UPDATE
GEOTECHNICAL INVESTIGATION

ZEPHYR – OCEANSIDE
OCEANSIDE, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

ZEPHYR PARTNERS
ENCINITAS, CALIFORNIA

AUGUST 13, 2019
PROJECT NO. G2322-32-01

Project No. G2322-32-01
August 13, 2019

Zephyr Partners
700 Second Street
Encinitas, California 92024

Attention: Mr. Mike Grehl

Subject: UPDATE GEOTECHNICAL INVESTIGATION
ZEPHYR – OCEANSIDE
OCEANSIDE, CALIFORNIA

Dear Mr. Grehl:

In accordance with your request, we have performed an update geotechnical investigation along the western boundary of the subject property located in Oceanside, California. The accompanying report presents the results of our study and our conclusions and recommendations regarding the geotechnical aspects of site grading. In addition, this report presents a compilation of studies on the property. In this regard, boring logs, laboratory test results, and liquefaction analyses from previous studies by others are included herein for ease of reference.

The results of our study indicate that the site can be graded as planned, provided the recommendations of this report are followed. The primary geotechnical consideration during grading is settlement of the alluvial soils underling the site. As development plans progress, update geotechnical reports will be necessary to provide specific design and construction recommendations for the ultimate proposed improvements.

Should you have any 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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UPDATE GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of an update geotechnical investigation performed along the western boundary of the subject site located in Oceanside, California (see *Vicinity Map*, Figure 1). The purpose of this study was to investigate the soil and geologic conditions beneath the existing flood control embankment, as well as evaluate geotechnical constraints, if any, that may impact areas of proposed development. This report also presents a compilation of information from Geocon and other consultants that have investigated the property.

This report provides recommendations relative to the geotechnical engineering aspects of the proposed grading based on the conditions encountered during this study and our previous study presented in the report entitled *Update Geotechnical Investigation and Change of Geotechnical Engineer of Record, Zephyr – Oceanside, Oceanside, California,* dated January 7, 2019. A subsequent document titled *Response to Geotechnical Review Comments, Zephyr-Oceanside, G19-00003, P-7-06, EXT 18-00006, Oceanside, California*, dated April 9, 2019, was also prepared to address third party and City of Oceanside review comments.

The scope of our recent and previous studies consisted of the following:

- Reviewing satellite imagery and readily available published and unpublished geologic literature.
- Reviewing the rough grading plans prepared by Project Design Consultants.
- Advancing three mud rotary borings on the flood control embankment along the western project margin to evaluate the underlying soil and geologic conditions (see Appendix A).
- Excavating six exploratory trenches across the site to evaluate the in-situ dry density, moisture content, and compressibility characteristics of the upper portions of the alluvium requiring remedial grading (see Appendix A).
- Performing laboratory tests on selected soil samples to evaluate their physical properties and compressibility characteristics (see Appendix B).
- Advancing six hollow-stem auger borings across the site to evaluate the underlying soil and geologic conditions (see Appendix C).
- Performing laboratory tests on selected soil samples to evaluate their physical properties (see Appendix D).
- Performing liquefaction analyses (see Appendix E).
- Performing settlement analyses (see Appendix F).

- Performing slope stability analyses on the existing flood control embankment (see Appendix G).
- Performing lateral spread analyses (see Appendix H).
- Preparing this report presenting our exploratory information and our conclusions and recommendations regarding the geotechnical aspects of grading the site as presently proposed. Previous field and laboratory test results performed by others between 2008 and 2018 are included in Appendices I and J. Previous liquefaction analyses are presented in Appendix K.

The approximate locations of the previous and recent exploratory borings, CPT soundings, exploratory trenches and infiltration tests are shown on the *Geologic Map*, Figure 2. *Geologic Cross-Sections* A-A´ through C-C´ (Figure 3) represent our interpretation of the geologic conditions beneath the flood control embankment and overall site.

2. SITE AND PROJECT DESCRIPTION

The approximately 90-acre property is situated north of Highway 76, east of Foussat Road, west of a residential subdivision, and south of an approximately 20 foot high flood control levee and bicycle pathway parallel to the San Luis Rey River. Remnants of the Oceanside drive-in theater and swap meet, including a thin layer of asphalt concrete, were observed in the south-central portion of the site. An existing utility easement is shown trending in a north-south direction across the eastern portion of the property. No grading or improvements are shown within this easement.

We understand that the current development plan consists of mass grading the property to create several sheet-graded pads for a future mixed-use development. Subsequent development will consist of placing additional imported soil and fine grading the sheet-graded pads to achieve the ultimate project configuration. The referenced rough grading plans indicates fill placement of approximately 1 to 9 feet above the existing natural ground surface.

As development plans progress, update geotechnical reports will be necessary to provide specific design and construction recommendations for the ultimate proposed improvements.

3. SOIL AND GEOLOGIC CONDITIONS

Based on our review of published geologic maps and our observations during our subsurface investigations, the site is underlain by two surficial soil units consisting of artificial fill and alluvium. The alluvium is in excess of 125 feet thick. Although not expected to be encountered during grading, Santiago Formation underlies the alluvium. The approximate extent of the deposits exposed at the surface have been shown on Figure 2. Each is discussed below in order of increasing age.

3.1 Artificial Fill (Qaf)

Artificial fill associated with the existing roadway embankments along old Foussat Road and the flood control levee were mapped based on topographic expression and subsurface exploration, respectively. The levee embankment consists of a medium dense to very dense, silty, fine to coarse sand. Based on field and laboratory testing, this embankment is considered suitable in its present condition to support additional fill or structural loads. We expect that any artificial fill outside the levee embankment will not be suitable in its present condition and will require remedial grading.

3.2 Alluvium (Qal)

Alluvial soils are present beneath the entire property and are estimated to be in excess of 125 feet thick based on the exploratory borings and CPT soundings. The deepest boring was approximately 146 feet below the top of the levee (see Boring B-2). Since the levee is approximately 20 feet thick, the alluvium was at least 126 feet below the ground surface at toe of levee embankment. These deposits consist primarily of relatively loose to medium dense, silty sands, poorly-graded sands, sandy/clayey silt and silty clay. Due to the relatively unconsolidated nature of the alluvial deposits, this unit will require special geotechnical considerations to mitigate its compression-related settlement and liquefaction potential.

4. GROUNDWATER

Groundwater was encountered in all the exploratory borings performed at the site. Groundwater varied from approximately 15 to 20 feet below the existing ground surface, or between elevations of approximately 18 to 23 feet above Mean Sea Level (MSL). Groundwater will be an important consideration during the development of the site and should be considered if proposed below grade improvements extend to the depths indicated above. As evidenced in previous studies, groundwater elevations encountered at the time of our investigation may vary seasonally. In this regard, consideration should be given to placing monitoring wells onsite to record such fluctuations if below-grade improvements are proposed near the water table.

It is not uncommon for groundwater or seepage conditions to develop where none previously existed. Groundwater elevations are dependent on seasonal precipitation, irrigation, and land use, among other factors, and vary as a result. Proper surface drainage will be important to future performance of the project. Depending upon seasonal conditions at the time of grading, specialized equipment to excavate the surficial soils and drying or mixing with other onsite materials to reduce the moisture content prior to placement as compacted fill may be required.

5. GEOLOGIC HAZARDS

5.1 Faulting and Seismicity

Based on our reconnaissance, field investigation, and a review of published geologic maps and reports, the site is not located on any known “active,” “potentially active” or “inactive” fault traces as defined by the California Geological Survey (CGS). The CGS considers a fault seismically active when evidence suggests seismic activity within roughly the last 11,000 years.

According to the computer program *EZFRISK* (Version 7.65), 10 known active faults are located within a search radius of 50 miles from the property. The nearest known active faults are the Newport Inglewood and Rose Canyon Fault Zones, located approximately 7 and 8 miles west of the site, respectively, and are the dominant sources of potential ground motion. Earthquakes that might occur on the Newport Inglewood or Rose Canyon Fault Zones or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. Table 5.1.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the most dominant faults in relationship to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2008) NGA acceleration-attenuation relationships.

TABLE 5.1.1
DETERMINISTIC SEISMIC SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
Newport Inglewood	7	7.5	0.25	0.25	0.32
Rose Canyon	8	6.9	0.22	0.21	0.24
Elsinore	21	7.85	0.21	0.15	0.19
Coronado Bank	24	7.4	0.18	0.12	0.14
Palos Verdes Connected	24	7.7	0.19	0.13	0.16
San Joaquin Hills	32	7.1	0.15	0.12	0.11
Palos Verdes	34	7.3	0.15	0.09	0.10
Chino	43	6.8	0.11	0.06	0.06
San Jacinto	43	7.88	0.16	0.09	0.12
Earthquake Valley	44	6.8	0.11	0.06	0.05

We used the computer program *EZ-FRISK* to perform a probabilistic seismic hazard analysis. The computer program *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mappable Quaternary fault is proportional to the faults slip rate. The program accounts for fault rupture length as a function of earthquake magnitude, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2008) in the analysis. Table 5.1.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 5.1.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2008 (g)
2% in a 50 Year Period	0.54	0.40	0.46
5% in a 50 Year Period	0.43	0.31	0.35
10% in a 50 Year Period	0.35	0.25	0.27

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the California Building Code (CBC) and other currently adopted city of San Diego codes.

5.2 Liquefaction, Seismically Induced Settlement and Lateral Spreading

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are poorly graded and cohesionless, groundwater is encountered within 50 feet of the surface, and soil 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 (2010) maps the site within a zone with 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 structures. We explored to a maximum depth of approximately 145 feet (125 feet below natural ground) during our investigations; and the liquefaction analyses considered the upper 70 feet of soil beneath the levee, or the upper 50 feet of alluvium beneath the property. The liquefaction analyses presented herein are based on SPT blow counts obtained from the levee study. Liquefaction analyses using the CPT test results were provided by EEI, the previous geotechnical consultant, and accepted by Geocon Incorporated. For ease of reference, the CPT based liquefaction analyses are presented in Appendix K.

Exploratory borings excavated within the alluvium revealed that this deposit is greater than 125 feet thick beneath the site. The water table is approximately 10 to 20 feet below the natural ground surface. The borings indicate the alluvium generally consists of loose to medium dense, silty, fine to medium sand, sandy silt, and clayey silt. Laboratory testing indicates that this deposit has a relatively moderate compression potential with limited lenses possessing a high compression potential. The grading plan indicates up to approximately 10 feet of fill is planned where the alluvium will be left in place below the groundwater during the first phase of site development. Based on these factors, and considering the conditions required for liquefaction to occur, it is our opinion that the potential for liquefaction and seismically induced settlement occurring within the soils is considered to be “high”.

We followed the methodology of NCEER (2001 and 2008) to perform a SPT-based liquefaction evaluation. We used a computed site acceleration (PGA_m) of 0.45g (based on ASCE 7-10) and a modal magnitude of 6.72 as evaluated from the NSHM 2014 Dynamic edition using a recurrence interval of 2,475 years (2% in 50 years) on the United States Geological Survey web site. We performed the SPT-based liquefaction analysis using the data from the exploratory borings performed during our recent field investigation. The boring logs are presented in Appendix A, and the results of our SPT-based liquefaction analyses are presented in Appendix E. The results of the CPT-based analyses are presented in Appendix K.

We used the blow counts for the liquefaction analysis based on the driven samplers in the field. In addition, we adjusted blow counts using a California sampler by two-thirds to obtain equivalent Standard Penetration Test (SPT) values. The blow counts were also adjusted for boring diameter, sampling method, rod length, overburden pressure, and energy delivered to the sampler corresponding to a driving-energy of 60 percent ($N_{1|60}$). We further adjusted the blow counts for estimated fines content and calculated a factor of safety. A site is considered to be susceptible to liquefaction when the computed factor of safety is less than 1.0. The results of our liquefaction analysis indicate factors of safety of approximately 0.4 to 3.9 within the alluvial soil below the groundwater table.

Our analyses concluded that the liquefaction potential at the site is high within the alluvial soil below the groundwater table for the levels of ground shaking assumed. Adverse impacts associated with this phenomenon include ground rupture and/or sand boils, lateral spread, and settlement of the liquefiable layers.

Sand boils occur where liquefiable soil is extruded upward through the overburden soil to the ground surface. Providing an increase in overburden pressure and a compacted fill mat can mitigate surface manifestation of liquefaction. Research presented by Ishihara (1985) indicates that the presence of a non-liquefiable surface layer typically results in the effects of at-depth liquefaction 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 0.2g ground acceleration) by Youd and Garris (1995). Proposed fill placement above the liquefiable soil reduces the probability to experience surface manifestation. Based on review of the modified Ishihara chart, surface manifestation of liquefaction is unlikely beneath the site where the thickness of non-liquefiable soil is greater than approximately 30 feet.

Table 5.2 summarizes the zones of potentially liquefiable soils, the thickness of non-liquefiable soil, and the estimated dynamic settlement. Recommendations presented in this report are intended to reduce the effects of seismically-induced settlement.

TABLE 5.2
ESTIMATED ZONES OF LIQUEFIABLE SOIL, THICKNESS OF NON-LIQUEFIABLE SOIL, AND ESTIMATED DYNAMIC SETTLEMENT

Boring No.	Approximate Depth (ft) of Liquefiable Soil Zones	Thickness of Non-Liquefiable Soil Above Liquefiable Soil (ft)	Estimated Dynamic Settlement (in)
1	45-50	45	1.9
2	25-30, 40-50, 70-75	25	5.1
3	40-45, 65-70	40	2.9
1 (w/o levee loading)	20-50	30*	7.0
2 (w/o levee loading)	20-50	30*	8.5
3 (w/o levee loading)	20-30, 40-50	30*	4.8

NOTE: (*): included 10 feet of imported fill to achieve finish grades.

The SPT-based liquefaction analyses (included in Appendix E) indicate that zones of the underlying alluvial soils to depths of approximately 50 feet below the site could be prone to up to 8.5 inches of total liquefaction-induced settlement during PGA_M ground motion.

The CPT-based liquefaction analyses presented in Appendix K indicate that approximately 6-inches of dynamic settlement could occur beneath the site as a result of a design-level seismic event.

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 soil density. Bartlett and Youd (2002) 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.

We analyzed the potential for lateral spreading using both a conventional limit equilibrium slope stability analysis and the Bartlett and Youd (2002) procedure.

We performed the slope stability analysis using residual undrained shear strength parameters (phi = 0) for the potentially liquefiable alluvial soils based on information provided in *Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction in California* and utilizing a published relationship between blow count and residual undrained shear strength presented by Seed and Harder (1990). Based on our analyses, a minimum factor of safety ranging between 1.6 and 2.2 was computed assuming residual undrained shear strength parameters for the liquefiable soils, therefore, it is our opinion there is a low potential for slope instability and lateral spreading impacts during a design level seismic event. The results of our analyses are shown graphically in Appendix G and discussed in Section 6.7.

In addition, lateral spread analyses were performed using the Bartlett and Youd (2002) procedure. The results of this analysis indicated that lateral spreading could occur, however a horizontal building setback of 100-feet from toe of slope adjacent to the San Luis River should be adequate. This setback distance is consistent with the previous studies by EEI and Group Delta. However, it is our opinion that the Bartlett and Youd procedure is overly conservative given the site conditions. According to Bartlett and Youd (2002), "*these equations appear to produce reliable predictions (i.e. ± a factor of two) for $6 \le M \le 8$ earthquakes at liquefiable sites underlain by continuous layers of sandy and silty, sandy sediments having topographical and soil conditions within the following ranges:*

$$1 \le W \le 20\%,\ 0.1 \le S \le 6\%,\ 1 \le T_{15} \le 15,\ 1 \le Zt < 10m,\ F_{15} \le 50\%,\ \text{and}\ D_{50} \le 1mm.$$

The authors continue to state *we noted that the depth to the top of the susceptible layer Zt was usually found only a few meters below the ground surface and was almost always within 10 m of the ground surface for sites that underwent lateral spread.*

Considering that the depth to encounter liquefiable soils beneath the property is approximately 30 feet below the ultimate proposed ground surface, it is our opinion that the commonly used Bartlett and Youd procedure to address lateral spreading is erroneous and should not be applied to this site. For reference, the lateral spread analyses using this methodology is presented in Appendix H. However, providing a 100-foot building setback from the toe of the levee embankment adjacent to the San Luis River is recommended in the event that groundwater raises significantly, and increases the potential for liquefaction and lateral spread.

5.3 Seiches and Tsunamis

Based on our review of the County of San Diego Multi-Jurisdictional Hazard Mitigation Plan (Reference No. 7) and Tsunami Inundation Map (Reference No. 17), and considering the project location in relation to the ocean and proposed finish grade elevations (above elevation 42 feet MSL), the site is not located within a tsunami inundation zone. The site is not located downstream of any known lakes or tanks that could produce a seiche that would impact the proposed development. An approximately 20-foot high embankment exists adjacent to the San Luis River to prevent flooding due to the river. It should be noted that the river valley has been relatively devoid of visible water during our site visits and explorations.

5.4 Landslides

No evidence of landslide deposits was encountered at the site during the geotechnical investigation.

5.5 Settlement Considerations

Estimates of potential settlement are generally based on the thickness of alluvium left-in-place, the thickness of additional fill to achieve finish grade, and the compressibility characteristics of the alluvial materials. The rate of settlement is generally based on the compressibility characteristics of the alluvial materials and the drainage path thickness that would allow for pore water pressure dissipation.

The alluvial deposits beneath the site were found to be moderately to highly compressible when subjected to increased vertical stress. Laboratory consolidation tests were performed on samples of the alluvium to aid in evaluating the magnitude and time rate of settlement that could occur from the proposed fill and future building loads. Based on the test results and our engineering analysis, it is estimated approximately 2 to 5 inches of static settlement could occur after placing approximately 10 feet of fill. The settlement is expected to take at least several months for primary consolidation to occur.

Our experience and test results indicate that approximately 1 to 6 months could be required after the placement of the fill for primary consolidation to be essentially complete, thereby permitting the construction of any proposed improvements. We expect the import operations will take six months to a year, or longer to achieve finish grades. Therefore, the majority of the settlement will most likely occur incrementally during the import operations. It should be noted that the magnitude of the total settlement and the associated time rate of consolidation may not be uniform throughout the site due to the variable thickness and compressibility characteristics of the underlying alluvial materials. The variable thickness of proposed fill will also affect the magnitude of settlement.

We understand that existing underground utilities located in old Foussat Road (the portion that extends into the property) will be relocated western of the North Foussat Road. In addition, a 20-inch reclaimed water line that parallels the northwest property margin, as well as the northern extension of the two sewer force mains, will be temporarily high-lined during site grading and re-located after the existing pipes have been removed, the embankments have been placed, and the settlement has occurred. The current grading plan provides a temporary construction setback from Old Foussat Road to enable future remedial grading after the improvements are re-located. Once the areas that contained these improvements are abandoned, remedial grading will be performed in accordance with our recommendations. Pre-loading with a surcharge embankment of 5 feet of additional soil above proposed <u>ultimate</u> finish grade will be required in the new utility corridor along the western project margin to induce settlement prior to placement of the utilities. The approximate location of the surcharge embankment is shown on Figure 2.

The proposed project grading will result in fill embankments along the 220-foot-wide utility easement that extends across the eastern third of the property. Fill will also be placed along the western and southern project margins where existing utilities area present. The embankment setbacks in these areas range from approximately 15 to 30 feet from the edge of the easement/project margins.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

6.1.1 No soil or geologic conditions were encountered that, in the opinion of Geocon Incorporated, would preclude the mass grading of the property as proposed, provided the recommendations of this report are followed. Future studies will be necessary to address the ultimate grading of the site, and provide geotechnical recommendations for the improvements.

6.1.2 The site is underlain by saturated compressible alluvium that is greater than 125-feet-thick. Our study indicates that approximately 2 to 5 inches of compression-related settlement is anticipated over several months based on laboratory testing and the current development plan. As a consequence, construction of the proposed improvements, including underground utilities, should be delayed until the primary consolidation of the alluvial deposits is essentially complete. However, the City of Oceanside requires a minimum of 6 months of settlement monitoring, therefore, it is our opinion that primary consolidation of the alluvial soils should be complete after the 6 month monitoring period.

6.1.3 The liquefaction analyses indicate that zones of the alluvium to depths of approximately 50 feet could be prone to as much as 9 inches of total settlement during a seismic event. Based on recent discussions, we understand that the City of Oceanside will require liquefaction mitigation for habitable structures to reduce the static and dynamic settlements.

6.2 Mitigation of Liquefaction

6.2.1 Although no structures are shown on the current rough grading plans, mitigation of liquefiable soils will be necessary for future settlement-sensitive structures. Ground improvement techniques, such as stone columns, soil mixing, compaction grouting, etc., are all methods that can reduce the estimated settlements to tolerable ranges. Upon completion of the Phase 2 (Ultimate) design, a design-build contractor specializing in ground improvement, such as Hayward Baker or Condon-Johnson, should review the available soil and geologic information presented herein and provide ground improvement alternatives to mitigate the estimated settlements to tolerable limits for foundations and other settlement-sensitive improvements.

6.3 Excavation and Soil Characteristics

6.3.1 Excavation of the surficial deposits should be possible with light to moderate effort using conventional heavy-duty equipment. Excavations into the formational materials is not anticipated. The existing near surface soils requiring remedial grading are expected to be relatively dry. Significant amounts of water may be needed during remedial grading to achieve near optimum moisture contents.

6.3.2 The soils encountered in the field investigation are considered to be "non expansive" (expansion index [EI] less than 20) as defined by 2016 California Building Code (CBC) Section 1803.5.3. Table 6.3 presents soil classifications based on the expansion index. The soil materials observed on site are anticipated to have a "very low" expansion potential (expansion index of 20 or less).

TABLE 6.3
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM 4829 Expansion Classification	2016 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

6.4 Corrosion

6.4.1 Geocon Incorporated does not practice in the field of corrosion engineering; therefore, if improvements that could be susceptible to corrosion are planned, it is recommended that further evaluation by a corrosion engineer be performed.

6.5 Grading

6.5.1 All grading should be performed in accordance with the attached *Recommended Grading Specifications* (Appendix L). Where the recommendations of this section conflict with Appendix L, the recommendations of this section take precedence. All earthwork should be observed and all fills tested for proper compaction by Geocon Incorporated.

6.5.2 Earthwork should be observed and compacted fill tested by representatives of Geocon Incorporated.

6.5.3 A pre-construction conference with a City of Oceanside representative, owner, contractor, civil engineer, and geotechnical engineer should be held at the site prior to the beginning of grading. Special soil handling requirements can be discussed at that time.

6.5.4 Site preparation should begin with the removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas or soils to be used as fill are relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

6.5.5 Artificial fill within areas of planned grading (i.e. drive-in theater, Foussat Road that crosses the site and any other artificial embankment areas encountered during grading) should be removed, properly moisture conditioned, and compacted prior to placing additional fill and/or structural loads. The upper portion of the alluvium below these embankments will also require remedial grading as described below. Normal benching should be sufficient where proposed fills are placed against existing North Foussat Road. The actual extent of unsuitable soil removals should be determined in the field by the geotechnical engineer and/or engineering geologist. Overly wet, surficial materials will require drying and/or mixing with drier soils to facilitate proper compaction.

6.5.6 The upper 5 feet of alluvium across the site should be removed and replaced with properly compacted fill prior to placing additional fill. Select areas may require deeper remedial excavation depending on the conditions encountered. The base of the remedial excavations should be scarified approximately 12 inches, heavily moisture conditioned, and compacted. Adequate survey control will be required during remedial grading to assure that the recommendations provided herein are followed.

6.5.7 After removal of unsuitable materials is performed, the site should then be brought to final elevations with structural fill compacted in layers. In general, soils native to the site are suitable for re-use as fill if free from vegetation, debris, and other deleterious material. Layers of fill should be no thicker than will allow for adequate bonding and compaction. All fill, including backfill and scarified ground surfaces, should be compacted to at least 90 percent of maximum dry density at or above optimum moisture content, as determined in accordance with ASTM Test Procedure D1557. Fill materials below optimum moisture content will require additional moisture conditioning prior to placing additional fill.

6.5.8 Import materials should consist of granular material with “very low” to “low” expansive (Expansion Index of 50 or less) potential. Prior to importing the material, samples from proposed export site should be obtained and subjected to laboratory testing to evaluate whether the material conforms to the recommended criteria. At least 5 working days should be allowed for laboratory testing of the soil prior to its importation. Import materials should be free of rock, construction debris or any other objectionable materials/conditions including a high moisture content. Fill brought to the site that is found to not meet these requirements should be exported from the property at the contractor’s expense.

6.5.9 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable OSHA rules and regulations in order to maintain safety and maintain the stability of adjacent existing improvements.

6.6 Surcharge

6.6.1 We understand that the reclaimed water line and two sewer force mains adjacent to the levee embankment area are planned to be removed, temporarily high-lined during grading, and replaced as soon as possible. In order to reduce the settlement potential after the ultimate grade is achieved, we recommend placing a 5-foot-thick surcharge embankment above ultimate finish grade in the new utility alignment. The surcharge soil should be compacted to at least 90 percent at or slightly above optimum moisture content. The approximate location of the proposed surcharge is shown on Figure 2.

6.6.2 As discussed previously, approximately 2 to 5 inches of settlement could occur as a result of the additional fill loads placed over the project site. The analyses also indicate that settlement could take several months after the placement of the fill for primary consolidation to be essentially complete thus delaying construction.

6.7 Settlement Monitoring

6.7.1 The proposed structural areas underlain by saturated alluvium should be monitored for settlement. In general, surface settlement plates should be installed at several locations within the development footprint and read periodically until primary consolidation has essentially ceased. The City of Oceanside requires a minimum 6-month monitoring period. Survey readings should be performed regularly following placement of the proposed fill. Specific details regarding the location and type of monitoring device as well as monitoring frequency will be provided once the development plans have been finalized.

6.8 Slope Stability Evaluation

6.8.1 Slope stability analyses were performed along Cross-Sections A-A’ through C-C’ depicting the existing levee embankment, ultimate grades, as well as ultimate grades with a temporary 5 foot surcharge added over the utility alignment. The analyses utilized the computer software program *GeoStudio 2018* to evaluate the factor of safety against deep-seated failure. A summary of the static and pseudo-static slope stability analyses performed is shown on Table 6.8.2. We considered both residual and ultimate strength parameters for the alluvium. Residual values were used to evaluate the slope stability considering liquefied alluvium.

6.8.2 We performed the slope stability analysis using residual undrained shear strength parameters (phi = 0) for the potentially liquefiable alluvial soils based on information provided in *Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction in California* and utilizing a published relationship between blow count and residual undrained shear strength presented by Seed and Harder (1990). Ultimate shear strength parameters were considered for non-liquefiable soils.

6.8.3 Laboratory tests were performed on relatively undisturbed ring samples of the prevailing soil and geologic units and the results are presented in Appendices B and D. Table 6.8.1 presents the soil strength parameters that were utilized in the slope stability analyses.

TABLE 6.8.1
SOIL STRENGTH PARAMETERS

Soil Condition	Angle of Internal Friction ϕ (degrees)	Cohesion c (psf)
Artificial Fill (levee embankment)	35	200
Alluvium (ML/CL)	20	400
Alluvium (SM)	30	100
Liquefiable Alluvium (SM) – N=10	0	200
Liquefiable Alluvium (SM) – N=12	0	300

6.8.4 In accordance with Special Publication 117 guidelines, seismic slope stability analyses were performed in accordance with *Recommended Procedures for Implementation of DMG Special Publication 117A: Guidelines for Evaluating and Mitigating Seismic Hazards in California*, prepared by the Southern California Earthquake Center (SCEC), revised and re-adopted September 11, 2008.

6.8.5 The seismic analysis was performed using a peak ground acceleration of 0.22g, corresponding to a 10 percent probability of exceedence in 50 years. In addition, a deaggregation analysis was performed for the site using the 2008 USGS interactive deaggregations website. A modal magnitude and modal distance of 6.9 and 11.8 kilometers, respectively, was used in the analysis.

6.8.6 Using the parameters discussed herein, an equivalent site acceleration, k_{EQ}, of 0.13g was calculated to perform the seismic slope stability analysis, as shown in Appendix G. The screening analysis was performed using an acceleration of 0.13g resulting in a pseudo-static factor of safety ranging between 1.6 and 1.7. Table 6.8.3 presents a summary of the seismic slope stability screening evaluation. A slope is considered acceptable by the screening analysis if the calculated factor of safety is greater than 1.0 using k_{EQ}; therefore, the most critical failure surfaces analyzed for the levee embankment pass the screening analysis for the seismic slope stability.

TABLE 6.8.2
STATIC SLOPE STABILITY SUMMARY

Section	Figure Number	Condition Analyzed	Factor Of Safety
A-A'	G-1	Existing condition - liquefied alluvium	1.6
	G-2	Proposed condition – liquefied alluvium	1.6
	G-3	Proposed condition with surcharge – liquefied alluvium	1.6
	G-4	Proposed condition with surcharge – ultimate strengths (non-liquefied alluvium)	2.2
	G-7	Proposed condition without surcharge – ultimate strengths (non-liquefied alluvium)	2.2
B-B'	G-10	Existing condition - liquefied alluvium	1.6
	G-11	Proposed condition – liquefied alluvium	1.6
	G-12	Proposed condition with surcharge – liquefied alluvium	1.6
	G-13	Proposed condition with surcharge – ultimate strengths (non-liquefied alluvium)	2.1
	G-16	Proposed condition without surcharge – ultimate strengths (non-liquefied alluvium)	2.1
C-C'	G-19	Existing condition – non-liquefied alluvium	2.3
	G-20	Proposed condition without surcharge – ultimate strengths (non-liquefied alluvium)	2.3
	G-23	Proposed condition with surcharge – ultimate strengths (non-liquefied alluvium)	2.3

TABLE 6.8.3
SEISMIC SLOPE STABILITY SCREENING EVALUATION (KEQ = 0.13G)

Section	Figure Number	Condition Analyzed	Factor Of Safety	Pass/Fail
A-A'	G-5	Proposed condition with surcharge – ultimate strengths (non-liquefied alluvium)	1.7	Pass
	G-8	Proposed condition without surcharge – ultimate strengths (non-liquefied alluvium)	1.7	Pass
B-B'	G-14	Proposed condition with surcharge – ultimate strengths (non-liquefied alluvium)	1.6	Pass
	G-17	Proposed condition without surcharge – ultimate strengths (non-liquefied alluvium)	1.6	Pass

Section	Figure Number	Condition Analyzed	Factor Of Safety	Pass/Fail
C-C’	G-21	Proposed condition without surcharge – ultimate strengths (non-liquefied alluvium)	1.7	Pass
	G-24	Proposed condition with surcharge – ultimate strengths (non-liquefied alluvium)	1.7	Pass

6.8.7 The output files and calculated factor of safeties for the conditions summarized in Tables 6.8.2 and 6.8.3 are presented in Appendix G.

6.9 Seismic Design Criteria

6.9.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 6.9.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 seconds. The values presented in Table 6.9.1 are for the risk-targeted maximum considered earthquake (MCE_R). Based on soil conditions and planned grading, the building should be designed using a Site Class D. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10.

TABLE 6.9.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	D	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.089g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.421g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.064	Table 1613.3.3(1)
Site Coefficient, F_V	1.579	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.159g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	0.665g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.773g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.443g	Section 1613.3.4 (Eqn 16-40)

6.9.2 Table 6.9.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 6.9.2
2016 CBC SITE ACCELERATION PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Site Class	D	Section 1613.3.2
Mapped MCE_G Peak Ground Acceleration, PGA	0.415g	Figure 22-7
Site Coefficient, F_{PGA}	1.085	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.45g	Section 11.8.3 (Eqn 11.8-1)

6.9.3 Conformance to the criteria in Tables 6.9.1 and 6.9.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

6.10 Grading Plan Reviews

6.10.1 The geotechnical engineer and engineering geologist should review the final grading plans prior to final City submittal to check their compliance with the recommendations of this report and to determine the need for additional comments, recommendations and/or analysis.

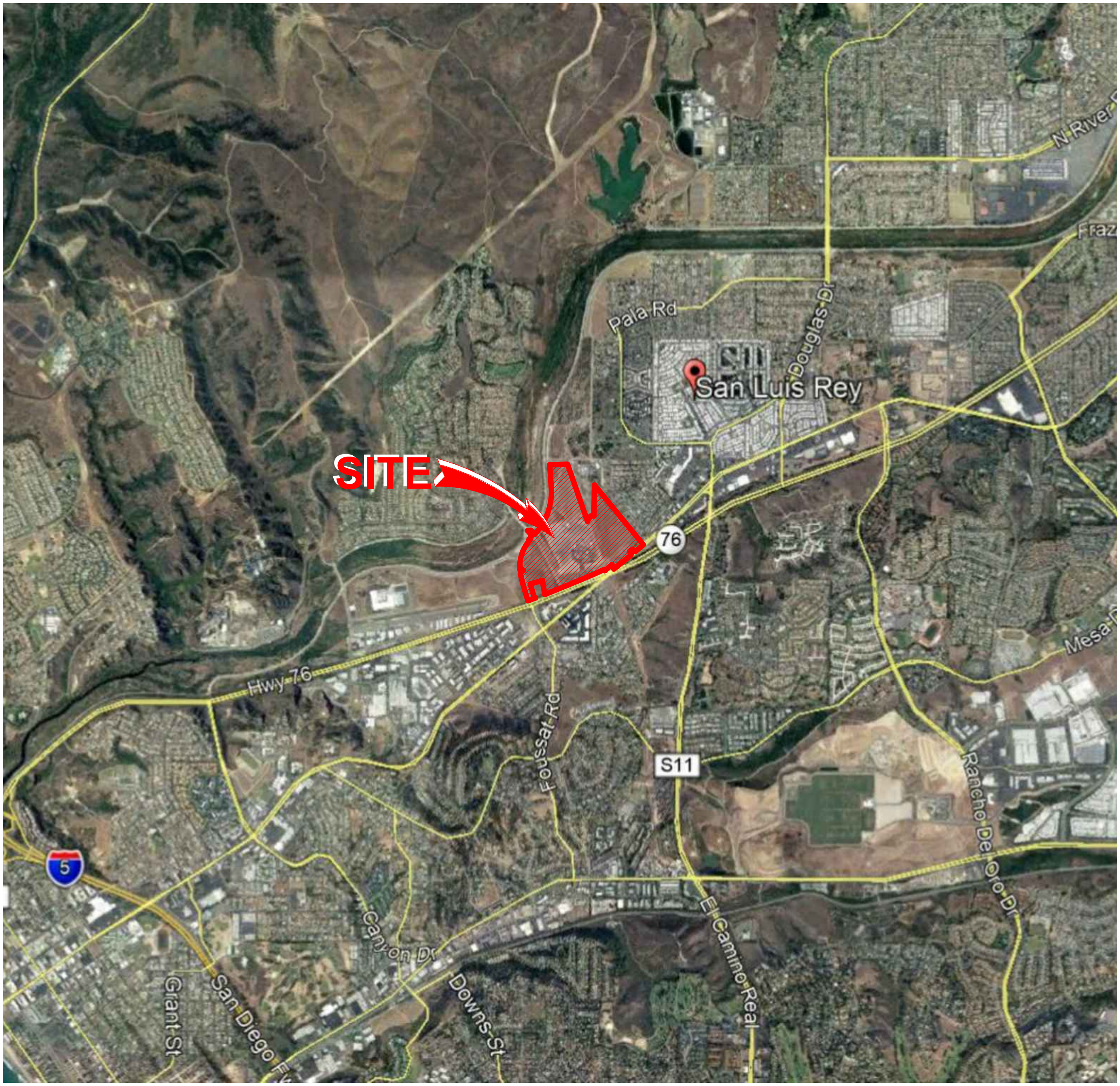
LIMITATIONS AND UNIFORMITY OF CONDITIONS

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.



THE GEOGRAPHICAL INFORMATION MADE AVAILABLE FOR DISPLAY WAS PROVIDED BY GOOGLE EARTH, SUBJECT TO A LICENSING AGREEMENT. THE INFORMATION IS FOR ILLUSTRATIVE PURPOSES ONLY; IT IS NOT INTENDED FOR CLIENT'S USE OR RELIANCE AND SHALL NOT BE REPRODUCED BY CLIENT. CLIENT SHALL INDEMNIFY, DEFEND AND HOLD HARMLESS GEOCON FROM ANY LIABILITY INCURRED AS A RESULT OF SUCH USE OR RELIANCE BY CLIENT.

N

NO SCALE

VICINITY MAP

GEOCON INCORPORATED

GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
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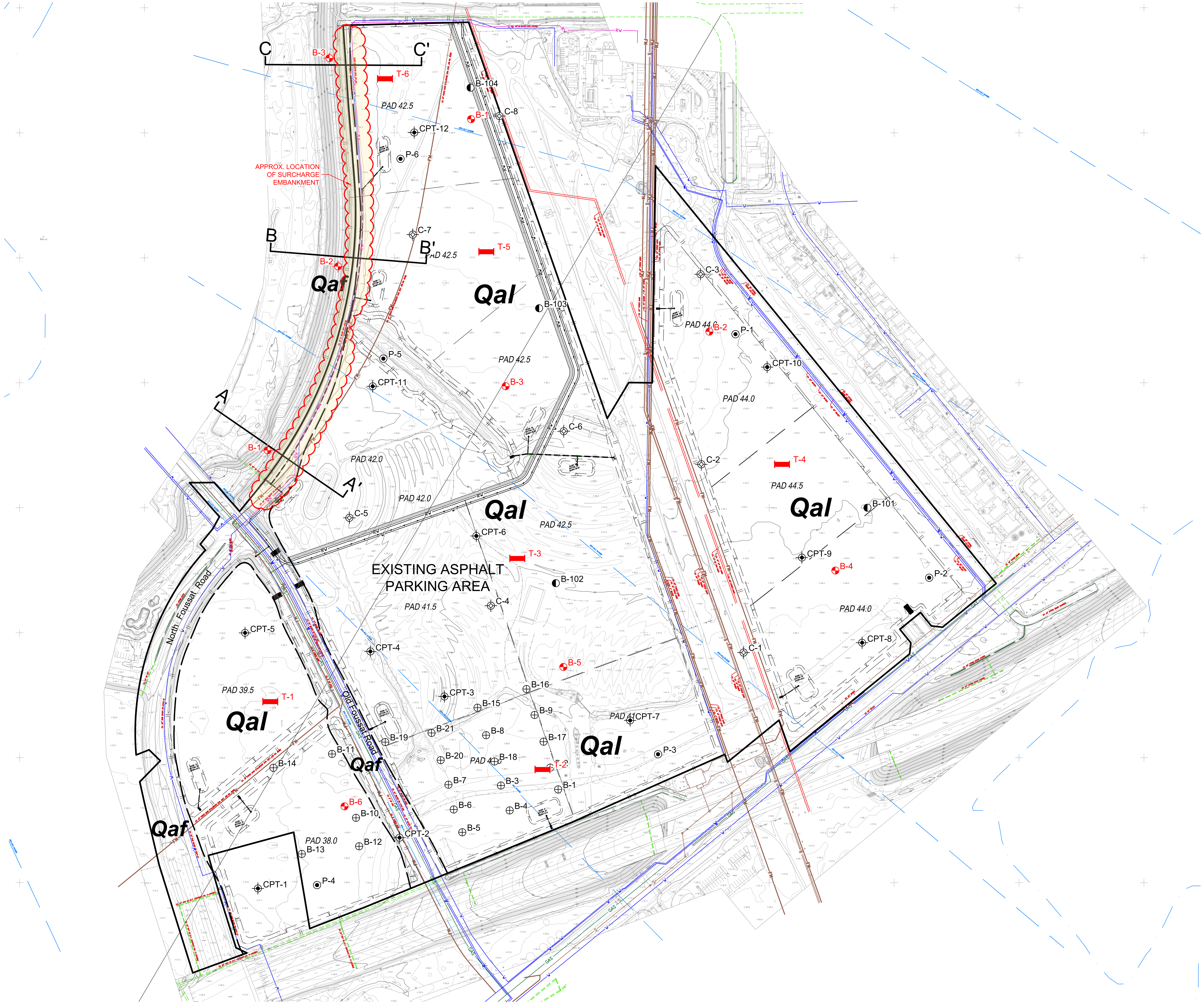
PHONE 858 558-6900 - FAX 858 558-6159

ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. 1



GRAPHIC SCALE

0' 75' 150' 225' 300' 450' 600'

SCALE 1"=150' (on 36x24)

GEOCON LEGEND

Qaf ....ARTIFICIAL FILL

Qal ....ALLUVIUM

........APPROX. LOCATION OF GEOLOGIC CONTACT

B-3 ....APPROX. LOCATION OF MUD ROTARY BORING (Geocon, June 2019)

T-6 ....APPROX. LOCATION OF TRENCH (Geocon, May 2019)

B-6 ....APPROX. LOCATION OF BORING (Geocon, 2018)

B-104 ....APPROX. LOCATION OF BORING (Group Delta, 2015)

B-21 ....APPROX. LOCATION OF BORING (EEI, 2008)

P-6 ....APPROX. LOCATION OF PERCOLATION TEST (EEI, 2015)

CPT-12 ....APPROX. LOCATION OF CPT (EEI, 2018)

C-8 ....APPROX. LOCATION OF CPT (Group Delta, 2015)

C C' ....APPROX. LOCATION OF GEOLOGIC CROSS-SECTIONS

GEOLOGIC MAP

ZEPHYR OCEANSIDE
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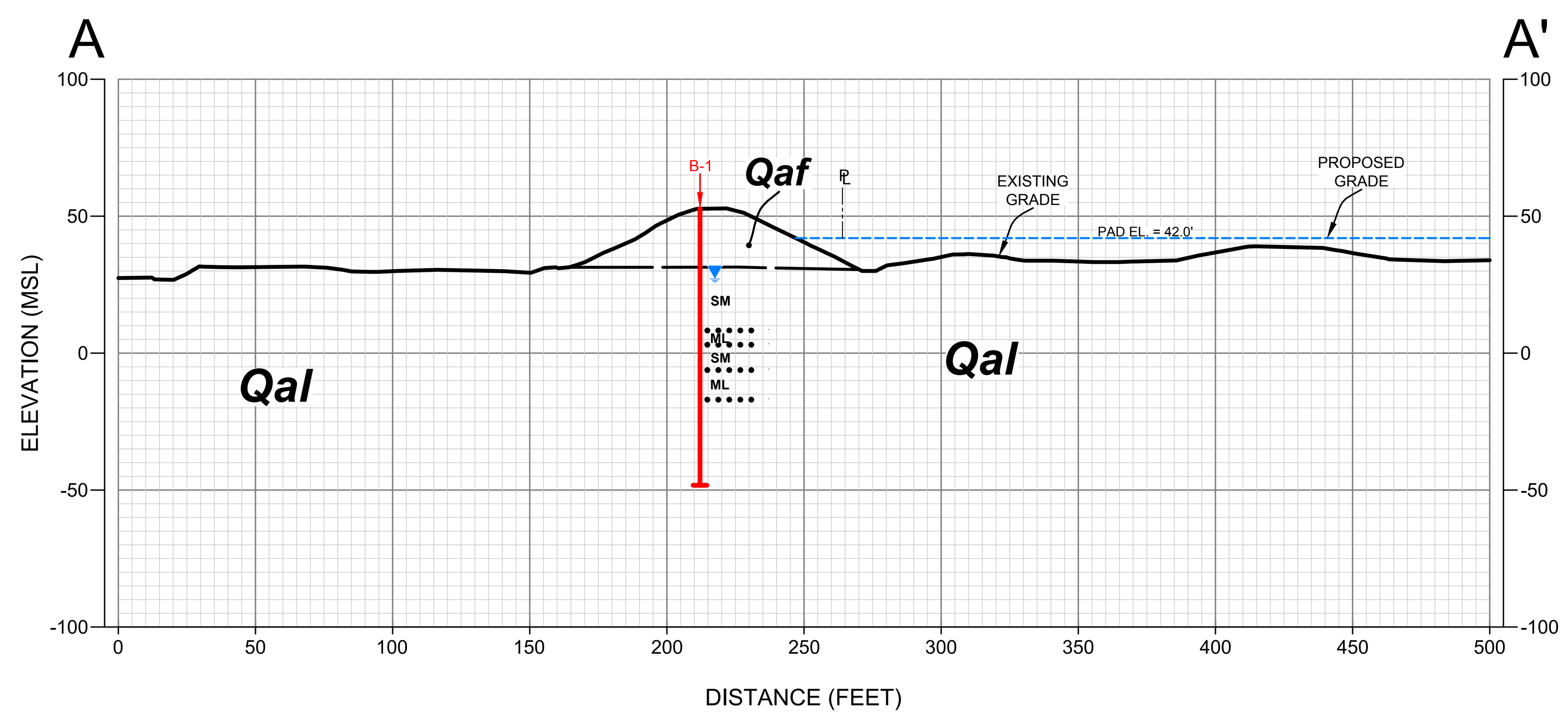
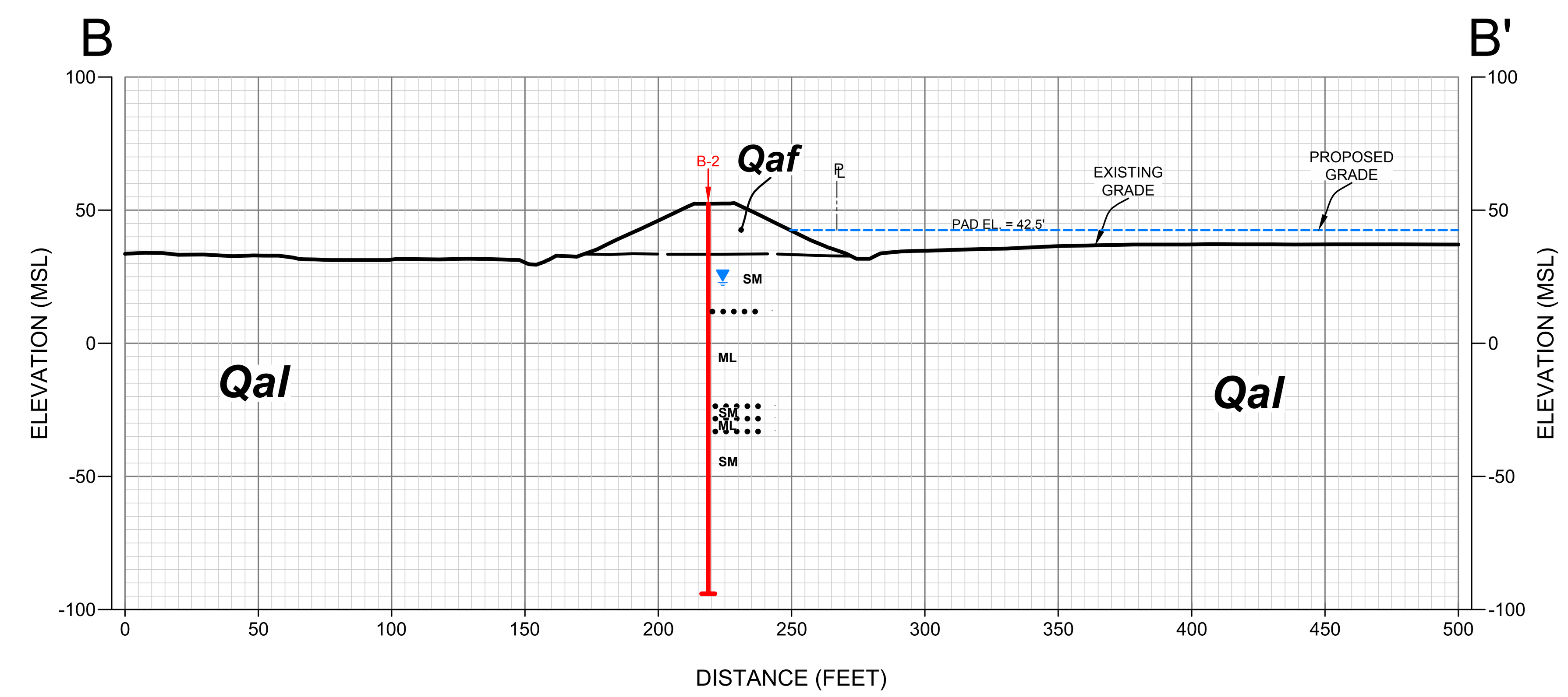
SCALE 1" = 150'	DATE 08 - 13 - 2019	
PROJECT NO. G2322 - 32 - 01		FIGURE 2
SHEET 1 OF 1		



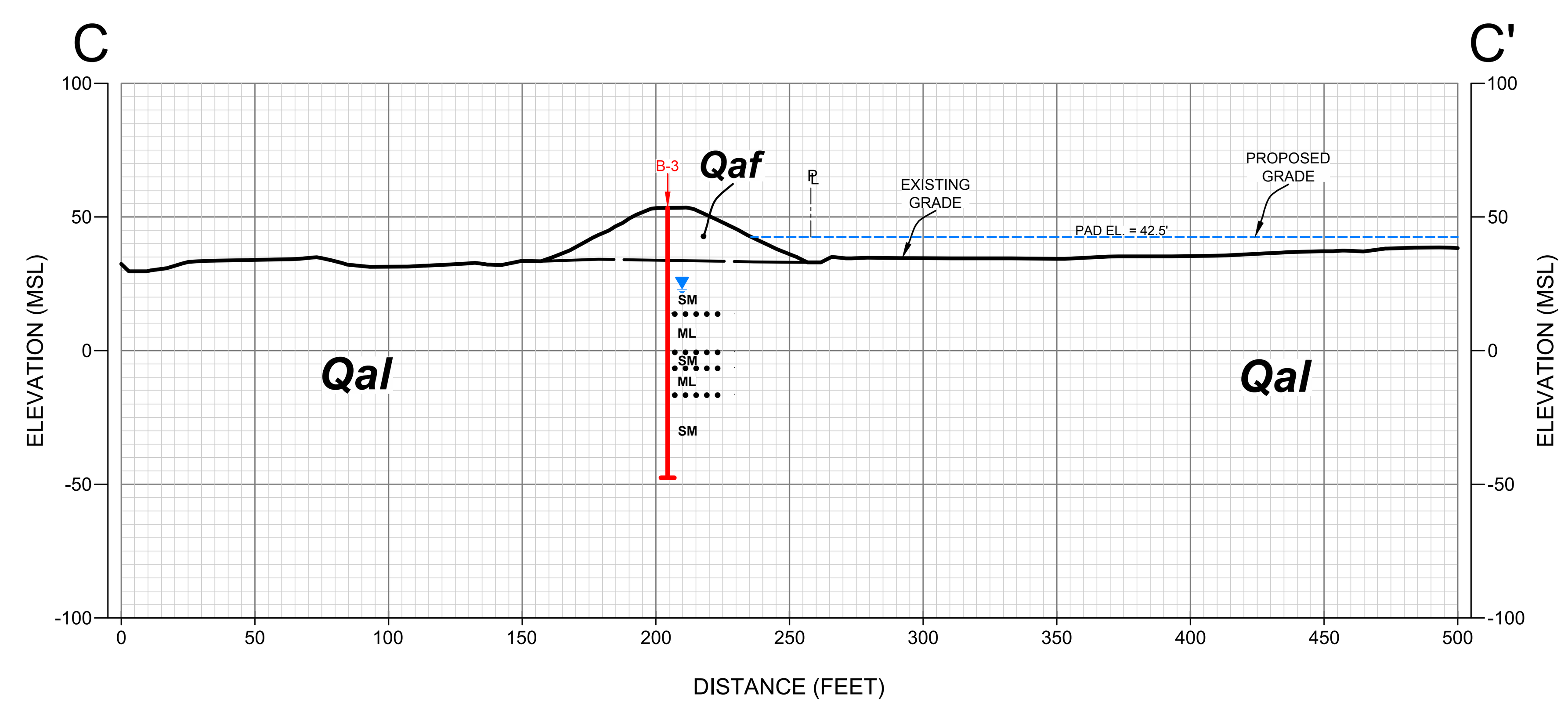
GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 50' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 50' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION C-C'

SCALE: 1" = 50' (Vert. = Horiz.)

GEOCON LEGEND

- **Qaf** ....ARTIFICIAL FILL
- **Qal** ....ALLUVIUM
- B-3 ....APPROX. LOCATION OF BORING
- ....APPROX. LOCATION OF GEOLOGIC CONTACT

GEOLOGIC CROSS - SECTIONS

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SCALE	DATE	
1" = 50'	08 - 13 - 2019	
PROJECT NO. G2322 - 32 - 01		FIGURE 3
SHEET 1 OF 1		

APPENDIX A

APPENDIX A

FIELD INVESTIGATION (2019)

The recent field investigation was performed between June 19 and June 21, 2019, and consisted of a visual site reconnaissance, drilling three mud rotatory borings (Boring Nos. B-1 through B-3) on the existing levee embankment. A subsequent field investigation was performed on May 3, 2019 and consisted of excavating six exploratory trenches across the site. The approximate locations of the exploratory borings and trenches are shown on the *Geologic Map*, Figure 2.

The recent exploratory borings were performed by Tri County Drilling using a truck-mounted, CME-75 mud rotary drill rig to a maximum depth of 146.5 feet below the levee embankment. Samples were collected at various depths using a 3-inch diameter California split-spoon sampler (CAL) or a 2-inch-diameter Standard Penetration Test (SPT) sampler, driven 12 and 18 inches, respectively into the undisturbed soil mass. An automatic trip hammer weighing 140 pounds and dropped 30 inches was used to drive the samplers. Relatively undisturbed samples were also collected from the exploratory trenches using a hand sampler.

The CAL sampler was equipped with 1-inch by 2⅜-inch, brass sampler rings to facilitate removal and testing. The soil collected within the SPT sampler was placed in plastic bags for testing. Blow counts were recorded for every 6 inches the sampler was driven and shown on the boring logs in terms of blows per foot. The values indicated on the boring logs are the sum of the last 12 inches of the sampler if driven 18 inches. These values are not to be taken as N-values, adjustments have not been applied. Logs of the borings and trenches depicting the soil and geologic conditions encountered and the depth at which samples were obtained are presented on Figures A-1 through A-9.

The soils encountered in the excavations were visually classified and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual Manual Procedure D 2488).

BORING B 1

ELEV. (MSL.) **52'** DATE COMPLETED **06-19-2019**

EQUIPMENT **CME 75 MUD ROTARY** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0			**ASPHALT CONCRETE**			
		SM	**ARTIFICIAL FILL (Qaf)** Medium dense, damp, dark brown to gray, Silty, fine to coarse SAND with gravel up to 1"			
2						
	B1-1			42	108.5	6.2
4						
	B1-2			36	103.4	7.9
6	B1-3					
8	B1-4			41	111.8	7.6
10	B1-5			55	116.3	6.8
	B1-6		-Becomes dense	19		
12						
	B1-7			35	109.7	9.5
14	B1-8			30		
	B1-9			32	117.7	7.5
16	B1-10			45		
			-Becomes fine to medium grained			
18	B1-11			31	99.0	17.7
20	B1-12		-Becomes dense	51	106.8	11.1
		SP-SM	**ALLUVIUM (Qal)** Medium dense, moist, tan brown/gray, fine to medium SAND with little silt; poorly graded			
22						
24						
	B1-13		-Becomes wet	15		
26						
	B1-14					
28						
			-Groundwater encountered at 29 feet			

Figure A-1,
Log of Boring B 1, Page 1 of 4

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 1

ELEV. (MSL.) 52' DATE COMPLETED 06-19-2019

EQUIPMENT CME 75 MUD ROTARY BY: D. GITHENS

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B1-15	SP-SM	-Becomes saturated	20		
32						
34						
	B1-16			35	105.3	20.6
36						
38						
40	B1-17		-Increase in silt content	16		
42						
44						
	B1-18	ML	Medium stiff, saturated, dark gray, fine to medium Sandy SILT	9	95.6	30.5
46						
48						
50	B1-19	SM	Medium dense, saturated, dark gray, Silty, fine to coarse SAND	12		
52						
54						
			-No recovery	20		
56						
58						

Figure A-1,
Log of Boring B 1, Page 2 of 4

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
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GEOCON

PROJECT NO. G2322-32-01

BORING B 1

ELEV. (MSL.) 52' DATE COMPLETED 06-19-2019

EQUIPMENT CME 75 MUD ROTARY BY: D. GITHENS

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B1-20			ML	Stiff, saturated, dark gray, fine to medium Sandy SILT	24	89.3	30.4
62								
64								
	B1-21					17		
66								
68								
70	B1-22					26	104.5	23.9
				SM	Medium dense, saturated, dark gray, Silty, fine to medium SAND			
72								
74								
	B1-23				-Increase in clay content	14		
76								
78								
80	B1-24					34	86.3	34.2
82								
84								
	B1-25					22		
86								
88								

Figure A-1,
Log of Boring B 1, Page 3 of 4

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 1

ELEV. (MSL.) 52' DATE COMPLETED 06-19-2019

EQUIPMENT CME 75 MUD ROTARY BY: D. GITHENS

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
90	B1-26			SM	Very dense, saturated, white/light gray, Silty, fine to coarse SAND	82	107.7	21.4
92								
94								
96								
98								
100	B1-27					52	100.5	25.3
					BORING TERMINATED AT 101 FEET Groundwater encountered at approx. 25 feet Backfilled with approx. 35 ft^3 of bentonite slurry			

Figure A-1,
Log of Boring B 1, Page 4 of 4

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G2322-32-01

BORING B 2

ELEV. (MSL.) 52' DATE COMPLETED 06-21-2019

EQUIPMENT CME 75 MUD ROTARY BY: D. GITHENS

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	2" **ASPHALT CONCRETE**			
					ARTIFICIAL FILL (Qaf) Medium dense, damp to moist, tan brown/gray, Silty, fine to coarse SAND			
2								
	B2-1					43	111.7	3.8
	B2-2							
4								
	B2-3					47	102.8	3.2
6								
8	B2-4					50	107.8	4.1
					-Becomes dense			
10	B2-5				-Becomes very dense	56		
12	B2-6					65	115.1	7.0
	B2-7					43	107.5	6.9
					-Becomes dense			
14	B2-8					30		
	B2-9					69	116.9	6.3
16	B2-10					35		
18								
				SM	**ALLUVIUM (Qal)** Loose, moist, dark gray, Silty, fine to medium SAND			
20	B2-11					11		
22	B2-12							
24					-Becomes wet, tan brown/gray			
	B2-13					13	96.6	14.9
26								
28								
			▼		-Groundwater encountered at 29 feet			

Figure A-2,
Log of Boring B 2, Page 1 of 5

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 2

ELEV. (MSL.) **52'** DATE COMPLETED **06-21-2019**

EQUIPMENT **CME 75 MUD ROTARY** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B2-14				-Becomes medium dense	23	100.3	23.5
32								
34								
36	B2-15					21		
38								
40	B2-16			ML	Soft, saturated, dark gray, fine Sandy SILT with little clay	6	80.3	43.8
42								
44				SM	Loose, saturated, dark gray, Silty, fine SAND			
46	B2-17					9		
48								
				ML	Medium stiff, saturated, dark gray, fine Sandy SILT with little clay			
50	B2-18					11	85.6	36.5
52								
54								
56	B2-19				-Becomes stiff	14		
58								

Figure A-2,
Log of Boring B 2, Page 2 of 5

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 2

ELEV. (MSL.) 52' DATE COMPLETED 06-21-2019

EQUIPMENT CME 75 MUD ROTARY BY: D. GITHENS

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B2-20			SM	Medium dense, saturated, dark gray, Silty, fine to medium SAND	23	94.4	29.3
62								
64								
	B2-21					14		
66								
68				ML-CL	Stiff, saturated, dark gray, Silty CLAY/Clayey SILT			
70	B2-22					10	83.1	39.3
72								
74								
	B2-23					27		
76				SM	Medium dense, saturated, dark gray/gray, Silty, fine to coarse SAND			
78								
80	B2-24			ML	Stiff, saturated, dark gray, fine to medium Sandy SILT	35	93.3	30.9
82								
84				SM	Medium dense, saturated, light gray/gray, Silty, fine to coarse SAND, trace gravel			
	B2-25					27		
86								
88								

Figure A-2,
Log of Boring B 2, Page 3 of 5

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 2

ELEV. (MSL.) **52'** DATE COMPLETED **06-21-2019**

EQUIPMENT **CME 75 MUD ROTARY** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
90	B2-26					42	103.4	24.1
92								
94								
	B2-27					24		
96								
98								
100	B2-28				-Becomes dense	50	103.1	23.3
102								
104								
	B2-29					80	102.9	25.0
106								
108								
110					-Same, no visible gravel			
112								
114								
	B2-30					67		
116								
118								

Figure A-2,
Log of Boring B 2, Page 4 of 5

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 2

ELEV. (MSL.) **52'** DATE COMPLETED **06-21-2019**

EQUIPMENT **CME 75 MUD ROTARY** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
120								
122								
124								
	B2-31					72	110.3	20.5
126								
128					-Some gravel encountered			
130								
132								
134								
	B2-32					86	97.3	26.3
136								
138								
140								
142								
144								
	B2-33					20		
146								

BORING TERMINATED AT 146.5 FEET
Groundwater encountered at approx. 29 feet
Backfilled with approx. 50 ft³ of bentonite slurry

Figure A-2,
Log of Boring B 2, Page 5 of 5

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2322-32-01

BORING B 3

ELEV. (MSL.) **53'** DATE COMPLETED **06-20-2019**

EQUIPMENT **CME 75 MUD ROTARY** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	2" **ASPHALT CONCRETE**			
					ARTIFICIAL FILL (Qaf) Medium dense, damp, tan brown to brown, Silty, fine to coarse SAND			
2								
	B3-1					25	101.4	23.3
					-Same, except layer of moist, fine to medium sandy silt			
4	B3-3							
	B3-2				-Becomes dense	31		
6								
					-Becomes very dense			
8	B3-4					80/11"	112.7	7.1
	B3-5					56		
10	B3-6					80/10"	112.0	5.1
	B3-7				-Becomes dense	48		
12								
	B3-8					66	109.8	10.8
					-Becomes very dense and moist			
14	B3-9					55		
	B3-10					83/11"	119.4	6.1
16								
	B3-11							
18								
				ML	**ALLUVIUM (Qal)** Stiff, very moist, dark gray, fine to medium Sandy SILT			
20	B3-12					11		
				SM	Loose, very moist, tan brown, Silty, fine to meduim SAND			
22								
24								
	B3-13				-Becomes medium dense	21	101.2	4.0
26								
28								
			▼		-Groundwater encountered at 30 feet			

Figure A-3,
Log of Boring B 3, Page 1 of 4

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 3

ELEV. (MSL.) **53'** DATE COMPLETED **06-20-2019**

EQUIPMENT **CME 75 MUD ROTARY** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B3-14					36	103.9	17.4
35					-No recovery	19		
40	B3-15			ML-SM	Stiff, saturated, dark gray, fine to medium Sandy SILT with little clay to Silty/Clayey fine SAND	16	94.0	32.8
45	B3-16					15		
50	B3-17				-Same, except no clay	35	95.1	29.4
54	B3-18			SM	Medium dense, saturated, light brown/gray, Silty, fine to coarse SAND	26		

Depth scale: 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58

Figure A-3,
Log of Boring B 3, Page 2 of 4

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2322-32-01

BORING B 3

ELEV. (MSL.) **53'** DATE COMPLETED **06-20-2019**

EQUIPMENT **CME 75 MUD ROTARY** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B3-19			ML	Stiff, saturated, dark gray, fine to medium Sandy SILT	29	106.5	23.0
62								
64								
	B3-20				-Becomes medium stiff	7		
66								
68								
70	B3-21			SM	Medium dense, saturated, light brown/gray, Silty, fine to coarse SAND	43	103.8	24.9
72								
74								
	B3-22				-Becomes fine to medium sand	29		
76								
78								
80	B3-23					46	93.3	27.8
82								
84				SM	Medium dense, saturated, light gray, Silty, fine to coarse SAND			
	B3-24					22		
86								
88								

Figure A-3,
Log of Boring B 3, Page 3 of 4

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 3

ELEV. (MSL.) **53'** DATE COMPLETED **06-20-2019**

EQUIPMENT **CME 75 MUD ROTARY** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
90	B3-25					45		
92								
94								
96					-No recovery	29		
98								
				SM	Dense, saturated, light gray, Silty, fine to coarse SAND (very coarse)			
100	B3-26					58	102.8	24.8

BORING TERMINATED AT 101 FEET
Groundwater encountered at approx. 30 feet
Backfilled with approx. 35 ft^3 of bentonite slurry

Figure A-3,
Log of Boring B 3, Page 4 of 4

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

TRENCH T 1

ELEV. (MSL.) **31'** DATE COMPLETED **05-03-2019**

EQUIPMENT **JD 410G Backhoe** BY: **T. MYERS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM** Loose, damp, yellowish brown, Silty, fine to coarse SAND			
2								
					Loose to medium dense, damp, yellowish white, black, Silty, fine to medium SAND			
4								
	T1-1						102.8	5.1
	T1-2							
	T1-3							
6					TRENCH TERMINATED AT 6 FEET Groundwater not encountered			

Figure A-4,
Log of Trench T 1, Page 1 of 1

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

TRENCH T 2

ELEV. (MSL.) **38'** DATE COMPLETED **05-03-2019**

EQUIPMENT **JD 410G Backhoe** BY: **T. MYERS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM** Loose, damp, grayish-brown, Silty, fine SAND			
2								
					Loose to medium dense, damp, white, black yellowish brown, Silty, fine to medium SAND			
4								
	T2-1						96.6	4.9
	T2-2							
	T2-3							
6					TRENCH TERMINATED AT 6 FEET Groundwater not encountered			

Figure A-5,
Log of Trench T 2, Page 1 of 1

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

TRENCH T 3

ELEV. (MSL.) **39'** DATE COMPLETED **05-03-2019**

EQUIPMENT **JD 410G Backhoe** BY: **T. MYERS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					2" **ASPHALT**			
				SM	**ALLUVIUM** Medium dense, moist, grayish-brown, Silty, fine SAND			
2								
4								
	T3-1						100.4	6.2
	T3-2							
	T3-3							
6					TRENCH TERMINATED AT 6 FEET Groundwater not encountered			

Figure A-6,
Log of Trench T 3, Page 1 of 1

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2322-32-01

TRENCH T 4

ELEV. (MSL.) **40'** DATE COMPLETED **05-03-2019**

EQUIPMENT **JD 410G Backhoe** BY: **T. MYERS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM** Loose, damp, grayish-brown, Silty, fine SAND			
2								
					-Becomes loose to medium dense			
4								
	T4-1						98.5	3.2
	T4-2							
	T4-3							
6					TRENCH TERMINATED AT 6 FEET Groundwater not encountered			

Figure A-7,
Log of Trench T 4, Page 1 of 1

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

TRENCH T 5

ELEV. (MSL.) **37'** DATE COMPLETED **05-03-2019**

EQUIPMENT **JD 410G Backhoe** BY: **T. MYERS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM** Loose, damp, grayish-brown, Silty, fine SAND			
2								
4								
	T5-1				-Some fine to coarse sand		90.4	6.0
	T5-2							
	T5-3							
6					TRENCH TERMINATED AT 6 FEET Groundwater not encountered			

Figure A-8,
Log of Trench T 5, Page 1 of 1

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G2322-32-01

TRENCH T 6

ELEV. (MSL.) 37' DATE COMPLETED 05-03-2019

EQUIPMENT JD 410G Backhoe BY: T. MYERS

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM** Loose, damp, grayish-brown, Silty, fine SAND			
2					-Becomes damp to moist, fine to medium grained			
4								
	T6-1						93.4	6.1
	T6-2							
6	T6-3							
	T6-4				Soft, moist, grayish-brown, fine Sandy SILT; micaceous		91.3	10.1
	T6-5							
8								
					TRENCH TERMINATED AT 8.5 FEET Groundwater not encountered			

Figure A-9,
Log of Trench T 6, Page 1 of 1

G2322-32-01 (2019_BERMSTUDY).GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

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GEOCON

APPENDIX B

APPENDIX B

LABORATORY TESTING (2019)

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected samples were tested for in-place dry density and moisture content, maximum dry density and optimum moisture content, shear strength, gradation, plasticity index, and consolidation characteristics. The results of our laboratory tests are summarized on Tables B-I through B-III and Figures B-1 through B-30. The results of the dry density and moisture content tests are presented on the boring and trench logs.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T1-3	Gray-brown, Silty, fine to medium SAND	111.6	16.3
T2-3	Gray-brown, Silty, fine to medium SAND	110.2	14.6
T3-3	Gray-brown, Silty, fine SAND	109.3	16.2
T4-3	Gray-brown, Silty, fine SAND	108.0	16.5
T5-3	Gray-brown, Silty, fine SAND	112.6	15.3
T6-3	Gray-brown, Silty, fine to medium SAND	110.4	13.7

TABLE B-II
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080

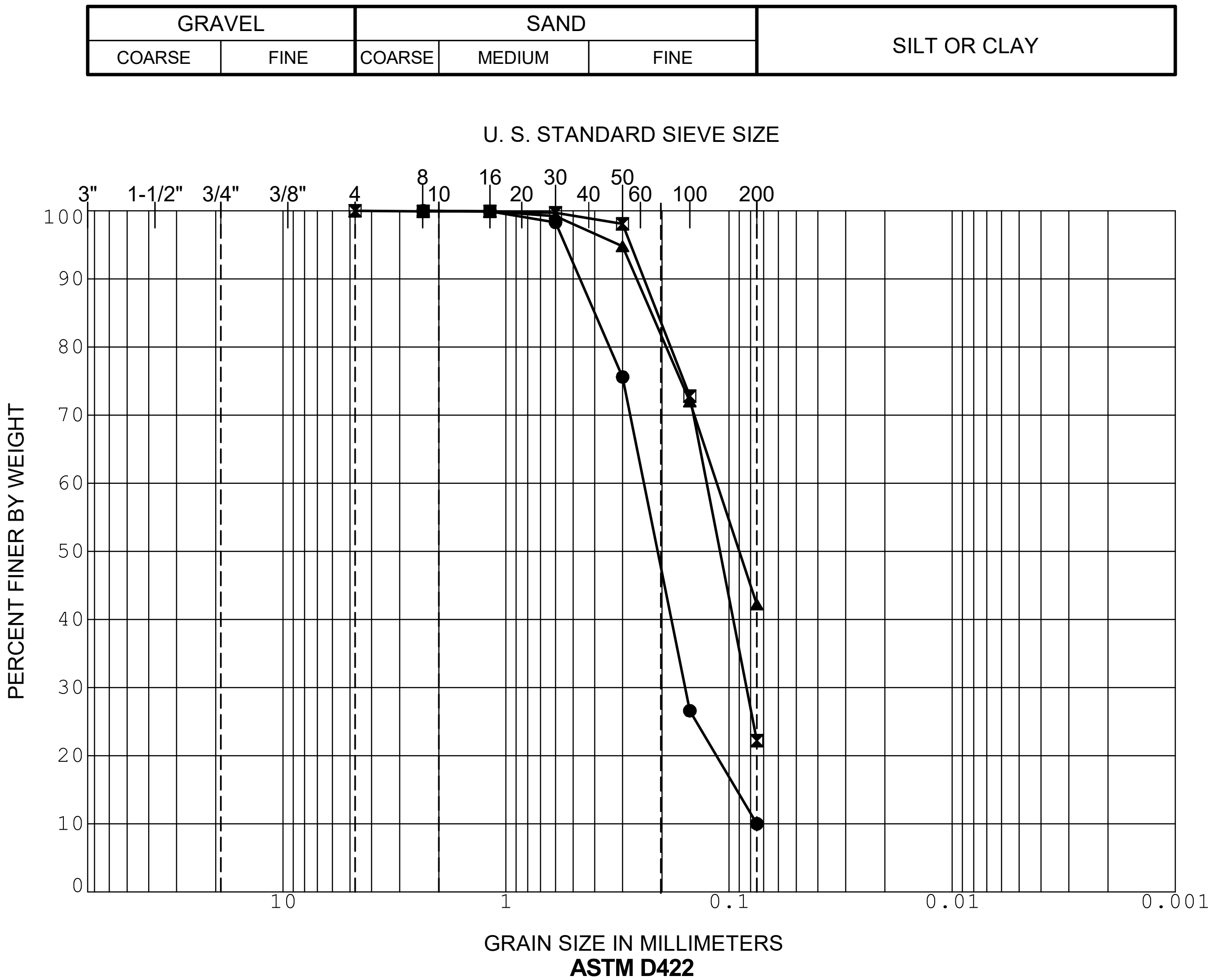
Sample No.	Geologic Unit [Soil Class]	Dry Density (pcf)	Moisture Content (%)	Peak [Ultimate] Cohesion (psf)	Peak [Ultimate] Angle of Shear Resistance (degrees)
B1-2	Qaf	103.4	7.9	60 [120]	41 [40]
B2-4	Qaf	107.8	4.1	700 [140]	39 [35]
B3-4	Qaf	112.7	7.1	920 [430]	45 [36]

TABLE B-III
SUMMARY OF LABORATORY PLASTICITY INDEX TEST RESULTS
ASTM D 4318

Sample No. [Geologic Unit]	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Unified Soil Classification (group symbol)
B1-18	--	--	NP	ML
B2-16	43	31	12	ML
B3-15	--	--	NP	SM-ML

NP- Non-Plastic

PROJECT NO. G2322-32-01



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B1-13	25.0	SP-SM; Poorly graded SAND with silt				
⊠	B2-17	45.0	SM; Silty SAND				
▲	B3-16	45.0	ML; Sandy SILT				

GRADATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

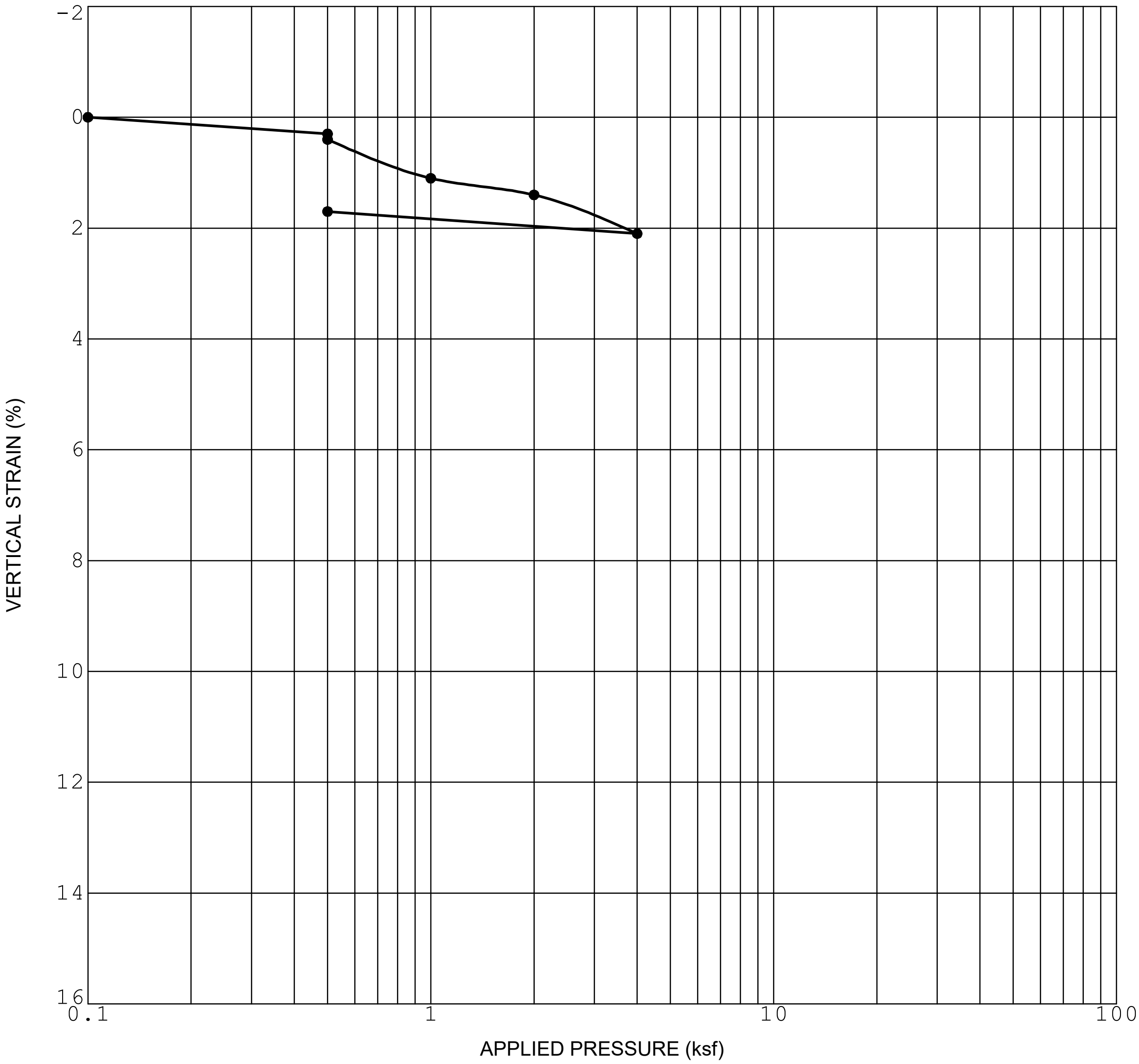
G2322-32-01 (2019_BERMSTUDY).GPJ

Figure B-1

GEOCON

PROJECT NO. G2322-32-01

SAMPLE NO. B1-4



ASTM D2435

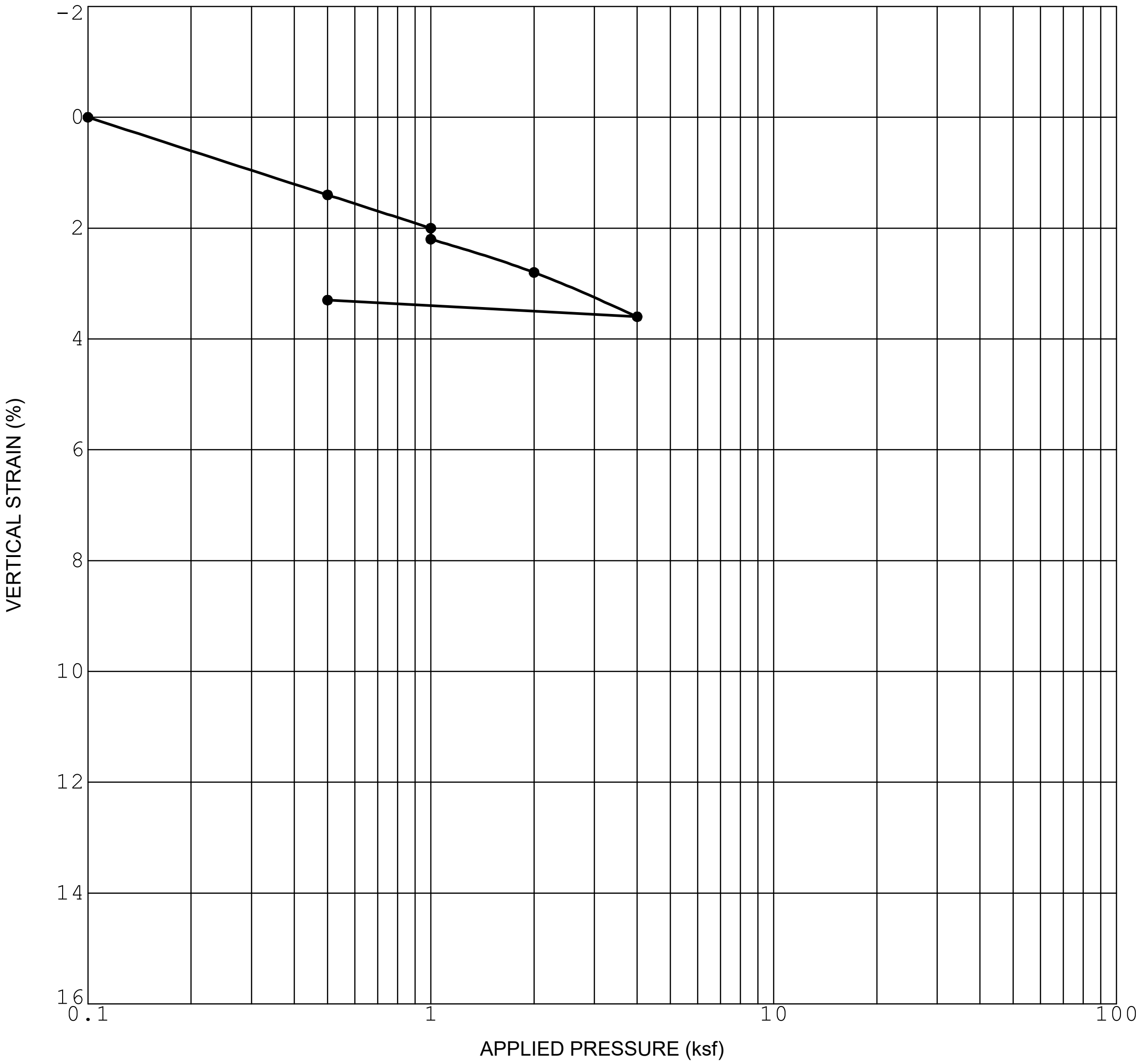
Initial Dry Density (pcf)	111.8	**Initial Saturation (%)**	41.9
Initial Water Content (%)	7.6	**Sample Saturated at (ksf)**	.5

CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

SAMPLE NO. B1-7



ASTM D2435

Initial Dry Density (pcf)	109.7
Initial Water Content (%)	9.5

Initial Saturation (%)	54.9
Sample Saturated at (ksf)	1.0

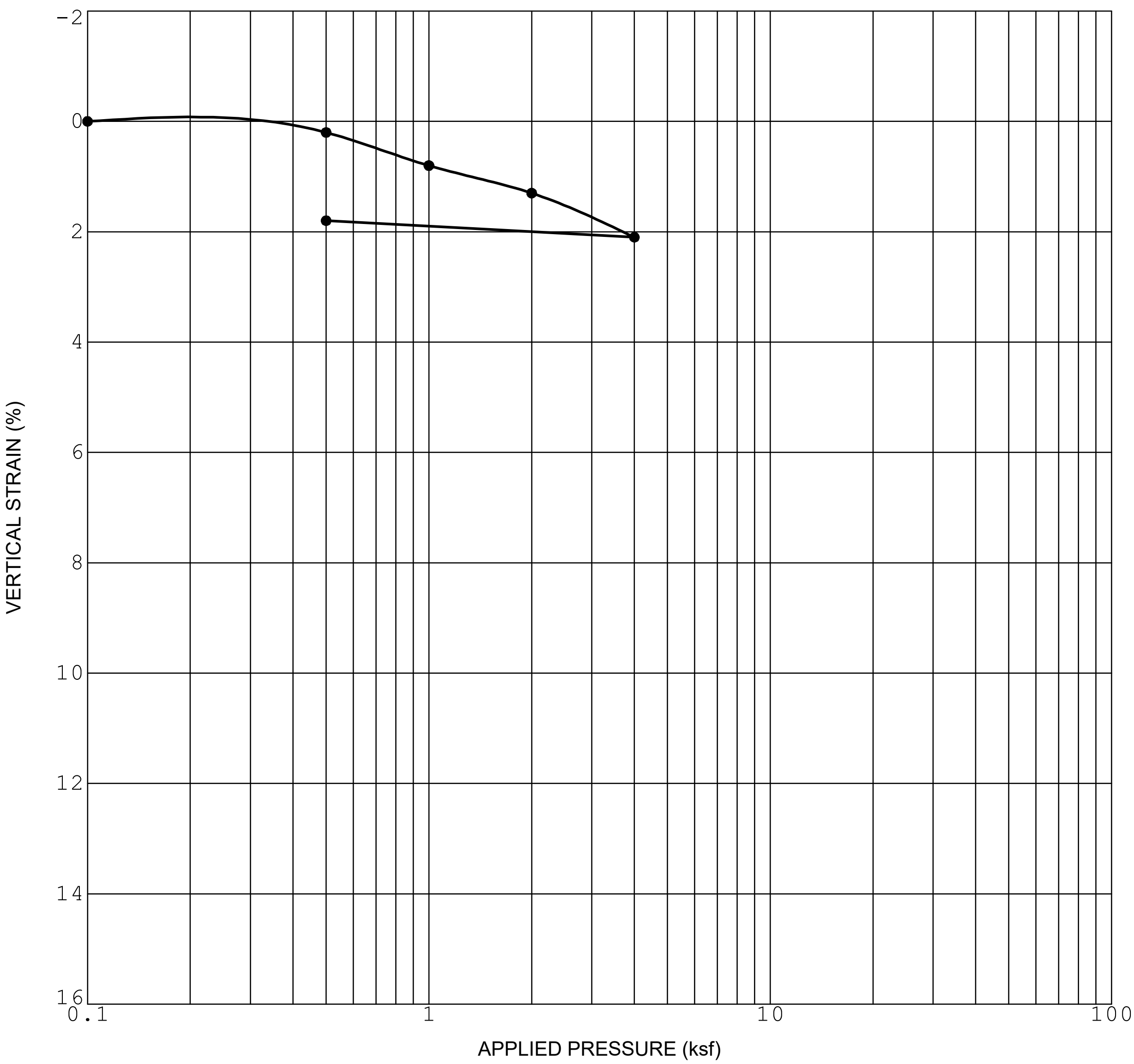
CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B1-9



ASTM D2435

Initial Dry Density (pcf)	117.7		**Initial Saturation (%)**	48.9
Initial Water Content (%)	7.5		**Sample Saturated at (ksf)**	1.0

CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

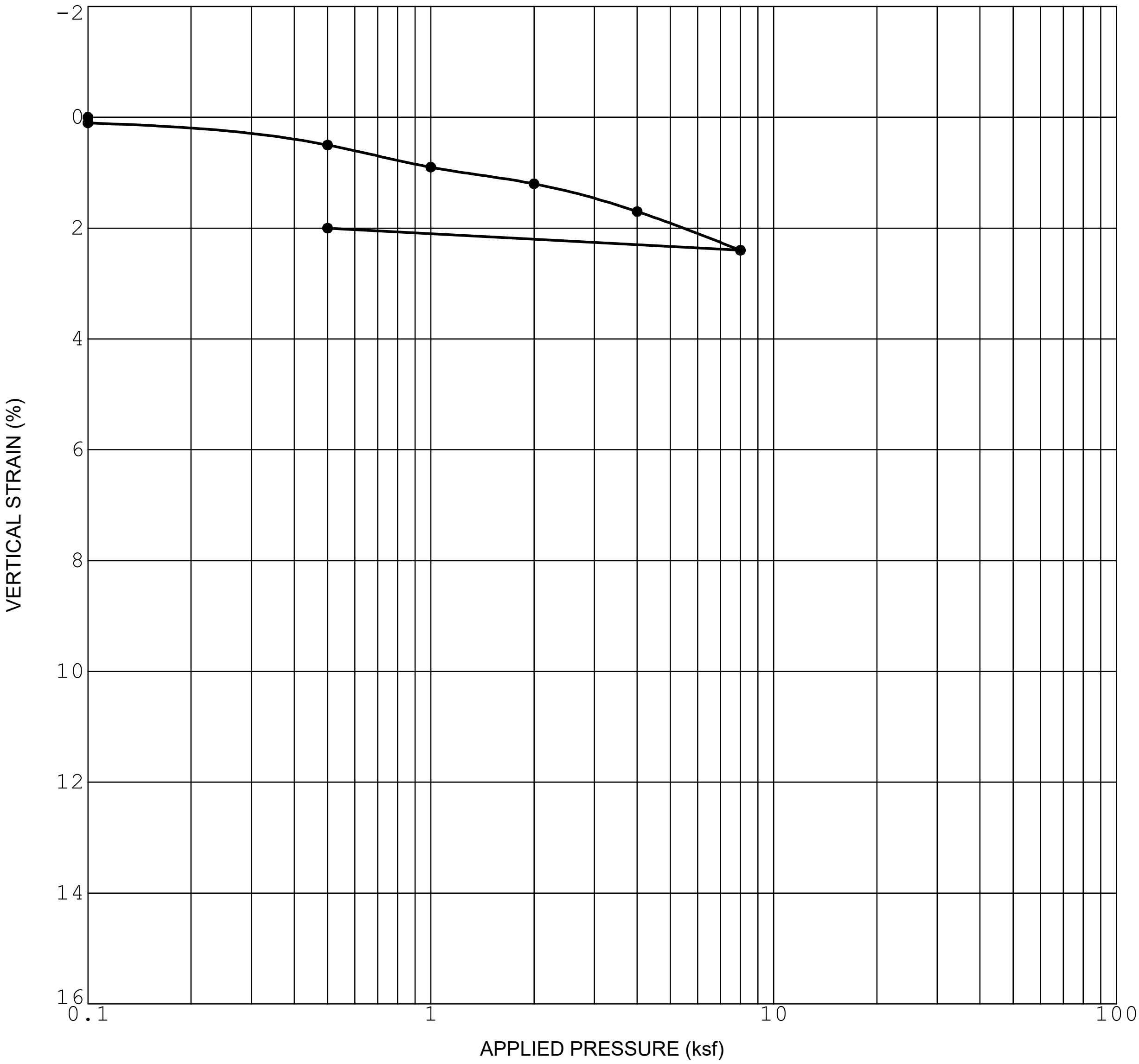
G2322-32-01 (2019_BERMSTUDY).GPJ

Figure B-4

GEOCON

PROJECT NO. G2322-32-01

SAMPLE NO. B1-16



ASTM D2435

Initial Dry Density (pcf)	105.3	**Initial Saturation (%)**	95.1
Initial Water Content (%)	20.6	**Sample Saturated at (ksf)**	.1

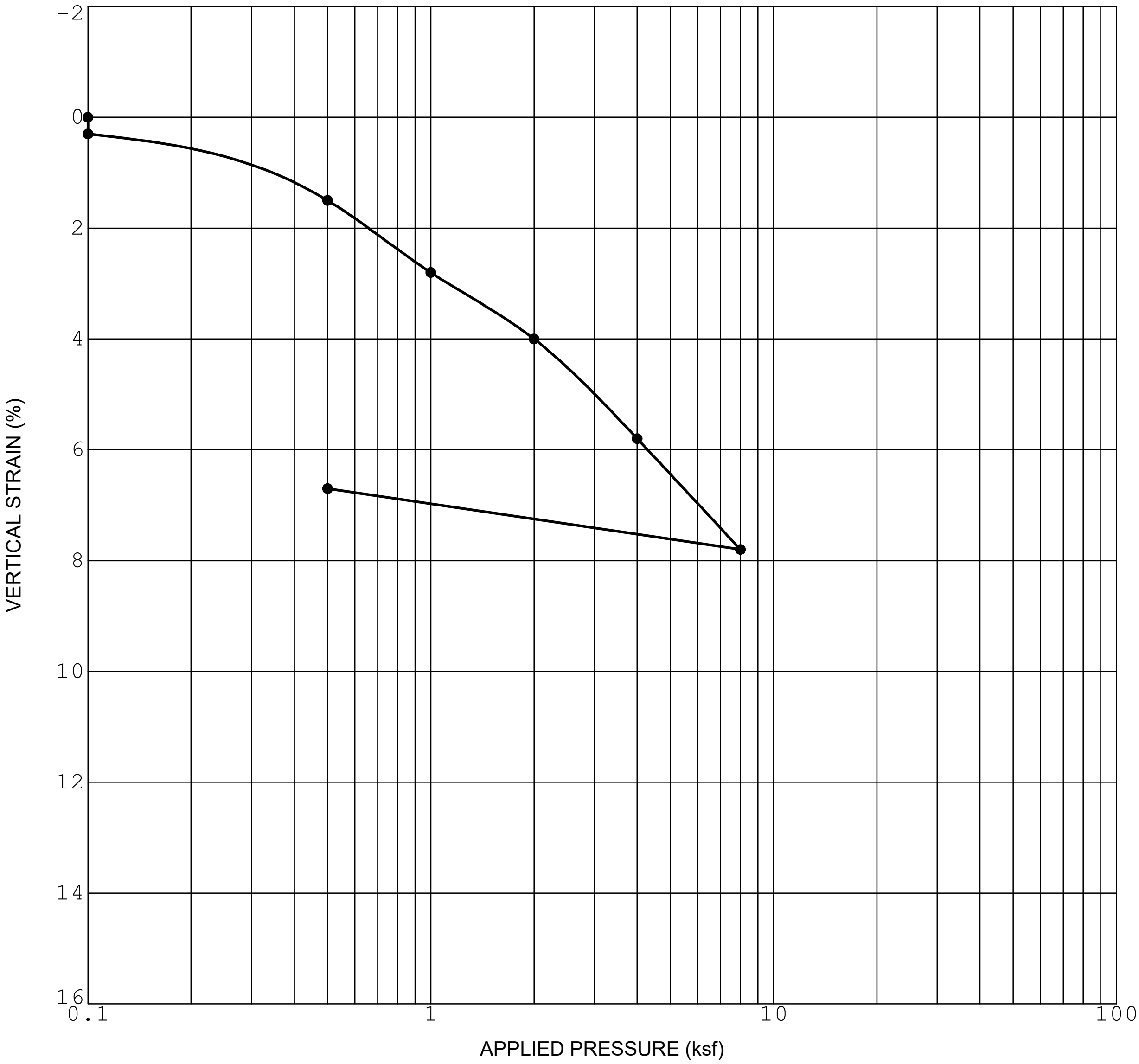
CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B1-18



ASTM D2435

Initial Dry Density (pcf)	95.6
Initial Water Content (%)	30.5

Initial Saturation (%)	100
Sample Saturated at (ksf)	.1

CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

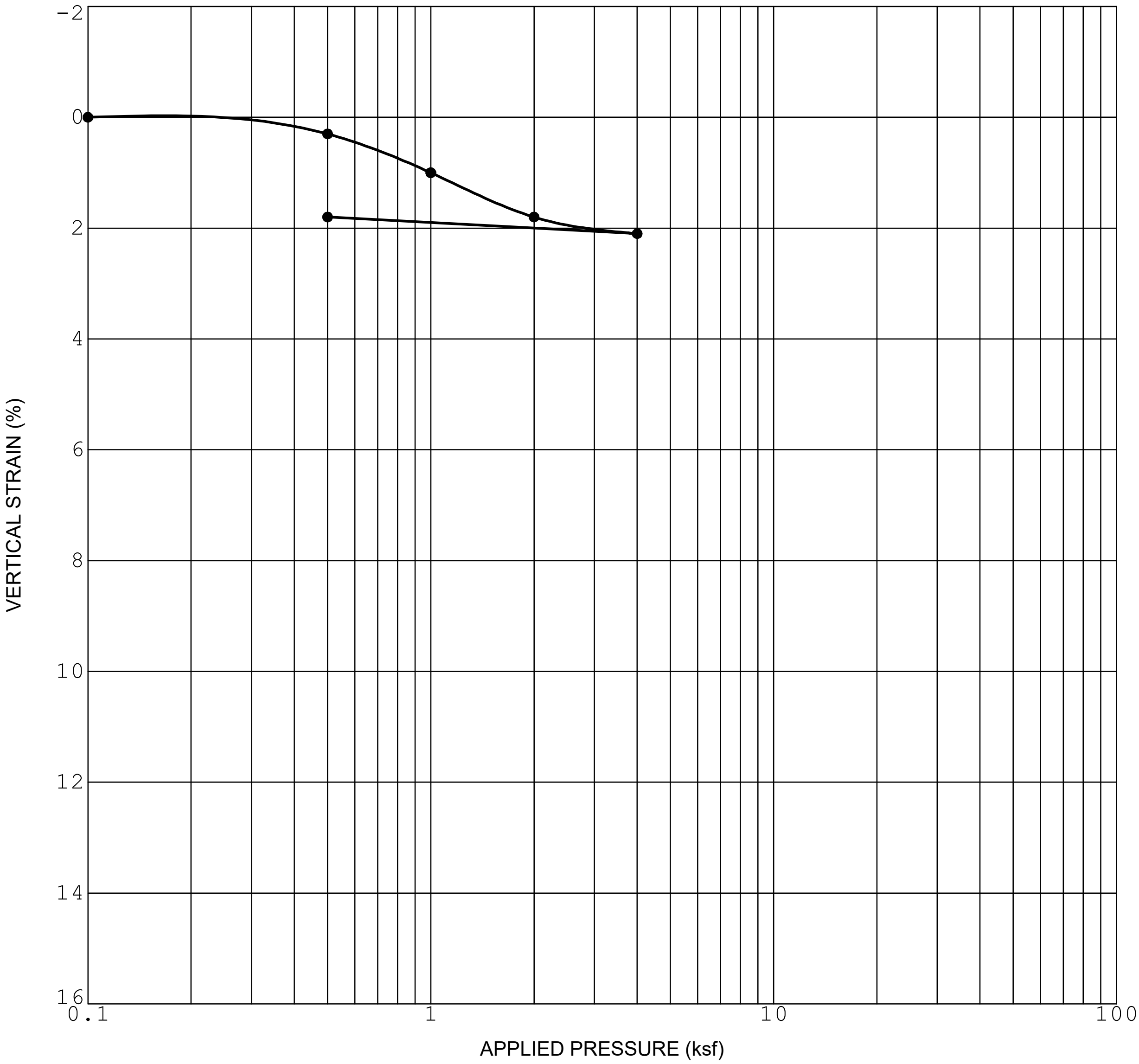
G2322-32-01 (2019_BERMSTUDY).GPJ

Figure B-6

GEOCON

PROJECT NO. G2322-32-01

SAMPLE NO. B2-7



ASTM D2435

Initial Dry Density (pcf)	107.5		**Initial Saturation (%)**	33.7
Initial Water Content (%)	6.9		**Sample Saturated at (ksf)**	1.0

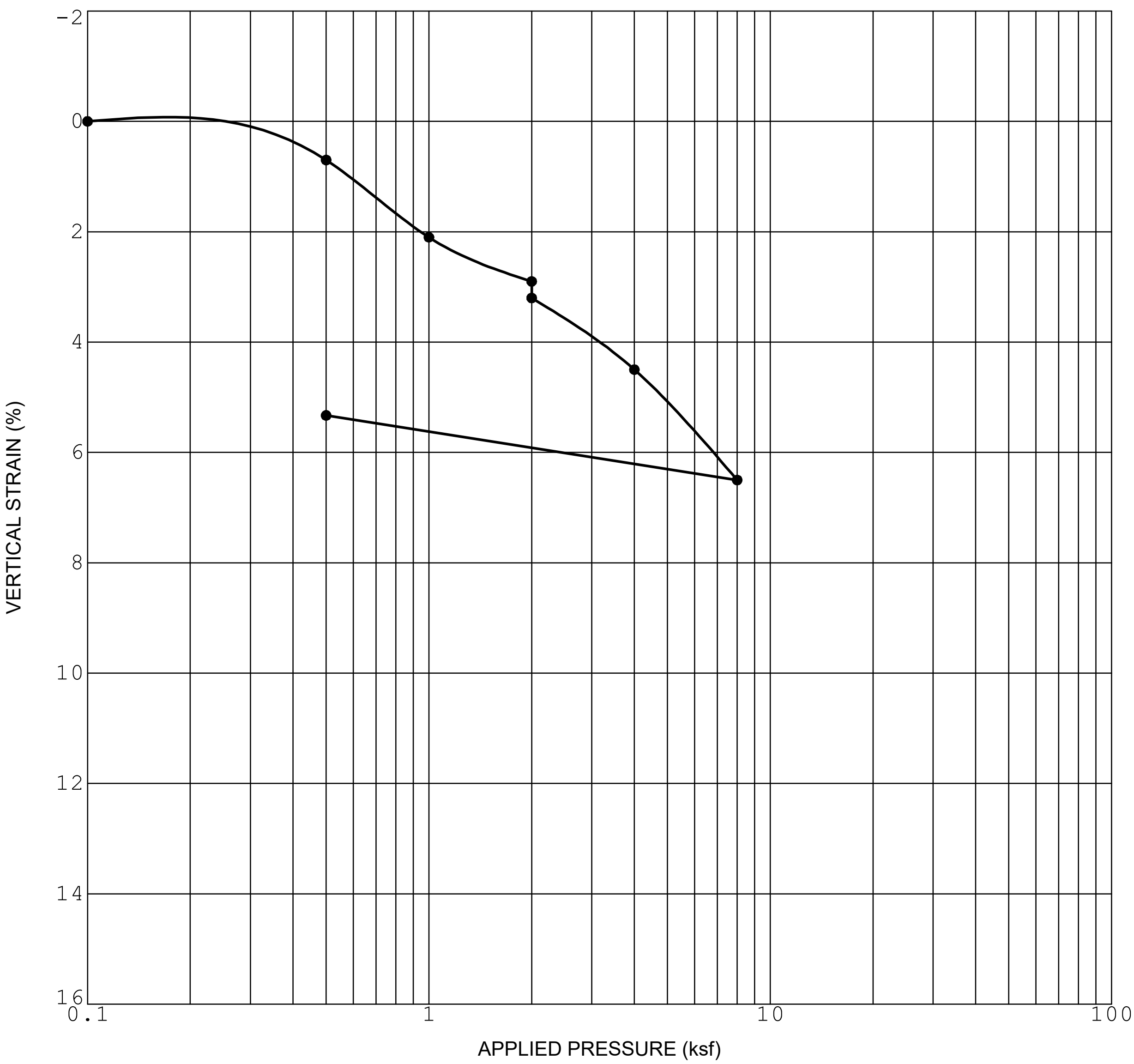
CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B2-13



ASTM D2435

Initial Dry Density (pcf)	96.6	**Initial Saturation (%)**	55.2
Initial Water Content (%)	14.9	**Sample Saturated at (ksf)**	2.0

CONSOLIDATION CURVE

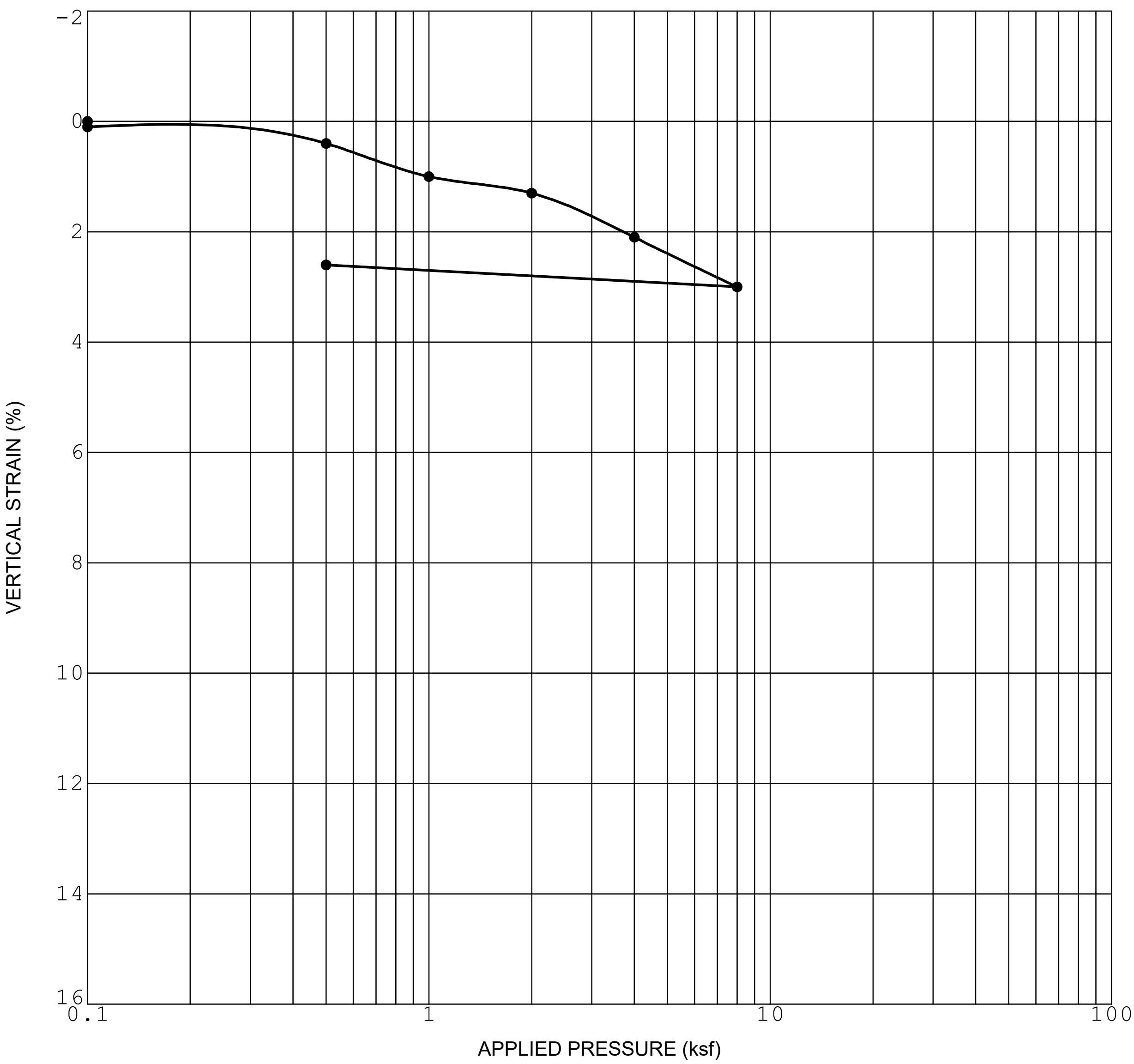
ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

G2322-32-01 (2019_BERMSTUDY).GPJ

GEOCON

SAMPLE NO. B2-14



ASTM D2435

Initial Dry Density (pcf)	100.3
Initial Water Content (%)	23.5

Initial Saturation (%)	95.7
Sample Saturated at (ksf)	.1

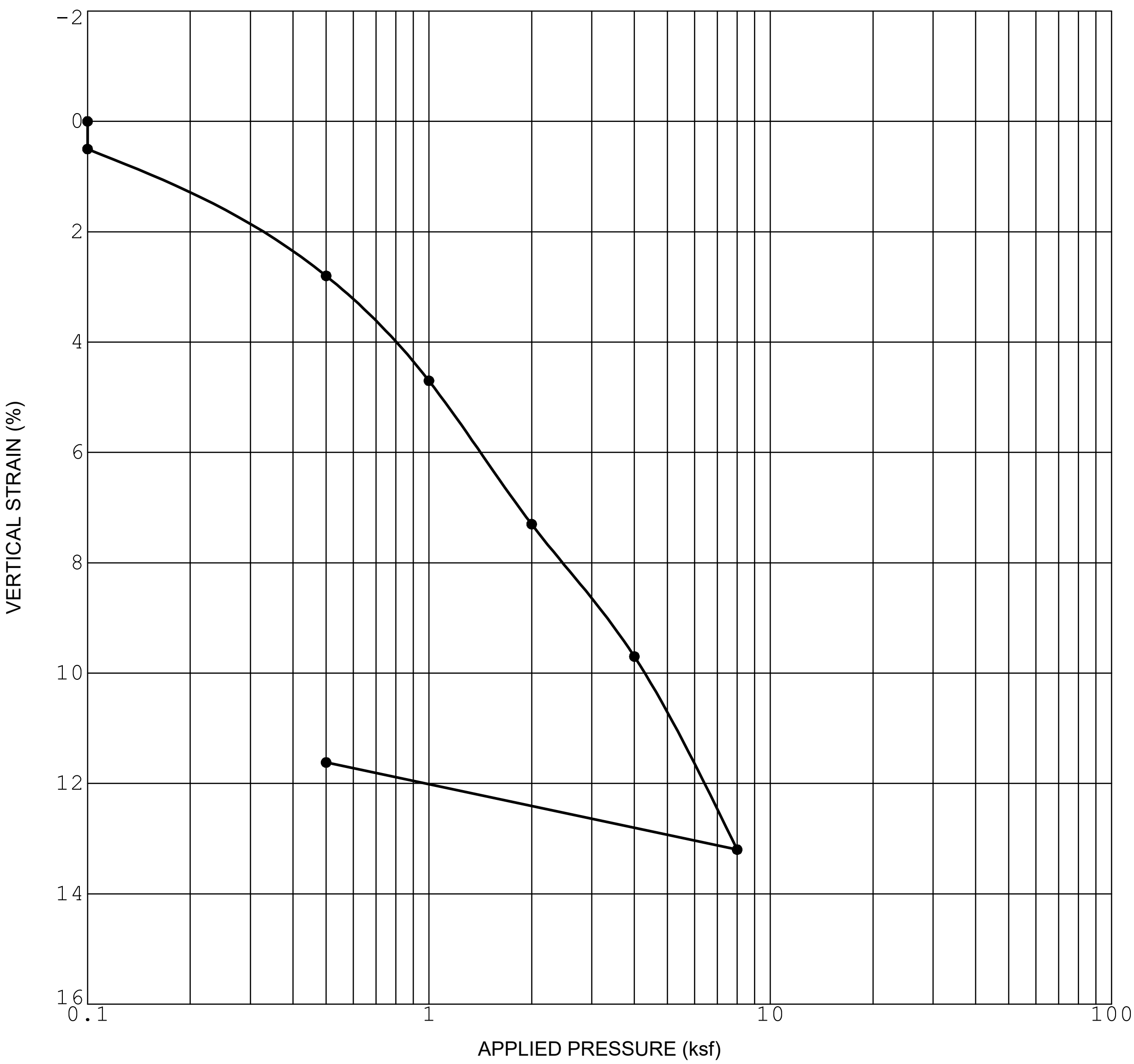
CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B2-16



ASTM D2435

Initial Dry Density (pcf)	80.3
Initial Water Content (%)	43.8

Initial Saturation (%)	100+
Sample Saturated at (ksf)	.1

CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

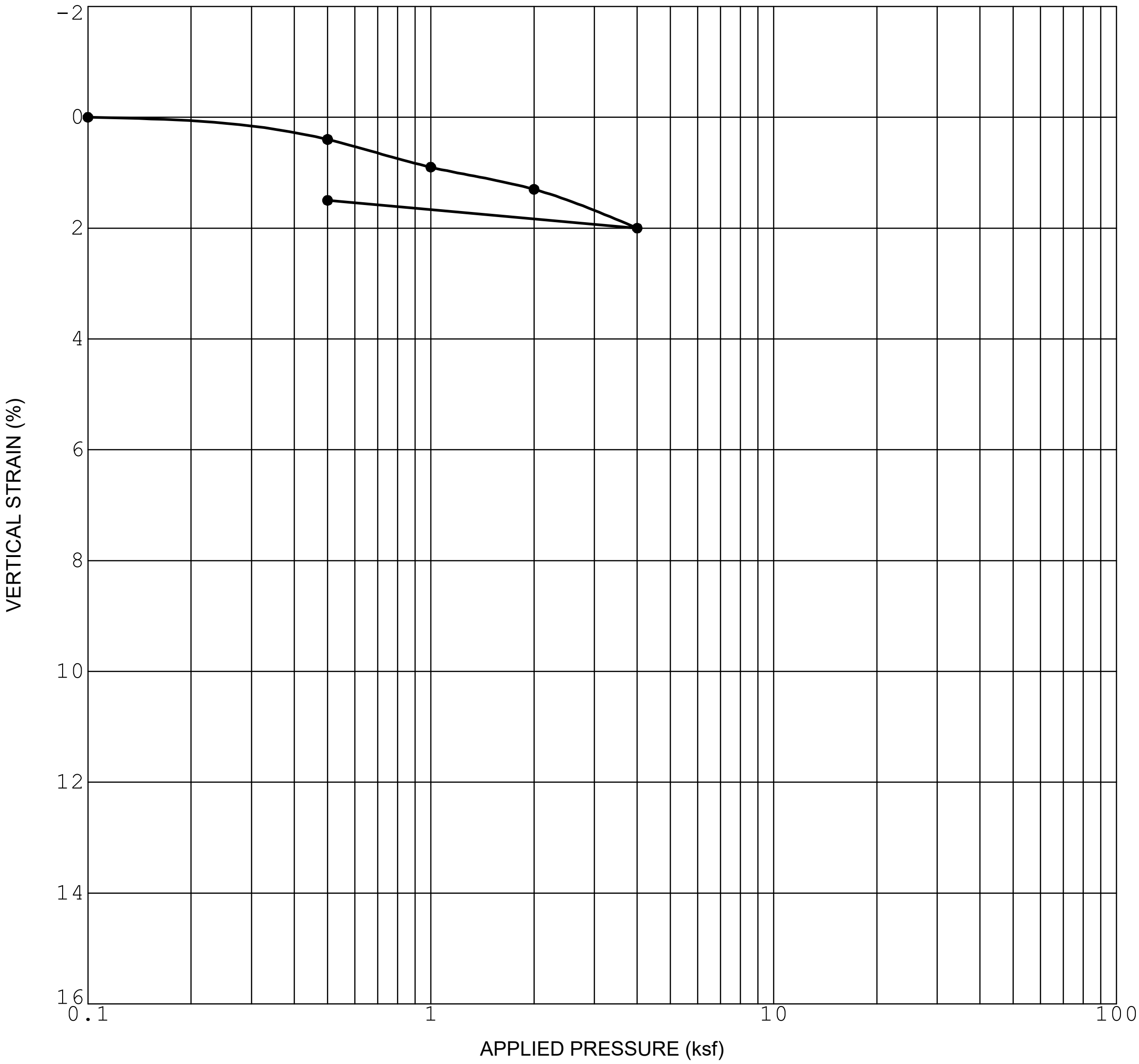
OCEANSIDE, CALIFORNIA

G2322-32-01 (2019_BERMSTUDY).GPJ

Figure B-10

GEOCON

SAMPLE NO. B3-8



ASTM D2435

Initial Dry Density (pcf)	109.8	**Initial Saturation (%)**	55.9
Initial Water Content (%)	10.8	**Sample Saturated at (ksf)**	0.5

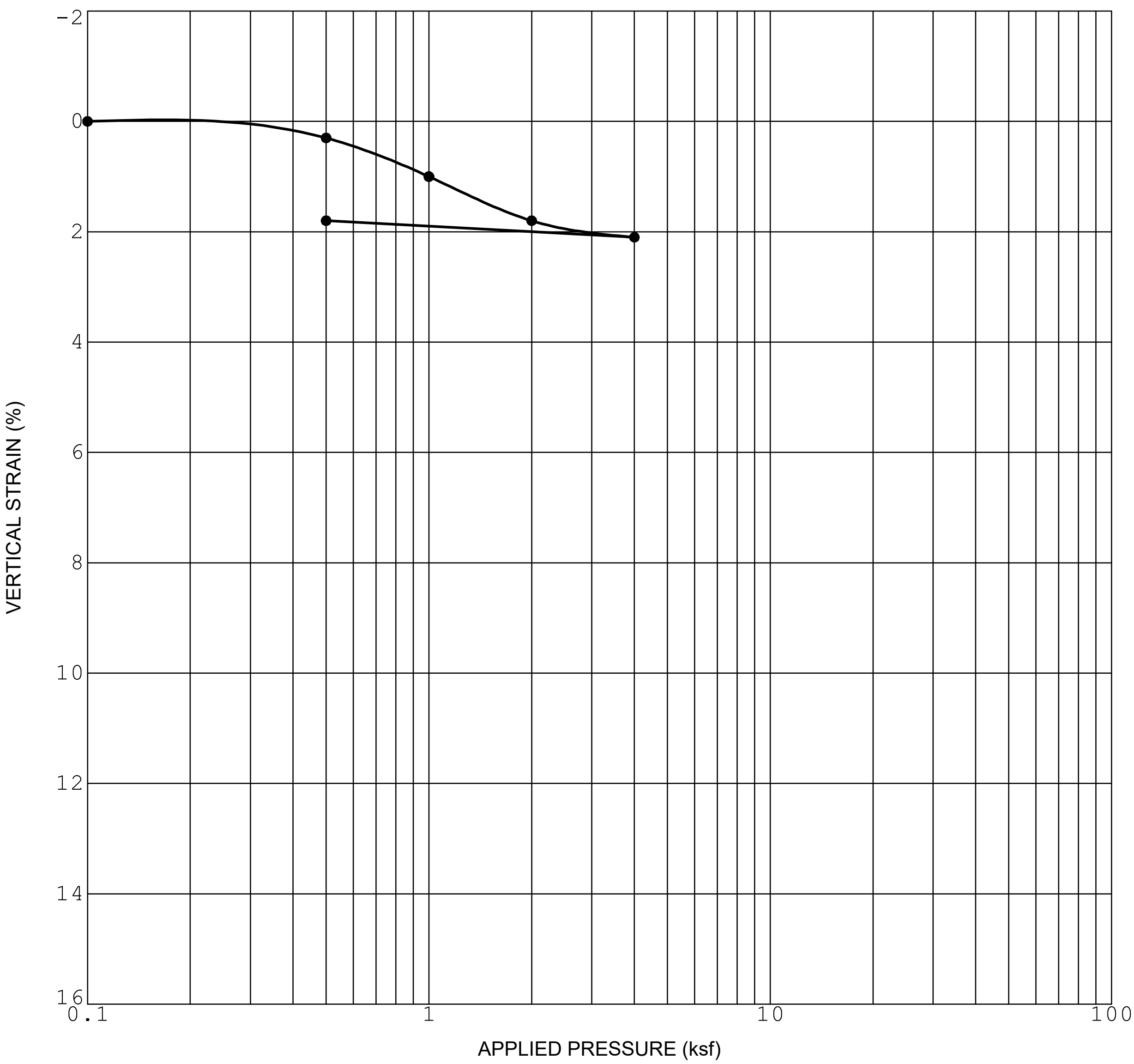
CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B3-10



ASTM D2435

Initial Dry Density (pcf)	107.5
Initial Water Content (%)	6.9

Initial Saturation (%)	33.7
Sample Saturated at (ksf)	1.0

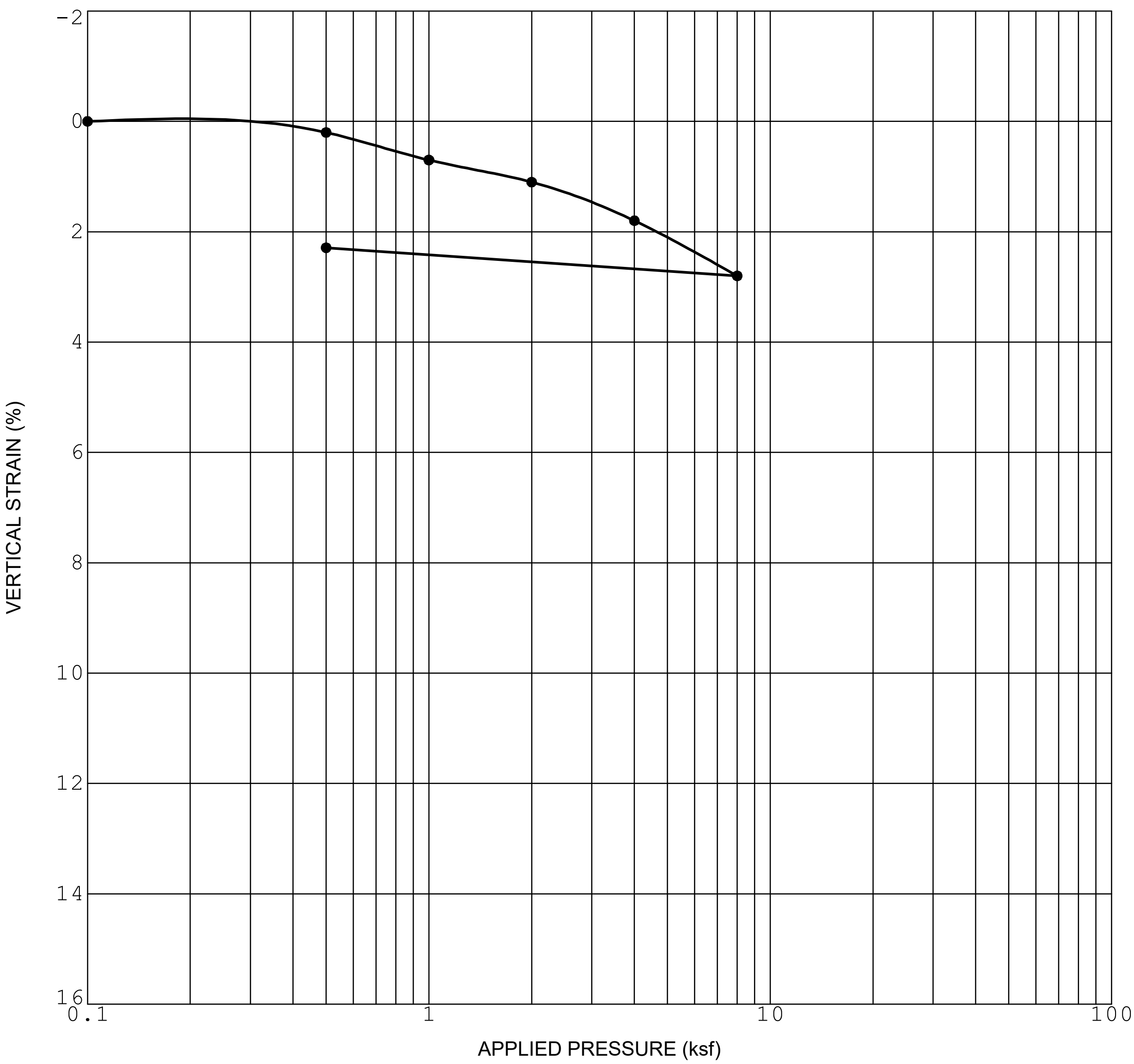
CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B3-13



ASTM D2435

Initial Dry Density (pcf)	101.2	**Initial Saturation (%)**	16.6
Initial Water Content (%)	4.0	**Sample Saturated at (ksf)**	1

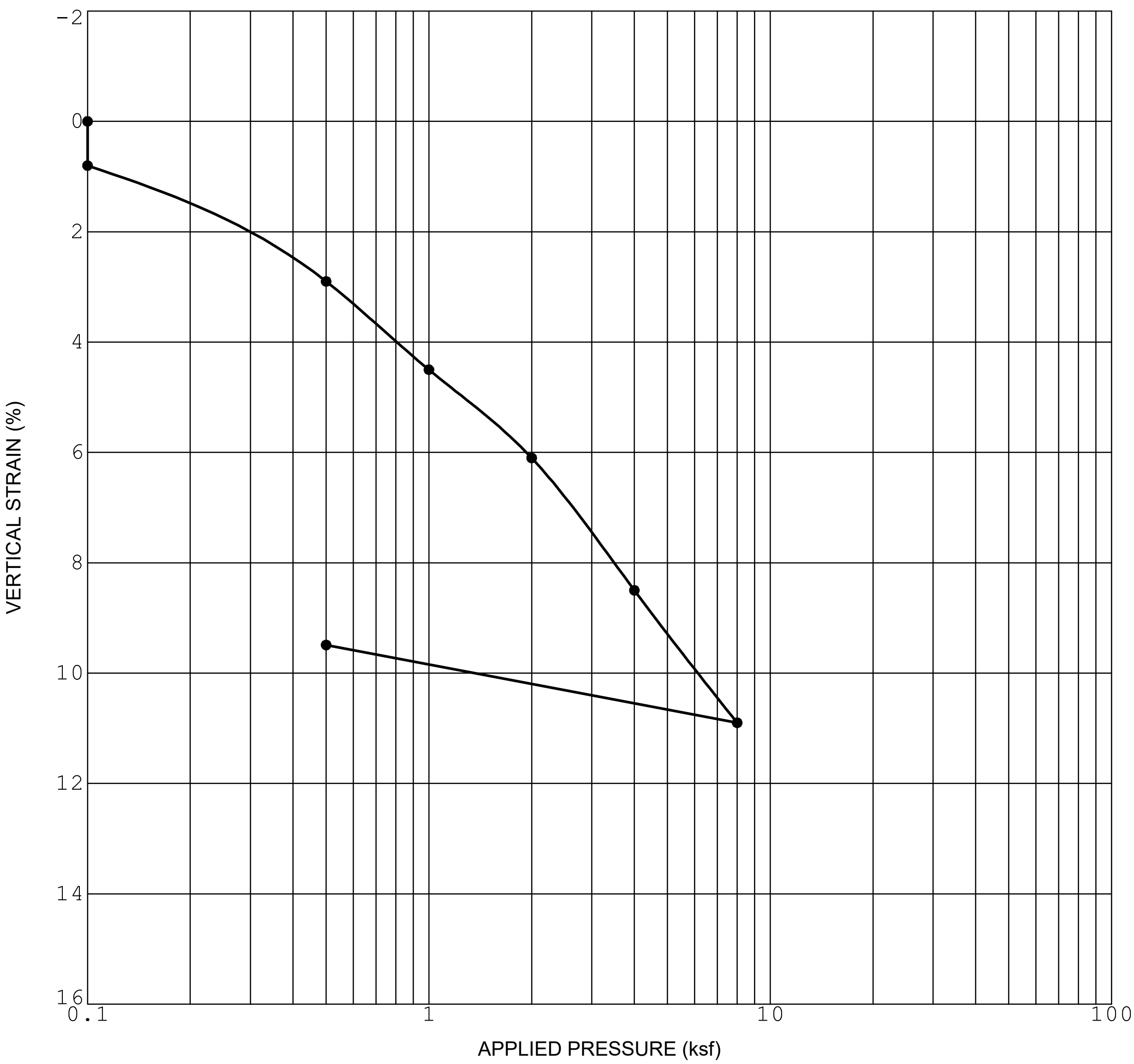
CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B3-15



ASTM D2435

Initial Dry Density (pcf)	94.0
Initial Water Content (%)	32.8

Initial Saturation (%)	100
Sample Saturated at (ksf)	.1

CONSOLIDATION CURVE

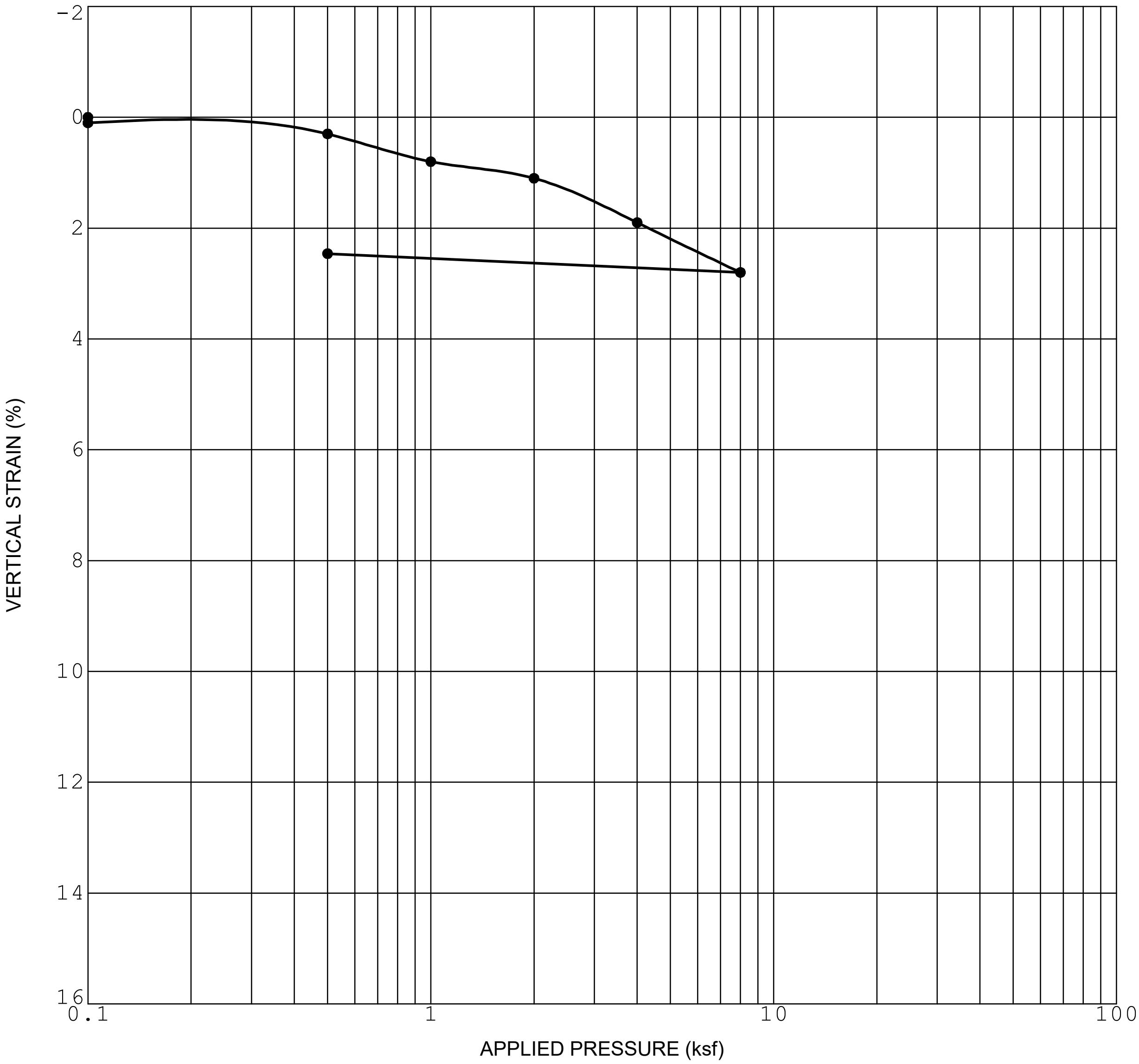
ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

G2322-32-01 (2019_BERMSTUDY).GPJ

GEOCON

SAMPLE NO. B3-21



ASTM D2435

Initial Dry Density (pcf)	103.8		**Initial Saturation (%)**	100+
Initial Water Content (%)	24.9		**Sample Saturated at (ksf)**	.1

CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. T1-1

ASTM D2435

Initial Dry Density (pcf)	102.8
Initial Water Content (%)	5.1

Initial Saturation (%)	22.1
Sample Saturated at (ksf)	2.0

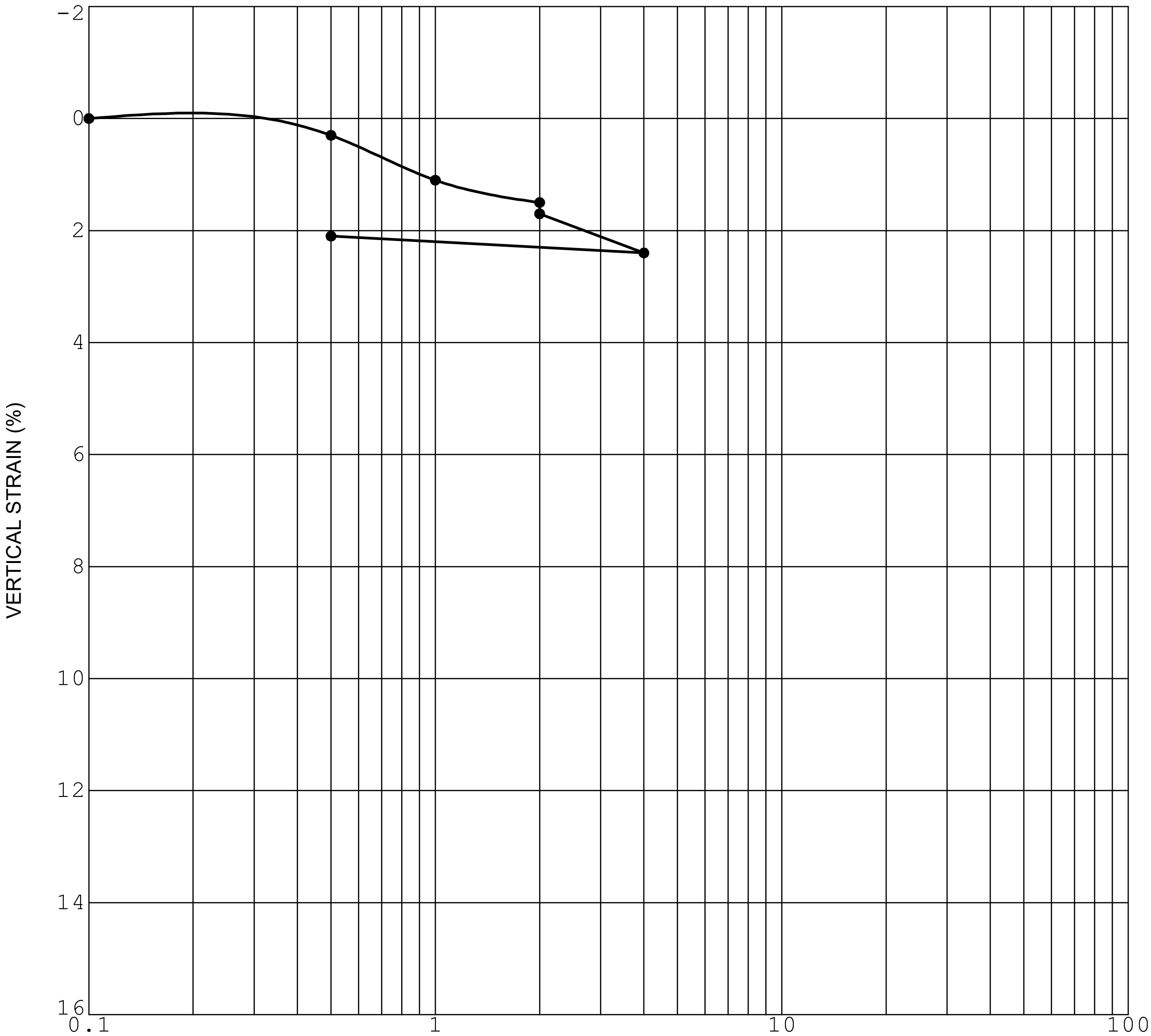
CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. T2-1



ASTM D2435

Initial Dry Density (pcf)	96.6
Initial Water Content (%)	4.9

Initial Saturation (%)	18.2
Sample Saturated at (ksf)	2.0

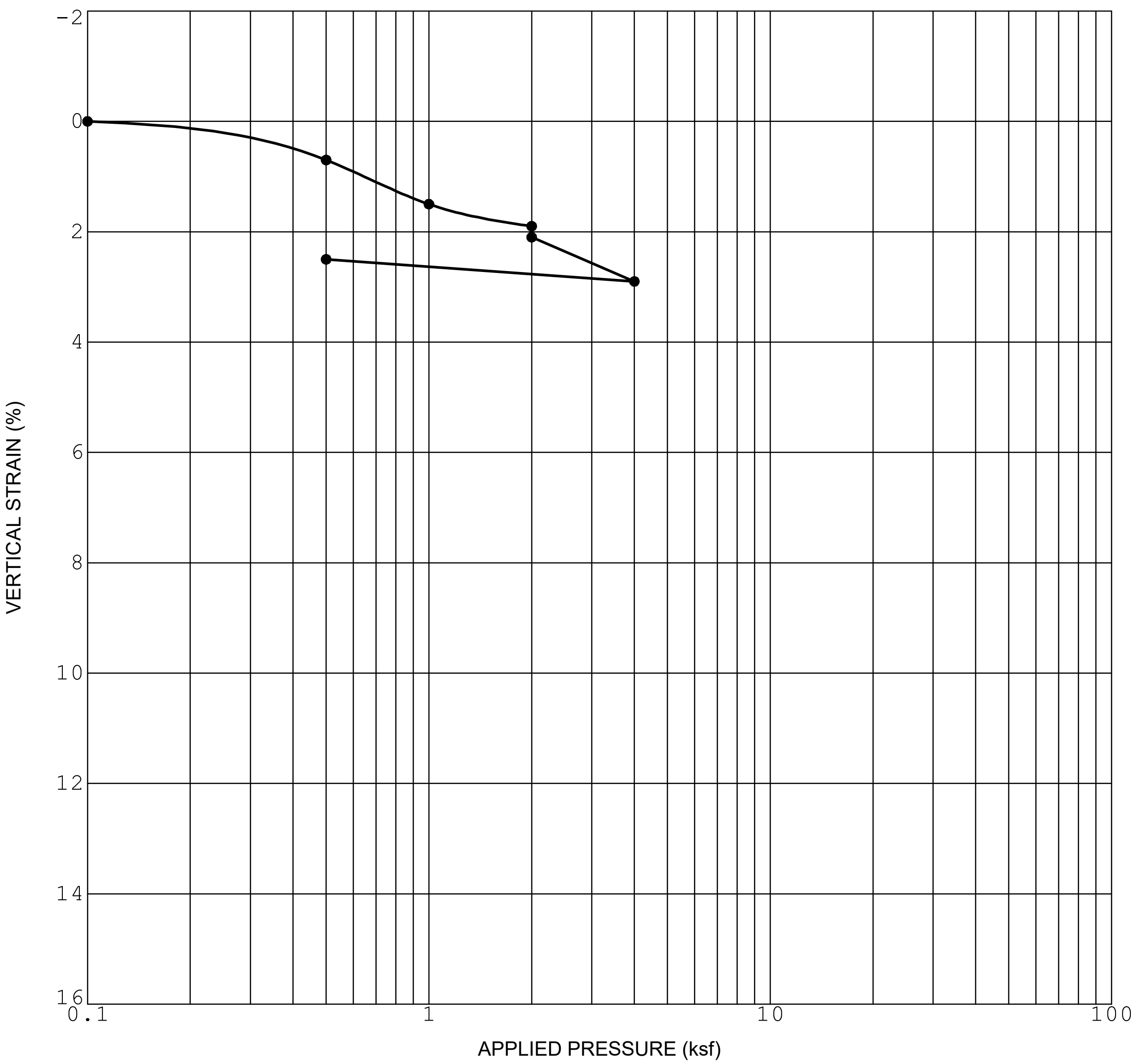
CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. T3-1



ASTM D2435

Initial Dry Density (pcf)	100.4
Initial Water Content (%)	6.2

Initial Saturation (%)	25.2
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

SAMPLE NO. T4-1

ASTM D2435

Initial Dry Density (pcf)	98.5
Initial Water Content (%)	3.2

Initial Saturation (%)	12.6
Sample Saturated at (ksf)	2.0

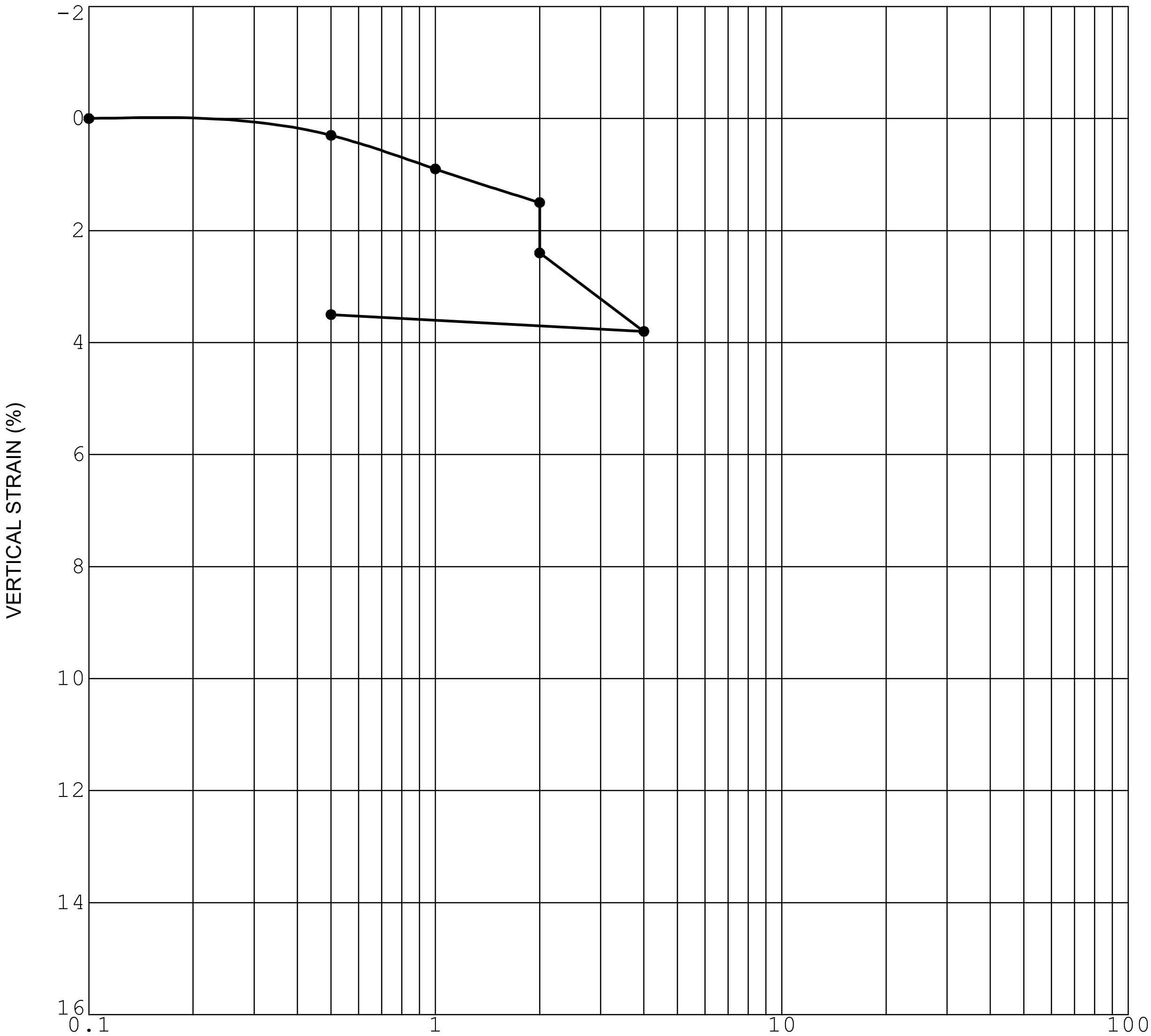
CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. T5-1



ASTM D2435

Initial Dry Density (pcf)	90.4
Initial Water Content (%)	6.0

Initial Saturation (%)	19.1
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

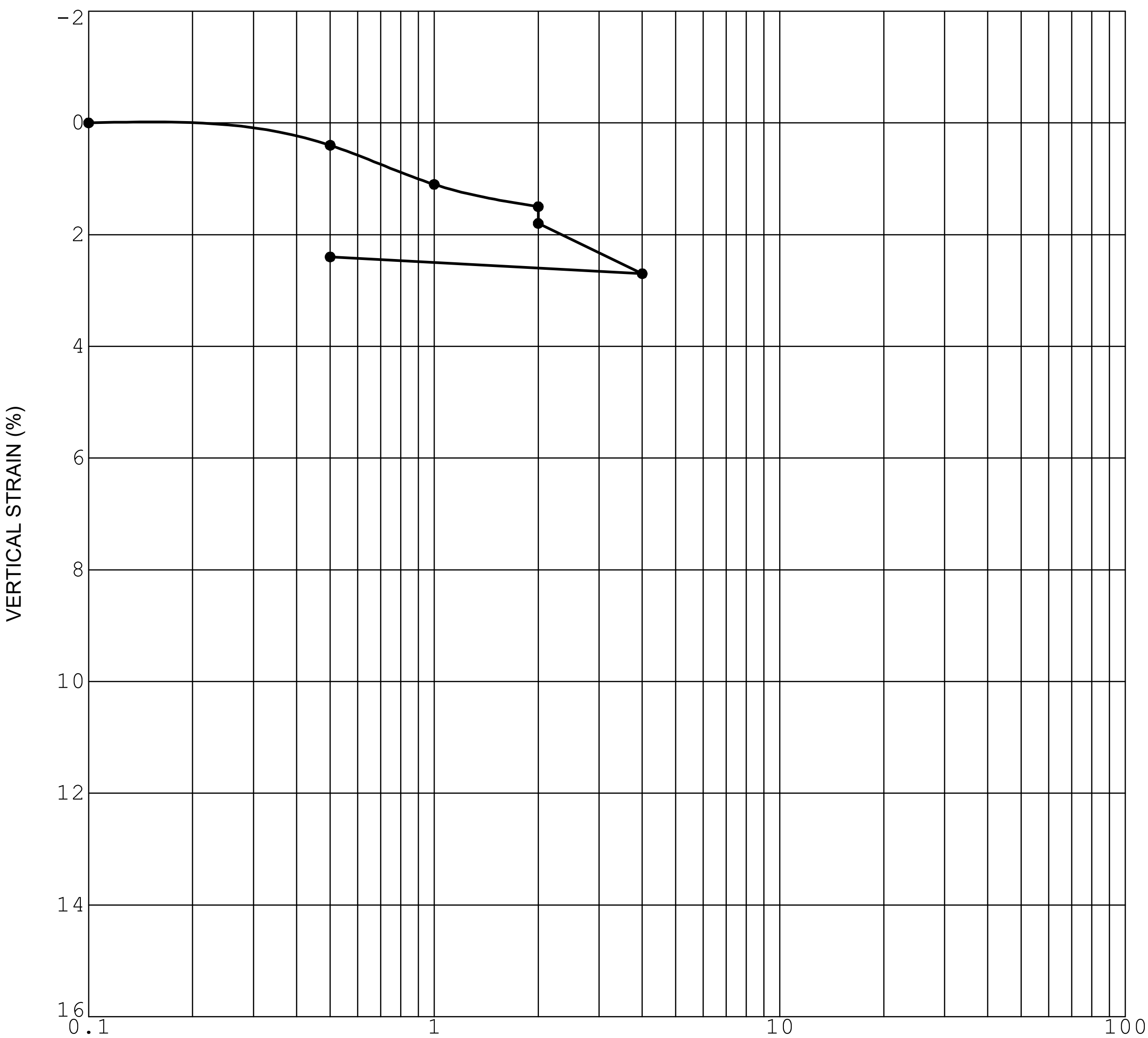
ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

G2322-32-01 (2019_BERMSTUDY).GPJ

GEOCON

SAMPLE NO. T6-1



ASTM D2435

Initial Dry Density (pcf)	93.4	**Initial Saturation (%)**	20.8
Initial Water Content (%)	6.1	**Sample Saturated at (ksf)**	2.0

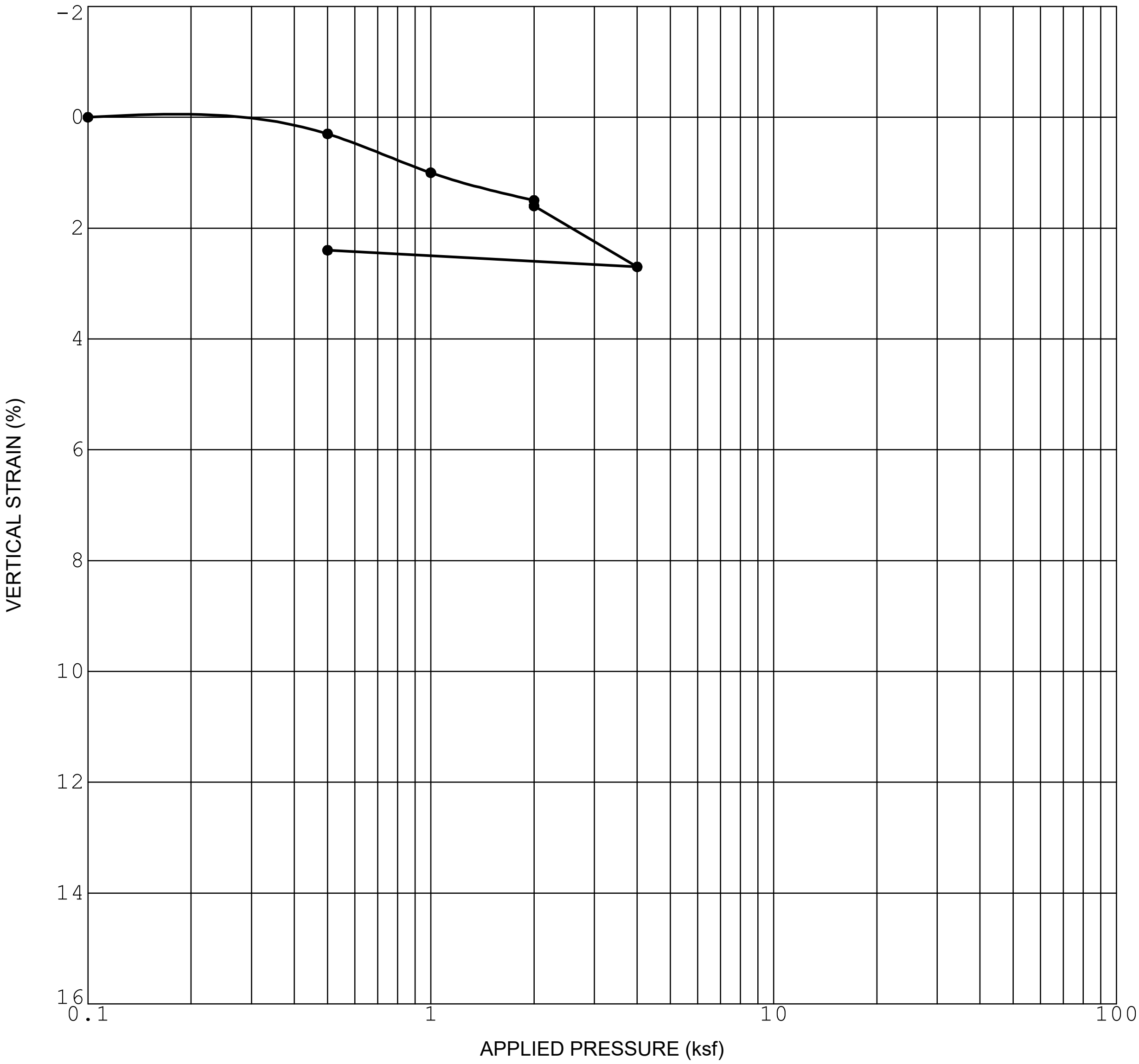
CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. T6-4



ASTM D2435

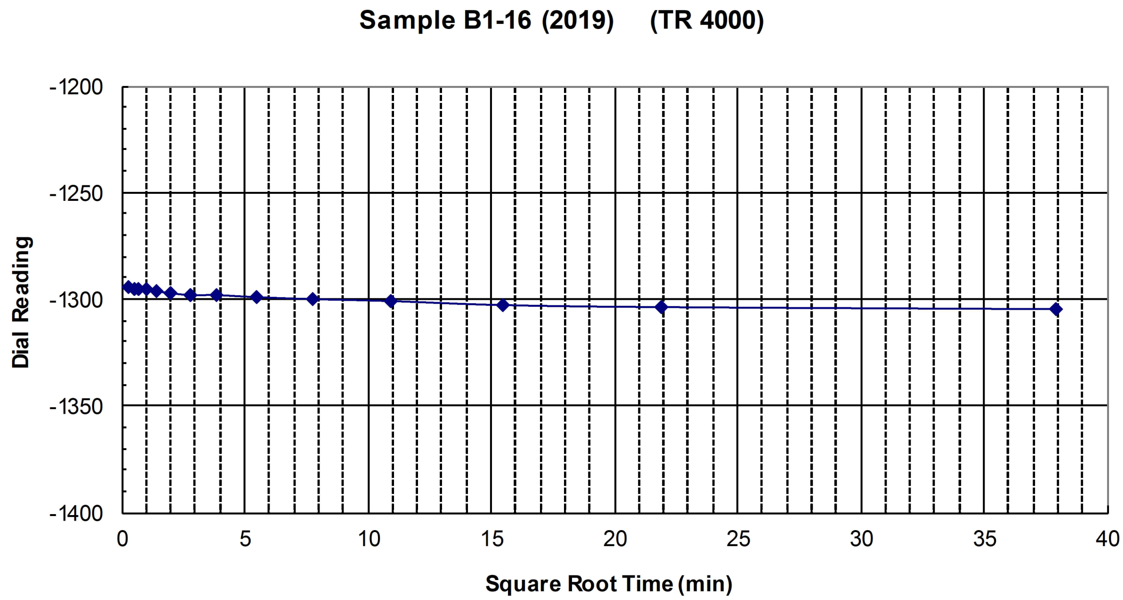
Initial Dry Density (pcf)	91.3
Initial Water Content (%)	10.1

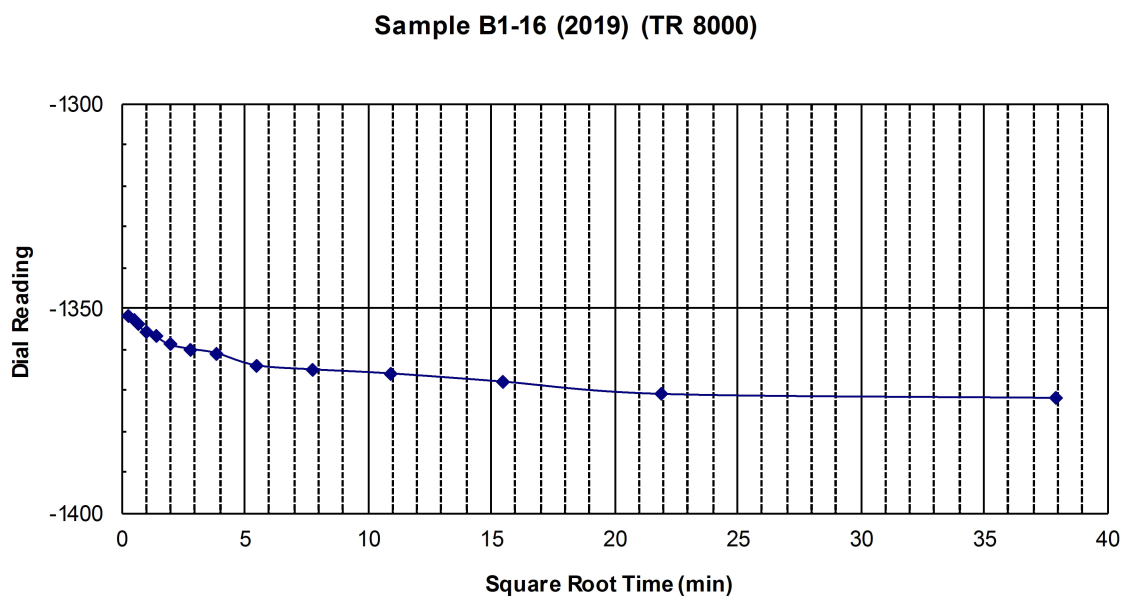
Initial Saturation (%)	32.8
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

ZEPHYR-OCEANSIDE

OCEANSIDE, CALIFORNIA





TIME RATE CONSOLIDATION CURVE

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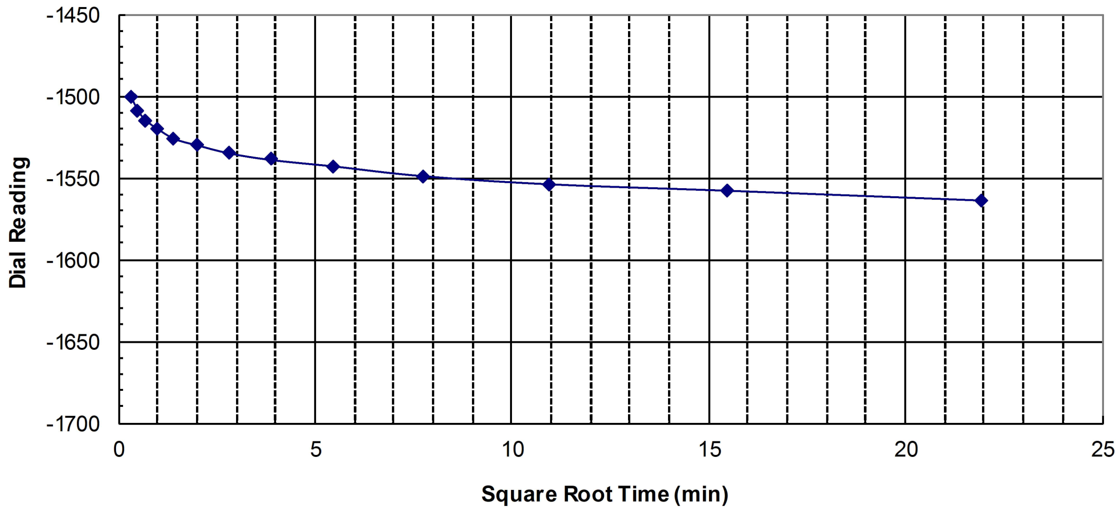
PHONE 858 558-6900 - FAX 858 558-6159

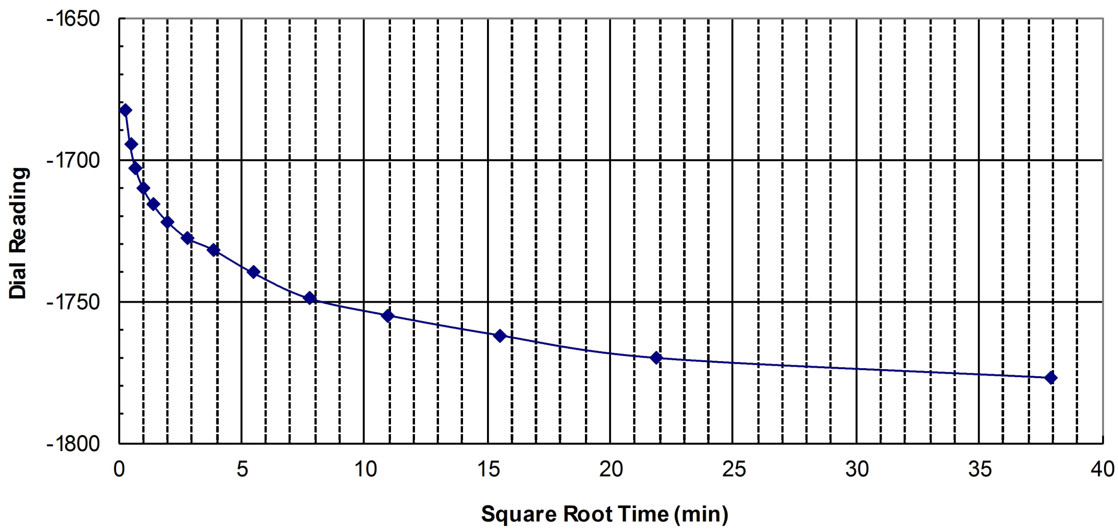
ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. B-23

Sample B1-18 (2019) (TR 4000)



Sample B1-18 (2019) (TR 8000)



TIME RATE CONSOLIDATION CURVE

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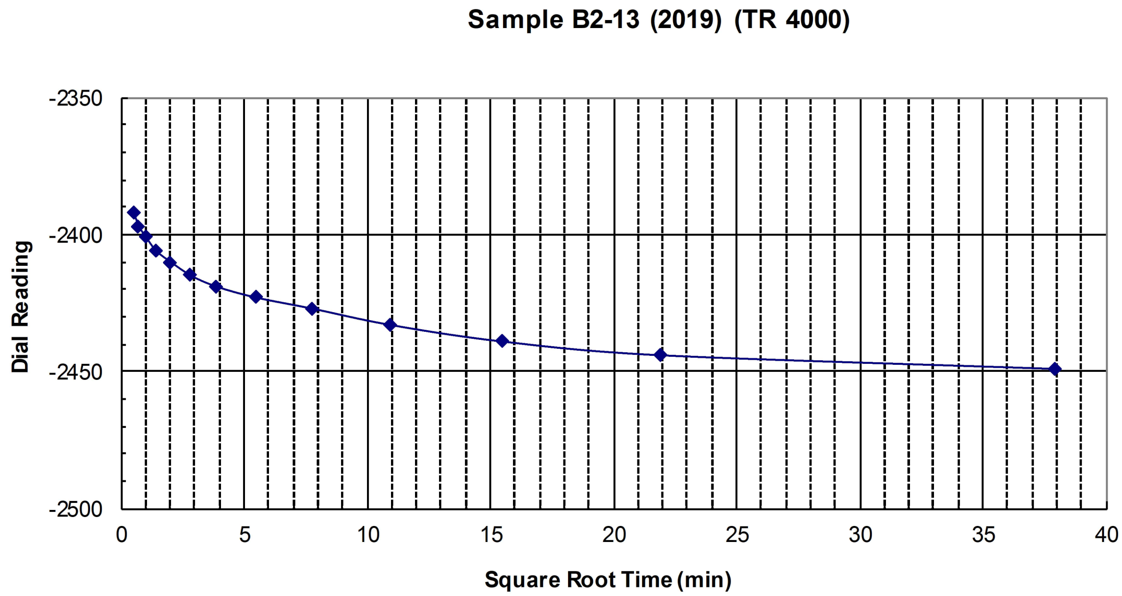
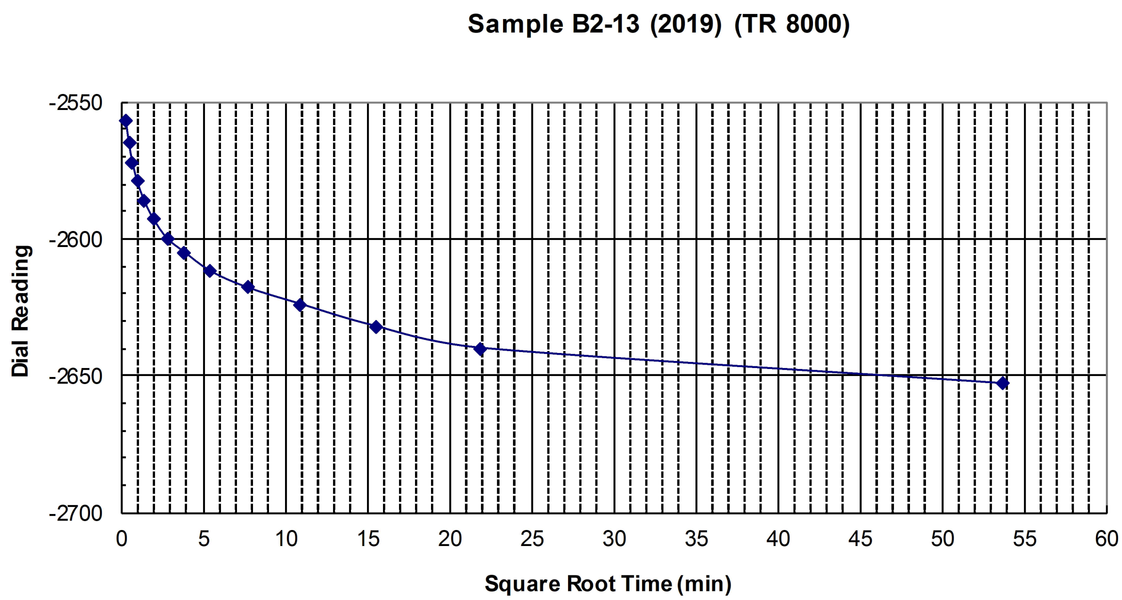
ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. B-24





TIME RATE CONSOLIDATION CURVE

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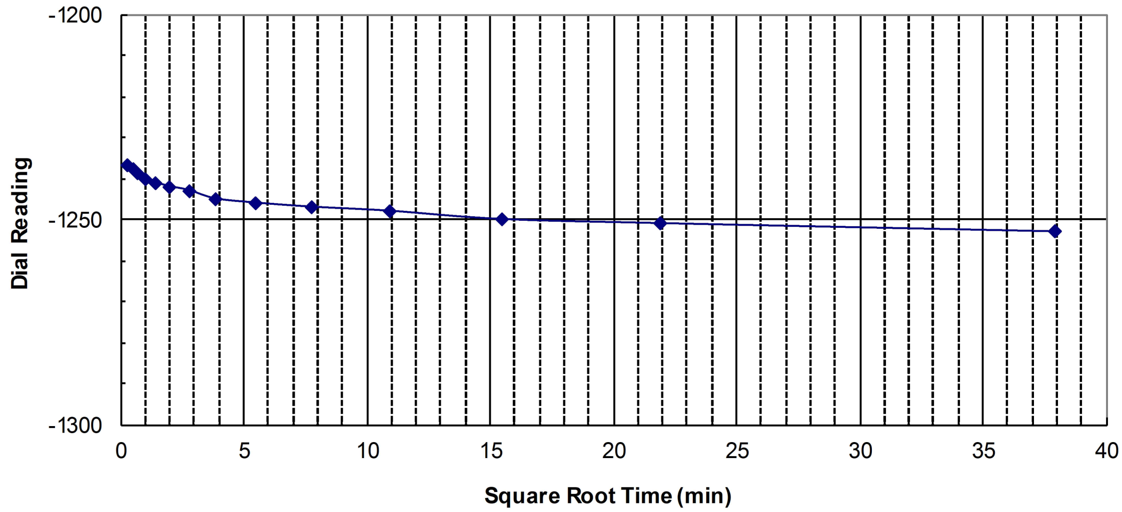
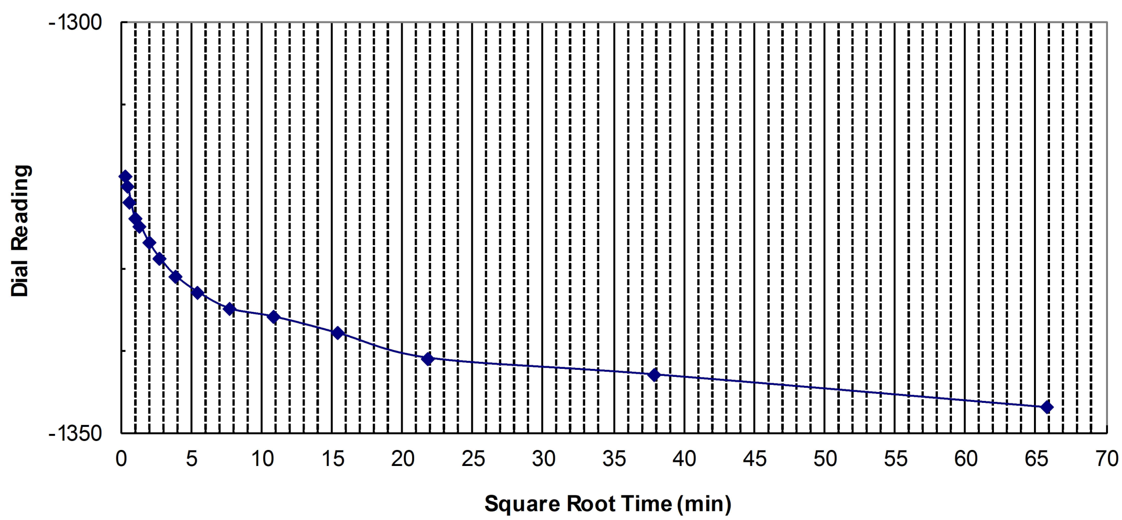
ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. B-25

Sample B2-14 (2019) (TR 4000)



Sample B2-14 (2019) (TR 8000)



TIME RATE CONSOLIDATION CURVE

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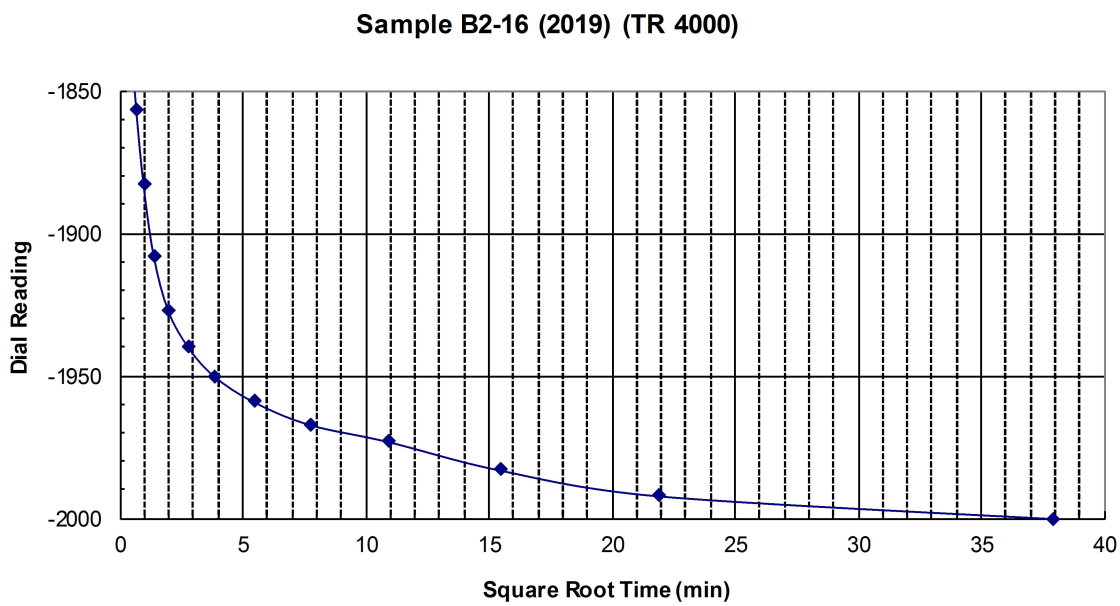
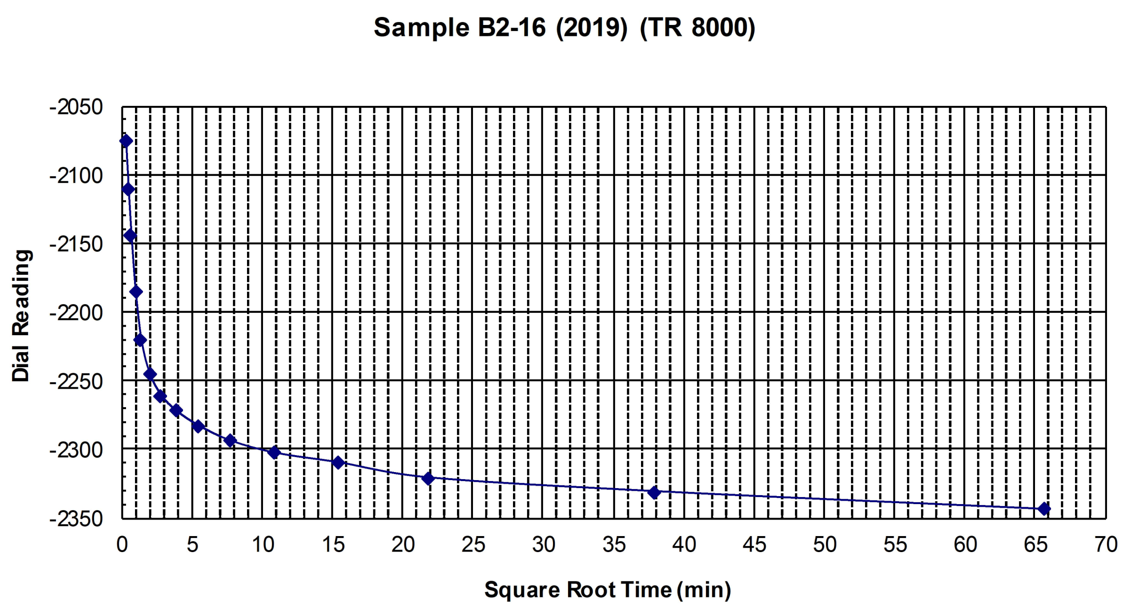
ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. B-26





TIME RATE CONSOLIDATION CURVE

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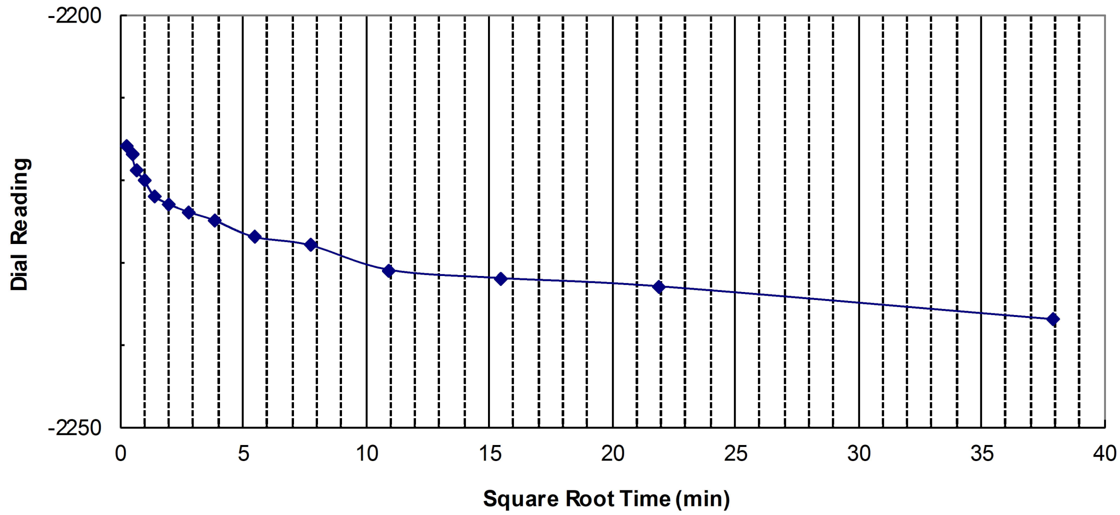
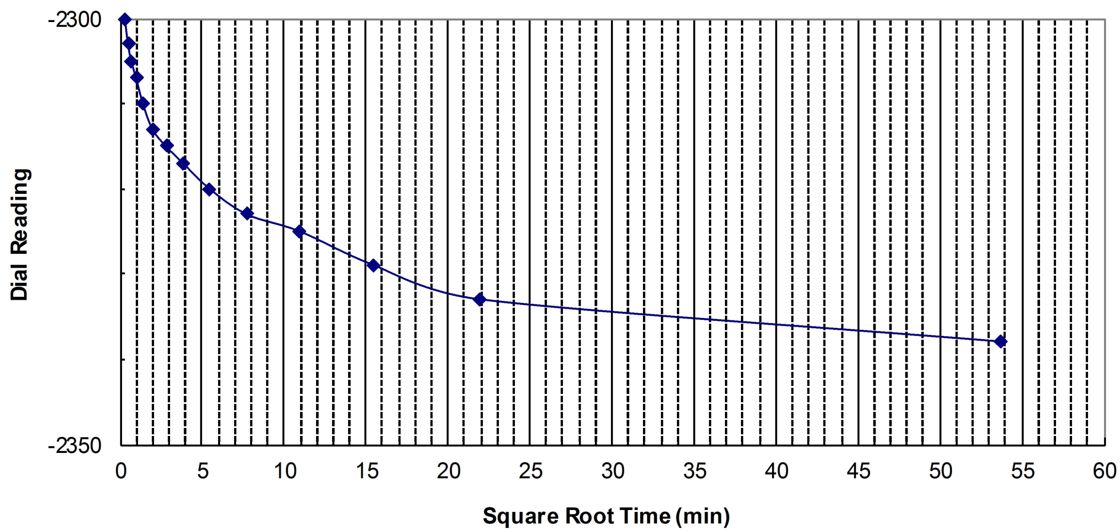
ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. B-27

Sample B3-13 (2019) (TR 4000)



Sample B3-13 (2019) (TR 8000)



TIME RATE CONSOLIDATION CURVE

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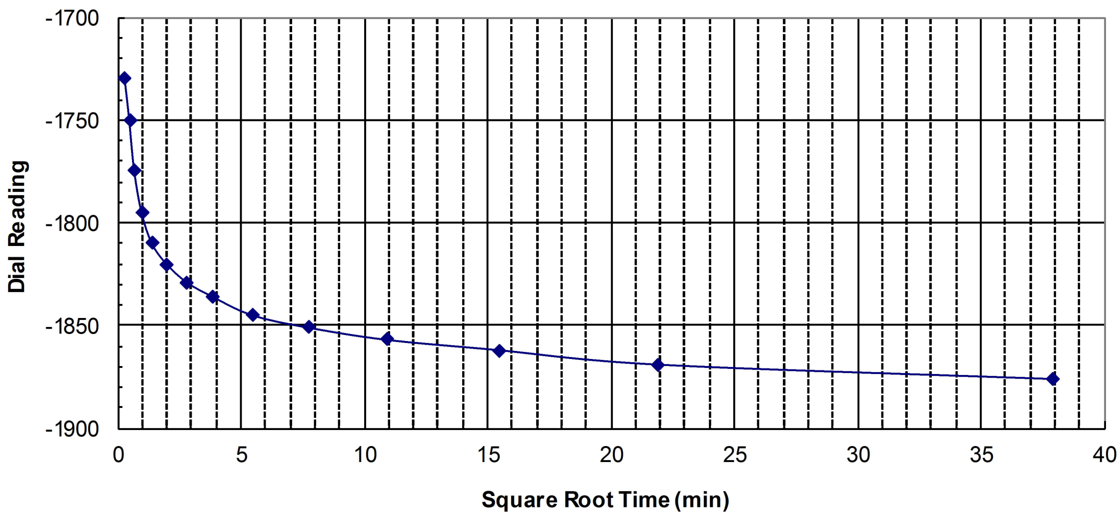
ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

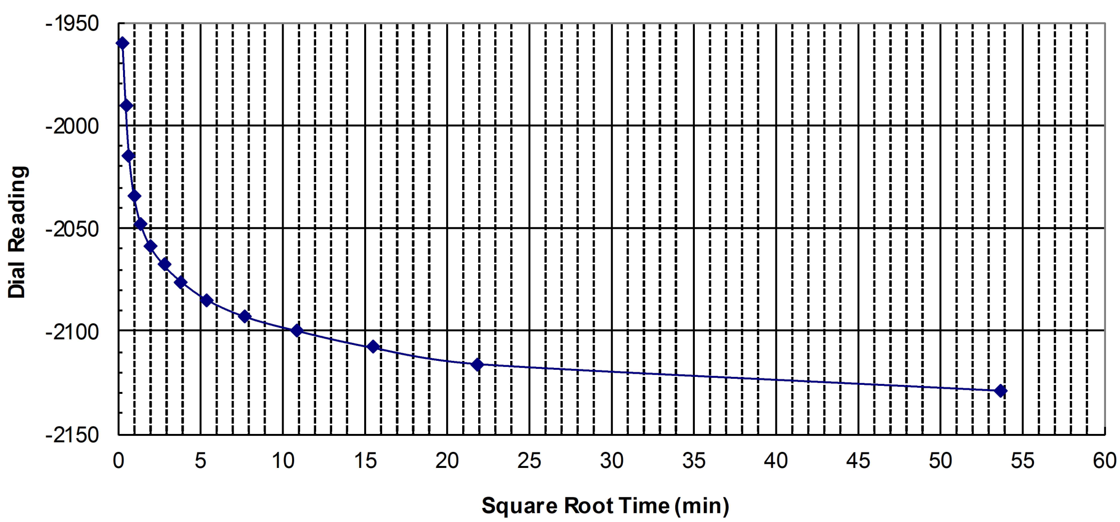
TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. B-28

Plotted:08/13/2019 8:46AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2322-32-01 (Zephyr)\Time Rate Consolidation Curves\2019\G2322-32-01 TimeRateConsolCurves_2019.dwg

Sample B3-15 (2019) (TR 4000)



Sample B3-15 (2019) (TR 8000)



TIME RATE CONSOLIDATION CURVE

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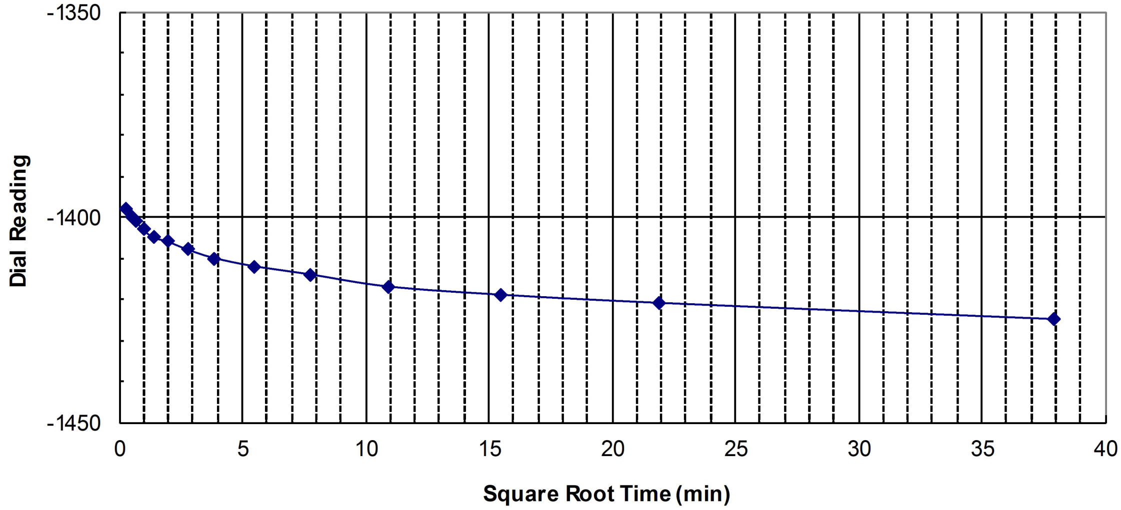
PHONE 858 558-6900 - FAX 858 558-6159

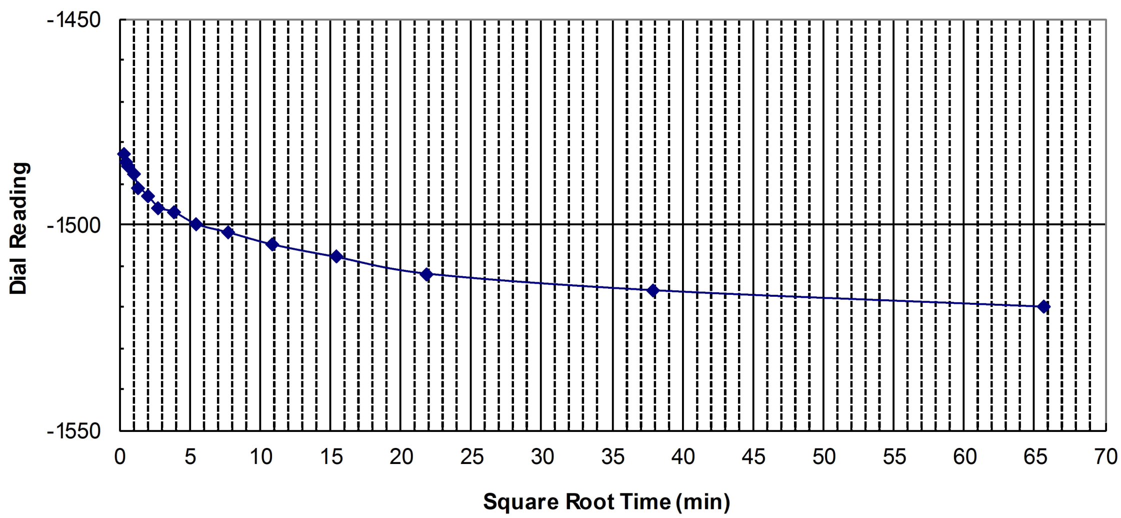
ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. B-29

Sample B3-21 (2019) (TR 4000)



Sample B3-21 (2019) (TR 8000)



TIME RATE CONSOLIDATION CURVE

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ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. B-30

Plotted:08/13/2019 8:46AM \| By:ALVIN LADRILLONO \| File Location:Y:\PROJECTS\G2322-32-01 (Zephyr)\Time Rate Consolidation Curves\2019\G2322-32-01 TimeRateConsolCurves_2019.dwg

APPENDIX C

APPENDIX C

FIELD INVESTIGATION (2018)

A field investigation was performed on October 16 and 17, 2018, and consisted of a visual site reconnaissance, and advancing six hollow-stem borings. The approximate locations of the previous and recent exploratory borings, trenches, and CPT soundings are shown on the *Geologic Map*, Figure 2.

The borings were advanced using a CME-95 drill rig equipped with 8-inch diameter, hollow-stem augers to a maximum depth of 31 feet below existing grades. Relatively undisturbed samples were obtained by driving a California split-spoon (CAL), split-tube sampler into the "undisturbed" soil mass. The CAL sampler was equipped with 1-inch by 2⅜-inch, brass sampler rings to facilitate removal and testing.

The soils encountered in the excavations were visually classified and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual Manual Procedure D 2488).

BORING B 1

ELEV. (MSL.) **39'** DATE COMPLETED **10-16-2018**

EQUIPMENT **CME 95** BY: **T. MYERS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM-SP	**ALLUVIUM (Qal)** Loose, dry, light yellowish-brown, Silty, fine to medium SAND; low silt content, micaceous			
2								
4								
6	B1-1				Medium dense, damp, light brown to white, Silty, fine to medium SAND; low silt content, micaceous	19	95.9	3.0
8								
10	B1-2				-Becomes loose	17	98.5	4.6
12								
14								
16	B1-3				Medium dense, damp to moist, light yellowish-brown, Silty, fine to medium SAND; low silt content, micaceous	20	100.6	4.7
18			▼		-Groundwater at 18 feet			
20	B1-4				Medium dense, wet, grey, Silty, fine to coarse SAND; low silt content, micaceous	28		
22								
24				ML	Loose, wet, grey, fine Sandy SILT			
26	B1-5					8	96.3	29.8
28								
30	B1-6					16	94.2	34.0

BORING TERMINATED AT 31 FEET
Groundwater encountered at 18 feet
Backfilled with non-slurry bentonite

Figure C-1,
Log of Boring B 1, Page 1 of 1

G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G2322-32-01

BORING B 2

ELEV. (MSL.) **38'** DATE COMPLETED **10-16-2018**

EQUIPMENT **CME 95** BY: **T. MYERS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM (Qal)** Loose, damp, brown, Silty, fine SAND			
2								
4								
6	B2-1					8	94.0	13.9
8								
10	B2-2			SM-SP	Medium dense, damp, light yellowish-brown to white, Silty, fine SAND, low silt content, micaceous	19	96.5	4.6
12								
14			▼					
16	B2-3				-Becomes very moist -Groundwater at 15.25'	21		
18								
20	B2-4				Loose, wet, gray, Silty, fine to coarse SAND; low silt content, micaceous	15		
22				CL	Stiff, wet, gray, Silty CLAY			
24				SM-SC	Loose, wet, gray, Silty/Clayey, fine to medium SAND			
26	B2-5					12	99.5	29.1
28				SM-SP	Medium dense, wet, gray, Silty, fine to coarse SAND; low silt content, micaceous			
30	B2-6					28	104.0	22.4

BORING TERMINATED AT 31 FEET
Groundwater encountered at 15 feet
Backfilled with non-slurry bentonite

Figure C-2,
Log of Boring B 2, Page 1 of 1

G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 3

ELEV. (MSL.) **36'** DATE COMPLETED **10-16-2018**

EQUIPMENT **CME 95** BY: **T. MYERS**

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		SM-SP	**ALLUVIUM (Qal)** Loose, dry, yellowish-brown, Silty, fine SAND; low silt content, micaceous			
5.5	B3-1		Loose, damp, yellowish-brown, Silty, fine to coarse SAND; low silt content, micaceous	9	105.3	4.1
10.5	B3-2		-Becomes medium dense	26	96.8	4.3
15.5			-No recovery	35		
17			-Groundwater at 17 feet			
20.5	B3-3		Medium dense, wet, gray, Silty, fine to medium SAND; low silt content, micaceous	27	101.2	24.4
25.5	B3-4		Loose, wet, gray, Silty, fine to coarse SAND; low silt content, micaceous	15	103.0	22.0
29		ML	Medium dense, wet, dark gray, fine Sandy SILT			
30.5	B3-5			30		

BORING TERMINATED AT 31 FEET
Groundwater encountered at 17 feet
Backfilled with non-slurry bentonite

Figure C-3,
Log of Boring B 3, Page 1 of 1

G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2322-32-01

BORING B 4

ELEV. (MSL.) **39'** DATE COMPLETED **10-16-2018**

EQUIPMENT **CME 95** BY: **T. MYERS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM (Qal)** Loose, dry, yellowish-brown, Silty, fine SAND			
2								
4				ML	Stiff, damp, dark yellowish brown, fine Sandy SILT			
6	B4-1					29	105.3	4.1
8								
10	B4-2			SM-SP	Medium dense, damp, white and yellowish-brown, Silty, fine SAND; low silt content, micaceous	21	92.3	2.4
12								
14								
16	B4-3					19	99.9	3.9
18								
20	B4-4		▼		-Groundwater at 20 feet Medium dense, wet, gray, Silty, fine to coarse SAND; low silt content, micaceous	27		
22								
24								
26	B4-5					22	102.1	24.2
28								
30	B4-6				Medium dense, wet, gray, Silty, fine to medium SAND; low silt content, micaceous	26	100.8	21.0

BORING TERMINATED AT 31 FEET
Groundwater encountered at 20 feet
Backfilled with non-slurry bentonite

Figure C-4,
Log of Boring B 4, Page 1 of 1

G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2322-32-01

BORING B 5

ELEV. (MSL.) 44' DATE COMPLETED 10-16-2018

EQUIPMENT CME 95 BY: T. MYERS

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**2-INCH ASPHALT CONCRETE** No AB			
					ALLUVIUM (Qal) Loose, damp, olive-brown, Silty, fine SAND			
6	B5-1					12	95.8	8.4
	B5-2							
10	B5-3				-Becomes fine- to medium-grained	15	91.4	4.0
16	B5-4					12	103.9	16.8
18				SM-SP	Medium dense, damp, white and yellowish-brown, fine to medium Silty SAND; low silt content, micaceous			
20	B5-5					27	105.5	3.7
25	B5-6		▼	ML	Medium stiff, wet, gray, fine Sandy SILT with little clay -Groundwater at 25.5 feet	11	98.7	28.8
30	B5-7				Stiff, wet, gray, fine Sandy SILT	16	99.0	27.3
					BORING TERMINATED AT 31 FEET Groundwater encountered at 25.5 feet Backfilled with non-slurry bentonite			

Figure C-5,
Log of Boring B 5, Page 1 of 1

G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2322-32-01

BORING B 6

ELEV. (MSL.) **30'** DATE COMPLETED **10-16-2018**

EQUIPMENT **CME 95** BY: **T. MYERS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM (Qal)** Loose, dry, yellowish-brown, Silty, fine to medium SAND			
3				SM-SP	Medium dense, damp, yellowish-brown and white, Silty, fine to medium SAND; low silt content, micaceous			
6	B6-1					24	103.5	3.8
7	B6-2							
11	B6-3					23	99.2	4.7
15			▼		-Groundwater at 15 feet			
16	B6-4				Loose, wet, gray, Silty, fine to coarse SAND; low silt content, micaceous	13	104.6	20.1
21	B6-5					21		
26	B6-6					23		
31	B6-7				Medium dense, wet, gray, Silty, fine to medium SAND; low silt content, micaceous	22	102.7	24.6

BORING TERMINATED AT 31 FEET
Groundwater encountered at 15 feet
Backfilled with non-slurry bentonite

Figure C-6,
Log of Boring B 6, Page 1 of 1

G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

APPENDIX D

APPENDIX D

LABORATORY TESTING (2018)

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected relatively undisturbed samples were tested for their in-place dry density and moisture content, maximum dry density and optimum moisture content, shear strength, expansion potential and consolidation characteristics. The in-place dry density and moisture content results are indicated on the exploratory boring logs. The results of our laboratory tests are summarized on Tables D-I through D-III and Figures D-1 through D-33.

Laboratory gradation and R-value tests were performed on random samples of the existing asphalt concrete materials associated with the drive-in theater. The testing was performed to evaluate possible re-use of this material as recycled aggregate base during future development. Samples AC-1 and AC-2 were chunk samples collected during drilling. Samples AC-3 through AC-5 were sampled after Pavement Recycling Systems pulverized the asphalt concrete in three test strips. The asphalt concrete laboratory test results are presented in Tables D-IV and D-V.

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

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry weight)
B5-2	Dark grayish brown, Silty, fine to coarse SAND with gravel	114.1	13.4
B6-2	Grayish brown, Silty, fine SAND	114.4	13.8

TABLE D-II
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
B5-2	102.2	14.1	490 [470]	28 [27]
B6-2	102.5	14.3	640 [440]	30 [32]

[ ] Denotes Ultimate Shear Strength.

TABLE D-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	CBC Expansion Classification
	Before Test	After Test			
B5-2	9.6	18.9	109.4	1	Very Low

TABLE D-IV
SUMMARY OF LABORATORY ASPHALT CONCRETE GRADATION AND ASPHALT CONTENT TEST RESULTS
ASTM C 136 AND D 6307

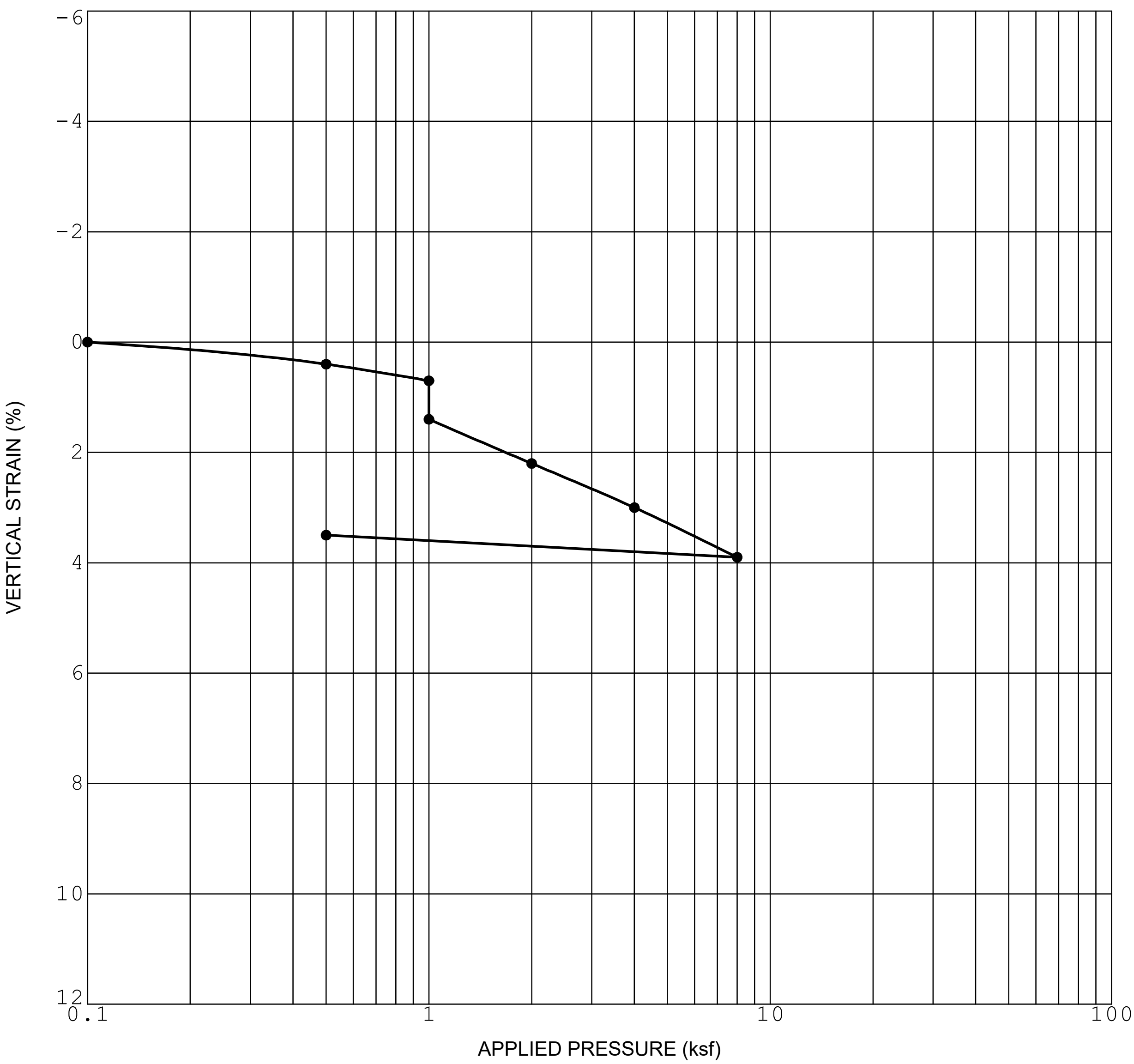
Sieve Analysis (sieve size)	1/2-Inch Aggregate (% passing)					2018 Greenbook Specifications for CMB Type B, Table 200-2.4.2 (% passing)
	AC-1	AC-2	AC-3	AC-4	AC-5	
1½-inch	100	100	100	100	100	100
3/4-inch	100	100	100	95	99	85 - 100
3/8-inch	90	79	72	65	71	55 - 75
No. 4	51	40	29	37	33	35 - 60
No. 30	29	21	17	22	16	10 - 30
No. 200	7	6	5	4	4	2 - 9

TABLE D-V
SUMMARY OF LABORATORY RESISTANCE VALUE (R-VALUE) TEST RESULTS
ASTM D 2844 (CALIFORNIA TEST METHOD 301)

Sample No.	Location	R-Value
AC-3	Drive-in Theater (South)	78
AC-4	Drive-in Theater (Middle)	78
AC-5	Drive-in Theater (North)	78

PROJECT NO. G2322-32-01

SAMPLE NO. B1-1



ASTM D2435

Initial Dry Density (pcf)	95.9	**Initial Saturation (%)**	10.8
Initial Water Content (%)	3.0	**Sample Saturated at (ksf)**	1.0

CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

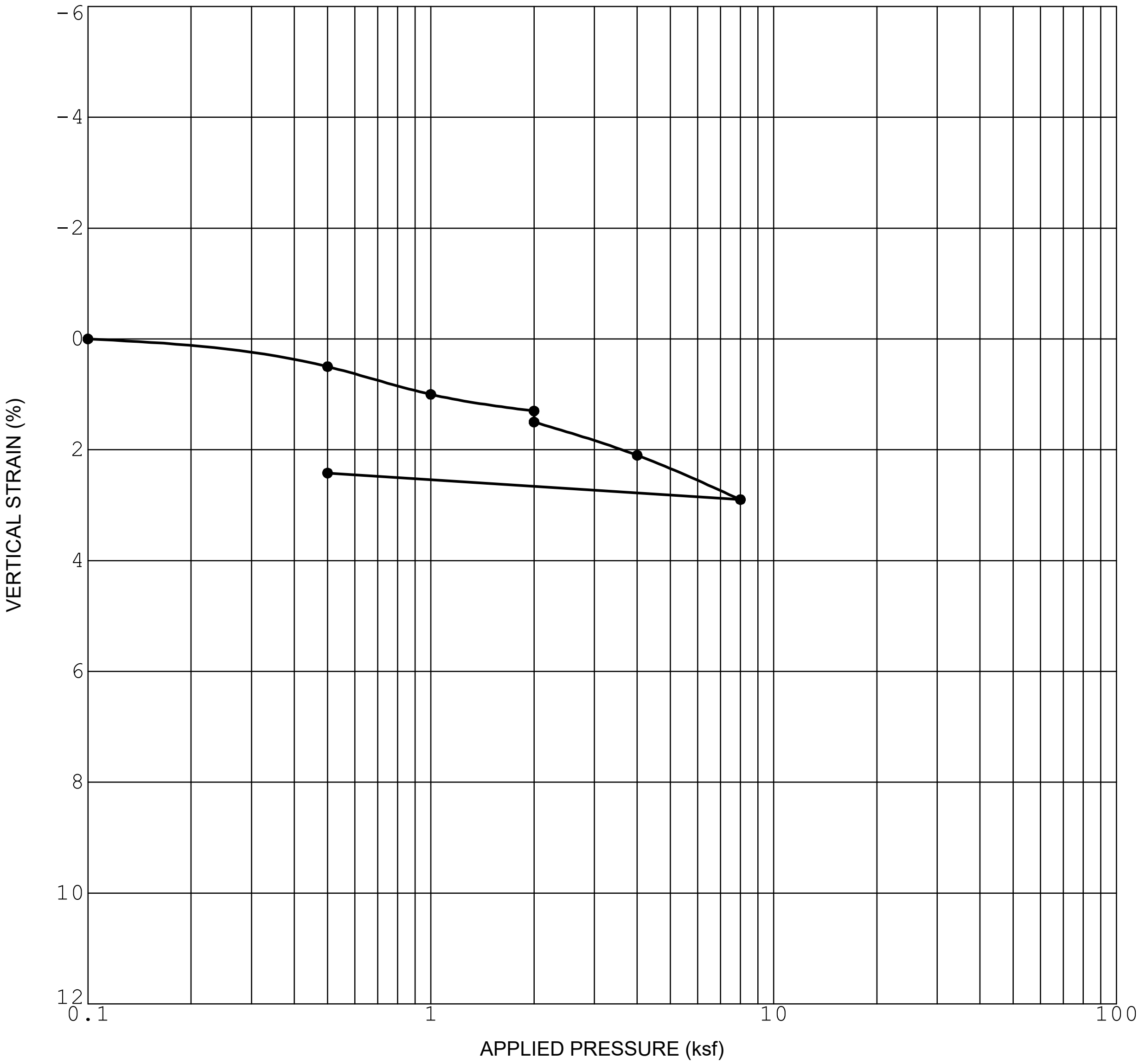
OCEANSIDE, CALIFORNIA

G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

Figure D-1

GEOCON

SAMPLE NO. B1-2



ASTM D2435

Initial Dry Density (pcf)	98.5
Initial Water Content (%)	4.6

Initial Saturation (%)	18.0
Sample Saturated at (ksf)	2.0

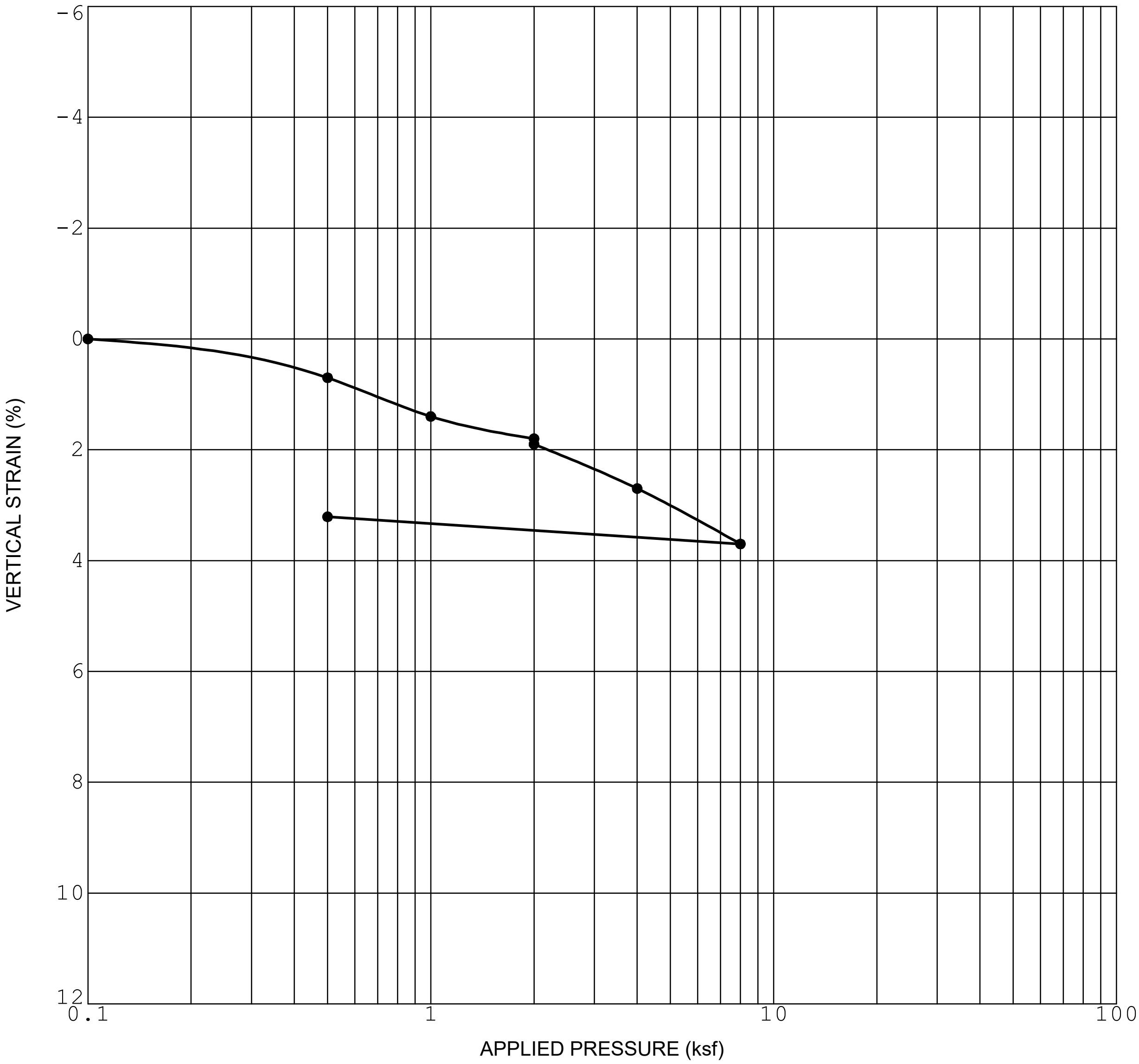
CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B1-3



ASTM D2435

Initial Dry Density (pcf)	100.6	**Initial Saturation (%)**	21.2
Initial Water Content (%)	4.7	**Sample Saturated at (ksf)**	2.0

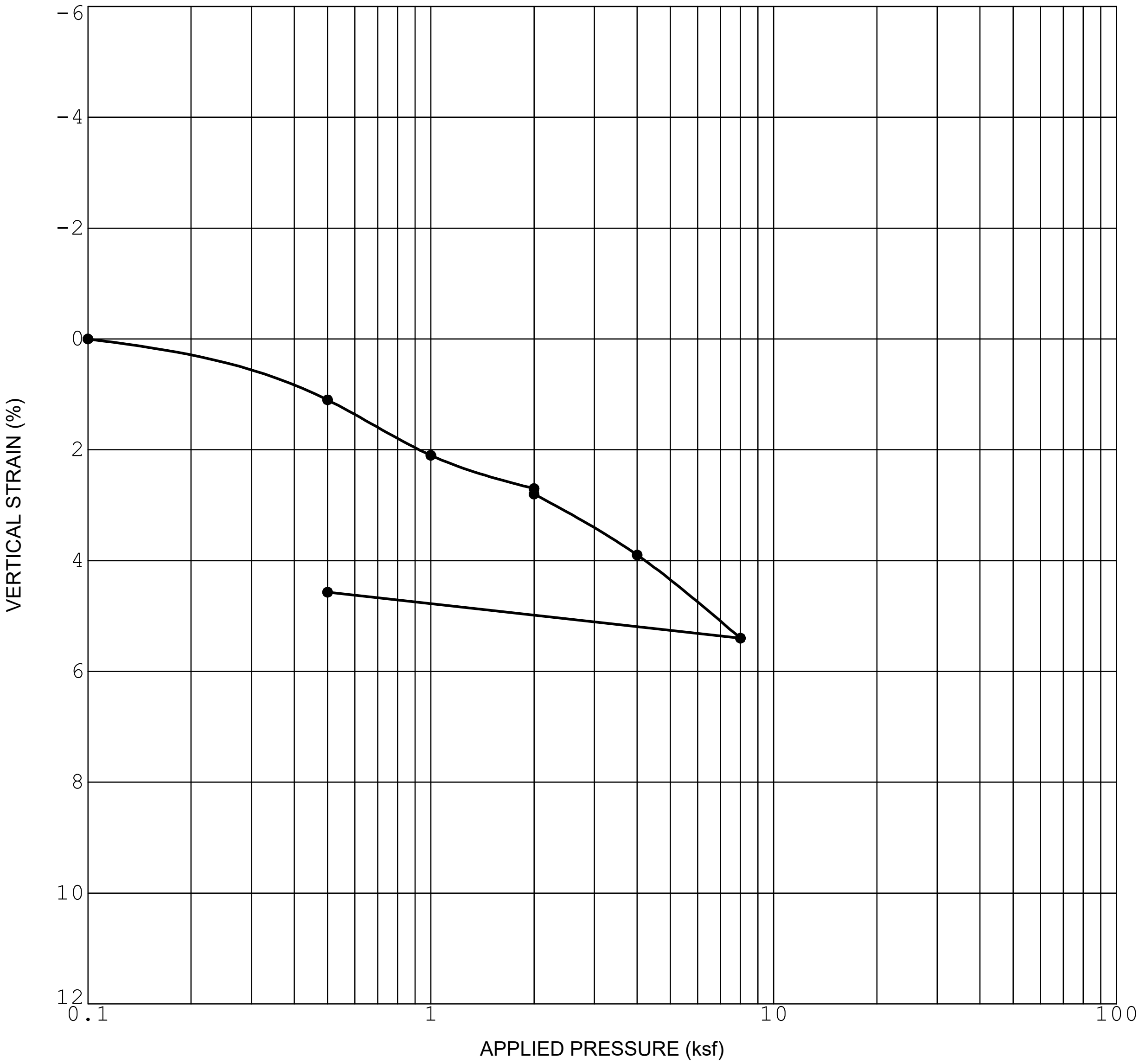
CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B1-5



ASTM D2435

Initial Dry Density (pcf)	96.3		**Initial Saturation (%)**	100+
Initial Water Content (%)	29.8		**Sample Saturated at (ksf)**	2.0

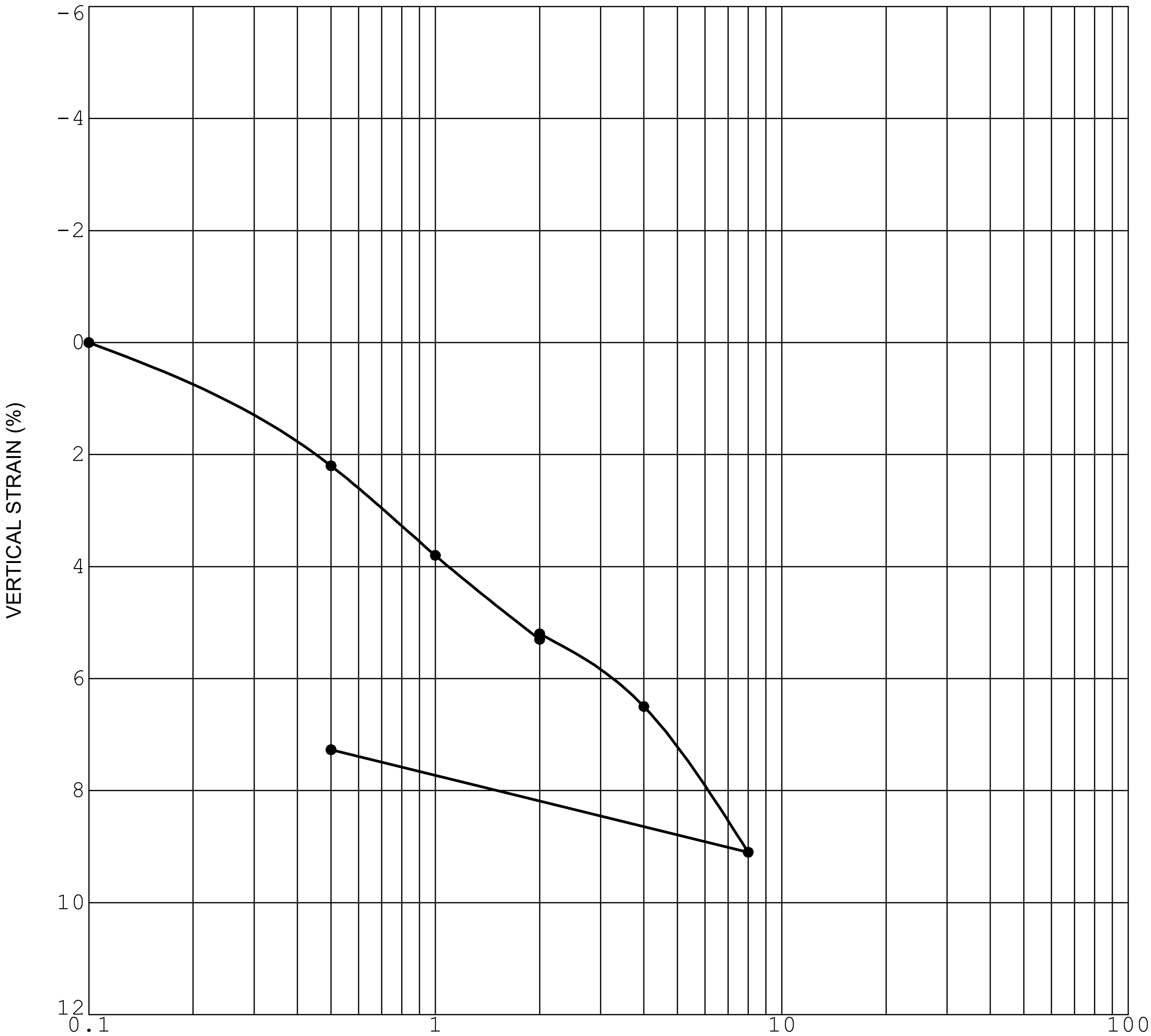
CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B1-6



ASTM D2435

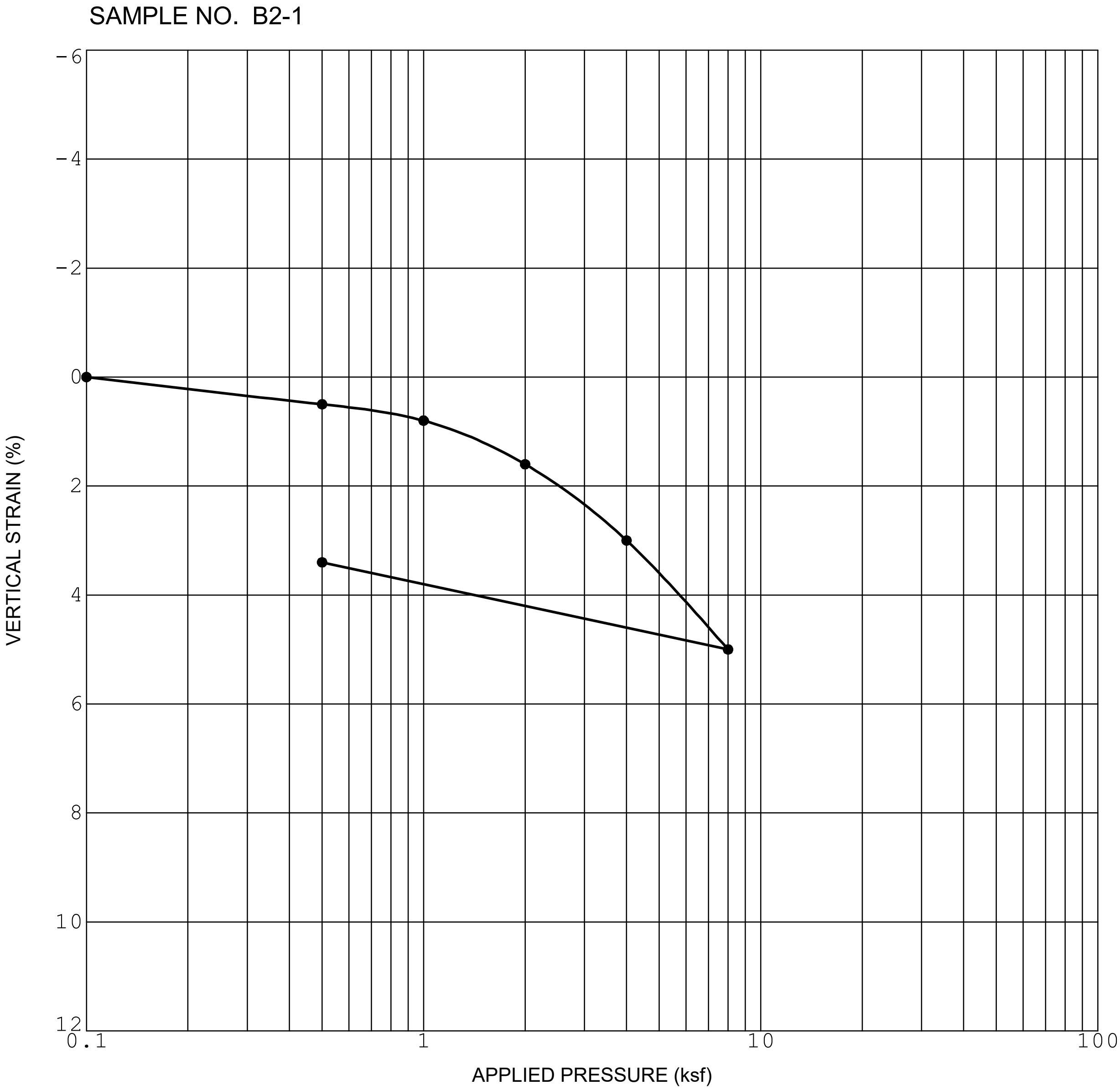
Initial Dry Density (pcf)	94.2
Initial Water Content (%)	34.0

Initial Saturation (%)	100+
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA



ASTM D2435

Initial Dry Density (pcf)	94.0	**Initial Saturation (%)**	48.4
Initial Water Content (%)	13.9	**Sample Saturated at (ksf)**	1.0

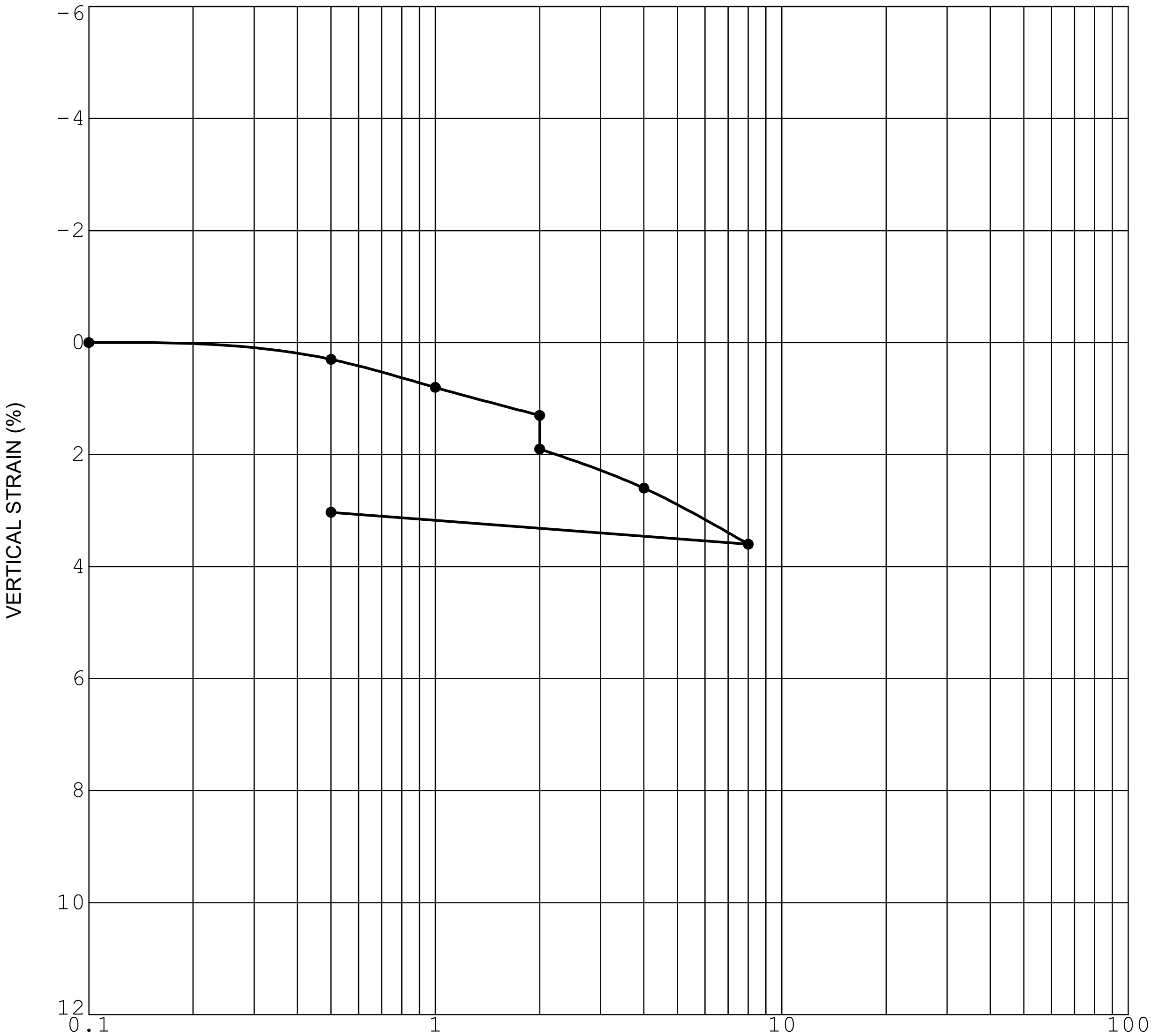
CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B2-2



ASTM D2435

Initial Dry Density (pcf)	96.5
Initial Water Content (%)	4.6

Initial Saturation (%)	16.8
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

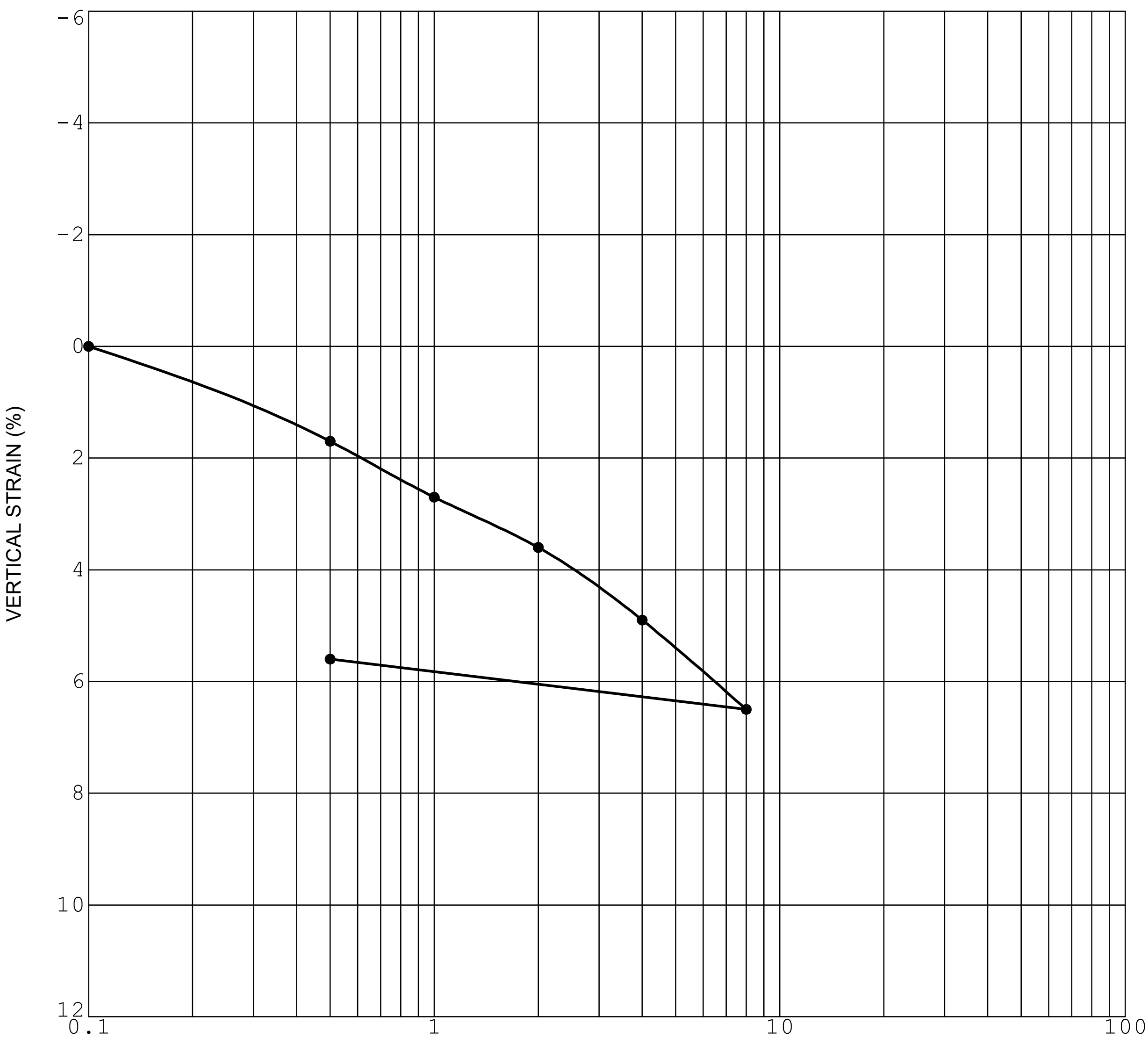
ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

GEOCON

PROJECT NO. G2322-32-01

SAMPLE NO. B2-5



ASTM D2435

Initial Dry Density (pcf)	99.5
Initial Water Content (%)	29.1

Initial Saturation (%)	100+
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

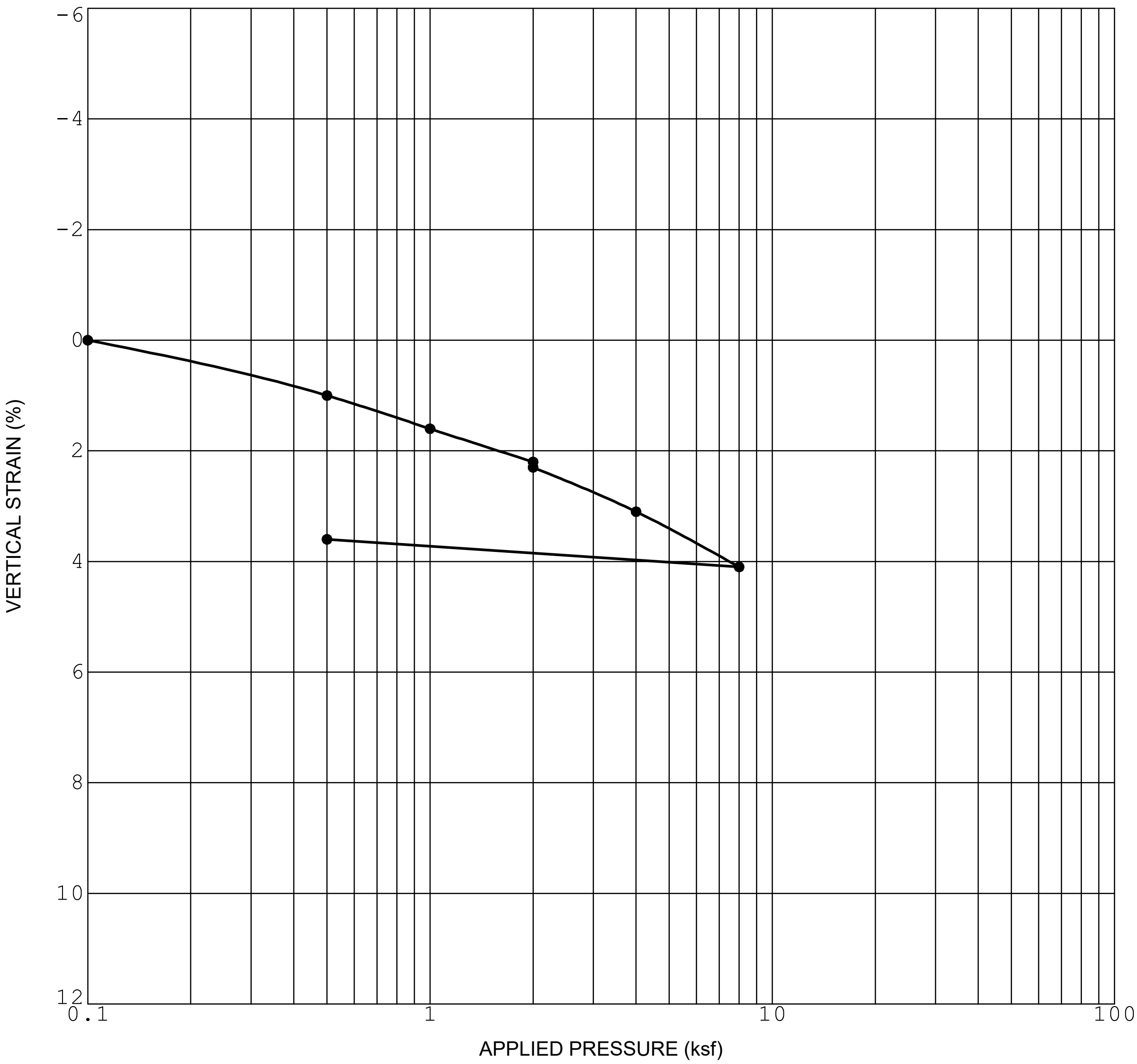
OCEANSIDE, CALIFORNIA

G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

Figure D-8

GEOCON

SAMPLE NO. B2-6



ASTM D2435

Initial Dry Density (pcf)	104.0
Initial Water Content (%)	22.4

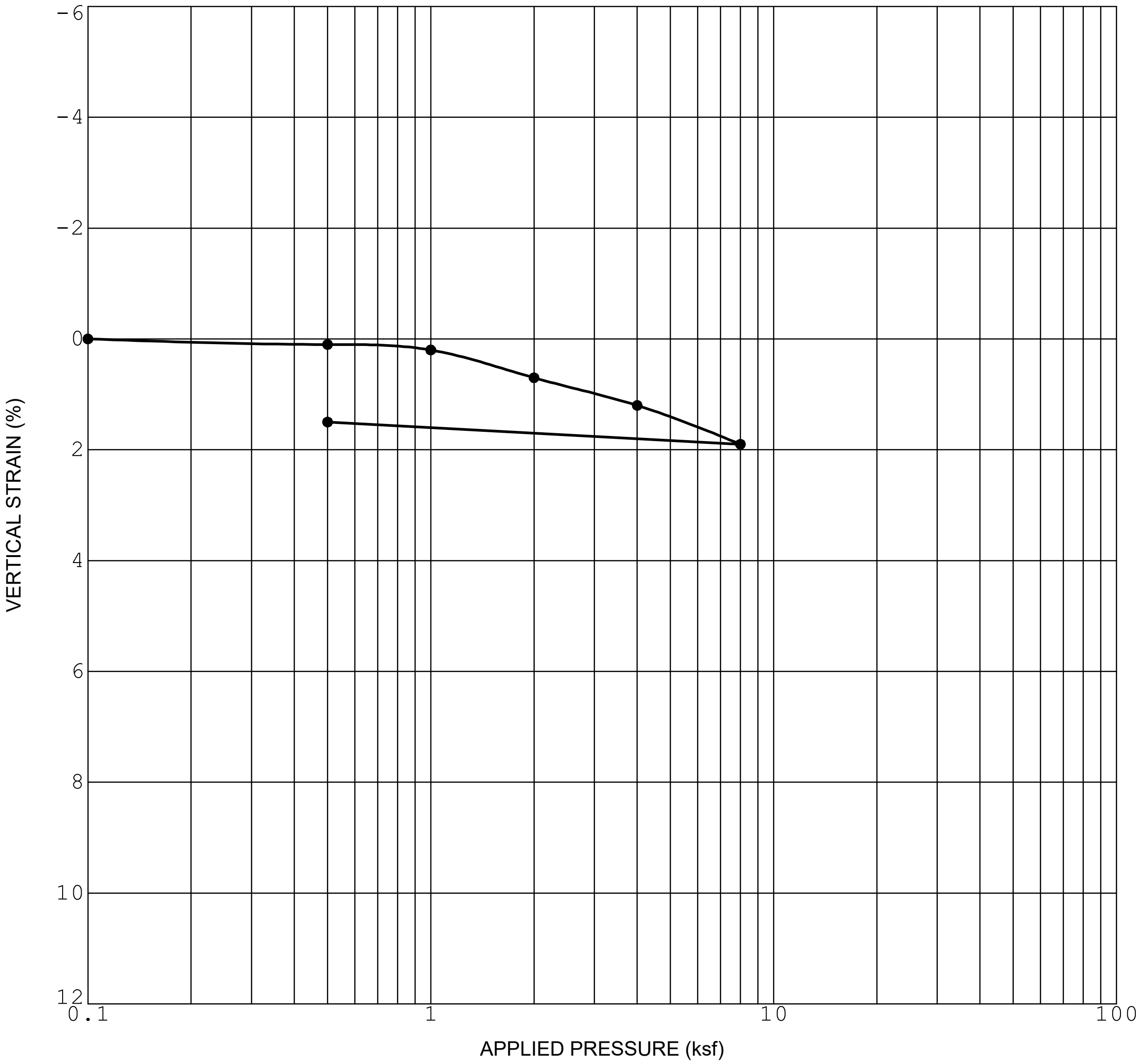
Initial Saturation (%)	100+
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

SAMPLE NO. B3-1



ASTM D2435

Initial Dry Density (pcf)	97.0
Initial Water Content (%)	2.2

Initial Saturation (%)	48.4
Sample Saturated at (ksf)	1.0

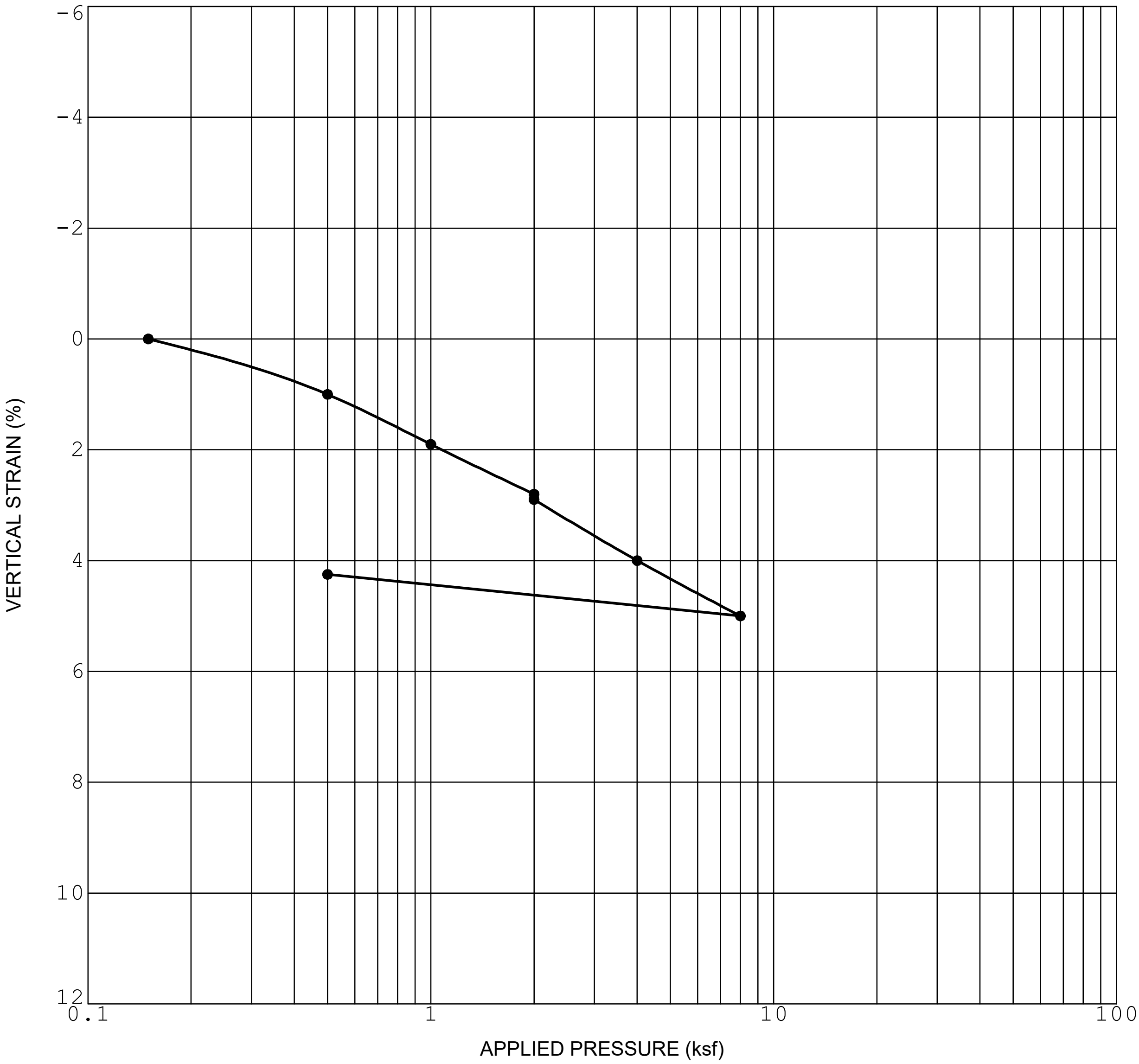
CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B3-2



ASTM D2435

Initial Dry Density (pcf)	96.8
Initial Water Content (%)	4.3

Initial Saturation (%)	15.9
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

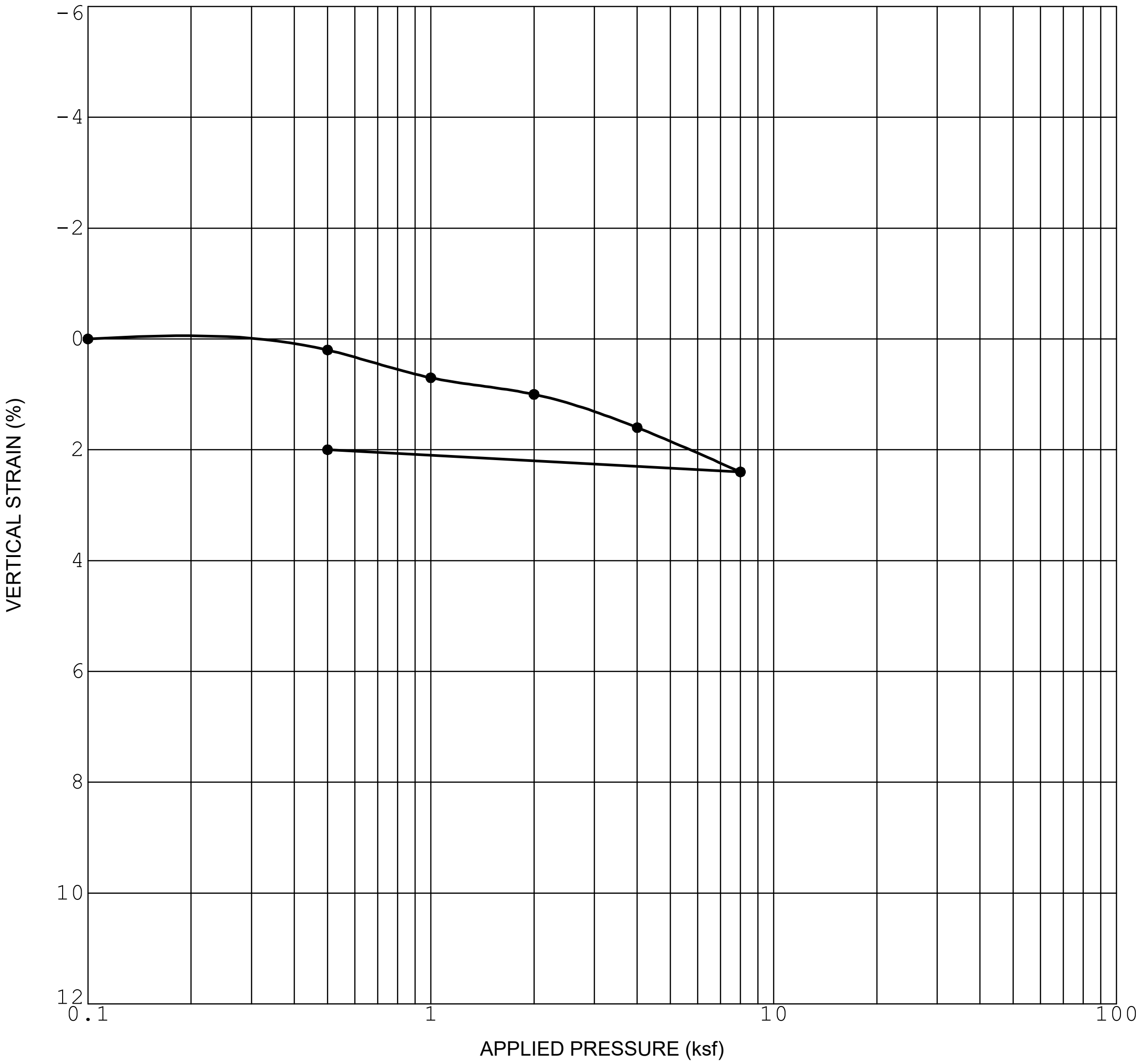
G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

Figure D-11

GEOCON

PROJECT NO. G2322-32-01

SAMPLE NO. B3-3



ASTM D2435

Initial Dry Density (pcf)	101.0	**Initial Saturation (%)**	100+
Initial Water Content (%)	24.4	**Sample Saturated at (ksf)**	2.0

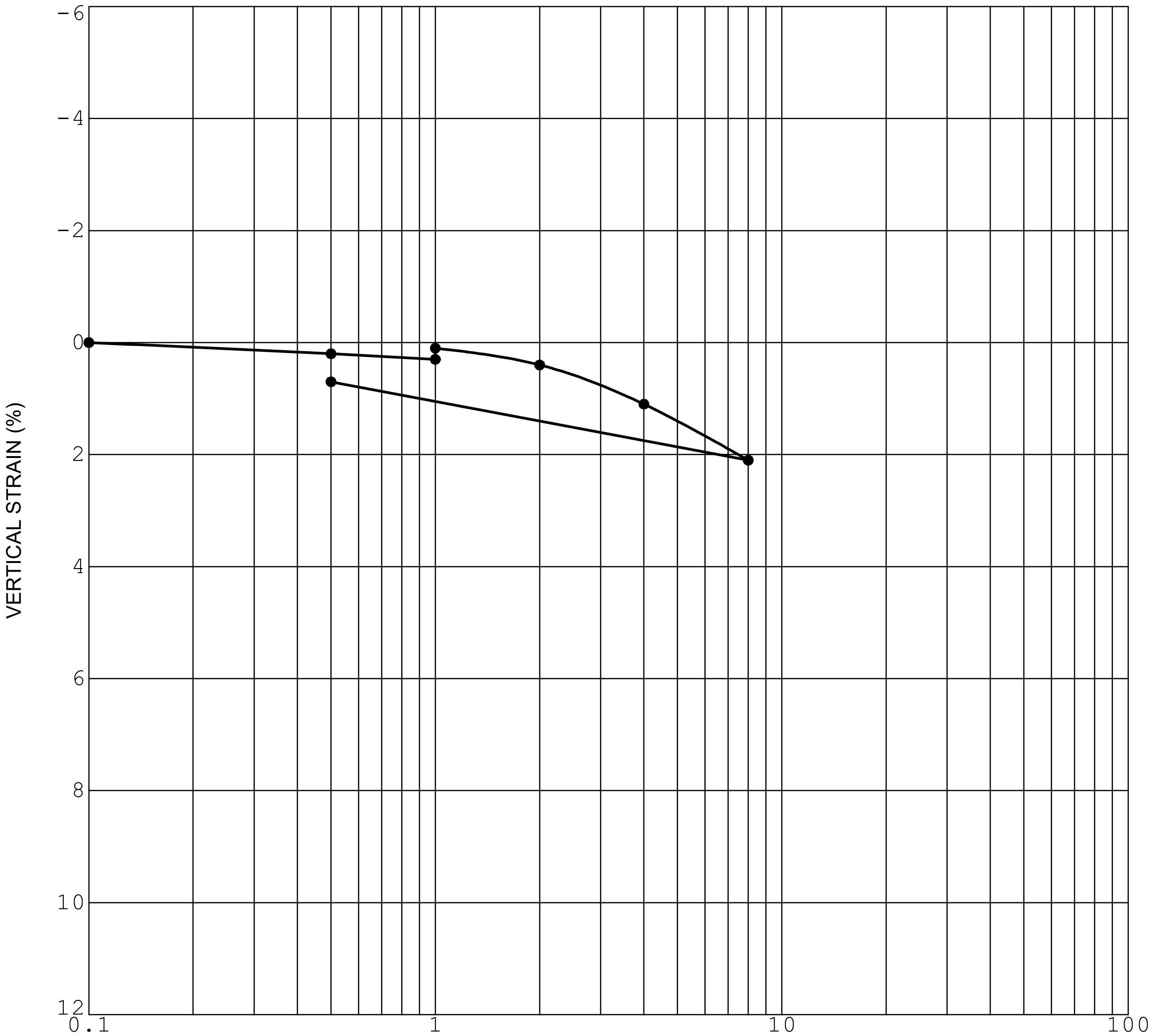
CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B4-1



ASTM D2435

Initial Dry Density (pcf)	105.3
Initial Water Content (%)	4.1

Initial Saturation (%)	18.9
Sample Saturated at (ksf)	1.0

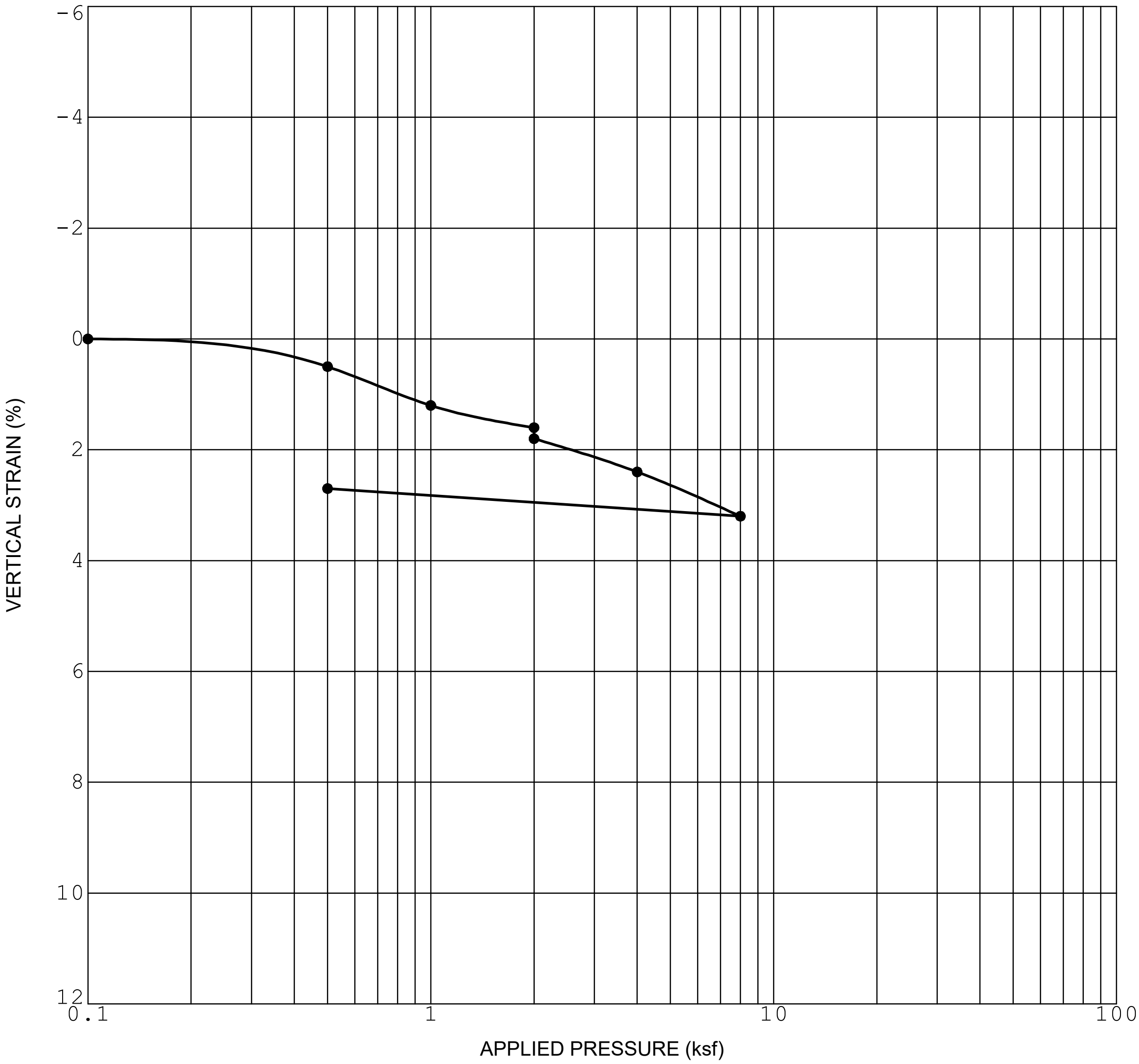
CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B4-2



ASTM D2435

Initial Dry Density (pcf)	92.3
Initial Water Content (%)	2.4

Initial Saturation (%)	8.8
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

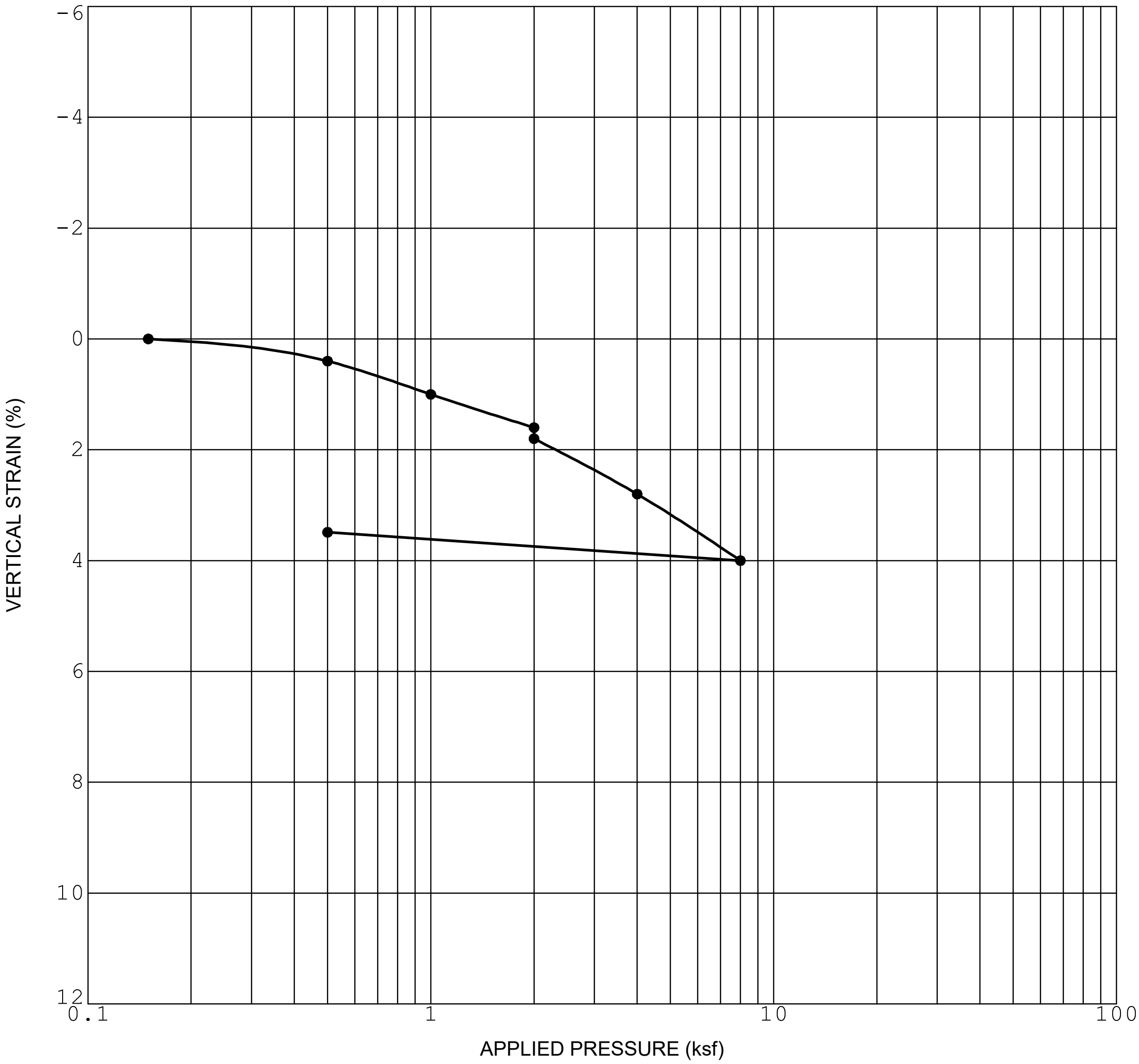
G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

Figure D-14

GEOCON

PROJECT NO. G2322-32-01

SAMPLE NO. B4-3



ASTM D2435

Initial Dry Density (pcf)	94.0
Initial Water Content (%)	3.9

Initial Saturation (%)	15.6
Sample Saturated at (ksf)	2.0

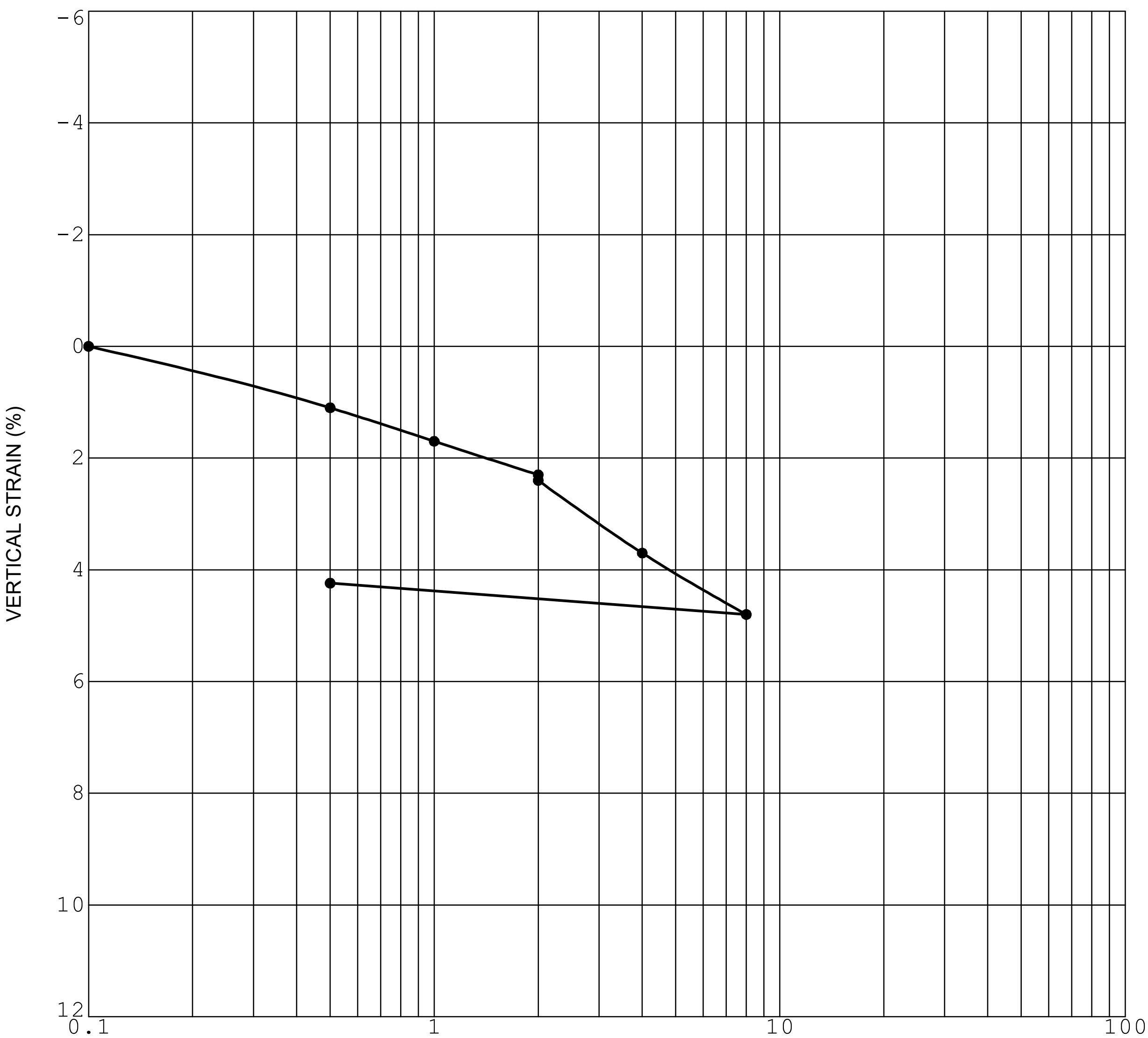
CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B4-5



ASTM D2435

Initial Dry Density (pcf)	102.1
Initial Water Content (%)	24.2

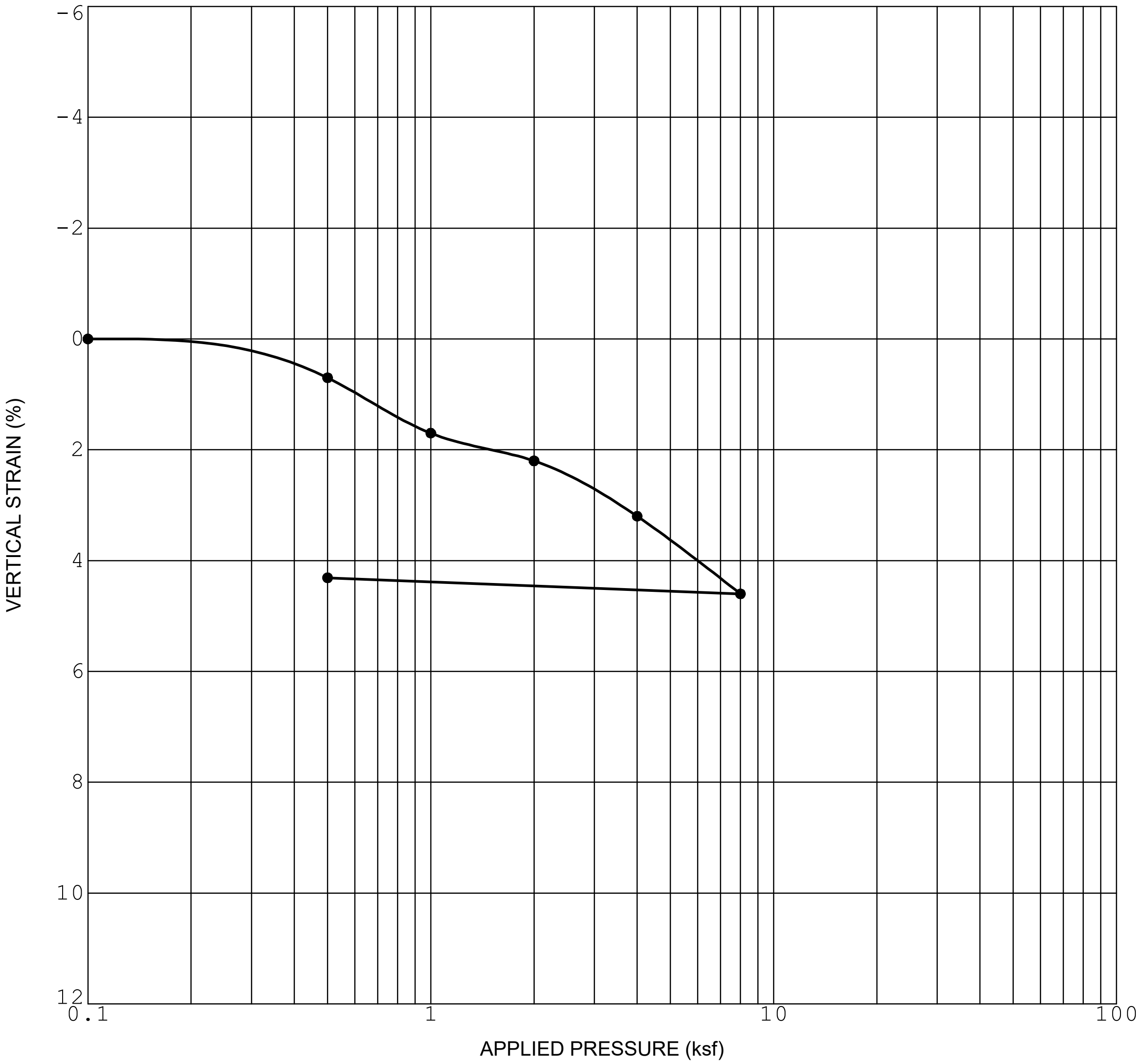
Initial Saturation (%)	100+
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

SAMPLE NO. B4-6



ASTM D2435

Initial Dry Density (pcf)	100.8
Initial Water Content (%)	21.0

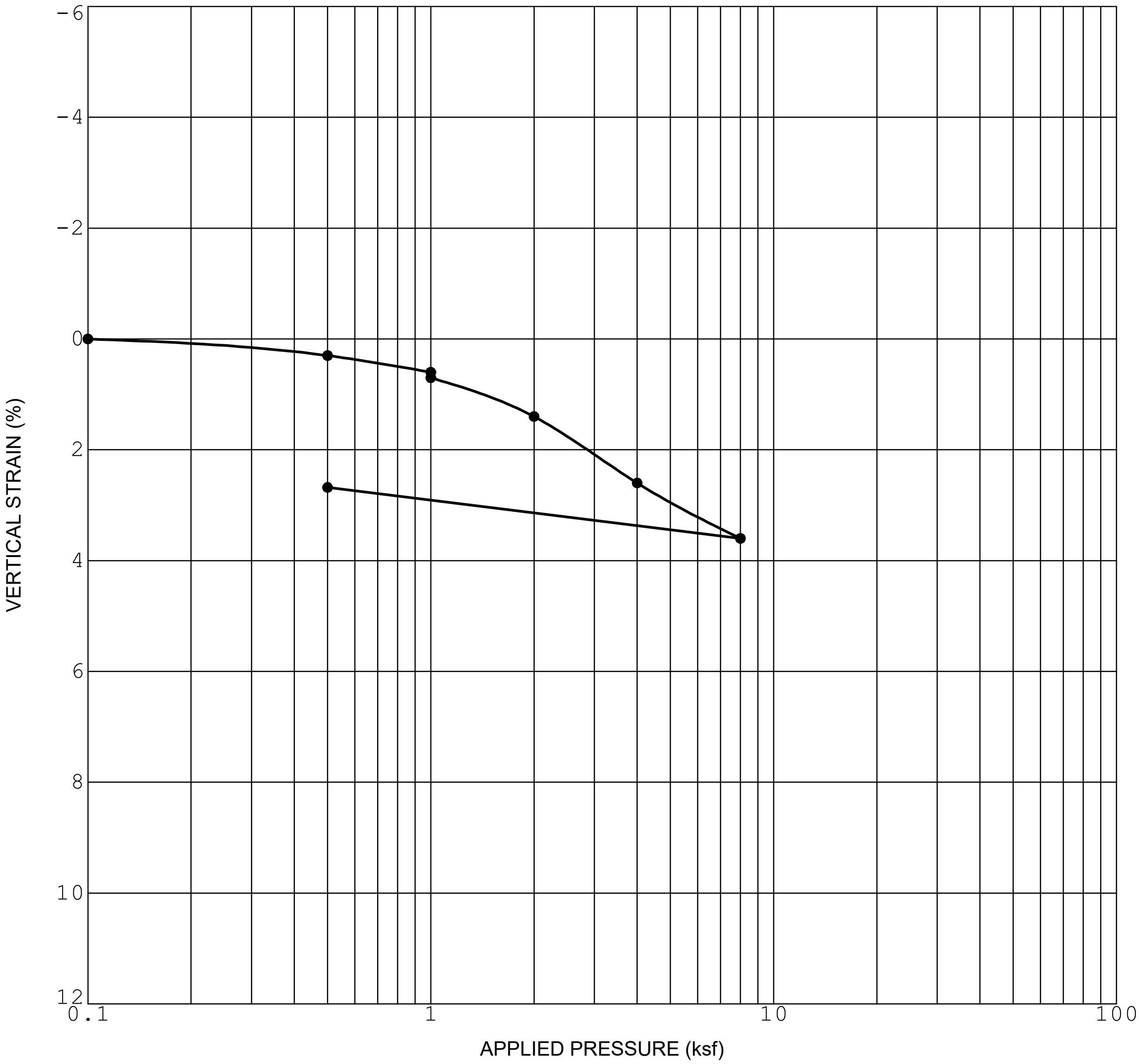
Initial Saturation (%)	86.5
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

SAMPLE NO. B5-1



ASTM D2435

Initial Dry Density (pcf)	99.1		**Initial Saturation (%)**	30.4
Initial Water Content (%)	8.4		**Sample Saturated at (ksf)**	1.0

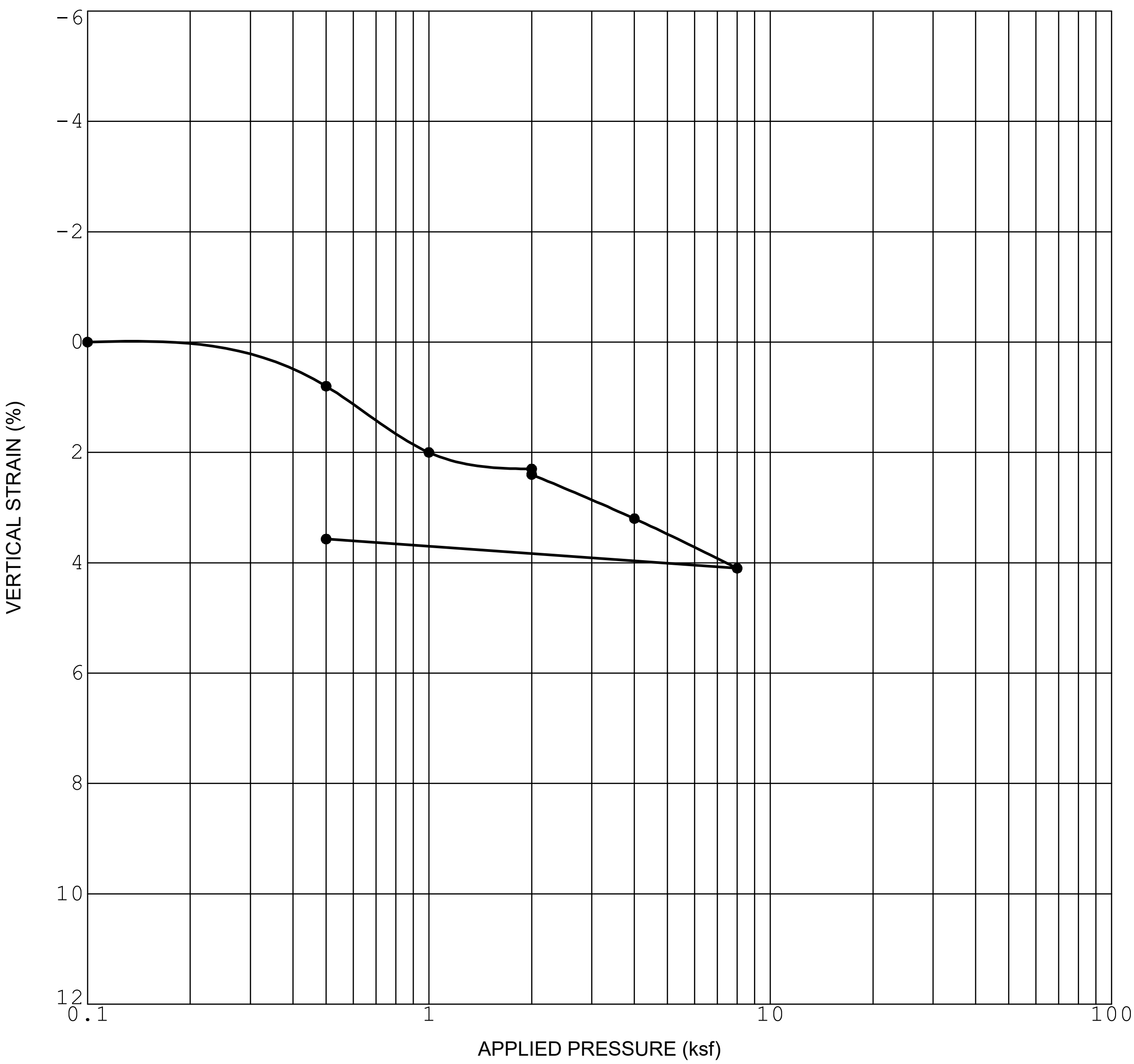
CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B5-3



ASTM D2435

Initial Dry Density (pcf)	91.4
Initial Water Content (%)	4.0

Initial Saturation (%)	12.9
Sample Saturated at (ksf)	2.0

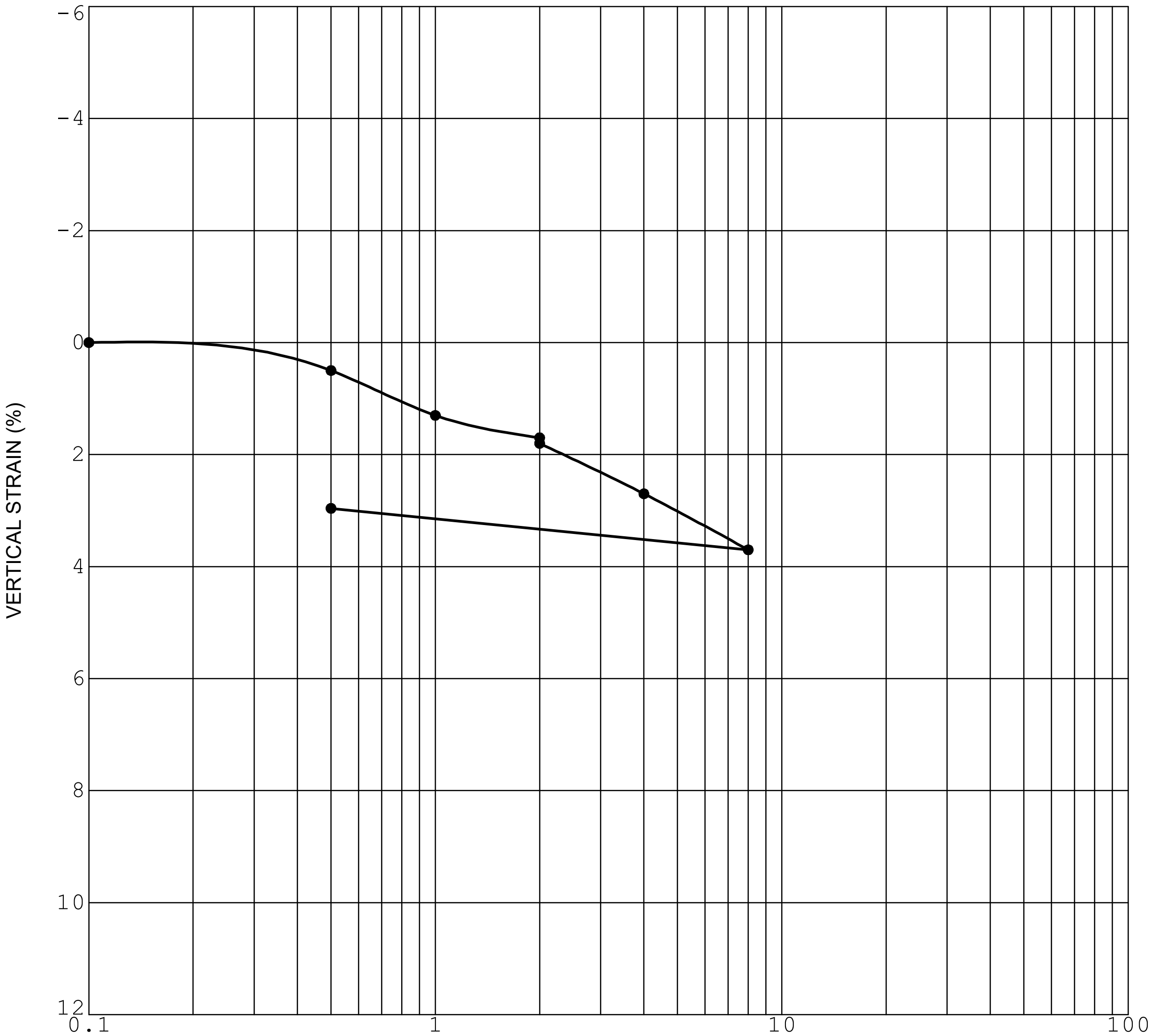
CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B5-4



ASTM D2435

Initial Dry Density (pcf)	103.8
Initial Water Content (%)	16.8

Initial Saturation (%)	74.9
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

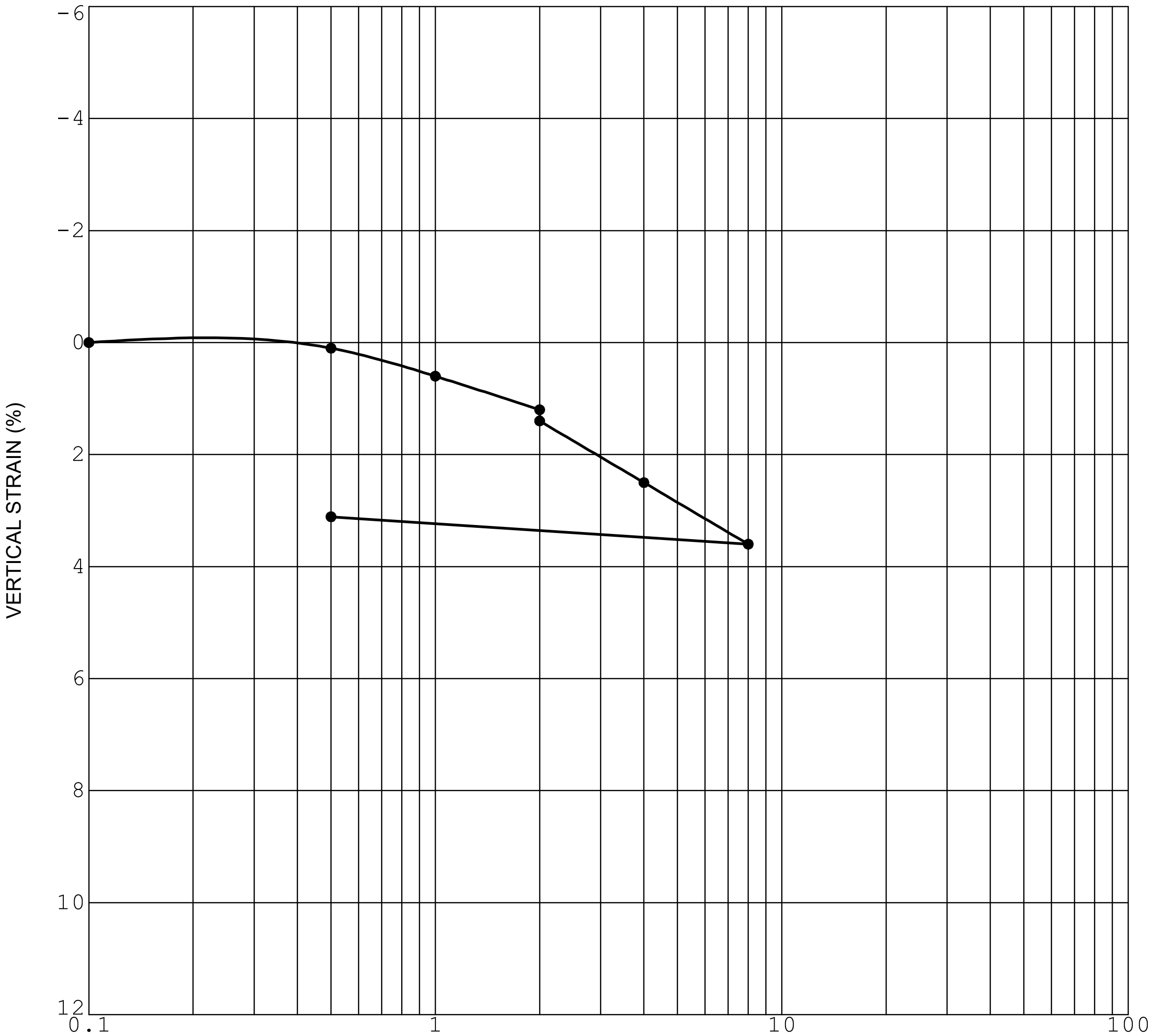
OCEANSIDE, CALIFORNIA

G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

GEOCON

PROJECT NO. G2322-32-01

SAMPLE NO. B5-5



ASTM D2435

Initial Dry Density (pcf)	105.5
Initial Water Content (%)	3.7

Initial Saturation (%)	17.1
Sample Saturated at (ksf)	2.0

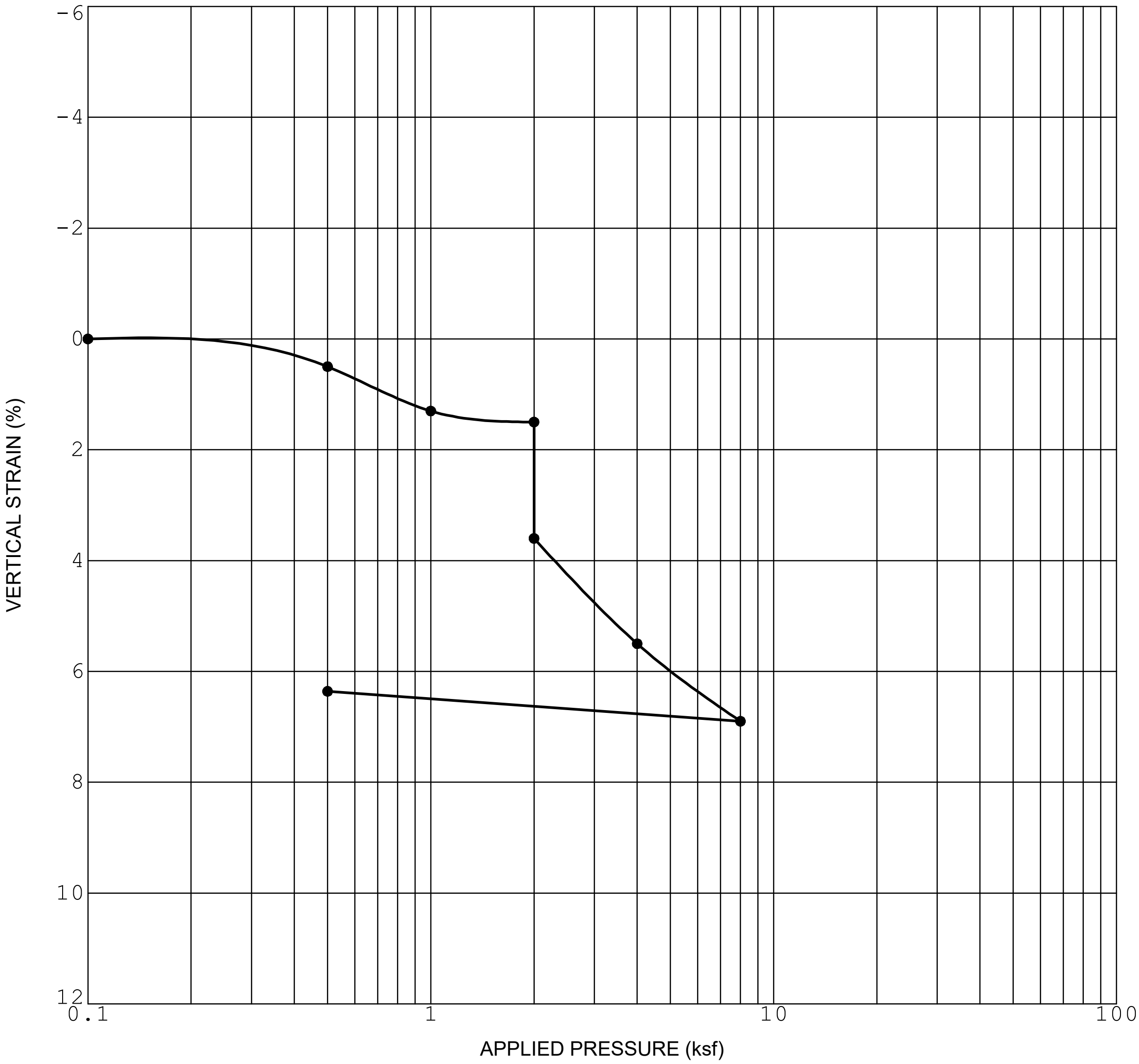
CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B5-6



ASTM D2435

Initial Dry Density (pcf)	98.7
Initial Water Content (%)	28.8

Initial Saturation (%)	100+
Sample Saturated at (ksf)	2.0

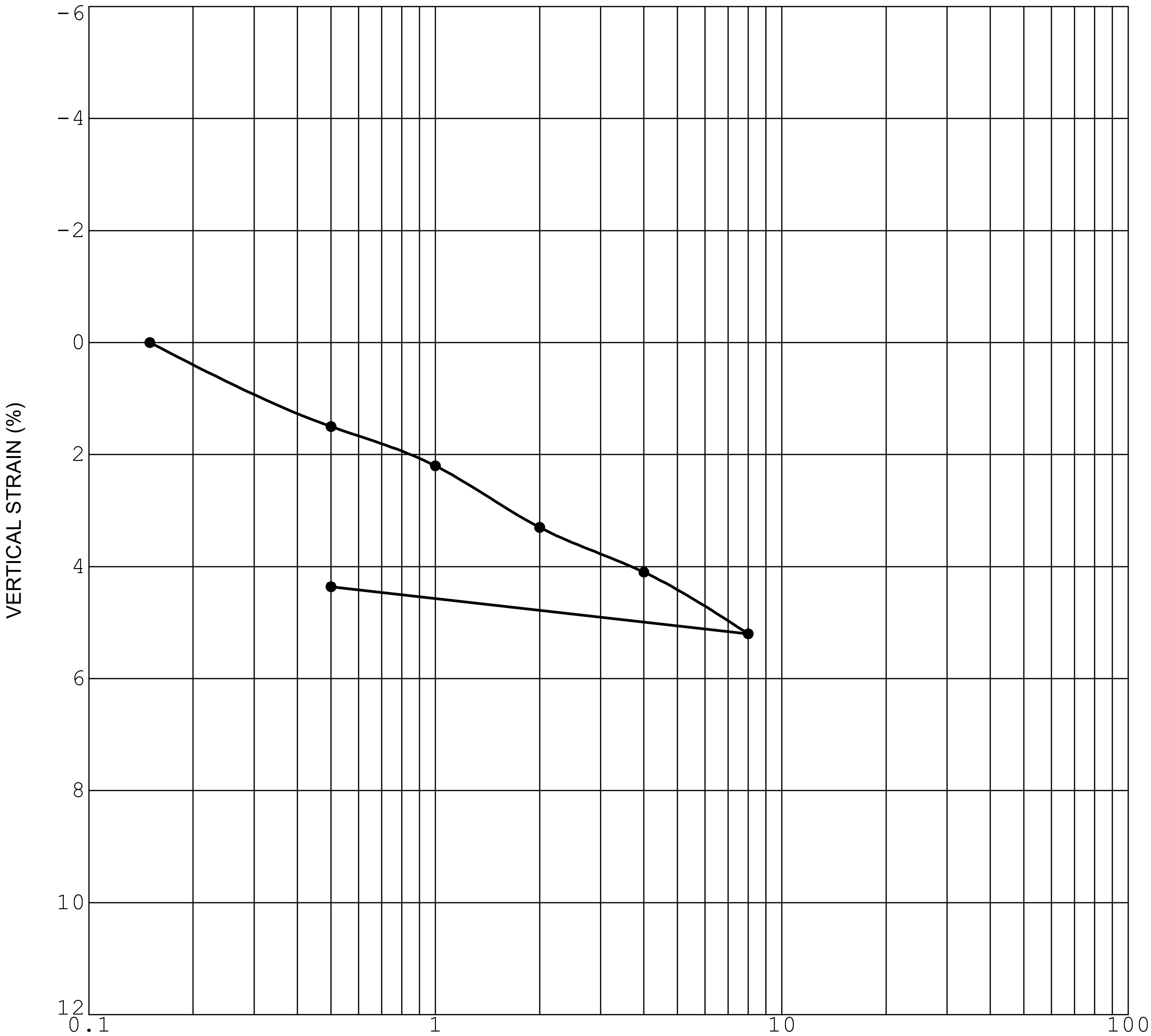
CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B5-7



ASTM D2435

Initial Dry Density (pcf)	99.0
Initial Water Content (%)	27.3

Initial Saturation (%)	100+
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

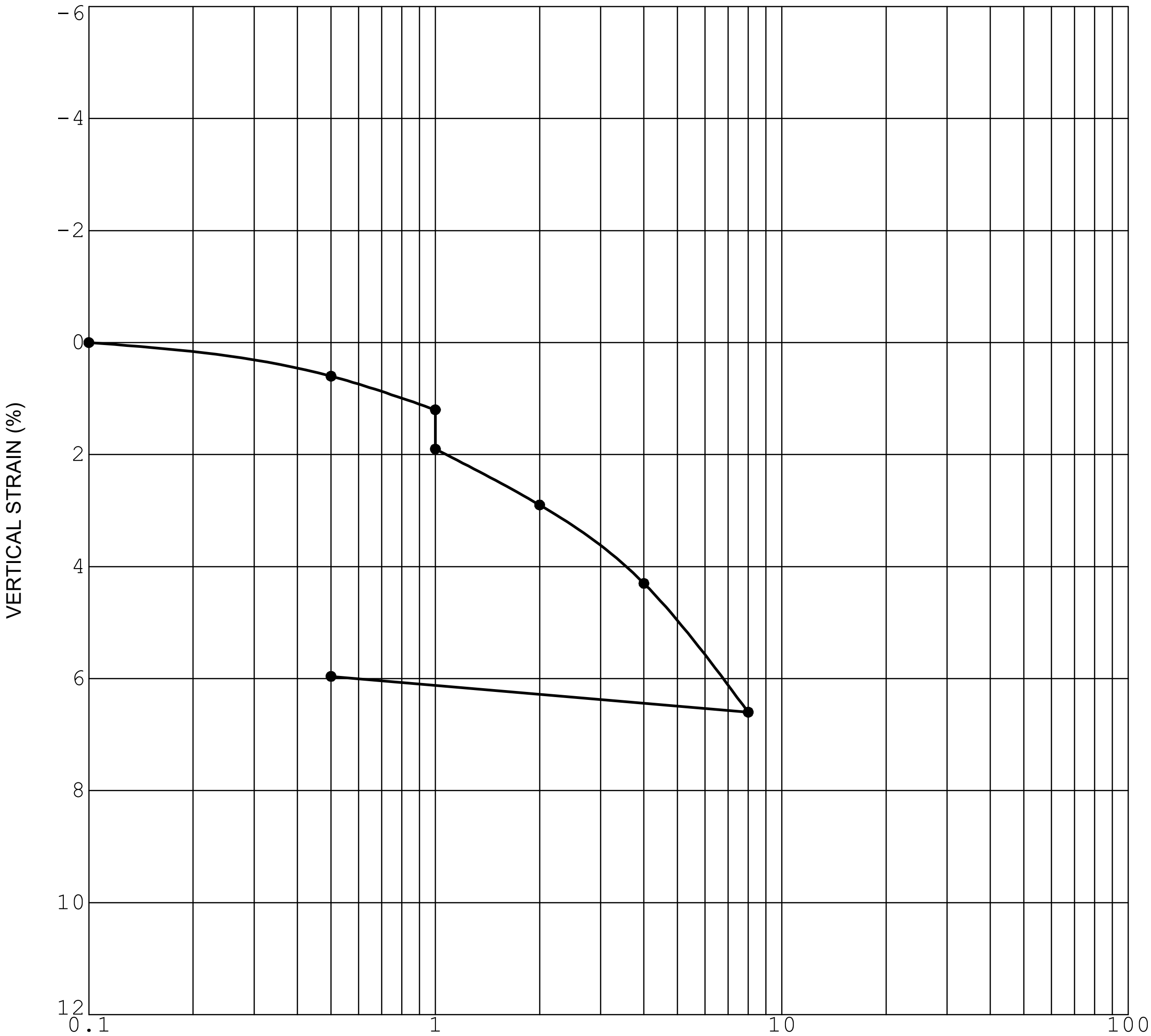
G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

Figure D-23

GEOCON

PROJECT NO. G2322-32-01

SAMPLE NO. B6-1



ASTM D2435

Initial Dry Density (pcf)	103.5
Initial Water Content (%)	3.8

Initial Saturation (%)	16.9
Sample Saturated at (ksf)	1.0

CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

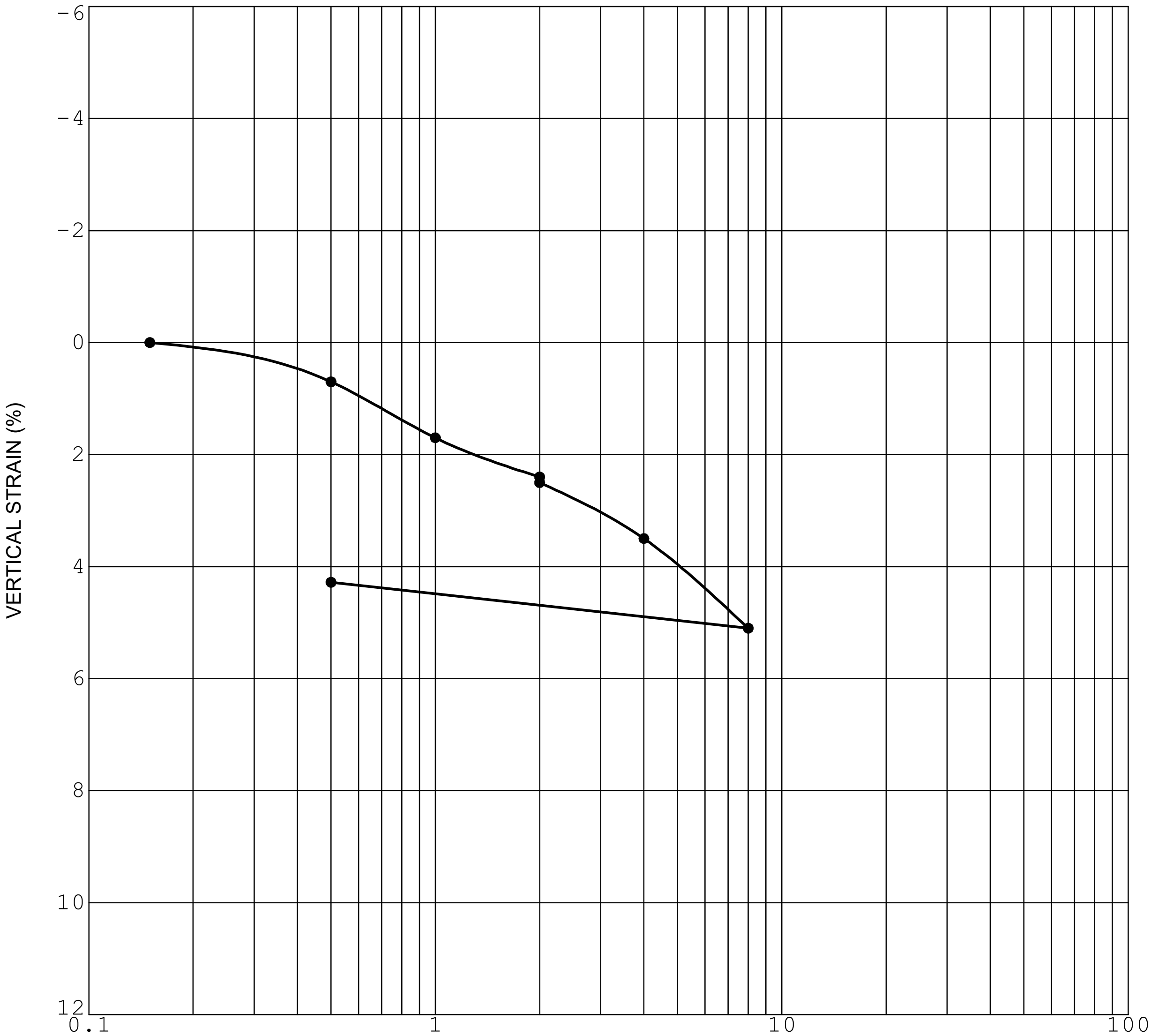
G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

Figure D-24

GEOCON

PROJECT NO. G2322-32-01

SAMPLE NO. B6-3



ASTM D2435

Initial Dry Density (pcf)	99.2
Initial Water Content (%)	4.7

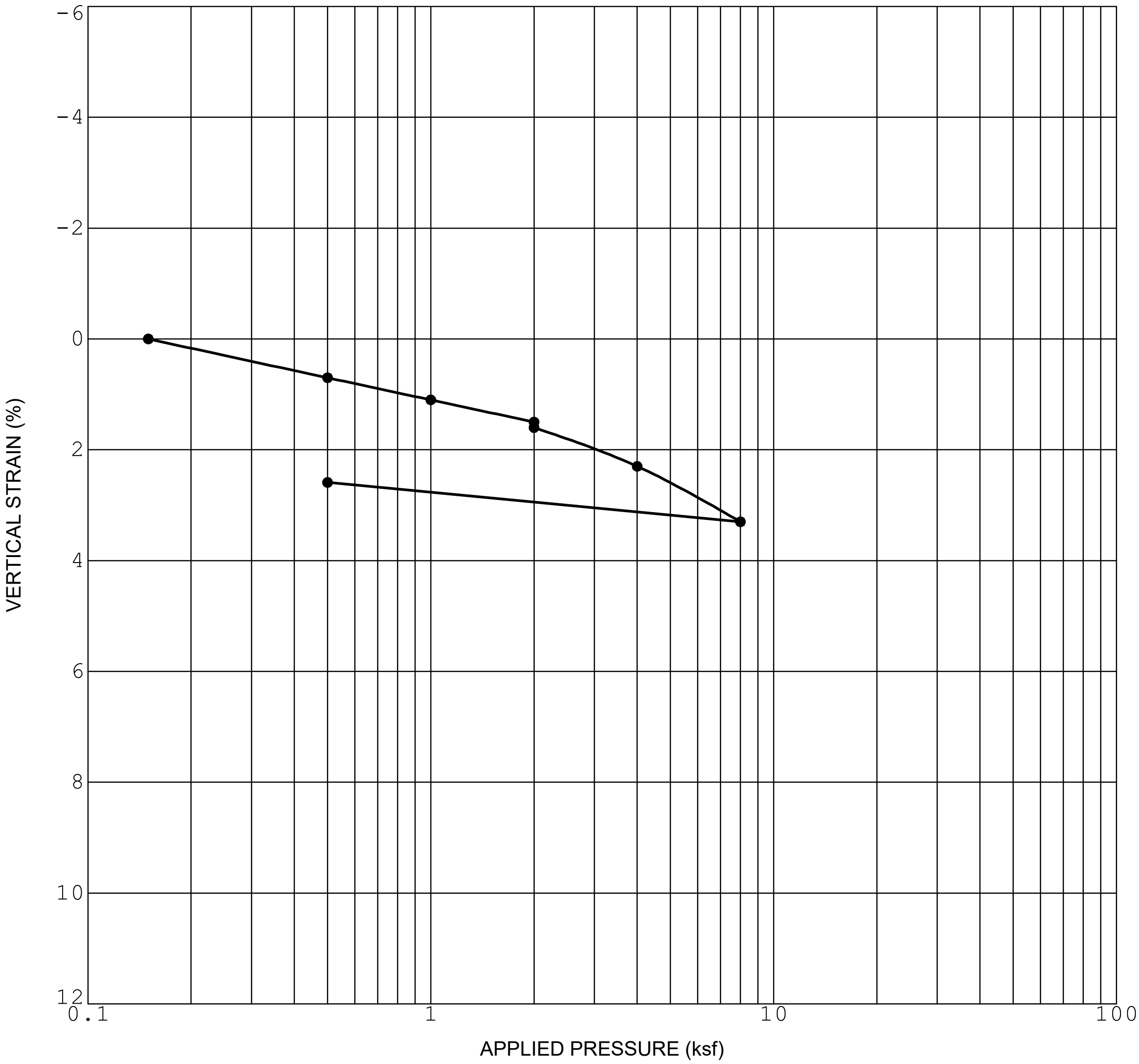
Initial Saturation (%)	18.5
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

SAMPLE NO. B6-4



ASTM D2435

Initial Dry Density (pcf)	104.6
Initial Water Content (%)	20.1

Initial Saturation (%)	91.2
Sample Saturated at (ksf)	2.0

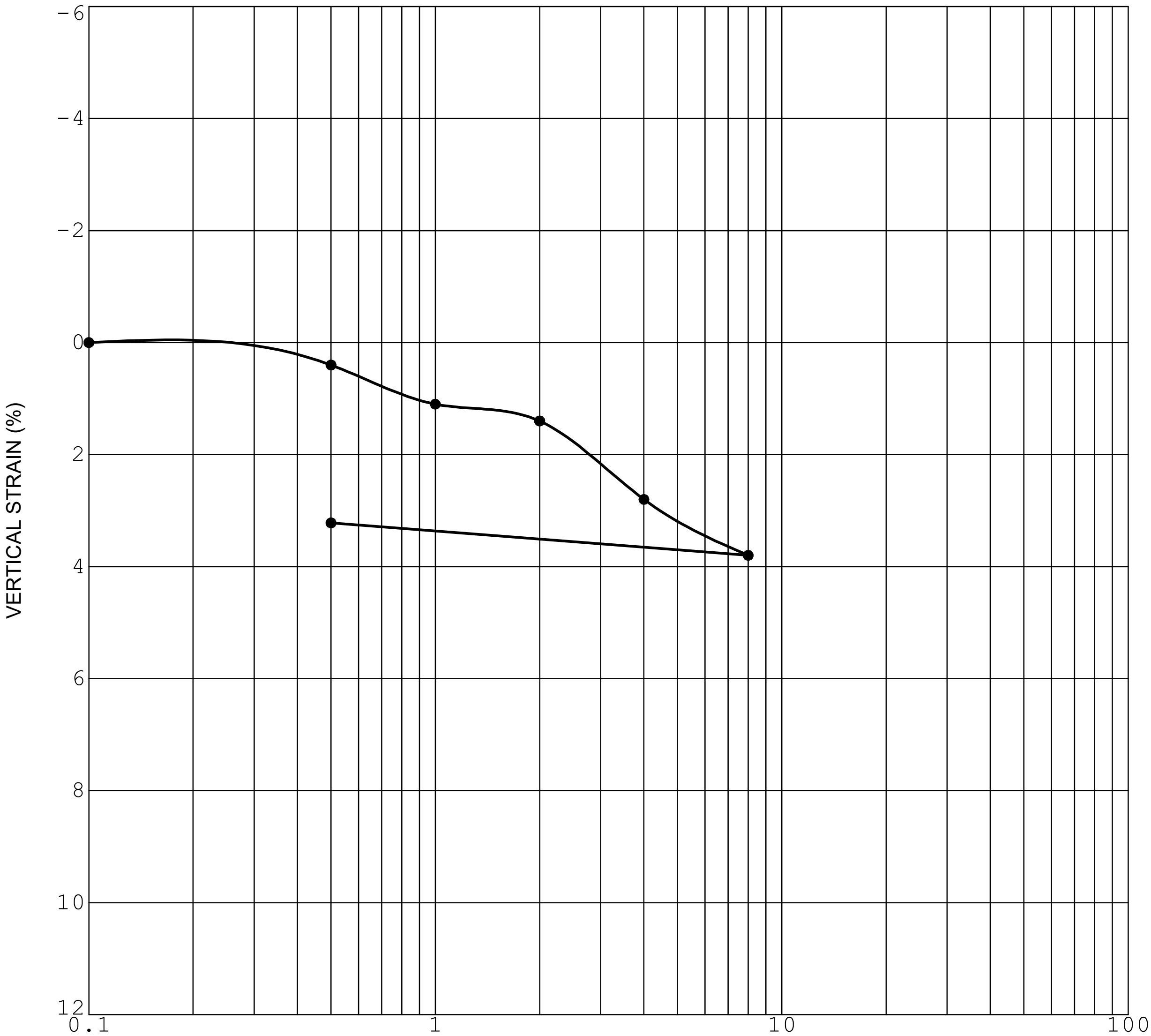
CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

SAMPLE NO. B6-7



ASTM D2435

Initial Dry Density (pcf)	102.7
Initial Water Content (%)	24.6

Initial Saturation (%)	100+
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

ZEPHYR - OCEANSIDE

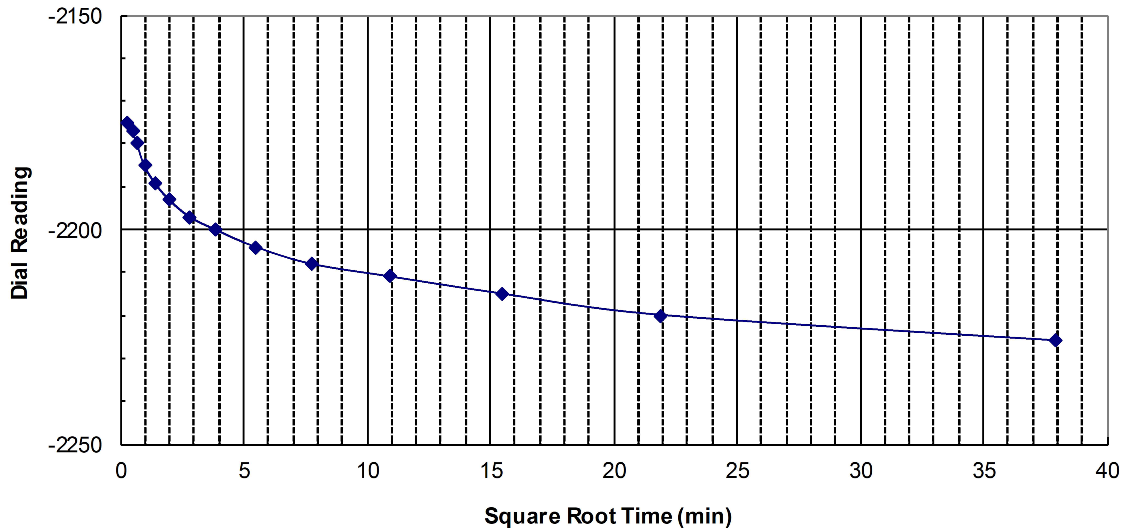
OCEANSIDE, CALIFORNIA

G2322-32-01 (FROM2018_FORAPPENDIX-C).GPJ

Figure D-27

GEOCON

Sample B1-5 (TR 8000)



TIME RATE CONSOLIDATION CURVE

GEOCON INCORPORATED
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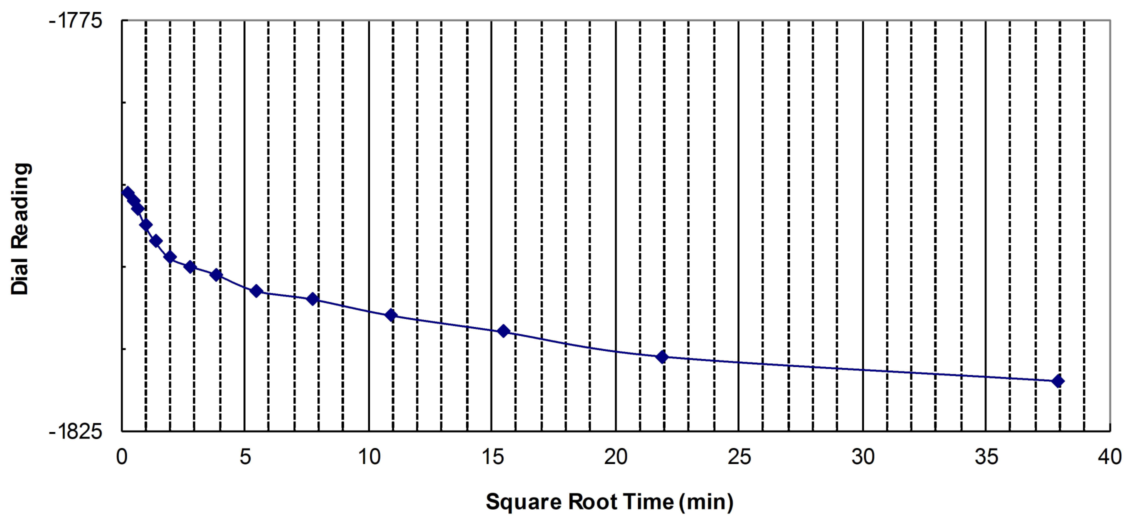
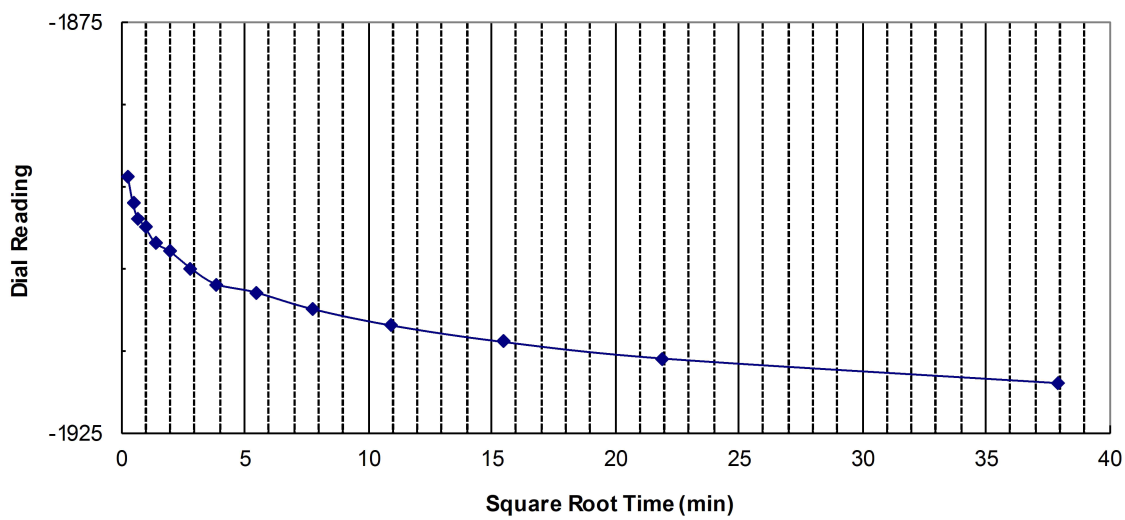
ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. D-28

Sample B2-6 (TR 4000)



Sample B2-6 (TR 8000)



TIME RATE CONSOLIDATION CURVE

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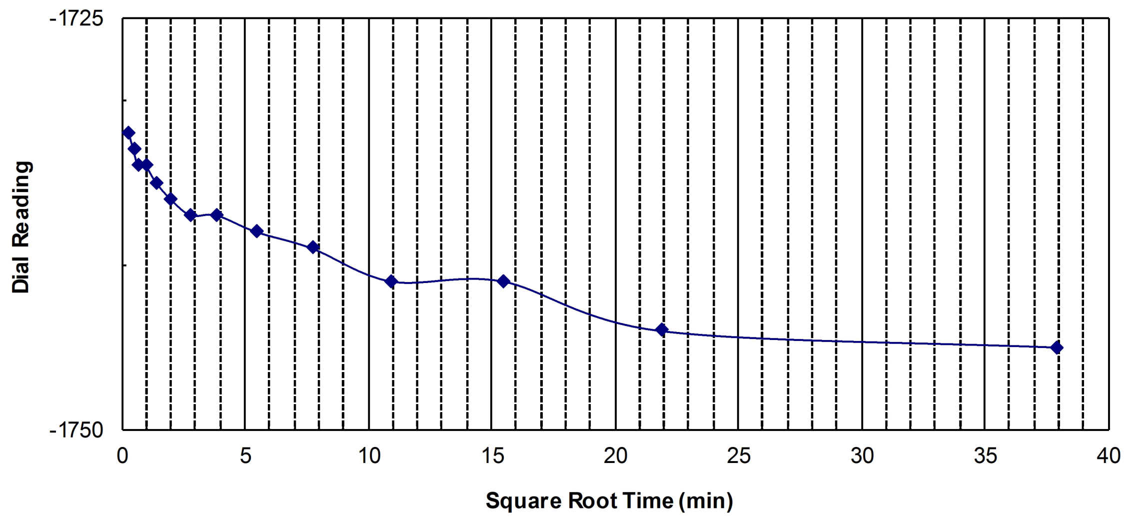
ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

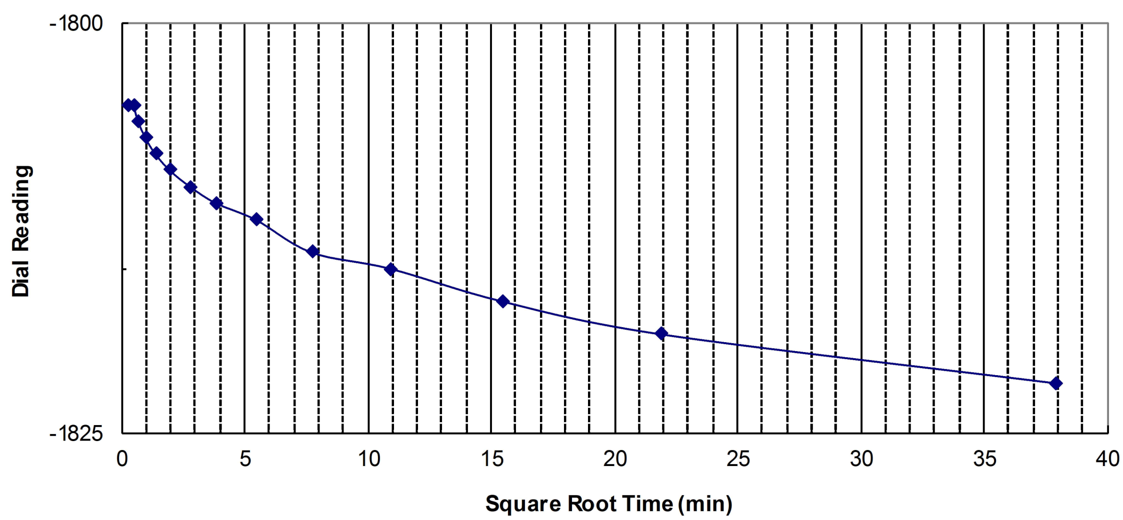
TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. D-29

Plotted:08/13/2019 8:34AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2322-32-01 (Zephyr)\Time Rate Consolidation Curves\G2322-32-01 TimeRateConsolCurves_2018.dwg

Sample B3-3 (TR 4000)



Sample B3-3 (TR 8000)



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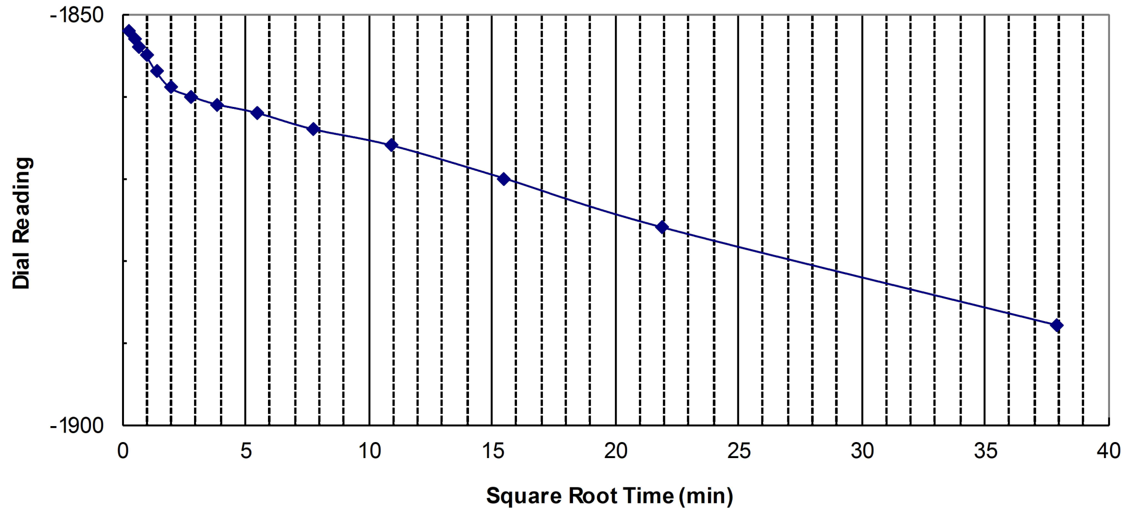
ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

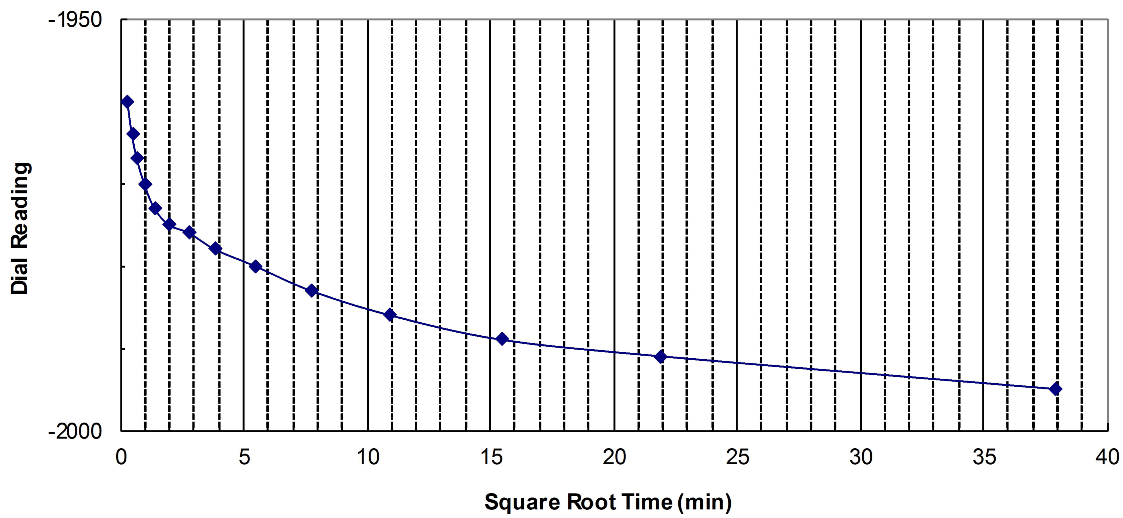
TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. D-30

Plotted:08/13/2019 8:34AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2322-32-01 (Zephyr)\Time Rate Consolidation Curves\G2322-32-01 TimeRateConsolCurves_2018.dwg

Sample B4-5 (TR 4000)



Sample B4-5 (TR 8000)



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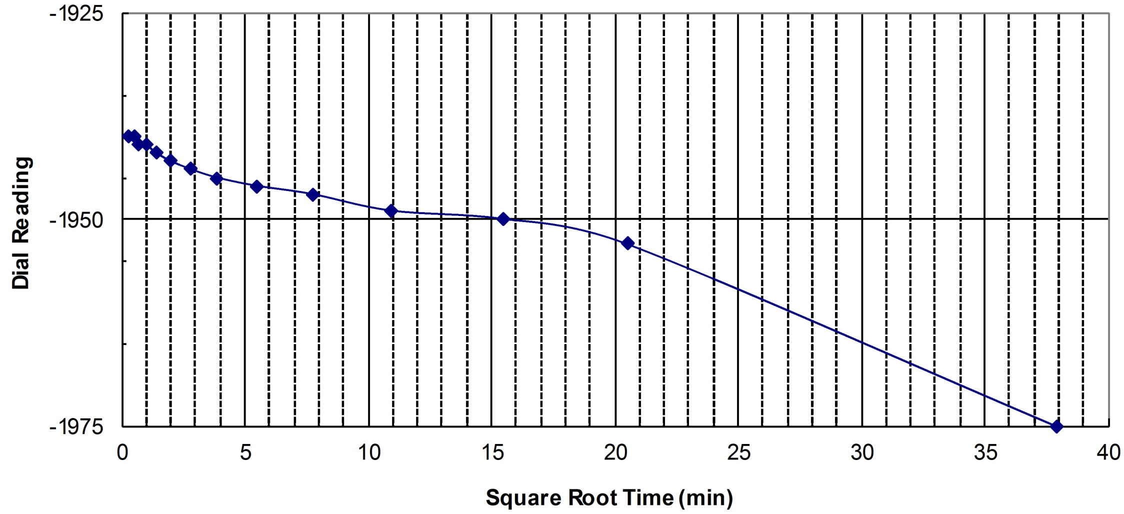
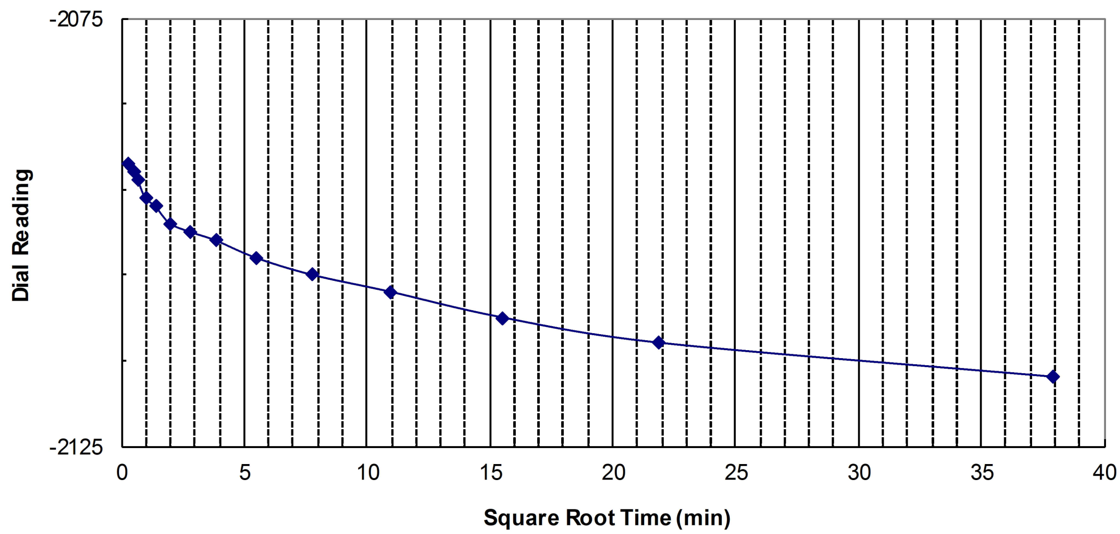
ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. D-31

Sample B5-6 (TR 4000)



Sample B5-6 (TR 8000)



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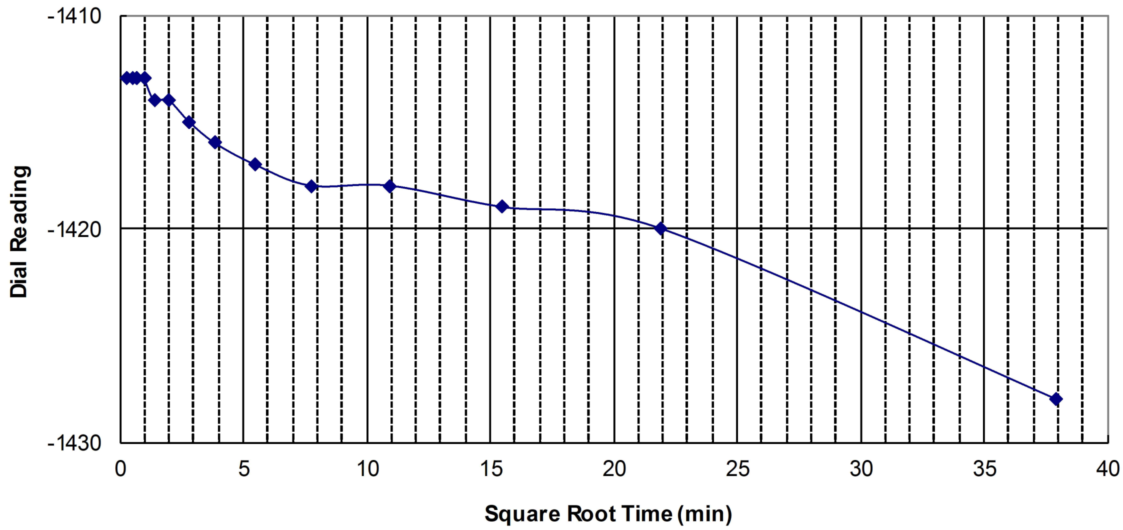
ZEPHYR - OCEANSIDE

OCEANSIDE, CALIFORNIA

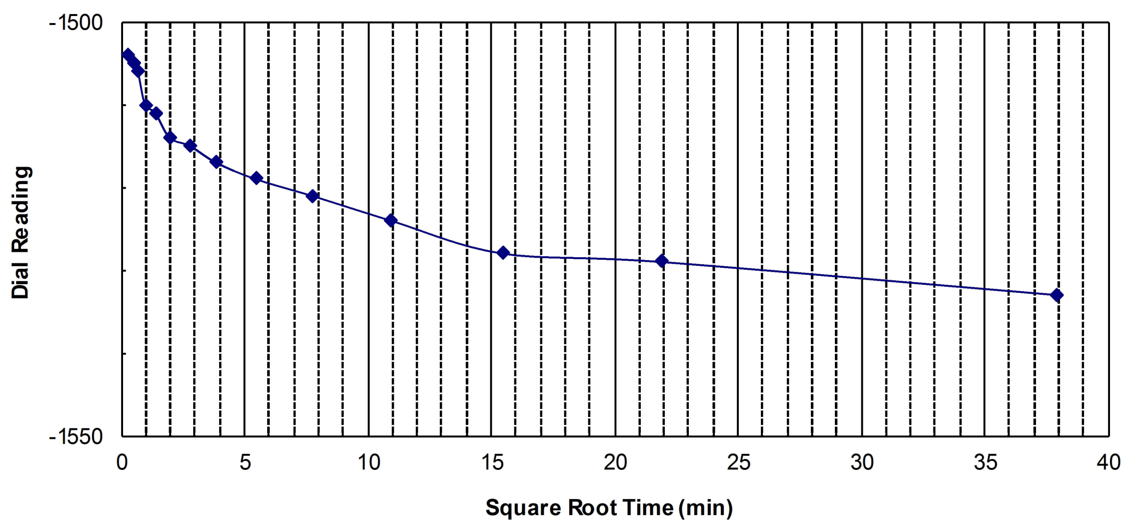
TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. D-32

Plotted:08/13/2019 8:35AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2322-32-01 (Zephyr)\Time Rate Consolidation Curves\G2322-32-01 TimeRateConsolCurves_2018.dwg

Sample B6-7 (TR 4000)



Sample B6-7 (TR 8000)



TIME RATE CONSOLIDATION CURVE

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ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

TM / RA		DSK/GTYPD	DATE 08 - 13 - 2019	PROJECT NO. G2322 - 32 - 01	FIG. D-33

APPENDIX E

APPENDIX E

LIQUEFACTION ANALYSIS (SPT – 2019)

FOR

ZEPHYR – OCEANSIDE
OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

GEOCON

Hammer Energy Correction Factors

Reference: Youd, et al, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Environmental Engineering, October, 2001, Vol. 127, No. 10

Project Name: Zephyr OC　　Date: 7/18/2019

Project Number: G2322-32-01

Hole Diameter, Inches:	8		Hole Diameter Correction, C_B: 1.15
Average Unit Weight, γ (pcf):	120		
Adjustment Factor for 350 LB Hammer Above Groundwater	1.00	<-- Enter 1.0 if an adjustment is not required; Applied to "MC" Samples	
Adjustment Factor for 350 LB Hammer Below Groundwater	1.00	<-- Enter 1.0 if an adjustment is not required; Applied to "MC" Samples	
Approximate Depth to Groundwater in Boring B-2	25		
Approximate Depth to Groundwater in Boring B-3	3	*Auto, Cathead, or Downhole Hammer	
Approximate Depth to Groundwater in Boring B-4	3		

Adjust for each GWT Level　　Energy Correction, C_E (1.0 Safe-T-Driver/Cathead, 1.3 Automatic)

Sample	Depth, Feet	Field Blow Count (per Foot)	Type of Sampler (MC or SPT)	Hammer Type* (A/C/D)	Equiv. SPT Blow Count, N	σ'_v, psf	Overburden Pressure Correction, C_N	Energy Ratio Correction, C_E	Rod Length Correction, C_R	Sampling Correction, C_S	N1|60 Blowcounts (Prior to Fines)
B1-1	2.5	42	MC	A	28.0	300.0	1.70	1.3	0.75	1.00	53
B1-2	5.0	36	MC	A	24.0	600.0	1.70	1.3	0.75	1.00	46
B1-4	7.5	41	MC	A	27.3	900.0	1.49	1.3	0.80	1.00	49
B1-5	10.0	55	MC	A	36.7	1200.0	1.29	1.3	0.80	1.00	57
B1-6	11.0	19	SPT	A	19.0	1320.0	1.23	1.3	0.85	1.10	33
B1-7	12.5	35	MC	A	23.3	1500.0	1.15	1.3	0.85	1.00	34
B1-8	13.5	30	SPT	A	30.0	1620.0	1.11	1.3	0.85	1.10	47
B1-9	15.0	32	MC	A	21.3	1800.0	1.05	1.3	0.85	1.00	29
B1-10	16.0	45	SPT	A	45.0	1920.0	1.02	1.3	0.85	1.10	64
B1-11	17.5	31	MC	A	20.7	2100.0	0.98	1.3	0.95	1.00	29
B1-12	20.0	51	MC	A	34.0	2400.0	0.91	1.3	0.95	1.00	44
B1-13	25.0	15	SPT	A	15.0	3000.0	0.82	1.3	0.95	1.10	19
B1-15	30.0	20	SPT	A	20.0	3288.0	0.78	1.3	1.00	1.10	26
B1-16	35.0	35	MC	A	23.3	3576.0	0.75	1.3	1.00	1.00	26
B1-17	40.0	16	SPT	A	16.0	3864.0	0.72	1.3	1.00	1.10	19
B1-18	45.0	9	MC	A	6.0	4152.0	0.69	1.3	1.00	1.00	6
B1-19	50.0	12	SPT	A	12.0	4440.0	0.67	1.3	1.00	1.10	13
B1-20	60.0	24	MC	A	16.0	5016.0	0.63	1.3	1.00	1.00	15
B1-21	65.0	17	SPT	A	17.0	5304.0	0.61	1.3	1.00	1.10	17
B1-22	70.0	26	MC	A	17.3	5592.0	0.60	1.3	1.00	1.00	15
B1-23	75.0	14	SPT	A	14.0	5880.0	0.58	1.3	1.00	1.10	13
B1-24	80.0	34	MC	A	22.7	6168.0	0.57	1.3	1.00	1.00	19
B1-25	85.0	22	SPT	A	22.0	6456.0	0.56	1.3	1.00	1.10	20
B1-26	90.0	82	MC	A	54.7	6744.0	0.54	1.3	1.00	1.00	45
B1-27	100.0	52	MC	A	34.7	7320.0	0.52	1.3	1.00	1.00	27

GEOCON

Hammer Energy Correction Factors

Reference: Youd, et al, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Environmental Engineering, October, 2001, Vol. 127, No. 10

Project Name: Zephyr OC   Date: 7/18/2019

Project Number: G2322-32-01

Hole Diameter, Inches: 8   Hole Diameter Correction, C_B: 1.15

Average Unit Weight, γ (pcf): 120

Adjustment Factor for 350 LB Hammer Above Groundwater 1.00 <-- Enter 1.0 if an adjustment is not required; Applied to "MC" Samples

Adjustment Factor for 350 LB Hammer Below Groundwater 1.00 <-- Enter 1.0 if an adjustment is not required; Applied to "MC" Samples

Approximate Depth to Groundwater in Boring B-2: 29

Approximate Depth to Groundwater in Boring B-3: 3   *Auto, Cathead, or Downhole Hammer

Approximate Depth to Groundwater in Boring B-4: 3

					Adjust for each GWT Level			Energy Correction, C_E (1.0 Safe-T-Driver/Cathead, 1.3 Automatic)			
Sample	Depth, Feet	Field Blow Count (per Foot)	Type of Sampler (MC or SPT)	Hammer Type* (A/C/D)	Equiv. SPT Blow Count, N	σ'_v, psf	Overburden Pressure Correction, C_N	Energy Ratio Correction, C_E	Rod Length Correction, C_R	Sampling Correction, C_S	N1|60 Blowcounts (Prior to Fines)
B2-1	2.5	43	MC	A	28.7	300.0	1.70	1.3	0.75	1.00	54.64
B2-3	5.0	47	MC	A	31.3	600.0	1.70	1.3	0.75	1.00	59.73
B2-4	7.5	50	MC	A	33.3	900.0	1.49	1.3	0.80	1.00	59.43
B2-5	10.0	56	SPT	A	56.0	1200.0	1.29	1.3	0.80	1.10	95.11
B2-6	11.5	65	MC	A	43.3	1380.0	1.20	1.3	0.85	1.00	66.29
B2-7	12.5	43	MC	A	28.7	1500.0	1.15	1.3	0.85	1.00	42.06
B2-8	13.5	30	SPT	A	30.0	1620.0	1.11	1.3	0.85	1.10	46.59
B2-9	15.0	69	MC	A	46.0	1800.0	1.05	1.3	0.85	1.00	61.62
B2-10	16.5	35	SPT	A	35.0	1980.0	1.01	1.3	0.85	1.10	49.17
B2-11	20.0	11	SPT	A	11.0	2400.0	0.91	1.3	0.95	1.10	15.69
B2-13	25.0	13	MC	A	8.7	3000.0	0.82	1.3	0.95	1.00	10.05
B2-14	30.0	23	MC	A	15.3	3537.6	0.75	1.3	1.00	1.00	17.24
B2-15	35.0	21	SPT	A	21.0	3825.6	0.72	1.3	1.00	1.10	24.97
B2-16	40.0	6	MC	A	4.0	4113.6	0.70	1.3	1.00	1.00	4.17
B2-17	45.0	9	SPT	A	9.0	4401.6	0.67	1.3	1.00	1.10	9.98
B2-18	50.0	11	MC	A	7.3	4689.6	0.65	1.3	1.00	1.00	7.16
B2-19	55.0	14	SPT	A	14.0	4977.6	0.63	1.3	1.00	1.10	14.59
B2-20	60.0	23	MC	A	15.3	5265.6	0.62	1.3	1.00	1.00	14.13
B2-21	65.0	14	SPT	A	14.0	5553.6	0.60	1.3	1.00	1.10	13.82
B2-22	70.0	10	MC	A	6.7	5841.6	0.59	1.3	1.00	1.00	5.83
B2-23	75.0	27	SPT	A	27.0	6129.6	0.57	1.3	1.00	1.10	25.36
B2-24	80.0	35	MC	A	23.3	6417.6	0.56	1.3	1.00	1.00	19.47
B2-25	85.0	27	SPT	A	27.0	6705.6	0.55	1.3	1.00	1.10	24.25
B2-26	90.0	42	MC	A	28.0	6993.6	0.53	1.3	1.00	1.00	22.39
B2-27	95.0	24	SPT	A	24.0	7281.6	0.52	1.3	1.00	1.10	20.68
B2-28	100.0	50	MC	A	33.3	7569.6	0.51	1.3	1.00	1.00	25.62
B2-29	105.0	80	MC	A	53.3	7857.6	0.50	1.3	1.00	1.00	40.23
B2-30	115.0	67	MC	A	44.7	8433.6	0.49	1.3	1.00	1.00	32.52
B2-31	125.0	72	MC	A	48.0	9009.6	0.47	1.3	1.00	1.00	33.81
B2-32	135.0	86	MC	A	57.3	9585.6	0.46	1.3	1.00	1.00	39.15
B2-33	145.0	20	SPT	A	20.0	10161.6	0.44	1.3	1.00	1.10	14.59

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Hammer Energy Correction Factors

Reference: Youd, et al, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Environmental Engineering, October, 2001, Vol. 127, No. 10

Project Name: Zephyr OC   Date: 7/18/2019

Project Number: G2322-32-01

Hole Diameter, Inches: 8   Hole Diameter Correction, C_B: 1.15

Average Unit Weight, γ (pcf): 120

Adjustment Factor for 350 LB Hammer Above Groundwater 1.00 <-- Enter 1.0 if an adjustment is not required; Applied to "MC" Samples

Adjustment Factor for 350 LB Hammer Below Groundwater 1.00 <-- Enter 1.0 if an adjustment is not required; Applied to "MC" Samples

Approximate Depth to Groundwater in Boring B-2 30

Approximate Depth to Groundwater in Boring B-3 3   *Auto, Cathead, or Downhole Hammer

Approximate Depth to Groundwater in Boring B-4 3

					Adjust for each GWT Level			Energy Correction, C_E (1.0 Safe-T-Driver/Cathead, 1.3 Automatic)			
Sample	Depth, Feet	Field Blow Count (per Foot)	Type of Sampler (MC or SPT)	Hammer Type* (A/C/D)	Equiv. SPT Blow Count, N	σ'_v, psf	Overburden Pressure Correction, C_N	Energy Ratio Correction, C_E	Rod Length Correction, C_R	Sampling Correction, C_S	N1|60 Blowcounts (Prior to Fines)
B3-1	2.5	25	MC	A	16.7	300.0	1.70	1.3	0.75	1.00	31.77
B3-3	5.0	31	SPT	A	31.0	600.0	1.70	1.3	0.75	1.10	65.00
B3-4	7.5	90	MC	A	60.0	900.0	1.49	1.3	0.80	1.00	100.00
B3-5	8.5	56	SPT	A	56.0	1020.0	1.40	1.3	0.80	1.10	100.00
B3-6	10.0	90	MC	A	60.0	1200.0	1.29	1.3	0.80	1.00	92.64
B3-7	11.0	48	SPT	A	48.0	1320.0	1.23	1.3	0.85	1.10	82.59
B3-8	12.5	66	MC	A	44.0	1500.0	1.15	1.3	0.85	1.00	64.56
B3-9	13.5	55	SPT	A	55.0	1620.0	1.11	1.3	0.85	1.10	85.42
B3-10	15.0	95	MC	A	63.3	1800.0	1.05	1.3	0.85	1.00	84.83
B3-12	20.0	11	SPT	A	11.0	2400.0	0.91	1.3	0.95	1.10	15.69
B3-13	25.0	21	MC	A	14.0	3000.0	0.82	1.3	0.95	1.00	16.23
B3-14	30.0	36	MC	A	24.0	3600.0	0.75	1.3	1.00	1.00	26.74
B3-15	40.0	16	MC	A	10.7	4176.0	0.69	1.3	1.00	1.00	11.04
B3-16	45.0	15	SPT	A	15.0	4464.0	0.67	1.3	1.00	1.10	16.51
B3-17	50.0	35	MC	A	23.3	4752.0	0.65	1.3	1.00	1.00	22.63
B3-18	55.0	26	SPT	A	26.0	5040.0	0.63	1.3	1.00	1.10	26.93
B3-19	60.0	29	MC	A	19.3	5328.0	0.61	1.3	1.00	1.00	17.71
B3-20	65.0	7	SPT	A	7.0	5616.0	0.60	1.3	1.00	1.10	6.87
B3-21	70.0	43	MC	A	28.7	5904.0	0.58	1.3	1.00	1.00	24.94
B3-22	75.0	29	SPT	A	29.0	6192.0	0.57	1.3	1.00	1.10	27.10
B3-23	80.0	46	MC	A	30.7	6480.0	0.56	1.3	1.00	1.00	25.47
B3-24	85.0	22	SPT	A	22.0	6768.0	0.54	1.3	1.00	1.10	19.67
B3-26	100.0	58	MC	A	38.7	7632.0	0.51	1.3	1.00	1.00	29.59

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Liquefaction Analysis Using SPT

References
1. *Youd, et al, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Environmental Engineering, October, 2001, Vol. 127, No. 10*
2. *Seed, et al, Recent Advances in Soil Liquefaction Engineering: A Unified and Consistant Framework, 2003.*

Project Name:	Zephyr Oceanside	Boring:	B-1
Project Number:	G2322-32-01		

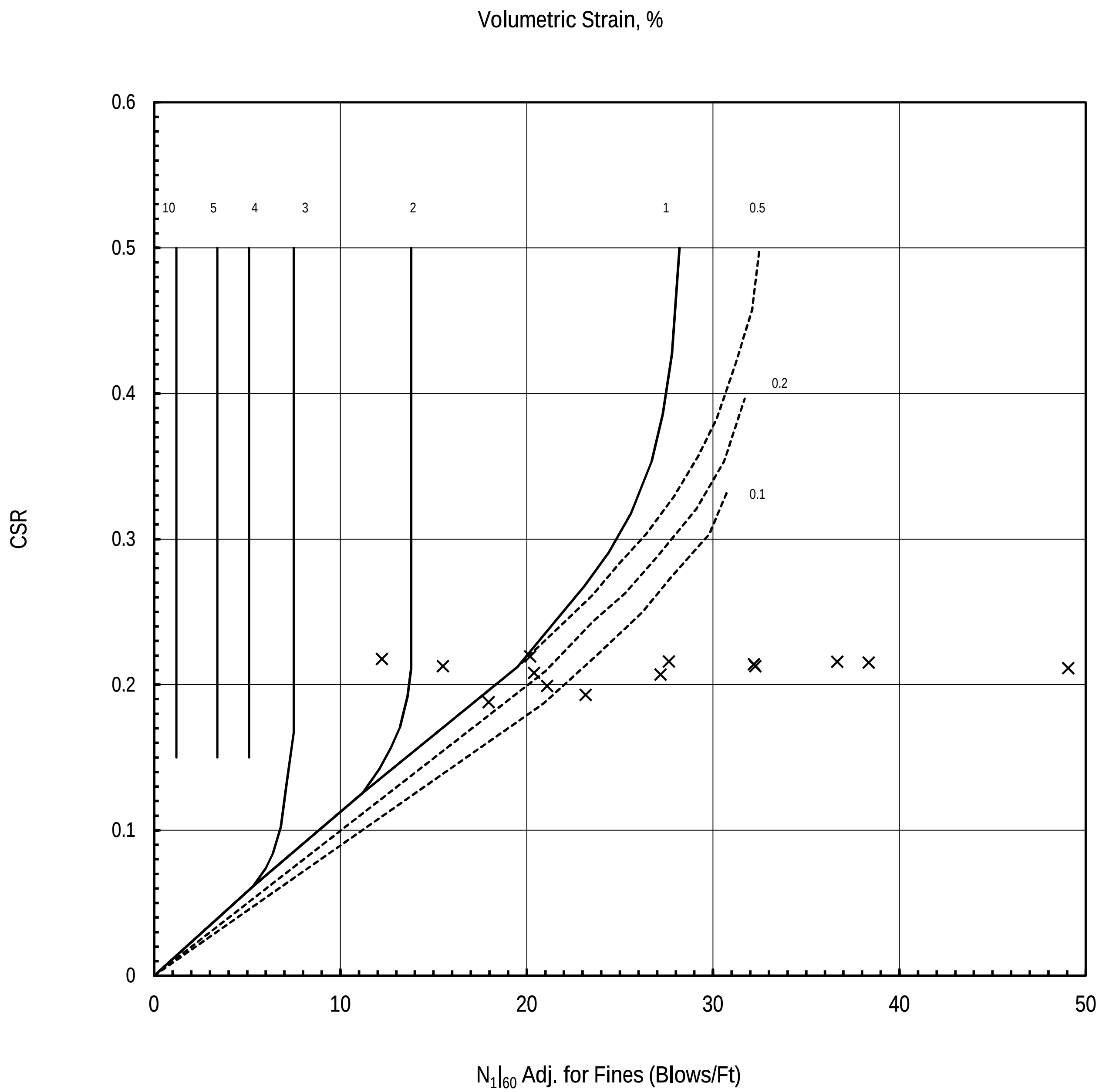
PGAm	0.450	Include Kσ (Y/N)	N
Modal Magnitude	6.72	Use NCEER CRR7.5 (1) or Rauch CRR7.5 (2)	1
Groundwater Depth, Ft	29.0	Minimum Factor of Safety for Liquefaction	1
Reference Pressure, p_a	1000		
Unit Weight of Water	62.4		
Soil Unit Weight, pcf	120		

				Enter for Fine-Grained Materials			Old	New							MWF Idriss(1997) = $(M)^{2.56}/10^{2.24}$				SP117 Graph	
Depth, ft	$N_1\|_{60}$	Fines Content, FC (%)	Water Content, w_C (%)	Liquid Limit	Plastic Limit	Plasticity Index	$N_1\|_{60}$, Adj. for Fines	$N_1\|_{60}$, Adj. for Fines	σ, psf	σ', psf	r_d	K_σ	NCEER $CRR_{7.5}$	RAUCH $CRR_{7.5}$	CSR M=7.5	Fines Liquefiable (Y/N)	Liquefaction Potential	Factor of Safety	Volumetric Strain, %	Settlement, in.
2.5	53	22	6.2			0	62.3	59.2	300.0	300.0	1.00	1.00	0.800	0.800	0.220	Y	Above GWT	3.64	0	0
5.0	46	22	7.9			0	53.9	50.9	600.0	600.0	0.99	1.00	0.800	0.800	0.219	Y	Above GWT	3.66	0	0
7.5	49	22	7.6			0	57.2	54.1	900.0	900.0	0.98	1.00	0.800	0.800	0.217	Y	Above GWT	3.68	0	0
10.0	57	22	6.8			0	65.8	62.7	1200.0	1200.0	0.98	1.00	0.800	0.800	0.216	Y	Above GWT	3.70	0	0
11.0	33	22	6.8			0	39.7	36.7	1320.0	1320.0	0.98	1.00	0.800	0.800	0.216	Y	Above GWT	3.71	0	0
12.5	34	22	9.5			0	41.4	38.4	1500.0	1500.0	0.97	1.00	0.800	0.800	0.215	Y	Above GWT	3.72	0	0
13.5	47	22	9.5			0	54.9	51.8	1620.0	1620.0	0.97	1.00	0.800	0.800	0.215	Y	Above GWT	3.73	0	0
15.0	29	22	7.5			0	35.2	32.2	1800.0	1800.0	0.97	1.00	0.800	0.800	0.214	Y	Above GWT	3.74	0	0
16.0	64	22	7.5			0	74.1	70.9	1920.0	1920.0	0.97	1.00	0.800	0.800	0.213	Y	Above GWT	3.75	0	0
17.5	29	22	17.7			0	35.2	32.3	2100.0	2100.0	0.96	1.00	0.800	0.800	0.213	Y	Above GWT	3.76	0	0
20.0	44	22	11.1			0	52.1	49.1	2400.0	2400.0	0.96	1.00	0.800	0.800	0.211	Y	Above GWT	3.78	0	0
25.0	19	10	20.6			0	20.4	20.4	3000.0	3000.0	0.94	1.00	0.223	0.221	0.208	Y	Above GWT	1.07	0	0
30.0	26	10	20.6			0	27.1	27.2	3600.0	3537.6	0.92	1.00	0.326	0.340	0.207	Y	NL	1.57	0	0
35.0	26	10	30.5			0	27.5	27.6	4200.0	3825.6	0.89	1.00	0.336	0.354	0.216	Y	NL	1.56	0	0
40.0	19	10	30.5			0	20.2	20.2	4800.0	4113.6	0.85	1.00	0.220	0.218	0.219	Y	NL	1.00	0	0
45.0	6	42	30.5			0	12.5	12.2	5400.0	4401.6	0.80	1.00	0.136	0.136	0.218	Y	LIQUEFIABLE	0.63	1.8	1.08
50.0	13	22	30.5			0	18.4	15.5	6000.0	4689.6	0.75	1.00	0.200	0.196	0.213	Y	LIQUEFIABLE	0.94	1.3	0.78
60.0	15	42	30.5			0	23.1	21.1	7200.0	5265.6	0.66	1.00	0.257	0.259	0.199	Y	NL	1.29	0	0
65.0	17	42	30.5			0	25.6	23.2	7800.0	5553.6	0.62	1.00	0.296	0.304	0.193	Y	NL	1.53	0	0
70.0	15	22	23.9			0	20.9	18.0	8400.0	5841.6	0.59	1.00	0.228	0.226	0.188	Y	NL	1.21	0	0

Total Settlement, S_{LIQ} (in.) = 1.86

Total Liquefiable Layers = 20

FIGURE E-1



Boring B-1

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LIQUEFACTION - VOLUMETRIC STRAIN

ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

TEM				PROJECT NO. G2232-32-01	E-2

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Liquefaction Analysis Using SPT

References 1. *Youd, et al, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Environmental Engineering, October, 2001, Vol. 127, No. 10*

2. *Seed, et al, Recent Advances in Soil Liquefaction Engineering: A Unified and Consistant Framework, 2003.*

Project Name:	Zephyr Oceanside	Boring:	B-2
Project Number:	G2322-32-01		

PGAm	0.450	Include Kσ (Y/N)	N
Modal Magnitude	6.72	Use NCEER CRR7.5 (1) or Rauch CRR7.5 (2)	1
Groundwater Depth, Ft	25.0	Minimum Factor of Safety for Liquefaction	1
Reference Pressure, p_a	1000		
Unit Weight of Water	62.4		
Soil Unit Weight, pcf	120		

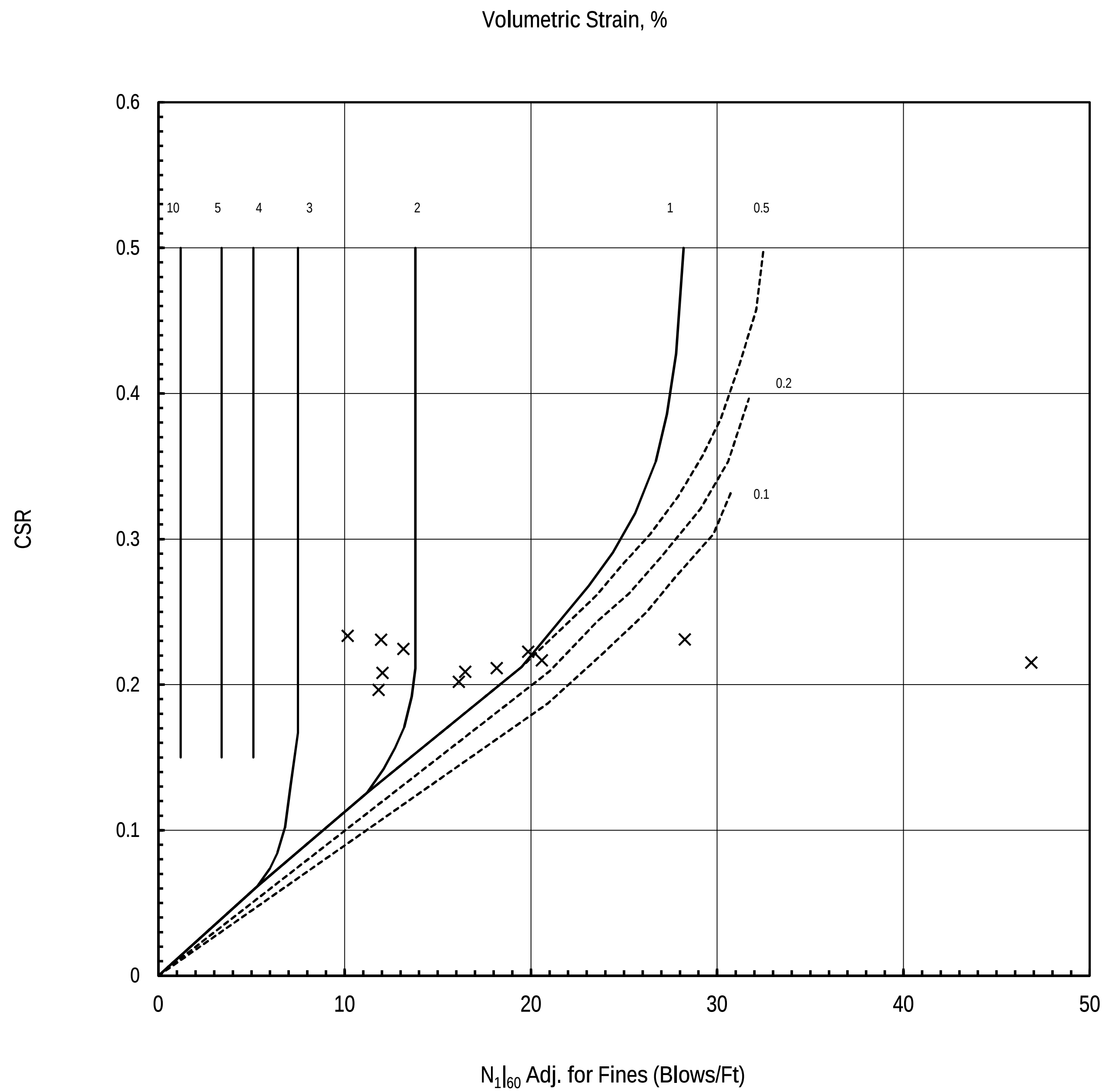
Enter for Fine-Grained Materials; Old; New; MWF Idriss(1997) = $(M)^{2.56}/10^{2.24}$; SP117 Graph

Depth, ft	$N_1\|_{60}$	Fines Content, FC (%)	Water Content, w_C (%)	Liquid Limit	Plastic Limit	Plasticity Index	(Old) $N_1\|_{60}$, Adj. for Fines	(New) $N_1\|_{60}$, Adj. for Fines	σ, psf	σ', psf	r_d	$K_σ$	NCEER $CRR_{7.5}$	RAUCH $CRR_{7.5}$	CSR M=7.5	Fines Liquefiable (Y/N)	Liquefaction Potential	Factor of Safety	Volumetric Strain, %	Settlement, in.
2.5	55	22	3.8			0	63.7	60.6	300.0	300.0	1.00	1.00	0.800	0.800	0.220	Y	Above GWT	3.64	0	0
5.0	60	22	3.2			0	69.2	66.1	600.0	600.0	0.99	1.00	0.800	0.800	0.219	Y	Above GWT	3.66	0	0
7.5	59	22	4.1			0	68.9	65.8	900.0	900.0	0.98	1.00	0.800	0.800	0.217	Y	Above GWT	3.68	0	0
10.0	95	22	4.1			0	107.9	104.6	1200.0	1200.0	0.98	1.00	0.800	0.800	0.216	Y	Above GWT	3.70	0	0
11.5	66	22	7.0			0	76.4	73.2	1380.0	1380.0	0.98	1.00	0.800	0.800	0.216	Y	Above GWT	3.71	0	0
12.5	42	22	6.9			0	49.9	46.9	1500.0	1500.0	0.97	1.00	0.800	0.800	0.215	Y	Above GWT	3.72	0	0
13.5	47	22	6.9			0	54.9	51.8	1620.0	1620.0	0.97	1.00	0.800	0.800	0.215	Y	Above GWT	3.73	0	0
15.0	62	22	6.3			0	71.3	68.1	1800.0	1800.0	0.97	1.00	0.800	0.800	0.214	Y	Above GWT	3.74	0	0
16.5	49	22	6.3			0	57.7	54.6	1980.0	1980.0	0.97	1.00	0.800	0.800	0.213	Y	Above GWT	3.75	0	0
20.0	16	22	10.0			0	21.1	18.2	2400.0	2400.0	0.96	1.00	0.231	0.229	0.211	Y	Above GWT	1.09	0	0
25.0	10	22	14.9			0	14.9	12.0	3000.0	3000.0	0.94	1.00	0.163	0.159	0.208	Y	LIQUEFIABLE	0.78	2	1.2
30.0	17	22	23.5			0	22.8	19.9	3600.0	3288.0	0.92	1.00	0.252	0.253	0.223	Y	NL	1.13	0	0
35.0	25	22	23.5			0	31.2	28.3	4200.0	3576.0	0.89	1.00	0.800	0.800	0.231	Y	NL	3.46	0	0
40.0	4	42	43.8	43	31	12	10.0	10.2	4800.0	3864.0	0.85	1.00	0.110	0.113	0.233	Y	LIQUEFIABLE	0.47	2.5	1.5
45.0	10	22	43.8			0	14.8	12.0	5400.0	4152.0	0.80	1.00	0.162	0.158	0.231	Y	LIQUEFIABLE	0.70	2.2	1.32
50.0	7	42	36.5	43	31	12	13.6	13.2	6000.0	4440.0	0.75	1.00	0.148	0.146	0.225	Y	LIQUEFIABLE	0.66	1.8	1.08
55.0	15	42	36.5	43	31	12	22.5	20.6	6600.0	4728.0	0.70	1.00	0.249	0.249	0.217	Y	NL	1.15	0	0
60.0	14	22	29.3			0	19.4	16.5	7200.0	5016.0	0.66	1.00	0.211	0.208	0.209	Y	NL	1.01	0	0
65.0	14	22	29.3			0	19.0	16.1	7800.0	5304.0	0.62	1.00	0.207	0.204	0.202	Y	NL	1.02	0	0
70.0	6	42	39.3	43	31	12	12.0	11.8	8400.0	5592.0	0.59	1.00	0.131	0.131	0.196	Y	LIQUEFIABLE	0.67	0	0

Total Settlement, S_{LIQ} (in.) = 5.1

Total Liquefiable Layers = 20

FIGURE E-3



Boring B-2

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LIQUEFACTION - VOLUMETRIC STRAIN

ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

TEM		

	PROJECT NO. G2232-32-01	E-4

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Liquefaction Analysis Using SPT

References
1. *Youd, et al, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Geoenvironmental Engineering, October, 2001, Vol. 127, No. 10*
2. *Seed, et al, Recent Advances in Soil Liquefaction Engineering: A Unified and Consistant Framework, 2003.*

Project Name: Zephyr Oceanside Boring: B-3
Project Number: G2322-32-01

PGAm	0.450
Modal Magnitude	6.72
Groundwater Depth, Ft	29.0
Reference Pressure, p_a	1000
Unit Weight of Water	62.4
Soil Unit Weight, pcf	120

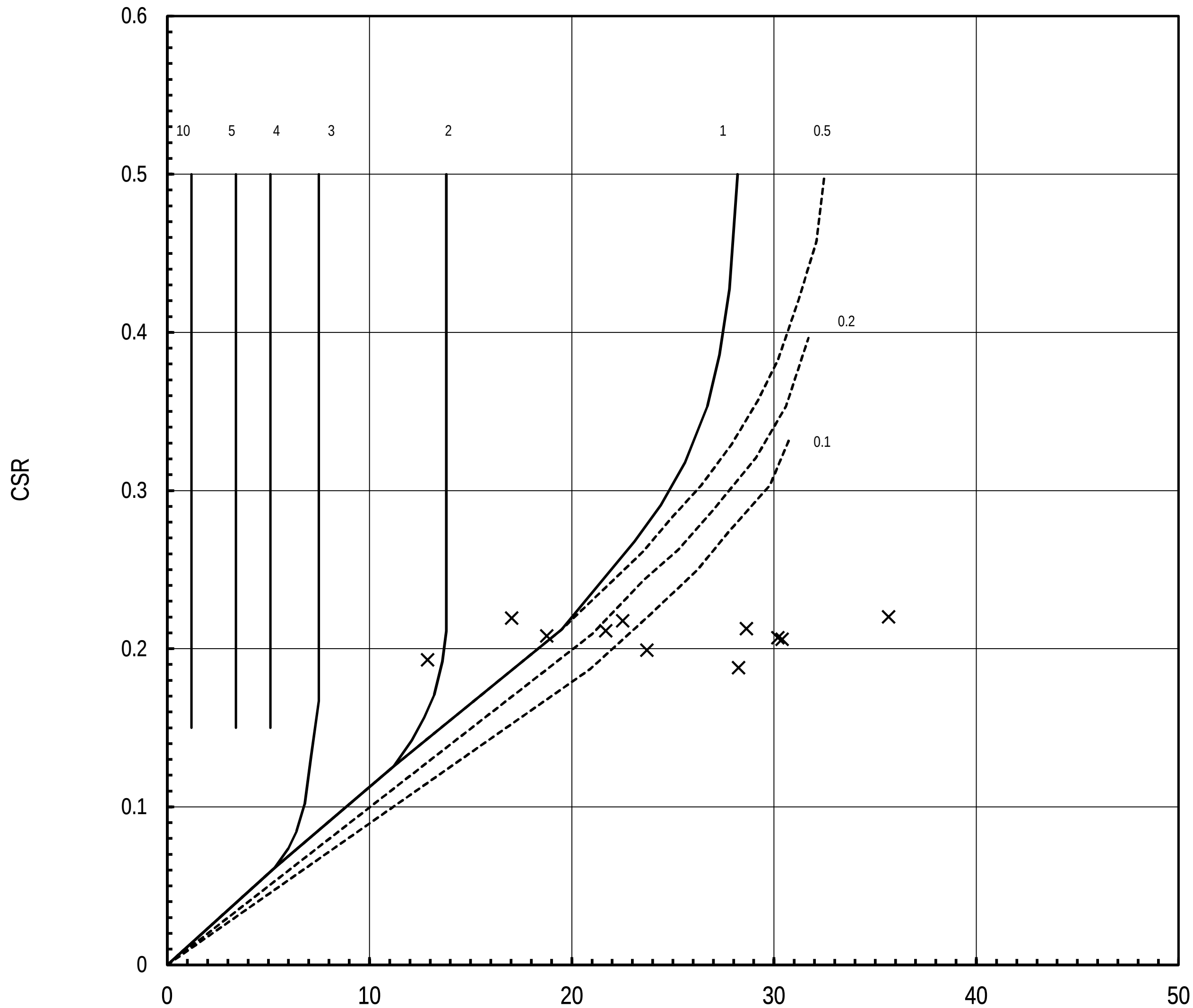
Include Kσ (Y/N)	N
Use NCEER CRR7.5 (1) or Rauch CRR7.5 (2)	1
Minimum Factor of Safety for Liquefaction	1

			Enter for Fine-Grained Materials				Old	New							MWF Idriss(1997) = $(M)^{2.56}/10^{2.24}$					SP117 Graph	
Depth, ft	$N_1\|_{60}$	Fines Content, FC (%)	Water Content, w_C (%)	Liquid Limit	Plastic Limit	Plasticity Index	$N_1\|_{60}$, Adj. for Fines	$N_1\|_{60}$, Adj. for Fines	σ, psf	σ', psf	r_d	K_σ	NCEER $CRR_{7.5}$	RAUCH $CRR_{7.5}$	CSR M=7.5	Fines Liquefiable (Y/N)	Liquefaction Potential	Factor of Safety	Volumetric Strain, %	Settlement, in.
2.5	32	22	23.0			0	38.7	35.7	300.0	300.0	1.00	1.00	0.800	0.800	0.220	Y	Above GWT	3.636	0	0
5.0	65	22	7.1			0	75.0	71.8	600.0	600.0	0.99	1.00	0.800	0.800	0.219	Y	Above GWT	3.657	0	0
7.5	100	22	7.1			0	113.2	109.9	900.0	900.0	0.98	1.00	0.800	0.800	0.217	Y	Above GWT	3.678	0	0
8.5	100	22	5.1			0	113.2	109.9	1020.0	1020.0	0.98	1.00	0.800	0.800	0.217	Y	Above GWT	3.687	0	0
10.0	93	22	5.1			0	105.2	101.9	1200.0	1200.0	0.98	1.00	0.800	0.800	0.216	Y	Above GWT	3.699	0	0
11.0	83	22	5.1			0	94.2	91.0	1320.0	1320.0	0.98	1.00	0.800	0.800	0.216	Y	Above GWT	3.707	0	0
12.5	65	22	10.8			0	74.5	71.3	1500.0	1500.0	0.97	1.00	0.800	0.800	0.215	Y	Above GWT	3.719	0	0
13.5	85	22	6.1			0	97.3	94.0	1620.0	1620.0	0.97	1.00	0.800	0.800	0.215	Y	Above GWT	3.727	0	0
15.0	85	22	6.1			0	96.7	93.4	1800.0	1800.0	0.97	1.00	0.800	0.800	0.214	Y	Above GWT	3.739	0	0
20.0	16	42	6.1	43	31	12	23.8	21.7	2400.0	2400.0	0.96	1.00	0.267	0.270	0.211	Y	Above GWT	1.263	0	0
25.0	16	22	4.0			0	21.7	18.8	3000.0	3000.0	0.94	1.00	0.238	0.237	0.208	Y	Above GWT	1.143	0	0
30.0	27	22	17.4			0	33.2	30.2	3600.0	3537.6	0.92	1.00	0.800	0.800	0.207	Y	NL	3.866	0	0
40.0	11	42	32.8	43	31	12	18.2	17.0	4800.0	4113.6	0.85	1.00	0.198	0.195	0.219	Y	LIQUEFIABLE	0.904	1.4	1.68
45.0	17	42	32.8	43	31	12	24.8	22.5	5400.0	4401.6	0.80	1.00	0.282	0.288	0.218	Y	NL	1.297	0	0
50.0	23	42	29.4	43	31	12	32.2	28.6	6000.0	4689.6	0.75	1.00	0.800	0.800	0.213	Y	NL	3.762	0	0
55.0	27	22	23.0			0	33.4	30.4	6600.0	4977.6	0.70	1.00	0.800	0.800	0.206	Y	NL	3.885	0	0
60.0	18	42	23.0	43	31	12	26.3	23.7	7200.0	5265.6	0.66	1.00	0.308	0.319	0.199	Y	NL	1.548	0	0
65.0	7	42	23.0	43	31	12	13.2	12.9	7800.0	5553.6	0.62	1.00	0.145	0.143	0.193	Y	LIQUEFIABLE	0.749	2.1	1.26
70.0	25	22	24.9			0	31.2	28.2	8400.0	5841.6	0.59	1.00	0.800	0.800	0.188	Y	NL	4.257	0	0

Total Settlement, S_{LIQ} (in.) = 2.94
Total Liquefiable Layers = 27

FIGURE E-5

Volumetric Strain, %



$N_1|_{60}$ Adj. for Fines (Blows/Ft)

Boring B-3

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LIQUEFACTION - VOLUMETRIC STRAIN

ZEPHYR - OCEANSIDE
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PROJECT NO. G2322-32-01

E-6

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Liquefaction Analysis Using SPT

References
1. *Youd, et al, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Environmental Engineering, October, 2001, Vol. 127, No. 10*
2. *Seed, et al, Recent Advances in Soil Liquefaction Engineering: A Unified and Consistant Framework, 2003.*

Project Name:	Zephyr Oceanside	Boring:	B-1 without berm loading
Project Number:	G2322-32-01		

PGAm	0.450	Include Kσ (Y/N)	N
Modal Magnitude	6.72	Use NCEER CRR7.5 (1) or Rauch CRR7.5 (2)	1
Groundwater Depth, Ft	9.0	Minimum Factor of Safety for Liquefaction	1
Reference Pressure, p_a	1000		
Unit Weight of Water	62.4		
Soil Unit Weight, pcf	120		

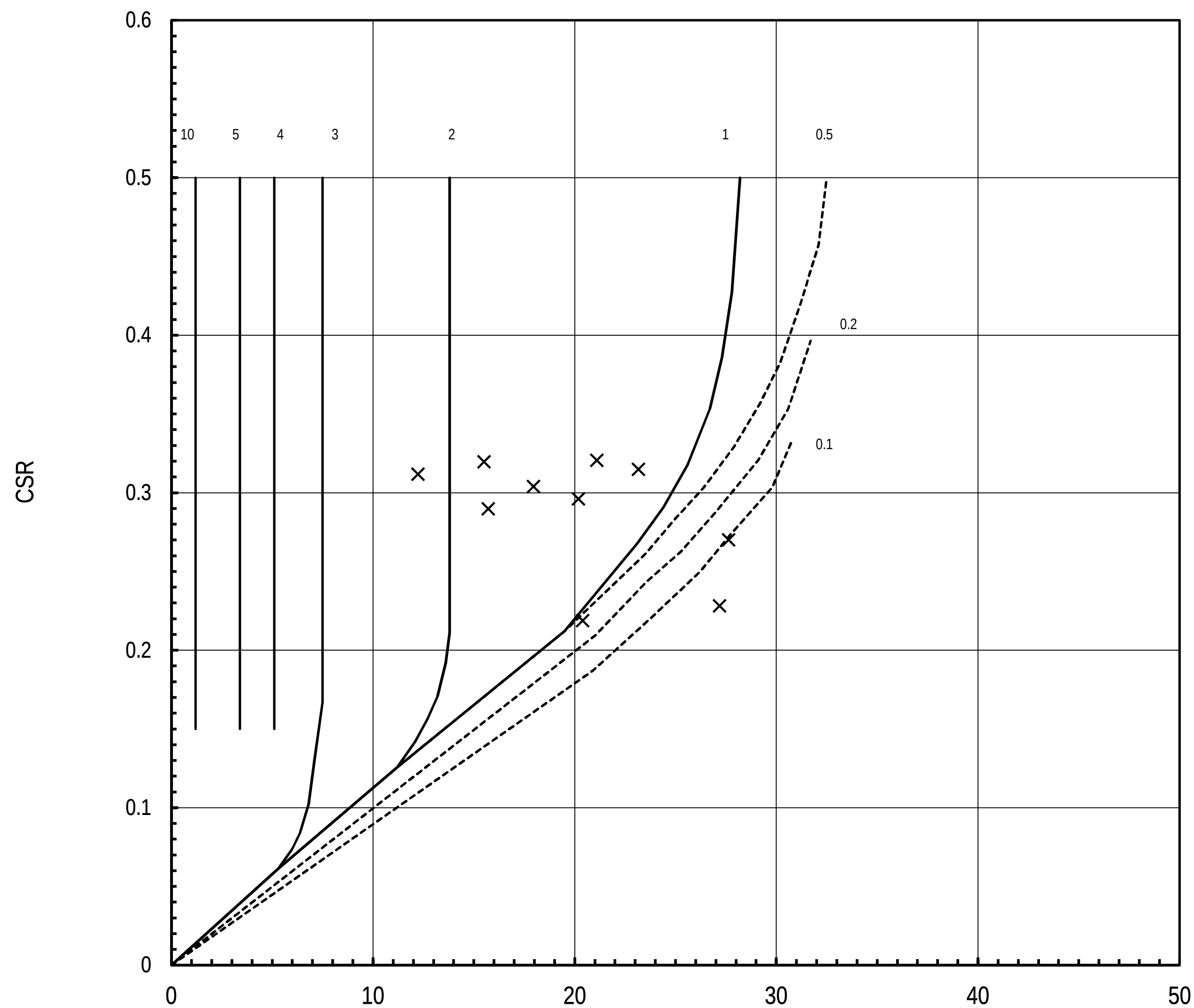
		Enter for Fine-Grained Materials					Old	New					MWF Idriss(1997) = $(M)^{2.56}/10^{2.24}$						SP117 Graph	
Depth, ft	$N_1\|_{60}$	Fines Content, FC (%)	Water Content, w_C (%)	Liquid Limit	Plastic Limit	Plasticity Index	$N_1\|_{60}$, Adj. for Fines	$N_1\|_{60}$, Adj. for Fines	σ, psf	σ', psf	r_d	K_σ	NCEER $CRR_{7.5}$	RAUCH $CRR_{7.5}$	CSR M=7.5	Fines Liquefiable (Y/N)	Liquefaction Potential	Factor of Safety	Volumetric Strain, %	Settlement, in.
5.0	19	10	20.6			0	20.4	20.4	600.0	600.0	0.99	1.00	0.223	0.221	0.219	Y	Above GWT	1.02	0	0
10.0	26	10	20.6			0	27.1	27.2	1200.0	1137.6	0.98	1.00	0.326	0.340	0.228	Y	NL	1.43	0	0
15.0	26	10	30.5			0	27.5	27.6	1800.0	1425.6	0.97	1.00	0.336	0.354	0.270	Y	NL	1.25	0	0
20.0	19	10	30.5			0	20.2	20.2	2400.0	1713.6	0.96	1.00	0.220	0.218	0.296	Y	LIQUEFIABLE	0.74	1.5	0.9
25.0	6	42	30.5			0	12.5	12.2	3000.0	2001.6	0.94	1.00	0.136	0.136	0.312	Y	LIQUEFIABLE	0.44	2.2	1.32
30.0	13	22	30.5			0	18.4	15.5	3600.0	2289.6	0.92	1.00	0.200	0.196	0.320	Y	LIQUEFIABLE	0.63	1.8	1.08
35.0	15	42	30.5			0	23.1	21.1	4200.0	2577.6	0.89	1.00	0.257	0.259	0.321	Y	LIQUEFIABLE	0.80	1.4	0.84
40.0	17	42	30.5			0	25.6	23.2	4800.0	2865.6	0.85	1.00	0.296	0.304	0.315	Y	LIQUEFIABLE	0.94	1.2	0.72
45.0	15	22	23.9			0	20.9	18.0	5400.0	3153.6	0.80	1.00	0.228	0.226	0.304	Y	LIQUEFIABLE	0.75	1.7	1.02
50.0	13	22	23.9			0	18.6	15.7	6000.0	3441.6	0.75	1.00	0.202	0.199	0.290	Y	LIQUEFIABLE	0.70	1.8	1.08

Total Settlement, S_{LIQ} (in.) = 6.96

Total Liquefiable Layers = 10

FIGURE E-7

Volumetric Strain, %



$N_1|_{60}$ Adj. for Fines (Blows/Ft)

Boring B-1 wo berm

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LIQUEFACTION - VOLUMETRIC STRAIN

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TEM				PROJECT NO. G2232-32-01	E-8

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Liquefaction Analysis Using SPT

References
1. *Youd, et al, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Environmental Engineering, October, 2001, Vol. 127, No. 10*
2. *Seed, et al, Recent Advances in Soil Liquefaction Engineering: A Unified and Consistant Framework, 2003.*

Project Name:	Zephyr Oceanside	Boring:	B-2 without berm loading
Project Number:	G2322-32-01		

PGAm	0.450	Include Kσ (Y/N)	N
Modal Magnitude	6.72	Use NCEER CRR7.5 (1) or Rauch CRR7.5 (2)	1
Groundwater Depth, Ft	9.0	Minimum Factor of Safety for Liquefaction	1
Reference Pressure, p_a	1000		
Unit Weight of Water	62.4		
Soil Unit Weight, pcf	120		

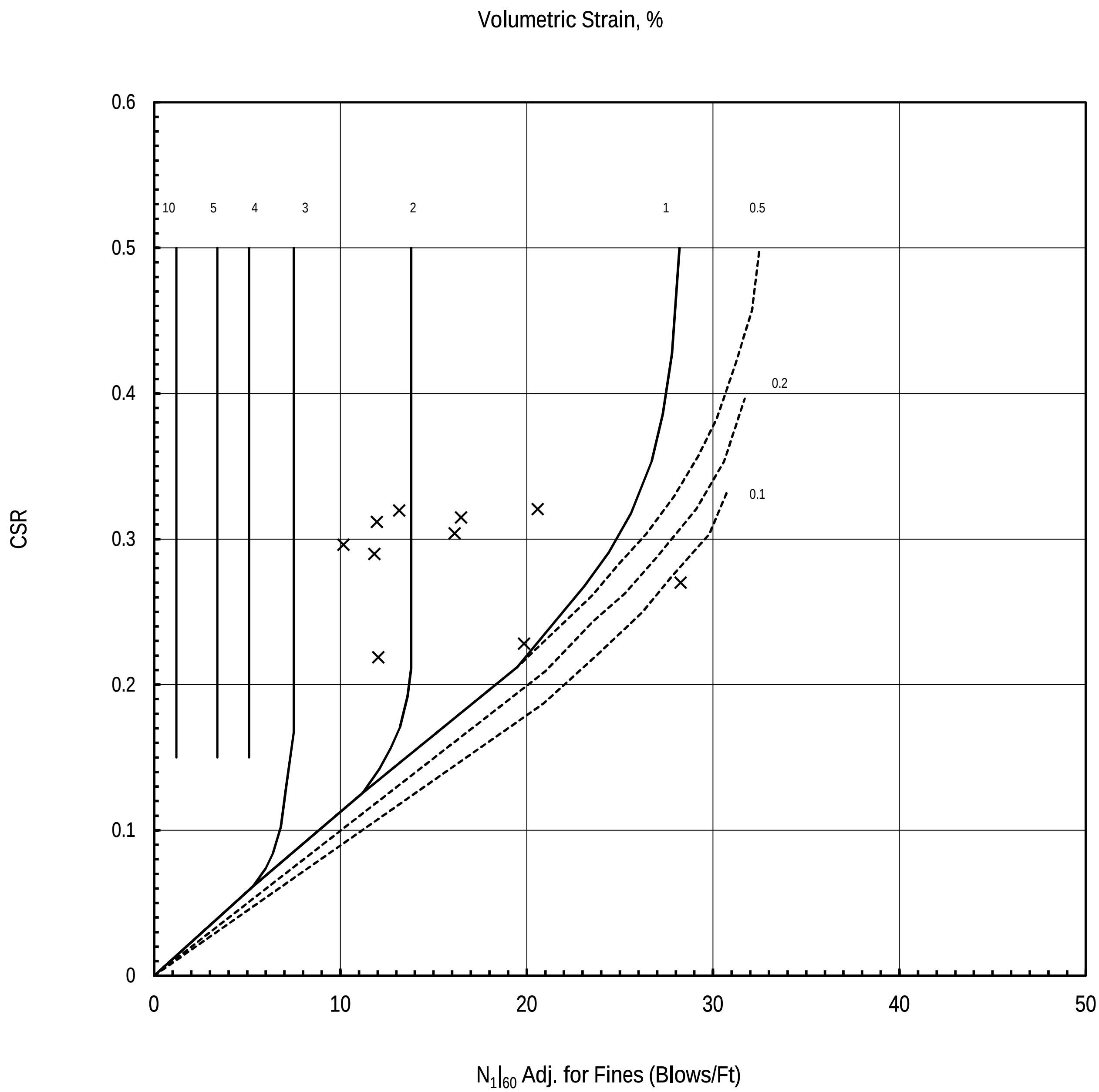
Enter for Fine-Grained Materials; Old; New; MWF Idriss(1997) = $(M)^{2.56}/10^{2.24}$; SP117 Graph

Depth, ft	$N_1\|_{60}$	Fines Content, FC (%)	Water Content, w_C (%)	Liquid Limit	Plastic Limit	Plasticity Index	Old $N_1\|_{60}$, Adj. for Fines	New $N_1\|_{60}$, Adj. for Fines	σ, psf	σ', psf	r_d	K_σ	NCEER $CRR_{7.5}$	RAUCH $CRR_{7.5}$	CSR M=7.5	Fines Liquefiable (Y/N)	Liquefaction Potential	Factor of Safety	Volumetric Strain, %	Settlement, in.
5.0	10	22	14.9			0	14.9	12.0	600.0	600.0	0.99	1.00	0.163	0.159	0.219	Y	Above GWT	0.74	0	0
10.0	17	22	23.5			0	22.8	19.9	1200.0	1137.6	0.98	1.00	0.252	0.253	0.228	Y	NL	1.11	0	0
15.0	25	22	23.5			0	31.2	28.3	1800.0	1425.6	0.97	1.00	0.800	0.800	0.270	Y	NL	2.96	0	0
20.0	4	42	43.8	43	31	12	10.0	10.2	2400.0	1713.6	0.96	1.00	0.110	0.113	0.296	Y	LIQUEFIABLE	0.37	2.6	1.56
25.0	10	22	43.8			0	14.8	12.0	3000.0	2001.6	0.94	1.00	0.162	0.158	0.312	Y	LIQUEFIABLE	0.52	2.2	1.32
30.0	7	42	36.5	43	31	12	13.6	13.2	3600.0	2289.6	0.92	1.00	0.148	0.146	0.320	Y	LIQUEFIABLE	0.46	2.1	1.26
35.0	15	42	36.5	43	31	12	22.5	20.6	4200.0	2577.6	0.89	1.00	0.249	0.249	0.321	Y	LIQUEFIABLE	0.78	1.5	0.9
40.0	14	22	29.3			0	19.4	16.5	4800.0	2865.6	0.85	1.00	0.211	0.208	0.315	Y	LIQUEFIABLE	0.67	1.8	1.08
45.0	14	22	29.3			0	19.0	16.1	5400.0	3153.6	0.80	1.00	0.207	0.204	0.304	Y	LIQUEFIABLE	0.68	1.8	1.08
50.0	6	42	39.3	43	31	12	12.0	11.8	6000.0	3441.6	0.75	1.00	0.131	0.131	0.290	Y	LIQUEFIABLE	0.45	2.2	1.32

Total Settlement, S_{LIQ} (in.) = 8.52

Total Liquefiable Layers = 10

FIGURE E-9



Boring B-2 wo berm

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LIQUEFACTION - VOLUMETRIC STRAIN

ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

PROJECT NO. G2232-32-01

E-10

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Liquefaction Analysis Using SPT

References 1. *Youd, et al, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Geoenvironmental Engineering, October, 2001, Vol. 127, No. 10*

2. *Seed, et al, Recent Advances in Soil Liquefaction Engineering: A Unified and Consistant Framework, 2003.*

Project Name:	Zephyr Oceanside	Boring:	B-3	without berm loading
Project Number:	G2322-32-01			

PGAm	0.450
Modal Magnitude	6.72
Groundwater Depth, Ft	9.0
Reference Pressure, p_a	1000
Unit Weight of Water	62.4
Soil Unit Weight, pcf	120

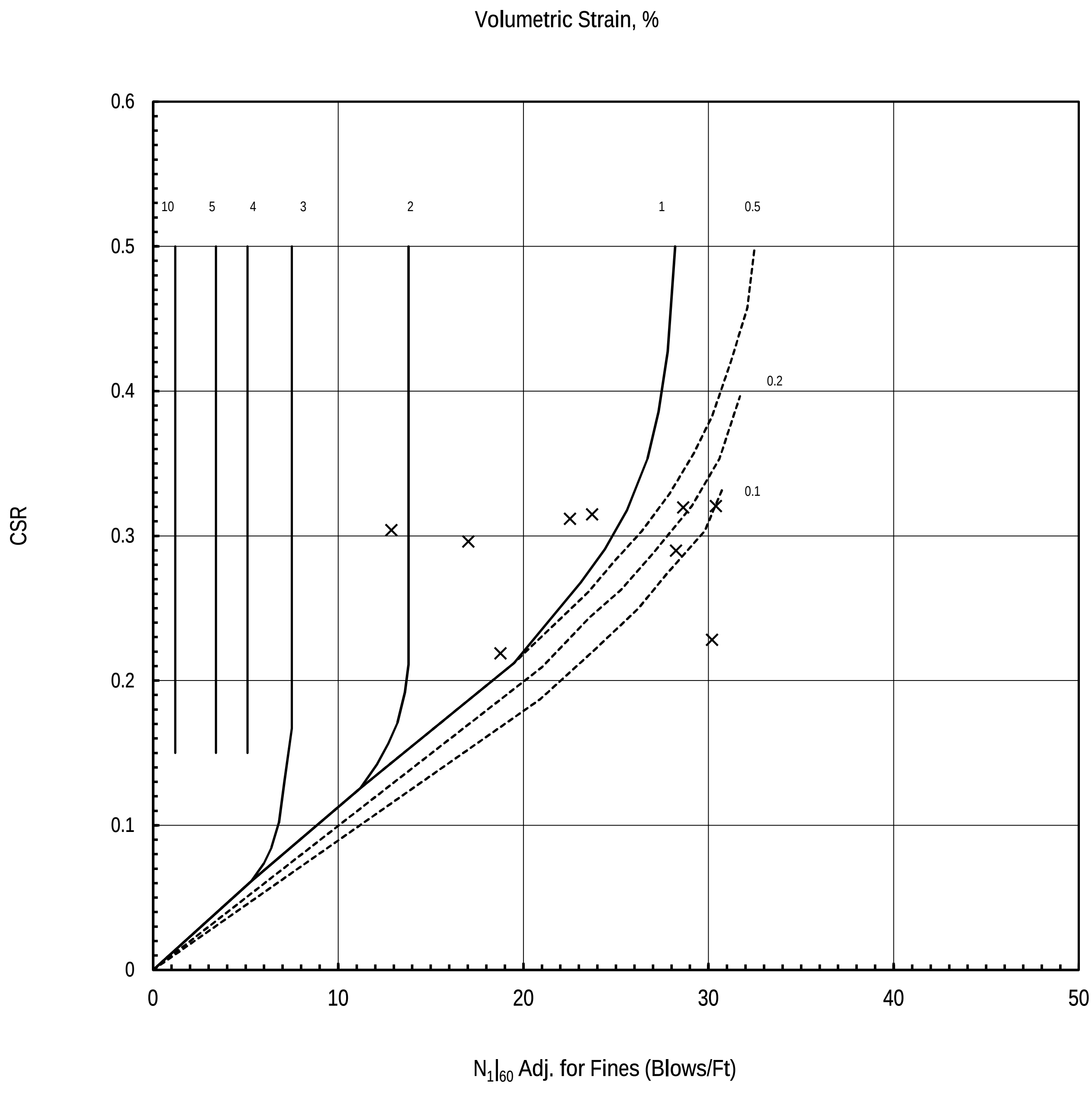
Include $K\sigma$ (Y/N)	N
Use NCEER CRR7.5 (1) or Rauch CRR7.5 (2)	1
Minimum Factor of Safety for Liquefaction	1

			Enter for Fine-Grained Materials				Old	New							MWF Idriss(1997) = $(M)^{2.56}/10^{2.24}$				SP117 Graph	
Depth, ft	$N_1\|_{60}$	Fines Content, FC (%)	Water Content, w_C (%)	Liquid Limit	Plastic Limit	Plasticity Index	$N_1\|_{60}$, Adj. for Fines	$N_1\|_{60}$, Adj. for Fines	σ, psf	σ', psf	r_d	K_σ	NCEER $CRR_{7.5}$	RAUCH $CRR_{7.5}$	CSR M=7.5	Fines Liquefiable (Y/N)	Liquefaction Potential	Factor of Safety	Volumetric Strain, %	Settlement, in.
5.0	16	22	4.0			0	21.7	18.8	600.0	600.0	0.99	1.00	0.238	0.237	0.219	Y	Above GWT	1.088	0	0
10.0	27	22	17.4			0	33.2	30.2	1200.0	1137.6	0.98	1.00	0.800	0.800	0.228	Y	NL	3.506	0	0
20.0	11	42	32.8	43	31	12	18.2	17.0	2400.0	1713.6	0.96	1.00	0.198	0.195	0.296	Y	LIQUEFIABLE	0.670	1.7	2.04
25.0	17	42	32.8	43	31	12	24.8	22.5	3000.0	2001.6	0.94	1.00	0.282	0.288	0.312	Y	LIQUEFIABLE	0.906	1.3	0.78
30.0	23	42	29.4	43	31	12	32.2	28.6	3600.0	2289.6	0.92	1.00	0.800	0.800	0.320	Y	NL	2.502	0	0
35.0	27	22	23.0			0	33.4	30.4	4200.0	2577.6	0.89	1.00	0.800	0.800	0.321	Y	NL	2.496	0	0
40.0	18	42	23.0	43	31	12	26.3	23.7	4800.0	2865.6	0.85	1.00	0.308	0.319	0.315	Y	LIQUEFIABLE	0.979	1.2	0.72
45.0	7	42	23.0	43	31	12	13.2	12.9	5400.0	3153.6	0.80	1.00	0.145	0.143	0.304	Y	LIQUEFIABLE	0.476	2.1	1.26
50.0	25	22	24.9			0	31.2	28.2	6000.0	3441.6	0.75	1.00	0.800	0.800	0.290	Y	NL	2.761	0	0

Total Settlement, S_{LIQ} (in.) = 4.8

Total Liquefiable Layers = 17

FIGURE E-11



Boring B-3 wo berm

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LIQUEFACTION - VOLUMETRIC STRAIN

ZEPHYR - OCEANSIDE
OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

E-12

APPENDIX F

APPENDIX F

SETTLEMENT ANALYSIS

FOR

ZEPHYR – OCEANSIDE
OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

Project Name:	Zephyr Oceanside
Project Number:	G2322-32-01
Date:	7/18/2019

Location: B1 - Bike Berm

GEOCON

Surcharge Thickness(ft)	10			Using		
Surcharge unit weight (pcf)	125			S=Cc(Hlayer/(1+e0))log((P0+ΔP)/P0)		
ΔP	1250					
				Total Settlement:	0.13 feet	**1.61 inches**
Layer Initial Depth(ft)	22					
Layer Average void ratio e	0.57					
Layer Cc	0.018	Hlayer	23			
Layer unit weight (pcf)	120	P0=	1380		S=	0.07 ft
Layer Bottom Depth(ft)	45					0.89 inches
Layer Initial Depth(ft)	45					
Layer Average void ratio e	0.73					
Layer Cc	0.065	Hlayer	5			
Layer unit weight (pcf)	115	P0=	8050		S=	0.01 ft
Layer Bottom Depth(ft)	50					0.14 inches
Layer Initial Depth(ft)	50					
Layer Average void ratio e	0.57					
Layer Cc	0.018	Hlayer	10			
Layer unit weight (pcf)	120	P0=	9600		S=	0.01 ft
Layer Bottom Depth(ft)	60					0.07 inches
Layer Initial Depth(ft)	60					
Layer Average void ratio e	0.73					
Layer Cc	0.065	Hlayer	10			
Layer unit weight (pcf)	115	P0=	10925		S=	0.02 ft
Layer Bottom Depth(ft)	70					0.21 inches
Layer Initial Depth(ft)	70					
Layer Average void ratio e	0.916					
Layer Cc	0.018	Hlayer	20			
Layer unit weight (pcf)	120	P0=	13800		S=	0.01 ft
Layer Bottom Depth(ft)	90					0.08 inches
Layer Initial Depth(ft)	90					
Layer Average void ratio e	0.535					
Layer Cc	0.018	Hlayer	10			
Layer unit weight (pcf)	120	P0=	16800		S=	0.00 ft
Layer Bottom Depth(ft)	100					0.04 inches
Layer Initial Depth(ft)	100					
Layer Average void ratio e	0.61					
Layer Cc	0.018	Hlayer	50			
Layer unit weight (pcf)	120	P0=	21000		S=	0.01 ft
Layer Bottom Depth(ft)	150					0.17 inches

Figure F-1

Project Name:	Zephyr Oceanside
Project Number:	G2322-32-01
Date:	7/18/2019

Location: B2 - Bike Berm

GEOCON

Surcharge Thickness(ft)	10					
Surcharge unit weight (pcf)	125					
ΔP	1250					

Using
S=Cc(Hlayer/(1+e0))log((P0+ΔP)/P0)

Total Settlement: 0.20 feet **2.38 inches**

Layer Initial Depth(ft)	19				
Layer Average void ratio e	0.68				
Layer Cc	0.049	Hlayer	21		
Layer unit weight (pcf)	120	P0=	4680	S=	0.06 ft
Layer Bottom Depth(ft)	40				0.76 inches
Layer Initial Depth(ft)	40				
Layer Average void ratio e	0.99				
Layer Cc	0.125	Hlayer	20		
Layer unit weight (pcf)	115	P0=	8050	S=	0.08 ft
Layer Bottom Depth(ft)	60				0.95 inches
Layer Initial Depth(ft)	60				
Layer Average void ratio e	0.76				
Layer Cc	0.023	Hlayer	8		
Layer unit weight (pcf)	120	P0=	11280	S=	0.00 ft
Layer Bottom Depth(ft)	68				0.06 inches
Layer Initial Depth(ft)	68				
Layer Average void ratio e	0.99				
Layer Cc	0.125	Hlayer	8		
Layer unit weight (pcf)	115	P0=	12190	S=	0.02 ft
Layer Bottom Depth(ft)	76				0.26 inches
Layer Initial Depth(ft)	76				
Layer Average void ratio e	0.76				
Layer Cc	0.023	Hlayer	4		
Layer unit weight (pcf)	120	P0=	13920	S=	0.00 ft
Layer Bottom Depth(ft)	80				0.02 inches
Layer Initial Depth(ft)	80				
Layer Average void ratio e	0.77				
Layer Cc	0.049	Hlayer	4		
Layer unit weight (pcf)	120	P0=	14640	S=	0.00 ft
Layer Bottom Depth(ft)	84				0.05 inches
Layer Initial Depth(ft)	84				
Layer Average void ratio e	0.61				
Layer Cc	0.023	Hlayer	16		
Layer unit weight (pcf)	120	P0=	16080	S=	0.01 ft
Layer Bottom Depth(ft)	100				0.09 inches
Layer Initial Depth(ft)	100				
Layer Average void ratio e	0.61				
Layer Cc	0.023	Hlayer	40		
Layer unit weight (pcf)	120	P0=	20400	S=	0.01 ft
Layer Bottom Depth(ft)	140				0.18 inches
Layer Initial Depth(ft)	140				
Layer Average void ratio e	0.61				
Layer Cc	0.018	Hlayer	10		
Layer unit weight (pcf)	125	P0=	26875	S=	0.00 ft
Layer Bottom Depth(ft)	150				0.03 inches

Figure F-2

Project Name:	Zephyr Oceanside
Project Number:	G2322-32-01
Date:	7/18/2019

Location: B3 - Bike Berm

GEOCON

Surcharge Thickness(ft)	10			Using		
Surcharge unit weight (pcf)	125			S=Cc(Hlayer/(1+e0))log((P0+ΔP)/P0)		
ΔP	1250					
				Total Settlement:	0.15 feet	**1.84 inches**

Layer Initial Depth(ft)	19				
Layer Average void ratio e	0.95				
Layer Cc	0.08	Hlayer	3		
Layer unit weight (pcf)	115	P0=	3450	S=	0.02 ft
Layer Bottom Depth(ft)	22				0.20 inches
Layer Initial Depth(ft)	22				
Layer Average void ratio e	0.59				
Layer Cc	0.023	Hlayer	18		
Layer unit weight (pcf)	120	P0=	5040	S=	0.03 ft
Layer Bottom Depth(ft)	40				0.30 inches
Layer Initial Depth(ft)	40				
Layer Average void ratio e	0.75				
Layer Cc	0.079	Hlayer	15		
Layer unit weight (pcf)	120	P0=	8100	S=	0.04 ft
Layer Bottom Depth(ft)	55				0.51 inches
Layer Initial Depth(ft)	55				
Layer Average void ratio e	0.61				
Layer Cc	0.023	Hlayer	5		
Layer unit weight (pcf)	120	P0=	10200	S=	0.00 ft
Layer Bottom Depth(ft)	60				0.04 inches
Layer Initial Depth(ft)	60				
Layer Average void ratio e	0.55				
Layer Cc	0.125	Hlayer	10		
Layer unit weight (pcf)	120	P0=	11400	S=	0.04 ft
Layer Bottom Depth(ft)	70				0.44 inches
Layer Initial Depth(ft)	70				
Layer Average void ratio e	0.61				
Layer Cc	0.023	Hlayer	14		
Layer unit weight (pcf)	120	P0=	13440	S=	0.01 ft
Layer Bottom Depth(ft)	84				0.09 inches
Layer Initial Depth(ft)	84				
Layer Average void ratio e	0.61				
Layer Cc	0.023	Hlayer	16		
Layer unit weight (pcf)	120	P0=	16080	S=	0.01 ft
Layer Bottom Depth(ft)	100				0.09 inches
Layer Initial Depth(ft)	100				
Layer Average void ratio e	0.61				
Layer Cc	0.018	Hlayer	50		
Layer unit weight (pcf)	120	P0=	21000	S=	0.01 ft
Layer Bottom Depth(ft)	150				0.17 inches

Figure F-3

Project Name:	Zephyr Oceanside	Location:	B1 - Bike Berm (wo berm load)
Project Number:	G2322-32-01		
Date:	7/18/2019		

GEOCON

Surcharge Thickness(ft)	10			Using		
Surcharge unit weight (pcf)	125			S=Cc(Hlayer/(1+e0))log((P0+ΔP)/P0)		
ΔP	1250					
				Total Settlement:	0.16 feet	**1.95 inches**
Layer Initial Depth(ft)	0					
Layer Average void ratio e	0.57					
Layer Cc	0.018	Hlayer	23			
Layer unit weight (pcf)	120	P0=	1380		S=	0.07 ft
Layer Bottom Depth(ft)	23					0.89 inches
Layer Initial Depth(ft)	23					
Layer Average void ratio e	0.73					
Layer Cc	0.065	Hlayer	5			
Layer unit weight (pcf)	115	P0=	4255		S=	0.02 ft
Layer Bottom Depth(ft)	28					0.25 inches
Layer Initial Depth(ft)	28					
Layer Average void ratio e	0.57					
Layer Cc	0.018	Hlayer	10			
Layer unit weight (pcf)	120	P0=	5640		S=	0.01 ft
Layer Bottom Depth(ft)	38					0.12 inches
Layer Initial Depth(ft)	38					
Layer Average void ratio e	0.73					
Layer Cc	0.065	Hlayer	10			
Layer unit weight (pcf)	115	P0=	7130		S=	0.03 ft
Layer Bottom Depth(ft)	48					0.32 inches
Layer Initial Depth(ft)	48					
Layer Average void ratio e	0.916					
Layer Cc	0.018	Hlayer	20			
Layer unit weight (pcf)	120	P0=	9840		S=	0.01 ft
Layer Bottom Depth(ft)	68					0.12 inches
Layer Initial Depth(ft)	68					
Layer Average void ratio e	0.535					
Layer Cc	0.018	Hlayer	10			
Layer unit weight (pcf)	120	P0=	12840		S=	0.00 ft
Layer Bottom Depth(ft)	78					0.06 inches
Layer Initial Depth(ft)	78					
Layer Average void ratio e	0.61					
Layer Cc	0.018	Hlayer	50			
Layer unit weight (pcf)	120	P0=	17040		S=	0.02 ft
Layer Bottom Depth(ft)	128					0.21 inches

Figure F-4

Project Name:	Zephyr Oceanside
Project Number:	G2322-32-01
Date:	7/18/2019

Location: B2 - Bike Berm (wo berm load)

GEOCON

Surcharge Thickness(ft)	10			Using		
Surcharge unit weight (pcf)	125			S=Cc(Hlayer/(1+e0))log((P0+ΔP)/P0)		
ΔP	1250					
			Total Settlement:	0.38 feet		**4.59 inches**
Layer Initial Depth(ft)	0					
Layer Average void ratio e	0.68					
Layer Cc	0.049	Hlayer	21			
Layer unit weight (pcf)	120	P0=	1260		S=	0.18 ft
Layer Bottom Depth(ft)	21					2.20 inches
Layer Initial Depth(ft)	21					
Layer Average void ratio e	0.99					
Layer Cc	0.125	Hlayer	20			
Layer unit weight (pcf)	115	P0=	4772.5		S=	0.13 ft
Layer Bottom Depth(ft)	41					1.52 inches
Layer Initial Depth(ft)	41					
Layer Average void ratio e	0.76					
Layer Cc	0.023	Hlayer	8			
Layer unit weight (pcf)	120	P0=	7860		S=	0.01 ft
Layer Bottom Depth(ft)	49					0.08 inches
Layer Initial Depth(ft)	49					
Layer Average void ratio e	0.99					
Layer Cc	0.125	Hlayer	8			
Layer unit weight (pcf)	115	P0=	8912.5		S=	0.03 ft
Layer Bottom Depth(ft)	57					0.34 inches
Layer Initial Depth(ft)	57					
Layer Average void ratio e	0.76					
Layer Cc	0.023	Hlayer	4			
Layer unit weight (pcf)	120	P0=	10500		S=	0.00 ft
Layer Bottom Depth(ft)	61					0.03 inches
Layer Initial Depth(ft)	61					
Layer Average void ratio e	0.77					
Layer Cc	0.049	Hlayer	4			
Layer unit weight (pcf)	120	P0=	11220		S=	0.01 ft
Layer Bottom Depth(ft)	65					0.06 inches
Layer Initial Depth(ft)	65					
Layer Average void ratio e	0.61					
Layer Cc	0.023	Hlayer	16			
Layer unit weight (pcf)	120	P0=	12660		S=	0.01 ft
Layer Bottom Depth(ft)	81					0.11 inches
Layer Initial Depth(ft)	81					
Layer Average void ratio e	0.61					
Layer Cc	0.023	Hlayer	40			
Layer unit weight (pcf)	120	P0=	16980		S=	0.02 ft
Layer Bottom Depth(ft)	121					0.21 inches
Layer Initial Depth(ft)	121					
Layer Average void ratio e	0.61					
Layer Cc	0.018	Hlayer	10			
Layer unit weight (pcf)	125	P0=	23312.5		S=	0.00 ft
Layer Bottom Depth(ft)	131					0.03 inches

Figure F-5

Project Name:	Zephyr Oceanside
Project Number:	G2322-32-01
Date:	7/18/2019

Location: B3 - Bike Berm (wo berm load)

GEOCON

Surcharge Thickness(ft)	10
Surcharge unit weight (pcf)	125
ΔP	1250

Using
S=Cc(Hlayer/(1+e0))log((P0+ΔP)/P0)

Total Settlement: 0.34 feet **4.07 inches**

Layer Initial Depth(ft)	0				
Layer Average void ratio e	0.95				
Layer Cc	0.08	Hlayer	3		
Layer unit weight (pcf)	115	P0=	172.5	S=	0.11 ft
Layer Bottom Depth(ft)	3				1.35 inches
Layer Initial Depth(ft)	3				
Layer Average void ratio e	0.59				
Layer Cc	0.023	Hlayer	18		
Layer unit weight (pcf)	120	P0=	1620	S=	0.06 ft
Layer Bottom Depth(ft)	21				0.78 inches
Layer Initial Depth(ft)	21				
Layer Average void ratio e	0.75				
Layer Cc	0.079	Hlayer	15		
Layer unit weight (pcf)	120	P0=	4680	S=	0.07 ft
Layer Bottom Depth(ft)	36				0.84 inches
Layer Initial Depth(ft)	36				
Layer Average void ratio e	0.61				
Layer Cc	0.023	Hlayer	5		
Layer unit weight (pcf)	120	P0=	6780	S=	0.01 ft
Layer Bottom Depth(ft)	41				0.06 inches
Layer Initial Depth(ft)	41				
Layer Average void ratio e	0.55				
Layer Cc	0.125	Hlayer	10		
Layer unit weight (pcf)	120	P0=	7980	S=	0.05 ft
Layer Bottom Depth(ft)	51				0.61 inches
Layer Initial Depth(ft)	51				
Layer Average void ratio e	0.61				
Layer Cc	0.023	Hlayer	14		
Layer unit weight (pcf)	120	P0=	10020	S=	0.01 ft
Layer Bottom Depth(ft)	65				0.12 inches
Layer Initial Depth(ft)	65				
Layer Average void ratio e	0.61				
Layer Cc	0.023	Hlayer	16		
Layer unit weight (pcf)	120	P0=	12660	S=	0.01 ft
Layer Bottom Depth(ft)	81				0.11 inches
Layer Initial Depth(ft)	81				
Layer Average void ratio e	0.61				
Layer Cc	0.018	Hlayer	50		
Layer unit weight (pcf)	120	P0=	17580	S=	0.02 ft
Layer Bottom Depth(ft)	131				0.20 inches

Figure F-6

Project Name:	Zephyr Oceanside
Project Number:	G2322-32-01
Date:	7/18/2019

Location: B-1 (2018)

GEOCON

Surcharge Thickness(ft)	10		Using			
Surcharge unit weight (pcf)	125		S=Cc(Hlayer/(1+e0))log((P0+ΔP)/P0)			
ΔP	1250					
			Total Settlement:	0.30 feet		**3.58 inches**
Layer Initial Depth(ft)	5					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	5			
Layer unit weight (pcf)	120	P0=	1200		S=	0.03 ft
Layer Bottom Depth(ft)	10					0.37 inches
Layer Initial Depth(ft)	10					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	8			
Layer unit weight (pcf)	57.6	P0=	1094.4		S=	0.05 ft
Layer Bottom Depth(ft)	18					0.64 inches
Layer Initial Depth(ft)	18					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	12			
Layer unit weight (pcf)	57.6	P0=	1900.8		S=	0.05 ft
Layer Bottom Depth(ft)	30					0.63 inches
Layer Initial Depth(ft)	30					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	3168		S=	0.06 ft
Layer Bottom Depth(ft)	50					0.69 inches
Layer Initial Depth(ft)	50					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	4896		S=	0.04 ft
Layer Bottom Depth(ft)	70					0.47 inches
Layer Initial Depth(ft)	70					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	6624		S=	0.03 ft
Layer Bottom Depth(ft)	90					0.36 inches
Layer Initial Depth(ft)	90					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	8352		S=	0.02 ft
Layer Bottom Depth(ft)	110					0.29 inches
Layer Initial Depth(ft)	110					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	10			
Layer unit weight (pcf)	57.6	P0=	9792		S=	0.01 ft
Layer Bottom Depth(ft)	120					0.13 inches

Figure F-7

Project Name:	Zephyr Oceanside	Location:	B-2 (2018)
Project Number:	G2322-32-01		
Date:	7/18/2019		

GEOCON

Surcharge Thickness(ft)	10			Using		
Surcharge unit weight (pcf)	125			S=Cc(Hlayer/(1+e0))log((P0+ΔP)/P0)		
ΔP	1250					
		Total Settlement:		0.33 feet		**3.92 inches**
Layer Initial Depth(ft)	5					
Layer Average void ratio e	0.71					
Layer Cc	0.034	Hlayer	5			
Layer unit weight (pcf)	120	P0=	1200		S=	0.03 ft
Layer Bottom Depth(ft)	10					0.37 inches
Layer Initial Depth(ft)	10					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	10			
Layer unit weight (pcf)	57.6	P0=	1152		S=	0.06 ft
Layer Bottom Depth(ft)	20					0.77 inches
Layer Initial Depth(ft)	15					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	5			
Layer unit weight (pcf)	57.6	P0=	1440		S=	0.03 ft
Layer Bottom Depth(ft)	20					0.33 inches
Layer Initial Depth(ft)	20					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	2304		S=	0.08 ft
Layer Bottom Depth(ft)	40					0.90 inches
Layer Initial Depth(ft)	40					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	4032		S=	0.05 ft
Layer Bottom Depth(ft)	60					0.56 inches
Layer Initial Depth(ft)	60					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	5760		S=	0.03 ft
Layer Bottom Depth(ft)	80					0.41 inches
Layer Initial Depth(ft)	80					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	7488		S=	0.03 ft
Layer Bottom Depth(ft)	100					0.32 inches
Layer Initial Depth(ft)	100					
Layer Average void ratio e	0.7					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	9216		S=	0.02 ft
Layer Bottom Depth(ft)	120					0.27 inches

Figure F-8

Project Name:	Zephyr Oceanside
Project Number:	G2322-32-01
Date:	7/18/2019

Location: B-3(2018)

GEOCON

Surcharge Thickness(ft)	10			Using		
Surcharge unit weight (pcf)	125			S=Cc(Hlayer/(1+e0))log((P0+ΔP)/P0)		
ΔP	1250					
				Total Settlement:	0.30 feet	**3.56 inches**
Layer Initial Depth(ft)	5					
Layer Average void ratio e	0.71					
Layer Cc	0.034	Hlayer	5			
Layer unit weight (pcf)	120	P0=	1200		S=	0.03 ft
Layer Bottom Depth(ft)	10					0.37 inches
Layer Initial Depth(ft)	10					
Layer Average void ratio e	0.71					
Layer Cc	0.034	Hlayer	7			
Layer unit weight (pcf)	57.6	P0=	1065.6		S=	0.05 ft
Layer Bottom Depth(ft)	17					0.56 inches
Layer Initial Depth(ft)	17					
Layer Average void ratio e	0.71					
Layer Cc	0.034	Hlayer	3			
Layer unit weight (pcf)	57.6	P0=	1555.2		S=	0.02 ft
Layer Bottom Depth(ft)	20					0.18 inches
Layer Initial Depth(ft)	20					
Layer Average void ratio e	0.71					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	2304		S=	0.07 ft
Layer Bottom Depth(ft)	40					0.90 inches
Layer Initial Depth(ft)	40					
Layer Average void ratio e	0.71					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	4032		S=	0.05 ft
Layer Bottom Depth(ft)	60					0.56 inches
Layer Initial Depth(ft)	60					
Layer Average void ratio e	0.71					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	5760		S=	0.03 ft
Layer Bottom Depth(ft)	80					0.41 inches
Layer Initial Depth(ft)	80					
Layer Average void ratio e	0.71					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	7488		S=	0.03 ft
Layer Bottom Depth(ft)	100					0.32 inches
Layer Initial Depth(ft)	100					
Layer Average void ratio e	0.71					
Layer Cc	0.034	Hlayer	20			
Layer unit weight (pcf)	57.6	P0=	9216		S=	0.02 ft
Layer Bottom Depth(ft)	120					0.26 inches

Figure F-9

Project Name:	Zephyr Oceanside	Location:	B-4(2018)
Project Number:	G2322-32-01		
Date:	7/18/2019		

GEOCON

Surcharge Thickness(ft)	10			Using			
Surcharge unit weight (pcf)	125			S=Cc(Hlayer/(1+e0))log((P0+ΔP)/P0)			
ΔP	1250						
				Total Settlement:	0.38 feet		**4.61 inches**
Layer Initial Depth(ft)	5						
Layer Average void ratio e	0.79						
Layer Cc	0.03	Hlayer	5				
Layer unit weight (pcf)	120	P0=	1200			S=	0.03 ft
Layer Bottom Depth(ft)	10						0.31 inches
Layer Initial Depth(ft)	10						
Layer Average void ratio e	0.62						
Layer Cc	0.04	Hlayer	10				
Layer unit weight (pcf)	57.6	P0=	1152			S=	0.08 ft
Layer Bottom Depth(ft)	20						0.95 inches
Layer Initial Depth(ft)	20						
Layer Average void ratio e	0.62						
Layer Cc	0.04	Hlayer	20				
Layer unit weight (pcf)	57.6	P0=	2304			S=	0.09 ft
Layer Bottom Depth(ft)	40						1.12 inches
Layer Initial Depth(ft)	40						
Layer Average void ratio e	0.64						
Layer Cc	0.047	Hlayer	20				
Layer unit weight (pcf)	57.6	P0=	4032			S=	0.07 ft
Layer Bottom Depth(ft)	60						0.81 inches
Layer Initial Depth(ft)	60						
Layer Average void ratio e	0.64						
Layer Cc	0.047	Hlayer	20				
Layer unit weight (pcf)	57.6	P0=	5760			S=	0.05 ft
Layer Bottom Depth(ft)	80						0.59 inches
Layer Initial Depth(ft)	80						
Layer Average void ratio e	0.64						
Layer Cc	0.047	Hlayer	20				
Layer unit weight (pcf)	57.6	P0=	7488			S=	0.04 ft
Layer Bottom Depth(ft)	100						0.46 inches
Layer Initial Depth(ft)	100						
Layer Average void ratio e	0.64						
Layer Cc	0.047	Hlayer	20				
Layer unit weight (pcf)	57.6	P0=	9216			S=	0.03 ft
Layer Bottom Depth(ft)	120						0.38 inches

Figure F-10

Project Name:	Zephyr Oceanside
Project Number:	G2322-32-01
Date:	7/18/2019

Location: B-5(2018)

Surcharge Thickness(ft)	10
Surcharge unit weight (pcf)	125
ΔP	1250

Using
S=Cc(Hlayer/(1+e0))log((P0+ΔP)/P0)

Total Settlement: 0.33 feet **3.99 inches**

Layer Initial Depth(ft)	5				
Layer Average void ratio e	0.81				
Layer Cc	0.03	Hlayer	5		
Layer unit weight (pcf)	120	P0=	1200	S=	0.03 ft
Layer Bottom Depth(ft)	10				0.31 inches
Layer Initial Depth(ft)	10				
Layer Average void ratio e	0.57				
Layer Cc	0.037	Hlayer	5		
Layer unit weight (pcf)	57.6	P0=	1008	S=	0.04 ft
Layer Bottom Depth(ft)	15				0.50 inches
Layer Initial Depth(ft)	15				
Layer Average void ratio e	0.57				
Layer Cc	0.037	Hlayer	10		
Layer unit weight (pcf)	57.6	P0=	1584	S=	0.06 ft
Layer Bottom Depth(ft)	25				0.71 inches
Layer Initial Depth(ft)	25				
Layer Average void ratio e	0.67				
Layer Cc	0.038	Hlayer	15		
Layer unit weight (pcf)	57.6	P0=	2592	S=	0.06 ft
Layer Bottom Depth(ft)	40				0.70 inches
Layer Initial Depth(ft)	40				
Layer Average void ratio e	0.67				
Layer Cc	0.038	Hlayer	20		
Layer unit weight (pcf)	57.6	P0=	4032	S=	0.05 ft
Layer Bottom Depth(ft)	60				0.64 inches
Layer Initial Depth(ft)	60				
Layer Average void ratio e	0.67				
Layer Cc	0.038	Hlayer	20		
Layer unit weight (pcf)	57.6	P0=	5760	S=	0.04 ft
Layer Bottom Depth(ft)	80				0.47 inches
Layer Initial Depth(ft)	80				
Layer Average void ratio e	0.67				
Layer Cc	0.038	Hlayer	20		
Layer unit weight (pcf)	57.6	P0=	7488	S=	0.03 ft
Layer Bottom Depth(ft)	100				0.37 inches
Layer Initial Depth(ft)	100				
Layer Average void ratio e	0.67				
Layer Cc	0.038	Hlayer	20		
Layer unit weight (pcf)	57.6	P0=	9216	S=	0.03 ft
Layer Bottom Depth(ft)	120				0.30 inches

Figure F-11

Project Name:	Zephyr Oceanside
Project Number:	G2322-32-01
Date:	7/18/2019

Location: B-6(2018)

GEOCON

Surcharge Thickness(ft)	10
Surcharge unit weight (pcf)	125
ΔP	1250

Using
$S=Cc(Hlayer/(1+e0))\log((P0+\Delta P)/P0)$

Total Settlement: 0.30 feet **3.58 inches**

Layer Initial Depth(ft)	5				
Layer Average void ratio e	0.6				
Layer Cc	0.032	Hlayer	5		
Layer unit weight (pcf)	120	P0=	1200	S=	0.03 ft
Layer Bottom Depth(ft)	10				0.37 inches
Layer Initial Depth(ft)	10				
Layer Average void ratio e	0.6				
Layer Cc	0.032	Hlayer	5		
Layer unit weight (pcf)	57.6	P0=	1008	S=	0.04 ft
Layer Bottom Depth(ft)	15				0.42 inches
Layer Initial Depth(ft)	15				
Layer Average void ratio e	0.6				
Layer Cc	0.032	Hlayer	5		
Layer unit weight (pcf)	57.6	P0=	1440	S=	0.03 ft
Layer Bottom Depth(ft)	20				0.33 inches
Layer Initial Depth(ft)	20				
Layer Average void ratio e	0.6				
Layer Cc	0.032	Hlayer	20		
Layer unit weight (pcf)	57.6	P0=	2304	S=	0.08 ft
Layer Bottom Depth(ft)	40				0.90 inches
Layer Initial Depth(ft)	40				
Layer Average void ratio e	0.6				
Layer Cc	0.032	Hlayer	20		
Layer unit weight (pcf)	57.6	P0=	4032	S=	0.05 ft
Layer Bottom Depth(ft)	60				0.56 inches
Layer Initial Depth(ft)	60				
Layer Average void ratio e	0.6				
Layer Cc	0.032	Hlayer	20		
Layer unit weight (pcf)	57.6	P0=	5760	S=	0.03 ft
Layer Bottom Depth(ft)	80				0.41 inches
Layer Initial Depth(ft)	80				
Layer Average void ratio e	0.6				
Layer Cc	0.032	Hlayer	20		
Layer unit weight (pcf)	57.6	P0=	7488	S=	0.03 ft
Layer Bottom Depth(ft)	100				0.32 inches
Layer Initial Depth(ft)	100				
Layer Average void ratio e	0.6				
Layer Cc	0.032	Hlayer	20		
Layer unit weight (pcf)	57.6	P0=	9216	S=	0.02 ft
Layer Bottom Depth(ft)	120				0.27 inches

Figure F-12

Time Rate Consolidation

Project No. G2322-32-01
Project Name: Zepyhr-Oceanside
Location: B1-16
t_{90}= $(0.848*(H_{dr})^2)/C_v$

GEOCON

4k

H_{dr}= 5 ft
C_v= 0.0654 in^2/min
t_{90}= 32 days

8k

H_{dr}= 15 ft
C_v= 0.0654 in^2/min
t_{90}= 292 days

Drainage Pathway (ft)	Time (days)	
		8k
5		32
10		130
15		292
20		519
30		1167
40		2075
50		3242
60		4668

Figure F-13

Time Rate Consolidation

Project No. G2322-32-01
Project Name: Zepyhr-Oceanside
Location: B1-18

$t_{90} = (0.848*(H_{dr})^2)/C_v$

GEOCON

4k

H_{dr}=	5	ft
C_v=	0.377	in^2/min
t_{90}=	6	days

8k

H_{dr}=	5	ft
C_v=	0.331	in^2/min
t_{90}=	6	days

Drainage Pathway (ft)	Time (days)	
	4k	8k
5	6	6
10	22	26
15	51	58
20	90	102
30	202	231
40	360	410
50	562	640
60	810	922

Figure F-14

Time Rate Consolidation

Project No. G2322-32-01
Project Name: Zepyhr-Oceanside
Location: B2-16

$t_{90}= (0.848*(H_{dr})^2)/C_v$

GEOCON

4k

$H_{dr}=$	5	ft
$C_v=$	0.0252	in^2/min
$t_{90}=$	84	days

8k

$H_{dr}=$	5	ft
$C_v=$	0.053	in^2/min
$t_{90}=$	40	days

Drainage Pathway (ft)	Time (days)	
	4k	8k
5	84	40
10	337	160
15	757	360
20	1346	640
30	3029	1440
40	5384	2560
50	8413	4000
60	12114	5760

Figure F-15

Time Rate Consolidation

Project No. G2322-32-01
Project Name: Zepyhr-Oceanside
Location: B2-14

$t_{90}= (0.848*(H_{dr})^2)/C_v$

4k

$H_{dr}=$ 5 ft
$C_v=$ 0.262 in^2/min
$t_{90}=$ 8 days

8k

$H_{dr}=$ 5 ft
$C_v=$ 0.175 in^2/min
$t_{90}=$ 12 days

Drainage Pathway (ft)	Time (days)	
	4k	8k
5	8	12
10	32	48
15	73	109
20	129	194
30	291	436
40	518	775
50	809	1211
60	1165	1744

Figure F-16

Time Rate Consolidation

Project No. G2322-32-01
Project Name: Zepyhr-Oceanside
Location: B2-13

$t_{90}= (0.848*(H_{dr})^2)/C_v$

4k

$H_{dr}=$ 5 ft

$C_v=$ 0.147 in^2/min

$t_{90}=$ 14 days

8k

$H_{dr}=$ 5 ft

$C_v=$ 0.053 in^2/min

$t_{90}=$ 40 days

Drainage Pathway (ft)	Time (days)	
	4k	8k
5	14	40
10	58	160
15	130	360
20	231	640
30	519	1440
40	923	2560
50	1442	4000
60	2077	5760

Figure F-17

Time Rate Consolidation

Project No. G2322-32-01
Project Name: Zepyhr-Oceanside
Location: B3-21

$t_{90}= (0.848*(H_{dr})^2)/C_v$

4k

$H_{dr}=$	5	ft
$C_v=$	0.1472	in^2/min
$t_{90}=$	14	days

8k

$H_{dr}=$	5	ft
$C_v=$	0.0942	in^2/min
$t_{90}=$	23	days

Drainage Pathway (ft)	Time (days)	
	4k	8k
5	14	23
10	58	90
15	130	203
20	230	360
30	518	810
40	922	1440
50	1440	2251
60	2074	3241

Figure F-18

Time Rate Consolidation

GEOCON

Project No. G2322-32-01
Project Name: Zepyhr-Oceanside
Location: B3-15

$t_{90} = (0.848*(H_{dr})^2)/C_v$

4k

H_{dr}= 5 ft
C_v= 0.0942 in^2/min
t_{90}= 23 days

8k

H_{dr}= 5 ft
C_v= 0.0942 in^2/min
t_{90}= 23 days

Drainage Pathway (ft)	Time (days)	
	4k	8k
5	23	23
10	90	90
15	203	203
20	360	360
30	810	810
40	1440	1440
50	2251	2251
60	3241	3241

Figure F-19

Time Rate Consolidation

Project No. G2322-32-01

Project Name: Zepyhr-Oceanside

Location: B3-13

$t_{90} = (0.848 * (H_{dr})^2) / C_v$

4k

$H_{dr}=$ 5 ft

$C_v=$ 0.125 in^2/min

$t_{90}=$ 17 days

8k

$H_{dr}=$ 5 ft

$C_v=$ 0.0368 in^2/min

$t_{90}=$ 58 days

Drainage Pathway (ft)	Time (days)	
	4k	8k
5	17	58
10	68	230
15	153	518
20	271	922
30	611	2074
40	1085	3687
50	1696	5761
60	2442	8296

Figure F-20

Time Rate Consolidation

Project No. G2322-32-01
Project Name: Zepyhr-Oceanside
Location: B1-5 (2018)

GEOCON

$t_{90}= (0.848*(H_{dr})^2)/C_v$

4k

$H_{dr}=$ 5 ft

$C_v=$ 0.0654 in^2/min

$t_{90}=$ 32 days

8k

$H_{dr}=$ 5 ft

$C_v=$ 0.0734 in^2/min

$t_{90}=$ 29 days

Drainage Pathway (ft)	Time (days)	
		8k
5		29
10		116
15		260
20		462
30		1040
40		1849
50		2888
60		4159

Figure F-21

Time Rate Consolidation

Project No. G2322-32-01
Project Name: Zepyhr-Oceanside
Location: B2-6 (2018)

GEOCON

$t_{90}= (0.848*(H_{dr})^2)/C_v$

4k

$H_{dr}=$ 5 ft
$C_v=$ 0.0339 in^2/min
$t_{90}=$ 63 days

8k

$H_{dr}=$ 5 ft
$C_v=$ 0.0734 in^2/min
$t_{90}=$ 29 days

Drainage Pathway (ft)	Time (days)	
	4k	8k
5	63	29
10	250	116
15	563	260
20	1001	462
30	2251	1040
40	4002	1849
50	6254	2888
60	9005	4159

Figure F-22

Time Rate Consolidation

Project No. G2322-32-01
Project Name: Zepyhr-Oceanside
Location: B3-3 (2018)
$t_{90} = (0.848*(H_{dr})^2)/C_v$

GEOCON

4k

H_{dr}= 5 ft
C_v= 0.1082 in^2/min
t_{90}= 20 days

8k

H_{dr}= 5 ft
C_v= 0.0828 in^2/min
t_{90}= 26 days

Drainage Pathway (ft)	Time (days)	
	4k	8k
5	20	26
10	78	102
15	176	230
20	313	410
30	705	922
40	1254	1639
50	1959	2560
60	2821	3687

Figure F-23

Time Rate Consolidation

Project No. G2322-32-01
Project Name: Zepyhr-Oceanside
Location: B4-5 (2018)
t_{90}= $(0.848*(H_{dr})^2)/C_v$

4k

H_{dr}=	5	ft
C_v=	0.0654	in^2/min
t_{90}=	32	days

8k

H_{dr}=	5	ft
C_v=	0.212	in^2/min
t_{90}=	10	days

Drainage Pathway (ft)	Time (days)	
	4k	8k
5	32	10
10	130	40
15	292	90
20	519	160
30	1167	360
40	2075	640
50	3242	1000
60	4668	1440

Figure F-24

Time Rate Consolidation

Project No. G2322-32-01
Project Name: Zepyhr-Oceanside
Location: B5-6 (2018)

t_{90}= $(0.848*(H_{dr})^2)/C_v$

GEOCON

4k

H_{dr}=	5	ft
C_v=	0.0654	in^2/min
t_{90}=	32	days

8k

H_{dr}=	5	ft
C_v=	0.083	in^2/min
t_{90}=	26	days

Drainage Pathway (ft)	Time (days)	
		8k
5		26
10		102
15		230
20		409
30		920
40		1635
50		2554
60		3678

Figure F-25

Time Rate Consolidation

Project No. G2322-32-01
Project Name: Zepyhr-Oceanside
Location: B6-7 (2018)
$t_{90}= (0.848*(H_{dr})^2)/C_v$

4k

$H_{dr}=$ 5 ft
$C_v=$ 0.0654 in^2/min
$t_{90}=$ 32 days

8k

$H_{dr}=$ 5 ft
$C_v=$ 0.027 in^2/min
$t_{90}=$ 79 days

Drainage Pathway (ft)	Time (days)	
		8k
5		79
10		314
15		707
20		1256
30		2827
40		5025
50		7852
60		11307

Figure F-26

APPENDIX G

APPENDIX G

SLOPE STABILITY ANALYSIS

FOR

ZEPHYR – OCEANSIDE
OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section A-A'
Name: A-A'case1.gsz
Date: 07/24/2019 Time: 07:16:10 AM

Existing Condition
Static Analysis
Residual Strength

Color	Name	Unit Weight (pcf)	Cohesion (psf)	Cohesion' (psf)	Phi' (°)
Yellow	Qaf - Artificial Fill	125		200	35
Cyan	Qal(ML/CL) - Alluvium	120		400	20
Red	Qal(SM) - Alluvium Liquefied (N60=12)	110	300		
Green	Qal(SM) - Alluvium, Non-Liquefied	120		100	30

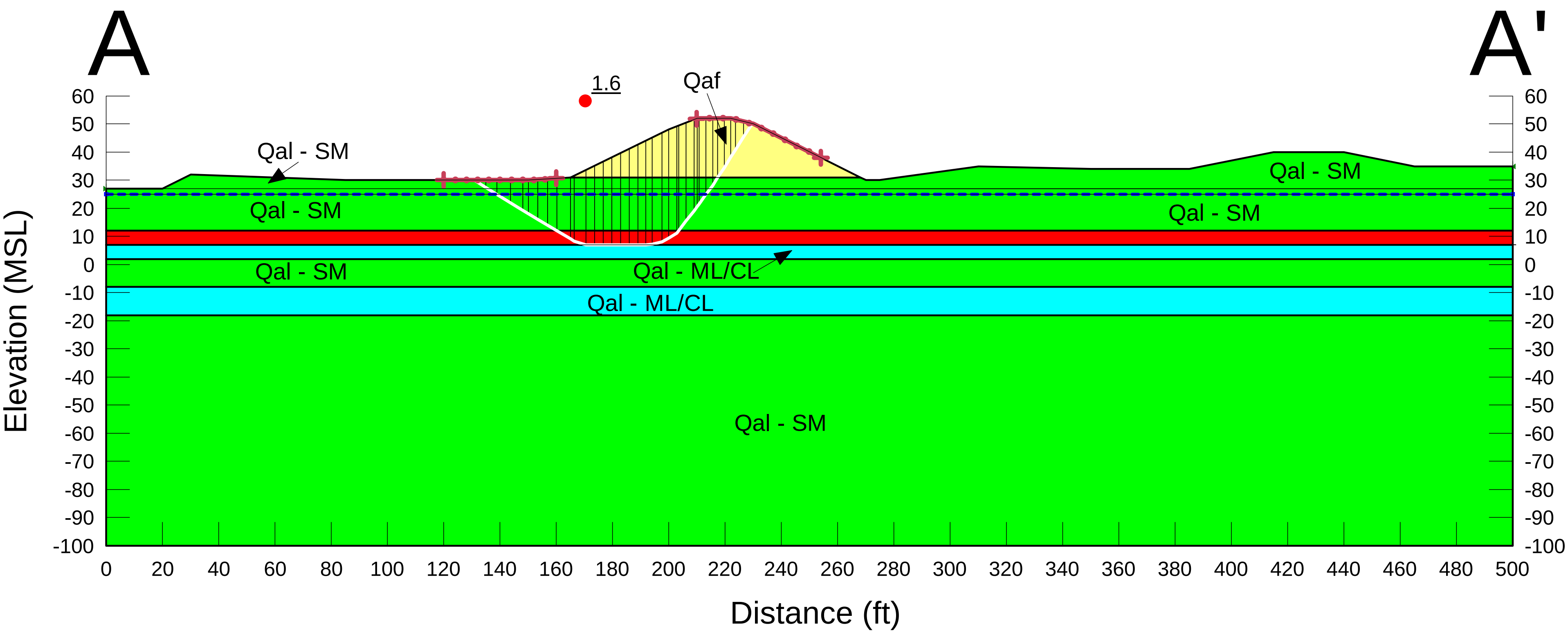


Figure G-1

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section A-A'
Name: A-A'case2.gsz
Date: 07/23/2019 Time: 05:24:53 PM

Proposed Condition
Static Analysis
Residual Strength

Color	Name	Unit Weight (pcf)	Cohesion (psf)	Cohesion' (psf)	Phi' (°)
(yellow)	Qaf - Artificial Fill	125		200	35
(cyan)	Qal(ML/CL) - Alluvium	120		400	20
(red)	Qal(SM) - Alluvium Liquefied (N60=12)	110	300		
(green)	Qal(SM) - Alluvium, Non-Liquefied	120		100	30

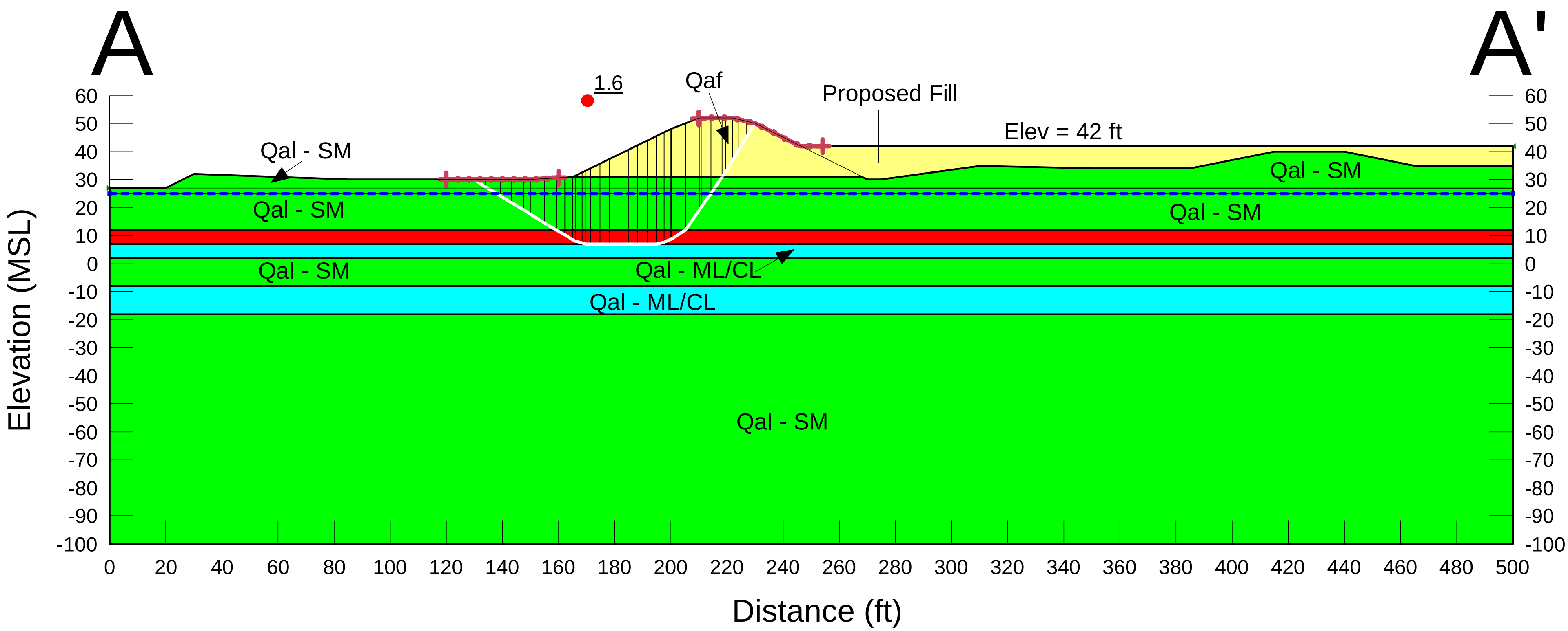


Figure G-2

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section A-A'
Name: A-A'case2a.gsz
Date: 07/29/2019 Time: 06:44:36 AM

Proposed Condition
Static Analysis
Residual Strength

Color	Name	Unit Weight (pcf)	Cohesion (psf)	Cohesion' (psf)	Phi' (°)
(yellow)	Qaf - Artificial Fill	125		200	35
(cyan)	Qal(ML/CL) - Alluvium	120		400	20
(red)	Qal(SM) - Alluvium Liquefied (N60=12)	110	300		
(green)	Qal(SM) - Alluvium, Non-Liquefied	120		100	30

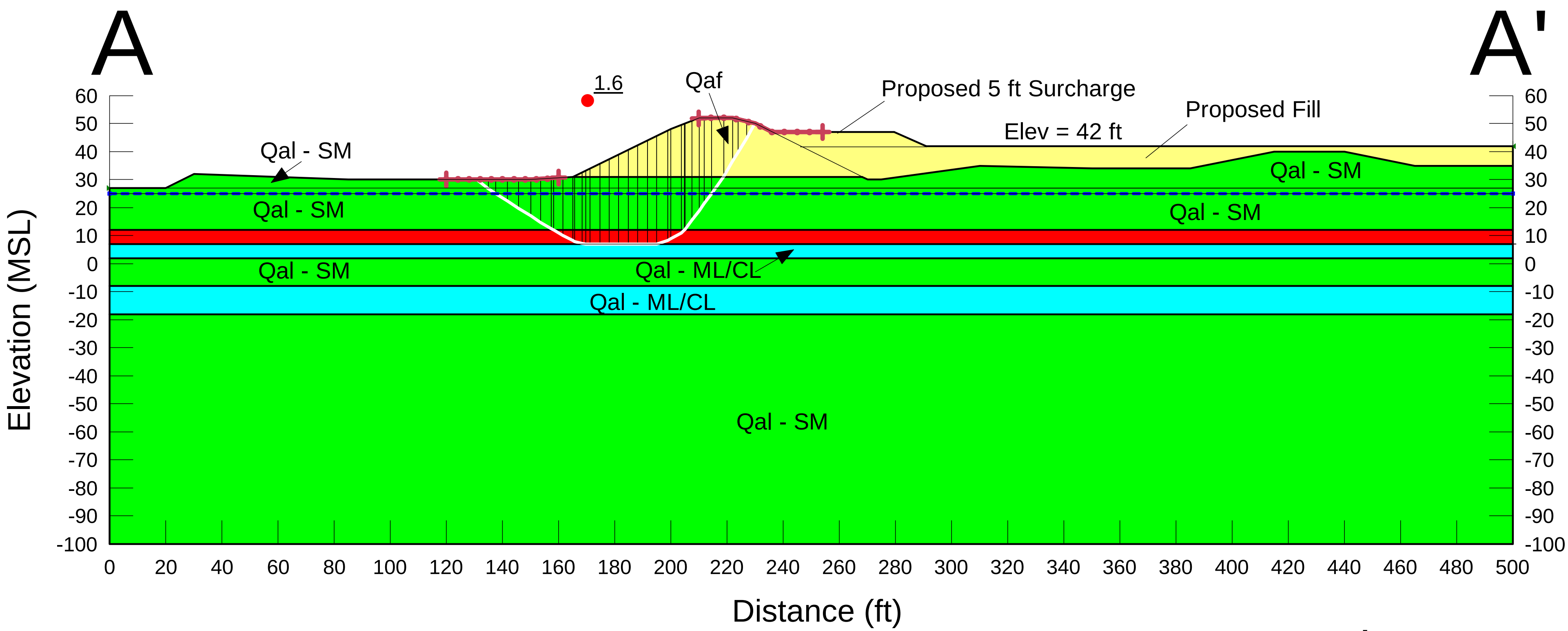


Figure G-3

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section A-A'
Name: A-A'case3.gsz
Date: 07/29/2019 Time: 06:50:01 AM

Proposed Condition
Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(yellow)	Qaf - Artificial Fill	125	200	35
(cyan)	Qal(ML/CL) - Alluvium	120	400	20
(green)	Qal(SM) - Alluvium, Non-Liquefied	120	100	30

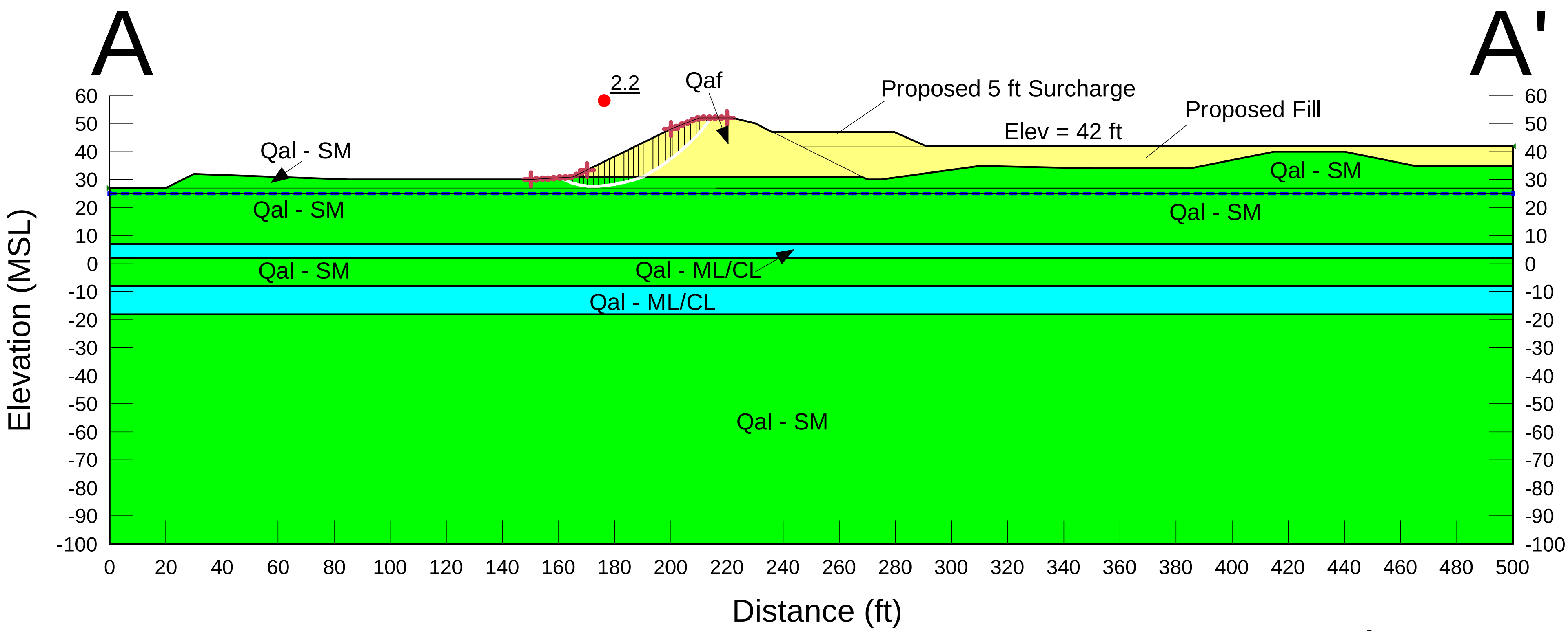


Figure G-4

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section A-A'
Name: A-A'case3s.gsz
Date: 07/29/2019 Time: 06:54:09 AM

Proposed Condition
Seismic Analysis
keq = 0.13g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(yellow)	Qaf - Artificial Fill	125	200	35
(cyan)	Qal(ML/CL) - Alluvium	120	400	20
(green)	Qal(SM) - Alluvium, Non-Liquefied	120	100	30

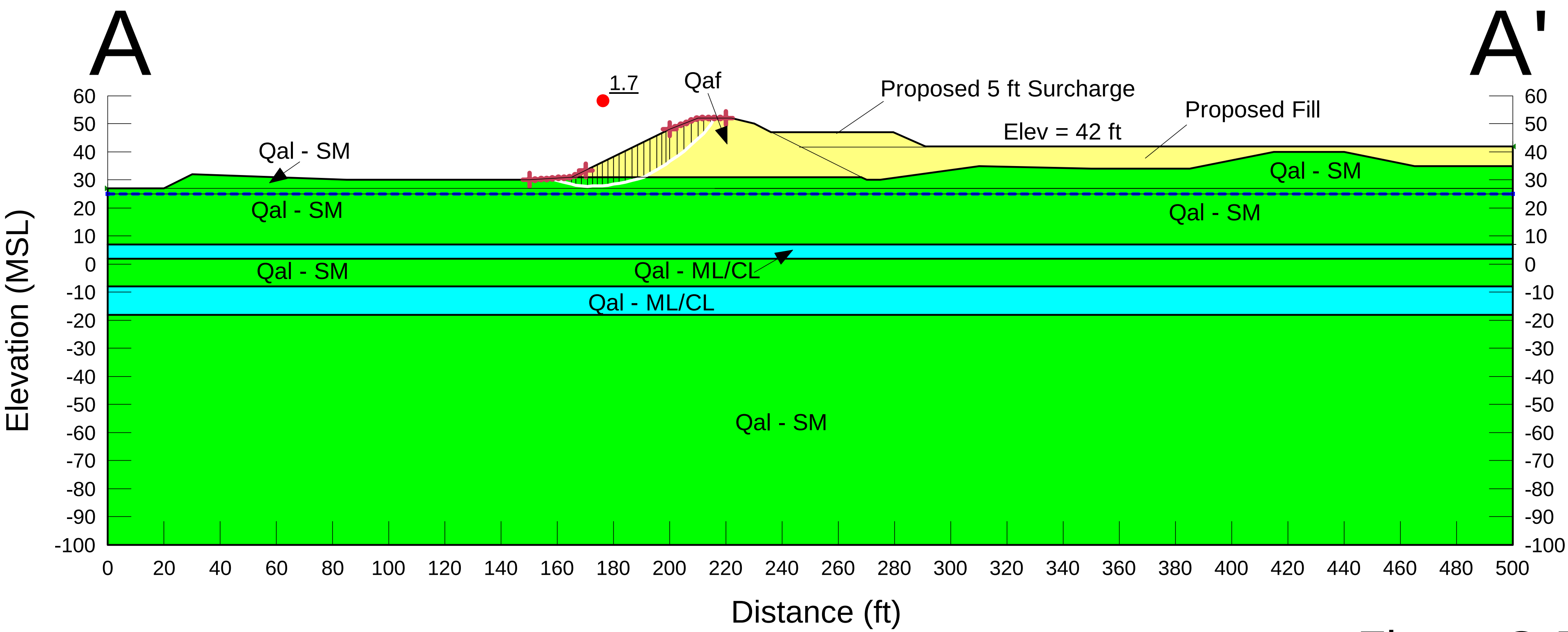


Figure G-5

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	Zephyr - Oceanside	Computed By	TEM
Project Number	G2322-32-01		
Date	07/24/19		
Filename	CC-Case3s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.22	10% in 50 years
Modal Magnitude, M	6.9	
Modal Distance, r, km	11.8	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5-95}\|_{med}$, sec	13.284	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.618	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.5818
k_{EQ} = feq(MHA_r)/g	0.128
Factor of Safety in Slope Analysis Using k_{EQ}	1.70

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.18
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE G-6

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section A-A'
Name: A-A'case4.gsz
Date: 07/24/2019 Time: 06:56:32 AM

Proposed Condition
Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qaf - Artificial Fill	125	200	35
	Qal(ML/CL) - Alluvium	120	400	20
	Qal(SM) - Alluvium, Non-Liquefied	120	100	30

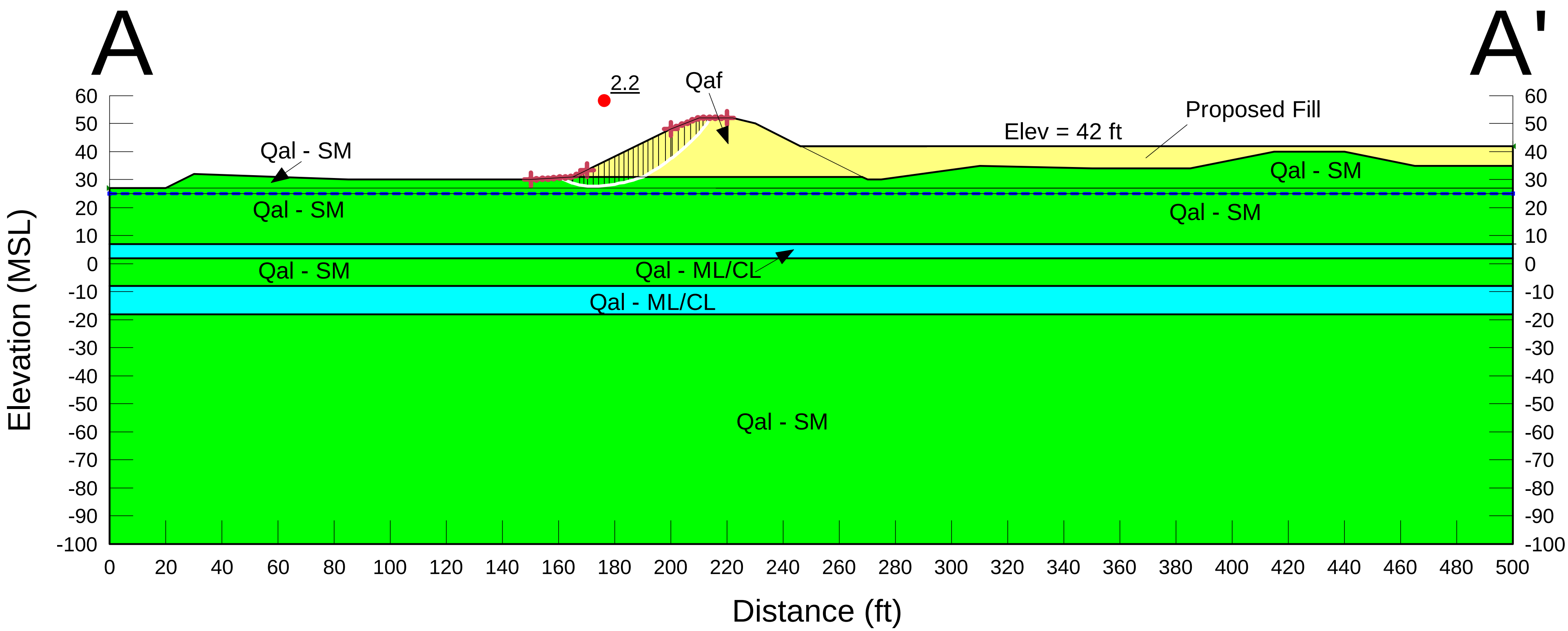


Figure G-7

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section A-A'
Name: A-A'case4s.gsz
Date: 07/24/2019 Time: 11:51:52 AM

Proposed Condition
Seismic Analysis
keq = 0.13g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(yellow)	Qaf - Artificial Fill	125	200	35
(cyan)	Qal(ML/CL) - Alluvium	120	400	20
(green)	Qal(SM) - Alluvium, Non-Liquefied	120	100	30

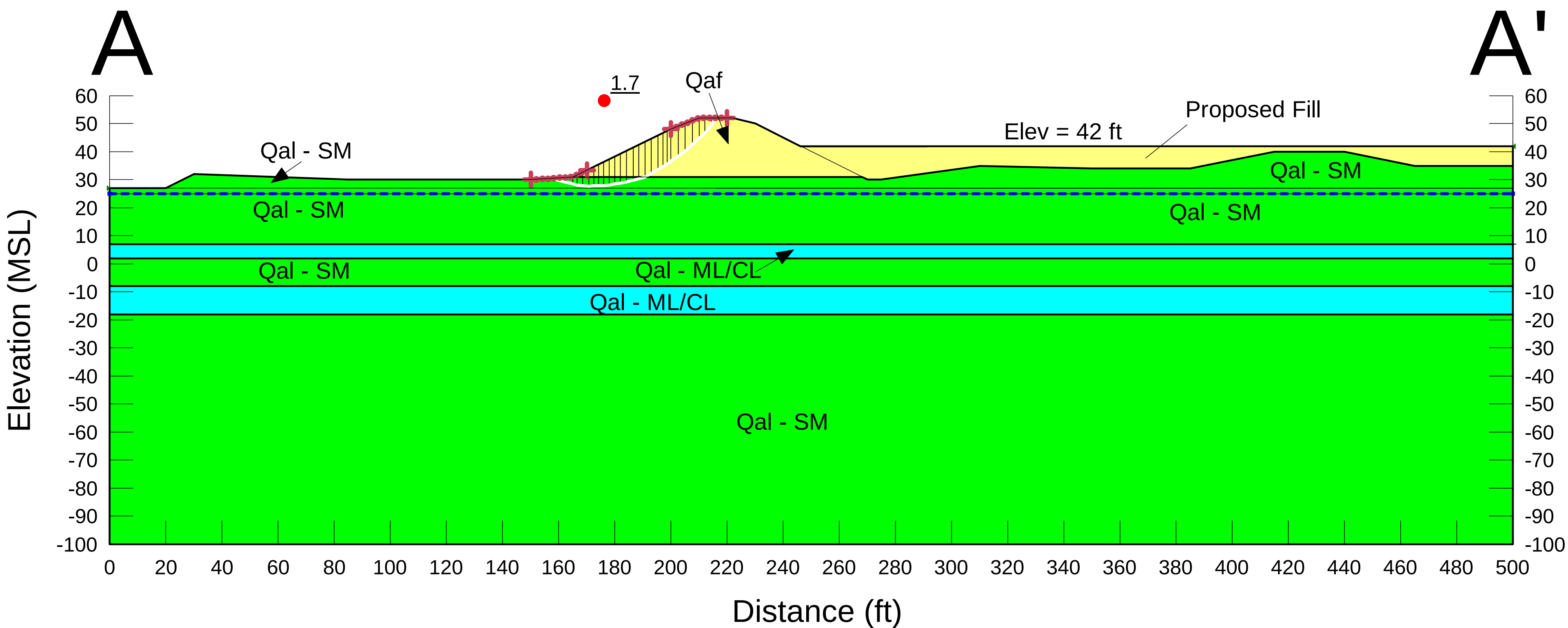


Figure G-8

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	Zephyr - Oceanside	Computed By	TEM
Project Number	G2322-32-01		
Date	07/24/19		
Filename	AA-Case4s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.22	10% in 50 years
Modal Magnitude, M	6.9	
Modal Distance, r, km	11.8	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	13.284	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.618	

Initial Screening with MHEA = MHA = k_{max}g		Approximation of Seismic Demand	
k_y/MHA	NA	Period of Sliding Mass, $T_s = 4H/V_s$, sec	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.5818	T_s/T_m	NA
k_{EQ} = feq(MHA_r)/g	0.128	MHEA/(MHA*NRF)	NA
Factor of Safety in Slope Analysis Using k_{EQ}	1.70	NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.18
Passes Initial Screening Analysis		MHEA/g	NA
		k_y/MHEA = k_y/k_{max}	NA
		Normalized Displacement, Normu	NA
		Estimated Displacement, u (cm)	**NA**

FIGURE G-9

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section B-B'
Name: B-B'case1.gsz
Date: 07/24/2019 Time: 10:01:58 AM

Existing Condition
Static Analysis
Residual Strength

Color	Name	Unit Weight (pcf)	Cohesion (psf)	Cohesion' (psf)	Phi' (°)
(yellow)	Qaf - Artificial Fill	125		200	35
(cyan)	Qal(ML/CL) - Alluvium	120		400	20
(red)	Qal(SM) - Alluvium, Liquefied (N60=10)	110	200		
(green)	Qal(SM) - Alluvium, Non-Liquefied	120		100	30

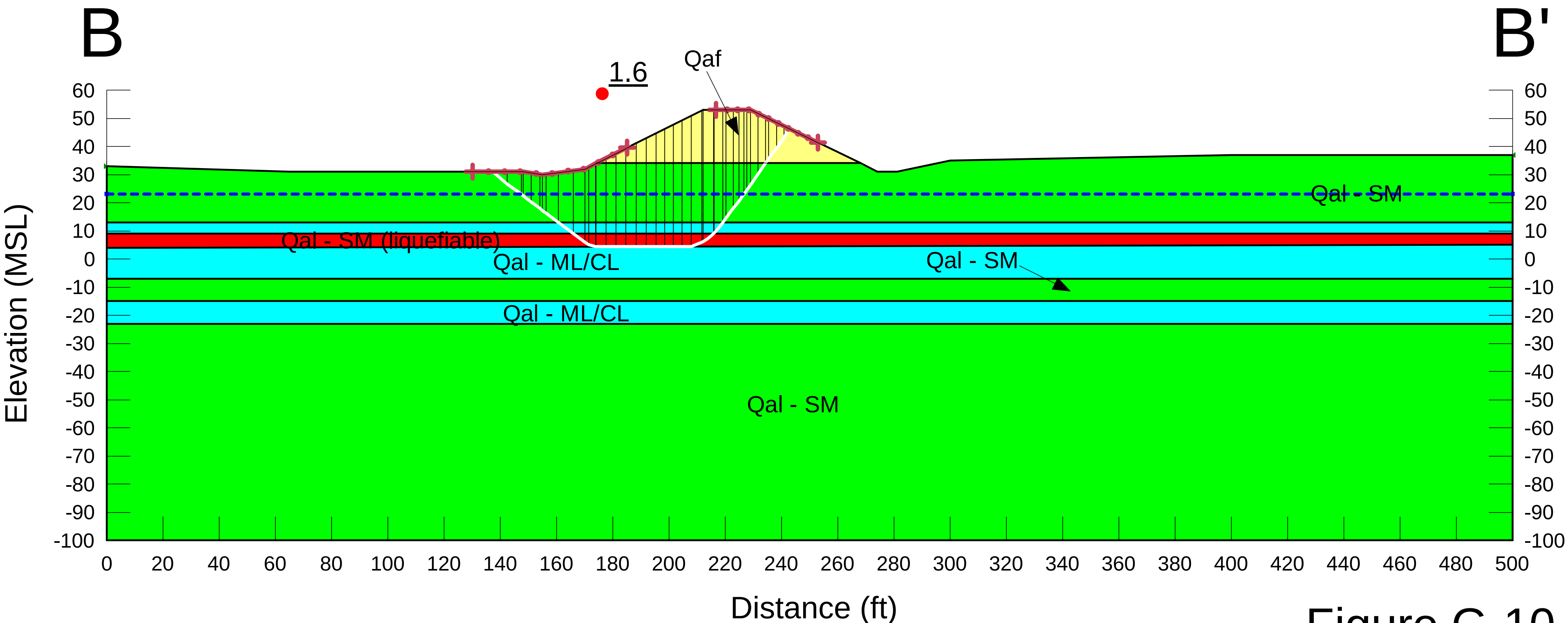


Figure G-10

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section B-B'
Name: B-B'case2.gsz
Date: 07/24/2019 Time: 10:04:51 AM

Existing Condition
Static Analysis
Residual Strength

Color	Name	Unit Weight (pcf)	Cohesion (psf)	Cohesion' (psf)	Phi' (°)
(yellow)	Qaf - Artificial Fill	125		200	35
(cyan)	Qal(ML/CL) - Alluvium	120		400	20
(red)	Qal(SM) - Alluvium, Liquefied (N60=10)	110	200		
(green)	Qal(SM) - Alluvium, Non-Liquefied	120		100	30

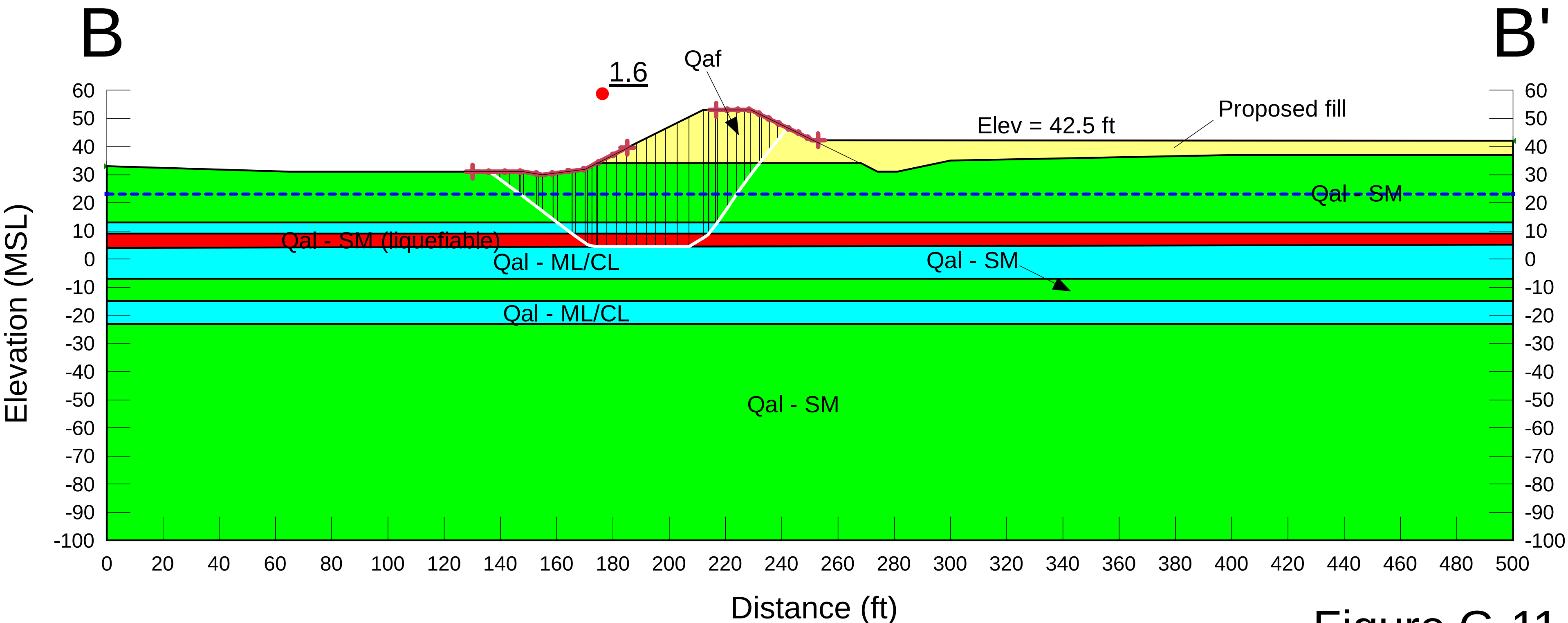


Figure G-11

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section B-B'
Name: B-B'case3.gsz
Date: 07/30/2019 Time: 10:48:13 AM

Existing Condition
Static Analysis
Residual Strength

Color	Name	Unit Weight (pcf)	Cohesion (psf)	Cohesion' (psf)	Phi' (°)
	Qaf - Artificial Fill	125		200	35
	Qal(ML/CL) - Alluvium	120		400	20
	Qal(SM) - Alluvium, Liquefied (N60=10)	110	200		
	Qal(SM) - Alluvium, Non-Liquefied	120		100	30

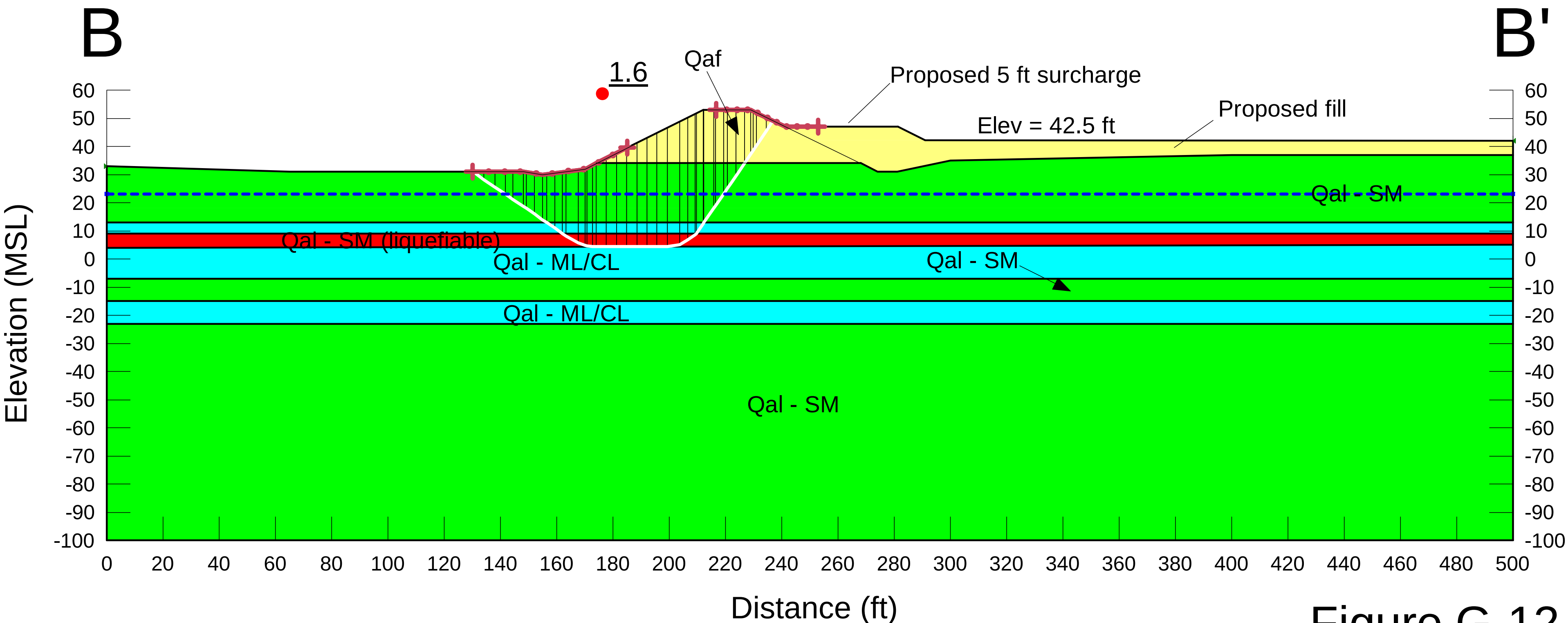


Figure G-12

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section B-B'
Name: B-B'case4.gsz
Date: 07/30/2019 Time: 10:50:30 AM

Existing Condition
Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(yellow)	Qaf - Artificial Fill	125	200	35
(cyan)	Qal(ML/CL) - Alluvium	120	400	20
(green)	Qal(SM) - Alluvium, Non-Liquefied	120	100	30

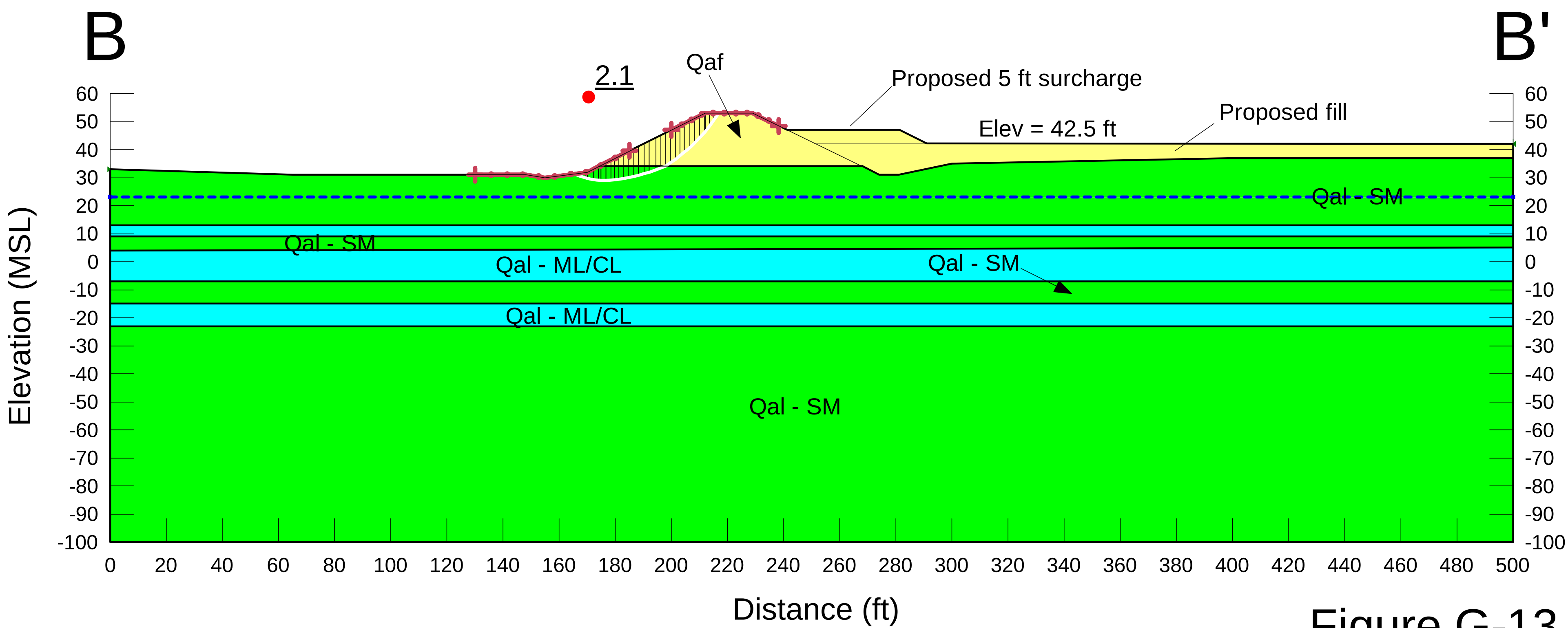


Figure G-13

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section B-B'
Name: B-B'case4s.gsz
Date: 07/30/2019 Time: 10:52:08 AM

Existing Condition
Seismic Analysis
keq = 0.13g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Yellow	Qaf - Artificial Fill	125	200	35
Cyan	Qal(ML/CL) - Alluvium	120	400	20
Green	Qal(SM) - Alluvium, Non-Liquefied	120	100	30

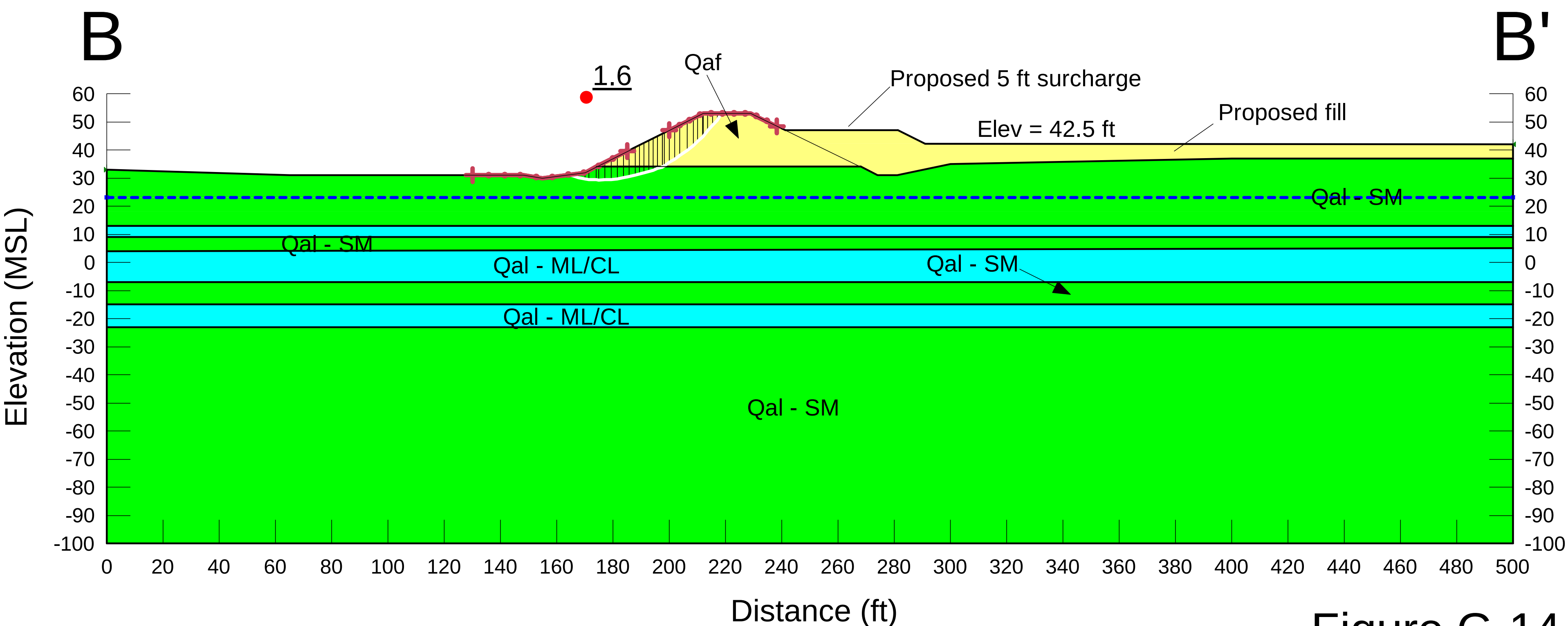


Figure G-14

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	Zephyr - Oceanside	Computed By	TEM
Project Number	G2322-32-01		
Date	07/24/19		
Filename	BB-Case4s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.22	10% in 50 years
Modal Magnitude, M	6.9	
Modal Distance, r, km	11.8	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	13.284	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.618	

Initial Screening with MHEA = MHA = $k_{max}g$

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.5818
k_{EQ} = feq(MHA_r)/g	0.128
Factor of Safety in Slope Analysis Using k_{EQ}	1.60

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, $T_s = 4H/V_s$, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.18
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA

Estimated Displacement, u (cm) NA

FIGURE G-15

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section B-B'
Name: B-B'case5.gsz
Date: 07/24/2019 Time: 10:09:52 AM

Existing Condition
Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qaf - Artificial Fill	125	200	35
	Qal(ML/CL) - Alluvium	120	400	20
	Qal(SM) - Alluvium, Non-Liquefied	120	100	30

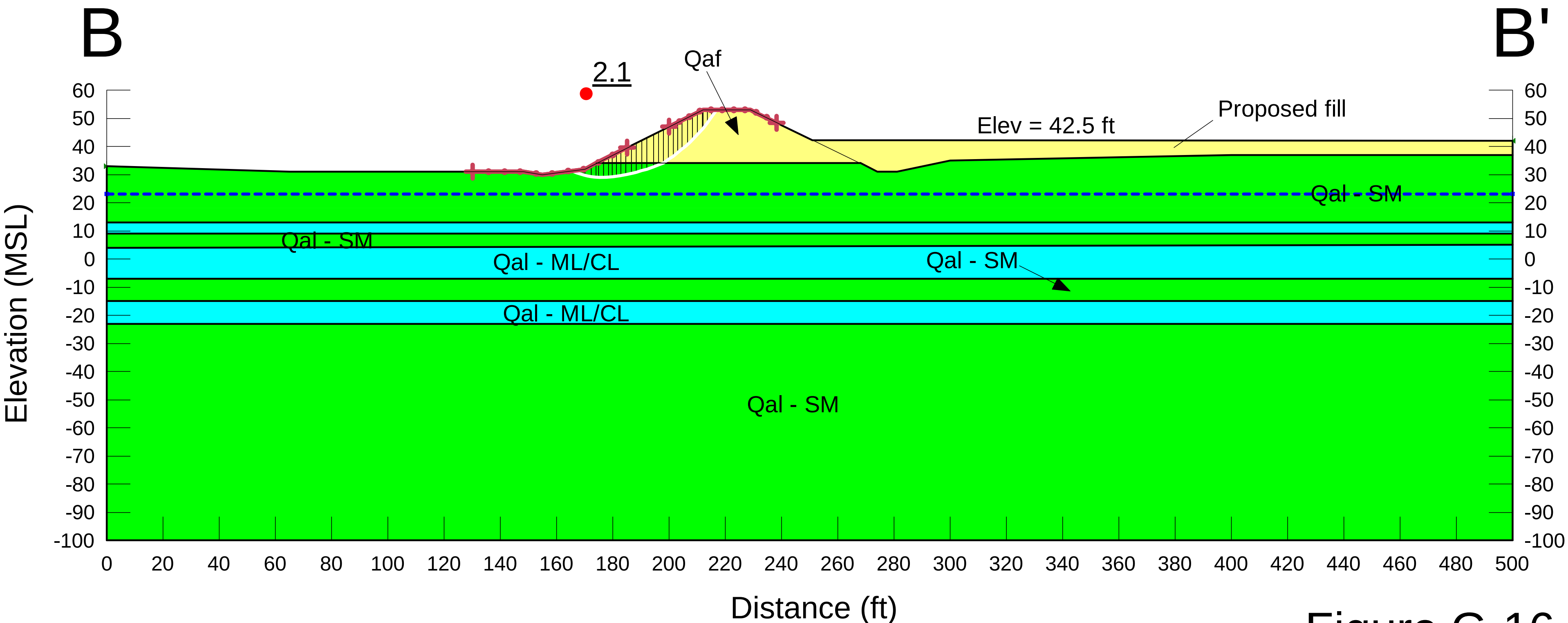


Figure G-16

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section B-B'
Name: B-B'case5s.gsz
Date: 07/24/2019 Time: 11:55:17 AM

Existing Condition
Seismic Analysis
keq = 0.13g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qaf - Artificial Fill	125	200	35
	Qal(ML/CL) - Alluvium	120	400	20
	Qal(SM) - Alluvium, Non-Liquefied	120	100	30

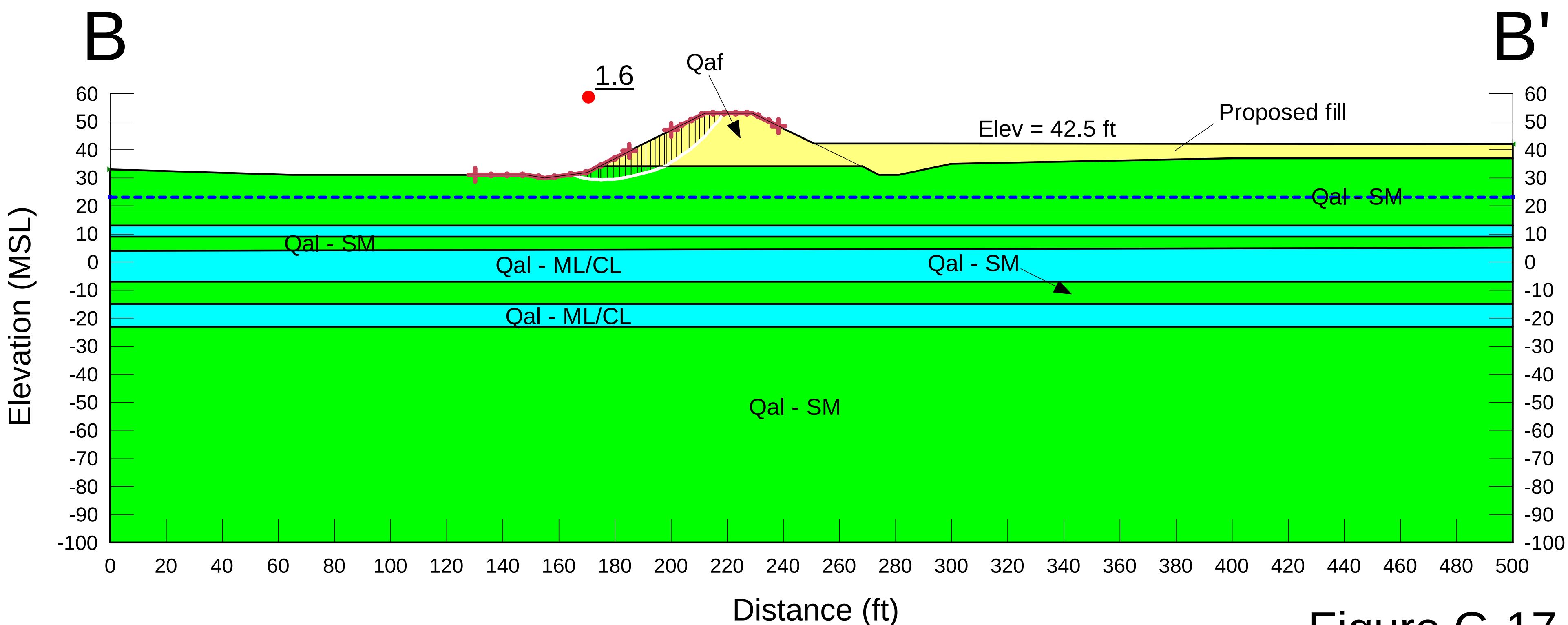


Figure G-17

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	Zephyr - Oceanside	Computed By	TEM
Project Number	G2322-32-01		
Date	07/24/19		
Filename	BB-Case5s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.22	10% in 50 years
Modal Magnitude, M	6.9	
Modal Distance, r, km	11.8	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	13.284	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.618	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.5818
k_{EQ} = feq(MHA_r)/g	0.128
Factor of Safety in Slope Analysis Using k_{EQ}	1.60

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.18
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE G-18

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section C-C'
Name: C-C'case1.gsz
Date: 07/24/2019 Time: 10:50:40 AM

Existing Condition
Static Analysis
Residual Strength

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(yellow)	Qaf - Artificial Fill	125	200	35
(cyan)	Qal(ML/CL) - Alluvium	120	400	20
(green)	Qal(SM) - Alluvium, Non-Liquefied	120	100	30

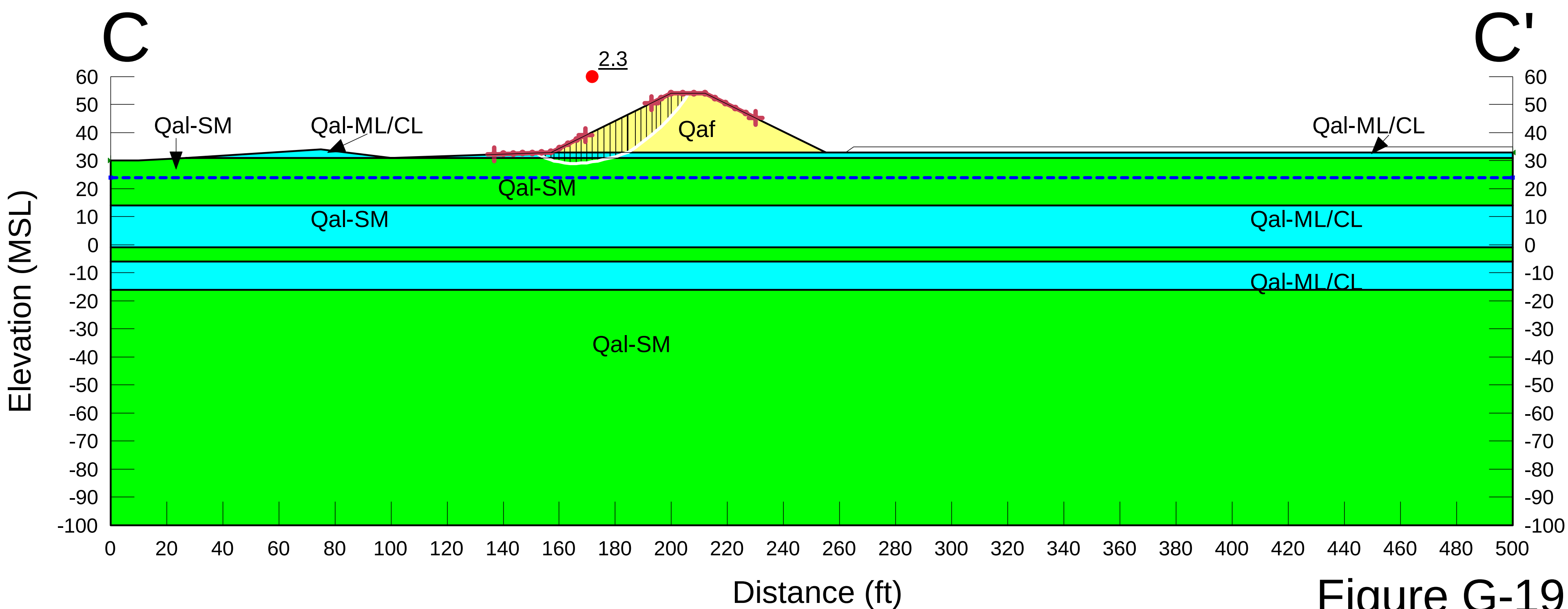


Figure G-19

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section C-C'
Name: C-C'case2.gsz
Date: 07/24/2019 Time: 11:00:39 AM

Proposed Condition
Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Yellow	Qaf - Artificial Fill	125	200	35
Cyan	Qal(ML/CL) - Alluvium	120	400	20
Green	Qal(SM) - Alluvium, Non-Liquefied	120	100	30

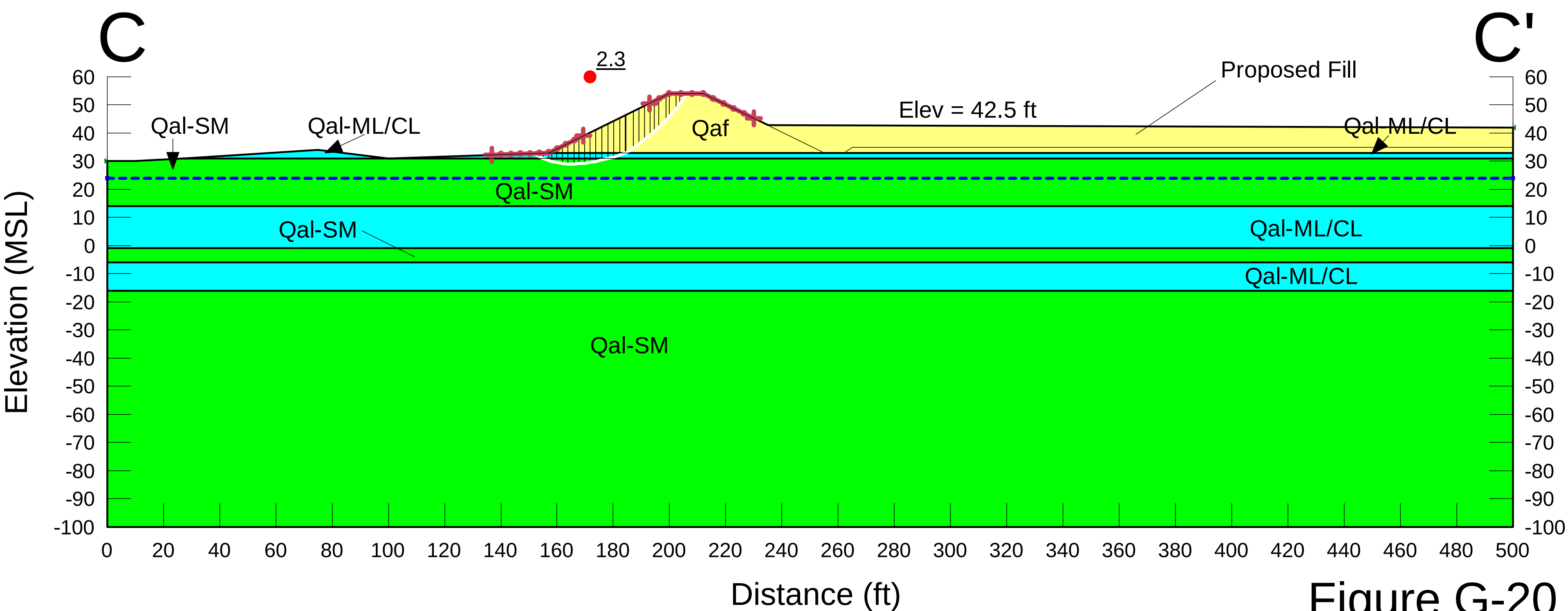


Figure G-20

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section C-C'
Name: C-C'case2s.gsz
Date: 07/24/2019 Time: 11:56:31 AM

Proposed Condition
Seismic Analysis
keq = 0.13g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Yellow	Qaf - Artificial Fill	125	200	35
Cyan	Qal(ML/CL) - Alluvium	120	400	20
Green	Qal(SM) - Alluvium, Non-Liquefied	120	100	30

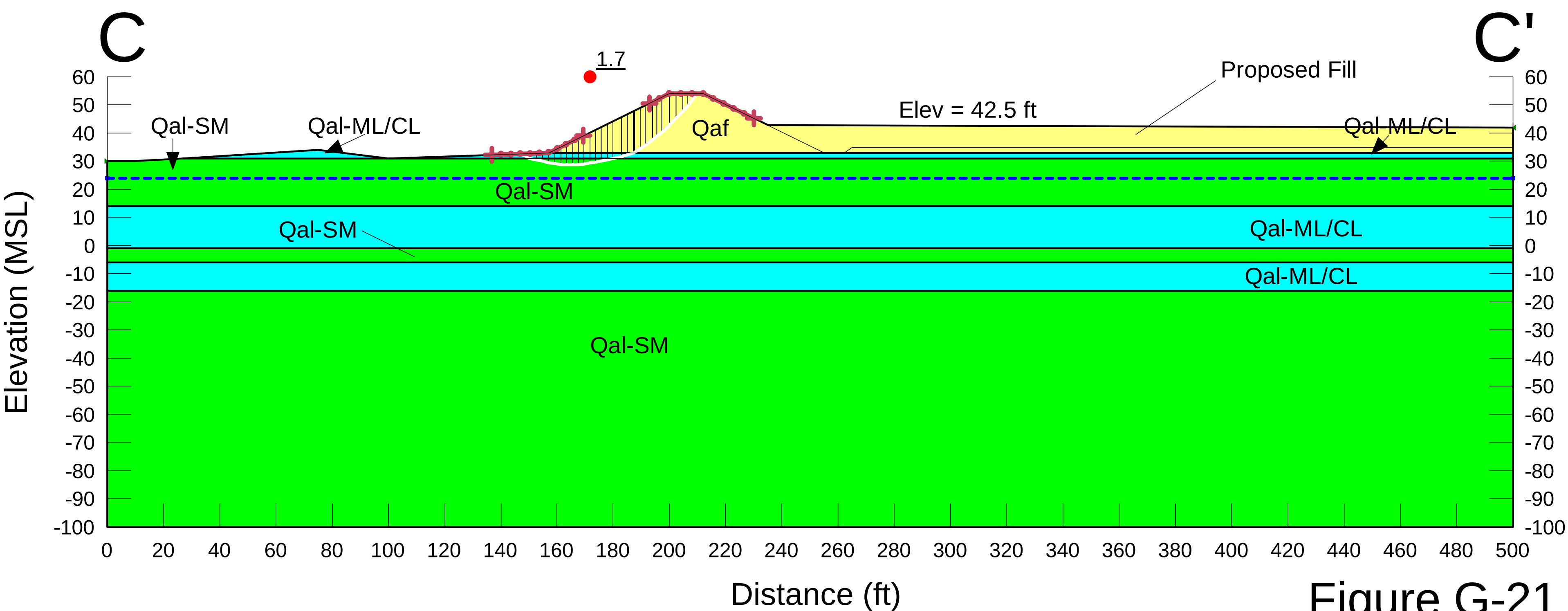


Figure G-21

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	Zephyr - Oceanside	Computed By	TEM
Project Number	G2322-32-01		
Date	07/24/19		
Filename	CC-Case2s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.22	10% in 50 years
Modal Magnitude, M	6.9	
Modal Distance, r, km	11.8	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	13.284	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.618	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.5818
k_{EQ} = feq(MHA_r)/g	0.128
Factor of Safety in Slope Analysis Using k_{EQ}	1.70

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.18
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE G-22

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section C-C'
Name: C-C'case3.gsz
Date: 07/30/2019 Time: 11:06:11 AM

Proposed Condition
Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(yellow)	Qaf - Artificial Fill	125	200	35
(cyan)	Qal(ML/CL) - Alluvium	120	400	20
(green)	Qal(SM) - Alluvium, Non-Liquefied	120	100	30

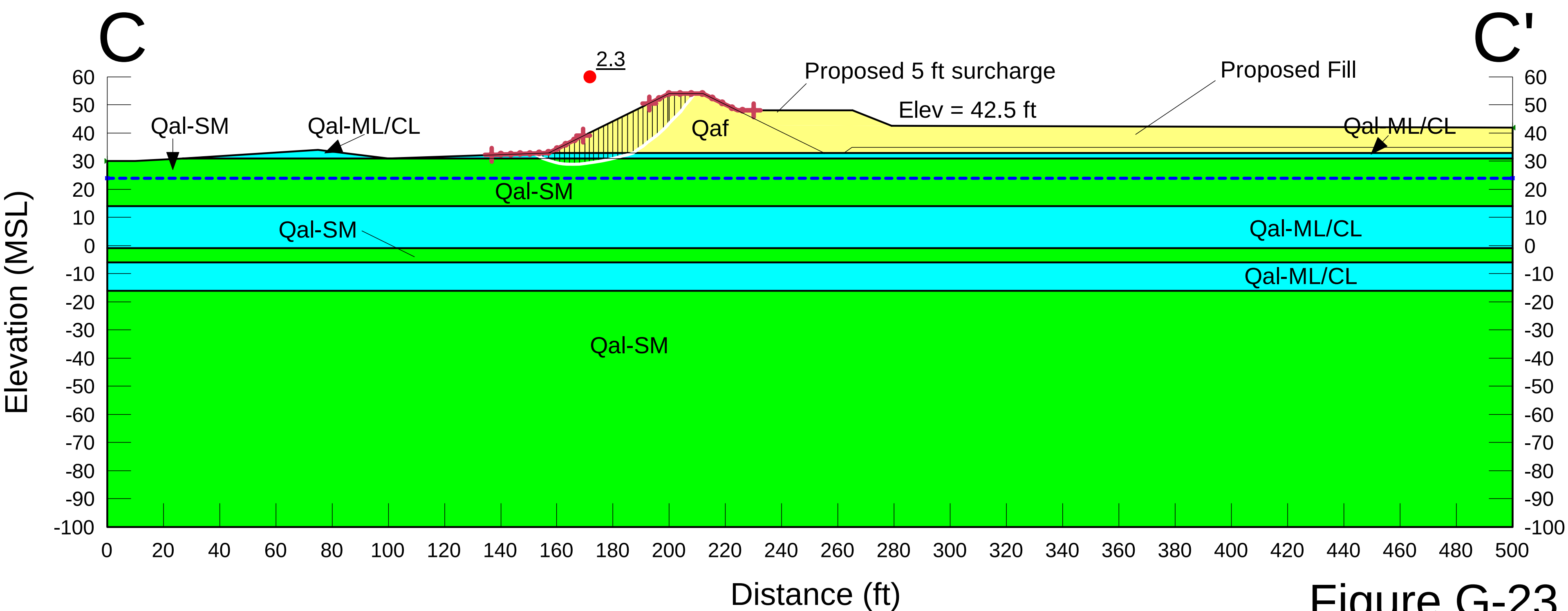


Figure G-23

Zephyr Oceanside - Bike Berm
Project No. G2322-32-01
Section C-C'
Name: C-C'case3s.gsz
Date: 07/30/2019 Time: 11:10:55 AM

Proposed Condition
Seismic Analysis
keq = 0.13g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(yellow)	Qaf - Artificial Fill	125	200	35
(cyan)	Qal(ML/CL) - Alluvium	120	400	20
(green)	Qal(SM) - Alluvium, Non-Liquefied	120	100	30

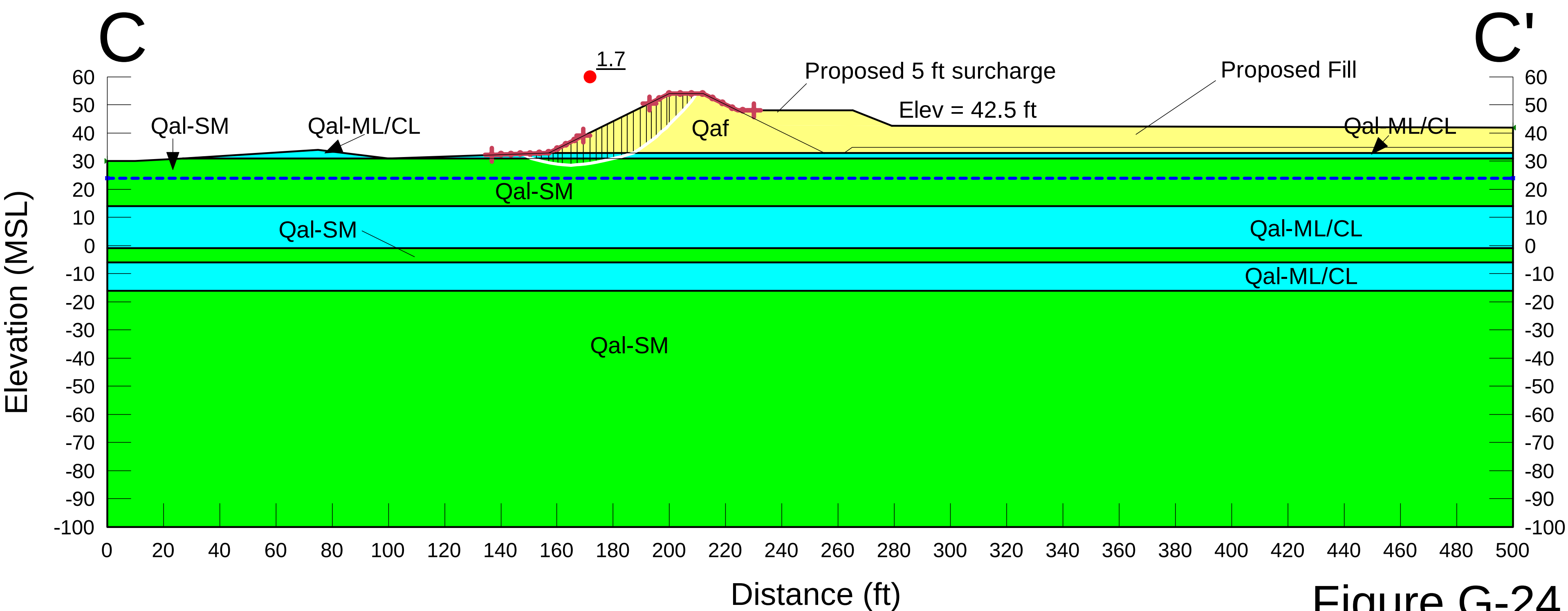


Figure G-24

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	Zephyr - Oceanside	Computed By	TEM
Project Number	G2322-32-01		
Date	07/24/19		
Filename	CC-Case3s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.22	10% in 50 years
Modal Magnitude, M	6.9	
Modal Distance, r, km	11.8	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	13.284	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.618	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.5818
k_{EQ} = feq(MHA_r)/g	0.128
Factor of Safety in Slope Analysis Using k_{EQ}	1.70

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.18
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE G-25

APPENDIX H

APPENDIX H

LATERAL SPREAD ANALYSIS

FOR

ZEPHYR – OCEANSIDE
OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

GEOCON

Prediction of Lateral Spread using Bartlett and Youd (2002)

M =	6.72	earthquake magnitude
R =	11.00	horizontal distance to seismic source (km)
R* =	13.19	horizontal distance to hypocenter of seismic energy source (km)
T(15) =	2.75	thickness of saturated layers (meters) with N1(60) < 15
F(15) =	32.00	average fines content in T(15) passing #200
D50(15) =	0.11	average D50 in T(15) (mm)
H =	20.00	height of free face (feet)
S=	0.01	ground slope, %

FREE FACE COMPONENT			
Distance From Slope Face, L (feet)	W	DH (meters)	DH (feet)
50	40.0	0.7	2.3
75	26.7	0.6	1.8
100	20.0	0.5	1.6
125	16.0	0.4	1.4
150	13.3	0.4	1.2
200	10.0	0.3	1.0

W = free face ratio (%), 100(H/L)
DH = predicted horizontal ground displacement

GROUND SLOPE COMPONENT			
Distance From Slope Face, L (feet)	W	DH (meters)	DH (feet)
50	40.0	0.1	0.2
100	20.0	0.1	0.2
200	10.0	0.1	0.2
300	6.7	0.1	0.2
400	5.0	0.1	0.2
500	4.0	0.1	0.2

S = ground slope, %
DH = predicted horizontal ground displacement

FIGURE H-1

GEOCON

Prediction of Lateral Spread using Bartlett and Youd (2002)

M =	6.72	earthquake magnitude
R =	11.00	horizontal distance to seismic source (km)
R* =	13.19	horizontal distance to hypocenter of seismic energy source (km)
T(15) =	3.66	thickness of saturated layers (meters) with N1(60) < 15
F(15) =	35.00	average fines content in T(15) passing #200
D50(15) =	0.10	average D50 in T(15) (mm)
H =	20.00	height of free face (feet)
S=	0.01	ground slope, %

FREE FACE COMPONENT			
Distance From Slope Face, L (feet)	W	DH (meters)	DH (feet)
50	40.0	0.7	2.4
75	26.7	0.6	1.9
100	20.0	0.5	1.6
125	16.0	0.4	1.4
150	13.3	0.4	1.3
200	10.0	0.3	1.1

W = free face ratio (%), 100(H/L)
DH = predicted horizontal ground displacement

GROUND SLOPE COMPONENT			
Distance From Slope Face, L (feet)	W	DH (meters)	DH (feet)
50	40.0	0.1	0.2
100	20.0	0.1	0.2
200	10.0	0.1	0.2
300	6.7	0.1	0.2
400	5.0	0.1	0.2
500	4.0	0.1	0.2

S = ground slope, %
DH = predicted horizontal ground displacement

FIGURE H-2

GEOCON

Prediction of Lateral Spread using Bartlett and Youd (2002)

M =	6.72	earthquake magnitude
R =	11.00	horizontal distance to seismic source (km)
R* =	13.19	horizontal distance to hypocenter of seismic energy source (km)
T(15) =	1.50	thickness of saturated layers (meters) with N1(60) < 15
F(15) =	42.00	average fines content in T(15) passing #200
D50(15) =	0.09	average D50 in T(15) (mm)
H =	20.00	height of free face (feet)
S=	0.01	ground slope, %

FREE FACE COMPONENT			
Distance From Slope Face, L (feet)	W	DH (meters)	DH (feet)
20	100.0	0.6	1.8
25	80.0	0.5	1.6
30	66.7	0.4	1.4
40	50.0	0.4	1.2
50	40.0	0.3	1.1
100	20.0	0.2	0.7

W = free face ratio (%), 100(H/L)
DH = predicted horizontal ground displacement

GROUND SLOPE COMPONENT			
Distance From Slope Face, L (feet)	W	DH (meters)	DH (feet)
50	40.0	0.0	0.1
100	20.0	0.0	0.1
200	10.0	0.0	0.1
300	6.7	0.0	0.1
400	5.0	0.0	0.1
500	4.0	0.0	0.1

S = ground slope, %
DH = predicted horizontal ground displacement

FIGURE H-3

APPENDIX I

APPENDIX I

PREVIOUSLY REPORTED BORING LOGS BY OTHERS

FOR

ZEPHYR – OCEANSIDE
OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

BORING NUMBER B1

EEI Engineering Solutions

CLIENT Zephyr Oceanside Investments, LLC
PROJECT NAME Pavilion at Oceanside
PROJECT NUMBER ZEP-72676.4
PROJECT LOCATION North of Hwy. 76 and Mission Ave., Oceanside CA
DATE STARTED 8/31/18 **COMPLETED** 8/31/18
GROUND ELEVATION **BORING DIAMETER** 8"
EQUIPMENT / RIG B-53 truck mounted rill rig
HAMMER EFFICIENCY (%) 86
METHOD 8" Hollow Stem Auger 140 lbs Auto Hammer
SPT CORRECTION 1.43 **CAL CORRECTION** 0.79
LOGGED BY WAP **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**ALLUVIUM**										
1		SILTY SAND, brown, fine to medium-grained, dry, loose										
2												
3				MC	2 5 10	12		2	98			
4			SM									
5		@ 5' Becomes damp and medium dense		MC	7 9 14	18		5	94			
6												
7		@ 6.5' Becomes moist		MC BULK	7 12 15	21		7 10	106		50.7	#200
8												

Total depth: 8'
No groundwater encountered
Backfilled

BORING NUMBER B2

EEI Engineering Solutions

CLIENT Zephyr Oceanside Investments, LLC

PROJECT NAME Pavilion at Oceanside

PROJECT NUMBER ZEP-72676.4

PROJECT LOCATION North of Hwy. 76 and Mission Ave., Oceanside CA

DATE STARTED 8/31/18 **COMPLETED** 8/31/18

GROUND ELEVATION **BORING DIAMETER** 8"

EQUIPMENT / RIG B-53 truck mounted rill rig

HAMMER EFFICIENCY (%) 86

METHOD 8" Hollow Stem Auger 140 lbs Auto Hammer

SPT CORRECTION 1.43 **CAL CORRECTION** 0.79

LOGGED BY WAP **CHECKED BY** JB

GROUNDWATER DEPTH (ft) Not Encountered

NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**ALLUVIUM**										
1		SILTY SAND, brown, fine to medium-grained, dry, medium dense										
2								2	105			
3			SM	MC	9 11 15	20						
4		@ 4' Becomes damp						3	105			
5				MC	6 9 13	17						
6				BULK				2			4.6	#200

Total depth: 6'
No groundwater encountered
Backfilled

BORING NUMBER B3

EEI Engineering Solutions

CLIENT	Zephyr Oceanside Investments, LLC	**PROJECT NAME**	Pavilion at Oceanside
PROJECT NUMBER	ZEP-72676.4	**PROJECT LOCATION**	North of Hwy. 76 and Mission Ave., Oceanside CA
DATE STARTED	8/31/18 **COMPLETED** 8/31/18	**GROUND ELEVATION**	**BORING DIAMETER** 8"
EQUIPMENT / RIG	B-53 truck mounted rill rig	**HAMMER EFFICIENCY (%)**	86
METHOD	8" Hollow Stem Auger 140 lbs Auto Hammer	**SPT CORRECTION**	1.43 **CAL CORRECTION** 0.79
LOGGED BY	WAP **CHECKED BY** JB	**GROUNDWATER DEPTH (ft)**	Not Encountered
NOTES			

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0–2		**ALLUVIUM** SILTY SAND, brown, fine to medium-grained, dry, loose, trace rootlets		BULK				2	99			
3			SM	MC	4 5 5	8						
5		@ 5' Becomes damp and medium dense						5	100			
6				MC	5 7 9	13		4	96			
7		@ 6.5' SILTY SAND, tan to gray, fine to medium-grained, trace coarse-grained sand, damp, loose	SM	MC	5 7 8	12					11.7	#200
8				BULK				5				

Total depth: 8'
No groundwater encountered
Backfilled

BORING NUMBER B4

EEI Engineering Solutions

CLIENT Zephyr Oceanside Investments, LLC
PROJECT NAME Pavilion at Oceanside
PROJECT NUMBER ZEP-72676.4
PROJECT LOCATION North of Hwy. 76 and Mission Ave., Oceanside CA
DATE STARTED 8/31/18 **COMPLETED** 8/31/18
GROUND ELEVATION **BORING DIAMETER** 8"
EQUIPMENT / RIG B-53 truck mounted rill rig
HAMMER EFFICIENCY (%) 86
METHOD 8" Hollow Stem Auger 140 lbs Auto Hammer
SPT CORRECTION 1.43 **CAL CORRECTION** 0.79
LOGGED BY WAP **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**ALLUVIUM** SILTY SAND, gray, fine-grained, damp, loose	SM									
1												
2								2	92			
3				MC	3 6 6	9						
4								2	96			
5				MC	4 7 6	10						
6				BULK				2	95			

Total depth: 6'
No groundwater encountered
Backfilled

BORING NUMBER B5

EEI Engineering Solutions

CLIENT Zephyr Oceanside Investments, LLC
PROJECT NAME Pavilion at Oceanside
PROJECT NUMBER ZEP-72676.4
PROJECT LOCATION North of Hwy. 76 and Mission Ave., Oceanside CA
DATE STARTED 8/31/18 **COMPLETED** 8/31/18
GROUND ELEVATION **BORING DIAMETER** 8"
EQUIPMENT / RIG B-53 truck mounted rill rig
HAMMER EFFICIENCY (%) 86
METHOD 8" Hollow Stem Auger 140 lbs Auto Hammer
SPT CORRECTION 1.43 **CAL CORRECTION** 0.79
LOGGED BY WAP **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0–1		**ALLUVIUM** SILTY SAND, brown, fine-grained, dry, medium dense										
2–3			SM	MC	6 8 8	13		3	96			
4–5		@ 4' SILTY SAND, tan to gray, fine to medium-grained, damp to moist, loose	SM	MC	4 6 6	9		2	91			
6				BULK				2			1.8	#200

Total depth: 6'
No groundwater encountered
Backfilled

BORING NUMBER B6

CLIENT Zephyr Oceanside Investments, LLC
PROJECT NAME Pavilion at Oceanside
PROJECT NUMBER ZEP-72676.4
PROJECT LOCATION North of Hwy. 76 and Mission Ave., Oceanside CA
DATE STARTED 8/31/18 **COMPLETED** 8/31/18
GROUND ELEVATION **BORING DIAMETER** 8"
EQUIPMENT / RIG B-53 truck mounted rill rig
HAMMER EFFICIENCY (%) 86
METHOD 8" Hollow Stem Auger 140 lbs Auto Hammer
SPT CORRECTION 1.43 **CAL CORRECTION** 0.79
LOGGED BY WAP **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0–1		**ALLUVIUM** SILTY SAND, tan to brown, fine to medium-grained, damp, medium dense	SM									
2–3				BULK MC	4 7 12	15		2	102			
5		@ 5' Becomes loose		MC	4 6 9	12		3	96			
6								2	101			
7–8		@ 7' SILTY SAND and SANDY SILT, brown, fine to medium-grained, moist, loose/stiff	SM	MC BULK	3 5 10	12		18			43.2	#200

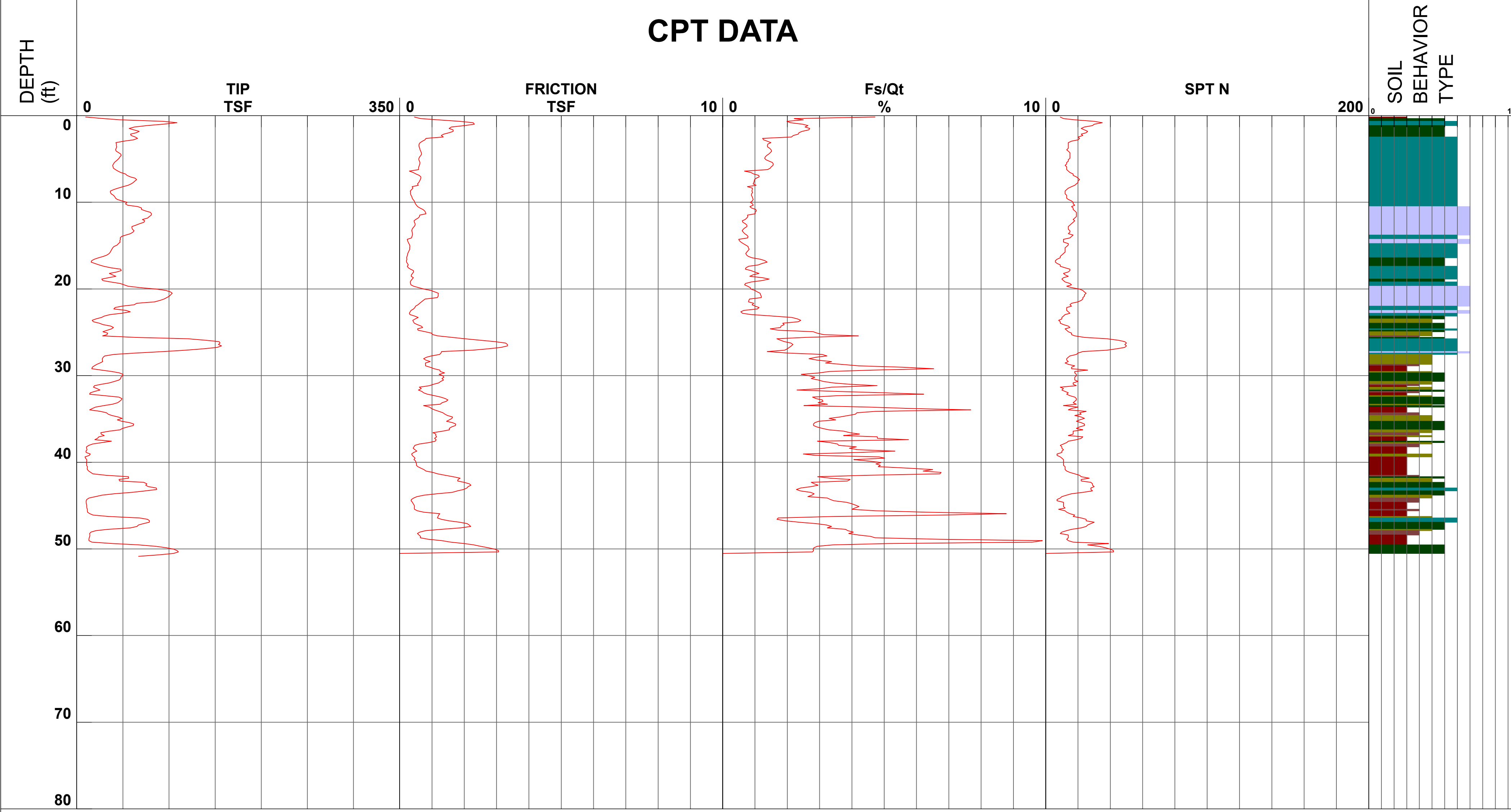
Total depth: 8'
No groundwater encountered
Backfilled

EEI Engineering Solutions

Project	Oceanside Pavillion	Operator	BH AS	Filename	SDF(136).cpt
Job Number	ZEP-72676.4	Cone Number	DDG1448	GPS	
Hole Number	CPT-01	Date and Time	8/21/2018 11:04:41 AM	Maximum Depth	50.85 ft
EST GW Depth During Test		11.40 ft			

Net Area Ratio .8

CPT DATA



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

Cone Size 10cm squared

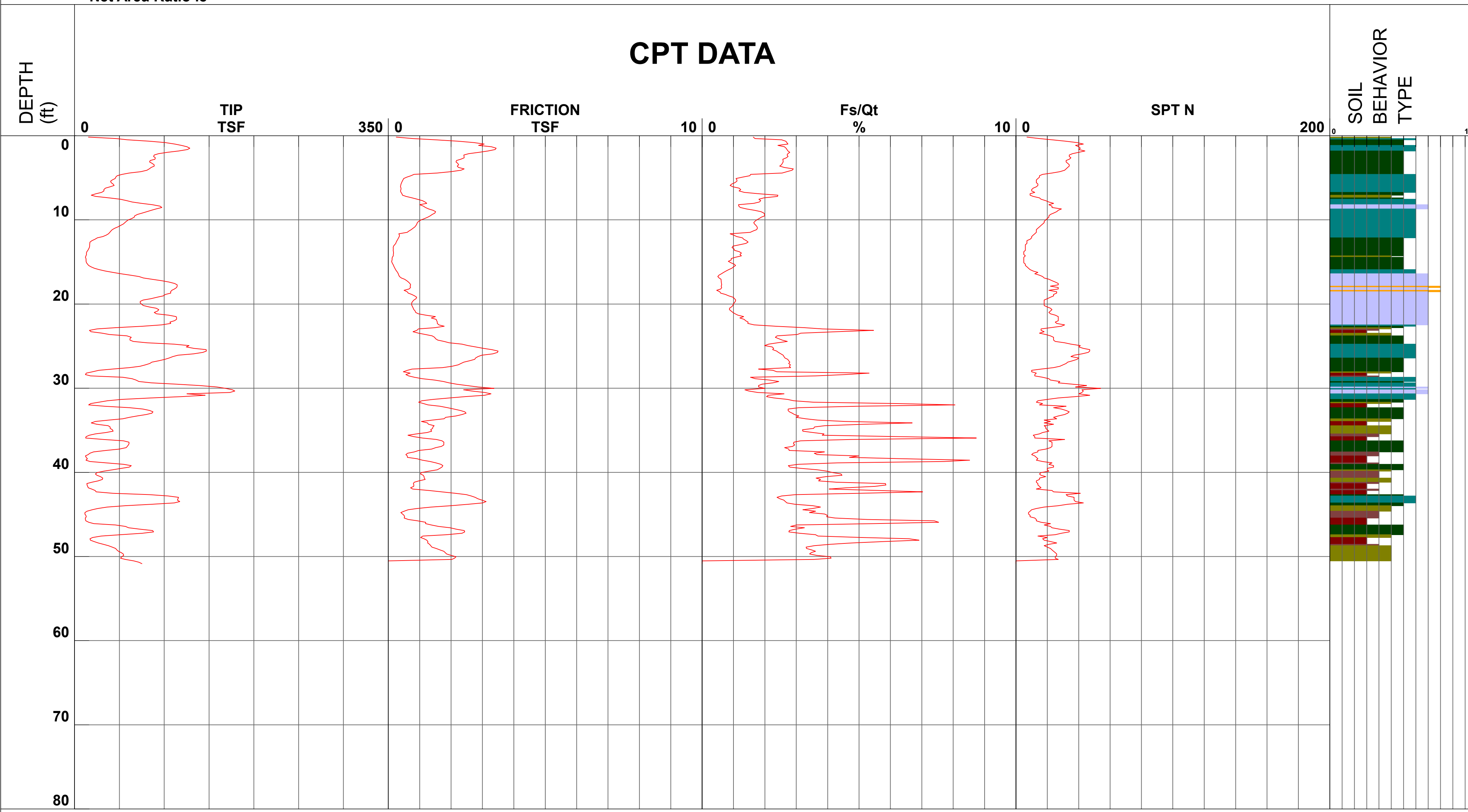
S*Soil behavior type and SPT based on data from UBC-1983

EEI Engineering Solutions

Project	Oceanside Pavillion	Operator	BH AS	Filename	SDF(137).cpt
Job Number	ZEP-72676.4	Cone Number	DDG1448	GPS	
Hole Number	CPT-02	Date and Time	8/21/2018 11:54:25 AM	Maximum Depth	50.85 ft
EST GW Depth During Test		12.80 ft			

Net Area Ratio .8

CPT DATA



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

Cone Size 10cm squared

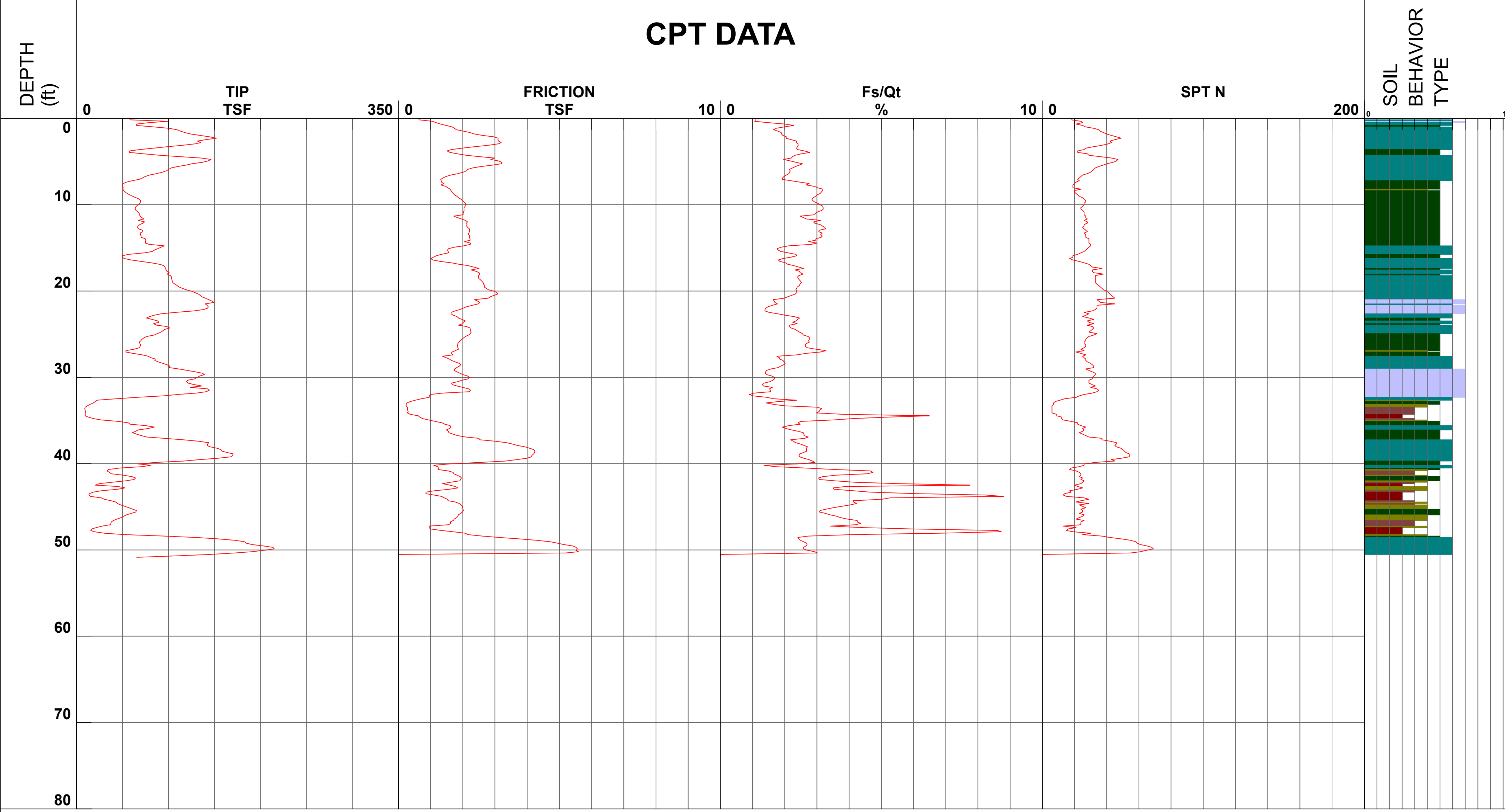
S*Soil behavior type and SPT based on data from UBC-1983

EEI Engineering Solutions

Project	Oceanside Pavillion	Operator	BH AS	Filename	SDF(133).cpt
Job Number	ZEP-72676.4	Cone Number	DDG1448	GPS	
Hole Number	CPT-03	Date and Time	8/21/2018 8:18:48 AM	Maximum Depth	50.85 ft
EST GW Depth During Test		19.40 ft			

Net Area Ratio .8

CPT DATA



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

Cone Size 10cm squared

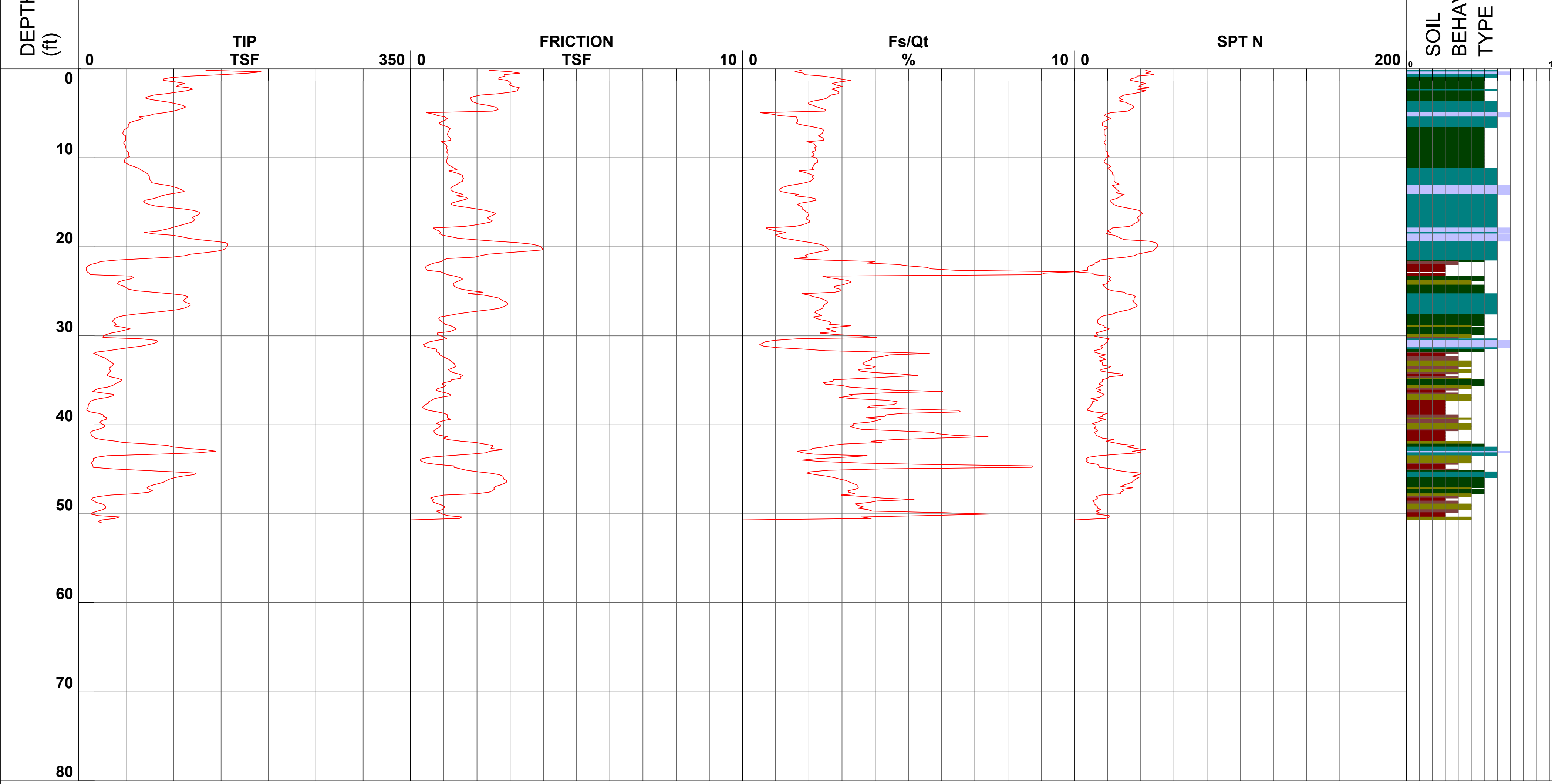
S*Soil behavior type and SPT based on data from UBC-1983

EEI Engineering Solutions

Project	Oceanside Pavillion	Operator	BH AS	Filename	SDF(135).cpt
Job Number	ZEP-72676.4	Cone Number	DDG1448	GPS	
Hole Number	CPT-04	Date and Time	8/21/2018 10:08:38 AM	Maximum Depth	51.02 ft
EST GW Depth During Test		12.50 ft			

Net Area Ratio .8

CPT DATA



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

Cone Size 10cm squared

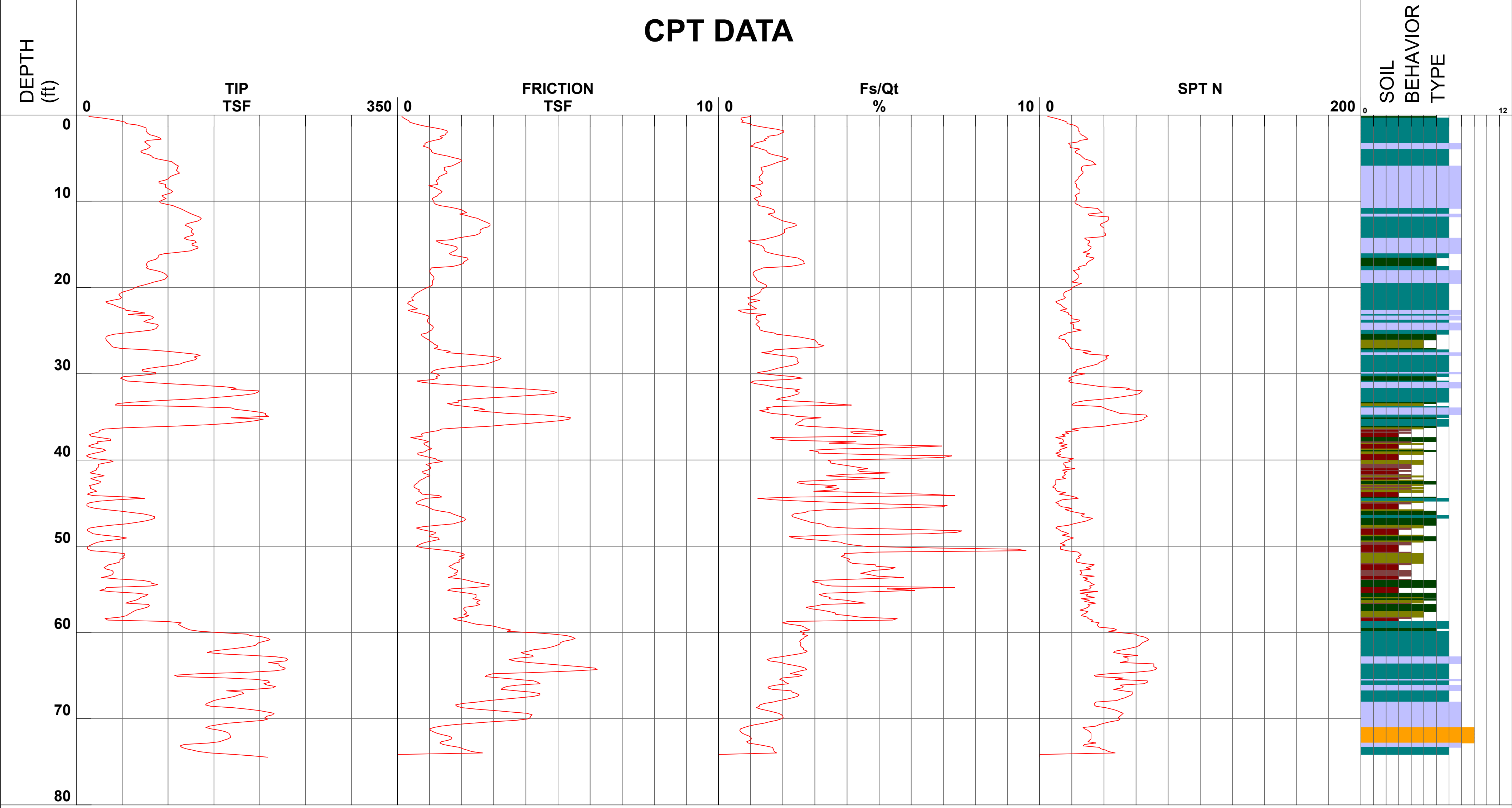
S*Soil behavior type and SPT based on data from UBC-1983

EEI Engineering Solutions

Project	Oceanside Pavillion	Operator	BH AS	Filename	SDF(138).cpt
Job Number	ZEP-72676.4	Cone Number	DDG1448	GPS	
Hole Number	CPT-05	Date and Time	8/21/2018 12:42:29 PM	Maximum Depth	74.47 ft
EST GW Depth During Test		15.00 ft			

Net Area Ratio .8

CPT DATA



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

Cone Size 10cm squared

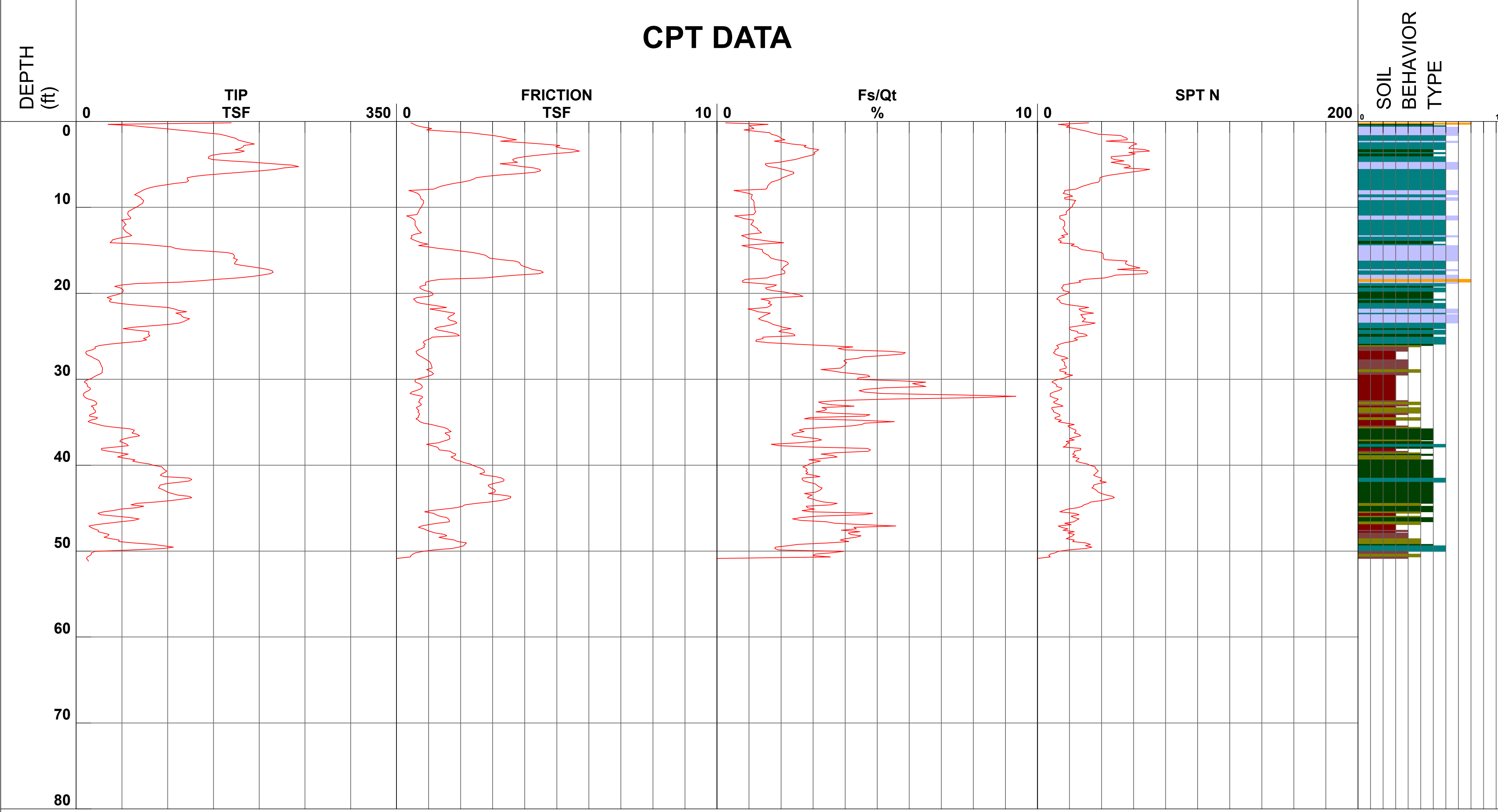
S*Soil behavior type and SPT based on data from UBC-1983

EEI Engineering Solutions

Project	Oceanside Pavillion	Operator	BH AS	Filename	SDF(134).cpt
Job Number	ZEP-72676.4	Cone Number	DDG1448	GPS	
Hole Number	CPT-06	Date and Time	8/21/2018 9:10:41 AM	Maximum Depth	51.18 ft
EST GW Depth During Test		17.10 ft			

Net Area Ratio .8

CPT DATA



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

Cone Size 10cm squared

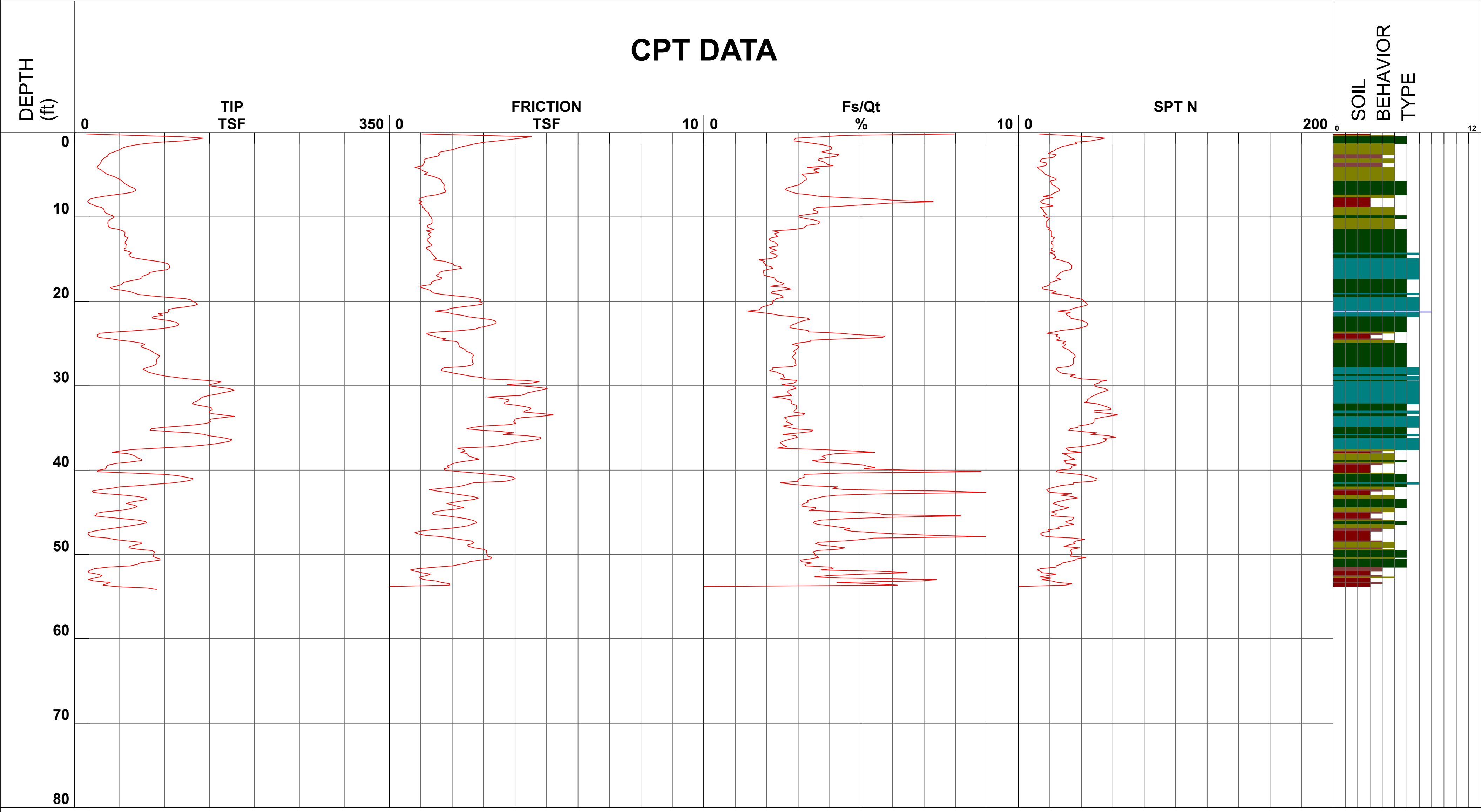
S*Soil behavior type and SPT based on data from UBC-1983

EEI Engineering Solutions

Project	Oceanside Pavillion	Operator	RC AS	Filename	SDF(130).cpt
Job Number	ZEP-72676.4	Cone Number	DDG1448	GPS	
Hole Number	CPT-07	Date and Time	8/20/2018 11:52:15 AM	Maximum Depth	54.13 ft
EST GW Depth During Test		19.90 ft			

Net Area Ratio .8

CPT DATA



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

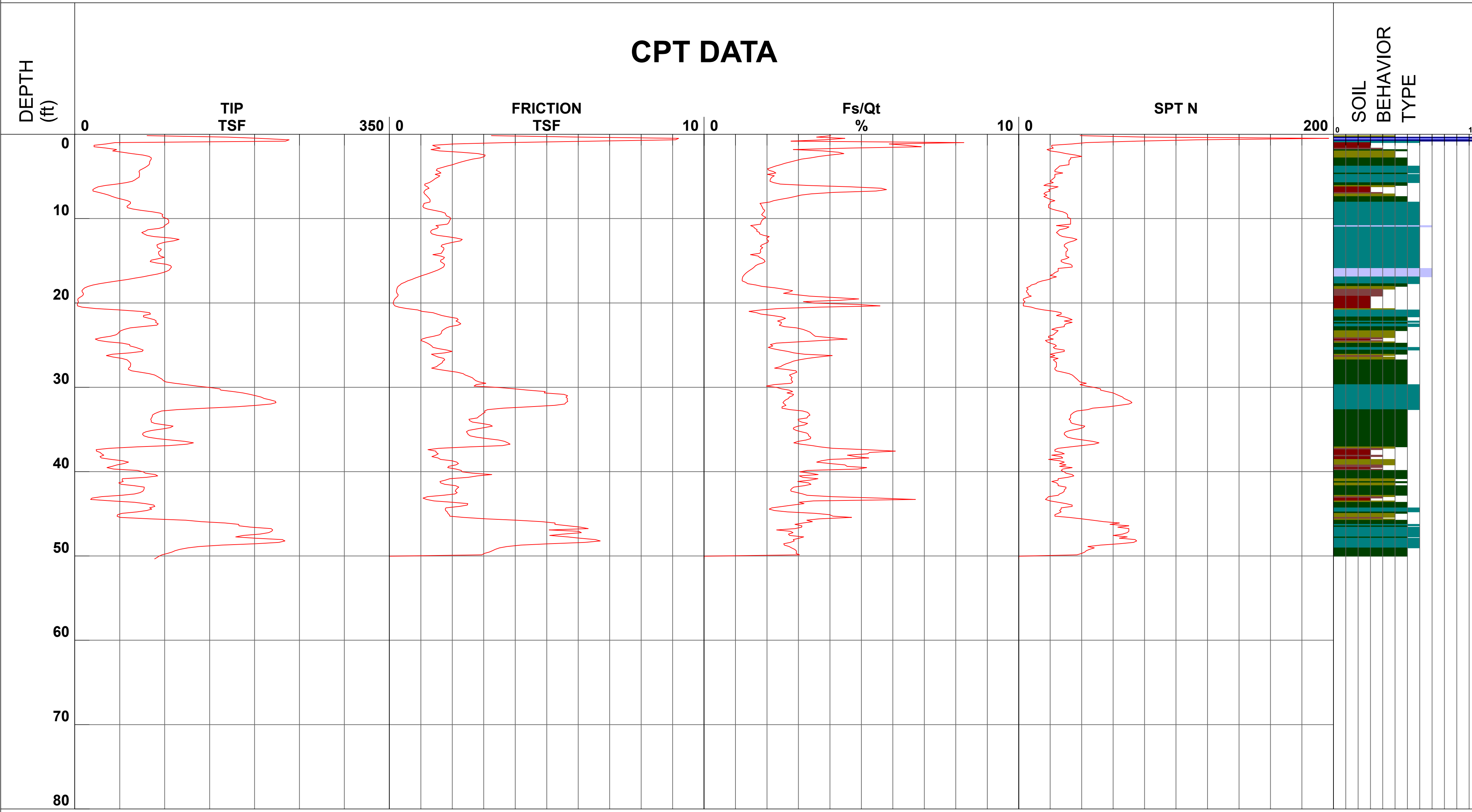
Cone Size 10cm squared

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

EEI Engineering Solutions

Project	Oceanside Pavillion	Operator	RC AS	Filename	SDF(127).cpt
Job Number	ZEP-72676.4	Cone Number	DDG1448	GPS	
Hole Number	CPT-08	Date and Time	8/20/2018 8:12:01 AM	Maximum Depth	50.36 ft
EST GW Depth During Test		19.00 ft			

Net Area Ratio .8



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

Cone Size 10cm squared

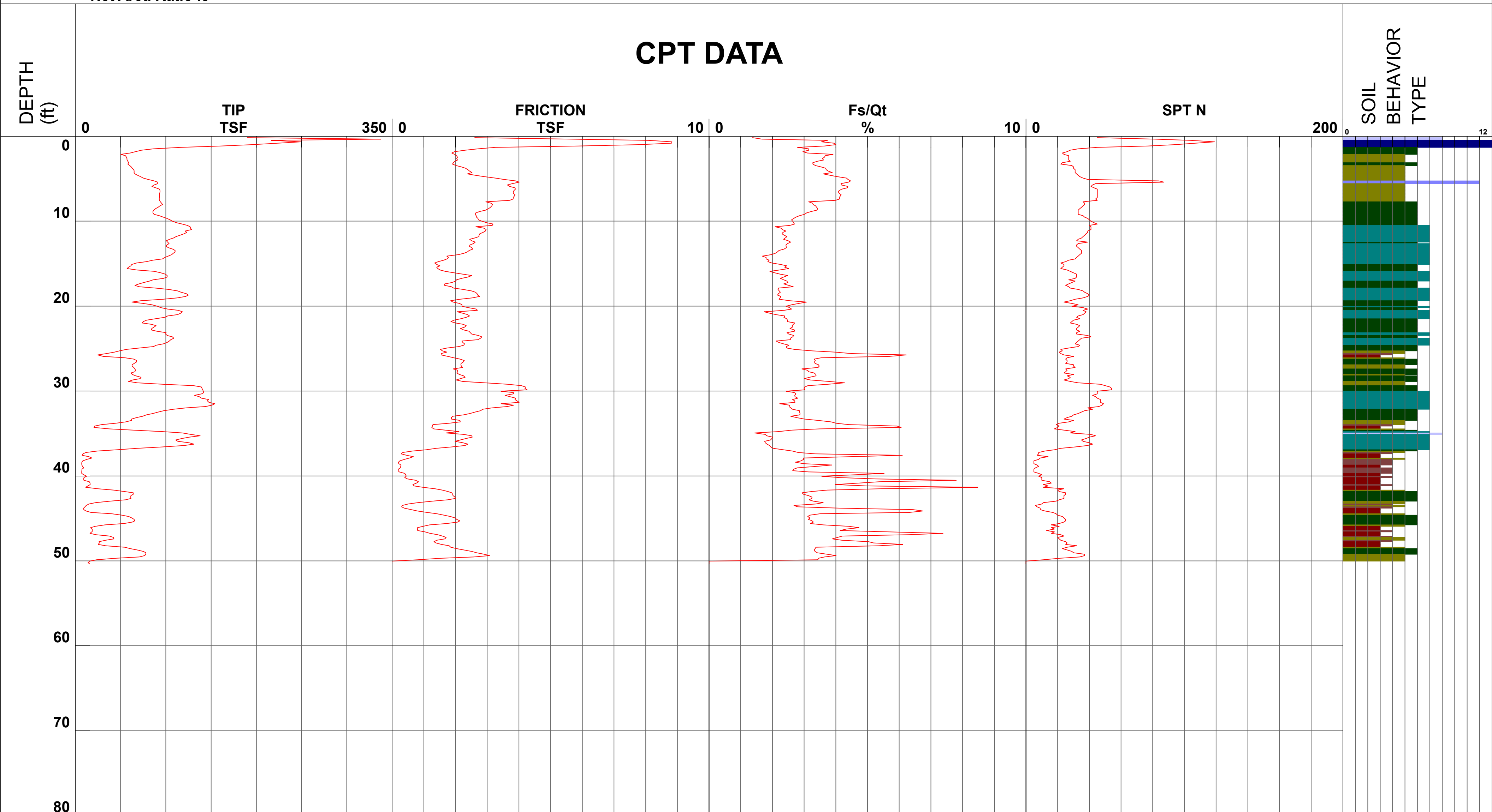
S*Soil behavior type and SPT based on data from UBC-1983

EEI Engineering Solutions

Project	Oceanside Pavillion	Operator	RC AS	Filename	SDF(128).cpt
Job Number	ZEP-72676.4	Cone Number	DDG1448	GPS	
Hole Number	CPT-09	Date and Time	8/20/2018 8:55:22 AM	Maximum Depth	50.36 ft
EST GW Depth During Test		17.20 ft			

Net Area Ratio .8

CPT DATA



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

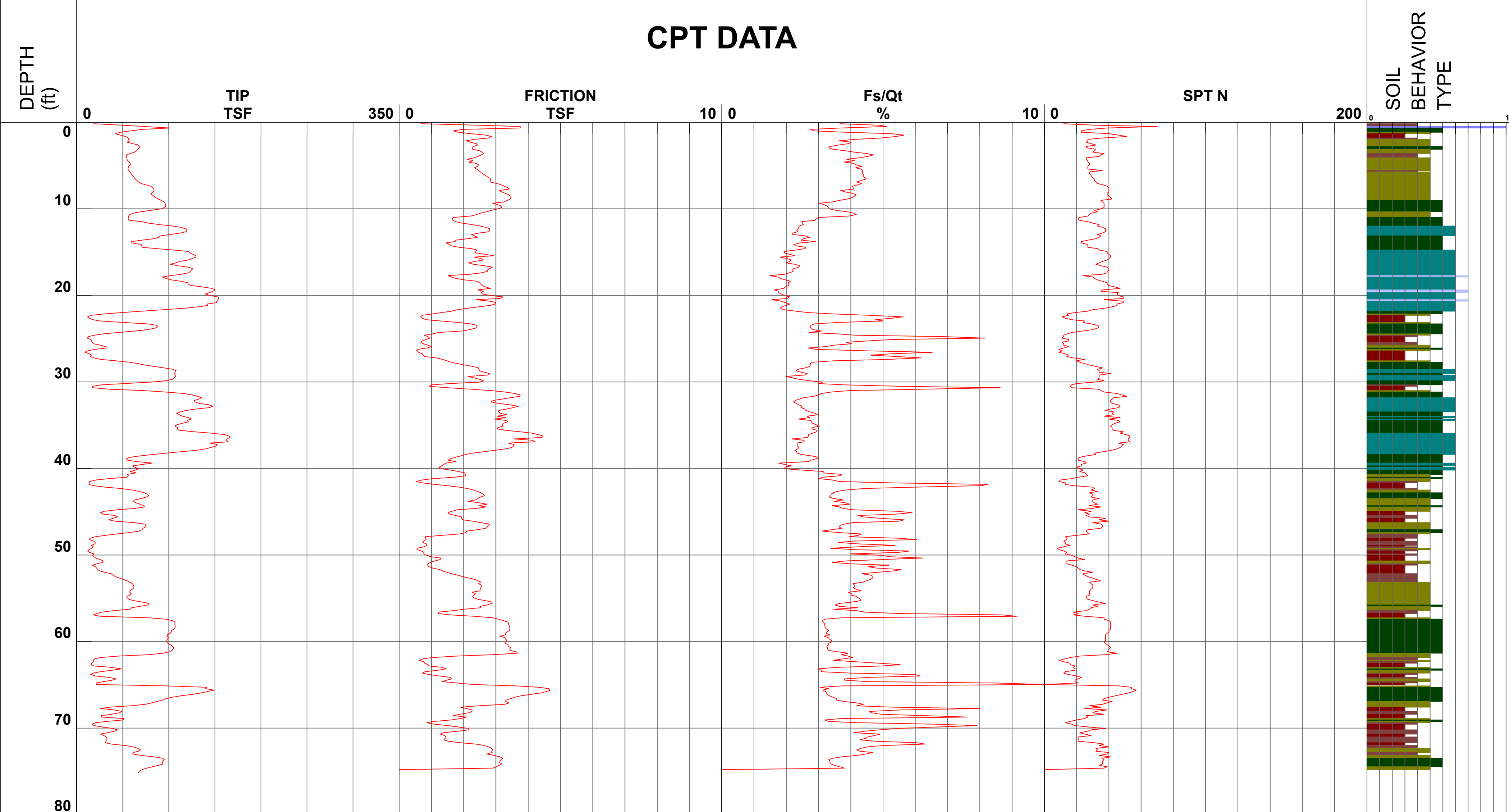
Cone Size 10cm squared

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

EEI Engineering Solutions

Project	Oceanside Pavillion	Operator	RC AS	Filename	SDF(129).cpt
Job Number	ZEP-72676.4	Cone Number	DDG1448	GPS	
Hole Number	CPT-10	Date and Time	8/20/2018 9:50:27 AM	Maximum Depth	75.13 ft
EST GW Depth During Test		16.80 ft			

Net Area Ratio .8



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

Cone Size 10cm squared

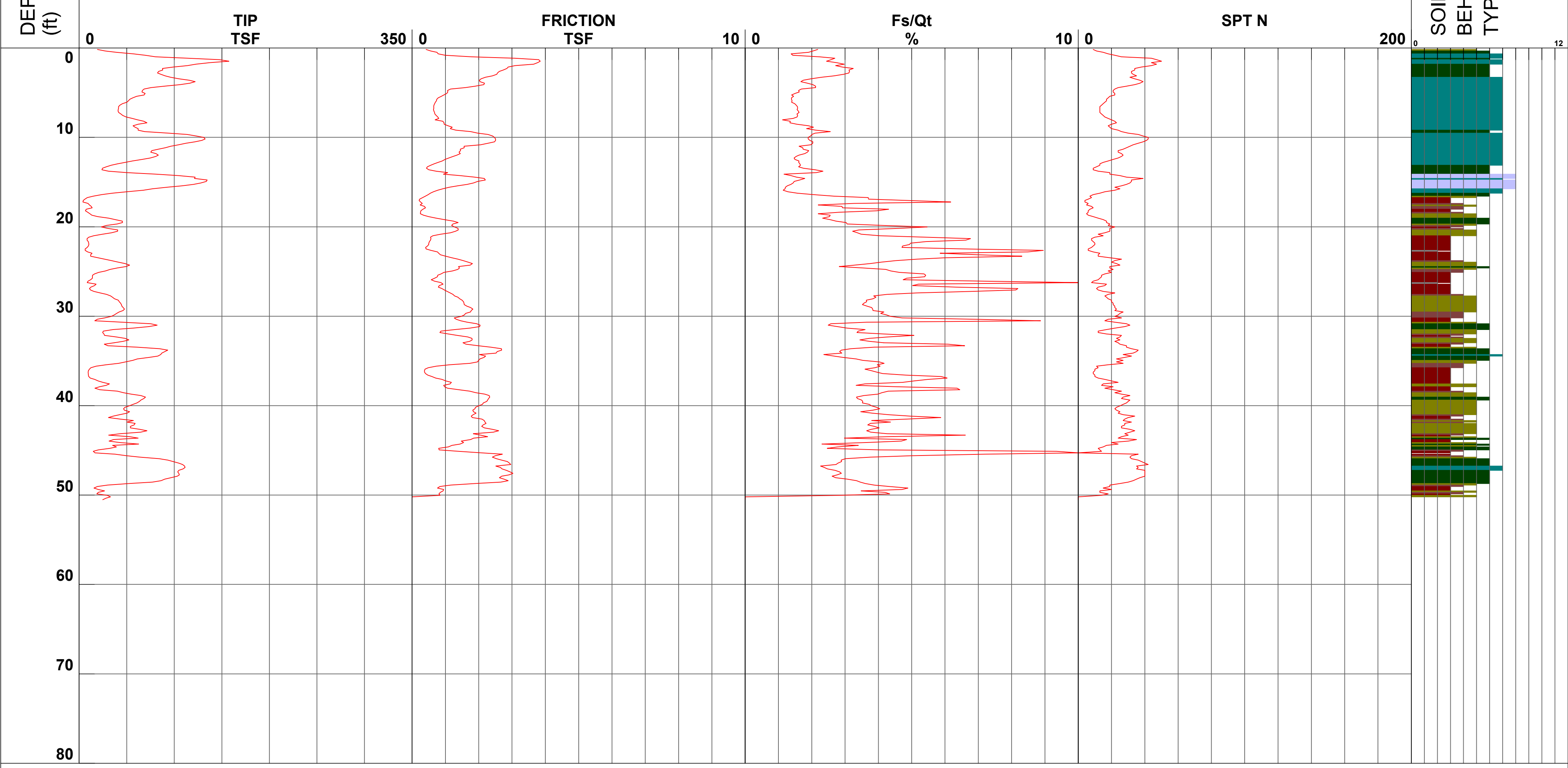
S*Soil behavior type and SPT based on data from UBC-1983

EEI Engineering Solutions

Project	Oceanside Pavillion	Operator	RC AS	Filename	SDF(131).cpt
Job Number	ZEP-72676.4	Cone Number	DDG1448	GPS	
Hole Number	CPT-11	Date and Time	8/20/2018 12:44:00 PM	Maximum Depth	50.52 ft
EST GW Depth During Test		13.90 ft			

Net Area Ratio .8

CPT DATA



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

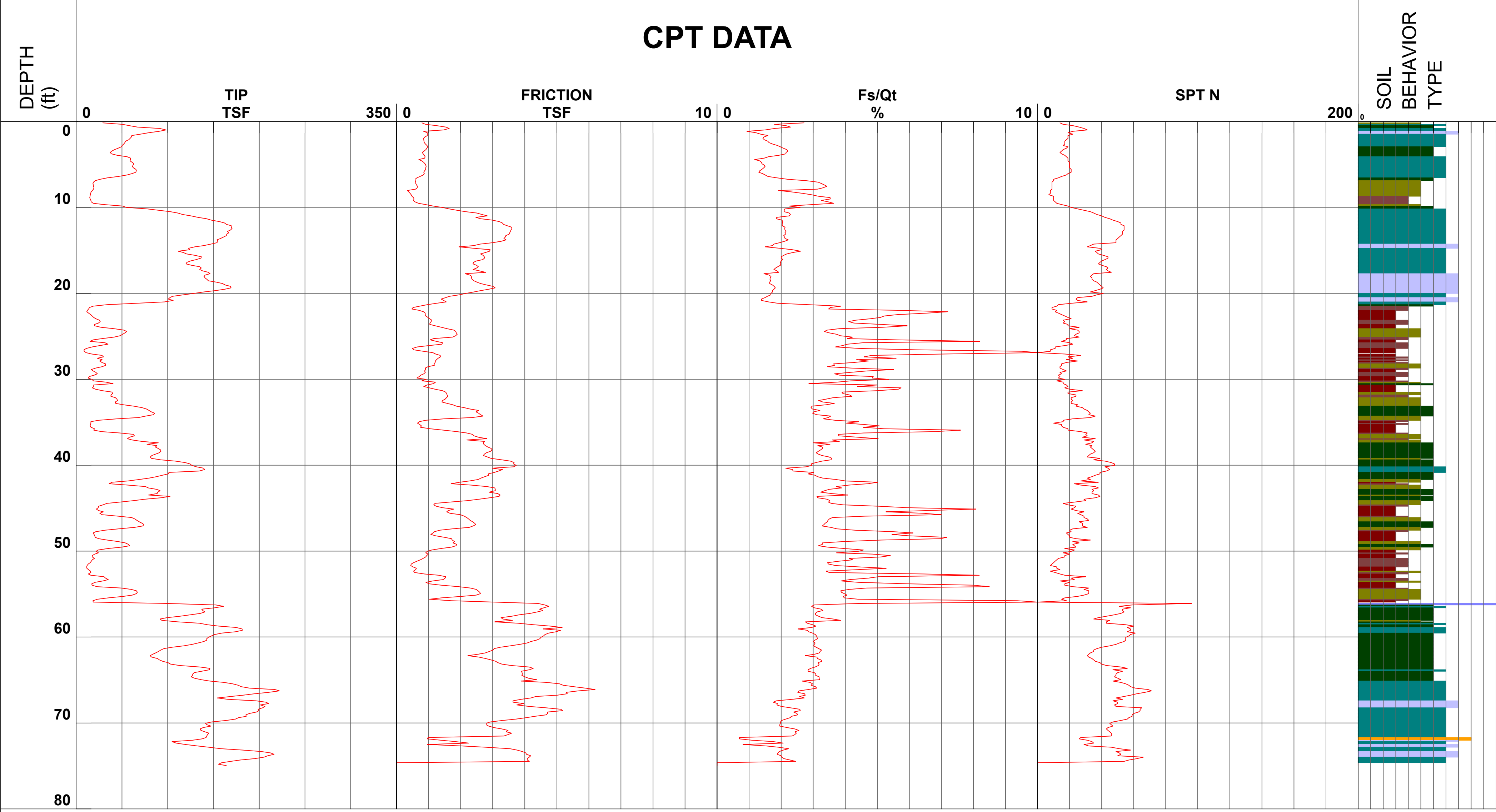
Cone Size 10cm squared

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

EEI Engineering Solutions

Project	Oceanside Pavillion	Operator	RC AS	Filename	SDF(132).cpt
Job Number	ZEP-72676.4	Cone Number	DDG1448	GPS	
Hole Number	CPT-12	Date and Time	8/20/2018 1:35:27 PM	Maximum Depth	74.97 ft
EST GW Depth During Test		16.50 ft			

Net Area Ratio .8



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

Cone Size 10cm squared

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

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	B-01
Client:	Thomas Enterprises - The Pavillion at Oceanside
Sheet:	1 of 2
Location:	Foussat Road and HWY 76, Oceanside, CA 92058
Date Started:	8/26/2008
Date Finished:	8/26/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B61; Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0		ALLUVIUM
	SPT	2 3 4			2.5	SM	@ 2.5' SILTY-SAND, brown, fine to medium grained sand, minor silt, dry, loose
	MC	3 3 4	94.0	11.1	5	SM	@ 5' SILTY-SAND, brown, fine to medium grained sand, minor silt, dry, loose
	SPT	2 2 2			7.5	SM	@ 7.5' SILTY-SAND, slightly moist, loose
	MC	2 4 7	100.9	20.8	10	SM	@ 10' SILTY-SAND, slightly moist, loose
	SPT	3 4 6			12.5	SM	@ 12.5' SILTY-SAND, brownish-gray, moist, medium dense
	SPT	3 5 7			15	SM	@ 15' SILTY-SAND, saturated, medium dense
	SPT	2 2 3			20	SM	@ 20' SILTY-SAND, saturated, loose
	SPT	2 2 2			25	ML	@ 25' SANDY-SILT, gray, fine grained sand, saturated, loose
	SPT	2 3 7			30	ML	@ 30' SANDY-SILT, gray, fine grained sand, saturated, loose to medium dense

Groundwater symbol (▽) shown at approximately 15 ft. Depth scale runs 1–34 ft.

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	B-01
Client:	Thomas Enterprises - The Pavillion at Oceanside
Sheet:	2 of 2
Location:	Foussat Road and HWY 76 Oceanside, CA 92058
Date Started:	8/26/2008
Date Finished:	8/26/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B61 Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG						BOREHOLE LOG		
Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
	SPT	4 7 10			35–40	ML		@ 25' SANDY-SILT, gray, fine grained sand, saturated, loose @ 35' SANDY-SILT, brown, fine to medium grained sand, saturated, medium dense
	SPT	2 2 3			40–45	ML		@ 40' dark gray, minor clay
	SPT	3 3 4			45–50	SC		@ 45' CLAYEY-SAND, dark gray, saturated, loose @ 50' dark gray, fine grained sand, minor clay, saturated, medium dense
	SPT	3 9 4			50			

Total Boring Depth = 50'
Groundwater encountered at approximately 15'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with bentonite grout 8/26/08.

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	B-02
Sheet:	1 of 1
Client:	Thomas Enterprises - The Pavillion at Oceanside
Location:	Foussat Road and HWY 76, Oceanside, CA 92058
Date Started:	8/26/2008
Date Finished:	8/26/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B61; Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	SM	ALLUVIUM
	SPT	3, 4, 5			2.5	SM	@ 2.5' SILTY-SAND, dark brown, minor silt, dry, loose, no odor or staining
	MC	3, 4, 5	91.5	12.7	5	SM	@ 5' SILTY-SAND, dark brown, moist, loose
	SPT	2, 2, 3			7.5	SM	@ 7.5' SILTY-SAND, moist, loose
	MC	2, 4, 5	85.2	30.2	10	SM	@ 10' SILTY-SAND, medium to fine grained sand, moist, loose
	SPT	2, 4, 6			12.5	SP	@ 12.5' POORLY-GRADED SAND, brownish-gray, medium to coarse grained sand, minor silt, saturated, medium dense
	SPT	4, 7, 18			15	SP	@ 15' SAND, brownish-gray, medium to coarse grained sand, minor silt, saturated, medium dense, no odor or staining
					20	SP	@ 20' SAND, brownish-gray, medium to coarse grained sand, minor silt, saturated, loose, no odor or staining

Total Boring Depth = 20'
Groundwater encountered at approximately 12.5'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite chips 8/26/08.

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	B-03
Client:	Thomas Enterprises - The Pavillion at Oceanside
Sheet:	1 of 1
Location:	Foussat Road and HWY 76 Oceanside, CA 92058
Date Started:	8/26/2008
Date Finished:	8/26/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B61 Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	SM	ALLUVIUM
	SPT	2, 2, 3			2.5	SM	@ 2.5' SILTY-SAND, dark brown, fine to medium grained sand, minor silt, slightly moist, loose
	MC	3, 4, 5	101.5	2.7	5	SM	@ 5' SAND, dark brown, medium to coarse grained sand, minor silt, slightly moist, loose
	SPT	1, 2, 3			7.5	SM	@ 7.5' SILTY-SAND, dark brown, medium to coarse grained sand, moist, loose
	MC	3, 2, 3	82.9	31.0	10	SM	@ 10' SILTY-SAND, dark brown, medium to coarse grained sand, moist, very loose
	SPT	3, 4, 6			12.5	SP	@ 12.5' SAND, brown, medium to coarse grained sand, minor silt, saturated, medium dense
	SPT	4, 6, 6			15	SP	@ 15' SAND, medium to coarse grained sand, minor silt, saturated, medium dense
	SPT	7, 11, 15			20	SP	@ 20' SAND, medium to coarse grained sand, saturated, medium dense

Total Boring Depth = 20'
Groundwater encountered at approximately 12.5'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/26/08.

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number: B-04	**Client:** Thomas Enterprises - The Pavillion at Oceanside	**Sheet:** 1 of 1	
Date Started: 8/26/2008	**Date Finished:** 8/26/2008	**Location:** Foussat Road and HWY 76, Oceanside, CA 92058	
EEI Rep: TK	**Project Number:** THO-70810	**Drill Rig/Sampling Method:** Hollow Stem Auger, B61, Autohammer, 140 pounds at 30-inch drop	**Borehole Diameter:** 8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	SM	**ALLUVIUM**
	SPT	1 2 2			2.5	SM	@ 2.5' SILTY-SAND, dark brown, fine to medium grained sand, dry, loose
	MC	3 4 5	92.6	3.1	5	SM	@ 5' SILTY-SAND, dark brown, fine to medium grained sand, slightly moist, loose
	SPT	2 2 3			7.5	SM	@ 7.5' SILTY-SAND, dark brown, fine to medium grained sand, slightly-moist, loose
	MC	2 3 4	83.5	36.1	10	SP	@ 10' SAND, dark brown, coarse grained sand, minor silt, moist, loose
	SPT	2 4 4			12.5	SP	@ 12.5' SAND, dark brown, coarse grained sand, minor silt, moist to saturated, loose
	SPT	2 3 4			15	SP	@ 15' SAND, dark brown, coarse grained sand, minor silt, saturated, loose
	SPT	1 2 3			20	SP	@ 20' SAND, dark brown, coarse grained sand, minor silt, saturated, loose

Total Boring Depth = 20'
Groundwater encountered at approximately 13'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/26/08.

BOREHOLE LOG THO-70810-FOUSSAT76-BORINGLOGS.GPJ EEI.GDT 9/8/08

EEI Geotechnical & Environmental Solutions

BOREHOLE LOG

Number: B-05

Client: Thomas Enterprises - The Pavillion at Oceanside

Sheet: 1 of 1

Location: Foussat Road and HWY 76, Oceanside, CA 92058

Date Started: 8/26/2008

Date Finished: 8/26/2008

EEI Rep: TK

Project Number: THO-70810

Drill Rig/Sampling Method: Hollow Stem Auger, B61; Autohammer, 140 pounds at 30-inch drop

Borehole Diameter: 8"

SAMPLE LOG						BOREHOLE LOG		
Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	SM		ALLUVIUM
	SPT	3, 3, 4			2.5	SM		@ 2.5' SILTY-SAND, brown, fine to medium grained sand, minor silt, dry, loose
	MC	4, 8, 11	92.7	3.6	5	SM		@ 5' SILTY-SAND, brown, fine to medium grained sand, minor silt, slightly moist, loose
	SPT	4, 3, 4			7.5	SM		@ 7.5' SILTY-SAND, brown, fine to medium grained sand, minor silt, moist, loose
	MC	3, 5, 6	88.5	20.4	10	SM		@ 10' SILTY-SAND, brown, fine to medium grained sand, minor silt, moist, loose
	SPT	2, 2, 4			12.5	SP	▽	
	SPT	3, 6, 9			15	SP		@ 15' SAND, brown, coarse grained sand, saturated, medium dense
	SPT	2, 3, 3			20	SP		@ 20' SAND, brown, coarse grained sand, saturated, loose

Total Boring Depth = 20'
Groundwater encountered at approximately 12.5'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/26/08.

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	B-06
Sheet:	1 of 1
Client:	Thomas Enterprises - The Pavillion at Oceanside
Location:	Foussat Road and HWY 76, Oceanside, CA 92058
Date Started:	8/26/2008
Date Finished:	8/26/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B61; Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	SM	ALLUVIUM
	SPT	2 3 3			2.5	SM	@ 2.5' SILTY-SAND, brown, minor silt, dry, loose
	MC	3 4 5	97.2	6.3	5	SM	@ 5' SILTY-SAND, brown, minor silt, slightly moist, loose
	SPT	3 3 4			7.5	SM	@ 7.5' SILTY-SAND, brown, moist, loose
	MC	4 5 7	89.3	12.4	10	SM	@ 10' SILTY-SAND, brown, moist, loose
	SPT	1 2 2			12.5	SP	@ 12.5' SAND, brown, coarse grained, very moist to saturated, loose
	SPT	3 5 6			15	SP	@ 15' SAND, brown, coarse grained, saturated
	SPT	5 11 13			20	SP	@ 20' SAND, brown, coarse grained, saturated, medium dense

Total Boring Depth = 20'
Groundwater encountered at approximately 13'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/26/08.

BOREHOLE LOG

Number: B-07	**Client:** Thomas Enterprises - The Pavillion at Oceanside	**Sheet:** 1 of 1	
Date Started: 8/26/2008	**Date Finished:** 8/26/2008	**Location:** Foussat Road and HWY 76, Oceanside, CA 92058	
EEI Rep: TK	**Project Number:** THO-70810	**Drill Rig/Sampling Method:** Hollow Stem Auger, B61; Autohammer, 140 pounds at 30-inch drop	**Borehole Diameter:** 8"

EEI Geotechnical & Environmental Solutions

SAMPLE LOG / **BOREHOLE LOG**

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	SM		**ALLUVIUM**
	SPT	2, 2, 4			2.5	SM		@ 2.5' SILTY-SAND, brown, fine to coarse grained sand, dry, loose
	MC	5, 8, 9		1.4	5	SM		@ 5' SILTY-SAND, brown, fine to coarse grained sand, slightly moist, loose
	SPT	2, 2, 4			7.5	SM		@ 7.5' SILTY-SAND, brown, coarse grained sand, moist, loose
	MC	2, 7, 4	90.6	1.8	10	SM		@ 10' SILTY-SAND, brown, coarse grained sand, moist, loose
	SPT	3, 4, 7			12.5	SP	∇	@ 12.5' SAND, brown, medium to coarse grained,, very moist to saturated, medium dense
	SPT	1, 1, 1			15	SP		@ 15' becomes very loose
	SPT	3, 3, 5			20	SP		@ 20' becomes very loose

Total Boring Depth = 20'
Groundwater encountered at approximately 13'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/26/08.

EEI Geotechnical & Environmental Solutions

BOREHOLE LOG

Number: B-08	**Client:** Thomas Enterprises - The Pavillion at Oceanside	**Sheet:** 1 of 1	
Date Started: 8/26/2008	**Date Finished:** 8/26/2008	**Location:** Foussat Road and HWY 76, Oceanside, CA 92058	
EEI Rep: TK	**Project Number:** THO-70810	**Drill Rig/Sampling Method:** Hollow Stem Auger, B61, Autohammer, 140 pounds at 30-inch drop	**Borehole Diameter:** 8"

SAMPLE LOG						BOREHOLE LOG		
Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	ASPHALT		@ 0-2.5" ASPHALT **ALLUVIUM**
	SPT	3 3 4			2.5	SM		@ 2.5' SILTY-SAND, brown, fine to coarse grained sand, dry, loose
	MC	3 4 8	96.2	3.8	5	SM		@ 5' SILTY-SAND, brown, medium to coarse grained sand, slightly moist, loose
	SPT	2 3 5			7.5	SM		@ 7.5' SILTY-SAND, brown, medium to coarse grained sand, moist, loose
	MC	4 6 6	92.5	10.5	10	SM		@ 10' SILTY-SAND, brown, coarse grained sand, moist, loose
	SPT	2 4 4			12.5	SW		@ 12.5' SAND, brown, coarse grained sand, very moist to moist, loose
	SPT	4 5 7			15	SW		@ 15' SAND, brown, coarse grained sand, saturated, medium dense
	SPT	5 9 10			20	SW		@ 20' SAND, brown, coarse grained sand, saturated, medium dense

Total Boring Depth = 20'
Groundwater encountered at approximately 15'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/26/08.

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	B-09
Client:	Thomas Enterprises - The Pavillion at Oceanside
Sheet:	1 of 1
Location:	Foussat Road and HWY 76, Oceanside, CA 92058
Date Started:	8/26/2008
Date Finished:	8/26/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B61; Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	ASPHALT	@ 0-2.5" ASPHALT
					1	SM	**ALLUVIUM**
	SPT	1 2 2			2.5	SM	@ 2.5' SILTY-SAND, dark brown, fine grained sand, slightly moist, loose
	MC	2 4 5	89.3	13.6	5	SM	@ 5' SILTY-SAND, dark brown, fine grained sand, slightly moist, loose
	SPT	2 2 2			7.5	SM	@ 7.5' SILTY-SAND, dark brown, fine grained sand, slightly moist, loose
	MC	2 3 5	81.9	33.9	10	SM	@ 10' SILTY-SAND, dark brown, fine grained sand, moist, loose
	SPT	2 2 4			12.5	SP	@ 12.5 SAND, dark brown, medium to coarse grained sand, minor silt, saturated, loose
	SPT	3 3 6			15	SP	@ 15' SAND, dark brown, medium to coarse grained sand, minor silt, saturated, loose
	SPT	4 7 9			20	SP	@ 20' SAND, dark brown, medium to coarse grained sand, minor silt, saturated, medium dense

Total Boring Depth = 20'
Groundwater encountered at approximately 13'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/26/08.

EEI Geotechnical & Environmental Solutions

BOREHOLE LOG

Number:	B-10
Client:	Thomas Enterprises - The Pavillion at Oceanside
Sheet:	1 of 1
Location:	Foussat Road and HWY 76, Oceanside, CA 92058
Date Started:	8/27/2008
Date Finished:	8/27/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B61; Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
1					0–2	SM		**FILL**
	SPT	3 4 5			2.5	SM		@ 2.5' SILTY-SAND, brownish-red, fine to coarse grained sand, minor clay, slightly moist, possible non-native
	MC	5 6 8	111.4	8.6	5	SM		**ALLUVIUM** @ 5' SILTY-SAND, dark brown, fine to coarse grained sand, minor clay, slightly moist, loose
	SPT	3 4 6			7.5	SM		@ 7.5' SILTY-SAND, dark brown, fine to coarse grained sand, minor clay, slightly moist, medium dense
	MC	3 4 5			10			@ 10' SILTY-SAND, dark brown, fine to coarse grained sand, moist to saturated, loose

Depth scale: 1–34 feet.

Total Boring Depth = 10'
Groundwater encountered at approximately 10'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/27/08.

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	B-11
Client:	Thomas Enterprises - The Pavillion at Oceanside
Sheet:	1 of 1
Location:	Foussat Road and HWY 76, Oceanside, CA 92058
Date Started:	8/27/2008
Date Finished:	8/27/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B61; Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0			**ALLUVIUM**
	SPT	7 6 4			2.5			@ 2.5' SILTY-SAND, reddish-brown, fine to medium grained sand, minor clay, dry, medium dense
	MC	4 5 5	88.3	2.5	5	SM		@ 5' SILTY-SAND, brown, fine to medium grained sand, minor silt, slightly moist, loose
	SPT	1 2 2			7.5			@ 7.5' SILTY-SAND, brown, fine to medium grained sand, moist, loose
					10		▽	@ 10' SILTY-SAND, brown, fine to coarse grained sand, moist to saturated, loose
	MC	3 5 6			10			

Total Boring Depth = 10'
Groundwater encountered at approximately 10'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/27/08.

Depth scale: 1–34 feet

BOREHOLE LOG THO-70810-FOUSSAT76-BORINGLOGS.GPJ EEI.GDT 9/8/08

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	B-12
Client:	Thomas Enterprises - The Pavillion at Oceanside
Sheet:	1 of 1
Location:	Foussat Road and HWY 76 Oceanside, CA 92058
Date Started:	8/27/2008
Date Finished:	8/27/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B61 Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0			**ALLUVIUM**
	SPT	1 2 2			2.5	SM		@ 2.5' SILTY-SAND, dark brown, minor clay, dry, loose
	MC	3 4 4	91.3	4.9	5	SM		@ 5' SILTY-SAND, dark brown, slightly moist, loose
	SPT	2 3 3			7.5	SM		@ 7.5' SILTY-SAND, minor clay, moist to saturated, loose
	MC	4 4 8			10	SM		@ 10' SILTY-SAND, minor clay, moist to saturated, loose

Total Boring Depth = 10'
Groundwater encountered at approximately 10'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/27/08.

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions		**Client:** Thomas Enterprises - The Pavillion at Oceanside	**Number:** B-13
			Sheet: 1 of 1
Date Started: 8/27/2008	**Date Finished:** 8/27/2008	**Location:** Foussat Road and HWY 76, Oceanside, CA 92058	
EEI Rep: TK	**Project Number:** THO-70810	**Drill Rig/Sampling Method:** Hollow Stem Auger, B61; Autohammer, 140 pounds at 30-inch drop	**Borehole Diameter:** 8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0		**ALLUVIUM**
	SPT	2, 3, 4			2.5		@ 2.5' SILTY-SAND, brown, fine to medium grained sand, dry, loose
	MC	3, 4, 5	93.4	25.5	5	SM	@ 5' SILTY-SAND, brown, fine to medium grained sand, moist, loose
	SPT	1, 1, 2			7.5		@ 7.5' SILTY-SAND, brown, fine to medium grained sand, moist to saturated, very loose
	MC	3, 4, 7			10		@ 10' SILTY-SAND, brown, medium to coarse grained sand, saturated, loose

Total Boring Depth = 10'
Groundwater encountered at approximately 10'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/27/08.

BOREHOLE LOG THO-70810-FOUSSAT76-BORINGLOGS.GPJ EEI.GDT 9/8/08

EEI Geotechnical & Environmental Solutions

BOREHOLE LOG

Number: B-14

Client: Thomas Enterprises - The Pavillion at Oceanside

Sheet: 1 of 1

Location: Foussat Road and HWY 76, Oceanside, CA 92058

Date Started: 8/27/2008

Date Finished: 8/27/2008

EEI Rep: TK

Project Number: THO-70810

Drill Rig/Sampling Method: Hollow Stem Auger, B61; Autohammer, 140 pounds at 30-inch drop

Borehole Diameter: 8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
2					0–1			ALLUVIUM
	SPT	4 5 5			2.5			@ 2.5' SILTY-SAND, brown, fine to medium grained sand, dry, medium dense
	MC	3 4 6	96.5	17.4	5	SM		@ 5' SILTY-SAND, brown, fine to medium grained sand, slightly moist, loose
	SPT	3 3 5			7.5			@ 7.5' SILTY-SAND, brown, fine to coarse grained sand, moist, loose
					10			@ 10' SILTY-SAND, brown, fine to coarse grained sand, saturated, loose
	MC	4 8 8			10			

Total Boring Depth = 10'
Groundwater encountered at approximately 10'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/27/08.

BOREHOLE LOG THO-70810-FOUSSAT76-BORINGLOGS.GPJ EEI.GDT 9/8/08

BOREHOLE LOG

Number: B-15

Client: Thomas Enterprises - The Pavillion at Oceanside

Sheet: 1 of 1

Location: Foussat Road and HWY 76, Oceanside, CA 92058

Date Started: 8/27/2008

Date Finished: 8/27/2008

EEI Rep: TK

Project Number: THO-70810

Drill Rig/Sampling Method: Hollow Stem Auger, B61; Autohammer, 140 pounds at 30-inch drop

Borehole Diameter: 8"

SAMPLE LOG						BOREHOLE LOG		
Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	ASPHALT		@ 0-1" ASPHALT
					1	SM		**ALLUVIUM**
	SPT	1 1 2			2.5	SM		@ 2.5' SILTY-SAND, dark brown, fine to medium grained sand, slightly moist, very loose
	MC	3 6 6	86.3	1.3	5	SM		@ 5' SILTY-SAND, dark brown, fine to medium grained sand, slightly moist, loose
	SPT	2 2 2			7.5	SM		@ 7.5' SILTY-SAND, light brown, moist, loose
	MC	4 4 8	94.5	11.2	10	SM		@ 10' SILTY-SAND, light brown, moist, loose
	SPT	2 3 3			12.5	SM		@ 12.5' SILTY-SAND, light brown, moist to saturated, loose
	SPT	1 1 1			15	SP		@ 15' SAND, brown, fine to medium grained sand, saturated, very loose
	SPT	3 3 7			20	SP		@ 20' SAND, brown, fine to medium grained sand, saturated, medium dense

Total Boring Depth = 20'
Groundwater encountered at approximately 13'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/27/08.

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	B-16
Client:	Thomas Enterprises - The Pavillion at Oceanside
Sheet:	1 of 1
Location:	Foussat Road and HWY 76, Oceanside, CA 92058
Date Started:	8/27/2008
Date Finished:	8/27/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B61 Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	ASPHALT		@ 0-2.5" ASPHALT
								ALLUVIUM
	SPT	3 4 4			2.5	SM		@ 2.5' SILTY-SAND, brown, fine to coarse grained sand, slightly moist, loose
	MC	3 4 6	92.5	2.1	5	SM		@ 5' SILTY-SAND, brown, fine to coarse grained sand, slightly moist, loose
	SPT	3 4 6			7.5	SM		@ 7.5' SILTY-SAND, brown, fine to coarse grained sand, slightly moist, medium dense
	MC	3 3 4	115.6	2.2	10	SM		@ 10' SILTY-SAND, brown, fine to coarse grained sand, slightly moist, loose
	SPT	1 2 2			12.5	SM		@ 12.5' SILTY-SAND, brown, fine to coarse grained sand, minor clay, moist to saturated, loose
	SPT	2 2 3			15	SP		@ 15' SAND, brown, fine to coarse grained sand, minor clay, saturated, loose
	SPT	5 5 4			20	SP		@ 20' SAND, brown, fine to coarse grained sand, minor clay, saturated, loose

Total Boring Depth = 20'
Groundwater encountered at approximately 13'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/27/08.

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	B-17
Client:	Thomas Enterprises - The Pavillion at Oceanside
Sheet:	1 of 1
Location:	Foussat Road and HWY 76, Oceanside, CA 92058
Date Started:	8/27/2008
Date Finished:	8/27/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B61; Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / **BOREHOLE LOG**

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
3					0	ASPHALT	@ 0-2" ASPHALT
					0–1	SM	**ALLUVIUM**
	SPT	1, 1, 2			2.5	SM	@ 2.5' SILTY-SAND, dark brown, fine to medium grained sand, slightly moist, very loose
	MC	3, 4, 5	79.7	17.3	5	SM	@ 5' SILTY-SAND, dark brown, fine to coarse grained sand, slightly moist, loose
	SPT	3, 4, 5			7.5	SM	@ 7.5' SANDY-SILT, dark brown, fine grained sand, moist, loose
	MC	2, 3, 5	87.1	27.5	10	SM	@ 10' SANDY-SILT, dark brown, fine grained sand, very moist, loose
	SPT	2, 5, 7			12.5	SP	@ 12.5' SAND, fine to coarse grained sand, minor silt, saturated, medium dense
	SPT	3, 3, 6			15	SP	@ 15' SAND, fine to coarse grained sand, saturated, loose
	SPT	4, 5, 6			20	SP	@ 20' SAND, fine to coarse grained sand, saturated, medium dense

Total Boring Depth = 20'
Groundwater encountered at approximately 12.5'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/27/08.

EEI Geotechnical & Environmental Solutions

BOREHOLE LOG

Number:	B-18
Client:	Thomas Enterprises - The Pavillion at Oceanside
Sheet:	1 of 1
Location:	Foussat Road and HWY 76, Oceanside, CA 92058
Date Started:	8/27/2008
Date Finished:	8/27/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B61; Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
4					0	ASPHALT	@ 0-2" ASPHALT
					0–2.5	SM	ALLUVIUM
	SPT	1 2 2			2.5	SM	@ 2.5' SILTY-SAND, dark brown, fine to medium grained sand, slightly moist, loose
	MC	2 4 6	87.8	15.0	5	SM	@ 5' SILTY-SAND, dark brown, fine to medium grained sand, slightly moist, loose
	SPT	2 2 3			7.5	ML	@ 7.5' SANDY-SILT, dark brown, fine grained sand, slightly moist, loose
	MC	2 3 4	82.3	37.3	10	ML	@ 10' SANDY-SILT, dark brown, fine grained sand, moist, loose
	SPT	2 3 3			12.5	SP	@ 12.5' SAND, light brown, fine to coarse grained sand, saturated, loose
	SPT	1 2 3			15	SP	@ 15' SAND, light brown, fine to coarse grained sand, saturated, loose
	SPT	2 3 9			20	SP	@ 20' SAND, light brown, fine to coarse grained sand, saturated, medium dense

Total Boring Depth = 20'
Groundwater encountered at approximately 13'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/27/08.

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	B-19
Client:	Thomas Enterprises - The Pavillion at Oceanside
Sheet:	1 of 1
Location:	Foussat Road and HWY 76 Oceanside, CA 92058
Date Started:	8/27/2008
Date Finished:	8/27/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B61 Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / **BOREHOLE LOG**

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0			ALLUVIUM
	SPT	2 3 4			2.5–4			@ 2.5' SILTY-SAND, dark brown, fine to medium grained sand, moist, loose
	MC	3 3 4	97.7	23.1	5–6.5	SM		@ 5' SAND, dark brown, fine to medium grained sand, minor silt, moist, loose
	SPT	3 3 4			7.5–9			@ 7.5' SAND, dark brown, fine to medium grained sand, moist, loose
					10			@ 10' SAND, dark brown, fine to medium grained sand, saturated, medium dense
	MC	4 8 12			10–11.5			

Depth scale: 1–34 feet.

Total Boring Depth = 10'
Groundwater encountered at approximately 10'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/27/08.

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	B-20
Client:	Thomas Enterprises - The Pavillion at Oceanside
Sheet:	1 of 1
Location:	Foussat Road and HWY 76, Oceanside, CA 92058
Date Started:	8/29/2008
Date Finished:	8/29/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B53; Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / BOREHOLE LOG

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	ASPHALT		@ 0-2" ASPHALT
					1	SM		**ALLUVIUM**
	SPT	6 10 11			2.5	SM		@ 2.5' SILTY-SAND, brown, fine to medium grained sand, dry, medium dense
	MC	8 11 14	106.0	5.0	5	SM		@ 5' SILTY-SAND, brown, fine to medium grained sand, slightly moist, medium dense
	SPT	3 3 5			7.5	SM		@ 7.5' SILTY-SAND, brown, fine to medium grained sand, slightly moist, loose
	MC	7 10 11	92.7	2.2	10	SM		@ 10' SILTY-SAND, brown, coarse grained sand, moist, medium dense
	SPT	3 3 5			12.5	SM		@ 12.5' SILTY-SAND, brown, coarse grained sand, moist to saturated, loose
	SPT	3 3 4			15	SP		@ 15' SAND, brownish-gray, medium to coarse grained sand, saturated, loose
	SPT	5 8 10			20	SP		@ 20' SAND, brownish-gray, coarse grained sand, saturated, medium dense

Total Boring Depth = 20'
Groundwater encountered at approximately 13.5'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/29/08.

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	B-21
Client:	Thomas Enterprises - The Pavillion at Oceanside
Sheet:	1 of 2
Location:	Foussat Road and HWY 76 Oceanside, CA 92058
Date Started:	8/29/2008
Date Finished:	8/29/2008
EEI Rep:	TK
Project Number:	THO-70810
Drill Rig/Sampling Method:	Hollow Stem Auger, B53 Autohammer, 140 pounds at 30-inch drop
Borehole Diameter:	8"

SAMPLE LOG / **BOREHOLE LOG**

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	ASPHALT		@ 0-2" ASPHALT
						SM		ALLUVIUM
	SPT	7 7 9			2.5	SM		@ 2.5' SILTY-SAND, brown, dry, medium dense
	MC	7 8 11	98.3	4.3	5	SM		@ 5' SILTY-SAND, brown, slightly moist, medium dense
	SPT	5 5 8			7.5	SM		@ 7.5' SILTY-SAND, brown, coarse grained sand, moist, medium dense
	MC	5 13 15	92.0	13.3	10	SP		@ 10' SAND, gray, coarse grained sand, moist, medium dense
	SPT	3 4 5			12.5	SP	▽	@ 12.5' SAND, gray, fine to medium grained sand, moist to saturated, loose
	SPT	3 6 8			15	SP		@ 15' SAND, gray, @ 15' fine to medium grained sand, saturated, medium dense
	SPT	4 7 8			20	SP		@ 20' SAND, gray, fine to coarse grained sand, minor silt, saturated, medium dense
	SPT	5 9 9			25	SP		@ 25' SAND, gray, fine to coarse grained sand, minor silt, saturated, medium dense
	SPT	3 4 7			30	SM		@ 30' SILTY-SAND, gray, fine to coarse grained sand, saturated, medium dense

BOREHOLE LOG

EEI Geotechnical & Environmental Solutions

Number:	Sheet:
B-21	2 of 2

Client: Thomas Enterprises - The Pavillion at Oceanside

Location: Foussat Road and HWY 76, Oceanside, CA 92058

Date Started:	Date Finished:	EEI Rep:	Project Number:	Drill Rig/Sampling Method:	Borehole Diameter:
8/29/2008	8/29/2008	TK	THO-70810	Hollow Stem Auger, B53 Autohammer, 140 pounds at 30-inch drop	8"

SAMPLE LOG / **BOREHOLE LOG**

Bulk	Sample Type	Blows Per 6"	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (SoilType, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
	SPT	7 14 16			35–40	SW		@ 35' SAND, gray, fine to coarse grained sand, minor clay, saturated, dense
	SPT	5 8 9			40–45	SM		@ 40' SILTY-SAND, gray, minor clay, saturated, medium dense
	SPT	3 2 3			45–50	CL		@ 45' CLAYEY-SILT, gray, some fine grained sand, saturated, firm @ 50' CLAYEY-SILT, gray, some fine grained sand, saturated, very stiff
	SPT	7 12 19			50			

Total Boring Depth = 50'
Groundwater encountered at approximately 13'
MC = Modified California sample
SPT = Standard Penetration Test sample

Hole backfilled with native soil and bentonite 8/29/08.

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Riverplace	IR630	**B-101**

SITE LOCATION	START	FINISH	SHEET NO.
Oceanside, CA (See Figure 2)	6/24/2015	6/24/2015	1 of 4

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
C&L Drilling	Mayhew 1000	Rotary Wash	Sathis/Grace	Kul

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi), %	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic, (140lbs, 30")	71	4.875	81.5	37.5	⊻ NM / *NM* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	BACKFILL METHOD	AFTER DRILLING
SPT (1.4"), CAL (2.4")	N60* = 1.18 Nspt = 0.79 Ncal	Bentonite chips	▼ 27.0 / *10.5* 6/24/2015

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N^*_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0															SILTY SAND (SM); medium dense; brown; moist; mostly fine to medium SAND; some fines, nonplastic.
	35		R-1	8 8 16	24	19			3.3	104					
			S-2	7 9 11	20	24									
5			R-3	7 14 20	34	27			4.8	106		#200			61% SAND; 39% fines
	30		S-4	9 15 19	34	40									Dense.
10															Poorly-graded SAND (SP); medium dense; pale brown; moist; mostly fine to medium SAND; trace fines; nonplastic; trace iron oxidation staining.
			R-5	5 9 11	20	16			1.8	100					
	25		S-6	5 7 7	14	17									Slightly micaceous.
15			R-7	5 10 13	23	18			3.5	103		#200			96% SAND; 4% fines
	20		S-8	7 10 10	20	24									
20			R-9	8 12 17	29	23			5.5	96					Mostly fine SAND; few medium SAND.
	15														

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-2 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Riverplace	IR630	B-101

SITE LOCATION	START	FINISH	SHEET NO.
Oceanside, CA (See Figure 2)	6/24/2015	6/24/2015	2 of 4

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
C&L Drilling	Mayhew 1000	Rotary Wash	Sathis/Grace	Kul

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi), %	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic, (140lbs, 30")	71	4.875	81.5	37.5	▽ NM / *NM* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	BACKFILL METHOD	AFTER DRILLING
SPT (1.4"), CAL (2.4")	N60* = 1.18 Nspt = 0.79 Ncal	Bentonite chips	▼ 27.0 / *10.5* 6/24/2015

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N^*_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
		SPT	S-10	7 8 8	16	19									SILTY SAND (SM); medium dense; gray; moist; mostly fine to medium SAND; little fines; nonplastic; slightly micaceous.
	10														▼
30		CAL	R-11	9 9 15	24	19			23.8	98					
	5														
35		SPT	S-12	8 8 9	17	20									Dark gray.
	0														
40		CAL	R-13	10 20 22	42	33			25.4	100					Poorly-graded SAND (SP); dense; light gray; wet; mostly fine to medium SAND; trace fines; nonplastic; slightly micaceous.
	-5														
45		SPT	S-14	0 3 5	8	9			38.5		39:14	#200			SANDY SILT/SANDY lean CLAY (ML/CL); medium stiff; dark gray; wet; mostly fines; some fine SAND; low to medium plasticity; PP=0.5 tsf; micaceous; trace seashell fragments. 61% fines; 38% SAND; 1% seashell fragments
	-10														

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-2 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Riverplace	IR630	B-101

SITE LOCATION	START	FINISH	SHEET NO.
Oceanside, CA (See Figure 2)	6/24/2015	6/24/2015	3 of 4

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
C&L Drilling	Mayhew 1000	Rotary Wash	Sathis/Grace	Kul

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi), %	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/ELEV. GW (ft)
Automatic, (140lbs, 30")	71	4.875	81.5	37.5	⊻ NM / *NM* DURING DRILLING; ▼ 27.0 / *10.5* AFTER DRILLING 6/24/2015

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	BACKFILL METHOD
SPT (1.4"), CAL (2.4")	N60* = 1.18 Nspt = 0.79 Ncal	Bentonite chips

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N^*_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
															(SANDY SILT/SANDY lean CLAY (ML/CL), continued.)
		CAL	R-15-2 / R-15-1	3 7 13	20	16			27.1	98					SILTY SAND (SM); medium dense; light gray; wet; mostly fine to medium SAND; little fines; nonplastic.
	-15														
55		SPT	S-16	2 6 10	16	19									Dark gray; mostly fine SAND; few medium SAND; trace organics.
	-20														
60		CAL	R-17	9 24 26	50	40			22.8	105					Poorly-graded SAND with SILT (SP-SM); dense; gray; wet; mostly fine to medium SAND; few fines; nonplastic.
	-25														
65		SPT	S-18	2 5 10	15	18									SANDY SILT (ML); medium stiff; dark gray; wet; mostly fines; some fine SAND; low plasticity; PP=0.5 tsf; slightly micaceous.
	-30														
70		CAL	R-19	6 8 13	21	17									PP=0.5 tsf.
	-35														

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Riverplace	IR630	**B-101**

SITE LOCATION	START	FINISH	SHEET NO.
Oceanside, CA (See Figure 2)	6/24/2015	6/24/2015	4 of 4

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
C&L Drilling	Mayhew 1000	Rotary Wash	Sathis/Grace	Kul

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi), %	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic, (140lbs, 30")	71	4.875	81.5	37.5	⊻ NM / *NM* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	BACKFILL METHOD	AFTER DRILLING
SPT (1.4"), CAL (2.4")	N60* = 1.18 Nspt = 0.79 Ncal	Bentonite chips	▼ 27.0 / *10.5* 6/24/2015

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N^*_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S-20	3 8 11	19	22									SILTY SAND (SM); medium dense; dark gray; wet; mostly fine SAND; some fines; nonplastic; slightly micaceous.
	-40														
80			R-21	16 21 32	53	42									Poorly-graded SAND with SILT (SP-SM); dense; light gray; wet; mostly fine to medium SAND; few fines; nonplastic.
															Bottom of borehole at 81.5 feet. Boring terminated at planned depth. This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010).
	-45														
85															
	-50														
90															
	-55														
95															
	-60														

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FIGURE

A-2 d

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Riverplace	IR630	B-102

SITE LOCATION	START	FINISH	SHEET NO.
Oceanside, CA (See Figure 2)	6/24/2015	6/24/2015	1 of 3

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
C&L Drilling	Mayhew 1000	Rotary Wash	Sathis/Grace	Kul

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi), %	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic, (140lbs, 30")	71	4.875	56.5	40.0	∇ NM / *NM* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	BACKFILL METHOD	AFTER DRILLING
SPT (1.4"), CAL (2.4")	N60* = 1.18 Nspt = 0.79 Ncal	Bentonite chips	▼ 27.0 / *13.0* 6/24/2015

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N^*_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0	40														Poorly-graded SAND with SILT (SP-SM); dense; light grayish brown; moist; mostly fine to medium SAND; few fines; nonplastic; slightly micaceous.
		CAL	R-1	14 27 33	60	48			6.0	112					
5	35	SPT	S-2	8 10 8	18	21									Medium dense; grayish brown.
		CAL	R-3	3 5 8	13	10			6.5	104		#200			Loose to medium dense. 92% SAND; 8% fines
10	30	SPT	S-4	2 3 6	9	11									Medium dense.
		CAL	R-5	4 6 9	15	12			15.2	102		SW			Mostly fine SAND.
15	25	SPT	S-6	4 6 7	13	15									Mostly fine to medium SAND.
		CAL	R-7	7 12 15	27	21			12.8	102					Poorly-graded SAND (SP); medium dense; pale brown; moist; mostly fine to medium SAND; trace fines; nonplastic; slightly micaceous.
20	20	SPT	S-8	6 7 5	12	14									Few coarse SAND.

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FIGURE A-3 a

BORING RECORD

PROJECT NAME: Riverplace		PROJECT NUMBER: IR630	HOLE ID: **B-102**	
SITE LOCATION: Oceanside, CA (See Figure 2)	START: 6/24/2015	FINISH: 6/24/2015	SHEET NO.: 2 of 3	
DRILLING COMPANY: C&L Drilling	DRILL RIG: Mayhew 1000	DRILLING METHOD: Rotary Wash	LOGGED BY: Sathis/Grace	CHECKED BY: Kul
HAMMER TYPE (WEIGHT/DROP): Automatic, (140lbs, 30")	HAMMER EFFICIENCY (ERi), %: 71	BORING DIA. (in): 4.875	TOTAL DEPTH (ft): 56.5	GROUND ELEV (ft): 40.0
DEPTH/*ELEV.* GW (ft): ∇ NM / *NM* DURING DRILLING; ▼ 27.0 / *13.0* AFTER DRILLING 6/24/2015				
DRIVE SAMPLER TYPE(S) & SIZE (ID): SPT (1.4"), CAL (2.4")	NOTES: N60* = 1.18 Nspt = 0.79 Ncal	BACKFILL METHOD: Bentonite chips		

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N^*_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
		CAL	R-9	10 16 20	36	29			3.6	104			*(Poorly-graded SAND (SP), continued.)* No coarse SAND.
30	10	SPT	S-10	4 4 4	8	9			25.3			#200	SILTY SAND (SM); loose; gray; wet; mostly fine SAND; some fines; nonplastic; slightly micaceous. 71% SAND; 29% fines
35	5	CAL	R-11	7 10 13	23	18			28.0	95			Medium dense.
40	0	SPT	S-12	0 1 7	8	9			34.3		39:14	#200	SANDY SILT/SANDY lean CLAY (ML/CL); medium stiff; dark gray; moist; nearly equal portions of fines and fine SAND; low plasticity; PP=0.5 tsf; slightly micaceous. 51% fines; 49% SAND
45	-5	CAL	R-13	14 20 22	42	33			22.7	104			SILTY SAND (SM); dense; light gray; wet; mostly fine to medium sand; little fines; nonplastic; slightly micaceous.

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Riverplace	IR630	**B-102**

SITE LOCATION	START	FINISH	SHEET NO.
Oceanside, CA (See Figure 2)	6/24/2015	6/24/2015	3 of 3

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
C&L Drilling	Mayhew 1000	Rotary Wash	Sathis/Grace	Kul

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi), %	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic, (140lbs, 30")	71	4.875	56.5	40.0	▽ NM / *NM* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	BACKFILL METHOD	AFTER DRILLING
SPT (1.4"), CAL (2.4")	N60* = 1.18 Nspt = 0.79 Ncal	Bentonite chips	▼ 27.0 / *13.0* 6/24/2015

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N^*_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
															(SILTY SAND (SM), continued.) Medium dense; gray; mostly fine SAND.
			S-14	6 10 10	20	24									
55	-15														
			R-15	7 13 18	31	25									
															Bottom of borehole at 56.5 feet. Boring terminated at planned depth.
															This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010).
60	-20														
65	-25														
70	-30														

BORING RECORD

PROJECT NAME Riverplace			**PROJECT NUMBER** IR630		**HOLE ID** B-103
SITE LOCATION Oceanside, CA (See Figure 2)			**START** 6/24/2015	**FINISH** 6/24/2015	**SHEET NO.** 1 of 3
DRILLING COMPANY C&L Drilling	**DRILL RIG** Mayhew 1000	**DRILLING METHOD** Rotary Wash		**LOGGED BY** Sathis/Grace	**CHECKED BY** Kul
HAMMER TYPE (WEIGHT/DROP) Automatic, (140lbs, 30")	**HAMMER EFFICIENCY (ERi), %** 71	**BORING DIA. (in)** 4.875	**TOTAL DEPTH (ft)** 61.5	**GROUND ELEV (ft)** 35.5	**DEPTH/*ELEV.* GW (ft)** ∇ NM / *NM* DURING DRILLING
DRIVE SAMPLER TYPE(S) & SIZE (ID) SPT (1.4"), CAL (2.4")	**NOTES** N60* = 1.18 Nspt = 0.79 Ncal		**BACKFILL METHOD** Bentonite chips		▼ 24.0 / *11.5* AFTER DRILLING 6/24/2015

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N^*_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0	35														SILTY SAND (SM); brown; moist; mostly fine to medium SAND; little fines; nonplastic.
															Poorly-graded SAND with SILT (SP-SM); loose to medium dense; pale brown; moist; mostly fine to medium SAND; few fines; nonplastic.
		CAL	R-1	3 6 6	12	10						CR			
5	30	SPT	S-2	3 4 5	9	11									Medium dense.
		CAL	R-3	3 7 9	16	13			8.5	96					Slightly micaceous.
10	25	SPT	S-4	5 6 6	12	14									
15	20	CAL	R-5	5 7 8	15	12			9.6	99		PA DS			92% SAND; 8% fines
20	15	SPT	S-6	6 9 7	16	19									
▼ 24															

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FIGURE A-4 a

BORING RECORD

PROJECT NAME Riverplace	**PROJECT NUMBER** IR630	**HOLE ID** B-103	
SITE LOCATION Oceanside, CA (See Figure 2)	**START** 6/24/2015	**FINISH** 6/24/2015	**SHEET NO.** 2 of 3
DRILLING COMPANY C&L Drilling	**DRILL RIG** Mayhew 1000	**DRILLING METHOD** Rotary Wash	**LOGGED BY** Sathis/Grace; **CHECKED BY** Kul
HAMMER TYPE (WEIGHT/DROP) Automatic, (140lbs, 30")	**HAMMER EFFICIENCY (ERi), %** 71	**BORING DIA. (in)** 4.875; **TOTAL DEPTH (ft)** 61.5; **GROUND ELEV (ft)** 35.5	**DEPTH/*ELEV.* GW (ft)** NM / *NM* DURING DRILLING; 24.0 / *11.5* 6/24/2015 AFTER DRILLING
DRIVE SAMPLER TYPE(S) & SIZE (ID) SPT (1.4"), CAL (2.4")	**NOTES** N60* = 1.18 Nspt = 0.79 Ncal	**BACKFILL METHOD** Bentonite chips	

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N^*_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	10	CAL	R-7	1 3 3	6	5			29.5	95					SANDY SILT (ML); medium stiff; gray; moist; mostly fines; some fine SAND; low plasticity; PP=0.5 tsf; slightly micaceous; trace organics.
30	5	SPT	S-8	2 3 5	8	9									SILTY SAND (SM); loose; gray; wet; mostly fine sand; some fines; nonplastic; slightly micaceous.
35	0	CAL	R-9	5 7 10	17	13			25.7	97					Medium dense.
40	-5	SPT	S-10	0 3 5	8	9									Loose; dark gray.
45	-10	CAL	R-11	6 8 10	18	14			34.7	88	0:0	#200			61% SAND; 39% fines

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Riverplace	IR630	**B-103**

SITE LOCATION	START	FINISH	SHEET NO.
Oceanside, CA (See Figure 2)	6/24/2015	6/24/2015	3 of 3

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
C&L Drilling	Mayhew 1000	Rotary Wash	Sathis/Grace	Kul

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi), %	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic, (140lbs, 30")	71	4.875	61.5	35.5	∇ NM / *NM* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	BACKFILL METHOD	AFTER DRILLING
SPT (1.4"), CAL (2.4")	N60* = 1.18 Nspt = 0.79 Ncal	Bentonite chips	▼ 24.0 / *11.5* 6/24/2015

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N^*_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	-15		S-12	0 6 11	17	20									SANDY SILT (ML); medium stiff; dark gray; moist; mostly fines; some fine SAND; low plasticity; PP=0.5 tsf.
55	-20		R-13	4 7 9	16	13									PP=0.5 tsf.
60	-25		S-14	4 4 6	10	12									PP=0.5 tsf.
															Bottom of borehole at 61.5 feet. Boring terminated at planned depth. This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010).
65	-30														
70	-35														

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FIGURE A-4 c

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Riverplace	IR630	B-104

SITE LOCATION	START	FINISH	SHEET NO.
Oceanside, CA (See Figure 2)	6/23/2015	6/23/2015	1 of 3

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
C&L Drilling	Mayhew 1000	Rotary Wash	Sathis/Grace	Kul

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi), %	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic, (140lbs, 30")	71	4.875	71.5	37.0	∇ NM / *NM* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	BACKFILL METHOD	AFTER DRILLING
SPT (1.4"), CAL (2.4")	N60* = 1.18 Nspt = 0.79 Ncal	Bentonite chips	▼ 24.0 / *13.0* 6/24/2015

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N^*_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
															SILTY SAND (SM); brown; moist; mostly fine to medium SAND; little fines; nonplastic.
	35														Poorly-graded SAND with SILT (SP-SM); medium dense; brown; moist; mostly fine to medium SAND; few fines; nonplastic.
		CAL	R-1	5 8 10	18	14			2.4	103					
5		SPT	S-2	2 3 4	7	8									Loose.
	30														
		CAL	R-3	4 5 8	13	10			10.2	96		#200			Loose to medium dense. 95% SAND; 5% fines
10		SPT	S-4	3 6 8	14	17									Medium dense; yellowish brown; trace iron oxidation staining.
	25														
		CAL	R-5	5 11 13	24	19			4.6	98		PA			Olive brown; slightly micaceous. 95% SAND; 5% fines
15		SPT	S-6	5 8 13	21	25									
	20														
		CAL	R-7	9 18 20	38	30			4.3	100					Medium dense to dense; light yellowish brown.
20		SPT	S-8	5 7 8	15	18									Medium dense.
	15														

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FIGURE

A-5 a

BORING RECORD

PROJECT NAME Riverplace	**PROJECT NUMBER** IR630	**HOLE ID** **B-104**	
SITE LOCATION Oceanside, CA (See Figure 2)	**START** 6/23/2015	**FINISH** 6/23/2015	**SHEET NO.** 2 of 3
DRILLING COMPANY C&L Drilling	**DRILL RIG** Mayhew 1000	**DRILLING METHOD** Rotary Wash	**LOGGED BY** Sathis/Grace — **CHECKED BY** Kul
HAMMER TYPE (WEIGHT/DROP) Automatic, (140lbs, 30")	**HAMMER EFFICIENCY (ERi), %** 71	**BORING DIA. (in)** 4.875 — **TOTAL DEPTH (ft)** 71.5 — **GROUND ELEV (ft)** 37.0	**DEPTH/*ELEV.* GW (ft)** ⊻ NM / *NM* DURING DRILLING
DRIVE SAMPLER TYPE(S) & SIZE (ID) SPT (1.4"), CAL (2.4")	**NOTES** N60* = 1.18 Nspt = 0.79 Ncal	**BACKFILL METHOD** Bentonite chips	AFTER DRILLING ▼ 24.0 / *13.0* 6/24/2015

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N^*_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	10		R-9	0 2 3	5	4			28.8	91					SANDY SILT (ML); soft; dark gray; moist to wet; mostly fines; some fine SAND; low plasticity; PP=0.5 tsf; micaceous.
30	5		S-10	2 4 6	10	12			31.4		30:5	#200			Medium stiff; trace fine GRAVEL; PP=0.5 tsf. 63% fines; 36% SAND; 1% GRAVEL
35	0		R-11	3 6 9	15	12			31.8	90					No GRAVEL; PP=0.5 tsf.
40	-5		S-12	4 11 13	24	28			27.3			#200			SILTY SAND (SM); medium dense; dark gray; wet; nearly equal portions of fine SAND and fines; low plasticity; micaceous. 51% SAND; 49% fines
45	-10		R-13	15 22 30	52	41			21.6	99					Poorly-graded SAND with SILT (SP-SM); dense; grayish brown; wet; mostly fine to medium SAND; few fines; nonplastic.

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Riverplace	IR630	B-104

SITE LOCATION	START	FINISH	SHEET NO.
Oceanside, CA (See Figure 2)	6/23/2015	6/23/2015	3 of 3

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
C&L Drilling	Mayhew 1000	Rotary Wash	Sathis/Grace	Kul

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi), %	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/ELEV. GW (ft)
Automatic, (140lbs, 30")	71	4.875	71.5	37.0	∇ NM / *NM* DURING DRILLING; ▼ 24.0 / *13.0* 6/24/2015 AFTER DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	BACKFILL METHOD
SPT (1.4"), CAL (2.4")	N60* = 1.18 Nspt = 0.79 Ncal	Bentonite chips

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N^*_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
		SPT	S-14	6 19 25	44	52									*(Poorly-graded SAND with SILT (SP-SM), continued.)* Very dense.
	-15														
55		CAL	R-15	15 25 33	58	46									Dense.
	-20														
60		SPT	S-16	8 12 13	25	30									SILTY SAND (SM); medium dense to dense; gray; wet; mostly fine SAND; some fines; nonplastic.
	-25														
65		SPT	S-17	10 15 16	31	37									Dense.
	-30														
70		SPT	S-18	15 23 25	48	57									Poorly graded SAND with SILT (SP-SM); very dense; light gray; wet; mostly fine to medium SAND; few fines; nonplastic.
	-35														Bottom of borehole at 71.5 feet. Boring terminated at planned depth.

This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010).

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FIGURE

A-5 c

APPENDIX J

APPENDIX J

PREVIOUSLY REPORTED
LABORATORY TEST RESULTS BY OTHERS

FOR

ZEPHYR – OCEANSIDE
OCEANSIDE, CALIFORNIA

PROJECT NO. G2322-32-01

GRAIN SIZE DISTIBUTION - PASSING #200 SIEVE

ASTM METHOD D422

Boring No.	**B-1**	**B-2**	**B-3**	**B-5**	**B-6**		
Depth	7	6	7	6	7		ft
Total Sample Weight	98.2	108.9	108.7	116.9	100.6		gm
Retained on #200 Sieve	48.4	103.9	96.0	114.8	57.1		gm
Passing #200 Sieve	49.8	5.0	12.7	2.1	43.5		gm
Fines Content	**50.7**	**4.6**	**11.7**	**1.8**	**43.2**		%

Boring No.							
Depth							ft
Total Sample Weight							gm
Retained on #200 Sieve							gm
Passing #200 Sieve							gm
Fines Content							%

Boring No.							
Depth							ft
Total Sample Weight							gm
Retained on #200 Sieve							gm
Passing #200 Sieve							gm
Fines Content							%

EEI Engineering Solutions

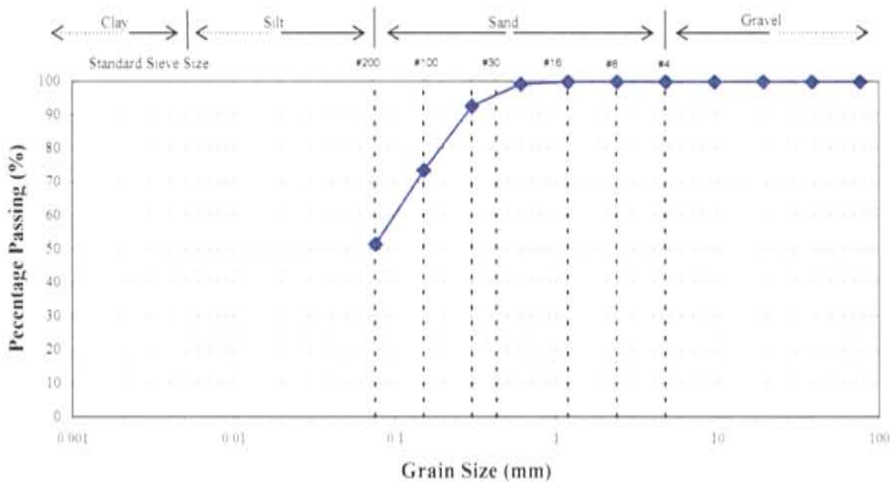
2195 Faraday Avenue, Suite K, Carlsbad, CA 92008

Client:	Zephyr Partners
Project Name:	Oceanside
Project Number:	ZEP-72676.4
Date:	9/5/18
Tested by:	B D
Reviewed by:	

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM METHOD D 422 (SIEVE ANALYSIS)

Sample :	B1@25ft		D_{10} (mm)	na
Total Weight (g)	164.8		D_{30} (mm)	na
Dry Weight (g)	121.6		D_{60} (mm)	0.10
Wet Sieve Weight (g)	60.1		Cu	na
Initial Moisture (%)	35.5		Cc	na

According to ASTM D 2487 Unified Soil Classification System (USCS) and ASTM D 422 (Standard Test Method for Particle-Size Analysis) test method results, soil sample B1 at 25 feet is classified as Sandy silt (**ML**).



Sieve Size (in)	Sieve Size (mm)	Cumulative Weight of dry soil (gm)	Percent Retained (%)	Percent Passing (%)
3"	76.2		0.0	100.0
1.5"	38.1		0.0	100.0
3/4"	19.05		0.0	100.0
3/8"	9.53		0.0	100.0
#4	4.75		0.0	100.0
#8	2.36		0.0	100.0
#16	1.18		0.0	100.0
#30	0.6	0.8	0.7	99.3
#50	0.3	8.8	7.2	92.8
#100	0.15	32.1	26.4	73.6
#200	0.075	58.9	48.4	51.6

EEI Geotechnical & Environmental Solutions

2195 Faraday Avenue, Suite K, Carlsbad CA 92008

Client: Thomas Enterprises

Project Name: Oceanside, CA

Job Number: THO-70810

Date: 9-4-08

Boring Number: B1

Location: 25 feet

Soil Description: Sandy silt, ML

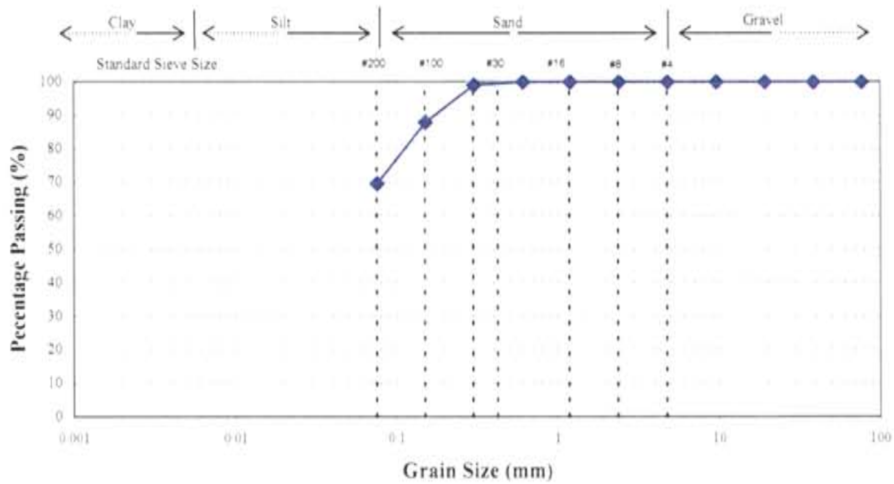
Tested by: AW

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM METHOD D 422 (SIEVE ANALYSIS)

Sample :	B1@40ft
Total Weight (g)	134.6
Dry Weight (g)	102.4
Wet Sieve Weight (g)	32.9
Initial Moisture (%)	31.4

D_{10} (mm)	na
D_{30} (mm)	na
D_{60} (mm)	na
Cu	na
Cc	na

According to ASTM D 2487 Unified Soil Classification System (USCS) and ASTM D 422 (Standard Test Method for Particle-Size Analysis) test method results, soil sample B1 at 40 feet is classified as Sandy silt (**ML**).



Sieve Size (in)	Sieve Size (mm)	Cumulative Weight of dry soil (gm)	Percent Retained (%)	Percent Passing (%)
3"	76.2		0.0	100.0
1.5"	38.1		0.0	100.0
3/4"	19.05		0.0	100.0
3/8"	9.53		0.0	100.0
#4	4.75		0.0	100.0
#8	2.36		0.0	100.0
#16	1.18		0.0	100.0
#30	0.6		0.0	100.0
#50	0.3	1.0	1.0	99.0
#100	0.15	12.3	12.0	88.0
#200	0.075	31.1	30.4	69.6

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2195 Faraday Avenue, Suite K, Carlsbad CA 92008

Client: Thomas Enterprises

Project Name: Oceanside, CA

Job Number: THO-70810

Date: 9-4-08

Boring Number: B1

Location: 40 feet

Soil Description: Sandy silt, ML

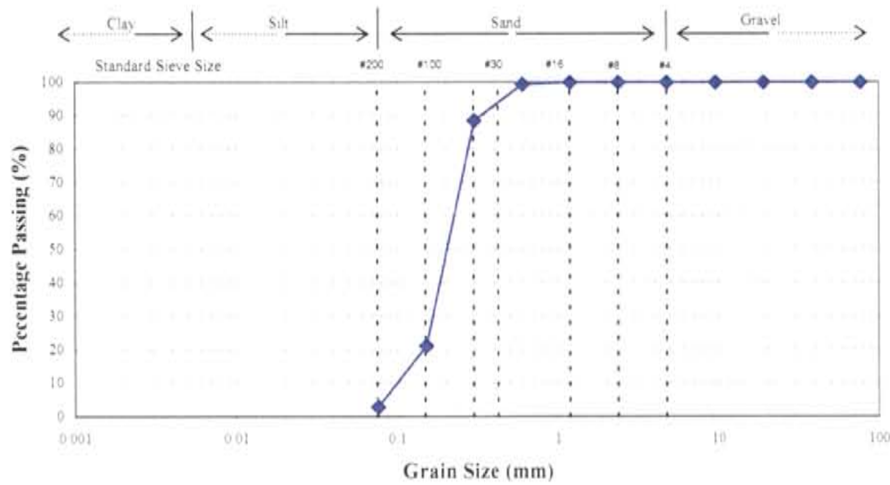
Tested by: AW

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM METHOD D 422 (SIEVE ANALYSIS)

Sample :	B21@12.5ft
Total Weight (g)	188.9
Dry Weight (g)	145.5
Wet Sieve Weight (g)	141.3
Initial Moisture (%)	29.8

D_{10} (mm)	0.10
D_{30} (mm)	0.15
D_{60} (mm)	0.22
Cu	2.20
Cc	1.02

According to ASTM D 2487 Unified Soil Classification System (USCS) and ASTM D 422 (Standard Test Method for Particle-Size Analysis) test method results, soil sample B21 at 12.5 feet is classified as Poorly graded sand (**SP**).



Sieve Size (in)	Sieve Size (mm)	Cumulative Weight of dry soil (gm)	Percent Retained (%)	Percent Passing (%)
3"	76.2		0.0	100.0
1.5"	38.1		0.0	100.0
3/4"	19.05		0.0	100.0
3/8"	9.53		0.0	100.0
#4	4.75		0.0	100.0
#8	2.36		0.0	100.0
#16	1.18		0.0	100.0
#30	0.6	0.8	0.5	99.5
#50	0.3	16.7	11.5	88.5
#100	0.15	114.6	78.8	21.2
#200	0.075	141.2	97.0	3.0

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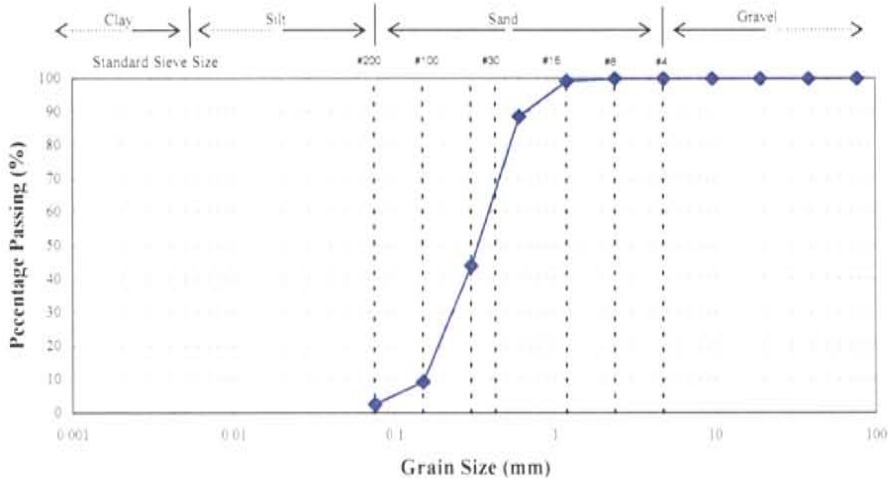
2195 Faraday Avenue, Suite K, Carlsbad CA 92008

Client: Thomas Enterprises
Project Name: Oceanside, CA
Job Number: THO-70810
Date: 9-4-08
Boring Number: B21
Location: 12.5 feet
Soil Description: Poorly graded sand, SP
Tested by: AW

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM METHOD D 422 (SIEVE ANALYSIS)

Sample :	B21@20ft		D10 (mm)	0.15
Total Weight (g)	115.8		D30 (mm)	0.23
Dry Weight (g)	90.8		D60 (mm)	0.39
Wet Sieve Weight (g)	88.5		Cu	2.60
Initial Moisture (%)	27.5		Cc	0.90

According to ASTM D 2487 Unified Soil Classification System (USCS) and ASTM D 422 (Standard Test Method for Particle-Size Analysis) test method results, soil sample B21 at 20 feet is classified as Poorly graded sand (**SP**).



Sieve Size (in)	Sieve Size (mm)	Cumulative Weight of dry soil (gm)	Percent Retained (%)	Percent Passing (%)
3"	76.2		0.0	100.0
1.5"	38.1		0.0	100.0
3/4"	19.05		0.0	100.0
3/8"	9.53		0.0	100.0
#4	4.75		0.0	100.0
#8	2.36		0.0	100.0
#16	1.18	0.7	0.8	99.2
#30	0.6	10.2	11.2	88.8
#50	0.3	50.8	55.9	44.1
#100	0.15	82.3	90.6	9.4
#200	0.075	88.4	97.4	2.6

Client: Thomas Enterprises

Project Name: Oceanside, CA

Job Number: THO-70810

Date: 9-4-08

Boring Number: B21

Location: 20 feet

Soil Description: Poorly graded sand, SP

Tested by: AW

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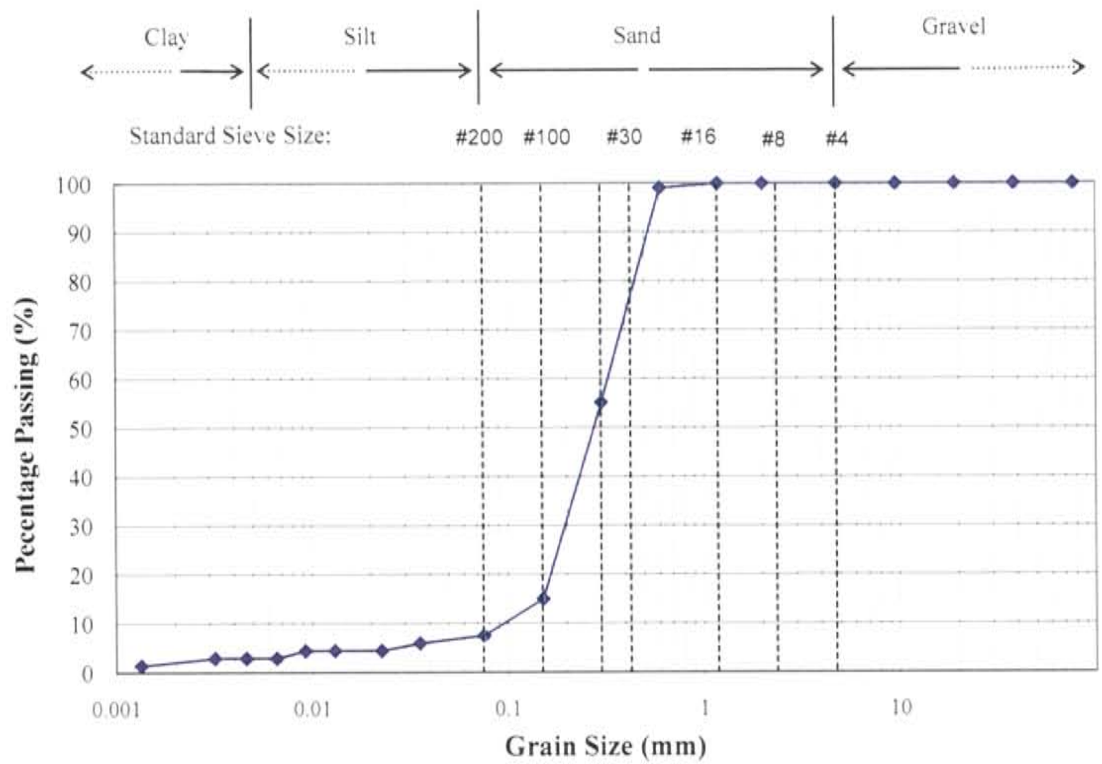
PARTICLE-SIZE ANALYSIS OF SOILS
ASTM METHOD D 422 (HYDROMETER CURVE)

Sample :	B21@35ft



According to ASTM D 2487 Unified Soil Classification System (USCS) and ASTM D 422 (Standard Test Method for Particle-Size Analysis) test method results, soil sample B21 at 35 feet is classified as a Poorly graded sand with silt (**SP-SM**).

D_{10} (mm)	**0.095**
D_{30} (mm)	**0.19**
D_{60} (mm)	**0.33**
C_u	**3.47**
C_c	**1.15**

EEI Geotechnical & Environmental Solutions

5845 Avenida Encinas, Suite 128 Carlsbad, CA 92008

Client: Thomas Enterprises
Project Name: Oceanside, CA
Job Number:THO-70810
Date: 9-8-08
Boring Number: B21
Location: 35 feet
Soil Description: Poorly graded sand with silt, SP-SM
Tested by: AW

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX

ASTM METHOD D 4318

	Sample: B1@40ft			
	One Point Liquid Limit		Plastic Limit	
Test Number	1		1	2
Container Number	10	30	16	14
Weight of Container (g)	13.88	13.98	13.88	13.6
Wet Weight of Soil and Container (g)	41.28	40.12	17.71	19.44
Dry Weight of Soil and Container (g)	34.3	32.8	16.81	17.93
Number of Blows	20	9		
Moisture Content (%)	34.5	38.9	30.7	34.9

Liquid Limit =	34
Plastic Limit =	33
Plasticity Index =	1

Classification of fine-grained portion of soils = ML

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Client: Thomas Enterprises
Project Name: Oceanside, CA
Job Number: THO-70810
Date: 9-5-08
Boring Number: B1
Location: 40 feet
Soil Description: Silt, ML
Tested by: AW

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX

ASTM METHOD D 4318

	Sample: B21@35ft			
	One Point Liquid Limit		Plastic Limit	
Test Number	1		1	2
Container Number	21	32	non-plastic	non-plastic
Weight of Container (g)	13.97	13.85		
Wet Weight of Soil and Container (g)	46.38	42.18		
Dry Weight of Soil and Container (g)	41.1	36.19		
Number of Blows	12	3		
Moisture Content (%)	19.3	26.8	na	na

Liquid Limit =	19
Plastic Limit =	na
Plasticity Index =	na

Classification of fine-grained portion of soils = ML

EEI Geotechnical & Environmental Solutions

Client: Thomas Enterprises

Project Name: Oceanside, CA

Job Number: THO-70810

Date: 9-5-08

Boring Number: B21

Location: 35 feet

Soil Description: Silt, ML

2195 Faraday Avenue, Suite K, Carlsbad, CA 92008

Tested by: AW

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX

ASTM METHOD D 4318

	Sample: B21@45ft			
	One Point Liquid Limit		Plastic Limit	
Test Number	1		1	2
Container Number	C	D	A	B
Weight of Container (g)	13.7	13.78	13.82	13.89
Wet Weight of Soil and Container (g)	35.13	38.87	22.18	20.77
Dry Weight of Soil and Container (g)	28.7	31.61	20.21	19.01
Number of Blows	9	12		
Moisture Content (%)	42.8	40.7	30.8	34.4

Liquid Limit =	38
Plastic Limit =	33
Plasticity Index =	5

Classification of fine-grained portion of soils = ML

EEI

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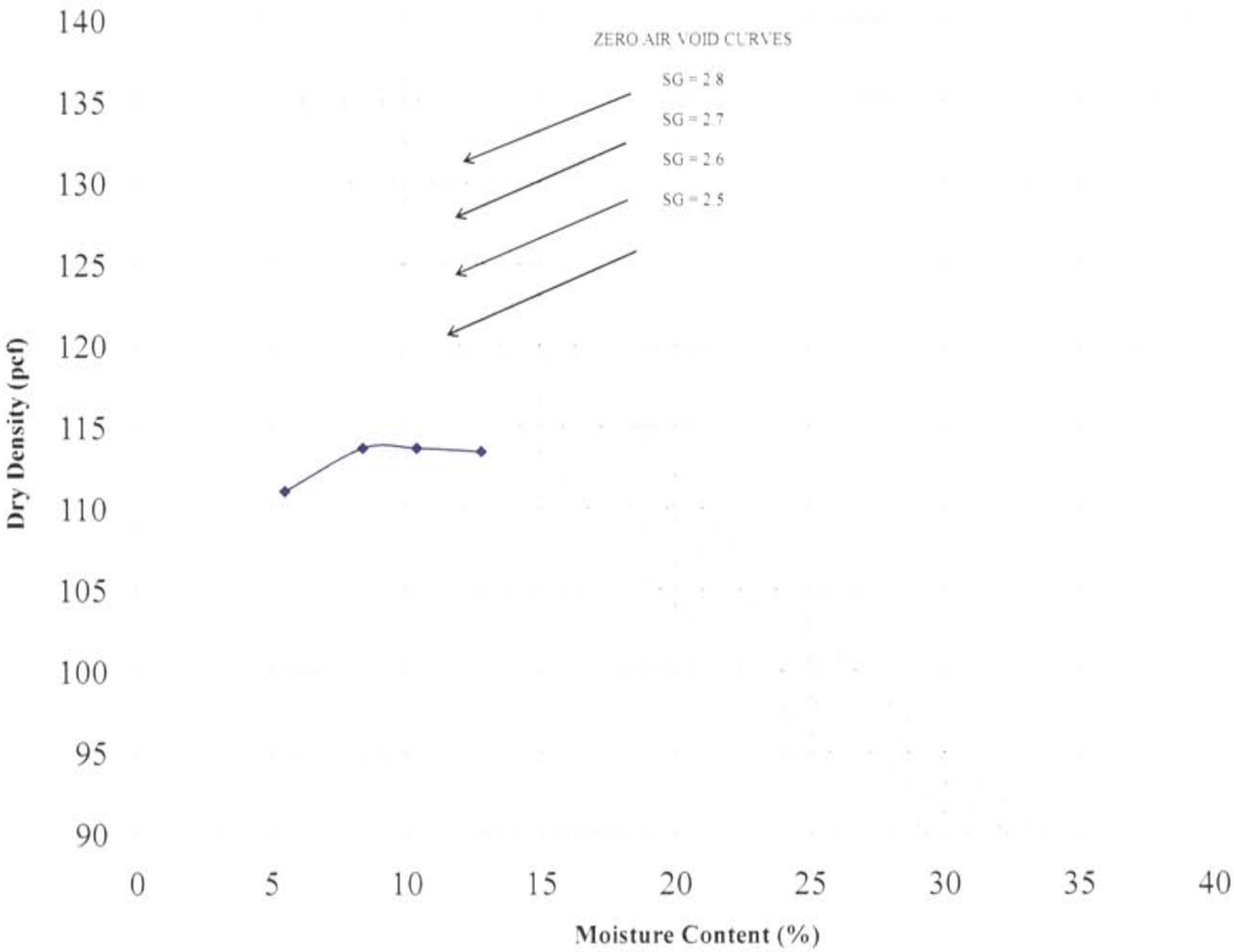
Client: Thomas Enterprises	
Project Name: Oceanside, CA	
Job Number: THO-70810	
Date: 9-5-08	
Boring Number: B21	
Location: 45 feet	
Soil Description: Silt, ML	
Tested by: AW	

LABORATORY COMPACTION ASTM D 1557

Sample	1	2	3	4
Mold and wet soil (lbs.)	13.140	13.342	13.418	13.516
Mold (lbs.)	9.250	9.250	9.250	9.250
Wet Soil (lbs.)	3.890	4.092	4.168	4.266
Wet Density (pcf)	117.17	123.25	125.54	128.03
Moisture (%)	**5.5**	**8.4**	**10.4**	**12.8**
Dry Density (pcf)	**111.1**	**113.7**	**113.7**	**113.5**



Maximum density 114pcf @ 9% moisture

Client: Thomas Enterprises
Project Name: Oceanside, CA
Procedure: Method A
Job Number: THO-70810
Date: 9-5-08
Boring Number: B18
Location: 0-2 feet
Soil Description: Silty sand, SM
Tested by: AW

EEI Geotechnical & Environmental Solutions

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DIRECT SHEAR TEST ASTM D 3080

Job Data	
Job No.:	THO-70810
Client:	Thomas Enterprises
Date:	9/8/08
Sample Data	
Sample:	B18@0-2ft
Remolded To:	to 90% of max
Remarks:	Soaked Before Placing in Shear Box
Soil Description:	Silty sand, SM

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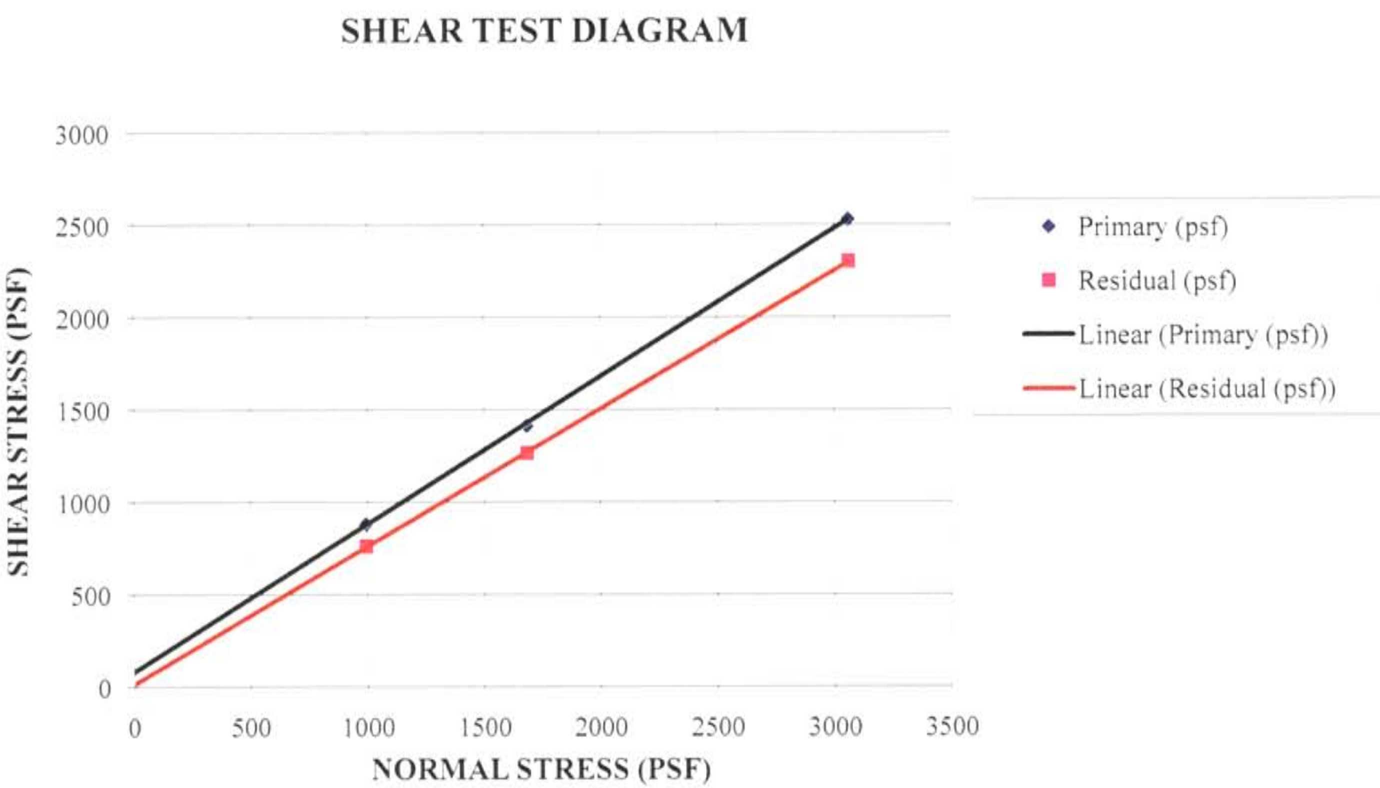

Test Results

	Phi		Cohesion	
Primary (psf)	39	degrees	82	psf
Residual (psf)	37	degrees	19	psf

Average Initial Moisture	9.0%
Average Dry Density	101.8 pcf
Average Final Moisture	20.2%

EXPANSION INDEX TEST

ASTM METHOD D 4829

Sample: B18@0-2ft

Moisture Content of Initial Sample		% Saturation of Re-molded Sample		Moisture Content of Final Sample	
Tare No. -		Wt. of Soil and Ring (g) -	551.5	Wt. of Soil and Ring (g) -	600.7
Wet Weight and Tare (g) -	174.2	Ring Weight (g) -	189.1	Ring Weight (g) -	189.1
Dry Weight and Tare (g) -	157.0	Wet Weight of Soil (g) -	362.4	Wet Weight of Soil (g) -	411.6
Tare Weight (g) -	31.0	Dry Weight of Soil (g) -	318.9	Dry Weight of Soil (g) -	318.9
Water Loss (g) -	17.2	Volume of Ring (ft^3) -	0.0073	Weight of Water (g) -	92.7
Dry Weight (g) -	126.1	Dry Density (pcf) -	96.3	*Final Moisture (%)*	*29.1*
Initial Moisture (%) -	*13.6*	*Initital Saturation (%) -*	*49.2*	*Final Saturation (%) -*	*104.7*

Expansion Test - UBC (144 PSF)				
	Date	Time	Reading	
Add Weight	9/2/2008	16:20	0.000	
10 Minutes		16:30	0.000	Initial Reading
Add Water		16:50	0.000	
	9/3/2008	17:05	0.000	
		17:26	0.000	Final Reading

EImeasured	=	0
EI_{50}	**=**	**0**

Expansion Index, EI_{50}	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

EEI
Geotechnical & Environmental Solutions

2195 Faraday Avenue, Suite K, Carlsbad, CA 92008

Client: Thomas Enterprises

Project Name: Oceanside, CA

Job Number: THO-70810

Date: 9-3-08

Boring Number: B18

Depth: 0-2 feet

Soil Description: Silty sand, SM

Tested by: AW

CONSOLIDATION-SWELL TEST ASTM D 2435

Job Data
Job No.: THO-70810
Client: Thomas Enterprises
Project Name: Oceanside, CA
Date: 9-8-08
Sample Data
Sample: B4@10ft
Sample Type: cal mod
Remarks: inundated at 2ksf
Soil Description: Silty sand, SM

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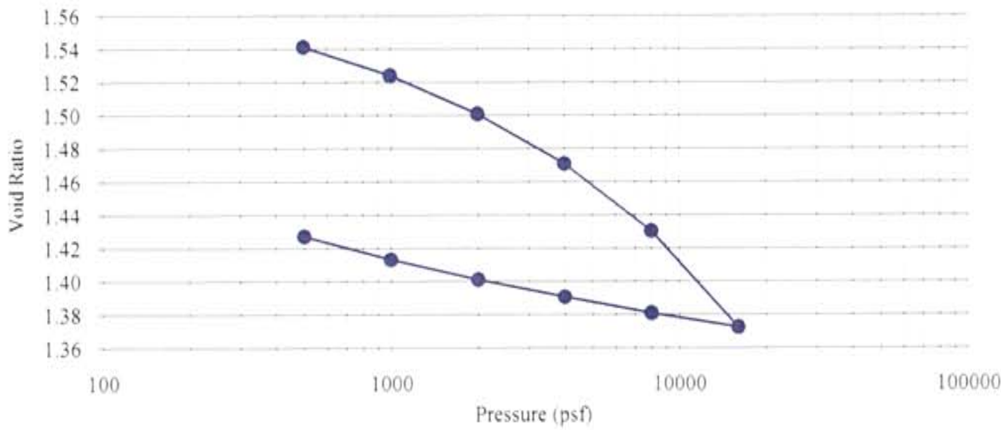

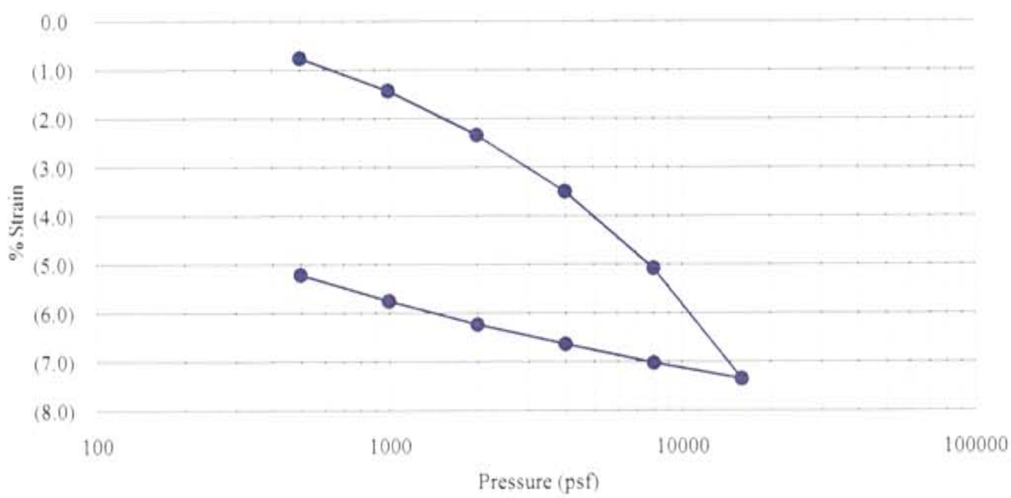

Swell Pressure:	1986	psf
Percent Swell:	0.0%	
Comp. Index (Cc):	0.193	
Consol. Index (Cr):	0.036	

Specimen Diameter:	2.418	in.
Specimen Height:	1.00	in.
Overburden Pressure (Po):	835	psf
Preconsol. Pressure (Pp):	n/a	psf

	Initial	Final
Moisture Content:	36.1%	34.0%
Void Ratio:	1.541	1.427
Saturation:	n/a	65%
Dry Density (pcf):	65.8	70.3

CONSOLIDATION-SWELL TEST ASTM D 2435

Job Data
Job No.: THO-70810
Client: Thomas Enterprises
Project Name: Oceanside, CA
Date: 9-8-08
Sample Data
Sample: B16@10ft
Sample Type: cal mod
Remarks: inundated at 2ksf
Soil Description: Silty sand, SM

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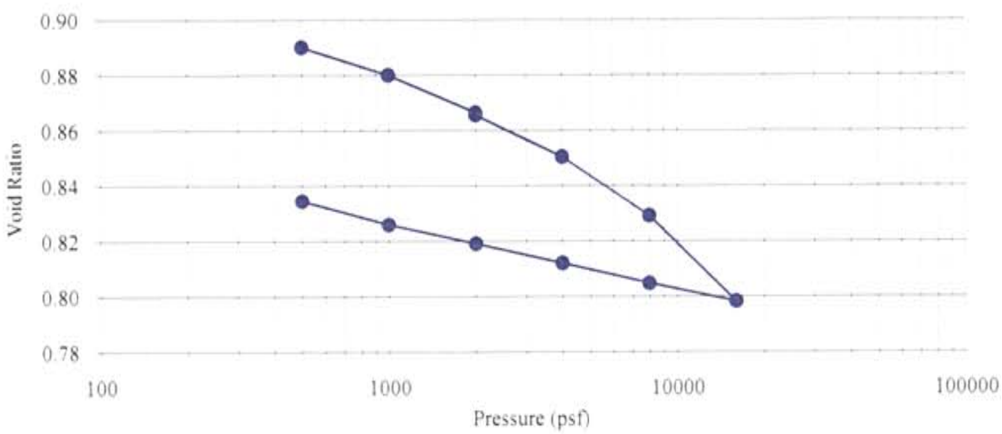

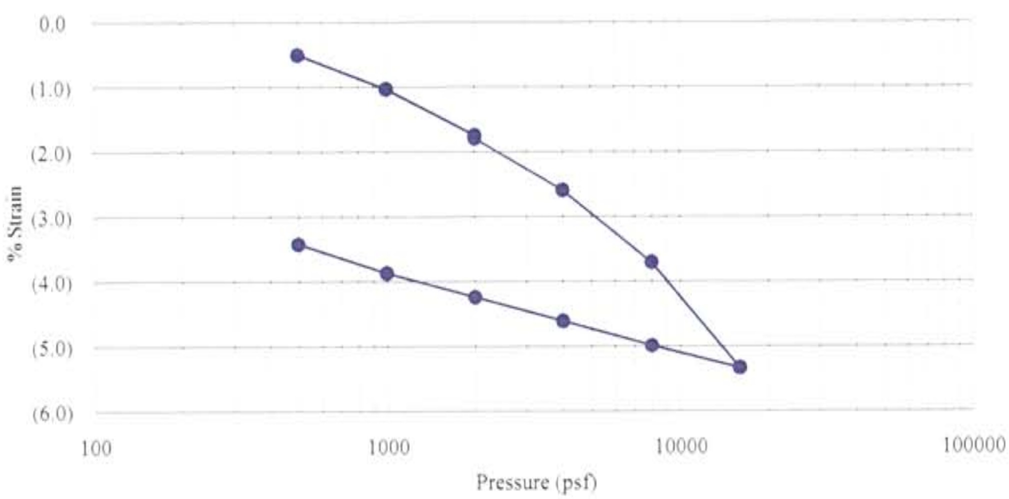

Swell Pressure:	1986	psf
Percent Swell:	-0.1%	
Comp. Index (Cc):	0.103	
Consol. Index (Cr):	0.024	

Specimen Diameter:	2.418	in.
Specimen Height:	1.00	in.
Overburden Pressure (Po):	1156	psf
Preconsol. Pressure (Pp):	n/a	psf

	Initial	Final
Moisture Content:	2.8%	31.2%
Void Ratio:	0.890	0.835
Saturation:	n/a	61%
Dry Density (pcf):	88.7	71.4

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Table 1 - Laboratory Tests on Soil Samples

EEI
Oceanside, CA
Your #THO-70810, SA #08-1039LAB
3-Sep-08

Sample ID			B21 @ 2.5' SM/SP
Resistivity		**Units**	
as-received		ohm-cm	40,000
minimum		ohm-cm	9,200
pH			7.7
Electrical Conductivity		mS/cm	0.10
Chemical Analyses			
Cations			
calcium	Ca^{2+}	mg/kg	63
magnesium	Mg^{2+}	mg/kg	8.7
sodium	Na^{1+}	mg/kg	14
potassium	K^{1+}	mg/kg	10
Anions			
carbonate	CO_3^{2-}	mg/kg	ND
bicarbonate	HCO_3^{1-}	mg/kg	165
flouride	F^{1-}	mg/kg	1.9
chloride	Cl^{1-}	mg/kg	2.5
sulfate	SO_4^{2-}	mg/kg	24
phosphate	PO_4^{3-}	mg/kg	3.2
Other Tests			
ammonium	NH_4^{1+}	mg/kg	1.2
nitrate	NO_3^{1-}	mg/kg	ND
sulfide	S^{2-}	qual	Negative
Redox		mV	372

Minimum resistivity per CTM 643

Electrical conductivity in millisiemens/cm and chemical analysis were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

431 West Baseline Road · Claremont, CA 91711
Phone: 909.626.0967 · Fax: 909.626.3316

R - VALUE DATA SHEET

P.N. THO-70810
Oceanside, CA

PROJECT NUMBER 35787 BORING NUMBER: B-14 @ 0'-2'

SAMPLE DESCRIPTION: Brown Sand

Item	SPECIMEN		
	a	b	c
Mold Number	1	3	4
Water added, grams	170	130	115
Initial Test Water, %	14.8	11.5	10.2
Compact Gage Pressure,psi	350	350	350
Exudation Pressure, psi	129	314	489
Height Sample, Inches	2.58	2.48	2.60
Gross Weight Mold, grams	2978	2945	2980
Tare Weight Mold, grams	1965	1977	1977
Sample Wet Weight, grams	1013	968	1003
Expansion, Inches x 10exp-4	0	0	0
Stability 2,000 lbs (160psi)	17 / 34	13 / 26	11 / 25
Turns Displacement	5.01	4.96	4.91
R-Value Uncorrected	65	72	73
R-Value Corrected	67	72	75
Dry Density, pcf	103.6	106.1	106.0
	DESIGN CALCULATION DATA		
Traffic Index Assumed:	4.0	4.0	4.0
G.E. by Stability	0.34	0.29	0.26
G. E. by Expansion	0.00	0.00	0.00

Equilibrium R-Value	71 by EXUDATION	Examined & Checked: 9 /4/ 08

REMARKS:
Gf = 1.25
0.0% Retained on the 3/4" Sieve.
Free Drainage.

Steven R. Marvin RCE 30659

REGISTERED PROFESSIONAL ENGINEER STEVEN R. MARVIN 30659 EXP 3/31/10 STATE OF CALIFORNIA

The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

LaBelle • Marvin

R-VALUE GRAPHICAL PRESENTATION

PROJECT NO. 35787 P.N. THO-70810

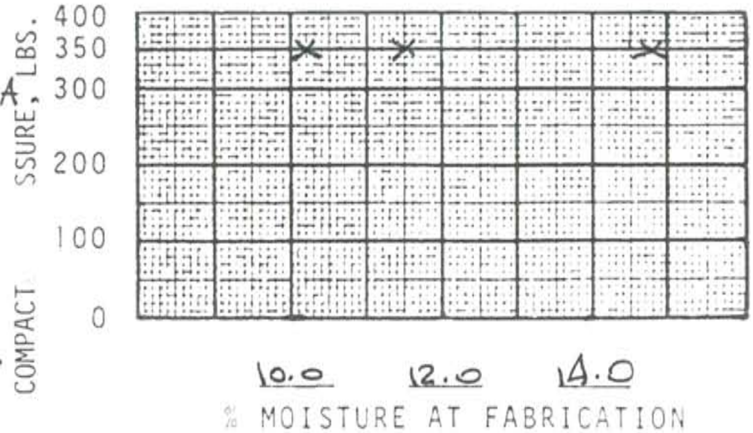
BORING NO. B-14 @ 0'-2' Oceanside CA. Thomas Ent.

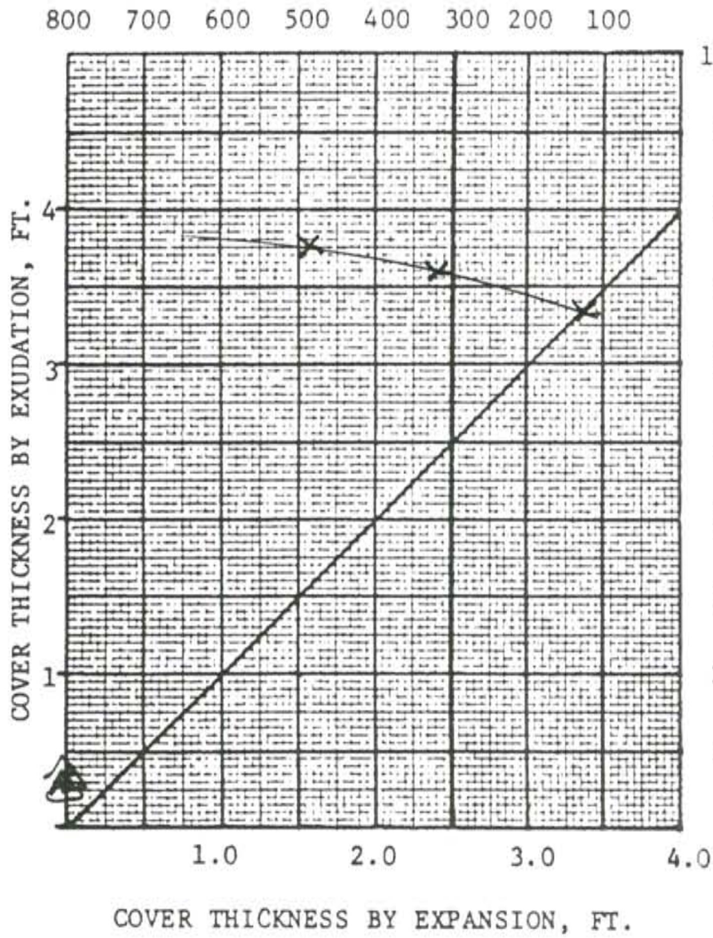
DATE 9-4-08

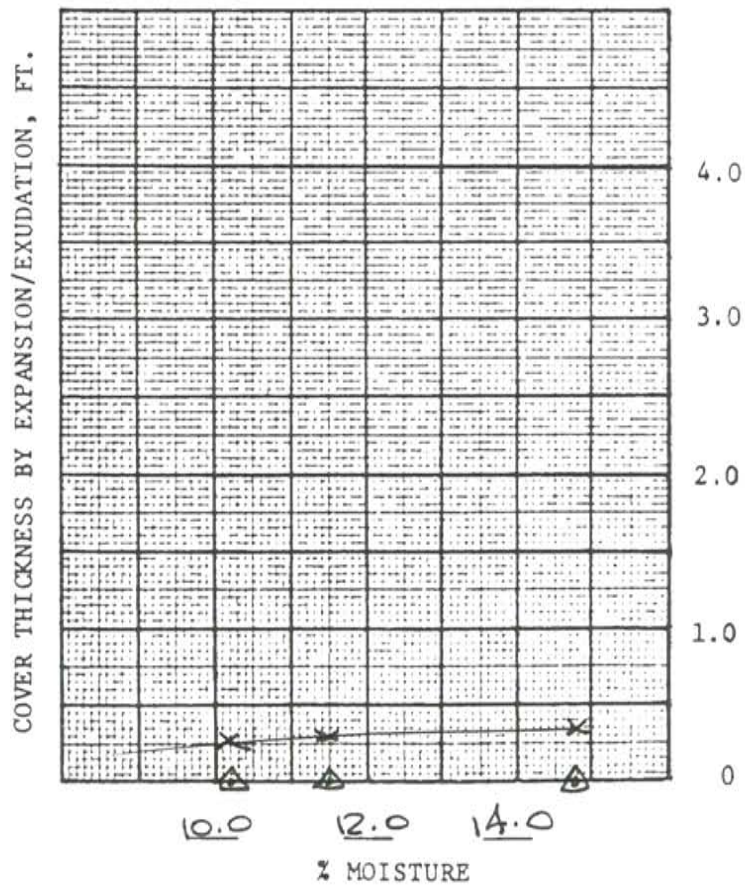
TRAFFIC INDEX Assume 4.0

R-VALUE BY EXUDATION 71

R-VALUE BY EXPANSION







R-VALUE vs. EXUD. PRES.

T by EXUDATION

EXUD. T vs. EXPAN. T

T by EXPANSION

REMARKS

GF=1.25

Boring No.	Sample No.	Depth (ft)	Sample Type	USCS Group Symbol	SPT N*60 (blows/ft)	Undrained Shear Strength, Su (ksf)			Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Wt (pcf)	Atterberg Limits			Grain Size Distribution (%) by dry weight			Other Tests
						Pocket Pen.	Mini Vane	UU Test				LL	PL	PI	Gravel	Sand	Fines	
B-101	R-1	1.0	MC	SM	19				3.3	104	107							
B-101	S-2	3.0	SPT	SM	24													
B-101	R-3	5.0	MC	SM	27				4.8	106	111				0	61	39	#200
B-101	S-4	7.5	SPT	SM	40													
B-101	R-5	10.0	MC	SP	16				1.8	100	102							
B-101	S-6	12.5	SPT	SP	17													
B-101	R-7	15.0	MC	SP	18				3.5	103	107				0	96	4	#200
B-101	S-8	17.5	SPT	SP	24													
B-101	R-9	20.0	MC	SP	23				5.5	96	101							
B-101	S-10	25.0	SPT	SM	19													
B-101	R-11	30.0	MC	SM	19				23.8	98	121							
B-101	S-12	35.0	SPT	SM	20													
B-101	R-13	40.0	MC	SP	33				25.4	100	125							
B-101	S-14	45.0	SPT	ML/CL	9	0.5			38.5			39	25	14	1	38	61	#200
B-101	R-15	50.0	MC	(ML/CL)&SM	16													
B-101	R-15-2	50.5	MC	ML/CL														
B-101	R-15-1	51.3	MC	SM					27.1	98	125							
B-101	S-16	55.0	SPT	SM	19													
B-101	R-17	60.0	MC	SP-SM	40				22.8	105	129							
B-101	S-18	65.0	SPT	ML	18	0.5												
B-101	R-19	70.0	MC	ML	17	0.5												
B-101	S-20	75.0	SPT	SM	22													
B-101	R-21	80.0	MC	SP-SM	42													
B-102	R-1	2.5	MC	SP-SM	48				6.0	112	119							
B-102	S-2	5.0	SPT	SP-SM	21													
B-102	R-3	7.5	MC	SP-SM	10				6.5	104	111				0	92	8	#200
B-102	S-4	10.0	SPT	SP-SM	11													
B-102	R-5	12.5	MC	SP-SM	12				15.2	102	118							SW
B-102	S-6	15.0	SPT	SP-SM	15													
B-102	R-7	17.5	MC	SP	21				12.8	102	115							

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TABLE B-1: Summary of Laboratory Results

Project: Riverplace
Location: Oceanside, California
Number: IR630

GDC TABLE B-1 (2015) IR 630 RIVERPLACE OCEANSIDE.GPJ GDC2013.GDT 7/7/15

Boring No.	Sample No.	Depth (ft)	Sample Type	USCS Group Symbol	SPT N*60 (blows/ft)	Undrained Shear Strength, Su (ksf)			Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Wt (pcf)	Atterberg Limits			Grain Size Distribution (%) by dry weight			Other Tests
						Pocket Pen.	Mini Vane	UU Test				LL	PL	PI	Gravel	Sand	Fines	
B-102	S-8	20.0	SPT	SP	14													
B-102	R-9	25.0	MC	SP	29				3.6	104	108							
B-102	S-10	30.0	SPT	SM	9				25.3						0	71	29	#200
B-102	R-11	35.0	MC	SM	18				28.0	95	122							
B-102	S-12	40.0	SPT	ML/CL	9	0.5			34.3			39	25	14	0	49	51	#200
B-102	R-13	45.0	MC	SM	33				22.7	104	128							
B-102	S-14	50.0	SPT	SM	24													
B-102	R-15	55.0	MC	SM	25													
B-103	R-1	2.5	MC	SP-SM	10													CR
B-103	S-2	5.0	SPT	SP-SM	11													
B-103	R-3	7.5	MC	SP-SM	13				8.5	96	104							
B-103	S-4	10.0	SPT	SP-SM	14													
B-103	R-5	15.0	MC	SP-SM	12				9.6	99	109				0	92	8	PA,DS
B-103	S-6	20.0	SPT	SP-SM	19													
B-103	R-7	25.0	MC	ML	5	0.5			29.5	95	123							
B-103	S-8	30.0	SPT	SM	9													
B-103	R-9	35.0	MC	SM	13				25.7	97	122							
B-103	S-10	40.0	SPT	SM	9													
B-103	R-11	45.0	MC	SM	14				34.7	88	119	0	0	0	0	61	39	#200
B-103	S-12	50.0	SPT	ML	20	0.5												
B-103	R-13	55.0	MC	ML	13	0.5												
B-103	S-14	60.0	SPT	ML	12	0.5												
B-104	R-1	2.5	MC	SP-SM	14				2.4	103	105							
B-104	S-2	5.0	SPT	SP-SM	8													
B-104	R-3	7.5	MC	SP-SM	10				10.2	96	106				0	95	5	#200
B-104	S-4	10.0	SPT	SP-SM	17													
B-104	R-5	12.5	MC	SP-SM	19				4.6	98	103				0	95	5	PA
B-104	S-6	15.0	SPT	SP-SM	25													
B-104	R-7	17.5	MC	SP-SM	30				4.3	100	104							
B-104	S-8	20.0	SPT	SP-SM	18													

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TABLE B-1: Summary of Laboratory Results

Project: Riverplace

Location: Oceanside, California

Number: IR630

Boring No.	Sample No.	Depth (ft)	Sample Type	USCS Group Symbol	SPT N*60 (blows/ft)	Undrained Shear Strength, Su (ksf)			Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Wt (pcf)	Atterberg Limits			Grain Size Distribution (%) by dry weight			Other Tests
						Pocket Pen.	Mini Vane	UU Test				LL	PL	PI	Gravel	Sand	Fines	
B-104	R-9	25.0	MC	ML	4	0.25			28.8	91	117							
B-104	S-10	30.0	SPT	ML	12	0.5			31.4			30	25	5	1	36	63	#200
B-104	R-11	35.0	MC	ML	12	0.5			31.8	90	119							
B-104	S-12	40.0	SPT	SM	28				27.3						0	51	49	#200
B-104	R-13	45.0	MC	SP-SM	41				21.6	99	120							
B-104	S-14	50.0	SPT	SP-SM	52													
B-104	R-15	55.0	MC	SP-SM	46													
B-104	S-16	60.0	SPT	SM	30													
B-104	S-17	65.0	SPT	SM	37													
B-104	S-18	70.0	SPT	SP-SM	57													

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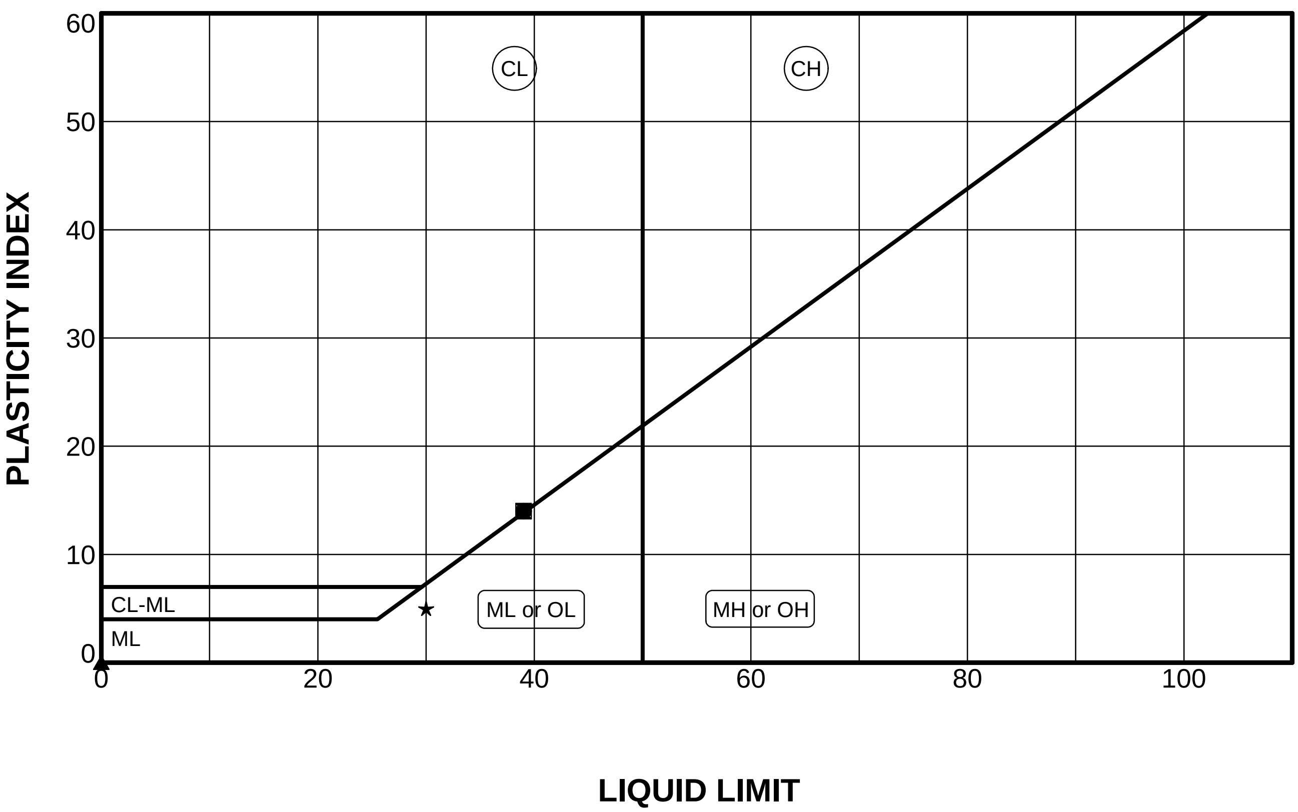
TABLE B-1: Summary of Laboratory Results

Project: Riverplace

Location: Oceanside, California

Number: IR630



SYMBOL	BORING	DEPTH (ft)	LL	PL	PI	LI	w%	USCS CLASSIFICATION
●	B-101	45.0	39	25	14	0.93	39	ML/CL) SANDY SILT/SANDY lean CLAY
⊠	B-102	40.0	39	25	14	0.64	34	ML/CL) SANDY SILT/SANDY lean CLAY
▲	B-103	45.0	NP	NP	NP		35	(SM) SILTY SAND
★	B-104	30.0	30	25	5	1.20	31	(ML) SANDY SILT

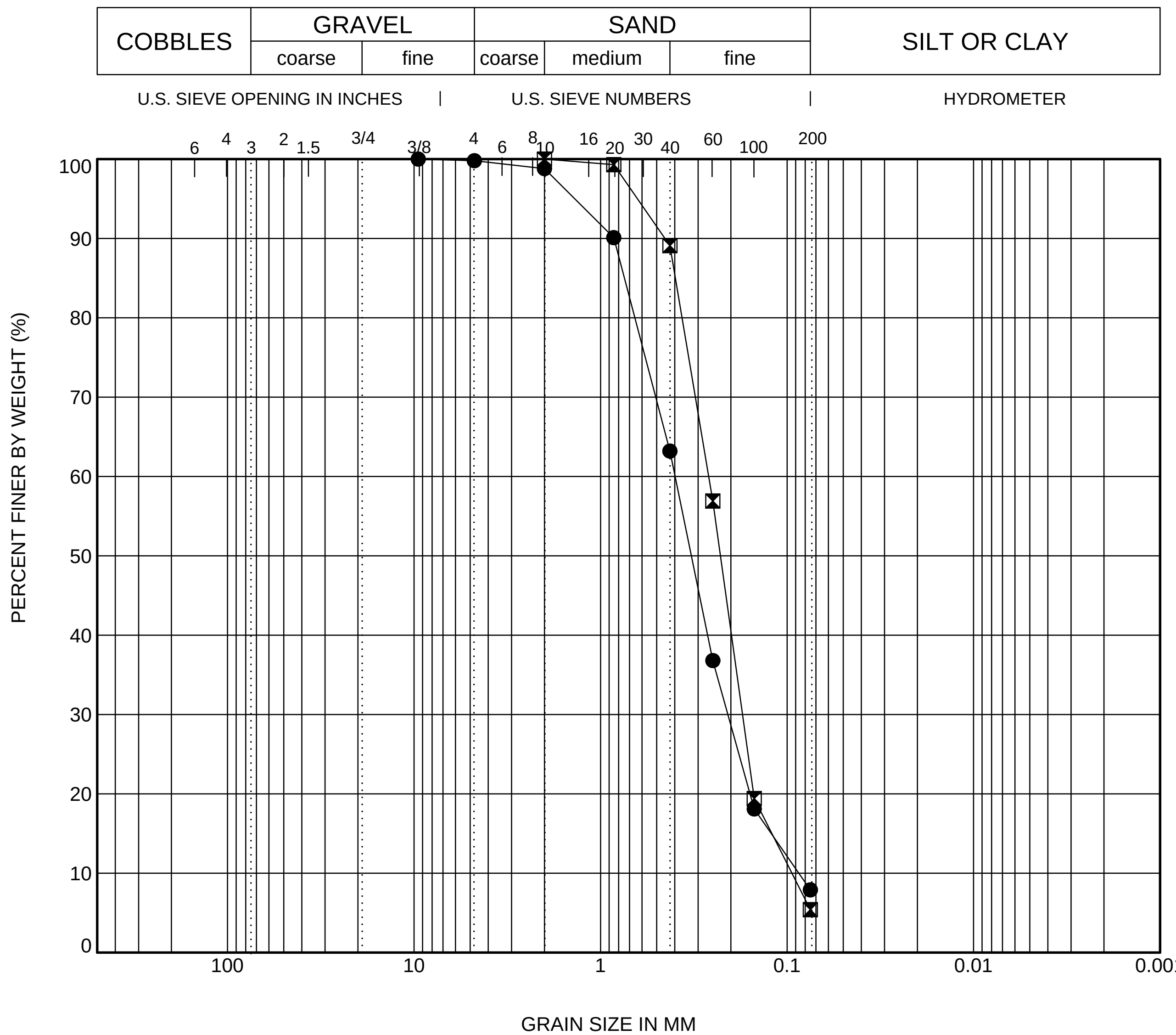
GDC_ATTERBERG_APP_E_IR 630 RIVERPLACE OCEANSIDE.GPJ GDC_WLOG.GDT 7/7/15

GROUP DELTA

ATTERBERG LIMITS

Group Delta Consultants, Inc.

Project: Riverplace
Location: Oceanside, California
Number: IR630



SYMBOL	BORING	DEPTH (ft)	USCS CLASSIFICATION
●	**B-103**	**15.0**	**(SP-SM) Poorly-graded SAND with SILT**
⊠	**B-104**	**12.5**	**(SP-SM) Poorly-graded SAND with SILT**

SYMBOL	BORING	DEPTH (ft)	D100	D60	D30	D10	LL	PL	PI	Cc	Cu
●	**B-103**	**15.0**	**9.5**	**0.399**	**0.208**	**0.087**				**1.25**	**4.61**
⊠	**B-104**	**12.5**	**2**	**0.263**	**0.173**	**0.094**				**1.21**	**2.79**

GDC_GRAIN_SIZE_APP_E_IR 630 RIVERPLACE OCEANSIDE.GPJ GDC_WLOG.GDT 7/7/15

GROUP DELTA

GRAIN SIZE DISTRIBUTION

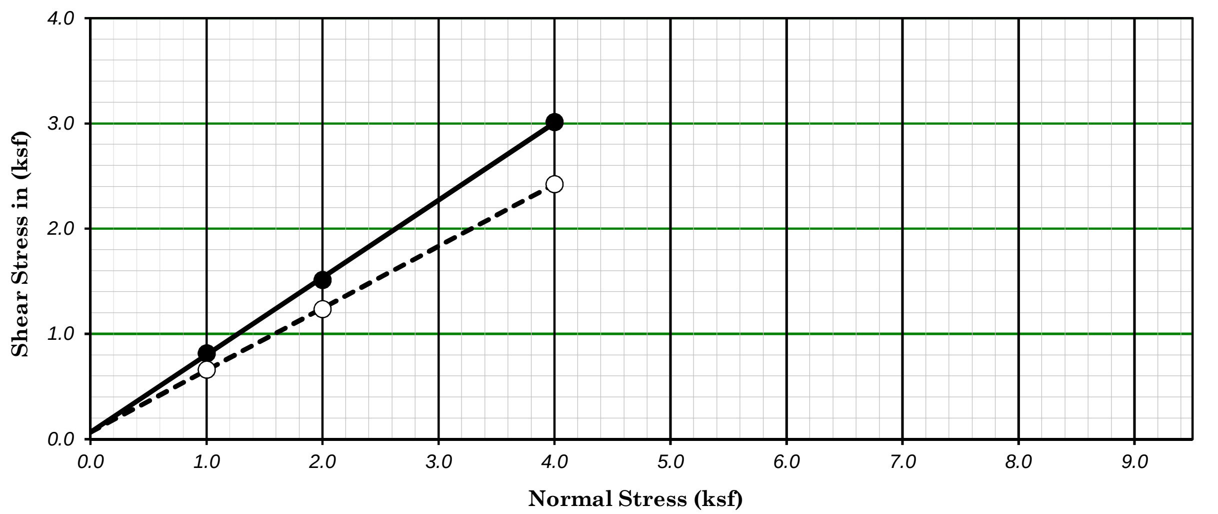
(ASTM D 422)

Group Delta Consultants, Inc.

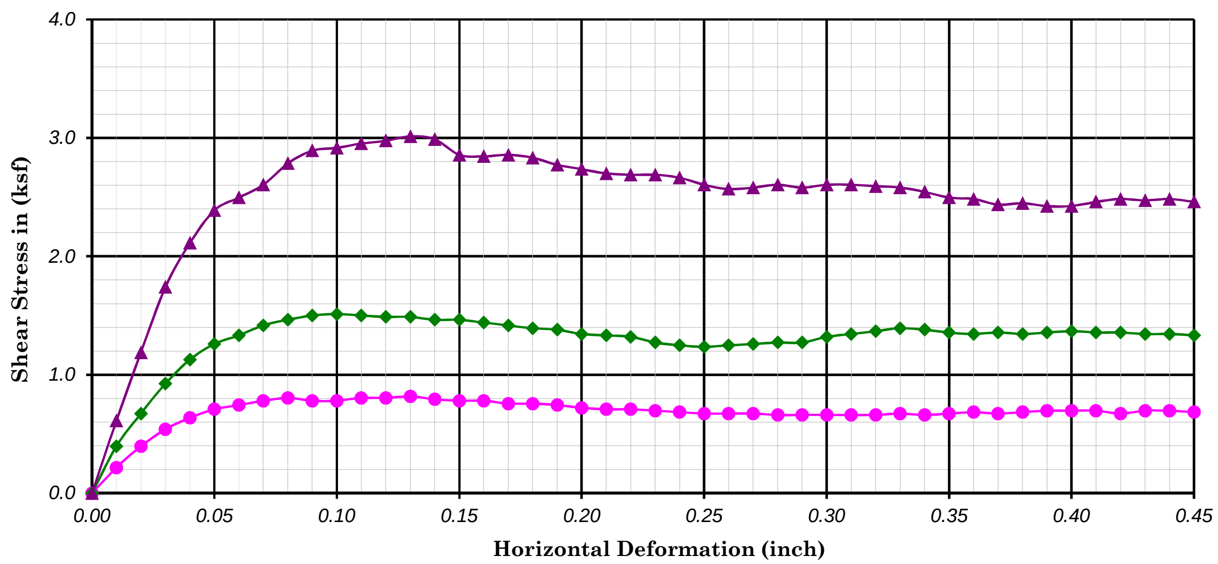
Project: Riverplace

Location: Oceanside, California

Number: IR630



Ultimate : ○ | Shear Type : Saturated | Undisturbed | Peak : ●



Boring No.	: B-103		Strength Intercept (C) :	0.07	(ksf)	Peak	0.07	(ksf)	Ultimate	
Sample No.	: R5			3.16	(kPa)		3.16	(kPa)		
Depth (ft/m)	: 16.0	4.88	Friction Angle (ϕ) :	36.30	Degree		30.49	Degree		
Description	: Pale brown Poorly-graded Sand with Silt						Shear Rate (inch/minute) :		0.025	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	25.02	99.18	15.61	0.70	1.00	47.88	0.82	39.07	0.66	31.60
◆	26.27	100.27	15.78	0.68	2.00	95.76	1.51	72.39	1.24	59.18
▲	23.28	102.03	16.06	0.65	4.00	191.52	3.01	144.21	2.42	116.06

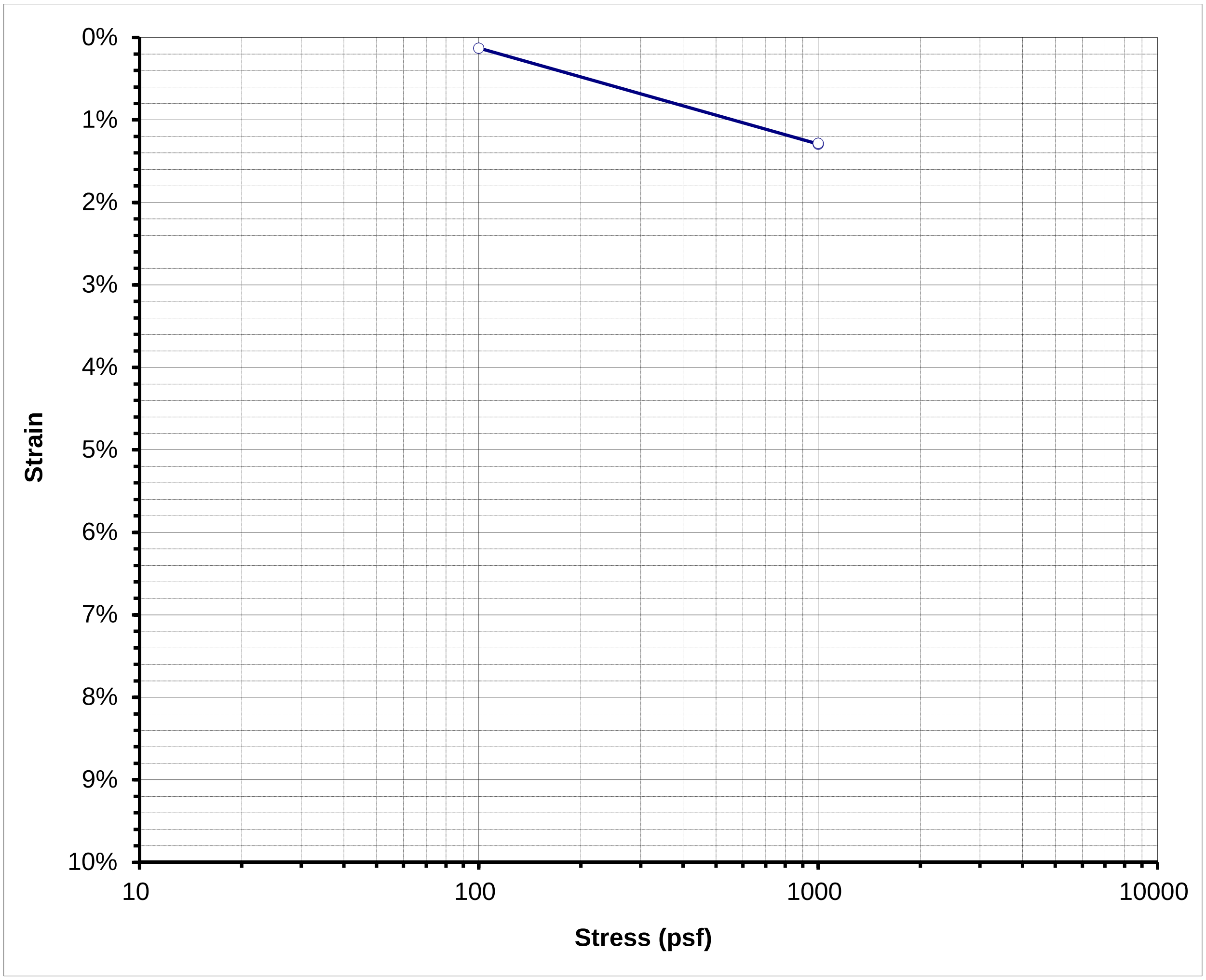
GROUP DELTA

River Place, Oceanside

Project No. : IR 630 | **Date :** 07/03/15

DIRECT SHEAR TEST
(ASTM D 3080)

ONE DIMENSIONAL SWELL/SETTLEMENT TEST RESULTS
ASTM D 4546



Boring No.	B-102	Sample Depth	13.5
Sample No.	R5	USCS	SP-SM

BEFORE TEST

Initial Moisture Content:	27.8%	
Initial Dry Unit Wt:	91.2	pcf
Initial Total Unit Wt.:	116.5	pcf
Initial Void Ratio:	0.8484	
Initial Degree of Saturation:	88.6%	

AFTER TEST

Final Moisture Content:	30.8%	
Final Dry Unit Wt:	91.2	pcf
Final Total Unit Wt.:	119.2	pcf
Final Void Ratio:	0.8484	
Final Degree of Saturation:	98.1%	

Water Added at: 1000 psf

ATTERBERG LIMITS					
LL=	Nonplastic	PL=	Nonplastic	PI=	Nonplastic

PRESSURE (psf)	SAMPLE STRAIN	VOID RATIO
100	0.13%	0.8460
1000	1.29%	0.8245
1000	1.28%	0.8246
0	0.00%	0.8484

Assumed Specific Gravity of Solids, Gs: 2.70

PROJECT NUMBER: *IR 630* PROJECT NAME: *River Place, Oceanside*

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STANDARD TEST METHOD FOR pH AND RESISTIVITY (CTM 643)

REV 9-22-10

PROJECT: ***River Place, Oceanside***

SAMPLE DESCRIPTION:

PROJECT NO.: ***IR 630***

B-103 / R-1 @ 2.5-4'

TESTED BY: ***JANK***

SAMPLED BY: ***Sathis***

DATE: ***7/6/2015***

CHECKED BY: ***DLR*** DATE: ***July 7, 2015***

pH OF SAMPLE

TEST RESULT ***7.09*** **pH**

RESISTIVITY OF SAMPLE

SAMPLE WEIGHT ***300*** gm.

TRIAL NO.	WATER ADDED (ml)	RESISTANCE (ohm)
1	***50***	***16,000***
2	***60***	***12,000***
3	***70***	***10,000***
4	***80***	***9,000***
5	***90***	***9,000***
6		
7		
8		
9		
10		

BOX CONSTANTS [CM]: SMALL (.5.5), MEDIUM (0.432), LARGE (6.458)

RESISTIVITY

A) BOX CONSTANT (SMALL, MEDIUM OR LARGE)	***0.505***	**CM**
B) LOW RESISTANCE X BOX CONSTANT (A)	***4545***	**OHM-CM**
C) TEMPERATURE AT MINIMUM RESISTIVITY	***23.7***	**^{0}C**
D) CORRECTED RESISTIVITY FOR 15.5 ^{0}C	***5477***	**OHM-CM**

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STANDARD METHOD FOR DETERMINING SOLUBLE SULFATE CONTENT OF SOILS (Modified ASTM D516)

REV 9-22-10

PROJECT: ***River Place, Oceanside*** SAMPLED BY: ***Sathis*** TESTED BY: ***JANK***

PROJECT NO.: ***IR 630*** CHECKED BY: ***DLR*** DATE: ***7/7/2015***

DESCRIPTION: ***Soil Extraction - SO.3233***

SULFATE DETERMINATION	*B-103*													
A) SAMPLE I.D.	BLANK	*R-1 @ 2.5-4'*			BLANK		BLANK		BLANK		BLANK		BLANK	
B) DILUTION FACTOR	*20:1*	*20:1*												
C) BLANK ABSORPTION	*0*	*0*												
D) ABSORPTION @ 30 S	*0.005*	*0.017*												
E) ABSORPTION @ 60 S	*0.005*	*0.015*												
F) ABSORPTION @ 90 S	*0.005*	*0.014*												
G) ABSORPTION @ 120 S	*0.005*	*0.013*												
H) ABSORPTION @ 150 S	*0.005*	*0.012*												
I) ABSORPTION @ 180 S	*0.005*	*0.011*												
J) ABSORPTION @ 210 S	*0.005*	*0.011*												
K) ABSORPTION @ 240 S	*0.005*	*0.010*												
L) MAX. ABSORPTION	*0.005*	*0.012*												
M) CHART CONCENTRATION [PPM]		*0*												
N) SULFATE (M*B/10,000) [%]		*< 0.01*												

Figure B-5b

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STANDARD METHOD FOR DETERMINING SOLUBLE CHLORIDE CONTENT OF SOILS (ION PROBE 9617BN) (ASTM D512)

REV 9-30-10

PROJECT: ***River Place, Oceanside*** SAMPLED BY: ***Sathis*** TESTED BY: ***JANK***

PROJECT NO.: ***IR 630*** CHECKED BY: ***DLR*** TEST DATE: ***7/7/2015***

DESCRIPTION: ***Soil Extraction B-103, SO-3233***

CHLORIDE DETERMINATION

	B-103										
A) SAMPLE I.D.	R-1 @ 2.5-4'										
B) INITIAL DILUTION	10:1										
C) INITIAL VOLUME [ML]	50.0										
D) ISA SOLUTION [ML]	2.0										
E) WATER ADDED [ML]	48.0										
F) DILUTION (B*(C+D+E)/C)	20.0										
G) ION PROBE READING	0.62										
H) CONC. (G*F) [PPM]	12.4										
I) CHLORIDE (H/10,000) [%]	< 0.01										

CHLORIDE DETERMINATION

A) SAMPLE I.D.											
B) INITIAL DILUTION											
C) INITIAL VOLUME [ML]											
D) ISA SOLUTION [ML]											
E) WATER ADDED [ML]											
F) DILUTION (B*(C+D+E)/C)											
G) ION PROBE READING											
H) CONC. (G*F) [PPM]											
I) CHLORIDE (H/10,000) [%]											

CHLORIDE DETERMINATION

A) SAMPLE I.D.											
B) INITIAL DILUTION											
C) INITIAL VOLUME [ML]											
D) ISA SOLUTION [ML]											
E) WATER ADDED [ML]											
F) DILUTION (B*(C+D+E)/C)											
G) ION PROBE READING											
H) CONC. (G*F) [PPM]											
I) CHLORIDE (H/10,000) [%]											

Figure B-5c