PRELIMINARY GEOTECHNICAL INVESTIGATION

PACIFIC BEACH HOTEL
4545 MISSION BAY DRIVE
SAN DIEGO, CALIFORNIA

NOVEMBER 21, 2024
PROJECT NO. G3422-52-01

PREPARED FOR:

PALACIO MISSION BAY, LLC

Project No. G3422-52-01
November 21, 2025

Palacio Mission Bay, LLC
4545 Mission Bay Drive
San Diego, California 92109

Attention: Mr. Ketan Patel

Subject: PRELIMINARY GEOTECHNICAL INVESTIGATION
PACIFIC BEACH HOTEL
4545 MISSION BAY DRIVE
SAN DIEGO, CALIFORNIA

Dear Mr. Patel:

In accordance with your request and authorization of our Proposal No. SD-24-1664-P-GT dated September 4, 2024, we herein submit the results of our preliminary geotechnical investigation for the subject project. We performed our investigation to evaluate the underlying soil and geologic conditions and potential geologic hazards, and to assist in the design of the proposed building and associated improvements.

The accompanying report presents the results of our study and conclusions and recommendations pertaining to geotechnical aspects of the proposed project. The site is suitable for the proposed buildings and improvements provided the recommendations of this report are incorporated into the design and construction of the planned project.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

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PRELIMINARY GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our preliminary geotechnical investigation for the proposed new hotel located at 4545 Mission Bay Drive in the City of San Diego, California (see Vicinity Map).

Vicinity Map

The purpose of the preliminary geotechnical investigation is to evaluate the surface and subsurface soil conditions and general site geology, and to identify geotechnical constraints that may affect development of the property including faulting, liquefaction and seismic shaking based on the 2022 CBC seismic design criteria. In addition, we provided recommendations for remedial grading, shallow foundations, concrete slab-on-grade, concrete flatwork, pavement and retaining walls.

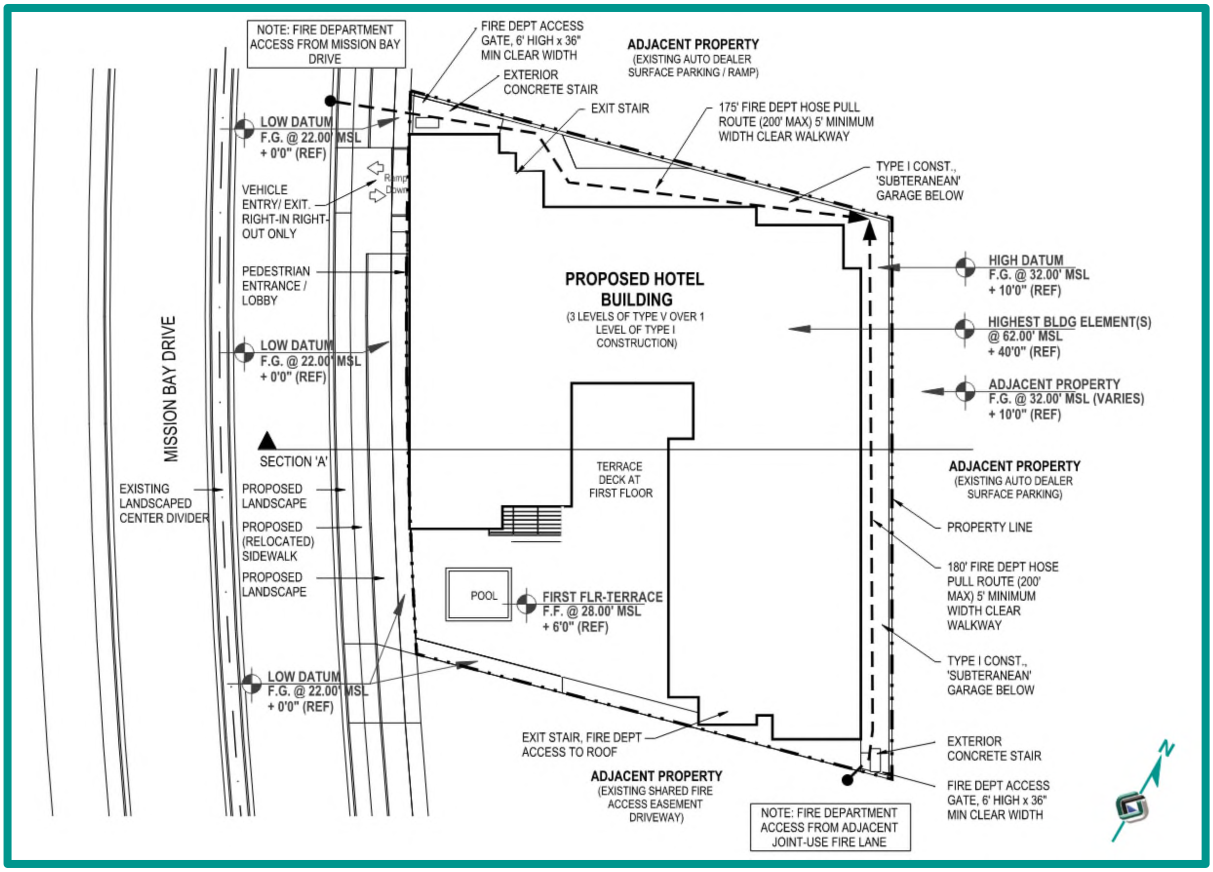
The scope of this investigation included reviewing readily available published and unpublished geologic literature (see List of References), performing engineering analyses and preparing this report. We drilled 3 exploratory borings to a maximum depth of about 51 feet, sampled soil and performed laboratory testing. Additionally, we performed cone penetrometer testing (CPT) to support a liquefaction and settlement evaluation for the subject site. Appendix A presents the exploratory boring logs, CPT sounding logs and details of the field investigation. The details of the laboratory tests and a summary of the test results are presented in Appendix B and on the boring logs in Appendix A. Appendix C provides the results of our liquefaction evaluation. Appendix D presents the recommended grading specifications.

2. SITE AND PROJECT DESCRIPTION

The subject property is located at 4545 Mission Bay Drive in the City of San Diego, California. The site is currently occupied with an existing hotel building, surface parking, and a swimming pool. The property is relatively flat at existing elevations of about 20 to 26 feet above mean sea level (MSL). The property is accessed from Mission Bay Drive. The Existing Site Map shows the current condition of the property.

Existing Site Map

We understand you are evaluating the subject property for a potential new development consisting of a 3- to 4-story hotel building with up to 2 levels of subterranean parking with associated underground utilities, driveways and landscaping. The Proposed Site Plan shows the planned building and improvements.



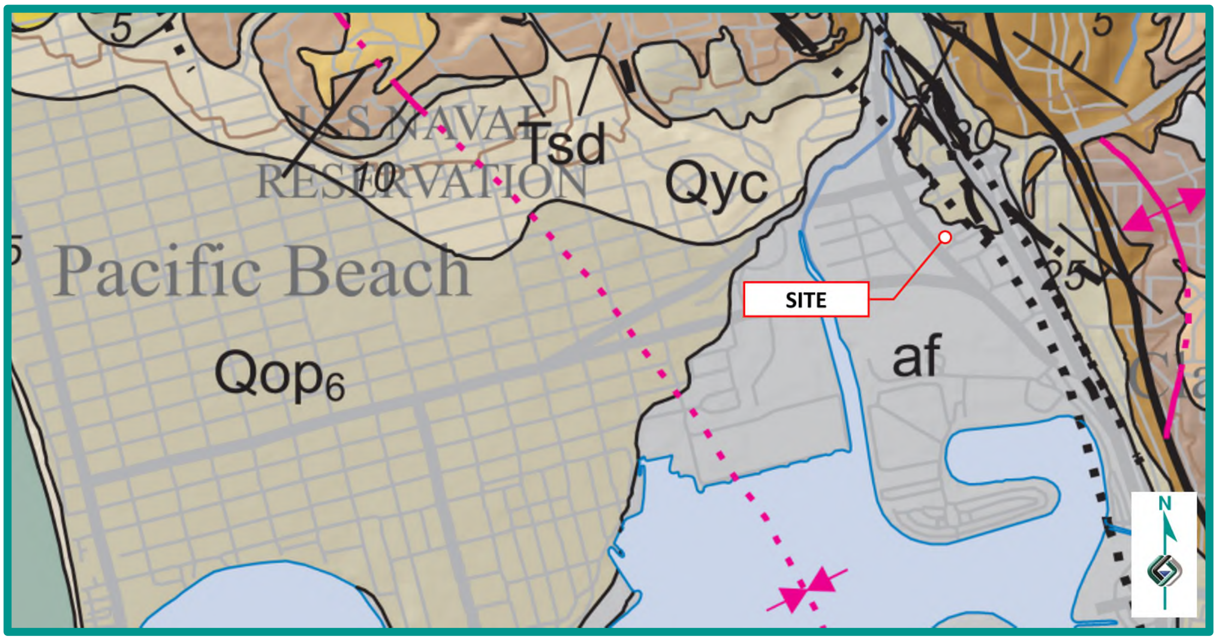
Proposed Site Plan

The locations, site descriptions, and proposed development are based on our site reconnaissance, review of published geologic literature, field investigations, and discussions with project personnel. If development plans differ from those described herein, Geocon Incorporated should be contacted for review of the plans and possible revisions to this report.

3. GEOLOGIC SETTING

Regionally, the site is in the Peninsular Ranges geomorphic province. The province is bounded by the Transverse Ranges to the north, the San Jacinto Fault Zone on the east, the Pacific Ocean coastline on the west, and the Baja California on the south. The province is characterized by elongated northwest-trending mountain ridges separated by straight-sided sediment-filled valleys. The northwest trend is further reflected in the direction of the dominant geologic structural features of the province that are northwest to west-northwest trending folds and faults, such as the nearby Rose Canyon fault zone.

The site is located on the western portion of the coastal plain adjacent to Mission Bay. Based on the Geologic Map by Kennedy and Tan, the site is underlain by artificial fill. Based on published geologic documents, we expect the fill is underlain by Bay Deposits and of Pleistocene-age Old Paralic Deposits (formerly known as the Bay Point Formation). The Old Paralic Deposits are shallow marine deposits generally consisting of sand and silty sand units interfingered with layers of silt and clay. This unit may be in excess of 100 feet thick and will extend below current sea level. The Regional Geologic Map shows the geologic units in the area of the site.



Regional Geologic Map

4. SOIL AND GEOLOGIC CONDITIONS

We encountered two surficial soil units (consisting of undocumented fill and Bay Deposits) and one formational unit (consisting of Old Paralic Deposits). The occurrence, distribution, and description of each unit encountered is shown on the Geologic Map, Figure 1 and on the boring logs in Appendix A. The Geologic Cross-Sections, Figure 2, show the approximate subsurface relationship between the geologic units. We prepared the geologic cross-sections using interpolation between exploratory excavations and observations; therefore, actual geotechnical conditions may vary from those illustrated and the cross-sections should be considered approximate. The surficial soil and geologic units are described herein in order of increasing age.

4.1 Undocumented Fill (Qudf)

We encountered undocumented fill in our exploratory excavations to depths ranging from about 5 to 15 feet. In general, the fill consists of medium dense, moist, silty sand and firm, moist, sandy clay and possesses a “very low” to “medium” expansion index (expansion index of 90 or less). The undocumented fill is relatively variable in material and density and is not considered suitable in its current condition for the support of foundations or structural fill and remedial grading will required, unless deep foundations are used or ground improvements are performed. The undocumented fill can be reused for new compacted fill during grading operations provided it is generally free of roots and debris.

4.2 Bay Deposits (Qb)

The Bay Deposits (bay mud) exist below the undocumented fill and extends to depths ranging from approximately 31 to 41 feet. The Bay Deposits generally consist of medium dense to dense, moist to saturated silty and clayey sand and stiff, moist, sandy and clayey silt. Sandy portions of the Bay Deposits are potentially liquefiable when subjected to strong ground motion. Soft muds within the Bay Deposits are subject to consolidation settlement under increasing loading. We consider these materials unsuitable in their present condition for the support of structures or structural fill.

4.3 Old Paralic Deposits (Qop)

The Quaternary-age Old Paralic Deposits exist below the undocumented fill and Bay Deposits across the site. We encountered Old Paralic Deposits in borings B-1 and B-2 approximately 41 and 31 feet below the existing surface, respectively. These deposits generally consist of medium dense to dense, reddish brown to grayish brown, silty, fine to medium sandstone to stiff, reddish brown to grayish brown, sandy siltstone. The Old Paralic Deposits are considered acceptable for support of fill and foundation loads for the development.

5. GROUNDWATER

We encountered groundwater during the field investigation at depths ranging from about 24 to 27 feet (+3 to -5 feet MSL) in Borings B-1 and B-2, respectively. The use of dewatering techniques may be necessary should heavy seepage or excavations below the groundwater elevation occur. It is not uncommon for groundwater or seepage conditions to develop where none previously existed. Groundwater and seepage is dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project. The following table presents the boring locations and depths/elevations of the groundwater encountered on the subject site.

RECORDED GROUNDWATER ELEVATION

Boring No.	Date Recorded	Approximate Depth of Groundwater Below Existing Grade (Feet)	Approximate Elevation of Groundwater (Feet, MSL)
B-1	10/21/2024	27	-5
B-2	10/21/2024	24	3

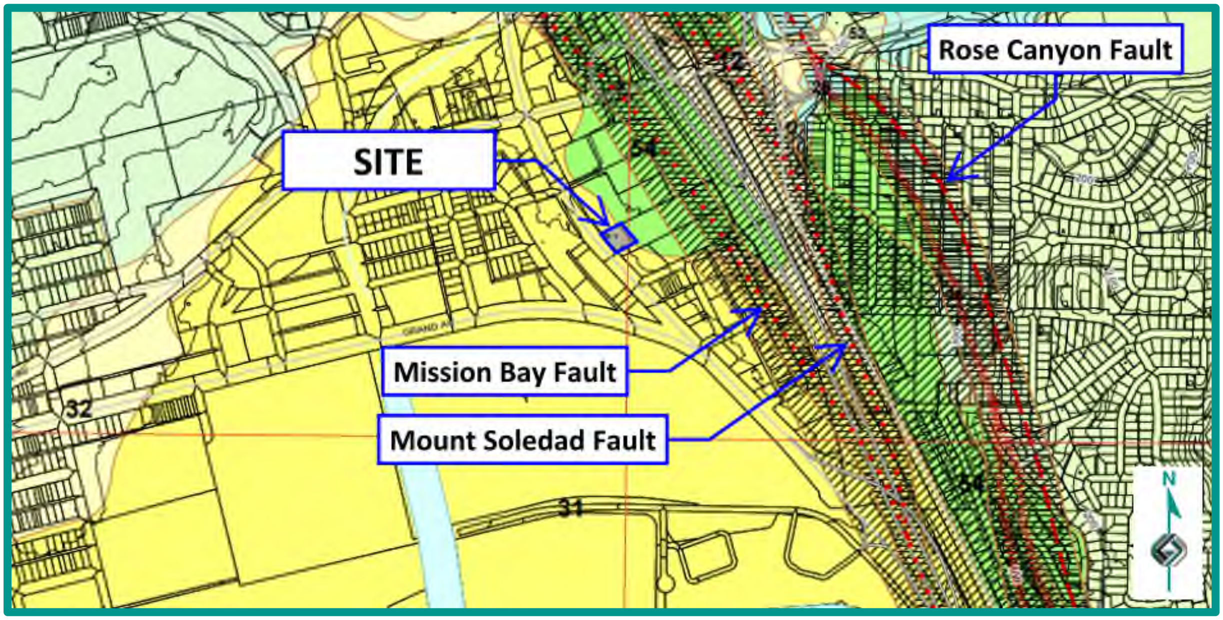
6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

The City of San Diego Seismic Safety Study (2008) includes a series of maps that indicate the likely geologic hazards. Based on a review of the map, there is a high potential for liquefaction at the site due to the presence of shallow groundwater, hydraulic fills, and proximity to major drainages. The site is also located in proximity to several faults classified as potentially active, inactive, presumed inactive, or activity unknown. We opine the existing geologic conditions are favorable for the planned development provided liquefaction is addressed appropriately. The following table and figure present the mapped hazard categories on and within the vicinity of the subject site.

CITY OF SAN DIEGO SEISMIC HAZARD CATEGORY – SHEET 25

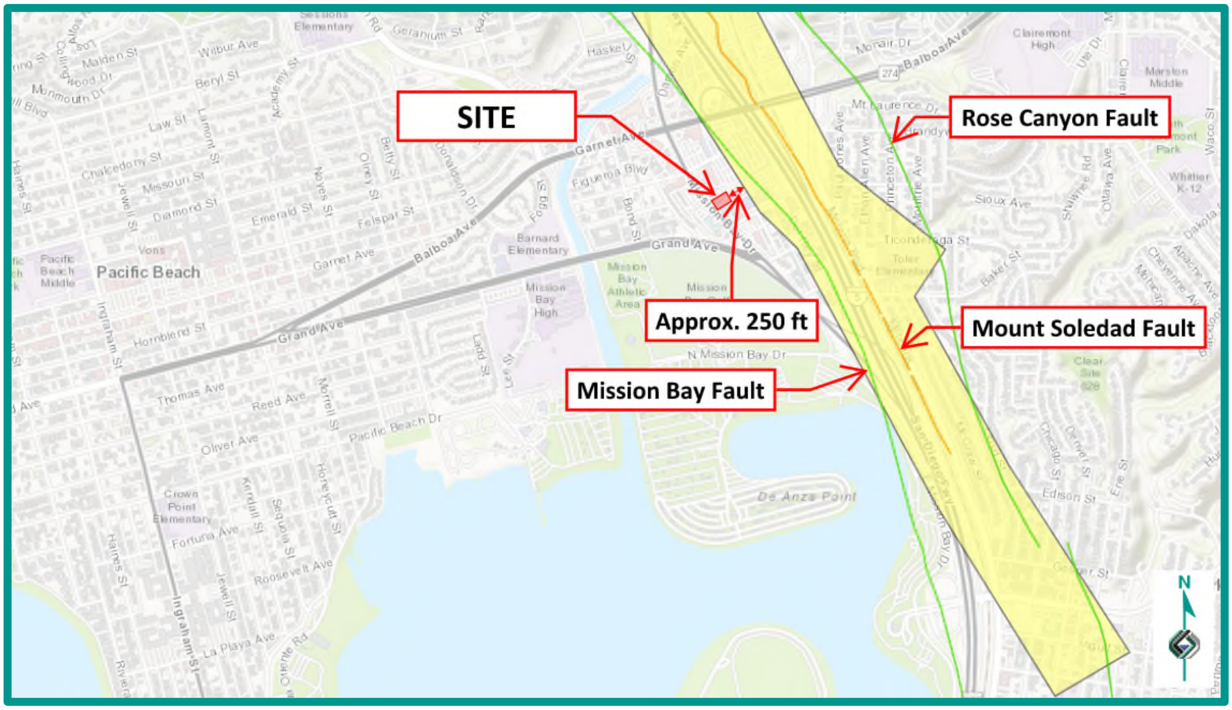
Hazard Zone	Hazard Category	Description	Vicinity of Site
Fault Zone	12	Potentially Active, Inactive, Presumed Inactive or Activity Unknown	Near Site
Liquefaction	31	High Potential – Shallow Groundwater, Major Drainages, Hydraulic Fills	On Site
Other Terrain	54	Steeply Sloping Terrain, Unfavorable or Fault Controlled Geologic Structure, Moderate Risk	On Site/ Near Site



Hazard Category Map

6.2 Regional Faulting and Seismicity

A review of the referenced geologic materials and our knowledge of the general area indicate that the site is not underlain by active, potentially active, or inactive faults. An active fault is defined by the California Geological Survey (CGS) as a fault showing evidence for activity within the last 11,700 years. The site is not located within a State of California Earthquake Fault Zone. The site is, however, located approximately 250 feet southwest of a State of California Earthquake Fault Zone, as shown in the CGS Fault Zone Map.

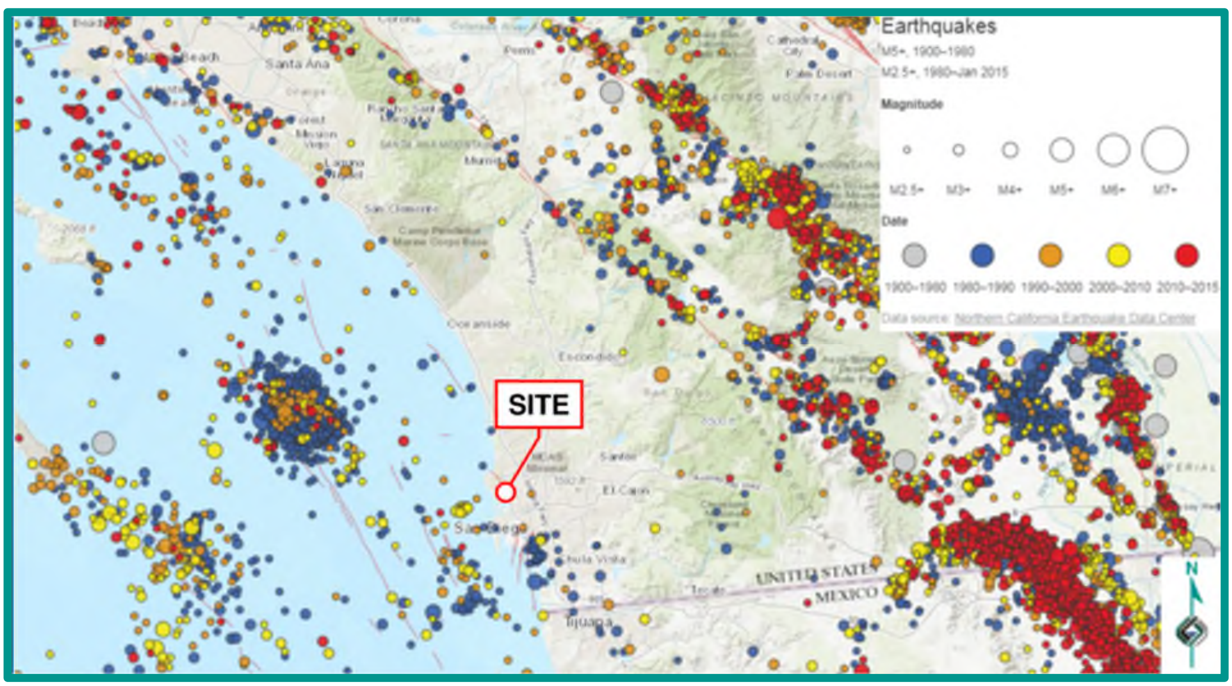


CGS Fault Zone Map

The USGS has developed a program to evaluate the approximate location of faulting in the area of a given property. The following figure shows the location of the existing faulting in the San Diego County and Southern California region. The fault traces are shown as solid, dashed and dotted lines that represent well-constrained, moderately constrained and inferred faults, respectively. The fault line colors represent faults with ages less than 150 years (red), 15,000 years (orange), 130,000 years (green), 750,000 years (blue) and 1.6 million years (black). The nearest fault to the site is inferred, more than 250 feet away and between 15,000 and 130,000 years old.

Faults in Southern California

The San Diego County and Southern California region is seismically active. The following figure presents the occurrence of earthquakes with a magnitude greater than 2.5 from the period of 1900 through 2015 according to the Bay Area Earthquake Alliance website.



Earthquakes in Southern California

Considerations important in seismic design include the frequency and duration of motion and the soil conditions underlying the site. Seismic design of structures should be evaluated in accordance with the California Building Code (CBC) guidelines currently adopted by the local agency.

6.3 Ground Rupture

Ground surface rupture occurs when movement along a fault is sufficient to cause a gap or rupture where the upper edge of the fault zone intersects the ground surface. The potential for ground rupture is considered to be very low due to the absence of active faults at the subject site.

6.4 Liquefaction Potential and Seismically Induced Settlement

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless or silt/clay with low plasticity, groundwater is encountered within 50 feet of the surface, and relative densities are less than about 70 percent. If the four previous criteria are met, a seismic event could result in a rapid pore water pressure increase from the earthquake-generated ground accelerations.

The County of San Diego Hazard Mitigation Plan (2023) maps the site as having zones of liquefiable layers. The current standard of practice, as outlined in the *Recommended Procedures for Implementation of DMG Special Publication 117A, Guidelines for Analyzing and Mitigating Liquefaction in California* requires liquefaction analysis to a depth of 50 feet below the lowest portion of the proposed structure. Liquefaction typically occurs in areas where the soils below the water table are composed of poorly consolidated, fine to medium-grained, primarily sandy soil. In addition to the requisite soil conditions, the ground acceleration and duration of the earthquake must also be of a sufficient level to induce liquefaction.

We performed liquefaction analyses of our CPT soundings using the program CLiq (Version 1.7). This program utilizes the 2001 NCEER method of analysis. We used a static groundwater elevation of 22 feet below grade, a modal magnitude of 6.9 earthquake (attributed to the Newport-Inglewood Fault), and a peak horizontal site acceleration, PGA_M, of 0.705g calculated from ASCE 7-16 Section 11.8.3. This semi-empirical method is based on correlations with the data collected from the CPT soundings and field performance data.

The liquefaction analyses (included in Appendix C) indicate the Bay Deposits below the design groundwater elevation is potentially susceptible to liquefaction. Additionally, isolated and discontinuous layers of the underlying Old Paralic Deposits are considered potentially susceptible to liquefaction. However, we do not expect liquefaction to occur within the underlying Old Paralic Deposits due to the density and age of the formational material. The site could be prone to up to about 1 inch of total liquefaction settlement during PGA_M ground motion. The average settlement estimated for all three CPTs is about 0.7 inch and average differential settlement is about 0.5 inch over 40 feet. Recommendations presented in this report are intended to minimize the effects of seismically-induced settlement due to liquefaction on the proposed structures. The following table summarizes the results of the liquefaction analyses.

SUMMARY OF LIQUEFACTION ANALYSES

CPT Location	Estimated Vertical Settlement (Inches)	Estimated Differential Settlement (Inches)	Depth of Liquefiable Layers (Feet) *	Elevation of Liquefiable Layers (Feet, MSL) *
CPT-1	0.7	0.5	25 - 28	(-3) - (-6)
CPT-2	1.0	0.7	24 - 33	(-2) - (-11)
CPT-3	0.4	0.3	22 - 29	(0) - (-7)

* Not including potentially liquefiable layers that are isolated and less than 12 inches thick.

Sand boils occur where liquefied soil is extruded upward through the surficial soil deposit to the ground surface. Providing an increase in overburden pressure and a compacted fill mat can mitigate surface manifestation. Research presented by Ishihara (1985) indicates that the presence of a relatively thick non-liquefiable surface layer typically decreases the potential of sand boils from reaching the surface. Modifications to Ishihara’s chart have been made to include higher ground accelerations (Ishihara’s 1985 chart was based on a 0.25g ground acceleration) by Youd and Garris (1995). Based on Youd’s modified curves and the thickness of the non-liquefiable soil layer (layer above the assumed groundwater table), the potential for surface manifestation at the site is low.

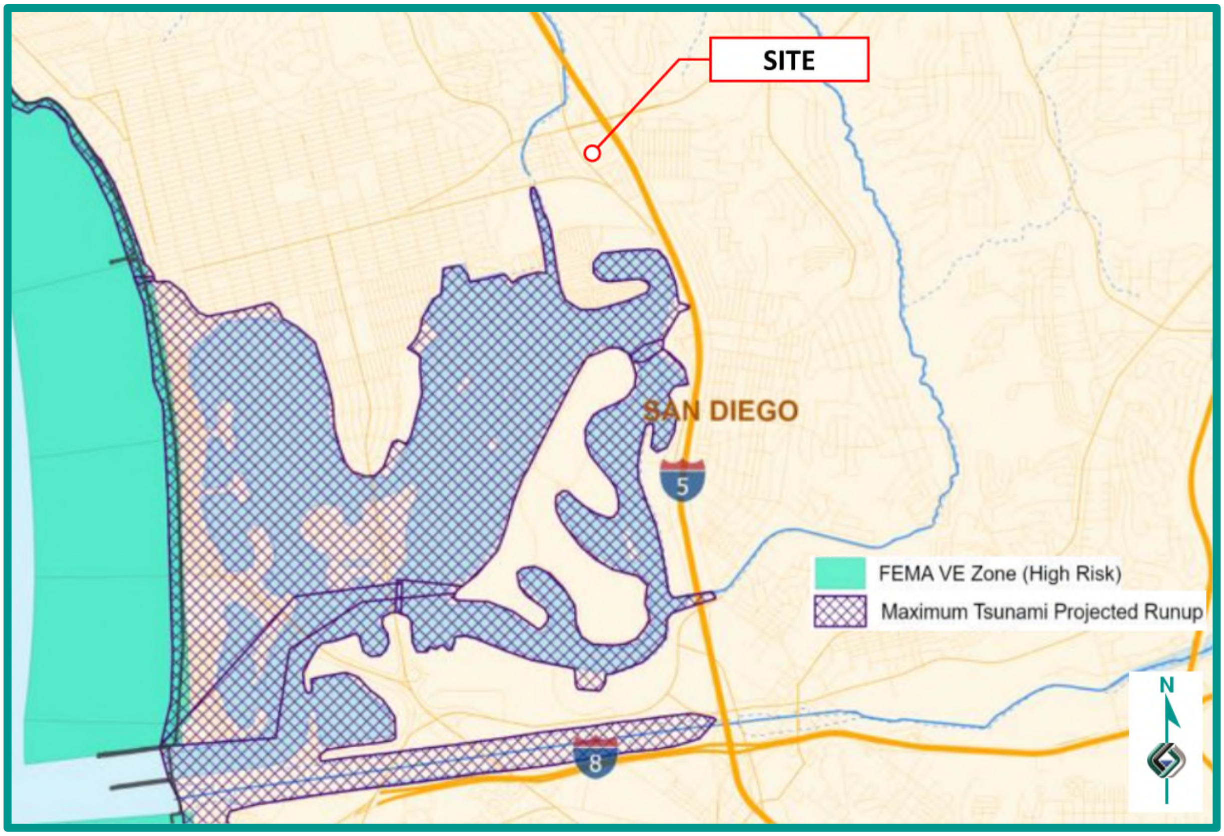
Lateral spreading occurs when liquefiable soil is in the immediate vicinity of a free face such as a slope. Factors controlling lateral displacement include earthquake magnitude, distance from the earthquake epicenter, thickness of liquefiable soil layer, grain size characteristics, fines content of the soil and SPT blow counts. Bartlett and Youd (1995) have concluded that lateral spreading is restricted to sediments with corrected SPT blow counts of 15 or less for earthquake magnitudes less than or equal to 8.0. The potential of lateral spreading in the liquefiable soil below the groundwater table is not considered an adverse impact to the proposed development due to the relatively flat topography of the site.

The mitigation of potential hazards due to liquefaction can be accomplished by the densification or removal of the potentially liquefiable soil or the use of foundation systems that still provide acceptable structural support should liquefaction occur. Soil densification can be accomplished by compaction grouting, vibrocompaction, soil mixing, and deep dynamic compaction (among others). Deep foundation systems may be used to transmit structural loads to load bearing soil layers below the liquefiable zones and may consist of driven piles or drilled piles. Deep foundations are designed to mitigate damage to the structures supported on the piles; however, they do not generally reduce the potential for damage to underground utilities and peripheral site improvements. The effects of differential settlement between structures and attached settlement-sensitive surface improvements can be mitigated by designing the utilities to accommodate differential movement at the connections.

6.5 Storm Surge, Tsunamis, and Seiches

Storm surges are large ocean waves that sweep across coastal areas when storms make landfall. Storm surges can cause inundation, severe erosion and backwater flooding along the waterfront. The site is located approximately 2,600 feet from Mission Bay, is at an elevation of about 20 feet or greater above Mean Sea Level (MSL) and is protected from ocean waves by the Mission Beach to the west. Based on historic and predicated wave heights and runout lengths, we opine that the proposed site elevation is sufficient to mitigate the risk; therefore, the potential of storm surges affecting the site is considered low.

A tsunami is a series of long period waves generated in the ocean by a sudden displacement of large volumes of water. Causes of tsunamis include underwater earthquakes, volcanic eruptions, or offshore slope failures. The first-order driving force for locally generated tsunamis offshore southern California is expected to be tectonic deformation from large earthquakes (Legg, *et al.*, 2002). Historically, tsunami wave heights have ranged up to 3.7 feet in the San Diego area. According to the County of San Diego Hazard Mitigation Plan (2023), the largest tsunami effect recorded in San Diego since 1950 was May 22, 1960 which had maximum run-up amplitudes of 2.1 feet (0.7 meters). Wave heights and run-up elevations from tsunamis along the San Diego Coast have historically fallen within the normal range of the tides. The County of San Diego Hazard Mitigation Plan (2023) maps zones of possible tsunami inundation for coastal areas throughout the county. The site is not included within one of these high-risk hazard areas. Therefore, we consider the risk of a tsunami hazard at the site to be low.



Tsunami Inundation Map

A seiche is a run-up of water within a lake or embayment triggered by fault- or landslide-induced ground displacement. The site is located approximately 2,600 feet from Mission Bay, is at an elevation of about 20 feet or greater above Mean Sea Level (MSL). Based on historic and predicated wave heights and runout lengths, it is our opinion that the proposed site elevation is sufficient to mitigate the risk; therefore, we consider the potential for seiches to impact the site low.

6.6 Landslides

We did not observe evidence of previous or incipient slope instability at the site during our study and the property is relatively flat. Published geologic mapping indicates landslides are not present on or adjacent to the site. Therefore, we opine the potential for a landslide is not a significant concern for this project.

6.7 Erosion

The site is relatively flat and is not located adjacent to the Pacific Ocean coast or a free-flowing drainage where active erosion is occurring. Provided the engineering recommendations herein are followed and the project civil engineer prepares the grading plans in accordance with generally accepted regional standards, we do not expect erosion to be a major impact to site development. In addition, we expect the proposed development would not increase the potential for erosion if properly designed.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 We did not encounter soil or geologic conditions during our exploration that would preclude the proposed development, provided the recommendations presented herein are followed and implemented during design and construction. We will provide supplemental recommendations if we observe variable or undesirable conditions during construction, or if the proposed construction will differ from that anticipated herein. The following table summarizes our conclusions and recommendations for the proposed project.

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Attribute	Conclusion/Recommendations
Existing Geologic Hazards	Very Strong Seismic Shaking
	Liquefaction and Seismic Settlement
Existing Geologic Units	Undocumented Fill (Requiring Recompaction)
	Bay Deposits (Requiring Recompaction)
	Old Paralic Deposits (Suitable for Support)
Groundwater	24 to 26 Feet Below Existing Grade
	+3 to -5 Feet MSL Elevation
Excavations	Surficial Soil – Moderate to Difficult
	Old Paralic Deposits – Moderate to Difficult
Expansion Index	90 or Less
Water-Soluble Sulfate Content	"S0"
Drainage	Maintain Drainage As Discussed Herein

7.1.2 The site may be subject to geologic hazards, including: moderate to very strong seismic shaking, liquefaction, seismically induced settlement and consolidation settlement. We included recommendations for the mitigation of these geologic hazards herein.

7.1.3 The undocumented fill and Bay Deposits have a potential for compression and liquefaction. We expect that the proposed structure will be supported by a shallow foundation or mat foundation system over ground improvements. However, the structure can be designed for a shallow or mat foundation system over compacted fill if the structural engineer determines the estimated settlements provided herein can be accommodated by the design. Alternatively, we can provide recommendations for a deep foundation system, if requested.

A design groundwater elevation of 3 Feet MSL should be used. If excavations, retaining walls, foundations or slabs-on-grade are extended to this elevation or below, modifications to our recommendations may be needed. 7.1.4 Proper drainage should be maintained in order to preserve the engineering properties of the fill in both the building pads and slope areas. Recommendations for site drainage are provided herein.

7.1.5 Based on our review of the project plans, we opine the planned development can be constructed in accordance with our recommendations provided herein. We do not expect the planned development will destabilize or result in settlement of adjacent properties if properly constructed.

7.1.6 Surface settlement monuments and canyon subdrains will not be required on this project.

7.2 Excavation and Soil Characteristics

7.2.1 Excavation of the in-situ soil should be possible with moderate to heavy effort using conventional heavy-duty equipment. The grading and improvement contractors should review this report and evaluate the proper equipment to use for the planned excavations.

7.2.2 The soil encountered in the field investigation is “non-expansive” and “expansive” (expansion index [EI] of 20 or less and greater than 20, respectively) as defined by 2022 California Building Code (CBC) Section 1803.5.3. We expect most of the soil encountered possess a “very low” to “medium” expansion potential (EI of 90 or less) in accordance with ASTM D 4829. The following presents soil classifications based on the expansion index.

EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2022 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

7.2.3 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Appendix B presents results of the laboratory water-soluble sulfate content tests. The test results indicate the on-site materials at the locations tested possess “S0” sulfate exposure to concrete structures as defined by 2022 CBC Section 1904 and ACI 318-19 Chapter 19. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

7.2.4 We tested samples for potential of hydrogen (pH) and resistivity laboratory tests to aid in evaluating the corrosion potential to subsurface metal structures. Appendix B presents the laboratory test results.

7.2.5 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements susceptible to corrosion are planned.

7.3 Grading

7.3.1 Grading should be performed in accordance with the recommendations provided in this report, the Recommended Grading Specifications contained in Appendix D and the local grading ordinance. Geocon Incorporated should observe the grading operations on a full-time basis and provide testing during the fill placement.

7.3.2 Prior to commencing grading, a preconstruction conference should be held at the site with the agency inspector, developer, grading and underground contractors, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

7.3.3 Site preparation should begin with the removal of deleterious material, debris, and vegetation. The depth of vegetation removal should be such that material exposed in cut areas or soil to be used as fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site. Asphalt and concrete should not be mixed with the fill soil unless approved by the Geotechnical Engineer.

7.3.4 Abandoned foundations and buried utilities (if encountered) should be removed and the resultant depressions and/or trenches should be backfilled with properly compacted material as part of the remedial grading.

7.3.5 **Proposed Structure - Ground Improvement Option:** The building can be supported on shallow foundations or a mat foundation over improved ground (i.e. soil mixing or aggregate piers). The upper 3 feet of materials situated below the proposed grade and at least 2 feet below foundations should be excavated and properly compacted fill should be placed. The excavations should extend at least 5 feet laterally outside of the proposed foundation zones, where possible. Deeper excavations may be required in areas where loose or saturated materials are encountered. The remedial grading should be performed after completion of ground improvement operations for aggregate piers and prior to construction of soil mix columns.

7.3.6 **Proposed Structure – Compacted Fill Option:** If the structural engineer determines that the proposed building can tolerate the estimated settlements, the building may be supported on a shallow or mat foundation over compacted fill. The undocumented fill and at least 3 feet below the proposed finish pad grade or 2 feet below foundations, whichever results in a deeper excavation, should be excavated and properly compacted fill should be placed. We expect these excavation could be up to 15 feet deep. The excavations should extend at least 5 feet laterally outside of the proposed foundation zones, where possible. Deeper excavations may be required in areas where loose or saturated materials are encountered.

7.3.7 In areas of proposed improvements outside of the building areas, the upper 2 to 3 feet of existing soil should be processed, moisture conditioned as necessary and recompacted. Deeper excavations may be required in areas where loose or saturated materials are encountered. The excavations should extend at least 2 feet laterally outside of the improvement area, where possible. The following table summarizes the remedial grading recommendations.

SUMMARY OF REMEDIAL GRADING RECOMMENDATIONS

Area	Remedial Grading Excavation Requirements
Building Pad - Ground Improvement Option	Excavate 3 Feet Below Pad Grade and/or 2 Feet Below Foundations
Building Pad – Compacted Fill Option	Excavate Undocumented Fill and 3 Feet Below Pad Grade and/or 2 Feet Below Foundations
Site Development	Process Upper 2 to 3 Feet of Existing Materials
Lateral Grading Limits	5 Feet Outside of Buildings
	2 Feet Outside of Improvement Areas
Exposed Bottoms of Excavations	Scarify Upper 12 Inches

7.3.8 The bottom of the excavations should be sloped 1 percent to the adjacent street or deepest fill. Prior to fill soil being placed, the existing ground surface should be scarified, moisture conditioned as necessary, and compacted to a depth of at least 12 inches. Deeper excavations may be required if saturated or loose fill soil is encountered. A representative of Geocon should be on-site during excavations to evaluate the limits of the remedial grading.

7.3.9 Some areas of overly wet and saturated soil could be encountered due to the existing landscape and pavement areas. The saturated soil would require additional effort prior to placement of compacted fill or additional improvements. Stabilization of the soil would include scarifying and air-drying, removing and replacing with drier soil, using stabilization fabric (e.g. Tensar NX750 or other approved fabric), or chemical treating (i.e. cement or lime treatment).

7.3.10 A design groundwater elevation of 3 Feet MSL should be used. The contractor should be careful during the remedial grading operations to avoid a “pumping” condition at the base of the excavations. Where recompaction of the excavated bottom will result in a “pumping” condition, the bottom of the excavation should be tracked with low ground pressure earthmoving equipment prior to placing fill. If needed to improve the stability of the excavation bottoms, reinforcing fabric or 2- to 3-inch crushed rock can be placed prior to placement of compacted fill.

7.3.11 The site should then be brought to final subgrade elevations with fill compacted in layers as recommended in the following table. In general, the existing soil is suitable for use from a geotechnical engineering standpoint as fill if relatively free from vegetation, debris and other deleterious material. Layers of fill should be about 6 to 8 inches in loose thickness and no thicker than will allow for adequate bonding and compaction. Fill materials placed below optimum moisture content may require additional moisture conditioning prior to placing additional fill.

SUMMARY OF COMPACTED FILL RECOMMENDATIONS

<table>
<tr><th>Fill Location</th><th>Relative Compaction*</th><th>Relative Moisture Content*</th></tr>
<tr><td>Grading</td><td rowspan="3">90% of Laboratory Maximum Dry Density</td><td rowspan="3">Near to Slightly Above Optimum</td></tr>
<tr><td>Utility/Retaining Wall Backfill</td></tr>
<tr><td>Sidewalk and Curb/Gutter Subgrade</td></tr>
<tr><td>Pavement and Cross-Gutter Subgrade</td><td rowspan="2">95% of Laboratory Maximum Dry Density</td><td rowspan="2">Near to Slightly Above Optimum</td></tr>
<tr><td>Base Materials</td></tr>
</table>

*In accordance with ASTM D 1557.

7.3.12 Import fill (if necessary) should consist of the characteristics presented in the following table. Geocon Incorporated should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to evaluate its suitability as fill material.

SUMMARY OF IMPORT FILL RECOMMENDATIONS

Soil Characteristic	Values
Expansion Potential	"Very Low" to "Medium" (Expansion Index of 90 or Less)
Particle Size	Maximum Dimension Less Than 3 Inches
	Generally Free of Debris

7.4 Subdrains

7.4.1 Except for retaining wall drains, we do not expect the installation of other subdrains.

7.5 Excavation Slopes, Shoring and Tiebacks

7.5.1 The recommendations included herein are provided for stable excavations. It is the responsibility of the contractor and their competent person to ensure all excavations, temporary slopes and trenches are properly constructed and maintained in accordance with applicable OSHA guidelines in order to maintain safety and the stability of the excavations and adjacent improvements. These excavations should not be allowed to become saturated or to dry out. Surcharge loads should not be permitted to a distance equal to the height of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

7.5.2 The stability of the excavations is dependent on the design and construction of the shoring system and site conditions. Therefore, Geocon Incorporated cannot be responsible for site safety and the stability of the proposed excavations.

7.5.3 The design of temporary shoring is governed by soil and groundwater conditions, and by the depth and width of the excavated area. Continuous support of the excavation face can be provided by a system of soldier piles and wood lagging or other applicable techniques.

Excavations exceeding 15 feet may require soil nails, tieback anchors or internal bracing to provide additional wall restraint.

7.5.4 The condition of existing buildings, streets, sidewalks, and other structures/improvements around the perimeter of the planned excavation should be documented prior to the start of shoring and excavation work. Special attention should be given to documenting existing cracks or other indications of differential settlement within these adjacent structures, pavements and other improvements. Underground utilities sensitive to settlement should be videotaped prior to construction to check the integrity of pipes. In addition, monitoring points should be established indicating location and elevation around the excavation and upon existing buildings. These points should be monitored on a weekly basis during excavation work and on a monthly basis thereafter. Inclinometers should be installed and monitored behind any shoring sections that will be advanced deeper than 30 feet below the existing ground surface.

7.5.5 In general, ground conditions are moderately suited for soldier pile and tieback anchor wall construction techniques. However, wet soil, gravel, cobble, and oversized material may be encountered in the existing materials that could be difficult to drill. Additionally, if cohesionless sands are encountered, some raveling may result along the unsupported portions of excavations. Groundwater would also be encountered during the excavation operations that extend below an elevation of about 3 feet MSL and may cause caving. Drilling mud and/or casing may be required to help prevent caving if soldier piles are installed.

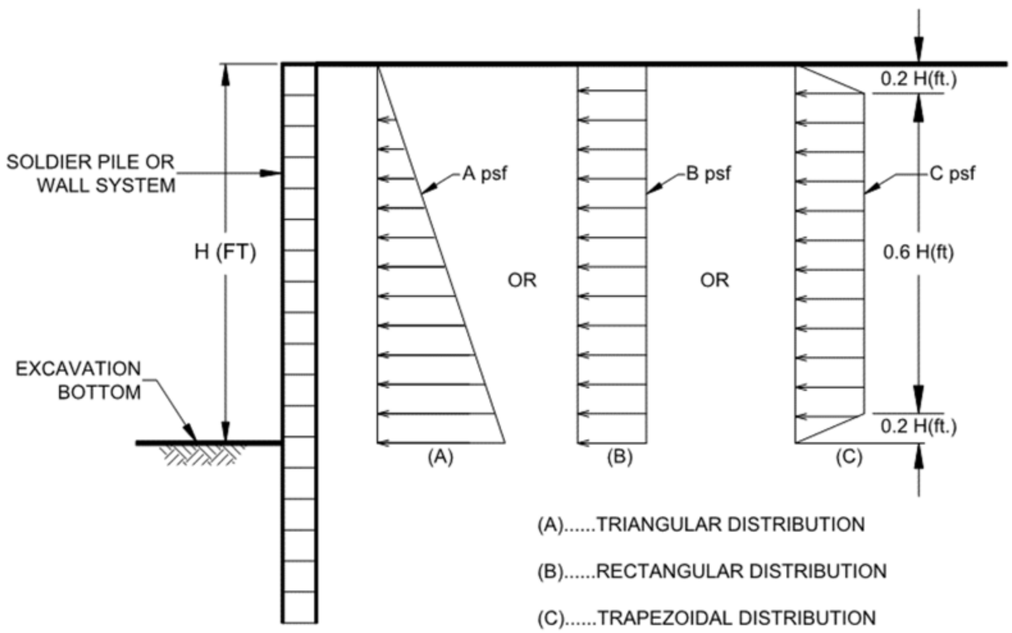
7.5.6 Temporary shoring should be designed using a lateral pressure envelope acting on the back of the shoring (as presented in the following table) assuming a level backfill. The distributions are shown on the Active Pressures for Temporary Shoring. Cantilevered shoring should use the triangular distribution and multi-braced systems (such as tieback anchors and rakers) should use the trapezoidal or rectangular distributions. The project shoring engineer should determine the applicable soil distribution for the design of the temporary shoring system. Additional lateral earth pressure due to the surcharging effects from construction equipment, sloping backfill, planned stockpiles, adjacent structures and/or traffic loads should be considered, where appropriate, during design of the shoring system.

SUMMARY OF TEMPORARY SHORING WALL RECOMMENDATIONS

Parameter	Value
Triangular Distribution, A	24H psf
Rectangular Distribution, B	16H psf
Trapezoidal Distribution, C	20H psf
Passive Pressure, P	350D + 500 psf
Effective Zone Angle, E	31 degrees
Maximum Design Lateral Movement	1 Inch
Maximum Design Vertical Movement	½ Inch
Maximum Design Retained Height, H	20 Feet

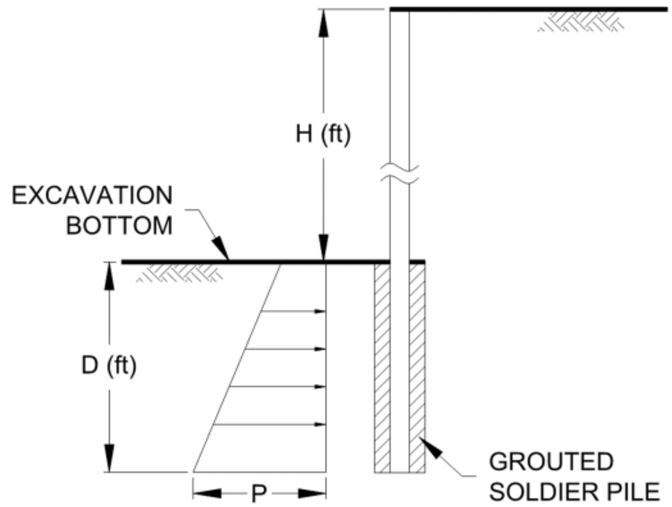
H equals the height of the retaining portion of the wall in feet

D equals the embedment depth of the retaining wall in feet



Active Pressures on Temporary Shoring

7.5.7 The passive resistance can be assumed to act over a width of three pile diameters. Typically, soldier piles are embedded a minimum of 0.5 times the maximum height of the excavation (this depth is to include footing excavations) if tieback anchors are not employed. The project structural engineer should determine the actual embedment depth.



Passive Pressures on Temporary Shoring

7.5.8 We should observe the drilled shafts for the soldier piles prior to the placement of steel reinforcement to check that the exposed soil conditions are similar to those expected and that excavations have been extended to the appropriate bearing strata and design depths. If unexpected soil conditions are encountered, design modifications may be required. The shoring engineer should provide recommendations for the drilling operations below groundwater.

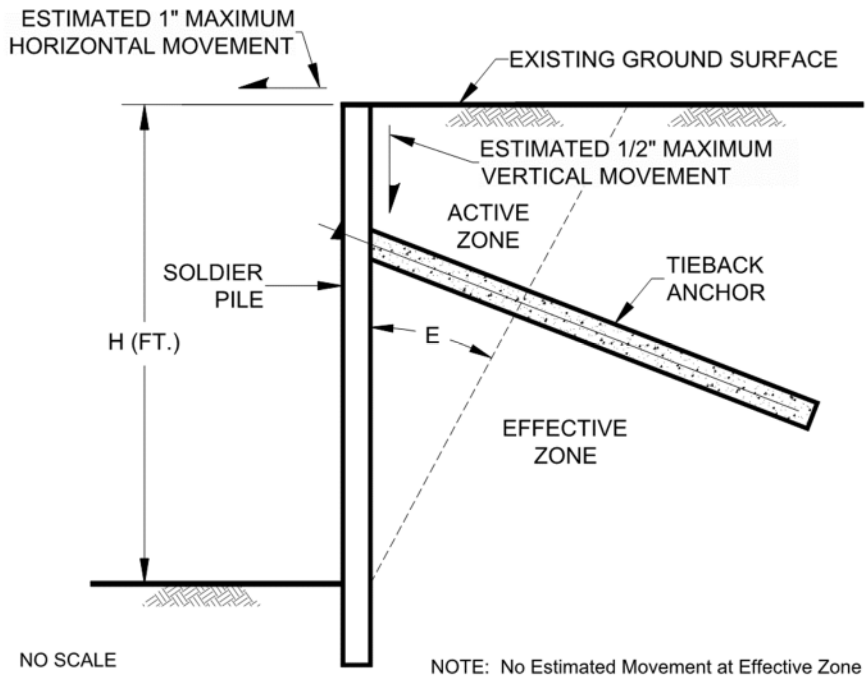
7.5.9 Lateral movement of shoring is associated with vertical ground settlement outside of the excavation. Therefore, it is essential that the soldier pile and tieback system allow very limited amounts of lateral displacement. Earth pressures acting on a lagging wall can cause movement of the shoring toward the excavation and result in ground subsidence outside of the excavation. Consequently, horizontal movements of the shoring wall should be accurately monitored and recorded during excavation and anchor construction.

7.5.10 Survey points should be established at the top of the pile on at least 20 percent of the soldier piles. An additional point located at an intermediate point between the top of the pile and the base of the excavation should be monitored on at least 20 percent of the piles if tieback anchors will be used. These points should be monitored on a weekly basis during excavation work and on a monthly basis thereafter until the permanent support system is constructed.

7.5.11 The project civil engineer should provide the approximate location, depth, and pipe type of the underground utilities to the shoring engineer to help select the shoring type and shoring design. The shoring system should be designed to limit horizontal soldier pile movement to a maximum of 1 inch. The amount of horizontal deflection can be assumed to be essentially zero along the Active Zone and Effective Zone boundary. The magnitude of movement for intermediate depths and distances from the shoring wall can be linearly interpolated. We understand the City of San Diego may require the developer to prepare a hold harmless agreement for the planned construction operations and development regarding the existing utilities and improvements.

7.5.12 If it is deemed necessary to limit dewatering, deep excavations may be performed within relatively impermeable shoring such as sheet piles. Sheet piles are generally driven or vibrated into place. The existing soils are moderately dense and firm; therefore, installation is expected to be relatively easy but should be evaluated by the shoring contractor. If sheet pile-supported excavations are planned in proximity of existing improvements, vibrations and ground surface settlement should be monitored by the contractor. The sheet pile contractor should review this report to evaluate if sheet piles can be used and installed for the planned improvements.

7.5.13 Tieback anchors employed in shoring should be designed such that anchors fully penetrate the Active Zone behind the shoring. The Active Zone can be considered the wedge of soil from the face of the shoring to a plane extending upward from the base of the excavation as shown on the Active Zone Detail. Normally, tieback anchors are contractor-designed and installed, and there are numerous anchor construction methods available. Non-shrinkage grout should be used for the construction of the tieback anchors.



Active Zone Detail

7.5.14 Experience has shown that the use of pressure grouting during formation of the bonded portion of the anchor will increase the soil-grout bond stress. A pressure grouting tube should be installed during the construction of the tieback. Post grouting should be performed if adequate capacity cannot be obtained by other construction methods.

7.5.15 Anchor capacity is a function of construction method, depth of anchor, batter, diameter of the bonded section and the length of the bonded section. Anchor capacity should be evaluated using the strength parameters shown in the following table.

SOIL STRENGTH PARAMETERS FOR TEMPORARY SHORING

Description	Soil Density (pcf)	Cohesion (psf)	Friction Angle (Degrees)
Previously Placed Fill	125	250	28
Bay Deposits	130	300	30

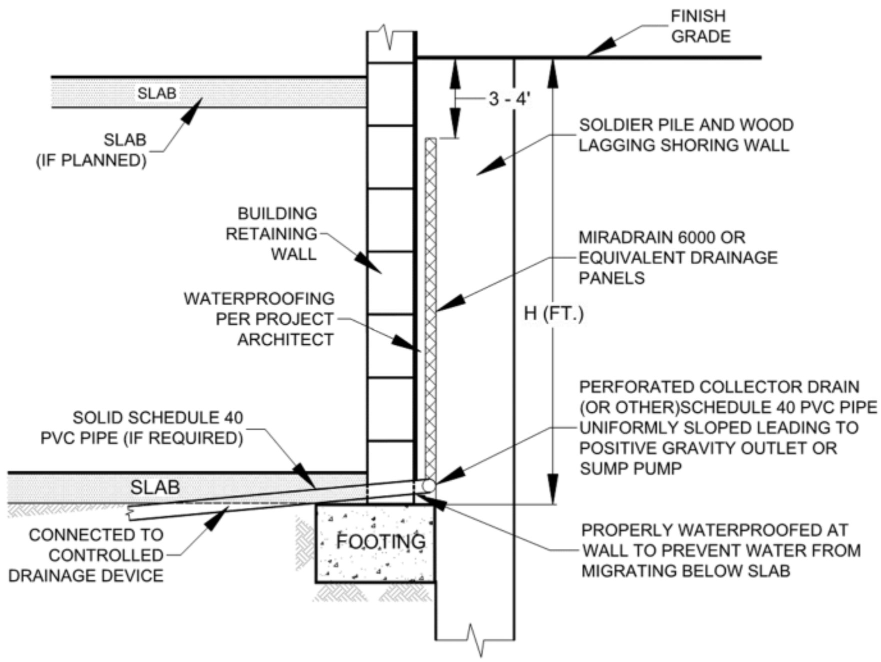
7.5.16 Grout should only be placed in the tieback anchor’s bonded section prior to testing. Tieback anchors should be proof-tested to at least 130 percent of the anchor’s design working load. Following a successful proof test, the tieback anchors should be locked off at 80 percent of the allowable working load. Tieback anchor test failure criteria should be established in project plans and specifications. The tieback anchor test failure criteria should be based upon a maximum allowable displacement at 130 percent of the anchor's working load (anchor creep) and a maximum residual displacement within the anchor following stressing. Tieback anchor stressing should only be conducted after sufficient hydration has occurred within the grout. Tieback anchors that fail to meet project specified test criteria should be replaced or additional anchors should be constructed.

7.5.17 Lagging should keep pace with excavation. The excavation should not be advanced deeper than three feet below the bottom of lagging at any time or as determined by the shoring contractor. These unlagged gaps should only be allowed to stand for short periods of time in order to decrease the probability of soil instability and should never be unsupported overnight. Proper backfilling should be conducted when necessary between the back of lagging and excavation sidewalls to reduce sloughing in this zone and all voids should be filled by the end of each day. It may be necessary to backfill with slurry to help prevent future lateral movement behind the supported excavation. Further, the excavation should not be advanced further than four feet below a row of tiebacks prior to those tiebacks being proof tested and locked off unless otherwise specific by the shoring engineer. Surface sloughing may occur during the excavation process.

7.5.18 If tieback anchors are employed, an accurate survey of existing utilities and other underground structures adjacent to the shoring wall should be conducted. The survey should include both locations and depths of existing utilities. Locations of anchors should be adjusted as necessary during the design and construction process to accommodate the existing and proposed utilities.

7.5.19 Tieback anchors within the City of San Diego right-of-way should be properly de-tensioned and removed where steel does not exist within the upper 20 feet from the existing grade. The Notice – Land Development Review/Shoring in City Right-Of-Way, prepared by the City of San Diego, dated July 1, 2003 should be reviewed and incorporated into the design of the tieback anchors. Procedures for removal of tieback anchors include unscrewing tendons using special couplings, use of explosives, or heat induction. Geocon Incorporated should be consulted if other methods of removal are planned.

7.5.20 The shoring system should incorporate a drainage system for the proposed retaining wall as shown herein.



Shoring Retaining Wall Drainage Detail

7.6 Seismic Design Criteria – 2022 California Building Code

7.6.1 The following table summarizes site-specific design criteria obtained from the 2022 California Building Code (CBC; Based on the 2021 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. We used the computer program *U.S. Seismic Design Maps*, provided by the Structural Engineers Association (SEA) to calculate the seismic design parameters. The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2022 CBC and Table 20.3-1 of ASCE 7-16. Although there are liquefiable soils underlying the site, we expect the building possesses a period of less than 0.5 second; therefore, a site response analysis will not be required in accordance with ASCE 7-16, Section 20.3.1 and the building improvements can be designed based on the parameters presented herein. The values presented herein are for the risk-targeted maximum considered earthquake (MCE_R). Sites designated as Site Class D, E and F may require additional analyses if requested by the project structural engineer and client.

2022 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2022 CBC Reference
Site Class	D	Section 1613.2.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.402g	Figure 1613.2.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.486g	Figure 1613.2.1(3)
Site Coefficient, F_A	1.000	Table 1613.2.3(1)
Site Coefficient, F_V	1.814*	Table 1613.2.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.402g	Section 1613.2.3 (Eqn 16-20)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.882g*	Section 1613.2.3 (Eqn 16-21)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.935g	Section 1613.2.4 (Eqn 16-22)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.558g*	Section 1613.2.4 (Eqn 16-23)

*See following paragraph.

7.6.2 Using the code-based values presented in the previous table, in lieu of performing a ground motion hazard analysis, requires the exceptions outlined in ASCE 7-16 Section 11.4.8 be followed by the project structural engineer. Per Section 11.4.8 of ASCE/SEI 7-16, a ground motion hazard analysis should be performed for projects for Site Class "D" sites with S1 greater than 0.2g. Section 11.4.8 also provides exceptions which indicates that the ground motion hazard analysis may be waived provided the exceptions are followed. Supplement 3 of ASCE 7-16 provides an exception stating that that the GMHA may be waived provided that the parameter S_{M1} is increased by 50% for all applications of S_{M1}. The values for parameters S_{M1} and S_{D1} presented herein above have **not** been increased in accordance with Supplement 3 of ASCE 7-16.

7.6.3 The following table presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

ASCE 7-16 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-16 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.641g	Figure 22-9
Site Coefficient, F_{PGA}	1.100	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.705g	Section 11.8.3 (Eqn 11.8-1)

7.6.4 Conformance to the criteria in this section for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur in the event of a large earthquake. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

7.6.5 The project structural engineer and architect should evaluate the appropriate Risk Category and Seismic Design Category for the planned structures. The values presented herein assume a Risk Category of II and resulting in a Seismic Design Category D. The following table summarizes the risk categories in accordance with ASCE 7-16.

ASCE 7-16 RISK CATEGORIES

Risk Category	Building Use	Examples
I	Low risk to Human Life at Failure	Barn, Storage Shelter
II	Nominal Risk to Human Life at Failure (Buildings Not Designated as I, III or IV)	Residential, Commercial and Industrial Buildings
III	Substantial Risk to Human Life at Failure	Theaters, Lecture Halls, Dining Halls, Schools, Prisons, Small Healthcare Facilities, Infrastructure Plants, Storage for Explosives/Toxins
IV	Essential Facilities	Hazardous Material Facilities, Hospitals, Fire and Rescue, Emergency Shelters, Police Stations, Power Stations, Aviation Control Facilities, National Defense, Water Storage

7.7 Ground Improvements

7.7.1 The undocumented fill and Bay Deposits have a potential for compression and liquefaction. Several alternatives are generally available for mitigation including deep foundations, ground improvements and structural mitigation. We expect that the building might be supported on a shallow or mat foundation system over ground improvements. The ground improvements should be designed to reduce the estimated seismic and static settlements to target levels and to provide increased building support.

7.7.2 Ground improvement techniques reduce potential settlements and increase bearing capacities by densifying existing soil through the use of aggregate piers, deep dynamic compaction, compaction grouting, soil mixing or other densification methods. The selection of the ground improvement option should be based on the acceptable risk for the project, the target seismic and static settlements determined by the project team, the thickness and properties of the settlement-prone soils, and the type of development. We have provided recommendations herein for typical target design values for ground improvements. However, we should update our recommendations based on review from the project structural engineer and design team.

7.8 Shallow Foundations

7.8.1 The proposed structure can be supported on a shallow foundation system founded in the compacted fill following ground improvements. We expect the ground improvement options that would be appropriate for this project include soil mixing or aggregate piers. The ground improvement should be designed by a specialty contractor experienced in that specific type of ground improvement design and construction. Foundations for the structure should consist of continuous strip footings and/or isolated spread footings and should be designed using the parameters in the following table.

SUMMARY OF FOUNDATION RECOMMENDATIONS (GROUND IMPROVEMENTS)

Parameter	Value
Minimum Continuous Foundation Width, W_C	12 Inches
Minimum Isolated Foundation Width, W_I	24 Inches
Minimum Foundation Depth, D	24 Inches Below Lowest Adjacent Grade
Minimum Steel Reinforcement	4 No. 5 Bars, 2 Top and 2 Bottom
Maximum Allowable Bearing Capacity	5,000 to 7,000 psf*
Estimated Total Settlement	1 Inch (Static) *
	½ Inch (Seismic) *
Estimated Differential Settlement	½ Inch in 40 Feet (Static) *
	<½ Inch in 40 Feet (Seismic) *
Design Expansion Index	90 or Less

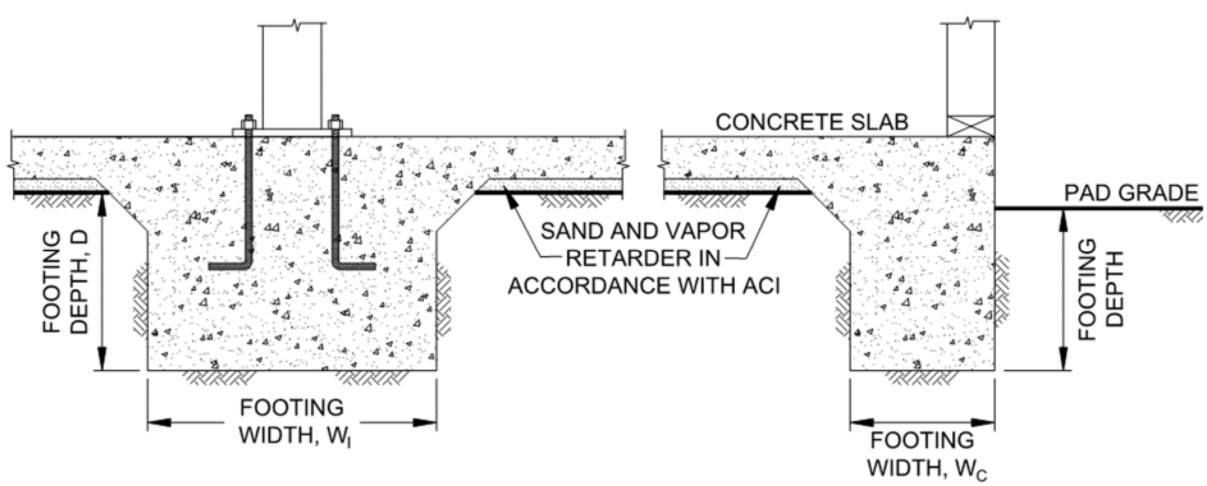
*To be evaluated by the ground modification contractor and design team. Recommended target settlements provided herein and should be evaluated or altered as needed by the project team.

7.8.2 Alternatively, the proposed structure can be supported on a shallow foundation system founded in compacted fill if the structural engineer determines that the proposed building can tolerate anticipated static and liquefaction settlements. The project structural engineer should determine if the proposed foundations can be designed to structurally accommodate the potential settlements from a life-safety standpoint. Foundations for the structure should consist of continuous strip footings and/or isolated spread footings and should be designed using the parameters in the following table.

SUMMARY OF FOUNDATION RECOMMENDATIONS (COMPACTED FILL)

Parameter	Value
Minimum Continuous Foundation Width, W_C	12 Inches
Minimum Isolated Foundation Width, W_I	24 Inches
Minimum Foundation Depth, D	24 Inches Below Lowest Adjacent Grade
Minimum Steel Reinforcement	4 No. 5 Bars, 2 Top and 2 Bottom
Maximum Allowable Bearing Capacity	4,000 psf
Estimated Foundation Size for Settlement	15 Feet
Estimated Total Settlement	1 Inch (Static)
	1 Inch (Seismic)
Estimated Differential Settlement	½ Inch in 40 Feet (Static)
	~¾ Inch in 40 Feet (Seismic)
Design Expansion Index	90 or Less

7.8.3 The foundations should be embedded in accordance with the recommendations herein and the Wall/Column Footing Dimension Detail. The embedment depths should be measured from the lowest adjacent pad grade for both interior and exterior footings. Footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope (unless designed with a post-tensioned foundation system as discussed herein).



Wall/Column Footing Dimension Detail

7.8.4 The bearing capacity values presented herein are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

7.8.5 We should observe the foundation excavations prior to the placement of reinforcing steel and concrete to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. Foundation modifications may be required if unexpected soil conditions are encountered.

7.8.6 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.9 Mat Foundation

7.9.1 We understand the proposed structure may be supported on a mat foundation bearing on either ground improvements or compacted fill. A mat foundation consists of a thick, rigid concrete mat that allows the entire footprint of the structure to carry building loads. In addition, the mat can tolerate significantly greater differential movements such as those associated with expansive soils or differential settlement. The ground improvement should be designed by a specialty contractor experienced in that specific type of ground improvement design and construction. Foundations for the structure should be designed using the parameters in the following table. We should provide updated estimates for settlement once the loading distribution is determined by the structural engineer.

SUMMARY OF MAT FOUNDATION RECOMMENDATIONS (GROUND IMPROVEMENTS)

Parameter	Value
Design Perimeter Foundation Width	12 Inches
Minimum Foundation Depth	Extend Below Slab Underlayment
Minimum Steel Reinforcement	Per Structural Engineer
Bearing Capacity	2,000 to 2,500 psf *
Estimated Total Settlement	½ to 1 Inch (Static) *
	½ Inch (Seismic) *
Estimated Differential Settlement	½ Inch in 40 Feet (Static) *
	<½ Inch in 40 Feet (Seismic) *
Modulus of Subgrade Reaction	150 to 200 pci
Design Expansion Index	90 or Less

*To be evaluated by the ground modification contractor and design team. Recommended target settlements provided herein and should be evaluated or altered as needed by the project team

7.9.2 Alternatively, the proposed structure can be supported on a mat system founded in compacted fill if the structural engineer determines that the proposed building can tolerate anticipated liquefaction settlements. The project structural engineer should determine if the proposed foundations can be designed to structurally accommodate the potential settlements from a life-safety standpoint. Foundations for the structure should be designed using the parameters in the following table. We should provide updated estimates for settlement once the loading distribution is determined by the structural engineer.

SUMMARY OF MAT FOUNDATION RECOMMENDATIONS (COMPACTED FILL)

Parameter	Value
Design Perimeter Foundation Width	12 Inches
Minimum Foundation Depth	Extend Below Slab Underlayment
Minimum Steel Reinforcement	Per Structural Engineer
Average (Uniform) Bearing Capacity	1,500 psf
Estimated Mat Foundation Size	100 Feet by 100 Feet
Estimated Total Settlement	1 Inch (Static)
	1 Inch (Seismic)
Estimated Differential Settlement	½ Inch in 40 Feet (Static)
	~¾ Inch in 40 Feet (Seismic)
Modulus of Subgrade Reaction	100 to 150 pci
Design Expansion Index	90 or Less

7.9.3 The modulus of subgrade reaction values should be modified as necessary using standard equations for mat size as required by the structural engineer. These modulus values are for a foundation measuring 1 foot by 1 foot and should be modified for design of the foundation using standard equations.

Square Foundation:

$$K_{(B \times B)} = K\left[\frac{B+1}{2B}\right]^2$$

Rectangular Foundation:

$$K_R = \left[\frac{K_{(B \times B)}\,(1 + 0.5\frac{B}{L})}{1.5}\right]$$

where: $K_{(B \times B)}$ = reduced subgrade modulus for square foundation
K_R = reduced subgrade modulus for rectangular foundation
K = unit subgrade modulus
B = foundation width (in feet)
L = foundation length (in feet)

7.9.4 A mat foundation system will allow the structure to settle with the ground and should have sufficient rigidity to allow the structure to move as a single unit. Re-leveling of the mat foundation could be necessary through the use of mud jacking, compaction grouting or other similar techniques if significant differential settlement occurs following a seismic event.

7.9.5 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

7.9.6 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

7.10 Concrete Slabs-On-Grade

7.10.1 Concrete slabs-on-grade for the structures should be constructed using the parameters presented in the following table. A design groundwater elevation of 3 Feet MSL should be used. The structural engineer should determine whether a slab-on-grade would be an appropriate option if subterranean levels extend to this elevation.

MINIMUM CONCRETE SLAB-ON-GRADE RECOMMENDATIONS

Parameter	Value
Minimum Concrete Slab Thickness	5 Inches
Minimum Steel Reinforcement	No. 3 Bars 18 Inches on Center, Both Directions
Typical Slab Underlayment	3 to 4 Inches of Sand/Gravel/Base
Design Expansion Index	90 or Less

7.10.2 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

7.10.3 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. It is common to have 3 to 4 inches of sand for 5-inch and 4-inch thick slabs, respectively, in the southern California region. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

7.10.4 Some projects remove the sand layer below the slab in parking structure areas. This is acceptable from a geotechnical engineering standpoint; however, relatively minor cracks could form due to differential curing. Therefore, the structural engineer and/or the concrete contractor should provide recommendations for proper curing techniques to help prevent cracking.

7.10.5 Concrete slabs should be provided with adequate crack-control joints, construction joints and/or expansion joints to reduce unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute (ACI) when establishing crack-control spacing. Crack-control joints should be spaced at intervals no greater than 12 feet. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed finished floors are planned.

7.10.6 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisturized to maintain a moist condition as would be expected in any such concrete placement.

7.10.7 The concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting expected loads.

7.10.8 Where exterior flatwork abuts the structure at entrant or exit areas, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.

7.10.9 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soil (if present), differential settlement of existing soil or soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.11 Exterior Concrete Flatwork

7.11.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations presented in the following table. The recommended steel reinforcement would help reduce the potential for cracking.

MINIMUM CONCRETE FLATWORK RECOMMENDATIONS

Expansion Index, EI	Minimum Steel Reinforcement* Options	Minimum Thickness
EI $\leq$ 90	6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh	4 Inches
	No. 3 Bars 18 inches on center, Both Directions	

*In excess of 8 feet square.

7.11.2 The subgrade soil should be properly moisturized and compacted prior to the placement of steel and concrete. The subgrade soil should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM D 1557.

7.11.3 Even with the incorporation of the recommendations of this report, the exterior concrete flatwork has a potential to experience some uplift due to expansive soil beneath grade. The steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork. Additionally, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork.

7.11.4 Concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be verified prior to placing concrete. Base materials will not be required below concrete improvements.

7.11.5 Where exterior flatwork abuts the structure at entrant or exit points, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.

7.11.6 The recommendations presented herein are intended to reduce the potential for cracking of exterior slabs as a result of differential movement. However, even with the incorporation of the recommendations presented herein, slabs-on-grade will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Crack control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

7.12 Retaining Walls

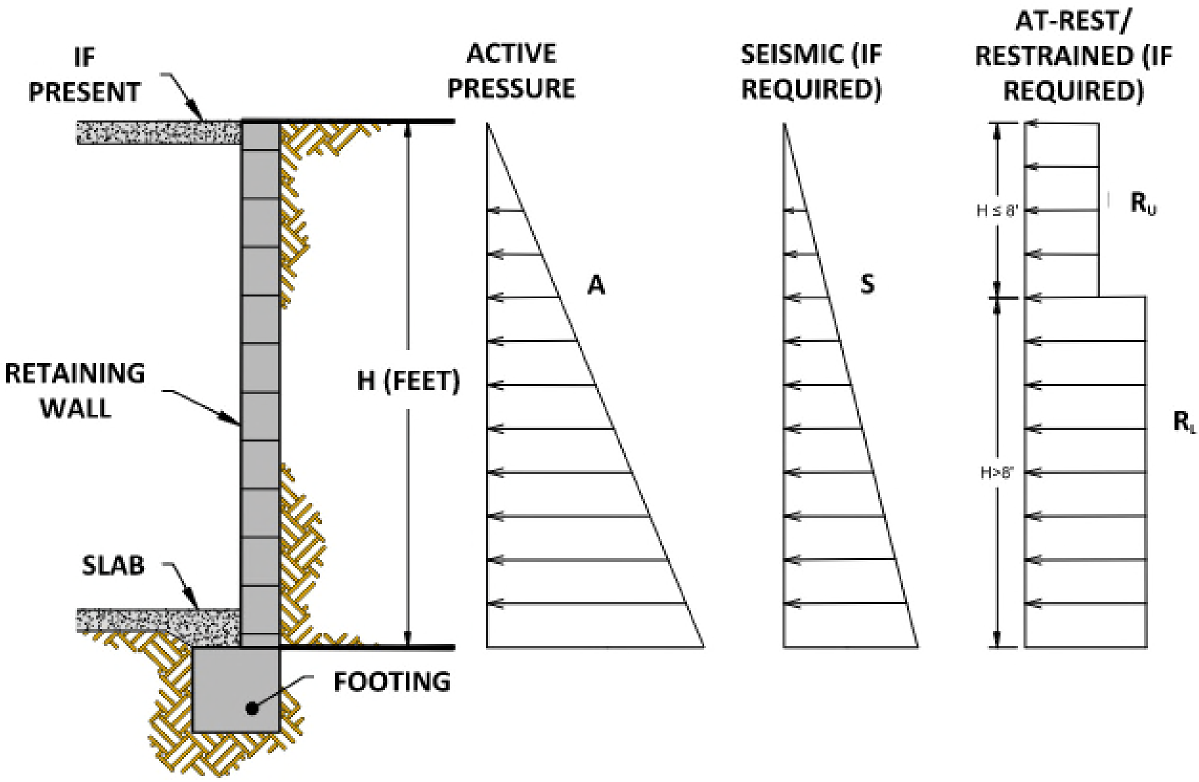
7.12.1 Retaining walls should be designed using the values presented in the following table. Soil with an expansion index (EI) of greater than 90 should not be used as backfill material behind retaining walls.

RETAINING WALL DESIGN RECOMMENDATIONS

Parameter	Value
Active Soil Pressure, A (Fluid Density, Level Backfill)	40 pcf
Active Soil Pressure, A (Fluid Density, 2:1 Sloping Backfill)	55 pcf
Seismic Pressure, S	15H psf
At-Rest/Restrained Walls Additional Uniform Pressure, R_U (0 to 8 Feet High)	7H psf
At-Rest/Restrained Walls Additional Uniform Pressure, R_L (8+ Feet High)	13H psf
Expected Expansion Index for the Subject Property	EI$\leq$90

H equals the height of the retaining portion of the wall

7.12.2 The project retaining walls should be designed as shown in the Retaining Wall Loading Diagram.



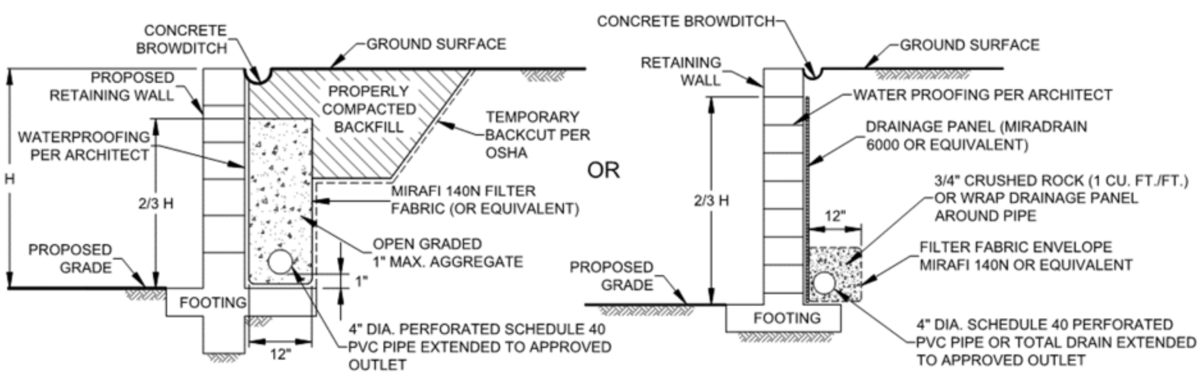
Retaining Wall Loading Diagram

7.12.3 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top (at-rest condition), an additional uniform pressure should be applied to the wall. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added to the upper 10 feet of the retaining wall.

7.12.4 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613 of the 2022 CBC or Section 11.6 of ASCE 7-16. For structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2022 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall.

7.12.5 Retaining walls should be designed to ensure stability against overturning sliding, and excessive foundation pressure. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, it is not necessary to consider active pressure on the keyway.

7.12.6 Drainage openings through the base of the wall (weep holes) should not be used where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. Weep holes should have a diameter of at least 4 inches and be spaced at a maximum of 8 feet on center, where used. The recommendations herein assume a properly compacted granular (EI of 90 or less) free-draining backfill material with no hydrostatic forces or imposed surcharge load. The retaining wall should be properly drained as shown in the Typical Retaining Wall Drainage Detail. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations. A design groundwater elevation of 3 Feet MSL should be used. If retaining walls extend to this elevation, alternative drainage methods or hydrostatic forces should be incorporated.



Typical Retaining Wall Drainage Detail

7.12.7 The retaining walls may be designed using either the active and restrained (at-rest) loading condition or the active and seismic loading condition as suggested by the structural engineer. Typically, it appears the design of the restrained condition for retaining wall loading may be adequate for the seismic design of the retaining walls. However, the active earth pressure combined with the seismic design load should be reviewed and also considered in the design of the retaining walls.

7.12.8 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls. In the event that other types of walls (such as mechanically stabilized earth [MSE] walls, soil nail walls, or soldier pile walls) are planned, Geocon Incorporated should be consulted for additional recommendations.

7.12.9 It is common to see retaining walls constructed in the areas of the elevator pits. The retaining walls should be properly drained and designed in accordance with the recommendations presented herein. If the elevator pit walls are not drained, the walls should be designed with an increased active pressure with an equivalent fluid density of 95 pcf. It is also common to see seepage and water collection within the elevator pit. The pit should be designed and properly waterproofed to prevent seepage and water migration into the elevator pit.

7.12.10 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.

7.12.11 Soil contemplated for use as retaining wall backfill, including import materials, should be identified in the field prior to backfill. At that time, Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

7.13 Lateral Loading

7.13.1 The values in the following table should be used to help design the proposed structures and improvements to resist lateral loads for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

SUMMARY OF LATERAL LOAD DESIGN RECOMMENDATIONS

Parameter	Value
Passive Pressure Fluid Density	350 pcf
Coefficient of Friction (Concrete and Soil)	0.35
Coefficient of Friction (Along Vapor Barrier)	0.2 to 0.25*

*Per manufacturer's recommendations.

7.13.2 The passive and frictional resistant loads can be combined for design purposes. The lateral passive pressures may be increased by one-third when considering transient loads due to wind or seismic forces.

7.14 Preliminary Pavement Recommendations

7.14.1 We calculated the flexible pavement sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) using an estimated Traffic Index (TI) of 5.0, 5.5, 6.0, and 7.0 for parking stalls, driveways, medium truck traffic areas, and heavy truck traffic areas, respectively. The project civil engineer and owner should review the pavement designations to determine appropriate locations for pavement thickness. The final pavement sections for the parking lot should be based on the R-Value of the subgrade soil encountered at final subgrade elevation. We have assumed an R-Value of 50 (based on laboratory testing) and 78 for the subgrade soil and base materials, respectively, for the purposes of this preliminary analysis. The following table presents the preliminary flexible pavement sections.

PRELIMINARY FLEXIBLE PAVEMENT SECTION

Location	Assumed Traffic Index	Assumed Subgrade R-Value	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Parking Stalls for Automobiles and Light-Duty Vehicles	5.0	50	3	4
Driveways for Automobiles and Light-Duty Vehicles	5.5	50	3	4
Medium Truck Traffic Areas	6.0	50	3.5	4
Driveways for Heavy Truck Traffic	7.0	50	4	5

7.14.2 Prior to placing base materials, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned as necessary, and recompacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. Similarly, the base material should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

7.14.3 Base materials should conform to Section 26-1.02B of the *Standard Specifications for The State of California Department of Transportation (Caltrans)* with a ¾-inch maximum size aggregate. Asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Greenbook)*.

7.14.4 The base thickness can be reduced if a reinforcement geogrid is used during the installation of the pavement. Geocon should be contact for additional recommendations if alternate design parameters are requested.

7.14.5 A rigid Portland cement concrete (PCC) pavement section should be placed in roadway aprons and cross gutters. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330-21 *Commercial Concrete Parking Lots and Site Paving Design and Construction – Guide.* We used the following traffic categories and design parameters used for the calculations for 20-year design life.

TRAFFIC CATEGORIES

Traffic Category	Description	Reliability (%)	Slabs Cracked at End of Design Life (%)
A	Car Parking Areas and Access Lanes	60	15
B	Entrance and Truck Service Lanes	60	15
D	Heavy Duty Trucks (80-Kip Gross Weight)	75	15
E	Garbage or Fire Truck Lane	75	15

7.14.6 We used the parameters presented in the following table to calculate the pavement design sections. We should be contacted to provide updated design sections, if necessary.

RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of Subgrade Reaction, k	100 pci
Modulus of Rupture for Concrete, M_R	500 psi
Concrete Compressive Strength	3,000 psi
Concrete Modulus of Elasticity, E	3,150,000 psi

7.14.7 Based on the criteria presented herein, the PCC pavement sections should have the following minimum thicknesses for the applicable traffic category.

RIGID VEHICULAR PAVEMENT RECOMMENDATIONS

Traffic Category	Trucks Per Day	Portland Cement Concrete, T (Inches)
A = Car Parking Areas and Access Lanes	10	5½
B = Entrance and Truck Service Lanes	10	6
D = Heavy Duty Trucks	50	6½
E = Garbage or Fire Truck Lanes	5	7

7.14.8 The PCC vehicular pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. The garbage truck pad should be large enough such that all wheels are on the concrete pad during the loading operations.

7.14.9 Adequate joint spacing should be incorporated into the design and construction of the rigid pavement in accordance with the following table.

MAXIMUM JOINT SPACING

Pavement Thickness, T (Inches)	Maximum Joint Spacing (Feet)
$4<T<5$	10
$5\leq T<6$	12.5
$6\leq T$	15

7.14.10 The rigid pavement should also be designed and constructed incorporating the following parameters.

ADDITIONAL RIGID PAVEMENT RECOMMENDATIONS

Subject	Value
Thickened Edge	1.2 Times Slab Thickness Adjacent to Structures
	1.5 Times Slab Thickness Adjacent to Soil
	Minimum Increase of 2 Inches
	4 Feet Wide
Crack Control Joint Depth	Early Entry Sawn = T/6 to T/5, 1.25 Inch Minimum
	Conventional (Tooled or Conventional Sawing) = T/4 to T/3
Crack Control Joint Width	¼-Inch for Sealed Joints and Per Sealer Manufacturer's Recommendations
	$^{1}/_{16}$- to $^{1}/_{4}$-Inch is Common for Unsealed Joints

7.14.11 Reinforcing steel will not be necessary within the concrete for geotechnical purposes.

7.14.12 To control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab. Crack-control joints should be sealed with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be in accordance with the referenced ACI guide.

7.14.13 To provide load transfer between adjacent pavement slab sections, a butt-type construction joint should be constructed. The butt-type joint should be thickened by at least 20 percent at the edge and taper back at least 4 feet from the face of the slab.

7.14.14 Concrete curb/gutter should be placed on soil subgrade compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Cross-gutters that receive vehicular traffic should be placed on subgrade soil compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Base materials should not be placed below the curb/gutter, or cross-gutters so water is not able to migrate from the adjacent parkways to the pavement sections. Where flatwork is located directly adjacent to the curb/gutter, the concrete flatwork should be structurally connected to the curbs to help reduce the potential for offsets between the curbs and the flatwork.

7.15 Site Drainage and Moisture Protection

7.15.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2022 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

7.15.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

7.15.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

7.15.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered.

7.15.5 We should prepare a storm water infiltration feasibility report of storm water management devices are planned.

7.16 Grading and Foundation Plan Review

7.16.1 Geocon Incorporated should review the grading and building foundation plans for the project prior to final design submittal to evaluate if additional analyses and/or recommendations are required.

7.17 Testing and Observation Services During Construction

7.17.1 Geocon Incorporated should provide geotechnical testing and observation services during the grading operations, foundation construction, utility installation, retaining wall backfill and pavement installation. The following table presents the typical geotechnical observations we would expect for the proposed improvements.

EXPECTED GEOTECHNICAL TESTING AND OBSERVATION SERVICES

Construction Phase	Observations	Expected Time Frame
Ground Modification	Ground Modification Installation	Full Time
	Confirmation Testing	Part Time to Full Time
Grading	Base of Removal	Part Time During Removals
	Fill Placement and Soil Compaction	Full Time
Soldier Piles	Solder Pile Drilling Depth	Part Time
Tieback Anchors	Tieback Drilling and Installation	Full Time
	Tieback Testing	Full Time
Foundations	Foundation Excavation Observations	Full Time
Utility Backfill	Fill Placement and Soil Compaction	Part Time to Full Time
Retaining Wall Backfill	Fill Placement and Soil Compaction	Part Time to Full Time
Subgrade for Sidewalks, Curb/Gutter and Pavement	Soil Compaction	Part Time
Pavement Construction	Base Placement and Compaction	Part Time
	Asphalt Concrete Placement and Compaction	Full Time

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

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

PACIFIC BEACH HOTEL
SAN DIEGO, CALIFORNIA

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0' 30' 60'
SCALE 1"= 30' (On 11x17)

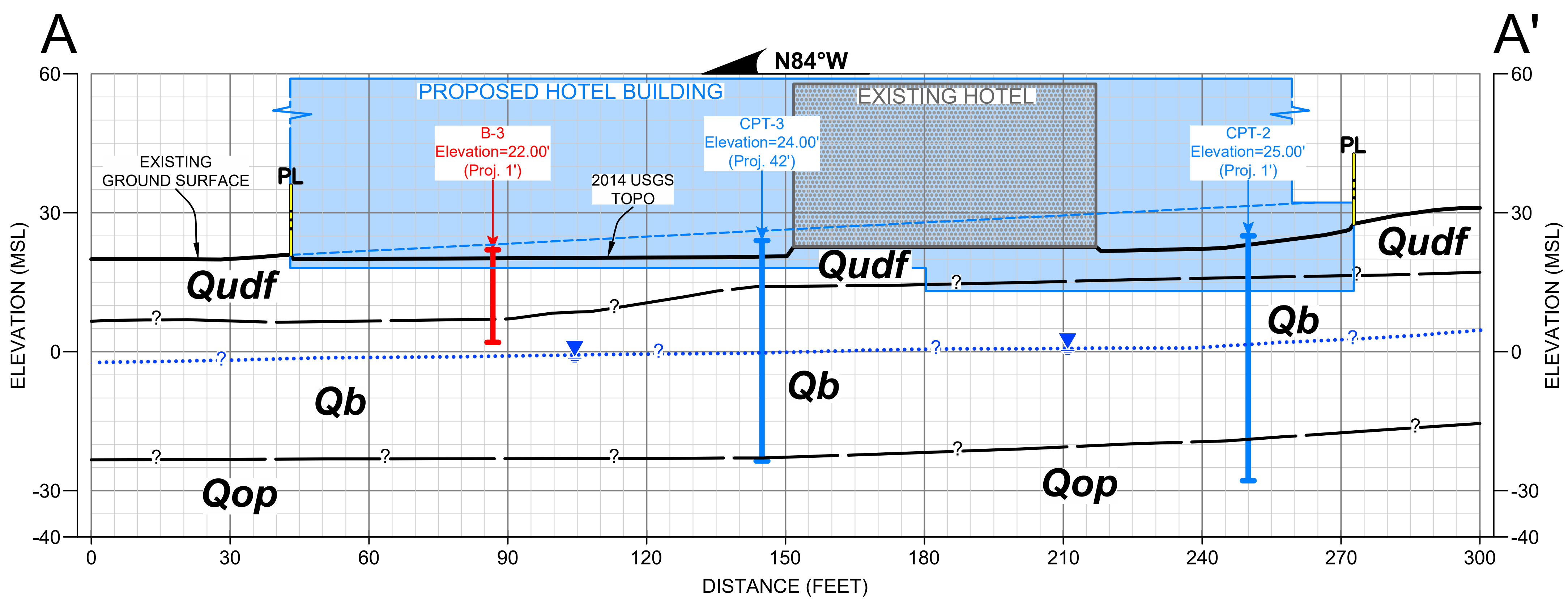
GEOCON LEGEND

Qudf ........UNDOCUMENTED FILL
Qb ....BAY DEPOSITS (Dotted Where Buried)
Qop ....OLD PARALIC DEPOSITS (Dotted Where Buried)
B-3 ....APPROX. LOCATION OF BORING
CPT-3 ....APPROX. LOCATION OF CONE PENETROMETER TEST
40' ....APPROX. DEPTH TO FORMATION (In Feet)
24' ....APPROX. DEPTH TO GROUNDWATER (In Feet)
B B' ....APPROX. LOCATION OF GEOLOGIC CROSS-SECTION

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

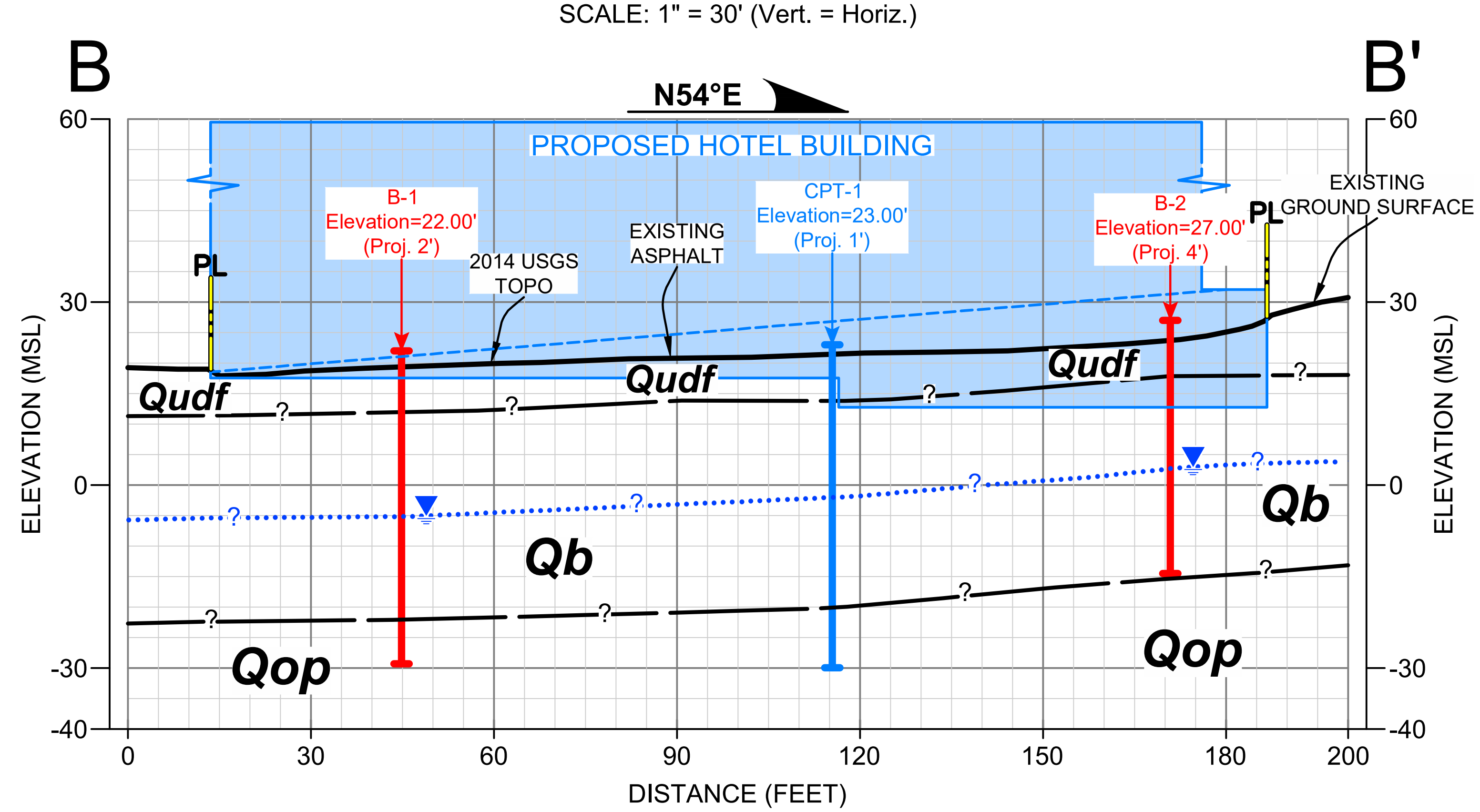
GEOLOGIC MAP
PROJECT NO. G3422 - 52 - 01
FIGURE 1
DATE 11 - 20 - 2024

PACIFIC BEACH HOTEL
SAN DIEGO, CALIFORNIA



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 30' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 30' (Vert. = Horiz.)

GEOCON LEGEND

Qudf ........UNDOCUMENTED FILL

Qb ....BAY DEPOSITS

Qop ....OLD PARALIC DEPOSITS

B-3 ....APPROX. LOCATION OF BORING

CPT-3 ....APPROX. LOCATION OF CONE PENETROMETER TEST

? ....APPROX. ELEVATION OF GROUNDWATER (Queried Where Uncertain)

? ....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

GEOLOGIC CROSS - SECTIONS

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PROJECT NO. G3422 - 52 - 01
FIGURE 2
DATE

APPENDIX A

APPENDIX A
FIELD INVESTIGATION

We performed the small-diameter drilling operations for our geotechnical borings on October 21, 2024 using a CME 75 drill rig equipped with hollow-stem augers with Baja Exploration. Borings extended to a maximum depth of approximately 50 feet. Additional field investigation work to support our liquefaction study included advancing 3 CPT soundings performed by Kehoe Testing & Engineering. The locations of the current exploratory excavations are shown on the Geologic Map, Figure 1. The boring logs are presented in this Appendix. The CPT logs are included in Appendix C. We located the borings in the field using a measuring tape and existing reference points; therefore, actual boring locations may deviate slightly.

We obtained samples during our subsurface exploration in the borings using a California sampler. The sampler is composed of steel and is driven to obtain ring samples. The California sampler has an inside diameter of 2.5 inches and an outside diameter of 3 inches. Up to 18 rings are placed inside the sampler that are 2.4 inches in diameter and 1 inch in height. We obtained ring samples at appropriate intervals, placed them in moisture-tight containers, and transported them to the laboratory for testing. The type of sample is noted on the exploratory boring logs.

The samplers were driven 12 inches. The sampler is connected to A rods and driven into the bottom of the excavation using a 140-pound hammer with a 30-inch drop. Blow counts are recorded for every 6 inches the sampler is driven. If the sampler was not driven for 6 inches, an approximate value is calculated or the final 6-inch interval is reported. These values are not to be taken as N-values as adjustments have not been applied. We estimated elevations shown on the boring logs either from a topographic map or by using a benchmark. Each excavation was backfilled as noted on the boring logs.

We visually examined, classified, and logged the soil encountered in the trenches and borings in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). The logs depict the soil and geologic conditions observed and the depth at which samples were obtained.

SOIL BORING NUMBER: B - 1

GEOCON

PROJECT NAME Pacific Beach Hotel
LOGGED BY W. Buckley
PROJECT NUMBER G3422-52-01
LATITUDE / LONGITUDE 32.8036, -117.2169
DATE STARTED 10/21/2024 **COMPLETED** 10/21/2024
DEPTH 51.3' **SURFACE ELEVATION** ~22'
LOCATION Parking Lot
DRILLING FIRM Baja Exploration
RIG TYPE CME-75
METHOD HSA **BORING DIAMETER** 8 in
HAMMER TYPE Auto
HAMMER WEIGHT / DROP 140lbs / 30in

Depth (ft)	Elevation (ft)	Water Levels	USCS	Material Description	Bulk	Driven	Recovery Length (inches)	Sample Number	Penetration Resistance (blows/foot)	Dry Density (pcf)	Moisture Content (%)	Pocket Penetrometer (tsf)
0	22			4" ASPHALT CONCRETE								
	20		SM	**UNDOCUMENTED FILL** (**Qudf**) Medium dense, moist, dark brown, **Silty**, fine to medium **SAND**; some gravel and cobbles up to 5"	X			B1-1				
5			CL	Stiff, moist, dark brown, **Sandy CLAY**		■	12	B1-2	53	119.0	15.0	4.5+
	15											
10			SC	**BAY DEPOSITS** (**Qb**) Medium dense, moist, reddish brown to grayish brown, **Clayey**, fine to medium **SAND**; some gravel up to 2"		■	12	B1-3	35	116.9	14.7	2.0
	10											
15				-Becomes wet to saturated		■	12	B1-4	32	121.5	16.5	3.0
	5											
20						■	12	B1-5	25	112.1	16.6	
	0											
25				-Trace gravel up to 3"		■	12	B1-6	67			
27	-5	▼										

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN APPLIES ONLY TO THE SPECIFIC BORING OR TRENCH LOCATION AT THE DATE INDICATED AND MIGHT NOT REPRESENT SUBSURFACE CONDITIONS AT OTHER LOCATIONS OR TIMES. THE STRATIGRAPHY PRESENTED REPRESENTS THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; THESE TRANSITIONS COULD BE GRADUAL.

GEOCON

SOIL BORING: B-1

Depth (ft)	Elevation (ft)	Water Levels	Graphic Log	USCS	Material Description	Bulk	Driven	Recovery Length (inches)	Sample Number	Penetration Resistance (blows/foot)	Dry Density (pcf)	Moisture Content (%)	Pocket Penetrometer (tsf)
32	-10			ML	Stiff, moist, grayish brown, **SILT**; trace iron oxide staining			12	B1-7	60			1.0
34, 36	-15				-No recovery			0	B1-8	76			
38, 40				SM	Dense, saturated, grayish brown, **Silty**, fine to medium **SAND**; mottled with iron oxide staining			12	B1-9	58	109.5	19.8	1.0
42, 44, 46, 48	-20, -25			ML	**<u>OLD PARALIC DEPOSITS</u>** (**Qop**) Stiff, moist, reddish brown to grayish brown, **Sandy SILTSTONE**; mottled with iron oxide staining			12	B1-10	34	115.6	17.1	4.5+
50	-30			SM	Dense, wet to saturated, reddish brown to grayish brown, **Silty**, fine- to medium-grained **SANDSTONE**; few gravel up to 2.5"			10	B1-11	70/10"			

BORING TERMINATED AT 51.3 FEET
Groundwater encountered at 27 feet
Backfilled with 17.9 cubic feet of grout
Patched with Aquaphalt

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN APPLIES ONLY TO THE SPECIFIC BORING OR TRENCH LOCATION AT THE DATE INDICATED AND MIGHT NOT REPRESENT SUBSURFACE CONDITIONS AT OTHER LOCATIONS OR TIMES. THE STRATIGRAPHY PRESENTED REPRESENTS THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; THESE TRANSITIONS COULD BE GRADUAL.

GEOCON

SOIL BORING NUMBER: B - 2

PROJECT NAME Pacific Beach Hotel

PROJECT NUMBER G3422-52-01

DATE STARTED 10/21/2024 **COMPLETED** 10/21/2024

LOCATION Parking Lot

DRILLING FIRM Baja Exploration

METHOD HSA **BORING DIAMETER** 8 in

LOGGED BY W. Buckley

LATITUDE / LONGITUDE 32.8038, -117.2166

DEPTH 41.5' **SURFACE ELEVATION** ~27'

RIG TYPE CME-75

HAMMER TYPE Auto

HAMMER WEIGHT / DROP 140lbs / 30in

Depth (ft)	Elevation (ft)	Water Levels	Graphic Log	USCS	Material Description	Bulk	Driven	Recovery Length (inches)	Sample Number	Penetration Resistance (blows/foot)	Dry Density (pcf)	Moisture Content (%)	Pocket Penetrometer (tsf)
0	27				4" ASPHALT CONCRETE								
1				CL	**UNDOCUMENTED FILL** (**Qudf**) Firm, moist, dark brown, **Sandy CLAY**; some gravel and cobbles up to 6"	X			B2-1				
3					-Becomes grayish brown, mottled with iron oxide staining -Becomes stiff, grayish brown to reddish brown								
5							■	12	B2-2	27	106.2	20.9	4.5
9				SC	**BAY DEPOSITS** (**Qb**) Medium dense, moist, reddish brown to grayish brown, **Clayey**, fine to medium **SAND**; trace gravel up to 1.5"								
10							■	12	B2-3	47	108.7	8.2	4.0
15				SM	Dense, moist, grayish brown, **Silty**, fine to medium **SAND**		■	12	B2-4	31	110.4	16.8	
20					-Becomes wet to saturated		■	11	B2-5	83/11"	109.2	19.2	
24		▼											
25				ML	Stiff, moist, reddish brown to gray, **Clayey SILT**		■	12	B2-6	44	100.2	27.2	4.0

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28. Elevation scale: 27, 25, 20, 15, 10, 5, 0.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN APPLIES ONLY TO THE SPECIFIC BORING OR TRENCH LOCATION AT THE DATE INDICATED AND MIGHT NOT REPRESENT SUBSURFACE CONDITIONS AT OTHER LOCATIONS OR TIMES. THE STRATIGRAPHY PRESENTED REPRESENTS THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; THESE TRANSITIONS COULD BE GRADUAL.

GEOCON

SOIL BORING: B-2

Depth (ft)	Elevation (ft)	Water Levels	Graphic Log	USCS	Material Description	Bulk	Driven	Recovery Length (inches)	Sample Number	Penetration Resistance (blows/foot)	Dry Density (pcf)	Moisture Content (%)	Pocket Penetrometer (tsf)
				ML				12	B2-7	37	98.4	25.9	2.5
32	-5			SM	Medium dense, wet, reddish brown to grayish brown, **Silty**, fine to medium **SAND**; mottled with iron oxide staining								
34													
36								12	B2-8	56	110.7	19.3	2.5
38	-10												
40				SM	**<u>OLD PARALIC DEPOSITS</u>** (**Qop**) Dense, wet, reddish brown to grayish brown, **Silty**, fine-grained **SANDSTONE**; mottled with iron oxide staining			12	B2-9	65	115.8	16.6	4.5+
	-15												

BORING TERMINATED AT 41.5 FEET
Groundwater encountered at 24 feet
Backfilled with 14.5 cubic feet of grout
Patched with Aquaphalt

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN APPLIES ONLY TO THE SPECIFIC BORING OR TRENCH LOCATION AT THE DATE INDICATED AND MIGHT NOT REPRESENT SUBSURFACE CONDITIONS AT OTHER LOCATIONS OR TIMES. THE STRATIGRAPHY PRESENTED REPRESENTS THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; THESE TRANSITIONS COULD BE GRADUAL.

GEOCON

SOIL BORING NUMBER: B - 3

PROJECT NAME Pacific Beach Hotel
LOGGED BY W. Buckley
PROJECT NUMBER G3422-52-01
LATITUDE / LONGITUDE 32.8038, -117.2172
DATE STARTED 10/21/2024 **COMPLETED** 10/21/2024
DEPTH 20' **SURFACE ELEVATION** ~22'
LOCATION Parking Lot
DRILLING FIRM Baja Exploration
RIG TYPE CME-75
METHOD HSA **BORING DIAMETER** 8 in
HAMMER TYPE Auto
HAMMER WEIGHT / DROP 140lbs / 30in

Depth (ft)	Elevation (ft)	Water Levels	Graphic Log	USCS	Material Description	Bulk	Driven	Recovery Length (inches)	Sample Number	Penetration Resistance (blows/foot)	Dry Density (pcf)	Moisture Content (%)	Pocket Penetrometer (tsf)
0	22				4" ASPHALT CONCRETE								
				SM	**UNDOCUMENTED FILL** (**Qudf**) Medium dense, moist, dark brown, **Silty**, fine to medium **SAND**; few gravel and cobbles up to 6"	X			B3-1				
2	20							6	B3-2	50/6"	109.7	6.7	1.0
4					-Becomes dense			10	B3-3	71/10"		5.9	1.0
6	15												
8													
10					-No recovery			0	B3-4	50/6"			
12	10			CL	Stiff, moist, dark brown, **Sandy CLAY**								
14													
15				SC	**BAY DEPOSITS** (**Qb**) Dense, moist to wet, reddish brown, **Clayey**, fine to medium **SAND**			12	B3-5	61	109.9	14.7	2.5
16	5												
18													
19				ML	Stiff, moist, reddish brown, **Clayey SILT**			12	B3-6	60	99.7	25.1	4.5+
20													

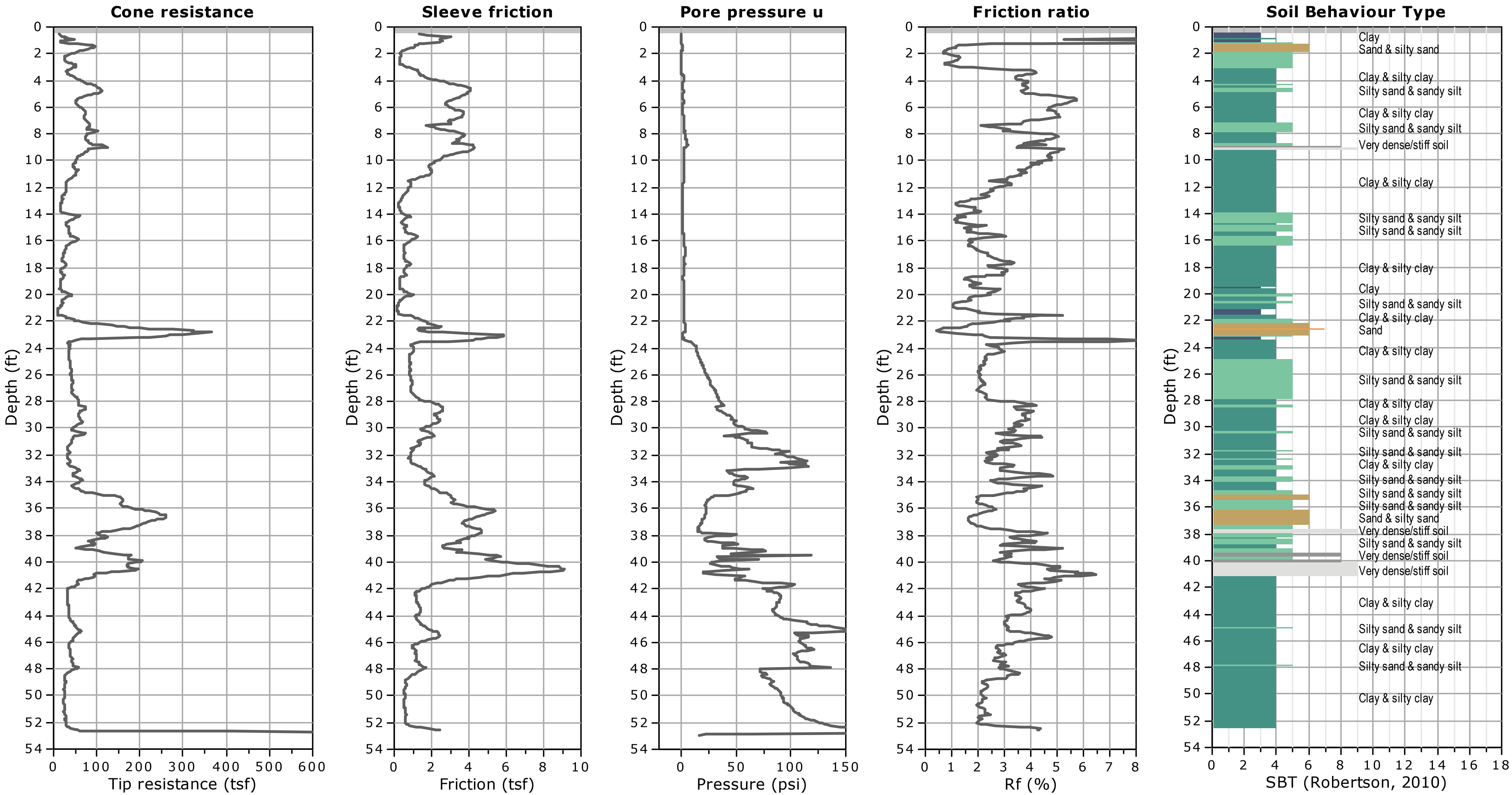
BORING TERMINATED AT 20 FEET
No groundwater encountered
Backfilled with spoils
Patched with Aquaphalt

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN APPLIES ONLY TO THE SPECIFIC BORING OR TRENCH LOCATION AT THE DATE INDICATED AND MIGHT NOT REPRESENT SUBSURFACE CONDITIONS AT OTHER LOCATIONS OR TIMES. THE STRATIGRAPHY PRESENTED REPRESENTS THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; THESE TRANSITIONS COULD BE GRADUAL.

Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Geocon / Pacific Beach Hotel**
Location: **4545 Mission Bay Dr, Mission Bay, CA**

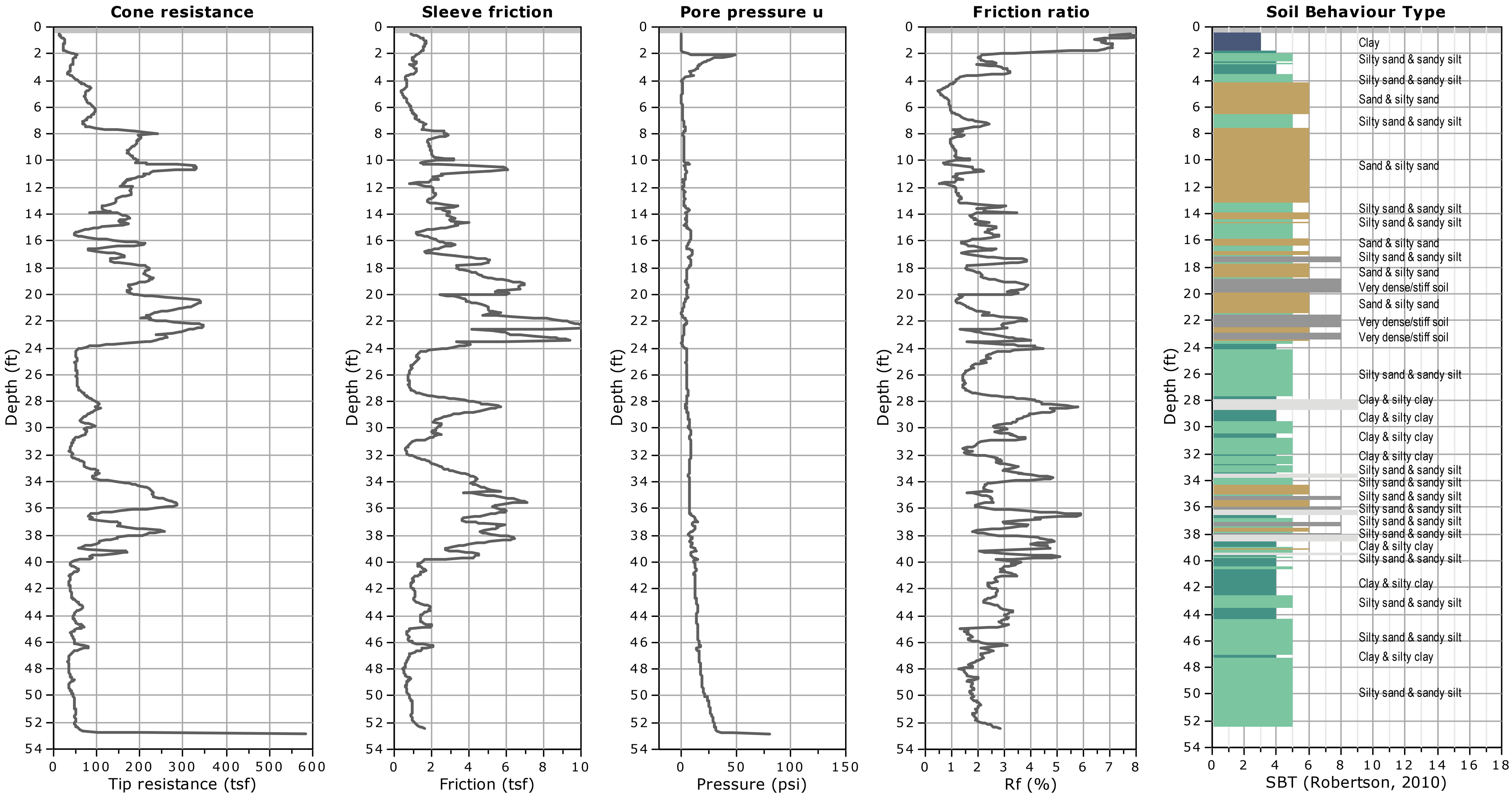
CPT-1
Total depth: 52.96 ft, Date: 10/22/2024



Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: Geocon / Pacific Beach Hotel
Location: 4545 Mission Bay Dr, Mission Bay, CA

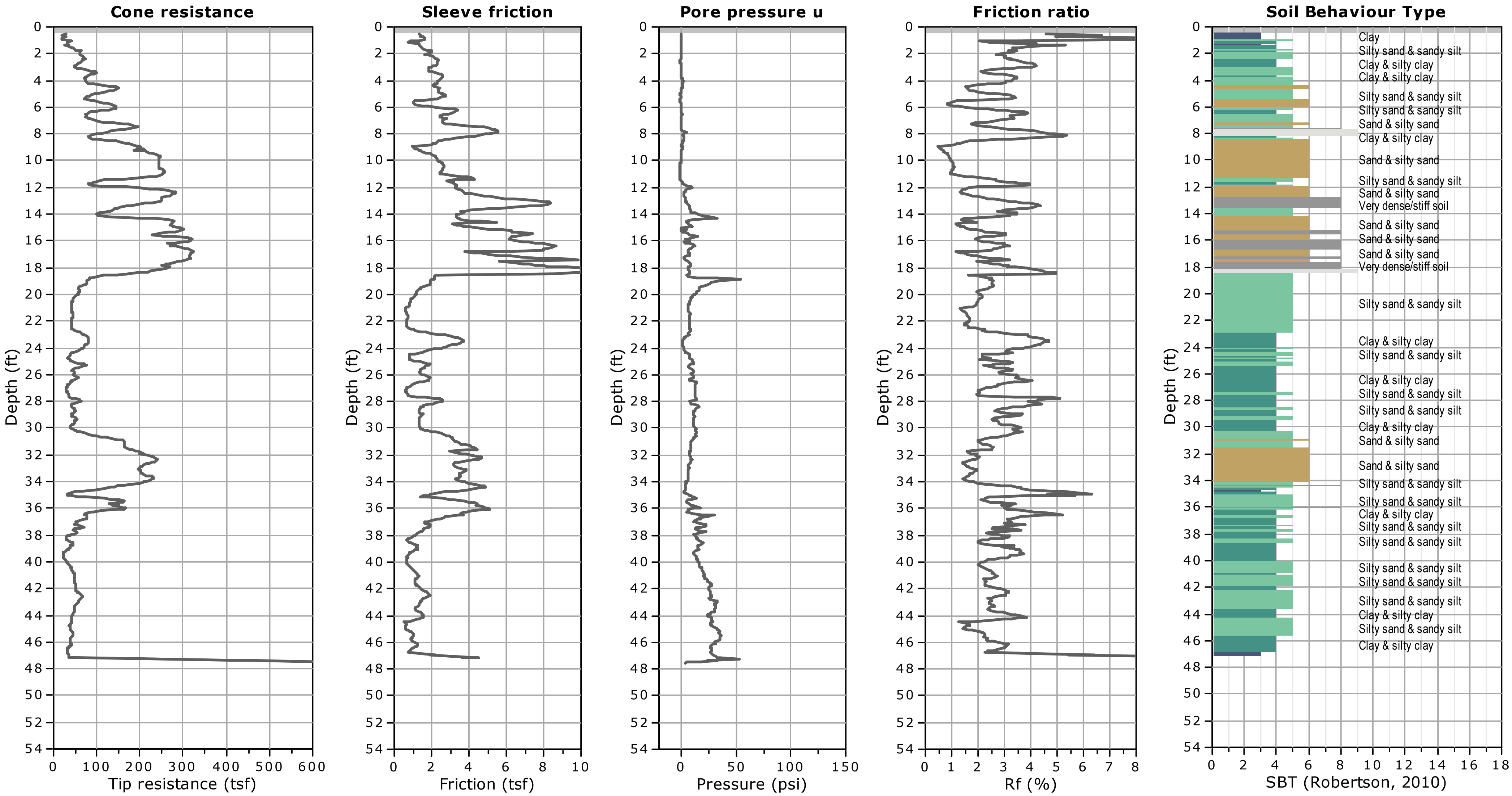
CPT-2
Total depth: 52.83 ft, Date: 10/22/2024



Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Geocon / Pacific Beach Hotel**
Location: **4545 Mission Bay Dr, Mission Bay, CA**

CPT-3
Total depth: 47.58 ft, Date: 10/22/2024



APPENDIX B

APPENDIX B
LABORATORY TESTING

We performed laboratory tests in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected soil samples for maximum density/optimum moisture content, expansion index, water-soluble sulfate, pH, resistivity, water-soluble chloride ion content, R-Value, direct shear strength, consolidation, and gradation characteristics. The results of our current laboratory tests are presented herein. The in-place dry density and moisture content of the samples tested are presented on the boring logs in Appendix A.

SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS ASTM D 1557

Sample No.	Description (Geologic Unit)	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
B1-1	Dark Brown, Silty, fine to medium SAND (SM), some gravel and cobbles	130.5	8.1

SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	2022 CBC Expansion Classification	ASTM Soil Expansion Classification
	Before Test	After Test				
B2-1	10.0	24.5	108.8	79	Expansive	Medium
B3-1	7.1	12.1	120.8	0	Non-Expansive	Very Low

SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS CALIFORNIA TEST NO. 417

Sample No.	Depth (Feet)	Geologic Unit	Water-Soluble Sulfate (%)	ACI 318 Sulfate Exposure
B2-1	1-4	Qudf	0.039	S0

SUMMARY OF LABORATORY CHLORIDE TEST RESULTS
AASHTO T 291

Sample No.	Depth (Feet)	Geologic Unit	Chloride Ion Content (ppm)	Chloride Ion Content (%)
B2-1	1-4	Qudf	321	0.032

SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (PH) AND RESISTIVITY TEST RESULTS
CALIFORNIA TEST NO. 643

Sample No.	Depth (Feet)	Geologic Unit	pH	Minimum Resistivity (ohm-centimeters)
B2-1	1-4	Qudf	8.1	620

SUMMARY OF LABORATORY RESISTANCE VALUE (R-VALUE) TEST RESULTS
ASTM D 2844

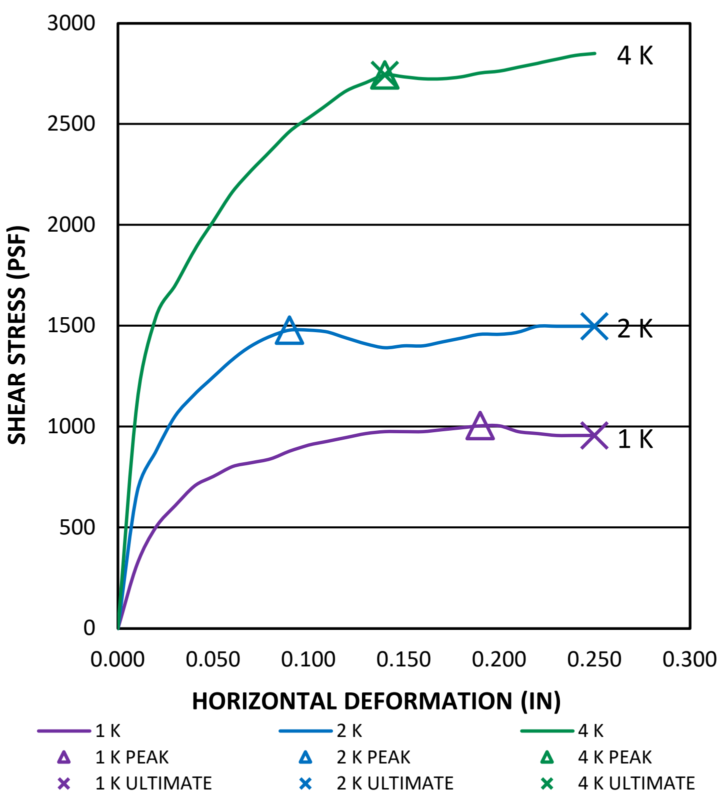
Sample No.	Depth (Feet)	Description (Geologic Unit)	R-Value
B1-1	1-5	Dark Brown, Silty, fine to medium SAND (SM), some gravel and cobbles	52

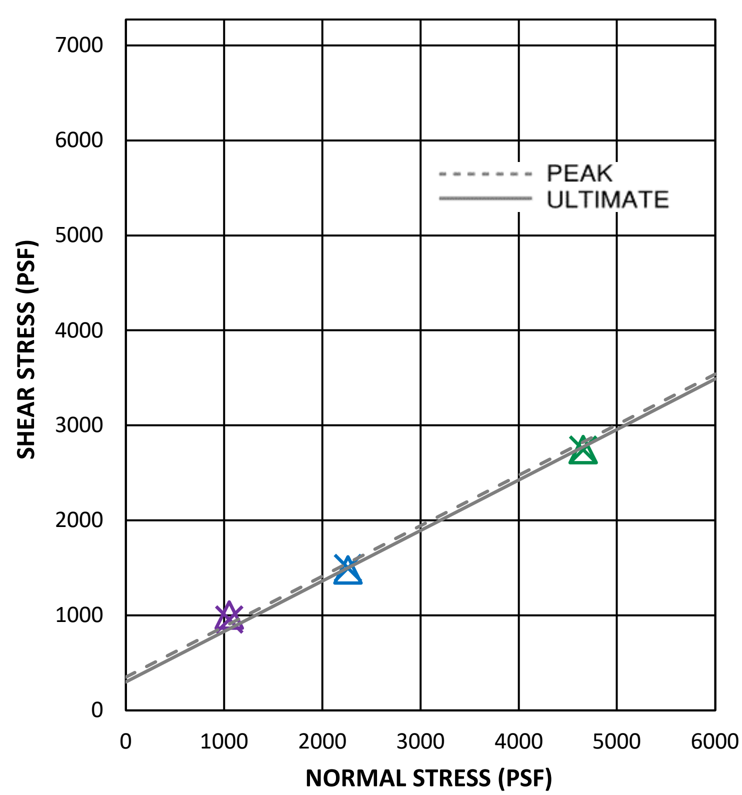
SAMPLE NO.:	B2-7	GEOLOGIC UNIT:	Qb
SAMPLE DEPTH (FT):	50'	NATURAL/REMOLDED:	N

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
ACTUAL NORMAL STRESS (PSF):	1053.8	2261.4	4657.4	--
WATER CONTENT (%):	24.9	26.4	26.3	25.9
DRY DENSITY (PCF):	99.4	97.9	97.9	98.4

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
WATER CONTENT (%):	24.9	26.5	26.4	26.0
PEAK SHEAR STRESS (PSF):	1005	1478	2744	--
ULT.-E.O.T. SHEAR STRESS (PSF):	957	1498	2744	--

RESULTS		
PEAK	COHESION, C (PSF)	350
	FRICTION ANGLE (DEGREES)	28
ULTIMATE	COHESION, C (PSF)	300
	FRICTION ANGLE (DEGREES)	28





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INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
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DIRECT SHEAR - AASHTO T-236

PACIFIC BEACH HOTEL

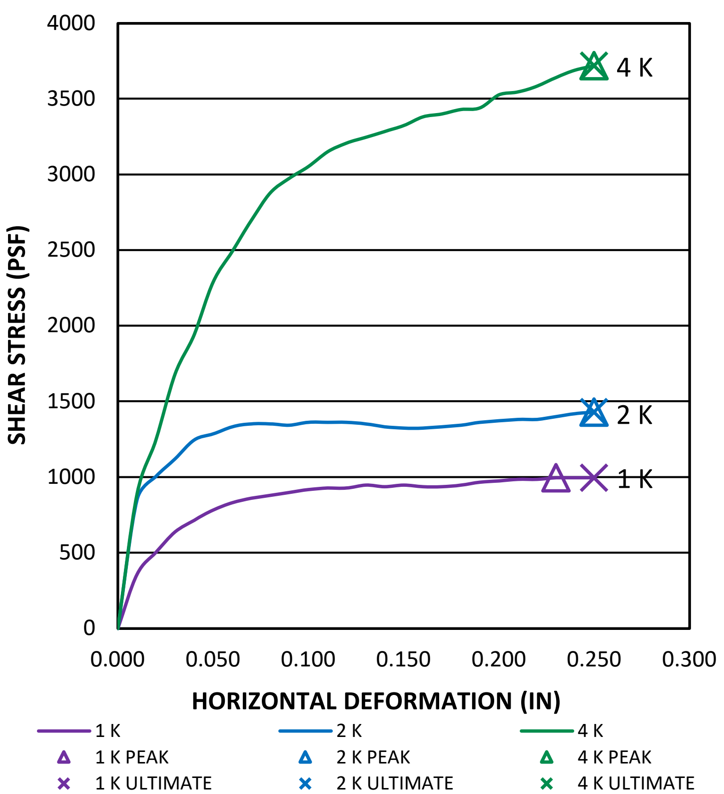
PROJECT NO.: G3422-52-01

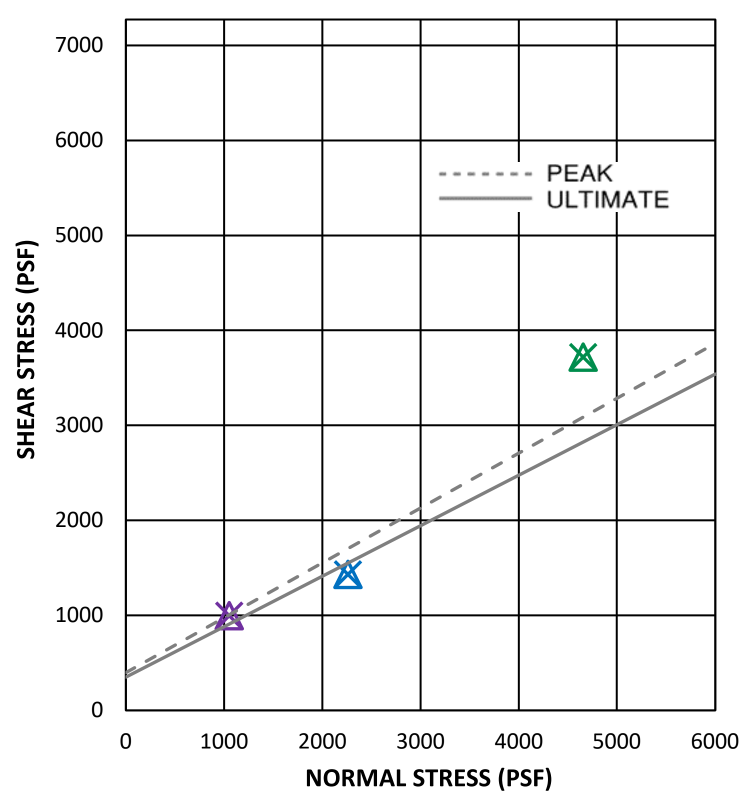
SAMPLE NO.:	B3-2	GEOLOGIC UNIT:	Qudf
SAMPLE DEPTH (FT):	2.5'	NATURAL/REMOLDED:	N

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
ACTUAL NORMAL STRESS (PSF):	1053.8	2261.4	4657.4	--
WATER CONTENT (%):	7.2	6.4	6.6	6.7
DRY DENSITY (PCF):	110.3	107.7	111.1	109.7

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
WATER CONTENT (%):	15.2	15.7	14.9	15.3
PEAK SHEAR STRESS (PSF):	995	1430	3720	--
ULT.-E.O.T. SHEAR STRESS (PSF):	995	1430	3720	--

RESULTS		
PEAK	COHESION, C (PSF)	400
	FRICTION ANGLE (DEGREES)	30
ULTIMATE	COHESION, C (PSF)	350
	FRICTION ANGLE (DEGREES)	28





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DIRECT SHEAR - AASHTO T-236

PACIFIC BEACH HOTEL

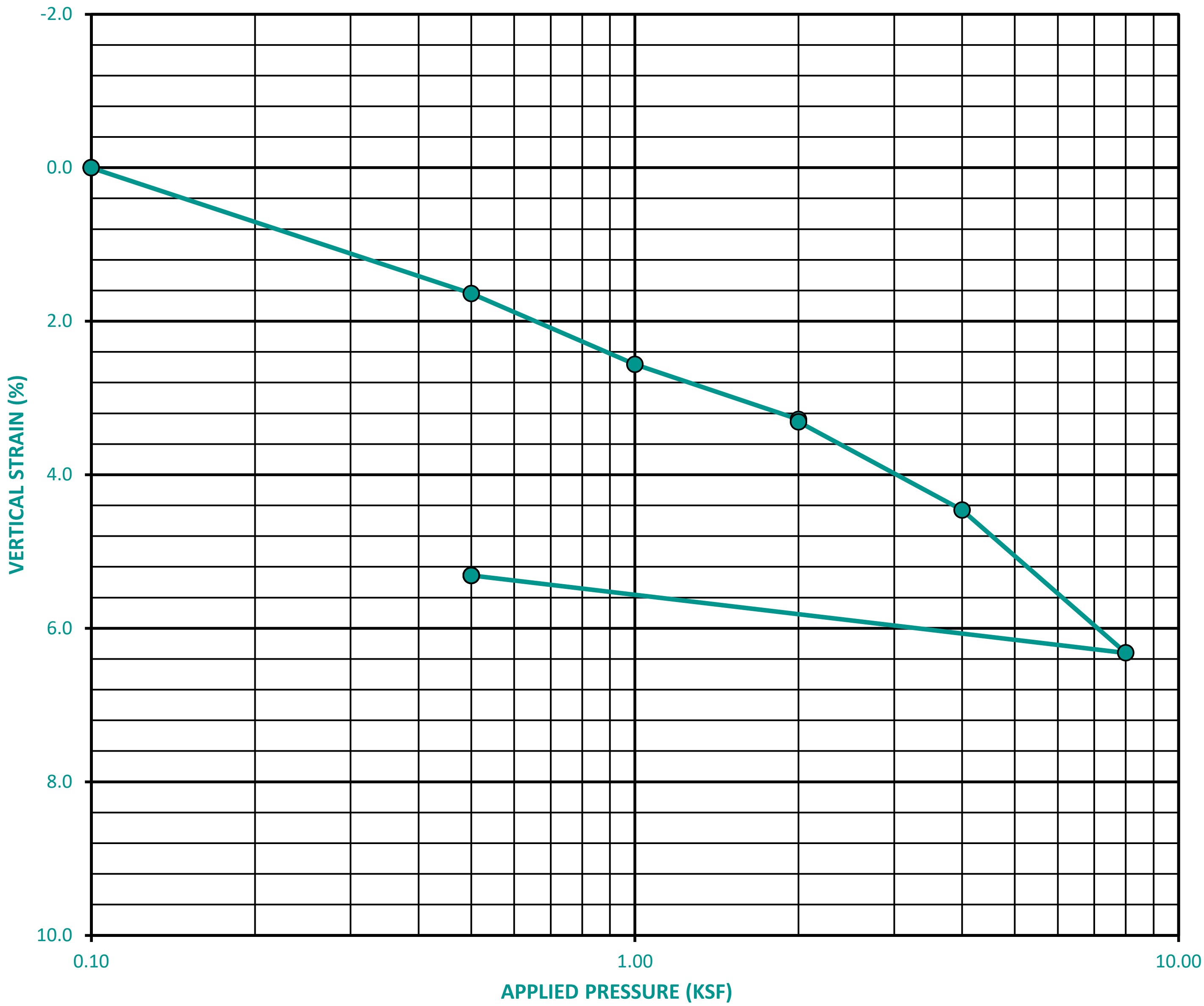
PROJECT NO.: G3422-52-01

SAMPLE NO.: B1-4

SAMPLE DEPTH (FT): 15'

GEOLOGIC UNIT: Qb

TEST INFORMATION	
INITIAL DRY DENSITY (PCF):	121.5
INITIAL WATER CONTENT (%):	16.5%
SAMPLE SATURATED AT (KSF):	2.0
INITIAL SATURATION (%):	100+



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CONSOLIDATION CURVE - ASTM D 2435

PACIFIC BEACH HOTEL

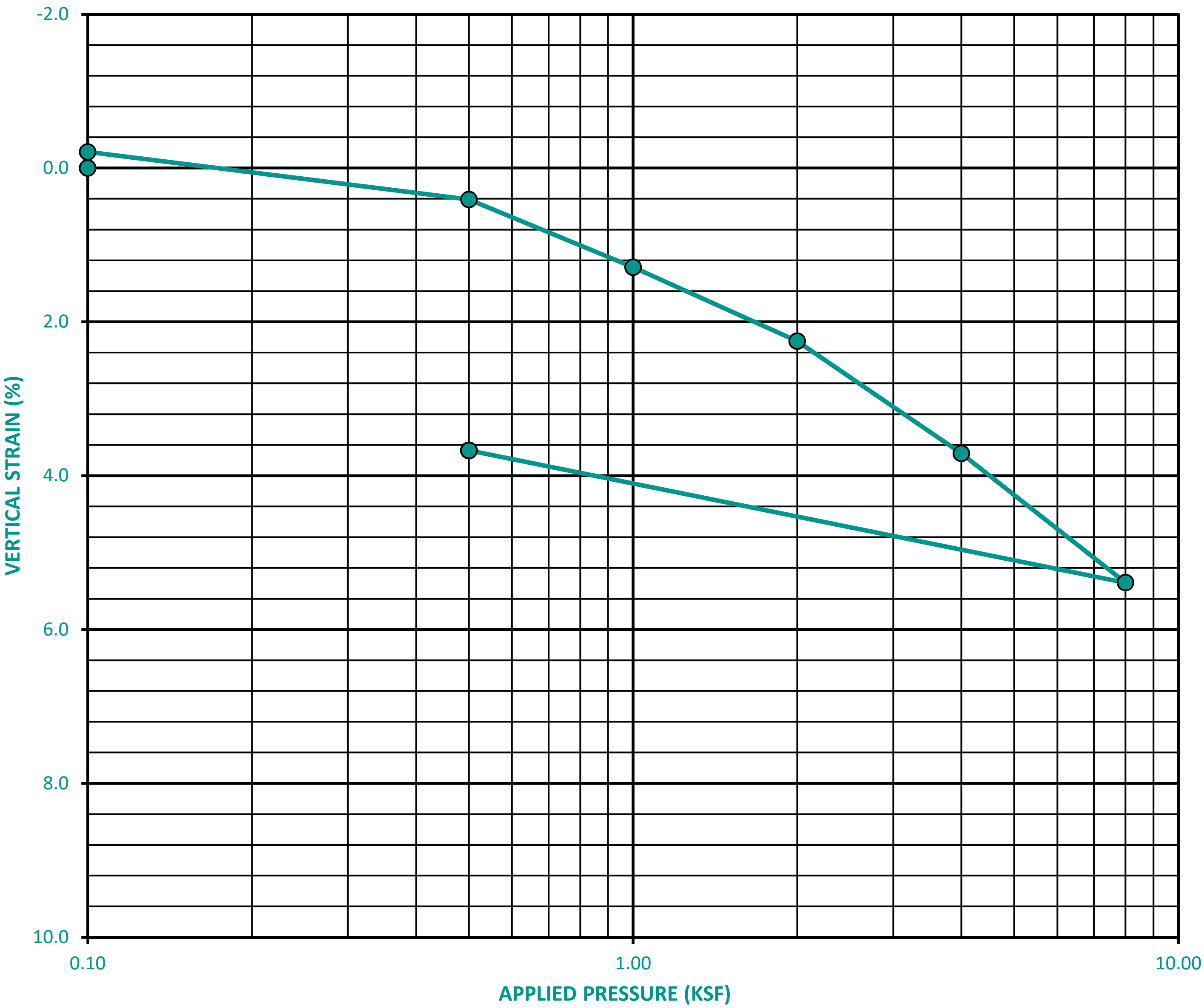
PROJECT NO.: G3422-52-01

SAMPLE NO.: B2-6

SAMPLE DEPTH (FT): 25'

GEOLOGIC UNIT: Qb

TEST INFORMATION	
INITIAL DRY DENSITY (PCF):	100.2
INITIAL WATER CONTENT (%):	27.2%
SAMPLE SATURATED AT (KSF):	.1
INITIAL SATURATION (%):	100+



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CONSOLIDATION CURVE - ASTM D 2435

PACIFIC BEACH HOTEL

PROJECT NO.: G3422-52-01

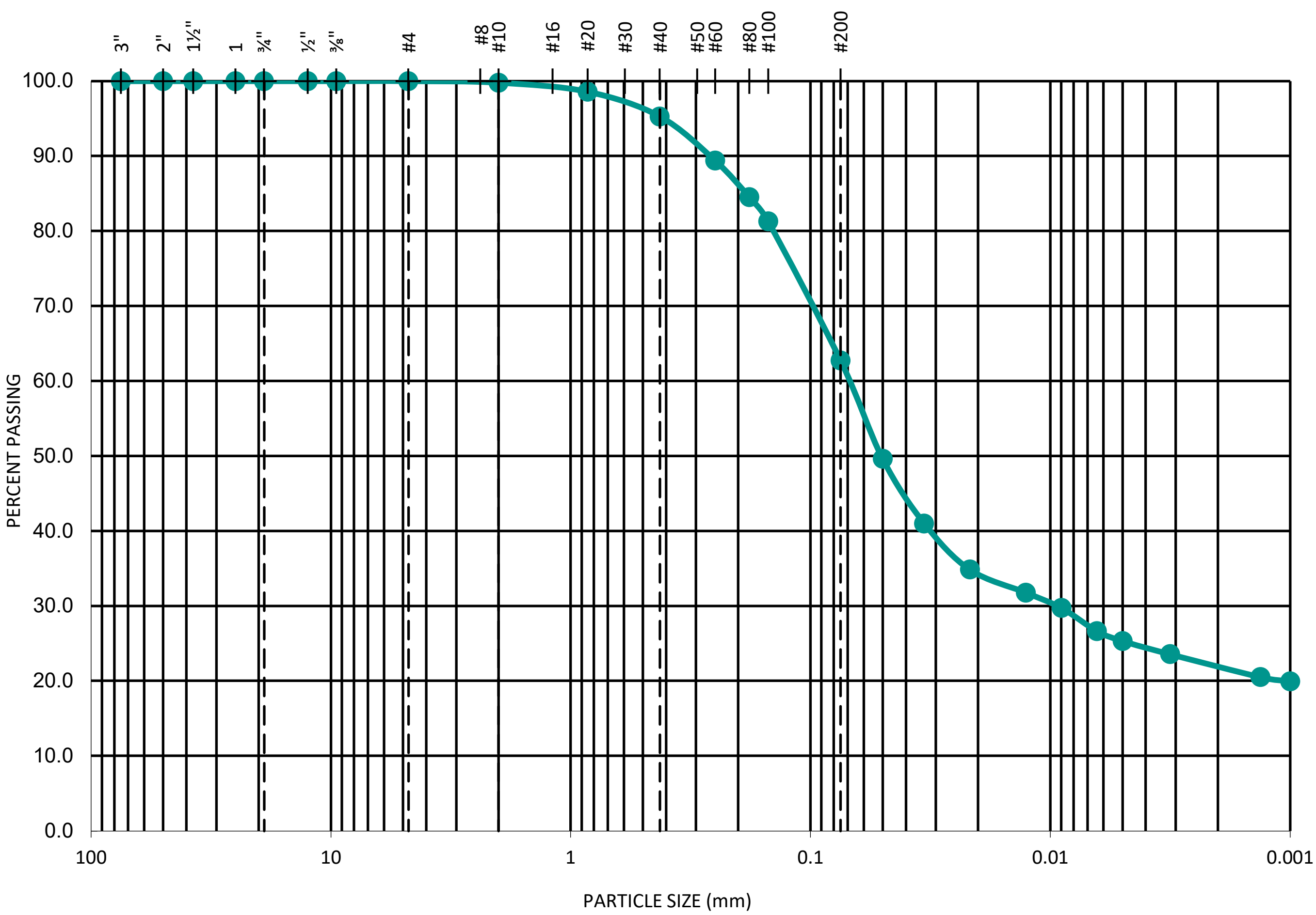
SAMPLE NO.: **B1-10**

SAMPLE DEPTH (FT.): **45'**

GEOLOGIC UNIT: **Qop**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
--	0.00948	0.06979	--	--	Sandy SILTSTONE

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SIEVE ANALYSES - ASTM D 135 & D 422

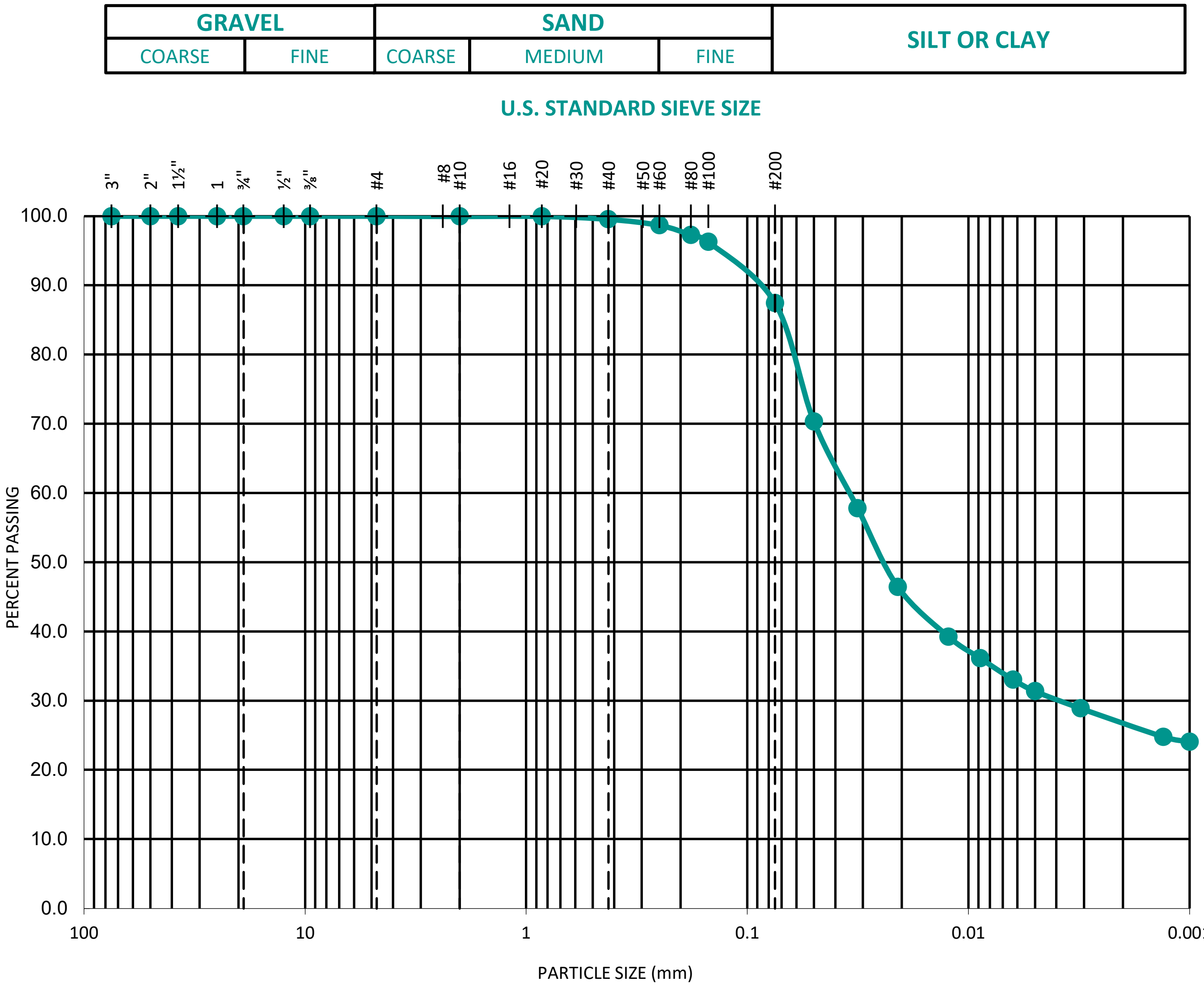
PACIFIC BEACH HOTEL

PROJECT NO.: G3422-52-01

SAMPLE NO.: **B2-2**

SAMPLE DEPTH (FT.): **5'**

GEOLOGIC UNIT: **Qudf**



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
--	0.00395	0.03495	--	--	Sandy CLAY

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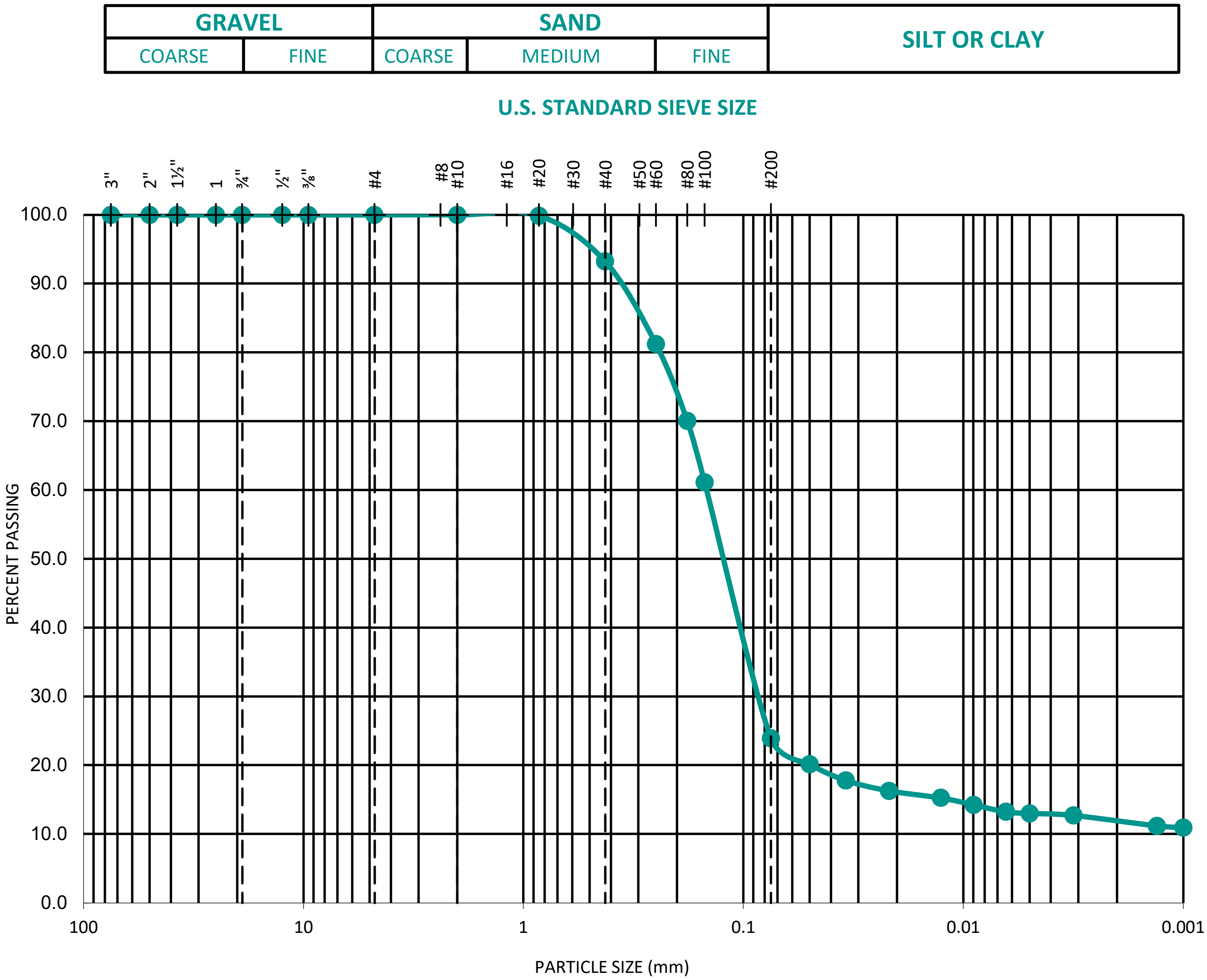
SIEVE ANALYSES - ASTM D 135 & D 422

PACIFIC BEACH HOTEL

PROJECT NO.: G3422-52-01

SAMPLE NO.: **B2-5** GEOLOGIC UNIT: **Qb**

SAMPLE DEPTH (FT.): **20'**



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
--	0.08726	0.14773	--	--	Silty SAND

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SIEVE ANALYSES - ASTM D 135 & D 422

PACIFIC BEACH HOTEL

PROJECT NO.: G3422-52-01

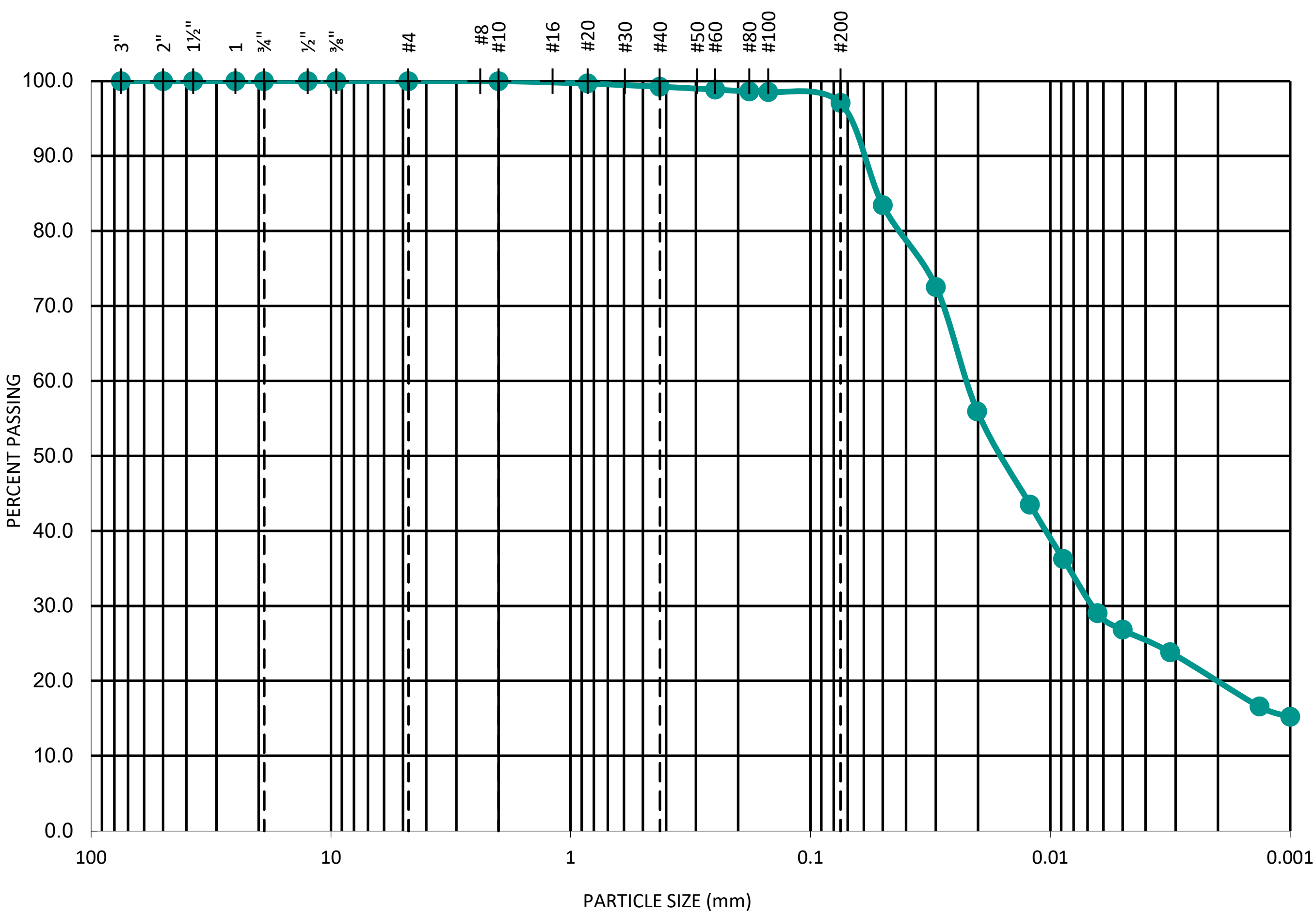
SAMPLE NO.: **B3-6**

SAMPLE DEPTH (FT.): **20'**

GEOLOGIC UNIT: **Qb**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
--	0.00668	0.02257	--	--	Clayey SILT

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SIEVE ANALYSES - ASTM D 135 & D 422

PACIFIC BEACH HOTEL

PROJECT NO.: G3422-52-01

APPENDIX C

APPENDIX C

LIQUEFACTION ANALYSIS

FOR

PACIFIC BEACH HOTEL
SAN DIEGO, CALIFORNIA

PROJECT NO. G3422-52-01

Geocon Incorporated

http://www.geoconinc.com

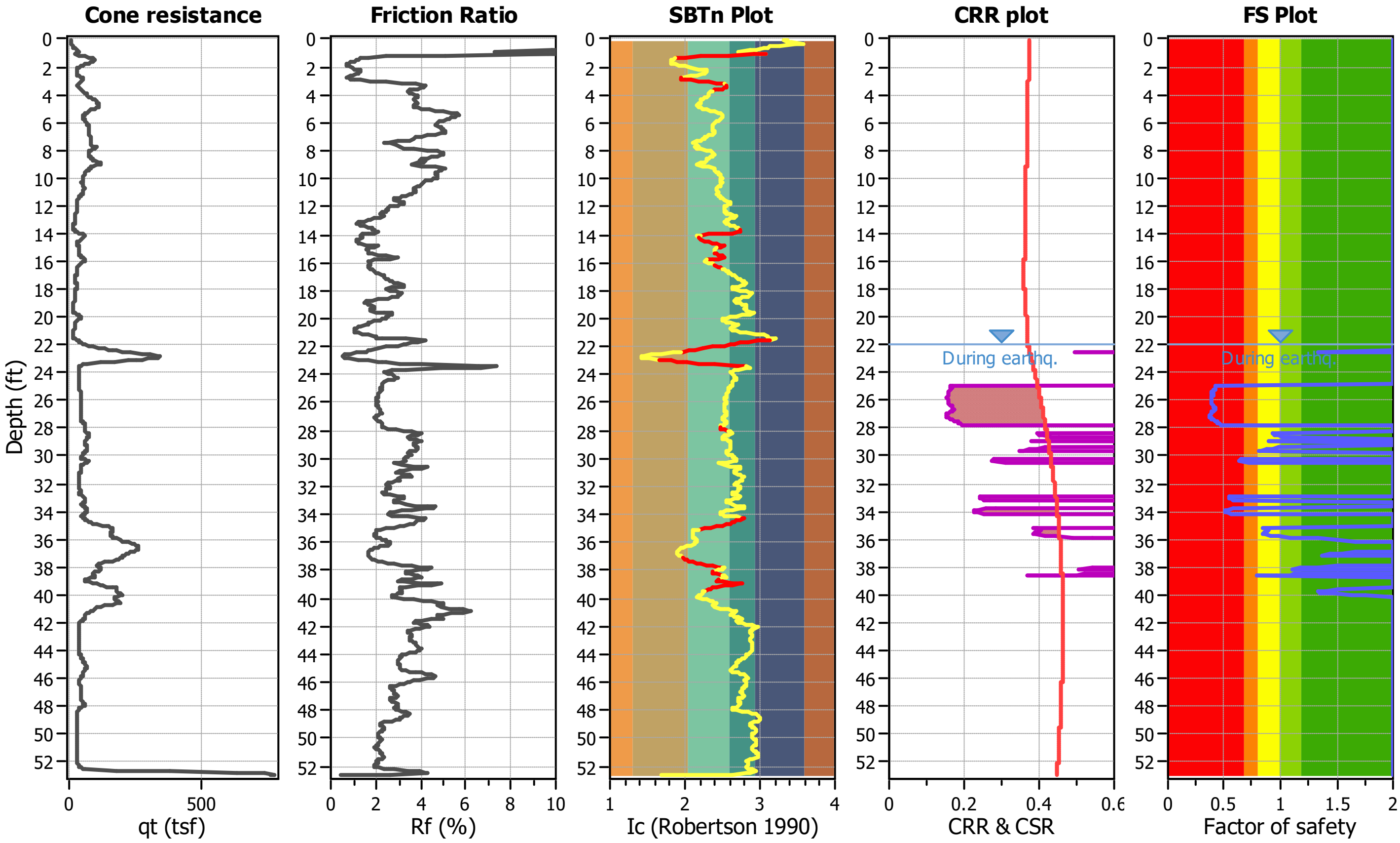
LIQUEFACTION ANALYSIS REPORT

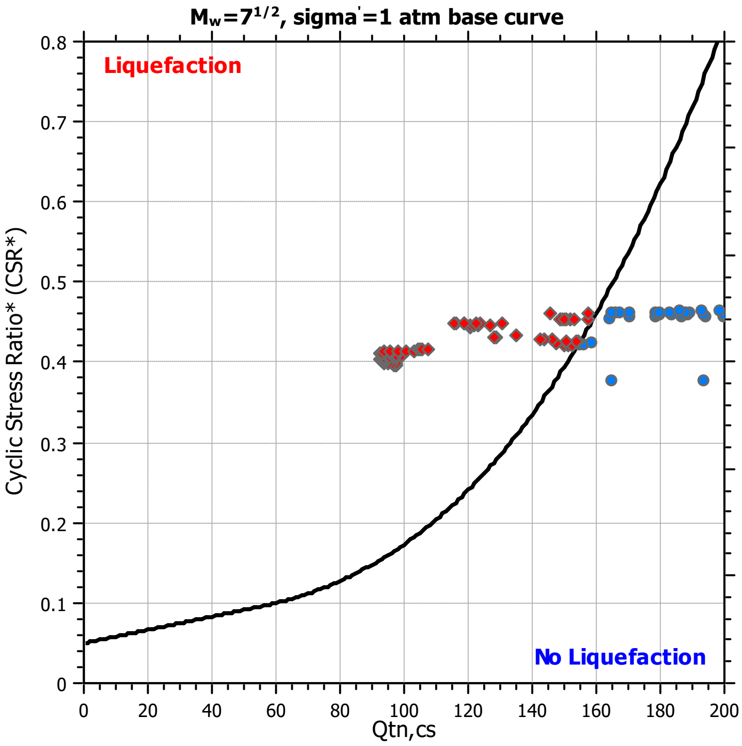
Project title : **Location :**

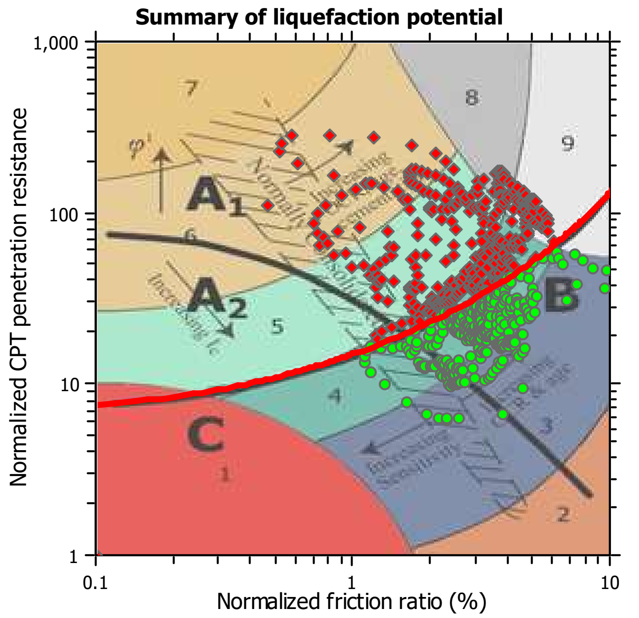
CPT file : CPT-1

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	24.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	22.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.71	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

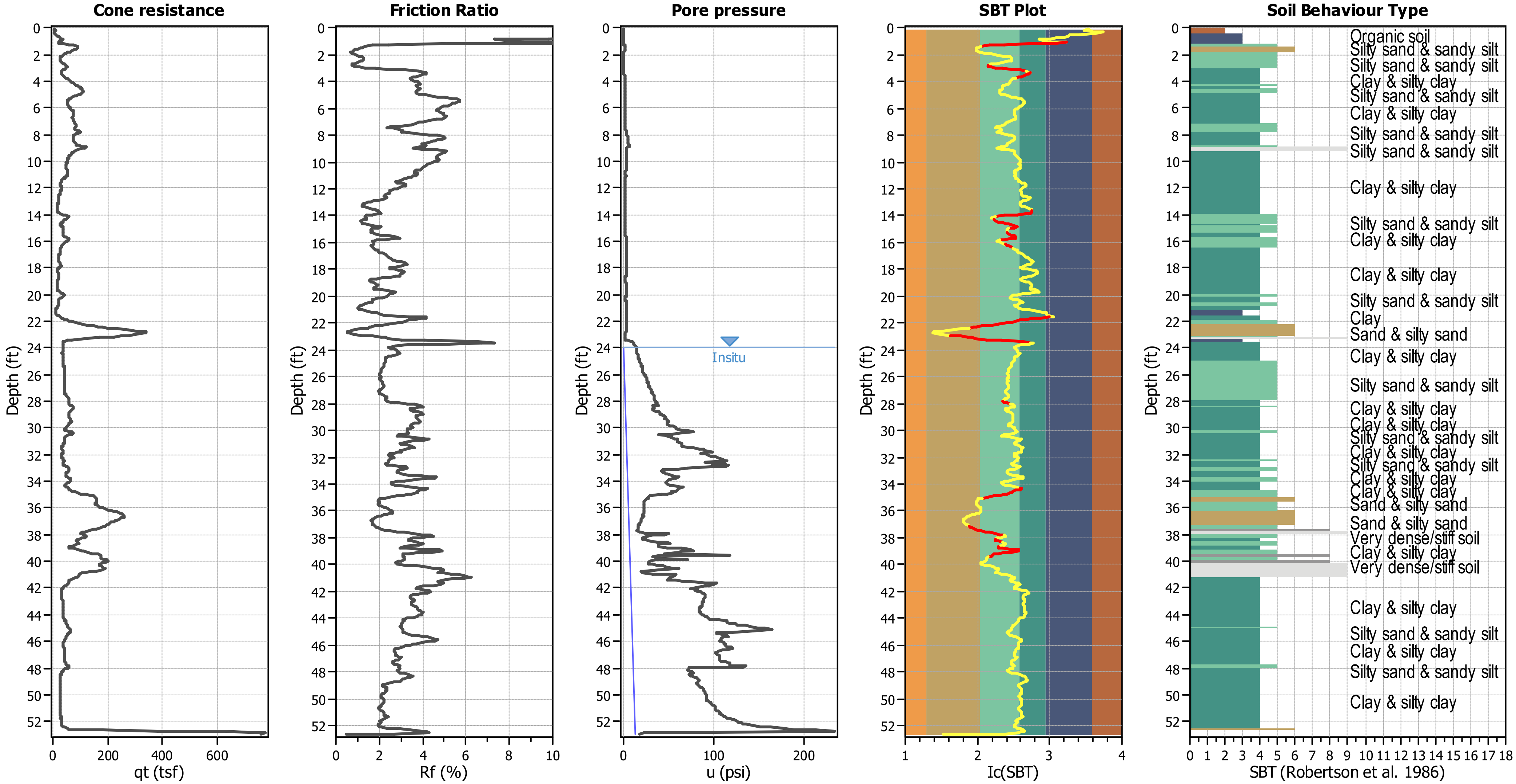






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



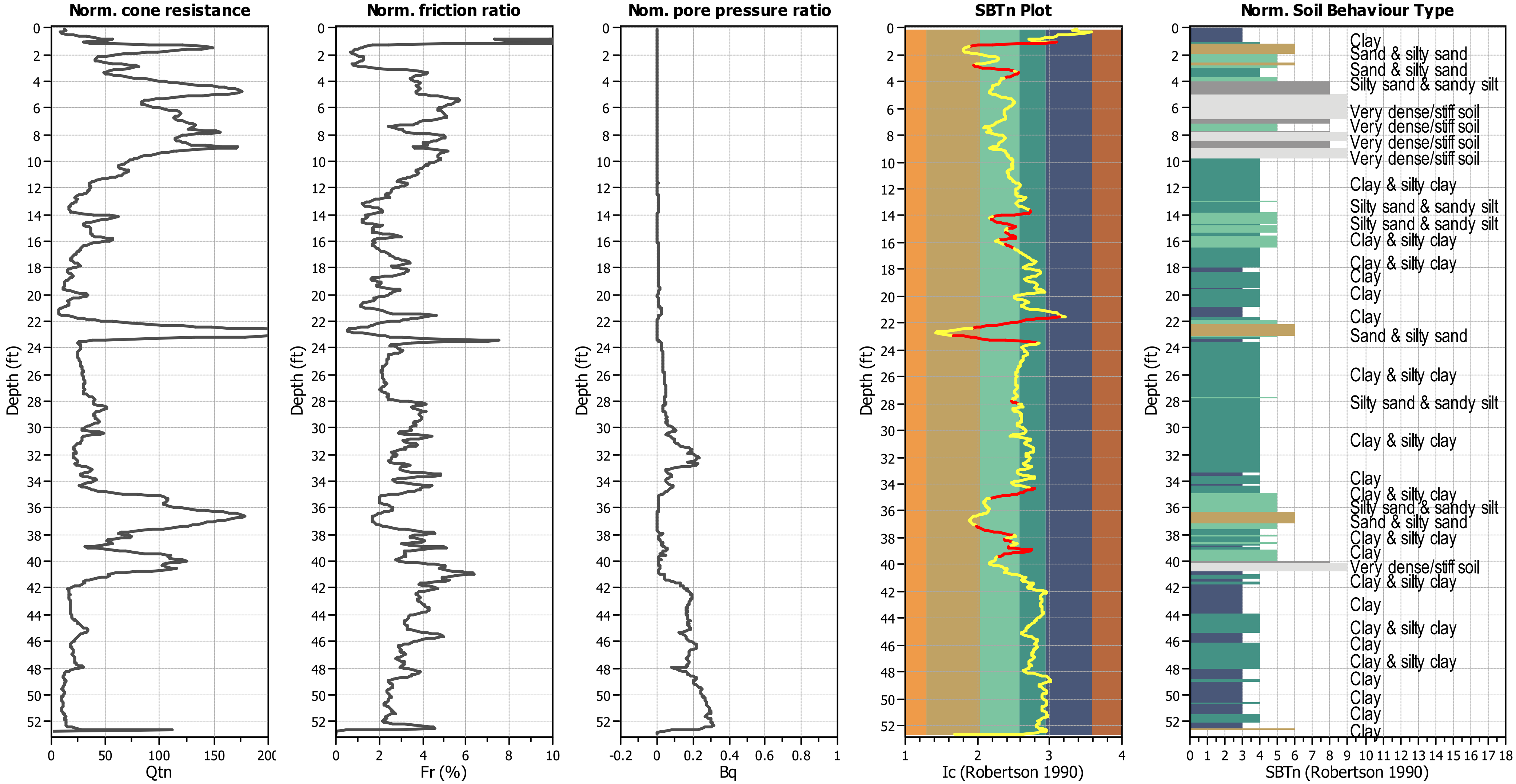
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBT legend

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

CPT basic interpretation plots (normalized)



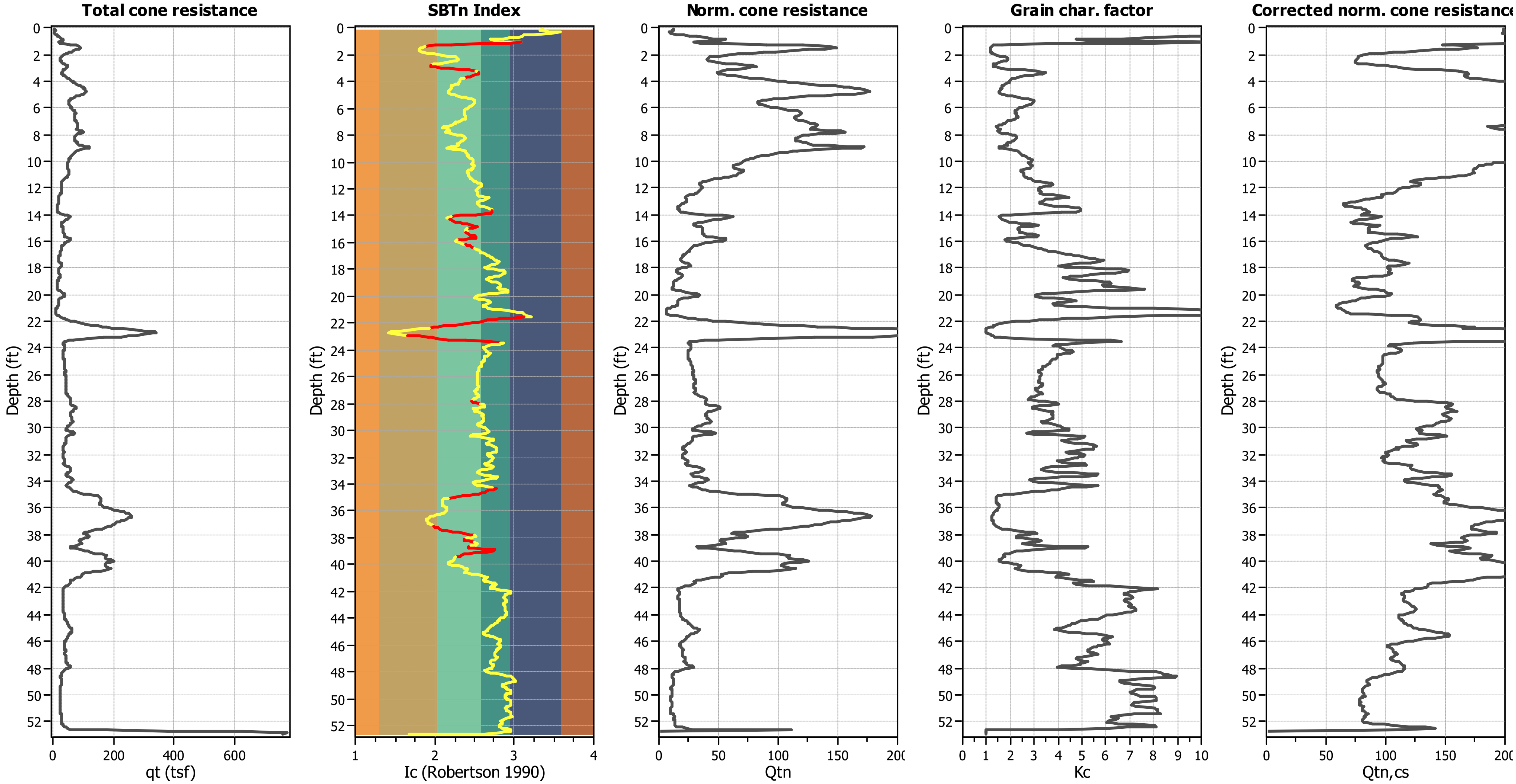
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBTn legend

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

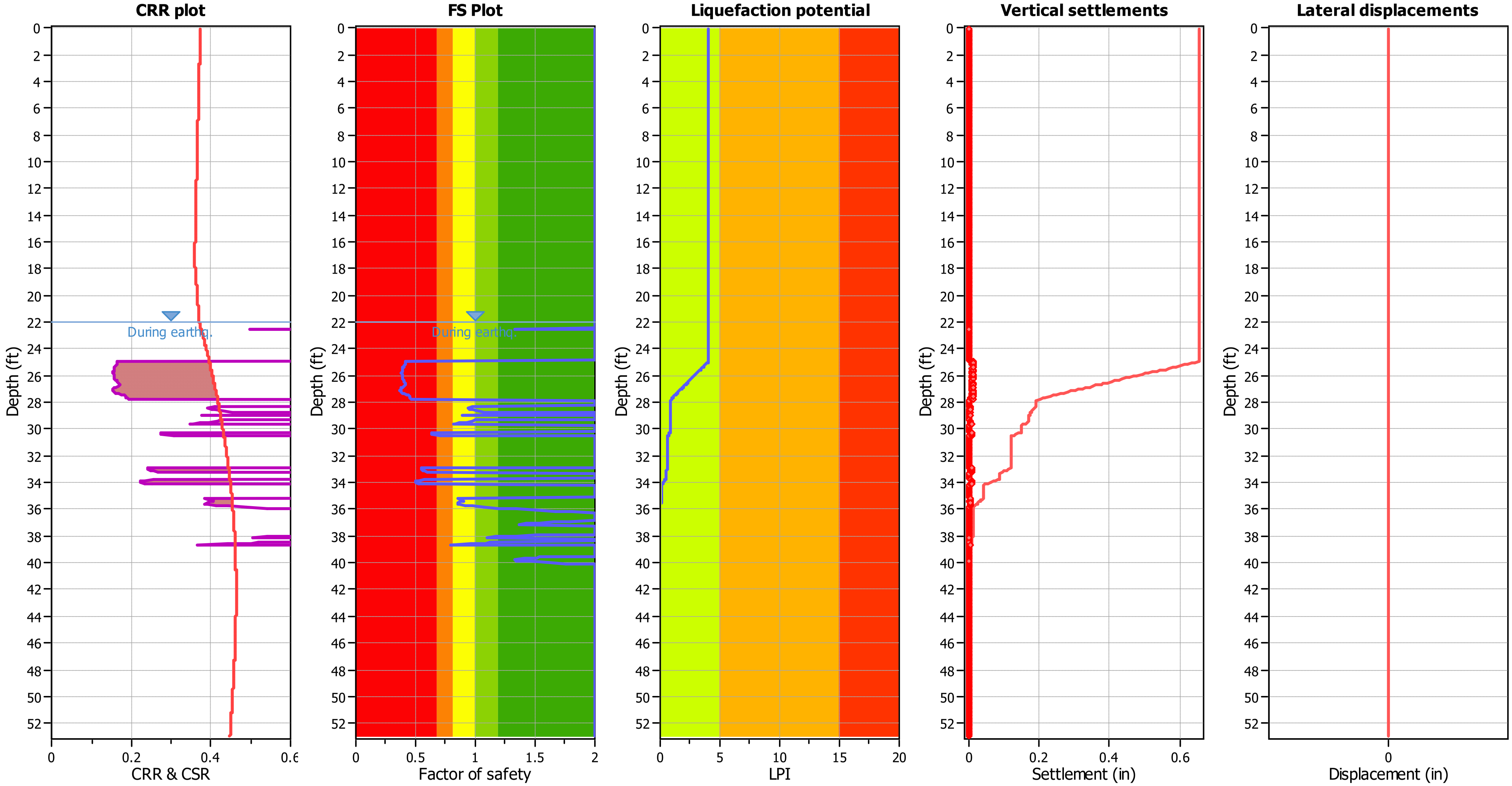
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

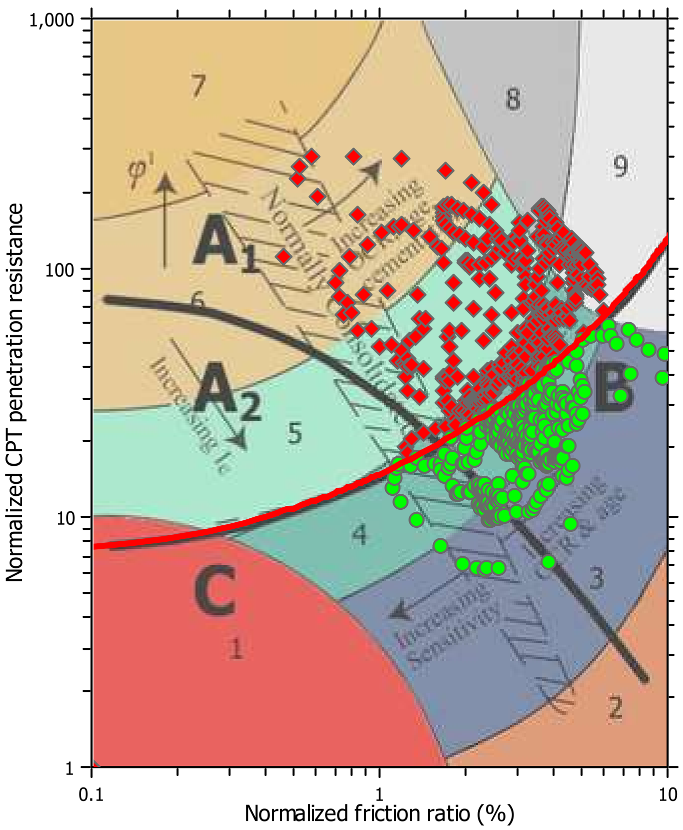
F.S. color scheme

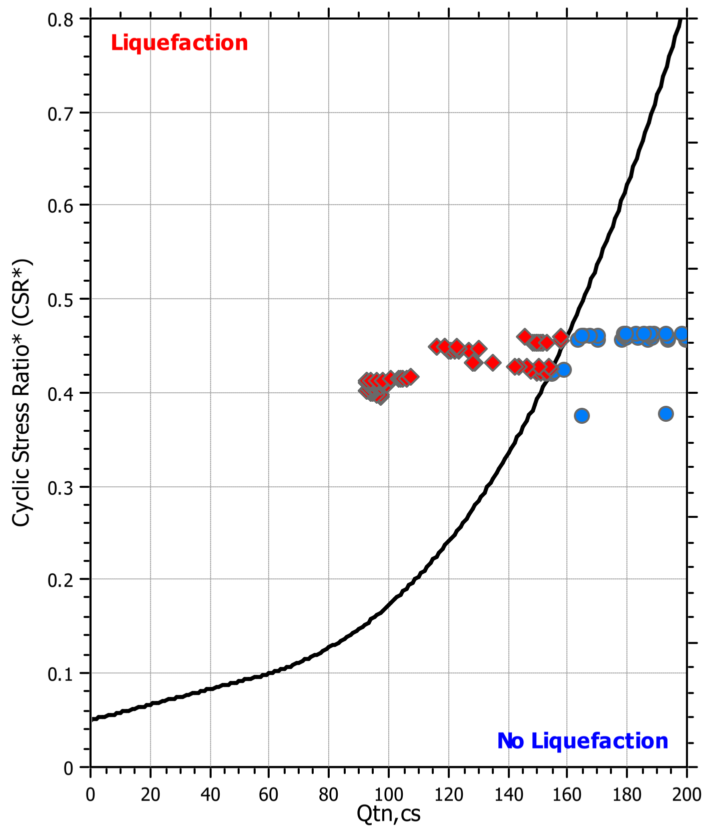
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

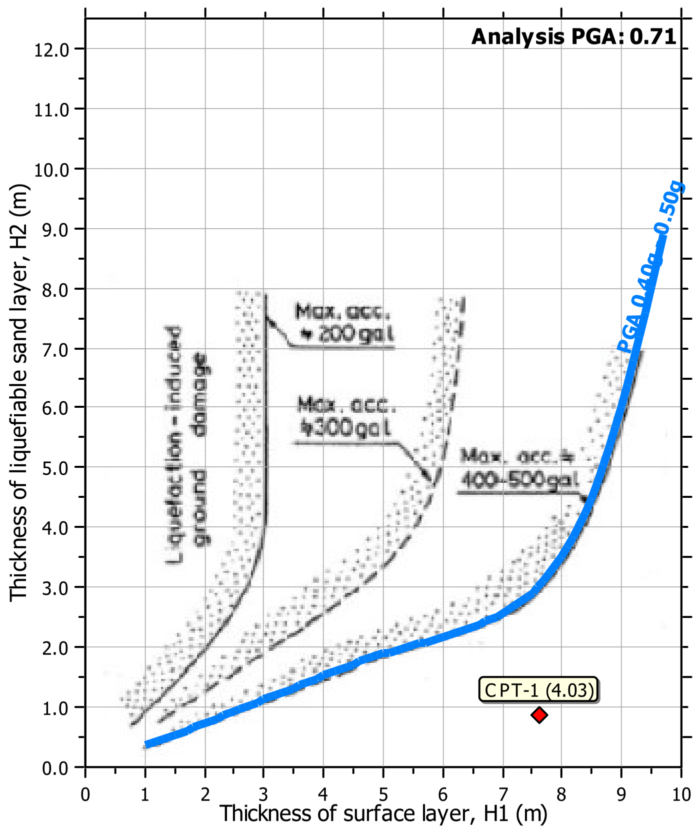
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



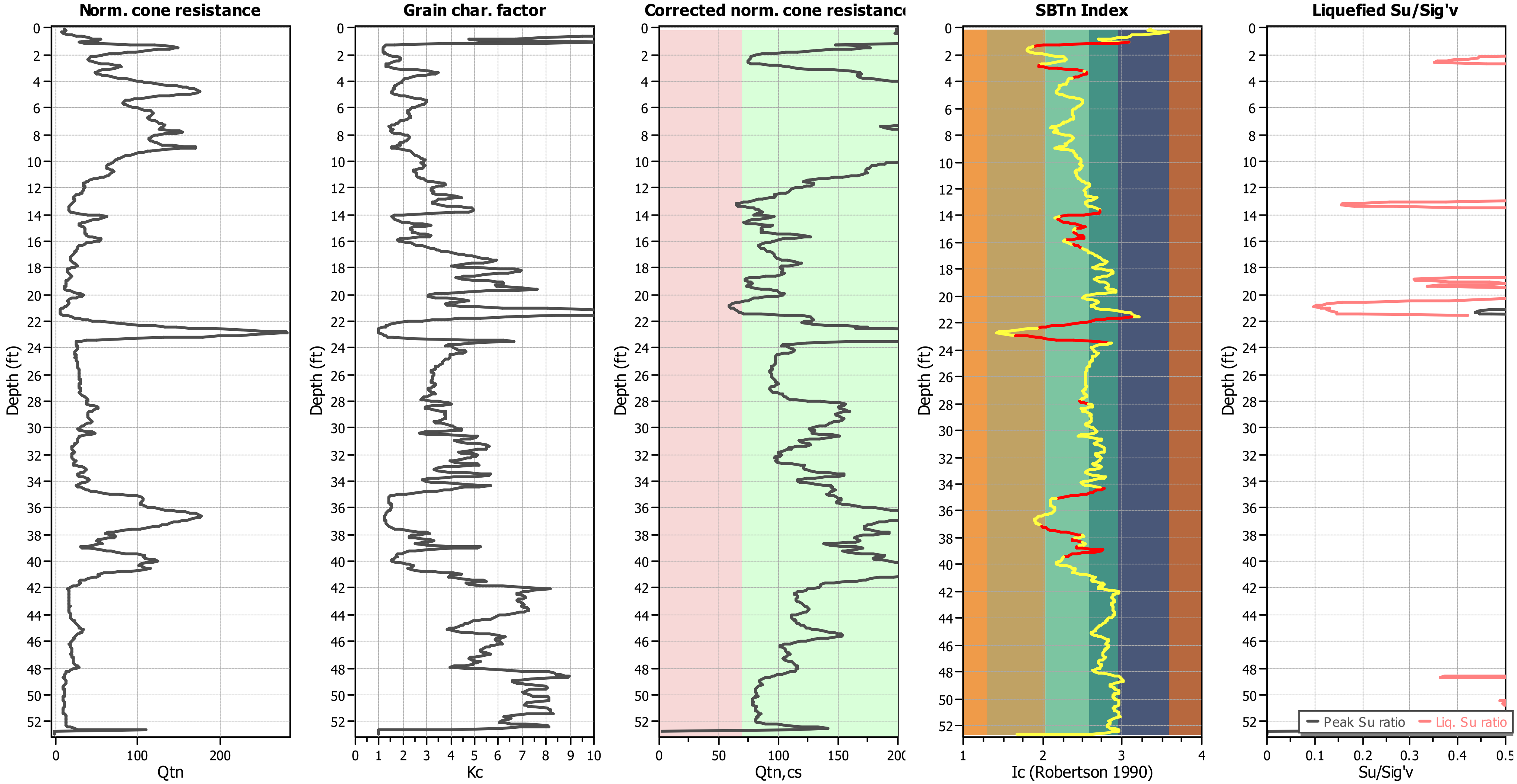




Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

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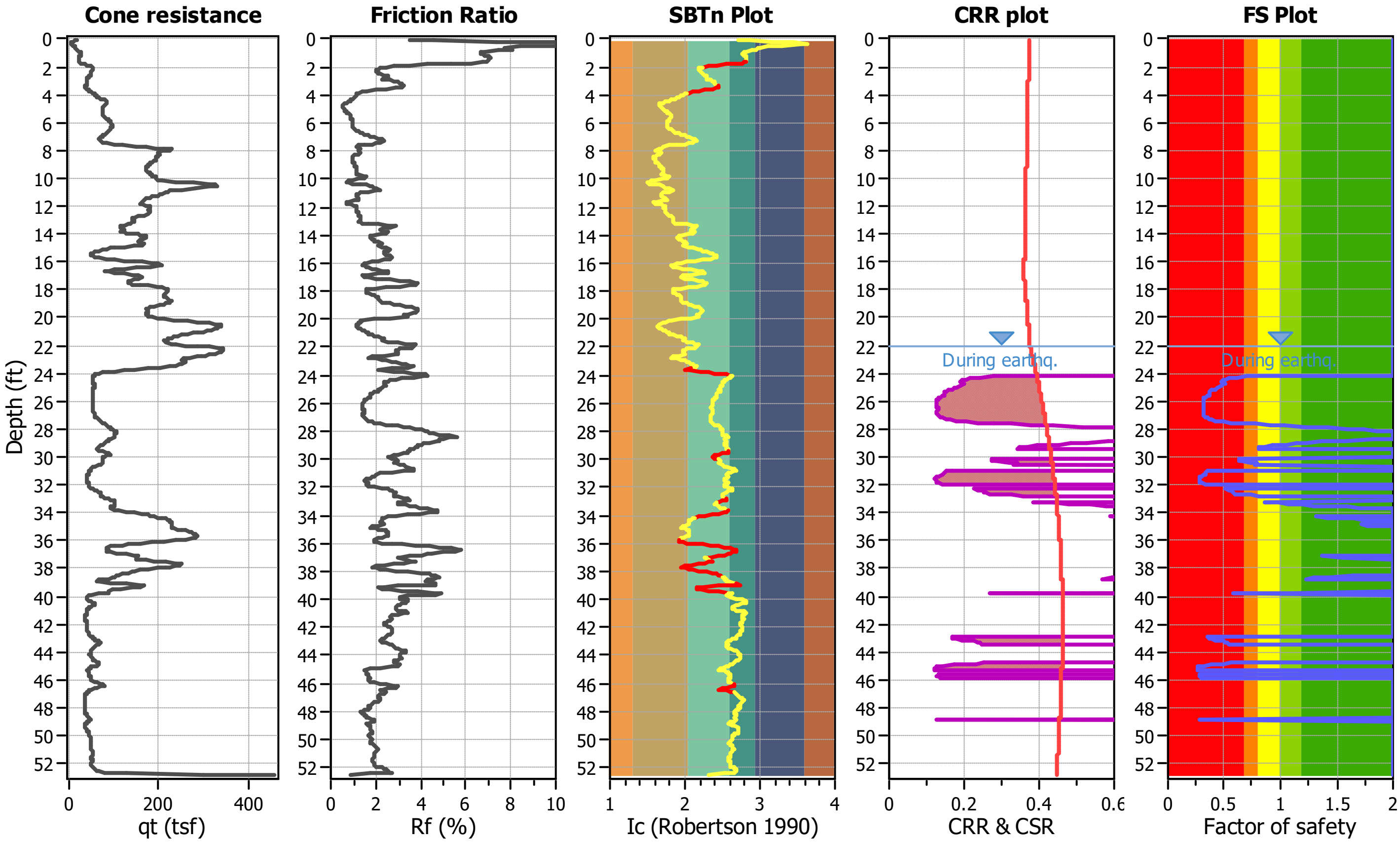
LIQUEFACTION ANALYSIS REPORT

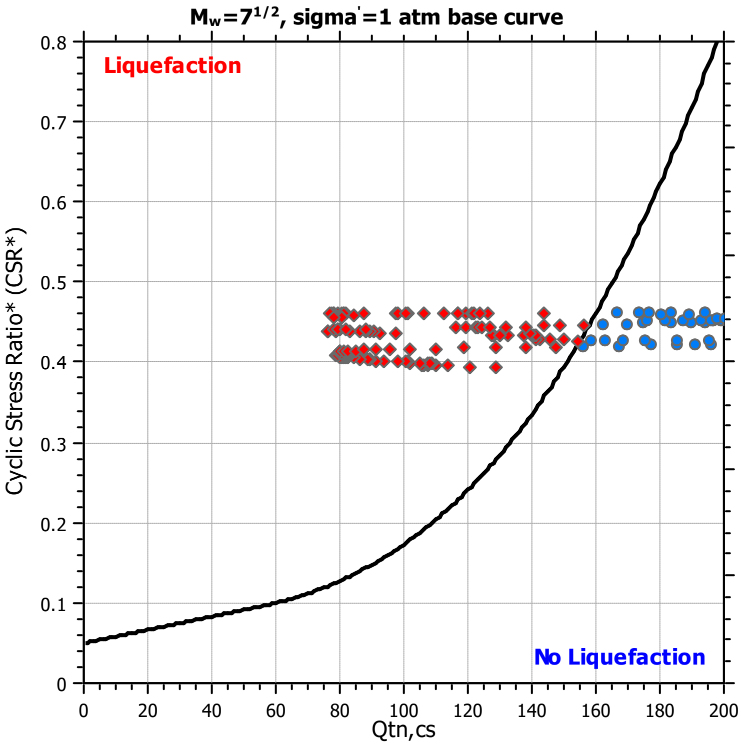
Project title : **Location :**

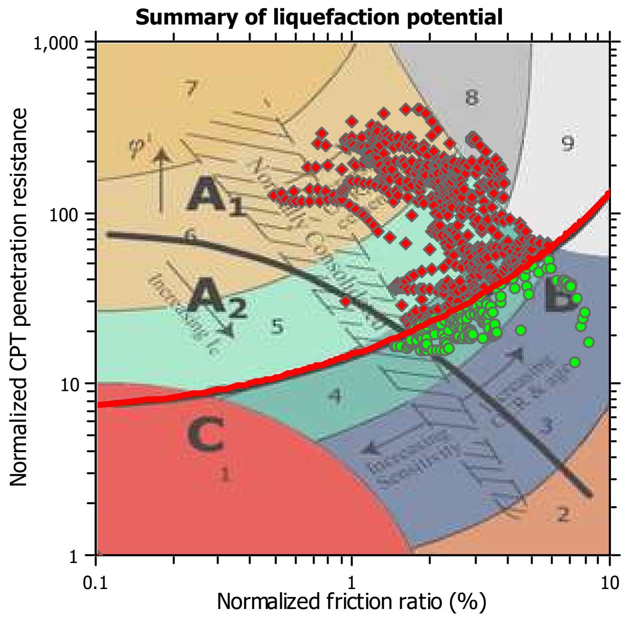
CPT file : CPT-2

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	24.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	22.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.71	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

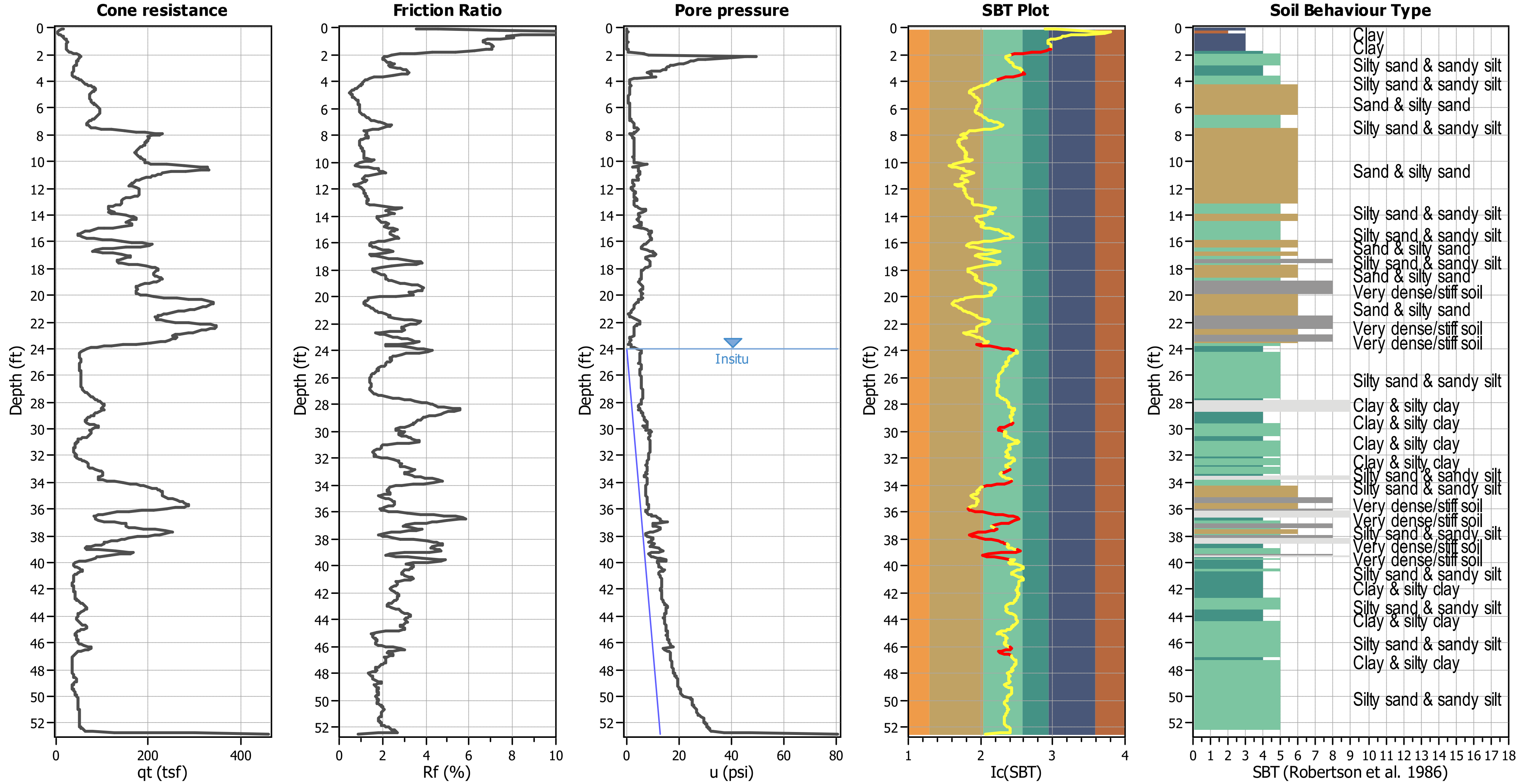






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



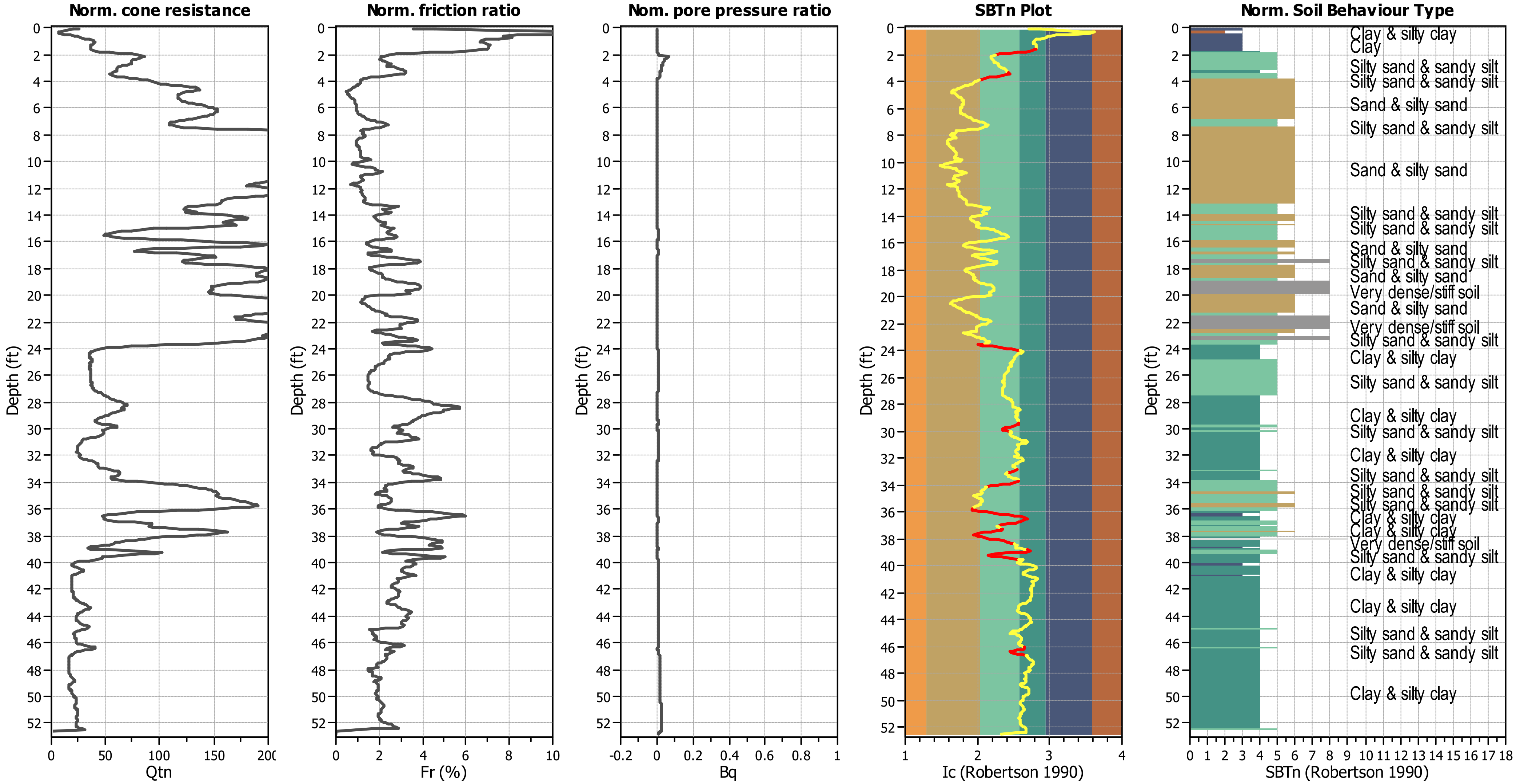
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBT legend

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

CPT basic interpretation plots (normalized)



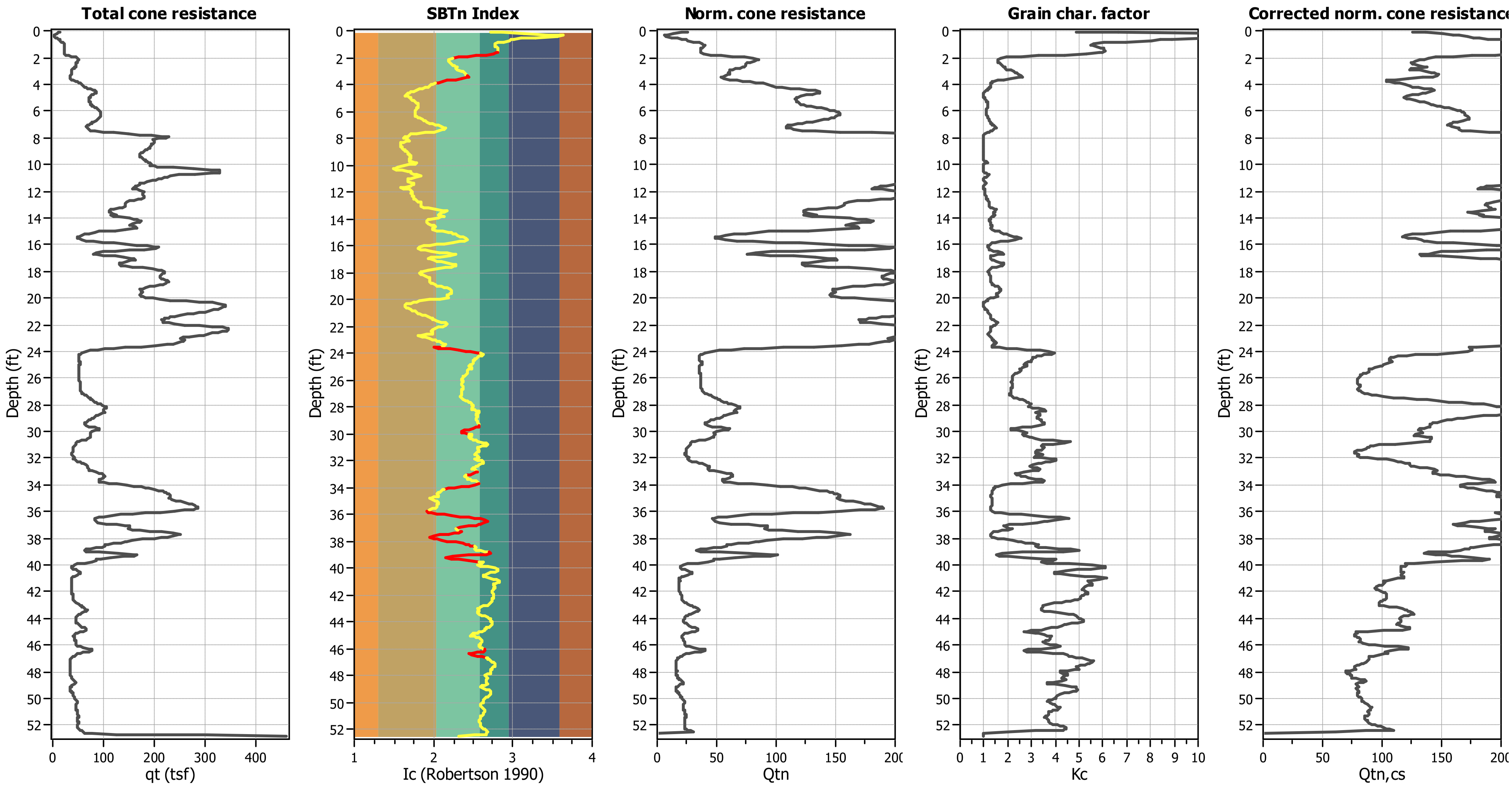
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBTn legend

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

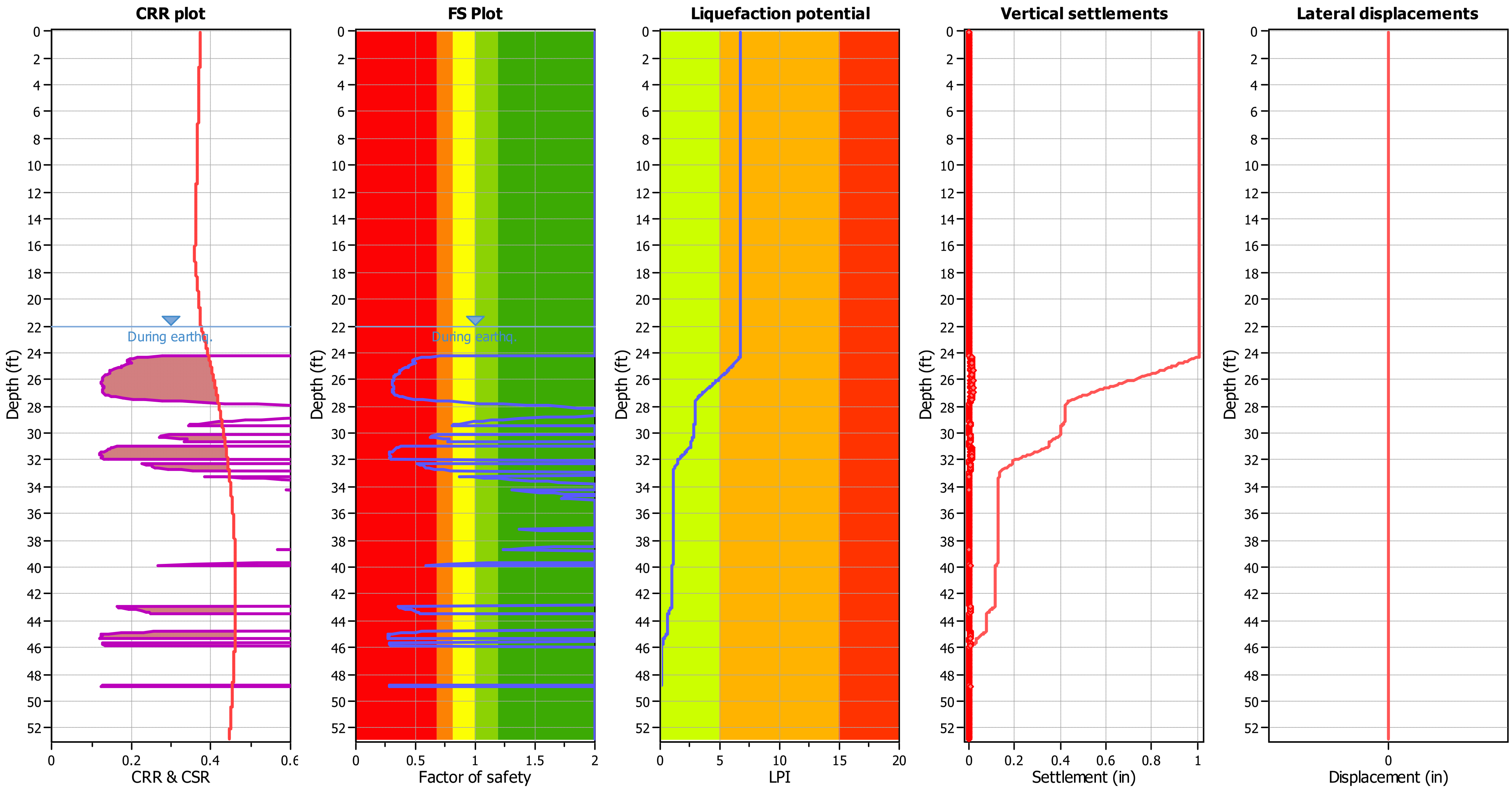
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

Liquefaction analysis overall plots



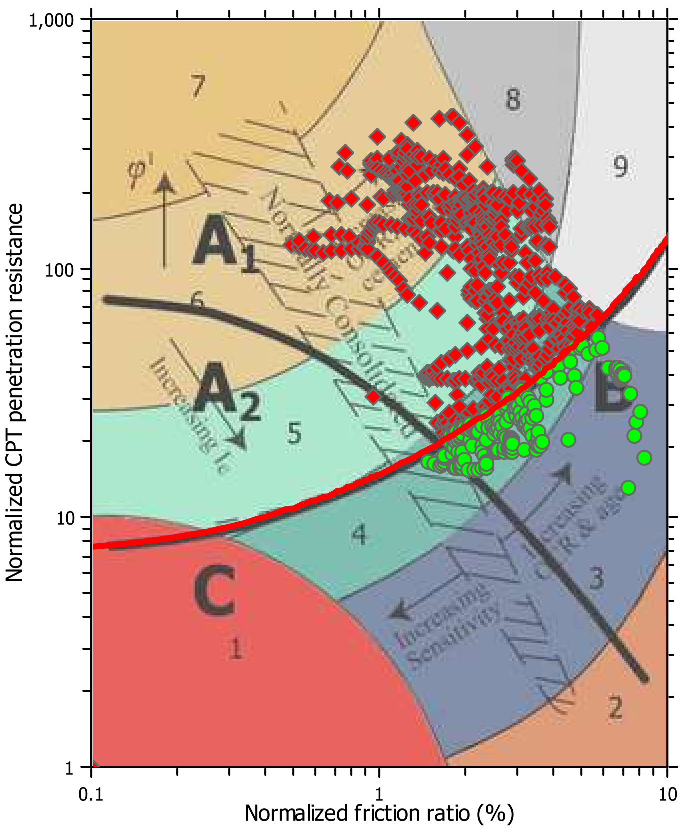
Input parameters and analysis data

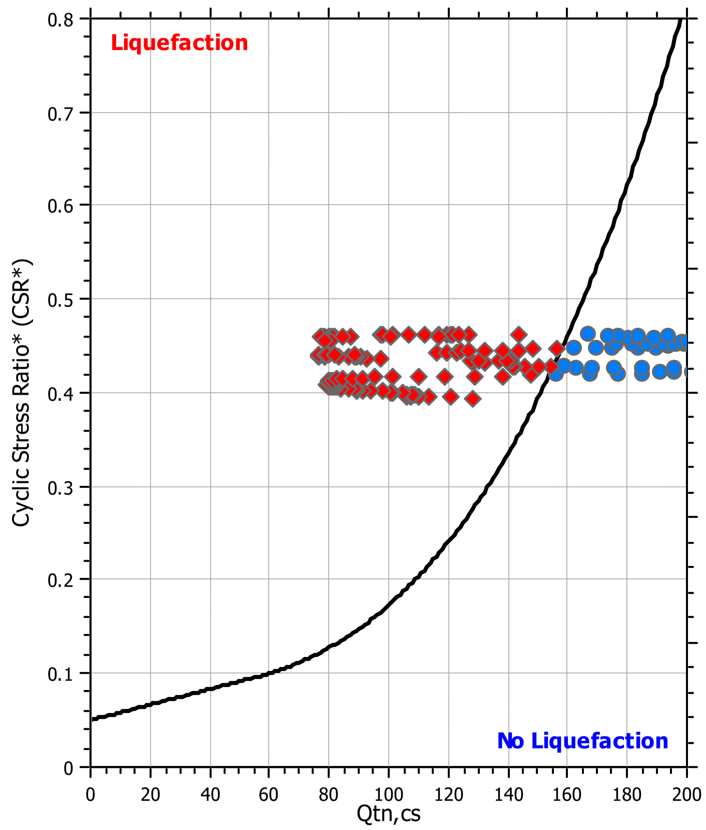
Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

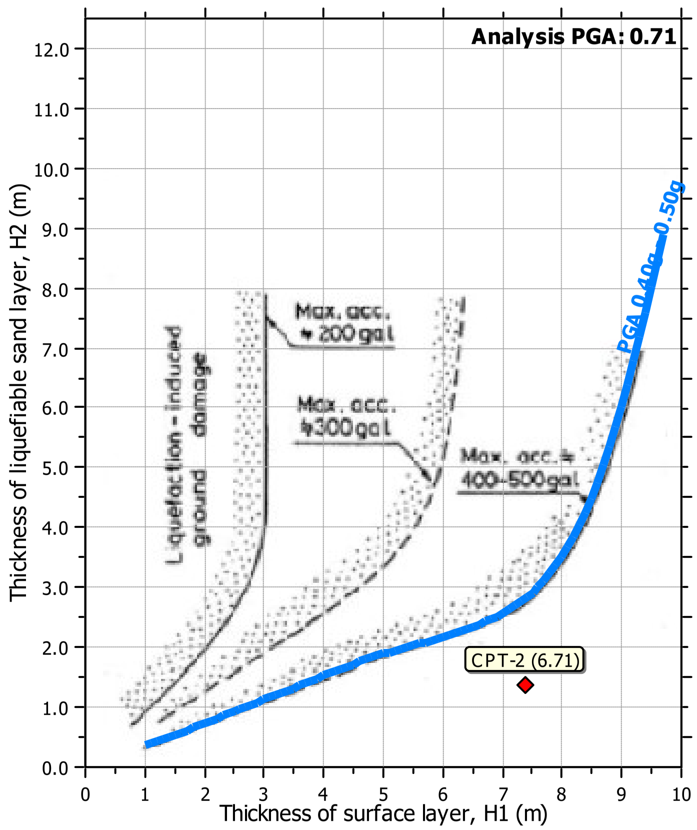
F.S. color scheme
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme
- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



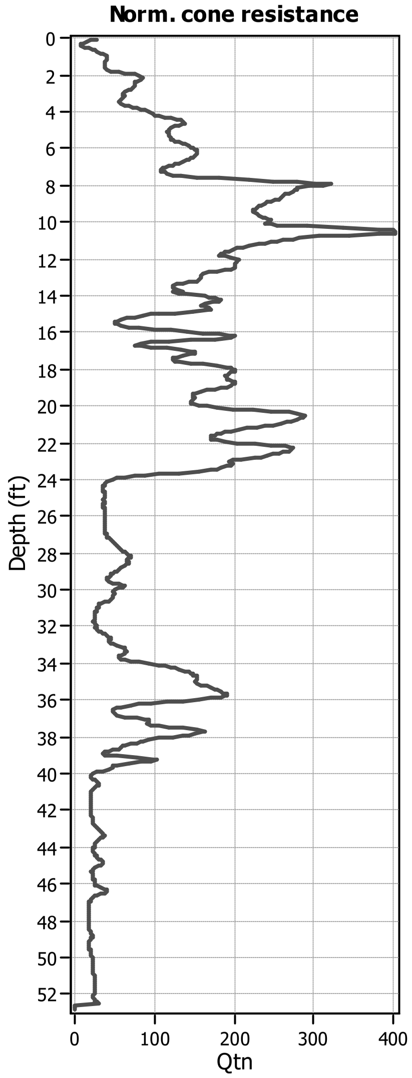


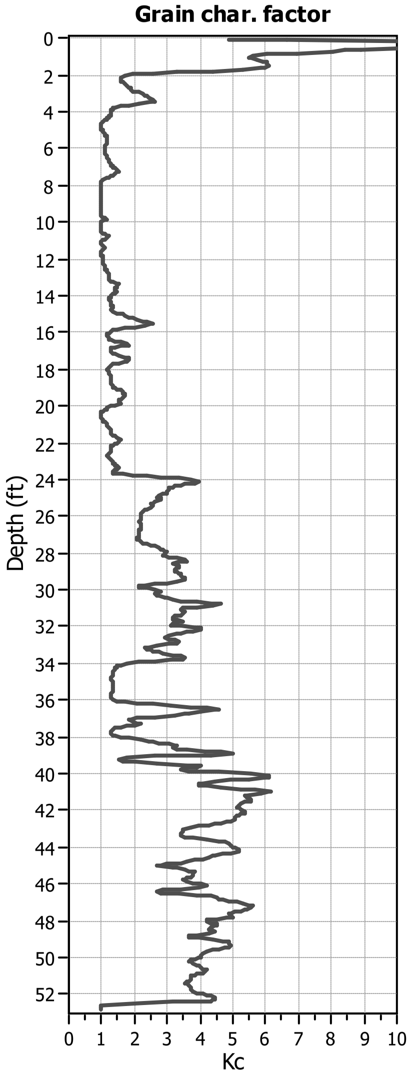


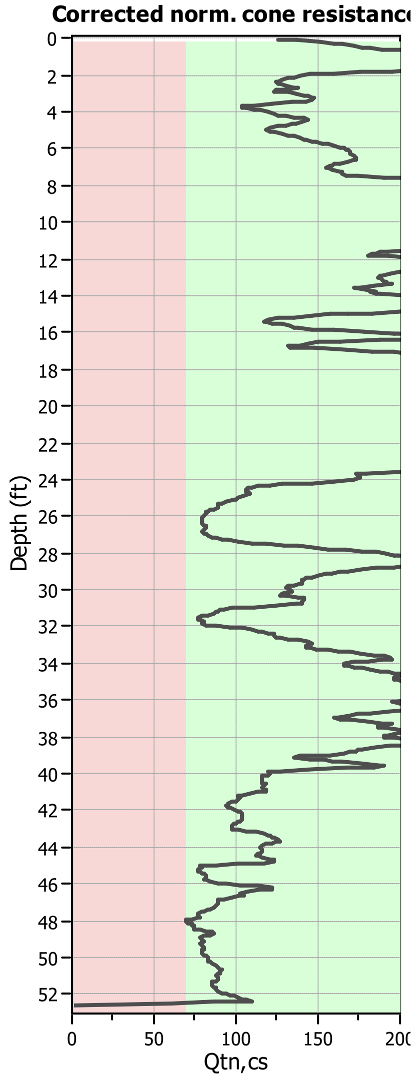
Input parameters and analysis data

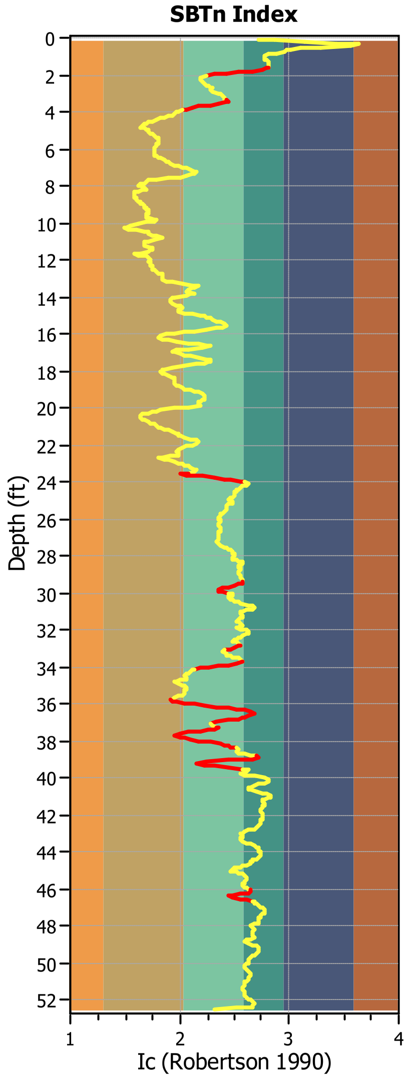
Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

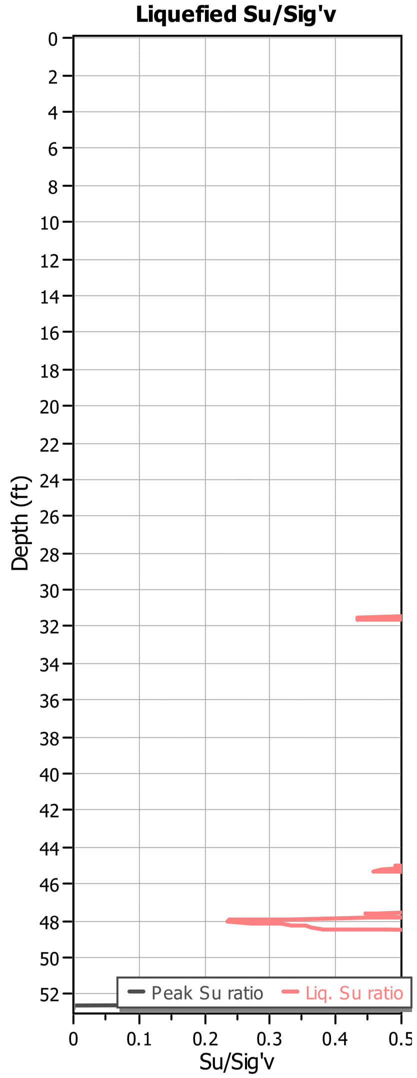
Check for strength loss plots (Robertson (2010))











Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

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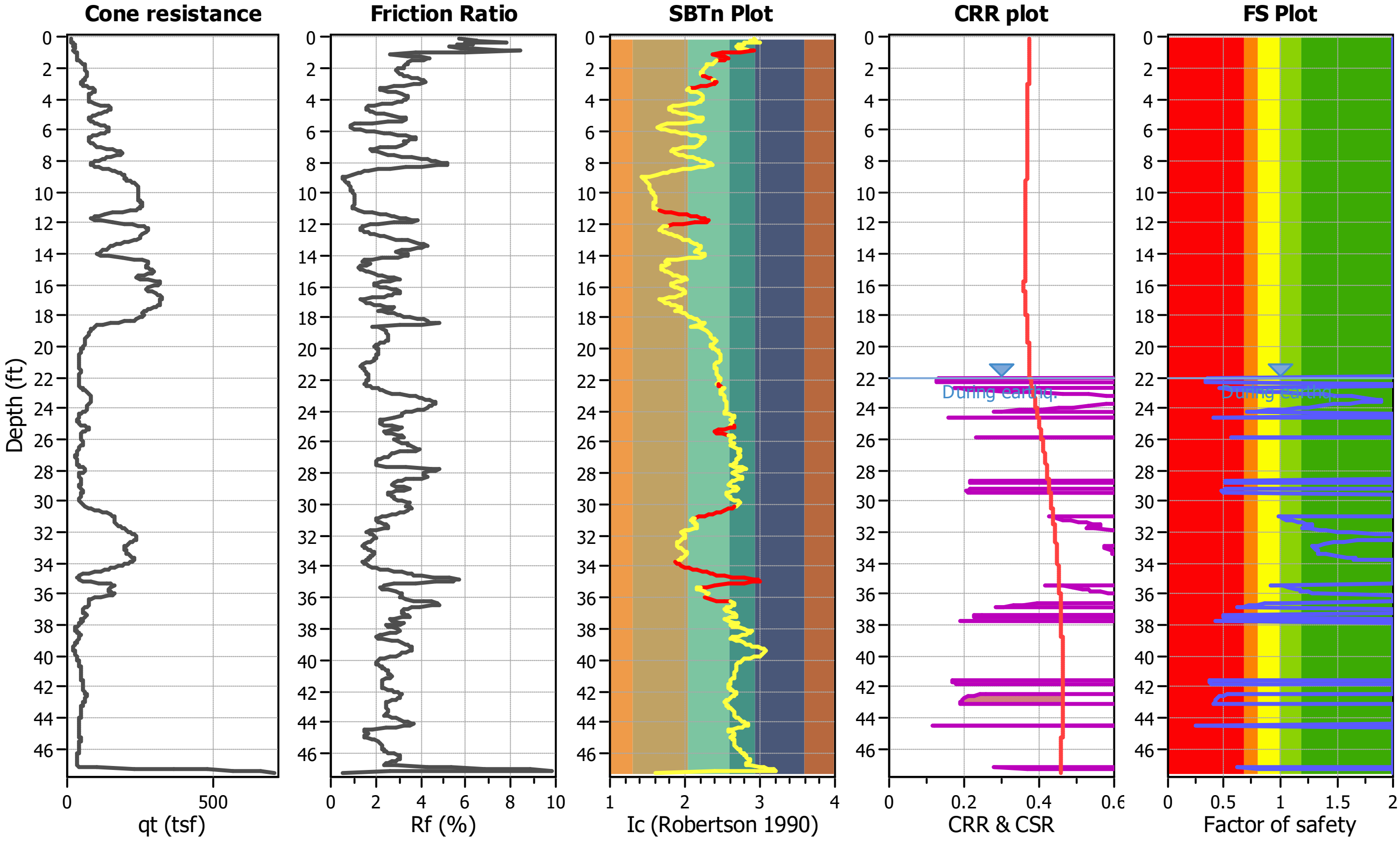
LIQUEFACTION ANALYSIS REPORT

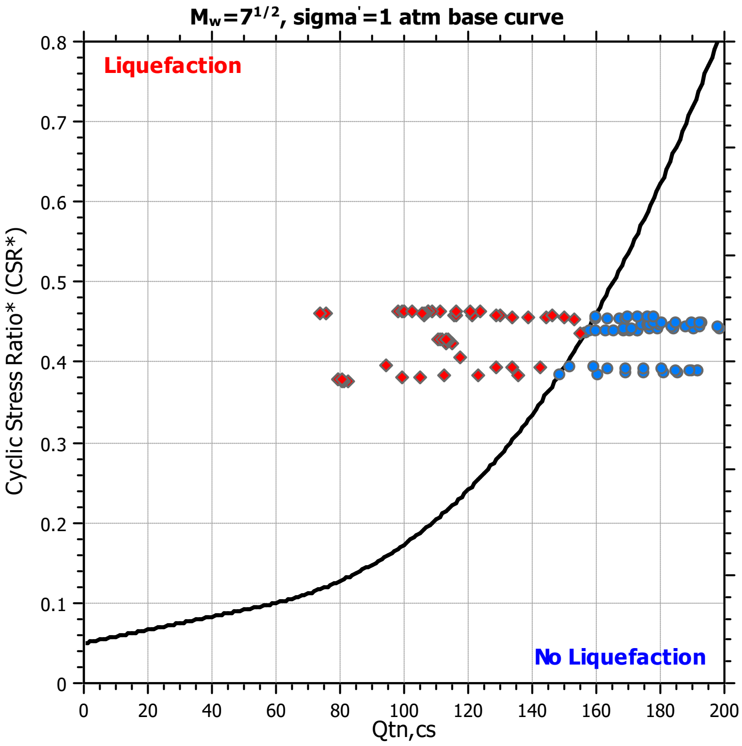
Project title : **Location :**

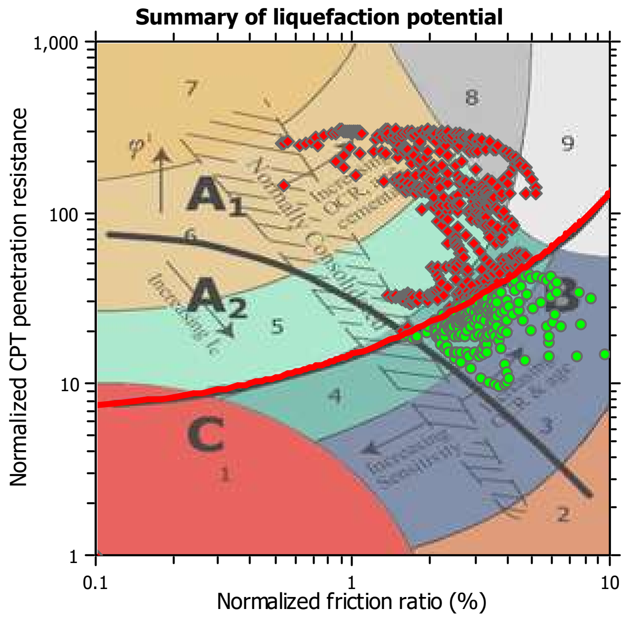
CPT file : CPT-3

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	24.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	22.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.71	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

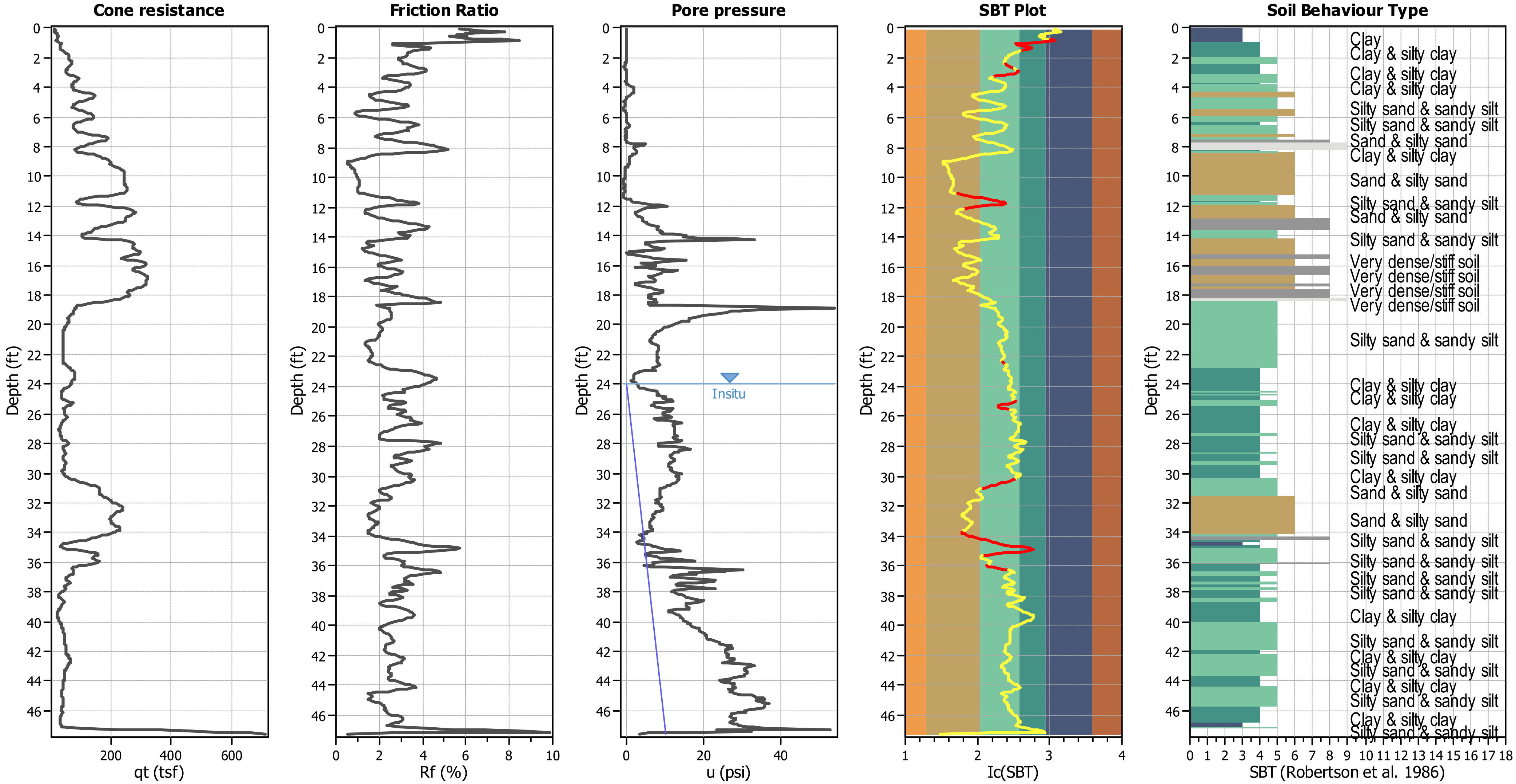






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



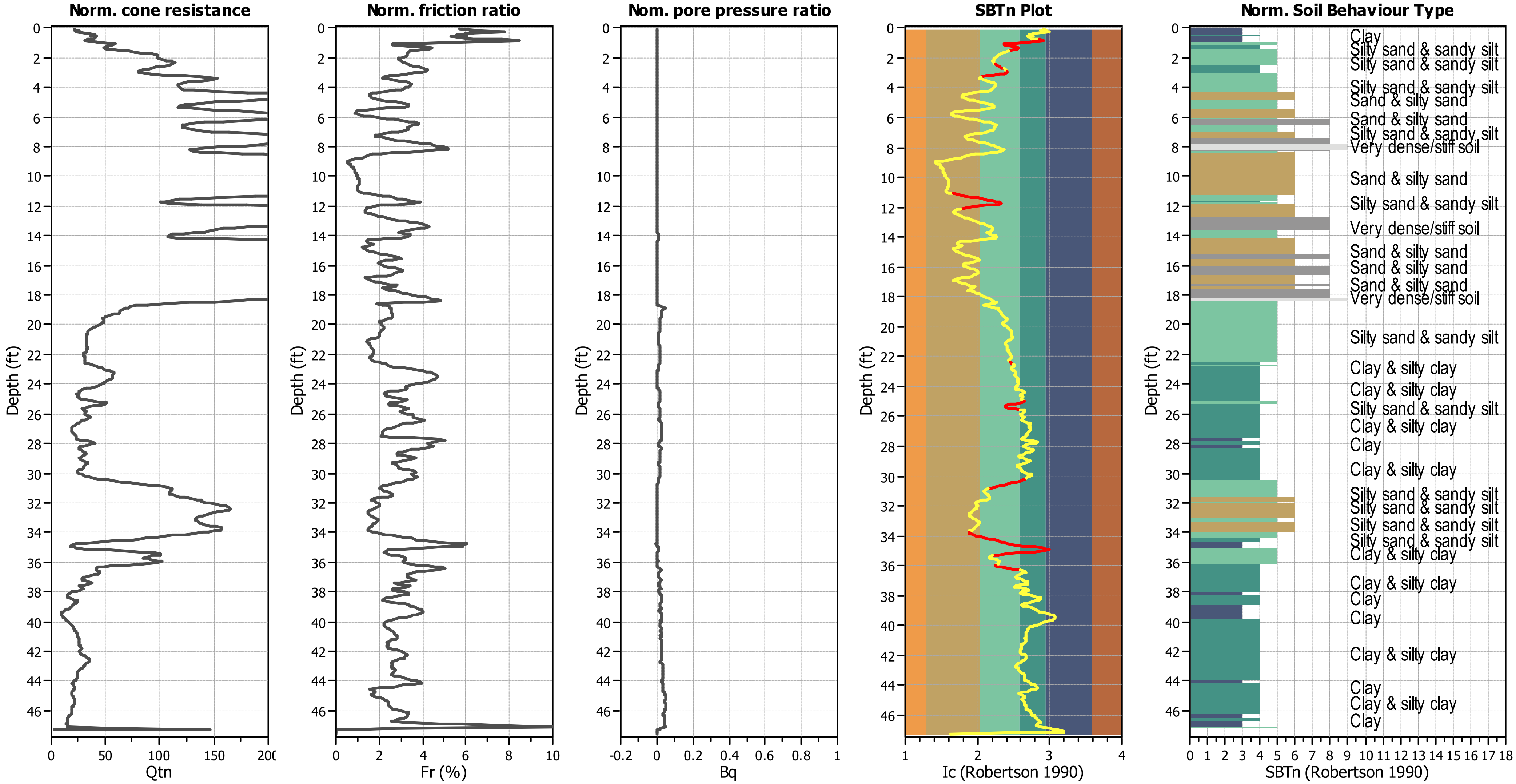
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBT legend

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

CPT basic interpretation plots (normalized)



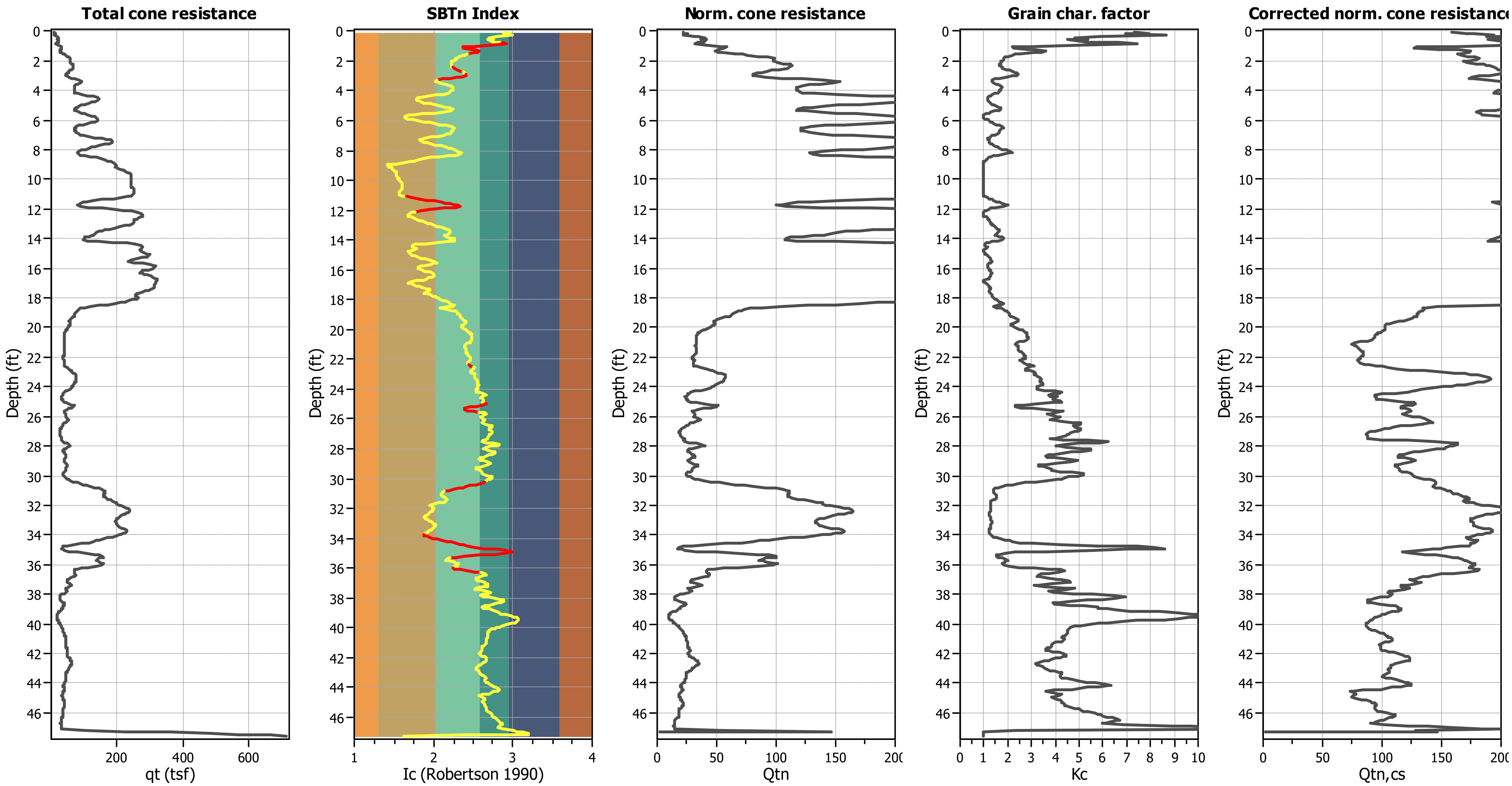
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBTn legend

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

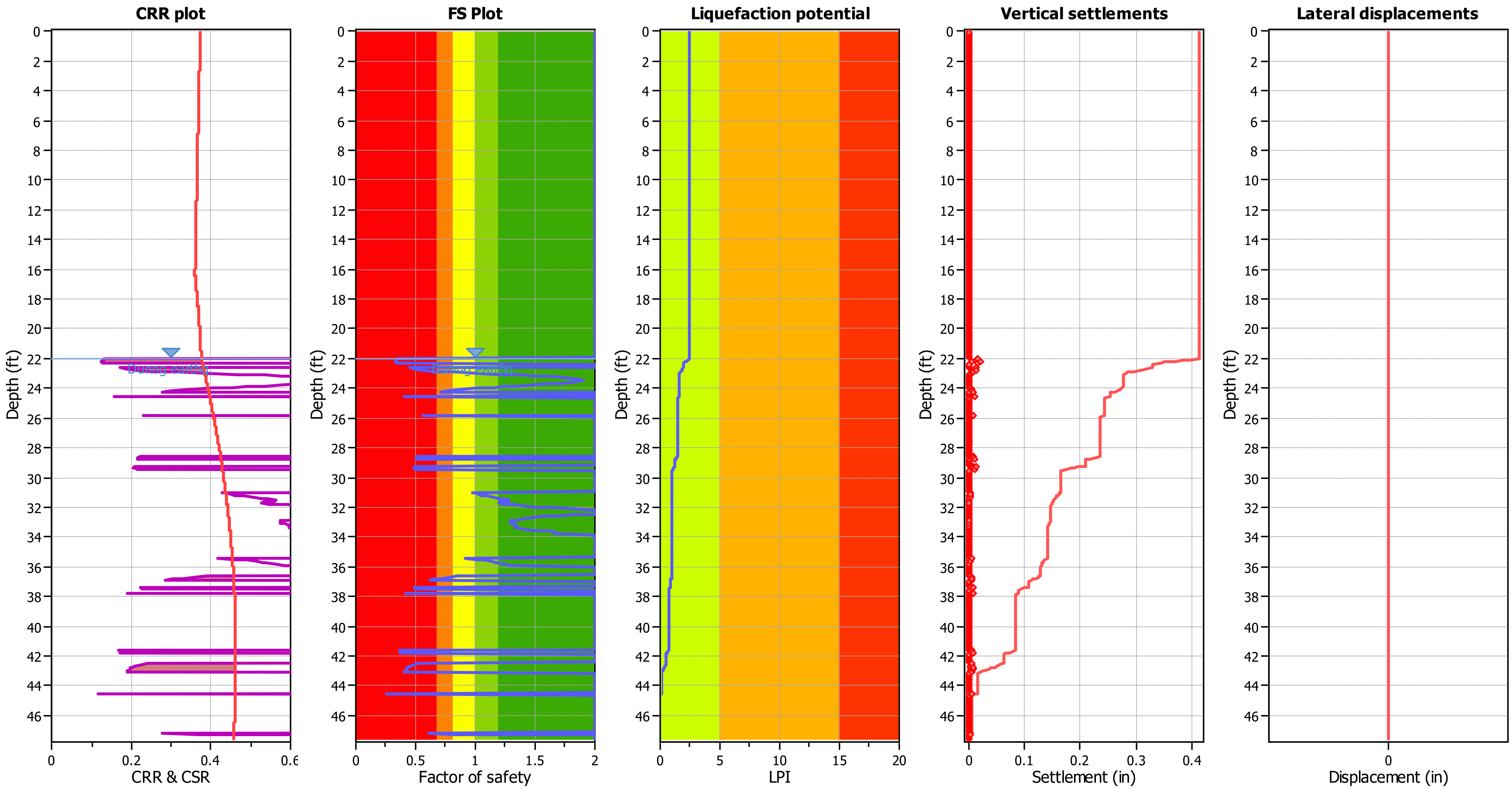
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
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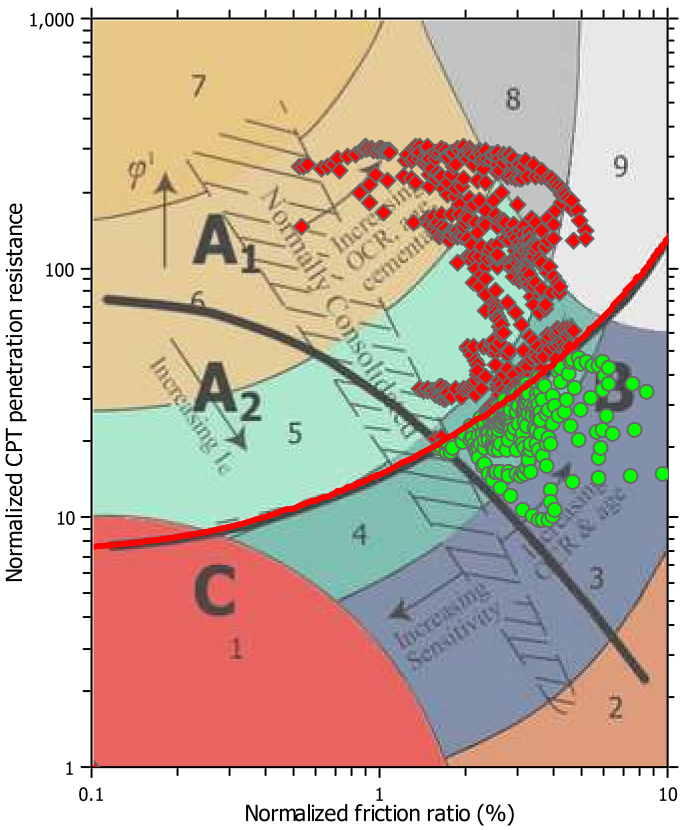
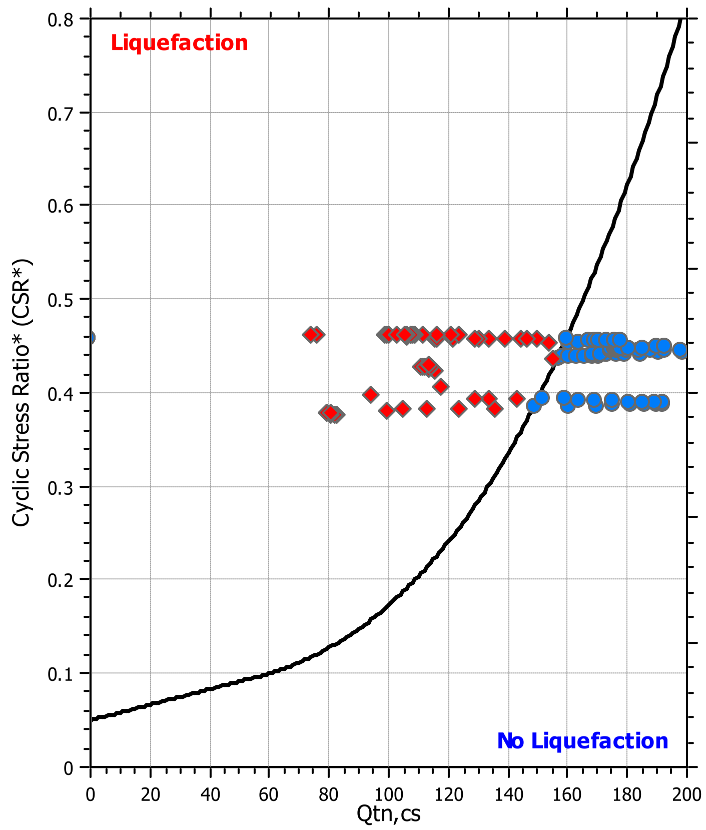
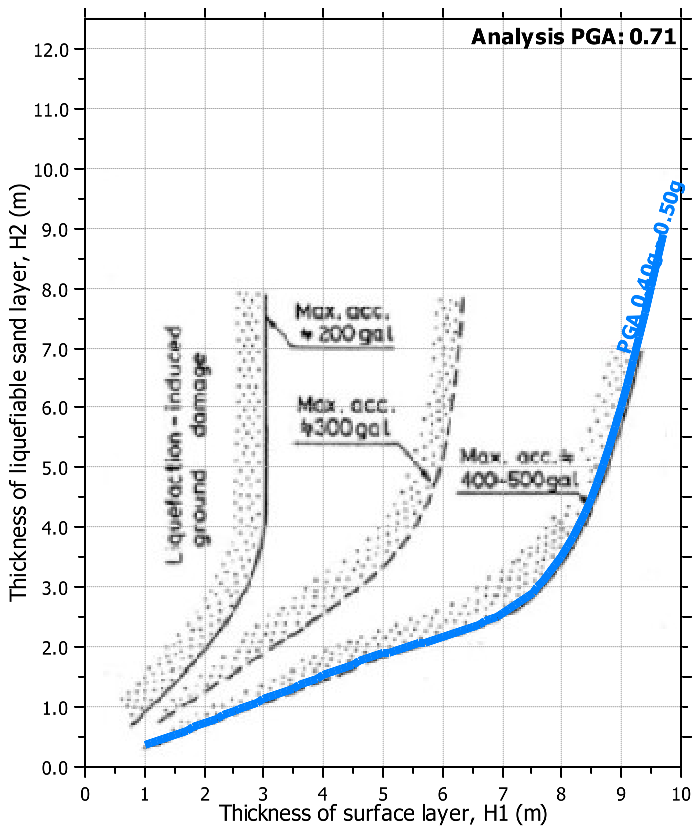
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



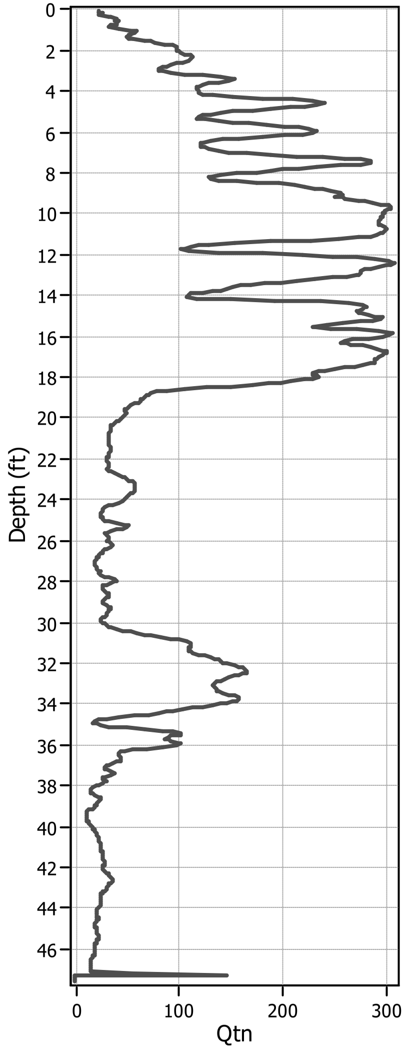


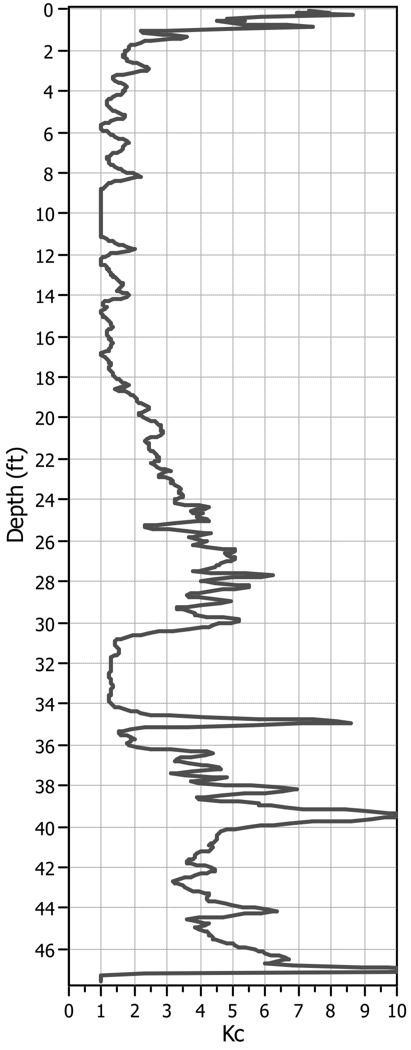


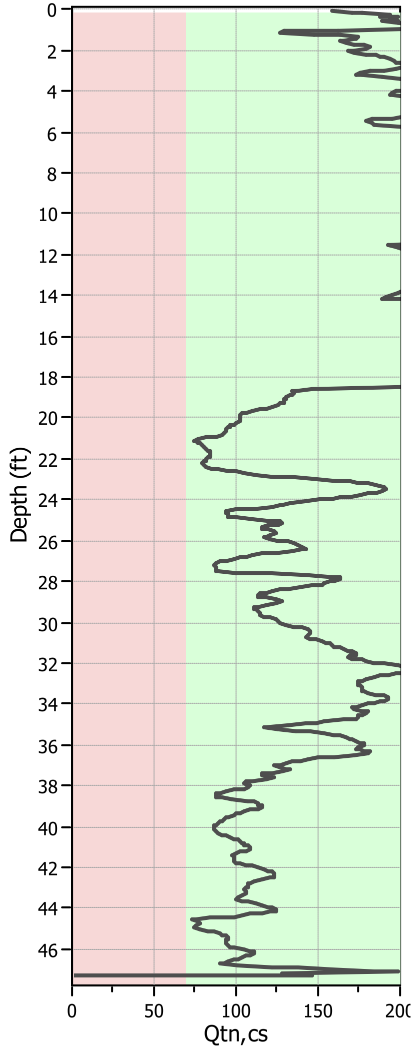
Input parameters and analysis data

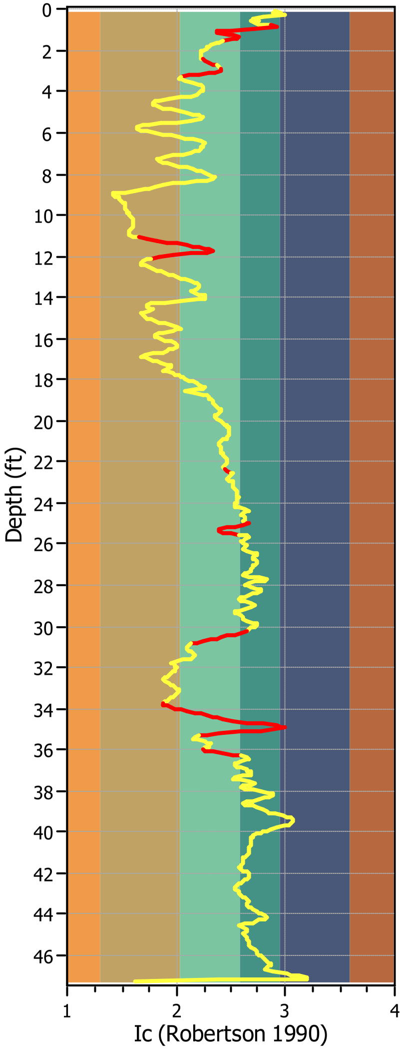
Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

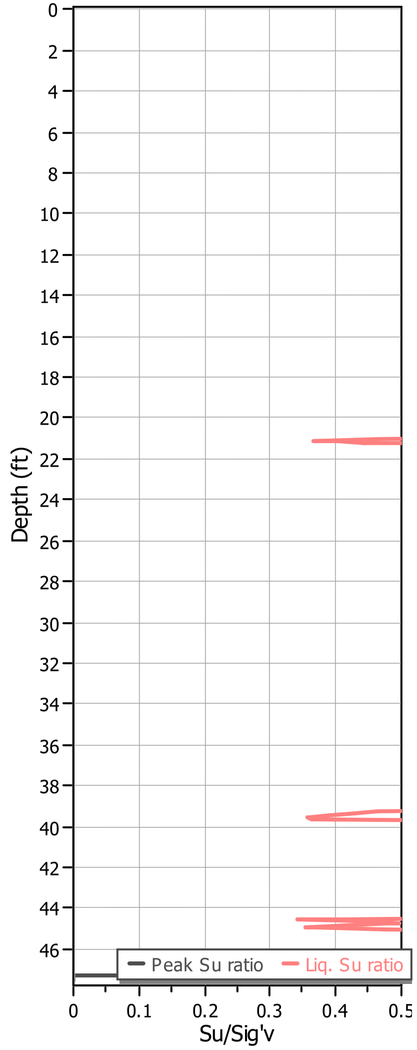
Check for strength loss plots (Robertson (2010))











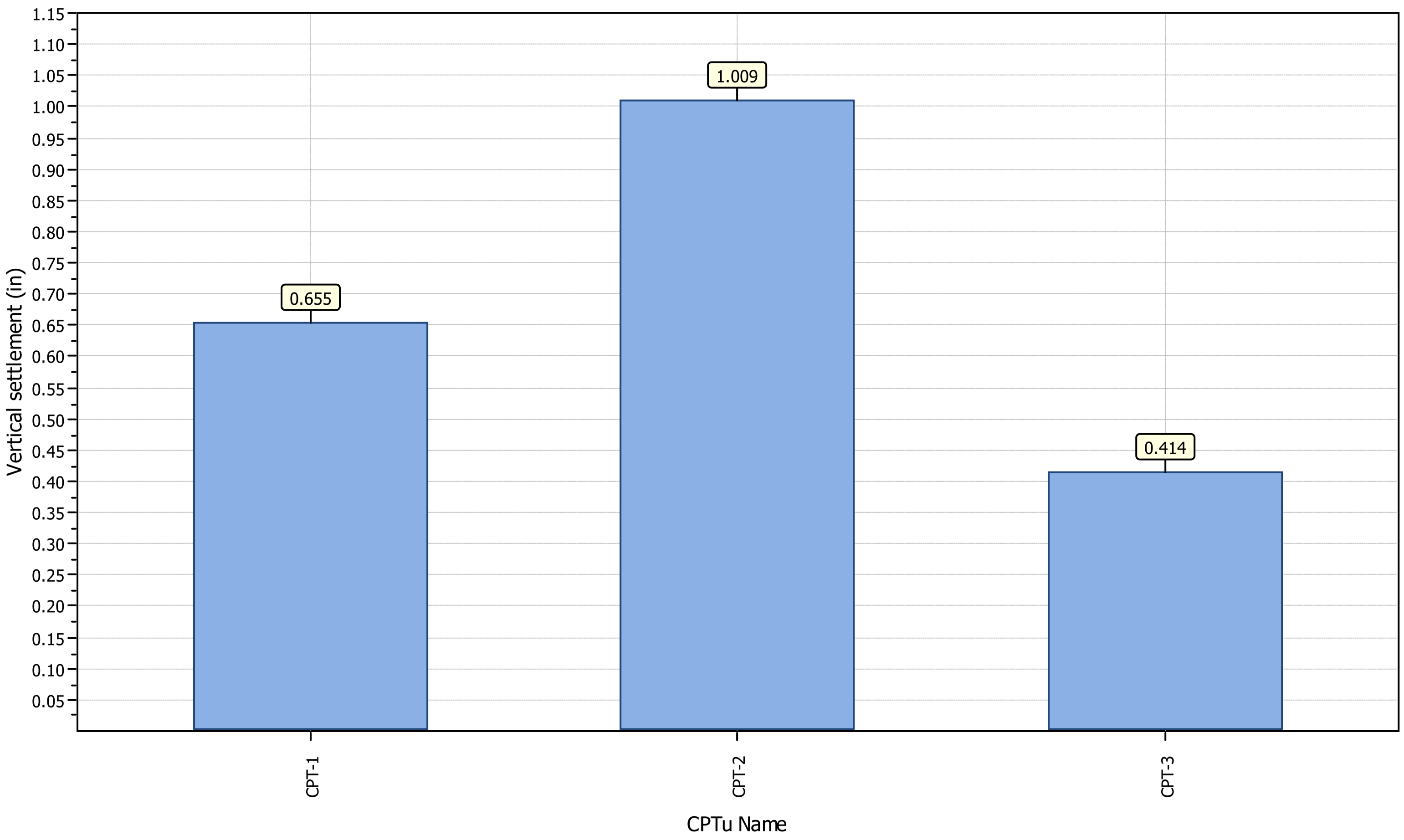
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	22.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	24.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

Project title :

Location :

Overall vertical settlements report



APPENDIX D

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

PACIFIC BEACH HOTEL
SAN DIEGO, CALIFORNIA

PROJECT NO. G3422-52-01

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition.

4. CLEARING AND PREPARING AREAS TO BE FILLED

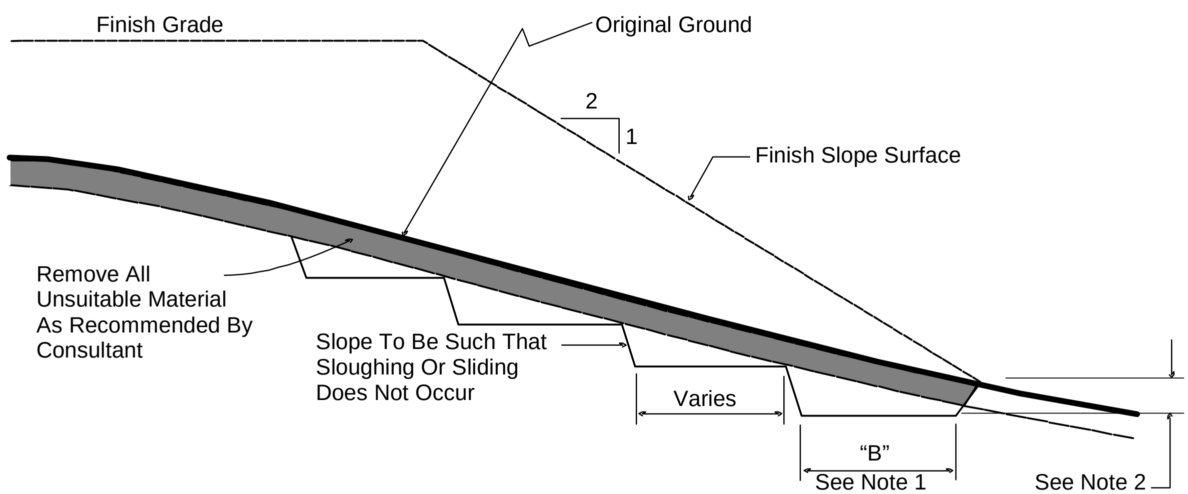
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

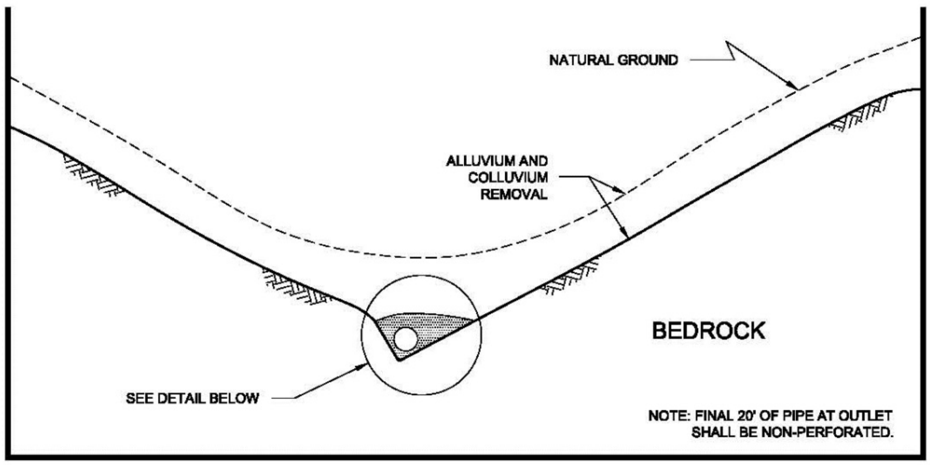
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

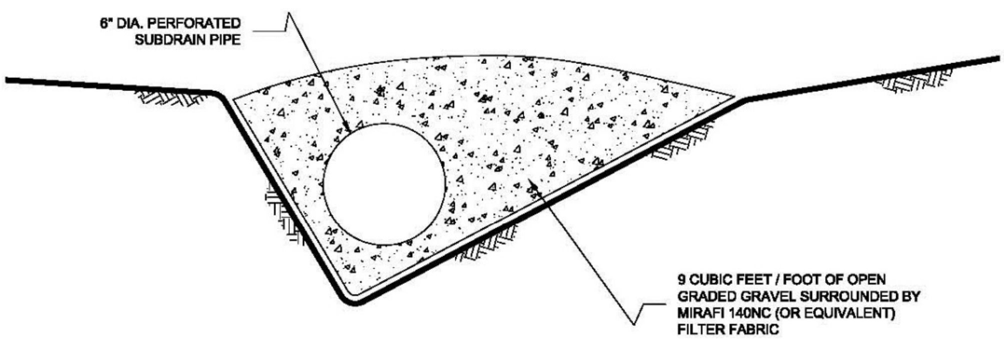
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

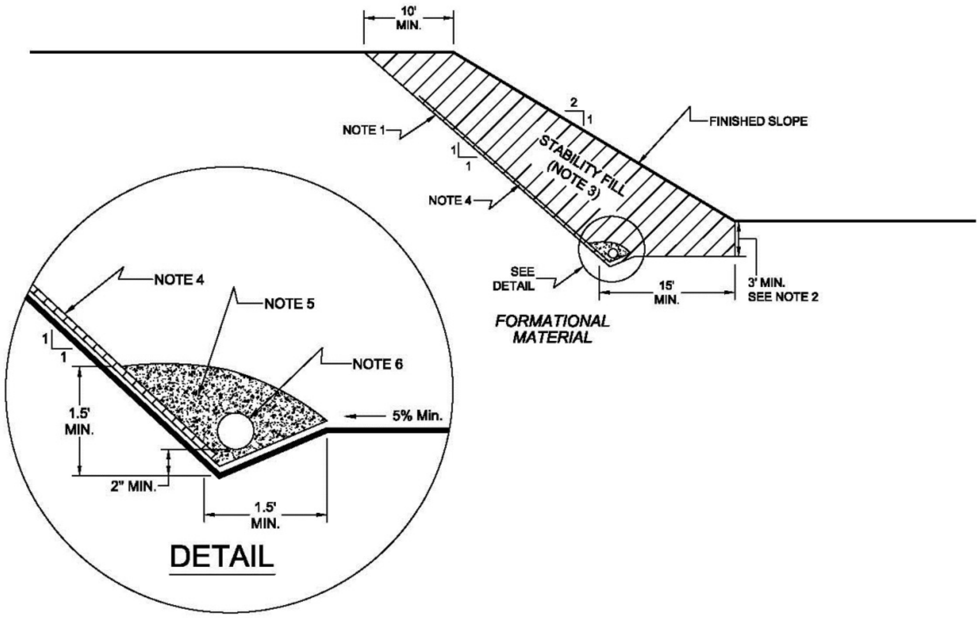
1......8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2......6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

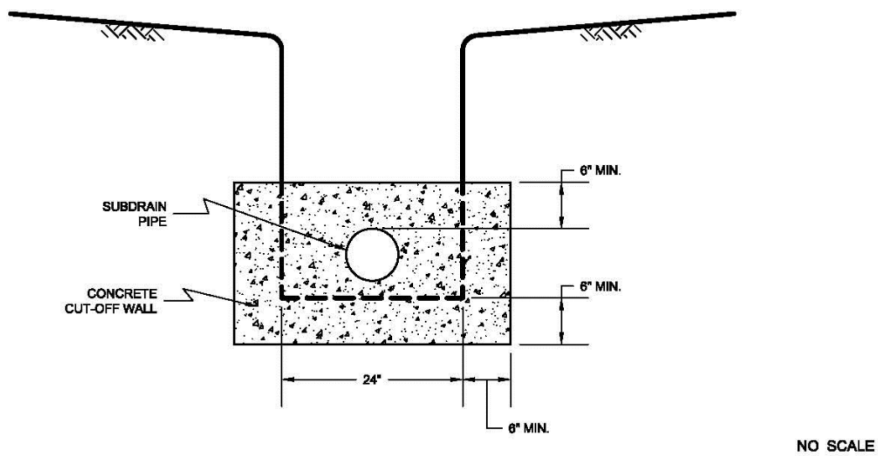
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

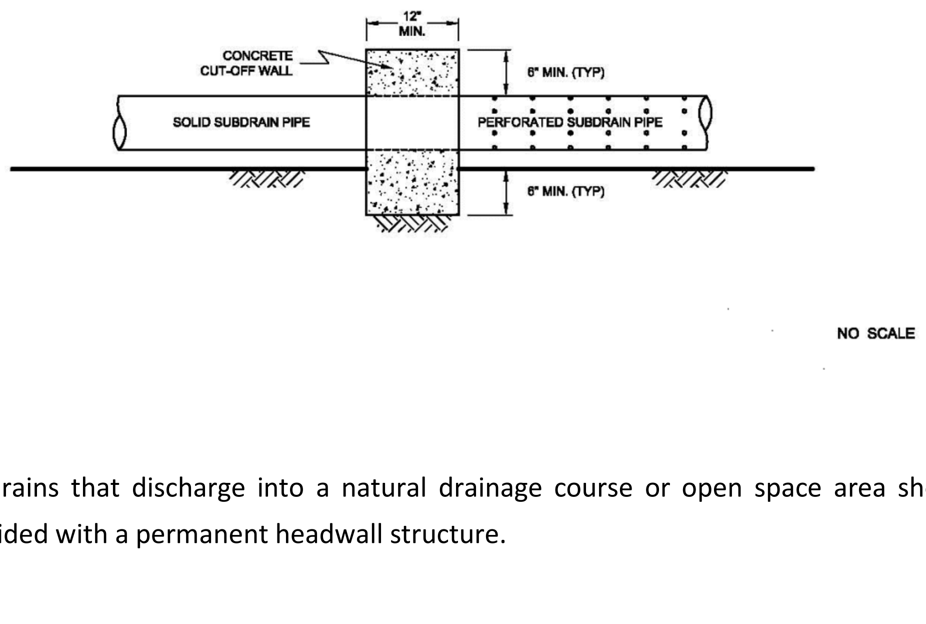
7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

TYPICAL CUT OFF WALL DETAIL

FRONT VIEW

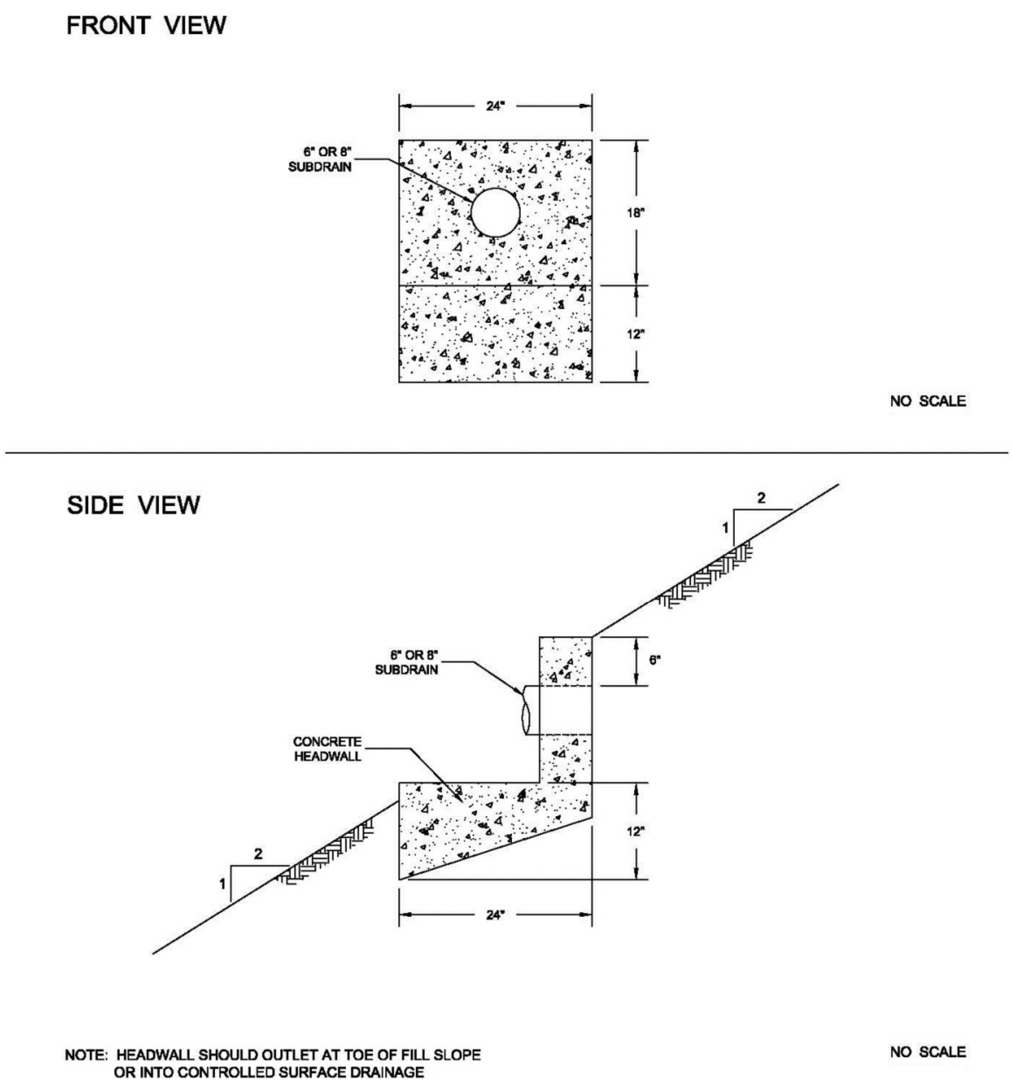


SIDE VIEW



7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

TYPICAL HEADWALL DETAIL



7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an “as-built” map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner’s representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

1. *2022 California Building Code, California Code of Regulations, Title 24, Part 2, based on the 2021 International Building Code*, prepared by California Building Standards Commission, dated January 2023.

2. *ACI 318-19, Commentary on Building Code Requirements for Structural Concrete,* prepared by the American Concrete Institute, dated May 2019.

3. *ACI 330-21, Commercial Concrete Parking Lots and Site Paving Design and Construction,* prepared by the American Concrete Institute, dated May 2021.

4. American Society of Civil Engineers (ASCE), *ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, 2017.

5. California Department of Conservation, Division of Mines and Geology, *Probabilistic Seismic Hazard Assessment for the State of California,* Open File Report 96-08, 1996.

6. California Geological Survey, *Earthquake Zones of Required Investigation*, accessed October 24, 2024. *https://maps.conservation.ca.gov/cgs/EQZApp/*

7. California Geological Survey, *Seismic Shaking Hazards in California,* Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model, 2002 (revised April 2003). 10% probability of being exceeded in 50 years.
http://redirect.conservation.ca.gov/cgs/rghm/pshamap/pshamain.html

8. California Geological Survey, *Special Publication 117A, Guidelines For Evaluating and Mitigating Seismic Hazards in California 2008*, California Geological Survey, Revised and Re-adopted September 11, 2008.

9. County of San Diego, *Multi-Jurisdictional Hazard Mitigation Plan, San Diego County, California,* dated 2023.

10. Historical Aerial Photos. *http://www.historicaerials.com*

11. Jennings, C. W., 1994, California Division of Mines and Geology, *Fault Activity Map of California and Adjacent Areas,* California Geologic Data Map Series Map No. 6.

12. Legg, M.R., J.C. Borrero, and C.E. Synolakis (2002), *Evaluation of Tsunami Risk to Southern California Coastal Cities,* 2002 NEHRP Professional Fellowship Report, dated January.

13. Kennedy, M.P. and Tan, S.S., 2008, *Geologic Map of the San Diego 30' x 60' quadrangle, California*, California Geological Survey, Regional Geologic Map RGM-3, Scale 1:100,000.

14. Unpublished reports, aerial photographs, and maps on file with Geocon Incorporated.

15. USGS computer program, Seismic Hazard Curves and Uniform Hazard Response Spectra, *http://geohazards.usgs.gov/designmaps/us/application.php.*