00	0.00	1.00	0.00
79.67	158.56	2.00	0.00	1.00	0.00	79.74	152.63	2.00	0.00	1.00	0.00
79.80	143.17	2.00	0.00	1.00	0.00	79.87	134.64	2.00	0.00	1.00	0.00
79.92	127.74	2.00	0.00	1.00	0.00	79.99	124.70	2.00	0.00	1.00	0.00
80.06	123.20	2.00	0.00	1.00	0.00	80.13	118.76	2.00	0.00	1.00	0.00
80.21	112.17	2.00	0.00	1.00	0.00	80.26	105.00	2.00	0.00	1.00	0.00
80.32	97.52	2.00	0.00	1.00	0.00	80.39	88.16	2.00	0.00	1.00	0.00
80.47	78.52	2.00	0.00	1.00	0.00	80.52	70.31	2.00	0.00	1.00	0.00
80.59	64.44	2.00	0.00	1.00	0.00	80.66	60.30	2.00	0.00	1.00	0.00
80.72	58.83	2.00	0.00	1.00	0.00	80.81	58.03	2.00	0.00	1.00	0.00
80.86	57.25	2.00	0.00	1.00	0.00	80.91	56.54	2.00	0.00	1.00	0.00
81.00	55.91	2.00	0.00	1.00	0.00	81.06	55.37	2.00	0.00	1.00	0.00
81.11	54.60	2.00	0.00	1.00	0.00	81.21	53.84	2.00	0.00	1.00	0.00
81.25	52.97	2.00	0.00	1.00	0.00	81.32	52.40	2.00	0.00	1.00	0.00
81.41	51.90	2.00	0.00	1.00	0.00	81.45	51.57	2.00	0.00	1.00	0.00
81.52	51.32	2.00	0.00	1.00	0.00	81.56	51.00	2.00	0.00	1.00	0.00
81.65	50.73	2.00	0.00	1.00	0.00	81.70	50.38	2.00	0.00	1.00	0.00
81.78	49.71	2.00	0.00	1.00	0.00	81.86	48.79	2.00	0.00	1.00	0.00
81.90	48.39	2.00	0.00	1.00	0.00	81.98	48.37	2.00	0.00	1.00	0.00
82.03	48.60	2.00	0.00	1.00	0.00	82.09	48.47	2.00	0.00	1.00	0.00
82.16	48.41	2.00	0.00	1.00	0.00	82.25	48.47	2.00	0.00	1.00	0.00
82.29	48.49	2.00	0.00	1.00	0.00	82.38	48.45	2.00	0.00	1.00	0.00
82.44	48.30	2.00	0.00	1.00	0.00	82.49	48.19	2.00	0.00	1.00	0.00
82.56	48.13	2.00	0.00	1.00	0.00	82.64	48.15	2.00	0.00	1.00	0.00
82.69	48.18	2.00	0.00	1.00	0.00	82.78	48.20	2.00	0.00	1.00	0.00
82.82	48.16	2.00	0.00	1.00	0.00	82.88	48.04	2.00	0.00	1.00	0.00
82.96	47.86	2.00	0.00	1.00	0.00	83.04	47.68	2.00	0.00	1.00	0.00
83.09	47.49	2.00	0.00	1.00	0.00	83.14	47.16	2.00	0.00	1.00	0.00
83.23	46.85	2.00	0.00	1.00	0.00	83.28	46.44	2.00	0.00	1.00	0.00
83.36	46.09	2.00	0.00	1.00	0.00	83.43	45.70	2.00	0.00	1.00	0.00
83.48	45.31	2.00	0.00	1.00	0.00	83.54	45.10	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
83.63	44.87	2.00	0.00	1.00	0.00	83.67	44.70	2.00	0.00	1.00	0.00
83.77	44.46	2.00	0.00	1.00	0.00	83.81	44.29	2.00	0.00	1.00	0.00
83.87	44.41	2.00	0.00	1.00	0.00	83.97	44.52	2.00	0.00	1.00	0.00
84.02	44.62	2.00	0.00	1.00	0.00	84.06	44.53	2.00	0.00	1.00	0.00
84.12	44.38	2.00	0.00	1.00	0.00	84.20	44.17	2.00	0.00	1.00	0.00
84.27	43.88	2.00	0.00	1.00	0.00	84.32	43.57	2.00	0.00	1.00	0.00
84.41	43.29	2.00	0.00	1.00	0.00	84.46	43.07	2.00	0.00	1.00	0.00
84.55	42.94	2.00	0.00	1.00	0.00	84.60	42.85	2.00	0.00	1.00	0.00
84.66	42.91	2.00	0.00	1.00	0.00	84.71	43.11	2.00	0.00	1.00	0.00
84.80	43.55	2.00	0.00	1.00	0.00	84.86	44.02	2.00	0.00	1.00	0.00
84.92	44.36	2.00	0.00	1.00	0.00	85.01	44.49	2.00	0.00	1.00	0.00
85.06	44.57	2.00	0.00	1.00	0.00	85.11	44.59	2.00	0.00	1.00	0.00
85.20	44.62	2.00	0.00	1.00	0.00	85.25	44.65	2.00	0.00	1.00	0.00
85.31	44.85	2.00	0.00	1.00	0.00	85.40	45.08	2.00	0.00	1.00	0.00
85.45	45.39	2.00	0.00	1.00	0.00	85.50	45.85	2.00	0.00	1.00	0.00
85.59	46.38	2.00	0.00	1.00	0.00	85.65	46.83	2.00	0.00	1.00	0.00
85.70	47.22	2.00	0.00	1.00	0.00	85.78	47.72	2.00	0.00	1.00	0.00
85.84	48.66	2.00	0.00	1.00	0.00	85.91	50.02	2.00	0.00	1.00	0.00
85.99	51.54	2.00	0.00	1.00	0.00	86.04	52.91	2.00	0.00	1.00	0.00
86.09	54.07	2.00	0.00	1.00	0.00	86.19	54.92	2.00	0.00	1.00	0.00
86.24	55.71	2.00	0.00	1.00	0.00	86.31	56.31	2.00	0.00	1.00	0.00
86.38	56.86	2.00	0.00	1.00	0.00	86.44	57.06	2.00	0.00	1.00	0.00
86.49	56.65	2.00	0.00	1.00	0.00	86.58	55.94	2.00	0.00	1.00	0.00
86.64	55.26	2.00	0.00	1.00	0.00	86.69	54.98	2.00	0.00	1.00	0.00
86.78	54.80	2.00	0.00	1.00	0.00	86.83	54.59	2.00	0.00	1.00	0.00
86.89	54.29	2.00	0.00	1.00	0.00	86.94	53.81	2.00	0.00	1.00	0.00
87.03	53.46	2.00	0.00	1.00	0.00	87.08	53.18	2.00	0.00	1.00	0.00
87.18	53.08	2.00	0.00	1.00	0.00	87.23	52.94	2.00	0.00	1.00	0.00
87.28	52.58	2.00	0.00	1.00	0.00	87.37	52.19	2.00	0.00	1.00	0.00
87.43	51.85	2.00	0.00	1.00	0.00	87.48	51.81	2.00	0.00	1.00	0.00
87.57	51.81	2.00	0.00	1.00	0.00	87.62	52.00	2.00	0.00	1.00	0.00
87.68	52.49	2.00	0.00	1.00	0.00	87.76	53.11	2.00	0.00	1.00	0.00
87.80	54.04	2.00	0.00	1.00	0.00	87.86	55.45	2.00	0.00	1.00	0.00
87.97	56.96	2.00	0.00	1.00	0.00	88.02	58.36	2.00	0.00	1.00	0.00
88.08	58.93	2.00	0.00	1.00	0.00	88.16	59.01	2.00	0.00	1.00	0.00
88.21	58.44	2.00	0.00	1.00	0.00	88.27	57.70	2.00	0.00	1.00	0.00
88.36	56.89	2.00	0.00	1.00	0.00	88.42	56.15	2.00	0.00	1.00	0.00
88.47	55.03	2.00	0.00	1.00	0.00	88.56	54.03	2.00	0.00	1.00	0.00
88.62	53.44	2.00	0.00	1.00	0.00	88.66	55.27	2.00	0.00	1.00	0.00
88.75	58.26	2.00	0.00	1.00	0.00	88.80	62.47	2.00	0.00	1.00	0.00
88.86	66.15	2.00	0.00	1.00	0.00	88.92	68.53	2.00	0.00	1.00	0.00
89.00	70.48	2.00	0.00	1.00	0.00	89.06	72.08	2.00	0.00	1.00	0.00
89.11	75.01	2.00	0.00	1.00	0.00	89.18	78.97	2.00	0.00	1.00	0.00
89.25	83.48	2.00	0.00	1.00	0.00	89.31	88.16	2.00	0.00	1.00	0.00
89.39	91.71	2.00	0.00	1.00	0.00	89.45	93.65	2.00	0.00	1.00	0.00
89.52	92.44	2.00	0.00	1.00	0.00	89.57	89.53	2.00	0.00	1.00	0.00
89.63	86.96	2.00	0.00	1.00	0.00	89.72	85.32	2.00	0.00	1.00	0.00
89.78	84.49	2.00	0.00	1.00	0.00	89.86	86.26	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
89.91	89.14	2.00	0.00	1.00	0.00	89.96	93.03	2.00	0.00	1.00	0.00
90.06	95.63	2.00	0.00	1.00	0.00	90.11	98.01	2.00	0.00	1.00	0.00
90.17	100.84	2.00	0.00	1.00	0.00	90.26	103.27	2.00	0.00	1.00	0.00
90.29	103.29	2.00	0.00	1.00	0.00	90.36	99.24	2.00	0.00	1.00	0.00
90.45	93.04	2.00	0.00	1.00	0.00	90.50	87.86	2.00	0.00	1.00	0.00
90.56	82.90	2.00	0.00	1.00	0.00	90.66	77.32	2.00	0.00	1.00	0.00
90.70	71.74	2.00	0.00	1.00	0.00	90.75	67.88	2.00	0.00	1.00	0.00
90.82	65.17	2.00	0.00	1.00	0.00	90.90	64.14	2.00	0.00	1.00	0.00
90.95	63.72	2.00	0.00	1.00	0.00	91.03	63.89	2.00	0.00	1.00	0.00
91.10	64.05	2.00	0.00	1.00	0.00	91.15	64.41	2.00	0.00	1.00	0.00
91.23	64.64	2.00	0.00	1.00	0.00	91.30	65.31	2.00	0.00	1.00	0.00
91.35	65.97	2.00	0.00	1.00	0.00	91.42	66.31	2.00	0.00	1.00	0.00
91.50	66.50	2.00	0.00	1.00	0.00	91.54	68.41	2.00	0.00	1.00	0.00
91.64	71.15	2.00	0.00	1.00	0.00	91.69	75.61	2.00	0.00	1.00	0.00
91.74	78.52	2.00	0.00	1.00	0.00	91.84	81.14	2.00	0.00	1.00	0.00
91.88	84.07	2.00	0.00	1.00	0.00	91.95	87.69	2.00	0.00	1.00	0.00
92.04	91.42	2.00	0.00	1.00	0.00	92.09	94.89	2.00	0.00	1.00	0.00
92.14	97.47	2.00	0.00	1.00	0.00	92.20	100.24	2.00	0.00	1.00	0.00
92.29	102.46	2.00	0.00	1.00	0.00	92.33	103.67	2.00	0.00	1.00	0.00
92.44	103.98	2.00	0.00	1.00	0.00	92.48	103.97	2.00	0.00	1.00	0.00
92.52	104.01	2.00	0.00	1.00	0.00	92.59	102.66	2.00	0.00	1.00	0.00
92.68	100.72	2.00	0.00	1.00	0.00	92.73	98.55	2.00	0.00	1.00	0.00
92.79	97.36	2.00	0.00	1.00	0.00	92.88	96.70	2.00	0.00	1.00	0.00
92.93	96.57	2.00	0.00	1.00	0.00	93.00	97.61	2.00	0.00	1.00	0.00
93.08	99.39	2.00	0.00	1.00	0.00	93.13	102.77	2.00	0.00	1.00	0.00
93.22	105.66	2.00	0.00	1.00	0.00	93.25	108.34	2.00	0.00	1.00	0.00
93.33	108.70	2.00	0.00	1.00	0.00	93.38	105.72	2.00	0.00	1.00	0.00
93.48	100.74	2.00	0.00	1.00	0.00	93.53	96.00	2.00	0.00	1.00	0.00
93.57	93.13	2.00	0.00	1.00	0.00	93.65	89.86	2.00	0.00	1.00	0.00
93.72	86.15	2.00	0.00	1.00	0.00	93.77	82.12	2.00	0.00	1.00	0.00
93.87	78.99	2.00	0.00	1.00	0.00	93.92	76.60	2.00	0.00	1.00	0.00
93.97	75.48	2.00	0.00	1.00	0.00	94.05	74.57	2.00	0.00	1.00	0.00
94.10	73.65	2.00	0.00	1.00	0.00	94.17	73.80	2.00	0.00	1.00	0.00
94.26	75.41	2.00	0.00	1.00	0.00	94.31	77.55	2.00	0.00	1.00	0.00
94.36	85.88	2.00	0.00	1.00	0.00	94.43	95.80	2.00	0.00	1.00	0.00
94.51	102.59	2.00	0.00	1.00	0.00	94.56	106.13	2.00	0.00	1.00	0.00
94.62	108.37	2.00	0.00	1.00	0.00	94.70	110.09	2.00	0.00	1.00	0.00
94.75	108.55	2.00	0.00	1.00	0.00	94.85	106.13	2.00	0.00	1.00	0.00
94.90	105.41	2.00	0.00	1.00	0.00	94.95	106.80	2.00	0.00	1.00	0.00
95.04	108.90	2.00	0.00	1.00	0.00	95.11	110.64	2.00	0.00	1.00	0.00
95.15	113.73	2.00	0.00	1.00	0.00	95.21	114.08	2.00	0.00	1.00	0.00
95.30	111.26	2.00	0.00	1.00	0.00	95.35	105.21	2.00	0.00	1.00	0.00
95.44	97.08	2.00	0.00	1.00	0.00	95.50	89.28	2.00	0.00	1.00	0.00
95.54	84.48	2.00	0.00	1.00	0.00	95.64	82.67	2.00	0.00	1.00	0.00
95.68	82.65	2.00	0.00	1.00	0.00	95.75	85.64	2.00	0.00	1.00	0.00
95.85	89.65	2.00	0.00	1.00	0.00	95.90	93.77	2.00	0.00	1.00	0.00
95.95	97.02	2.00	0.00	1.00	0.00	96.00	100.33	2.00	0.00	1.00	0.00
96.06	107.19	2.00	0.00	1.00	0.00	96.13	114.84	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
96.21	119.54	2.00	0.00	1.00	0.00	96.30	122.51	2.00	0.00	1.00	0.00
96.34	124.20	2.00	0.00	1.00	0.00	96.39	126.21	2.00	0.00	1.00	0.00
96.49	128.32	2.00	0.00	1.00	0.00	96.54	130.44	2.00	0.00	1.00	0.00
96.59	131.72	2.00	0.00	1.00	0.00	96.67	132.67	2.00	0.00	1.00	0.00
96.73	133.18	2.00	0.00	1.00	0.00	96.79	133.03	2.00	0.00	1.00	0.00
96.89	132.46	2.00	0.00	1.00	0.00	96.94	131.65	2.00	0.00	1.00	0.00
96.99	130.59	2.00	0.00	1.00	0.00	97.08	129.48	2.00	0.00	1.00	0.00
97.14	128.45	2.00	0.00	1.00	0.00	97.18	127.39	2.00	0.00	1.00	0.00
97.28	126.33	2.00	0.00	1.00	0.00	97.33	125.33	2.00	0.00	1.00	0.00
97.39	124.58	2.00	0.00	1.00	0.00	97.48	123.98	2.00	0.00	1.00	0.00
97.53	123.65	2.00	0.00	1.00	0.00	97.58	123.91	2.00	0.00	1.00	0.00
97.67	124.44	2.00	0.00	1.00	0.00	97.72	125.55	2.00	0.00	1.00	0.00
97.78	126.91	2.00	0.00	1.00	0.00	97.85	127.84	2.00	0.00	1.00	0.00
97.92	128.80	2.00	0.00	1.00	0.00	97.97	129.85	2.00	0.00	1.00	0.00
98.06	131.36	2.00	0.00	1.00	0.00	98.11	131.85	2.00	0.00	1.00	0.00
98.17	132.45	2.00	0.00	1.00	0.00	98.26	132.70	2.00	0.00	1.00	0.00
98.30	133.53	2.00	0.00	1.00	0.00	98.37	132.85	2.00	0.00	1.00	0.00
98.46	131.65	2.00	0.00	1.00	0.00	98.51	129.60	2.00	0.00	1.00	0.00
98.57	126.46	2.00	0.00	1.00	0.00	98.66	122.72	2.00	0.00	1.00	0.00
98.71	119.29	2.00	0.00	1.00	0.00	98.76	116.64	2.00	0.00	1.00	0.00
98.84	113.96	2.00	0.00	1.00	0.00	98.90	110.03	2.00	0.00	1.00	0.00
98.96	104.98	2.00	0.00	1.00	0.00	99.06	100.27	2.00	0.00	1.00	0.00
99.11	96.86	2.00	0.00	1.00	0.00	99.16	95.81	2.00	0.00	1.00	0.00
99.25	96.07	2.00	0.00	1.00	0.00	99.30	97.55	2.00	0.00	1.00	0.00
99.36	98.67	2.00	0.00	1.00	0.00	99.44	99.09	2.00	0.00	1.00	0.00
99.50	98.16	2.00	0.00	1.00	0.00	99.56	95.69	2.00	0.00	1.00	0.00
99.65	93.33	2.00	0.00	1.00	0.00	99.69	91.32	2.00	0.00	1.00	0.00
99.75	90.19	2.00	0.00	1.00	0.00	99.81	86.79	2.00	0.00	1.00	0.00
99.90	82.67	2.00	0.00	1.00	0.00	99.95	77.43	2.00	0.00	1.00	0.00
100.00	74.90	2.00	0.00	1.00	0.00						

Total estimated settlement: 0.82

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

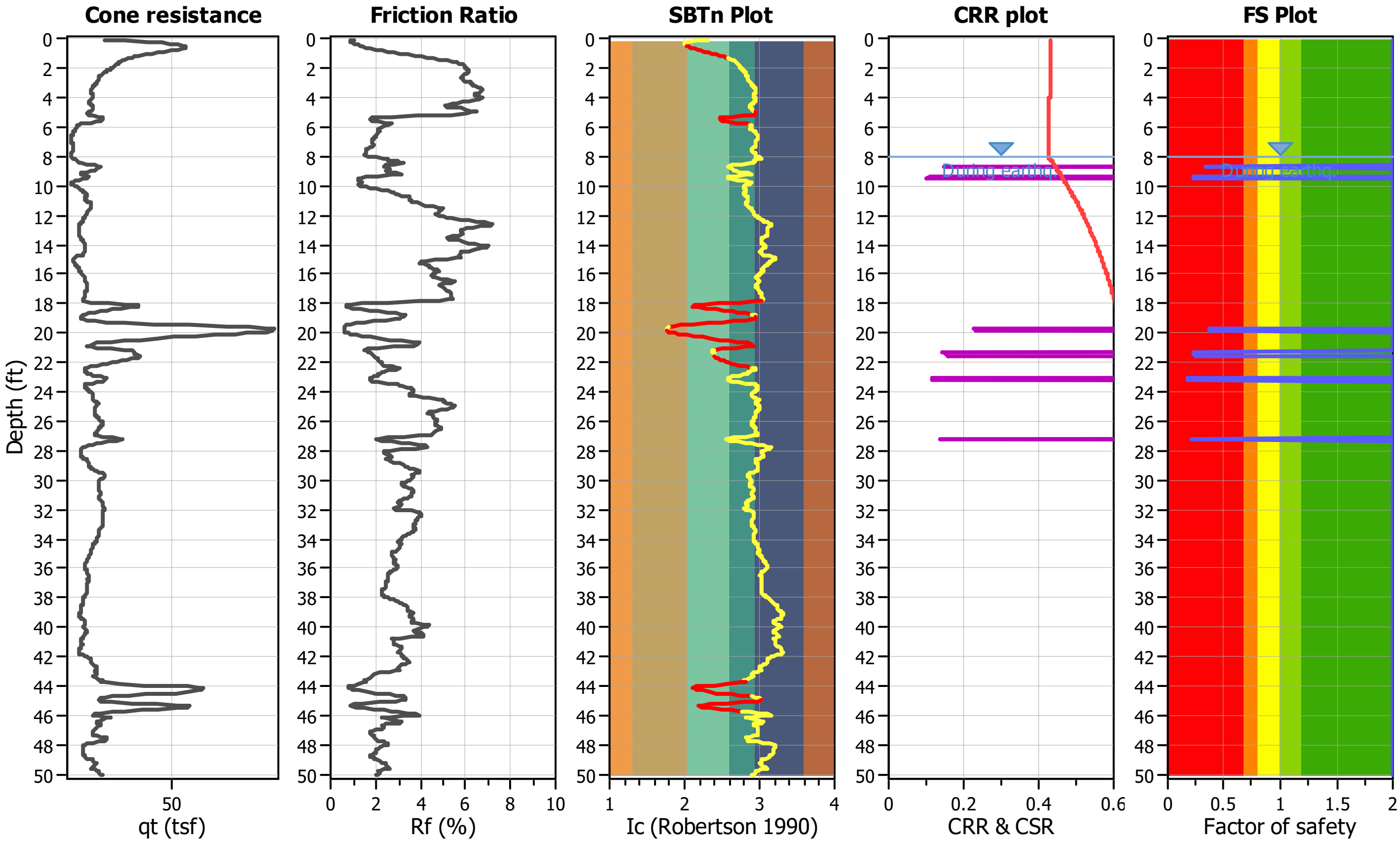
LIQUEFACTION ANALYSIS REPORT

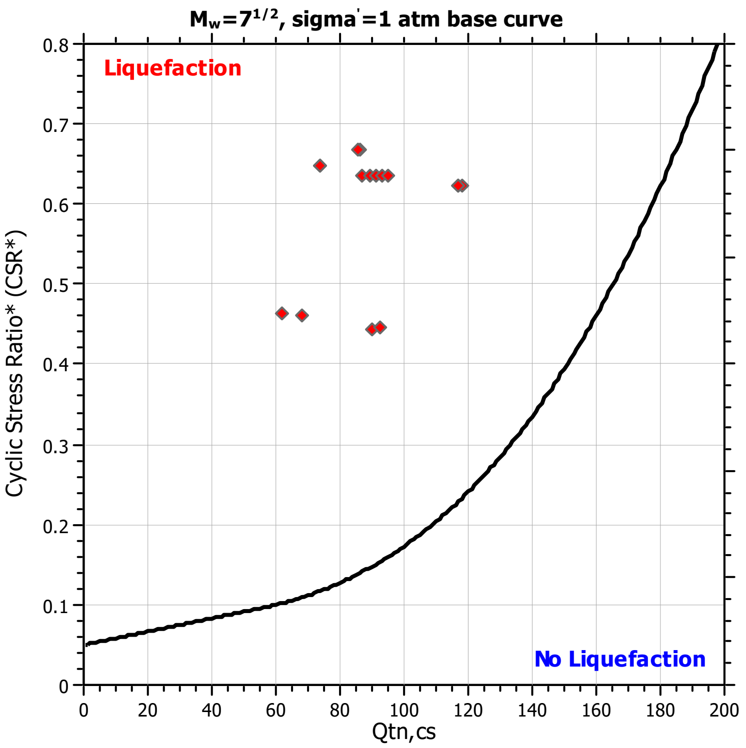
Project title : Morton Bay Geothermal Plant **Location : Calipatria, CA**

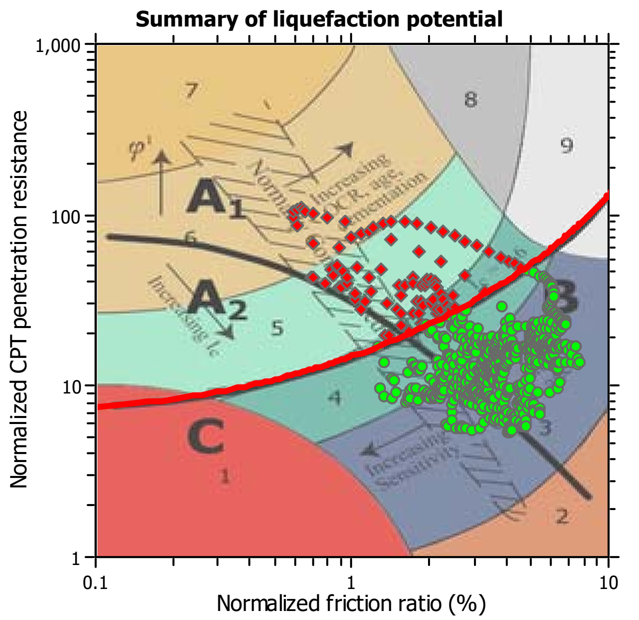
CPT file : CPT-02

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.61	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

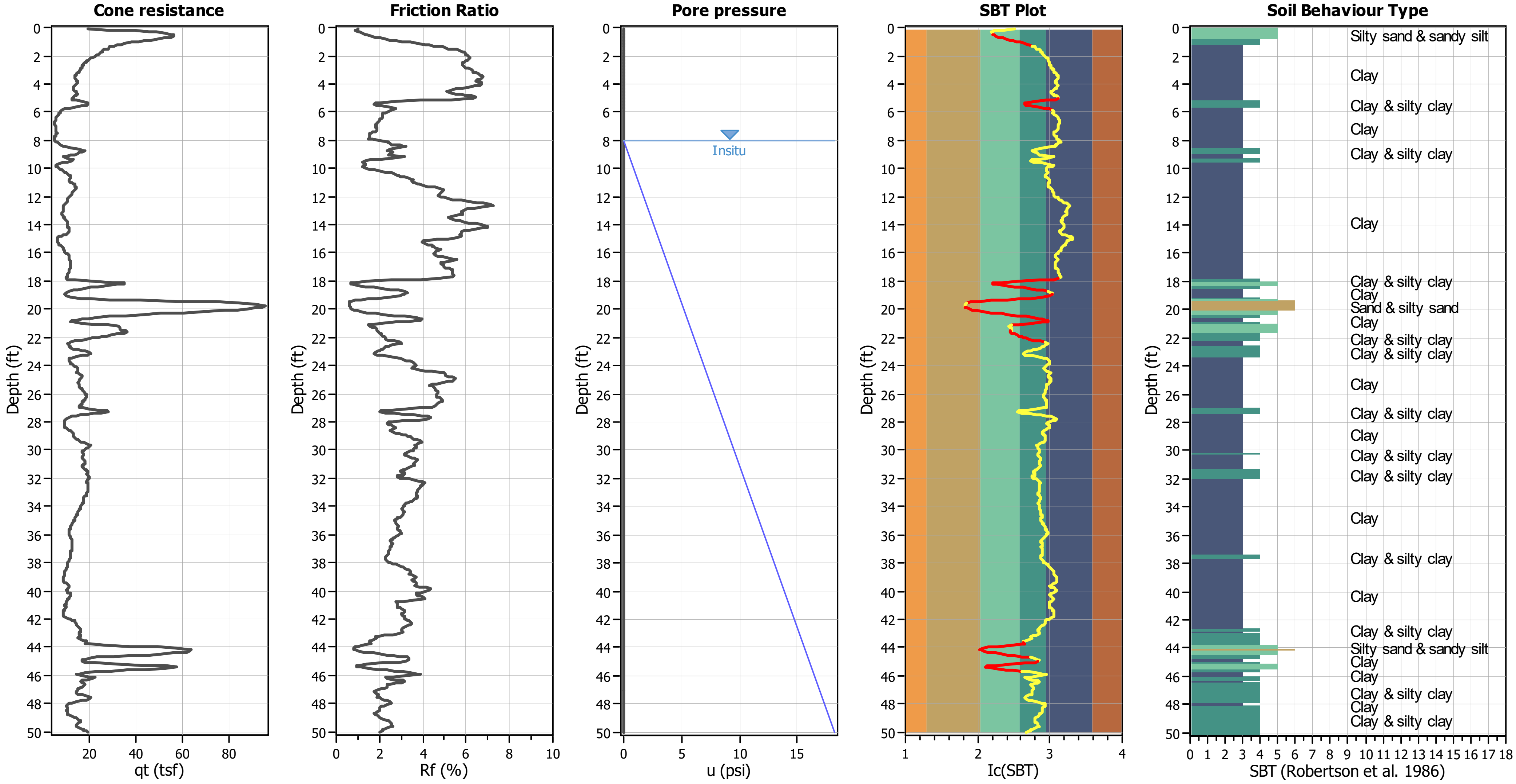






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



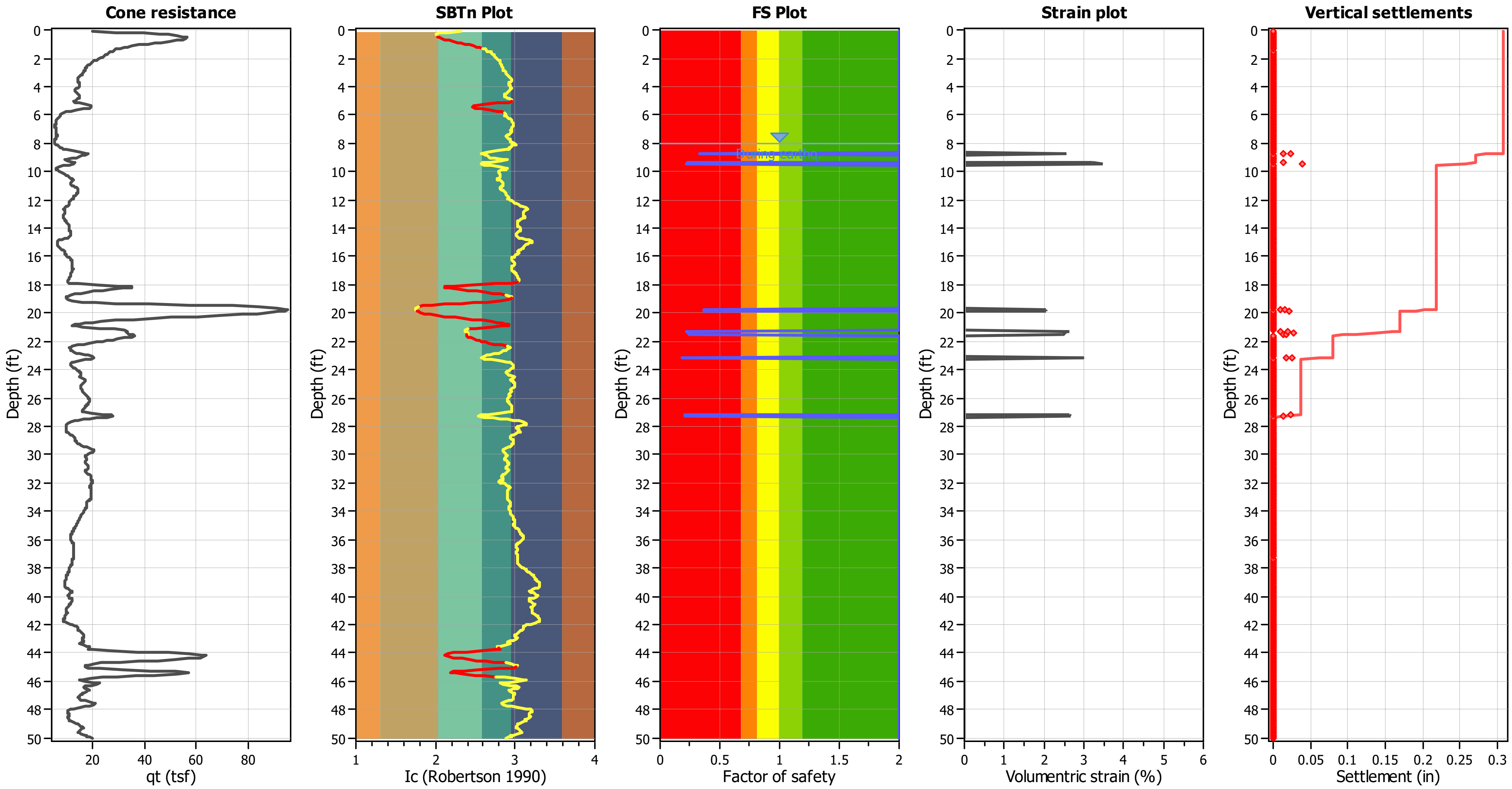
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	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:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

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)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
8.04	55.48	2.00	0.00	1.00	0.00
8.15	62.22	2.00	0.00	1.00	0.00
8.29	69.10	2.00	0.00	1.00	0.00
8.43	78.58	2.00	0.00	1.00	0.00
8.54	85.88	2.00	0.00	1.00	0.00
8.70	90.04	0.33	2.55	1.00	0.02
8.80	93.36	2.00	0.00	1.00	0.00
8.94	87.23	2.00	0.00	1.00	0.00
9.09	81.07	2.00	0.00	1.00	0.00
9.20	80.68	2.00	0.00	1.00	0.00
9.35	74.94	2.00	0.00	1.00	0.00
9.48	61.86	0.22	3.46	1.00	0.04
9.58	54.24	2.00	0.00	1.00	0.00
9.73	49.23	2.00	0.00	1.00	0.00
9.87	46.60	2.00	0.00	1.00	0.00
9.99	51.61	2.00	0.00	1.00	0.00
10.12	60.67	2.00	0.00	1.00	0.00
10.27	71.31	2.00	0.00	1.00	0.00
10.37	80.38	2.00	0.00	1.00	0.00
10.52	86.98	2.00	0.00	1.00	0.00
10.64	90.06	2.00	0.00	1.00	0.00
10.76	92.93	2.00	0.00	1.00	0.00
10.92	93.62	2.00	0.00	1.00	0.00
11.04	97.88	2.00	0.00	1.00	0.00
11.16	104.01	2.00	0.00	1.00	0.00
11.31	111.35	2.00	0.00	1.00	0.00
11.46	118.59	2.00	0.00	1.00	0.00
11.55	118.89	2.00	0.00	1.00	0.00
11.71	114.48	2.00	0.00	1.00	0.00
11.85	111.45	2.00	0.00	1.00	0.00
11.96	108.89	2.00	0.00	1.00	0.00
12.08	108.61	2.00	0.00	1.00	0.00
12.23	111.17	2.00	0.00	1.00	0.00
12.35	117.30	2.00	0.00	1.00	0.00
12.47	119.50	2.00	0.00	1.00	0.00
12.63	116.60	2.00	0.00	1.00	0.00
12.74	112.51	2.00	0.00	1.00	0.00
12.88	107.36	2.00	0.00	1.00	0.00
13.03	104.48	2.00	0.00	1.00	0.00
13.13	103.08	2.00	0.00	1.00	0.00
13.28	102.73	2.00	0.00	1.00	0.00
13.42	101.72	2.00	0.00	1.00	0.00
13.52	102.58	2.00	0.00	1.00	0.00
13.67	108.37	2.00	0.00	1.00	0.00
13.82	115.20	2.00	0.00	1.00	0.00
13.92	121.63	2.00	0.00	1.00	0.00
14.07	126.25	2.00	0.00	1.00	0.00
14.21	127.17	2.00	0.00	1.00	0.00

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
8.11	59.85	2.00	0.00	1.00	0.00
8.20	65.29	2.00	0.00	1.00	0.00
8.34	74.35	2.00	0.00	1.00	0.00
8.47	83.26	2.00	0.00	1.00	0.00
8.62	87.96	2.00	0.00	1.00	0.00
8.74	92.66	0.35	2.49	1.00	0.01
8.89	91.54	2.00	0.00	1.00	0.00
9.02	83.63	2.00	0.00	1.00	0.00
9.13	80.84	2.00	0.00	1.00	0.00
9.28	78.81	2.00	0.00	1.00	0.00
9.38	68.04	0.24	3.20	1.00	0.01
9.52	56.57	2.00	0.00	1.00	0.00
9.66	51.86	2.00	0.00	1.00	0.00
9.78	47.29	2.00	0.00	1.00	0.00
9.93	47.86	2.00	0.00	1.00	0.00
10.07	56.36	2.00	0.00	1.00	0.00
10.18	66.26	2.00	0.00	1.00	0.00
10.32	76.14	2.00	0.00	1.00	0.00
10.47	84.07	2.00	0.00	1.00	0.00
10.57	88.28	2.00	0.00	1.00	0.00
10.71	91.82	2.00	0.00	1.00	0.00
10.83	93.32	2.00	0.00	1.00	0.00
10.96	95.16	2.00	0.00	1.00	0.00
11.11	101.03	2.00	0.00	1.00	0.00
11.22	107.57	2.00	0.00	1.00	0.00
11.36	115.77	2.00	0.00	1.00	0.00
11.51	120.13	2.00	0.00	1.00	0.00
11.65	116.82	2.00	0.00	1.00	0.00
11.77	112.81	2.00	0.00	1.00	0.00
11.90	109.97	2.00	0.00	1.00	0.00
12.05	108.54	2.00	0.00	1.00	0.00
12.15	109.64	2.00	0.00	1.00	0.00
12.29	114.40	2.00	0.00	1.00	0.00
12.45	119.33	2.00	0.00	1.00	0.00
12.55	118.21	2.00	0.00	1.00	0.00
12.69	114.71	2.00	0.00	1.00	0.00
12.83	109.91	2.00	0.00	1.00	0.00
12.98	105.77	2.00	0.00	1.00	0.00
13.07	103.67	2.00	0.00	1.00	0.00
13.22	102.78	2.00	0.00	1.00	0.00
13.32	102.40	2.00	0.00	1.00	0.00
13.48	101.32	2.00	0.00	1.00	0.00
13.60	105.27	2.00	0.00	1.00	0.00
13.71	111.97	2.00	0.00	1.00	0.00
13.86	118.65	2.00	0.00	1.00	0.00
14.02	124.24	2.00	0.00	1.00	0.00
14.12	127.04	2.00	0.00	1.00	0.00
14.25	125.86	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
14.32	123.67	2.00	0.00	1.00	0.00	14.41	121.26	2.00	0.00	1.00	0.00
14.45	119.56	2.00	0.00	1.00	0.00	14.51	117.69	2.00	0.00	1.00	0.00
14.60	114.47	2.00	0.00	1.00	0.00	14.67	110.13	2.00	0.00	1.00	0.00
14.71	105.01	2.00	0.00	1.00	0.00	14.78	100.24	2.00	0.00	1.00	0.00
14.84	94.59	2.00	0.00	1.00	0.00	14.91	89.57	2.00	0.00	1.00	0.00
14.97	84.24	2.00	0.00	1.00	0.00	15.06	80.65	2.00	0.00	1.00	0.00
15.10	78.13	2.00	0.00	1.00	0.00	15.18	77.50	2.00	0.00	1.00	0.00
15.26	77.80	2.00	0.00	1.00	0.00	15.30	80.43	2.00	0.00	1.00	0.00
15.40	83.63	2.00	0.00	1.00	0.00	15.45	87.09	2.00	0.00	1.00	0.00
15.49	89.42	2.00	0.00	1.00	0.00	15.55	91.70	2.00	0.00	1.00	0.00
15.63	94.09	2.00	0.00	1.00	0.00	15.70	96.14	2.00	0.00	1.00	0.00
15.75	97.18	2.00	0.00	1.00	0.00	15.85	97.10	2.00	0.00	1.00	0.00
15.90	97.10	2.00	0.00	1.00	0.00	15.99	97.93	2.00	0.00	1.00	0.00
16.05	99.63	2.00	0.00	1.00	0.00	16.09	101.41	2.00	0.00	1.00	0.00
16.16	103.68	2.00	0.00	1.00	0.00	16.24	105.91	2.00	0.00	1.00	0.00
16.29	108.72	2.00	0.00	1.00	0.00	16.36	111.61	2.00	0.00	1.00	0.00
16.45	114.11	2.00	0.00	1.00	0.00	16.49	114.98	2.00	0.00	1.00	0.00
16.55	112.90	2.00	0.00	1.00	0.00	16.64	109.76	2.00	0.00	1.00	0.00
16.69	107.94	2.00	0.00	1.00	0.00	16.75	108.52	2.00	0.00	1.00	0.00
16.84	109.86	2.00	0.00	1.00	0.00	16.88	110.51	2.00	0.00	1.00	0.00
16.93	110.64	2.00	0.00	1.00	0.00	17.03	110.52	2.00	0.00	1.00	0.00
17.08	110.70	2.00	0.00	1.00	0.00	17.14	110.93	2.00	0.00	1.00	0.00
17.23	110.98	2.00	0.00	1.00	0.00	17.26	110.79	2.00	0.00	1.00	0.00
17.33	109.85	2.00	0.00	1.00	0.00	17.41	108.87	2.00	0.00	1.00	0.00
17.47	108.33	2.00	0.00	1.00	0.00	17.53	107.69	2.00	0.00	1.00	0.00
17.61	106.88	2.00	0.00	1.00	0.00	17.68	105.70	2.00	0.00	1.00	0.00
17.73	103.89	2.00	0.00	1.00	0.00	17.79	99.09	2.00	0.00	1.00	0.00
17.88	92.51	2.00	0.00	1.00	0.00	17.92	81.97	2.00	0.00	1.00	0.00
17.98	71.32	2.00	0.00	1.00	0.00	18.07	65.61	2.00	0.00	1.00	0.00
18.15	65.00	2.00	0.00	1.00	0.00	18.18	64.31	2.00	0.00	1.00	0.00
18.26	63.84	2.00	0.00	1.00	0.00	18.32	66.35	2.00	0.00	1.00	0.00
18.41	70.87	2.00	0.00	1.00	0.00	18.44	77.02	2.00	0.00	1.00	0.00
18.52	80.86	2.00	0.00	1.00	0.00	18.61	83.91	2.00	0.00	1.00	0.00
18.66	84.90	2.00	0.00	1.00	0.00	18.71	84.36	2.00	0.00	1.00	0.00
18.79	82.87	2.00	0.00	1.00	0.00	18.86	80.70	2.00	0.00	1.00	0.00
18.91	78.70	2.00	0.00	1.00	0.00	18.97	77.74	2.00	0.00	1.00	0.00
19.06	77.35	2.00	0.00	1.00	0.00	19.11	76.39	2.00	0.00	1.00	0.00
19.21	73.75	2.00	0.00	1.00	0.00	19.26	71.40	2.00	0.00	1.00	0.00
19.30	70.92	2.00	0.00	1.00	0.00	19.36	74.98	2.00	0.00	1.00	0.00
19.45	84.84	2.00	0.00	1.00	0.00	19.50	97.45	2.00	0.00	1.00	0.00
19.56	106.45	2.00	0.00	1.00	0.00	19.65	113.18	2.00	0.00	1.00	0.00
19.71	116.62	0.37	2.06	1.00	0.02	19.76	117.98	0.37	2.04	1.00	0.01
19.84	117.11	0.37	2.05	1.00	0.02	19.90	115.32	2.00	0.00	1.00	0.00
19.95	113.23	2.00	0.00	1.00	0.00	20.02	111.25	2.00	0.00	1.00	0.00
20.10	109.75	2.00	0.00	1.00	0.00	20.15	107.57	2.00	0.00	1.00	0.00
20.24	106.91	2.00	0.00	1.00	0.00	20.29	108.43	2.00	0.00	1.00	0.00
20.38	111.02	2.00	0.00	1.00	0.00	20.44	114.56	2.00	0.00	1.00	0.00
20.49	116.48	2.00	0.00	1.00	0.00	20.58	115.77	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
20.65	112.03	2.00	0.00	1.00	0.00	20.69	106.37	2.00	0.00	1.00	0.00
20.75	99.74	2.00	0.00	1.00	0.00	20.84	92.33	2.00	0.00	1.00	0.00
20.89	86.48	2.00	0.00	1.00	0.00	20.93	81.72	2.00	0.00	1.00	0.00
21.03	76.68	2.00	0.00	1.00	0.00	21.08	75.01	2.00	0.00	1.00	0.00
21.15	77.95	2.00	0.00	1.00	0.00	21.23	83.12	2.00	0.00	1.00	0.00
21.27	86.96	0.22	2.62	1.00	0.01	21.33	89.36	0.23	2.56	1.00	0.02
21.42	91.23	0.24	2.52	1.00	0.03	21.48	92.92	0.24	2.48	1.00	0.02
21.53	94.97	0.25	2.44	1.00	0.01	21.62	96.80	2.00	0.00	1.00	0.00
21.68	97.21	2.00	0.00	1.00	0.00	21.73	95.40	2.00	0.00	1.00	0.00
21.82	93.22	2.00	0.00	1.00	0.00	21.88	91.29	2.00	0.00	1.00	0.00
21.92	90.42	2.00	0.00	1.00	0.00	22.02	88.86	2.00	0.00	1.00	0.00
22.07	85.91	2.00	0.00	1.00	0.00	22.14	83.17	2.00	0.00	1.00	0.00
22.22	81.07	2.00	0.00	1.00	0.00	22.26	80.65	2.00	0.00	1.00	0.00
22.32	79.81	2.00	0.00	1.00	0.00	22.42	78.21	2.00	0.00	1.00	0.00
22.45	75.78	2.00	0.00	1.00	0.00	22.52	73.13	2.00	0.00	1.00	0.00
22.61	70.99	2.00	0.00	1.00	0.00	22.66	69.94	2.00	0.00	1.00	0.00
22.71	70.31	2.00	0.00	1.00	0.00	22.80	71.32	2.00	0.00	1.00	0.00
22.86	72.94	2.00	0.00	1.00	0.00	22.91	74.59	2.00	0.00	1.00	0.00
22.98	75.00	2.00	0.00	1.00	0.00	23.06	74.60	2.00	0.00	1.00	0.00
23.11	73.86	0.18	3.00	1.00	0.02	23.18	73.90	0.18	2.99	1.00	0.03
23.26	74.57	2.00	0.00	1.00	0.00	23.30	76.51	2.00	0.00	1.00	0.00
23.41	78.12	2.00	0.00	1.00	0.00	23.45	78.76	2.00	0.00	1.00	0.00
23.51	77.98	2.00	0.00	1.00	0.00	23.59	77.67	2.00	0.00	1.00	0.00
23.63	78.92	2.00	0.00	1.00	0.00	23.70	81.51	2.00	0.00	1.00	0.00
23.77	84.41	2.00	0.00	1.00	0.00	23.85	86.55	2.00	0.00	1.00	0.00
23.90	88.28	2.00	0.00	1.00	0.00	23.96	89.93	2.00	0.00	1.00	0.00
24.05	91.31	2.00	0.00	1.00	0.00	24.10	91.86	2.00	0.00	1.00	0.00
24.15	91.66	2.00	0.00	1.00	0.00	24.24	92.44	2.00	0.00	1.00	0.00
24.31	95.39	2.00	0.00	1.00	0.00	24.40	99.05	2.00	0.00	1.00	0.00
24.44	102.61	2.00	0.00	1.00	0.00	24.49	105.14	2.00	0.00	1.00	0.00
24.55	108.10	2.00	0.00	1.00	0.00	24.63	110.74	2.00	0.00	1.00	0.00
24.68	113.68	2.00	0.00	1.00	0.00	24.77	115.81	2.00	0.00	1.00	0.00
24.83	117.40	2.00	0.00	1.00	0.00	24.88	117.48	2.00	0.00	1.00	0.00
24.96	116.69	2.00	0.00	1.00	0.00	25.02	115.09	2.00	0.00	1.00	0.00
25.07	112.99	2.00	0.00	1.00	0.00	25.14	110.53	2.00	0.00	1.00	0.00
25.22	107.48	2.00	0.00	1.00	0.00	25.30	104.72	2.00	0.00	1.00	0.00
25.37	102.64	2.00	0.00	1.00	0.00	25.41	102.03	2.00	0.00	1.00	0.00
25.47	103.07	2.00	0.00	1.00	0.00	25.56	104.48	2.00	0.00	1.00	0.00
25.61	105.82	2.00	0.00	1.00	0.00	25.67	106.94	2.00	0.00	1.00	0.00
25.75	108.41	2.00	0.00	1.00	0.00	25.82	110.00	2.00	0.00	1.00	0.00
25.86	111.10	2.00	0.00	1.00	0.00	25.94	111.59	2.00	0.00	1.00	0.00
26.01	111.94	2.00	0.00	1.00	0.00	26.06	112.36	2.00	0.00	1.00	0.00
26.16	112.67	2.00	0.00	1.00	0.00	26.21	113.03	2.00	0.00	1.00	0.00
26.26	113.29	2.00	0.00	1.00	0.00	26.36	113.33	2.00	0.00	1.00	0.00
26.41	113.15	2.00	0.00	1.00	0.00	26.47	112.61	2.00	0.00	1.00	0.00
26.51	111.46	2.00	0.00	1.00	0.00	26.60	109.70	2.00	0.00	1.00	0.00
26.68	107.56	2.00	0.00	1.00	0.00	26.75	105.90	2.00	0.00	1.00	0.00
26.80	104.80	2.00	0.00	1.00	0.00	26.86	103.30	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
26.95	101.56	2.00	0.00	1.00	0.00	26.98	98.50	2.00	0.00	1.00	0.00
27.05	94.83	2.00	0.00	1.00	0.00	27.13	89.61	2.00	0.00	1.00	0.00
27.20	86.24	0.21	2.64	1.00	0.02	27.25	85.37	0.21	2.66	1.00	0.01
27.35	86.97	2.00	0.00	1.00	0.00	27.40	89.37	2.00	0.00	1.00	0.00
27.45	91.37	2.00	0.00	1.00	0.00	27.50	92.02	2.00	0.00	1.00	0.00
27.59	91.63	2.00	0.00	1.00	0.00	27.63	89.46	2.00	0.00	1.00	0.00
27.69	86.09	2.00	0.00	1.00	0.00	27.78	80.96	2.00	0.00	1.00	0.00
27.85	75.50	2.00	0.00	1.00	0.00	27.89	69.61	2.00	0.00	1.00	0.00
27.98	64.92	2.00	0.00	1.00	0.00	28.04	62.49	2.00	0.00	1.00	0.00
28.09	61.93	2.00	0.00	1.00	0.00	28.18	62.64	2.00	0.00	1.00	0.00
28.24	63.38	2.00	0.00	1.00	0.00	28.33	64.86	2.00	0.00	1.00	0.00
28.39	66.09	2.00	0.00	1.00	0.00	28.43	67.03	2.00	0.00	1.00	0.00
28.50	67.16	2.00	0.00	1.00	0.00	28.58	67.15	2.00	0.00	1.00	0.00
28.62	68.95	2.00	0.00	1.00	0.00	28.69	71.47	2.00	0.00	1.00	0.00
28.78	74.16	2.00	0.00	1.00	0.00	28.83	75.77	2.00	0.00	1.00	0.00
28.88	77.68	2.00	0.00	1.00	0.00	28.96	79.53	2.00	0.00	1.00	0.00
29.02	80.86	2.00	0.00	1.00	0.00	29.07	82.20	2.00	0.00	1.00	0.00
29.18	83.42	2.00	0.00	1.00	0.00	29.22	85.47	2.00	0.00	1.00	0.00
29.28	88.71	2.00	0.00	1.00	0.00	29.37	92.42	2.00	0.00	1.00	0.00
29.43	95.45	2.00	0.00	1.00	0.00	29.47	97.12	2.00	0.00	1.00	0.00
29.56	98.07	2.00	0.00	1.00	0.00	29.62	99.05	2.00	0.00	1.00	0.00
29.67	99.51	2.00	0.00	1.00	0.00	29.76	99.32	2.00	0.00	1.00	0.00
29.82	98.14	2.00	0.00	1.00	0.00	29.87	96.29	2.00	0.00	1.00	0.00
29.94	94.06	2.00	0.00	1.00	0.00	30.02	91.98	2.00	0.00	1.00	0.00
30.07	89.93	2.00	0.00	1.00	0.00	30.14	88.19	2.00	0.00	1.00	0.00
30.21	86.92	2.00	0.00	1.00	0.00	30.25	86.68	2.00	0.00	1.00	0.00
30.36	86.96	2.00	0.00	1.00	0.00	30.40	87.79	2.00	0.00	1.00	0.00
30.47	88.89	2.00	0.00	1.00	0.00	30.56	90.01	2.00	0.00	1.00	0.00
30.59	91.53	2.00	0.00	1.00	0.00	30.65	92.77	2.00	0.00	1.00	0.00
30.71	93.82	2.00	0.00	1.00	0.00	30.79	94.06	2.00	0.00	1.00	0.00
30.86	93.74	2.00	0.00	1.00	0.00	30.94	93.16	2.00	0.00	1.00	0.00
31.00	92.52	2.00	0.00	1.00	0.00	31.05	91.58	2.00	0.00	1.00	0.00
31.13	90.27	2.00	0.00	1.00	0.00	31.20	88.76	2.00	0.00	1.00	0.00
31.24	87.72	2.00	0.00	1.00	0.00	31.35	87.09	2.00	0.00	1.00	0.00
31.40	86.73	2.00	0.00	1.00	0.00	31.45	86.46	2.00	0.00	1.00	0.00
31.50	86.90	2.00	0.00	1.00	0.00	31.60	87.81	2.00	0.00	1.00	0.00
31.65	88.90	2.00	0.00	1.00	0.00	31.69	88.96	2.00	0.00	1.00	0.00
31.76	88.09	2.00	0.00	1.00	0.00	31.84	84.87	2.00	0.00	1.00	0.00
31.89	84.97	2.00	0.00	1.00	0.00	31.99	86.72	2.00	0.00	1.00	0.00
32.03	91.67	2.00	0.00	1.00	0.00	32.09	94.48	2.00	0.00	1.00	0.00
32.19	96.66	2.00	0.00	1.00	0.00	32.24	98.00	2.00	0.00	1.00	0.00
32.28	98.81	2.00	0.00	1.00	0.00	32.35	98.93	2.00	0.00	1.00	0.00
32.43	98.75	2.00	0.00	1.00	0.00	32.50	98.19	2.00	0.00	1.00	0.00
32.58	97.71	2.00	0.00	1.00	0.00	32.63	97.29	2.00	0.00	1.00	0.00
32.69	96.92	2.00	0.00	1.00	0.00	32.78	96.48	2.00	0.00	1.00	0.00
32.82	96.13	2.00	0.00	1.00	0.00	32.89	95.66	2.00	0.00	1.00	0.00
32.97	95.13	2.00	0.00	1.00	0.00	33.02	94.44	2.00	0.00	1.00	0.00
33.11	93.86	2.00	0.00	1.00	0.00	33.17	93.42	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
33.22	93.11	2.00	0.00	1.00	0.00	33.27	92.61	2.00	0.00	1.00	0.00
33.34	91.84	2.00	0.00	1.00	0.00	33.42	91.10	2.00	0.00	1.00	0.00
33.47	90.27	2.00	0.00	1.00	0.00	33.56	89.40	2.00	0.00	1.00	0.00
33.62	88.39	2.00	0.00	1.00	0.00	33.67	87.07	2.00	0.00	1.00	0.00
33.75	85.65	2.00	0.00	1.00	0.00	33.79	84.19	2.00	0.00	1.00	0.00
33.86	82.99	2.00	0.00	1.00	0.00	33.95	82.01	2.00	0.00	1.00	0.00
34.00	81.12	2.00	0.00	1.00	0.00	34.06	80.31	2.00	0.00	1.00	0.00
34.16	79.50	2.00	0.00	1.00	0.00	34.21	79.00	2.00	0.00	1.00	0.00
34.27	78.72	2.00	0.00	1.00	0.00	34.36	78.55	2.00	0.00	1.00	0.00
34.39	78.37	2.00	0.00	1.00	0.00	34.46	78.02	2.00	0.00	1.00	0.00
34.55	77.41	2.00	0.00	1.00	0.00	34.60	76.51	2.00	0.00	1.00	0.00
34.67	75.20	2.00	0.00	1.00	0.00	34.76	73.88	2.00	0.00	1.00	0.00
34.80	72.66	2.00	0.00	1.00	0.00	34.89	71.98	2.00	0.00	1.00	0.00
34.91	71.23	2.00	0.00	1.00	0.00	35.00	70.52	2.00	0.00	1.00	0.00
35.05	69.90	2.00	0.00	1.00	0.00	35.12	69.54	2.00	0.00	1.00	0.00
35.20	69.22	2.00	0.00	1.00	0.00	35.25	68.97	2.00	0.00	1.00	0.00
35.34	68.82	2.00	0.00	1.00	0.00	35.38	68.79	2.00	0.00	1.00	0.00
35.45	68.46	2.00	0.00	1.00	0.00	35.52	67.78	2.00	0.00	1.00	0.00
35.59	67.04	2.00	0.00	1.00	0.00	35.64	66.48	2.00	0.00	1.00	0.00
35.73	66.23	2.00	0.00	1.00	0.00	35.77	66.56	2.00	0.00	1.00	0.00
35.84	66.83	2.00	0.00	1.00	0.00	35.91	67.10	2.00	0.00	1.00	0.00
35.97	66.97	2.00	0.00	1.00	0.00	36.04	66.69	2.00	0.00	1.00	0.00
36.13	66.40	2.00	0.00	1.00	0.00	36.19	66.19	2.00	0.00	1.00	0.00
36.23	66.04	2.00	0.00	1.00	0.00	36.32	65.83	2.00	0.00	1.00	0.00
36.38	65.47	2.00	0.00	1.00	0.00	36.43	65.50	2.00	0.00	1.00	0.00
36.53	65.63	2.00	0.00	1.00	0.00	36.55	65.89	2.00	0.00	1.00	0.00
36.63	65.97	2.00	0.00	1.00	0.00	36.68	65.90	2.00	0.00	1.00	0.00
36.77	65.70	2.00	0.00	1.00	0.00	36.82	65.48	2.00	0.00	1.00	0.00
36.90	65.15	2.00	0.00	1.00	0.00	36.97	64.76	2.00	0.00	1.00	0.00
37.02	64.30	2.00	0.00	1.00	0.00	37.12	63.91	2.00	0.00	1.00	0.00
37.17	63.68	2.00	0.00	1.00	0.00	37.21	63.44	2.00	0.00	1.00	0.00
37.32	63.18	2.00	0.00	1.00	0.00	37.37	62.78	2.00	0.00	1.00	0.00
37.44	62.31	2.00	0.00	1.00	0.00	37.47	61.74	2.00	0.00	1.00	0.00
37.56	61.35	2.00	0.00	1.00	0.00	37.61	60.97	2.00	0.00	1.00	0.00
37.71	60.71	2.00	0.00	1.00	0.00	37.75	60.41	2.00	0.00	1.00	0.00
37.82	60.16	2.00	0.00	1.00	0.00	37.86	59.90	2.00	0.00	1.00	0.00
37.94	59.85	2.00	0.00	1.00	0.00	38.00	60.18	2.00	0.00	1.00	0.00
38.06	61.13	2.00	0.00	1.00	0.00	38.13	62.17	2.00	0.00	1.00	0.00
38.20	63.23	2.00	0.00	1.00	0.00	38.26	63.94	2.00	0.00	1.00	0.00
38.34	64.28	2.00	0.00	1.00	0.00	38.41	64.40	2.00	0.00	1.00	0.00
38.50	64.38	2.00	0.00	1.00	0.00	38.55	64.48	2.00	0.00	1.00	0.00
38.60	64.47	2.00	0.00	1.00	0.00	38.65	64.34	2.00	0.00	1.00	0.00
38.73	63.93	2.00	0.00	1.00	0.00	38.80	63.53	2.00	0.00	1.00	0.00
38.85	63.25	2.00	0.00	1.00	0.00	38.93	63.43	2.00	0.00	1.00	0.00
39.00	63.51	2.00	0.00	1.00	0.00	39.04	63.08	2.00	0.00	1.00	0.00
39.15	62.24	2.00	0.00	1.00	0.00	39.19	61.52	2.00	0.00	1.00	0.00
39.28	61.94	2.00	0.00	1.00	0.00	39.34	63.06	2.00	0.00	1.00	0.00
39.39	64.93	2.00	0.00	1.00	0.00	39.45	67.22	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
39.54	69.43	2.00	0.00	1.00	0.00	39.59	70.35	2.00	0.00	1.00	0.00
39.65	71.07	2.00	0.00	1.00	0.00	39.73	72.40	2.00	0.00	1.00	0.00
39.78	73.82	2.00	0.00	1.00	0.00	39.84	73.72	2.00	0.00	1.00	0.00
39.92	72.25	2.00	0.00	1.00	0.00	39.96	70.80	2.00	0.00	1.00	0.00
40.03	70.61	2.00	0.00	1.00	0.00	40.14	70.70	2.00	0.00	1.00	0.00
40.19	71.27	2.00	0.00	1.00	0.00	40.23	71.97	2.00	0.00	1.00	0.00
40.33	72.78	2.00	0.00	1.00	0.00	40.38	73.53	2.00	0.00	1.00	0.00
40.43	73.34	2.00	0.00	1.00	0.00	40.53	72.75	2.00	0.00	1.00	0.00
40.57	71.14	2.00	0.00	1.00	0.00	40.64	66.59	2.00	0.00	1.00	0.00
40.73	62.26	2.00	0.00	1.00	0.00	40.77	58.82	2.00	0.00	1.00	0.00
40.83	59.03	2.00	0.00	1.00	0.00	40.93	58.74	2.00	0.00	1.00	0.00
40.96	58.45	2.00	0.00	1.00	0.00	41.02	58.48	2.00	0.00	1.00	0.00
41.08	58.89	2.00	0.00	1.00	0.00	41.16	59.47	2.00	0.00	1.00	0.00
41.21	59.83	2.00	0.00	1.00	0.00	41.29	59.74	2.00	0.00	1.00	0.00
41.34	59.45	2.00	0.00	1.00	0.00	41.41	58.99	2.00	0.00	1.00	0.00
41.49	58.22	2.00	0.00	1.00	0.00	41.55	57.38	2.00	0.00	1.00	0.00
41.61	56.74	2.00	0.00	1.00	0.00	41.70	56.43	2.00	0.00	1.00	0.00
41.75	56.79	2.00	0.00	1.00	0.00	41.80	58.39	2.00	0.00	1.00	0.00
41.87	61.56	2.00	0.00	1.00	0.00	41.95	64.67	2.00	0.00	1.00	0.00
42.00	67.64	2.00	0.00	1.00	0.00	42.08	70.05	2.00	0.00	1.00	0.00
42.15	72.47	2.00	0.00	1.00	0.00	42.24	73.96	2.00	0.00	1.00	0.00
42.26	74.67	2.00	0.00	1.00	0.00	42.35	74.69	2.00	0.00	1.00	0.00
42.39	74.62	2.00	0.00	1.00	0.00	42.46	74.37	2.00	0.00	1.00	0.00
42.55	74.10	2.00	0.00	1.00	0.00	42.59	74.15	2.00	0.00	1.00	0.00
42.70	74.45	2.00	0.00	1.00	0.00	42.74	74.85	2.00	0.00	1.00	0.00
42.79	75.03	2.00	0.00	1.00	0.00	42.89	74.95	2.00	0.00	1.00	0.00
42.94	74.48	2.00	0.00	1.00	0.00	42.98	72.29	2.00	0.00	1.00	0.00
43.09	69.73	2.00	0.00	1.00	0.00	43.11	65.54	2.00	0.00	1.00	0.00
43.19	62.17	2.00	0.00	1.00	0.00	43.28	59.09	2.00	0.00	1.00	0.00
43.34	58.42	2.00	0.00	1.00	0.00	43.38	58.98	2.00	0.00	1.00	0.00
43.47	59.32	2.00	0.00	1.00	0.00	43.54	59.30	2.00	0.00	1.00	0.00
43.59	59.10	2.00	0.00	1.00	0.00	43.68	59.17	2.00	0.00	1.00	0.00
43.73	59.29	2.00	0.00	1.00	0.00	43.78	59.98	2.00	0.00	1.00	0.00
43.86	60.80	2.00	0.00	1.00	0.00	43.93	62.39	2.00	0.00	1.00	0.00
43.98	65.51	2.00	0.00	1.00	0.00	44.04	69.17	2.00	0.00	1.00	0.00
44.13	72.11	2.00	0.00	1.00	0.00	44.17	74.10	2.00	0.00	1.00	0.00
44.23	77.84	2.00	0.00	1.00	0.00	44.32	83.31	2.00	0.00	1.00	0.00
44.37	90.38	2.00	0.00	1.00	0.00	44.47	94.95	2.00	0.00	1.00	0.00
44.52	97.52	2.00	0.00	1.00	0.00	44.56	95.87	2.00	0.00	1.00	0.00
44.66	92.69	2.00	0.00	1.00	0.00	44.71	88.17	2.00	0.00	1.00	0.00
44.77	83.74	2.00	0.00	1.00	0.00	44.84	80.18	2.00	0.00	1.00	0.00
44.89	78.04	2.00	0.00	1.00	0.00	44.96	76.61	2.00	0.00	1.00	0.00
45.05	75.07	2.00	0.00	1.00	0.00	45.08	71.91	2.00	0.00	1.00	0.00
45.16	68.06	2.00	0.00	1.00	0.00	45.26	66.11	2.00	0.00	1.00	0.00
45.30	68.28	2.00	0.00	1.00	0.00	45.36	71.55	2.00	0.00	1.00	0.00
45.41	76.63	2.00	0.00	1.00	0.00	45.51	81.81	2.00	0.00	1.00	0.00
45.55	87.04	2.00	0.00	1.00	0.00	45.63	88.94	2.00	0.00	1.00	0.00
45.67	87.77	2.00	0.00	1.00	0.00	45.76	84.50	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
45.83	80.65	2.00	0.00	1.00	0.00	45.90	78.24	2.00	0.00	1.00	0.00
45.95	77.25	2.00	0.00	1.00	0.00	46.00	76.41	2.00	0.00	1.00	0.00
46.10	74.71	2.00	0.00	1.00	0.00	46.14	72.84	2.00	0.00	1.00	0.00
46.20	73.01	2.00	0.00	1.00	0.00	46.30	73.64	2.00	0.00	1.00	0.00
46.35	74.29	2.00	0.00	1.00	0.00	46.40	74.12	2.00	0.00	1.00	0.00
46.49	73.25	2.00	0.00	1.00	0.00	46.55	71.75	2.00	0.00	1.00	0.00
46.59	69.94	2.00	0.00	1.00	0.00	46.67	68.32	2.00	0.00	1.00	0.00
46.74	66.98	2.00	0.00	1.00	0.00	46.79	66.01	2.00	0.00	1.00	0.00
46.86	64.80	2.00	0.00	1.00	0.00	46.94	62.95	2.00	0.00	1.00	0.00
46.99	60.12	2.00	0.00	1.00	0.00	47.05	57.08	2.00	0.00	1.00	0.00
47.14	55.13	2.00	0.00	1.00	0.00	47.18	55.44	2.00	0.00	1.00	0.00
47.29	56.78	2.00	0.00	1.00	0.00	47.33	58.62	2.00	0.00	1.00	0.00
47.39	60.56	2.00	0.00	1.00	0.00	47.47	62.88	2.00	0.00	1.00	0.00
47.53	65.00	2.00	0.00	1.00	0.00	47.59	66.55	2.00	0.00	1.00	0.00
47.68	67.31	2.00	0.00	1.00	0.00	47.73	67.19	2.00	0.00	1.00	0.00
47.78	66.05	2.00	0.00	1.00	0.00	47.87	63.51	2.00	0.00	1.00	0.00
47.93	60.08	2.00	0.00	1.00	0.00	47.98	56.22	2.00	0.00	1.00	0.00
48.08	53.56	2.00	0.00	1.00	0.00	48.13	51.51	2.00	0.00	1.00	0.00
48.22	50.83	2.00	0.00	1.00	0.00	48.28	50.65	2.00	0.00	1.00	0.00
48.32	50.73	2.00	0.00	1.00	0.00	48.36	50.83	2.00	0.00	1.00	0.00
48.48	50.65	2.00	0.00	1.00	0.00	48.53	49.98	2.00	0.00	1.00	0.00
48.59	49.40	2.00	0.00	1.00	0.00	48.65	49.10	2.00	0.00	1.00	0.00
48.70	49.13	2.00	0.00	1.00	0.00	48.80	49.34	2.00	0.00	1.00	0.00
48.84	50.99	2.00	0.00	1.00	0.00	48.90	53.51	2.00	0.00	1.00	0.00
48.98	55.93	2.00	0.00	1.00	0.00	49.02	57.77	2.00	0.00	1.00	0.00
49.10	59.98	2.00	0.00	1.00	0.00	49.19	62.48	2.00	0.00	1.00	0.00
49.24	64.43	2.00	0.00	1.00	0.00	49.29	65.17	2.00	0.00	1.00	0.00
49.34	64.82	2.00	0.00	1.00	0.00	49.44	63.84	2.00	0.00	1.00	0.00
49.48	63.12	2.00	0.00	1.00	0.00	49.59	62.82	2.00	0.00	1.00	0.00
49.64	63.01	2.00	0.00	1.00	0.00	49.67	62.97	2.00	0.00	1.00	0.00
49.79	62.78	2.00	0.00	1.00	0.00	49.83	62.95	2.00	0.00	1.00	0.00
49.89	63.93	2.00	0.00	1.00	0.00	49.98	64.55	2.00	0.00	1.00	0.00
50.03	64.81	2.00	0.00	1.00	0.00						

Total estimated settlement: 0.31

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

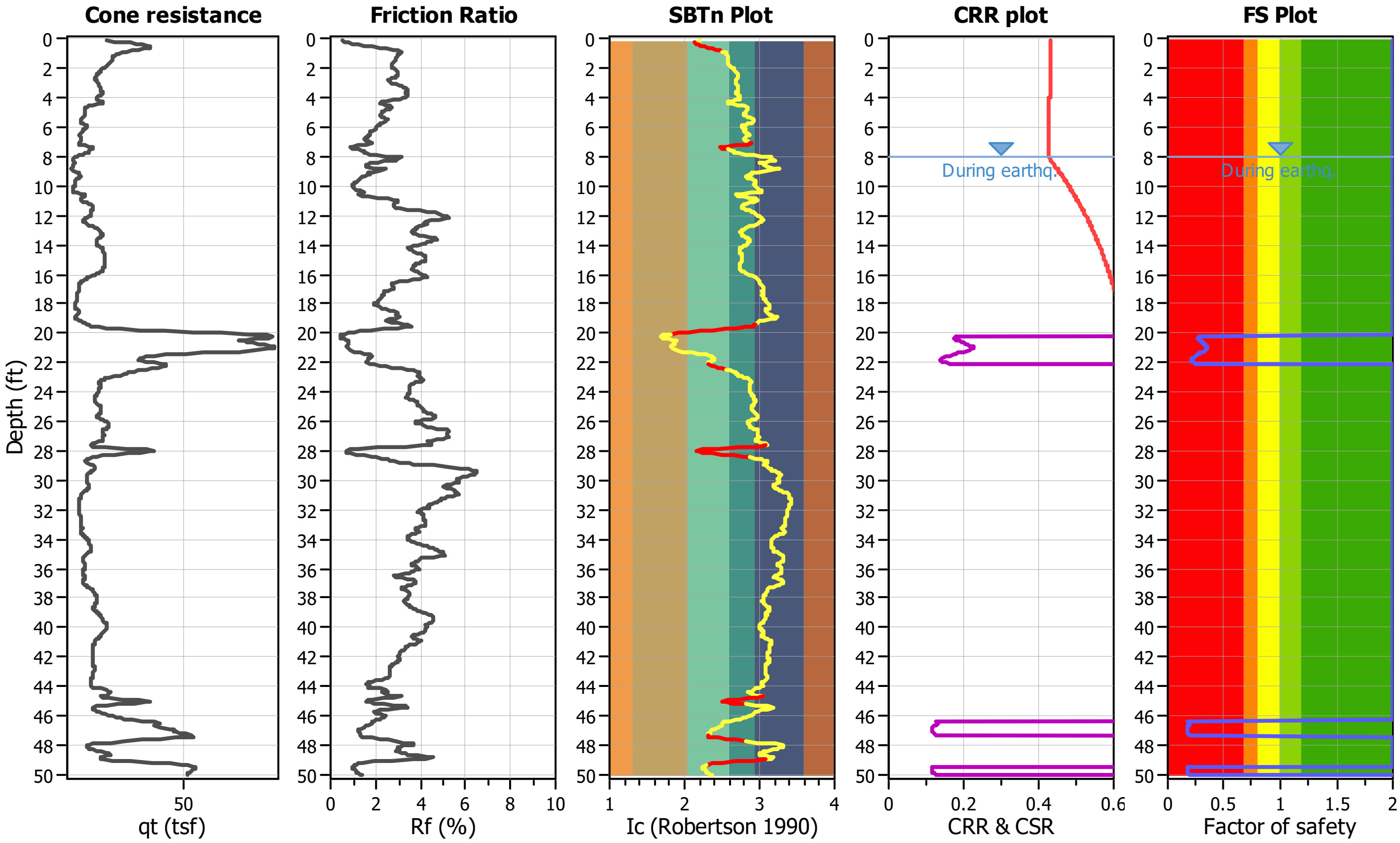
LIQUEFACTION ANALYSIS REPORT

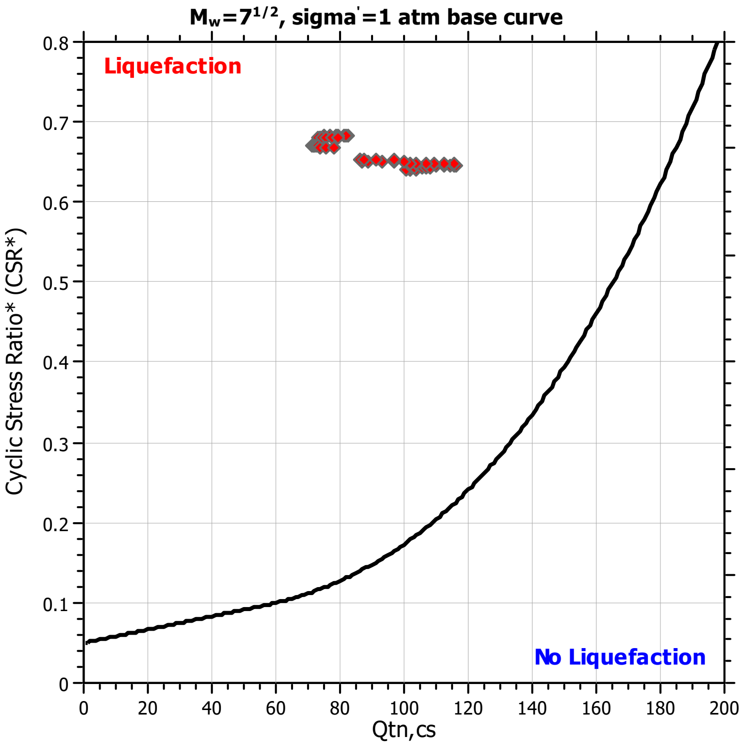
Project title : Morton Bay Geothermal Plant **Location : Calipatria, CA**

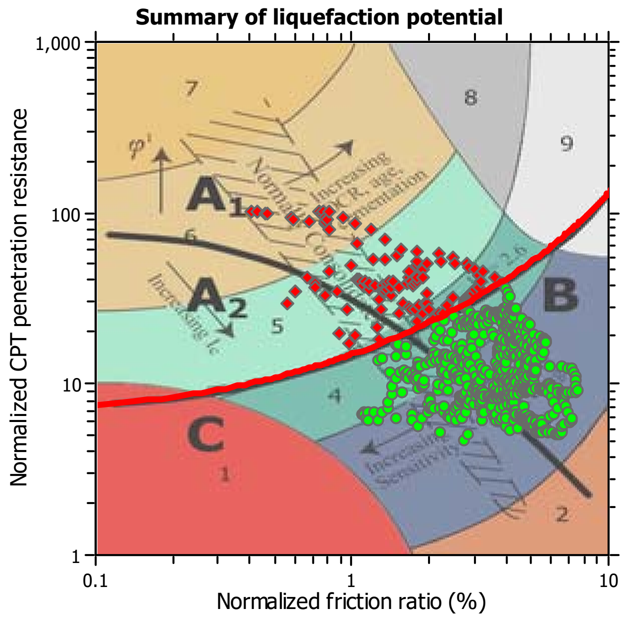
CPT file : CPT-03

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.61	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

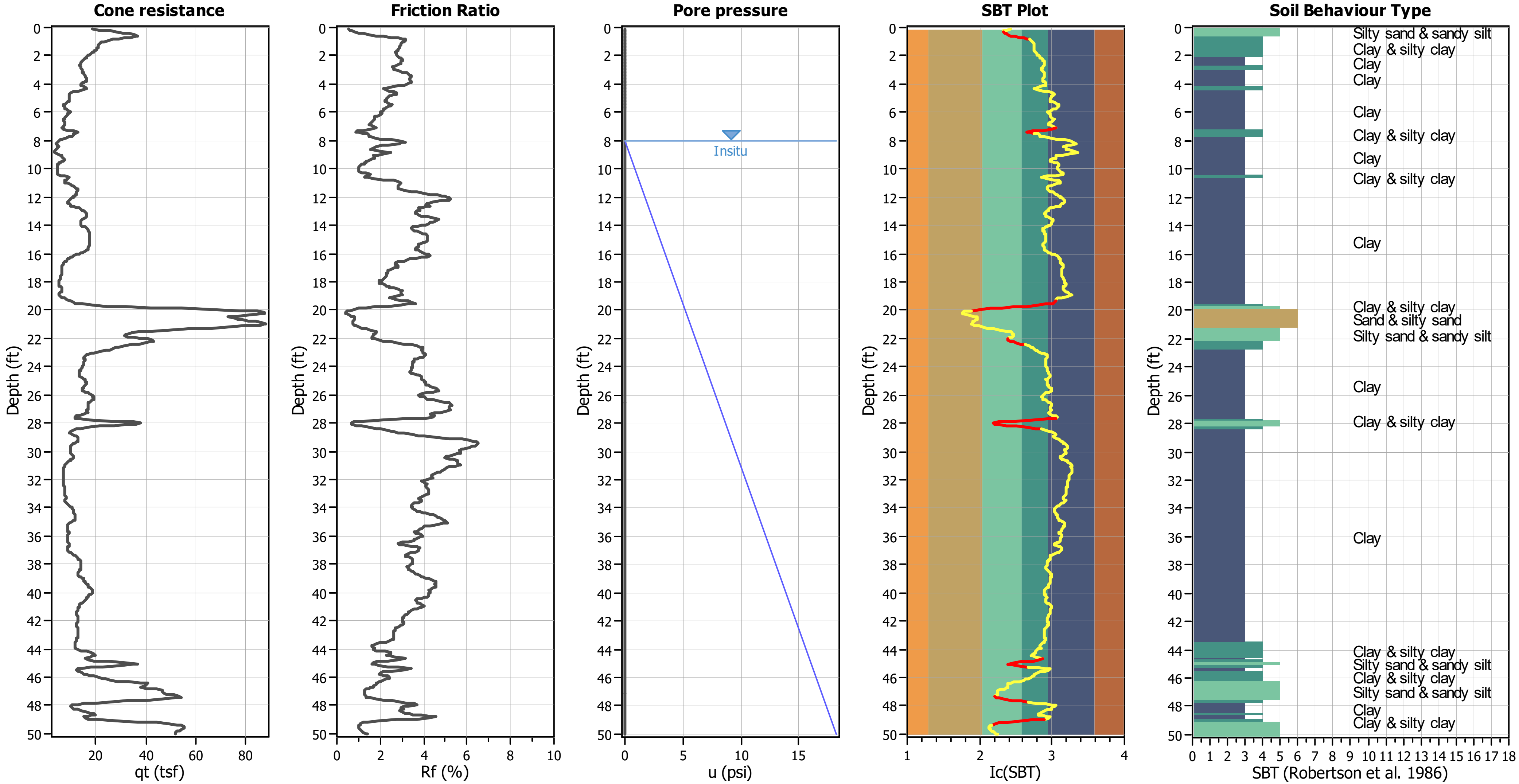






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



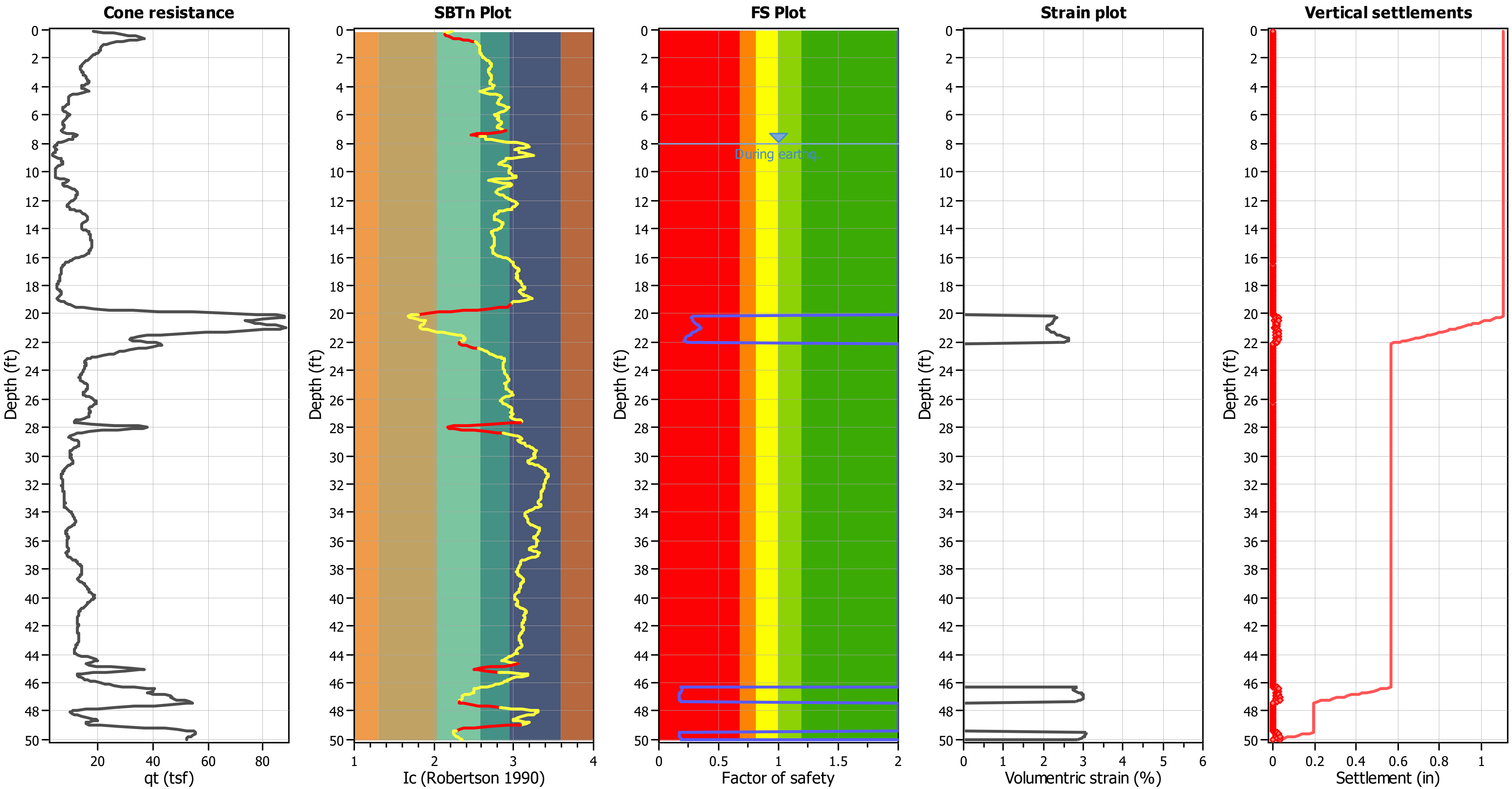
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	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:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

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)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
8.04	60.25	2.00	0.00	1.00	0.00	8.08	60.79	2.00	0.00	1.00	0.00
8.15	58.59	2.00	0.00	1.00	0.00	8.24	55.53	2.00	0.00	1.00	0.00
8.29	53.39	2.00	0.00	1.00	0.00	8.38	51.90	2.00	0.00	1.00	0.00
8.42	50.84	2.00	0.00	1.00	0.00	8.48	48.90	2.00	0.00	1.00	0.00
8.58	46.86	2.00	0.00	1.00	0.00	8.60	44.83	2.00	0.00	1.00	0.00
8.68	44.52	2.00	0.00	1.00	0.00	8.76	45.31	2.00	0.00	1.00	0.00
8.82	46.90	2.00	0.00	1.00	0.00	8.87	49.22	2.00	0.00	1.00	0.00
8.94	51.74	2.00	0.00	1.00	0.00	9.02	53.20	2.00	0.00	1.00	0.00
9.07	53.82	2.00	0.00	1.00	0.00	9.12	54.84	2.00	0.00	1.00	0.00
9.22	55.65	2.00	0.00	1.00	0.00	9.27	55.77	2.00	0.00	1.00	0.00
9.32	54.31	2.00	0.00	1.00	0.00	9.41	52.19	2.00	0.00	1.00	0.00
9.47	49.84	2.00	0.00	1.00	0.00	9.52	47.69	2.00	0.00	1.00	0.00
9.61	45.71	2.00	0.00	1.00	0.00	9.66	44.15	2.00	0.00	1.00	0.00
9.71	42.73	2.00	0.00	1.00	0.00	9.80	41.50	2.00	0.00	1.00	0.00
9.86	40.70	2.00	0.00	1.00	0.00	9.91	40.37	2.00	0.00	1.00	0.00
9.98	40.18	2.00	0.00	1.00	0.00	10.06	39.97	2.00	0.00	1.00	0.00
10.11	39.73	2.00	0.00	1.00	0.00	10.21	39.61	2.00	0.00	1.00	0.00
10.26	40.50	2.00	0.00	1.00	0.00	10.30	43.18	2.00	0.00	1.00	0.00
10.40	46.24	2.00	0.00	1.00	0.00	10.45	49.57	2.00	0.00	1.00	0.00
10.52	52.26	2.00	0.00	1.00	0.00	10.60	54.46	2.00	0.00	1.00	0.00
10.64	57.28	2.00	0.00	1.00	0.00	10.71	60.64	2.00	0.00	1.00	0.00
10.80	63.99	2.00	0.00	1.00	0.00	10.83	67.15	2.00	0.00	1.00	0.00
10.90	70.00	2.00	0.00	1.00	0.00	10.99	73.06	2.00	0.00	1.00	0.00
11.04	76.03	2.00	0.00	1.00	0.00	11.09	78.58	2.00	0.00	1.00	0.00
11.19	80.72	2.00	0.00	1.00	0.00	11.24	82.41	2.00	0.00	1.00	0.00
11.29	83.75	2.00	0.00	1.00	0.00	11.38	85.16	2.00	0.00	1.00	0.00
11.44	87.12	2.00	0.00	1.00	0.00	11.49	90.14	2.00	0.00	1.00	0.00
11.59	93.14	2.00	0.00	1.00	0.00	11.64	96.29	2.00	0.00	1.00	0.00
11.69	99.92	2.00	0.00	1.00	0.00	11.79	103.69	2.00	0.00	1.00	0.00
11.83	106.88	2.00	0.00	1.00	0.00	11.88	108.06	2.00	0.00	1.00	0.00
11.98	108.33	2.00	0.00	1.00	0.00	12.01	107.53	2.00	0.00	1.00	0.00
12.08	106.21	2.00	0.00	1.00	0.00	12.17	104.80	2.00	0.00	1.00	0.00
12.21	101.53	2.00	0.00	1.00	0.00	12.28	96.63	2.00	0.00	1.00	0.00
12.37	91.52	2.00	0.00	1.00	0.00	12.43	89.08	2.00	0.00	1.00	0.00
12.47	90.36	2.00	0.00	1.00	0.00	12.57	92.70	2.00	0.00	1.00	0.00
12.62	95.53	2.00	0.00	1.00	0.00	12.66	97.88	2.00	0.00	1.00	0.00
12.76	100.03	2.00	0.00	1.00	0.00	12.80	102.36	2.00	0.00	1.00	0.00
12.91	104.54	2.00	0.00	1.00	0.00	12.95	105.94	2.00	0.00	1.00	0.00
13.01	106.37	2.00	0.00	1.00	0.00	13.10	106.69	2.00	0.00	1.00	0.00
13.13	107.60	2.00	0.00	1.00	0.00	13.21	108.79	2.00	0.00	1.00	0.00
13.28	110.40	2.00	0.00	1.00	0.00	13.35	112.55	2.00	0.00	1.00	0.00
13.40	115.26	2.00	0.00	1.00	0.00	13.49	117.46	2.00	0.00	1.00	0.00
13.55	118.48	2.00	0.00	1.00	0.00	13.60	117.18	2.00	0.00	1.00	0.00
13.70	115.13	2.00	0.00	1.00	0.00	13.75	112.74	2.00	0.00	1.00	0.00
13.79	110.99	2.00	0.00	1.00	0.00	13.86	109.12	2.00	0.00	1.00	0.00
13.94	107.34	2.00	0.00	1.00	0.00	13.99	105.68	2.00	0.00	1.00	0.00
14.05	104.66	2.00	0.00	1.00	0.00	14.14	104.29	2.00	0.00	1.00	0.00
14.20	104.80	2.00	0.00	1.00	0.00	14.24	105.91	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
14.33	106.97	2.00	0.00	1.00	0.00	14.37	108.55	2.00	0.00	1.00	0.00
14.44	110.91	2.00	0.00	1.00	0.00	14.54	113.73	2.00	0.00	1.00	0.00
14.59	116.07	2.00	0.00	1.00	0.00	14.64	117.72	2.00	0.00	1.00	0.00
14.72	118.97	2.00	0.00	1.00	0.00	14.79	119.87	2.00	0.00	1.00	0.00
14.83	120.30	2.00	0.00	1.00	0.00	14.94	120.52	2.00	0.00	1.00	0.00
14.98	120.78	2.00	0.00	1.00	0.00	15.08	120.66	2.00	0.00	1.00	0.00
15.13	120.09	2.00	0.00	1.00	0.00	15.18	118.56	2.00	0.00	1.00	0.00
15.24	116.60	2.00	0.00	1.00	0.00	15.33	114.75	2.00	0.00	1.00	0.00
15.37	113.58	2.00	0.00	1.00	0.00	15.42	112.78	2.00	0.00	1.00	0.00
15.52	112.02	2.00	0.00	1.00	0.00	15.56	110.78	2.00	0.00	1.00	0.00
15.63	109.87	2.00	0.00	1.00	0.00	15.71	109.36	2.00	0.00	1.00	0.00
15.75	109.79	2.00	0.00	1.00	0.00	15.82	109.48	2.00	0.00	1.00	0.00
15.91	108.57	2.00	0.00	1.00	0.00	15.97	107.09	2.00	0.00	1.00	0.00
16.02	105.52	2.00	0.00	1.00	0.00	16.09	103.26	2.00	0.00	1.00	0.00
16.17	100.33	2.00	0.00	1.00	0.00	16.21	96.03	2.00	0.00	1.00	0.00
16.29	91.20	2.00	0.00	1.00	0.00	16.37	86.00	2.00	0.00	1.00	0.00
16.41	80.05	2.00	0.00	1.00	0.00	16.52	74.75	2.00	0.00	1.00	0.00
16.56	69.83	2.00	0.00	1.00	0.00	16.62	67.85	2.00	0.00	1.00	0.00
16.71	66.78	2.00	0.00	1.00	0.00	16.75	66.46	2.00	0.00	1.00	0.00
16.82	66.52	2.00	0.00	1.00	0.00	16.91	66.47	2.00	0.00	1.00	0.00
16.95	65.99	2.00	0.00	1.00	0.00	17.00	64.80	2.00	0.00	1.00	0.00
17.09	63.24	2.00	0.00	1.00	0.00	17.15	61.85	2.00	0.00	1.00	0.00
17.20	60.86	2.00	0.00	1.00	0.00	17.29	60.27	2.00	0.00	1.00	0.00
17.34	59.97	2.00	0.00	1.00	0.00	17.39	59.85	2.00	0.00	1.00	0.00
17.46	59.49	2.00	0.00	1.00	0.00	17.54	59.00	2.00	0.00	1.00	0.00
17.59	58.19	2.00	0.00	1.00	0.00	17.68	57.27	2.00	0.00	1.00	0.00
17.73	56.14	2.00	0.00	1.00	0.00	17.79	54.89	2.00	0.00	1.00	0.00
17.88	53.56	2.00	0.00	1.00	0.00	17.93	52.06	2.00	0.00	1.00	0.00
17.99	51.25	2.00	0.00	1.00	0.00	18.08	50.79	2.00	0.00	1.00	0.00
18.14	51.20	2.00	0.00	1.00	0.00	18.18	53.12	2.00	0.00	1.00	0.00
18.28	55.56	2.00	0.00	1.00	0.00	18.33	58.24	2.00	0.00	1.00	0.00
18.38	60.36	2.00	0.00	1.00	0.00	18.45	62.81	2.00	0.00	1.00	0.00
18.53	64.98	2.00	0.00	1.00	0.00	18.61	66.05	2.00	0.00	1.00	0.00
18.64	65.55	2.00	0.00	1.00	0.00	18.73	64.35	2.00	0.00	1.00	0.00
18.77	62.38	2.00	0.00	1.00	0.00	18.87	60.58	2.00	0.00	1.00	0.00
18.92	58.80	2.00	0.00	1.00	0.00	18.98	58.37	2.00	0.00	1.00	0.00
19.06	58.62	2.00	0.00	1.00	0.00	19.10	60.76	2.00	0.00	1.00	0.00
19.17	64.47	2.00	0.00	1.00	0.00	19.25	70.29	2.00	0.00	1.00	0.00
19.32	75.54	2.00	0.00	1.00	0.00	19.37	81.67	2.00	0.00	1.00	0.00
19.46	86.26	2.00	0.00	1.00	0.00	19.52	91.55	2.00	0.00	1.00	0.00
19.57	95.34	2.00	0.00	1.00	0.00	19.66	97.12	2.00	0.00	1.00	0.00
19.71	95.02	2.00	0.00	1.00	0.00	19.77	90.58	2.00	0.00	1.00	0.00
19.86	89.15	2.00	0.00	1.00	0.00	19.89	92.66	2.00	0.00	1.00	0.00
19.96	97.26	2.00	0.00	1.00	0.00	20.05	102.03	2.00	0.00	1.00	0.00
20.11	98.95	2.00	0.00	1.00	0.00	20.16	101.88	0.28	2.30	1.00	0.01
20.25	101.90	0.28	2.30	1.00	0.03	20.30	100.43	0.27	2.33	1.00	0.01
20.35	103.48	0.29	2.27	1.00	0.01	20.45	102.70	0.28	2.29	1.00	0.03
20.49	103.06	0.28	2.28	1.00	0.01	20.55	105.44	0.29	2.24	1.00	0.02

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
20.64	106.81	0.30	2.21	1.00	0.02	20.69	108.42	0.31	2.19	1.00	0.01
20.74	110.19	0.32	2.16	1.00	0.01	20.82	112.42	0.33	2.12	1.00	0.02
20.90	114.14	0.34	2.10	1.00	0.02	20.94	115.72	0.35	2.07	1.00	0.01
21.00	116.07	0.35	2.07	1.00	0.01	21.09	115.53	0.35	2.08	1.00	0.02
21.14	112.73	0.33	2.12	1.00	0.01	21.24	109.66	0.31	2.17	1.00	0.03
21.29	106.88	0.30	2.21	1.00	0.01	21.33	103.91	0.28	2.26	1.00	0.01
21.44	101.65	0.27	2.31	1.00	0.03	21.48	99.87	0.27	2.34	1.00	0.01
21.54	96.75	0.25	2.40	1.00	0.02	21.63	92.94	0.24	2.48	1.00	0.03
21.68	88.62	0.22	2.58	1.00	0.01	21.73	86.77	0.22	2.63	1.00	0.02
21.83	86.15	0.21	2.64	1.00	0.03	21.88	85.95	0.21	2.65	1.00	0.02
21.93	87.78	0.22	2.60	1.00	0.02	22.01	91.02	0.23	2.52	1.00	0.02
22.06	96.86	0.25	2.40	1.00	0.01	22.13	103.58	2.00	0.00	1.00	0.00
22.22	110.38	2.00	0.00	1.00	0.00	22.27	116.69	2.00	0.00	1.00	0.00
22.32	121.49	2.00	0.00	1.00	0.00	22.38	126.38	2.00	0.00	1.00	0.00
22.47	129.62	2.00	0.00	1.00	0.00	22.52	130.45	2.00	0.00	1.00	0.00
22.62	128.90	2.00	0.00	1.00	0.00	22.66	127.58	2.00	0.00	1.00	0.00
22.71	125.83	2.00	0.00	1.00	0.00	22.82	123.10	2.00	0.00	1.00	0.00
22.86	119.41	2.00	0.00	1.00	0.00	22.91	115.36	2.00	0.00	1.00	0.00
23.00	111.28	2.00	0.00	1.00	0.00	23.06	108.22	2.00	0.00	1.00	0.00
23.11	106.51	2.00	0.00	1.00	0.00	23.16	104.42	2.00	0.00	1.00	0.00
23.27	102.15	2.00	0.00	1.00	0.00	23.31	99.83	2.00	0.00	1.00	0.00
23.37	98.22	2.00	0.00	1.00	0.00	23.45	96.65	2.00	0.00	1.00	0.00
23.51	95.43	2.00	0.00	1.00	0.00	23.56	94.88	2.00	0.00	1.00	0.00
23.66	94.45	2.00	0.00	1.00	0.00	23.70	94.21	2.00	0.00	1.00	0.00
23.80	93.84	2.00	0.00	1.00	0.00	23.86	93.60	2.00	0.00	1.00	0.00
23.91	93.51	2.00	0.00	1.00	0.00	23.95	92.75	2.00	0.00	1.00	0.00
24.05	91.53	2.00	0.00	1.00	0.00	24.10	90.39	2.00	0.00	1.00	0.00
24.15	89.46	2.00	0.00	1.00	0.00	24.25	88.73	2.00	0.00	1.00	0.00
24.30	87.49	2.00	0.00	1.00	0.00	24.37	86.56	2.00	0.00	1.00	0.00
24.45	86.72	2.00	0.00	1.00	0.00	24.49	88.29	2.00	0.00	1.00	0.00
24.55	90.39	2.00	0.00	1.00	0.00	24.64	91.78	2.00	0.00	1.00	0.00
24.70	92.99	2.00	0.00	1.00	0.00	24.76	94.90	2.00	0.00	1.00	0.00
24.86	96.77	2.00	0.00	1.00	0.00	24.90	98.50	2.00	0.00	1.00	0.00
24.95	99.42	2.00	0.00	1.00	0.00	25.00	100.36	2.00	0.00	1.00	0.00
25.10	101.01	2.00	0.00	1.00	0.00	25.14	101.56	2.00	0.00	1.00	0.00
25.21	101.64	2.00	0.00	1.00	0.00	25.30	101.58	2.00	0.00	1.00	0.00
25.34	101.86	2.00	0.00	1.00	0.00	25.40	102.40	2.00	0.00	1.00	0.00
25.50	102.70	2.00	0.00	1.00	0.00	25.54	102.61	2.00	0.00	1.00	0.00
25.59	102.67	2.00	0.00	1.00	0.00	25.70	102.99	2.00	0.00	1.00	0.00
25.74	103.85	2.00	0.00	1.00	0.00	25.84	104.01	2.00	0.00	1.00	0.00
25.85	103.41	2.00	0.00	1.00	0.00	25.94	102.45	2.00	0.00	1.00	0.00
25.98	102.34	2.00	0.00	1.00	0.00	26.09	103.33	2.00	0.00	1.00	0.00
26.14	105.14	2.00	0.00	1.00	0.00	26.19	107.08	2.00	0.00	1.00	0.00
26.30	108.56	2.00	0.00	1.00	0.00	26.34	109.63	2.00	0.00	1.00	0.00
26.38	111.15	2.00	0.00	1.00	0.00	26.48	112.73	2.00	0.00	1.00	0.00
26.53	114.18	2.00	0.00	1.00	0.00	26.59	114.54	2.00	0.00	1.00	0.00
26.67	114.45	2.00	0.00	1.00	0.00	26.73	114.33	2.00	0.00	1.00	0.00
26.78	114.15	2.00	0.00	1.00	0.00	26.86	113.99	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
26.93	113.94	2.00	0.00	1.00	0.00	26.98	113.78	2.00	0.00	1.00	0.00
27.05	113.43	2.00	0.00	1.00	0.00	27.11	112.54	2.00	0.00	1.00	0.00
27.18	110.63	2.00	0.00	1.00	0.00	27.26	107.98	2.00	0.00	1.00	0.00
27.31	103.91	2.00	0.00	1.00	0.00	27.38	99.18	2.00	0.00	1.00	0.00
27.47	94.38	2.00	0.00	1.00	0.00	27.52	90.82	2.00	0.00	1.00	0.00
27.57	87.73	2.00	0.00	1.00	0.00	27.67	84.69	2.00	0.00	1.00	0.00
27.70	80.86	2.00	0.00	1.00	0.00	27.77	74.48	2.00	0.00	1.00	0.00
27.85	66.36	2.00	0.00	1.00	0.00	27.92	62.93	2.00	0.00	1.00	0.00
27.96	61.59	2.00	0.00	1.00	0.00	28.05	60.08	2.00	0.00	1.00	0.00
28.11	58.98	2.00	0.00	1.00	0.00	28.16	59.03	2.00	0.00	1.00	0.00
28.24	60.59	2.00	0.00	1.00	0.00	28.31	62.43	2.00	0.00	1.00	0.00
28.36	64.10	2.00	0.00	1.00	0.00	28.43	64.61	2.00	0.00	1.00	0.00
28.51	64.89	2.00	0.00	1.00	0.00	28.56	64.65	2.00	0.00	1.00	0.00
28.62	64.74	2.00	0.00	1.00	0.00	28.70	65.69	2.00	0.00	1.00	0.00
28.76	69.35	2.00	0.00	1.00	0.00	28.83	74.59	2.00	0.00	1.00	0.00
28.90	80.37	2.00	0.00	1.00	0.00	28.95	85.75	2.00	0.00	1.00	0.00
29.01	92.30	2.00	0.00	1.00	0.00	29.10	98.29	2.00	0.00	1.00	0.00
29.16	103.22	2.00	0.00	1.00	0.00	29.21	105.39	2.00	0.00	1.00	0.00
29.29	106.05	2.00	0.00	1.00	0.00	29.34	105.28	2.00	0.00	1.00	0.00
29.40	103.04	2.00	0.00	1.00	0.00	29.47	100.03	2.00	0.00	1.00	0.00
29.55	96.63	2.00	0.00	1.00	0.00	29.60	93.71	2.00	0.00	1.00	0.00
29.67	91.62	2.00	0.00	1.00	0.00	29.74	90.31	2.00	0.00	1.00	0.00
29.80	89.57	2.00	0.00	1.00	0.00	29.88	88.96	2.00	0.00	1.00	0.00
29.95	88.48	2.00	0.00	1.00	0.00	29.99	88.05	2.00	0.00	1.00	0.00
30.06	87.77	2.00	0.00	1.00	0.00	30.12	87.69	2.00	0.00	1.00	0.00
30.19	87.95	2.00	0.00	1.00	0.00	30.29	88.08	2.00	0.00	1.00	0.00
30.33	88.20	2.00	0.00	1.00	0.00	30.39	88.11	2.00	0.00	1.00	0.00
30.48	87.76	2.00	0.00	1.00	0.00	30.52	87.38	2.00	0.00	1.00	0.00
30.59	86.20	2.00	0.00	1.00	0.00	30.68	84.78	2.00	0.00	1.00	0.00
30.71	82.60	2.00	0.00	1.00	0.00	30.78	80.28	2.00	0.00	1.00	0.00
30.88	77.87	2.00	0.00	1.00	0.00	30.93	76.08	2.00	0.00	1.00	0.00
30.98	74.50	2.00	0.00	1.00	0.00	31.07	72.88	2.00	0.00	1.00	0.00
31.11	71.01	2.00	0.00	1.00	0.00	31.18	69.27	2.00	0.00	1.00	0.00
31.27	67.41	2.00	0.00	1.00	0.00	31.32	66.05	2.00	0.00	1.00	0.00
31.37	65.26	2.00	0.00	1.00	0.00	31.47	64.67	2.00	0.00	1.00	0.00
31.52	64.20	2.00	0.00	1.00	0.00	31.61	63.99	2.00	0.00	1.00	0.00
31.67	63.89	2.00	0.00	1.00	0.00	31.72	63.97	2.00	0.00	1.00	0.00
31.77	63.95	2.00	0.00	1.00	0.00	31.87	64.01	2.00	0.00	1.00	0.00
31.91	63.73	2.00	0.00	1.00	0.00	31.96	62.40	2.00	0.00	1.00	0.00
32.06	61.26	2.00	0.00	1.00	0.00	32.11	60.67	2.00	0.00	1.00	0.00
32.16	61.54	2.00	0.00	1.00	0.00	32.26	62.11	2.00	0.00	1.00	0.00
32.31	62.67	2.00	0.00	1.00	0.00	32.36	62.92	2.00	0.00	1.00	0.00
32.45	63.19	2.00	0.00	1.00	0.00	32.50	63.59	2.00	0.00	1.00	0.00
32.55	64.48	2.00	0.00	1.00	0.00	32.65	65.47	2.00	0.00	1.00	0.00
32.70	66.42	2.00	0.00	1.00	0.00	32.75	66.61	2.00	0.00	1.00	0.00
32.84	66.49	2.00	0.00	1.00	0.00	32.89	66.37	2.00	0.00	1.00	0.00
32.94	66.27	2.00	0.00	1.00	0.00	33.04	66.10	2.00	0.00	1.00	0.00
33.07	65.64	2.00	0.00	1.00	0.00	33.14	65.25	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
33.22	64.78	2.00	0.00	1.00	0.00	33.29	64.49	2.00	0.00	1.00	0.00
33.34	64.07	2.00	0.00	1.00	0.00	33.42	63.65	2.00	0.00	1.00	0.00
33.47	63.23	2.00	0.00	1.00	0.00	33.54	63.12	2.00	0.00	1.00	0.00
33.62	63.34	2.00	0.00	1.00	0.00	33.69	63.79	2.00	0.00	1.00	0.00
33.74	64.75	2.00	0.00	1.00	0.00	33.82	65.75	2.00	0.00	1.00	0.00
33.87	67.24	2.00	0.00	1.00	0.00	33.93	68.56	2.00	0.00	1.00	0.00
34.01	70.09	2.00	0.00	1.00	0.00	34.08	71.25	2.00	0.00	1.00	0.00
34.13	72.66	2.00	0.00	1.00	0.00	34.23	74.11	2.00	0.00	1.00	0.00
34.28	75.59	2.00	0.00	1.00	0.00	34.32	76.90	2.00	0.00	1.00	0.00
34.40	78.24	2.00	0.00	1.00	0.00	34.47	79.65	2.00	0.00	1.00	0.00
34.52	81.40	2.00	0.00	1.00	0.00	34.62	82.75	2.00	0.00	1.00	0.00
34.67	83.89	2.00	0.00	1.00	0.00	34.72	84.37	2.00	0.00	1.00	0.00
34.80	84.32	2.00	0.00	1.00	0.00	34.87	83.73	2.00	0.00	1.00	0.00
34.92	82.24	2.00	0.00	1.00	0.00	34.99	79.88	2.00	0.00	1.00	0.00
35.07	77.17	2.00	0.00	1.00	0.00	35.12	73.93	2.00	0.00	1.00	0.00
35.20	70.80	2.00	0.00	1.00	0.00	35.27	67.88	2.00	0.00	1.00	0.00
35.31	66.26	2.00	0.00	1.00	0.00	35.39	65.55	2.00	0.00	1.00	0.00
35.46	65.23	2.00	0.00	1.00	0.00	35.51	65.12	2.00	0.00	1.00	0.00
35.58	65.18	2.00	0.00	1.00	0.00	35.66	65.29	2.00	0.00	1.00	0.00
35.70	65.76	2.00	0.00	1.00	0.00	35.81	66.15	2.00	0.00	1.00	0.00
35.85	66.53	2.00	0.00	1.00	0.00	35.91	66.68	2.00	0.00	1.00	0.00
36.00	66.66	2.00	0.00	1.00	0.00	36.05	66.26	2.00	0.00	1.00	0.00
36.11	65.22	2.00	0.00	1.00	0.00	36.20	64.06	2.00	0.00	1.00	0.00
36.24	63.29	2.00	0.00	1.00	0.00	36.30	62.75	2.00	0.00	1.00	0.00
36.39	61.46	2.00	0.00	1.00	0.00	36.44	60.00	2.00	0.00	1.00	0.00
36.50	59.53	2.00	0.00	1.00	0.00	36.60	60.59	2.00	0.00	1.00	0.00
36.65	62.30	2.00	0.00	1.00	0.00	36.70	63.37	2.00	0.00	1.00	0.00
36.76	63.76	2.00	0.00	1.00	0.00	36.81	63.83	2.00	0.00	1.00	0.00
36.88	63.63	2.00	0.00	1.00	0.00	36.96	63.76	2.00	0.00	1.00	0.00
37.03	64.24	2.00	0.00	1.00	0.00	37.11	64.92	2.00	0.00	1.00	0.00
37.17	65.70	2.00	0.00	1.00	0.00	37.22	66.67	2.00	0.00	1.00	0.00
37.32	67.94	2.00	0.00	1.00	0.00	37.37	69.26	2.00	0.00	1.00	0.00
37.42	70.57	2.00	0.00	1.00	0.00	37.47	72.17	2.00	0.00	1.00	0.00
37.55	73.97	2.00	0.00	1.00	0.00	37.62	75.57	2.00	0.00	1.00	0.00
37.67	76.85	2.00	0.00	1.00	0.00	37.78	77.59	2.00	0.00	1.00	0.00
37.81	78.18	2.00	0.00	1.00	0.00	37.86	78.04	2.00	0.00	1.00	0.00
37.96	77.57	2.00	0.00	1.00	0.00	38.01	76.95	2.00	0.00	1.00	0.00
38.06	76.39	2.00	0.00	1.00	0.00	38.19	75.92	2.00	0.00	1.00	0.00
38.21	75.65	2.00	0.00	1.00	0.00	38.26	75.61	2.00	0.00	1.00	0.00
38.34	75.55	2.00	0.00	1.00	0.00	38.40	75.54	2.00	0.00	1.00	0.00
38.46	75.58	2.00	0.00	1.00	0.00	38.53	75.50	2.00	0.00	1.00	0.00
38.59	75.19	2.00	0.00	1.00	0.00	38.66	74.99	2.00	0.00	1.00	0.00
38.72	75.57	2.00	0.00	1.00	0.00	38.81	76.88	2.00	0.00	1.00	0.00
38.85	78.92	2.00	0.00	1.00	0.00	38.93	81.17	2.00	0.00	1.00	0.00
39.00	83.71	2.00	0.00	1.00	0.00	39.05	86.07	2.00	0.00	1.00	0.00
39.13	87.97	2.00	0.00	1.00	0.00	39.20	89.52	2.00	0.00	1.00	0.00
39.24	90.83	2.00	0.00	1.00	0.00	39.34	91.77	2.00	0.00	1.00	0.00
39.39	92.43	2.00	0.00	1.00	0.00	39.44	92.95	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
39.54	93.41	2.00	0.00	1.00	0.00	39.59	93.90	2.00	0.00	1.00	0.00
39.64	94.27	2.00	0.00	1.00	0.00	39.72	94.48	2.00	0.00	1.00	0.00
39.79	94.54	2.00	0.00	1.00	0.00	39.84	94.59	2.00	0.00	1.00	0.00
39.92	94.64	2.00	0.00	1.00	0.00	39.99	94.65	2.00	0.00	1.00	0.00
40.03	94.11	2.00	0.00	1.00	0.00	40.12	93.07	2.00	0.00	1.00	0.00
40.19	91.86	2.00	0.00	1.00	0.00	40.23	90.49	2.00	0.00	1.00	0.00
40.31	88.74	2.00	0.00	1.00	0.00	40.38	86.76	2.00	0.00	1.00	0.00
40.43	84.77	2.00	0.00	1.00	0.00	40.49	82.97	2.00	0.00	1.00	0.00
40.58	81.69	2.00	0.00	1.00	0.00	40.63	80.48	2.00	0.00	1.00	0.00
40.72	79.41	2.00	0.00	1.00	0.00	40.77	78.63	2.00	0.00	1.00	0.00
40.83	78.50	2.00	0.00	1.00	0.00	40.92	78.55	2.00	0.00	1.00	0.00
40.96	77.92	2.00	0.00	1.00	0.00	41.02	76.82	2.00	0.00	1.00	0.00
41.11	75.56	2.00	0.00	1.00	0.00	41.15	74.41	2.00	0.00	1.00	0.00
41.21	72.95	2.00	0.00	1.00	0.00	41.30	71.47	2.00	0.00	1.00	0.00
41.35	70.25	2.00	0.00	1.00	0.00	41.42	69.79	2.00	0.00	1.00	0.00
41.50	69.47	2.00	0.00	1.00	0.00	41.55	69.02	2.00	0.00	1.00	0.00
41.60	68.59	2.00	0.00	1.00	0.00	41.70	68.23	2.00	0.00	1.00	0.00
41.75	68.04	2.00	0.00	1.00	0.00	41.80	67.92	2.00	0.00	1.00	0.00
41.90	67.78	2.00	0.00	1.00	0.00	41.93	67.78	2.00	0.00	1.00	0.00
42.00	67.88	2.00	0.00	1.00	0.00	42.08	67.83	2.00	0.00	1.00	0.00
42.13	67.71	2.00	0.00	1.00	0.00	42.20	67.30	2.00	0.00	1.00	0.00
42.29	66.77	2.00	0.00	1.00	0.00	42.34	66.19	2.00	0.00	1.00	0.00
42.39	65.65	2.00	0.00	1.00	0.00	42.49	65.24	2.00	0.00	1.00	0.00
42.54	64.98	2.00	0.00	1.00	0.00	42.62	64.87	2.00	0.00	1.00	0.00
42.69	64.80	2.00	0.00	1.00	0.00	42.73	64.63	2.00	0.00	1.00	0.00
42.81	64.40	2.00	0.00	1.00	0.00	42.88	64.20	2.00	0.00	1.00	0.00
42.92	64.15	2.00	0.00	1.00	0.00	42.98	64.07	2.00	0.00	1.00	0.00
43.07	63.90	2.00	0.00	1.00	0.00	43.14	63.71	2.00	0.00	1.00	0.00
43.18	63.44	2.00	0.00	1.00	0.00	43.27	63.01	2.00	0.00	1.00	0.00
43.33	62.35	2.00	0.00	1.00	0.00	43.38	61.47	2.00	0.00	1.00	0.00
43.44	60.07	2.00	0.00	1.00	0.00	43.53	58.36	2.00	0.00	1.00	0.00
43.58	55.64	2.00	0.00	1.00	0.00	43.67	53.21	2.00	0.00	1.00	0.00
43.72	51.25	2.00	0.00	1.00	0.00	43.78	50.67	2.00	0.00	1.00	0.00
43.87	50.47	2.00	0.00	1.00	0.00	43.91	52.14	2.00	0.00	1.00	0.00
43.97	51.58	2.00	0.00	1.00	0.00	44.05	52.68	2.00	0.00	1.00	0.00
44.10	56.73	2.00	0.00	1.00	0.00	44.17	64.65	2.00	0.00	1.00	0.00
44.27	71.15	2.00	0.00	1.00	0.00	44.32	73.28	2.00	0.00	1.00	0.00
44.36	73.10	2.00	0.00	1.00	0.00	44.42	71.71	2.00	0.00	1.00	0.00
44.50	71.62	2.00	0.00	1.00	0.00	44.59	72.51	2.00	0.00	1.00	0.00
44.65	73.78	2.00	0.00	1.00	0.00	44.70	73.57	2.00	0.00	1.00	0.00
44.76	72.82	2.00	0.00	1.00	0.00	44.85	71.67	2.00	0.00	1.00	0.00
44.90	70.95	2.00	0.00	1.00	0.00	44.95	72.88	2.00	0.00	1.00	0.00
45.05	75.10	2.00	0.00	1.00	0.00	45.08	77.30	2.00	0.00	1.00	0.00
45.19	76.97	2.00	0.00	1.00	0.00	45.24	76.39	2.00	0.00	1.00	0.00
45.29	74.91	2.00	0.00	1.00	0.00	45.34	72.61	2.00	0.00	1.00	0.00
45.41	68.96	2.00	0.00	1.00	0.00	45.49	65.30	2.00	0.00	1.00	0.00
45.59	61.81	2.00	0.00	1.00	0.00	45.63	59.45	2.00	0.00	1.00	0.00
45.68	58.76	2.00	0.00	1.00	0.00	45.78	59.61	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
45.84	62.02	2.00	0.00	1.00	0.00	45.88	65.56	2.00	0.00	1.00	0.00
45.93	70.13	2.00	0.00	1.00	0.00	46.03	73.83	2.00	0.00	1.00	0.00
46.07	75.90	2.00	0.00	1.00	0.00	46.14	75.90	2.00	0.00	1.00	0.00
46.23	75.65	2.00	0.00	1.00	0.00	46.26	76.56	2.00	0.00	1.00	0.00
46.33	78.77	0.18	2.84	1.00	0.02	46.42	81.36	0.19	2.77	1.00	0.03
46.46	82.65	0.19	2.73	1.00	0.01	46.52	81.73	0.19	2.76	1.00	0.02
46.61	79.18	0.18	2.83	1.00	0.03	46.67	76.67	0.18	2.91	1.00	0.02
46.72	75.08	0.18	2.96	1.00	0.02	46.81	74.35	0.17	2.98	1.00	0.03
46.87	74.05	0.17	2.99	1.00	0.02	46.92	73.92	0.17	2.99	1.00	0.02
47.01	73.63	0.17	3.00	1.00	0.03	47.07	73.30	0.17	3.01	1.00	0.02
47.11	74.11	0.17	2.99	1.00	0.02	47.22	75.62	0.18	2.94	1.00	0.04
47.27	77.59	0.18	2.88	1.00	0.02	47.33	79.21	0.19	2.83	1.00	0.02
47.41	80.97	2.00	0.00	1.00	0.00	47.46	84.09	2.00	0.00	1.00	0.00
47.52	87.12	2.00	0.00	1.00	0.00	47.61	89.77	2.00	0.00	1.00	0.00
47.65	89.52	2.00	0.00	1.00	0.00	47.72	85.94	2.00	0.00	1.00	0.00
47.80	80.82	2.00	0.00	1.00	0.00	47.84	74.91	2.00	0.00	1.00	0.00
47.91	69.32	2.00	0.00	1.00	0.00	47.99	63.28	2.00	0.00	1.00	0.00
48.04	59.01	2.00	0.00	1.00	0.00	48.11	57.36	2.00	0.00	1.00	0.00
48.18	58.07	2.00	0.00	1.00	0.00	48.26	60.61	2.00	0.00	1.00	0.00
48.30	63.54	2.00	0.00	1.00	0.00	48.36	66.50	2.00	0.00	1.00	0.00
48.45	71.29	2.00	0.00	1.00	0.00	48.54	76.29	2.00	0.00	1.00	0.00
48.60	80.56	2.00	0.00	1.00	0.00	48.64	82.54	2.00	0.00	1.00	0.00
48.70	83.55	2.00	0.00	1.00	0.00	48.79	83.53	2.00	0.00	1.00	0.00
48.83	82.45	2.00	0.00	1.00	0.00	48.89	80.83	2.00	0.00	1.00	0.00
48.97	78.62	2.00	0.00	1.00	0.00	49.02	75.84	2.00	0.00	1.00	0.00
49.09	72.80	2.00	0.00	1.00	0.00	49.16	69.98	2.00	0.00	1.00	0.00
49.23	69.72	2.00	0.00	1.00	0.00	49.28	70.35	2.00	0.00	1.00	0.00
49.36	71.02	2.00	0.00	1.00	0.00	49.43	71.33	2.00	0.00	1.00	0.00
49.50	71.42	0.17	3.08	1.00	0.02	49.58	71.62	0.17	3.07	1.00	0.03
49.63	72.08	0.17	3.06	1.00	0.02	49.68	72.63	0.17	3.04	1.00	0.02
49.78	73.03	0.17	3.02	1.00	0.04	49.83	73.49	0.17	3.01	1.00	0.02
49.88	75.35	0.18	2.95	1.00	0.02	49.98	77.92	0.19	2.87	1.00	0.03
50.02	80.20	2.00	0.00	1.00	0.00						

Total estimated settlement: 1.11

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

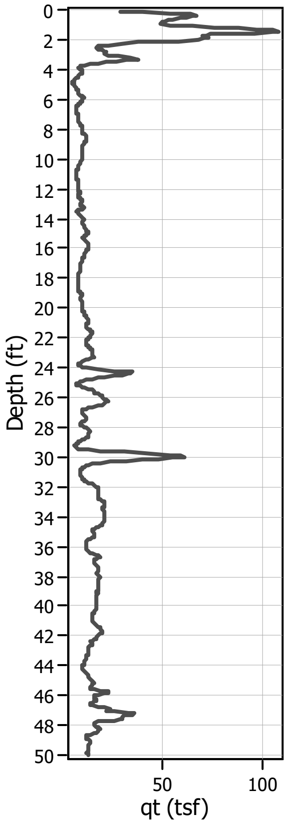
Project title : Morton Bay Geothermal Plant **Location : Calipatria, CA**

CPT file : CPT-04

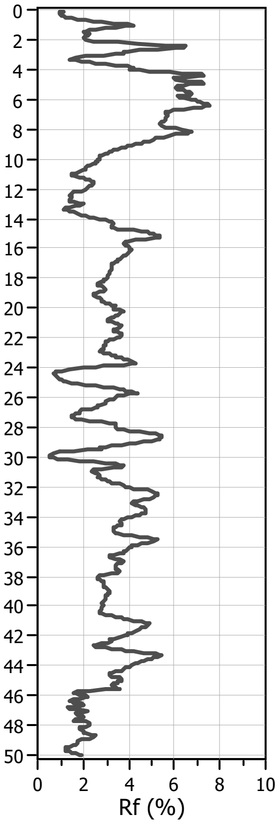
Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.61	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

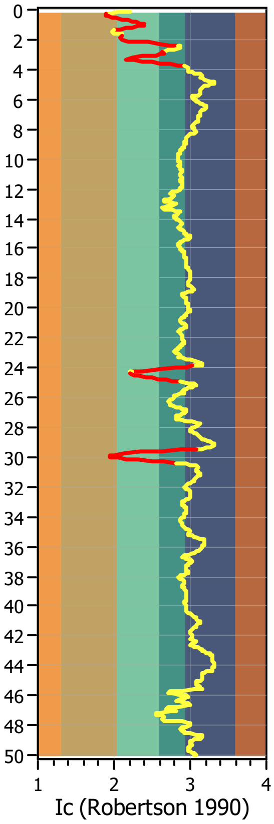
Cone resistance



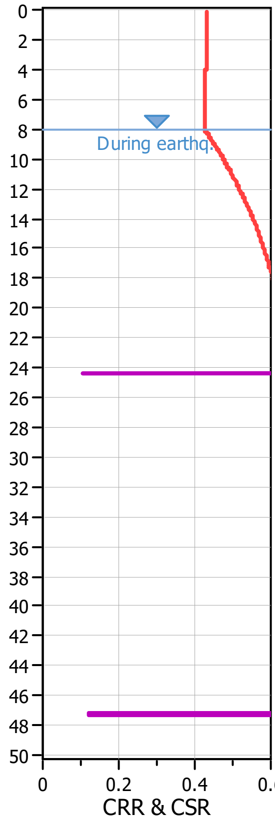
Friction Ratio



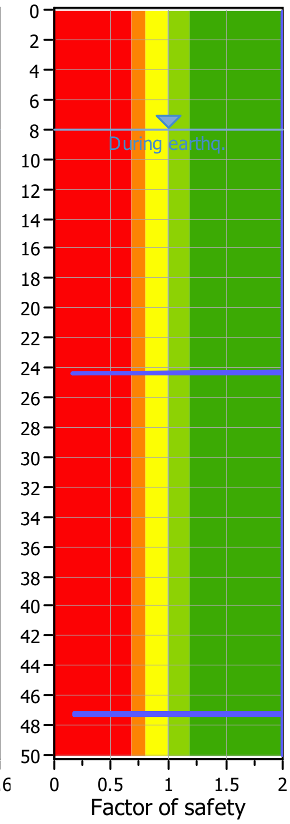
SBTn Plot



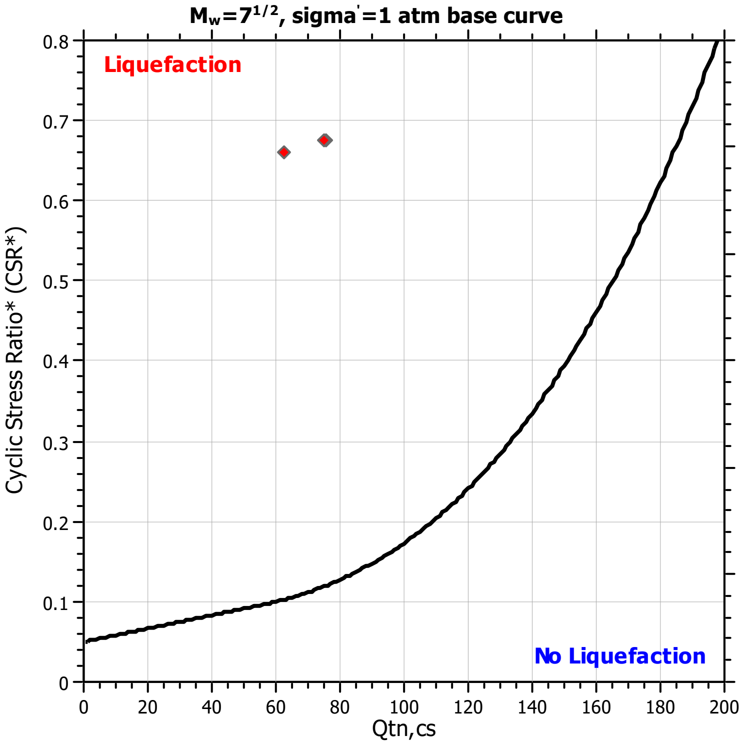
CRR plot



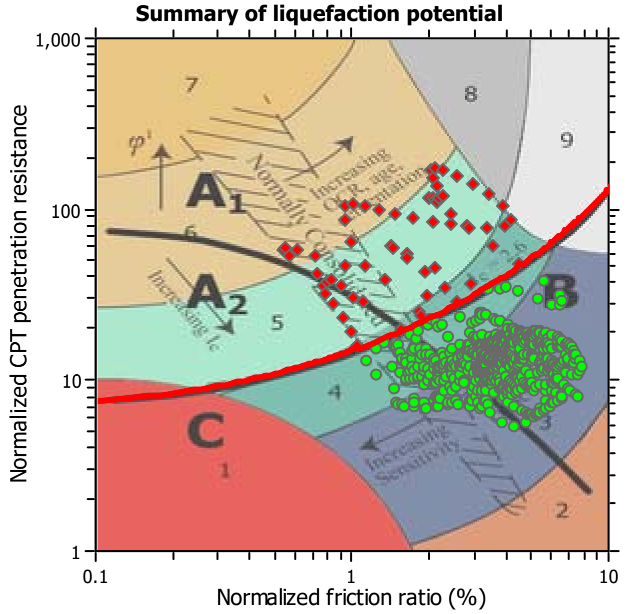
FS Plot



$M_w=7^{1/2}$, sigma'=1 atm base curve

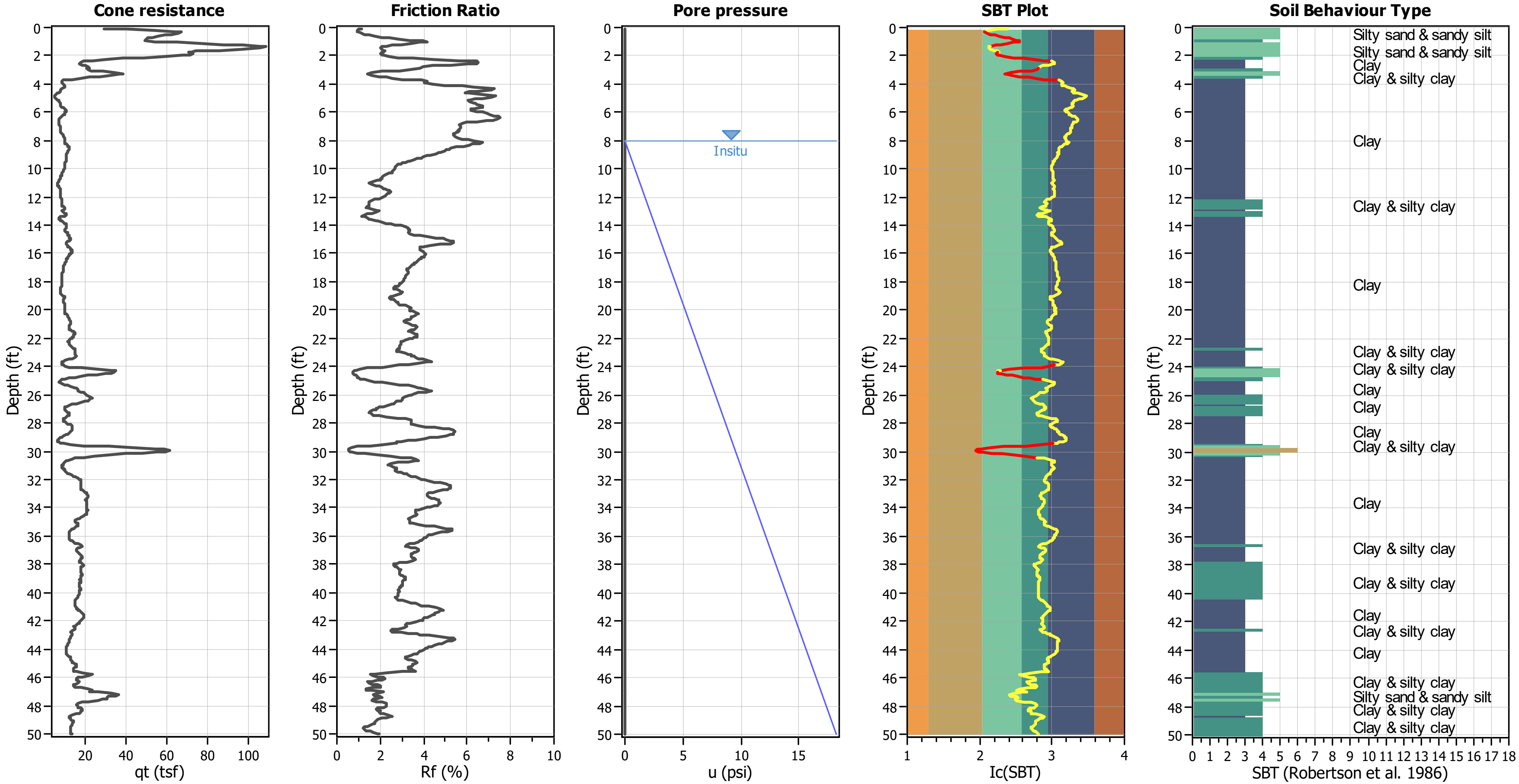


Summary of liquefaction potential



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



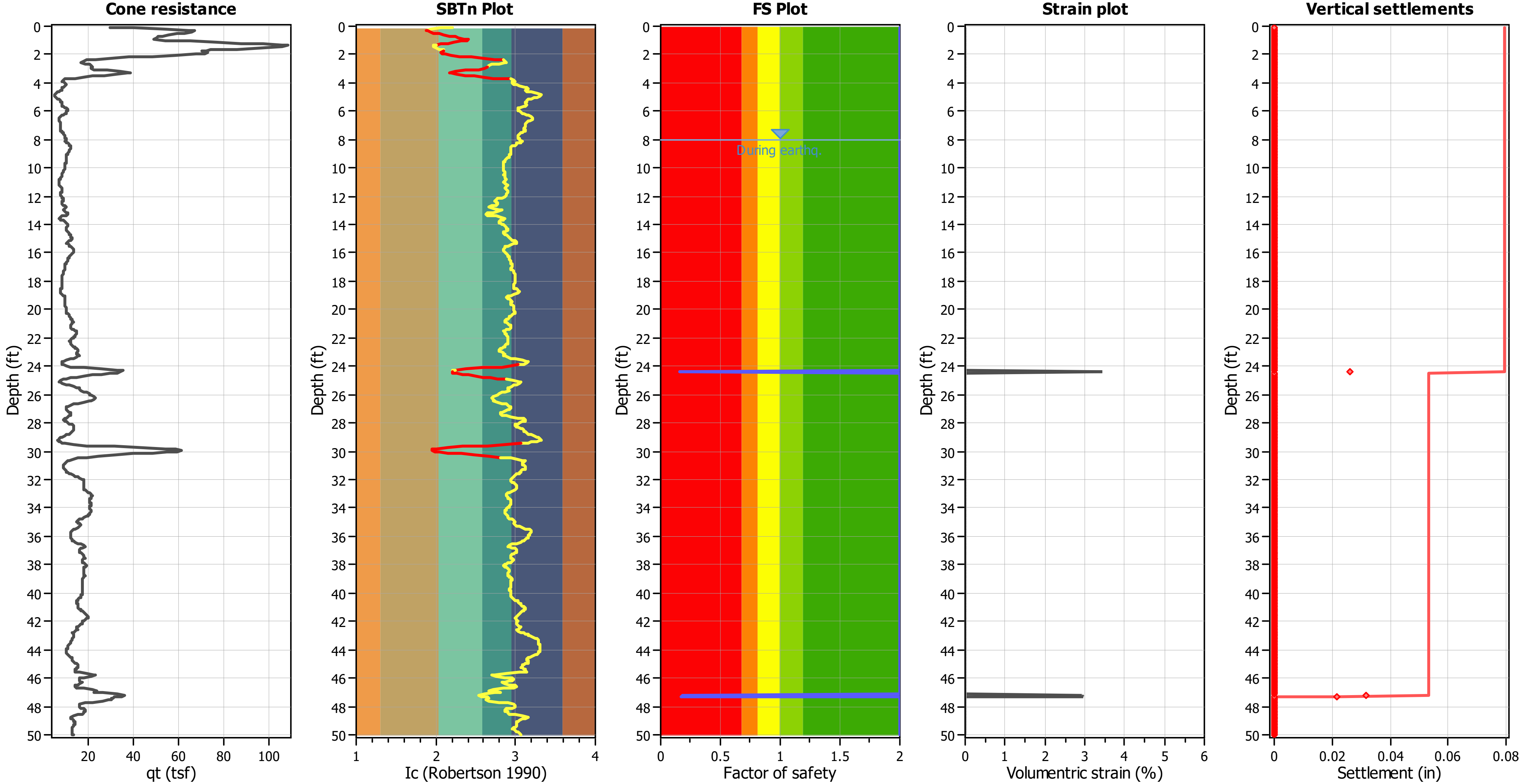
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	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:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

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)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
8.06	115.70	2.00	0.00	1.00	0.00	8.10	117.64	2.00	0.00	1.00	0.00
8.15	118.70	2.00	0.00	1.00	0.00	8.23	119.56	2.00	0.00	1.00	0.00
8.28	120.00	2.00	0.00	1.00	0.00	8.34	119.68	2.00	0.00	1.00	0.00
8.43	118.77	2.00	0.00	1.00	0.00	8.49	117.20	2.00	0.00	1.00	0.00
8.58	115.58	2.00	0.00	1.00	0.00	8.62	113.94	2.00	0.00	1.00	0.00
8.67	111.96	2.00	0.00	1.00	0.00	8.78	110.03	2.00	0.00	1.00	0.00
8.81	107.84	2.00	0.00	1.00	0.00	8.88	105.90	2.00	0.00	1.00	0.00
8.93	102.83	2.00	0.00	1.00	0.00	9.01	99.44	2.00	0.00	1.00	0.00
9.07	96.65	2.00	0.00	1.00	0.00	9.13	94.79	2.00	0.00	1.00	0.00
9.22	93.69	2.00	0.00	1.00	0.00	9.27	91.57	2.00	0.00	1.00	0.00
9.37	89.70	2.00	0.00	1.00	0.00	9.42	87.78	2.00	0.00	1.00	0.00
9.47	86.41	2.00	0.00	1.00	0.00	9.54	84.66	2.00	0.00	1.00	0.00
9.62	82.80	2.00	0.00	1.00	0.00	9.66	80.97	2.00	0.00	1.00	0.00
9.72	79.13	2.00	0.00	1.00	0.00	9.82	77.62	2.00	0.00	1.00	0.00
9.85	76.87	2.00	0.00	1.00	0.00	9.91	76.81	2.00	0.00	1.00	0.00
10.01	76.78	2.00	0.00	1.00	0.00	10.05	75.97	2.00	0.00	1.00	0.00
10.12	74.77	2.00	0.00	1.00	0.00	10.20	73.41	2.00	0.00	1.00	0.00
10.26	72.54	2.00	0.00	1.00	0.00	10.31	70.45	2.00	0.00	1.00	0.00
10.40	68.12	2.00	0.00	1.00	0.00	10.46	65.88	2.00	0.00	1.00	0.00
10.51	65.07	2.00	0.00	1.00	0.00	10.60	64.41	2.00	0.00	1.00	0.00
10.65	63.66	2.00	0.00	1.00	0.00	10.71	62.81	2.00	0.00	1.00	0.00
10.76	61.48	2.00	0.00	1.00	0.00	10.85	58.70	2.00	0.00	1.00	0.00
10.90	55.28	2.00	0.00	1.00	0.00	10.96	53.00	2.00	0.00	1.00	0.00
11.05	52.57	2.00	0.00	1.00	0.00	11.10	54.65	2.00	0.00	1.00	0.00
11.20	56.97	2.00	0.00	1.00	0.00	11.24	60.15	2.00	0.00	1.00	0.00
11.32	62.66	2.00	0.00	1.00	0.00	11.38	64.71	2.00	0.00	1.00	0.00
11.42	66.62	2.00	0.00	1.00	0.00	11.51	67.93	2.00	0.00	1.00	0.00
11.57	68.93	2.00	0.00	1.00	0.00	11.66	68.88	2.00	0.00	1.00	0.00
11.70	68.20	2.00	0.00	1.00	0.00	11.77	67.17	2.00	0.00	1.00	0.00
11.83	66.23	2.00	0.00	1.00	0.00	11.91	65.79	2.00	0.00	1.00	0.00
11.96	65.54	2.00	0.00	1.00	0.00	12.01	64.61	2.00	0.00	1.00	0.00
12.11	63.30	2.00	0.00	1.00	0.00	12.16	61.37	2.00	0.00	1.00	0.00
12.21	59.44	2.00	0.00	1.00	0.00	12.31	57.55	2.00	0.00	1.00	0.00
12.35	56.53	2.00	0.00	1.00	0.00	12.41	56.38	2.00	0.00	1.00	0.00
12.50	56.73	2.00	0.00	1.00	0.00	12.55	57.05	2.00	0.00	1.00	0.00
12.61	57.83	2.00	0.00	1.00	0.00	12.69	58.24	2.00	0.00	1.00	0.00
12.75	58.54	2.00	0.00	1.00	0.00	12.80	59.38	2.00	0.00	1.00	0.00
12.87	61.42	2.00	0.00	1.00	0.00	12.96	63.67	2.00	0.00	1.00	0.00
13.00	64.55	2.00	0.00	1.00	0.00	13.09	63.67	2.00	0.00	1.00	0.00
13.15	62.63	2.00	0.00	1.00	0.00	13.19	60.16	2.00	0.00	1.00	0.00
13.26	57.34	2.00	0.00	1.00	0.00	13.35	54.23	2.00	0.00	1.00	0.00
13.41	53.33	2.00	0.00	1.00	0.00	13.50	53.35	2.00	0.00	1.00	0.00
13.54	53.65	2.00	0.00	1.00	0.00	13.58	56.25	2.00	0.00	1.00	0.00
13.69	59.91	2.00	0.00	1.00	0.00	13.73	63.97	2.00	0.00	1.00	0.00
13.79	68.24	2.00	0.00	1.00	0.00	13.89	72.39	2.00	0.00	1.00	0.00
13.93	76.26	2.00	0.00	1.00	0.00	14.00	79.50	2.00	0.00	1.00	0.00
14.04	83.31	2.00	0.00	1.00	0.00	14.13	85.80	2.00	0.00	1.00	0.00
14.19	86.77	2.00	0.00	1.00	0.00	14.28	86.40	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
14.32	86.17	2.00	0.00	1.00	0.00	14.39	86.52	2.00	0.00	1.00	0.00
14.48	87.19	2.00	0.00	1.00	0.00	14.53	88.57	2.00	0.00	1.00	0.00
14.59	90.84	2.00	0.00	1.00	0.00	14.68	93.87	2.00	0.00	1.00	0.00
14.72	98.54	2.00	0.00	1.00	0.00	14.79	103.71	2.00	0.00	1.00	0.00
14.87	108.76	2.00	0.00	1.00	0.00	14.92	112.32	2.00	0.00	1.00	0.00
14.97	114.28	2.00	0.00	1.00	0.00	15.05	115.00	2.00	0.00	1.00	0.00
15.12	114.90	2.00	0.00	1.00	0.00	15.17	113.31	2.00	0.00	1.00	0.00
15.27	110.97	2.00	0.00	1.00	0.00	15.31	107.80	2.00	0.00	1.00	0.00
15.36	104.49	2.00	0.00	1.00	0.00	15.45	101.25	2.00	0.00	1.00	0.00
15.52	98.77	2.00	0.00	1.00	0.00	15.56	98.74	2.00	0.00	1.00	0.00
15.65	99.87	2.00	0.00	1.00	0.00	15.71	101.24	2.00	0.00	1.00	0.00
15.76	102.51	2.00	0.00	1.00	0.00	15.85	103.56	2.00	0.00	1.00	0.00
15.91	104.28	2.00	0.00	1.00	0.00	15.96	103.98	2.00	0.00	1.00	0.00
16.06	103.14	2.00	0.00	1.00	0.00	16.10	102.12	2.00	0.00	1.00	0.00
16.15	100.34	2.00	0.00	1.00	0.00	16.25	98.28	2.00	0.00	1.00	0.00
16.30	96.25	2.00	0.00	1.00	0.00	16.35	95.17	2.00	0.00	1.00	0.00
16.41	93.74	2.00	0.00	1.00	0.00	16.50	92.24	2.00	0.00	1.00	0.00
16.54	90.35	2.00	0.00	1.00	0.00	16.65	88.79	2.00	0.00	1.00	0.00
16.70	87.26	2.00	0.00	1.00	0.00	16.74	86.30	2.00	0.00	1.00	0.00
16.81	85.20	2.00	0.00	1.00	0.00	16.89	83.95	2.00	0.00	1.00	0.00
16.95	82.66	2.00	0.00	1.00	0.00	17.04	81.56	2.00	0.00	1.00	0.00
17.09	80.95	2.00	0.00	1.00	0.00	17.14	80.37	2.00	0.00	1.00	0.00
17.22	79.98	2.00	0.00	1.00	0.00	17.29	79.54	2.00	0.00	1.00	0.00
17.34	79.22	2.00	0.00	1.00	0.00	17.41	78.76	2.00	0.00	1.00	0.00
17.46	77.97	2.00	0.00	1.00	0.00	17.54	77.11	2.00	0.00	1.00	0.00
17.59	76.47	2.00	0.00	1.00	0.00	17.68	76.10	2.00	0.00	1.00	0.00
17.74	75.37	2.00	0.00	1.00	0.00	17.83	74.69	2.00	0.00	1.00	0.00
17.87	74.20	2.00	0.00	1.00	0.00	17.92	73.97	2.00	0.00	1.00	0.00
17.99	73.57	2.00	0.00	1.00	0.00	18.07	72.94	2.00	0.00	1.00	0.00
18.13	72.30	2.00	0.00	1.00	0.00	18.18	71.76	2.00	0.00	1.00	0.00
18.28	71.34	2.00	0.00	1.00	0.00	18.32	69.58	2.00	0.00	1.00	0.00
18.38	68.61	2.00	0.00	1.00	0.00	18.48	67.95	2.00	0.00	1.00	0.00
18.51	69.16	2.00	0.00	1.00	0.00	18.57	69.72	2.00	0.00	1.00	0.00
18.68	70.02	2.00	0.00	1.00	0.00	18.72	70.22	2.00	0.00	1.00	0.00
18.80	70.28	2.00	0.00	1.00	0.00	18.86	70.39	2.00	0.00	1.00	0.00
18.90	70.72	2.00	0.00	1.00	0.00	19.00	70.75	2.00	0.00	1.00	0.00
19.05	70.59	2.00	0.00	1.00	0.00	19.11	70.53	2.00	0.00	1.00	0.00
19.19	70.65	2.00	0.00	1.00	0.00	19.24	71.26	2.00	0.00	1.00	0.00
19.31	72.13	2.00	0.00	1.00	0.00	19.40	73.00	2.00	0.00	1.00	0.00
19.44	73.90	2.00	0.00	1.00	0.00	19.51	74.78	2.00	0.00	1.00	0.00
19.60	75.67	2.00	0.00	1.00	0.00	19.64	76.46	2.00	0.00	1.00	0.00
19.69	78.21	2.00	0.00	1.00	0.00	19.80	79.87	2.00	0.00	1.00	0.00
19.84	81.41	2.00	0.00	1.00	0.00	19.89	81.43	2.00	0.00	1.00	0.00
20.00	81.26	2.00	0.00	1.00	0.00	20.04	81.06	2.00	0.00	1.00	0.00
20.09	82.26	2.00	0.00	1.00	0.00	20.15	84.33	2.00	0.00	1.00	0.00
20.24	86.37	2.00	0.00	1.00	0.00	20.28	87.10	2.00	0.00	1.00	0.00
20.35	87.06	2.00	0.00	1.00	0.00	20.44	86.66	2.00	0.00	1.00	0.00
20.48	86.90	2.00	0.00	1.00	0.00	20.56	86.91	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
20.64	86.88	2.00	0.00	1.00	0.00	20.68	85.85	2.00	0.00	1.00	0.00
20.79	85.08	2.00	0.00	1.00	0.00	20.84	85.04	2.00	0.00	1.00	0.00
20.89	86.23	2.00	0.00	1.00	0.00	20.93	87.47	2.00	0.00	1.00	0.00
21.03	88.33	2.00	0.00	1.00	0.00	21.09	88.87	2.00	0.00	1.00	0.00
21.13	88.98	2.00	0.00	1.00	0.00	21.22	89.00	2.00	0.00	1.00	0.00
21.26	89.17	2.00	0.00	1.00	0.00	21.36	89.34	2.00	0.00	1.00	0.00
21.39	89.38	2.00	0.00	1.00	0.00	21.48	89.81	2.00	0.00	1.00	0.00
21.53	91.69	2.00	0.00	1.00	0.00	21.63	93.87	2.00	0.00	1.00	0.00
21.68	95.62	2.00	0.00	1.00	0.00	21.75	95.74	2.00	0.00	1.00	0.00
21.82	95.26	2.00	0.00	1.00	0.00	21.87	94.03	2.00	0.00	1.00	0.00
21.93	91.94	2.00	0.00	1.00	0.00	22.02	89.61	2.00	0.00	1.00	0.00
22.06	87.00	2.00	0.00	1.00	0.00	22.12	83.84	2.00	0.00	1.00	0.00
22.22	80.75	2.00	0.00	1.00	0.00	22.26	79.23	2.00	0.00	1.00	0.00
22.31	79.48	2.00	0.00	1.00	0.00	22.42	80.09	2.00	0.00	1.00	0.00
22.46	80.38	2.00	0.00	1.00	0.00	22.52	81.25	2.00	0.00	1.00	0.00
22.61	82.13	2.00	0.00	1.00	0.00	22.64	83.33	2.00	0.00	1.00	0.00
22.71	83.71	2.00	0.00	1.00	0.00	22.79	83.82	2.00	0.00	1.00	0.00
22.86	83.54	2.00	0.00	1.00	0.00	22.91	84.17	2.00	0.00	1.00	0.00
22.98	85.69	2.00	0.00	1.00	0.00	23.06	87.99	2.00	0.00	1.00	0.00
23.11	90.05	2.00	0.00	1.00	0.00	23.18	92.01	2.00	0.00	1.00	0.00
23.26	93.51	2.00	0.00	1.00	0.00	23.30	94.54	2.00	0.00	1.00	0.00
23.36	94.04	2.00	0.00	1.00	0.00	23.46	92.32	2.00	0.00	1.00	0.00
23.51	88.96	2.00	0.00	1.00	0.00	23.60	85.27	2.00	0.00	1.00	0.00
23.65	81.72	2.00	0.00	1.00	0.00	23.69	77.98	2.00	0.00	1.00	0.00
23.79	74.32	2.00	0.00	1.00	0.00	23.85	70.97	2.00	0.00	1.00	0.00
23.89	69.69	2.00	0.00	1.00	0.00	24.00	68.86	2.00	0.00	1.00	0.00
24.05	67.38	2.00	0.00	1.00	0.00	24.09	64.84	2.00	0.00	1.00	0.00
24.19	63.35	2.00	0.00	1.00	0.00	24.24	64.31	2.00	0.00	1.00	0.00
24.29	64.34	2.00	0.00	1.00	0.00	24.35	62.69	0.16	3.43	1.00	0.03
24.44	60.55	2.00	0.00	1.00	0.00	24.49	58.55	2.00	0.00	1.00	0.00
24.55	56.83	2.00	0.00	1.00	0.00	24.64	55.19	2.00	0.00	1.00	0.00
24.69	53.31	2.00	0.00	1.00	0.00	24.75	51.56	2.00	0.00	1.00	0.00
24.84	49.97	2.00	0.00	1.00	0.00	24.89	49.00	2.00	0.00	1.00	0.00
24.94	48.88	2.00	0.00	1.00	0.00	25.03	49.23	2.00	0.00	1.00	0.00
25.09	50.75	2.00	0.00	1.00	0.00	25.13	55.84	2.00	0.00	1.00	0.00
25.22	63.11	2.00	0.00	1.00	0.00	25.29	70.93	2.00	0.00	1.00	0.00
25.33	79.84	2.00	0.00	1.00	0.00	25.43	87.34	2.00	0.00	1.00	0.00
25.48	93.48	2.00	0.00	1.00	0.00	25.53	97.26	2.00	0.00	1.00	0.00
25.62	100.66	2.00	0.00	1.00	0.00	25.68	103.46	2.00	0.00	1.00	0.00
25.73	105.06	2.00	0.00	1.00	0.00	25.79	105.16	2.00	0.00	1.00	0.00
25.87	104.00	2.00	0.00	1.00	0.00	25.92	102.60	2.00	0.00	1.00	0.00
25.99	101.21	2.00	0.00	1.00	0.00	26.07	100.56	2.00	0.00	1.00	0.00
26.12	99.46	2.00	0.00	1.00	0.00	26.21	98.88	2.00	0.00	1.00	0.00
26.27	98.68	2.00	0.00	1.00	0.00	26.32	97.49	2.00	0.00	1.00	0.00
26.41	94.82	2.00	0.00	1.00	0.00	26.46	89.29	2.00	0.00	1.00	0.00
26.55	84.16	2.00	0.00	1.00	0.00	26.61	79.12	2.00	0.00	1.00	0.00
26.66	74.31	2.00	0.00	1.00	0.00	26.74	68.79	2.00	0.00	1.00	0.00
26.81	63.39	2.00	0.00	1.00	0.00	26.84	60.02	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
26.91	58.64	2.00	0.00	1.00	0.00	27.00	57.82	2.00	0.00	1.00	0.00
27.05	57.53	2.00	0.00	1.00	0.00	27.11	56.73	2.00	0.00	1.00	0.00
27.19	55.93	2.00	0.00	1.00	0.00	27.26	55.76	2.00	0.00	1.00	0.00
27.30	56.98	2.00	0.00	1.00	0.00	27.37	58.51	2.00	0.00	1.00	0.00
27.45	60.08	2.00	0.00	1.00	0.00	27.50	62.52	2.00	0.00	1.00	0.00
27.60	65.34	2.00	0.00	1.00	0.00	27.65	68.30	2.00	0.00	1.00	0.00
27.70	70.04	2.00	0.00	1.00	0.00	27.80	71.09	2.00	0.00	1.00	0.00
27.83	72.01	2.00	0.00	1.00	0.00	27.90	73.81	2.00	0.00	1.00	0.00
27.99	76.48	2.00	0.00	1.00	0.00	28.05	79.41	2.00	0.00	1.00	0.00
28.09	82.76	2.00	0.00	1.00	0.00	28.18	86.64	2.00	0.00	1.00	0.00
28.25	90.75	2.00	0.00	1.00	0.00	28.29	94.57	2.00	0.00	1.00	0.00
28.36	98.15	2.00	0.00	1.00	0.00	28.44	100.59	2.00	0.00	1.00	0.00
28.49	101.36	2.00	0.00	1.00	0.00	28.56	100.34	2.00	0.00	1.00	0.00
28.64	98.98	2.00	0.00	1.00	0.00	28.68	96.52	2.00	0.00	1.00	0.00
28.78	93.84	2.00	0.00	1.00	0.00	28.82	88.91	2.00	0.00	1.00	0.00
28.89	82.63	2.00	0.00	1.00	0.00	28.98	75.84	2.00	0.00	1.00	0.00
29.01	70.43	2.00	0.00	1.00	0.00	29.08	65.92	2.00	0.00	1.00	0.00
29.18	61.55	2.00	0.00	1.00	0.00	29.23	58.24	2.00	0.00	1.00	0.00
29.28	57.50	2.00	0.00	1.00	0.00	29.34	58.29	2.00	0.00	1.00	0.00
29.43	60.98	2.00	0.00	1.00	0.00	29.48	64.60	2.00	0.00	1.00	0.00
29.53	67.04	2.00	0.00	1.00	0.00	29.63	65.72	2.00	0.00	1.00	0.00
29.67	62.84	2.00	0.00	1.00	0.00	29.78	64.12	2.00	0.00	1.00	0.00
29.82	68.94	2.00	0.00	1.00	0.00	29.87	71.90	2.00	0.00	1.00	0.00
29.97	74.04	2.00	0.00	1.00	0.00	30.01	73.82	2.00	0.00	1.00	0.00
30.07	73.37	2.00	0.00	1.00	0.00	30.12	73.84	2.00	0.00	1.00	0.00
30.19	77.89	2.00	0.00	1.00	0.00	30.26	84.43	2.00	0.00	1.00	0.00
30.32	88.42	2.00	0.00	1.00	0.00	30.42	88.44	2.00	0.00	1.00	0.00
30.46	86.04	2.00	0.00	1.00	0.00	30.52	83.17	2.00	0.00	1.00	0.00
30.61	79.68	2.00	0.00	1.00	0.00	30.66	75.32	2.00	0.00	1.00	0.00
30.73	71.10	2.00	0.00	1.00	0.00	30.79	65.92	2.00	0.00	1.00	0.00
30.89	61.44	2.00	0.00	1.00	0.00	30.92	58.99	2.00	0.00	1.00	0.00
30.99	59.02	2.00	0.00	1.00	0.00	31.08	59.94	2.00	0.00	1.00	0.00
31.14	61.23	2.00	0.00	1.00	0.00	31.18	62.25	2.00	0.00	1.00	0.00
31.26	62.83	2.00	0.00	1.00	0.00	31.31	63.41	2.00	0.00	1.00	0.00
31.38	64.75	2.00	0.00	1.00	0.00	31.47	66.83	2.00	0.00	1.00	0.00
31.51	69.77	2.00	0.00	1.00	0.00	31.58	72.55	2.00	0.00	1.00	0.00
31.63	75.73	2.00	0.00	1.00	0.00	31.71	78.83	2.00	0.00	1.00	0.00
31.78	82.74	2.00	0.00	1.00	0.00	31.83	86.81	2.00	0.00	1.00	0.00
31.90	91.10	2.00	0.00	1.00	0.00	31.98	94.43	2.00	0.00	1.00	0.00
32.02	97.78	2.00	0.00	1.00	0.00	32.12	100.61	2.00	0.00	1.00	0.00
32.17	103.59	2.00	0.00	1.00	0.00	32.22	106.13	2.00	0.00	1.00	0.00
32.30	108.32	2.00	0.00	1.00	0.00	32.37	109.93	2.00	0.00	1.00	0.00
32.42	110.74	2.00	0.00	1.00	0.00	32.50	110.86	2.00	0.00	1.00	0.00
32.57	110.53	2.00	0.00	1.00	0.00	32.62	109.73	2.00	0.00	1.00	0.00
32.71	108.81	2.00	0.00	1.00	0.00	32.77	108.00	2.00	0.00	1.00	0.00
32.81	107.18	2.00	0.00	1.00	0.00	32.91	106.26	2.00	0.00	1.00	0.00
32.96	105.50	2.00	0.00	1.00	0.00	33.01	105.38	2.00	0.00	1.00	0.00
33.08	105.49	2.00	0.00	1.00	0.00	33.16	105.91	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
33.21	106.58	2.00	0.00	1.00	0.00	33.29	107.32	2.00	0.00	1.00	0.00
33.36	107.97	2.00	0.00	1.00	0.00	33.40	108.63	2.00	0.00	1.00	0.00
33.49	109.14	2.00	0.00	1.00	0.00	33.54	109.83	2.00	0.00	1.00	0.00
33.61	110.43	2.00	0.00	1.00	0.00	33.69	110.77	2.00	0.00	1.00	0.00
33.75	110.40	2.00	0.00	1.00	0.00	33.80	109.08	2.00	0.00	1.00	0.00
33.88	107.13	2.00	0.00	1.00	0.00	33.95	105.11	2.00	0.00	1.00	0.00
34.00	102.93	2.00	0.00	1.00	0.00	34.09	100.68	2.00	0.00	1.00	0.00
34.15	98.65	2.00	0.00	1.00	0.00	34.20	97.33	2.00	0.00	1.00	0.00
34.28	96.70	2.00	0.00	1.00	0.00	34.35	96.39	2.00	0.00	1.00	0.00
34.42	96.00	2.00	0.00	1.00	0.00	34.50	95.26	2.00	0.00	1.00	0.00
34.54	94.19	2.00	0.00	1.00	0.00	34.60	91.69	2.00	0.00	1.00	0.00
34.69	88.58	2.00	0.00	1.00	0.00	34.74	85.30	2.00	0.00	1.00	0.00
34.82	83.15	2.00	0.00	1.00	0.00	34.89	81.64	2.00	0.00	1.00	0.00
34.94	80.74	2.00	0.00	1.00	0.00	34.99	81.26	2.00	0.00	1.00	0.00
35.08	82.37	2.00	0.00	1.00	0.00	35.12	84.75	2.00	0.00	1.00	0.00
35.19	87.77	2.00	0.00	1.00	0.00	35.26	91.18	2.00	0.00	1.00	0.00
35.34	93.53	2.00	0.00	1.00	0.00	35.38	94.43	2.00	0.00	1.00	0.00
35.47	93.99	2.00	0.00	1.00	0.00	35.53	92.83	2.00	0.00	1.00	0.00
35.57	90.37	2.00	0.00	1.00	0.00	35.68	87.67	2.00	0.00	1.00	0.00
35.73	85.07	2.00	0.00	1.00	0.00	35.76	82.77	2.00	0.00	1.00	0.00
35.88	80.73	2.00	0.00	1.00	0.00	35.92	79.14	2.00	0.00	1.00	0.00
35.96	78.81	2.00	0.00	1.00	0.00	36.08	78.64	2.00	0.00	1.00	0.00
36.12	78.69	2.00	0.00	1.00	0.00	36.19	78.92	2.00	0.00	1.00	0.00
36.27	79.29	2.00	0.00	1.00	0.00	36.31	79.72	2.00	0.00	1.00	0.00
36.37	80.36	2.00	0.00	1.00	0.00	36.42	81.27	2.00	0.00	1.00	0.00
36.49	82.36	2.00	0.00	1.00	0.00	36.55	83.30	2.00	0.00	1.00	0.00
36.62	83.94	2.00	0.00	1.00	0.00	36.71	84.28	2.00	0.00	1.00	0.00
36.76	84.49	2.00	0.00	1.00	0.00	36.81	84.92	2.00	0.00	1.00	0.00
36.89	85.47	2.00	0.00	1.00	0.00	36.97	85.79	2.00	0.00	1.00	0.00
37.01	85.45	2.00	0.00	1.00	0.00	37.11	84.78	2.00	0.00	1.00	0.00
37.16	84.34	2.00	0.00	1.00	0.00	37.21	84.48	2.00	0.00	1.00	0.00
37.28	85.05	2.00	0.00	1.00	0.00	37.36	85.71	2.00	0.00	1.00	0.00
37.40	86.41	2.00	0.00	1.00	0.00	37.51	86.89	2.00	0.00	1.00	0.00
37.55	87.22	2.00	0.00	1.00	0.00	37.60	87.36	2.00	0.00	1.00	0.00
37.67	87.15	2.00	0.00	1.00	0.00	37.75	85.16	2.00	0.00	1.00	0.00
37.85	82.37	2.00	0.00	1.00	0.00	37.90	79.21	2.00	0.00	1.00	0.00
37.95	77.74	2.00	0.00	1.00	0.00	38.02	77.18	2.00	0.00	1.00	0.00
38.10	77.16	2.00	0.00	1.00	0.00	38.14	77.44	2.00	0.00	1.00	0.00
38.19	77.75	2.00	0.00	1.00	0.00	38.28	78.21	2.00	0.00	1.00	0.00
38.35	78.56	2.00	0.00	1.00	0.00	38.40	78.85	2.00	0.00	1.00	0.00
38.47	78.88	2.00	0.00	1.00	0.00	38.54	78.85	2.00	0.00	1.00	0.00
38.59	79.05	2.00	0.00	1.00	0.00	38.70	79.44	2.00	0.00	1.00	0.00
38.74	80.08	2.00	0.00	1.00	0.00	38.80	80.59	2.00	0.00	1.00	0.00
38.84	80.96	2.00	0.00	1.00	0.00	38.94	81.19	2.00	0.00	1.00	0.00
38.99	81.00	2.00	0.00	1.00	0.00	39.09	80.57	2.00	0.00	1.00	0.00
39.14	79.98	2.00	0.00	1.00	0.00	39.19	79.60	2.00	0.00	1.00	0.00
39.28	79.29	2.00	0.00	1.00	0.00	39.34	79.08	2.00	0.00	1.00	0.00
39.39	78.71	2.00	0.00	1.00	0.00	39.48	78.36	2.00	0.00	1.00	0.00

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
39.54	78.08	2.00	0.00	1.00	0.00	39.59	77.91	2.00	0.00	1.00	0.00
39.64	77.54	2.00	0.00	1.00	0.00	39.73	77.09	2.00	0.00	1.00	0.00
39.78	76.75	2.00	0.00	1.00	0.00	39.83	76.58	2.00	0.00	1.00	0.00
39.92	76.47	2.00	0.00	1.00	0.00	39.96	76.30	2.00	0.00	1.00	0.00
40.03	76.05	2.00	0.00	1.00	0.00	40.12	75.65	2.00	0.00	1.00	0.00
40.18	75.26	2.00	0.00	1.00	0.00	40.23	74.52	2.00	0.00	1.00	0.00
40.31	73.35	2.00	0.00	1.00	0.00	40.37	72.27	2.00	0.00	1.00	0.00
40.42	71.81	2.00	0.00	1.00	0.00	40.52	72.09	2.00	0.00	1.00	0.00
40.57	73.10	2.00	0.00	1.00	0.00	40.62	75.11	2.00	0.00	1.00	0.00
40.72	77.31	2.00	0.00	1.00	0.00	40.77	79.35	2.00	0.00	1.00	0.00
40.83	80.18	2.00	0.00	1.00	0.00	40.92	81.67	2.00	0.00	1.00	0.00
40.96	84.50	2.00	0.00	1.00	0.00	41.02	88.40	2.00	0.00	1.00	0.00
41.12	91.25	2.00	0.00	1.00	0.00	41.15	92.76	2.00	0.00	1.00	0.00
41.21	93.33	2.00	0.00	1.00	0.00	41.28	94.12	2.00	0.00	1.00	0.00
41.37	94.80	2.00	0.00	1.00	0.00	41.43	95.53	2.00	0.00	1.00	0.00
41.52	96.03	2.00	0.00	1.00	0.00	41.57	96.42	2.00	0.00	1.00	0.00
41.62	96.35	2.00	0.00	1.00	0.00	41.67	95.06	2.00	0.00	1.00	0.00
41.77	93.30	2.00	0.00	1.00	0.00	41.81	91.48	2.00	0.00	1.00	0.00
41.87	90.05	2.00	0.00	1.00	0.00	41.96	88.36	2.00	0.00	1.00	0.00
42.01	86.12	2.00	0.00	1.00	0.00	42.07	83.12	2.00	0.00	1.00	0.00
42.16	79.90	2.00	0.00	1.00	0.00	42.20	77.36	2.00	0.00	1.00	0.00
42.26	75.59	2.00	0.00	1.00	0.00	42.34	74.22	2.00	0.00	1.00	0.00
42.41	73.04	2.00	0.00	1.00	0.00	42.45	72.46	2.00	0.00	1.00	0.00
42.55	70.44	2.00	0.00	1.00	0.00	42.61	67.09	2.00	0.00	1.00	0.00
42.68	64.33	2.00	0.00	1.00	0.00	42.76	63.72	2.00	0.00	1.00	0.00
42.80	66.85	2.00	0.00	1.00	0.00	42.90	70.37	2.00	0.00	1.00	0.00
42.95	73.77	2.00	0.00	1.00	0.00	43.00	75.57	2.00	0.00	1.00	0.00
43.05	78.21	2.00	0.00	1.00	0.00	43.15	80.72	2.00	0.00	1.00	0.00
43.19	83.01	2.00	0.00	1.00	0.00	43.25	83.45	2.00	0.00	1.00	0.00
43.32	82.83	2.00	0.00	1.00	0.00	43.39	81.48	2.00	0.00	1.00	0.00
43.45	79.78	2.00	0.00	1.00	0.00	43.54	78.10	2.00	0.00	1.00	0.00
43.59	76.46	2.00	0.00	1.00	0.00	43.65	74.47	2.00	0.00	1.00	0.00
43.75	72.58	2.00	0.00	1.00	0.00	43.79	70.79	2.00	0.00	1.00	0.00
43.84	69.49	2.00	0.00	1.00	0.00	43.94	68.33	2.00	0.00	1.00	0.00
43.98	67.52	2.00	0.00	1.00	0.00	44.04	66.87	2.00	0.00	1.00	0.00
44.13	66.21	2.00	0.00	1.00	0.00	44.16	65.63	2.00	0.00	1.00	0.00
44.24	65.47	2.00	0.00	1.00	0.00	44.33	65.50	2.00	0.00	1.00	0.00
44.38	65.66	2.00	0.00	1.00	0.00	44.43	65.94	2.00	0.00	1.00	0.00
44.51	66.06	2.00	0.00	1.00	0.00	44.57	66.48	2.00	0.00	1.00	0.00
44.63	67.45	2.00	0.00	1.00	0.00	44.73	68.80	2.00	0.00	1.00	0.00
44.78	70.20	2.00	0.00	1.00	0.00	44.83	72.24	2.00	0.00	1.00	0.00
44.93	73.98	2.00	0.00	1.00	0.00	44.98	75.45	2.00	0.00	1.00	0.00
45.02	75.74	2.00	0.00	1.00	0.00	45.08	76.46	2.00	0.00	1.00	0.00
45.17	76.21	2.00	0.00	1.00	0.00	45.22	74.64	2.00	0.00	1.00	0.00
45.28	72.86	2.00	0.00	1.00	0.00	45.35	72.06	2.00	0.00	1.00	0.00
45.42	72.84	2.00	0.00	1.00	0.00	45.52	73.21	2.00	0.00	1.00	0.00
45.56	73.07	2.00	0.00	1.00	0.00	45.61	71.76	2.00	0.00	1.00	0.00
45.70	69.03	2.00	0.00	1.00	0.00	45.76	65.51	2.00	0.00	1.00	0.00

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

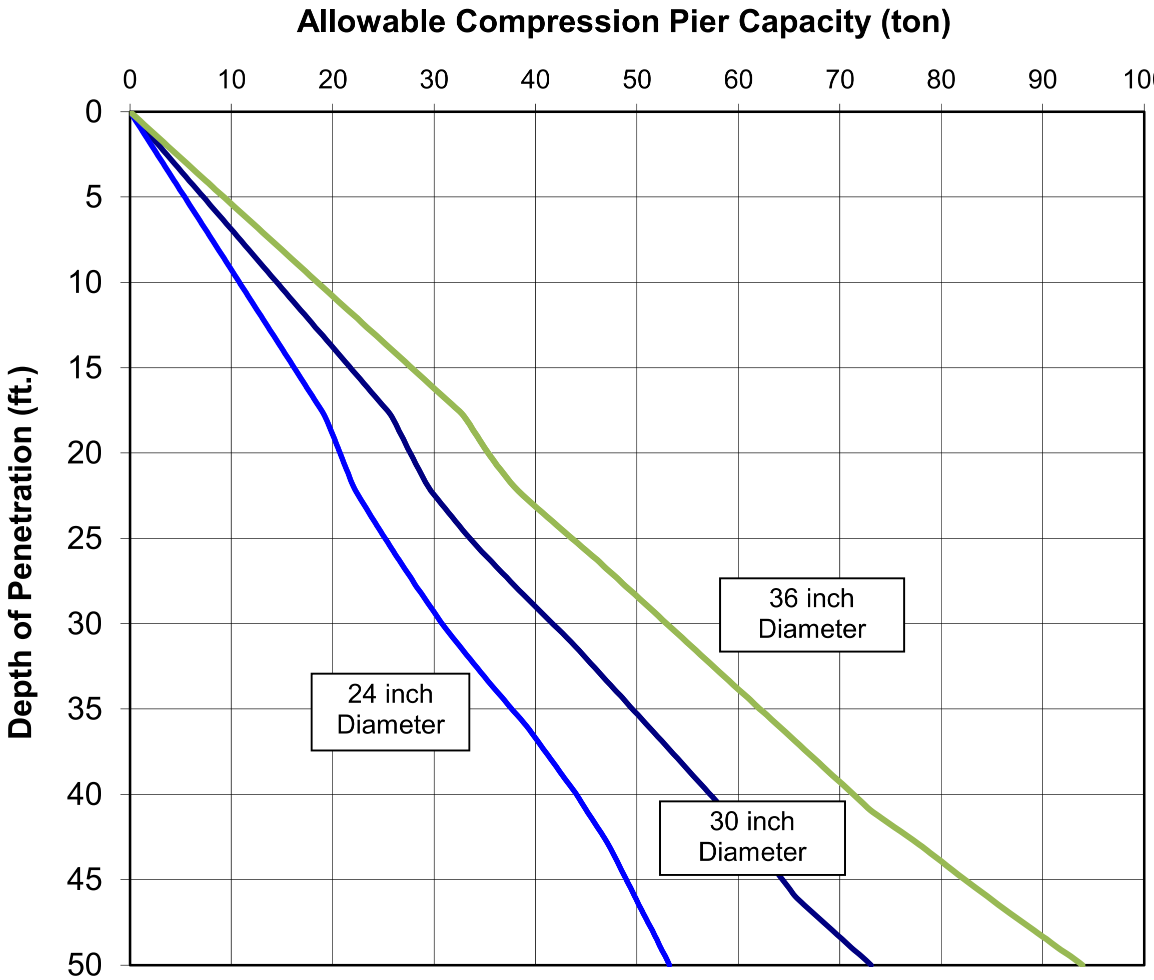
Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
45.80	63.35	2.00	0.00	1.00	0.00	45.89	62.63	2.00	0.00	1.00	0.00
45.95	62.71	2.00	0.00	1.00	0.00	46.00	63.15	2.00	0.00	1.00	0.00
46.10	63.31	2.00	0.00	1.00	0.00	46.15	61.92	2.00	0.00	1.00	0.00
46.22	59.42	2.00	0.00	1.00	0.00	46.30	56.62	2.00	0.00	1.00	0.00
46.34	54.87	2.00	0.00	1.00	0.00	46.40	54.58	2.00	0.00	1.00	0.00
46.49	54.97	2.00	0.00	1.00	0.00	46.53	57.04	2.00	0.00	1.00	0.00
46.60	58.52	2.00	0.00	1.00	0.00	46.69	59.33	2.00	0.00	1.00	0.00
46.74	58.63	2.00	0.00	1.00	0.00	46.79	57.85	2.00	0.00	1.00	0.00
46.88	59.88	2.00	0.00	1.00	0.00	46.94	63.90	2.00	0.00	1.00	0.00
46.99	71.01	2.00	0.00	1.00	0.00	47.06	75.78	2.00	0.00	1.00	0.00
47.14	76.28	2.00	0.00	1.00	0.00	47.23	75.55	0.18	2.94	1.00	0.03
47.29	74.98	0.18	2.96	1.00	0.02	47.34	77.24	2.00	0.00	1.00	0.00
47.41	77.78	2.00	0.00	1.00	0.00	47.48	76.65	2.00	0.00	1.00	0.00
47.53	73.41	2.00	0.00	1.00	0.00	47.58	69.13	2.00	0.00	1.00	0.00
47.68	66.09	2.00	0.00	1.00	0.00	47.72	64.91	2.00	0.00	1.00	0.00
47.77	64.65	2.00	0.00	1.00	0.00	47.86	63.96	2.00	0.00	1.00	0.00
47.90	63.53	2.00	0.00	1.00	0.00	47.98	63.61	2.00	0.00	1.00	0.00
48.03	63.61	2.00	0.00	1.00	0.00	48.12	62.70	2.00	0.00	1.00	0.00
48.18	61.52	2.00	0.00	1.00	0.00	48.27	61.20	2.00	0.00	1.00	0.00
48.32	61.86	2.00	0.00	1.00	0.00	48.38	62.55	2.00	0.00	1.00	0.00
48.43	62.15	2.00	0.00	1.00	0.00	48.52	61.74	2.00	0.00	1.00	0.00
48.57	60.80	2.00	0.00	1.00	0.00	48.67	60.08	2.00	0.00	1.00	0.00
48.72	58.92	2.00	0.00	1.00	0.00	48.78	58.06	2.00	0.00	1.00	0.00
48.87	56.93	2.00	0.00	1.00	0.00	48.91	55.16	2.00	0.00	1.00	0.00
48.97	54.26	2.00	0.00	1.00	0.00	49.07	53.83	2.00	0.00	1.00	0.00
49.09	54.39	2.00	0.00	1.00	0.00	49.16	54.30	2.00	0.00	1.00	0.00
49.26	53.60	2.00	0.00	1.00	0.00	49.31	52.41	2.00	0.00	1.00	0.00
49.36	50.29	2.00	0.00	1.00	0.00	49.46	48.32	2.00	0.00	1.00	0.00
49.51	46.44	2.00	0.00	1.00	0.00	49.56	45.70	2.00	0.00	1.00	0.00
49.61	45.62	2.00	0.00	1.00	0.00	49.71	46.07	2.00	0.00	1.00	0.00
49.75	47.19	2.00	0.00	1.00	0.00	49.81	48.92	2.00	0.00	1.00	0.00
49.90	51.10	2.00	0.00	1.00	0.00	49.96	53.45	2.00	0.00	1.00	0.00
50.00	54.84	2.00	0.00	1.00	0.00						

Total estimated settlement: 0.08

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



Notes:

1. Compression load capacity are based on skin friction and end-bearing capacity. The structural capacity of the piers should be checked.
2. The indicated capacities are for sustained (dead plus live) vertical compression load, and include a factor of safety of at least 2.5
3. For temporary wind or seismic load, the above values may be increased by one-third.
4. Capacities of other pier sizes are in direct proportion to the pile diameter.
5. Pier capacity in tension should be taken as 50% of the compression capacity.

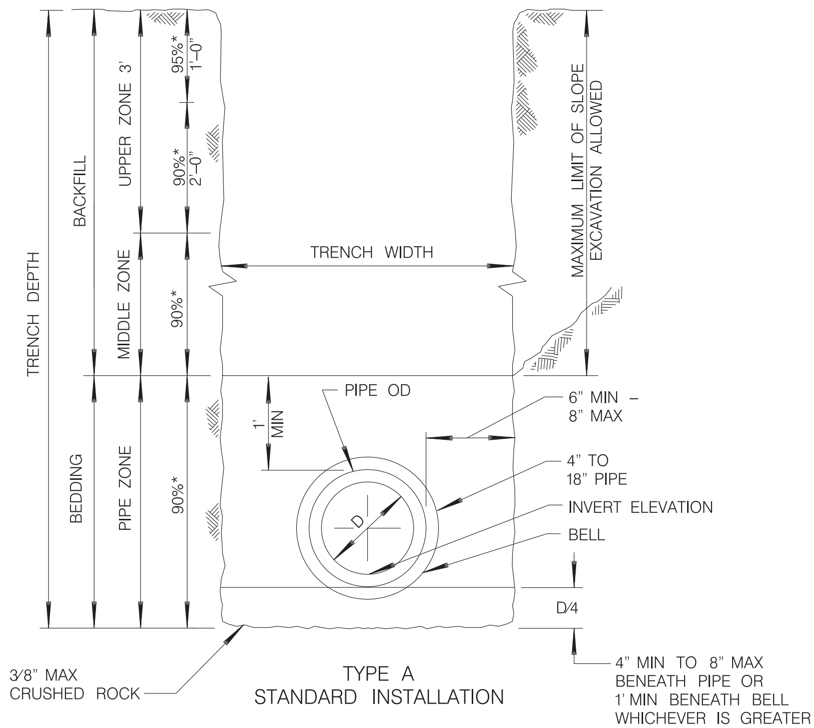
LANDMARK Geo-Engineers and Geologists

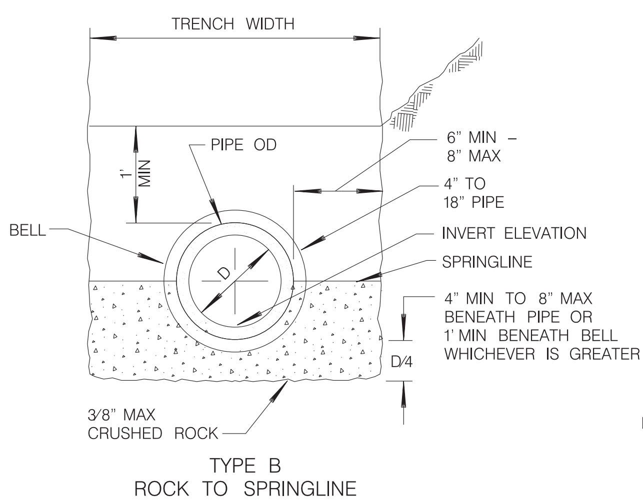
Project No.: LE22197

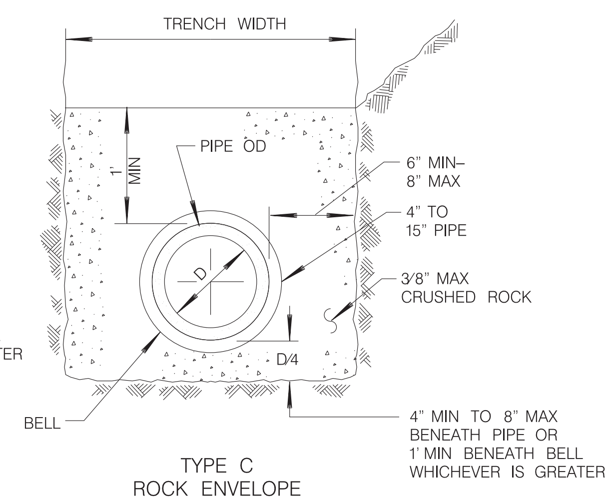
Drlled Piers Compression Capacity Chart
Morton Bay Geothermal Plant
Calipatria, California

Figure E-1

APPENDIX F







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.: LE22197**	**Pipe Bedding and Trench Backfill Recommendations**	**Plate F-1**

APPENDIX G

CALENERGY – MORTON BAY SITE
SOIL ASSESSMENT SUMMARY REPORT

Presented To:

Landmark Consultants

Prepared by:

Project No. 22136

OCTOBER 20, 2022

INTRODUCTION

RFYeager Engineering has completed an electrical and thermal resistivity assessment at the proposed CalEnergy Morton Bay site near Calipatria, California. A chemical analysis of two (2) soil samples provided by Landmark was also conducted. The objective of this study is to determine the thermal and electrical resistivity, as well as to determine the corrosivity of the soil at the project site.

The location and numbering of the assessment sites is shown in Figure 1 at the end of this report. Figure 1 is based upon the site map provided by Landmark.

SCOPE

The electrical resistivity of the soil was determined by using the Wenner 4 pin method in accordance with ASTM G57 standards. Six readings were obtained and recorded for each assessment site based upon pin spacings of 40, 20, 15, 10, 5, and 2.5 feet. Readings were recorded at two locations within the Morton Bay site boundaries. All resistivity readings were recorded utilizing a Soil Resistance Meter (Megger Model DET4T2).

The soil corrosivity was evaluated based on the results of the field soil electrical resistivity assessment and the chemical analyses of the two soil samples. The soil samples were obtained by Landmark from a depth of approximately 3 feet. The samples were analyzed for pH, soluble salts (chlorides and sulfates) as well as resistivity in the saturated condition.

The thermal resistivity was determined using a Decagon KD2 Pro Portable Thermal Properties Analyzer (KD2 Pro) outfitted with the 100 mm long, 2.4 mm diameter TR-1 sensor. The KD2 Pro works in accordance with ASTM D5334-08 using a transient heat method.

CONCLUSIONS

The following are significant conclusions resulting from this assessment:

1. The results of the field electrical resistivity assessment are provided in Table 1. Resistivity readings ranging from less than 77 ohm-cm to 148 ohm-cm. All readings fell within the "Very Corrosive" soil classification (see Discussion).

Table 1 – CalEnergy Morton Bay Site **Soil Electrical Resistivity Data** Prepared by: RFYeager Engineering Test Date: 9.30.2022							
		Soil Resistivity (Ohm-cm)					
	Assessment Site ID	**Ave. Soil Depth (feet)**					
Test No.		**40**	**20**	**15**	**10**	**5**	**2.5**
1	ER-1 (E/W Orientation)	<77[2]	77	86	115	134	139
	ER-1 (N/S Orientation)	<77	77	86	134	124	148
2	ER-2 (E/W Orientation)	<77	77	86	115	134	129
	ER-2 (N/S Orientation)	<77	77	86	134	144	134

1 - See Figure 1 for soil assessment location relative to project site
2 - Electrical resistivity below detectable level of field equipment

2. The chemical analysis results are provided in Table 2. Both samples contained very high concentrations of chlorides (i.e. greater than 300 ppm) and sulfates (i.e. greater than 1000 ppm). The saturated soil resistivities of the two samples were very low at 49 ohm-cm and 46 ohm-cm, respectively. The pH readings were indicative of slightly alkaline soil conditions.

Table 2 – CalEnergy Morton Bay Site **Chemical Analysis Data** Prepared by: RFYeager Engineering				
Sample ID[1]	**Min. Soil Box Resistivity[2] (ohm-cm)**	**Chloride Concentration[3] (ppm)**	**Sulfate Concentration[4] (ppm)**	**pH[5]**
1	49	10,890	7,220	7.6
2	46	10,470	7.6	8.7

1 - See Figure 1 for soil sample location. Soil sample taken from a depth of 3 feet
2 - Min. Electrical Resistivity - Miller Soil Box Method, Cal. Test 643
3 - Soluble Soil Chlorides - Cal. Test 422
4 - Soluble Sulfate Content - Cal. Test 417
5 - pH - Cal. Test 643

3. The data collected from the project site indicates that the soil should be considered as very aggressive to buried metallic utilities. This conclusion is based upon the low soil resistivities and high concentrations of soluble salts.

4. Overall, the data from project site indicates that the surrounding soil will support and promote metallic corrosion. Accordingly, supplemental corrosion control measures, such as cathodic protection, are recommended for any buried metallic utilities in order to prevent premature failure.

5. The soil thermal resistivity is provided in Table 3. The corresponding Time vs. Temperature graphs for each assessment site is provided in Appendix A.

Table 3 – CalEnergy Morton Bay Site
Thermal Resistivity Data
Prepared by: RFYeager Engineering

Sample ID[1]	In-Situ Thermal Resistivity[2] ($m\ ^0CW^{-1}$)
TR1	0.95
TR2	0.99

1 - See Figure 1 for test location relative to project site
2 – ASTM D5334-08.

DISCUSSION

Electrical Resistivity Assessment

Soil electrical resistivity (inverse of conductivity) measures the ability of an electrolyte (soil) to support electrical current flow. The most common method of measuring soil electrical resistivity is the Wenner 4-Pin Method which uses four pins (electrodes) that are driven into the earth and equally spaced apart in a straight line. The Wenner 4-pin Method provides an average resistivity of a hemisphere (essentially) of soil whose radius is approximately equal to the pin spacing. For example, the electrical resistivity value obtained with the pins spaced at 5 feet apart is the average resistivity of a hemisphere of soil from the surface to a depth of 5 feet. By taking readings at different pin spacings (or depths), average soil electrical resistivity conditions can be obtained within areas at, above, and below trench zones.

Corrosion versus Resistivity

Corrosion is an electrochemical process, whereby the reaction rate is largely dependent upon the electrical conductivity of the surrounding electrolyte. Accordingly, the lower the electrical resistivity, then the greater the current flow and the greater the corrosion rate assuming all other factors are equal.

One common relationship between corrosivity and soil electrical resistivity used by corrosion engineers is provided below.

Corrosivity	Electrical Resistivity
Very Corrosive	0-1000 ohm-cm
Corrosive	1001-2000 ohm-cm
Fairly Corrosive	2001-5000 ohm-cm
Moderately Corrosive	5001-12000 ohm-cm
Slightly Corrosive	12001-30000 ohm-cm
Relatively Non-Corrosive	Greater than 30001 ohm-cm

Thermal Resistivity Assessment

Thermal resistivity of the soil was measured at two locations selected by Landmark within the Morton Bay site. Assessments were conducted within test pits at a depth of approximately 2 feet. At each site, the thermal resistivity was measured three times with the average provided in Table 3. The assessment was conducted in general accordance with the standard method ASTM D5334-08 which calculates thermal resistivity by monitoring the dissipation of heat from a line heat source. The field assessment consists of inserting a thermal sensor into the soil with a known current and voltage applied. The corresponding temperature rise in the soil over a period of time is recorded. The thermal resistivity is obtained from an analysis of the time series temperature data during the heating and cooling cycle of the sensor.

For purposes of this report, the thermal resistivity values are provided as "data only" in order to assist others in the project design.

Thank you for this opportunity to provide these corrosion engineering services. Please contact me if you have any questions.

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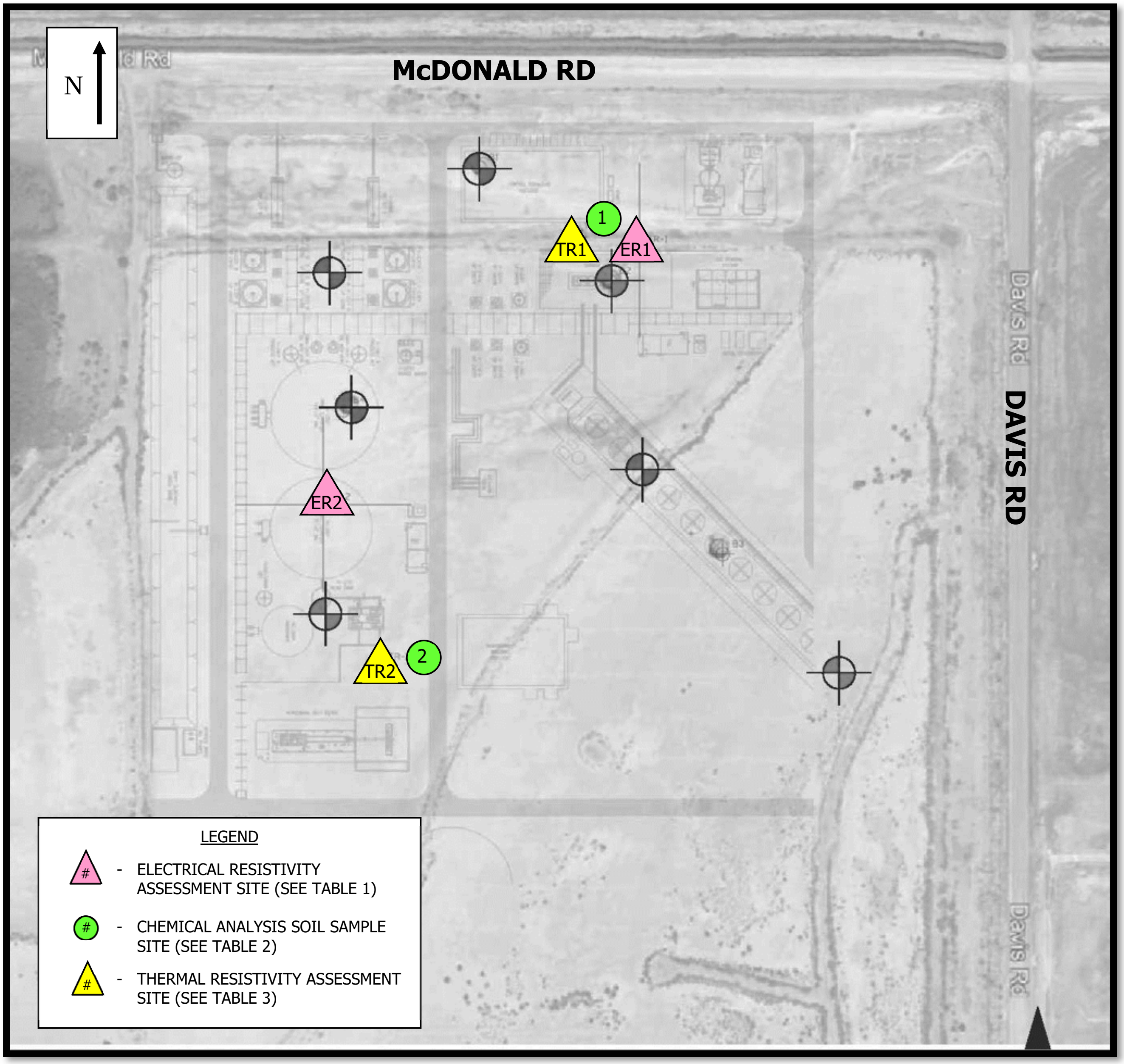
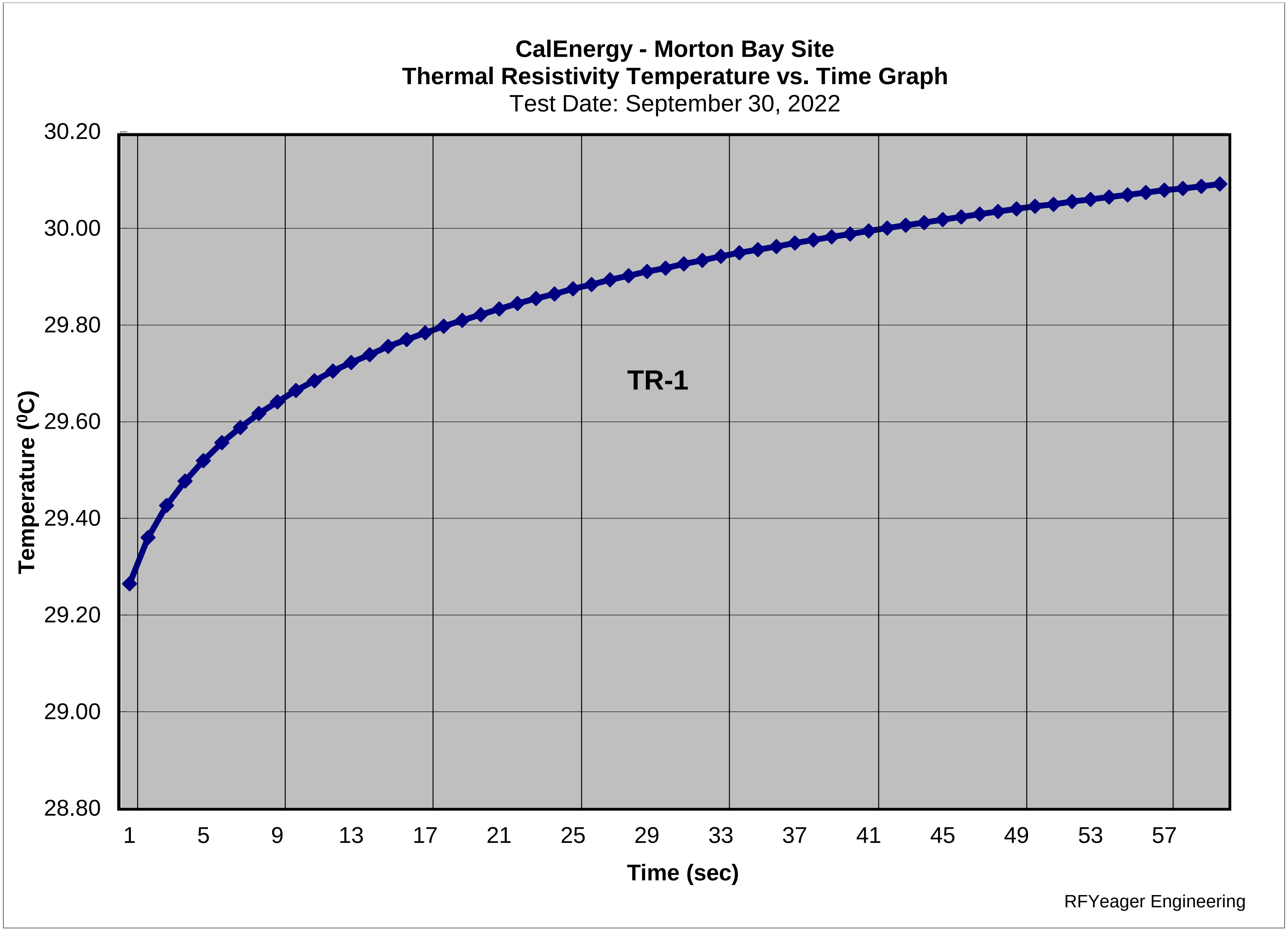


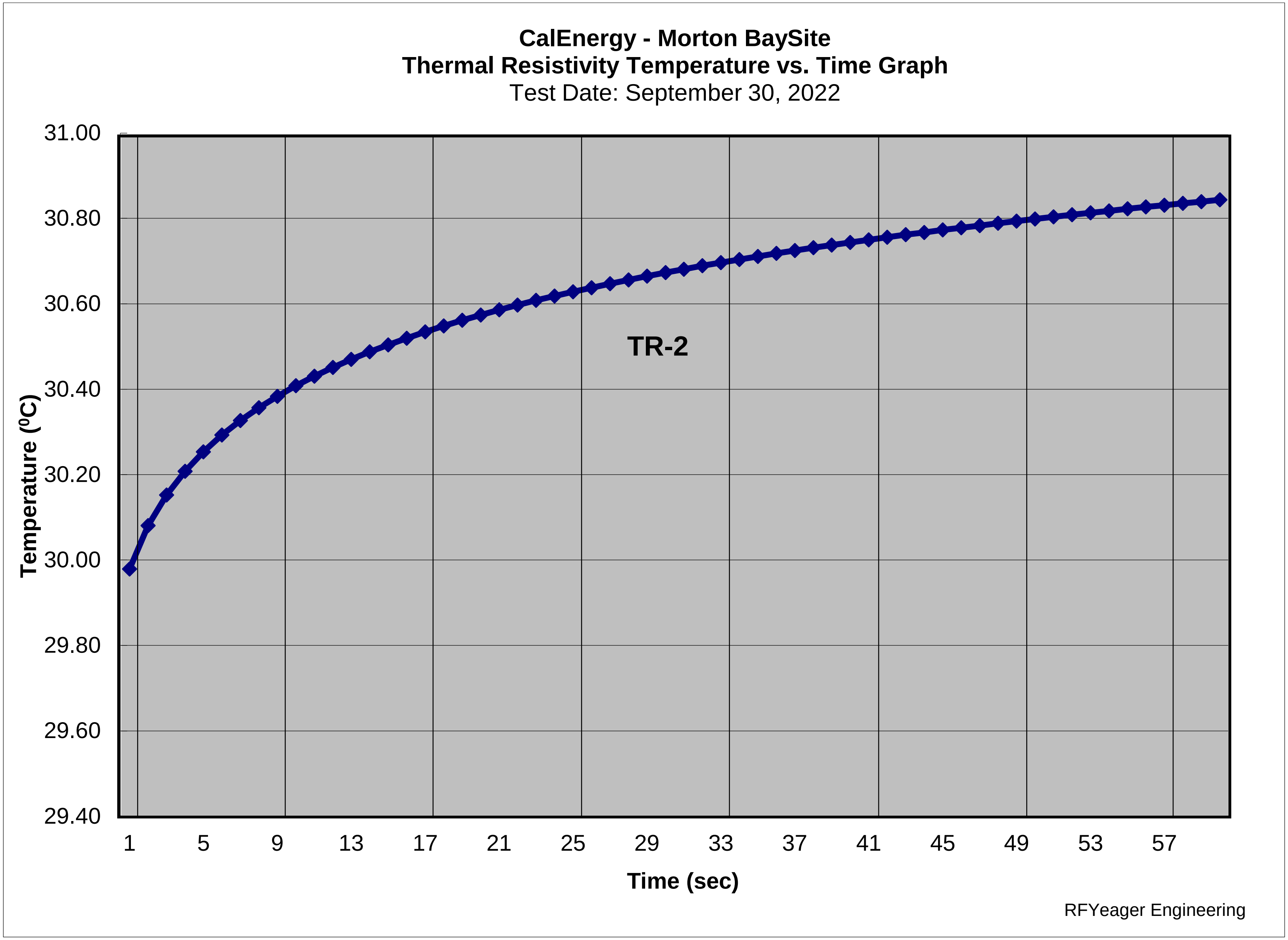
Figure 1 – CalEnergy Morton Bay Assessment Locations

APPENDIX A

THERMAL RESISTIVITY

TEMPERATURE VS. TIME GRAPHS


CalEnergy - Morton Bay Site
Thermal Resistivity Temperature vs. Time Graph
Test Date: September 30, 2022
30.20
30.00
29.80
29.60
29.40
29.20
29.00
28.80
Temperature (ºC)
TR-1
1
5
9
13
17
21
25
29
33
37
41
45
49
53
57
Time (sec)
RFYeager Engineering


CalEnergy - Morton BaySite
Thermal Resistivity Temperature vs. Time Graph
Test Date: September 30, 2022
Temperature (°C)
31.00
30.80
30.60
30.40
30.20
30.00
29.80
29.60
29.40
TR-2
1
5
9
13
17
21
25
29
33
37
41
45
49
53
57
Time (sec)
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