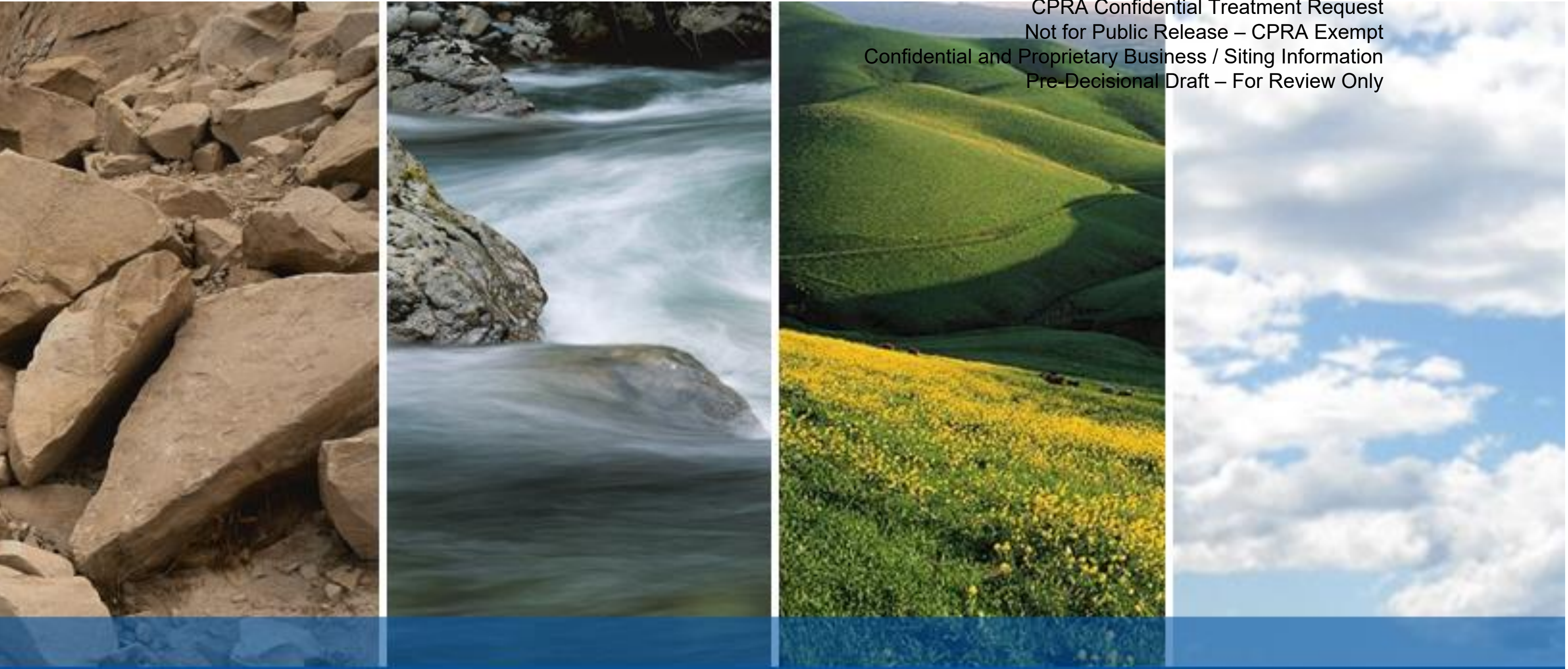

CARIBBEAN 100
SUNNYVALE, CALIFORNIA

PRELIMINARY GEOTECHNICAL REPORT

Submitted to
Google, Inc.
1600 Amphitheatre Parkway
Mountain View, CA 94043

Prepared by
ENGEO Incorporated

February 5, 2018

Project No.
14505.000.000

Expect Excellence

GEOTECHNICAL
ENVIRONMENTAL
WATER RESOURCES
CONSTRUCTION SERVICES

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Project No.
14505.000.000

February 5, 2018

Mr. Peter McDonnell
Google, Inc.
1600 Amphitheatre Parkway
Mountain View, CA 94043

Subject: Caribbean 100
Sunnyvale, California

PRELIMINARY GEOTECHNICAL REPORT

Dear Mr. McDonnell:

We are pleased to present this Preliminary Geotechnical Report for the proposed Caribbean 100 project located in Sunnyvale, California. This report presents our geotechnical observations, as well as our preliminary conclusions and recommendations for the project. We also provide preliminary site grading, drainage, and foundation recommendations for use during land planning.

Based upon our initial assessment, the site is suitable for the planned development from a geotechnical standpoint provided the conclusions and preliminary recommendations presented in this report are incorporated into preliminary design. A design-level study is currently in-progress to assess the identified geotechnical concerns.

If you have any questions or comments regarding this report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

David Teague, EIT, PhD

Jeanine Ruffoni, PE

Yan Lap Janet Kan, GE, CEG

Jeff Fippin, GE

dt/jr/jk/jf/jf

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this preliminary geotechnical report for the Caribbean 100 project is to provide an assessment of potential geotechnical concerns associated with the use of the site for the proposed campus development. We performed the following tasks:

- Review available literature and geologic maps.
- Review available geotechnical explorations and geophysical data.
- Perform subsurface field exploration.
- Analyze preliminary data.
- Provide preliminary recommendations.

For our use, we received the following:

1. Caribbean 100 Concept Design dated December 21, 2017.
2. Topographic survey prepared by Kier & Wright Civil Engineers and Surveyors, Inc. dated August 2017.
3. L400 Grading Plan prepared by Olin Partnership LTD dated December 22, 2017.
4. Utility Plans prepared by BESS Utility Solutions dated November 1, 2017.

This report was prepared for the exclusive use of our client and its consultants for design of this project. In the event that any changes are made in the character, design or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to evaluate whether modifications are recommended. This document may not be reproduced in whole or in part by any means whatsoever, nor may it be quoted or excerpted without our express written consent.

1.2 SITE LOCATION AND DESCRIPTION

The site is located in Sunnyvale, California approximately ¼ mile south of the San Francisco Bay and is bounded by West Caribbean Drive to the north, the Sunnyvale West Channel operated by the Santa Clara Valley Water District to the west, Caspian Court to the south, and Borregas Avenue to the east as shown in our Vicinity Map (Figure 1). The site is approximately 17.2 acres in area and is currently occupied by five office structures along with surface parking. The Site Plan (Figure 2) shows site boundaries and approximate locations of our explorations.

The Sunnyvale West Channel bounds the western edge of the site. This man-made channel extends approximately 3 miles from the San Francisco Bay and drains a watershed of approximately 7.6 square miles (Horizon Water and Environment, 2013). The channel is protected by a system of earthen embankment/levees with a crest at approximately Elevation 11 to 12 feet (NAVD88), which is approximately 5 to 6 feet above the existing ground surface. The water surface elevation associated with the 100-year flood is approximately 12.4 feet (Horizon Water and Environment, LLC, 2013). It should be noted that the site is located in flood zone “AE” and subject to inundation by the 100-year flood; the terminology “100-year flood” refers to a flood event that has approximately a 1 percent chance of being equaled or exceeded in a given year.

1.3 PROPOSED DEVELOPMENT

Based on our discussions with the project team and review of the information provided, we understand the following site improvements are proposed:

1. A five-story, approximately 540,000-square-foot office structure.
2. Planned fill up to 7 feet high.
3. Paved streets, parking, and drive lanes.
4. Utilities and other infrastructure improvements.
5. Landscaping and landscape structures, including on top of the building roof.

1.4 AVAILABLE GEOTECHNICAL INFORMATION

BSK Associates (BSK) performed a preliminary geotechnical investigation for the Caribbean 200 project located immediately adjacent to the west of this site. Their field exploration involved drilling three exploratory borings (B-1 through B-3) and performing three CPTs (CPT-1 through CPT-3). The borings were drilled to depths ranging from 41½ to 50 feet and all CPTs were advanced to approximately 75 feet below existing ground surface (bgs).

Additionally, we performed six cone penetration tests (CPTs), designated 1-CPT01 through 1-CPT06, at the adjacent Caribbean 200 project. We show the locations of the subsurface explorations within the subject site as well as the adjacent Caribbean 200 project on the Site Plan (Figure 2).

2.0 FINDINGS

2.1 SITE HISTORY

We reviewed historic aerial photographs of the site (www.historicalaerials.com) from dates ranging from 1948 to present. Topographic maps suggest that the site may have been used for agricultural purposes prior to being developed in the late 1900s. Currently, the project site encompasses five commercial structures as well as surface parking.

2.2 REGIONAL AND SITE GEOLOGY

The site is located at the northwestern end of the Santa Clara Valley in the Coast Ranges geomorphic province of California. The Coast Ranges are dominated by a series of northwest-trending ridges and valleys formed by faulting and folding of the earth's crust. The Santa Clara Valley region lies to the east of the San Andreas Fault and to the west of the Hayward and Calaveras Faults.

Geologic mapping prepared by Brabb et al. (2000) (Figure 3) indicates that the northern portion of the site is underlain by Holocene-age basin deposits (Qhbs) consisting primarily of very fine silty clay to clay deposits and the southern portion of the site is underlain by Holocene-age basin deposits (Qhb) consisting of very fine silty clay to clay deposits occupying flat-floored basins at the distal edge of alluvial fans adjacent to bay mud. These deposits are known to contain unconsolidated, locally organic, plastic silt and silty clay. Additionally, carbonate nodules and iron-stained mottling may be present in some locations.

2.3 SEISMICITY

Numerous small earthquakes occur every year in the San Francisco Bay Region, and larger earthquakes have been recorded and can be expected to occur in the future. Figure 4 shows the approximate locations of active faults and significant historic earthquakes recorded within the San Francisco Bay Region. The Sunnyvale area contains numerous active earthquake faults. The nearest active faults are the Monte Vista-Shannon, Hayward-Rogers Creek, Northern San Andreas, and Calaveras faults, which are capable of producing earthquakes with moment magnitudes of 6.5, 7.3, 8.1, and 7.0, respectively. Other active faults within 30 miles of the site are summarized in the table below. An active fault is defined by the State Mining and Geology Board as one that has had surface displacement within Holocene time (about the last 11,000 years) (Bryant and Hart, 2007).

TABLE 2.3-1: Seismic Sources Within 30 Miles of the Site

SOURCE	CLOSEST DISTANCE (Miles)	MOMENT MAGNITUDE (M_W)	FAULT MECHANISM	SITE LIES
Monte Vista-Shannon	7.4	6.5	Reverse	Northeast
Hayward-Rodgers Creek	8.9	7.3	Strike Slip	Southwest
Northern San Andreas	10.3	8.1	Strike Slip	Northeast
Calaveras	11.7	7.0	Strike Slip	West
San Gregorio Connected	22.3	7.5	Strike Slip	East
Zayante-Vergeles	22.7	7.0	Strike Slip	North
Mount Diablo Thrust	24.7	6.7	Reverse	Southwest
Greenville Connected	25.9	7.0	Strike Slip	Southwest
San Andreas Creeping Section Gridded	27.9	6.0	Strike Slip	Northwest
Great Valley 7	29.6	6.9	Reverse	Southwest

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone and no known surface expression of active faults is believed to exist within the site; as such, the risk of fault rupture through the site is considered low.

2.4 FIELD EXPLORATION

Our field exploration included advancing six CPTs, designated 1-CPT07 through 1-CPT12, at various locations on the site. We performed our field exploration on December 14 and 15, 2017. We located the CPTs and estimated elevations using a handheld GPS device; they should be considered accurate to the degree implied by the method used. The locations of the explorations are shown in Figure 2.

We retained the services of a contractor with a CPT rig to perform CPTs in general accordance with ASTM D-5778. Measurements include the tip resistance to penetration of the cone (Qc), the resistance of the surface sleeve (Fs), and pore pressure (U) (Robertson and Campanella, 1988). The CPT logs are presented in Appendix A.

We performed a design-level exploration consisting of seven borings between December 7, 2017, and January 5, 2018. Samples collected from the design-level exploration are currently being tested and findings will be included in a design-level geotechnical exploration report to be published at a later date.

2.5 SURFACE AND SUBSURFACE CONDITIONS

We anticipate up to 12 inches of combined asphalt and aggregate base at the paved areas of the site. Although the CPT probes do not provide soil samples for visual classification and testing, material type and properties can be inferred from CPT data. Based on the CPT results, we anticipate medium stiff to stiff sandy clay and silt interlayered with medium dense to dense clayey sand to a depth of approximately 40 feet. Between 40 and 95 feet, we anticipate medium stiff to very stiff clay. Several CPTs suggest a transition to a sandier material at approximately 95 to 100 feet. We terminated all the CPTs at a depth of approximately 100 feet.

2.6 GROUNDWATER CONDITIONS

Based on the site location, we anticipate shallow groundwater. The pore pressure dissipation tests performed in our CPTs suggest that the groundwater level is approximately 3½ to 7½ feet bgs, which corresponds to elevations ranging from approximately -3½ to 1½ feet (refer to Table 2.6-1 below). Plate 1.2 of the Seismic Hazard Zone Report for the Mountain View Quadrangle (2006) maps the highest historical groundwater within the site vicinity approximately less than 5 feet below the ground surface. For the purpose of preliminary analyses and recommendations, we consider a design groundwater depth of 3½ feet appropriate.

TABLE 2.6-1: Recorded Groundwater Levels (at Time of Exploration)

CPT	GROUNDWATER DEPTH (FEET BGS)	GROUNDWATER ELEVATION (NAVD 88, FEET)
1-CPT01	8.5	-3.5
1-CPT02	5.5	-0.5
1-CPT03	5.5	-0.5
1-CPT04	8.5	-3.5
1-CPT05	7.0	-2.0
1-CPT06	7.7	-1.7
1-CPT07	6.7	-1.7
1-CPT08	7.0	-2.0
1-CPT09	7.2	-2.2
1-CPT10	3.7	1.3
1-CPT11	4.0	1.0
1-CPT12	7.3	-2.3

Fluctuations in the level of groundwater may occur due to variations in rainfall, irrigation practice, and other factors not evident at the time measurements were made. Excavations for utility installation may encounter groundwater, depending upon the time of year of construction.

3.0 DISCUSSION AND PRELIMINARY CONCLUSIONS

Based on this preliminary study, the project site is feasible for the proposed development provided the preliminary recommendations contained in this report and future design-level geotechnical studies are incorporated into the design plans.

The primary geotechnical concerns for the proposed site redevelopment include:

- The presence of non-engineered fill.
- The presence of potentially expansive near-surface soil.
- The presence of compressible soil susceptible to consolidation settlement.
- The presence of soil susceptible to liquefaction and/or cyclic softening and associated settlement.
- The presence of shallow groundwater.

We summarize our preliminary conclusions and recommendations below.

3.1 EXISTING FILL

In general, we could not determine the presence of fill due to our exploration type; however, minor fill likely exists associated with the existing structures and prior site development. The presence of existing fill can lead to differential foundation movement due to the unknown density of the fill and due to differences in material properties for structures that span from the fill to native materials. Mitigation can include removal and recompaction of the fill.

3.2 POTENTIALLY EXPANSIVE SOIL

The CPT data indicate clayey near-surface soil. Some of these materials may exhibit a high shrink/swell potential and could potentially change in volume with changes in moisture. Such soil can shrink or swell and cause heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations. The shrink/swell potential of near-surface soil will be assessed with additional laboratory testing during the design-level study.

Successful performance of structures on expansive soil requires special attention during construction. It is imperative that exposed soil be kept moist prior to placement of concrete for foundation construction. It can be difficult to remoisturize clayey soil without excavation, moisture conditioning, and recompaction. We also provide specific grading recommendations for compaction of clay soil at the site. The purpose of these recommendations is to reduce the swell potential of the clay by compacting the soil at a high moisture content and controlling the amount of compaction.

3.3 STATIC CONSOLIDATION SETTLEMENT

Our explorations did not encounter highly compressible clay layers. Provided that the maximum allowable bearing pressure is not exceeded, we expect total consolidation settlements to be 1 inch or less. We expect differential consolidation settlement on the order of approximately half of the total settlement over a distance of 30 feet. We are currently performing consolidation testing on relatively undistributed samples recovered from our design-level boring exploration. We will consider the results of this testing in the design-level geotechnical report.

3.4 SEISMIC HAZARDS

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. The common secondary seismic hazards include ground shaking, and liquefaction. The following sections present a discussion of these hazards as they apply to the site. Based on topographic and lithologic data, the risk of regional subsidence or uplift, lurching, landslides, tsunamis, or seiches is considered low to negligible at the site.

3.4.1 Ground Rupture

Since there are no known active faults crossing the property and the site is not located within an Earthquake Fault Special Study Zone, ground rupture is unlikely at the subject property.

3.4.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Francisco Bay Region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the ground shaking effects, all structures should be designed using sound engineering judgment and the latest California Building Code (CBC) requirements as a minimum. We provide appropriate 2016 CBC Seismic Design Parameters below in a subsequent section of this report.

Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead-and-live loads. The code-prescribed lateral forces are generally considered to be substantially smaller than the comparable forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse, but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

3.4.3 Liquefaction / Cyclic Softening

The site is located within a State of California Seismic Hazard Zone (CGS, 2006) for areas that may be susceptible to liquefaction (Figure 5).

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Soils most susceptible to liquefaction are clean, loose, saturated, uniformly graded fine sand below the groundwater table. Empirical evidence indicates that loose silty sand is also potentially liquefiable. When seismic ground shaking occurs, the soil is subjected to cyclic shear stresses that can cause excess hydrostatic pressures to develop. If excess hydrostatic pressures exceed the effective confining stress from the overlying soil, the sand may undergo deformation. If the sand undergoes virtually unlimited deformation without developing significant resistance, it is said to have liquefied, and if the sand consolidates or vents to the surface during and following liquefaction, ground settlement and surface deformation may occur.

In addition to liquefaction of sandy materials, clayey soil can also undergo “cyclic softening” or strength loss as a result of cyclic loading. Since the site is composed of many thick clay layers, it is also important to consider potential cyclic softening.

We performed a liquefaction potential analysis of the CPTs to estimate liquefaction potential using the computer software CLiq Version 1.7 developed by GeoLogismiki. The software incorporates the procedure introduced by the 1996 National Center for Earthquake Engineering Research

(NCEER) workshop and the 1998 NCEER/National Science Foundation (NSF) workshop. The workshops are summarized by Youd et al. (2001) and updated by Robertson (2009). This software also incorporates the method introduced by Idriss and Boulanger (2008) and updated by Boulanger and Idriss (2014). We estimated the Cyclic Stress Ratio (CSR) for a Peak Ground Acceleration (PGA_M) value of 0.50g as outlined in the latest building code with an earthquake magnitude of 8.1. We used a groundwater depth of 3½ feet for this analysis.

We performed our analysis of liquefaction and cyclic-softening analyses using the Robertson (2009) and Boulanger and Idriss (2014) methods. Both methods have a means of accounting for cyclic softening of clay. Interestingly, the results of these two procedures vary. The Robertson (2009) method predicts 4 to 6 inches of seismically induced settlement, which results primarily from cyclic softening in clay materials at depths below 30 feet. Conversely, the Boulanger and Idriss (2014) method estimates approximately 1½ to 3 inches of seismically induced settlement resulting from liquefaction of sand materials at depths above 30 feet. The Boulanger and Idriss (2014) method typically considers soil layers with a soil behavior type index (Ic) less than 2.6 to be “sandy” and greater than 2.6 to be “clayey”. It is important to note that many of the soils in the upper 30 to 40 feet have Ic values in the range of 2.5 to 2.8 and are thus at the boundary of sandy and clayey. If the Ic cutoff is marginally increased to 2.7, seismically induced settlements increase to 4 to 6 inches, primarily in the upper 30 feet.

In order to address the disparity between the two liquefaction analyses, additional geotechnical laboratory testing should be performed. The plasticity, water content, and fines content of the soil should be assessed. This will allow for refinement of the liquefaction settlements estimated from the Boulanger and Idriss (2014) method. Additionally, shear strength and consolidation testing should be performed on the clayey materials below 30 feet to refine the cyclic softening estimates obtained from the Robertson (2009) method. For preliminary purposes, we recommend considering that up to 6 inches of seismically induced settlement is possible.

We provide the results of our calculations in Appendices B and C, with our estimate of post-earthquake settlements. The analysis sheets in Appendices B and C summarize the CPT tip resistance, computed factor of safety, volumetric strain, and resulting settlement as a function of depth for each CPT. The plots directly show which soil layers liquefy and which do not. They also relate soil behavior type zones that may contribute to site settlement, as well as the relative contribution of each zone, and the distribution of settlements with depth.

3.4.4 Treatment of Potentially Liquefiable Soil

As discussed above, liquefaction-induced settlements may range between approximately 1½ to 6 inches. The higher end of this range of settlement would be unsuitable for performance of the planned building if unmitigated. While other options exist, on a preliminary basis, we estimate that founding the building on a shallow foundation system in conjunction with ground improvement will likely be the most efficient means of achieving appropriate levels of seismic foundation performance. We provide preliminary ground improvement considerations in Section 5.1.3 of this report.

Alternatively, the building can be supported on a deep foundation system without mitigating the potentially liquefiable soil. Deep foundation design should consider downdrag contributions of the potentially liquefiable soil.

3.4.5 Lateral Spreading

Lateral spreading is a failure within a nearly horizontal soil zone (possibly due to liquefaction) that causes the overlying soil mass to move toward a free face or down a gentle slope. Minor movements in the direction of the Sunnyvale West Creek are possible. However, based on our observations of the relatively flat site topography, the potential for significant lateral spreading is low to negligible. However, the embankment adjacent to the Sunnyvale West Creek could potentially undergo deformations as a result of strong ground shaking. Detailed geologic assessment and stability analyses of the embankment were outside the scope of services for this study.

3.4.6 Flooding

Federal Emergency Management Agency (FEMA) Flood Map Number 06085C0045H (https://msc.fema.gov/portal) indicates that the site is within a special flood hazard area subject to inundation by the 1 percent annual chance flood. The Civil Engineer should review pertinent information relating to possible flood levels for the subject site based on final pad elevations and provide appropriate design measures for development of the project.

3.5 2016 CBC SEISMIC DESIGN PARAMETERS

Based on the subsurface conditions at the site, including liquefiable soils, we characterized the site as Site Class F in accordance with the 2016 CBC. However, if liquefaction potential is mitigated as part of the site development, the site can be reclassified as a Site Class D.

We provide the 2016 CBC seismic design parameters in the table below, which includes design spectral response acceleration parameters based on the mapped Risk-Targeted Maximum Considered Earthquake (MCE_R) spectral response acceleration parameters.

Site-specific ground response seismic hazard analyses will be performed as part of design-level studies depending on results of more rigorous liquefaction susceptibility screening.

TABLE 3.5-1: 2016 CBC Seismic Design Parameters
Latitude: 37.41567 and Longitude: -122.01824

PARAMETER	VALUE
Site Class	D
Mapped MCE_R Spectral Response Acceleration at Short Periods, S_S (g)	1.50
Mapped MCE_R Spectral Response Acceleration at 1-second Period, S_1 (g)	0.60
Site Coefficient, F_A	1.0
Site Coefficient, F_V	1.5
MCE_R Spectral Response Acceleration at Short Periods, S_{MS} (g)	1.50
MCE_R Spectral Response Acceleration at 1-second Period, S_{M1} (g)	0.90
Design Spectral Response Acceleration at Short Periods, S_{DS} (g)	1.00
Design Spectral Response Acceleration at 1-second Period, S_{D1} (g)	0.60
Mapped MCE Geometric Mean Peak Ground Acceleration (g)	0.50
Site Coefficient, F_{PGA}	1.00
MCE Geometric Mean Peak Ground Acceleration, PGA_M (g)	0.50
Long period transition-period, T_L	12 sec

3.6 GROUNDWATER

Groundwater may impact any excavation below the design groundwater level depth of 3½ feet, (Elevation 1½ feet). Where the planned bottom of the excavations or trenches extend below the groundwater level, the following should be considered.

1. Construction dewatering.
2. Unstable conditions at the base of excavation requiring stabilization prior to foundation construction.
3. Transmission of moisture vapor through slabs causing excessive mold/mildew build-up, fogging of windows, damage to computers and sensitive floor coverings.

3.7 SOIL CORROSION POTENTIAL

As part of the design-level study, we will send representative soil samples obtained from our borings to a California State certified analytical lab for determination of redox potential, pH, resistivity, sulfate, and chloride. These tests will provide an indication of the corrosion potential of the soil on buried concrete structures and metal pipes.

4.0 PRELIMINARY EARTHWORK RECOMMENDATIONS

The following recommendations are for initial land planning and preliminary estimating purposes. Final recommendations regarding site grading and foundation construction will be provided after the additional site-specific exploration has been completed.

4.1 DEMOLITION AND STRIPPING

Grading operations should be observed and tested by our qualified field representative. We should be notified a minimum of three days prior to grading in order to coordinate its schedule with the grading contractor.

Site development should commence with the removal of structures, foundations, and buried structures, including abandoned utilities and septic tanks and their leach fields, if any exist. All debris and soft compressible soils should be removed from any location to be graded, from areas to receive fill or structures, or those areas to serve as borrow. The depth of removal of such materials should be determined by our representative in the field at the time of grading.

Existing vegetation should be removed from areas to receive fill or improvements, or those areas to serve for borrow. Tree roots should be removed down to a depth of at least 3 feet below existing grade. Any topsoil that will be retained for future use in landscape areas should be stockpiled in areas where it will not interfere with grading operations. All excavations from demolition below design grades should be cleaned to a firm undisturbed native soil surface determined by our representative. This surface should then be scarified, moisture conditioned, and backfilled with compacted engineered fill. All backfill materials should be placed and compacted as engineered fill according to the recommendations in a subsequent section.

Materials and debris should be removed from the project site. With the exception of construction debris (wood, brick, asphalt, concrete, metal, etc.), organically contaminated materials (soil which contains more than 3 percent organic content by weight), and environmentally impacted soils (if any), it is possible that the upper 10 feet of subsurface material is suitable for use as engineered fill.

4.2 EXISTING FILL

As stated previously, existing fill should be anticipated at the site due to existing development conditions. Existing fill is considered non-engineered and should be subexcavated to expose underlying firm native soil that are approved by our representative. If in a fill area, the base of the subexcavations should be processed, moisture conditioned (as needed) and compacted in accordance with the recommendations for engineered fill.

4.3 OVER-OPTIMUM SOIL MOISTURE CONDITIONS

The contractor should anticipate encountering excessively over-optimum (wet) soil moisture conditions during winter or spring grading, or during or following periods of rain. Wet soil can make proper compaction difficult or impossible. Wet soil conditions can be mitigated by:

1. Frequent spreading and mixing during warm dry weather.
2. Mixing with drier materials.
3. Mixing with a lime, lime-flyash, or cement product; or
4. Stabilizing with aggregate, geotextile stabilization fabric, or both.

We should evaluate Options 3 and 4 prior to implementation.

4.4 ACCEPTABLE FILL

Onsite soil material is suitable as fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 8 inches in maximum dimension.

Imported fill materials should meet the above requirements and have a plasticity index less than 12 and at least 20 percent passing the No. 200 sieve. Allow us to sample and test proposed imported fill materials at least 5 days prior to delivery to the site.

4.5 REUSE OF ONSITE RECYCLED MATERIALS

If desired, the existing asphalt concrete and aggregate can be considered for use as recycled aggregate to replace some of the import aggregate base for pavements as well as for structural fill. The material will need to be broken down, but not pulverized, to have a maximum particle size less than 6 inches if used for fill and should conform to the gradations of aggregate base if used to substitute for roadway base.

4.6 FILL COMPACTION

4.6.1 Grading in Structural Areas

When using the expansive, onsite soil as fill material, perform subgrade compaction prior to fill placement, following cutting operations, and in areas left at grade the contractor should:

1. Scarify to a depth of at least 8 inches.

2. Moisture condition soil to at least 4 percentage points over the optimum moisture content; **and**

3. Compact the soil to between 87 and 92 percent relative compaction. Compact the upper 6 inches of finish pavement subgrade to at least 90 percent relative compaction prior to aggregate base placement.

After the subgrade has been compacted, the contractor should place and compact acceptable fill as follows:

1. Spread fill in loose lifts that do not exceed 8 inches.

2. Moisture condition lifts to at least 4 percentage points over the optimum moisture content; **and**

3. Compact fill to between 87 and 92 percent relative compaction; compact the upper 6 inches of fill in pavement areas to at least 90 percent relative compaction prior to aggregate base placement.

Where lime treatment of the soil is used to mitigate expansive soil conditions, we recommend uniformly mixing the subgrade soil with 4 percent high calcium lime by dry weight. The soil should be moisture conditioned to at least 3 percentage points above the optimum moisture content before mixing. The mixing should be performed in accordance with the current version of Caltrans Standard Specifications with the following exceptions:

1. Following mixing, the treated soils should be allowed to fully hydrate prior to compaction.

2. Following hydration, the treated soil should be compacted according to ASTM D-1557 to not less than 95 percent relative compaction at a moisture content at least 2 percentage points above the optimum to a non-yielding surface.

If importing non- or low-expansive fill material, perform subgrade compaction prior to fill placement, following cutting operations, and in areas left at grade, the contractor should:

1. Scarify to a depth of at least 8 inches.

2. Moisture condition soil to at least 2 percentage point above the optimum moisture content; **and**

3. Compact the subgrade to at least 90 percent relative compaction. Compact the upper 6 inches of finish pavement subgrade to at least 95 percent relative compaction prior to aggregate base placement.

After the subgrade soil has been compacted, the contractor should place and compact acceptable fill as follows:

1. Spread fill in loose lifts that do not exceed 8 inches.

2. Moisture condition lifts to at least 2 percentage point above the optimum moisture content; **and**

3. Compact fill to a minimum of 90 percent relative compaction; Compact the upper 6 inches of fill in pavement areas to 95 percent relative compaction prior to aggregate base placement.

The contractor should compact the pavement Caltrans Class 2 Aggregate Base section to at least 95 percent relative compaction (ASTM D1557). Moisture condition aggregate base to or slightly above the optimum moisture content prior to compaction.

4.6.2 Underground Utility Backfill

The contractor is responsible for conducting trenching and shoring in accordance with CALOSHA requirements. Project consultants involved in utility design should specify pipe-bedding materials.

Utility trench backfill should conform to the recommendations in Section 4.6.1.

Where utility trenches cross underneath buildings, we recommend that a plug be placed within the trench backfill to help prevent the normally granular bedding materials from acting as a conduit for water to enter beneath the building. The plug should be constructed using a sand cement slurry (minimum 28-day compressive strength of 500 psi) or relatively impermeable native soil for pipe bedding and backfill. We recommend that the plug extend for a distance of at least 3 feet in each direction from the point where the utility enters the building perimeter.

Jetting of backfill is not an acceptable means of compaction. We may allow thicker loose lift thicknesses based on acceptable density test results, where increased effort is applied to rocky fill, or for the first lift of fill over pipe bedding.

4.7 SLOPE GRADIENTS

Final slope gradients should be compacted to 2:1 (horizontal:vertical) or flatter. The contractor is responsible to construct temporary construction slopes in accordance with CALOSHA requirements.

4.8 STORMWATER BIORETENTION AREAS

If bioretention areas are implemented, we recommend that, when practical, they be planned a minimum of 5 feet away from property lines and structural site improvements, such as buildings, streets, retaining walls, and sidewalks/driveways. When this is not practical, bioretention areas located within 5 feet of structural site improvements can either:

1. Be constructed with structural side walls capable of withstanding the loads from the adjacent improvements, or

2. Incorporate filter material compacted to between 85 and 90 percent relative compaction (ASTM D1557, latest edition) and a waterproofing system designed to reduce the potential for moisture transmission into the subgrade soil beneath the adjacent improvement.

In addition, site improvements located adjacent to bioretention areas that are underlain by base rock, sand, or other imported granular materials, should be designed with a deepened edge that extends to the bottom of the imported material underlying the improvement.

Where adjacent site improvements include buildings greater than three stories, streets steeper than 3 percent, or design elements that will experience lateral loads (such as from impact or traffic), additional design considerations may be required. In addition, although not recommended, if trees are to be planted within bioretention areas, HDPE Tree Boxes that extend below the bottom of the bioretention system should be installed to reduce potential impact to subdrain systems that may be part of the bioretention area design. For this condition, the waterproofing system should be connected to the HPDE Tree Box with a waterproof seal.

Given the nature of bioretention systems and possible proximity to improvements, we recommend that we be retained to review design plans and provide testing and observation services during the installation of linings, compaction of the filter material, and connection of designed drains.

It should be noted that the contractor is responsible for conducting all excavation and shoring in a manner that does not cause damage to adjacent improvements during construction and future maintenance of the bioretention areas. As with any excavation adjacent to improvements, the contractor should minimize the exposure time such that the improvements are not detrimentally impacted.

5.0 PRELIMINARY FOUNDATION RECOMMENDATIONS

The main considerations in foundation design for this project are the potentially expansive near-surface soils and the potential for seismically induced settlements. We developed preliminary foundation recommendations using data obtained from our CPT field exploration and engineering analysis.

The following recommended foundation options address the effects of the near-surface expansive soil and differential soil movement:

1. Structural mat foundation in conjunction with ground improvement.
2. Shallow footings with slabs-on-grade in conjunction with ground improvement.
3. Deep foundation system such as auger-cast piles.

5.1 SHALLOW FOUNDATIONS WITH GROUND IMPROVEMENT

Considering the degree of estimated seismically induced settlement, it is our opinion the proposed building can be supported by a shallow foundation in conjunction with ground improvement.

We recommend shallow foundation design consider an allowance for ½ inch of total seismically induced settlement after ground improvement is implemented and an allowance for 1 inch of total consolidation settlement. We preliminarily anticipate differential settlements approximately half of the total settlement when ground improvement elements are constructed through the liquefiable soil.

5.1.1 Structural Mat Foundation

The structure may be supported on a rigid mat foundation over improved ground. The thickness of the mat will be driven by the structural design. With consideration of ground improvement, the mat may be preliminarily designed for a maximum bearing pressure of 4,000 pounds per square foot (psf) for dead-plus-live loads. This allowable bearing pressure may be increased to 5,300 psf in areas of loading concentration. The allowable bearing pressure can be increased by one-third for short-term loading that includes wind or seismic load combinations.

5.1.2 Shallow Footings Combined with Floor Slab-on-Grade

As an alternative to a structural mat foundation system, conventional footings with slab-on-grade floors may be used. We recommend the following minimum footing dimensions.

TABLE 5.1.2-1: Minimum Footing Dimensions

FOOTING TYPE	*MINIMUM DEPTH (INCHES)	MINIMUM WIDTH (INCHES)
Continuous	30	12
Isolated	30	12

* below lowest adjacent pad grade

The minimum footing depths shown above are taken from lowest adjacent pad grade. With consideration of ground improvement, foundations recommended above can be designed for a maximum allowable bearing pressure of 4,000 pounds per square foot for dead-plus-live loads. This bearing capacity can be increased by one-third for the short-term effects of wind or seismic loading. The maximum allowable bearing pressure is a net value; the weight of the footing may be neglected for design purposes. Footings located adjacent to utility trenches should have their bearing surfaces below an imaginary 1:1 (horizontal:vertical) plane projected upward from the bottom edge of the trench to the footing.

If a two-pour system is used for footings and slab, the cold joint between the exterior footing and slab-on-grade should be located at least 4 inches above adjacent finish exterior grade. If this is not done, then we recommend the addition of a waterstop between the two pours to reduce moisture penetration through the cold joint and migration under the slab. Use of a monolithic pour would eliminate the need for the waterstop.

The Structural Engineer should design footing reinforcement to support the intended structural loads without excessive settlement. Continuous footings should be reinforced with top and bottom steel to provide structural continuity and to permit spanning of local irregularities. At a minimum, continuous footings should be designed to structurally span a clear distance of 5 feet.

Lateral loads may be resisted by friction along the base and by passive pressure along the sides of foundations. The passive pressure is based on an equivalent fluid pressure in pounds per cubic foot (pcf). We recommend the following allowable values for design:

- Passive Lateral Pressure: 250 pcf
- Coefficient of Friction: 0.30

5.1.3 Ground Improvement Options

Considering the degree of estimated liquefaction-induced settlement at this preliminary stage, the use of either the shallow foundation systems listed above requires ground improvement to achieve appropriate levels of performance. If subsequent testing indicates some of the soil identified as liquefiable based on CPTs only, it may be feasible to eliminate the ground improvement.

Liquefaction mitigation can be accomplished through various means such as by soil-cement mixing, vibratory replacement (stone columns), drilled displacement columns, and rammed aggregate piers (RAPs). For planning purposes, a treatment depth ranging from approximately

40 to 80 feet below existing ground surface is anticipated to mitigate the impacts of intolerable liquefaction-induced settlement and to provide relatively uniform foundation support.

Ground improvement would only be required within the building pad, leaving a greater amount of settlement within the planned surface parking and landscape areas of the site. The soil above the potentially liquefiable soil is insufficient to resist upward pressure. Accordingly, localized occurrence of sand boils may be expected in unmitigated areas should liquefaction occur. Landscaped and walkway areas may be impacted by these surface expressions. If the design team considers foregoing ground improvement measures in unmitigated areas, maintenance and repairs should be expected in future seismic events to repair improvements such as sidewalks and walkways should sand boils occur.

Soil improvement is typically procured as a design-build element of a project. This allows consideration of individual contractors' proprietary means and methods in selecting the most cost-effective approach that meets specific project performance and quality objectives. Conceptual ground improvement plans should show the extent of the work, coordination with other elements, including foundations, utilities, and project phasing requirements. We can assist in the preparation of a design-build RFP for the ground improvement and should review the design submittal prior to construction. During ground improvement selection, we should be consulted regarding the selection's load-transfer considering the recommended allowable bearing capacity and differential settlement recommendations provided in this report may need to be readdressed.

The selection and design of the ground improvement system should be determined by an experienced ground improvement designer/contractor. Ground improvement recommendations will be provided in the design-level study.

5.2 DEEP FOUNDATIONS

A deep foundation system may be used to support the proposed structure as an alternative to shallow foundations. We understand that the design team would like to consider 18-inch-diameter auger-cast piles. Auger-cast piles, also known as continuous flight auger piles (CFA), are deep foundation elements that are installed by rotating a continuous flight hollow-stem auger into the soil. Concrete or grout is pumped under pressure through the hollow stem as the auger is withdrawn and a reinforcing cage can be installed while the concrete or grout is still in a fluid condition. CFA piles would be used under pile caps that are connected by grade beams. CFA piles will likely be designed and installed by a specialty trade partner to the contractor using proprietary means and methods. The specialty trade partner's design should be verified via full-scale load tests to assess the axial capacity.

For preliminary purposes, we provide the below vertical capacities and downdrag considerations:

TABLE 5.2-1: Preliminary Auger-Cast Pile Design

CONDITION	SKIN FRICTION	
	DEPTH RANGE	ULTIMATE CAPACITY
Static	Upper 10 feet	750 psf
	10 to 30 feet	560 psf
	≥ 30 feet	750 psf
Seismic	Upper 30 feet	52.3 kips liquefaction-induced downdrag
	≥ 30 feet	975 psf

1. All capacities and loads are ultimate values.
2. Depths are relative to the proposed grade considering 7 feet of planned fill.

Additional geotechnical laboratory testing should be performed in order to refine the above capacities and assess the downdrag concerns.

Other deep foundation systems, such as concrete piles and steel piles are also feasible from a geotechnical engineering standpoint.

6.0 RETAINING WALLS

Unrestrained drained retaining walls constructed on level ground may be designed using an active equivalent fluid pressure of 50 pounds per cubic foot (pcf). Restrained drained site retaining walls should be designed for an equivalent fluid pressure of 70 pcf.

Passive pressure acting on foundations may be calculated using an equivalent fluid pressure of 250 pcf. The upper 1 foot of soil should be excluded from passive pressure computations. The friction factor for sliding resistance may be assumed as 0.30. Retaining walls can be supported on either footings or pile foundations. Please refer to Section 5.1.2 for preliminary footing recommendations. Due to the expansive soil at the site, wall footings should extend to a depth of at least 24 inches. Appropriate safety factors against overturning and sliding should be incorporated into the design calculations.

All walls retaining more than 2 feet of soil should be provided with drainage facilities to prevent the build-up of hydrostatic pressures behind the walls. Wall drainage may be provided using a 4-inch-diameter perforated pipe embedded in either free-draining gravel surrounded by synthetic filter fabric (minimum 6-ounce) or Class 2 permeable material. The width of the drain blanket should be at least 12 inches, and the drain blanket should extend to about 1 foot below the finished grades. The upper 1 foot of wall backfill should consist of compacted site soils. As an alternative, prefabricated synthetic wall drain panels can be used. Drainage should be collected into solid pipes and directed to an outlet approved by the Civil Engineer.

All backfill should be placed in accordance with the recommendations provided above for engineered fill. Light equipment should be used during backfill compaction to reduce possible overstressing of the walls. The foundation details and structural calculations for retaining walls should be submitted for review.

7.0 SECONDARY SLABS-ON-GRADE

Exterior flatwork includes items such as concrete sidewalks, steps, and outdoor courtyards exposed to foot traffic only. Concrete flatwork should have a minimum thickness of 4 inches and include control and construction joints in accordance with current Portland Cement Association Guidelines.

Exterior slabs should slope away from the building to prevent water from flowing toward the foundations. Site soils should be moistened just prior to concrete placement.

8.0 PRELIMINARY PAVEMENT DESIGN

We prepared preliminary pavement design recommendations based on assumed Traffic Index and subgrade resistance values (R-value). The Traffic Index should be determined by the Civil Engineer or appropriate public agency. The sections provided below should be reviewed and revised, if applicable, based on R-value tests performed on samples of actual subgrade materials recovered at the time of grading.

8.1 FLEXIBLE PAVEMENTS

We developed the following preliminary pavement sections for parking areas and access streets Traffic Indices of 5 to 9, based on an assumed R-value of 5 and Topic 633 of the Caltrans Highway Design Manual (including the asphalt factor of safety).

TABLE 8.1-1: Recommended Asphalt Concrete Pavement Sections

TRAFFIC INDEX	SECTION	
	ASPHALT CONCRETE (AC) (INCHES)	CLASS 2 AGGREGATE BASE (INCHES)
5	4	7½
6	4	11½
7	4	15½
8	4½	18½
9	5	21½

The civil engineer should determine the appropriate traffic indices based on the estimated traffic loads and frequencies.

We recommend that representative bulk samples of subgrade soil be obtained during rough grading to allow confirmation R-value testing for the design R-value assumed above.

8.2 RIGID PAVEMENTS

Concrete pavement sections can be used to resist heavy loads and turning forces in areas such as fire lanes or trash enclosures. Final design of rigid pavement sections and accompanying reinforcement should be performed based on estimated traffic loads and frequencies. We recommend the following minimum design sections for rigid pavements:

- Use a minimum section of 6 inches of Portland Cement concrete over 6 inches of Caltrans Class 2 Aggregate Base.
- Concrete pavement should have a minimum 28-day compressive strength of 3,500 psi.
- Provide minimum control joint spacing in accordance with Portland Cement Association guidelines.

8.3 PAVEMENT SUBGRADE PREPARATION

The contractor should compact finished subgrade and aggregate base in accordance with Section 4.6.1. Aggregate Base should meet the requirements for ¾-inch maximum Class 2 AB in accordance with Section 26-1.02a of the latest Caltrans Standard Specifications.

9.0 DESIGN GEOTECHNICAL REPORT

We are currently completing a site-specific, design-level geotechnical exploration. The exploration includes borings and laboratory soil testing to provide data for preparation of specific recommendations regarding grading, foundation design, and drainage for the proposed development. The exploration allows for more detailed evaluations of the geotechnical issues discussed in this report and afford the opportunity to provide recommendations regarding techniques and procedures to be implemented during construction to mitigate potential geotechnical/geological hazards.

10.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This preliminary report presents geotechnical recommendations for preliminary design of the Caribbean 100 project. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strived to perform our professional services in accordance with generally accepted geotechnical engineering principles and practices currently employed in the area; no warranty is expressed or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data are representative of the actual subsurface conditions across the site. Considering possible underground variability of soil, rock, stockpiled material, and groundwater, additional unexpected costs may be incurred in completing the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, ENGEO should be notified immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include excavation sloping or shoring, soil volume change factors, flood potential, or a geohazard exploration. In addition, our geotechnical exploration did not include work to determine the existence of possible hazardous materials. If any hazardous materials are encountered during construction, the proper regulatory officials should be notified immediately.

This document must not be subject to unauthorized reuse, that is, reusing without written authorization of ENGEO. Such authorization is essential because it requires ENGEO to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

Actual field or other conditions will necessitate clarifications, adjustments, modifications or other changes to ENGEO's recommendations. Therefore, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include onsite construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.

SELECTED REFERENCES

American Society of Civil Engineers, (2010), Minimum Design Loads for Buildings and other Structures ASCE 7-10. Reston: American Society of Civil Engineers.

Boulanger, R. W., & Idriss, I. M. (2014), CPT and SPT based liquefaction triggering procedures. Rep. No. UCD/CGM-14, 1.

Brabb, E., Graymer, R. W., and Jones, D. L., (2000), Geologic Map and Map Database of the Palo Alto 30' x 60' Quadrangle, California, U.S. Geological Survey, Miscellaneous Field Studies Map MF-2332, http://pubs.usgs.gov/mf/2000/mf-2332/.

BSK Associates, (2017), Preliminary Geotechnical Investigation Report for the West Caribbean Campus, Sunnyvale, California, BSK PROJECT NO. G17-045-10L.

California Building Code, (2016). http://www.bsc.ca.gov/codes.aspx.

California Geologic Survey, (2008), Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California.

California Geologic Survey, (2006), Seismic Hazard Zones, Official Map, Mountain View Quadrangle.

Dibblee, T. W., and Minch, J. A. (2007), Geologic amp of the Palo Alto and Mountain View quadrangles, Alameda, San Mateo, and Santa Clara Counties, California, Dibblee Geological Foundation, Dibblee Foundation Map DF-350, scale 1:24,000.

Field, E.H., Biasi, G.P., Bird, P., Dawson, T.E., Felzer, K.R., Jackson, D.D., Johnson, K.M., Jordan, T.H., Madden, C., Michael, A.J., Milner, K.R., Page, M.T., Parsons, T., Powers, P.M., Shaw, B.E., Thatcher, W.R., Weldon, R.J., II, and Zeng, Y., (2013), Uniform California earthquake rupture forecast, version 3 (UCERF3)—The time-independent model: U.S. Geological Survey Open-File Report 2013–1165, 97 p., California Geological Survey Special Report 228, and Southern California Earthquake Center Publication 1792, <http://pubs.usgs.gov/of/2013/1165/>.

Horizon Water and Environment, LLC, (2013), “Sunnyvale East and West Channels Flood Projection Project.” Draft Environmental Impact Report prepared for Santa Clara Valley Water District, Oakland, CA.

Idriss, I.M. and Boulanger, R.W., (2008), Soil Liquefaction During Earthquakes; Earthquake Engineering Research Institute.

Ishihara, K. (1985), Stability of Natural Deposits During Earthquakes, Proc 11th International Conference on Soil Mechanics and Foundation Engineering, Vol 1, A. A. Balkema, Rotterdam, The Netherlands, 321-376.

Kennedy, D.G., (2002), Neotectonic character of the Serra Fault, northern San Francisco Peninsula, California Publisher San Francisco State University, pp. 234.

SELECTED REFERENCES (Continued)

Mitchell, J. K. (2008), Aging of Sand -A Continuing Enigma?, 6th International Conference on Case Histories in Geotechnical Engineering, Arlington, VA.

SEAOC, (1996), Recommended Lateral Force Requirements and Tentative Commentary. Structural Engineers Association of California.

Robertson, P. K. and Campanella, R. G. (1988), Guidelines for Geotechnical Design Using CPT and CPTU Data. Civil Engineering Department, University of British Columbia.

Robertson, P. K. (2009), Performance based earthquake design using the CPT, Gregg Drilling and Testing, Inc.

Rogers, J. D., and Figuers, (1991), S.H., Site Stratigraphy and Near Shore Development Effects on Soil Amplification in the Greater Oakland Area, ed Baldwin, J.E., II and Sitar, N.; Association of Engineering Geologists Special Publication No. 1, pp. 123-150.

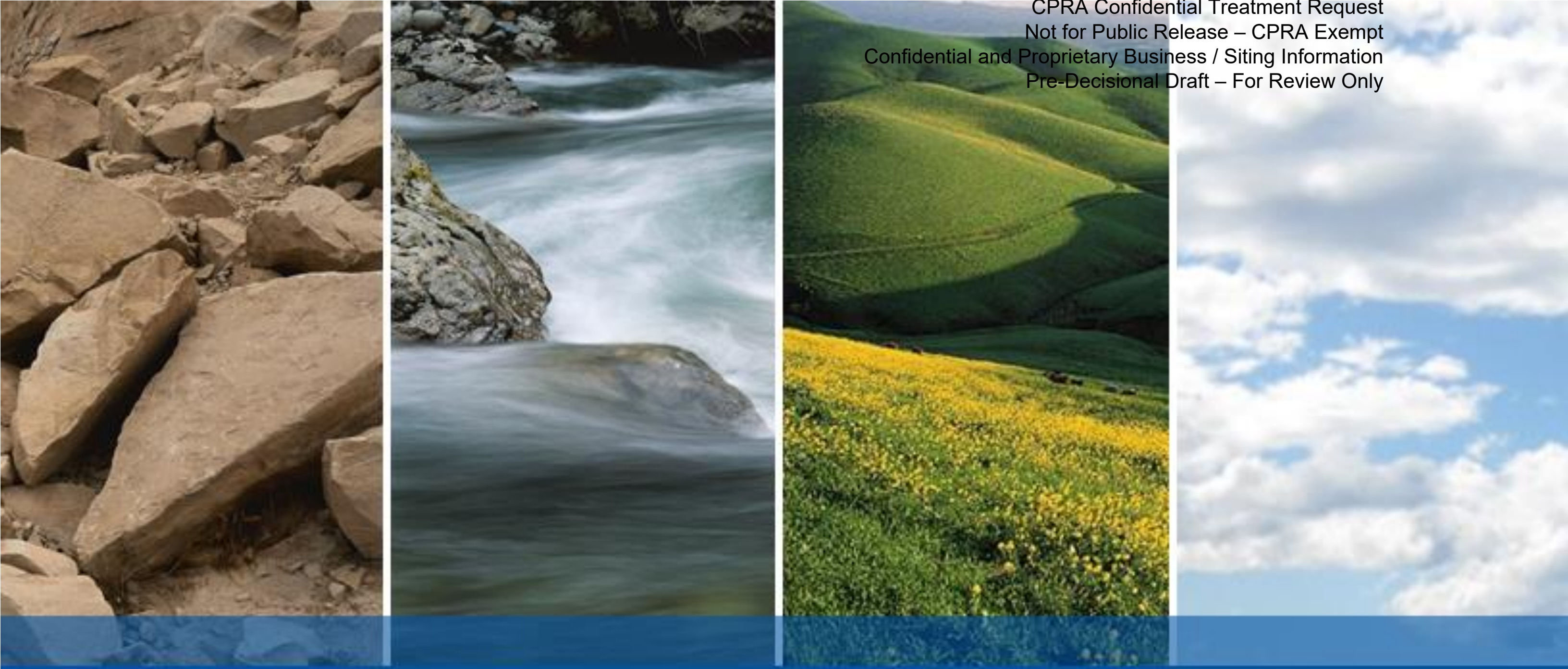
Witter C.W., Knudsen K.L., et al., (2006), Map of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, USGS Open File Report 06-1037, 2006.

Working Group on California Earthquake Probabilities, (2014), The Uniform California Earthquake Rupture Forecast, Version 3 UCERF 3, USGS Open File Report 2013-1165.

Youd, T. L. and C. T. Garris, (1995), Liquefaction induced Ground-Surface Description: Journal of Geotechnical Engineering, Vol. 121, No. 11, pp. 805 – 809.

Youd, T. L. and I. M. Idriss, (2001), Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshop on Evaluation of Liquefaction Resistance of Soils.

Zhang, G. Robertson. P.K, Brachman, R., (2002), Estimating Liquefaction Induced Ground Settlements from the CPT, Canadian Geotechnical Journal, 39: pp 1168-1180.



FIGURES

0 FEET 2000
0 METERS 1000

N

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO Expect Excellence	VICINITY MAP CARIBBEAN 100 SUNNYVALE, CALIFORNIA	PROJECT NO.: 14505.000.000 SCALE: AS SHOWN DRAWN BY: SRP / CHECKED BY: JK	FIGURE NO. 1

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ORIGINAL FIGURE PRINTED IN COLOR

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Pre-Decisional Draft – For Review Only

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

1-CPT12	CONE PENETRATION TEST (ENGEO, 2017)
CPT-3	CONE PENETRATION TEST (BSK, 2017)
B-3	BORING (BSK, 2017)

N

0 FEET 200
0 METERS 100

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO Expect Excellence	SITE PLAN CARIBBEAN 100 SUNNYVALE, CALIFORNIA	PROJECT NO.: 14505.000.000 SCALE: AS SHOWN DRAWN BY: GLJ CHECKED BY: JK	FIGURE NO. 2

ORIGINAL FIGURE PRINTED IN COLOR

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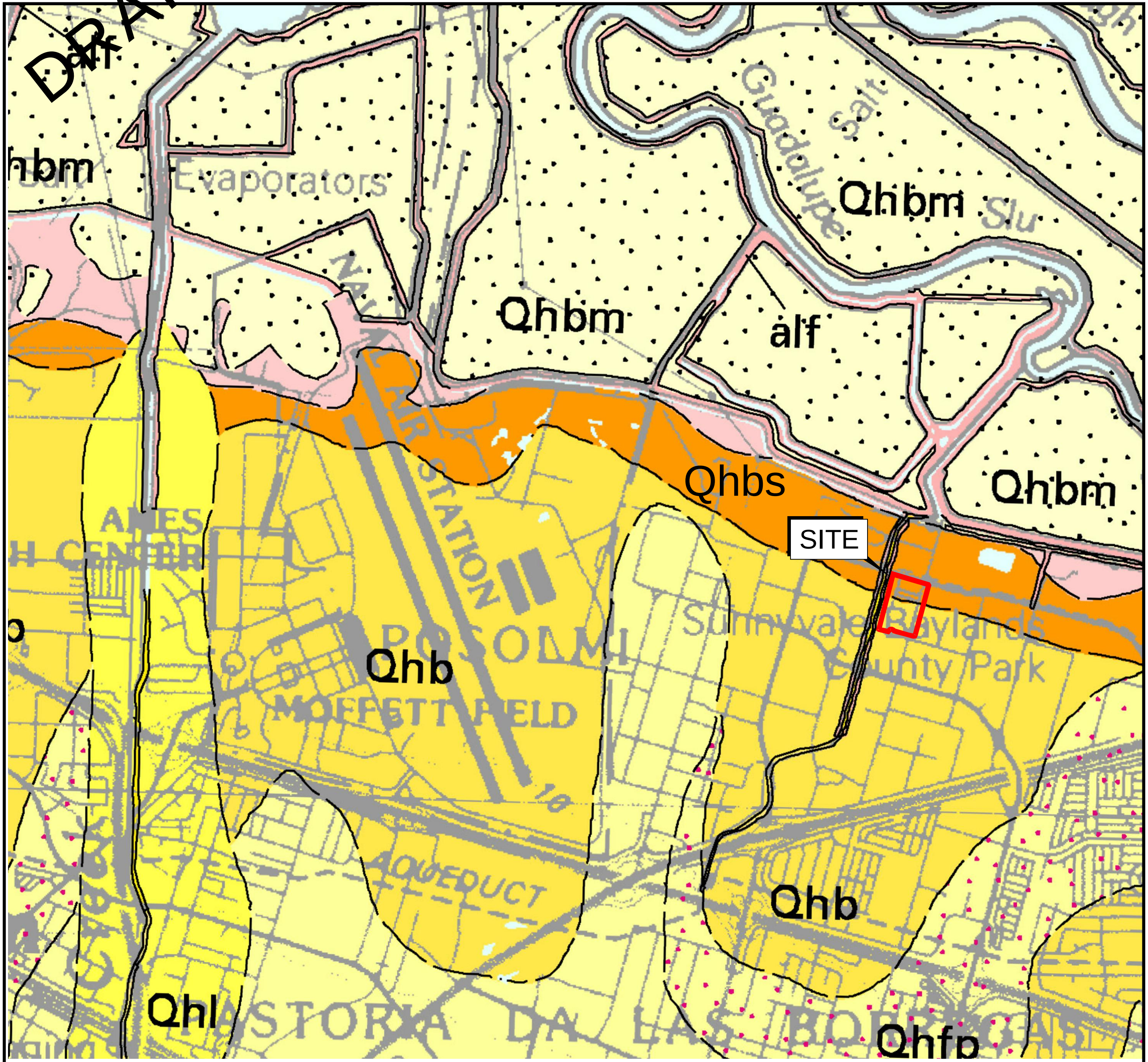

N

0 FEET 3000
0 METERS 1500

EXPLANATION

——— – – –	GEOLOGIC CONTACT-DASHED WHERE GRADATIONAL OR APPROXIMATELY LOCATED
alf	ARTIFICIAL FILL
Qhb	BASIN DEPOSITS
Qhbm	BAY MUD
Qhl	NATURAL LEVEE DEPOSITS
Qhbs	BASIN DEPOSITS, SALT-AFFECTED

BASE MAP SOURCE: BRABB, 2000

ENGEO
Expect Excellence

REGIONAL GEOLOGIC MAP
CARIBBEAN 100
SUNNYVALE, CALIFORNIA

PROJECT NO.: 14505.000.000	FIGURE NO. 3
SCALE: AS SHOWN	
DRAWN BY: SRP	CHECKED BY: JK

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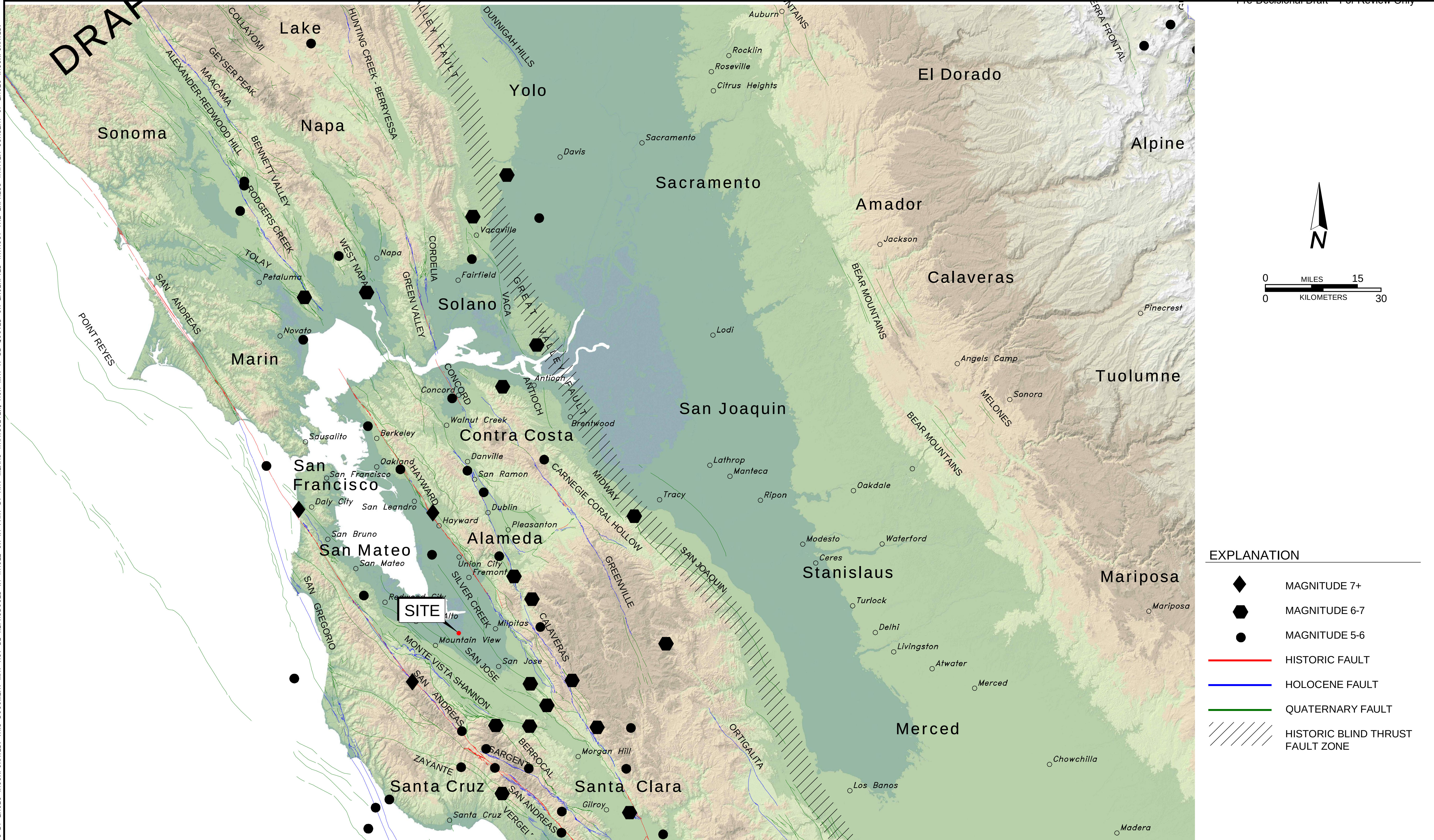

BASE MAP SOURCE:
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATASET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, NOVEMBER, 2010
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800–2000)

ENGEO
Expect Excellence

REGIONAL FAULTING AND SEISMICITY
CARIBBEAN 100
SUNNYVALE, CALIFORNIA

PROJECT NO.: 14505.000.000	FIGURE NO. 4
SCALE: AS SHOWN	
DRAWN BY: SRP	CHECKED BY: JK

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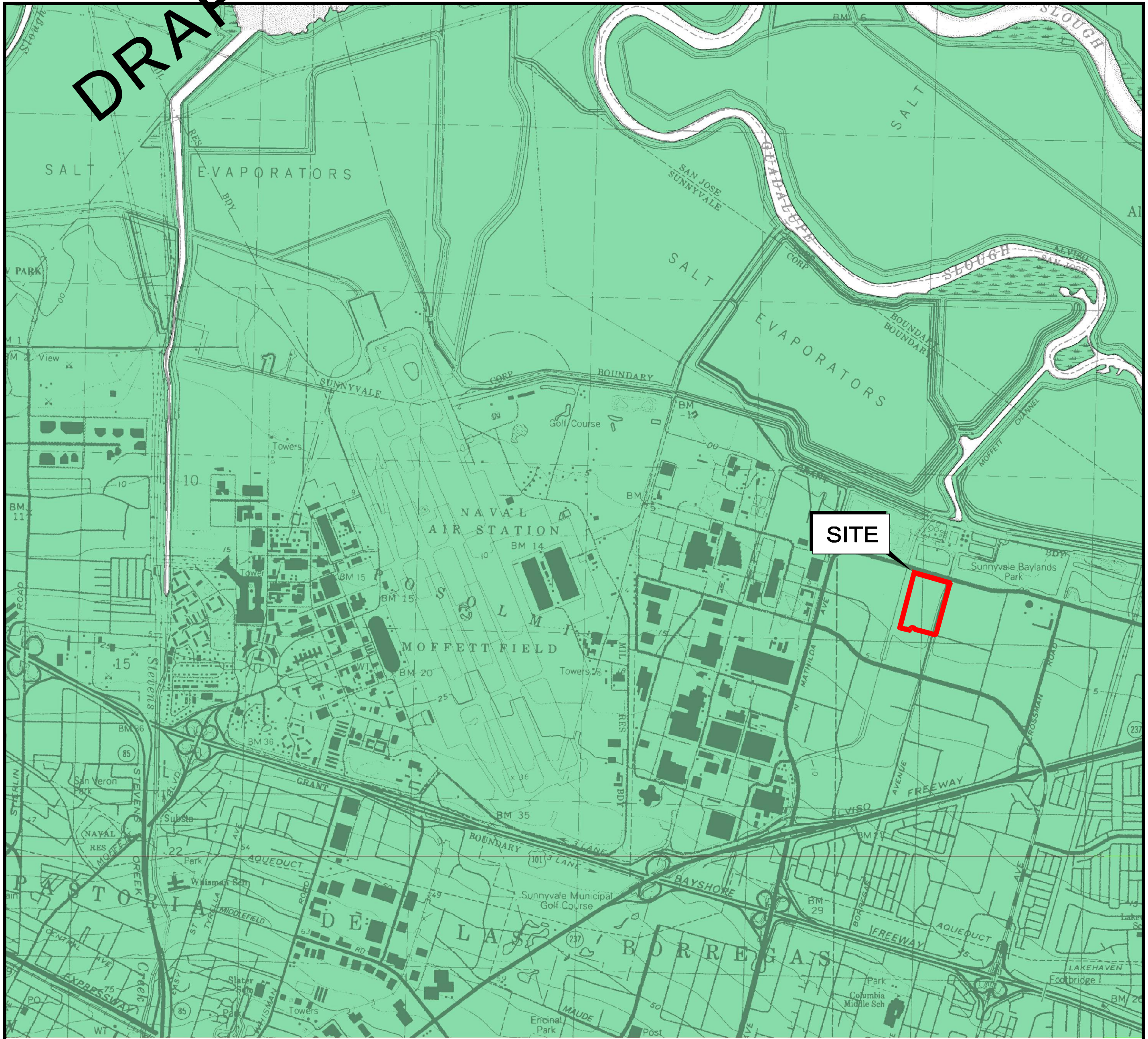
ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

LIQUEFACTION

AREAS WHERE HISTORIC OCCURRENCE OF LIQUEFACTION, OR LOCAL GEOLOGICAL, GEOTECHNICAL AND GROUNDWATER CONDITIONS INDICATE A POTENTIAL FOR PERMANENT GROUND DISPLACEMENTS SUCH THAT MITIGATION AS DEFINED IN PUBLIC RESOURCES CODE SECTION 2693(c) WOULD BE REQUIRED

N

0 FEET 3000
0 METERS 1500

BASE MAP SOURCE: CALIFORNIA DEPARTMENT OF CONSERVATION, CALIFORNIA GEOLOGICAL SURVEY, 2006

ENGEO — Expect Excellence

SEISMIC HAZARD ZONES MAP
CARIBBEAN 100
SUNNYVALE, CALIFORNIA

PROJECT NO.: 14505.000.000		FIGURE NO.
SCALE: AS SHOWN		5
DRAWN BY: SRP	CHECKED BY: JK	

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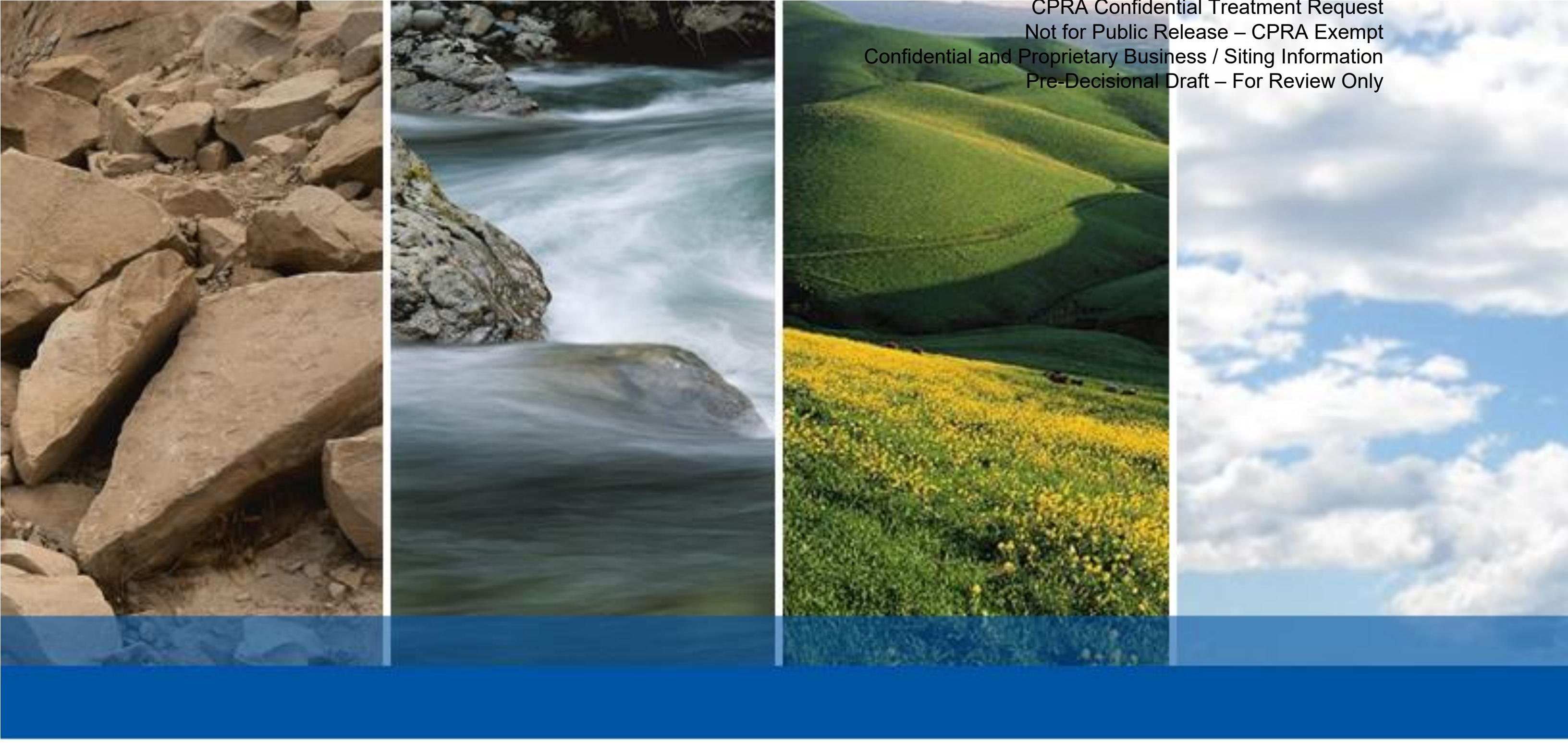


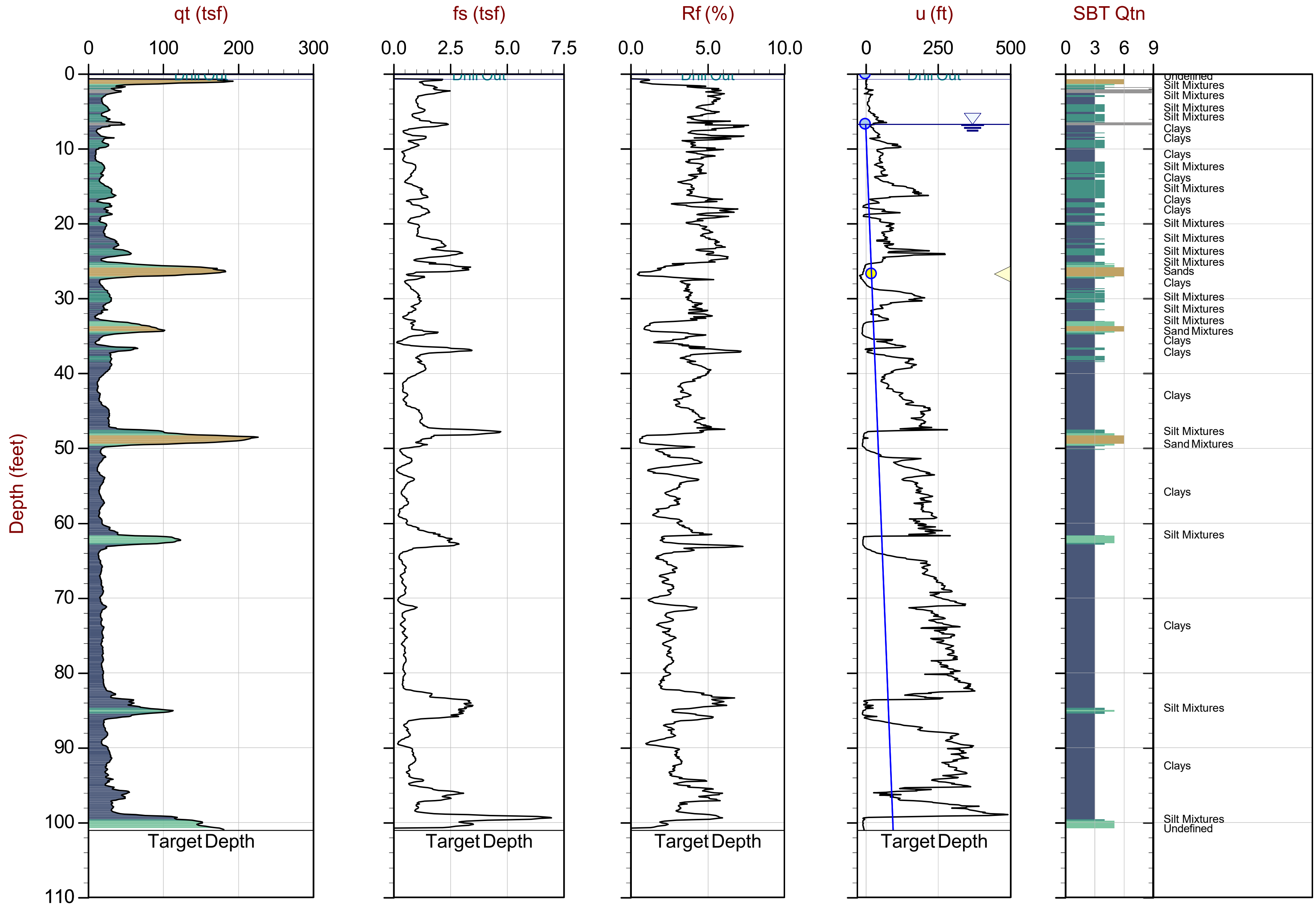
APPENDIX A

CONE PENETRATION TEST LOGS

CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56142
Date: 2017-12-15 08:44
Site: West Caribbean and Borregas Campuses
Sounding: 1-CPT07
Cone: 447:T1500F15U500



Max Depth: 30.800 m / 101.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-56142_CP07.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4141539m E: 586894m
Sheet No: 1 of 1

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Dissipation, equilibrium assumed | Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

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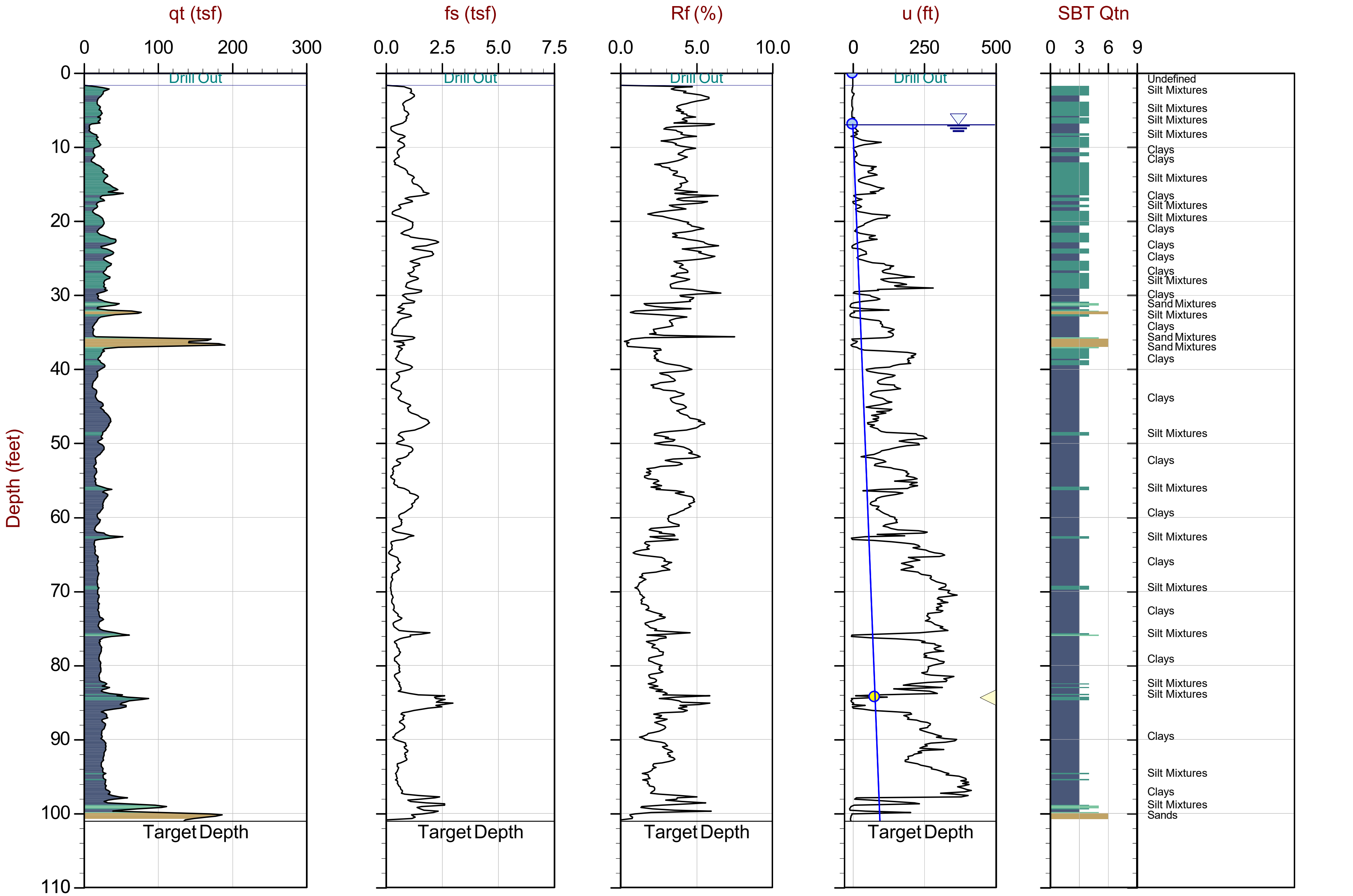
CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56142
Date: 2017-12-15 10:08
Site: West Caribbean and Borregas Campuses
Sounding: 1-CPT08
Cone: 494:T1500F15U500



Max Depth: 30.800 m / 101.05 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-56142_CP08.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4141466m E: 586957m
Sheet No: 1 of 1

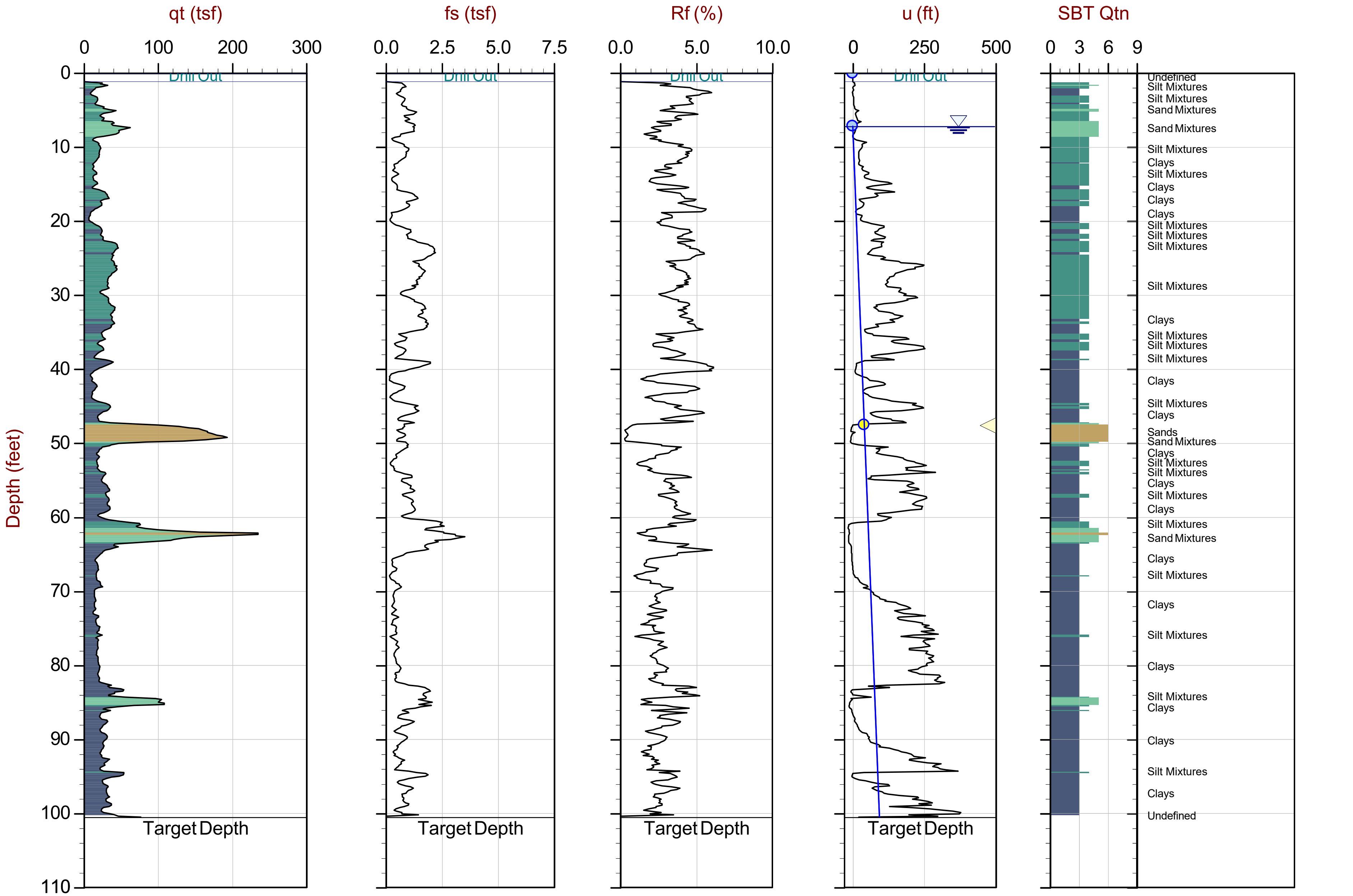
Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Dissipation, equilibrium assumed | Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56142
Date: 2017-12-15 12:49
Site: West Caribbean and Borregas Campuses
Sounding: 1-CPT09
Cone: 494:T1500F15U500



Max Depth: 30.650 m / 100.56 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-56142_CP09.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4141431m E: 586767m
Sheet No: 1 of 1

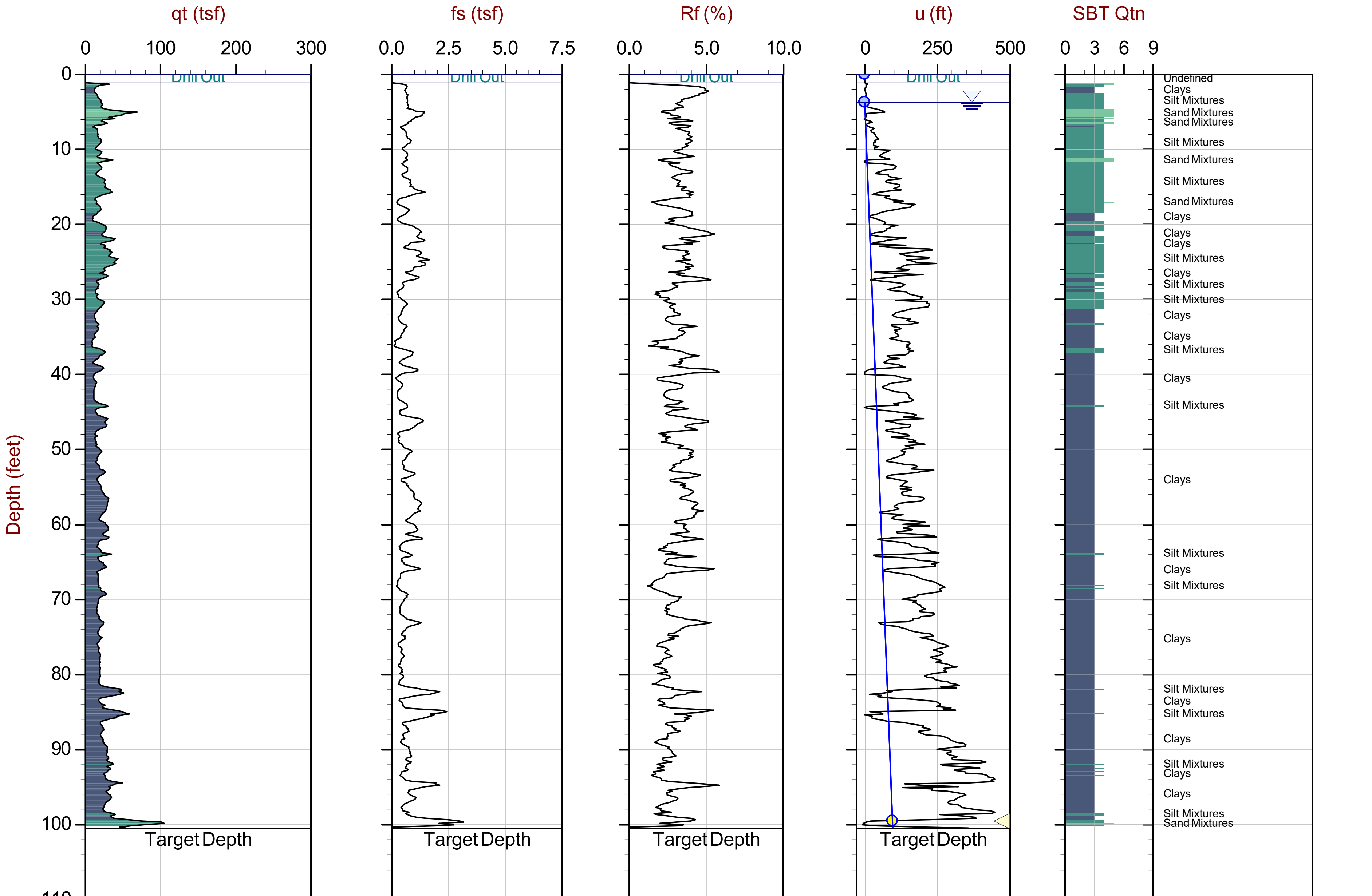
Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Dissipation, equilibrium assumed Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56142
Date: 2017-12-15 11:21
Site: West Caribbean and Borregas Campuses
Sounding: 1-CPT10
Cone: 494:T1500F15U500



Max Depth: 30.650 m / 100.56 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-56142_SP10.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4141387m E: 586879m
Sheet No: 1 of 1

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Dissipation, equilibrium assumed | Hydrostatic Line

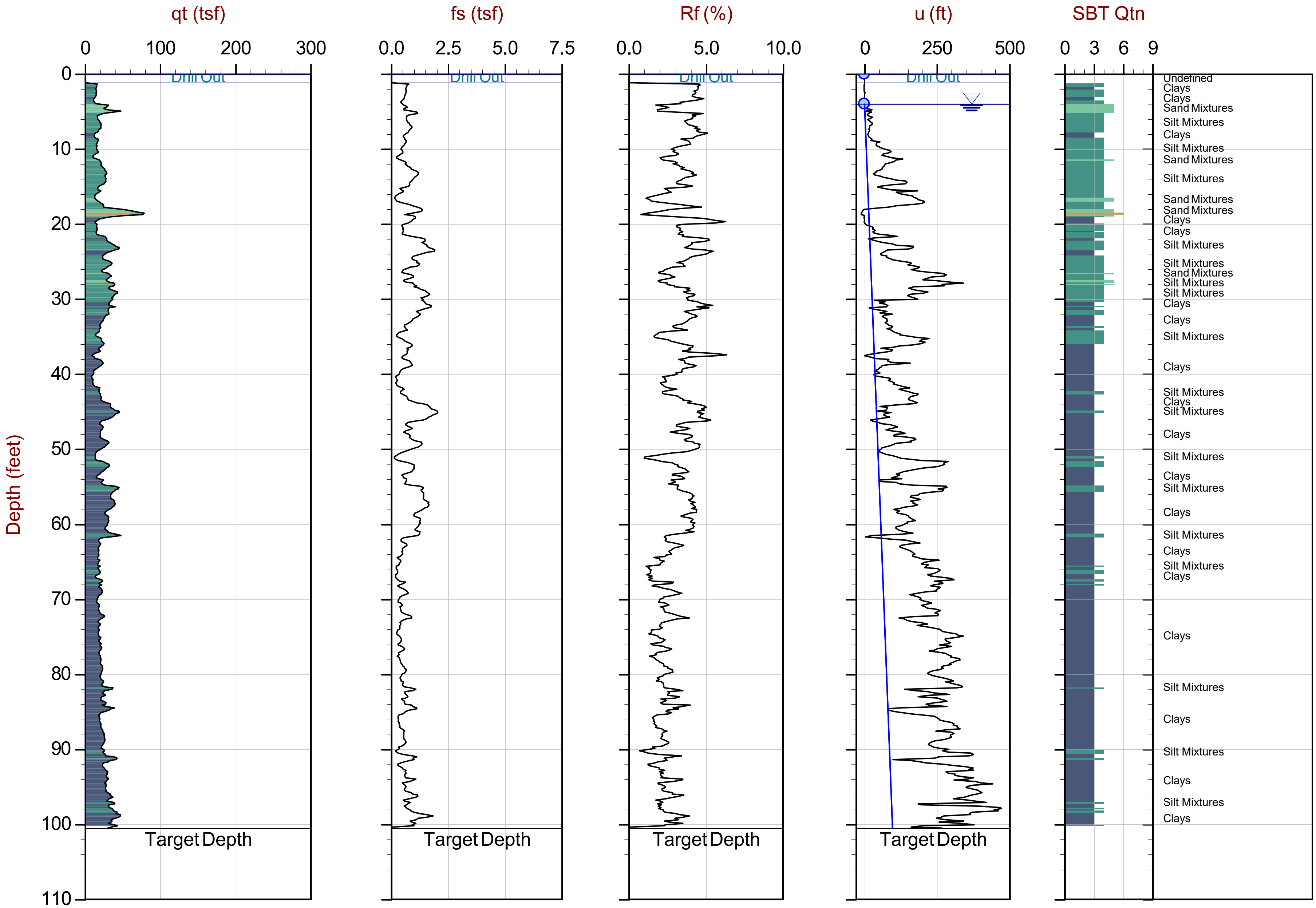
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CPRA Confidential Treatment Request
Not for Public Release – CPRA Exempt
Confidential and Proprietary Business / Siting Information
Pre-Decisional Draft – For Review Only

CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56142
Date: 2017-12-15 14:07
Site: West Caribbean and Borregas Campuses
Sounding: 1-CPT11
Cone: 494:T1500F15U500



Max Depth: 30.650 m / 100.56 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-56142_CP11.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4141273m E: 586939m
Sheet No: 1 of 1

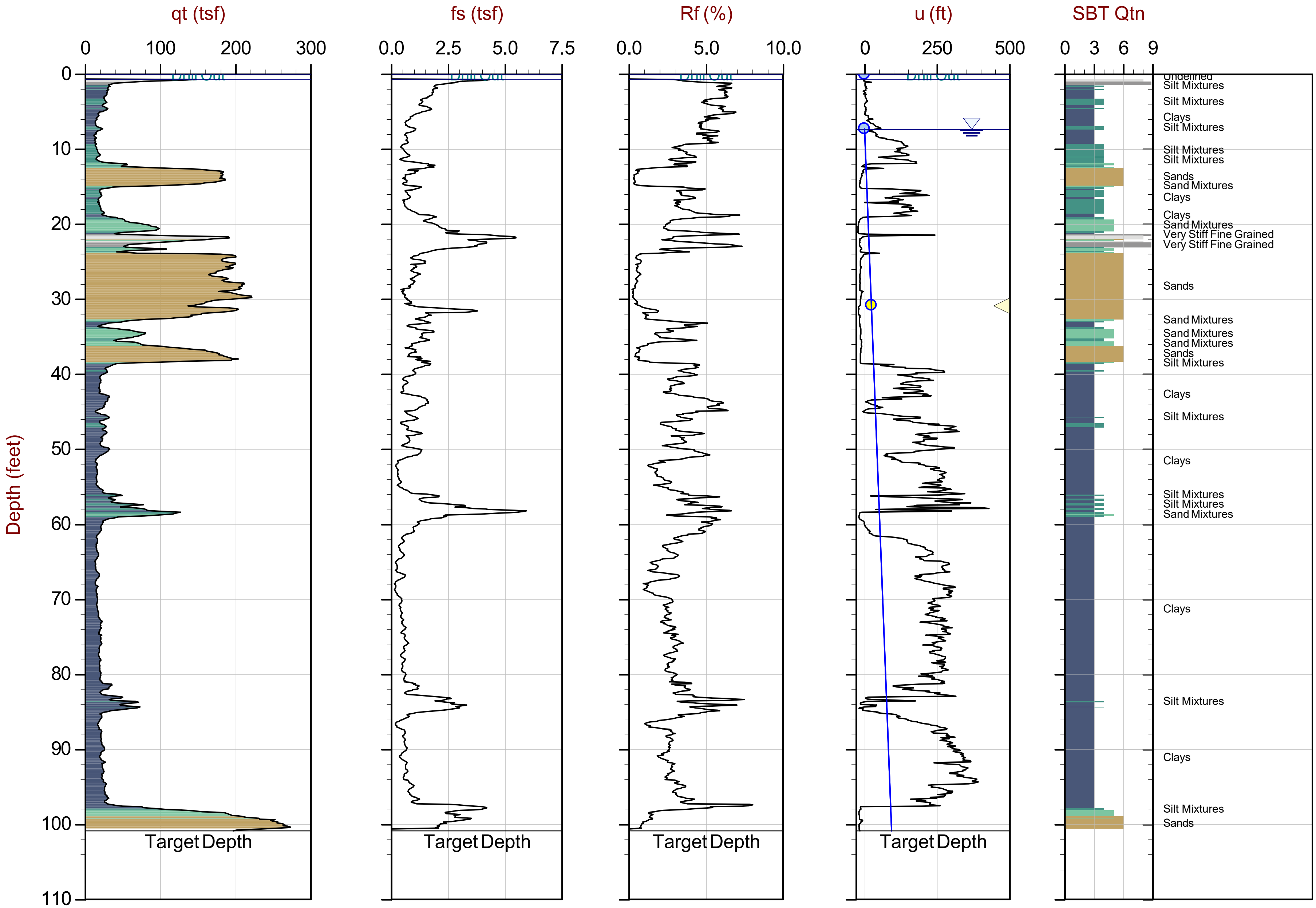
Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Dissipation, equilibrium assumed Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56142 Sounding: 1-CPT12
Date: 2017-12-15 09:51 Cone: 447:T1500F15U500
Site: West Caribbean and Borregas Campuses



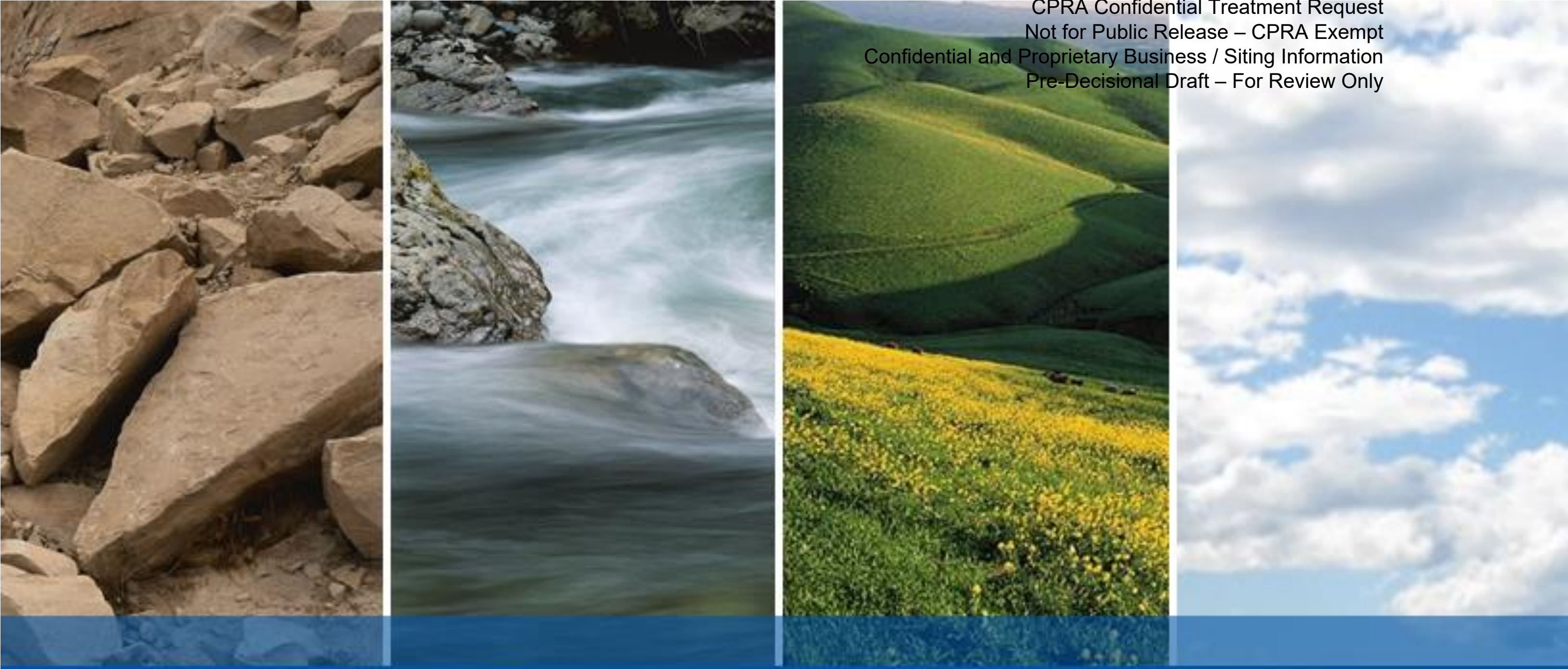
Max Depth: 30.750 m / 100.88 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-56142_CP12.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4141307m E: 586756m
Sheet No: 1 of 1

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Dissipation, equilibrium assumed | Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



APPENDIX B

PRELIMINARY LIQUEFACTION ANALYSIS (ROBERTSON, 2009)

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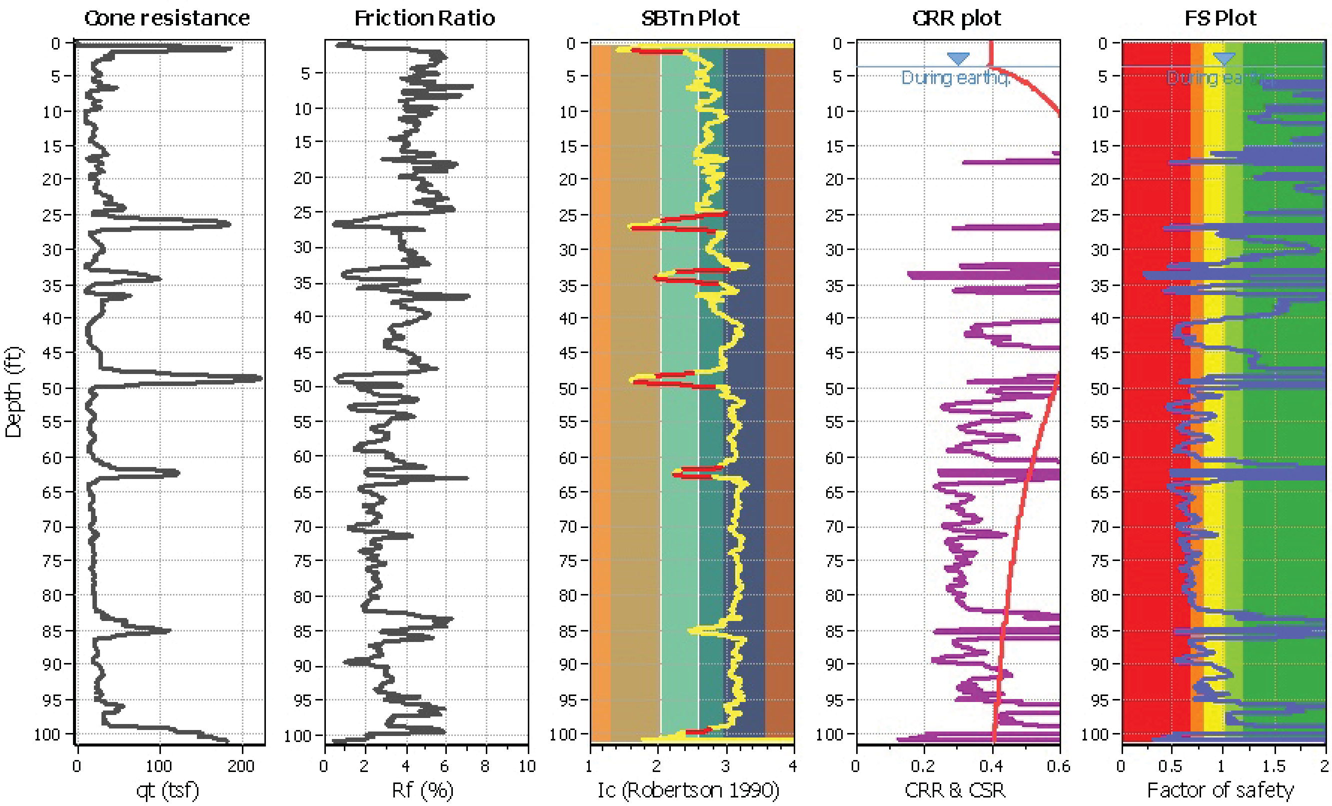
LIQUEFACTION ANALYSIS REPORT

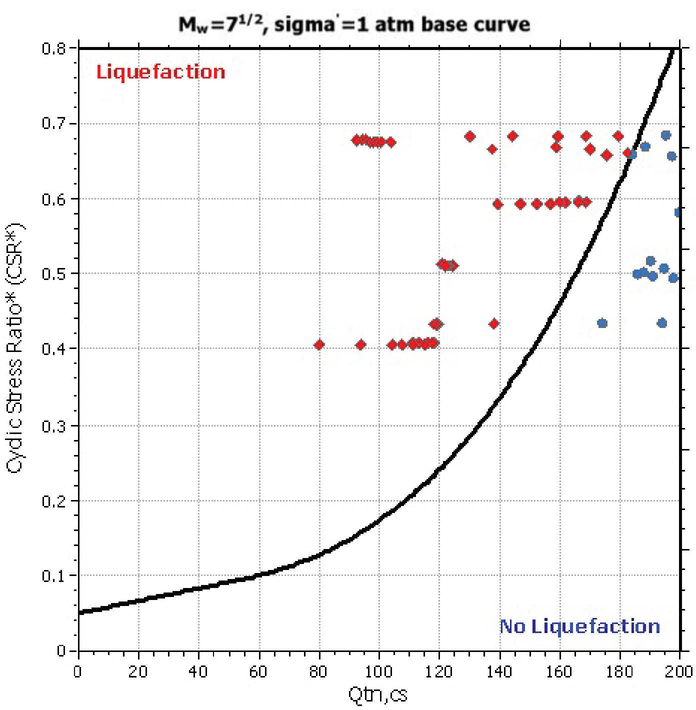
Project title : Caribbean 100 **Location : Sunnyvale, CA**

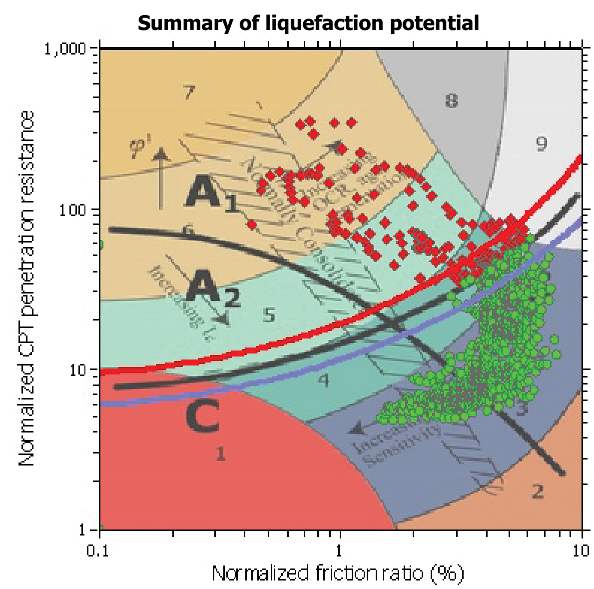
CPT file : 1-CPT07

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	6.70 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	No		







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

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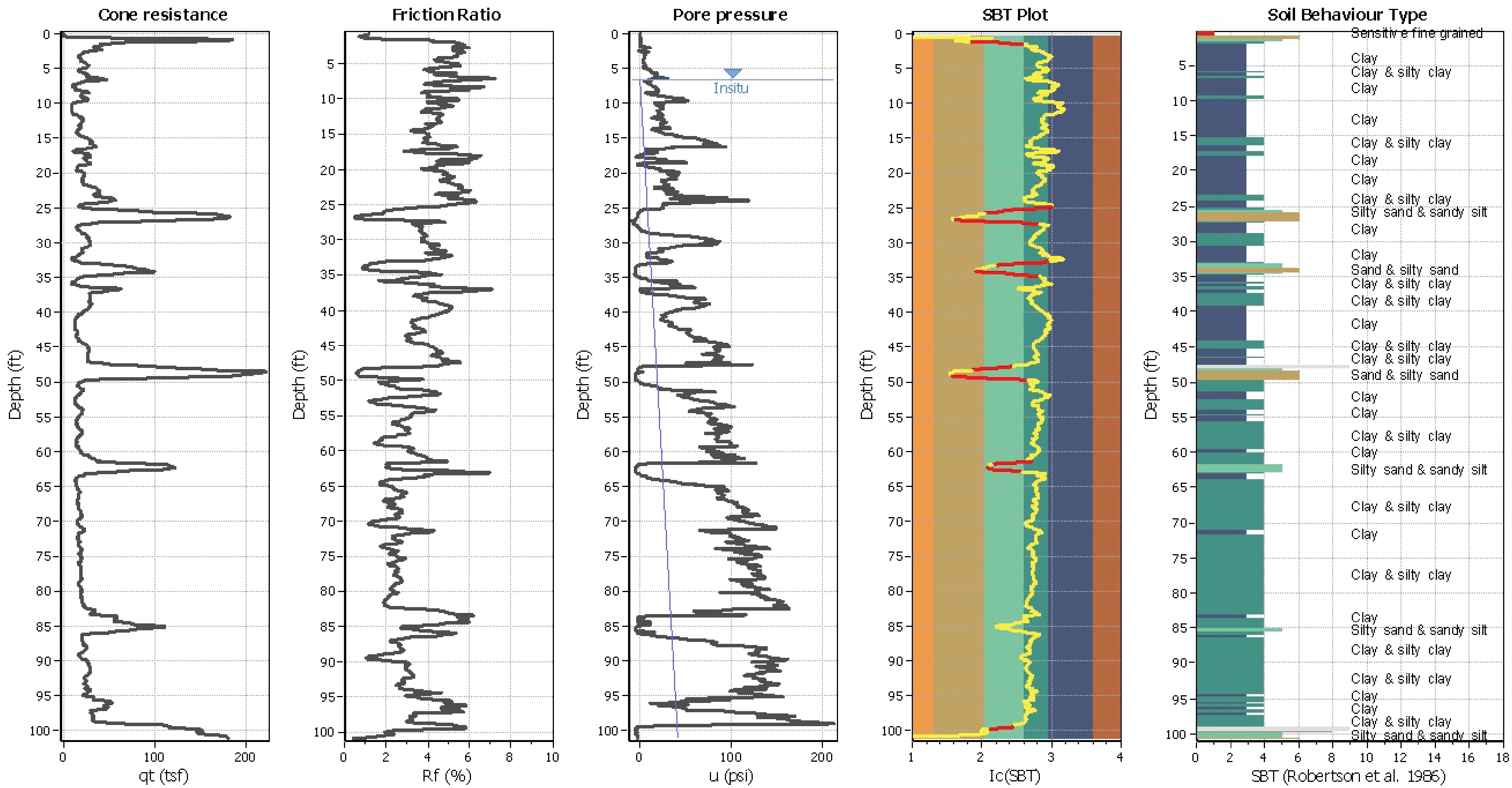
CPT name: 1-CPT07

CPT basic interpretation plo



Input parameters and analysis data

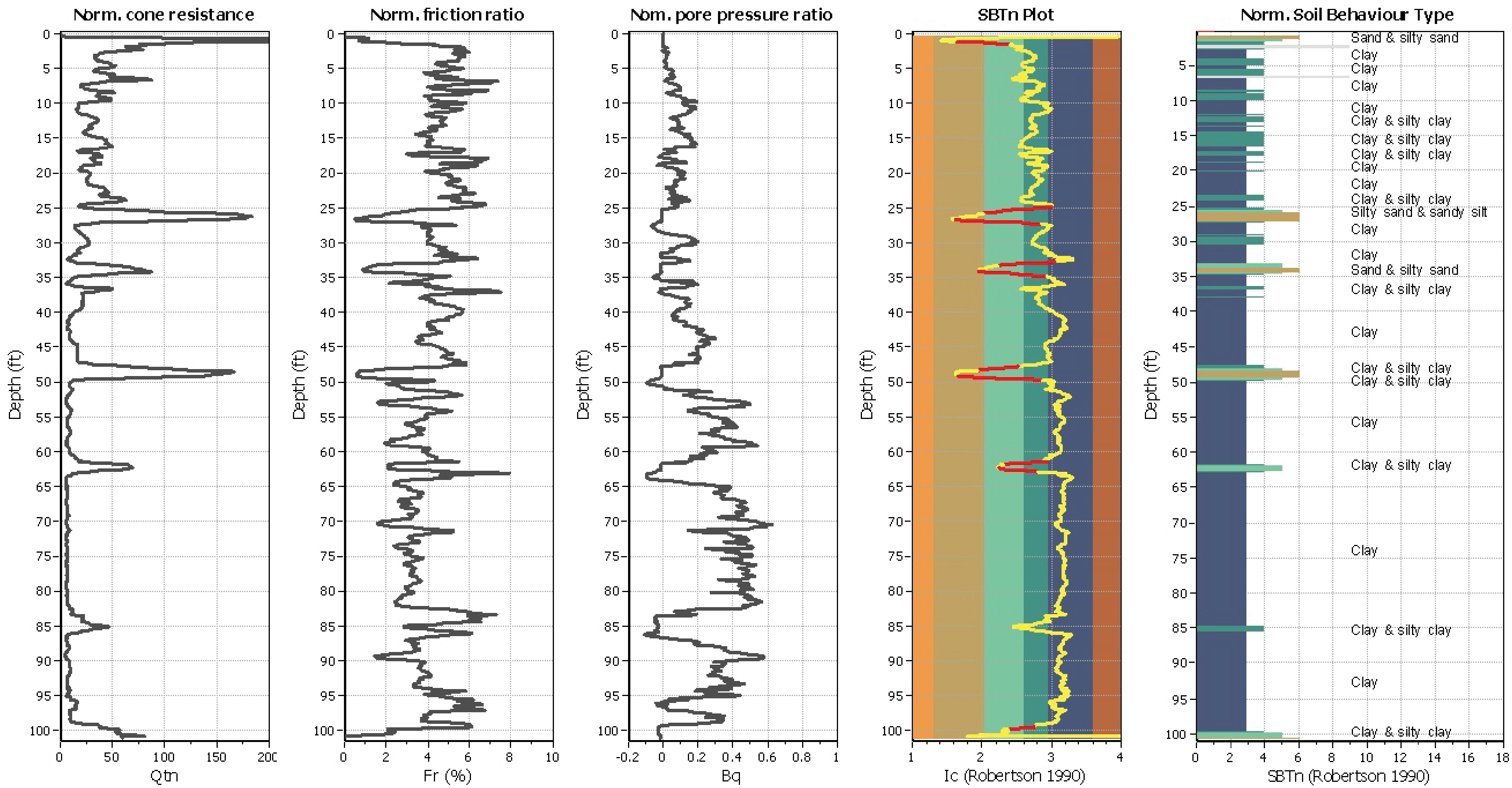
Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.70 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT name: 1-CPT07

CPT basic interpretation plots (normaliz



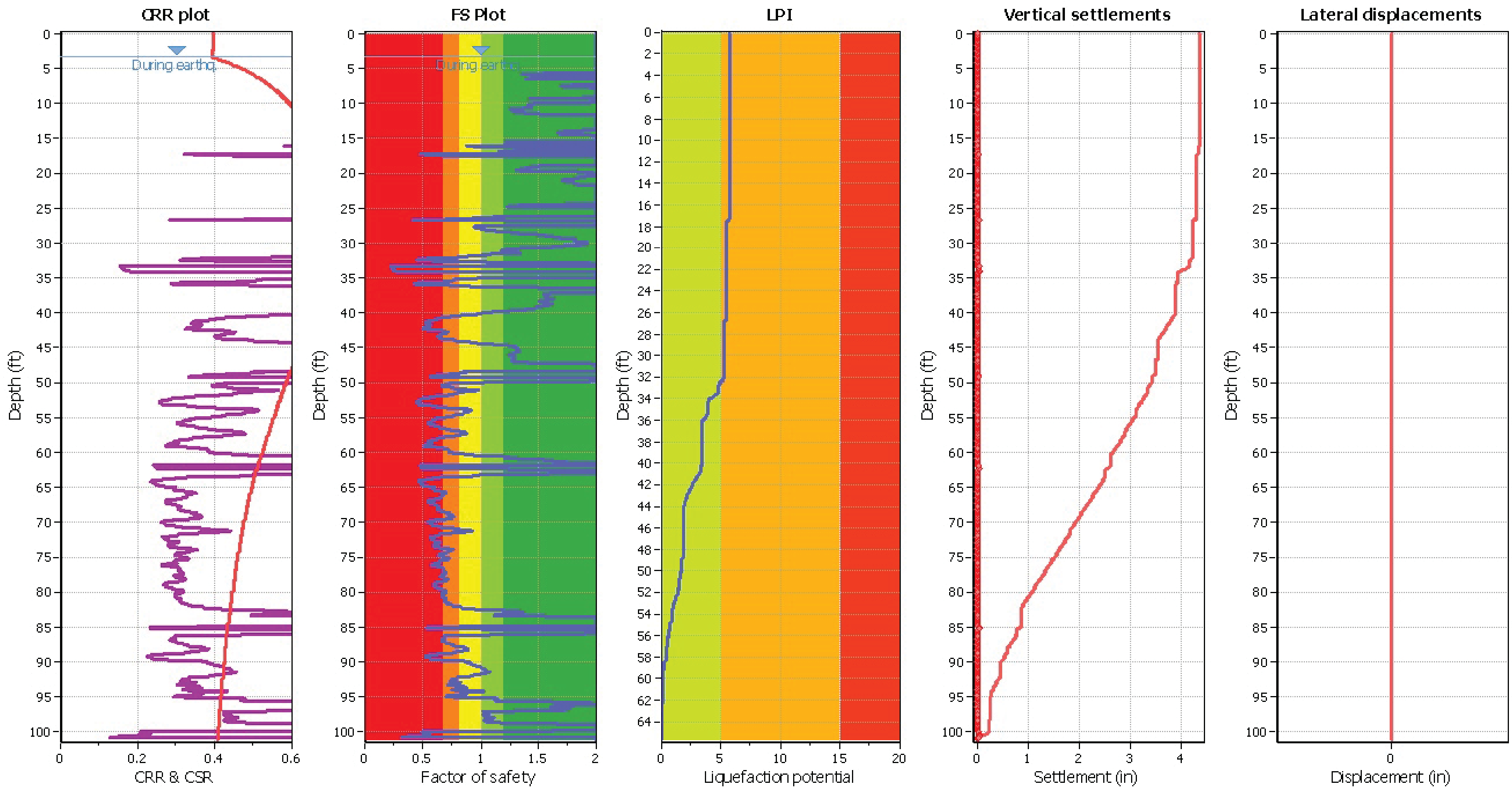
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.70 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.70 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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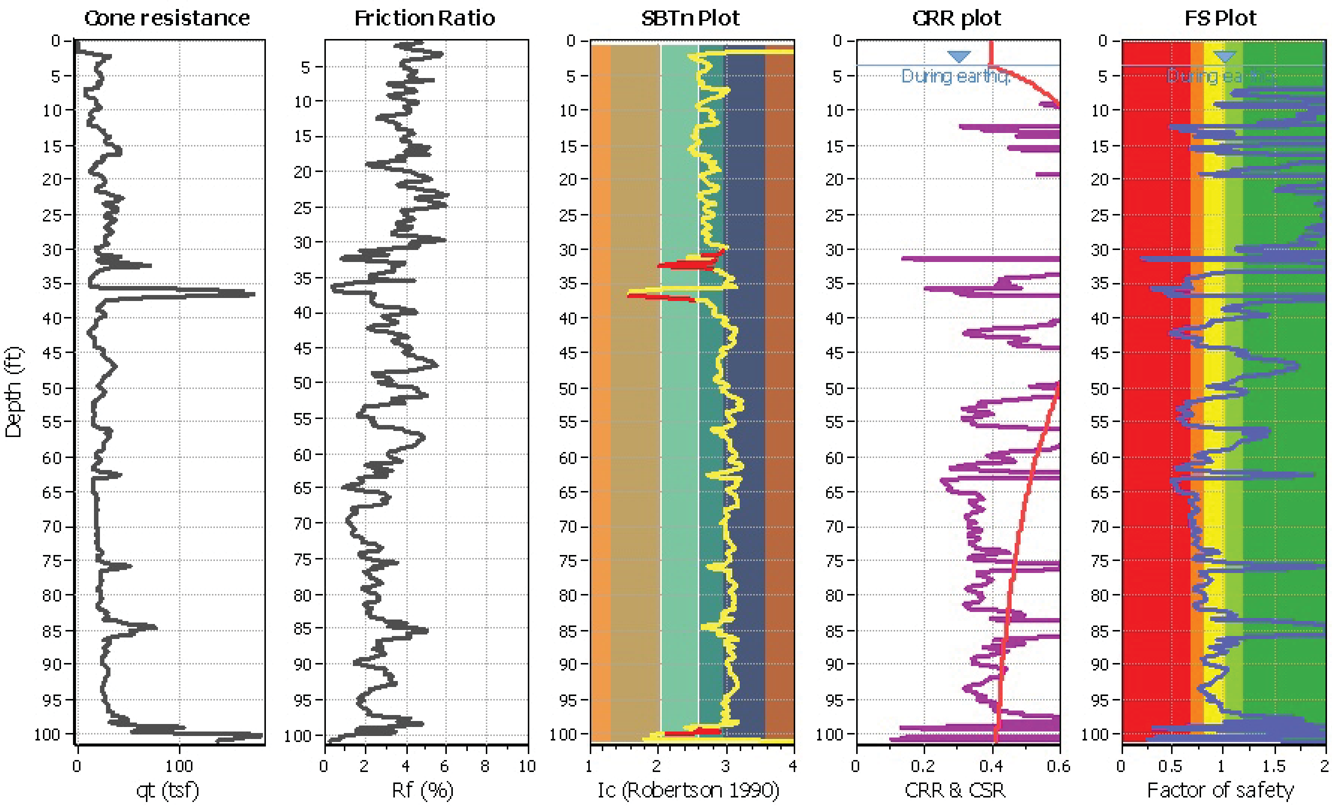
LIQUEFACTION ANALYSIS REPORT

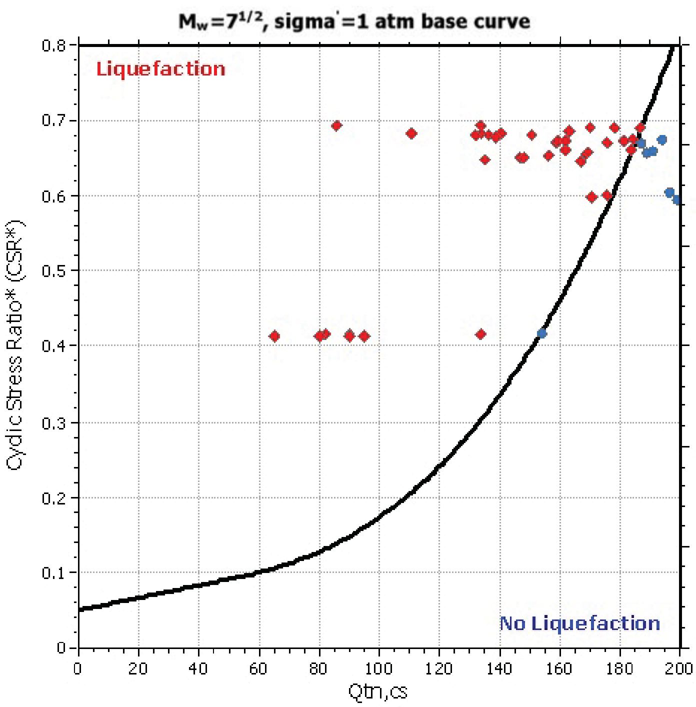
Project title : Caribbean 100 **Location : Sunnyvale, CA**

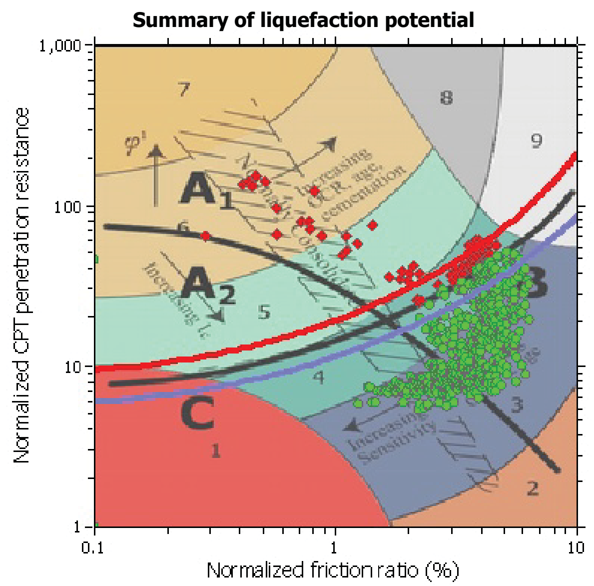
CPT file : 1-CPT08

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	7.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	No		



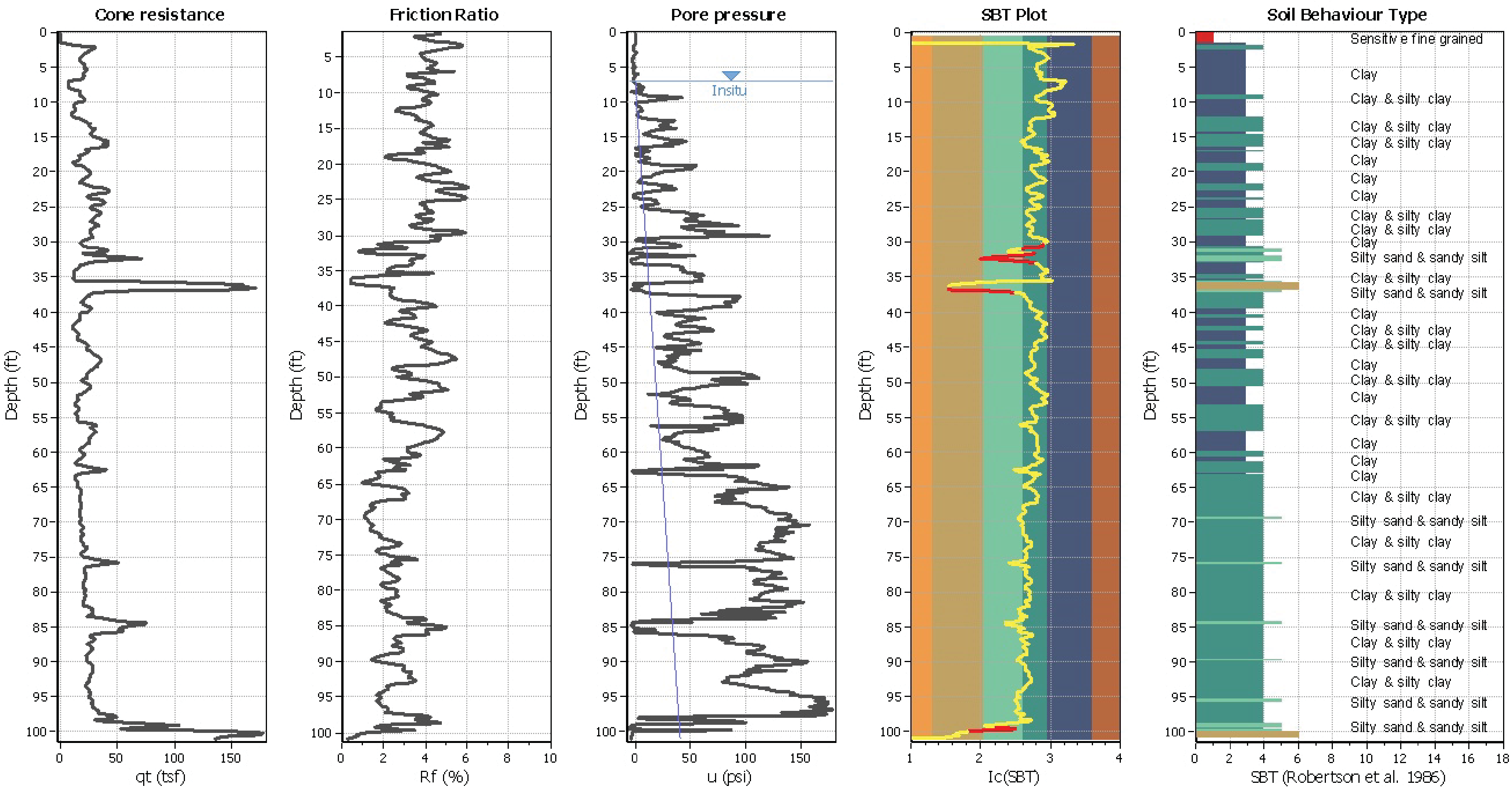




Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT name: 1-CPT08

CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

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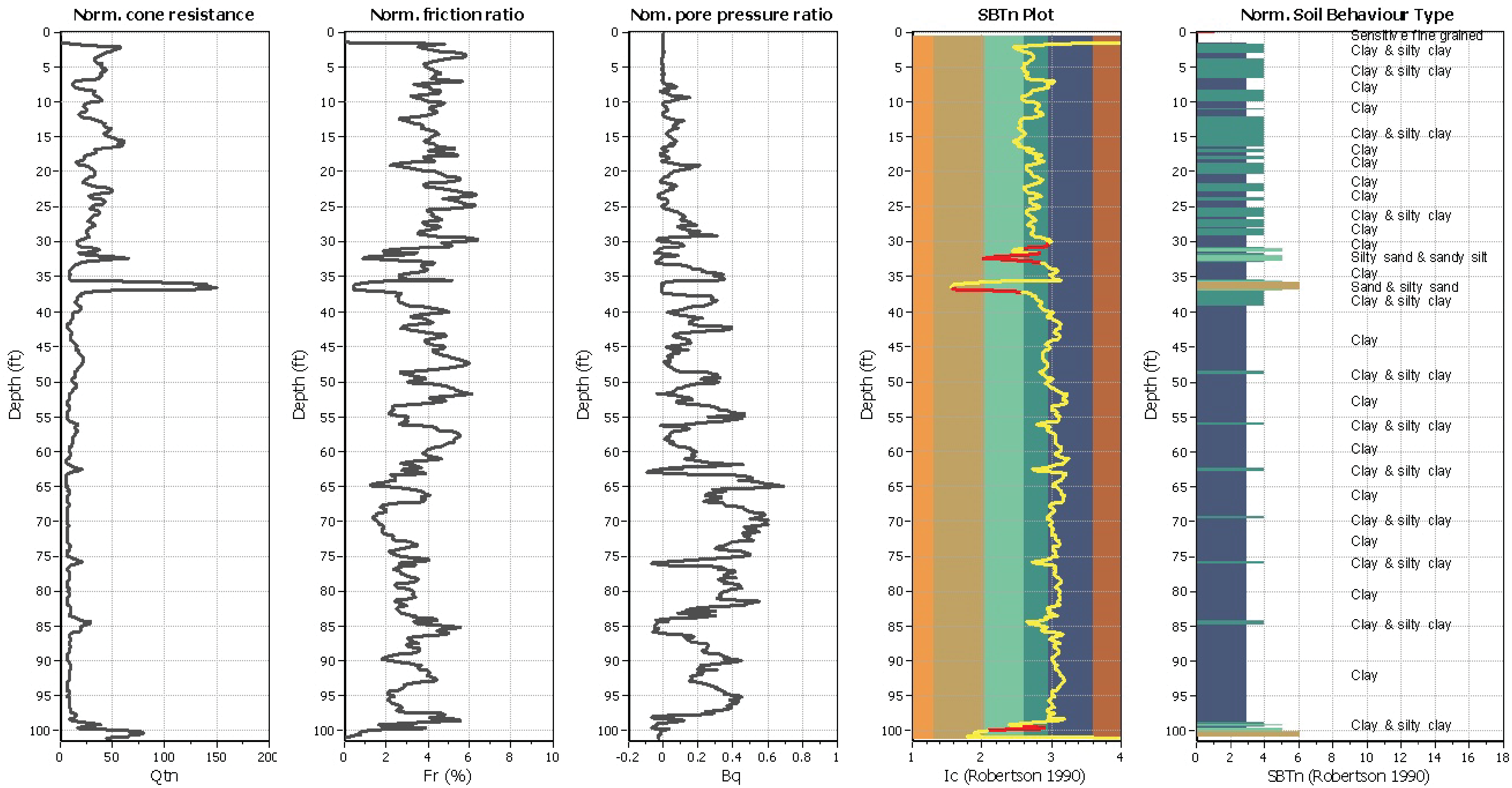
CPT name: 1-CPT08

CPT basic interpretation plots (normaliz



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

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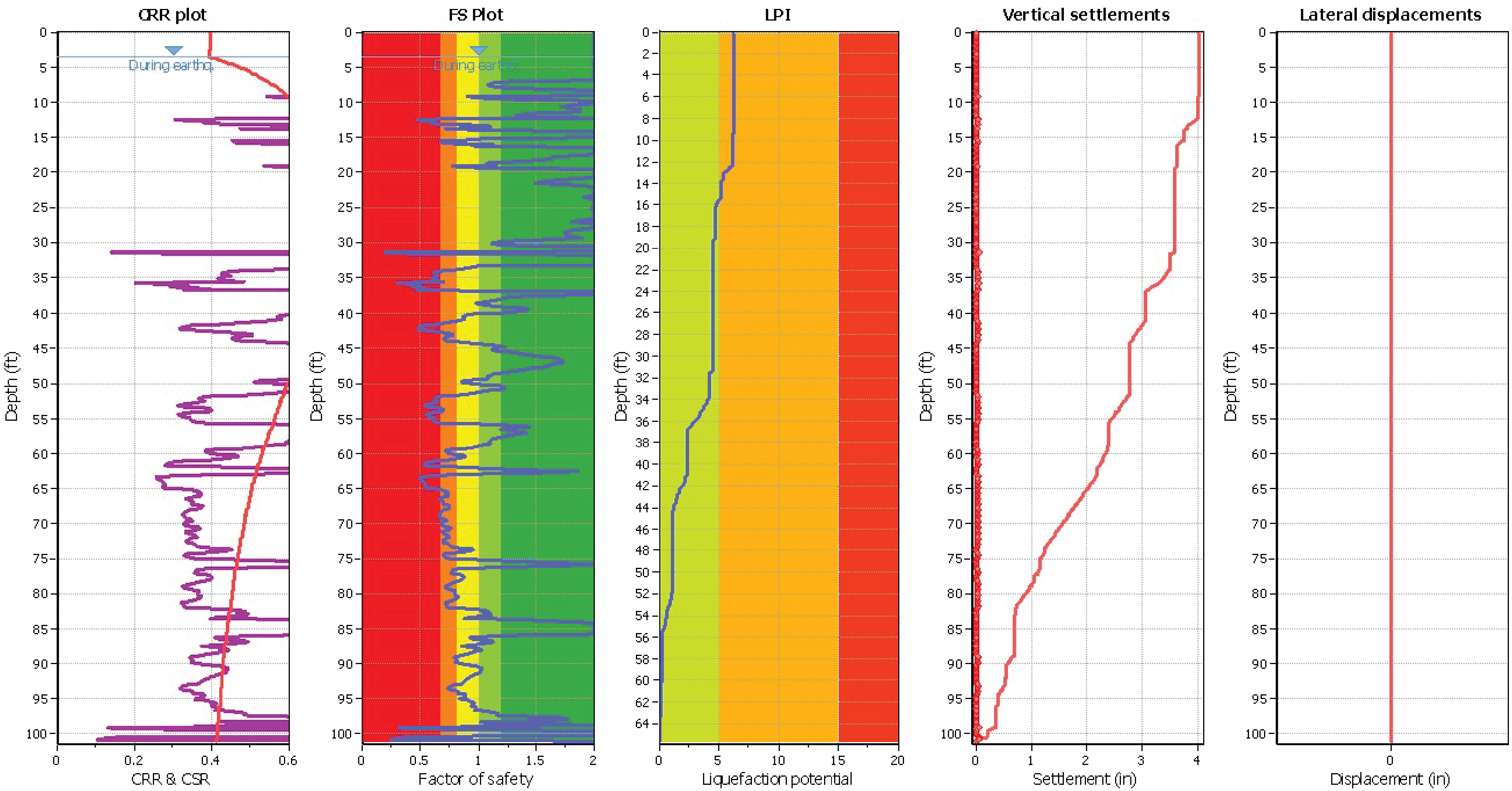
CPT name: 1-CPT08

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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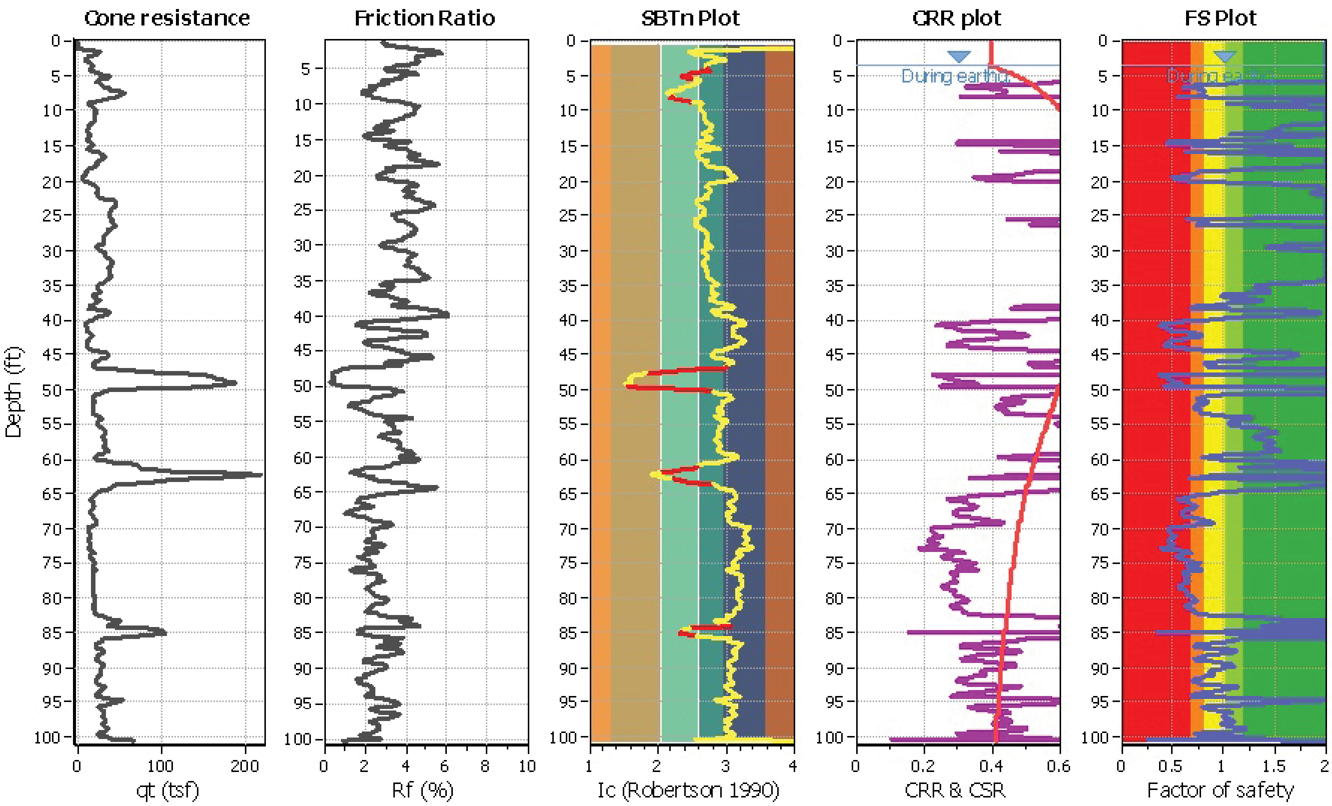
LIQUEFACTION ANALYSIS REPORT

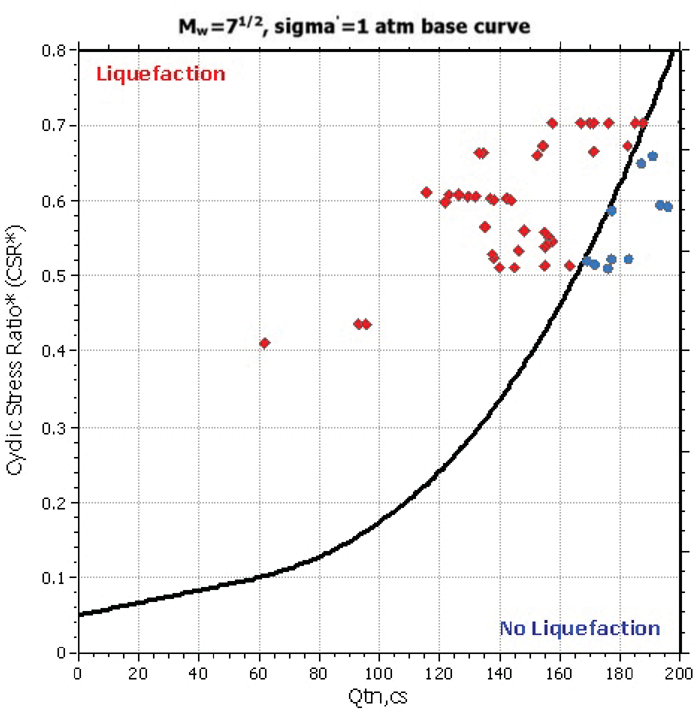
Project title : Caribbean 100 **Location : Sunnyvale, CA**

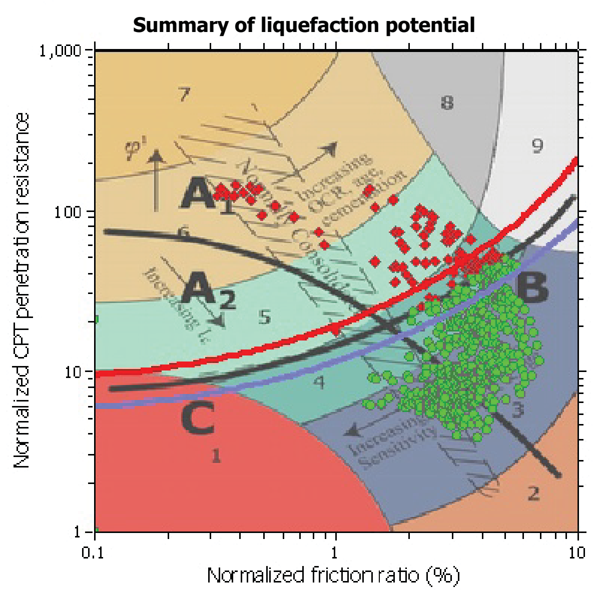
CPT file : 1-CPT09

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	7.20 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	No		

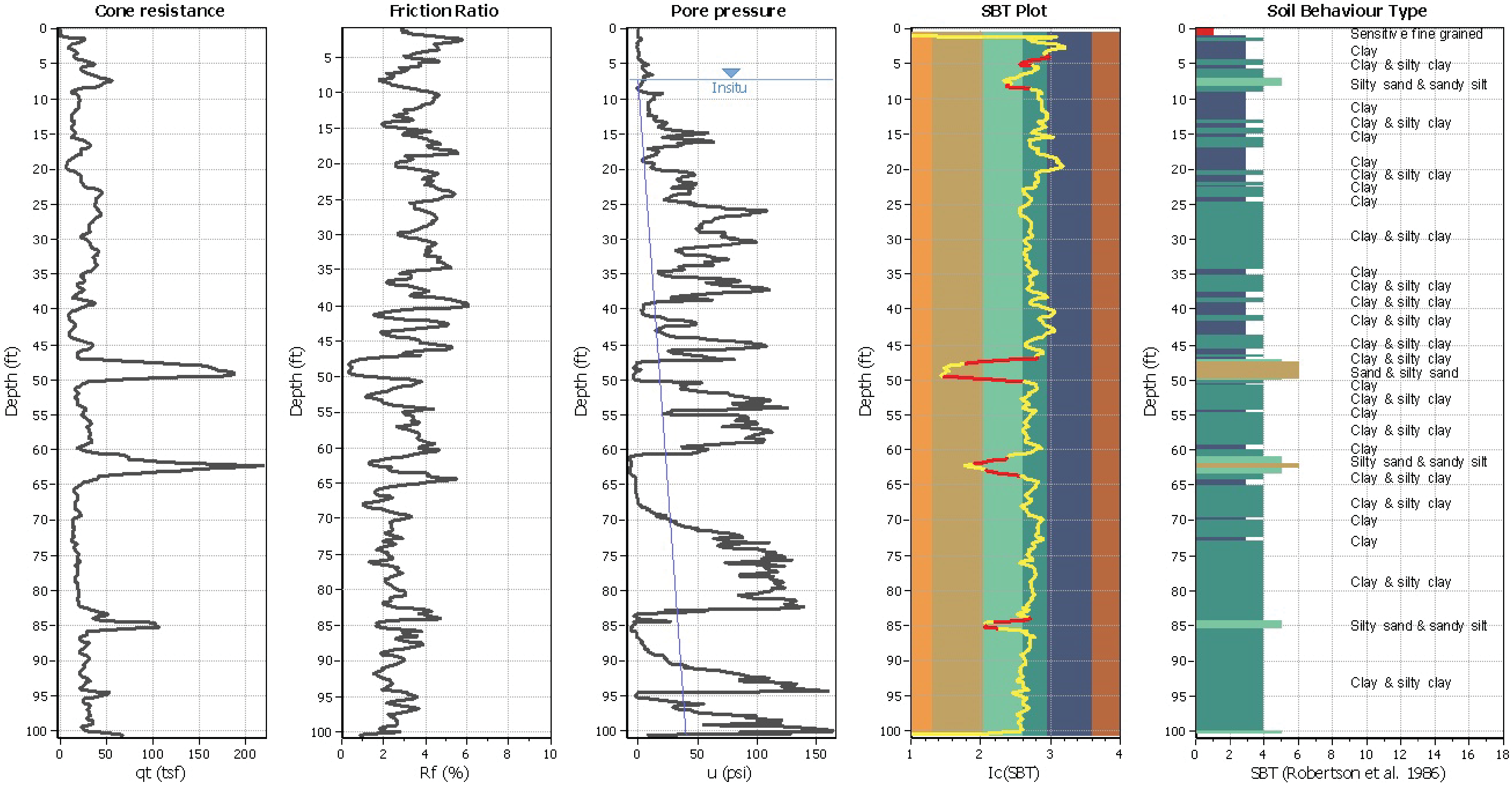






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.20 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

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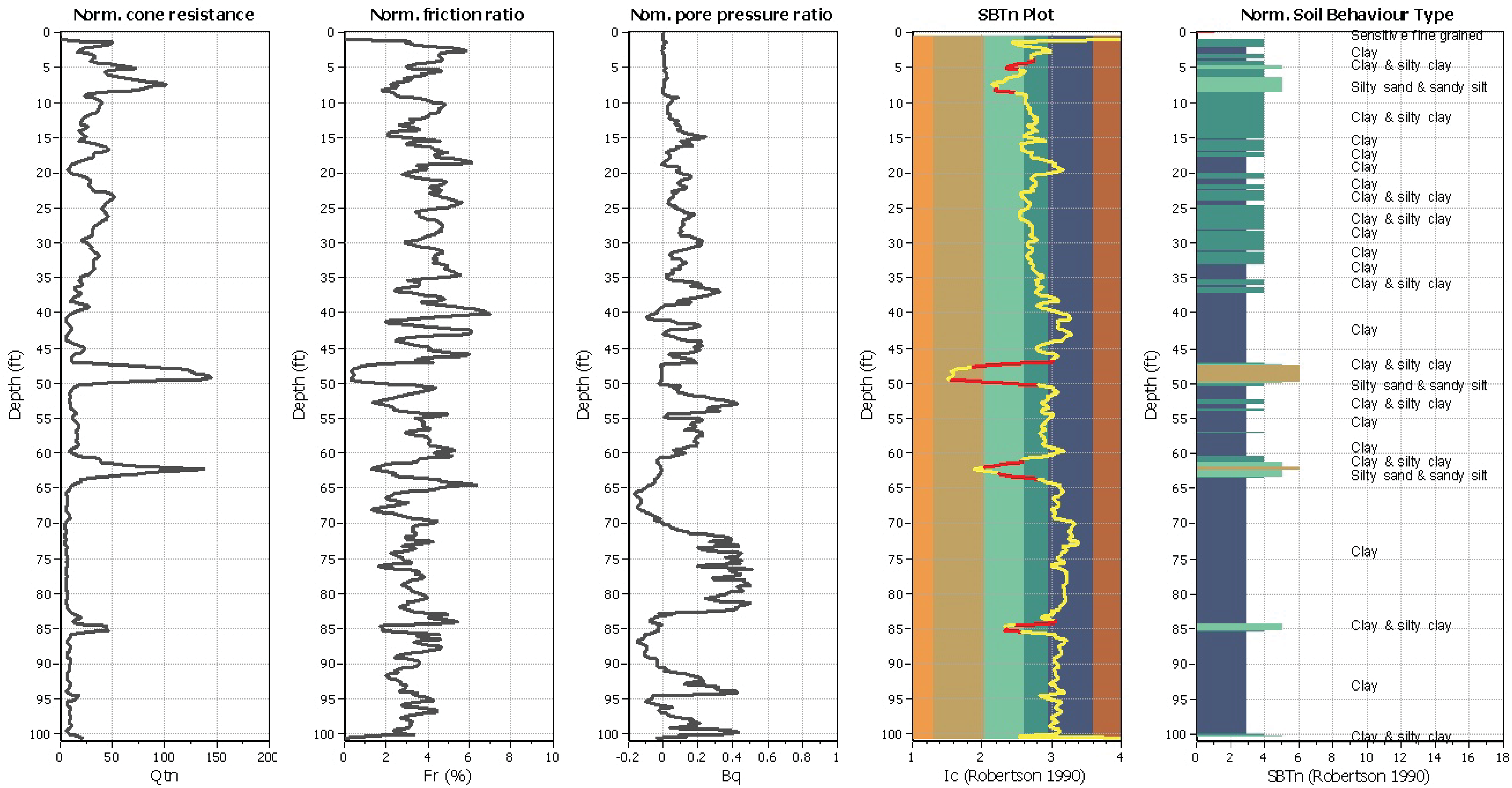
CPT name: 1-CPT09

CPT basic interpretation plots (normaliz



Input parameters and analysis data

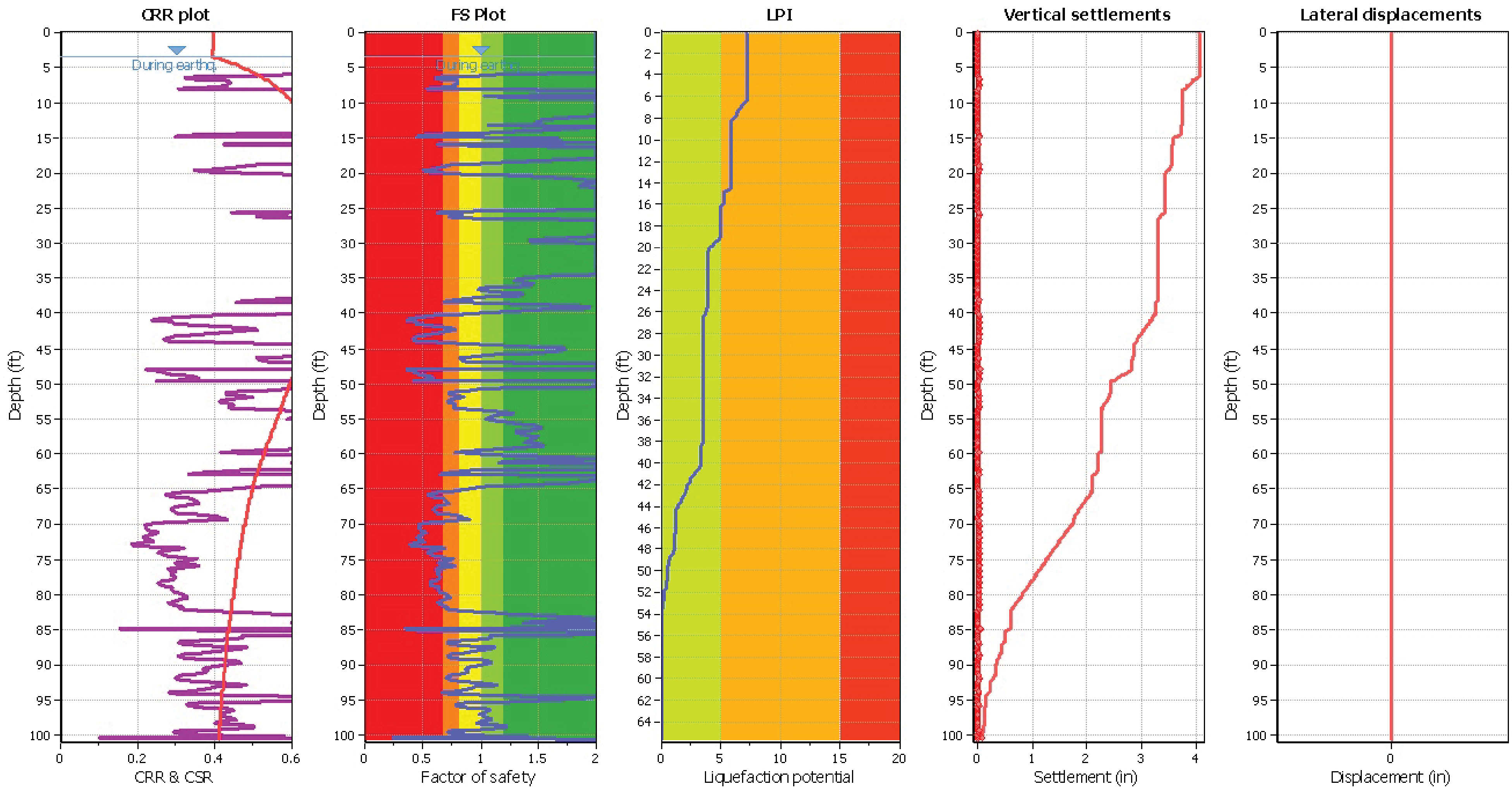
Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.20 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

CPT name: 1-CPT09

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.20 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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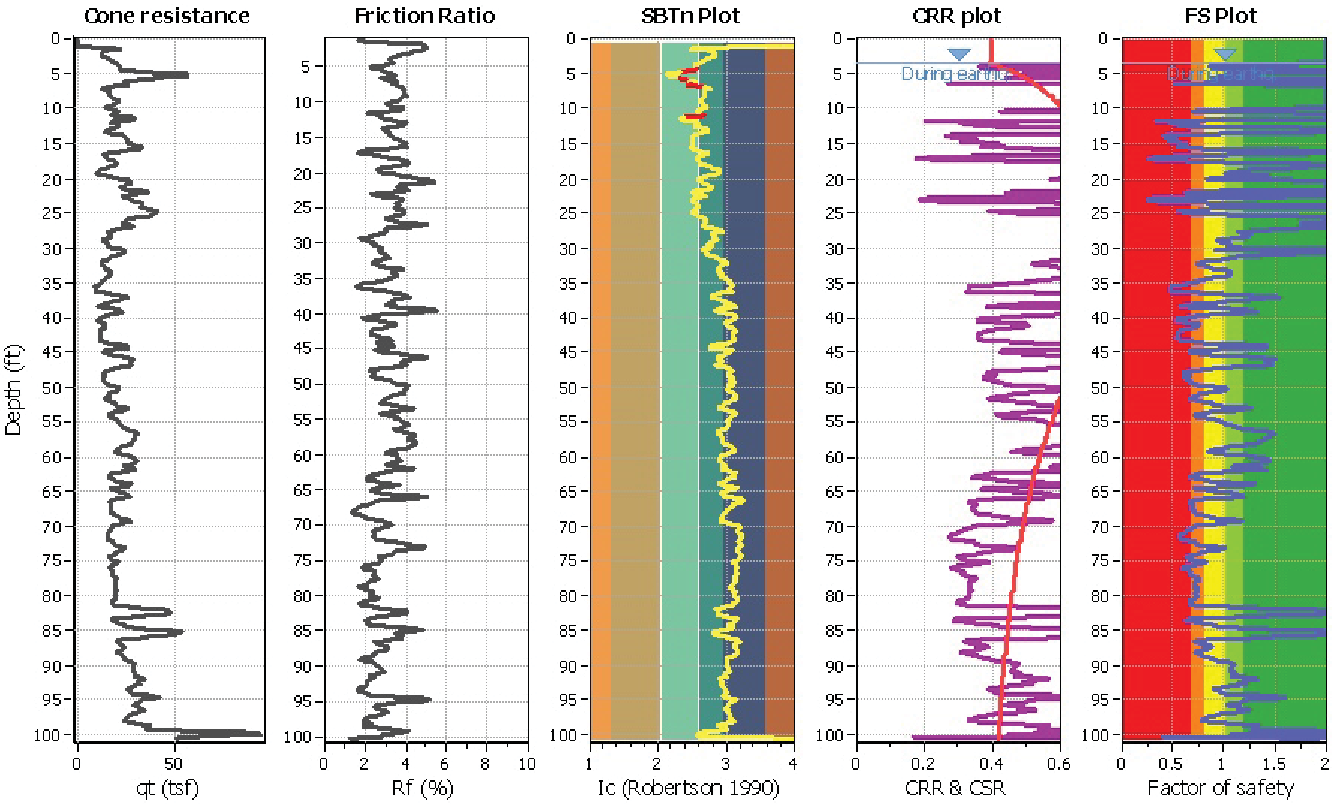
LIQUEFACTION ANALYSIS REPORT

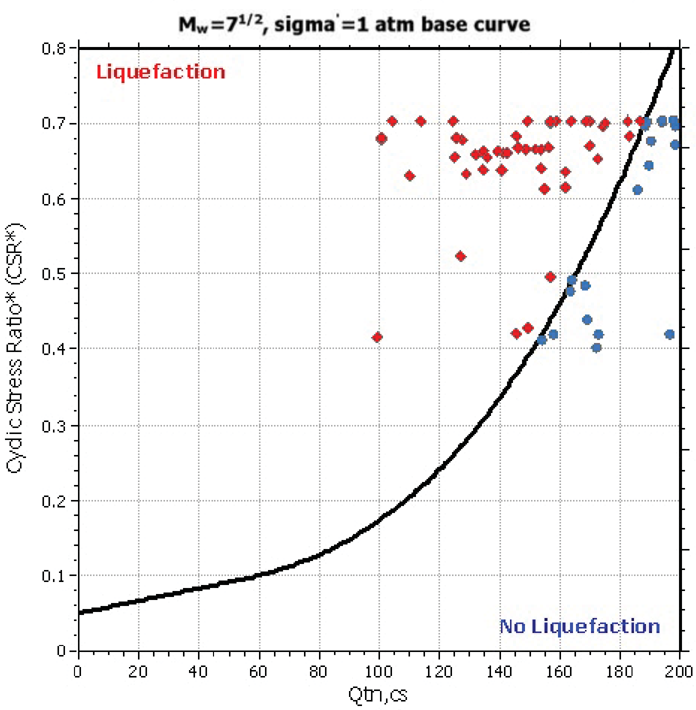
Project title : Caribbean 100 **Location : Sunnyvale, CA**

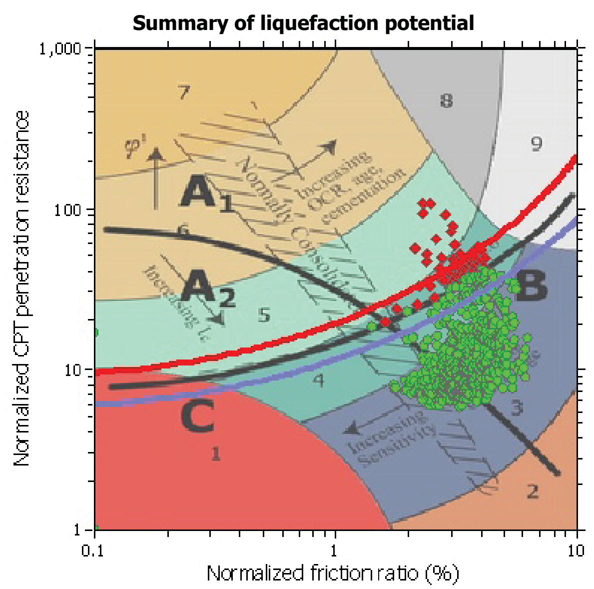
CPT file : 1-CPT10

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	3.70 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	No		



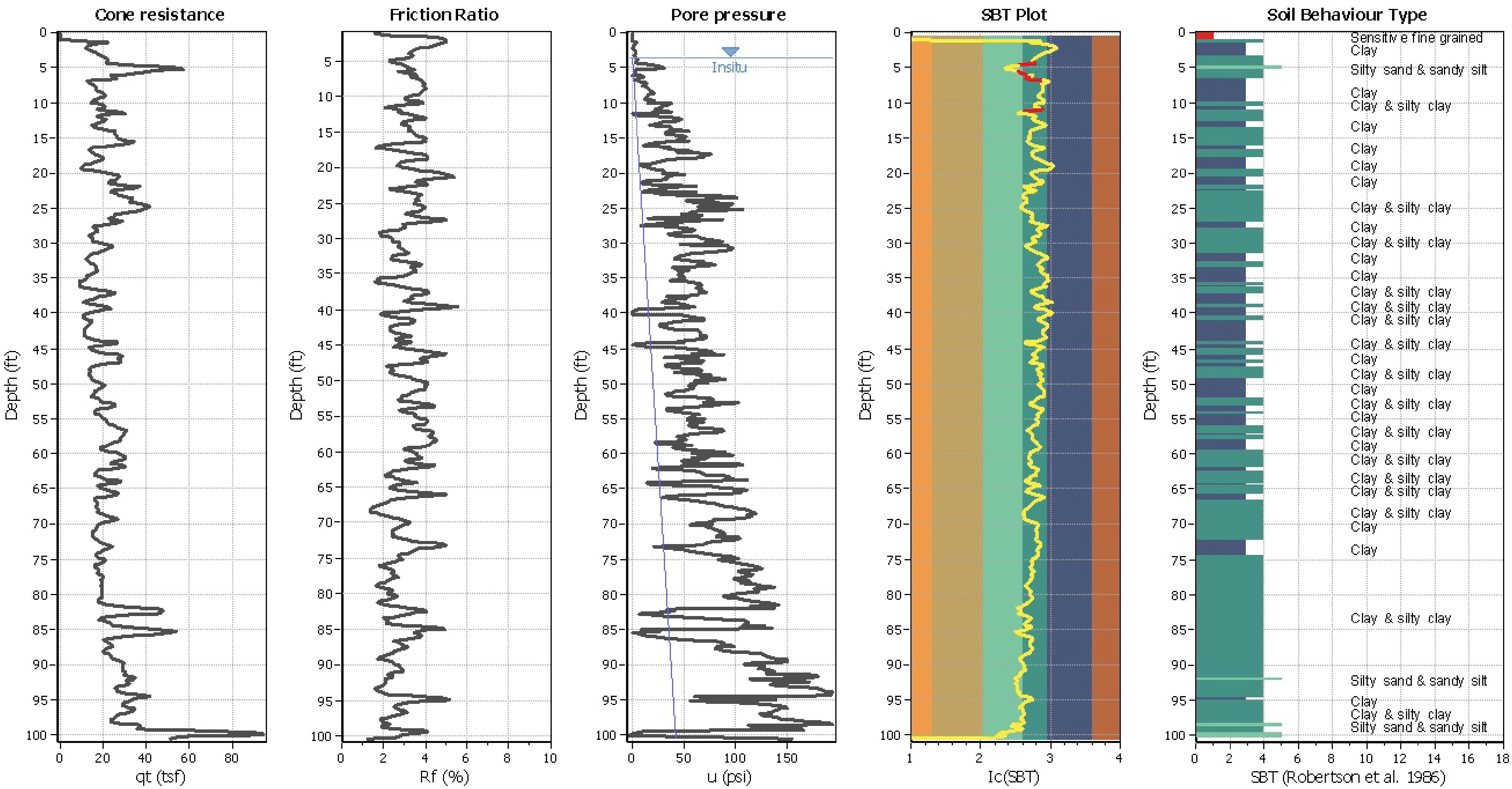




Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT name: 1-CPT10

CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.70 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

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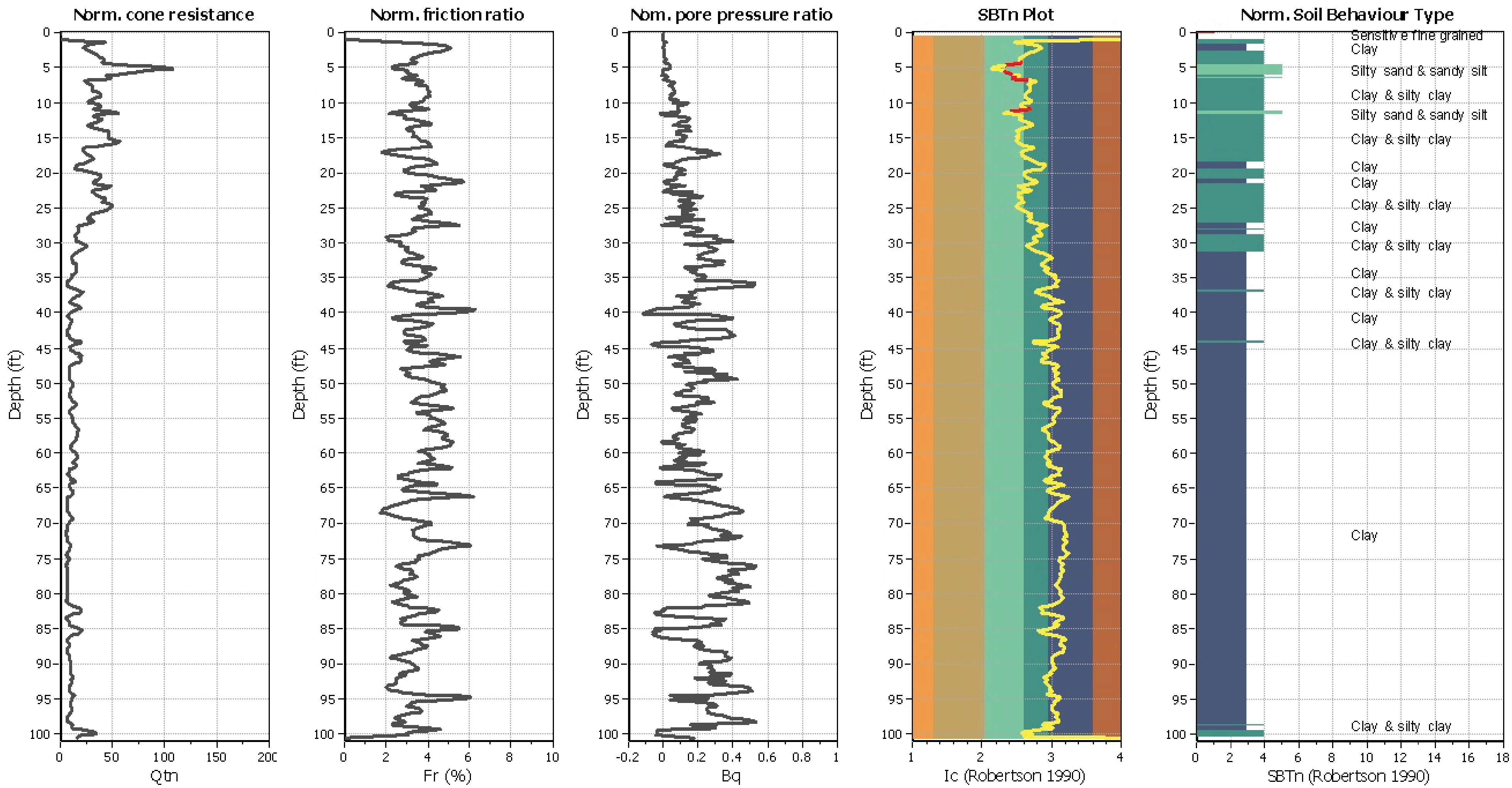
CPT name: 1-CPT10

CPT basic interpretation plots (normaliz



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.70 ft	Fill height:	N/A	Limit depth:	N/A

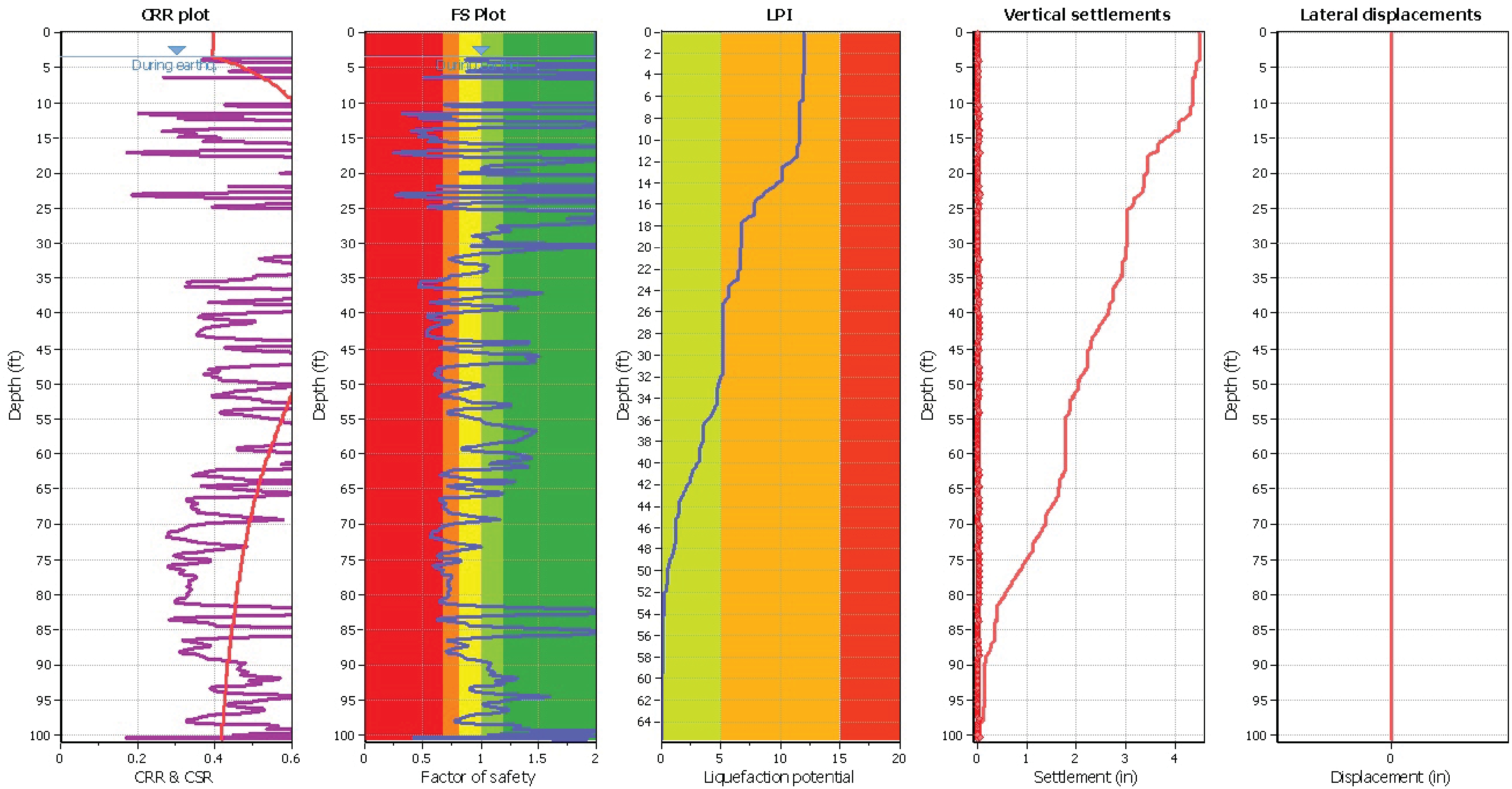
SBTn legend

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

This software is licensed to: ENGEO Incorporated

CPT name: 1-CPT10

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.70 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

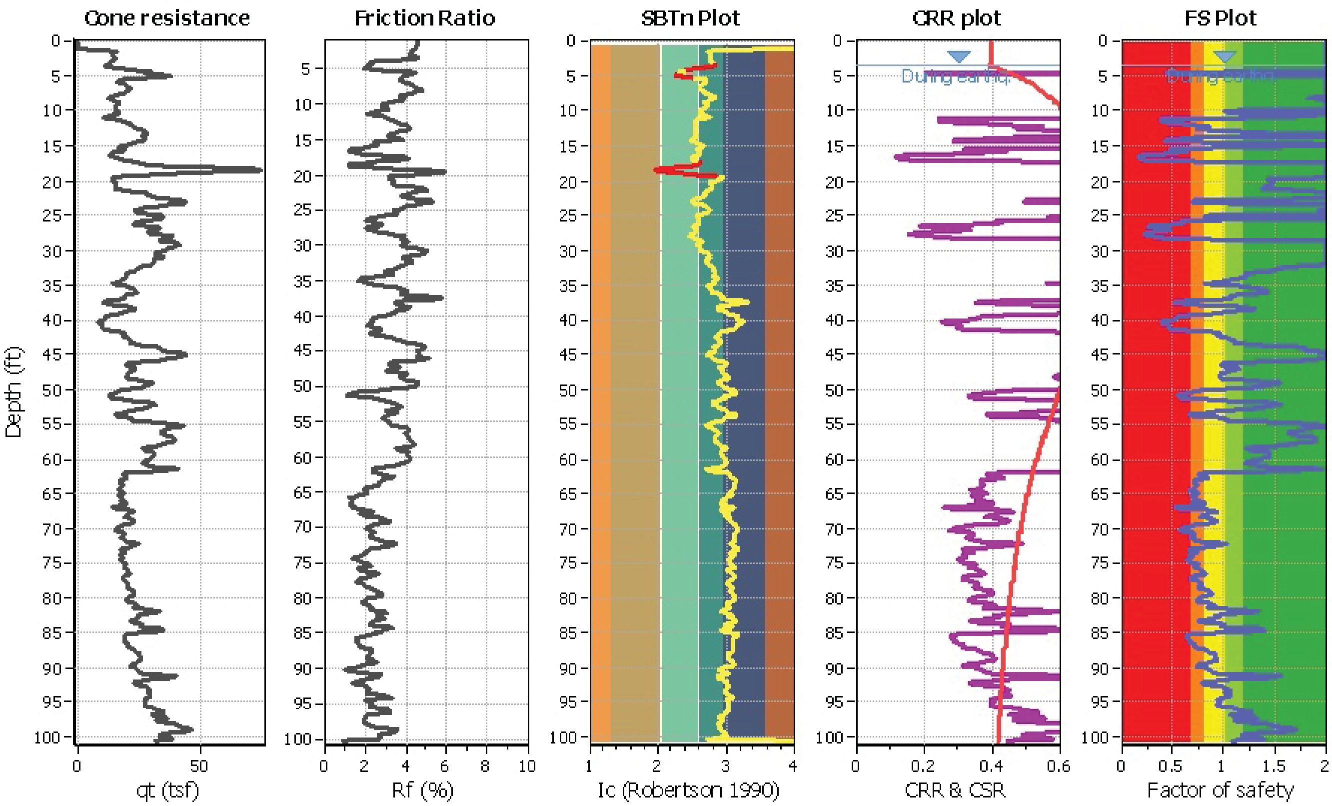
LIQUEFACTION ANALYSIS REPORT

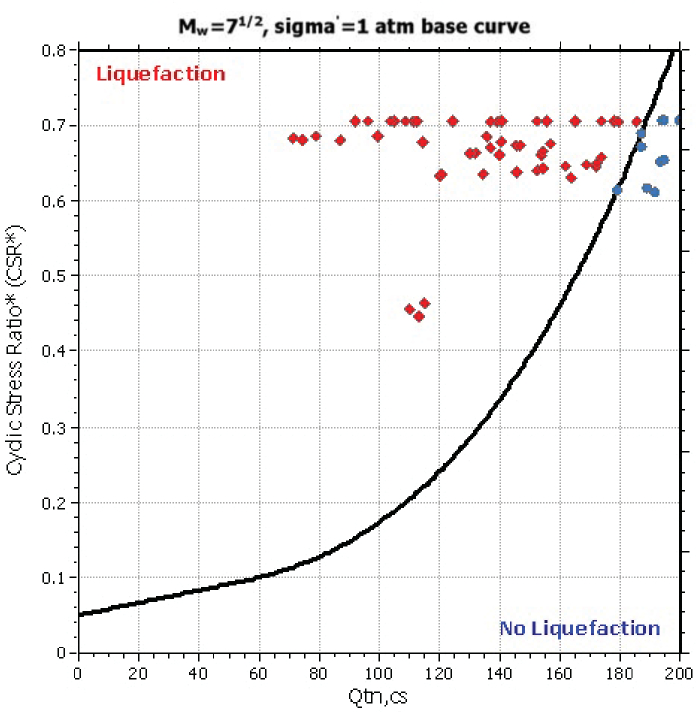
Project title : Caribbean 100 **Location : Sunnyvale, CA**

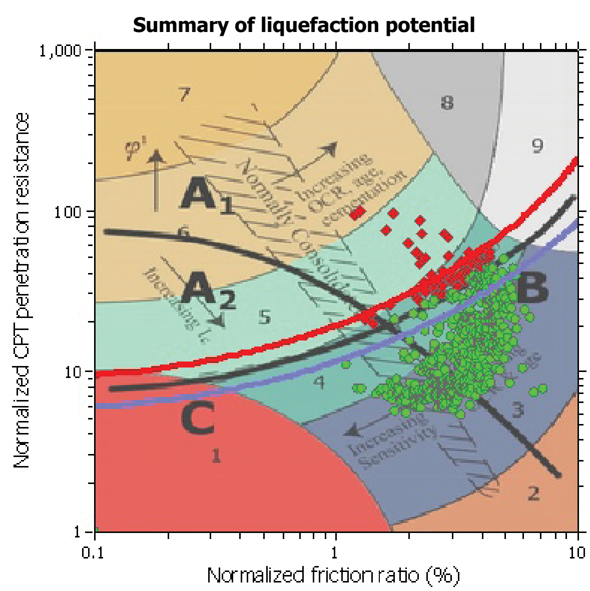
CPT file : 1-CPT11

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	4.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	No		







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

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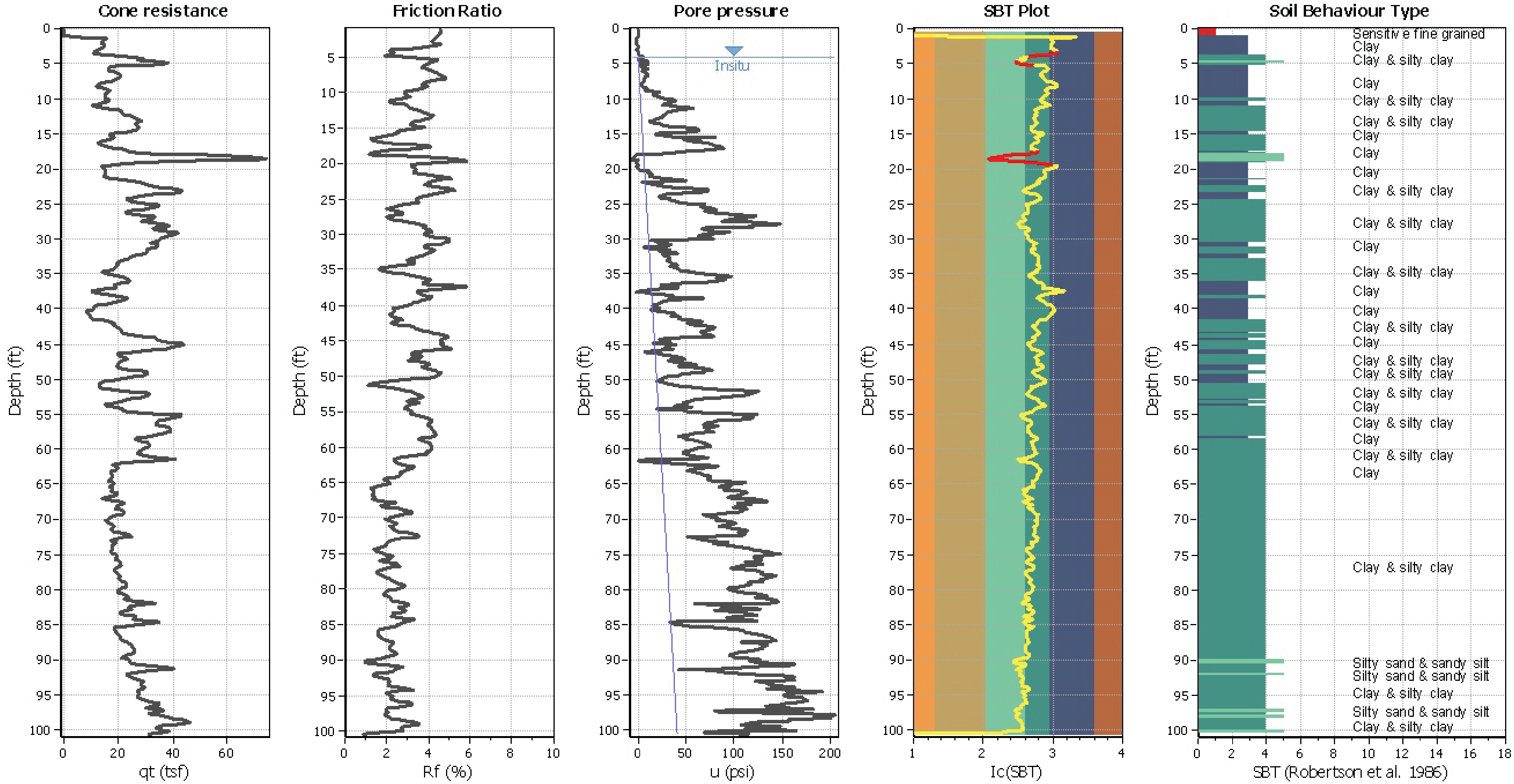
CPT name: 1-CPT11

CPT basic interpretation plo



Input parameters and analysis data

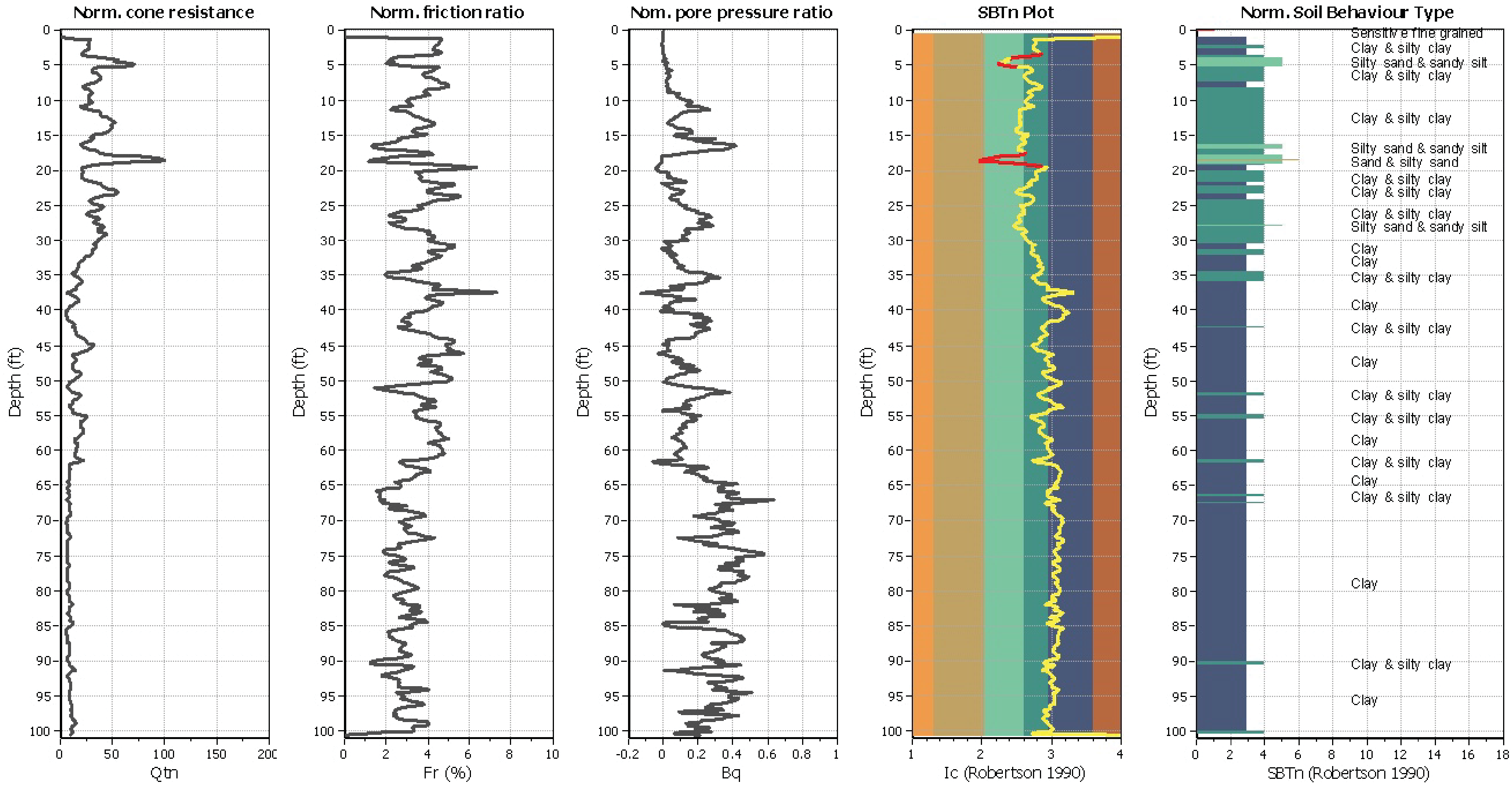
Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

This software is licensed to: ENGEO Incorporated — CPT name: 1-CPT11

CPT basic interpretation plots (normaliz



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

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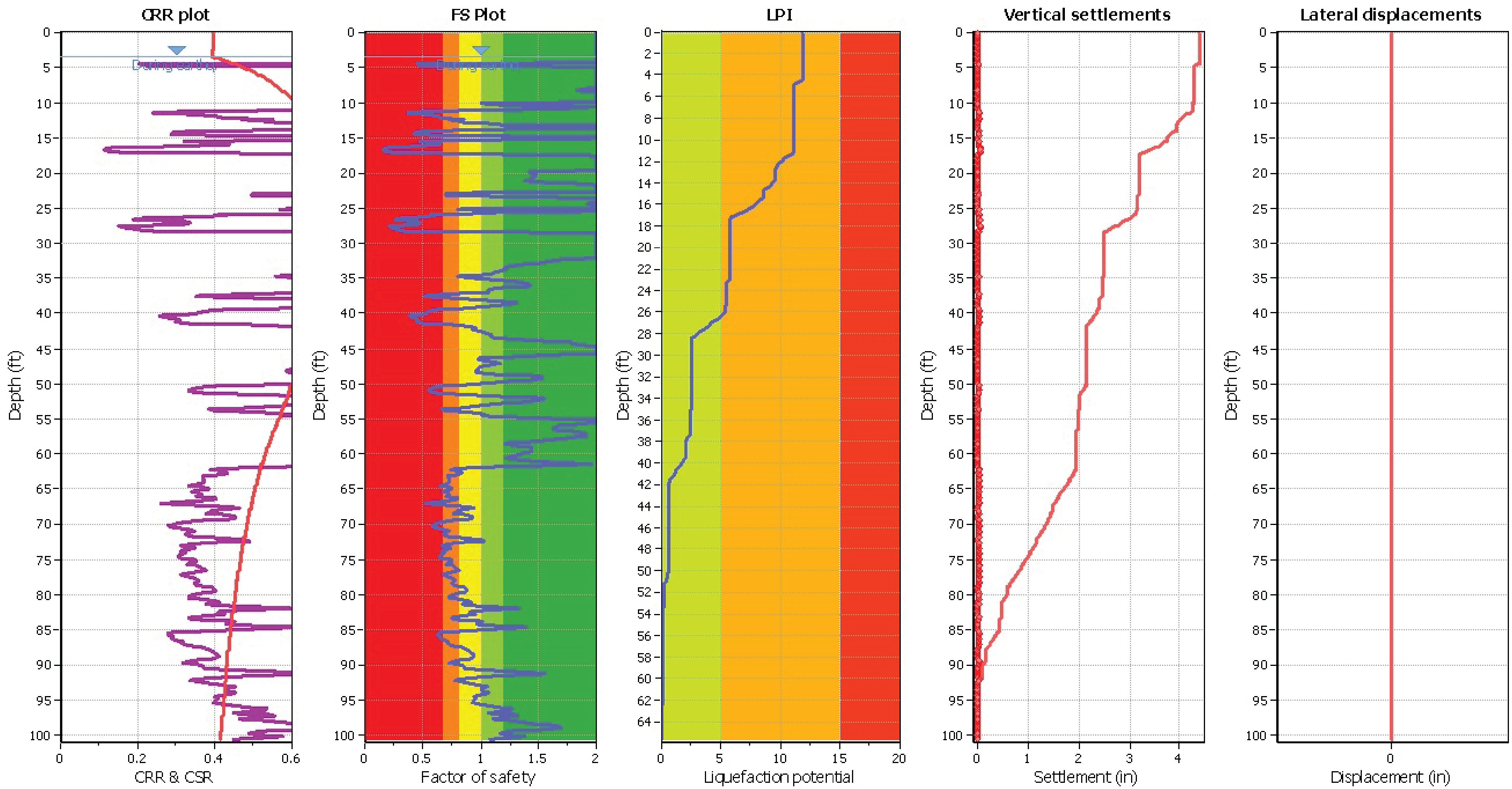
CPT name: 1-CPT11

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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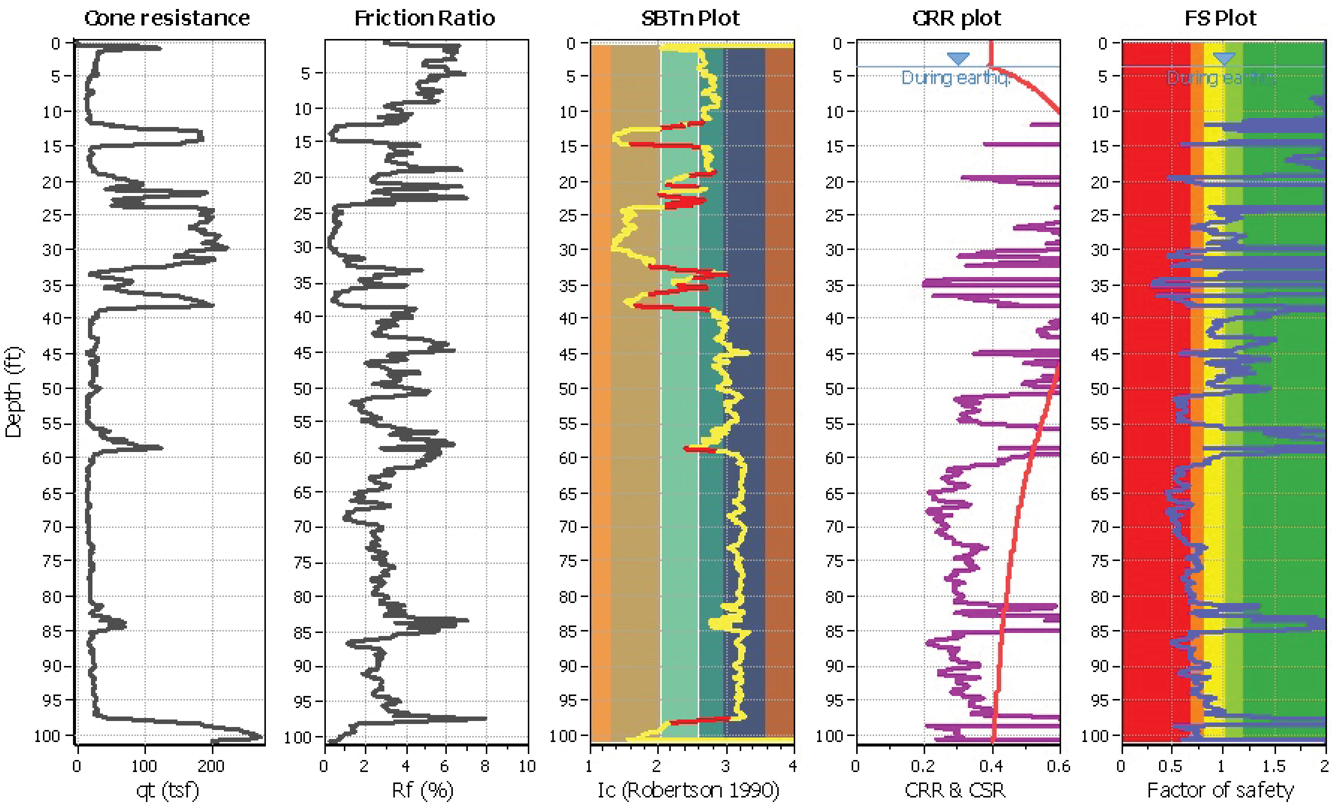
LIQUEFACTION ANALYSIS REPORT

Project title : Caribbean 100 **Location : Sunnyvale, CA**

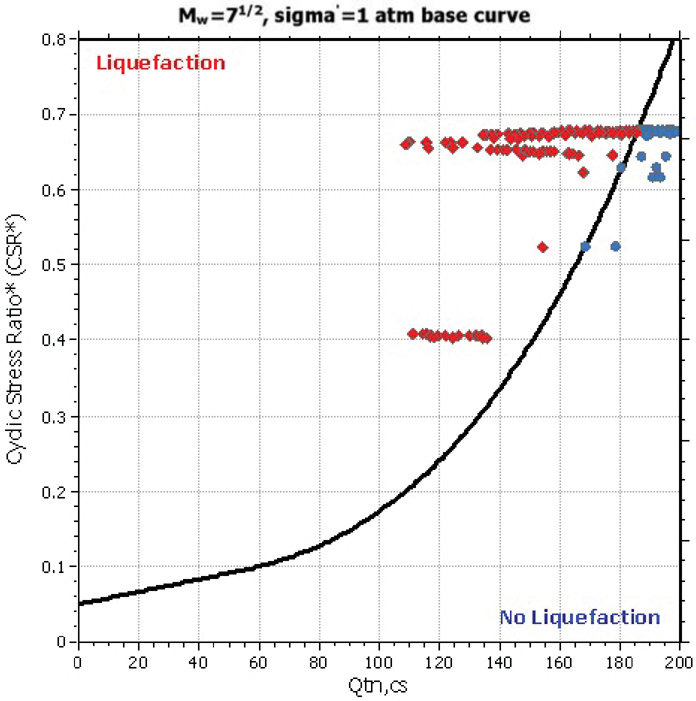
CPT file : 1-CPT12

Input parameters and analysis data

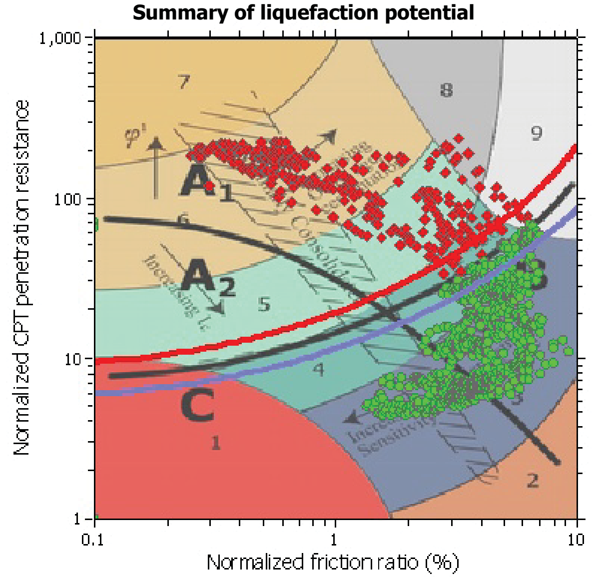
Analysis method:	Robertson (2009)	G.W.T. (in-situ):	7.30 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	No		



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



Summary of liquefaction potential



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

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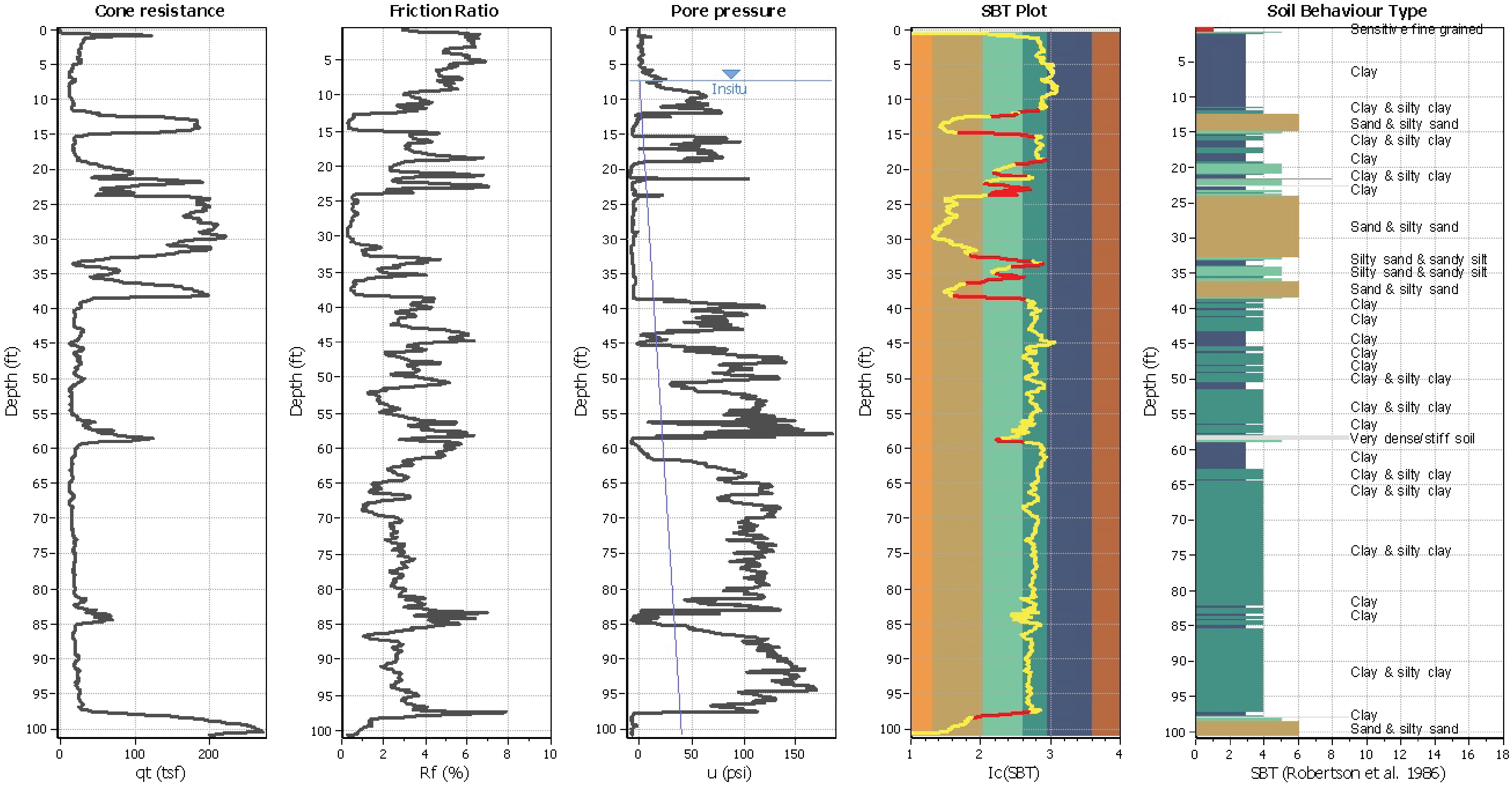
CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.30 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

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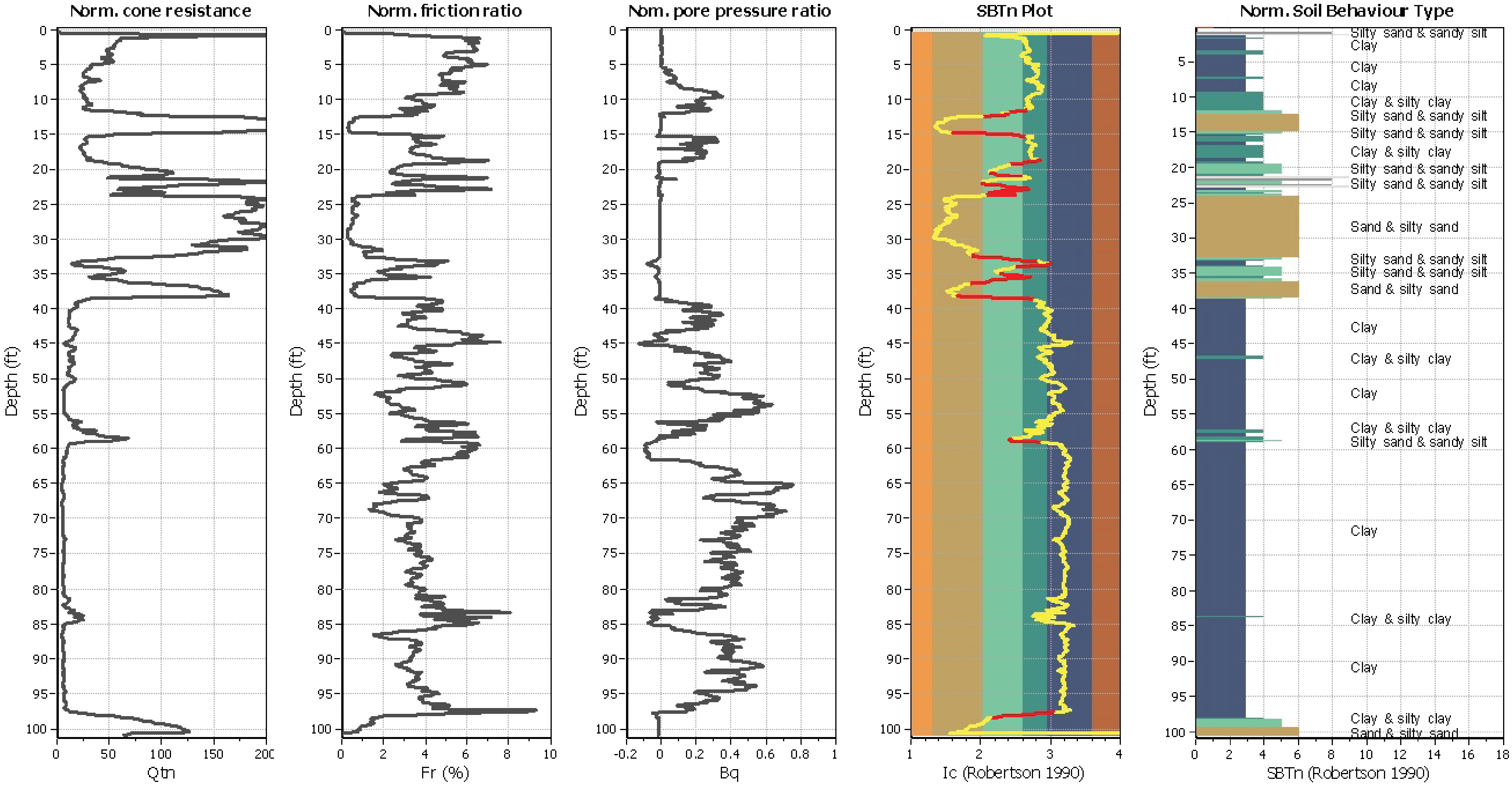
CPT name: 1-CPT12

CPT basic interpretation plots (normaliz



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.30 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

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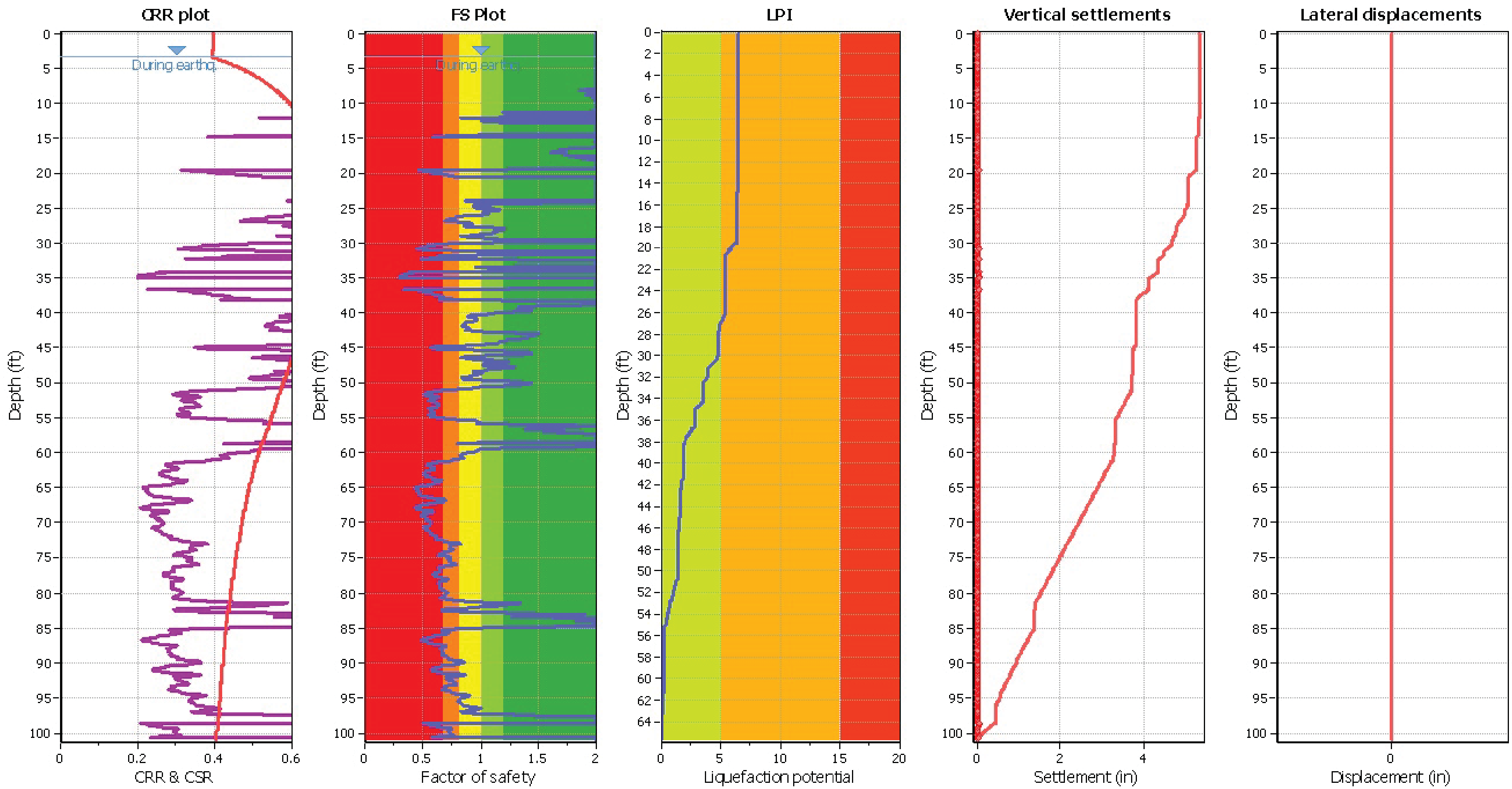
CPT name: 1-CPT12

Liquefaction analysis overall plot



Input parameters and analysis data

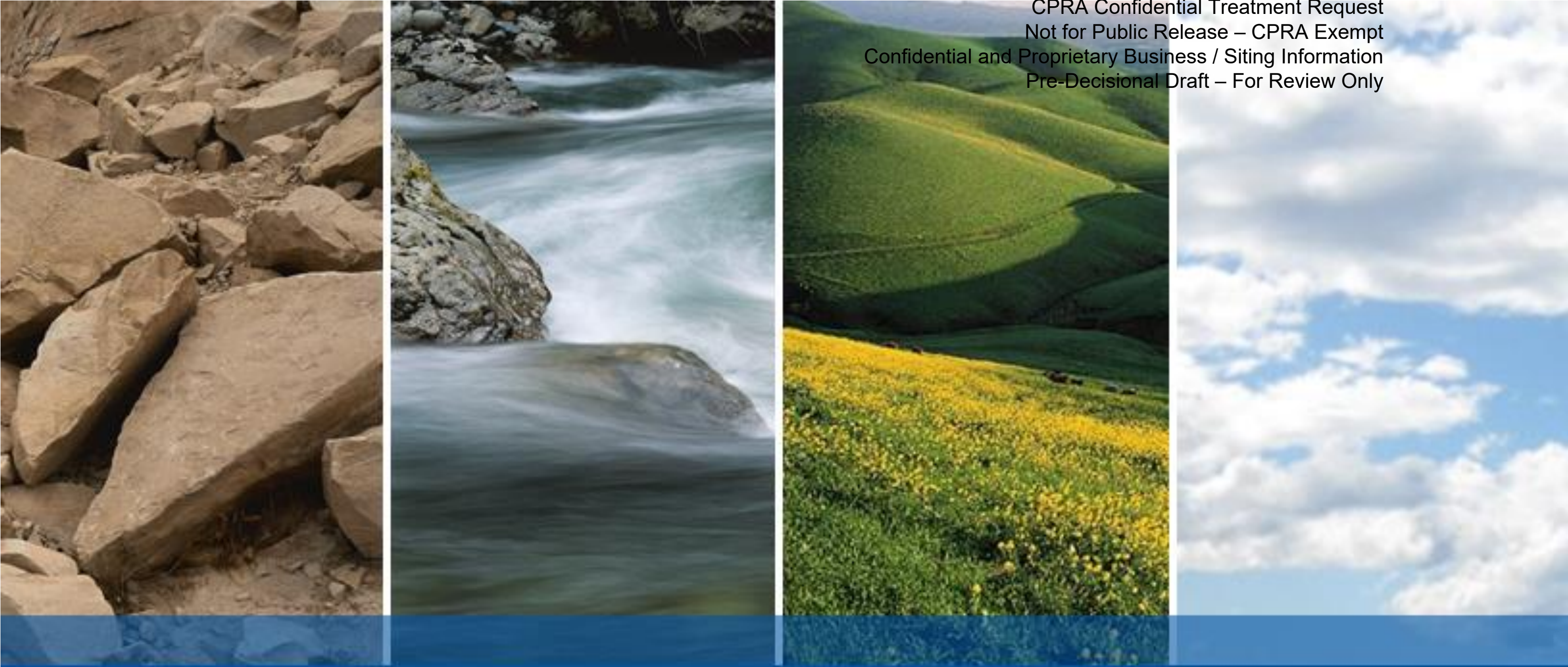
Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.30 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk



APPENDIX C

PRELIMINARY LIQUEFACTION ANALYSIS (BOULANGER & IDRISS, 2014)

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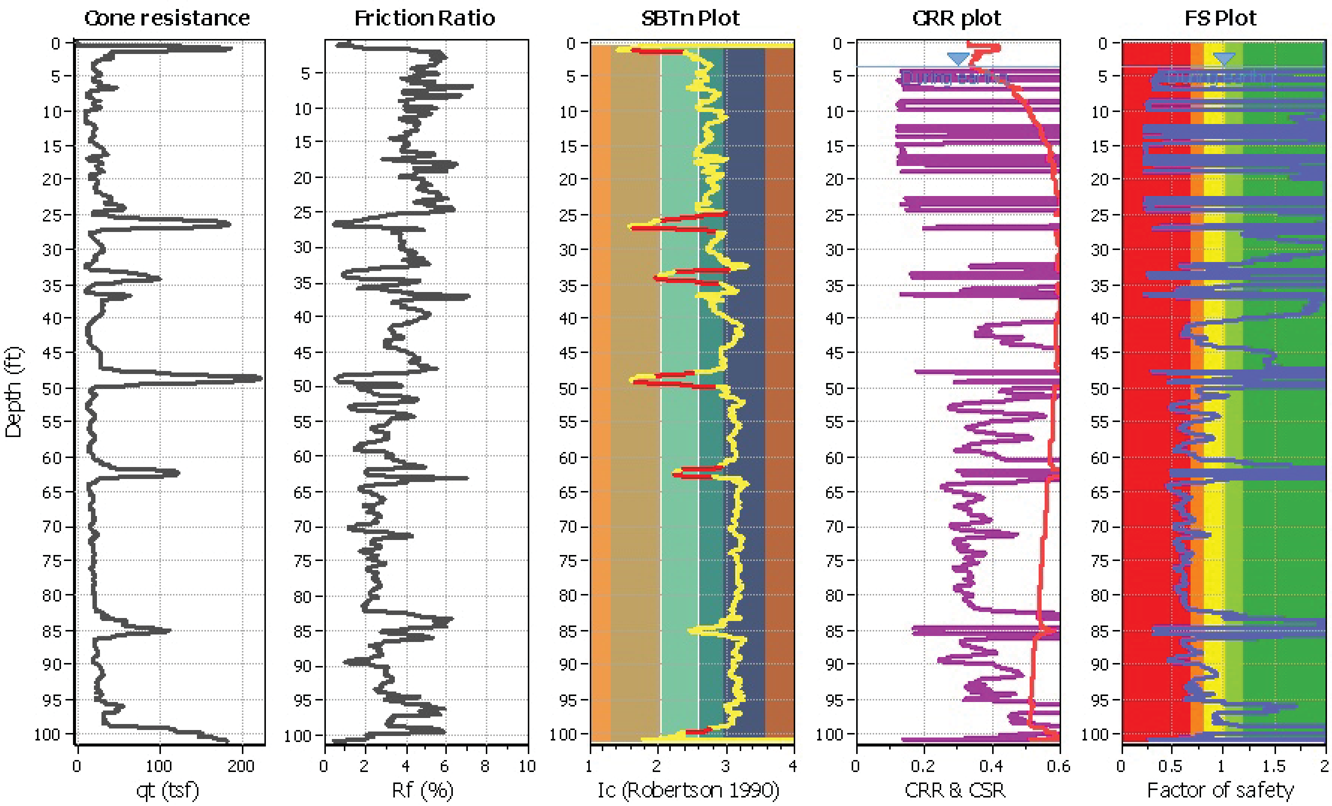
LIQUEFACTION ANALYSIS REPORT

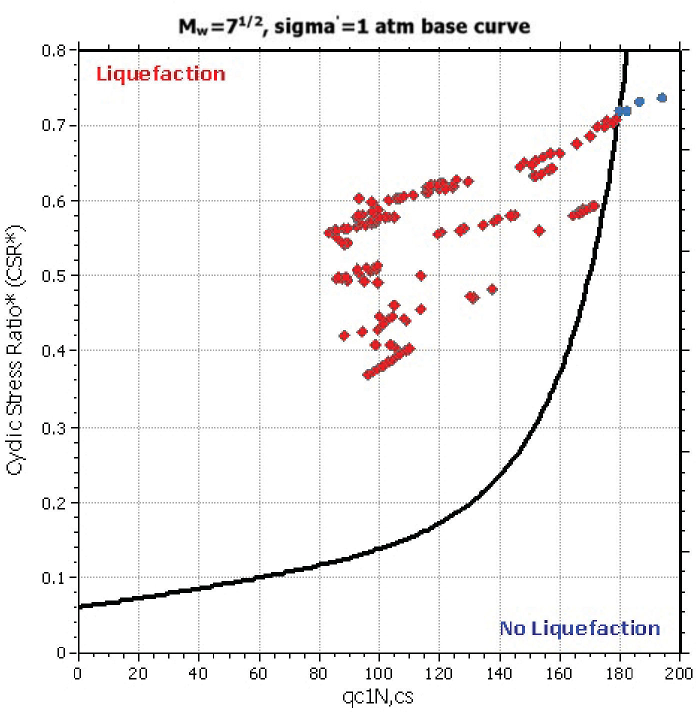
Project title : Caribbean 100 **Location : Sunnyvale, CA**

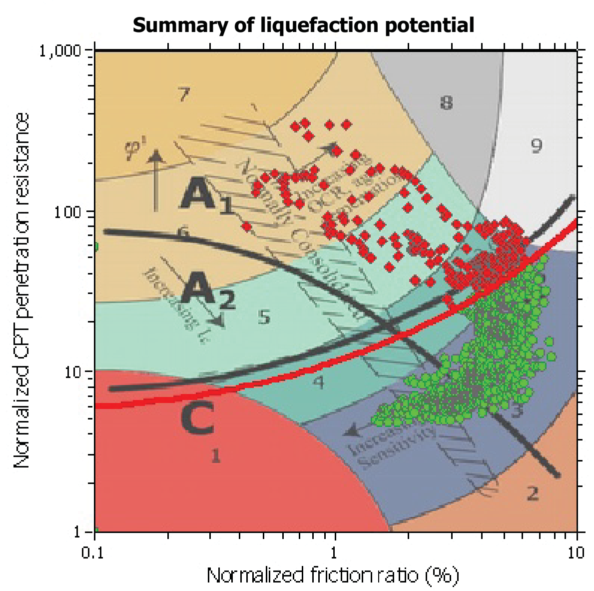
CPT file : 1-CPT07

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.70 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.70	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







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

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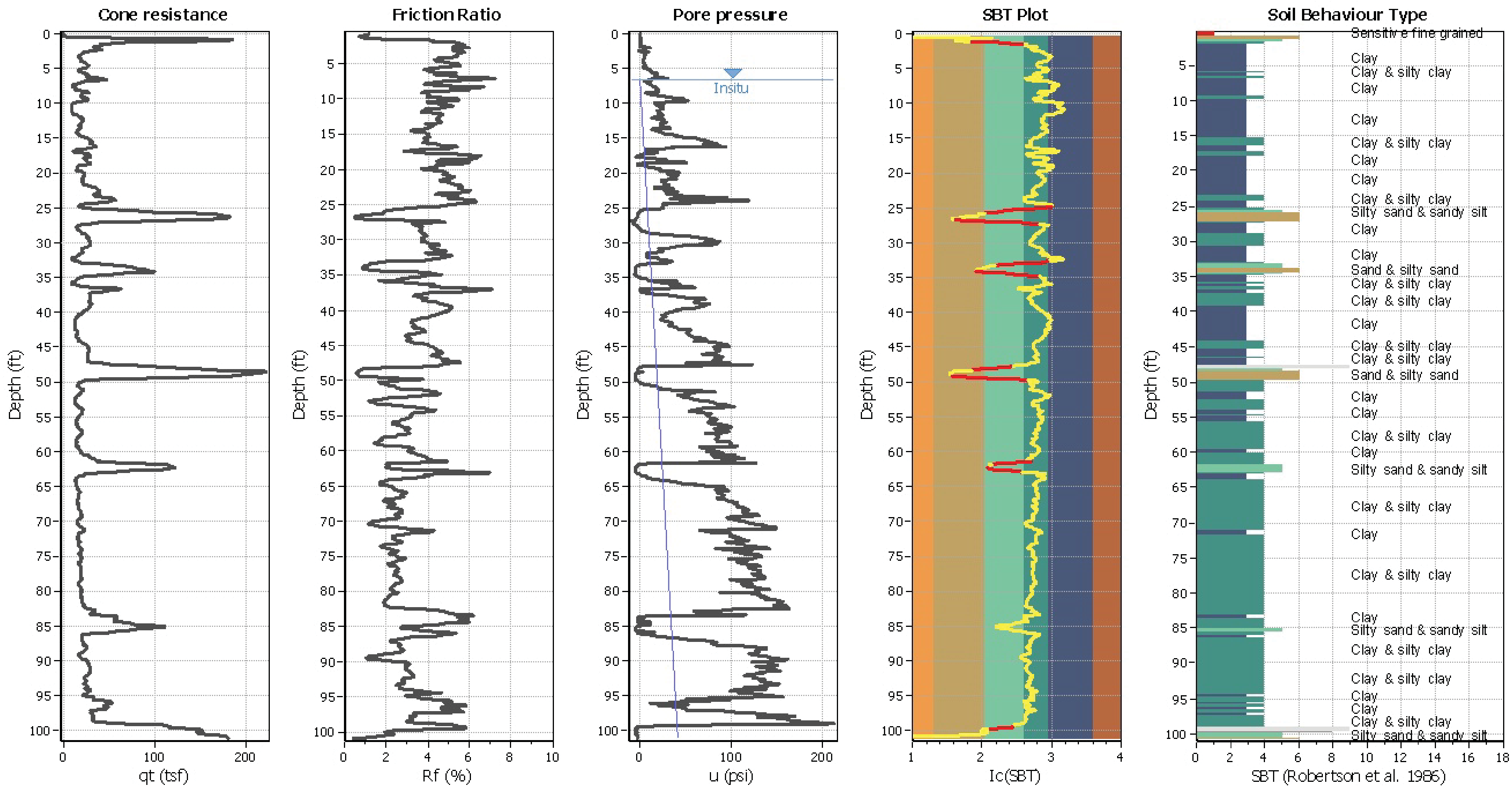
CPT name: 1-CPT07

CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.70 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

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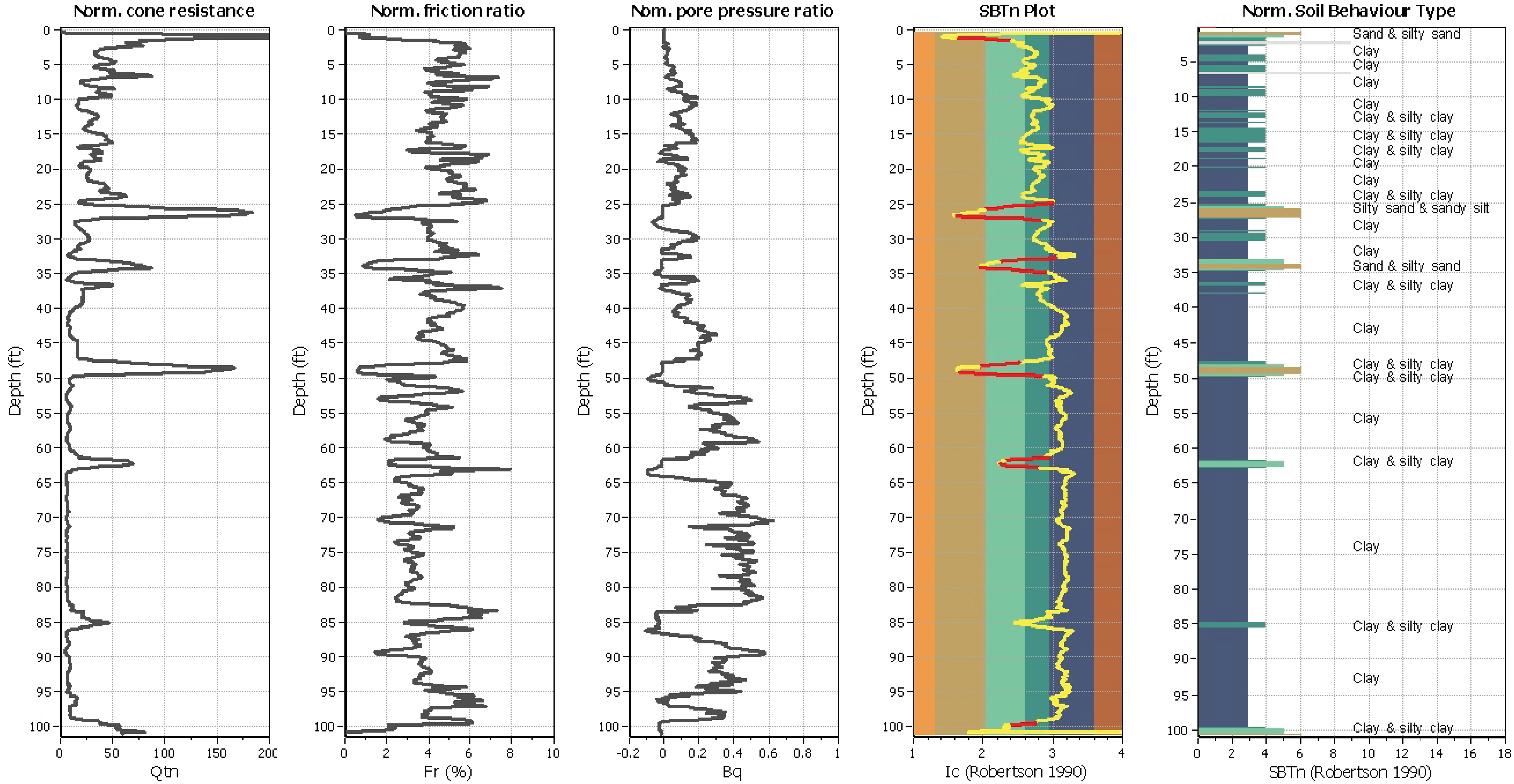
CPT name: 1-CPT07

CPT basic interpretation plots (normaliz



Input parameters and analysis data

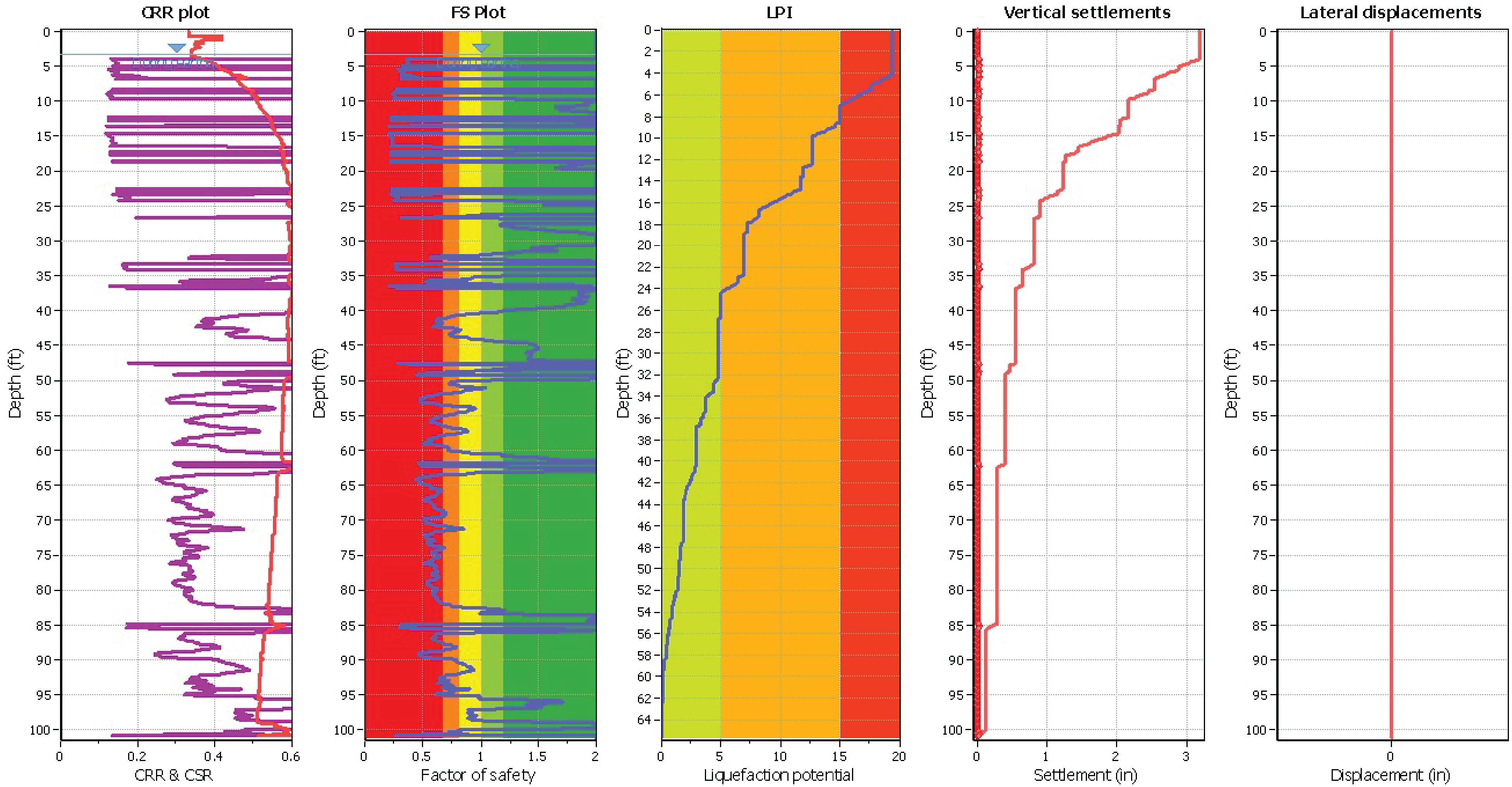
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.70 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

This software is licensed to: ENGEO Incorporated CPT name: 1-CPT07

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.70 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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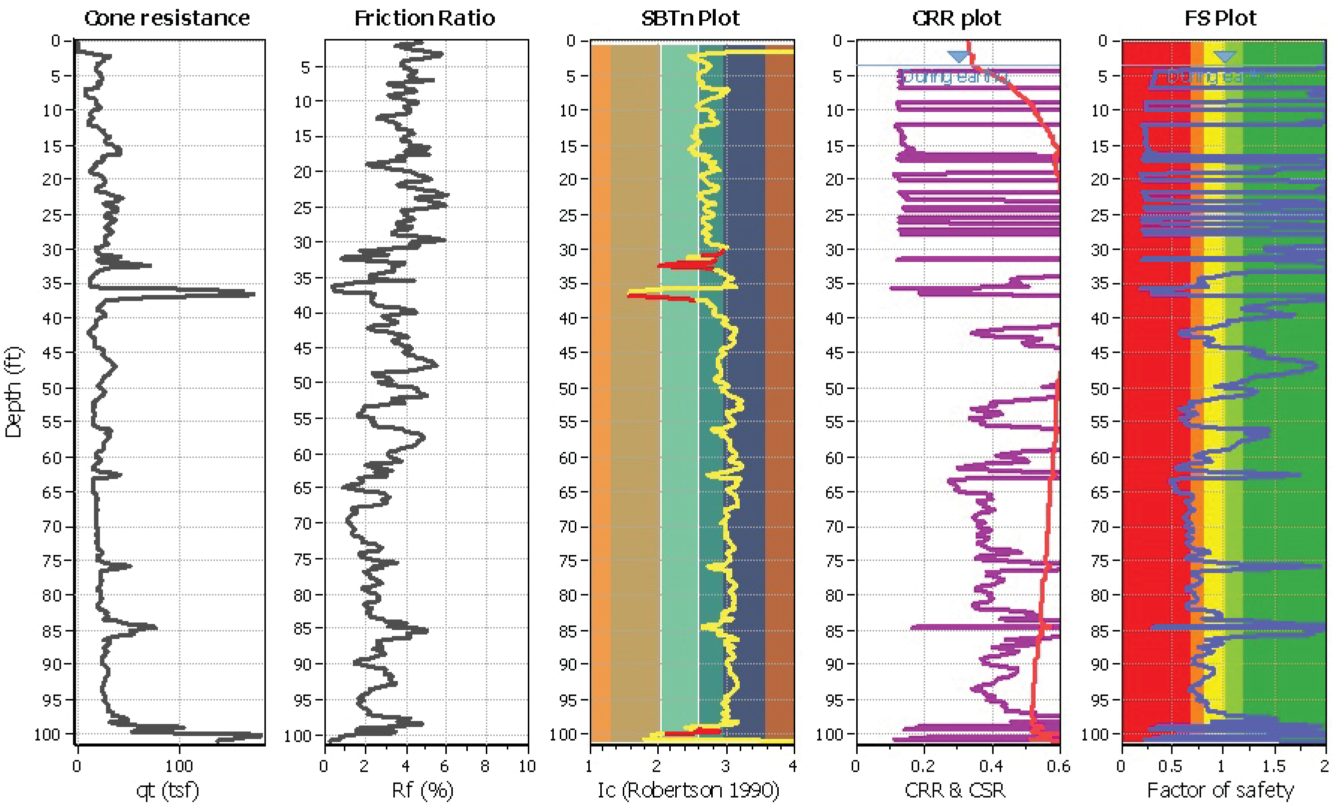
LIQUEFACTION ANALYSIS REPORT

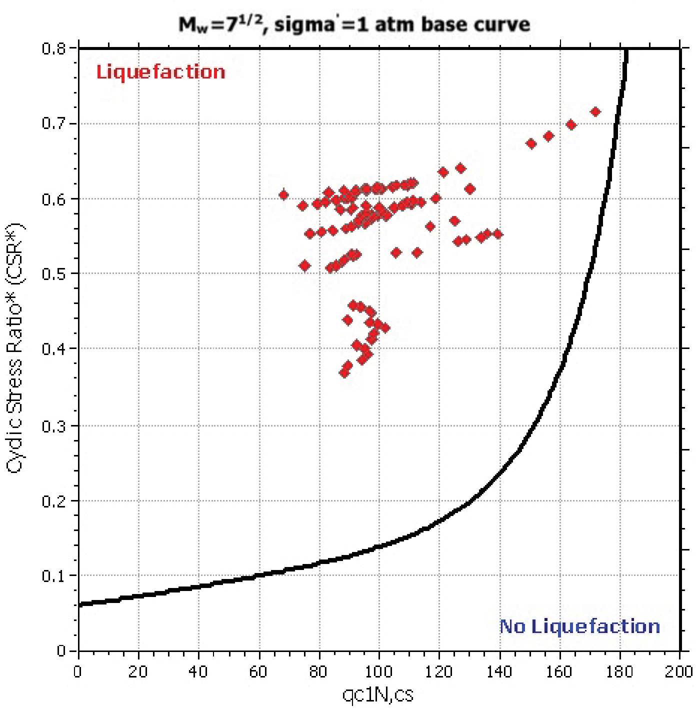
Project title : Caribbean 100 **Location : Sunnyvale, CA**

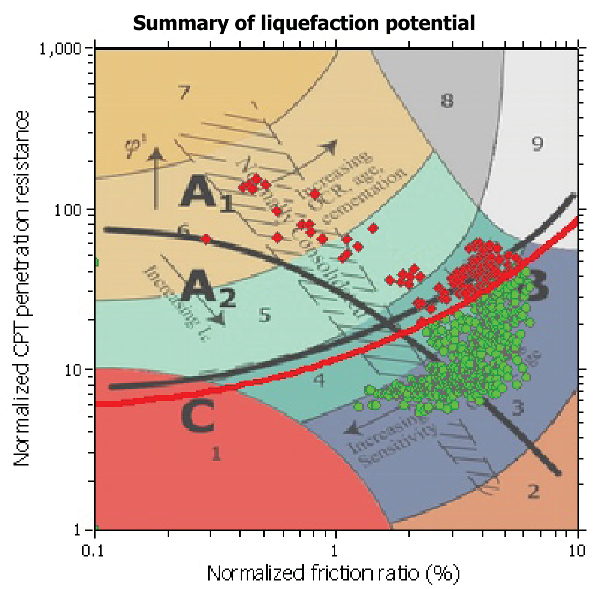
CPT file : 1-CPT08

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.70	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

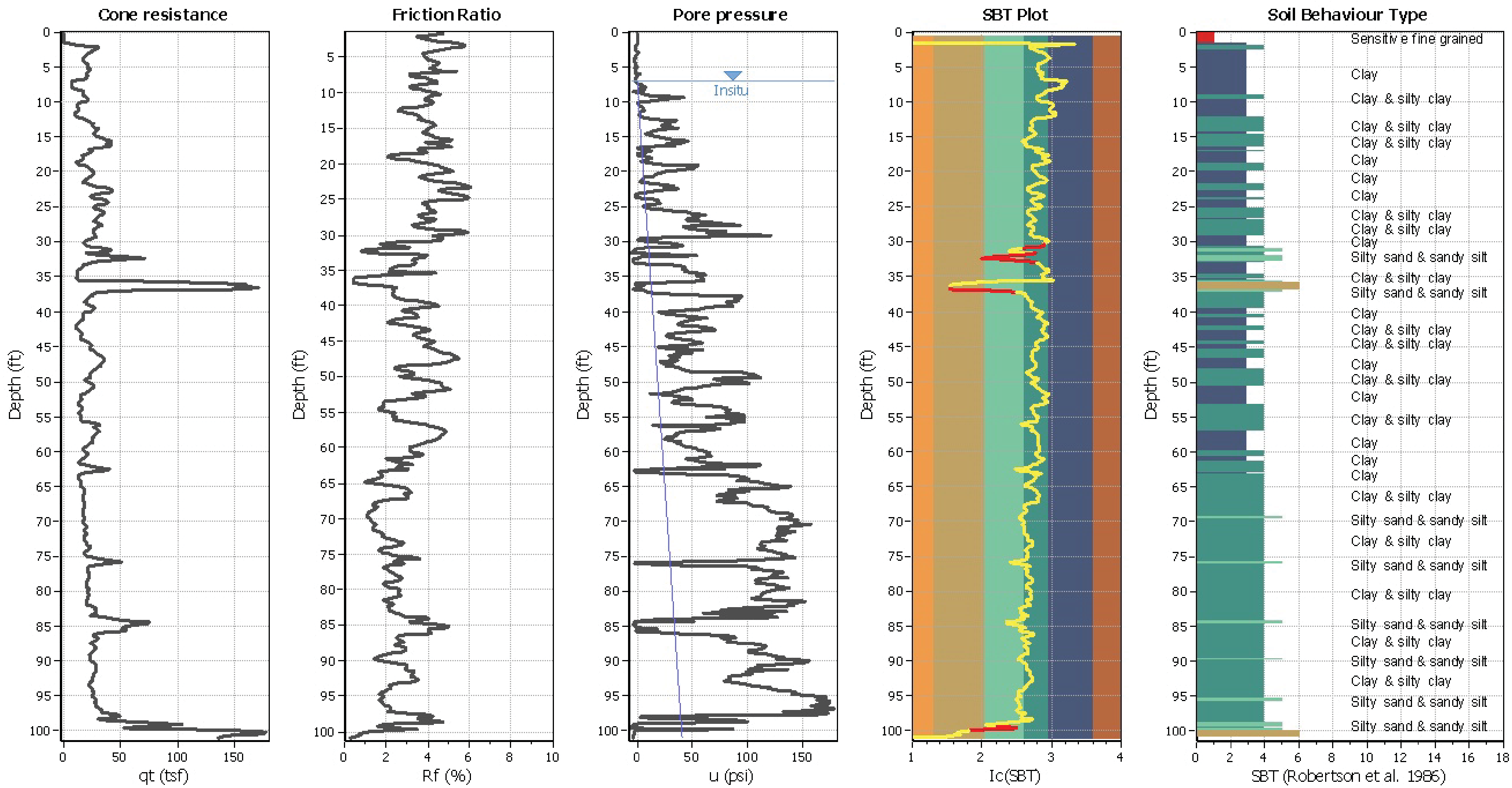






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

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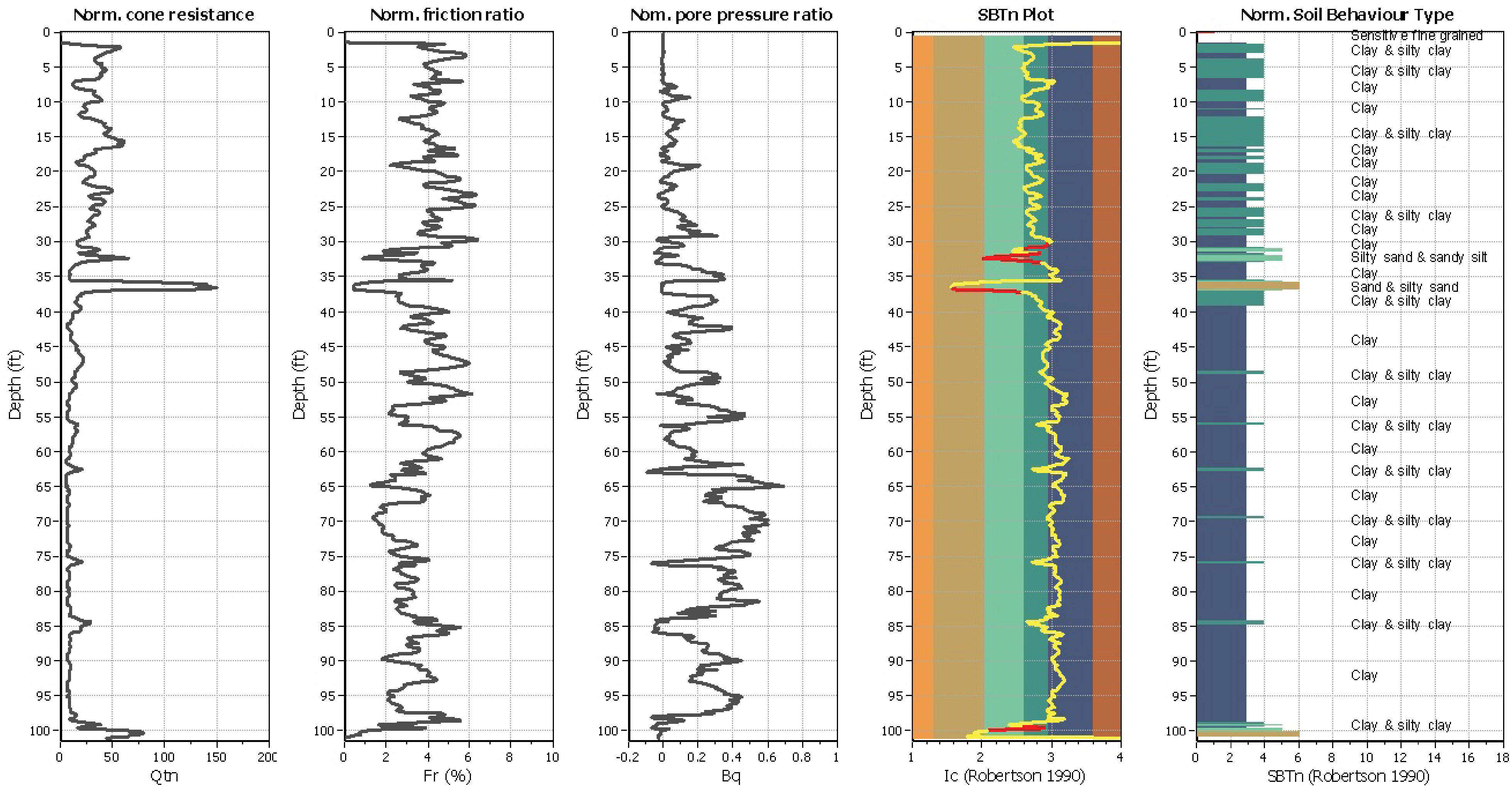
CPT name: 1-CPT08

CPT basic interpretation plots (normaliz



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

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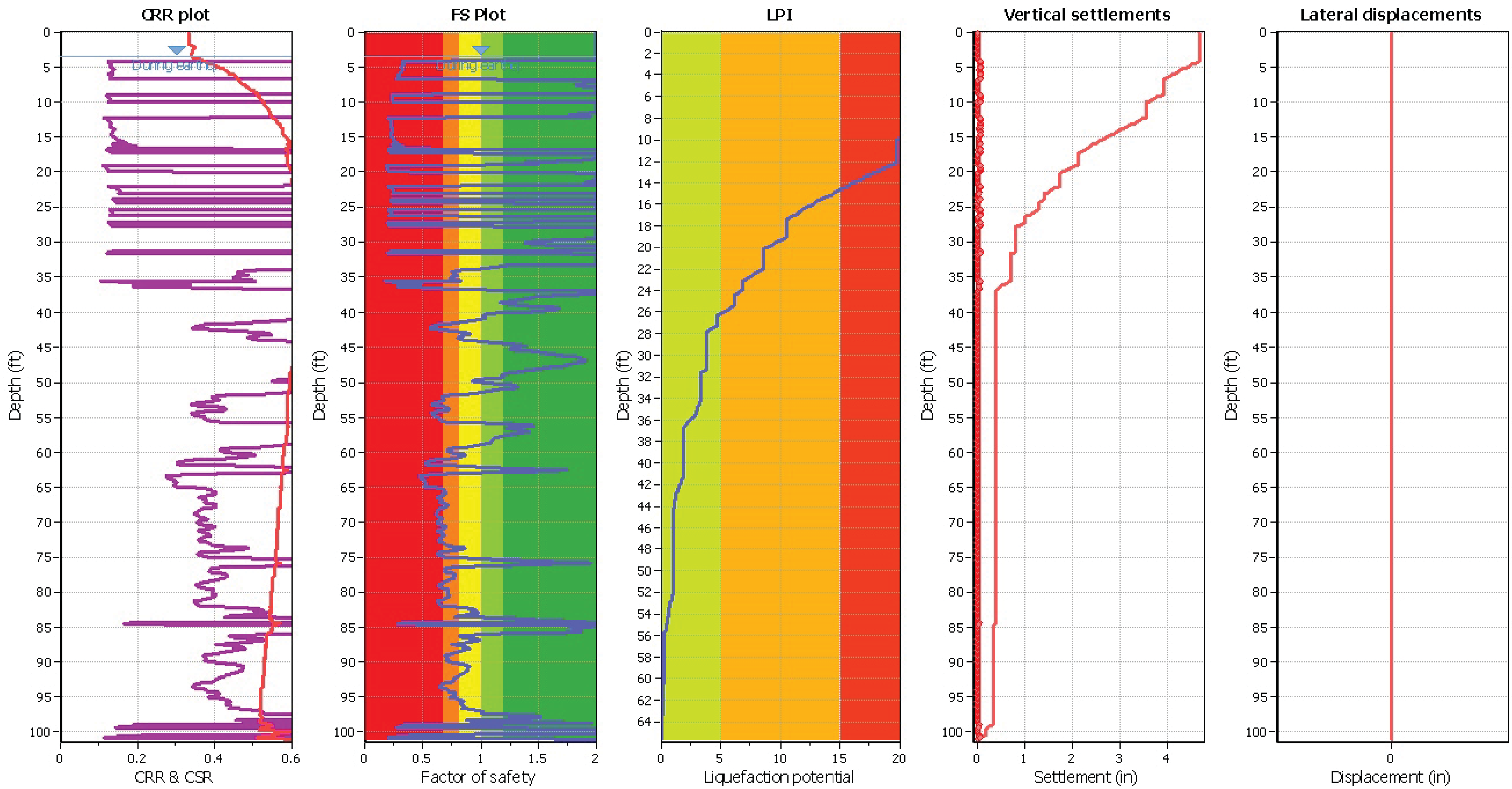
CPT name: 1-CPT08

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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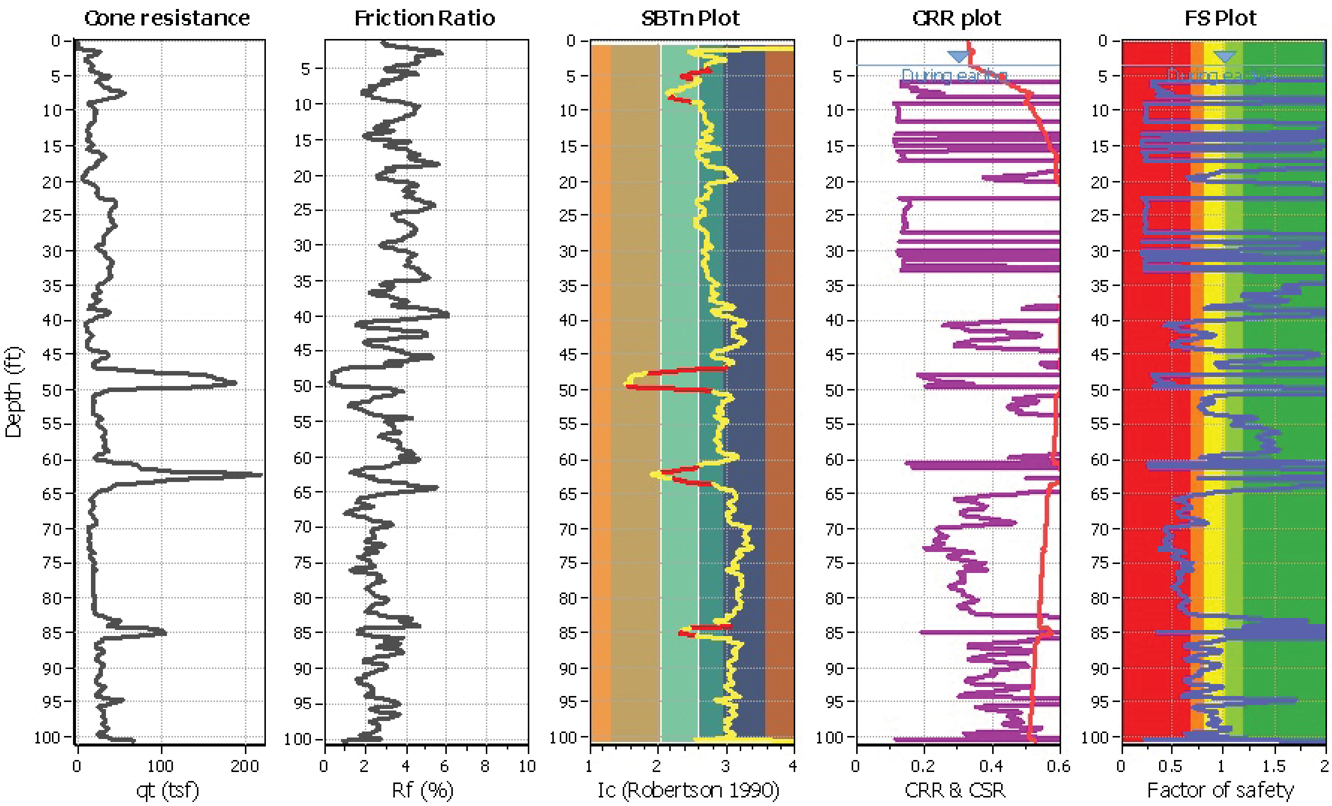
LIQUEFACTION ANALYSIS REPORT

Project title : Caribbean 100 **Location : Sunnyvale, CA**

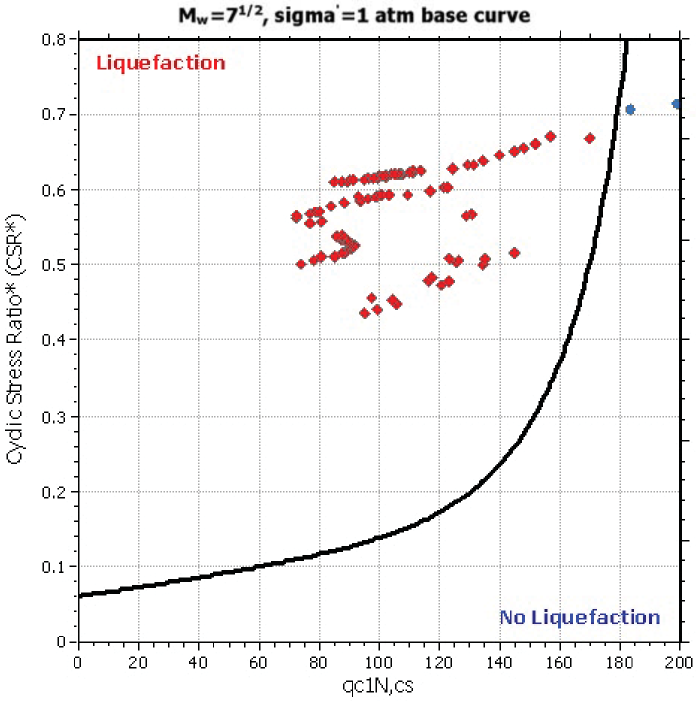
CPT file : 1-CPT09

Input parameters and analysis data

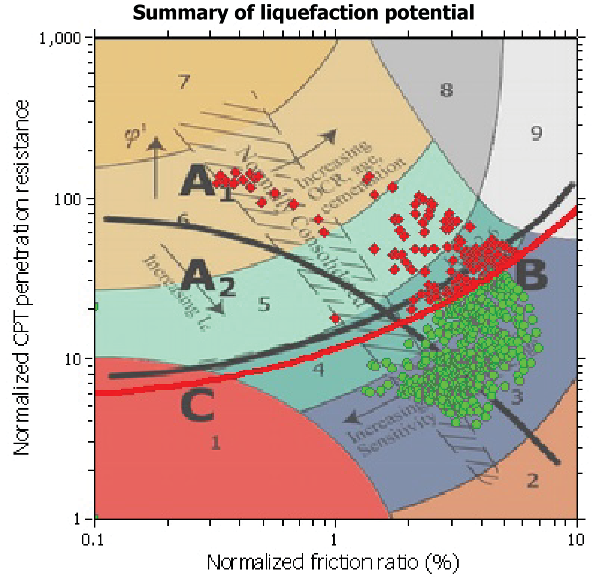
Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.20 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.70	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



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



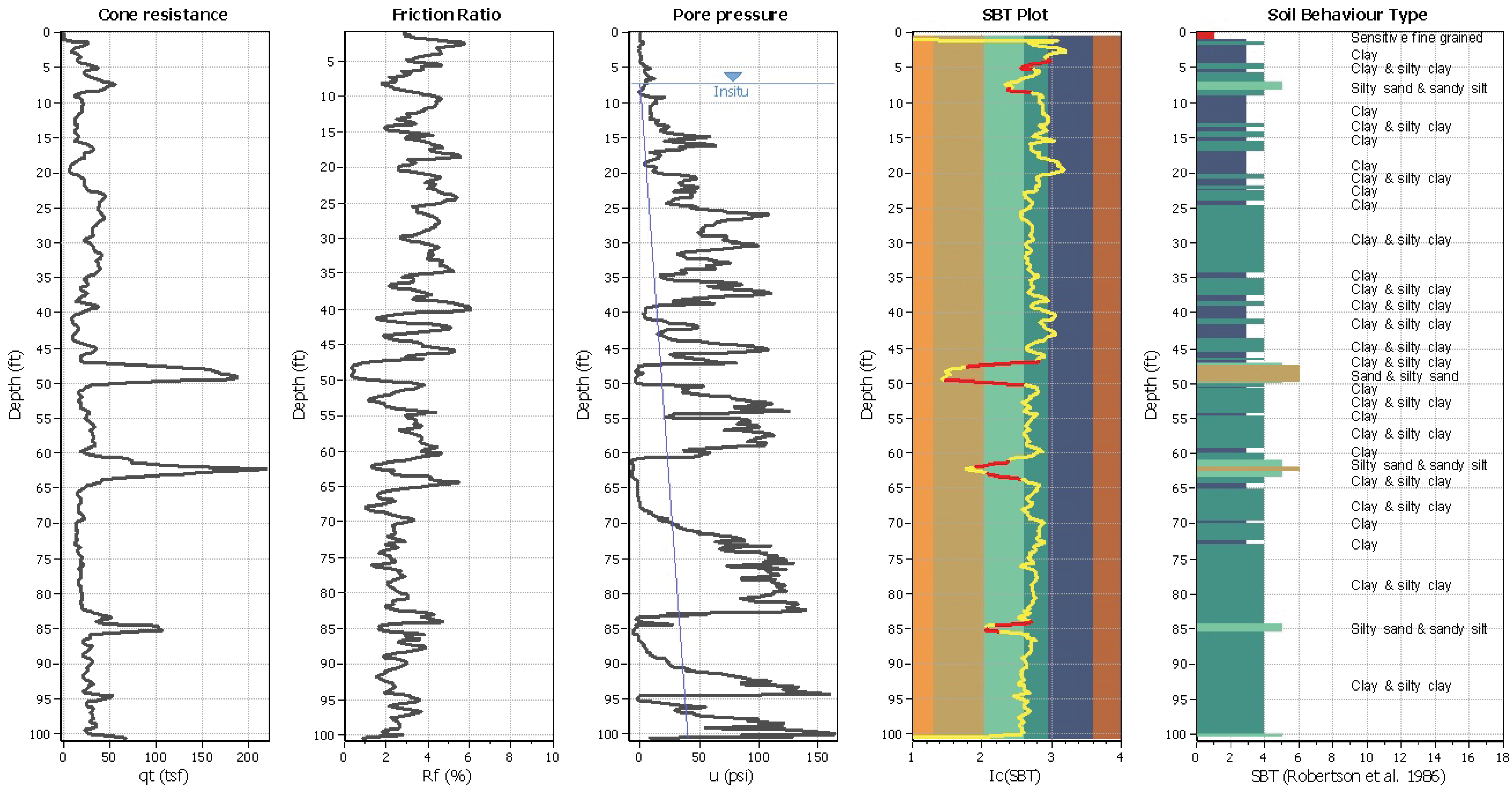
Summary of liquefaction potential



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

This software is licensed to: ENGEO Incorporated CPT name: 1-CPT09

CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.20 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

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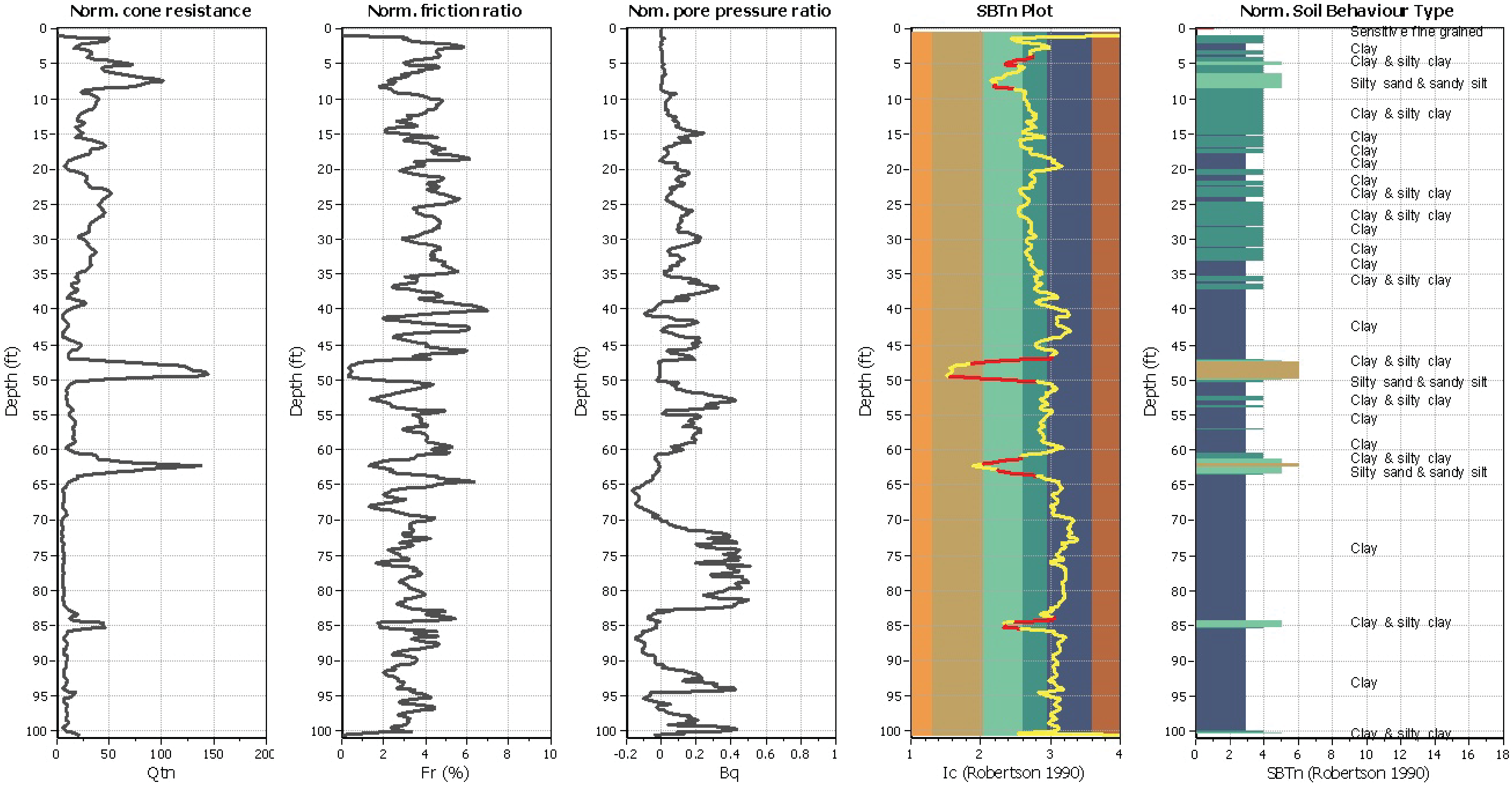
CPT name: 1-CPT09

CPT basic interpretation plots (normaliz



Input parameters and analysis data

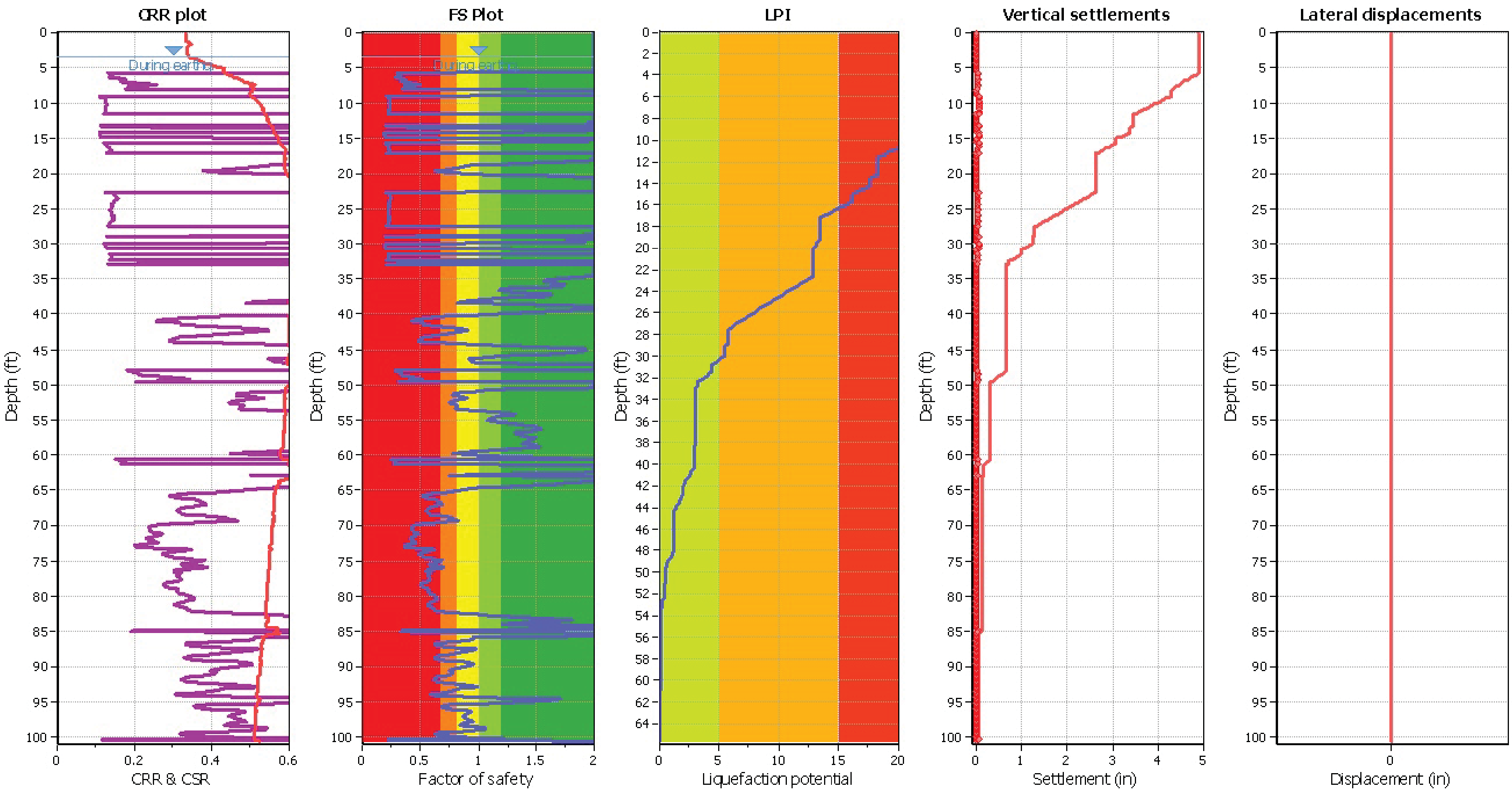
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.20 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

CPT name: 1-CPT09

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.20 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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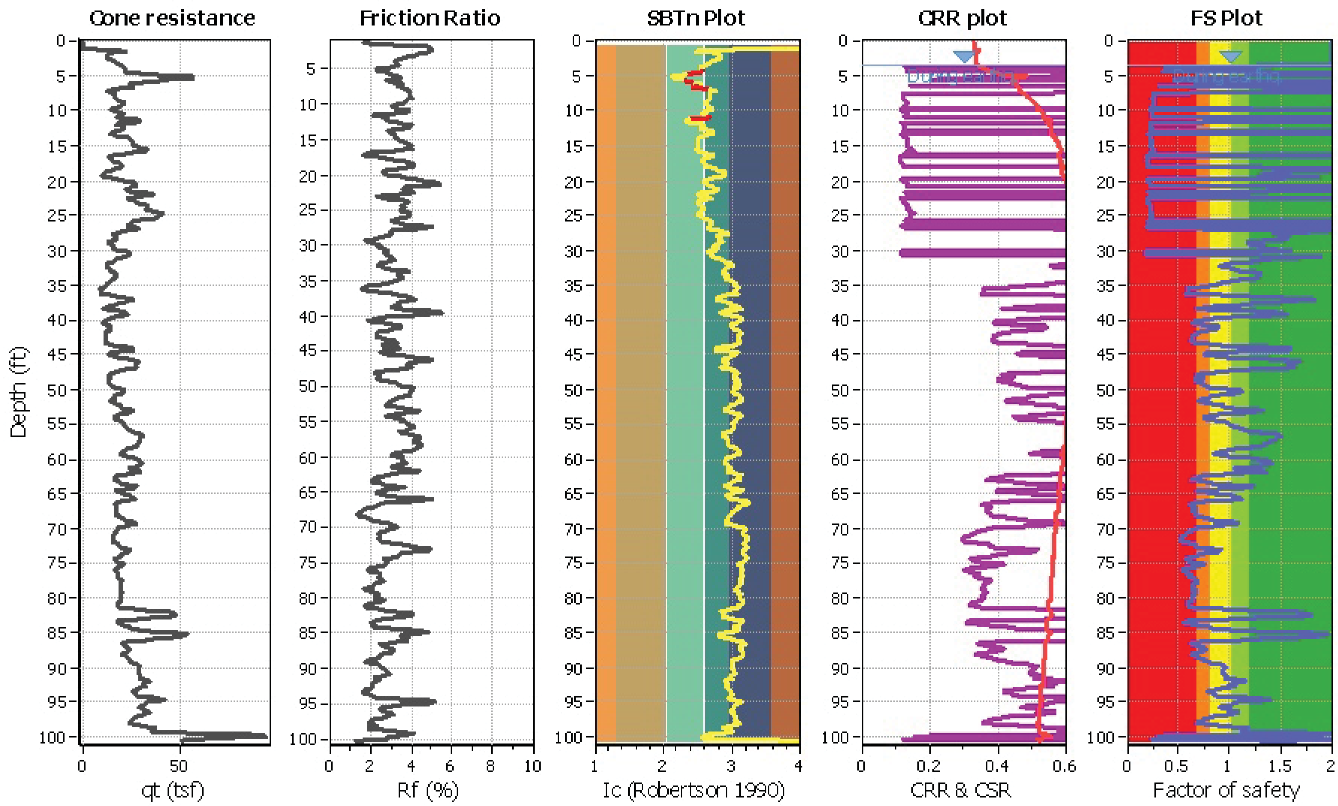
LIQUEFACTION ANALYSIS REPORT

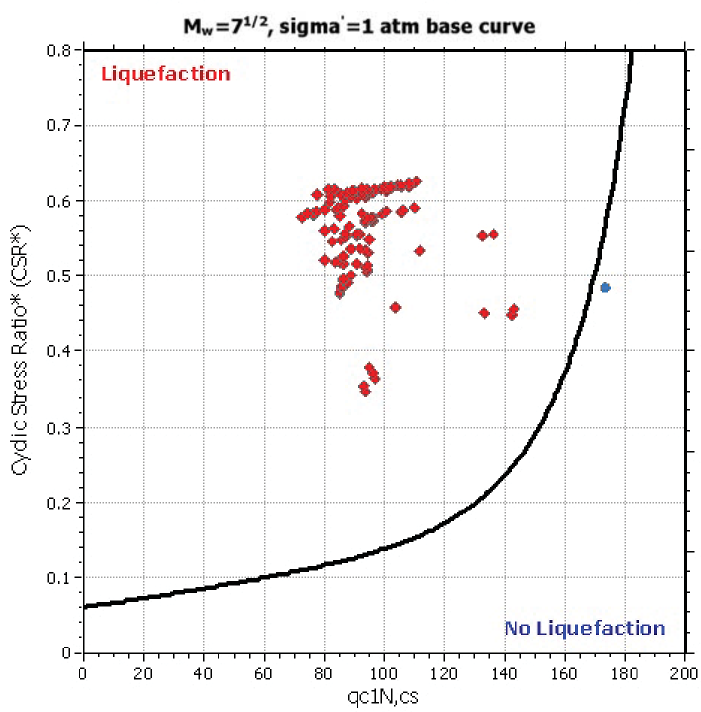
Project title : Caribbean 100 **Location : Sunnyvale, CA**

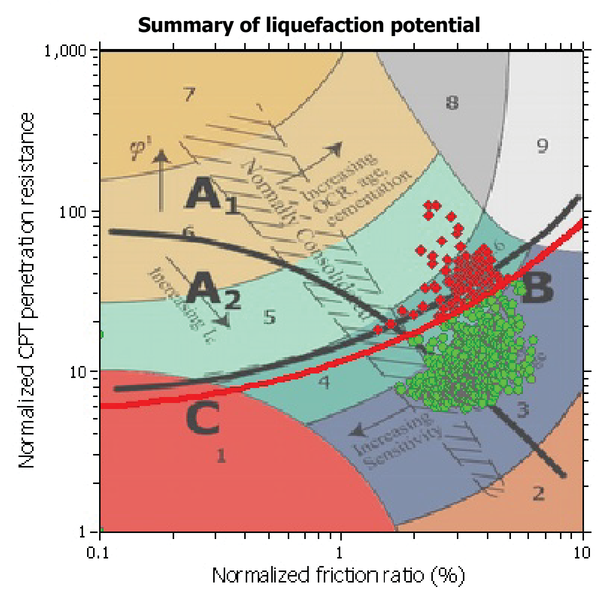
CPT file : 1-CPT10

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.70 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.70	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method



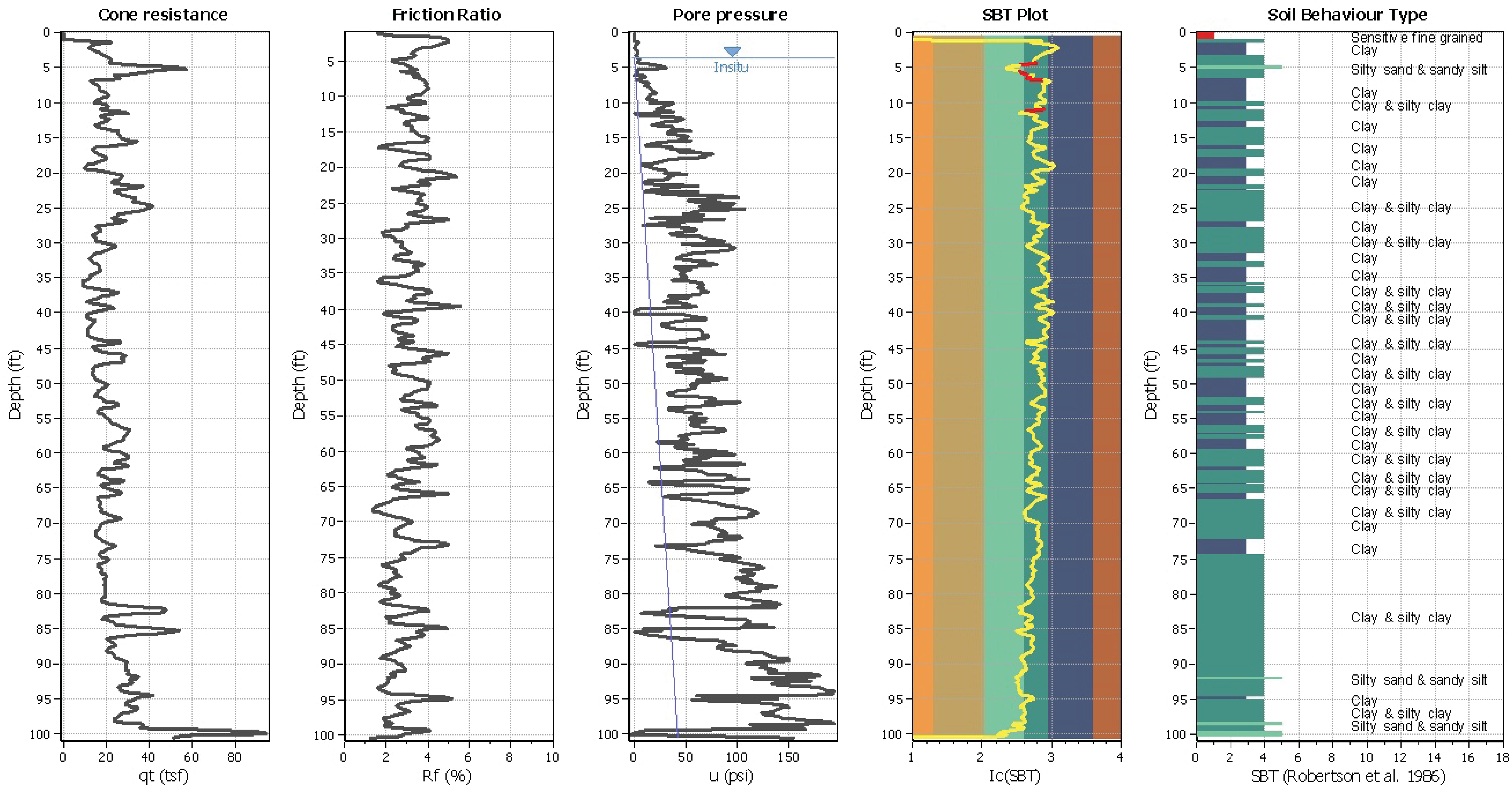




Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

 CPT name: 1-CPT10

CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.70 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

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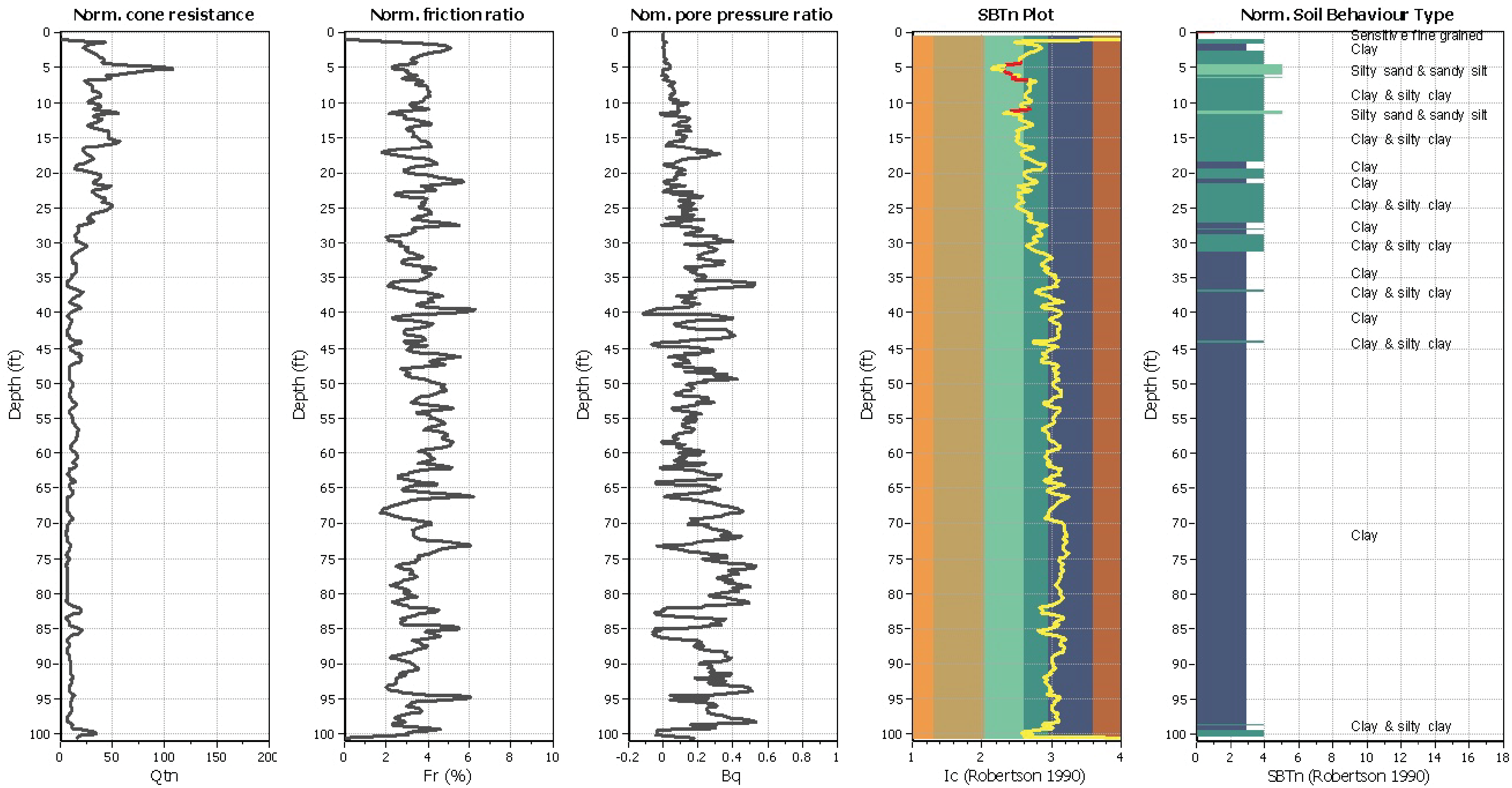
CPT name: 1-CPT10

CPT basic interpretation plots (normaliz



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.70 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

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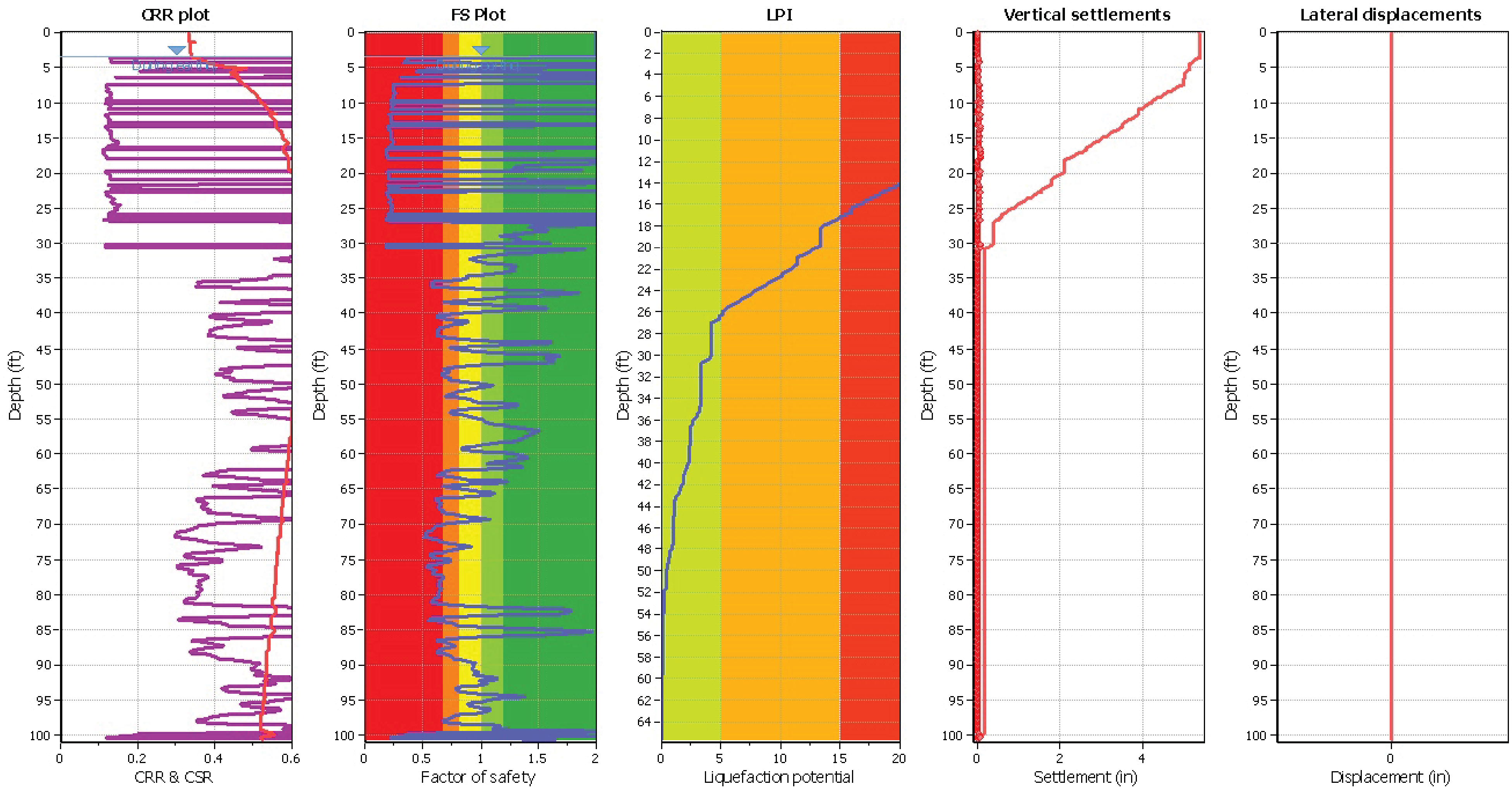
CPT name: 1-CPT10

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.70 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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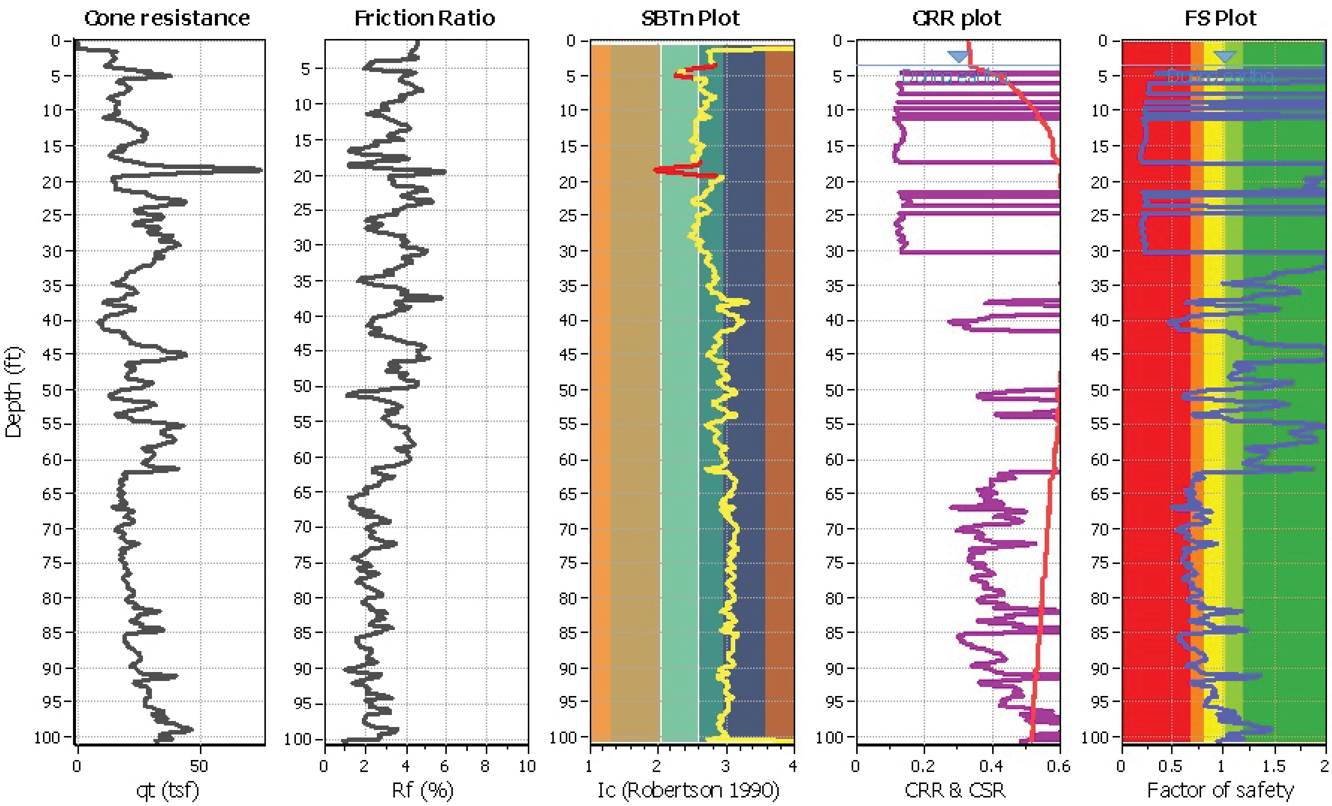
LIQUEFACTION ANALYSIS REPORT

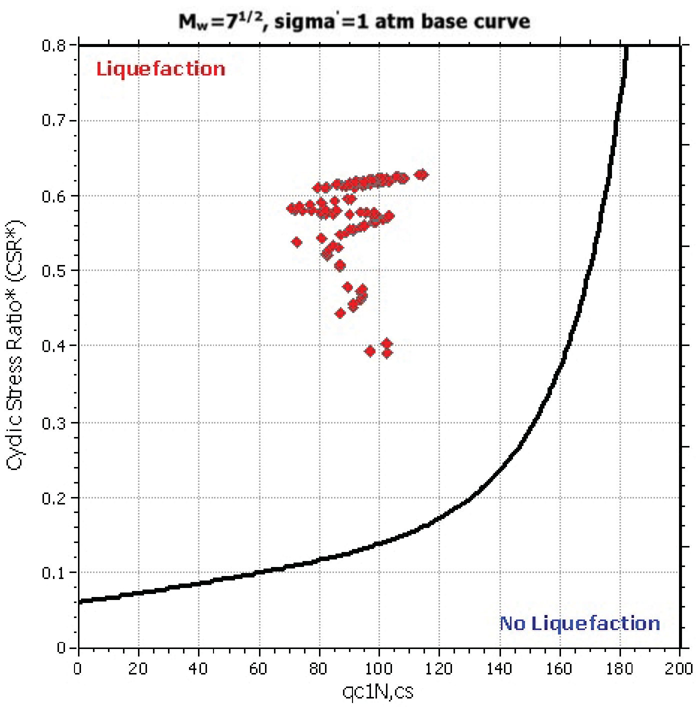
Project title : Caribbean 100 **Location : Sunnyvale, CA**

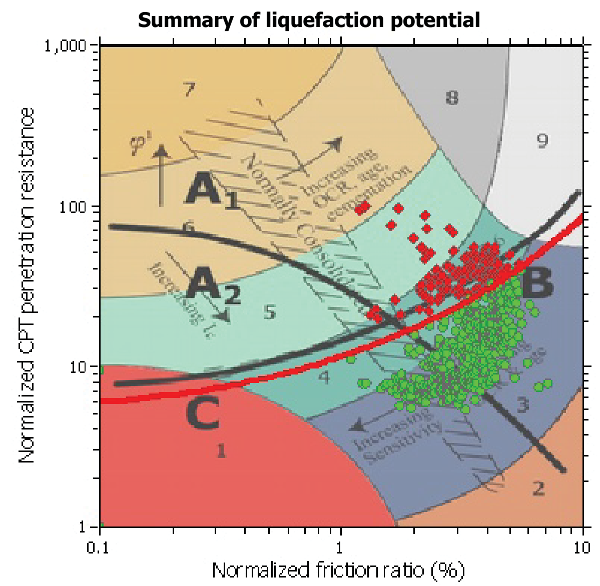
CPT file : 1-CPT11

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.70	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







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

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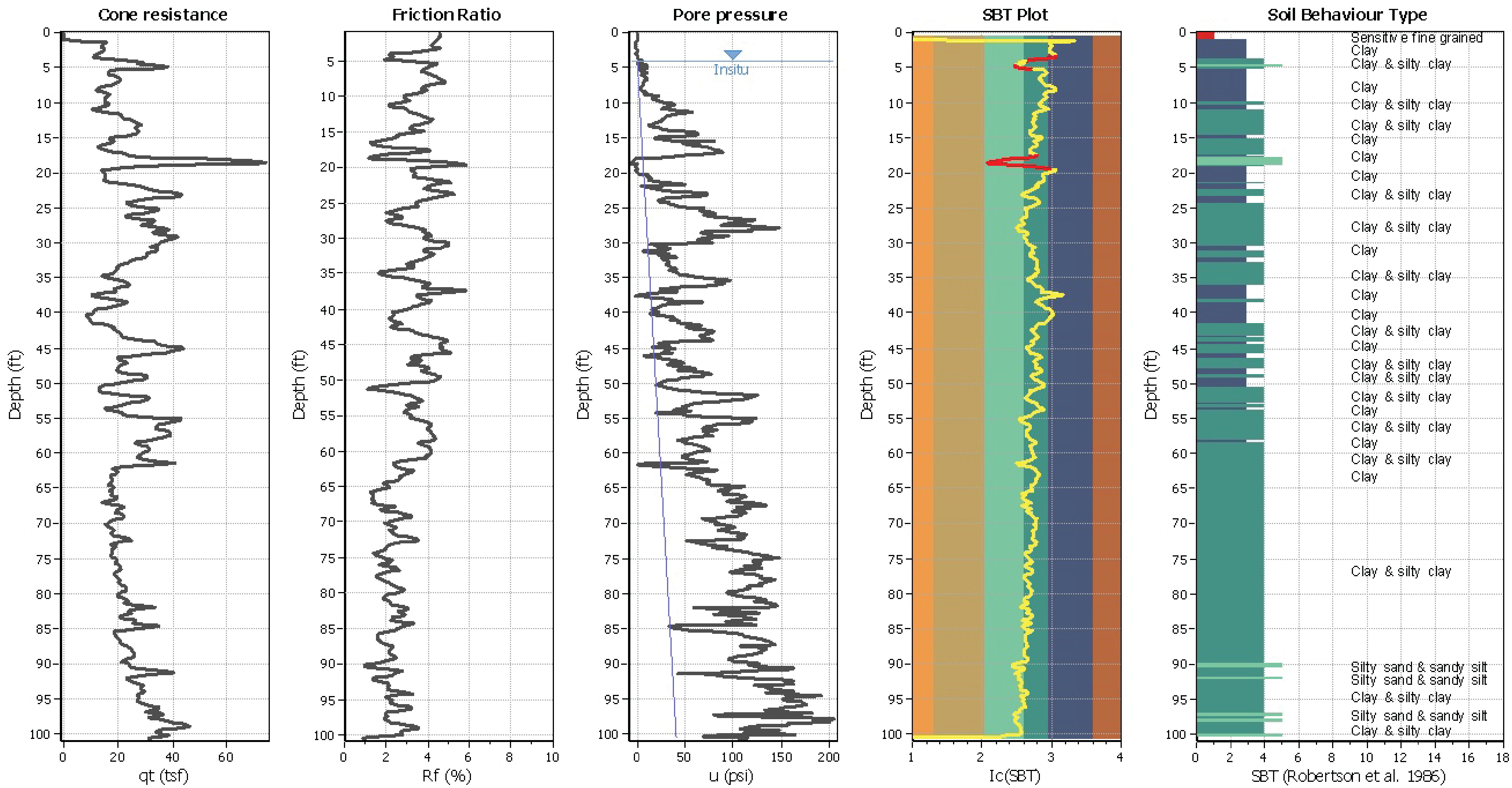
CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

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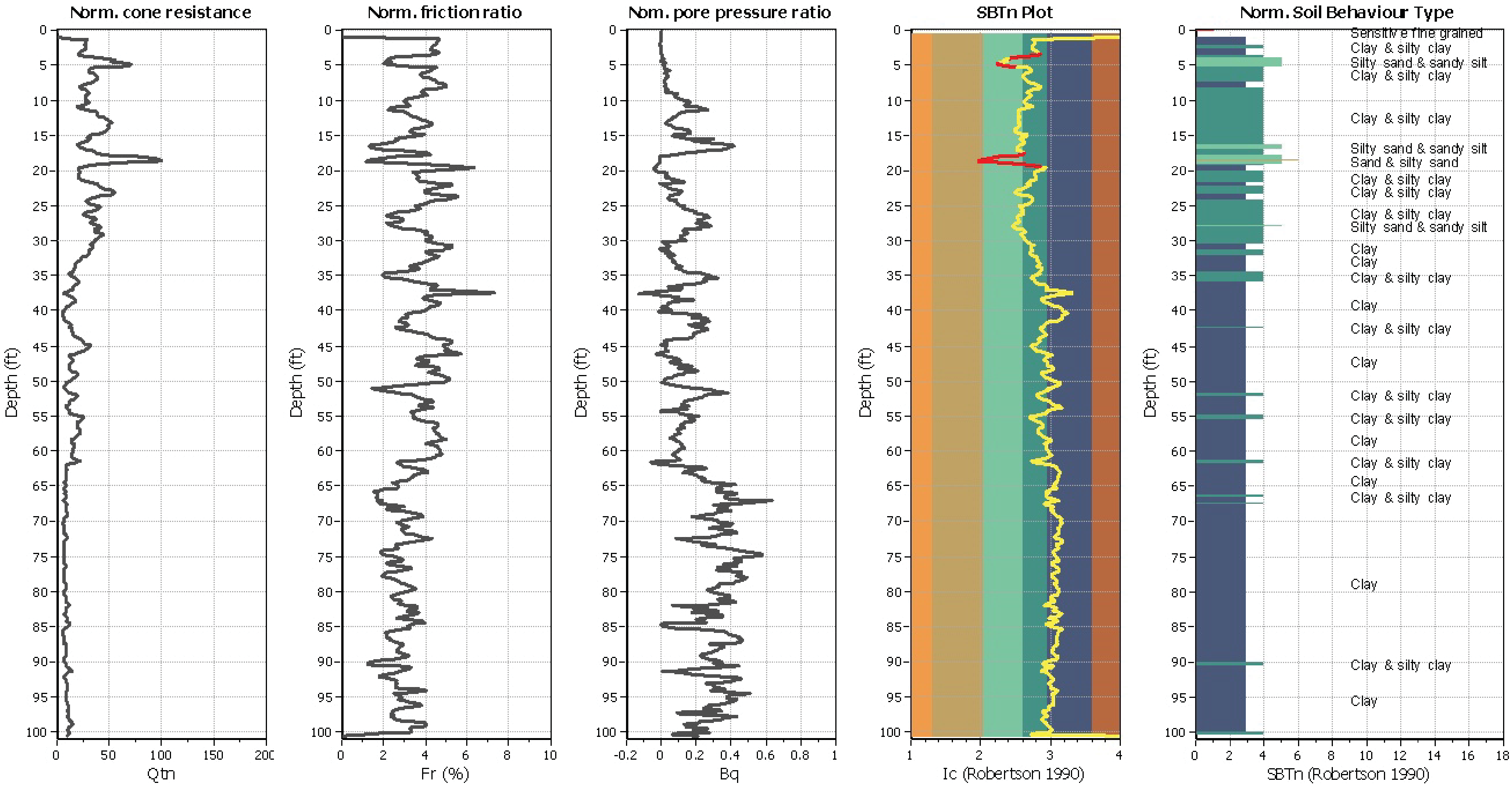
CPT name: 1-CPT11

CPT basic interpretation plots (normaliz



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	N/A	Limit depth:	N/A

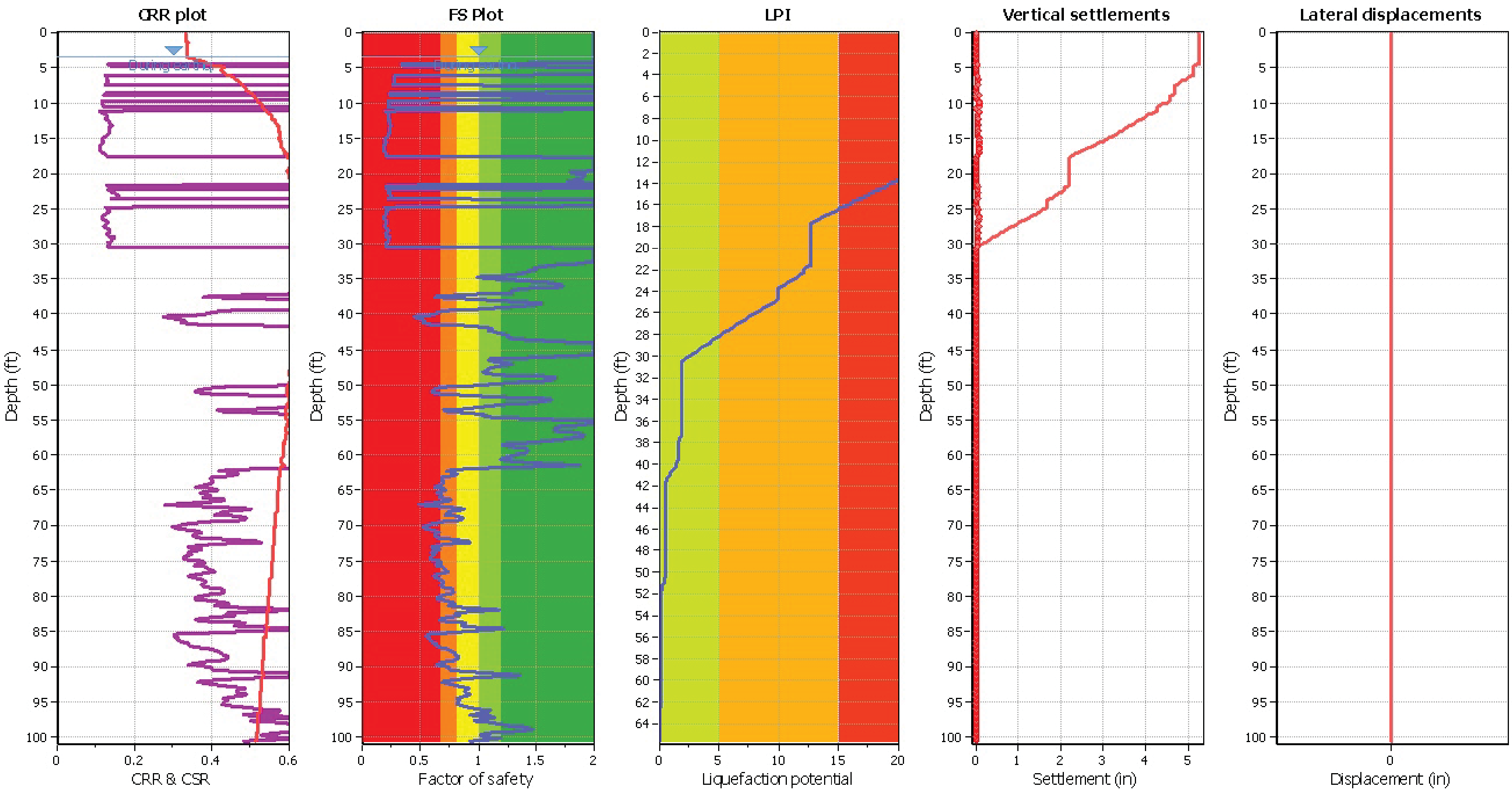
SBTn legend

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

This software is licensed to: ENGEO Incorporated

CPT name: 1-CPT11

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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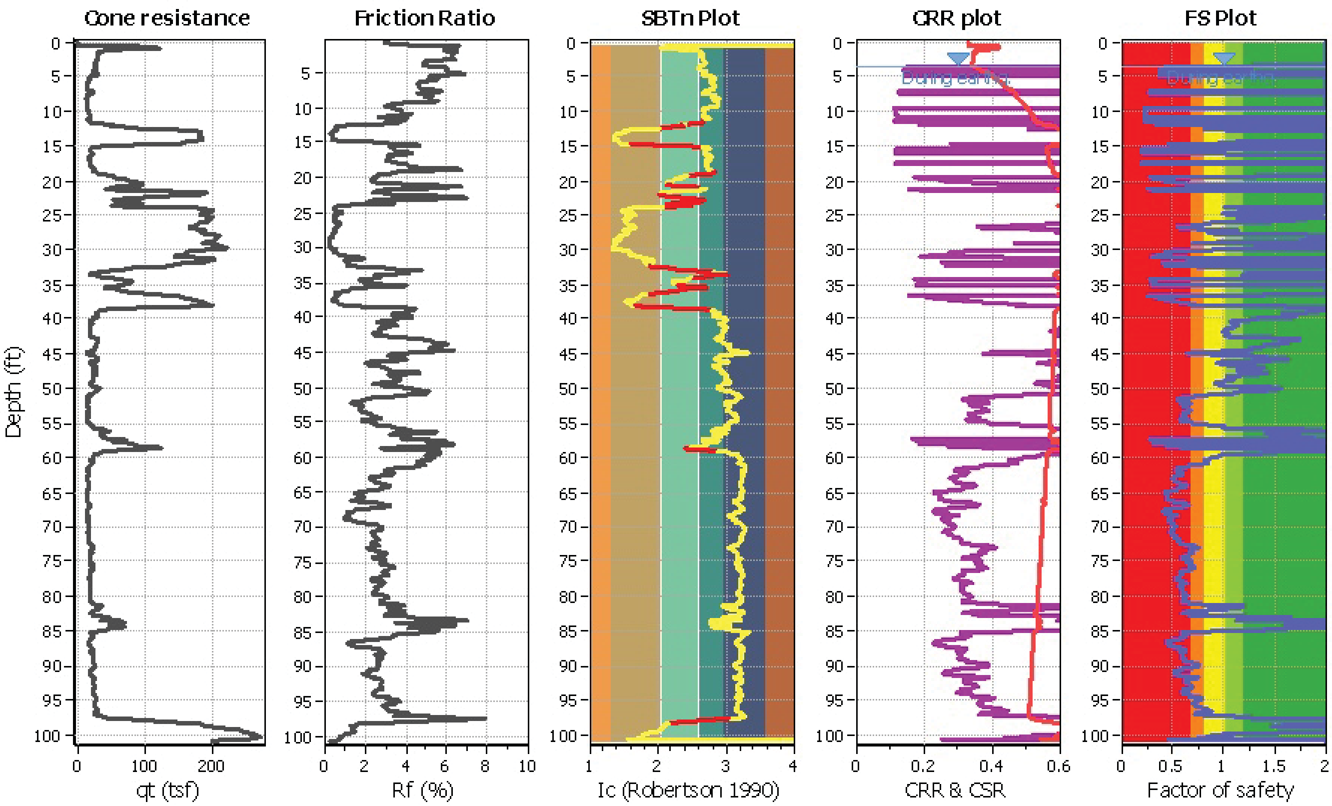
LIQUEFACTION ANALYSIS REPORT

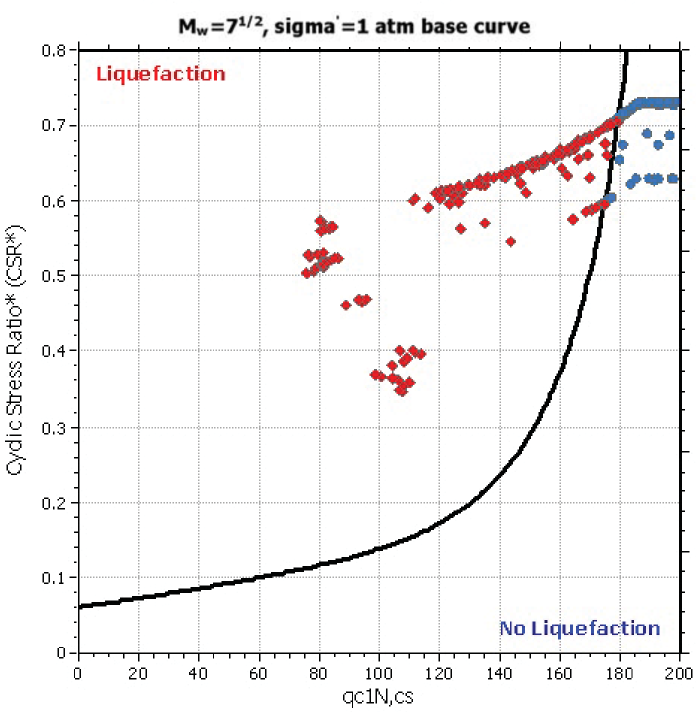
Project title : Caribbean 100 **Location : Sunnyvale, CA**

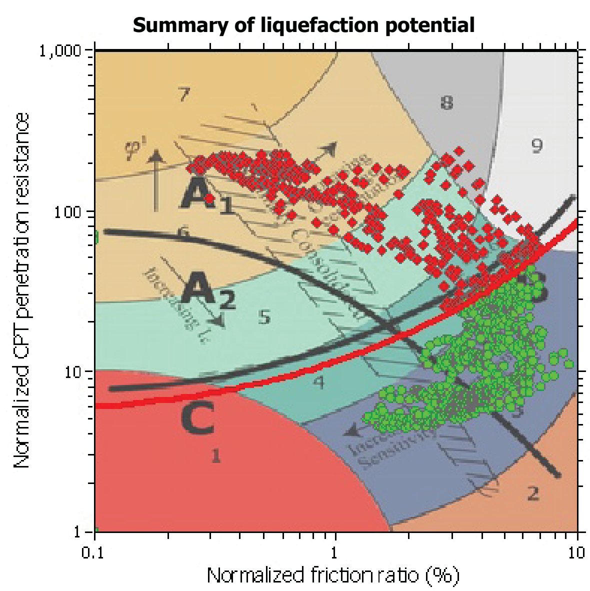
CPT file : 1-CPT12

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.30 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.70	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



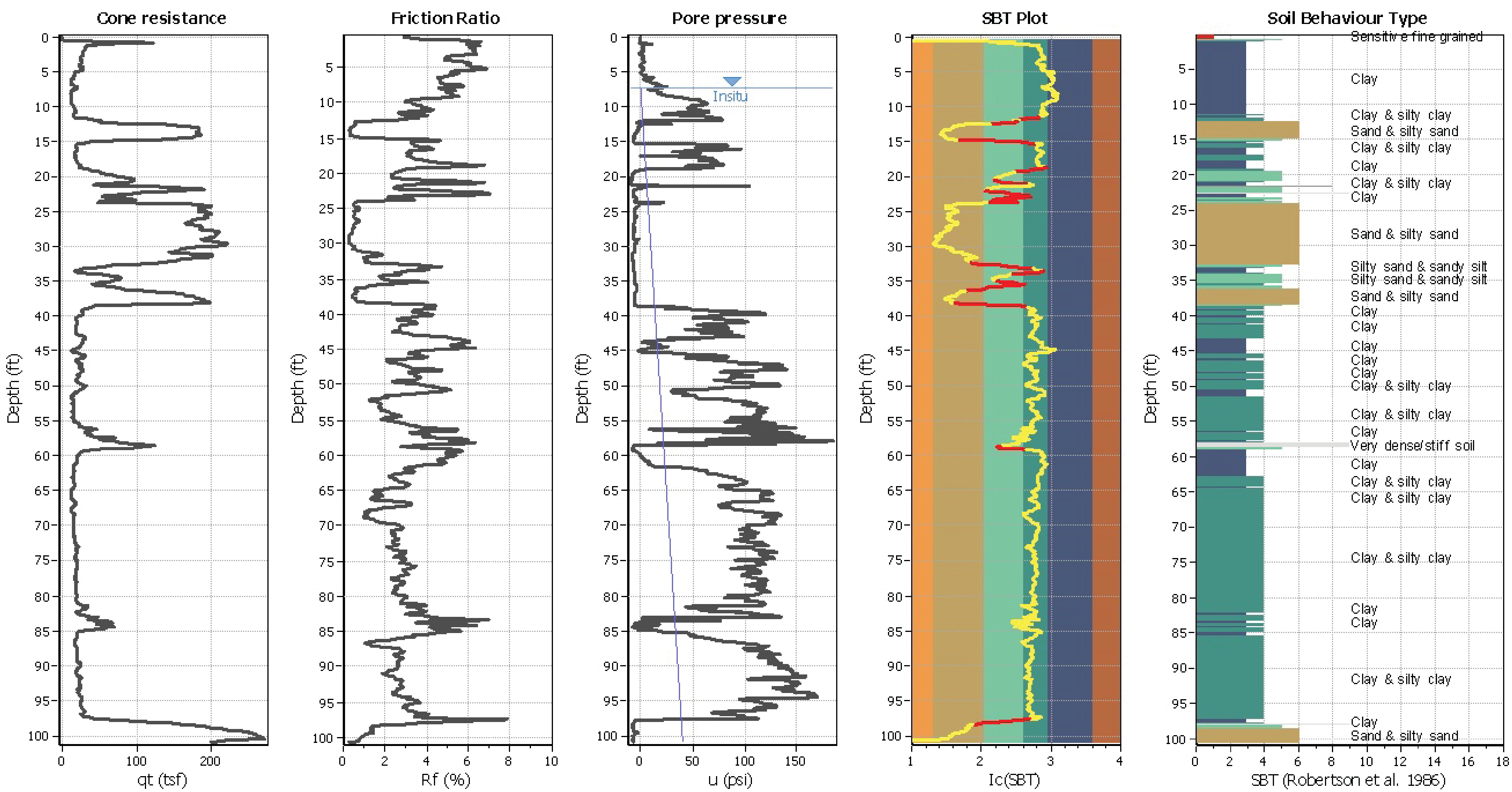




Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT name: 1-CPT12

CPT basic interpretation plo



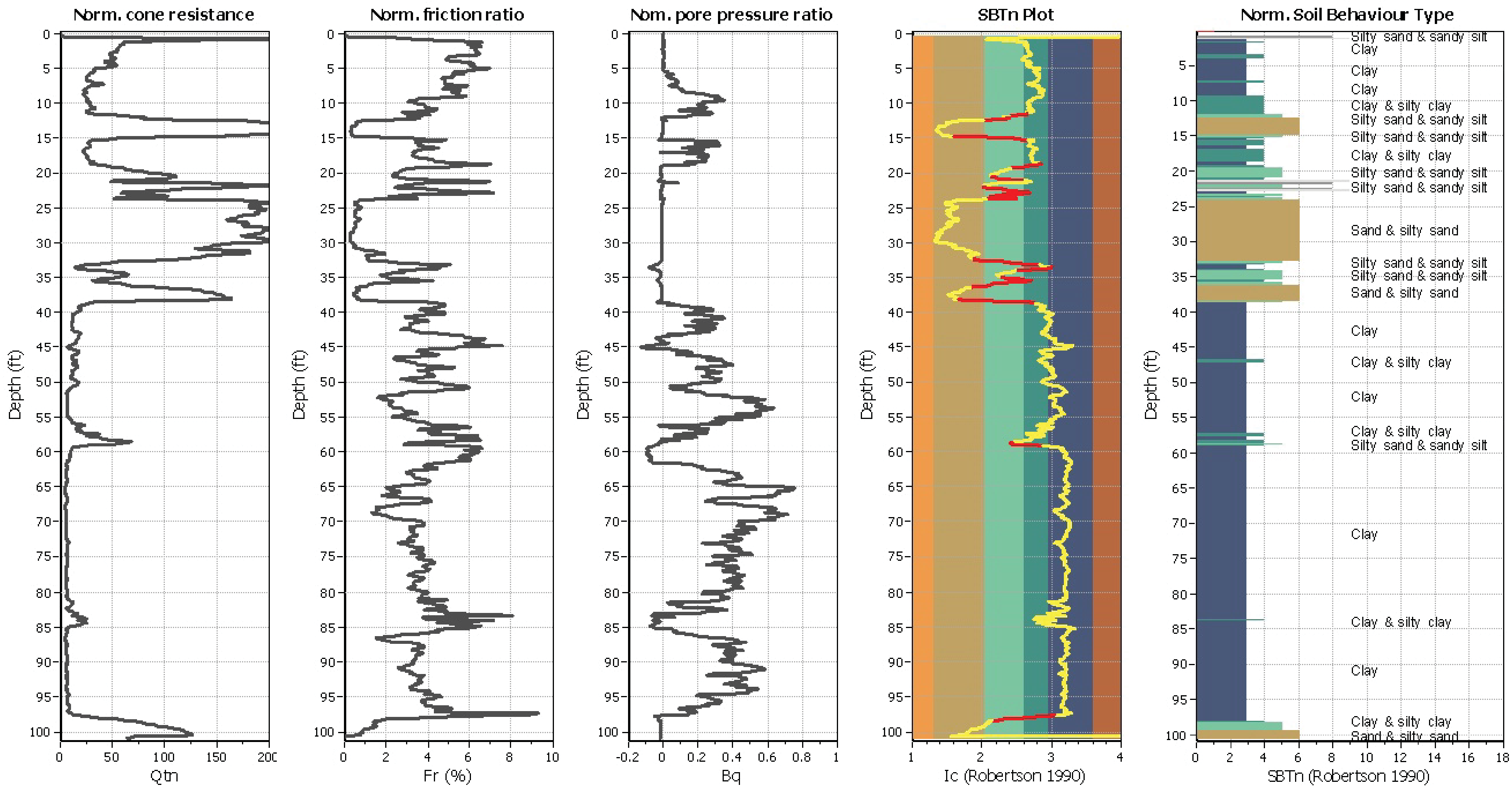
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.30 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normaliz



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.30 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

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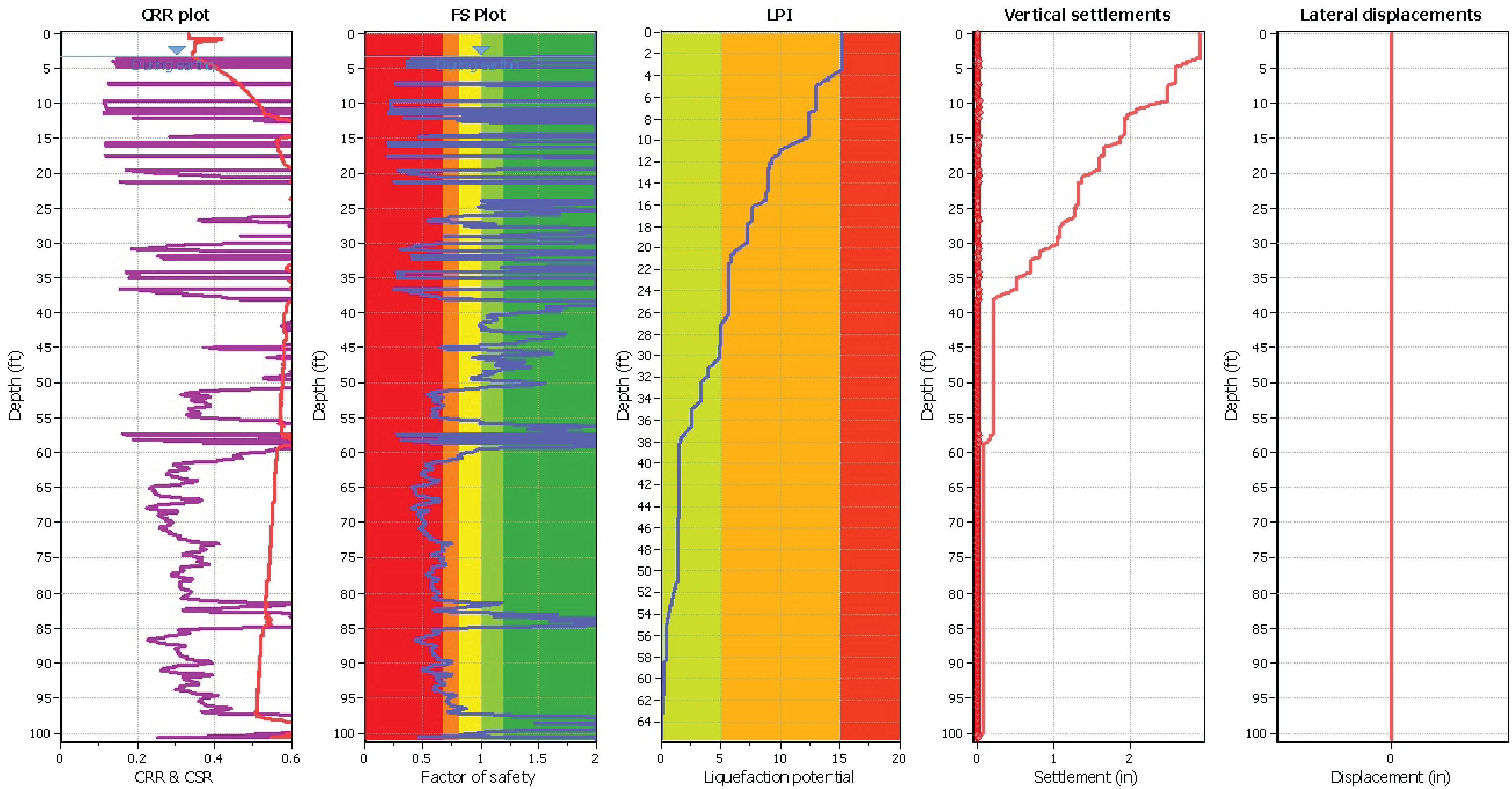
CPT name: 1-CPT12

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.30 ft	Fill height:	N/A	Limit depth:	N/A

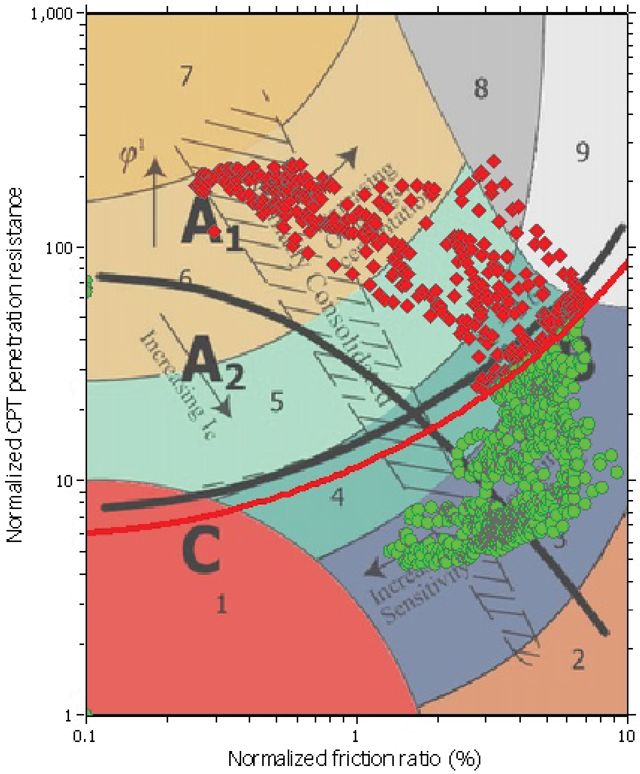
F.S. color scheme

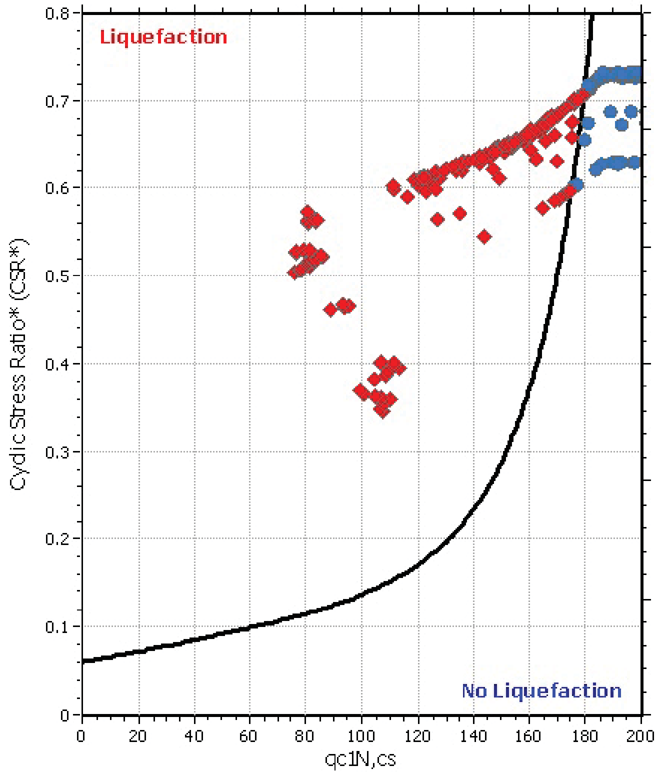
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

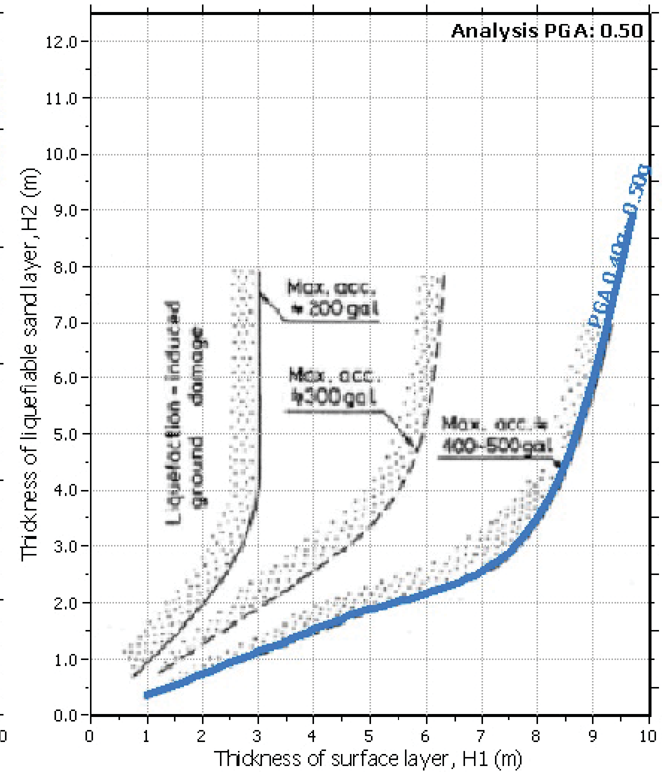
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plo

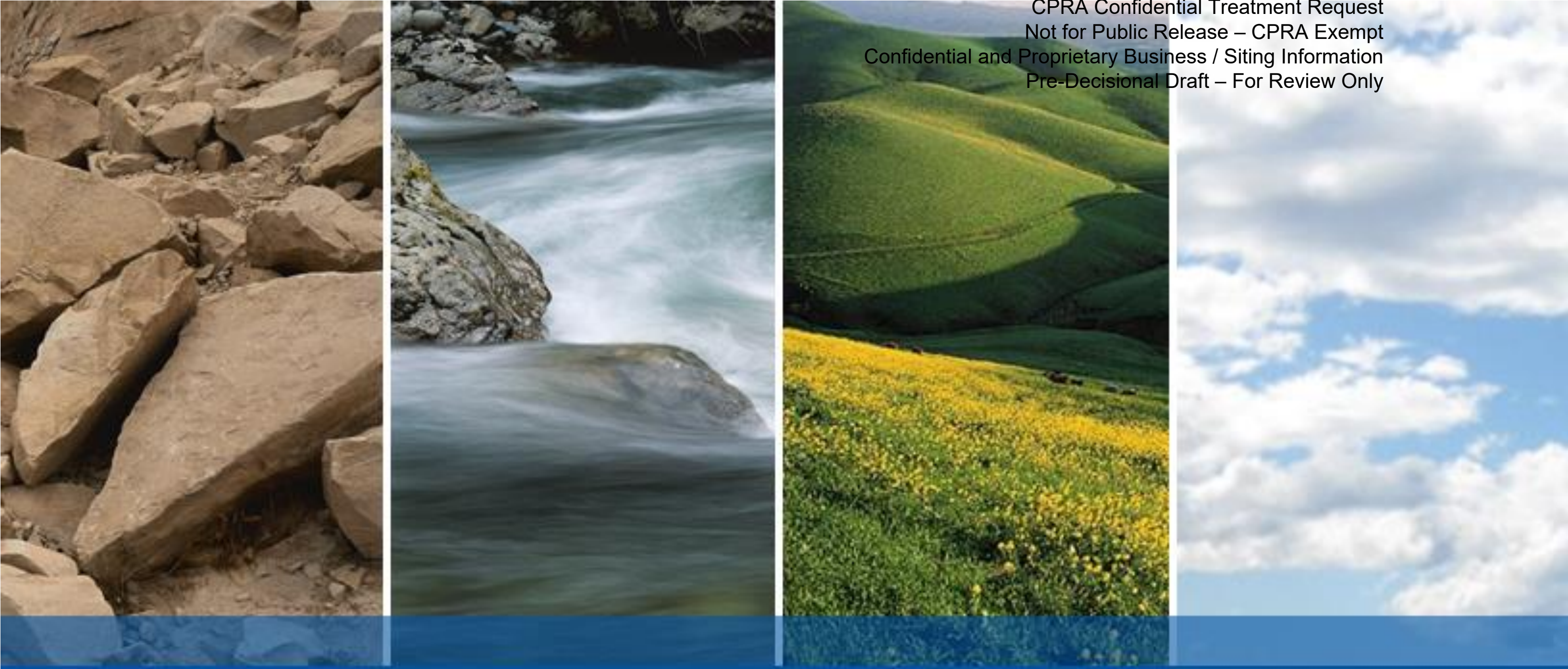






Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.30 ft	Fill height:	N/A	Limit depth:	N/A



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