# APPENDIX C

# GEOTECHNICAL REPORT

# GEOTECHNICAL ENGINEERING STUDY
# 1000 GIBRALTAR DRIVE WAREHOUSE
# 1000 GIBRALTAR DRIVE
# MILPITAS, CALIFORNIA

March 1, 2019

Prepared for

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March 1, 2019 File No.: 302865-001

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PROJECT: 1000 GIBRALTAR DRIVE WAREHOUSE
1000 GIBRALTAR DRIVE
MILPITAS, CALIFORNIA

SUBJECT: Revised Geotechnical Engineering Study

REF.: Proposal for Geotechnical Engineering Study, 1000 Gibraltar Drive Warehouse, 1000 Gibraltar Drive, Milpitas, California, by Earth Systems Pacific, December 10, 2018.

Dear Mr. Johnson:

In accordance with your authorization of the above referenced proposal, this geotechnical engineering study has been prepared by Earth Systems Pacific (Earth Systems) for use in the development of plans and specifications for the proposed warehouse facility in Milpitas, California. The conclusions and recommendations presented herein are based on our understanding of the currently proposed development, a review of the subsurface conditions revealed by the soil borings and Cone Penetrometer Tests advanced as a part of this investigation, the results of laboratory tests and our engineering analysis.

We appreciate the opportunity to assist you on this project. Should you have any questions regarding the contents of this report, please contact the undersigned.

Sincerely,

Earth Systems Pacific

Kira Ortiz PE 88089
Project Engineer

Ajay Singh, GE 3057
Principal Engineer

Doc. No.: 1902-062.SER/kt

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## 1.0 INTRODUCTION

This report presents the results of the geotechnical engineering study performed by Earth Systems Pacific (Earth System), for the proposed warehouse facility to be constructed off Gibraltar Drive in Milpitas, California. The attached Site Location Map Figure 1, shows the general location of the site and the attached Site Plan, Figure 2, shows the location of the borings and Cone Penetrometer Tests (CPTs) advanced at the site as part of this investigation.

### Site Setting

The subject property is located at 1000 Gibraltar Drive in Milpitas, California. The center of the site has an approximate latitude of 37.4184°N and a longitude of -121.8915°W (See Figure 1).

### Site Description

The site is located in the northwest corner of the intersection of Gibraltar Drive and South Milpitas Boulevard in Milpitas, California. The project site is an approximate 28.96-acre, irregular-shaped, flat lot and is currently occupied by four office buildings. The majority of the site is covered in asphaltic concrete with the exception of an area in the central portion along the southern border of the property that is designed as a bioretention area as shown on the attached Site Plan (Figure 2).

### Project Description

According to the conceptual plan by HPA architecture, dated November 5, 2018, the proposed building will be a 504,130 square foot, single story, warehouse structure that will be located within the approximately 28.96-acre parcel. Related site improvements will include associated utility lines, hardscape, pavement, and other site elements. No basements are anticipated for the proposed building. The proposed building will likely be constructed using concrete tilt up panels which will be set on conventional continuous spread footings. The warehouse building will have an at-grade concrete slab which will likely be used to form the concrete tilt-up panels. Roof trusses will be used to connect the tilt-up concrete panels to form a warehouse structure.

### Scope of Services

The scope of work for the geotechnical engineering study included general site reconnaissance, subsurface exploration, laboratory testing, engineering evaluation and analysis of the data collected by Earth Systems, and preparation of this report. The analysis and engineering recommendations presented in the following sections of this report are based on our understanding of the proposed development at the subject site and our experience with projects of a similar nature.

The report and recommendations are intended to comply with the considerations of Section 1803 of the California Building Code (CBC), 2016 Edition, and common geotechnical engineering practice in this area at this time under similar conditions.

Preliminary geotechnical recommendations for site preparation and grading, foundations, slabs-on-grade, exterior flatwork, utility trench backfill, site drainage management, and geotechnical observation and testing are presented to guide the development of project plans and specifications. It is our intent that this report be used by the client to form the geotechnical basis of the design of the project as described herein, and in the preparation of plans and specifications.

Detailed evaluation of the site geology and potential geologic hazards, and analyses of the soil for infiltration rates, mold or other microbial content, asbestos, radioisotopes, hydrocarbons, or other chemical properties are beyond the scope of this report. This report also does not address issues in the domain of contractors such as, but not limited to, site safety, loss of volume due to stripping of the site, shrinkage of soils during compaction, excavatability, shoring, temporary slope angles, and construction means and methods. Ancillary features such as temporary access roads, fences, light poles, and non-structural fills are not within our scope and are also not addressed.

To verify that pertinent issues have been addressed and to aid in conformance with the intent of this report, it is requested that final grading and foundation plans be submitted to this office for review. In the event that there are any changes in the nature, design, or locations of improvements, or if any assumptions used in the preparation of this update report prove to be incorrect, the conclusions and recommendations contained herein should not be considered valid unless the changes are reviewed and the conclusions of this update report are verified or modified in writing by the geotechnical engineer. The criteria presented in this update report are considered preliminary until such time as they are verified or modified in writing by the geotechnical engineer in the field during construction.

## 2.0 GEOLOGIC SETTING

### Regional Geology

A review the published geologic maps of the area and some readily available subsurface information indicate the soil profile in the vicinity of the proposed development predominantly consists of Late Pleistocene to Holocene age alluvial fan deposits (Qhf).

**Seismic Setting**

The entire San Francisco Bay Area, is considered to be an active seismic region due to the presence of several active faults. Three northwest-trending major earthquake faults that are responsible for the majority of the movement on San Andreas fault system extend through the Bay Area. They include the San Andreas fault, the Hayward fault and the Calaveras fault, which are respectively located approximately 15.5 miles to the southwest, 1.7 miles to the northeast and 4.9 miles to the northeast. The Monta-Vista Shannon fault is located approximately 11.4 miles southwest of the site. Using information from recent earthquakes, improved mapping of active faults, and a new model for estimating earthquake probabilities, the 2014 Working Group on California Earthquake Probabilities updated the 30 years earthquake forecast for California. They concluded that there is a 72 percent probability (or likelihood) of at least one earthquake of magnitude 6.7 greater striking somewhere in the San Francisco Bay region before 2043. A summary of the significant faults in the near vicinity of the site and their respective probability of exceeding or equaling moment magnitude of 6.7 within the next 30 years are listed below.

Major Active Faults

| Fault | Distance from Site (miles)[1] | Probability of $M_w \geq 6.7$ within 30 Years[2] |
|---|---|---|
| Hayward | 1.7 (NE) | 32% |
| Calaveras | 4.9 (NE) | 26% |
| Monta-Vista Shannon | 11.4 (SW) | 1% |
| San Andreas | 15.5 (SW) | 33% |

[1] Google Earth, 2019

[2] Working Group on California Earthquake Probabilities, 2014

## 3.0 FIELD INVESTIGATION

**Subsurface Exploration**

Our subsurface exploration program at the site consisted of advancing eight Cone Penetrometer Tests (CPTs) on February 4, 2019 and drilling nine exploratory borings on January 24, 2019 at the approximate locations shown on the Site Plan, Figure 2.

Exploratory Borings

The borings were drilled using a truck-mounted drilling rig equipped with 8-inch diameter hollow stem augers and sampled to depths ranging from 5 to 50 feet below the ground surface (bgs). The drilling process consisted of augering to the desired depth and upon reaching that depth, the plug blocking the auger was retrieved and a standard sampler connected to steel rods was

lowered into the hole through the augers that formed temporary casing for the hole. The standard samplers were driven into undisturbed ground with a 140-pound, safety hammer falling about 30 inches per drop. The samplers were driven up to 18 inches and the hammer blows required to drive every six inches of the samplers were recorded and are presented on the boring logs. This information was used to interpret soil consistency/density.

Our project engineer supervised the drilling program, described the soil conditions revealed by the boring to create a continuous log, and collected representative samples for laboratory testing. The borings were backfilled with lean cement grout. The boring logs show soil description including: color, major and minor components, USCS classification, changes in soil conditions with depth, moisture content, consistency/density, plasticity, sampler type, and sampling depths and laboratory test results. Copies of the boring logs advanced for this investigation are presented in Appendix A.

Cone Penetrometer Tests

The CPT soundings were performed with Middle Earth Geo Testing, Inc. (MEGT) 25-ton truck mounted CPT rig. The soundings were conducted in accordance with ASTM specifications and pushed to a maximum depth of 60 feet below the ground surface. A copy of the CPT soundings is included in Appendix A.

A CPT involves pushing a standardized size instrument of a conical shape into the ground at a specified constant rate. The Conical Instrument (cone) used for this project had a tip area of 10 $cm^2$ and a friction sleeve area of 150 $cm^2$. The cone was pushed into ground at a constant rate of 20-mm per second using the 25-ton truck as reaction weight. The cone was fitted with load cells, which recorded the total force acting on the cone (Qc), sleeve friction (Fs), and pore pressure (u) readings at 5 cm depth intervals. The data collected from the CPT was used to interpret soil behavior type, site stratigraphy, soil consistency, strength, and many other geotechnical engineering properties using published relationships. Generally, cohesive soils (clays) have high friction ratios (sleeve friction divided by cone bearing – Rf), low cone bearing, and generate large excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing, and generate little in the way of excess pore water pressures.

**Subsurface Profile**

In general, the soils encountered in the exploratory borings were mixtures of clays, silts, sands, and gravels typical of alluvial soil desposits. The CPTs advanced at the site encountered soil behavior types that were predominately clayey and silty in nature. The predominantly fine-grained soils typically had medium stiff to very stiff consistencies. The predominantly coarse-

grained materials were generally medium dense to dense, although zones of loose soils were present in the upper 8 feet of the site. Except for some slightly moist surface material, the soils were generally moist at the time of drilling.

Groundwater encountered at the site ranged from approximately 8 to 18 feet below the ground surface. The historic high depth to groundwater level according to the CGS Seismic Hazards Zones Report for the Milpitas Quadrangle maps is reported to be between 5 and 10 feet below the ground surface. It should be noted, however, that fluctuations in the level of subsurface water can occur due to variations in rainfall, temperature, and recharge from the nearby San Francisco Bay, and groundwater levels should not be considered constant.

## 4.0 DATA ANALYSIS

### Subsurface Soil Classification

Based on the data acquired during our subsurface investigation (See Appendix A), the site is assigned to Site Class D ("stiff soil") as defined by Table 20.3-1 of the ASCE 7-10.

### Seismic Design Parameters

The following seismic design parameters represent the general procedure as outlined in Section 1613 of the CBC and in ASCE 7. The values determined below are based on the 2009 National Earthquake Hazard Reduction Program (NEHRP) maps and were obtained using the Structural Engineers Association of California Seismic Design Maps Web Application.

Summary of Seismic Parameters - CBC 2016
(Site Coordinates 37.5286°N, 122.0281°W)

| Parameter | Design Value |
|---|---|
| Site Class | D |
| Mapped Short Term Spectral Response Parameter, ($S_s$) | 1.73g |
| Mapped 1-second Spectral Response Parameter, ($S_1$) | 0.68g |
| Site Coefficient, ($F_a$) | 1.0 |
| Site Coefficient, ($F_v$) | 1.5 |
| Site Modified Short Term Response Parameter, ($S_{Ms}$) | 1.73g |
| Site Modified 1-second Response Parameter, ($S_{M1}$) | 1.03g |
| Design Short Term Response Parameter, ($S_{Ds}$) | 1.15g |
| Design 1-second Response Parameter, ($S_{D1}$) | 0.68g |

**Liquefaction**

Soil liquefaction is a phenomenon where saturated granular soils undergo a substantial loss of strength due to increased pore water pressure resulting from cyclic stress applications induced by earthquakes or other vibrations. In this process, the soil acquires mobility sufficient to permit both vertical and horizontal movements, which may result in significant deformations. Soils most susceptible to liquefaction are loose, uniformly graded, fine-grained sands. In addition, recent literature indicates that fine grained soils may also be susceptible to liquefaction or cyclic strain softening. Examples of highly susceptible fine-grained soil include "non-plastic silts and clayey silts of low plasticity (PI<12) at high water content to liquid limit ratios ($w_c$/LL>0.85)." Examples of soils moderately susceptible to liquefaction include "clayey silts and silty clays of moderate plasticity (12<PI<18) at natural water content and Liquid Limits ratios ($w_c$/LL) greater than 0.80" (Bray and Sancio, 2006). It is generally acknowledged that liquefaction will not affect surface improvements if these deposits are located at a depth greater than 50 feet below the ground surface. In the deeper deposits, the greater overburden pressure is sufficient to prevent liquefaction effects from occurring.

Analysis Parameters

The liquefaction analysis was carried out using an assumed groundwater table of 5 feet below ground surface (bgs) based on Plate 1.2 from the Seismic Hazard Zone Report for the Milpitas Quadrangle (2001). In accordance with USGS Interactive Deaggregations Web Application, the predominant earthquake is the Hayward fault with a magnitude of 6.9. The liquefaction analysis was based on the methodology suggested by Idriss and Boulanger, 2014 and utilizing the peak ground acceleration of 0.67g (PGAm) based on the United States Geological Survey's Design Maps Web.

Analysis Results

Liquefaction analysis was performed using subsurface data from both the CPTs and borings. Liquefaction related settlement was estimated to be less than ½-inch using CPT data and approximately 2-inches using data from Boring B6 and negligible using data from Boring B2. The liquefaction analysis results are included in Appendix C.

Discussion

In summary, there is a high potential of the granular deposits to liquefy during a design-level seismic event. Using the CPT data collected from the site, liquefaction-related settlements were calculated to be on the order of approximately 2 inches. As discussed in Special Publication 117A, differential settlements may be taken as two-thirds of the total settlements (slightly less and 1½-inches).

The boundary curve for discriminating between occurrence and non-occurrence of surface effects of liquefaction, after Ishihara 1985 (Youd and Garris, 1995), is presented at the end of Appendix C in Figure C1. All the points for the borings and CPTs and borings plot below the curve, indicating a low likelihood of surface manifestation potential.

Due to the depths of the liquefiable soils and the relatively flat nature of the site, and the fact that there are no open creek channels crossing or bordering the subject property, it is our opinion the potential for lateral spreading to occur within the site is low.

**Static Settlement**

The possibility of settlement is minimized by the light structural loads expected for the proposed development. Anticipated static settlements of the onsite native soils are on the order of 1½-inches with a differential settlement of ¾-inch.

## 5.0 CONCLUSIONS

**General**

Based on the results of the field investigation and the laboratory testing program, in our opinion, the site is geotechnically suitable for the proposed warehouse building provided that the recommendations contained herein are incorporated in the design and implemented during construction. The primary geotechnical concerns are the potential for the loose to medium dense saturated granular soils underlying the site to settle as a result of liquefaction and ground disturbance from demolition activities.

**Site Preparation and Grading**

Grading plans were not available during the preparation of this report. The site is currently occupied by existing office buildings. Demolition of the existing onsite structures and associated pavement and flatwork and removal of existing footing will result in ground disturbance. These depressions will need to be backfilled properly, as recommended in the following sections of the report.

**Soil Expansion Potential**

Plasticity index tests performed on samples of the upper soils from the site resulted in liquid limits (LL) ranging from 30 to 31 and plasticity indices (PI) ranging from 11 to 12. These values indicate that the sample tested has a low expansion potential. Therefore, measures other than moistening and compacting the soils are not considered necessary to mitigate soil expansion.

**Foundations**

The proposed warehouse building may be supported on conventional footings. Details of the foundation recommendations are included in the following sections of the report.

**Groundwater**

Groundwater was encountered at approximately 8 to 16 feet below the ground surface. The historic high depth to groundwater level according to the CGS Seismic Hazards Zones Report for the Milpitas Quadrangle maps is reported to be between 5 and 10 feet below the ground surface. Variations in rainfall, temperature, and other factors may affect water levels, and therefore groundwater levels should not be considered constant; however, groundwater is not expected to have an adverse effect on the construction of the proposed residence.

**Corrosion Potential Screening Results**

Two samples of the near surface soils were collected for screening of corrosion potential of soils. The samples were sent to Cerco Analytical and tested in accordance with ASTM Test Methods. Based on the review of the test results, they conclude that the soil is classified as corrosive to buried metallic utility pipes. The chloride ion concentrations of the samples ranged from 28 to 180 mg/kg. These low concentrations are considered to be insufficient to attack steel embedded in a concrete mortar coating. The sulfate ion concentrations of the samples ranged from 56 to 140 mg/kg. These low concentrations are considered to be insufficient to damage reinforced concrete structures. While no cement type restriction is required, in our opinion, it is generally a good idea to include some sulfate resistance and to maintain a relatively low water-cement ratio. Earth Systems does not practice corrosion engineering and we recommend that a qualified corrosion engineer be consulted regarding mitigation of the corrosive effects of the site soils on metals. The results of the test along with a brief corrosivity analysis by CERCO are included at the end of this report, in Appendix B.

**Seismicity**

The San Francisco Bay area is recognized by geologists and seismologists as one of the most seismically active regions in the United States. The significant earthquakes in this area are generally associated with crustal movement along well-defined, active fault zones which regionally trend in a northwesterly direction. Although research on earthquake prediction has greatly increased in recent years, seismologists cannot predict when and where an earthquake will occur. Nevertheless, based on current technology, it is reasonable to assume that the proposed development will be subjected to at least one moderate to severe earthquake during its lifetime. During such an earthquake, the danger from fault offset on the site is low, but strong shaking of the site is likely to occur and, therefore, the project should be designed in accordance

with the seismic design provisions of the latest California Building Code. The California Building Code seismic design parameters are not intended to prevent structural damage during an earthquake, but to reduce damage and minimize loss of life.

## 6.0 RECOMMENDATIONS

### Site Preparation and Grading

General Site Preparation

1. Site clearing, placement of fill, and grading operations at the site should be conducted in accordance with the recommendations provided in this report. Compaction recommendations for site grading can be found later in this section.

2. The site should be prepared for grading by removing structures scheduled for demolition, existing flatwork, existing trees and their root systems, vegetation, debris, and other potentially deleterious materials from areas to receive improvements. Existing utility lines that will not be serving the proposed project should be either removed or abandoned. The appropriate method of utility abandonment will depend upon the type and depth of the utility. Recommendations for abandonment can be made as necessary.

3. Due to potential ground disturbance from site clearing activities, a program of over-excavation and backfilling may be required. Loose, disturbed soil within the building areas should be cleaned out (excavated) to competent, undisturbed soil. Over-excavation of the upper 1 to 2 feet of existing ground may be needed. The exposed ground should be inspected by the geotechnical engineer to determine the need for additional excavation work. The bottoms of the resulting depressions should be scarified and cross-scarified at least 8 inches in depth, moisture conditioned and recompacted. The depressions should then be backfilled with approved, compacted, moisture conditioned structural fill, as recommended in other sections of this report.

4. Some of the soil borings indicated the presence of loose silty sand at shallow depths. These soils will likely be unstable under wheel loads. Therefore, areas where these soils are present at shallow depths may have to over-excavated and backfilled with excavated soil as engineered fills. The extent of these areas can be better defined during site grading by our field engineer.

5. Site clearing and backfilling operations should be conducted under the field observation of the geotechnical engineer.

6. The geotechnical engineer should be notified at least 48 hours prior to commencement of grading operations.

Compaction Recommendations

1. In general, the underlying native soil should be scarified at least 8 inches, moisture conditioned and recompacted to the recommended relative compaction presented below, unless noted otherwise. This scarification operation should be performed at locations designated for proposed structural fill, exterior flatwork, foundations, and pavement areas.

2. Some of the areas where loose silty sands are present at shallow depth may need to be stabilized prior to adding any additional fill. The stabilization effort may require over-excavation of these loose soils and placement of excavated soils as engineered fill.

3. Recompacted native soils and fill soils should be compacted to a minimum relative compaction of 90 percent of maximum dry density at a moisture content that is slightly over optimum.

4. In areas to be paved, the upper 8 inches of subgrade soil and the aggregate base course should be compacted to a minimum 95 percent of maximum dry density at a moisture content that is slightly over optimum. The subgrade and base should be firm and unyielding when proof-rolled with heavy, rubber-tired equipment prior to paving. The pavement subgrade soils should be frequently moistened as necessary prior to placement of the aggregate base and concrete slab to maintain the soil moisture content above optimum.

Fill Recommendations

1. The on-site native and fill soils that are free of debris, excessive amounts of organics and other deleterious material, may be used as structural fill.

2. If fill is to be imported for general use at the site as non-expansive imported material, the soil should meet the following criteria:

    a. Be coarse grained and have a plasticity index of less than 15 and/or an expansion index less than 20;
    b. Be free of organics, debris or other deleterious material;
    c. Have a maximum rock size of 3 inches; and
    d. Contain sufficient clay binder to allow for stable foundation and utility trench excavations.

3. A representative sample of the proposed imported soils should be submitted at least three days before being transported to the site for evaluation by the geotechnical engineer. During importation to the site the material should be further reviewed on an intermittent basis.

**Foundations**

1. The proposed self-storage building may be supported by conventional footings bearing on the stiff native or engineered fill material. The footings should be established at a minimum depth of 24 inches below the lowest adjacent soil pad grade.

2. The footings should be designed using a maximum allowable bearing pressure of 2,000 psf for dead plus live load. This value may be increased by one-third when transient loads such as wind or seismicity are included.

3. Resistance to lateral loads should be calculated based on a passive equivalent fluid pressure of 250 pcf and a friction factor of 0.305. Passive and frictional resistance can be combined in the calculations without reductions. These values are based on the assumption that backfill adjacent to foundations is properly compacted. The upper 12 inches of embedment should be disregarded in calculating passive resistance where uncompacted soil, such as landscaping, abut the foundation.

4. The foundation excavations should be kept moist by frequent, light, moisture sprays prior to the placement of concrete, as recommended by the geotechnical engineer in the field. The geotechnical engineer should observe the foundation excavations prior to forming or placement of reinforcing steel to verify the adequacy of the conditioning or recommend additional moisture conditioning, if deemed necessary.

**Concrete Slab-on-Grade Construction**

1. Interior slab-on-grade concrete should have a minimum thickness of 4 full inches and should be reinforced as directed by the architect/engineer.

2. Interior slabs-on-grade can be placed directly on compacted native soil that has been prepared in accordance with the recommendations in this report. Prior to placement of the aggregate base, the subgrade soil should be moistened as necessary to maintain the soil moisture content at or above optimum, and no desiccations cracks should be present. If adverse conditions are encountered during grading, a layer of low-expansive material may be recommended by the geotechnical engineer.

3. For conventional interior slab-on-grade floor construction in areas which will receive carpet of other floor coverings or where moisture sensitive materials will be stored directly on the slab, a capillary break system that consists a vapor retarder and a 4-inch-thick, clean crushed rock layer should be placed above the pad subgrade to serve as a capillary break.

4. The vapor retarder should comply with ASTM Standard Specification E 1745-17 and the latest recommendations of ACI Committee 302. The vapor retarder should be installed in accordance with ASTM Standard Practice E 1643-17. Care should be taken to properly lap and seal the vapor retarder, particularly around utilities, and to protect it from damage during construction.

5. A sand layer over the vapor retarder is optional. If sand, gravel or other permeable material is to be placed over the vapor retarder, the material over the vapor retarder should be only lightly moistened and not saturated prior to casting the slab. Excess water above the vapor retarder would increase the potential for moisture damage to floor coverings. Recent studies, including those by ACI Committee 302, have concluded that excess water above the vapor retarder would increase the potential for moisture damage to floor coverings and could increase the potential for mold growth or other microbial contamination. These studies also concluded that it is preferable to eliminate the sand layer and place the slab in direct contact with the vapor retarder, particularly during wet weather construction. However, placing the concrete directly on the vapor retarder would require special attention to using the proper vapor retarder, concrete mix design, and finishing and curing techniques.

6. When concrete slabs are in direct contact with vapor retarders, the concrete water to cement (w/c) ratio must be correctly specified to control bleed water and plastic shrinkage and cracking. The concrete w/c ratio for this type of application is typically in the range of 0.45 to 0.50. The concrete should be properly cured to reduce slab curling and plastic shrinkage cracking. Concrete materials, placement, and curing methods should be specified by the architect/engineer.

**Exterior Flatwork**

1. Exterior flatwork that will not experience vehicular traffic should have a minimum thickness of 4 full inches and should be reinforced as directed by the architect/engineer. If adverse conditions are encountered during grading, a layer of low-expansive material may be recommended by the geotechnical engineer.

2. Assuming that movement (i.e., 1/4-inch or more) of exterior flatwork beyond the structure is acceptable, the flatwork should be designed to be independent of the building foundations. The flatwork should not be doweled to foundations, and a separator should be placed between the two.

3. To reduce shrinkage cracks in concrete, the concrete aggregates should be of appropriate size and proportion, the water/cement ratio should be low, the concrete should be properly placed and finished, contraction joints should be installed, and the concrete should be properly cured. Concrete materials, placement and curing specifications should be at the direction of the designer; ACI 302.1R-04 and ACI 302.2R-04 are suggested as resources for the designer in preparing such specifications.

**Flexible Pavement Sections**

1. The asphalt pavement design sections were developed using the State of California Highway Design Manual, Chapter 630-Flexible Pavement. An assumed R-Value of 15 was assigned to the untreated native soil. Determination of the appropriate TI for each area to be paved is the province of the civil engineer and the jurisdiction. The calculated Asphalt Concrete (AC) and aggregate base (AB) thicknesses are for compacted subgrade material. Normal Caltrans construction tolerances should apply. The aggregate base should conform to Caltrans Class 2.

Summary of Pavement Sections (*Aggregate Subbase*)
*R-Value of 15*

| Traffic Index | Asphaltic Concrete (AC) inches | Class II Aggregate Base (AB) inches |
|---|---|---|
| 4 | 2½ | 5½ |
| 4.5 | 2½ | 7½ |
| 5.0 | 3 | 8 |
| 5.5 | 3 | 10 |
| 6.0 | 3½ | 10½ |
| 6.5 | 4 | 11½ |
| 7.0 | 4 | 13 |

2. As an alternate, the asphalt could be constructed directly on a section of lime treated native soil. Alternate pavement design sections were developed using the State of California Highway Design Manual, Chapter 630-Flexible Pavement. An assumed R-Value of 15 was assigned to the untreated native soil. An R-Value of 50 was assigned to the

treated native soil. An additional 6 inches of treated soil was included to compensate for the lack of compaction of the underlying native soil. The default lime percentage is 5 percent.

Summary of Pavement Sections (*Lime Treated Subbase*)
*R-Value of 15*

| Traffic Index | Asphaltic Concrete (AC) inches | Lime Treated Native Soil inches |
|---|---|---|
| 4 | 4 | 12 |
| 4.5 | 4½ | 12 |
| 5.0 | 5 | 12 |
| 5.5 | 5½ | 12 |
| 6.0 | 6½ | 12 |
| 6.5 | 7 | 12 |
| 7.0 | 7½ | 18 |

3. For the proper performance of the lime treated subgrade it is important not to breach the section with last minute utility trenches. Therefore, all utilities should be installed in advance of lime treatment and to a depth that will not be disturbed or damaged by the mixing or compaction effort. The parking lot should be rough graded approximately 1 inch lower than the design subgrade elevations to allow for bulking of the soils following treatment. If it is necessary to breach the lime section, the trench should be backfilled with compacted aggregate base or controlled low strength material (CLSM) with a 28-day strength ranging from 100 to 200 psi. Recompacted treated soils are not equivalent to the original treated soil.

4. The chemical treatment operations should be performed in general accordance with Chapter 7 of the Caltrans *Guidelines for the Stabilization of Subgrade Soils in California, Guideline: UCPRC-GL-2101-01* (Caltrans, 2012). The chemically treated material should be compacted to a minimum 90 percent of maximum dry density on the building pad, and 95 percent of maximum dry density in areas to receive pavement. The chemical treatment and compaction should be observed and tested by the geotechnical engineer.

**Rigid Pavement Sections**

1. No traffic data has been provided. We have assumed that the majority of the traffic would be multi-axle truck traffic. The concrete pavement was designed using the methodology outlined in the Army Corp of Engineers engineering and design manual, “Rigid Pavements

and Roads, Streets, Walks and Open Storage Areas." For design purposes the subgrade soil was assumed to have a modulus of subgrade reaction of 100 psi, a Traffic Category of IV, and a Design Index of 4.

2. The minimum thickness of concrete pavement is 7.5 inches. This thickness may be reduced to 7.0 inches if the subgrade is lime treated. Reinforcing of the concrete is optional. The concrete should have a minimum modulus of rupture of 650 psi. Construction joints should be doweled.

3. If the rigid pavements are to be subjected to traffic, such as where the rigid pavement is adjacent to flexible pavement, it is recommended that the thickness of the edges be increased by 20 percent and tapered back to normal slab thickness over a distance of 10 times the slab thickness.

**Utility Trench Backfills**

1. A select, noncorrosive, granular, easily compacted material should be used as bedding and shading immediately around utility pipes. The site soils may be used for trench backfill above the select material.

2. Trench backfill in the upper 8 inches of subgrade beneath pavement areas should be compacted to a minimum of 92 percent of maximum dry density at a moisture content at least 3 percentage points above optimum moisture content and the aggregate base courses should be compacted to a minimum 95 percent of maximum dry density at a moisture content slightly over optimum. Trench backfill in other areas should be compacted to a minimum of 90 percent of maximum dry density at a moisture content at least 3 percentage points above optimum moisture content. Jetting of utility trench backfill should not be allowed.

3. Where utility trenches extend under perimeter foundations, the trenches should be backfilled entirely with approved fill soil compacted to a minimum of 90 percent of maximum dry density at a moisture content at least 3 percentage points above optimum moisture content. The zone of approved fill soil should extend a minimum distance of 2 feet on both sides of the foundation. If utility pipes pass through sleeves cast into the perimeter foundations, the annulus between the pipes and sleeves should be completely sealed.

4. Parallel trenches excavated in the area under foundations defined by a plane radiating at a 45-degree angle downward from the bottom edge of the footing should be avoided, if possible. Trench backfill within this zone, if necessary, should consist of Controlled Density Fill (Flowable Fill).

**Surfacewater Drainage Management and Finish Improvements**

1. Unpaved ground surfaces should be finish graded to direct surface runoff away from site improvements at a minimum 5 percent grade for a minimum distance of 10 feet. If this is not practical due to the terrain or other site features, swales with improved surfaces should be provided to divert drainage away from improvements. The landscaping should be planned and installed to maintain proper surface drainage conditions.

2. Runoff from driveways, roof gutters, downspouts, planter drains and other improvements should be collected in a closed pipe system which discharge in a non-erosive manner away from foundations, pavements, and other improvements.

3. Stabilization of surface soils, particularly those disturbed during construction, by vegetation or other means during and following construction is essential to protect the site from erosion damage. Care should be taken to establish and maintain vegetation.

4. Raised planter beds adjacent to foundations should be provided with sealed sides and bottoms so that irrigation water is not allowed to penetrate the subsurface beneath foundations. Outlets should be provided in the planters to direct accumulated irrigation water away from foundations.

5. Open areas adjacent to exterior flatwork should be irrigated or otherwise maintained so that constant moisture conditions are created throughout the year. Irrigation systems should be controlled to the minimum levels that will sustain the vegetation without saturating the soil.

6. Bio-retention swales constructed within 10 feet or less from the building foundation should be lined with a 20-mil pond liner.

**Geotechnical Observation and Testing**

1. It must be recognized that the recommendations contained in this report are based on a limited number of borings and rely on continuity of the subsurface conditions encountered.

2. It is assumed that the geotechnical engineer will be retained to provide consultation during the design phase, to interpret this report during construction, and to provide construction monitoring in the form of testing and observation.

3. Unless otherwise stated, the terms "compacted" and "recompacted" refer to soils placed in level lifts not exceeding 8 inches in loose thickness and compacted to a minimum of 90 percent of maximum dry density. The standard tests used to define maximum dry density and field density should be ASTM D 1557-12 and ASTM D 6938-17, respectively, or other methods acceptable to the geotechnical engineer and jurisdiction.

4. “Moisture conditioning” refers to adjusting the soil moisture to at least 3 percentage points above optimum moisture content prior to application of compactive effort. If the soils are overly moist so that they become unstable, or if the recommended compaction cannot be readily achieved, drying the soil to optimum moisture content or just above may be necessary. Placement of gravel layers or geotextiles may also be necessary to help stabilize unstable soils. The geotechnical engineer should be contacted for recommendations for mitigating unstable soils.

5. At a minimum, the following should be provided by the geotechnical engineer:
   - Review of final grading and foundation plans,
   - Professional observation during site preparation, grading, and foundation excavation,
   - Oversight of soil compaction testing during grading,
   - Oversight of soil special inspection during grading.

6. Special inspection of grading should be provided as per Section 1705.6 and 1705.8 and Table 1705.6 and 1705.8 of the CBC; the soils special inspector should be under the direction of the geotechnical engineer. In our opinion, the following operations should be subject to *continuous* soils special inspection:
   - Scarification and recompaction,
   - Fill placement and compaction,
   - Foundation excavation,
   - Over-excavation to the recommended depth.

7. In our opinion, the following operations may be subject to *periodic* soils special inspection; subject to approval by the Building Official:

- Site preparation,
- Compaction of utility trench backfill,
- Removal of existing development features,
- Compaction of subgrade and aggregate base,
- Observation of foundation excavations,
- Building pad moisture conditioning.

8. It will be necessary to develop a program of quality control prior to beginning grading. It is the responsibility of the owner, contractor, or project manager to determine any additional inspection items required by the architect/engineer or the governing jurisdiction.

9. The locations and frequencies of compaction tests should be as per the recommendations of the geotechnical engineer at the time of construction. The recommended test locations and frequencies may be subject to modification by the geotechnical engineer based upon soil and moisture conditions encountered, the size and type of equipment used by the contractor, the general trend of the compaction test results, and other factors.

10. A preconstruction conference among a representative of the owner, the geotechnical engineer, soils special inspector, the architect/engineer, and contractors is recommended to discuss planned construction procedures and quality control requirements. Earth Systems should be notified at least 48 hours prior to beginning grading operations.

## 7.0 CLOSURE

This report is valid for conditions as they exist at this time for the type of project described herein. Our intent was to perform the investigation in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the locality of this project at this time under similar conditions. No representation, warranty, or guarantee is either expressed or implied. This report is intended for the exclusive use by the client as discussed in the Scope of Services section. Application beyond the stated intent is strictly at the user's risk.

If changes with respect to the project type or location become necessary, if items not addressed in this report are incorporated into plans, or if any of the assumptions stated in this report are not correct, Earth Systems should be notified for modifications to this report. Any items not specifically addressed in this report should comply with the California Building Code and the requirements of the governing jurisdiction.

The preliminary recommendations of this report are based upon the geotechnical conditions encountered during the investigation and may be augmented by additional requirements of the architect/engineer, or by additional recommendations provided by this firm based on conditions exposed at the time of construction.

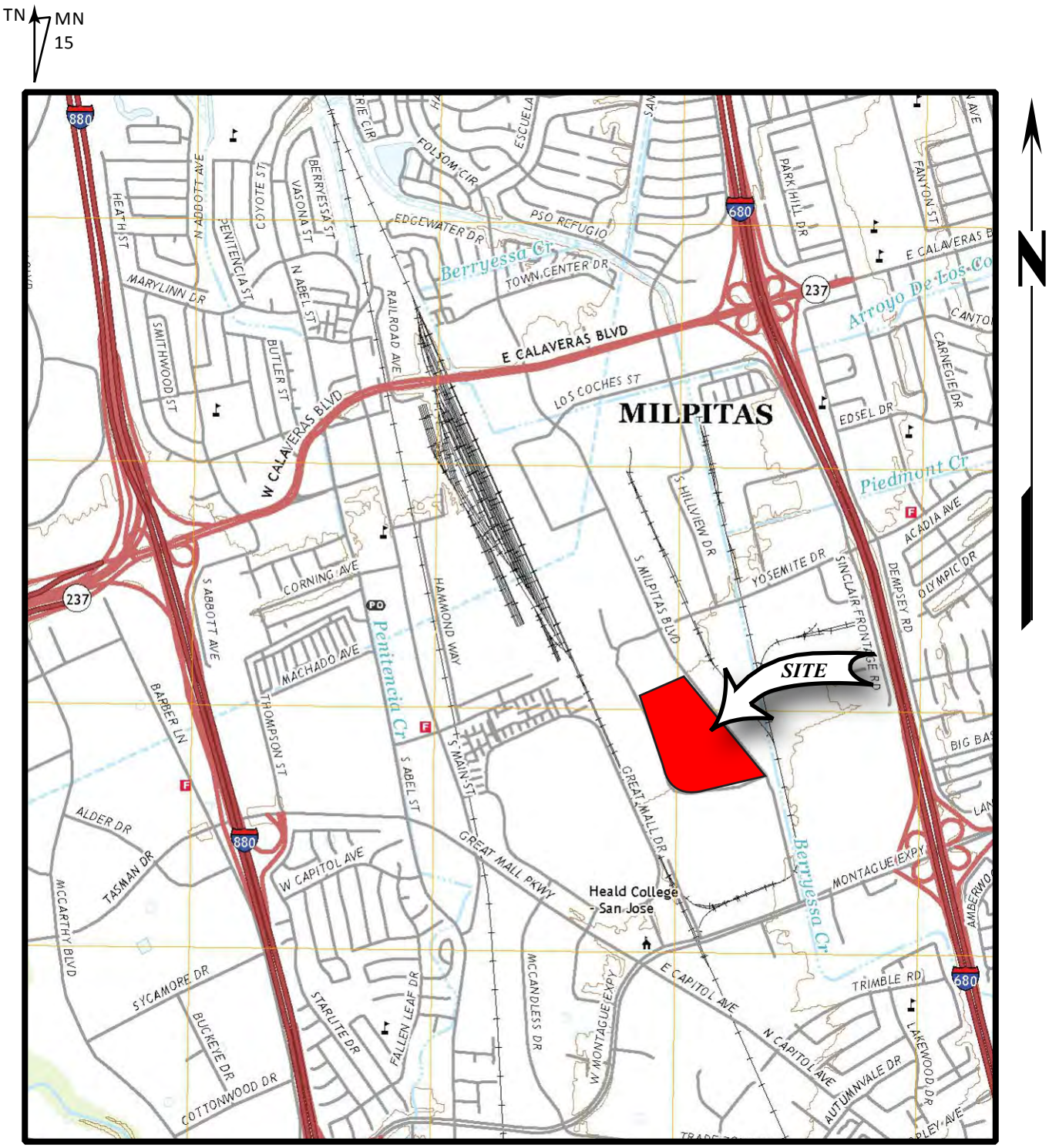
If Earth Systems is not retained to provide construction observation and testing services, it will not be responsible for the interpretation of the information by others or any consequences arising there from.

This document, the data, conclusions, and recommendations contained herein are the property of Earth Systems. This report should be used in its entirety, with no individual sections reproduced or used out of context. Copies may be made only by Earth Systems, the client, and his authorized agents for use exclusively on the subject project. Any other use is subject to federal copyright laws and the written approval of Earth Systems.

**FIGURES**

Figure 1 - Site Location Map
Figure 2 - Site Plan

*Figure 1*



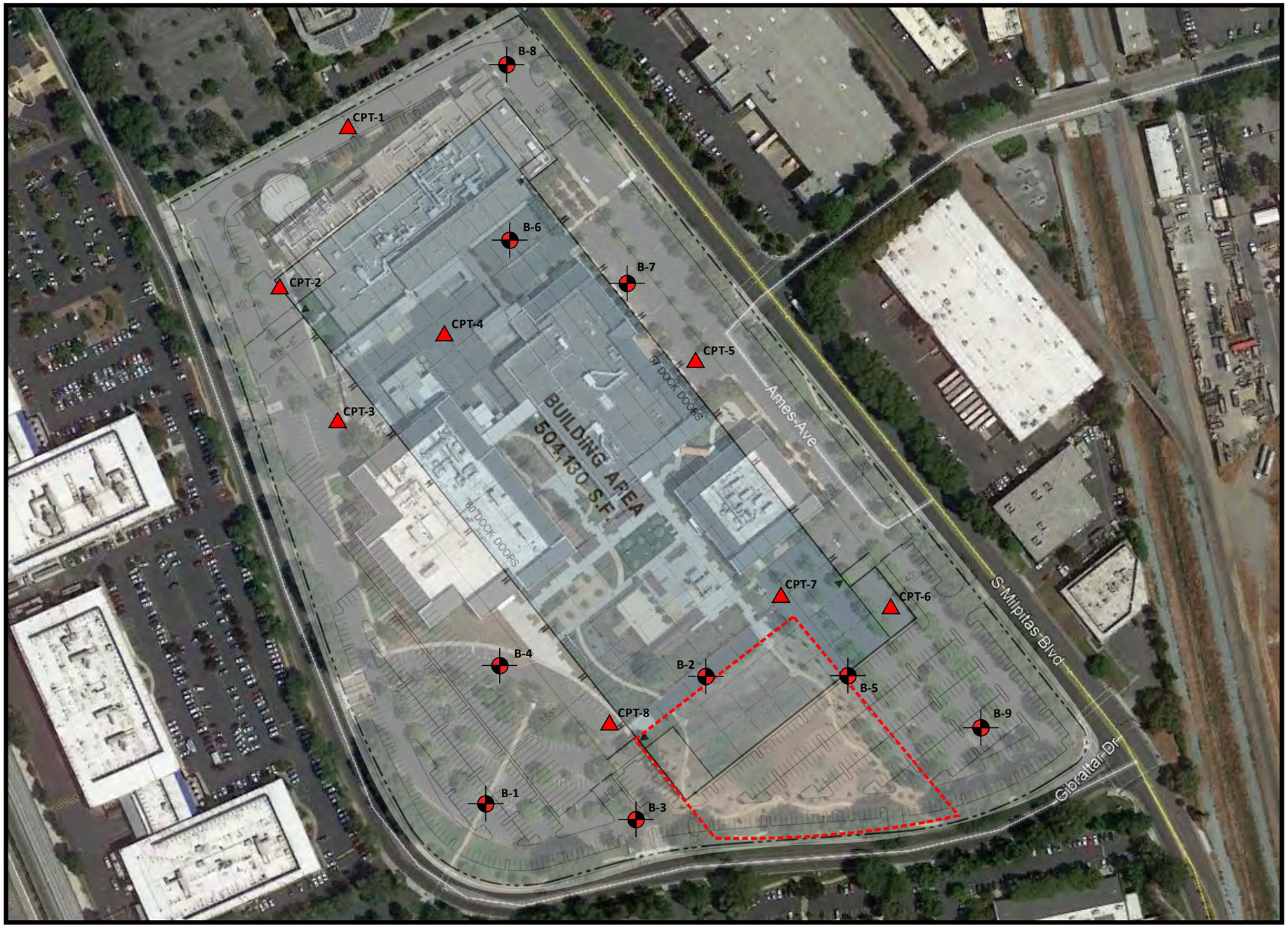

**Approximate Scale 1: 24,000**

1 0 Mile

1 0 1 Kilometer

Base: USGS 7.5 Minute Series, Milpitas Quadrangle (2018)

| | | |
|---|---|---|
| *Earth Systems Pacific* | **1000 Gibralter Drive Warehouse**<br>**1000 Gibralter Drive**<br>**Milpitas, California** | **Site Locaon Map**<br>**302865-001** |



**EXPLANATION**

B-2 Approximate Boring Locaon

CPT-2 Approximate CPT Locaon

Approximate Bio-Retenon Area

100 0 100 200

Approximate Scale in Feet

Base: Google Earth, 2019 and Scheme 1 by Overton Moore Properties (2018)

| | | |
|---|---|---|
| Earth Systems Pacific | 1000 Gibraltar Drive Warehouse<br>1000 Gibraltar Drive<br>Milpitas, California | Site Plan<br>File No: 302865-001 |

**APPENDIX A**

Boring Logs (9)
Cone Penetrometer Tests (8)

# Earth Systems Pacific

Boring No. 1

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA


JOB NO.: 302865-001
DATE: 1/23/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | SAMPLE DATA: INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | 2.5"AC, 6" AB | | | | | | | |
| 1 | CL | | SANDY Lean CLAY; gray brown, very stiff, moist | | | | | | | |
| 2 | | | | | | | | | 9 | |
| | | | | | | | | | 10 | |
| 3 | | | | 1.0-2.5 | 1-1 | ■ | 100 | 24.2 | 10 | 3.0 |
| 4 | | | | | | | | | 6 | |
| | | | | | | | | | 8 | |
| 5 | | | | 3.5-5.0 | 1-2 | ■ | 104 | 21.5 | 12 | 2.25 |
| 6 | | | Boring was terminated at 5 feet bgs. Groundwater was not encountered. | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |
| 9 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 11 | | | | | | | | | | |
| 12 | | | | | | | | | | |
| 13 | | | | | | | | | | |
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| 19 | | | | | | | | | | |
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| 21 | | | | | | | | | | |
| 22 | | | | | | | | | | |
| 23 | | | | | | | | | | |
| 24 | | | | | | | | | | |
| 25 | | | | | | | | | | |
| 26 | | | | | | | | | | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

Boring No. 2

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA


JOB NO.: 302865-001
DATE: 1/23/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | 2.5" AC, 6" AB | | | | | | | |
| 1–3 | CL | | SANDY Lean CLAY; gray brown, very stiff, moist, some black mottling [FILL?] | 1.0-2.5 | 2-1 | ■ | 112 | 14.9 | 5 7 12 | >4.5 |
| 3–7 | SC | | CLAYEY SAND; light brown, loose, moist, fine to medium coarse sand | 3.0-4.5 | 2-2 | ■ | 111 | 5.8 | 6 3 4 | |
| 7–13 | CL | | Lean CLAY with SAND; dark gray brown, stiff, wet ▼ | 8.0-9.5 | 2-3 | ■ | 100 | 26.3 | 2 4 8 | 1.25 |
| 13–16 | ML | | SILT; gray to gray brown, medium stiff, wet, some orange brown mottling LL=32, PI=7 | 13.0-14.5 | 2-4 | ■ | 92 | 32.9 | 3 4 6 | 1.25 |
| 16–26 | CL | | Lean CLAY; gray to dark gray, stiff, wet | 18.0-19.5 | 2-5 | ■ | 106 | 23.2 | 9 6 9 | 2.75 |
| | | | -very stiff | 23.0-24.5 | 2-6 | ■ | 103 | 24.9 | 5 9 14 | 1.5 |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

Boring No. 2


LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA

JOB NO.: 302865-001
DATE: 1/23/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | SAMPLE DATA: INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 - 27 | | | CONTINUED... | | | | | | | |
| 28 - 29 - 30 - 31 - 32 - 33 | SM | | SILTY SAND; light gray brown, dense, wet, fine coarse sand | 28.0-29.5 | 2-7 | ■ | | | 11<br>17<br>32 | |
| 34 - 35 - 36 - 37 | | | -Medium dense<br>%Fines=21 | 33.0-34.5 | 2-8 | ■ | | | 5<br>12<br>17 | |
| 38 - 39 - 40 - 41 - 42 - 43 | CL | | SANDY Lean CLAY; gray brown, very stiff, wet | 38.0-39.5 | 2-9 | ■ | | | 6<br>11<br>19 | 2.5 |
| 44 - 45 - 46 - 47 | | | -Hard | 43.0-44.5 | 2-10 | ■ | | | 7<br>15<br>23 | 3.5 |
| 48 - 49 - 50 | | | -Very stiff | 47.0-48.5 | 2-11 | ■ | | | 10<br>14<br>19 | 2.0 |
| 51 - 52 | | | Boring was terminated at 50 feet bgs.<br>Groundwater was encountered at 8 feet bgs. | | | | | | | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

Boring No. 3

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA


JOB NO.: 302865-001
DATE: 1/23/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | 2" AC, 6" AB | | | | | | | |
| 1 | CL | | SANDY Lean CLAY; gray brown, medium stiff, moist | | | | | | 6 | |
| 2 | | | | 1.0-2.5 | 3-1 | ■ | | | 4 5 | 3.0 |
| 3 | | | | | | | | | 2 | |
| 4 | | | LL=31, PI=12 | 3.0-4.5 | 3-2 | ■ | | | 3 4 | 0.75 |
| 5 | | | | | | | | | | |
| 6 | | | | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | CL | | Lean CLAY; gray to gray brown, very stiff, wet ▼ | | | | | | 4 | |
| 9 | | | | 8.0-9.5 | 3-3 | ■ | 96 | 26.3 | 6 13 | 0.75 |
| 10 | | | | | | | | | | |
| 11 | | | | | | | | | | |
| 12 | | | | | | | | | | |
| 13 | | | -Dark gray brown, stiff | | | | | | 5 | |
| 14 | | | | 13.0-14.5 | 3-4 | ■ | 92 | 30.8 | 5 6 | 1.5 |
| 15 | | | | | | | | | | |
| 16 | | | | | | | | | | |
| 17 | | | | | | | | | | |
| 18 | CL | | SANDY Lean CLAY; gray brown, very stiff, wet, trace gravels | | | | | | 8 | |
| 19 | | | | 18.0-19.5 | 3-5 | ■ | 112 | 18.3 | 11 14 | 2.0 |
| 20 | | | | | | | | | | |
| 21 | | | | | | | | | | |
| 22 | | | | | | | | | | |
| 23 | | | | | | | | | | |
| 24 | | | -Stiff | | | | | | 9 | |
| 25 | | | | 23.5-25.0 | 3-6 | ● | | | 8 10 | |
| 26 | | | | | | | | | | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

Boring No. 3

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA


JOB NO.: 302865-001
DATE: 1/23/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | SAMPLE DATA: INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | CONTINUED... | | | | | | | |
| 27 | | | | | | | | | | |
| 28 | | | | | | | | | | |
| 29 | | | | | | | | | 4 | |
| 30 | | | | 28.5-30.0 | 3-7 | ● | | | 5<br>7 | |
| | | | Boring was terminated at 30 feet bgs.<br>Groundwater was encounter at 8.5 feet bgs. | | | | | | | |
| 31 | | | | | | | | | | |
| 32 | | | | | | | | | | |
| 33 | | | | | | | | | | |
| 34 | | | | | | | | | | |
| 35 | | | | | | | | | | |
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| 50 | | | | | | | | | | |
| 51 | | | | | | | | | | |
| 52 | | | | | | | | | | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

Boring No. 4
PAGE 1 OF 2

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA

JOB NO.: 302865-001
DATE: 1/23/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | 2" AC, 6" AB | | | | | | | |
| 1 | CL | | SANDY Lean CLAY; gray brown, very stiff, moist, trace gravel | 1.0-2.5 | 4-1 | ■ | | | 7 9 14 | 4.0 |
| 2 | | | | | | | | | | |
| 3 | | | | | | | | | | |
| 4 | | | -Stiff %Fines=50 | 3.0-4.5 | 4-2 | ■ | 107 | 19.8 | 5 7 9 | 3.5 |
| 5 | | | | | | | | | | |
| 6 | | | | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | CL | | Lean CLAY; dark gray brown, very stiff, moist | 8.0-9.5 | 4-3 | ■ | 103 | 22.8 | 4 9 11 | 2.25 |
| 9 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 11 | | | -Wet ▼ | | | | | | | |
| 12 | | | | | | | | | | |
| 13 | | | | | | | | | | |
| 14 | | | -Trace rootlets, stiff | 13.0-14.5 | 4-4 | ■ | 96 | 27.9 | 4 5 9 | 1.5 |
| 15 | | | | | | | | | | |
| 16 | | | | | | | | | | |
| 17 | | | | | | | | | | |
| 18 | CL | | SANDY Lean CLAY; gray to gray brown, very stiff, wet | 18.0-19.5 | 4-5 | ■ | 109 | 21.2 | 4 8 12 | |
| 19 | | | | | | | | | | |
| 20 | | | | | | | | | | |
| 21 | | | | | | | | | | |
| 22 | | | | | | | | | | |
| 23 | | | | | | | | | | |
| 24 | | | | 23.5-25.0 | 4-6 | ● | | | 8 9 11 | |
| 25 | | | | | | | | | | |
| 26 | | | | | | | | | | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

Boring No. 4

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA


JOB NO.: 302865-001
DATE: 1/23/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | SAMPLE DATA: INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | CONTINUED... | | | | | | | |
| 27 | | | | | | | | | | |
| 28 | | | | | | | | | | |
| 29 | | | | | | | | | 5 | |
| 30 | | | | 28.5-30.0 | 4-7 | ● | | | 6<br>6 | |
| | | | Boring was terminated at 30 feet bgs.<br>Groundwater was encountered at 11 feet. | | | | | | | |
| 31 | | | | | | | | | | |
| 32 | | | | | | | | | | |
| 33 | | | | | | | | | | |
| 34 | | | | | | | | | | |
| 35 | | | | | | | | | | |
| 36 | | | | | | | | | | |
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| 50 | | | | | | | | | | |
| 51 | | | | | | | | | | |
| 52 | | | | | | | | | | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

Boring No. 5
PAGE 1 OF 2

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA

JOB NO.: 302865-001
DATE: 1/23/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | 2" AC, 8" AB | | | | | | | |
| 1 | GC | | CLAYEY GRAVEL with SAND; brown, medium dense, fine coarse sand/gravel [FILL?] | 1.0-2.5 | 5-1 | ■ | 120 | 6.8 | 10 11 12 | |
| 3 | SM | | SILTY SAND; light brown, loose, moist, fine to medium coarse sand %Fines=50 | 3.0-4.5 | 5-2 | ■ | 117 | 14.7 | 4 5 8 | |
| 8 | CL | | Lean CLAY with SAND; dark gray, medium stiff, moist | 8.0-9.5 | 5-3 | ■ | 94 | 29.7 | 2 3 4 | 1.25 |
| 11 | | | -Wet ▼ | | | | | | | |
| 14 | SM | | SILTY SAND; gray brown, medium dense, wet %Fines=21 | 13.0-14.5 | 5-4 | ■ | 70 | 20.8 | 4 5 11 | |
| 18 | CL | | SANDY Lean CLAY; gray, stiff, wet | 18.5-20.0 | 5-5 | ● | | | 4 5 8 | |
| 23 | | | -Some gravel, more sand | 23.5-25.0 | 4-6 | ● | | | 5 8 6 | |
| 26 | | | | | | | | | | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

Boring No. 5

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA


JOB NO.: 302865-001
DATE: 1/23/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | SAMPLE DATA: INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | CONTINUED... | | | | | | | |
| 27 | | | | | | | | | | |
| 28 | | | | | | | | | | |
| 29 | | | | | | | | | 11 | |
| 30 | | | | 28.5-30.0 | 5-7 | ● | | | 7<br>9 | |
| | | | Boring was terminated at 30 feet bgs.<br>Groundwater was encountered at 12 feet bgs. | | | | | | | |
| 31 | | | | | | | | | | |
| 32 | | | | | | | | | | |
| 33 | | | | | | | | | | |
| 34 | | | | | | | | | | |
| 35 | | | | | | | | | | |
| 36 | | | | | | | | | | |
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| 38 | | | | | | | | | | |
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| 43 | | | | | | | | | | |
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| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | | | | | | | | | | |
| 51 | | | | | | | | | | |
| 52 | | | | | | | | | | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

## Boring No. 6

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA


JOB NO.: 302865-001
DATE: 1/24/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | 2" AC, 8" AB | | | | | | | |
| 1 | CL | | SANDY Lean CLAY; very dark brown, very stiff, moist, trace gravels [FILL?] LL=31, PI=11 | 1.0-2.5 | 6-1 | ■ | 109 | 16.8 | 20 15 19 | >4.5 |
| 3 | | | | 3.0-4.5 | 6-2 | ■ | 112 | 15.8 | 5 8 10 | 4.25 |
| 7 | SP | | Poorly Graded SAND with GRAVEL; gray brown to dark gray, medium dense, very moist %Gravel=50, %Sand=43, %Fines=7 | 8.0-9.5 | 6-3 | ■ | 134 | 7.9 | 11 19 15 | |
| 13 | CL | | Lean CLAY; light gray brown, very stiff, wet, orange brown mottling | 13.0-14.5 | 6-4 | ■ | 121 | 30.0 | 16 12 12 | 2.75 |
| 19 | | | | 18.0-19.5 | 6-5 | ■ | 104 | 23.8 | 4 8 11 | 2.0 |
| 24 | | | | 23.5-25.0 | 6-6 | ● | 113 | 18.6 | 8 12 15 | 1.5 |
| 26 | CL | | SANDY Lean CLAY; gray brown, very stiff, wet | | | | | | | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA

Boring No. 6

JOB NO.: 302865-001
DATE: 1/24/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | SAMPLE DATA: INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | CONTINUED... | | | | | | | |
| 27 | | | | | | | | | | |
| 28 | | | | | | | | | | |
| 29 | | | | | | | | | 7 | |
| 30 | | | LL=37, PI=19 | 28.5-30.0 | 6-7 | ● | | 19.2 | 13<br>16 | |
| 31 | | | | | | | | | | |
| 32 | | | | | | | | | | |
| 33 | | | -Stiff | | | | | | | |
| 34 | | | | | | | | | 4 | |
| 35 | | | | 33.5-35.0 | 6-8 | ● | | | 5<br>9 | |
| 36 | | | | | | | | | | |
| 37 | | | | | | | | | | |
| 38 | | | | | | | | | | |
| 39 | | | | | | | | | 4 | |
| 40 | | | | 28.5-30.0 | 6-9 | ● | | | 6<br>12 | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | 7 | |
| 45 | | | | 43.5-45.0 | 6-10 | ● | | | 8<br>10 | |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | SC | | CLAYEY SAND with GRAVEL; brown, very dense, wet, fine coarse sand/gravel | | | | | | | |
| 49 | | | | | | | | | 20 | |
| 50 | | | | 48.5-50.0 | 6-11 | ● | | | 26<br>50/3" | |
| 51 | | | Boring was terminated at 50 feet bgs.<br>Groundwater was encountered at 12 feet bgs. | | | | | | | |
| 52 | | | | | | | | | | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

Boring No. 7

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA


JOB NO.: 302865-001
DATE: 1/24/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | 2" AC, 6" AB | | | | | | | |
| 1 | SP-SC | | Poorly Graded SAND with CLAY and GRAVEL; brown, medium dense, moist, fine coarse sand/gravel | 1.0-2.5 | 7-1 | ■ | 99 | 6.2 | 5 22 14 | |
| 2 | | | | | | | | | | |
| 3 | | | -More gravels, dense | | | | | | | |
| 4 | | | | 3.0-4.5 | 7-2 | ■ | | 5.8 | 21 20 33 | |
| 5 | | | | | | | | | | |
| 6 | | | | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | CL | | Lean CLAY with SAND; very dark brown, medium stiff, wet ▼ | | | | | | | |
| 9 | | | | 8.0-9.5 | 7-3 | ■ | 90 | 31.2 | 2 3 6 | 1.0 |
| 10 | | | | | | | | | | |
| 11 | | | | | | | | | | |
| 12 | | | | | | | | | | |
| 13 | | | -Stiff | | | | | | | |
| 14 | | | | 13.0-14.5 | 7-4 | ■ | 96 | 26.3 | 3 5 9 | 2.0 |
| 15 | | | | | | | | | | |
| 16 | | | | | | | | | | |
| 17 | CL | | SANDY Lean CLAY; light gray brown, very stiff, wet | | | | | | | |
| 18 | | | | | | | | | | |
| 19 | | | | 18.0-19.5 | 7-5 | ■ | 107 | 23.3 | 5 8 10 | 1.5 |
| 20 | | | | | | | | | | |
| 21 | | | | | | | | | | |
| 22 | | | | | | | | | | |
| 23 | | | | | | | | | | |
| 24 | | | | | | | | | | |
| 25 | | | | 23.5-25.0 | 7-6 | ● | | | 6 10 12 | |
| 26 | | | | | | | | | | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

Boring No. 7

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA


JOB NO.: 302865-001
DATE: 1/24/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | SAMPLE DATA: INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | CONTINUED... | | | | | | | |
| 27 | | | | | | | | | | |
| 28 | | | -More sand | | | | | | | |
| 29 | | | | | | | | | 7 | |
| 30 | | | | 28.5-30.0 | 7-7 | ● | | | 12<br>15 | |
| | | | Boring was terminated at 30 feet bgs.<br>Groundwater was encountered at 8.5 feet bgs. | | | | | | | |
| 31 | | | | | | | | | | |
| 32 | | | | | | | | | | |
| 33 | | | | | | | | | | |
| 34 | | | | | | | | | | |
| 35 | | | | | | | | | | |
| 36 | | | | | | | | | | |
| 37 | | | | | | | | | | |
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| 50 | | | | | | | | | | |
| 51 | | | | | | | | | | |
| 52 | | | | | | | | | | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

Boring No. 8
PAGE 1 OF 2

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA

JOB NO.: 302865-001
DATE: 1/24/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | 2" AC, 6" AB | | | | | | | |
| 1 | CL | | Lean CLAY with SAND; very dark brown, medium stiff, moist, trace gravels | 1.0-2.5 | 8-1 | ■ | | | 5 6 9 | >4.5 |
| 3 | CL | | SANDY Lean CLAY; gray brown, very stiff, moist | 3.0-4.5 | 8-2 | ■ | 110 | 16.0 | 7 9 9 | >4.5 |
| 8 | CL | | Lean CLAY; gray brown, soft, very moist, some gray brown mottling<br>%Fines=75<br>LL=31, PI=13 | 8.0-9.5 | 8-3 | ■ | 100 | 22.1 | 8 4 3 | 0.75 |
| 13 | | | -Very dark brown, stiff | 13.0-14.5 | 8-4 | ■ | 94 | 27.7 | 3 6 7 | 1.75 |
| 18 | CL | | SANDY Lean CLAY; gray brown, very stiff, wet ▼ | 18.0-19.5 | 8-5 | ■ | 101 | 22.7 | 6 7 9 | 1.5 |
| 25 | | | | 23.5-25.0 | 8-6 | ● | | | 6 7 10 | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

Boring No. 7

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA


JOB NO.: 302865-001
DATE: 1/24/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | SAMPLE DATA: INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | CONTINUED... | | | | | | | |
| 27 | | | | | | | | | | |
| 28 | | | | | | | | | | |
| 29 | | | | | | | | | 6 | |
| 30 | | | | 28.5-30.0 | 8-7 | ● | | | 7<br>12 | |
| 31 | | | Boring was terminated at 30 feet bgs.<br>Groundwater was encountered at 18 feet bgs. | | | | | | | |
| 32 | | | | | | | | | | |
| 33 | | | | | | | | | | |
| 34 | | | | | | | | | | |
| 35 | | | | | | | | | | |
| 36 | | | | | | | | | | |
| 37 | | | | | | | | | | |
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| 49 | | | | | | | | | | |
| 50 | | | | | | | | | | |
| 51 | | | | | | | | | | |
| 52 | | | | | | | | | | |

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

Boring No. 9

LOGGED BY: P. Penrose
DRILL RIG: B-53 Blue
AUGER TYPE: 8-Inch HSA


JOB NO.: 302865-001
DATE: 1/24/19

**1000 Gibralter Dr Warehouse**
**1000 Gibralter Dr**
**Milpitas, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | SAMPLE DATA: INTERVAL (feet) | SAMPLE NUMBER | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. | POCKET PEN (t.s.f) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | 3"AC, 8" AB | | | | | | | |
| 1 | CL | | SANDY Lean CLAY; very dark brown, medium stiff, moist | | | | | | 4 | |
| 2 | | | | | | | | | 5 | |
| | | | LL=30, PI=12 | 1.0-2.5 | 9-1 | ■ | | | 6 | |
| 3 | | | | | | | | | | |
| 4 | | | -Gray brown, stiff | | | | | | 5 | |
| | | | | | | | | | 7 | |
| 5 | | | | 3.5-5.0 | 9-2 | ■ | 121 | 14.6 | 9 | |
| 6 | | | Boring was terminated at 5 feet bgs. Groundwater was not encountered. | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |
| 9 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 11 | | | | | | | | | | |
| 12 | | | | | | | | | | |
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| 16 | | | | | | | | | | |
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| 20 | | | | | | | | | | |
| 21 | | | | | | | | | | |
| 22 | | | | | | | | | | |
| 23 | | | | | | | | | | |
| 24 | | | | | | | | | | |
| 25 | | | | | | | | | | |
| 26 | | | | | | | | | | |

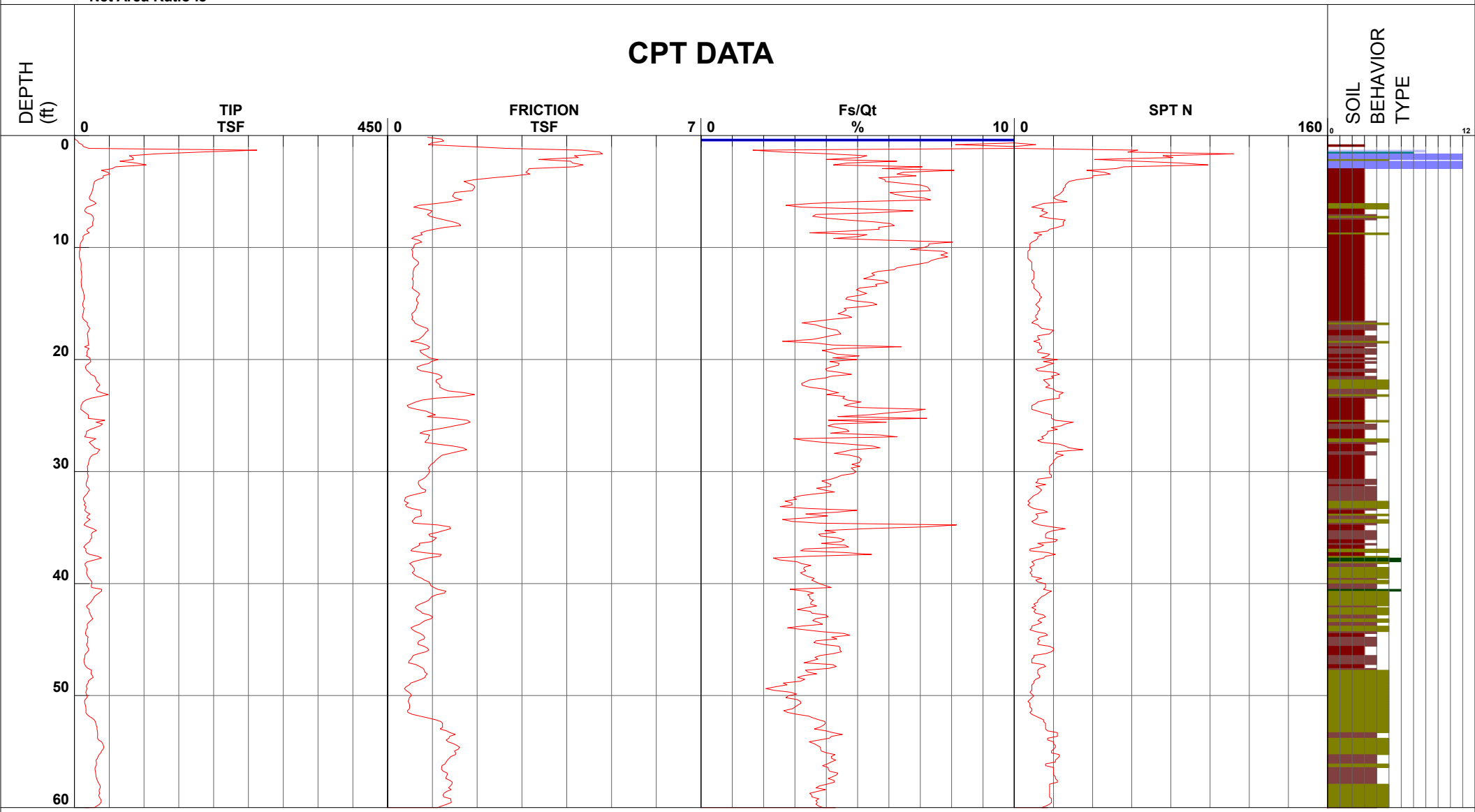
LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby Tube Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems

| | | | | | |
|---|---|---|---|---|---|
| Project | Gibraltar Drive Warehouse | Operator | AS-JM | Filename | SDF(046).cpt |
| Job Number | 302865-001 | Cone Number | DDG1448 | GPS | |
| Hole Number | CPT-01 | Date and Time | 2/4/2019 11:35:41 AM | Maximum Depth | 61.02 ft |
| EST GW Depth During Test | 12.00 ft | | | | |

Net Area Ratio .8




1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

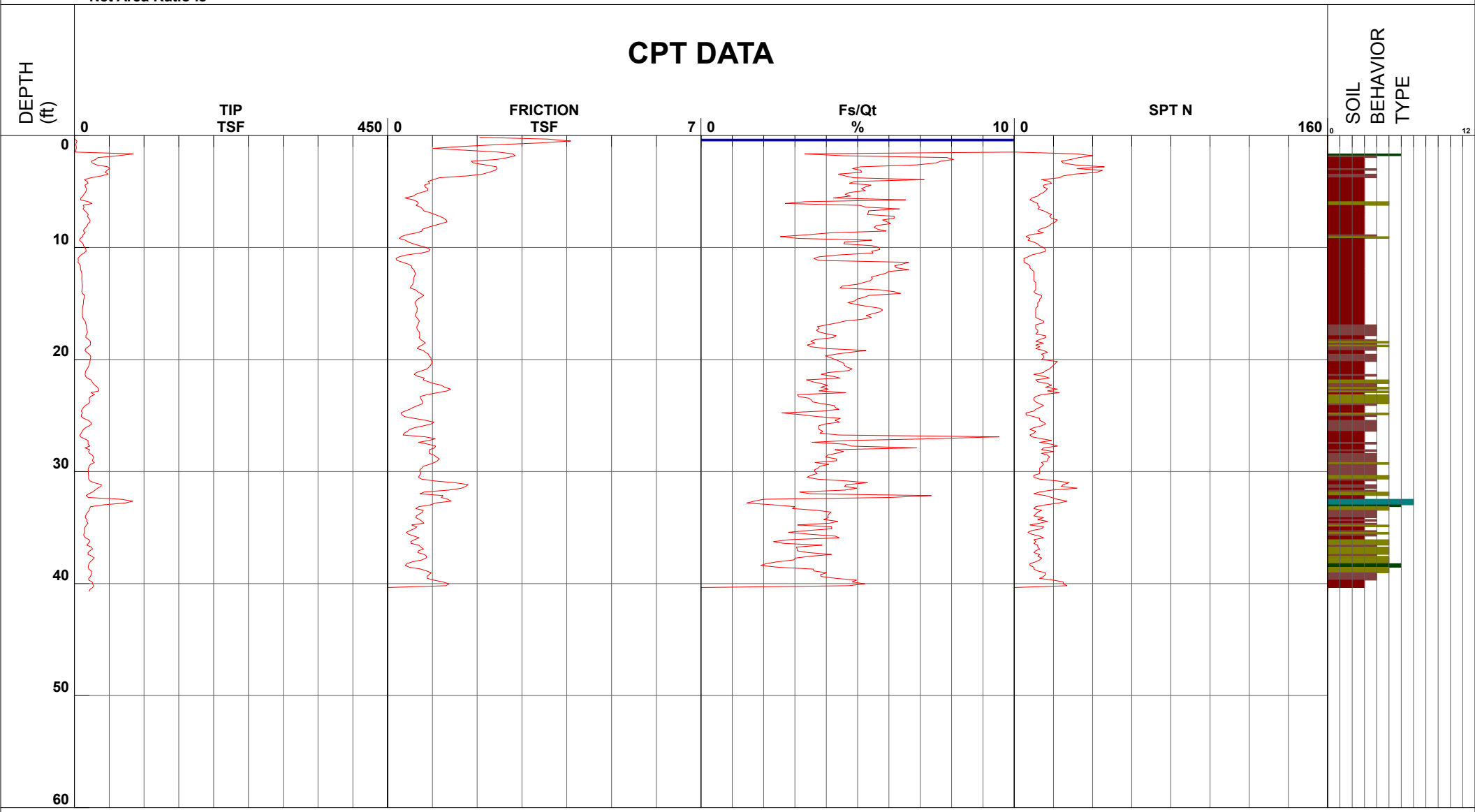
Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

# Earth Systems

| | | | | | |
|---|---|---|---|---|---|
| Project | Gibraltar Drive Warehouse | Operator | AS-JM | Filename | SDF(048).cpt |
| Job Number | 302865-001 | Cone Number | DDG1448 | GPS | |
| Hole Number | CPT-02 | Date and Time | 2/4/2019 1:10:49 PM | Maximum Depth | 40.68 ft |
| EST GW Depth During Test | | 15.00 ft | | | |

Net Area Ratio .8




1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

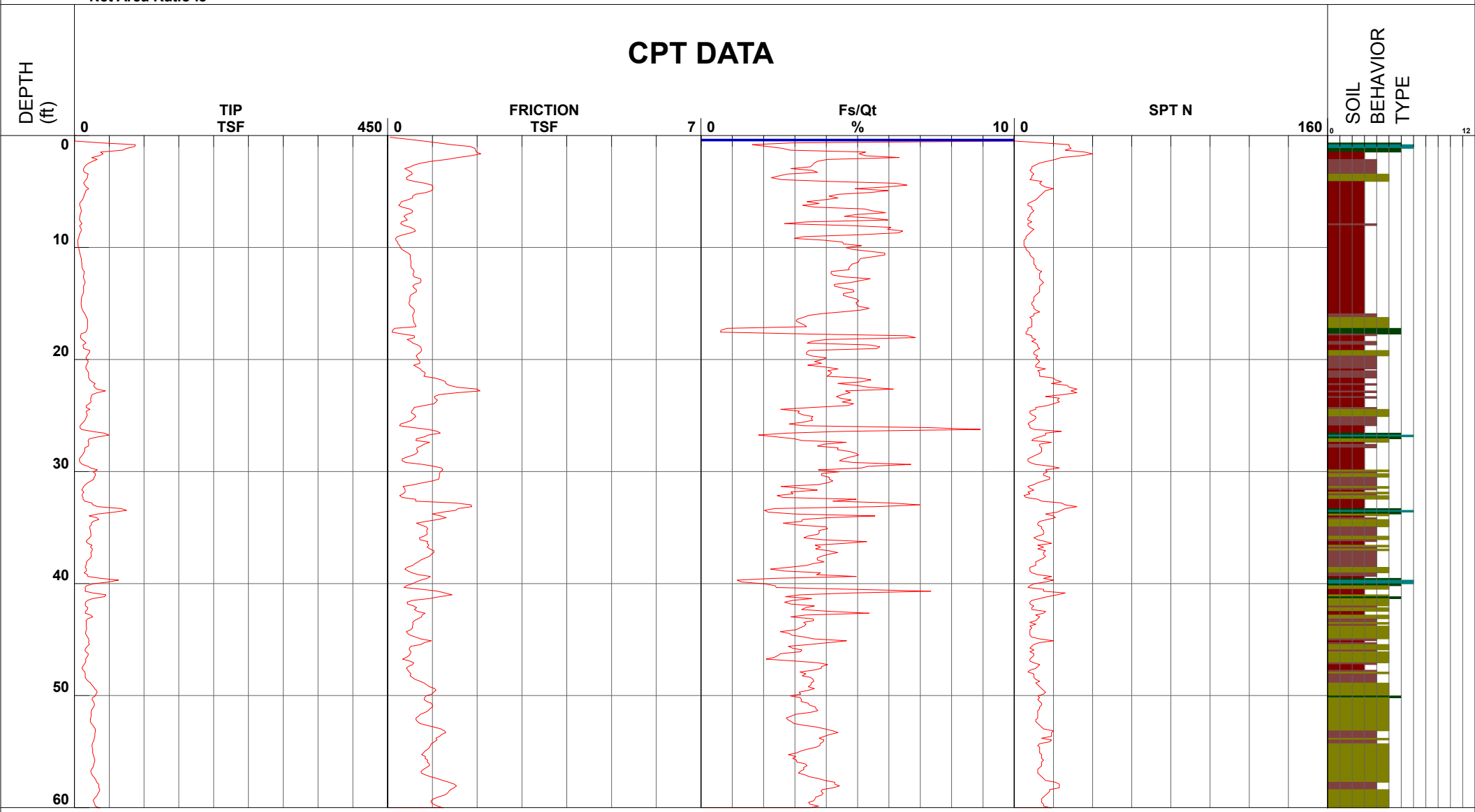
Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

# Earth Systems

| | | | | | |
|---|---|---|---|---|---|
| Project | Gibraltar Drive Warehouse | Operator | AS-JM | Filename | SDF(049).cpt |
| Job Number | 302865-001 | Cone Number | DDG1448 | GPS | |
| Hole Number | CPT-03 | Date and Time | 2/4/2019 2:00:37 PM | Maximum Depth | 60.69 ft |
| EST GW Depth During Test | 16.00 ft | | | | |

Net Area Ratio .8




1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

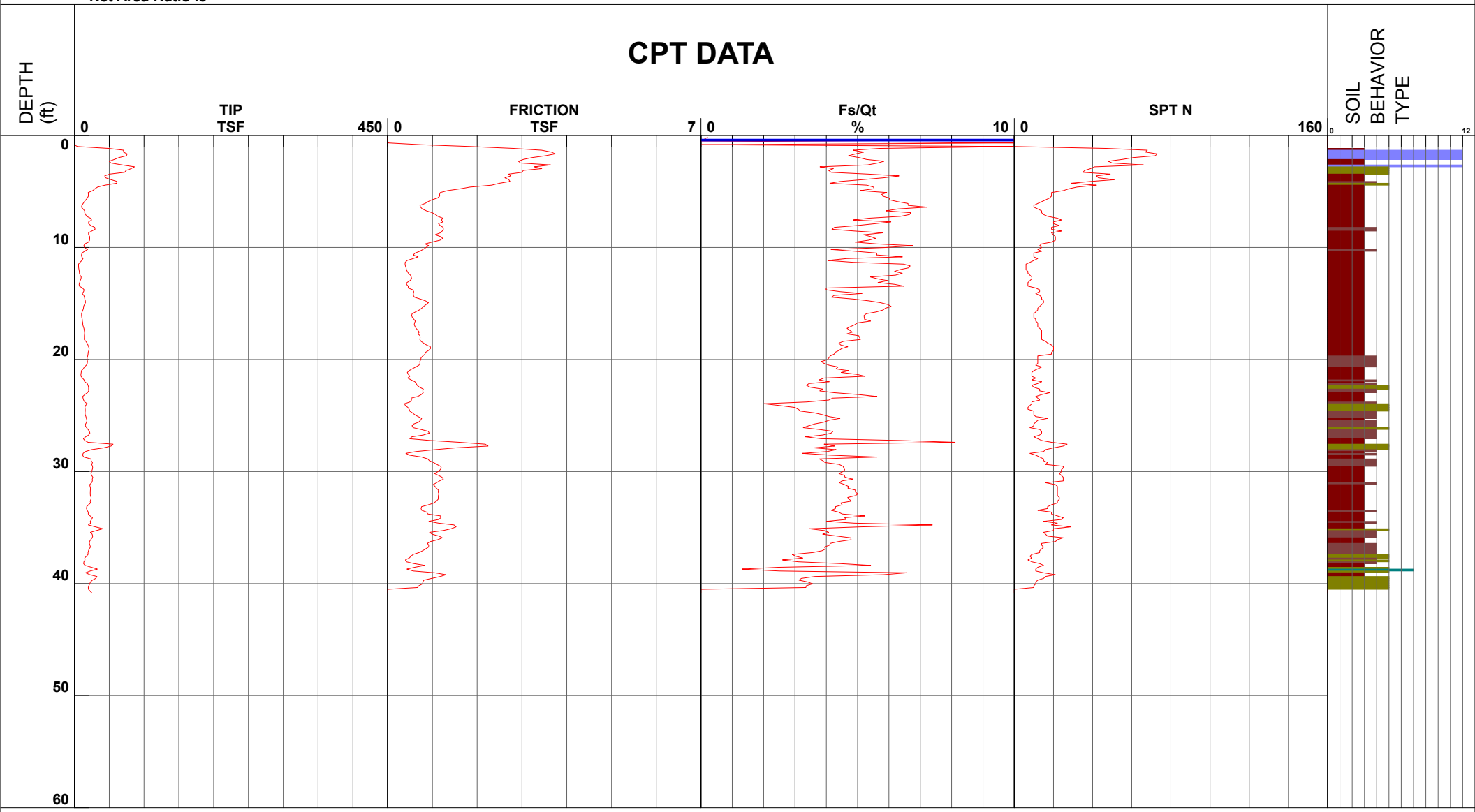
Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

# Earth Systems

| | | | | | |
|---|---|---|---|---|---|
| Project | Gibraltar Drive Warehouse | Operator | AS-JM | Filename | SDF(052).cpt |
| Job Number | 302865-001 | Cone Number | DDG1448 | GPS | |
| Hole Number | CPT-04 | Date and Time | 2/4/2019 5:37:03 PM | Maximum Depth | 40.85 ft |
| EST GW Depth During Test | 10.00 ft | | | | |

Net Area Ratio .8




1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 15cm squared

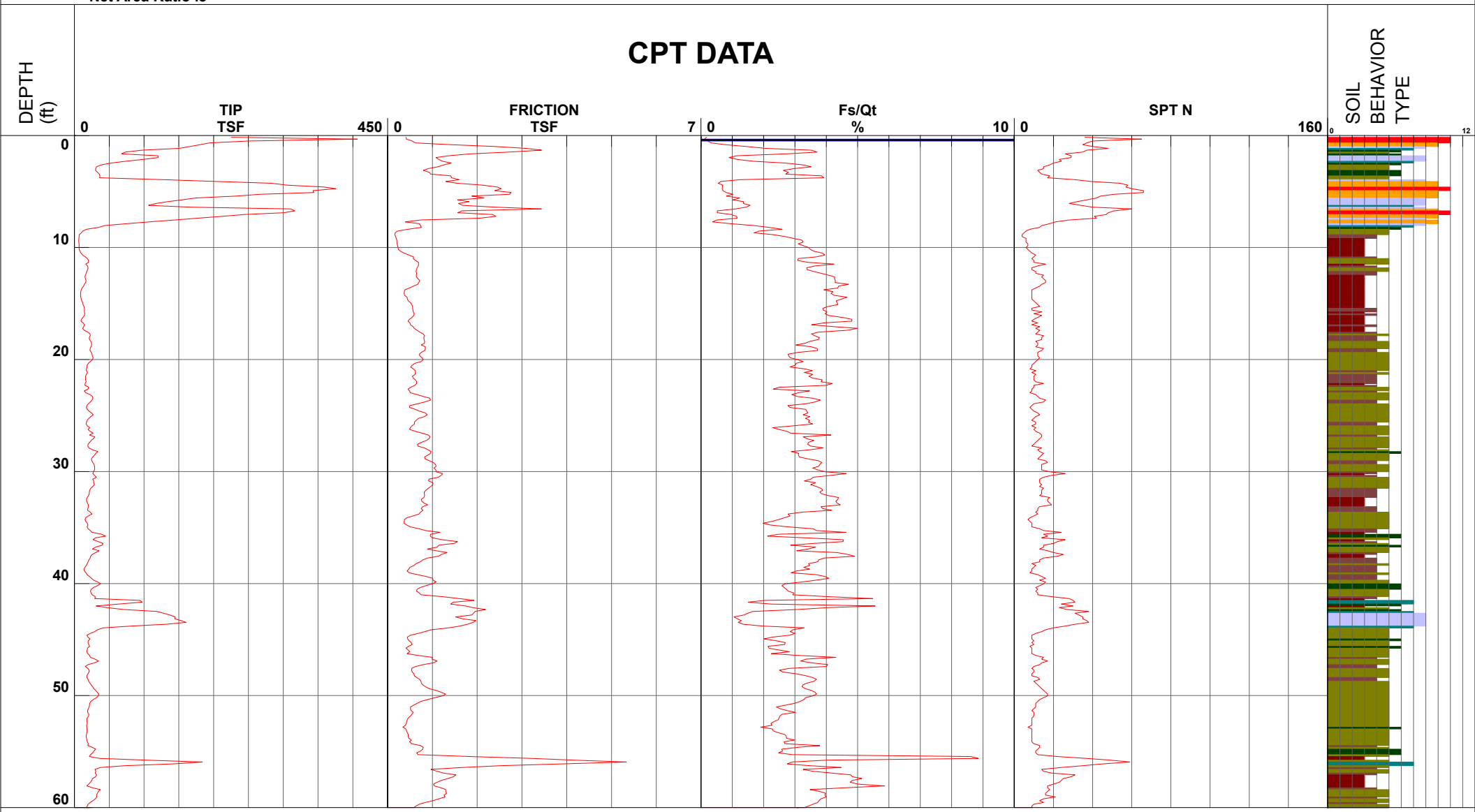
S*Soil behavior type and SPT based on data from UBC-1983

# Earth Systems

| | | | | | |
|---|---|---|---|---|---|
| Project | Gibraltar Drive Warehouse | Operator | AS-JM | Filename | SDF(042).cpt |
| Job Number | 302865-001 | Cone Number | DDG1448 | GPS | |
| Hole Number | CPT-05 | Date and Time | 2/4/2019 8:27:24 AM | Maximum Depth | 60.86 ft |
| EST GW Depth During Test | 12.00 ft | | | | |

Net Area Ratio .8

## CPT DATA




- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Cone Size 15cm squared

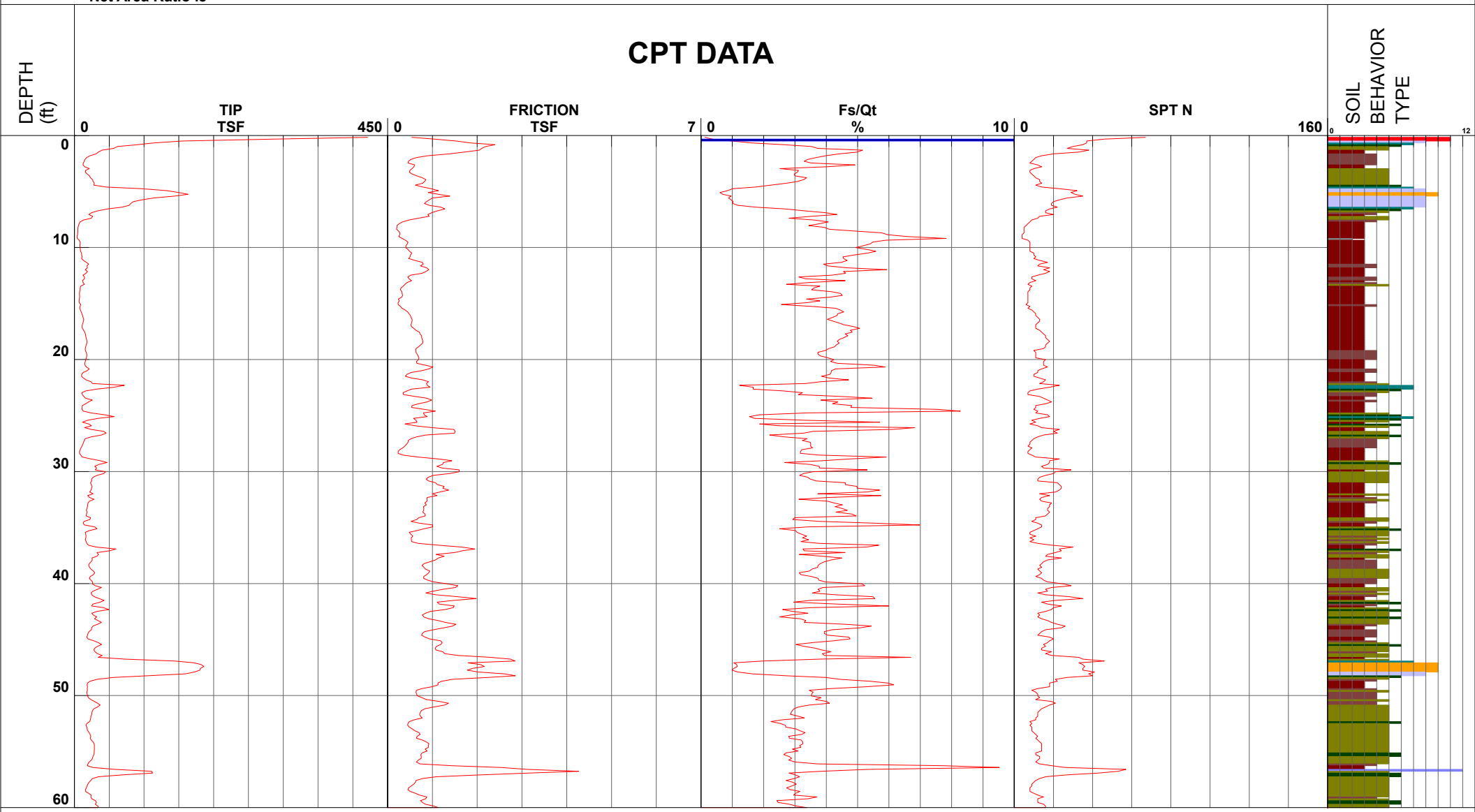
S*Soil behavior type and SPT based on data from UBC-1983

# Earth Systems

| | | | | | |
|---|---|---|---|---|---|
| Project | Gibraltar Drive Warehouse | Operator | AS-JM | Filename | SDF(043).cpt |
| Job Number | 302865-001 | Cone Number | DDG1448 | GPS | |
| Hole Number | CPT-06 | Date and Time | 2/4/2019 9:19:02 AM | Maximum Depth | 60.53 ft |
| EST GW Depth During Test | 9.20 ft | | | | |

Net Area Ratio .8

## CPT DATA




- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

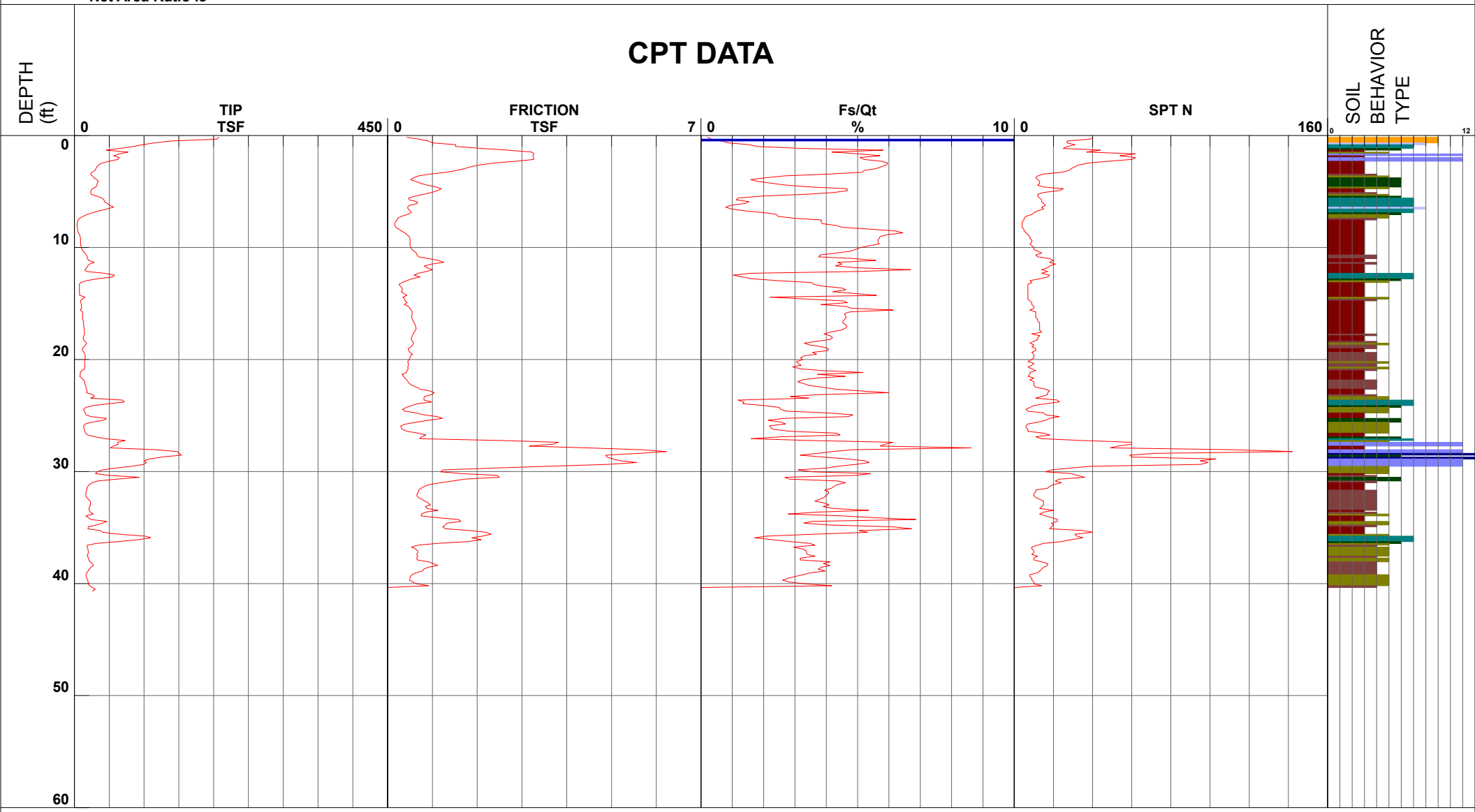
Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

# Earth Systems

| | | | | | |
|---|---|---|---|---|---|
| Project | Gibraltar Drive Warehouse | Operator | AS-JM | Filename | SDF(044).cpt |
| Job Number | 302865-001 | Cone Number | DDG1448 | GPS | |
| Hole Number | CPT-07 | Date and Time | 2/4/2019 10:11:26 AM | Maximum Depth | 40.68 ft |
| EST GW Depth During Test | 10.30 ft | | | | |

Net Area Ratio .8




1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

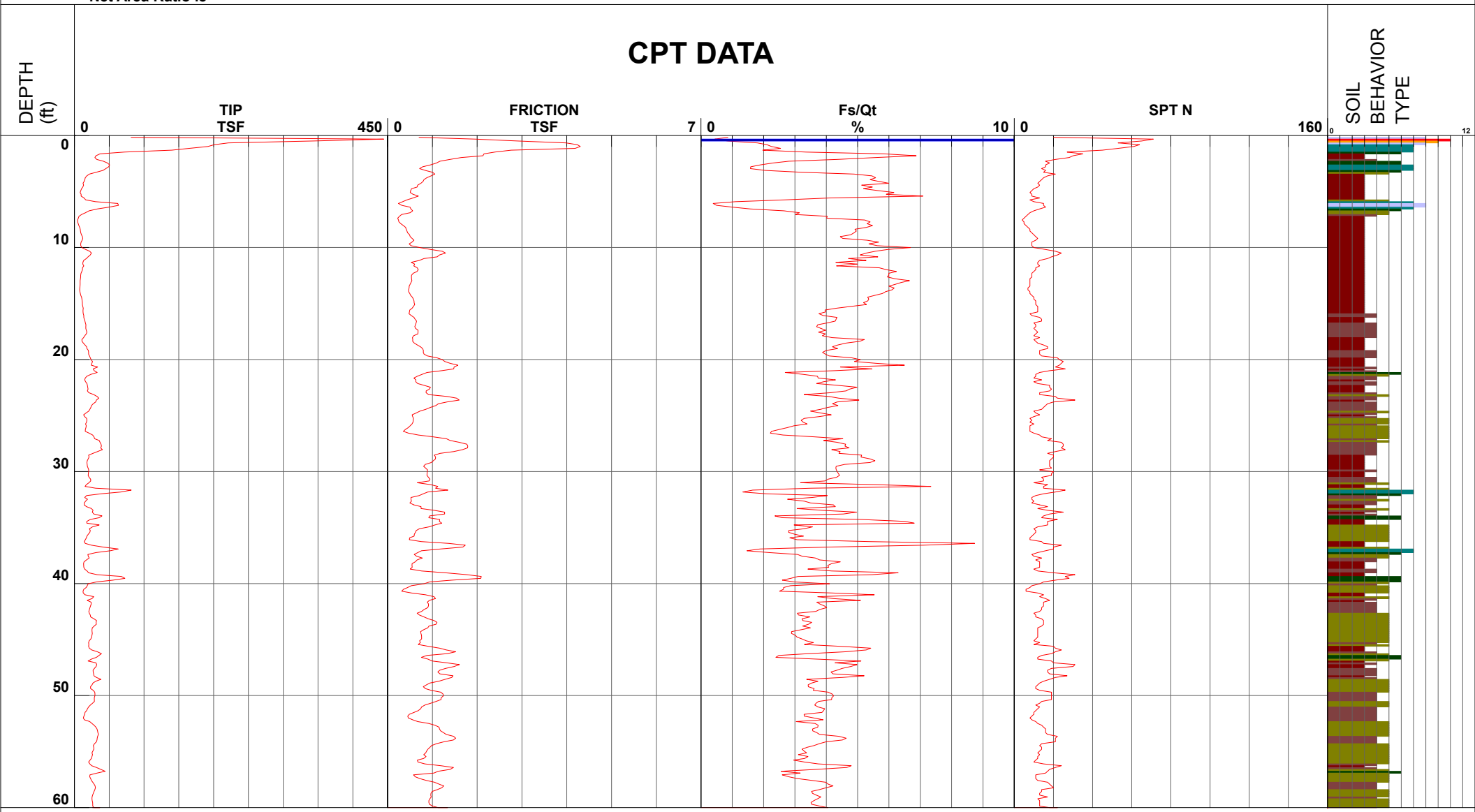
Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

# Earth Systems

| | | | | | |
|---|---|---|---|---|---|
| Project | Gibraltar Drive Warehouse | Operator | AS-JM | Filename | SDF(050).cpt |
| Job Number | 302865-001 | Cone Number | DDG1448 | GPS | |
| Hole Number | CPT-08 | Date and Time | 2/4/2019 3:13:29 PM | Maximum Depth | 60.69 ft |
| EST GW Depth During Test | 8.20 ft | | | | |

Net Area Ratio .8




1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

# APPENDIX B

Laboratory Test Results

**Earth Systems Pacific**

Gibraltar Drive Warehouse 302865-001

## BULK DENSITY TEST RESULTS

**ASTM D 2937-17 (modified for ring liners)**

January 30, 2019

| BORING NO. | DEPTH feet | MOISTURE CONTENT, % | WET DENSITY, pcf | DRY DENSITY, pcf |
|---|---|---|---|---|
| B-1 | 2.5 - 3.0 | 24.2 | 123.5 | 99.5 |
| B-1 | 4.5 - 5.0 | 21.5 | 126.5 | 104.1 |
| | | | | |
| B-2 | 2.5 - 3.0 | 14.9 | 128.2 | 111.6 |
| B-2 | 4.5 - 5.0 | 5.8 | 117.7 | 111.3 |
| B-2 | 9.5 - 10.0 | 26.3 | 126.3 | 100.0 |
| B-2 | 14.5 - 15.0 | 32.9 | 122.0 | 91.8 |
| B-2 | 19.5 - 20.0 | 23.2 | 130.2 | 105.8 |
| B-2 | 24.5 - 25.0 | 24.9 | 129.0 | 103.3 |
| | | | | |
| B-3 | 9.5 - 10.0 | 26.3 | 121.1 | 95.9 |
| B-3 | 14.5 - 15.0 | 30.8 | 120.4 | 92.1 |
| B-3 | 19.5 - 20.0 | 18.3 | 132.0 | 111.5 |
| | | | | |
| B-4 | 2.5 - 3.0 | | | |
| B-4 | 4.5 - 5.0 | 19.8 | 128.2 | 107.0 |
| B-4 | 9.5 - 10.0 | 22.8 | 126.3 | 102.8 |
| B-4 | 14.5 - 15.0 | 27.9 | 122.4 | 95.7 |
| B-4 | 19.5 - 20.0 | 21.2 | 131.6 | 108.6 |
| | | | | |
| B-5 | 2.5 - 3.0 | 6.8 | 128.2 | 120.1 |
| B-5 | 4.5 - 5.0 | 14.7 | 134.2 | 117.0 |
| B-5 | 9.5 - 10.0 | 29.7 | 122.1 | 94.1 |
| B-5 | 14.5 - 15.0 | 20.8 | 84.5 | 70.0 |
| | | | | |
| B-6 | 2.5 - 3.0 | 16.8 | 127.1 | 108.8 |
| B-6 | 4.5 - 5.0 | 15.8 | 129.4 | 111.7 |
| B-6 | 9.5 - 10.0 | 7.9 | 144.4 | 133.8 |
| B-6 | 14.5 - 15.0 | 30.0 | 117.2 | 120.8 |
| B-6 | 19.5 - 20.0 | 23.8 | 128.1 | 103.5 |
| B-6 | 24.0 - 24.5 | 18.6 | 133.5 | 112.6 |
| B-6 | 28.5 - 29.0 | 19.2 | | |

**Earth Systems Pacific**

Gibraltar Drive Warehouse 302865-001

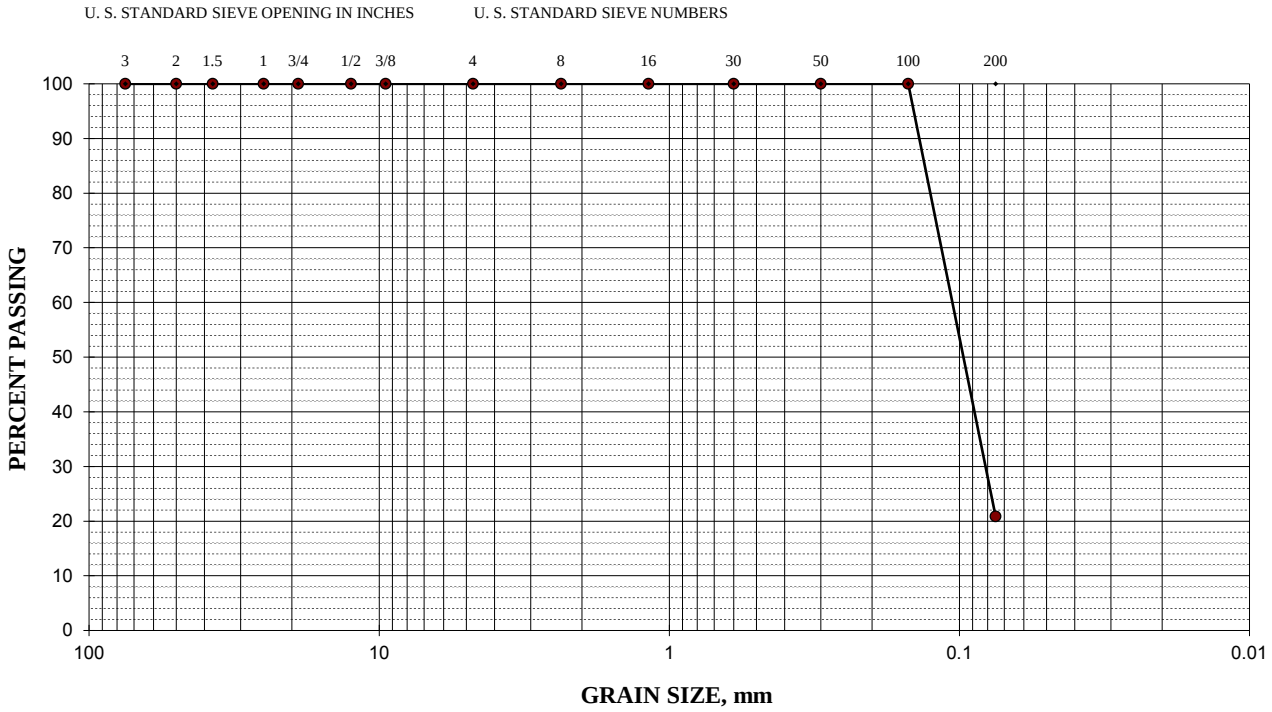
## PARTICLE SIZE ANALYSIS

**ASTM D 422-63/07; D 1140-17**

Boring #B-2 @ 34.5 - 35.0' January 30, 2019

Yellowish Brown Poorly Graded Sand with Clay (SP-SC)

| Sieve size | % Retained | % Passing |
|---|---|---|
| #200 (75-µm) | 79 | 21 |



**Earth Systems Pacific**

Gibraltar Drive Warehouse 302865-001

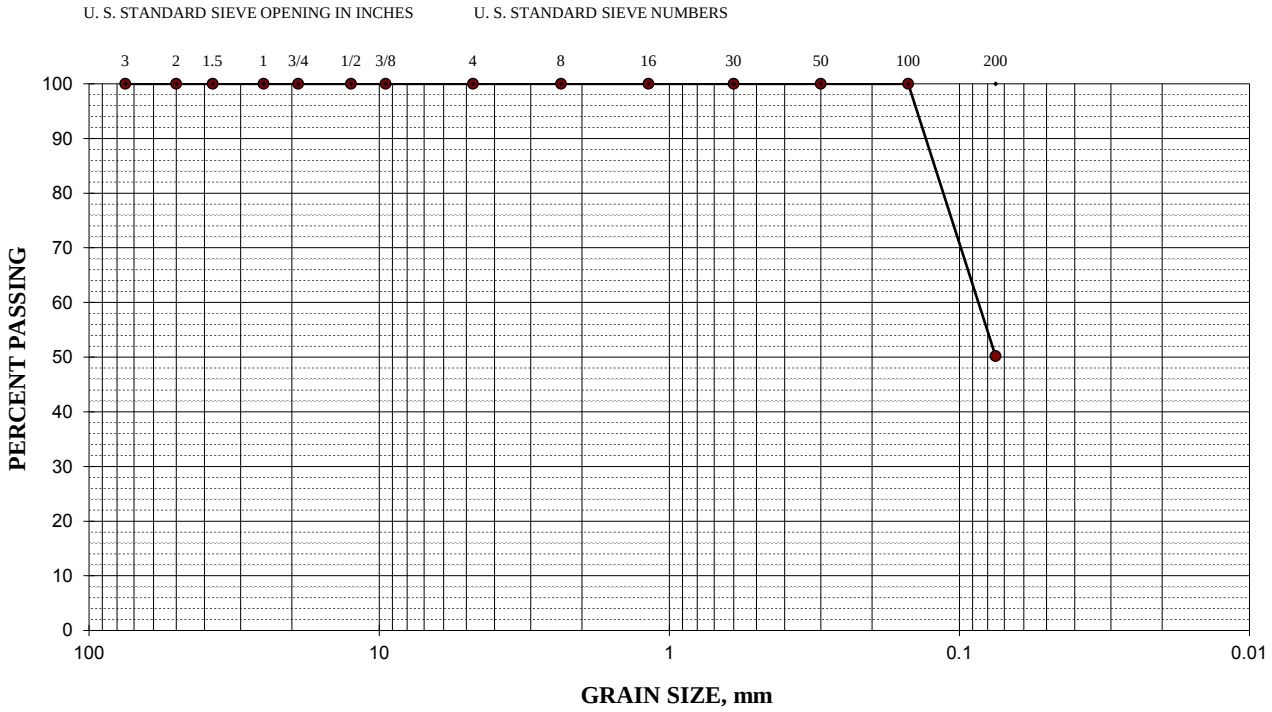
## PARTICLE SIZE ANALYSIS

**ASTM D 422-63/07; D 1140-14**

Boring #B-5 @ 4.5 - 5.0' January 30, 2019

Yellowish Brown Lean Clay with Sand (CL)

| Sieve size | % Retained | % Passing |
|---|---|---|
| #200 (75-µm) | 50 | 50 |



**Earth Systems Pacific**

Gibraltar Drive Warehouse 302865-001

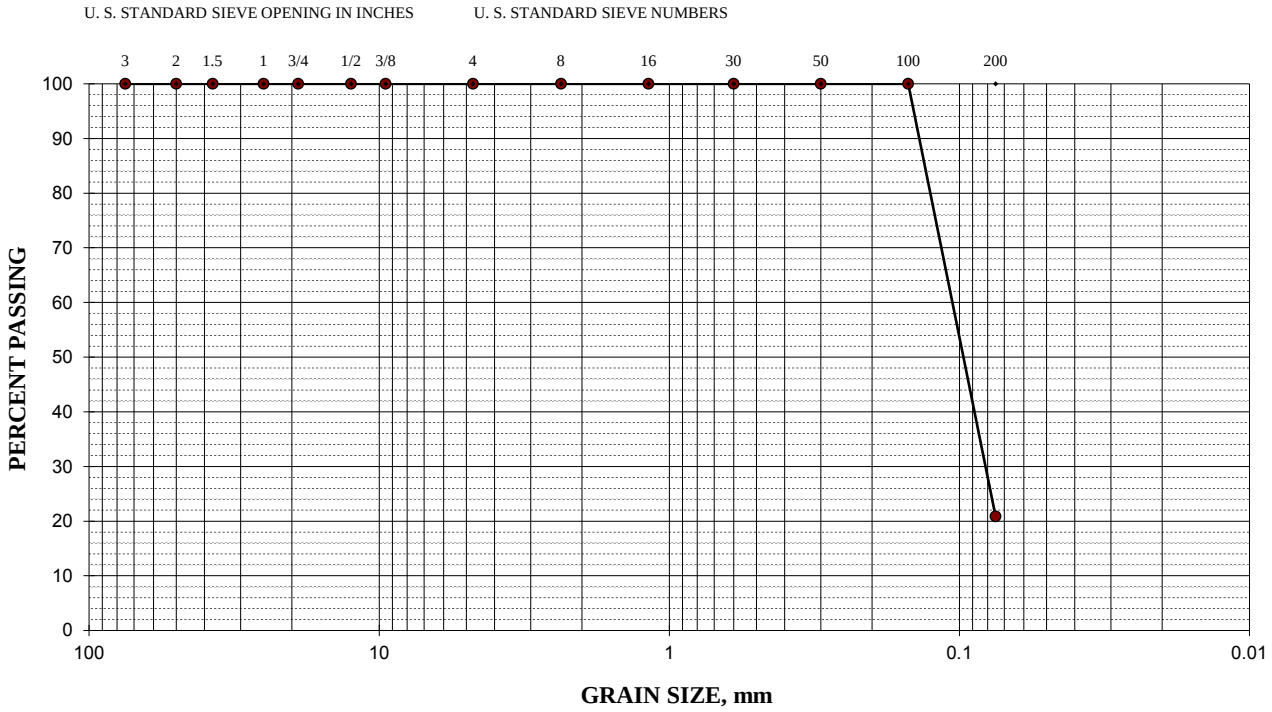
## PARTICLE SIZE ANALYSIS

**ASTM D 422-63/07; D 1140-14**

Boring #B-5 @ 14.5 - 15.0' January 30, 2019

Dark Grayish Brown Poorly Graded Sand with Silt and Gravel (SP-SM)

| Sieve size | % Retained | % Passing |
|---|---|---|
| #200 (75-µm) | 79 | 21 |



**Earth Systems Pacific**

Gibraltar Drive Warehouse 302865-001

## PARTICLE SIZE ANALYSIS

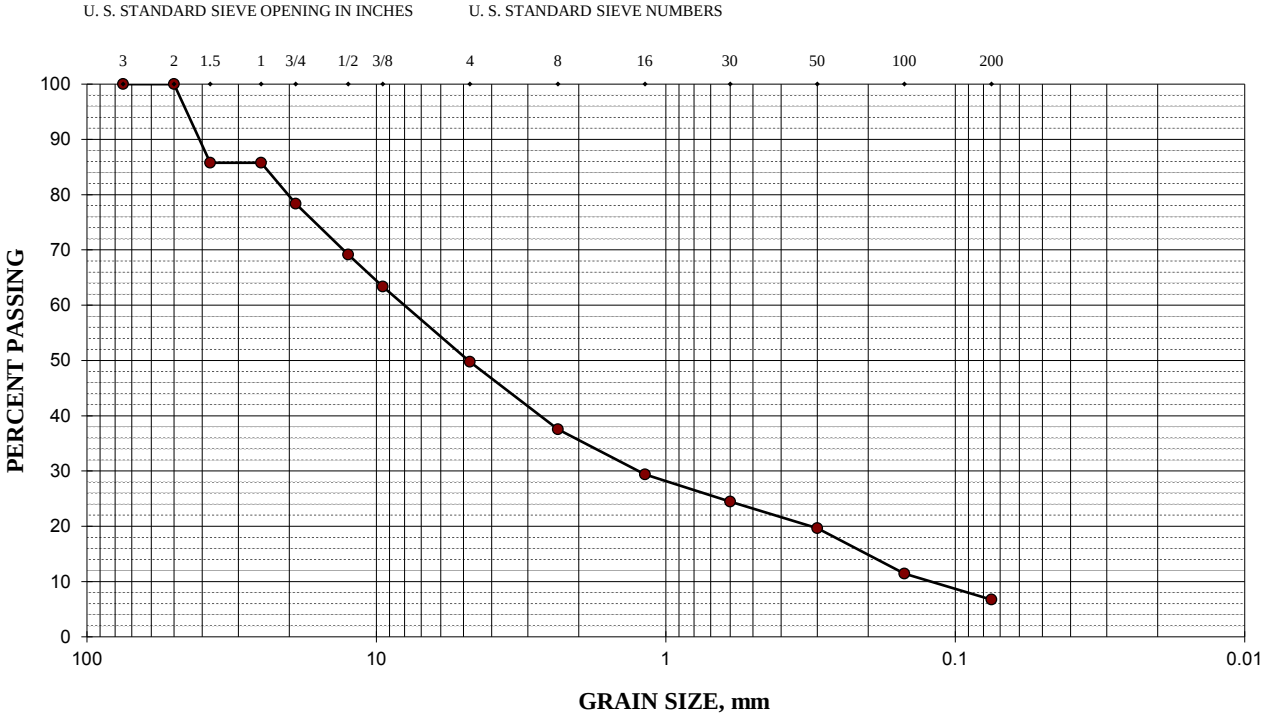
**ASTM D 422-63/07; D 1140-14**

Boring #B-6 @ 9.5 - 10.0' January 30, 2019

Dark Brown Well Graded Sand with Gravel (SW)

Cu = 66.2; Cc = 1.6

| Sieve size | % Retained | % Passing |
|---|---|---|
| 3" (75-mm) | 0 | 100.0 |
| 2" (50-mm) | 0 | 100.0 |
| 1.5" (37.5-mm) | 14 | 85.8 |
| 1" (25-mm) | 14 | 85.8 |
| 3/4" (19-mm) | 22 | 78.4 |
| 1/2" (12.5-mm) | 31 | 69.1 |
| 3/8" (9.5-mm) | 37 | 63.4 |
| #4 (4.75-mm) | 50 | 49.8 |
| #8 (2.36-mm) | 62 | 37.5 |
| #16 (1.18-mm) | 71 | 29.4 |
| #30 (600-µm) | 76 | 24.5 |
| #50 (300-µm) | 80 | 19.7 |
| #100 (150-µm) | 89 | 11.4 |
| #200 (75-µm) | 93 | 6.7 |



**Earth Systems Pacific**

Gibraltar Drive Warehouse 302865-001

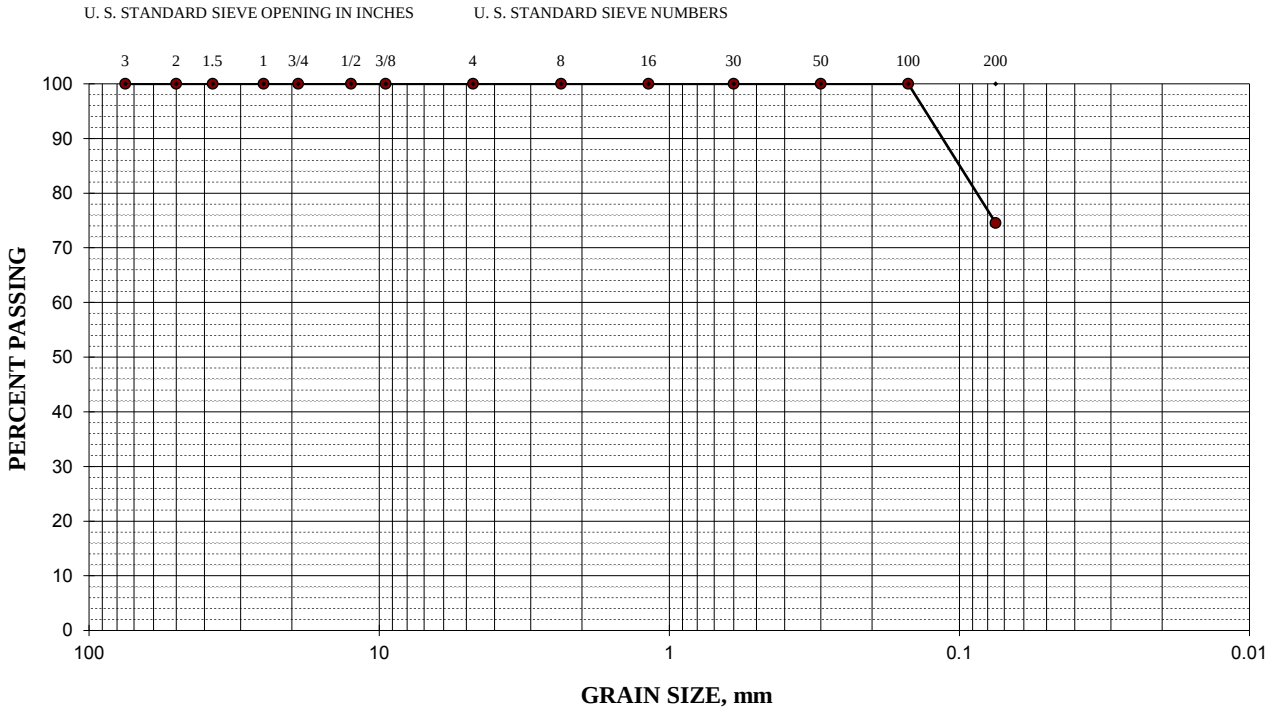
## PARTICLE SIZE ANALYSIS

**ASTM D 422-63/07; D 1140-14**

Boring #B-8 @ 9.5 - 10.0' January 30, 2019

Yellowish Brown Lean Clay with Sand (CL)

| Sieve size | % Retained | % Passing |
|---|---|---|
| #200 (75-µm) | 25 | 75 |



**Earth Systems Pacific**

Gibraltar Drive Warehouse 302865-001

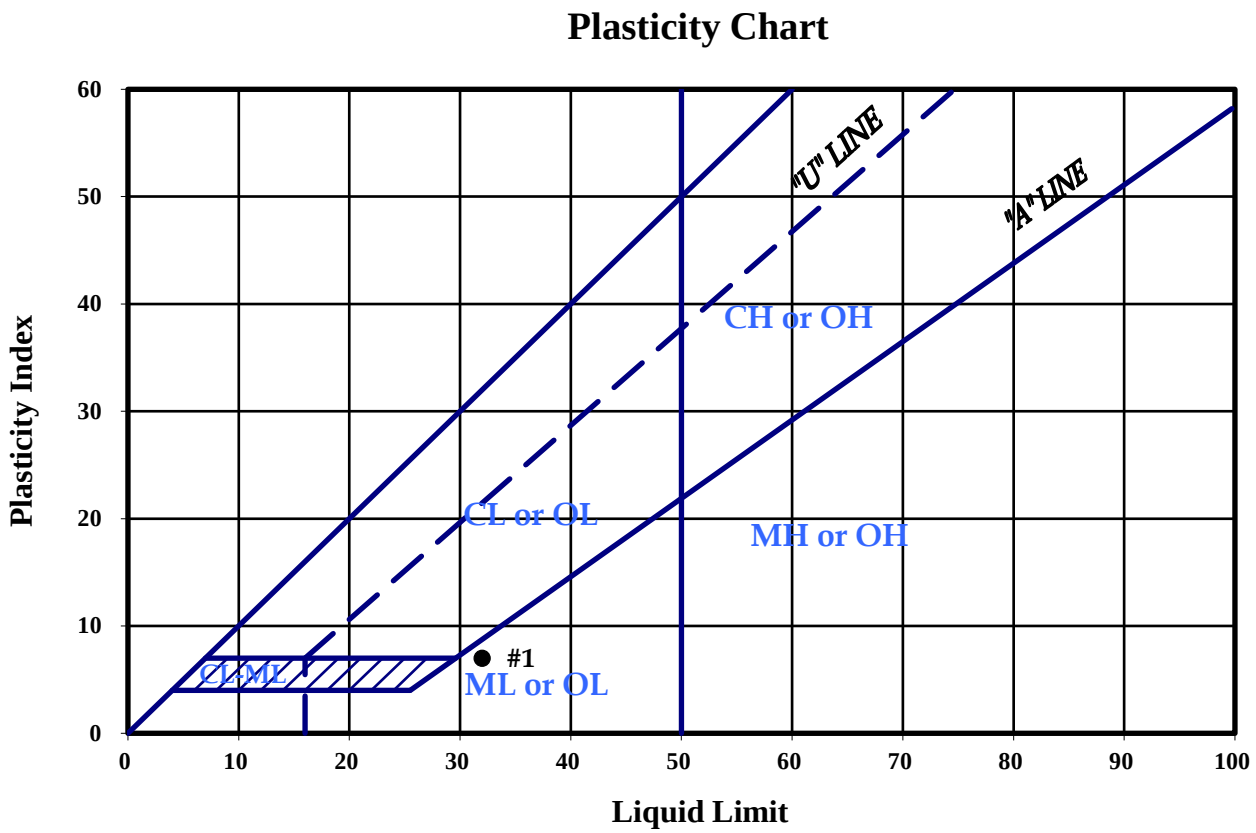
## PLASTICITY INDEX

ASTM D 4318-17

Grayish Brown Lean Silt (ML)

January 30, 2019

| Test No.: | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Boring No.: | B-2 | | | | |
| Sample Depth: | 14.5 - 15.0' | | | | |
| Liquid Limit: | 32 | | | | |
| Plastic Limit: | 25 | | | | |
| Plasticity Index: | 7 | | | | |



**Earth Systems Pacific**

Gibraltar Drive Warehouse 302865-001

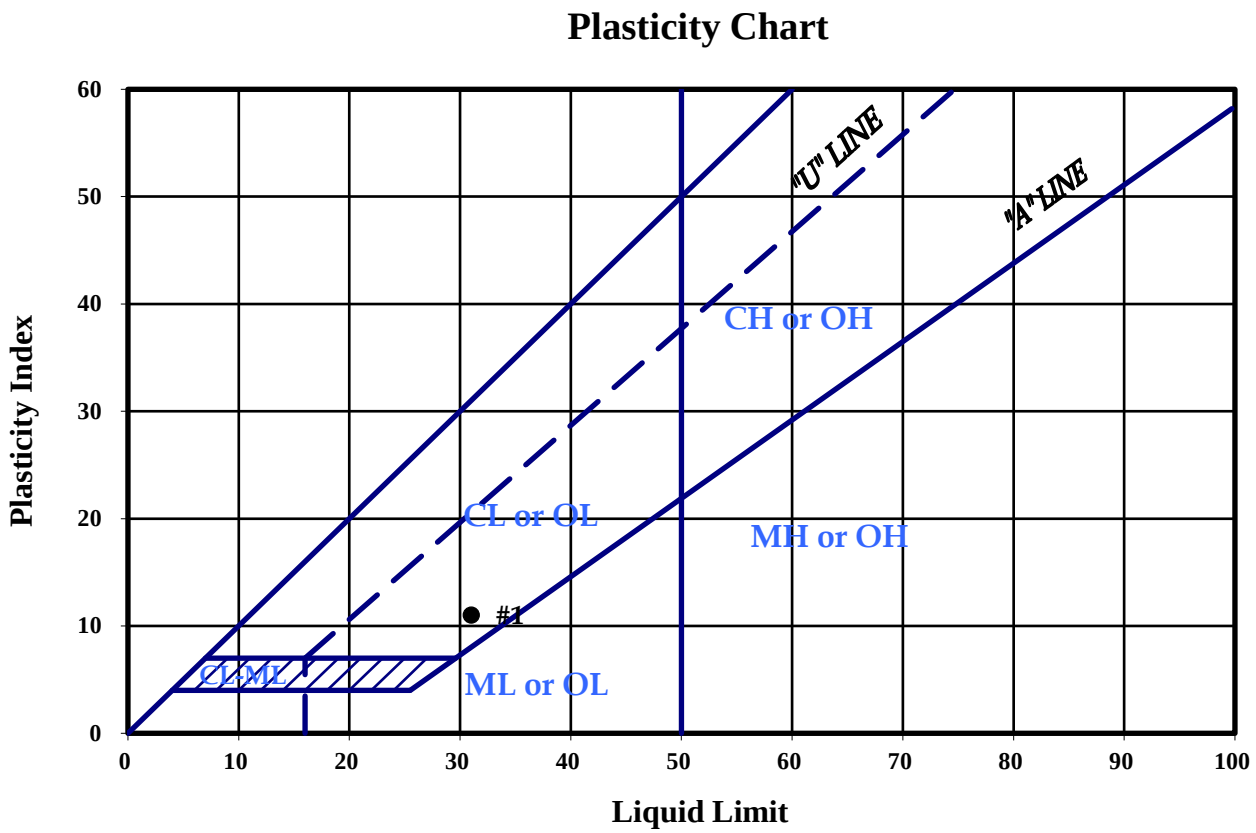
## PLASTICITY INDEX

ASTM D 4318-17

Black Sandy Lean Clay (CL)

January 30, 2019

| Test No.: | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Boring No.: | B-6 | | | | |
| Sample Depth: | 2.5 - 3.0' | | | | |
| Liquid Limit: | 31 | | | | |
| Plastic Limit: | 20 | | | | |
| Plasticity Index: | 11 | | | | |



**Earth Systems Pacific**

Gibraltar Drive Warehouse 302865-001

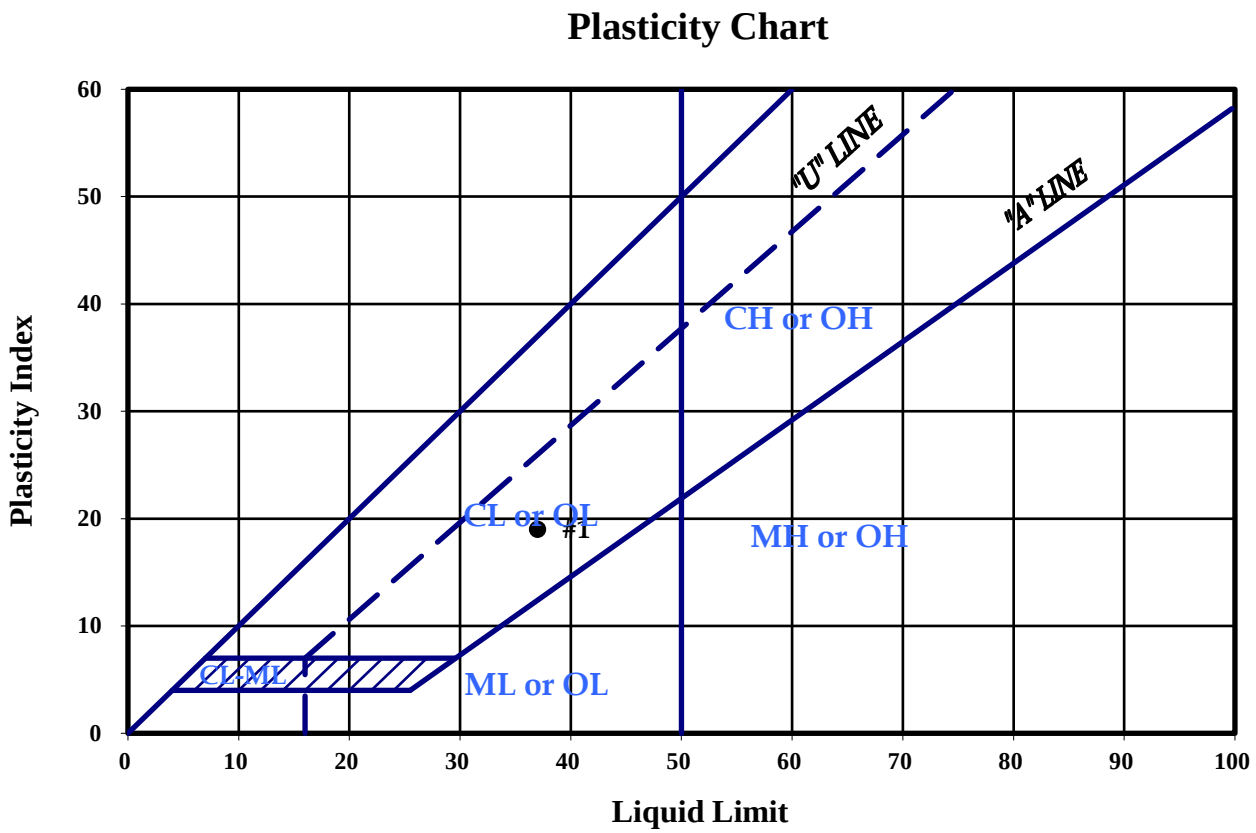
## PLASTICITY INDEX

**ASTM D 4318-17**

Grayish Brown Lean Clayn (CL)

January 30, 2019

| Test No.: | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Boring No.: | B-6 | | | | |
| Sample Depth: | 28.5 - 29.0' | | | | |
| Liquid Limit: | 37 | | | | |
| Plastic Limit: | 18 | | | | |
| Plasticity Index: | 19 | | | | |



**Earth Systems Pacific**

Gibraltar Drive Warehouse 302865-001

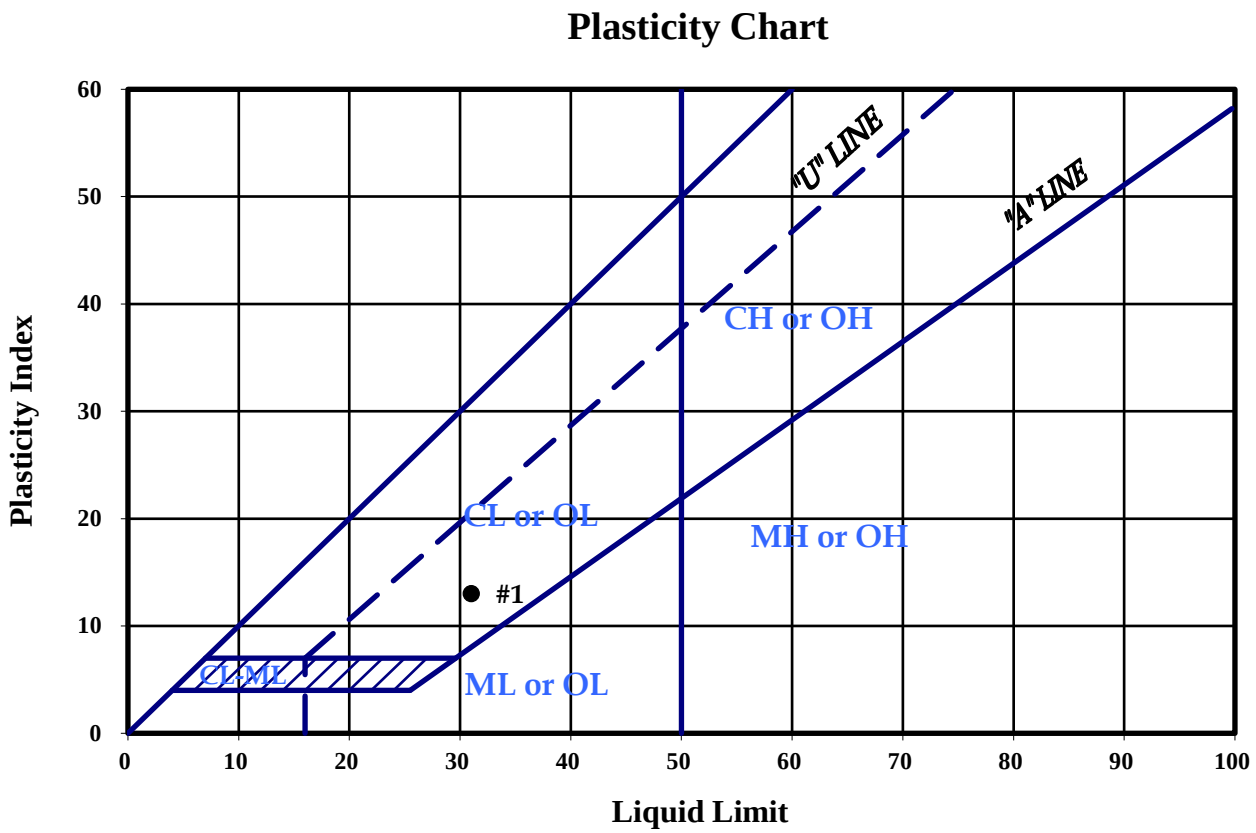
## PLASTICITY INDEX

**ASTM D 4318-17**

Yellowish Brown Lean Clay with Sand (CL)

January 30, 2019

| Test No.: | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Boring No.: | B-8 | | | | |
| Sample Depth: | 9.5 - 10.0' | | | | |
| Liquid Limit: | 31 | | | | |
| Plastic Limit: | 18 | | | | |
| Plasticity Index: | 13 | | | | |



**Earth Systems Pacific**

Gibralter Drive Warehouse 32865-001

## RESISTANCE '*R*' VALUE AND EXPANSION PRESSURE

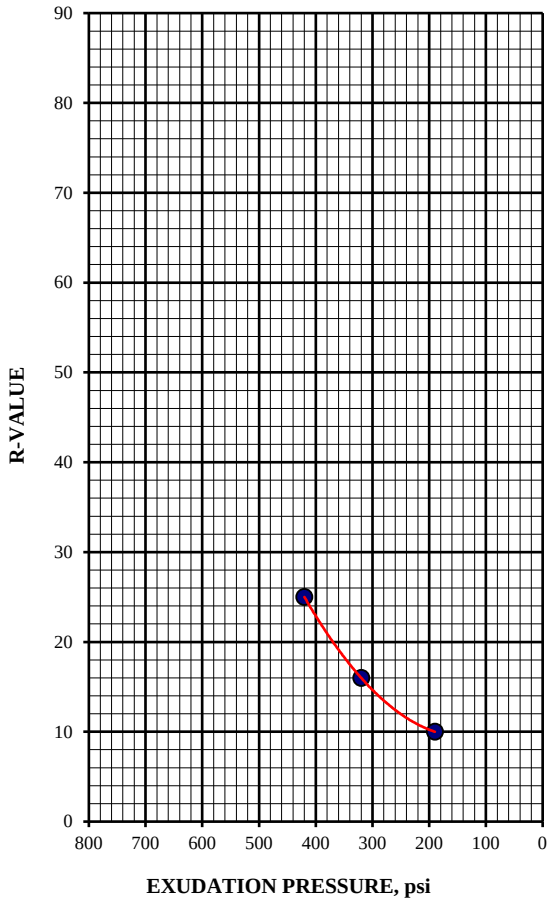
**ASTM D 2844/D2844M-13**

February 6, 2019

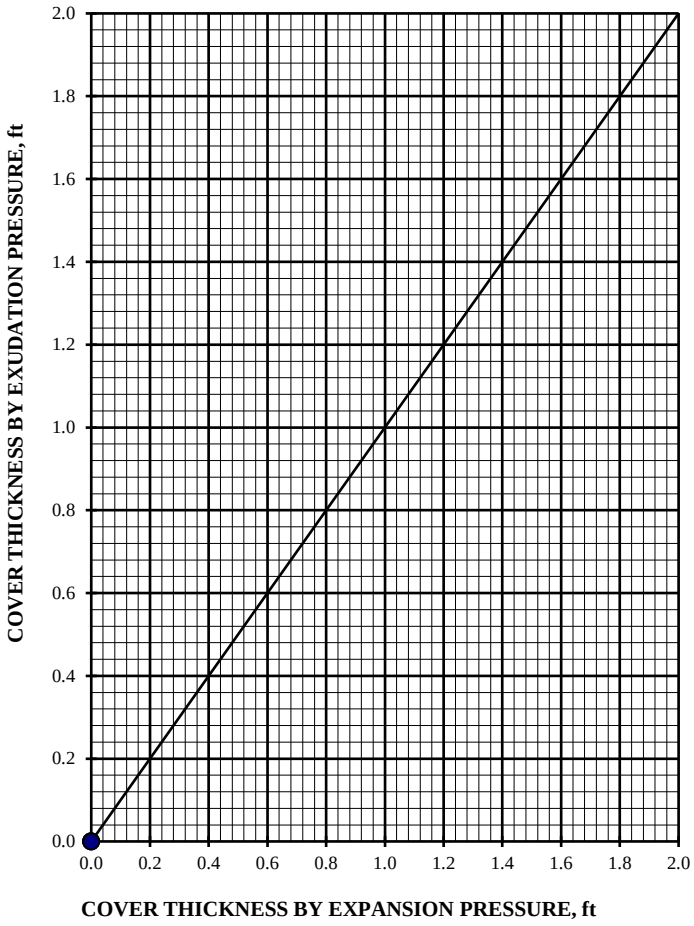
Bag B @ 1.0 - 5.0'
Dark Brown Sandy Lean Clay (CL)

Dry Density @ 300 psi Exudation Pressure: 119.1-pcf
%Moisture @ 300 psi Exudation Pressure: 15.7%
R-Value - Exudation Pressure: 15
R-Value - Expansion Pressure: N/A
**R-Value @ Equilibrium: 15**

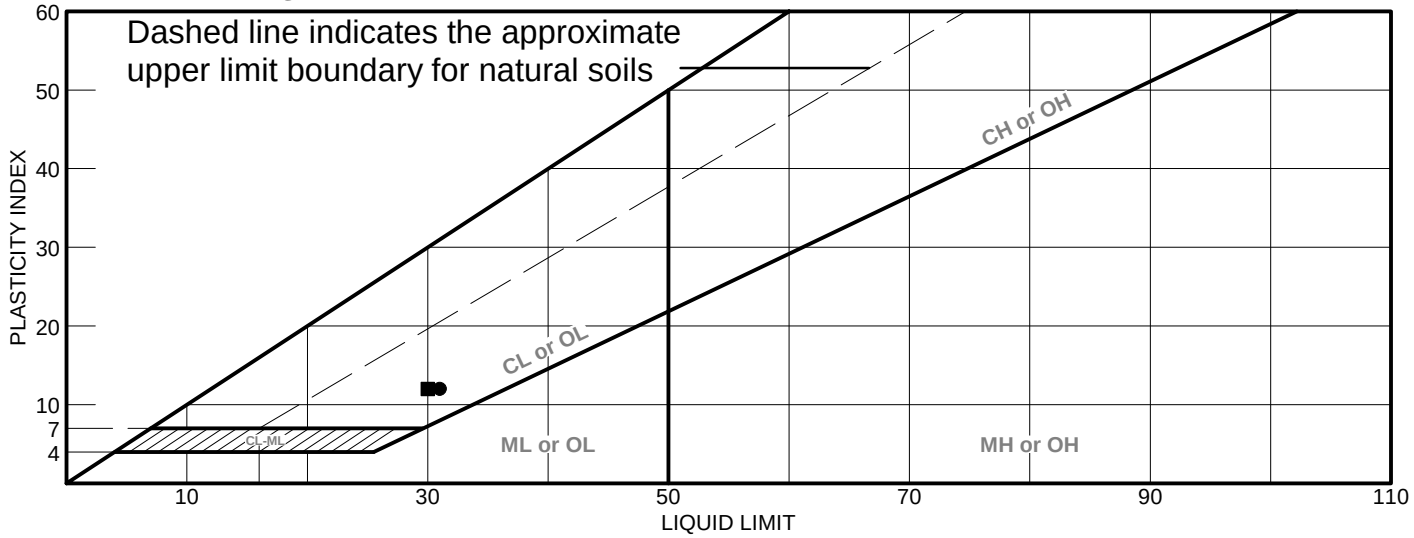
### EXUDATION PRESSURE CHART




### EXPANSION PRESSURE CHART



# LIQUID AND PLASTIC LIMITS TEST REPORT



| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Grayish Brown Lean Clayey SAND | 31 | 19 | 12 | | | |
| ■ | Dark Grayish Brown Lean Clayey SAND w/ Gravel | 30 | 18 | 12 | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 218-109 **Client:** Earth Systems

**Project:** Gibraltar Drive Warehouse - 302865-001

● **Source:** B3 **Elev./Depth:** 4.5-5'

■ **Source:** B9 **Elev./Depth:** 2.5-3'

**Remarks:**

●

■

LIQUID AND PLASTIC LIMITS TEST REPORT

**COOPER TESTING LABORATORY**

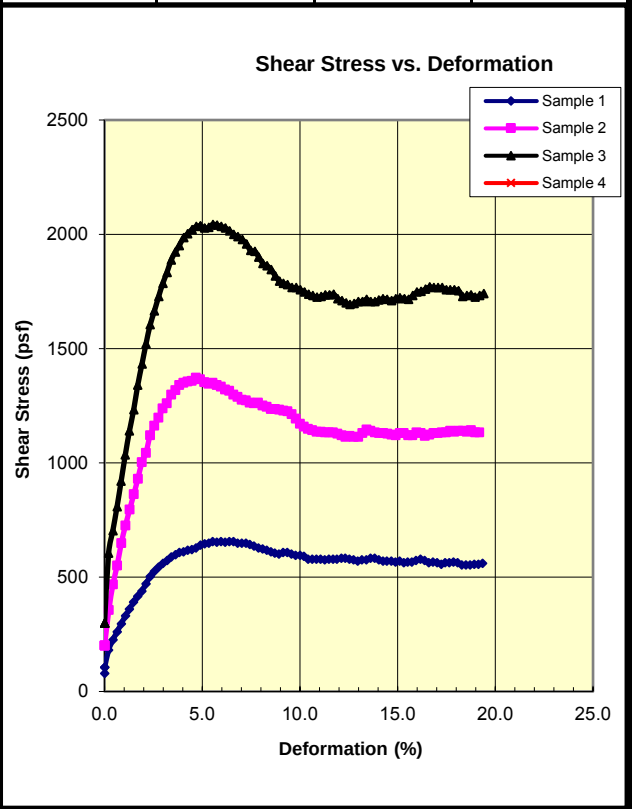
**Figure**

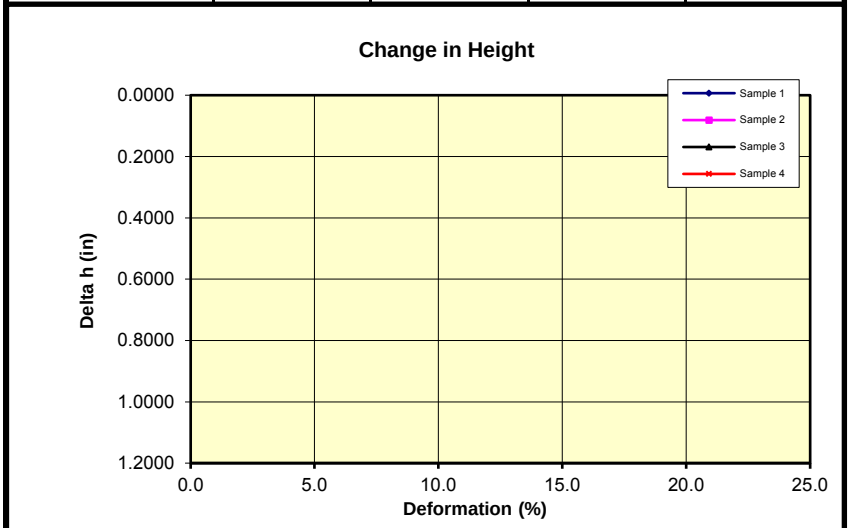
# Consolidated Undrained Direct Shear (ASTM D3080M)

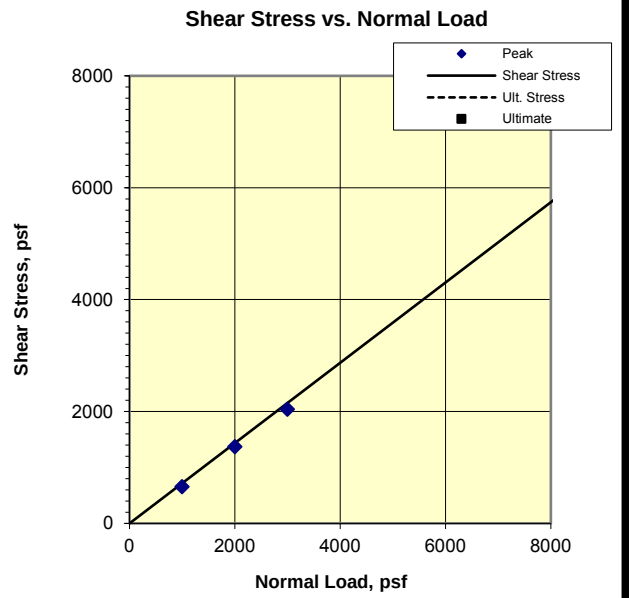
| | | | | | |
|---|---|---|---|---|---|
| CTL Job #: | 218-109 | Project #: | 302865-001 | By: | MD |
| Client: | Earth Systems | Date: | 2/14/2019 | Checked: | PJ |
| Project Name: | Gibraltar Drive Warehouse | Remolding Info: | | | |

| Phi (deg) | 35.7 | Ult. Phi (deg) | |
|---|---|---|---|
| Cohesion (psf) | 0 | Ult. Cohesion (psf) | |

| Specimen Data | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Boring: | B3 | B3 | B3 | |
| Sample: | | | | |
| Depth (ft): | 4.5-5.0 | 4.5-5.0 | 4.5-5.0 | |
| Visual Description: | Grayish Brown Lean Clayey SAND | Grayish Brown Lean Clayey SAND | Grayish Brown Lean Clayey SAND | |
| Normal Load (psf) | 1000 | 2000 | 3000 | |
| Dry Mass of Specimen (g) | 115.6 | 120.2 | 122.5 | |
| Initial Height (in) | 1.00 | 1.00 | 1.00 | |
| Initial Diameter (in) | 2.40 | 2.40 | 2.40 | |
| Initial Void Ratio | 0.731 | 0.665 | 0.634 | |
| Initial Moisture (%) | 22.4 | 21.3 | 21.0 | |
| Initial Wet Density (pcf) | 119.2 | 122.8 | 124.8 | |
| Initial Dry Density (pcf) | 97.4 | 101.2 | 103.1 | |
| Initial Saturation (%) | 82.9 | 86.5 | 89.4 | |
| ΔHeight Consol (in) | 0.0193 | 0.0320 | 0.0438 | |
| At Test Void Ratio | 0.697 | 0.612 | 0.563 | |
| At Test Moisture (%) | 22.7 | 20.7 | 19.7 | |
| At Test Wet Density (pcf) | 121.8 | 126.2 | 129.1 | |
| At Test Dry Density (pcf) | 99.3 | 104.6 | 107.9 | |
| At Test Saturation (%) | 87.9 | 91.4 | 94.5 | |
| Strain Rate (%/min) | 1.2 | 1.1 | 1.1 | |
| Strengths Picked at | Peak | Peak | Peak | |
| Shear Stress (psf) | 656 | 1372 | 2044 | |
| ΔHeight (in) at Peak | | | | |
| Ultimate Stress (psf) | | | | |




Remarks: *DS-CU* A fully undrained condition may not be attained in this test. ΔH is not measured during undrained direct shear tests.

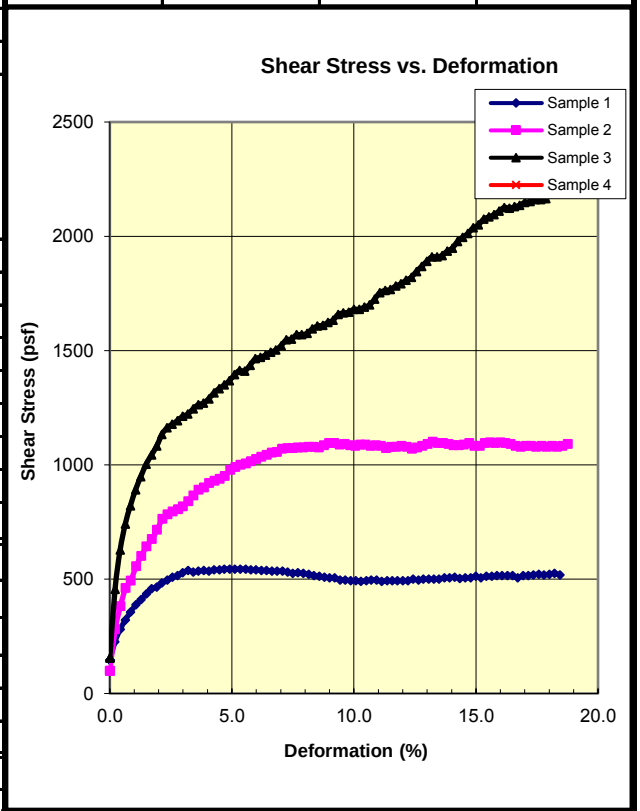
©

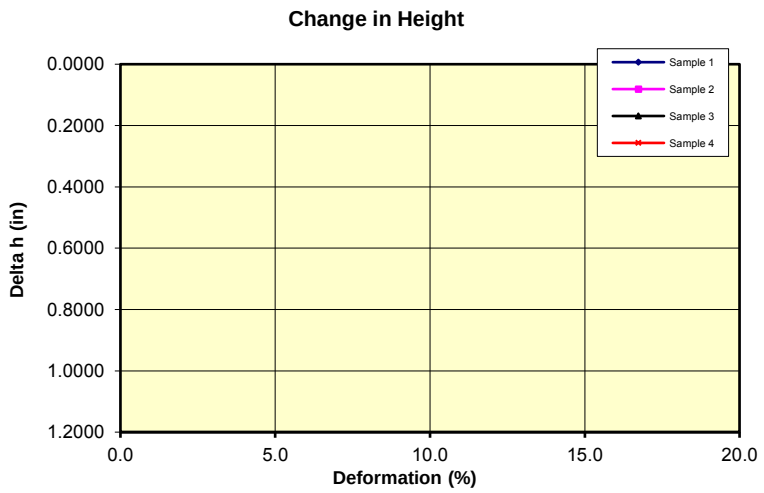
# Consolidated Undrained Direct Shear (ASTM D3080M)

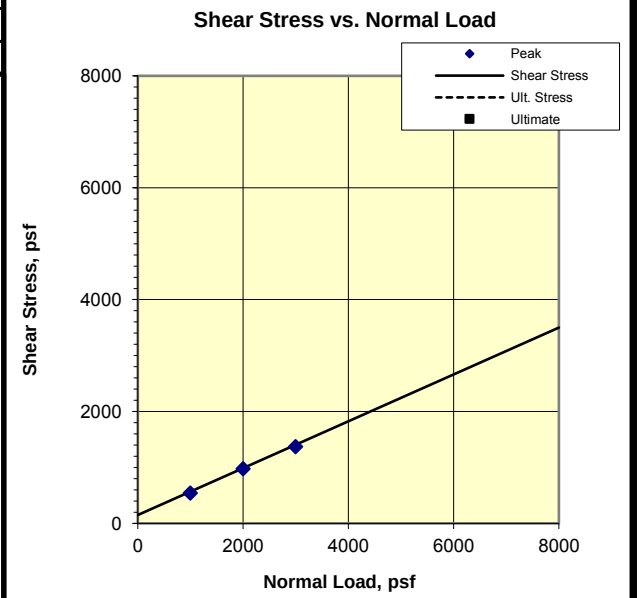
| | | | | | |
|---|---|---|---|---|---|
| CTL Job #: | 218-109 | Project #: | 302865-001 | By: | MD |
| Client: | Earth Systems | Date: | 2/14/2019 | Checked: | PJ |
| Project Name: | Gibraltar Drive Warehouse | Remolding Info: | | | |

| Phi (deg) | 22.7 | Ult. Phi (deg) | |
|---|---|---|---|
| Cohesion (psf) | 150 | Ult. Cohesion (psf) | |

| Specimen Data | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Boring: | B9 | B9 | B9 | |
| Sample: | | | | |
| Depth (ft): | 2.5-3.0 | 2.5-3.0 | 2.5-3.0 | |
| Visual Description: | Dark Grayish Brown Lean Clayey SAND w/ Gravel | Dark Grayish Brown Lean Clayey SAND w/ Gravel | Dark Grayish Brown Lean Clayey SAND w/ Gravel | |
| Normal Load (psf) | 1000 | 2000 | 3000 | |
| Dry Mass of Specimen (g) | 120.5 | 118.6 | 122.0 | |
| Initial Height (in) | 1.00 | 1.00 | 1.00 | |
| Initial Diameter (in) | 2.40 | 2.40 | 2.40 | |
| Initial Void Ratio | 0.662 | 0.687 | 0.641 | |
| Initial Moisture (%) | 12.5 | 12.5 | 11.9 | |
| Initial Wet Density (pcf) | 114.1 | 112.4 | 114.9 | |
| Initial Dry Density (pcf) | 101.4 | 99.9 | 102.7 | |
| Initial Saturation (%) | 51.0 | 49.3 | 50.1 | |
| ΔHeight Consol (in) | 0.0169 | 0.0596 | 0.0754 | |
| At Test Void Ratio | 0.634 | 0.587 | 0.517 | |
| At Test Moisture (%) | 19.4 | 18.6 | 17.3 | |
| At Test Wet Density (pcf) | 123.2 | 126.0 | 130.3 | |
| At Test Dry Density (pcf) | 103.2 | 106.2 | 111.1 | |
| At Test Saturation (%) | 82.6 | 85.6 | 90.4 | |
| Strain Rate (%/min) | 1.1 | 1.1 | 1.1 | |
| Strengths Picked at | 5% | 5% | 5% | |
| Shear Stress (psf) | 544 | 977 | 1369 | |
| ΔHeight (in) at 5% | | | | |
| Ultimate Stress (psf) | | | | |




Remarks: *DS-CU* A fully undrained condition may not be attained in this test. ΔH is not measured during undrained direct shear tests.

©

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

7 February, 2019

Job No. 1901198
Cust. No. 11221

Ms. Kira Ortiz
Earth Systems
500 Park Center Drive, Suite 1
Hollister, CA 95023

Subject: Project No.: 302865-001
Project Name: Gibraltar Drive Warehouse
Corrosivity Analysis – ASTM Test Methods

Dear Mr. Ortiz:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on January 29, 2019. Based on the analytical results, a brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurements, both samples are classified as "corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations are 28 & 180 mg/kg and determined to be insufficient to attack steel embedded in a concrete mortar coating.

The sulfate ion concentrations are 56 & 140 mg/kg and are determined to be insufficient to damage reinforced concrete structures and cement mortar-coated steel at these locations.

The pH of the soils are 8.36 & 8.32, which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potentials are 210 & 230-mV, and are indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
**CERCO ANALYTICAL, INC.**

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: Earth Systems
Client's Project No.: 302865-001
Client's Project Name: Gibraltar Drive Warehouse
Date Sampled: 01/23 & 24/19
Date Received: 29-Jan-19
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 7-Feb-2019

| Job/Sample No. | Sample I.D. | Redox (mV) | pH | Conductivity (umhos/cm)* | Resistivity (100% Saturation) (ohms-cm) | Sulfide (mg/kg)* | Chloride (mg/kg)* | Sulfate (mg/kg)* |
|---|---|---|---|---|---|---|---|---|
| 1901198-001 | B-3 @ 2.5-3' | 210 | 8.36 | - | 810 | - | 180 | 140 |
| 1901198-002 | B-8 @ 2.5-3' | 230 | 8.32 | - | 1,600 | - | 28 | 56 |

| Method: | ASTM D1498 | ASTM D4972 | ASTM D1125M | ASTM G57 | ASTM D4658M | ASTM D4327 | ASTM D4327 |
|---|---|---|---|---|---|---|---|
| Reporting Limit: | - | - | 10 | - | 50 | 15 | 15 |
| Date Analyzed: | 4-Feb-2019 | 4-Feb-2019 | - | 6-Feb-2019 | - | 4-Feb-2019 | 4-Feb-2019 |

* Results Reported on "As Received" Basis

Cheryl McMillen
Laboratory Director

**Quality Control Summary - All laboratory quality control parameters were found to be within established limits**

1901198

# Chain of Custody



1100 Willow Pass Court
Concord, CA 94520-1006
925 462 2771
Fax: 925 462 2775

CERCO analytical

| Job No. | CU# | | Client Project I.D. |
|---|---|---|---|
| 302865-001 | | | 302865-001 |

Schedule
Analyte

Date Sampled: 1/23-24/19
Date Due:

**Full Name**: Kira Ortiz
**Phone**: (510) 353-3833
**Fax**:
**Cell**:
**Company and/or Mailing Address**: Earth Systems, 4500 Park Center Dr., #1, Hollister, CA 95023
**Sample Source**: Gibraltar Drive Warehouse

ANALYSIS — ASTM

| Lab No. | Sample I.D. | Date | Time | Matrix | Contain. | Size | Preserv. | Qtv. | Redox Potential | pH | Sulfate | Chloride | Resistivity-100% Saturated | | | Brief Evaluation | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | B-3 @ 2.5-3.0 | 1/23/19 | 9am | S | | | | 1 | X | X | X | X | X | | | X | | | | | | | |
| 002 | B-8 @ 2.5-3.0 | 1/24/19 | 9am | S | | | | 1 | X | X | X | X | X | | | X | | | | | | | |

**MATRIX**: DW - Drinking Water; GW - Ground Water; SW - Surface Water; WW - Waste Water Water; SL - Sludge; S - Soil; Product

**ABBREVIATIONS**: HB - Hosebib; PV - Petcock Valve; PT - Pressure Tank; PH - Pump House; RR - Restroom; GL - Glass; PL - Plastic; ST - Sterile

**SAMPLE RECEIPT**: Total No. of Containers; Rec'd Good Cond/Cold; Conforms to Record; Temp. a t Lab -°C; Sampler

Relinquished By: [signature] Date 1/29/18 Time 12:00pm
Received By: Misty Pereira Date 1/29/18 Time 11:16am
Relinquished By: Date 1/29/18 Time
Received By: Date Time
Relinquished By: Date Time
Received By: Date Time

**Comments:**

THERE IS AN ADDITIONAL CHARGE FOR EXTRUDING SOIL FROM METAL TUBES

**Email Address**: kortiz@earthsystems.com

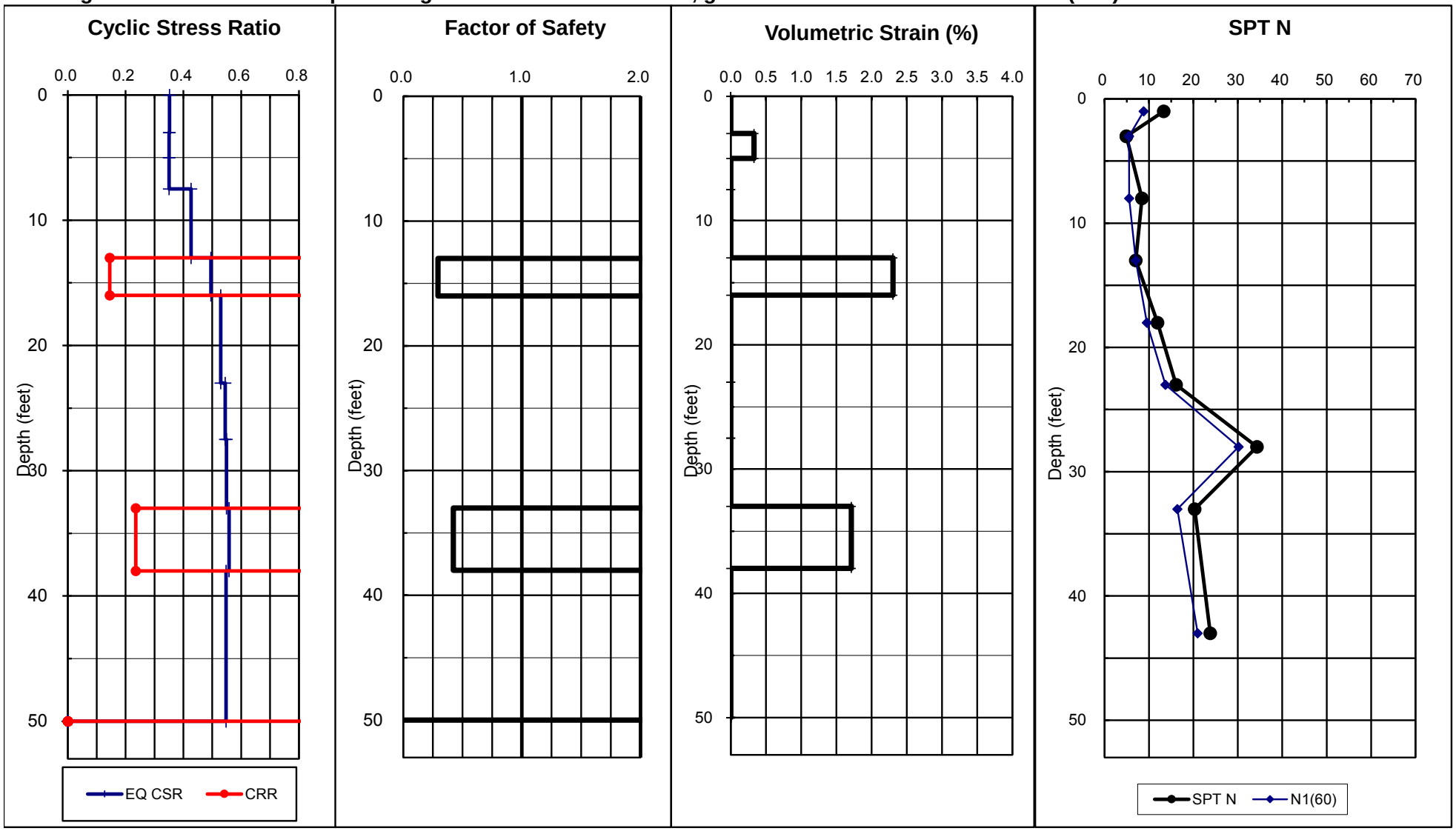
**APPENDIX C**

Liquefaction Analysis
Figure C1 – Surface Manifestation

**EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED SUBSIDENCE**

**Gibraltar Drive Warehouse** **Project No: 302865-0001** 1996/1998 NCEER Method

**Boring: B-2** **Earthquake Magnitude: 6.9** **PGA, g: 0.67** **Calc GWT (feet): 5**

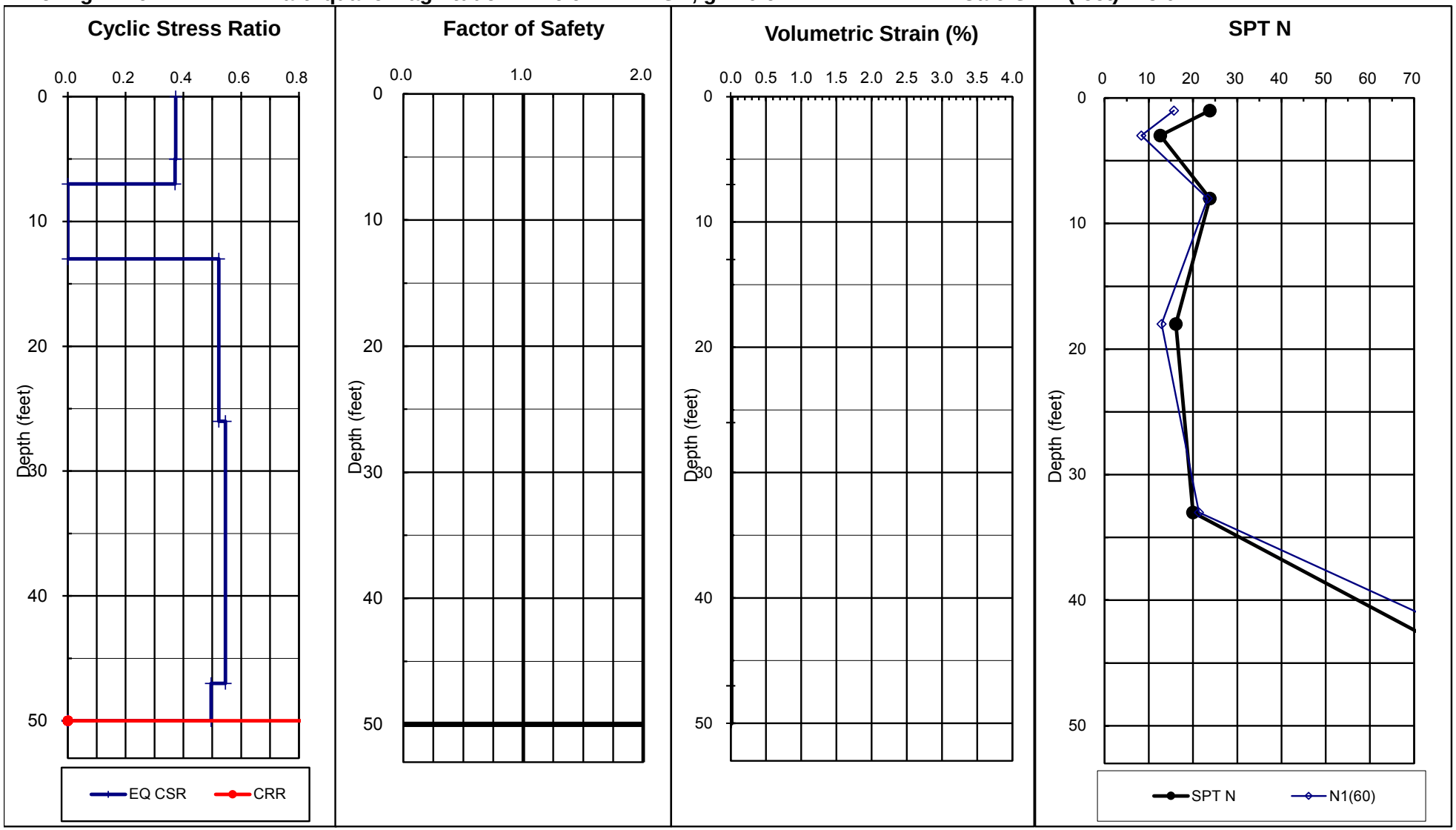



**Total Thickness of Liquefiable Layers: 8.0 feet** **Estimated Total Ground Subsidence: 1.9 inches**

**EARTH SYSTEMS - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED SUBSIDENCE**

**Gibraltar Drive Warehouse** **Project No: 302865-0001** Idriss & Boulanger Method, 2004

**Boring: B-6** **Earthquake Magnitude: 6.9** **PGA, g: 0.67** **Calc GWT (feet): 5.0**

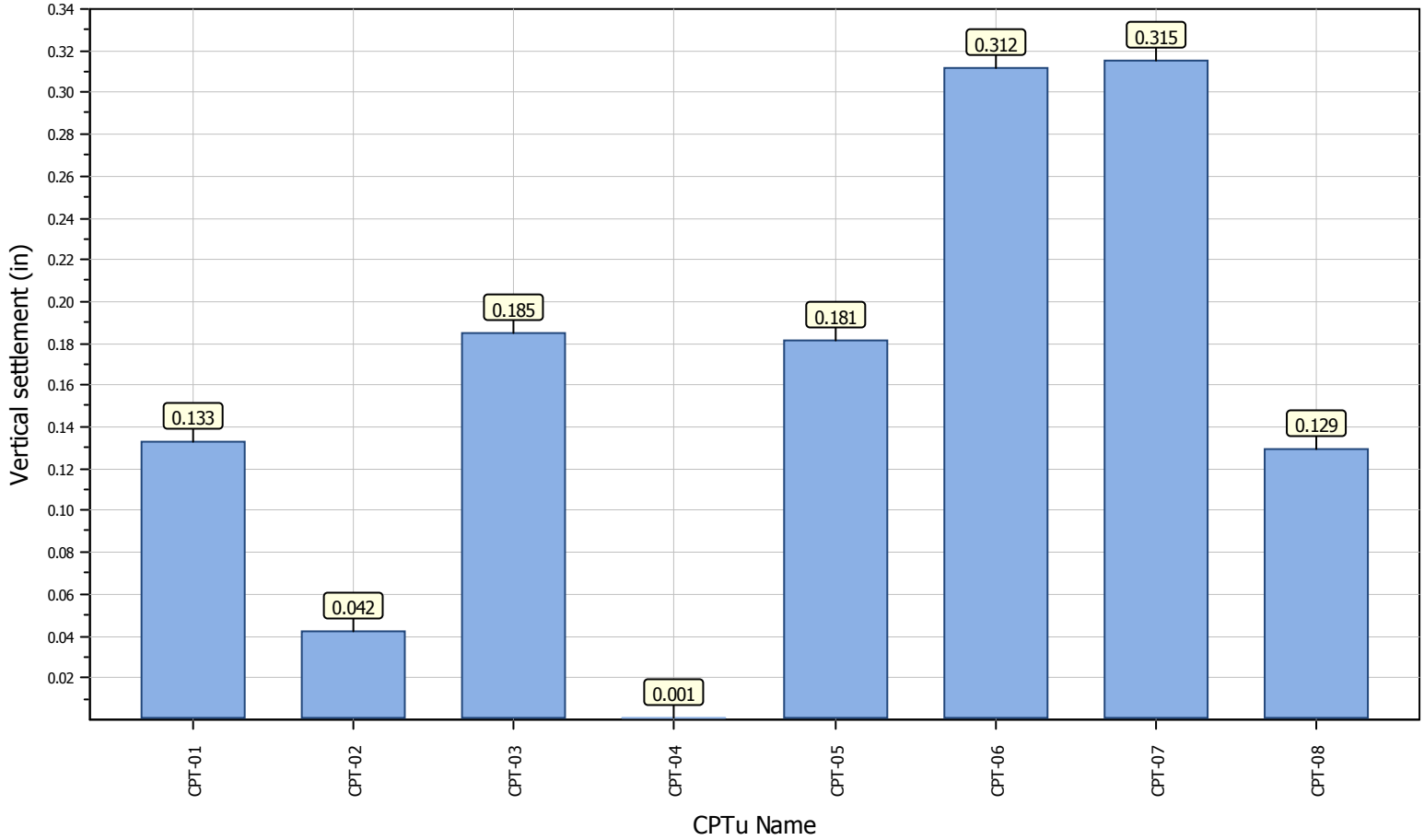



**Total Thickness of Liquefiable Layers: 10.5 feet** **Min. Factor of Safety: 0.27** **Estimated Total Ground Subsidence: 0.0 inches**

**Project title : Gibralter Warehouse**

**Location : Milpitas, CA**

## Overall vertical settlements report



**Earth Systems**
Geotechnical Engineers

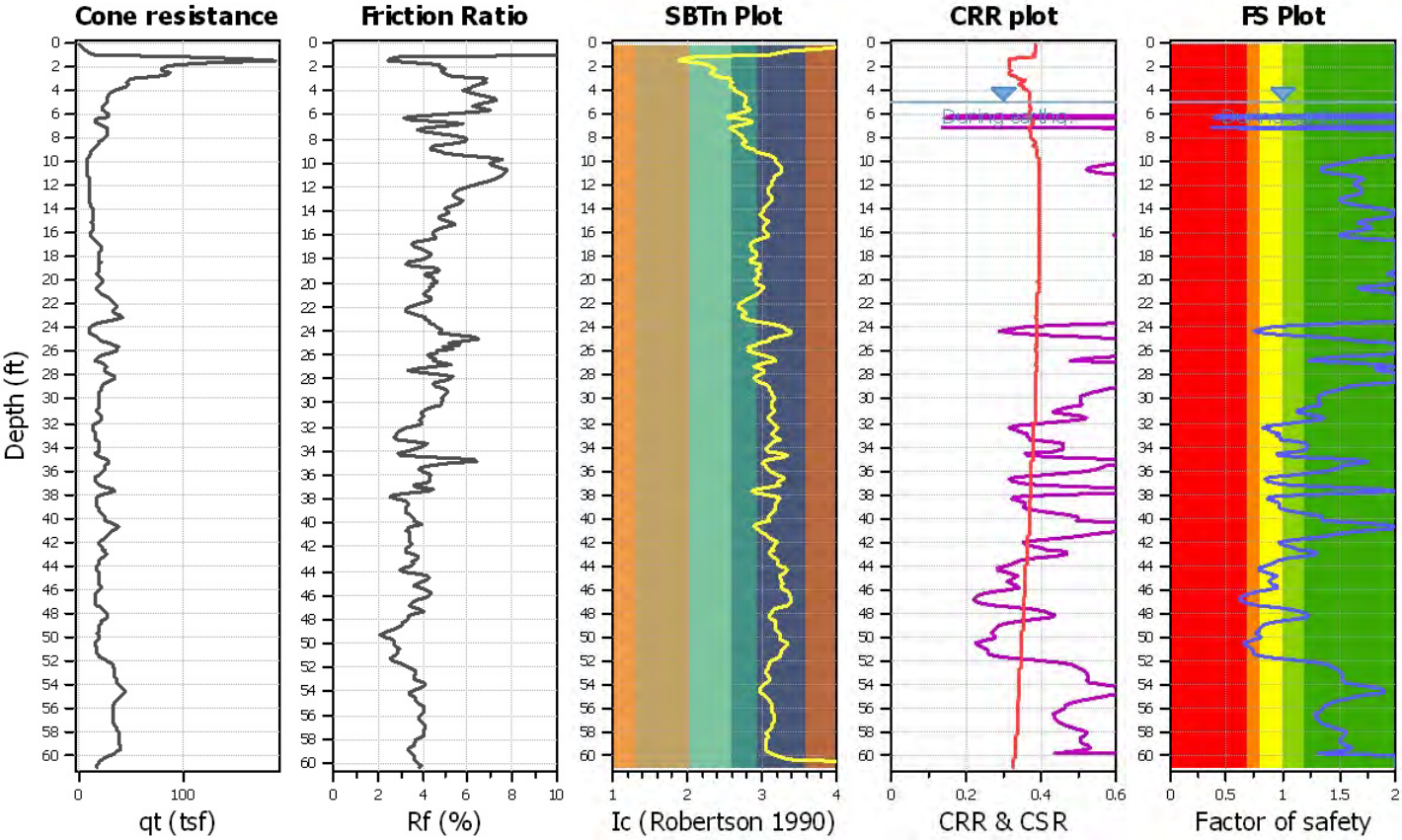
## LIQUEFACTION ANALYSIS REPORT

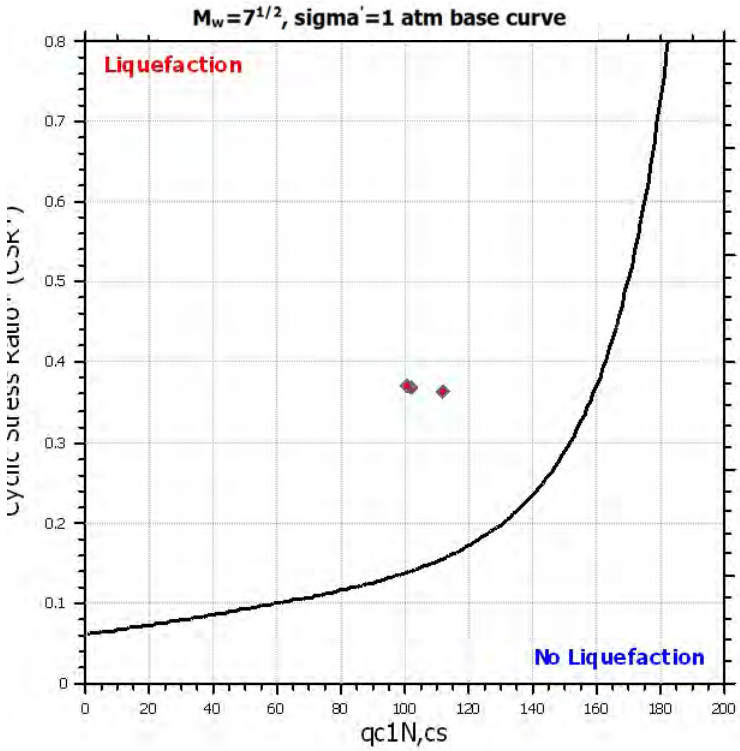
**Project title : Gibralter Warehouse** **Location : Milpitas, CA**

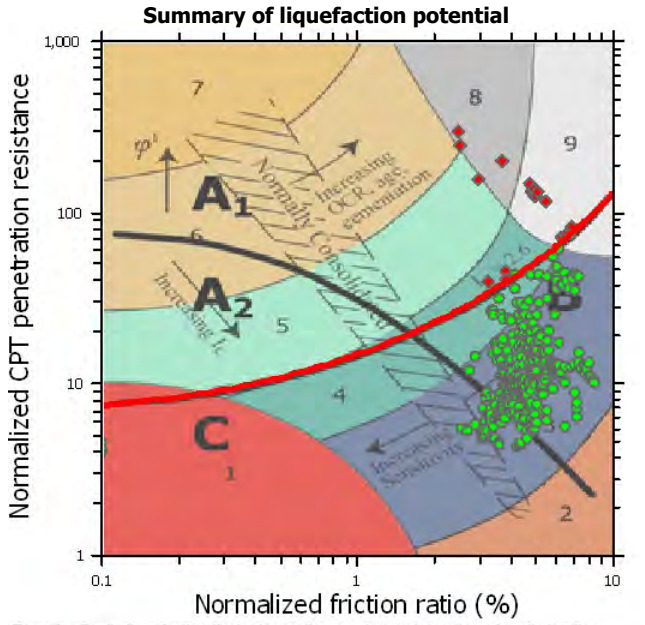
**CPT file : CPT-01**

**Input parameters and analysis data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | G.W.T. (in-situ): | 8.00 ft | Use fill: | No | Clay like behavior | |
| Fines correction method: | B&I (2014) | G.W.T. (earthq.): | 5.00 ft | Fill height: | N/A | applied: | Sand & Clay |
| Points to test: | Based on Ic value | Average results interval: | 3 | Fill weight: | N/A | Limit depth applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Ic cut-off value: | 2.60 | Trans. detect. applied: | Yes | Limit depth: | 60.00 ft |
| Peak ground acceleration: | 0.67 | Unit weight calculation: | Based on SBT | $K_\sigma$ applied: | Yes | MSF method: | Method |

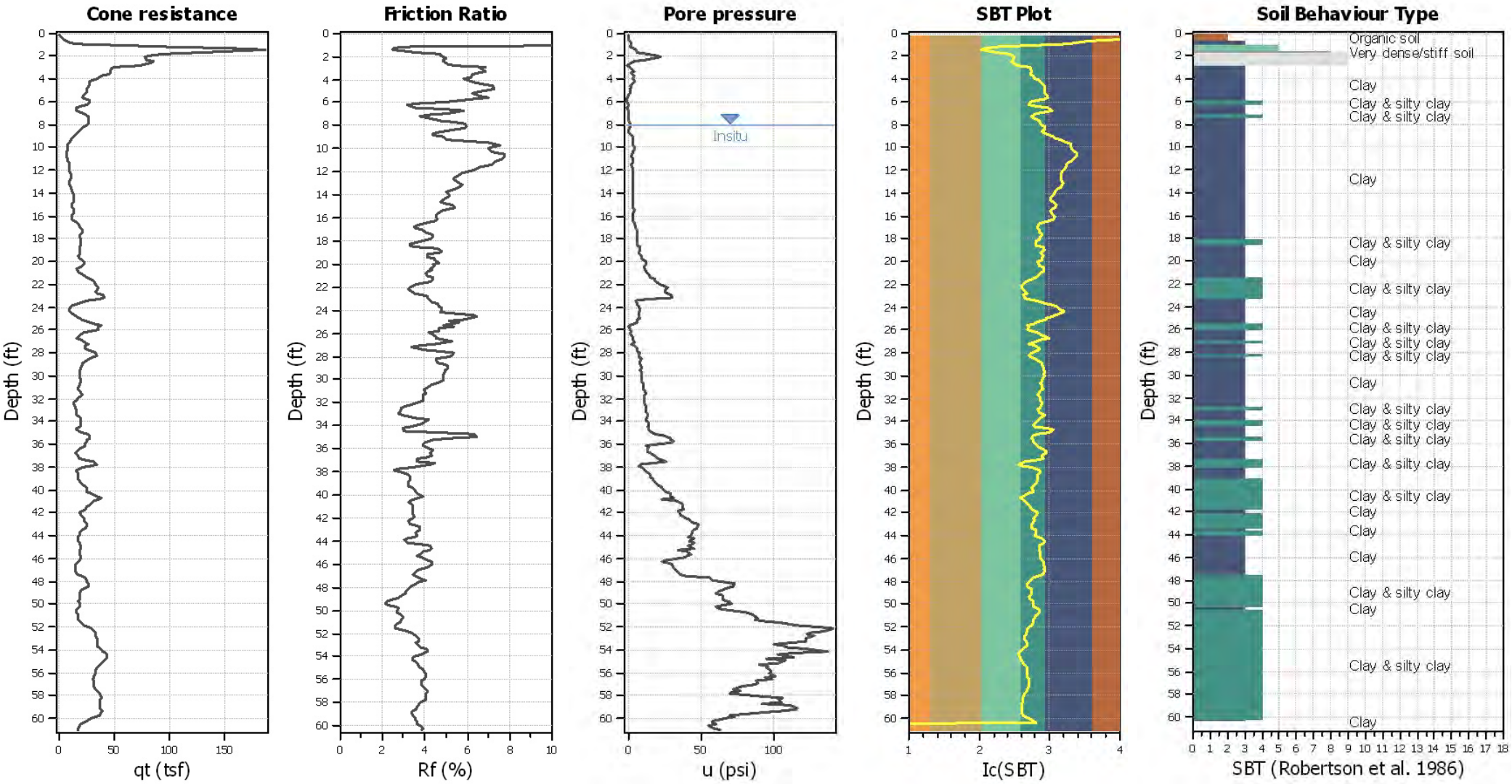



Zone $A_1$: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone $A_2$: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction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

## CPT basic interpretation plo



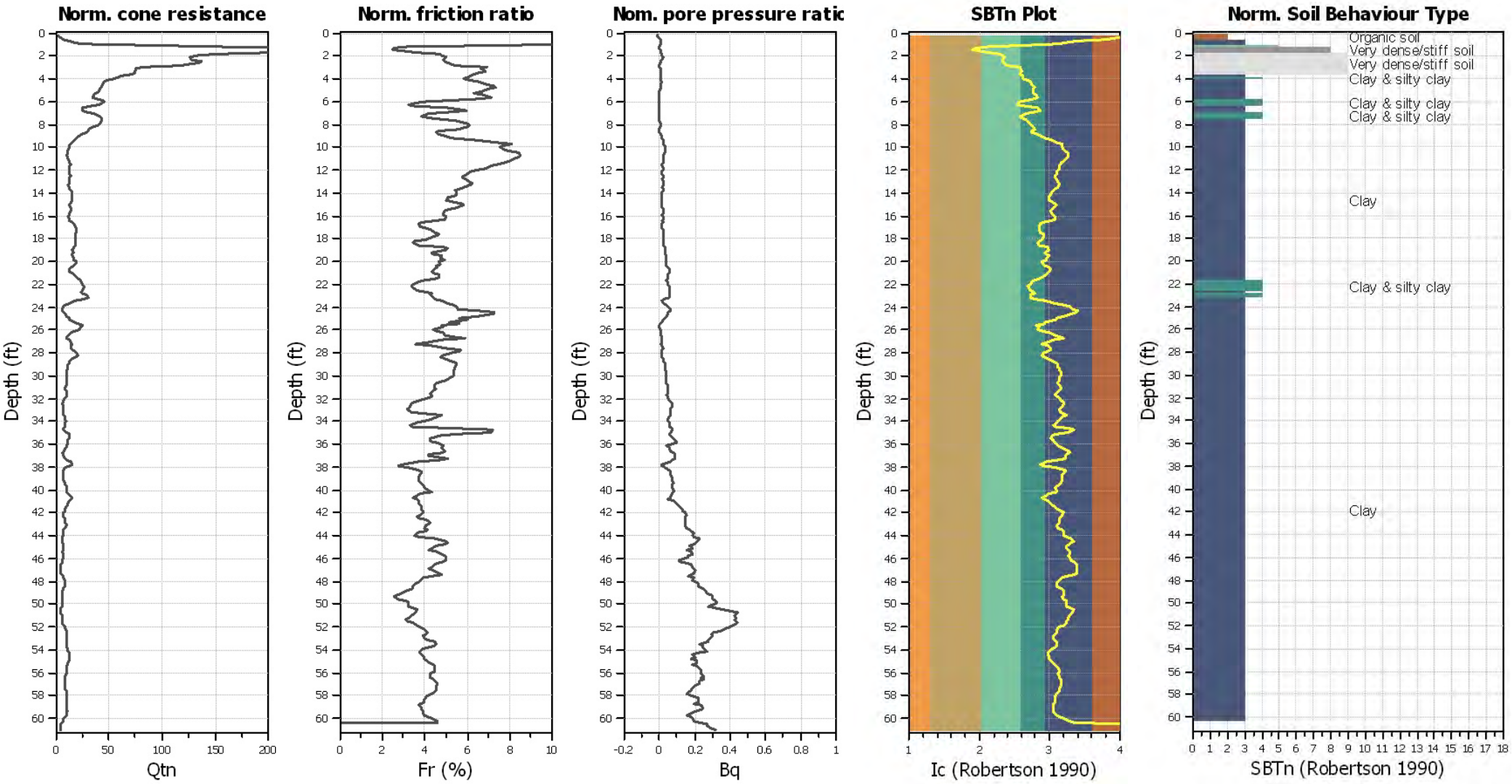

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBT legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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



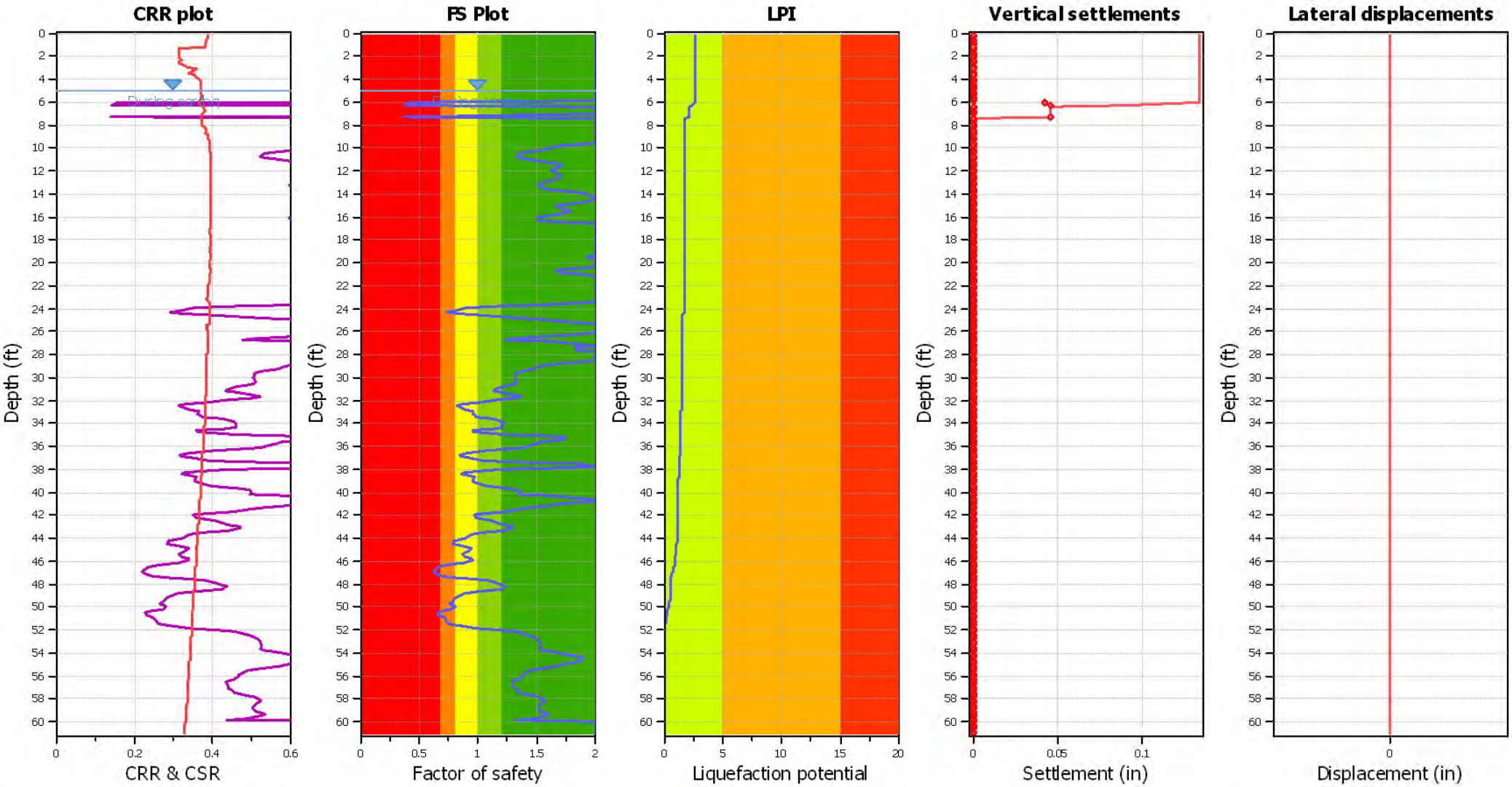

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBTn legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**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

**Earth Systems**
Geotechnical Engineers

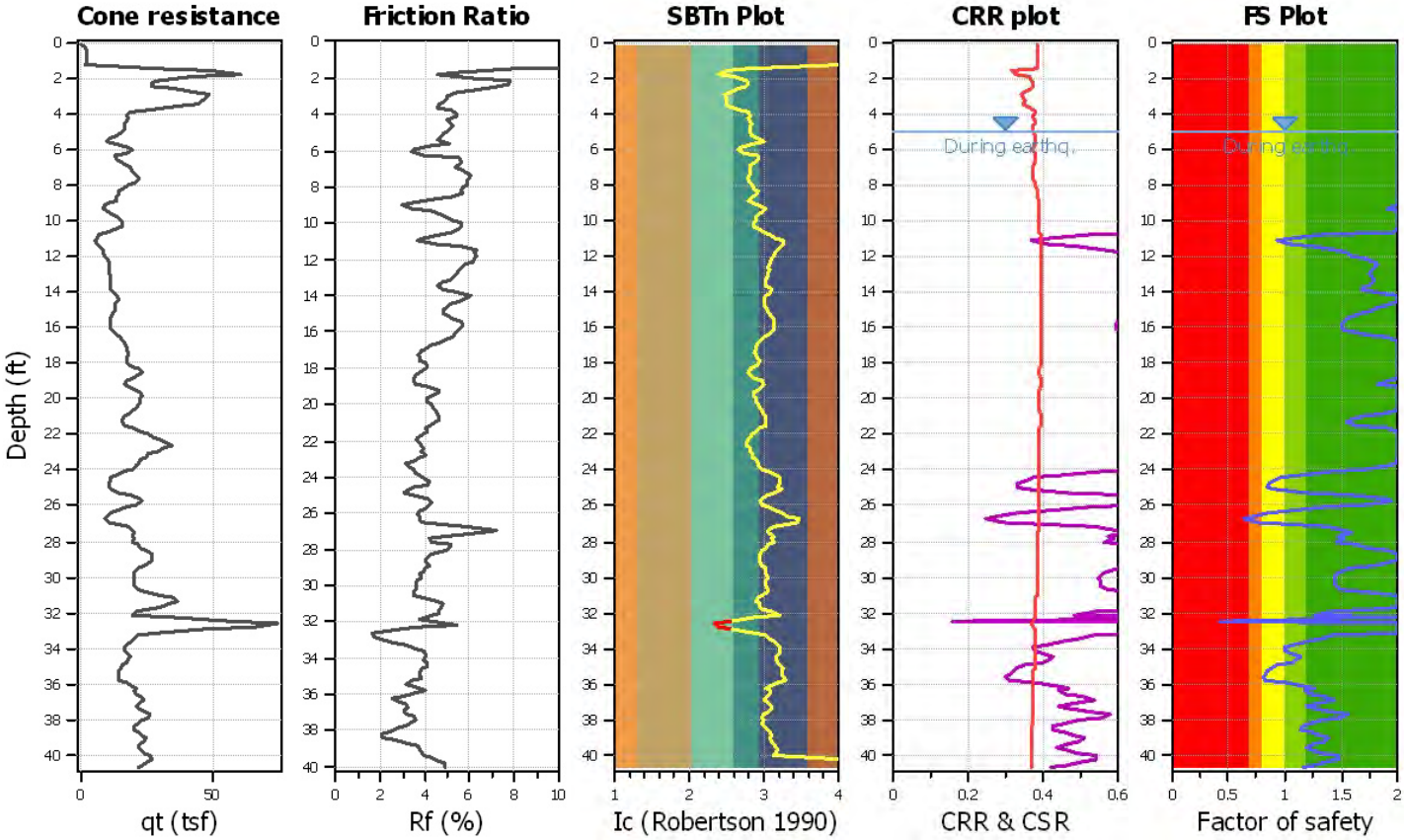
## LIQUEFACTION ANALYSIS REPORT

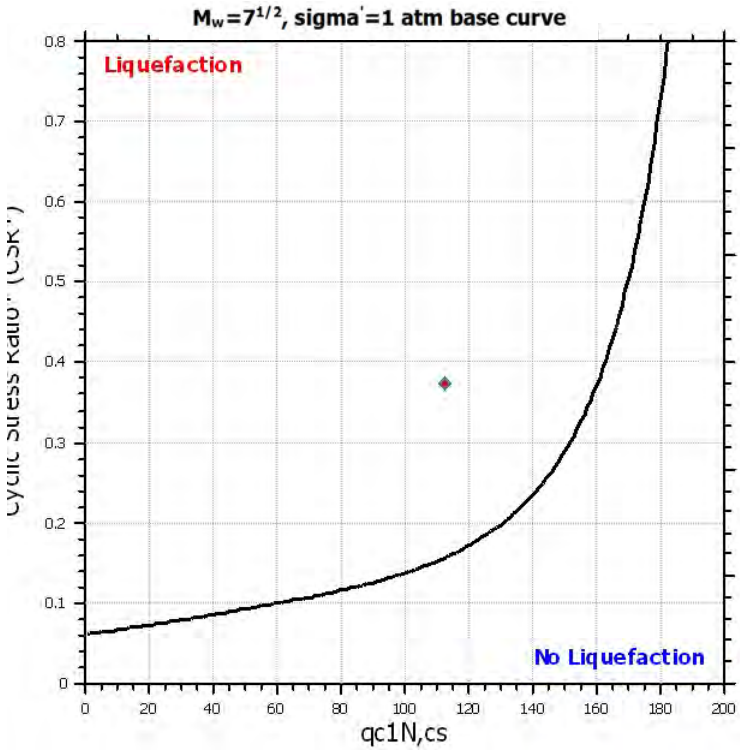
**Project title : Gibralter Warehouse** **Location : Milpitas, CA**

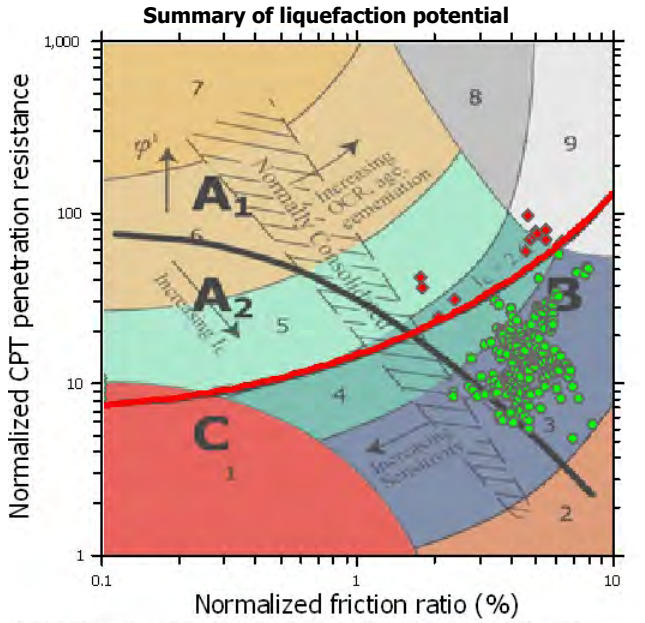
**CPT file : CPT-02**

**Input parameters and analysis data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | G.W.T. (in-situ): | 8.00 ft | Use fill: | No | Clay like behavior applied: | Sand & Clay |
| Fines correction method: | B&I (2014) | G.W.T. (earthq.): | 5.00 ft | Fill height: | N/A | Limit depth applied: | Yes |
| Points to test: | Based on Ic value | Average results interval: | 3 | Fill weight: | N/A | Limit depth: | 60.00 ft |
| Earthquake magnitude $M_w$: | 6.90 | Ic cut-off value: | 2.60 | Trans. detect. applied: | Yes | MSF method: | Method |
| Peak ground acceleration: | 0.67 | Unit weight calculation: | Based on SBT | $K_\sigma$ applied: | Yes | | |

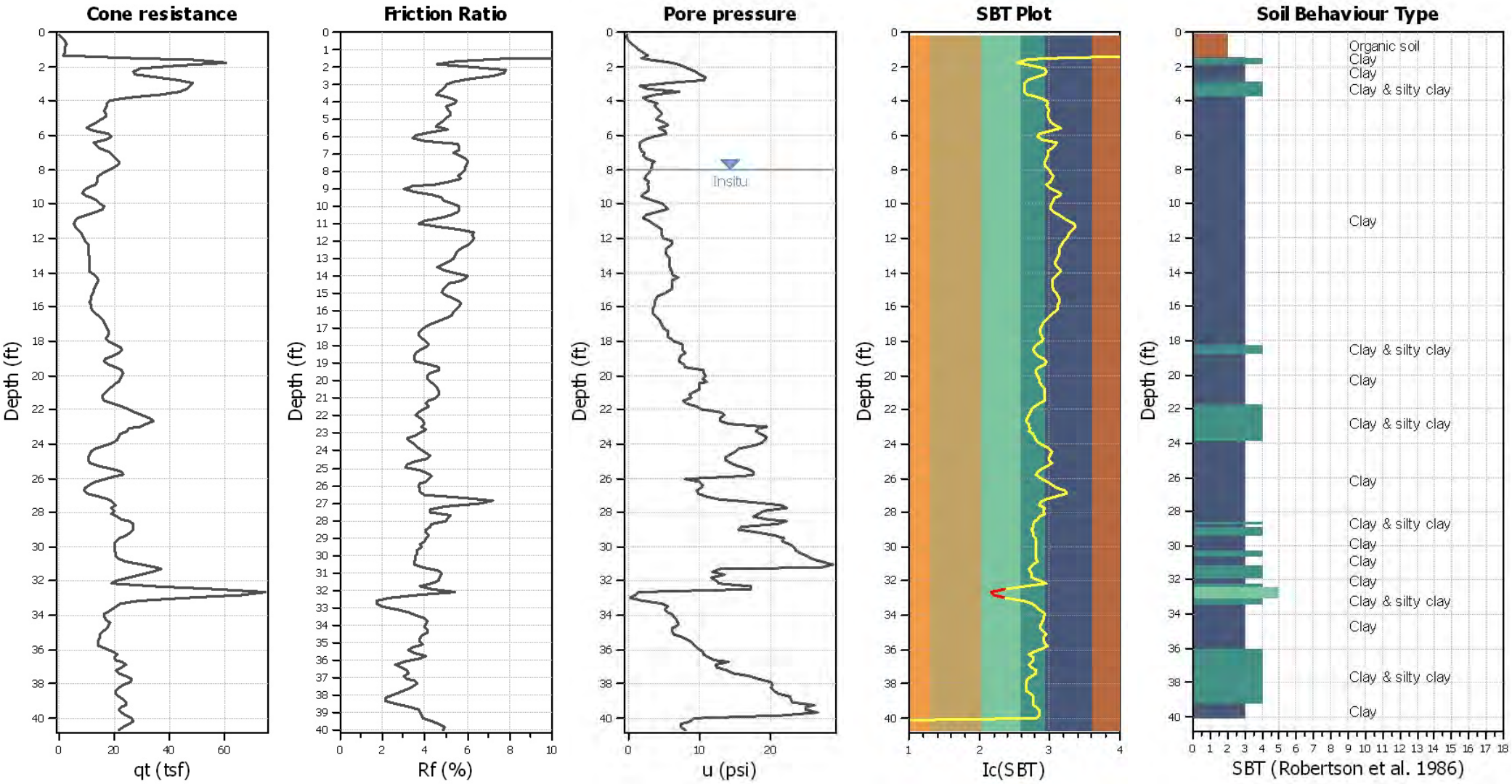



Zone $A_1$: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone $A_2$: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction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

## CPT basic interpretation plo



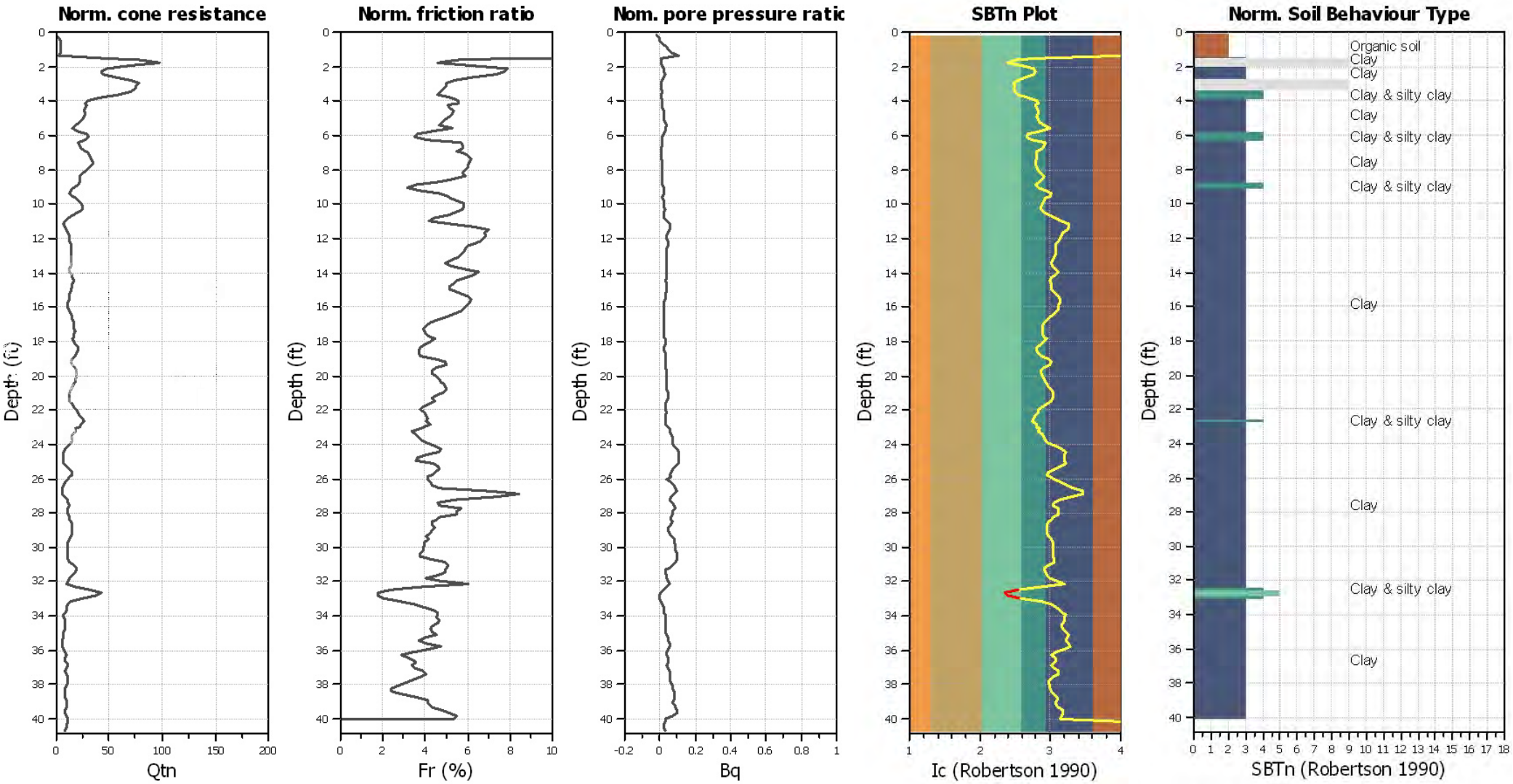

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBT legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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



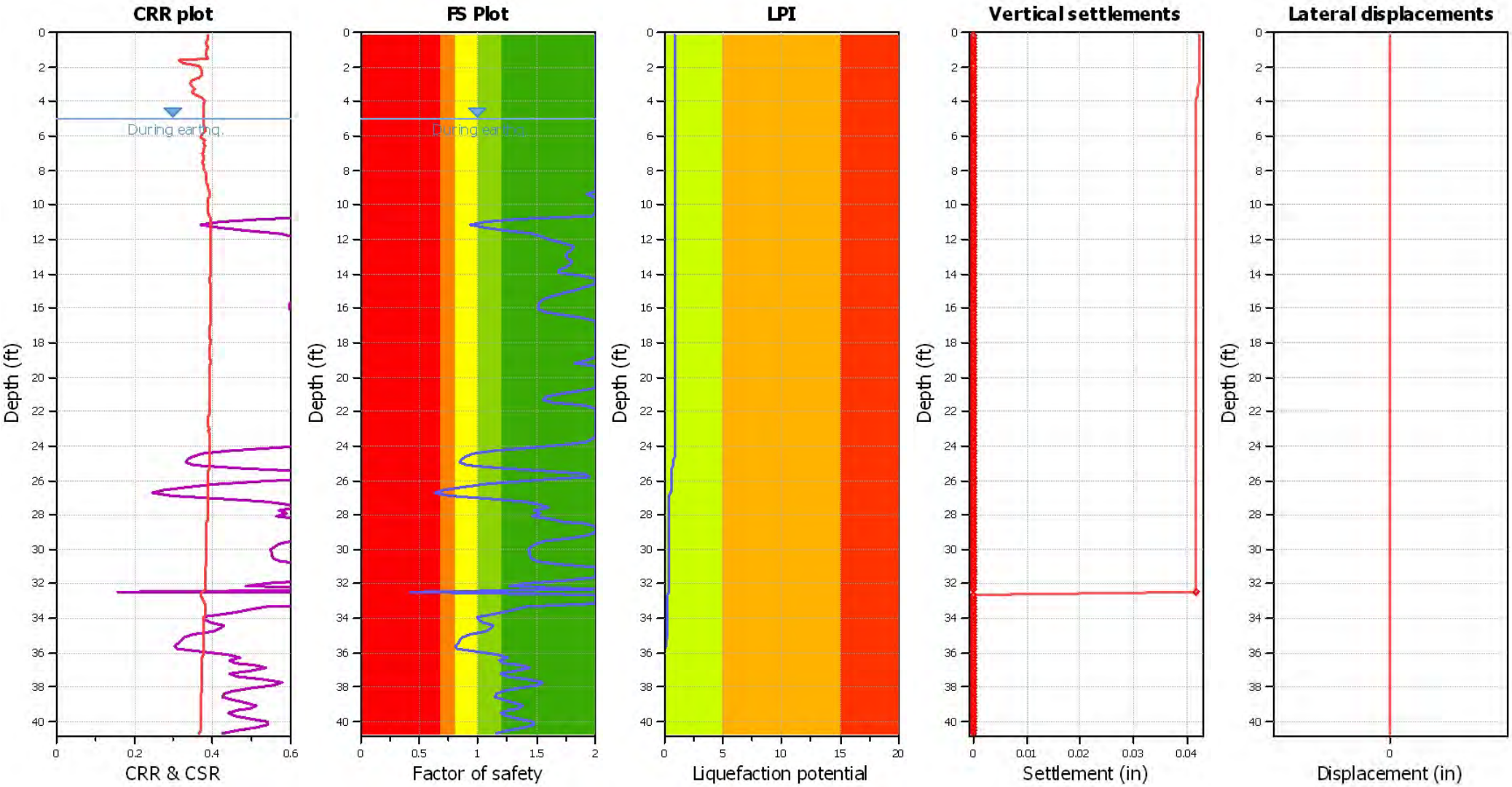

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBTn legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**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

**Earth Systems**
Geotechnical Engineers

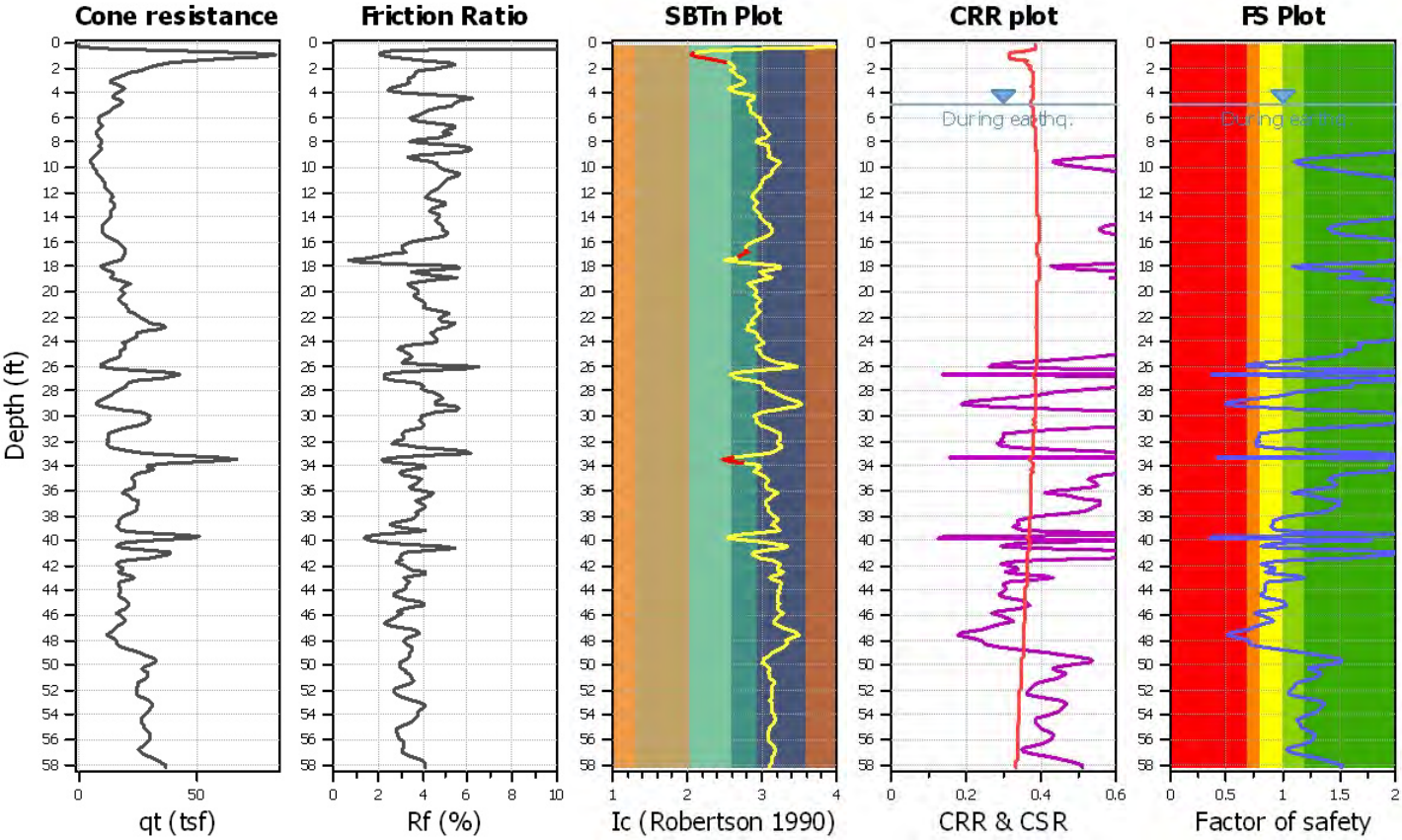
## LIQUEFACTION ANALYSIS REPORT

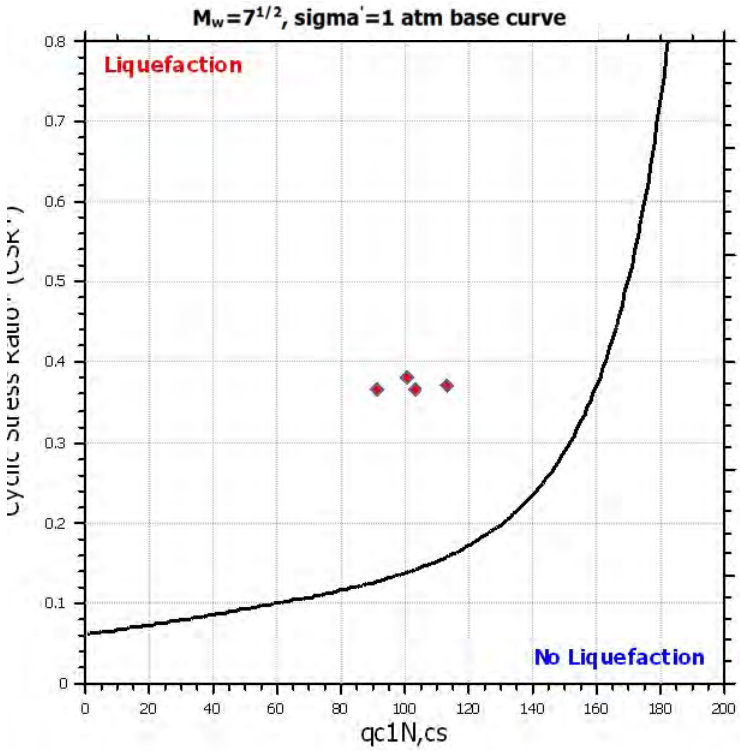
**Project title : Gibralter Warehouse** **Location : Milpitas, CA**

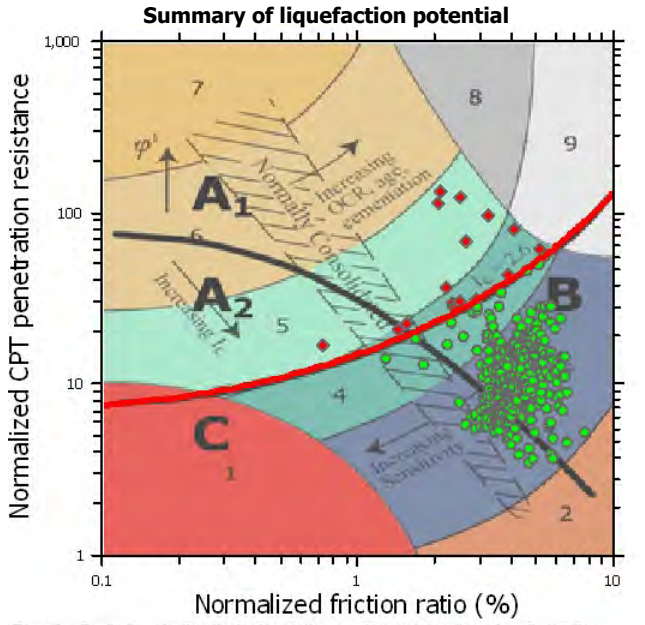
**CPT file : CPT-03**

**Input parameters and analysis data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | G.W.T. (in-situ): | 8.00 ft | Use fill: | No | Clay like behavior applied: | Sand & Clay |
| Fines correction method: | B&I (2014) | G.W.T. (earthq.): | 5.00 ft | Fill height: | N/A | Limit depth applied: | Yes |
| Points to test: | Based on Ic value | Average results interval: | 3 | Fill weight: | N/A | Limit depth: | 60.00 ft |
| Earthquake magnitude $M_w$: | 6.90 | Ic cut-off value: | 2.60 | Trans. detect. applied: | Yes | MSF method: | Method |
| Peak ground acceleration: | 0.67 | Unit weight calculation: | Based on SBT | $K_\sigma$ applied: | Yes | | |

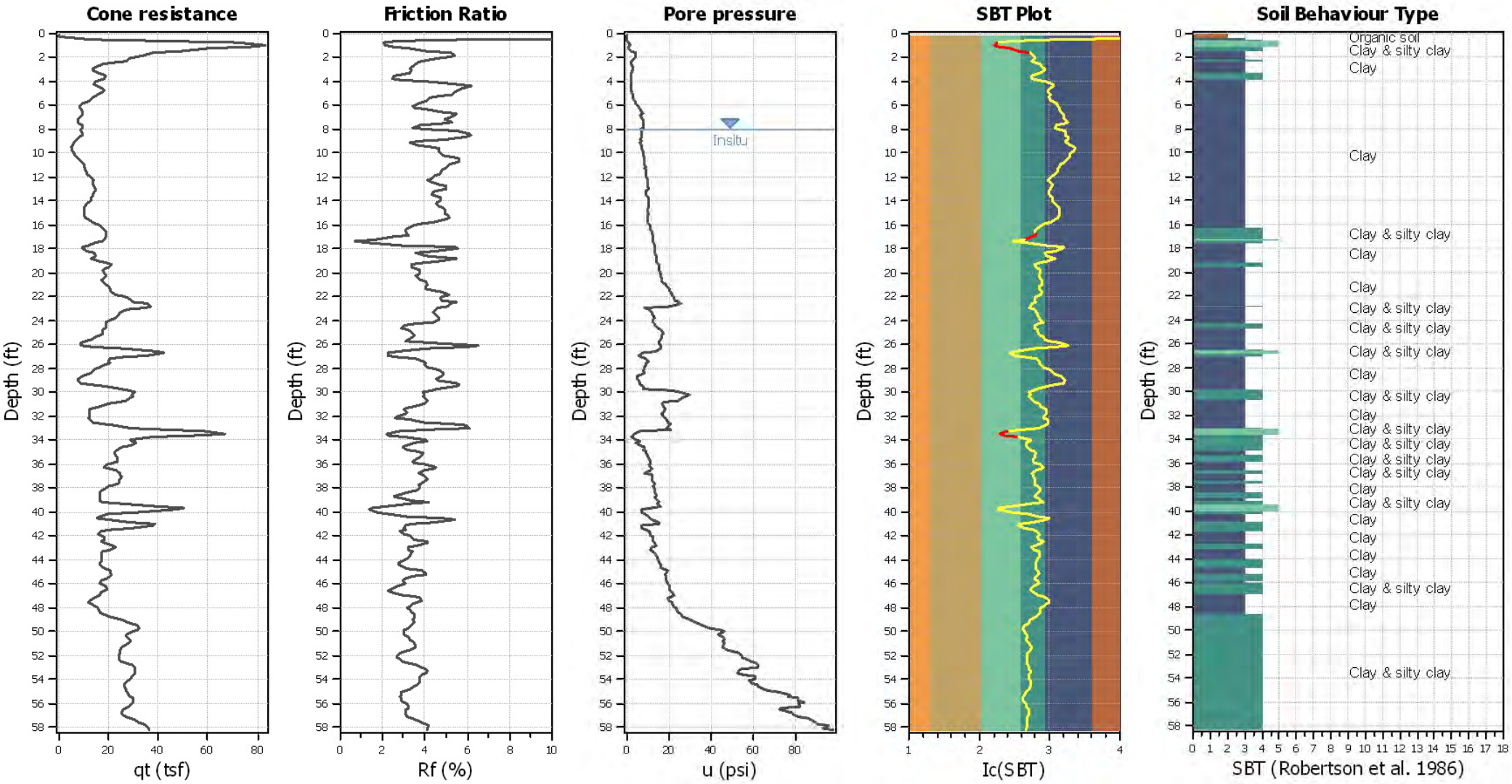



Zone $A_1$: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone $A_2$: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction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

## CPT basic interpretation plo



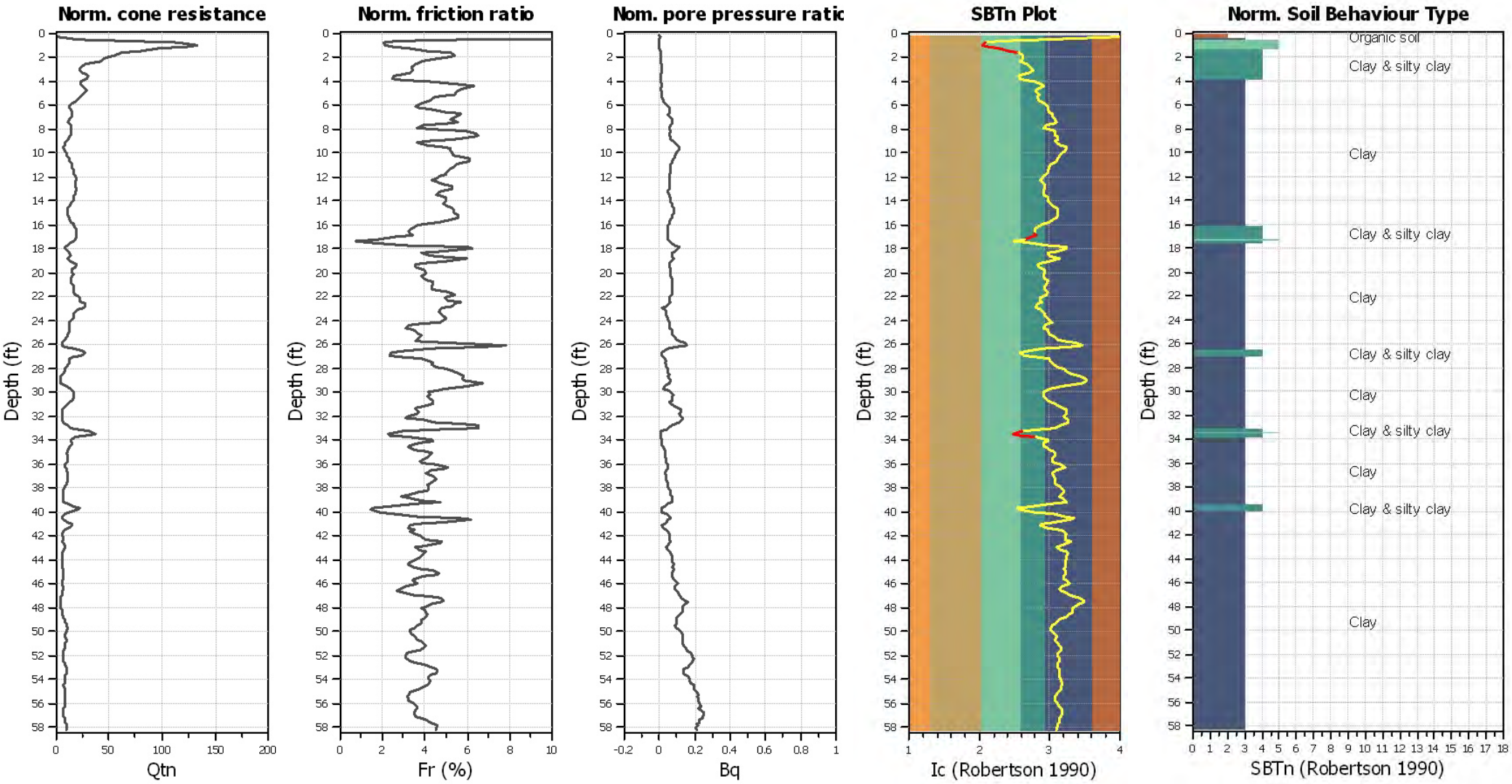

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBT legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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



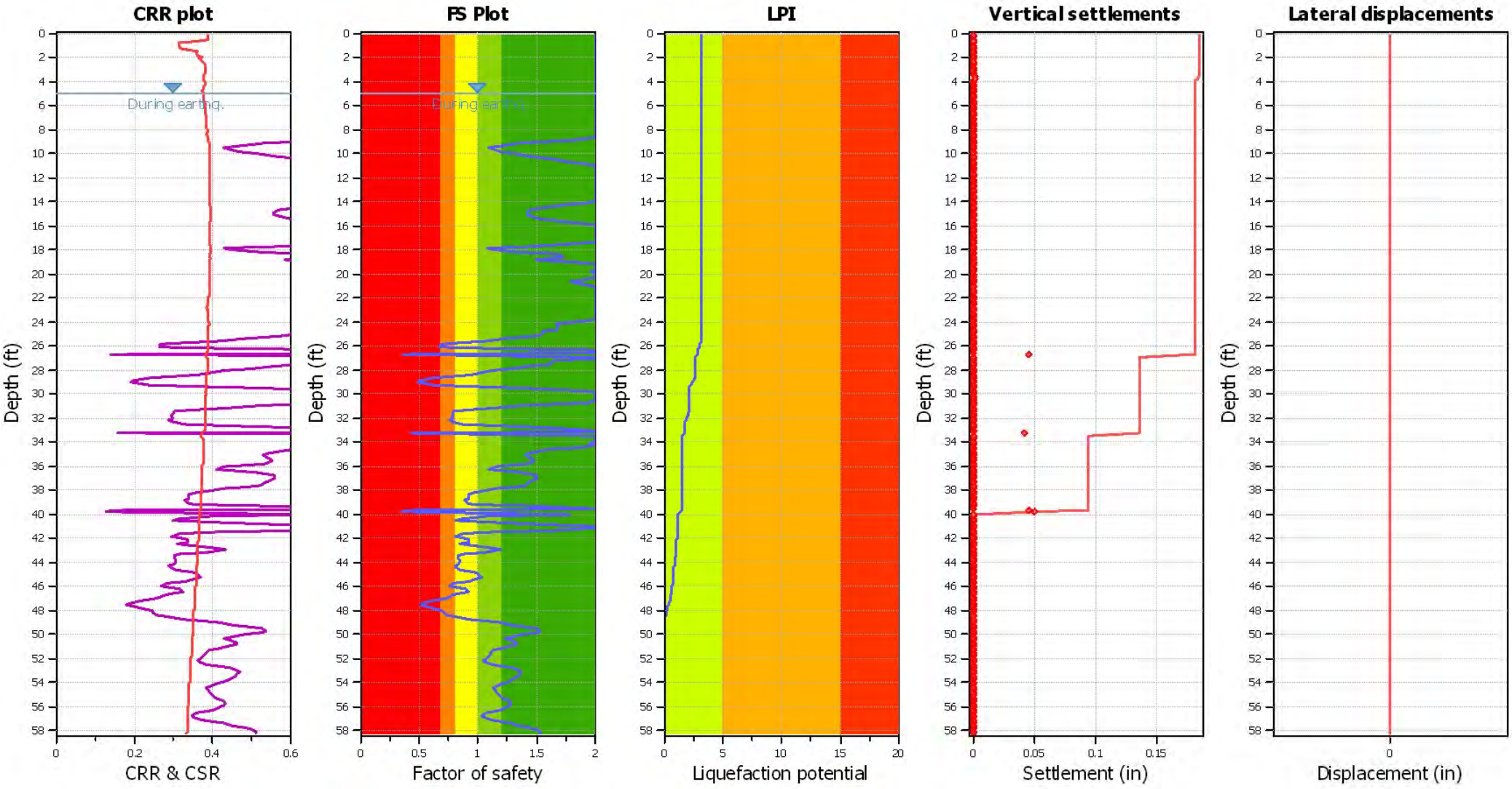

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBTn legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**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

**Earth Systems**
Geotechnical Engineers

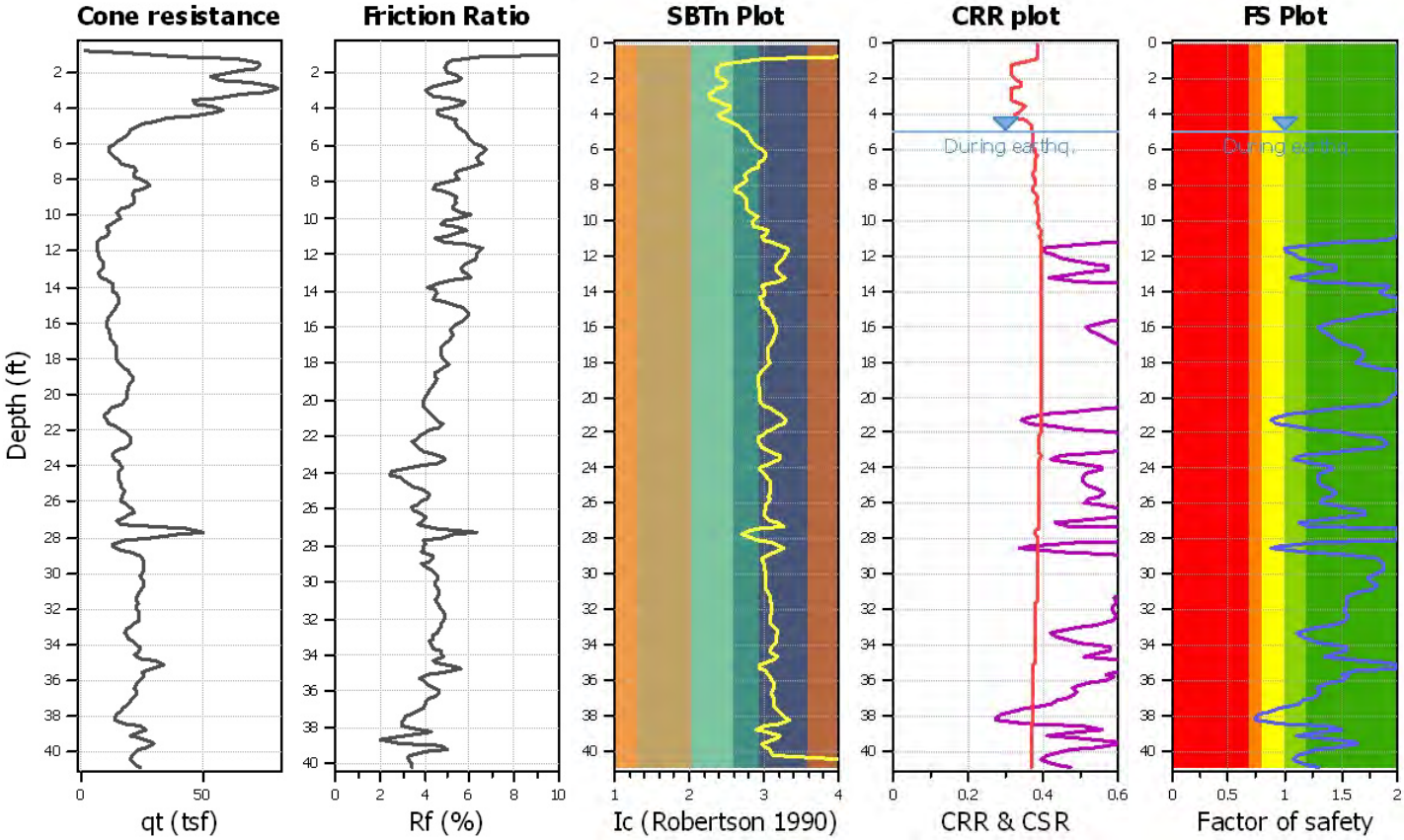
## LIQUEFACTION ANALYSIS REPORT

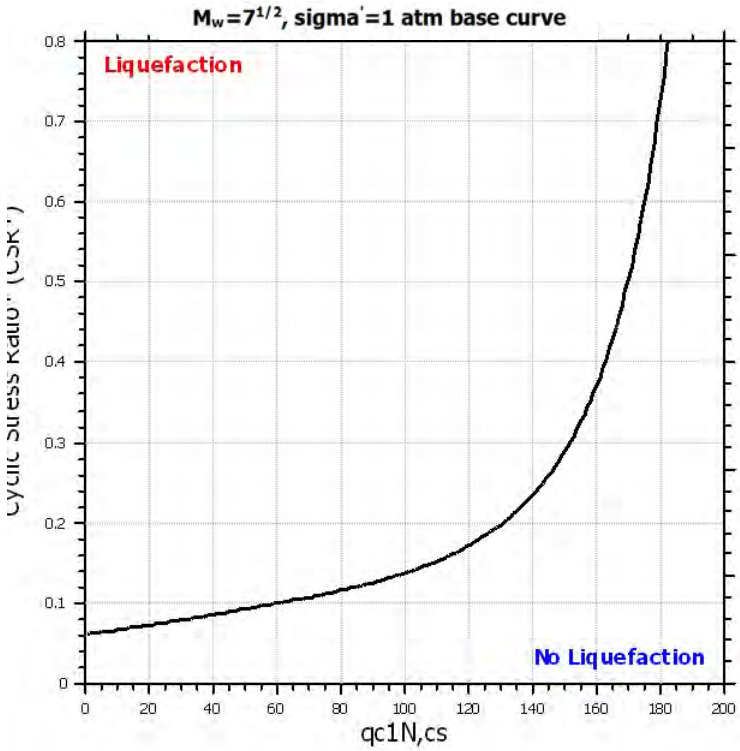
**Project title : Gibralter Warehouse** **Location : Milpitas, CA**

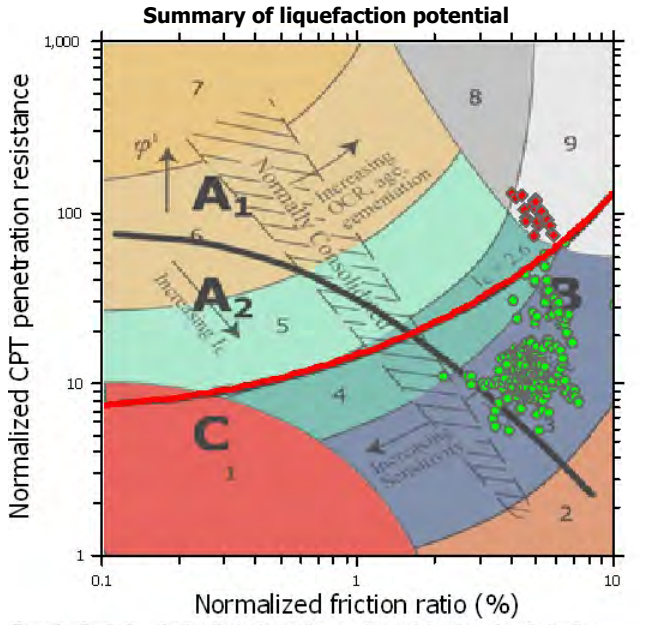
**CPT file : CPT-04**

**Input parameters and analysis data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | G.W.T. (in-situ): | 8.00 ft | Use fill: | No | Clay like behavior | |
| Fines correction method: | B&I (2014) | G.W.T. (earthq.): | 5.00 ft | Fill height: | N/A | applied: | Sand & Clay |
| Points to test: | Based on Ic value | Average results interval: | 3 | Fill weight: | N/A | Limit depth applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Ic cut-off value: | 2.60 | Trans. detect. applied: | Yes | Limit depth: | 60.00 ft |
| Peak ground acceleration: | 0.67 | Unit weight calculation: | Based on SBT | $K_\sigma$ applied: | Yes | MSF method: | Method |

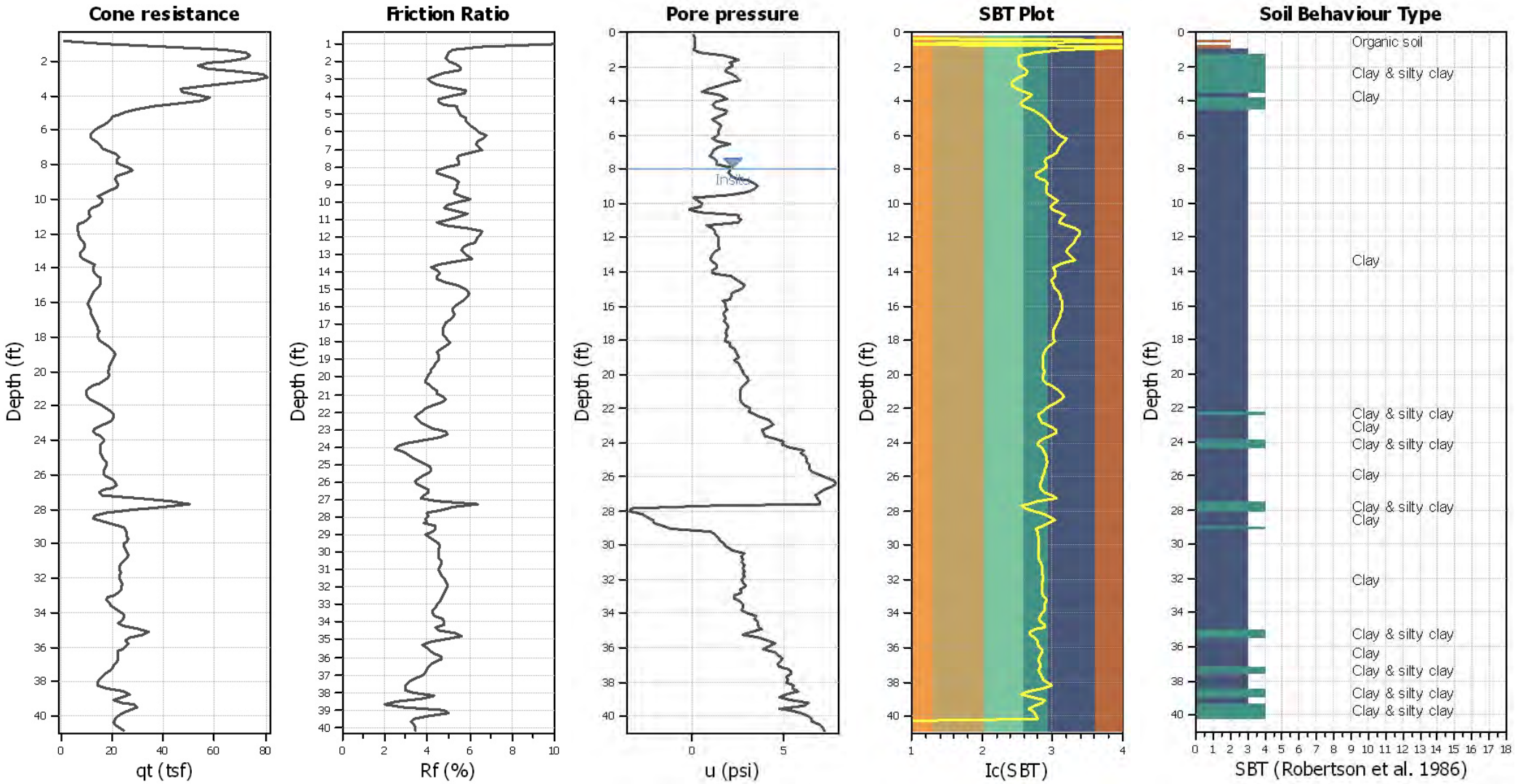



Zone $A_1$: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone $A_2$: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction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

## CPT basic interpretation plo



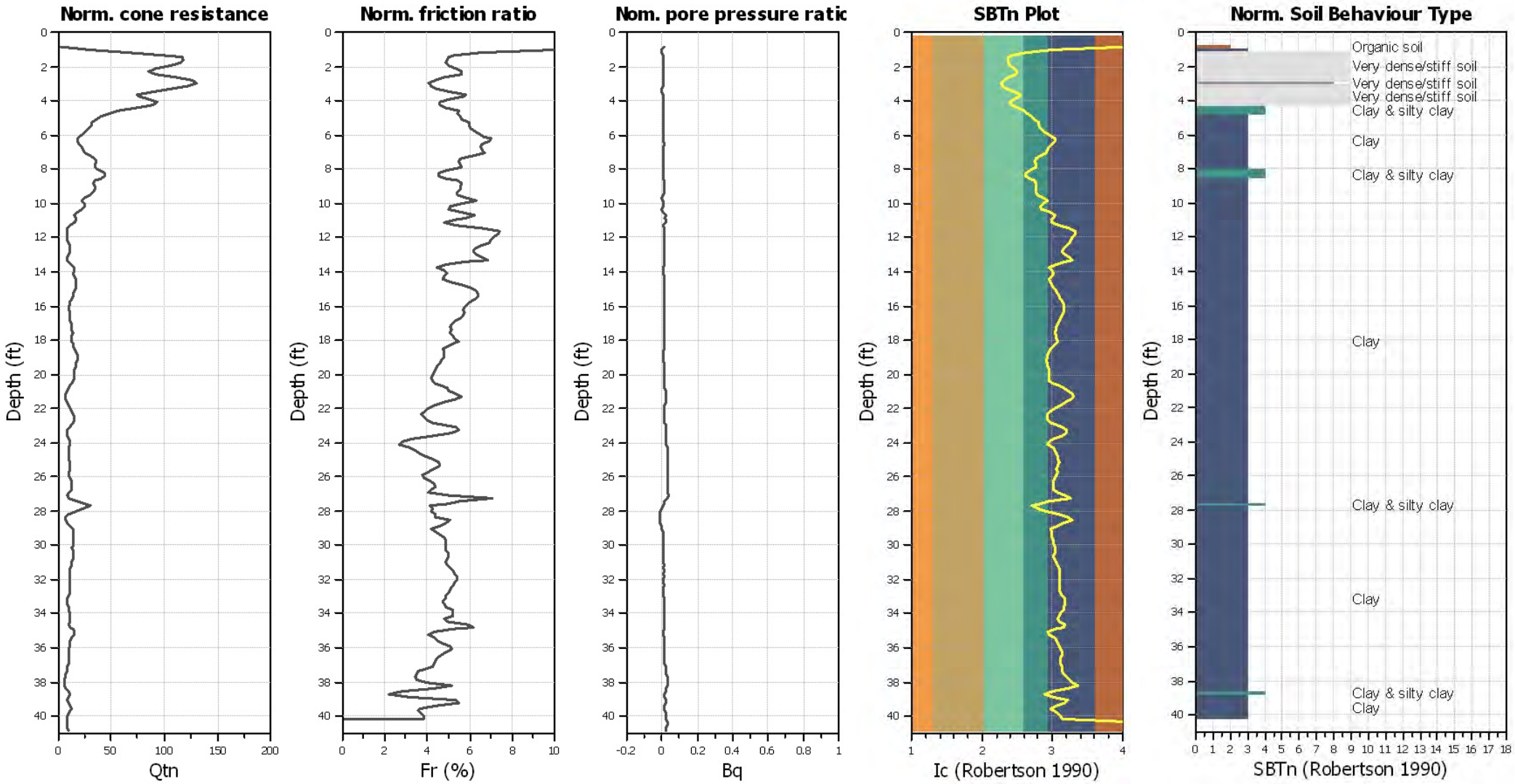

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBT legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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



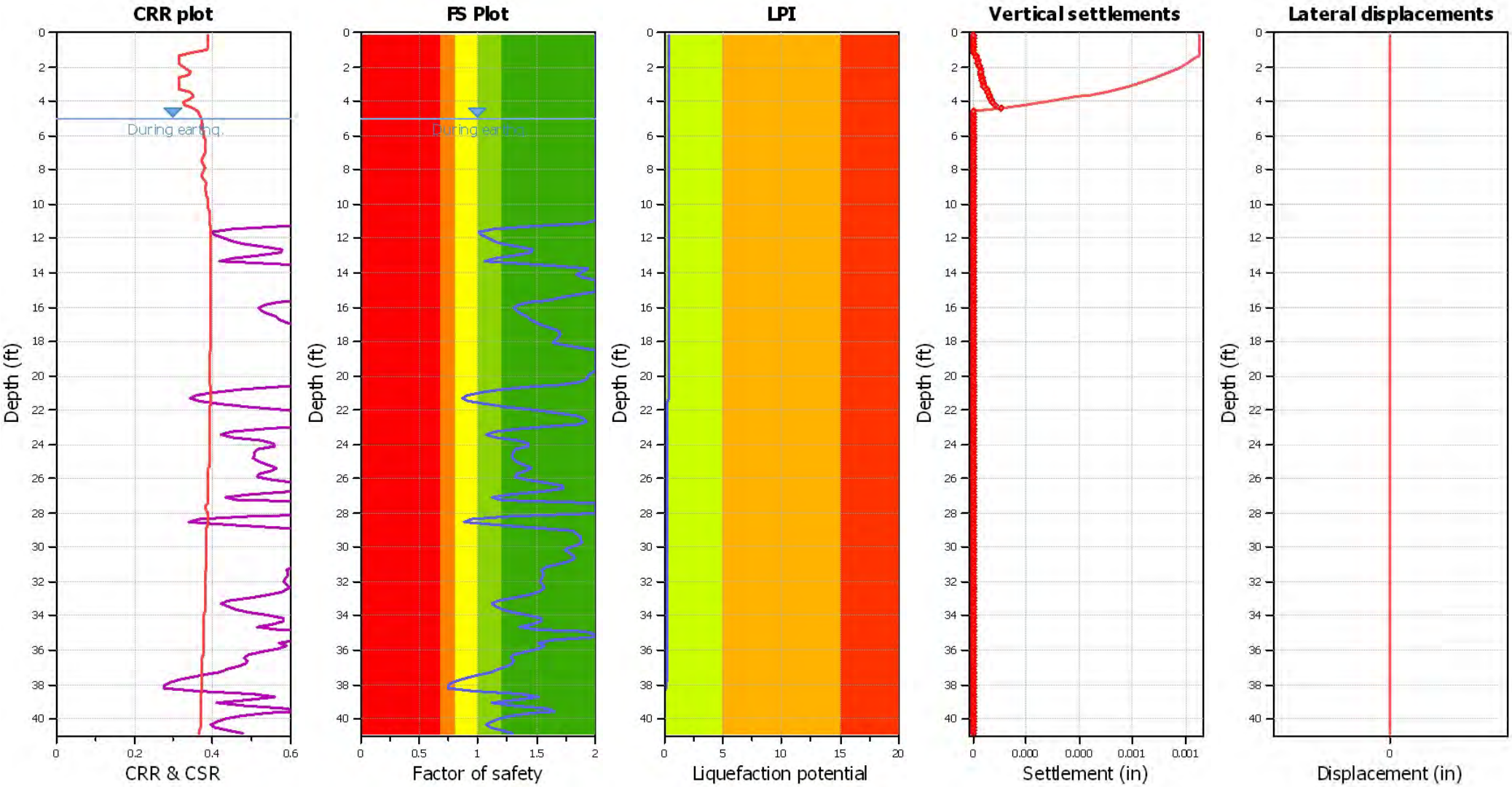

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBTn legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**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

**Earth Systems**
Geotechnical Engineers

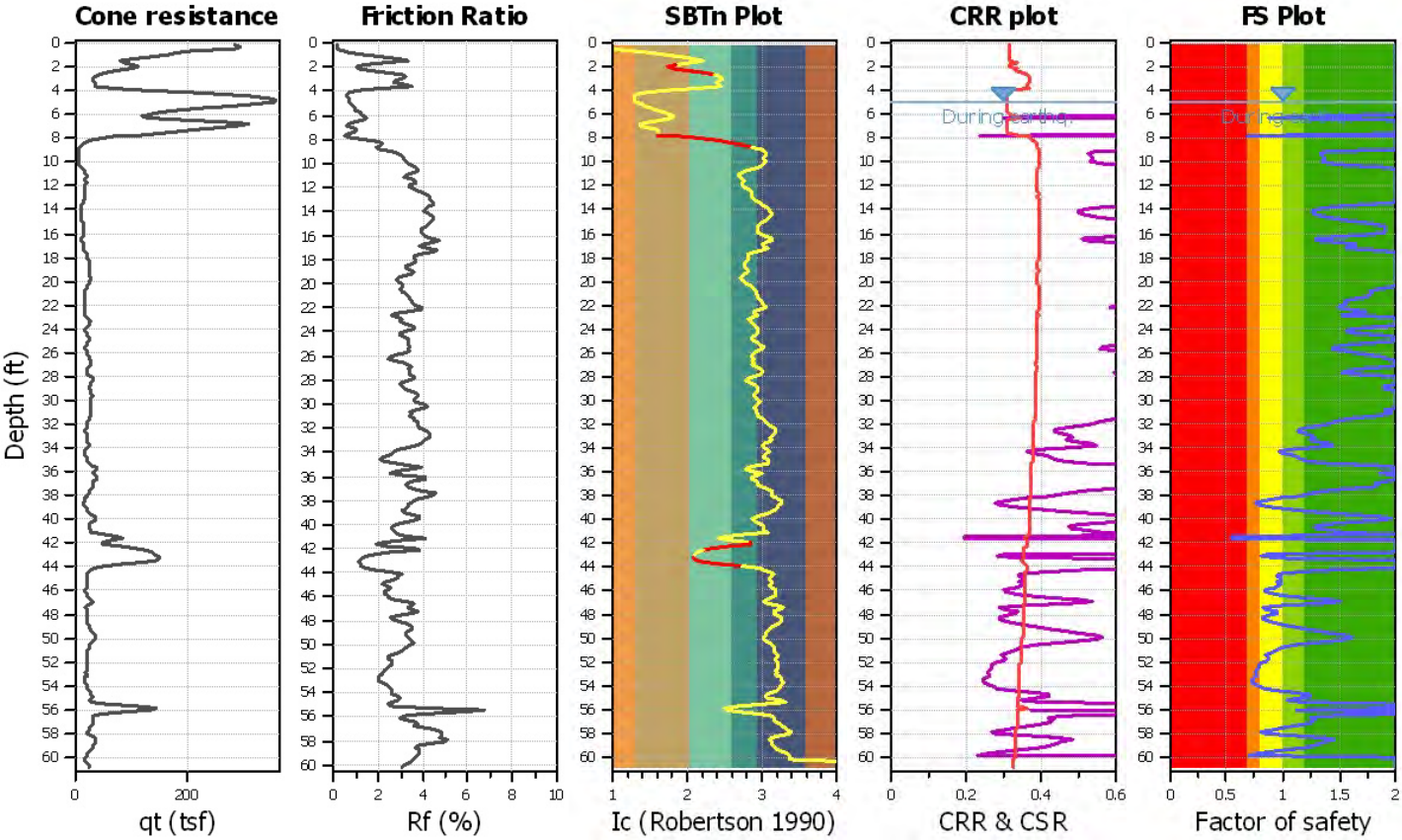
## LIQUEFACTION ANALYSIS REPORT

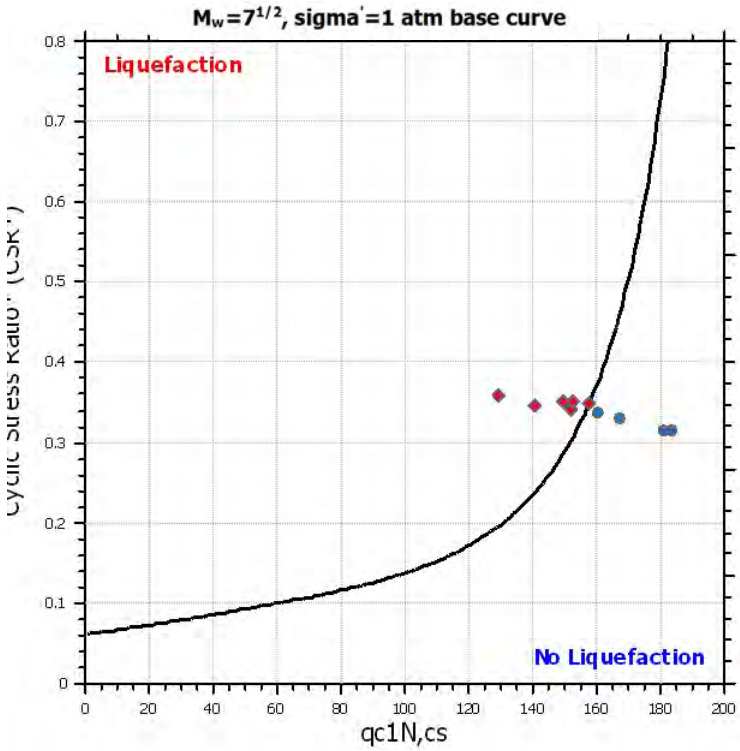
**Project title : Gibralter Warehouse** **Location : Milpitas, CA**

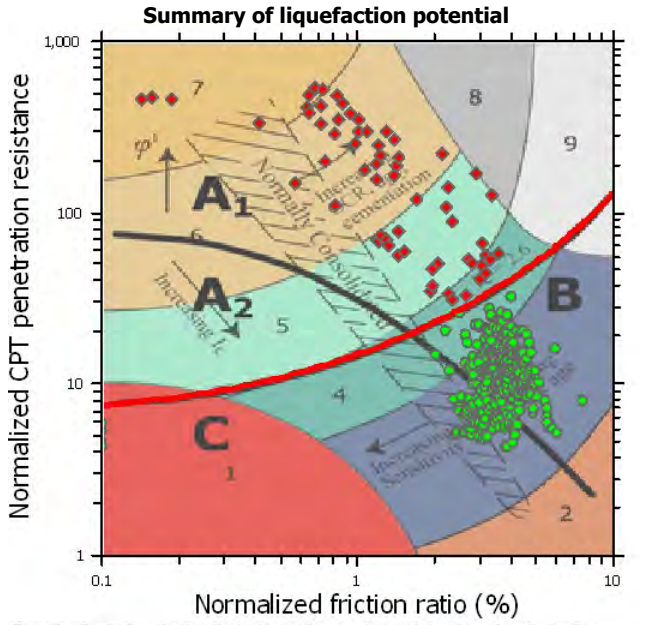
**CPT file : CPT-05**

**Input parameters and analysis data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | G.W.T. (in-situ): | 8.00 ft | Use fill: | No | Clay like behavior | |
| Fines correction method: | B&I (2014) | G.W.T. (earthq.): | 5.00 ft | Fill height: | N/A | applied: | Sand & Clay |
| Points to test: | Based on Ic value | Average results interval: | 3 | Fill weight: | N/A | Limit depth applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Ic cut-off value: | 2.60 | Trans. detect. applied: | Yes | Limit depth: | 60.00 ft |
| Peak ground acceleration: | 0.67 | Unit weight calculation: | Based on SBT | $K_\sigma$ applied: | Yes | MSF method: | Method |

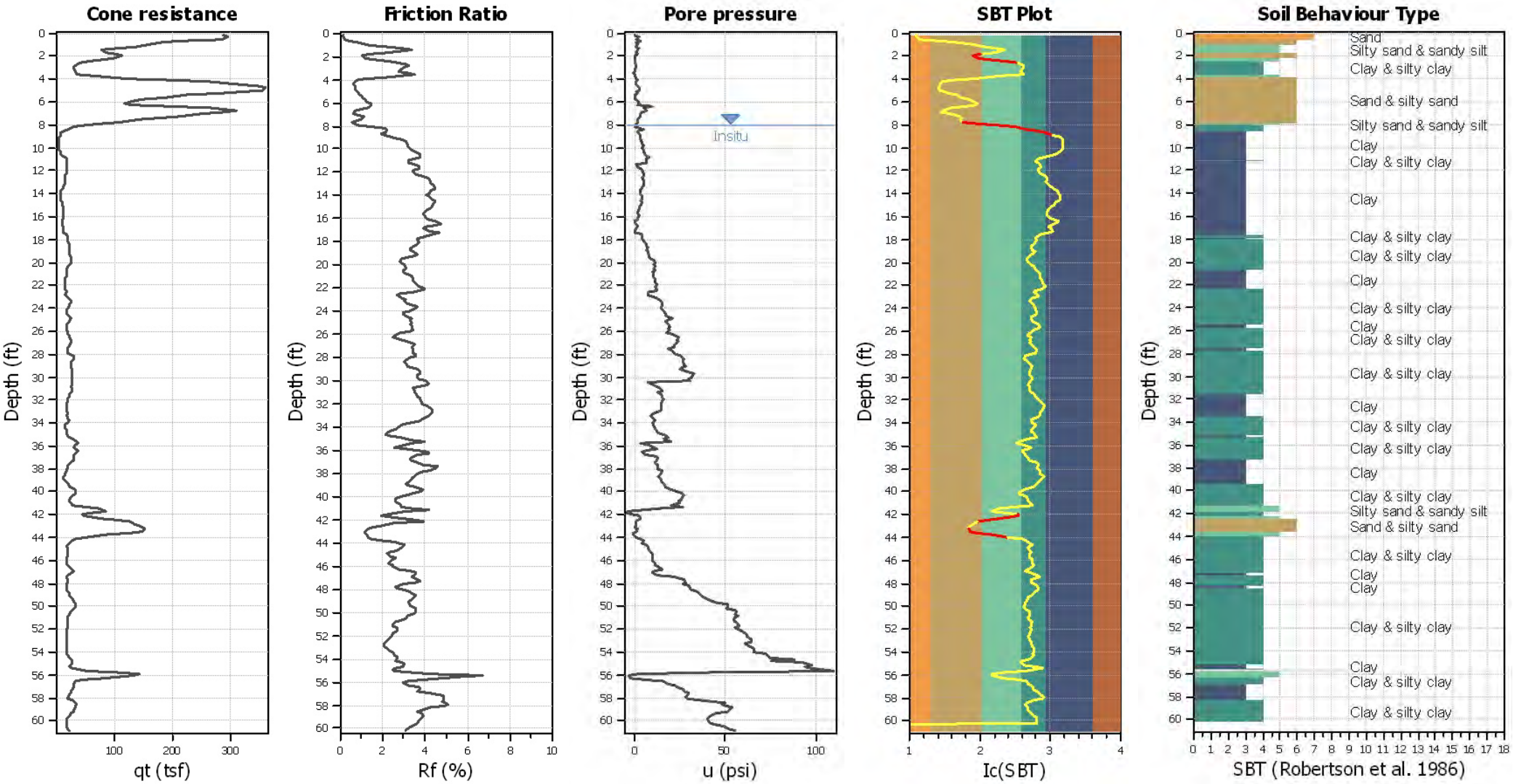



Zone $A_1$: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone $A_2$: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction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

## CPT basic interpretation plo



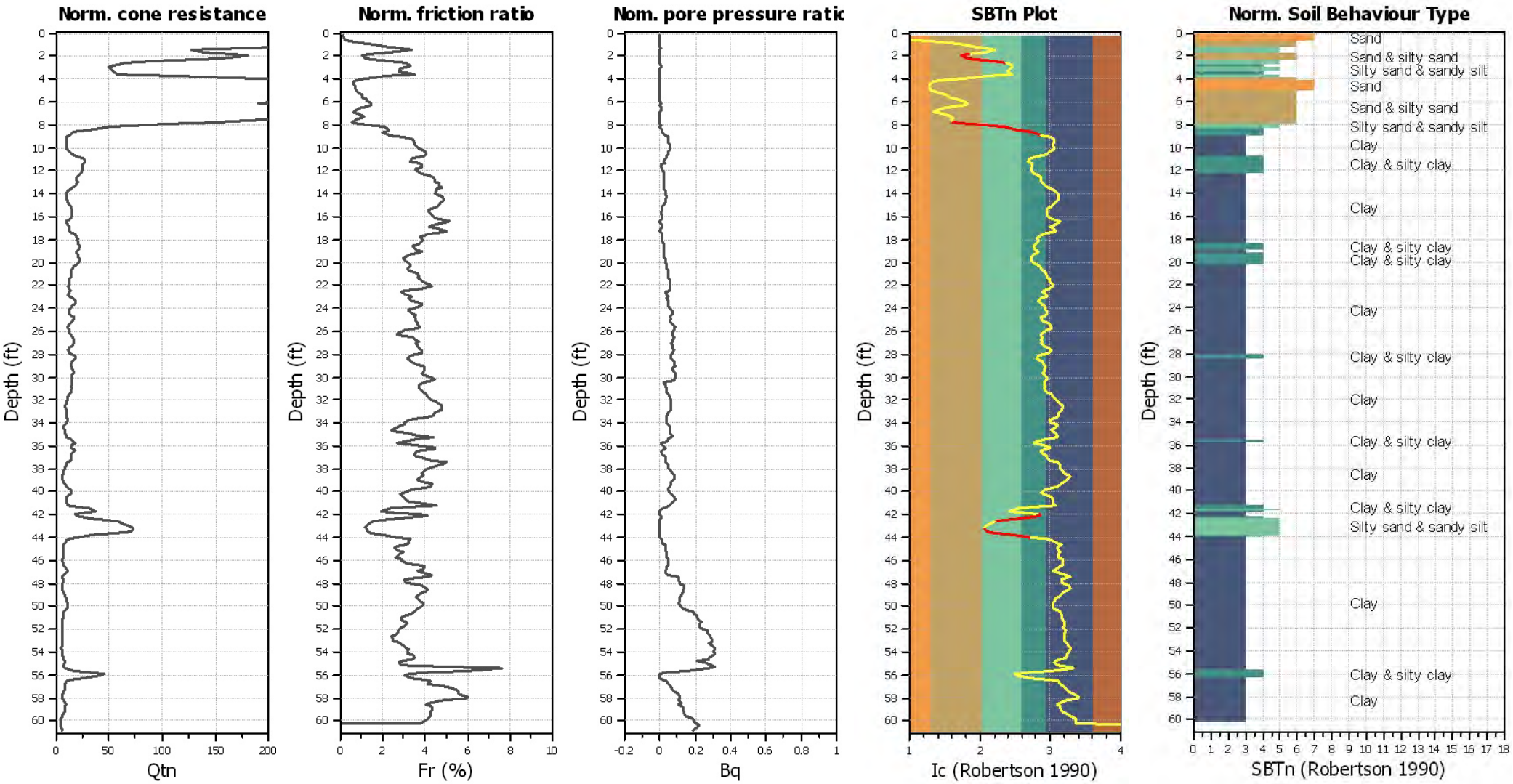

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBT legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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



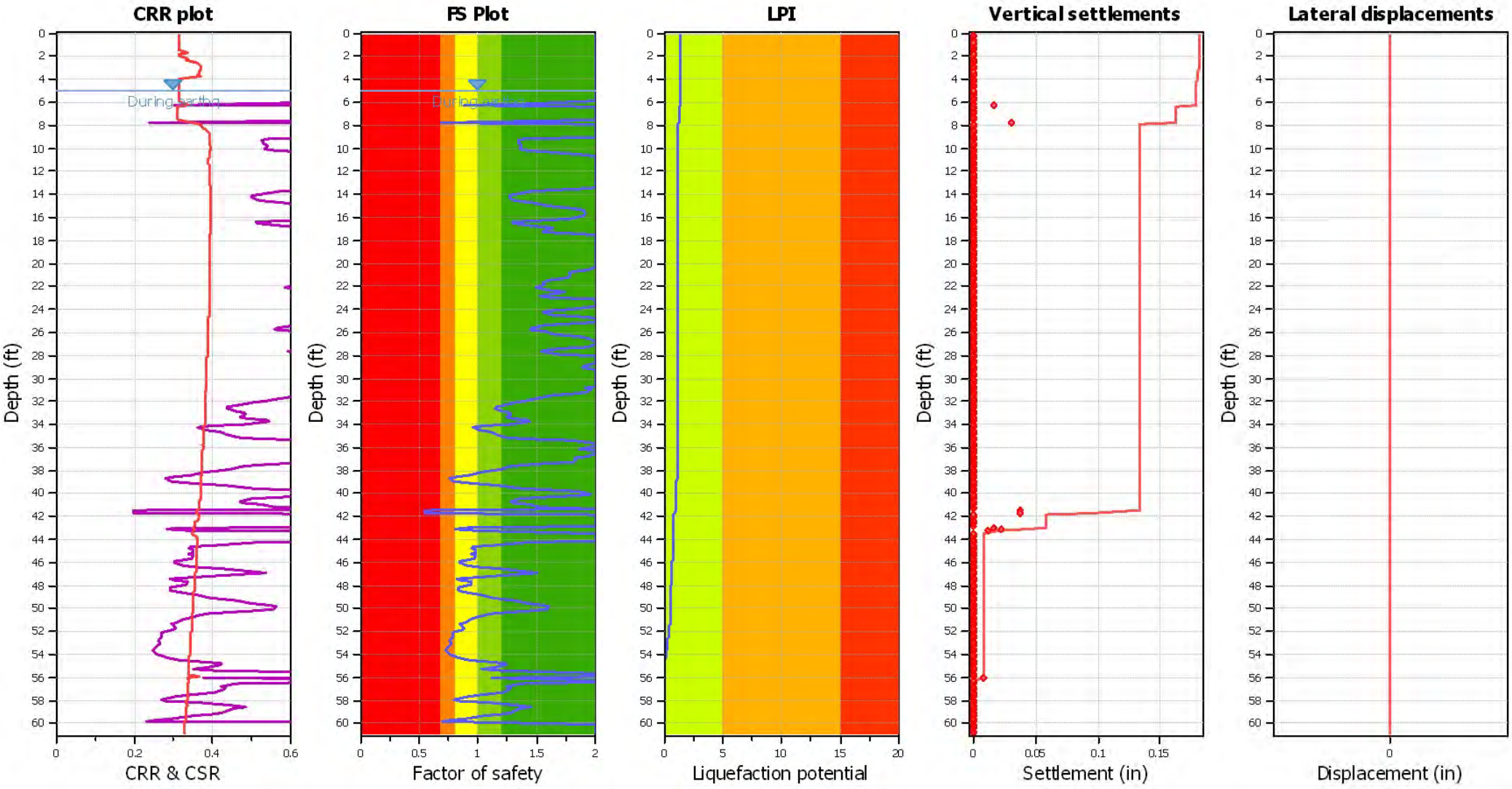

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBTn legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**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

**Earth Systems**
Geotechnical Engineers

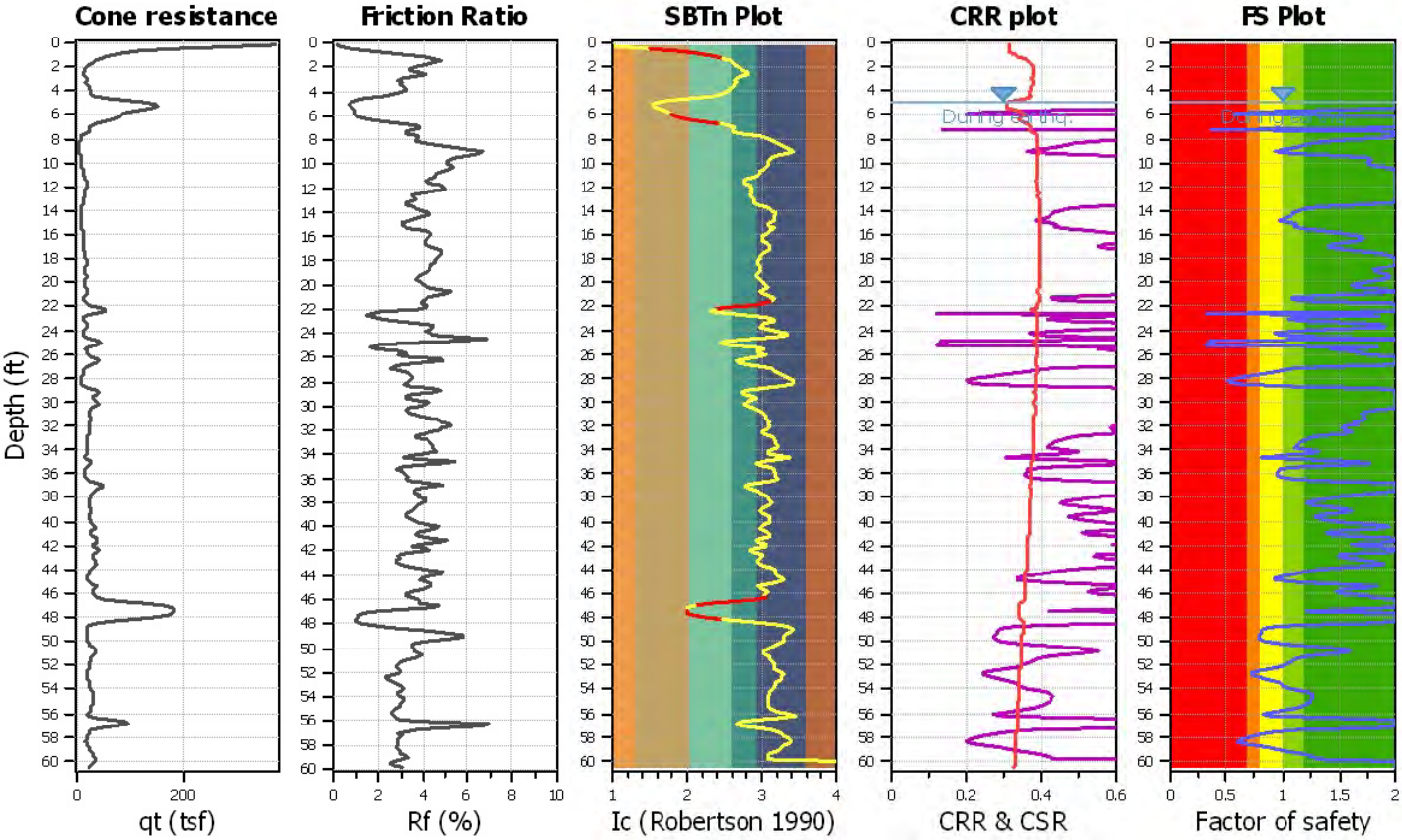
## LIQUEFACTION ANALYSIS REPORT

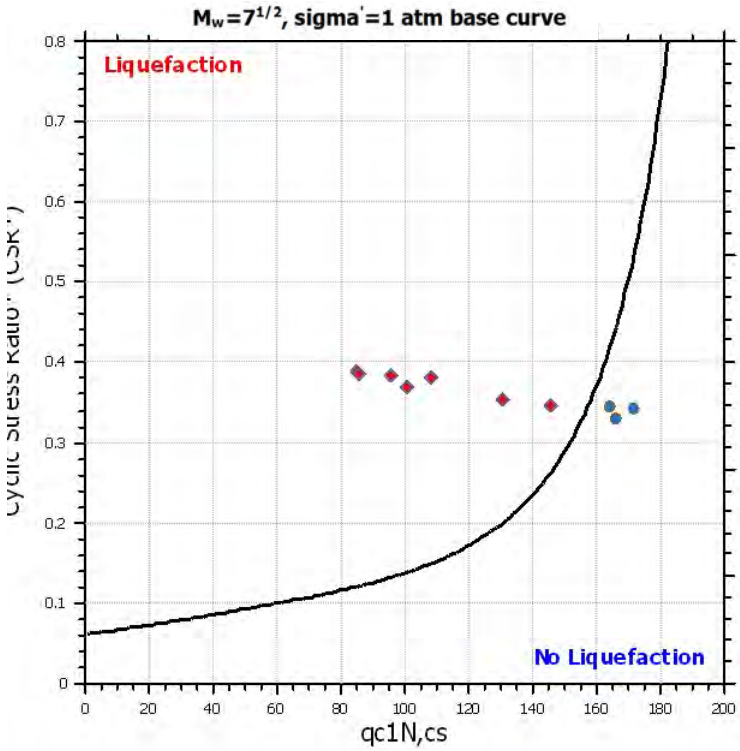
**Project title : Gibralter Warehouse** **Location : Milpitas, CA**

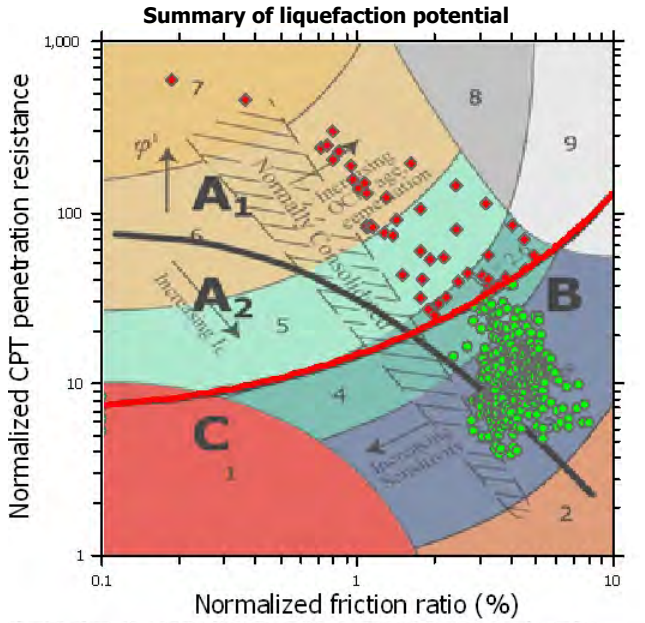
**CPT file : CPT-06**

**Input parameters and analysis data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | G.W.T. (in-situ): | 8.00 ft | Use fill: | No | Clay like behavior applied: | Sand & Clay |
| Fines correction method: | B&I (2014) | G.W.T. (earthq.): | 5.00 ft | Fill height: | N/A | Limit depth applied: | Yes |
| Points to test: | Based on Ic value | Average results interval: | 3 | Fill weight: | N/A | Limit depth: | 60.00 ft |
| Earthquake magnitude $M_w$: | 6.90 | Ic cut-off value: | 2.60 | Trans. detect. applied: | Yes | MSF method: | Method |
| Peak ground acceleration: | 0.67 | Unit weight calculation: | Based on SBT | $K_\sigma$ applied: | Yes | | |

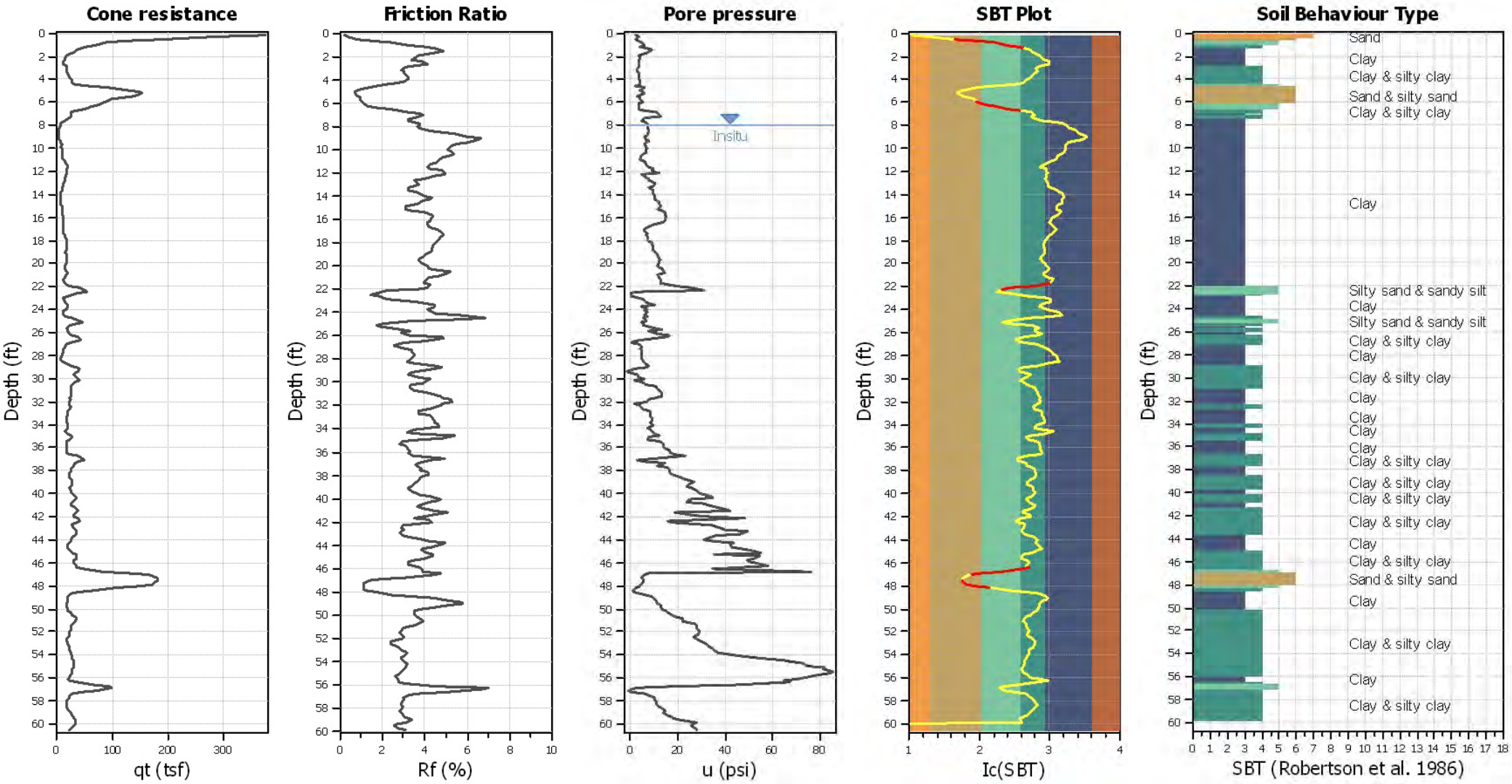



Zone $A_1$: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone $A_2$: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction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

## CPT basic interpretation plo



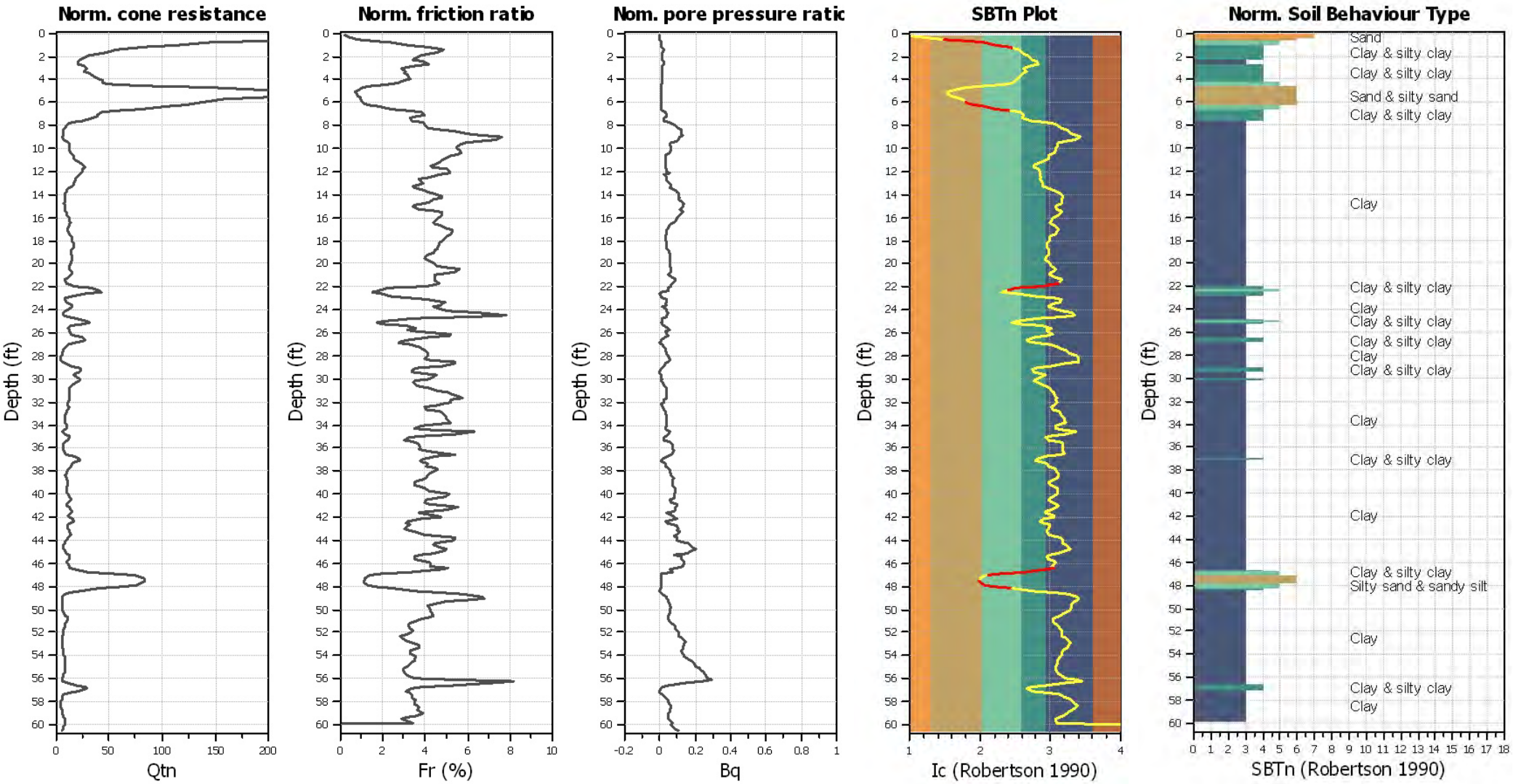

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBT legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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



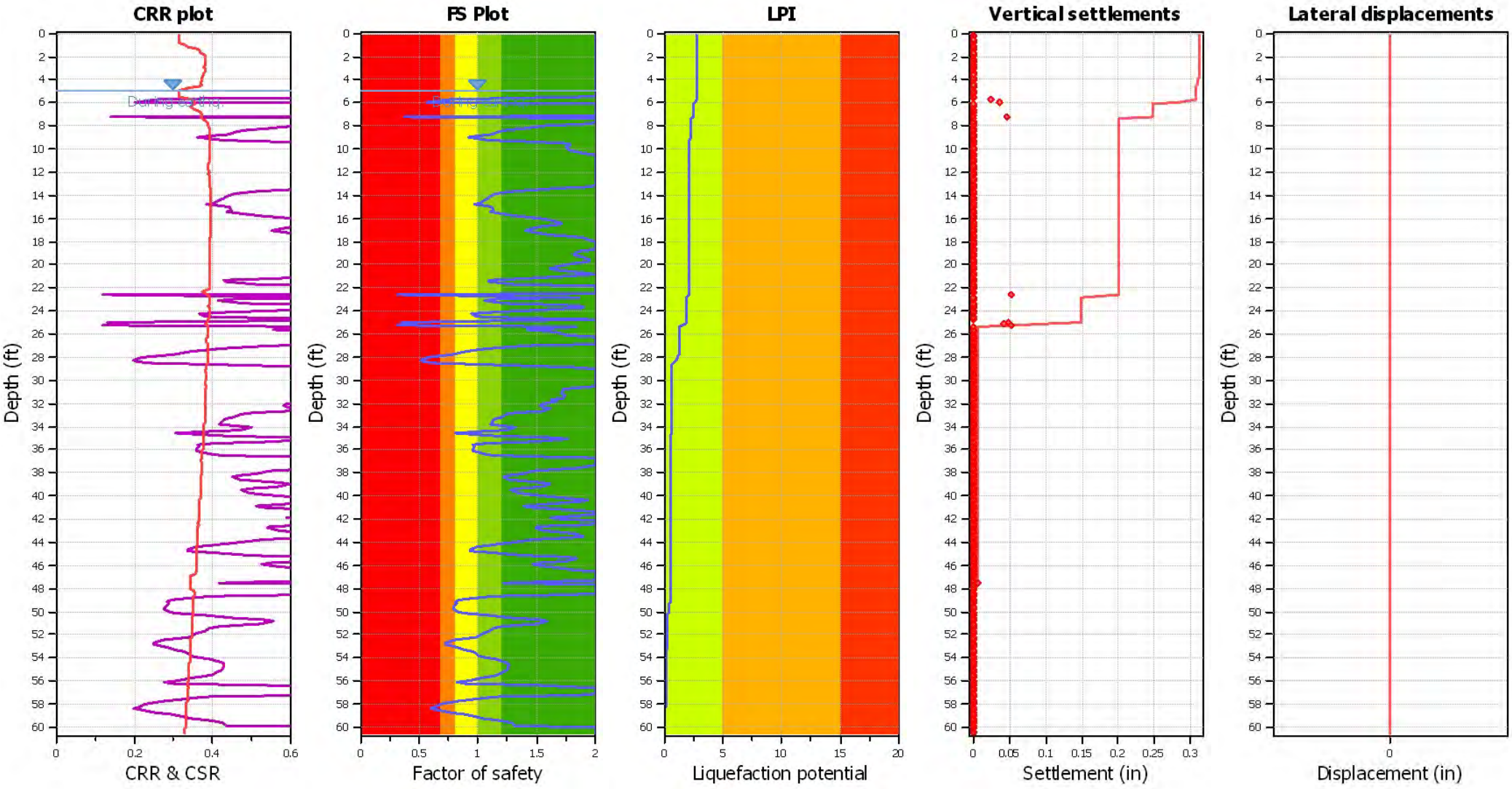

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBTn legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**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

**Earth Systems**
Geotechnical Engineers

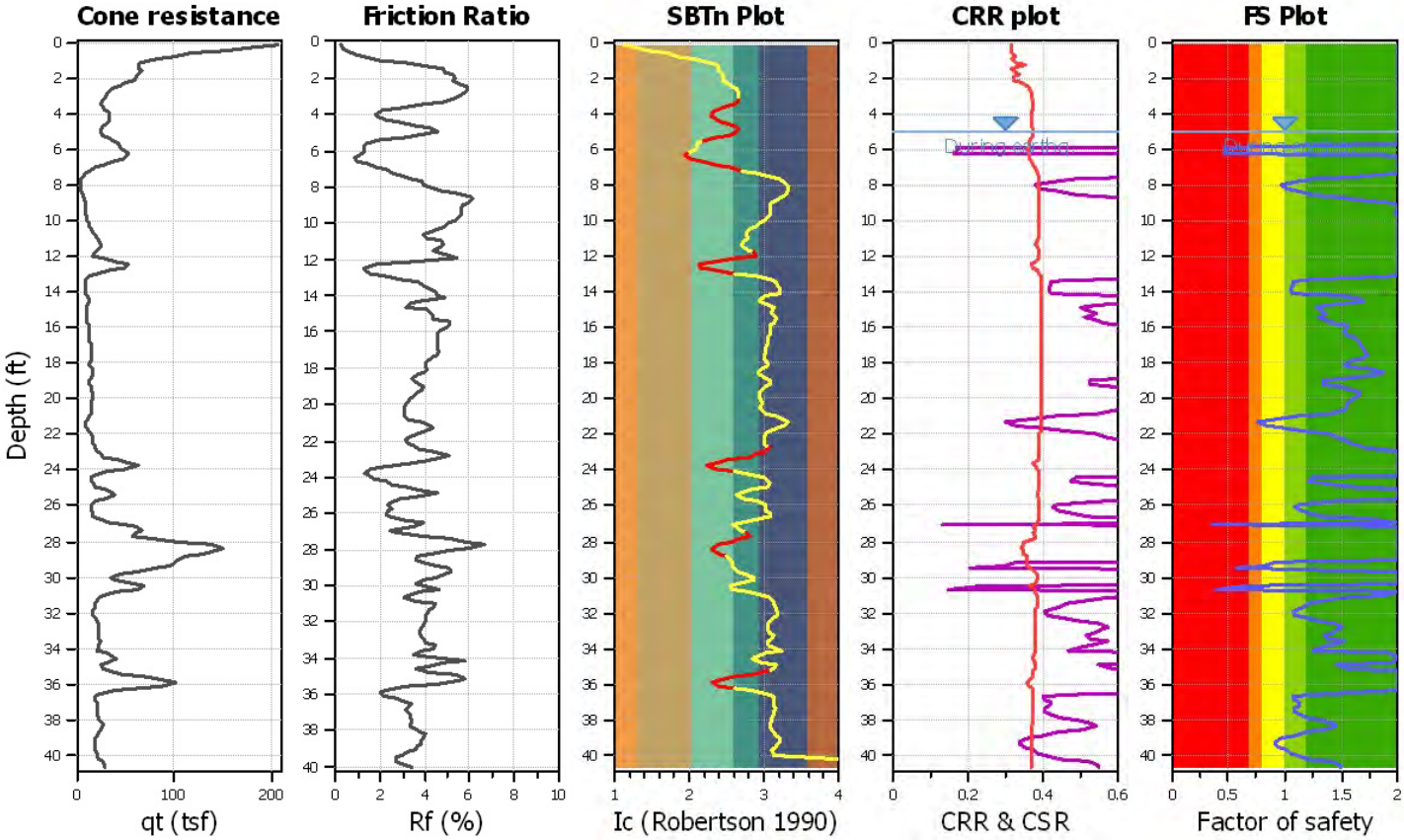
## LIQUEFACTION ANALYSIS REPORT

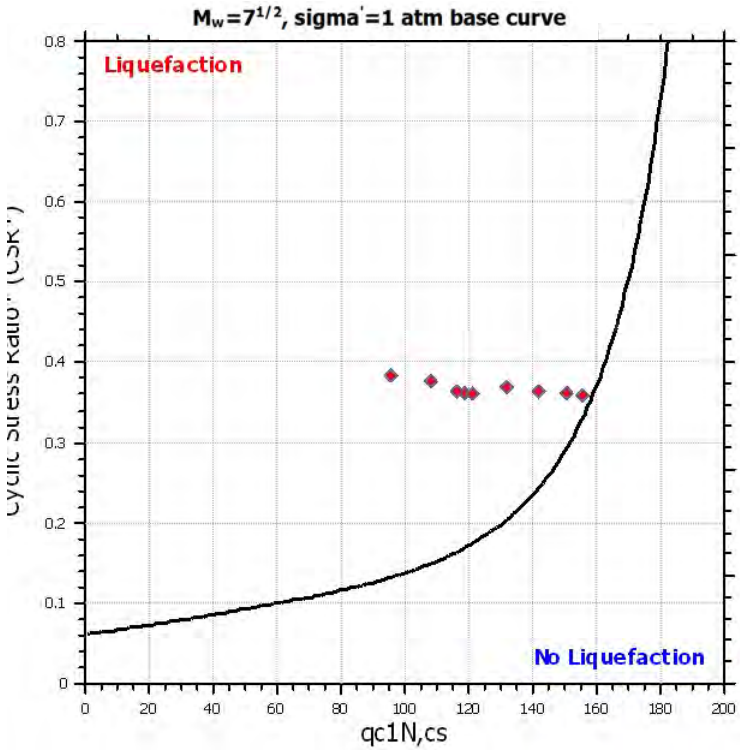
**Project title : Gibralter Warehouse** **Location : Milpitas, CA**

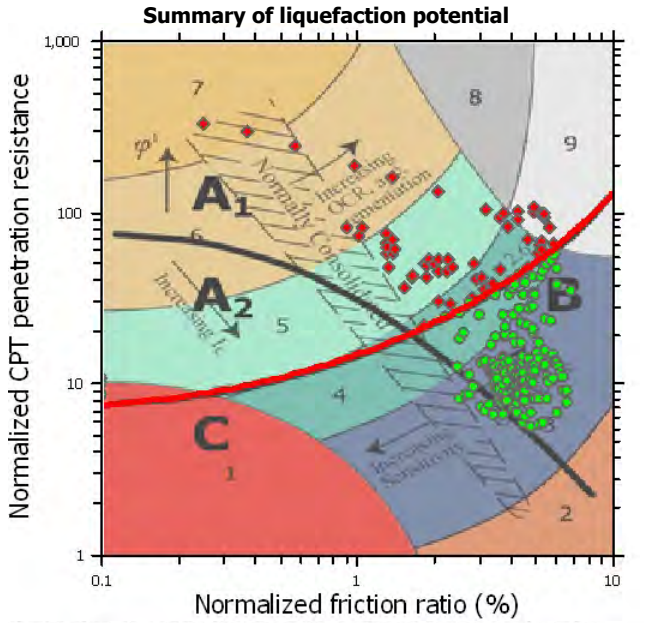
**CPT file : CPT-07**

**Input parameters and analysis data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | G.W.T. (in-situ): | 8.00 ft | Use fill: | No | Clay like behavior | |
| Fines correction method: | B&I (2014) | G.W.T. (earthq.): | 5.00 ft | Fill height: | N/A | applied: | Sand & Clay |
| Points to test: | Based on Ic value | Average results interval: | 3 | Fill weight: | N/A | Limit depth applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Ic cut-off value: | 2.60 | Trans. detect. applied: | Yes | Limit depth: | 60.00 ft |
| Peak ground acceleration: | 0.67 | Unit weight calculation: | Based on SBT | $K_\sigma$ applied: | Yes | MSF method: | Method |

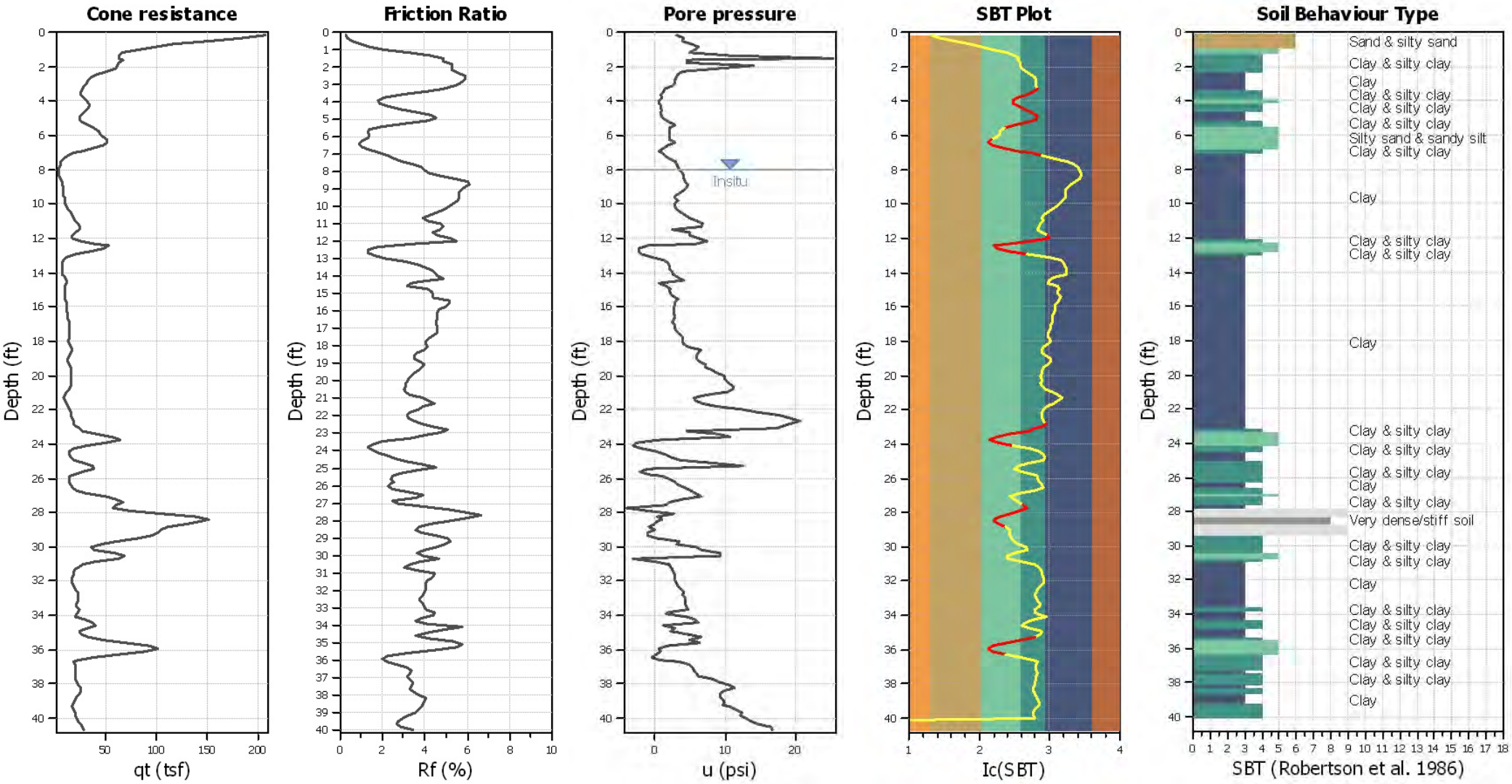



Zone $A_1$: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone $A_2$: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction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

## CPT basic interpretation plo



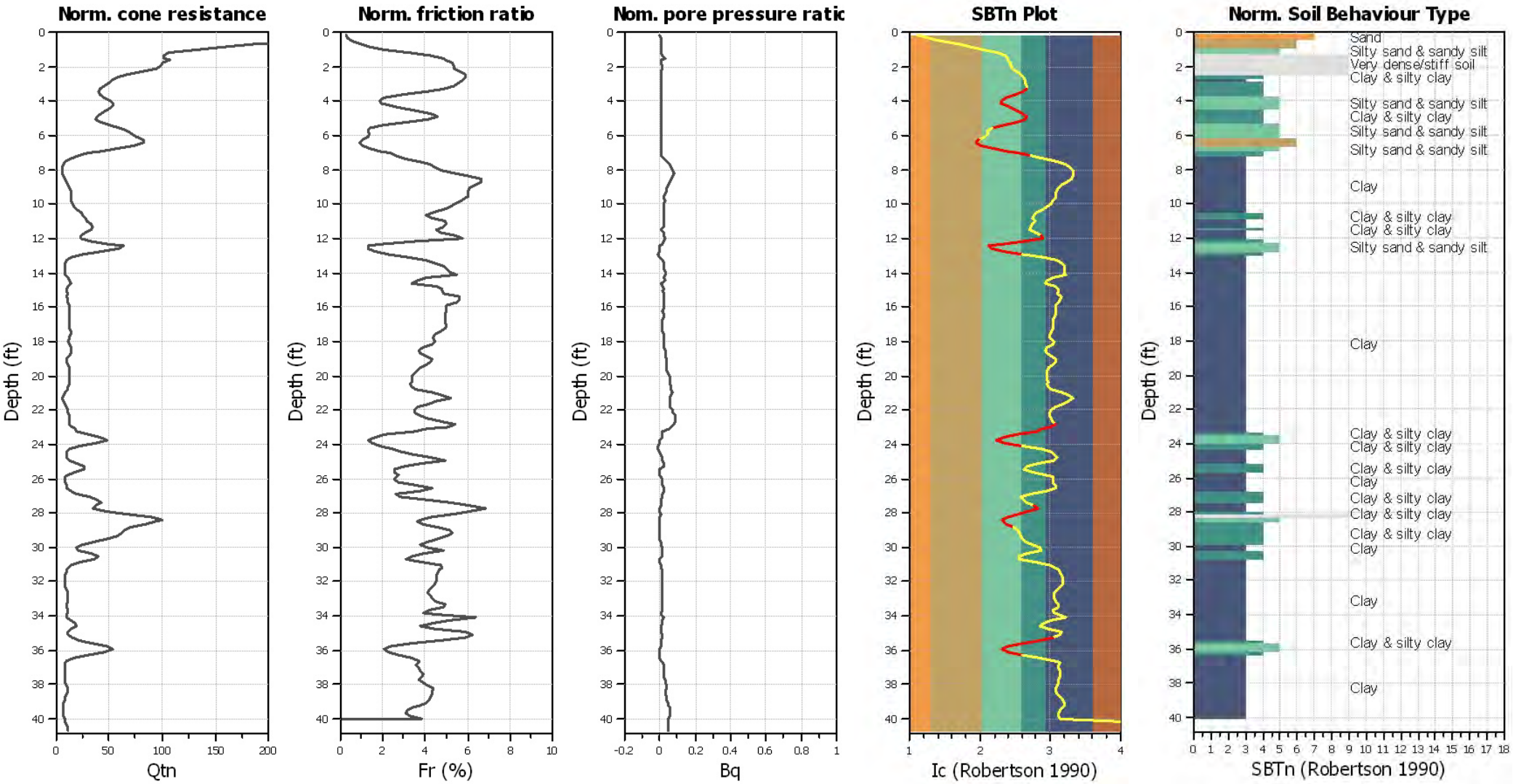

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

### SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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



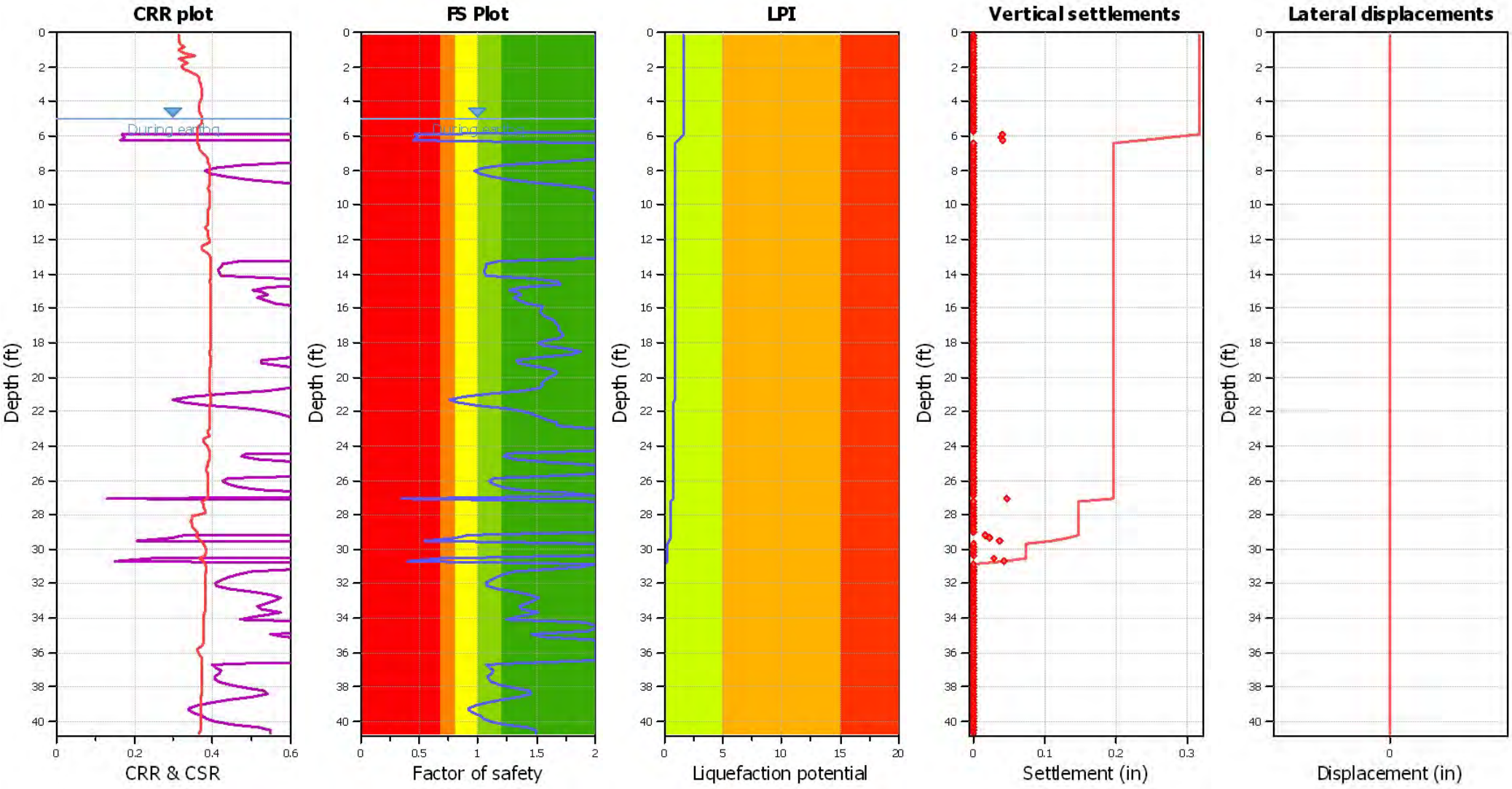

### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.90 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sand & Clay |
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBTn legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
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| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**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

**Earth Systems**
Geotechnical Engineers

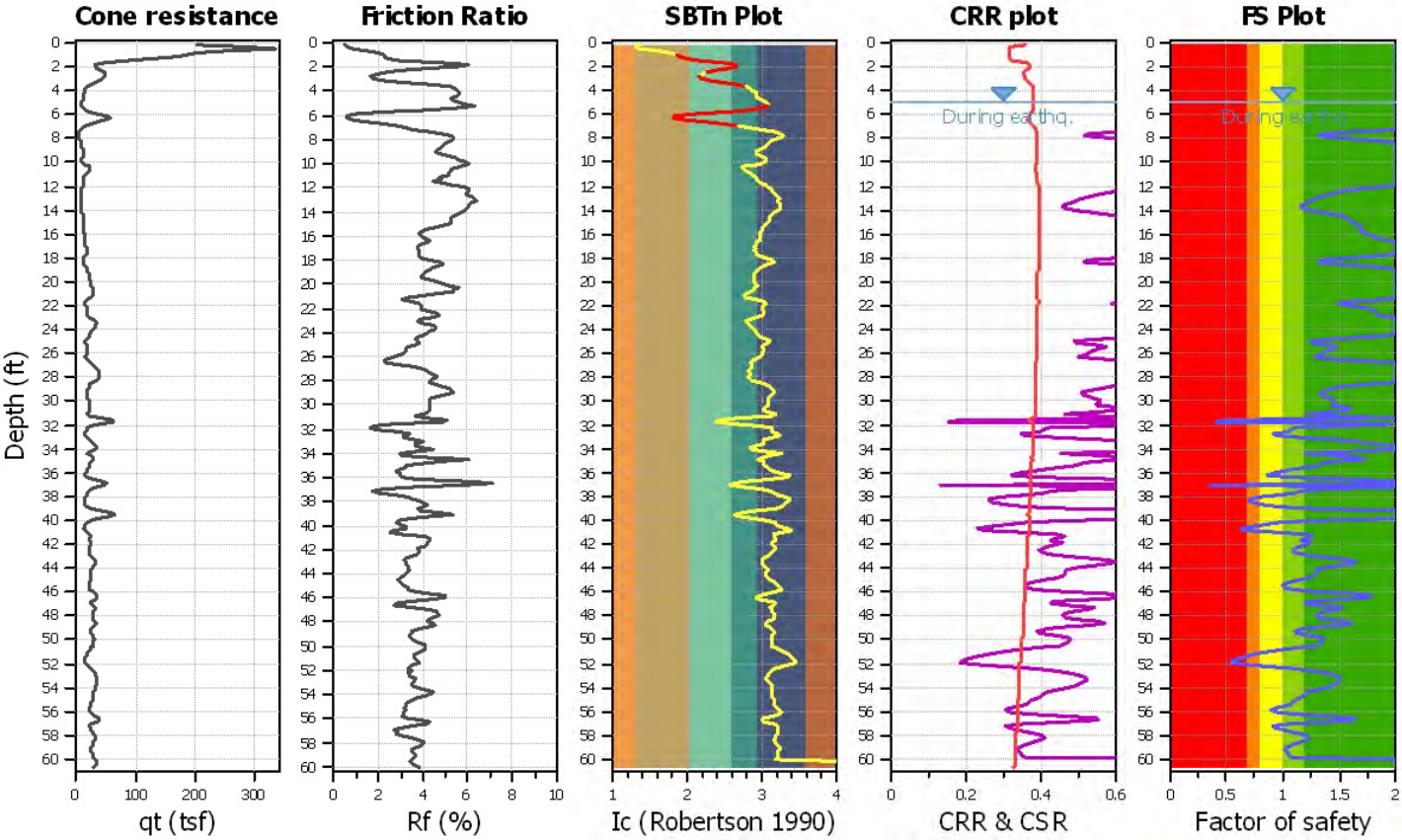
## LIQUEFACTION ANALYSIS REPORT

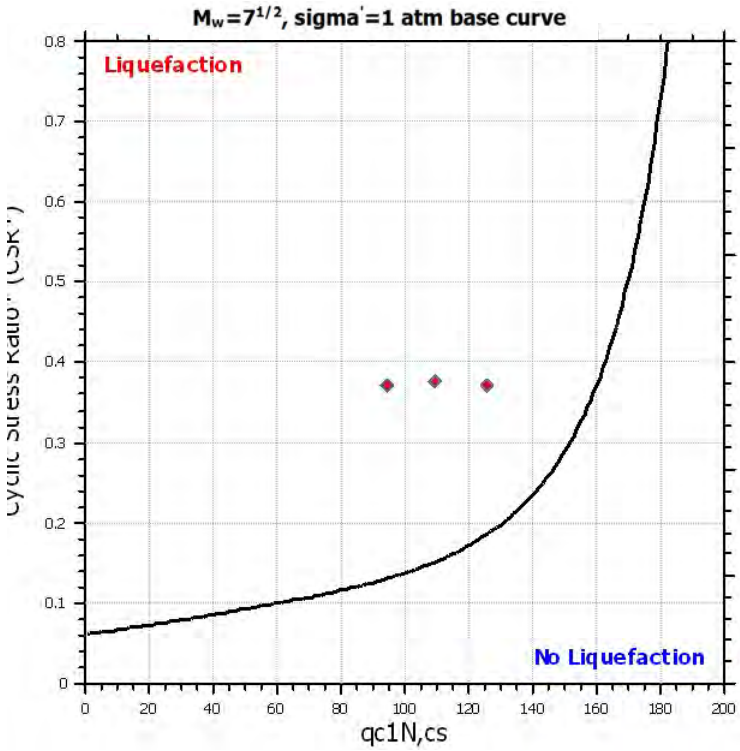
**Project title : Gibralter Warehouse** **Location : Milpitas, CA**

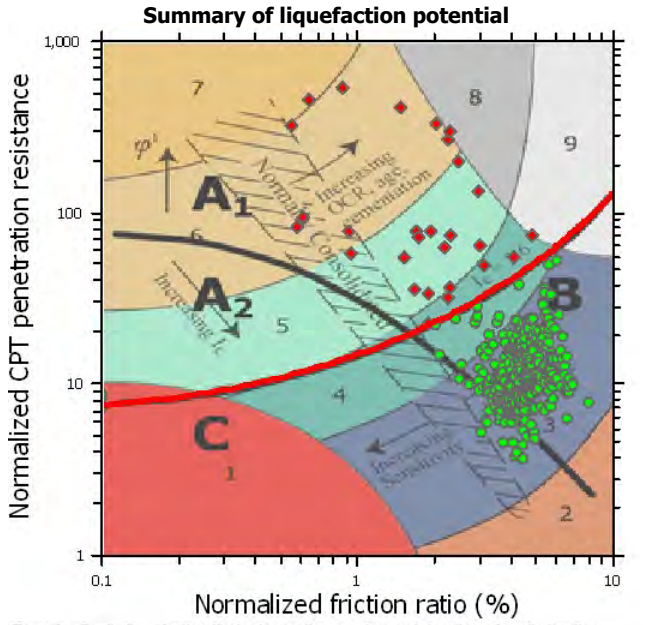
**CPT file : CPT-08**

**Input parameters and analysis data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | G.W.T. (in-situ): | 8.00 ft | Use fill: | No | Clay like behavior applied: | Sand & Clay |
| Fines correction method: | B&I (2014) | G.W.T. (earthq.): | 5.00 ft | Fill height: | N/A | Limit depth applied: | Yes |
| Points to test: | Based on Ic value | Average results interval: | 3 | Fill weight: | N/A | Limit depth: | 60.00 ft |
| Earthquake magnitude $M_w$: | 6.90 | Ic cut-off value: | 2.60 | Trans. detect. applied: | Yes | MSF method: | Method |
| Peak ground acceleration: | 0.67 | Unit weight calculation: | Based on SBT | $K_\sigma$ applied: | Yes | | |

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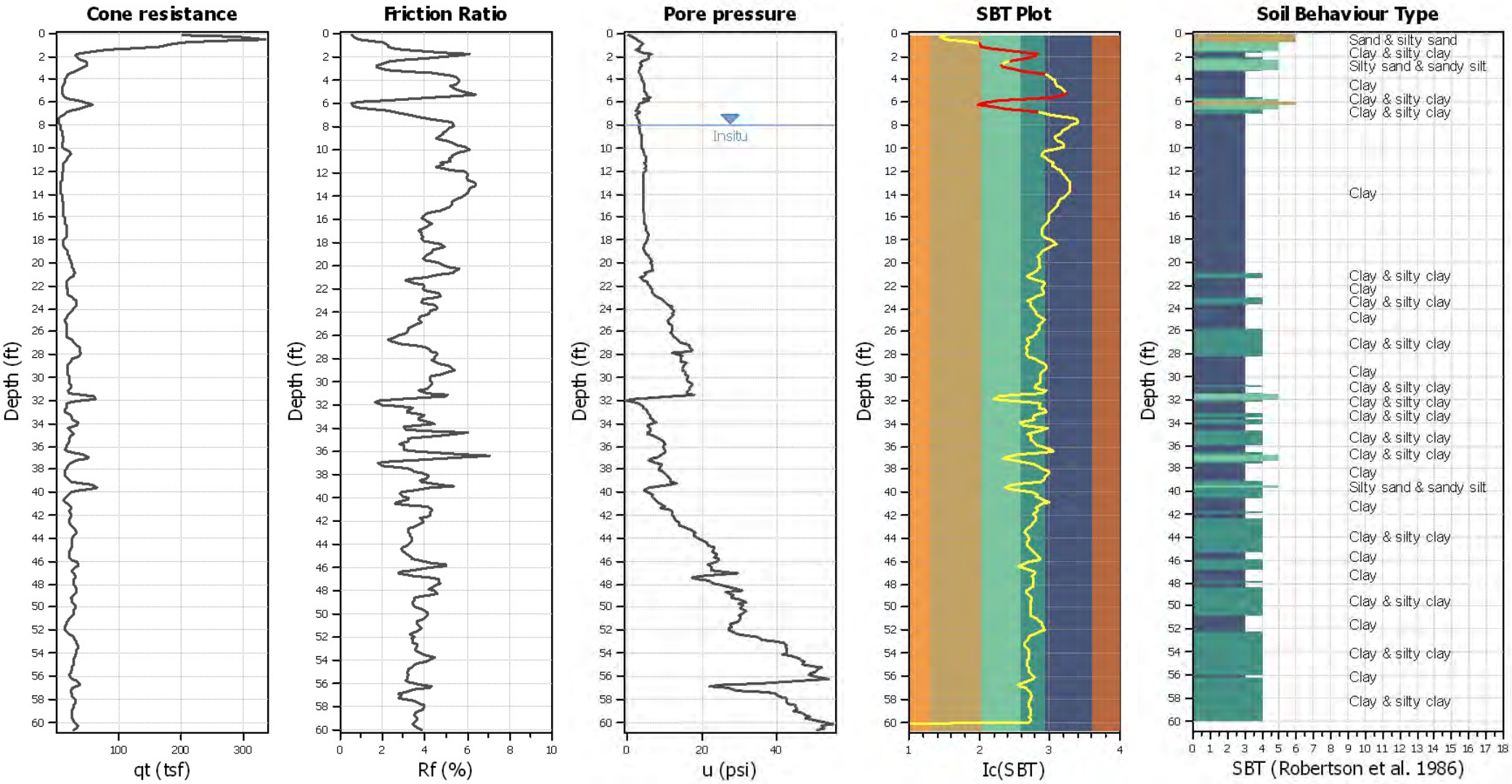
## CPT basic interpretation plo




### Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
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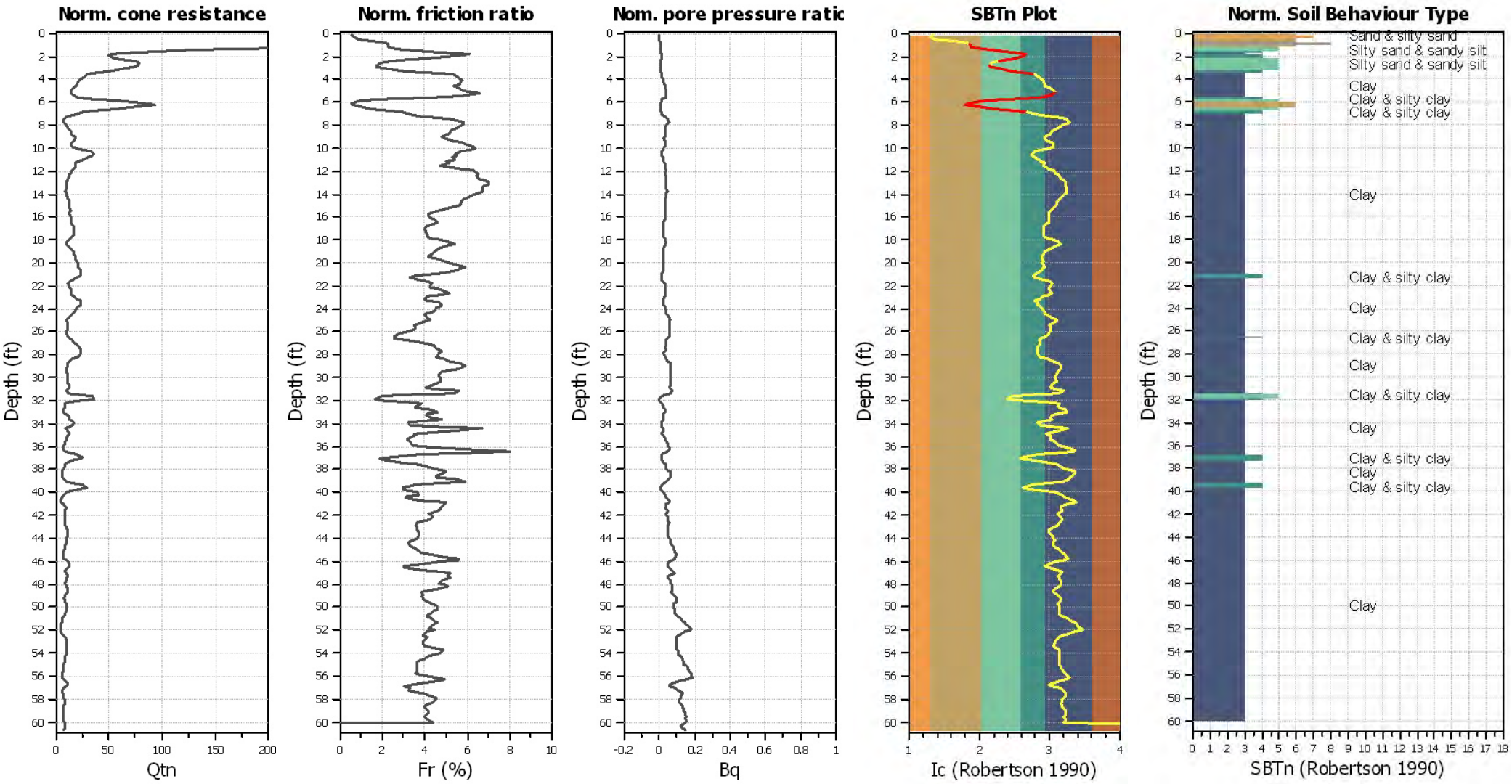
| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**SBT legend**

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
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

| | | | | | |
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**SBTn legend**

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6. Clean sand to silty sand
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8. Very stiff sand to clayey sand
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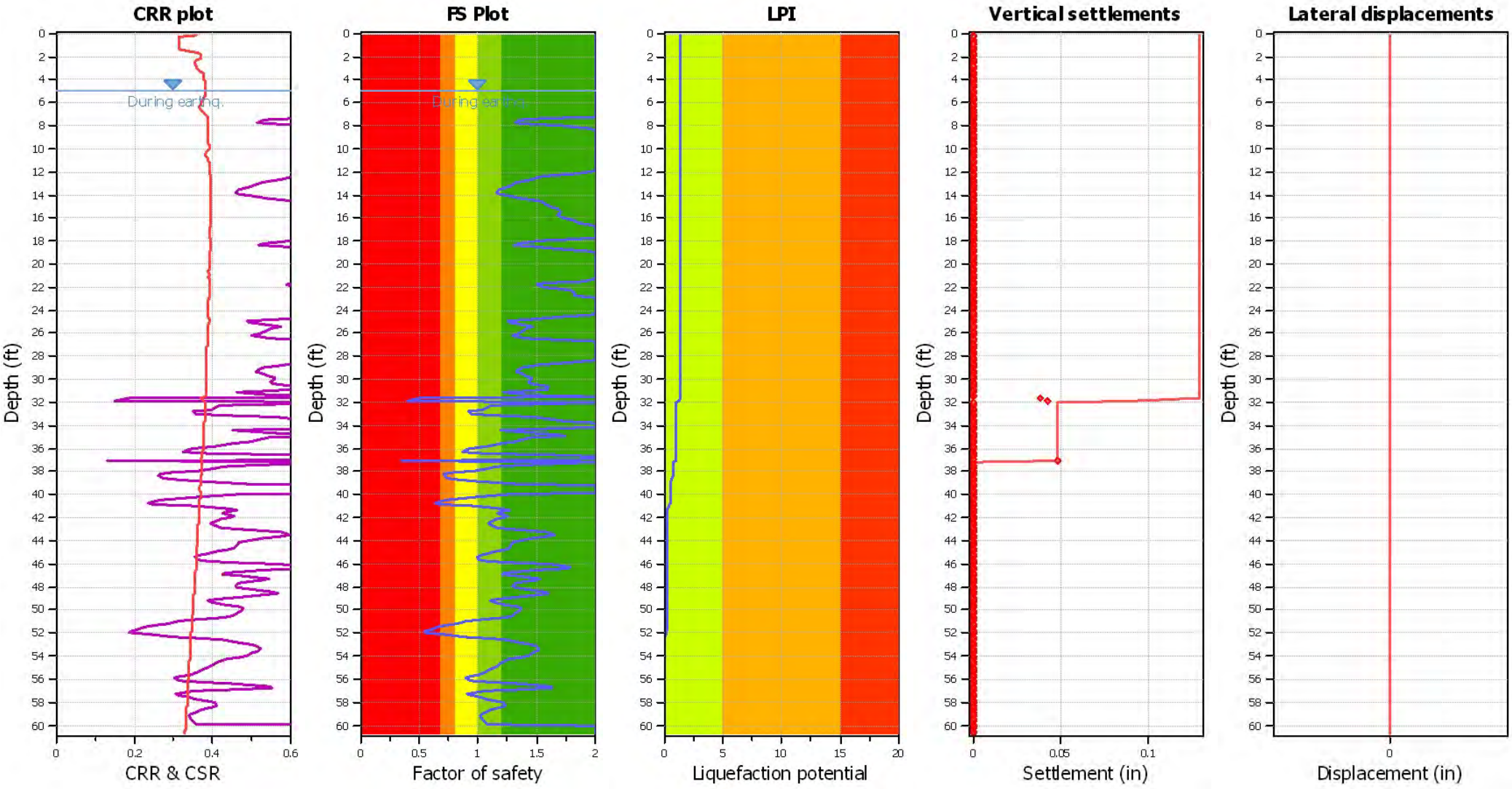
# Liquefaction analysis overall plot




## Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | B&I (2014) | Depth to GWT (erthq.): | 5.00 ft | Fill weight: | N/A |
| Fines correction method: | B&I (2014) | Average results interval: | 3 | Transition detect. applied: | Yes |
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| Peak ground acceleration: | 0.67 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 8.00 ft | Fill height: | N/A | Limit depth: | 60.00 ft |

**F.S. color scheme**

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- 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

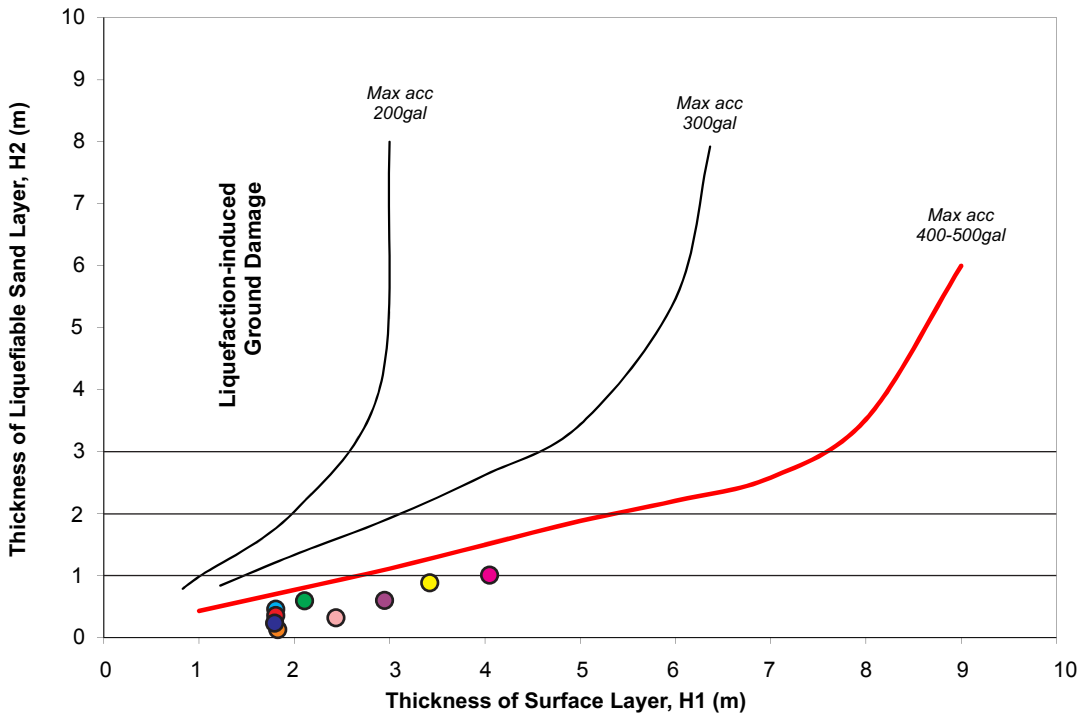


**Figure A.** Boundary Curve for Discriminating Between Occurrence and Nonoccurrence of Surface Effects of Liquefaction. Base: Youd & Garris, 1995

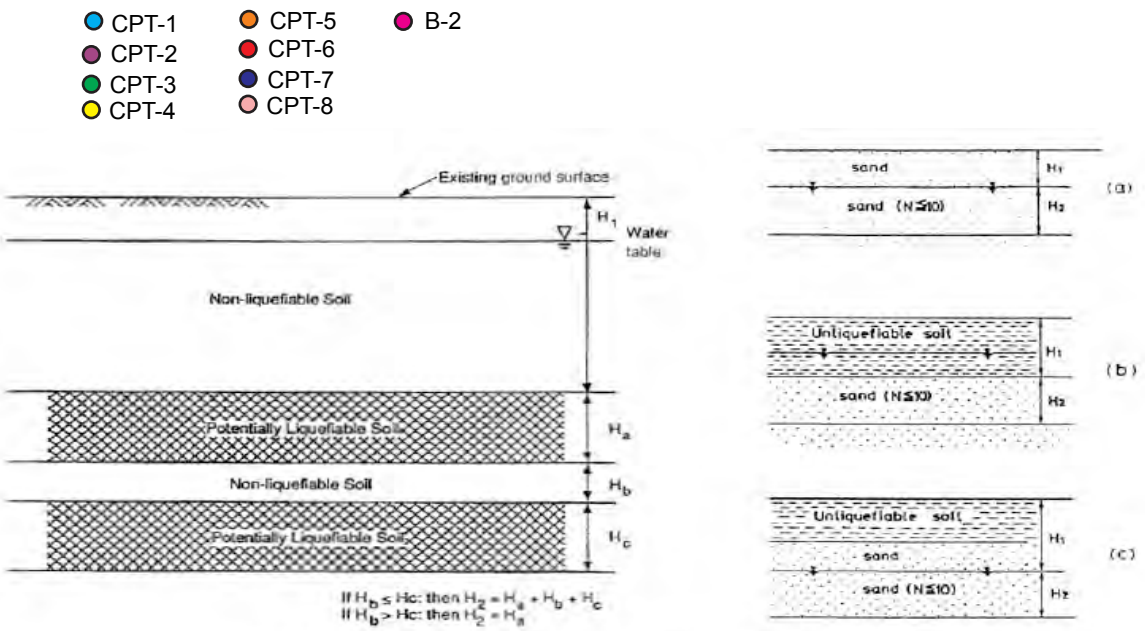


Figure B. Schematic Diagram for Determination of H1 and H2 Used in Figure B (After Ishihara, 1985)
Base: Martin and Lew, 1999

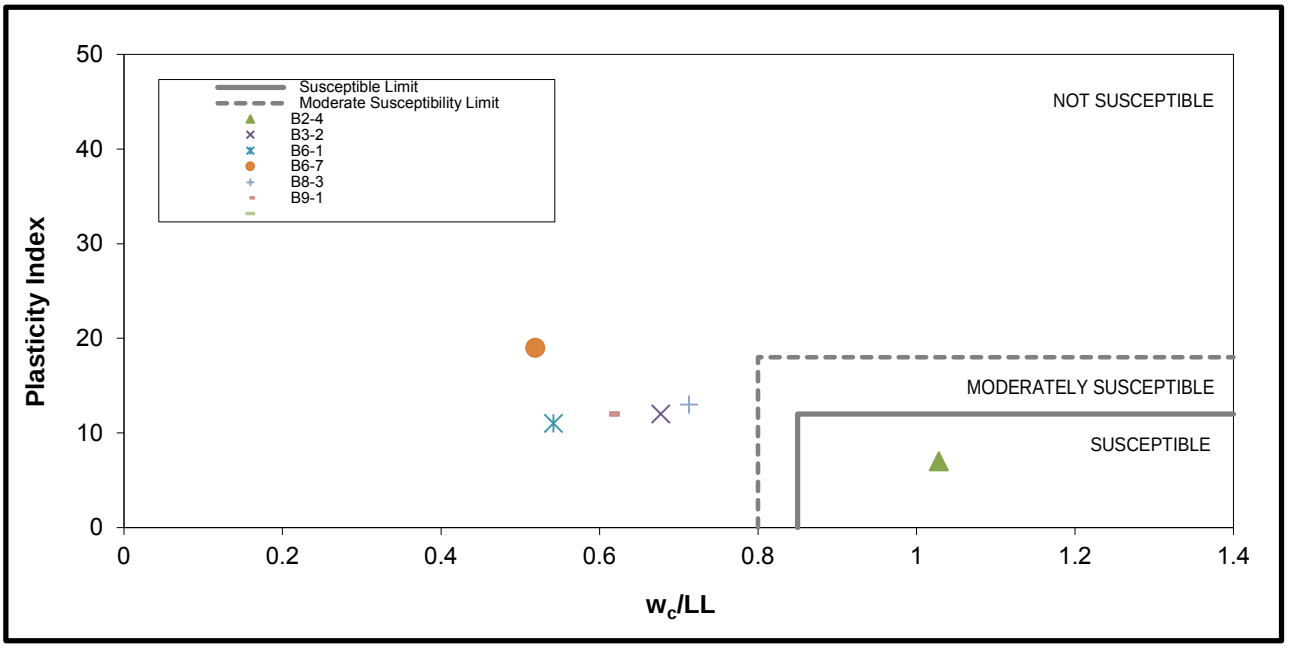


**Figure A.** Graphical representation of the liquefaction susceptibility criteria proposed in *Assessment of the Liquefaction Susceptibility of Fine-Grained Soils* by Bray and Sancio (2006)

| Sample No. | Sample Interval, ft | Moisture Content ($w_c$) | Plasticity Index (PI) | Liquid Limit (LL) | $w_c$/LL |
|---|---|---|---|---|---|
| B2-4 | 13.0-14.5 | 32.9 | 7 | 32 | 1.03 |
| B3-2 | 3.0-4.5 | 21.0 | 12 | 31 | 0.68 |
| B6-1 | 1.0-2.5 | 16.8 | 11 | 31 | 0.54 |
| B6-7 | 28.5-30.0 | 19.2 | 19 | 37 | 0.52 |
| B8-3 | 8.0-9.5 | 22.1 | 13 | 31 | 0.71 |
| B9-1 | 1.0-2.5 | 18.4 | 12 | 30 | 0.61 |