# APPENDIX L

***Updated Geotechnical Evaluation***

**UPDATED GEOTECHNICAL EVALUATION**
**PALOMAR HEIGHTS PROJECT**
**VALLEY PARKWAY & HICKORY STREET**
**ESCONDIDO, SAN DIEGO COUNTY, CALIFORNIA**

**PREPARED FOR**

**INTEGRAL COMMUNITIES**
**2235 ENCINITAS BOULEVARD, SUITE 216**
**ENCINITAS, CALIFORNIA 92024**

**ATTENTION: MS. NINIA HAMMOND**

**PREPARED BY**


**GEOTEK, INC.**
**1384 POINSETTIA AVENUE, SUITE A**
**VISTA, CALIFORNIA 92081**


**PROJECT NO. 3610-SD** **NOVEMBER 25, 2019**

GEOTEK

GeoTek, Inc.
1384 Poinsettia Avenue, Suite A Vista, CA 92081-8505
(760) 599-0509 Office (760) 599-0593 Fax www.geotekusa.com

November 25, 2019
Project No. 3610-SD

**Integral Communities**
2235 Encinitas Boulevard, Suite 216
Encinitas, California 92024

Attention: Ms. Ninia Hammond

Subject: Updated Geotechnical Evaluation
Palomar Heights Project
Valley Parkway & Hickory Street
Escondido, San Diego County, California

Dear Ms. Hammond:

We are pleased to provide the results of our updated geotechnical evaluation for the proposed Palomar Heights project that will be constructed on the subject site in the city of Escondido, San Diego County, California. This report presents a discussion of our evaluation and provides preliminary geotechnical recommendations for site preparation, foundation design, and construction.

Based on the results of our evaluation, development of the property appears feasible from a geotechnical viewpoint provided that the recommendations presented in this report and in future reports are incorporated into design and construction.

The opportunity to be of service is sincerely appreciated. If you have any questions, please do not hesitate to contact our office.

Respectfully submitted,
**GeoTek, Inc.**

Robert R. Russell
GE 2042, Exp. 12/31/20
Senior Project Engineer

Edward H. LaMont
CEG 1892, Exp. 07/31/20
Principal Geologist

Christopher Livesey
PG 9584, Exp. 5/31/21
Project Geologist

Benjamin R. Grenis
RCE 83971, Exp. 09/30/21
Project Engineer

Distribution: (1) Addressee via email (one PDF file)

*V:\Projects\Projects 3000 to 3999\Projects 3600 to 3649\3610-SD The Palomar Heights Project Owner, LLC Palomar Heights\GEO\Palomar Heights Geo report.docx*

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# 1. PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to evaluate the existing geotechnical conditions for the anticipated site development. Services provided for this study have included the following:

- Research and review of available geologic data and general information pertinent to the site,
- Review of the prior *Preliminary Geotechnical Investigation* report prepared by Geocon, Inc. (Geocon, 2018 and revised date September 9, 2019),
- A site reconnaissance,
- Excavation and logging of five (5) additional geotechnical exploratory borings,
- Collection of soil samples,
- Laboratory testing of selected soil samples,
- Review and evaluation of site seismicity, and;
- Compilation of this update geotechnical report which presents our preliminary recommendations for site development.

The intent of this report is to aid in the evaluation of the site for future proposed development from a geotechnical perspective. The professional opinions and geotechnical information contained in this report may need to be updated based upon our review of the final site development plans. These plans should be provided to GeoTek, Inc. for review when available.

# 2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

## 2.1 SITE DESCRIPTION

The approximately 14-acre site is located southeast of the intersection of Valley Parkway and Hickory Street in Escondido, San Diego County, California. The site is bordered by Grand Avenue to the south, Fig Street to the east, Valley parkway to the north and Valley Road on the west. A small portion of the site extends west of Valley Road. The site is currently occupied by the former Palomar Hospital building, including a parking structure area, adjacent medical offices and related infrastructure. The former Palomar Hospital includes the main hospital building, adjacent medical offices, driveways, surface parking lots and a parking structure. The property has an elevated central area with descending elevations towards the perimeter of the site. Existing elevations range from about 670 msl to 715 msl.

The approximate location of the site is indicated on the attached Figure 1, and also shows the general site area topography.

### 2.2 PROPOSED DEVELOPMENT

Based on a review of a *Colored Site Plan* prepared by Summa Architecture, dated September 10, 2019, we understand that the project will include four-story multi-family residential apartment buildings, four-story senior apartments, three-story rowhomes, three-story villas a recreational area and a 12,000 square foot commercial space. The family apartment buildings will consist of 258 units, the senior apartments will consist of 90 units with 72 rowhome and 90 villa units.

A review of the *Preliminary Grading Plan,* prepared by Hunsaker & Associates with a latest revision of September 11, 2019, indicates that the maximum depths of cuts and fills will be on the order of 20 to 30 feet. No significant fill slopes are currently anticipated to be constructed, but some retaining walls are indicated to be on the order of up to 10 feet high.

The structures are anticipated to be 3- to 4-story wood framed buildings. Maximum column and wall loads of about 150 kips and 6 kips per foot have been estimated for the purpose of this report. Once actual structural loading information is known, that information should be provided to GeoTek to determine if modifications to the recommendations presented in this report are warranted.

### 2.3 PRIOR GEOTECHNICAL INVESTIGATION

A *Preliminary Geotechnical Investigation* report was prepared by Geocon, Inc. (Geocon, 2018) for the subject site. The prior Geocon report included ten geotechnical borings that were extended to depths ranging from about 9-½ to 29-½ feet below existing grade. The Geocon report also included the logs for two borings drilled at the site by Dames & Moore in 1999. The borings by Dames & Moore were excavated to depths of approximately 65 feet and 73 feet (see logs in Appendix B). Soil and bedrock materials reported by Geocon within their borings included undocumented fill, younger alluvium, older alluvium and granitic bedrock. Geocon indicated that groundwater was encountered within two of their borings at a depth of about 17 feet below grade. Geocon further indicated that Dames & Moore reported groundwater at the site at depths ranging from 32 to 40 feet below grade in 1999. Following site grading, Geocon indicated that conventional shallow footings or a post-tensioned foundation system could be used for support of the planned structures at this site.

Copies of the Geocon and Dames & Moore boring logs are provided in Appendix B.

# 3. FIELD EXPLORATION AND LABORATORY TESTING

## 3.1 FIELD EXPLORATION

Our field exploration was conducted on October 25, 2019 and consisted of excavating five (5) test borings which were drilled with a hollow-stem auger drill rig to depths ranging from about 15-½ to 20-½ feet below ground surface (bgs). A hollow-stem auger with an outside diameter of 8 inches was utilized. The inside diameter of the auger was 4.5 inches. A geologist from GeoTek, Inc. logged the exploratory borings. The approximate boring locations are presented on Figure 2. Logs of the exploratory borings are included in Appendix A.

The exploration logs show subsurface conditions at the dates and locations indicated and may not be representative of other locations and times. The stratification lines presented on the logs represent the approximate boundaries between soil types and the transitions may be gradual.

Relatively undisturbed soil samples were recovered at various depths/intervals in the geotechnical borings with a California sampler. The California sampler is a 3-inch outside diameter, 2.4-inch inside diameter, split barrel sampler lined with brass rings. The sampler was 18 inches long. The sampler conformed to the requirements of ASTM D 3550. A 140-pound automatic trip hammer was utilized, dropping 30 inches for each blow. The relatively undisturbed samples, together with bulk samples of representative soil types, were returned to the laboratory for testing and evaluation. The California Ring sampler penetration data are presented on the boring logs.

## 3.2 LABORATORY TESTING

Laboratory testing was performed on selected soil samples obtained during our field exploration. The purpose of the laboratory testing was to confirm the field classification of the soils encountered and to evaluate the physical properties of the soils for use in engineering design and analysis.

Included in our laboratory testing were moisture-density determinations on undisturbed samples. Consolidation and collapse testing were also performed on representative undisturbed samples to evaluate the collapse and settlement potential of the site soils. Optimum moisture content-maximum dry density relationships were established for typical soil types so that the relative compaction of the subsoils could be determined. Direct shear testing was performed on three selected samples to help evaluate the bearing capacity of the soils. Expansion index testing was performed on selected samples to evaluate the expansion potential of the on-site soils. Chemical testing comprised of pH, soluble sulfate, chloride and resistivity testing was conducted on selected samples. The moisture-density data are presented on the exploration logs in Appendix A. The maximum density, direct shear, expansion index and chemical test data are presented in Appendix C. Previous testing reported on by Geocon is presented in Appendix B.

# 4. GEOLOGIC AND SOILS CONDITIONS

## 4.1 REGIONAL SETTING

The subject property is situated in the southern portion of the Peninsular Ranges geomorphic province. The Peninsular Ranges province is one of the largest geomorphic units in western North America. It extends approximately 975 miles south of the Transverse Ranges geomorphic province to the tip of Baja California. This province varies in width from about 30 to 100 miles. It is bounded on the west by the Pacific Ocean, on the south by the Gulf of California and on the east by the Colorado Desert Province.

The Peninsular Ranges are essentially a series of northwest-southeast oriented fault blocks. Several major fault zones are found in this province. The Elsinore Fault zone and the San Jacinto Fault zone trend northwest-southeast and are found near the middle of the province. The San Andreas Fault zone borders the northeasterly margin of the province.

More specific to the subject property, the site is located in an area geologically mapped to be underlain by older alluvial deposits and granitic bedrock (CGS, 2007).

## 4.2 GENERAL SOIL/GEOLOGIC CONDITIONS

A brief description of the soils encountered on the site is presented in the following sections. Based on our field exploration and observations, the site is generally underlain by alluvium and older alluvium.

### 4.2.1 Undocumented Fill

Undocumented fill soils were encountered within three of our test borings to depths of about 4 feet below existing grade. Undocumented fill was also previously encountered within five of the Geocon borings to depths ranging from about 2-½ to 5-½ feet below grade. As encountered, the undocumented fill consisted of dense to very dense silty sand.

### 4.2.2 Younger Alluvium

Younger alluvial deposits were not encountered within the GeoTek borings but was encountered in the prior Geocon borings. The younger alluvial deposits were noted by Geocon to extend to depths ranging from about 3 to 13 feet below existing grade at their boring locations. As noted by Geocon, the younger alluvium typically consisted of a medium dense to dense clayey and silty sand.

### 4.2.3 Older Alluvium

Older alluvial soils were encountered within two of the GeoTek borings to depths of about 9-½ feet below grade. Geocon reported older alluvium within several of their borings to depths ranging from 5 to 22 feet below existing grade. As encountered within our borings, the older alluvium consisted of medium dense to very dense/very stiff clayey sand, silty sand and sandy silt.

### 4.2.4 Weathered Granitic Bedrock

Weathered granitic bedrock was encountered within the GeoTek and Geocon borings beneath the undocumented fill, younger alluvium or older alluvium and extended to the maximum depths explored. The weathered granite generally excavates as a reddish- to grayish-brown silty sand, with some gravel clasts.

## 4.3 SURFACE AND GROUNDWATER

### 4.3.1 Surface Water

Surface water was not observed during our site visit. If encountered during earthwork construction, surface water on this site is the result of precipitation or possibly some minor surface run-off from immediately surrounding properties. Overall site area drainage is generally in a easterly direction, as directed by site topography. Provisions for surface drainage will need to be accounted for by the project civil engineer.

#### 4.3.2 Groundwater

Groundwater was not encountered within any of our test borings at the time of drilling to a maximum exploration depth of 20-½ feet. Geocon reported groundwater within two of their borings at a depth of about 17 feet below grade. Dames & More indicated groundwater in their borings (1999) at depths of about 32 to 40 feet below grade. Based on the depths of groundwater encountered, we do not anticipate any significant groundwater related problems during or after construction. Should localized shallow perched water conditions be encountered, we anticipate that the perched water can be effectively managed with the use of conventional sump pumps placed in lined pits.

### 4.4 FAULTING AND SEISMICITY

The geologic structure of the entire southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. The site is in a seismically active region. No active or potentially active fault is presently known to exist at this site nor is the site situated within an *"Alquist-Priolo"* Earthquake Fault Zone. The nearest known active faults are the Elsinore fault Zone and the Newport-Inglewood-Rose Canyon fault Zone located about 16.2 miles to the northeast and 16.5 miles to the southwest, respectively.

#### 4.4.1 Seismic Design Parameters

The site is located at approximately 33.1252$^o$ Latitude and -117.0750$^o$ Longitude. Site spectral accelerations ($S_a$ and $S_1$), for 0.2 and 1.0 second periods for a Class "C" site, was determined from the SEAOC/OSHPD web interface that utilizes the USGS web services and retrieves the seismic design data and presents that information in a report format. Based on the presence of shallow granitic bedrock, a Site Class C is deemed appropriate for this site. The results, based on ASCE 7-16 and the 2019 CBC, are presented in the following table.

| SITE SEISMIC PARAMETERS | |
|---|---|
| Mapped 0.2 sec Period Spectral Acceleration, $S_S$ | 0.904g |
| Mapped 1.0 sec Period Spectral Acceleration, $S_1$ | 0.330g |
| Site Coefficient for Site Class "C," $F_a$ | 1.2 |
| Site Coefficient for Site Class "C," $F_v$ | 1.5 |
| Maximum Considered Earthquake Spectral Response Acceleration for 0.2 Second, $S_{MS}$ | 1.085g |
| Maximum Considered Earthquake Spectral Response Acceleration for 1.0 Second, $S_{M1}$ | 0.495g |
| 5% Damped Design Spectral Response Acceleration Parameter at 0.2 Second, $S_{DS}$ | 0.723g |
| 5% Damped Design Spectral Response Acceleration Parameter at 1 second, $S_{D1}$ | 0.330g |
| $PGA_M$ | 0.468g |
| Seismic Design Category | D |

Final selection of the appropriate seismic design coefficients should be made by the project structural engineer based upon the local practices and ordinances, expected building response and desired level of conservatism.

## 4.5 LIQUEFACTION ANALYSIS

Liquefaction describes a phenomenon in which cyclic stresses, produced by earthquake-induced ground motion, create excess pore pressures in relatively cohesionless soils. These soils may thereby acquire a high degree of mobility, which can lead to lateral movement, sliding, settlement of loose sediments, sand boils and other damaging deformations. This phenomenon occurs only below the water table, but, after liquefaction has developed, the effects can propagate upward into overlying non-saturated soil as excess pore water dissipates.

The factors known to influence liquefaction potential include soil type and grain size, relative density, groundwater level, soil plasticity, confining pressures, and both intensity and duration of ground shaking. In general, materials that are susceptible to liquefaction are loose, saturated granular soils having low fines content and some low plastic silts and clays under low confining pressures.

Due to the presence of dense older alluvium, shallow bedrock, and planned engineered fill, it is our opinion that the liquefaction potential at this site is very low.

Due to the very low liquefaction potential, it is our opinion that surface manifestations and/or lateral spreading is not expected.

### 4.6 OTHER SEISMIC HAZARDS

Evidence of ancient landslides or slope instability at this site was not observed during our investigation and the project site is relatively flat. Thus, the potential for landslides is considered negligible for design purposes.

### 4.7 HYDRO COLLAPSE

Two samples within the older alluvium were tested to evaluate their potential for hydro collapse. These tests were performed in oedometer (consolidation) devices and measure 1-dimensional (vertical) response to loading. Based on the results of testing, the samples experienced a volumetric strain of approximately one-quarter of one percent upon inundation with water. NAVFAC 7.01 identifies collapse potential below 1 percent as 'No problem' and we consider this collapse potential essentially negligible for design purposes.

## 5. CONCLUSIONS AND RECOMMENDATIONS

### 5.1 GENERAL

The anticipated site development appears feasible from a geotechnical viewpoint provided that the following recommendations, and those provided by this firm at a later date are incorporated into the design and construction phases of development. Site development and grading plans should be reviewed by GeoTek, Inc. when they become available.

The on-site soils exhibit a "very low" to "low" expansion potential. Expansion index testing for near-surface soils should be conducted at the completion of earthwork operations to verify.

### 5.2 EARTHWORK CONSIDERATIONS

Earthwork and grading should be performed in accordance with the applicable grading ordinances of the City of Escondido, the 2019 California Building Code (CBC) and recommendations contained in this report. The Grading Guidelines included in Appendix D outline general procedures and do not anticipate all site-specific situations. In the event of conflict, the recommendations presented in the text of this report should supersede those contained in Appendix D.

### 5.2.1 Demolition & Site Clearing

In areas of planned grading and improvements, all existing buildings and improvement should be removed. Demolition should include removal of all foundations, floor slabs, utilities and any other below-grade construction. Existing asphalt and concrete pavements should also be removed or if crushed to maximum 3-inch particle size could be potentially incorporated into the engineered fill soils to be placed at the site. The site should also be cleared of vegetation and other deleterious materials. Debris should be properly disposed of off-site. Voids resulting from site clearing should be replaced with engineered fill following proper preparation as described in the following report sections.

### 5.2.2 Remedial Grading

Subsequent to site clearing and lowering of site grades, where necessary, all existing undocumented fill should be removed beneath all areas to receive surface improvements and/or new fill. The lateral extent of the recommended over-excavation should extend at least 5 feet beyond the improvement limits, where possible, or down and away at a 1:1 projection until a suitable removal bottom is exposed.

All disturbed, loose or soft native soil should also be removed to expose competent natural soil. Competent natural soil is defined as native soils that possess a minimum relative compaction of 85% and does not exhibit significant porosity. Based on the result of our field and laboratory testing, we anticipate that only the upper 1 to 2 feet of native soil may require over-excavation. However, the precise depth of over-excavation should be determined by a GeoTek representative at the time of site grading.

Following site clearing, lowering of site grades, where necessary, completion of any needed over-excavation and prior to fill placement, the exposed soil beneath all improvement areas of the site should then be proof rolled with a heavy rubber-tired piece of construction equipment approved by and in the presence of GeoTek. The proof roll equipment should possess a minimum weight of 20 tons and proof rolling should include at least four passes, 2 in each perpendicular direction. Any soil that ruts or excessively deflects during proof rolling should be removed as recommended by the GeoTek representative.

### 5.2.3 Transition Pads

The cut portion of building pads that will transition from cut to fill sections should have the cut portion over-excavated to a depth of at least 3 feet and be backfilled with a properly compacted engineered fill. The purpose of this recommendation is to provide a relatively uniform mat for foundation support and to minimize sharp transitions from cut to fill soils beneath foundations and floor slabs. A deeper over-excavation depth may be necessary based on exposed conditions, and proposed improvements.

### 5.2.4 Preparation of Excavation Bottoms

A representative of this firm should observe the bottom of all excavations. Upon approval, the exposed soils and all soils in areas to receive engineered fill should be scarified to a depth of approximately 12 inches, moistened to at least the optimum moisture content and compacted to a minimum relative compaction of 90 percent (ASTM D 1557).

### 5.2.5 Engineered Fills

The on-site soils are generally considered suitable for reuse as engineered fill provided that they are free from vegetation, debris, oversized materials and other deleterious material. Engineered fill should be placed in loose lifts with a thickness of eight inches or less, moisture conditioned to at least the optimum moisture content and compacted to a minimum relative compaction of 90 percent (ASTM D 1557).

### 5.2.6 Excavation Characteristics

Excavation in the on-site alluvial soils is expected to be feasible utilizing heavy-duty grading equipment in good operating condition. However, excavations extending into the underlying granitic bedrock is expected to encounter more resistant materials. Dependent upon the depth of the excavations and the hardness of the encountered bedrock, specialized excavation techniques and/or equipment may be required. All temporary excavations for grading purposes and installation of underground utilities should be constructed in accordance with local and Cal-OSHA guidelines. Temporary excavations within the on-site materials should be stable at 1:1 (horizontal: vertical) inclinations for cuts less than ten feet in height.

### 5.2.7 Shrinkage and Subsidence

Several factors will impact earthwork balancing on the site, including shrinkage, subsidence, trench spoil from utilities and footing excavations, as well as the accuracy of topography.

Shrinkage and subsidence are primarily dependent upon the degree of compactive effort achieved during construction. For planning purposes, a shrinkage/bulking factor of about ± 5 percent may be considered for undocumented fill and alluvial materials requiring removal and recompaction. A bulking factor of about 0 to 10 percent may be considered for excavation and recompaction of the weathered granitic bedrock. Site balance areas should be available in order to adjust project grades, depending on actual field conditions at the conclusion of earthwork. Subsidence on the order of up to 0.10 foot may be anticipated resulting from preparation of the underlying alluvial soils.

## 5.3 DESIGN RECOMMENDATIONS

### 5.3.1 Foundation Design Criteria

Foundation design criteria for a conventional foundation system, in general conformance with the 2019 CBC, are presented below. Based on laboratory test results, subsequent to earthwork operations it is anticipated that the as-graded near-surface soils may have a "very low" to "low" expansion potential.

Additional expansion index and soluble sulfate testing of the soils should be performed during construction to evaluate the as-graded conditions. Final recommendations should be based upon the as-graded soils conditions.

A summary of our foundation design recommendations is presented in the following table:

| Design Parameter | "Very Low" Expansion Potential | "Low" Expansion Potential |
|---|---|---|
| Foundation Depth or Minimum Perimeter Beam Depth (inches below lowest adjacent grade) | 12-1 & 2 stories<br>18-3 stories<br>24-3+ stories | 18 for 1-3 stories<br>24-3+ stories |
| Minimum Foundation Width (Inches)* | 12-1 story wall footings<br>15-2 story wall footings<br>18-3+ story wall footings<br>24-1 story column footings<br>30-2 story column footings<br>36-3+ story column footings | 12-1 story wall footings<br>15-2 story wall footings<br>18-3+ story wall footings<br>24-1 story column footings<br>30-2 story column footings<br>36-3+ story column footings |
| Minimum Slab Thickness (actual)[1] | 4 – Actual | 4 – Actual |
| Sand Blanket and Moisture Retardant Membrane Below On-Grade Building Slabs | 2 inches of sand** overlying moisture vapor retardant membrane overlying 2 inches of sand** | 2 inches of sand** overlying moisture vapor retardant membrane overlying 2 inches of sand** |
| Minimum Slab Reinforcing | 6" x 6" – W1.4/W1.4 welded wire fabric placed in middle of slab or No. 3 bars at 24 inch centers | 6" x 6" – W2.9/W2.9 welded wire fabric placed in middle of slab or No. 3 bars at 18 inch centers. |
| Minimum Footing Reinforcement | Two No. 4 reinforcing bars, one placed near the top and one near the bottom | Two No. 5 reinforcing bars, one placed near the top and one near the bottom |
| Effective Plasticity Index*** | 15 | 15 |
| Presaturation of Subgrade Soil (Percent of Optimum) | Minimum of 100% of the optimum moisture content to a depth of at least 12 inches prior to placing concrete | Minimum of 110% of the optimum moisture content to a depth of at least 12 inches prior to placing concrete |

* Code minimums per Table 1809.7 of the 2019 CBC.
** Sand should have a sand equivalent of at least 30.

*** Effective plasticity index should be verified at the completion of rough grading.

1. Slab thickness and reinforcement should be determined necessary by the structural engineer.

It should be noted that the criteria provided are based on soil support characteristics only. The structural engineer should design the slab and beam reinforcement based on actual loading conditions.

The following criteria for design of foundations are preliminary and should be re-evaluated based on the results of additional laboratory testing of samples obtained near finish pad grade.

An allowable bearing capacity of 3,000 pounds per square foot (psf) may be used for design of footings 12 inches deep and 12 inches wide. This value may be increased by 750 pounds per square foot for each additional 12 inches in depth and 350 pounds per square foot for each additional 12 inches in width to a maximum value of 4,500 psf. Footing directly supported by granitic bedrock may be designed for an allowable soil bearing pressure of 6,000 psf. An increase of one-third may be applied when considering short-term live loads (e.g. seismic and wind loads).

Structural foundations may be designed in accordance with the 2019 CBC, and to withstand a total static settlement of 1 inch and maximum differential static settlement of one-half of the total settlement over a horizontal distance of 40 feet.

The passive earth pressure may be computed as an equivalent fluid having a density of 250 psf per foot of depth, to a maximum earth pressure of 2,500 psf for footings founded on engineered fill. A coefficient of friction between soil and concrete of 0.4 may be used with dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

If desired, the building floor slabs may be designed using an estimated subgrade modulus of 175 pci, which is based on a value typically obtained from a 1 foot by 1 foot plate bearing test. Depending on how the floor slab is loaded, the subgrade modulus may need to be geometrically modified.

### 5.3.2 Underslab Moisture Membrane

A moisture and vapor retarding system should be placed below slabs-on-grade where moisture migration through the slab is undesirable. Guidelines for these are provided in the 2016 California Green Building Standards Code (CALGreen) Section 4.505.2, the 2019 CBC Section 1907.1 and ACI 360R-10. The vapor retarder design and construction should also meet the requirements of ASTM E 1643. A portion of the vapor retarder design should be the implementation of a moisture vapor retardant membrane.

It should be realized that the effectiveness of the vapor retarding membrane can be adversely impacted as a result of construction related punctures (e.g. stake penetrations, tears, punctures from walking on the vapor retarder placed on the underlying aggregate layer, etc.). These occurrences should be limited as much as possible during construction. Thicker membranes are generally more resistant to accidental puncture than thinner ones. Products specifically designed for use as moisture/vapor retarders may also be more puncture resistant. Although the CBC specifies a 6-mil vapor retarder membrane, a minimum 10 mil thick membrane with joints properly overlapped and sealed should be considered, unless otherwise specified by the slab design professional. The membrane should consist of Stego wrap or the equivalent.

A two-inch layer of clean sand with a sand equivalent of at least 30 should be placed over the moisture vapor retardant membrane to promote setting of the concrete. The moisture in the sand should not exceed two percent below the optimum moisture content.

Moisture and vapor retarding systems are intended to provide a certain level of resistance to vapor and moisture transmission through the concrete, but do not eliminate it. The acceptable level of moisture transmission through the slab is to a large extent based on the type of flooring used and environmental conditions. Ultimately, the vapor retarding system should be comprised of suitable elements to limit migration of water and reduce transmission of water vapor through the slab to acceptable levels. The selected elements should have suitable properties (i.e. thickness, composition, strength, and permeability) to achieve the desired performance level.

Moisture retarders can reduce, but not eliminate, moisture vapor rise from the underlying soils up through the slab. Moisture retarder systems should be designed and constructed in accordance with applicable American Concrete Institute, Portland Cement Association, Post-Tensioning Concrete Institute, ASTM and California Building Code requirements and guidelines.

GeoTek recommends that a qualified person, such as a flooring contractor, structural engineer, architect, and/or other experts specializing in moisture control within the buildings be consulted to evaluate the general and specific moisture and vapor transmission paths and associated potential impact on the proposed construction. That person should provide recommendations relative to the slab moisture and vapor retarder systems and for migration of potential adverse impact of moisture vapor transmission on various components of the structures, as deemed appropriate.

In addition, the recommendations in this report and our services in general are not intended to address mold prevention, since we, along with geotechnical consultants in general, do not practice in the area of mold prevention. If specific recommendations addressing potential mold issues are desired, then a professional mold prevention consultant should be contacted.

We recommend that control joints be placed in two directions spaced approximately 24 to 36 times the thickness of the slab in inches. These joints are a widely accepted means to control cracks and should be reviewed by the project structural engineer.

### 5.3.3 Miscellaneous Foundation Recommendations

To minimize moisture penetration beneath the slab-on-grade areas, utility trenches should be backfilled with engineered fill, lean concrete or concrete slurry where they intercept the perimeter footing or thickened slab edge.

Soils from the footing excavations should not be placed in the slab-on-grade areas unless properly compacted and tested. The excavations should be free of loose/sloughed materials and be neatly trimmed at the time of concrete placement.

### 5.3.4 Foundation Set Backs

Minimum setbacks for all foundations should comply with the 2019 CBC or City of Escondido requirements, whichever is more stringent. Improvements not conforming to these setbacks are subject to the increased likelihood of excessive lateral movement and/or differential settlement. If large enough, these movements can compromise the integrity of the improvements.

- The outside top edge of all footings should be set back a minimum of H/3 (where H is the slope height) from the face of any descending slope. The setback should be at least five feet and need not exceed 40 feet.

- The bottom of any proposed foundations should be deepened so as to extend below a 1:1 upward projection from the bottom edge of the nearest excavation and the bottom edge of the closest footing.

## 5.4 RETAINING WALL DESIGN AND CONSTRUCTION

### 5.4.1 General Design Criteria

Recommendations presented in this report apply to typical masonry or concrete vertical retaining walls. These are typical design criteria and are not intended to supersede the design by the structural engineer.

Retaining wall foundations should be designed in accordance with *Section 5.3.1* of this report. A minimum foundation embedment of 12 inches into engineered compacted fill or competent native soils with "very low" to "low" expansion potential is recommended. Structural needs may govern and should be evaluated by the project structural engineer.

All earth retention structure plans, as applicable, should be reviewed by this office prior to finalization.

The backfill material placement for all earth retention structures should meet the requirement of *Section 5.4.4* in this report.

In general, cantilever earth retention structures, which are designed to yield at least 0.001H, where H is equal to the height of the wall to the base of the footing, may be designed using the active condition. Rigid earth retention structures (including but not limited to rigid walls, and walls braced at top, such as typical basement walls) should be designed using the at-rest condition as discussed in Section 4.4.3.

In addition to the design lateral forces due to retained earth, surcharges due to improvements, such as an adjacent building or traffic loading, should be considered in the design of the earth retention structures. Loads applied within a 1:1 (h:v) projection from the surcharge on the stem of the earth retention structure should be considered in the design.

For walls with a retained height greater than 6 feet, a seismic surcharge pressure should also be considered in wall design. Based on the Mononobe-Okabe method, it is our opinion that an equivalent fluid pressure of 14.6 pcf should be added, where required, to account for earthquake loading conditions. The earthquake load can be represented as a conventional triangular pressure distribution.

Final selection of the appropriate design parameters should be made by the designer of the earth retention structures.

### 5.4.2 Cantilevered Walls

The recommendations presented below are for cantilevered retaining walls. Active earth pressure may be used for retaining wall design, provided the top of the wall is not restrained from minor deflections. An equivalent fluid pressure approach may be used to compute the horizontal pressure against the wall. Appropriate fluid unit weights are given below for specific slope gradients of the retained material. These do not include other superimposed loading conditions such as traffic, structures, seismic events, or adverse geologic conditions.

| ACTIVE EARTH PRESSURES | |
|---|---|
| Surface Slope of Retained Materials (h:v) | Equivalent Fluid Pressure (pcf)* |
| Level | 35 |
| 2:1 | 60 |

* The design pressures assume the backfill material has an expansion index less than or equal to 20. Backfill zone includes area between the back of the wall and footing to a plane (1:1 h:v) up from the bottom of the wall foundation to the ground surface.

### 5.4.3 Restrained Retaining Walls

Retaining walls that will be restrained prior to placing and compacting backfill material, or that have reentrant or male corners, should be designed for an at-rest equivalent fluid pressure of 60 pcf, plus any applicable surcharge loading, for very low expansive backfill (EI<20) and level back slope condition. For areas of male or reentrant corners, the restrained wall design should extend a minimum distance of twice the height of the wall laterally from the corner, or a distance otherwise determined by the project structural engineer.

### 5.4.4 Retaining Wall Backfill and Drainage

Retaining wall backfill should consist of materials with expansion index (EI) ≤ 20 and free of deleterious and/or oversized materials. The wall backfill should also include a minimum one-foot wide section of ¾- to 1-inch clean crushed rock (or approved equivalent). The rock should be placed immediately adjacent to the back of wall and extend up from the back drain to within approximately 12 inches of finish grade. The upper 12 inches should consist of compacted onsite materials. Presence of other materials might necessitate revision to the parameters provided and modification of wall designs. The backfill materials should be placed in lifts no greater than 8-inches in thickness and compacted to a minimum of 90 percent relative compaction in accordance with ASTM Test Method D 1557. Proper surface drainage needs to be provided and maintained. Bracing of the walls during backfilling and compaction may also be necessary.

All earth retention structures should be provided with an adequate pipe and gravel back drain system to reduce the potential for hydrostatic pressure build up. As a minimum, backdrains should consist of a four-inch diameter perforated collector pipe (Schedule 40, SDR 35, or approved equivalent) embedded in a minimum of one cubic foot per lineal foot of ¾- to 1-inch clean crushed rock or equivalent, wrapped in filter fabric (Mirafi 140N or approved equivalent). The drain system should be connected to a suitable outlet, as determined by the civil engineer. Drain outlets should be maintained over the life of the project and should not be obstructed or plugged by adjacent improvements. Waterproofing of site walls should be performed where moisture migration through the wall is undesirable.

Proper surface drainage needs to be provided and maintained. Water should not be allowed to pond behind retaining walls. Waterproofing of site walls should be performed where moisture migration through the wall is undesirable.

## 5.5 SOIL CORROSIVITY

Based on the chemical test results presented in Appendix C, the corrosivity test results indicate that the on-site soils are "highly corrosive" to "corrosive" to buried ferrous metal. This corrosion classification is obtained from "Corrosion Basics: An Introduction," by Pierre R. Roberge, 2nd Edition, 2000. Recommendations for protection of buried ferrous metal should be provided by a corrosion engineer. Additional corrosion testing should be performed at the time of site grading to assess the corrosion of potential of the as-graded soils.

### 5.5.1 Soil Sulfate Content

The results of chemical testing performed on representative samples of the site soils indicate soluble sulfate contents less than 0.1 percent by weight. Soluble sulfate contents of this level would be in the range of sulfate exposure class "S0" per Table 19.3.1.1 of ACI 318. Based on the test results and Table 19.3.2.1 of ACI 318, special concrete mix design is not anticipated to be necessary to resist sulfate attack. Additional soluble sulfate testing should be performed during site grading to further evaluate the as-grade sulfate exposure.

### 5.5.2 Import Soils

Import soils should have a "very low" to "low' expansion potential. GeoTek, Inc. also recommends that the proposed import soils be tested for expansion and corrosivity potential. GeoTek, Inc. should be notified a minimum of 72 hours prior to importing so that appropriate sampling and laboratory testing can be performed.

### 5.5.3 Preliminary Pavement Design and Construction

Based on previous laboratory testing and preliminary designs, preliminary pavement sections have been designed using assumed R-values of 15 and 50. Traffic Indices (TIs) of 5.0 and 7.0 was utilized, and depending on final guidance from a traffic engineer, may require revision of the following recommendations:

For an assumed R-value of 15 and a Traffic Index of 5.0:

4-inches asphalt-concrete over
6-inches of aggregate base over
12-inches compacted subgrade to 95% per ASTM D 1557

For an assumed R-value of 15 and a Traffic Index of 7.0:

4-inches asphalt-concrete over
13-inches of aggregate base over
12-inches compacted subgrade to 95% per ASTM D 1557

For an assumed R-value of 50 and a Traffic Index of 5.0:

4-inches asphalt-concrete over
4-inches of aggregate base over
12-inches compacted subgrade to 95% per ASTM D 1557

For an assumed R-value of 50 and a Traffic Index of 7.0:

4-inches asphalt-concrete over
5-inches of aggregate base over
12-inches compacted subgrade to 95% per ASTM D 1557

The provided pavement sections are intended as a minimum guideline and final selection of pavement cross section parameters should be made by the project civil engineer, based upon the local laws and ordinates, expected subgrade and pavement response, and desired level of conservatism. If thinner or highly variable pavement sections are constructed, increased maintenance and repair could be expected. Irrigation adjacent to pavements, without a deep curb or other cutoff to separate landscaping from the paving will result in premature pavement failure. Final pavement design should be checked by testing of soils exposed at subgrade (the upper 12 inches) after final grading has been completed.

Asphalt concrete and aggregate base should conform to current Caltrans Standard Specifications Section 39 and 26-1.02, respectively. As an alternative, asphalt concrete can conform to Section 203-6 of the current Standard Specifications for Public Work (Green Book). Crushed aggregate base or crushed miscellaneous base can conform to Section 200-2.2 and 200-2.4 of the Green Book, respectively. Pavement base should be compacted to at least 95 percent of the ASTM D1557 laboratory maximum dry density (modified proctor).
All pavement installation, including preparation and compaction of subgrade, compaction of base material, placement and rolling of asphaltic concrete, should be done in accordance with the UFC manual, and under the observation and testing of GeoTek and a qualified Inspector where required. Jurisdictional minimum compaction requirements in excess of the aforementioned minimums may govern.

As an alternative to Asphalt Concrete over Aggregate Base, the pavement may be constructed using Portland Cement Concrete (PCC) placed on compacted aggregate base. The PCC should be 6.0-inches thick (actual) over 6.0-inches aggregate base, over 12-inches compacted subgrade, prepared as outlined above, and be constructed with an appropriate joint pattern, not to exceed 12 feet between joints.

### 5.5.4 Concrete Flatwork

#### 5.5.4.1 Exterior Concrete Slabs, Sidewalks and Driveways

Exterior concrete slabs, sidewalks and driveways should be designed using a four-inch minimum thickness. Some shrinkage and cracking of the concrete should be anticipated as a result of typical mix designs and curing practices typically utilized in construction.

Sidewalks and driveways may be under the jurisdiction of the governing agency. If so, jurisdictional design and construction criteria would apply, if more restrictive than the recommendations presented in this report.

Subgrade soils should be pre-moistened prior to placing concrete. The subgrade soils below exterior slabs, sidewalks, driveways, etc. should be pre-saturated to a minimum of 100 percent (for "very low") or 110 percent (for "low") of the optimum moisture content to a depth of 12 inches.

All concrete installation, including preparation and compaction of subgrade, should be done in accordance with the City of Escondido specifications, and under the observation and testing of GeoTek, Inc. and a City inspector, if necessary.

#### 5.5.4.2 Concrete Performance

Concrete cracks should be expected. These cracks can vary from sizes that are essentially unnoticeable to more than 1/8 inch in width. Most cracks in concrete, while unsightly, do not significantly impact long-term performance. While it is possible to take measures (proper concrete mix, placement, curing, control joints, etc.) to reduce the extent and size of cracks that occur, some cracking will occur despite the best efforts to minimize it. Concrete undergoes chemical processes that are dependent on a wide range of variables, which are difficult, at best, to control. Concrete, while seemingly a stable material, is subject to internal expansion and contraction due to external changes over time.

One of the simplest means to control cracking is to provide weakened control joints for cracking to occur along. These do not prevent cracks from developing; they simply provide a relief point for the stresses that develop. These joints are a widely accepted means to control cracks but are not always effective. Control joints are more effective the more closely spaced they are. GeoTek, Inc. suggests that control joints be placed in two directions and located a distance apart approximately equal to 24 to 36 times the slab thickness.

## 5.6 POST CONSTRUCTION CONSIDERATIONS

### 5.6.1 Landscape Maintenance and Planting

Water has been shown to weaken the inherent strength of soil, and slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from graded slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Controlling surface drainage and runoff and maintaining a suitable vegetation cover can minimize erosion. Plants selected for landscaping should be lightweight, deep-rooted types that require little water and are capable of surviving the prevailing climate.

Overwatering should be avoided. An abatement program to control ground-burrowing rodents should be implemented and maintained. Burrowing rodents can decrease the long-term performance of slopes.

It is common for planting to be placed adjacent to structures in planter or lawn areas. This will result in the introduction of water into the ground adjacent to the foundations. This type of landscaping should be avoided.

### 5.6.2 Drainage

Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond or seep into the ground adjacent to the footings and floor-slabs. Pad drainage should be directed toward approved areas and not be blocked by other improvements.

Roof gutters should be installed that will direct the collected water at least 20 feet from the buildings.

## 5.7 PLAN REVIEW AND CONSTRUCTION OBSERVATIONS

We recommend that specifications and foundation plans be reviewed by this office prior to construction to check for conformance with the recommendations of this report. We also recommend that GeoTek, Inc. representatives be present during site grading and foundation construction to observe and document proper implementation of the geotechnical recommendations. The owner/developer should verify that GeoTek, Inc. representatives perform at least the following duties:

- Observe site clearing and grubbing operations for proper removal of unsuitable materials.
- Observe and test bottom of removals prior to fill placement.
- Evaluate the suitability of on-site and import materials for fill placement and collect soil samples for laboratory testing where necessary.
- Observe the fill for uniformity during placement, including utility trench backfill. Also, perform field density testing of the fill materials.
- Observe and probe foundation excavations to confirm suitability of bearing materials with respect to density.

If requested, a construction observation and compaction report can be provided by GeoTek, Inc. which can comply with the requirements of the governmental agencies having jurisdiction over the project. We recommend that these agencies be notified prior to commencement of construction so that necessary grading permits can be obtained.

# 6. INTENT

It is the intent of this report to aid in the design and construction of the proposed development. Implementation of the advice presented in this report is intended to reduce risk associated with construction projects. The professional opinions and geotechnical advice contained in this report are not intended to imply total performance of the project or guarantee that unusual or variable conditions will not be discovered during or after construction.

The scope of our evaluation is limited to the boundaries of the subject property. This review does not and should in no way be construed to encompass any areas beyond the specific area of the proposed construction as indicated to us by the client. Further, no evaluation of any existing site improvements is included. The scope is based on our understanding of the project and geotechnical engineering standards normally used on similar projects in this locality.

# 7. LIMITATIONS

Our findings are based on site conditions observed and the stated sources. Thus, our comments are professional opinions that are limited to the extent of the available data.

GeoTek has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report.

Since our recommendations are based on the site conditions observed and encountered, and laboratory testing, our conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty of any kind is expressed or implied. Standards of care/practice are subject to change with time.

# 8. SELECTED REFERENCES

American Concrete Institute (ACI), 2006, Publication 302.2R-06, Guide for Concrete Slabs That Receive Moisture Sensitive Flooring Materials.

______, 2010, Publication 360R-10, Guide to Design of Slabs-On-Ground.

______, 2014, Publication 318-14 and 318R-14, Vuilding Code Requirements for Structural Concrete and Commentary on Building Code Requirements for Structureal Concrete.

American Society of Civil Engineers (ASCE), 2016, "Minimum Design Loads for Buildings and Other Structures," ASCE/SEI 7-16.

Bowles, J. E., 1977, "Foundation Analysis and Design", Second Edition.

Bryant, W.A., and Hart, E.W., 2007, "Fault Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps," California Geological Survey: Special Publication 42.

California Code of Regulations, Title 24, 2019, "California Building Code,".

California Geological Survey, 2007, "Geologic Map of the Oceanside 30x60 minute Quadrangle", Kennedy, M.P., Tan, S S., Bovard, K. R., Alvarez, R. M., Watson, M. J. and Gutierrez, C. I., CGS Regional Geologic Map No. 2.

Department of the Navy, 1982, "Foundations and Earth Structures", Design Manual 7.2.

Geocon Incorporated, 2018, Preliminary Geotechnical Investigation, Palomar Heights, Escondido, California", Project No. G2109-11-02, dated April 17. Revised September 9, 2019.

GeoTek, Inc., In-house proprietary information.

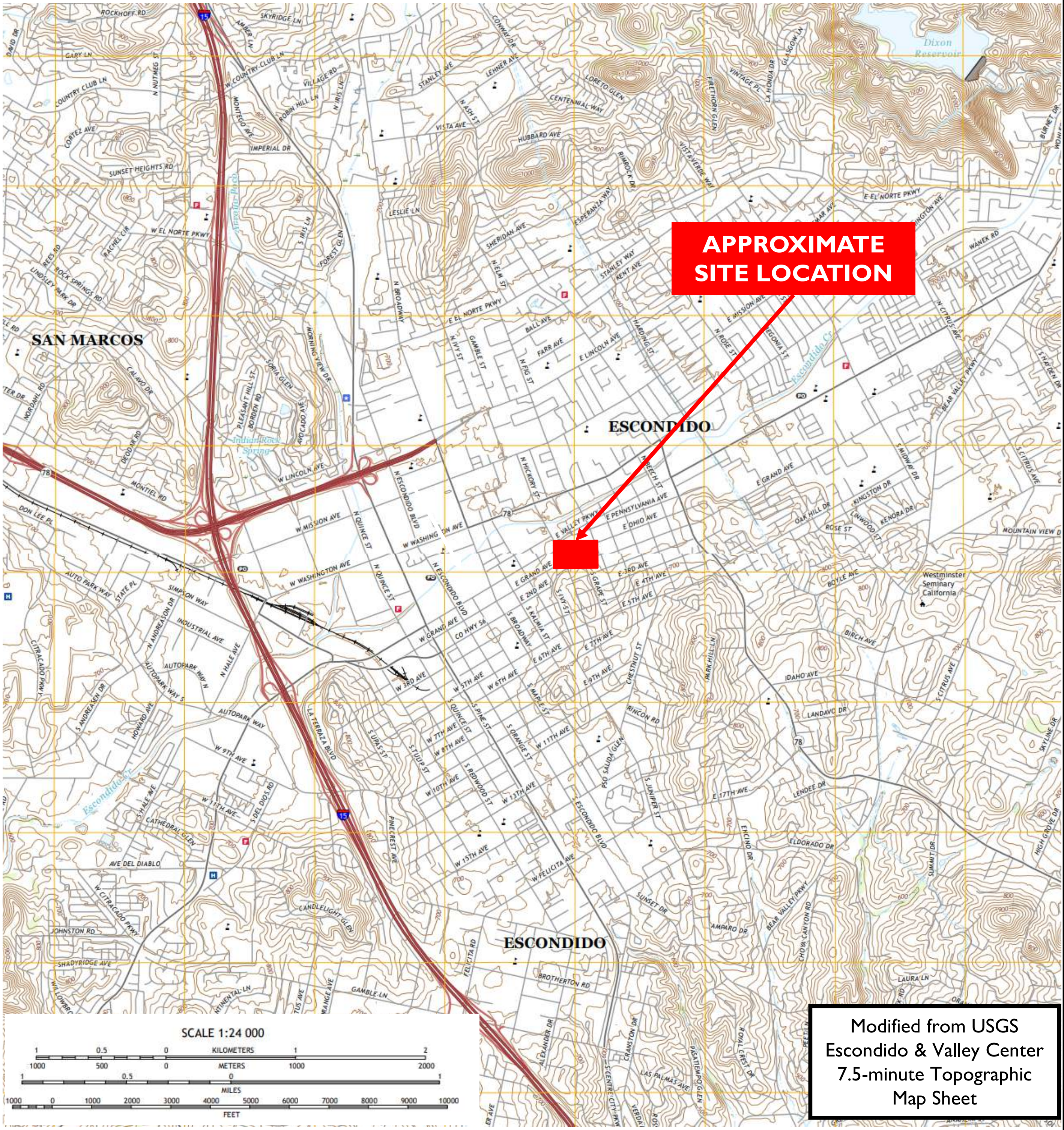
Roberge, P. R., 2005, "Corrosion Basics: An Introduction", second edition.

SEA/OSHPD web service, "Seismic Design Maps" (https://seismicmaps.org)

Southern California Earthquake Center (SCEC), 1999, Martin, G. R., and Lew, M., ed., "Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction Hazards in California,", dated March 1999.

State of California, California Geological Survey (CGS, formerly referred to as the California Division of Mines and Geology), 2008, "Guidelines for Evaluating and Mitigating Seismic Hazards in California," Special Publication 117A.

Terzaghi, K and Peck, R. B., 1967, "Soil Mechanics in Engineering Practice", second edition.



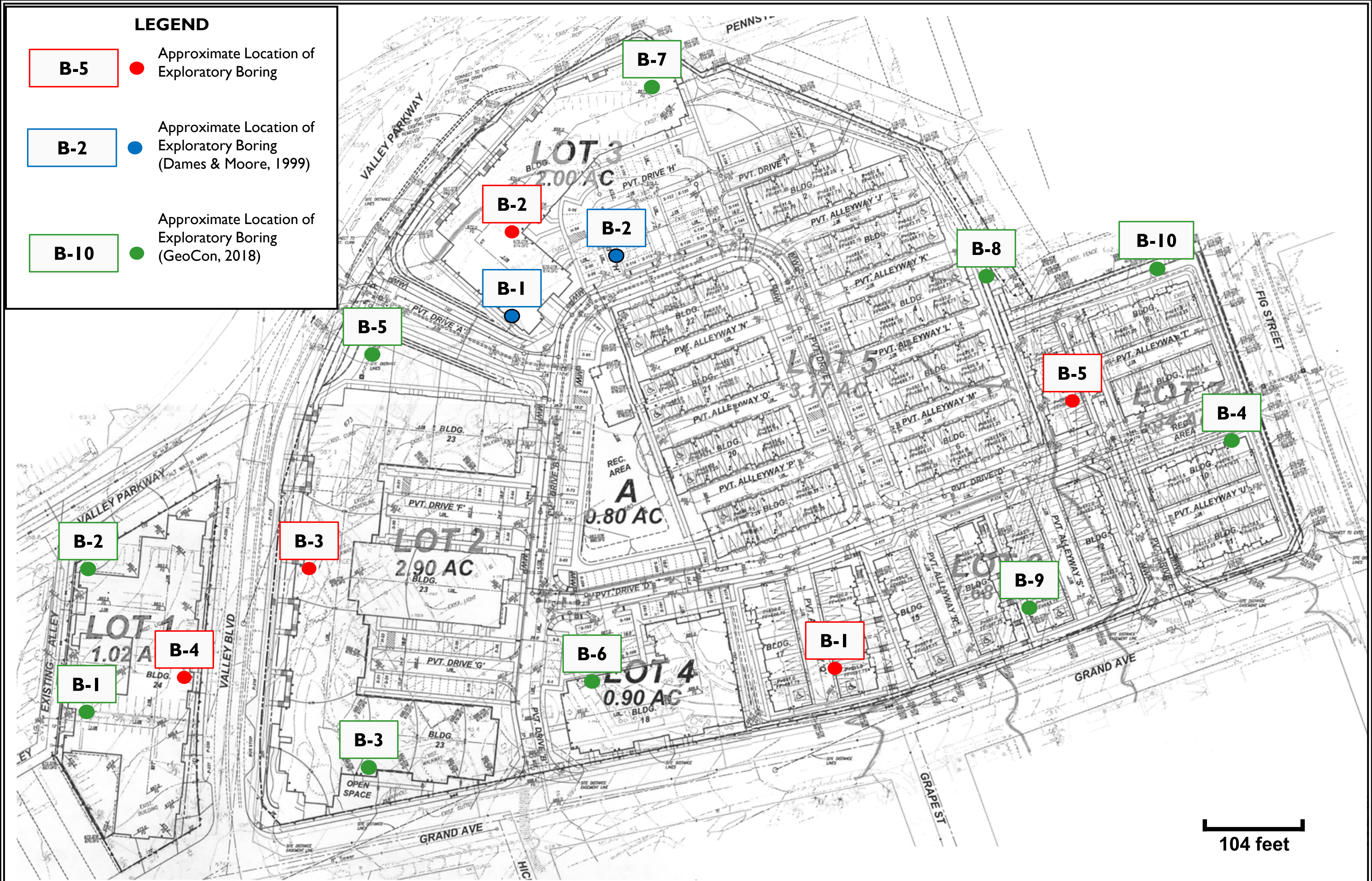

**Integral Communities**
Palomar Heights
Escondido, San Diego County, California

Project No. 3610-SD

NORTH

**Figure 1**
**Site Location and General Site Topography Map**

GEOTEK




**Integral Communities**
Palomar Heights
Escondido, San Diego County, California

GeoTek Project No. 3610-SD

N

**Figure 2**

**Boring Location Map**

GEOTEK

# APPENDIX A

## LOGS OF GEOTEK EXPLORATORY BORINGS

**Palomar Heights**
**Escondido, San Diego County, California**
**Project No. 3610-SD**

GEOTEK

## A - FIELD TESTING AND SAMPLING PROCEDURES

The Modified Split-Barrel Sampler (Ring)
The Ring sampler is driven into the ground in accordance with ASTM Test Method D 3550. The sampler, with an external diameter of 3.0 inches, is lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sampler is typically driven into the ground 12 or 18 inches with a 140-pound hammer free falling from a height of 30 inches. Blow counts are recorded for every 6 inches of penetration as indicated on the log of boring. The samples are removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

Bulk Samples (Large)
These samples are normally large bags of earth materials over 20 pounds in weight collected from the field by means of hand digging or exploratory cuttings.

Bulk Samples (Small)
These are plastic bag samples which are normally airtight and contain less than 5 pounds in weight of earth materials collected from the field by means of hand digging or exploratory cuttings. These samples are primarily used for determining natural moisture content and classification indices.

## B – BORING/TRENCH LOG LEGEND

The following abbreviations and symbols often appear in the classification and description of soil and rock on the logs of borings/trenches:

*SOILS*

| | |
|---|---|
| USCS | Unified Soil Classification System |
| f-c | Fine to coarse |
| f-m | Fine to medium |

*GEOLOGIC*

| | |
|---|---|
| B: Attitudes | Bedding: strike/dip |
| J: Attitudes | Joint: strike/dip |
| C: Contact line | |
| ……….. | Dashed line denotes USCS material change |
| ——— | Solid Line denotes unit / formational change |
| ━━━ | Thick solid line denotes end of boring/trench |

(Additional denotations and symbols are provided on the log of borings/trenches)

# GeoTek, Inc.
# LOG OF EXPLORATORY BORING

| | | | | | |
|---|---|---|---|---|---|
| **CLIENT:** | Integral Communities | **DRILLER:** | 2R | **LOGGED BY:** | KM |
| **PROJECT NAME:** | Palomar Heights | **DRILL METHOD:** | Hollw stem Auger | **OPERATOR:** | Jeff |
| **PROJECT NO.:** | 3610-SD | **HAMMER:** | 140lbs/30in. | **RIG TYPE:** | Track |
| **LOCATION:** | See Boring Location Map | | | **DATE:** | 10/25/2019 |

**BORING NO.: B- 1**

| Depth (ft) | SAMPLES: Sample Type | Blows/ 6 in | Sample Number | USCS Symbol | MATERIAL DESCRIPTION AND COMMENTS | Laboratory Testing: Water Content (%) | Dry Density (pcf) | Others |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Asphaltic Concrete: 4"**<br>**Aggregate Base: 4"** | | | |
| | | | | | **Undocumented Fill:** | | | |
| | Ring | 18<br>20<br>24 | R1 | SM | Silty f-m SAND, dark brown, moist, dense | 5.1 | 117.8 | SH |
| | | | | | **Weathered Granitic Bedrock:** | | | |
| 5 | Ring | 24<br>50/5" | R2 | | Granodiorite, yellowish brown, moist, hard, very weathered, breaks down to f-c SAND with GRAVEL | 3.3 | 121.4 | HC |
| | Ring | 50/6" | R3 | | Same | | | |
| 10 | Ring | 50/5" | R4 | | Same, less weathering | 2.5 | 120.3 | |
| 15 | Ring | 50/5" | R5 | | Same, very little to no weathering | | | |
| 20 | No Recovery | 50/2" | | | No Recovery | | | |
| | | | | | **BORING TERMINATED AT 20.2 FEET** | | | |
| | | | | | No groundwater encountered<br>Boring backfilled with soil cuttings | | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |

**LEGEND**

**Sample type**: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

**Lab testing:**
AL = Atterberg Limits
EI = Expansion Index
SA = Sieve Analysis
RV = R-Value Test
SR = Sulfate/Resisitivity Test
SH = Shear Test
HC= Consolidation
MD = Maximum Density

GeoTek, Inc.

# LOG OF EXPLORATORY BORING

| | | | | | |
|---|---|---|---|---|---|
| **CLIENT:** | Integral Communities | **DRILLER:** | 2R | **LOGGED BY:** | KM |
| **PROJECT NAME:** | Palomar Heights | **DRILL METHOD:** | Hollow stem Auger | **OPERATOR:** | Jeff |
| **PROJECT NO.:** | 3610-SD | **HAMMER:** | 140lbs/30in. | **RIG TYPE:** | Track |
| **LOCATION:** | See Boring Location Map | | | **DATE:** | 10/25/2019 |

## BORING NO.: B- 2

| Depth (ft) | SAMPLES: Sample Type | SAMPLES: Blows/ 6 in | SAMPLES: Sample Number | USCS Symbol | MATERIAL DESCRIPTION AND COMMENTS | Laboratory Testing: Water Content (%) | Laboratory Testing: Dry Density (pcf) | Laboratory Testing: Others |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Asphaltic Concrete: 3"**<br>**Aggregate Base: 0"** | | | |
| | | | | | **Undocumented Fill:** | | | MD |
| | | 10<br>16<br>27 | R1 | SM | Silty f SAND, brown, slightly moist to moist, dense | 5.5 | 130.5 | SH<br>EI=0<br>SR |
| | | | | | **Weathered Granitic Bedrock:** | | | |
| 5 | | 50/6" | R2 | | Granodiorite, orangish brown, slightly moist to moist, hard, decomposed to highly weathered | 4.4 | 119.5 | |
| | | 50/4" | R3 | | Same, less weathered, breaks down to f-c SAND | 1.8 | | |
| 10 | | 50/4" | R4 | | No Recovery | | | |
| 15 | | 50/6" | R5 | | Same, Slightly moist | | | |
| | | | | | **BORING TERMINATED AT 15.5 FEET** | | | |
| | | | | | No groundwater encountered<br>Boring backfilled with soil cuttings | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |

LEGEND

**Sample type**: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

**Lab testing:**
AL = Atterberg Limits | EI = Expansion Index | SA = Sieve Analysis | RV = R-Value Test
SR = Sulfate/Resisitivity Test | SH = Shear Test | HC= Consolidation | MD = Maximum Density

# GeoTek, Inc.
# LOG OF EXPLORATORY BORING

| | | | | | |
|---|---|---|---|---|---|
| **CLIENT:** | Integral Communities | **DRILLER:** | 2R | **LOGGED BY:** | KM |
| **PROJECT NAME:** | Palomar Heights | **DRILL METHOD:** | Hollw stem Auger | **OPERATOR:** | Jeff |
| **PROJECT NO.:** | 3610-SD | **HAMMER:** | 140lbs/30in. | **RIG TYPE:** | Track |
| **LOCATION:** | See Boring Location Map | | | **DATE:** | 10/25/2019 |

**BORING NO.: B- 3**

| Depth (ft) | Sample Type | Blows/ 6 in | Sample Number | USCS Symbol | MATERIAL DESCRIPTION AND COMMENTS | Water Content (%) | Dry Density (pcf) | Others |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Older Alluvium:** | | | |
| | | 10<br>12<br>16 | R1 | SC | Clayey SAND, dark reddish brown, moist, medium dense, trace f GRAVEL | 8.9 | 129.7 | MD<br>EI=29<br>LL=31; PI=15<br>SR<br>SH |
| 5 | | 10<br>19<br>27 | R2 | | Clayey f-m SAND, dark brownish red, moist, dense, trace f GRAVEL | 13.5 | 122.9 | HC |
| | | 15<br>50/5" | R3 | | Same, very dense | 12.5 | 125.2 | |
| 10 | | 50/5" | R4 | | **Weathered Granitic Bedrock:**<br>Granodiorite, dark red, slightly moist to moist, hard, breaks down to f-c SAND | 8.5 | 114.2 | |
| 15 | | 50/4" | R5 | | Same, poor recovery, little to no weathering | | | |
| | | | | | Drilling slowed | | | |
| 20 | | 50/3" | | | No Recovery | | | |
| | | | | | **BORING TERMINATED AT 20.3 FEET**<br>No groundwater encountered<br>Boring backfilled with soil cuttings | | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |

SAMPLES | Laboratory Testing

LEGEND

**Sample type**: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

**Lab testing:** AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

# GeoTek, Inc.
# LOG OF EXPLORATORY BORING

| | | | | | |
|---|---|---|---|---|---|
| **CLIENT:** | Integral Communities | **DRILLER:** | 2R | **LOGGED BY:** | KM |
| **PROJECT NAME:** | Palomar Heights | **DRILL METHOD:** | Hollw stem Auger | **OPERATOR:** | Jeff |
| **PROJECT NO.:** | 3610-SD | **HAMMER:** | 140lbs/30in. | **RIG TYPE:** | Track |
| **LOCATION:** | See Boring Location Map | | | **DATE:** | 10/25/2019 |

**BORING NO.: B- 4**

| Depth (ft) | SAMPLES: Sample Type | SAMPLES: Blows/ 6 in | SAMPLES: Sample Number | USCS Symbol | MATERIAL DESCRIPTION AND COMMENTS | Laboratory Testing: Water Content (%) | Laboratory Testing: Dry Density (pcf) | Laboratory Testing: Others |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Asphaltic Concrete: 3"** | | | |
| | | | | | **Aggregate Base: 3"** | | | |
| | | | | | **Older Alluvium:** | | | |
| | Ring | 7<br>11<br>17 | R1 | SC | Clayey f SAND, dark brownish red, moist to very moist, medium dense, trace f GRAVEL | 12.4 | 124.0 | HC |
| 5 | Ring | 15<br>50/6" | R2 | | Same, highly oxidized, very dense | 12.3 | 125.0 | SH |
| | Ring | 26<br>50/6" | R3 | SM | Silty f SAND with some CLAY, dark red, moist, very dense, oxidized | 11.5 | 128.4 | |
| | | | | | **Weathered Granitic Bedrock:** | | | |
| 10 | Ring | 50/6" | R4 | | Granodiorite, dark reddish yellow, moist to very moist, hard, highly weathered to decomposed, breaks down to f-c SAND | 16.4 | 106.5 | |
| 15 | No Recovery | 50/3" | | | No Recovery | | | |
| | | | | | Drilling Slowed<br>Water added during excavation | | | |
| 20 | Ring | 50/5" | R5 | | Same, dark gray, little to no weathering | | | |
| | | | | | **BORING TERMINATED AT 20.5 FEET** | | | |
| | | | | | No groundwater encountered<br>Boring backfilled with soil cuttings | | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |

**LEGEND**

**Sample type**: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

**Lab testing:**

| | | | |
|---|---|---|---|
| AL = Atterberg Limits | EI = Expansion Index | SA = Sieve Analysis | RV = R-Value Test |
| SR = Sulfate/Resisitivity Test | SH = Shear Test | HC= Consolidation | MD = Maximum Density |

# GeoTek, Inc.
## LOG OF EXPLORATORY BORING

| | | | | | |
|---|---|---|---|---|---|
| **CLIENT:** | Integral Communities | **DRILLER:** | 2R | **LOGGED BY:** | KM |
| **PROJECT NAME:** | Palomar Heights | **DRILL METHOD:** | Hollw stem Auger | **OPERATOR:** | Jeff |
| **PROJECT NO.:** | 3610-SD | **HAMMER:** | 140lbs/30in. | **RIG TYPE:** | Track |
| **LOCATION:** | See Boring Location Map | | | **DATE:** | 10/25/2019 |

**BORING NO.: B- 5**

| Depth (ft) | SAMPLES: Sample Type | Blows/ 6 in | Sample Number | USCS Symbol | MATERIAL DESCRIPTION AND COMMENTS | Laboratory Testing: Water Content (%) | Dry Density (pcf) | Others |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Asphaltic Concrete: 3" Aggregate Base: 0"** | | | |
| | | | | | **Undocumented Fill** | | | |
| | Ring | 40 50/5" | R1 | SM | Silty f-m SAND with some CLAY, yellowish brown, moist, very dense | 5.2 | | |
| 5 | Ring | 50/5" | R2 | | **Weathered Granitic Bedrock** Granodiorite, orangish brown, slightly moist to moist, hard, breaks down to f-c SAND, decomposed | 5.3 | | |
| | Large Bulk | | | | | | | |
| | Ring | 50/5" | R3 | | Same, highly weathered, moist | 3.4 | | |
| | | | | | Drilling slowed | | | |
| 10 | No Recovery | 50/3 | R4 | | No Recovery | | | |
| 15 | Ring | 50/5" | R5 | | Same, little to no weathering | | | |
| | | | | | **BORING TERMINATED AT 15.5 FEET** | | | |
| | | | | | No groundwater encountered<br>Boring backfilled with soil cuttings | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |

**LEGEND**

**Sample type**: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

**Lab testing:**
AL = Atterberg Limits  EI = Expansion Index  SA = Sieve Analysis  RV = R-Value Test
SR = Sulfate/Resisitivity Test  SH = Shear Test  HC= Consolidation  MD = Maximum Density

# APPENDIX B

**BORING LOGS & LABORATORY TEST RESULTS (Geocon, 2018)**

**Palomar Heights**

**Escondido, San Diego County, California**

**Project No. 3610-SD**

GEOTEK

## BORING B 1

ELEV. (MSL.) ________ DATE COMPLETED **03-22-2018**

EQUIPMENT **TRUCK MOUNTED DRILL RIG W/8" HSA** BY: **K. HAASE**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 4½" **ASPHALT** over 7½" **BASE** | | | |
| | B1-1 | | | SC | **YOUNGER ALLUVIUM (Qya)**<br>Dense, moist, reddish brown, Clayey, fine SAND | | | |
| 2 | | | | | | | | |
| | B1-2 | | | | | 59 | 118.4 | 14.6 |
| 4 | | | | | | | | |
| | | | | SC | **OLDER ALLUVIUM (Qoa)**<br>Very dense, moist, dark reddish brown, Clayey, fine to medium SAND | | | |
| 6 | B1-3 | | | | | 50/6" | 122.0 | 12.9 |
| 8 | | | | | | | | |
| | B1-4 | | | | | 50/6" | 123.0 | 12.9 |
| 10 | | | | | | | | |
| 12 | | | | | | | | |
| | B1-5 | | | | **GRANITIC ROCK (Kgd)**<br>Completely weathered, reddish brown to grayish brown, weak GRANITIC ROCK | | | |
| 14 | | | | | | | | |
| | B1-6 | | | | | 50/5" | | |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| | B1-7 | | | | | 50/4" | | |
| | | | | | BORING TERMINATED AT 19.5 FEET<br>No groundwater encountered | | | |

**Figure 1,**
**Log of Boring B 1, Page 1 of 1**

G2109-11-02.GPJ

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

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

GEOCON

PROJECT NO. G2109-11-02

# BORING B 2

ELEV. (MSL.) ________ DATE COMPLETED **03-23-2018**

EQUIPMENT **TRUCK MOUNTED DRILL RIG W/8" HSA** BY: **K. HAASE**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 3" **ASPHALT** over 3" **BASE** | | | |
| | B2-1 | | | SC | **YOUNGER ALLUVIUM (Qya)**<br>Medium dense, moist, dark reddish brown, Clayey, fine SAND; trace gravel | | | |
| 2 | | | | | | | | |
| | B2-2 | | | SC | **OLDER ALLUVIUM (Qoa)**<br>Dense, moist, dark reddish brown, Clayey, fine to medium SAND | 58 | 123.1 | 12.8 |
| 4 | | | | | | | | |
| 6 | B2-3 | | | | | 85/10½" | 124.7 | 12.3 |
| 8 | | | | | | | | |
| | B2-4 | | | | **GRANITIC ROCK (Kgd)**<br>Completely weathered, light reddish brown to grayish brown, weak GRANITIC ROCK | 90/10" | 127.1 | 10.6 |
| 10 | | | | | | | | |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | | | | | -Becomes dark grayish brown | | | |
| | | | | | BORING TERMINATED AT 15.5 FEET<br>No groundwater encountered | | | |

**Figure 2,**
**Log of Boring B 2, Page 1 of 1**

G2109-11-02.GPJ

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

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

GEOCON

PROJECT NO. G2109-11-02

# BORING B 3

ELEV. (MSL.) ________ DATE COMPLETED **03-23-2018**

EQUIPMENT **TRUCK MOUNTED DRILL RIG W/8" HSA** BY: **K. HAASE**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | SC | **UNDOCUMENTED FILL (Qudf)**<br>Loose to medium dense, moist to saturated, Clayey, fine SAND; little roots | | | |
| | B3-1 | | | | | | | |
| 2 | | | | | | | | |
| | B3-2 | | | SC | **YOUNGER ALLUVIUM (Qya)**<br>Medium dense, moist, dark brown, Clayey, fine SAND | 43 | 122.5 | 14.0 |
| 4 | | | | | | | | |
| 6 | B3-3 | | | | -Cobble up to 4" diameter | 95/11½" | | |
| 8 | | | | SC | **OLDER ALLUVIUM (Qoa)**<br>Very dense, moist, reddish brown to olive brown, Clayey, fine SAND | | | |
| | B3-4 | | | | | 77/11" | 118.5 | 15.9 |
| 10 | | | | | | | | |
| 12 | | | | | **GRANITIC ROCK (Kgd)**<br>Completely weathered, olive to grayish brown, weak GRANITIC ROCK | | | |
| 14 | | | | | | | | |
| | B3-5 | | | | | 83/10" | | |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| | B3-6 | | | | -Becomes dark grayish brown | 50/3" | | |
| | | | | | BORING TERMINATED AT 19.5 FEET<br>No groundwater encountered | | | |

**Figure 3,**
**Log of Boring B 3, Page 1 of 1**

G2109-11-02.GPJ

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

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

GEOCON

# BORING B 4

ELEV. (MSL.) ________ DATE COMPLETED **03-23-2018**

EQUIPMENT **TRUCK MOUNTED DRILL RIG W/8" HSA** BY: **K. HAASE**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 2½" **ASPHALT** over 3" **BASE** | | | |
| | B4-1 | | | SC | **UNDOCUMENTED FILL (Qudf)**<br>Loose, moist, brown, Clayey, fine SAND; micaceous, trace roots | | | |
| 2 | | | | | | | | |
| | B4-2 | | | | | 9 | 118.5 | 12.8 |
| 4 | | | | | | | | |
| 6 | B4-3 | | | SC | **OLDER ALLUVIUM (Qoa)**<br>Dense, moist, reddish brown, Clayey, fine to medium SAND | 59 | 119.4 | 13.6 |
| 8 | | | | | | | | |
| | B4-4 | | | | **GRANITIC ROCK (Kgd)**<br>Completely weathered, reddish brown, weak GRANITIC ROCK | 50/6" | | |
| 10 | | | | | | | | |
| 12 | B4-5 | | | | -Becomes grayish brown | 50/4½" | | |

BORING TERMINATED AT 12.5 FEET
No groundwater encountered

**Figure 4,**
**Log of Boring B 4, Page 1 of 1**

G2109-11-02.GPJ

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

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

# BORING B 5

ELEV. (MSL.) ________ DATE COMPLETED **03-22-2018**

EQUIPMENT **TRUCK MOUNTED DRILL RIG W/8" HSA** BY: **K. HAASE**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | SM | **UNDOCUMENTED FILL (Qudf)** Dense, damp, light reddish brown, Silty, fine to medium SAND | | | |
| 2 | B5-1 | | | | | | | |
| | B5-2 | | | | **GRANITIC ROCK (Kgd)** Completely weathered, grayish brown to reddish brown, weak GRANITIC ROCK | 50/4½" | 117.7 | 4.1 |
| 4 | | | | | | | | |
| 6 | B5-3 | | | | | 50/4" | | |
| 8 | | | | | | | | |
| | B5-4 | | | | | 50/5½" | | |

BORING TERMINATED AT 9.5 FEET
No groundwater encountered

**Figure 5,**
**Log of Boring B 5, Page 1 of 1**

G2109-11-02.GPJ

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

PROJECT NO. G2109-11-02

# BORING B 6

ELEV. (MSL.) ________ DATE COMPLETED **03-22-2018**

EQUIPMENT **TRUCK MOUNTED DRILL RIG W/8" HSA** BY: **K. HAASE**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | SM | **UNDOCUMENTED FILL (Qudf)** Medium dense, moist, olive brown to brown, Silty, fine to coarse SAND | | | |
| 2 | | | | | | | | |
| 4 | B6-1 | | | | | 36 | 122.8 | 6.3 |
| | | | | SC | **YOUNGER ALLUVIUM (Qya)** Medium dense, moist, reddish brown, Clayey, fine to coarse SAND | | | |
| 6 | B6-2 | | | | | 35 | 130.9 | 9.7 |
| 8 | | | | | | | | |
| 10 | B6-3 | | | SC | Medium dense, moist, dark brown, Clayey, fine to medium SAND; trace roots | 31 | 125.3 | 9.6 |
| 12 | | | | | | | | |
| 14 | | | | | **GRANITIC ROCK (Kgd)** Completely weathered, olive brown, weak GRANITIC ROCK | | | |
| 16 | B6-4 | | | | | 50/5" | 123.6 | 4.1 |
| 18 | | | | | | | | |
| | B6-5 | | | | | 50/3" | | |
| | | | | | BORING TERMINATED AT 19.5 FEET<br>No groundwater encountered | | | |

## Figure 6,
## Log of Boring B 6, Page 1 of 1

G2109-11-02.GPJ

SAMPLE SYMBOLS

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

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

GEOCON

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | BORING B 7<br>ELEV. (MSL.) ________ DATE COMPLETED **03-22-2018**<br>EQUIPMENT **TRUCK MOUNTED DRILL RIG W/8" HSA** BY: **K. HAASE** | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| | | | | | MATERIAL DESCRIPTION | | | |
| 0 | | | | SC | **TOPSOIL**<br>Loose, moist, dark brown, Clayey, fine SAND; trace roots | | | |
| | B7-1 | | | SC | **YOUNGER ALLUVIUM (Qya)**<br>Medium dense, moist, dark brown, Clayey, fine to medium SAND | | | |
| 2 | | | | | | | | |
| | B7-2 | | | | | 31 | 121.2 | 12.8 |
| 4 | | | | | | | | |
| 6 | B7-3 | | | | | 41 | 118.8 | 15.4 |
| | | | | | -Becomes finer grained | | | |
| 8 | | | | | | | | |
| | B7-4 | | | | | 24 | 107.3 | 19.9 |
| 10 | | | | | | | | |
| 12 | | | | | | | | |
| | | | | SC | **OLDER ALLUVIUM (Qoal)**<br>Medium dense, moist, reddish brown, Clayey, fine to medium SAND; micaceous | | | |
| 14 | | | | | | | | |
| | B7-5 | | | | | 43 | 108.0 | 20.7 |
| 16 | | | ▼ | | | | | |
| | B7-6 | | | | | | | |
| 18 | | | | | | | | |
| | B7-7 | | | | -Becomes coarser grained; gravel up to 1" in diameter | 35 | 112.3 | 18.9 |
| 20 | | | | | | | | |
| 22 | | | | | **GRANITIC ROCK (Kgd)**<br>Completely weathered, reddish brown to grayish brown, weak GRANITIC ROCK | | | |
| 24 | B7-8 | | | | | 50/2½" | | |
| 26 | | | | | | | | |
| 28 | | | | | | | | |
| | B7-9 | | | | -Becomes dark grayish brown | 50/3" | | |

**Figure 7,**
**Log of Boring B 7, Page 1 of 2**

G2109-11-02.GPJ

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

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

GEOCON

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | BORING B 7<br>ELEV. (MSL.) ________ DATE COMPLETED 03-22-2018<br>EQUIPMENT TRUCK MOUNTED DRILL RIG W/8" HSA BY: K. HAASE | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| | | | | | MATERIAL DESCRIPTION | | | |
| | | | | | BORING TERMINATED AT 29.5 FEET<br>Groundwater encountered at 17 feet<br>Backfilled with 10.3 ft³ of slurry | | | |

**Figure 7,**
**Log of Boring B 7, Page 2 of 2**

G2109-11-02.GPJ

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

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

PROJECT NO. G2109-11-02

# BORING B 8

ELEV. (MSL.) ________ DATE COMPLETED **03-23-2018**

EQUIPMENT **TRUCK MOUNTED DRILL RIG W/8" HSA** BY: **K. HAASE**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 4" **ASPHALT** over 7" **BASE** | | | |
| | | | | SM | **UNDOCUMENTED FILL (Qudf)**<br>Medium dense, moist, olive brown, Silty, fine SAND | | | |
| 2 | | | | SM | **OLDER ALLUVIUM (Qoa)**<br>Dense, damp, brown, Silty, fine to coarse SAND | | | |
| | B8-1 | | | | | 58 | 120.1 | 2.6 |
| 4 | | | | | | | | |
| 6 | B8-2 | | | | | 77 | 129.0 | 8.6 |
| 8 | | | | | | | | |
| | B8-3 | | | SC | Dense, moist, dark brown, Clayey, fine to coarse SAND; some gravel up to 1.5" diameter | 73 | 135.0 | 9.3 |
| 10 | | | | | | | | |
| 12 | | | | | | | | |
| 14 | | | | | **GRANITIC ROCK (Kgd)**<br>Completely weathered, reddish brown to grayish brown, weak GRANITIC ROCK | | | |
| | B8-4 | | | | | 50/5½" | | |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| | B8-5 | | | | | 50/4" | | |

BORING TERMINATED AT 19.5 FEET
No groundwater encountered

**Figure 8,**
**Log of Boring B 8, Page 1 of 1**

G2109-11-02.GPJ

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

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

GEOCON

# BORING B 9

ELEV. (MSL.) ________ DATE COMPLETED **03-23-2018**

EQUIPMENT **TRUCK MOUNTED DRILL RIG W/8" HSA** BY: **K. HAASE**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 4" **ASPHALT** over 4" **BASE** | | | |
| | B9-1 | | | SM | **OLDER ALLUVIUM (Qoa)**<br>Very dense, damp, reddish brown, Silty, fine to coarse SAND | | | |
| 2 | | | | | | | | |
| | B9-2 | | | | | 50/5" | 126.2 | 10.1 |
| 4 | | | | | | | | |
| | B9-3 | | | | **GRANITIC ROCK (Kgd)**<br>Completely weathered, reddish to grayish brown, weak GRANITIC ROCK | 50/5½" | | |
| 6 | | | | | | | | |
| 8 | | | | | | | | |
| | B9-4 | | | | | 50/2½" | | |
| | | | | | BORING TERMINATED AT 9.5 FEET<br>No groundwater encountered | | | |

**Figure 9,**
**Log of Boring B 9, Page 1 of 1**

G2109-11-02.GPJ

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

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

GEOCON

PROJECT NO. G2109-11-02

# BORING B 10

ELEV. (MSL.) ________ DATE COMPLETED **03-23-2018**

EQUIPMENT **TRUCK MOUNTED DRILL RIG W/8" HSA** BY: **K. HAASE**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 6" **ASPHALT** over 3" **BASE** | | | |
| | B10-1 | | | SC | **YOUNGER ALLUVIUM (Qya)** Medium dense, moist, dark reddish brown, Clayey, fine SAND; some silt | | | |
| 2 | | | | | | | | |
| | B10-2 | | | | | 39 | 117.6 | 15.3 |
| 4 | | | | | | | | |
| | | | | SM | **OLDER ALLUVIUM (Qoa)** Dense, moist, brown, Silty, fine to coarse SAND | | | |
| 6 | B10-3 | | | | | 55 | 113.3 | 18.1 |
| 8 | | | | | | | | |
| | B10-4 | | | | -Becomes olive brown | 47 | 110.2 | 19.2 |
| 10 | | | | | | | | |
| 12 | | | | | | | | |
| | | | | | **GRANITIC ROCK (Kgd)** Completely weathered, grayish brown to brown, weak GRANITIC ROCK | | | |
| 14 | | | | | | | | |
| | B10-5 | | | | | 95/9" | | |
| 16 | | | ▼ | | | | | |
| 18 | | | | | | | | |
| | B10-6 | | | | | 50/4" | | |

BORING TERMINATED AT 19.5 FEET
Groundwater encountered at 17 feet
Backfilled with 6.8 ft³ of slurry

G2109-11-02.GPJ

**Figure 10,**
**Log of Boring B 10, Page 1 of 1**

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

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

GEOCON

| | | | |
|---|---|---|---|
| Date(s) Drilled | 5/25/99 | Logged By | SFM |
| Drilling Method | Hollow Stem Auger | Drill Bit Size/Type | 8-inches diameter |
| Drill Rig Type | Cme-185 | Hammer Data | 140 lb., 30-in. drop |
| Sampling Method(s) | SPT | | |
| Approximate Groundwater Depth and Date Measured | Groundwater encountered at 40 feet | | |
| Comments | | | |

# Boring B-1

Sheet 1 of 1

| | |
|---|---|
| Job Number | 41735-003-004 |
| Total Depth Drilled (ft) | 65.0 |
| Approximate Ground Surface Elevation(ft) | |

| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per foot | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | SM | **DECOMPOSED GRANITE:** Medium to dark brown, silty sand (SM), dense, slightly moist | | | |
| | | | 1 | 10 18 50 | | Grades slightly less weathered | 7 | | -200 (24) |
| | 10 | | 2 | 20 | | **SAN MARCOS GABBRO:** | 4 | | -200 (12) |
| | | | 3 | 50 50/0" | | Granitic bedrock, moderately to slightly weathered, localized highly weathered zones | 3 | | -200 (16) |
| | | | | | | Grades very hard drilling | | | |
| | | | | | | Grading to fresh granite, still slightly weathered | | | Auger drilling refusal switch to air-rotary |
| | 20 | | 4 | | | Slightly weathered with seams of fresh granite | 2 | | |
| | 30 | | | | | Fresh rock | | | |
| | | | 5 | | | Grades blue, very hard | 2 | | |
| | 40 | | | | | Grades less hard, brown weathered granitic seam | | | |
| | | | | | | Grades black to dark grayish blue granite | | | |
| | 50 | | | | | | | | 11:55 While blowing out hole, large amount of H2O encountered 11:56 Stop drilling to change out drum to catch cuttings 12:15 Lots of H2O in hole |
| | 60 | | | | | Grades softer | | | |
| | | | 6 | | | | 13 | | |
| | 70 | | | | | | | | |

Report: DMG4; Project File: S:\GINTW\PALOMAR.GPJ; Data Template:DMLA.GDT Printed: 7/7/99

This log is part of the report prepared by Dames & Moore for this project and should be read together with the report. This summary applies only at the location of the exploration and at the time of drilling or excavation. Subsurface conditions may differ at other locations and may change at this location with time. Data presented are a simplification of actual conditions encountered.

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

## LOG OF BORING

Palomar Medical Center
Escondido
FOR: Palomar-Pomerado Health System

Figure 2

| | | | |
|---|---|---|---|
| Date(s) Drilled | 5/24/99 | Logged By | SFM |
| Drilling Method | Hollow Stem Auger | Drill Bit Size/Type | 8-inches diameter |
| Drill Rig Type | Cme-185 | Hammer Data | 140 lb., 30-in. drop |
| Sampling Method(s) | SPT | | |
| Approximate Groundwater Depth and Date Measured | Groundwater encountered at 33 feet | | |
| Comments | | | |

# Boring B-2

Sheet 1 of 1

| | |
|---|---|
| Job Number | 41735-003-004 |
| Total Depth Drilled (ft) | 74.0 |
| Approximate Ground Surface Elevation(ft) | |

| 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 | | | | | SM | ARTIFICIAL FILL: Brown to olive brown silty sand, dense | | | |
| | | | | | | | Slight increase in moisture | | | |
| | | ◪ | 1 | 50/6" | | SM | DECOMPOSED GRANITE: Brown sand, very dense | 2 | | -200 (13) |
| | 10 | ◪ | 2 | 50/5" | | | | 2 | | -200 (15) |
| | | ◪ | 3 | 41,50/3" | | | | 3 | | -200 (16) |
| | | | | | | | SAN MARCOS GABBRO: Granitic bedrock, grayish brown, highly to locally completely weathered, very friable | | | |
| | 20 | ◪ | 4 | 37 50/3" | | | Slightly increasing moisture content, weathered | 3 | | -200 (19) |
| | | ◪ | 5 | 35 50/3" | | | Grades brown, moist, friable | 5 | | -200 (21) |
| | 30 | ◪ | 6 | 50/6" | | | | 13 | | -200 (10) |
| | | | | | | ▽ | Grades wet, gravel encountered | | | |
| | | ◪ | 7 | 50/5" | | | | 14 | | -200 (19) |
| | 40 | ◪ | 8 | 20 50/4" | | | Weathered | 17 | | -200 (18) |
| | 50 | | | | | | | | | |
| | | ◪ | 9 | 37 50/1" | | | | 10 | | -200 (14) |
| | 60 | | | | | | Grades brown | | | |
| | | | | | | | Grades very dense | | | |
| | 70 | | | | | | | | | Switch to air rotary |



This log is part of the report prepared by Dames & Moore for this project and should be read together with the report. This summary applies only at the location of the exploration and at the time of drilling or excavation. Subsurface conditions may differ at other locations and may change at this location with time. Data presented are a simplification of actual conditions encountered.

## LOG OF BORING

Palomar Medical Center

Escondido

FOR: Palomar-Pomerado Health System

DAMES & MOORE

A DAMES & MOORE GROUP COMPANY

Figure 3

# APPENDIX B

## LABORATORY TESTING

We performed the laboratory tests in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were tested for in-place dry density and moisture content, maximum dry density and optimum moisture content, shear strength, expansion, water-soluble sulfate content, R-value, and consolidation characteristics. The results of our laboratory tests are presented on Tables B-I through B-V and Figures B-1 through B-5. In-place dry density and moisture content test results are shown on the small diameter boring logs in Appendix A.

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

| Sample No. | Description (Geologic Unit) | Maximum Dry Density (pcf) | Optimum Moisture Content (% dry wt.) |
|---|---|---|---|
| B7-1 | Brown, Clayey, fine to coarse SAND; trace gravel (Qya) | 138.4 | 8.0 |

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

| Sample No. | Dry Density (pcf) | Moisture Content (%) | | Peak [Ultimate[2]] Cohesion (psf) | Peak [Ultimate[2]] Angle of Shear Resistance (degrees) |
|---|---|---|---|---|---|
| | | Initial | After Test | | |
| B6-3 (Qya) | 125.3 | 9.6 | 12.1 | 1125 [950] | 32 [29] |
| B6-4 (Kgd) | 123.6 | 4.9 | 12.1 | 500 [475] | 42 [39] |
| B7-1[1] (Qya) | 125.8 | 7.6 | 13.9 | 625 [625] | 29 [29] |
| B7-7 (Qoa) | 108.6 | 19.3 | 19.4 | 475 [400] | 36 [32] |

[1] Sample remolded to a dry density of approximately 90 percent of the laboratory maximum dry density near optimum moisture content.

[2] Ultimate value evaluated from the end-of-test at a deflection of 0.2 inches.

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

| Sample No. | Moisture Content (%) | | Dry Density (pcf) | Expansion Index | 2016 CBC Expansion Classification | Soil Expansion Classification |
|---|---|---|---|---|---|---|
| | Before Test | After Test | | | | |
| B1-1 (Qya) | 8.5 | 16.2 | 115.2 | 9 | Non-Expansive | Very Low |
| B10.1 (Qya) | 7.7 | 14.5 | 118.8 | 3 | Non-Expansive | Very Low |

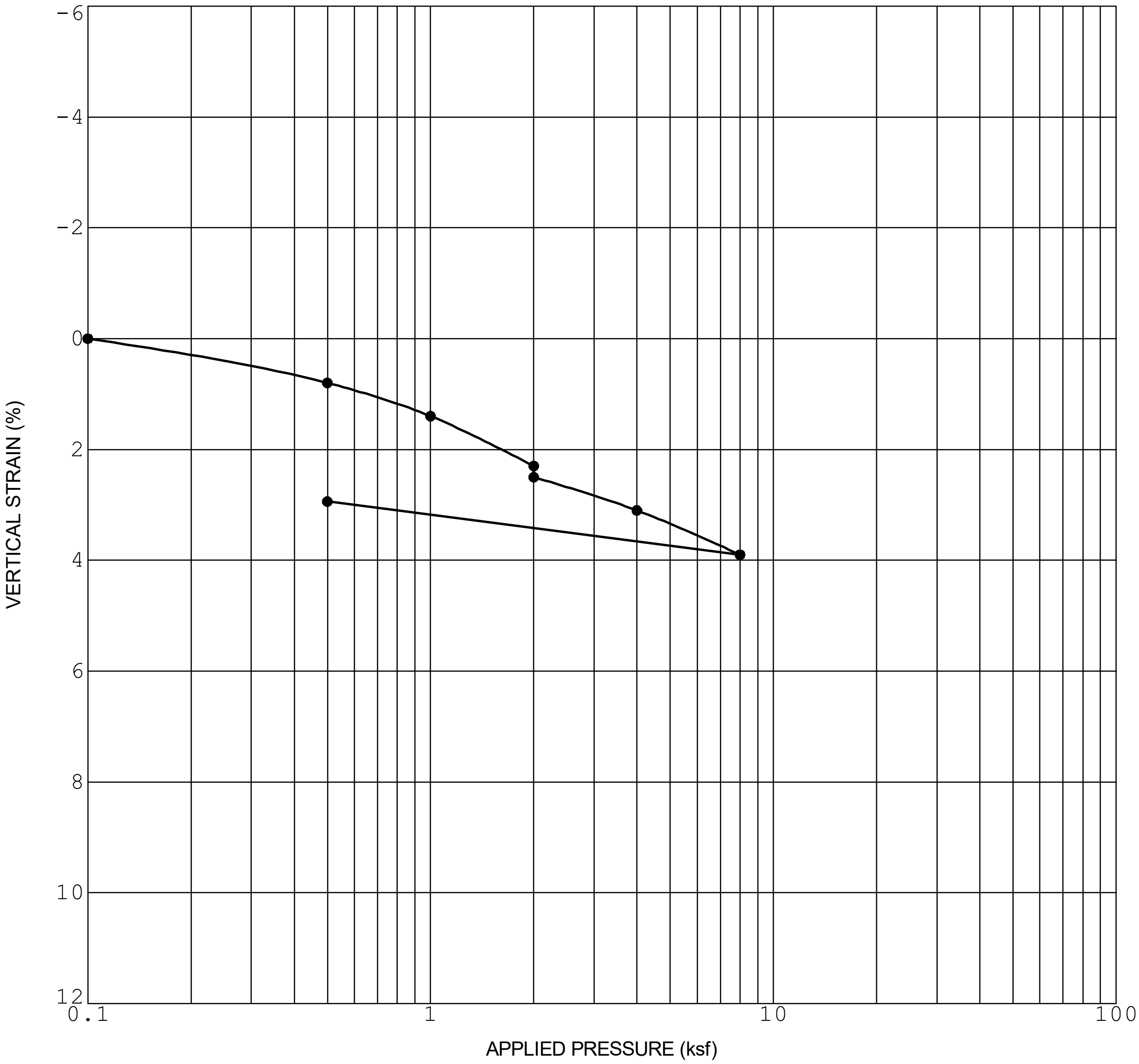
## TABLE B-IV
## SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
## CALIFORNIA TEST NO. 417

| Sample No. | Water-Soluble Sulfate (%) | Sulfate Severity |
|---|---|---|
| B1-1 | 0.003 | Not Applicable (S0) |
| B10-1 | 0.020 | Not Applicable (S0) |

## TABLE B-V
## SUMMARY OF LABORATORY RESISTANCE VALUE (R-VALUE) TEST RESULTS
## ASTM D 2844

| Sample No. | R-Value |
|---|---|
| B1-1 | 17 |
| B10-1 | 55 |

SAMPLE NO. B1-2




**ASTM D2435**

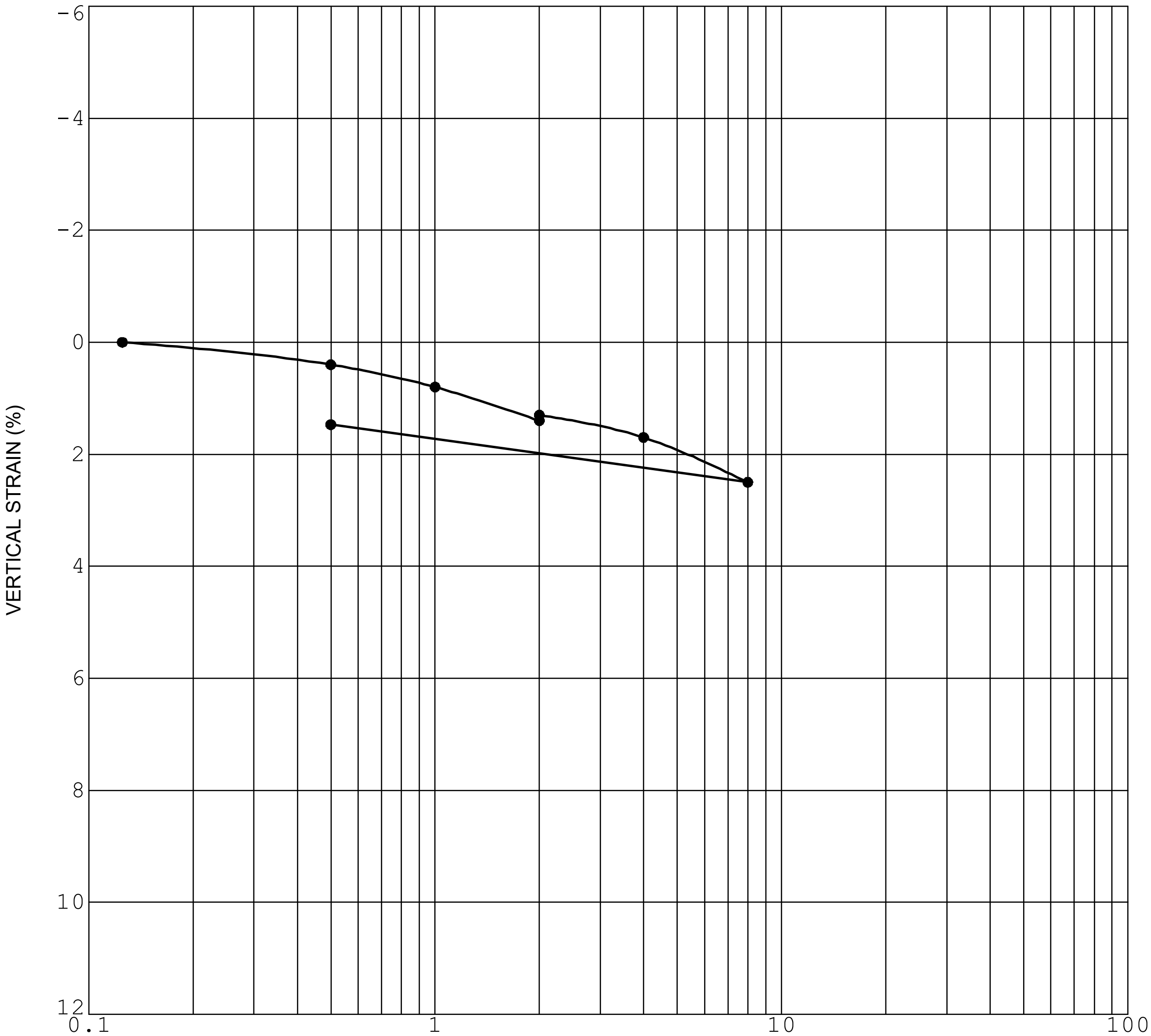
| | | | |
|---|---|---|---|
| **Initial Dry Density (pcf)** | 118.4 | **Initial Saturation (%)** | 96.8 |
| **Initial Water Content (%)** | 14.6 | **Sample Saturated at (ksf)** | 2.0 |

# CONSOLIDATION CURVE

PALOMAR HEIGHTS

ESCONDIDO, CALIFORNIA

SAMPLE NO. B6-2




**ASTM D2435**

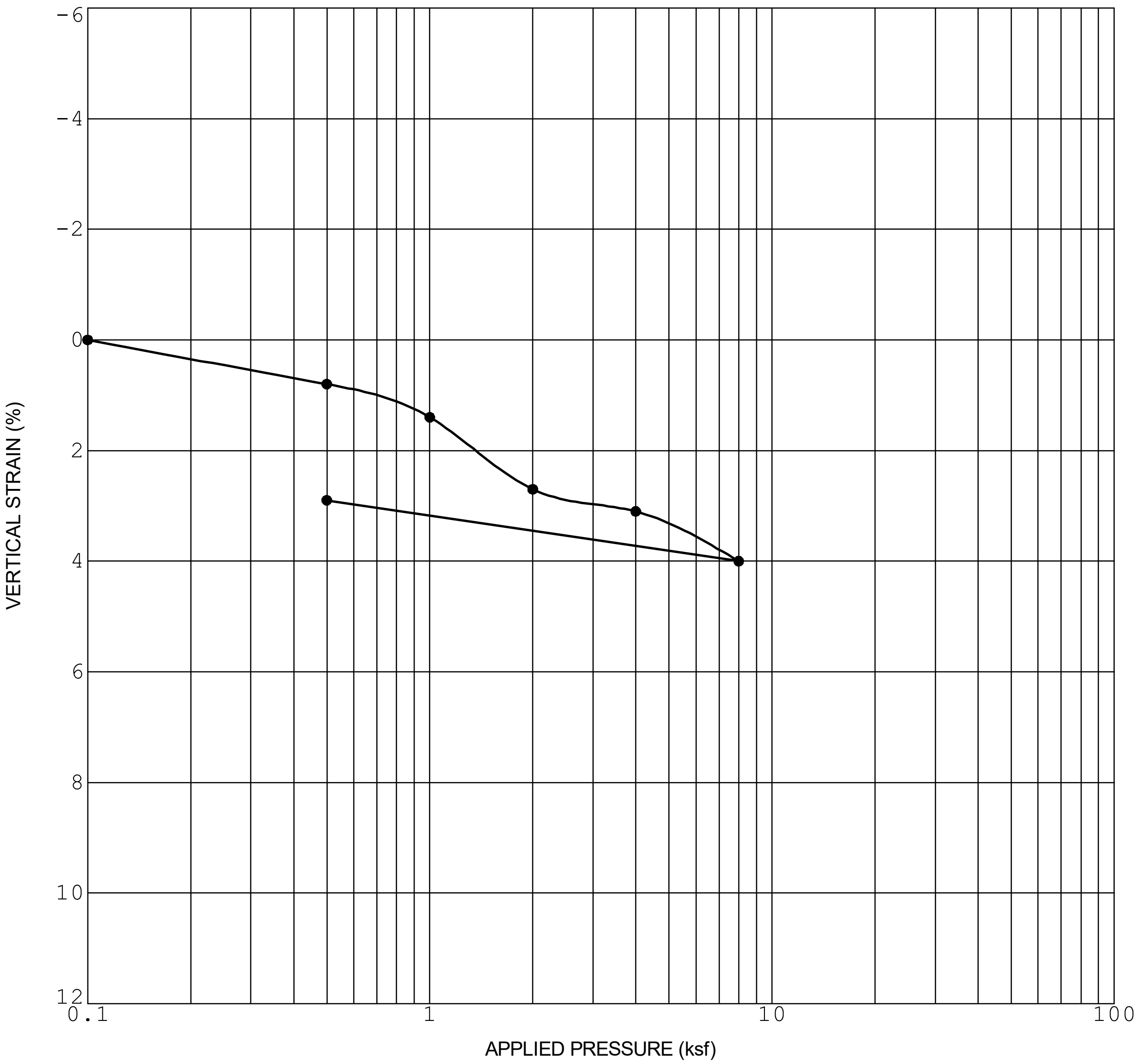
| | | | |
|---|---|---|---|
| **Initial Dry Density (pcf)** | 130.9 | **Initial Saturation (%)** | 97.1 |
| **Initial Water Content (%)** | 9.7 | **Sample Saturated at (ksf)** | 2.0 |

# CONSOLIDATION CURVE

PALOMAR HEIGHTS

ESCONDIDO, CALIFORNIA

SAMPLE NO. B7-3




**ASTM D2435**

| | | | | |
|---|---|---|---|---|
| **Initial Dry Density (pcf)** | 118.8 | | **Initial Saturation (%)** | 100+ |
| **Initial Water Content (%)** | 15.4 | | **Sample Saturated at (ksf)** | 2.0 |

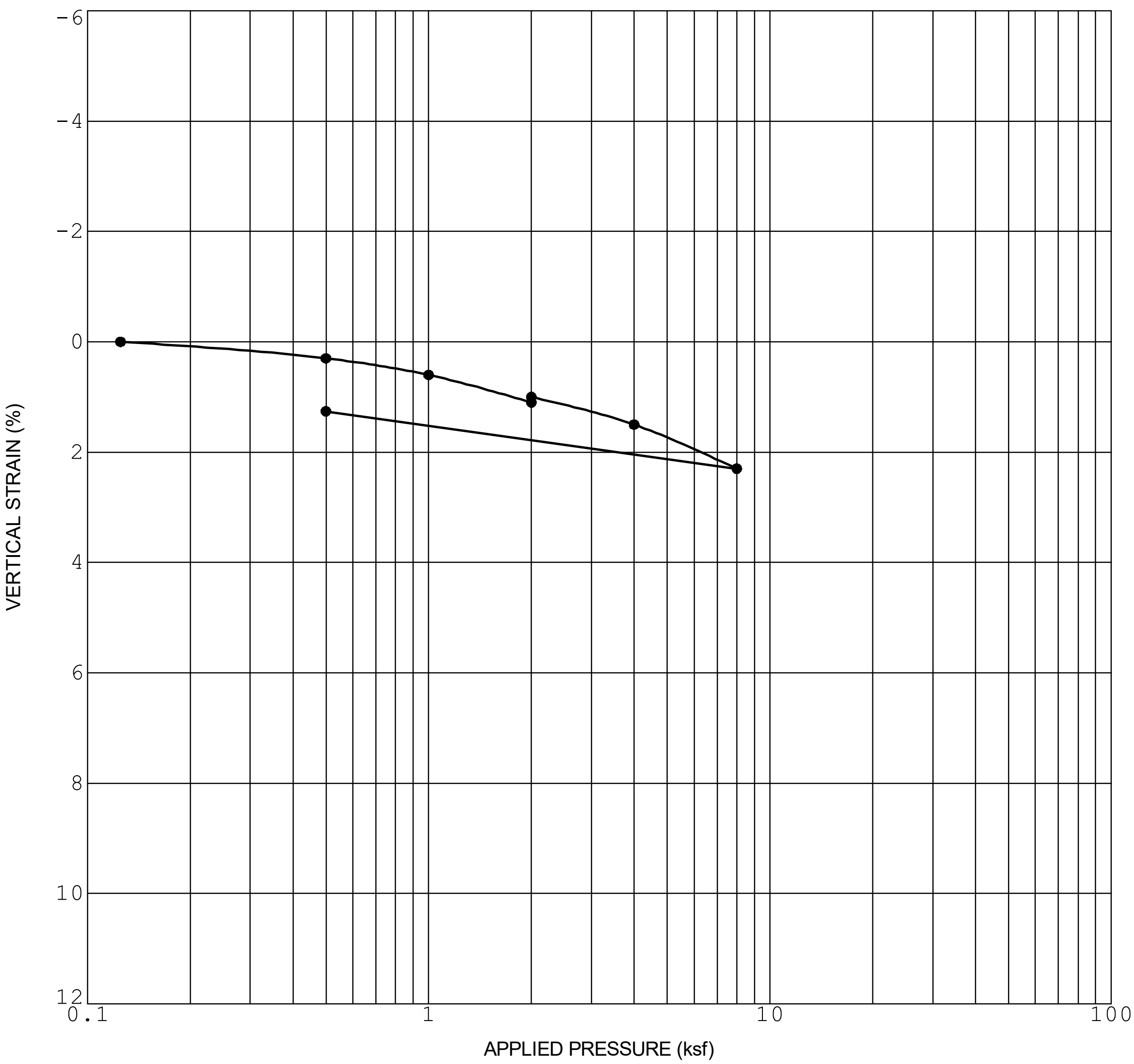
# CONSOLIDATION CURVE

PALOMAR HEIGHTS

ESCONDIDO, CALIFORNIA

PROJECT NO. G2109-11-02

SAMPLE NO. B8-2




**ASTM D2435**

| | | | |
|---|---|---|---|
| **Initial Dry Density (pcf)** | 129.0 | **Initial Saturation (%)** | 79.4 |
| **Initial Water Content (%)** | 8.6 | **Sample Saturated at (ksf)** | 2.0 |

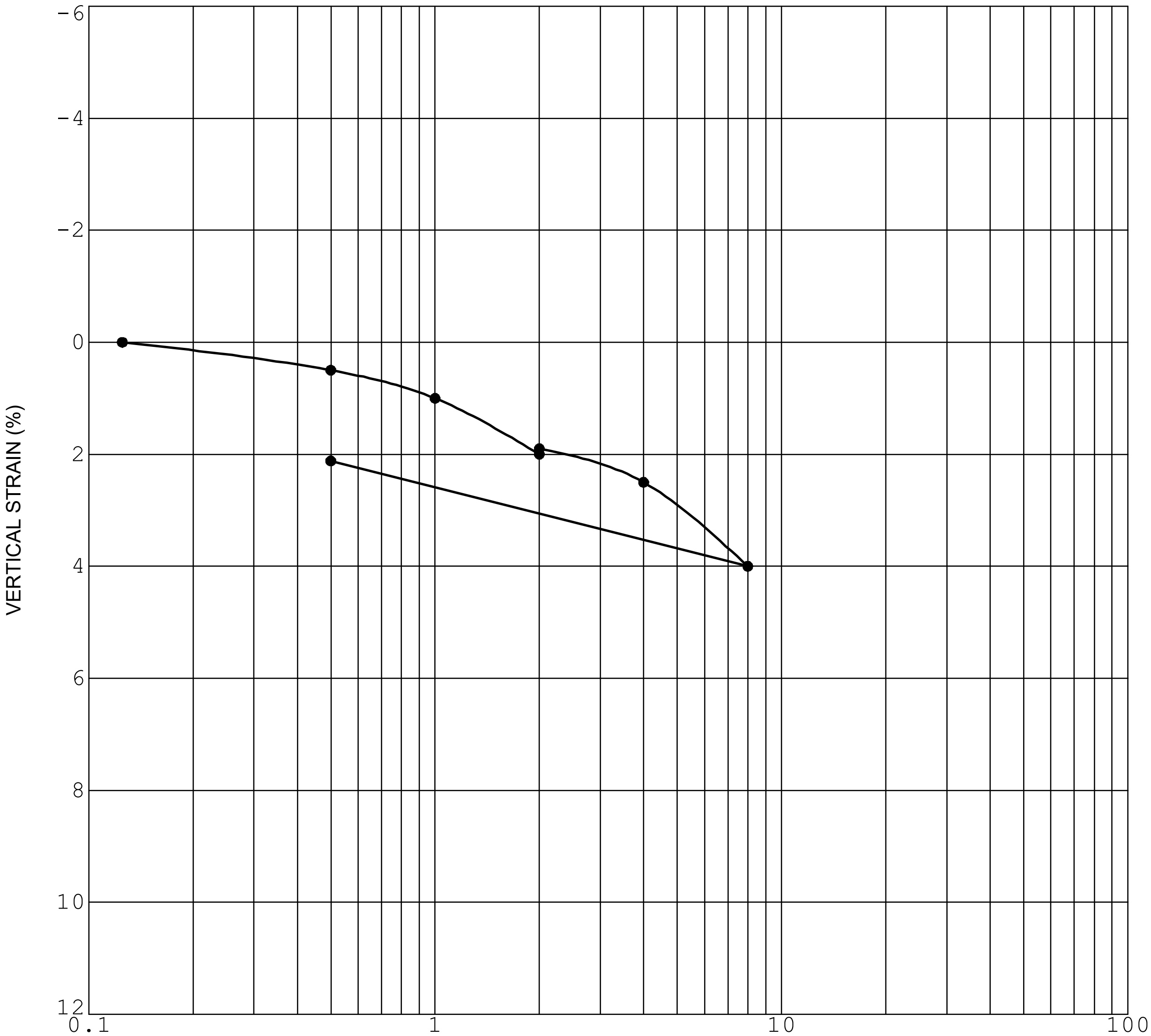
# CONSOLIDATION CURVE

PALOMAR HEIGHTS

ESCONDIDO, CALIFORNIA

PROJECT NO. G2109-11-02

SAMPLE NO. B10-4




**ASTM D2435**

| | |
|---|---|
| **Initial Dry Density (pcf)** | 110.2 |
| **Initial Water Content (%)** | 19.2 |

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

# CONSOLIDATION CURVE

PALOMAR HEIGHTS

ESCONDIDO, CALIFORNIA

# APPENDIX C

**GEOTEK LABORATORY TEST RESULTS**

**Palomar Heights**
**Escondido, San Diego County, California**
**Project No. 3610-SD**

## SUMMARY OF LABORATORY TESTING

### Classification

Soils were classified in general accordance to the standard practice for description and identification of soils (visual-manual procedure) (ASTM Test Method D 2488). The soil classifications are shown on the log of borings in Appendix A.

### Consolidation

One-dimensional consolidation testing was performed on selected samples of the site soils according to ASTM Test Method D 2435. Samples were loaded in increments to a prescribed overburden, inundated with water and allowed to reach equilibrium, then unloaded in increments. Vertical deformation was recorded for each loading increment. The results of this testing are presented at the rear of this appendix.

### Direct Shear

Shear testing was performed in a direct shear machine of the strain-control type in general accordance with ASTM Test Method D 3080. The rate of deformation is approximately 0.035 inch per minute. The samples were sheared under varying confining loads in order to determine the coulomb shear strength parameters, angle of internal friction and cohesion. The results of the testing are presented at the rear of this appendix.

### Expansion Index

The expansion potential of the soils was determined by performing expansion index testing on one sample in general accordance with ASTM D 4829. The results of the testing are provided below.

| Boring No. | Depth (ft.) | Soil Type | Expansion Index | Classification |
|---|---|---|---|---|
| B-2 | 0-5 | Silty Sand | 0 | Very Low |
| B-3 | 0-5 | Silty Clayey Sand | 29 | Low |

### In-Situ Moisture and Density

The natural water content was determined (ASTM D 2216) on samples of the materials recovered from the subsurface exploration. In addition, in-place dry density determination (ASTM D 2937) were performed on relatively undisturbed samples to measure the unity weight of the subsurface soils. Results of these tests are shown on the logs at the appropriate sample depths in Appendix A.

### Atterberg Limits

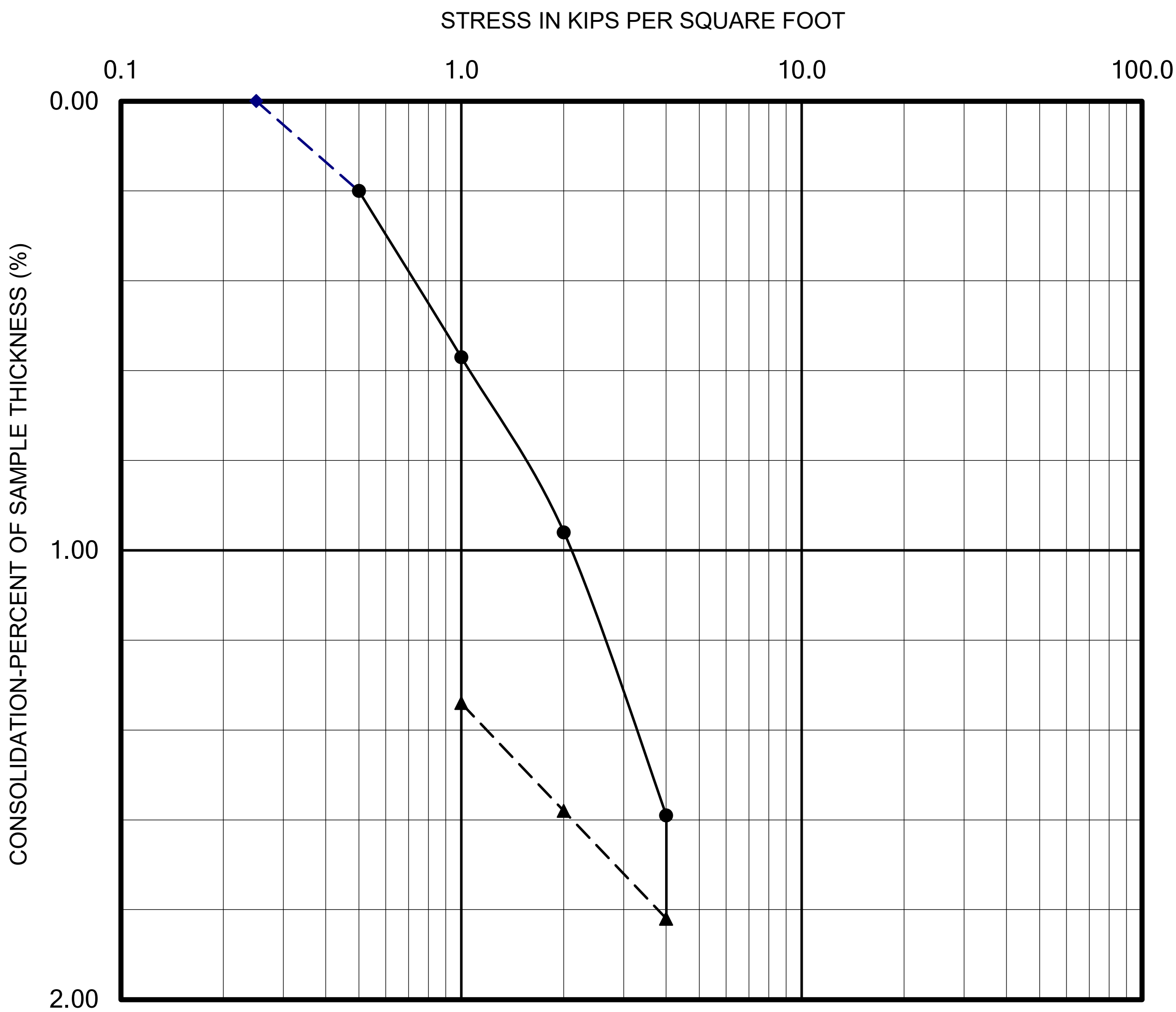
Atterberg limits testing was performed on a clayey sample collected from the site. The test was performed in general accordance with ASTM D 4318. The test results are presented on the boring logs.

**Moisture-Density Relationship**
Laboratory testing was performed on a sample obtained during the subsurface exploration. The laboratory maximum dry density and optimum moisture content was determined in general accordance with ASTM D 1557. The results of the testing are provided below and in Appendix B.

| Boring No. | Depth (ft.) | Description | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|---|
| B-2 | 0-5 | Silty Sand | 139.0 | 8.0 |
| B-3 | 0-5 | Silty Clayey Sand | 128.5 | 10.0 |

**Sulfate Content, Resistivity and Chloride Content**
Testing to determine the water-soluble sulfate content was performed by others in general accordance with ASTM D516. Resistivity testing was completed by others in general accordance with ASTM G187. Testing to determine the chloride content was performed by others in general accordance with ASTM D512B. The results of the testing are provided below and in Appendix B.

| Boring No. | Depth (ft.) | pH CT-643 | Chloride CT-422 (ppm) | Sulfate CT-417 (% by weight) | Resistivity ASTM G187 (ohm-cm) |
|---|---|---|---|---|---|
| B-2 | 0-5 | 7.9 | 25.9 | 0.0031 | 3,484 |
| B-3 | 0-5 | 7.7 | 76.9 | 0.0920 | 1,675 |




Seating Cycle
Loading Prior to Inundation
Loading After Inundation
Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435

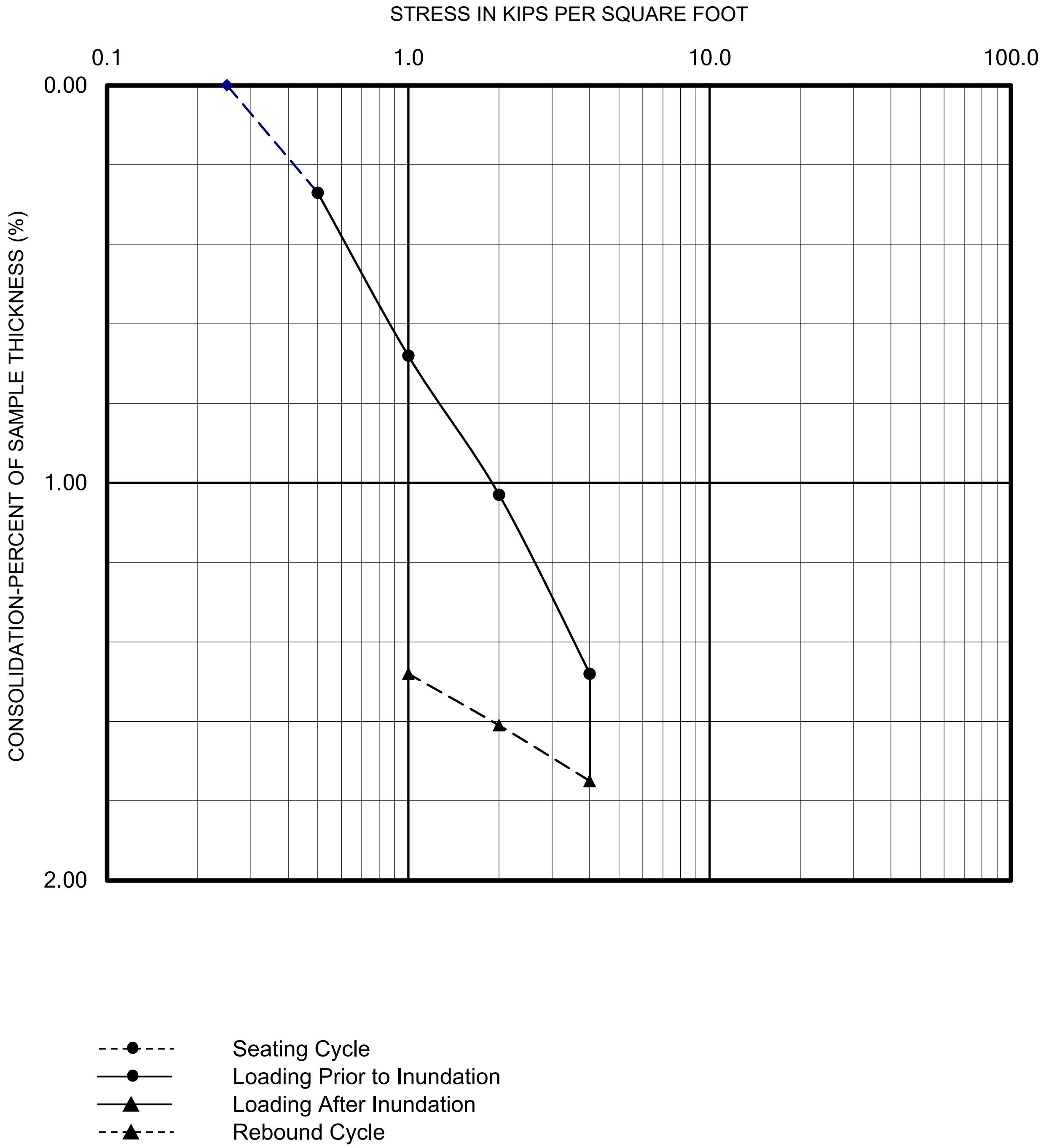
GEOTEK

# CONSOLIDATION REPORT

**Sample:**
**B-3 @ 4**

**Plate C-1**

| | |
|---|---|
| CHECKED BY: | Lab: |
| PROJECT NO.: 3610-SD | Date: |




PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435

GEOTEK

# CONSOLIDATION REPORT

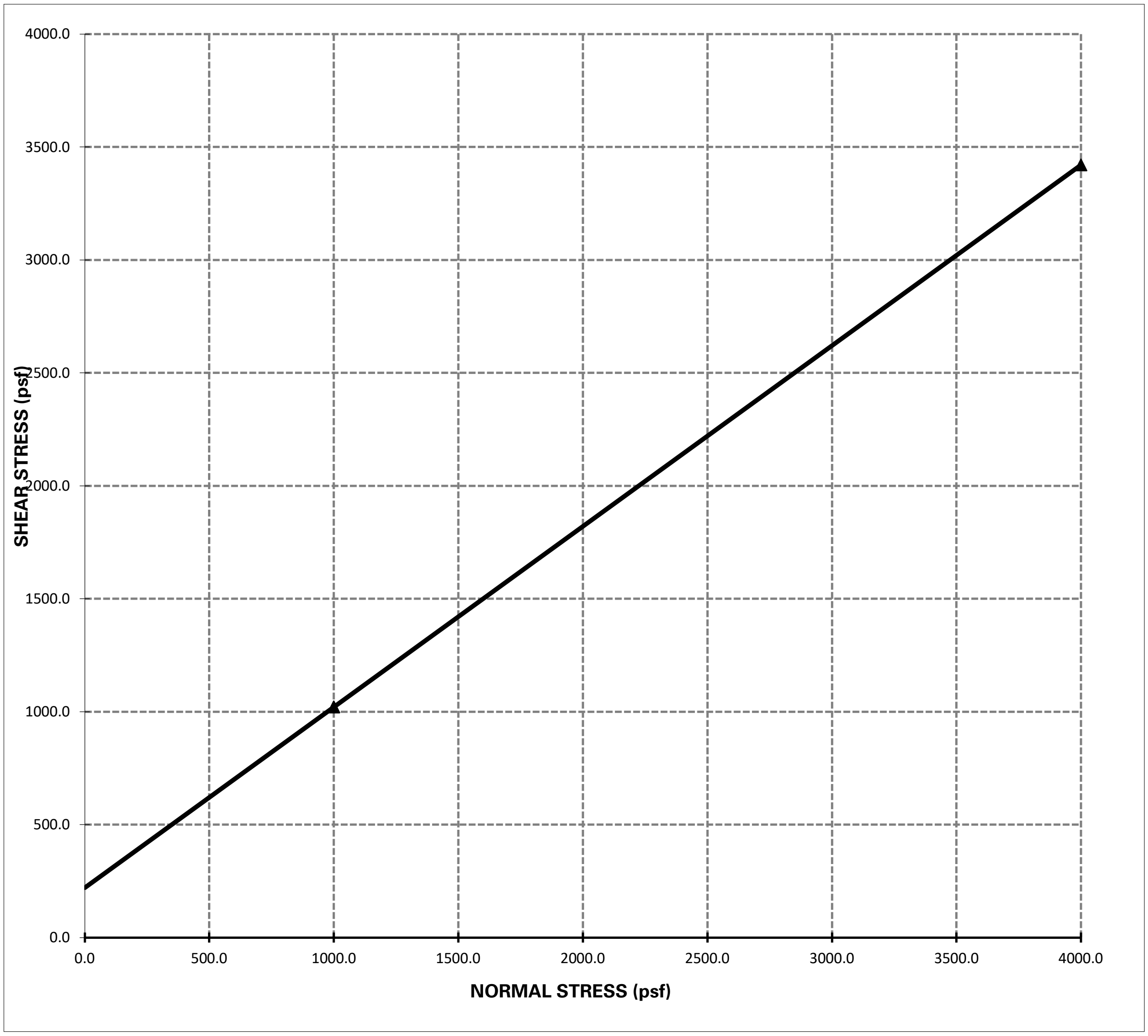
**Sample:**
**B-4 @ 2**

**Plate C-2**

| | |
|---|---|
| CHECKED BY: | Lab: |
| PROJECT NO.: 3610-SD | Date: |

# DIRECT SHEAR TEST

| | | | |
|---|---|---|---|
| ***Project Name:*** | Palomar Heights | ***Sample Location:*** | B-1 @ 2 |
| ***Project Number:*** | 3610-SD | ***Date Tested:*** | 11/13/2019 |

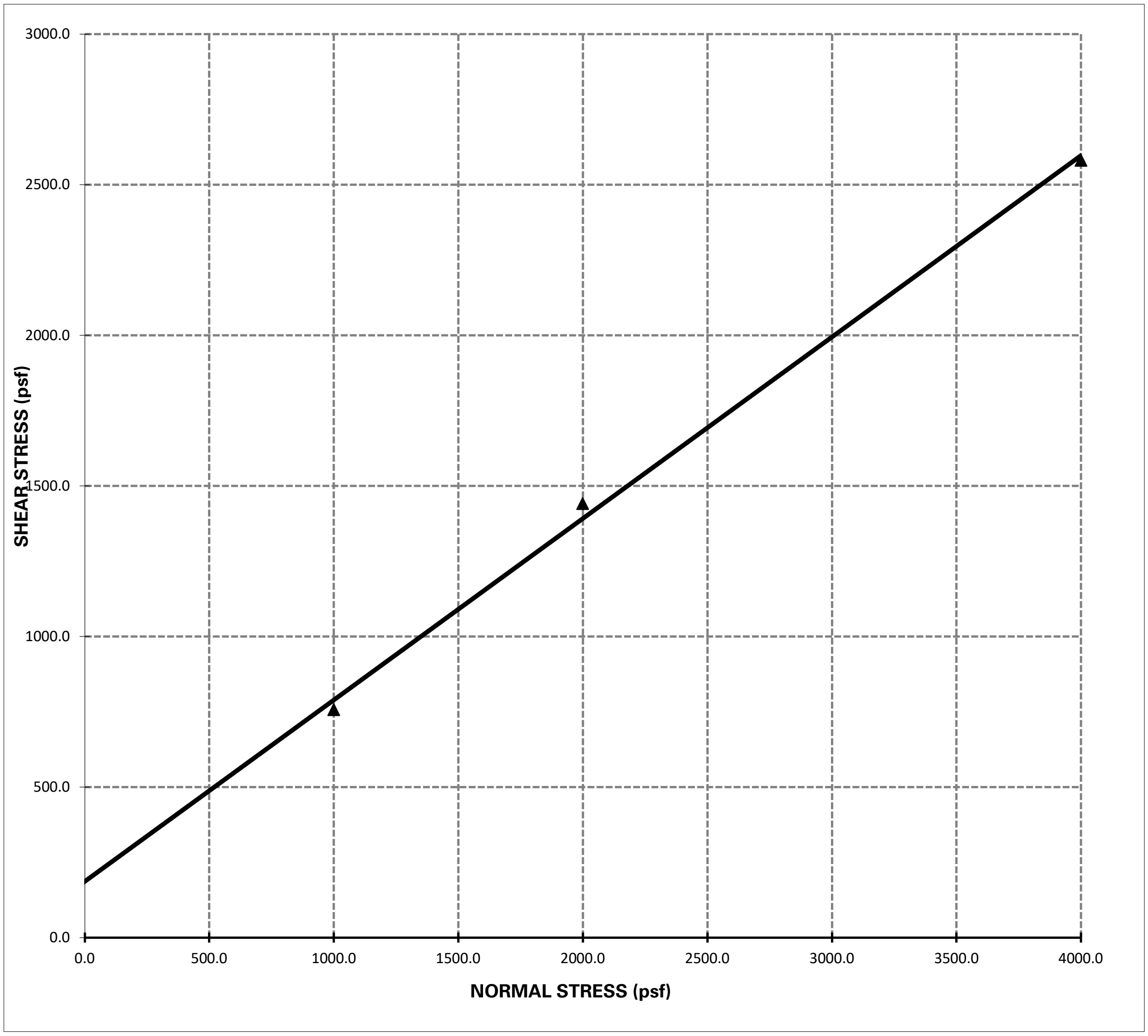



**Shear Strength:** $\Phi$ = **38.7 °** , **C = 220.00 psf**

**Notes:** 1 - The soil specimens sheared were "undisturbed" ring samples.
2 - The above reflect direct shear strength at saturated conditions.
3 - The tests were run at a shear rate of 0.035 in/min.

# DIRECT SHEAR TEST

| | | | |
|---|---|---|---|
| ***Project Name:*** | Palomar Heights | ***Sample Location:*** | B-2 @ 0 - 5 |
| ***Project Number:*** | 3610-SD | ***Date Tested:*** | 11/14/2019 |




**Shear Strength:** $\Phi$ = **31.1 °**, **C = 186.00 psf**

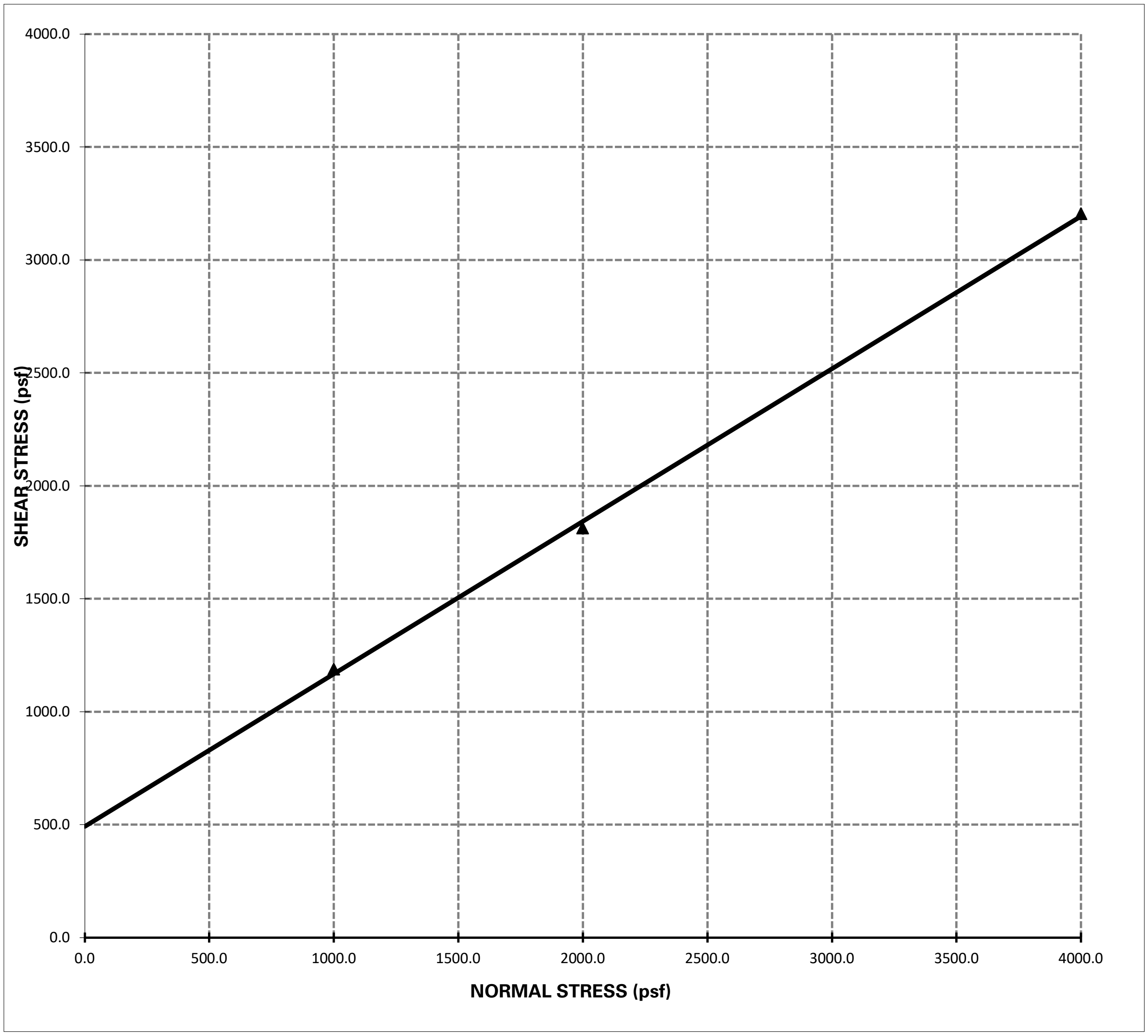
**Notes:** 1 - The soil specimen used in the shear box was a ring sample remolded to approximately 90% relative compaction from a bulk sample collected during the field investigation.

2 - The above reflect direct shear strength at saturated conditions.

3 - The tests were run at a shear rate of 0.035 in/min.

# DIRECT SHEAR TEST

| | | | |
|---|---|---|---|
| ***Project Name:*** | Palomar Heights | ***Sample Location:*** | B-4 @ 5 |
| ***Project Number:*** | 3610-SD | ***Date Tested:*** | 11/13/2019 |




**Shear Strength:** $\Phi$ = **34.0 °** , **C = 492.00 psf**

**Notes:** 1 - The soil specimens sheared were "undisturbed" ring samples.
2 - The above reflect direct shear strength at saturated conditions.
3 - The tests were run at a shear rate of 0.035 in/min.

# APPENDIX D

**GENERAL GRADING GUIDELINES**

**Palomar Heights**
**Escondido, San Diego County, California**
**Project No. 3610-SD**

GEOTEK

## GENERAL GRADING GUIDELINES

Guidelines presented herein are intended to address general construction procedures for earthwork construction. Specific situations and conditions often arise which cannot reasonably be discussed in general guidelines, when anticipated these are discussed in the text of the report. Often unanticipated conditions are encountered which may necessitate modification or changes to these guidelines. It is our hope that these will assist the contractor to more efficiently complete the project by providing a reasonable understanding of the procedures that would be expected during earthwork and the testing and observation used to evaluate those procedures.

### General

Grading should be performed to at least the minimum requirements of governing agencies, Chapters 18 and 33 of the Uniform Building Code and the guidelines presented below.

### Preconstruction Meeting

A preconstruction meeting should be held prior to site earthwork. Any questions the contractor has regarding our recommendations, general site conditions, apparent discrepancies between reported and actual conditions and/or differences in procedures the contractor intends to use should be brought up at that meeting. The contractor (including the main onsite representative) should review our report and these guidelines in advance of the meeting. Any comments the contractor may have regarding these guidelines should be brought up at that meeting.

### Grading Observation and Testing

1. Observation of the fill placement should be provided by our representative during grading. Verbal communication during the course of each day will be used to inform the contractor of test results. The Contractor should receive a copy of the "Daily Field Report" indicating results of field density tests that day. If our representative does not provide the contractor with these reports, our office should be notified.
2. Testing and observation procedures are, by their nature, specific to the work or area observed and location of the tests taken, variability may occur in other locations. The contractor is responsible for the uniformity of the grading operations, our observations and test results are intended to evaluate the contractor’s overall level of efforts during grading. The contractor’s personnel are the only individuals participating in all aspect of site work. Compaction testing and observation should not be considered as relieving the contractor’s responsibility to properly compact the fill.
3. Cleanouts, processed ground to receive fill, key excavations, and subdrains should be observed by our representative prior to placing any fill. It will be the Contractor's responsibility to notify our representative or office when such areas are ready for observation.
4. Density tests may be made on the surface material to receive fill, as considered warranted by this firm.
5. In general, density tests would be made at maximum intervals of two feet of fill height or every 1,000 cubic yards of fill placed. Criteria will vary depending on soil conditions and size of the fill. More frequent testing may be performed. In any case, an adequate number of field density tests should be made to evaluate the required compaction and moisture content is generally being obtained.
6. Laboratory testing to support field test procedures will be performed, as considered warranted, based on conditions encountered (e.g. change of material sources, types, etc.) Every effort will be

made to process samples in the laboratory as quickly as possible and in progress construction projects are our first priority. However, laboratory workloads may cause in delays and some soils may require a **minimum of 48 to 72 hours to complete test procedures**. Whenever possible, our representative(s) should be informed in advance of operational changes that might result in different source areas for materials.

7. Procedures for testing of fill slopes are as follows:
   a) Density tests should be taken periodically during grading on the flat surface of the fill three to five feet horizontally from the face of the slope.
   b) If a method other than over building and cutting back to the compacted core is to be employed, slope compaction testing during construction should include testing the outer six inches to three feet in the slope face to determine if the required compaction is being achieved.
8. Finish grade testing of slopes and pad surfaces should be performed after construction is complete.

**Site Clearing**

1. All vegetation, and other deleterious materials, should be removed from the site. If material is not immediately removed from the site it should be stockpiled in a designated area(s) well outside of all current work areas and delineated with flagging or other means. Site clearing should be performed in advance of any grading in a specific area.
2. Efforts should be made by the contractor to remove all organic or other deleterious material from the fill, as even the most diligent efforts may result in the incorporation of some materials. This is especially important when grading is occurring near the natural grade. All equipment operators should be aware of these efforts. Laborers may be required as root pickers.
3. Nonorganic debris or concrete may be placed in deeper fill areas provided the procedures used are observed and found acceptable by our representative. Typical procedures are similar to those indicated on Plate G-4.

**Treatment of Existing Ground**

1. Following site clearing, all surficial deposits of alluvium and colluvium as well as weathered or creep effected bedrock, should be removed (see Plates G-1, G-2 and G-3) unless otherwise specifically indicated in the text of this report.
2. In some cases, removal may be recommended to a specified depth (e.g. flat sites where partial alluvial removals may be sufficient) the contractor should not exceed these depths unless directed otherwise by our representative.
3. Groundwater existing in alluvial areas may make excavation difficult. Deeper removals than indicated in the text of the report may be necessary due to saturation during winter months.
4. Subsequent to removals, the natural ground should be processed to a depth of six inches, moistened to near optimum moisture conditions and compacted to fill standards.
5. Exploratory back hoe or dozer trenches still remaining after site removal should be excavated and filled with compacted fill if they can be located.

**Subdrainage**

1. Subdrainage systems should be provided in canyon bottoms prior to placing fill, and behind buttress and stabilization fills and in other areas indicated in the report. Subdrains should conform to schematic diagrams G-1 and G-5, and be acceptable to our representative.

2. For canyon subdrains, runs less than 500 feet may use six-inch pipe. Typically, runs in excess of 500 feet should have the lower end as eight-inch minimum.
3. Filter material should be clean, 1/2 to 1-inch gravel wrapped in a suitable filter fabric. Class 2 permeable filter material per California Department of Transportation Standards tested by this office to verify its suitability, may be used without filter fabric. A sample of the material should be provided to the Soils Engineer by the contractor at least two working days before it is delivered to the site. The filter should be clean with a wide range of sizes.
4. Approximate delineation of anticipated subdrain locations may be offered at 40-scale plan review stage. During grading, this office would evaluate the necessity of placing additional drains.
5. All subdrainage systems should be observed by our representative during construction and prior to covering with compacted fill.
6. Subdrains should outlet into storm drains where possible. Outlets should be located and protected. The need for backflow preventers should be assessed during construction.
7. Consideration should be given to having subdrains located by the project surveyors.

**Fill Placement**

1. Unless otherwise indicated, all site soil and bedrock may be reused for compacted fill; however, some special processing or handling may be required (see text of report).
2. Material used in the compacting process should be evenly spread, moisture conditioned, processed, and compacted in thin lifts six (6) to eight (8) inches in compacted thickness to obtain a uniformly dense layer. The fill should be placed and compacted on a nearly horizontal plane, unless otherwise found acceptable by our representative.
3. If the moisture content or relative density varies from that recommended by this firm , the Contractor should rework the fill until it is in accordance with the following:
   a) Moisture content of the fill should be at or above optimum moisture. Moisture should be evenly distributed without wet and dry pockets. Pre-watering of cut or removal areas should be considered in addition to watering during fill placement, particularly in clay or dry surficial soils. The ability of the contractor to obtain the proper moisture content will control production rates.
   b) Each six-inch layer should be compacted to at least 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency. In most cases, the testing method is ASTM Test Designation D-1557.
4. Rock fragments less than eight inches in diameter may be utilized in the fill, provided:
   a) They are not placed in concentrated pockets;
   b) There is a sufficient percentage of fine-grained material to surround the rocks;
   c) The distribution of the rocks is observed by and acceptable to our representative.
5. Rocks exceeding eight (8) inches in diameter should be taken off site, broken into smaller fragments, or placed in accordance with recommendations of this firm in areas designated suitable for rock disposal (See Plate G-4). On projects where significant large quantities of oversized materials are anticipated, alternate guidelines for placement may be included. If significant oversize materials are encountered during construction, these guidelines should be requested.
6. In clay soil dry or large chunks or blocks are common; if in excess of eight (8) inches minimum dimension then they are considered as oversized. Sheepsfoot compactors or other suitable methods should be used to break up blocks. When dry they should be moisture conditioned to provide a uniform condition with the surrounding fill.

**Slope Construction**

1. The Contractor should obtain a minimum relative compaction of 90 percent out to the finished slope face of fill slopes. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment.
2. Slopes trimmed to the compacted core should be overbuilt by at least three (3) feet with compaction efforts out to the edge of the false slope. Failure to properly compact the outer edge results in trimming not exposing the compacted core and additional compaction after trimming may be necessary.
3. If fill slopes are built "at grade" using direct compaction methods then the slope construction should be performed so that a constant gradient is maintained throughout construction. Soil should not be "spilled" over the slope face nor should slopes be "pushed out" to obtain grades. Compaction equipment should compact each lift along the immediate top of slope. Slopes should be back rolled or otherwise compacted at approximately every 4 feet vertically as the slope is built.
4. Corners and bends in slopes should have special attention during construction as these are the most difficult areas to obtain proper compaction.
5. Cut slopes should be cut to the finished surface, excessive undercutting and smoothing of the face with fill may necessitate stabilization.

**Keyways, Buttress and Stabilization Fills**

Keyways are needed to provide support for fill slope and various corrective procedures.

1. Side-hill fills should have an equipment-width key at their toe excavated through all surficial soil and into competent material and tilted back into the hill (Plates G-2, G-3). As the fill is elevated, it should be benched through surficial soil and slopewash, and into competent bedrock or other material deemed suitable by our representatives (See Plates G-1, G-2, and G-3).
2. Fill over cut slopes should be constructed in the following manner:
   a) All surficial soils and weathered rock materials should be removed at the cut-fill interface.
   b) A key at least one (1) equipment width wide (or as needed for compaction) and tipped at least one (1) foot into slope should be excavated into competent materials and observed by our representative.
   c) The cut portion of the slope should be excavated prior to fill placement to evaluate if stabilization is necessary, the contractor should be responsible for any additional earthwork created by placing fill prior to cut excavation.
   (See Plate G-3 for schematic details.)
3. Daylight cut lots above descending natural slopes may require removal and replacement of the outer portion of the lot. A schematic diagram for this condition is presented on Plate G-2.
4. A basal key is needed for fill slopes extending over natural slopes. A schematic diagram for this condition is presented on Plate G-2.
5. All fill slopes should be provided with a key unless within the body of a larger overall fill mass. Please refer to Plate G-3, for specific guidelines.

Anticipated buttress and stabilization fills are discussed in the text of the report. The need to stabilize other proposed cut slopes will be evaluated during construction. Plate G-5 is shows a schematic of buttress construction.

1. All backcuts should be excavated at gradients of 1:1 or flatter. The backcut configuration should be determined based on the design, exposed conditions and need to maintain a minimum fill width and provide working room for the equipment.
2. On longer slopes backcuts and keyways should be excavated in maximum 250 feet long segment. The specific configurations will be determined during construction.
3. All keys should be a minimum of two (2) feet deep at the toe and slope toward the heel at least one foot or two (2%) percent whichever is greater.
4. Subdrains are to be placed for all stabilization slopes exceeding 10 feet in height. Lower slopes are subject to review. Drains may be required. Guidelines for subdrains are presented on Plate G-5.
5. Benching of backcuts during fill placement is required.

**Lot Capping**

1. When practical, the upper three (3) feet of material placed below finish grade should be comprised of the least expansive material available. Preferably, highly and very highly expansive materials should not be used. We will attempt to offer advise based on visual evaluations of the materials during grading, but it must be realized that laboratory testing is needed to evaluate the expansive potential of soil. Minimally, this testing takes two (2) to four (4) days to complete.
2. Transition lots (cut and fill) both per plan and those created by remedial grading (e.g. lots above stabilization fills, along daylight lines, above natural slope, etc.) should be capped with a three foot thick compacted fill blanket.
3. Cut pads should be observed by our representative(s) to evaluate the need for overexcavation and replacement with fill. This may be necessary to reduce water infiltration into highly fractured bedrock or other permeable zones, and/or due to differing expansive potential of materials beneath a structure. The overexcavation should be at least three feet. Deeper overexcavation may be recommended in some cases.

## ROCK PLACEMENT AND ROCK FILL GUIDELINES

It is anticipated that large quantities of oversize material would be generated during grading. It's likely that such materials may require special handling for burial. Although alternatives may be developed in the field, the following methods of rock disposal are recommended on a preliminary basis.

**Limited Larger Rock**

When materials encountered are principally soil with limited quantities of larger rock fragments or boulders, placement in windrows is recommended. The following procedures should be applied:

1. Oversize rock (greater than 8 inch) should be placed in windrows.
    a) Windrows are rows of single file rocks placed to avoid nesting or clusters of rock.
    b) Each adjacent rock should be approximately the same size (within ~one foot in diameter).
    c) The maximum rock size allowed in windrows is four feet
2. A minimum vertical distance of three feet between lifts should be maintained. Also, the windrows should be offset from lift to lift. Rock windrows should not be closer than 15 feet to the face of fill slopes and sufficient space must be maintained for proper slope construction (see Plate G-4).
3. Rocks greater than eight inches in diameter should not be placed within seven feet of the finished subgrade for a roadway or pads and should be held below the depth of the lowest utility. This will allow easier trenching for utility lines.

4. Rocks greater than four feet in diameter should be broken down, if possible, or they may be placed in a dozer trench. Each trench should be excavated into the compacted fill a minimum of one foot deeper than the largest diameter of rock.
   a) The rock should be placed in the trench and granular fill materials (SE>30) should be flooded into the trench to fill voids around the rock.
   b) The over size rock trenches should be no closer together than 15 feet from any slope face.
   c) Trenches at higher elevation should be staggered and there should be a minimum of four feet of compacted fill between the top of the one trench and the bottom of the next higher trench.
   d) It would be necessary to verify 90 percent relative compaction in these pits. A 24 to 72 hour delay to allow for water dissipation should be anticipated prior to additional fill placement.

**Structural Rock Fills**

If the materials generated for placement in structural fills contains a significant percentage of material more than six (6) inch in one dimension, then placement using conventional soil fill methods with isolated windrows would not be feasible. In such cases the following could be considered.

1. Mixes of large of rock or boulders may be placed as rock fill. They should be below the depth of all utilities both on pads and in roadways and below any proposed swimming pools or other excavations. If these fills are placed within seven (7) feet of finished grade they may effect foundation design.
2. Rock fills are required to be placed in horizontal layers that should **not exceed two feet in thickness, or the maximum rock size present, which ever is less**. All rocks exceeding two feet should be broken down to a smaller size, windrowed (see above), or disposed of in non-structural fill areas. Localized larger rock up to 3 feet in largest dimension may be placed in rock fill as follows:
   a) individual rocks are placed in a given lift so as to be roughly 50% exposed above the typical surface of the fill ,
   b) loaded rock trucks or alternate compactors are worked around the rock on all sides to the satisfaction of the soil engineer,
   c) the portion of the rock above grade is covered with a second lift.
3. Material placed in each lift should be well graded. No unfilled spaces (voids) should be permitted in the rock fill.

**Compaction procedures:**

Compaction of rock fills is largely procedural. The following procedures have been found to generally produce satisfactory compaction.

1. Provisions for routing of construction traffic over the fill should be implemented.
   a) Placement should be by rock trucks crossing the lift being placed and dumping at its edge.
   b) The trucks should be routed so that each pass across the fill is via a different path and that all areas are uniformly traversed.
   c) The dumped piles should be knocked down and spread by a large dozer (D-8 or larger suggested). (Water should be applied before and during spreading.)
2. Rock fill should be generously watered (sluiced)
   a) Water should be applied by water trucks to the:
      i) dump piles,

ii) front face of the lift being placed and,
iii) surface of the fill prior to compaction.

b) No material should be placed without adequate water.

c) The number of water trucks and water supply should be sufficient to provide constant water.

d) Rock fill placement should be suspended when water trucks are unavailable:
i) for more than 5 minutes straight, or,
ii) for more than 10 minutes/hour.

3. In addition to the truck pattern and at the discretion of the soil engineer, large, rubber tired compactors may be required.
a) The need for this equipment will depend largely on the ability of the operators to provide complete and uniform coverage by wheel rolling with the trucks.
b) Other large compactors will also be considered by the soil engineer provided that required compaction is achieved.

4. Placement and compaction of the rock fill is largely procedural. Observation by trenching should be made to check:
a) the general segregation of rock size,
b) for any unfilled spaces between the large blocks, and
c) the matrix compaction and moisture content.

5. Test fills may be required to evaluate relative compaction of finer grained zones or as deemed appropriate by the soil engineer.
a) A lift should be constructed by the methods proposed as proposed

6. Frequency of the test trenching is to be at the discretion of the soil engineer.
Control areas may be used to evaluate the contractors procedures.

7. A minimum horizontal distance of 15 feet should be maintained from the face of the rock fill and any finish slope face. At least the outer 15 feet should be built of conventional fill materials.

**<u>Piping Potential and Filter Blankets:</u>**

Where conventional fill is placed over rock fill, the potential for piping (migration) of the fine grained material from the conventional fill into rock fills will need to be addressed.
The potential for particle migration is related to the grain size comparisons of the materials present and in contact with each other. Provided that 15 percent of the finer soil is larger than the effective pore size of the coarse soil, then particle migration is substantially mitigated. This can be accomplished with a well-graded matrix material for the rock fill and a zone of fill similar to the matrix above it. The specific gradation of the fill materials placed during grading must be known to evaluate the need for any type of filter that may be necessary to cap the rock fills. This, unfortunately, can only be accurately determined during construction.

In the event that poorly graded matrix is used in the rock fills, properly graded filter blankets 2 to 3 feet thick separating rock fills and conventional fill may be needed. As an alternative, use of two layers of filter fabric (Mirafi 700 x or equivalent) could be employed on top of the rock fill. In order to mitigate excess puncturing, the surface of the rock fill should be well broken down and smoothed prior to placing the filter fabric. The first layer of the fabric may then be placed and covered with relatively permeable fill material (with respect to overlying material) 1 to 2 feet thick. The relative permeable material should be compacted to fill standards. The second layer of fabric should be placed and conventional fill placement continued.

**Subdrainage**

Rock fill areas should be tied to a subdrainage system. If conventional fill is placed that separates the rock from the main canyon subdrain then a secondary system should be installed. A system consisting of an adequately graded base (3 to 4 percent to the lower side) with a collector system and outlets may suffice.

Additionally, at approximately every 25 foot vertical interval, a collector system with outlets should be placed at the interface of the rock fill and the conventional fill blanketing a fill slope

**Monitoring**

Depending upon the depth of the rock fill and other factors, monitoring for settlement of the fill areas may be needed following completion of grading. Typically, if rock fill depths exceed 40 feet, monitoring would be recommend prior to construction of any settlement sensitive improvements. Delays of 3 to 6 months or longer can be expected prior to the start of construction.

## UTILITY TRENCH CONSTRUCTION AND BACKFILL

Utility trench excavation and backfill is the contractors responsibility. The geotechnical consultant typically provides periodic observation and testing of these operations. While, efforts are made to make sufficient observations and tests to verify that the contractors' methods and procedures are adequate to achieve proper compaction, it is typically impractical to observe all backfill procedures. As such, it is critical that the contractor use consistent backfill procedures.

Compaction methods vary for trench compaction and experience indicates many methods can be successful. However, procedures that "worked" on previous projects may or may not prove effective on a given site. The contractor(s) should outline the procedures proposed, so that we may discuss them **prior** to construction. We will offer comments based on our knowledge of site conditions and experience.

1. Utility trench backfill in slopes, structural areas, in streets and beneath flat work or hardscape should be brought to at least optimum moisture and compacted to at least 90 percent of the laboratory standard. Soil should be moisture conditioned prior to placing the trench.
2. Flooding and jetting are not typically recommended or acceptable for native soils. Flooding or jetting may be used with select sand having a Sand Equivalent (SE) of 30 or higher. This is typically limited to the following uses:
   a) shallow (12 + inches) under slab interior trenches and,
   b) as bedding in pipe zone.

   The water should be allowed to dissipate prior to pouring slabs or completing trench compaction.
3. Care should be taken not to place soils at high moisture content within the upper three feet of the trench backfill in street areas, as overly wet soils may impact subgrade preparation. Moisture may be reduced to 2% below optimum moisture in areas to be paved within the upper three feet below sub grade.
4. Sand backfill should not be allowed in exterior trenches adjacent to and within an area extending below a 1:1 projection from the outside bottom edge of a footing, unless it is similar to the surrounding soil.
5. Trench compaction testing is generally at the discretion of the geotechnical consultant. Testing frequency will be based on trench depth and the contractors procedures. A probing rod would be used to assess the consistency of compaction between tested areas and untested areas. If zones are found that are considered less compact than other areas, this would be brought to the contractors attention.

## JOB SAFETY

**General**

Personnel safety is a primary concern on all job sites. The following summaries our safety considerations for use by all our employees on multi-employer construction sites. On ground personnel are at highest risk of injury and possible fatality on grading construction projects. The company recognizes that construction activities will vary on each site and that job site safety is the contractor's responsibility. However, it is, imperative that all personnel be safety conscious to avoid accidents and potential injury.

In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of our field personnel on grading and construction projects.

1. Safety Meetings: Our field personnel are directed to attend the contractor's regularly scheduled safety meetings.
2. Safety Vests: Safety vests are provided for and are to be worn by our personnel while on the job site.
3. Safety Flags: Safety flags are provided to our field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.

In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

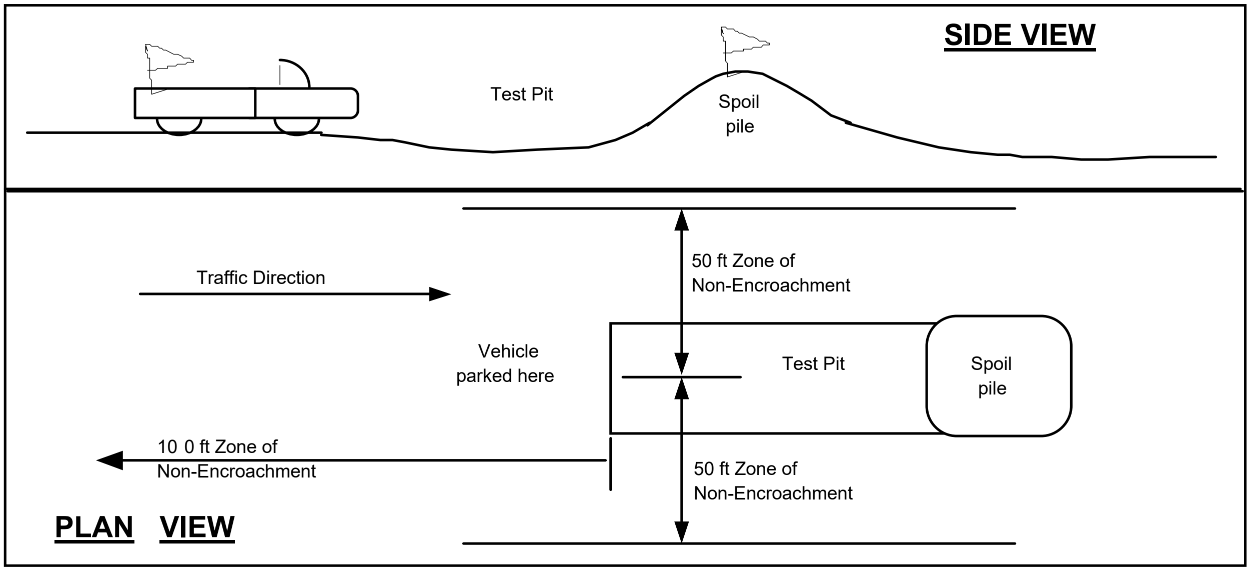
**Test Pits Location, Orientation and Clearance**

The technician is responsible for selecting test pit locations. The primary concern is the technician's safety. However, it is necessary to take sufficient tests at various locations to obtain a representative sampling of the fill. As such, efforts will be made to coordinate locations with the grading contractors authorized representatives (e.g. dump man, operator, supervisor, grade checker, etc.), and to select locations following or behind the established traffic pattern, preferable outside of current traffic. The contractors authorized representative should direct excavation of the pit and safety during the test period. Again, safety is the paramount concern.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates that the fill be maintained in a drivable condition. Alternatively, the contractor may opt to park a piece of equipment in front of test pits, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits (see diagram below) No grading equipment should enter this zone during the test procedure. The zone should extend outward to the sides approximately 50 feet from the center of the test pit and 100 feet in the direction of traffic flow. This zone is established both for safety and to avoid excessive ground vibration, which typically decreases test results.

## TEST PIT SAFETY PLAN




**Slope Tests**

When taking slope tests, the technician should park their vehicle directly above or below the test location on the slope. The contractor's representative should effectively keep all equipment at a safe operation distance (e.g. 50 feet) away from the slope during testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location.

**Trench Safety:**

It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Trenches for all utilities should be excavated in accordance with CAL-OSHA and any other applicable safety standards. Safe conditions will be required to enable compaction testing of the trench backfill.

All utility trench excavations in excess of 5 feet deep, which a person enters, are to be shored or laid back. Trench access should be provided in accordance with OSHA standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

Our personnel are directed not to enter any excavation which;

1. is 5 feet or deeper unless shored or laid back,
2. exit points or ladders are not provide,
3. displays any evidence of instability, has any loose rock or other debris which could fall into the trench, or
4. displays any other evidence of any unsafe conditions regardless of depth.

If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraws and notifies their supervisor. The contractors representative will then be contacted in an effort to effect a solution. All backfill not tested due to safety concerns or other reasons is subject to reprocessing and/or removal.

**Procedures**

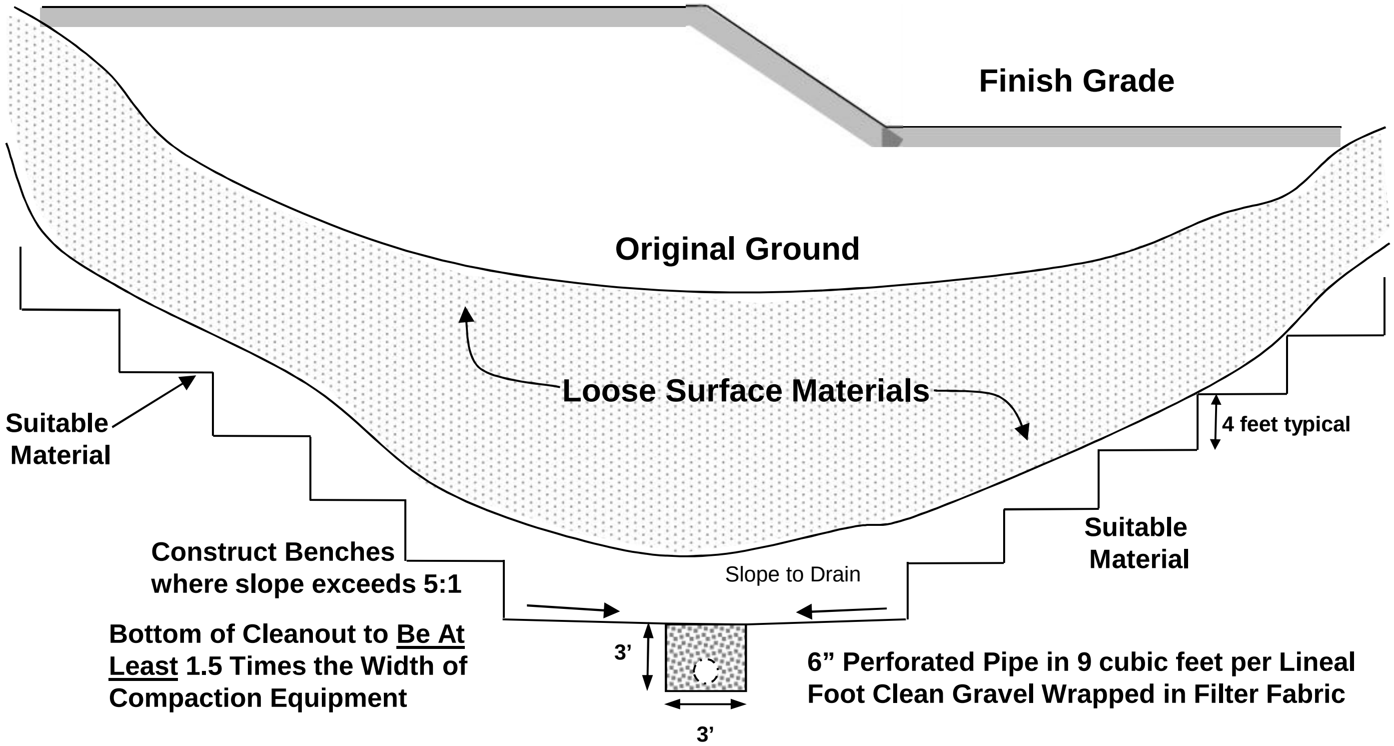
In the event that the technician's safety is jeopardized or compromised as a result of the contractor's failure to comply with any of the above, the technician is directed to inform both the developer's and contractor's representatives. If the condition is not rectified, the technician is required, by company policy, to immediately withdraw and notify their supervisor. The contractor’s representative will then be contacted in an effort to effect a solution. No further testing will be performed until the situation is rectified. Any fill placed in the interim can be considered unacceptable and subject to reprocessing, recompaction or removal.

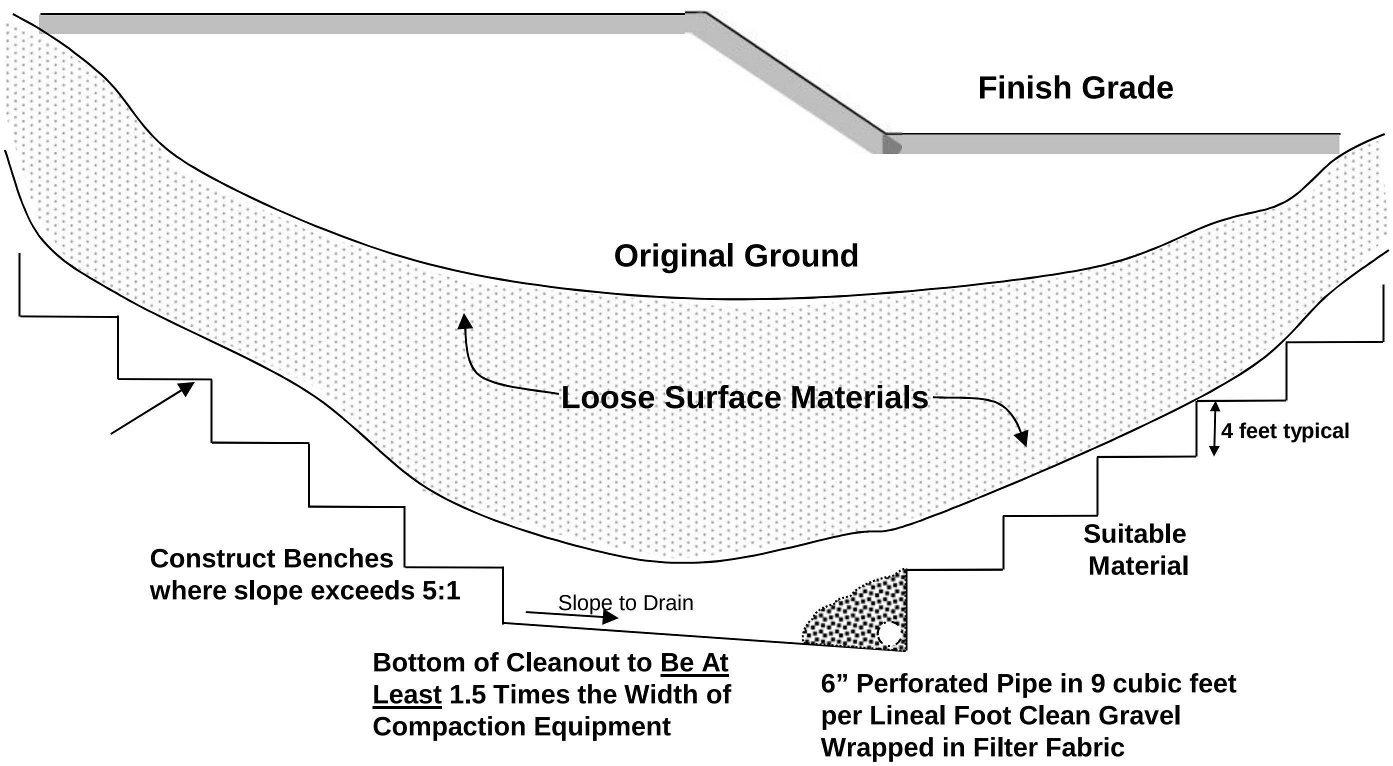
In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to technicians attention and notify our project manager or office. Effective communication and coordination between the contractors' representative and the field technician(s) is strongly encouraged in order to implement the above safety program and safety in general.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

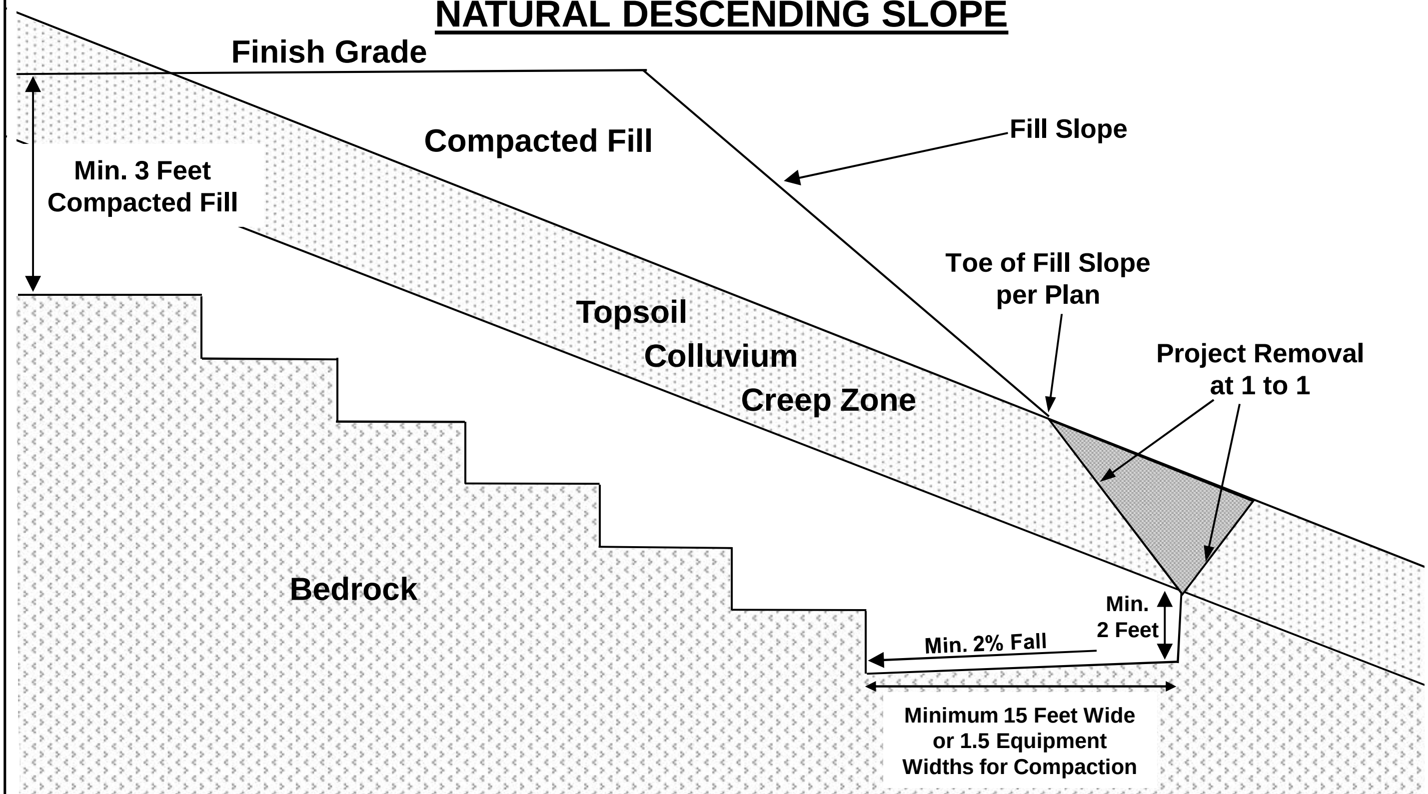
## ALTERNATES



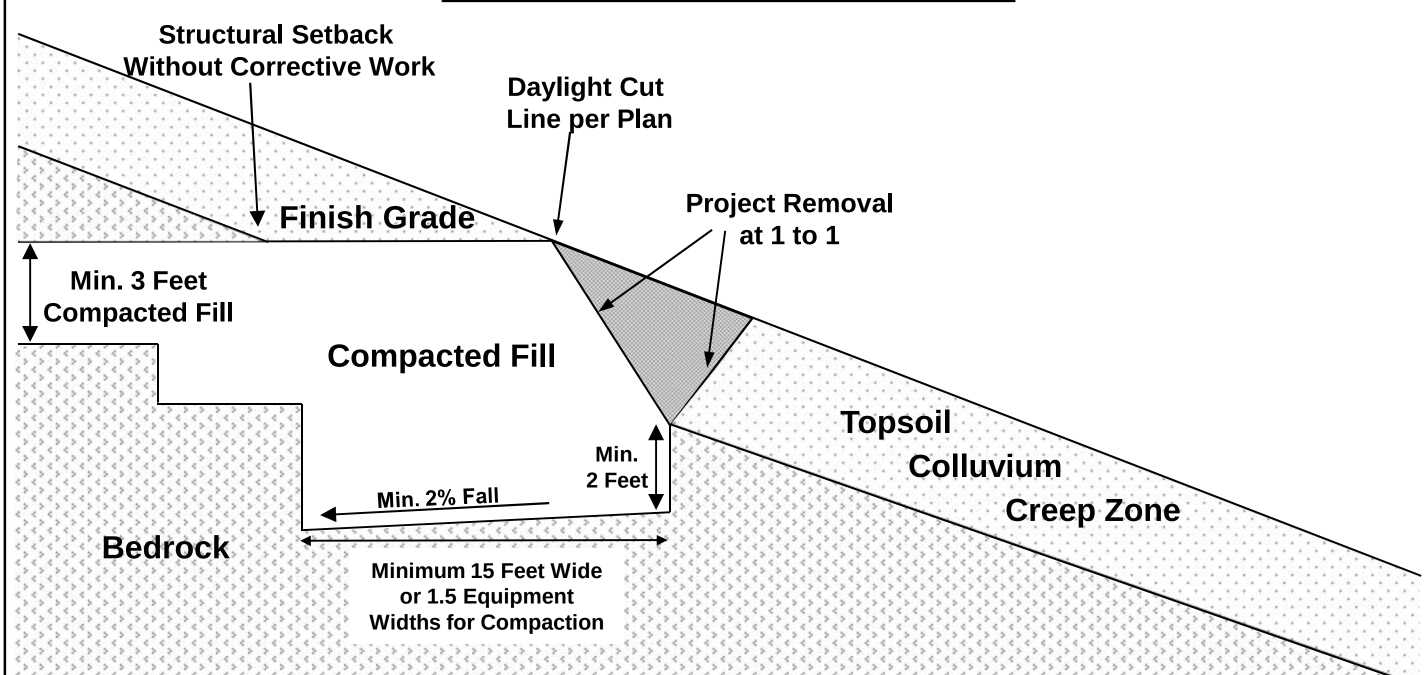




| | | | |
|---|---|---|---|
| GEOTEK | 1384 Poinsettia Avenue, Suite A<br>Vista, California 92083 | TYPICAL CANYON CLEANOUT | STANDARD GRADING GUIDELINES<br>PLATE G-1 |

## TYPICAL FILL SLOPE OVER NATURAL DESCENDING SLOPE




## DAYLIGHT CUT AREA OVER NATURAL DESCENDING SLOPE





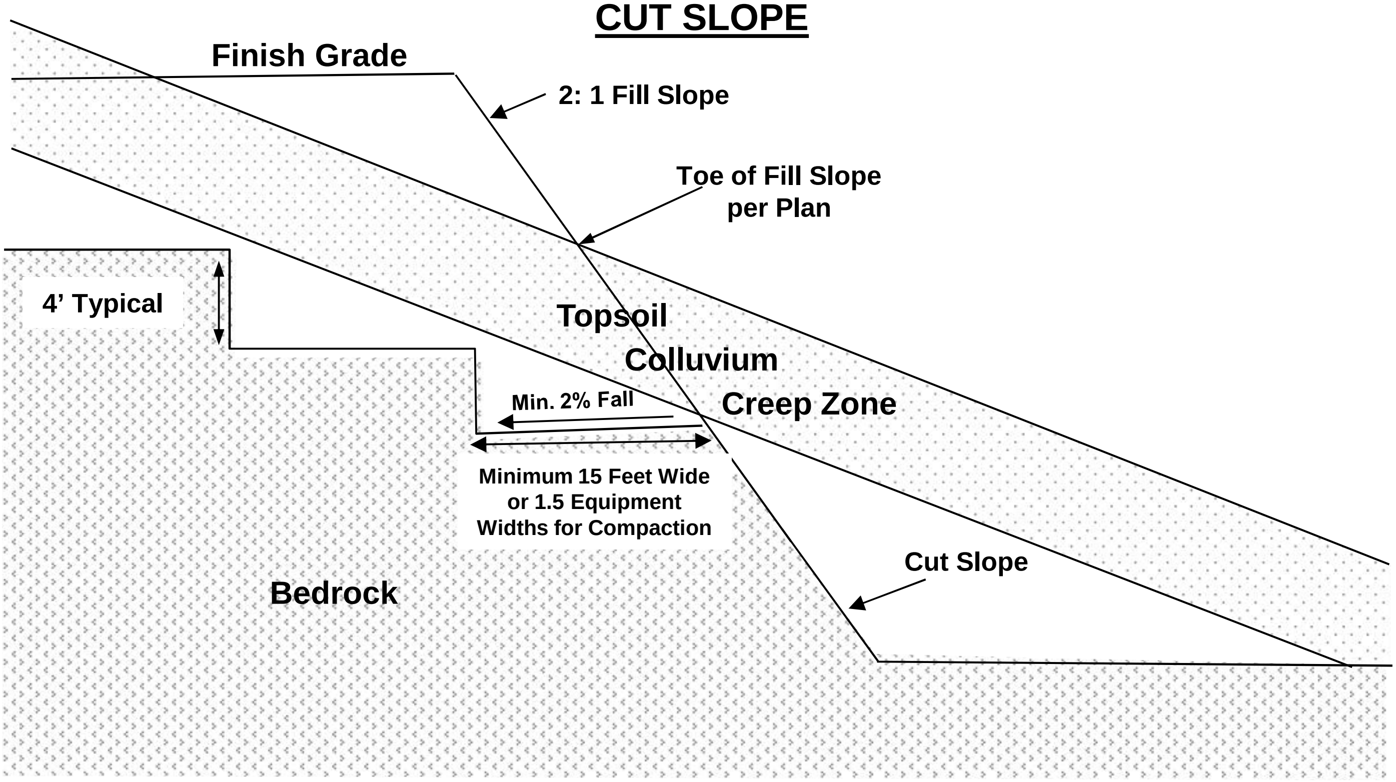
GEOTEK
1384 Poinsettia Avenue, Suite A
Vista, California 92081-8505


**TREATMENT ABOVE NATURAL SLOPES**

**STANDARD GRADING GUIDELINES**

**PLATE G-2**

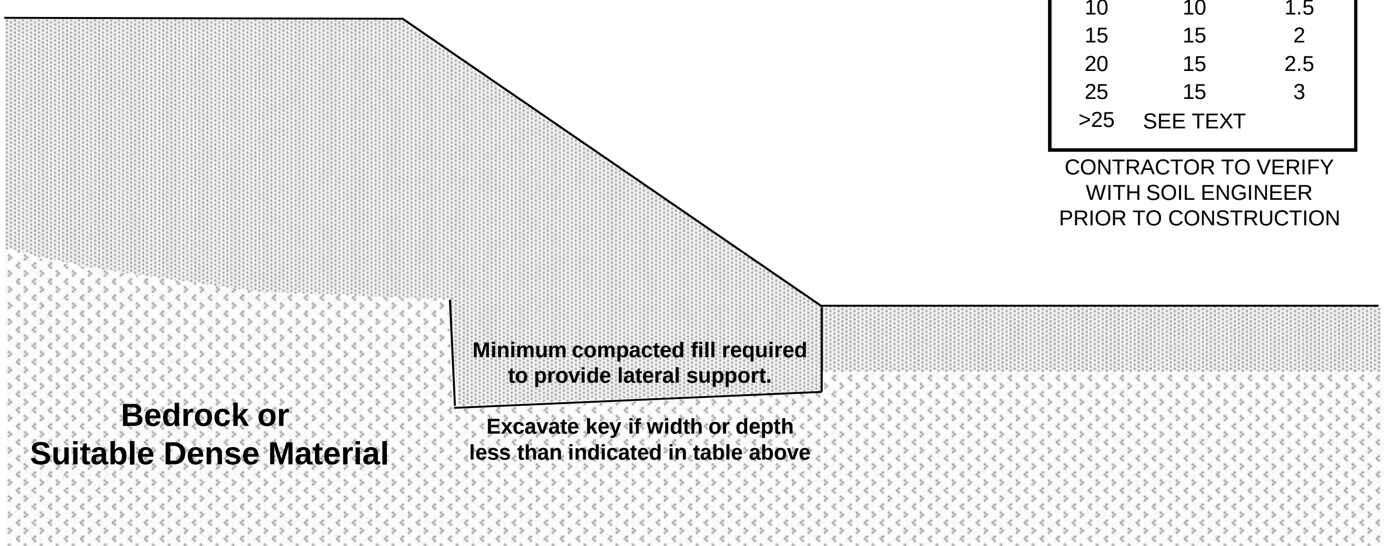
## TYPICAL FILL SLOPE OVER CUT SLOPE




## TYPICAL FILL SLOPE

| SLOPE HEIGHT | MIN. KEY WIDTH | MIN. KEY DEPTH |
|---|---|---|
| 5 | 7 | 1 |
| 10 | 10 | 1.5 |
| 15 | 15 | 2 |
| 20 | 15 | 2.5 |
| 25 | 15 | 3 |
| >25 | SEE TEXT | |

CONTRACTOR TO VERIFY WITH SOIL ENGINEER PRIOR TO CONSTRUCTION





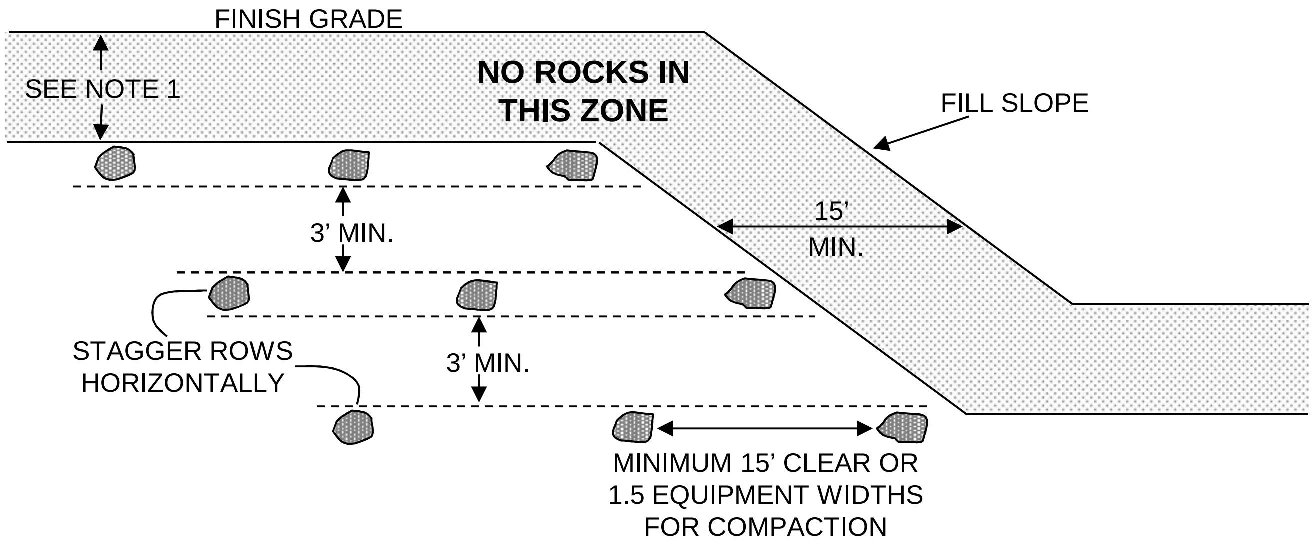
GEOTEK
1384 Poinsettia Avenue, Suite A
Vista, California 92081-8505


**COMMON FILL SLOPE KEYS**

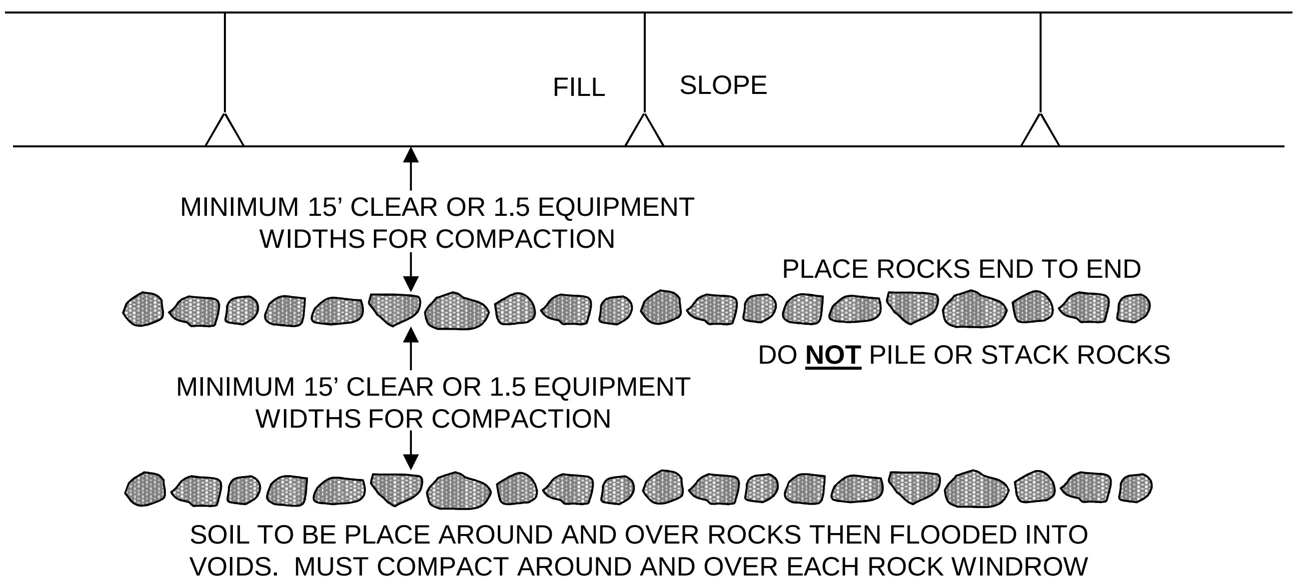
**STANDARD GRADING GUIDELINES**

**PLATE G-3**

# CROSS SECTIONAL VIEW




# PLAN VIEW




NOTES:

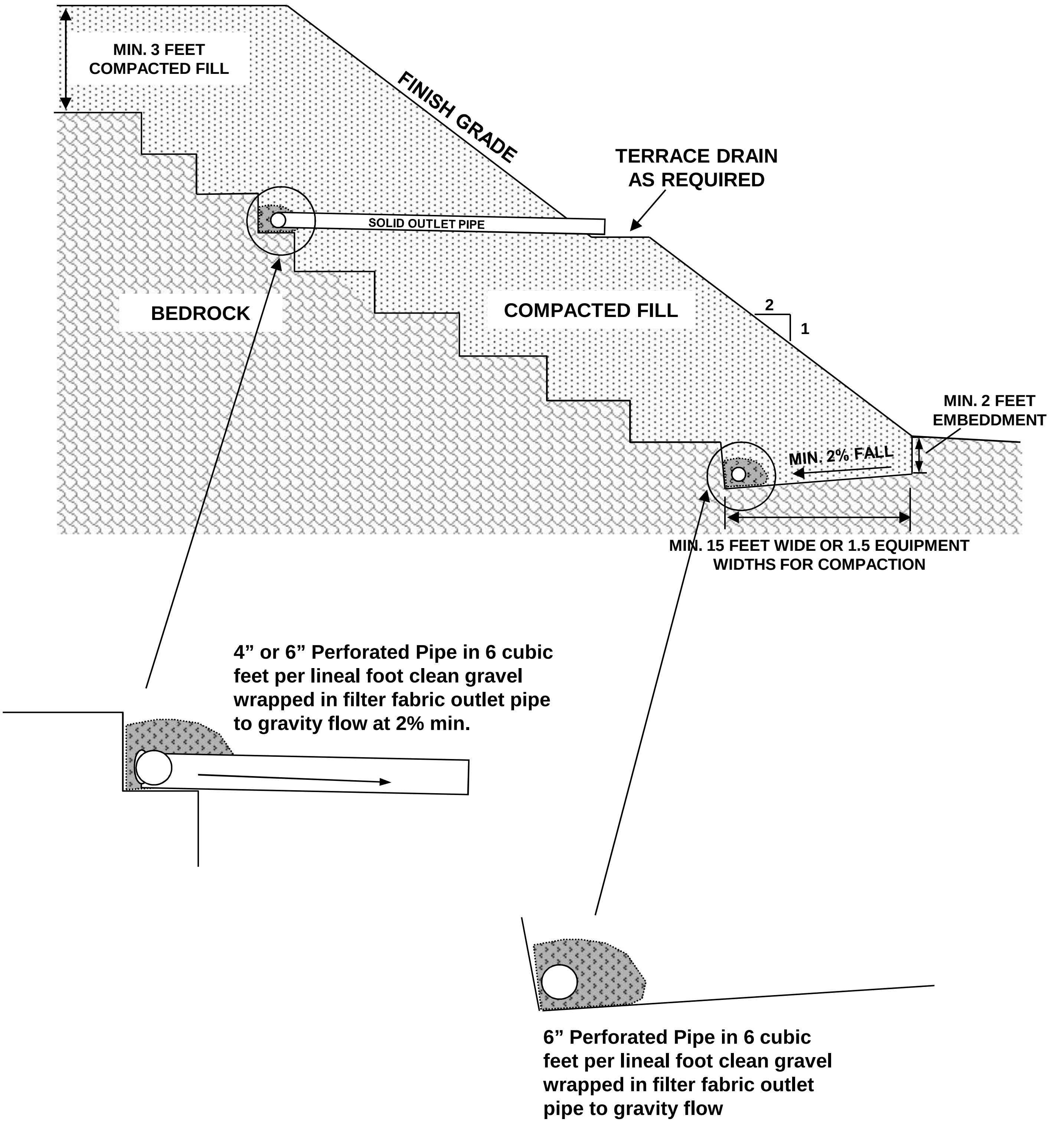
1) SOIL FILL OVER WINDROW SHOULE BE 7 FEET OR PER JURISDUICTIONAL STANDARDS AND SUFFICIENT FOR FUTURE EXCAVATIONS TO AVOID ROCKS
2) MAXIMUM ROCK SIZE IN WINDROWS IS 4 FEET MINIMUM DIAMETER
3) SOIL AROUND WINDROWS TO BE SANDY MATERIAL SUBJECT TO SOIL ENGINEER ACCEPTANCE
4) SPACING AND CLEARANCES MUST BE SUFFICIENT TO ALLOW FOR PROPER COMPACTION
5) INDIVDUAL LARGE ROCKS MAY BE BURIED IN PITS.

GEOTEK
1384 Poinsettia Avenue, Suite A
Vista, California 92081-8505

**ROCK BURIAL DETAILS**

**STANDARD GRADING GUIDELINES**

**PLATE G-4**





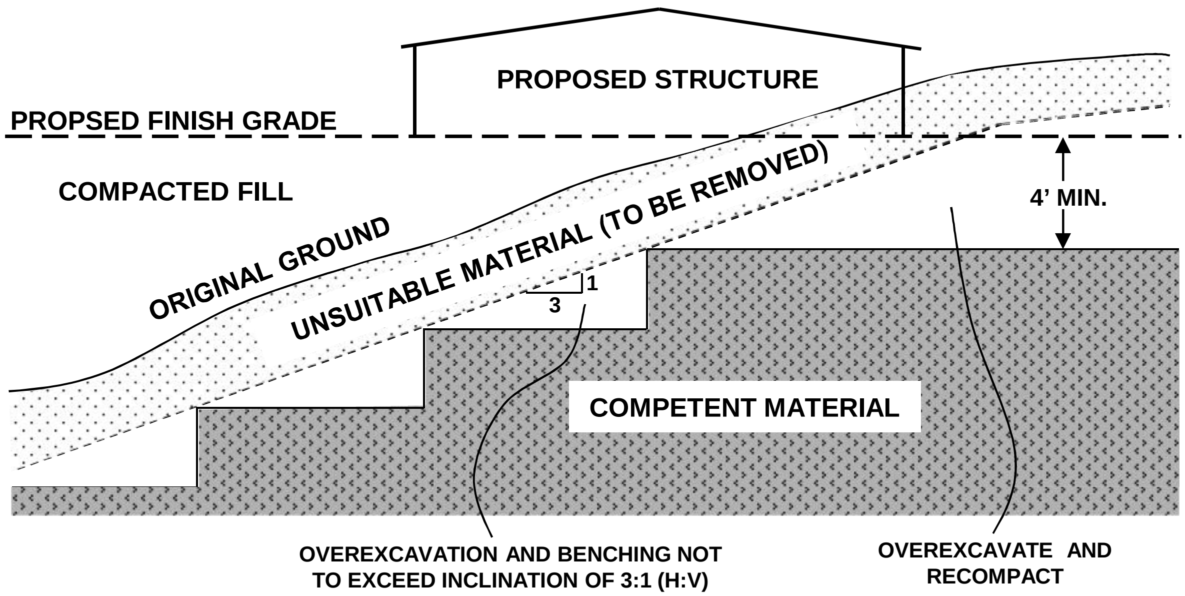
GEOTEK

1384 Poinsettia Avenue, Suite A
Vista, California 92083

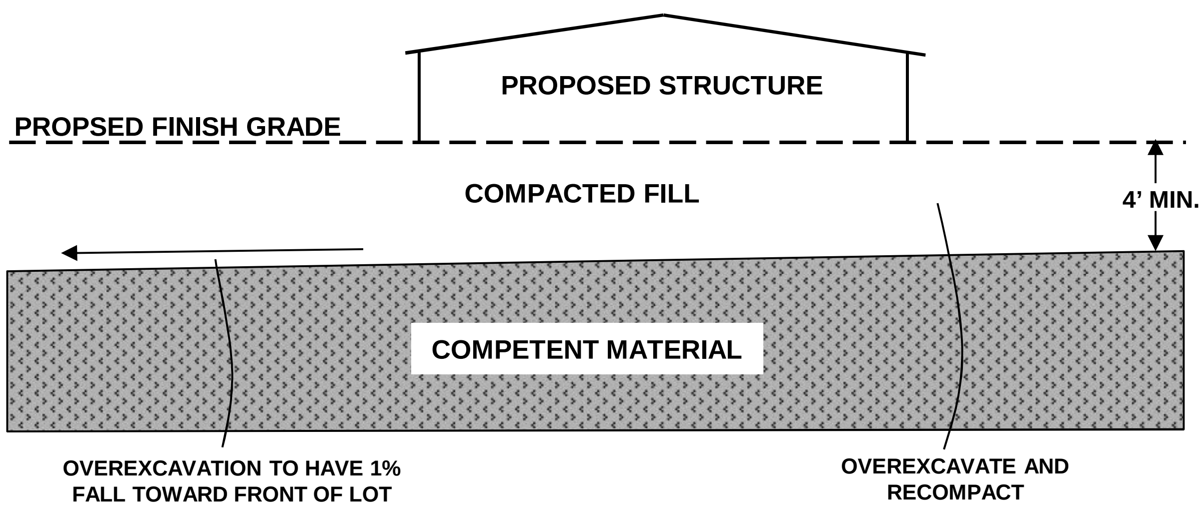

**Typical Buttress and Stabilization Fill**

**PLATE G-5**

# TRANSITION LOT




# UNDERCUT LOT




Notes:
1. Removed/overexcavated soils should be recompacted in accordance with recommendations included in the text of the report.
2. Location of cut/fill transition should verified in the field during site grading.

GEOTEK
1384 Poinsettia Avenue, Suite A
Vista, California 92081-8505

**TRANSITION & UNDERCUT LOTS**

**STANDARD GRADING GUIDELINES**

**PLATE G-6**