UPDATE OF GEOTECHNICAL ENGINEERING REPORT
FOR
PROPOSED COMMERCIAL ORGANICS PROCESSING FACILITY
EDWARDS RANCH ROAD
SANTA PAULA AREA OF VENTURA COUNTY, CALIFORNIA

PROJECT NO.: VT-24872-02
May 17, 2017

PREPARED FOR
HARRISON INDUSTRIES

BY
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County of Ventura
Notice of Preparation of an EIR
PL17-0154
Attachment 9 - Update of
Geotechnical Engineering Report

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Project No.: VT-24872-02
Report No.: 17-5-68

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Project: Commercial Organics Processing Facility
Edwards Ranch Road
Santa Paula Area of Ventura County, California

Subject: Update of Geotechnical Engineering Report

References:
1) Geotechnical Engineering Report, Proposed Biogenic Energy Park, Edward Ranch Road, Santa Paula Area of Ventura County, California, by Earth Systems Southern California, Project No. VT-24872-01, Report No. 14-3-17, dated April 22, 2014.
2) Evaluation of On-Site Disposal Feasibility, APN 090-0-180-085 Proposed Biogenic Energy Park, Santa Paula Area of Ventura County, California, by Earth Systems Southern California, Project No. VT-24872-01, Report No. 14-1-60, dated February 5, 2014.

Introduction

Earth Systems Southern California (Earth Systems) has been asked to prepare an Update of Geotechnical Engineering Report for a proposed commercial organics processing facility in the Santa Paula area of Ventura County, California. A Geotechnical Engineering Investigation Report was prepared by Earth Systems in 2014 for the northwestern 40 acres of the expanded 70-acre site. A copy of our 2014 report was previously provided. If desired, a copy of the 2014 report can be provided upon request. The 30-acre expansion is proposed on property situated south-southeast of the 40-acre site. In addition to the increase in site size, the location and number of buildings has changed; the location of the detention basins has changed; and the number of employees working at the facility has increased.

Sewer service is not available to the site; thus, on-site wastewater treatment systems (OWTS, or septic systems) will be necessary for those structures that will have interior plumbing. An OWTS Report has been prepared for the subject site, and will be submitted under a separate cover.

Proposed Development
On a preliminary basis, Earth Systems understands the proposed commercial organics processing facility will include a Facility Administration Building, a Maintenance Building, a Packaging Building, a Scale House, a Wet Organic Materials Building, and a Green/Wood Material Building. Appurtenant construction will include paved parking areas, exterior flatwork, and underground utilities. Except for the proposed Facility Administration Building, Earth Systems anticipates that the proposed buildings will be tall, one-story structures with slab-on-grade floor systems. Structural loading for the proposed buildings is anticipated to be moderate to heavy. In addition, two retention basins are proposed along the site's southeastern boundary.

The proposed layout for the proposed improvements is shown on the Site Plan provided in Appendix A.

Purpose and Scope of Work
Because of the increase in site size and a change in the location and number of proposed improvements, supplemental subsurface exploration and laboratory testing programs were implemented to analyze the soil conditions in areas of the site previously not explored for any proposed improvements. The scope of work for this update report included:

1. Performing a reconnaissance of the site.
2. Drilling, sampling, and logging three (3) exploratory test borings, and the excavation of five (5) exploratory test pits to study soil and groundwater conditions.
3. Advancing a total of seven (7) cone penetrometer test (CPT) soundings to study soil properties and conditions.
4. In addition, four (4) other borings (IT-1 through IT-4) were advanced for use in infiltration testing.
5. In addition, four (4) percolation test holes were drilled and ten (10) exploratory test pits excavated to evaluate soil percolation characteristics at the project site for on-site septic system design. The percolation test holes and test pits are addressed in a separate report.
6. Laboratory testing soil samples obtained from the subsurface exploration to determine their physical and engineering properties.
7. Analyzing the geotechnical data obtained.
8. Preparing this update report.

Supplemental Field and Laboratory Testing Programs

Similar to the test borings drilled for the referenced geotechnical report, alluvial deposits were typically encountered to the maximum depths explored, with the exception of Test Pits TP-1 through TP-5 and Boring B-1. In these test pits/boring, artificial (undocumented) fill was encountered to depths ranging from approximately 0.5 to 1.5 feet below existing site grade.

In the referenced geotechnical report, undocumented fill was encountered to a depth of approximately 18 feet in Boring B-3 and 5 feet in Boring B-7. Although not encountered in any of the other test pits and borings performed for both studies, undocumented fill may be present in other areas of the site due to previous site activities. The undocumented fill encountered in the test pits/ borings consisted of soft to stiff, sandy to clayey silts and soft to medium stiff, sandy to silty clays. Some minor trash and debris were observed in the undocumented fill.

The undocumented fill encountered in the test pits and borings cited above was underlain by alluvial deposits that extended to the maximum depth explored in both borings. The alluvial soils encountered in our test borings were indicative of typical overbank stream deposits characterized by interbedded, discontinuous strata of silts, clays, sands, and gravels generally stratified planar to the ground surface. Cobbles were encountered in the borings and CPT soundings performed in the southern portion of the site. More detailed descriptions of the encountered subsurface soil conditions are included in the test pit and boring logs and CPT sounding interpretations. The test pit and boring logs and CPT sounding interpretations are presented in Attachment B, and the approximate locations are shown on the Site Plan presented in Attachment A.

In the referenced geotechnical report, testing of the near-surface soils indicated that these soils lie in both the "low" to "medium" expansion ranges based on measured expansion indices of 41 and 64. One additional sample of the near-surface soils was tested for this study that resulted in an Expansion Index (EI) of 76, which falls in the "medium" expansion range. [The locally adopted version of this classification of soil expansion, Table 1809.7(1), is included in Appendix B of this update report. Due to the variability of the near-surface soils encountered at the site, foundations and slabs should be designed based on the bearing soils being in the "medium" expansion range. It appears that soils can be cut by normal grading equipment.

In the referenced geotechnical report, groundwater was encountered at depths ranging from approximately 20.5 to 25 feet below the existing ground surface. During our 2017 field investigation, groundwater was encountered at a depth of approximately 40 feet below the existing ground surface in Boring B-1, drilled at the location of the proposed Scale House. A mapping of historic high groundwater levels in the subject area by the State shows the site to have a high historical groundwater level between 10 and 20 feet below the ground surface near the subject site (CGS, 2002 and 2003). A copy of the map of historical high groundwater levels is presented in Appendix A of the referenced geotechnical report. It should also be noted that fluctuations in the groundwater levels and soil moisture conditions do occur due to change in seasons, variations in rainfall, irrigation practices, construction impacts, and other factors.

Additional samples of near-surface soils were tested for pH, resistivity, soluble sulfates, and soluble chlorides for this update report. It should be noted that sulfate contents (330 and

890 mg/Kg) fall within the "S0" exposure class range of Table 19.3.1.1 of ACI 318-14; therefore, it appears that special concrete designs will not be necessary for the measured sulfate contents. The corrosion test results attached and those provided in Appendix B of the referenced geotechnical report should be distributed to the design team for their interpretations pertaining to the corrosivity or reactivity of various construction materials (such as concrete and piping) with the soils.

Based on criteria established by the County of Los Angeles, measurements of resistivity of additional samples of the near-surface soils ranged from 880 to 2,400 Ohms-cm indicating that they are "severely corrosive to moderately corrosive" to ferrous metal (i.e. cast iron, etc.) pipes.

Seismicity and Seismic Design

It is assumed that the 2016 CBC and ASCE 7-10 guidelines will apply for the seismic design parameters. The 2016 CBC includes several seismic design parameters that are influenced by the geographic site location with respect to active and potentially active faults, and with respect to subsurface soil or rock conditions. The seismic design parameters presented herein were determined by the U.S. Seismic Design Maps "risk-targeted" calculator on the USGS website for the jobsite coordinates (34.30214° North Latitude and 119.12341° West Longitude) at the center of the subject site. The calculator adjusts for Soil Site Class D, and for Occupancy (Risk) Category I/II/III.

The calculated 2016 California Building Code (CBC) and ASCE 7-10 seismic parameters typically used for structural design are attached to this update report and summarized in the table below.

Summary of Seismic Parameters – 2016 CBC

Site Class (Table 20.3-1 of ASCE 7-10 with 2013 update)	D
Occupancy (Risk) Category	I/II/III
Maximum Considered Earthquake (MCE) Ground Motion	
Spectral Response Acceleration, Short Period – S_s	2.811 g
Spectral Response Acceleration at 1 sec. – S_1	1.084 g
Site Coefficient – F_a	1.00
Site Coefficient – F_v	1.50
Site-Modified Spectral Response Acceleration, Short Period – S_{MS}	2.811 g
Site-Modified Spectral Response Acceleration at 1 sec. – S_{M1}	1.627 g
Design Earthquake Ground Motion	

Short Period Spectral Response – S_{DS}	1.874 g
One Second Spectral Response – S_{D1}	1.084 g
Reference: USGS, 2017 Latitude: 34.30214 N degrees; Longitude: 119.12341 W degrees	

The values presented in the table above are appropriate for a 2 percent probability of exceedance in 50 years. A listing of the calculated 2016 CBC and ASCE 7-10 seismic parameters is attached. The site peak ground acceleration (PGA) per Section 1803.5.12 of the 2016 CBC and Section 11.8.3 of ASCE 7-10 is 1.099 g.

The Fault Parameters table in Appendix D lists the significant "active" and "potentially active" faults within a 31-mile (50-kilometer) radius of the subject site. The distance between the site and the nearest portion of each fault is shown, as well as the respective estimated maximum earthquake magnitudes, and the deterministic mean site peak ground accelerations.

Liquefaction and Seismically-Induced Settlement of Dry Sands

For the referenced geotechnical report, liquefaction and seismically-induced settlement of dry sands were evaluated for Borings B-1 and B-2 drilled in 2014. The results of our analyses indicated that there was the potential for about 8 to 9 inches of seismic induced settlement in the zones above the groundwater level, and the potential for about 1 to 2 inches of seismic induced settlement due to liquefaction. Therefore, the total seismic induced settlement was estimated to be approximately 9 inches near Boring B-1, and approximately 11 inches in near Boring B-2.

For this update report, liquefaction-induced settlement and seismically-induced settlement of dry sands were evaluated for the cone penetrometer test (CPT) soundings and Boring B-2 performed for this update report using an in-house proprietary spreadsheet. In the proprietary spreadsheet, the peak ground acceleration is used for soil layers below the groundwater level to evaluate the liquefaction potential and settlement, whereas two-thirds of the peak ground acceleration is applied to soil layers above the groundwater level to evaluate the seismically-induced settlement of dry sands. The total induced subsidence shown on the attached results is the combination of liquefaction-induced settlements and seismically-induced settlement of dry sands.

A cyclic mobility analysis was undertaken to analyze the liquefaction potentials of the various soil layers. The analysis was performed in general accordance with the methods proposed by NCEER (1997). In the analysis, the design earthquake was a 7.0 moment magnitude event, an assumed historic high groundwater level of 15 feet, and a peak ground acceleration of 1.099 g were used per the referenced geotechnical report.

The volumetric strain for the potentially liquefiable zones was estimated using a chart derived by Tokimatsu and Seed (1987) after reducing the $N_{1(60)}$ values derived by the analytical program by the calculated "FC Delta" value, then adjustments are made for fines content as per Seed (1987) and SCEC (1999). Using this methodology, the volumetric strain was found to be as follows:

The Tokimatsu and Seed procedure, as implemented by Pradel, has been used to evaluate seismically-induced settlement at this site. The site acceleration was assumed to be the two-thirds of the peak ground acceleration (PGA), or 1.099 g. (Based on conversations with California Geological Survey representatives, the PGA is applicable to liquefaction analysis because of potential bearing failures that liquefaction can induce, whereas seismically-induced settlement cannot cause a bearing failure, and the reduced PGA results in more realistic analytical values.) Furthermore, at the full PGA_M, calculated shear strains are well beyond the range of 0.03% to 1%, upon which Pradel's equations are based.

The following table summarizes the total seismically-induced settlement (i.e., liquefaction-induced settlements and seismically-induced settlement of dry sands) for groundwater at a depth of 15 feet below the existing ground surface.

CPT/Boring Number	Total Seismic-Induced Settlement (inches)
CPT-1	0.3
CPT-2	2.5
CPT-3	1.0
CPT-4	0.2(1)
CPT-4a	1.4(1)
CPT-5	0.1(1)(2)
CPT-5a	0.0(1)(2)
CPT-6	11.1
CPT-7	4.0
B-2	3.2(3)

(1) CPT soundings could not extend below a depth of 15 feet for evaluating the liquefaction due to the quantity of cobbles in the underlying soils.
(2) CPT soundings could not extend to a depth of 15 feet for evaluating the seismically-induced settlement of dry sands above the assumed groundwater level.
(3) Boring B-2 met auger refusal on cobbles at a depth of approximately 41 feet below the existing ground surface.

As shown in the table, calculations indicate that the total seismically-induced settlement could be as much as 11 inches near CPT-6 for groundwater at a depth of 15 feet (see attached results).

Based on our re-evaluation of liquefaction and seismically-induced settlement of dry sands, it is the opinion of this firm that the soils underlying the site would be prone to liquefaction and/or seismically-induced settlements during a strong seismic event. Based on the estimated liquefaction settlements and seismically-induced settlements of dry sands, considerable remedial grading or some type of ground improvement (i.e., deep dynamic compaction, cemented deep soil mixed columns, stone columns, etc.) will be required for support of the proposed structures.

Cement Treated Composting Areas

Earth Systems understands that the proposed cement treated subgrade beneath the composting areas should have a maximum hydraulic conductivity (permeability) of 1×10^{-5} centimeters per second (cm/sec) to meet the regulatory requirements. In addition to meeting the minimum permeability requirement, the cement treated subgrade should also be durable enough to withstand the equipment traffic and loads from the composting operations that will take place on them.

Permeability tests and unconfined compression tests were performed on remolded test specimens of the subgrade soils. The test specimens were compacted to 95 percent of the maximum dry density at various cement contents. For this study, the cement contents used to prepare the test specimens were 6, 9, and 12 percent (by dry weight).

The following table summarizes the results of the permeability tests performed on the sample of near-surface soils collected from the composting areas.

Percent Cement Added (%)	Hydraulic Conductivity (cm/sec)
6	5.0×10^{-7}
9	1.4×10^{-7}
12	6.9×10^{-8}

The following table summarizes the results of the unconfined compressive strength tests performed on the sample of near-surface soils collected from the composting areas.

Percent Cement Added (%)	Compressive Strength (psi)
6	243.8
9	325.0
12	373.2

Based on the laboratory test results, the minimum permeability of 1×10^{-5} cm/sec may be achieved with 6 percent or more cement (by dry weight) for the subgrade soils within the upper 18 inches throughout the composting areas. The unconfined compressive strength of the cement treated soil ranged from approximately 244 psi for 6 percent cement to 373 psi for 12 percent cement.

Because the subgrade soils in the proposed composting areas consists predominantly of fine-grained soils, the use of 12 percent cement or higher may be needed to provide a workable surface that is durable enough to withstand the equipment traffic and loads from the composting operations. To increase the durability of the cement treated subgrade, while possibly reducing the percent cement needed, a layer of aggregate base material could be placed on the subgrade surface prior to cement treatment. This increase in the sand and gravel content of the treated material should result in an increase in the unconfined compressive strength, and therefore an increase in durability. Although testing was not performed on a composited sample of native soil and aggregate base material to determine the percentage of aggregate base material needed to increase the durability of the cement treated subgrade, Earth Systems anticipates that a 4- to 6-inch thick layer of aggregate base material would increase the durability considerably. If desired, additional testing can be performed on a composited sample of native soil and aggregate base material to determine the percentage of aggregate base material needed or if a reduction in the percentage of cement is possible.

Based on 12 percent Portland cement (by dry weight) and an assumed dry unit weight of 110 pcf, a minimum spread rate of 19.8 $\pm$ 0.2 pounds per square foot (psf) will be required for a treatment depth of 18 inches in the composting areas. To reduce the amount of cement needed to increase the durability of the cement treated subgrade in the composting areas, the subgrade beneath the composting areas could be treated with 6 percent cement (by dry weight) to provide 1 foot of soil with a maximum permeability no greater than 1×10^{-5} cm/sec. For the working surface, a 2-inch layer of asphalt could be placed. Should cracks develop in the asphalt layer under normal working conditions, the underlying cement treated subgrade would act as a low permeability liner.

Eighteen (18) inches of soil cement treated with 12 percent cement would provide a treated section capable for supporting equipment traffic equivalent to a traffic index (TI) of 6.2. If the TI from the anticipated equipment traffic working on the treated section will be greater than 6.2, the percentage of cement will need to be increased, or the thickness of the treated section will need to be increased, or some combination of the two will need to be considered.

Recommendations for cement treatment in the proposed composting areas is provided in Section A of this update report.

Infiltration Testing

The locations of the detention basins have changed from the referenced geotechnical report. A total of four infiltration tests (Nos. IT-1 through IT-4) were performed for the new locations of the retention basins on the subject property.

On March 3, 2017, four small diameter borings (Nos. IT-1 through IT-4) were drilled for infiltration testing in accordance with County of Ventura guidelines. Two borings were drilled in the proposed Retention Basin #1 located in the southwest corner of the site, and the two other borings were drilled in the proposed Retention Basin #2 located in the southeast corner of the site. (A site plan showing the locations of the infiltration test holes is attached)

In each of the proposed retention basins, one boring was drilled to a depth of about 2 feet below the existing ground surface, and the second boring was drilled to a depth of approximately 12.4 to 13 feet below the existing ground surface. Logs of the infiltration test borings are attached. After drilling, a 2-inch inside diameter perforated PVC casing was lowered into each hole. The annuli between the casings and holes were filled with pea gravel.

Infiltration tests were run in accordance with a procedure presented in the referenced County of Ventura guideline document. The holes were pre-saturated on the day they were drilled by adding 30 inches of water and allowing the water to percolate away two times before running the infiltration test. Because the water did not percolate away at fast enough rates to allow a same-day test, the tests were run on the following day.

Approximately 2 feet of water was added to the bottom of each hole to start the test, and the drop in the water surface was monitored by taking periodic measurements. Water was added as necessary after the holes had become nearly dry. Test results (attached) indicate that relatively steady infiltration rates were obtained:

According to the referenced guidelines, the percolation rates measured in the field are converted to infiltration rates using the following formulas:

Infiltration Rate (in minutes per inch) = Percolation Rate/Reduction Factor

Reduction Factor = $[(2d_1 - \Delta d) / \text{Diameter}] + 1$,
Where d_1 = Initial Water Depth (in inches),
Δd = Water drop of slowest reading (in inches), and
Diameter = Diameter of boring (in inches).

Infiltration Rate (in./hr.) X 0.000706 = Infiltration Rate (cm./sec.)

Based on the testing of Boring IT-1, which was located within Retention Basin #2, the recommended test infiltration rate is:

$$33.64 \text{ in./hr.} = 9.4 \times 10^{-2} \text{ cm./sec.}$$

Based on the testing of Boring IT-2, which was located within Retention Basin #2, the recommended test infiltration rate is:

$$11.32 \text{ in./hr.} = 8.0 \times 10^{-3} \text{ cm./sec.}$$

Based on the testing of Boring IT-3, which was located within Retention Basin #1, the recommended test infiltration rate is:

$$1.79 \text{ in./hr.} = 1.3 \times 10^{-3} \text{ cm./sec.}$$

Based on the testing of Borings IT-4, which was located within Retention Basin #1, the recommended test Infiltration rate is:

$$29.44 \text{ in./hr.} = 2.1 \times 10^{-2} \text{ cm./sec.}$$

There are many factors that influence the infiltration rate. Clear water was used in our tests, whereas oil residue, silt, organic matter, and other deleterious material will likely be contained in the storm water. Variations in soil conditions within the limits of the proposed infiltration system will likely affect infiltration characteristics. The designer of the proposed infiltration system for the project should consider these factors in their design, as well as apply a factor-of-safety to the infiltration rate to account for future siltation in the bottoms and along the sidewalls of the proposed retention basins.

GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

Based on the data provided in this report, it appears that the site is suitable for the proposed development from a Geotechnical Engineering standpoint provided the recommendations provided herein are properly implemented into the project. Given the site conditions encountered, we conclude that considerable remedial grading or some type of ground improvement (i.e., deep dynamic compaction, cemented deep soil mixed columns, stone columns, etc.) should be performed for support of the proposed structures. The primary geotechnical consideration from a development standpoint is as follows:

- The potential for about 0.5 to 12.2 inches of total seismically-induced settlement (i.e., liquefaction and seismically-induced settlement of dry sands) with groundwater at its assumed historically shallowest level of 15 feet below the ground surface.

For habitable buildings, structural mitigation is commonly acceptable where total combined settlement (i.e., static plus seismic-induced) of 2 inches or less is predicted, whereas ground modification may be required where the predicted total combined settlement exceeds 2 inches. Methods to mitigate the earthquake-related ground movement hazard may include remedial grading or ground improvement (i.e., deep dynamic compaction, cemented deep soil mixed columns, stone columns, etc.) to reduce the susceptibility of the soil to seismic settlement of dry sands and liquefaction, or structural measures such as rigid foundations (i.e., mat or "waffle" foundations, reinforced structural slabs or reinforced conventional spread footings tied together with grade beams) or deep foundations that extend down to firm soil below the liquefiable soil.

The majority of the estimated seismically-induced settlement is settlement of the dry, loose soils above the assumed historically shallowest level of 15 feet below the ground surface. The following table summarizes the total seismic-induced settlement with 7.5, 10, 12.5, and 15 feet of removal and replacement.

CPT/Boring Number	Total Seismic-Induced Settlement (inches)			
	7.5 feet	10 feet	12.5 feet	15 feet
CPT-1	0.3	0.3	0.3	0.3
CPT-2	0.8	0.8	0.8	0.8
CPT-3	1.0	1.0	1.0	1.0
CPT-4	0.1	0.0	0.0	0.0
CPT-4a	0.1	0.0	0.1	0.1
CPT-5	0.0	0.0	0.0	0.0
CPT-5a	0.0	0.0	0.0	0.0
CPT-6	0.8	0.2	0.1	0.1
CPT-7	1.7	1.8	1.1	0.7
B-2	2.4	2.1	1.8	1.7
B-1 (2014)	5.2	5.1	1.1	1.1
B-2 (2014)	10.8	7.0	3.4	2.8

As shown in the table above, removal and replacement of the soils will reduce the estimated total seismically-induced settlements. The depth of removal and replacement to be carried out at each of the proposed structures should be governed by the amount of settlement the structure can tolerate. The Owner should evaluate whether remedial grading is the most cost effective mitigation measure as compared to ground improvement methods.

Specific conclusions and recommendations addressing this geotechnical consideration, as well as general recommendations regarding the geotechnical aspects of design and construction, are presented in the following sections.

A. Revised Grading Recommendations

1. Pre-Grading Considerations

a. Plans and specifications should be provided to Earth Systems prior to grading. Plans should include the grading plans, foundation plans, and foundation details. Earth Systems will review these plans only for conformity with geotechnical parameters not including drainage. It is the responsibility of the Client and other Engineers to review and approve designs and plans for conformity with all engineering and design requirements necessary to the proper function and performance of the structures.

b. Roof draining systems, if required by the appropriate jurisdictional agency, should be designed so that water is not discharged into bearing soils or near structures.

c. Final site grade should be designed so that all water is diverted away from the proposed improvements over paved surfaces or over landscaped surfaces in accordance with current codes. Surface draining systems should be designed so that water is not discharged into bearing soils or near the structures. Final site grade could be such that all water is diverted away from the buildings toward either hardscapes or drain inlets, and is not allowed to pond. In landscape areas adjacent to the buildings, the 2016 California Building Code (Section 1803.3) requires a minimum gradient of 5 percent away from the edge of the building foundations for a minimum distance of 10 feet.

d. It is recommended that Earth Systems be retained to provide Geotechnical Engineering services during site development and grading, and foundation construction phases of the work to observe compliance with the design concepts, specifications and recommendations, and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

e. Compaction tests shall be made to determine the relative compaction of the fills in accordance with the following minimum guidelines: one test for each 2-foot vertical lift in any isolated fill; one test for each 1,000 cubic yards of material placed; one test at the final fill slope face for each 4-foot of slope height; and two tests in the building pads.

f. Soils chemistry testing (pH, sulfates, chlorides, and resistivity) should be performed prior to final design to evaluate the corrosivity or reactivity of the soils to various construction materials (such as concrete and piping).

2. Rough Grading/Areas of Development
   a. Grading at a minimum should conform to Appendix J in the 2016 California Building Code (CBC), and with the recommendations of the Geotechnical Engineer during construction. Where the recommendations of this report and the cited section of the 2016 CBC are in conflict, the Owner should request clarification from the Geotechnical Engineer.
   b. The existing ground surface should be initially prepared for grading by removing all vegetation, debris, other organic material and non-complying fill within the construction limits. Organics and debris should be stockpiled away from areas to be graded, and ultimately removed from the site to prevent their inclusion in fills. Voids created by removal of such material should be properly backfilled and compacted. No compacted fill should be placed unless the underlying soil has been observed by the Geotechnical Engineer or a qualified representative.
   c. To minimize the propagation of seismic-induced ground damage to the proposed Facility Administration Building, Packaging Building, Maintenance Building, Scale House, Wet Organic Materials Building, and Green/Wood Material Building and to minimize differential settlement, Earth Systems recommends the following:
      - Native soils beneath these improvements should be excavated a minimum of 7.5 feet below the existing ground surface. The actual depth will depend on the amount of settlement the structure can tolerate. Remedial excavations should be performed laterally beyond the perimeter of the proposed structure to a distance equal to the depth of fill below the footings. If uncertified fill is still present at the remedial excavation bottom, the excavation should be deepened as necessary in those areas to remove all uncertified fill. Structural plans and details should be checked carefully during grading to establish the actual bottom of foundation elevations in the field.
      - If subgrade conditions permit, the bottom of the remedial excavation should be scarified to a depth of 6 inches; uniformly moisture conditioned to near optimum moisture content, and compacted to achieve a relative compaction of 90 percent of the ASTM D 1557 maximum dry density. **Compaction of the prepared subgrade should be verified by testing.**
      - Due to the high in-place moisture contents measured in the laboratory on soils at the bottom of the remedial excavations, unstable subgrade conditions may exist. Should unstable subgrade conditions exist, the bottom of the remedial excavations should be remediated. Typical remedial measures include discing and aerating the soils during dry weather, mixing the soil with dryer materials, stabilization with a geotextile fabric or grid, placement of aggregate base (AB) material or surge rock, or mixing the soil with an approved hydrating agent such as a lime or cement product. Earth Systems should be consulted prior to implementing any remedial measure to observe the unstable subgrade condition and provide site-specific recommendations.

- The excavated soils may be reused to backfill the remedial excavations provided they are processed to remove any deleterious materials and debris, and are properly moisture conditioned and compacted. Due to the high in-place moisture contents measured in the laboratory on the soils within the remedial excavation depths, the excavated soil will most likely be considerably above the optimum moisture content and be too wet to be reused as engineered fill with some remediation. Typical remedial measures include discing and aerating the soils during dry weather or mixing the soil with dryer materials.
- Soils used to backfill the remedial excavations should be moisture conditioned to above optimum moisture content and be uniformly compacted to achieve a relative compaction 90 percent of the ASTM D 1557 minimum dry density using mechanical compaction equipment. To aid in the compaction operation, fill should be placed in lifts not exceeding 8 inches in loose thickness. **Compaction should be verified by testing.** Additional fill lifts should not be placed if the previous lift did not meet the required relative compaction or if soil conditions are not stable.
- If the sidewalls of the remedial excavations are sloped back to the inclination recommended in Item 5 of Section A of the Grading recommendations, the soil used to backfill the remedial excavations should be benched into the sidewalls of the excavation as the backfill is brought up to finished subgrade.

d. Areas outside of the building area to receive fill, exterior slabs-on-grade, equipment pads, sidewalks, or pavement should be overexcavated a minimum of 3 feet below existing grade or as deep as necessary to remove all loose soils/fill. The resulting surface should be scarified to a depth of 6 inches; uniformly moisture conditioned to above optimum moisture, and compacted to achieve a relative compaction of 90 percent of the ASTM D 1557 maximum dry density.

e. The bottoms of all excavations should be observed by a representative of this firm prior to processing or placing fill.

f. Cobbles were encountered in the test borings and CPT soundings performed in the southern portion of the site. Earth Systems anticipates that cobbles will be encountered within the proposed depths of remedial grading beneath the structures and within the depths of the proposed retention basins. The grading contractor should expect to encounter cobbles within these areas, and plan accordingly in his bid for handling and disposal of the oversized particles.

g. On-site soils may be used for fill once they are cleaned of all organic material, rock, debris, and irreducible material larger than 8 inches.

h. Fill and backfill placed at above optimum moisture in layers with loose thickness not greater than 8 inches should be compacted to a minimum of 90 percent of the maximum dry density obtainable by the ASTM D 1557 test method. Random compaction tests by Earth Systems can assist the Grading Contractor in evaluating whether the Grading Contractor is meeting compaction requirements. However, compaction tests pertain only to a specific location and do not guaranty that all fill has been compacted to the prescribed percentage of maximum density. It is the ultimate responsibility of the Grading Contractor to achieve uniform compaction in accordance with the requirements of this report and the grading ordinance.

i. Import soils used to raise site grade should be equal to, or better than, on-site soils in strength, expansion, and compressibility characteristics. Import soil can be evaluated, but will not be prequalified by the Geotechnical Engineer. Final comments on the characteristics of the import will be given after the material is at the project site.

3. Cement Treatment of Composting Areas

a. All trench backfill for culverts, utilities and pipes planned for beneath the composting areas should be properly placed and compacted to at least 90 percent relative compaction (ASTM D1557) up to 18 inches below finished subgrade. Since the upper 18 inches will be cement treated, compaction of this material will not be required prior to treatment. It will be compacted following the blending and mixing in of cement.

b. Based on 12 percent Portland cement (by dry weight) and an assumed dry unit weight of 110 pcf, a minimum spread rate of 19.8 ± 0.2 pounds per square foot (psf) will be required for a treatment depth of 18 inches in the proposed composting areas. The amount of cement being placed should be monitored throughout cement treatment operations, with modifications made as necessary for existing field conditions.

c. Portland cement should comply with the latest Specifications for Portland cement (ASTM 150, CSA A-5, or AASHTO M85) Type II.

d. The cement should be spread with a mechanical spreader and mixed with a high-speed rotary mixer. The equipment should be capable of pulverizing and thoroughly mixing in the cement to the depth necessary to produce a compacted cement treated thickness of 18 inches.

e. At the start of compaction, the mixture should be in a uniform, loose condition throughout its full depth. The moisture content of the mix should be wet of optimum to achieve proper hydration of the cement, and adjusted as needed to achieve the compaction requirements. Water should be clear and free from injurious amounts of oil, acid, alkali, organic matter or other deleterious substance.

f. Cement treatment operations should not take place when the air temperature is below 45°F, unless the air temperature is 40°F and rising.

g. No area of cement treated subgrade should be left undisturbed for longer than 30 minutes during compaction operations.

h. The cement treated soils should be compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density. The compaction equipment used during the cement treatment operations should be capable of achieving the required compaction to a depth of 18 inches. Wheel rolling with hauling equipment only is not an acceptable method of compaction. **Compaction of the cement treated subgrade should be verified by testing.**

i. Permanently exposed surfaces should be kept in a moist condition for 7 days for curing of the cement treated subgrade.
j. Experience has shown that 24-hour compressive strength results for moist cured samples are approximately 50 to 60 percent of the 7-day strength (moist cured for 6 days and soaked in water for 24 hours). A 24-hour test should be run on the cement treated subgrade soils in each area to obtain a 24-hour compressive strength which will be used to monitor the daily production. Seven day samples should also be taken for final acceptance.

4. Utility Trenches
   a. Utility trench backfill should be governed by the provisions of this report relating to minimum compaction standards. In general, on-site service lines may be backfilled with native soils compacted to 90 percent of the ASTM D 1557 maximum dry density. Backfill of offsite service lines will be subject to the specifications of the jurisdictional agency or this report, whichever are greater.
   b. Compacted native soils should be utilized for trench backfill below structures. Sand should not be used in trenches under structures because it provides a conduit for water to migrate under foundations.
   c. Backfill operations should be observed and tested by the Geotechnical Engineer to monitor compliance with these recommendations.
   d. Jetting should not be utilized for compaction in utility trenches.
   e. We recommend that flexible connections should be provided where critical underground utilities enter buildings or other proposed improvements to accommodate the anticipated differential movements due to seismic-induced settlements.

B. Structural Design
1. Conventional Spread Foundations
   a. Conventional continuous footings and/or isolated pad footings may be used to support the proposed structures and retaining walls (if planned).
   b. All building footings should bear onto compacted fill as recommended elsewhere in this report. Foundation excavations should be observed by a representative of this firm after excavation, but prior to placing of reinforcing steel or concrete, to verify bearing conditions.
   c. Based on the recommended embedment depth of 21 inches and a minimum of 15 inches in width, conventional continuous footings bearing onto at least 3.5 feet of compacted fill may be designed based on an allowable bearing value of 2,000 psf. These values have a factor of safety of at least 3.
   d. Based on the recommended embedment depth of 21 inches and a minimum of 2 feet in width, isolated pad footings bearing onto at least 3.5 feet of compacted fill may be designed based on an allowable bearing value of 2,200 psf. These values have a factor of safety of at least 3.

e. Isolated pad foundations should be restrained laterally in both directions by means of tie-beams, or other approved method. We recommend that the tie-beams be embedded 21 inches.
f. Allowable bearing values are net (weight of footing and soil surcharge may be neglected) and are applicable for dead plus reasonable live loads.
g. Bearing values may be increased by one-third when transient loads such as wind and/or seismicity are included.
h. Lateral loads may be resisted by soil friction on floor slabs and foundations and by passive resistance of the soils acting on foundation stem walls. Lateral capacity is based on the assumption that any required backfill adjacent to foundations and grade beams is properly compacted.
i. The information that follows regarding reinforcement and pre-moistening for footings is the same as that given in the attached Table 1809.7(1) for the "medium" expansion range. Actual footing designs should be provided by the project Structural Engineer, but the dimensions and reinforcement recommended should not be less than the criteria set forth in the attached Table 1809.7(1) for the appropriate expansion range.
j. Continuous footings bottomed into recompacted soils in the "medium" expansion range should be reinforced, at a minimum, with one No. 4 bar along the bottom and top.
k. Bearing soils should be premoistened to 3 percent above the optimum moisture content to a depth of 18 inches below lowest adjacent grade.
l. Premoistening of slab areas should be observed and tested by this firm for compliance with these recommendations prior to placing of reinforcing steel or concrete.

2. <u>Frictional and Lateral Coefficients</u>
   a. Resistance to lateral loading may be provided by friction acting on the base of foundations. Assuming the spread footings will be found into compacted native soils, a coefficient of friction of 0.55 may be applied to dead load forces. This value does not include a factor of safety.
   b. Passive resistance acting on the sides of foundation stems in compacted native soils equal to 300 pcf of equivalent fluid weight may be included for resistance to lateral load. This value does not include a factor of safety.
   c. A minimum factor of safety of 1.5 should be used when designing for sliding or overturning.
   d. For the building foundations, passive resistance may be combined with frictional resistance provided a one-third reduction in the coefficient of friction is used.
3. <u>Slabs-on-Grade</u>
   a. Concrete slabs should be supported by at least 3.5 feet of compacted engineered fill as recommended elsewhere in this report.

b. It is recommended that perimeter slabs (walks, patios, etc.) be designed relatively independent of footing stems (i.e. free floating) so foundation adjustment will be less likely to cause cracking.
c. Earth Systems anticipates the floor slabs in the Wet Organic Material Building, Green/Wood Material Building and Packaging Building will be subjected to heavy rack loads and/or truck and fork lift traffic. The Structural Engineer should design the thickness and reinforcement of the floor slabs in these buildings to handle the anticipated loads.
c. A modulus of subgrade reaction ("k" value) of 100 kips per cubic foot may be used for design of the slab-on-grade provided the subgrade soils are prepared and compacted as recommended in Section A of this report.
d. The information that follows regarding design criteria for slabs is the same as that given in Table 1809.7(1) for the "medium" expansion range. Actual slab designs should be provided by the Structural Engineer, but the reinforcement and slab thicknesses he recommends should not be less than the criteria set forth in Table 1809.7(1) for the appropriate expansion range.
e. Slabs bottomed on soils in the "medium" expansion range should be underlain with a minimum of 4 inches of sand. Areas where floor wetness would be undesirable should be underlain with a vapor retarder (as specified by the Project Architect or Civil Engineer) to reduce moisture transmission from the subgrade soils to the slab. The retarder should be placed as specified by the structural designer.
f. Slabs bottomed on soils in the "medium" expansion range should at a minimum be reinforced at mid-slab with No. 3 bars on 24-inch centers, each way. No. 3 bars acting as dowels should also extend out of the perimeter footings, and should be bent so that they extend a minimum of 3 feet into adjacent slabs.
g. Soils underlying slabs that are in the "medium" expansion range should be premoistened to 3 percent above the optimum moisture content to a depth of 18 inches below lowest adjacent grade.
h. Premoistening of slab areas should be observed and tested by this firm for compliance with these recommendations prior to placing of sand, reinforcing steel, or concrete.

4. Preliminary Asphalt Pavement Sections
a. Based on the exploratory borings, the near-surface soils within the proposed paved areas are generally silts and clays that have a low traffic support capacity when recompacted and used as pavement subgrade. For preliminary pavement evaluation, an R-Value of 5 has been assumed for the anticipated subgrade soil. Following site grading, Earth Systems recommends that a representative subgrade sample be obtained and R-value testing be performed.
b. Asphalt pavement sections for untreated subgrade soils are presented below based on an R-value of 5; current Caltrans design procedures, and traffic indices ranging from 4.5 to 6.5. The traffic index (TI) is a measure of traffic wheel loading frequency and intensity of anticipated traffic. For comparison, TI's between 4 and 5 are often

suitable for design of automobile parking areas, TI's between 5 and 6 are commonly used for design of fire truck access lanes and areas subject to channelized flow with light delivery trucks, and TI's greater than 6.0 are common for design of pavements supporting light to moderate bus and truck traffic. Traffic indices assumed above should be reviewed by the project Owner, Architect, and/or Civil Engineer to evaluate their suitability for this project.

TRAFFIC INDEX	ASPHALT-CONCRETE (INCH)	AGGREGATE BASE (INCH)
4.5	3.0	8.0
5.0	3.0	10.0
5.5	3.0	12.0
6.0	4.0	11.5
6.5	4.0	13.5

c. The preliminary paving sections provided above have been designed for the type of traffic indicated. If the pavement is placed before construction on the project is complete, construction loads, which could increase the traffic index values assumed above, should be taken into account.
d. The subgrade soils in the upper 12 inches below the finished subgrade elevation should be properly moisture conditioned to above optimum moisture, and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density. The subgrade soils should be in a stable, non-pumping condition at the time the aggregate base material is placed and compacted.
e. Aggregate base materials should conform to the specifications stated in the 2015 "Greenbook" and be compacted as engineered fill to at least 90 percent compaction.
f. Asphalt paving materials and placement methods should meet specifications stated in the 2015 "Greenbook" for asphalt concrete.
g. Adequate drainage (both surface and subsurface) should be provided such that the subgrade soils and aggregate base materials are not allowed to become continuously wet.
h. All concrete curbs separating pavement and landscaped areas should extend at least 2 inches into the subgrade and below the bottom of the adjacent aggregate base to provide a barrier against lateral migration of landscape water or runoff into the pavement section.
i. Periodic maintenance should be performed to repair degraded areas and seal cracks with appropriate filler.

To reduce the thickness of aggregate base material required for pavement supported on untreated subgrade, we have provided the following pavement sections for cement treated subgrade.

RECOMMENDED CEMENT-TREATED SUBGRADE PAVEMENT SECTIONS

Traffic Index (T.I.)	Asphalt Concrete Thickness (inches)	Class 2 Aggregate Base Thickness (inches)	CTB*
4.5	2.5	4.0	12 (minimum)
5.0	2.5	4.0	12 (minimum)
5.5	3.0	4.0	12 (minimum)
6.0	3.0	4.0	12 (minimum)
6.5	3.0	4.0	12 (minimum)

*CTB = Cement-Treated Subgrade consisting of 6 percent cement treated soil. All trenching in areas to be designed for CTB conditions shall be performed prior to cement treatment.

Based on 6 percent Portland cement (by dry weight) and an assumed dry unit weight of 110 pcf, a minimum spread rate of 6.6 $\pm$ 0.2 pounds per square foot (psf) will be required for a treatment depth of 12 inches in the proposed pavement areas.

6. <u>Preliminary Concrete Paving Sections</u>

   a. For those areas that will be subjected to heavy truck traffic and will be paved with concrete, the following minimum criteria may be used for design:

   1. Concrete pavement sections should be a minimum of 6.5 inches thick for a 28-day concrete flexural strength of 625 pounds per square inch (psi), which roughly corresponds to a 28-day compressive strength of 5,000 psi. For a flexural strength of 535 psi (roughly corresponding to 4,000 psi compressive strength), the concrete pavement should be at least 7.25 inches thick.

   2. For improved support and drainage, a 4-inch thick layer of compacted aggregate base (or crushed miscellaneous base) is recommended beneath the concrete pavement.

   3. For crack control, a minimum reinforcing should be included consisting of No. 4 bars at a maximum spacing of 24-inches in each direction. Reinforcing bars should be placed at mid-height of the concrete slab and maintained at mid-height during placement of concrete. Contraction joints should be placed at intervals not exceeding 12 feet.

The preliminary paving sections discussed above have been designed for an R-Value of 5 and a traffic index of 6.5 following design methods described by the American Concrete Institute (ACI 330R-01). If the pavement is placed before construction on the project is complete, construction loads should be taken into account. If the anticipated traffic index is expected to exceed 6.5, these sections should be re-evaluated. Traffic should not be allowed on the pavement until 28 days after concrete placement, or until the 28-day design strength is achieved.

Conclusions

Based on our observations and review of the referenced geotechnical report, we conclude that the referenced information along with the additional revised information included in this update report are appropriate for the proposed construction. This update report shall serve to update the referenced geotechnical report for a period of 1 year.

Limitations and Uniformity of Conditions

The analysis and recommendations submitted herein are based upon the data obtained from the supplemental subsurface exploration and laboratory testing programs, and that provided in the referenced geotechnical report. If variations from the assumed conditions appear evident, it will be necessary to re-evaluate the recommendations of this update report.

The scope of services did not include any environmental assessment or investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water, groundwater or air, on, below, or around this site. Any statements in this update report or on the soil boring logs contained in the referenced geotechnical report regarding odors noted, unusual or suspicious items or conditions observed are strictly for the information of the Client.

Findings of this update report are valid as of this date; however, changes in conditions of a property can occur with passage of time whether they be due to natural processes or works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur whether they result from legislation or broadening of knowledge. Accordingly, findings of this update report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of 1 year.

In the event that any changes in the nature, design, or location of the proposed improvements are planned, the conclusions and recommendations contained in this update report shall not be considered valid unless the changes are reviewed and conclusions of this letter report modified or verified in writing.

This update report is issued with the understanding that it is the responsibility of the Owner, or of his representative to insure that the information and recommendations contained herein are called to the attention of the Architect and Engineers for the project and incorporated into the plan and that the necessary steps are taken to see that the Contractor and Subcontractors carry out such recommendations in the field.

As the Geotechnical Engineers for this project, Earth Systems has striven to provide services in accordance with generally accepted geotechnical engineering practices in this community at this time. No warranty or guarantee is expressed or implied. This update report was prepared for the exclusive use of the Client for the purposes stated in this document for the referenced project only. No third party may use or rely on this report without express written authorization from Earth Systems for such use or reliance.

It is recommended that Earth Systems be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications. If Earth Systems is not accorded the privilege of making this recommended review, it can assume no responsibility for misinterpretation of the recommendations contained herein.

Prior to construction we request the opportunity to review the grading and foundation plans to verify that our recommendations are properly incorporated and make any additional recommendations that might be needed.

Please call if you have any questions, or if we can be of further service.

Respectfully submitted,

EARTH SYSTEMS SOUTHERN CALIFORNIA

Reviewed and Approved

REGISTERED PROFESSIONAL ENGINEER
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5/17/17

Richard M. Beard
Geotechnical Engineer

Attachments:
Attachment A – Figures
Attachment B – Logs of Borings, Logs of Test Pits, and CPT Sounding Interpretations
Attachment C – Laboratory Test Results
Attachment D – Seismic Design Parameters
Attachment E – Results of Seismically-Induced Settlement Analyses
Attachment F – Results of Infiltration Testing

Copies: 3 - Client (2 US Mail, 1 email)
1 - Project File

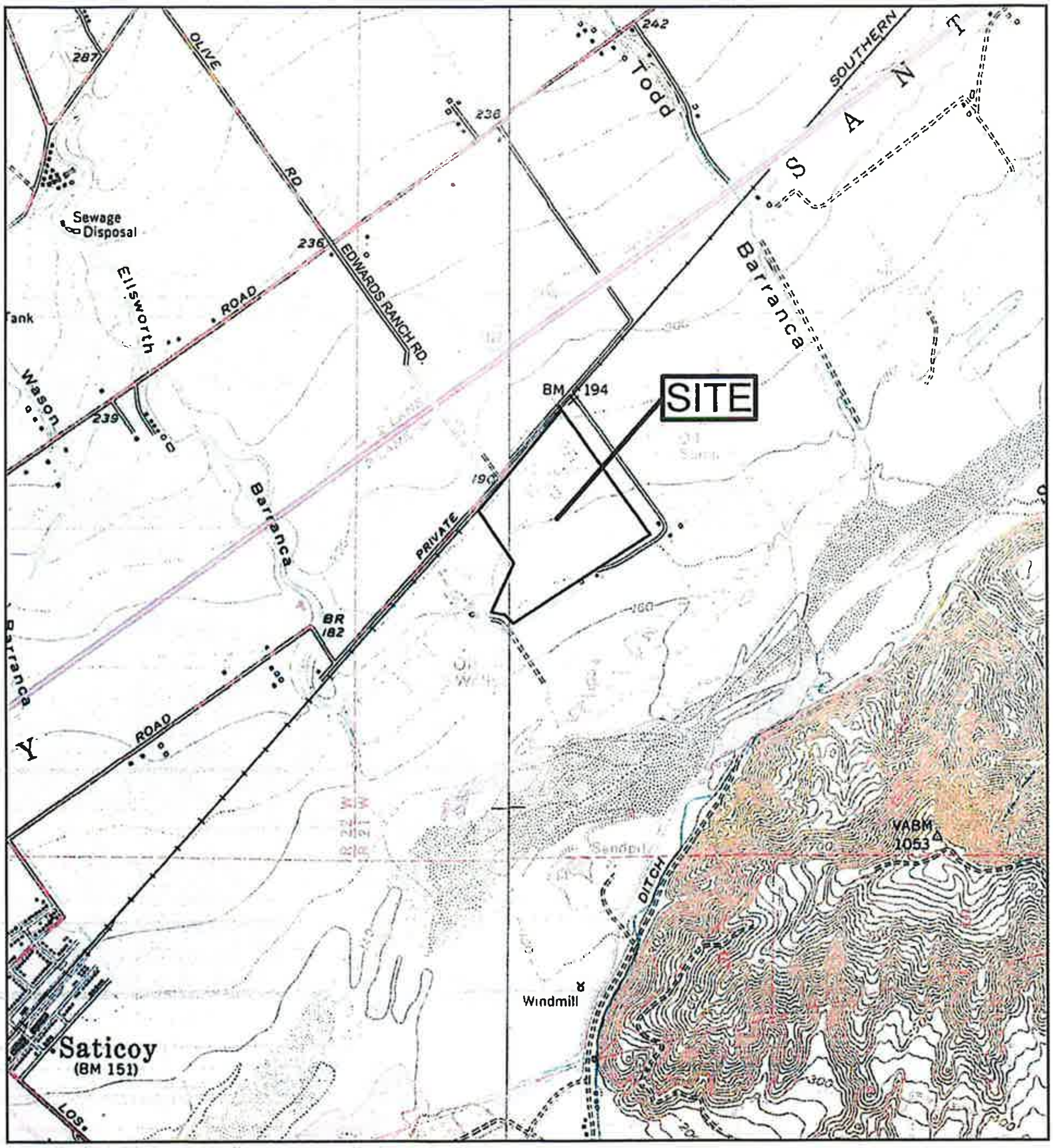
ATTACHMENT A

Vicinity Map

Regional Geologic Map

Seismic Hazard Zones Map

Site Plan



Base Map: USGS 7.5' Topographic Maps of the Saticoy and Santa Paula Quadrangles, 1967.
Scale: 1 in. = 2,000 ft.

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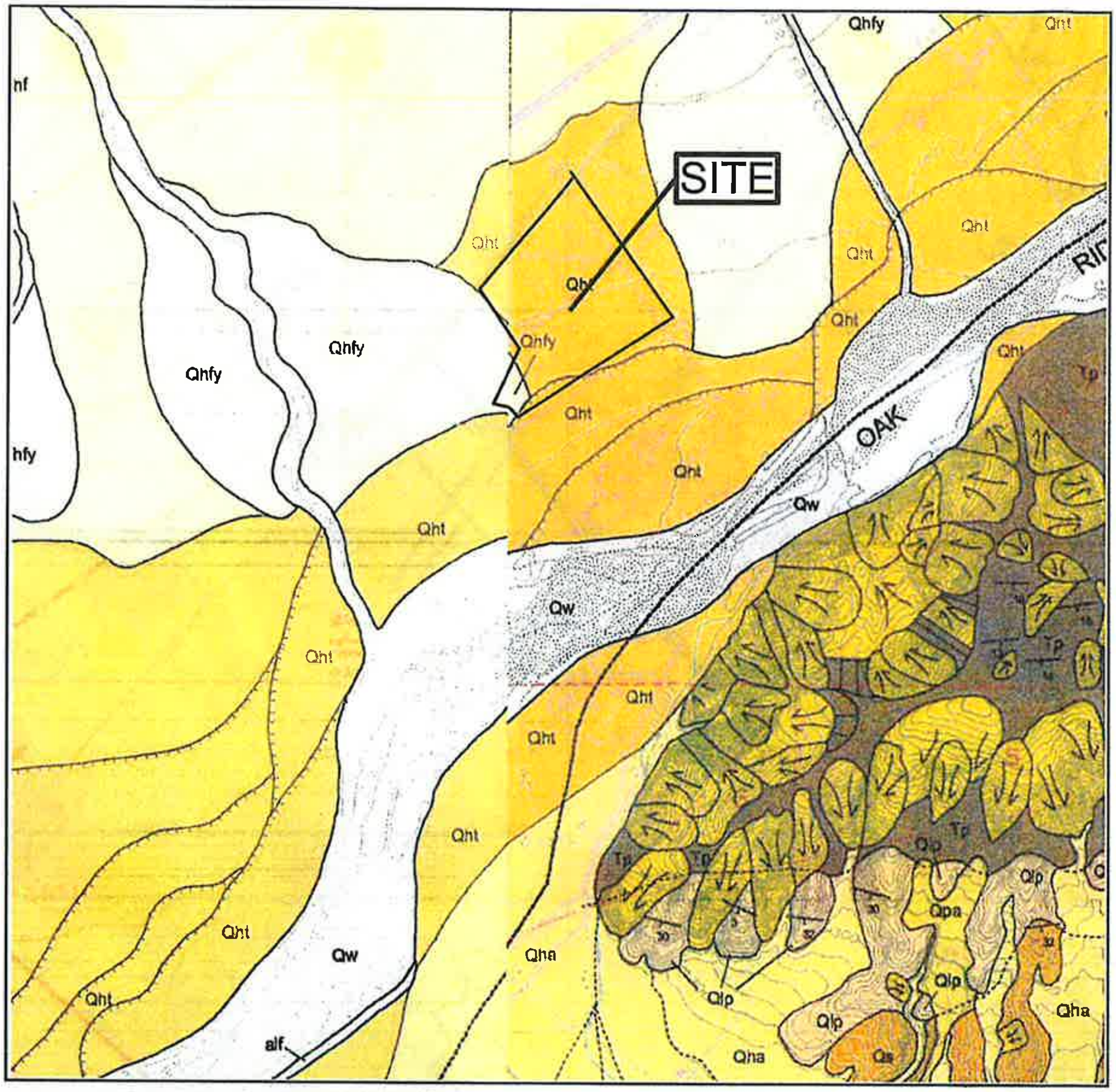
VICINITY MAP

Commercial Organics Processing Facility
Santa Paula, California

Earth Systems
Southern California

May 2017	VT-24872-02



From USGS, Geologic Maps of the Saticoy and Santa Paula Quadrangles, 2004

LEGEND

Historic
alf Artificial levee fill

Historic - Holocene
Qw Wash deposits in major river channels
Qhfy Alluvial fan deposits

Holocene
Qht Stream Terrace deposits
Qha Undivided alluvial deposits
Qhf Alluvial fan deposits

0 ft. ~ 1,000 ft. ~ 2,000 ft.

Syncline

Anticline

Geologic contact

Fault - Dashed where approximate, dotted where buried

25 Bedding Attitude

20 Overturned Bedding

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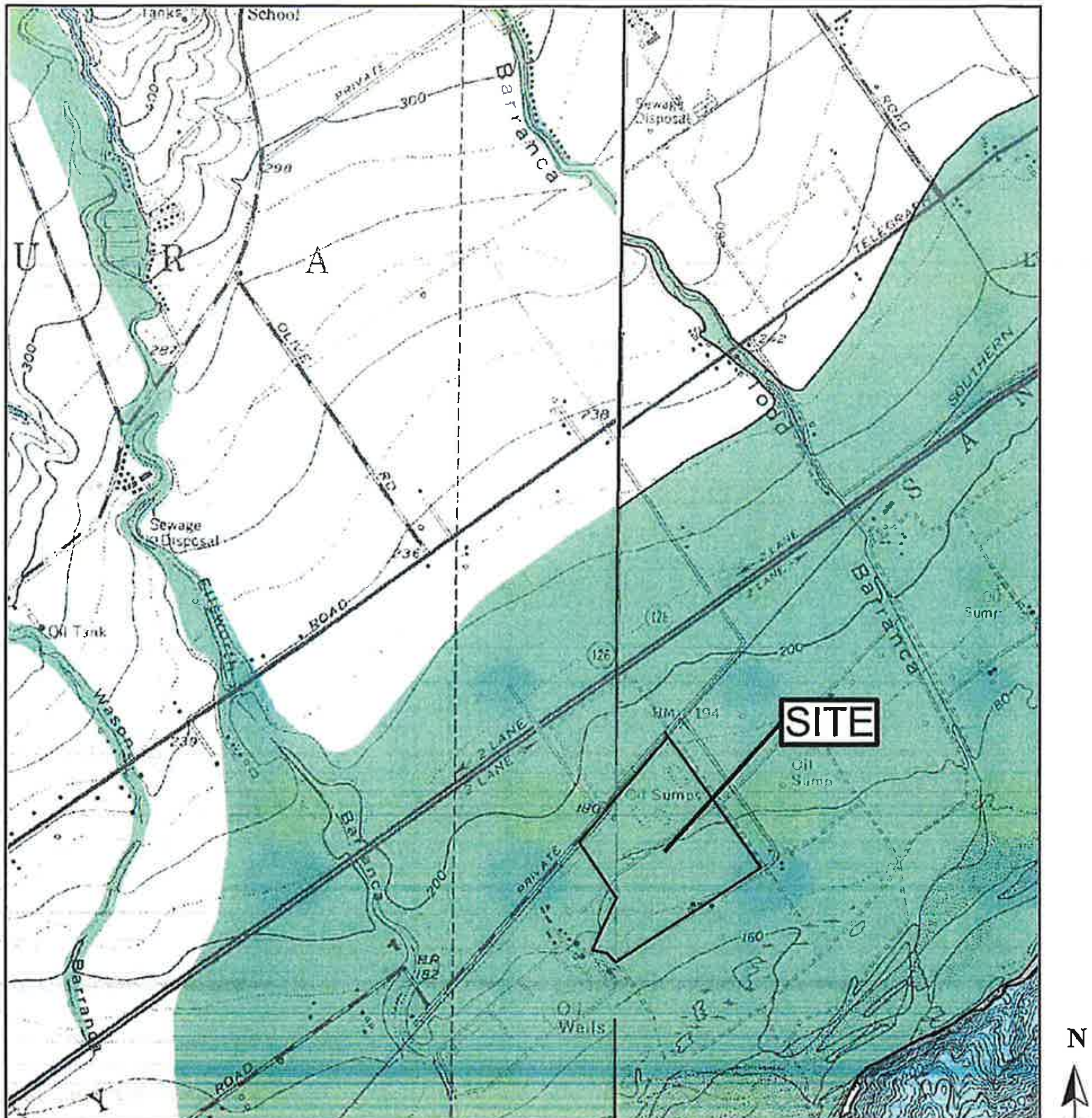
REGIONAL GEOLOGIC MAP	
Commercial Organics Processing Facility Santa Paula, California	
Earth Systems Southern California	
May 2017	VT-24872-02



From California Geological Survey, 2003 AND 2002, Seismic Hazards Zones Maps - Saticoy and Santa Paula Quadrangles
Scale: 1 in. = 2000 ft.

MAP EXPLANATION
Zones of Required Investigation

- **Liquefaction**
Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground-water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693 (c) would be required.

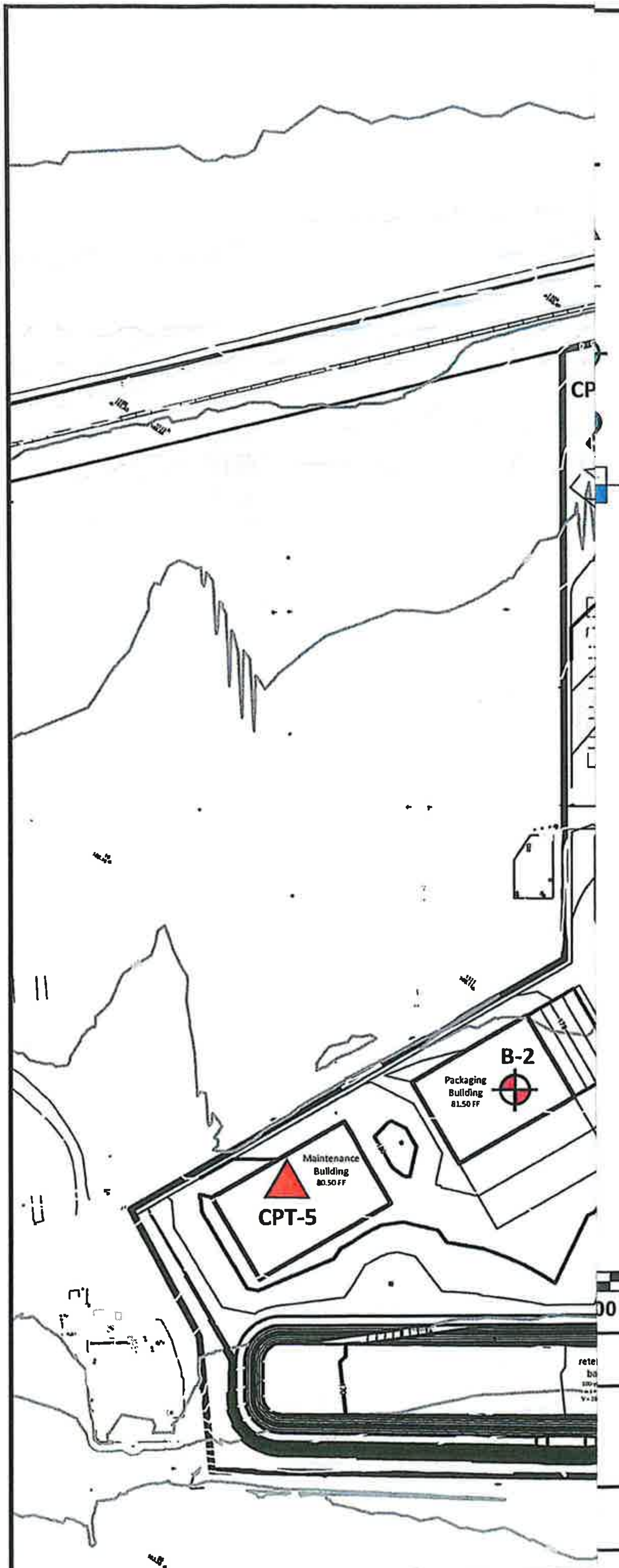
- **Earthquake-Induced Landslides**
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693 (c) would be required.

SEISMIC HAZARD ZONES MAP

Commercial Organics Processing Facility
Santa Paula, California

Earth Systems
Southern California

May 2017	VT-24872-02



LEGEND

- Approximate Boring Location
- Approximate CPT Location
- Approximate Test Pit Location
- Approximate Boring Location (2014)
- Approximate Percolation Test Location (2014)
- Approximate Test Pit Location (2014)

APPROXIMATE
SCALE
1 in = 200 ft

00 0 100 200 400

N

SITE PLAN

Commercial Organics Processing Facility
Santa Paula, California

Earth Systems
Southern California

May 2017	VT-24872-02

ATTACHMENT B

Logs of Borings

Logs of Test Pits

Symbols Commonly Used on Boring Logs

Unified Soil Classification System

Logs of Cone Penetrometer Test Soundings

Interpretations of Cone Penetrometer Test Soundings

Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-1	DRILLING DATE: February 1, 2017
PROJECT NAME: Commercial Organics Processing Facility	DRILLING METHOD: 6.0" Hollow Stem Auger
PROJECT NUMBER: VT-24872-02	DRILL: Mobile B-61
BORING LOCATION: Per Plan	LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0	X					ML			ARTIFICIAL FILL: Medium brown clayey silt; firm; damp.
	X		■	5/8/6		ML	91.2	18.1	ALLUVIUM: Medium to yellowish brown clayey silt; stiff; moist.
5			■	5/7/9		ML	101.9	9.8	ALLUVIUM: Yellowish brown clayey silt to sandy silt; stiff; moist.
10			■	3/6/9		SM	98.3	10.7	ALLUVIUM: Pale yellowish brown silty sand; very fine grained; some iron staining; medium dense; damp.
15			■	2/6/6		SM/ ML	88.0	27.4	ALLUVIUM: Interbedded yellowish brown silty sand and sandy silt; medium dense; damp to moist.
									Total Depth: 16.5 feet. No Groundwater Encountered.
20									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-2	DRILLING DATE: February 1, 2017
PROJECT NAME: Commercial Organics Processing Facility	DRILL RIG: Mobile B-61
PROJECT NUMBER: VT-24872-02	DRILLING METHOD: Six Inch Hollow Stem Auger
BORING LOCATION: Per Plan	LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0	X								ALLUVIUM: Medium brown clayey silt to sandy silt; stiff; very moist
	X		■	4/4/5		ML	84.7	30.9	
5			■	P/3/5		ML	92.1	23.1	ALLUVIUM: Yellowish brown sandy silt; loose; moist.
10			■	3/5/5		ML	93.7	28.8	ALLUVIUM: Mottled yellowish brown and gray clayey silt; stiff; moist to very moist.
15			■	3/8/16					
						SM	101.6	6.4	ALLUVIUM: Yellowish brown silty sand; fine grained; medium dense; moist. Gravels and scattered cobbles at 17.5 feet.
20			■	13/14/17		SW	114.7	5.6	ALLUVIUM: Pale grayish brown sand with gravels; well graded; medium dense; damp to moist.
25			■	9/27/50		SW	106.6	7.3	ALLUVIUM: Pale grayish brown sand with gravels; well graded; medium dense; damp to moist.
30			■	33/40		SM	121.0	4.5	ALLUVIUM: Pale grayish brown silty sand with gravels; well graded; dense; damp.
35			■	9/7/18		SM	132.7	12.0	ALLUVIUM: Gray gravelly silty sand with thin silt lenses; medium dense; moist to very moist. Scattered cobbles.

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-2 (Continued)
PROJECT NAME: Biogenic Park
PROJECT NUMBER: VT-24872-02
BORING LOCATION: Per Plan

DRILLING DATE: February 1, 2017
DRILL RIG: Mobile B-61
DRILLING METHOD: Six Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
40			■	50-2"		SM			**ALLUVIUM:** Gray gravelly silty sand; cobbles; dense; wet. Refusal at 40.5 feet due to cobbles.
									Total Depth: 40.5 feet Groundwater Depth: 40.0 feet.
45									
50									
55									
60									
65									
70									
75									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

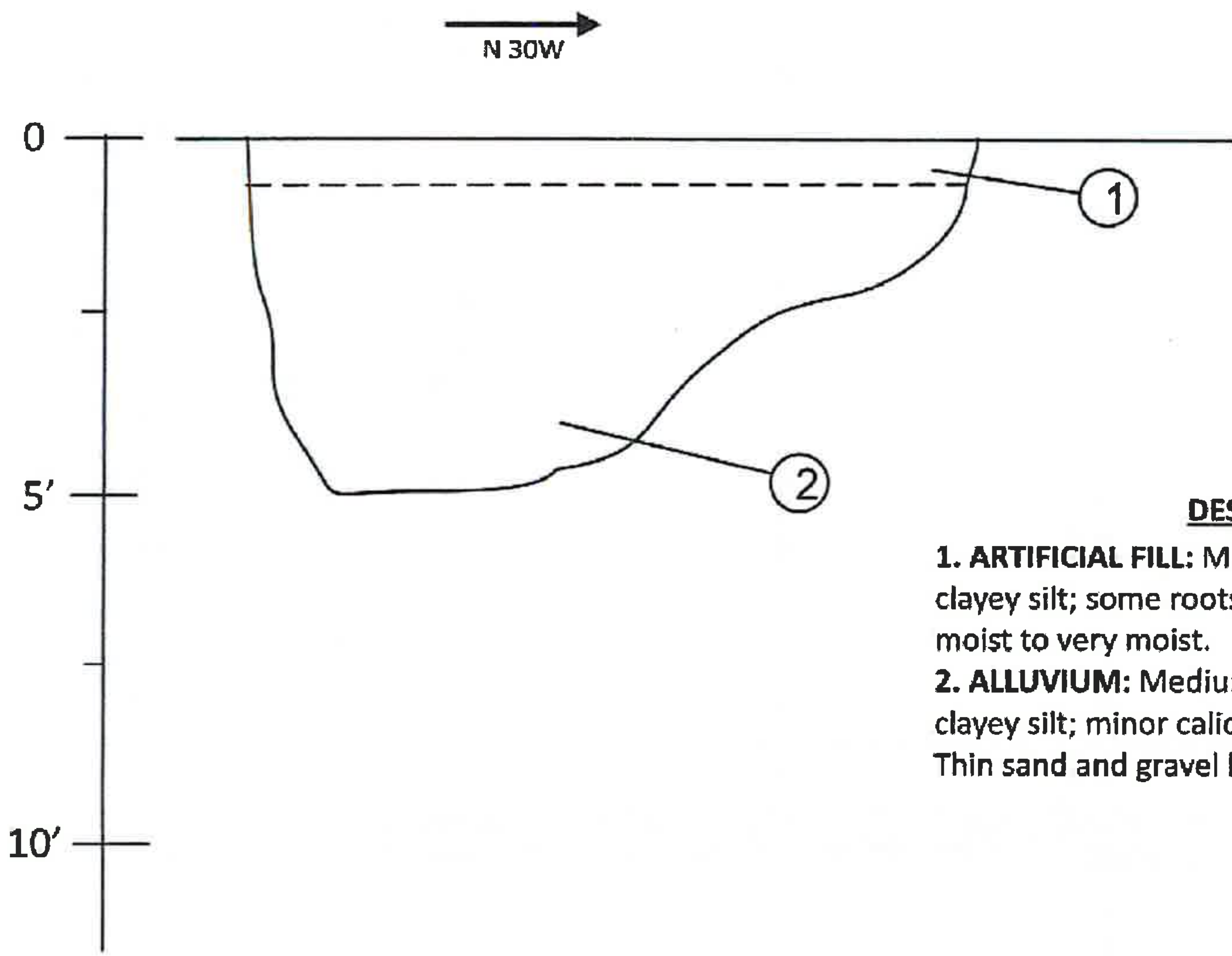
Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-3
PROJECT NAME: Commercial Organics Processing Facility
PROJECT NUMBER: VT-24872-02
BORING LOCATION: Per Plan

DRILLING DATE: February 1, 2017
DRILLING METHOD: 6.0" Hollow Stem Auger
DRILL: Mobile B-61
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									Chipseal: 1.0 inch
			■	3/4/4		ML	90.9	21.5	ALLUVIUM: Medium to yellowish brown clayey silt; stiff; moist.
5			■	5/7/9		SM/ ML	97.3	5.2	ALLUVIUM: Interbedded yellowish brown silty fine sand and sandy silts; loose; moist.
10			■	3/5/5		SM	98.7	13.4	ALLUVIUM: Yellowish brown silty fine sand; loose; damp to moist.
15			■	2/6/6		SM/ ML	89	20.7	ALLUVIUM: Interbedded yellowish brown and reddish brown silty sands and sandy silts; loose; moist.
									Total Depth: 16.5 feet. No Groundwater Encountered.
20									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.



DESCRIPTIONS

1. ARTIFICIAL FILL: Medium brown and yellowish brown clayey silt; some roots; some trash and debris; soft to firm; moist to very moist.

2. ALLUVIUM: Medium brown and yellowish brown clayey silt; minor caliche; soft to firm; moist to very moist. Thin sand and gravel lense at four feet.

TOTAL DEPTH: 5.0 FEET
NO GROUNDWATER ENCOUNTERED

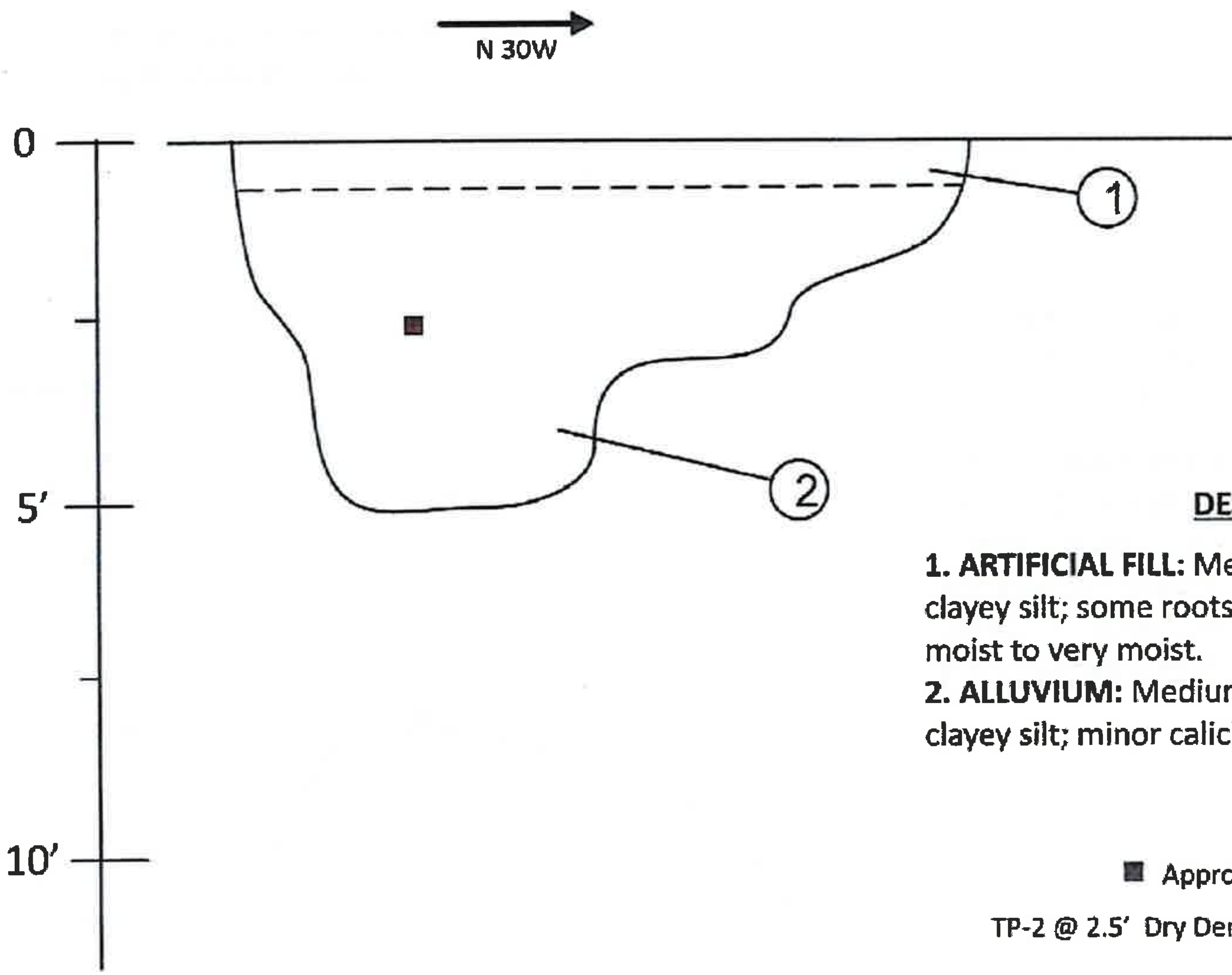
SCALE: 1" = 2.5' (VERTICAL & HORIZONTAL)

TEST PIT # 1

Commercial Organics Processing Facility
Santa Paula, California

Earth Systems
Southern California

January 17, 2017 | VT-24872-02



DESCRIPTIONS

1. ARTIFICIAL FILL: Medium brown and yellowish brown clayey silt; some roots; some trash and debris; soft to firm; moist to very moist.

2. ALLUVIUM: Medium brown and yellowish brown clayey silt; minor caliche; firm to stiff; moist.

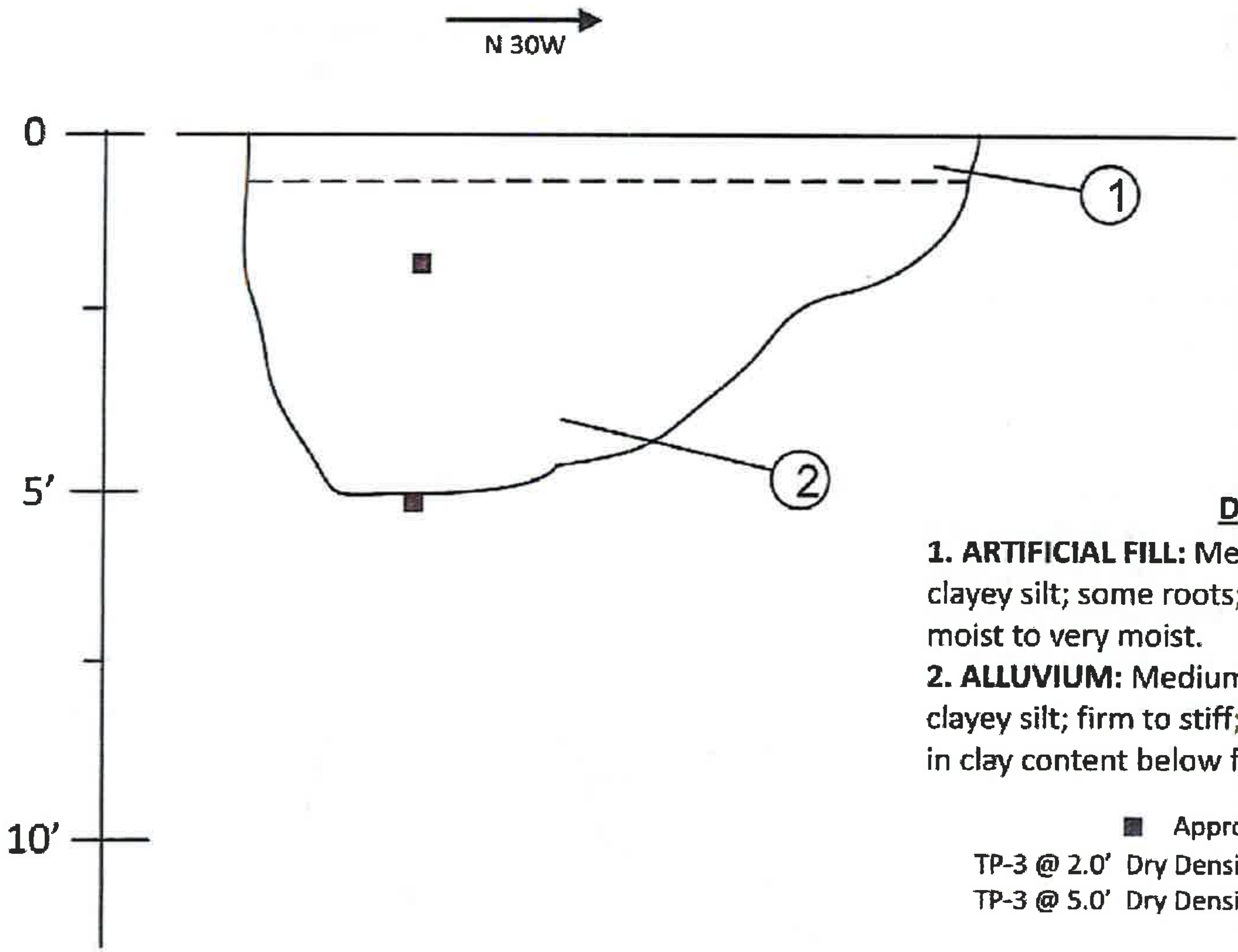
■ Approximate Sample Location

TP-2 @ 2.5' Dry Density 83.9 lbs/ft^3, Moisture 28.7 %

TOTAL DEPTH: 5.0 FEET
NO GROUNDWATER ENCOUNTERED

SCALE: 1" = 2.5' (VERTICAL & HORIZONTAL)

TEST PIT # 2	
Commercial Organics Processing Facility Santa Paula, California	
Earth Systems Southern California	
January 17, 2017	VT-24872-02



DESCRIPTIONS

1. ARTIFICIAL FILL: Medium brown and yellowish brown clayey silt; some roots; some trash and debris; soft to firm; moist to very moist.

2. ALLUVIUM: Medium brown and yellowish brown clayey silt; firm to stiff; moist to very moist. Slight increase in clay content below four feet.

■ Approximate Sample Location

TP-3 @ 2.0' Dry Density 72.3 lbs/ft³, Moisture 33.2 %

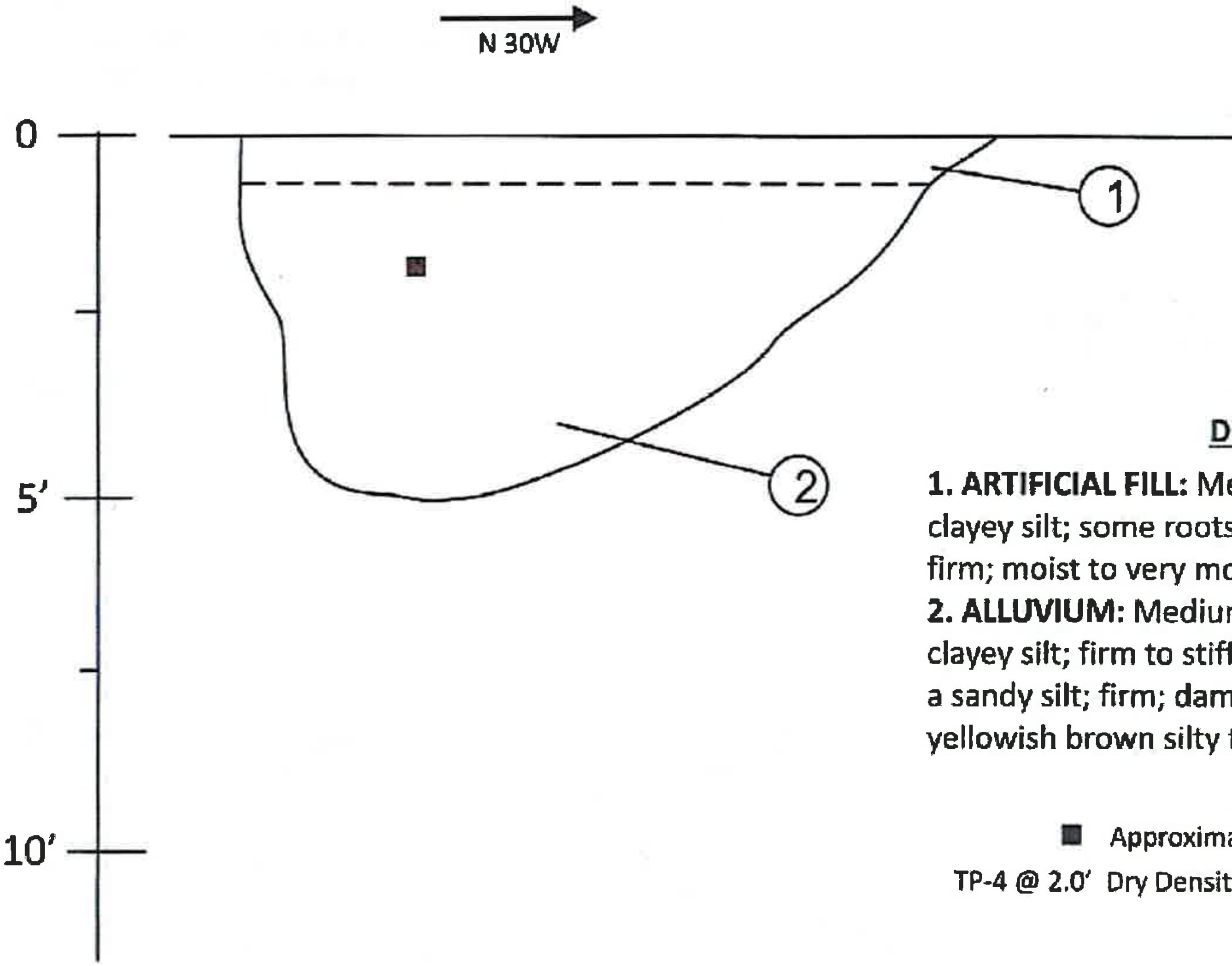
TP-3 @ 5.0' Dry Density 79.0 lbs/ft³, Moisture 32.9 %

TOTAL DEPTH: 5.5 FEET

NO GROUNDWATER ENCOUNTERED

SCALE: 1" = 2.5' (VERTICAL & HORIZONTAL)

TEST PIT # 3	
Commercial Organics Processing Facility Santa Paula, California	
Earth Systems Southern California	
January 17, 2017	VT-24872-02



DESCRIPTIONS

1. ARTIFICIAL FILL: Medium brown and yellowish brown clayey silt; some roots; some trash and debris; soft to firm; moist to very moist.

2. ALLUVIUM: Medium brown and yellowish brown clayey silt; firm to stiff; moist. At two feet becomes a sandy silt; firm; damp. At four feet becomes a yellowish brown silty fine sand; loose; damp.

■ Approximate Sample Location

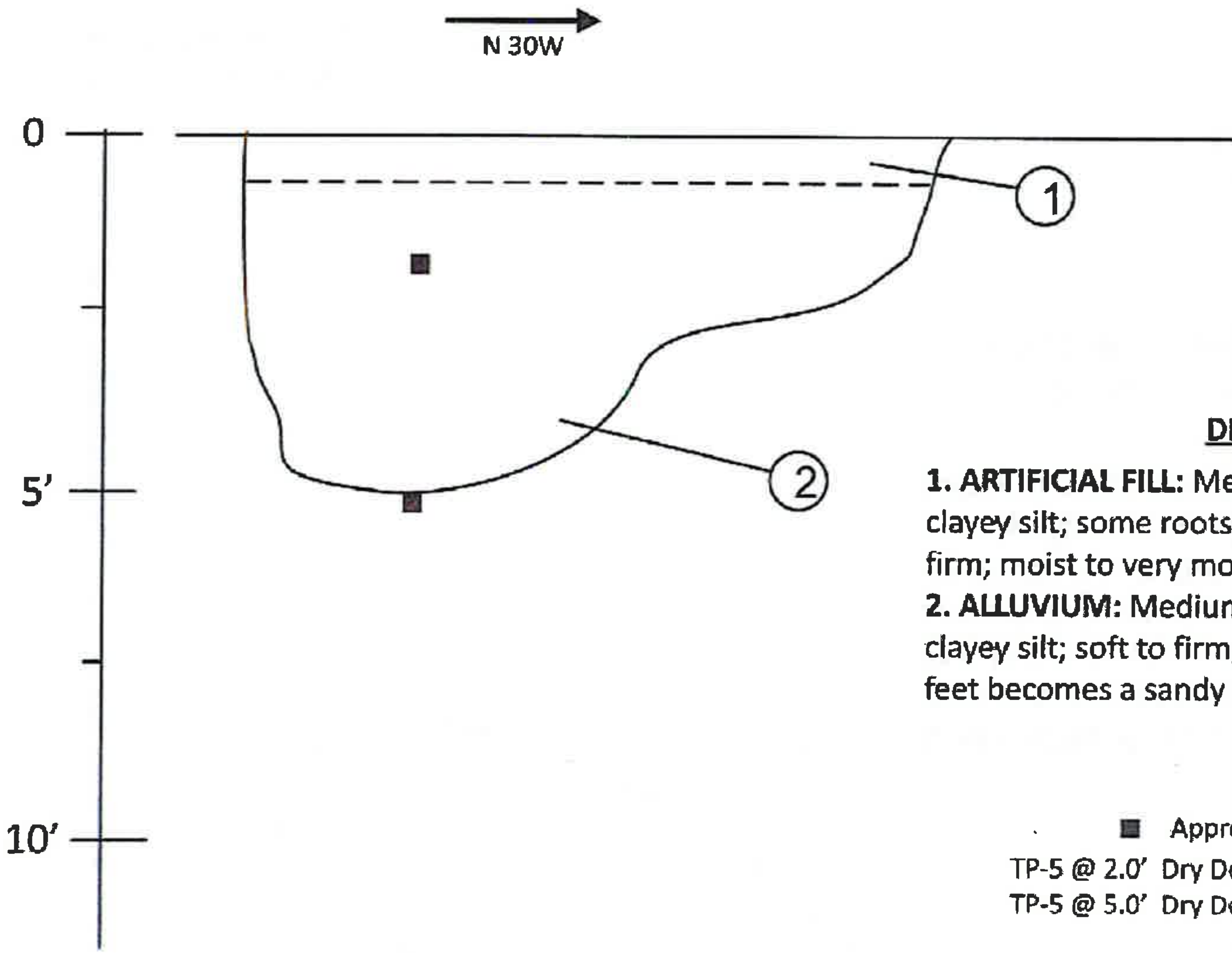
TP-4 @ 2.0' Dry Density 83.3 lbs/ft^3, Moisture 15.0 %

TOTAL DEPTH: 5.5 FEET

NO GROUNDWATER ENCOUNTERED

SCALE: 1" = 2.5' (VERTICAL & HORIZONTAL)

TEST PIT # 4	
Commercial Organics Processing Facility Santa Paula, California	
Earth Systems Southern California	
January 17, 2017	VT-24872-02



DESCRIPTIONS

1. ARTIFICIAL FILL: Medium brown and yellowish brown clayey silt; some roots; some trash and debris; soft to firm; moist to very moist.

2. ALLUVIUM: Medium brown and yellowish brown clayey silt; soft to firm; moist to very moist. At five feet becomes a sandy silt; soft; very moist.

■ Approximate Sample Location

TP-5 @ 2.0' Dry Density 77.5 lbs/ft^3, Moisture 27.2 %

TP-5 @ 5.0' Dry Density 82.9 lbs/ft^3, Moisture 31.2 %

TOTAL DEPTH: 5.5 FEET

NO GROUNDWATER ENCOUNTERED

SCALE: 1" = 2.5' (VERTICAL & HORIZONTAL)

TEST PIT # 5	
Commercial Organics Processing Facility Santa Paula, California	
Earth Systems Southern California	
January 17, 2017	VT-24872-02

Modified California Split Barrel Sampler

Modified California Split Barrel Sampler - No Recovery

Standard Penetration Test (SPT) Sampler

Standard Penetration Test (SPT) Sampler - No Recovery

Perched Water Level

Water Level First Encountered

Water Level After Drilling

Pocket Penetrometer (tsf)

Vane Shear (ksf)

1. The approximate locations of borings were determined by sighting and pacing from nearby prominent topographic or cultural features. Borehole elevations were estimated by interpolating between available plan contour intervals. The location and elevation of each boring should be considered accurate only to the degree implied by this method.

2. Stratification lines represent the approximate boundary between soil and/or rock types. The transition between statigraphic units may be gradual.

3. Water level readings taken in boreholes are approximate and apply only to the time and date of drilling. Fluctuations in the level of groundwater from the time of initial measurement may occur due to variations in rainfall, tides, barometric pressure, temperature, or other factors.

Earth Systems So. Calif.

1731-A Walter Street, Ventura, California 93003
PH: (805) 642-6727 FAX: (805) 642-1325

Symbols Commonly Used on Boring Logs

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		G W	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				G P	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		G M	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				G C	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		S W	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				S P	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SAND WITH FINES (APPRECIABLE AMOUNT OF FINES)		S M	SILTY SANDS, SAND-SILT MIXTURES
				S C	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		M L	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				C L	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				O L	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		M H	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				C H	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				O H	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				P T	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

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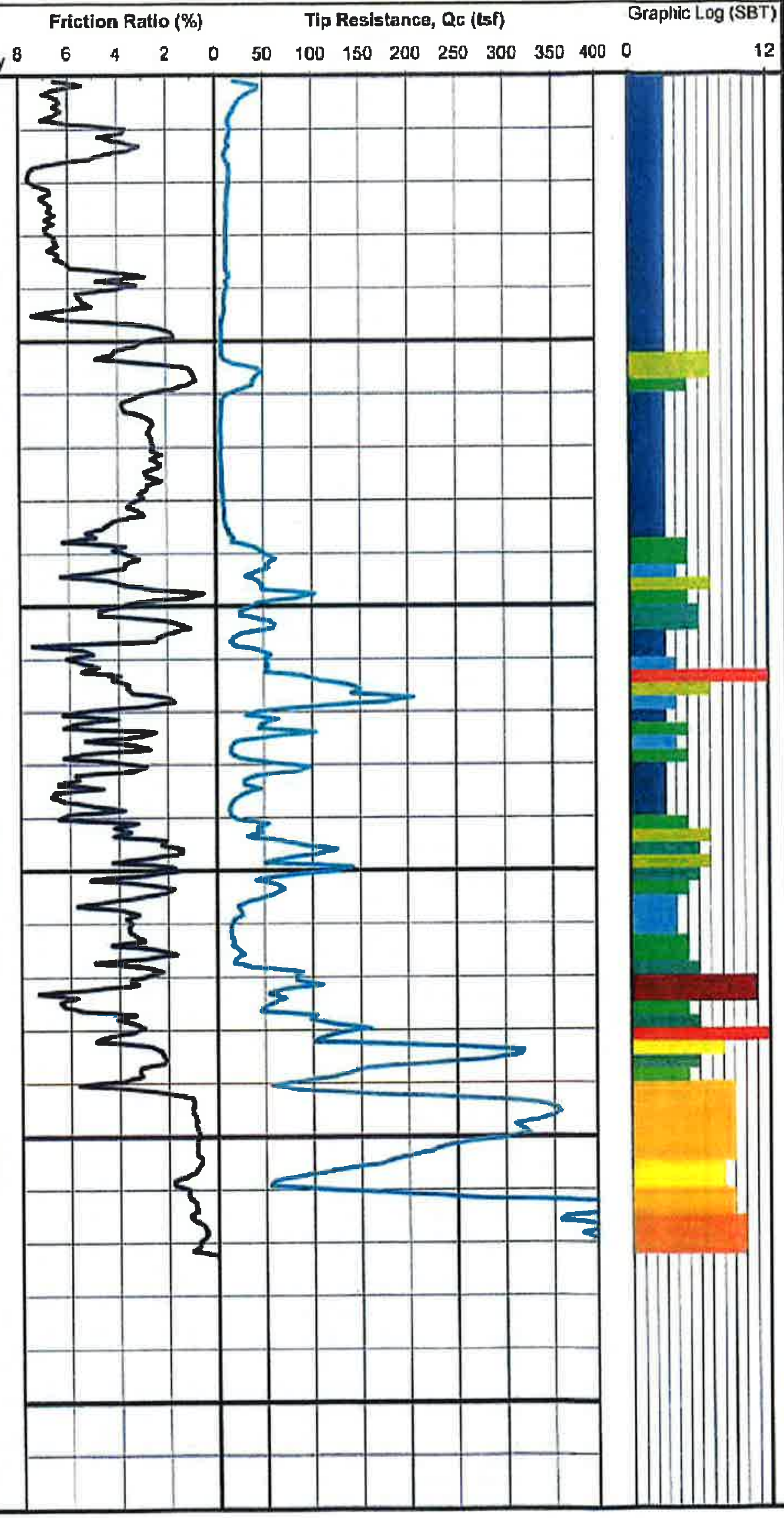
Unified Soil Classification System (USCS)

Earth Systems
Southern California

CPT No: CPT-1
Project Name: Commercial Organics Processing Facility
Project No.: VT-24872-02
Location: See Site Exploration Plan
CPT Vendor: Middle Earth
Truck Mounted Electric
Cone with 23-ton reaction
Date: 1/30/2017

DEPTH (FEET)

Interpreted Soil Stratigraphy Robertson & Campanella ('89)	Density/Consistency
Clay	very stiff
Clay	stiff
Clay	stiff
Clay	stiff
Clay	stiff
Clay	stiff
Clay	stiff
Clay	stiff
Clay	firm
Clay	firm
Clayey Silt to Silty Clay	very stiff
Sandy Silt to Clayey Silt	medium dense
Clay	firm
Clay	soft
Clay	firm
Clay	firm
Clay	stiff
Silty Clay to Clay	hard
Silty Clay to Clay	hard
Sandy Silt to Clayey Silt	medium dense
Sandy Silt to Clayey Silt	medium dense
Clay	hard
Clayey Silt to Silty Clay	dense
Sandy Silt to Clayey Silt	dense
Clayey Silt to Silty Clay	hard
Clayey Silt to Silty Clay	hard
Clay	hard
Clay	very stiff
Sandy Silt to Clayey Silt	medium dense
Silty Sand to Sandy Silt	medium dense
Sandy Silt to Clayey Silt	medium dense
Silty Clay to Clay	very stiff
Clayey Silt to Silty Clay	stiff
Sandy Silt to Clayey Silt	medium dense
Overconsolidated Soil	hard
Sandy Silt to Clayey Silt	dense
Silty Sand to Sandy Silt	very dense
Sandy Silt to Clayey Silt	dense
Sand	dense
Sand	dense
Sand	medium dense
Sand to Silty Sand	medium dense
Sand	very dense
Gravelly Sand to Sand	dense



End of Sounding @ 44.8 feet

Earth Systems
Southern California

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella 1989)

Project: Commercial Organics Processing Facility — Project No: VT-24672-02 — Date: 01/30/17

CPT SOUNDING: CPT-1 — Pick: 1 — Density: 1 SPT N — Dr correlation: 0 Baldi — Qc/N: 1 Robertson

Est. GWT (feet): 24.0

Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Phi Correlation: 1 SPT N — Nk: 17

Base Depth meters	Base Depth feet	Avg Tip Qc tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	Ic (2.6)	Kc	Clean Sand Qc1n	$N_{1(60)}$	Clean Sand $N_{1(60)}$	Rel. Dens. Dr (%)	Phi (deg)	Su (tsf)	OCR
0.15	0.5	39.45	6.34	Clay	CL/CH	hard	110	1.0	30	0.014	0.014	6.34	0.79	1.70	63.4	2.62			30				2.32	####
0.30	1.0	21.92	6.47	Clay	CL/CH	very stiff	110	1.0	22	0.041	0.041	6.48	0.85	1.70	35.2	2.80			22				1.29	####
0.46	1.5	14.54	6.87	Clay	CL/CH	stiff	110	1.0	15	0.069	0.069	6.70	0.89	1.70	23.4	2.93			15				0.85	63.1
0.61	2.0	13.82	4.46	Clay	CL/CH	stiff	110	1.0	14	0.096	0.096	4.49	0.86	1.70	22.2	2.83			14				0.81	42.8
0.76	2.5	12.10	3.85	Clay	CL/CH	stiff	110	1.0	12	0.124	0.124	3.90	0.86	1.70	19.4	2.84			12				0.70	28.0
0.91	3.0	9.14	4.41	Clay	CL/CH	stiff	110	1.0	9	0.151	0.151	4.48	0.90	1.70	14.7	2.97			9				0.53	17.8
1.07	3.5	13.33	7.16	Clay	CL/CH	stiff	110	1.0	13	0.179	0.179	7.25	0.90	1.70	21.4	2.98			13				0.77	22.1
1.22	4.0	13.05	7.58	Clay	CL/CH	stiff	110	1.0	13	0.206	0.206	7.69	0.91	1.70	21.0	3.01			13				0.76	18.7
1.37	4.5	11.64	6.89	Clay	CL/CH	stiff	110	1.0	12	0.234	0.234	7.03	0.92	1.70	18.7	3.02			12				0.67	14.6
1.52	5.0	11.02	6.82	Clay	CL/CH	stiff	110	1.0	11	0.261	0.261	6.98	0.92	1.70	17.7	3.03			11				0.63	13.4
1.68	5.5	10.88	6.77	Clay	CL/CH	stiff	110	1.0	11	0.289	0.289	6.95	0.92	1.70	17.5	3.04			11				0.62	11.0
1.83	6.0	10.27	6.66	Clay	CL/CH	stiff	110	1.0	10	0.316	0.316	6.89	0.93	1.70	16.5	3.05			10				0.58	9.4
1.98	6.5	10.86	6.57	Clay	CL/CH	stiff	110	1.0	11	0.344	0.344	6.78	0.92	1.70	17.4	3.03			11				0.62	9.1
2.13	7.0	9.80	6.18	Clay	CL/CH	stiff	110	1.0	10	0.371	0.371	6.43	0.93	1.70	15.7	3.05			10				0.56	7.6
2.29	7.5	12.04	3.96	Clay	CL/CH	stiff	110	1.0	12	0.399	0.399	4.09	0.87	1.70	19.3	2.85			12				0.68	6.8
2.44	8.0	10.20	4.37	Clay	CL/CH	stiff	110	1.0	10	0.426	0.426	4.00	0.89	1.70	16.4	2.94			10				0.57	6.0
2.59	8.5	8.23	5.34	Clay	CL/CH	firm	110	1.0	8	0.454	0.454	5.60	0.93	1.70	13.2	3.07			8				0.46	5.1
2.74	9.0	7.41	6.71	Clay	CL/CH	firm	110	1.0	7	0.481	0.481	7.10	0.97	1.70	11.9	3.17			7				0.41	4.3
2.90	9.5	5.27	2.47	Clay	CL/CH	firm	110	1.0	5	0.509	0.509	2.74	0.93	1.70	8.5	3.03			5				0.28	2.8
3.05	10.0	5.33	2.68	Clay	CL/CH	firm	110	1.0	5	0.536	0.536	2.98	0.93	1.70	8.7	3.05			5				0.29	2.7
3.20	10.5	6.35	4.39	Clay	CL/CH	firm	110	1.0	6	0.564	0.564	4.82	0.95	1.70	10.2	3.11			6				0.34	3.1
3.35	11.0	35.54	1.82	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	12	0.591	0.591	1.80	0.69	1.50	50.3	2.28	1.89	84.9	15	19	40	32		
3.51	11.5	36.80	0.88	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	13	0.619	0.619	0.98	0.65	1.42	52.0	2.13	1.51	76.3	18	16	50	32		
3.66	12.0	14.28	2.72	Clayey Silt to Silty Clay	ML/CL	stiff	110	2.0	7	0.646	0.646	2.85	0.83	1.51	20.3	2.77			7				0.80	6.3
3.81	12.5	5.50	3.80	Clay	CL/CH	firm	110	1.0	5	0.674	0.674	4.33	0.97	1.55	8.1	3.17			5				0.28	2.1
3.96	13.0	4.63	2.78	Clay	CL/CH	soft	110	1.0	5	0.701	0.701	3.25	0.98	1.50	6.5	3.17			5				0.23	1.7
4.11	13.5	4.69	2.71	Clay	CL/CH	soft	110	1.0	5	0.729	0.729	3.21	0.98	1.44	6.4	3.18			5				0.23	1.6
4.27	14.0	4.72	2.61	Clay	CL/CH	soft	110	1.0	5	0.756	0.756	3.10	0.98	1.39	6.2	3.18			5				0.23	1.6
4.42	14.5	4.63	2.38	Clay	CL/CH	soft	110	1.0	5	0.784	0.784	2.86	0.98	1.34	5.9	3.18			5				0.23	1.5
4.57	15.0	5.51	2.69	Clay	CL/CH	firm	110	1.0	6	0.811	0.811	3.15	0.97	1.29	6.7	3.15			6				0.28	1.7
4.72	15.5	5.98	2.62	Clay	CL/CH	firm	110	1.0	6	0.839	0.839	3.05	0.96	1.25	7.1	3.13			6				0.30	1.8
4.88	16.0	7.16	3.38	Clay	CL/CH	firm	110	1.0	7	0.866	0.866	3.79	0.96	1.21	8.2	3.12			7				0.37	2.2
5.03	16.5	7.80	3.40	Clay	CL/CH	firm	110	1.0	8	0.894	0.894	3.84	0.95	1.17	8.7	3.11			8				0.41	2.3
5.18	17.0	11.54	4.77	Clay	CL/CH	stiff	110	1.0	12	0.921	0.921	5.16	0.94	1.14	12.4	3.08			12				0.62	3.5
5.33	17.5	23.62	4.96	Clay	CL/CH	very stiff	110	1.0	24	0.949	0.949	5.17	0.89	1.10	24.5	2.84			24				1.33	7.2
5.49	18.0	53.03	3.64	Clayey Silt to Silty Clay	ML/CL	medium dense	110	2.0	27	0.976	0.976	3.71	0.76	1.06	53.3	2.50	2.70	147.3	27	29	51	35		
5.64	18.5	48.63	4.08	Clayey Silt to Silty Clay	ML/CL	medium dense	110	2.0	24	1.004	1.004	4.17	0.78	1.04	47.9	2.57	3.13	149.9	24	30	48	34		
5.79	19.0	40.15	4.84	Silty Clay to Clay	CL	hard	110	1.5	27	1.031	1.031	4.90	0.82	1.02	38.7	2.69			27				2.30	11.4
5.94	19.5	77.83	1.42	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	26	1.059	1.059	1.43	0.64	1.00	73.5	2.11	1.48	108.8	26	22	64	35		
6.10	20.0	35.31	3.98	Clayey Silt to Silty Clay	ML/CL	hard	110	2.0	18	1.086	1.086	4.12	0.82	0.98	32.7	2.68			18				2.01	8.6
6.25	20.5	44.84	2.88	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	18	1.114	1.114	2.94	0.76	0.96	40.7	2.51	2.83	115.2	17	23	40	32		
6.40	21.0	35.56	1.74	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	14	1.143	1.143	1.70	0.75	0.94	31.7	2.48	2.57	81.5	13	18	29	31		
6.55	21.5	25.77	5.15	Clay	CL/CH	very stiff	120	1.0	26	1.173	1.173	5.40	0.88	0.91	22.3	2.88			26				1.45	8.3
6.71	22.0	52.95	5.54	Clay	CL/CH	hard	120	1.0	53	1.203	1.203	5.67	0.81	0.89	45.1	2.68			52				3.05	12.9
6.86	22.5	64.74	4.75	Silty Clay to Clay	CL	dense	120	1.5	43	1.233	1.233	4.84	0.78	0.88	54.3	2.58	3.19	173.3	38	35	51	36		
7.01	23.0	131.38	3.82	Sand to Clayey Sand	SP/SC	medium dense	120	6.0	22	1.263	1.263	3.86	0.70	0.84	109.7	2.30	1.96	215.1	18	43	81	33		
7.16	23.5	173.40	2.37	Silty Sand to Sandy Silt	SM/ML	very dense	120	3.0	58	1.293	1.293	2.30	0.63	0.86	144.6	2.07	1.40	201.9	51	40	92	41		
7.32	24.0	61.25	4.74	Silty Clay to Clay	CL	hard	120	1.5	41	1.323	1.323	4.85	0.79	0.84	48.5	2.61			41				3.55	13.8
7.47	24.5	51.76	5.28	Clay	CL/CH	hard	120	1.0	52	1.353	1.337	5.43	0.82	0.83	40.4	2.70			52				2.97	11.3
7.62	25.0	59.18	3.65	Clayey Silt to Silty Clay	ML/CL	medium dense	120	2.0	30	1.383	1.351	3.74	0.77	0.83	46.3	2.54	3.00	138.5	26	26	45	35		
7.77	25.5	15.22	3.85	Silty Clay to Clay	CL	stiff	120	1.5	10	1.413	1.366	4.24	0.93	0.79	11.3	3.04			10				0.81	3.0
7.92	26.0	59.50	4.38	Clayey Silt to Silty Clay	ML/CL	hard	120	2.0	30	1.443	1.380	4.49	0.79	0.81	45.6	2.61			30				3.42	12.8
8.08	26.5	45.93	6.28	Clay	CL/CH	hard	120	1.0	46	1.473	1.395	5.46	0.84	0.79	34.5	2.75			46				2.62	9.8
8.23	27.0	32.09	5.98	Clay	CL/CH	very stiff	120	1.0	32	1.503	1.409	6.28	0.90	0.78	23.9	2.91			32				1.80	6.5
8.38	27.5	14.33	5.01	Clay	CL/CH	stiff	120	1.0	14	1.533	1.423	5.62	0.96	0.76	10.2	3.15			14				0.76	2.7
8.53	28.0	29.33	5.28	Clay	CL/CH	very stiff	120	1.0	29	1.563	1.438	5.56	0.90	0.76	21.1	2.91			29				1.64	5.8
8.69	28.5	40.21	3.97	Clayey Silt to Silty Clay	ML/CL	hard	120	2.0	20	1.593	1.452	4.13	0.83	0.77	29.2	2.72			20				2.28	8.0
8.84	29.0	93.80	1.91	Silty Sand to Sandy Silt	SM/ML	medium dense	120	3.0	31	1.623	1.467	1.94	0.67	0.80	71.2	2.21	1.70	120.7	26	24	63	35		
8.99	29.5	76.73	2.79	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	31	1.653	1.481	2.85	0.73	0.78	56.8	2.40	2.30	130.7	25	26	53	35		
9.14	30.0	111.79	2.13	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	37	1.683	1.495	2.16	0.67	0.79	83.9	2.19	1.65	138.2	30	28	70	36		
9.30	30.5	66.90	3.33	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	23	1.713	1.510	3.43	0.78	0.76	40.6	2.56	3.07	125.5	16	25	40	33		
9.45	31.0	46.93	3.22	Clayey Silt to Silty Clay	ML/CL	hard	120	2.0	23	1.743	1.524	3.34	0.80	0.75	33.2	2.62			23				2.67	9.0
9.60	31.5	24.03	4.26	Silty Clay to Clay	CL	very stiff	120	1.5	16	1.773	1.539	4.59	0.90	0.71	16.2	2.94			16				1.32	4.3
9.75	32.0	15.44	3.60	Silty Clay to Clay	CL	stiff	120	1.5	10	1.803	1.553	4.00	0.94	0.70	10.2	3.07			10				0.82	2.6
9.91	32.5	15.23	3.29	Silty Clay to Clay	CL	stiff	120	1.5	10	1.833	1.567	3.74	0.94	0.69	10.0	3.05			10				0.80	2.6
10.06	33.0	21.82	2.81	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	11	1.863	1.582	3.07	0.88	0.70	14.5	2.87			11				1.19	3.8
10.21	33.5	24.99	3.60	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	12	1.893	1.596	3.93	0.88	0.70	16.4	2.89			12				1.38	4.3
10.36	34.0	84.03	2.87	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	34	1.923	1.611	2.94	0.73	0.74	58.5	2.40	2.30	134.7	27	27	55	35		
10.52	34.5	78.66	5.16	Overconsolidated Soil	??	hard	120	6.0	13	1.953	1.625	5.20	0.80	0.71	51.5	2.62			13				4.41	13.8
10.67	35.0	69.88	6.13	Overconsolidated Soil	??	hard	120	6.0	10	1.983	1.639	6.33	0.84	0.69	39.2	2.76			10				3.43	10.6
10.82	35.5	81.87	4.32	Clayey Silt to Silty Clay	ML/CL	dense	120	2.0	41	2.013	1.654	4.43	0.77	0.71	54.8	2.55	3.01	164.9	32	33	52	37		
10.97	36.0	136.44	3.29	Sandy Silt to Clayey Silt	ML	dense	120	2.5	55	2.043	1.668	3.34	0.70	0.73	91.8	2.30	1.94	182.3	42	36	74	39		
11.13	36.5	189.78	3.07	Sand to Clayey Sand	SP/SC	medium dense	120	6.0	32	2.073	1.683	3.11	0.68	0.73	130.7	2.24	1.78	232.8	24	47	88	39		
11.28	37.0	273.47	2.18	Sand to Silty Sand	SP/SM	very dense	120	4.0	68	2.103	1.697	2.20	0.60	0.75	195.0	2.06	1.25	243.5	52	49	100	41		
11.43	37.5	138.51	3.14	Sandy Silt to Clayey Silt	ML	dense	120	2.5	55	2.133	1.711	3.19	0.69	0.72	93.7	2.28	1.90	177.7	42	36	74	39		
11.58	38.0	78.20	4.24	Clayey Silt to Silty Clay	ML/CL	medium dense	120	2.0	39	2.163	1.726	4.37	0.76	0.68	48.4	2.58	3.19	154.7	26	31	47	36		
11.73	38.5	257.86	1.27	Sand	SP	dense	120	5.0	52	2.193	1.740	1.28	0.55	0.76	185.7	1.79	1.10	204.2	39	41	100	39		
11.89	39.0	352.71	0.97	Sand	SP	very dense	120	5.0	71	2.223	1.755	0.98	0.50	0.74	250.0	1.61	1.00	249.9	53	52	100	41		
12.04	39.5	319.07	0.96	Sand	SP	dense	120	5.0	64	2.253	1.769	0.97	0.50	0.77	233.7	1.60	1.00	233.7	48	47	100	40		
12.19	40.0	293.84	0.81	Sand	SP	dense	120	5.0	59	2.283	1.783	0.81	0.50	0.77	213.9	1.60	1.00	213.9	44	43	100	39		
12.34	40.5	220.53	0.84	Sand	SP	dense	120	5.0	44	2.313	1.798	0.85	0.52	0.76	157.8	1.71	1.05	165.3	33	33	96	37		
12.50	41.0	162.26	0.71	Sand	SP	medium dense	120	5.0	32	2.343	1.812	0.72	0.54	0.75	114.5	1.78	1.09	124.8	24	25	82	34		
12.65	41.5	82.21	1.34	Sand to Silty Sand	SP/SM	medium dense	120	4.0	21	2.373	1.827	1.39	0.67	0.69	53.8	2.21	1.68	90.6	16	18	51	32		
12.80	42.0	126.95	1.38	Sand to Silty Sand	SP/SM	medium dense	120	4.0	32	2.403	1.841	1.41	0.63	0.71	84.7	2.06	1.39	117.7	23	24	73	34		
12.95	42.5	393.51	0.88	Sand	SP	very dense	120	5.0	79	2.433	1.855	0.89	0.50	0.76	280.0	1.58	1.00	280.9	60	59	100	42		
13.11	43.0	382.52	0.88	Sand	SP	very dense	120	5.0	77	2.463	1.870	1.00	0.50	0.75	272.0	1.60	1.00	272.0	56	54	100	42		
13.26	43.5	400.47	0.52	Gravelly Sand to Sand	SW	dense	120	6.0	67	2.493	1.884	0.52	0.50	0.75	283.6	1.38	1.00	283.6	49	57	100	40		
13.41	44.0	420.31	0.75	Gravelly Sand to Sand	SW	very dense	120	6.0	70	2.523	1.899	0.76	0.50	0.75	298.8	1.48	1.00	298.8	51	58	100	41		
13.56	44.5	446.15	0.34	Gravelly Sand to Sand	SW	very dense	120	6.0	74	2.553	1.913	0.34	0.50	0.74	313.8	1.23	1.00	313.8	54	63	100	41		

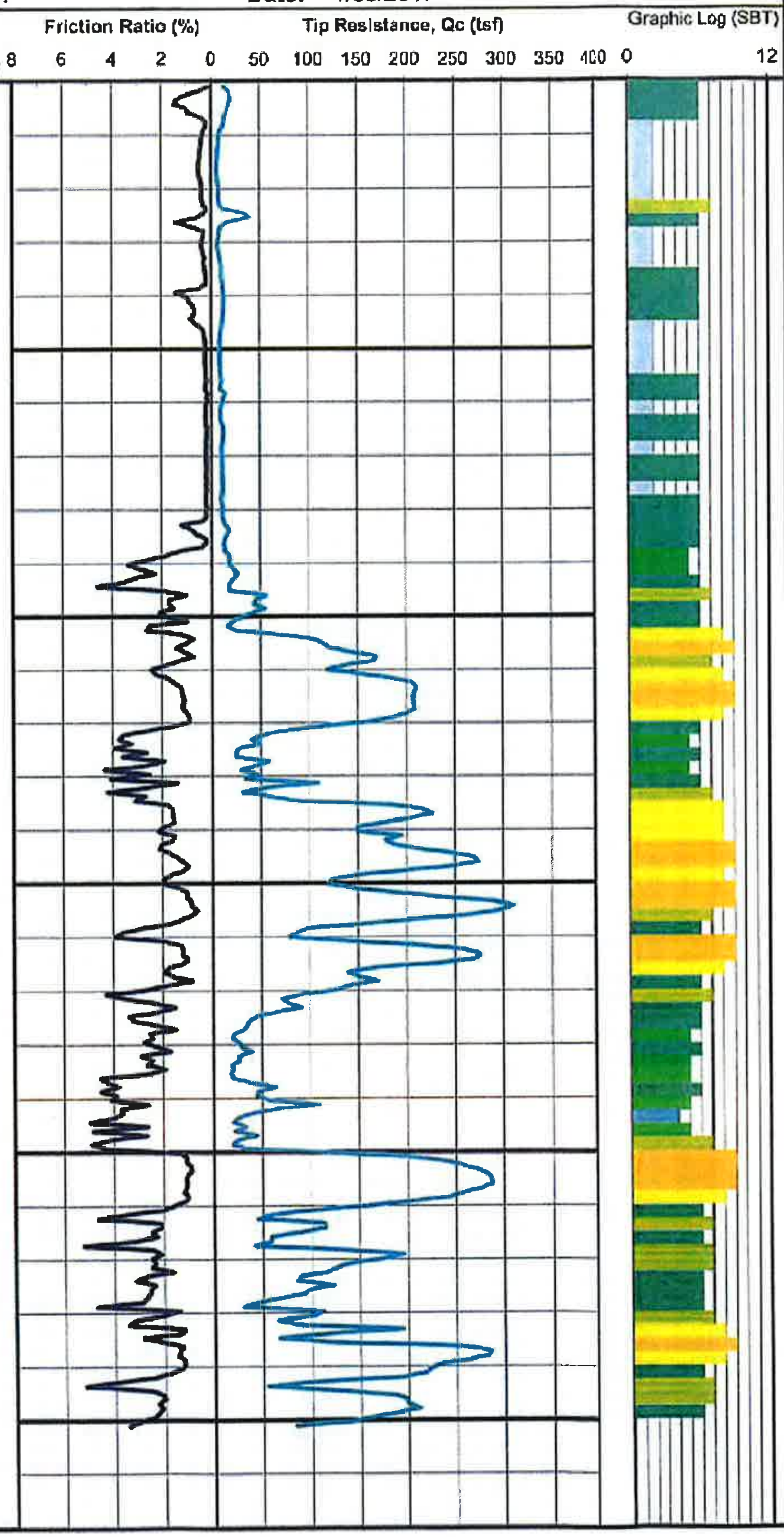
Earth Systems
Southern California

CPT No: CPT-2
Project Name: Commercial Organics Processing Facility
Project No.: VT-24872-02
Location: See Site Exploration Plan

CPT Vendor: Middle Earth
Truck Mounted Electric
Cone with 23-ton reaction
Date: 1/30/2017

DEPTH (FEET)

Interpreted Soil Stratigraphy Robertson & Campanella ('89)	Density/Consistency
Sandy Silt to Clayey Silt	medium dense
Sensitive fine grained	loose
Sensitive fine grained	firm
Sensitive fine grained	firm
Silty Sand to Sandy Silt	medium dense
Sensitive fine grained	loose
Sensitive fine grained	loose
Sandy Silt to Clayey Silt	loose
Sandy Silt to Clayey Silt	loose
Sensitive fine grained	loose
Sensitive fine grained	loose
Sandy Silt to Clayey Silt	loose
Sensitive fine grained	loose
Sandy Silt to Clayey Silt	loose
Sandy Silt to Clayey Silt	loose
Sandy Silt to Clayey Silt	loose
Sandy Silt to Clayey Silt	loose
Clayey Silt to Silty Clay	stiff
Clayey Silt to Silty Clay	very stiff
Silty Sand to Sandy Silt	medium dense
Silty Sand to Sandy Silt	medium dense
Sand to Silty Sand	dense
Sand to Silty Sand	dense
Sand	dense
Clayey Silt to Silty Clay	hard
Clayey Silt to Silty Clay	hard
Silty Sand to Sandy Silt	medium dense
Sand to Silty Sand	dense
Sand to Silty Sand	dense
Sand to Silty Sand	dense
Sand	dense
Silty Sand to Sandy Silt	dense
Sand	dense
Silty Sand to Sandy Silt	dense
Sandy Silt to Clayey Silt	medium dense
Sandy Silt to Clayey Silt	very stiff
Clayey Silt to Silty Clay	very stiff
Clayey Silt to Silty Clay	hard
Clayey Silt to Silty Clay	very stiff
Sandy Silt to Clayey Silt	medium dense
Sand	dense
Sand to Silty Sand	dense
Sandy Silt to Clayey Silt	medium dense
Sandy Silt to Clayey Silt	dense
Silty Sand to Sandy Silt	medium dense
Sandy Silt to Clayey Silt	medium dense
Silty Sand to Sandy Silt	dense
Sand to Silty Sand	dense
Sandy Silt to Clayey Silt	dense
Silty Sand to Sandy Silt	dense



End of Sounding @ 50.4 feet

Earth Systems Southern California

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella, 1989)

Project: Commercial Organics Processing Facility — Project No: VT-24872-02 — Date: 01/30/17

CPT SOUNDING: CPT-2 — Plot 2 — Density 1 — SPT N — Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Est. GWT (feet): 24.0 — Dr correlation: 0 Baldi — Qc/N 1 Robertson — Phi Correlation: 4 SPT N — Nk: 17

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	Ic	Kc	Clean Sand Qc1n	$N_{1(60)}$	Clean Sand $N_{1(60)cs}$	Rel. Dens. Dr (%)	Phi (deg)	Su (tsf)	OCR
0.15	0.5	18.43	1.01	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	7	0.014	0.014	1.02	0.71	1.70	29.6	2.34	2.10	62.2	13	12	26	31		
0.30	1.0	16.41	1.18	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	7	0.041	0.041	1.17	0.73	1.70	26.4	2.42	2.38	63.1	11	13	22	30		
0.46	1.5	12.50	0.28	Sandy Silt to Clayey Silt	ML	loose	110	2.5	5	0.063	0.060	0.30	0.69	1.70	20.1	2.27	1.00	20.1	9	4	10	29		
0.61	2.0	7.30	0.30	Sensitive fine grained	ML	loose	110	2.0	4	0.095	0.096	0.37	0.76	1.70	12.1	2.51	1.00	12.1	6	2	-11	29		
0.76	2.5	6.03	0.45	Sensitive fine grained	ML	firm	110	2.0	3	0.124	0.124	0.45	0.80	1.70	9.7	2.63			3				0.35	14.4
0.91	3.0	5.44	0.50	Sensitive fine grained	ML	firm	110	2.0	3	0.151	0.151	0.51	0.82	1.70	8.7	2.68			3				0.31	10.5
1.07	3.5	5.27	0.50	Sensitive fine grained	ML	firm	110	2.0	3	0.173	0.170	0.51	0.82	1.70	6.6	2.71			3				0.30	8.5
1.22	4.0	5.40	0.41	Sensitive fine grained	ML	loose	110	2.0	3	0.203	0.200	0.42	0.79	1.70	10.1	2.60	1.00	10.1	5	2	-18	28		
1.37	4.5	6.90	0.37	Sensitive fine grained	ML	loose	110	2.0	3	0.234	0.234	0.38	0.78	1.70	11.2	2.55	1.00	11.2	6	2	-14	28		
1.52	5.0	26.47	0.38	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	9	0.261	0.261	0.30	0.60	1.70	46.7	1.98	1.00	45.7	16	9	44	32		
1.68	5.5	9.97	0.74	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.283	0.280	0.77	0.77	1.70	16.0	2.62	2.87	46.0	7	9	1	29		
1.83	6.0	5.80	0.38	Sensitive fine grained	ML	firm	110	2.0	3	0.315	0.316	0.41	0.80	1.70	9.6	2.63			3				0.33	5.3
1.98	6.5	7.95	0.31	Sensitive fine grained	ML	loose	110	2.0	4	0.344	0.344	0.35	0.76	1.70	12.8	2.47	1.00	12.3	7	3	-8	28		
2.13	7.0	8.82	0.27	Sensitive fine grained	ML	loose	110	2.0	5	0.371	0.371	0.28	0.72	1.70	15.8	2.37	1.00	15.9	8	3	0	28		
2.29	7.5	10.08	0.32	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.392	0.390	0.33	0.72	1.70	17.2	2.38	1.00	17.2	7	3	4	29		
2.44	8.0	11.83	1.13	Sandy Silt to Clayey Silt	ML	loose	110	2.5	5	0.426	0.428	1.17	0.77	1.70	19.0	2.54	2.09	56.3	7	11	8	29		
2.59	8.5	11.52	0.71	Sandy Silt to Clayey Silt	ML	loose	110	2.5	5	0.454	0.454	0.74	0.75	1.70	16.5	2.40	2.57	47.5	7	9	7	29		
2.74	9.0	10.25	0.65	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.481	0.481	0.68	0.76	1.70	16.5	2.49	2.71	44.8	6	8	2	28		
2.90	9.5	8.44	0.30	Sensitive fine grained	ML	loose	110	2.0	4	0.509	0.509	0.31	0.75	1.70	13.0	2.45	1.00	13.0	6	3	-6	28		
3.05	10.0	8.01	0.27	Sensitive fine grained	ML	loose	110	2.0	4	0.533	0.536	0.20	0.76	1.67	12.7	2.47	1.00	12.7	5	3	-5	28		
3.20	10.5	8.20	0.27	Sensitive fine grained	ML	loose	110	2.0	4	0.564	0.564	0.20	0.76	1.61	12.6	2.48	1.00	12.6	6	3	-6	20		
3.35	11.0	8.32	0.23	Sensitive fine grained	ML	loose	110	2.0	5	0.591	0.591	0.26	0.74	1.54	13.6	2.42	1.00	13.0	6	3	-6	29		
3.51	11.5	10.70	0.23	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.619	0.619	0.24	0.73	1.48	14.9	2.37	1.00	14.9	5	3	-2	28		
3.66	12.0	10.54	0.22	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.645	0.646	0.23	0.73	1.44	14.3	2.39	1.00	14.3	5	3	-4	28		
3.81	12.5	9.10	0.25	Sensitive fine grained	ML	loose	110	2.0	5	0.674	0.674	0.27	0.76	1.41	12.1	2.47	1.00	12.1	6	2	-11	28		
3.96	13.0	11.08	0.21	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.701	0.701	0.22	0.73	1.36	14.2	2.38	1.00	14.2	5	3	-4	28		
4.11	13.5	10.63	0.21	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.729	0.729	0.23	0.74	1.32	13.3	2.42	1.00	13.3	5	3	-7	28		
4.27	14.0	10.10	0.22	Sensitive fine grained	ML	loose	110	2.0	5	0.756	0.756	0.24	0.75	1.29	12.3	2.45	1.00	12.3	6	2	-10	28		
4.42	14.5	10.44	0.21	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.784	0.784	0.23	0.75	1.25	12.4	2.45	1.00	12.4	5	2	-10	28		
4.57	15.0	10.78	0.21	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.811	0.811	0.23	0.75	1.22	12.4	2.45	1.00	12.4	5	2	-10	28		
4.72	15.5	10.19	0.22	Sensitive fine grained	ML	loose	110	2.0	5	0.839	0.839	0.24	0.76	1.19	11.5	2.48	1.00	11.5	6	2	-12	29		
4.88	16.0	10.41	0.22	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.865	0.866	0.24	0.76	1.17	11.5	2.48	1.00	11.5	4	2	-12	28		
5.03	16.5	14.41	0.78	Sandy Silt to Clayey Silt	ML	loose	110	2.5	6	0.894	0.894	0.84	0.78	1.14	15.5	2.55	3.03	47.1	6	8	0	28		
5.18	17.0	13.83	0.37	Sandy Silt to Clayey Silt	ML	loose	110	2.5	6	0.921	0.921	0.40	0.75	1.11	14.5	2.45	1.00	14.5	6	3	-3	28		
5.33	17.5	16.09	1.24	Sandy Silt to Clayey Silt	ML	stiff	110	2.5	6	0.949	0.949	1.32	0.81	1.09	15.6	2.64			6				0.83	4.5
5.49	18.0	19.54	2.99	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	10	0.976	0.978	3.15	0.84	1.07	19.8	2.77			10				1.09	5.7
5.64	18.5	22.87	3.01	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	11	1.004	1.004	3.15	0.83	1.04	22.8	2.73			11				1.29	6.5
5.79	19.0	30.47	2.55	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	12	1.031	1.031	2.64	0.79	1.02	29.4	2.59	3.28	95.7	12	19	28	31		
5.94	19.5	47.54	1.88	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	16	1.058	1.059	1.72	0.71	1.00	44.9	2.33	2.05	91.9	15	18	44	32		
6.10	20.0	31.22	1.84	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	12	1.086	1.086	1.70	0.75	0.98	28.9	2.48	2.66	78.9	12	15	25	31		
6.25	20.5	35.20	2.14	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	14	1.114	1.114	2.21	0.76	0.96	32.0	2.51	2.83	90.5	13	18	30	31		
6.40	21.0	112.86	1.10	Sand to Silty Sand	SP/SM	medium dense	120	4.0	28	1.143	1.143	1.11	0.59	0.96	102.0	1.83	1.22	124.8	26	25	73	35		
6.56	21.5	150.16	1.08	Sand	SP	medium dense	120	5.0	32	1.173	1.173	1.08	0.50	0.94	142.1	1.82	1.12	150.5	26	32	81	35		
6.71	22.0	130.01	2.24	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	45	1.200	1.203	2.28	0.64	0.92	110.4	2.10	1.48	173.2	41	35	84	38		
6.86	22.5	189.80	1.55	Sand to Silty Sand	SP/SM	dense	120	4.0	50	1.233	1.233	1.56	0.57	0.92	173.2	1.87	1.17	201.9	45	40	100	40		
7.01	23.0	207.02	1.18	Sand	SP	dense	120	5.0	41	1.263	1.263	1.19	0.54	0.91	177.8	1.78	1.03	194.1	37	38	100	38		
7.16	23.5	205.87	1.13	Sand	SP	dense	120	5.0	41	1.293	1.293	1.13	0.54	0.90	174.6	1.77	1.09	189.4	36	38	100	38		
7.32	24.0	163.87	1.16	Sand to Silty Sand	SP/SM	dense	120	4.0	39	1.323	1.323	1.17	0.57	0.88	128.0	1.88	1.17	149.3	33	30	87	37		
7.47	24.5	58.16	3.34	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	22	1.350	1.337	3.42	0.77	0.84	44.3	2.53	2.92	129.5	19	20	43	33		
7.62	25.0	33.73	3.31	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	17	1.383	1.351	3.45	0.82	0.82	28.1	2.70			17				1.80	7.2
7.77	25.5	42.81	2.77	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	17	1.413	1.368	2.87	0.78	0.82	32.0	2.57	3.17	104.4	15	21	31	32		
7.92	26.0	38.57	3.69	Clayey Silt to Silty Clay	ML/CL	hard	120	2.0	18	1.443	1.380	3.84	0.83	0.80	27.7	2.71			16				2.07	7.6
8.08	26.5	64.26	2.75	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	26	1.473	1.395	2.81	0.74	0.81	49.5	2.44	2.47	122.2	22	24	45	34		
8.23	27.0	181.55	2.20	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	54	1.503	1.409	2.22	0.63	0.83	127.4	2.08	1.42	180.4	45	38	87	40		
8.38	27.5	202.71	1.60	Sand to Silty Sand	SP/SM	dense	120	4.0	51	1.533	1.423	1.61	0.50	0.84	181.3	1.61	1.15	192.8	42	39	87	38		
8.53	28.0	164.39	1.62	Sand to Silty Sand	SP/SM	dense	120	4.0	41	1.563	1.436	1.93	0.62	0.83	123.6	2.03	1.34	172.4	34	34	87	37		
8.69	28.5	181.45	1.95	Sand to Silty Sand	SP/SM	dense	120	4.0	48	1.593	1.452	1.97	0.61	0.83	149.3	1.90	1.29	192.7	40	38	89	38		
8.84	29.0	262.72	1.45	Sand	SP	dense	120	5.0	53	1.623	1.467	1.46	0.55	0.84	207.8	1.80	1.11	229.9	45	48	100	38		
8.99	29.5	190.12	1.29	Sand	SP	dense	120	5.0	40	1.653	1.481	1.30	0.56	0.83	154.8	1.85	1.14	177.3	33	35	85	37		
9.14	30.0	129.28	1.77	Sand to Silty Sand	SP/SM	medium dense	120	4.0	32	1.683	1.495	1.76	0.64	0.80	93.1	2.00	1.43	140.5	26	28	78	35		
9.30	30.5	236.83	0.98	Sand	SP	dense	120	5.0	47	1.713	1.510	1.00	0.52	0.83	188.0	1.71	1.04	194.3	39	39	100	38		
9.45	31.0	200.81	0.76	Sand	SP	dense	120	5.0	50	1.743	1.524	0.77	0.50	0.83	223.0	1.57	1.00	228.0	47	40	100	40		
9.60	31.5	190.34	1.93	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	62	1.773	1.539	1.95	0.63	0.79	116.8	2.08	1.39	162.3	42	32	83	39		
9.75	32.0	103.10	3.19	Sandy Silt to Clayey Silt	ML	dense	120	2.5	41	1.803	1.553	3.25	0.72	0.76	74.0	2.36	2.15	159.1	33	32	84	37		
9.91	32.5	260.27	1.26	Sand	SP	dense	120	5.0	52	1.833	1.567	1.27	0.54	0.81	181.1	1.78	1.09	208.6	40	42	100	38		
10.06	33.0	224.00	1.33	Sand	SP	dense	120	5.0	45	1.863	1.582	1.34	0.56	0.80	183.6	1.83	1.13	191.8	36	38	99	37		
10.21	33.5	152.85	1.47	Sand to Silty Sand	SP/SM	dense	120	4.0	39	1.893	1.596	1.46	0.61	0.78	112.6	1.89	1.26	144.7	30	29	82	36		
10.36	34.0	110.73	2.66	Sandy Silt to Clayey Silt	ML	dense	120	2.5	48	1.923	1.611	3.00	0.70	0.75	84.4	2.20	1.83	163.0	38	33	70	38		
10.52	34.5	80.21	2.47	Silty Sand to Sandy Silt	SM/ML	medium dense	120	3.0	27	1.953	1.625	2.52	0.72	0.73	55.6	2.37	2.10	121.8	21	24	52	34		
10.67	35.0	48.84	2.96	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	20	1.983	1.639	3.06	0.79	0.71	32.7	2.60	3.31	108.2	15	22	30	32		
10.82	35.5	29.29	2.15	Sandy Silt to Clayey Silt	ML	very stiff	120	2.5	12	2.013	1.654	2.30	0.82	0.69	18.2	2.70			12				1.63	4.9
10.97	36.0	34.65	2.54	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	12	2.043	1.668	2.76	0.84	0.68	15.0	2.61			12				1.37	4.1
11.13	36.5	28.17	2.46	Sandy Silt to Clayey Silt	ML	very stiff	120	2.5	11	2.073	1.683	2.86	0.84	0.68	18.0	2.76			11				1.56	4.7
11.28	37.0	19.62	3.05	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	10	2.103	1.697	3.41	0.91	0.65	12.0	2.86			10				1.05	3.1
11.43	37.5	50.00	4.22	Clayey Silt to Silty Clay	ML/CL	hard	120	2.0	25	2.133	1.711	4.41	0.82	0.67	31.8	2.71			25				2.85	8.4
11.58	38.0	70.31	3.57	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	28	2.163	1.720	3.86	0.77	0.69	45.5	2.54	3.00	136.6	25	27	44	34		
11.73	38.5	41.66	3.61	Clayey Silt to Silty Clay	ML/CL	hard	120	2.0	21	2.193	1.740	4.02	0.84	0.56	28.0	2.75			21				2.35	6.8
11.88	39.0	25.35	4.18	Silty Clay to Clay	CL	very stiff	120	1.5	17	2.223	1.755	4.59	0.90	0.63	15.2	2.96			17				1.39	4.0
12.04	39.5	29.30	3.96	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	15	2.253	1.769	4.28	0.88	0.64	17.8	2.89			15				1.62	4.8
12.19	40.0	126.02	2.28	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	42	2.283	1.783	2.30	0.67	0.70	83.7	2.21	1.70	142.2	31	28	66	36		
12.34	40.5	259.51	0.98	Sand	SP	dense	120	5.0	52	2.313	1.798	0.99	0.52	0.78	185.9	1.71	1.04	194.1	38	38	100	38		
12.50	41.0	285.04	1.09	Sand	SP	dense	120	5.0	57	2.343	1.812	1.10	0.52	0.75	205.2	1.72	1.05	213.0	42	43	100	39		
12.65	41.5	259.06	1.12	Sand	SP	dense	120	5.0	52	2.373	1.827	1.13	0.54	0.75	182.7	1.78	1.08	196.8	38	38	100	38		
12.80	42.0	156.69	1.62	Sand to Silty Sand	SP/SM	medium dense	120	4.0	39	2.403	1.841	1.64	0.62	0.71	104.9	2.04	1.36	142.3	29	20	79	36		
12.95	42.5	72.96	3.48	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	29	2.433	1.855	3.60	0.77	0.65	44.8	2.54	3.00	133.8	21	27	43	34		
13.11	43.0	87.70	2.31	Silty Sand to Sandy Silt	SM/ML	medium dense	120	3.0	29	2.463	1.870	2.40	0.72	0.65	56.1	2.38	2.14	117.8	21	24	52	34		
13.26	43.5	77.89	3.64	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	31	2.493	1.884	3.76	0.77	0.64	47.1	2.54	2.98	140.3	23	28	46	34		
13.41	44.0	189.73	2.39	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	51	2.523	1.899	2.39	0.65	0.68	109.5	2.14	1.54	168.6	41	34	81	39		
13.56	44.5	110.48	2.32	Silty Sand to Sandy Silt	SM/ML	medium dense	120	3.0	37	2.553	1.913	2.37	0.66	0.65	80.4	2.28	1.89	130.9	27	26	62	35		

Earth Systems
Southern California

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella, 1989)

Project: Commercial Organics Processing Facility Project No: VT-24872-02 Date: 01/30/17

CPT SOUNDING: CPT-2 Plot: 2 Density: 1 SPT N

Est. GWT (feet): 24.0 Dr correlation: 0 Baldi Qc/N: 1 Robertson

Program developed 2003 by Shelton L. Stringer, GE Earth Systems Southwest

Phi Correlation: 1 SPT N Nk: 17

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total σo tsf	σ'o tsf	F	n	Cq	Norm. Qc1n	Ic	Kc	Clean Sand Qc1n	$N_{1(60)}$	Clean Sand $N_{1(60)}$	Rel. Dens. Dr (%)	Phi (deg.)	Su (tsf)	OCR
13.72	45.0	102.32	2.74	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	41	2.583	1.927	2.81	0.72	0.65	62.8	2.36	2.16	135.0	26	27	53	36		
13.87	45.5	68.32	2.77	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	27	2.613	1.942	2.88	0.78	0.63	40.6	2.51	2.80	113.0	28	23	39	33		
14.02	46.0	81.32	2.74	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	33	2.643	1.956	2.83	0.74	0.63	48.6	2.44	2.50	121.7	22	24	47	34		
14.17	46.5	114.82	2.03	Silty Sand to Sandy Silt	SM/ML	medium dense	120	3.0	38	2.673	1.971	2.09	0.71	0.64	70.0	2.32	2.00	140.1	27	28	62	35		
14.33	47.0	142.01	1.83	Sand to Silty Sand	SP/SM	medium dense	120	4.0	36	2.703	1.985	1.91	0.65	0.66	89.1	2.14	1.53	135.9	26	27	72	35		
14.48	47.5	276.00	1.39	Sand	SP	dense	120	5.0	55	2.733	1.999	1.38	0.56	0.70	183.1	1.82	1.12	205.5	36	41	106	38		
14.63	48.0	224.46	1.45	Sand to Silty Sand	SP/SM	dense	120	4.0	56	2.763	2.014	1.47	0.58	0.69	145.9	1.80	1.19	174.1	40	35	93	38		
14.78	48.5	117.37	3.83	Sandy Silt to Clayey Silt	ML	dense	120	2.5	47	2.793	2.028	3.93	0.74	0.62	63.4	2.44	2.49	170.5	35	34	51	37		
14.94	49.0	153.17	2.25	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	50	2.823	2.043	2.26	0.65	0.65	103.3	2.16	1.55	160.1	35	32	78	38		
15.09	49.5	198.76	2.24	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	66	2.853	2.057	2.27	0.64	0.65	122.9	2.08	1.49	177.6	40	30	85	40		
15.24	50.0	129.66	2.99	Sandy Silt to Clayey Silt	ML	dense	120	2.5	52	2.883	2.071	3.06	0.71	0.62	78.1	2.33	2.05	150.2	36	31	65	38		

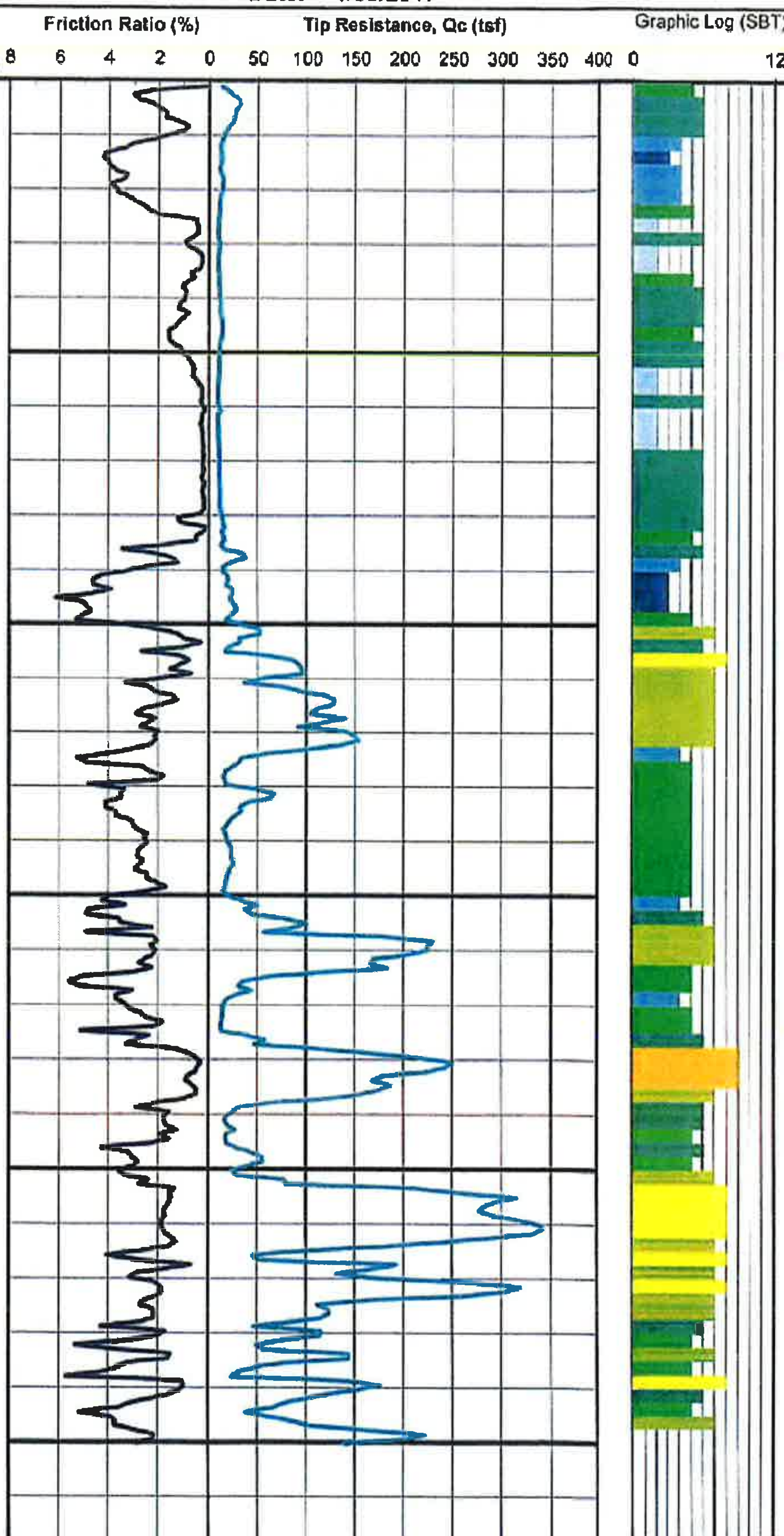
Earth Systems
Southern California

CPT No: CPT-3

Project Name: Commercial Organics Processing Facility
Project No.: VT-24872-02
Location: See Site Exploration Plan

CPT Vendor: Middle Earth
Truck Mounted Electric
Cone with 23-ton reaction
Date: 1/30/2017

DEPTH (FEET)	Interpreted Soil Stratigraphy Robertson & Campanella ('89)	Density/Consistency
	Sandy Silt to Clayey Silt	medium dense
	Sandy Silt to Clayey Silt	medium dense
	Clay	stiff
	Silty Clay to Clay	stiff
5	Clayey Silt to Silty Clay	stiff
	Sensitive fine grained	loose
	Sensitive fine grained	loose
	Sandy Silt to Clayey Silt	loose
	Sandy Silt to Clayey Silt	loose
	Clayey Silt to Silty Clay	loose
10	Sensitive fine grained	loose
	Sensitive fine grained	loose
	Sensitive fine grained	loose
	Sensitive fine grained	loose
	Sandy Silt to Clayey Silt	loose
15	Sandy Silt to Clayey Silt	loose
	Sandy Silt to Clayey Silt	stiff
	Clayey Silt to Silty Clay	very stiff
	Clay	very stiff
	Silty Clay to Clay	very stiff
20	Silty Sand to Sandy Silt	medium dense
	Silty Sand to Sandy Silt	medium dense
	Silty Sand to Sandy Silt	dense
	Silty Sand to Sandy Silt	dense
	Sandy Silt to Clayey Silt	medium dense
25	Clayey Silt to Silty Clay	very stiff
	Clayey Silt to Silty Clay	hard
	Clayey Silt to Silty Clay	very stiff
	Clayey Silt to Silty Clay	very stiff
	Clayey Silt to Silty Clay	very stiff
30	Clayey Silt to Silty Clay	medium dense
	Silty Sand to Sandy Silt	very dense
	Sandy Silt to Clayey Silt	dense
	Clayey Silt to Silty Clay	very stiff
	Clayey Silt to Silty Clay	stiff
35	Sand to Silty Sand	medium dense
	Sand	medium dense
	Silty Sand to Sandy Silt	medium dense
	Sandy Silt to Clayey Silt	very stiff
	Clayey Silt to Silty Clay	hard
40	Sand to Silty Sand	dense
	Sand to Silty Sand	very dense
	Silty Sand to Sandy Silt	dense
	Silty Sand to Sandy Silt	dense
	Silty Sand to Sandy Silt	very dense
45	Silty Sand to Sandy Silt	medium dense
	Sandy Silt to Clayey Silt	medium dense
	Silty Sand to Sandy Silt	medium dense
	Clayey Silt to Silty Clay	medium dense
50		



End of Sounding @ 50.2 feet

Earth Systems
Southern California

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella, 1989)

Project: Commercial Organics Processing Facility — Project No: VT-24872-02 — Date: 01/30/17

CPT SOUNDING: CPT-3 — Plot: 3 — Density: 1 — SPT N — Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Est. GWT (feet): 24.0 — Dr correlation: 0 Baldi — Qc/N: 1 Robertson — Phi Correlation: 4 SPT N — Nc: 17 — Norm: 2.6

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total σo tsf	σ'o tsf	F	n	Cq	Norm Qc1n	Ic	Kc	Clean Sand Qc1n	N1(60)	Clean Sand N1(60)	Rel. Dens. Dr(%)	Phi (deg.)	Su (tsf)	OCR
0.15	0.5	24.25	2.74	Clayey Silt to Silty Clay	ML/CL	medium dense	110	2.0	12	0.014	0.014	2.74	0.76	1.70	33.0	2.51	2.80	100.1	21	22	38	33		
0.30	1.0	28.51	1.87	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	11	0.041	0.041	1.97	0.72	1.70	45.8	2.36	2.15	98.6	19	20	44	33		
0.46	1.5	23.47	1.24	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	9	0.069	0.069	1.25	0.70	1.70	37.7	2.31	1.97	74.2	16	15	35	32		
0.61	2.0	15.15	1.61	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	6	0.096	0.096	1.62	0.77	1.70	24.3	2.53	2.90	70.7	10	14	18	30		
0.76	2.5	11.71	3.51	Silty Clay to Clay	CL	stiff	110	1.5	8	0.124	0.124	3.54	0.86	1.70	18.8	2.82			8				0.88	28.1
0.91	3.0	11.82	4.09	Clay	CL/CH	stiff	110	1.0	12	0.151	0.151	4.15	0.87	1.70	19.0	2.60			12				0.89	23.1
1.07	3.5	12.09	3.50	Silty Clay to Clay	CL	stiff	110	1.5	8	0.179	0.179	3.56	0.85	1.70	19.4	2.81			8				0.70	20.0
1.22	4.0	12.52	3.77	Silty Clay to Clay	CL	stiff	110	1.5	8	0.206	0.206	3.84	0.86	1.70	22.1	2.82			8				0.72	17.9
1.37	4.5	10.87	2.94	Silty Clay to Clay	CL	stiff	110	1.5	7	0.234	0.234	3.00	0.89	1.70	17.5	2.80			7				0.63	13.8
1.52	5.0	9.66	1.62	Clayey Silt to Silty Clay	ML/CL	stiff	110	2.0	5	0.261	0.261	1.68	0.82	1.70	15.6	2.70			5				0.55	10.8
1.68	5.5	8.97	0.50	Sensitive fine grained	ML	loose	110	2.0	4	0.288	0.288	0.52	0.78	1.70	14.4	2.49	2.73	39.4	0	8	-4	29		
1.83	6.0	9.69	0.75	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.316	0.318	0.78	0.77	1.70	15.6	2.53	2.85	45.9	7	9	0	29		
1.98	6.5	8.71	0.20	Sensitive fine grained	ML	loose	110	2.0	4	0.344	0.344	0.30	0.74	1.70	14.0	2.43	1.00	14.0	7	3	-5	29		
2.13	7.0	9.20	0.56	Sensitive fine grained	ML	loose	110	2.0	5	0.371	0.371	0.50	0.76	1.70	14.8	2.50	2.78	41.2	8	8	-2	29		
2.28	7.5	9.60	0.95	Clayey Silt to Silty Clay	ML/CL	loose	110	2.0	5	0.399	0.399	0.99	0.79	1.70	15.7	2.58	3.10	60.9	8	10	0	29		
2.44	8.0	11.10	1.02	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.426	0.426	1.06	0.78	1.70	17.8	2.54	3.01	53.6	7	11	5	29		
2.59	8.5	11.70	1.01	Sandy Silt to Clayey Silt	ML	loose	110	2.5	5	0.454	0.454	1.05	0.77	1.70	18.5	2.52	2.90	54.2	7	11	7	29		
2.74	9.0	12.75	1.38	Sandy Silt to Clayey Silt	ML	loose	110	2.5	5	0.481	0.481	1.44	0.78	1.70	20.5	2.56	3.10	83.4	7	13	11	29		
2.90	9.5	11.82	1.54	Clayey Silt to Silty Clay	ML/CL	stiff	110	2.0	6	0.509	0.509	1.61	0.80	1.70	19.0	2.61			6				0.67	6.7
3.05	10.0	10.51	1.00	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.536	0.536	1.05	0.78	1.70	18.9	2.56	3.11	62.5	6	10	3	28		
3.20	10.5	10.08	0.65	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.564	0.564	0.69	0.77	1.62	15.5	2.51	2.64	44.0	5	9	-1	28		
3.35	11.0	9.45	0.52	Sensitive fine grained	ML	loose	110	2.0	5	0.591	0.591	0.56	0.77	1.57	14.0	2.52	2.86	40.0	9	6	-5	29		
3.51	11.5	8.46	0.27	Sensitive fine grained	ML	loose	110	2.0	4	0.619	0.619	0.29	0.78	1.51	12.0	2.49	1.00	12.0	5	2	-11	28		
3.66	12.0	10.25	0.25	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.545	0.646	0.27	0.74	1.44	14.0	2.41	1.00	14.0	5	3	-5	28		
3.81	12.5	8.45	0.30	Sensitive fine grained	ML	loose	110	2.0	4	0.674	0.674	0.32	0.78	1.42	11.3	2.52	1.00	11.3	5	2	-14	28		
3.96	13.0	8.13	0.20	Sensitive fine grained	ML	loose	110	2.0	5	0.701	0.701	0.26	0.76	1.37	11.8	2.49	1.00	11.8	5	2	-12	28		
4.11	13.5	9.97	0.23	Sensitive fine grained	ML	loose	110	2.0	5	0.729	0.729	0.25	0.75	1.32	12.5	2.45	1.00	12.5	6	2	-10	28		
4.27	14.0	10.37	0.23	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.756	0.756	0.25	0.75	1.29	12.6	2.45	1.00	12.6	5	3	-9	28		
4.42	14.5	10.52	0.24	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.784	0.784	0.26	0.76	1.25	12.5	2.46	1.00	12.5	5	2	-10	28		
4.57	15.0	11.09	0.23	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.811	0.811	0.25	0.75	1.22	12.8	2.44	1.00	12.8	5	3	-8	28		
4.72	15.5	11.32	0.22	Sandy Silt to Clayey Silt	ML	loose	110	2.5	6	0.839	0.839	0.24	0.75	1.18	12.7	2.44	1.00	12.7	5	3	-8	28		
4.88	16.0	12.58	0.72	Sandy Silt to Clayey Silt	ML	loose	110	2.5	5	0.866	0.866	0.78	0.78	1.17	13.9	2.58	3.19	44.5	5	9	-5	28		
5.03	16.5	14.42	0.29	Sandy Silt to Clayey Silt	ML	loose	110	2.5	6	0.894	0.894	0.30	0.73	1.13	16.4	2.39	1.00	16.4	6	3	-1	28		
5.18	17.0	14.23	1.09	Clayey Silt to Silty Clay	ML/CL	stiff	110	2.0	7	0.921	0.921	2.02	0.84	1.12	15.1	2.75			7				0.76	4.3
5.33	17.5	31.37	1.39	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	13	0.949	0.949	1.64	0.74	1.08	32.1	2.43	2.44	78.5	13	16	30	31		
5.46	18.0	15.83	3.42	Silty Clay to Clay	CL	stiff	110	1.5	11	0.976	0.976	3.65	0.86	1.07	16.1	2.88			11				0.87	4.8
5.64	18.5	20.27	4.41	Clay	CL/CH	very stiff	110	1.0	20	1.004	1.004	4.64	0.86	1.06	20.1	2.87			20				1.15	5.8
5.79	19.0	23.22	6.22	Clay	CL/CH	very stiff	110	1.0	23	1.031	1.031	6.54	0.88	1.02	22.4	2.90			24				1.31	6.9
5.94	19.5	25.28	4.83	Clay	CL/CH	very stiff	110	1.0	25	1.059	1.059	5.11	0.87	1.00	23.8	2.85			25				1.42	6.9
6.10	20.0	34.41	3.51	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	17	1.086	1.086	3.65	0.81	0.95	31.8	2.65			17				1.96	9.2
6.25	20.5	38.11	0.83	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	13	1.114	1.114	0.87	0.60	0.97	34.8	2.25	1.80	62.0	12	13	33	31		
6.40	21.0	32.83	1.53	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	13	1.143	1.143	1.64	0.75	0.84	29.4	2.48	2.59	76.1	12	15	28	31		
6.55	21.5	91.24	1.14	Sand to Silty Sand	SP/SM	medium dense	120	4.0	23	1.173	1.173	1.16	0.62	0.84	80.9	2.02	1.33	107.8	21	22	68	34		
6.71	22.0	62.34	1.95	Silty Sand to Sandy Silt	SM/ML	medium dense	120	3.0	21	1.203	1.203	2.00	0.70	0.81	53.8	2.31	1.88	106.7	19	21	61	33		
6.86	22.5	88.14	1.95	Silty Sand to Sandy Silt	SM/ML	medium dense	120	3.0	33	1.233	1.233	2.01	0.66	0.80	83.8	2.17	1.60	133.9	28	27	70	36		
7.01	23.0	121.05	1.83	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	40	1.263	1.263	1.95	0.64	0.80	102.2	2.10	1.46	140.9	38	30	78	36		
7.16	23.5	116.63	2.48	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	40	1.293	1.293	2.52	0.67	0.85	85.6	2.18	1.65	152.6	35	33	78	37		
7.32	24.0	127.02	2.32	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	42	1.323	1.323	2.32	0.66	0.86	103.7	2.15	1.56	161.6	37	32	78	38		
7.47	24.5	128.88	2.53	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	43	1.353	1.337	2.52	0.66	0.86	105.2	2.17	1.61	169.0	37	34	78	38		
7.62	25.0	40.83	4.74	Silty Clay to Clay	CL	hard	120	1.5	27	1.383	1.351	4.92	0.84	0.82	31.4	2.75			27				2.32	8.8
7.77	25.5	16.82	2.27	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	8	1.413	1.366	2.45	0.86	0.80	14.3	2.82			8				1.03	3.6
7.92	26.0	27.19	3.42	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	14	1.443	1.383	3.61	0.85	0.80	20.5	2.80			14				1.52	5.8
8.08	26.5	50.41	3.61	Clayey Silt to Silty Clay	ML/CL	hard	120	2.0	25	1.473	1.395	3.03	0.80	0.80	39.2	2.62			25				2.88	10.6
8.23	27.0	27.07	3.81	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	14	1.503	1.409	3.71	0.86	0.76	20.0	2.81			14				1.51	5.4
8.38	27.5	17.09	2.78	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	9	1.533	1.423	3.08	0.89	0.77	12.4	2.93			9				0.92	3.3
8.53	28.0	20.33	2.88	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	10	1.563	1.438	2.78	0.87	0.77	14.8	2.84			10				1.12	3.9
8.69	28.5	23.38	2.77	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	12	1.593	1.452	2.87	0.86	0.76	16.8	2.81			12				1.29	4.5
8.84	29.0	22.12	2.74	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	11	1.623	1.467	2.86	0.87	0.76	15.6	2.83			11				1.21	4.2
8.99	29.5	17.43	2.07	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	9	1.653	1.481	2.29	0.87	0.75	12.3	2.86			9				0.94	3.2
9.14	30.0	23.65	3.63	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	12	1.683	1.495	3.87	0.89	0.74	16.4	2.89			12				1.30	4.4
9.30	30.5	44.04	4.35	Silty Clay to Clay	CL	hard	120	1.5	29	1.713	1.510	4.62	0.83	0.74	31.0	2.73			29				2.50	8.4
9.45	31.0	80.09	3.12	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	35	1.743	1.524	3.18	0.73	0.77	63.6	2.40	2.30	146.5	29	29	58	36		
9.60	31.5	155.65	3.04	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	52	1.773	1.538	3.07	0.67	0.76	114.5	2.22	1.71	195.2	42	39	82	39		
9.75	32.0	216.59	2.21	Silty Sand to Sandy Silt	SM/ML	very dense	120	3.0	72	1.803	1.553	2.23	0.61	0.79	161.6	2.01	1.32	212.9	53	43	97	42		
9.91	32.5	171.68	2.53	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	57	1.833	1.567	2.55	0.65	0.70	128.0	2.13	1.51	193.7	46	38	86	40		
10.06	33.0	69.35	4.58	Clayey Silt to Silty Clay	ML/CL	hard	120	2.0	35	1.863	1.582	4.69	0.79	0.73	47.7	2.61			35				3.96	12.8
10.21	33.5	33.78	3.98	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	17	1.893	1.596	4.21	0.88	0.70	22.5	2.81			17				1.86	6.0
10.36	34.0	16.28	3.39	Silty Clay to Clay	CL	stiff	120	1.5	11	1.923	1.611	3.64	0.93	0.68	10.4	3.05			11				0.86	2.7
10.52	34.5	14.05	2.53	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	7	1.953	1.625	2.71	0.93	0.67	8.8	3.01			7				0.73	2.2
10.67	35.0	21.42	3.21	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	11	1.983	1.639	3.54	0.89	0.69	13.7	2.93			11				1.16	3.8
10.82	35.5	73.40	2.49	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	29	2.013	1.654	2.56	0.73	0.72	49.3	2.41	2.36	116.2	23	23	47	34		
10.97	36.0	211.14	0.51	Sand	SP	dense	120	5.0	42	2.043	1.668	0.51	0.50	0.80	158.9	1.57	1.00	158.9	33	32	86	37		
11.13	36.5	201.16	0.65	Sand	SP	dense	120	5.0	41	2.073	1.683	0.66	0.51	0.78	151.0	1.69	1.01	152.9	31	31	84	38		
11.28	37.0	172.58	0.53	Sand	SP	medium dense	120	5.0	35	2.103	1.697	0.53	0.51	0.78	128.3	1.69	1.01	129.5	25	26	67	35		
11.43	37.5	71.74	1.95	Silty Sand to Sandy Silt	SM/ML	medium dense	120	3.0	24	2.133	1.711	2.01	0.72	0.71	48.1	2.35	2.12	101.7	19	20	46	35		
11.58	38.0	19.67	1.71	Sandy Silt to Clayey Silt	ML	very stiff	120	2.5	8	2.163	1.726	1.92	0.86	0.69	12.2	2.82			8				1.06	3.0
11.73	38.5	21.54	1.62	Sandy Silt to Clayey Silt	ML	very stiff	120	2.5	9	2.193	1.740	1.81	0.85	0.66	13.3	2.77			9				1.16	3.3
11.88	39.0	21.17	2.80	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	11	2.223	1.755	3.01	0.89	0.64	12.8	2.91			11				1.14	3.2
12.04	39.5	50.84	3.03	Sandy Silt to Clayey Silt	ML	hard	120	2.5	20	2.253	1.769	3.17	0.80	0.66	31.9	2.81			20				2.89	8.2
12.19	40.0	31.12	3.31	Clayey Silt to Silty Clay	ML/CL	very stiff	120	2.0	16	2.283	1.783	3.50	0.86	0.64	18.8	2.82			16				1.73	4.9
12.34	40.5	122.64	2.10	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	41	2.313	1.798	2.22	0.67	0.70	81.1	2.21	1.69	137.5	30	27	88	38		
12.50	41.0	288.68	1.50	Sand to Silty Sand	SP/SM	very dense	120	4.0	72	2.343	1.812	1.54	0.56	0.74	202.7	1.83	1.13	227.7	54	46	100	41		
12.65	41.5	282.57	1.73	Sand to Silty Sand	SP/SM	very dense	120	4.0	71	2.373	1.827	1.74	0.57	0.73	195.4	1.88	1.17	228.3	52	46	100	41		
12.80	42.0	330.67	1.86	Sand to Silty Sand	SP/SM	very dense	120	4.0	83	2.403	1.841	1.87	0.57	0.73	228.2	1.86	1.15	263.4	61	53	100	43		
12.95	42.5	288.88	1.51	Sand to Silty Sand	SP/SM	very dense	120	4.0	72	2.433	1.856	1.52	0.56	0.73	199.8	1.83	1.13	224.8	53	45	100	41		
13.11	43.0	107.98	2.78	Silty Sand to Sandy Silt	SM/ML	medium dense	120	3.0	36	2.463	1.870	2.85	0.71	0.67	68.0	2.34	2.08	142.2	26	28	61	35		
13.26	43.5	137.60	1.75	Sand to Silty Sand	SP/SM	medium dense	120	4.0	34	2.493	1.884	1.78	0.64	0.69	89.6	2.11	1.48	132.6	26	27	72	35		
13.41	44.0	186.89	2.74	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	63	2.523	1.899	2.78	0.66	0.68	121.4	2.17	1.59	192.6	48	39	85	40		
13.56	44.5	295.13	1.94	Sand to Silty Sand	SP/SM	very dense	120	4.0	74	2.563	1.913	1.95	0.59	0.71	197.4	1.91	1.20	237.5	63	47	100	41		

Earth Systems
Southern California

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella, 1989)

Project: Commercial Organics Processing Facility | **Project No.** VT-24872-02 | **Date:** 01/30/17

CPT SOUNDING: CPT-3 | Plot: 3 | Density: 1 SPT N | Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Est. GWT (feet): 24.0 | Dr correlation: 0 Baldi | Qc/N: 1 Robertson | Phi Correlation: 1 SPT N

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	2.5 Ic	Kc	Clean Sand Qc1n	$N_{1(60)}$	Clean Sand $N_{1(60)cs}$	Rel. Dens Dr (%)	Phi (deg.)	Nk: 17 Su (tsf)	OCR
13.72	45.0	132.14	2.60	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	44	2.583	1.927	2.55	0.69	0.60	82.8	2.25	1.78	148.5	32	38	60	38		
13.87	45.5	107.22	2.36	Silty Sand to Sandy Silt	SM/ML	medium dense	120	3.0	36	2.613	1.942	2.41	0.70	0.65	68.2	2.30	1.88	128.8	28	28	60	35		
14.02	46.0	91.72	2.86	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	37	2.643	1.958	2.78	0.73	0.84	55.4	2.43	2.30	127.2	25	25	52	35		
14.17	46.5	58.83	4.11	Clayey Silt to Silty Clay	ML/CL	hard	120	2.0	29	2.673	1.971	4.30	0.82	0.60	33.5	2.69			29				3.35	8.6
14.33	47.0	102.15	2.65	Silty Sand to Sandy Silt	SM/ML	medium dense	120	3.0	34	2.703	1.985	2.80	0.71	0.84	61.6	2.34	2.10	129.4	24	26	57	34		
14.48	47.5	64.80	3.85	Clayey Silt to Silty Clay	ML/CL	hard	120	2.0	32	2.733	1.998	3.81	0.80	0.60	36.7	2.62			32				3.66	8.3
14.63	48.0	149.07	1.24	Sand to Silty Sand	SP/SM	medium dense	120	4.0	37	2.763	2.014	1.27	0.61	0.66	95.2	1.99	1.29	122.8	26	25	75	35		
14.78	48.5	80.60	3.01	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	32	2.793	2.028	3.11	0.76	0.81	46.5	2.49	2.70	125.6	23	25	49	34		
14.94	49.0	60.86	4.30	Clayey Silt to Silty Clay	ML/CL	hard	120	2.0	30	2.823	2.043	4.51	0.82	0.56	33.4	2.70			30				3.45	8.5
16.09	49.5	161.69	2.07	Silty Sand to Sandy Silt	SM/ML	dense	120	3.0	54	2.853	2.057	3.02	0.68	0.63	99.0	2.29	1.82	178.1	36	35	78	36		

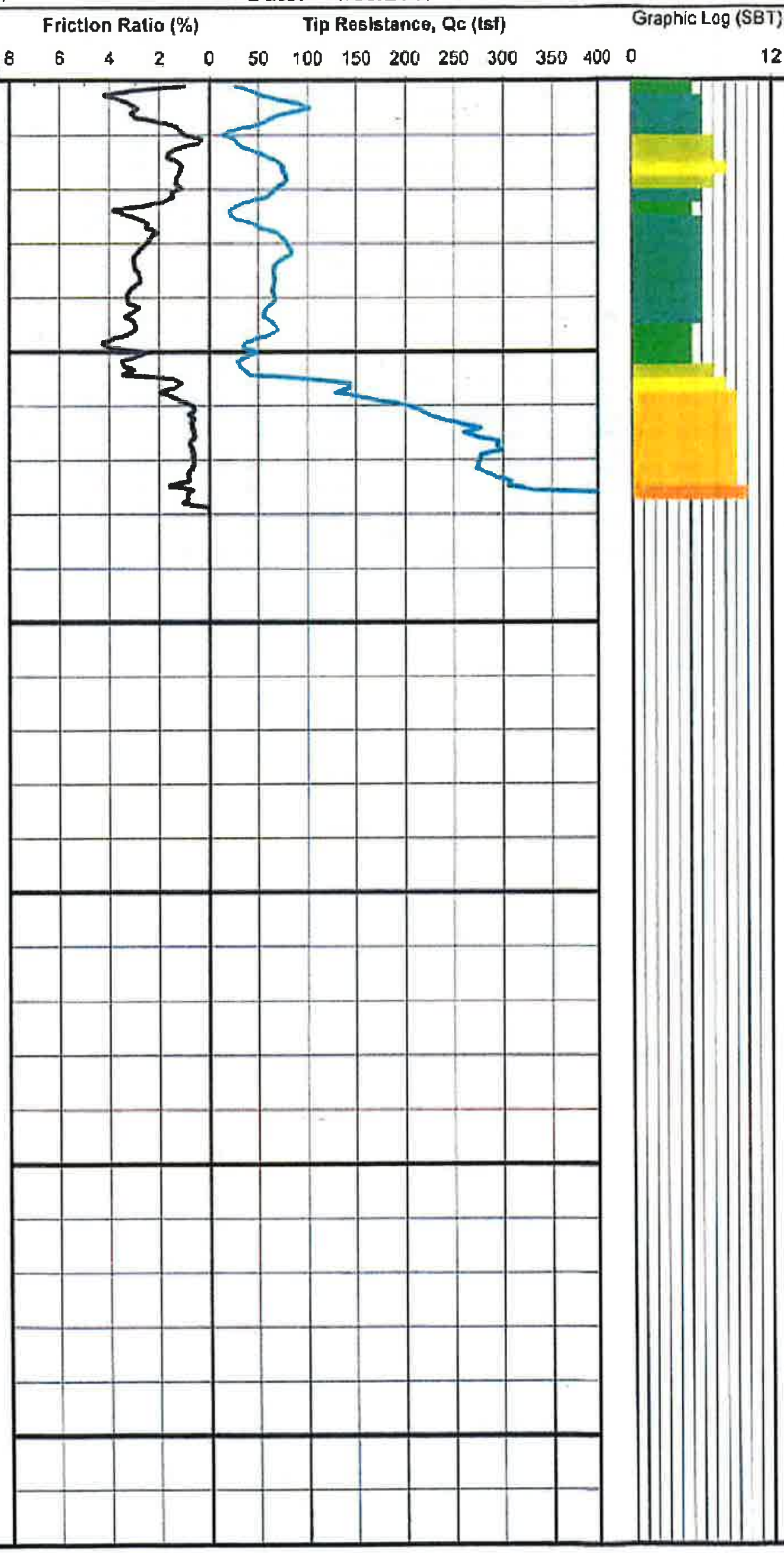
Earth Systems
Southern California

CPT No: CPT-4

Project Name: Commercial Organics Processing Facility
Project No.: VT-24872-02
Location: See Site Exploration Plan

CPT Vendor: Middle Earth
Truck Mounted Electric
Cone with 23-ton reaction
Date: 1/30/2017

DEPTH (FEET)	Interpreted Soil Stratigraphy Robertson & Campanella ('89)	Density/Consistency
	Sandy Silt to Clayey Silt	dense
	Silty Sand to Sandy Silt	medium dense
	Silty Sand to Sandy Silt	medium dense
	Silty Sand to Sandy Silt	dense
5	Sandy Silt to Clayey Silt	medium dense
	Sandy Silt to Clayey Silt	dense
	Sandy Silt to Clayey Silt	dense
	Sandy Silt to Clayey Silt	dense
	Sandy Silt to Clayey Silt	dense
10	Clayey Silt to Silty Clay	dense
	Sandy Silt to Clayey Silt	dense
	Sand to Silty Sand	very dense
	Sand	very dense
	Gravelly Sand to Sand	very dense
15	Sand	very dense
20		
25		
30		
35		
40		
45		
50		



End of Sounding @ 16.1 feet

Earth Systems
Southern California

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella, 1989)

Project: Commercial Organics Processing Facility Project No: VT-24872-02 Date: 01/30/17

CPT SOUNDING: CPT-4 Plot 4 Density: 1 SPT N Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Est. GWT (feet): 24.0 Dr correlation: 0 Baldi Cc/N: 1 Robertson Phi Correlation: 1 SPT N

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	Ic (2.6)	Kc	Clean Sand Qc1n	N1(60)	Clean Sand N1(60)	Rel. Dens. Dr (%)	Phi (deg.)	Su (tsf) (Nk: 17)	OCR
0.15	0.5	53.97	3.67	Clayey Silt to Silty Clay	ML/CL	dense	110	2.0	27	0.014	0.014	3.67	0.71	1.70	85.7	2.36	2.13	184.4	48	37	71	40		
0.30	1.0	89.87	3.09	Sandy Silt to Clayey Silt	ML	very dense	110	2.5	36	0.041	0.041	3.08	0.65	1.70	144.4	2.15	1.56	225.3	61	45	92	43		
0.46	1.5	54.70	2.17	Sandy Silt to Clayey Silt	ML	dense	110	2.5	23	0.069	0.069	2.17	0.66	1.70	87.9	2.10	1.62	142.2	37	28	71	38		
0.61	2.0	19.93	0.84	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	8	0.096	0.096	0.85	0.69	1.70	32.0	2.27	1.87	59.9	14	12	30	31		
0.76	2.5	37.10	1.10	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	12	0.124	0.124	1.11	0.64	1.70	56.7	2.11	1.46	88.4	21	18	55	34		
0.91	3.0	67.20	1.37	Silty Sand to Sandy Silt	SM/ML	dense	110	3.0	22	0.151	0.151	1.37	0.60	1.70	108.1	1.96	1.27	137.2	30	27	60	36		
1.07	3.5	75.65	1.24	Sand to Silty Sand	SP/SM	dense	100	4.0	19	0.178	0.178	1.24	0.58	1.70	121.0	1.91	1.20	146.0	32	29	65	37		
1.22	4.0	67.98	1.34	Silty Sand to Sandy Silt	SM/ML	dense	110	3.0	23	0.204	0.204	1.34	0.60	1.70	109.2	1.97	1.26	137.5	30	27	60	38		
1.37	4.5	41.66	1.98	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	17	0.231	0.231	1.97	0.66	1.70	67.3	2.23	1.75	117.9	26	24	60	36		
1.52	5.0	22.19	3.37	Clayey Silt to Silty Clay	ML/CL	medium dense	110	2.0	11	0.259	0.259	3.41	0.79	1.70	35.7	2.00	3.31	118.1	18	24	34	33		
1.68	5.5	58.97	2.38	Sandy Silt to Clayey Silt	ML	dense	110	2.5	24	0.286	0.286	2.30	0.66	1.70	94.7	2.19	1.64	155.1	40	31	75	38		
1.83	6.0	79.51	2.65	Sandy Silt to Clayey Silt	ML	very dense	110	2.5	32	0.314	0.314	2.66	0.65	1.70	127.8	2.14	1.52	194.6	54	39	87	41		
1.98	6.5	74.09	3.03	Sandy Silt to Clayey Silt	ML	very dense	110	2.5	30	0.341	0.341	3.04	0.67	1.70	119.0	2.20	1.67	198.7	50	40	84	41		
2.13	7.0	65.04	2.90	Sandy Silt to Clayey Silt	ML	dense	110	2.5	26	0.369	0.369	2.91	0.65	1.70	104.5	2.22	1.72	180.3	43	36	79	39		
2.29	7.5	64.71	3.00	Sandy Silt to Clayey Silt	ML	dense	110	2.5	26	0.396	0.396	3.02	0.68	1.70	104.0	2.24	1.70	183.0	41	37	78	39		
2.44	8.0	64.97	3.28	Sandy Silt to Clayey Silt	ML	dense	110	2.5	26	0.424	0.424	3.30	0.69	1.70	104.4	2.26	1.84	192.1	40	38	79	39		
2.59	8.5	55.09	3.10	Sandy Silt to Clayey Silt	ML	dense	110	2.5	22	0.451	0.451	3.13	0.70	1.70	89.0	2.29	1.91	172.1	33	34	72	37		
2.74	9.0	66.04	3.01	Sandy Silt to Clayey Silt	ML	dense	110	2.5	26	0.479	0.479	3.03	0.68	1.70	106.1	2.23	1.75	185.0	38	37	79	38		
2.90	9.5	47.72	3.83	Clayey Silt to Silty Clay	ML/CL	dense	110	2.0	24	0.506	0.506	3.87	0.73	1.70	76.7	2.40	2.33	178.6	34	35	69	37		
3.05	10.0	40.00	3.17	Clayey Silt to Silty Clay	ML/CL	medium dense	110	2.0	20	0.534	0.534	3.21	0.73	1.65	62.3	2.41	2.34	145.6	27	29	57	36		
3.20	10.5	31.51	3.32	Clayey Silt to Silty Clay	ML/CL	medium dense	110	2.0	16	0.561	0.561	3.36	0.76	1.62	48.2	2.50	2.77	133.7	21	27	47	34		
3.35	11.0	94.74	2.02	Silty Sand to Sandy Silt	SM/ML	dense	110	3.0	32	0.589	0.589	2.03	0.62	1.44	129.0	2.05	1.36	175.9	41	35	87	39		
3.51	11.5	141.57	1.62	Sand to Silty Sand	SP/SM	dense	100	4.0	35	0.615	0.615	1.62	0.57	1.36	182.4	1.67	1.16	212.4	45	42	100	40		
3.66	12.0	198.35	0.81	Sand	SP	dense	100	5.0	40	0.640	0.640	0.82	0.50	1.29	241.0	1.57	1.00	241.0	50	48	100	40		
3.81	12.5	238.33	0.73	Sand	SP	very dense	100	5.0	48	0.665	0.665	0.73	0.50	1.26	264.1	1.48	1.00	264.1	59	57	100	42		
3.96	13.0	260.86	0.63	Sand	SP	very dense	100	5.0	54	0.690	0.690	0.63	0.50	1.24	316.8	1.41	1.00	316.9	65	63	100	43		
4.11	13.5	266.66	0.73	Sand	SP	very dense	100	5.0	59	0.715	0.715	0.73	0.50	1.22	339.9	1.43	1.00	339.8	70	68	100	44		
4.27	14.0	276.69	0.63	Sand	SP	very dense	100	5.0	55	0.740	0.740	0.63	0.50	1.20	311.6	1.41	1.00	311.6	64	62	100	43		
4.42	14.5	282.23	0.78	Sand	SP	very dense	100	5.0	56	0.765	0.765	0.78	0.50	1.18	313.7	1.48	1.00	313.7	65	63	100	43		
4.57	15.0	314.64	1.03	Sand	SP	very dense	100	5.0	63	0.790	0.790	1.03	0.50	1.16	344.4	1.55	1.00	344.4	71	69	100	44		
4.72	15.5	462.25	0.91	Gravelly Sand to Sand	SW	very dense	110	6.0	77	0.616	0.616	0.91	0.50	1.14	497.4	1.41	1.00	497.4	85	99	100	46		

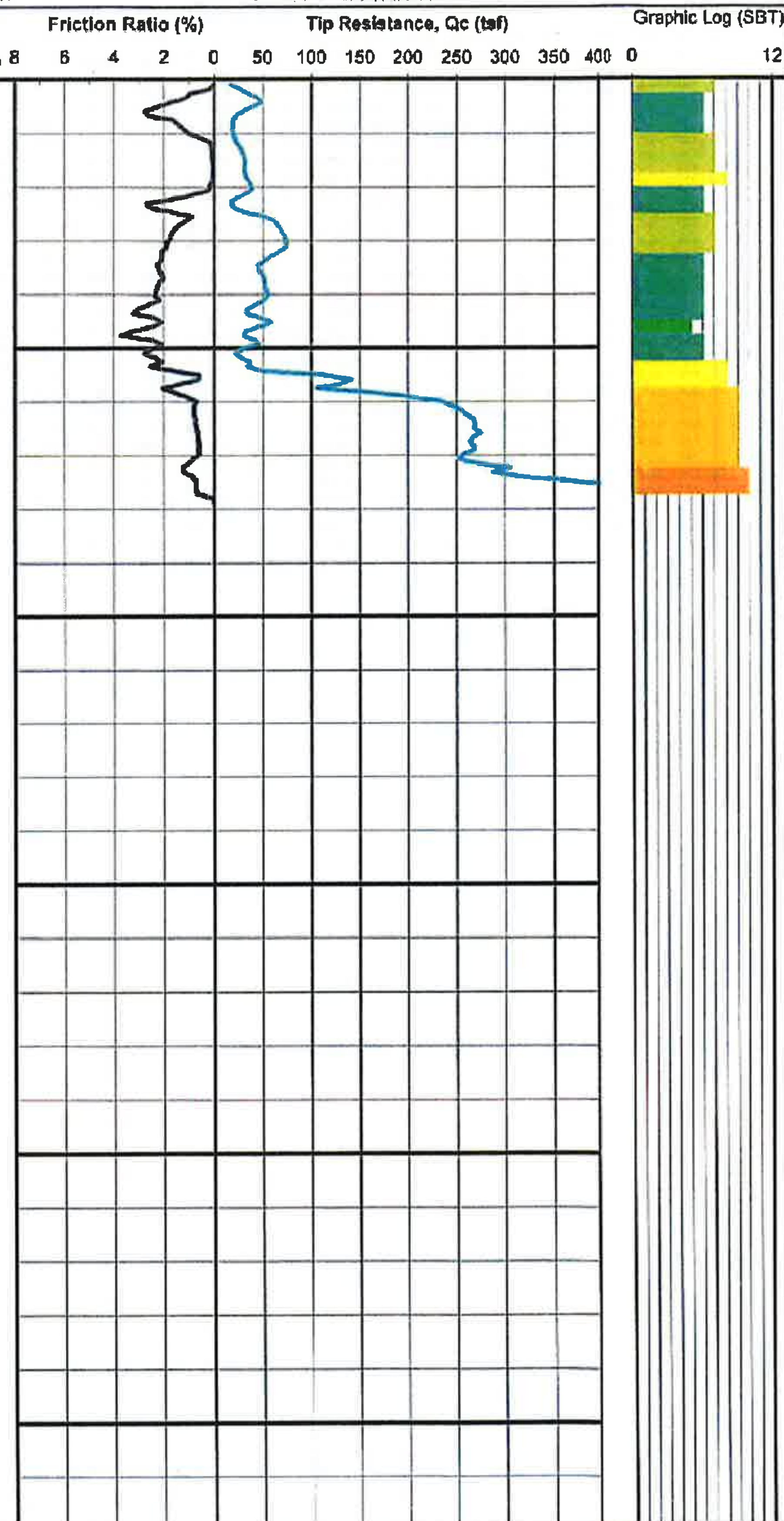
Earth Systems
Southern California

CPT No: CPT-4A
Project Name: Commercial Organics Processing Facility
Project No.: VT-24872-02
Location: See Site Exploration Plan

CPT Vendor: Middle Earth
Truck Mounted Electric
Cone with 23-ton reaction
Date: 1/30/2017

DEPTH (FEET)

Interpreted Soil Stratigraphy Robertson & Campanella ('89)	Density/Consistency
Silty Sand to Sandy Silt	medium dense
Sandy Silt to Clayey Silt	medium dense
Silty Sand to Sandy Silt	medium dense
Sand to Silty Sand	medium dense
Sandy Silt to Clayey Silt	medium dense
Silty Sand to Sandy Silt	dense
Sandy Silt to Clayey Silt	dense
Sandy Silt to Clayey Silt	dense
Sandy Silt to Clayey Silt	medium dense
Sandy Silt to Clayey Silt	medium dense
Silty Sand to Sandy Silt	medium dense
Sand	dense
Sand	very dense
Sand	very dense
Sand	very dense



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End of Sounding @ 15.9 feet

Earth Systems
Southern California

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella, 1989)

Project: Commercial Organics Processing Facility — Project No: VT-24872-02 — Date: 01/30/17

CPT SOUNDING: CPT-4A — Plot: 5 — Density: 1 — SPT N

Est. GWT (feet): 24.0 — Dr correlation: 0 — Baldi — Qc/N: 1 — Robertson

Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest — Phi Correlation: 1 — SPT-N

Nk: 17 — Ic: 2.6

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	Ic	Kc	Clean Sand Qc1n	N1(60)	Clean Sand N1(60)	Rel. Dens. Dr (%)	Phi (deg.)	Su (tsf)	OCR
0.15	0.5	34.59	0.77	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	12	0.014	0.014	0.71	0.62	1.70	55.6	2.05	1.37	76.1	20	15	52	33		
0.30	1.0	38.74	2.33	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	15	0.041	0.041	2.30	0.76	1.70	61.3	2.30	1.98	122.2	26	24	57	35		
0.46	1.5	20.41	1.62	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	8	0.069	0.069	1.62	0.75	1.70	32.8	2.47	2.80	99.4	14	17	31	31		
0.61	2.0	18.03	0.95	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	8	0.098	0.098	0.66	0.70	1.70	33.6	2.32	2.02	61.8	15	12	25	31		
0.76	2.5	24.92	0.12	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	8	0.124	0.124	0.12	0.59	1.70	42.0	1.60	1.00	40.0	14	8	39	31		
0.91	3.0	30.58	0.06	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	10	0.151	0.151	0.06	0.54	1.70	49.1	1.70	1.00	49.1	17	10	47	32		
1.07	3.5	31.24	0.05	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	10	0.179	0.179	0.06	0.54	1.70	53.2	1.77	1.00	50.2	18	10	48	33		
1.22	4.0	37.13	0.14	Sand to Silty Sand	SP/SM	medium dense	100	4.0	9	0.205	0.205	0.16	0.53	1.70	59.7	1.74	1.00	59.7	18	12	55	32		
1.37	4.5	22.34	1.70	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	9	0.231	0.231	1.78	0.73	1.70	35.8	2.41	2.37	85.1	15	17	34	32		
1.52	5.0	33.48	1.70	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	13	0.260	0.260	1.72	0.59	1.70	53.8	2.27	1.85	99.4	23	20	51	34		
1.68	5.5	65.48	1.43	Silty Sand to Sandy Silt	SM/ML	dense	110	3.0	22	0.286	0.286	1.48	0.81	1.70	105.8	2.00	1.33	139.3	36	28	66	38		
1.83	6.0	73.62	1.67	Silty Sand to Sandy Silt	SM/ML	dense	110	3.0	25	0.314	0.314	1.88	0.92	1.70	118.1	2.05	1.37	161.3	42	32	84	39		
1.98	6.5	59.78	2.11	Silty Sand to Sandy Silt	SM/ML	dense	110	3.0	20	0.341	0.341	2.12	0.95	1.70	84.4	2.15	1.56	146.8	32	29	74	37		
2.13	7.0	46.35	2.21	Sandy Silt to Clayey Silt	ML	dense	110	2.5	19	0.369	0.369	2.22	0.88	1.70	74.5	2.24	1.77	131.5	31	26	65	36		
2.29	7.5	51.66	2.18	Sandy Silt to Clayey Silt	ML	dense	110	2.5	21	0.396	0.396	2.15	0.87	1.70	83.0	2.20	1.67	138.5	32	28	69	37		
2.44	8.0	52.72	2.32	Sandy Silt to Clayey Silt	ML	dense	110	2.5	21	0.424	0.424	2.33	0.87	1.70	84.7	2.21	1.70	144.1	32	29	70	37		
2.59	8.5	36.80	2.00	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	15	0.451	0.451	3.03	0.73	1.70	59.1	2.40	2.33	137.7	22	26	55	34		
2.74	9.0	50.53	2.34	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	20	0.479	0.479	2.37	0.80	1.70	81.2	2.23	1.75	141.7	26	28	60	36		
2.90	9.5	34.35	3.17	Clayey Silt to Silty Clay	ML/CL	medium dense	110	2.0	17	0.506	0.506	3.22	0.74	1.70	55.2	2.44	2.50	138.3	24	28	52	34		
3.05	10.0	32.37	2.45	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	13	0.534	0.534	2.49	0.73	1.65	50.4	2.40	2.30	115.9	18	23	40	33		
3.20	10.5	32.64	2.34	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	13	0.561	0.561	2.39	0.73	1.59	48.9	2.39	2.28	111.4	17	22	47	32		
3.35	11.0	100.66	0.96	Sand to Silty Sand	SP/SM	dense	100	4.0	25	0.588	0.588	0.99	0.56	1.38	131.7	1.81	1.11	146.3	32	29	88	37		
3.51	11.5	132.56	1.06	Sand to Silty Sand	SP/SM	dense	100	4.0	33	0.613	0.613	1.07	0.56	1.37	171.9	1.90	1.19	204.0	42	41	90	39		
3.66	12.0	220.06	0.86	Sand	SP	very dense	100	5.0	48	0.638	0.638	0.88	0.50	1.29	277.7	1.55	1.00	277.7	57	50	100	42		
3.81	12.5	260.16	0.78	Sand	SP	very dense	100	5.0	52	0.663	0.663	0.78	0.50	1.26	310.7	1.48	1.00	310.7	64	62	100	43		
3.96	13.0	260.62	0.71	Sand	SP	very dense	100	5.0	54	0.688	0.688	0.72	0.50	1.24	318.1	1.45	1.00	318.1	65	63	100	43		
4.11	13.5	284.06	0.82	Sand	SP	very dense	100	5.0	53	0.713	0.713	0.82	0.50	1.22	305.2	1.41	1.00	305.2	63	61	100	43		
4.27	14.0	250.32	0.70	Sand	SP	very dense	100	5.0	52	0.738	0.738	0.70	0.50	1.20	292.4	1.46	1.00	292.4	60	58	100	42		
4.42	14.5	268.92	1.16	Sand	SP	very dense	100	5.0	57	0.763	0.763	1.17	0.50	1.18	319.5	1.61	1.00	319.5	66	64	100	43		
4.57	15.0	302.53	0.77	Gravelly Sand to Sand	SW	very dense	110	6.0	60	0.789	0.789	0.78	0.50	1.16	356.0	1.41	1.00	356.0	69	70	100	44		
4.72	15.5	502.15	0.46	Gravelly Sand to Sand	SW	very dense	110	6.0	84	0.816	0.816	0.46	0.50	1.14	540.4	1.15	1.00	540.4	93	108	100	47		

Earth Systems
Southern California

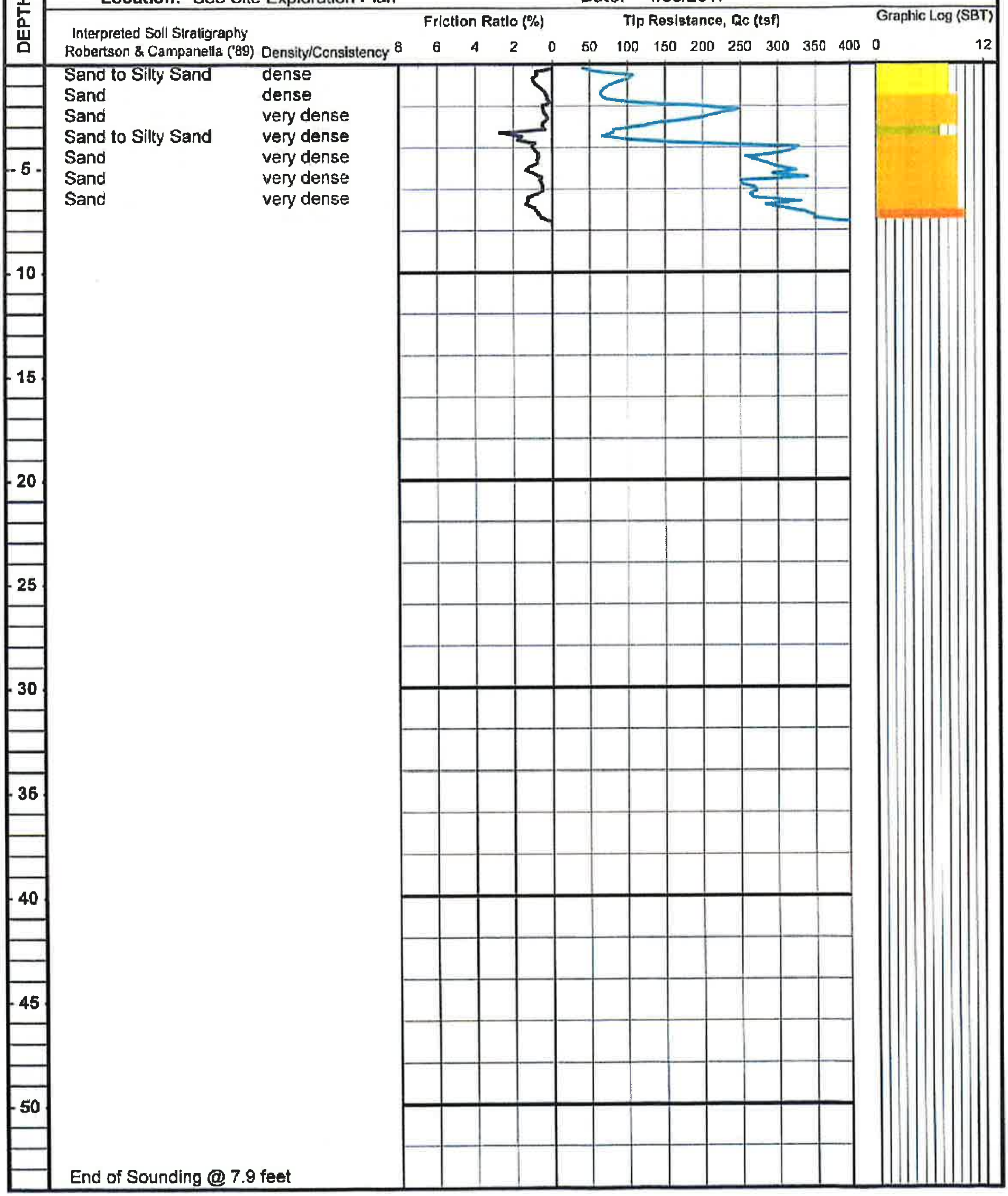
CPT No: CPT-5 | **CPT Vendor:** Middle Earth

Project Name: Commercial Organics Processing Facility | Truck Mounted Electric

Project No.: VT-24872-02 | Cone with 23-ton reaction

Location: See Site Exploration Plan | **Date:** 1/30/2017

Interpreted Soil Stratigraphy Robertson & Campanella ('89)	Density/Consistency
Sand to Silty Sand	dense
Sand	dense
Sand	very dense
Sand to Silty Sand	very dense
Sand	very dense
Sand	very dense
Sand	very dense



End of Sounding @ 7.9 feet

Earth Systems Southern California

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella, 1989)

Project: Commercial Organics Processing Facility — Project No: VT-24072-02 — Date: 01/30/17

CPT SOUNDING: CPT-5 — Plot: 6 — Density: 1 SPT N — Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

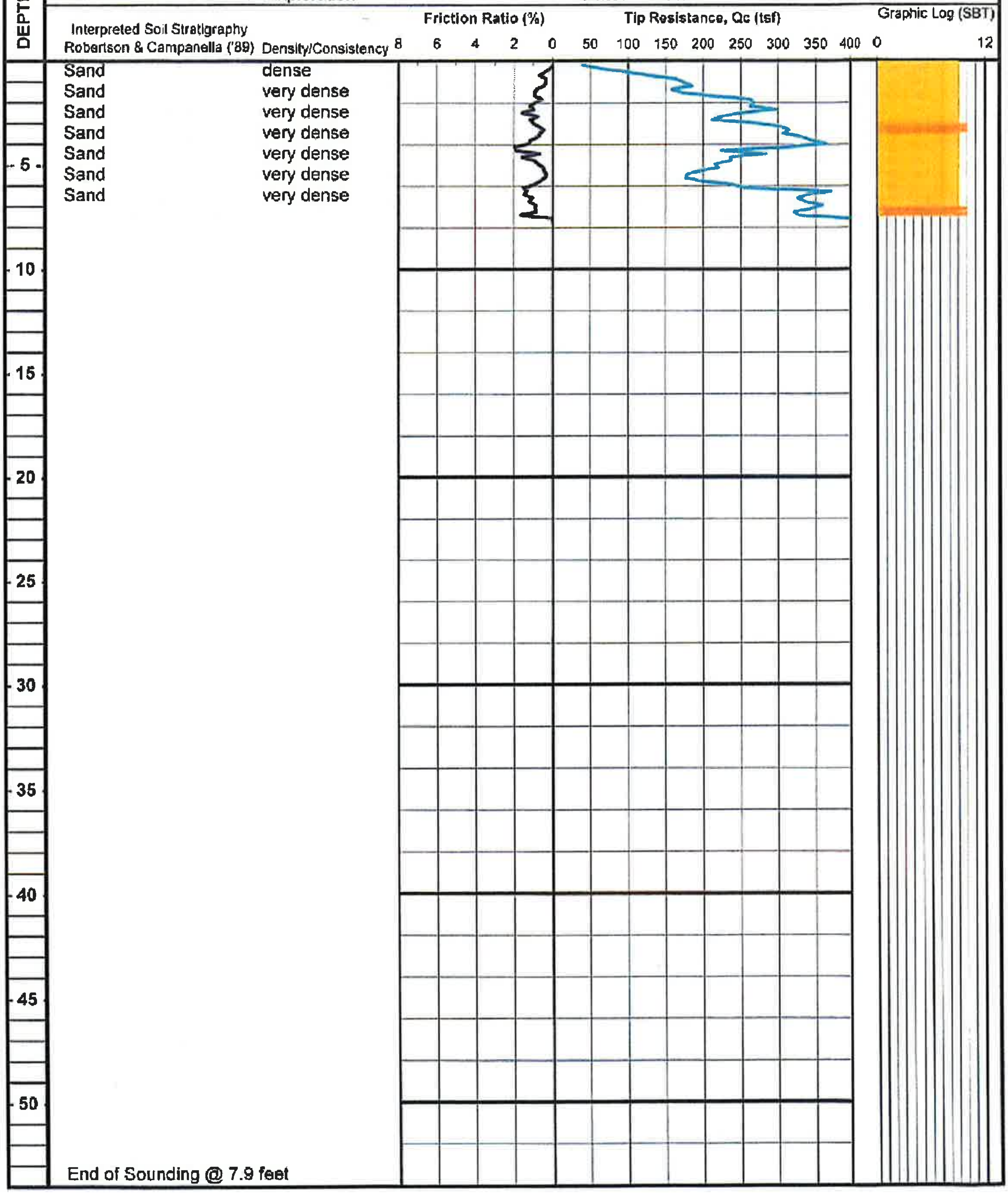
Est. GWT (feet): 24.0 — Dr correlation: 0 Baldi — Qc/N: 1 Robertson — Phi Correlation: 4 SPT N — Nk: 17

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	Ic	Kc	Clean Sand Qc1n	N1(60)	Clean Sand N1(60)	Rel. Dens. Dr (%)	Phi (deg.)	Su (tsf)	OCR
0.15	0.5	83.12	0.84	Sand to Silty Sand	SP/SM	dense	100	4.0	22	0.013	0.013	0.84	0.54	1.70	141.8	1.78	1.09	154.5	37	31	81	38		
0.30	1.0	76.48	0.83	Sand to Silty Sand	SP/SM	dense	100	4.0	17	0.038	0.038	0.82	0.54	1.70	122.8	1.79	1.10	134.9	33	27	85	37		
0.40	1.5	65.73	0.35	Sand to Silty Sand	SP/SM	medium dense	100	4.0	18	0.063	0.063	0.35	0.60	1.70	105.9	1.83	1.00	105.6	28	21	79	38		
0.61	2.0	181.21	0.38	Sand	SP	very dense	100	5.0	35	0.088	0.088	0.38	0.50	1.70	301.2	1.30	1.00	291.2	62	58	100	43		
0.76	2.5	204.73	0.36	Sand	SP	very dense	100	5.0	41	0.113	0.113	0.36	0.53	1.70	328.0	1.23	1.00	328.0	70	68	100	44		
0.91	3.0	111.65	0.49	Sand	SP	dense	100	5.0	22	0.138	0.138	0.48	0.55	1.70	178.4	1.52	1.00	176.4	38	30	100	38		
1.07	3.5	84.60	2.08	Silty Sand to Sandy Silt	SM/ML	dense	110	3.0	25	0.164	0.164	2.08	0.62	1.70	136.4	2.04	1.36	184.4	46	37	93	40		
1.22	4.0	270.43	0.80	Sand	SP	very dense	100	5.0	56	0.190	0.190	0.09	0.50	1.70	440.0	1.47	1.00	440.0	95	80	100	47		
1.37	4.5	275.81	0.70	Sand	SP	very dense	100	5.0	55	0.215	0.215	0.78	0.50	1.70	443.3	1.39	1.00	443.3	94	88	100	47		
1.52	5.0	303.78	1.14	Sand	SP	very dense	100	5.0	61	0.240	0.240	1.15	0.50	1.70	488.1	1.50	1.00	488.1	103	88	100	48		
1.68	5.5	283.51	0.71	Sand	SP	very dense	100	5.0	57	0.265	0.265	0.71	0.50	1.70	455.5	1.34	1.00	455.5	98	91	100	47		
1.83	6.0	267.28	0.84	Sand	SP	very dense	100	5.0	53	0.290	0.290	0.84	0.50	1.70	428.5	1.33	1.00	428.5	91	88	100	47		
1.98	6.5	293.70	1.34	Sand	SP	very dense	100	5.0	59	0.315	0.315	1.34	0.60	1.70	471.0	1.57	1.00	471.9	100	94	100	47		
2.13	7.0	330.61	0.84	Sand	SP	very dense	100	5.0	65	0.340	0.340	0.84	0.50	1.70	531.4	1.37	1.00	531.1	112	106	100	49		
2.29	7.5	453.00	0.20	Gravelly Sand to Sand	SW	very dense	110	6.0	75	0.365	0.365	0.20	0.50	1.70	727.7	0.80	1.00	727.7	125	140	100	49		

Earth Systems
Southern California

CPT No: CPT-5A **CPT Vendor:** **Middle Earth**
Project Name: Commercial Organics Processing Facility — Truck Mounted Electric
Project No.: VT-24872-02 — Cone with 23-ton reaction
Location: See Site Exploration Plan **Date:** 1/30/2017

Interpreted Soil Stratigraphy Robertson & Campanella ('89)	Density/Consistency
Sand	dense
Sand	very dense
Sand	very dense
Sand	very dense
Sand	very dense
Sand	very dense
Sand	very dense



End of Sounding @ 7.9 feet

Earth Systems
Southern California

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella, 1989)

Project: Commercial Organics Processing Facility — Project No: VT-24672-02 — Date: 01/30/17

CPT SOUNDING: CPT-5A — Plot 7 — Density: 1 SPT N — Dr correlation: 0 Baldi — QcN: 1 Robertson

Est. GWT (feet): 24.0

Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Phi Correlation: 4 SPT N — Nk: 17

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	2.3 Ic	Kc	Clean Sand Qc1n	$N_{1(60)}$	Clean Sand $N_{1(60)cs}$	Rel. Dens. Dr (%)	Phi (deg.)	Su (tsf)	OCR
0.15	0.5	97.81	0.42	Sand	SP	dense	100	5.0	20	0.013	0.013	0.42	0.50	1.70	157.2	1.53	1.00	157.2	32	31	86	37		
0.30	1.0	173.38	0.38	Sand	SP	very dense	100	5.0	35	0.038	0.038	0.38	0.50	1.70	278.6	1.31	1.00	278.6	50	56	100	42		
0.46	1.5	179.19	0.90	Sand	SP	very dense	100	5.0	36	0.063	0.063	0.90	0.50	1.70	287.8	1.56	1.00	287.8	61	58	100	43		
0.61	2.0	263.25	0.80	Sand	SP	very dense	100	5.0	53	0.088	0.088	0.80	0.50	1.70	423.0	1.44	1.00	423.0	80	85	100	45		
0.76	2.5	257.38	1.11	Sand	SP	very dense	100	5.0	51	0.113	0.113	1.11	0.50	1.70	413.5	1.63	1.00	413.5	88	83	100	45		
0.91	3.0	261.13	0.98	Sand	SP	very dense	100	5.0	52	0.139	0.139	0.98	0.50	1.70	419.6	1.47	1.00	419.6	80	84	100	45		
1.07	3.5	317.07	0.84	Gravelly Sand to Sand	SW	very dense	110	6.0	53	0.164	0.164	0.84	0.50	1.70	509.6	1.20	1.00	509.6	90	102	100	46		
1.22	4.0	340.03	1.48	Sand	SP	very dense	100	5.0	68	0.189	0.189	1.48	0.50	1.70	546.4	1.57	1.00	546.4	116	109	100	48		
1.37	4.5	247.23	1.30	Sand	SP	very dense	100	5.0	49	0.215	0.215	1.30	0.50	1.70	397.2	1.62	1.00	397.2	84	79	100	46		
1.52	5.0	223.68	0.73	Sand	SP	very dense	100	5.0	45	0.240	0.240	0.73	0.50	1.70	359.4	1.42	1.00	359.4	78	72	100	45		
1.68	5.5	185.99	0.48	Sand	SP	very dense	100	5.0	37	0.265	0.265	0.48	0.50	1.70	298.9	1.39	1.00	298.9	62	60	100	43		
1.83	6.0	287.64	1.28	Sand	SP	very dense	100	5.0	58	0.290	0.290	1.28	0.50	1.70	462.2	1.56	1.00	462.2	90	92	100	47		
1.98	6.5	332.81	1.25	Sand	SP	very dense	100	5.0	67	0.315	0.315	1.25	0.50	1.70	534.8	1.51	1.00	534.8	113	107	100	48		
2.13	7.0	340.70	0.68	Sand	SP	very dense	100	5.0	68	0.340	0.340	0.68	0.50	1.70	547.5	1.38	1.00	547.5	116	110	100	49		
2.29	7.5	426.15	0.58	Gravelly Sand to Sand	SW	very dense	110	6.0	71	0.368	0.368	0.58	0.50	1.70	684.8	1.18	1.00	684.8	117	137	100	49		

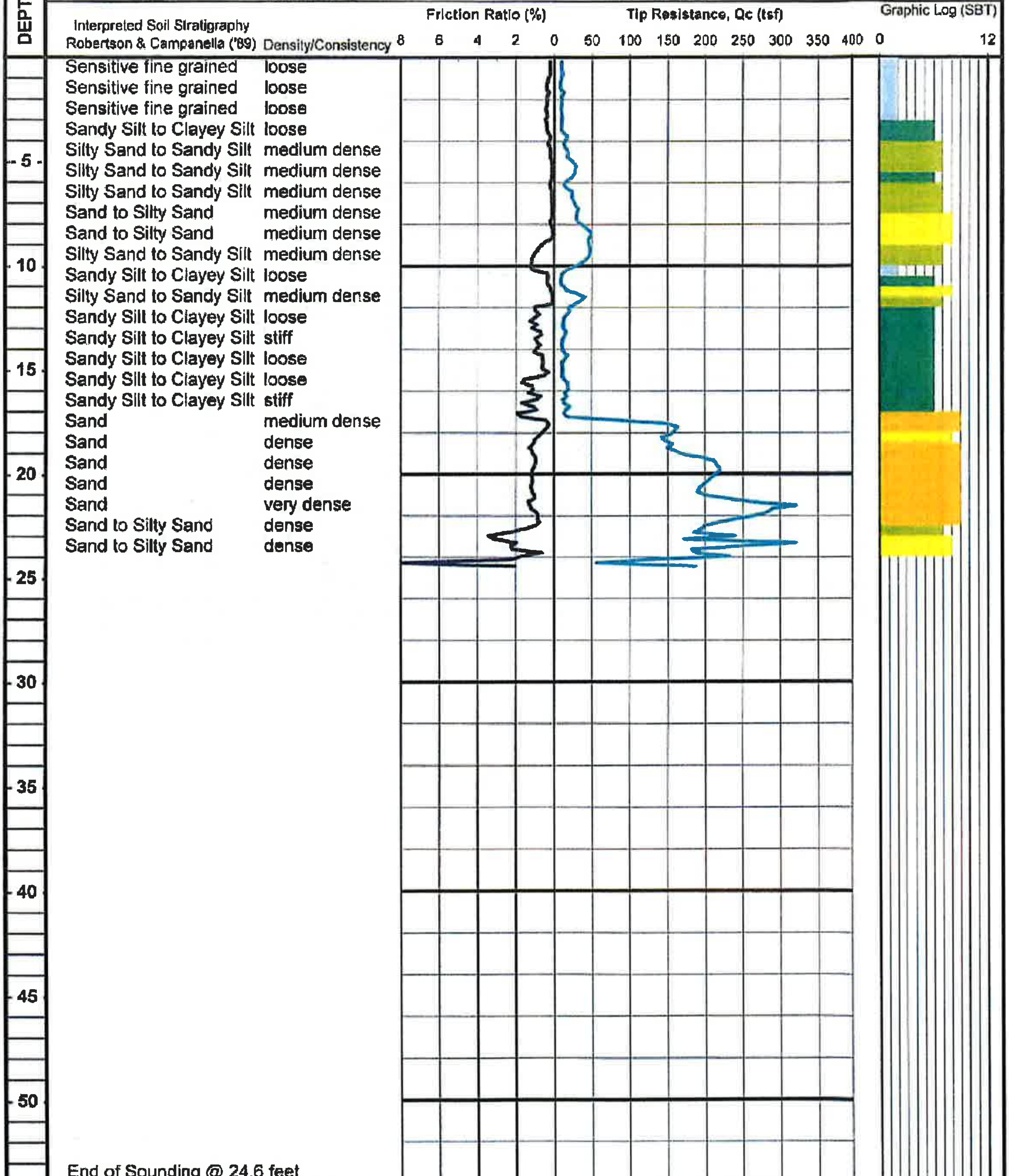
Earth Systems
Southern California

CPT No: CPT-6
Project Name: Commercial Organics Processing Facility
Project No.: VT-24872-02
Location: See Site Exploration Plan

CPT Vendor: **Middle Earth**
Truck Mounted Electric
Cone with 23-ton reaction
Date: 1/30/2017

DEPTH (FEET)

Interpreted Soil Stratigraphy Robertson & Campanella ('89)	Density/Consistency
Sensitive fine grained	loose
Sensitive fine grained	loose
Sensitive fine grained	loose
Sandy Silt to Clayey Silt	loose
Silty Sand to Sandy Silt	medium dense
Silty Sand to Sandy Silt	medium dense
Silty Sand to Sandy Silt	medium dense
Sand to Silty Sand	medium dense
Sand to Silty Sand	medium dense
Silty Sand to Sandy Silt	medium dense
Sandy Silt to Clayey Silt	loose
Silty Sand to Sandy Silt	medium dense
Sandy Silt to Clayey Silt	loose
Sandy Silt to Clayey Silt	stiff
Sandy Silt to Clayey Silt	loose
Sandy Silt to Clayey Silt	loose
Sandy Silt to Clayey Silt	stiff
Sand	medium dense
Sand	dense
Sand	dense
Sand	dense
Sand	very dense
Sand to Silty Sand	dense
Sand to Silty Sand	dense



End of Sounding @ 24.6 feet

Earth Systems
Southern California

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella, 1989)

Project: Commercial Organics Processing Facility | Project No: VT-24872-02 | Date: 01/30/17

CPT SOUNDING: CPT-6 | Plot: 8 | Density: 1 | SPT N
Est. GWT (feet): 24.0 | Dr correlation: 0 | Baldi | Qc/N: 1 | Robertson | Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest | Phi Correlation: 1 | SPT N | Nk: 17

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	Ic (2.6)	Kc	Clean Sand Qc1n	N1(60)	Clean Sand N1(60)	Rel. Dens. Dr (%)	Phi (deg.)	Su (tsf)	OCR
0.15	0.5	9.61	0.33	Sensitive fine grained	ML	loose	110	2.0	5	0.014	0.014	0.33	0.71	1.70	15.4	2.35	1.00	15.4	6	3	-1	28		
0.30	1.0	8.69	0.30	Sensitive fine grained	ML	loose	110	2.0	4	0.041	0.041	0.30	0.75	1.70	14.3	2.42	1.00	14.3	6	3	-4	28		
0.46	1.5	8.14	0.37	Sensitive fine grained	ML	loose	110	2.0	5	0.069	0.069	0.37	0.74	1.70	14.7	2.43	1.00	14.7	5	3	-3	28		
0.61	2.0	8.51	0.37	Sensitive fine grained	ML	loose	110	2.0	5	0.095	0.096	0.37	0.73	1.70	15.3	2.42	1.00	15.3	6	3	-1	29		
0.76	2.5	8.70	0.41	Sensitive fine grained	ML	loose	110	2.0	4	0.124	0.124	0.41	0.75	1.70	14.0	2.47	1.00	14.0	7	3	-5	29		
0.91	3.0	8.74	0.41	Sensitive fine grained	ML	loose	110	2.0	5	0.151	0.151	0.41	0.74	1.70	15.6	2.42	1.00	15.6	8	3	0	29		
1.07	3.5	10.47	0.38	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.178	0.178	0.37	0.72	1.70	16.6	2.39	1.00	16.8	7	3	3	20		
1.22	4.0	14.88	0.25	Sandy Silt to Clayey Silt	ML	medium dense	110	2.8	6	0.206	0.204	0.25	0.66	1.70	23.9	2.10	1.00	23.9	10	5	17	30		
1.37	4.5	15.38	0.22	Silty Sand to Sandy Silt	SM/ML	loose	110	3.0	5	0.234	0.234	0.22	0.65	1.70	26.3	2.13	1.00	26.3	8	5	21	30		
1.52	5.0	22.23	0.16	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	7	0.261	0.261	0.16	0.60	1.70	35.6	1.88	1.00	35.8	13	7	34	31		
1.68	5.5	26.62	0.12	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	9	0.289	0.288	0.12	0.57	1.70	42.8	1.66	1.00	42.8	16	0	42	32		
1.83	6.0	14.57	0.21	Sandy Silt to Clayey Silt	ML	loose	110	2.5	6	0.315	0.316	0.22	0.66	1.70	23.4	2.17	1.00	23.4	10	5	17	30		
1.98	6.5	23.28	0.13	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	8	0.344	0.344	0.13	0.59	1.70	37.4	1.93	1.00	37.4	13	7	36	31		
2.13	7.0	28.54	0.11	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	10	0.371	0.371	0.11	0.56	1.70	46.9	1.83	1.00	45.9	18	8	44	32		
2.29	7.5	29.08	0.12	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.5	10	0.398	0.399	0.12	0.55	1.70	47.7	1.82	1.00	47.7	16	10	46	32		
2.44	8.0	37.63	0.18	Sand to Silty Sand	SP/SM	medium dense	100	4.0	9	0.425	0.425	0.16	0.54	1.63	58.0	1.76	1.00	58.0	14	12	64	31		
2.59	8.5	47.31	0.10	Sand to Silty Sand	SP/SM	medium dense	100	4.0	12	0.453	0.450	0.10	0.50	1.54	68.8	1.65	1.00	68.8	10	14	61	33		
2.74	9.0	46.04	0.09	Sand to Silty Sand	SP/SM	medium dense	100	4.0	12	0.475	0.475	0.69	0.69	1.61	69.8	1.94	1.23	86.0	17	17	62	32		
2.90	9.5	44.85	1.08	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.5	15	0.501	0.501	1.10	0.83	1.60	67.0	2.07	1.40	95.0	21	19	61	34		
3.05	10.0	28.91	1.19	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	9	0.523	0.529	1.21	0.89	1.61	41.1	2.27	1.86	76.0	12	15	40	31		
3.20	10.5	8.46	0.35	Sensitive fine grained	ML	loose	110	2.0	5	0.556	0.556	0.37	0.75	1.62	14.6	2.44	1.00	14.5	6	3	-3	20		
3.35	11.0	12.61	0.26	Sandy Silt to Clayey Silt	ML	loose	110	2.5	5	0.584	0.584	0.27	0.71	1.52	18.1	2.30	1.00	18.1	7	4	6	29		
3.51	11.5	35.80	0.08	Sand to Silty Sand	SP/SM	medium dense	100	4.0	9	0.610	0.610	0.09	0.58	1.39	46.0	1.81	1.00	46.0	11	9	45	30		
3.66	12.0	22.37	0.70	Silty Sand to Sandy Silt	SM/ML	loose	110	3.0	7	0.636	0.636	0.72	0.80	1.42	30.1	2.28	1.84	55.3	8	11	27	30		
3.81	12.5	13.82	1.01	Sandy Silt to Clayey Silt	ML	loose	110	2.5	6	0.664	0.664	1.06	0.77	1.43	18.7	2.63	2.91	54.4	7	11	7	29		
3.96	13.0	12.84	0.93	Sandy Silt to Clayey Silt	ML	loose	110	2.5	5	0.691	0.691	0.99	0.78	1.38	17.0	2.66	3.02	51.4	8	10	3	29		
4.11	13.5	11.88	0.85	Sandy Silt to Clayey Silt	ML	loose	110	2.5	5	0.713	0.719	0.90	0.79	1.35	15.2	2.57	3.17	48.1	0	10	-1	26		
4.27	14.0	10.84	0.90	Sandy Silt to Clayey Silt	ML	stiff	110	2.5	4	0.746	0.746	0.96	0.81	1.32	13.8	2.63			4				0.59	4.1
4.42	14.5	13.93	0.60	Sandy Silt to Clayey Silt	ML	loose	110	2.5	6	0.774	0.774	0.63	0.76	1.27	16.7	2.47	2.61	43.6	9	9	3	29		
4.57	15.0	10.85	0.50	Sandy Silt to Clayey Silt	ML	loose	110	2.5	4	0.801	0.801	0.54	0.76	1.24	12.9	2.55	3.01	38.7	5	8	-3	28		
4.72	15.5	13.58	1.26	Sandy Silt to Clayey Silt	ML	stiff	110	2.5	6	0.829	0.829	1.35	0.81	1.22	15.8	2.68			5				0.75	4.6
4.88	16.0	16.50	1.06	Sandy Silt to Clayey Silt	ML	loose	110	2.5	7	0.856	0.856	1.12	0.78	1.18	18.4	2.54	3.01	55.2	7	11	7	29		
5.03	16.5	14.77	1.24	Sandy Silt to Clayey Silt	ML	stiff	110	2.5	8	0.884	0.884	1.32	0.80	1.16	15.1	2.65			6				0.82	4.7
5.18	17.0	15.04	1.53	Sandy Silt to Clayey Silt	ML	stiff	110	2.5	6	0.911	0.911	1.62	0.82	1.13	15.1	2.08			6				0.83	4.7
5.33	17.5	133.06	0.35	Sand	SP	medium dense	100	5.0	27	0.938	0.936	0.36	0.50	1.08	133.6	1.55	1.00	133.6	27	27	88	35		
5.49	18.0	152.05	0.70	Sand	SP	dense	100	5.0	30	0.963	0.963	0.71	0.51	1.06	150.8	1.68	1.02	154.2	31	31	84	38		
5.64	18.5	161.05	1.15	Sand to Silty Sand	SP/SM	dense	100	4.0	38	0.988	0.986	1.15	0.58	1.04	148.3	1.83	1.13	168.8	38	33	90	38		
5.79	19.0	179.23	1.08	Sand	SP	dense	100	5.0	35	1.013	1.013	1.09	0.54	1.02	168.6	1.77	1.08	183.5	35	37	88	37		
5.94	19.5	215.16	1.00	Sand	SP	dense	100	5.0	43	1.038	1.038	1.01	0.51	1.01	205.4	1.68	1.03	211.1	42	42	100	38		
6.10	20.0	212.57	1.17	Sand	SP	dense	100	5.0	43	1.063	1.063	1.18	0.53	1.00	200.5	1.74	1.07	213.7	41	43	100	38		
6.25	20.5	198.81	1.19	Sand	SP	dense	100	5.0	39	1.088	1.088	1.19	0.54	0.99	183.1	1.77	1.08	198.8	38	40	100	38		
6.40	21.0	205.85	1.09	Sand	SP	dense	120	5.0	41	1.115	1.115	1.09	0.53	0.97	188.2	1.73	1.06	200.6	38	40	100	38		
6.55	21.5	269.66	1.26	Sand	SP	very dense	120	5.0	58	1.145	1.145	1.28	0.52	0.96	262.8	1.70	1.03	271.9	54	54	100	41		
6.71	22.0	283.33	0.90	Sand	SP	dense	120	5.0	53	1.176	1.178	0.91	0.50	0.95	238.2	1.81	1.00	235.2	49	47	100	40		
6.86	22.5	203.46	1.11	Sand	SP	dense	120	5.0	41	1.205	1.206	1.12	0.64	0.93	179.4	1.78	1.09	193.2	37	39	100	38		
7.01	23.0	198.34	2.96	Silty Sand to Sandy Silt	SM/ML	very dense	120	3.0	66	1.235	1.235	3.00	0.84	0.91	169.8	2.10	1.46	247.6	59	50	90	42		
7.16	23.5	240.73	2.14	Sand to Silty Sand	SP/SM	very dense	120	4.0	62	1.265	1.265	2.15	0.50	0.90	211.7	1.90	1.22	257.5	55	62	100	42		
7.32	24.0	180.82	1.54	Sand to Silty Sand	SP/SM	dense	120	4.0	45	1.295	1.295	1.55	0.58	0.89	151.9	1.91	1.20	182.2	40	36	84	38		

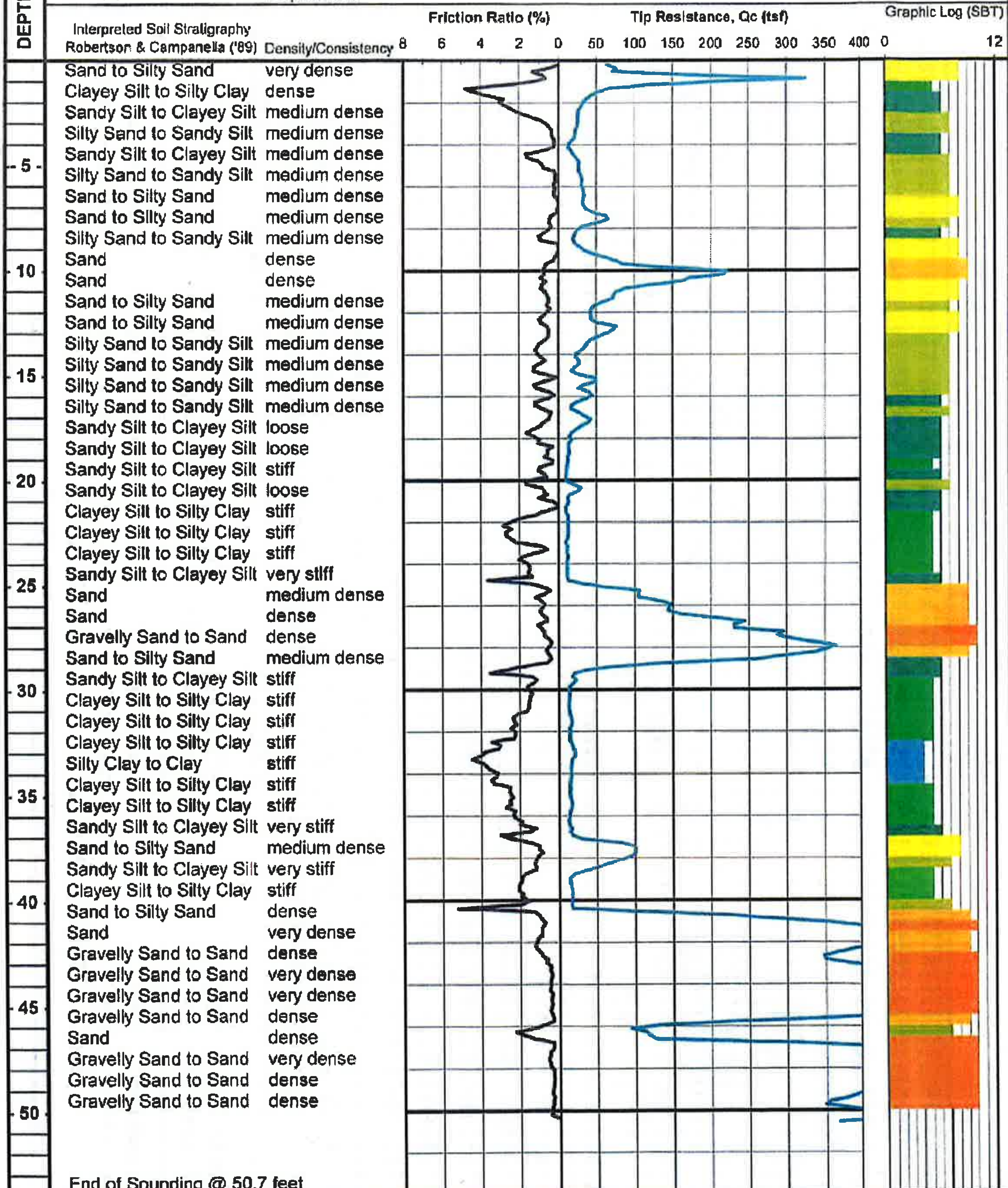
Earth Systems
Southern California

CPT No: CPT-7
Project Name: Commercial Organics Processing Facility
Project No.: VT-24872-02
Location: See Site Exploration Plan

CPT Vendor: **Middle Earth**
Truck Mounted Electric
Cone with 23-ton reaction
Date: 1/30/2017

DEPTH (FEET)

Interpreted Soil Stratigraphy Robertson & Campanella ('89)	Density/Consistency
Sand to Silty Sand	very dense
Clayey Silt to Silty Clay	dense
Sandy Silt to Clayey Silt	medium dense
Silty Sand to Sandy Silt	medium dense
Sandy Silt to Clayey Silt	medium dense
Silty Sand to Sandy Silt	medium dense
Sand to Silty Sand	medium dense
Sand to Silty Sand	medium dense
Silty Sand to Sandy Silt	medium dense
Sand	dense
Sand	dense
Sand to Silty Sand	medium dense
Sand to Silty Sand	medium dense
Silty Sand to Sandy Silt	medium dense
Silty Sand to Sandy Silt	medium dense
Silty Sand to Sandy Silt	medium dense
Silty Sand to Sandy Silt	medium dense
Sandy Silt to Clayey Silt	loose
Sandy Silt to Clayey Silt	loose
Sandy Silt to Clayey Silt	stiff
Sandy Silt to Clayey Silt	loose
Clayey Silt to Silty Clay	stiff
Clayey Silt to Silty Clay	stiff
Clayey Silt to Silty Clay	stiff
Sandy Silt to Clayey Silt	very stiff
Sand	medium dense
Sand	dense
Gravelly Sand to Sand	dense
Sand to Silty Sand	medium dense
Sandy Silt to Clayey Silt	stiff
Clayey Silt to Silty Clay	stiff
Clayey Silt to Silty Clay	stiff
Clayey Silt to Silty Clay	stiff
Silty Clay to Clay	stiff
Clayey Silt to Silty Clay	stiff
Clayey Silt to Silty Clay	stiff
Sandy Silt to Clayey Silt	very stiff
Sand to Silty Sand	medium dense
Sandy Silt to Clayey Silt	very stiff
Clayey Silt to Silty Clay	stiff
Sand to Silty Sand	dense
Sand	very dense
Gravelly Sand to Sand	dense
Gravelly Sand to Sand	very dense
Gravelly Sand to Sand	very dense
Gravelly Sand to Sand	dense
Sand	dense
Gravelly Sand to Sand	very dense
Gravelly Sand to Sand	dense
Gravelly Sand to Sand	dense



End of Sounding @ 50.7 feet

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella, 1989)

Project: Commercial Organics Processing Facility — Project No: VT-24872-02 — Date: 01/30/17

CPT SOUNDING: CPT-7 — Plot: 9 — Density: 1 — SPT N

Est. GWT (feet): 24.0 — Dr correlation: 0 Baldi — Qc/N: 1 Robertson

Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Phi Correlation: 1 SPT N

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	Ic	Kc	Clean Sand Qc1n	$N_{1(60)}$	Clean Sand $N_{1(60)cs}$	Rel Dens Dr (%)	Phi (deg.)	Nk: 17 Su (tsf)	OCR
0.15	0.5	158.15	0.92	Sand to Silty Sand	SP/SM	dense	100	4.0	27	0.013	0.013	0.92	0.52	1.70	170.0	1.71	1.05	178.4	45	36	83	40		
0.30	1.0	212.18	1.75	Sand to Silty Sand	SP/SM	very dense	100	4.0	53	0.026	0.026	1.76	0.53	1.70	340.9	1.74	1.06	362.3	80	72	100	45		
0.46	1.5	52.03	4.25	Clayey Silt to Silty Clay	ML/CL	dense	110	2.0	26	0.054	0.064	4.27	0.73	1.70	88.8	2.41	2.35	199.0	45	40	70	40		
0.61	2.0	32.05	2.60	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	13	0.091	0.091	2.90	0.74	1.70	52.5	2.43	2.43	127.4	22	25	50	34		
0.76	2.5	25.83	1.99	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	10	0.119	0.119	1.99	0.75	1.70	41.2	2.40	2.30	94.9	17	19	45	32		
0.91	3.0	24.15	0.73	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	8	0.146	0.146	0.73	0.66	1.70	38.8	2.17	1.60	62.1	14	12	35	31		
1.07	3.5	21.69	0.34	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	7	0.174	0.174	0.35	0.63	1.70	34.6	2.07	1.00	34.6	12	7	33	31		
1.22	4.0	14.22	0.25	Sandy Silt to Clayey Silt	ML	loose	110	2.5	6	0.201	0.201	0.25	0.67	1.70	22.9	2.30	1.00	22.9	10	5	16	30		
1.37	4.5	19.14	1.30	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	8	0.229	0.229	1.40	0.73	1.70	30.8	2.41	2.34	72.1	13	14	28	31		
1.52	5.0	26.32	0.91	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	9	0.256	0.256	0.92	0.67	1.70	42.3	2.10	1.65	69.8	15	14	41	32		
1.68	5.5	26.02	0.18	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	10	0.284	0.284	0.18	0.57	1.70	40.8	1.87	1.00	40.8	14	9	45	32		
1.83	6.0	31.58	0.24	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	11	0.311	0.311	0.24	0.57	1.70	50.7	1.88	1.00	50.7	18	10	49	33		
1.98	6.5	32.05	0.11	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	11	0.339	0.339	0.11	0.54	1.70	52.0	1.77	1.00	52.0	19	11	50	33		
2.13	7.0	38.67	0.09	Sand to Silty Sand	SP/SM	medium dense	100	4.0	10	0.365	0.365	0.06	0.51	1.70	62.1	1.68	1.00	62.1	18	12	57	32		
2.29	7.5	59.13	0.49	Sand to Silty Sand	SP/SM	medium dense	100	4.0	15	0.390	0.390	0.46	0.53	1.70	94.7	1.73	1.00	94.7	24	19	75	34		
2.44	8.0	26.02	0.57	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	9	0.416	0.416	0.58	0.64	1.70	41.7	2.10	1.45	60.4	15	12	40	31		
2.59	8.5	19.69	0.71	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	8	0.444	0.444	0.72	0.66	1.70	31.6	2.25	1.79	56.5	12	11	29	31		
2.74	9.0	35.89	0.09	Sand to Silty Sand	SP/SM	medium dense	100	4.0	9	0.470	0.470	0.09	0.49	1.65	52.4	1.77	1.00	52.4	13	10	52	31		
2.90	9.5	73.04	0.38	Sand to Silty Sand	SP/SM	medium dense	100	4.0	18	0.496	0.496	0.38	0.51	1.47	102.4	1.60	1.00	102.4	26	20	78	35		
3.05	10.0	102.03	0.78	Sand	SP	very dense	100	5.0	36	0.520	0.520	0.78	0.50	1.43	250.0	1.53	1.00	250.0	53	52	100	41		
3.20	10.5	151.13	0.82	Sand	SP	dense	100	5.0	30	0.545	0.545	0.82	0.50	1.39	199.0	1.63	1.00	199.0	41	40	100	39		
3.35	11.0	78.43	0.75	Sand to Silty Sand	SP/SM	medium dense	100	4.0	20	0.570	0.570	0.75	0.50	1.41	104.5	1.62	1.12	117.1	28	23	79	35		
3.51	11.5	56.12	0.57	Sand to Silty Sand	SP/SM	medium dense	100	4.0	16	0.595	0.595	0.58	0.57	1.30	78.3	1.87	1.16	88.4	18	18	68	33		
3.66	12.0	42.78	0.62	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	14	0.621	0.621	0.63	0.61	1.36	60.0	2.00	1.30	72.9	18	15	53	33		
3.81	12.5	56.43	0.65	Sand to Silty Sand	SP/SM	medium dense	100	4.0	14	0.646	0.646	0.66	0.61	1.35	71.9	1.98	1.28	91.9	18	18	63	32		
3.96	13.0	62.41	0.54	Sand to Silty Sand	SP/SM	medium dense	100	4.0	16	0.673	0.673	0.54	0.57	1.29	78.2	1.85	1.15	87.6	19	17	59	33		
4.11	13.5	38.03	0.93	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	13	0.699	0.699	0.95	0.66	1.31	47.2	2.16	1.57	74.3	15	15	45	32		
4.27	14.0	24.85	1.07	Silty Sand to Sandy Silt	SM/ML	loose	110	3.0	8	0.726	0.726	1.10	0.72	1.31	30.9	2.35	2.11	65.2	10	13	28	30		
4.42	14.5	24.63	1.02	Silty Sand to Sandy Silt	SM/ML	loose	110	3.0	8	0.754	0.754	1.05	0.72	1.27	29.9	2.35	2.12	63.3	10	13	27	30		
4.57	15.0	28.48	0.73	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	10	0.781	0.781	0.72	0.66	1.23	34.2	2.22	1.71	58.4	11	12	32	30		
4.72	15.5	30.33	1.04	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	12	0.809	0.809	1.07	0.68	1.20	41.2	2.24	1.76	72.8	13	15	40	31		
4.88	16.0	36.77	0.64	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	12	0.838	0.838	0.65	0.65	1.17	39.4	2.14	1.54	60.5	13	12	38	31		
5.03	16.5	18.43	0.83	Sandy Silt to Clayey Silt	ML	loose	110	2.5	8	0.864	0.864	0.88	0.74	1.16	21.3	2.43	2.46	52.3	8	10	13	29		
5.18	17.0	37.88	0.63	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	13	0.891	0.891	0.62	0.65	1.12	40.0	2.12	1.50	59.9	13	12	39	31		
5.33	17.5	22.71	1.33	Sandy Silt to Clayey Silt	ML	loose	110	2.5	9	0.919	0.919	1.39	0.76	1.11	23.9	2.50	2.75	65.7	9	13	17	30		
5.49	18.0	14.36	1.13	Sandy Silt to Clayey Silt	ML	stiff	110	2.5	6	0.946	0.946	1.20	0.81	1.09	14.9	2.64			6				0.73	4.3
5.64	18.5	13.01	0.48	Sandy Silt to Clayey Silt	ML	loose	110	2.5	5	0.974	0.974	0.53	0.78	1.07	13.1	2.54	2.85	38.7	5	8	-1	26		
5.79	19.0	10.65	0.45	Sandy Silt to Clayey Silt	ML	stiff	110	2.5	4	1.001	1.001	0.50	0.80	1.05	10.8	2.80			4				0.58	3.0
5.94	19.5	9.84	0.93	Clayey Silt to Silty Clay	ML/CL	stiff	110	2.0	5	1.020	1.020	1.04	0.86	1.02	9.8	2.78			5				0.62	2.6
6.10	20.0	12.88	1.35	Sandy Silt to Clayey Silt	ML	stiff	110	2.5	5	1.058	1.058	1.47	0.84	1.00	12.3	2.76			5				0.70	3.4
6.25	20.5	23.17	0.75	Silty Sand to Sandy Silt	SM/ML	loose	110	3.0	8	1.084	1.084	0.78	0.74	0.96	21.5	2.41	2.35	50.6	7	10	13	29		
6.40	21.0	11.39	0.45	Sandy Silt to Clayey Silt	ML	stiff	120	2.5	5	1.113	1.113	0.51	0.81	0.96	10.3	2.63			5				0.60	2.6
6.55	21.5	9.93	0.72	Sandy Silt to Clayey Silt	ML	stiff	120	2.5	4	1.143	1.143	0.81	0.85	0.94	8.6	2.77			4				0.51	2.3
6.71	22.0	11.65	2.49	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	6	1.173	1.173	2.77	0.91	0.91	10.0	2.98			6				0.62	2.7
6.86	22.5	11.81	2.04	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	6	1.203	1.203	2.04	0.92	0.89	9.9	2.99			6				0.63	2.6
7.01	23.0	10.14	1.85	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	5	1.233	1.233	2.11	0.92	0.87	8.3	2.98			5				0.52	2.2
7.16	23.5	10.87	1.10	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	5	1.263	1.263	1.35	0.88	0.86	8.6	2.87			5				0.55	2.2
7.32	24.0	10.33	1.74	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	5	1.290	1.293	1.99	0.92	0.83	8.1	2.98			5				0.53	2.1
7.47	24.5	10.45	1.50	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	5	1.323	1.307	1.72	0.91	0.83	8.2	2.94			6				0.54	2.1
7.62	25.0	34.89	1.66	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	14	1.353	1.321	2.06	0.78	0.84	27.6	2.54	3.00	82.8	12	17	23	31		
7.77	25.5	104.78	0.78	Sand	SP	medium dense	120	5.0	21	1.383	1.335	0.80	0.58	0.87	88.5	1.80	1.18	102.8	18	21	71	33		
7.92	26.0	140.99	0.85	Sand	SP	medium dense	120	5.0	28	1.413	1.350	0.85	0.55	0.87	116.4	1.82	1.12	130.2	24	26	83	34		
8.08	26.5	189.39	0.78	Sand	SP	dense	120	6.0	38	1.443	1.365	0.79	0.52	0.88	155.9	1.69	1.03	142.3	32	32	98	37		
8.23	27.0	252.23	0.92	Sand	SP	dense	120	6.0	50	1.472	1.379	0.93	0.50	0.87	208.6	1.65	1.01	208.7	43	42	100	39		
8.38	27.5	306.52	0.58	Gravelly Sand to Sand	SW	dense	120	6.0	61	1.503	1.393	0.59	0.50	0.87	254.1	1.46	1.00	254.1	44	51	100	39		
8.53	28.0	351.12	0.58	Gravelly Sand to Sand	SW	dense	120	6.0	59	1.533	1.400	0.57	0.50	0.87	287.7	1.40	1.00	287.7	49	59	100	40		
8.69	28.5	235.44	0.49	Sand	SP	dense	120	6.0	41	1.563	1.422	0.49	0.50	0.86	191.9	1.50	1.00	191.9	39	38	100	38		
8.84	29.0	47.32	2.63	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	19	1.593	1.437	2.72	0.77	0.79	35.5	2.54	2.88	104.6	16	21	34	32		
8.99	29.5	10.43	1.31	Sandy Silt to Clayey Silt	ML	very stiff	120	2.5	8	1.623	1.451	1.41	0.83	0.77	14.2	2.70			8				1.08	3.7
9.14	30.0	13.62	1.54	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	7	1.653	1.465	1.75	0.89	0.75	9.8	2.89			7				0.71	2.4
9.30	30.5	12.67	1.53	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	6	1.683	1.480	1.78	0.90	0.74	9.0	2.91			6				0.67	2.3
9.45	31.0	13.53	1.79	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	7	1.713	1.494	2.05	0.90	0.73	9.4	2.93			7				0.71	2.4
9.60	31.5	15.69	2.26	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	8	1.743	1.508	2.58	0.90	0.73	11.0	2.92			8				0.85	2.8
9.75	32.0	14.23	2.35	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	7	1.773	1.523	2.09	0.92	0.72	9.8	2.98			7				0.75	2.5
9.91	32.5	15.38	2.06	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	8	1.803	1.537	3.35	0.92	0.71	10.3	3.01			8				0.81	2.6
10.06	33.0	18.99	3.60	Silty Clay to Clay	CL	very stiff	120	1.5	13	1.833	1.552	4.08	0.91	0.71	13.3	2.97			13				1.08	3.5
10.21	33.5	16.19	4.07	Silty Clay to Clay	CL	stiff	120	1.5	11	1.863	1.566	4.80	0.94	0.69	10.8	3.09			11				0.88	2.7
10.36	34.0	15.45	3.35	Silty Clay to Clay	CL	stiff	120	1.5	10	1.893	1.581	3.82	0.94	0.68	10.0	3.08			10				0.82	2.6
10.52	34.5	14.58	3.15	Silty Clay to Clay	CL	stiff	120	1.5	10	1.923	1.595	3.63	0.94	0.68	9.4	3.07			10				0.76	2.4
10.67	35.0	14.82	2.61	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	7	1.953	1.609	2.90	0.92	0.68	9.4	3.01			7				0.77	2.4
10.82	35.5	16.17	2.61	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	8	1.983	1.624	2.98	0.91	0.68	10.3	2.98			8				0.86	2.8
10.97	36.0	13.67	2.31	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	7	2.013	1.638	2.71	0.93	0.67	8.6	3.03			7				0.71	2.3
11.13	36.5	14.05	1.67	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	7	2.043	1.653	1.95	0.90	0.67	8.9	2.94			7				0.73	2.3
11.28	37.0	41.44	2.35	Sandy Silt to Clayey Silt	ML	medium dense	120	2.5	17	2.073	1.667	2.47	0.78	0.70	27.3	2.60	3.30	90.2	13	18	23	31		
11.43	37.5	99.81	0.98	Sand to Silty Sand	SP/SM	medium dense	120	4.0	25	2.103	1.681	1.00	0.62	0.75	70.8	2.03	1.34	94.7	19	19	63	33		
11.58	38.0	80.28	1.19	Sand to Silty Sand	SP/SM	medium dense	120	4.0	20	2.133	1.696	1.22	0.68	0.73	55.6	2.18	1.58	88.0	15	18	52	32		
11.73	38.5	37.07	1.40	Silty Sand to Sandy Silt	SM/ML	loose	120	3.0	12	2.163	1.710	1.49	0.77	0.69	24.3	2.51	2.81	68.1	9	14	16	30		
11.89	39.0	14.78	1.99	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	7	2.193	1.725	2.33	0.93	0.64	8.9	2.98			7				0.77	2.2
12.04	39.5	16.20	2.02	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	8	2.223	1.739	2.33	0.90	0.64	9.8	2.94			6				0.86	2.4
12.19	40.0	15.98	1.81	Clayey Silt to Silty Clay	ML/CL	stiff	120	2.0	8	2.253	1.753	2.11	0.90	0.63	9.8	2.93			6				0.84	2.4
12.34	40.5	115.81	2.54	Silty Sand to Sandy Silt	SM/ML	medium dense	120	3.0	39	2.283	1.766	2.59	0.66	0.70	78.0	2.20	1.87	145.5	23	28	66	36		
12.50	41.0	342.10	0.85	Sand	SP	very dense	120	5.0	68	2.313	1.782	0.85	0.50	0.77	248.2	1.57	1.00	249.2	51	50	100	41		
12.65	41.5	495.14	0.91	Gravelly Sand to Sand	SW	very dense	120	6.0	76	2.343	1.797	0.92	0.50	0.77	330.1	1.52	1.00	330.1	57	66	100	42		
12.80	42.0	456.54	1.20	Sand	SP	very dense	120	5.0	81	2.373	1.811	1.20	0.50	0.76	329.8	1.61	1.00	329.8	68	66	100	44		
12.95	42.5	356.30	1.01	Sand	SP	very dense	120	5.0	73	2.403	1.825	1.02	0.50	0.78	263.7	1.61	1.00	263.7	54	53	100	41		
13.11	43.0	398.30	0.58	Gravelly Sand to Sand	SW	dense	120	6.0	67	2.433	1.840	0.59	0.50	0.76	286.3	1.41	1.00	286.3	49	57	100	40		
13.26	43.5	473.54	0.45	Gravelly Sand to Sand	SW	very dense	120	6.0	79	2.463	1.854	0.45	0.50	0.76	338.1	1.28	1.00	338.1	59	68	100	42		
13.41	44.0	496.25	0.47	Gravelly Sand to Sand	SW	very dense	120	6.0	83	2.493	1.869	0.48	0.50	0.76	353.0	1.28	1.00	353.0	61	71	100	42		
13.56	44.5	495.91	0.44	Gravelly Sand to Sand	SW	very dense	120	6.0	83	2.523	1.883	0.44	0.50	0.76	351.4	1.27	1.00	351.4	60	70	100	42		

Earth Systems
Southern California

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella, 1989)

Project: Commercial Organics Processing Facility | Project No: VT-24872-02 | Date: 01/30/17

CPT SOUNDING: CPT-7 | Plot: 9 | Density: 1 | SPT N | Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Est. GWT (feet): 24.0 | Dr correlation: 0 | Baldi | Qc/N: 1 | Robertson | Phi Correlation: 0 | SPT N

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total σo tsf	σ'o tsf	F	n	Cq	Norm. Qc1n	2.6 Ic	Kc	Clean Sand Qc1n	$N_{1(60)}$	Clean Sand $N_{1(60)}$	Rel. Dens. Dr (%)	Phi (deg.)	Nk: 17 Su (tsf)	OCR
13.72	45.0	491.66	0.43	Gravelly Sand to Sand	SW	very dense	120	6.0	82	2.553	1.897	0.44	0.50	0.75	347.0	1.27	1.00	347.5	59	60	100	42		
13.87	45.5	424.20	0.41	Gravelly Sand to Sand	SW	very dense	120	6.0	71	2.583	1.912	0.41	0.50	0.74	298.3	1.30	1.00	298.3	51	60	100	41		
14.02	46.0	153.05	0.82	Sand	SP	medium dense	120	5.0	31	2.613	1.926	0.83	0.57	0.71	103.7	1.85	1.16	110.5	22	24	78	34		
14.17	46.5	119.69	1.80	Silty Sand to Sandy Silt	SM/ML	medium dense	120	3.0	40	2.643	1.941	1.84	0.66	0.67	76.0	2.18	1.61	121.8	26	24	85	30		
14.33	47.0	397.56	0.39	Gravelly Sand to Sand	SW	dense	120	6.0	66	2.673	1.955	0.39	0.50	0.74	276.5	1.31	1.00	276.5	47	56	100	40		
14.48	47.5	427.61	0.56	Gravelly Sand to Sand	SW	very dense	120	6.0	71	2.703	1.969	0.55	0.50	0.73	296.2	1.38	1.00	296.2	51	59	100	41		
14.63	48.0	420.67	0.39	Gravelly Sand to Sand	SW	dense	120	6.0	70	2.733	1.984	0.39	0.50	0.73	290.4	1.28	1.00	290.4	50	58	100	41		
14.78	48.5	413.05	0.31	Gravelly Sand to Sand	SW	dense	120	6.0	69	2.763	1.998	0.31	0.50	0.73	284.1	1.24	1.00	284.1	48	57	100	40		
14.94	49.0	400.72	0.38	Gravelly Sand to Sand	SW	dense	120	6.0	68	2.793	2.013	0.38	0.50	0.73	276.7	1.30	1.00	276.7	48	56	100	40		
15.09	49.5	362.49	0.34	Gravelly Sand to Sand	SW	dense	120	6.0	60	2.823	2.027	0.34	0.50	0.72	247.5	1.31	1.00	247.5	43	50	100	39		
15.24	50.0	431.60	0.44	Gravelly Sand to Sand	SW	very dense	120	6.0	72	2.853	2.041	0.44	0.50	0.72	293.6	1.33	1.00	293.6	50	59	100	41		

ATTACHMENT C

Individual Laboratory Test Results

Table 1809.7(1) with Footnotes

File Number: VT-24872-02 Lab Number: 097323

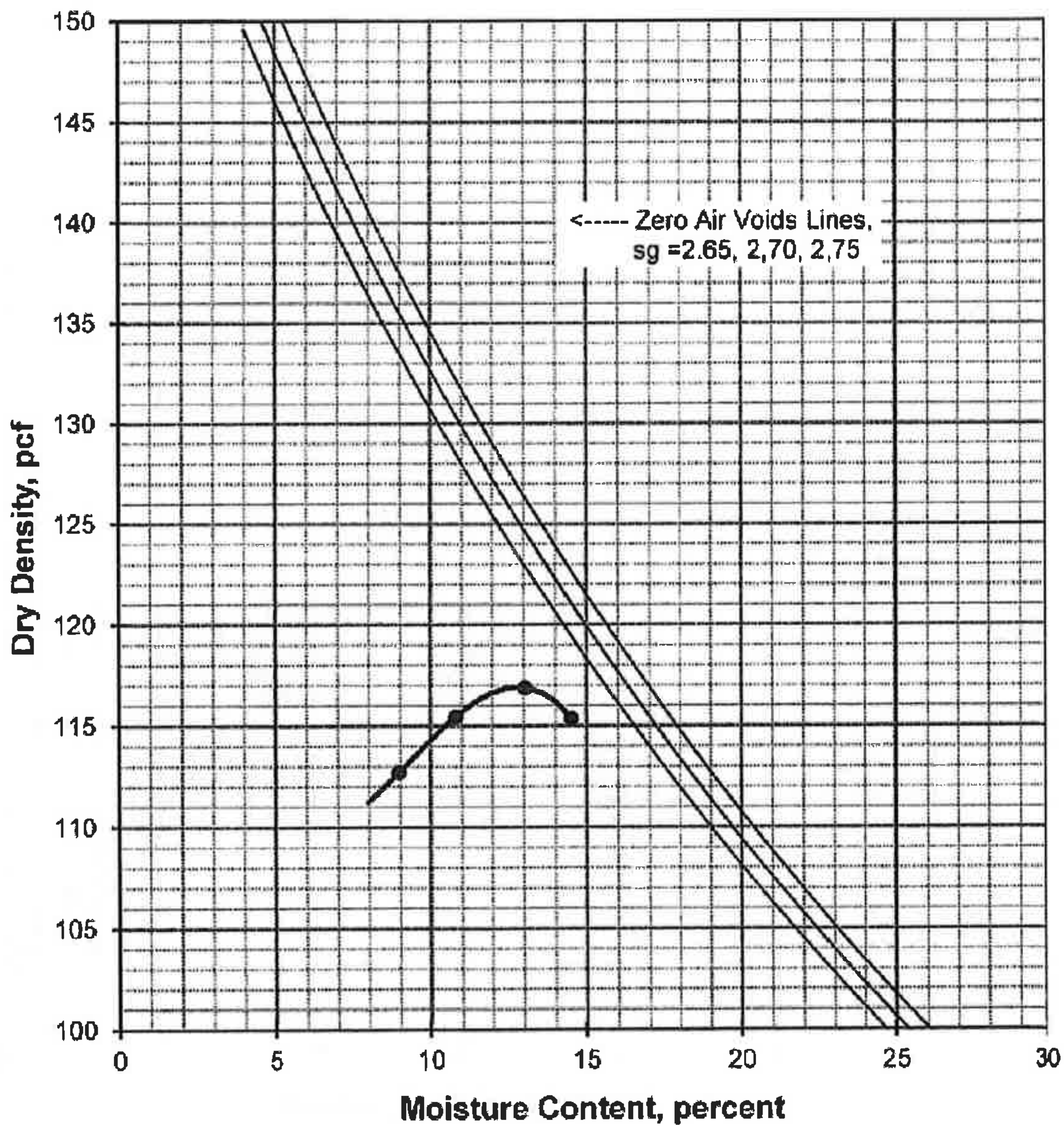
MAXIMUM DENSITY / OPTIMUM MOISTURE ASTM D 1557-07 (Modified)

Job Name: Commercial Organics Processing Facility
Sample ID: B-2 @ 0-5'
Location:
Description: Olive Brown Clayey Silt

Procedure Used: A
Prep. Method: Moist
Rammer Type: Automatic

Maximum Density: **117 pcf**
Optimum Moisture: **13%**

Sieve Size	% Retained
3/4"	0.0
3/8"	0.0
#4	0.0



File Number: VT-24872-02 Lab Number: 097323

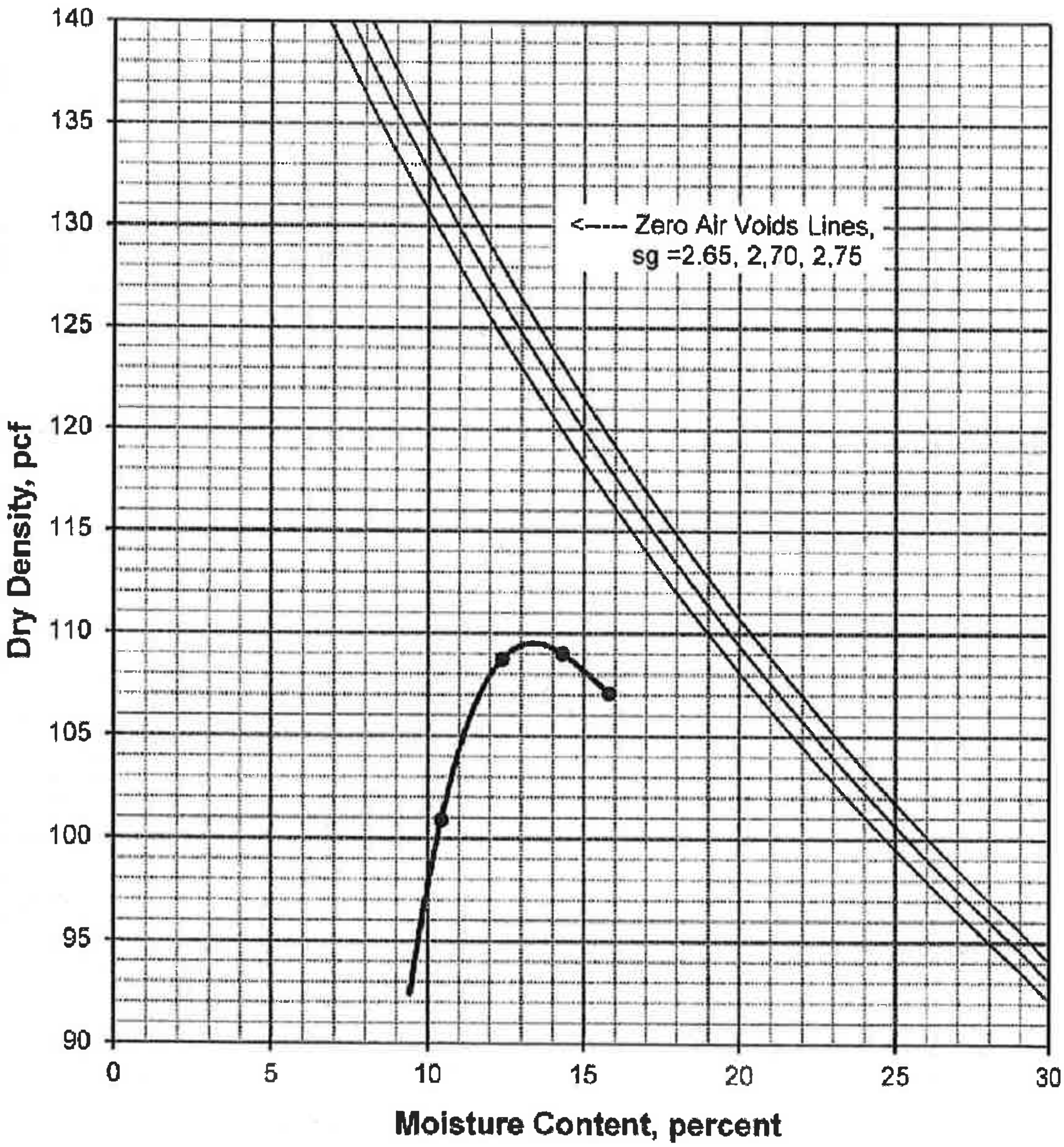
MAXIMUM DENSITY / OPTIMUM MOISTURE ASTM D 1557-07 (Modified)

Job Name: Commercial Organics Processing Facility
Sample ID: TP-3 @ 0-5'
Location:
Description: Light Olive Brown Clayey Silt with 6% Cement

Procedure Used: A
Prep. Method: Moist
Rammer Type: Automatic

Maximum Density: **109.5 pcf**
Optimum Moisture: 13.5%

Sieve Size	% Retained
3/4"	0.0
3/8"	0.0
#4	0.0



File Number: VT-24872-02 Lab Number: 097323

MAXIMUM DENSITY / OPTIMUM MOISTURE

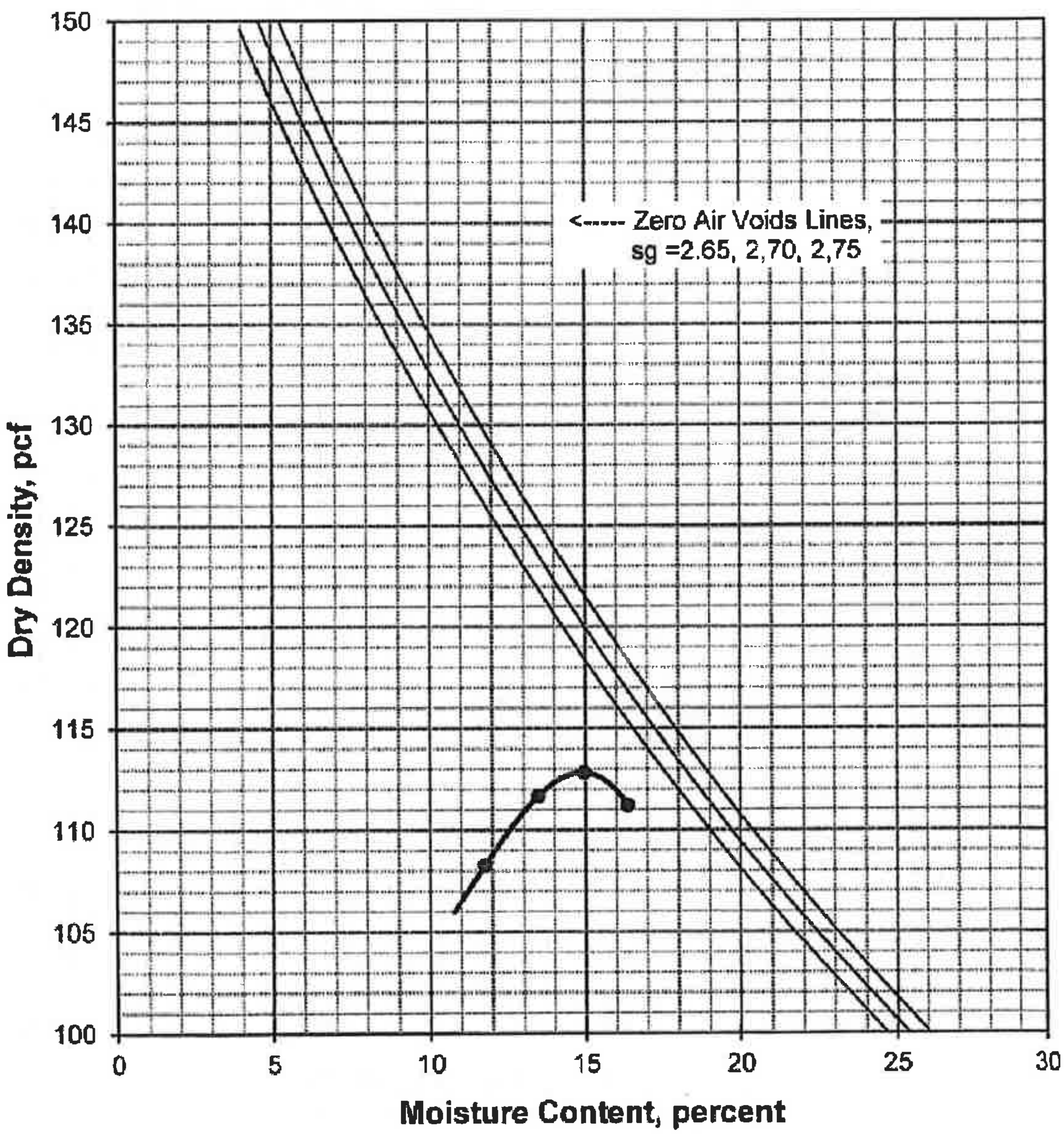
ASTM D 1557-07 (Modified)

Job Name: Commercial Organics Processing Facility
Sample ID: TP-5 @ 0-5'
Location:
Description: Light Olive Brown Clayey Silt with 6% Cement

Procedure Used: A
Prep. Method: Moist
Rammer Type: Automatic

Maximum Density: **113 pcf**
Optimum Moisture: **15%**

Sieve Size	% Retained
3/4"	0.0
3/8"	0.0
#4	0.0

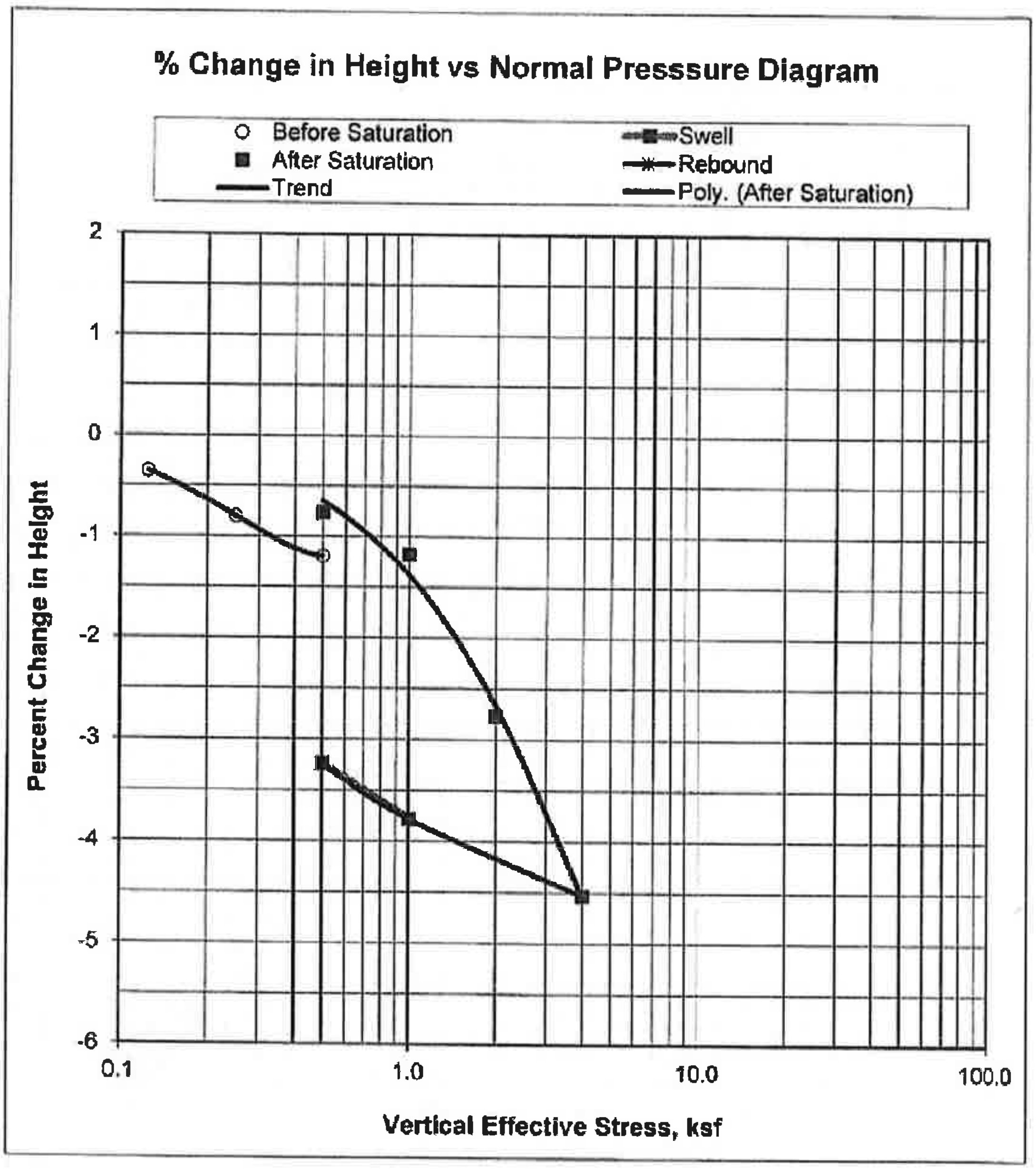


CONSOLIDATION TEST

ASTM D 2435-90

Commercial Organics Processing Facility
B-2 @ 10'
ML
Ring Sample

Initial Dry Density: 93.7 pcf
Initial Moisture, %: 28.8%
Specific Gravity: 2.67 (assumed
Initial Void Ratio: 0.779

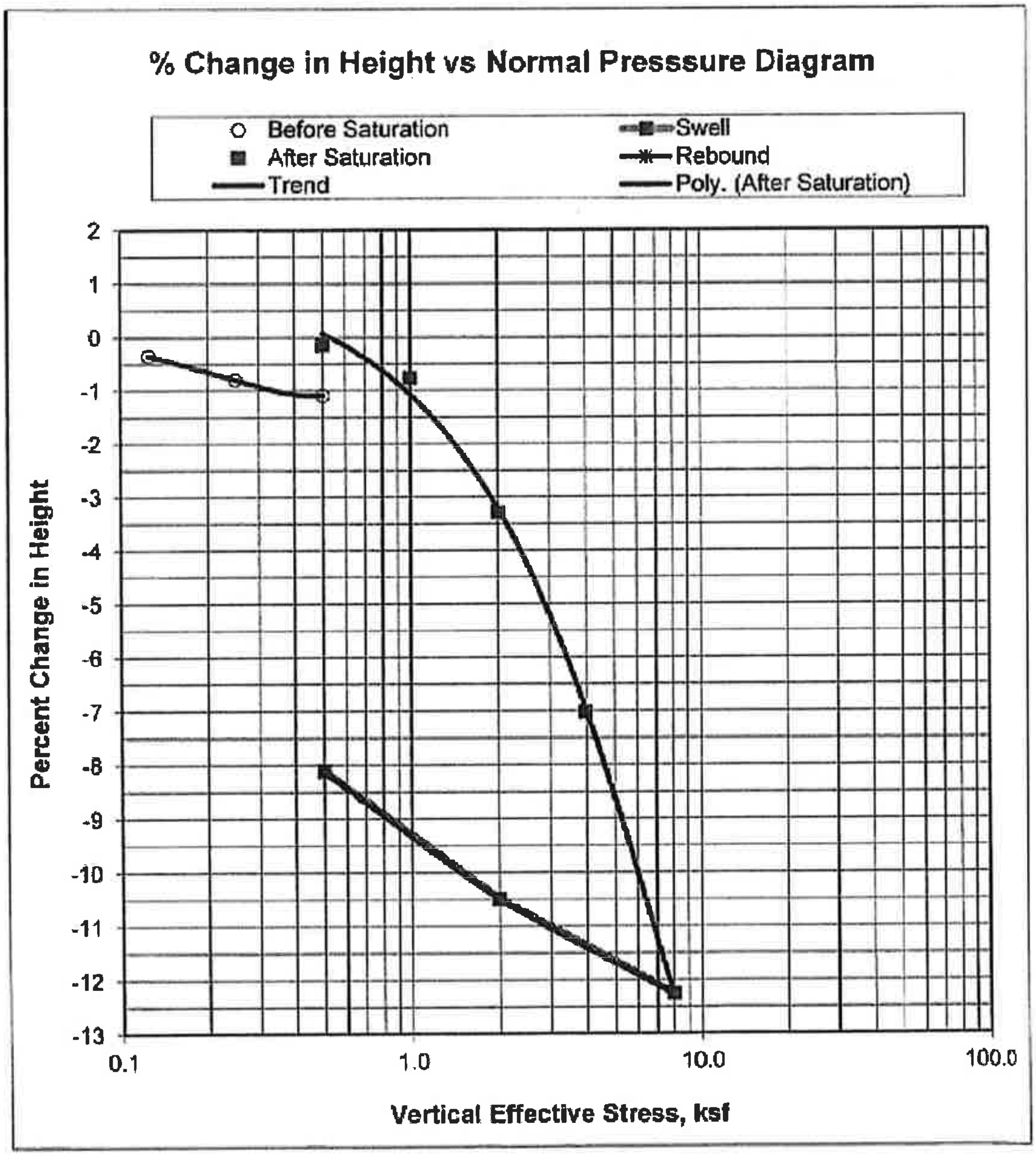


CONSOLIDATION TEST

ASTM D 2435-90

Commercial Organics Processing Facility
TP-3 @ 5'
ML
Ring Sample

Initial Dry Density: 79.0 pcf
Initial Moisture, %: 32.9%
Specific Gravity: 2.67 (assumed
Initial Void Ratio: 1.110



File No.: VT-24872-02

March 2, 2017

EXPANSION INDEX

ASTM D-4829, UBC 18-2

Job Name: Commercial Organics Processing Facility
Sample ID: B-2 @ 0-5'
Soil Description: ML

Initial Moisture, %:	11.0
Initial Compacted Dry Density, pcf:	105.4
Initial Saturation, %:	50
Final Moisture, %:	25.6
Volumetric Swell, %:	7.6

Expansion Index: 76 Medium

EI	UBC Classification
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
130+	Very High

CERTIFICATE OF ANALYSIS

Client: Earth Systems Southern California
CAS LAB NO: 170377-01
Sample ID: B1@0-5'
Analyst: GP

Date Sampled: 02/15/17
Date Received: 02/16/17
Sample Matrix: Soil

WET CHEMISTRY ANALYSIS SUMMARY

COMPOUND	RESULTS	UNITS	DF	PQL	METHOD	ANALYZED
pH (Corrosivity)	7.7	S.U.	1	---	9045	02/20/17
Resistivity*	880	Ohms-cm	1	---	SM 120.1M	02/20/17
Chloride	270	mg/Kg	1	0.6	300.0M	02/21/17
Sulfate	890	mg/Kg	1	0.6	300.0M	02/21/17

*Sample was extracted using a 1:3 ratio of soil and DI water.
DF: Dilution Factor

DF: Dilution Factor
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
mg/Kg: Milligrams/Kilograms (ppm)

CAPCO Analytical Services, Inc.

Environmental and Analytical Services-Since 1994
California State Accredited Laboratory in Accordance with ELAP Certificate # 2332

CERTIFICATE OF ANALYSIS

Client: Earth Systems Southern California
CAS LAB NO: 170377-02
Sample ID: B2@0-5'
Analyst: GP

Date Sampled: 02/15/17
Date Received: 02/16/17
Sample Matrix: Soil

WET CHEMISTRY ANALYSIS SUMMARY

COMPOUND	RESULTS	UNITS	DF	PQL	METHOD	ANALYZED
pH (Corrosivity)	8.1	S.U.	1	---	9045	02/20/17
Resistivity*	2400	Ohms-cm	1	---	SM 120.1M	02/20/17
Chloride	17	mg/Kg	1	0.6	300.0M	02/21/17
Sulfate	330	mg/Kg	1	0.6	300.0M	02/21/17

*Sample was extracted using a 1:3 ratio of soil and DI water.
DF: Dilution Factor

DF: Dilution Factor
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
mg/Kg: Milligrams/Kilograms (ppm)

COOPER

Hydraulic Conductivity
ASTM D 5084
Method C: Falling Head Rising Tailwater

Job No:	780-008	Boring:	TP-5	Date:	04/06/17
Client:	Earth Systems	Sample:	12% Cement	By:	MD/PJ
Project:	VT-24872-02	Depth, ft.:		Remolded:	95% of 113 pcf @ 15%(OPT)+12% Cement

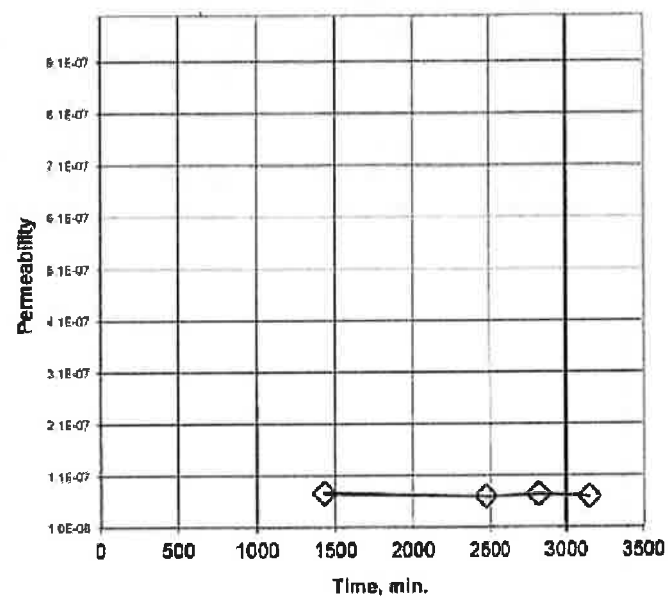
Visual Classification: Brown Clayey SAND (+12% Cement)

Max Sample Pressures, psi:			
Cell:	Bottom	Top	Avg. Sigma3
84	79.5	78.5	5

B: = >0.95 ("B" is an indication of saturation)

Max Hydraulic Gradient: = 14

Date	Minutes	Head, (in)	K,cm/sec
4/1/2017	0.00	42.69	Start of Test
4/2/2017	1429.00	39.74	7.6E-08
4/3/2017	2468.00	38.04	6.9E-08
4/3/2017	2828.00	37.34	7.3E-08
4/3/2017	3147.00	36.94	6.9E-08



Average Hydraulic Conductivity: 7.E-08 cm/sec

Sample Data:	Initial (As-Received)		Final (At-Test)
Height, in	3.00		3.09
Diameter, in	2.38		2.39
Area, in2	4.43		4.47
Volume in3	13.29		13.78
Total Volume, cc	217.8		225.9
Volume Solids, cc	141.8		141.8
Volume Voids, cc	76.0		84.1
Void Ratio	0.5		0.6
Total Porosity, %	34.9		37.2
Air-Filled Porosity (θa),%	13.8		1.2
Water-Filled Porosity (θw),%	21.1		36.0
Saturation, %	60.4		96.7
Specific Gravity	2.70	Assumed	2.70
Wet Weight, gm	428.7		464.1
Dry Weight, gm	382.8		382.8
Tare, gm	0.00		0.00
Moisture, %	12.0		21.2
Wet Bulk Density, pcf	122.8		128.2
Dry Bulk Density, pcf	109.7		105.8
Wet Bulk Dens.pb, (g/cm^3)	1.97		2.05
Dry Bulk Dens.pb, (g/cm^3)	1.76		1.69

Remarks:

Hydraulic Conductivity
ASTM D 5084
Method C: Falling Head Rising Tailwater

Job No:	780-008	**Boring:**	TP-5	**Date:**	04/06/17
Client:	Earth Systems	**Sample:**	+6% Cement	**By:**	MD/PJ
Project:	VT-24872-02	**Depth, ft.:**		**Remolded:**	95% of 113 pcf @ 15%(OPT)+6% Cement

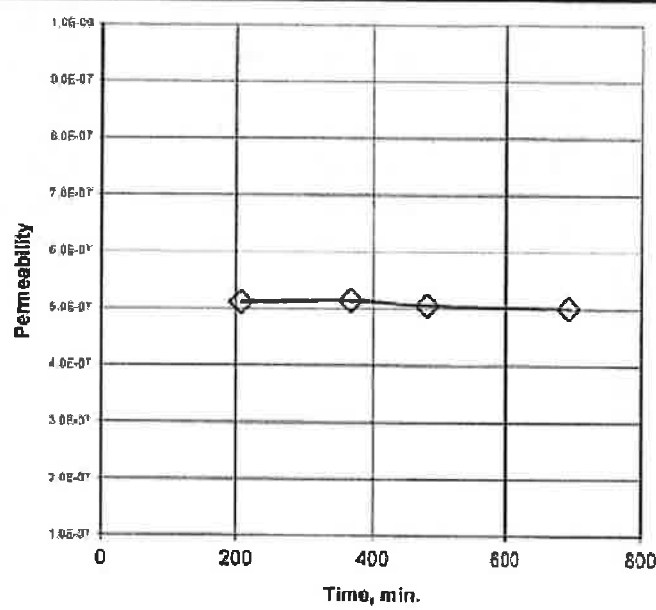
Visual Classification: Brown Clayey SAND (+6% Cement)

Max Sample Pressures, psi:			
Cell:	Bottom	Top	Avg. Sigma3
84	79.5	78.5	5

B: = >0.95 ("B" is an indication of saturation)

Max Hydraulic Gradient: = 9

Date	Minutes	Head, (in)	K,cm/sec
4/3/2017	0.00	28.69	Start of Test
4/3/2017	207.00	26.79	5.1E-07
4/3/2017	368.00	25.39	5.1E-07
4/3/2017	479.00	24.49	5.1E-07
4/3/2017	692.00	22.79	5.0E-07



Average Hydraulic Conductivity: 5.E-07 cm/sec

Sample Data:	Initial (As-Received)		Final (At-Test)
Height, in	3.00		3.09
Diameter, in	2.38		2.38
Area, in2	4.43		4.45
Volume in3	13.29		13.74
Total Volume, cc	217.8		225.1
Volume Solids, cc	140.1		140.1
Volume Voids, cc	77.6		85.0
Void Ratio	0.6		0.6
Total Porosity, %	35.7		37.7
Air-Filled Porosity (θa),%	12.7		1.1
Water-Filled Porosity (θw),%	23.0		36.6
Saturation, %	64.4		97.1
Specific Gravity	2.70	Assumed	2.70
Wet Weight, gm	428.4		460.9
Dry Weight, gm	378.4		378.4
Tare, gm	0.00		0.00
Moisture, %	13.2		21.8
Wet Bulk Density, pcf	122.7		127.8
Dry Bulk Density, pcf	108.4		104.9
Wet Bulk Dens.ρb, (g/cm^3)	1.97		2.05
Dry Bulk Dens.ρb, (g/cm^3)	1.74		1.68

Remarks:

Hydraulic Conductivity
ASTM D 5084
Method C: Falling Head Rising Tailwater

Job No:	780-008	**Boring:**	TP-5	**Date:**	04/06/17
Client:	Earth Systems	**Sample:**	+9% Cement	**By:**	MD/PJ
Project:	VT-24872-02	**Depth, ft.:**		**Remolded:**	95% of 113 pcf @ 15%(OPT)+9% Cement

Visual Classification: Brown Clayey SAND (+9% Cement)

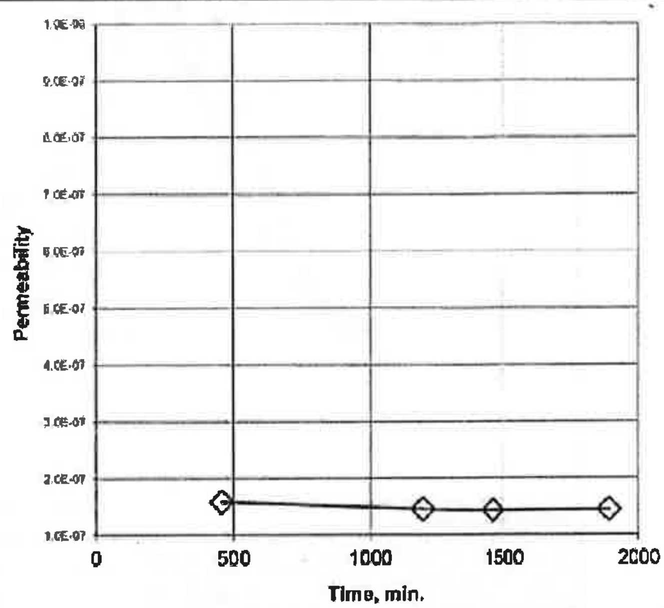
Max Sample Pressures, psi:

Cell:	Bottom	Top	Avg. Sigma3
84	79.5	78.5	5

B: = >0.95 ("B" is an indication of saturation)

Max Hydraulic Gradient: = 11

Date	Minutes	Head, (in)	K,cm/sec
3/29/2017	0.00	34.29	Start of Test
3/29/2017	458.00	32.69	1.6E-07
3/30/2017	1193.00	30.59	1.5E-07
3/30/2017	1458.00	29.89	1.4E-07
3/30/2017	1888.00	28.69	1.4E-07



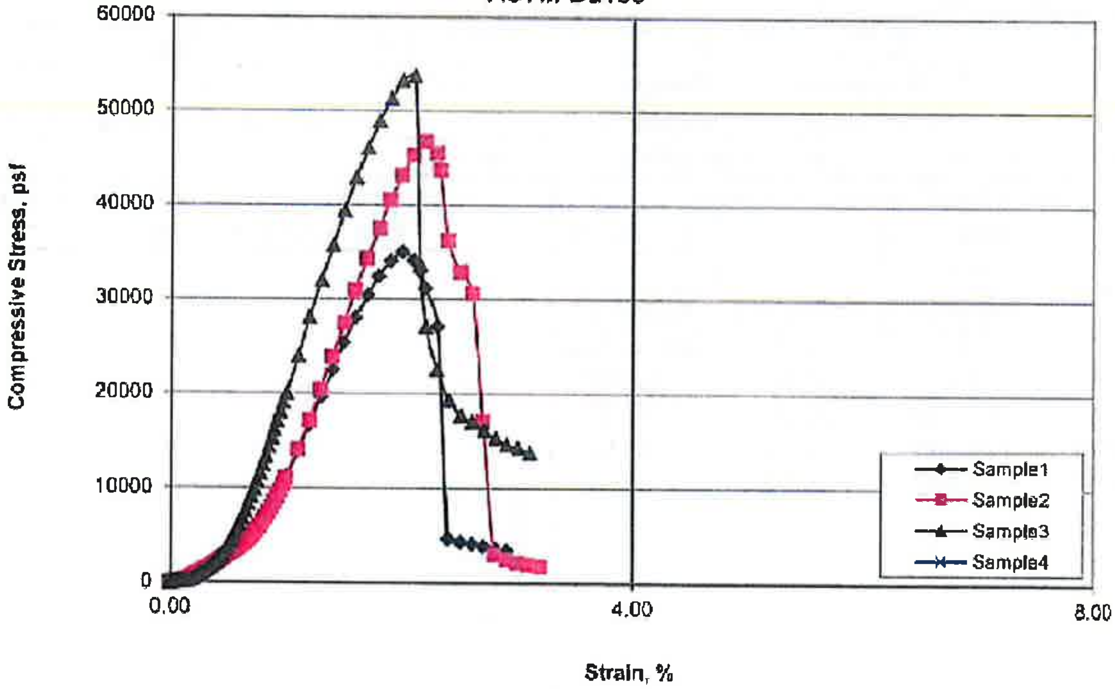
Average Hydraulic Conductivity: 1.E-07 cm/sec

Sample Data:	Initial (As-Received)		Final (At-Test)
Height, in	3.00		3.10
Diameter, In	2.37		2.38
Area, in2	4.41		4.43
Volume in3	13.23		13.71
Total Volume, cc	216.9		224.7
Volume Solids, cc	141.0		141.0
Volume Voids, cc	75.9		83.7
Void Ratio	0.5		0.6
Total Porosity, %	35.0		37.2
Air-Filled Porosity (θa),%	13.0		1.4
Water-Filled Porosity (θw),%	22.0		35.8
Saturation, %	62.8		96.2
Specific Gravity	2.70	Assumed	2.70
Wet Weight, gm	428.4		461.2
Dry Weight, gm	380.7		380.7
Tare, gm	0.00		0.00
Moisture, %	12.5		21.1
Wet Bulk Density, pcf	123.3		128.1
Dry Bulk Density, pcf	109.5		105.7
Wet Bulk Dens.ρb, (g/cm^3)	1.97		2.05
Dry Bulk Dens.ρb, (g/cm^3)	1.75		1.69

Remarks:

Unconfined Compressive Strength

ASTM D2166



Sample No.:	1	2	3	4	
Unconfined Compressive Strength, psf	35100	46804	53739		
Unconfined Compressive Strength, psi	243.8	325.0	373.2		
Undrained Shear Strength, psf	17550	23402	26870		
Failure Strain, %	2.0	2.2	2.1		
Strain Rate, % per minute	1.0	1.0	1.0		
Strain Rate, inches/minute	0.05	0.05	0.05		
Moisture Content, %	14.0	13.7	13.2		
Dry Density, pcf	107.6	108.0	108.8		
Saturation, %	66.7	66.2	65.1		
Void Ratio	0.567	0.560	0.549		
Specimen Diameter, inches	2.370	2.360	2.360		
Specimen Height, inches	5.04	5.08	5.06		
Height to Diameter Ratio	2.1	2.2	2.1		
Assumed Specific Gravity	2.70	2.70	2.70		

Sample Location				
	Boring	Sample	Depth, ft.	Soil Description
1	TP-5	+6% Cement		Brown Clayey SAND
2	TP-5	+9% Cement		Brown Clayey SAND
3	TP-5	+12% Cement		Brown Clayey SAND
4				

Job No.:	780-008	Type of Sample	Remolded
Client:	Earth Systems		
Project:	VT-24872-02		
Date:	3/20/2017	By:	MD/RU

COOPER

Remarks:
Sample 1- Remolded to 95% of 113 pcf @ 15%(OPT)+6% Cement.
Sample 2- Remolded to 95% of 113 pcf @ 15%(OPT)+9% Cement.
Sample 3- Remolded to 95% of 113 pcf @ 15%(OPT)+12% Cement.

ATTACHMENT D

2013 CBC & ASCE 7-10 Seismic Parameters

USGS Design Maps Report

Fault Parameters Table

2016 California Building Code (CBC) (ASCE 7-10) Seismic Design Parameters

			CBC Reference	ASCE 7-10 Reference
Seismic Design Category		E	Table 1613.5.6	Table 11.6-2
Site Class		D	Table 1613.5.2	Table 20.3-1
Latitude:		34.302 N		
Longitude:		-119.123 W		
Maximum Considered Earthquake (MCE) Ground Motion				
Short Period Spectral Reponse	S_S	**2.811 g**	Figure 1613.5	Figure 22-3
1 second Spectral Response	S_1	**1.084 g**	Figure 1613.5	Figure 22.4
Site Coefficient	F_a	1.00	Table 1613.5.3(1)	Table 11.4-1
Site Coefficient	F_v	1.50	Table 1613.5.3(2)	Table 11-4.2
	S_{MS}	2.811 g	$= F_a * S_S$	
	S_{M1}	1.626 g	$= F_v * S_1$	
Design Earthquake Ground Motion				
Short Period Spectral Reponse	S_{DS}	**1.874 g**	$= 2/3 * S_{MS}$	
1 second Spectral Response	S_{D1}	**1.084 g**	$= 2/3 * S_{M1}$	
	To	0.12 sec	$= 0.2 * S_{D1}/S_{DS}$	
	Ts	0.58 sec	$= S_{D1}/S_{DS}$	
Seismic Importance Factor	I	1.00	Table 1604.5	
	F_{PGA}	1.00		

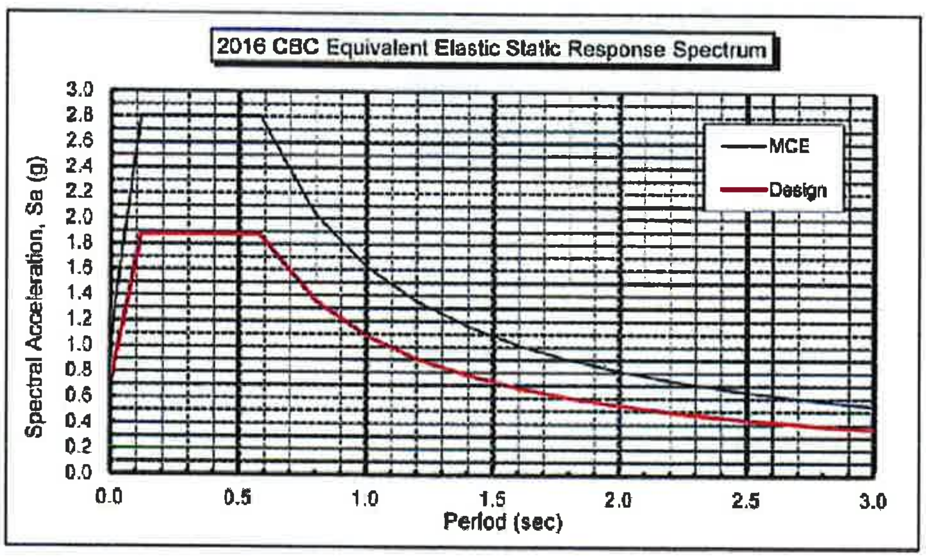


Table 11.5-1

Period T (sec)	Design Sa (g)
0.00	0.750
0.05	1.236
0.12	1.874
0.58	1.874
0.80	1.355
1.00	1.084
1.20	0.903
1.40	0.774
1.60	0.678
1.80	0.602
2.00	0.542
2.20	0.493
2.40	0.452
2.60	0.417
2.80	0.387
3.00	0.361

USGS Design Maps Summary Report

User–Specified Input

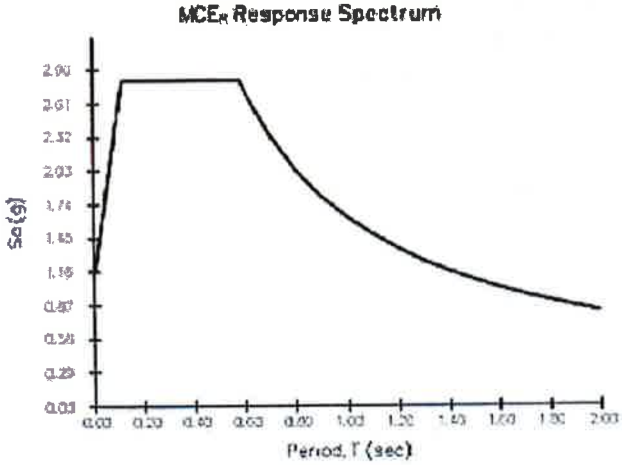
Report Title	Commercial Organics Processing Facility Wed May 17, 2017 19:18:21 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	34.30214°N, 119.12341°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

USGS–Provided Output

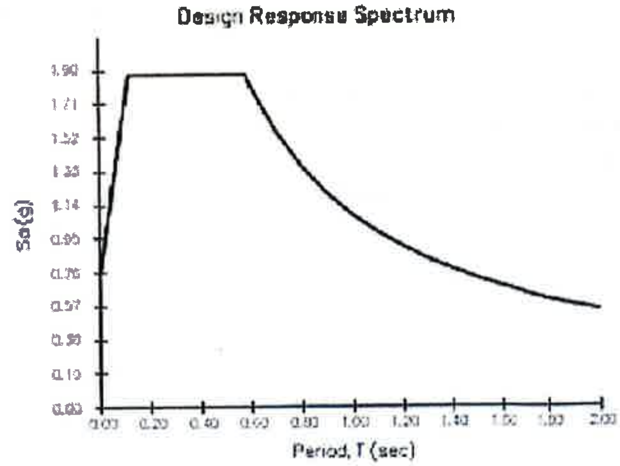
S_S =	2.811 g	S_{MS} =	2.811 g	S_{DS} =	1.874 g
S_1 =	1.084 g	S_{M1} =	1.627 g	S_{D1} =	1.084 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

MCE_R Response Spectrum



Design Response Spectrum



For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

USGS Design Maps Detailed Report

ASCE 7-10 Standard (34.30214°N, 119.12341°W)

Site Class D – "Stiff Soil", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1]	S_S = 2.811 g
From Figure 22-2 [2]	S_1 = 1.084 g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index PI > 20, • Moisture content w ≥ 40%, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk–Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4–1: Site Coefficient F_a

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at Short Period				
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = D and S_S = 2.811 g, F_a = 1.000

Table 11.4–2: Site Coefficient F_v

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at 1–s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = D and S_1 = 1.084 g, F_v = 1.500

Equation (11.4-1): $S_{MS} = F_aS_S = 1.000 \times 2.811 = 2.811$ g

Equation (11.4-2): $S_{M1} = F_vS_1 = 1.500 \times 1.084 = 1.627$ g

Section 11.4.4 — Design Spectral Acceleration Parameters

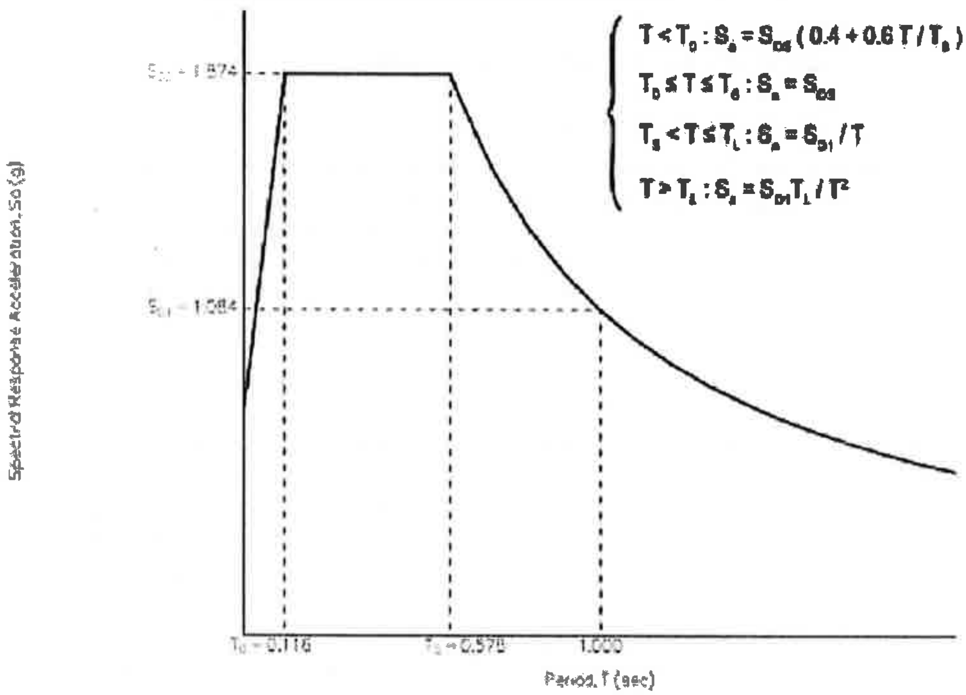
Equation (11.4-3): $S_{DS} = ⅔ S_{MS} = ⅔ \times 2.811 = 1.874$ g

Equation (11.4-4): $S_{D1} = ⅔ S_{M1} = ⅔ \times 1.627 = 1.084$ g

Section 11.4.5 — Design Response Spectrum

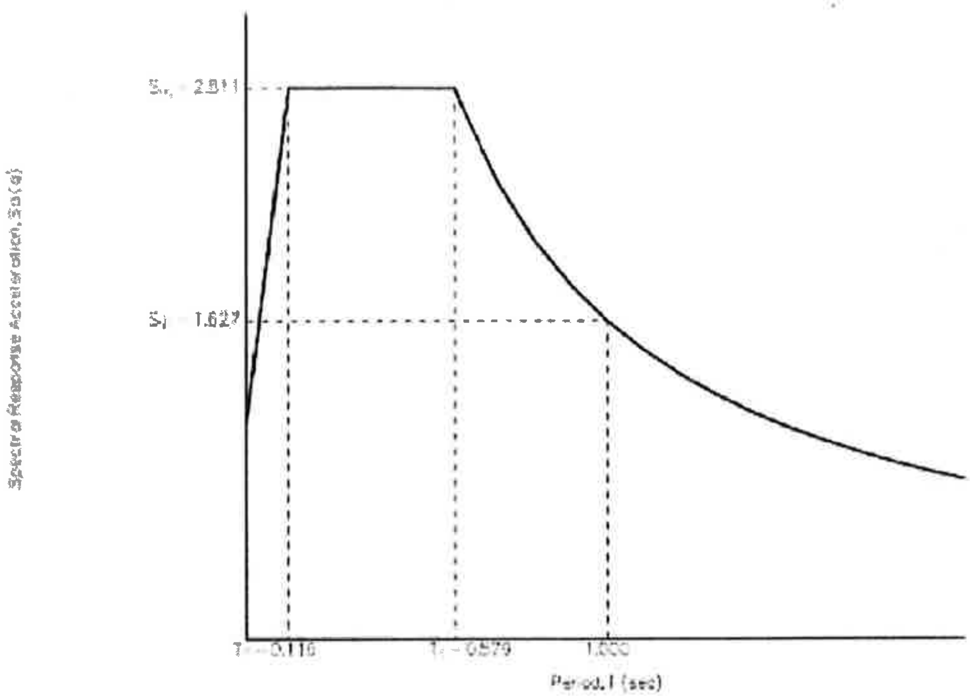
From Figure 22-12[3] $T_L = 8$ seconds

Figure 11.4-1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] PGA = 1.099

Equation (11.8-1): $PGA_M = F_{PGA}PGA = 1.000 \times 1.099 = 1.099$ g

Table 11.8-1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of PGA

For Site Class = D and PGA = 1.099 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] C_{RS} = 0.919

From Figure 22-18 [6] C_{R1} = 0.904

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 1.874 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 1.084 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = E

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

Table 1
Fault Parameters

Fault Section Name	Distance (miles)	Distance (km)	Avg Dip Angle (deg.)	Avg Dip Direction (deg.)	Avg Rake (deg.)	Trace Length (km)	Fault Type	Mean Mag	Mean Return Interval (years)	Slip Rate (mm/yr)
Oak Ridge (Onshore)	0.4	0.7	65	159	90	49	B	7.2		4
Ventura-Pitas Point	2.9	4.7	64	353	60	44	B	6.9		1
Simi-Santa Rosa	5.9	9.5	60	346	30	39	B	6.8		1
Sisar	8.5	13.7	29	168	na	20	B'	7.0		
San Cayetano	9.1	14.6	42	3	90	42	B	7.2		6
Oak Ridge (Offshore)	9.2	14.8	32	180	90	38	B	6.9		3
Red Mountain	10.6	17.1	56	2	90	101	B	7.4		2
Mission Ridge-Arroyo Parida-Santa Ana	11.2	17.9	70	176	90	69	B	6.8		0.4
Santa Ynez (East)	16.0	25.8	70	172	0	68	B	7.2		2
Malibu Coast (Extension), alt 1	16.5	26.6	74	4	30	35	B'	6.5		
Malibu Coast (Extension), alt 2	16.5	26.6	74	4	30	35	B'	6.9		
North Channel	17.2	27.8	26	10	90	51	B	6.7		1
Pine Mtn	19.0	30.5	45	5	na	62	B'	7.3		
Santa Susana, alt 2	20.6	33.2	53	10	90	43	B'	6.8		
Channel Islands Thrust	20.7	33.3	20	354	90	59	B	7.3		1.5
Santa Susana, alt 1	20.7	33.3	55	9	90	27	B	6.8		5
Malibu Coast, alt 1	20.7	33.4	75	3	30	38	B	6.6		0.3
Malibu Coast, alt 2	20.7	33.4	74	3	30	38	B	6.9		0.3
Pitas Point (Lower)-Montalvo	22.1	35.6	16	359	90	30	B	7.3		2.5
Anacapa-Dume, alt 1	22.6	36.4	45	354	60	51	B	7.2		3
Anacapa-Dume, alt 2	22.6	36.4	41	352	60	65	B	7.2		3
Channel Islands Western Deep Ramp	22.8	36.7	21	204	90	62	B'	7.3		
Del Valle	22.8	36.8	73	195	90	9	B'	6.3		
Holser, alt 1	23.1	37.2	58	187	90	20	B	6.7		0.4
Holser, alt 2	23.1	37.2	58	182	90	17	B'	6.7		
Santa Cruz Island	23.4	37.6	90	188	30	69	B	7.1		1
Northridge Hills	23.8	38.3	31	19	90	25	B'	7.0		
Northridge	24.8	39.8	35	201	90	33	B	6.8		1.5
Pitas Point (Upper)	26.6	42.8	42	15	90	35	B	6.8		1
Shelf (Projection)	27.2	43.8	17	21	na	70	B'	7.8		
Big Pine (Central)	28.2	45.3	76	167	na	23	B'	6.3		
San Gabriel	29.7	47.8	61	39	180	71	B	7.3		1
Big Pine (East)	30.0	48.4	73	338	na	23	B'	6.6		
Big Pine (West)	30.4	49.0	50	2	na	18	B'	6.5		
Santa Cruz Catalina Ridge	30.7	49.4	90	38	na	137	B'	7.3		
San Pedro Basin	31.1	50.1	88	51	na	69	B'	7.0		
Oak Ridge (Offshore), west extension	31.8	51.1	67	195	na	28	B'	6.1		
Santa Monica Bay	31.9	51.3	20	44	na	17	B'	7.0		
Santa Ynez (West)	32.2	51.8	70	182	0	63	B	6.9		2
Compton	35.3	56.7	20	34	90	65	B'	7.5		

Reference: USGS OFR 2007-1437 (CGS SP 203) Based on Site Coordinates of 34.30214 Latitude, -119.12341 Longitude

Mean Magnitude for Type A Faults based on 0.1 weight for unsegmented section, 0.9 weight for segmented model (weighted by probability of each scenario with section listed as given on Table 3 of Appendix G in OFR 2007-1437). Mean magntude is average of Ellworths-B and Hanks & Bakun moment area relationship.

ATTACHMENT E

Results of Seismically-Induced Settlement Analyses

CPT-LIQUEFY.XLS - A SPREADSHEET FOR EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL USING CPT DATA
Developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Project: Commercial Organics Processing Facility
Job No: VT-24872-02
Date: 5/17/2017
Sounding: CPT-1

Liquefaction Analysis using 1998 NCEER (Robertson & Wride) method
Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5

Plot: 1
Method Used: 1 1998 NCEER (Robertson & Wride)

EARTHQUAKE INFORMATION:
Magnitude: 7 7.5
PGA, g: 1.10 0.92
MSF: 1.19
GWT, feet: 24.0
Calc GWT, feet: 15.0

Averaging Increment: 3 0.15 m
Ignore 1st/last increment into sand/silt soils: 1 yes
Induced CSR (M=7.5) = 0.65*PGA*(po/p'o)*rd/MSF
Ignore/remediate upper: 0.00 m
Clean Sand Qc1n = C_q*K_c*K_s*Qc
Unit Weight of unsaturated soils: 115 pcf
SF = $CRR_{7.5}$*K_σ/CSR
Unit Weight of saturated soils: 130 pcf
Limiting Ic for liquefiable soils: 2.60
Limiting Ic for K_c: 2.5

Use Moss @ F_c: 15%
Use Tokimatsu & Seed (0) or Ishihara & Yoshimine (1): 0
Required SF: 1.50 Max $\Delta N_{1(60)}$ - sand liquefied: 5.5
Min SF of Liquefiable Layers: 0.17 Min $\Delta N_{1(60)}$ - non liquefied: 10.0
Avg SF of Liquefiable Layers: 0.37

Total Liquefied Thickness (feet): 3.0
Total Induced Subsidence (inches): 0.5

SETTLEMENT OF DRY SANDS
Qc1n / N1(60) Ratio for clean sand
$p = 0.67 \cdot po$
$\tau_{av} = 0.65 \cdot PGA \cdot po \cdot rd$
$G_{max} = 447 \cdot N_{1(60)}^{1/3} \cdot p^{0.5}$
$a = 0.0389 \cdot (p/1) + 0.124$
$b = 6400 \cdot (p/1)^{-0.6}$
$\gamma = [1 + a \cdot EXP(b \cdot \tau_{av}/G_{max})]/(1+a) \cdot \tau_{av}/G_{max}$
$E_{15} = \gamma \cdot (N_{1(60)}/20)^{-1.2}$
$Nc = (MAG-4)^{2.17}$
$E_{nc} = (Nc/15)^{0.45} \cdot E15$
$S = 2 \cdot H \cdot E_{nc}$
Nc = 10.8

Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa	Moss Δqc MPa	Moss qc,mod MPa	Moss eff K_c	Qc1n	Ic	Override	Liquef. Suscept. (0 or 1)	Rel Dens. Dr (%)	K_c	K_s	Clean Sand Qc1n	K_σ	CRR	Induced M=7.5 CSR	Liquefac. Safety Factor	Qc1n $N_{1(60)}$ Ratio	Equiv. $N_{1(60)}$	FC Adj $\Delta N_{1(60)}$	Equiv. $N_{1(60)cs}$	Volumetric Strain (%)	p (tsf)	G_{max} (tsf)	τ_{av} (tsf)	Shear Strain γ	Strain E_{15}	Strain Enc	Dry Sand Subsidence (in.)
0.49	0.15	35.07	2.14	6.09	3.36	115	0.028	0.028	1.000	6.09	0.60	1.70	56.31	5.71	5.00	10.71		56.35	2.54		0			1.00		1.00		0.399	Non-Liq.	3.8	14.7			0.00	0.019						
0.98	0.30	26.39	1.17	4.43	2.52	115	0.057	0.057	1.000	4.44	0.60	1.70	42.27	4.29	4.36	8.66		42.36	2.62		0			1.00		1.00		0.399	Non-Liq.	3.9	11.0			0.00	0.038						
1.48	0.45	18.14	1.47	6.08	1.74	115	0.085	0.085	0.999	6.12	0.89	1.70	29.01	2.95	5.00	7.95		29.14	2.93		0			1.00		1.00		0.399	Non-Liq.	3.3	8.9			0.00	0.057						
1.97	0.60	13.79	0.98	7.12	1.32	115	0.113	0.113	0.997	7.18	0.90	1.70	21.97	2.24	6.00	7.24		22.15	2.97		0			1.00		1.00		0.398	Non-Liq.	3.2	7.0			0.00	0.076						
2.46	0.75	12.30	0.65	5.26	1.19	115	0.141	0.141	0.996	5.32	0.89	1.70	19.68	2.02	4.99	7.01		19.91	2.92		0			1.00		1.00		0.398	Non-Liq.	3.3	6.1			0.00	0.095						
2.95	0.90	10.22	0.44	4.35	0.98	115	0.170	0.170	0.995	4.42	0.89	1.70	16.14	1.66	4.27	5.93		16.42	2.93		0			1.00		1.00		0.397	Non-Liq.	3.3	5.0			0.00	0.114						
3.44	1.05	11.84	0.57	4.80	1.13	115	0.198	0.198	0.994	4.88	0.88	1.70	18.76	1.93	4.77	6.69		19.02	2.91		0			1.00		1.00		0.397	Non-Liq.	3.3	5.8			0.00	0.133						
3.94	1.20	13.67	0.90	6.62	1.31	115	0.226	0.226	0.993	6.73	0.90	1.70	21.61	2.23	4.98	7.21		21.97	2.96		0			1.00		1.00		0.396	Non-Liq.	3.2	6.8			0.00	0.152						
4.43	1.35	11.91	0.94	7.67	1.14	115	0.255	0.255	0.992	6.64	0.93	1.70	18.72	1.94	4.99	6.92		19.13	3.06		0			1.00		1.00		0.396	Non-Liq.	3.0	6.3			0.00	0.171						
4.92	1.50	11.12	0.80	7.19	1.06	115	0.283	0.283	0.990	7.38	0.92	1.70	17.41	1.81	4.98	6.79		17.87	3.05		0			1.00		1.00		0.395	Non-Liq.	3.0	5.0			0.00	0.190						
5.41	1.65	11.07	0.76	6.86	1.06	115	0.311	0.311	0.989	7.06	0.92	1.70	17.29	1.80	4.98	6.78		17.79	3.04		0			1.00		1.00		0.395	Non-Liq.	3.0	5.6			0.00	0.209						
5.91	1.80	10.39	0.73	7.02	1.00	115	0.340	0.340	0.988	7.28	0.93	1.70	16.15	1.69	4.98	6.67		16.70	3.07		0			1.00		1.00		0.395	Non-Liq.	3.0	5.6			0.00	0.226						
6.40	1.95	10.84	0.70	6.59	1.07	115	0.368	0.368	0.987	6.83	0.92	1.70	16.50	1.73	4.98	6.71		17.09	3.05		0			1.00		1.00		0.394	Non-Liq.	3.0	5.6			0.00	0.240						
6.89	2.10	10.43	0.69	6.62	1.00	115	0.396	0.396	0.986	6.88	0.93	1.70	16.13	1.70	4.98	6.67		16.76	3.06		0			1.00		1.00		0.394	Non-Liq.	3.0	5.6			0.00	0.265						
7.38	2.25	10.42	0.62	5.95	1.00	115	0.424	0.424	0.985	6.21	0.92	1.70	16.07	1.70	4.97	6.67		16.75	3.03		0			1.00		1.00		0.393	Non-Liq.	3.1	5.5			0.00	0.284						
7.87	2.40	12.88	0.50	3.88	1.23	115	0.453	0.453	0.984	4.00	0.87	1.70	19.94	1.99	3.71	5.71		20.66	2.83		0			1.00		1.00		0.393	Non-Liq.	3.5	6.0			0.00	0.303						
8.37	2.55	10.20	0.44	4.28	0.98	115	0.481	0.481	0.983	4.49	0.91	1.70	15.81	1.59	4.18	5.77		16.38	2.95		0			1.00		1.00		0.392	Non-Liq.	3.2	5.1			0.00	0.322						
8.86	2.70	8.23	0.44	5.30	0.79	115	0.509	0.509	0.982	5.65	0.95	1.70	12.41	1.29	4.97	6.25		13.22	3.09		0			1.00		1.00		0.392	Non-Liq.	3.0	6.5			0.00	0.341						
9.35	2.85	7.41	0.47	6.33	0.71	115	0.538	0.538	0.981	6.83	0.98	1.70	11.05	1.13	4.97	6.10		11.81	3.18		0			1.00		1.00		0.392	Non-Liq.	2.8	4.3			0.00	0.360						
9.84	3.00	5.27	0.32	5.98	0.50	115	0.566	0.566	0.979	6.70	1.00	1.70	7.58	0.86	4.96	5.82		8.47	3.30		0			1.00		1.00		0.391	Non-Liq.	2.5	3.3			0.00	0.379						
10.33	3.15	5.39	0.14	2.57	0.52	115	0.594	0.594	0.978	2.89	0.98	1.70	7.70	0.87	2.28	3.15		8.66	3.08		0			1.00		1.00		0.391	Non-Liq.	3.0	2.9			0.00	0.398						
10.83	3.30	6.35	0.21	3.37	0.61	115	0.623	0.623	0.977	3.73	0.96	1.66	9.01	0.93	3.16	4.09		9.98	3.09		0			1.00		1.00		0.390	Non-Liq.	3.0	3.4			0.00	0.417						
11.32	3.45	35.54	0.38	1.06	3.40	115	0.651	0.651	0.976	1.08	0.68	1.39	45.63	6.20	0.62	6.82		65.69	2.20		0			1.41		1.00		0.390	Non-Liq.	4.7	14.0			0.00	0.436						
11.81	3.60	38.89	0.42	1.09	3.72	115	0.679	0.679	0.975	1.11	0.67	1.35	48.54	6.57	0.65	7.22		69.51	2.19		0			1.41		1.00		0.389	Non-Liq.	4.7	14.7			0.00	0.455						
12.30	3.75	14.26	0.35	2.48	1.37	130	0.711	0.711	0.974	2.61	0.85	1.40	17.95	1.73	2.18	3.91		18.88	2.76		0			1.00		1.00		0.389	Non-Liq.	3.6	5.2			0.00	0.476						
12.80	3.90	5.50	0.27	4.97	0.53	130	0.743	0.743	0.973	5.74	1.00	1.42	6.40	0.71	4.92	5.62		7.40	3.32		0			1.00		1.00		0.389	Non-Liq.	2.5	3.0			0.00	0.498						
13.29	4.05	4.60	0.17	3.60	0.44	130	0.775	0.775	0.972	4.40	1.00	1.36	4.93	0.59	3.48	4.07		5.93	3.34		0			1.00		1.00		0.388	Non-Liq.	2.5	2.4			0.00	0.519						
13.78	4.20	4.49	0.13	2.71	0.45	130	0.807	0.807	0.971	3.28	1.00	1.31	4.81	0.53	2.43	3.02		3.81	3.28		0			1.00		1.00		0.388	Non-Liq.	2.6	2.3			0.00	0.541						
14.27	4.35	4.72	0.13	2.65	0.45	130	0.839	0.839	0.970	5.22	1.00	1.28	4.83	0.58	2.38	2.93		5.63	3.29		0			1.00		1.00		0.387	Non-Liq.	2.6	2.2			0.00	0.562						
14.76	4.50	4.63	0.12	2.92	0.44	130	0.871	0.871	0.969	3.11	1.00	1.21	4.31	0.53	2.22	2.76		5.31	3.31		0			1.00		1.00		0.387	Non-Liq.	2.5	2.1			0.00	0.584						
15.26	4.65	5.51	0.13	2.35	0.53	130	0.903	0.903	0.968	2.81	0.98	1.17	5.09	0.61	2.31	2.92		6.09	3.23		0			1.00		1.00		0.580	Non-Liq.	2.7	2.3			0.00	0.605						
15.75	4.80	5.99	0.15	2.56	0.57	130	0.935	0.935	0.967	3.03	0.98	1.13	5.40	0.64	2.59	3.23		6.40	3.22		0			1.00		1.00		0.589	Non-Liq.	2.7	2.4			0.00	0.626						
16.24	4.95	6.96	0.19	2.72	0.67	130	0.967	0.967	0.966	3.16	0.97	1.09	6.20	0.72	2.81	3.53		7.20	3.18		0			1.00		1.00		0.598	Non-Liq.	2.8	2.6			0.00	0.648						
16.73	5.10	7.82	0.24	3.04	0.75	130	0.999	0.999	0.965	3.49	0.96	1.06	6.81	0.78	3.23	4.01		7.81	3.17		0			1.00		1.00		0.606	Non-Liq.	2.8	2.8			0.00	0.669						
17.22	5.25	9.74	0.34	3.50	0.93	130	1.031	1.031	0.964	3.91	0.95	1.02	8.44	0.95	3.82	4.77		9.44	3.12		0			1.00		1.00		0.614	Non-Liq.	2.9	3.3			0.00	0.691						
17.72	5.40	15.23	0.63	4.15	1.46	130	1.063	1.063	0.962	4.40	0.91	1.00	13.33	1.45	4.67	6.12		14.33	3.00		0			1.00		1.00		0.622	Non-Liq.	3.1	4.8			0.00	0.712						
18.21	5.55	45.51	1.29	2.82	4.36	130	1.095	1.095	0.961	2.89	0.76	0.97	40.90	4.30	2.98	7.29		41.91	2.81		0			1.00		1.00		0.629	Non-Liq.	4.1	10.2			0.00	0.734						
18.70	5.70	55.45	1.84	3.32	5.32	130	1.127	1.127	0.960	3.39	0.76	0.95	49.04	7.33	3.63	10.58		70.43	2.50		0			1.41		1.00		0.636	Non-Liq.	4.1	17.1			0.00	0.755						
19.19	5.85	37.85	1.93	5.10	3.62	130	1.159	1.159	0.959	5.26	0.83	0.93	32.14	3.92	5.81	9.33		33.16	2.76		0			1.00		1.00		0.643	Non-Liq.	3.0	9.2			0.00	0.777						
19.69	6.00	65.43	1.55	2.35	6.28	130	1.191	1.191	0.958	2.40	0.71	0.92	55.99	8.48	2.41	10.89		80.22	2.35		0			1.41		1.00		0.649	Non-Liq.	4.4	18.2			0.00	0.798						
20.18	6.15	54.83	1.23	2.25	5.25	130	1.223	1.223	0.956	2.30	0.73	0.90	45.61	7.00	2.27	9.27		65.83	2.40		0			1.41		1.00		0.655	Non-Liq.	4.3	15.3			0.00	0.819						
20.67	6.30	33.07	1.22	3.70	3.17	130	1.255	1.255	0.955	3.84	0.82	0.87	26.13	2.96	4.16	7.13		27.16	2.73		0			1.00		0.99		0.661	Non-Liq.	3.8	7.4			0.00	0.841						
21.16	6.45	49.64	0.93	1.87	4.75	130	1.287	1.287	0.954	1.92	0.72	0.87	39.66	5.55	1.78	7.34		51.48	2.40		0			1.26		0.99		0.667	Non-Liq.	4.3	12.0			0.00	0.862						
21.65	6.60	16.63	0.70	4.17	1.61	130	1.319	1.319	0.952	4.53	0.91	0.82	12.00	1.44	4.81	6.25		13.02	3.04		0			1.00		0.99		0.672	Non-Liq.	3.1	4.3			0.00	0.884						
22.15	6.75	50.43	1.75	3.46	4.83	130	1.351	1.351	0.951	3.56	0.78	0.83	38.36	4.45	3.89	8.33		39.41	2.59		0			1.00		0.99		0.678	Non-Liq.	3.9	10.0			0.00	0.905						
22.64	6.90	51.94	2.75	5.30	4.97	130	1.383	1.383	0.950	5.45	0.82	0.80	38.41	4.60	5.92	10.52		39.48	2.72		0			1.00		0.98		0.683	Non-Liq.	3.7	18.7			0.00	0.927						
23.13	7.05	111.81	3.54	3.17	10.71	130	1.415	1.415	0.948	3.21	0.70	0.82	85.21	12.53	3.52	16.04		109.12	2.31		0			1.26		0.98		0.687	Non-Liq.	4.5	24.4			0.00	0.948						
23.62	7.20	165.02	4.55	2.76	15.80	130	1.447	1.447	0.946	2.79	0.65	0.82	128.12	18.47	2.99	21.45	1.18	160.88	2.18		1	97	1.56	1.26	251.5	0.96	Infin.	0.692	Non-Liq.	4.8	33.7	10.0	43.7	0.00	0.909	1,550	0.052	1.3E-03			
24.11	7.35	109.29	3.77	3.45	10.46	130	1.478	1.479	0.945	3.50	0.71	0.79	80.33	12.12	3.90	16.02		102.97	2.36		0			1.26		0.97		0.696	Non-Liq.	4.4	23.5			0.00	0.991						
24.61	7.50	47.37	2.60	5.48	4.54	130	1.511	1.500	0.943	5.66	0.83	0.75	32.44	4.09	5.95	10.05		33.50	2.78		0			1.00		0.97		0.700	Non-Liq.	3.8	8.4			0.00	1.012						
25.10	7.65	67.16	2.39	3.52	6.43	130	1.543	1.516	0.941	3.60	0.79	0.75	47.25	5.77	4.01	9.77		48.34	2.53		0			1.00		0.97		0.704	Non-Liq.	4.1	11.9			0.00	1.034						
25.59	7.80	16.89	1.50	4.90	1.62	130	1.575	1.533	0.940	9.79	0.94	0.68	10.08	1.38	5.98	7.36		11.08	3.31		0			1.00		0.97		0.708	Non-Liq.	2.5	4.4			0.00	1.055						
26.08	7.95	32.19	1.11	3.44	3.08	130	1.607	1.549	0.938	3.62	0.83	0.73	21.09	2.65	3.92	6.57		22.55	2.79		0			1.00		0.96		0.711	Non-Liq.	3.5	6.3			0.00	1.077						
26.57	8.10	74.44	2.11	2.83	7.13	130	1.639	1.566	0.936	2.89	0.73	0.75	51.75	9.55	3.11	13.08		63.52	2.43		0			1.56		0.96		0.715	Non-Liq.	4.2	18.7			0.00	1.098						
27.07	8.25	34.55	2.27	6.57	3.31	130	1.671	1.583	0.934	6.88	0.88	0.70	21.84	2.90	6.00	8.91		22.99	2.96		0			1.00		0.96		0.718	Non-Liq.	3.2	7.1			0.00	1.119						
27.56	8.40	22.01	1.65	7.52	2.11	130	1.703	1.599	0.932	8.11	0.94	0.68	13.07	1.80	6.01	7.81		14.09	3.17		0			1.00		0.95		0.721	Non-Liq.	2.8	5.1			0.00	1.141						
28.05	8.55	13.90	1.07	7.69	1.33	130	1.735	1.616	0.930	8.70	1.00	0.65	7.60	1.09	6.02	7.10		8.60	3.37		0			1.00		0.95		0.723	Non-Liq.	2.4	3.6			0.00	1.162						
28.54	8.70	38.52	1.15	2.98	3.69	130	1.767	1.633	0.928	3.11	0.80	0.71	24.61	3.12	3.31	6.43		25.70	2.89		0			1.00		0.95		0.726	Non-Liq.	3.7	6.9			0.00	1.184						
29.04	8.85	48.42	1.53	3.15	4.64	130	1.798	1.649	0.925	3.27	0.78	0.71	31.21	3.97	3.58	7.52		32.31	2.63		0			1.00		0.95		0.728	Non-Liq.	3.9	8.4			0.00	1.205						
29.53	9.00	107.34	1.61	1.50	10.28	130	1.831	1.666	0.923	1.52	0.64	0.75	74.72	11.08	1.34	12.42		95.87	2.13		0			1.26		0.95		0.731	Non-Liq.	4.8	19.8			0.00	1.227						
30.02	9.15	88.20	1.99	2.26	8.45	130	1.863	1.683	0.920	2.30	0.70	0.72	59.23	9.20	2.36	11.55	1.26	76.34	2.32		1	66	2.02	1.26	153.9	0.92	0.419	0.733	0.53	4.5	17.1	5.5	22.6	1.34	1.248	1,412	0.817	2.7E-03			
30.51	9.30	77.88	2.13	2.73	7.47	130	1.895	1.699	0.918	2.79	0.73	0.71	51.12	8.33	2.99	11.13		60.08	2.42		0			1.26		0.94		0.734	Non-Liq.	4.3	15.5			0.00	1.269						
31.00	9.45	59.40	1.78	3.00	5.69	130	1.927	1.716	0.915	3.09	0.76	0.69	37.73	4.84	3.38	8.21		38.96	2.55		0			1.00		0.94		0.736	Non-Liq.	4.0	5.7			0.00	1.291						
31.50	9.60	25.78	1.36	5.28	2.47	130	1.959	1.732	0.913	5.66	0.90	0.64	14.59	2.04	6.05	8.09		15.64	3.03		0			1.00		0.94		0.737	Non-Liq.	3.1	5.1			0.00	1.312						
31.99	9.75	19.55	0.93	4.75	1.87	130	1.991	1.749	0.910	5.21	0.92	0.63	10.58	1.49	5.71	7.21		11.62	3.12		0			1.00		0.94		0.739	Non-Liq.	2.9	4.0			0.00	1.334						

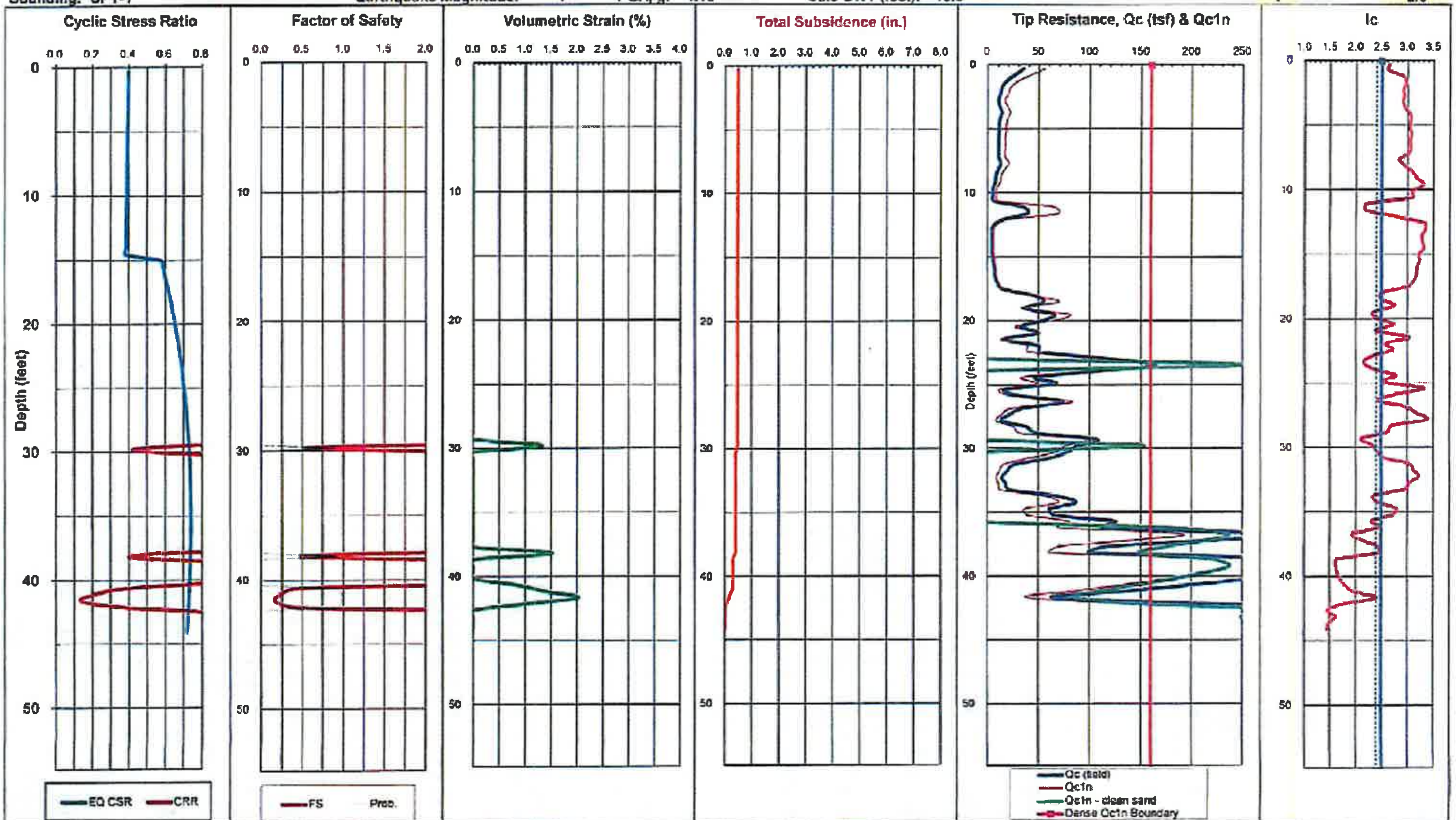
Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qt MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Mod. qc1 MPa	Mod. Δqc MPa	Mod. qc1ncs MPa	Mod. eff Kc	Qc1n	Ic	Overide	Liquef. Suscept. (0 or 1)	Rel Dens. Dr (%)	Kc	Kσ	Clean Sand Qc1n	Kα	CRR	Induced M=7.5 CSR	Liquefac. Safety Factor	Qc1n N1(60) Ratio	Equiv. N1(60)	FC Adj ΔN1(60)	Equiv. N1(60)cs	Volumetric Strain (%)	p (tsf)	Gmax (tsf)	τav (tsf)	Shear Strain γ	Strain Eγ	Strain Enc	Dry Sand Subsidence (in.)
32.48	9.90	14.44	0.59	4.07	1.38	130	2.023	1.768	0.907	4.64	0.95	0.62	7.37	1.05	4.80	5.86		8.40	3.21		0			1.00		0.93		0.740	Non-Liq.	2.7	3.1			0.00	1.355						
32.97	10.05	17.99	0.54	2.98	1.72	130	2.055	1.782	0.904	3.30	0.90	0.63	8.59	1.31	3.33	4.65		10.65	3.04		0			1.00		0.93		0.741	Non-Liq.	3.1	3.5			0.00	1.377						
33.46	10.20	21.53	0.60	2.78	2.05	130	2.087	1.799	0.901	3.03	0.87	0.63	11.75	1.58	3.07	4.66		12.82	2.94		0			1.00		0.93		0.742	Non-Liq.	3.2	4.0			0.00	1.398						
33.96	10.35	69.08	1.21	1.76	6.61	130	2.119	1.816	0.898	1.80	0.70	0.68	43.50	6.83	1.59	9.52		55.49	2.35		0			1.20		0.93		0.742	Non-Liq.	4.4	12.9			0.00	1.419						
34.45	10.50	86.70	2.54	2.93	8.30	130	2.151	1.832	0.894	2.99	0.73	0.67	53.87	8.92	3.27	12.19		69.58	2.43		0			1.25		0.93		0.743	Non-Liq.	4.2	16.4			0.00	1.441						
34.94	10.65	61.05	3.39	5.88	5.85	130	2.183	1.849	0.891	6.08	0.82	0.63	35.31	5.64	6.08	11.10		35.41	2.78		0			1.00		0.92		0.743	Non-Liq.	3.8	10.2			0.00	1.462						
35.43	10.80	66.11	3.47	5.24	6.33	130	2.215	1.866	0.888	5.38	0.81	0.63	38.43	5.44	6.06	11.50		39.35	2.71		0			1.00		0.92		0.743	Non-Liq.	3.7	10.7			0.00	1.484						
35.93	10.95	126.34	3.67	2.90	12.10	130	2.247	1.882	0.884	2.95	0.69	0.67	79.03	10.42	3.24	13.65		80.52	2.31		0			1.00		0.92		0.743	Non-Liq.	4.5	18.0			0.00	1.505						
36.42	11.10	113.01	4.55	4.03	10.82	130	2.279	1.899	0.880	4.10	0.75	0.65	68.40	9.38	4.75	14.13	1.61	69.57	2.46		1	82	2.55	1.00	177.7	0.88	Infin.	0.743	Non-Liq.	4.2	16.6	10.0	26.6	0.00	1.527	1.649	0.955	2.1E-03			
36.91	11.25	287.77	5.92	2.08	27.58	130	2.311	1.915	0.877	2.07	0.59	0.71	190.71	23.84	2.10	25.94	1.09	191.99	1.94		1	100	1.23	1.00	236.6	0.84	Infin.	0.742	Non-Liq.	5.2	37.0	10.0	47.0	0.00	1.548	2.007	0.965	1.2E-03			
37.40	11.40	219.80	6.14	2.80	21.03	130	2.343	1.932	0.873	2.82	0.64	0.68	139.58	16.29	3.09	21.38	1.17	141.12	2.13		1	91	1.51	1.00	213.6	0.84	Infin.	0.742	Non-Liq.	4.8	29.2	10.0	39.2	0.00	1.569	1.993	0.974	1.4E-03			
37.89	11.55	115.56	4.53	3.92	11.07	130	2.375	1.949	0.869	3.98	0.73	0.64	68.76	9.52	4.80	14.12	1.48	69.96	2.45		1	82	2.51	1.00	175.3	0.87	Infin.	0.741	Non-Liq.	4.2	16.6	10.0	26.6	0.00	1.591	1.683	0.982	2.0E-03			
38.39	11.70	101.25	3.39	3.35	9.70	130	2.406	1.965	0.865	3.42	0.73	0.64	59.83	8.20	3.84	12.04	1.47	61.02	2.44		1	58	2.47	1.00	150.9	0.87	0.400	0.740	0.47	4.2	14.4	5.5	19.9	1.53	1.612	1.539	0.991	2.9E-03			
38.88	11.85	320.48	3.05	0.95	30.69	130	2.438	1.982	0.861	0.96	0.50	0.73	218.62	25.07	0.61	25.68	1.02	220.59	1.65		1	100	1.00	1.00	221.5	0.83	Infin.	0.739	Non-Liq.	5.8	38.3	6.0	44.3	0.00	1.634	2.022	1.000	1.2E-03			
39.37	12.00	346.24	3.20	0.92	33.16	130	2.470	1.999	0.857	0.93	0.50	0.73	236.73	27.04	0.57	27.61	1.02	238.11	1.62		1	100	1.00	1.00	238.1	0.82	Infin.	0.736	Non-Liq.	5.8	40.8	6.8	47.6	0.00	1.655	2.085	1.008	1.2E-03			
39.86	12.15	317.30	2.94	0.93	30.39	130	2.502	2.015	0.852	0.93	0.50	0.72	215.72	24.62	0.57	25.20	1.02	217.10	1.65		1	100	1.00	1.00	217.1	0.82	Infin.	0.736	Non-Liq.	5.8	37.6	5.8	43.4	0.00	1.677	2.034	1.016	1.2E-03			
40.35	12.30	263.65	2.41	0.92	25.25	130	2.534	2.032	0.848	0.92	0.52	0.71	176.36	20.21	0.56	20.77	1.00	177.73	1.70		1	100	1.04	1.00	184.9	0.82	Infin.	0.735	Non-Liq.	5.7	31.4	5.6	37.0	0.00	1.698	1.940	1.023	1.4E-03			
40.85	12.45	203.07	1.89	0.93	19.45	130	2.566	2.049	0.843	0.94	0.55	0.70	132.54	15.34	0.58	15.92	1.04	133.90	1.80		1	89	1.11	1.00	148.2	0.81	0.382	0.733	0.42	5.5	24.5	5.2	29.6	0.86	1.720	1.814	1.031	1.7E-03			
41.34	12.60	138.00	1.34	0.97	13.21	130	2.598	2.065	0.839	0.98	0.59	0.67	88.70	10.21	0.63	10.84	1.06	88.02	1.95		1	72	1.24	1.00	109.5	0.81	0.202	0.732	0.22	5.2	17.0	4.9	21.9	1.39	1.741	1.650	1.038	2.3E-03			
41.83	12.75	84.65	1.05	1.65	8.11	130	2.630	2.082	0.834	1.70	0.71	0.62	38.02	4.68	1.54	6.22	1.33	37.23	2.40		1	38	2.32	1.00	88.3	0.98	0.140	0.730	0.17	4.3	8.7	5.5	14.2	2.04	1.762	1.439	1.045	3.9E-03			
42.32	12.90	201.98	1.68	0.83	19.34	130	2.662	2.098	0.830	0.84	0.54	0.69	130.77	14.97	0.44	15.41	1.03	132.15	1.77		1	88	1.09	1.00	143.7	0.81	0.358	0.728	0.39	5.5	23.9	4.8	28.7	1.00	1.784	1.829	1.052	1.7E-03			
42.81	13.05	443.19	3.15	0.71	42.44	130	2.694	2.115	0.825	0.71	0.50	0.71	294.86	33.56	0.28	33.84	1.01	296.27	1.47		1	100	1.00	1.00	296.3	0.80	Infin.	0.726	Non-Liq.	6.1	48.4	10.0	58.4	0.00	1.805	2.330	1.059	8.5E-04			
43.31	13.20	376.25	3.66	0.97	36.03	130	2.726	2.132	0.820	0.98	0.50	0.70	249.12	29.02	0.83	29.86	1.02	250.54	1.62		1	100	1.00	1.00	250.5	0.80	Infin.	0.724	Non-Liq.	5.8	43.0	7.1	50.1	0.00	1.827	2.227	1.065	1.1E-03			
43.80	13.35	396.03	2.68	0.68	37.92	130	2.758	2.148	0.816	0.68	0.50	0.70	261.25	29.52	0.23	29.76	1.01	262.69	1.49		1	100	1.00	1.00	262.7	0.80	Infin.	0.721	Non-Liq.	6.1	43.2	9.4	52.5	0.00	1.848	2.276	1.071	1.0E-03			
44.29	13.50	428.61	2.81	0.66	41.04	130	2.790	2.165	0.811	0.66	0.50	0.70	281.77	31.89	0.21	32.10	1.01	283.20	1.46		1	100	1.00	1.00	283.2	0.79	Infin.	0.719	Non-Liq.	6.1	45.1	10.0	56.1	0.00	1.870	2.339	1.077	9.6E-04			

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

Commercial Organics Processing Facility   Project No: VT-24872-02   Method Used: 1   1998 NCEER (Robertson & Wride)

Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5   Plot 1   Limiting Ic: 2.6

Sounding: CPT-1   Earthquake Magnitude: 7   PGA, g: 1.10   Calc GWT (feet): 15.0



Total Thickness of Liquefiable Layers: 3.0 feet   Estimated Total Ground Subsidence (Settlement): 0.5 inches

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

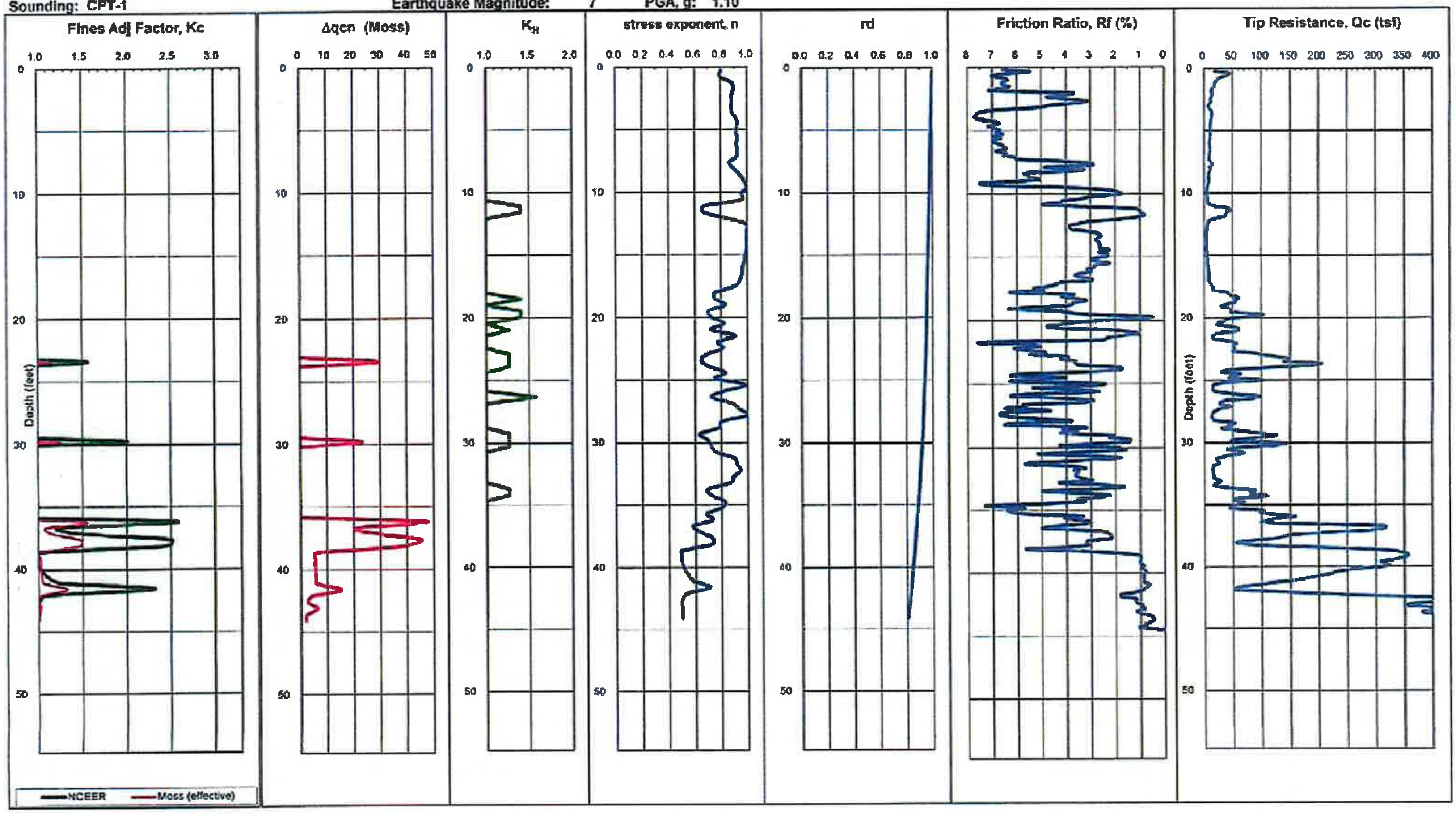
3 avg increment =0.15m Qc1n/N1(60): 5

Ignore 1st/last increment into sand/silt soils: 0

Method Used: 1998 NCEER (Robertson & Wride)

Sounding: CPT-1

Earthquake Magnitude: 7 PGA, g: 1.10



CPT-1 LIQUEFY.XLS - A SPREADSHEET FOR EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL USING CPT DATA

Developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Project: Commercial Organics Processing Facility
Job No: VT-24472-02
Date: 5/17/2017
Sounding: CPT-2

Liquefaction Analysis using 1998 NCEER (Robertson & Wride) method
Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5

Plot: 2
Method Used: 1 1998 NCEER (Robertson & Wride)

EARTHQUAKE INFORMATION:

Magnitude: 7 7.5
PGA, g: 1.10 0.92
MSF: 1.19
GWT, feet: 24.0
Calc GWT, feet: 15.0

Averaging Increment: 3 0.15 m
Induced CSR (M=7.5) = 0.65*PGA*(po/p'o)*rd/MSF
Clean Sand Qc1n = Cq*Kc*Kα*Qc
SF = CRR*Kσ*Kα/CSR

Ignore 1st/last increment into sand/silt soils: 1 yes
Ignore/intermediate upper: 0.00 m
Unit Weight of unsaturated soils: 115 pcf
Unit Weight of saturated soils: 130 pcf
Limiting Ic for liquefiable soils: 2.50 Limiting Ic for Kσ: 2.5

Use Moss @ PL: 15%
Use Tokimatsu & Seed (0) or Ishihara & Yoshimine (1): 0
Required SF: 1.50 Max ΔN1(60) - sand/silt: 5.5
Min SF of Liquefiable Layers: 0.28 Max ΔN1(60) - non-sand: 10.0
Avg SF of Liquefiable Layers: 0.43

Total Liquefied Thickness (feet)	Total Induced Subsidence (inches)
6.5	5.2

SETTLEMENT OF DRY SANDS

Qc1n / N1(60) Ratio for clean sand:

$p = 0.67 \cdot po$

$\tau_{av} = 0.65 \cdot PGA \cdot po \cdot rd$

$G_{max} = 447 \cdot N_{1(60)}^{1/3} \cdot p^{0.5}$

$a = 0.0389 \cdot (p/1) + 0.124$

$b = 6400 \cdot (p/1)^{-0.6}$

$\gamma = [1 + a \cdot EXP(b \cdot \tau_{av}/G_{max})] / [1 + a] \cdot \tau_{av}/G_{max}$

$E_{15} = \gamma \cdot (N_{1(60)cs}/20)^{-1.2}$

$Nc = (MAG-4)^{2.17}$

$E_{nc} = (Nc/15)^{0.45} \cdot E15$

$S = 2 \cdot H \cdot E_{nc}$ Nc = 10.8

Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa	Moss Δqc MPa	Moss qc_thresh MPa	Moss eff Kc	Qc1n	Ic	Override	Liquef. Suscept. (0 or 1)	Rel Dens Dr(%)	Kc	Kσ	Clean Sand Qc1n	Kα	CRR	Induced M=7.5 CSR	Liquefac. Safety Factor	Qc1n/N1(60) Ratio	Equiv N1(60)	FC Adj ΔN1(60)	Equiv N1(60)cs	Volumetric Strain (%)	p (tsf)	Gmax (tsf)	τav (tsf)	Shear Strain γ	Strain E15	Strain Enc	Dry Sand Subsidence (in.)
0.49	0.15	16.39	0.10	0.64	1.57	115	0.028	0.028	1.000	0.64	0.70	1.70	20.29	2.67	0.15	2.82	1.06	26.34	2.29		1	21	1.93	1.00	50.7	1.00	0.092	0.399	Non-Liq.	4.5	5.8	4.3	10.1	4.79	0.019	133	0.013	1.2E-02	2.8E-02	2.4E-02	0.283
0.98	0.30	17.95	0.10	0.57	1.72	115	0.057	0.057	1.000	0.57	0.63	1.70	20.70	2.92	0.08	3.00	1.03	28.65	2.24		1	25	1.78	1.00	50.8	1.00	0.092	0.399	Non-Liq.	4.8	6.2	3.0	10.2	4.23	0.038	169	0.027	1.1E-02	2.4E-02	2.1E-02	0.250
1.48	0.45	14.15	0.18	1.24	1.38	115	0.085	0.085	0.999	1.24	0.76	1.70	22.00	2.30	0.82	3.12	1.30	22.74	2.49		1	15	2.72	1.00	61.9	1.00	0.102	0.399	Non-Liq.	4.1	5.5	6.9	12.4	2.00	0.057	247	0.040	9.5E-03	1.2E-02	1.0E-02	0.118
1.97	0.60	10.52	0.07	0.66	1.01	115	0.112	0.112	0.997	0.67	0.75	1.70	16.70	1.72	0.18	1.89		16.97	2.48		0			1.00		1.00		0.398	Non-Liq.	4.2	4.1			0.00	0.076						
2.46	0.75	6.28	0.03	0.43	0.60	115	0.141	0.141	0.996	0.44	0.79	1.70	9.57	1.02	0.00	1.02		10.10	2.52		0			1.00		1.00		0.398	Non-Liq.	3.9	2.6			0.00	0.095						
2.95	0.90	5.79	0.03	0.47	0.55	115	0.170	0.170	0.995	0.49	0.81	1.70	8.88	0.93	0.00	0.93		9.15	2.66		0			1.00		1.00		0.397	Non-Liq.	3.6	2.4			0.00	0.114						
3.44	1.05	5.01	0.03	0.53	0.48	115	0.198	0.198	0.994	0.55	0.83	1.70	7.72	0.82	0.04	0.85		8.05	2.76		0			1.00		1.00		0.397	Non-Liq.	3.6	2.2			0.00	0.133						
3.94	1.20	6.17	0.03	0.42	0.59	115	0.226	0.226	0.993	0.44	0.80	1.70	9.58	1.00	0.00	1.00		9.92	2.64		0			1.00		1.00		0.396	Non-Liq.	3.8	2.6			0.00	0.152						
4.43	1.35	6.68	0.03	0.40	0.63	115	0.255	0.255	0.992	0.41	0.79	1.70	10.18	1.07	0.00	1.07		10.57	2.60		0			1.00		1.00		0.396	Non-Liq.	3.9	2.7			0.00	0.171						
4.92	1.50	18.05	0.04	0.22	1.73	115	0.283	0.283	0.990	0.22	0.64	1.70	28.59	3.72	0.00	3.72		28.73	2.09		0			1.26		1.00		0.395	Non-Liq.	4.9	7.5			0.00	0.190						
5.41	1.65	21.52	0.12	0.56	2.06	115	0.311	0.311	0.989	0.57	0.66	1.70	34.08	4.43	0.07	4.50		43.73	2.17		0			1.26		1.00		0.395	Non-Liq.	4.8	9.2			0.00	0.209						
5.91	1.80	6.77	0.11	1.58	0.65	115	0.340	0.340	0.988	1.64	0.90	1.70	10.33	1.10	1.17	2.28		10.88	2.84		0			1.00		1.00		0.395	Non-Liq.	3.4	2.2			0.00	0.228						
6.40	1.95	6.14	0.02	0.37	0.59	115	0.368	0.368	0.987	0.40	0.80	1.70	9.27	1.00	0.00	1.00		9.87	2.63		0			1.00		1.00		0.394	Non-Liq.	3.8	2.6			0.00	0.246						
6.89	2.10	9.04	0.02	0.27	0.87	115	0.396	0.396	0.986	0.28	0.74	1.70	13.88	1.70	0.00	1.70		18.75	2.42		0			1.15		1.00		0.394	Non-Liq.	4.3	3.9			0.00	0.265						
7.38	2.25	9.85	0.03	0.26	0.94	115	0.424	0.424	0.985	0.27	0.73	1.70	15.15	1.85	0.00	1.85	1.00	19.25	2.38		1	6	1.00	1.15	18.2	1.00	0.065	0.393	Non-Liq.	4.3	4.2	0.0	4.2	20.00	0.284	385	0.199	7.1E-02	4.6E-01	1.0E-01	1.181
7.87	2.40	10.90	0.03	0.28	1.04	115	0.453	0.453	0.984	0.29	0.72	1.70	16.75	2.05	0.00	2.05	1.00	20.19	2.35		1	10	1.00	1.15	20.2	1.00	0.067	0.393	Non-Liq.	4.4	4.6	0.0	4.6	20.00	0.303	409	0.212	5.9E-02	3.3E-01	1.0E-01	1.181
8.37	2.55	11.83	0.08	0.71	1.13	115	0.481	0.481	0.983	0.74	0.78	1.70	18.24	2.22	0.23	2.46		21.92	2.46		0			1.15		1.00		0.392	Non-Liq.	4.2	5.2			0.00	0.322						
8.86	2.70	11.52	0.11	0.93	1.10	115	0.509	0.509	0.982	0.98	0.79	1.70	17.69	1.87	0.48	2.35		18.51	2.53		0			1.00		1.00		0.392	Non-Liq.	4.0	4.6			0.00	0.341						
9.35	2.85	10.25	0.08	0.73	0.98	115	0.538	0.538	0.981	0.77	0.79	1.70	15.60	1.67	0.26	1.92		16.46	2.51		0			1.00		1.00		0.392	Non-Liq.	4.0	4.1			0.00	0.360						
9.84	3.00	8.44	0.05	0.55	0.81	115	0.566	0.566	0.979	0.59	0.80	1.65	12.30	1.37	0.05	1.43		13.19	2.56		0			1.00		1.00		0.391	Non-Liq.	4.0	3.3			0.00	0.379						
10.33	3.15	8.01	0.02	0.29	0.77	115	0.594	0.594	0.978	0.32	0.79	1.56	11.04	1.30	0.00	1.30		11.83	2.53		0			1.00		1.00		0.391	Non-Liq.	4.0	3.0			0.00	0.398						
10.83	3.30	8.20	0.02	0.27	0.79	115	0.623	0.623	0.977	0.39	0.78	1.52	10.98	1.35	0.00	1.35		11.87	2.52		0			1.00		1.00		0.390	Non-Liq.	4.1	2.9			0.00	0.417						
11.32	3.45	9.32	0.02	0.23	0.89	115	0.651	0.651	0.976	0.25	0.77	1.45	11.80	1.86	0.00	1.86		16.10	2.47		0			1.26		1.00		0.390	Non-Liq.	4.2	3.8			0.00	0.436						
11.81	3.60	10.70	0.02	0.21	1.02	115	0.679	0.679	0.975	0.22	0.75	1.39	13.19	2.04	0.00	2.04	1.00	17.80	2.42		1	5	1.00	1.26	17.8	1.00	0.065	0.389	Non-Liq.	4.3	4.2	0.0	4.2	20.00	0.455	485	0.315	6.4E-02	4.2E-01	1.0E-01	1.181
12.30	3.75	10.54	0.02	0.22	1.01	130	0.711	0.711	0.974	0.23	0.75	1.35	12.53	1.81	0.00	1.81		16.95	2.44		0			1.26		1.00		0.389	Non-Liq.	4.2	4.0			0.00	0.476						
12.80	3.90	9.10	0.02	0.25	0.87	130	0.743	0.743	0.973	0.27	0.78	1.32	10.42	1.25	0.00	1.25		11.34	2.54		0			1.00		1.00		0.389	Non-Liq.	4.0	2.8			0.00	0.498						
13.29	4.05	11.09	0.02	0.21	1.06	130	0.775	0.775	0.972	0.22	0.75	1.26	12.37	2.05	0.00	2.05		18.64	2.45		0			1.41		1.00		0.388	Non-Liq.	4.2	4.4			0.00	0.519						
13.78	4.20	10.63	0.02	0.21	1.02	130	0.807	0.807	0.971	0.23	0.76	1.23	11.41	1.89	0.00	1.89		17.37	2.46		0			1.41		1.00		0.388	Non-Liq.	4.1	4.2			0.00	0.541						
14.27	4.35	10.10	0.02	0.22	0.97	130	0.839	0.839	0.970	0.24	0.77	1.20	10.47	1.23	0.00	1.23		11.42	2.52		0			1.00		1.00		0.387	Non-Liq.	4.1	2.8			0.00	0.562						
14.76	4.50	10.44	0.02	0.21	1.00	130	0.871	0.871	0.969	0.23	0.77	1.16	10.50	1.22	0.00	1.22		11.46	2.52		0			1.00		1.00		0.387	Non-Liq.	4.1	2.8			0.00	0.584						
15.26	4.65	10.78	0.02	0.21	1.03	130	0.903	0.903	0.968	0.23	0.77	1.13	10.55	1.21	0.00	1.21		11.51	2.51		0			1.00		1.00		0.580	Non-Liq.	4.1	2.6			0.00	0.605						
15.75	4.80	10.19	0.02	0.22	0.98	130	0.935	0.935	0.967	0.25	0.76	1.10	9.63	1.11	0.00	1.11		10.60	2.56		0			1.00		1.00		0.589	Non-Liq.	4.0	2.7			0.00	0.626						
16.24	4.95	10.43	0.02	0.22	1.00	130	0.967	0.967	0.966	0.24	0.76	1.07	9.59	1.09	0.00	1.09		10.57	2.56		0			1.00		1.00		0.598	Non-Liq.	4.0	2.6			0.00	0.646						
16.73	5.10	12.02	0.05	0.41	1.15	130	0.999	0.999	0.965	0.45	0.79	1.05	10.88	1.21	0.00	1.21		11.88	2.59		0			1.00		1.00		0.606	Non-Liq.	3.9	3.0			0.00	0.665						
17.22	5.25	15.66	0.09	0.54	1.50	130	1.031	1.031	0.964	0.58	0.77	1.02	14.10	1.53	0.06	1.59		15.10	2.52		0			1.00		1.00		0.614	Non-Liq.	4.1	3.7			0.00	0.691						
17.72	5.40	12.92	0.09	0.72	1.24	130	1.063	1.063	0.962	0.78	0.81	1.00	11.17	1.23	0.28	1.51		12.17	2.67		0			1.00		1.00		0.622	Non-Liq.	3.8	3.2			0.00	0.712						
18.21	5.55	18.26	0.29	1.58	1.75	130	1.095	1.095	0.961	1.68	0.81	0.97	15.78	1.71	1.39	3.10		15.79	2.69		0			1.00		1.00		0.629	Non-Liq.	3.7	4.5			0.00	0.734						
18.70	5.70	23.98	0.57	2.38	2.30	130	1.127	1.127	0.960	2.50	0.82	0.95	20.51	2.23	2.43	4.65		21.53	2.70		0			1.00		1.00		0.636	Non-Liq.	3.7	5.8			0.00	0.755						
19.19	5.85	18.28	0.64	3.50	1.75	130	1.159	1.159	0.959	3.74	0.88	0.92	14.94	1.67	3.88	5.55		15.95	2.81		0			1.00		1.00		0.643	Non-Liq.	3.3	4.8			0.00	0.777						
19.69	6.00	48.03	0.66	1.38	4.60	130	1.191	1.191	0.958	1.41	0.70	0.92	40.76	5.03	1.14	6.16		48.17	2.31		0			1.15		1.00		0.649	Non-Liq.	4.5	10.8			0.00	0.788						
20.18	6.15	42.26	0.73	1.74	4.05	130	1.223	1.223	0.956	1.79	0.73	0.90	34.90	4.36	1.61	5.99		41.43	2.43		0			1.15		1.00		0.655	Non-Liq.	4.3	6.7			0.00	0.810						
20.67	6.30	19.94	0.59	2.95	1.91	130	1.255	1.255	0.955	3.14	0.88	0.88	15.25	1.75	3.19	4.94		16.27	2.68		0			1.00		0.99		0.661	Non-Liq.	3.4	4.8			0.00	0.841						
21.16	6.45	94.86	0.60	0.71	9.09	130	1.287	1.287	0.954	0.72	0.58	0.89	76.99	8.32	0.28	8.60		80.37	1.91		0			1.00		0.99		0.667	Non-Liq.	5.3	15.3			0.00	0.852						
21.65	6.60	143.85	1.25	0.87	13.77	130	1.319	1.319	0.952	0.87	0.55	0.80	115.31	12.62	0.48	13.10	1.04	120.41	1.81		1	85	1.12	1.00	134.5	0.98	0.306	0.672	0.45	5.4	22.1	4.8	26.9	1.08	0.884	1,259	0.598	2.1E-03			
22.15	6.75	140.49	2.07	1.48	13.45	130	1.351	1.351	0.951	1.49	0.60	0.86	113.53	12.41	1.28	13.69	1.10	114.63	1.99		1	82	1.23	1.00	147.0	0.97	0.375	0.678	0.54	5.1	22.4	5.5	27.9	1.07	0.905	1,200	0.612	2.0E-03			
22.64	6.90	180.96	2.98	1.64	17.33	130	1.383	1.383	0.950	1.66	0.59	0.85	144.85	18.00	1.50	17.51	1.09	146.06	1.95		1	93	1.23	1.00	180.4	0.97	Infin.	0.683	Non-Liq.	5.2	28.1	7.9	36.1	0.00	0.927	1,422	0.625	1.3E-03			
23.13	7.05	208.29	2.96	1.42	19.95	130	1.415	1.415	0.948	1.43	0.56	0.85	185.97	18.26	1.22	19.48	1.07	187.10	1.86		1	98	1.15	1.00	192.6	0.96	Infin.	0.687	Non-Liq.	5.4	31.2	7.3	38.5	0.00	0.948	1,470	0.639	1.4E-03			
23.62	7.20	207.60	2.50	1.20	19.88	130	1.447	1.447	0.946	1.21	0.55	0.84	164.06	17.96	0.93	18.89	1.05	165.22	1.81		1	98	1.11	1.00	184.0	0.96	Infin.	0.692	Non-Liq.	5.5	30.3	6.5	36.8	0.00	0.969	1,434	0.652	1.5E-03			
24.11	7.35	162.44	2.10	1.15	17.47	130	1.479	1.479	0.945	1.16	0.56	0.83	141.88	15.59	0.86	16.45	1.08	143.04	1.84		1	92	1.14	1.00	182.6	0.95	Infin.	0.695	Non-Liq.	5.4	26.5	6.0	32.5	0.00	0.991	1,420	0.665	1.7E-03			
24.61	7.50	81.01	1.84	2.27	7.76	130	1.511	1.500	0.943	2.31	0.70	0.78	58.90	6.81	2.34	9.25		60.02	2.32		0			1.00		0.97		0.700	Non-Liq.	4.5	13.5			0.00	1.012						
25.10	7.65	39.23	1.66	4.23	3.76	130	1.543	1.516	0.941	4.40	0.83	0.74	28.47	3.31	4.95	8.27		27.53	2.77		0			1.00		0.97		0.704	Non-Liq.	3.6	7.7			0.00	1.034						
25.59	7.80	35.57	1.16	3.25	3.41	130	1.575	1.533	0.940	3.40	0.82	0.74	23.78	2.95	3.65	6.60		24.85	2.73		0			1.00		0.97		0.708	Non-Liq.	3.7	6.8			0.00	1.055						
26.08	7.95	40.26	1.06	2.64	3.85	130	1.607	1.549	0.938	2.74	0.79	0.74	27.12	3.32	2.84	6.16		28.20	2.63		0			1.00		0.96		0.711	Non-Liq.	3.9	7.3			0.00	1.077						
26.57	8.10	66.49	1.36	2.04	6.36	130	1.639	1.566	0.936	2.09	0.71	0.78	46.37	5.91	2.06	7.96		50.88	2.37		0			1.07		0.96		0.715	Non-Liq.	4.4	11.7			0.00	1.098						
27.07	8.25	58.34	1.67	2.87	5.59	130	1.671	1.583	0.934	2.95	0.75	0.74	39.59	4.87	3.16	8.03		40.69	2.52		0			1.00		0.96		0.718	Non-Liq.	4.1	10.0			0.00	1.119						
27.56	8.40	209.31	2.69	1.28	20.04	130	1.703	1.599	0.932	1.29	0.58	0.79	155.60	17.66	1.05	18.71		157.59	1.85		0			1.00		0.96		0.721	Non-Liq.	5.4	29.3			0.00	1.141						
28.05	8.55	176.93	3.26	1.85	16.94	130	1.735	1.616	0.930	1.86	0.61	0.77	127.29	15.00	1.80	16.80	1.12	129.16	2.02		1	87	1.33	1.00	171.3	0.91	Infin.	0.723	Non-Liq.	5.0	25.5	8.7	34.3	0.00	1.162	1,585	0.768	1.7E-03			
28.54	8.70	173.92	3.04	1.75	16.65	130	1.767	1.633	0.928	1.77	0.61	0.77	125.18	14.66	1.67	16.33	1.11	126.35	2.01		1	87	1.31	1.00	165.7	0.91	Infin.	0.726	Non-Liq.	5.1	24.9	8.2	33.1	0.00	1.184	1,582	0.780	1.7E-03			
29.04	8.85	214.14	3.84	1.78	20.51	130	1.799	1.649	0.925	1.71	0.59	0.77	154.85	18.09	1.61	19.70	1.09	156.05	1.94		1	95	1.23	1.00	191.3	0.90	Infin.	0.728	Non-Liq.	5.2	30.0	8.3	38.3	0.00	1.205	1,651	0.793	1.5E-03			
29.53	9.00	263.47	3.69	1.40	25.23	130	1.831	1.666	0.923	1.41	0.55	0.76	192.83	22.12	1.21	23.33	1.05	194.06	1.81		1	100	1.11	1.00	216.3	0.90	Infin.	0.731	Non-Liq.	5.5	35.6	7.7	43.3	0.00	1.227	1,738	0.805	1.3E-03			
30.02	9.15	156.31	2.81	1.80	14.57	130	1.863	1.683	0.920	1.82	0.62	0.75	109.80	13.03	1.74	14.77	1.13	110.80	2.06		1	81	1.36	1.00	153.2	0.89	0.414	0.733	0.61	5.0	22.3	5.5	27.8	1.04	1.248	1,913	0.817	2.1E-03			
30.51	9.30	151.25	2.26	1.49	14.48	130	1.895	1.699	0.918	1.51	0.61	0.75	108.04	12.43	1.34	13.77	1.11	107.25	2.01		1	80	1.31	1.00	141.0	0.89	0.341	0.734	0.41	5.1	21.2	5.5	26.7	1.10	1.269	1,505	0.828	2.2E-03			
31.00	9.45	272.79	2.18	0.80	26.12	130	1.927	1.716	0.915	0.81	0.50	0.79	201.19	21.98	0.40	22.38	1.02	202.47	1.02		1	100	1.00	1.00	202.5	0.89	Infin.	0.735	Non-Liq.	6.8	34.8	5.7	40.5	0.00	1.291	1,744	0.840	1.4E-03			
31.50	9.60	212.93	2.40	1.13	20.39	130	1.959	1.732	0.913	1.13	0.55	0.76	152.25	17.32	0.84	18.16	1.05	153.50	1.81		1	95	1.12	1.00	171.2	0.88	Infin.	0.737	Non-Liq.	5.5	28.2	6.1	34.2	0.00	1.312	1,603	0.851	1.7E-03			
31.99	9.75	87.62	2.78	3.15	8.39	130	1.991	1.749	0.910	3.22	0.73	0.69	56.25	7.26	3.57	10.83	1.49	57.42	2.44		1	54	2.47	1.00	142.0	0.91	0.346	0.739	0.42	4.2	13.6	5.5	19.1	1.59	1.334	1,379	0.863	3.2E-03			

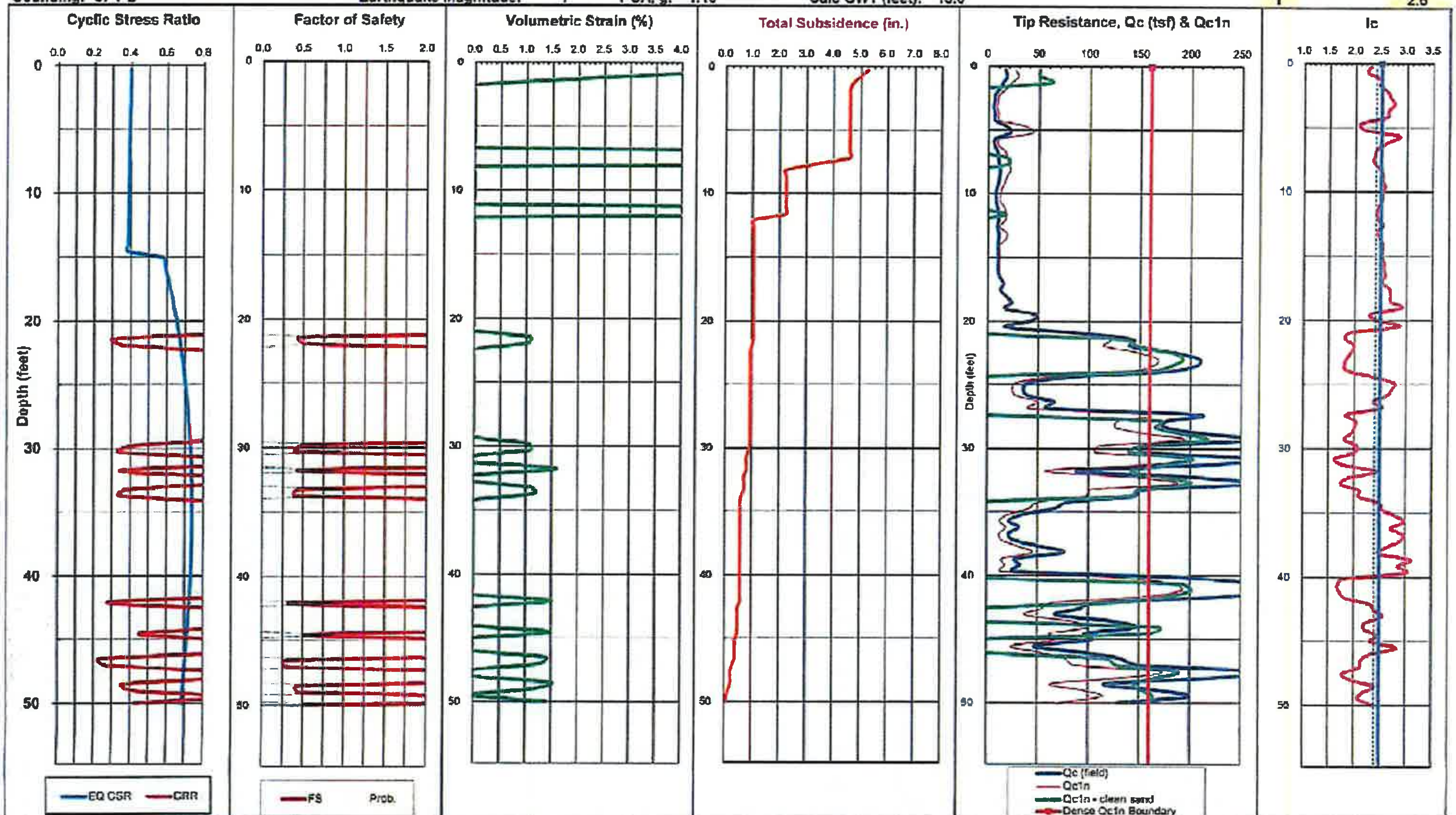
Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa	Moss Δqc MPa	Moss qc_{mod} MPa	Moss eff Kc	Qc1n	Ic	Override	Liquef. Suscept. (0 or 1)	Rel. Dens. Dr(%)	Kc	Kα	Clean Sand Qc1s	Kσ	CRR	Induced M=7.5 CSR	Liquefac. Safety Factor	Qc1n $N_{1(60)}$ Ratio	Equiv. $N_{1(60)}$	FC Adj $\Delta N_{1(60)}$	Equiv. $N_{1(60)cs}$	Volumetric Strain (%)	σ (tsf)	G_{max} (tsf)	τ_{av} (tsf)	Shear Strain γ	Strain E_{15}	Strain Enc	Dry Sand Subsidence (in.)
32.48	9.90	206.90	2.99	1.45	19.77	130	2.023	1.706	0.907	1.46	0.58	0.74	144.04	16.93	1.27	18.21	1.05	145.28	1.91		1	92	1.20	1.00	173.6	0.87	Infin.	0.740	Non-Liq.	5.3	27.6	7.1	34.7	0.00	1.355	1.698	0.874	1.6E-03			
32.97	10.05	261.03	2.97	1.14	25.00	130	2.055	1.782	0.904	1.15	0.53	0.76	185.58	21.22	0.88	22.09	1.04	188.85	1.75		1	100	1.07	1.00	200.5	0.87	Infin.	0.741	Non-Liq.	5.6	33.6	6.6	40.2	0.00	1.377	1.790	0.884	1.4E-03			
33.46	10.20	151.33	2.85	1.89	14.49	130	2.087	1.799	0.901	1.91	0.63	0.72	101.11	12.36	1.87	14.25	1.15	102.23	2.10		1	75	1.45	1.00	148.4	0.87	0.384	0.742	0.45	4.9	20.6	5.5	26.4	1.11	1.398	1.574	0.895	2.2E-03			
33.96	10.35	146.11	2.60	1.78	13.99	130	2.119	1.816	0.898	1.80	0.63	0.71	97.10	11.86	1.72	13.58	1.14	98.33	2.09		1	76	1.44	1.00	141.5	0.86	0.344	0.742	0.40	4.9	20.0	5.5	25.5	1.16	1.419	1.560	0.906	2.2E-03			
34.45	10.50	70.03	2.63	3.28	7.65	130	2.151	1.832	0.894	3.35	0.74	0.68	49.08	6.52	3.74	10.25		50.23	2.49		0			1.00		0.93		0.743	Non-Liq.	4.1	12.2			0.00	1.441						
34.94	10.65	67.01	2.11	3.15	6.42	130	2.183	1.849	0.891	3.24	0.78	0.66	40.35	5.38	3.57	8.85		41.50	2.54		0			1.00		0.92		0.743	Non-Liq.	4.0	10.3			0.00	1.462						
35.43	10.80	34.62	1.15	3.32	3.31	130	2.215	1.866	0.888	3.50	0.83	0.62	19.32	2.66	3.78	6.45		20.42	2.81		0			1.00		0.92		0.743	Non-Liq.	3.5	5.8			0.00	1.484						
35.93	10.95	22.45	0.71	3.18	2.15	130	2.247	1.882	0.884	3.47	0.88	0.60	11.72	1.64	3.61	5.28		12.79	2.98		0			1.00		0.92		0.743	Non-Liq.	3.2	4.0			0.00	1.505						
36.42	11.10	31.74	0.65	2.05	3.04	130	2.278	1.899	0.880	2.19	0.80	0.62	17.63	2.32	2.10	4.42		18.75	2.72		0			1.00		0.92		0.743	Non-Liq.	3.7	5.1			0.00	1.527						
36.91	11.25	22.08	0.62	2.81	2.11	130	2.311	1.915	0.877	3.07	0.87	0.60	11.35	1.58	3.11	4.65		12.43	2.96		0			1.00		0.92		0.742	Non-Liq.	3.2	3.9			0.00	1.548						
37.40	11.40	26.01	0.78	2.99	2.49	130	2.343	1.932	0.873	3.23	0.86	0.58	13.58	1.90	3.35	5.25		14.67	2.91		0			1.00		0.91		0.742	Non-Liq.	3.3	4.4			0.00	1.569						
37.89	11.55	51.85	1.57	3.03	4.96	130	2.375	1.949	0.869	3.15	0.78	0.62	28.24	4.02	3.41	7.42		30.38	2.64		0			1.00		0.91		0.741	Non-Liq.	3.8	7.9			0.00	1.591						
38.38	11.70	75.73	2.31	3.05	7.25	130	2.406	1.965	0.865	3.13	0.75	0.63	43.94	6.00	3.43	9.43		45.11	2.51		0			1.00		0.91		0.740	Non-Liq.	4.1	11.0			0.00	1.612						
38.88	11.85	28.24	1.83	6.49	2.70	130	2.438	1.982	0.861	6.98	0.92	0.56	13.97	2.17	6.05	8.22		15.62	3.11		0			1.00		0.91		0.739	Non-Liq.	2.9	5.2			0.00	1.634						
39.37	12.00	33.02	1.11	3.36	3.16	130	2.470	1.999	0.857	3.57	0.84	0.59	17.18	2.48	3.84	6.30		18.27	2.85		0			1.00		0.91		0.736	Non-Liq.	3.4	5.4			0.00	1.655						
39.86	12.15	26.02	1.11	4.25	2.49	130	2.502	2.015	0.852	4.52	0.89	0.58	12.79	1.91	5.05	6.99		13.87	2.82		0			1.00		0.91		0.736	Non-Liq.	3.1	4.5			0.00	1.677						
40.35	12.30	196.05	1.72	0.88	18.77	130	2.534	2.032	0.849	0.89	0.54	0.79	128.67	15.05	0.50	15.56		132.69	1.79		0			1.02		0.90		0.735	Non-Liq.	5.5	24.2			0.00	1.698						
40.85	12.45	272.43	2.45	0.90	26.09	130	2.566	2.049	0.843	0.91	0.51	0.71	182.61	21.28	0.54	21.79	1.03	187.17	1.69		1	100	1.00	1.02	192.8	0.81	Infin.	0.733	Non-Liq.	5.7	32.9	5.7	38.6	0.00	1.720	1.980	1.031	1.4E-03			
41.34	12.60	282.63	2.89	1.02	27.06	130	2.598	2.065	0.839	1.03	0.52	0.71	186.97	22.27	0.70	22.98	1.03	192.22	1.72		1	100	1.05	1.02	202.1	0.81	Infin.	0.732	Non-Liq.	5.6	34.1	6.3	40.4	0.00	1.741	2.024	1.038	1.3E-03			
41.83	12.75	235.52	2.91	1.24	22.55	130	2.630	2.082	0.834	1.25	0.58	0.68	151.31	18.64	0.99	18.63	1.05	155.80	1.84		1	85	1.14	1.02	177.5	0.81	Infin.	0.730	Non-Liq.	5.4	28.9	6.6	35.5	0.00	1.762	1.950	1.045	1.4E-03			
42.32	12.90	108.28	2.48	2.29	10.37	130	2.662	2.098	0.830	2.34	0.69	0.62	62.65	8.60	2.40	11.00	1.28	65.21	2.31		1	59	1.97	1.02	126.8	0.85	0.278	0.726	0.32	4.5	14.5	5.5	20.0	1.52	1.784	1.622	1.052	2.5E-03			
42.81	13.05	91.41	2.33	2.55	8.75	130	2.694	2.115	0.825	2.61	0.71	0.61	51.45	7.23	2.74	9.97		53.75	2.40		0			1.02		0.90		0.726	Non-Liq.	4.3	12.5			0.00	1.805						
43.31	13.20	68.75	2.09	3.04	6.58	130	2.726	2.132	0.820	3.14	0.78	0.59	36.99	5.28	3.40	8.69		38.18	2.58		0			1.00		0.89		0.724	Non-Liq.	4.0	9.6			0.00	1.827						
43.80	13.35	123.44	2.52	2.04	11.82	130	2.758	2.148	0.816	2.08	0.67	0.62	71.55	10.99	2.06	13.05		83.93	2.23		0			1.15		0.89		0.721	Non-Liq.	4.8	15.1			0.00	1.848						
44.29	13.50	146.81	3.44	2.34	14.06	130	2.790	2.165	0.811	2.37	0.68	0.62	85.05	13.30	2.46	15.75	1.16	93.50	2.22		1	77	1.71	1.15	170.3	0.79	Infin.	0.719	Non-Liq.	4.7	21.4	10.0	31.4	0.00	1.870	1.927	1.077	1.5E-03			
44.78	13.65	97.30	3.01	3.10	9.32	130	2.822	2.182	0.806	3.17	0.73	0.59	53.08	8.78	3.46	12.23	1.40	62.59	2.45		1	57	2.53	1.15	158.5	0.84	0.450	0.717	0.53	4.2	14.9	5.5	20.4	1.49	1.891	1.679	1.083	2.3E-03			
45.28	13.80	104.78	2.52	2.41	10.03	130	2.854	2.198	0.801	2.46	0.70	0.60	55.20	9.29	2.54	11.83		68.52	2.35		0			1.15		0.89		0.714	Non-Liq.	4.4	15.5			0.00	1.912						
45.77	13.95	47.11	2.09	4.44	4.51	130	2.886	2.215	0.796	4.66	0.83	0.54	22.92	3.56	5.25	8.81		24.85	2.83		0			1.00		0.89		0.711	Non-Liq.	3.5	7.0			0.00	1.934						
46.26	14.10	93.18	1.72	1.84	8.92	130	2.918	2.231	0.791	1.89	0.69	0.60	51.49	6.95	1.78	8.73		52.85	2.31		0			1.00		0.89		0.709	Non-Liq.	4.5	11.8			0.00	1.955						
46.75	14.25	133.71	2.13	1.59	12.80	130	2.950	2.248	0.786	1.62	0.64	0.62	76.81	10.02	1.45	11.47	1.14	78.12	2.13		1	67	1.52	1.00	118.7	0.83	0.236	0.706	0.28	4.8	16.2	5.5	21.7	1.40	1.977	1.753	1.104	2.1E-03			
47.24	14.40	148.72	2.44	1.64	14.24	130	2.982	2.265	0.781	1.67	0.63	0.62	85.64	11.23	1.52	12.74	1.14	86.98	2.11		1	71	1.47	1.00	127.8	0.78	0.274	0.703	0.30	4.9	17.8	5.5	23.3	1.29	1.998	1.806	1.109	1.9E-03			
47.74	14.55	276.00	3.17	1.15	26.43	130	3.014	2.281	0.776	1.16	0.54	0.66	170.82	20.84	0.86	21.70	1.04	172.24	1.79		1	99	1.09	1.00	188.8	0.79	Infin.	0.700	Non-Liq.	5.5	31.3	6.4	37.7	0.00	2.020	2.130	1.114	1.2E-03			
48.23	14.70	224.48	3.52	1.57	21.49	130	3.046	2.298	0.771	1.58	0.59	0.63	132.99	17.20	1.41	18.61	1.08	134.37	1.90		1	89	1.25	1.00	167.6	0.77	Infin.	0.697	Non-Liq.	5.2	26.0	7.5	33.5	0.00	2.041	2.059	1.118	1.3E-03			
48.72	14.85	117.37	3.54	3.01	11.24	130	3.078	2.315	0.766	3.07	0.71	0.57	62.34	9.11	3.32	12.43	1.36	63.56	2.36		1	58	2.28	1.00	145.6	0.82	0.354	0.694	0.43	4.3	14.7	5.5	20.2	1.50	2.062	1.749	1.123	2.1E-03			
49.21	15.00	169.17	3.77	2.24	16.10	130	3.110	2.331	0.761	2.27	0.69	0.60	93.81	13.01	2.30	15.30	1.16	95.13	2.17		1	75	1.61	1.00	152.8	0.77	0.412	0.691	0.44	4.7	20.1	5.5	25.6	1.16	2.084	1.981	1.127	1.7E-03			
49.70	15.15	199.78	4.07	2.05	19.03	130	3.142	2.348	0.756	2.07	0.63	0.61	112.67	15.37	2.04	17.41	1.13	114.02	2.09		1	82	1.44	1.00	164.8	0.76	Infin.	0.688	Non-Liq.	4.9	23.2	9.6	32.8	0.80	2.105	2.076	1.131	1.3E-03			
50.20	15.30	129.66	4.09	3.16	12.42	130	3.174	2.365	0.751	3.22	0.71	0.57	68.13	10.10	3.50	13.60	1.35	69.40	2.38		1	62	2.23	1.00	154.8	0.82	0.425	0.685	0.51	4.3	16.0	5.5	21.5	1.41	2.127	1.912	1.135	1.9E-03			

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

Commercial Organics Processing Facility   Project No: VT-24872-02   Method Used: 1   1998 NCEER (Robertson & Wride)

Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5   Plot 1   Limiting Ic: 2.6

Sounding: CPT-2   Earthquake Magnitude: 7   PGA, g: 1.10   Calc GWT (feet): 15.0



Total Thickness of Liquefiable Layers: 6.9 feet   Estimated Total Ground Subsidence (Settlement): 5.2 inches

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

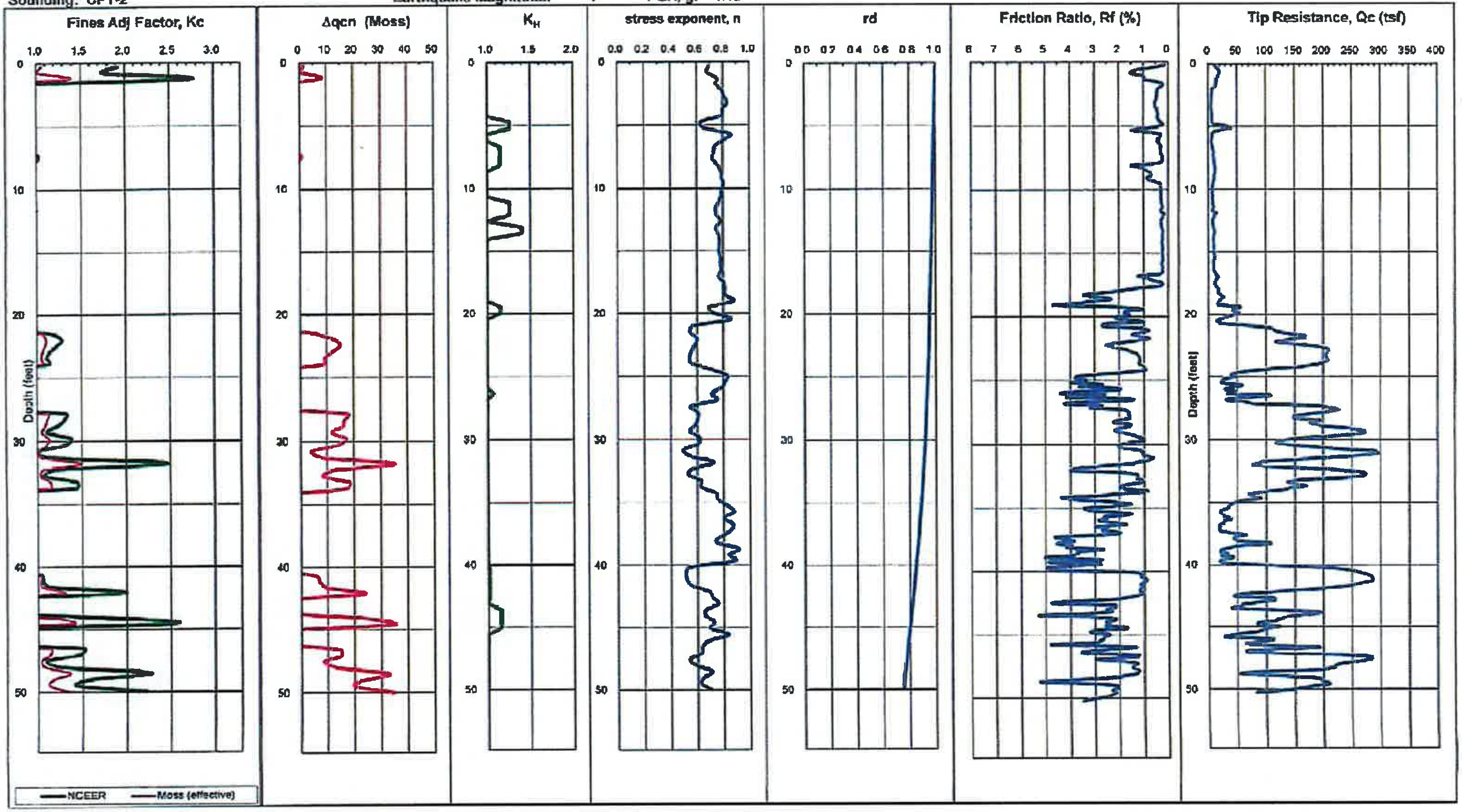
3 avg increment =0.15m Qc1n/N1(60): 5

Ignore 1st/last increment into sand/silt soils: 0

Method Used: 1998 NCEER (Robertson & Wride)

Sounding: CPT-2

Earthquake Magnitude: 7 PGA, g: 1.10



CPT-LIQUEFY.XLS - A SPREADSHEET FOR EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL USING CPT DATA
Developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Project: Commercial Organics Processing Facility
Job No: VT-24872-02
Date: 5/17/2017
Sounding: CPT-3

Liquefaction Analysis using 1998 NCEER (Robertson & Wride) method
Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5

Plot: 3
Method Used: 1 1998 NCEER (Robertson & Wride)

EARTHQUAKE INFORMATION:

Magnitude:	7	7.5
PGA, g:	1.10	0.92
MSF:	1.19	
GWT, feet:	24.8	
Calc GWT, feet:	15.0	

Averaging Increment: 3 0.15 m
Induced CSR (M=7.5) = 0.65*PGA*(po/p'o)*rd/MSF
Clean Sand Qc1n = C_q*K_c*K_σ*Qc
SF = CRR*K_σ*K_α/CSR

Ignore 1st/last increment into sand/silt soils: 1 yes
Ignore/intermediate soil layers: 0.00 m
Unit Weight of unsaturated soils: 115 pcf
Unit Weight of saturated soils: 130 pcf
Limiting Ic for liquefiable soils: 2.50 Limiting Ic for K_c: 2.5

Use Moss @ P_L: 15%
Use Tokimatsu & Seed (0) or Ishihara & Yoshimine (1): 0
Required SF: 1.50 Max $\Delta N_{1(60)}$: 5.5
Min SF of Liquefiable Layers: 0.23 Max $\Delta N_{1(60)}$: 10.0
Avg SF of Liquefiable Layers: 0.41

Total Liquefied Thickness (feet)	Total Induced Subsidence (inches)
3.4	0.6

SETTLEMENT OF DRY SANDS
Qc1n / N1(60) Ratio for clean sand: 5
p = 0.57*po
τ_{av} = 0.65*PGA*po*rd
G_{max} = 447*$N_{1(60)cs}^{1/3}$*$p^{0.5}$
a = 0.0389*(p/1)-0.124
b = 6400*$(p/1)^{-0.6}$
γ = [1+a*EXP(b*τ_{av}/G_{max})]/[(1+a)*τ_{av}/G_{max}]
E_{15} = γ*$(N_{1(60)cs}/20)^{-1.2}$
Nc = $(MAG-4)^{2.17}$
E_c = $(Nc/15)^{0.45}$*E15
S = 2*H*E_c
Nc = 10.6

Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa	Moss Δqc MPa	Moss qc,thresh MPa	Moss eff Kc	Qc1n	Ic	Override	Liquef. Suscept. (0 or 1)	Rel Dens Dr(%)	Kc	Kσ	Clean Sand Qc1n	Kα	CRR	Induced CSR M=7.5	Liquefac. Safety Factor	Qc1n N1(60) Ratio	Equiv. N1(60)	FC Adj ΔN1(60)	Equiv. N1(60)cs	Volumetric Strain (%)	p (tsf)	Gmax (tsf)	τav (tsf)	Shear Strain γ	Strain E15	Strain Enc	Dry Sand Subsidence (in.)
0.49	0.15	18.58	0.40	2.16	1.78	115	0.028	0.028	1.000	2.16	0.77	1.70	29.80	3.02	1.84	4.87		29.85	2.53		0			1.00		1.00		0.399	Non-Liq.	4.0	7.4			0.00	0.019						
0.98	0.30	29.83	0.33	1.10	2.86	115	0.057	0.057	1.000	1.11	0.67	1.70	47.85	5.14	0.87	6.31		69.61	2.19		0			1.26		1.00		0.399	Non-Liq.	4.7	12.9			0.00	0.036						
1.48	0.45	25.49	0.57	2.23	2.44	115	0.085	0.085	0.999	2.24	0.74	1.70	40.83	5.25	1.92	7.17	1.37	51.60	2.43		1	50	2.45	1.26	127.0	1.00	0.271	0.398	Non-Liq.	4.2	12.2	10.0	22.2	0.30	0.057	390	0.040	2.8E-03	1.7E-03	1.5E-03	0.018
1.97	0.60	20.13	0.34	1.68	1.93	115	0.113	0.113	0.997	1.69	0.74	1.70	32.18	4.14	1.31	5.45		40.89	2.44		0			1.26		1.00		0.398	Non-Liq.	4.2	9.7			0.00	0.076						
2.46	0.75	12.04	0.29	2.40	1.15	115	0.141	0.141	0.996	2.43	0.82	1.70	19.11	1.95	2.11	4.07		19.34	2.71		0			1.00		1.00		0.398	Non-Liq.	3.7	5.2			0.00	0.095						
2.95	0.90	12.03	0.42	3.49	1.15	115	0.170	0.170	0.995	3.54	0.85	1.70	19.05	1.96	3.32	5.28		19.33	2.82		0			1.00		1.00		0.397	Non-Liq.	3.5	5.5			0.00	0.114						
3.44	1.05	11.41	0.46	4.01	1.09	115	0.198	0.198	0.994	4.08	0.87	1.70	18.01	1.86	3.89	5.75		18.32	2.87		0			1.00		1.00		0.397	Non-Liq.	3.4	5.4			0.00	0.133						
3.94	1.20	13.03	0.45	3.45	1.25	115	0.226	0.226	0.993	3.51	0.84	1.70	20.58	2.12	3.27	5.39		20.94	2.79		0			1.00		1.00		0.396	Non-Liq.	3.5	5.9			0.00	0.152						
4.43	1.35	11.33	0.43	3.78	1.08	115	0.255	0.255	0.992	3.87	0.87	1.70	17.90	1.84	3.63	5.48		18.21	2.85		0			1.00		1.00		0.396	Non-Liq.	3.4	5.4			0.00	0.171						
4.92	1.50	10.13	0.30	3.00	0.97	115	0.283	0.283	0.990	3.09	0.85	1.70	15.82	1.65	2.77	4.42		16.28	2.84		0			1.00		1.00		0.395	Non-Liq.	3.4	4.7			0.00	0.190						
5.41	1.65	9.10	0.14	1.53	0.87	115	0.311	0.311	0.989	1.58	0.82	1.70	14.13	1.48	1.14	2.62		14.63	2.72		0			1.00		1.00		0.395	Non-Liq.	3.7	4.0			0.00	0.209						
5.91	1.80	9.03	0.05	0.58	0.86	115	0.340	0.340	0.988	0.60	0.77	1.70	13.98	1.47	0.09	1.56		14.60	2.53		0			1.00		1.00		0.395	Non-Liq.	4.0	3.6			0.00	0.228						
6.40	1.95	9.53	0.06	0.59	0.91	115	0.368	0.368	0.987	0.62	0.78	1.70	14.73	1.55	0.10	1.65		15.32	2.51		0			1.00		1.00		0.394	Non-Liq.	4.1	3.8			0.00	0.246						
6.89	2.10	8.69	0.04	0.46	0.83	115	0.396	0.396	0.986	0.48	0.77	1.70	13.32	1.41	0.00	1.41		13.96	2.51		0			1.00		1.00		0.394	Non-Liq.	4.1	3.4			0.00	0.265						
7.38	2.25	9.45	0.05	0.51	0.90	115	0.424	0.424	0.985	0.53	0.77	1.70	14.50	2.43	0.01	2.44		23.09	2.49		0			1.58		1.00		0.393	Non-Liq.	4.1	5.8			0.00	0.284						
7.87	2.40	9.70	0.08	0.86	0.93	115	0.453	0.453	0.984	0.90	0.79	1.70	14.86	1.58	0.40	1.98		15.59	2.56		0			1.00		1.00		0.393	Non-Liq.	3.9	4.0			0.00	0.303						
8.37	2.55	11.10	0.11	0.99	1.06	115	0.481	0.481	0.983	1.00	0.79	1.70	17.07	1.81	0.51	2.31		17.84	2.55		0			1.00		1.00		0.392	Non-Liq.	4.0	4.5			0.00	0.322						
8.86	2.70	11.70	0.12	0.99	1.12	115	0.509	0.509	0.982	1.04	0.79	1.70	17.98	1.90	0.54	2.45		18.78	2.54		0			1.00		1.00		0.392	Non-Liq.	4.0	4.7			0.00	0.341						
9.35	2.85	12.75	0.15	1.15	1.22	115	0.538	0.538	0.981	1.21	0.79	1.70	19.62	1.99	0.72	2.71		20.48	2.54		0			1.00		1.00		0.392	Non-Liq.	4.0	5.1			0.00	0.360						
9.84	3.00	11.82	0.18	1.52	1.13	115	0.566	0.566	0.979	1.59	0.82	1.67	17.78	1.75	1.12	2.88		18.67	2.64		0			1.00		1.00		0.391	Non-Liq.	3.8	4.9			0.00	0.379						
10.33	3.15	10.51	0.14	1.36	1.01	115	0.594	0.594	0.978	1.45	0.83	1.62	15.15	1.55	0.95	2.50		16.05	2.67		0			1.00		1.00		0.391	Non-Liq.	3.8	4.3			0.00	0.398						
10.83	3.30	10.08	0.09	0.85	0.96	115	0.623	0.623	0.977	0.90	0.81	1.54	13.74	1.48	0.38	1.87		14.64	2.61		0			1.00		1.00		0.390	Non-Liq.	3.9	3.8			0.00	0.417						
11.32	3.45	9.45	0.06	0.61	0.90	115	0.651	0.651	0.976	0.66	0.80	1.48	12.28	1.39	0.12	1.51		13.20	2.60		0			1.00		1.00		0.390	Non-Liq.	3.9	3.4			0.00	0.436						
11.81	3.60	8.45	0.04	0.43	0.81	115	0.679	0.679	0.975	0.47	0.81	1.43	10.50	1.23	0.00	1.23		11.41	2.81		0			1.00		1.00		0.389	Non-Liq.	3.9	2.9			0.00	0.455						
12.30	3.75	10.25	0.02	0.23	0.98	130	0.711	0.711	0.974	0.25	0.74	1.35	12.98	2.32	0.00	2.32		20.70	2.45		0			1.58		1.00		0.389	Non-Liq.	4.2	5.0			0.00	0.476						
12.80	3.90	8.45	0.03	0.30	0.81	130	0.743	0.743	0.973	0.32	0.80	1.33	9.66	1.15	0.00	1.15		10.59	2.59		0			1.00		1.00		0.389	Non-Liq.	3.9	2.7			0.00	0.498						
13.29	4.05	9.13	0.02	0.27	0.87	130	0.775	0.775	0.972	0.29	0.79	1.28	10.09	1.20	0.00	1.20		11.03	2.56		0			1.00		1.00		0.388	Non-Liq.	4.0	2.8			0.00	0.519						
13.78	4.20	9.97	0.02	0.23	0.95	130	0.807	0.807	0.971	0.25	0.77	1.23	10.67	1.26	0.00	1.26		11.61	2.52		0			1.00		1.00		0.388	Non-Liq.	4.1	2.9			0.00	0.541						
14.27	4.35	10.37	0.02	0.23	0.99	130	0.839	0.839	0.970	0.25	0.77	1.20	10.77	1.26	0.00	1.25		11.72	2.51		0			1.00		1.00		0.387	Non-Liq.	4.1	2.9			0.00	0.562						
14.76	4.50	10.62	0.02	0.23	1.01	130	0.871	0.871	0.969	0.26	0.77	1.16	10.59	1.22	0.00	1.22		11.55	2.52		0			1.00		1.00		0.387	Non-Liq.	4.1	2.8			0.00	0.584						
15.26	4.65	11.09	0.03	0.23	1.06	130	0.903	0.903	0.968	0.25	0.77	1.13	10.87	1.24	0.00	1.24		11.83	2.51		0			1.00		1.00		0.588	Non-Liq.	4.1	2.9			0.00	0.605						
15.75	4.80	11.32	0.03	0.22	1.08	130	0.935	0.935	0.967	0.24	0.77	1.10	10.79	1.23	0.00	1.23		11.78	2.51		0			1.00		1.00		0.589	Non-Liq.	4.1	2.9			0.00	0.626						
16.24	4.95	12.09	0.05	0.41	1.16	130	0.967	0.967	0.966	0.44	0.78	1.07	11.29	1.25	0.00	1.25		12.25	2.57		0			1.00		1.00		0.568	Non-Liq.	4.0	3.1			0.00	0.648						
16.73	5.10	14.24	0.07	0.50	1.36	130	0.999	0.999	0.965	0.54	0.77	1.05	13.08	1.43	0.01	1.44		14.07	2.54		0			1.00		1.00		0.608	Non-Liq.	4.0	3.5			0.00	0.669						
17.22	5.25	13.91	0.09	0.66	1.33	130	1.031	1.031	0.964	0.72	0.79	1.02	12.42	1.36	0.21	1.57		13.42	2.61		0			1.00		1.00		0.614	Non-Liq.	3.9	3.4			0.00	0.691						
17.72	5.40	29.50	0.36	1.22	2.83	130	1.063	1.063	0.962	1.27	0.74	1.00	26.87	4.48	0.92	5.39		44.03	2.43		0			1.58		1.00		0.622	Non-Liq.	4.2	10.4			0.00	0.712						
18.21	5.55	16.50	0.49	2.95	1.58	130	1.095	1.095	0.961	3.16	0.87	0.97	14.13	1.55	3.15	4.70		15.13	2.88		0			1.00		1.00		0.629	Non-Liq.	3.3	4.5			0.00	0.734						
18.70	5.70	18.53	0.61	3.27	1.77	130	1.127	1.127	0.960	3.48	0.87	0.95	15.57	1.72	3.56	5.28		16.58	2.88		0			1.00		1.00		0.636	Non-Liq.	3.4	4.9			0.00	0.755						
19.19	5.85	23.13	0.99	4.26	2.22	130	1.159	1.159	0.959	4.49	0.87	0.92	19.19	2.13	4.86	6.99		20.20	2.88		0			1.00		1.00		0.643	Non-Liq.	3.4	6.0			0.00	0.777						
19.69	6.00	26.06	1.20	4.60	2.50	130	1.191	1.191	0.958	4.82	0.88	0.90	21.22	2.38	5.32	7.70		22.24	2.87		0			1.00		1.00		0.649	Non-Liq.	3.4	6.6			0.00	0.798						
20.18	6.15	24.51	1.16	4.73	2.35	130	1.223	1.223	0.956	4.96	0.87	0.88	19.39	2.21	5.49	7.70		20.41	2.90		0			1.00		1.00		0.655	Non-Liq.	3.3	6.2			0.00	0.819						
20.67	6.30	44.99	0.86	1.91	4.31	130	1.255	1.255	0.955	1.96	0.73	0.88	38.46	4.30	1.84	6.13		40.18	2.44		0			1.07		0.99		0.661	Non-Liq.	4.2	9.5			0.00	0.841						
21.16	6.45	22.56	0.46	2.02	2.16	130	1.287	1.287	0.954	2.15	0.82	0.85	17.13	1.95	1.99	3.94		18.17	2.72		0			1.00		0.99		0.667	Non-Liq.	3.7	4.9			0.00	0.862						
21.65	6.60	80.48	0.52	0.65	7.71	130	1.319	1.319	0.952	0.66	0.59	0.88	65.67	6.93	0.20	7.13		67.02	1.95		0			1.00		0.99		0.672	Non-Liq.	5.2	13.0			0.00	0.884						
22.15	6.75	81.77	0.93	1.13	7.80	130	1.351	1.351	0.951	1.15	0.63	0.86	65.12	7.07	0.83	7.91	1.12	66.21	2.09		1	50	1.44	1.00	95.7	0.98	0.181	0.678	0.23	4.9	13.5	5.5	19.0	1.59	0.905	1,835	0.612	3.3E-03			
22.64	6.90	69.71	1.37	1.97	6.68	130	1.383	1.383	0.950	2.01	0.70	0.83	53.59	6.06	1.03	7.09	1.32	54.67	2.31		1	62	1.99	1.00	108.9	0.97	0.200	0.683	0.29	4.5	12.2	5.5	17.7	1.49	0.927	1,122	0.625	3.7E-03			
23.13	7.05	125.40	1.81	1.44	12.01	130	1.415	1.415	0.948	1.46	0.61	0.84	95.08	10.87	1.24	12.11	1.11	99.20	2.02		1	76	1.33	1.00	132.3	0.98	0.296	0.687	0.41	5.0	19.7	5.5	25.2	1.18	0.948	1,276	0.639	2.3E-03			
23.62	7.20	117.22	2.43	2.08	11.23	130	1.447	1.447	0.946	2.10	0.65	0.82	89.19	10.20	2.08	12.28	1.20	90.30	2.17		1	73	1.59	1.00	143.3	0.96	0.353	0.692	0.49	4.8	19.0	5.5	24.5	1.22	0.969	1,278	0.652	2.4E-03			
24.11	7.35	115.90	2.83	2.44	11.10	130	1.479	1.479	0.945	2.47	0.67	0.80	86.39	10.07	2.57	12.64	1.26	87.51	2.23		1	71	1.73	1.00	151.6	0.95	0.404	0.696	0.55	4.6	18.9	5.5	24.4	1.23	0.991	1,290	0.665	2.4E-03			
24.61	7.50	145.24	2.88	2.02	14.00	130	1.511	1.500	0.943	2.04	0.63	0.80	109.74	12.65	2.01	14.67		110.87	2.09		0			1.00		0.97		0.700	Non-Liq.	4.9	22.8			0.00	1.012						
25.10	7.65	64.02	2.80	4.38	6.13	130	1.543	1.518	0.941	4.48	0.78	0.75	44.58	5.53	5.14	10.67		45.67	2.61		0			1.00		0.97		0.704	Non-Liq.	3.9	11.7			0.00	1.034						
25.59	7.80	23.68	1.62	6.84	2.27	130	1.575	1.533	0.940	7.31	0.92	0.71	14.87	1.87	5.98	7.95		15.69	3.10		0			1.00		0.97		0.708	Non-Liq.	2.8	5.4			0.00	1.055						
26.08	7.95	16.47	0.67	4.04	1.58	130	1.607	1.549	0.938	4.46	0.92	0.70	9.92	1.30	4.71	6.01		10.95	3.10		0			1.00		0.96		0.711	Non-Liq.	2.9	3.7			0.00	1.077						
26.57	8.10	59.41	1.27	2.14	5.69	130	1.639	1.565	0.936	2.20	0.73	0.75	41.31	7.77	2.19	9.97		68.70	2.43		0			1.58		0.96		0.715	Non-Liq.	4.2	15.7			0.00	1.098						
27.07	8.25	34.73	1.73	4.97	3.33	130	1.671	1.583	0.934	5.21	0.88	0.71	22.19	2.80	6.59	8.85		22.26	2.87		0			1.00		0.96		0.718	Non-Liq.	3.4	6.9			0.00	1.119						
27.56	8.40	22.35	1.07	4.77	2.14	130	1.703	1.599	0.932	5.14	0.90	0.69	13.52	1.80	5.70	7.50		14.55	3.03		0			1.00		0.96		0.721	Non-Liq.	3.1	4.8			0.00	1.141						
28.05	8.55	16.84	0.59	3.51	1.61	130	1.735	1.616	0.930	3.88	0.91	0.68	9.79	1.30	4.02	5.32		10.83	3.07		0			1.00		0.95		0.723	Non-Liq.	3.0	3.6			0.00	1.162						
28.54	8.70	21.94	0.51	2.34	2.10	130	1.767	1.633	0.928	2.53	0.85	0.69	13.29	1.68	2.47	4.15		14.35	2.85		0			1.00		0.95		0.726	Non-Liq.	3.4	4.2			0.00	1.184						
29.04	8.85	24.12	0.62	2.59	2.31	130	1.799	1.649	0.925	2.78	0.84	0.69	14.59	1.87	2.80	4.67		15.65	2.84		0			1.00		0.95		0.728	Non-Liq.	3.4	4.6			0.00	1.205						
29.53	9.00	19.93	0.59	2.98	1.91	130	1.831	1.666	0.923	3.26	0.88	0.67	11.58	1.52	3.33	4.85		12.64	2.97		0			1.00		0.95		0.731	Non-Liq.	3.2	4.0			0.00	1.227						
30.02	9.15	16.42	0.43	2.65	1.57	130	1.863	1.683	0.920	2.95	0.90	0.66	9.19	1.22	2.88	4.10		10.24	3.02		0			1.00		0.95		0.733	Non-Liq.	2.1	3.3			0.00	1.248						
30.51	9.30	35.02	0.83	2.37	3.35	130	1.895	1.699	0.918	2.49	0.80	0.68	21.59	2.74	2.51	5.25		22.08	2.68		0			1.00		0.94		0.734	Non-Liq.	3.8	8.0			0.00	1.269						
31.00	9.45	60.70	1.91	3.14	5.81	130	1.927	1.716	0.915	3.23	0.76	0.69	38.55	4.97	3.55	8.51		39.67	2.55		0			1.00		0.94		0.736	Non-Liq.	4.0	9.3			0.00	1.291						
31.50	9.60	107.86	2.69	2.50	10.33	130	1.959	1.732	0.913	2.54	0.69	0.71	71.48	10.30	2.69	12.98		83.74	2.29		0			1.15		0.94		0.737	Non-Liq.	4.5	18.6			0.00	1.312						
31.99	9.75	225.77	3.80	1.72	21.62	130	1.991	1.749	0.910	1.73	0.59	0.75	157.79	21.68	1.84	23.52	1.08	183.29	1.94		1	100	1.22	1.15	224.4	0.88	Infin.	0.739	Non-Liq.	6.2	35.7	9.7	44.9	0.00	1.334	1,335	0.863	1.3E-03			

Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa	Moss ΔQc MPa	Moss qc1mod MPa	Moss eff Kc	Qc1n	Ic
32.46	9.90	173.66	4.05	2.60	17.11	130	2.023	1.766	0.907	2.63	0.65	0.72	120.05	17.33	2.83	20.16	1.16	139.70	2.15
32.97	10.05	118.42	3.97	3.35	11.34	130	2.055	1.782	0.904	3.40	0.71	0.69	78.21	11.43	3.84	15.27		89.16	2.36
33.46	10.20	36.37	2.57	7.07	3.48	130	2.087	1.799	0.901	7.44	0.89	0.62	20.38	2.96	6.65	8.01		21.42	3.01
33.96	10.35	20.29	1.18	5.80	1.94	130	2.119	1.816	0.898	6.36	0.84	0.60	10.52	1.55	6.06	7.61		11.56	3.18
34.45	10.50	14.79	0.57	3.86	1.42	130	2.151	1.832	0.894	4.40	0.94	0.60	7.29	1.06	4.52	5.58		8.33	3.20
34.94	10.65	12.65	0.40	3.15	1.21	130	2.183	1.849	0.891	3.60	0.95	0.59	5.01	0.87	3.57	4.44		7.04	3.23
35.43	10.80	48.02	0.59	1.85	4.60	130	2.215	1.866	0.888	1.92	0.75	0.65	28.55	3.64	1.81	5.45		29.70	2.91
35.93	10.95	165.42	1.32	0.80	15.84	130	2.247	1.882	0.884	0.80	0.55	0.73	112.71	14.52	0.40	14.92		131.41	1.81
36.42	11.10	239.26	1.10	0.46	22.91	130	2.279	1.899	0.880	0.48	0.50	0.75	167.47	29.28	0.00	29.28	1.00	194.57	1.53
36.91	11.25	170.61	1.17	0.66	16.91	130	2.311	1.915	0.877	0.67	0.53	0.73	120.72	15.19	0.22	15.41	1.01	140.68	1.74
37.40	11.40	152.13	1.13	0.74	14.57	130	2.343	1.932	0.873	0.75	0.55	0.72	101.75	13.08	0.33	13.40		118.79	1.63
37.89	11.55	38.52	0.86	2.24	3.69	130	2.375	1.949	0.869	2.38	0.78	0.62	21.33	2.85	2.34	5.19		22.47	2.67
38.39	11.70	17.97	0.57	3.19	1.72	130	2.408	1.965	0.865	3.58	0.91	0.57	8.61	1.25	3.62	4.88		9.57	3.09
38.88	11.85	20.89	0.32	1.52	2.00	130	2.438	1.982	0.861	1.68	0.84	0.59	10.55	1.39	1.37	2.77		11.66	2.84
39.37	12.00	29.94	0.66	2.20	2.87	130	2.470	1.999	0.857	2.36	0.82	0.59	15.88	2.14	2.29	4.43		16.80	2.78
39.86	12.15	49.75	1.23	2.48	4.76	130	2.502	2.015	0.852	2.58	0.77	0.61	27.43	3.74	2.66	6.40		28.59	2.61
40.35	12.30	43.34	1.35	3.11	4.15	130	2.534	2.032	0.848	3.27	0.81	0.59	23.06	3.27	3.51	6.78		24.20	2.73
40.85	12.45	183.50	2.12	1.16	17.57	130	2.566	2.049	0.843	1.17	0.57	0.68	117.36	15.05	0.88	15.93		127.16	1.90
41.34	12.60	295.87	3.83	1.29	28.33	130	2.598	2.065	0.839	1.30	0.54	0.70	193.42	24.99	1.06	26.05	1.04	208.87	1.78
41.83	12.75	293.88	4.96	1.69	28.14	130	2.630	2.082	0.834	1.70	0.57	0.68	187.76	25.24	1.59	26.83	1.06	202.59	1.88
42.32	12.90	336.24	5.70	1.69	32.20	130	2.662	2.098	0.830	1.70	0.56	0.65	215.54	28.89	1.60	30.59	1.06	232.37	1.84
42.81	13.05	239.78	4.78	2.00	22.96	130	2.694	2.115	0.825	2.02	0.60	0.66	147.91	20.57	2.01	22.58		159.88	2.00
43.31	13.20	63.74	2.71	4.25	6.10	130	2.726	2.132	0.820	4.40	0.80	0.57	33.32	4.88	5.01	9.89		34.47	2.70
43.80	13.35	163.79	2.31	1.41	15.68	130	2.758	2.148	0.816	1.43	0.61	0.65	99.50	14.38	1.22	15.60		110.22	2.01
44.29	13.50	251.38	4.20	1.67	24.07	130	2.790	2.165	0.811	1.68	0.58	0.66	155.25	22.81	1.56	24.38	1.07	180.50	1.93
44.78	13.65	243.56	5.40	2.22	23.32	130	2.822	2.182	0.806	2.24	0.61	0.64	146.35	22.48	2.29	24.77	1.10	170.22	2.04
45.28	13.80	118.75	3.93	3.31	11.37	130	2.854	2.198	0.801	3.37	0.72	0.59	65.24	10.85	3.75	14.59		76.62	2.41
45.77	13.95	81.89	2.53	3.09	7.62	130	2.886	2.215	0.796	3.16	0.75	0.58	43.30	6.28	3.45	9.73		44.51	2.52
46.26	14.10	99.97	2.22	2.22	9.57	130	2.918	2.231	0.791	2.27	0.70	0.59	54.94	9.55	2.29	11.87		71.85	2.34
46.75	14.25	82.75	2.25	2.72	7.92	130	2.950	2.248	0.786	2.79	0.73	0.58	43.78	7.94	2.94	10.88	1.37	58.90	2.47
47.24	14.40	88.61	2.25	2.54	8.49	130	2.982	2.265	0.781	2.60	0.72	0.58	47.15	6.70	2.70	9.40		48.39	2.43
47.74	14.55	64.69	1.77	2.74	6.19	130	3.014	2.281	0.776	2.84	0.76	0.58	32.85	4.79	2.96	7.75		34.05	2.57
48.23	14.70	149.07	1.57	1.06	14.27	130	3.046	2.298	0.771	1.07	0.59	0.63	87.58	10.78	0.73	11.51		89.28	1.97
48.72	14.85	80.50	2.07	2.57	7.71	130	3.078	2.315	0.766	2.65	0.73	0.58	41.64	6.01	2.74	8.75		42.87	2.47
49.21	15.00	60.63	2.42	3.99	5.81	130	3.110	2.331	0.761	4.15	0.80	0.53	28.29	4.58	4.61	9.19		30.46	2.72
49.70	15.15	161.83	3.50	2.16	15.50	130	3.142	2.348	0.756	2.19	0.65	0.60	89.81	12.48	2.19	14.67		91.47	2.18

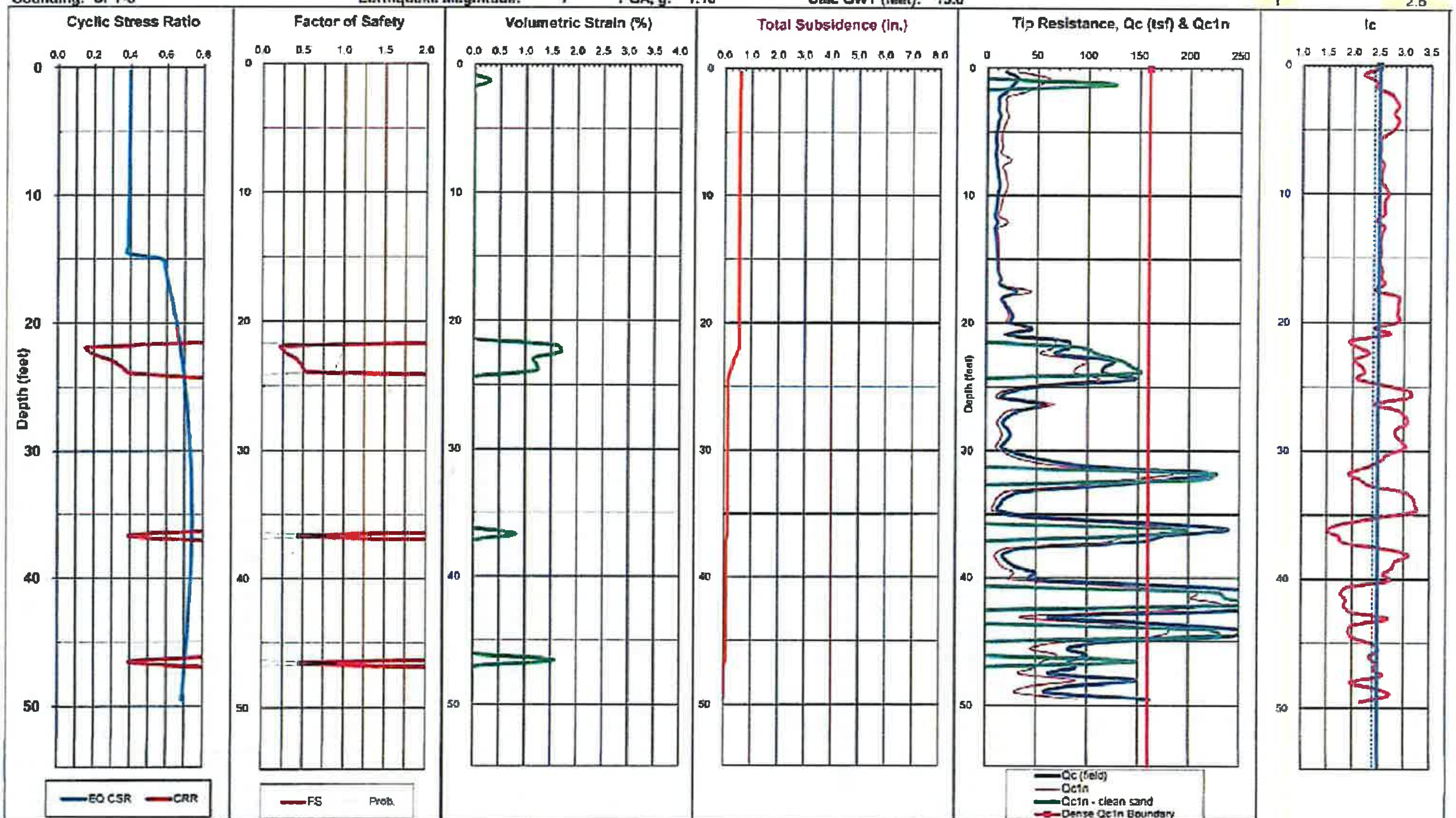
Depth (feet)	Liquef. Suscept. (0 or 1)	Rel Dens. Dr (%)	Kc	K	Clean Sand Qc1n	Kσ	CRR	Induced M=7.5 CSR	Liquefac. Safety Factor	Qc1n N1(60) Ratio	Equiv. N1(60)	FC Adj ΔN1(60)	Equiv. N1(60)cs	Volumetric Strain (%)	p (tsf)	Gmax (tsf)	Tav (tsf)	Shear Strain γ	Strain ε15	Strain Enc	Dry Sand Subsidence (in.)
32.46	1	91	1.55	1.15	217.0	0.87	Infin.	0.740	Non-Liq.	4.6	29.2	10.0	39.2	0.00	1.355	1.767	0.874	1.5E-03			
32.97	0			1.15		0.93		0.741	Non-Liq.	4.4	20.4			0.00	1.377						
33.46	0			1.00		0.93		0.742	Non-Liq.	3.1	6.9			0.00	1.398						
33.96	0			1.00		0.93		0.742	Non-Liq.	2.5	4.2			0.00	1.419						
34.45	0			1.00		0.93		0.743	Non-Liq.	2.7	3.1			0.00	1.441						
34.94	0			1.00		0.92		0.743	Non-Liq.	2.7	2.6			0.00	1.462						
35.43	0			1.00		0.92		0.743	Non-Liq.	4.1	7.3			0.00	1.484						
35.93	0			1.15		0.92		0.743	Non-Liq.	5.5	24.1			0.00	1.505						
36.42	1	100	1.00	1.15	194.6	0.84	Infin.	0.743	Non-Liq.	6.0	32.4	6.5	38.9	0.00	1.527	1.872	0.955	1.4E-03			
36.91	1	91	1.06	1.15	149.6	0.84	0.391	0.742	0.44	5.6	25.1	4.8	29.9	0.82	1.548	1.728	0.965	1.6E-03			
37.40	0			1.15		0.91		0.742	Non-Liq.	5.4	21.9			0.00	1.569						
37.89	0			1.00		0.91		0.741	Non-Liq.	3.8	5.9			0.00	1.591						
38.39	0			1.00		0.91		0.740	Non-Liq.	2.9	3.3			0.00	1.612						
38.88	0			1.00		0.91		0.739	Non-Liq.	3.4	3.4			0.00	1.634						
39.37	0			1.00		0.91		0.738	Non-Liq.	3.6	4.7			0.00	1.655						
39.86	0			1.00		0.91		0.736	Non-Liq.	3.9	7.3			0.00	1.677						
40.35	0			1.00		0.90		0.735	Non-Liq.	3.7	6.6			0.00	1.698						
40.85	0			1.07		0.90		0.733	Non-Liq.	5.3	24.1			0.00	1.720						
41.34	1	100	1.18	1.07	228.5	0.81	Infin.	0.732	Non-Liq.	5.5	37.9	7.8	45.7	0.00	1.741	2.109	1.038	1.2E-03			
41.83	1	100	1.17	1.07	237.1	0.81	Infin.	0.729	Non-Liq.	5.3	38.1	9.3	47.4	0.00	1.762	2.148	1.045	1.1E-03			
42.32	1	100	1.14	1.07	264.9	0.81	Infin.	0.728	Non-Liq.	5.4	43.1	9.9	53.0	0.00	1.784	2.242	1.052	1.0E-03			
42.81	0			1.07		0.90		0.725	Non-Liq.	5.1	31.5			0.00	1.805						
43.31	0			1.00		0.90		0.724	Non-Liq.	3.7	9.3			0.00	1.827						
43.80	0			1.15		0.89		0.721	Non-Liq.	5.1	23.6			0.00	1.848						
44.29	1	100	1.22	1.15	220.1	0.79	Infin.	0.719	Non-Liq.	5.2	34.6	9.4	44.0	0.00	1.870	2.158	1.077	1.2E-03			
44.78	1	99	1.36	1.15	231.0	0.79	Infin.	0.717	Non-Liq.	5.0	34.0	10.0	44.0	0.00	1.891	2.170	1.083	1.1E-03			
45.28	0			1.15		0.89		0.714	Non-Liq.	4.3	17.9			0.00	1.912						
45.77	0			1.00		0.89		0.711	Non-Liq.	4.1	10.9			0.00	1.934						
46.26	0			1.20		0.84		0.709	Non-Liq.	4.4	16.1			0.00	1.955						
46.75	1	53	2.64	1.26	150.2	0.83	0.395	0.706	0.46	4.2	13.7	5.5	19.2	1.58	1.977	1.693	1.104	2.3E-03			
47.24	0			1.00		0.88		0.703	Non-Liq.	4.2	11.4			0.00	1.998						
47.74	0			1.00		0.88		0.700	Non-Liq.	4.0	8.6			0.00	2.020						
48.23	0			1.00		0.88		0.697	Non-Liq.	5.1	17.4			0.00	2.041						
48.72	0			1.00		0.88		0.694	Non-Liq.	4.2	10.3			0.00	2.062						
49.21	0			1.00		0.88		0.691	Non-Liq.	3.7	8.3			0.00	2.084						
49.70	0			1.00		0.87		0.688	Non-Liq.	4.7	19.3			0.00	2.105						

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

Commercial Organics Processing Facility | Project No: VT-24872-02 | Method Used: 1 1996 NCEER (Robertson & Wride)

Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5

Sounding: CPT-3 | Earthquake Magnitude: 7 | PGA, g: 1.10 | Calc GWT (feet): 15.0 | Plot 1 | Limiting Ic: 2.6



Total Thickness of Liquefiable Layers: 3.4 feet

Estimated Total Ground Subsidence (Settlement): 0.6 inches

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

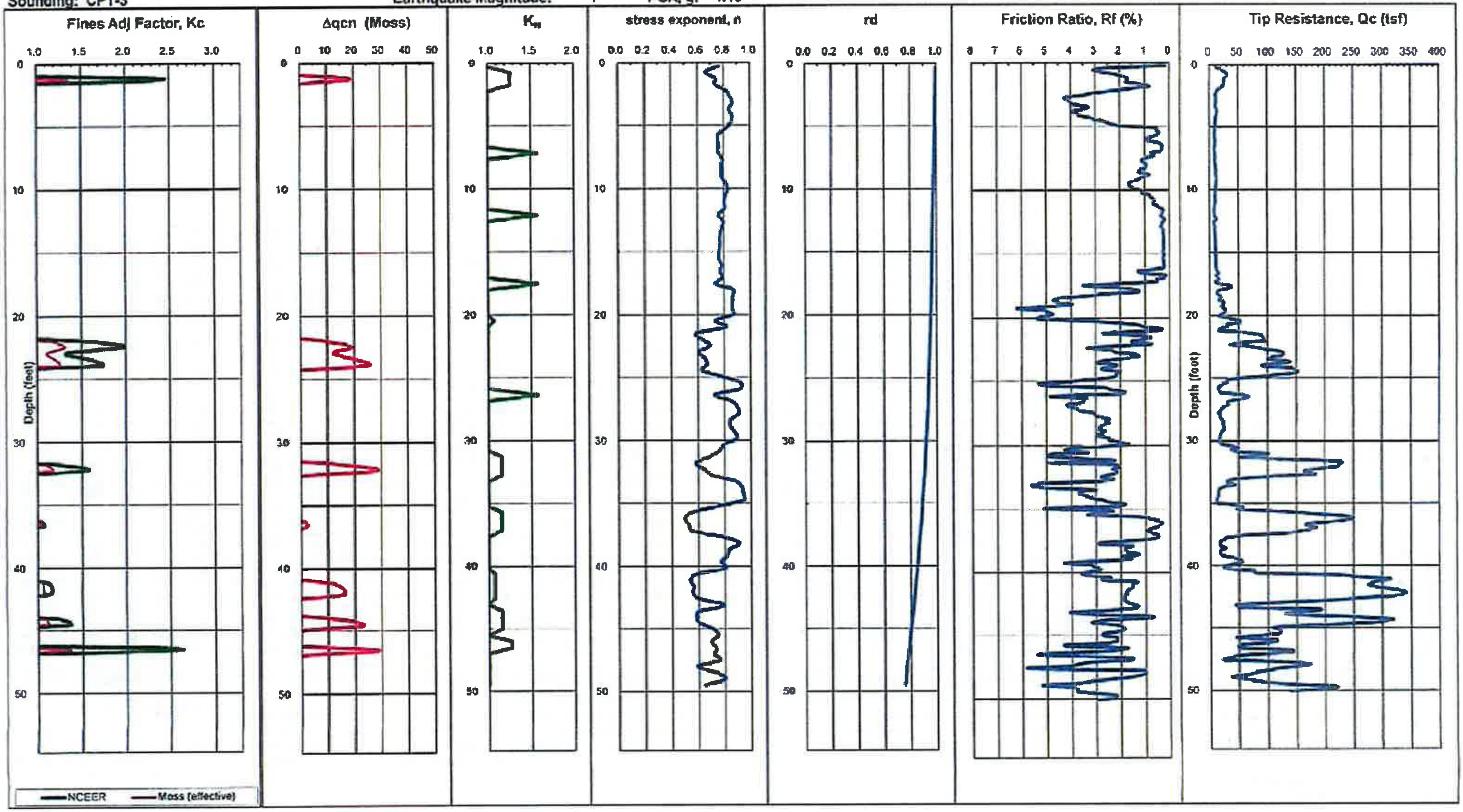
3 avg increment =0.15m Qc1n/N1(60): 5

Ignore 1st/last increment into sand/silt soils: 0

Method Used: 1998 NCEER (Robertson & Wride)

Sounding: CPT-3

Earthquake Magnitude: 7 PGA, g: 1.10



CPT-LIQUEFY.XLS - A SPREADSHEET FOR EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL USING CPT DATA
Developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Project: Commercial Organics Processing Facility
Job No: VT-24872-02
Date: 5/17/2017
Sounding: CPT-1

Liquefaction Analysis using 1998 NCEER (Robertson & Wride) method
Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5

EARTHQUAKE INFORMATION:		
Magnitude:	7	7.5
PGA, g:	1.10	0.92
MSF:	1.19	
GWT, feet:	24.0	
Calc GWT, feet:	15.0	

Pick: 4
Method Used: 1 1998 NCEER (Robertson & Wride)
Averaging increment: 3 0.15 m
Induced CSR (M=7.5) = 0.65*PGA*(po/p'o)*rd/MSF
Clean Sand Qc1n = C_Q*K_c*K_1*Qc
SF = $CRR_{7.5}$*Kσ/CSR

Ignore 1st/last increment into sand/silt soils: 1 yes
Ignore/remediate upper: 0.00 m
Unit Weight of unsaturated soils: 115 pcf
Unit Weight of saturated soils: 130 pcf
Limiting Ic for liquefiable soils: 2.60 Limiting Ic for K_c: 2.5

Use Moss @ P_L: 15%
Use Tokimatsu & Seed (0) or Ishihara & Yoshimine (1): 0
Required SF: 1.50 Max ΔN(1,60) - plastic/silty: 5.5
Min SF of Liquefiable Layers: 0.00 Max ΔN(1,60) - non-plastic: 10.0
Avg SF of Liquefiable Layers: #DIV/0!

Total Liquefied Thickness (feet)	0.0
Total Induced Subsidence (inches)	0.2

SETTLEMENT OF DRY SANDS
Qc1n / N1(60) Ratio for clean sand
p = 0.67*po
τ_{av} = 0.65*PGA*po*rd
G_{max} = 447*$N_{1,60,cs}$^(1/3)*p^0.5
n = 0.0389*(p/1)+0.124
b = 8400*(p/1)^0.6
γ = [(1+a*EXP(b*τ_{av}/G_{max}))/(1+a)*τ_{av}/G_{max}]
E_{15} = γ*($N_{1,60,cs}$/20)^-1.2
Nc = (MAG-4)^2.17
E_{nc} = (Nc/15)^0.45*E15
S = 2*H*E_{nc}
Nc = 10.8

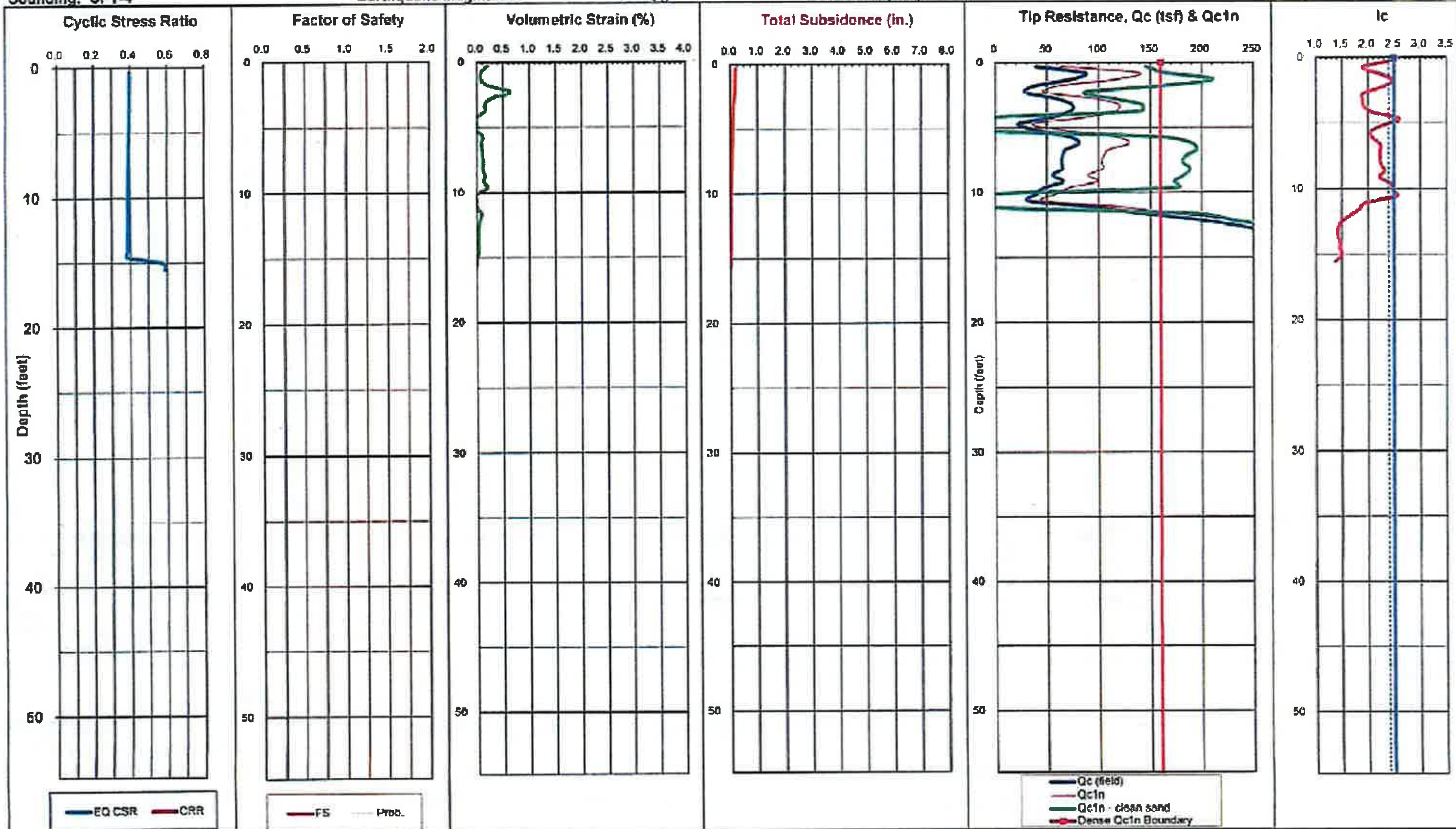
Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa	Moss ΔqC MPa	Moss qc1mod MPa	Moss eff Kc	Qc1n	Ic	Override	Liquef. Assumed (0 or 1)	Rel. Dens. Dr(%)	Kc	Kσ	Clean Sand Qc1n	Kα	CRR	Induced M=7.5 CSR	Liquefac. Safety Factor	Qc1n Nspt Ratio	Equiv. N 1(60)	FC Adj ΔN1(60)	Equiv. N1(60)cs	Volumetric Strain (%)	p (tsf)	Gmax (tsf)	τav (tsf)	Shear Strain γ	Strain E15	Strain Enc	Dry Sand Subsidence (in.)
0.49	0.15	39.34	1.25	3.18	3.77	115	0.028	0.028	1.000	3.19	0.73	1.70	63.17	6.40	2.97	9.38	1.48	63.22	2.40		1	55	2.31	1.00	145.8	1.00	0.368	0.399	Non-Liq.	4.3	14.7	10.0	24.7	0.21	0.019	178	0.013	1.6E-03	1.2E-03	1.1E-03	0.012
0.98	0.30	69.79	1.20	1.39	8.31	115	0.057	0.057	1.000	1.39	0.58	1.70	139.36	14.13	0.99	15.12	1.07	139.45	1.90		1	91	1.19	1.00	166.0	1.00	Infin.	0.399	Non-Liq.	5.3	26.4	6.8	33.2	0.09	0.038	280	0.027	6.5E-04	5.2E-04	4.5E-04	0.005
1.48	0.45	73.60	2.53	3.43	7.05	115	0.085	0.085	0.999	3.44	0.66	1.70	118.12	11.98	3.28	15.24	1.27	118.25	2.24		1	84	1.78	1.00	210.8	1.00	Infin.	0.399	Non-Liq.	4.5	25.7	10.0	35.7	0.08	0.057	351	0.040	6.9E-04	4.4E-04	3.8E-04	0.005
1.97	0.60	37.46	1.46	3.88	3.84	115	0.113	0.113	0.997	3.87	0.75	1.70	60.62	6.18	3.73	9.91	1.60	61.00	2.47		1	58	2.63	1.00	160.5	1.00	Infin.	0.398	Non-Liq.	4.2	14.7	10.0	24.7	0.23	0.076	356	0.054	1.7E-03	1.3E-03	1.1E-03	0.013
2.46	0.75	29.00	0.43	1.47	2.78	115	0.141	0.141	0.996	1.48	0.69	1.70	46.47	4.73	1.08	5.81	1.23	46.70	2.28		1	45	1.87	1.00	87.5	1.00	0.142	0.398	Non-Liq.	4.5	10.3	7.2	17.5	0.44	0.095	357	0.067	3.1E-03	3.7E-03	3.2E-03	0.035
2.95	0.90	58.83	0.55	0.94	5.64	115	0.170	0.170	0.995	0.94	0.56	1.70	94.34	9.59	0.49	10.07	1.05	94.61	1.91		1	75	1.20	1.00	113.7	1.00	0.217	0.397	Non-Liq.	5.3	18.0	4.7	22.7	0.29	0.114	427	0.080	2.0E-03	1.7E-03	1.5E-03	0.017
3.44	1.05	74.60	0.89	1.19	7.14	115	0.198	0.198	0.994	1.19	0.58	1.70	119.54	12.14	0.78	12.91	1.06	119.65	1.90		1	84	1.19	1.00	142.7	1.00	0.350	0.397	Non-Liq.	5.3	22.7	5.8	28.5	0.16	0.133	498	0.094	1.4E-03	9.2E-04	7.9E-04	0.009
3.94	1.20	72.83	0.90	1.24	6.98	115	0.226	0.226	0.993	1.24	0.58	1.70	116.69	11.86	0.82	12.68	1.07	117.06	1.92		1	83	1.21	1.00	141.7	1.00	0.345	0.396	Non-Liq.	5.2	22.4	6.0	28.3	0.16	0.152	531	0.107	1.4E-03	9.5E-04	8.2E-04	0.010
4.43	1.35	53.72	0.89	1.65	5.14	115	0.255	0.255	0.992	1.66	0.64	1.70	85.50	8.74	1.27	10.02		86.31	2.19		0			1.00		1.00		0.396	Non-Liq.	4.9	17.7			0.00	0.171						
4.92	1.50	22.58	0.78	3.47	2.16	115	0.283	0.283	0.990	3.52	0.79	1.70	35.90	3.67	3.29	6.97		36.25	2.61		0			1.00		1.00		0.395	Non-Liq.	3.9	5.3			0.00	0.190						
5.41	1.65	40.57	0.89	2.19	3.88	115	0.311	0.311	0.989	2.21	0.69	1.70	64.61	6.48	1.88	8.35		65.35	2.28		0			1.00		1.00		0.395	Non-Liq.	4.5	14.4			0.00	0.209						
5.91	1.80	72.40	1.37	1.89	6.93	115	0.340	0.340	0.988	1.90	0.62	1.70	115.79	10.47	1.54	12.01	1.15	118.34	2.05		1	83	1.38	1.00	160.4	1.00	Infin.	0.395	Non-Liq.	5.0	23.4	8.7	32.1	0.13	0.228	677	0.160	1.3E-03	7.3E-04	6.3E-04	0.007
6.40	1.95	81.12	1.86	2.44	7.77	115	0.368	0.368	0.987	2.45	0.64	1.70	129.76	10.92	2.15	13.06	1.20	130.35	2.11		1	86	1.46	1.00	190.0	1.00	Infin.	0.394	Non-Liq.	4.9	26.7	10.0	36.7	0.09	0.246	738	0.173	1.1E-03	5.3E-04	4.6E-04	0.005
6.89	2.10	68.54	2.18	3.19	6.56	115	0.396	0.396	0.986	3.20	0.68	1.70	109.49	8.91	2.97	11.88	1.33	110.13	2.24		1	81	1.78	1.00	195.5	1.00	Infin.	0.394	Non-Liq.	4.8	23.0	10.0	33.9	0.11	0.265	745	0.186	1.2E-03	6.6E-04	5.7E-04	0.007
7.38	2.25	65.49	1.97	3.00	9.27	115	0.424	0.424	0.985	3.02	0.68	1.70	104.54	8.41	2.77	11.18	1.35	105.22	2.24		1	79	1.76	1.00	184.9	1.00	Infin.	0.393	Non-Liq.	4.8	22.8	10.0	32.8	0.13	0.284	783	0.199	1.3E-03	7.3E-04	6.3E-04	0.007
7.87	2.40	64.12	1.81	2.87	6.14	115	0.453	0.453	0.984	3.00	0.69	1.70	102.31	8.09	2.73	10.83	1.34	103.03	2.24		1	78	1.77	1.00	181.9	1.00	Infin.	0.393	Non-Liq.	4.6	22.3	10.0	32.3	0.13	0.303	784	0.212	1.4E-03	7.6E-04	6.6E-04	0.008
8.37	2.55	64.97	2.05	3.16	6.22	115	0.481	0.481	0.983	3.18	0.70	1.70	103.62	7.98	2.43	10.82	1.37	104.39	2.25		1	79	1.81	1.00	189.0	1.00	Infin.	0.392	Non-Liq.	4.6	22.8	10.0	32.8	0.13	0.322	812	0.225	1.3E-03	7.4E-04	6.4E-04	0.008
8.86	2.70	55.69	1.93	3.45	5.36	115	0.509	0.509	0.982	3.48	0.72	1.69	88.79	6.89	3.26	10.06	1.46	89.60	2.33		1	72	2.04	1.00	182.9	1.00	Infin.	0.392	Non-Liq.	4.4	20.2	10.0	30.2	0.16	0.341	815	0.238	1.5E-03	9.3E-04	8.0E-04	0.009
9.35	2.85	66.64	1.86	2.82	6.32	115	0.538	0.538	0.981	2.84	0.69	1.59	93.67	7.89	2.56	10.45	1.32	93.48	2.23		1	77	1.75	1.00	173.8	1.00	Infin.	0.392	Non-Liq.	4.6	21.5	10.0	31.5	0.15	0.360	847	0.251	1.5E-03	8.4E-04	7.3E-04	0.009
9.84	3.00	47.72	1.88	3.95	4.57	115	0.566	0.566	0.979	4.00	0.75	1.60	71.37	5.62	3.81	9.42	1.68	72.23	2.44		1	65	2.46	1.00	177.9	1.00	Infin.	0.391	Non-Liq.	4.2	17.1	10.0	27.1	0.22	0.379	825	0.264	1.8E-03	1.2E-03	1.1E-03	0.013
10.33	3.15	40.60	1.51	3.77	3.83	115	0.594	0.594	0.976	3.83	0.77	1.58	57.99	4.71	3.61	8.31		58.64	2.49		0			1.00		1.00		0.391	Non-Liq.	4.1	14.2			0.00	0.398						
10.83	3.30	31.51	1.14	3.81	3.02	115	0.623	0.623	0.977	3.89	0.79	1.52	44.36	3.72	3.43	7.15		45.24	2.55		0			1.00		1.00		0.390	Non-Liq.	4.0	11.3			0.00	0.417						
11.32	3.45	94.74	1.27	1.34	9.07	115	0.651	0.651	0.976	1.35	0.59	1.34	118.73	10.94	0.93	11.87		120.00	1.84		0			1.00		1.00		0.390	Non-Liq.	5.2	23.1			0.00	0.436						
11.81	3.60	141.57	1.88	1.33	13.56	115	0.679	0.679	0.975	1.34	0.56	1.28	170.67	15.78	0.91	16.69	1.06	171.44	1.63		1	98	1.13	1.00	193.4	1.00	Infin.	0.389	Non-Liq.	5.4	31.6	7.0	38.7	0.09	0.455	1,020	0.315	1.2E-03	5.4E-04	4.7E-04	0.006
12.30	3.75	198.35	1.92	0.97	18.99	130	0.711	0.711	0.974	0.97	0.50	1.22	227.01	21.87	0.52	22.39	1.02	228.73	1.64		1	100	1.00	1.00	228.2	1.00	Infin.	0.389	Non-Liq.	5.8	39.8	6.1	45.6	0.06	0.476	1,103	0.330	1.0E-03	3.7E-04	3.2E-04	0.004
12.80	3.90	238.33	1.65	0.69	22.82	130	0.743	0.743	0.973	0.69	0.50	1.19	267.65	20.17	0.21	26.39	1.01	268.79	1.48		1	100	1.00	1.00	268.8	1.00	Infin.	0.380	Non-Liq.	6.1	44.2	9.6	53.8	0.05	0.498	1,190	0.344	8.5E-04	2.6E-04	2.3E-04	0.003
13.29	4.05	269.86	1.71	0.64	25.84	130	0.775	0.775	0.972	0.64	0.50	1.17	297.14	29.19	0.15	29.33	1.01	298.00	1.43		1	100	1.00	1.00	298.0	1.00	Infin.	0.388	Non-Liq.	6.2	48.1	10.0	58.1	0.04	0.519	1,247	0.359	8.1E-04	2.2E-04	1.9E-04	0.002
13.78	4.20	295.66	1.93	0.65	28.31	130	0.807	0.807	0.971	0.60	0.50	1.14	319.08	31.38	0.17	31.55	1.01	319.95	1.42		1	100	1.00	1.00	320.0	1.00	Infin.	0.388	Non-Liq.	6.2	51.4	10.0	61.4	0.03	0.541	1,297	0.373	7.7E-04	2.0E-04	1.7E-04	0.002
14.27	4.35	275.69	1.95	0.71	26.40	130	0.839	0.839	0.970	0.71	0.50	1.12	291.71	28.79	0.23	29.02	1.01	292.80	1.47		1	100	1.00	1.00	292.8	1.00	Infin.	0.387	Non-Liq.	6.1	47.8	10.0	57.8	0.04	0.562	1,286	0.388	8.3E-04	2.3E-04	2.0E-04	0.002
14.76	4.50	282.23	1.97	0.70	27.03	130	0.871	0.871	0.969	0.70	0.50	1.10	293.08	29.08	0.22	29.28	1.01	293.90	1.46		1	100	1.00	1.00	294.0	1.00	Infin.	0.387	Non-Liq.	6.1	47.0	10.0	57.0	0.04	0.584	1,323	0.402	8.4E-04	2.3E-04	2.0E-04	0.002
15.26	4.65	314.84	2.70	0.86	30.15	130	0.903	0.903	0.968	0.86	0.50	1.08	321.18	31.80	0.45	32.25	1.01	322.10	1.50		1	100	1.00	1.00	322.1	1.00	Infin.	0.580	Non-Liq.	6.1	53.2	10.0	63.2	0.00	0.605	1,385	0.416	7.8E-04			
15.75	4.80	462.25	3.71	0.80	44.27	130	0.935	0.935	0.967	0.80	0.50	1.05	463.81	46.05	0.38	46.43	1.01	464.75	1.38		1	100	1.00	1.00	464.7	1.00	Infin.	0.589	Non-Liq.	6.3	73.9	10.0	83.9	0.00	0.626	1,549	0.431	6.2E-04			

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

Commercial Organics Processing Facility   Project No: VT-24872-02   Method Used: 1   1998 NCEER (Robertson & Wride)

Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5   Plot 1   Limiting Ic: 2.6

Sounding: CPT-4   Earthquake Magnitude: 7   PGA, g: 1.10   Calc GWT (feet): 15.0



Total Thickness of Liquefiable Layers: 0.0 feet   Estimated Total Ground Subsidence (Settlement): 0.2 inches

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

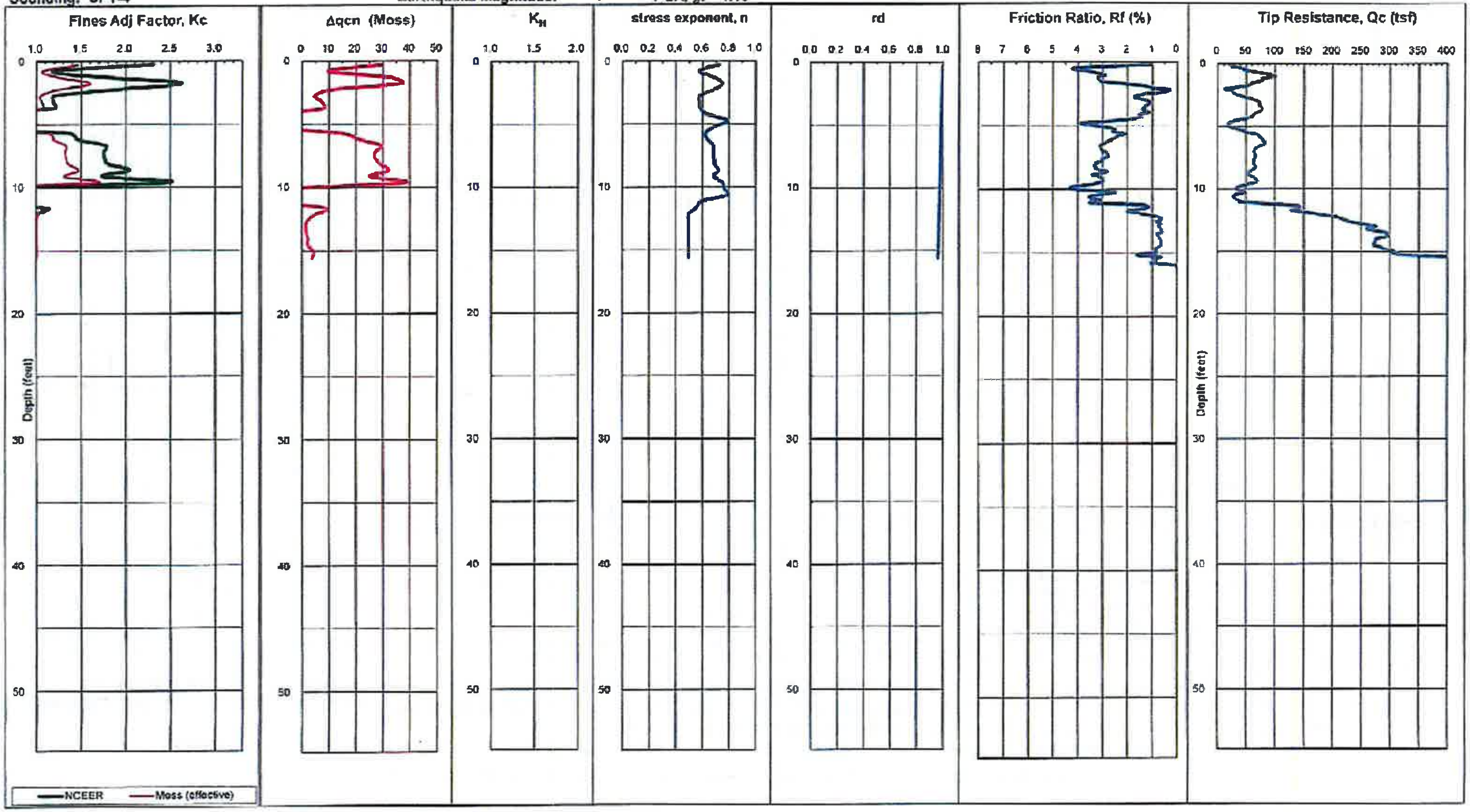
3 avg increment =0.15m Qc1n/N1(60): 5

Ignore 1st/last increment into sand/silt soils: 0

Method Used: 1998 NCEER (Robertson & Wride)

Sounding: CPT-4

Earthquake Magnitude: 7 PGA, g: 1.10



CPT-LIQUEFY.XLS - A SPREADSHEET FOR EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL USING CPT DATA
Developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Project: Commercial Organics Processing Facility
Job No: VT-24872-02
Date: 5/17/2017
Sounding: CPT-4A

Liquefaction Analysis using 1998 NCEER (Robertson & Wride) method
Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5

EARTHQUAKE INFORMATION:
Magnitude: 7 7.5
PGA, g: 1.10 0.82
MSF: 1.19
GWT, feet: 24.0
Calc GWT, feet: 15.0

Plot: 5
Method Used: 1 1998 NCEER (Robertson & Wride)
Averaging Increment: 3 0.15 m
Induced CSR (M=7.5) = 0.65*PGA*(po/p'o)*rd/MSF
Clean Sand Qc1n = Cq*Kc*Ka*Qc
SF = CRR7.5*Ka/CSR

Ignore 1st/last increment into sand/silt soils: 1 yes
Ignore/remediate upper: 0.00 m
Unit Weight of unsaturated soils: 115 pcf
Unit Weight of saturated soils: 130 pcf
Limiting Ic for liquefiable soils: 2.50 Limiting Ic for Kc: 2.5

Use Moss @ PL: 15%
Use Tokimatsu & Seed (0) or Ishihara &Yasuhara (1): 0
Required SF: 1.50 Max $\Delta N_{1(60)}$ - post liquefaction: 5.5
Min SF of Liquefiable Layers: 0.00 Max $\Delta N_{1(60)}$ - non-liquefaction: 10.0
Avg SF of Liquefiable Layers: #DIV/0!

Total Liquefied Thickness (feet)
0.0
Total Induced Subsidence (inches)
1.4

SETTLEMENT OF DRY SANDS
Qc1n / N1(60) Ratio for clean sand:
$p = 0.67 \cdot po$
$\tau_{av} = 0.65 \cdot PGA \cdot po \cdot rd$
$G_{max} = 447 \cdot N_{1(60)cs}^{(1/3)} \cdot p^{0.5}$
$a = 0.0389 \cdot (p/1) + 0.124$
$b = 6400 \cdot (p/1)^{-0.6}$
$\gamma = [(1+a \cdot EXP(b \cdot \tau_{av}/G_{max}))/((1+a) \cdot \tau_{av}/G_{max})]$
$E_{15} = \gamma \cdot (N_{1(60)cs}/20)^{-1.2}$
$Nc = (MAG-4)^{2.17}$
$E_{c} = (Nc/15)^{0.45} \cdot E15$
$S = 2 \cdot H \cdot E_{c}$
Nc = 10.8

Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qt MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa	Moss Δqc MPa	Moss qc1ncs MPa	Moss eff Kc	Qc1n	Ic
0.49	0.15	25.15	0.12	0.42	2.41	115	0.028	0.028	1.000	0.49	0.63	1.70	40.37	4.09	0.00	4.09	1.00	40.41	2.88
0.98	0.30	43.74	0.70	0.60	4.18	115	0.057	0.057	1.000	0.80	0.58	1.70	70.20	7.12	0.12	7.24	1.02	70.29	1.91
1.48	0.45	27.25	0.75	2.77	2.61	115	0.085	0.085	0.999	2.78	0.75	1.70	43.65	4.44	2.52	6.96		43.79	2.47
1.97	0.60	19.02	0.51	2.67	1.82	115	0.113	0.113	0.997	2.59	0.78	1.70	30.38	3.10	2.41	5.50		30.56	2.58
2.46	0.75	22.32	0.16	0.72	2.14	115	0.141	0.141	0.998	0.73	0.67	1.70	35.84	3.65	0.25	3.90		35.80	2.20
2.95	0.90	29.44	0.04	0.12	2.82	115	0.170	0.170	0.995	0.13	0.58	1.70	47.04	4.79	0.00	4.79	1.00	47.31	1.63
3.44	1.05	30.99	0.02	0.06	2.97	115	0.198	0.198	0.994	0.06	0.54	1.70	49.48	5.04	0.00	5.04	1.00	49.79	1.78
3.94	1.20	35.09	0.03	0.07	3.36	115	0.226	0.226	0.993	0.07	0.52	1.70	56.02	5.71	0.00	5.71	1.00	56.39	1.72
4.43	1.35	29.54	0.13	0.45	2.83	115	0.255	0.255	0.992	0.45	0.61	1.70	47.05	4.81	0.00	4.81	1.00	47.46	2.00
4.92	1.50	22.04	0.36	1.63	2.11	115	0.283	0.283	0.990	1.65	0.73	1.70	34.95	3.59	1.25	4.83	1.35	35.41	2.40
5.41	1.65	59.19	0.59	1.00	5.67	115	0.311	0.311	0.989	1.00	0.59	1.70	94.61	9.64	0.55	10.19	1.06	95.11	1.93
5.91	1.80	70.66	0.95	1.35	6.77	115	0.340	0.340	0.988	1.35	0.60	1.70	112.99	10.78	0.94	11.89	1.09	113.54	1.96
6.40	1.95	71.33	1.31	1.83	6.83	115	0.368	0.368	0.987	1.84	0.62	1.70	114.02	10.07	1.48	11.55	1.15	114.51	2.05
6.89	2.10	51.59	1.26	2.45	4.94	115	0.396	0.396	0.986	2.47	0.68	1.70	82.20	7.11	2.15	9.27	1.30	82.80	2.24
7.38	2.25	48.45	1.07	2.21	4.64	115	0.424	0.424	0.985	2.23	0.68	1.70	77.16	6.63	1.89	8.52	1.29	77.84	2.23
7.87	2.40	51.81	1.09	2.11	4.96	115	0.453	0.453	0.984	2.12	0.68	1.70	82.53	6.90	1.77	8.67	1.26	83.25	2.19
8.37	2.55	52.72	1.19	2.26	5.05	115	0.481	0.481	0.983	2.28	0.69	1.70	83.94	6.80	1.94	8.74	1.29	84.72	2.21
8.86	2.70	36.80	1.16	3.14	3.52	115	0.509	0.509	0.982	3.19	0.75	1.70	58.31	4.68	2.92	7.60	1.62	59.13	2.42
9.35	2.85	50.53	1.13	2.24	4.84	115	0.538	0.538	0.981	2.27	0.69	1.60	75.49	6.28	1.82	8.20	1.31	76.30	2.24
9.84	3.00	34.35	1.12	3.26	3.29	115	0.566	0.566	0.979	3.32	0.77	1.61	51.56	4.21	3.05	7.26	1.72	52.42	2.47
10.33	3.15	32.37	0.92	2.83	3.10	115	0.594	0.594	0.978	2.88	0.76	1.55	46.60	3.95	2.57	6.52	1.65	47.47	2.46
10.83	3.30	32.64	0.76	2.34	3.13	115	0.623	0.623	0.977	2.38	0.75	1.49	44.98	3.95	2.03	5.97	1.51	45.85	2.42
11.32	3.45	100.88	0.77	0.76	9.64	115	0.651	0.651	0.976	0.77	0.54	1.30	122.84	12.01	0.29	12.30	1.02	123.74	1.77
11.81	3.60	132.55	1.47	1.11	12.68	115	0.679	0.679	0.975	1.11	0.55	1.27	158.90	14.96	0.67	15.63	1.04	159.72	1.79
12.30	3.75	228.06	2.06	0.90	21.84	130	0.711	0.711	0.974	0.91	0.50	1.22	262.11	25.13	0.45	25.56	1.02	262.93	1.56
12.80	3.90	260.16	2.00	0.77	24.91	130	0.743	0.743	0.973	0.77	0.50	1.19	292.57	28.35	0.30	28.65	1.01	293.41	1.49
13.29	4.05	268.82	1.98	0.73	25.82	130	0.775	0.775	0.972	0.74	0.50	1.17	296.88	28.97	0.26	29.23	1.01	297.74	1.47
13.78	4.20	264.98	1.78	0.67	25.37	130	0.807	0.807	0.971	0.57	0.50	1.14	285.86	28.15	0.19	28.34	1.01	286.74	1.45
14.27	4.35	258.32	1.71	0.65	24.74	130	0.830	0.830	0.970	0.66	0.50	1.12	273.27	27.07	0.16	27.24	1.01	274.16	1.47
14.76	4.50	288.92	2.97	0.80	27.48	130	0.871	0.871	0.969	0.80	0.50	1.10	297.97	29.34	0.44	29.78	1.01	298.88	1.54
15.26	4.65	362.53	3.07	0.85	34.72	130	0.903	0.903	0.968	0.85	0.50	1.08	369.97	36.57	0.44	37.01	1.01	370.89	1.45
15.75	4.80	502.15	2.48	0.49	48.09	130	0.935	0.935	0.967	0.49	0.50	1.06	503.92	59.43	0.00	60.43	1.00	504.86	1.19

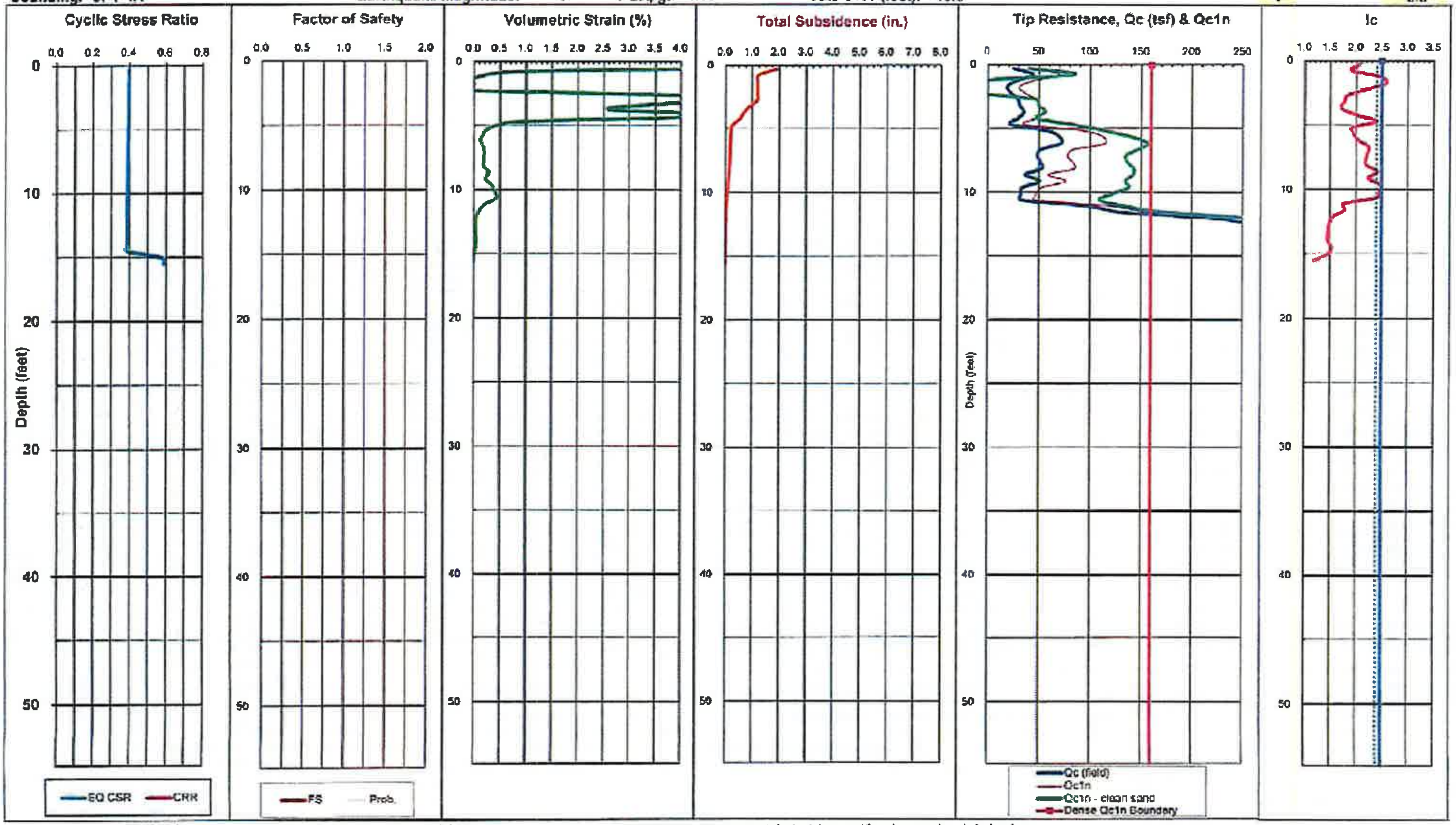
Depth (feet)	Override	Liquef. Suscept. (0 or 1)	Rel Dens Dr (%)	Kc	Kσ	Clean Sand Qc1n	Kα	CRR	Induced M=7.5 CSR	Liquefac. Safety Factor	Qc1n N1(60) Ratio	Equiv. N1(60)	FC Adj ΔN1(60)	Equiv. N1(60)cs	Volumetric Strain (%)	p (tsf)	Gmax (tsf)	τav (tsf)	Shear Strain γ	Strain E15	Strain Enc	Dry Sand Subsidence (in.)
0.49		1	39	1.00	1.00	40.4	1.00	0.084	0.399	Non-Liq.	4.9	8.2	0.0	8.2	11.11	0.019	124	0.013	2.2E-02	6.4E-02	5.6E-02	0.656
0.98		1	62	1.20	1.00	84.1	1.00	0.135	0.399	Non-Liq.	5.3	13.4	3.5	16.8	0.13	0.038	223	0.027	3.4E-03	4.2E-03	3.0E-03	0.043
1.48		0			1.00		1.00		0.399	Non-Liq.	4.2	10.5			0.00	0.057						
1.97		0			1.00		1.00		0.398	Non-Liq.	3.9	7.7			0.00	0.076						
2.46		0			1.00		1.00		0.398	Non-Liq.	4.7	7.7			0.00	0.095						
2.95		1	46	1.00	1.00	47.5	1.00	0.089	0.397	Non-Liq.	5.4	8.7	0.7	9.5	4.77	0.114	319	0.080	1.1E-02	2.8E-02	2.4E-02	0.282
3.44		1	48	1.00	1.00	49.8	1.00	0.091	0.397	Non-Liq.	5.5	9.0	0.9	10.0	3.95	0.133	350	0.094	9.9E-03	2.3E-02	2.0E-02	0.233
3.94		1	53	1.00	1.00	56.4	1.00	0.097	0.396	Non-Liq.	5.6	10.0	1.3	11.3	2.58	0.152	390	0.107	7.5E-03	1.5E-02	1.3E-02	0.152
4.43		1	46	1.00	1.00	47.5	1.00	0.090	0.396	Non-Liq.	5.1	9.3	0.2	9.5	4.55	0.171	391	0.120	1.1E-02	2.6E-02	2.3E-02	0.269
4.92		1	34	2.33	1.00	82.5	1.00	0.132	0.395	Non-Liq.	4.3	8.2	8.2	16.5	0.79	0.190	455	0.133	3.6E-03	4.6E-03	3.9E-03	0.046
5.41		1	75	1.22	1.00	115.9	1.00	0.225	0.395	Non-Liq.	5.2	18.2	5.0	23.2	0.30	0.209	582	0.147	2.1E-03	1.7E-03	1.5E-03	0.018
5.91		1	82	1.25	1.00	141.8	1.00	0.345	0.395	Non-Liq.	5.2	22.0	6.4	28.4	0.17	0.228	650	0.160	1.5E-03	1.0E-03	8.7E-04	0.010
6.40		1	82	1.37	1.00	157.2	1.00	0.441	0.394	Non-Liq.	5.0	23.0	8.4	31.4	0.14	0.248	700	0.173	1.3E-03	7.8E-04	6.8E-04	0.008
6.89		1	69	1.77	1.00	146.7	1.00	0.374	0.394	Non-Liq.	4.6	18.0	10.0	28.0	0.19	0.265	699	0.186	1.6E-03	1.1E-03	9.3E-04	0.011
7.38		1	68	1.74	1.00	135.3	1.00	0.311	0.393	Non-Liq.	4.6	16.8	10.0	26.8	0.21	0.284	713	0.199	1.7E-03	1.2E-03	1.1E-03	0.012
7.87		1	69	1.65	1.00	137.2	1.00	0.320	0.393	Non-Liq.	4.7	17.7	9.8	27.4	0.20	0.303	743	0.212	1.7E-03	1.2E-03	1.0E-03	0.012
8.37		1	70	1.69	1.00	143.0	1.00	0.352	0.392	Non-Liq.	4.7	18.1	10.0	28.1	0.19	0.322	772	0.225	1.7E-03	1.1E-03	9.5E-04	0.011
8.86		1	55	2.41	1.00	142.6	1.00	0.350	0.392	Non-Liq.	4.3	13.9	10.0	23.9	0.29	0.341	752	0.238	2.1E-03	1.7E-03	1.5E-03	0.017
9.35		1	68	1.77	1.00	136.0	1.00	0.309	0.392	Non-Liq.	4.6	16.5	10.0	26.5	0.22	0.360	800	0.251	1.8E-03	1.3E-03	1.1E-03	0.013
9.84		1	50	2.64	1.00	138.4	1.00	0.328	0.391	Non-Liq.	4.2	12.6	10.0	22.6	0.34	0.379	779	0.264	2.3E-03	2.0E-03	1.7E-03	0.020
10.33		1	48	2.59	1.00	122.9	1.00	0.253	0.391	Non-Liq.	4.2	11.4	10.0	21.4	0.40	0.398	783	0.277	2.5E-03	2.3E-03	2.0E-03	0.024
10.83		1	44	2.39	1.00	109.7	1.00	0.203	0.390	Non-Liq.	4.3	10.8	10.0	20.8	0.44	0.417	793	0.290	2.7E-03	2.5E-03	2.2E-03	0.026
11.32		1	86	1.08	1.00	134.1	1.00	0.304	0.390	Non-Liq.	5.5	22.4	4.5	26.8	0.23	0.436	884	0.303	1.8E-03	1.3E-03	1.1E-03	0.013
11.81		1	96	1.10	1.00	175.9	1.00	Infin.	0.389	Non-Liq.	5.5	29.1	6.1	35.2	0.12	0.455	988	0.315	1.3E-03	6.5E-04	5.8E-04	0.007
12.30		1	100	1.00	1.00	262.9	1.00	Infin.	0.389	Non-Liq.	5.9	44.5	8.1	52.6	0.05	0.476	1,159	0.330	8.7E-04	2.7E-04	2.3E-04	0.003
12.80		1	100	1.00	1.00	293.4	1.00	Infin.	0.389	Non-Liq.	6.1	48.3	10.0	58.3	0.04	0.498	1,220	0.344	7.9E-04	2.2E-04	1.0E-04	0.002
13.29		1	100	1.00	1.00	297.7	1.00	Infin.	0.388	Non-Liq.	6.1	48.7	10.0	58.7	0.04	0.519	1,252	0.359	8.0E-04	2.2E-04	1.9E-04	0.002
13.78		1	100	1.00	1.00	286.7	1.00	Infin.	0.388	Non-Liq.	6.1	46.7	10.0	56.7	0.04	0.541	1,263	0.373	8.4E-04	2.4E-04	2.1E-04	0.002
14.27		1	100	1.00	1.00	274.2	1.00	Infin.	0.387	Non-Liq.	6.1	44.8	10.0	54.8	0.05	0.562	1,273	0.388	8.7E-04	2.6E-04	2.3E-04	0.003
14.76		1	100	1.00	1.00	298.9	1.00	Infin.	0.387	Non-Liq.	6.0	50.0	9.8	59.8	0.04	0.584	1,335	0.402	8.1E-04	2.2E-04	1.9E-04	0.002
15.26		1	100	1.00	1.00	370.9	1.00	Infin.	0.580	Non-Liq.	6.1	60.4	10.0	70.4	0.00	0.605	1,438	0.416	7.1E-04			
15.75		1	100	1.00	1.00	504.9	1.00	Infin.	0.589	Non-Liq.	5.5	91.3	9.7	101.0	0.00	0.626	1,648	0.431	5.4E-04			

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

Commercial Organics Processing Facility   Project No: VT-24872-02   Method Used: 1   1998 NCEER (Robertson & Wride)

Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5   Plot 1   Limiting Ic: 2.6

Sounding: CPT-4A   Earthquake Magnitude: 7   PGA, g: 1.10   Calc GWT (feet): 15.0



Total Thickness of Liquefiable Layers: 0.0 feet   Estimated Total Ground Subsidence (Settlement): 1.9 inches

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

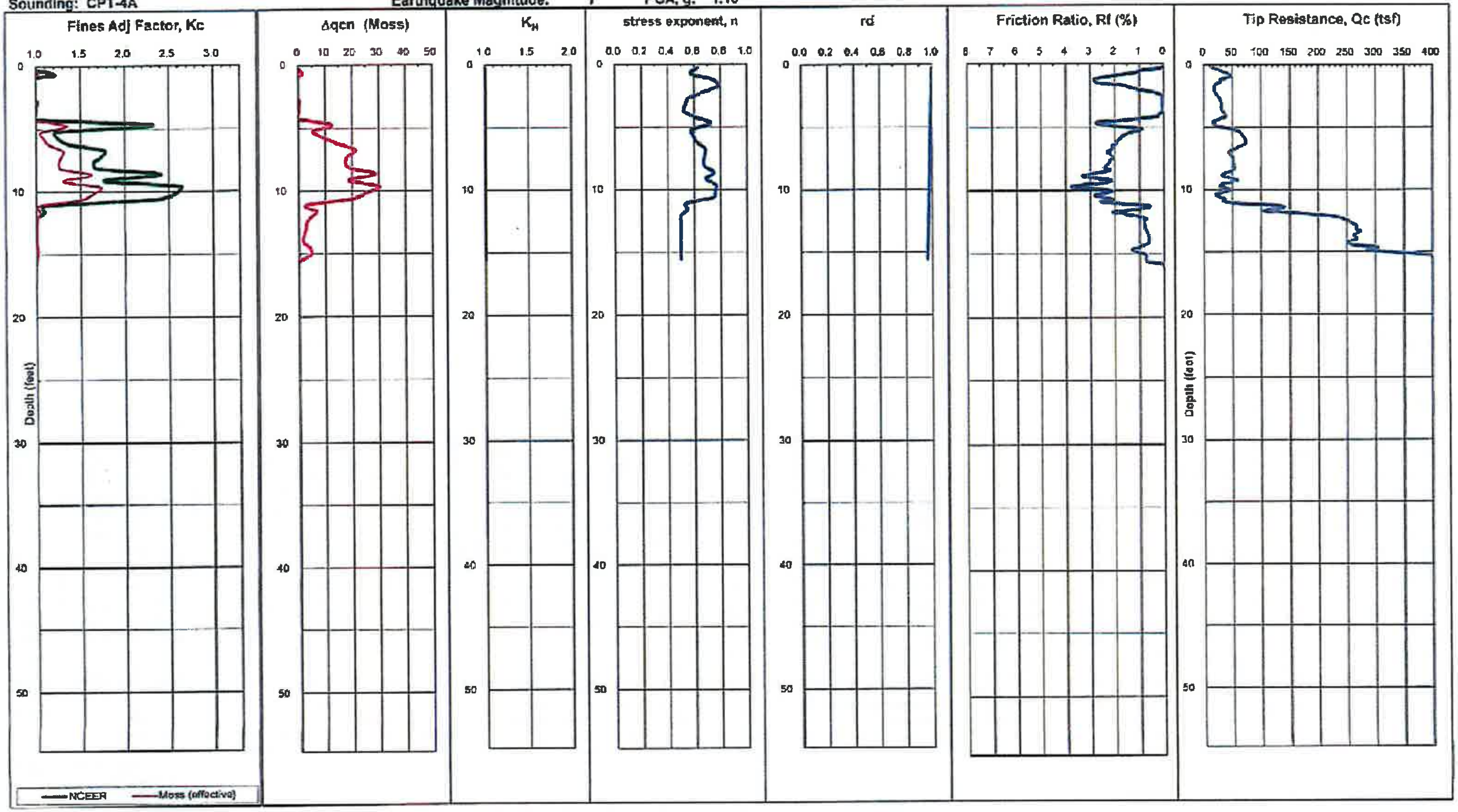
3 avg increment =0.15m Qc1n/N1(60): 5

Ignore 1st/last increment into sand/silt soils: 0

Method Used: 1998 NCEER (Robertson & Wride)

Sounding: CPT-4A

Earthquake Magnitude: 7 PGA, g: 1.10



CPT-LIQUEFY.XLS - A SPREADSHEET FOR EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL USING CPT DATA
Developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Project: Commercial Organics Processing Facility
Job No: VT-24872-02
Date: 5/17/2017
Sounding: CPT-5

Liquefaction Analysis using 1998 NCEER (Robertson & Wride) method
Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5

EARTHQUAKE INFORMATION:

Magnitude:	7	7.5
PGA, g:	1.10	0.52
MSF:	1.19	
GWT, feet:	24.0	
Calc GWT, feet:	15.8	

Plot: 6
Method Used: 1 — 1998 NCEER (Robertson & Wride)
Averaging Increment: 3 — 0.15 m
Induced CSR (M=7.5) = 0.65*PGA*(po/p'o)*rd/MSF
Clean Sand Qc1n = C_Q*K_C*K_α*Qc
SF = $CRR_{7.5}$*Kσ/CSR

Ignore 1st/last increment into sand/silt soils: 1 yes
Ignore/remediate upper: 0.00 m
Unit Weight of unsaturated soils: 115 pcf
Unit Weight of saturated soils: 130 pcf
Limiting Ic for liquefiable soils: 2.60
Limiting Ic for K_C: 2.5

Use Moss @ P_L: 15%
Use Tokimatsu & Seed (0) or Ishihara &Yoshimine (1): 0
Required SF: 1.50 — Min $\Delta N_{1(60)}$ (sand/gravel): 9.5
Min SF of Liquefiable Layers: 0.00 — Max $\Delta N_{1(60)}$: 10.0
Avg SF of Liquefiable Layers: #DIV/0!

Total Liquefied Thickness (feet)	Total Induced Subsidence (inches)
0.0	0.1

SETTLEMENT OF DRY SANDS
Qc1n / N1(60) Ratio for clean sand
p = 0.67*po
τ_{av} = 0.65*PGA*po*rd
G_{max} = 447*$N_{1(60)cs}$$^{0.333}$*$p^{0.5}$
a = 0.0389*(p/1)+0.124
b = 6400*(p/1)$^{-0.6}$
γ = [1+a*EXP(b*τ_{av}/G_{max})]/[(1+a)*τ_{av}/G_{max}]
E_{15} = γ*($N_{1(60)cs}$/20)$^{-1.2}$
Nc = (MAG-4)$^{2.17}$
E_{nc} = (Nc/15)$^{0.45}$*E15
S = 2*H*E_{nc}
Nc = 10.6

Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa	Moss Δqc MPa	Moss qc,mod MPa	Moss eff Kc	Qc1n	Ic
0.49	0.15	88.29	0.47	0.69	8.54	115	0.028	0.028	1.000	0.69	0.54	1.70	108.69	11.12	0.21	11.33	1.02	109.73	1.76
0.98	0.30	87.08	0.49	0.48	8.34	115	0.057	0.057	1.000	0.46	0.50	1.70	139.83	14.18	0.00	14.18	1.00	139.82	1.58
1.48	0.45	66.69	0.62	0.92	6.39	115	0.085	0.085	0.999	0.92	0.57	1.70	107.02	16.86	0.47	11.33	1.04	107.16	1.87
1.97	0.60	108.52	0.43	0.40	10.38	115	0.113	0.113	0.997	0.40	0.50	1.70	174.19	17.67	0.00	17.67	1.00	174.27	1.48
2.46	0.75	226.75	0.75	0.33	21.71	115	0.141	0.141	0.996	0.33	0.50	1.70	364.11	36.91	0.00	36.91	1.00	364.34	1.17
2.95	0.90	145.27	0.81	0.56	13.91	115	0.170	0.170	0.995	0.56	0.50	1.70	233.15	23.65	0.06	23.71	1.00	233.43	1.47
3.44	1.05	75.48	0.92	1.22	7.23	115	0.198	0.198	0.994	1.22	0.58	1.70	120.97	12.29	0.80	13.08	1.06	121.29	1.91
3.94	1.20	209.80	1.63	0.87	20.09	115	0.226	0.226	0.993	0.88	0.50	1.70	336.75	34.15	0.42	34.57	1.01	337.11	1.50
4.43	1.35	291.07	2.44	0.84	27.87	115	0.255	0.255	0.992	0.84	0.50	1.70	467.29	45.62	0.37	45.99	1.01	467.70	1.40
4.92	1.50	288.75	2.59	0.90	27.46	115	0.283	0.283	0.990	0.90	0.50	1.70	460.29	42.83	0.44	43.27	1.01	460.75	1.43
5.41	1.65	318.50	2.95	0.93	30.50	115	0.311	0.311	0.989	0.93	0.50	1.70	511.27	45.45	0.47	45.92	1.01	511.77	1.41
5.91	1.80	256.92	2.31	0.91	24.60	115	0.340	0.340	0.988	0.91	0.50	1.70	412.27	38.38	0.45	38.83	1.01	412.82	1.40
6.40	1.95	265.99	1.96	0.74	25.58	115	0.368	0.368	0.987	0.74	0.50	1.70	427.32	37.80	0.26	38.06	1.01	427.81	1.37
6.89	2.10	307.23	3.09	1.00	29.42	115	0.396	0.396	0.986	1.01	0.50	1.63	473.94	40.22	0.56	40.78	1.01	474.55	1.46
7.38	2.25	344.31	3.11	0.90	32.97	115	0.424	0.424	0.985	0.90	0.50	1.58	513.17	44.34	0.44	44.78	1.01	513.60	1.40
7.87	2.40	467.23	1.23	0.26	44.74	115	0.453	0.453	0.984	0.26	0.50	1.53	674.43	68.52	0.00	68.52	1.00	675.08	0.91

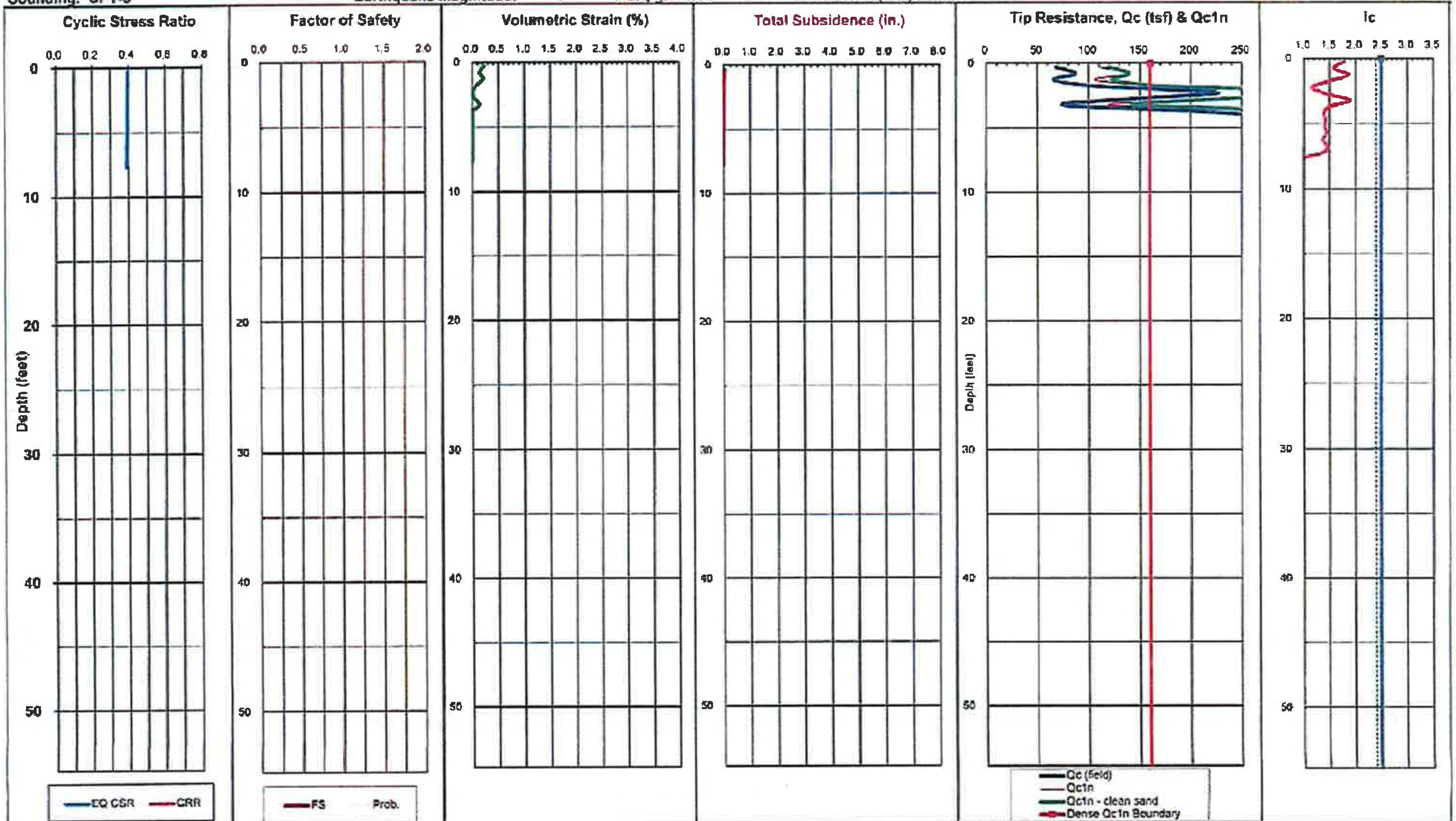
Depth (feet)	Override	Liquef. Suscept. (0 or 1)	Rel Dens Dr (%)	K_C	Kσ	Clean Sand Qc1n	Kα	CRR	Induced M=7.5 CSR	Liquefac. Safety Factor	Qc1n/N1(60) Ratio	Equiv. N1(60)	FC Adj ΔN1(60)	Equiv. N1(60)cs	Volumetric Strain (%)	p (tsf)	G_{max} (tsf)	τ_{av} (tsf)	Shear Strain γ	Strain E_{15}	Strain Enc	Dry Sand Subsidence (in.)
0.49		1	81	1.09	1.00	119.8	1.00	0.240	0.399	Non-Liq.	5.5	19.9	4.1	24.0	0.23	0.019	177	0.013	1.7E-03	1.3E-03	1.2E-03	0.014
0.98		1	91	1.00	1.00	139.9	1.00	0.335	0.399	Non-Liq.	5.9	23.8	4.2	28.0	0.15	0.038	284	0.027	1.3E-03	8.5E-04	7.4E-04	0.009
1.48		1	80	1.16	1.00	124.1	1.00	0.258	0.399	Non-Liq.	5.3	20.0	4.8	24.8	0.22	0.057	311	0.040	1.6E-03	1.3E-03	1.1E-03	0.013
1.97		1	100	1.00	1.00	174.4	1.00	Infin.	0.398	Non-Liq.	6.1	28.6	6.3	34.9	0.09	0.076	402	0.054	9.6E-04	4.9E-04	4.3E-04	0.005
2.46		1	100	1.00	1.00	364.3	1.00	Infin.	0.398	Non-Liq.	5.5	65.9	7.0	72.9	0.01	0.095	575	0.067	3.9E-04	8.2E-05	7.1E-05	0.001
2.95		1	100	1.00	1.00	233.4	1.00	Infin.	0.397	Non-Liq.	6.1	38.1	8.6	46.7	0.04	0.114	543	0.080	6.9E-04	2.5E-04	2.1E-04	0.003
3.44		1	85	1.19	1.00	144.8	1.00	0.363	0.397	Non-Liq.	5.3	23.0	5.9	29.0	0.15	0.133	500	0.094	1.4E-03	8.0E-04	7.0E-04	0.009
3.94		1	100	1.00	1.00	337.1	1.00	Infin.	0.396	Non-Liq.	6.1	55.6	10.0	65.6	0.02	0.152	702	0.107	5.0E-04	1.2E-04	1.0E-04	0.001
4.43		1	100	1.00	1.00	467.7	1.00	Infin.	0.396	Non-Liq.	6.1	74.7	10.0	84.7	0.01	0.171	811	0.120	4.0E-04	7.0E-05	6.1E-05	0.001
4.92		1	100	1.00	1.00	460.7	1.00	Infin.	0.395	Non-Liq.	6.2	74.2	10.0	84.2	0.01	0.190	853	0.133	4.1E-04	7.3E-05	6.4E-05	0.001
5.41		1	100	1.00	1.00	511.8	1.00	Infin.	0.395	Non-Liq.	6.2	82.1	10.0	92.1	0.01	0.209	922	0.147	3.9E-04	6.3E-05	5.4E-05	0.001
5.91		1	100	1.00	1.00	412.8	1.00	Infin.	0.395	Non-Liq.	6.1	67.2	10.0	77.2	0.02	0.228	909	0.160	4.7E-04	9.4E-05	8.1E-05	0.001
6.40		1	100	1.00	1.00	427.9	1.00	Infin.	0.394	Non-Liq.	6.3	67.8	10.0	77.8	0.02	0.246	948	0.173	4.8E-04	9.5E-05	8.2E-05	0.001
6.89		1	100	1.00	1.00	474.6	1.00	Infin.	0.394	Non-Liq.	6.1	77.3	10.0	87.3	0.01	0.265	1,021	0.186	4.5E-04	7.6E-05	6.6E-05	0.001
7.38		1	100	1.00	1.00	513.8	1.00	Infin.	0.393	Non-Liq.	6.3	82.1	10.0	92.1	0.01	0.284	1,077	0.199	4.4E-04	7.0E-05	6.0E-05	0.001
7.87		1	100	1.00	1.00	875.1	1.00	Infin.	0.393	Non-Liq.	5.5	122.0	10.0	132.0	0.01	0.333	1,254	0.212	3.3E-04	3.5E-05	3.0E-05	0.000

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

Commercial Organics Processing Facility   Project No: VT-24872-02   Method Used: 1   1998 NCEER (Robertson & Wride)

Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5   Plot 1   Limiting Ic: 2.6

Sounding: CPT-5   Earthquake Magnitude: 7   PGA, g: 1.10   Calc GWT (feet): 15.0



Total Thickness of Liquefiable Layers: 0.0 feet   Estimated Total Ground Subsidence (Settlement): 0.1 inches

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

3 avg increment =0.15m Qc1n/N1(60): 5

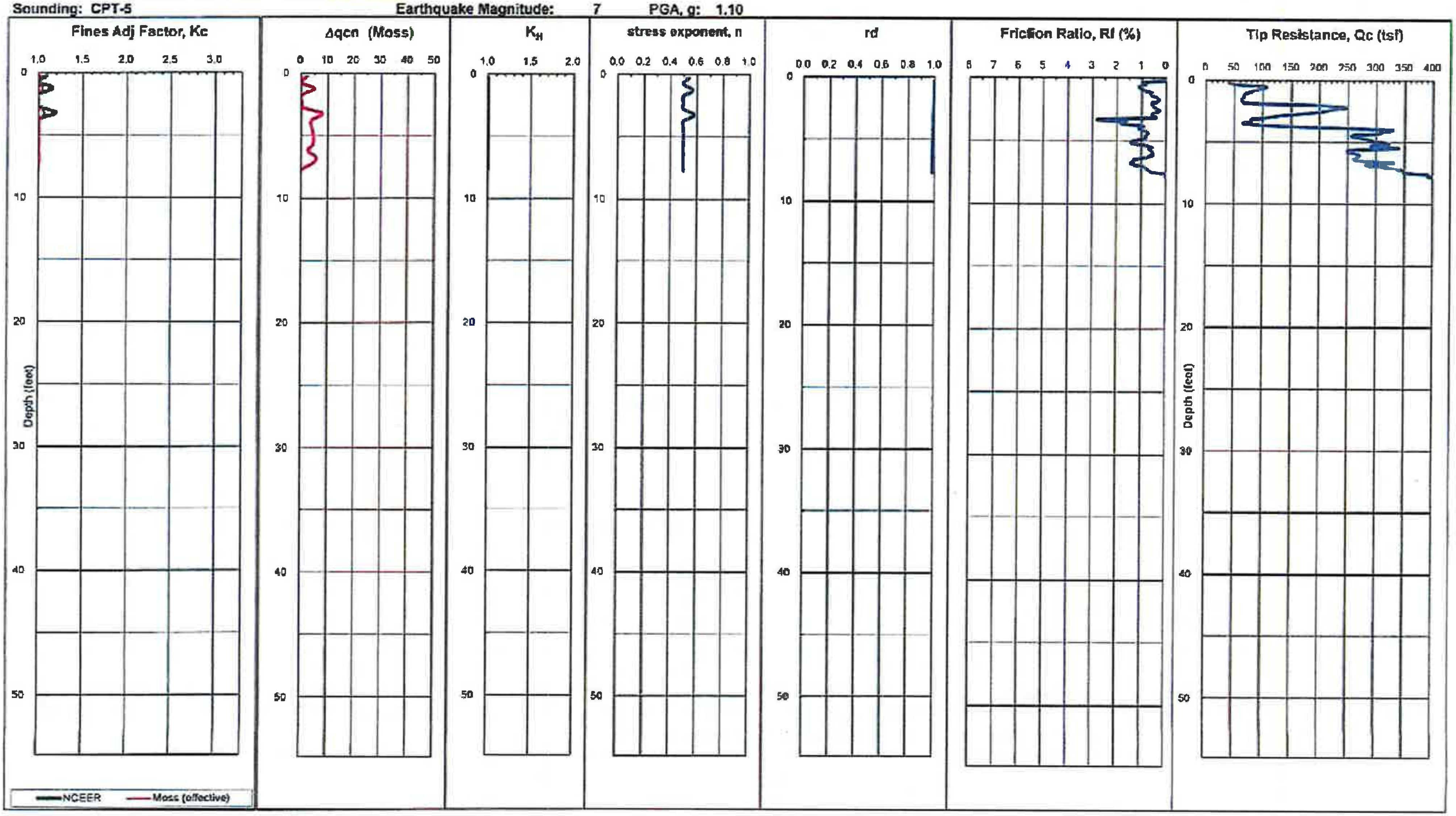
Ignore 1st/last increment into sand/silt soils: 0

Method Used: 1998 NCEER (Robertson & Wride)

Sounding: CPT-5

Earthquake Magnitude: 7

PGA, g: 1.10



CPT-LIQUEFY.XLS - A SPREADSHEET FOR EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL USING CPT DATA

Developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Project: Commercial Organics Processing Facility
Job No: VT-24472-02
Date: 8/17/2017
Sounding: CPT-5A

Liquefaction Analysis using 1998 NCEER (Robertson & Wride) method
Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5

EARTHQUAKE INFORMATION:

Magnitude:	7	7.5
PGA, g:	1.10	0.92
MSF:	1.19	
GWT, feet:	24.0	
Calc GWT, feet:	15.0	

Plot: 7
Method Used: 1 — 1998 NCEER (Robertson & Wride)
Averaging increment: 3 — 0.15 m
Induced CSR (M=7.5) = 0.65*PGA*(po/p'o)*rd/MSF
Clean Sand Qc1n = C_q*K_c*K_σ*Qc
SF = $CRR_{7.5}$*K_σ/CSR

Ignore 1st/last increment into sand/silt soils: 1 yes
Ignore/remediate upper: 0.00 m
Unit Weight of unsaturated soils: 115 pcf
Unit Weight of saturated soils: 130 pcf
Limiting Ic for liquefiable soils: 2.50
Limiting Ic for K_c: 2.5

Use Moss @ P_L: 15%
Use Tokimatsu & Seed (0) or Ishihara &Yoshimine (1): 0
Required SF: 1.50 — Max $\Delta N_{1(60)}$ - post liquefied: 5.5
Min SF of Liquefiable Layers: 0.00 — Max $\Delta N_{1(60)}$ - non liquefied: 10.6
Avg SF of Liquefiable Layers: #DIV/0!

Total Liquefied Thickness (feet)	Total Induced Subsidence (inches)
0.0	0.0

SETTLEMENT OF DRY SANDS

Qc1n / N1(60) Ratio for clean sand: 5

$p = 0.67 \cdot p_o$
$\tau_{av} = 0.65 \cdot PGA \cdot p_o \cdot r_d$
$G_{max} = 447 \cdot N_{1(60)cs}^{1/3} \cdot p^{1/2}$
$a = 0.0389 \cdot (p/1) + 0.124$
$b = 6400 \cdot (p/1)^{-0.6}$
$\gamma = [1 + a \cdot EXP(b \cdot \tau_{av}/G_{max})]/[(1+a) \cdot \tau_{av}/G_{max}]$
$E_{15} = \gamma \cdot (N_{1(60)cs}/20)^{-1.2}$
$Nc = (MAG-4)^{2.17}$
$E_{nc} = (Nc/15)^{0.45} \cdot E15$
$S = 2 \cdot H \cdot E_{nc}$
Nc = 10.6

Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa
0.49	0.15	68.04	0.17	0.25	6.52	115	0.028	0.028	1.000	0.25	0.50	1.70	109.28	11.08
0.98	0.30	154.97	0.26	0.17	14.84	115	0.057	0.057	1.000	0.17	0.50	1.70	248.92	25.23
1.48	0.45	175.03	0.84	0.48	16.76	115	0.085	0.085	0.999	0.48	0.50	1.70	281.10	28.49
1.97	0.60	215.31	1.51	0.70	20.62	115	0.113	0.113	0.997	0.70	0.50	1.70	345.77	35.05
2.46	0.75	269.81	2.67	0.99	25.84	115	0.141	0.141	0.995	0.99	0.50	1.70	433.31	43.92
2.95	0.90	235.08	2.81	1.20	22.51	115	0.170	0.170	0.995	1.20	0.50	1.70	377.43	38.27
3.44	1.05	307.33	2.09	0.68	29.43	115	0.198	0.198	0.994	0.68	0.50	1.70	493.51	50.03
3.94	1.20	345.52	2.78	0.81	33.09	115	0.226	0.226	0.993	0.81	0.50	1.70	554.82	55.80
4.43	1.35	274.08	3.92	1.43	26.25	115	0.255	0.255	0.992	1.43	0.50	1.70	439.59	39.36
4.92	1.50	228.50	3.34	1.46	21.89	115	0.283	0.283	0.990	1.46	0.50	1.70	366.79	32.25
5.41	1.65	197.29	1.69	0.86	18.89	115	0.311	0.311	0.989	0.86	0.50	1.70	316.51	29.79
5.91	1.80	203.29	1.12	0.55	19.47	115	0.340	0.340	0.988	0.55	0.50	1.70	326.08	31.96
6.40	1.95	320.80	2.99	0.93	30.72	115	0.368	0.368	0.987	0.93	0.50	1.70	513.62	43.29
6.89	2.10	339.48	4.09	1.20	32.55	115	0.396	0.396	0.986	1.21	0.50	1.63	524.37	43.28
7.38	2.25	330.41	3.69	1.12	31.64	115	0.424	0.424	0.985	1.12	0.50	1.58	492.42	41.64
7.87	2.40	449.38	1.90	0.42	43.03	115	0.453	0.453	0.984	0.42	0.50	1.53	648.64	61.31

Depth (feet)	Moss Δq_c MPa	Moss $q_{c1,mod}$ MPa	Moss diff K_c	Qc1n	Ic	Override	Liquef. Suscept. (0 or 1)	Rel Dens Dr (%)	K_c	K_σ	Clean Sand Qc1n	K_α	CRR	Induced M=7.5 CSR	Liquefac. Safety Factor
0.49	0.00	11.08	1.00	189.33	1.56		1	81	1.00	1.00	189.3	1.00	0.202	0.399	Non-Liq.
0.98	0.00	25.23	1.00	249.01	1.16		1	100	1.00	1.00	249.0	1.00	Infin.	0.399	Non-Liq.
1.48	0.00	28.49	1.00	281.23	1.36		1	100	1.00	1.00	281.2	1.00	Infin.	0.398	Non-Liq.
1.97	0.22	35.27	1.01	345.96	1.41		1	100	1.00	1.00	346.0	1.00	Infin.	0.398	Non-Liq.
2.46	0.55	44.47	1.01	433.54	1.47		1	100	1.00	1.00	433.5	1.00	Infin.	0.398	Non-Liq.
2.95	0.77	39.04	1.02	377.70	1.58		1	100	1.00	1.00	377.7	1.00	Infin.	0.397	Non-Liq.
3.44	0.20	50.23	1.00	493.82	1.31		1	100	1.00	1.00	493.8	1.00	Infin.	0.397	Non-Liq.
3.94	0.34	56.13	1.01	555.15	1.34		1	100	1.00	1.00	555.2	1.00	Infin.	0.396	Non-Liq.
4.43	1.03	40.39	1.03	440.40	1.60		1	100	1.00	1.00	440.4	1.00	Infin.	0.396	Non-Liq.
4.92	1.08	33.33	1.03	367.25	1.66		1	100	1.01	1.00	369.8	1.00	Infin.	0.395	Non-Liq.
5.41	0.40	30.18	1.04	317.01	1.51		1	100	1.00	1.00	317.0	1.00	Infin.	0.395	Non-Liq.
5.91	0.08	32.04	1.00	326.63	1.36		1	100	1.00	1.00	326.6	1.00	Infin.	0.395	Non-Liq.
6.40	0.48	43.77	1.01	514.21	1.41		1	100	1.00	1.00	514.2	1.00	Infin.	0.394	Non-Liq.
6.89	0.78	44.06	1.02	524.98	1.50		1	100	1.00	1.00	525.0	1.00	Infin.	0.394	Non-Liq.
7.38	0.68	42.32	1.02	493.05	1.49		1	100	1.00	1.00	493.1	1.00	Infin.	0.393	Non-Liq.
7.87	0.00	61.31	1.00	649.30	1.07		1	100	1.00	1.00	649.3	1.00	Infin.	0.393	Non-Liq.

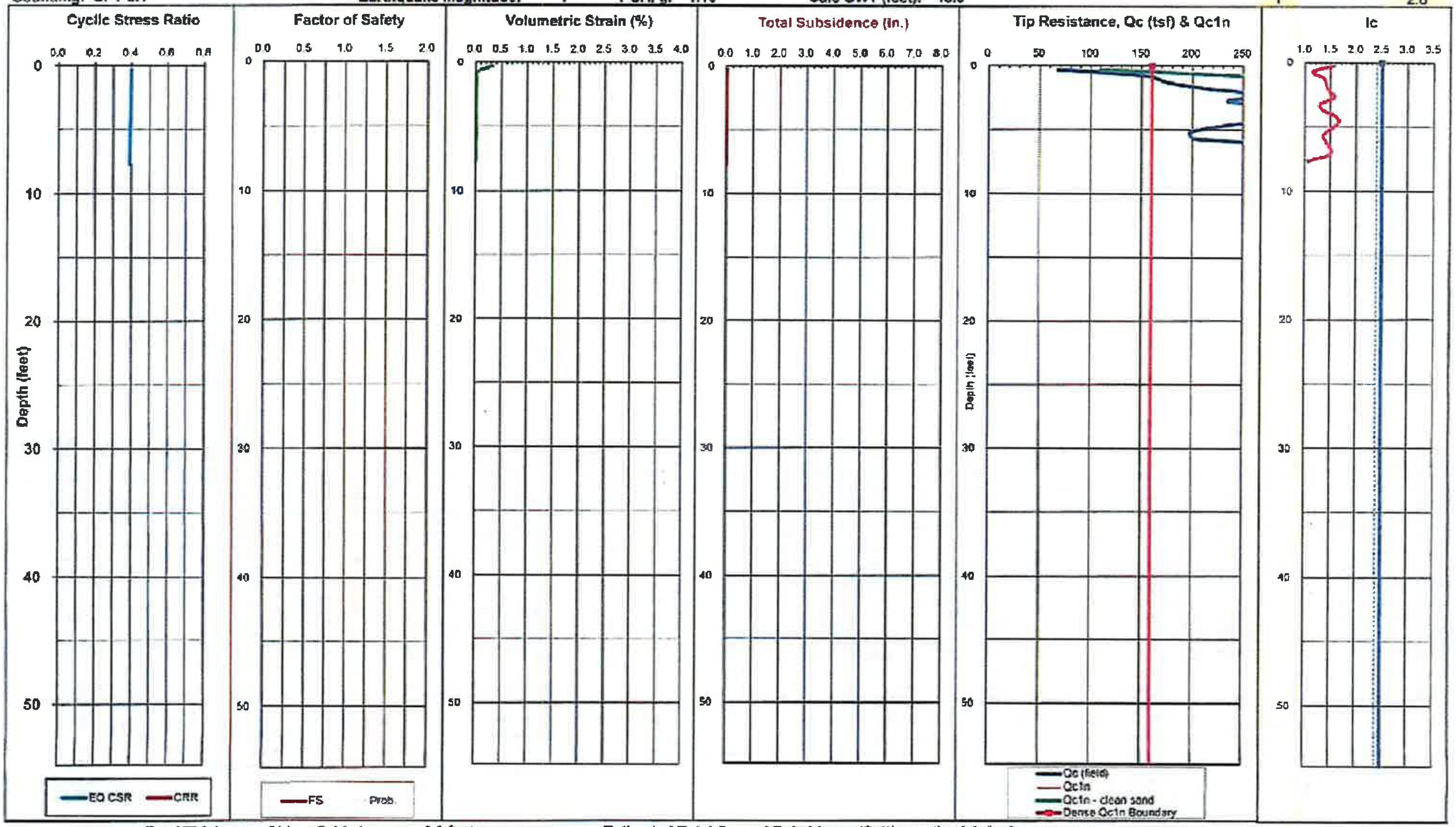
Depth (feet)	Qc1n $N_{1(60)}$ Ratio	Equiv. $N_{1(60)}$	FC Adj. $\Delta N_{1(60)}$	Equiv. $N_{1(60)cs}$	Volumetric Strain (%)	p (tsf)	G_{max} (tsf)	τ_{av} (tsf)	Shear Strain γ	Strain E_{15}	Strain Enc	Dry Sand Subsidence (in.)
0.49	5.9	18.4	3.5	21.9	0.31	0.019	172	0.013	2.0E-03	1.8E-03	1.6E-03	0.018
0.98	5.5	45.0	4.8	49.8	0.03	0.038	320	0.027	5.1E-04	1.7E-04	1.5E-04	0.002
1.48	6.3	44.4	10.0	54.4	0.03	0.057	404	0.040	4.9E-04	1.5E-04	1.3E-04	0.001
1.97	6.2	55.6	10.0	65.6	0.02	0.076	496	0.054	4.1E-04	9.9E-05	8.6E-05	0.001
2.46	6.1	70.9	10.0	80.9	0.01	0.095	595	0.067	3.5E-04	6.5E-05	5.6E-05	0.001
2.95	5.9	63.9	10.0	73.9	0.01	0.114	633	0.080	4.0E-04	8.4E-05	7.3E-05	0.001
3.44	5.5	89.3	9.5	98.8	0.01	0.133	753	0.094	3.2E-04	4.7E-05	4.0E-05	0.000
3.94	6.4	87.1	10.0	97.1	0.01	0.152	800	0.107	3.4E-04	5.1E-05	4.4E-05	0.001
4.43	5.9	75.2	10.0	85.2	0.01	0.171	813	0.120	3.9E-04	6.9E-05	6.0E-05	0.001
4.92	5.8	63.6	10.0	73.6	0.02	0.190	816	0.133	4.7E-04	9.8E-05	8.5E-05	0.001
5.41	6.0	52.4	10.0	62.4	0.03	0.209	810	0.147	5.7E-04	1.5E-04	1.3E-04	0.001
5.91	6.3	51.5	10.0	61.5	0.03	0.228	842	0.160	5.9E-04	1.5E-04	1.3E-04	0.002
6.40	6.2	82.5	10.0	92.5	0.01	0.246	1,004	0.173	4.1E-04	6.6E-05	5.7E-05	0.001
6.89	6.1	88.7	10.0	98.7	0.01	0.265	1,057	0.186	4.1E-04	6.2E-05	5.3E-05	0.001
7.38	6.1	81.0	10.0	91.0	0.01	0.284	1,072	0.199	4.4E-04	7.1E-05	6.2E-05	0.001
7.87	5.5	117.4	10.0	127.4	0.01	0.303	1,239	0.212	3.4E-04	3.7E-05	3.2E-05	0.000

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

Commercial Organics Processing Facility   Project No: VT-24872-02   Method Used: 1   1998 NCEER (Robertson & Wride)

Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5

Sounding: CPT-5A   Earthquake Magnitude: 7   PGA, g: 1.10   Calc GWT (feet): 15.0   Plot 1   Limiting Ic: 2.6



Total Thickness of Liquefiable Layers: 0.0 feet   Estimated Total Ground Subsidence (Settlement): 0.0 inches

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

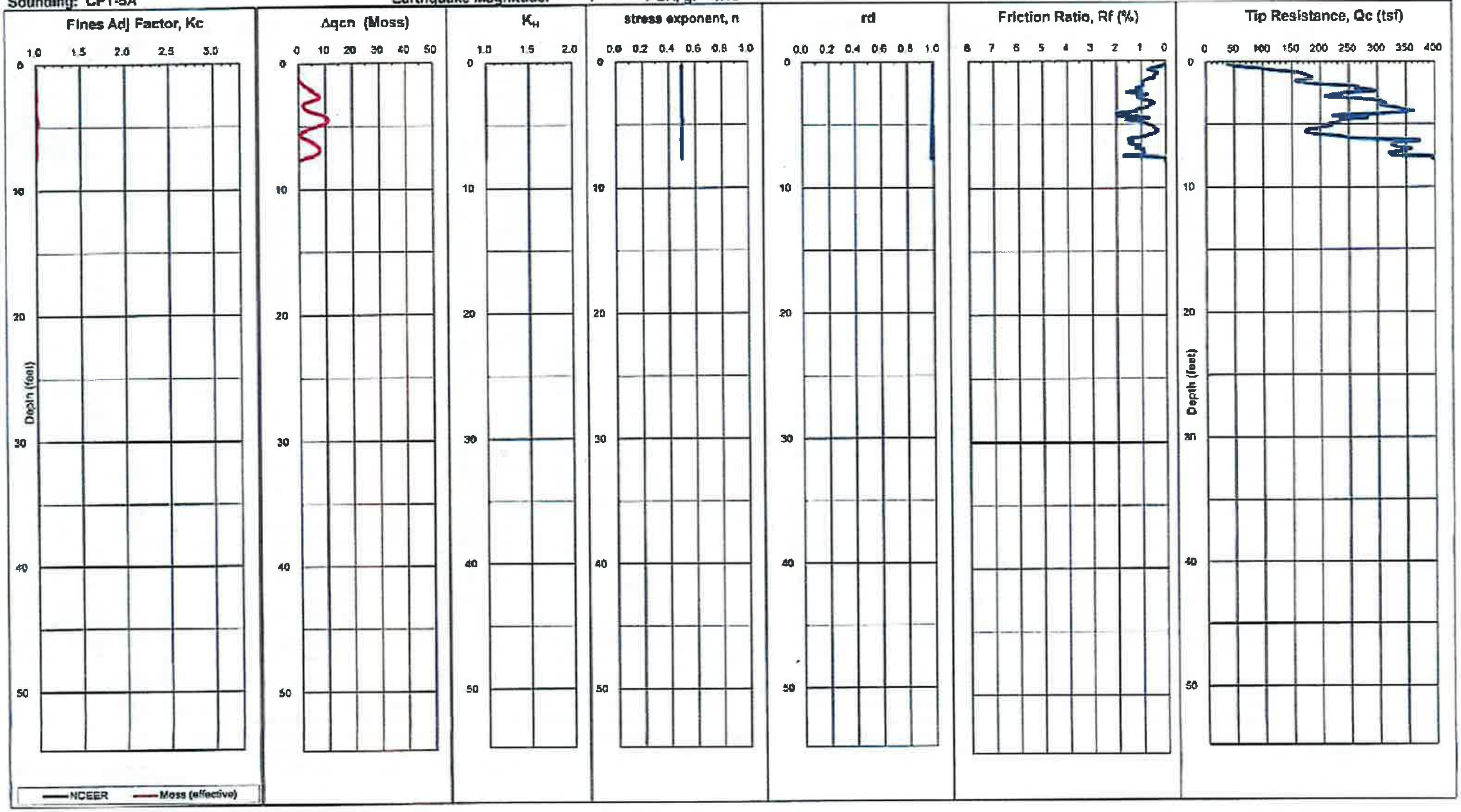
Method Used: 1998 NCEER (Robertson & Wride)

3 avg increment =0.15m Qc1n/N1(60): 5

Ignore 1st/last increment into sand/silt soils: 0

Sounding: CPT-5A

Earthquake Magnitude: 7 PGA, g: 1.10



CPT-LIQUEFY.XLS - A SPREADSHEET FOR EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL USING CPT DATA
Developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Project: Commercial Organics Processing Facility
Job No: VT-24872-02
Date: 5/17/2017
Sounding: CPT-4
Plot: 6

Liquefaction Analysis using 1998 NCEER (Robertson & Wride) method
Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5

EARTHQUAKE INFORMATION:		
Magnitude:	7	7.5
PGA, g:	1.10	0.92
MSF:	1.19	
GWT, feet:	24.0	
Calc GWT, feet:	15.0	

Method Used: 1 — 1998 NCEER (Robertson & Wride)
Averaging Increment: 3 — 0.15 m
Induced CSR (M=7.5) = 0.65*PGA*(po/p'o)*rd/MSF
Clean Sand Qc1n = C_q*K_c*K_a*Qc
SF = CRR$_{7.5}$*Kσ/CSR

Ignore 1st/last increment into sand/silt soils: 1 yes
Ignore/remediate upper: 0.00 m
Unit Weight of unsaturated soils: 115 pcf
Unit Weight of saturated soils: 130 pcf
Limiting Ic for liquefiable soils: 2.50
Limiting Ic for K_c: 2.5

Use Moss @ P_L: 15%
Use Tokimatsu & Seed (0) or Ishihara &Yoshimine (1): 0
Required SF: 1.50 — Max $\Delta N_{1(60)}$ - sand modified: 5.5
Min SF of Liquefiable Layers: 0.67 — Max $\Delta N_{1(60)}$ - non modified: 10.0
Avg SF of Liquefiable Layers: 0.55

Total Liquefied Thickness (feet)	1.0
Total Induced Subsidence (inches)	12.2

SETTLEMENT OF DRY SANDS
Qc1n / N1(60) Ratio for clean sand
p = 0.67*po
τ_{av} = 0.65*PGA*po*rd
G_{max} = 447*$N_{1(60)CS}^{1/3}$*$p^{0.5}$
a = 0.0389*(p/1)+0.124
b = 6400*$(p/1)^{-0.6}$
γ = [1+a*EXP(b*τ_{av}/G_{max})]/[(1+a)*τ_{av}/G_{max}]
E_{15} = γ*$(N_{1(60)CS}/20)^{-1.2}$
N_C = $(MAG-4)^{2.17}$
E_{NC} = $(N_C/15)^{0.45}$*E15
S = 2*H*E_{NC}
N_C = 10.6

Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa
0.49	0.15	8.98	0.02	0.24	0.86	115	0.028	0.028	1.000	0.24	0.72	1.70	14.39	1.46
0.98	0.30	10.10	0.01	0.14	0.97	115	0.057	0.057	1.000	0.14	0.70	1.70	16.15	1.64
1.48	0.45	7.20	0.03	0.36	0.69	115	0.085	0.085	0.999	0.37	0.77	1.70	11.43	1.17
1.97	0.60	9.92	0.03	0.31	0.95	115	0.113	0.113	0.997	0.31	0.72	1.70	15.78	1.62
2.46	0.75	8.82	0.03	0.39	0.84	115	0.141	0.141	0.996	0.40	0.75	1.70	13.95	1.44
2.95	0.90	9.60	0.04	0.39	0.92	115	0.170	0.170	0.995	0.39	0.74	1.70	15.16	1.56
3.44	1.05	9.26	0.04	0.41	0.89	115	0.198	0.198	0.994	0.42	0.74	1.70	14.56	1.51
3.94	1.20	15.12	0.04	0.24	1.45	115	0.226	0.226	0.993	0.25	0.69	1.70	23.94	2.46
4.43	1.35	14.37	0.04	0.25	1.38	115	0.255	0.255	0.992	0.25	0.67	1.70	22.68	2.34
4.92	1.50	19.31	0.04	0.18	1.85	115	0.283	0.283	0.990	0.18	0.62	1.70	30.58	3.14
5.41	1.65	27.68	0.03	0.12	2.65	115	0.311	0.311	0.989	0.12	0.58	1.70	43.97	4.51
5.91	1.80	22.11	0.03	0.14	2.12	115	0.340	0.340	0.988	0.14	0.60	1.70	34.99	3.60
6.40	1.95	17.00	0.03	0.18	1.63	115	0.368	0.368	0.987	0.19	0.64	1.70	26.77	2.77
6.89	2.10	24.10	0.03	0.13	2.31	115	0.396	0.396	0.986	0.13	0.58	1.70	38.09	3.92
7.38	2.25	29.06	0.03	0.10	2.87	115	0.424	0.424	0.985	0.10	0.55	1.67	46.56	4.98
7.87	2.40	29.54	0.03	0.11	2.83	115	0.453	0.453	0.984	0.11	0.57	1.62	44.56	4.81
8.37	2.55	37.03	0.04	0.12	3.55	115	0.481	0.481	0.983	0.12	0.54	1.53	63.81	6.13
8.86	2.70	47.31	0.05	0.11	4.53	115	0.509	0.509	0.982	0.11	0.51	1.46	64.37	7.70
9.35	2.85	46.04	0.18	0.39	4.41	115	0.538	0.538	0.981	0.40	0.57	1.47	63.37	6.92
9.84	3.00	44.85	0.40	0.90	4.29	115	0.566	0.566	0.979	0.91	0.63	1.48	62.14	5.86
10.33	3.15	29.91	0.40	1.50	2.86	115	0.594	0.594	0.978	1.54	0.73	1.52	37.88	3.50
10.83	3.30	9.48	0.18	1.88	0.91	115	0.623	0.623	0.977	2.01	0.87	1.59	13.24	1.34
11.32	3.45	12.61	0.03	0.25	1.21	115	0.651	0.651	0.976	0.26	0.73	1.42	15.10	2.44
11.81	3.60	35.80	0.03	0.08	3.43	115	0.679	0.679	0.975	0.08	0.57	1.29	42.66	7.02
12.30	3.75	22.37	0.09	0.37	2.14	130	0.711	0.711	0.974	0.39	0.68	1.31	26.77	3.71
12.80	3.90	13.82	0.14	0.99	1.32	130	0.743	0.743	0.973	1.04	0.79	1.32	16.35	1.71
13.29	4.05	12.94	0.13	0.98	1.24	130	0.775	0.775	0.972	1.05	0.80	1.28	14.76	1.56
13.78	4.20	11.85	0.11	0.92	1.14	130	0.807	0.807	0.971	0.96	0.81	1.25	13.01	1.40
14.27	4.35	10.84	0.10	0.91	1.04	130	0.839	0.839	0.970	0.98	0.83	1.21	11.45	1.25
14.76	4.50	13.89	0.09	0.65	1.33	130	0.871	0.871	0.969	0.70	0.78	1.18	14.38	1.55
15.26	4.65	10.95	0.07	0.63	1.05	130	0.903	0.903	0.968	0.69	0.81	1.14	10.80	1.20
15.75	4.80	13.56	0.12	0.88	1.30	130	0.935	0.935	0.967	0.94	0.80	1.10	13.19	1.43
16.24	4.95	16.63	0.19	1.14	1.59	130	0.967	0.967	0.966	1.21	0.80	1.07	15.96	1.69
16.73	5.10	13.30	0.17	1.27	1.27	130	0.999	0.999	0.965	1.37	0.83	1.05	12.29	1.33
17.22	5.25	16.09	0.17	1.07	1.54	130	1.031	1.031	0.964	1.14	0.80	1.02	14.50	1.57
17.72	5.40	84.62	0.28	0.34	8.10	130	1.063	1.063	0.962	0.34	0.53	1.00	78.78	8.11
18.21	5.55	158.80	0.59	0.37	15.21	130	1.095	1.095	0.961	0.38	0.50	0.99	146.52	14.93
18.70	5.70	148.77	1.17	0.78	14.25	130	1.127	1.127	0.960	0.79	0.53	0.97	134.94	13.88
19.19	5.85	159.67	1.70	1.07	15.29	130	1.159	1.159	0.959	1.07	0.55	0.95	142.47	14.80
19.69	6.00	207.48	1.95	0.94	19.87	130	1.191	1.191	0.958	0.94	0.52	0.94	183.38	19.05
20.18	6.15	216.73	2.25	1.04	20.75	130	1.223	1.223	0.956	1.04	0.52	0.93	188.81	19.78
20.67	6.30	201.54	2.42	1.20	19.30	130	1.255	1.255	0.955	1.21	0.55	0.91	172.48	18.25
21.16	6.45	193.47	2.29	1.18	18.53	130	1.287	1.287	0.954	1.19	0.55	0.90	163.14	17.38
21.65	6.60	269.67	2.77	1.03	25.84	130	1.319	1.319	0.952	1.03	0.51	0.89	227.02	24.08
22.15	6.75	279.42	3.08	1.10	26.78	130	1.351	1.351	0.951	1.11	0.51	0.89	231.84	24.78
22.64	6.90	218.65	2.38	1.09	20.94	130	1.383	1.383	0.950	1.10	0.53	0.87	178.03	19.15
23.13	7.05	206.22	3.59	1.74	19.75	130	1.415	1.415	0.948	1.75	0.58	0.84	163.34	18.19
23.62	7.20	245.30	5.48	2.23	23.49	130	1.447	1.447	0.946	2.25	0.60	0.83	191.21	21.75
24.11	7.35	200.19	4.38	2.18	19.17	130	1.479	1.479	0.945	2.20	0.61	0.81	153.01	17.57
24.61	7.50	122.13	3.43	2.80	11.70	130	1.511	1.508	0.943	2.84	0.68	0.79	69.94	10.64

Depth (feet)	Moss ΔqC MPa	Moss qc_{1mod} MPa	Moss eff K_c	Qc1n	Ic	Override	Liquef. Suscept. (0 or 1)	Rel Dens. Dr(%)	K_c	K_α	Clean Sand Qc1n	Kσ	CRR	Induced M=7.5 CSR	Liquefac. Safety Factor	Qc1n / $N_{1(60)}$ Ratio	Equiv. $N_{1(60)}$	FC Adj $\Delta N_{1(60)}$	Equiv. $N_{1(60)CS}$	Volumetric Strain (%)
0.49	0.00	1.46	1.00	14.43	2.39		1	0	1.00	1.00	14.4	1.00	0.062	0.399	Non-Liq.	4.3	3.3	0.0	3.3	20.00
0.98	0.00	1.64		16.22	2.29		0			1.00		1.00		0.399	Non-Liq.	4.5	3.5			0.60
1.48	0.00	1.17		11.57	2.54		0			1.00		1.00		0.399	Non-Liq.	4.0	2.9			0.80
1.97	0.00	1.62		16.00	2.38		0			1.00		1.00		0.398	Non-Liq.	4.3	3.7			0.80
2.46	0.00	1.44	1.00	14.18	2.47		1	0	1.00	1.00	14.2	1.00	0.062	0.398	Non-Liq.	4.2	3.4	0.0	3.4	20.00
2.95	0.00	1.56	1.00	15.43	2.43		1	0	1.00	1.00	15.4	1.00	0.063	0.397	Non-Liq.	4.2	3.6	0.0	3.6	20.00
3.44	0.00	1.51	1.00	14.87	2.40		1	0	1.00	1.00	14.9	1.00	0.062	0.397	Non-Liq.	4.2	3.5	0.0	3.5	20.00
3.94	0.00	2.46	1.00	24.30	2.18		1	18	1.00	1.00	24.3	1.00	0.070	0.396	Non-Liq.	4.7	5.1	0.0	5.1	20.00
4.43	0.00	2.34	1.00	23.08	2.20		1	16	1.00	1.00	23.1	1.00	0.069	0.396	Non-Liq.	4.7	4.9	0.0	4.9	20.00
4.92	0.00	3.14	1.00	31.00	2.04		1	28	1.00	1.00	31.0	1.00	0.076	0.395	Non-Liq.	5.0	6.2	0.0	6.2	20.00
5.41	0.00	4.51	1.00	44.47	1.85		1	43	1.00	1.00	44.5	1.00	0.087	0.395	Non-Liq.	5.4	8.3	0.6	8.9	5.58
5.91	0.00	3.60	1.00	35.53	1.95		1	34	1.00	1.00	35.5	1.00	0.080	0.395	Non-Liq.	5.2	6.9	0.2	7.1	11.89
6.40	0.00	2.77	1.00	27.35	2.10		1	23	1.00	1.00	27.4	1.00	0.073	0.394	Non-Liq.	4.9	5.6	0.0	5.6	20.00
6.89	0.00	3.92	1.00	38.72	1.92		1	37	1.00	1.00	38.7	1.00	0.082	0.394	Non-Liq.	5.7	7.4	0.4	7.7	8.73
7.38	0.00	4.98	1.00	47.23	1.82		1	46	1.00	1.00	47.2	1.00	0.089	0.393	Non-Liq.	5.4	8.7	0.6	9.4	4.47
7.87	0.00	4.81	1.00	45.19	1.84		1	44	1.00	1.00	45.2	1.00	0.088	0.393	Non-Liq.	5.4	8.4	0.7	9.0	5.15
8.37	0.00	6.13	1.00	54.61	1.76		1	52	1.00	1.00	54.5	1.00	0.095	0.392	Non-Liq.	5.5	9.9	1.1	10.9	2.81
8.86	0.00	7.70	1.00	65.07	1.68		1	58	1.00	1.00	65.1	1.00	0.106	0.392	Non-Liq.	5.7	11.4	1.6	13.0	1.63
9.35	0.00	6.92	1.00	64.07	1.68		1	59	1.00	1.00	64.1	1.00	0.104	0.392	Non-Liq.	5.4	12.0	0.9	12.8	1.71
9.84	0.44	6.40	1.07	62.94	2.05		1	58	1.37	1.00	86.2	1.00	0.140	0.391	Non-Liq.	5.0	12.6	4.6	17.2	0.72
10.33	1.11	4.60		38.73	2.35		0			1.00		1.00		0.391	Non-Liq.	4.4	8.8			0.00
10.83	1.52	2.85		14.16	2.80		0			1.00		1.00		0.390	Non-Liq.	3.5	4.0			0.00
11.32	0.00	2.44		21.48	2.33		0			1.26		1.00		0.390	Non-Liq.	4.4	4.9			0.00
11.81	0.00	7.02	1.00	54.95	1.85		1	52	1.00	1.26	55.0	1.00	0.095	0.389	Non-Liq.	5.4	10.2	0.8	11.0	2.73
12.30	0.00	3.71		34.96	2.29		0			1.26		1.00		0.389	Non-Liq.	4.7	7.4			0.00
12.80	0.54	2.24		17.28	2.57		0			1.00		1.00		0.389	Non-Liq.	4.0	4.4			0.00
13.29	0.53	2.09		15.70	2.61		0			1.00		1.00		0.388	Non-Liq.	3.9	4.0			0.00
13.78	0.46	1.85		13.96	2.65		0			1.00		1.00		0.388	Non-Liq.	3.8	3.7			0.00
14.27	0.45	1.70		12.41	2.70		0			1.00		1.00		0.387	Non-Liq.	3.7	3.3			0.00
14.76	0.17	1.72		15.32	2.55		0			1.00		1.00		0.387	Non-Liq.	4.0	3.8			0.00
15.26	0.16	1.36		11.77	2.68		0			1.00		1.00		0.580	Non-Liq.	3.8	3.1			0.00
15.75	0.47	1.90		14.17	2.64		0			1.00		1.00		0.589	Non-Liq.	3.8	3.7			0.00
16.24	0.81	2.50		16.88	2.62		0			1.00		1.00		0.598	Non-Liq.	3.9	4.4			0.00
16.73	0.97	2.30		13.19	2.74		0			1.00		1.00		0.606	Non-Liq.	3.6	3.6			0.00
17.22	0.73	2.29		15.50	2.64		0			1.00		1.00		0.614	Non-Liq.	3.8	4.0			0.00
17.72	0.00	8.11		80.68	1.74		0			1.00		1.00		0.622	Non-Liq.	5.6	14.3			0.00
18.21	0.00	14.93	1.00	147.54	1.53		1	93	1.00	1.00	147.5	1.00	0.378	0.629	0.60	6.0	24.6	4.9	29.5	0.83
18.70	0.37	14.25	1.05	135.07	1.75		1	90	1.07	1.00	145.2	1.00	0.363	0.636	0.57	5.6	24.4	4.7	29.0	0.91
19.19	0.73	15.53	1.05	143.51	1.82		1	92	1.12	1.00	160.5	1.00	Infin.	0.643	Non-Liq.	5.4	26.4	5.7	32.1	0.00
19.69	0.57	19.62	1.03	184.44	1.70		1	100	1.04	1.00	191.2	1.00	Infin.	0.649	Non-Liq.	5.7	32.5	5.7	38.2	0.00
20.18	0.70	20.46	1.04	188.89	1.72		1	100	1.05	1.00	199.6	1.00	Infin.	0.655	Non-Liq.	5.8	32.7	6.2	39.9	0.00
20.67	0.91	19.17	1.05	173.98	1.79		1	100	1.10	1.00	191.3	0.99	Infin.	0.661	Non-Liq.	5.5	31.6	6.6	38.3	0.00
21.16	0.89	18.25	1.05	164.23	1.81		1	97	1.11	1.00	182.4	0.98	Infin.	0.667	Non-Liq.	5.5	30.1	6.4	36.5	0.00
21.65	0.69	24.75	1.03	228.13	1.69		1	100	1.01	1.00	230.8	0.98	Infin.	0.672	Non-Liq.	5.7	39.7	6.4	46.2	0.00
22.15	0.79	25.58	1.03	233.07	1.68		1	100	1.02	1.00	238.8	0.97	Infin.	0.678	Non-Liq.	5.7	40.8	6.9	47.7	0.00
22.64	0.77	19.93	1.04	179.17	1.75		1	100	1.07	1.00	192.4	0.97	Infin.	0.683	Non-Liq.	5.8	32.2	6.3	38.5	0.00
23.13	1.63	19.82	1.09	164.47	1.93		1	97	1.22	1.00	200.1	0.96	Infin.	0.687	Non-Liq.	5.2	31.5	6.5	40.0	0.00
23.62	2.29	24.04	1.11	192.34	1.97		1	100	1.26	1.00	243.0	0.96	Infin.	0.692	Non-Liq.	5.1	37.4	10.0	47.4	0.00
24.11	2.23	19.80	1.13	154.15	2.02		1	95	1.33	1.00	205.4	0.95	Infin.	0.696	Non-Liq.	5.0	30.6	10.0	40.6	0.00
24.61	3.05	13.69	1.29	91.86	2.28		1	73	1.82	1.00	165.8	0.94	Infin.	0.700	Non-Liq.	4.6	19.9	10.0	29.9	0.00

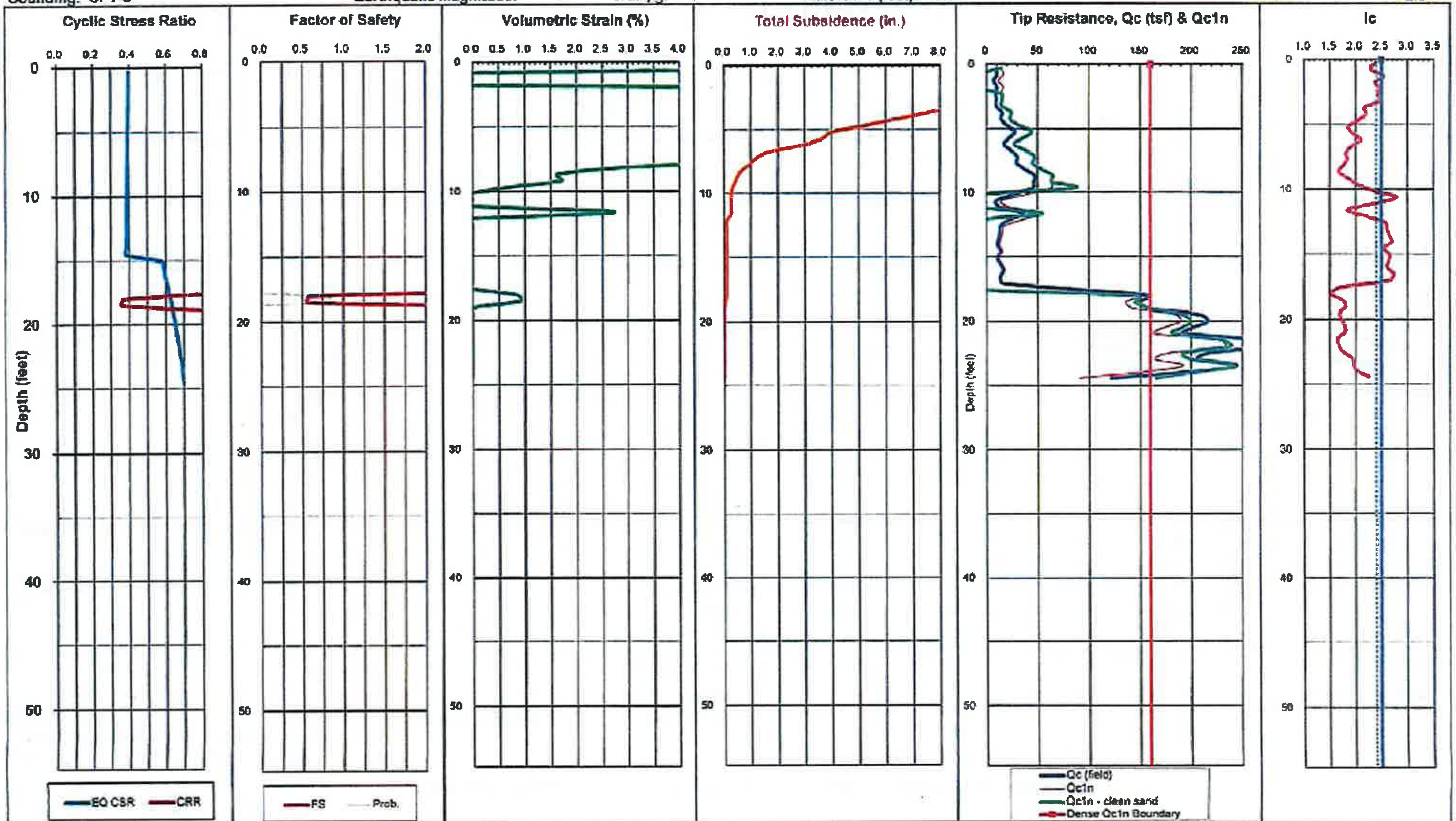
Depth (feet)	p (tsf)	G_{max} (tsf)	τ_{av} (tsf)	Shear Strain γ	Strain E_{15}	Strain E_{NC}	Dry Sand Subsidence (in.)
0.49	0.019	92	0.013	4.1E-01	3.5E+00	1.0E-01	1.181
0.98	0.038						
1.48	0.057						
1.97	0.076						
2.46	0.095	297	0.067	1.9E-01	1.5E+00	1.0E-01	1.181
2.95	0.114	332	0.080	1.4E-01	1.1E+00	1.0E-01	1.181
3.44	0.133	248	0.094	1.4E-01	1.2E+00	1.0E-01	1.181
3.94	0.152	380	0.107	4.9E-02	2.5E-01	1.0E-01	1.181
4.43	0.171	314	0.120	5.3E-02	2.8E-01	1.0E-01	1.181
4.92	0.190	358	0.133	2.8E-02	1.2E-01	1.0E-01	1.181
5.41	0.209	423	0.147	1.2E-02	3.2E-02	2.8E-02	0.329
5.91	0.228	410	0.160	2.9E-02	5.9E-02	6.0E-02	0.708
6.40	0.246	384	0.173	3.5E-02	1.6E-01	1.0E-01	1.181
6.89	0.265	456	0.186	1.6E-02	5.1E-02	4.4E-02	0.516
7.38	0.284	504	0.199	1.1E-02	2.6E-02	2.2E-02	0.264
7.87	0.303	513	0.212	1.1E-02	3.0E-02	2.6E-02	0.304
8.37	0.322	563	0.225	7.6E-03	1.6E-02	1.4E-02	0.168
8.86	0.341	614	0.238	5.6E-03	9.4E-03	8.2E-03	0.099
9.35	0.360	628	0.251	5.8E-03	9.9E-03	8.6E-03	0.101
9.84	0.379	717	0.264	3.5E-03	4.2E-03	3.6E-03	0.043
10.33	0.398						
10.83	0.417						
11.32	0.436						
11.81	0.455	671	0.315	7.7E-03	1.6E-02	1.4E-02	0.161
12.30	0.476						
12.80	0.498						
13.29	0.519						
13.78	0.541						
14.27	0.562						
14.76	0.584						
15.26	0.605						
15.75	0.626						
16.24	0.648						
16.73	0.669						
17.22	0.691						
17.72	0.712						
18.21	0.734	1,183	0.501	1.8E-03			
18.70	0.755	1,194	0.515	1.9E-03			
19.19	0.777	1,252	0.529	1.7E-03			
19.69	0.798	1,345	0.543	1.4E-03			
20.18	0.819	1,393	0.557	1.3E-03			
20.67	0.841	1,381	0.571	1.4E-03			
21.16	0.862	1,377	0.585	1.5E-03			
21.65	0.884	1,507	0.598	1.2E-03			
22.15	0.905	1,542	0.612	1.1E-03			
22.64	0.927	1,453	0.625	1.4E-03			
23.13	0.948	1,489	0.639	1.4E-03			
23.62	0.969	1,593	0.652	1.2E-03			
24.11	0.991	1,529	0.665	1.4E-03			
24.61	1.012	1,396	0.679	1.9E-03			

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

Commercial Organics Processing Facility   Project No: VT-24872-02   Method Used: 1   1998 NCEER (Robertson & Wride)

Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5   Plot 1   Limiting Ic: 2.6

Sounding: CPT-6   Earthquake Magnitude: 7   PGA, g: 1.10   Calc GWT (feet): 15.0



Total Thickness of Liquefiable Layers: 1.0 feet   Estimated Total Ground Subsidence (Settlement): 12.2 inches

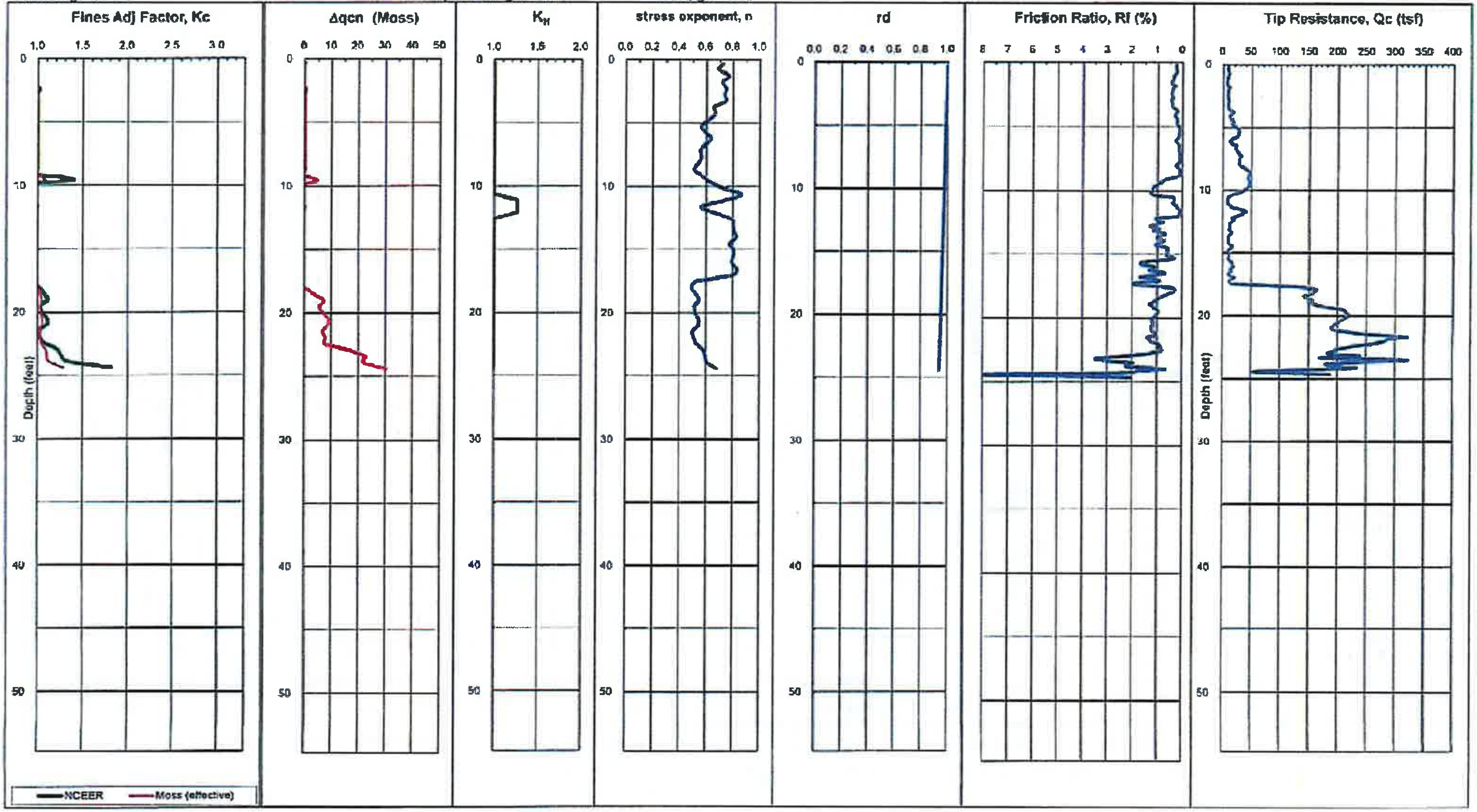
EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

3 avg increment =0.15m Qc1n/N1(60): 5

Ignore 1st/last increment into sand/silt soils: 0

Method Used: 1998 NCEER (Robertson & Wride)

Sounding: CPT-6 Earthquake Magnitude: 7 PGA, g: 1.10



CPT-LIQUEFY.XLS - A SPREADSHEET FOR EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL USING CPT DATA
Developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Project: Commercial Organics Processing Facility
Job No: VT-24872-02
Date: 5/17/2017
Sounding: CPT-7

Liquefaction Analysis using 1998 NCEER (Robertson & Wride) method
Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio ≈5

EARTHQUAKE INFORMATION:
Magnitude: 7 / 7.5
PGA, g: 1.10 / 0.92
MSF: 1.19
GWT, feet: 24.0
Calc GWT, feet: 15.0

Plot: 9
Method Used: 1 — 1998 NCEER (Robertson & Wride)
Averaging Increment: 3 — 0.15 m
Induced CSR (M=7.5) = 0.65*PGA*(po/p'o)*rd/MSF
Clean Sand Qc1n = C_Q*K_C*K_σ*Qc
SF = CRR$_{7.5}$*Kα/CSR
Ignore 1st/last increment into sand/silt soils: 1 yes
Ignore/remediate upper: 0.00 m
Unit Weight of unsaturated soils: 115 pcf
Unit Weight of saturated soils: 130 pcf
Limiting Ic for liquefiable soils: 2.60 — Limiting Ic for K_c: 2.5
Use Moss @ P_L: 15%
Use Tokimatsu & Seed (0) or Ishihara &Yoshimine (1): 0
Required SF: 1.50 — Max ΔN$_{1(60)}$ (fines adjustment): 5.5
Min SF of Liquefiable Layers: 0.17 — Max ΔN$_{1(60)}$ (fines adjustment): 18.0
Avg SF of Liquefiable Layers: 0.26

Total Liquefied Thickness (feet): 3.4
Total Induced Subsidence (inches): 4.1

SETTLEMENT OF DRY SANDS
Qc1n / N1(60) Ratio for clean sand: 5
p = 0.67*po
τ_{av} = 0.65*PGA*po*rd
G_{max} = 447*N$_{1(60)cs}$$^{1/3}$*p$^{0.5}$
a = 0.0389*(p/1)+0.124
b = 6400*(p/1)$^{-0.6}$
γ = [1+a*EXP(b*τ_{av}/G_{max})]/[(1+a)*τ_{av}/G_{max}]
E_{15} = γ*(N$_{1(60)cs}$/20)$^{-1.2}$
Nc = (MAG-4)$^{2.17}$
E_{nc} = (Nc/15)$^{0.45}$*E15
S = 2*H*E_{nc}
Nc = 10.8

Depth (feet)	Depth (m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff Stress p'o (tsf)	rd	F %	n	Cq (Max 1.70)	Q	Moss qc1 MPa	Moss Δqc MPa	Moss qc1mod MPa	Moss Kc	Qc1n	Ic	Ic>2.6 (0 or 1)
0.49	0.15	70.19	0.46	0.66	6.72	115	0.028	0.028	1.000	0.66	0.54	1.70	112.74	11.43	0.18	11.60	1.02	112.79	1.76	1
0.98	0.30	231.06	0.80	0.35	22.13	115	0.057	0.057	1.000	0.35	0.50	1.70	371.18	37.62	0.00	37.62	1.00	371.27	1.18	1
1.48	0.45	98.77	2.81	2.84	9.46	115	0.085	0.085	0.999	2.84	0.64	1.70	158.57	16.08	2.80	18.88		158.70	2.10	0
1.97	0.60	41.39	2.48	6.00	3.96	115	0.113	0.113	0.997	6.01	0.79	1.70	66.52	6.74	5.00	11.73		66.61	2.59	0
2.46	0.75	27.13	1.11	4.09	2.60	115	0.141	0.141	0.996	4.11	0.79	1.70	43.36	4.42	3.98	8.40		43.59	2.59	0
2.95	0.90	24.73	0.46	1.88	2.37	115	0.170	0.170	0.995	1.87	0.73	1.70	39.46	4.04	1.51	5.55		39.68	2.40	0
3.44	1.05	22.26	0.18	0.80	2.13	115	0.198	0.198	0.994	0.80	0.66	1.70	35.45	3.62	0.33	3.95	1.09	35.77	2.23	1
3.94	1.20	17.14	0.07	0.40	1.64	115	0.226	0.226	0.993	0.40	0.67	1.70	27.18	2.79	0.00	2.79	1.00	27.54	2.20	1
4.43	1.35	15.79	0.10	0.62	1.51	115	0.255	0.255	0.992	0.67	0.70	1.70	24.98	2.57	0.18	2.75	1.07	25.37	2.32	1
4.92	1.50	24.91	0.23	0.81	2.39	115	0.283	0.283	0.990	0.92	0.67	1.70	39.58	4.06	0.45	4.51	1.11	40.03	2.22	1
5.41	1.65	27.27	0.20	0.73	2.61	115	0.311	0.311	0.989	0.74	0.65	1.70	43.12	4.44	0.25	4.69	1.06	43.82	2.13	1
5.91	1.80	30.24	0.08	0.28	2.90	115	0.340	0.340	0.988	0.28	0.58	1.70	48.05	4.92	0.00	4.92	1.00	48.60	1.91	1
6.40	1.95	32.67	0.07	0.20	3.16	115	0.368	0.368	0.987	0.21	0.56	1.70	52.39	5.37	0.00	5.37	1.00	52.98	1.83	1
6.89	2.10	32.30	0.04	0.13	3.10	115	0.396	0.396	0.986	0.14	0.55	1.70	51.41	5.27	0.00	5.27	1.00	52.04	1.79	1
7.38	2.25	48.45	0.06	0.12	4.64	115	0.424	0.424	0.985	0.12	0.53	1.58	71.78	7.59	0.00	7.59	1.00	72.40	1.64	1
7.87	2.40	60.23	0.20	0.33	5.77	115	0.453	0.453	0.984	0.33	0.52	1.55	87.78	9.81	0.00	9.81	1.00	88.44	1.70	1
8.37	2.55	25.92	0.22	0.84	2.48	115	0.481	0.481	0.983	0.86	0.58	1.70	40.58	4.05	0.38	4.43	1.09	41.65	2.19	1
8.86	2.70	19.69	0.14	0.70	1.89	115	0.509	0.509	0.982	0.72	0.70	1.67	30.32	3.15	0.22	3.37	1.07	31.13	2.26	1
9.35	2.85	35.60	0.07	0.21	3.42	115	0.538	0.538	0.981	0.21	0.57	1.47	48.84	5.81	0.00	5.81	1.00	49.66	1.86	1
9.84	3.00	73.64	0.16	0.21	7.05	115	0.566	0.566	0.979	0.21	0.50	1.37	94.43	11.22	0.00	11.22	1.00	95.16	1.59	1
10.33	3.15	192.09	0.91	0.47	18.39	115	0.594	0.594	0.978	0.47	0.50	1.33	241.51	24.10	0.00	24.10	1.00	242.26	1.41	1
10.83	3.30	151.10	1.38	0.91	14.47	115	0.623	0.623	0.977	0.91	0.51	1.31	185.74	17.76	0.45	18.21	1.03	187.52	1.66	1
11.32	3.45	78.40	0.91	1.17	7.51	115	0.651	0.651	0.976	1.18	0.60	1.34	98.42	9.19	0.73	9.92	1.08	99.24	1.96	1
11.81	3.60	58.12	0.46	0.70	6.57	115	0.679	0.679	0.975	0.80	0.50	1.31	70.97	6.97	0.32	7.30	1.05	71.81	1.97	1
12.30	3.75	42.79	0.30	0.69	4.10	130	0.711	0.711	0.974	0.71	0.63	1.20	51.12	5.14	0.21	5.36	1.04	51.96	2.06	1
12.80	3.90	56.49	0.36	0.64	5.41	130	0.743	0.743	0.973	0.65	0.60	1.25	65.06	6.57	0.15	6.72	1.02	65.93	1.95	1
13.29	4.05	62.41	0.40	0.63	5.98	130	0.775	0.775	0.972	0.64	0.59	1.20	69.96	7.08	0.16	7.21	1.02	70.83	1.92	1
13.78	4.20	38.03	0.34	0.90	3.64	130	0.807	0.807	0.971	0.92	0.67	1.20	42.16	4.22	0.44	4.67	1.10	43.10	2.19	1
14.27	4.35	24.99	0.31	1.24	2.39	130	0.839	0.839	0.970	1.28	0.74	1.19	27.08	2.73	0.82	3.54	1.30	28.03	2.43	1
14.70	4.50	24.63	0.26	1.04	2.35	130	0.871	0.871	0.969	1.00	0.71	1.15	26.12	2.67	0.59	3.26	1.22	27.07	2.40	1
15.20	4.65	29.49	0.26	0.88	2.82	130	0.903	0.903	0.968	0.88	0.69	1.12	30.12	3.12	0.20	3.33	1.07	31.08	2.25	1
15.75	4.80	30.33	0.25	0.80	3.48	130	0.935	0.935	0.967	0.71	0.67	1.09	38.33	3.75	0.25	3.99	1.07	37.29	2.18	1
16.24	4.95	30.85	0.27	0.87	3.62	130	0.967	0.967	0.966	0.69	0.66	1.06	38.09	4.02	0.22	4.24		39.95	2.16	0
16.73	5.10	18.49	0.19	1.03	1.77	130	0.999	0.999	0.965	1.09	0.78	1.05	17.29	1.84	0.67	2.51		18.26	2.56	0
17.22	5.25	33.66	0.18	0.54	3.24	130	1.031	1.031	0.964	0.55	0.67	1.02	31.57	4.64	0.05	4.69		45.81	2.19	0
17.72	5.40	29.98	0.23	0.78	2.87	130	1.063	1.063	0.962	0.79	0.70	1.00	27.24	4.03	0.34	4.38		39.74	2.37	0
18.21	5.55	15.54	0.25	1.63	1.49	130	1.095	1.095	0.961	1.75	0.84	0.97	13.28	1.46	1.45	2.90		14.27	2.77	0
18.70	5.70	12.70	0.15	1.15	1.22	130	1.127	1.127	0.960	1.26	0.84	0.95	10.38	1.16	0.83	2.00		11.39	2.79	0
19.19	5.85	12.07	0.07	0.62	1.16	130	1.159	1.159	0.959	0.66	0.82	0.93	9.57	1.07	0.15	1.22		10.39	2.70	0
19.69	6.00	10.16	0.07	0.71	0.97	130	1.191	1.191	0.958	0.80	0.85	0.90	7.67	0.88	0.27	1.15		8.69	2.82	0
20.18	6.15	9.83	0.09	0.94	0.95	130	1.223	1.223	0.956	1.07	0.87	0.88	7.22	0.84	0.57	1.41		8.24	2.89	0
20.67	6.30	24.59	0.18	0.74	2.36	130	1.255	1.255	0.955	0.78	0.74	0.86	19.45	3.33	0.31	3.64		32.38	2.45	0
21.16	6.45	12.71	0.17	1.32	1.22	130	1.287	1.287	0.954	1.47	0.86	0.84	9.12	1.06	1.08	2.14		10.15	2.87	0
21.65	6.60	9.70	0.06	0.57	0.93	130	1.319	1.319	0.952	0.66	0.85	0.83	6.57	0.76	0.09	0.85		7.60	2.85	0
22.15	6.75	11.56	0.13	1.10	1.11	130	1.351	1.351	0.951	1.25	0.87	0.81	7.92	0.92	0.79	1.72		8.96	2.89	0
22.64	6.90	11.79	0.27	2.30	1.13	130	1.383	1.383	0.950	2.61	0.91	0.78	7.70	0.95	2.37	3.32		8.73	3.06	0
23.13	7.05	10.40	0.29	2.78	1.00	130	1.415	1.415	0.948	3.20	0.95	0.76	6.45	0.82	2.98	3.80		7.47	3.17	0
23.62	7.20	10.48	0.17	1.67	1.00	130	1.447	1.447	0.946	1.94	0.91	0.75	6.40	0.80	1.55	2.35		7.43	3.06	0
24.11	7.35	10.67	0.15	1.39	1.02	130	1.479	1.479	0.945	1.58	0.90	0.74	6.43	0.80	1.14	1.94		7.47	3.02	0
24.61	7.50	10.37	0.18	1.72	0.99	130	1.511	1.500	0.943	2.02	0.92	0.73	6.00	0.77	1.62	2.39		7.12	3.09	0
25.10	7.65	17.68	0.25	1.43	1.69	130	1.543	1.516	0.941	1.58	0.83	0.74	11.32	1.38	1.23	2.59		12.38	2.80	0
25.59	7.80	90.51	0.46	0.51	8.67	130	1.575	1.533	0.940	0.52	0.57	0.81	68.07	7.14	0.01	7.15		69.50	1.88	0
26.08	7.95	127.74	0.68	0.69	12.23	130	1.607	1.549	0.938	0.70	0.55	0.81	96.54	10.33	0.25	10.58	1.02	97.73	1.83	1
26.57	8.10	149.63	1.27	0.85	14.33	130	1.639	1.566	0.936	0.86	0.55	0.80	112.64	12.27	0.47	12.74	1.04	113.83	1.83	1
27.07	8.25	227.63	1.57	0.69	21.80	130	1.671	1.583	0.934	0.69	0.50	0.82	174.87	18.61	0.25	18.87	1.01	175.90	1.62	1
27.56	8.40	271.20	1.99	0.73	25.97	130	1.703	1.599	0.932	0.74	0.50	0.81	207.25	22.29	0.31	22.61	1.01	208.49	1.59	1
28.05	8.55	334.28	1.87	0.56	32.01	130	1.735	1.616	0.930	0.56	0.50	0.81	254.38	27.09	0.08	27.17	1.00	255.63	1.44	1
28.54	8.70	327.90	1.72	0.52	31.40	130	1.767	1.633	0.928	0.53	0.50	0.80	248.25	26.33	0.03	26.36	1.00	249.49	1.43	1
29.04	8.85	164.75	1.51	0.92	15.78	130	1.799	1.649	0.925	0.92	0.55	0.78	120.57	13.34	0.56	13.89		121.79	1.83	0
29.53	9.00	25.74	0.90	3.49	2.46	130	1.831	1.666	0.923	3.73	0.86	0.69	15.39	2.03	4.61	6.64		16.45	2.30	0
30.02	9.15	18.08	0.46	2.53	1.73	130	1.863	1.683	0.920	2.79	0.88	0.68	10.29	1.35	2.72	4.07		11.35	2.97	0
30.51	9.30	13.34	0.22	1.65	1.28	130	1.895	1.699	0.918	1.89	0.89	0.66	7.22	0.93	1.54	2.48		8.27	3.01	0
31.00	9.45	12.95	0.20	1.55	1.24	130	1.927	1.716	0.915	1.79	0.89	0.65	6.90	0.89	1.42	2.31		7.86	3.02	0
31.50	9.60	15.57	0.28	1.80	1.49	130	1.959	1.732	0.913	2.02	0.88	0.65	6.49	1.10	1.74	2.85		8.55	2.96	0
31.99	9.75	14.89	0.35	2.35	1.43	130	1.991	1.749	0.910	2.65	0.90	0.64	7.69	1.06	2.49	3.54		8.04	3.05	0

Depth (feet)	Liquef. Rel. Dens. Dr (%)	Kc	Kσ	Clean Sand Qc1n	Kα	CRR	Induced M=7.5 CSR	Liquefac. Safety Factor	Qc1n N1(60) Ratio	Equiv. N1(60)	FC Adj ΔN1(60)	Equiv. N1(60)cs	Volumetric Strain (%)	p (tsf)	Gmax (tsf)	τav (tsf)	Shear Strain γ	Strain Eν	Strain Enc	Dry Sand Subsidence (in.)
0.49	82	1.08	1.00	121.4	1.00	0.247	0.399	Non-Liq.	5.6	20.3	4.9	24.3	0.22	0.019	178	0.013	1.6E-03	1.3E-03	1.1E-03	0.013
0.98	100	1.00	1.00	371.3	1.00	Infin.	0.399	Non-Liq.	5.5	67.1	7.1	74.5	0.01	0.038	358	0.027	3.0E-04	6.2E-05	5.4E-05	0.001
1.48			1.00		1.00		0.399	Non-Liq.	4.9	32.5			0.00	0.057						
1.97			1.00		1.00		0.398	Non-Liq.	3.9	16.9			0.00	0.076						
2.46			1.00		1.00		0.398	Non-Liq.	3.9	11.1			0.00	0.095						
2.95			1.00		1.00		0.397	Non-Liq.	4.3	9.3			0.00	0.114						
3.44	34	1.73	1.00	62.0	1.00	0.062	0.397	Non-Liq.	4.6	7.7	4.7	12.4	1.90	0.133	377	0.094	8.2E-03	1.1E-02	9.5E-03	0.112
3.94	23	1.00	1.00	27.5	1.00	0.073	0.396	Non-Liq.	4.7	5.9	0.0	5.9	20.00	0.152	314	0.107	3.4E-02	1.5E-01	1.0E-01	1.181
4.43	20	2.02	1.00	51.4	1.00	0.093	0.396	Non-Liq.	4.5	5.7	4.6	10.3	3.48	0.171	401	0.120	9.1E-03	2.0E-02	1.7E-02	0.206
4.92	39	1.70	1.00	68.3	1.00	0.110	0.395	Non-Liq.	4.7	8.6	5.1	13.7	1.40	0.190	465	0.133	5.1E-03	8.1E-03	7.0E-03	0.082
5.41	43	1.52	1.00	66.4	1.00	0.107	0.395	Non-Liq.	4.8	9.1	4.2	13.3	1.52	0.209	483	0.147	5.4E-03	8.8E-03	7.6E-03	0.090
5.91	47	1.00	1.00	48.6	1.00	0.090	0.395	Non-Liq.	5.3	9.2	0.5	9.7	4.12	0.228	459	0.160	1.0E-02	2.4E-02	2.1E-02	0.244
6.40	50	1.06	1.00	53.0	1.00	0.084	0.394	Non-Liq.	5.4	9.6	0.6	10.6	3.10	0.246	487	0.173	8.4E-03	1.8E-02	1.5E-02	0.183
6.89	50	1.00	1.00	52.0	1.00	0.083	0.394	Non-Liq.	5.5	9.5	0.9	10.4	3.27	0.265	503	0.186	8.7E-03	1.9E-02	1.6E-02	0.193
7.38	63	1.00	1.00	72.4	1.00	0.115	0.393	Non-Liq.	5.8	12.5	2.0	14.5	1.18	0.284	581	0.199	4.8E-03	6.8E-03	5.9E-03	0.070
7.87	72	1.00	1.00	88.4	1.00	0.144	0.393	Non-Liq.	5.7	15.6	2.1	17.7	0.66	0.303	641	0.212	3.3E-03	3.8E-03	3.3E-03	0.039
8.37	40	1.53	1.00	68.1	1.00	0.109	0.392	Non-Liq.	4.7	8.8	4.8	13.6	1.42	0.322	606	0.225	5.2E-03	8.2E-03	7.1E-03	0.084
8.86	28	1.83	1.00	57.0	1.00	0.097	0.392	Non-Liq.	4.6	6.8	4.6	11.4	2.44	0.341	588	0.238	7.2E-03	1.4E-02	1.2E-02	0.144
9.35	48	1.00	1.00	49.7	1.00	0.091	0.392	Non-Liq.	5.4	9.3	0.7	9.9	3.76	0.360	577	0.251	9.4E-03	2.2E-02	1.9E-02	0.222
9.84	75	1.00	1.00	95.2	1.00	0.160	0.391	Non-Liq.	5.9	18.2	2.9	19.0	0.55	0.379	735	0.264	3.6E-03	3.2E-03	2.7E-03	0.032
10.33	100	1.00	1.00	242.3	1.00	Infin.	0.391	Non-Liq.	6.2	38.8	9.6	48.5	0.05	0.398	1,028	0.277	9.0E-04	3.1E-04	2.7E-04	0.003
10.83	100	1.03	1.00	192.4	1.00	Infin.	0.390	Non-Liq.	5.7	32.9	5.6	38.5	0.09	0.417	975	0.290	1.2E-03	5.3E-04	4.6E-04	0.005
11.32	77	1.25	1.00	124.3	1.00	0.259	0.390	Non-Liq.	5.2	19.2	5.6	24.9	0.27	0.436	861	0.303	2.1E-03	1.6E-03	1.4E-03	0.016
11.81	63	1.26	1.00	90.4	1.00	0.150	0.389	Non-Liq.	5.1	14.0	4.2	18.2	0.64	0.455	792	0.315	3.3E-03	3.7E-03	3.2E-03	0.038
12.30	50	1.39	1.00	72.1	1.00	0.115	0.389	Non-Liq.	5.6	10.5	4.0	14.4	1.22	0.476	751	0.330	4.8E-03	7.1E-03	6.1E-03	0.072
12.80	60	1.24	1.00	81.8	1.00	0.131	0.389	Non-Liq.	5.2	12.7	3.6	16.4	0.86	0.498	801	0.344	3.9E-03	5.0E-03	4.3E-03	0.051
13.29	63	1.21	1.00	85.7	1.00	0.139	0.388	Non-Liq.	5.2	13.5	3.6	17.1	0.79	0.519	834	0.359	3.7E-03	4.4E-03	3.8E-03	0.045
13.78	42	1.55	1.00	71.0	1.00	0.113	0.388	Non-Liq.	4.7	8.2	5.9	14.2	1.29	0.541	796	0.373	5.0E-03	7.5E-03	6.5E-03	0.078
14.27	24	2.45	1.00	68.6	1.00	0.110	0.387	Non-Liq.	4.2	6.8	7.1	13.7	1.42	0.562	803	0.388	5.3E-03	8.3E-03	7.2E-03	0.085
14.70	23	2.33	1.00	63.1	1.00	0.100	0.387	Non-Liq.	4.3	6.3	6.3	12.6	1.83	0.584	795	0.402	6.1E-03	1.1E-02	9.1E-03	0.108
15.20	28	1.81	1.00	56.2	1.00	0.096	0.569	0.17	4.6	6.8	4.5	11.2	2.35	0.605	779	0.416	7.5E-03			
15.75	38	1.64	1.00	61.3	1.00	0.101	0.569	0.17	4.7	7.9	4.3	12.3	2.23	0.626	816	0.431	6.4E-03			
16.24			1.00		1.00		0.598	Non-Liq.	4.8	8.4			0.00	0.648						
16.73			1.00		1.00		0.606	Non-Liq.	4.0	4.6			0.00	0.669						
17.22			1.41		1.00		0.614	Non-Liq.	4.7	9.7			0.00	0.691						
17.72			1.41		1.00		0.622	Non-Liq.	4.5	8.9			0.00	0.712						
18.21			1.09		1.00		0.629	Non-Liq.	3.6	4.0			0.00	0.734						
18.70			1.09		1.00		0.636	Non-Liq.	3.5	3.2			0.00	0.755						
19.19			1.00		1.00		0.643	Non-Liq.	3.7	2.9			0.00	0.777						
19.69			1.00		1.00		0.649	Non-Liq.	3.5	2.5			0.00	0.799						
20.18			1.06		1.00		0.655	Non-Liq.	3.3	2.5			0.00	0.819						
20.67			1.58		0.99		0.661	Non-Liq.	4.2	7.7			0.00	0.841						
21.16			1.00		0.99		0.667	Non-Liq.	3.4	3.0			0.00	0.862						
21.65			1.00		0.99		0.672	Non-Liq.	3.4	2.2			0.00	0.884						
22.15			1.00		0.99		0.678	Non-Liq.	3.3	2.7			0.00	0.905						
22.64			1.00		0.98		0.683	Non-Liq.	3.0	2.9			0.00	0.927						
23.13			1.00		0.98		0.687	Non-Liq.	2.8	2.7			0.00	0.948						
23.62			1.00		0.98		0.692	Non-Liq.	3.0	2.5			0.00	0.969						
24.11			1.00		0.97		0.696	Non-Liq.	3.1	2.4			0.00	0.991						
24.61			1.00		0.97		0.700	Non-Liq.	3.0	2.4			0.00	1.012						
25.10			1.00		0.97		0.704	Non-Liq.	3.5	3.5			0.00	1.034						
25.59			1.00		0.97		0.708	Non-Liq.	5.3	13.1			0.00	1.055						
26.08	78	1.13	1.00	110.2	0.93	0.204	0.711	0.27	5.4	18.0	4.0	22.0	1.38	1.077	1,300	0.718	2.8E-03			
26.57	82	1.13	1.00	128.4	0.93	0.277	0.715	0.36	5.4	21.0	4.7	25.7	1.16	1.098	1,332	0.730	2.3E-03			
27.07	100	1.00	1.00	175.9	0.92	Infin.	0.718	Non-Liq.	5.8	30.2	5.0	35.2	0.00	1.119	1,550	0.743	1.6E-03			
27.56	100	1.00	1.00	208.5	0.92	Infin.	0.721	Non-Liq.	5.9	35.4	6.3	41.7	0.00	1.141	1,656	0.756	1.4E-03			
28.05	100	1.00	1.00	255.6	0.91	Infin.	0.723	Non-Liq.	6.2	41.4	9.7	51.1	0.00	1.162	1,789	0.768	1.1E-03			
28.54	100	1.00	1.00	249.5	0.91	Infin.	0.726	Non-Liq.	6.2	40.2	9.7	49.9	0.00	1.184	1,790	0.780	1.2E-03			
29.04			1.00		0.95		0.728	Non-Liq.	5.4	22.5			0.00	1.205						
29.53			1.00		0.95		0.731	Non-Liq.	3.3	5.0			0.00	1.227						
30.02			1.00		0.95		0.733	Non-Liq.	3.2	3.6			0.00	1.248						
30.51			1.00		0.94		0.734	Non-Liq.	3.1	2.7			0.00	1.269						
31.00			1.00		0.94		0.736	Non-Liq.	3.1	2.6			0.00	1.291						
31.50			1.00		0.94		0.737	Non-Liq.	3.2	3.0			0.00	1.312						
31.99			1.00		0.94		0.739	Non-Liq.	3.0	3.0			0.00	1.334						

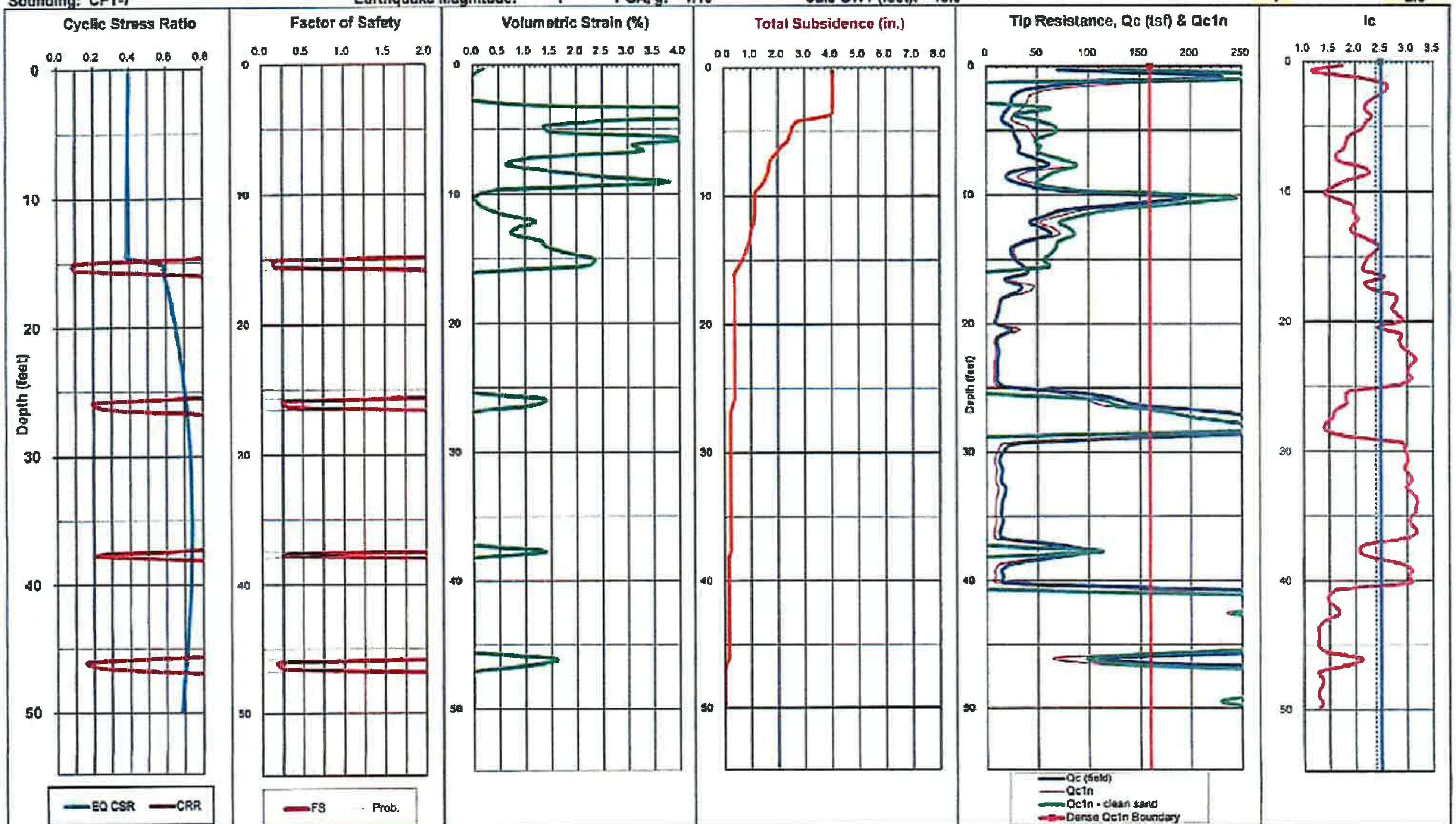
Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa	Moss Δqc MPa	Moss qc1mod MPa	Moss eff Kc	Qc1n	Ic	Override δ	Liquef. Suscept. (0 or 1)	Rel. Dens. Dr (%)	Kc	Kσ	Clean Sand Qc1n	Kα	CRR	Induced M-7.5 CSR	Liquefac. Safety Factor	Qc1n N60 Ratio	Equiv. N60	FC Adj. ΔN1,60	Equiv. N1,60cs	Volumetric Strain (%)	p (tsf)	Gmax (tsf)	γeff (tsf)	Shear Strain γ	Strain Ec	Strain Enc	Dry Sand Subsidence (in.)
32.48	9.90	14.40	0.37	2.55	1.38	130	2.023	1.766	0.907	2.81	0.91	0.63	7.46	1.09	2.76	3.78		8.53	3.09		0			1.00		0.93		0.740	Non-Liq.	2.9	2.9			0.00	1.355						
32.97	10.05	18.74	0.51	2.74	1.79	130	2.055	1.782	0.904	3.03	0.89	0.63	10.10	1.37	3.01	4.38		11.18	3.00		0			1.00		0.93		0.741	Non-Liq.	3.1	3.6			0.00	1.377						
33.46	10.20	17.78	0.69	3.87	1.70	130	2.087	1.799	0.901	4.30	0.92	0.61	9.27	1.31	4.53	5.84		10.31	3.11		0			1.00		0.93		0.742	Non-Liq.	2.9	3.6			0.00	1.398						
33.96	10.35	15.43	0.64	4.15	1.48	130	2.119	1.816	0.898	4.70	0.94	0.60	7.76	1.12	4.92	6.04		8.78	3.20		0			1.00		0.93		0.742	Non-Liq.	2.7	3.2			0.00	1.419						
34.45	10.50	14.95	0.52	3.50	1.43	130	2.151	1.832	0.894	3.99	0.93	0.60	7.43	1.06	4.05	5.11		8.46	3.17		0			1.00		0.93		0.743	Non-Liq.	2.8	3.0			0.00	1.441						
34.94	10.65	14.41	0.44	3.04	1.38	130	2.183	1.849	0.891	3.49	0.93	0.60	7.06	1.01	3.42	4.42		8.10	3.16		0			1.00		0.92		0.743	Non-Liq.	2.8	2.9			0.00	1.462						
35.43	10.80	15.88	0.38	2.41	1.52	130	2.215	1.866	0.888	2.73	0.90	0.60	7.95	1.10	2.58	3.68		9.00	3.06		0			1.00		0.92		0.743	Non-Liq.	3.0	3.0			0.00	1.484						
35.93	10.95	14.82	0.38	2.58	1.42	130	2.247	1.882	0.884	2.95	0.92	0.59	7.22	1.02	2.80	3.81		8.27	3.11		0			1.00		0.92		0.743	Non-Liq.	2.9	2.8			0.00	1.505						
36.42	11.10	12.58	0.31	2.50	1.20	130	2.279	1.899	0.880	2.95	0.94	0.56	5.84	0.84	2.70	3.53		6.67	3.19		0			1.00		0.92		0.743	Non-Liq.	2.8	2.5			0.00	1.527						
36.91	11.25	15.95	0.29	1.78	1.53	130	2.311	1.915	0.877	2.04	0.88	0.59	7.87	1.06	1.74	2.81		8.94	2.99		0			1.00		0.92		0.742	Non-Liq.	3.1	2.8			0.00	1.548						
37.40	11.40	68.97	0.65	0.94	6.60	130	2.343	1.932	0.873	0.97	0.66	0.67	42.64	6.33	0.60	6.92		55.47	2.20		0			1.26		0.91		0.742	Non-Liq.	4.7	11.8			0.00	1.569						
37.89	11.55	98.09	0.98	1.00	9.39	130	2.375	1.948	0.869	1.02	0.62	0.68	62.07	9.23	0.68	9.90	1.07	80.03	2.08		1	66	1.42	1.26	113.6	0.87	0.216	0.741	0.29	4.9	16.3	5.5	21.8	1.40	1.591	1.574	0.882	2.5E-03			
38.39	11.70	88.34	0.90	1.35	8.35	130	2.406	1.965	0.865	1.40	0.69	0.65	39.68	6.24	1.15	7.39		51.70	2.32		0			1.26		0.91		0.740	Non-Liq.	4.5	11.6			0.00	1.612						
38.88	11.85	24.63	0.60	2.43	2.38	130	2.438	1.982	0.861	2.84	0.85	0.59	12.55	1.74	2.60	4.34		13.65	2.68		0			1.00		0.91		0.739	Non-Liq.	3.4	4.1			0.00	1.634						
39.37	12.00	15.02	0.34	2.26	1.44	130	2.470	1.999	0.857	2.61	0.91	0.56	6.99	0.99	2.37	3.36		7.96	3.10		0			1.00		0.91		0.738	Non-Liq.	2.9	2.7			0.00	1.655						
39.86	12.15	16.29	0.31	1.91	1.56	130	2.502	2.015	0.852	2.18	0.89	0.58	7.62	1.06	1.90	2.96		8.70	3.02		0			1.00		0.91		0.736	Non-Liq.	3.1	2.6			0.00	1.677						
40.35	12.30	16.51	0.41	2.49	1.58	130	2.534	2.032	0.848	2.80	0.90	0.55	7.59	1.10	2.63	3.73		8.68	3.08		0			1.00		0.90		0.735	Non-Liq.	3.0	2.9			0.00	1.699						
40.85	12.45	203.03	1.33	0.65	19.53	130	2.566	2.049	0.843	0.66	0.51	0.71	135.80	14.95	0.20	15.15		137.69	1.69		0			1.00		0.90		0.733	Non-Liq.	5.7	24.2			0.00	1.720						
41.34	12.60	388.70	2.70	0.70	37.22	130	2.598	2.065	0.839	0.70	0.50	0.72	281.57	29.44	0.26	29.70	1.01	282.85	1.50		1	100	1.00	1.00	283.0	0.81	Infin.	0.732	Non-Liq.	6.1	43.3	9.2	52.6	0.00	1.741	2.210	1.038	1.0E-03			
41.83	12.75	476.86	3.93	0.83	45.68	130	2.630	2.082	0.834	0.84	0.50	0.71	318.91	36.95	0.45	37.40	1.01	321.31	1.50		1	100	1.00	1.00	321.3	0.81	Infin.	0.730	Non-Liq.	6.1	52.9	10.0	62.9	0.00	1.762	2.361	1.045	9.1E-04			
42.32	12.90	422.74	4.90	1.16	40.48	130	2.662	2.098	0.830	1.17	0.50	0.71	282.23	33.49	0.79	34.28	1.03	283.64	1.64		1	100	1.00	1.00	282.8	0.81	Infin.	0.728	Non-Liq.	5.8	43.0	7.6	50.6	0.00	1.784	2.292	1.052	9.6E-04			
42.81	13.05	354.72	4.00	1.13	33.97	130	2.694	2.115	0.825	1.14	0.51	0.70	233.55	27.71	0.85	28.56	1.03	234.85	1.69		1	100	1.03	1.00	241.5	0.80	Infin.	0.726	Non-Liq.	5.7	41.3	7.1	48.4	0.00	1.805	2.160	1.059	1.1E-03			
43.31	13.20	436.48	2.63	0.60	41.80	130	2.726	2.132	0.820	0.61	0.50	0.70	289.23	32.41	0.14	32.54	1.00	290.65	1.42		1	100	1.00	1.00	290.6	0.80	Infin.	0.724	Non-Liq.	6.2	45.8	10.0	55.8	0.00	1.827	2.322	1.065	9.0E-04			
43.80	13.35	486.13	2.22	0.46	46.55	130	2.758	2.148	0.816	0.46	0.50	0.70	321.02	35.12	0.00	35.12	1.00	322.45	1.31		1	100	1.00	1.00	322.4	0.80	Infin.	0.721	Non-Liq.	5.5	58.3	6.2	64.5	0.00	1.848	2.437	1.071	8.7E-04			
44.29	13.50	493.67	2.27	0.46	47.27	130	2.790	2.165	0.811	0.46	0.50	0.70	324.76	35.81	0.00	35.81	1.00	326.19	1.30		1	100	1.00	1.00	325.2	0.79	Infin.	0.719	Non-Liq.	5.5	59.0	6.3	65.2	0.00	1.870	2.460	1.077	8.6E-04			
44.78	13.65	493.38	2.23	0.45	47.25	130	2.822	2.182	0.806	0.45	0.50	0.70	323.32	35.41	0.00	35.41	1.00	324.75	1.30		1	100	1.00	1.00	324.8	0.79	Infin.	0.717	Non-Liq.	5.5	58.7	6.3	65.0	0.00	1.891	2.471	1.083	8.6E-04			
45.28	13.80	490.87	2.13	0.43	47.01	130	2.854	2.198	0.801	0.44	0.50	0.69	320.43	34.95	0.00	34.95	1.00	321.88	1.29		1	100	1.00	1.00	321.9	0.79	Infin.	0.714	Non-Liq.	5.5	58.2	6.2	64.4	0.00	1.912	2.477	1.089	8.8E-04			
45.77	13.95	342.08	1.72	0.50	32.76	130	2.886	2.215	0.796	0.51	0.50	0.69	222.02	24.22	0.00	24.22	1.00	223.47	1.46		1	100	1.00	1.00	223.5	0.79	Infin.	0.711	Non-Liq.	6.1	36.3	8.3	44.7	0.00	1.934	2.206	1.094	1.1E-03			
46.26	14.10	113.27	1.43	1.26	10.85	130	2.918	2.231	0.791	1.29	0.63	0.82	65.35	8.24	1.02	9.26	1.12	66.66	2.12		1	60	1.50	1.00	99.9	0.83	0.173	0.709	0.20	4.8	13.8	5.5	19.3	1.58	1.955	1.676	1.099	2.4E-03			
46.75	14.25	180.46	1.61	0.89	17.28	130	2.950	2.248	0.786	0.91	0.56	0.66	110.58	13.04	0.52	13.56	1.04	111.87	1.85		1	82	1.14	1.00	128.2	0.78	0.276	0.706	0.39	5.4	20.8	4.8	25.6	1.35	1.977	1.853	1.104	1.8E-03			
47.24	14.40	431.48	1.69	0.39	41.32	130	2.982	2.265	0.781	0.39	0.50	0.68	277.28	29.71	0.00	29.71	1.00	278.75	1.31		1	100	1.00	1.00	278.7	0.78	Infin.	0.703	Non-Liq.	6.4	43.4	10.0	53.4	0.00	1.998	2.379	1.109	9.5E-04			
47.74	14.55	427.51	2.05	0.48	40.94	130	3.014	2.281	0.776	0.48	0.50	0.68	273.71	30.11	0.00	30.11	1.00	275.17	1.37		1	100	1.00	1.00	275.2	0.78	Infin.	0.700	Non-Liq.	6.3	43.6	10.0	53.6	0.00	2.020	2.395	1.114	9.4E-04			
48.23	14.70	420.67	1.99	0.47	40.28	130	3.046	2.298	0.771	0.47	0.50	0.68	268.31	29.46	0.00	29.46	1.00	269.79	1.37		1	100	1.00	1.00	269.8	0.77	Infin.	0.697	Non-Liq.	6.3	42.8	10.0	52.8	0.00	2.041	2.385	1.118	9.4E-04			
48.72	14.85	413.05	1.45	0.35	39.55	130	3.078	2.315	0.766	0.36	0.50	0.68	262.47	27.71	0.00	27.71	1.00	263.99	1.30		1	100	1.00	1.00	263.9	0.77	Infin.	0.694	Non-Liq.	5.5	47.7	5.1	52.8	0.00	2.062	2.406	1.123	9.3E-04			
49.21	15.00	406.72	1.41	0.35	38.95	130	3.110	2.331	0.761	0.35	0.50	0.67	257.49	27.08	0.00	27.08	1.00	258.98	1.30		1	100	1.00	1.00	259.0	0.77	Infin.	0.691	Non-Liq.	5.5	46.8	5.0	51.8	0.00	2.084	2.405	1.127	9.4E-04			
49.70	15.15	362.49	1.39	0.38	34.71	130	3.142	2.348	0.756	0.38	0.50	0.67	228.50	24.20	0.00	24.20	1.00	229.99	1.37		1	100	1.00	1.00	230.0	0.76	Infin.	0.688	Non-Liq.	6.3	38.4	9.6	48.0	0.00	2.105	2.324	1.131	1.0E-03			
50.20	15.30	431.50	1.58	0.36	41.32	130	3.174	2.365	0.751	0.36	0.50	0.67	271.32	28.85	0.00	28.85	1.00	272.81	1.30		1	100	1.00	1.00	272.8	0.76	Infin.	0.685	Non-Liq.	5.5	49.3	5.3	54.6	0.00	2.127	2.472	1.135	8.9E-04			

EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

Commercial Organics Processing Facility   Project No: VT-24872-02   Method Used: 1   1998 NCEER (Robertson & Wride)

Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5   Plot: 1   Limiting Ic: 2.6

Sounding: CPT-7   Earthquake Magnitude: 7   PGA, g: 1.10   Calc GWT (feet): 15.0



Total Thickness of Liquefiable Layers: 3.4 feet   Estimated Total Ground Subsidence (Settlement): 4.1 inches

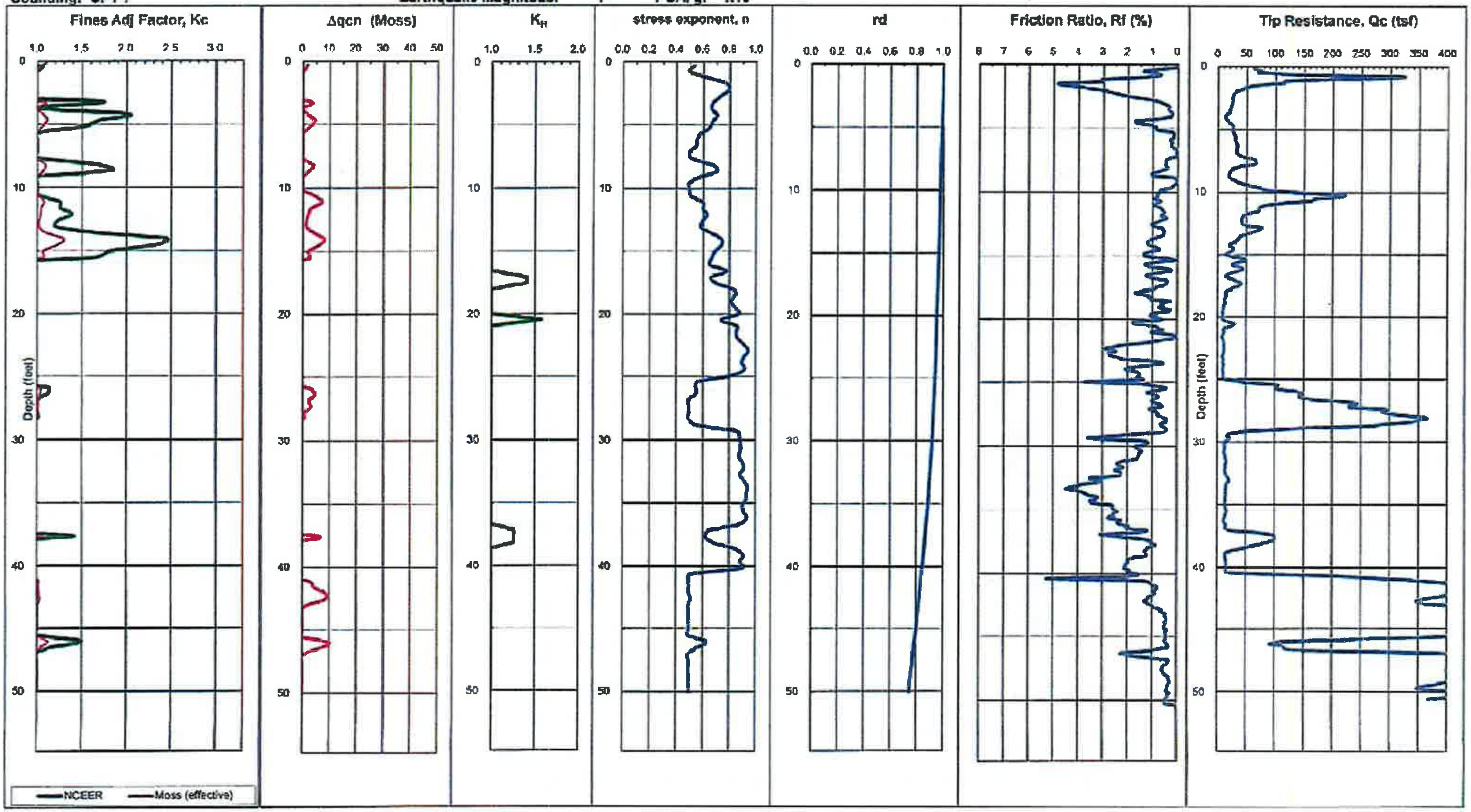
EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

3 avg increment =0.15m Qc1n/N1(60): 5

Ignore 1st/last increment into sand/silt soils: 0

Method Used: 1998 NCEER (Robertson & Wride)

Sounding: CPT-7 Earthquake Magnitude: 7 PGA, g: 1.10



ATTACHMENT F

Log of Borings IT-1 through IT-4

Infiltration Test Data and Calculations

Earth Systems Southern California

1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: IT-1	DRILLING DATE: February 1, 2017
PROJECT NAME: Commercial Organics Processing Facility	DRILLING METHOD: 6.0" Hollow Stem Auger
PROJECT NUMBER: VT-24872-02	DRILL: Mobile B-61
BORING LOCATION: Per Plan	LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0						ML			ALLUVIUM: Medium to yellowish brown clayey silt to sandy silt; medium dense; moist.
									Total Depth: 2.0 feet. No Groundwater Encountered. Installed 2.0 feet of 2.0 inch slotted PVC pipe and gravel pack.
5									
10									
15									
20									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Infiltration Testing

Test Through Zone at Bottom of Infiltration Device

Infiltration Testing Field Data

Date: 3/3/2017

Project Location:	Commercial Organics Processing Facility	Job Number:	VT-24872-02
Earth Description:	See Log	Tested By:	SC
Field Test in Boring	IT-1	Start Time:	8:03 AM
Boring Diameter (inches):	4	Total Pipe Length (feet):	3
Boring Depth (feet):	2	Pipe Stick-Up (inches):	1

Time of Day, : (hh:mm)	Delta Time, Δt (min.)	Delta Time, Δt (hr.)	Top of Pipe to Water, (ft.)	Water Depth, d (in.)	Water Depth, d (ft.)	Drop in Water Height, Δc (in.)	Drop in Water Height, Δd (ft.)	Perc Rate, (in/hr)	Corr. Factor, RF	Infilt. Rate (in/hr)
8:03		-	1.50	18.0	1.50					
8:04	1.0	0.02	2.44	6.7	0.56	11.28	0.94	676.80	7.18	94.26
8:04			2.44	6.7	0.56					
8:05	1.0	0.02	2.79	2.5	0.21	4.20	0.35	252.00	3.31	76.13
8:05			2.79	2.5	0.21					
8:06	1.0	0.02	2.95	0.6	0.05	1.92	0.16	115.20	1.78	64.72
8:08			1.50	18.0	1.50					
8:09	1.0	0.02	2.28	8.6	0.72	9.36	0.78	561.60	7.66	73.32
8:09			2.28	8.6	0.72					
8:10	1.0	0.02	2.67	4.0	0.33	4.68	0.39	280.80	4.15	67.66
8:10			2.67	4.0	0.33					
8:11	1.0	0.02	2.85	1.8	0.15	2.16	0.18	129.60	2.44	53.11
8:11			2.85	1.8	0.15					
8:12	1.0	0.02	2.97	0.4	0.03	1.44	0.12	86.40	1.54	56.10
8:13			1.50	18.0	1.50					
8:14	1.0	0.02	2.13	10.4	0.87	7.56	0.63	453.60	8.11	55.93
8:14			2.13	10.4	0.87					
8:15	1.0	0.02	2.52	5.8	0.48	4.68	0.39	280.80	5.05	55.60
8:15			2.52	5.8	0.48					
8:16	1.0	0.02	2.68	3.8	0.32	1.92	0.16	115.20	3.40	33.88
8:16			2.68	3.8	0.32					
8:17	1.0	0.02	2.82	2.2	0.18	1.68	0.14	100.80	2.50	40.32
8:17			2.82	2.2	0.18					
8:18	1.0	0.02	2.91	1.1	0.09	1.08	0.09	64.80	1.81	35.80
8:19			1.50	18.0	1.50					
8:20	1.0	0.02	2.05	11.4	0.95	6.60	0.55	396.00	8.35	47.43
8:20			2.05	11.4	0.95					
8:21	1.0	0.02	2.35	7.8	0.65	3.60	0.30	216.00	5.80	37.24
8:21			2.35	7.8	0.65					
8:22	1.0	0.02	2.60	4.8	0.40	3.00	0.25	180.00	4.15	43.37
8:22			2.60	4.8	0.40					
8:23	1.0	0.02	2.79	2.5	0.21	2.28	0.19	136.80	2.83	48.34
8:23			2.79	2.5	0.21					
8:24	1.0	0.02	2.91	1.1	0.09	1.44	0.12	86.40	1.90	45.47
8:33			1.50	18.0	1.50					
8:34	1.0	0.02	2.09	10.9	0.91	7.08	0.59	424.80	8.23	51.62
8:34			2.09	10.9	0.91					
8:35	1.0	0.02	2.37	7.6	0.63	3.36	0.28	201.60	5.62	35.87
8:35			2.37	7.6	0.63					
8:36	1.0	0.02	2.60	4.8	0.40	2.76	0.23	165.60	4.09	40.49
8:36			2.60	4.8	0.40					

Infiltration Testing

Test Through Zone at Bottom of Infiltration Device

Infiltration Testing Field Data

Date: 3/3/2017

Project Location:	Commercial Organics Processing Facility	Job Number:	VT-24872-02
Earth Description:	See Log	Tested By:	SC
Field Test in Boring	IT-1	Start Time:	8:03 AM
Boring Diameter (inches):	4	Total Pipe Length (feet):	3
Boring Depth (feet):	2	Pipe Stick-Up (inches):	1

Time of Day, t (hh:mm)	Delta Time, Δt (min.)	Delta Time, Δt (hr.)	Top of Pipe to Water, (ft.)	Water Depth, d (in.)	Water Depth, d (ft.)	Drop in Water Height, Δd (in.)	Drop in Water Height, Δd (ft.)	Perc Rate, (in/hr)	Corr. Factor, RF	Infilt. Rate (in/hr)
8:37	1.0	0.02	2.76	2.9	0.24	1.92	0.16	115.20	2.92	39.45
8:37			2.76	2.9	0.24					
8:38	1.0	0.02	2.86	1.7	0.14	1.20	0.10	72.00	2.14	33.64
8:38			2.86	1.7	0.14					
8:39	1.0	0.02	2.94	0.7	0.06	0.96	0.08	57.60	1.60	36.00

Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: IT-2	DRILLING DATE: February 1, 2017
PROJECT NAME: Commercial Organics Processing Facility	DRILLING METHOD: 6.0" Hollow Stem Auger
PROJECT NUMBER: VT-24872-02	DRILL: Mobile B-61
BORING LOCATION: Per Plan	LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0						ML			**ALLUVIUM:** Medium to yellowish brown clayey silt to sandy silt; medium dense; moist.
5		■		3/5/5		ML			**ALLUVIUM:** Medium to yellowish brown clayey silt to sandy silt; medium dense; moist.
10		■		3/5/4		SM			**ALLUVIUM:** Pale brown silty fine sand with thin silt lenses; loose; moist.
15									Total Depth: 13.0 feet. No Groundwater Encountered. Installed 13.0 feet of 2.0 inch slotted PVC pipe and gravel pack.
20									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Infiltration Testing

Test Through Zone Eleven Feet Below Bottom of Infiltration Device

Infiltration Testing Field Data

Date: 3/3/2017

Project Location:	Commercial Organics Processing Facility	Job Number:	VT-24872-02
Earth Description:	See Log	Tested By:	SC
Field Test in Boring	IT-2	Start Time:	9:01 AM
Boring Diameter (inches):	7	Total Pipe Length (feet):	13
Boring Depth (feet):	13	Pipe Stick-Up (inches):	0

Time of Day, t (hh:mm)	Delta Time, Δt (min.)	Delta Time, Δt (hr.)	Top of Pipe to Water, (ft.)	Water Depth, d (in.)	Water Depth, d (ft.)	Drop in Water Height, Δd (in.)	Drop in Water Height, Δd (ft.)	Perc Rate, (in/hr)	Corr. Factor, RF	Infilt. Rate (in/hr)
9:01		-	11.00	24.0	2.00					
9:02	1.0	0.02	11.74	15.1	1.26	8.88	0.74	532.80	6.59	80.87
9:02			11.74	15.1	1.26					
9:03	1.0	0.02	12.25	9.0	0.75	6.12	0.51	367.20	4.45	82.60
9:03			12.25	9.0	0.75					
9:04	1.0	0.02	12.50	6.0	0.50	3.00	0.25	180.00	3.14	57.27
9:04			12.50	6.0	0.50					
9:05	1.0	0.02	12.63	4.4	0.37	1.56	0.13	93.60	2.49	37.57
9:05			12.63	4.4	0.37					
9:06	1.0	0.02	12.73	3.2	0.27	1.20	0.10	72.00	2.10	34.33
9:06			12.73	3.2	0.27					
9:07	1.0	0.02	12.80	2.4	0.20	0.84	0.07	50.40	1.81	27.91
9:07			12.80	2.4	0.20					
9:08	1.0	0.02	12.85	1.8	0.15	0.60	0.05	36.00	1.60	22.50
9:08			12.85	1.8	0.15					
9:09	1.0	0.02	12.90	1.2	0.10	0.60	0.05	36.00	1.43	25.20
9:23			11.00	24.0	2.00					
9:24	1.0	0.02	11.72	15.4	1.28	8.64	0.72	518.40	6.62	78.27
9:24			11.72	15.4	1.28					
9:25	1.0	0.02	12.15	10.2	0.85	5.16	0.43	309.60	4.65	66.56
9:25			12.15	10.2	0.85					
9:26	1.0	0.02	12.40	7.2	0.60	3.00	0.25	180.00	3.49	51.64
9:26			12.40	7.2	0.60					
9:27	1.0	0.02	12.52	5.8	0.48	1.44	0.12	86.40	2.85	30.30
9:27			12.52	5.8	0.48					
9:28	1.0	0.02	12.60	4.8	0.40	0.96	0.08	57.60	2.51	22.96
9:28			12.60	4.8	0.40					
9:29	1.0	0.02	12.69	3.7	0.31	1.08	0.09	64.80	2.22	29.23
9:29			12.69	3.7	0.31					
9:30	1.0	0.02	12.75	3.0	0.25	0.72	0.06	43.20	1.96	22.04
9:30			12.75	3.0	0.25					
9:31	1.0	0.02	12.79	2.5	0.21	0.48	0.04	28.80	1.79	16.10
9:31			12.79	2.5	0.21					
9:32	1.0	0.02	12.85	1.8	0.15	0.72	0.06	43.20	1.62	26.71
9:34			11.00	24.0	2.00					
9:35	1.0	0.02	11.50	18.0	1.50	6.00	0.50	360.00	7.00	51.43
9:35			11.50	18.0	1.50					
9:36	1.0	0.02	11.85	13.8	1.15	4.20	0.35	252.00	5.54	45.46
9:36			11.85	13.8	1.15					
9:37	1.0	0.02	12.13	10.4	0.87	3.36	0.28	201.60	4.46	45.17
9:37			12.13	10.4	0.87					

Infiltration Testing

Test Through Zone Eleven Feet Below Bottom of Infiltration Device

Infiltration Testing Field Data | **Date:** 3/3/2017

Project Location:	Commercial Organics Processing Facility	**Job Number:**	VT-24872-02
Earth Description:	See Log	**Tested By:**	SC
Field Test in Boring	IT-2	**Start Time:**	9:01 AM
Boring Diameter (inches):	7	**Total Pipe Length (feet):**	13
Boring Depth (feet):	13	**Pipe Stick-Up (inches):**	0

Time of Day, t (hh:mm)	Delta Time, Δt (min.)	Delta Time, Δt (hr.)	Top of Pipe to Water, (ft.)	Water Depth, d (in.)	Water Depth, d (ft.)	Drop in Water Height, Δd (in.)	Drop in Water Height, Δd (ft.)	Perc Rate, (in/hr)	Corr. Factor, RF	Infilt. Rate (in/hr)
9:38	1.0	0.02	12.33	8.0	0.67	2.40	0.20	144.00	3.64	39.56
9:38			12.33	8.0	0.67					
9:39	1.0	0.02	12.45	6.6	0.55	1.44	0.12	86.40	3.09	27.95
9:39			12.45	6.6	0.55					
9:40	1.0	0.02	12.57	5.2	0.43	1.44	0.12	86.40	2.68	32.24
9:40			12.57	5.2	0.43					
9:41	1.0	0.02	12.65	4.2	0.35	0.96	0.08	57.60	2.34	24.65
9:41			12.65	4.2	0.35					
9:42	1.0	0.02	12.70	3.6	0.30	0.60	0.05	36.00	2.11	17.03
9:42			12.70	3.6	0.30					
9:43	1.0	0.02	12.75	3.0	0.25	0.60	0.05	36.00	1.94	18.53
9:43			12.75	3.0	0.25					
9:44	1.0	0.02	12.80	2.4	0.20	0.60	0.05	36.00	1.77	20.32
9:44			12.80	2.4	0.20					
9:45	1.0	0.02	12.85	1.8	0.15	0.60	0.05	36.00	1.60	22.50
9:50			11.00	24.0	2.00					
9:51	1.0	0.02	11.53	17.6	1.47	6.36	0.53	381.60	6.95	54.92
9:51			11.53	17.6	1.47					
9:52	1.0	0.02	11.85	13.8	1.15	3.84	0.32	230.40	5.49	41.96
9:52			11.85	13.8	1.15					
9:53	1.0	0.02	12.12	10.6	0.88	3.24	0.27	194.40	4.48	43.39
9:53			12.12	10.6	0.88					
9:54	1.0	0.02	12.30	8.4	0.70	2.16	0.18	129.60	3.71	34.95
9:54			12.30	8.4	0.70					
9:55	1.0	0.02	12.45	6.6	0.55	1.80	0.15	108.00	3.14	34.36
9:55			12.45	6.6	0.55					
9:56	1.0	0.02	12.53	5.6	0.47	0.96	0.08	57.60	2.75	20.96
9:56			12.53	5.6	0.47					
9:57	1.0	0.02	12.60	4.8	0.40	0.84	0.07	50.40	2.49	20.23
9:57			12.60	4.8	0.40					
9:58	1.0	0.02	12.66	4.1	0.34	0.72	0.06	43.20	2.27	19.04
9:58			12.66	4.1	0.34					
9:59	1.0	0.02	12.72	3.4	0.28	0.72	0.06	43.20	2.06	20.94
9:59			12.72	3.4	0.28					
10:00	1.0	0.02	12.75	3.0	0.25	0.36	0.03	21.60	1.91	11.32
10:00			12.75	3.0	0.25					
10:01	1.0	0.02	12.80	2.4	0.20	0.60	0.05	36.00	1.77	20.32
10:01			12.80	2.4	0.20					
10:02	1.0	0.02	12.84	1.9	0.16	0.48	0.04	28.80	1.62	17.81

Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: IT-3 PROJECT NAME: Commercial Organics Processing Facility PROJECT NUMBER: VT-24872-02 BORING LOCATION: Per Plan	DRILLING DATE: February 1, 2017 DRILLING METHOD: 6.0" Hollow Stem Auger DRILL: Mobile B-61 LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0						ML			ALLUVIUM: Medium to yellowish brown clayey silt to sandy silt; firm; moist.
						SM			ALLUVIUM: Brown silty sand with gravels; loose; moist.
									Total Depth: 2.0 feet. No Groundwater Encountered. Installed 2.0 feet of 2.0 inch slotted PVC pipe and gravel pack.
5									
10									
15									
20									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Infiltration Testing

Test Through Zone at Bottom of Infiltration Device

Infiltration Testing Field Data — **Date:** 3/3/2017

Project Location:	Commercial Organics Processing Facility	Job Number:	VT-24872-02
Earth Description:	See Log	Tested By:	SC
Field Test in Boring	IT-3	Start Time:	11:00 AM
Boring Diameter (inches):	4	Total Pipe Length (feet):	2
Boring Depth (feet):	2	Pipe Stick-Up (inches):	0

Time of Day, t (hh:mm)	Delta Time, Δt (min.)	Delta Time, Δt (hr.)	Top of Pipe to Water, (ft.)	Water Depth, d (in.)	Water Depth, c (ft.)	Drop in Water Height, Δd (in.)	Drop in Water Height, Δd (ft.)	Perc Rate, (in/hr)	Corr. Factor, RF	Infilt. Rate (in/hr)
11:00		-	0.60	16.8	1.40					
11:05	5.0	0.08	1.20	9.6	0.80	7.20	0.60	86.40	7.60	11.37
11:05			1.20	9.6	0.80					
11:10	5.0	0.08	1.31	8.3	0.69	1.32	0.11	15.84	5.47	2.90
11:10			1.31	8.3	0.69					
11:15	5.0	0.08	1.38	7.4	0.62	0.84	0.07	10.08	4.93	2.04
11:15			1.38	7.4	0.62					
11:20	5.0	0.08	1.45	6.6	0.55	0.84	0.07	10.08	4.51	2.24
11:20			1.45	6.6	0.55					
11:25	5.0	0.08	1.51	5.9	0.49	0.72	0.06	8.64	4.12	2.10
11:25			1.51	5.9	0.49					
11:30	5.0	0.08	1.55	5.4	0.45	0.48	0.04	5.76	3.82	1.51
11:30			1.55	5.4	0.45					
11:35	5.0	0.08	1.60	4.8	0.40	0.60	0.05	7.20	3.55	2.03
11:35			1.60	4.8	0.40					
11:40	5.0	0.08	1.64	4.3	0.36	0.48	0.04	5.76	3.28	1.76
11:40			1.64	4.3	0.36					
11:45	5.0	0.08	1.67	4.0	0.33	0.36	0.03	4.32	3.07	1.41
11:45			1.67	4.0	0.33					
11:50	5.0	0.08	1.70	3.6	0.30	0.36	0.03	4.32	2.89	1.49
11:50			1.70	3.6	0.30					
11:55	5.0	0.08	1.73	3.2	0.27	0.36	0.03	4.32	2.71	1.59
11:55			1.73	3.2	0.27					
12:00	5.0	0.08	1.75	3.0	0.25	0.24	0.02	2.88	2.56	1.13
12:03			0.60	16.8	1.40					
12:08	5.0	0.08	0.89	13.3	1.11	3.48	0.29	41.76	8.53	4.90
12:08			0.89	13.3	1.11					
12:13	5.0	0.08	1.07	11.2	0.93	2.16	0.18	25.92	7.12	3.64
12:13			1.07	11.2	0.93					
12:18	5.0	0.08	1.17	10.0	0.83	1.20	0.10	14.40	6.28	2.29
12:18			1.17	10.0	0.83					
12:23	5.0	0.08	1.26	8.9	0.74	1.08	0.09	12.96	5.71	2.27
12:23			1.26	8.9	0.74					
12:28	5.0	0.08	1.32	8.2	0.68	0.72	0.06	8.64	5.26	1.64
12:28			1.32	8.2	0.68					
12:33	5.0	0.08	1.38	7.4	0.62	0.72	0.06	8.64	4.90	1.76
12:33			1.38	7.4	0.62					
12:38	5.0	0.08	1.43	6.8	0.57	0.60	0.05	7.20	4.57	1.58
12:38			1.43	6.8	0.57					
12:43	5.0	0.08	1.47	6.4	0.53	0.48	0.04	5.76	4.30	1.34
12:43			1.47	6.4	0.53					

Infiltration Testing

Test Through Zone at Bottom of Infiltration Device

Infiltration Testing Field Data — Date: 3/3/2017

Project Location:	Commercial Organics Processing Facility	Job Number:	VT-24872-02
Earth Description:	See Log	Tested By:	SC
Field Test In Boring	IT-3	Start Time:	11:00 AM
Boring Diameter (inches):	4	Total Pipe Length (feet):	2
Boring Depth (feet):	2	Pipe Stick-Up (inches):	0

Time of Day, t (hh:mm)	Delta Time, Δt (min.)	Delta Time, Δt (hr.)	Top of Pipe to Water, (ft.)	Water Depth, d (in.)	Water Depth, c (ft.)	Drop In Water Height, Δd (in.)	Drop in Water Height, Δd (ft.)	Perc Rate, (in/hr)	Corr. Factor, RF	Infilt. Rate (in/hr)
12:48	5.0	0.08	1.51	5.9	0.49	0.48	0.04	5.76	4.06	1.42
12:48			1.51	5.9	0.49					
12:53	5.0	0.08	1.55	5.4	0.45	0.48	0.04	5.76	3.82	1.51
12:53			1.55	5.4	0.45					
12:58	5.0	0.08	1.58	5.0	0.42	0.36	0.03	4.32	3.61	1.20
12:58			1.58	5.0	0.42					
13:03	5.0	0.08	1.61	4.7	0.39	0.36	0.03	4.32	3.43	1.26
13:03			1.61	4.7	0.39					
13:08	5.0	0.08	1.65	4.2	0.35	0.48	0.04	5.76	3.22	1.79
13:08			1.65	4.2	0.35					
13:13	5.0	0.08	1.68	3.8	0.32	0.36	0.03	4.32	3.01	1.44
13:13			1.68	3.8	0.32					
13:18	5.0	0.08	1.71	3.5	0.29	0.36	0.03	4.32	2.83	1.53
13:18			1.71	3.5	0.29					
13:23	5.0	0.08	1.75	3.0	0.25	0.52	0.04	6.19	2.63	2.36
13:23			1.75	3.0	0.25					
13:28	5.0	0.08	1.78	2.6	0.22	0.36	0.03	4.32	2.41	1.79
13:30			0.60	16.8	1.40					
13:35	5.0	0.08	0.83	14.0	1.17	2.76	0.23	33.12	8.71	3.80
13:35			0.83	14.0	1.17					
13:40	5.0	0.08	1.07	11.2	0.93	2.88	0.24	34.56	7.30	4.73
13:40			1.07	11.2	0.93					
13:45	5.0	0.08	1.20	9.6	0.80	1.56	0.13	18.72	6.19	3.02

Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: IT-4
PROJECT NAME: Commercial Organics Processing Facility
PROJECT NUMBER: VT-24872-02
BORING LOCATION: Per Plan

DRILLING DATE: February 1, 2017
DRILLING METHOD: 6.0" Hollow Stem Auger
DRILL: Mobile B-61
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0						ML			ALLUVIUM: Medium to yellowish brown clayey silt to sandy silt; medium dense; moist.
									As above with lenses of silty sand; minor gravels.
5		X		P/2/3		ML/ SM			ALLUVIUM: Brown and dark brown interbedded clayey silts and silty sands; soft; moist.
10		X		5/10/12		SM			ALLUVIUM: Pale yellowish brown silty sand to sand with gravels; medium dense; damp.
15									Total Depth: 13.0 feet. No Groundwater Encountered. Installed 13.0 feet of 2.0 inch slotted PVC pipe and gravel pack.
20									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Infiltration Testing

Test Through Zone Eleven Feet Below Bottom of Infiltration Device

Infiltration Testing Field Data

Date: 3/3/2017

Project Location: Commercial Organics Processing Facility
Earth Description: See Log
Field Test in Boring: IT-4
Boring Diameter (inches): 7
Boring Depth (feet): 12.4

Job Number: VT-24872-02
Tested By: SC
Start Time: 11:12 AM
Total Pipe Length (feet): 12.4
Pipe Stick-Up (inches): 0

Time of Day, t (hh:mm)	Delta Time, Δt (min.)	Delta Time, Δt (hr.)	Top of Pipe to Water, (ft.)	Water Depth, d (in.)	Water Depth, d (ft.)	Drop in Water Height, Δd (in.)	Drop in Water Height, Δd (ft.)	Perc Rate, (in/hr)	Corr. Factor, RF	Infilt. Rate (in/hr)
11:12		-	10.45	23.4	1.95					
11:13	1.0	0.02	11.44	11.5	0.96	11.88	0.99	712.80	5.99	119.03
11:13			11.44	11.5	0.96					
11:14	1.0	0.02	11.80	7.2	0.60	4.32	0.36	259.20	3.67	70.54
11:14			11.80	7.2	0.60					
11:15	1.0	0.02	12.00	4.8	0.40	2.40	0.20	144.00	2.71	53.05
11:15			12.00	4.8	0.40					
11:16	1.0	0.02	12.22	2.2	0.18	2.64	0.22	158.40	1.99	79.43
11:16			12.22	2.2	0.18					
11:17	1.0	0.02	12.35	0.6	0.05	1.56	0.13	93.60	1.39	67.13
11:22			10.40	24.0	2.00					
11:23	1.0	0.02	11.15	15.0	1.25	9.00	0.75	540.00	6.57	82.17
11:23			11.15	15.0	1.25					
11:24	1.0	0.02	11.55	10.2	0.85	4.80	0.40	288.00	4.60	62.61
11:24			11.55	10.2	0.85					
11:25	1.0	0.02	11.74	7.9	0.66	2.28	0.19	136.80	3.59	38.12
11:25			11.74	7.9	0.66					
11:26	1.0	0.02	11.90	6.0	0.50	1.92	0.16	115.20	2.99	38.55
11:26			11.90	6.0	0.50					
11:27	1.0	0.02	12.02	4.6	0.38	1.44	0.12	86.40	2.51	34.44
11:27			12.02	4.6	0.38					
11:28	1.0	0.02	12.18	2.6	0.22	1.92	0.16	115.20	2.03	56.79
11:28			12.18	2.6	0.22					
11:29	1.0	0.02	12.29	1.3	0.11	1.32	0.11	79.20	1.57	50.58
11:37			10.40	24.0	2.00					
11:38	1.0	0.02	11.02	16.6	1.38	7.44	0.62	446.40	6.79	65.70
11:38			11.02	16.6	1.38					
11:39	1.0	0.02	11.32	13.0	1.08	3.60	0.30	216.00	5.22	41.40
11:39			11.32	13.0	1.08					
11:40	1.0	0.02	11.57	10.0	0.83	3.00	0.25	180.00	4.27	42.11
11:40			11.57	10.0	0.83					
11:41	1.0	0.02	11.73	8.0	0.67	1.92	0.16	115.20	3.57	32.26
11:41			11.73	8.0	0.67					
11:42	1.0	0.02	11.84	6.7	0.56	1.32	0.11	79.20	3.11	25.48
11:42			11.84	6.7	0.56					
11:43	1.0	0.02	11.91	5.9	0.49	0.84	0.07	50.40	2.80	18.00
11:43			11.91	5.9	0.49					
11:44	1.0	0.02	11.98	5.0	0.42	0.84	0.07	50.40	2.56	19.69
11:44			11.98	5.0	0.42					
11:45	1.0	0.02	12.07	4.0	0.33	1.08	0.09	64.80	2.29	28.35
11:45			12.07	4.0	0.33					

Infiltration Testing

Test Through Zone Eleven Feet Below Bottom of Infiltration Device

Infiltration Testing Field Data | **Date:** 3/3/2017

Project Location:	Commercial Organics Processing Facility	**Job Number:**	VT-24872-02
Earth Description:	See Log	**Tested By:**	SC
Field Test in Boring	IT-4	**Start Time:**	11:12 AM
Boring Diameter (inches):	7	**Total Pipe Length (feet):**	12.4
Boring Depth (feet):	12.4	**Pipe Stick-Up (inches):**	0

Time of Day, t (hh:mm)	Delta Time, Δt (min.)	Delta Time, Δt (hr.)	Top of Pipe to Water, (ft.)	Water Depth, d (in.)	Water Depth, d (ft.)	Drop in Water Height, Δd (in.)	Drop in Water Height, Δd (ft.)	Perc Rate, (in/hr)	Corr. Factor, RF	Infilt. Rate (in/hr)
11:46	1.0	0.02	12.15	3.0	0.25	0.96	0.08	57.60	1.99	28.88
11:46			12.15	3.0	0.25					
11:47	1.0	0.02	12.25	1.8	0.15	1.20	0.10	72.00	1.69	42.71
11:47			12.25	1.8	0.15					
11:48	1.0	0.02	12.31	1.1	0.09	0.72	0.06	43.20	1.41	30.61
11:48			12.31	1.1	0.09					
11:49	1.0	0.02	12.37	0.4	0.03	0.72	0.06	43.20	1.21	35.83
11:52			10.40	24.0	2.00					
11:53	1.0	0.02	10.95	17.4	1.45	6.60	0.55	396.00	6.91	57.27
11:53			10.95	17.4	1.45					
11:54	1.0	0.02	11.22	14.2	1.18	3.24	0.27	194.40	5.51	35.29
11:54			11.22	14.2	1.18					
11:55	1.0	0.02	11.43	11.6	0.97	2.52	0.21	151.20	4.69	32.27
11:55			11.43	11.6	0.97					
11:56	1.0	0.02	11.60	9.6	0.80	2.04	0.17	122.40	4.03	30.34
11:56			11.60	9.6	0.80					
11:57	1.0	0.02	11.75	7.8	0.65	1.80	0.15	108.00	3.49	30.98
11:57			11.75	7.8	0.65					
11:58	1.0	0.02	11.83	6.8	0.57	0.96	0.08	57.60	3.09	18.63
11:58			11.83	6.8	0.57					
11:59	1.0	0.02	11.90	6.0	0.50	0.84	0.07	50.40	2.83	17.78
11:59			11.90	6.0	0.50					
12:00	1.0	0.02	11.98	5.0	0.42	0.96	0.08	57.60	2.58	22.35
12:00			11.98	5.0	0.42					
12:01	1.0	0.02	12.08	3.8	0.32	1.20	0.10	72.00	2.27	31.74
12:01			12.08	3.8	0.32					
12:02	1.0	0.02	12.13	3.2	0.27	0.60	0.05	36.00	2.01	17.90
12:02			12.13	3.2	0.27					
12:03	1.0	0.02	12.20	2.4	0.20	0.84	0.07	50.40	1.81	27.91
12:03			12.20	2.4	0.20					
12:04	1.0	0.02	12.26	1.7	0.14	0.72	0.06	43.20	1.58	27.29
12:04			12.26	1.7	0.14					
12:05	1.0	0.02	12.32	1.0	0.08	0.72	0.06	43.20	1.38	31.37
12:17			10.40	24.0	2.00					
12:18	1.0	0.02	11.00	16.8	1.40	7.20	0.60	432.00	6.83	63.26
12:18			11.00	16.8	1.40					
12:19	1.0	0.02	11.30	13.2	1.10	3.60	0.30	216.00	5.29	40.86
12:19			11.30	13.2	1.10					
12:20	1.0	0.02	11.53	10.4	0.87	2.76	0.23	165.60	4.38	37.83
12:20			11.53	10.4	0.87					
12:21	1.0	0.02	11.73	8.0	0.67	2.40	0.20	144.00	3.64	39.56

Infiltration Testing

Test Through Zone Eleven Feet Below Bottom of Infiltration Device

Infiltration Testing Field Data | **Date:** 3/3/2017

Project Location:	Commercial Organics Processing Facility	Job Number:	VT-24872-02
Earth Description:	See Log	Tested By:	SC
Field Test in Boring	IT-4	Start Time:	11:12 AM
Boring Diameter (inches):	7	Total Pipe Length (feet):	12.4
Boring Depth (feet):	12.4	Pipe Stick-Up (inches):	0

Time of Day, t (hh:mm)	Delta Time, Δt (min.)	Delta Time, Δt (hr.)	Top of Pipe to Water, (ft.)	Water Depth, d (in.)	Water Depth, d (ft.)	Drop in Water Height, Δd (in.)	Drop in Water Height, Δd (ft.)	Perc Rate, (in/hr)	Corr. Factor, RF	Infilt. Rate (in/hr)
12:21			11.73	8.0	0.67					
12:22	1.0	0.02	11.82	7.0	0.58	1.08	0.09	64.80	3.14	20.62
12:22			11.82	7.0	0.58					
12:23	1.0	0.02	11.90	6.0	0.50	0.96	0.08	57.60	2.85	20.20
12:23			11.90	6.0	0.50					
12:24	1.0	0.02	11.99	4.9	0.41	1.08	0.09	64.80	2.56	25.31
12:24			11.99	4.9	0.41					
12:25	1.0	0.02	12.10	3.6	0.30	1.32	0.11	79.20	2.22	35.72
12:25			12.10	3.6	0.30					
12:26	1.0	0.02	12.18	2.6	0.22	0.96	0.08	57.60	1.89	30.45
12:26			12.18	2.6	0.22					
12:27	1.0	0.02	12.25	1.8	0.15	0.84	0.07	50.40	1.63	30.84
12:27			12.25	1.8	0.15					
12:28	1.0	0.02	12.31	1.1	0.09	0.72	0.06	43.20	1.41	30.61
12:28			12.31	1.1	0.09					
12:29	1.0	0.02	12.36	0.5	0.04	0.60	0.05	36.00	1.22	29.44