# F. Geotechnical Investigation

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# GEOTECHNICAL INVESTIGATION

## The Hive - Proposed Multi-Family Residential Development
## Susan Street and West Sunflower Street
## Costa Mesa, California

Submitted to:

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NOVA Project No. 3023028
February 29, 2024

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February 29, 2024
NOVA Project No. 3023028

Subject: Geotechnical Investigation
The Hive - Proposed Multi-Family Residential Development
Susan Street and W. Sunflower Avenue
Costa Mesa, California

Dear Mr. Pinto:

NOVA Services, Inc. (NOVA) is pleased to present its report describing a geotechnical investigation for the "The Hive" Building project. NOVA's services were conducted in general accordance with our proposal dated September 29, 2023. This site is considered geotechnically suitable for the proposed construction provided the recommendations in this report are followed.

NOVA appreciates the opportunity to be of continued service to Legacy Partners. If you have any questions regarding this report, please do not hesitate to call us at 949.388.7710.

Sincerely,
**NOVA Services, Inc.**

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# GEOTECHNICAL INVESTIGATION

## The Hive

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92626

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# 1. INTRODUCTION

This report presents the results of the geotechnical investigation by NOVA Services, Inc. (NOVA) for the "The Hive" building project. As currently planned, the project will consist of construction of three five-story residential wrap buildings with six level garages. Schematic architectural drawings indicate there are several areas of landscape improvement. NOVA anticipates there will also be improvements to fire lane located adjacent to the proposed building limits and to underground utilities.

The purpose of NOVA's work is to make recommendations regarding design and construction of the geotechnical aspects of the project. Figure 1-1 depicts the site vicinity. Figure 1-2 shows the site location on a recent aerial image.

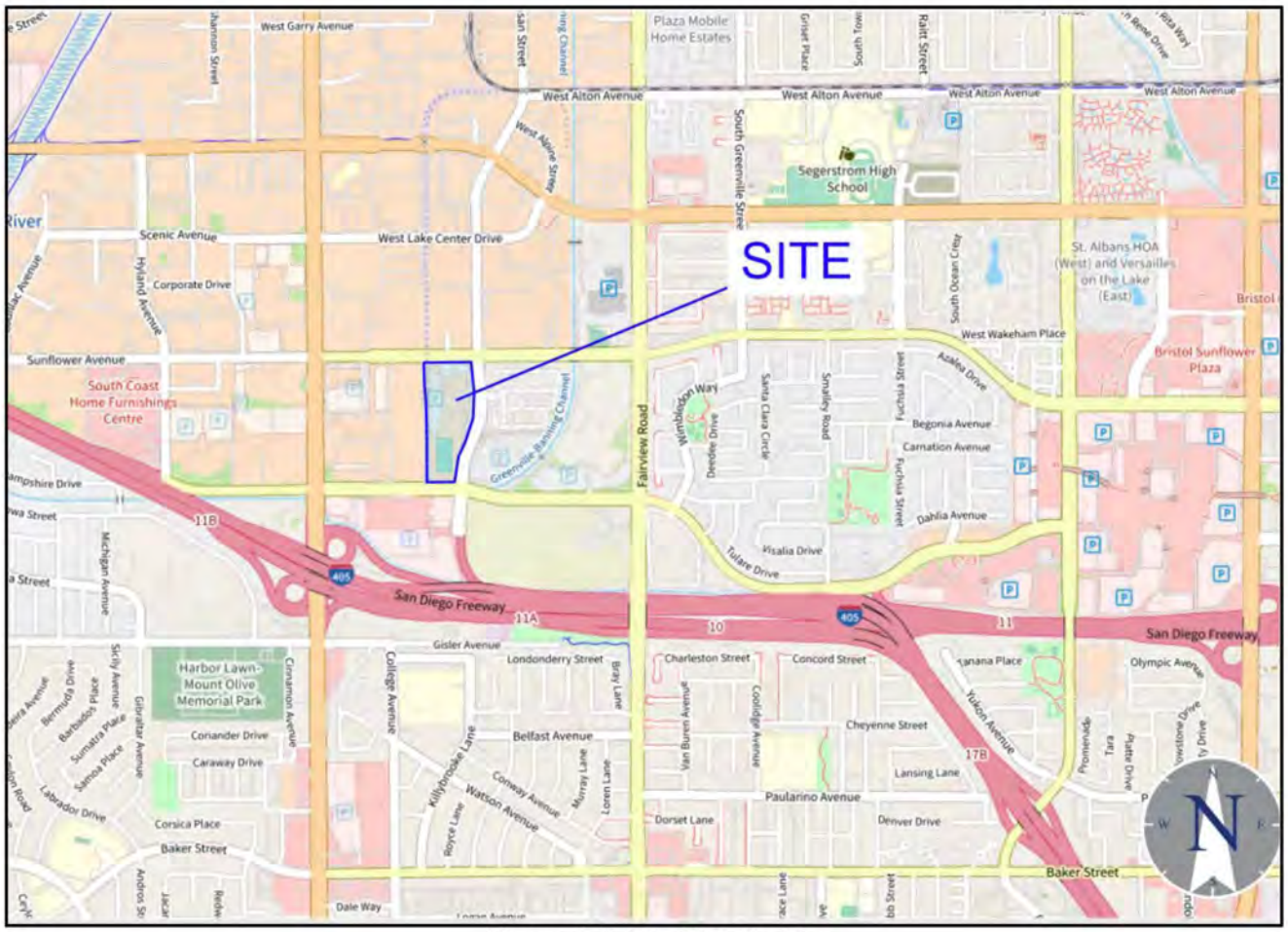


**Figure 1-1. Site Vicinity Map**

**Figure 1-2. Site Location Map**

# 2. SCOPE OF WORK

## 2.1. Field Investigation

### *2.1.1 General*

NOVA explored the subsurface conditions by two means.

1. Borings. Four geotechnical borings (B-1 through B-4) to depths up to about 51½ feet below the ground surface (bgs) using a truck-mounted drill rig equipped with a hollow-stem auger as well as
2. Soundings. Two Cone Penetration Test ('CPT', after ASTM D5778) soundings (CPT-1 through CPT-2) were extended to a depth of up to 100ft with a 30-ton CPT rig.

Figure 2-1 presents the approximate locations of the borings. Plate 1 presents the exploration locations on a larger scale.

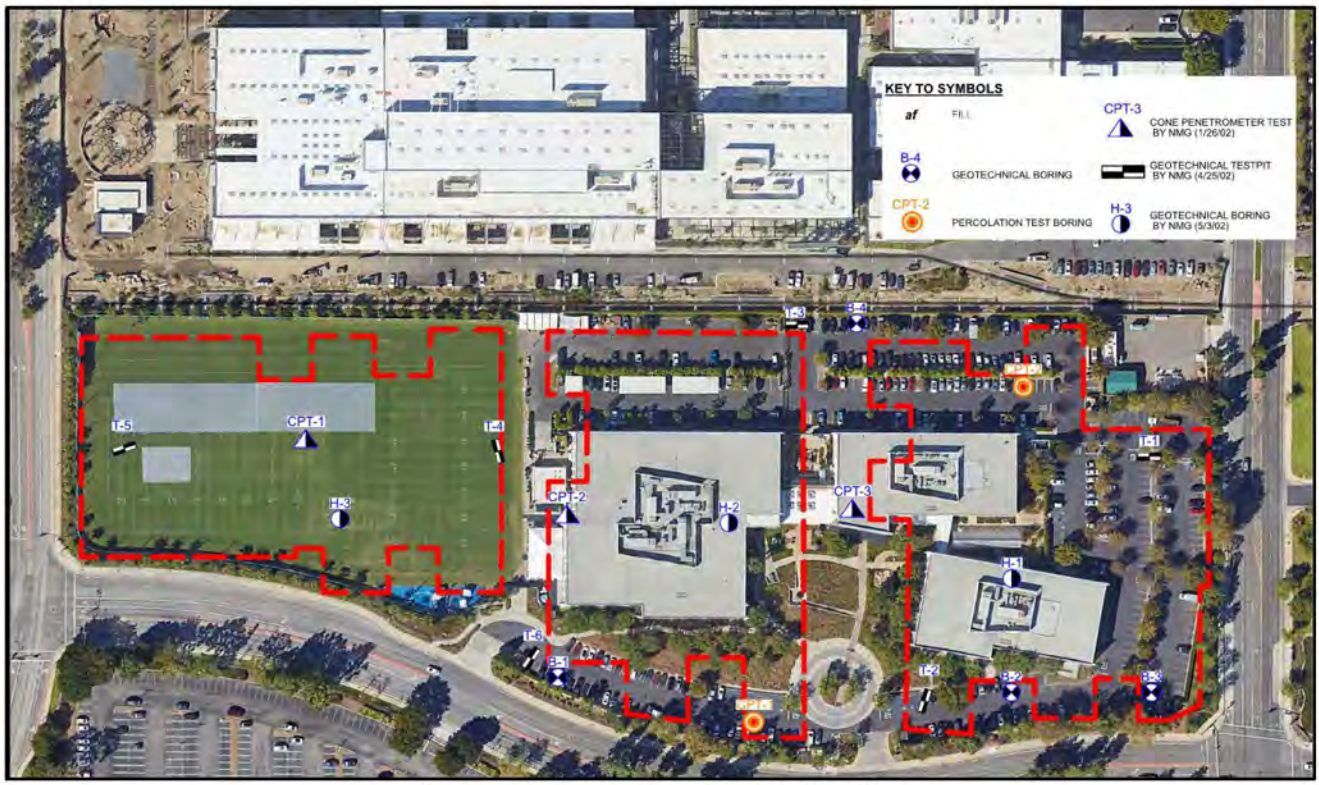


**Figure 2-1. Subsurface Exploration Map**

### *2.1.2 Logging and Sampling the Borings*

A NOVA engineer logged the borings and collected samples of the materials encountered for laboratory testing. Relatively undisturbed samples were obtained using a modified California (CAL) sampler, a ring-lined split tube sampler with a 3-inch outer diameter and 2½-inch inner diameter. Standard Penetration Tests (SPT) were performed in the borings using a 2-inch outer diameter and 1⅜-inch inner diameter split tube sampler.

The CAL and SPT samplers were driven using an automatic hammer with a calibrated Energy Transfer Ratio (ETR) of 81.5%. The number of blows needed to drive the sampler 18 inches is noted in three, 6-inch intervals on the logs. Sampler refusal was encountered when 50 blows were applied during any one of the three 6-inch intervals, a total of 100 blows was applied, or there was no discernible sampler advancement during the application of ten successive blows. The field blow counts, N, were corrected to a standard hammer (cathead and rope) with a 60% ETR. The corrected blow counts are noted on the boring logs as $N_{60}$. Disturbed bulk samples were obtained from the SPT sampler and the drill cuttings.

Appendix B presents logs of the borings. Soils are classified according to the Unified Soil Classification System.

## 2.2. Laboratory Testing

NOVA tested selected samples from the borings to evaluate soil classification and engineering properties and develop geotechnical conclusions and recommendations. The laboratory tests consisted of in-place dry density and moisture content, maximum dry density and optimum moisture content, particle-size distribution, Atterberg limits, expansion index, consolidation, direct shear and corrosivity.

Appendix C presents the results of the laboratory tests and brief explanations of the test procedures.

## 2.3. Analysis and Report Preparation

The results of the field investigation and laboratory testing were evaluated to develop conclusions and recommendations regarding the geotechnical aspects of the proposed construction and site improvements.

# 3. SITE AND PROJECT DESCRIPTION

## 3.1. Site Description

The approximately 13.5-acre, irregular shaped site is located at 3333 Susan Street in the City of Costa Mesa. The site is bounded by Sunflower Avenue to the north, Susan Street to the east, Coast Drive to the south, and a mix of warehouse and commercial use buildings and associated parking to the west. The western limit of the property is also adjacent to a portion of abandoned railway.

The site is relatively level with elevations ranging from +30 feet mean sea level(msl) to +34 feet msl throughout the site (elevations are sourced from Google Earth). The site is used for a variety of purposes including: three connected two-story buildings for commercial use with associated parking within the northern, western, and eastern portions of the property. An athletic field is developed within the southern portion of the property. Additionally, two small stand-alone single-story buildings are present adjacent to the north west entrance.

Review of aerial photography from the earliest aerial survey available from 1953 indicates the site was undeveloped. The vicinity of the site appears to be generally developed for agricultural purposes. Roads adjacent to the north and south of the site vicinity appear paved by 1963. By 1972, portions of the adjacent commercial buildings were developed. By 1992 additional commercial buildings west of the site were developed. Susan Street first appears in photographs in 1996. Development of the site property began in 2003. By 2004 the commercial buildings on the subject property were developed. By 2018, the athletic field had been developed. The site has remained relatively unchanged since then.

## 3.2. Site History

NOVA reviewed several geotechnical reports for the subject site.

1. NMG 2002a. A report by NMG Geotechnical (NMG) on August 1, 2002, addresses a geotechnical investigation for the proposed Emulex Development. Exploration consisted of three exploratory borings reaching up to 51.5 feet in depth, six backhoe trenches reaching up to 10.5 feet in depth, and three Cone Penetrometer Test (CPT) soundings reaching up to 66.4 feet in depth. Groundwater was observed between depths of 15 feet to 20 feet.

2. NMG 2002b. An October 28, 2002, report by NMG addresses recommendations for construction and settlement monitoring a surcharge fill to precompress soils for the Emulex Development. NMG recommended a minimum 9.3 feet high surcharge fill placed at least 10 feet beyond building footprint. NMG also recommended that the top of the surcharge fill be placed beyond building footprint.

3. NMG 2002c. A December 26, 2002, project memorandum NMG -summarizes the total ground settlement following the placement of surcharge fill. About 3.68 to 4.16 inches of settlement was recorded within Buildings A, B, and C following 40 to 50 days of surcharge.

4. Petra 2010. A February 8, 2010, report by Petra Geotechnical (Petra) addresses issues regarding moisture intrusion within the buildings causing damage to the floor tiles. Petra concluded that moisture intrusion was likely due to the vaporization of the natural moisture within the subsurface soils coupled with the vapor barrier not functioning as intended.

References of the provided geotechnical reports indicate numerous reports prepared by NMG during the design and construction of the subject property. A public records request has been made with the City Clerk's office. The City has indicated that additional documents are still being prepared. A supplemental letter will be issued once additional documents are provided.

## 3.3. Proposed Construction

### *3.3.1 Architectural*

Review of schematic plans indicates the project will consist of the design of three five-story residential wrap structures with six level garages. These residential buildings contain between 320 units and 370 units. Each apartment building is associated with a swimming pool with adjacent hardscape and landscape.

Between structures there is planned to be recreational areas, landscaping, and various types of flatwork improvements. NOVA anticipates there will also be improvements to the pavement for the fire lane located adjacent to the proposed building limits. A variety of underground utilities will extend to and from the structures.

### *3.3.2 Structural*

No structural information was available for this evaluation. However, based upon experience with similar structures/evelopments, NOVA expects that the residential buildings and the parking structures will be developed approximately as described below.

The residential apartment buildings will rise to five levels, to about 75 feet above surrounding ground level). It is expected that the apartment buildings will be developed with four levels of Type III-A wood framed construction atop a single level Type IA podium. Column loads at the apartments are expected to be in the range of DL + LL ~200 kips to 300 kips.

The parking structure will include six levels, rising about ±70 feet above surrounding grades. The structure will be of reinforced concrete construction, structurally separated from the adjacent residential apartment building. Column loads at the grag3e will be much higher than at the apartments are expected to be a in the range of DL + LL ~400 kips to 600 kips.

### *3.3.3 Earthwork*

NOVA understands the proposed finished grades will generally match the existing grades, such that design cuts and fills are anticipated to be minimal. Earthwork is anticipated to consist of remedial and fine grading, footing excavations, backfilling underground utilities, subgrade preparation, and pavement construction.

# 4. GEOLOGY AND SUBSURFACE CONDITIONS

## 4.1. Regional Geology

The site is located within the Peninsular Ranges Geomorphic Province of California, which stretches from the Los Angeles basin to the tip of Baja California in Mexico. This province is characterized as a series of northwest-trending mountain ranges separated by subparallel fault zones and a coastal plain of subdued landforms. The mountain ranges are underlain primarily by Mesozoic metamorphic rocks that were intruded by plutonic rocks of the western Peninsular Ranges batholith, while the coastal plain is underlain by subsequently deposited marine and nonmarine sedimentary formations. The site is located within the coastal plain portion of the province and is underlain by Quaternary, Late Holocene to Late Pleistocene alluvial deposits. Figure 4-1 presents the regional geology in the vicinity of the site.

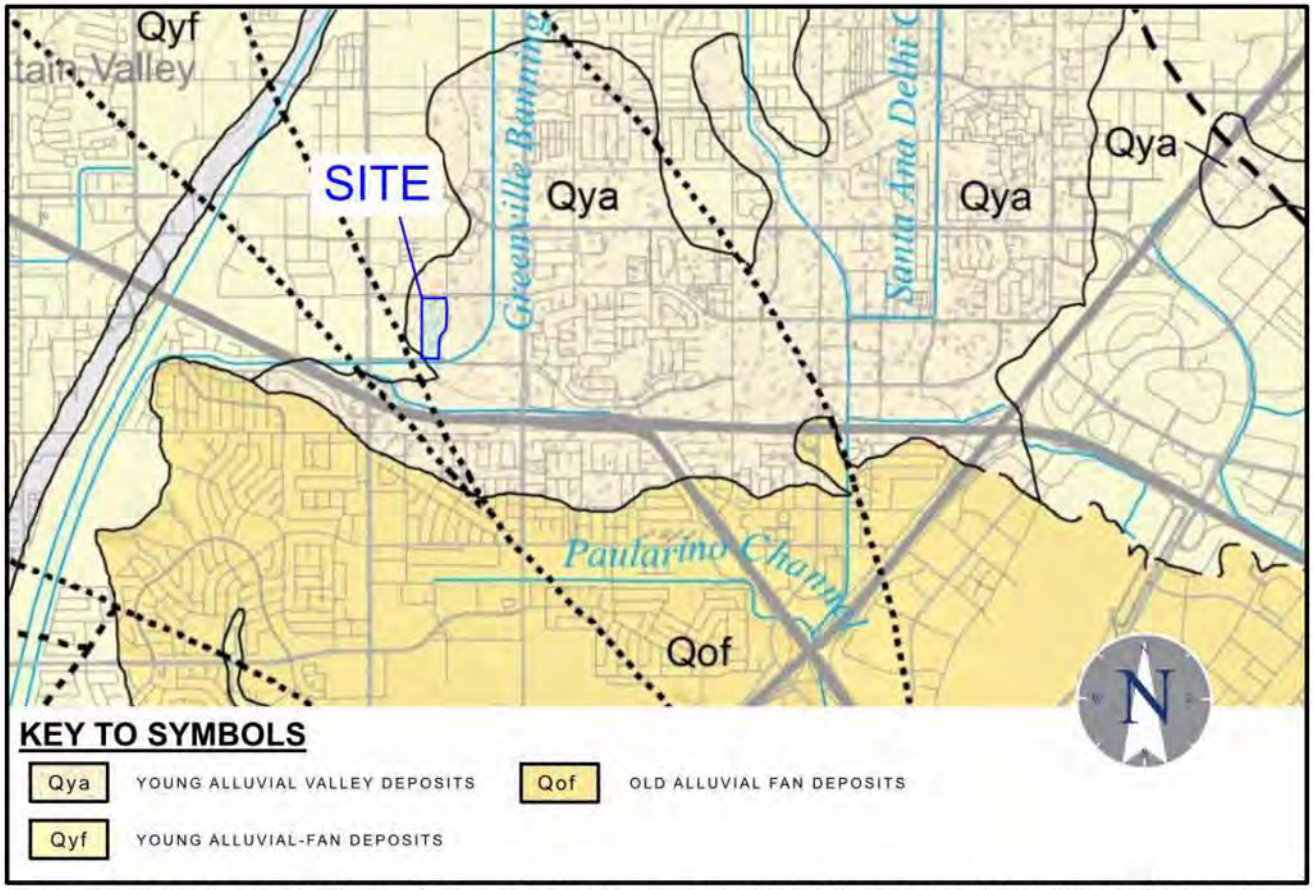


**Figure 4-1. Geologic Compilation of Quaternary Surficial Deposits of Southern California,** Orange County 30' x 60' quadrangles, California 2012

### 4.2. Site-Specific Geology

The subsurface investigation by NOVA indicates that the site is underlain by minor fill and alluvial deposits. The description of the material encountered in the borings is presented below. Plate 1 (provided following the text of the report) presents site-specific geology.

**Fill (af):** Fill was encountered in all the four borings with an approximate thickness up to about 3 feet. As encountered in the borings, the fill generally consists of slightly moist to moist, soft to stiff sandy silt and sandy clay to loose to medium dense clayey sand. NOVA has no records regarding the placement and compaction of the fill; therefore, the fill is considered 'undocumented' and at risk for wide variations in quality.

**Alluvium (Qa):** The site is underlain by Quaternary-aged Alluvium. As encountered in the borings, the alluvium consists of olive brown and brown with variable red brown mottling, firm to stiff, sandy clay to clay and sandy silt to clayey silt. Layers of sand were observed at 25 feet and 40 feet.

**Groundwater:** Groundwater was encountered in the borings between 22 feet and 24 feet below ground surface. Groundwater was observed by NMG during their exploration in 2002 at depths between 15 and 20 feet. Based on the review of the referenced CDMG Special Report, the site is mapped with a historical groundwater depth of 10 feet.

# 5. GEOLOGIC HAZARDS

## 5.1. Faulting and Surface Rupture

Major known active faults in the region consist generally of en echelon, northwest striking, right-lateral, strike-slip faults. These include the San Andreas, Elsinore, and San Jacinto Faults located east of the site, and the Palos Verdes, San Pedro Basin Fault Zone, and Newport-Inglewood-Rose Canyon Fault Zone (NIRC) located to the west of the site.

Earthquake Fault Zones have been established along known active faults in California in accordance with the Alquist-Priolo Earthquake Fault Zoning Act. The State Geologist defines an "active" fault as one which has had surface rupture within recent geologic time (i.e., Holocene time, <11,700 years b.p.). Earthquake Fault Zones have been delineated to encompass traces of known Holocene-active faults to address hazards associated with fault surface rupture within California. Where developments for human occupancy are proposed within these zones, the state requires detailed fault evaluations be performed so that engineering geologists can identify the locations of active faults and recommend setbacks from locations of possible surface fault rupture.

The site is not located in the Alquist-Priolo Earthquake Fault Zone. No active surface faults are mapped across the site. Evidence of active faulting was not observed at the site during our field investigation. The probability of fault rupture is considered low. Figure 5-1 shows the locations of known faults in the site vicinity.

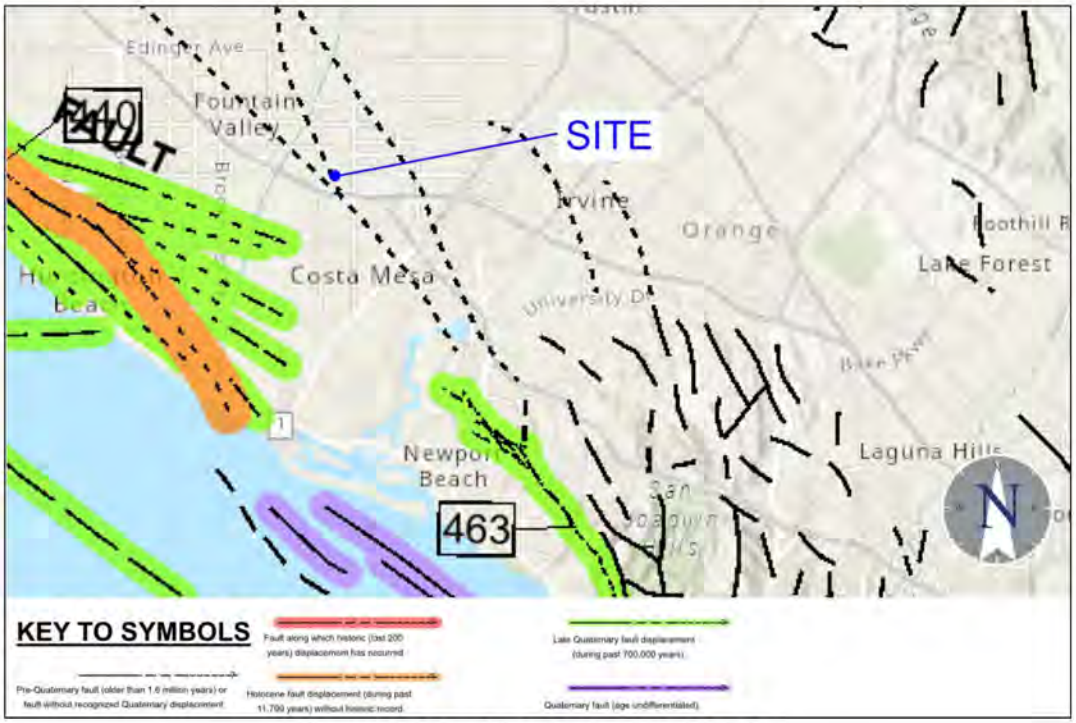


**Figure 5-1. Faulting in the Site Vicinity**

## 5.2. Site Class

Site Class is determined using the average shear-wave velocity or average standard penetration resistance blowcounts (N-values) of the soil/rock underlying a site in the upper 100 feet. The shear wave velocity measurements as measured within CPT-1 indicates a value of 937 feet per second. Therefore, the site can be classified as Site Class D in accordance with Table 20.3-1 of ASCE 7-16.

## 5.3. CBC Seismic Design Parameters

The mapped site coefficients and maximum considered earthquake ($MCE_R$) spectral response acceleration parameters in accordance with the 2022 CBC/ASCE 7-16 are presented in Table 5-1.

**Table 5-1. 2022 CBC and ASCE 7-16 Mapped Seismic Design Parameters**

| Site Coordinates | |
|---|---|
| Latitude: 33.693721° | Longitude: -117.914595 ° |
| **Site Coefficients and Spectral Response Acceleration Parameters** | **Value** |
| Risk Category | I |
| Site Class | D |
| Site Coefficients, $F_a$ | 1.0 |
| Site Coefficients, $F_v$ | 1.853 |
| Mapped Spectral Response Acceleration at Short Period, $S_s$ | 1.314g |
| Mapped Spectral Response Acceleration at 1-Second Period, $S_1$ | 0.472g |
| Adjusted $MCE_R$ Spectral Response Acceleration at short periods, $S_{MS}$ | 1.314 |
| Adjusted $MCE_R$ Spectral Response Acceleration at short periods, $S_{M1}$ | 1.312 |
| Design Spectral Response Acceleration at 1-Second Period, $S_{DS}$ | 0.876 |
| Design Spectral Response Acceleration at 1-Second Period, $S_{D1}$ | 0.875 |
| Peak Ground Acceleration, $PGA_M$ | 0.622 g |

According to Section 11.4.8 in ASCE 7-16 and Supplement 3, "*a ground motion hazard analysis shall be performed in accordance with Section 21.2 for the following structures on Site Class D site with S1 greater than or equal to 0.2.*" However, "*A ground motion hazard analysis is not required for structures where the value of the parameter SM1 determined by Eq. (11.4-2) is increased by 50 percent for all applications of SM1 in the Standard. The resulting value of the parameter SD1 determined by Eq. (11.4-4) shall be used for all applications of SD1 in this Standard.*" Should this exception not be met, the site-specific seismic design parameters provided below should be used.

In addition to the Code Spectra parameters presented in Table 5-1, NOVA has performed a site-specific ground motion hazard analysis in accordance with Chapter 21 of ASCE 7-16 to obtain site-specific seismic design acceleration parameters, the risk-targeted maximum considered earthquake response spectrum, and the design earthquake response spectrum. The site-specific seismic design parameters are presented on Table 5-2.

**Table 5-2. 2022 CBC and ASCE 7-16 Site-Specific Seismic Design Parameters**

| Site Coefficients and Spectral Response Acceleration Parameters | Value |
|---|---|
| Site Amplification Factor at 0.2 Second, $F_a$ | 1.0 |
| Site Amplification Factor at 1 Second, $F_v$ | 2.5 |
| Adjusted $MCE_R$ Spectral Response Acceleration at short periods, $S_{MS}$ | 1.051 |
| Adjusted $MCE_R$ Spectral Response Acceleration at short periods, $S_{M1}$ | 0.944 |
| Design Spectral Response Acceleration at 1-Second Period, $S_{DS}$ | 0.701 |
| Design Spectral Response Acceleration at 1-Second Period, $S_{D1}$ | 0.629 |
| Peak Ground Acceleration, $PGA_M$ | 0.498g |
| Seismic Design Category | D |

## 5.4. Liquefaction

Liquefaction occurs when loose, saturated, generally fine sands and silts are subjected to strong ground shaking. The soils lose shear strength and become liquid, resulting in large total and differential ground surface settlements, as well as possible lateral spreading during an earthquake. The site is located within a State-designated zone for liquefaction. Figure 5-2 shows the locations of seismic hazard zones in the site vicinity.

Engineering analyses have been performed to evaluate the potential for liquefaction at the site if the design earthquake event were to occur. The evaluation was performed utilizing the CLiq computer program developed by GeoLogismiki. The program utilized the procedure by Robertson (NCEER R&W 1998, 2009). These analyses are based on field test data obtained by the CPT soundings.

The liquefaction evaluation is provided in Appendix C. High groundwater was assumed at a depth of 10 feet below the existing ground surface based historic high groundwater as discussed in Section 4.2. The analyses indicate that some subsurface layers have a factor of safety below 1.25 and as such, are potentially prone to liquefaction during the design earthquake event. The estimated settlement caused by soil liquefaction is on the order of 0.5 to 0.7 inches.

Based on the State of California Special Publication 117A, hazards from liquefaction should be mitigated to the extent required to reduce seismic risk to "acceptable levels". The acceptable level of risk means, "that level that provides reasonable protection of the public safety" [California Code of Regulations Title 14, Section 3721 (a)]. The use of well-reinforced foundations, such as post-tensioned slabs, grade beams with structural slabs, or mat foundations have been proven to adequately provide basal support for similar structures during comparable liquefaction events.

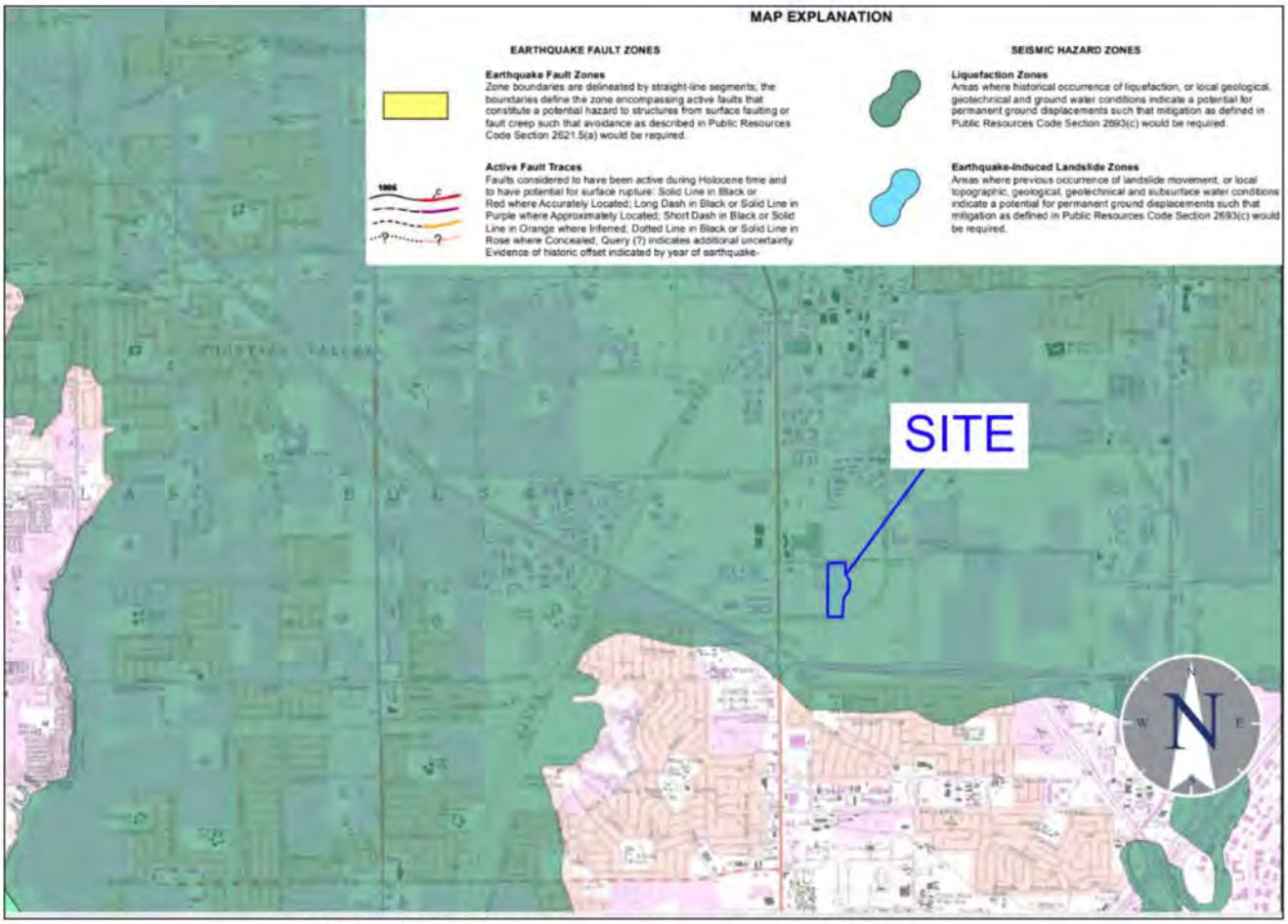


**Figure 5-2. California Department of Conservation Seismic Hazard Zones**

## 5.5. Landslides and Slope Stability

Evidence of landslides, deep-seated landslides, or slope instabilities was not observed at the time of NOVA's field evaluation. The site is relatively level. Additionally, there are no mapped landslides in the vicinity of the project site in both published geologic maps and the California Department of Conservation Landslide Inventory database.

The potential for landslides or slope instabilities to occur at the site is considered very low given the flat topography, and flat-lying geological structure below the site.

## 5.6. Flooding, Tsunamis, and Seiches

The site is mapped within Zone X (FEMA, 2012), which are areas of minimal flood hazard. As such, the risk of a flood to affect the site is considered low. Figure 5-3 shows the flood zone mapped within the site vicinity mapped by the Federal Emergency Management Agency.

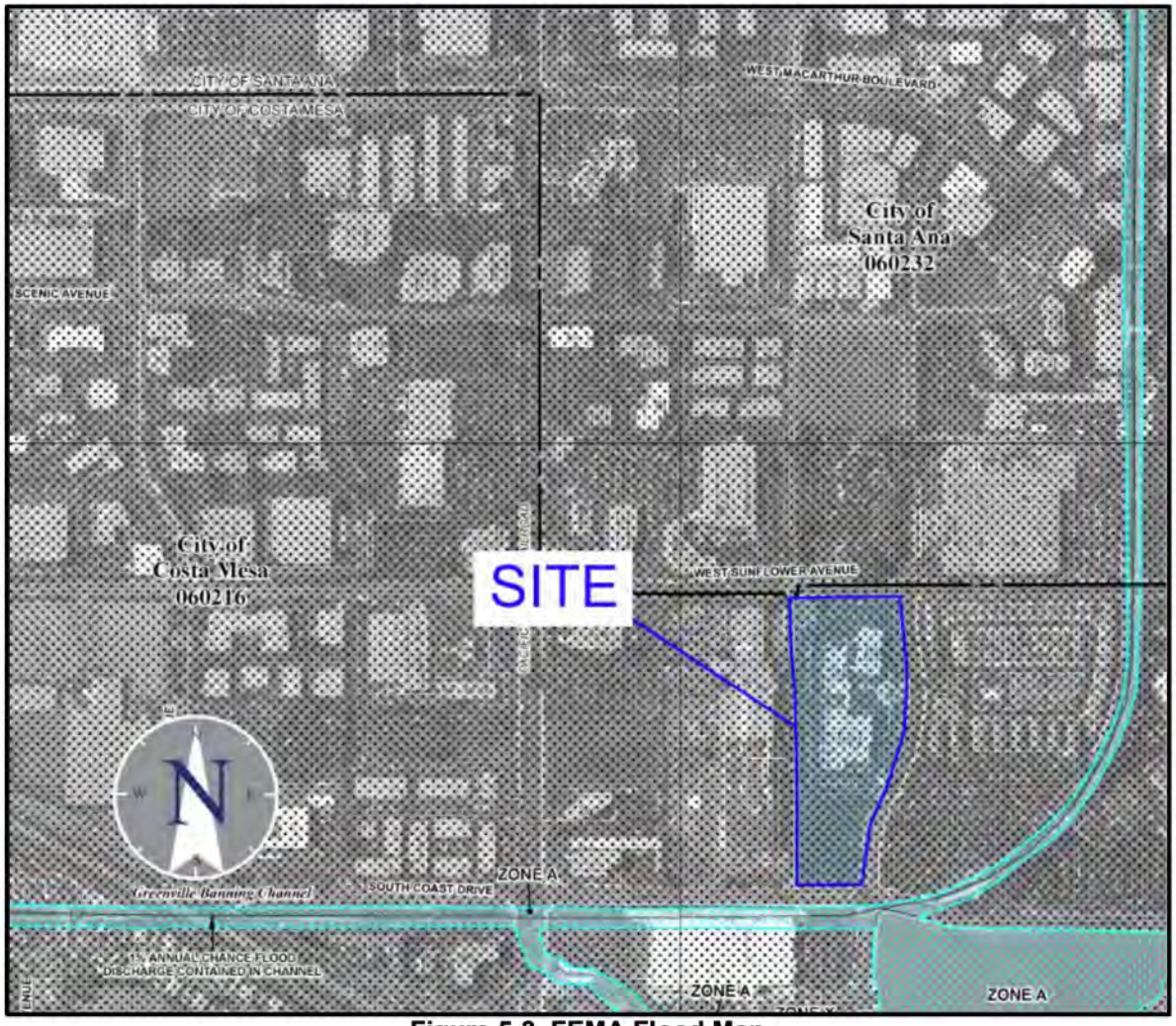


**Figure 5-3. FEMA Flood Map**

The site is not located within a mapped area on the State of California Tsunami Inundation Maps (CGS, 2022); therefore, damage due to tsunamis is considered low.

Seiches are periodic oscillations in large bodies of water such as lakes, harbors, bays, or reservoirs. The site is not located adjacent to any lakes or confined bodies of water; therefore, the potential for a seiche to affect the site is considered low.

## 5.7. Subsidence

The site is not located in an area of known subsidence associated with fluid withdrawal (groundwater or petroleum); therefore, the potential for subsidence due to the extraction of fluids is considered very low.

# 6. CONCLUSIONS

Based on the results of NOVA's investigation, we consider the proposed construction feasible from a geotechnical standpoint provided the recommendations contained in this report are followed. Geotechnical conditions exist that should be addressed prior to construction. Geotechnical design and construction considerations include the following.

There are no known active faults underlying the site. The primary seismic hazard at the site is the potential for moderate to severe ground shaking in response to large-magnitude earthquakes generated during the lifetime of the proposed construction. The risk of strong ground motion is common to all construction in southern California and is typically mitigated through building design in accordance with the CBC. While strong ground motion could affect the site, the risk of liquefaction is considered very low.

- Surcharge fill was placed as part of the development of the existing structures. However, the limits of the surcharge fill are unknown and likely limited to the existing structures. The proposed structures are planned beyond the perimeters of the existing structures. Differential settlement associated with the unimproved and improved portions of the site will exceed tolerances typical for the proposed structures. Recommendations for remedial grading are provided in this report.
- The site is underlain by minor undocumented fill and Alluvial Deposits. The deeper portions of the Alluvial Deposits are considered suitable for support of structural or fill loads. The undocumented fill and the near-surface portions of the alluvium, however, is potentially compressible and unsuitable for support of structural or fill loads. Recommendations for remedial grading are provided in this report.
- Based on laboratory testing, the on-site soils are anticipated to have a low expansion potential. Recommendations for expansive soils are not a design consideration.
- In general, excavations should be achievable using standard heavy earthmoving equipment in good working order with experienced operators.
- The proposed residential buildings can be supported on shallow spread footings with bottom levels bearing entirely on engineered fill. Recommendations for foundations are provided herein.
- Due to the anticipated structural loads of the proposed parking structures, static settlements are estimated to exceed typical tolerance levels. Therefore, ground improvement is recommended to reduce settlements and increase bearing capacity.
- Groundwater was encountered in NOVA's borings. The permanent groundwater table is at deep enough levels not expected to be a constraint to development. However, groundwater seepage may develop in the future. These conditions can be mitigated if they occur.

# 7. RECOMMENDATIONS

The remainder of this report presents recommendations regarding earthwork construction as well as preliminary geotechnical recommendations for the design of the proposed improvements. These recommendations are based on empirical and analytical methods typical of the standard-of-practice in southern California. If these recommendations appear not to address a specific feature of the project, please contact NOVA for additions or revisions to the recommendations. The recommendations presented herein may need to be updated once final plans are developed.

## 7.1. Earthwork

Grading and earthwork should be conducted in accordance with the CBC and the recommendations of this report. The following recommendations are provided regarding specific aspects of the proposed earthwork construction. These recommendations should be considered subject to revision based on field conditions observed by a NOVA field representative during grading.

### *7.1.1 Site Preparation*

Site preparation should begin with the removal of existing improvements, vegetation, and debris. Subsurface improvements that are to be abandoned should be removed, and the resulting excavations should be backfilled and compacted in accordance with the recommendations of this report. Pipeline abandonment can consist of capping or rerouting at the project perimeter and removal within the project perimeter. If appropriate, abandoned pipelines can be filled with grout or slurry as recommended by and observed by the geotechnical consultant.

### *7.1.2 Remedial Grading – Residential Building Pad Slab on Grade*

Beneath the proposed residential building pad to support a slab-on-grade, the existing fill and near-surface portions of the alluvium should be excavated to expose competent alluvial materials. The removals should extend to at least a depth of 5 feet below the existing ground surface or 2 feet below the bottom of the deepest footing, whichever is deeper. If a cut/fill transition exists at finished pad grade, the cut portion of the pad should be excavated to a depth of 3 feet below finished pad grade or 2 feet below the bottom of the deepest footing, whichever is deeper. This will likely require over-excavation of the near-surface alluvium. Horizontally, excavations should extend at least 5 feet outside the planned perimeter building foundations or up to existing improvements or the limits of grading, whichever is less. NOVA should observe the conditions exposed in the bottom of excavations to evaluate whether additional excavation is recommended.

Prior to placing any fill, the excavation bottom should be scarified to a depth of 6 to 8 inches, moisture conditioned to at least 110% of the optimum moisture content and compacted to at least 90% relative compaction.

Removals performed adjacent to existing improvements should be performed in slots to avoid undermining existing foundations. The dimensions of the slots can be provided during grading operations.

### *7.1.3 Remedial Grading – Pedestrian Hardscape*

Beneath proposed pedestrian hardscape areas, the existing soils should be excavated to a depth of at least 2 feet below existing grade or planned subgrade elevation, whichever is deeper. Horizontally, excavations should extend at least 2 feet outside the planned hardscape or up to existing improvements or the limits of grading, whichever is less. NOVA should observe the conditions exposed in the bottom of excavations to evaluate whether additional excavation is recommended.

### *7.1.4 Remedial Grading – Vehicular Pavements*

Beneath proposed vehicular pavement areas, the existing soils should be excavated to a depth of at least 2 feet below existing grade or planned subgrade elevation, whichever is deeper. Horizontally, excavations should extend at least 2 feet outside the planned pavement or up to existing improvements or the limits of grading, whichever is less. NOVA should observe the conditions exposed in the bottom of excavations to evaluate whether additional excavation is recommended.

### *7.1.5 Expansive Soil*

The on-site soils tested have EI's of 25 and 26, classified as low expansion potential. The recommendations presented herein are based on such soils. Additional testing of site soils should be performed by the project geotechnical consultant to confirm the basis of these recommendations during site grading. Based on results of such testing, the preliminary recommendations presented herein may require modification.

### *7.1.6 Engineered Fill*

Excavated soils free of organic matter, construction debris, rocks greater than 6 inches, and expansive soil as described above should generally be suitable for reuse as compacted fill. Areas to receive fill should be scarified to a depth of 6 to 8 inches, moisture conditioned to at least 110% of optimum moisture content, and compacted to at least 90% relative compaction. Fill and backfill should be placed in 6- to 8-inch-thick loose lifts, moisture conditioned to at least 110% of optimum moisture content, and compacted to at least 90% relative compaction. The top 12 inches of subgrade beneath pavements should be compacted to at least 95% relative compaction. The maximum density and optimum moisture content for the evaluation of relative compaction should be determined in accordance with ASTM D1557.

### *7.1.7 Imported Soil*

Imported soil should consist of EI's less than 30, free of organic matter and rocks greater than 6 inches. Imported soil should be observed and, if appropriate, tested by NOVA prior to transport to the site to evaluate suitability for the intended use.

### *7.1.8 Subgrade Stabilization*

Excavation bottoms should be firm and unyielding prior to placing fill. In areas of saturated or yielding subgrade, a reinforcing geogrid such as Tensar® InterAx™ NX650 or equivalent can be placed on the excavation bottom, and then at least 12 inches of aggregate base placed and compacted. Once the

surface of the aggregate base is firm enough to achieve compaction, then the remaining excavation should be filled to the finished pad grade with suitable material.

#### *7.1.9 Excavation Characteristics*

It is anticipated that excavations can be achieved with conventional earthwork equipment in good working order. The existing near-surface materials are well above optimum moisture content and will require drying to achieve proper compaction.

Volumetric changes in earth quantities will occur when excavated on-site soil materials are replaced as properly compacted fill. We estimate that the existing surficial soils will shrink approximately less than 15%. Subsidence due to reprocessing of removal bottoms is anticipated to be approximately 0.1 to 0.2 feet. The estimates of shrinkage and subsidence are intended as an aid for project engineers in determining earthwork quantities. However, these estimates should be used with some caution since they are not absolute values. Contingencies should be made for balancing earthwork quantities based on actual shrinkage and subsidence that occurs during the grading process.

#### *7.1.10 Oversized Material*

Excavations may generate oversized material. Oversized material is defined as rocks or cemented clasts greater than 6 inches in largest dimension. Oversized material should be broken down to no greater than 6 inches in largest dimension for use in fill, used as landscape material, or disposed of off-site.

#### *7.1.11 Temporary Excavations*

Temporary excavations 4 feet deep or less can be made vertically. Deeper temporary excavations in fill should be laid back no steeper than 1:1 (horizontal:vertical) (h:v). If cohesionless, poorly graded sands are encountered, temporary excavations should be laid back no steeper than 1½:1 (h:v) with no allowances of a vertical cut. The faces of temporary slopes should be inspected daily by the contractor's Competent Person before personnel are allowed to enter the excavation. Any zones of potential instability, sloughing, or raveling should be brought to the attention of the engineer and corrective action implemented before personnel begin working in the excavation. Excavated soils should not be stockpiled behind temporary excavations within a distance equal to the depth of the excavation. NOVA should be notified if other surcharge loads are anticipated so that lateral load criteria can be developed for the specific situation. If temporary slopes are to be maintained during the rainy season, berms are recommended along the tops of slopes to prevent runoff water from entering the excavation and eroding the slope faces.

Slopes steeper than those described above will require shoring. Additionally, temporary excavations that extend below a plane inclined at 1½:1 (h:v) downward from the outside bottom edge of existing structures or improvements will require shoring. Soldier piles and lagging, internally braced shoring, or trench boxes could be used. If trench boxes are used, the soil immediately adjacent to the trench box is not directly supported. Ground surface deformations immediately adjacent to the pit or trench could be greater where trench boxes are used compared to other methods of shoring.

#### *7.1.12 Groundwater Seepage*

Due to the cohesive nature of the existing soils on-site, seepage from perched groundwater is anticipated to occur locally in excavations. If dewatering is necessary, the dewatering method should be evaluated and implemented by an experienced dewatering subcontractor.

#### *7.1.13 Surface Drainage*

Final surface grades around structures should be designed to collect and direct surface water away from structures, including retaining walls, and toward appropriate drainage facilities. The ground around the structure should be graded so that surface water flows rapidly away from the structure without ponding. In general, we recommend that the ground adjacent to the structure slope away at a gradient of at least 2%. Densely vegetated areas where runoff can be impaired should have a minimum gradient of at least 5% within the first 5 feet from the structure. Roof gutters with downspouts that discharge directly into a closed drainage system are recommended on structures. Drainage patterns established at the time of fine grading should be maintained throughout the life of the proposed structures. Site irrigation should be limited to the minimum necessary to sustain landscape growth. Should excessive irrigation, impaired drainage, or unusually high rainfall occur, saturated zones of perched groundwater can develop.

#### *7.1.14 Grading Plan Review*

NOVA should review the grading plans and earthwork specifications to ascertain whether the intent of the recommendations contained in this report have been implemented and that no revised recommendations are needed due to changes in the development scheme.

### 7.2. Foundations

#### *7.2.1 General*

The foundation recommendations provided herein are considered generally consistent with methods typically used in southern California. Other alternatives may be available. NOVA's recommendations are only minimum criteria based on geotechnical factors and should not be considered a structural design, or to preclude more restrictive criteria of governing agencies or by the structural engineer. The design of the foundation system should be performed by the structural engineer, incorporating the geotechnical parameters described herein and the requirements of applicable building codes.

As previously mentioned, the proposed residential buildings should be supported on shallow spread footings with bottom levels bearing entirely on engineered fill materials. Buildings should not be underlain by cut/fill transitions or transitions from shallow fill to deep fill. Due to excessive static settlements coupled with low bearing capacities, foundations for the parking structure should bear on a ground improvement system, such as Rammed Aggregate Piers®, (RAPs).

#### *7.2.2 Shallow Spread Footings*

Footings should extend at least 24 inches below lowest adjacent finished grade and bear entirely into engineered fill. A minimum width of 18 inches is recommended for continuous footings and 24 inches for isolated or retaining wall footings. An allowable bearing capacity of 2,500 psf can be used for

spread footings supported on engineered fill. The allowable bearing capacity can be increased by 300 psf for each foot of depth below the minimum and 700 psf for each foot of width beyond the minimum up to a maximum of 3,500 psf on formation. The bearing value can be increased by ⅓ when considering the total of all loads, including wind or seismic forces.

Lateral loads will be resisted by friction between the bottoms of footings and passive pressure on the faces of footings and other structural elements below grade. An allowable coefficient of friction of 0.34 can be used. An allowable passive pressure of 250 psf per foot of depth below the ground surface can be used for level ground conditions where the ground is horizontal for a distance of at least 10 feet or three times the height generating the passive pressure. The passive pressure can be increased by ⅓ when considering the total of all loads, including wind or seismic forces. The upper 1 foot of soil should not be relied on for passive support unless the ground is covered with pavements or slabs.

### *7.2.3 Mat Foundation*

The allowable bearing capacity provided in the spread footings section of this report is also applicable to mat foundations. Mat foundations typically experience some deflection due to loads placed on the mat and the reaction of the soils underlying the mat. A design modulus of subgrade reaction, k, of k = 80 pounds per cubic inch (pci) can be used for the subgrade soils in evaluating such deflections. This value is based on an area of 1 square foot and should be adjusted for larger mats. Adjusted values of the modulus of subgrade reaction, $K_v$, can be obtained from the following equation for square mats of various widths:

$$K_V = K\left[\frac{\mathrm{B}+1}{2\mathrm{B}}\right]^2 (pci)$$

Where B is the width of the mat in feet.

Adjusted values of the modulus of subgrade reaction, K', can be obtained from the following equation for rectangular mats:

$$K' = \frac{K_v\left(1 + 0.5\left(\frac{B}{L}\right)\right)}{1.5} (pci)$$

Where B is the width and L is the length of the mat in feet.

### *7.2.4 Foundation Plan Review*

As an alternative to the mat foundations, a Geopier-supported foundation system may be utilized to support the proposed buildings. A Geopier foundation system takes aggregate elements, such as the Geopier Impact™ system that utilizes Rammed Aggregate Pier®, (RAP), and compacts them to a density that forms a high stiffness engineered element. The compaction process in turn increases the lateral stresses and improves the surrounding soils. The densification of the adjacent soils should reduce the potential of liquefiable soils.

Following the installation of the Geopiers, the proposed building can then be supported on conventional shallow spread footings with a greater maximum allowable soil bearing pressure between the base of the foundation elements and the underlying aggregate materials.

#### *7.2.5 Foundation Plan Review*

NOVA should review the foundation plans to ascertain that the intent of the recommendations in this report has been implemented and that revised recommendations are not necessary as a result of changes after this report was completed.

#### *7.2.6 Foundation Excavation Observations*

A representative from NOVA should observe the foundation excavations prior to forming or placing reinforcing steel.

### 7.3. Interior Slabs-On-Grade

Interior concrete slabs-on-grade should be underlain by supported on engineered fill provided the subgrade has been prepared as previously described above. It is recommended that the floor slab expansive subgrade soils be moisture conditioned and maintained to at least 110% above the soil's optimum moisture content to a depth of at least 12 inches prior to concrete placement. Testing by the geotechnical engineer within 24 hours of floor slab concrete placement is recommended to document that the expansive soils have been adequately moisture treated. The intent of this recommendation is to pre-wet the expansive soils in attempt to reduce the potential for post-construction heave.

We recommend that conventional concrete slab-on-grade floors be at least 5 inches thick and reinforced with at least No. 4 bars at 18 inches on center each way. To reduce the potential for excessive cracking, slabs should be provided with construction or 'weakened plane' joints at frequent intervals. The project structural engineer should design on-grade building slabs, reinforcement, and joint spacing.

Moisture protection should be installed beneath slabs where moisture-sensitive floor coverings will be used. The project architect should review the tolerable moisture transmission rate of the proposed floor covering and specify an appropriate moisture protection system. Typically, a plastic vapor barrier is used. Minimum 15-mil plastic is recommended. The plastic should comply with ASTM E1745. The vapor barrier installation should comply with ASTM E1643 and the manufacturer's recommendations. The slab can be placed directly on the vapor barrier. If desired, granular material can be placed beneath the plastic to provide a level surface.

### 7.4. Hardscape

Pedestrian hardscape should be underlain by at least 2 feet of engineered fill material. The top 12 inches of subgrade soils should be moisture conditioned to at least 110% of the optimum moisture content. Moistening should be accomplished by lightly spraying the area over a period of a few days just prior to pouring concrete. The geotechnical consultant should observe and verify the density and moisture content of subgrade soils prior to pouring concrete to ensure that the required compaction and pre-moistening recommendations have been met.

Exterior concrete slabs should be at least 4 inches thick and reinforced with at least No. 3 bars at 18 inches on center each way. Slabs should be provided with weakened plane joints. Joints should be placed in accordance with the American Concrete Institute (ACI) guidelines. The project architect should select the final joint patterns. A 1-inch maximum size aggregate mix is recommended for concrete for exterior slabs. The corrosion potential of on-site soils with respect to reinforced concrete will need to be taken into account in concrete mix design. Coarse and fine aggregate in concrete should conform to the "Greenbook" Standard Specifications for Public Works Construction.

## 7.5. Retaining and Screen Walls

### *7.5.1 Footings*

Conventional retaining walls can be supported on spread footings. The recommendations for spread footings in the foundation section of this report are also applicable to conventional retaining walls. The passive resistance for walls along property lines, where lateral removals are restricted, should be limited to 150 psf. The passive pressure and bearing capacity can be increased by ⅓ in determining the seismic stability of the wall.

### *7.5.2 Lateral Earth Pressures*

The active earth pressure for design of unrestrained retaining walls with level backfill can be taken as equivalent to the pressure of a fluid weighing 45 pcf. The at-rest earth pressure for design of restrained retaining wall with level backfill can be taken as equivalent to the pressure of a fluid weighing 65 pcf. These values assume existing soil with an EI<30 and drained backfill condition.

For walls with 2:1 (h:v) sloping backfill, an equivalent fluid pressure of 85 pcf should be used for design purposes. The above values do not include an FS. Appropriate factors of safety should be incorporated into the design. If any other surcharge loads are anticipated, NOVA should be contacted for the necessary increase in soil pressure.

Based on the 2022 CBC, walls that retain less than 6 feet need not be designed for seismic earth pressures. Seismic earth pressures provided herein are based on the method provided by Seed & Whitman (1970) using a peak ground acceleration (PGA) of 0.37 g, for 10% probability of exceedance in 50 years. The seismic earth pressure can be taken as equivalent to the pressure of a fluid pressure weighing 12 pcf. This value is for level backfill and does not include an Factor of Safety. Appropriate factors of safety should be incorporated into the design. This pressure is in addition to the un-factored, active earth pressure. The total equivalent fluid pressure can be modeled as an inverted triangular pressure distribution with the resultant acting at a height of H/3 up from the top of the wall, where H is the retained height of the wall.

The total force, including both static and seismic components can be taken as a uniform load of 29 pcf over the entire height of the wall. The total of static and seismic force acts at the center of the wall. Seismic surcharge only acts at 2/3H while static only acts at 1/3H. Consideration can be given to using a load factor of 1.0 for the seismic surcharge portion and a load factor of 1.7 for the static portion (SEAOSC).

### *7.5.3 Drainage*

Retaining walls should be provided with a backdrain to reduce the accumulation of hydrostatic pressure or be designed to resist hydrostatic pressure. Backdrains can consist of a 12-inch-wide zone of ¾-inch crushed rock. The crushed rock should be separated from the adjacent soils using a non-woven filter fabric, such as Mirafi 140N or equivalent. A perforated pipe should be installed at the base of the backdrain and sloped to discharge to a suitable storm drain facility, or weep holes should be provided. As an alternative, a geocomposite drainage system such as Miradrain 6000 or equivalent placed behind the wall and connected to a suitable storm drain facility can be used. The architect should provide dampproofing/waterproofing specifications and details. Figure 7-1 presents typical conventional retaining wall backdrain details. Note that the guidance provided on Figure 7-1 is conceptual. A variety of options are available to drain retaining walls.

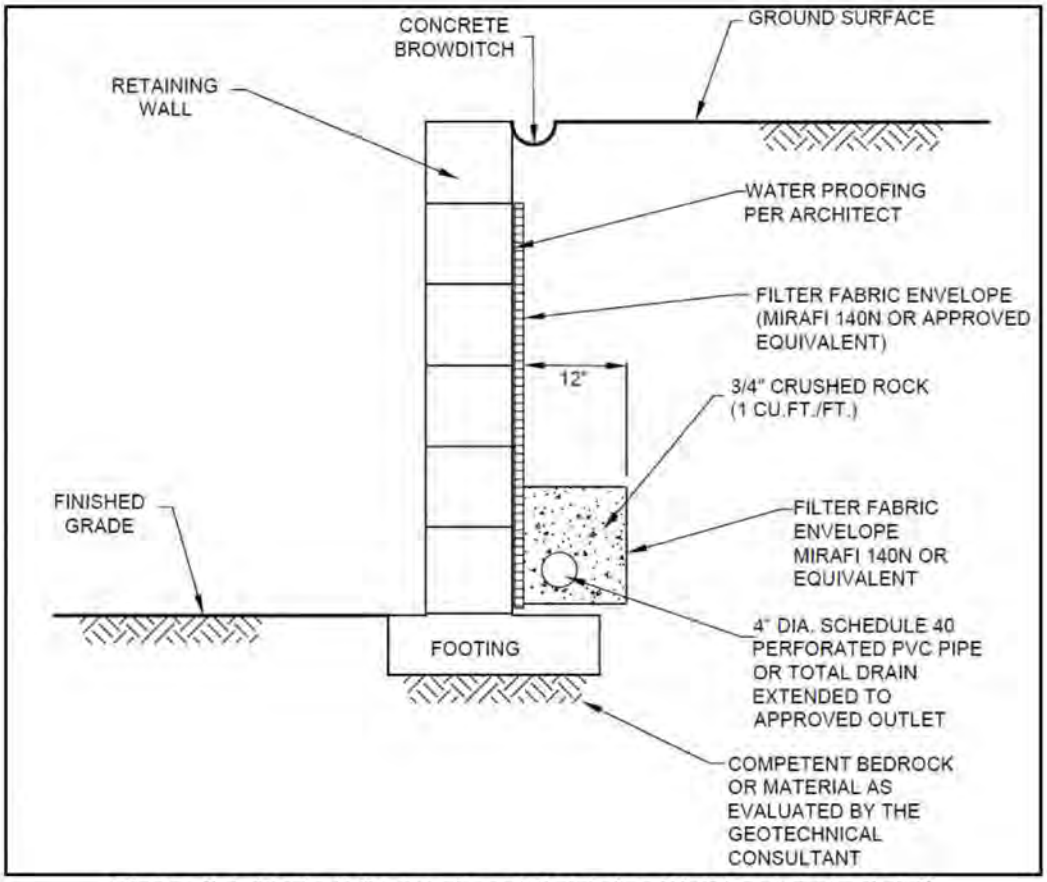


**Figure 7-1. Typical Conventional Retaining Wall Backdrain Detail**

### *7.5.4 Backfill*

Wall backfill should consist of onsite soils with EI < 30. The backfill zone is defined by a 1:1 plane projected upward from the heel of the wall. Additionally, backfill within 3 feet from the back of the wall should not contain rocks greater than 3 inches in dimension. Backfill should be compacted to at least 90% relative compaction.

Backfill should not be placed until walls have achieved adequate structural strength. Compaction of wall backfill will be necessary to minimize settlement of the backfill and overlying settlement sensitive improvements. However, some settlement should still be anticipated. Provisions should be made for some settlement of concrete slabs and pavements supported on backfill. Additionally, any utilities supported on backfill should be designed to tolerate differential settlement.

## 7.6. Pavement Sections

The pavement support characteristics of the upper soils encountered during NOVA's investigation are considered low. An R-value of 5 was assumed for design of preliminary pavement sections. The actual R-value of the subgrade soils should be determined after grading, and the final pavement sections provided. The following preliminary pavement structural sections are provided based on an R-value of 5 for the assumed Traffic Indexes in Table 7-1.

**Table 7-1. AC and PCC Pavement Sections**

| Traffic Type | Traffic Index | Asphalt Concrete (inches) | Portland Cement Concrete (inches) |
|---|---|---|---|
| Parking Stalls | 4.5 | 3 AC / 6 AB | 6 PCC / 4 AB |
| Driveways | 6.0 | 4 AC / 13 AB | 9 PCC / 4 AB |
| Fire Lanes | 7.5 | 5 AC / 17 AB | 11 PCC / 4 AB |

AC: Asphalt Concrete
AB: Aggregate Base
PCC: Portland Cement Concrete

Subgrade preparation should be performed immediately prior to placement of the pavement section. The upper 12 inches of subgrade should be scarified, moisture conditioned to at least 110% of optimum moisture content, and compacted to at least 95% relative compaction. All soft or yielding areas should be stabilized or removed and replaced with compacted fill or aggregate base. Aggregate base and asphalt concrete should conform to the Caltrans Standard Specifications or the "Greenbook" and should be compacted to at least 95% relative compaction. Aggregate base should have an R-value of not less than 78. All materials and methods of construction should conform to good engineering practices and the minimum local standards.

## 7.7. Pipelines

For level ground conditions, a passive earth pressure of 350 psf per foot of depth below the lowest adjacent final grade can be used to compute allowable thrust block resistance. A value of 150 psf per foot should be used below groundwater level, if encountered.

A modulus of soil reaction (E') of 400 psi can be used to evaluate the deflection of buried flexible pipelines. This value assumes that granular bedding material is placed adjacent to the pipe and is compacted to at least 90% relative compaction.

Pipe bedding as specified in the "Greenbook" Standard Specifications for Public Works Construction can be used. Bedding material should consist of clean sand having a sand equivalent not less than 20 and should extend to at least 12 inches above the top of pipe. Alternative materials meeting the intent of the bedding specifications are also acceptable. Samples of materials proposed for use as bedding should be provided to the engineer for inspection and testing before the material is imported for use on the project. The on-site materials are not expected to meet "Greenbook" bedding specifications. The pipe bedding material should be placed over the full width of the trench. After placement of the pipe, the bedding should be brought up uniformly on both sides of the pipe to reduce the potential for unbalanced loads. No voids or uncompacted areas should be left beneath the pipe haunches. Ponding or jetting the pipe bedding should not be allowed.

Where pipeline inclinations exceed 15%, cutoff walls are recommended in trench excavations. Additionally, we do not recommend that open graded rock be used for pipe bedding or backfill because of the potential for piping erosion. The recommended bedding is clean sand having a sand equivalent not less than 20 or 2-sack sand/cement slurry. If sand/cement slurry is used for pipe bedding to at least 1 foot over the top of the pipe, cutoff walls are not considered necessary. The need for cutoff walls should be further evaluated by the project civil engineer designing the pipeline.

### 7.8. Corrosivity

A representative sample of the on-site soils was tested to evaluate corrosion potential. The test results are presented in Appendix C. The project design engineer can use the sulfate results in conjunction with ACI 318 to specify the water/cement ratio, compressive strength, and cementitious material types for concrete exposed to soil. A corrosion engineer should be contacted to provide specific corrosion control recommendations.

# 8. CLOSURE

NOVA should review project plans and specifications prior to bidding and construction to check that the intent of the recommendations in this report has been incorporated. Observations and tests should be performed during construction. If the conditions encountered during construction differ from those anticipated based on the subsurface exploration program, the presence of personnel from NOVA during construction will enable an evaluation of the exposed conditions and modifications of the recommendations in this report or development of additional recommendations in a timely manner.

NOVA should be advised of changes in the project scope so that the recommendations contained in this report can be evaluated with respect to the revised plans. Changes in recommendations will be verified in writing. The findings in this report are valid as of the date of this report. Changes in the condition of the site can, however, occur with the passage of time, whether they are due to natural processes or work on this or adjacent areas. In addition, changes in the standards of practice and government regulations can occur. Thus, the findings in this report may be invalidated wholly or in part by changes beyond NOVA's control. This report should not be relied upon after a period of two years without a review by NOVA verifying the suitability of the conclusions and recommendations to site conditions at that time.

In the performance of professional services, NOVA exercises the level of care and skill ordinarily exercised by members of the geotechnical profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the boring locations and that the data, interpretations, and recommendations reported herein are based solely on the information obtained by NOVA. NOVA will be responsible for those data, interpretations, and recommendations, but shall not be responsible for interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

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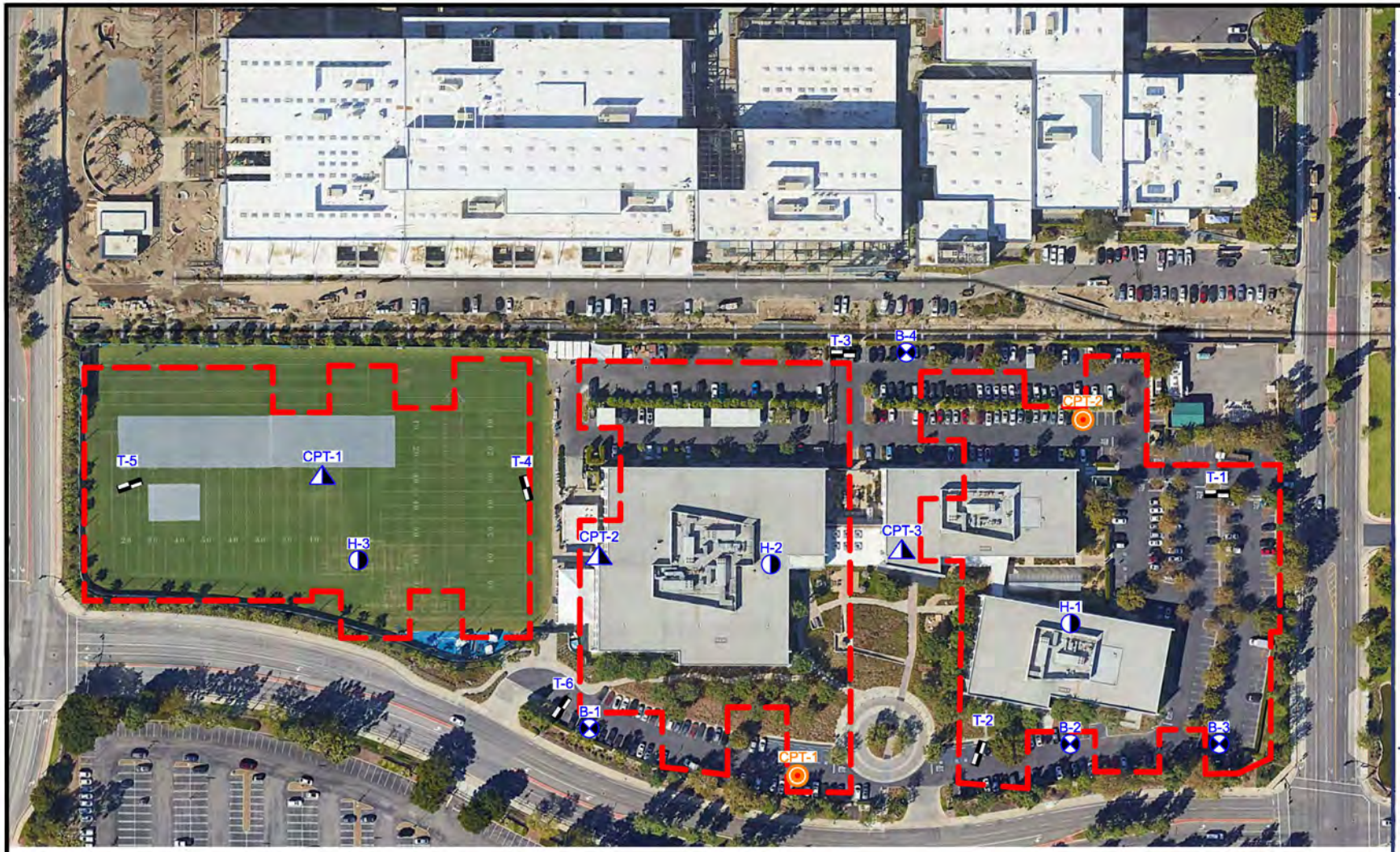
# PLATES




**KEY TO SYMBOLS**

| | |
|---|---|
| *af* | FILL |
| B-4 | GEOTECHNICAL BORING |
| CPT-2 | PERCOLATION TEST BORING |
| CPT-3 | CONE PENETROMETER TEST BY NMG (1/26/02) |
| | GEOTECHNICAL TESTPIT BY NMG (4/25/02) |
| H-3 | GEOTECHNICAL BORING BY NMG (5/3/02) |

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| REVIEWED BY: | PK |
| SCALE: | 1"=100' |
| DRAWING TITLE: | |

GEOTECHNICAL MAP

PLATE NO. 1 OF 1

# APPENDIX A
# USE OF THE GEOTECHNICAL REPORT

# Important Information About Your

# Geotechnical Engineering Report

*Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.*

*The following information is provided to help you manage your risks.*

## Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

## Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

## A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

## Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

## Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

## A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

## A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

## Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

## Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

## Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

## Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

## Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

## Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

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IIGER06045.0M

# APPENDIX B
# BORING LOGS AND CPT DATA

| MAJOR DIVISIONS | | | | TYPICAL NAMES |
|---|---|---|---|---|
| COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE | GRAVEL MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE | CLEAN GRAVEL WITH LESS THAN 15% FINES | GW | WELL-GRADED GRAVEL WITH OR WITHOUT SAND |
| | | | GP | POORLY GRADED GRAVEL WITH OR WITHOUT SAND |
| | | GRAVEL WITH 15% OR MORE FINES | GM | SILTY GRAVEL WITH OR WITHOUT SAND |
| | | | GC | CLAYEY GRAVEL WITH OR WITHOUT SAND |
| | SAND MORE THAN HALF COARSE FRACTION IS FINER THAN NO. 4 SIEVE SIZE | CLEAN SAND WITH LESS THAN 15% FINES | SW | WELL-GRADED SAND WITH OR WITHOUT GRAVEL |
| | | | SP | POORLY GRADED SAND WITH OR WITHOUT GRAVEL |
| | | SAND WITH 15% OR MORE FINES | SM | SILTY SAND WITH OR WITHOUT GRAVEL |
| | | | SC | CLAYEY SAND WITH OR WITHOUT GRAVEL |
| FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT 50% OR LESS | | ML | SILT WITH OR WITHOUT SAND OR GRAVEL |
| | | | CL | LEAN CLAY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OL | ORGANIC SILT OR CLAY OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50% | | MH | ELASTIC SILT WITH OR WITHOUT SAND OR GRAVEL |
| | | | CH | FAT CLAY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OH | ORGANIC SILT OR CLAY OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| HIGHLY ORGANIC SOILS | | | PT | PEAT AND OTHER HIGHLY ORGANIC SOILS |

- GROUNDWATER / STABILIZED
- GROUNDWATER SEEPAGE
- BULK SAMPLE
- SPT SAMPLE (ASTM D1586)
- MOD. CAL. SAMPLE (ASTM D3550)
- UNRELIABLE BLOW COUNTS
- GEOLOGIC CONTACT
- SOIL TYPE CHANGE

**LAB TEST ABBREVIATIONS**

| | |
|---|---|
| CR | CORROSIVITY |
| MD | MAXIMUM DENSITY |
| DS | DIRECT SHEAR |
| EI | EXPANSION INDEX |
| AL | ATTERBERG LIMITS |
| SA | SIEVE ANALYSIS |
| RV | RESISTANCE VALUE |
| CN | CONSOLIDATION |
| SE | SAND EQUIVALENT |

**LOG ABBREVIATIONS**

| | |
|---|---|
| REF | REFUSAL |

| RELATIVE DENSITY OF COHESIONLESS SOILS | | CONSISTENCY OF COHESIVE SOILS | | |
|---|---|---|---|---|
| RELATIVE DENSITY | SPT N60 BLOWS/FOOT | CONSISTENCY | SPT N60 BLOWS/FOOT | POCKET PENETROMETER MEASUREMENT (TSF) |
| VERY LOOSE | 0 - 4 | VERY SOFT | 0 - 2 | 0 - 0.25 |
| LOOSE | 5 - 10 | SOFT | 3 - 4 | 0.26 - 0.50 |
| MEDIUM DENSE | 11 - 30 | MEDIUM STIFF | 5 - 8 | 0.51 - 1.0 |
| DENSE | 31 - 50 | STIFF | 9 - 15 | 1.1 - 2.0 |
| VERY DENSE | OVER 50 | VERY STIFF | 16 - 30 | 2.1 - 4.0 |
| | | HARD | OVER 30 | OVER 4.0 |

NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

IF THE SEATING INTERVAL (1st 6 INCH INTERVAL) IS NOT ACHIEVED, N IS REPORTED AS REF. IF MORE THAN 50 BLOWS ARE RECORDED IN ANY 6-INCH INTERVAL, $_{60}$ IS REPORTED AS REF.

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# SUBSURFACE EXPLORATION LEGEND

# LOG OF BORING B-1

**DATE DRILLED:** DEC 8, 2023 **DRILLING EQUPMENT:** CME 75 **SAMPLE METHOD:** HAMMER: 140 LBS., DROP: 30 IN (AUTO)

**ELEVATION (FT):** +31 (Google Earth) **DRILLING METHOD:** 8-INCH HOLLOW STEM AUGER **LOGGED BY:** PK

**GROUNDWATER DEPTH (FT):** N/A **NOTES:** ETR~81.5% **REVIEWED BY:** PK

| DEPTH (FT) | BULK SAMPLE | CAL/SPT SAMPLE | BLOWS PER 6 IN N | $N_{60}$ | MOISTURE (%) | DRY DENSITY (pcf) | SOIL CLASS (USCS) | SOIL DESCRIPTION<br>*SUMMARY OF SUBSURFACE CONDITIONS (USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)* | LAB TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | **3 INCHES OF A.C. OVER 6 INCHES OF AB** | |
| | X | | | | | | SC | **ARTIFICIAL FILL (af):** SANDY CLAY/ CLAYEY SAND, *OLIVE BROWN, SL MOIST TO MOIST, DENSE, FINE GRAINED, MICACEOUS* | AL |
| | X | | | | | | | **ALLUVIUM (Qa):** *SILTY CLAY, OLIVE BROWN, MOIST, STIFF* | EI<br>DS |
| 5 | | ■ | 6<br>8<br>10 | 12 | 25.7 | 99.1 | ML | *INCREASED SILT CONTENT* | CN |
| 10 | | ■ | 3<br>4<br>7 | 8 | 33.3 | 87.3 | CL | *CLAY, BROWN TO OLIVE BROWN, MOIST TO WET, STIFF* | |
| 15 | | ⧄ | 2<br>2<br>4 | 9 | 36.5 | | | | |
| 20 | | ⧄ | 2<br>1<br>2 | 4 | 23.3 | | | *MEDIUM STIFF* | |
| | | | | | | | | *BORING TERMINATED AT 21½ FT. NO GROUNDWATER ENCOUNTERED.* | |
| 25 | | | | | | | | | |
| 30 | | | | | | | | | |


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| P: 858.292.7575 | | |
|---|---|---|
| DRAFTED BY: PK | PROJECT: 3023028 | APPENDIX: B.1 |

# LOG OF BORING B-2

**DATE DRILLED:** DEC 8, 2023 **DRILLING EQUPMENT:** CME 75 **SAMPLE METHOD:** HAMMER: 140 LBS., DROP: 30 IN (AUTO)

**ELEVATION (FT):** +29 (Google Earth) **DRILLING METHOD:** 8-INCH HOLLOW STEM AUGER **LOGGED BY:** PK

**GROUNDWATER DEPTH (FT):** 24 **NOTES:** ETR~81.5% **REVIEWED BY:** PK

| DEPTH (FT) | BULK SAMPLE | CAL/SPT SAMPLE | BLOWS PER 6 IN N | $N_{60}$ | MOISTURE (%) | DRY DENSITY (pcf) | SOIL CLASS (USCS) | SOIL DESCRIPTION<br>*SUMMARY OF SUBSURFACE CONDITIONS (USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)* | LAB TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | **3 INCHES OF A.C. OVER 6 INCHES OF AB** | |
| | | | | | | | ML | **ARTIFICIAL FILL(af):** *SANDY SILT, OLIVE BROWN, SLIGHTLY MOIST TO MOIST, MICACEOUS, FINE GRAINED* | |
| | | | | | | | SP | *SAND, GRAY BROWN, SLIGHTLY MOIST TO MOIST AT 3'* | |
| 5 | | ■ | 3<br>7<br>13 | 13 | 28.7 | 91.0 | CL | **ALLUVIUM (Qa):***CLAY, MOTTLED OLIVE BROWN TO BROWN, SLIGHTLY MOIST TO MOIST, STIFF*<br>*INCREASED SILT, FINE GRAINED SAND* | CN |
| 10 | | ■ | 3<br>7<br>6 | 10 | 35.0 | 86.0 | ML | *CLAYEY SILT, WET, STIFF* | CN |
| 15 | | ⧄ | 2<br>2<br>2 | 6 | | | CH | *CLAY, OLIVE BROWN, MOIST, MEDIUM STIFF, CONTAINS CALICHE STRINGERS* | AL |
| 20 | | ⧄ | 1<br>2<br>2 | 6 | 28.6 | | | *WATER AT 24'* | |
| 25 | | ⧄ | 4<br>9<br>15 | 37 | 17.7 | | CL | *SANDY CLAY, MOTTLED BROWN AND OLIVE BROWN WITH BLACK CARBONATE SPECS, HARD, GRAY CALICHE STRINGERS* | |
| 30 | | | | | | | | | |


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| DRAFTED BY: DB | PROJECT: 3023028 | APPENDIX: B.2 |
|---|---|---|

# LOG OF BORING B-2(CONT.)

**DATE DRILLED:** DEC 8, 2023 **DRILLING EQUPMENT:** CME 75 **SAMPLE METHOD:** HAMMER: 140 LBS., DROP: 30 IN (AUTO)

**ELEVATION (FT):** +29 (Google Earth) **DRILLING METHOD:** 8-INCH HOLLOW STEM AUGER **LOGGED BY:** PK

**GROUNDWATER DEPTH (FT):** N/A **NOTES:** ETR~81.5% **REVIEWED BY:** PK

| DEPTH (FT) | BULK SAMPLE | CAL/SPT SAMPLE | BLOWS PER 6 IN N | $N_{60}$ | MOISTURE (%) | DRY DENSITY (pcf) | SOIL CLASS (USCS) | SOIL DESCRIPTION<br>*SUMMARY OF SUBSURFACE CONDITIONS (USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)* | LAB TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 30 | | ✓ | 2<br>2<br>2 | 7 | | | CL | *SANDY CLAY, BROWN, MOIST, MEDIUM STIFF, CLAYEY SAND NOTED AT TIP OF SAMPLER* | AL |
| 35 | | ✓ | 2<br>3<br>3 | 10 | 21.1 | | SP<br>CL | *SAND, MOTTLED GRAY AND BROWN, MORE OR LESS SATURATED, LOOSE, COARSE*<br>*CLAY, MOTTLED OLIVE BROWN AND BROWN, MOIST, STIFF, AT 35'* | |
| 40 | | ✓ | 3<br>5<br>5 | 16 | 22.6 | | SP<br>CL | *SAND, MEDIUM DENSE*<br>*SILTLY CLAY, MOTTLED RED BROWN AND OLIVE BROWN, VERY STIFF AT41'* | |
| 45 | | ✓ | 5<br>16<br>25 | 67 | | | SP | *SAND, VERY DENSE* | |
| 50 | | ✓ | | | | | | *SAMPLE LOST* | |
| | | | | | | | | *BORING TERMINATED AT 51½ FT. GROUNDWATER ENCOUNTERED AT 24FT.* | |
| 55 | | | | | | | | | |
| 60 | | | | | | | | | |


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| DRAFTED BY: DB | PROJECT: 3023028 | APPENDIX: B.3 |
|---|---|---|

# LOG OF BORING B-3

**DATE DRILLED:** DEC 8, 2023 **DRILLING EQUPMENT:** CME 75 **SAMPLE METHOD:** HAMMER: 140 LBS., DROP: 30 IN (AUTO)

**ELEVATION (FT):** +28 (Google Earth) **DRILLING METHOD:** 8-INCH HOLLOW STEM AUGER **LOGGED BY:** PK

**GROUNDWATER DEPTH (FT):** N/A **NOTES:** ETR~81.5% **REVIEWED BY:** PK

| DEPTH (FT) | BULK SAMPLE | CAL/SPT SAMPLE | BLOWS PER 6 IN N | $N_{60}$ | MOISTURE (%) | DRY DENSITY (pcf) | SOIL CLASS (USCS) | SOIL DESCRIPTION<br>*SUMMARY OF SUBSURFACE CONDITIONS (USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)* | LAB TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 0 | X | | | | | | | **3 INCHES OF A.C. OVER 6 INCHES OF AB** | AL |
| | X | | | | | | ML | **ARTIFICIAL FILL (AF):** *SANDY SILT, OLIVE BROWN, SLIGHTLY MOIST TO MOIST, MICACEOUS, FINE GRAINED* | EI<br>DS<br>CR |
| | X | | | | | | SP | *SAND, GRAY, SLIGHTLY MOIST* | |
| 5 | | ■ | 6<br>8<br>14 | 15 | 25.4 | 96.5 | CL | **ALLUVIUM (Qa):** *CLAY, OLIVE BROWN, SLIGHTLY MOIST TO MOIST, STIFF* | CN |
| 10 | | ■ | 7<br>11<br>7 | 14 | 29.5 | 91.6 | ML | *SANDY SILT, MOTTLED BROWN, OLIVE BROWN, AND RED BROWN, STIFF, FINE GRAINED, MICACEOUS* | |
| 15 | | ⧸ | 2<br>2<br>3 | 7 | 33.0 | | CL | *CLAY, OLIVE BROWN, MOIST TO WET, MEDIUM STIFF* | |
| 20 | | ⧸ | 2<br>2<br>2 | 6 | 36.3 | | | | |
| | | | | | | | | *BORING TERMINATED AT 21½ FT. NO GROUNDWATER ENCOUNTERED.* | |
| 25 | | | | | | | | | |
| 30 | | | | | | | | | |


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| DRAFTED BY: DB | PROJECT: 3023028 | APPENDIX: B.4 |
|---|---|---|

# LOG OF BORING B-4

**DATE DRILLED:** DEC 8, 2023 **DRILLING EQUPMENT:** CME 75 **SAMPLE METHOD:** HAMMER: 140 LBS., DROP: 30 IN (AUTO)

**ELEVATION (FT):** +30 (Google Earth) **DRILLING METHOD:** 8-INCH HOLLOW STEM AUGER **LOGGED BY:** PK

**GROUNDWATER DEPTH (FT):** 23 **NOTES:** ETR~81.5% **REVIEWED BY:** PK

| DEPTH (FT) | BULK SAMPLE | CAL/SPT SAMPLE | BLOWS PER 6 IN N | $N_{60}$ | MOISTURE (%) | DRY DENSITY (pcf) | SOIL CLASS (USCS) | SOIL DESCRIPTION<br>*SUMMARY OF SUBSURFACE CONDITIONS (USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)* | LAB TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | **3 INCHES OF A.C. OVER 6 INCHES OF AB** | |
| | | | | | | | | **ARTIFICIAL FILL (af):** SANDY CLAY/ CLAYEY SAND, *OLIVE BROWN, SL MOIST TO MOIST, DENSE, FINE GRAINED, MICACEOUS* | |
| | | | | | | | SC | **ALLUVIUM (Qa):** *CLAYEY SAND, OLIVE BROWN, MOIST TO WET, VERY LOOSE, FINE GRAINED, MICACEOUS* | |
| 5 | | ■ | 3<br>3<br>3 | 4 | 33.4 | 86.5 | | | CN |
| 10 | | ■ | 2<br>2<br>2 | 3 | 33.7 | 88.7 | CL | *CLAY, MOTTLED BROWN AND RED BROWN, MOIST TO WET, SOFT, CALICHE STRINGERS PRESENT* | CN |
| 15 | | ⧄ | 2<br>1<br>2 | 4 | 36.2 | | | *MEDIUM STIFF* | AL |
| 20 | | ⧄ | 2<br>3<br>3 | 9 | | | | *STIFF*<br>*WATER AT 23'* | |
| 25 | | ⧄ | 4<br>9<br>16 | 39 | | | SC | *CLAYEY SAND, MOTTLED BROWN AND GRAY WITH BLACK CARBONATE SPECS, WET, DENSE, SCATTERED CALICHE STRINGERS* | AL |
| 30 | | | | | | | | | |


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DRAFTED BY: DB | PROJECT: 3023028 | APPENDIX: B.5

# LOG OF BORING B-4(CONT.)

**DATE DRILLED:** DEC 8, 2023 **DRILLING EQUPMENT:** CME 75 **SAMPLE METHOD:** HAMMER: 140 LBS., DROP: 30 IN (AUTO)

**ELEVATION (FT):** +30 (Google Earth) **DRILLING METHOD:** 8-INCH HOLLOW STEM AUGER **LOGGED BY:** PK

**GROUNDWATER DEPTH (FT):** 23 **NOTES:** ETR~81.5% **REVIEWED BY:** PK

| DEPTH (FT) | BULK SAMPLE | CAL/SPT SAMPLE | BLOWS PER 6 IN N | $N_{60}$ | MOISTURE (%) | DRY DENSITY (pcf) | SOIL CLASS (USCS) | SOIL DESCRIPTION<br>*SUMMARY OF SUBSURFACE CONDITIONS (USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)* | LAB TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | | SP | *SAND, BROWN, SATURATED, MEDIUM DENSE, COARSE GRAINED* | |
| | | ✓ | 3<br>5<br>7 | 20 | 30.6 | | CL | *SANDY CLAY, BROWN, MOIST TO WET, VERY STIFF* | AL |
| 35 | | ✓ | 2<br>3<br>5 | 13 | 28.6 | | CL | *SATURATED, STIFF*<br>*CLAY, MOTTLED GRAY AND OLIVE BROWN, SLIGHTLY MOIST TO MOIST, STIFF* | |
| 40 | | ✓ | 7<br>15<br>18 | 54 | | | SP | *SAND, BROWN, SATURATED, DENSE, COARSE GRAINED* | |
| 45 | | ✓ | 5<br>16<br>4 | 33 | 18.1 | | | *DENSE, COARSENESS DECREASES WITH DEPTH* | |
| 50 | | ✓ | 8<br>12<br>14 | 42 | | | | | |
| | | | | | | | | *BORING TERMINATED AT 51½ FT. GROUNDWATER ENCOUNTERED AT 23 FT.* | |
| 55 | | | | | | | | | |
| 60 | | | | | | | | | |


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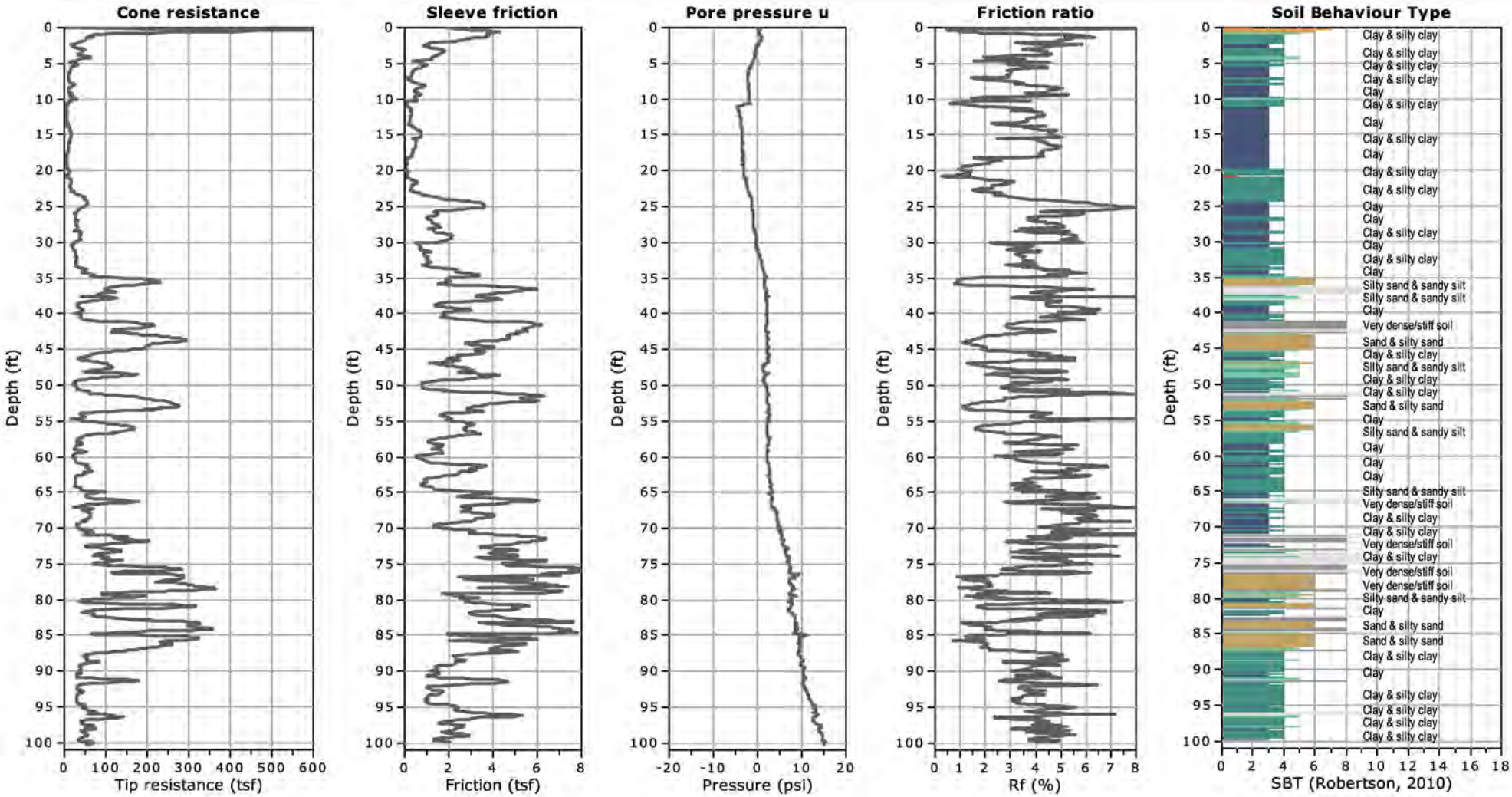
| DRAFTED BY: DB | PROJECT: 3023028 | APPENDIX: B.6 |
|---|---|---|

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

**Project:** **NOVA Services / The Hive**
**Location:** **3335 Susan St, Costa Mesa, CA**

**CPT-1**
Total depth: 100.22 ft, Date: 12/8/2023



**Kehoe Testing and Engineering**
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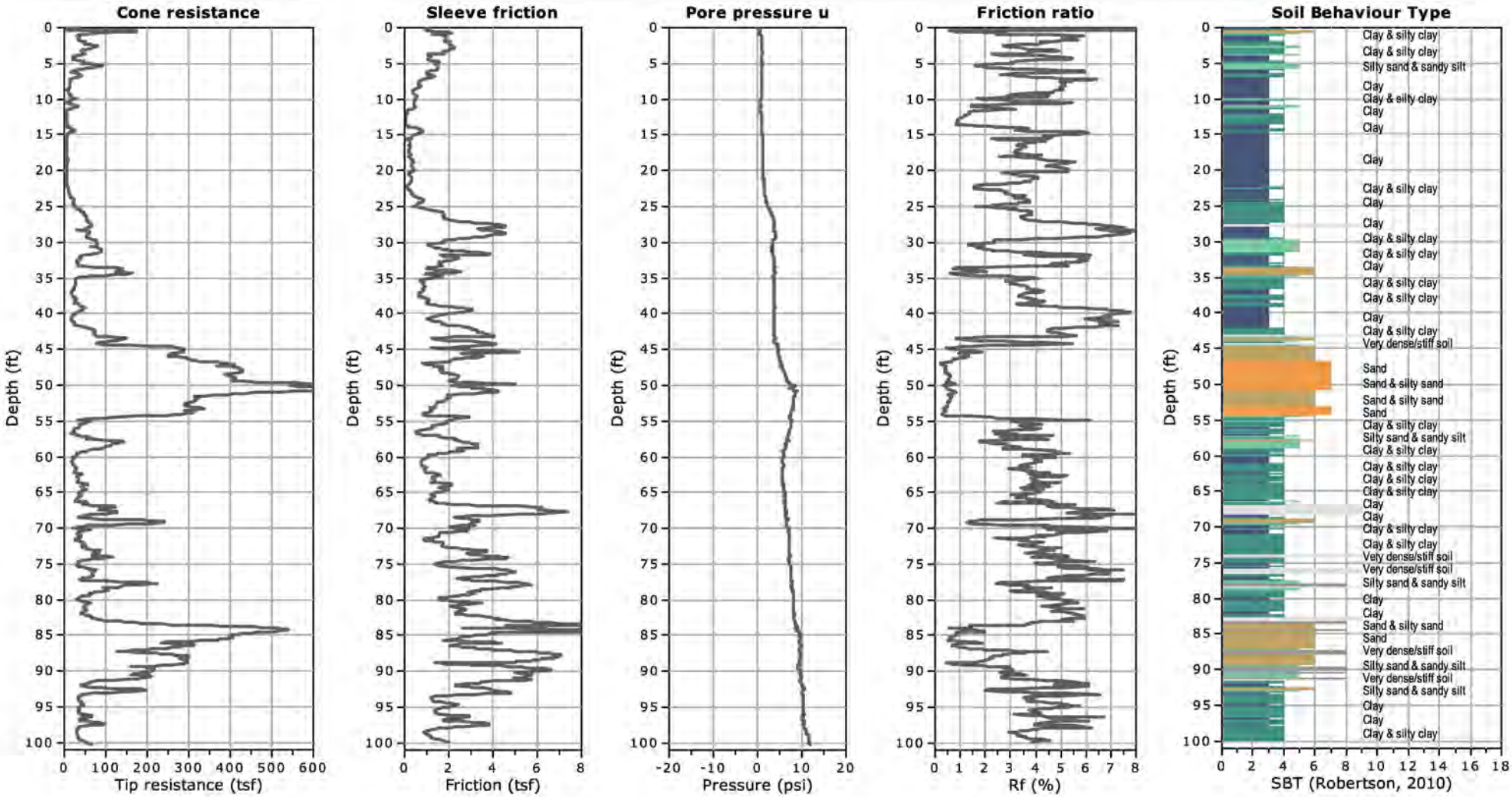
steve@kehoetesting.com
www.kehoetesting.com

**Project:** NOVA Services / The Hive
**Location:** 3335 Susan St, Costa Mesa, CA

**CPT-2**
Total depth: 100.24 ft, Date: 12/8/2023



# APPENDIX C
# LABORATORY TESTING

*Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. Brief descriptions of the tests performed are presented below:*

- **CLASSIFICATION:** *Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soils Classification System and are presented on the exploration logs in Appendix B.*

- **MOISTURE CONTENT (ASTM D2216):** *A test was performed on a selected represenative soil sample to evaluate the water (moisture) content by mass of soil, rock, and similar materials where the reduction in mass by drying is due to loss of water. The test sample is dried in an oven at a temperature of 110° ± 5°C to a constant mass. The loss of mass due to drying is considered to be water. The water (moisture) content was determined in general accordance with ASTM D2216.*

- **MOISTURE AND DENSITY OF SOIL IN PLACE (ASTM D2937):** *In-place moisture contents and dry densities were determined for representative soil samples. This information was an aid to classification and permitted recognition of variations in material consistency with depth. The dry unit weight is determined in pounds per cubic foot, and the in-place moisture content is determined as a percentage of the soil's dry weight. The results are summarized in the exploration logs presented in Appendix B. The moisture and density of the soil was determined in general accordance with ASTM D2937.*

- **GRADATION ANALYSIS (ASTM D6913):** *Gradation analyses were performed on representative soil samples in general accordance with ASTM D422. The grain size distributions of the samples were determined in general accordance with ASTM D6913.*

- **ATTERBERG LIMITS (ASTM D4318):** *Tests were performed on selected representative fine-grained soil samples to evaluate the liquid limits, plastic limits, and plasticity indexes in general accordance with ASTM D4318. These test results were utilized to evaluate the soil classification in accordance with the Unified Soil Classification System.*

- **EXPANSION INDEX (ASTM D4829):** *The expansion indexes of selected materials were evaluated in general accordance with ASTM D4829. Specimens were molded under a specified compactive energy at approximately 50 percent saturation (plus or minus 1 percent). The prepared 1-inch thick by 4-inch diameter specimens were loaded with a surcharge of 144 pounds per square foot and were inundated with tap water. Readings of volumetric swell were made for a period of 24 hours.*

- **CORROSIVITY (CAL. TEST METHOD 417, 422, 643):** *Soil PH, and minimum resistivity tests were performed on a representative soil sample in general accordance with test method CT 643. The sulfate and chloride content of the selected sample were evaluated in general accordance with CT 417 and CT 422, respectively.*

- **MAXIMUM DENSITY AND OPTIMUM MOISTURE CONTENT (ASTM D1557 METHOD A,B,C):** *The maximum dry density and optimum moisture content of typical soils were determined in the laboratory in accordance with ASTM Standard Test D 1557, Method A, Method B, Method C*

*Soil samples not tested are now stored in our laboratory for future reference and evaluation, if needed. Unless notified to the contrary, samples will be disposed of 90 days from the date of this report.*

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# LAB TEST SUMMARY

**Proposed Residential Multi-Family Development**

**Hive Live**

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

| DRAFTED BY: SB | REVIEWED BY: PK | PROJECT: 3023028 | FIGURE: C.1 |
|---|---|---|---|

*Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. Brief descriptions of the tests performed are presented below:*

- **DIRECT SHEAR:** *The shear strength parameters, angle of internal friction adn cohesion, were determined from undisturbed samples obtained from our exploratory borings. The test was performed in general conformance with ASTM D 3080. For each test, the three specimens were artificially saturated in the laboratory and were sheared under submergerd conditions and varied loads at an appropriate rate of constant rate of strain. Residual shear of the Mission Valley Formation along bedding was determined by repeatedly shearing a sample in the direct shear machine.*

- **CONSOLIDATION PROPERTIES (ASTM D2435):** *Tests were performed on selected relatively undisturbed soil samples in general accordance with ASTM D2435. The samples were inundated during testing to represent adverse field conditions. The percent of consolidation for each load cycle was recorded as a ratio of the amount of vertical compression to the original height of the sample.*

*Soil samples not tested are now stored in our laboratory for future reference and evaluation, if needed. Unless notified to the contrary, samples will be disposed of 90 days from the date of this report.*

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## LAB TEST SUMMARY

**Proposed Residential Multi-Family Development**

**Hive Live**

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

| DRAFTED BY: SB | REVIEWED BY: PK | PROJECT: 3023028 | FIGURE: C.1a |
|---|---|---|---|

## Maximum Dry Density and Optimum Moisture Content (ASTM D1557)

| Sample Location | Sample Depth (ft.) | Soil Description | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|---|
| B-1 | 0 - 5 | Clayey Sand | 115.6 | 12.7 |
| B-4 | 0 - 5 | Clayey Sand | 112.5 | 13.9 |

## Atterberg Limits (ASTM D4318)

| Sample Location | Sample Depth (ft.) | Liquid Limit, LL | Plastic Limit PL | Plasticity Index, PI |
|---|---|---|---|---|
| B-1 | 0 - 5 | 34 | 17 | 17 |
| B-2 | 15 | 61 | 20 | 41 |
| B-2 | 30 | 30 | 15 | 15 |
| B-4 | 0 - 5 | 36 | 18 | 18 |
| B-4 | 20 | 36 | 12 | 24 |
| B-4 | 25 | 40 | 15 | 25 |

## Expansion Index (ASTM D4829)

| Sample Location | Sample Depth (ft.) | Expansion Index | Expansion Potential |
|---|---|---|---|
| B-1 | 0 - 5 | 26 | Low |
| B-4 | 0 - 5 | 25 | Low |

## Classification of Expansive Soil (ASTM D4829)

| Expansion Index | Expansion Potential |
|---|---|
| 0-20 | Very Low |
| 21-50 | Low |
| 51-90 | Medium |
| 91-130 | High |
| >130 | Very High |

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**LAB TEST RESULTS**

**Proposed Residential Multi-Family Development**

**Hive Live**

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

| DRAFTED BY: SB | REVIEWED BY: PK | PROJECT: 3023028 | FIGURE: C.2 |
|---|---|---|---|

## Corrosivity (Cal. Test Method 417,422,643)

| Sample Location | Sample Depth (ft.) | pH | Resistivity (Ohm-cm) | Sulfate Content (ppm) | Sulfate Content (%) | Chloride Content (ppm) | Chloride Content (%) |
|---|---|---|---|---|---|---|---|
| B-1 | 0 - 5 | 8.09 | 2600 | 24 | 0.002 | 27 | 0.003 |
| B-4 | 0 - 5 | 8.13 | 1800 | 33 | 0.003 | 19 | 0.002 |

## Water-Soluble Sulfate Exposure (ACI 318 Table 19.3.1.1 and Table 19.3.2.1)

| Water-Soluble Sulfate ($SO_4$) in Soil (% by Weight) | Exposure Severity | Exposure Class | Cement Type (ASTM C150) | Max. W/C | Min. $f_c'$ (psi) |
|---|---|---|---|---|---|
| $SO_4 < 0.10$ | N/A | S0 | No type restriction | N/A | 2,500 |
| $0.10 \leq SO_4 < 0.20$ | Moderate | S1 | II | 0.50 | 4,000 |
| $0.20 \leq SO_4 \leq 0.20$ | Severe | S2 | V | 0.45 | 4,500 |
| $SO_4 > 2.00$ | Very Severe | S3 | V plus pozzolan or slag cement | 0.45 | 4,500 |

## Direct Shear (ASTM D3080)

| Sample Location | Sample Depth (ft.) | Soil Description | Friction Angle Peak/Ultimate (degrees) | Apparent Cohesion Peak/Ultimate (psf) |
|---|---|---|---|---|
| B-1 | 0 - 5 | Clayey Sand | 27/28 | 300/140 |
| B-4 | 0 - 5 | Clayey Sand | 31/31 | 90/12 |

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**LAB TEST RESULTS**

**Proposed Residential Multi-Family Development**

**Hive Live**

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

| DRAFTED BY: SB | REVIEWED BY: PK | PROJECT: 3023028 | FIGURE: C.2a |
|---|---|---|---|

# Classification Test Results

| Sample Location | Sample Depth (ft.) | USCS Soil Type | Passing No. 200 (%) |
|---|---|---|---|
| B-2 | 15 | CH | 98 |
| B-2 | 30 | CL | 74 |
| B-2 | 45 | SC | 14 |
| B-4 | 20 | CL | 89 |
| B-4 | 40 | SP | 10 |

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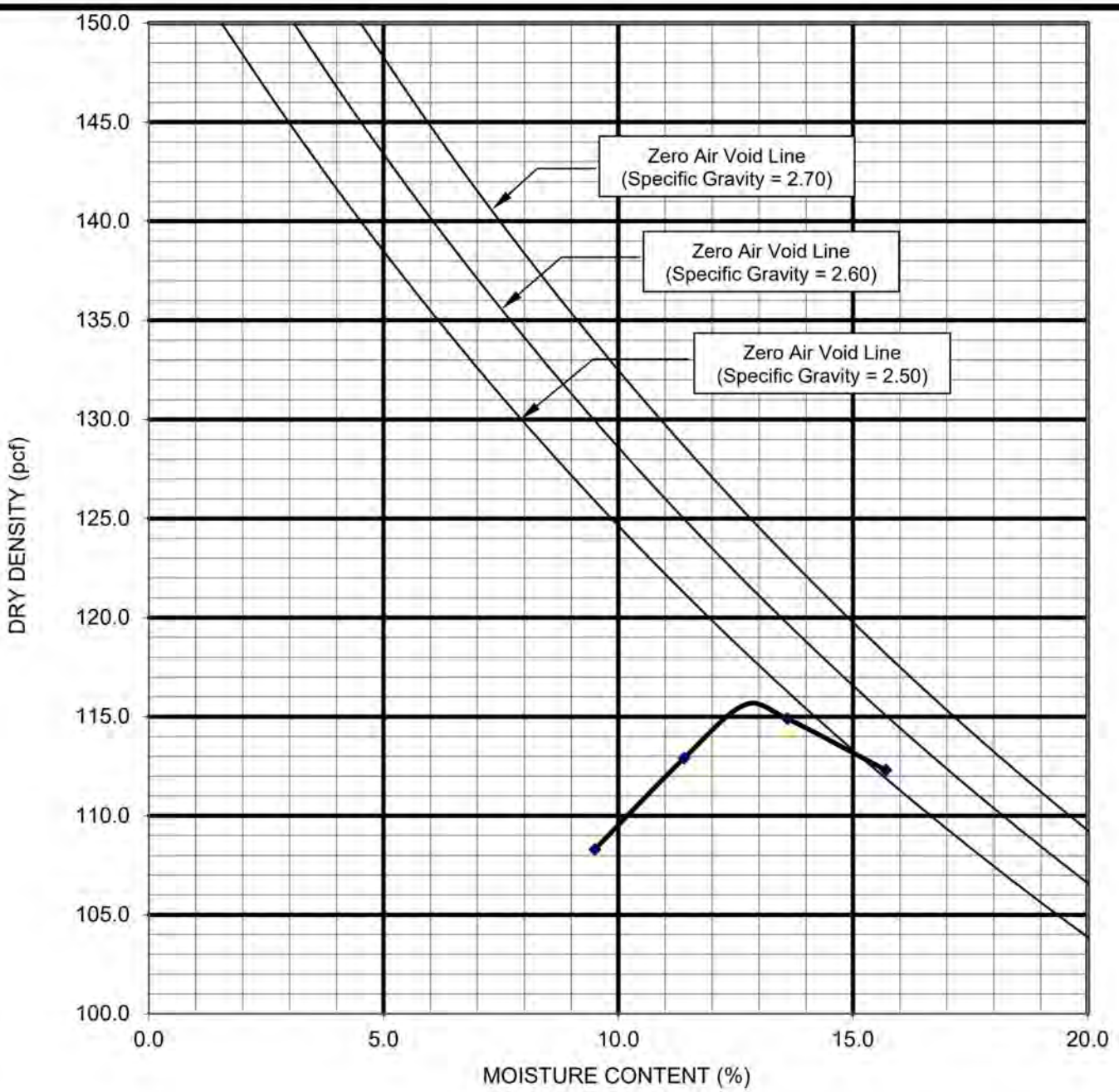
CLASSIFICATION TEST RESULTS

**Proposed Residential Multi-Family Development**

**Hive Live**

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

| DRAFTED BY: SB | REVIEWED BY: PK | PROJECT: 3023028 | FIGURE: C.3 |
|---|---|---|---|




| Sample Location | Soil Description | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| B-1 @ 0'-5' | LIGHT GRAY BROWN CLAYEY SAND | 115.6 | 12.7 |
| Dry Density and Moisture Content Values Corrected for Oversize (ASTM D4718) | | | |

PERFORMED IN GENERAL ACCORDANCE WITH: ☑ ASTM D 1557 ☐ ASTM D 698 METHOD: ☑ A ☐ B ☐ C

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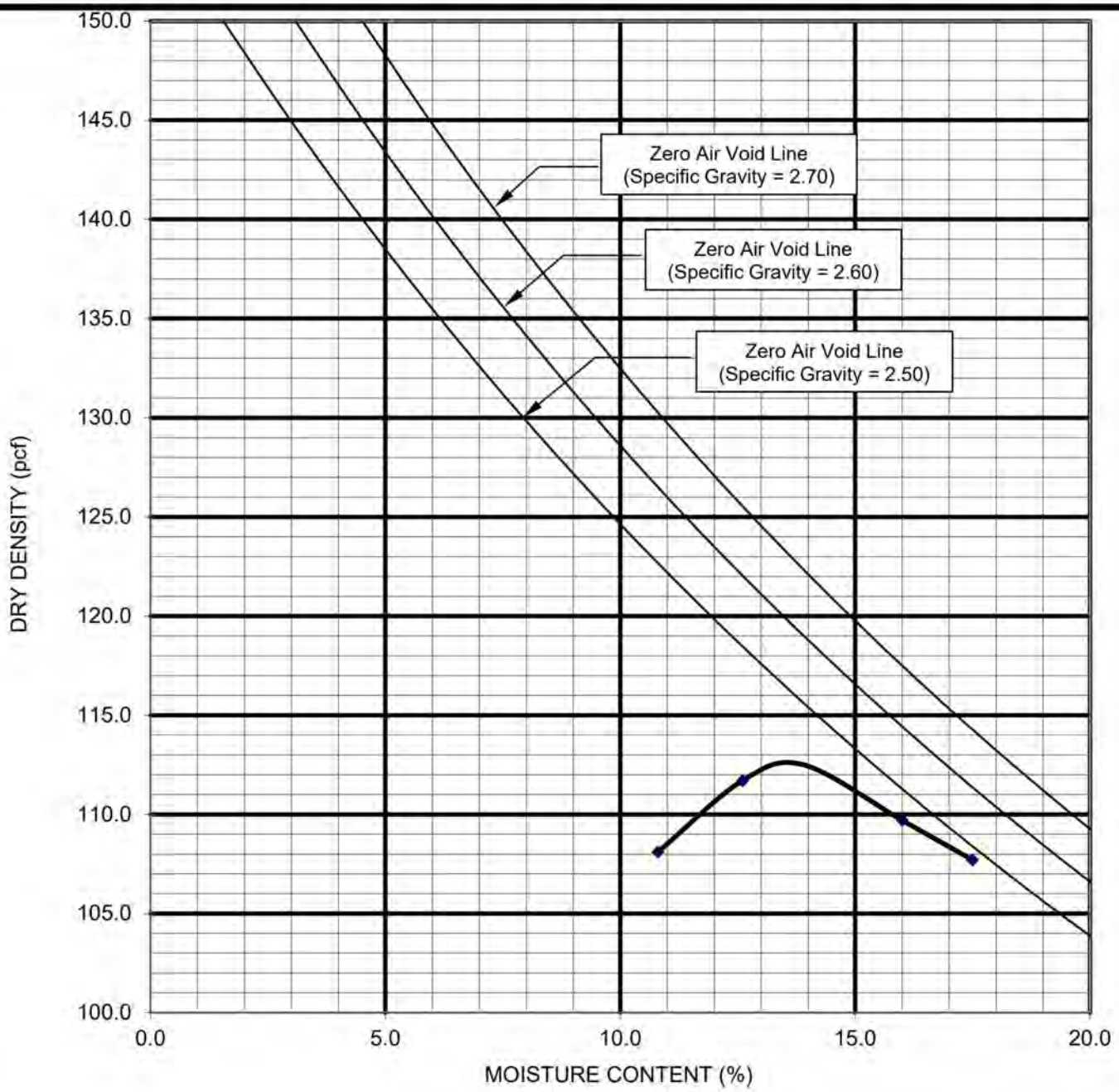
# PROCTOR DENSITY TEST RESULTS

**Proposed Residential Multi-Family Development**

**Hive Live**

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

| DRAFTED BY: SB | REVIEWED BY: PK | PROJECT: 3023028 | FIGURE: C.4 |
|---|---|---|---|




| Sample Location | Soil Description | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| B-4 @ 0'-5' | MEDIUM GRAY BROWN CLAYEY SAND | 112.5 | 13.9 |
| Dry Density and Moisture Content Values Corrected for Oversize (ASTM D4718) | | | |

PERFORMED IN GENERAL ACCORDANCE WITH: ☑ ASTM D 1557 ☐ ASTM D 698 METHOD: ☑ A ☐ B ☐ C

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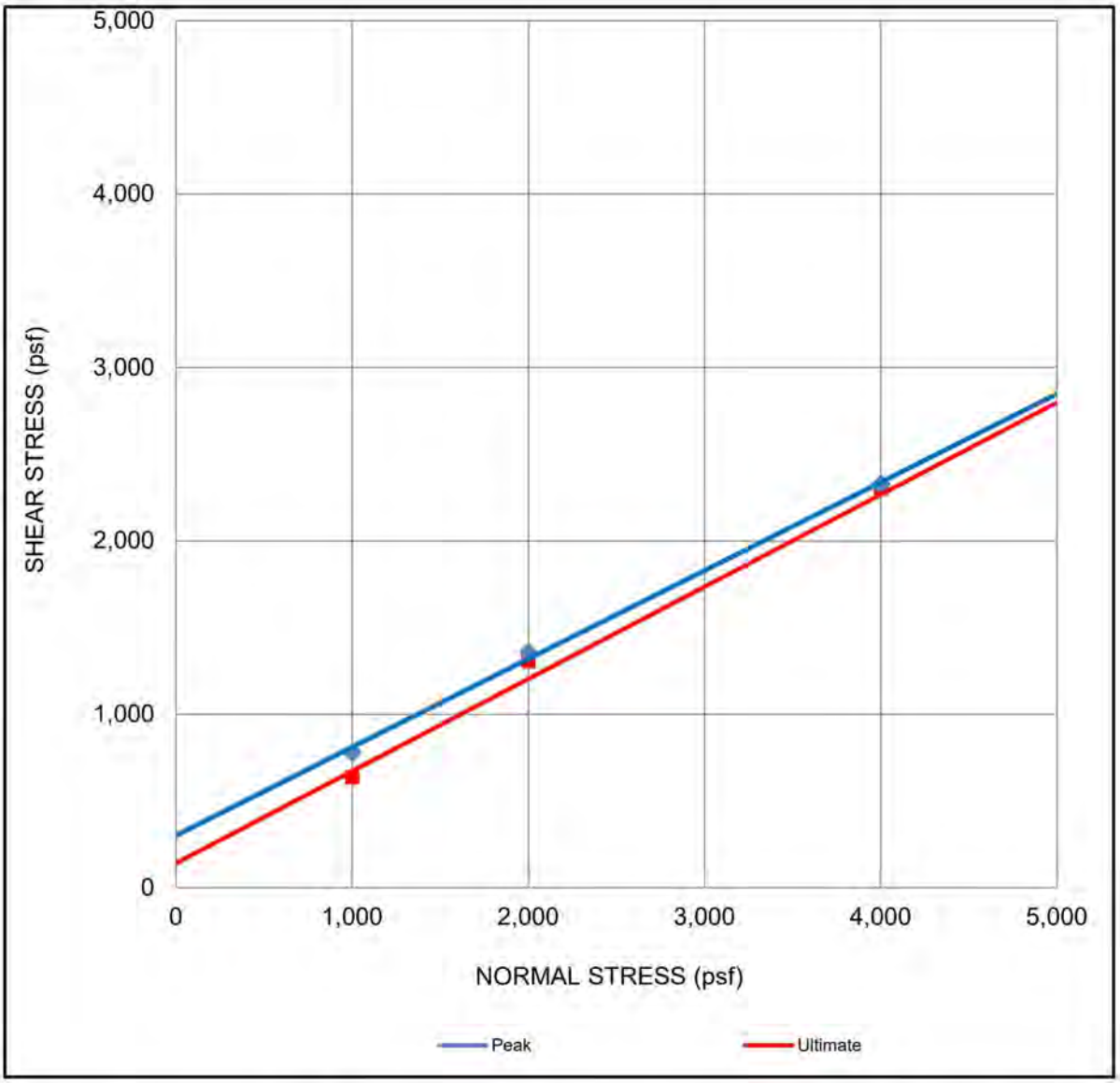
# PROCTOR DENSITY TEST RESULTS

**Proposed Residential Multi-Family Development**

**Hive Live**

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

| DRAFTED BY: SB | REVIEWED BY: PK | PROJECT: 3023028 | FIGURE: C.5 |
|---|---|---|---|




**Sample:** B-1 @ 0'-5'

**Description:** : Clayey Sand

**Sample Type:** REMOLD

**Strain Rate:** 0.025 in./min.

| | Peak | Ultimate |
|---|---|---|
| $\phi'$ | 27 ° | 28 ° |
| C' | 300 psf | 140 psf |

| | REMOLD | As Tested |
|---|---|---|
| $\gamma_d$ | 103.5 pcf | 103.5 pcf |
| $w_c$ | 13.0 % | 23.8 % |

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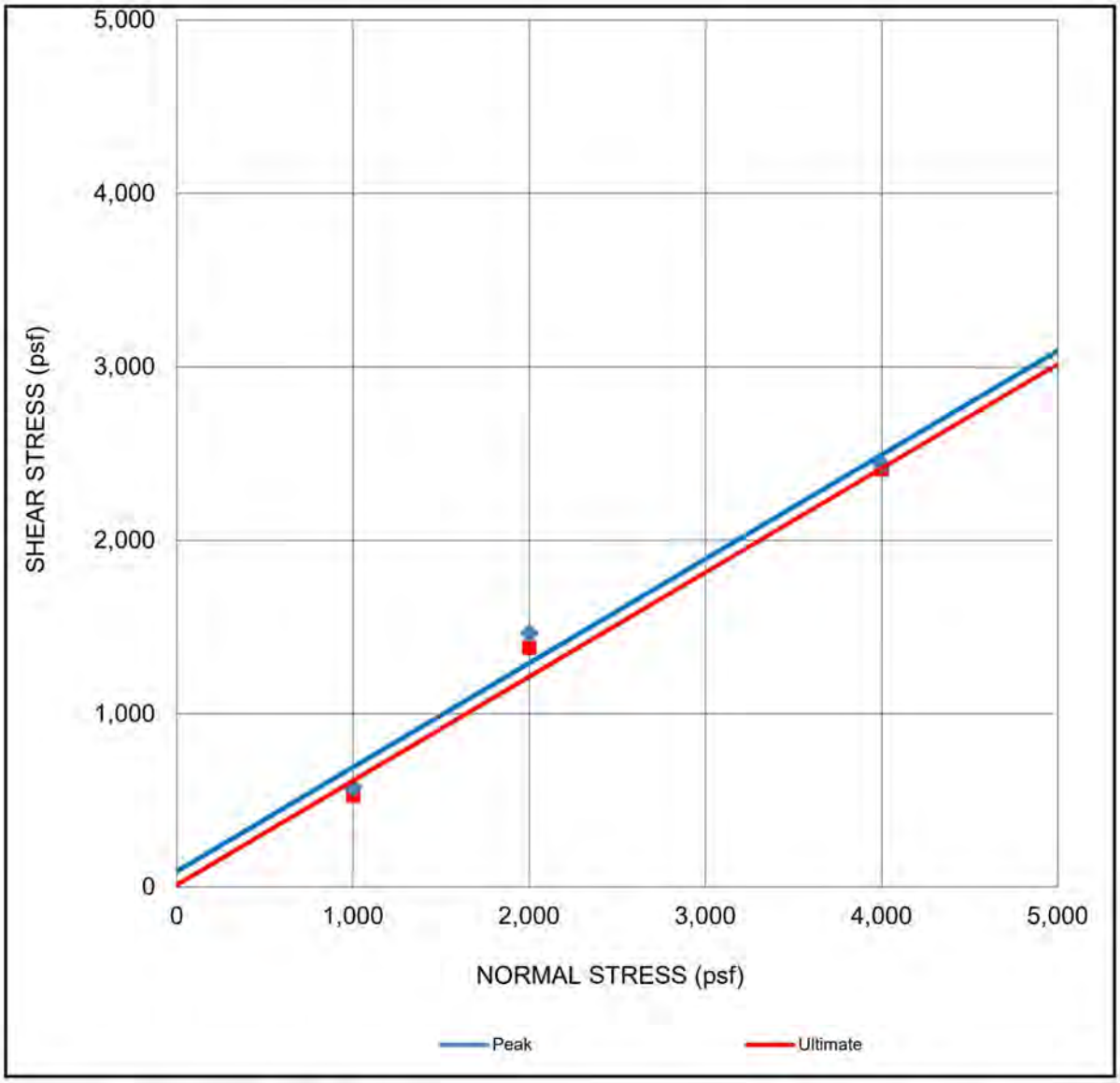
## DIRECT SHEAR TEST RESULTS

**Proposed Residential Multi-Family Development**

**Hive Live**

Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

| DRAFTED BY: SB | REVIEWED BY: PK | PROJECT: 3023028 | FIGURE: C.6 |
|---|---|---|---|




**Sample:** B-4 @ 0'-5'

**Description: SC**

**Sample Type:** REMOLD

**Strain Rate:** 0.025 in./min.

| | Peak | Ultimate |
|---|---|---|
| $\phi'$ | 31 ° | 31 ° |
| C' | 90 psf | 12 psf |

| | REMOLD | As Tested |
|---|---|---|
| $\gamma_d$ | 100.8 pcf | 100.8 pcf |
| $w_c$ | 13.6 % | 27.8 % |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## DIRECT SHEAR TEST RESULTS

**Proposed Residential Multi-Family Development**

**Hive Live**

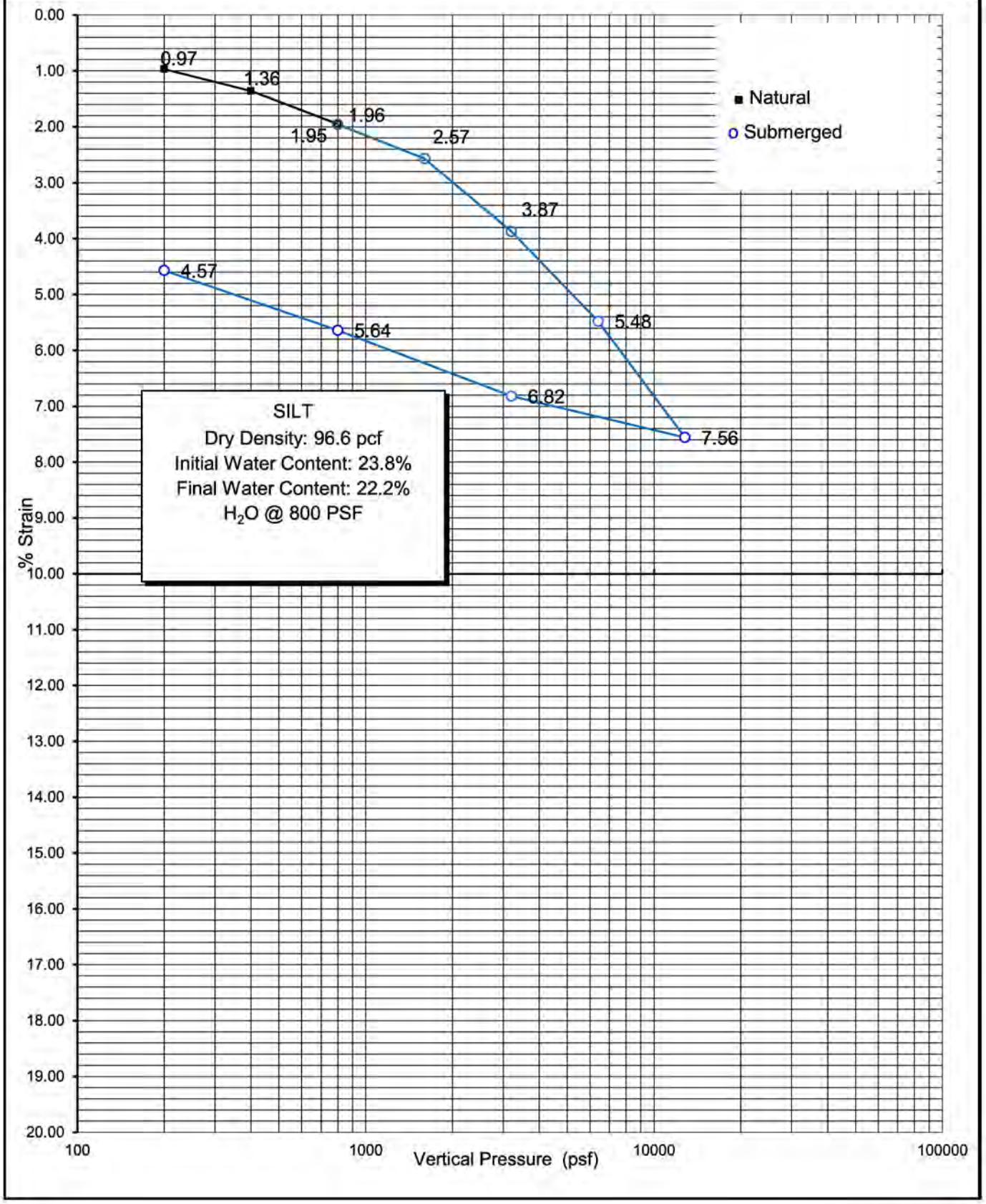
Susan Street and West Sunflower Avenue, Costa Mesa, CA 92606

| DRAFTED BY: SB | REVIEWED BY: PK | PROJECT: 3023028 | FIGURE: C.7 |
|---|---|---|---|

# CONSOLIDATION TEST - ASTM D2435



| Boring / Sample No. | B-1 | Depth: | 5' | Date | 12-21-23 |
|---|---|---|---|---|---|

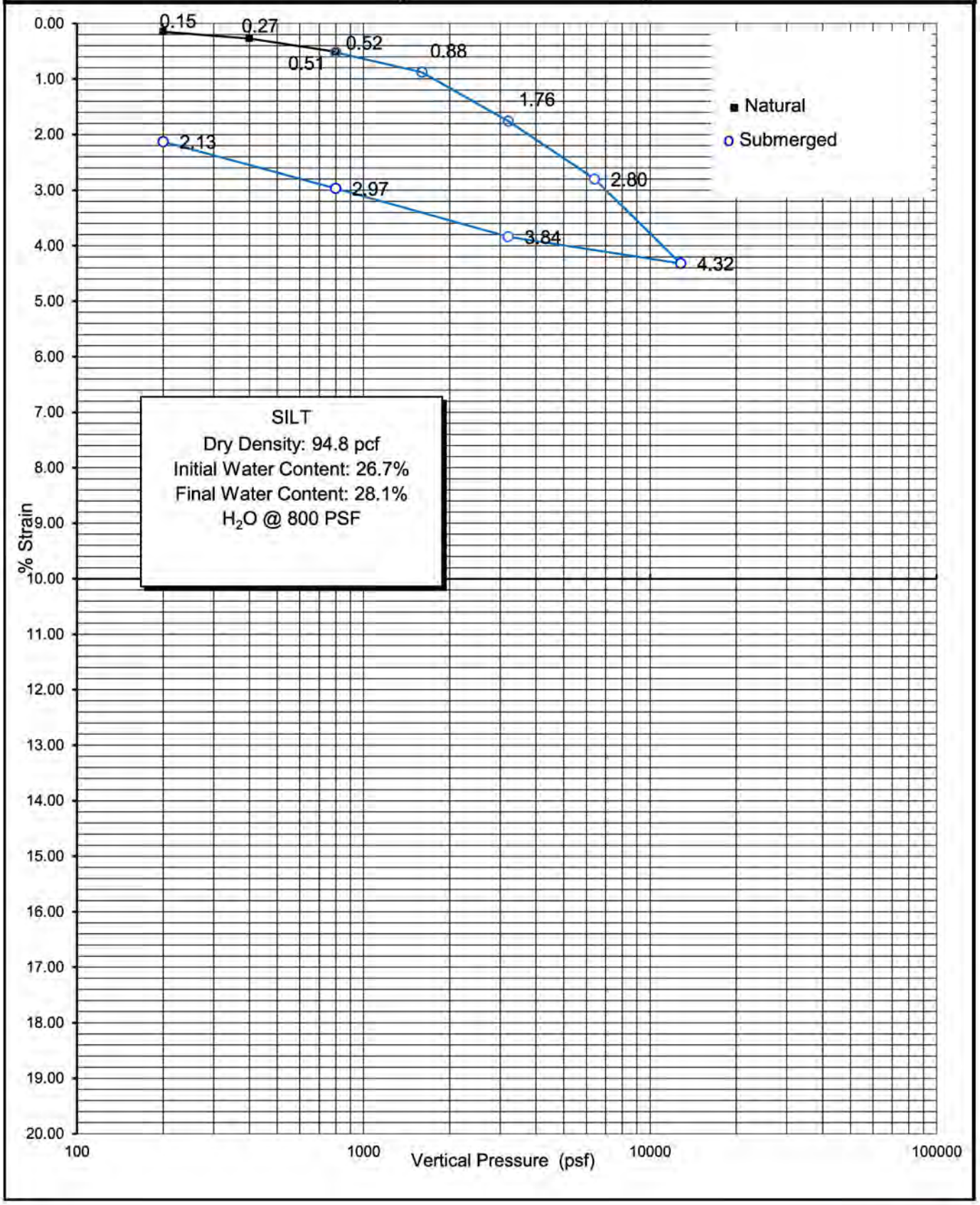



Geo-Logic Associates

# CONSOLIDATION TEST - ASTM D2435



| Boring / Sample No. | B-2 | Depth: | 5' | Date | 12-21-23 |
|---|---|---|---|---|---|

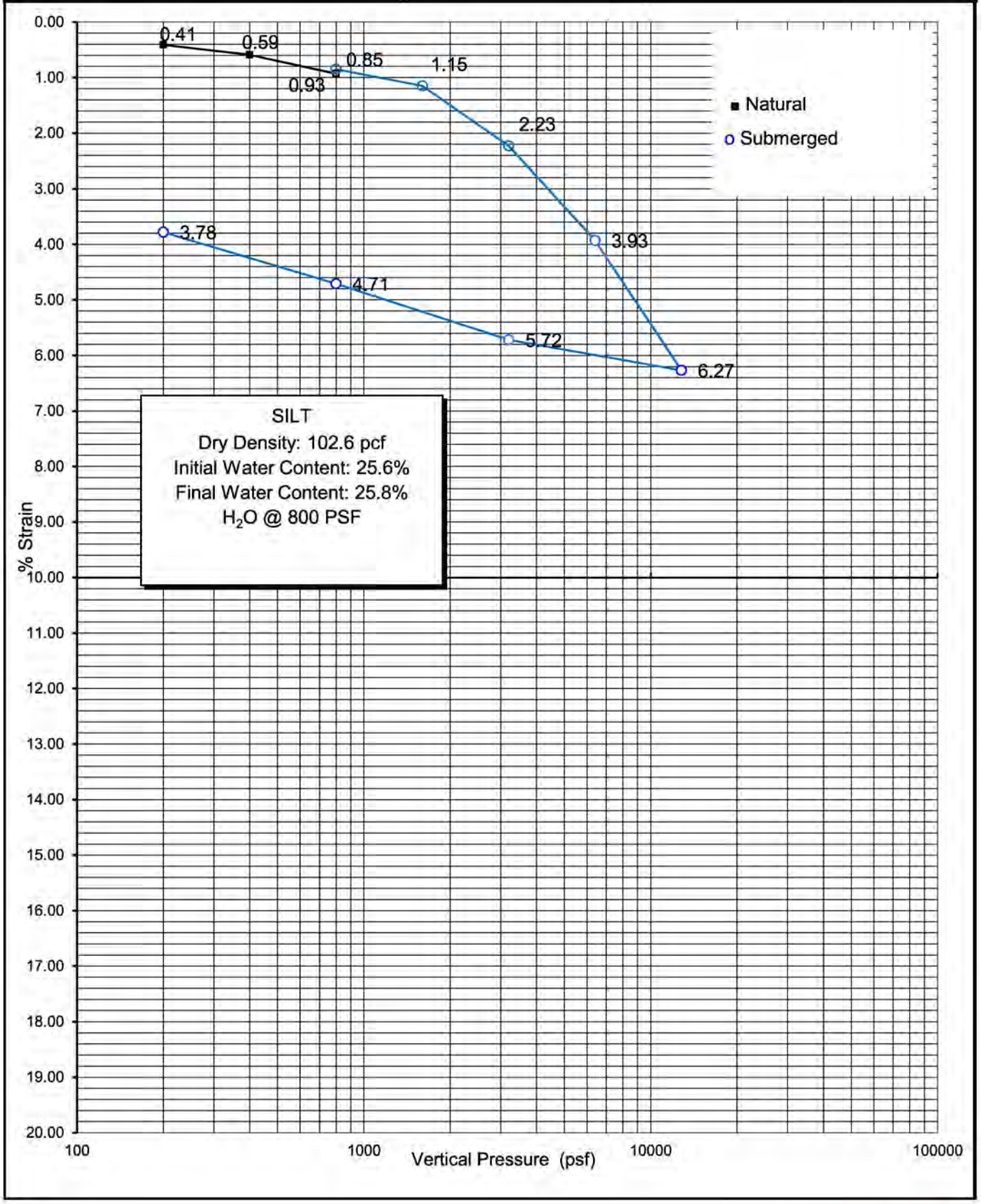



Geo-Logic Associates

# CONSOLIDATION TEST - ASTM D2435



| Boring / Sample No. | B-3 | Depth: | 5' | Date | 12-21-23 |
|---|---|---|---|---|---|

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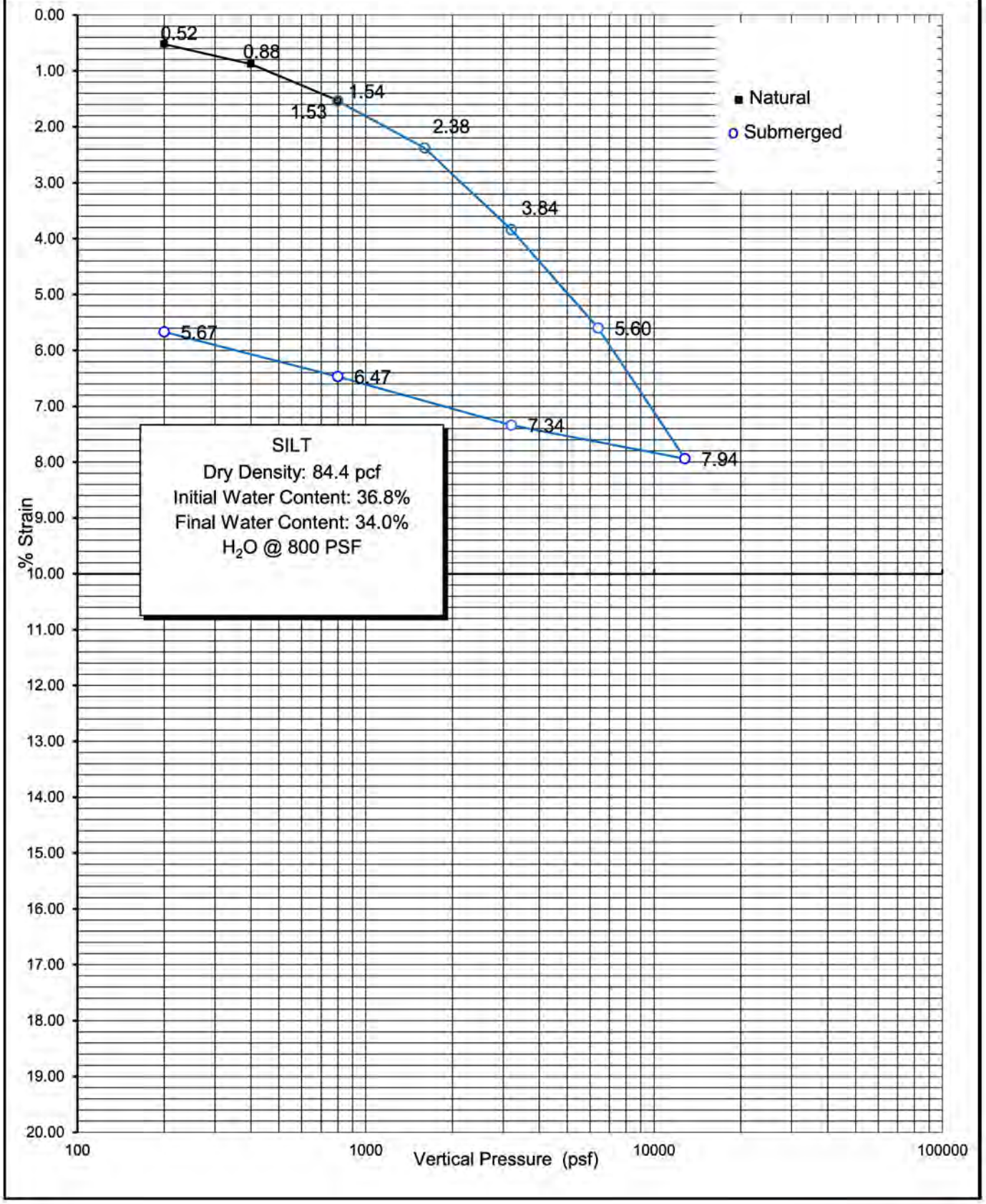
# CONSOLIDATION TEST - ASTM D2435



| Boring / Sample No. | B-4 | Depth: | 5' | Date | 12-21-23 |
|---|---|---|---|---|---|

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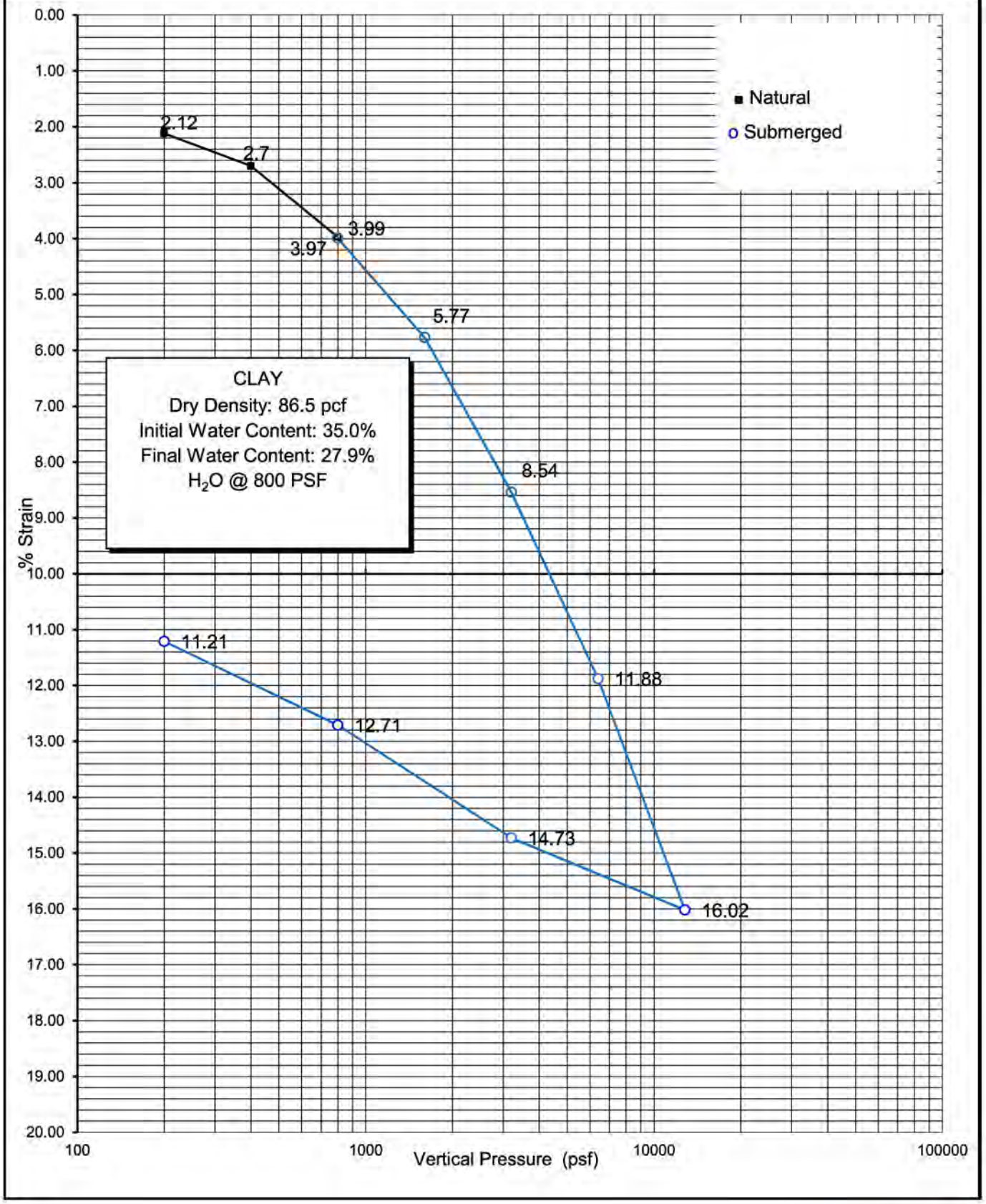
# CONSOLIDATION TEST - ASTM D2435



| Boring / Sample No. | B-4 | Depth: | 10' | Date | 12-21-23 |
|---|---|---|---|---|---|

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# APPENDIX D
# LIQUEFACTION ANALYSIS

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

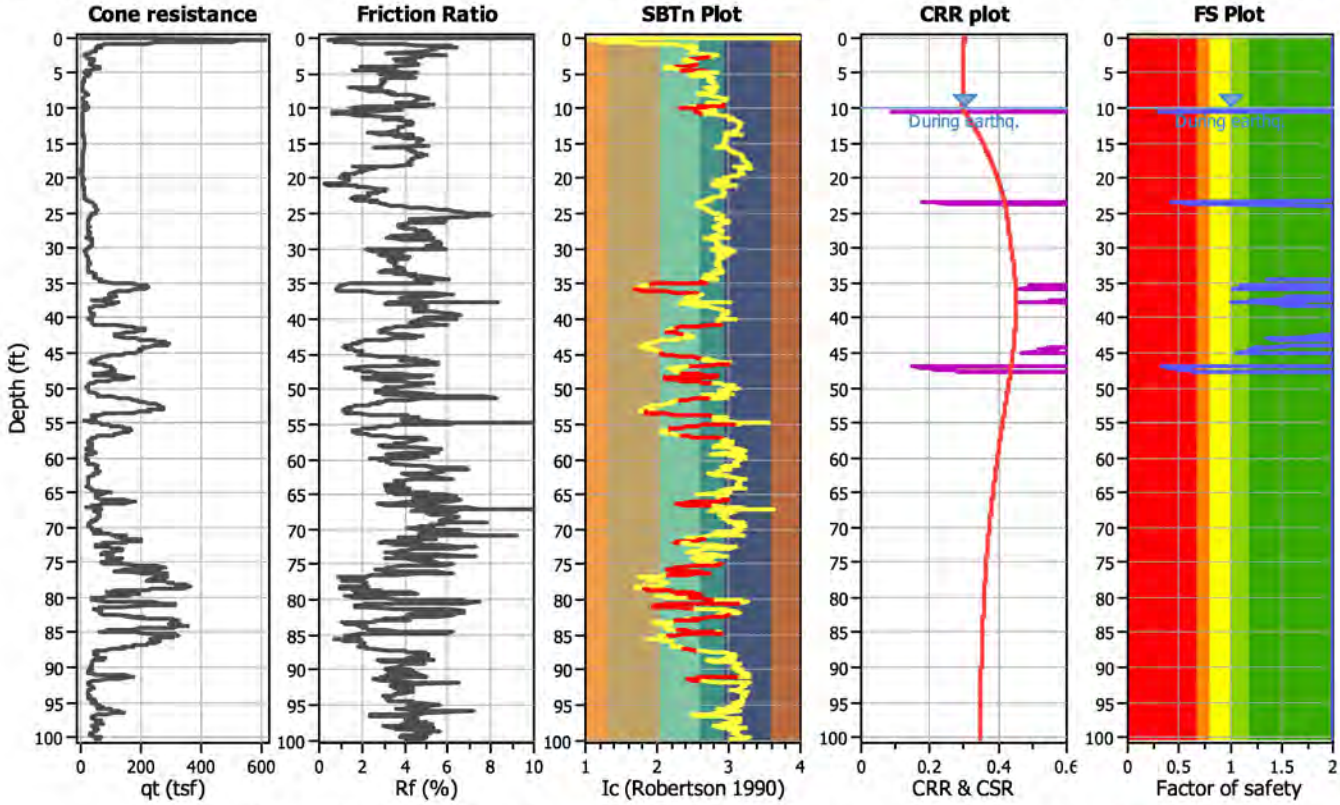
# LIQUEFACTION ANALYSIS REPORT

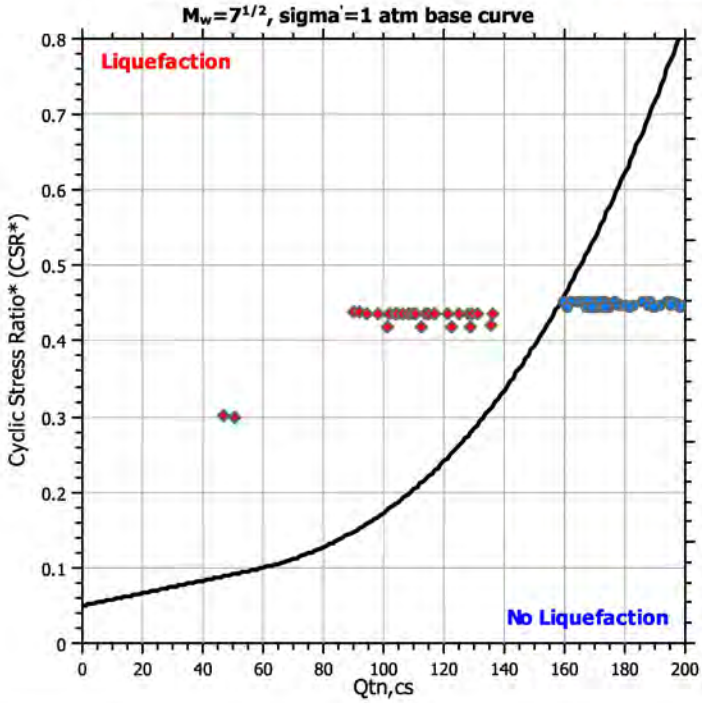
**Project title : NOVA Services / The Hive** **Location : 3335 Susan St, Costa Mesa, CA**

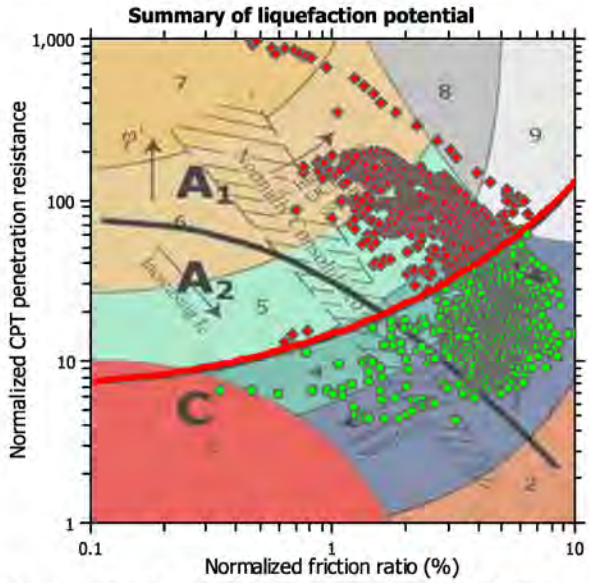
**CPT file : CPT-1**

**Input parameters and analysis data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Analysis method: | NCEER (1998) | G.W.T. (in-situ): | 22.00 ft | Use fill: | No | Clay like behavior applied: | Sands only |
| Fines correction method: | NCEER (1998) | G.W.T. (earthq.): | 10.00 ft | Fill height: | N/A | Limit depth applied: | Yes |
| Points to test: | Based on Ic value | Average results interval: | 1 | Fill weight: | N/A | Limit depth: | 50.00 ft |
| Earthquake magnitude $M_w$: | 6.66 | Ic cut-off value: | 2.60 | Trans. detect. applied: | Yes | MSF method: | Method based |
| Peak ground acceleration: | 0.50 | Unit weight calculation: | Based on SBT | $K_\sigma$ applied: | Yes | | |

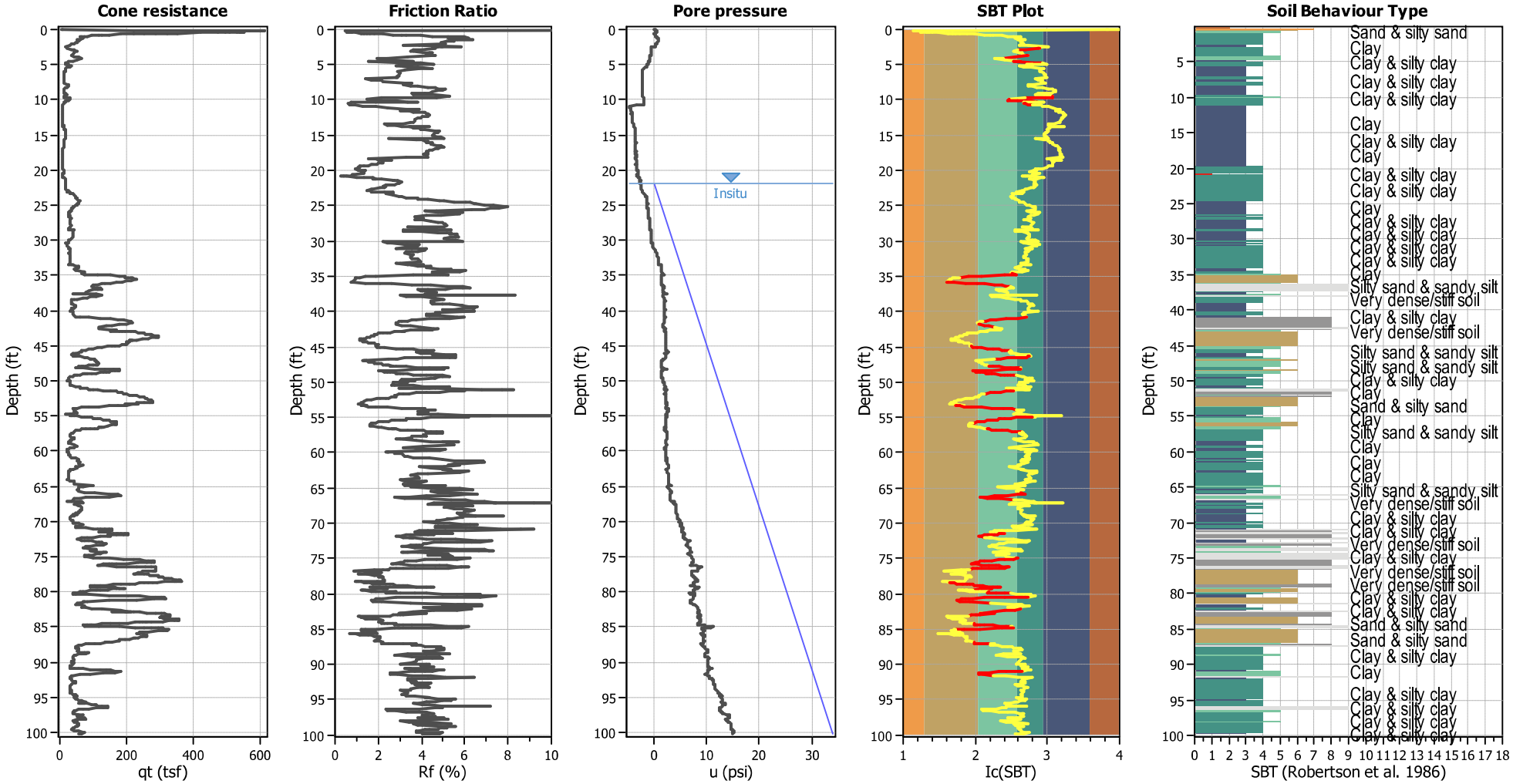



Zone $A_1$: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone $A_2$: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction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

# CPT basic interpretation plots



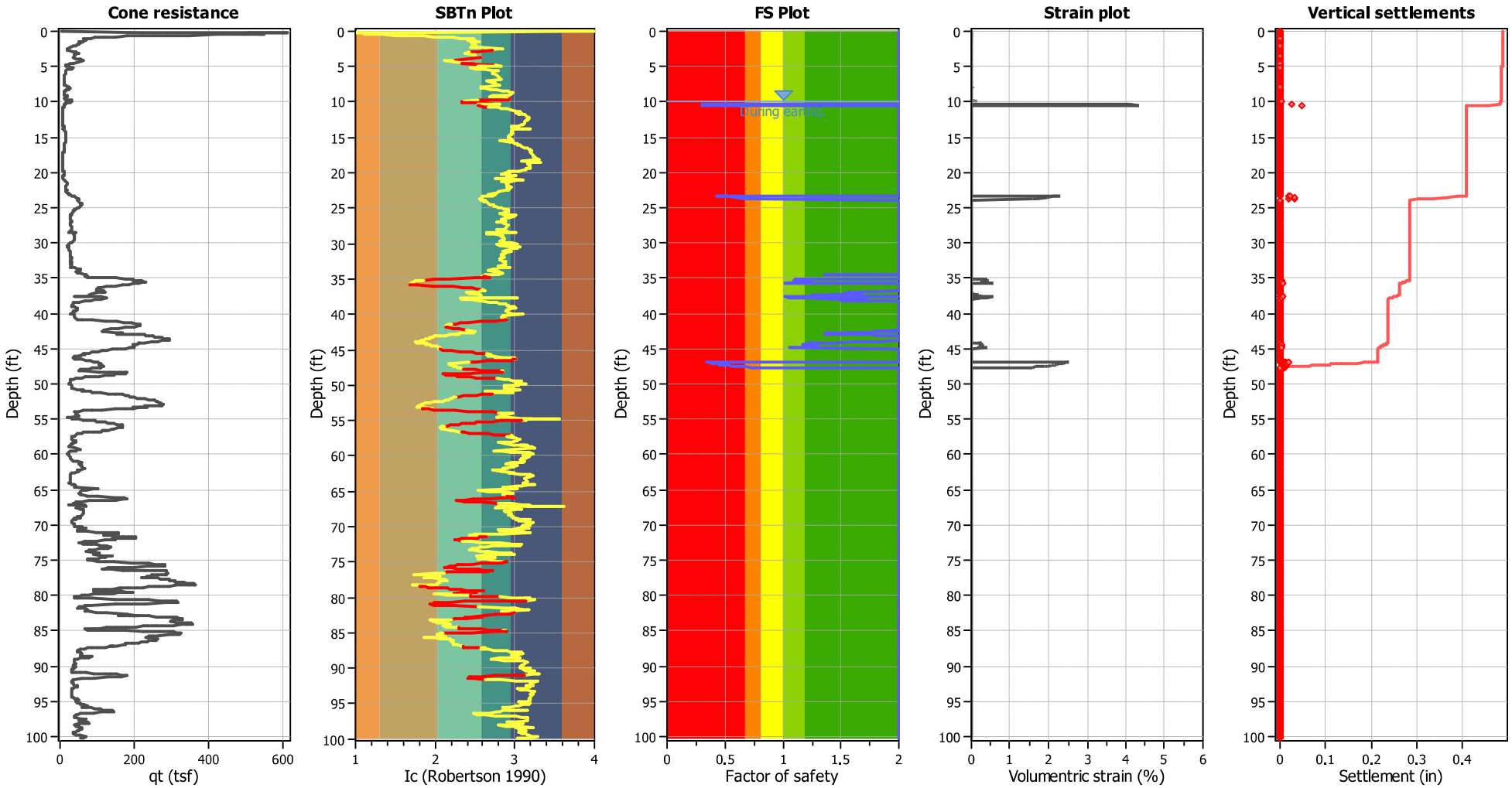

## Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | NCEER (1998) | Depth to water table (erthq.): | 10.00 ft | Fill weight: | N/A |
| Fines correction method: | NCEER (1998) | Average results interval: | 1 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.66 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sands only |
| Peak ground acceleration: | 0.50 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 22.00 ft | Fill height: | N/A | Limit depth: | 50.00 ft |

## SBT legend

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

## Estimation of post-earthquake settlements




**Abbreviations**

| | |
|---|---|
| $q_t$: | Total cone resistance (cone resistance $q_c$ corrected for pore water effects) |
| $I_c$: | Soil Behaviour Type Index |
| FS: | Calculated Factor of Safety against liquefaction |
| Volumentric strain: | Post-liquefaction volumentric strain |

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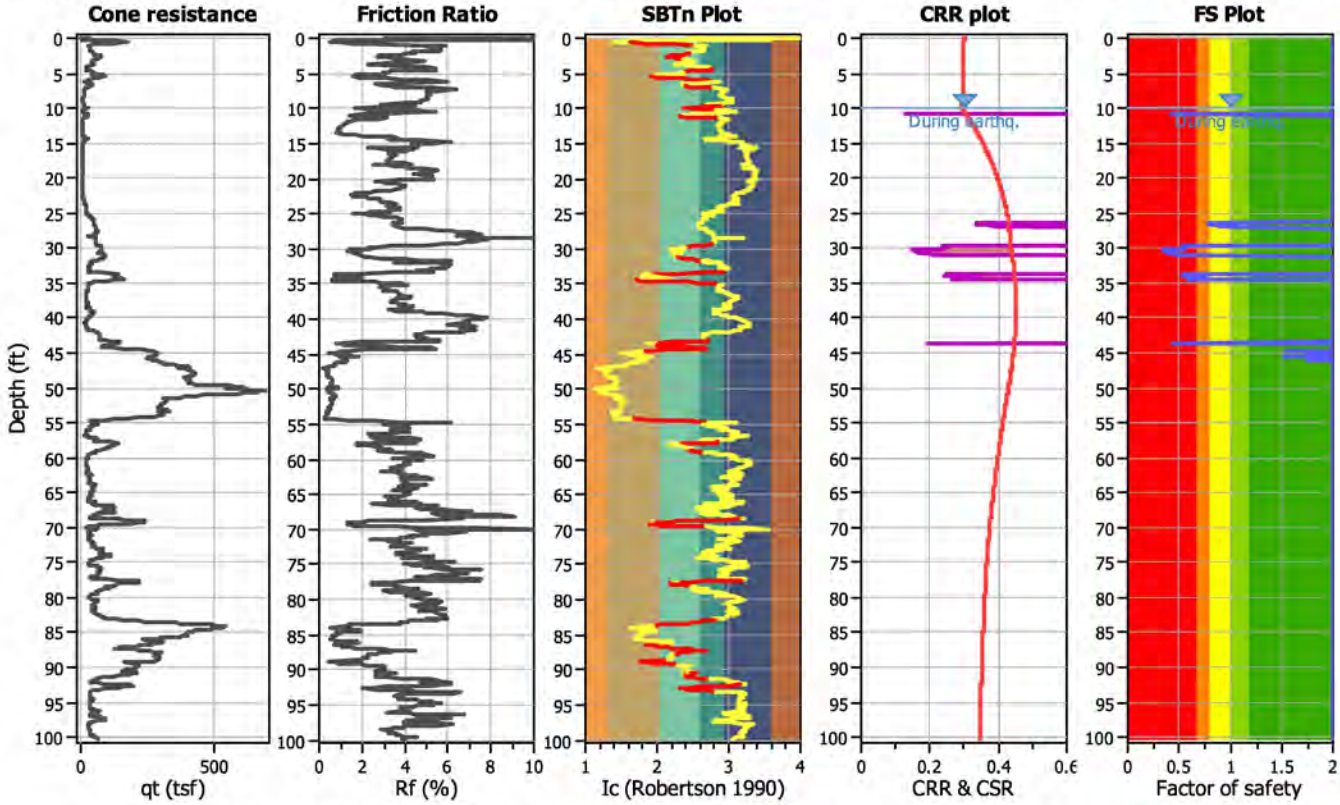
# LIQUEFACTION ANALYSIS REPORT

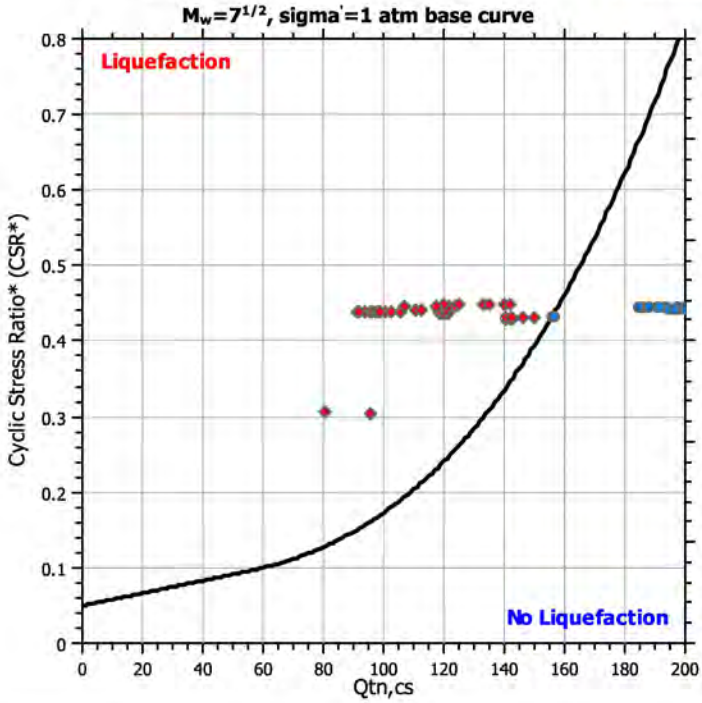
**Project title : NOVA Services / The Hive** **Location : 3335 Susan St, Costa Mesa, CA**

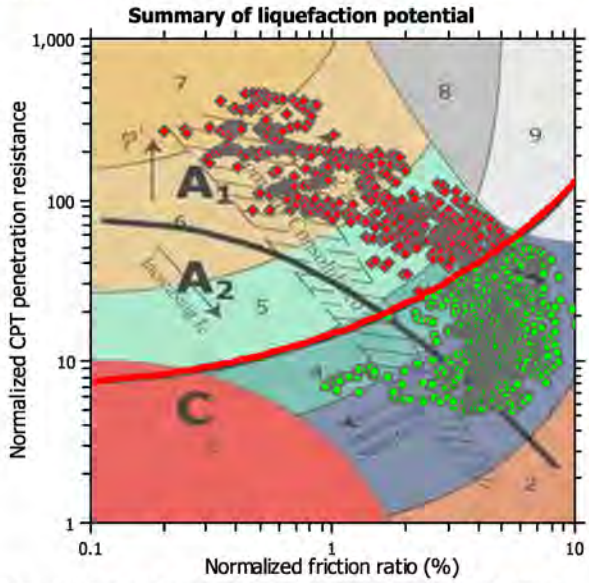
**CPT file : CPT-2**

**Input parameters and analysis data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Analysis method: | NCEER (1998) | G.W.T. (in-situ): | 22.00 ft | Use fill: | No | Clay like behavior applied: | Sands only |
| Fines correction method: | NCEER (1998) | G.W.T. (earthq.): | 10.00 ft | Fill height: | N/A | Limit depth applied: | Yes |
| Points to test: | Based on Ic value | Average results interval: | 1 | Fill weight: | N/A | Limit depth: | 50.00 ft |
| Earthquake magnitude $M_w$: | 6.66 | Ic cut-off value: | 2.60 | Trans. detect. applied: | Yes | MSF method: | Method based |
| Peak ground acceleration: | 0.50 | Unit weight calculation: | Based on SBT | $K_\sigma$ applied: | Yes | | |

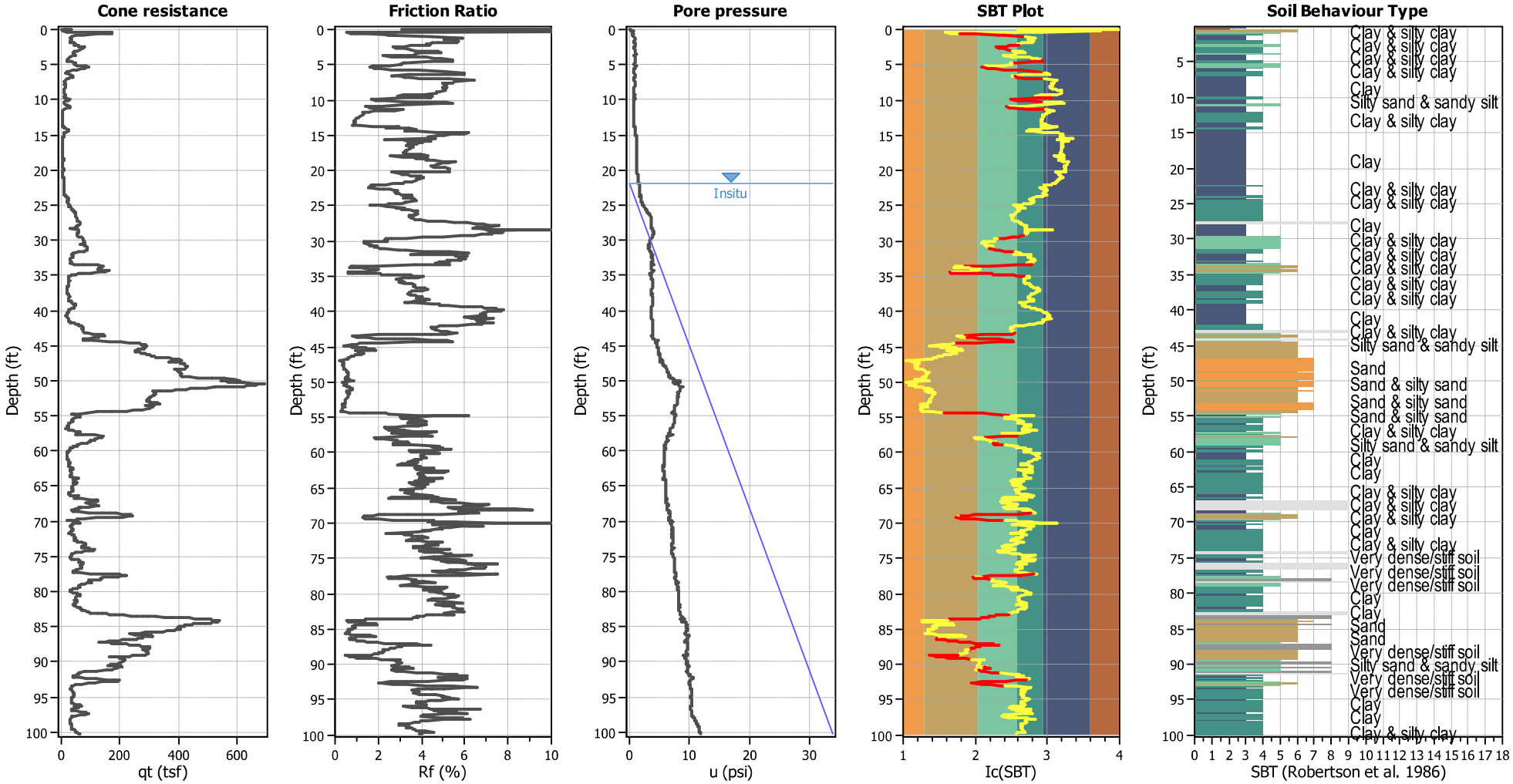



Zone $A_1$: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone $A_2$: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction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

# CPT basic interpretation plots



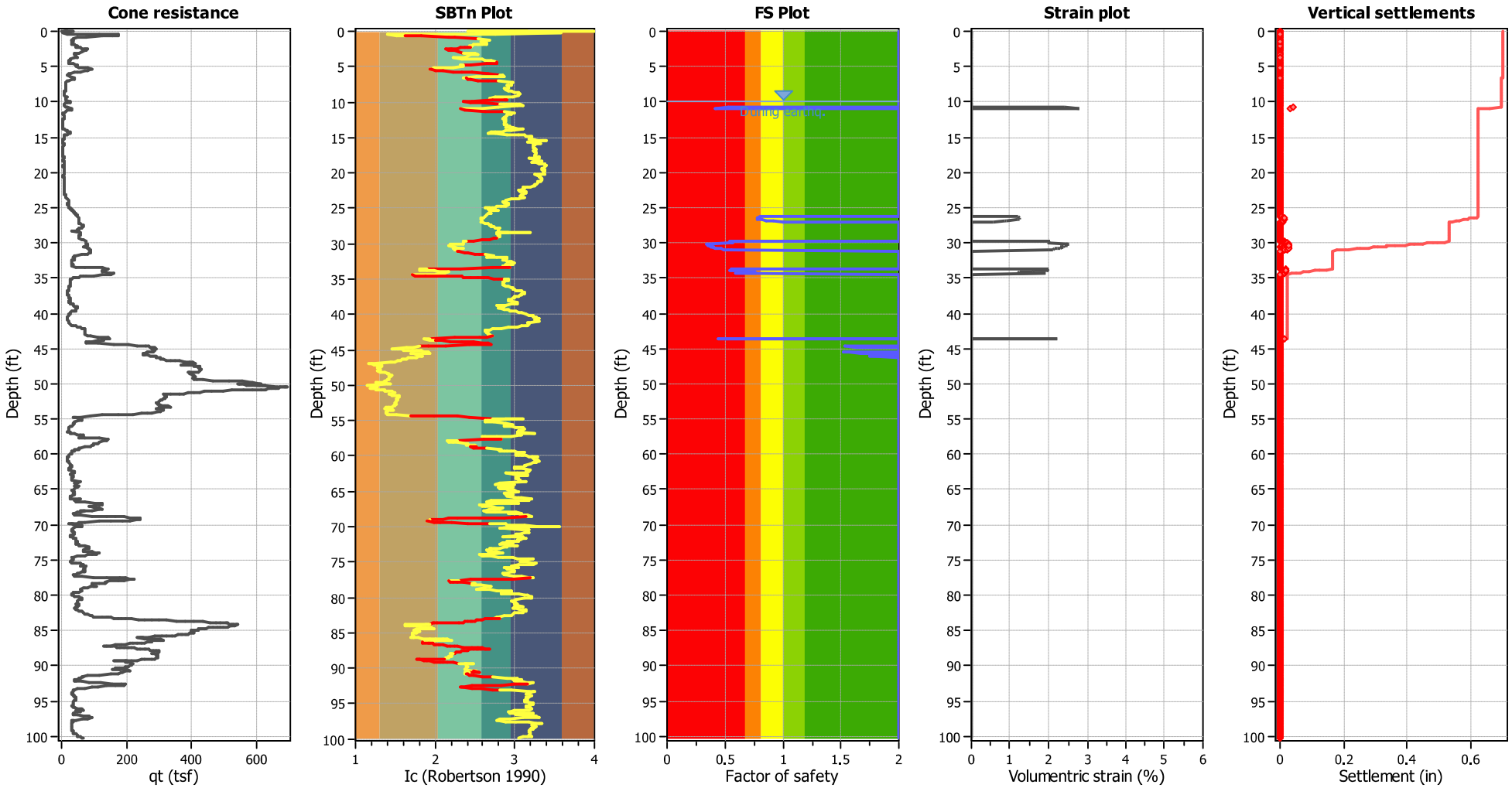

## Input parameters and analysis data

| | | | | | |
|---|---|---|---|---|---|
| Analysis method: | NCEER (1998) | Depth to water table (erthq.): | 10.00 ft | Fill weight: | N/A |
| Fines correction method: | NCEER (1998) | Average results interval: | 1 | Transition detect. applied: | Yes |
| Points to test: | Based on Ic value | Ic cut-off value: | 2.60 | $K_\sigma$ applied: | Yes |
| Earthquake magnitude $M_w$: | 6.66 | Unit weight calculation: | Based on SBT | Clay like behavior applied: | Sands only |
| Peak ground acceleration: | 0.50 | Use fill: | No | Limit depth applied: | Yes |
| Depth to water table (insitu): | 22.00 ft | Fill height: | N/A | Limit depth: | 50.00 ft |

**SBT legend**

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

## Estimation of post-earthquake settlements




**Abbreviations**

| | |
|---|---|
| $q_t$: | Total cone resistance (cone resistance $q_c$ corrected for pore water effects) |
| $I_c$: | Soil Behaviour Type Index |
| FS: | Calculated Factor of Safety against liquefaction |
| Volumentric strain: | Post-liquefaction volumentric strain |

# APPENDIX E
# NMG LOGS AND LAB DATA

# SOIL CLASSIFICATION CHART

| MAJOR DIVISIONS | | | SYMBOLS | TYPICAL DESCRIPTIONS |
|---|---|---|---|---|
| COARSE GRAINED SOILS<br>MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE | GRAVEL AND GRAVELLY SOILS<br>MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE | CLEAN GRAVELS (LITTLE OR NO FINES) | GW | WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES |
| | | | GP | POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES |
| | | GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES) | GM | SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES |
| | | | GC | CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES |
| | SAND AND SANDY SOILS<br>MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE | CLEAN SANDS (LITTLE OR NO FINES) | SW | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | | | SP | POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | | SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES) | SM | SILTY SANDS, SAND - SILT MIXTURES |
| | | | SC | CLAYEY SANDS, SAND - CLAY MIXTURES |
| FINE GRAINED SOILS<br>MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE | SILTS AND CLAYS | LIQUID LIMIT LESS THAN 50 | ML | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY |
| | | | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS |
| | | | OL | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY |
| | SILTS AND CLAYS | LIQUID LIMIT GREATER THAN 50 | MH | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS |
| | | | CH | INORGANIC CLAYS OF HIGH PLASTICITY |
| | | | OH | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS |
| HIGHLY ORGANIC SOILS | | | PT | PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS |

NOTE: Dual symbols are used to indicate gravels or sand with 5-12% fines and soils with fines classifying as CL-ML. Symbols separated by a slash indicate borderline soil classifications.

## Sampler and Symbol Descriptions

- Modified California sample (63.5 mm diameter)
- Standard Penetration Test
- Undisturbed pushed tube sample
- Large bulk sample
- Small bulk sample
- Approximate depth of perched water or groundwater

Note: Number of blows required to advance driven sample 300 mm (or length noted) is recorded, blow count recorded for seating interval (initial 150 mm of drive) is indicated by an asterisk

## Laboratory and Field Test Abbreviations

| | |
|---|---|
| MD | Laboratory compaction test |
| CN | Laboratory consolidation test |
| DS | Laboratory direct shear test |
| AL | Atterberg limits |
| SE | Sand Equivalent |
| GS | Grain Size Analysis (Sieve and/or Hydro.) |
| RV | R-Value |
| CC | Chemical Testing Incl. Soluble Sulfate |
| EI | Expansion Index |

## GENERAL NOTES

1. Station location is indicated with offset to right (R) or left (L) of centerline (CL).
2. Soil classifications are based on the Unified Soil System and include color, moisture, and relative density or consistency. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate. Bedrock descriptions are based on visual classification and include rock type, moisture, color, grain size, strength, and weathering.
3. Descriptions on these boring logs apply only at the specific boring locations and at the time the borings were made. They are not warranted to be representative of subsurface conditions at other locations or times.

# KEY TO LOG OF BORING

**Segerstrom/Emulex**
**Costa Mesa**
**PROJECT NO. 02021-01**

NMG Geotechnical, Inc.

| | | | |
|---|---|---|---|
| Date(s) Drilled | 5/3/02 | Logged By | DAO |
| Drilling Company | Gregg Drilling | Drill Bit Size/Type | 8 inch |
| Drill Rig Type | Mobil B-53 | Hammer Data | 140 lbs/ 30 inch drop |
| Sampling Method(s) | Modified California and Bulk | | |
| Approximate Groundwater Depth: | 15.5 ft | | |
| Comments | See Plate 1 for Boring Location | | |

**H- 1**

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | 51.5 |
| Approximate Ground Surface Elevation (ft) | 30.0 |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 0 | | | | | ML/CL | Alluvium (Qal)<br>@ 0' Light gray brown clayey SILT to clayey SILT with fine sand, dry, tilled for row crops, sparse weeds, fine SAND layers. | | | B-1 @ 0-5' |
| | 5 | | B-1 | | | | | | | |
| | | | B-2<br>D-1 | 5 | | | @ 7.5' Medium gray brown clayey SILT to silty CLAY with fine sand, wet, soft, porous, fine sand layers. | 36.1 | 86.6 | B-2 @ 7.5-8.5' |
| 20 | 10 | | D-2 | 2 | | CH | @ 10' Medium reddish brown to gray brown silty CLAY, wet, very soft, porous, root holes and nodules, pinhole porosity, very plastic. | 33.8 | 87.4 | CN |
| | 15 | | D-3 | 8 | | | ▼ @ 15' Medium reddish brown to gray brown silty CLAY, wet, very soft, porous, root holes and nodules, pinhole porosity, very plastic. | 30.0 | 91.5 | |
| | | | D-4 | 2 | | | @ 17.5' Medium reddish brown to gray brown silty CLAY, wet, very soft, porous, less root holes and nodules, pinhole porosity, very plastic. | 38.4 | 83.9 | CN |
| 10 | 20 | | D-5 | 11 | | | @ 20' Medium dark gray silty CLAY, wet, medium stiff, pinhole porosity, very plastic. | 26.5 | 96.4 | |
| | | | D-6 | 13 | | CL | @ 22' Medium gray sandy CLAY, wet, stiff, less plastic. | 21.5 | 107.5 | |
| | 25 | | D-7 | 42 | | SC/CL | @ 25' Medium red brown fine to medium sandy CLAY/clayey fine to medium SAND, wet, very stiff/medium dense. | 14.0 | 123.1 | |
| 0 | 30 | | | | | | | | | |

**LOG OF BORING**

Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG

Report HOLLOW STEM, Project P:\02021\02021-01\Geotech\02021-01.rpj, Data Template: NMGHOV98.GDT, Printed 6/2/02

Segerstrom/Emulex Costa Mesa

**H-1**
Sheet 2 of 2

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 30 | | D-8 | 18 | | ML | @ 30' Medium reddish brown fine sandy SILT with some clay, moist to wet, stiff, some lenses of silty fine SAND. | 23.2 | 104.2 | |
| | 35 | | D-9 | 24 | | CH | @ 35' Medium gray to reddish brown silty CLAY with some fine sand, wet, very stiff, plastic. | 30.0 | 93.3 | |
| -10 | 40 | | D-10 | 13 | | ML | @ 40' Medium gray brown and yellow brown fine sandy SILT with clay and silty fine SAND, wet, stiff to loose, some FeO stained zones. | 27.9 | 99.1 | |
| | 45 | | D-11 | 5 | | SM | @ 45' Medium gray yellow brown fine sandy SILT, wet, medium stiff. | 28.5 | 96.0 | GS |
| -20 | 50 | | D-12 | 15 | | SM/ML | @ 50' Tail: Medium gray brown silty fine to coarse SAND with gravel, wet, medium dense. Tip: Medium gray brown fine sandy SILT with clay, wet, stiff. | 16.1 | 104.4 | |
| | 55 | | | | | | Total Depth = 51.5 feet<br>Groundwater Encountered at 27 feet, rose to 17 feet during drilling, rose to 15.5 feet at end of day<br>Backfilled with Cuttings | | | |
| -30 | 60 | | | | | | | | | |
| | 65 | | | | | | | | | |

## LOG OF BORING

Segerstrom/Emulex
Costa Mesa

PROJECT NO. 02021-01

NMG

Template: HOLLOW STEM, Prj ID: 02021-01.GPJ, Printed: 8/2/02

Report HOLLOW STEM, Project P:\02021\02021-01.GPJ, Data Template, HAGHOVER.GDT, Printed 8/2/02

| | | | |
|---|---|---|---|
| Date(s) Drilled | 5/3/02 | Logged By | DAO |
| Drilling Company | Gregg Drilling | Drill Bit Size/Type | 8 Inch |
| Drill Rig Type | Mobil B-53 | Hammer Data | 140 lbs/ 30 inch drop |
| Sampling Method(s) | Modified California and Bulk | | |
| Approximate Groundwater Depth: | 20 ft | | |
| Comments: | See Plate 1 for Boring Location | | |

**H-2**

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | 51.5 |
| Approximate Ground Surface Elevation (ft) | 30.0 |

| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 0 | | B-1 | | | ML/CL | Alluvium (Qal) @ 0' Light gray brown clayey SILT to silty CLAY with fine sand, dry, tilled for row crops, sparse weeds, fine SAND layers. | | | B-1 @ 0-5' - MD, DS (Remolded) |
| | 5 | | D-1 | 8 | | SM/ML | @ 5' Medium gray brown silty fine SAND to clayey SILT, moist to wet, loose to medium stiff, highly plastic silt. | 12.6 | 101.6 | CN |
| | | | D-2 | 16 | | SP/ML | @ 7.5' Medium gray brown fine SAND (micaceous) to fine sandy SILT with clay, wet, medium dense to stiff. | 26.5 | 97 | |
| 20 | 10 | | D-3, B-2 | | | CH | @ 10' Medium reddish brown silty CLAY, wet, medium stiff, some porosity, highly plastic, some fine SAND and SILT layers. | 30.3 | 91.5 | B-2 @ 10-12' - EI, CC, AL, GS |
| | 15 | | D-4 | 7 | | | @ 15' Medium reddish brown silty CLAY, wet, medium stiff, little porosity, highly plastic. | 40.6 | 81.6 | CN |
| 10 | 20 | | D-5 | 13 | | CL | @ 20' Dark gray to black fine to coarse sandy CLAY, wet, stiff, moderate plasticity. | 18.0 | 111.7 | |
| | | | D-6 | 20 | | | @ 22' Medium gray to dark brownish red fine to coarse sandy CLAY, wet, stiff, moderate plasticity. | 16.5 | 116.6 | |
| | 25 | | D-7 | 14 | | SM/ML | @ 25' Medium gray to red brown silty fine to medium SAND/sandy SILT, wet, loose, slightly micaceous, trace coarse sand. | 17.6 | 112.0 | GS |
| 0 | 30 | | | | | | | | | |

**LOG OF BORING**

Segerstrom/Emulex

Costa Mesa

PROJECT NO. 02021-01

NMG

Report HOLLOW STEM, Project: P:\2002\02021 ON\CAT\VA02021-01.GPJ, Data Template HAGNOVER.GDT, Printed 6/2/02

Segerstrom/Emulex Costa Mesa

H- 2
Sheet 2 of 2

| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 30 | | D-8 | 25 | | ML | @ 30' Light yellow brown fine to coarse sandy SILT, wet, very stiff, coarse sand grades in and out. | 20.0 | 110.4 | GS |
| | 35 | | D-9 | 79 | | SW/SM | @ 35' Light yellow brown slightly silty fine to coarse SAND, wet, very dense. | 11.5 | 129.7 | |
| -10 | 40 | | D-10 | 74/11" | | | @ 40' Light yellow brown slightly silty fine to coarse SAND, wet, very dense, some gravel. | 11.9 | 127.5 | |
| | 45 | | D-11 | 28 | | | @ 45' Light yellow brown slightly silty fine to coarse SAND, wet, medium dense, some gravel. | 15.1 | 114.6 | |
| -20 | 50 | | D-12 | 19 | | CL/ML | @ 50' Medium gray brown clayey SILT with fine sand to silty clay, wet, stiff. | 38.0 | 123.4 | |
| | 55 | | | | | | Total Depth = 51.5 feet<br>Groundwater Encountered at 25 feet during drilling, stabilized at 20 feet after 10 minutes<br>Backfilled with Cuttings | | | |
| -30 | 60 | | | | | | | | | |
| | 65 | | | | | | | | | |

# LOG OF BORING

Segerstrom/Emulex
Costa Mesa

PROJECT NO. 02021-01

NMG



Report: HOLLOW STEM, Project: P:\2002\02021-01\CAN\WO2021-01.GPJ, Data Template: NMGHOVB.GDT, Printed: 8/2/02

| | | | |
|---|---|---|---|
| Date(s) Drilled | 5/3/02 | Logged By | DAO |
| Drilling Company | Gregg Drilling | Drill Bit Size/Type | 8 inch |
| Drill Rig Type | Mobil B-53 | Hammer Data | 140 lbs/ 30 inch drop |
| Sampling Method(s) | Modified California and Bulk | | |
| Approximate Groundwater Depth: | 19 ft | | |
| Comments | See Plate 1 for Boring Location | | |

**H- 3**

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | 51.5 |
| Approximate Ground Surface Elevation (ft) | 30.0 |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 0 | B | | | | ML/CL | Alluvium (Qal) @ 0' Light gray brown clayey SILT to silty CLAY with fine sand, dry, tilled for row crops, sparse weeds, fine SAND layers. | | | B-1 @ 0-5' - EI, CC, AL, GS |
| | 5 | | D-1 | 16 | | SM/ML | @ 5' Medium gray brown fine sandy SILT/silty fine SAND, moist to wet, stiff/medium dense, micaceous. | 21.7 | 103.1 | DS |
| | | | D-2 | 7 | | SM/CH | @ 7.5' Tail: Medium gray brown silty CLAY, wet, very soft to soft, "salt" veins, FeO staining, very plastic. Tip: Medium gray brown silty fine SAND, wet, loose. | 37.2 | 87.1 | CN |
| 20 | 10 | | D-3 B-2 | 6 | | CH | @ 10' Medium dark gray brown silty CLAY, wet, soft to medium stiff, some porosity, micaceous, very plastic. | 40.0 | 85.2 | B-2 @ 10-12' |
| | 15 | | D-4 | 7 | | | @ 15' Dark gray to black silty CLAY, wet, medium stiff, very plastic. | 42.7 | 79.3 | |
| 10 | 20 | | D-5 | 16 | | CH/CL | @ 20' Dark gray to black silty CLAY, wet, medium stiff, very plastic, sparse rootlets and pores, grades to fine to coarse sandy CLAY, less plastic. | 22.3 | 108.3 | |
| | | | D-6 | 44 | | CL | @ 22' Medium red brown with some medium gray fine to coarse sandy CLAY, wet, very stiff. | 12.8 | 124.0 | |
| | 25 | | D-7 | 31 | | SM | @ 25' Medium reddish brown silty fine to medium SAND with some clay, wet, medium dense, slightly micaceous. | 15.3 | 118.5 | |
| 0 | 30 | | | | | | | | | |

# LOG OF BORING

Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG

Report: HOLLOW STEM, Project: P:\02021\02021-01\GPJ\02021-01.GPJ, Data Template: NMG\NOV98.GDT, Printed: 8/2/02

Segerstrom/Emulex Costa Mesa

H- 3
Sheet 7 of 2

| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 30 | | D-8 | 54 | | SM/SW | @ 30' Tail: Medium reddish brown silty fine to medium SAND, wet, dense. Tip: Medium reddish brown slightly silty fine to coarse SAND, wet, dense. | 24.0 | 105.0 | |
| | 35 | | D-9 | 36 | | SW | @ 35' Light yellow to gray brown slightly silty fine to coarse SAND, wet, medium dense. | 17.3 | 115.2 | |
| -10 | 40 | | D-10 | 40 | | SM/SW | @ 40' Tail: Light yellow to gray brown slightly silty fine to coarse SAND, wet, medium dense. Tip: Light yellow to gray brown silty fine to medium SAND, wet, medium dense, slightly micaceous. | 14.9 | 113.9 | |
| | 45 | | D-11 | 52 | | SM | @ 45' Light gray brown silty fine SAND, wet, dense. | 25.4 | 104.9 | |
| -20 | 50 | | D-12 | 28 | | | @ 50' Light gray brown silty fine SAND, wet, medium dense. | 25.0 | 102.5 | |
| | 55 | | | | | | Total Depth = 51.5 feet<br>Groundwater Encountered at 25 feet during drilling, stabilized at 19 feet after 10 minutes<br>Backfilled with Cuttings | | | |
| -30 | 60 | | | | | | | | | |
| | 65 | | | | | | | | | |

# LOG OF BORING

Segerstrom/Emulex
Costa Mesa

PROJECT NO. 02021-01

NMG

Report HOLLOW STEM, Project P:\2002\02021-01\GINTW\02021 01.GPJ; Data Template HMCHOVRS.GDT, Printed 8/2/02

Template: HOLLOW STEM, Prj ID: 02021-01.GPJ, Printed 8/2/02

NMG Geotechnical, Inc.

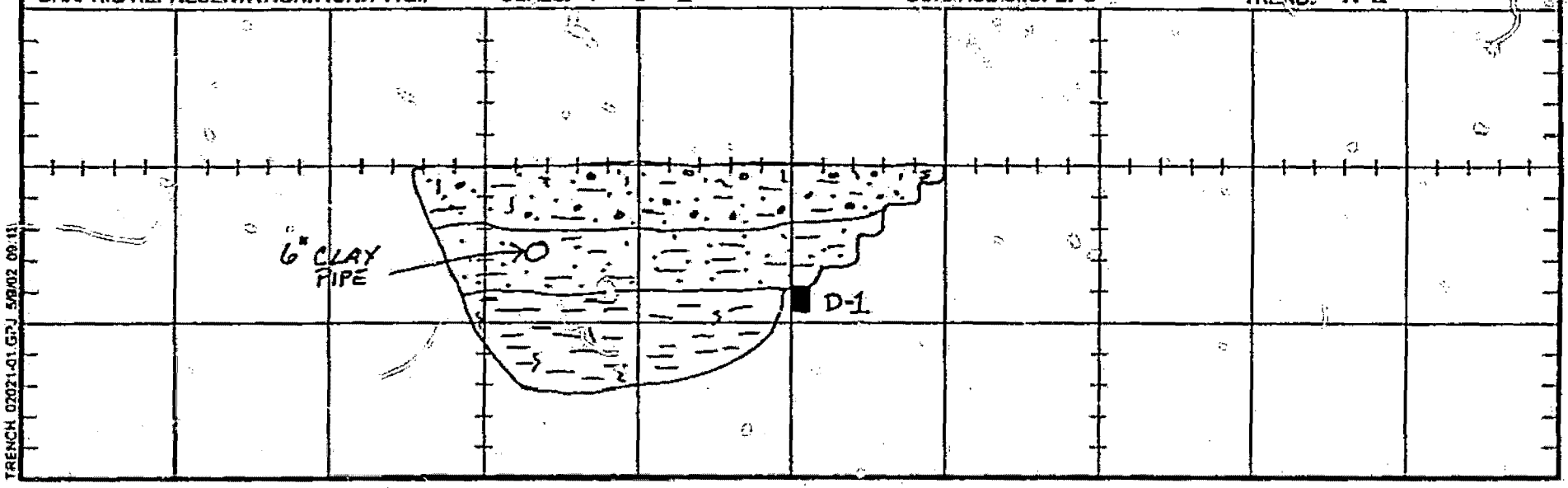
Project Name: Segerstrom/Emulex
Project Number: 02021-01
Equipment: Case 580L Backhoe

Logged By: KV
Elevation: 30 ±
Location: North End along sunflower

TRENCH NO.: T-1

| GEOLOGIC ATTITUDES | DATE: 4/25/02 DESCRIPTION: | GEOLOGIC UNIT | ENGINEERING PROPERTIES U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | Alluvium (Qal)<br>@ 0' Plowed Zone: Light brownish gray silty fine to medium SAND, dry, loose, micaceous, scattered subrounded pebbles, 1"-2" diameter. | | SM | | | |
| | @ 2' Light brownish gray slightly silty fine SAND, dry, loose to medium dense, friable, micaceous, no pores. | | SP/SM | B-1 @ 2'-3' | | |
| | @ 4' Dark brown silty CLAY, very moist to wet, medium stiff, abundant pinhole porosity, trace root hairs, micaceous, plastic, FeO staining. | | CL | D-1 @ 4' | 6.1 | 102.6 |
| | Notes:<br>Total Depth 7 ft.<br>Backfilled with Cuttings | | | | | |

GRAPHIC REPRESENTATION: North Wall SCALE: 1" = 5' ± SURFACE SLOPE: 0° TREND: W-E




LOG OF TRENCH NO: T-1

TRENCH 02021-01.GPJ 5/9/02 09:11

NMG Geotechn .C.

Project Name: Segerstrom/Emulex
Project Number: 02021-01
Equipment: Case 580L Backhoe

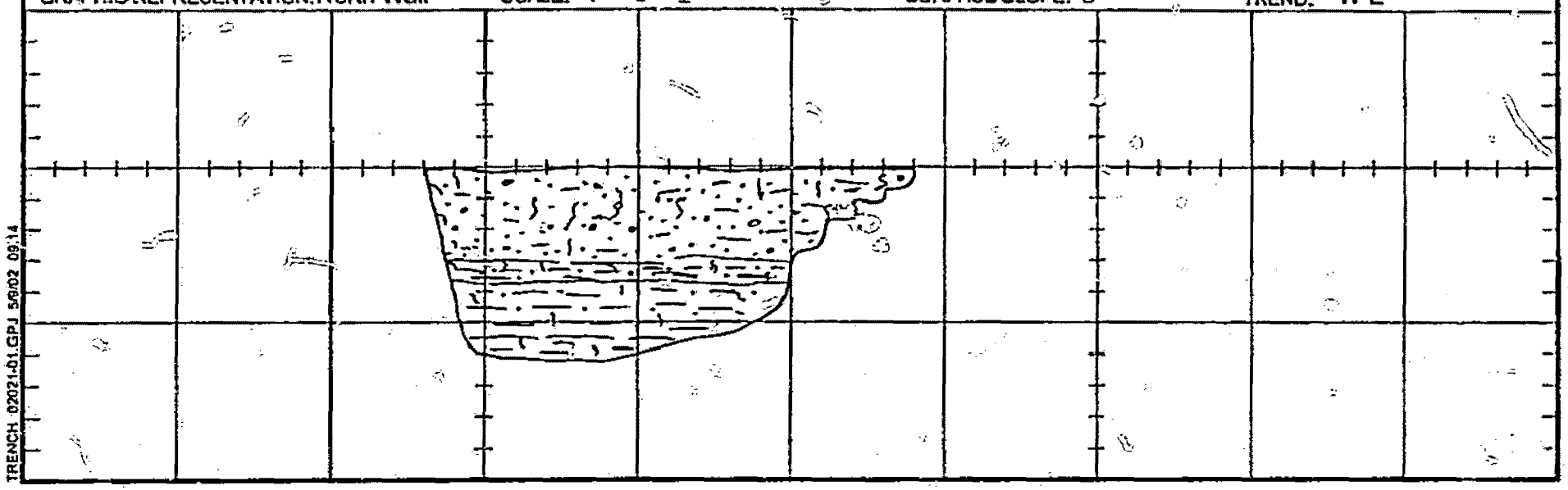
Logged By: KV
Elevation: 30 ±
Location: Northeast Portion along Susan st.

TRENCH NO.: T-2

| GEOLOGIC ATTITUDES | DATE: 4/25/02 DESCRIPTION: | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | Alluvium (Qal)<br>@ 0' Plowed Zone: Grayish brown fine sandy SILT, dry to damp, loose. | | ML | | | |
| | @ 1.5' Brown silty fine SAND/fine sandy SILT, damp to moist, slight to moderate porosity, root hairs, scattered subrounded pebbles (1"-2" diameter), micaceous. | | SM/ML | | | |
| | @ 3' Dark brown and dark reddish brown SILT with trace clay, moist to very moist, medium stiff, micaceous, root hairs, trace pinhole porosity.<br>@ 3.5' Mottled gray, brown and reddish brown SILT, moist to very moist, medium stiff, very micaceous, FeO staining, little to no porosity, trace root hairs, locally clayey. | | ML | | | |
| | @ 5.5' Dark brown and reddish brown clayey SILT, very moist, medium stiff, very micaceous, trace root hairs, FeO staining. | | | | | |

Notes:
Total Depth 6 ft.
Backfilled with Cuttings

GRAPHIC REPRESENTATION: North Wall SCALE: 1" = 5' ± SURFACE SLOPE: 0° TREND: W-E



LOG OF TRENCH NO: T-2

TRENCH 02021-01.GPJ 5/9/02 09:14

NMG Geotechnical, Inc.

Project Name: Segerstrom/Emulex
Project Number: 02021-01
Equipment: Case 580L Backhoe

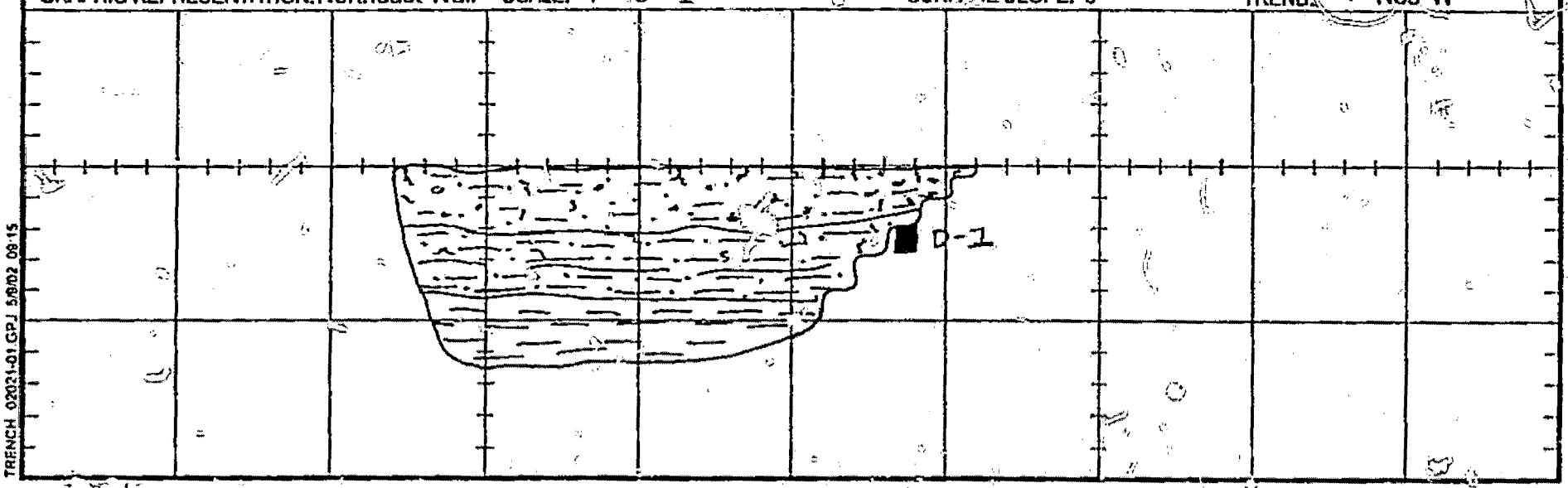
Logged By: KV
Elevation: 30 ±
Location: Central Portion

TRENCH NO.: T-3

| GEOLOGIC ATTITUDES | DATE: 4/25/02 DESCRIPTION: | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | Alluvium (Qal)<br>@ 0' Plowed Zone: Light grayish brown fine sandy SILT, dry, soft, scattered subrounded pebbles (1"-2" diameter). | | ML | | | |
| | @ 2' Brown to dark brown fine sandy SILT, damp to moist, soft to medium stiff, micaceous, moderately porous (to 1/16" diameter), root hairs, trace clay. | | ML | | | |
| | @ 3' Light gray and brown very fine sandy SILT, moist to very moist, soft to medium stiff, very micaceous, little to no porosity. | | | D-1 @ 3' | 26.3 | 87.6 |
| | @ 4' Mottled dark grayish brown, brown, and reddish brown slightly clayey SILT, very moist, medium stiff, very micaceous, trace pinhole porosity, FeO staining. | | | | | |

Notes:
Total Depth 6.5 ft.
Backfilled with Cuttings

GRAPHIC REPRESENTATION: Northeast Wall SCALE: 1" = 5' ± SURFACE SLOPE: 0° TREND: <– N85°W




LOG OF TRENCH NO: T-3

TRENCH 02021-01.GPJ 5/8/02 08:15

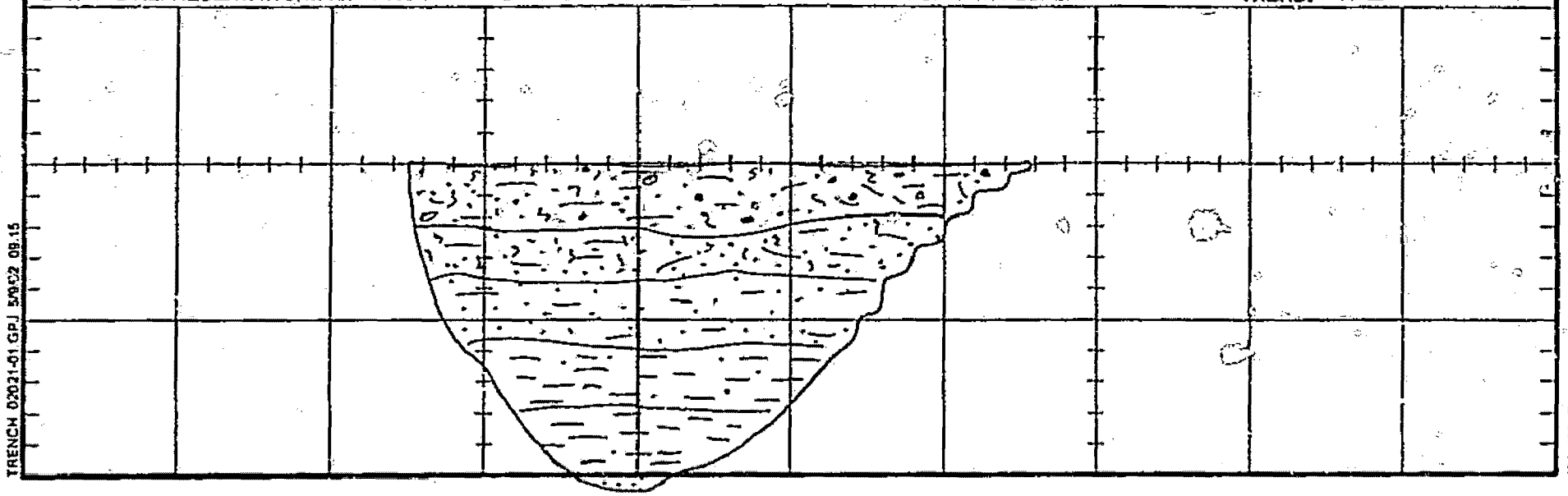
NMG Geotechnical, Inc.

| | | | |
|---|---|---|---|
| Project Name: Segerstrom/Emulex | Logged By: KV | TRENCH NO. | ENGINEERING PROPERTIES |
| Project Number: 02021-01 | Elevation: 30 ± | T-4 | |
| NMG Equipment: Case 580L Backhoe | Location: Central Portion | | |

| GEOLOGIC ATTITUDES | DATE: 4/25/02 DESCRIPTION: | GEOLOGIC UNIT | U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | Alluvium (Qal)<br>@ 0' Plowed Zone: Light grayish brown silty fine to medium SAND/fine to medium sandy SILT, loose/soft, scattered weeds, scattered subrounded pebbles (1"-2" diameter). | | SM/ML | | | |
| | @ 2' Brown silty fine to medium SAND, moist, medium dense, micaceous, pinhole porosity, root hairs. | | SM | | | |
| | @ 3.5' Light gray and light brown slightly silty very fine to fine SAND, damp, loose to medium dense, very micaceous, no porosity, FeO staining. | | SM/SP | | | |
| | @ 5.5' Grayish brown to dark grayish brown silty CLAY/clayey SILT, very moist, medium stiff, micaceous, porous, slightly plastic, FeO and MnO staining. | | CL/ML | B-1 @ 6'-7' | | |
| | @ 8' Grades moist to wet, caliche nodules. | | | | | |
| | @ 9.5' Dark grayish brown silty CLAY, very moist to wet, medium stiff, micaceous, slight to moderate plasticity, little to no porosity, FeO and MnO staining. | | CL | | | |
| | @ 10' Grayish brown silty fine to medium SAND, wet, medium dense, micaceous, slightly friable. | | SM | | | |

Notes:
Total Depth 10.5 ft.
Surface Logged from 6 to 10.5 ft.
Backfilled with Cuttings

GRAPHIC REPRESENTATION: North Wall SCALE: 1" = 5' ± SURFACE SLOPE: 0° TREND: W-E



LOG OF TRENCH NO: T-4

TRENCH 02021-01.GPJ 5/9/02 09:15

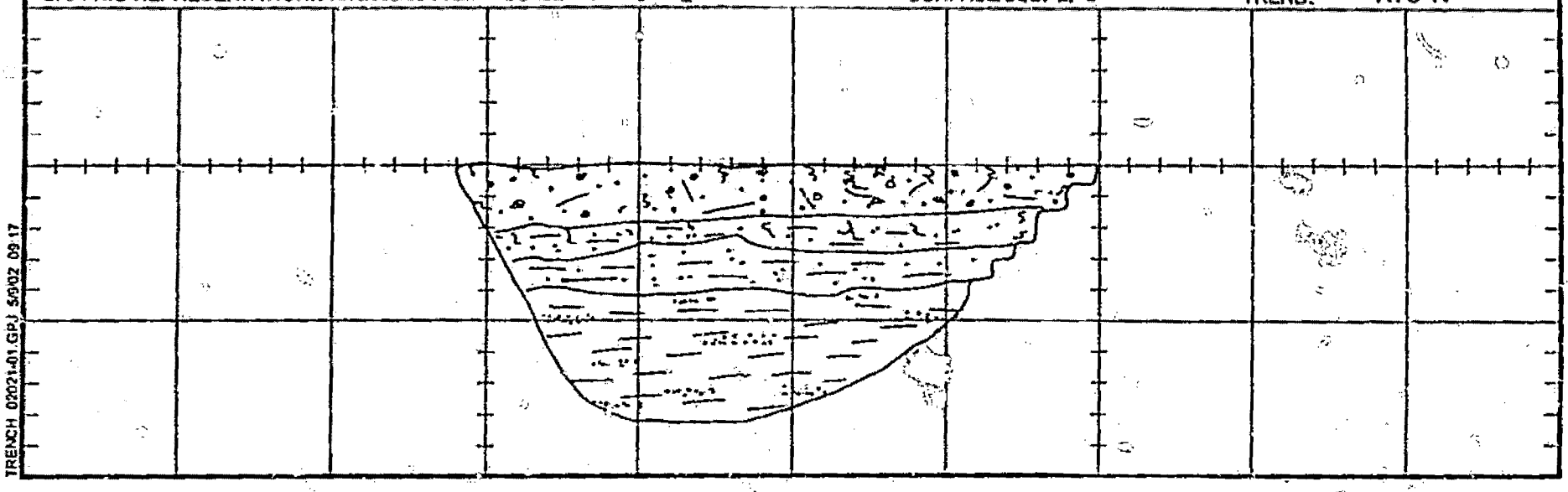
Project Name: Segerstrom/Emulex
Project Number: 02021-01
NMG Equipment: Case 580L Backhoe

Logged By: KV
Elevation: 30 ±
Location: Southern End along South Coast Dr.

TRENCH NO.: T-5

| GEOLOGIC ATTITUDES | DATE: 4/25/02 DESCRIPTION: | GEOLOGIC UNIT | ENGINEERING PROPERTIES U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | Alluvium (Qal)<br>@ 0' Plowed Zone: Light grayish brown silty fine to coarse SAND, dry, loose, micaceous, scattered subangular pebbles (1"-3" diameter). | | SM | | | |
| | @ 2' Dark brown to black clayey fine to medium SAND, moist, medium dense, micaceous, slight to moderate porosity, root hairs. | | SC | | | |
| | @ 3' Light gray silty very fine SAND/very fine sandy SILT, damp to moist, medium dense/medium stiff, micaceous, no visible porosity. | | SM/ML | | | |
| | @ 4' Mottled dark brown, grayish brown, and reddish brown silty CLAY, moist, medium stiff, micaceous, abundant caliche stringers, FeO staining, abundant pinhole porosity, slightly plastic, locally sandy. | | CL | | | |
| | Notes:<br>Total Depth 6 ft.<br>Backfilled with Cuttings | | | | | |

GRAPHIC REPRESENTATION: Northeast Wall SCALE: 1" = 5' ± SURFACE SLOPE: 0° TREND: <– N75°W



NMG Geotechnical, Inc.

LOG OF TRENCH NO: T-5

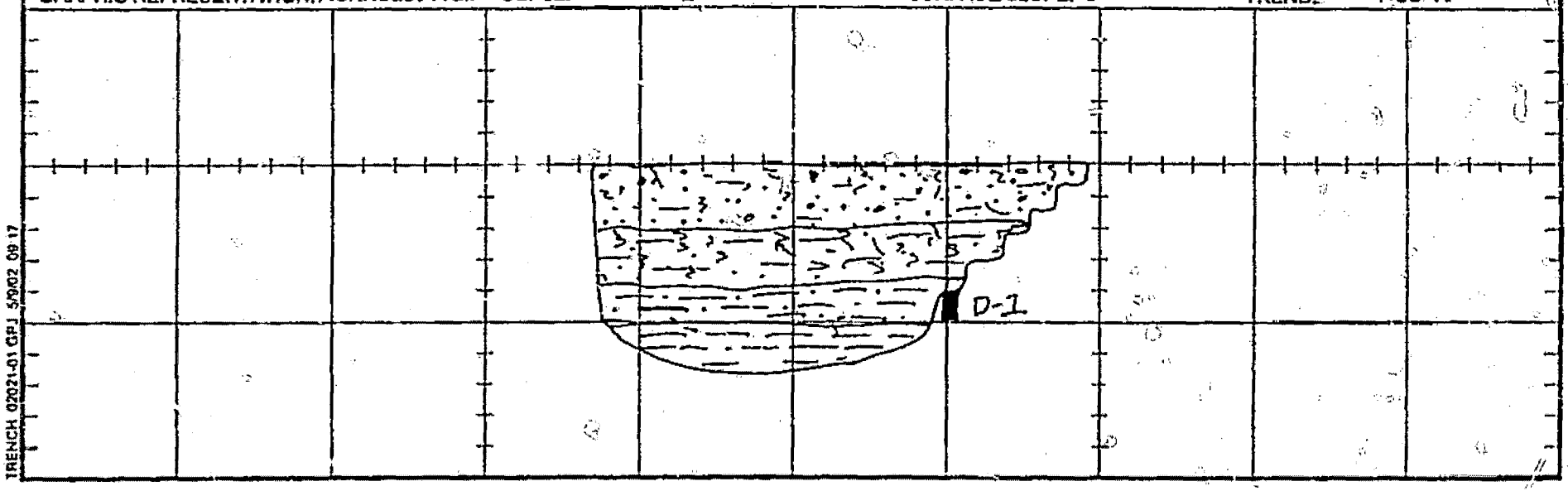
TRENCH 02021-01.GPJ 5/9/02 09:17

NMG Geotechnical, Inc.

| | | | |
|---|---|---|---|
| Project Name: Segerstrom/Emulex | Logged By: KV | TRENCH NO.: T-6 | ENGINEERING PROPERTIES |
| Project Number: 02021-01 | Elevation: 30 ± | | |
| Equipment: Case 580L Backhoe | Location: Southeastern Portion along Susan St. | | |

| GEOLOGIC ATTITUDES | DATE: 4/25/02 DESCRIPTION: | GEOLOGIC UNIT | U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | Alluvium (Qal)<br>@ 0' Plowed Zone: Light grayish brown silty fine to coarse SAND, dry, loose, scattered weeds, scattered subangular to subrounded pebbles (1"-3" diameter). | | SM | | | |
| | @ 2' Dark brown clayey fine to medium SAND/fine to medium sandy CLAY, moist, medium dense/medium stiff, micaceous, abundant root hairs, abundant pinhole porosity. | | SC/CL | | | |
| | @ 3.5' Gray, brown, and brownish gray clayey SILT, moist, medium stiff, very micaceous, slightly plastic, no porosity. | | ML | D-1 @ 4' | 19.0 | 91.9 |
| | @ 5' Brown to dark reddish brown silty CLAY, moist, medium stiff, micaceous, FeO staining, plastic, trace pinhole porosity. | | CL | | | |
| | Notes:<br>Total Depth 6.5 ft.<br>Backfilled with Cuttings | | | | | |

GRAPHIC REPRESENTATION: Northeast Wall SCALE: 1" = 5' ± SURFACE SLOPE: 0° TREND: <– N68°W




LOG OF TRENCH NO: T-6

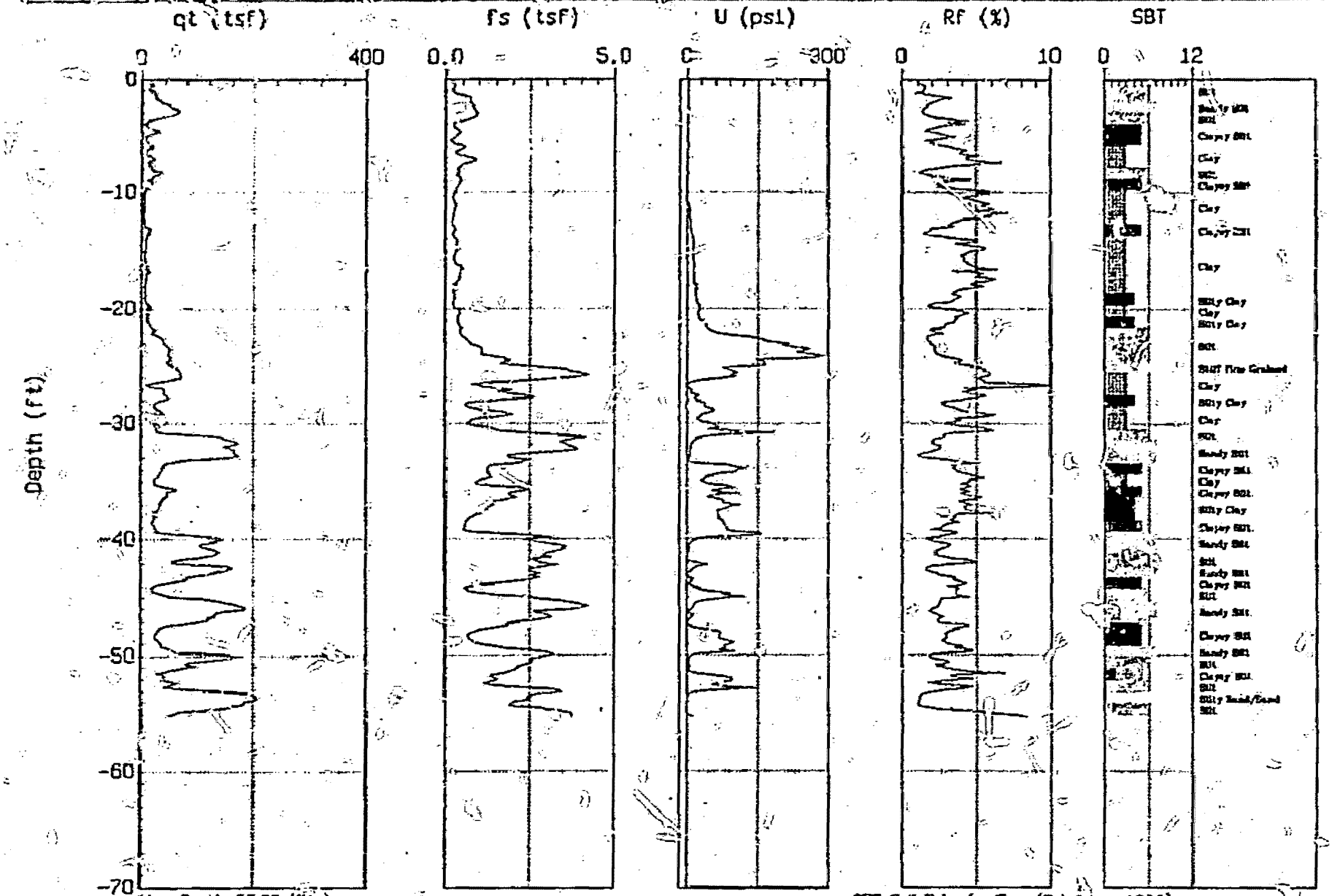
TRENCH 02021-01.GPJ 5/9/02 09:17

GREGG

# NMG GEOTECHNICAL

Site : SUNFLOWER & SUSAN
Location : CPT-1

Engineer : K. VOLLMER
Date : 04:26:02 12:30




Max. Depth: 55.28 (ft)
Depth Inc: 0.16

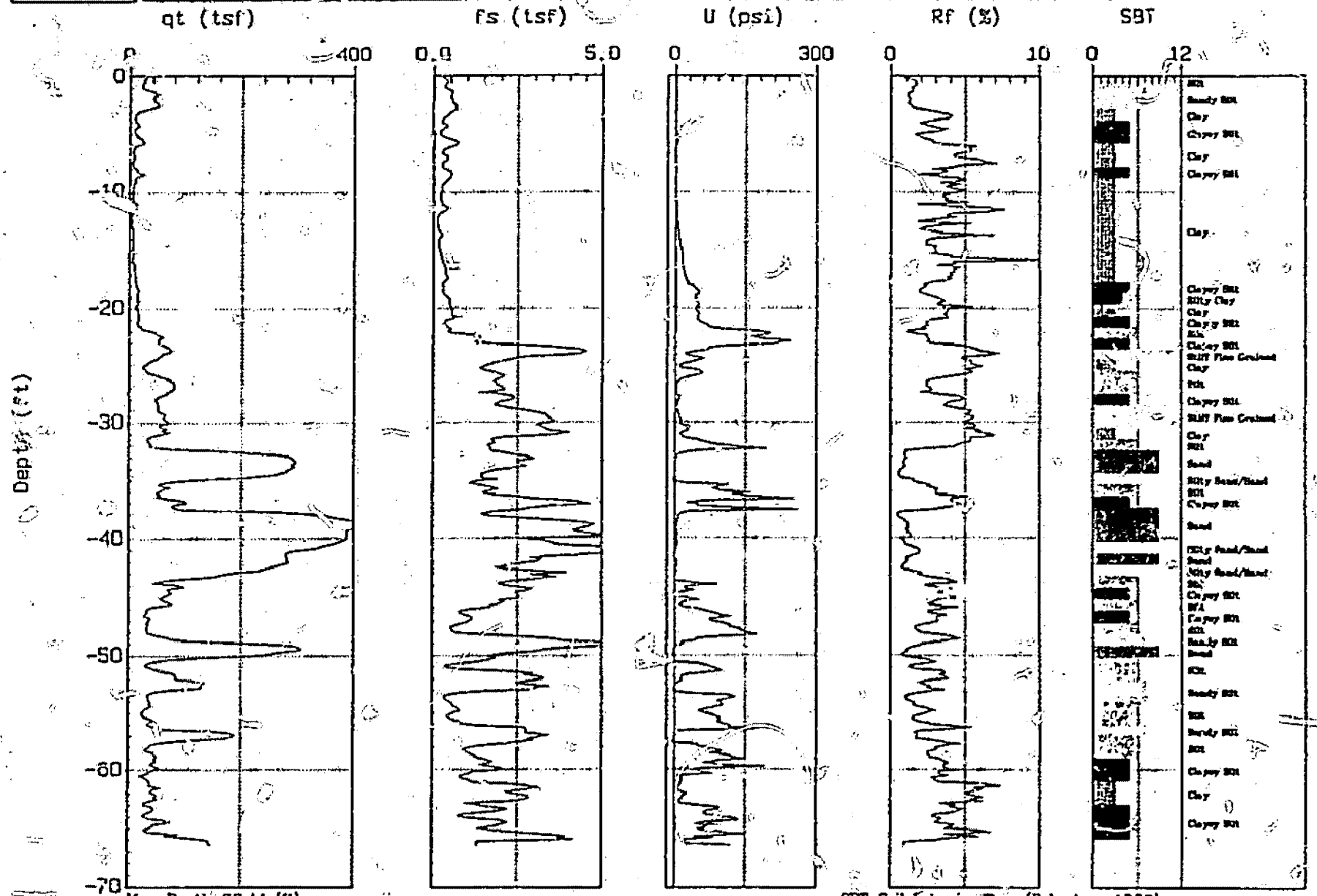
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# NMG GEOTECHNICAL

Site : SUNFLOWER & SUSAN
Location : CPT-2

Engineer : K. VOLLMER
Date : 04:26:02 11:48




Max. Depth: 66.44 (ft)
Depth Inc: 0.164 (ft)

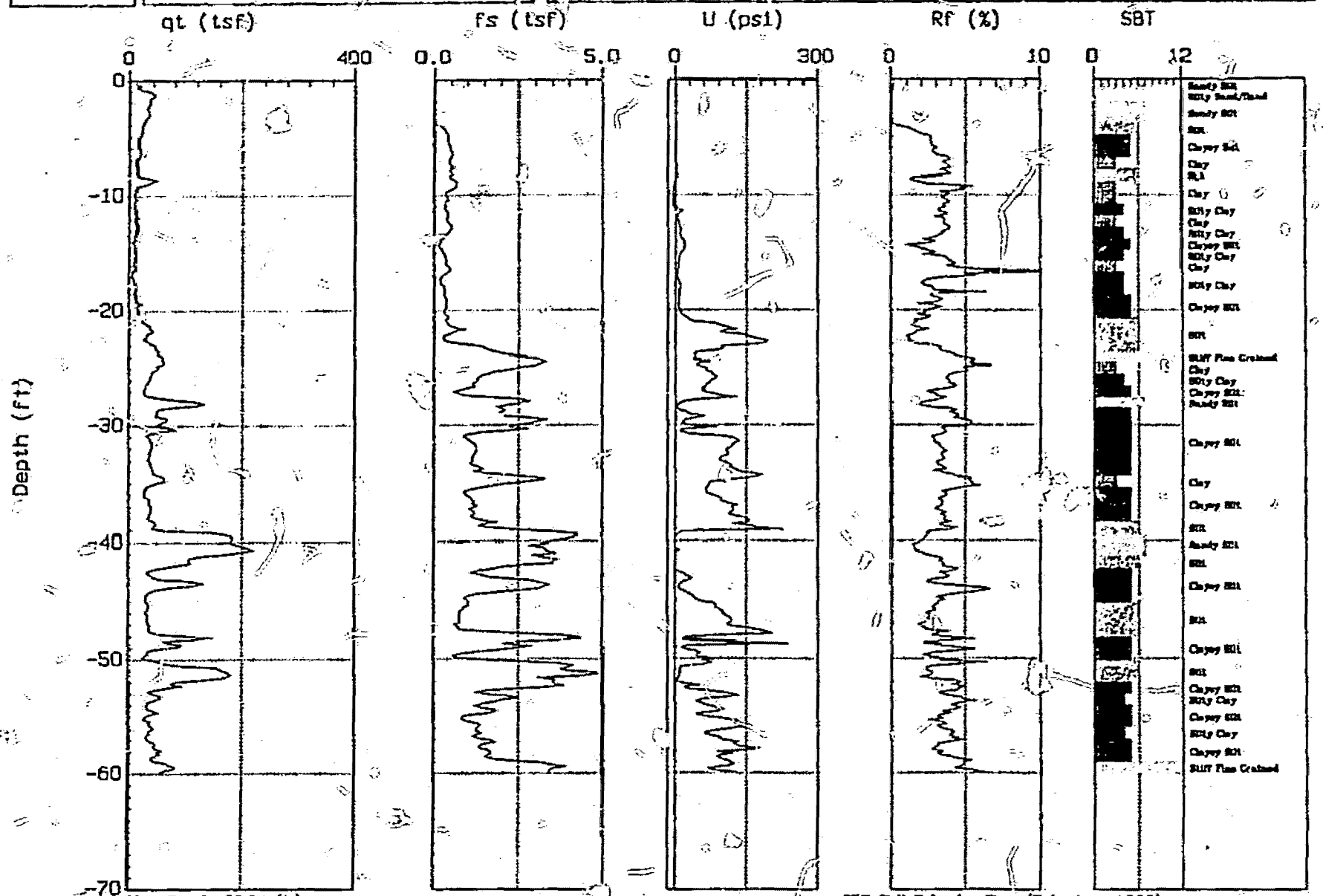
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# NMG GEOTECHNICAL

Site : SUNFLOWER & SUSAN
Location : CPT-3

Engineer : K. VOLLMER
Date : 04:26:02 11:20




Max. Depth: 60.04 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

| | | | |
|---|---|---|---|
| Date(s) Drilled | 1/14/02 | Logged By | SWP |
| Drilling Company | 2R Drilling | Drill Bit Size/Type | 8" Hollow Stem |
| Drill Rig Type | CME 55 | Hammer Data | 140 lb @ 30" drop |
| Sampling Method(s) | Modified California, Bulk | | |
| Approximate Groundwater Depth: 23' | | | |
| Comments | Northwest Corner | | |

**H-1**

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | 36.5 |
| Approximate Ground Surface Elevation (ft) | 31.0 MSL |

| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | ML | SURFACE: Uncertified Artificial Fill (Afu) @ 0' Yellowish brown clayey SILT, moist, micaceous | | | MD, DS, EI, CC, GS |
| 30 | | | B-1 | | | | Alluvium (Qal) | | | |
| | | | D-1 | 17 | | ML | @ 2.5' Light yellowish brown SILT, moist, stiff, micaceous, slight pinhole porosity | 13.2 | 105.3 | |
| | 5 | | D-2 | 15 | | ML | @ 5' Dark brown clayey SILT, very moist, stiff, rootlets, porosity, trace of caliche, plastic | 22.9 | 103.0 | |
| | | | D-3 | 14 | | ML | @ 7.5' Dark yellowish brown clayey SILT, very moist, stiff, trace of pinhole porosity, slightly micaceous, trace of FeO stains, moderately plastic | 27.2 | 99.6 | |
| | 10 | | D-4 | 10 | | ML | @ 10' Dark yellowish brown clayey SILT, very moist to wet, medium stiff, micaceous, FeO stains, plastic | 36.9 | 84.2 | CN, AL |
| 20 | | | | | | | | | | |
| | 15 | | D-5 | | | ML | @ 15' Grayish brown clayey SILT, very moist to wet, stiff, FeO stains, pinhole porosity, plastic | 34.3 | 85.9 | |
| | 20 | | D-6 | 14 | | ML | @ 20' Dark grayish brown clayey SILT, wet, stiff, caliche, rootlets, pinhole porosity, trace of FeO stains | 14.8 | 119.2 | |
| 10 | | | | | | | | | | |
| | 25 | | D-7 | 31 | | ML+SM | @ 25' Dark brown clayey SILT with trace of fine to medium sand, very moist to wet, FeO stains, rootlets, lens of silty fine to coarse SAND | 12.1 | 125.7 | |
| | 30 | | | | | | | | | |

# LOG OF BORING

Standard Pacific/Home Ranch
Costa Mesa, CA
PROJECT NO. 01071-01

NMG

Report: HOLLOW STEM; Project: P:\2001\01071-01\UNTW01071-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 2/27/0

Standard Pacific/Home Ranch Costa Mesa, CA

**H-1**
Sheet 2 of 2

| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | | | | | | | | | |
| 0 | | | D-8 | 29 | | SM | @ 30' Reddish brown silty fine to coarse SAND, wet, medium dense, micaceous | 16.9 | 115.7 | |
| | 35 | | D-9 | 35 | | ML | @ 35' Yellowish brown clayey SILT, wet, very stiff, trace of mica | 22.2 | 106.8 | |
| | 40 | | | | | | Notes: Total Depth = 36.5 feet Groundwater Encountered At 23' Backfilled With Cuttings | | | |
| -10 | | | | | | | | | | |
| | 45 | | | | | | | | | |
| | 50 | | | | | | | | | |
| -20 | | | | | | | | | | |
| | 55 | | | | | | | | | |
| | 60 | | | | | | | | | |
| -30 | | | | | | | | | | |
| | 65 | | | | | | | | | |

**LOG OF BORING**
Standard Pacific/Home Ranch
Costa Mesa, CA
PROJECT NO. 01071-01

NMG

Report: HOLLOW STEM; Project: P:\2001\01071-01\GINTW\01071-01.GPJ; Data Template: NMCHCV98.GDT; Printed: 2/27/0

| | | | |
|---|---|---|---|
| Date(s) Drilled | 1/14/02 | Logged By | SWP |
| Drilling Company | 2R Drilling | Drill Bit Size/Type | 8" Hollow Stem |
| Drill Rig Type | CME 55 | Hammer Data | 140 lb @ 30" drop |
| Sampling Method(s) | Modified California, Bulk | | |
| Approximate Groundwater Depth: | 2' | | |
| Comments | Southwest Corner | | |

**H-4**

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | 51.5 |
| Approximate Ground Surface Elevation (ft) | 30.0 MSL |

| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 0 | | | | | ML | SURFACE: Uncertified Artificial Fill (Afu) @ 0' Light yellowish brown SILT, damp to moist | | | |
| | | | B-1 | | | | Alluvium (Qal) | | | |
| | 5 | | D-1 | 13 | | ML | @ 4' Light to medium brown SILT with trace of clay, moist, stiff, porous, roots, trace of caliche, trace of FeO stains | 15.5 | 90.9 | |
| | | | D-2 | 13 | | ML | @ 7' Brown clayey SILT, very moist, stiff, pinhole porosity, trace of FeO stains, micaceous, moderately plastic | 32.5 | 89.4 | |
| 20 | 10 | | D-3 | 12 | | ML | @ 10' Brownish gray clayey SILT, very moist to wet, stiff, trace of mica, FeO stains, plastic | 29.9 | 90.4 | |
| | 15 | | D-4 | 15 | | ML | @ 15' Dark gray clayey SILT, very moist to wet, stiff, trace of caliche, FeO stains, plastic | 30.4 | 89.3 | |
| 10 | 20 | | D-5 | 12 | | ML | @ 20' Dark gray clayey SILT, wet, stiff, rootlets, moderately plastic | 17.6 | 113.4 | |
| | 25 | | D-6 | 29 | | SM | @ 25' Reddish brown silty fine to coarse SAND, wet, medium dense, trace of FeO stains | 12.9 | 123.2 | |
| 0 | 30 | | | | | | | | | |

## LOG OF BORING

Standard Pacific/Home Ranch
Costa Mesa, CA
PROJECT NO. 01071-01

NMG

Report: HOLLOW STEM; Project: P:\2001\01071-01\GINTW\01071-01.GPJ; Data Template: NMG\NCV98.GDT; Printed: 2/27/0

Report: HOLLOW STEM; Project: P:\2001\01071-01\GINTW\01071-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 2/27/0

Standard Pacific/Home Ranch Costa Mesa, CA

**H-4**
Sheet 2 of 2

| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 30 | | D-7 | 24 | | ML | @ 30' Yellowish brown SILT, saturated, stiff, micaceous | 26.9 | 96.6 | |
| | 35 | | D-8 | 21 | | ML | @ 35' Light brown clayey SILT, saturated, stiff, trace of caliche, trace of FeO strains, micaceous | 22.5 | 105.9 | |
| -10 | 40 | | D-9 | 30 | | ML | @ 40' Light yellowish brown clayey SILT, saturated, very stiff, caliche, trace of FeO stains, moderately plastic | 20.5 | 108.9 | |
| | 45 | | D-10 | 33 | | ML | @ 45' Brown clayey SILT, saturated, very stiff, micaceous, moderately plastic | 30.1 | 94.2 | |
| -20 | 50 | | D-11 | 80 | | SM | @ 50' Grayish brown silty SAND, saturated, very dense | 20.1 | 108.9 | |
| | 55 | | | | | | Notes:<br>Total Depth = 51.5 feet<br>Groundwater Encountered At 28'<br>Backfilled With Cuttings | | | |
| -30 | 60 | | | | | | | | | |
| | 65 | | | | | | | | | |

**LOG OF BORING**
Standard Pacific/Home Ranch
Costa Mesa, CA

PROJECT NO. 01071-01

NMG

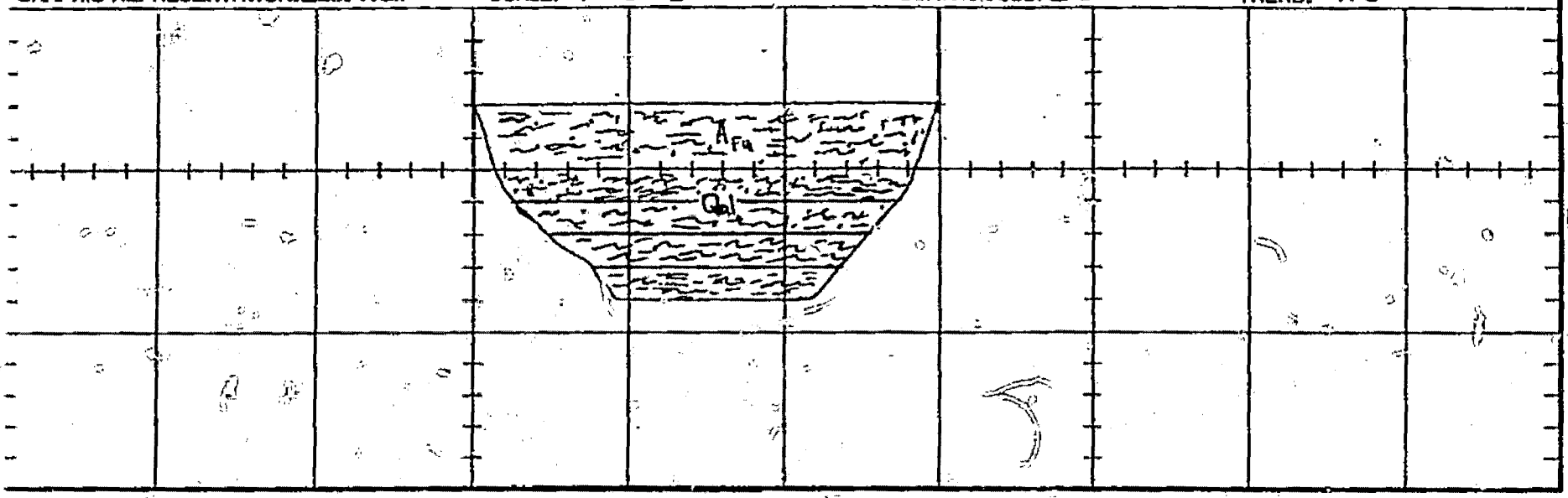
NMG Geotechnical, Inc.

LOG OF TRENCH NO. T-1

| | | | |
|---|---|---|---|
| Project Name: Standard Pacific/Home Ranch | Logged By: DAO | TRENCH NO.: T-1 | ENGINEERING PROPERTIES |
| Project Number: 01071-01 | Elevation: 31 ± | | |
| Equipment: Case 580L Backhoe | Location: Northwest Corner | | |

| GEOLOGIC ATTITUDES | DATE: 1/10/02 DESCRIPTION: | GEOLOGIC UNIT | U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | Uncertified Artificial Fill (Afu) - Plowed Zone<br>0' - 2' Medium gray brown clayey SILT with fine sand and trace gravel, damp to moist, soft to medium stiff, disturbed, moderate to heavy porosity, light to moderate vegetation | Afu | ML | | | |
| | Alluvium (Qal)<br>2' - 3' Medium gray brown fine sandy SILT with trace clay to clayey SILT with trace fine sand, moist to wet, medium stiff, moderate to heavy porosity, micaceous, rootlets | Qal | ML | | | |
| | 3' - 4' Light gray fine sandy SILT, moist, medium stiff, no plasticity, compressible, moderate porosity, micaceous | | ML | | | |
| | 4' - 5' Medium gray brown clayey SILT with fine sand, wet, light porosity, micaceous | | ML | | | |
| | 5' -6' Dark brown silty CLAY, wet, very plastic | | CH | | | |
| | Notes:<br>Total Depth = 6 feet<br>No Groundwater Encountered<br>Backfilled with Cuttings | | | | | |

GRAPHIC REPRESENTATION: East Wall SCALE: 1" = 5' ± SURFACE SLOPE: 0° TREND: N-S



Project Name: Standard Pacific/Home Ranch
Project Number: 01071-01
IMG Equipment: Case 580L Backhoe

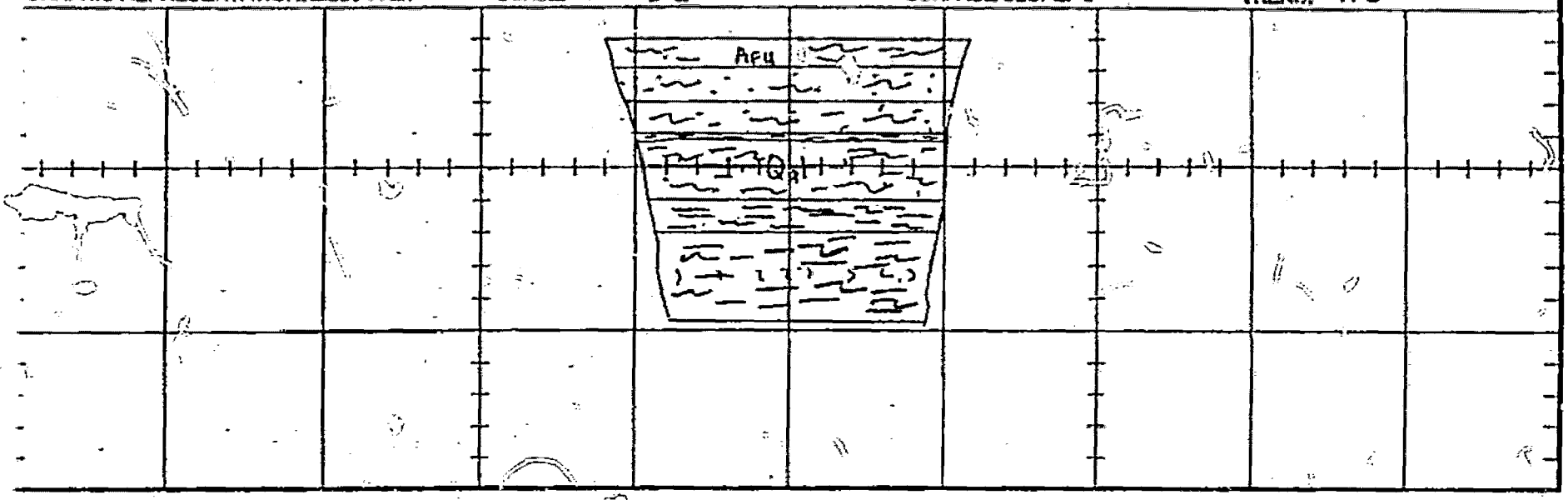
Logged By: DAO
Elevation: 30 ±
Location: Southwest Corner

TRENCH NO.: **T-5**

| GEOLOGIC ATTITUDES | DATE: 1/10/02 DESCRIPTION: | GEOLOGIC UNIT | ENGINEERING PROPERTIES U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | Uncertified Artificial Fill (Afu) - Plowed Zone<br>0' - 2' Medium gray brown clayey SILT with fine sand and trace gravel, damp to moist, soft to medium stiff, disturbed, moderate to heavy porosity, light to moderate vegetation | Afu | ML | | | |
| | Alluvium (Qal)<br>2' - 3' Medium gray brown fine sandy SILT with clay, damp to moist, medium stiff, heavy porosity, rootlets | Qal | ML | | | |
| | 3' - 4' Light gray fine sandy SILT, damp, moderate porosity, micaceous, rootlets | | ML | | | |
| | 4' - 6' Medium gray brown fine sandy to clayey SILT, moist, light porosity, rootlets | | ML | | | |
| | 6' - 6.5' Dark brown silty CLAY, wet, very plastic | | CH | | | |
| | 6.5' - 10' Clayey to sandy SILT, wet, light to moderate porosity | | ML | | | |
| | 10' - 12' Silty CLAY, wet | | CH | B-1 @ 10-12' | | |
| | 12' - 17.5' Soft CLAY and SILT, root zones encountered at approximately 15 feet. | | ML-CH | | | |

Notes:
Total Depth = 17.5 feet
No Groundwater Encountered
Backfilled with Cuttings

GRAPHIC REPRESENTATION: East Wall SCALE: 1" = 10' ± SURFACE SLOPE: 0° TREND: N-S



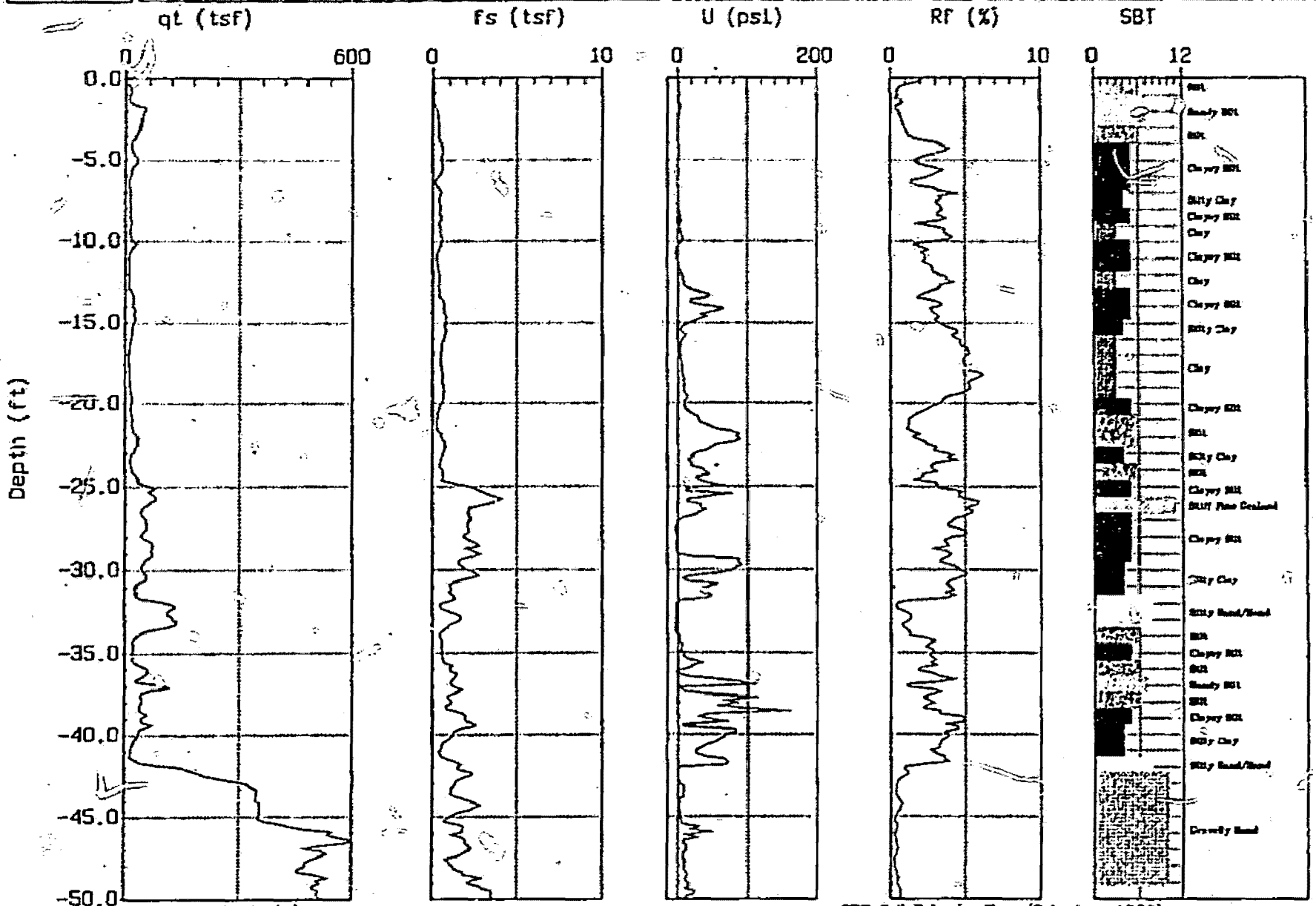

LOG OF TRENCH NO: T-5

GREGG

# NMG GEOTECHNICAL

Site : HOME RANCH
Location : CPT-3

Engineer : K. MARKOUIZOS
Date : 01:09:02 10:52




Max. Depth: 50.03 (ft)

Depth Inc: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

# GEOTECHNICAL BORING LOG

: 11/18/94 Boring No.: B-1 Logged by: TW Sheet: 1 of 1

ect Name: Sunflower & Susan Proj. No.: 94070-1

ion: Duxbury Rig Type: Hollow stem Hole Dia: 8 inches

ive Weight: 140 lbs. Drop: 30 inches Hole Elev.: 31 ± ' Datum: sea level

Location: 105' West of Susan St. ℄; 15' South of overhead Line

| Depth (ft) | Graphic Log | Attitudes | Sample No. | Blows / Foot | Dry Density (pcf) | Moisture Content % | Soil Class (USCS) | Geotechnical Descriptions |
|---|---|---|---|---|---|---|---|---|
| | | | (1) | | | | | Soil/Alluvium/Plowed & Disced Field: @0' Gry brn, fine sa. silt, slightly clayey, damp-moist, med. stiff to stiff, porous, roots. Plowed/disced to 8± inches. |
| | | | 1 | 4 9 | 88.3 | 28.4 | ML/SM | @4' Dk brn, clayey fine sandy silt, v. moist, medium stiff, micaceous. |
| | | | 2 | 9 19 | 92.0 | 32.1 | SM/ML | @9' Dk. brn, clayey fine sandy silt, v. moist, medium stiff, micaceous |
| 5 | | | 3 | 4 | 89.3 | 33.7 | ML/CL | @14' Dk brn, mottled gray, clayey silt/silty clay, moist-v. moist, stiff, minor organics |
| | | | | | | | | T.D. 15' No ground water. |

# GEOTECHNICAL BORING LOG

Date: 11/18/94 Boring No.: B-4 Logged by: TW Sheet: 1 of 1

Project Name: Sunflower & Susan Proj. No.: 94070-1

Driller: Duxbury Rig Type: Hollow stem Hole Dia: 8 Inches

Drive Weight: 140 lbs. Drop: 30 Inches Hole Elev.: 30.2 Datum: sea level

Location: Middle proposed Susan St. in Plowed Field.

| Depth (ft) | Graphic Log | Attitudes | Sample No. | Blows / Foot | Dry Density (pcf) | Moisture Content % | Soil Class (USCS) | Geotechnical Descriptions |
|---|---|---|---|---|---|---|---|---|
| 0 | | | 1 | | | | | SOIL/ALLUVIUM: Gry brn, sa. cl. silt, damp-moist, med. stiff, porous, roots, plowed & tracked field. |
| 5 | | | 1 | 16 18 | 101.2 | 12.3 | ML/CL | @4' Med. gry brn, sl. clayey silt, damp-moist, med. stiff, porous |
| 10 | | | 2 | 14 18 | — | — | SC | @9' Brown, cl. sand & sa. clay, v. moist, med. stiff-dense, minor organic staining, micaceous, laminated Sample disturbed @ 9' |
| 15 | | | 3 | 7 12 | 85.2 | 37.3 | CL/ML | @14' Brown, clayey silt/silty clay, v. moist, med. stiff, dk. organic staining, laminated |

T.D. 15'

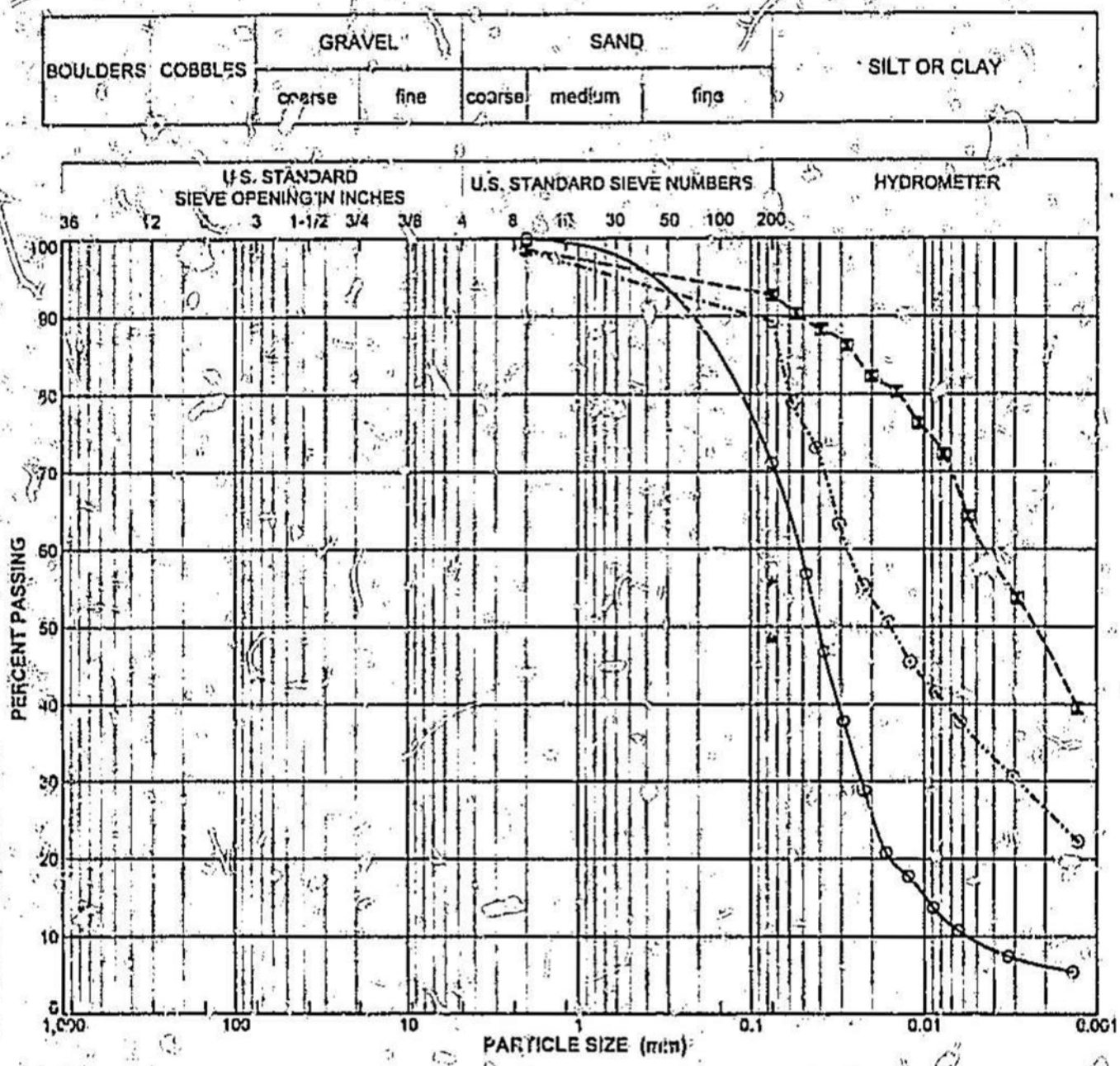
No ground wtr

# APPENDIX C

# Laboratory Test Methods

Majority of NMG's laboratory testing is performed in general compliance with the latest test method by the American Standards for Testing and Materials (ASTM). Other testing procedures used include the Uniform Building Code (UBC), State of California Department of Transportation Test Method (CTM), or other test method as designated below. The laboratory test results for this project are included in this appendix. Discussion, conclusion and recommendations pertaining to these results are found in the text of this report.

| TEST METHOD | | TEST DESCRIPTION |
|---|---|---|
| ASTM | *Other* | |
| D422 | | Particle Size Distribution (Full Sieve and Hydrometer) |
| D516 | CTM 422 | Chloride Content |
| D1140 | | Grain Size (Passing No. 200 sieve) |
| D1557[1] | CTM 216[2] | Soil and Aggregate Base Compaction<br>1 – Maximum Dry Density<br>2 – Maximum Wet Density |
| D1559[1]<br>D1560[2]<br>D2726[1] | CTM 308[2] | Asphalt Concrete Compaction (Maximum Density)<br>1 – Marshall Apparatus<br>2 – Hveem Apparatus |
| D2166 | | Unconfined Compressive Strength |
| D2216 | | Water (Moisture) Content and Dry Density |
| D2419 | CTM 217 | Sand Equivalent Value |
| D2435 | | Consolidation Properties |
| D2487<br>D2488 | | Description, Identification and Classification of Soils (Unified Soil Classification System, USCS) |
| D2844 | CTM 301 | Resistance (R-Value) |
| D3080 | | Direct Shear |
| D4318 | | Liquid Limits, Plastic Limit and Plasticity Index (Atterberg Limits) |
| D4829 | UBC 18-2 | Expansion Index |
| D5156 | HACH SF-1 (Turbidimetric)<br>CTM 417,422 | Soluble Sulfate Content |
| G51 | | Ph |
| G57 | CTM 643 | Electric Resistivity |




| Symbol | Boring Number | Sample Number | Depth (feet) | Field Moisture (%) | LL | PI | Activity PI/-2μ | $C_u$ | $C_c$ | Passing No. 200 Sieve (%) | Passing 2μ (%) | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O | H-1 | D-11 | 45.0 | 28 | | | | 9.67 | 1.81 | 71 | 6 | ML |
| ⊠ | H-2 | B-2 | 10.1 | | 52 | 28 | | | | 93 | 47 | CH |
| ⊿ | H-2 | D-7 | 25.0 | 18 | | | | | | 49 | | SM |
| ★ | H-2 | D-8 | 30.0 | 20 | | | | | | 56 | | ML |
| ⊙ | H-3 | B-1 | 4.9 | | 36 | 12 | | | | 89 | 26 | ML/CL |

## PARTICLE SIZE DISTRIBUTION

Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG Geotechnical, Inc.

Template: NMSIV; Prj ID: 02021-01.GPJ, Printed: 8/1/02

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Boring No. | T-1 | | | | | | | |
| Sample No. | B-1 | | | | | | | |
| Depth (ft.) | 2-3 | | | | | | | |
| Sample Type | Bulk | | | | | | | |
| Visual Soil Classification | s(ML) | | | | | | | |
| **Moisture Correction** | | | | | | | | |
| Wet Weight of Soil + Container (gm.) | | | | | | | | |
| Dry Weight of Soil + Container (gm.) | | | | | | | | |
| Weight of Container (gm) | | | | | | | | |
| Moisture Content (%) | 0.00 | | | | | | | |
| Container No.: | | | | | | | | |
| **Sample Dry Weight Determination** | | | | | | | | |
| Weight of Sample + Container (gm.) | 961.80 | | | | | | | |
| Weight of Container (gm.) | 108.90 | | | | | | | |
| Weight of Dry Sample (gm.) | 852.90 | | | | | | | |
| Container | 954 | | | | | | | |
| **After Wash** | | | | | | | | |
| Dry Weight of Sample + Container (gm) | 427.60 | | | | | | | |
| Weight of Container (gm) | 108.90 | | | | | | | |
| Dry Weight of Sample (gm) | 318.70 | | | | | | | |
| % Passing No. 200 Sieve | 62.6 | | | | | | | |
| % Retained No. 200 Sieve | 37.4 | | | | | | | |

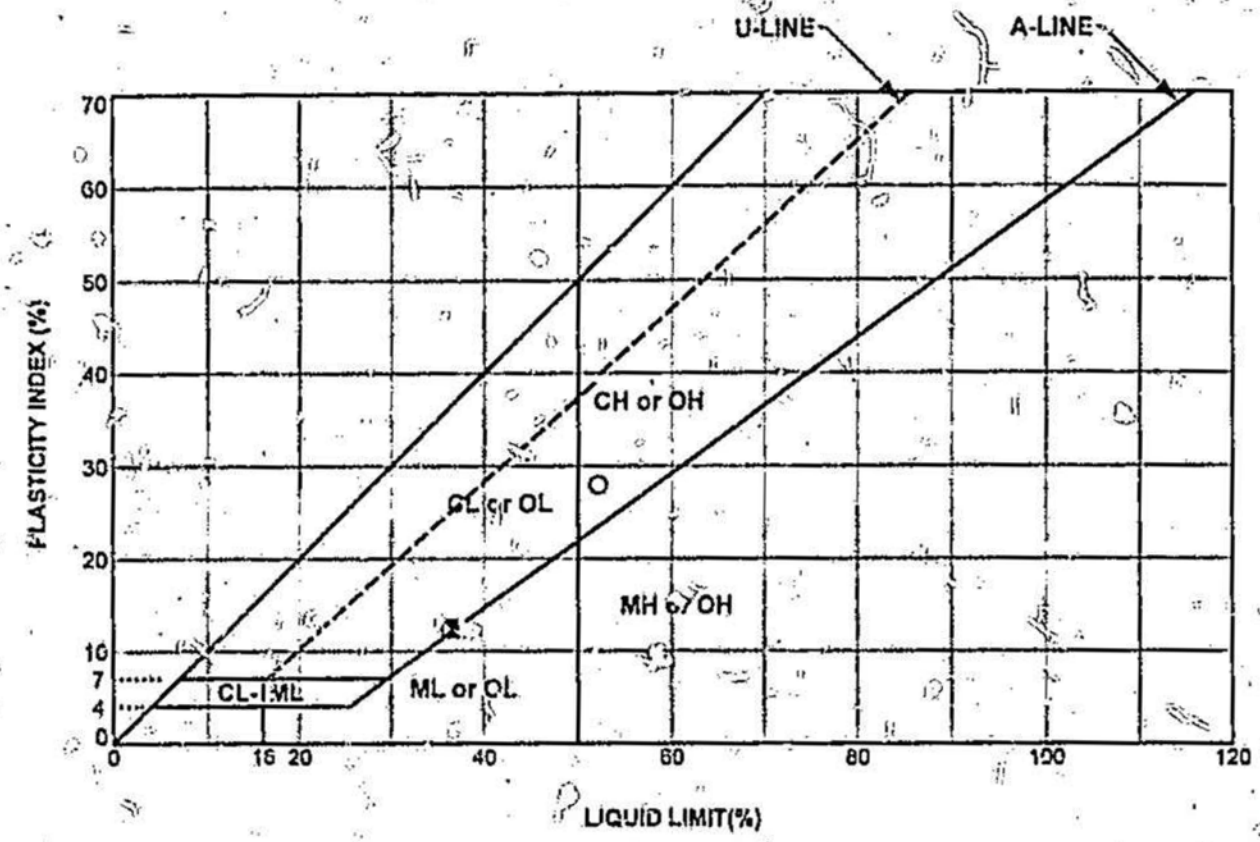
TERATEST LABS

# PERCENT PASSING No. 200 SIEVE

ASTM D 1140

Project Name: Emulex / Home Ranch
Project No.: 02021-01
Client Name: NMG
Tested By: ACS Date: 05/15/02

-#200 Sieve T1-B1

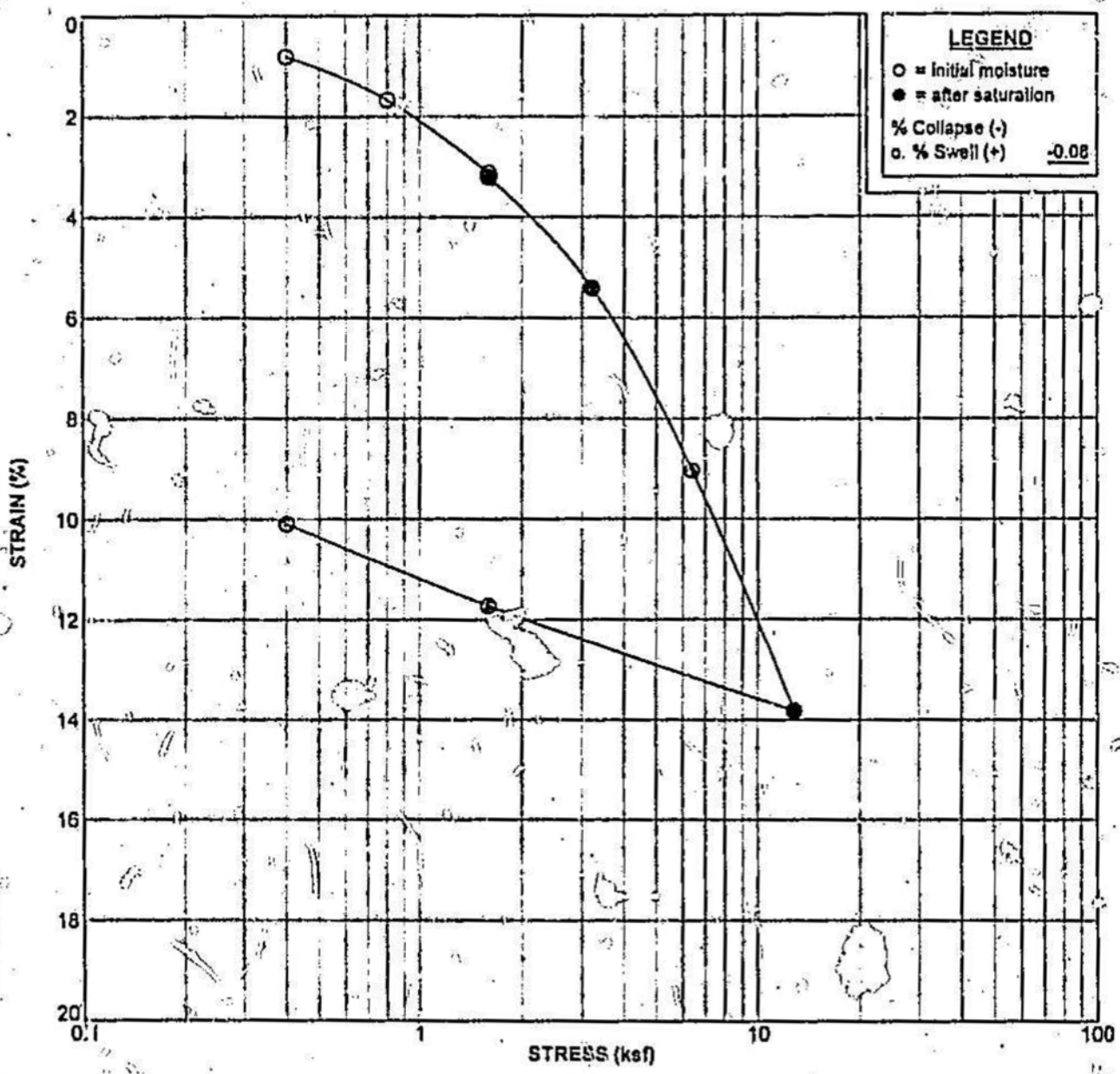



| Symbol | Boring Number | Depth (feet) | Sample Number | Passing No. 200 Sieve (%) | LL | PI | USCS | Description |
|---|---|---|---|---|---|---|---|---|
| O | H-2 | 10.1 | B-2 | 93 | 52 | 28 | CH | brown silty CLAY |
| ⊠ | H-3 | 4.9 | B-1 | 89 | 36 | 12 | ML/CL | Olive Brown Clayey SILT/silty CLAY |

**PLASTICITY CHART**
Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG Geotechnical, Inc.

Template: NMA.TT, Prj ID: 02021-01.GPJ, Printed: 8/1/02




| Boring No. H-1 | Sample No. D-2 | Depth: 10.0 ft |
|---|---|---|
| Sample Description: Olive Brown CLAY (CH) | | |
| Liquid Limit: | Plasticity Index: | Percent Passing No. 200 Sieve: |

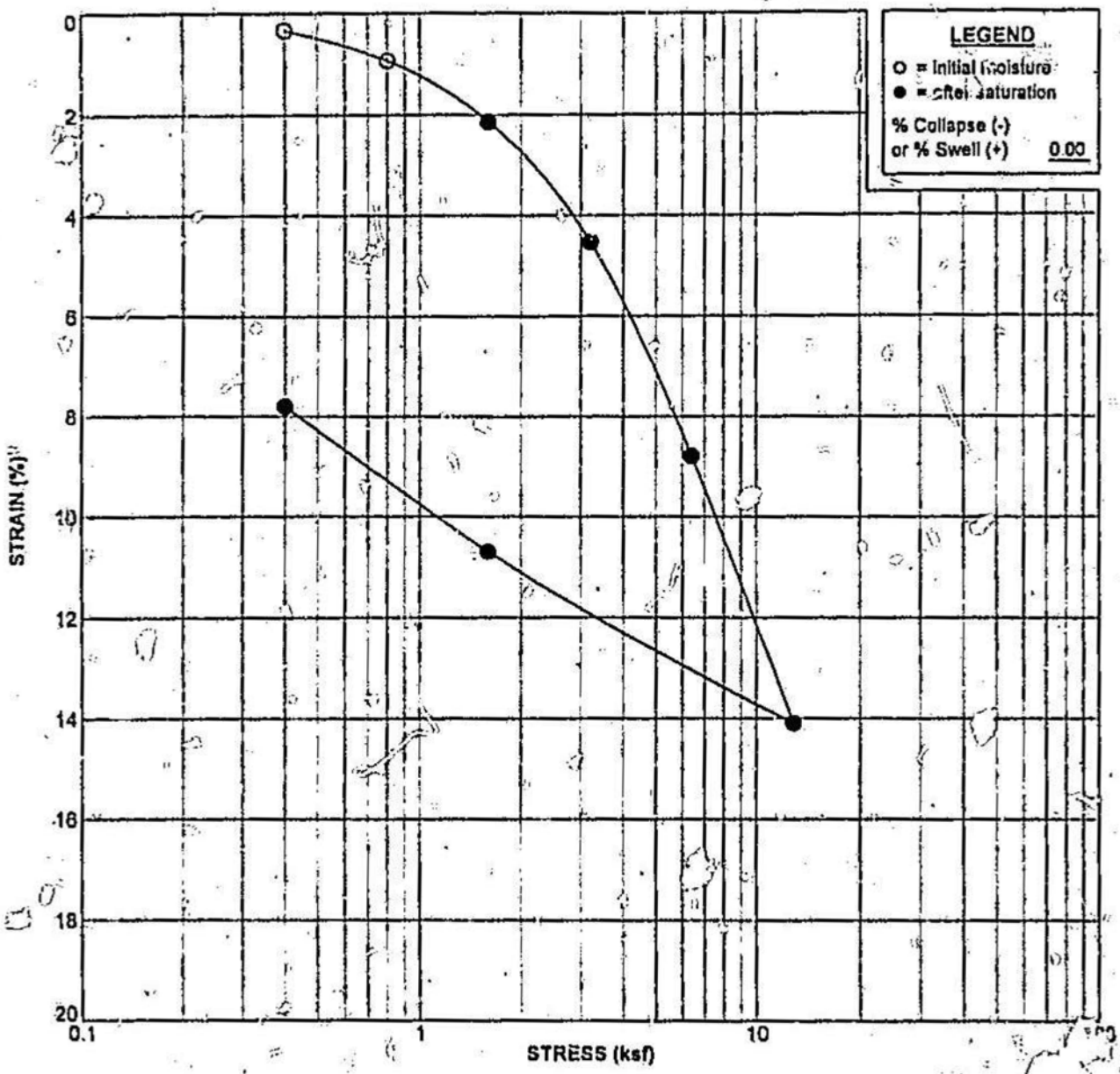
| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| Initial | 37.7 | 84.2 | 103.8 | 0.963 |
| Final | 31.4 | 92.7 | 106.2 | 0.784 |

## CONSOLIDATION TEST RESULTS

Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG Geotechnical, Inc.

Template: NMCONS, Prj ID: 02021-01.GPJ; Printed: 8/1/02




| Boring No. H- 1 | Sample No. D-4 | Depth: 17.5 ft |
|---|---|---|
| Sample Description: | Reddish to Grayish Brown Silty CLAY (CH) | |
| Liquid Limit: | Plasticity Index: | Percent Passing No. 200 Sieve: |

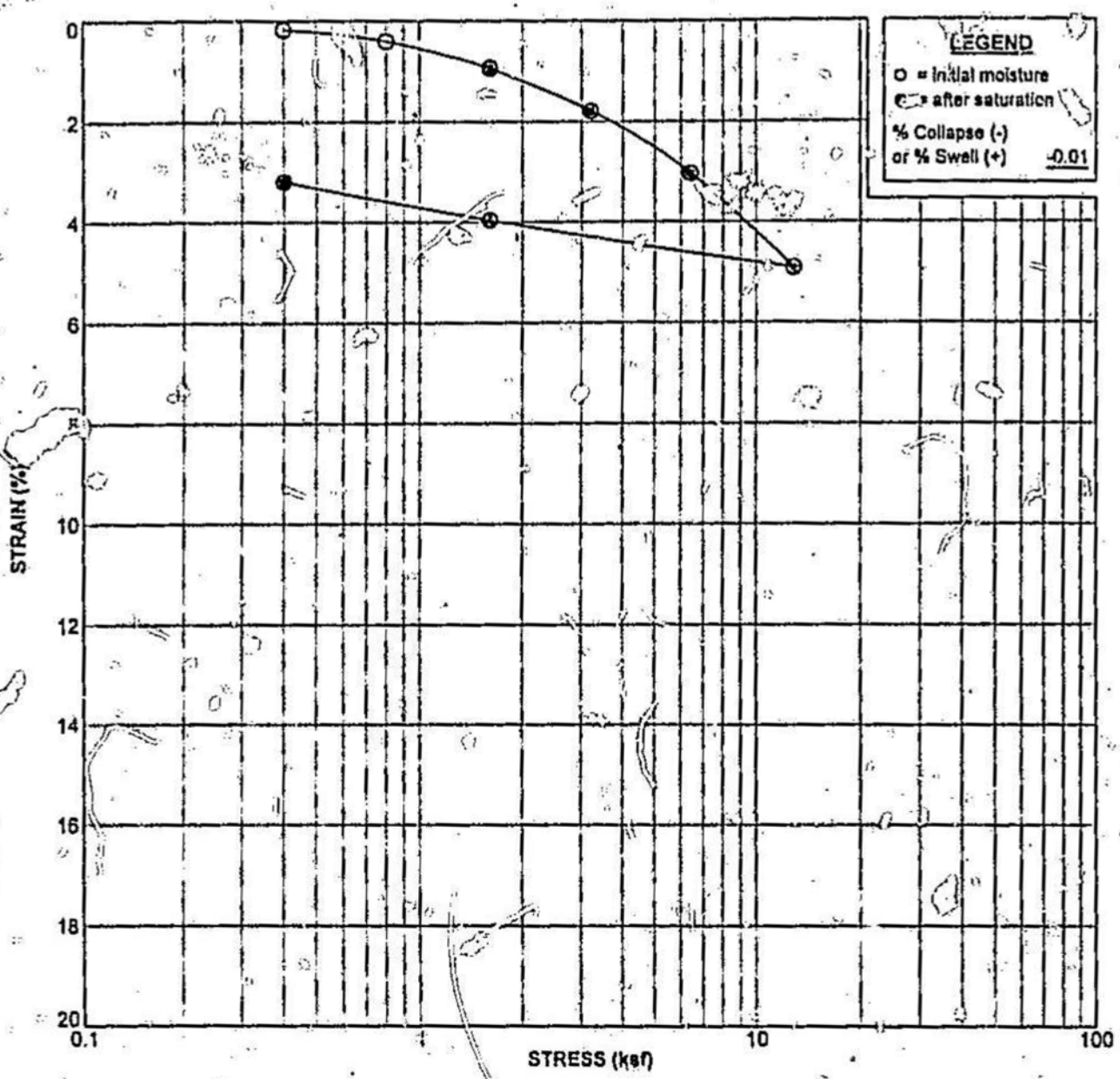
| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| Initial | 34.1 | 85.4 | 96.5 | 0.936 |
| Final | 29.5 | 92.1 | 96.3 | 0.795 |

## CONSOLIDATION TEST RESULTS

Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

HMG Geotechnical, Inc.

Template: NMCONS; Prj ID: 02021-01 GPJ; Printed: 8/1/02




| Boring No. H- 2 | Sample No. D-1 | Depth: 5.0 ft |
|---|---|---|
| Sample Description: | Olive Fine Sandy SILT (MH) | |
| Liquid Limit: | Plasticity Index: | Percent Passing No. 200 Sieve: |

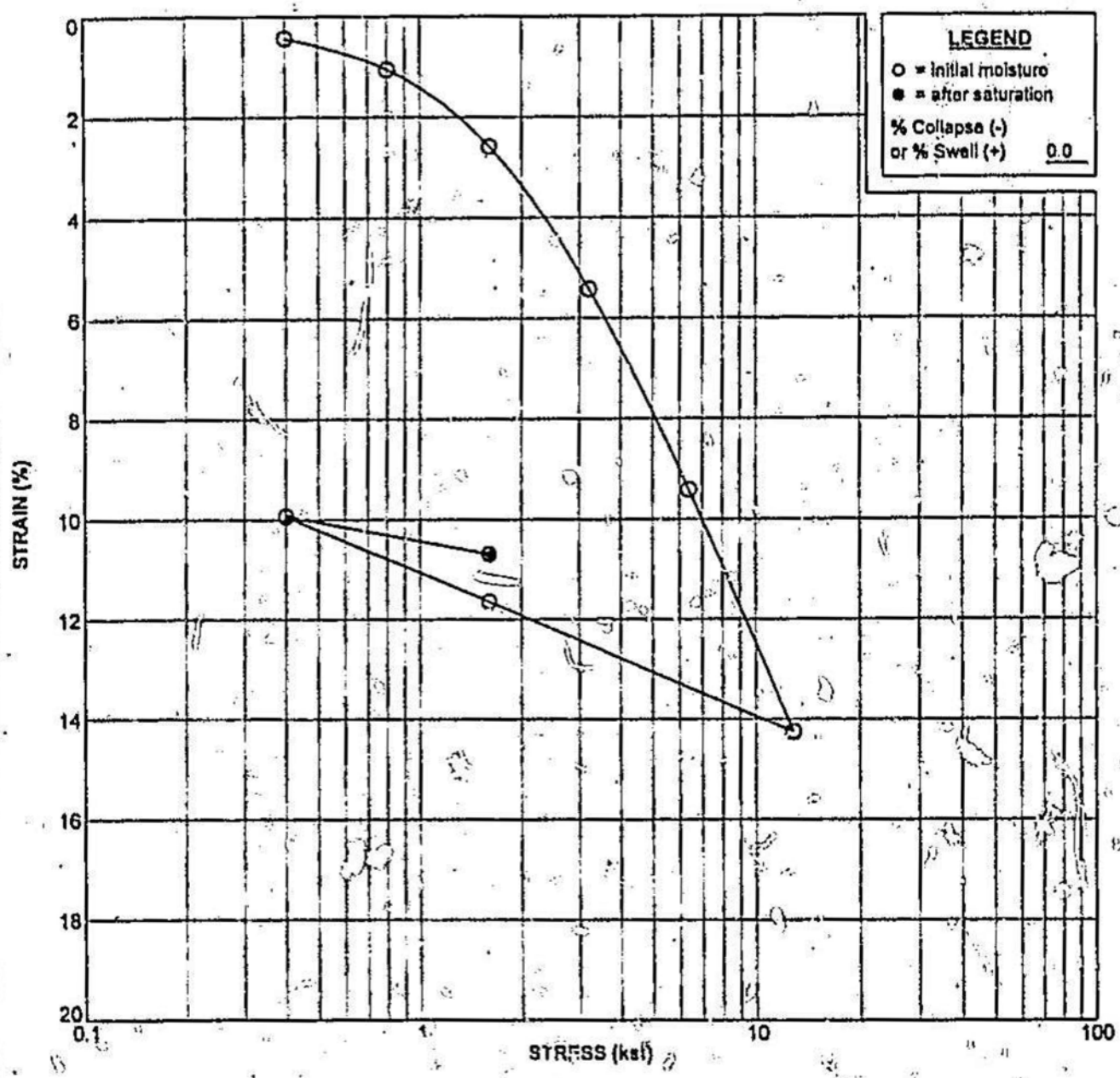
| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| Initial | 13.5 | 103.9 | 60.6 | 0.591 |
| Final | 19.8 | 107.2 | 98.7 | 0.543 |

## CONSOLIDATION TEST RESULTS

Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG Geotechnical, Inc.

Template: NMCONS, Prj ID: 02021-01.GPJ; Printed: 8/1/02




| Boring No. H- 2 | Sample No. D-4 | Depth: 16.0 ft |
|---|---|---|
| Sample Description: | Reddish Brown Silty CLAY (CH) | |
| Liquid Limit: | Plasticity Index: | Percent Passing No. 200 Sieve: |

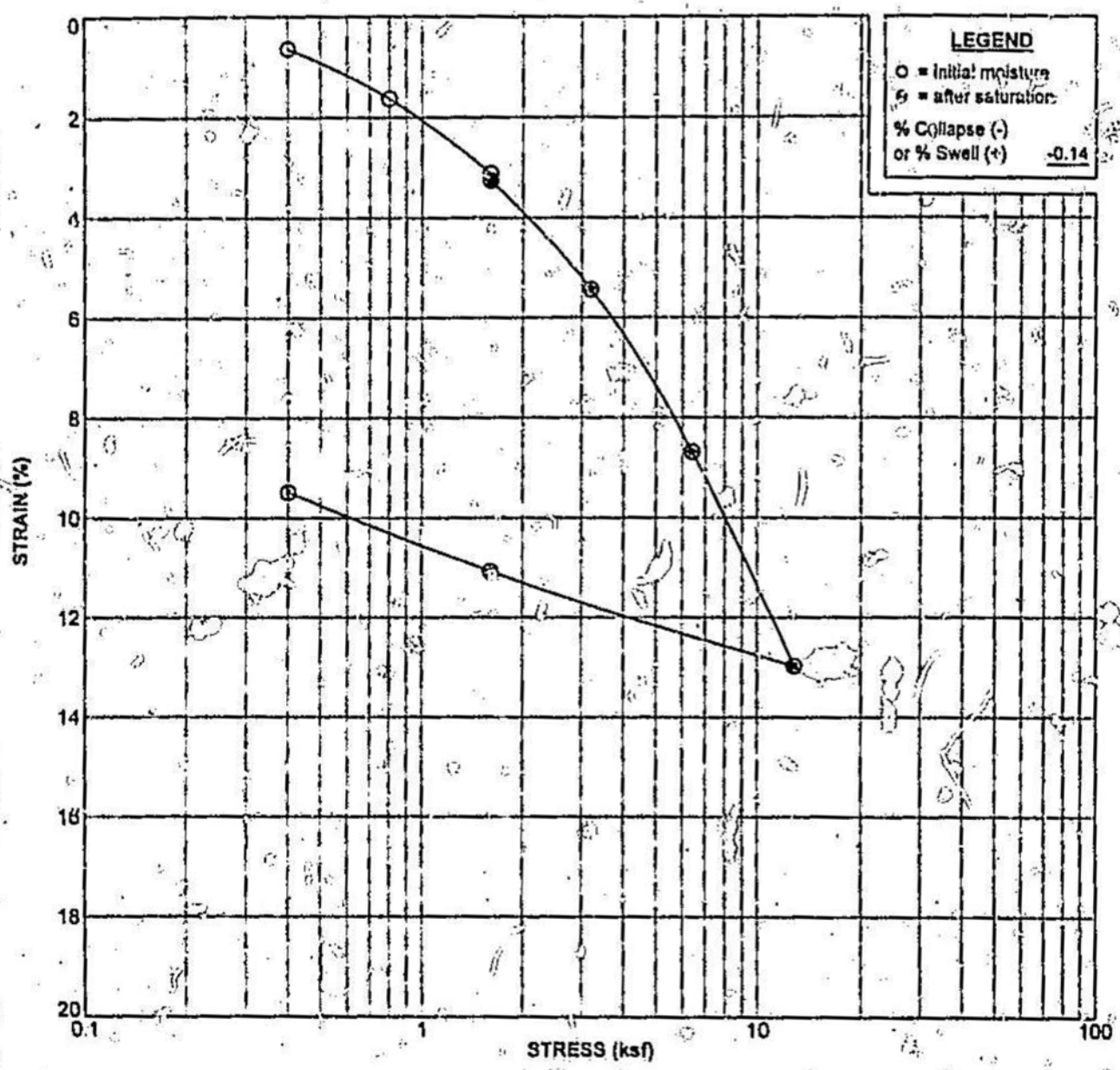
| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| Initial | 35.4 | 83.6 | 95.9 | 0.978 |
| Final | 29.4 | 91.9 | 97.5 | 0.799 |

# CONSOLIDATION TEST RESULTS

Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG Geotechnical, Inc.

Template: NMCONS; Prj.ID: 02021-01.GPJ; Printed: 8/1/02




| Boring No. H- 3 | Sample No. D-2 | Depth: 7.8 ft |
|---|---|---|
| Sample Description: | Olive Silty CLAY (CH) | |
| Liquid Limit: | Plasticity Index: | Percent Passing No. 200 Sieve: |

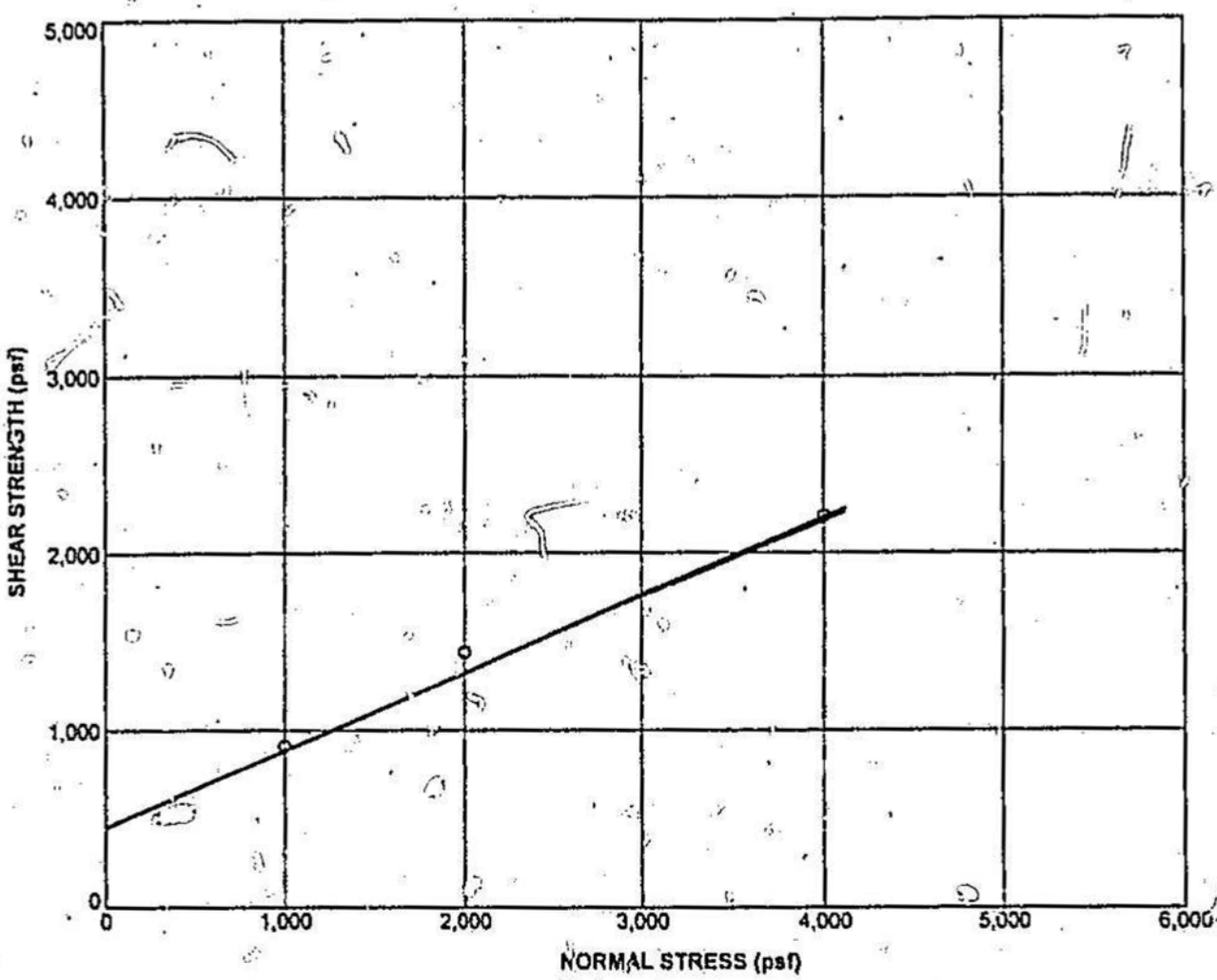
| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| Initial | 39.1 | 81.8 | 101.6 | 1.021 |
| Final | 33.9 | 89.5 | 106.0 | 0.848 |

## CONSOLIDATION TEST RESULTS

Sogerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG Geotechnical, Inc.

Template: NMCONS; Proj: 02021-01.GPJ; Printed: 8/1/02




| | | | | | |
|---|---|---|---|---|---|
| Boring No. H- 2 | | Sample No. B-1 | | Depth: 6.1 ft | |
| Sample Description: | Olive Brown Fine Sandy SILT (ML) | | | | |
| Liquid Limit: | | Plasticity Index: | | Percent Passing No. 200 Sieve: | 71 |
| Moisture Content (%): | 17.5 | Dry Density (pcf): | 111.8 | Degree of Saturation (%): | 97 |
| Sample Type: | Remolded 90% R.C. | Rate of Shear (in./min.): | .05 | | |

SHEAR STRENGTH PARAMETERS

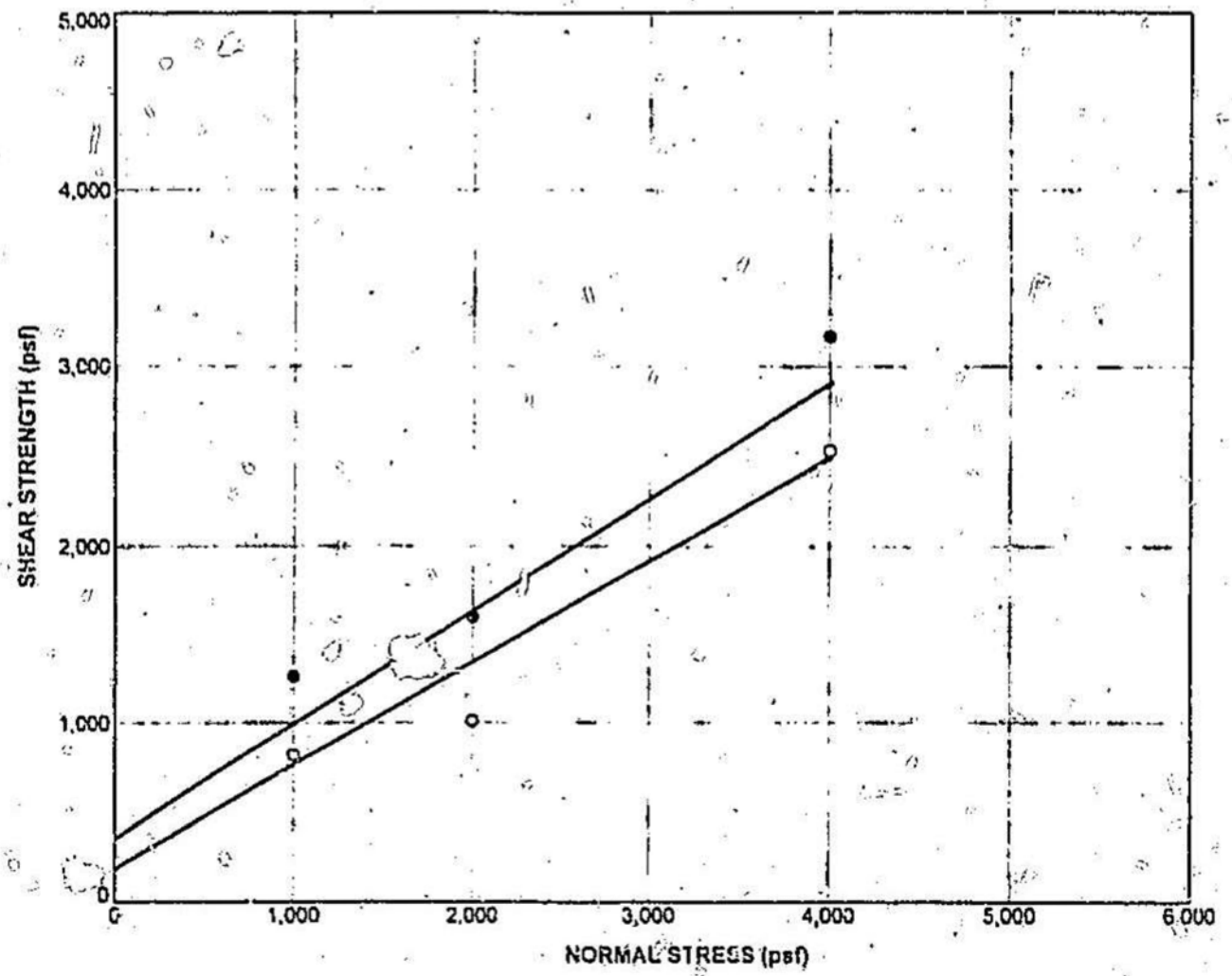
| Parameter | Peak ● | Ultimate ○ |
|---|---|---|
| Cohesion (psf) | 500 | 500 |
| Friction Angle (degrees) | 23.5 | 23.5 |

## DIRECT SHEAR TEST RESULTS

Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG Geotechnical, Inc.

Template: NVDS. Prj ID: 02021-01.GPJ. Printed: 6/2/02




| | | | | | |
|---|---|---|---|---|---|
| Boring No. H-3 | | Sample No. D-1 | | Depth: 5.0 ft | |
| Sample Description: | Clayey SILT/Silty CLAY w/ trace of Fine Sand | | | | |
| Liquid Limit: | | Plasticity Index: | | Percent Passing No. 200 Sieve: | |
| Moisture Content (%): | 24.9 | Dry Density (pcf): | 101.0 | Degree of Saturation (%): | 104 |
| Sample Type: | Undisturbed | Rate of Shear (in./min.): | .05 | | |

SHEAR STRENGTH PARAMETERS

| Parameter | Peak ● | Ultimate ○ |
|---|---|---|
| Cohesion (psf) | 400 | 250 |
| Friction Angle (degrees) | 32.5 | 30.0 |

# DIRECT SHEAR TEST RESULTS

Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG Geotechnical, Inc.

| Sample No. | Sample Description | Test Method | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|---|
| Boring H-2 B-1 @ 0-5' | Olive Brown Fine Sandy SILT (ML) | A | 124.0 | 10.0 |
| Trench T-1 B-1 @ 2'-3' | Olive Sandy SILT (ML) | A | 116.5 | 14.0 |
| | | | | |
| | | | | |
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| | | | | |

Test Method:

[A] ASTM D1557 *for Soil and Aggregate Base*
[B] CTM 216 *for Asphaltic Concrete (Hveem)*
[C] ASTM D1559 & ASTM D2726 *for Asphaltic Concrete (Marshall)*

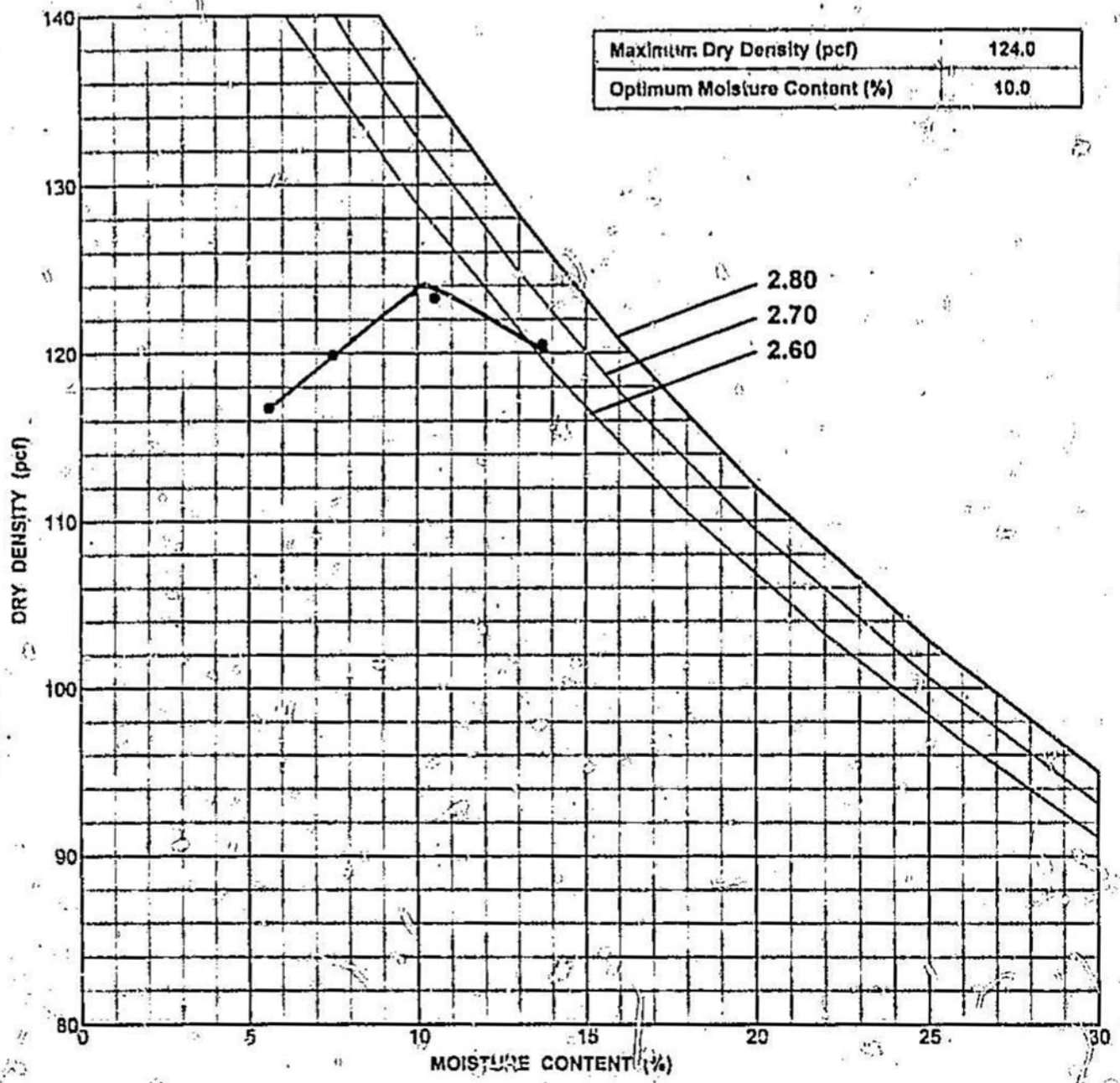
*Notes:*

**Maximum Density Test Results**
(FRM019 Rev.0)

Project No. 020021-01

Project Name: Segerstrom/ Emulex

NMG




| | | |
|---|---|---|
| Boring No. H- 2 | Sample No. B-1 | Depth: 5.1 ft |
| Sample Description: Olive Brown Fine Sandy SILT (ML) | | |
| Liquid Limit: | Plasticity Index: | Percent Passing No. 200 Sieve: 71 |
| Comments: 1557A | | |

## COMPACTION TEST RESULTS

Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG Geotechnical, Inc.

Template: NVCOMP Prj ID: 02021-01.GPJ Printed: 8/1/02

TERATEST LABS

# COMPACTION TEST

ASTM D 1557

| | | | | | |
|---|---|---|---|---|---|
| Project Name: | Einulex / Home Ranch | Tested By : | MTR | Date: | May-15-02 |
| Project No.: | 02021-01 | Calculated By : | JHW | Date: | May-16-02 |
| Boring No.: | N/A | Depth (ft.) | 2-3 | | |
| Sample No. : | B-1 | | | | |

Visual Sample Description: Olive Sandy Silt, s(ML)

Preparation Method: [ ] Moist [X] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03322 *Ram Weight 10 LBS Drop 18 inches*

| TEST NO. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Wt. Comp. Soil + Mold (gm.) | 3648.0 | 3745.0 | 3809.0 | 3737.0 | | |
| Wt. of Mold (gm.) | 1803.0 | 1803.0 | 1803.0 | 1803.0 | | |
| Net Wt. of Soil (gm.) | 1845.0 | 1942.0 | 2006.0 | 1934.0 | | |
| Wet Wt. of Soil + Cont. (gm.) | 483.50 | 490.40 | 501.70 | 520.30 | | |
| Dry Wt. of Soil + Cont. (gm.) | 448.20 | 443.30 | 451.40 | 451.20 | | |
| Wt. of Container (gm.) | 51.10 | 50.80 | 49.30 | 50.80 | | |
| Moisture Content (%) | 8.89 | 12.00 | 14.25 | 17.26 | | |
| Wet Density (pcf) | 122.4 | 128.9 | 133.1 | 128.3 | | |
| Dry Density (pcf) | 112.4 | 115.1 | 116.5 | 109.5 | | |

Maximum Dry Density (pcf) 116.5 Optimum Moisture Content (%) 14.0

PROCEDURE USED

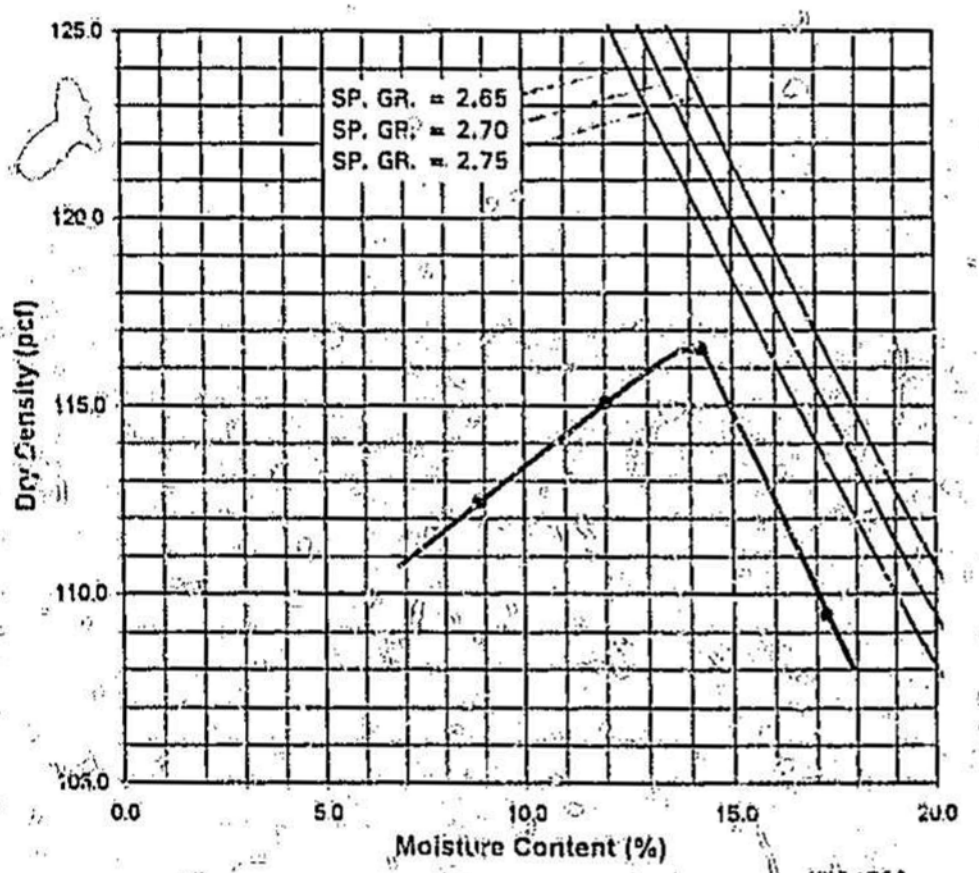
[X] Procedure A
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

[ ] Procedure B
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + #4 > 20% and + 3/8" < 20%

[ ] Procedure C
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + ¾ in <30%

Particle-Size Distribution:
GR,SA,FI

Atterberg Limits:
LL,PL,PI



| Sample | Compacted Moisture (%) | Compacted Dry Density (pcf) | Final Moisture (%) | Volumetric Swell (%) | Expansion Index[1] Value/Method | | Expansive Classification[2] | Soluble Sulfate (%) | Sulfate Exposure[3] |
|---|---|---|---|---|---|---|---|---|---|
| Boring H-2 B-2 @ 10-12' | 13.7 | 100.1 | 34.0 | 9.2 | 96 | B | High | 0.2700 | Severe |
| Boring H-3 B-1 @ 0-5' | 16.2 | 104.2 | 28.5 | 4.9 | 54 | B | Medium | 0.2250 | Severe |
| | | | | | | | | | |
| | | | | | | | | | |
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Test Method:

ASTM D4829 / UBC Standard 18-2

HACH SF-1 (Turbidimetric)

*Notes:*

1. Expansion Index (EI) method of determination:
   [A] E.I. determined by adjusting water content to achieve a 50 ±1% degree of saturation
   [B] E.I. calculated based on measured saturation within the range of 40% and 60%
2. 1997 UBC Table 18-1-B *(Classification of Expansive Soil)*
3. 1997 UBC Table 19-A-4 *(Requirement for Concrete Exposed to Sulfate-Containing Solutions)*

**Expansion Index and Soluble Sulfate Test Results**

Project No. 02021-01

Project Name: Segerstrom/ Ethulex

NMG

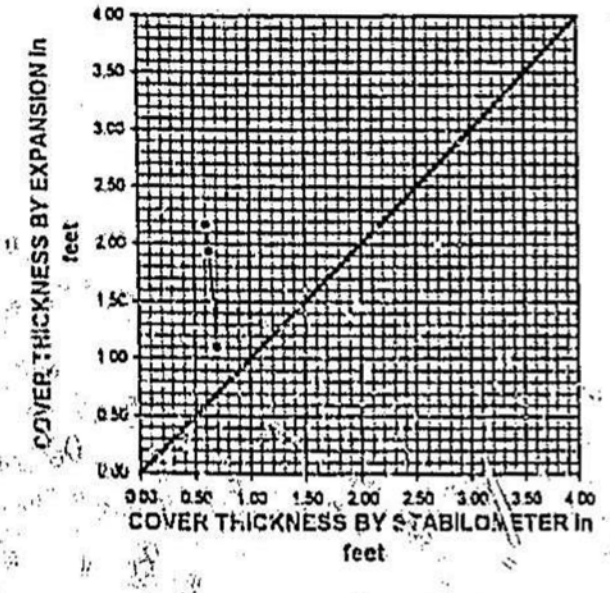
| TERATEST LABS | R-VALUE TEST RESULTS |
|---|---|

| | | | |
|---|---|---|---|
| PROJECT NAME: | Emulex/ Home Ranch | PROJECT NUMBER: | 02021-01 |
| SAMPLE NUMBER: | B-1 | SAMPLE LOCATION: | T-1 |
| SAMPLE DESCRIPTION: | s(ML) | TECHNICIAN: | ACS |
| | | DATE SAMPLED | 4/25/02 |

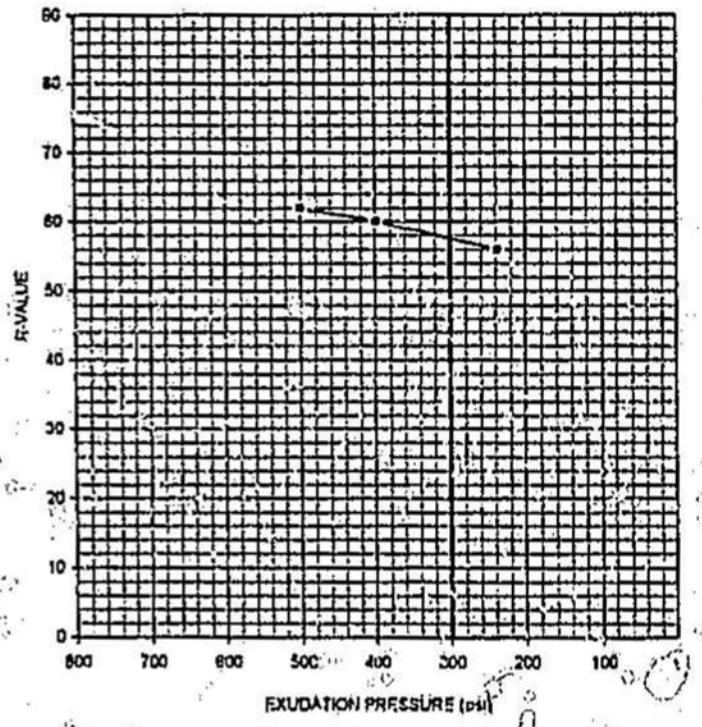
| TEST SPECIMEN | a | b | c |
|---|---|---|---|
| MOISTURE AT COMPACTION % | 13.8 | 14.2 | 15.1 |
| HEIGHT OF SAMPLE, inches | 2.48 | 2.48 | 2.51 |
| DRY DENSITY, pcf | 111.1 | 110.6 | 110.2 |
| COMPACTOR AIR PRESSURE, psf | 300 | 250 | 200 |
| EXUDATION PRESSURE, psf | 500 | 399 | 238 |
| EXPANSION, Inches x 10exp-4 | 65 | 58 | 33 |
| STABILITY Ph 2,000 lbs (160 psi) | 38 | 40 | 44 |
| TURNS DISPLACEMENT | 4.92 | 5.10 | 5.21 |
| R-VALUE UNCORRECTED | 62 | 60 | 56 |
| R-VALUE CORRECTED | 62 | 60 | 56 |

| DESIGN CALCULATION DATA | a | b | c |
|---|---|---|---|
| GRAVEL EQUIVALENT FACTOR | 1.0 | 1.0 | 1.0 |
| TRAFFIC INDEX | 5.0 | 5.0 | 5.0 |
| STABILOMETER THICKNESS, ft. | 0.61 | 0.64 | 0.70 |
| EXPANSION PRESSURE THICKNESS, ft. | 2.17 | 1.93 | 1.10 |

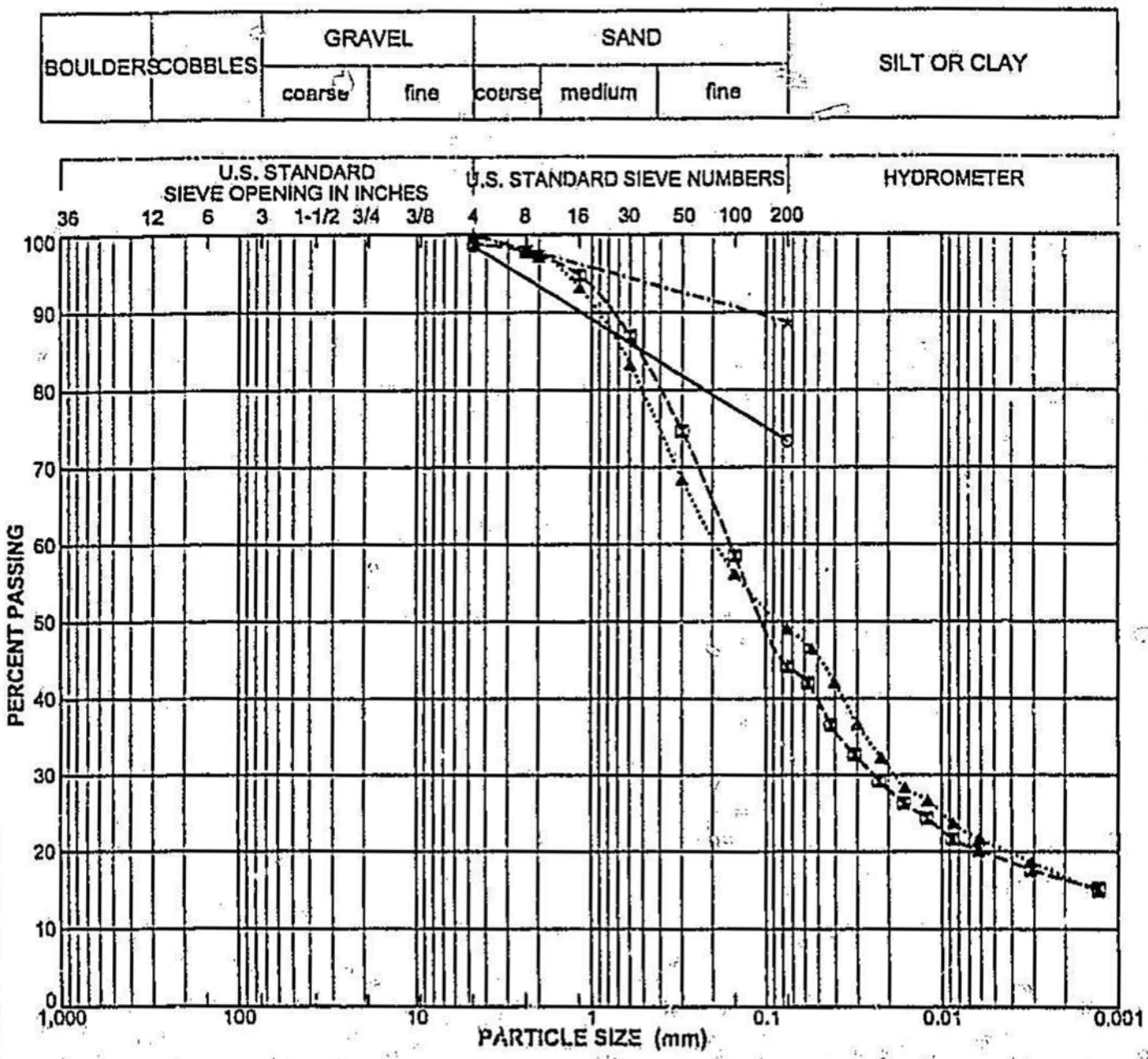
EXPANSION PRESSURE CHART




EXUDATION PRESSURE CHART




| | |
|---|---|
| R-VALUE BY EXPANSION: | 55 |
| R-VALUE BY EXUDATION: | 58 |
| EQUILIBRIUM R-VALUE: | 55 |



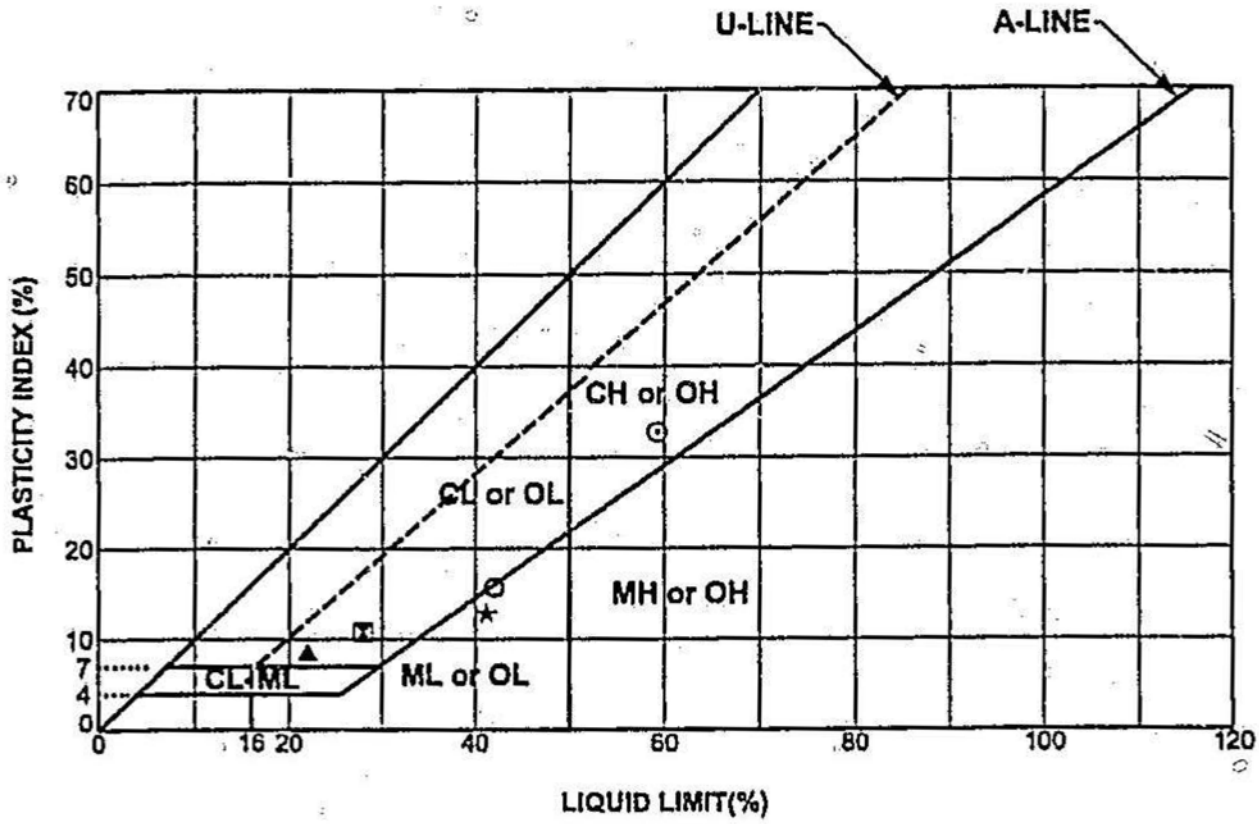

| Symbol | Boring Number | Sample Number | Depth (feet) | Field Moisture (%) | LL | PI | Activity PI/<2μ | $C_u$ | $C_c$ | Passing No. 200 Sieve (%) | Passing 2μ (%) | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | H-1 | B-1 | 0.0 | | | | | | | 73 | | ML |
| ⊠ | H-2 | D-7 | 30.0 | 16 | 28 | 11 | | | | 44 | 16 | SC |
| ▲ | H-3 | D-5 | 20.0 | 14 | 22 | 9 | | | | 49 | 17 | SC |
| ★ | H-5 | B-1 | 0.0 | | | | | | | 89 | | ML |

# PARTICLE SIZE DISTRIBUTION

Standard Pacific/Home Ranch
Costa Mesa, CA
PROJECT NO. 01071-01

NMG Geotechnical, Inc.

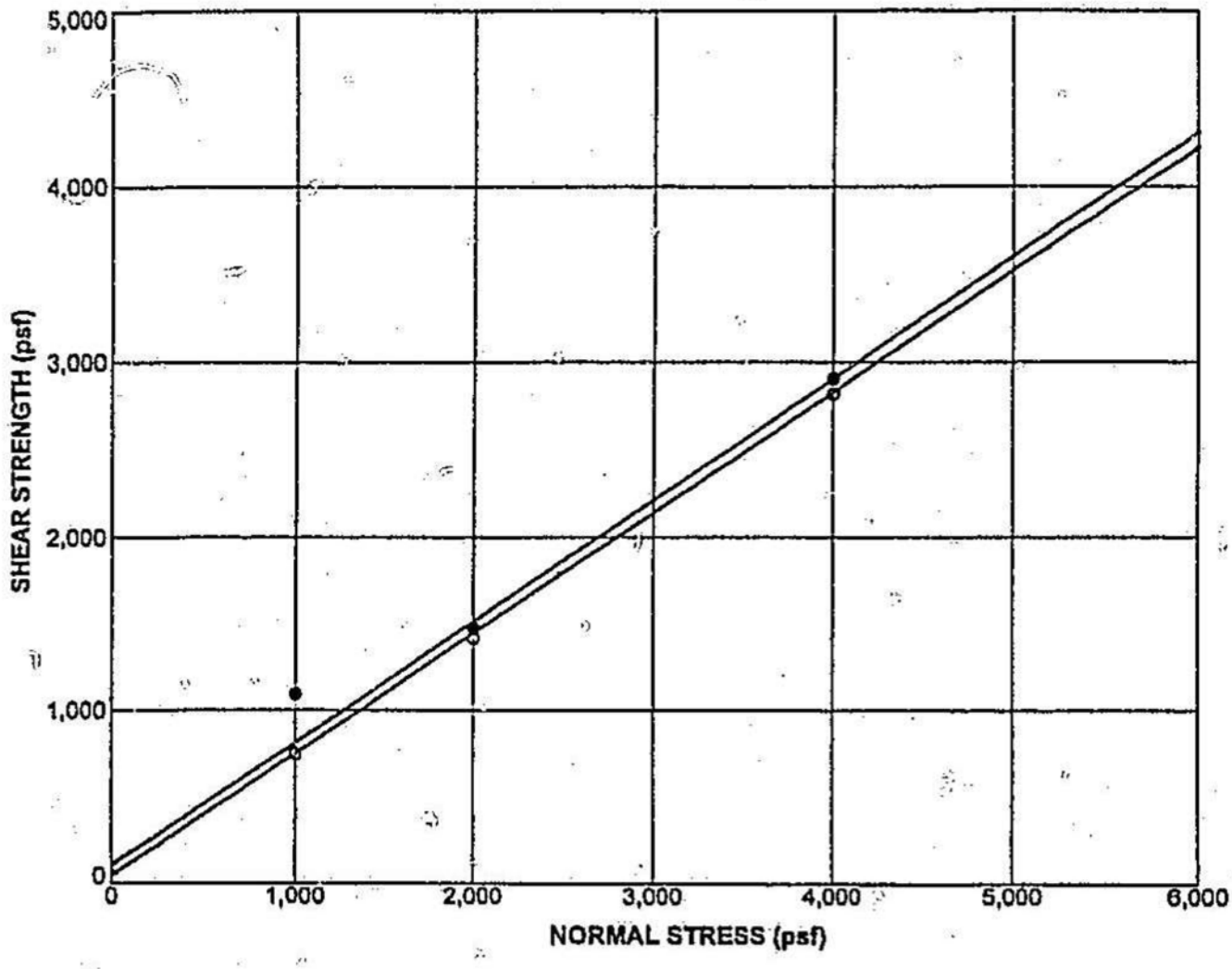
Template\NMSIV- Pd ID: 01071-01 GPJ: Printed: 6/3/02




| Symbol | Boring Number | Depth (feet) | Sample Number | Passing No. 200 Sieve (%) | LL | PI | USCS | Description |
|---|---|---|---|---|---|---|---|---|
| ○ | H-1 | 7.5 | D-3 | | 42 | 16 | CL/ML | Silty CLAY/Clayey SILT |
| ⊠ | H-2 | 30.0 | D-7 | 44 | 28 | 11 | SC | Clayey SAND |
| ▲ | H-3 | 20.0 | D-5 | 49 | 22 | 9 | SC | Clayey SAND |
| + | H-5 | 4.0 | D-1 | | 41 | 13 | ML | Fine sandy SILT |
| ⊙ | T-3 | 4.0 | D-1 | | 59 | 33 | CH | CLAY |

**PLASTICITY CHART**
Standard Pacific/Home Ranch
Costa Mesa, CA
PROJECT NO. 01071-01

NMG Geotechnical, Inc.



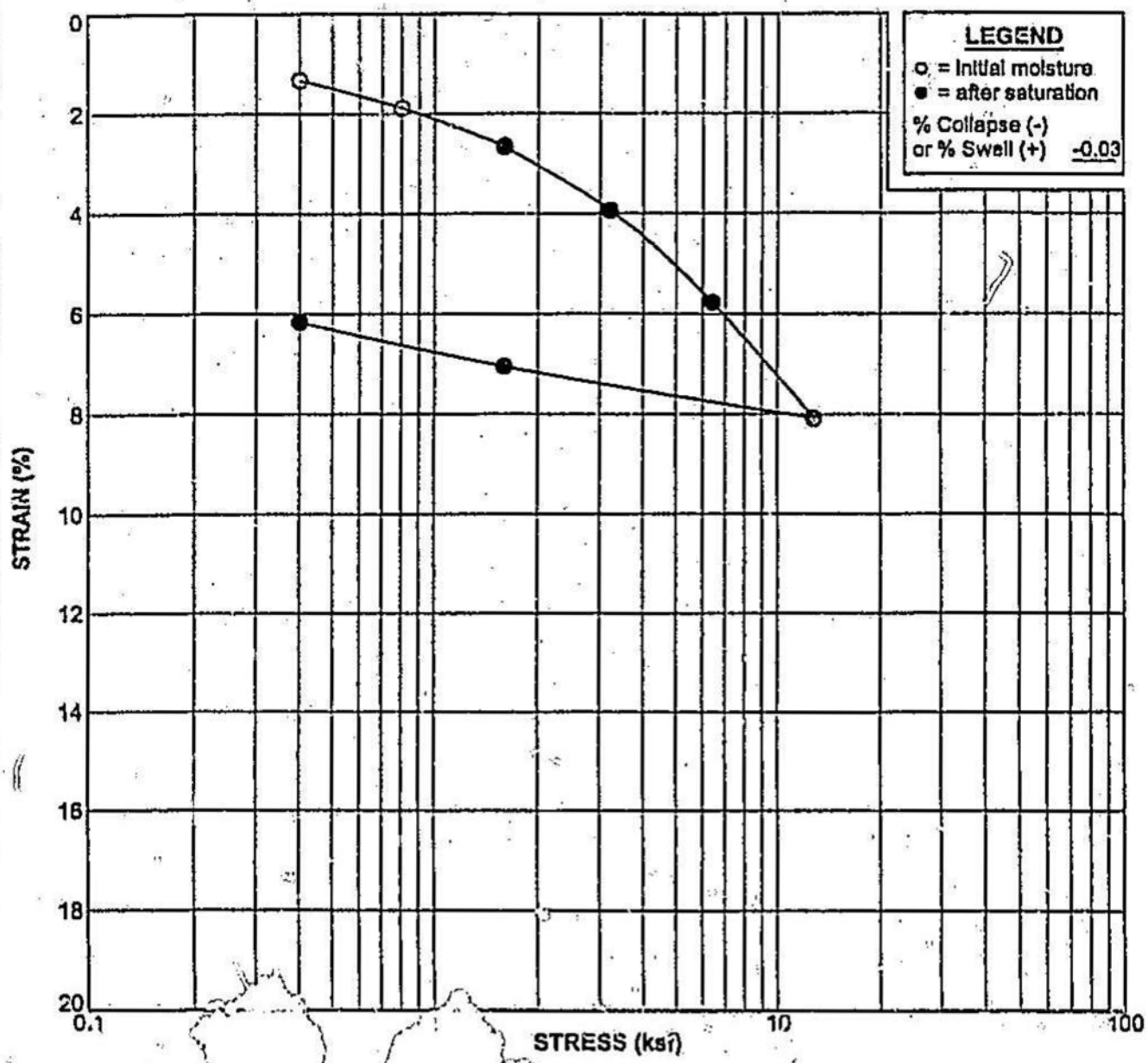

| Boring No. H-1 | Sample No. B-1 | Depth: 0.0 ft |
|---|---|---|
| Sample Description: Olive Sandy SILT | | |
| Liquid Limit: | Plasticity Index: | Percent Passing No. 200 Sieve: 73 |
| Moisture Content (%): 22.5 | Dry Density (pcf): 106.8 | Degree of Saturation (%): 109 |
| Sample Type: Remolded to 90% R.C. Rate of Shear (in./min.): .05 | | |

| SHEAR STRENGTH PARAMETERS | | |
|---|---|---|
| Parameter | Peak ● | Ultimate ○ |
| Cohesion (psf) | 100 | 50 |
| Friction Angle (degrees) | 35 | 35.0 |

**DIRECT SHEAR TEST RESULTS**

Standard Pacific/Home Ranch
Costa Mesa, CA
PROJECT NO. 01071.01

NMG Geotechnical, Inc.




| | | | |
|---|---|---|---|
| [illegible] H- [illegible] | [illegible]le No. D-3 | Depth: 7.5 ft | |
| [illegible] Description: [illegible] | Clayey SILT | | |
| [illegible]d Limit: 42 | Plasticity Index: 16 | Percent Passing No. 200 Sieve: | |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| Initial | 27.3 | 96.5 | 101.5 | 0.713 |
| Final | 25.7 | 102.4 | 110.6 | 0.615 |

# CONSOLIDATION TEST RESULTS

Standard Pacific/Homo Ranch
Costa Mesa, CA
PROJECT NO. 01071-01

NMG Geotechnical, Inc.

Template: NMGTDUS Rel ID: 01071-01.GPJ Created: 3/27/02

| Sample No. | Sample Description | Test Method | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|---|
| H-1 B-1 0-5' | Gray Brown fine Sandy SILT | A | 118.5 | 12.5 |
| H-5 B-1 0-5' | Dark Gray Brown fine Sandy SILT with trace Clay | A | 118.5 | 13.0 |
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Test Method:

[A] ASTM D1557 *for Soil and Aggregate Base*
[B] CTM 216 *for Asphaltic Concrete (Hveem)*
[C] ASTM D1559 & ASTM D2726 *for Asphaltic Concrete (Marshall)*

*Notes:*

**Maximum Density Test Results**
(FSM010 Rev.1)

Project No. 01071-01

Project Name: Standard Pacific/Horne Ranch

NMG

| Sample | Compacted Moisture (%) | Compacted Dry Density (pcf) | Final Moisture (%) | Volumetric Swell (%) | Expansion Index | | Expansive Classification | Soluble Sulfate (%) | Sulfate Exposure |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Valid Method | | | | |
| Surface Sample (11/15/01) B-1 @ 2' | 12.0 | 101.1 | 29.9 | .71 | 70 | B | Medium | .0225 | Negligible |
| H-1 B-1 0-5' | 14.0 | 102.3 | 24.3 | .33 | 38 | B | Low | .0150 | Negligible |
| H-5 B-1 0-5' | 15.5 | 97.9 | 34.1 | .86 | 94 | B | High | .0186 | Negligible |
| | | | | | | | | | |
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Test Method:

ASTM D4829 / UBC Standard 18-2

HACH SE 1 (Turbidimetric)

*Notes:*

1. Expansion Index (EI) method of determination:
   [A] E.I. determined by adjusting water content to achieve a 50 ±1% degree of saturation
   [B] E.I. calculated based on measured saturation within the range of 40% and 60%
2. 1997 UBC Table 18-1-B *(Classification of Expansive Soil)*
3. 1997 UBC Table 19-A-4 *(Requirements for Concrete Exposed to Sulfate-Containing Solutions)*

**Expansion Index and Soluble Sulfate Test Results**
(FRM001 Rev.5)

Project No. 01071-01

Project Name: Standard Pacific/Home Ranch

NMG

| Sample No. | Sample Location | R-Value | Remarks |
|---|---|---|---|
| B-1 0-5' | H-2 (Northeast Corner) | 16 | Run by Teratest Labs |
| B-1 0-5' | H-5 (Southeast Corner) | 13 | Run by Teratest Labs |
| | | | |
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Test Method:

ASTM D2844 or CTM 301

Notes:

**R-Value Test Results**
(FRM030 Rev.1)

Project No. 01071-01

Project Name: Standard Pacific/Home Ranch

NMG

| TERATEST LABS | R-VALUE TEST RESULTS |
|---|---|

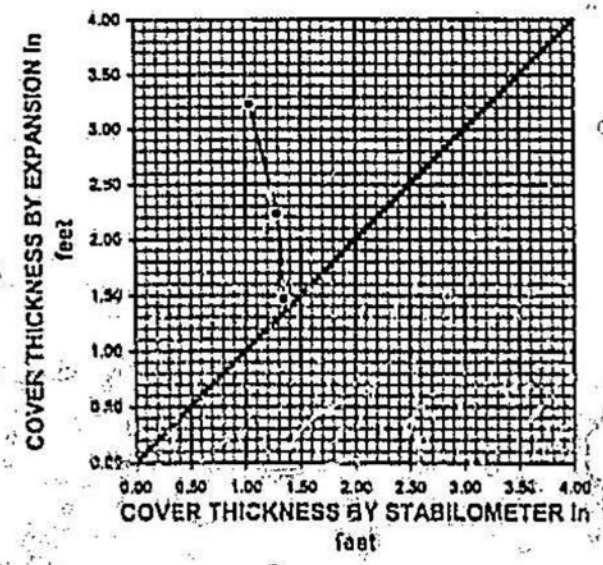
PROJECT NAME: SP / Home Ranch
SAMPLE NUMBER: B-1
SAMPLE DESCRIPTION: ML

PROJECT NUMBER: 01071-0[illegible]
SAMPLE LOCATION: H-5 0-5'
TECHNICIAN: SCF
DATE SAMPLED 1/14/02

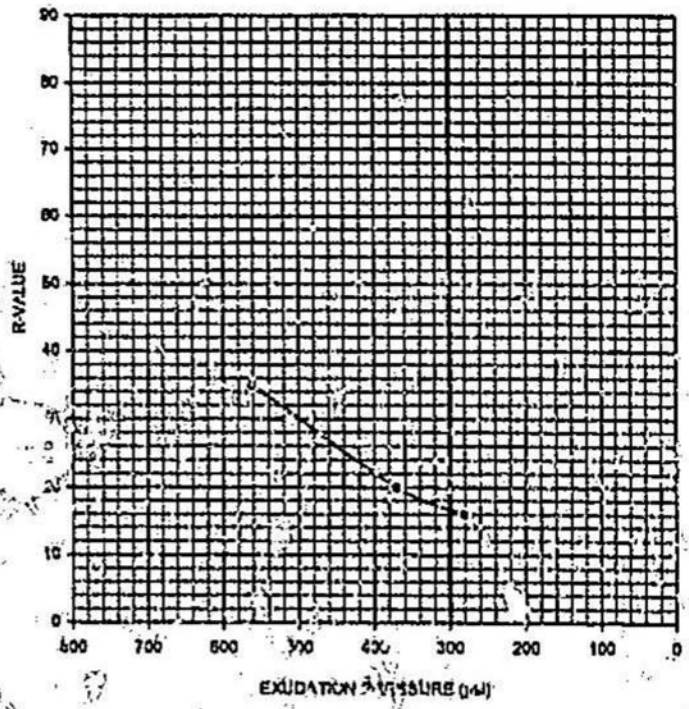
| TEST SPECIMEN | a | b | c |
|---|---|---|---|
| MOISTURE AT COMPACTION % | 18.9 | 19.9 | 20.4 |
| HEIGHT OF SAMPLE, Inches | 2.46 | 2.54 | 2.54 |
| DRY DENSITY, pcf | 108.7 | 106.1 | 104.9 |
| COMPACTOR AIR PRESSURE, psf | 150 | 75 | 50 |
| EXUDATION PRESSURE, psf | 562 | 371 | 281 |
| EXPANSION, Inches x 10exp-4 | 97 | 67 | 44 |
| STABILITY Ph 2,000 lbs (160 psi) | 89 | 117 | 124 |
| TURNS DISPLACEMENT | 3.66 | 3.79 | 3.89 |
| R-VALUE UNCORRECTED | 35 | 20 | 16 |
| R-VALUE CORRECTED | 35 | 20 | 16 |

| DESIGN CALCULATION DATA | a | b | c |
|---|---|---|---|
| GRAVEL EQUIVALENT FACTOR | 1.0 | 1.0 | 1.0 |
| TRAFFIC INDEX | 5.0 | 5.0 | 5.0 |
| STABILOMETER THICKNESS, ft. | 1.04 | 1.28 | 1.34 |
| EXPANSION PRESSURE THICKNESS, ft. | 3.23 | 2.23 | 1.47 |

EXPANSION PRESSURE CHART




EXUDATION PRESSURE CHART




R-VALUE BY EXPANSION: 13
R-VALUE BY EXUDATION: 17
EQUILIBRIUM R-VALUE: 13

| TERATEST LABS | R-VALUE TEST RESULTS |
|---|---|

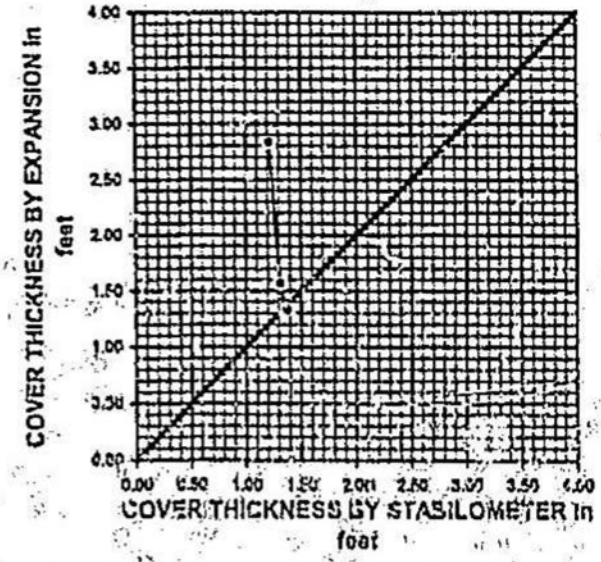
PROJECT NAME: SP / Home Ranch
SAMPLE NUMBER: B-1
SAMPLE DESCRIPTION: ML

PROJECT NUMBER: 01071-01
SAMPLE LOCATION: H-2 0-5'
TECHNICIAN: SCF
DATE SAMPLED 1/14/02

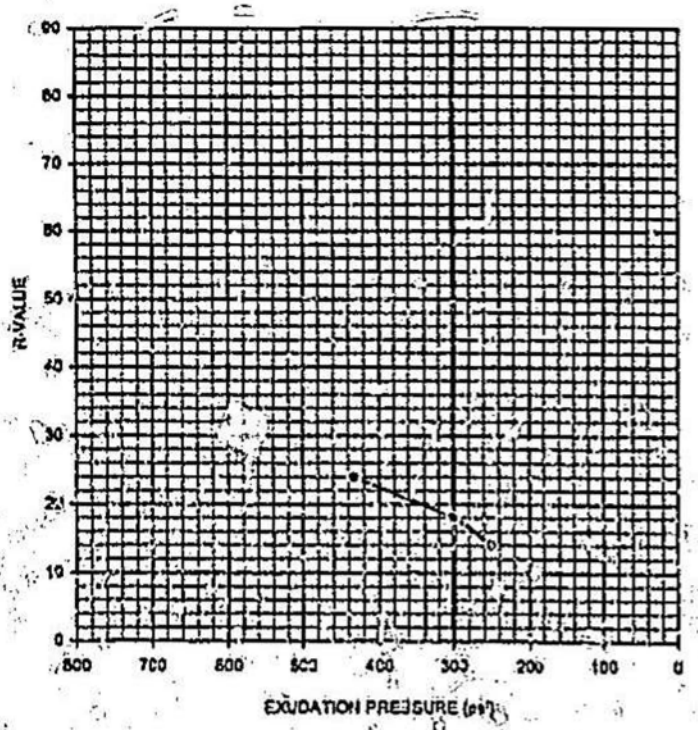
| TEST SPECIMEN | a | b | c |
|---|---|---|---|
| MOISTURE AT COMPACTION % | 21.9 | 22.9 | 23.1 |
| HEIGHT OF SAMPLE, Inches | 2.55 | 2.65 | 2.60 |
| DRY DENSITY, pcf | 103.1 | 99.2 | 100.7 |
| COMPACTOR AIR PRESSURE, psf | 125 | 50 | 50 |
| EXUDATION PRESSURE, psf | 432 | 302 | 251 |
| EXPANSION, Inches x 10exp-4 | 85 | 47 | 40 |
| STABILITY Ph 2,000 lbs (160 psi) | 114 | 124 | 130 |
| TURNS DISPLACEMENT | 3.27 | 3.62 | 3.86 |
| R-VALUE UNCORRECTED | 24 | 17 | 13 |
| R-VALUE CORRECTED | 24 | 18 | 14 |

| DESIGN CALCULATION DATA | a | b | c |
|---|---|---|---|
| GRAVEL EQUIVALENT FACTOR | 1.0 | 1.0 | 1.0 |
| TRAFFIC INDEX | 5.0 | 5.0 | 5.0 |
| STABILOMETER THICKNESS, ft. | 1.22 | 1.31 | 1.38 |
| EXPANSION PRESSURE THICKNESS, ft. | 2.83 | 1.57 | 1.33 |

EXPANSION PRESSURE CHART




EXUDATION PRESSURE CHART




R-VALUE BY EXPANSION: 16
R-VALUE BY EXUDATION: 18
EQUILIBRIUM R-VALUE: 16

M. J. Schiff & Associates, Inc.
*Consulting Corrosion Engineers - Since 1959*
1308 Monte Vista Avenue, Suite 6
Upland, CA 91786-8224
Phone: 909/931-1360

## Table 1 - Laboratory Tests on Soil Samples

*Home Ranch Residential Project, Costa Mesa, CA*
*Your #01071-01, MJS&A #02-0049HQ*
*22-Jan-02*

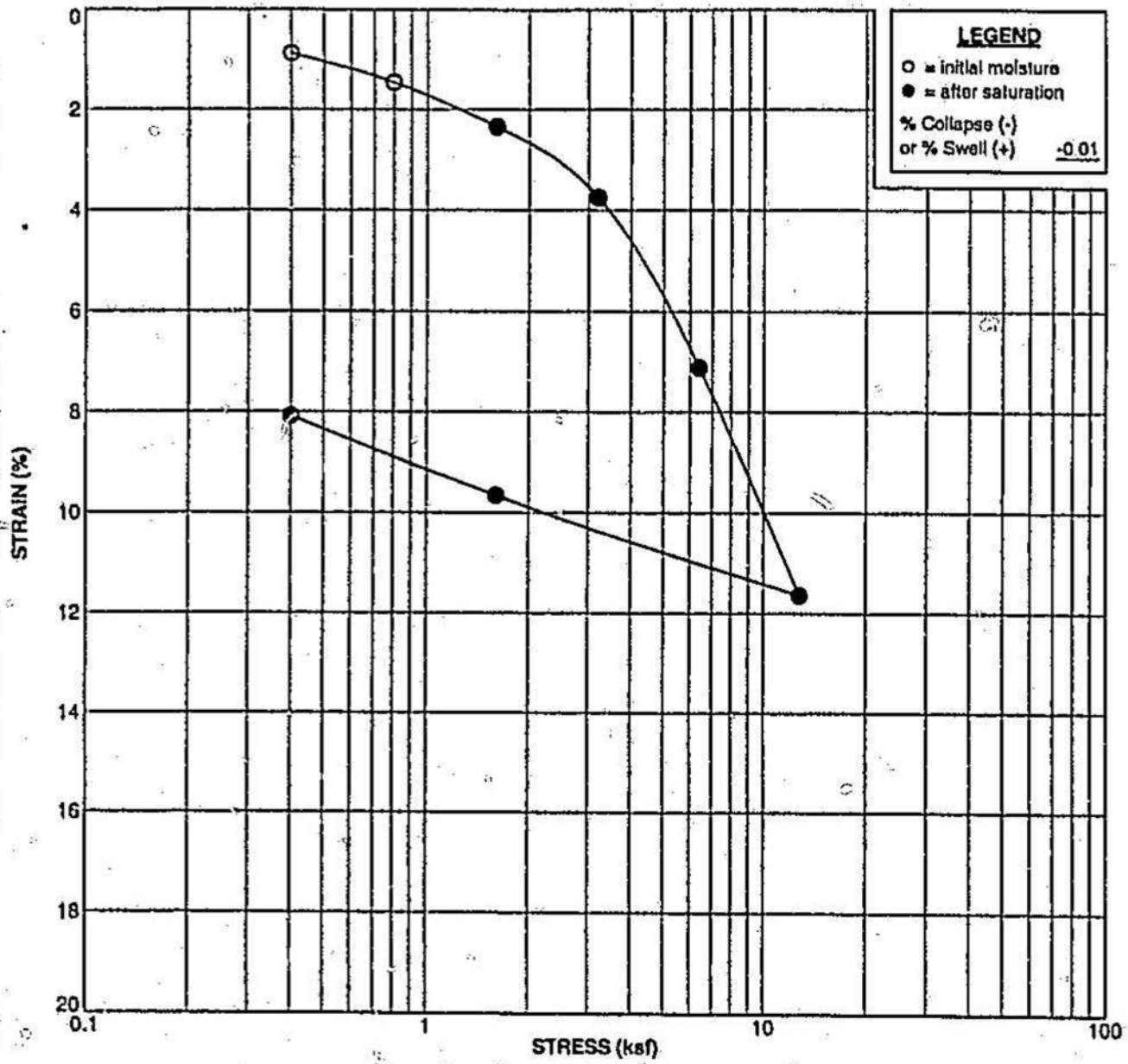
| Sample ID | | | Trench T-4 @ 1-4' Sample No MB-1 Dark Grayish Brown Silt | Trench T-5 @ 10-12' Sample No. MB-1 Very Dark Grayish Brown Clay |
|---|---|---|---|---|
| Resistivity | | Units | | |
| as-received | | ohm-cm | 7,500 | 860 |
| saturated | | ohm-cm | 1,500 | 860 |
| pH | | | 6.6 | 6.7 |
| Electrical Conductivity | | mS/cm | 0.29 | 0.23 |
| Chemical Analyses | | | | |
| Cations | | | | |
| calcium | $Ca^{2+}$ | mg/kg | 144 | 28 |
| magnesium | $Mg^{2+}$ | mg/kg | 24 | 19 |
| sodium | $Na^{1+}$ | mg/kg | ND | 107 |
| Anions | | | | |
| carbonate | $CO_3^{2-}$ | mg/kg | ND | ND |
| bicarbonate | $HCO_3^{1-}$ | mg/kg | 284 | 149 |
| chloride | $Cl^{1-}$ | mg/kg | 45 | 65 |
| sulfate | $SO_4^{2-}$ | mg/kg | 126 | 162 |
| Other Tests | | | | |
| ammonium | $NH_4^{1+}$ | mg/kg | 9.4 | 13.5 |
| nitrate | $NO_3^{1-}$ | mg/kg | 5.8 | 67.9 |
| sulfide | $S^{2-}$ | qual | na | na |
| Redox | | mv | na | na |

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

# LABORATORY TEST RESULTS

## ADDITIONAL CONSOLIDATION TESTING (NOT INCLUDED IN PRIOR REPORTS)

| *Sample ID* | *Time-Rate Loading* |
|---|---|
| 1) H-1, D-2 @10' | 1.6 ksf |
| 2) H-1, D-4 @17.5' | 1.6 ksf |
| 3) H-1, D-4 @17.5 | 3.2 ksf |
| 4) H-2, D-4 @15' | 1.6 ksf |
| 5) H-2, D-4 @15' | 3.2 ksf |
| 6) H-3, D-2 @7.5' | 1.6 ksf |




| Boring No. H- 1 | Sample No. D-2 | Depth: 10.0 ft |
|---|---|---|
| Sample Description: | Olive Brown CLAY (CH) | |
| Liquid Limit: | Plasticity Index: | Percent Passing No. 200 Sieve: |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| Initial | 31.7 | 89.6 | 99.1 | 0.846 |
| Final | 28.1 | 98.7 | 104.9 | 0.710 |

## CONSOLIDATION TEST RESULTS

Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG Geotechnical, Inc.

Template: NMCONS; PJID: 02021-01.GPJ; Printed: 10/8/02

| Project No. : 02021-01 | Project Name: CJS/EMULEX |
|---|---|

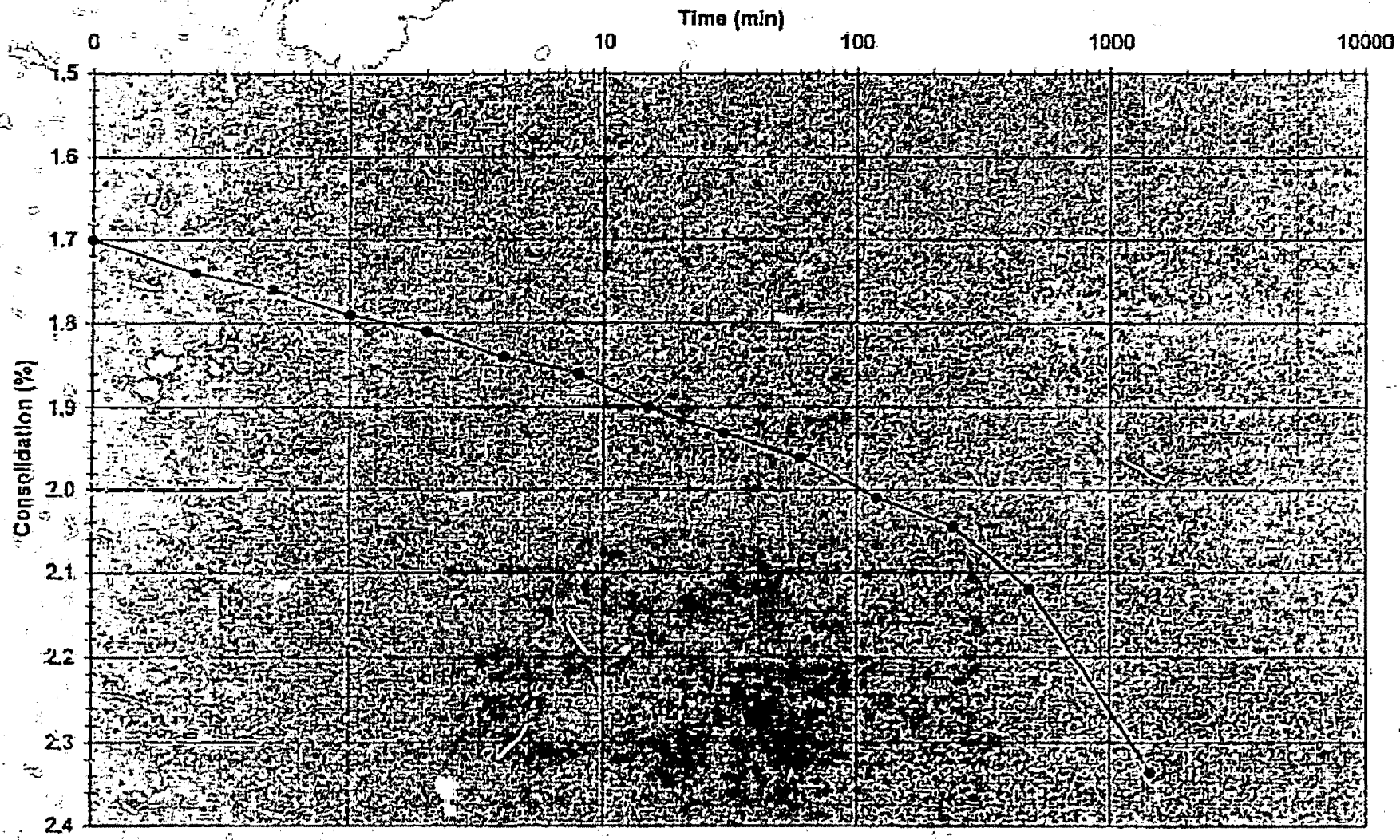
Date:

Sample ID: H-1, D-2 , 1.6 KSF

| Time Readings | Time (min) | Sq.Rt. Time (Min) | Strain |
|---|---|---|---|
| 6 sec | 0.10 | 0.32 | 1,700 |
| 15 sec | 0.25 | 0.50 | 1,740 |
| 30 sec | 0.50 | 0.71 | 1,760 |
| 1 min | 1.00 | 1.00 | 1,790 |
| 2 min | 2.00 | 1.41 | 1,810 |
| 4 min | 4.00 | 2.00 | 1,840 |
| 8 min | 8.00 | 2.83 | 1,860 |
| 15 min | 15.00 | 3.87 | 1,900 |
| 30 min | 30.00 | 5.48 | 1,930 |
| 1 hr | 60.00 | 7.75 | 1,960 |
| 2 hr | 120.00 | 10.95 | 2,010 |
| 4 hr | 240.00 | 15.49 | 2,045 |
| 8 hr | 480.00 | 21.91 | 2,120 |
| 24 hr | 1440.00 | 37.95 | 2,335 |

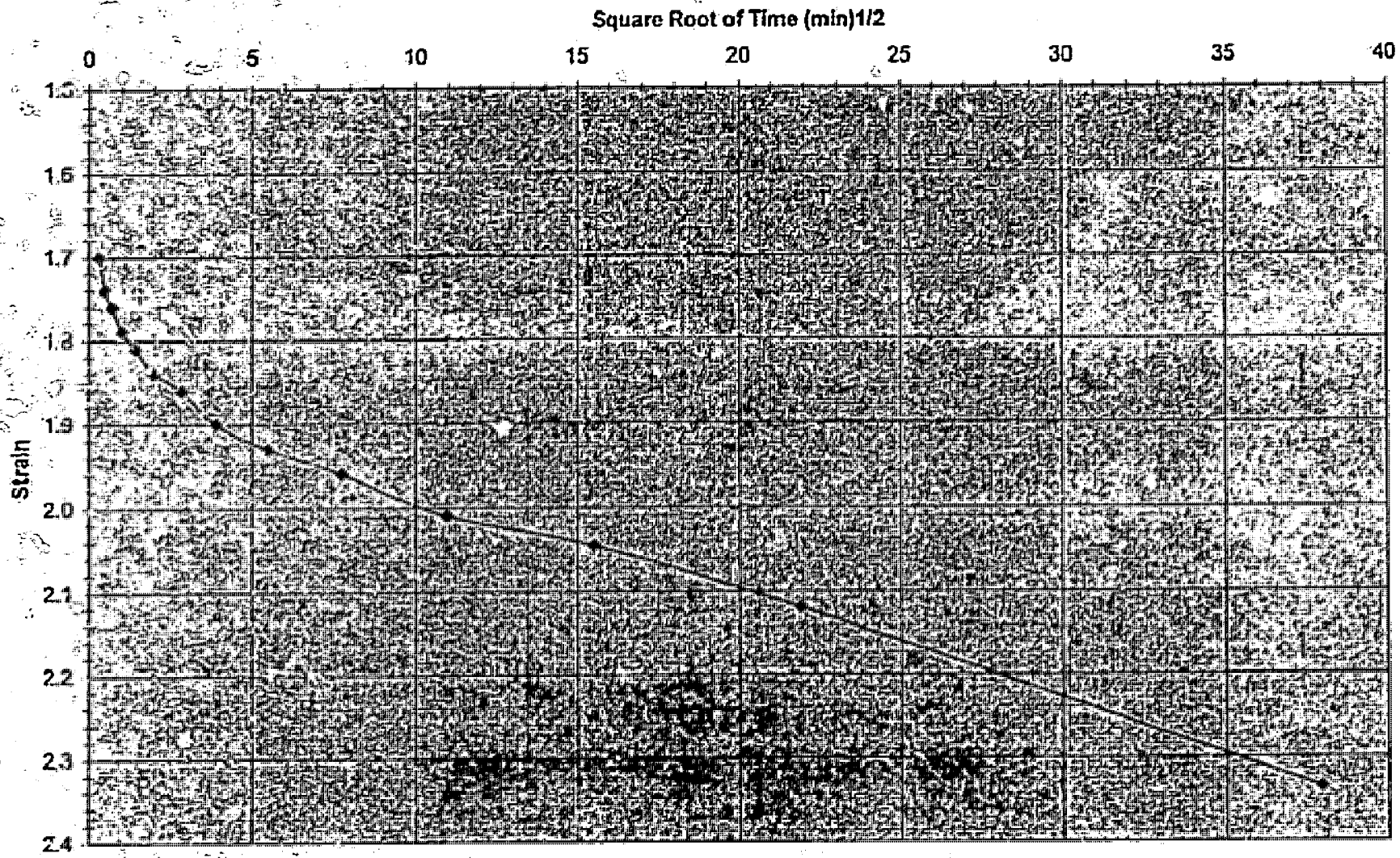
## Time-Rate Consolidation

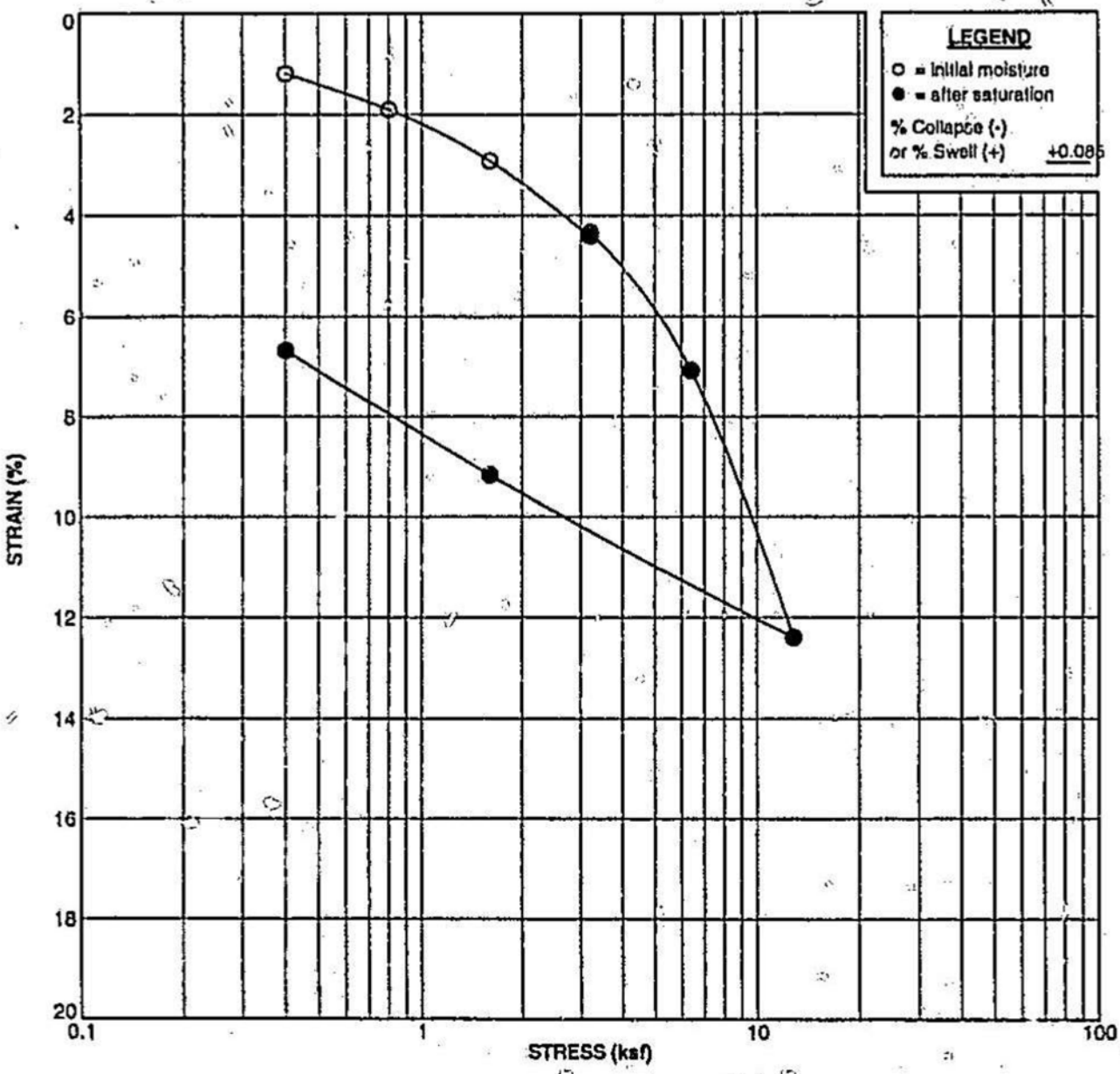
H-1, D-2 @ 1.6KSF



## Time-Rate Consolidation

H-1, 0-2 @ 1.6 KSF






| Boring No. H- 1 | Sample No. D-4 | Depth: 17.5 ft |
|---|---|---|
| Sample Description: | Brown Silty CLAY (CH) | |
| Liquid Limit: | Plasticity Index: | Percent Passing No. 200 Sieve: |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| Initial | 37.4 | 82.9 | 99.7 | 0.995 |
| Final | 36.2 | | 110.5 | 0.871 |

## CONSOLIDATION TEST RESULTS

Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG Geotechnical, Inc.

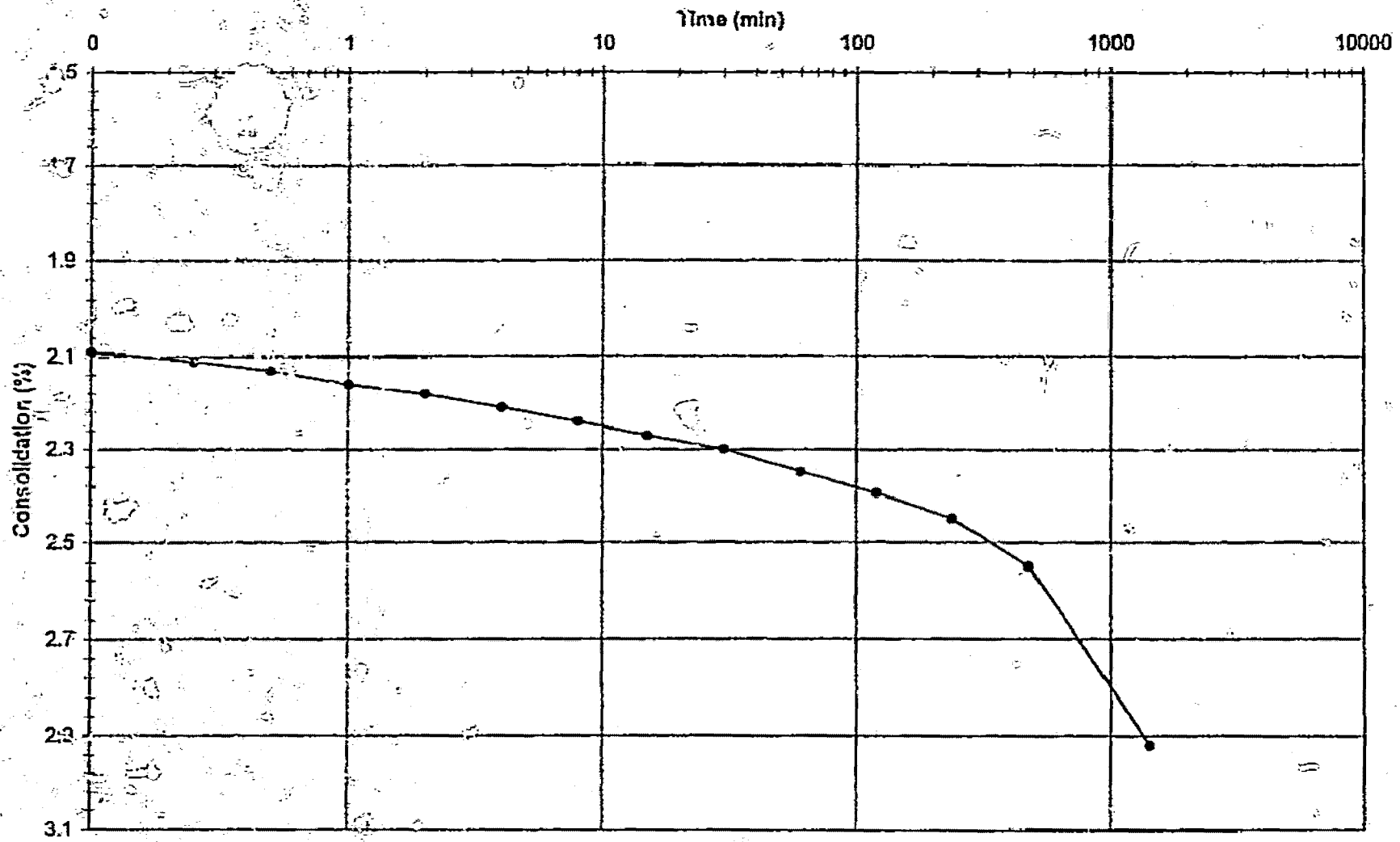
Template: NMCONS; Prj ID: 02021-01.GPJ; Printed: 10/29/02

| Project No. : 02021-01 | Project Name: CJS/EMULEX |
|---|---|
| Date: 9/20/02 | |
| Sample ID: H-1 D-4 @ 1.6 KSF | |

| Time Readings | Time (min) | Sq.Rt. Time (Min) | Strain |
|---|---|---|---|
| 6 sec. | 0.10 | 0.32 | 2,090 |
| 15 sec | 0.25 | 0.50 | 2,110 |
| 30 sec | 0.50 | 0.71 | 2,130 |
| 1 min | 1.00 | 1.00 | 2,160 |
| 2 min | 2.00 | 1.41 | 2,180 |
| 4 min | 4.00 | 2.00 | 2,210 |
| 8 min | 8.00 | 2.83 | 2,240 |
| 15 min | 15.00 | 3.87 | 2,270 |
| 30 min | 30.00 | 5.48 | 2,300 |
| 1 hr | 60.00 | 7.75 | 2,350 |
| 2 hr | 120.00 | 10.95 | 2,395 |
| 4 hr | 240.00 | 15.49 | 2,450 |
| 8 hr | 480.00 | 21.91 | 2,550 |
| 24 hr | 1440.00 | 37.95 | 2,920 |

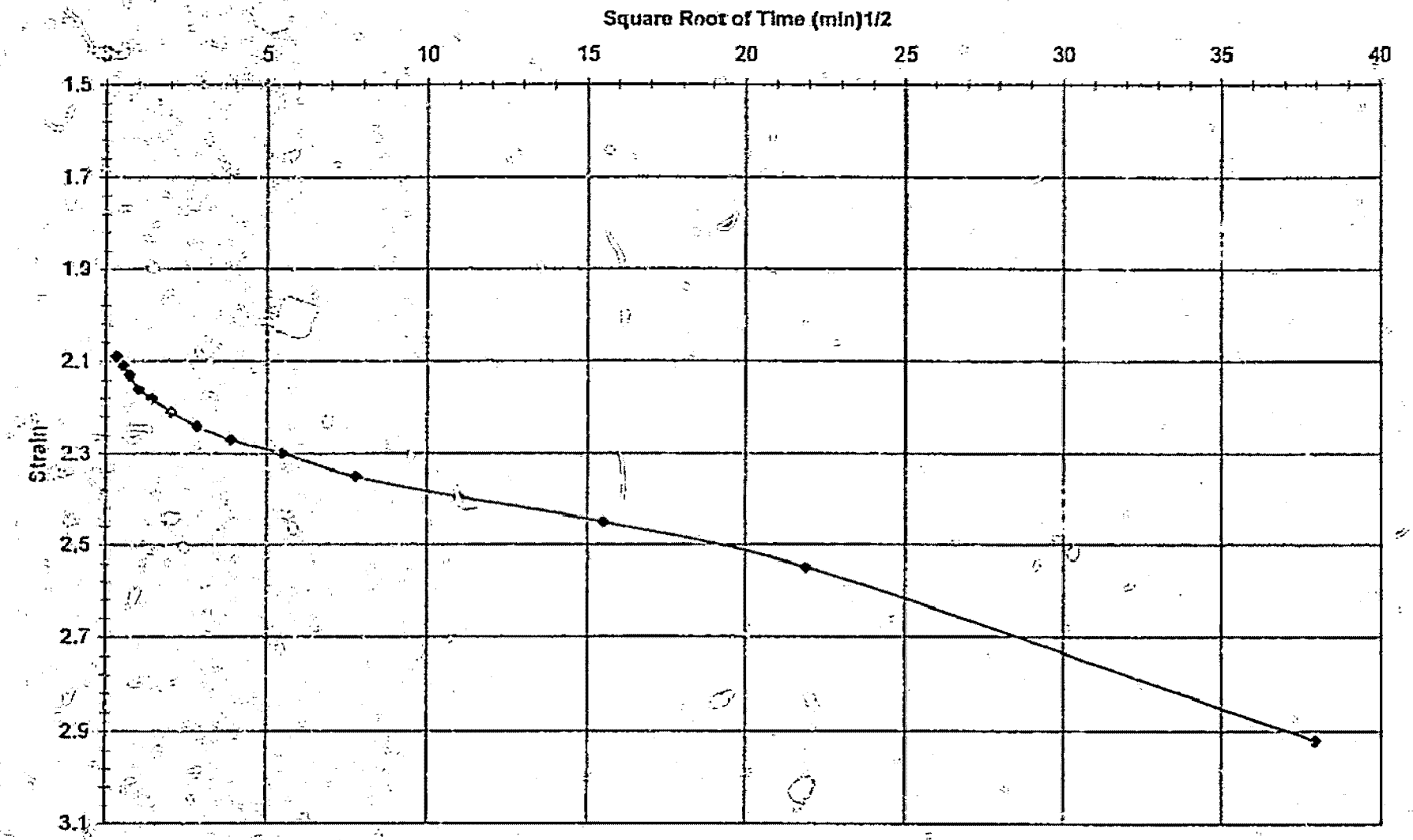
## Time-Rate Consolidation

H-1, D-4 @ 1.6 KSF



## Time-Rate Consolidation

H-1, D-4 @ 1.6 KSF

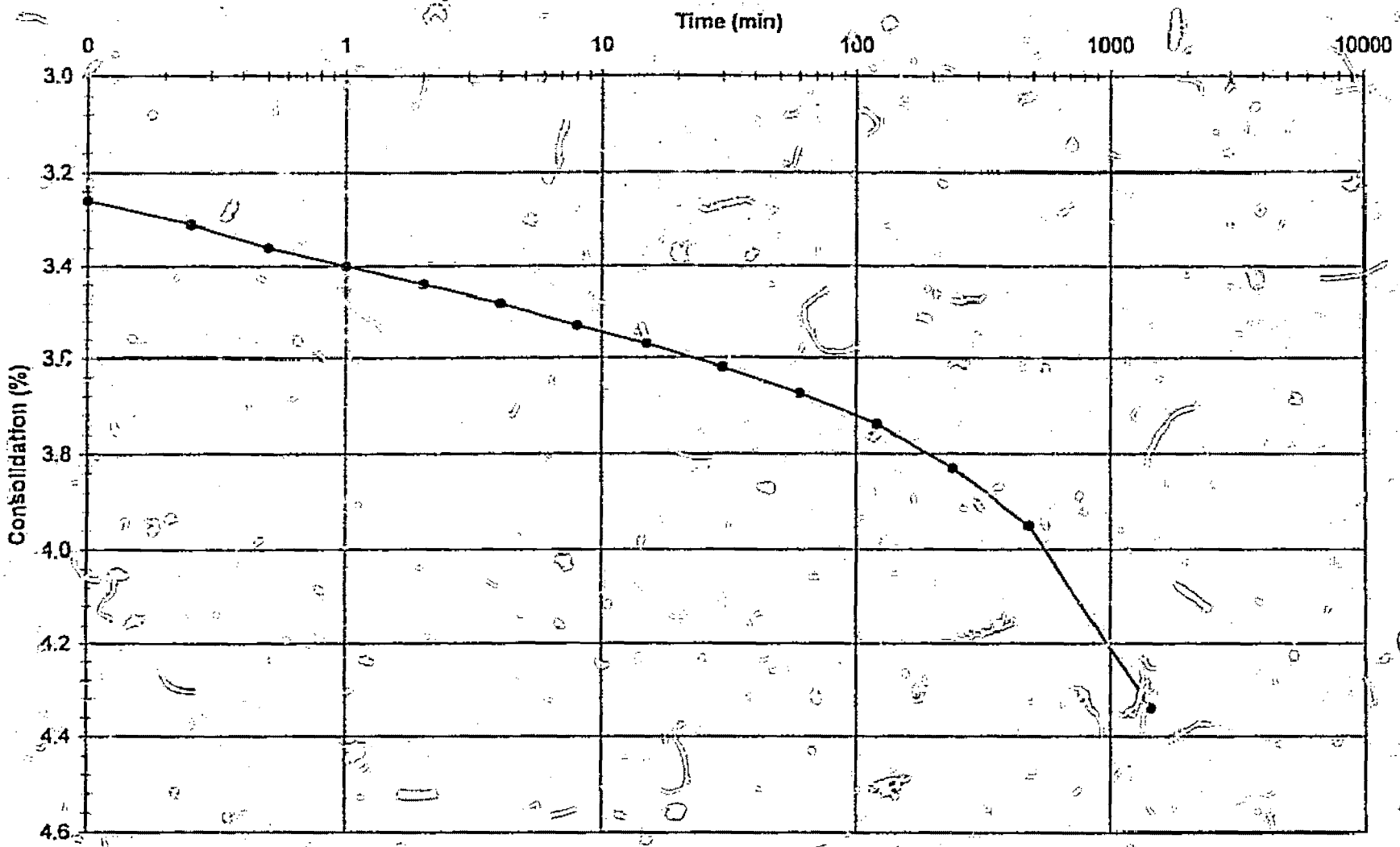


| | |
|---|---|
| Project No.: 02021-01 | Project Name: CJS/EMULEX |
| Date: 9/20/02 | |
| Sample ID: H-1 D-4 @ 3.2 KSF | |

| Time Readings | Time (min) | Sq.Rt. Time (Min) | Strain |
|---|---|---|---|
| 6 sec | 0.10 | 0.32 | 3,260 |
| 15 sec | 0.25 | 0.50 | 3,310 |
| 30 sec | 0.50 | 0.71 | 3,360 |
| 1 min | 1.00 | 1.00 | 3,400 |
| 2 min | 2.00 | 1.41 | 3,440 |
| 4 min | 4.00 | 2.00 | 3,480 |
| 8 min | 8.00 | 2.83 | 3,530 |
| 15 min | 15.00 | 3.87 | 3,570 |
| 30 min | 30.00 | 5.48 | 3,620 |
| 1 hr | 60.00 | 7.75 | 3,675 |
| 2 hr | 120.00 | 10.95 | 3,740 |
| 4 hr | 240.00 | 15.49 | 3,830 |
| 8 hr | 480.00 | 21.91 | 3,950 |
| 24 hr | 1440.00 | 37.95 | 4,340 |

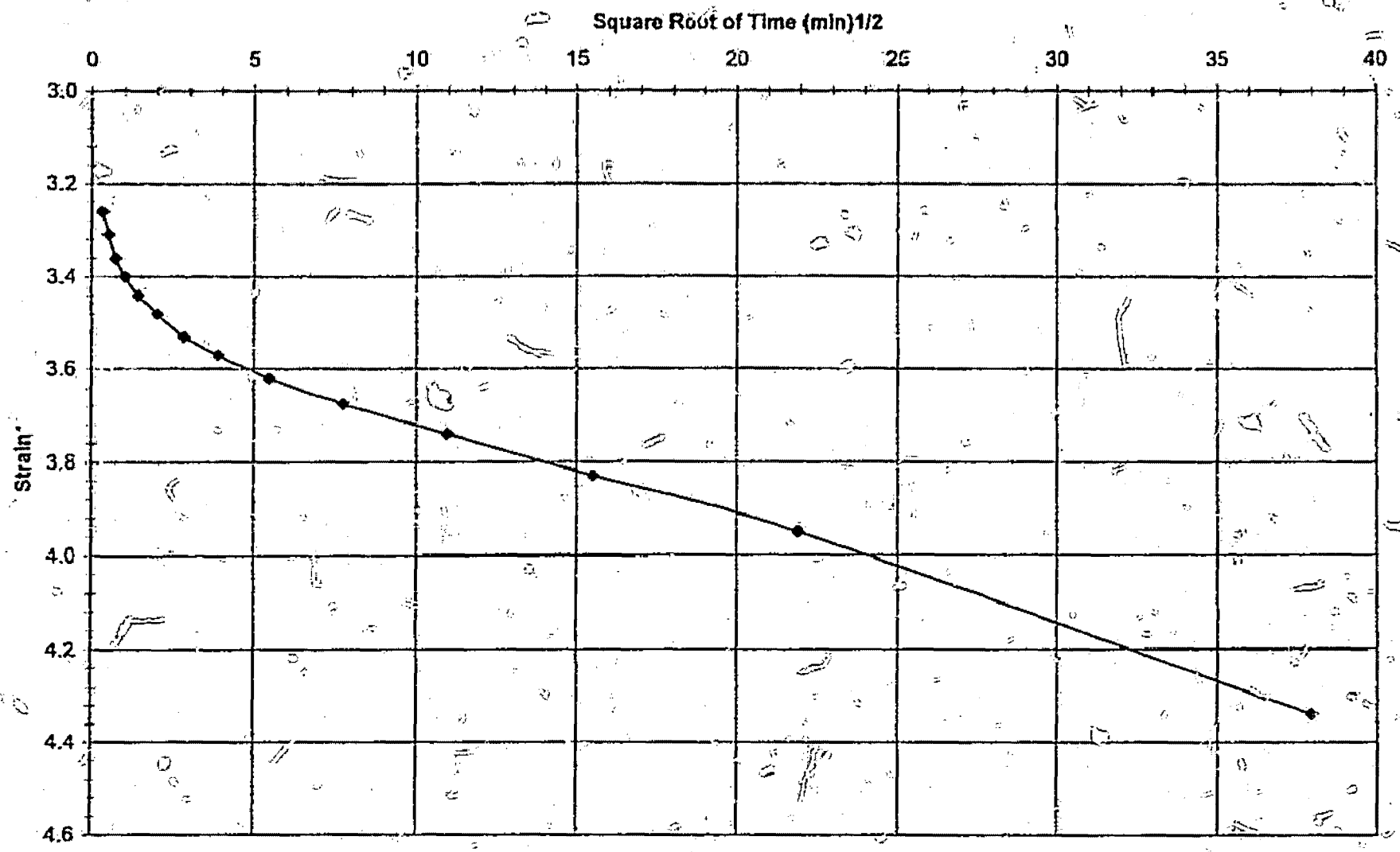
## Time-Rate Consolidation

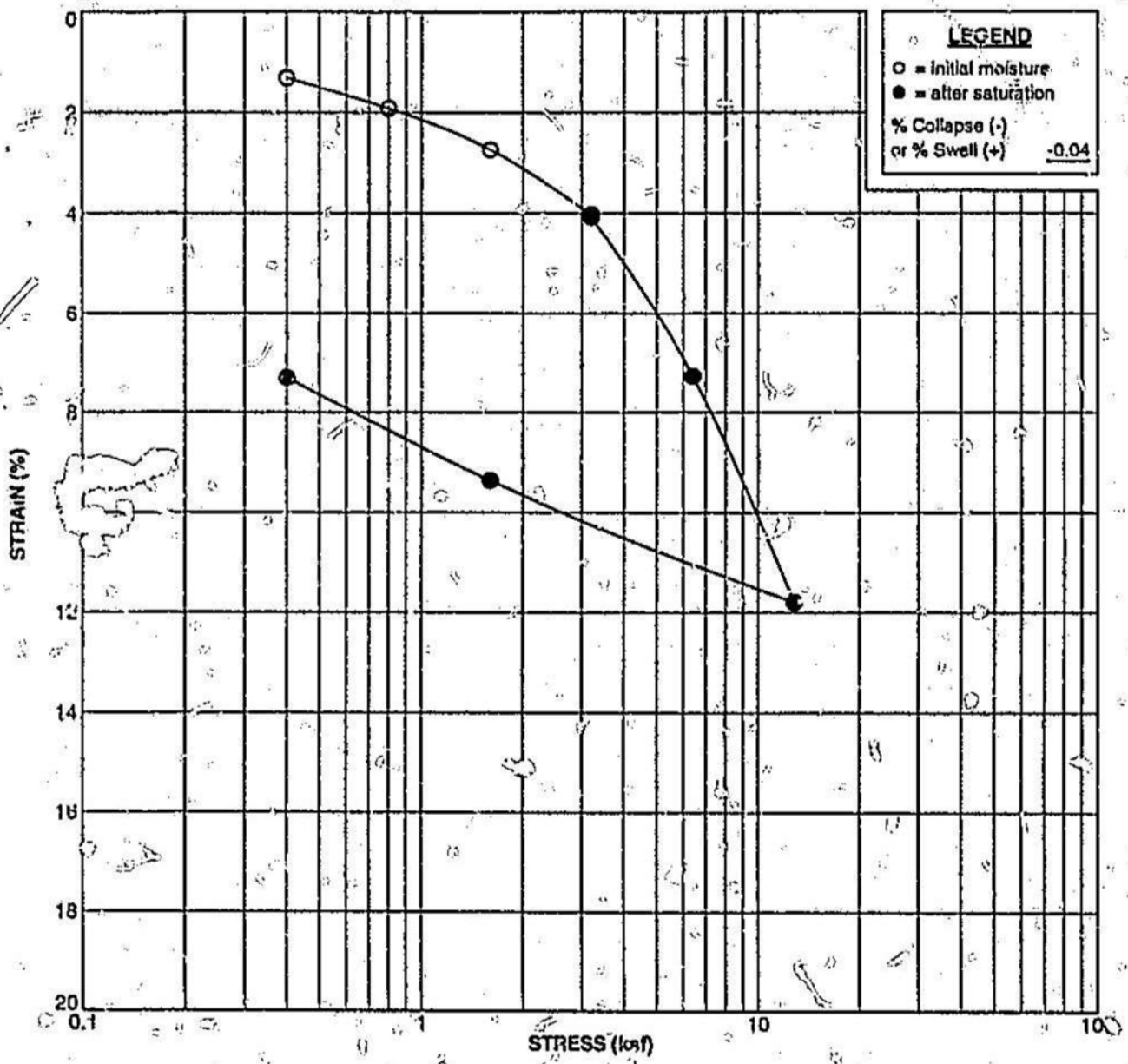
H-1, D-4 @ 3.2 KSF



Time Rate Consolidation

H-1, D-4 @ 3.2 KSF






| Boring No. H-2 | Sample No. D-4 | Depth: 15.0 ft |
|---|---|---|
| Sample Description: | Reddish Brown Silty CLAY (CH) | |
| Liquid Limit: | Plasticity Index: | Percent Passing No. 200 Sieve: |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| Initial | 40.5 | 80.5 | 101.8 | 1.054 |
| Final | 35.5 | 86.4 | 102.9 | 0.914 |

## CONSOLIDATION TEST RESULTS

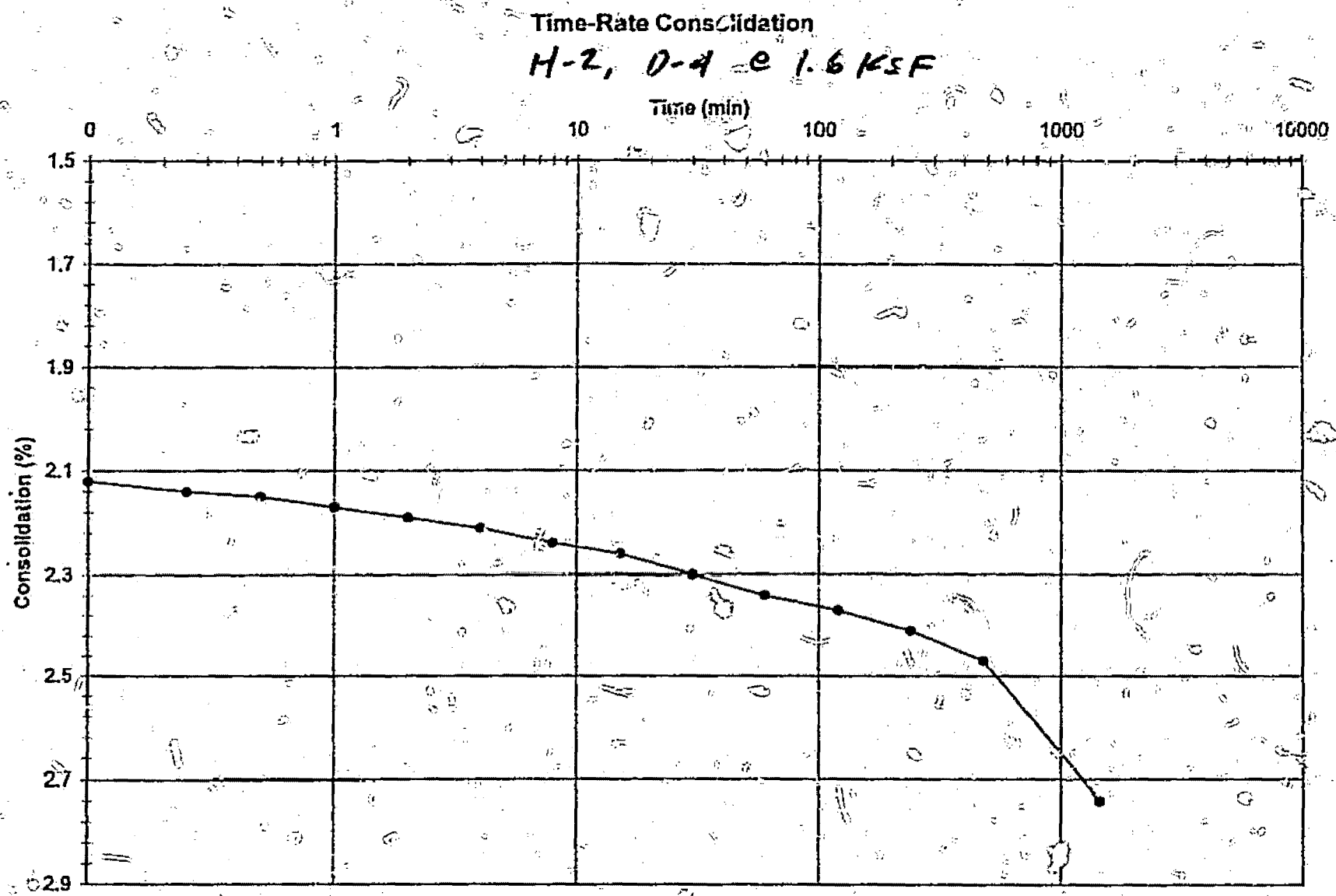
Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG Geotechnical, Inc.

Template: VACONS, Prj ID: 02021-01.GPJ; Printed: 10/29/02

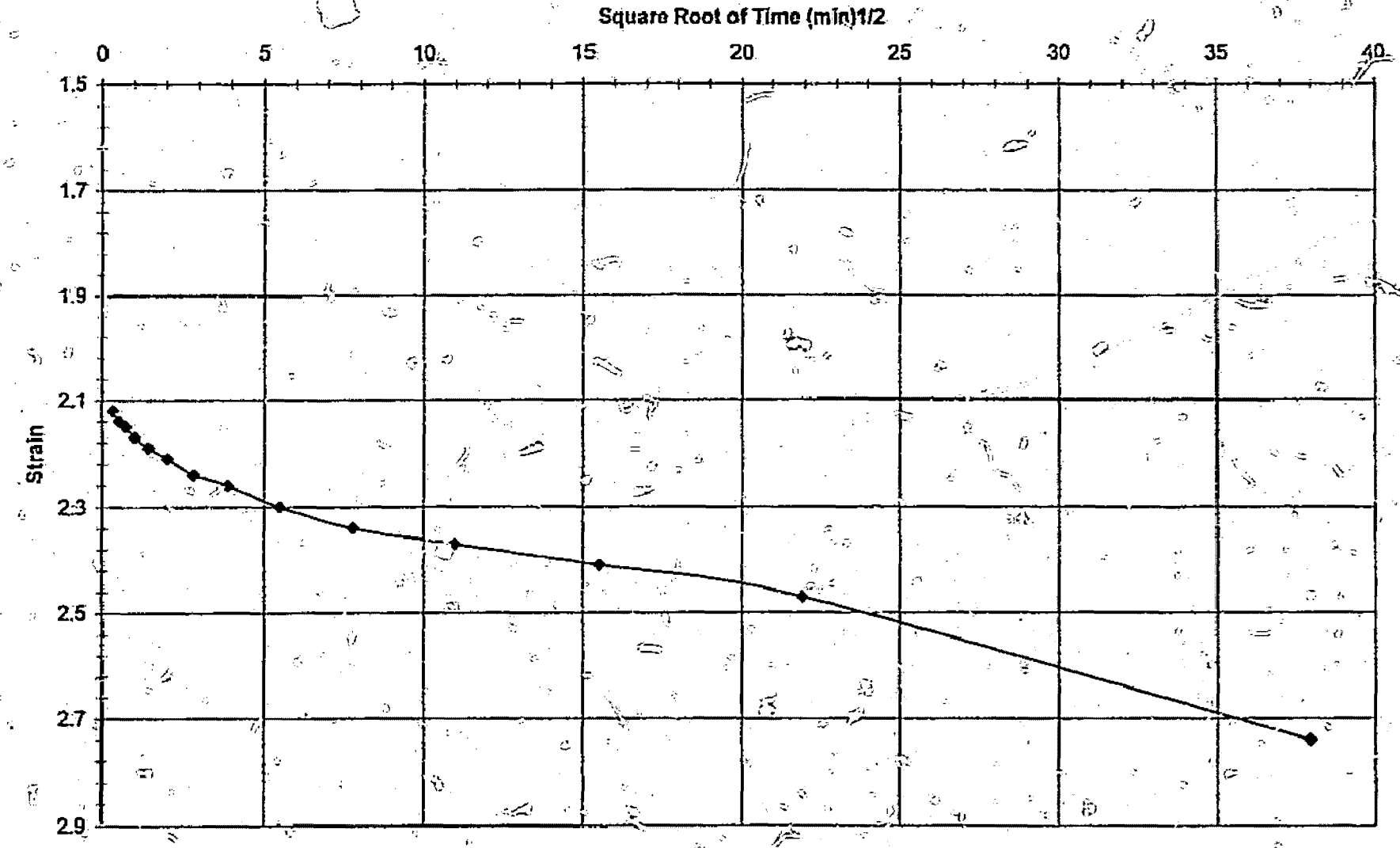
| | |
|---|---|
| Project No.: 02031-01 | Project Name: CJS/EMULEX |
| Date: 9/20/02 | |
| Sample ID: H2 D-4 | @1.6 KSF |

| Time Readings | Time (min) | Sq.Rt. Time (Min) | Strain |
|---|---|---|---|
| 6 sec | 0.10 | 0.32 | 2.120 |
| 15 sec | 0.25 | 0.50 | 2.140 |
| 30 sec | 0.50 | 0.71 | 2.150 |
| 1 min | 1.00 | 1.00 | 2.170 |
| 2 min | 2.00 | 1.41 | 2.190 |
| 4 min | 4.00 | 2.00 | 2.210 |
| 8 min | 8.00 | 2.83 | 2.240 |
| 15 min | 15.00 | 97 | 2.260 |
| 30 min | 30.00 | 48 | 2.300 |
| 1 hr | 60.00 | 7.75 | 2.340 |
| 2 hr | 120.00 | 10.95 | 2.370 |
| 4 hr | 240.00 | 15.49 | 2.410 |
| 8 hr | 480.00 | 21.91 | 2.470 |
| 24 hr | 1440.00 | 37.95 | 2.740 |


Time-Rate Consolidation
H-2, 0-4 @ 1.6 KSF
Time (min)
0
1
10
100
1000
10000
Consolidation (%)
1.5
1.7
1.9
2.1
2.3
2.5
2.7
2.9

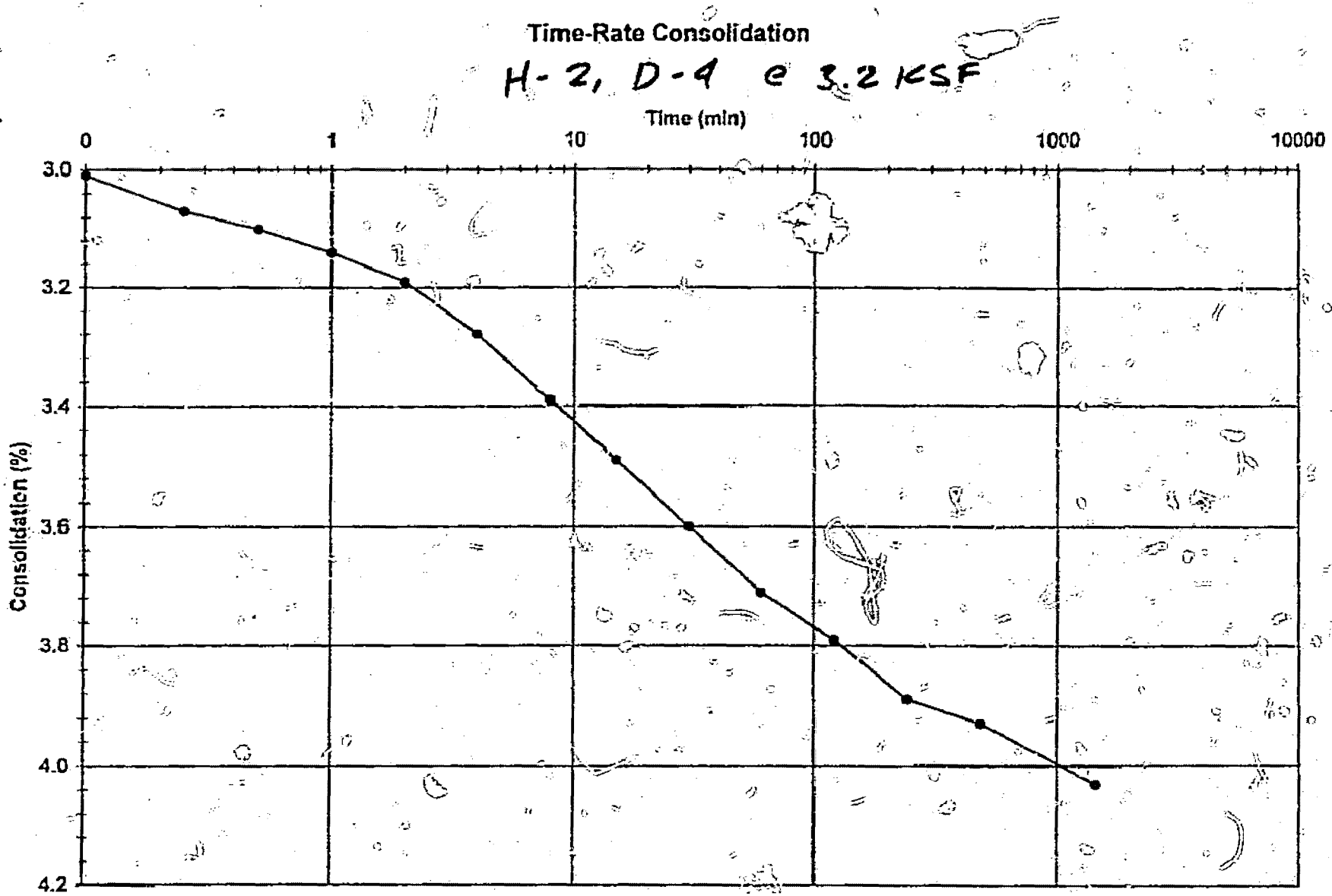
Time-Rate Consolidation

H-2, D-4 @ 1.6 KSF



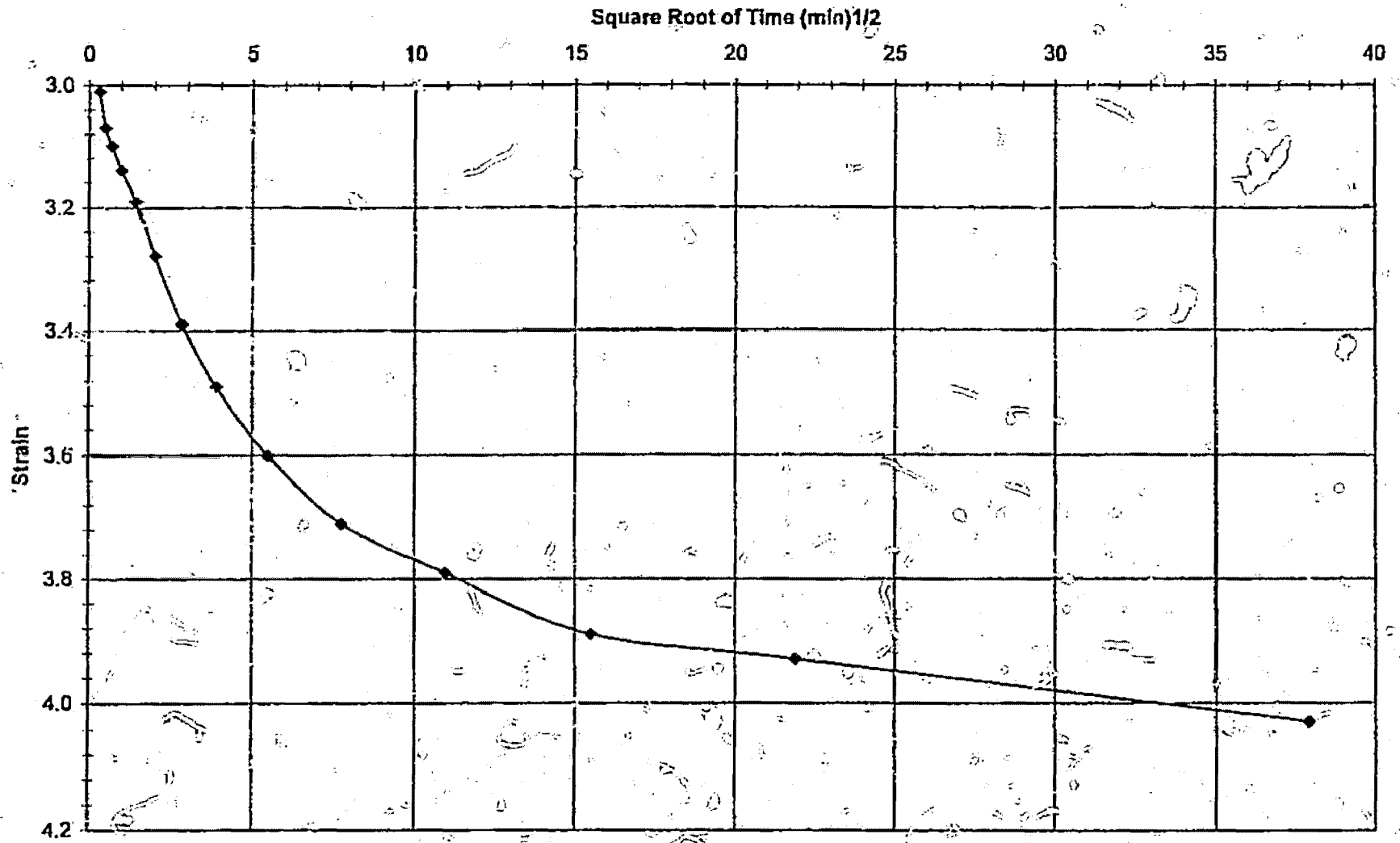
| | |
|---|---|
| Project No.: 02021-01 | Project Name: CJS/EMULEX |
| Date: 9/20/02 | |
| Sample ID: H2 D-4 | @3.2 KSF |

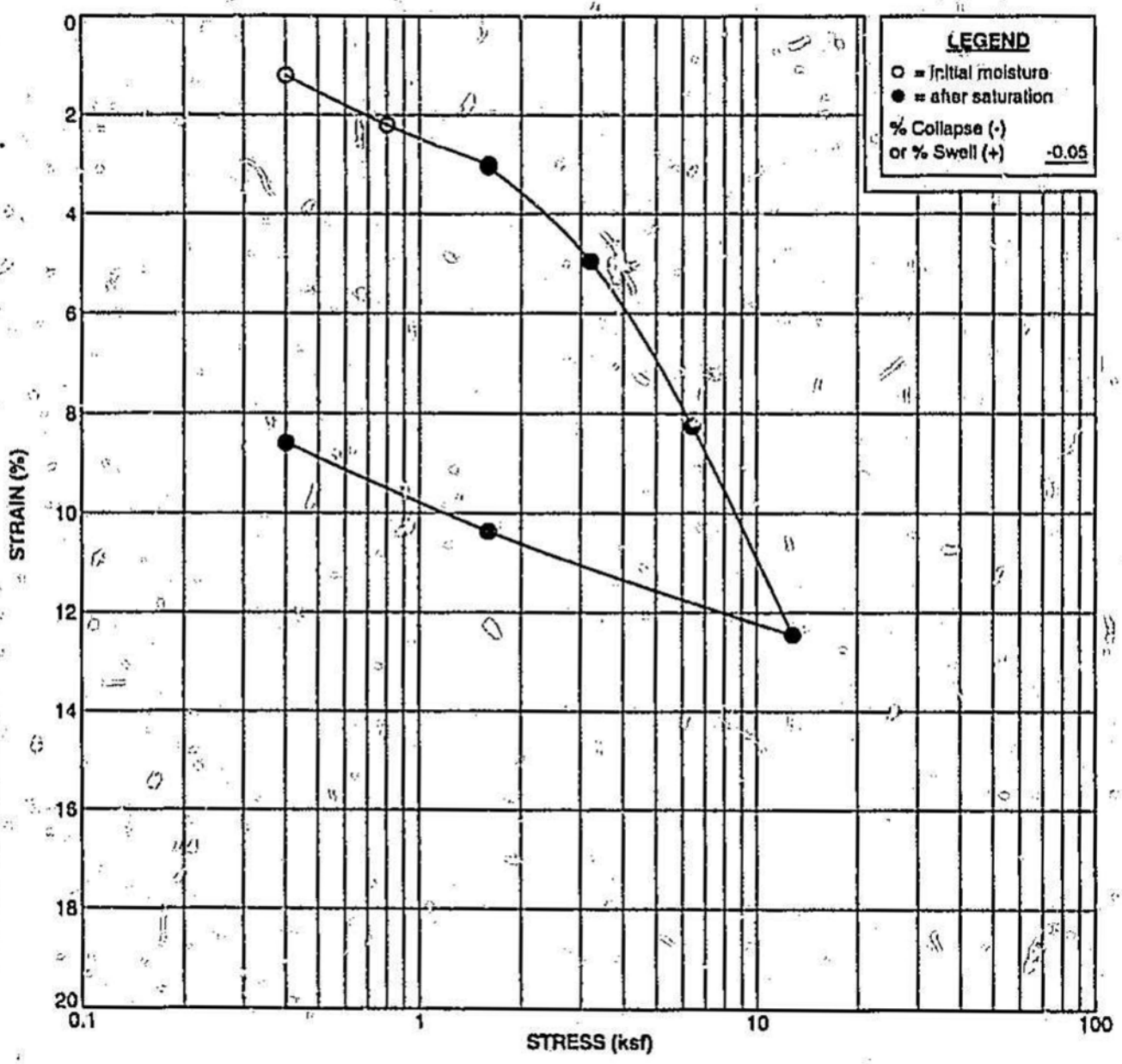
| Time Readings | Time (min) | Sq.Rt. Time (Min) | Strain |
|---|---|---|---|
| 6 sec | 0.10 | 0.32 | 3.010 |
| 15 sec | 0.25 | 0.50 | 3.070 |
| 30 sec | 0.50 | 0.71 | 3.100 |
| 1 min | 1.00 | 1.00 | 3.140 |
| 2 min | 2.00 | 1.41 | 3.190 |
| 4 min | 4.00 | 2.00 | 3.280 |
| 8 min | 8.00 | 2.83 | 3.390 |
| 15 min | 15.00 | 3.87 | 3.490 |
| 30 min | 30.00 | 5.48 | 3.600 |
| 1 hr | 60.00 | 7.75 | 3.710 |
| 2 hr | 120.00 | 10.95 | 3.790 |
| 4 hr | 240.00 | 15.49 | 3.890 |
| 8 hr | 480.00 | 21.91 | 3.930 |
| 24 hr | 1440.00 | 37.95 | 4.030 |


Time-Rate Consolidation
H-2, D-4 @ 3.2 KSF
Time (min)
0
1
10
100
1000
10000
Consolidation (%)
3.0
3.2
3.4
3.6
3.8
4.0
4.2

## Time-Rate Consolidation

H-2, D-4 @ 3.2 KSF






| Boring No. H-3 | Sample No. D-2 | Depth: 7.5 ft |
|---|---|---|
| Sample Description: | Olive Silty CLAY (CH) | |
| Liquid Limit: | Plasticity Index: | Percent Passing No. 200 Sieve: |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| Initial | 35.0 | 84.4 | 98.6 | 0.959 |
| Final | 30.5 | 91.6 | 100.4 | 0.805 |

## CONSOLIDATION TEST RESULTS

Segerstrom/Emulex
Costa Mesa
PROJECT NO. 02021-01

NMG Geotechnical, Inc.

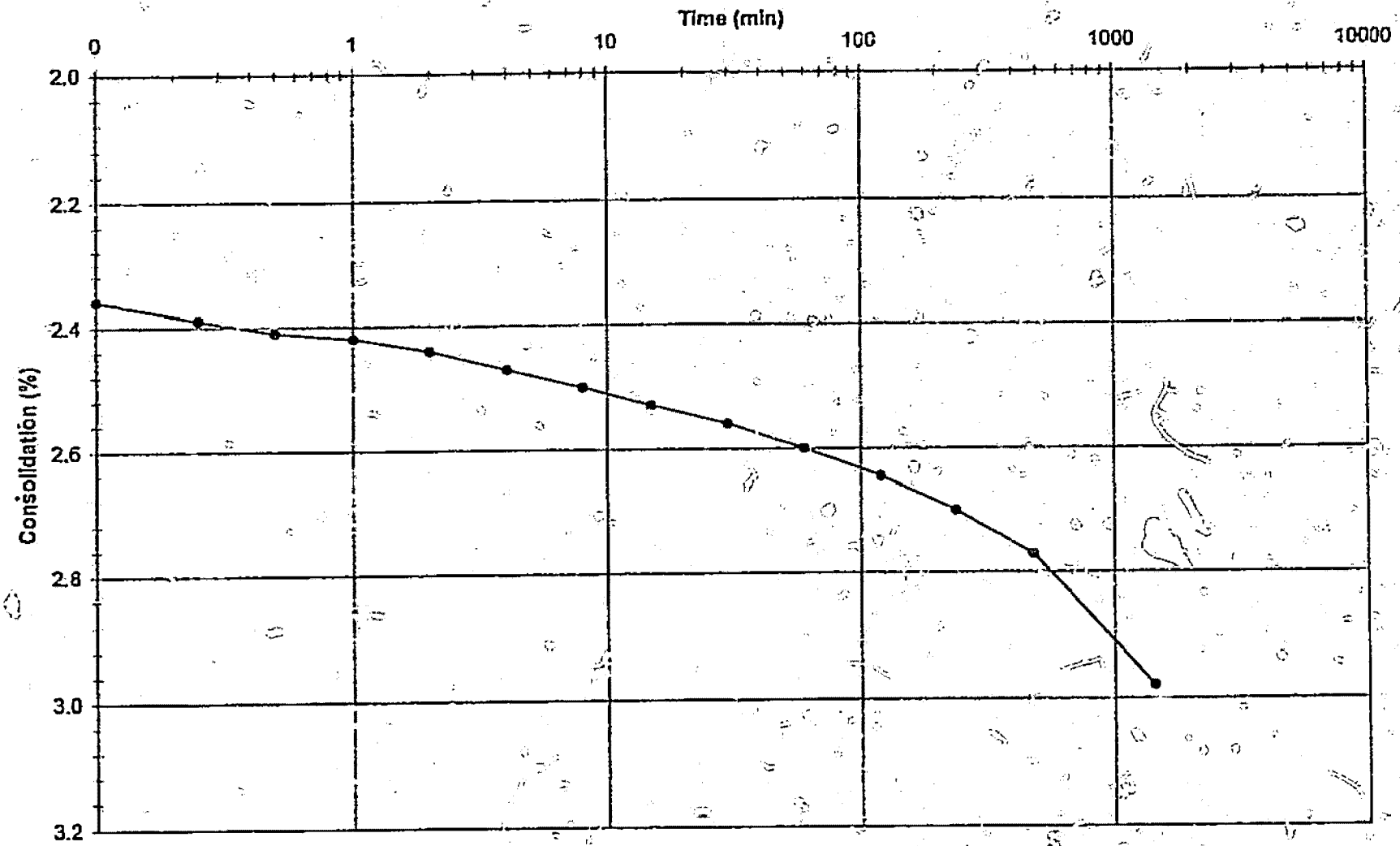
Template: NMCONS; Prj ID: 02021-01.GPJ; Printed: 10/29/02

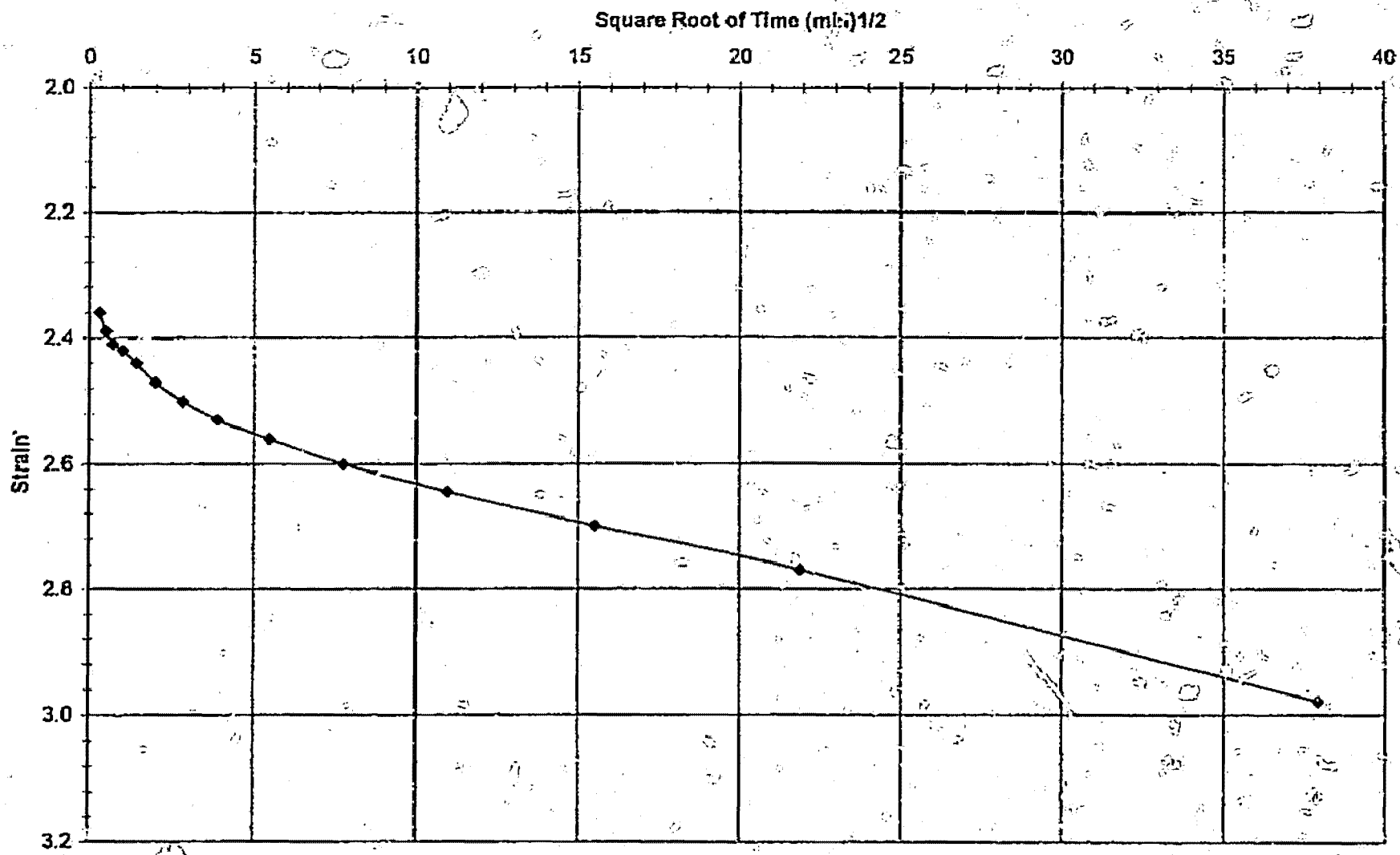
| | |
|---|---|
| Project No.: 02021-01 | Project Name: CJS/EMULEX |
| Date: 9/20/02 | |
| Sample ID: H3 D-2 | @1.6 KSF |

| Time Readings | Time (min) | Sq.Rt. Time (Min) | Strain |
|---|---|---|---|
| 6 sec | 0.10 | 0.32 | 2.360 |
| 15 sec | 0.25 | 0.50 | 2.390 |
| 30 sec | 0.50 | 0.71 | 2.410 |
| 1 min | 1.00 | 1.00 | 2.420 |
| 2 min | 2.00 | 1.41 | 2.440 |
| 4 min | 4.00 | 2.00 | 2.470 |
| 8 min | 8.00 | 2.83 | 2.500 |
| 15 min | 15.00 | 3.87 | 2.530 |
| 30 min | 30.00 | 5.48 | 2.530 |
| 1 hr | 60.00 | 7.75 | 2.600 |
| 2 hr | 120.00 | 10.95 | 2.645 |
| 4 hr | 240.00 | 15.49 | 2.700 |
| 8 hr | 480.00 | 21.91 | 2.770 |
| 24 hr | 1440.00 | 37.95 | 2.980 |

## Time-Rate Consolidation

H-3, D-2 @ 1.6 KSF



Time-Rate Consolidation

H-3, D-2 @ 1.6 KSF