Appendix G1

Geotechnical Investigation – Residential North and Residential West Sites

UPDATED
GEOTECHNICAL INVESTIGATION

CARLTON OAKS GOLF COURSE
RESIDENTIAL NORTH (PA-2) AND
RESIDENTIAL WEST (PA-1) SITES
SANTEE, CALIFORNIA

PREPARED FOR:

LENNAR HOMES
SAN DIEGO, CALIFORNIA

PREPARED BY

GEOCON
INCORPORATED

GEOTECHNICAL ENVIRONMENTAL MATERIALS

FEBRUARY 3, 2022
REVISED JUNE 11, 2024
PROJECT NO. G2290-32-01

Project No. G2290-32-01
February 3, 2022
Revised June 11, 2024

Lennar Homes
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Attention: Mr. David Shepherd

Subject: UPDATED GEOTECHNICAL INVESTIGATION
CARLTON OAKS GOLF COURSE
RESIDENTIAL NORTH (PA-2) AND RESIDENTIAL WEST (PA-1) SITES
SANTEE, CALIFORNIA

Dear Mr. Shepherd:

In accordance with the request of Summit Planning Group and Hunsaker & Associates, San Diego, Inc., and your recent authorization, we have prepared this updated geotechnical investigation for the subject project located in Santee, California. The accompanying report presents the results of our study and our conclusions and recommendations regarding the geotechnical aspects of project development. This update report was prepared to address revised grading plans, including off-site improvement areas, and to provide geotechnical design parameters in accordance with the 2022 California Building Code (2022 CBC).

The results of our study indicate that the sites can be developed as planned, provided the recommendations of this report are followed. The primary geotechnical consideration during site development is remedial grading of potentially compressible surficial deposits.

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

Very truly yours,

GEOCON INCORPORATED

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UPDATED GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This updated report presents the results of a geotechnical study for the subject sites located within portions of the Carlton Oaks Golf Course property in Santee, California. (see *Vicinity Map*, Figure 1). The purpose of the study was to investigate the soil and geologic conditions at the sites, as well as evaluate geotechnical constraints, if any, that may impact areas of proposed development. This update report was prepared to address changes to the grading plans and to provide geotechnical design parameters in accordance with the 2022 CBC. In addition, we are addressing the proposed off-site improvements to West Hills Parkway and Carlton Oaks Drive.

This report provides recommendations relative to the geotechnical engineering aspects of the proposed development based on the conditions encountered during this study and a previous study performed by GeoTek Incorporated (GI). Their report is entitled *Preliminary Geotechnical Evaluation for Proposed Residential Development, Golf Clubhouse, and Maintenance Buildings, Santee, California,* dated February 28, 2006.

The scope of our study consisted of the following:

- Reviewing satellite imagery and readily available published and unpublished geologic literature.
- Reviewing grading plans prepared by Hunsaker and Associates, San Diego, Inc.
- Advancing fourteen small-diameter borings within the two development footprints to evaluate the underlying soil and geologic conditions (see Appendix A).
- Excavating five exploratory trenches using a rubber tire backhoe to evaluate the underlying soil and geologic conditions (see Appendix A).
- Performing laboratory tests on soil samples collected to evaluate their physical properties (see Appendix B).
- Performing four infiltration tests in select areas to be utilized during storm water management design and providing storm water management guidelines in accordance with the City of Santee Storm Water Standards Manual (See Appendix C).
- Preparing this report presenting our exploratory information and our conclusions and recommendations regarding the geotechnical aspects of developing the site as presently proposed.

The approximate locations of the exploratory trenches, borings and infiltration tests are shown on the *Geologic Maps*, Figures 2 and 3. In addition, we have included the boring logs and laboratory test results from GI's previous study in Appendix D.

2. SITE AND PROJECT DESCRIPTION

We understand that the overall proposed project site (PA-1, PA-2 and PA-3) that will be developed is located on approximately 169 acres and would include the redesign of the existing Carlton Oaks Golf Course and the following components: (1) redesign the golf course; (2) reconstruction of the clubhouse and pro shop, practice area, and learning center structure; (3) a hotel and associated cottages *(reported under separate cover);* (4) residential accessory uses consisting of two residential neighborhoods with open space areas; and (5) related on-site infrastructure. Approximately 3.4 acres consist of areas outside of the project site that will be developed with improvements associated with the Project and are located either in the City of San Diego or Santee (Off-site improvement areas). The off-site improvement areas and the proposed project site (developed and undeveloped) make up the CEQA Study area, as shown on the Site Plan and Off-Site Improvement Area exhibit presented as Figure 2.

The residential portion of the project consists of two sites (Residential North Site, PA-2, and Residential West Site, PA-1), that total approximately 29 acres located within portions of the Carlton Oaks Golf Course in Santee, California. The areas are located within the existing golf course, which is bounded to the north by residential homes, the south by the San Diego River, the west by West Hills Parkway and east by open space and residential development.

Topographically, the sites exhibit gently sloping terrain with vegetation primarily consisting of maintained grass areas utilized for the golf course along with areas of heavy brush and dense vegetation and numerous mature trees scattered about the property. Man-made improvements consist of a hotel and pool, pro shop, restaurant, lounge, offices, maintenance buildings, asphalt paved parking lot and other hardscape improvements. There are also two man-made lakes of unknown depth within the areas of planned development.

Proposed development includes grading to support two residential sites, Residential North (PA-2) and Residential West (PA-1), consisting of 160 and 89 dwelling units, respectively. Associated private roadways, public and private underground utilities and modular wetland units are also planned. The Residential West Site (PA-1) will be accessed via a proposed private street from West Hills Parkway. The existing top of slope north of the entrance to the West Site will be extended eastward to accommodate a new turn lane. The Residential North Site (PA-2) will be accessed from existing Carlton Oaks Drive across from Burning Tree Way. Proposed off-site improvements also consist of the construction of underground utilities. The recent revisions to the grading plans include:

- Residential West Site (PA-1) remains unchanged, however, Residential North Site (PA-2) has been reduced in size on the south side of property, and slightly wider on the east side.
- Addition of a vehicle crossing bridge from PA-2 (Residential North Site) to PA-3 (Hotel Site).

- The former driving range has been removed and will be used as a practice area. A practice area has also been added on the northern side of the resort area adjacent to the existing townhomes (Vista del Verde).
- Water quality basins are being replaced with Modular Wetland Systems.
- A new primary entrance has been added into Residential North from Carlton Oaks Drive across from Burning Tree Way.
- Primary access through the existing townhomes (Vista del Verde) has been changed to a secondary access only for emergency vehicle use.
- The proposed emergency vehicle access (EVA) roadway was also revised.

Grading is expected to consist of cuts and fills on the order of 10 and 20 feet, respectively, to create the building pads and streets. Grading will consist of raising the southern portion of both sites (near the San Diego River) approximately 10 to 20 feet, which will require approximately 180,000 cubic yards of import material for the Residential West Site, and approximately 100,000 cubic yards of import material for the Residential North Site.

3. SOIL AND GEOLOGIC CONDITIONS

Based on a review of published geologic maps, and observations during our site reconnaissance and subsurface investigation, the site is underlain by two surficial soil units and two formational units. The surficial units consist of previously placed artificial fill and Holocene-age young alluvial deposits. The two formational units consist of Pleistocene/Holocene-age older alluvial deposits and Eocene-age Friars Formation. Each is discussed below in order of increasing age.

3.1 Artificial Fill (Qaf and Qaf_2)

Previously placed undocumented fill consisting of golf course and roadway embankments were mapped across both sites based on topographic interpretation. The fill was found to be up to 14 feet-thick, and consists of loose to medium-dense silty/clayey sands and soft to firm sandy clays. Concrete and other debris was observed within the fill in the drainage west of the main parking lot. The previously placed fill is not suitable for the support of proposed improvements or structural fill and will require remedial grading in the form of complete removal and recompaction. The golf course grass surface, along with other deleterious material, such as trees, heavy brush, concrete, trash, debris, etc., will require removal and exportation from the site.

3.2 Young Alluvium (Qya)

Young alluvial soils (Holocene-age) are present below the artificial fill in the West Site and a portion of the North Site. The total thickness of this unit is unknown. These deposits consist primarily of medium dense to very dense silty sands with gravel and cobble layers.

3.3 Older Alluvium (Qoa)

Older alluvial soils (Pleistocene/Holocene-age) are present below the artificial fill and exposed at the surface in the North Site. The thickness of this unit ranges from 5 feet to greater than 16 feet thick based on the exploratory borings. These deposits consist primarily of dense to very dense, clayey/silty sands, gravels and cobbles. Portions of this unit may be cemented.

3.4 Friars Formation (Tf)

The Middle Eocene-age Friars Formation was encountered in Boring Nos. B-8 and B-11 at depths varying from 5 to 19 feet below the existing ground surface. It was also encountered in the GI Boring Nos. B-3, B-4, B-5, B-6, B-8, B-9, B-10, B-13, and B-15; at depths varying from 10 to 19 feet below existing ground surface. This formation, where encountered, consists of dense to very dense, pale green, silty, fine sandstone and hard fine sandy claystone/siltstone. We do not anticipate this unit will be encountered during development of the site.

4. GROUNDWATER

Groundwater, presumably associated with the San Diego River and its tributaries, was encountered in a number of exploratory borings from 5 to 19 feet below the existing ground surface. In addition, water is present at the surface in several ponds/lakes in both sites. The seepage/water table will be an important factor in determining the depth of remedial grading of surficial deposits. In addition, groundwater/seepage should be considered when planning improvements that extend below these depths. The groundwater depths indicated on the *Geologic Maps* are reflective of elevations encountered during the time of our investigations and may vary seasonally. Wet alluvial removals will be encountered during grading operations, leading to difficult excavation and compaction conditions.

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

5. GEOLOGIC HAZARDS

5.1 Faulting and Seismicity

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

According to the computer program *EZ-FRISK* (Version 7.65), 6 known active faults are located within a search radius of 50 miles from the property. The nearest known active faults are the Newport Inglewood and Rose Canyon Fault Zones, located approximately 11 miles west of the site and are the dominant sources of potential ground motion. Earthquakes that might occur on the Newport Inglewood or Rose Canyon Fault Zones or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. Table 5.1.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the most dominant faults in relationship to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2008) NGA acceleration-attenuation relationships.

TABLE 5.1.1
DETERMINISTIC SEISMIC SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
Newport Inglewood	11	7.5	0.25	0.20	0.25
Rose Canyon	11	6.9	0.22	0.18	0.20
Coronado Bank	24	7.4	0.17	0.12	0.14
Palos Verdes Connected	24	7.7	0.19	0.13	0.16
Elsinore	30	7.85	0.18	0.11	0.15
Earthquake Valley	35	6.8	0.11	0.07	0.06

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

TABLE 5.1.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2008 (g)
2% in a 50 Year Period	0.43	0.36	0.41
5% in a 50 Year Period	0.32	0.27	0.30
10% in a 50 Year Period	0.25	0.21	0.22

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

5.2 Liquefaction and Seismically Induced Settlement

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

The City of Santee Geotechnical/Seismic Hazard Study for The Safety Element of the Santee General Plan (2002) maps the site as having a “moderate to high” liquefaction hazard potential. The current standard of practice, as outlined in the *Recommended Procedures for Implementation of DMG Special Publication 117A, Guidelines for Analyzing and Mitigating Liquefaction in California* requires liquefaction analysis to a depth of 50 feet below the lowest portion of the proposed structure.

Exploratory borings excavated within the younger alluvium in the North Site revealed that this deposit is up to approximately 20 feet-thick and is underlain by the Friars Formation. The water table is approximately 6 to 15 feet below the ground surface. The borings indicate the alluvium consists of medium dense to very dense well-graded sand and gravel/cobble and some sandy clay layers. Laboratory testing indicates that this deposit has a very low compression potential. The grading plan indicates approximately 15 feet of fill is planned along the southern portion of the Residential North Site where the younger alluvium will be left in place. Based on these factors, and considering the conditions required for liquefaction to occur, it is our opinion that the potential for liquefaction and seismically induced settlement occurring within the Residential North Site soils is considered to be "low".

The Residential West Site is underlain by artificial fill and younger alluvium to the maximum depth explored of 20 feet below the ground surface where difficult drilling or refusal was encountered. The water table is approximately 5 to 19 feet below the ground surface. The borings indicate the alluvium primarily consists of medium dense to very dense well-graded sand and gravel/cobble. Laboratory testing indicates that this deposit has a very low compression potential. The grading plan indicates approximately 20 feet of fill is planned along the southern portion of the Residential West Site where the younger alluvium will be left in place. Based on these factors, and considering the conditions required for liquefaction to occur, it is our opinion that the potential for liquefaction and seismically induced settlement occurring within the West Site soils is considered to be "low".

5.3 Seiches and Tsunamis

Considering the project location in relation to the ocean and proposed grade elevation (above elevation 300 to 340 feet MSL), the site is not located within a tsunami inundation zone. Seiche-related phenomena are defined as being proximal to a lake, reservoir, or bay. The project is not located near a large body of water such as those; however, proximity to the San Diego River is discussed below.

5.4 Flooding from Dam Hazards

The City of Santee Geotechnical/Seismic Hazard Study for The Safety Element of the Santee General Plan (2002) identifies the site as being within the zone of inundation in the San Diego River Valley downstream of three major dams in San Diego County. These include the San Vicente Dam, the El Capitan Dam, and the Chet Harrit Dam (Lake Jennings). According to the Safety Element report, maps prepared in the 1970s indicate the site is located within the inundation limits considering complete failure of any one of the three dams. Information concerning the safety of these dams, which is reviewed annually by the California Department of Water Resources, Division of Dam Safety, may be obtained from that department.

5.5 Landslides

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

5.6 Settlement Considerations

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

Laboratory consolidation tests were performed on samples of the alluvium to aid in evaluating the magnitude of settlement that could occur from the proposed fill and building loads presently planned. The alluvium was found to have a very low compression potential when subjected to increased vertical stress. Based on the test results and analysis, it is estimated that up to 1 to 2 inches of settlement could occur after site grading. Given the granular nature of the alluvium left in-place, the settlement is expected to occur relatively quickly after grading (approximately 2 to 4 weeks).

It should be noted that the magnitude of the total settlement and the associated rate of consolidation may not be uniform throughout the site due to the variable thickness and compressibility of the underlying alluvial materials. In addition, the variable thickness of proposed fill can affect the magnitude of settlement.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

6.1.1 No soil or geologic conditions were encountered that, in the opinion of Geocon Incorporated, would preclude the development of the property as proposed, provided the recommendations of this report are followed.

6.1.2 Both sites are blanketed with artificial fill associated with golf course grading (Qaf) and off-site roadways (Qaf_2), including West Hills Parkway and Carlton Oaks Drive. The artificial fill in the southern portion of the Residential North Site, and Residential West Site, is underlain by saturated younger alluvium. Our study indicates that all artificial fill (Qaf) and limited portions of young alluvial deposits above groundwater should be removed and recompacted as engineered fill. Removals should be performed to approximately 2 to 3 feet above the groundwater elevation at the time of grading. The estimated thickness of remedial grading, based on consolidation testing and the water elevations at the time of our study, are shown on Figures 3 and 4. In some instances an additional foot was added to the estimated removal depth to consider weathered materials.

6.1.3 Portions of the sites are underlain by saturated younger alluvium. Our study indicates that up to 1 to 2 inches of settlement may occur after grading based on laboratory testing and the current development plan. As a consequence, construction of the proposed improvements, including underground utilities should be delayed until the primary consolidation of the younger alluvial deposits is essentially complete. We anticipate this time frame to be short but settlement monitoring should be performed to verify when primary compression has occurred. The specific settlement monitoring procedure can be provided as development plans progress.

6.1.4 As with the existing lake areas, logistical constraints precluded investigation of the natural drainage that traverses proposed Lots 70 through 79 (Residential North Site). This area has potentially thick surficial deposits (Qya) that will require remedial grading prior to proposed fill placement. A similar condition occurs in the Residential West Site, west of Lots 1 through 6 and the adjacent entrance road. Exploratory trenches are recommended in these areas for budgeting purposes as plans progress to identify the extent of remedial grading that will be required. The additional information can be provided in an addendum to this report.

6.1.5 Proposed below grade improvements, such as underground utilities, should consider the groundwater elevation information contained in this study. Temporary and/or permanent design considerations may be necessary in the event that these improvements are located near or below the water table.

6.1.6 A proposed vehicle crossing and bridge between PA-2 and PA-3 is shown on the plans. The roadway and bridge abutments are expected to be supported on compacted fill placed above saturated younger alluvium. For preliminary design purposes, we have also provided drilled pier parameters for any bridge foundations extending beyond the younger alluvium and into the underlying formational materials.

6.2 Excavation and Soil Characteristics

6.2.1 Excavation of the surficial deposits should be possible with light to moderate effort using conventional heavy-duty equipment. Excavations within the Older Alluvial Deposits (Qoa) may encounter cemented portions and may require very heavy effort with difficult ripping conditions. Excavations into the Friars Formation are not anticipated. Hard concretionary fragments may be generated from this unit and require special handling.

6.2.2 The soils encountered in the field investigation are considered to be "expansive" (expansion index [EI] of 20 or more) as defined by 2022 California Building Code (CBC) Section 1803.5.3. Table 6.2 presents soil classifications based on the expansion index. The soil materials observed on site are anticipated to have a "very low" to "medium" expansion potential (expansion index of 90 or less).

TABLE 6.2
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

<table>
<tr><th>Expansion Index (EI)</th><th>ASTM 4829
Expansion Classification</th><th>2022 CBC
Expansion Classification</th></tr>
<tr><td>0 – 20</td><td>Very Low</td><td>Non-Expansive</td></tr>
<tr><td>21 – 50</td><td>Low</td><td rowspan="4">Expansive</td></tr>
<tr><td>51 – 90</td><td>Medium</td></tr>
<tr><td>91 – 130</td><td>High</td></tr>
<tr><td>Greater Than 130</td><td>Very High</td></tr>
</table>

6.3 Soluble Sulfate Exposure

6.3.1 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate. Results from the laboratory water-soluble sulfate content testing are presented in Table IV and indicate that the on-site materials at the locations tested possess a "Not Applicable" and "S0" sulfate exposure, or "Moderate" and "S1" sulfate exposure to concrete structures as defined by 2022 CBC Section 1904 and ACI 318. Table 6.3 presents a summary of concrete requirements set forth by 2022 CBC Section 1904 and ACI 318.

TABLE 6.3
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Exposure Class		Water-Soluble Sulfate (SO_4) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight[1]	Minimum Compressive Strength (psi)
S0		$SO_4<0.10$	No Type Restriction	n/a	2,500
S1		$0.10\leq SO_4<0.20$	II	0.50	4,000
S2		$0.20\leq SO_4\leq 2.00$	V	0.45	4,500
S3	Option 1	$SO_4>2.00$	V+Pozzolan or Slag	0.45	4,500
	Option 2		V	0.40	5,000

[1] Maximum water to cement ratio limits do not apply to lightweight concrete

6.3.2 The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

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

6.4 Grading

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

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

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

6.4.4 Site preparation should begin with the removal of all deleterious material and vegetation. There are areas of very thick brush, vegetation, and large trees in both sites. The depth of removal should be such that material to be used as fill are free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

6.4.5 Potentially compressible soils consisting of artificial fill and portions of the alluvium should be removed to approximately 2 to 3 feet above the groundwater table, or competent material, and properly compacted. The actual extent of unsuitable soil removals will be determined in the field during grading by the geotechnical engineer and/or engineering geologist. The estimated remedial grading thickness is presented on Figures 3 and 4.

6.4.6 We understand that an emergency vehicle access road is planned that crosses known cultural resources. As a consequence, remedial grading to remove potentially compressible surficial soils is prohibited. In order to limit potential settlement beneath the roadway, stabilization measures, such as using geogrid reinforcement (such as Tensar TX-5 or equivalent), are recommended at the ground surface. The Project Civil Engineer has created an exhibit that shows the recommended stabilization measures using two rows of geogrid reinforcement.

6.4.7 Each of the two sites has a man-made lake within the proposed grading limits. The lakes should be de-watered and evaluated with respect to remedial grading. Wet materials should be expected in the vicinity of these lakes.

6.4.8 As with the existing lake areas, logistical constraints precluded investigation of the natural drainage in Lots 70 through 79. This area has potentially thick surficial deposits (Qya) that will require remedial grading prior to proposed fill placement. Exploratory trenches are recommended in this area for budgetary purposes as plans progress to identify the extent of remedial grading that will be required. The additional information can be provided in an addendum to this report.

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

6.4.10 Proposed off-site improvements to West Hills Parkway include extending the existing roadway embankment to the east to accommodate a new turning lane. At the base of the existing slope to West Hills Parkway, we expect to encounter approximately 5 to 6 feet of surficial soil over saturated younger alluvial deposits. Remedial grading should consist of removing the surficial soils, where practical, to expose the younger alluvium. As the grading extends into the existing embankment supporting the roadway, heavy benching is recommended. Settlement monitoring of the new embankment may be necessary after fill placement.

6.4.11 Proposed off-site improvements to Carlton Oaks Drive consist of removing existing utility poles and undergrounding utilities. Once the existing utilities are removed, the exposed trenches should be properly backfilled in accordance with our recommendations. Utility pole excavations should be filled with a 2-sack cement slurry. Trench backfill beneath existing roads should be compacted to at least 95 percent of the applicable maximum dry density at slightly over optimum moisture content.

6.4.12 It is our understanding that imported soils will be required, and that this material may be generated during grading operations within other portions of the golf course. Import materials should consist of granular material with “very low” to “low” expansive (Expansion Index of 50 or less) potential. Prior to importing the material, samples from proposed export site should be obtained and subjected to laboratory testing to determine whether the material conforms to the recommended criteria. At least 5 working days should be allowed for laboratory testing of the soil prior to its importation. Import materials should be free of oversize rock and construction debris.

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

6.5 Seismic Design Criteria

6.5.1 Table 6.5.1 summarizes site-specific design criteria obtained from the 2022 California Building Code (CBC; Based on the 2021 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. We used the computer program *U.S. Seismic Design Maps*, provided by the Structural Engineers Association (SEA) to calculate the seismic design parameters. The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2022 CBC and Table 20.3-1 of ASCE 7-16. The values presented herein are for the risk-targeted maximum considered earthquake (MCE_R). Sites designated as Site Class D, E and F may require additional analyses if requested by the project structural engineer and client.

TABLE 6.5.1
2022 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2022 CBC Reference
Site Class	D	Section 1613.2.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.783g	Figure 1613.2.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.287g	Figure 1613.2.1(2)
Site Coefficient, F_A	1.187	Table 1613.2.3(1)
Site Coefficient, F_V	2.026	Table 1613.2.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	0.929g	Section 1613.2.3 (Eqn 16-36)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.582g	Section 1613.2.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.62g	Section 1613.2.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.388g	Section 1613.2.4 (Eqn 16-39)

***Note:** Using the code-based values presented in this table, in lieu of a performing a ground motion hazard analysis, requires the exceptions outlined in ASCE 7-16 Section 11.4.8 be followed by the project structural engineer. Per Section 11.4.8 of ASCE/SEI 7-16, a ground motion hazard analysis should be performed for projects for Site Class "E" sites with Ss greater than or equal to 1.0g and for Site Class "D" and "E" sites with S1 greater than 0.2g. Section 11.4.8 also provides exceptions which indicates that the ground motion hazard analysis may be waived provided the exceptions are followed.

6.5.2 Table 6.5.2 presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

TABLE 6.5.2
ASCE 7-16 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-16 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.336g	Figure 22-9
Site Coefficient, F_{PGA}	1.264	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.425g	Section 11.8.3 (Eqn 11.8-1)

6.5.3 Conformance to the criteria in Tables 6.5.1 and 6.5.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur in the event of a large earthquake. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

6.5.4 The project structural engineer and architect should evaluate the appropriate Risk Category and Seismic Design Category for the planned structures. The values presented herein assume a Risk Category of I and resulting in a Seismic Design Category D. Table 6.5.3 presents a summary of the risk categories in accordance with ASCE 7-16.

TABLE 6.5.3
ASCE 7-16 RISK CATEGORIES

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

6.6 Foundation and Concrete Slabs-On-Grade Recommendations

6.6.1 The foundation recommendations herein are for proposed one- to three-story residential structures. The foundation recommendations have been separated into three categories based on either the maximum and differential fill thickness or Expansion Index. The foundation category criteria are presented in Table 6.6.1.

TABLE 6.6.1
FOUNDATION CATEGORY CRITERIA

Foundation Category	Maximum Fill Thickness, T (Feet)	Differential Fill Thickness, D (Feet)	Expansion Index (EI)
I	$T<20$	--	$EI\leq50$
II	$20\leq T<50$	$10\leq D<20$	$50<EI\leq90$
III	$T\geq50$	$D\geq20$	$90<EI\leq130$

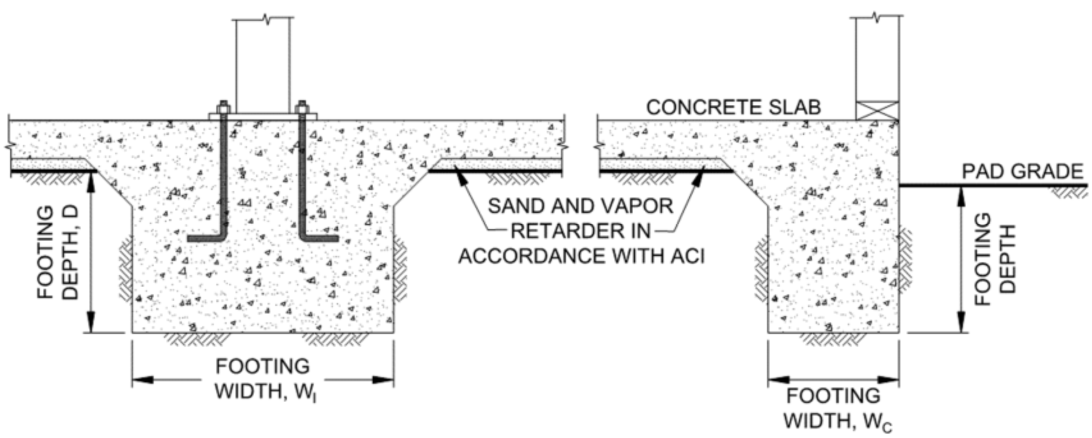
6.6.2 We will provide final foundation categories for each building or lot after finish pad grades have been achieved, the underlying fill-bedrock geometry is evaluated and we perform laboratory testing of the subgrade soil. Category III foundations are recommended for structures supported on buildings pads underlain with alluvial soil left in place.

6.6.3 Table 6.6.2 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems.

TABLE 6.6.2
CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth, D (inches)	Minimum Continuous Footing Reinforcement	Minimum Footing Width (Inches)
I	12	Two No. 4 bars, one top and one bottom	12 – Continuous, W_C 24 – Isolated, W_I
II	18	Four No. 4 bars, two top and two bottom	
III	24	Four No. 5 bars, two top and two bottom	

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



Wall/Column Footing Dimension Detail

6.6.5 The proposed structures can be supported on a shallow foundation system founded in the compacted fill/formational materials. Table 6.6.3 provides a summary of the foundation design recommendations.

TABLE 6.6.3
SUMMARY OF FOUNDATION RECOMMENDATIONS

Parameter	Value
Allowable Bearing Capacity	2,000 psf
Bearing Capacity Increase	500 psf per Foot of Depth
	300 psf per Foot of Width
Maximum Allowable Bearing Capacity	4,000 psf
Estimated Total Static Settlement*	1 Inch
Estimated Differential Static Settlement*	½ Inch in 40 Feet

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

6.6.7 The concrete slab-on-grades should be designed in accordance with Table 6.6.4.

TABLE 6.6.4
CONVENTIONAL SLAB-ON-GRADE RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Concrete Slab Thickness (inches)	Interior Slab Reinforcement	Typical Slab Underlayment
I	4	6 x 6 - 10/10 welded wire mesh at slab mid-point	3 to 4 Inches of Sand/Gravel/Base
II	4	No. 3 bars at 24 inches on center, both directions	
III	5	No. 3 bars at 18 inches on center, both directions	

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

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

6.6.10 As an alternative to the conventional foundation recommendations, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems (foundation dimensions and embedment depths, slab thickness and steel placement) should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI) DC 10.5-12 *Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive Soils* or *WRI/CRSI Design of Slab-on-Ground Foundations*, as required by the 2022 California Building Code (CBC Section 1808.6.2). Although this procedure was developed for expansive soil conditions, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented in Table 6.6.5 for the particular Foundation Category designated. The parameters presented in Table 6.6.5 are based on the guidelines presented in the PTI DC 10.5 design manual.

TABLE 6.6.5
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI) DC10.5 Design Parameters	Foundation Category		
	I	II	III
Thornthwaite Index	-20	-20	-20
Equilibrium Suction	3.9	3.9	3.9
Edge Lift Moisture Variation Distance, e_M (Feet)	5.3	5.1	4.9
Edge Lift, y_M (Inches)	0.61	1.10	1.58
Center Lift Moisture Variation Distance, e_M (Feet)	9.0	9.0	9.0
Center Lift, y_M (Inches)	0.30	0.47	0.66

6.6.11 The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer. If a post-tensioned mat foundation system is planned, the slab should possess a thickened edge with a minimum width of 12 inches and extend below the clean sand or crushed rock layer.

6.6.12 If the structural engineer proposes a post-tensioned foundation design method other than PTI, DC 10.5:

- The deflection criteria presented in Table 6.6.5 are still applicable.
- Interior stiffener beams should be used for Foundation Categories II and III.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 12 inches, 18 inches and 24 inches for foundation categories I, II, and III, respectively. The embedment depths should be measured from the lowest adjacent pad grade.

6.6.13 Foundation systems for the lots that possess a foundation Category I and a "very low" expansion potential (expansion index of 20 or less) can be designed using the method described in Section 1808 of the 2022 CBC. If post-tensioned foundations are planned, an alternative, commonly accepted design method (other than PTI) can be used. However, the post-tensioned foundation system should be designed with a total and differential deflection of 1 inch. Geocon Incorporated should be contacted to review the plans and provide additional information, if necessary.

6.6.14 If an alternate design method is contemplated, Geocon Incorporated should be contacted to evaluate if additional expansion index testing should be performed to identify the lots that possess a "very low" expansion potential (expansion index of 20 or less).

6.6.15 Our experience indicates post-tensioned slabs may be susceptible to excessive edge lift from tensioning, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

6.6.16 During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints form between the footings/grade beams and the slab during the construction of the post-tension foundation system unless designed by the structural engineer.

6.6.17 Isolated footings outside of the slab area, if present, should have the minimum embedment depth and width recommended for conventional foundations for a particular Foundation Category. The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended for Category

III. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams in both directions. In addition, consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

6.6.18 Interior stiffening beams should be incorporated into the design of the foundation system in accordance with the PTI design procedures.

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

6.6.20 Where buildings or other improvements are planned near the top of a slope 3:1 (horizontal:vertical) or steeper, special foundation and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high or cut slopes regardless of height, footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. A post-tensioned slab and foundation system or mat foundation system can be used to reduce the potential for distress in the structures associated with strain softening and lateral fill extension. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.

- If swimming pools are planned, Geocon Incorporated should be contacted for a review of specific site conditions.

- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height. For swimming pools located near the top of fill slopes greater than 30 feet in height, additional recommendations may be required and Geocon Incorporated should be contacted for a review of specific site conditions.

- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures which would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

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

6.6.22 Concrete slabs should be provided with adequate crack-control joints, construction joints and/or expansion joints to reduce unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute when establishing crack-control spacing. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed finished floors are planned.

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

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

6.7 Concrete Flatwork

6.7.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations herein. Slab panels should be a minimum of 4 inches thick and, when in excess of 8 feet square, should be reinforced with 6 x 6 - W2.9/W2.9 (6 x 6 - 6/6) welded wire mesh or No. 3 reinforcing bars at 18 inches on center in both directions to reduce the potential for cracking. In addition, concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be checked prior to placing concrete.

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

6.7.3 The recommendations presented herein are intended to reduce the potential for cracking of slabs and foundations as a result of differential movement. However, even with the incorporation of the recommendations presented herein, foundations and slabs-on-grade will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

6.8 Proposed Bridge Foundations

6.8.1 We understand a bridge is proposed from PA-2 (Residential North Site) to PA-3 (Hotel Site). We expect the abutment foundations to consist of isolated spread footings supported on compacted fill. Any bents, if needed, should be supported using drilled piers supported on Friars Formation beneath the younger alluvium.

6.8.2 The bridge abutments may be supported on a shallow foundation system founded in the compacted fill. Continuous footings should be at least 12 inches wide and extend 18 inches below lowest adjacent pad grade. Isolated spread footings should have a minimum width of 2 feet and should also extend 18 inches below lowest adjacent pad grade. In addition, footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

6.8.3 Steel reinforcement for continuous footings should consist of at least four No. 5 steel reinforcing bars placed horizontally in the footings, two near the top and two near the bottom. Steel reinforcement for the spread footings should be designed by the project structural engineer.

6.8.4 The recommendations herein are based on soil characteristics only (EI of 50 or less) and is not intended to replace reinforcement required for structural considerations.

6.8.5 The recommended allowable bearing capacity for foundations with minimum dimensions described herein and bearing in properly compacted fill is 2,000 pounds per square foot (psf).

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

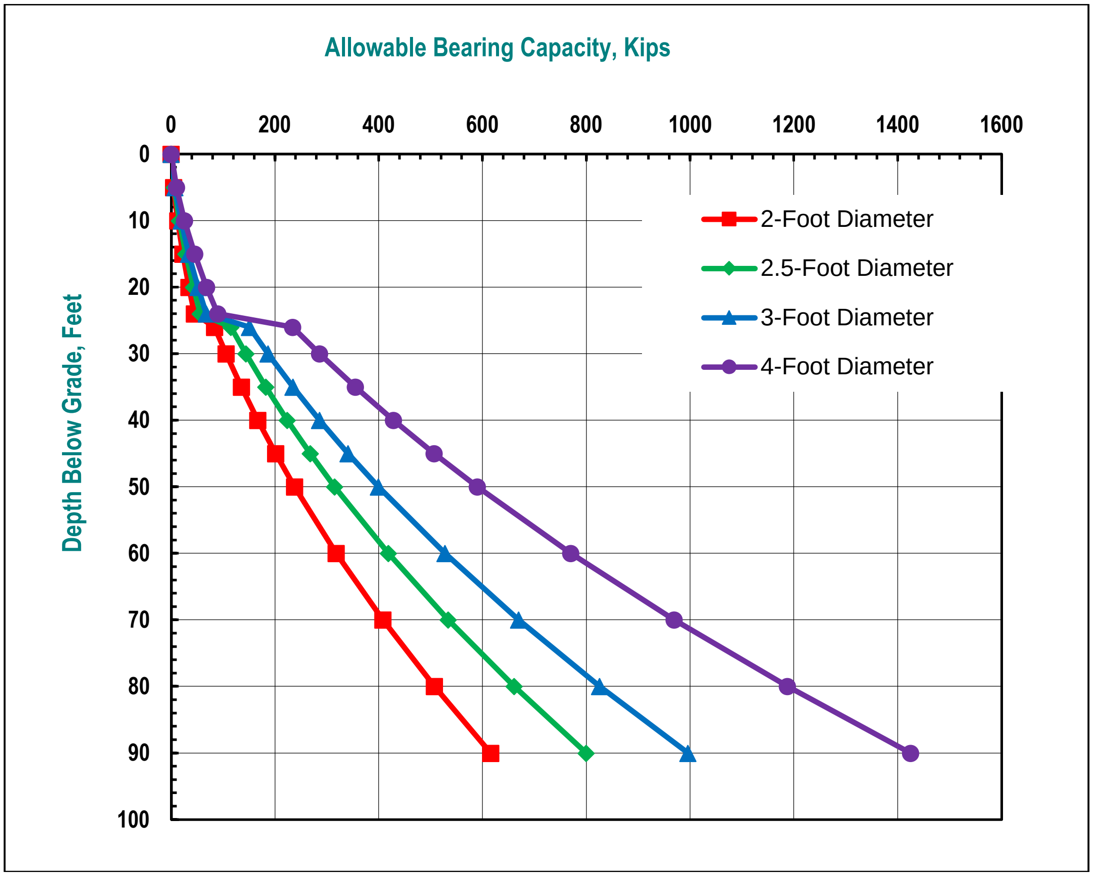
6.8.6 We estimate the total and differential settlements under the imposed allowable loads to be about 1 inch and ½ inch, respectively, based on a 5-foot-square footing. These settlement values are based on the underlying soil being densified as recommended herein.

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

6.9 Drilled Pier Recommendations

6.9.1 If needed, drilled piers should be used for foundation support for any bridge bents. The foundation recommendations herein assume that the piers will extend through the younger alluvium and into the Friars Formation. Groundwater and wet drilling techniques should be expected. The piers should be embedded at least 5 feet within the formational materials. For design purposes, a surficial soil thickness of 25 feet was used to compute the allowable bearing capacities shown below. Once actual foundation types and locations are determined, revised allowable capacities may be provided based on actual site conditions. Additional field exploration may be needed to refine the recommendations presented herein.

6.9.2 Piers can be designed to develop support by end bearing within the formational materials and skin friction within the formational materials and younger alluvium. The allowable bearing capacity can be determined by the chart presented below. These allowable values possess a factor of safety of 2 and 3 for skin friction and end bearing, respectively.



Allowable Bearing Capacity Chart

6.9.3 Piers can be designed to develop support by end bearing within the formational materials and skin friction within the formational materials and younger alluvium using the design parameters presented in Table 6.9.

TABLE 6.9
SUMMARY OF DRILLED PIER RECOMMENDATIONS

Parameter	Value
Minimum Pile Diameter	2 Feet
Minimum Pile Spacing	3 Times Pile Diameter
Minimum Foundation Embedment Depth	10 Feet
	5 Feet in Formational Materials
Allowable Bearing Capacity	Per Chart
Estimated Total Settlement	½ Inch
Estimated Differential Settlement	½ Inch in 40 Feet

6.9.4 The design length of the drilled piers should be determined by the designer based on the elevation of the pile cap or grade beam and the elevation of the top of the formational materials obtained from the Geologic Map and Geologic Cross-Sections presented herein. It is difficult to evaluate the exact length of the proposed drilled piers due to the variable thickness of the younger alluvium; therefore, some variation should be expected during drilling operations.

6.9.5 If pier spacing is at least three times the maximum dimension of the pier, no reduction in axial capacity for group effects is considered necessary. If piles are spaced between 2 and 3 pile diameters (center to center), the single pile axial capacity should be reduced by 25 percent. Geocon Incorporated should be contacted to provide single-pile capacity if piers are spaced closer than 2 diameters.

6.9.6 The allowable downward capacity may be increased by one-third when considering transient wind or seismic loads.

6.9.7 The younger alluvial materials may contain gravel and cobble zones and could experience caving; therefore, the drilling contractor should expect wet and caving drilling conditions during excavations for the piers. Because a significant portion of the piers capacity will be developed by end bearing, the bottom of the borehole should be cleaned of loose cuttings prior to the placement of steel and concrete. Experience indicates that backspinning the auger does not remove loose material and a flat cleanout plate is necessary. We expect localized seepage may be encountered during the drilling operations and casing may be required to maintain the integrity of the pier excavation, particularly if seepage or sidewall instability is encountered. Concrete should be placed within the excavation as soon as possible after the auger/cleanout plate is withdrawn to reduce the potential for discontinuities or caving.

6.9.8 Pile settlement of production piers is expected to be on the order of ½ inch if the piers are loaded to their allowable capacities. Geocon should provide updated settlement estimates once the foundation plans are available. Settlements should be essentially complete shortly after completion of the building superstructure.

6.10 Conventional Retaining Walls

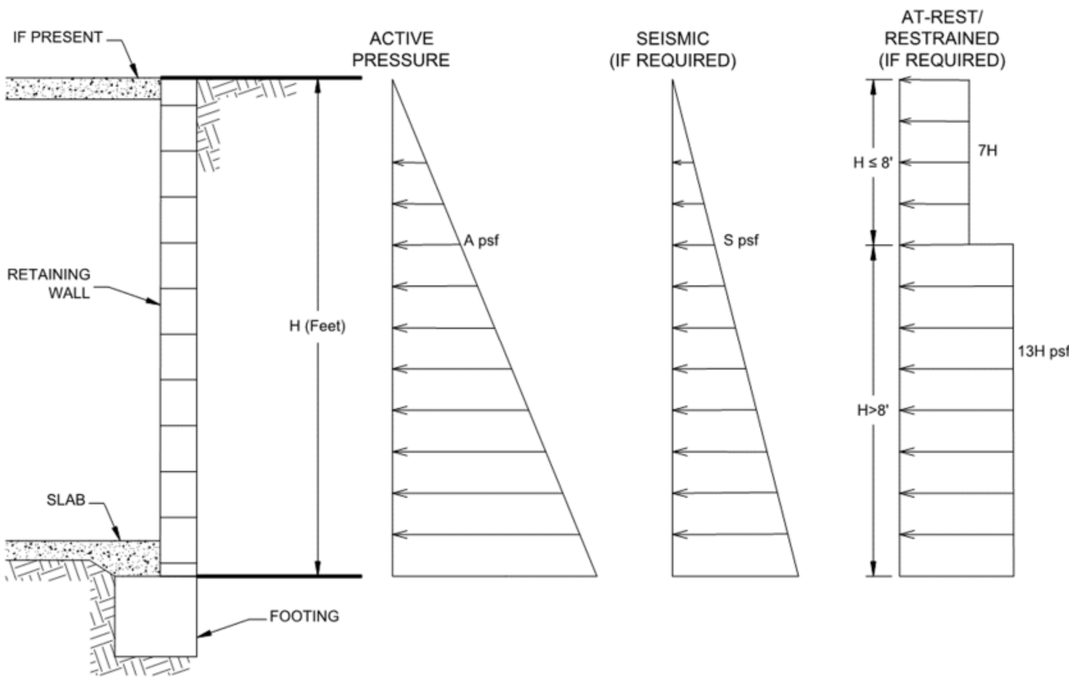
6.10.1 Retaining walls should be designed using the values presented in Table 6.10.1. Soil with an expansion index (EI) of greater than 50 should not be used as backfill material behind retaining walls.

TABLE 6.10.1
RETAINING WALL DESIGN RECOMMENDATIONS

Parameter	ValueP
Active Soil Pressure, A (Fluid Density, Level Backfill)	35 pcf
Active Soil Pressure, A (Fluid Density, 2:1 Sloping Backfill)	50 pcf
Seismic Pressure, S	19H psf
At-Rest/Restrained Walls Additional Uniform Pressure (0 to 8 Feet High)	8H psf
At-Rest/Restrained Walls Additional Uniform Pressure (8+ Feet High)	12H psf
Expected Expansion Index for the Subject Property	EI≤50

H equals the height of the retaining portion of the wall

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



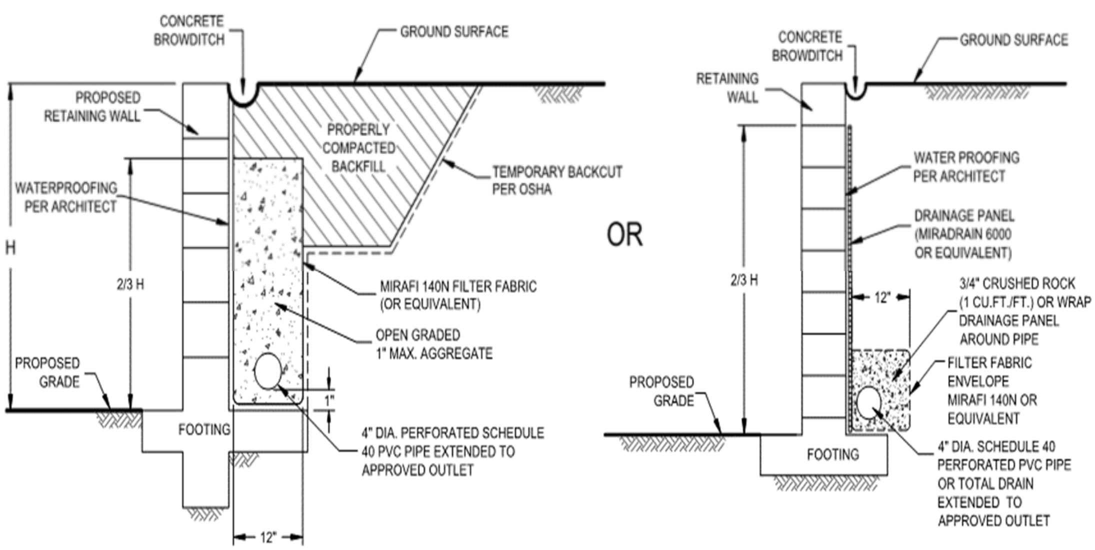
Retaining Wall Loading Diagram

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

6.10.4 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613.3.5 of the 2022 CBC or Section 11.6 of ASCE 7-16. For structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2022 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall.

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

6.10.6 Drainage openings through the base of the wall (weep holes) should not be used where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted granular (EI of 90 or less) free-draining backfill material with no hydrostatic forces or imposed surcharge load. The retaining wall should be properly drained as shown in the Typical Retaining Wall Drainage Detail. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.



Typical Retaining Wall Drainage Detail

6.10.7 The retaining walls may be designed using either the active and restrained (at-rest) loading condition or the active and seismic loading condition as suggested by the structural engineer.

Typically, it appears the design of the restrained condition for retaining wall loading may be adequate for the seismic design of the retaining walls. However, the active earth pressure combined with the seismic design load should be reviewed and also considered in the design of the retaining walls.

6.10.8 In general, wall foundations should be designed in accordance with Table 6.10.2. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, retaining wall foundations should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

TABLE 6.10.2
SUMMARY OF RETAINING WALL FOUNDATION RECOMMENDATIONS

Parameter	Value
Minimum Retaining Wall Foundation Width	12 inches
Minimum Retaining Wall Foundation Depth	12 Inches
Minimum Steel Reinforcement	Per Structural Engineer
Allowable Bearing Capacity	2,000 psf
Bearing Capacity Increase	500 psf per Foot of Depth
	300 psf per Foot of Width
Maximum Allowable Bearing Capacity	4,000 psf
Estimated Total Static Settlement*	1 Inch
Estimated Differential Static Settlement*	½ Inch in 40 Feet

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

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

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

6.11 Lateral Loading

6.11.1 Table 6.11 should be used to help design the proposed structures and improvements to resist lateral loads for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

TABLE 6.11
SUMMARY OF LATERAL LOAD DESIGN RECOMMENDATIONS

Parameter	Value
Passive Pressure Fluid Density	300 pcf
Coefficient of Friction (Concrete and Soil)	0.35
Coefficient of Friction (Along Vapor Barrier)	0.2 to 0.25*

*Per manufacturer's recommendations.

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

6.12 Site Drainage and Moisture Protection

6.12.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2022 CBC 1804.3 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

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

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

6.13 Slope Maintenance

6.13.1 Slopes that are steeper than 3:1 (horizontal:vertical) may, under conditions that are both difficult to prevent and predict, be susceptible to near-surface (surficial) slope instability. The instability is typically limited to the outer 3 feet of a portion of the slope and usually does not directly impact the improvements on the pad areas above or below the slope. The occurrence of surficial instability is more prevalent on fill slopes and is generally preceded by a period of heavy rainfall, excessive irrigation, or the migration of subsurface seepage. The disturbance and/or loosening of the surficial soils, as might result from root growth, soil expansion, or excavation for irrigation lines and slope planting, may also be a significant contributing factor to surficial instability. It is therefore recommended that, to the maximum extent practical: (a) disturbed/loosened surficial soils be either removed or properly recompacted, (b) irrigation systems be periodically inspected and maintained to eliminate leaks and excessive irrigation, and (c) surface drains on and adjacent to slopes be periodically maintained to preclude ponding or erosion. Although the incorporation of the above recommendations should reduce the potential for surficial slope instability, it will not eliminate the possibility and, therefore, it may be necessary to rebuild or repair a portion of the project's slopes in the future.

6.14 Grading and Foundation Plan Review

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

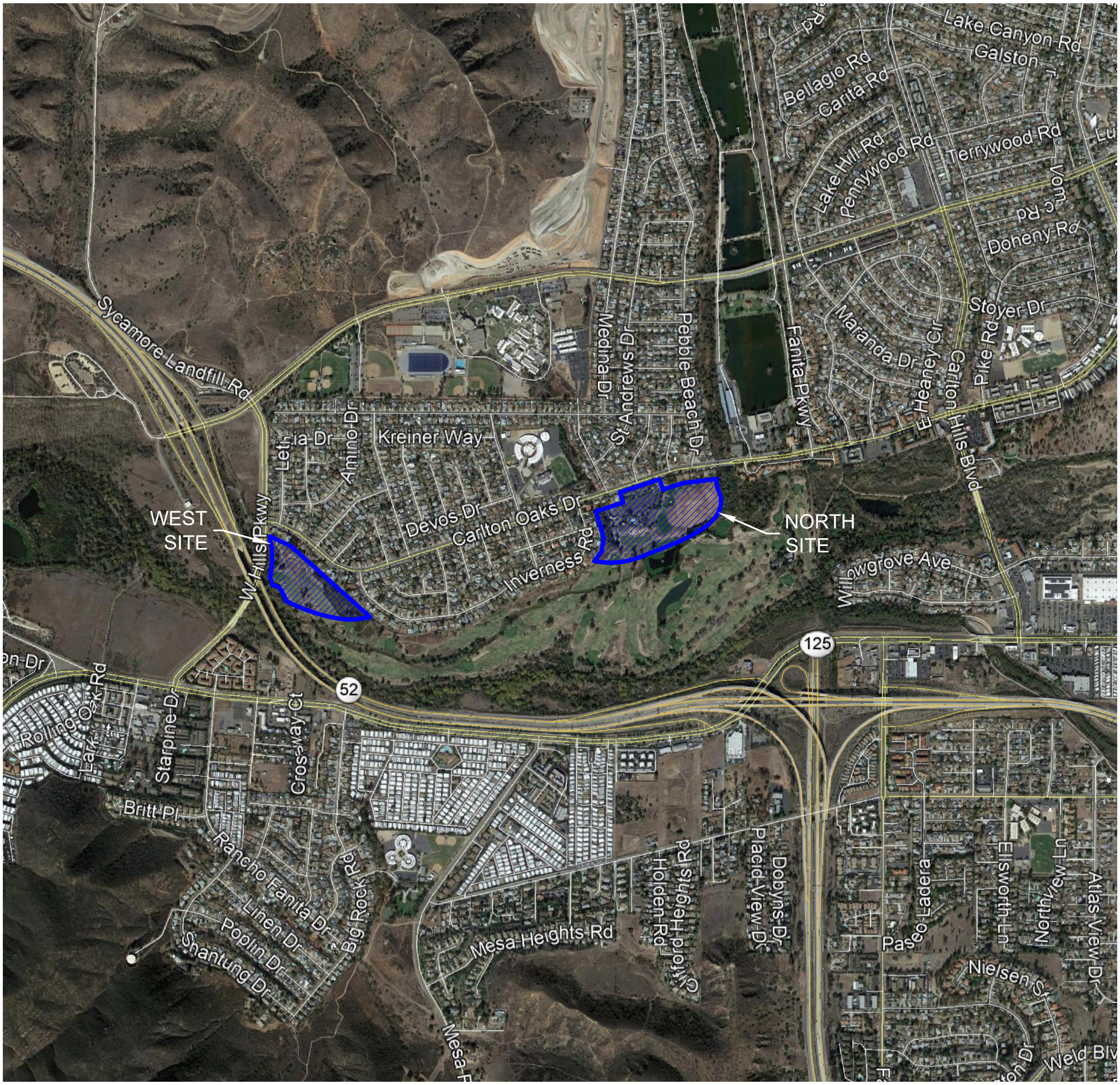
LIMITATIONS AND UNIFORMITY OF CONDITIONS

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

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

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

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



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N

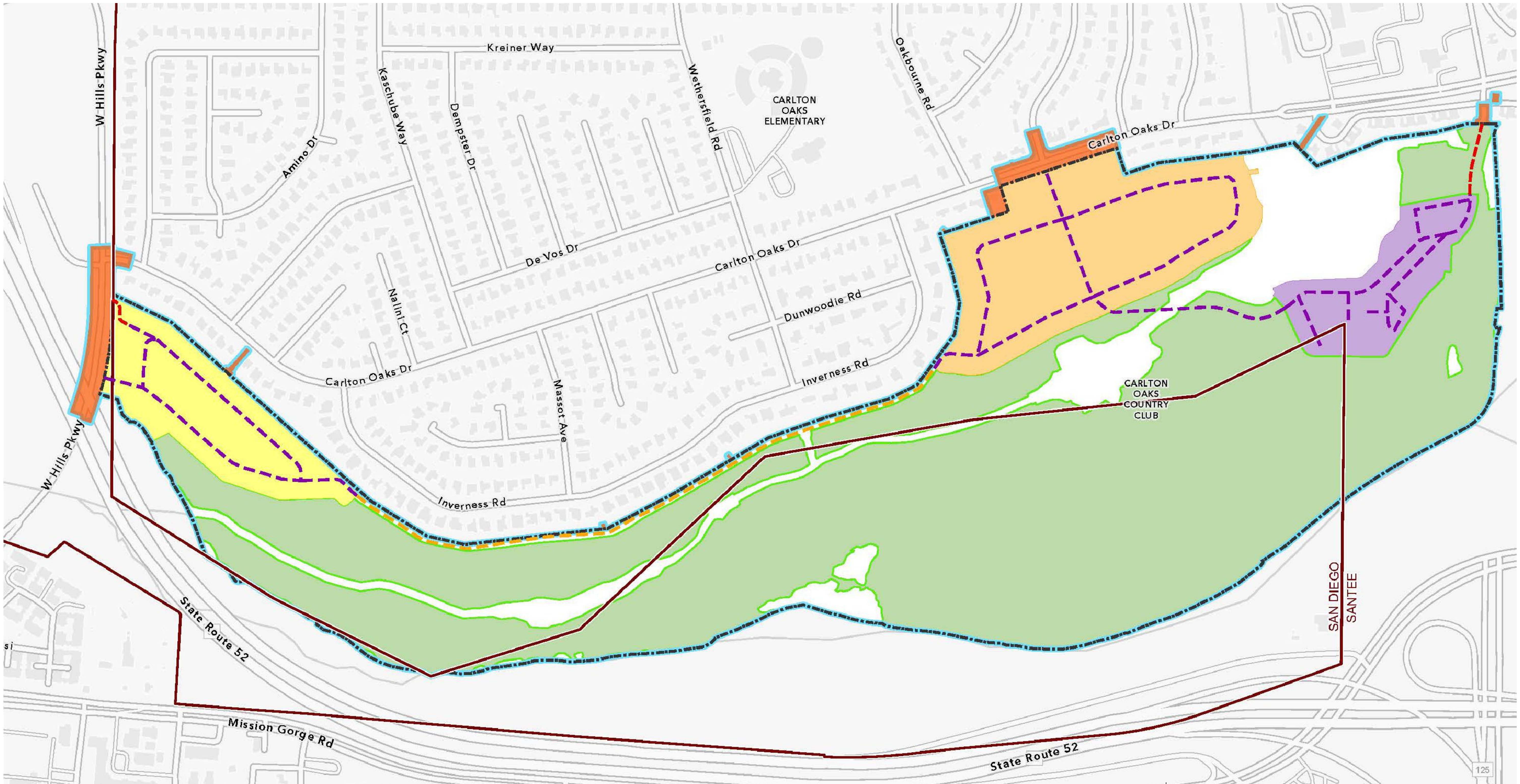
NO SCALE

VICINITY MAP

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

CARLTON OAKS GOLF COURSE
RESIDENTIAL NORTH (PA-2) AND WEST (PA-1) SITES
SANTEE, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 06 - 11 - 2024	PROJECT NO. G2290 - 32 - 01	FIG. 1



Project Site
Off-Site Improvements
CEQA Study Area
City of Santee/San Diego Municipal Boundary
Residential North
Residential West
Golf Course Redesign
Hotel and Clubhouse
Emergency Vehicle Access Only
Private Utility Maintenance Road
Residential / Resort Circulation Roadway

SITE PLAN AND OFF-SITE IMPROVEMENTS

CARLTON OAKS GOLF COURSE
SANTEE, CALIFORNIA

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

SCALE 1" = 200' | DATE 06 - 11 - 2024
PROJECT NO. G2290 - 32 - 01 | FIGURE 2
SHEET 1 OF 3

Plotted:06/10/2024 9:01AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2290-32-01 (Carlton Oaks)\SHEETS\G2290-32-01 Offsite Improvements.dwg

GEOCON LEGEND

- Qaf_2 ......OFF-SITE ARTIFICIAL FILL
- Qaf ......ARTIFICIAL FILL
- Qya ......YOUNG ALLUVIUM (Dotted Where Buried)
- Qoa ......OLDER ALLUVIUM (Dotted Where Buried)
- Tf ......FRIARS FORMATION (Dotted Where Buried)
- ......APPROX. LOCATION OF GEOLOGIC CONTACT (Dotted Where Buried)
- B-14 ......APPROX. LOCATION OF RECENT EXPLORATORY BORING (Geocon, June 2018)
- T-5 ......APPROX. LOCATION OF RECENT EXPLORATORY TRENCH (Geocon, June 2018)
- I-4 ......APPROX. LOCATION OF INFILTRATION TEST
- -9' ......APPROX. DEPTH TO GROUNDWATER (In Feet)
- ......ESTIMATED THICKNESS OF SURFICIAL DEPOSIT REQUIRING REMOVAL AND COMPACTION

GEOLOGIC MAP

CARLTON OAKS GOLF COURSE
WEST SITE (PA-1)
SANTEE, CALIFORNIA

GEOCON INCORPORATED	SCALE 1" = 50'	DATE 06 - 11 - 2024	
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS 6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974 PHONE 858 558-6900 - FAX 858 558-6159	PROJECT NO. G2290 - 32 - 01		FIGURE 3
	SHEET 2 OF 3		

GEOCON LEGEND

- Qaf_2 ....OFF-SITE ARTIFICIAL FILL
- Qaf ....ARTIFICIAL FILL
- Qya ....YOUNG ALLUVIUM (Dotted Where Buried)
- Qoa ....OLDER ALLUVIUM (Dotted Where Buried)
- Tf ....FRIARS FORMATION (Dotted Where Buried)
- ....APPROX. LOCATION OF GEOLOGIC CONTACT (Dotted Where Buried)
- B-14 ....APPROX. LOCATION OF RECENT EXPLORATORY BORING (Geocon, June 2018)
- T-5 ....APPROX. LOCATION OF RECENT EXPLORATORY TRENCH (Geocon, June 2018)
- I-4 ....APPROX. LOCATION OF INFILTRATION TEST
- -9'.........APPROX. DEPTH TO GROUNDWATER (In Feet)
- 7 ....ESTIMATED THICKNESS OF SURFICIAL DEPOSIT REQUIRING REMOVAL AND COMPACTION

GEOLOGIC MAP

CARLTON OAKS GOLF COURSE
NORTH SITE (PA-2)
SANTEE, CALIFORNIA

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

SCALE 1" = 50'	DATE 06 - 11 - 2024
PROJECT NO. G2290 - 32 - 01	FIGURE 4
SHEET 3 OF 3	

Plotted:05/16/2025 8:50AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\G2290-32-01 Carlton Oaks Golf Course_West Site (PA-1)\G2290-32-01 Geo Map.30 (North-West).dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The field investigation was performed between June 27 and 28, 2018, and consisted of a visual site reconnaissance, drilling fourteen small-diameter borings (Boring Nos. B-1 through B-14) and excavating five exploratory test pits (Trench Nos. T-1 through T-5). In addition, four infiltration tests (Infiltration Test Nos. I-1 through I-4) were performed within proposed storm water management areas at the locations provided by SB&O, Inc. The approximate locations of the previous and recent exploratory borings, test pits and infiltration tests are shown on the *Geologic Maps*, Figures 2 and 3.

The recent exploratory borings were performed by Scott's Drilling Company using a truck-mounted, drill rig (Ingersoll Rand A-300) to a maximum depth of 20 feet below existing grade. Samples were collected at 5-foot intervals using a 3-inch diameter California split-spoon sampler (CAL) or a 2-inch-diameter Standard Penetration Test (SPT) sampler, driven 12 and 18 inches, respectively into the undisturbed soil mass. A manual trip hammer weighing 140 pounds and dropped 30 inches was used to drive the samplers.

The CAL sampler was equipped with 1-inch by 2⅜-inch, brass sampler rings to facilitate removal and testing. The soil collected within the SPT sampler was placed in plastic bags for testing. Blow counts were recorded for every 6 inches the sampler was driven and shown on the boring logs in terms of blows per foot. The values indicated on the boring logs are the sum of the last 12 inches of the sampler if driven 18 inches. These values are not to be taken as N-values, adjustments have not been applied. Logs of the borings depicting the soil and geologic conditions encountered and the depth at which samples were obtained are presented on Figures A-1 through A-14.

The exploratory trenches were excavated with a John Deere 310G backhoe, using a 24-inch-wide bucket. The soils encountered were visually examined, classified and logged. Logs of the trenches depicting the soil and geologic conditions encountered are presented on Figures A-15 through A-19.

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

BORING B 1

ELEV. (MSL.) **299'** DATE COMPLETED **06-27-2018**

EQUIPMENT **IR A-300** BY: **J. PAGNILLO**

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	**ARTIFICIAL FILL (Qaf)** Loose to medium dense, damp, grayish brown, Silty, fine to coarse SAND			
2								
	B1-1					20		
4								
	B1-2				-Becomes moist below 5 feet	18		
6								
				SM	**YOUNG ALLUVIUM (Qya)** Medium dense, damp, gray, Silty, fine to course SAND			
8								
			▼		-Groundwater at 9 feet			
10	B1-3				-No recovery at 10 feet	30		
12								
					-Gravel at 13 feet			
14								
	B1-4			SM/GM	Medium dense, saturated, dark gray, Silty, fine to coarse SAND with gravel	43		
16								
18					-Gravel at 18.5 feet			
	B1-5			SM	Very dense, saturated, dark gray, Silty, fine to coarse SAND	50/4"	120.1	16.4
20					BORING TERMINATED AT 20 FEET Groundwater encountered at 9 feet			

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

G2290-32-01.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. G2290-32-01

BORING B 2

ELEV. (MSL.) **303'** DATE COMPLETED **06-27-2018**

EQUIPMENT **IR A-300** BY: **J. PAGNILLO**

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	**ARTIFICIAL FILL (Qaf)** Loose to medium dense, damp, brown, Silty, fine to medium SAND			
2	B2-1					17		
4								
	B2-2			SM	**YOUNG ALLUVIUM (Qya)** Loose, moist, brownish gray, Silty, fine to medium SAND	10	93.4	9.4
6								
	B2-3		▼		-Groundwater at 7 feet			
8								
10	B2-4			SM	Medium dense, saturated, dark gray, Silty, fine to coarse SAND	29	107.6	23.7
12								
	B2-5							
14								
	B2-6			SM	Dense, saturated, dark gray, Silty, fine to coarse SAND with gravel	53	121.8	15.3
16								
					-Gravel layer at 17 feet			
18					REFUSAL ON COBBLE/BOULDER AT 18 FEET Groundwater encountered at 7 feet			

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

G2290-32-01.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. G2290-32-01

BORING B 3

ELEV. (MSL.) **296'** DATE COMPLETED **06-27-2018**

EQUIPMENT **IR A-300** BY: **J. PAGNILLO**

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	**ARTIFICIAL FILL (Qaf)** Loose to medium dense, damp, brown, Silty, fine to medium SAND			
2	B3-1					18		
4								
6	B3-2				Dense, damp, light brown, Silty, fine to medium SAND	45		
8								
				SM	**YOUNG ALLUVIUM (Qya)** Medium dense, wet, brown, Silty, fine to coarse SAND			
10	B3-3		▼		-Groundwater at 10 feet	19	108.6	23.7
12								
14					-Gravel layer at 14 feet			
	B3-4			SM	Very dense, saturated, dark gray, Silty, fine to coarse SAND	50/3"	117.2	16.0
16					-Gravel layer at 16 feet, difficult drilling			

BORING TERMINATED AT 17 FEET
Groundwater encountered at 10 feet

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

G2290-32-01.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. G2290-32-01

BORING B 4

ELEV. (MSL.) **313'** DATE COMPLETED **06-27-2018**

EQUIPMENT **IR A-300** BY: **J. PAGNILLO**

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	**ARTIFICIAL FILL (Qaf)** Medium dense, damp, reddish brown, Clayey, fine to medium SAND			
2	B4-1					31		
4	B4-2				-Becomes brown below 5 feet	30		
6								
8	B4-3							
10	B4-4			SM	Medium dense, damp, dark gray, Silty, fine to medium SAND with clay	28		
12								
14				SM	**YOUNG ALLUVIUM (Qya)** Medium dense, damp, light brown, Sitly, fine to medium SAND; low cohesion			
	B4-5					30	102.2	5.3
16								
18	B4-6					23	98.7	8.5
20					BORING TERMINATED AT 20 FEET Groundwater not encountered			

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

G2290-32-01.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. G2290-32-01

BORING B 5

ELEV. (MSL.) **298'** DATE COMPLETED **06-27-2018**

EQUIPMENT **IR A-300** BY: **J. PAGNILLO**

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	**ARTIFICIAL FILL (Qaf)** Loose to medium dense, damp, brown, Silty, fine to medium SAND			
2	B5-1					20		
4								
	B5-2			SM	**YOUNG ALLUVIUM (Qya)** Loose, damp, dark brown, Silty, fine SAND	8	99.8	21.4
6								
					-Gravel layer at 7 feet; refusal on cobble/boulder (Hole abandoned-re-drilled 10 feet south)			
8	B5-3		▼		-Groundwater at 8 feet			
10	B5-4				-No recovery	50/4"		
					-Gravel; difficult drilling a 11 feet			
12								
					REFUSAL ON COBBLE/BOULDER AT 12.5 FEET Groundwater encountered at 8 feet			

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

G2290-32-01.GPJ

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

GEOCON

BORING B 6

ELEV. (MSL.) 308' DATE COMPLETED 06-27-2018

EQUIPMENT IR A-300 BY: J. PAGNILLO

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	**ARTIFICIAL FILL (Qaf)** Medium dense, moist, reddish brown, Silty, fine to medium SAND with clay			
2	B6-1					30		
4	B6-2				-Becomes dense	36		
6	B6-3							
8								
10	B6-4			SM	**YOUNG ALLUVIUM (Qya)** Medium dense, moist, reddish brown, Silty, fine to coarse SAND; cohesionless	25	98.0	7.7
12								
14	B6-5					37	100.3	9.1
16								
18					-Groundwater at 19 feet			
	B6-6			SM	Very dense, wet, dark gray, Silty, fine to coarse SAND; low cohesion	85/10"	119.2	15.4
20					BORING TERMINATED AT 20 FEET Groundwater encountered 19 feet			

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

G2290-32-01.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 7

ELEV. (MSL.) 318' DATE COMPLETED 06-28-2018

EQUIPMENT IR A-300 BY: J. PAGNILLO

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	**ARTIFICIAL FILL (Qaf)** Medium dense, damp, reddish brown, Silty, fine to medium SAND with gravel			
2								
	B7-1					37		
4	B7-2							
	B7-3			SM	**OLDER ALLUVIUM (Qoa)** Dense, damp, reddish brown, Silty, fine to medium SAND with gravel	76		
6								
					-Gravel/boulder at 7 feet -Refusal at 7.5 feet on cobble/boulder (hole abandoned; re-drilled 10 feet north)			

REFUSAL ON COBBLE/BOULDER AT 7.5 FEET
Groundwater not encountered

Figure A-7,
Log of Boring B 7, Page 1 of 1

G2290-32-01.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. G2290-32-01

BORING B 8

ELEV. (MSL.) **311'** DATE COMPLETED **06-28-2018**

EQUIPMENT **IR A-300** BY: **J. PAGNILLO**

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	**ARTIFICIAL FILL (Qaf)** Medium dense, moist, light brown, Silty, fine to medium SAND (contact observed in sampler)			
2								
4								
	B8-1					29		
6			▼	SM	**YOUNG ALLUVIUM (Qya)** Medium dense, saturated, brown, Silty, fine to medium SAND with gravel			
8								
10	B8-2					28	109.2	17.1
12								
14								
	B8-3			SM	Medium dense, saturated, Silty, fine to coarse SAND with gravel; low cohesion	30	110.4	17.9
16								
18					-Gravel layer at 18 feet			
	B8-4			ML	**FRIARS FORMATION** Hard, saturated, pale green, SILTSTONE	66	101.8	23.9
20					BORING TERMINATED AT 20 FEET Groundwater encountered at 6 feet			

Figure A-8,
Log of Boring B 8, Page 1 of 1

G2290-32-01.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.) **320'** DATE COMPLETED **06-28-2018**

EQUIPMENT **IR A-300** BY: **J. PAGNILLO**

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	**ARTIFICIAL FILL (Qaf)** Medium dense, damp, reddish brown, Silty, fine to medium SAND with clay and gravel			
2	B9-1					24		
4								
6	B9-2			SM	**OLDER ALLUVIUM (Qoa)** Very dense, damp, reddish brown, Silty, fine to medium SAND with clay and gravel (rock fragment in shoe)	84	107.7	11.7
8					-Gravel/boulder layer at 8 feet; difficult drilling below 8 feet			
10	B9-3			SM	Very dense, damp, reddish brown, Silty, fine to medium SAND with clay; gravel (rock fragment making sampling difficult)	50/5"		
12					REFUSAL ON COBBLE/BOULDER AT 12 FEET Groundwater not encountered			

Figure A-9,
Log of Boring B 9, Page 1 of 1

G2290-32-01.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 10

ELEV. (MSL.) **312'** DATE COMPLETED **06-28-2018**

EQUIPMENT **IR A-300** BY: **J. PAGNILLO**

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	**ARTIFICIAL FILL (Qaf)** Medium dense, damp, reddish brown, Silty, fine to medium SAND with clay; gravel			
2				SM	**YOUNG ALLUVIUM (Qya)** Dense, damp, yellowish brown, Silty, fine to coarse SAND			
	B10-1					54	112.2	8.0
4								
	B10-2					65	91.5	16.7
6								
	B10-3							
8								
			▼		-Groundwater at 9 feet			
10	B10-4			SM	Medium dense, saturated, dark gray, Silty, fine to coarse SAND; low cohesion (cobble in sampler, poor recovery)	11		
12								
14								
	B10-5				-Saturated sample, poor recovery	22	115.8	14.4
16								
18								
	B10-6				-No recovery, most likely hitting cobble	50/4"		
20					BORING TERMINATED AT 20 FEET Groundwater encountered at 9 feet			

Figure A-10,
Log of Boring B 10, Page 1 of 1

G2290-32-01.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. G2290-32-01

BORING B 11

ELEV. (MSL.) **319'** DATE COMPLETED **06-28-2018**

EQUIPMENT **IR A-300** BY: **J. PAGNILLO**

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	**ARTIFICIAL FILL (Qaf)** Medium dense, moist, dark brown, Clayey, fine to medium SAND			
2								
	B11-1					36		
4	B11-2							
	B11-3			SM	**FRIARS FORMATION (Tf)** Medium dense, moist, pale green, Silty, fine SANDSTONE; yellow mottling	43	93.4	23.3
6								
8								
10	B11-4				-Becomes dense at 10 feet	58	94.3	27.9
					BORING TERMINATED AT 11 FEET Groundwater not encountered			

Figure A-11,
Log of Boring B 11, Page 1 of 1

G2290-32-01.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 12

ELEV. (MSL.) **351'** DATE COMPLETED **06-28-2018**

EQUIPMENT **IR A-300** BY: **J. PAGNILLO**

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	**ARTIFICIAL FILL (Qaf)** Medium dense, wet, brown, Silty, fine to medium SAND with clay			
2								
	B12-1					57/5"		
				SM	**OLDER ALLUVIUM (Qoa)** Very dense, moist, reddish brown, Silty, fine to medium SAND (contact observed in sample)			
4								

REFUSAL ON COBBLE/BOULDER AT 4 FEET
Attempted SPT sample unsuccessful; Second hole location 10 east; sample at 2nd location; refusal on boulder
Groundwater not encountered

Figure A-12,
Log of Boring B 12, Page 1 of 1

G2290-32-01.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. G2290-32-01

BORING B 13

ELEV. (MSL.) **344'** DATE COMPLETED **06-28-2018**

EQUIPMENT **IR A-300** BY: **J. PAGNILLO**

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	**ARTIFICIAL FILL (Qaf)** Loose, moist, dark brown, Silty, fine to medium SAND with clay and gravel			
2								
	B13-1					15		
4								
	B13-2			SM	**OLDER ALLUVIUM (Qoa)** Very dense, moist, reddish brown, Silty, fine to coarse SAND with gravel and boulders; difficult drilling below 5 feet	50/3"		
6								
8								
	B13-3				-Poor recovery; cobble/boulder	50/5.5"		

REFUSAL ON COBBLE/BOULDER AT 9 FEET
Groundwater not encountered

Figure A-13,
Log of Boring B 13, Page 1 of 1

G2290-32-01.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. G2290-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 14 ELEV. (MSL.)_______ DATE COMPLETED **06-28-2018** EQUIPMENT **IR A-300** BY: **J. PAGNILLO**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					9" **ASPHALT CONCRETE/DG BASE**			
				SM	**OLDER ALLUVIUM (Qoa)** Very dense, damp, reddish brown, Silty, fine to coarse SAND with cobble and boulders (poor recovery); difficult drilling below 1 foot			
2								
	B14-1					50/4"		
4								
	B14-2					50/4"	110.2	16.1
6								
8								
10	B14-3				-Becomes moist	81	112.8	16.7
12								
14					REFUSAL ON COBBLE/BOULDER AT 14 FEET Groundwater not encountered			

Figure A-14,
Log of Boring B 14, Page 1 of 1

G2290-32-01.GPJ

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

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

GEOCON

TRENCH T 1

ELEV. (MSL.) **299'** DATE COMPLETED **06-28-2018**

EQUIPMENT **310G BACKHOE (W/ 24" Bucket)** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ARTIFICIAL FILL (Qaf)** Loose, dry, grayish brown, Silty, fine to medium SAND -Becomes damp, brown			
2								
4					-Becomes wet at 4 feet			
6			▼	SM	**YOUNG ALLUVIUM (Qya)** Loose, wet, dark gray, fine to coarse SAND with gravel			

TRENCH TERMINATED AT 7 FEET
Groundwater encountered at 7 feet

Figure A-15,
Log of Trench T 1, Page 1 of 1

G2290-32-01.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)	TRENCH T 2 ELEV. (MSL.) 304' DATE COMPLETED 06-28-2018 EQUIPMENT 310G BACKHOE (W/ 24" Bucket) BY: D. GITHENS	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ARTIFICIAL FILL (Qaf)** Loose, dry, gray brown, Silty, fine to medium SAND with gravel			
2					-Becomes brown			
4				SM	**YOUNG ALLUVIUM (Qya)** Loose, damp, brown, Silty, fine to medium SAND			
6			▼		TRENCH TERMINATED AT 6 FEET Groundwater encountered at 6 feet			

Figure A-16,
Log of Trench T 2, Page 1 of 1

G2290-32-01.GPJ

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

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

GEOCON

TRENCH T 3

ELEV. (MSL.) 303'   DATE COMPLETED 06-28-2018

EQUIPMENT 310G BACKHOE (W/ 24" Bucket)   BY: D. GITHENS

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ARTIFICIAL FILL (Qaf)** Loose, damp, reddish brown, Silty, fine to medium SAND			
2								
4			▼	SM	**YOUNG ALLUVIUM (Qya)** Loose, wet, dark gray, Silty, fine to coarse SAND			
					TRENCH TERMINATED AT 5 FEET Groundwater encountered at 5 feet			

Figure A-17,
Log of Trench T 3, Page 1 of 1

G2290-32-01.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.

TRENCH T 4

ELEV. (MSL.) **297'** DATE COMPLETED **06-28-2018**

EQUIPMENT **310G BACKHOE (W/ 24" Bucket)** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T1-1			SM	**ARTIFICIAL FILL (Qaf)** Loose, dry, olive brown, Silty, fine to medium SAND			
				SM	Loose, damp, tan brown, Silty, fine to medium SAND with gravel			
2								
4				SM	**YOUNG ALLUVIUM (Qya)** Loose, wet, gray, Silty, fine to coarse SAND with gravel			
			▼		TRENCH TERMINATED AT 5 FEET Groundwater encountered at 5 feet			

Figure A-18,
Log of Trench T 4, Page 1 of 1

G2290-32-01.GPJ

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

GEOCON

TRENCH T 5

ELEV. (MSL.) 323' DATE COMPLETED 06-28-2018

EQUIPMENT 310G BACKHOE (W/ 24" Bucket) BY: D. GITHENS

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ARTIFICIAL FILL (Qaf)** Loose, dry, grayish brown, Silty, fine to medium SAND			
	T5-1				**OLDER ALLUVIUM (Qoa)** Very dense, damp, reddish brown, Silty/Sandy GRAVEL; moderate cementation, difficult excavation			
2				GM				

REFUSAL AT 2 FEET; CEMENTED GRAVEL
Groundwater not encountered

Figure A-19,
Log of Trench T 5, Page 1 of 1

G2290-32-01.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.

APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected samples were tested for in-place dry density and moisture content, maximum dry density and optimum moisture content, expansion index, shear strength, soluble sulfate content, and consolidation characteristics. The results of our laboratory tests are summarized on Tables B-I through B-IV and Figures B-1 through B-9. The results of the in-place dry density and moisture content tests are presented on the boring logs.

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

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
B4-3	Dark brown Clayey, fine to coarse SAND with trace gravel	128.1	10.5
B6-3	Reddish brown Clayey, fine to medium SAND, with trace gravel	127.5	10.3
B7-2	Brown Silty, fine to coarse SAND, with some gravel	132.9	7.9
B11-2	Dark grayish brown Clayey, fine to coarse SAND, with trace gravel	124.7	11.2
T5-1	Reddish brown Silty, fine to coarse SAND, with some gravel	130.3	8.9

TABLE B-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index
	Before Test	After Test		
B4-3	9.6	21.8	110.9	68
B6-3	10.4	23.9	108.1	73
B7-2	8.9	17.1	112.2	22
B11-2	10.5	24.3	106.1	81
T5-1	8.8	15.6	113.7	9

TABLE B-III
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS

Sample No.*	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
B4-3	118.1	18.3	650	23
B6-3	116.4	17.7	615	23
B7-2	121.9	13.7	475	30
B11-2	115.9	17.7	875	23
T5-1	116.2	14.5	560	29

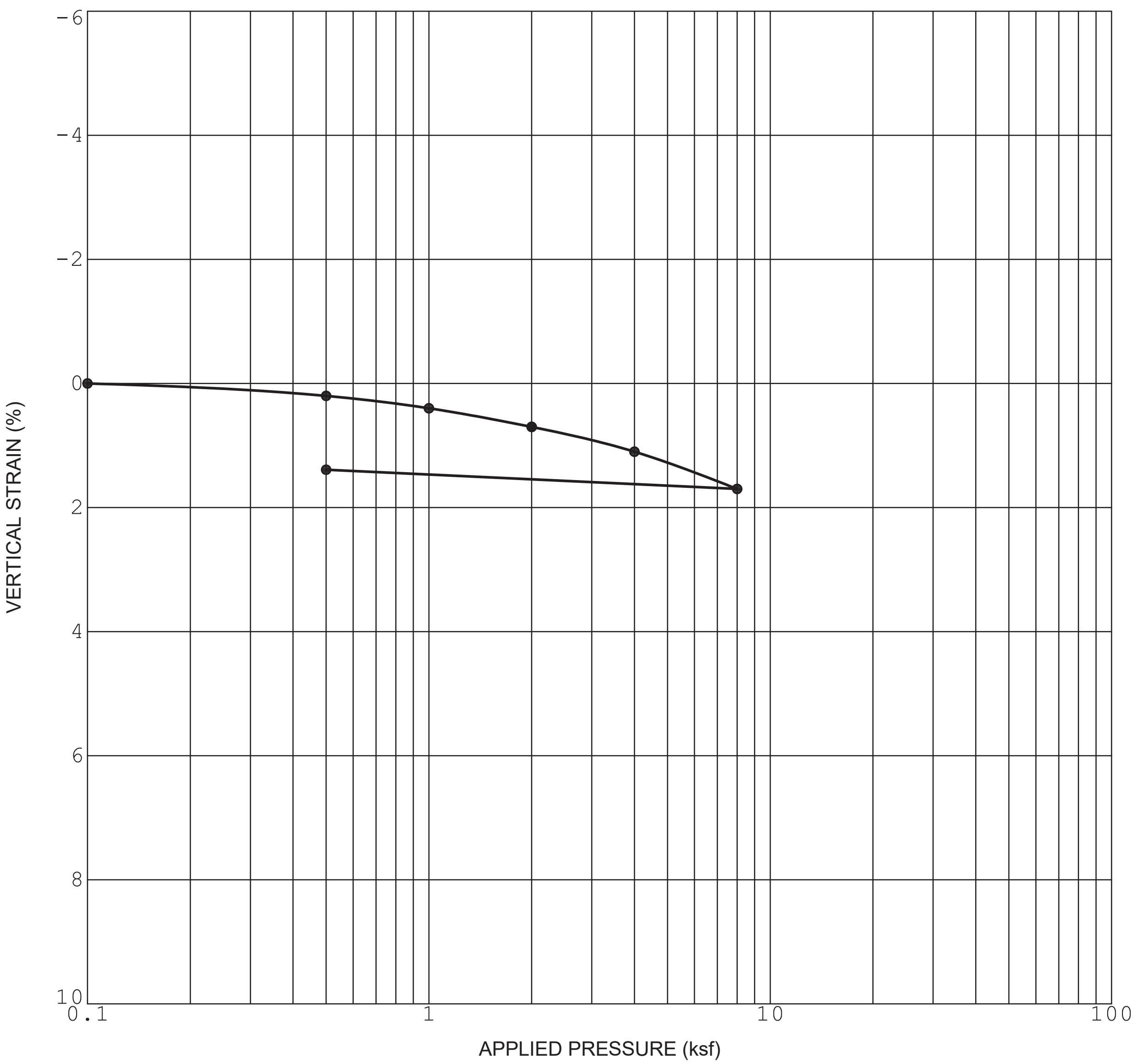
*Samples remolded to approximately 90 percent of maximum dry density at near optimum moisture content.

TABLE B-IV
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS

Sample No.	Water-Soluble Sulfate Content (%)	Exposure
B4-3	0.138	**Moderate (S1)**
B6-3	0.038	Not Applicable (S0)
T5-1	0.085	Not Applicable (S0)

PROJECT NO. G2290-32-01

SAMPLE NO. B2-4



ASTM D2435

Initial Dry Density (pcf)	107.6
Initial Water Content (%)	23.7

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

CONSOLIDATION CURVE

CARLTON OAKS GOLF COURSE

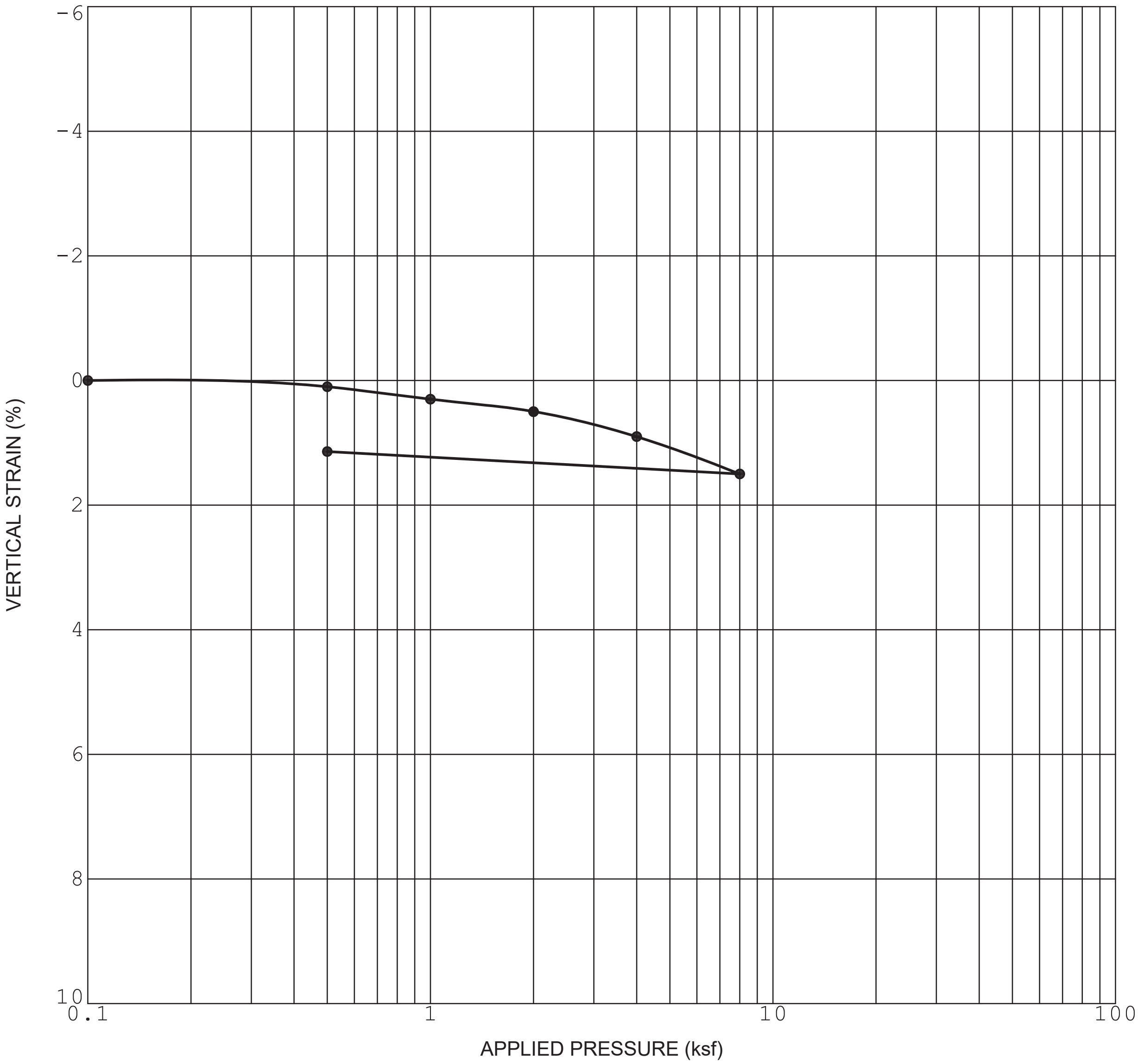
SANTEE, CALIFORNIA

G2290-32-01.GPJ

Figure B-1

GEOCON

SAMPLE NO. B3-3



ASTM D2435

Initial Dry Density (pcf)	108.6	**Initial Saturation (%)**	100
Initial Water Content (%)	23.7	**Sample Saturated at (ksf)**	2.0

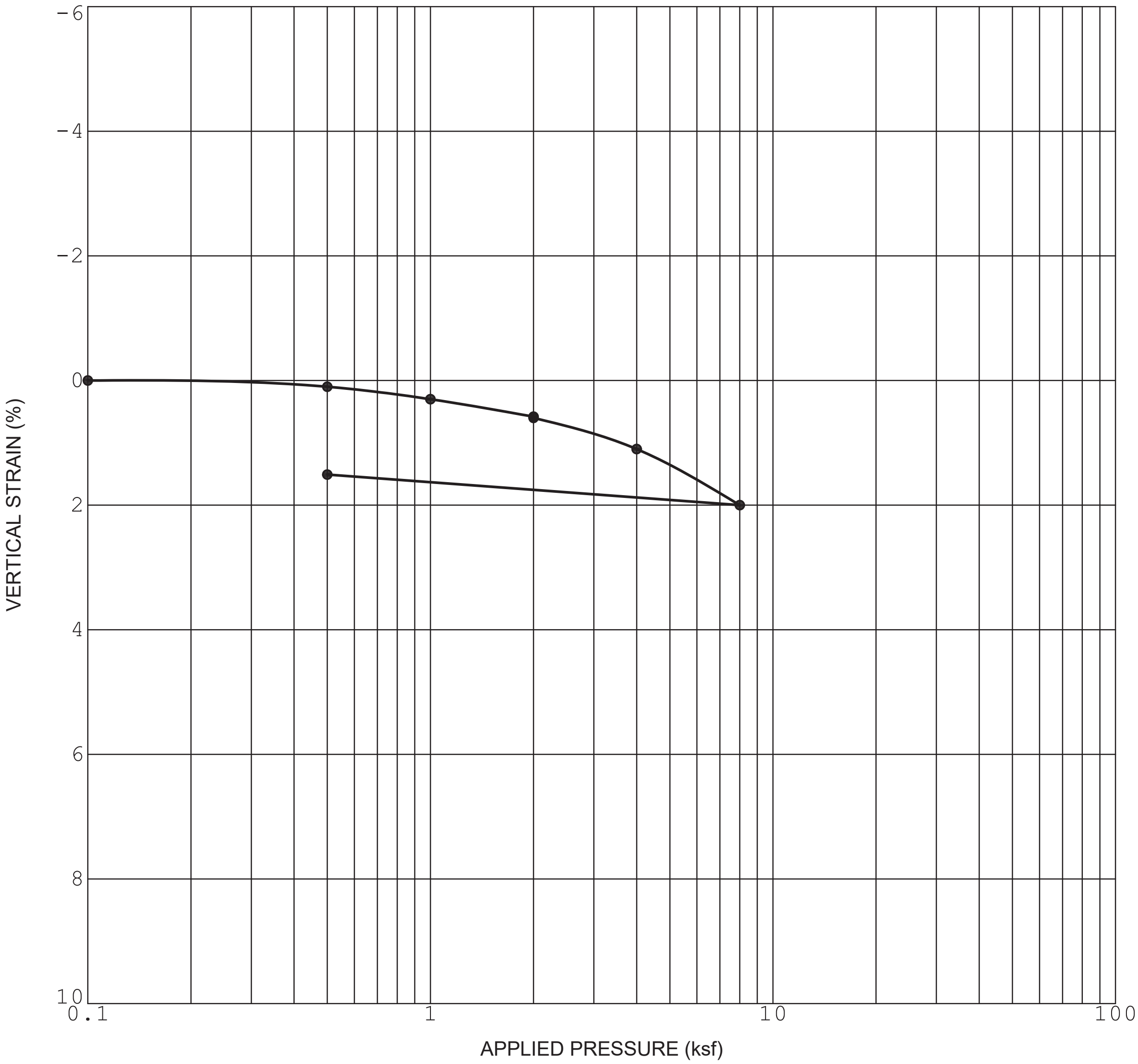
CONSOLIDATION CURVE

CARLTON OAKS GOLF COURSE

SANTEE, CALIFORNIA

PROJECT NO. G2290-32-01

SAMPLE NO. B4-6



ASTM D2435

Initial Dry Density (pcf)	98.7
Initial Water Content (%)	8.5

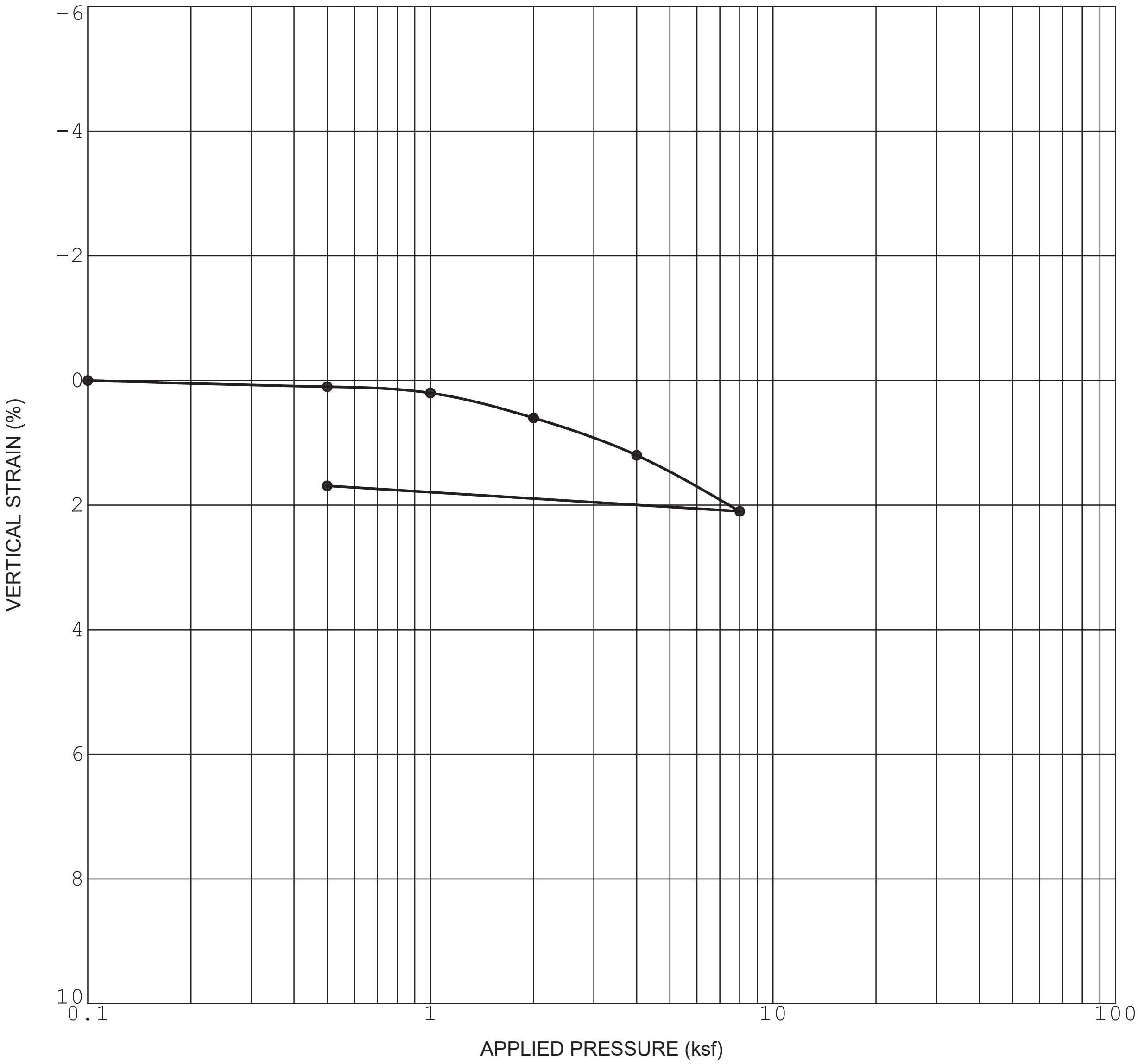
Initial Saturation (%)	33.0
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

CARLTON OAKS GOLF COURSE

SANTEE, CALIFORNIA

SAMPLE NO. B6-4



ASTM D2435

Initial Dry Density (pcf)	98.0	**Initial Saturation (%)**	29.3
Initial Water Content (%)	7.7	**Sample Saturated at (ksf)**	2.0

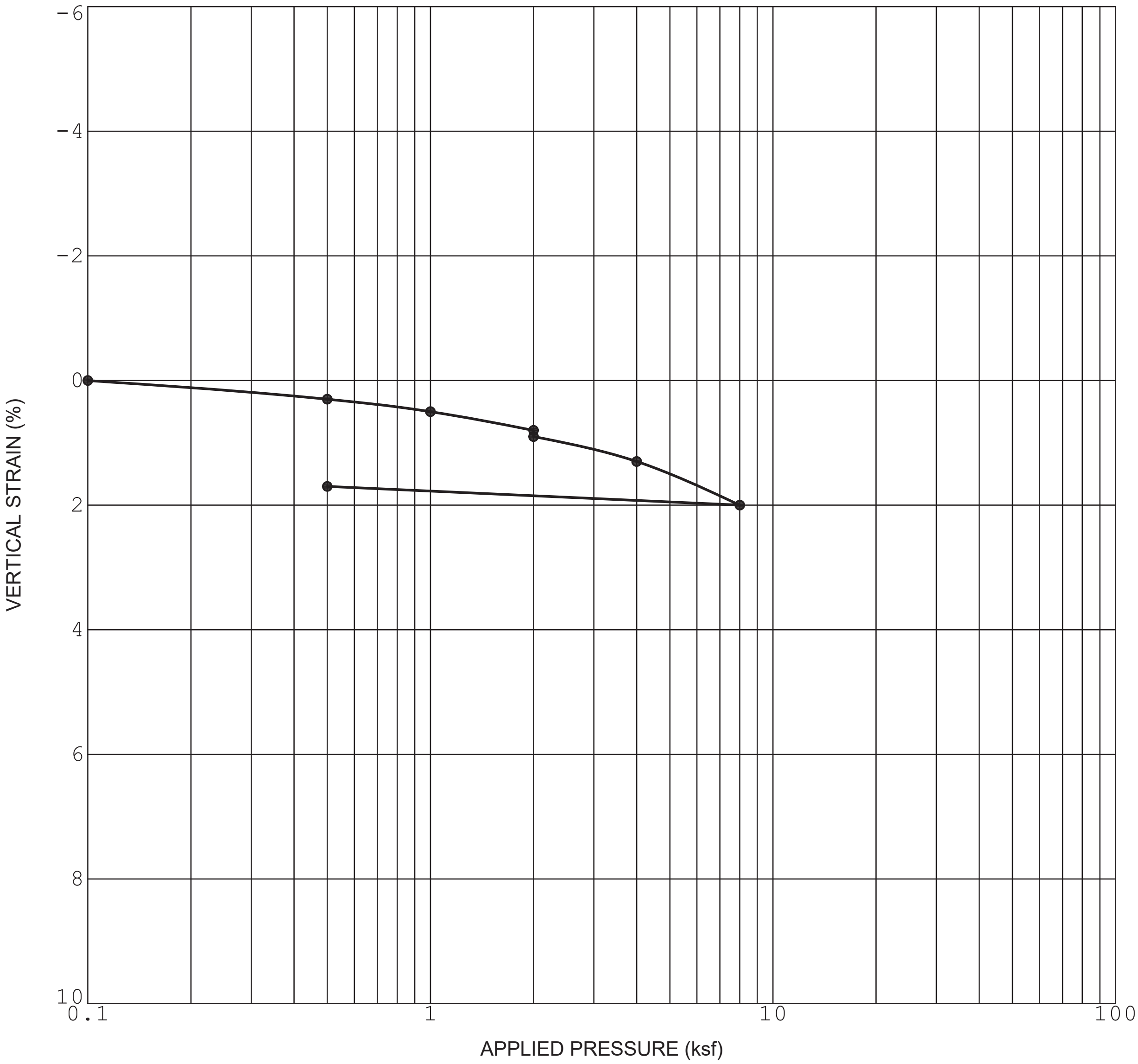
CONSOLIDATION CURVE

CARLTON OAKS GOLF COURSE

SANTEE, CALIFORNIA

PROJECT NO. G2290-32-01

SAMPLE NO. B6-5



ASTM D2435

Initial Dry Density (pcf)	100.3
Initial Water Content (%)	9.1

Initial Saturation (%)	37.0
Sample Saturated at (ksf)	2.0

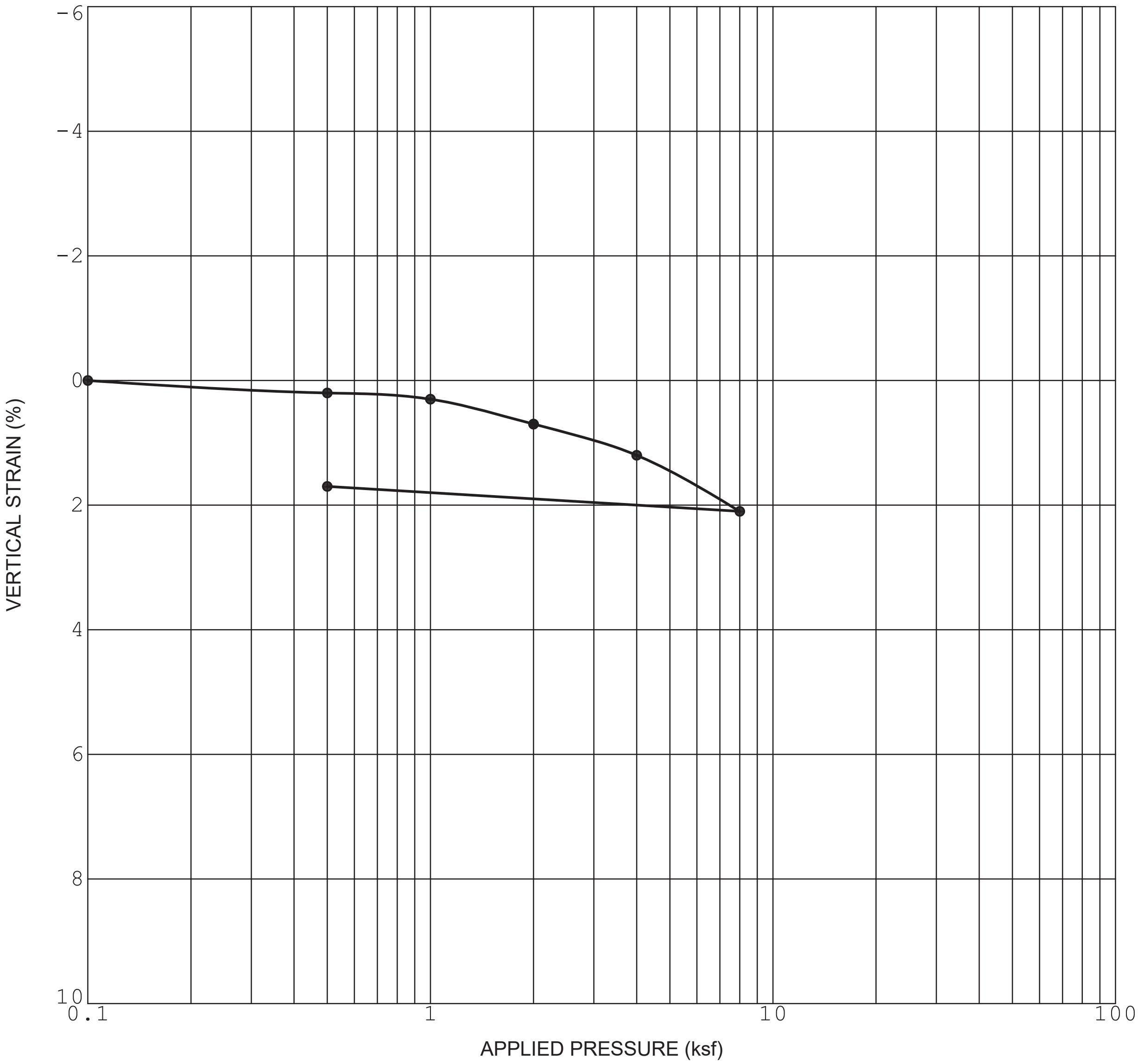
CONSOLIDATION CURVE

CARLTON OAKS GOLF COURSE

SANTEE, CALIFORNIA

GEOCON

SAMPLE NO. B8-2



ASTM D2435

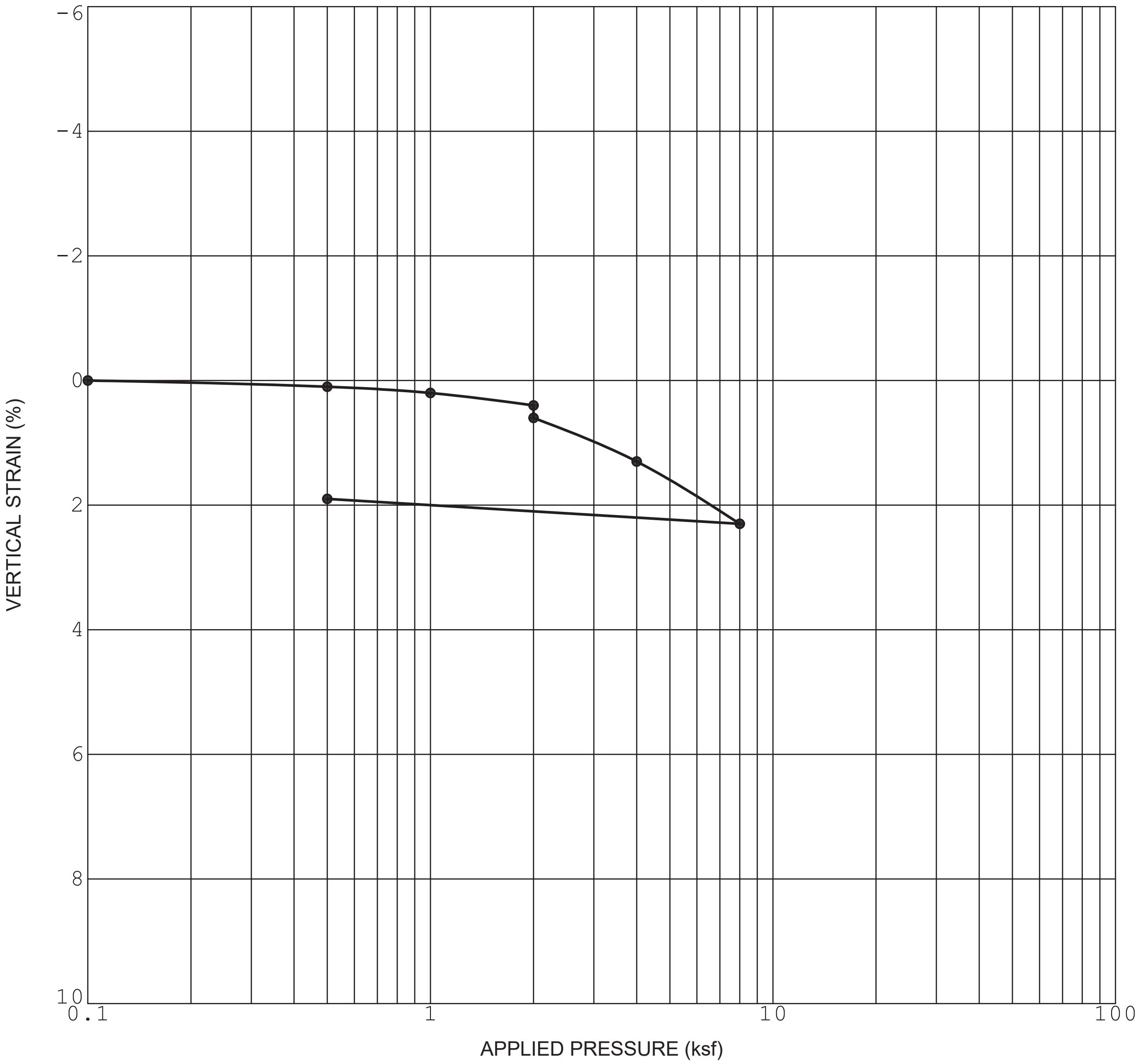
Initial Dry Density (pcf)	109.2		**Initial Saturation (%)**	87.7
Initial Water Content (%)	17.1		**Sample Saturated at (ksf)**	2.0

CONSOLIDATION CURVE

CARLTON OAKS GOLF COURSE

SANTEE, CALIFORNIA

SAMPLE NO. B10-2



ASTM D2435

Initial Dry Density (pcf)	91.5
Initial Water Content (%)	16.7

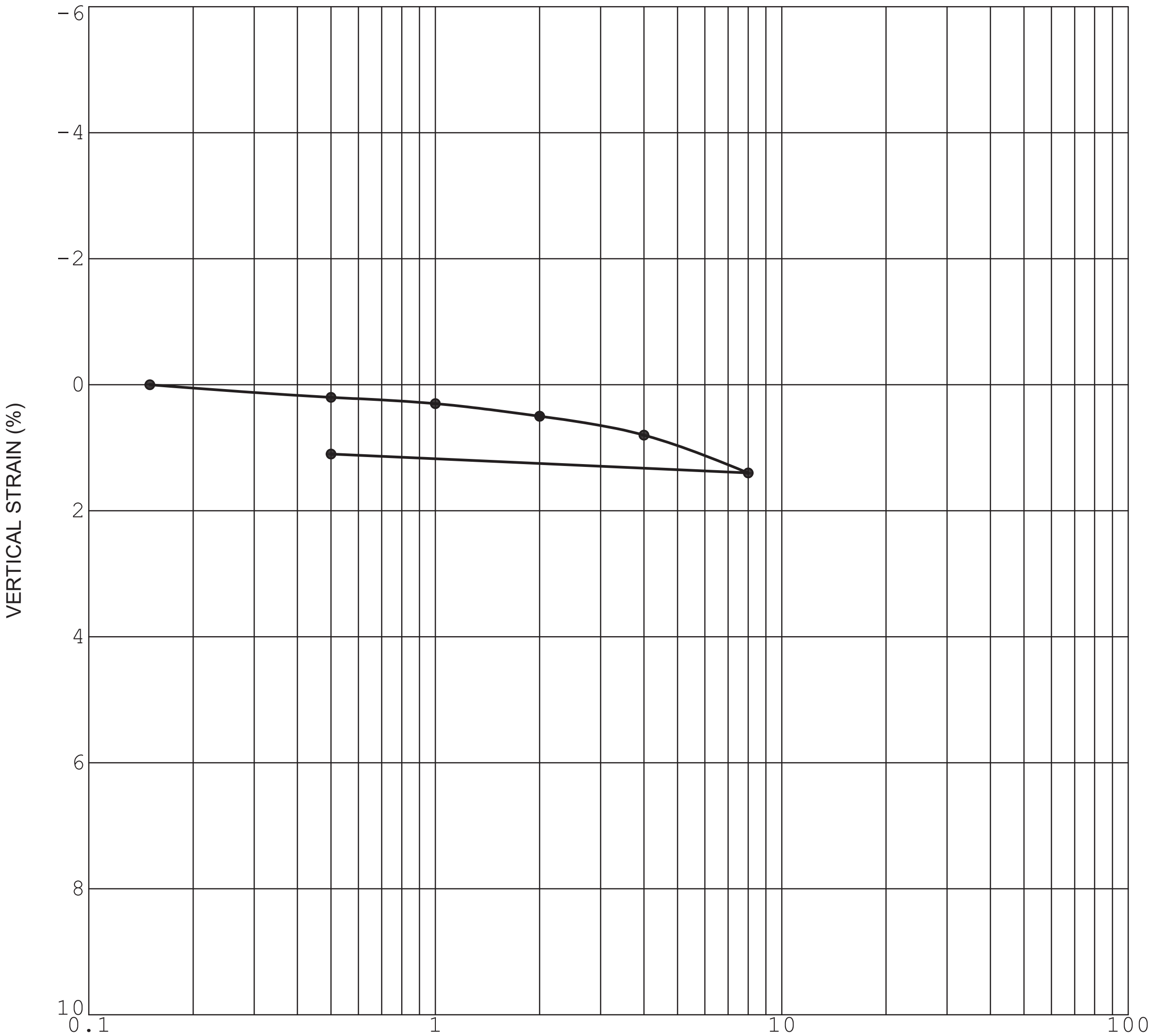
Initial Saturation (%)	54.4
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

CARLTON OAKS GOLF COURSE

SANTEE, CALIFORNIA

SAMPLE NO. B10-5



ASTM D2435

Initial Dry Density (pcf)	115.8
Initial Water Content (%)	14.4

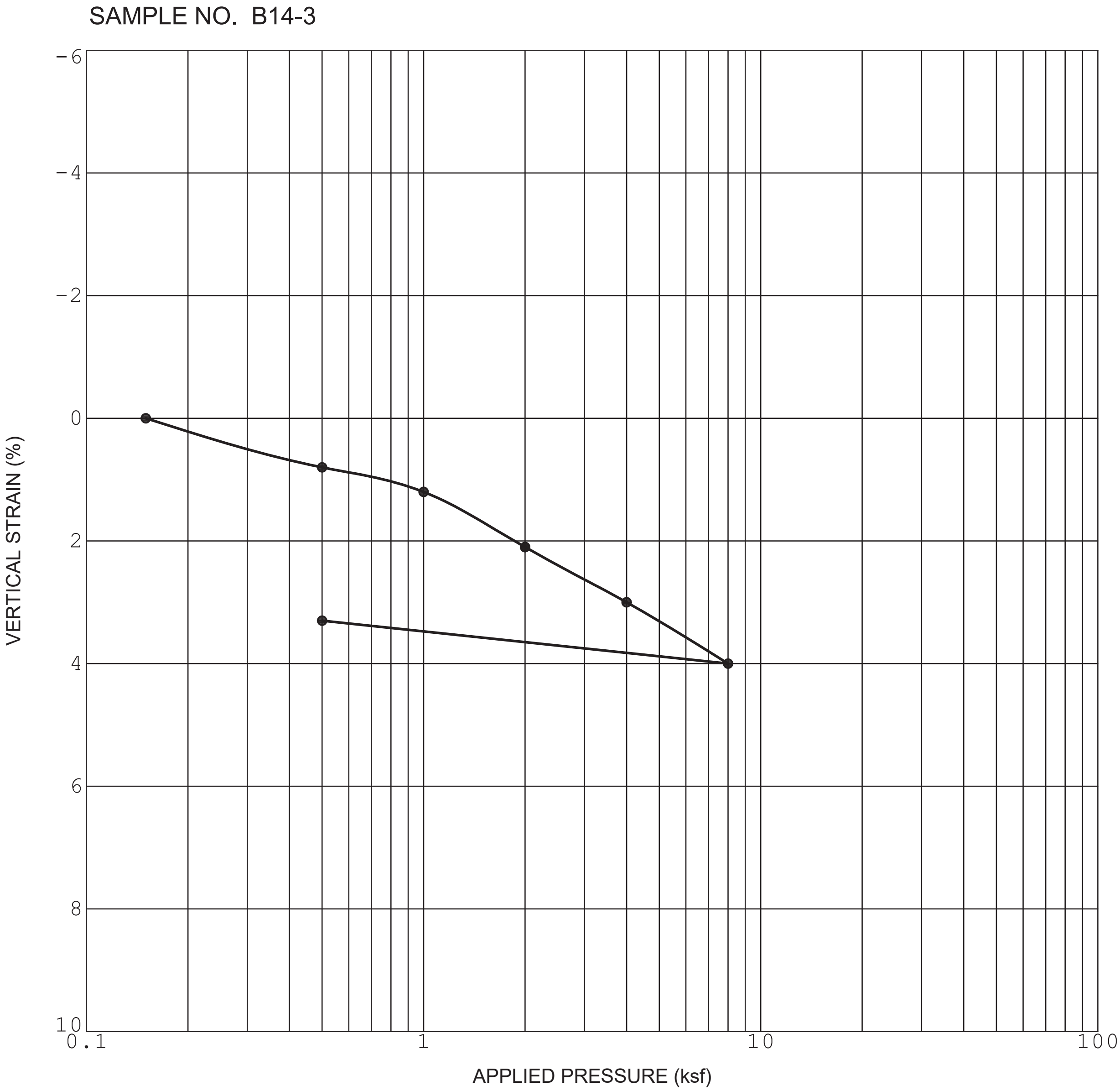
Initial Saturation (%)	88.2
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

CARLTON OAKS GOLF COURSE

SANTEE, CALIFORNIA

PROJECT NO. G2290-32-01



ASTM D2435

Initial Dry Density (pcf)	112.8
Initial Water Content (%)	16.7

Initial Saturation (%)	94.1
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

CARLTON OAKS GOLF COURSE

SANTEE, CALIFORNIA

GEOCON

APPENDIX C

APPENDIX C

STORM WATER MANAGEMENT INVESTIGATION

FOR

CARLTON OAKS GOLF COURSE
RESIDENTIAL NORTH AND RESIDENTIAL WEST SITES
SANTEE, CALIFORNIA

PROJECT NO. G2290-32-01

APPENDIX C

STORM WATER MANAGEMENT INVESTIGATION

We understand storm water management devices are being proposed in accordance with the *2016 City of Santee BMP Design Manual for Permanent Site Design, Storm Water Treatment and Hydromodification Management,* commonly referred to as the *Storm Water Standards* (SWS). If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff occurs, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, possesses general information regarding the existing soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table C-I presents the descriptions of the hydrologic soil groups. In addition, the USDA website also provides an estimated saturated hydraulic conductivity for the existing soil.

TABLE C-I
HYDROLOGIC SOIL GROUP DEFINITIONS

Soil Group	Soil Group Definition
A	Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
B	Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
C	Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
D	Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high-water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The Residential West Site is underlain by three units identified as Redding gravelly loam (RdC), Riverwash (Rm), and Visalia gravelly sandy loam (VbC). The Redding gravelly loam (RdC) and Riverwash (Rm) are classified as Soil Group D. The Visalia gravelly sandy loam is classified as Soil Group A. Table C-II presents the information from the USDA website for the West Site.

TABLE C-II
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (inches/hour)
Redding Gravelly Loam	RdC	40	D	0.00 – 0.06
Riverwash	Rm	55	D	5.95 – 19.98
Visalia Gravelly Sandy Loam	VbC	6	A	1.98 – 5.95

The Residential North Site is underlain by five units identified as Redding gravelly loam (RdC), Redding cobbly loam (ReE), Redding Urban Land complex (RhC and RhE), and Visalia gravelly sandy loam (VbC). The Redding gravelly loam (RdC), Redding cobbly loam (ReE), and Redding Urban Land complex (RhC and RhE) are classified as Soil Group D. The Visalia gravelly sandy loam is classified as Soil Group A. Table C-III presents the information from the USDA website for the North Site.

TABLE C-III
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (inches/hour)
Redding Gravelly Loam	RdC	1	D	0.00 – 0.06
Redding Cobbly Loam	ReE	35	D	0.00 – 0.06
Redding Urban Land Complex	RhC	17	D	0.00 – 0.06
Redding Urban Land Complex	RhE	10	D	0.00 – 0.06
Visalia Gravelly Sandy Loam	VbB	37	A	1.98 – 5.95

In-Situ Testing

The infiltration rate, percolation rates and saturated hydraulic conductivity are different and have different meanings. Percolation rates tend to overestimate infiltration rates and saturated hydraulic conductivities by a factor of 10 or more. Table C-IV describes the differences in the definitions.

TABLE C-IV
SOIL PERMEABILITY DEFINITIONS

Term	Definition
Infiltration Rate	The observation of the flow of water through a material into the ground downward into a given soil structure under long term conditions. This is a function of layering of soil, density, pore space, discontinuities and initial moisture content.
Percolation Rate	The observation of the flow of water through a material into the ground downward and laterally into a given soil structure under long term conditions. This is a function of layering of soil, density, pore space, discontinuities and initial moisture content.
Saturated Hydraulic Conductivity (k_{SAT}, Permeability)	The volume of water that will move in a porous medium under a hydraulic gradient through a unit area. This is a function of density, structure, stratification, fines content and discontinuities. It is also a function of the properties of the liquid as well as of the porous medium.

The degree of soil compaction or in-situ density has a significant impact on soil permeability and infiltration. Based on our experience and other studies we performed, an increase in compaction results in a decrease in soil permeability.

We performed four downhole permeameter tests, I-1 through I-4, at locations shown on the attached *Geologic Maps*, Figures 2 and 3. Tests I-1 and I-2 were located in the Residential West Site and Tests I-3 and I-4 were situated in the Residential North Site. The test borings were 4 inches in diameter. The results of the tests provide parameters for the saturated hydraulic conductivity characteristics of onsite soil and geologic units. Table C-V presents the results of the estimated field saturated hydraulic conductivity and estimated infiltration rates obtained from the downhole permeameter tests. The field sheets are also attached herein. We applied a feasibility factor of safety of 2 to the field results for use in preparation of Worksheet C.4-1. The results of the testing in the Residential West Site (I-1 and I-2) indicate adjusted soil infiltration rates of 3.75 inches per hour (iph) and 0.5 iph after applying a Factor of Safety of 2. The results of the testing in the Residential North Site (I-3 and I-4) indicate adjusted soil infiltration rates of 0.05 inches per hour (iph) and 0.002 iph after applying a Factor of Safety of 2. Based on a discussion in the County of Riverside *Design Handbook for Low Impact Development Best Management Practices*, the infiltration rate should be considered equal to the saturated hydraulic conductivity rate.

TABLE C-V
FIELD PERMEAMETER INFILTRATION TEST RESULTS

Test No.	Geologic Unit	Test Depth (feet)	Field-Saturated Hydraulic Conductivity, k_{sat} (inch/hour)	Worksheet[1] Saturated Hydraulic Conductivity, k_{sat} (inch/hour)
I-1	Qya	2.5	7.5	3.75
I-2	Qya	3	1.0	0.50
I-3	Qya	3	0.1	0.05
I-4	Qoa	2	0.004	0.002

[1] Using a factor of safety of 2 for Worksheet C.4-1.

STORM WATER MANAGEMENT CONCLUSIONS

The *Geologic Maps*, Figures 3 and 4, depict the existing property, proposed development, the approximate lateral limits of the geologic units, the locations of the field excavations and the in-situ infiltration test locations.

Soil Types

Young Alluvium – Infiltration Tests I-1 through I-3 were performed in young alluvium. The young alluvium consists of loose to very dense, silty, fine to coarse sand with varying amounts of gravel and cobble. Groundwater is expected to occur approximately 7 to 10 feet or greater below existing grades. The infiltration rates obtained in the younger alluvial deposits above groundwater exhibit permeability characteristics that support either full or partial infiltration.

Older Alluvium – Infiltration Test I-4 was performed in older alluvium. The older alluvium consists of very dense, silty, fine to medium sand with clay and gravel. Groundwater is expected to occur approximately 6 to 8 feet below existing grades. The infiltration rates obtained in the older alluvial deposits do not exhibit permeability characteristics that support full infiltration.

Infiltration Rates

The results of the infiltration rates (including the feasibility factor of safety of 2) ranged between 0.002 and 3.75 inches per hour. Therefore, based on the results of the infiltration testing, full infiltration should be considered feasible for any infiltration BMPs located in the Residential West Site (Tests I-1 and I-2), and partial to no infiltration should be considered for any infiltration BMPs in the Residential North Site.

Groundwater Elevations

Groundwater elevations across the golf course generally range between 286 ft (MSL) to 305 ft (MSL), or approximately 5 to 19 feet below existing grades. In accordance with the 2016 SWS, groundwater must be at least 10 feet below the bottom of any infiltration BMPs for infiltration to be allowed. If infiltration is proposed, this non-compliant condition would have to be waived by the City of Santee.

Soil or Groundwater Contamination

Although the proposed BMP's may be situated within 10 feet of groundwater, no soil or groundwater contamination is expected because the basins incorporate bio-filtration prior to infiltrating into the subsurface soils.

New or Existing Utilities

We expect that any on-site utilities would be removed prior to site development, if any. Full or partial infiltration near existing or proposed utilities should be avoided to prevent lateral water migration into the permeable trench backfill materials.

Existing and Planned Structures

The property is a golf course with residential developments to the north and the San Diego River to the south. The existing residential developments in the area are at higher elevations than the proposed development or basins.

Slopes

The site is relatively flat to gently sloping and significant slopes do not exist adjacent to the site. An approximately 20-foot-high, 2:1 fill slope is shown on the southern property boundary to raise grades out of the San Diego River.

Recommendations

Due to the infiltration rates obtained in the younger alluvium exposed in the Residential West Site, full infiltration may be considered feasible. Partial infiltration of storm water may be considered feasible within the proposed water quality BMPs in the Residential North Site. However, the City of Santee would need to provide a variance or waiver to the 10-foot separation to high ground water level. Otherwise, liners and subdrains should be incorporated into the design and construction of the planned storm water devices. The liners, if needed, should be impermeable (e.g., High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride, PVC) to prevent water migration. The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. Seams and penetrations of the liners should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations. If designing any storm water infiltration BMPs for partial infiltration, side liners and a subdrain are recommended.

Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. The attached Worksheet C.4-1 presents the completed information for the submittal process.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table C-VI describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

TABLE C-VI
SUITABILITY ASSESSMENT RELATED CONSIDERATIONS
FOR INFILTRATION FACILITY SAFETY FACTORS

Consideration	High Concern – 3 Points	Medium Concern – 2 Points	Low Concern – 1 Point
Assessment Methods	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods	Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., Infiltrometer). Moderate spatial resolution	Direct measurement with localized (i.e., small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods.
Predominant Soil Texture	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site Soil Variability	Highly variable soils indicated from site assessment or unknown variability	Soil boring/test pits indicate moderately homogenous soils	Soil boring/test pits indicate relatively homogenous soils
Depth to Groundwater/ Impervious Layer	<5 feet below facility bottom	5-15 feet below facility bottom	>15 feet below facility bottom

Based on our geotechnical investigation and the information in Table C-VI, Table C-VII presents the estimated factor values for the evaluation of the factor of safety. This table only provides the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B) and use the combined safety factor for the design infiltration rate.

TABLE C-VII
FACTOR OF SAFETY WORKSHEET DESIGN VALUES – PART A[1]

Suitability Assessment Factor Category	Assigned Weight (w)	Factor Value (v)	Product (p = w x v)
Assessment Methods	0.25	3	0.75
Predominant Soil Texture	0.25	2	0.50
Site Soil Variability	0.25	2	0.50
Depth to Groundwater/ Impervious Layer	0.25	2	0.50
Suitability Assessment Safety Factor, $S_A = \sum p$			2.25

[1] The project civil engineer should complete Worksheet D.5-1 or Form I-9 using the data on this table. Additional information is required to evaluate the design factor of safety.

Carlton Oaks Golf Course - West Site

Categorization of Infiltration Feasibility Condition		Worksheet C.4-1	
Part 1 - Full Infiltration Feasibility Screening Criteria **Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?**			
Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	
Provide basis: Based on results of permeability testing in two locations across the site, one at each of the proposed bio-filtration basins, the unfactored infiltration rate was measured to be 7.5 inches/hour and 1.0 inches/hour using a constant head borehole permeameter. If applying a feasibility factor of safety of 2.0, the infiltration rates would be 3.75 iph and 0.5 iph. Information collected from the USDA website is attached for reference. The Aardvark Permeameter test results are attached. In accordance with the Riverside County storm water procedures, which reference the United States Bureau of Reclamation Well Permeameter Method (USBR 7300), the saturated hydraulic conductivity is equal to the unfactored infiltration rate.			
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
Provide basis: The site is a golf course with the San Diego River to the south. The proposed basins are located down gradient from the proposed development within the golf course. Groundwater is located within 10 feet from bottom of the basins, however it is our opinion that an infiltration BMP is suitable at this location because the site is golf course with heavy irrigation.			

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis: Shallow groundwater is located within 10 feet from the 2 proposed infiltration basins, however the site is golf course that receives heavy irrigation water, and no soil or groundwater contamination is expected as a result of these bio-filtration basins. Based on the Geotracker website, no active cleanup sites are located in the vicinity of the proposed basins.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis: It is our opinion there are no adverse impacts to groundwater, water balance impacts to stream flow, or impacts on any downstream water rights. It should be noted that researching downstream water rights or evaluating water balance issues to stream flows is beyond the scope of the geotechnical consultant.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration

If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td>Full Infiltration</td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 3 of 4</th></tr>
<tr><td colspan="4"><u>Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria</u>

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?</td></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>5</td><td>Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.</td><td></td><td></td></tr>
<tr><td colspan="4">Provide basis:</td></tr>
<tr><td>6</td><td>Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.</td><td></td><td></td></tr>
<tr><td colspan="4">Provide basis:</td></tr>
</table>

Worksheet C.4-1 Page 4 of 4			
Criteria	Screening Question	**Yes**	**No**
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis:			
8	**Can infiltration be allowed without violating downstream water rights**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presentedin Appendix C.3.		
Provide basis:			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**		

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

GEOCON

Aardvark Permeameter Data Analysis

Project Name: Carlton Oaks Golf Resort
Project Number: G2290-32-01
Test Number: I-1

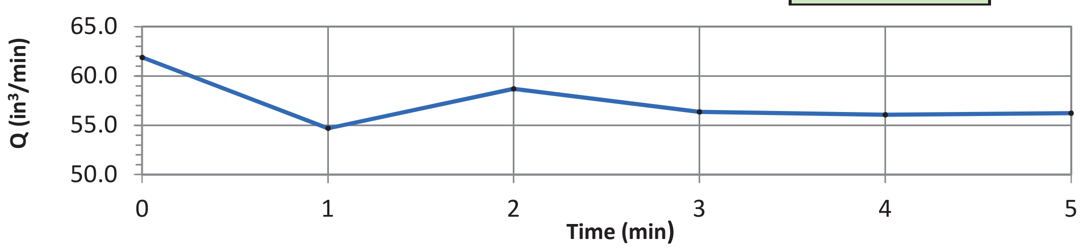
Date: 6/28/2018
By: DEG

Borehole Diameter, d (in.):	4.00
Borehole Depth, **H** (in):	18.00
Distance Between Reservoir & Top of Borehole (in.)	28.00
Estimated Depth to Water Table, **S** (feet):	100.00
Height APM Raised from Bottom (in.):	1.00
Pressure Reducer Used:	No

Ref. EL (feet, MSL):	293.0
Bottom EL (feet, MSL):	291.5

Distance Between Resevoir and APM Float, **D** (in.):	37.75
Head Height Calculated, **h** (in.):	4.63
Head Height Measured, **h** (in.):	5.00
Distance Between Constant Head and Water Table, **L** (in.):	1187.00

Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	1.00	1.735	48.05	48.046
3	1.00	2.235	61.89	61.892
4	1.00	1.975	54.69	54.692
5	1.00	2.120	58.71	58.708
6	1.00	2.035	56.35	56.354
7	1.00	2.025	56.08	56.077
8	1.00	2.030	56.22	56.215
9	1.00	2.005	55.52	55.523
			Steady Flow Rate, Q (in^3/min):	55.500



Soil Matric Flux Potential, Φ_m

Φ_m= 1.23288 in^2/min

Field-Saturated Hydraulic Conductivity (Infiltration Rate)

K_{sat} = 1.26E-01 in/min   7.545 in/hr

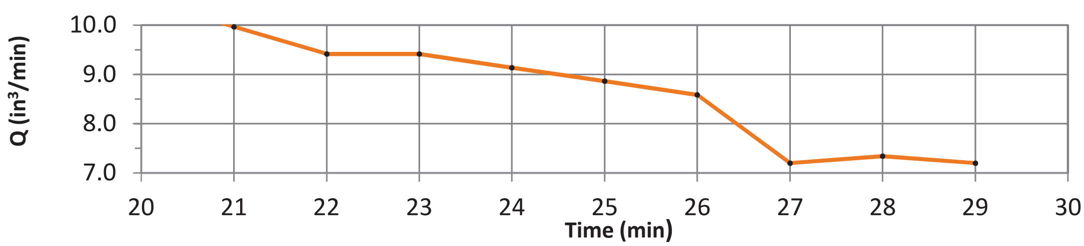
Aardvark Permeameter Data Analysis

Project Name:	Carlton Oaks Golf Resort	Date:	6/28/2018
Project Number:	G2290-32-01	By:	DEG
Test Number:	I-2	Ref. EL (feet, MSL):	297.5
		Bottom EL (feet, MSL):	296.0

Borehole Diameter, d (in.):	4.00
Borehole Depth, **H** (in):	18.00
Distance Between Reservoir & Top of Borehole (in.)	28.00
Estimated Depth to Water Table, **S** (feet):	100.00
Height APM Raised from Bottom (in.):	1.00
Pressure Reducer Used:	No

Distance Between Resevoir and APM Float, **D** (in.):	37.75
Head Height Calculated, **h** (in.):	4.63
Head Height Measured, **h** (in.):	5.00
Distance Between Constant Head and Water Table, **L** (in.):	1187.00

Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	1.00	0.440	12.18	12.185
3	1.00	0.410	11.35	11.354
4	1.00	0.380	10.52	10.523
5	1.00	0.360	9.97	9.969
6	1.00	0.340	9.42	9.415
7	1.00	0.340	9.42	9.415
8	1.00	0.330	9.14	9.138
9	1.00	0.320	8.86	8.862
10	1.00	0.310	8.58	8.585
11	1.00	0.260	7.20	7.200
12	1.00	0.265	7.34	7.338
13	1.00	0.260	7.20	7.200
			Steady Flow Rate, Q (in^3/min):	7.200



Soil Matric Flux Potential, Φ_m

Φ_m= 0.1599 in^2/min

Field-Saturated Hydraulic Conductivity (Infiltration Rate)

K_{sat} = 1.63E-02 in/min | 0.979 in/hr

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

San Diego County Area, California

Carlton Oaks Golf Course West Site

July 16, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

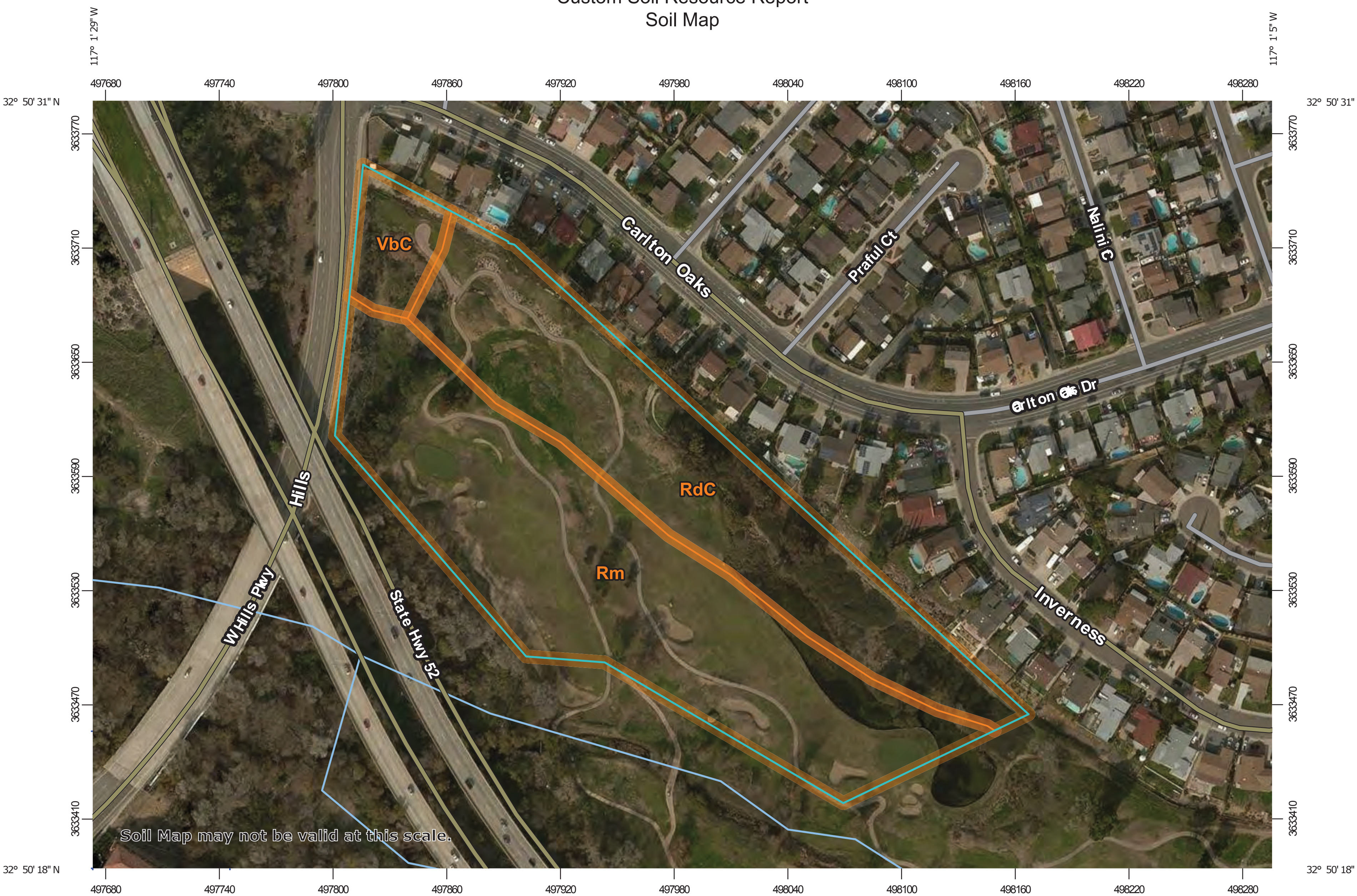
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,850 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 40, 80, 160, 240

Feet: 0, 100, 200, 400, 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 12, Sep 13, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 7, 2014—Jan 4, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
RdC	Redding gravelly loam, 2 to 9 percent slopes	5.1	39.7%
Rm	Riverwash	7.0	54.8%
VbC	Visalia gravelly sandy loam, 5 to 9 percent slopes	0.7	5.5%
Totals for Area of Interest		**12.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

San Diego County Area, California

RdC—Redding gravelly loam, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hbfy
Elevation: 100 to 1,500 feet
Mean annual precipitation: 14 to 25 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Redding and similar soils: 85 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Redding

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Typical profile

H1 - 0 to 15 inches: gravelly loam
H2 - 15 to 30 inches: gravelly clay loam, gravelly clay
H2 - 15 to 30 inches: indurated
H3 - 30 to 45 inches:

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: About 15 inches to abrupt textural change; 20 to 40 inches to duripan
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: ACID CLAYPAN (Claypan Mesas - 1975) (R019XD062CA)
Hydric soil rating: No

Minor Components

Unnamed, ponded
Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Oliventain
Percent of map unit: 2 percent
Hydric soil rating: No

Huerhuero
Percent of map unit: 2 percent
Hydric soil rating: No

Chesterton
Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 2 percent
Hydric soil rating: No

Rm—Riverwash

Map Unit Setting
National map unit symbol: hbg6
Elevation: 700 to 2,900 feet
Mean annual precipitation: 8 to 15 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition
Riverwash: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Riverwash

Setting
Landform: Drainageways
Parent material: Sandy, gravelly, or cobbly alluvium derived from mixed sources

Typical profile
H1 - 0 to 6 inches: gravelly coarse sand
H2 - 6 to 60 inches: stratified extremely gravelly coarse sand to gravelly sand

Properties and qualities
Slope: 0 to 4 percent
Natural drainage class: Excessively drained
Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 60 to 72 inches
Frequency of flooding: Occasional
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Yes

VbC—Visalia gravelly sandy loam, 5 to 9 percent slopes

Map Unit Setting
National map unit symbol: hbh7
Elevation: 0 to 1,500 feet
Mean annual precipitation: 15 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 200 to 350 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Visalia and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Visalia

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, flat
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium derived from granite

Typical profile
H1 - 0 to 12 inches: gravelly sandy loam
H2 - 12 to 40 inches: gravelly sandy loam
H3 - 40 to 60 inches: gravelly loam

Properties and qualities
Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: LOAMY (1975) (R019XD029CA)
Hydric soil rating: No

Minor Components

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Placentia

Percent of map unit: 5 percent
Hydric soil rating: No

Ramona

Percent of map unit: 3 percent
Hydric soil rating: No

Tujunga

Percent of map unit: 2 percent
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Carlton Oaks Golf Course - North Site

Categorization of Infiltration Feasibility Condition			Worksheet C.4-1
Part 1 - Full Infiltration Feasibility Screening Criteria **Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?**			
Criteria	Screening Question	**Yes**	**No**
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: Based on results of permeability testing in two locations across the site, one at each of the proposed bio-filtration basins, the unfactored infiltration rate was measured to be 0.1 inches/hour and 0.004 inches/hour using a constant head borehole permeameter. If applying a feasibility factor of safety of 2.0, the infiltration rates would be 0.05 iph and 0.002 iph. The USDA NRCS website indicates the site soils belong to Hydrologic Soil Groups A and D. Information collected from the USDA website is attached. The Aardvark Permeameter test results are attached. In accordance with the Riverside County storm water procedures, which reference the United States Bureau of Reclamation Well Permeameter Method (USBR 7300), the saturated hydraulic conductivity is equal to the unfactored infiltration rate.			
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
Provide basis: Based on our comprehensive evaluation of risks associated with implementing storm water infiltration BMP's, no significant slopes exist that would be adversely impacted, ground water mounding is not expected, no landslides or existing utilities are in the vicinity. The site is a golf course that receives heavy watering, therefore, it is our opinion that infiltration BMP's at the location shown are acceptable.			

Worksheet C.4-1 Page 2 of 4			
Criteria	Screening Question	**Yes**	**No**
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Shallow groundwater is located within 10 feet from the 2 proposed infiltration basins, however the site is golf course that receives heavy irrigation water, and no soil or groundwater contamination is expected as a result of these bio-filtration basins.			
4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: It is our opinion there are no adverse impacts to groundwater, water balance impacts to stream flow, or impacts on any downstream water rights. It should be noted that researching downstream water rights or evaluating water balance issues to stream flows is beyond the scope of the geotechnical consultant.			
Part 1 Result*	If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2		No Full Infiltration

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

Worksheet C.4-1 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	

Provide basis: Although the infiltration rates are very low, the proposed bio-filtration basins are located down gradient from the proposed development. Shallow groundwater was encountered, however, the site is a golf course with heavy irrigation. It is our opinion that an infiltration BMP is acceptable at this site.

Criteria	Screening Question	Yes	No
6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provide basis: Based on our comprehensive evaluation of risks associated with implementing storm water infiltration BMP's, no significant slopes exist that would be adversely impacted, ground water mounding is not expected, no landslides or existing utilities are in the vicinity. The site is a golf course that receives heavy watering, therefore, it is our opinion that infiltration BMP's at the location shown are acceptable.

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 4 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis: Shallow groundwater is located within 10 feet from the 2 proposed infiltration basins, however the site is golf course that receives heavy irrigation water, and no soil or groundwater contamination is expected as a result of these bio-filtration basins.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presentedin Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis: Geocon is not aware of any downstream water rights that would be affected by incidental infiltration of storm water. Researching downstream water rights is beyond the scope of the geotechnical consultant.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.

If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td>Partial Infiltration</td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

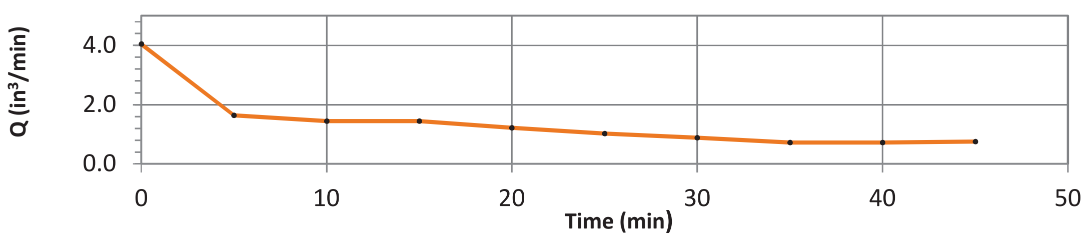
Aardvark Permeameter Data Analysis

Project Name:	Carlton Oaks Golf Resort	Date:	6/28/2018
Project Number:	G2290-32-01	By:	DEG
Test Number:	I-3	Ref. EL (feet, MSL):	306.5
		Bottom EL (feet, MSL):	305.0

Borehole Diameter, d (in.):	4.00
Borehole Depth, **H** (in):	18.00
Distance Between Reservoir & Top of Borehole (in.)	28.00
Estimated Depth to Water Table, **S** (feet):	100.00
Height APM Raised from Bottom (in.):	1.00
Pressure Reducer Used:	No

Distance Between Resevoir and APM Float, **D** (in.):	37.75
Head Height Calculated, **h** (in.):	4.63
Head Height Measured, **h** (in.):	5.00
Distance Between Constant Head and Water Table, **L** (in.):	1187.00

Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	5.00	0.350	9.69	1.938
3	5.00	0.050	1.38	0.277
4	5.00	0.730	20.22	4.043
5	5.00	0.295	8.17	1.634
6	5.00	0.260	7.20	1.440
7	5.00	0.260	7.20	1.440
8	5.00	0.220	6.09	1.218
9	5.00	0.185	5.12	1.025
10	5.00	0.160	4.43	0.886
11	5.00	0.130	3.60	0.720
12	5.00	0.130	3.60	0.720
13	5.00	0.135	3.74	0.748
			Steady Flow Rate, Q (in^3/min):	0.720



Soil Matric Flux Potential, Φ_m

Φ_m= 0.0160 in^2/min

Field-Saturated Hydraulic Conductivity (Infiltration Rate)

K_{sat} = 1.63E-03 in/min 0.098 in/hr

GEOCON

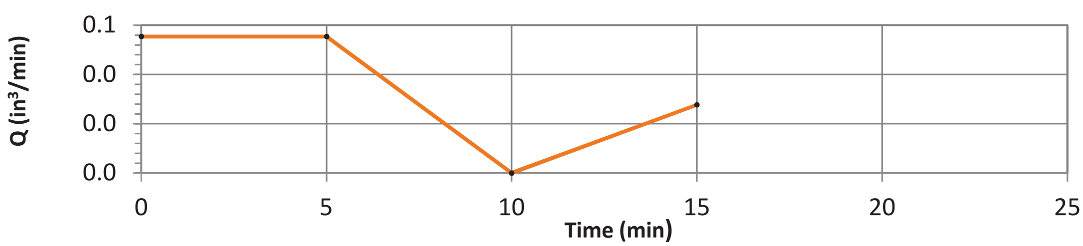
Aardvark Permeameter Data Analysis

Project Name:	Carlton Oaks Golf Resort	Date:	6/28/2018
Project Number:	G2290-32-01	By:	DEG
Test Number:	I-4	Ref. EL (feet, MSL):	306.5
		Bottom EL (feet, MSL):	305.7

Borehole Diameter, d (in.):	4.00
Borehole Depth, **H** (in):	10.00
Distance Between Reservoir & Top of Borehole (in.)	28.00
Estimated Depth to Water Table, **S** (feet):	100.00
Height APM Raised from Bottom (in.):	1.00
Pressure Reducer Used:	0.00

Distance Between Resevoir and APM Float, **D** (in.):	29.75
Head Height Calculated, **h** (in.):	5.00
Head Height Measured, **h** (in.):	5.00
Distance Between Constant Head and Water Table, **L** (in.):	1195.00

Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	5.00	0.000	0.00	0.000
3	5.00	0.000	0.00	0.000
4	5.00	0.000	0.00	0.000
5	5.00	0.000	0.00	0.000
6	5.00	0.000	0.00	0.000
7	5.00	0.000	0.00	0.000
8	5.00	0.000	0.00	0.000
9	5.00	0.010	0.28	0.055
10	5.00	0.010	0.28	0.055
11	5.00	0.000	0.00	0.000
12	5.00	0.005	0.14	0.028
			Steady Flow Rate, Q (in^3/min):	0.028



Soil Matric Flux Potential, Φ_m

Φ_m= 0.0006 in^2/min

Field-Saturated Hydraulic Conductivity (Infiltration Rate)

K_{sat} = 6.34E-05 in/min 0.004 in/hr

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

San Diego County Area, California

Carlton Oaks Golf Course North Site

July 16, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map


117° 0' 43" W
117° 0' 22" W
498900
498950
499000
499050
499100
499150
499200
499250
499300
499350
499400
32° 50' 38" N
32° 50' 26" N
3633980
3633930
3633880
3633830
3633780
3633730
3633680
3633630
Carlton Oaks
Carlton Oaks Dr
Inwood Dr
Inverness
RhC
VbB
RhE
RdC
ReE
Soil Map may not be valid at this scale.
Map Scale: 1:2,530 if printed on A landscape (11" x 8.5") sheet.
Meters
0
35
70
140
210
N
Feet
0
100
200
400
600
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 12, Sep 13, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 7, 2014—Jan 4, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
RdC	Redding gravelly loam, 2 to 9 percent slopes	0.2	0.9%
ReE	Redding cobbly loam, 9 to 30 percent slopes	6.5	35.3%
RhC	Redding-Urban land complex, 2 to 9 percent slopes	3.1	17.0%
RhE	Redding-Urban land complex, 9 to 30 percent slopes	1.8	10.0%
VbB	Visalia gravelly sandy loam, 2 to 5 percent slopes	6.8	36.8%
Totals for Area of Interest		**18.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

San Diego County Area, California

RdC—Redding gravelly loam, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hbfy
Elevation: 100 to 1,500 feet
Mean annual precipitation: 14 to 25 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Redding and similar soils: 85 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Redding

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Typical profile

H1 - 0 to 15 inches: gravelly loam
H2 - 15 to 30 inches: gravelly clay loam, gravelly clay
H2 - 15 to 30 inches: indurated
H3 - 30 to 45 inches:

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: About 15 inches to abrupt textural change; 20 to 40 inches to duripan
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: ACID CLAYPAN (Claypan Mesas - 1975) (R019XD062CA)
Hydric soil rating: No

Minor Components

Unnamed, ponded

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Oliventain

Percent of map unit: 2 percent
Hydric soil rating: No

Huerhuero

Percent of map unit: 2 percent
Hydric soil rating: No

Chesterton

Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 2 percent
Hydric soil rating: No

ReE—Redding cobbly loam, 9 to 30 percent slopes

Map Unit Setting

National map unit symbol: hbfz
Elevation: 130 to 1,000 feet
Mean annual precipitation: 14 to 25 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 260 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Redding and similar soils: 85 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Redding

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Typical profile

H1 - 0 to 10 inches: cobbly loam
H2 - 10 to 20 inches: cobbly clay loam, cobbly clay

H2 - 10 to 20 inches: indurated
H3 - 20 to 30 inches:

Properties and qualities
Slope: 9 to 30 percent
Depth to restrictive feature: About 10 inches to abrupt textural change; 20 to 40 inches to duripan
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.2 inches)

Interpretive groups
Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: ACID CLAYPAN (Claypan Mesas - 1975) (R019XD062CA)
Hydric soil rating: No

Minor Components

Oliventain
Percent of map unit: 5 percent
Hydric soil rating: No

Huerhuero
Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed, ponded
Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

RhC—Redding-Urban land complex, 2 to 9 percent slopes

Map Unit Setting
National map unit symbol: hbg1
Elevation: 100 to 1,500 feet
Mean annual precipitation: 14 to 25 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition
Redding and similar soils: 50 percent
Urban land: 30 percent

Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Redding

Setting

Landform: Marine terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Typical profile

H1 - 0 to 15 inches: gravelly loam
H2 - 15 to 30 inches: gravelly clay loam, gravelly clay
H2 - 15 to 30 inches: indurated
H3 - 30 to 45 inches:

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: About 15 inches to abrupt textural change; 20 to 45 inches to duripan
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Urban Land

Typical profile

H1 - 0 to 6 inches: variable

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Oliventain

Percent of map unit: 5 percent
Hydric soil rating: No

RhE—Redding-Urban land complex, 9 to 30 percent slopes

Map Unit Setting

National map unit symbol: hbg2
Elevation: 100 to 1,500 feet
Mean annual precipitation: 14 to 25 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Redding and similar soils: 50 percent
Urban land: 30 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Redding

Setting

Landform: Marine terraces
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Typical profile

H1 - 0 to 15 inches: gravelly loam
H2 - 15 to 30 inches: gravelly clay loam, gravelly clay
H2 - 15 to 30 inches: indurated
H3 - 30 to 45 inches:

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: About 15 inches to abrupt textural change; 20 to 40 inches to duripan
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Urban Land

Typical profile

H1 - 0 to 6 inches: variable

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Oliventain

Percent of map unit: 5 percent
Hydric soil rating: No

VbB—Visalia gravelly sandy loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: hbh6
Elevation: 0 to 1,500 feet
Mean annual precipitation: 15 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 200 to 350 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Visalia and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Visalia

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, flat
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 12 inches: gravelly sandy loam
H2 - 12 to 40 inches: gravelly sandy loam
H3 - 40 to 60 inches: gravelly loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained

Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: LOAMY (1975) (R019XD029CA)
Hydric soil rating: No

Minor Components

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Placentia

Percent of map unit: 5 percent
Hydric soil rating: No

Tujunga

Percent of map unit: 5 percent
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX D

APPENDIX D

PREVIOUSLY REPORTED BORING LOGS AND LABORATORY TEST RESULTS PERFORMED BY GEOTEK INCORPORATED

FOR

CARLTON OAKS GOLF COURSE RESIDENTIAL NORTH AND RESIDENTIAL WEST SITES SANTEE, CALIFORNIA

PROJECT NO. G2290-32-01

LEGEND TO FIELD TESTING AND SAMPLING

A - FIELD TESTING AND SAMPLING PROCEDURES

The Standard Penetration Test (SPT)
The SPT is performed in accordance with ASTM Test Method D 1586-99. The SPT 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 split-barrel sampler has an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The samples of earth materials collected in the sampler are typically classified in the field, bagged, sealed and transported to the laboratory for further testing.

The Modified Split-Barrel Sampler (Ring)
The Ring sampler is driven into the ground in accordance with ASTM Test Method D 3550-84. 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.

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

Small Bulk Samples
These samples are normally airtight plastic bags that are typically less than 5 pounds in weight of representative earth materials collected from the field by means of the split spoon sampler, hand digging or exploratory cuttings. These samples are primarily used for determining natural moisture content and classification indices.

B - BORING LOG LEGEND

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

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

(Additional denotations and symbols are provided on the logs of borings)

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

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
					3" Asphalt			
					Artificial Fill			
				SC	Red-brown, moist, loose, clayey SAND with gravel			
	SPT	1 1 3	B1-1		-Same	8.3		
5	SPT	2 2 2	B1-2	SM	Red-brown, damp, loose, silty SAND with gravel; trace clay	11.1		
	Ring	3 6 7	B1-3		-Same; becomes brown to red-brown	8.3	114.3	
10	Ring	9 22 46	B1-4	SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Brown to orange-browm, moist, dense, silty to clayey SAND with gravel	13.8	115.7	
					Orange-brown, moist, medium dense, clayey f-c SAND, trace well rounded small gravels			
15	SPT	7 10 13	B1-5			15.4		
					Boring Terminated at 16.5 Feet No Groundwater Encountered Excavation 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= Hydrocollasped test
MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-2

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
				SC	**3" Asphalt** **Artificial Fill** Brown, moist, medium dense, clayey SAND with gravel and rock fragments			
	SPT	4 4 6	B2-1		-Same	12.5		
					-Becomes rockier			
5	Ring	8 5 13	B2-2	CL	Dark brown, moist, medium dense, silty to sandy CLAY with gravel and rock fragments	23	102.6	
	SPT	17 13 10	B2-3	SM/SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Orange-brown, moist, medium dense, silty to clayey SAND with gravel and rock fragments; limited recovery	9.8		
10	Ring	7 15 16	B2-4	SM	Orange-brown, moist, medium dense, silty fine SAND with clay; micaceous, trace medium sand	20.1	107.7	
				CL	-Becomes sandy CLAY with silt			
	Small Bulk		B2-5	CL	**Friars Formation** Pale greenish gray, moist, stiff, silty CLAYSTONE with fine sand			
15	SPT	8 14 21	B2-6	SC/CL	-becomes dense, clayey fine SANDSTONE with silt interbedded with silty CLAYSTONE with fine sand			
					-Same			
20	Ring	17 27 25/3"	B2-7	SP	-becomes dense to very dense, fine SAND; trace silt and clay			
					Boring Terminated at 21.5 Feet No Groundwater Encountered Excavation 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= Hydrocollasped test
MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: *B-3*

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
				SM	**Artificial Fill** Dark brown, wet, loose, silty f-m SAND with clay; concrete debris			
					-Difficult drilling, abundant concrete with rebar			
5					-Same			
	SPT	11 16 20	B3-1	SM	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, damp to moist, dense, silty f-m SAND with gravel and rock fragments -Becomes very rocky	5.8		
10	SPT	9 16 16	B3-2	SM/SC	Brown to red-brown, wet to saturated, dense, silty to clayey f-c SAND with gravel and rock fragments -Abundant rounded cobbles in cuttings	Water Table 12.8		
				SM	-Becomes silty f-c SAND with clay			
15	Ring	10 20 24	B3-3		Red-brown, saturated, medium dense, silty f-c SAND with clay	23.8		
				SC	**Friars Formation** Pale greenish gray, moist, dense, clayey fine SANDSTONE with silt			
20	SPT	27 40 50/5"	B3-4		-Same, very dense	19.1		
25	Ring	17 56/6"	B3-5		-Same, interbedded with SILTSTONE/CLAYSTONE			
30					(continued)			

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= Hydrocollasped test; MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: *B-3 continued*

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
30	SPT	14 18 27	B3-6	ML/CL	**continued** Pale greenish gray, moist, hard, CLAYSTONE/SILTSTONE interbedded with dense, silty to clayey fine SANDSTONE			
					Boring Terminated at 31.5 Feet Groundwater Encountered at 10 Feet Excavation Backfilled with Bentonite Grout			
35								
40								
45								
50								
55								
60								

LEGEND

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

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

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-4

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
				SM	**Artificial Fill** Brown, moist to wet, loose, silty f-m SAND with gravel and rock fragments; trace clay			
	SPT	8 11 25/3"	B4-1	SC	Brown to red-brown, medium dense, moist, clayey f-c SAND with gravel and rock fragments	8		
5	Large Bulk		B4-2		-Difficult drilling, very rocky			
	SPT	8 15 14	B4-3	SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, wet to saturated, medium dense, clayey f-c SAND with gravel and rock fragments	Water Table 13.5		
10	Ring	43 50/5"	B4-4		Same, dense to very dense	9.3	117.2	
15	Ring	10 11 13	B4-5	SP	Red-brown, saturated, medium dense, f-m SAND with silt; trace clay			
				ML/CL	**Friars Formation** Pale greenish gray, wet, very stiff, fine sandy CLAYSTONE to clayey SILTSTONE with fine sand			
20	SPT	8 8 9	B4-6		-Same			
25	SPT	8 9 14	B4-7	ML	Pale greenish gray, moist, very stiff, clayey SILTSTONE with fine sand	24.1		
30					**(continued)**			

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= Hydrocollasped test; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: *B-4 continued*

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
30	SPT	8 9 15	B4-8	ML/CL	**Continued** Gray, moist, very stiff, silty CLAYSTONE to clayey SILTSTONE with fine sand			
35	SPT	18 17 24			-Becomes hard; trace fine sand			
					Boring Terminated at 36.5 Feet Groundwater Encountered at 7 Feet Excavation Backfilled with Bentonite Grout			
40								
45								
50								
55								
60								

LEGEND

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

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

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-5

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
				SM	**Artficial Fill** Brown, moist, loose, silty f-m SAND with clay; some gravel and rock fragments			
	SPT	11 18 18	B5-1	SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, moist, dense, clayey SAND with gravel and rock fragments	11.5		
5					-Difficult drilling, very rocky			
					-Becomes wet to saturated @ 7' Perched groundwater	▽		
					-Same			
10	SPT	9 12 20	B5-2	SM	Red-brown, saturated, dense, silty f-c SAND with clay, gravel and rock fragments	14.2		
				ML/CL	**Friars Formation** Pale greenish gray, moist, very stiff, CLAYSTONE/SILTSTONE; trace fine sand			
15	SPT	5 9 12	B5-3		-Same			
20	SPT	8 12 18	B5-4		-Same, become hard; minor caliche spottings			
					Boring Terminated at 21.5 Feet Groundwater Encountered at 7 Feet Excavation Backfilled with Bentonite			
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= Hydrocollasped test	MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-6

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
					Artficial Fill			
				SM	Brown, moist, loose, silty f-m SAND with gravel and rock fragments			
					Terrace Deposits/Older Alluvium (undifferentiated)			
				SC	Red-brown, moist, medium dense, clayey SAND with gravel and rock fragments			
5	SPT	21 16 16	B6-1		-Same, becomes dense	2.6		
	Small Bulk		B6-2		-Difficult drilling, very rocky	8.1		
10	SPT	10 5 5	B6-3		**Friars Formation**			
				CL	Pale greenish gray, moist to wet, stiff, silty CLAYSTONE with fine sand	25.1		
	SPT	6 8 12	B6-4		-Same, minor iron oxide staining			
15					Boring Terminated at 15 Feet No Groundwater Encountered Excavation 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= Hydrocollasped test | MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-7

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
				SM/SC	**Artficial Fill** Brown, moist, loose, silty to clayey f-m SAND with gravel			
				SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, moist, medium dense, clayey SAND with gravel and rock fragments			
5	SPT	10 15 18	B7-1		-Same, becomes dense	7.7		
					-Difficult drilling, very rocky			
					Refusal at 7.5 Feet No Groundwater Encountered Excavation Backfilled with Soil Cuttings			
10								
15								
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= Hydrocollasped test	MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-8

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
				SM/SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, moist, medium dense, silty to clayey SAND with gravel and rock fragments			
	SPT	13 20 21	B8-1		-Same, becomes dense, very rocky	6.3		
5	SPT	9 12 22	B8-2		-Same	11.2		
					@ 7' Perched groundwater	▽		
	SPT	13 36 50/5"	B8-3		-Same, becomes very dense	9.5	120.1	
10	SPT	8 6 5	B8-4	CL	**Friars Formation** Pale greenish gray, moist, stiff, silty CLAYSTONE with fine sand			
					Boring Terminated at 11.5 Feet Groundwater Encountered at 7 Feet Excavation Backfilled with Bentonite			
15								
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= Hydrocollasped test; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-9

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
					Terrace Deposits/Older Alluvium (undifferentiated)			
				SM/SC	Red-brown, moist, medium dense, silty to clayey SAND with gravel and rock fragments			
	Ring	9 15 15	B9-1		-Same, becomes dense	10.9		
5	Ring	6 9 16	B9-2	SC	-Becomes medium dense, clayey f-c SAND	13.5		
	Ring	15 27 28	B9-3		-Same, becomes dense to very dense; rocky	8.7		
10	Ring	13 11 14	B9-4	SC/CL	**Friars Formation** Pale greenish gray, moist, very stiff, clayey fine SANDSTONE with silt to silty CLAYSTONE with fine sand	17.8		
					Boring Terminated at 11.5 Feet No Groundwater Encountered Excavation Backfilled with Soil Cuttings			
15								
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= Hydrocollasped test	MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-10

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
				SM	**Artificial Fill** Dark brown, moist, loose, silty fine SAND; trace clay, roots			
	SPT	4 2 1	B10-1	SP	Brown, moist, very loose, f-m SAND with silt and rock fragments; trace gravel	13.9		
5	Ring	3 4		SC/CL	Grey-brown, moist, loose, clayey fine SAND to fine sandy CLAY			
		7	B10-2	SC	Dark brown, moist, loose, clayey f-c SAND	16.6	109.7	
	SPT	2 2 4	B10-3	CL	**Terrace Deposits/Older Alluvium (undifferentiated)** Brown to grey-brown mottled with iron oxide, wet, firm, fine sandy CLAY with silt	22.6		
10	Ring	3 6 7	B10-4		Brown mottled with iron oxide, moist, stiff, fine sandy CLAY -Grades to clayey fine SAND -Become rocky @ 14' Perched groundwater	▽		
15	SPT	2 6 5	B10-5	SP	Brown to red-brown, saturated, medium dense, f-m SAND with silt; trace clay	28.1		
				ML/CL	**Friars Formation** Pale greenish gray, moist, very stiff, clayey SILTSTONE with fine sand to fine sandy CLAYSTONE with silt			
20	Ring	8 14 26	B10-6		-Same; trace manganese oxide staining			
25	SPT	6 12 18	B10-7		-Same	21.6		
30					(Continued)			

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= Hydrocollasped test; MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: *B-10 continued*

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
30	SPT	10 14 20	B10-8	ML/CL	**Continued** Pale greenish gray, moist, hard, clayey SILTSTONE with fine sand to fine sandy CLAYSTONE with silt			
					Boring Terminated at 31.5 Feet Groundwater Encountered at 14 Feet Excavation Backfilled with Bentonite Grout			
35								
40								
45								
50								
55								
60								

LEGEND

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

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

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-11

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
				SM	**Artficial Fill** Dark brown, moist, loose, silty fine SAND; trace clay, roots			
	Ring	2 2 2	B11-1		-Same; trace gravel and rock fragments	9.6		
5	Ring	3 6		SP	Red-brown, moist, loose, f-c SAND with silt, gravel, and rock fragments; trace clay			
		10	B11-2	SC	-Becomes clayey f-c SAND with silt; trace gravel and rock fragments	7.5	119.3	
	SPT	10 14 16	B11-3	SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Brown mottled with iron oxide, moist, dense, clayey fine SAND with silt; some m-c sand	14		
10	Ring	9 16 20	B11-4	SP/SC	Red-brown, moist, dense, clayey fine SAND interbedded clayey f-m SAND and f-m SAND; trace coarse sand	16.1		
					Boring Terminated at 11.5 Feet No Groundwater Encountered Excavation Backfilled with Soil Cuttings			
15								
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= Hydrocollasped test	MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-12

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
				SM	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, dry to damp, medium dense, silty f-m SAND with gravel and rock fragments; roots			
	SPT	6 7 10	B12-1		-Same -Becomes brown to red-brown, silty f-c SAND with gravel and rock fragments; rootlets, minor pinhole porosity	7.9		
5	SPT	8 20 25/1"	B12-2		-Same, damp to moist, very rocky	9.6		
					Refusal at 6.5 Feet No Groundwater Encountered Excavation Backfilled with Soil Cuttings			
10								
15								
20								
25								
30								

LEGEND

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

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

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-13

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
				SC	**Artificial Fill** Brown, moist, loose to medium dense, clayey f-m SAND; roots			
				SM	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, moist, medium dense, silty f-c SAND with gravel and rock fragments			
5	Ring	10 20 50/4"	B13-1	SM/SC	Red-brown, damp to moist, medium dense to dense, silty f-m SAND to clayey f-c SAND with gravel and rock fragments	11.7	117.5	
	SPT	20 27 25	B13-2	SC	Grey-brown mottled with iron oxide, moist, very dense, clayey fine SAND to clay f-c SAND with gravel and rock fragments			
10	SPT	17 10 14	B13-3		-Limited recovery	5.4		
	SPT	5 5 9	B13-4	CL	**Friars Formation** Olive-grey, moist, stiff, silty CLAYSTONE; trace sand and gravel, iron oxide and manganese oxide staining			
15	SPT	4 6 8	B13-5		Olive-grey, moist, stiff, silty CLAYSTONE			
					Boring Terminated at 16.5 Feet No Groundwater Encountered Excavation 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
SR = Sulfate/Resisitivity Test
EI = Expansion Index
SH = Shear Test
SA = Sieve Analysis
HC= Hydrocollasped test
RV = R-Value Test
MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-14

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
				SC	**Artficial Fill** Brown, moist, very loose, clayey f-m SAND with silt			
	SPT	2 3 4	B14-1		Brown, moist, loose, clayey fine SAND -Becomes red-brown, clayey f-m SAND with silt	11.6		
5	Ring	5 12 24	B14-2	SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, moist, medium dense, clayey f-c SAND	14.7	117.8	
	SPT	5 7 8	B14-3	SC/CL CL	Brown to red-brown, moist, medium dense, interbedded clayey f-c SAND and sandy CLAY; iron oxide -Becomes silty CLAY with fine sand	19.6		
10	SPT	3 4 5	B14-4		Brown mottled with iron oxide, moist, stiff, silty CLAY with fine sand -Becomes wet	22.2		
15	SPT	6 3 3	B14-5	SC	Brown to red-brown, saturated, firm/loose, clayey fine SAND -Same; some gravel in cuttings	▽ 17.3		
20	SPT	3 11 26	B14-6	SW	Red-brown, saturated, dense, f-c SAND with silt; trace clay	19.8		
25					Boring Terminated at 21.5 Feet Groundwater Encountered at 15 Feet Excavation Backfilled with Bentonite			
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= Hydrocollasped test	MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-15

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
				SC/CL	**Artficial Fill** Brown, moist, loose, sandy CLAY to clayey f-c SAND with gravel and rock fragments			
	SPT	2 5 8	B15-1	CL	Dark brown to black, moist, stiff, sandy CLAY; caliche	20.8		
5	Ring	11 26 46	B14-2	SM	**Friars Formation** Pale greenish grey, moist, dense, silty fine SANDSTONE; trace clay -Same	19.3	105.8	
10	SPT	10 15		SM/SC	Olive-grey, moist, dense, silty to clayey fine SANDSTONE			
		17		ML	-Becomes pale green, clayey SILTSTONE			
					Boring Terminated at 11.5 Feet No Groundwater Encountered Excavation Backfilled with Soil Cuttings			
15								
20								
25								
30								

LEGEND

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

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

SUMMARY OF LABORATORY TESTING

Classification
Soils were classified visually according to the Unified Soil Classification System (ASTM Test Method D2487). The soil classifications are shown on the logs of exploratory borings in Appendix A.

Grain size distribution (particle size analysis) was performed on selected samples in general accordance with ASTM D422. Results of the grain size analysis are included herein (see Plates SA-1 through SA-3).

Liquid limit, plastic limit and plasticity index were determined in general accordance with ASTM Test Method D4318. Results are shown on the logs of exploratory borings in Appendix A.

Moisture-Density Relations
Laboratory testing was performed on representative samples collected during the subsurface exploration. The laboratory maximum dry density and optimum moisture content for representative soil types were determined in general accordance with test method ASTM D1557. Test results are presented on Plate MD-1.

Sulfate Content
Analysis to determine the water-soluble sulfate content was performed in accordance with California Test No. 417. Results of the testing indicated 0.006% sulfate by weight, which is considered negligible as per Table 19-A-4 of the UBC. The results of the testing are included herein (see Plate SL-1).

pH and Resistivity
Representative surficial soil samples were collected and tested for pH and resistivity in general accordance with California Test 643. The results of the testing are included herein (see Plate SR-1).

Expansion Index
Expansion Index testing was performed on a representative near-surface samples. Testing was performed in general accordance with ASTM Test Method D4829. The results indicate an Expansion Index (EI) is 2 for the soil tested. This is considered a very low expansion potential in accordance with Table 18AI-B of the 2001 CBC. The results are shown on Plate EI-1 through EI-2.

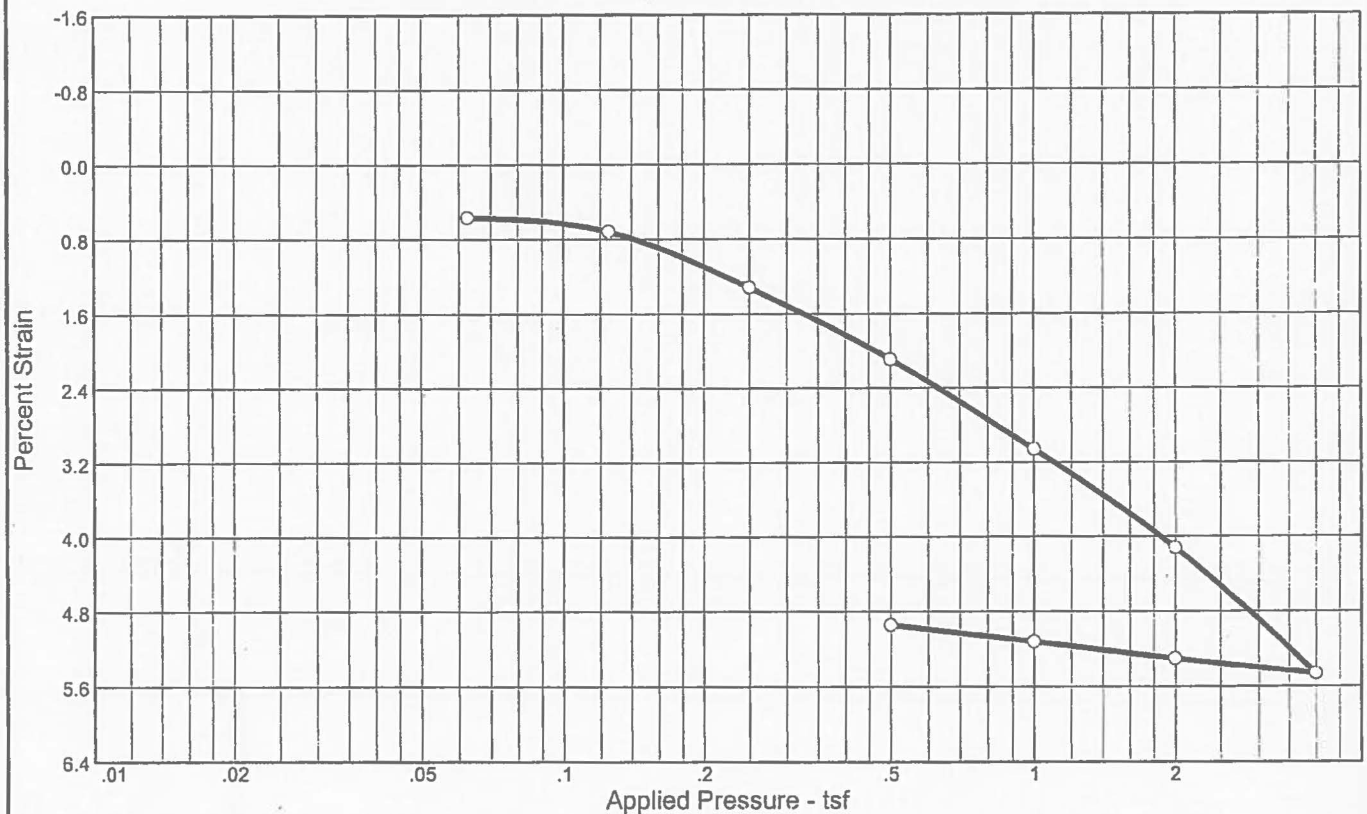
Direct Shear
Shear testing was performed in a direct shear machine of the strain-control type in general accordance with ASTM Test Method D3080. The rate of deformation is 0.03 inches per minute. The sample was sheared under varying confining loads in order to determine the

coulomb shear strength parameters, angle of internal friction and cohesion. The shear test results are presented on Plates SH-1 and SH-2 included herein.

Consolidation

Settlement predictions of the soil's behavior under loads are made on the basis of the consolidation tests in general accordance with ASTM D 2435. The consolidation apparatus is designed to receive a one-inch high ring used in the California split-spoon sampler. Loads are applied in several increments in a geometric progression, and the resulting deformations are recorded at selected time intervals. Porous stones are placed in contact with the top and bottom of each specimen to permit addition and release of pore fluid. Samples are initially tested at natural moisture content then fully saturated at a normal load as indicated. The results are shown on Plates C-1 thru C-2.

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (tsf)	C_v (ft.^{2}/day)	C_α	No.	Load (tsf)	C_v (ft.^{2}/day)	C_α	No.	Load (tsf)	C_v (ft.^{2}/day)	C_α
2	0.13	3.64									
3	0.25	0.40									
4	0.50	1.71									
5	1.00	0.92									
6	2.00	0.43									
7	4.00	1.31									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	Initial Void Ratio
Saturation	Moisture								
100.2 %	20.2 %	107.9			2.65		0.43	0.07	0.534

MATERIAL DESCRIPTION	USCS	AASHTO
Yellowish Brown Silty Fine to Medium Sand		

Project No. 2975 SD3 **Client:** William Lyon Homes

Project: Carlton Oaks

Location: B4-5 @ 15 Feet

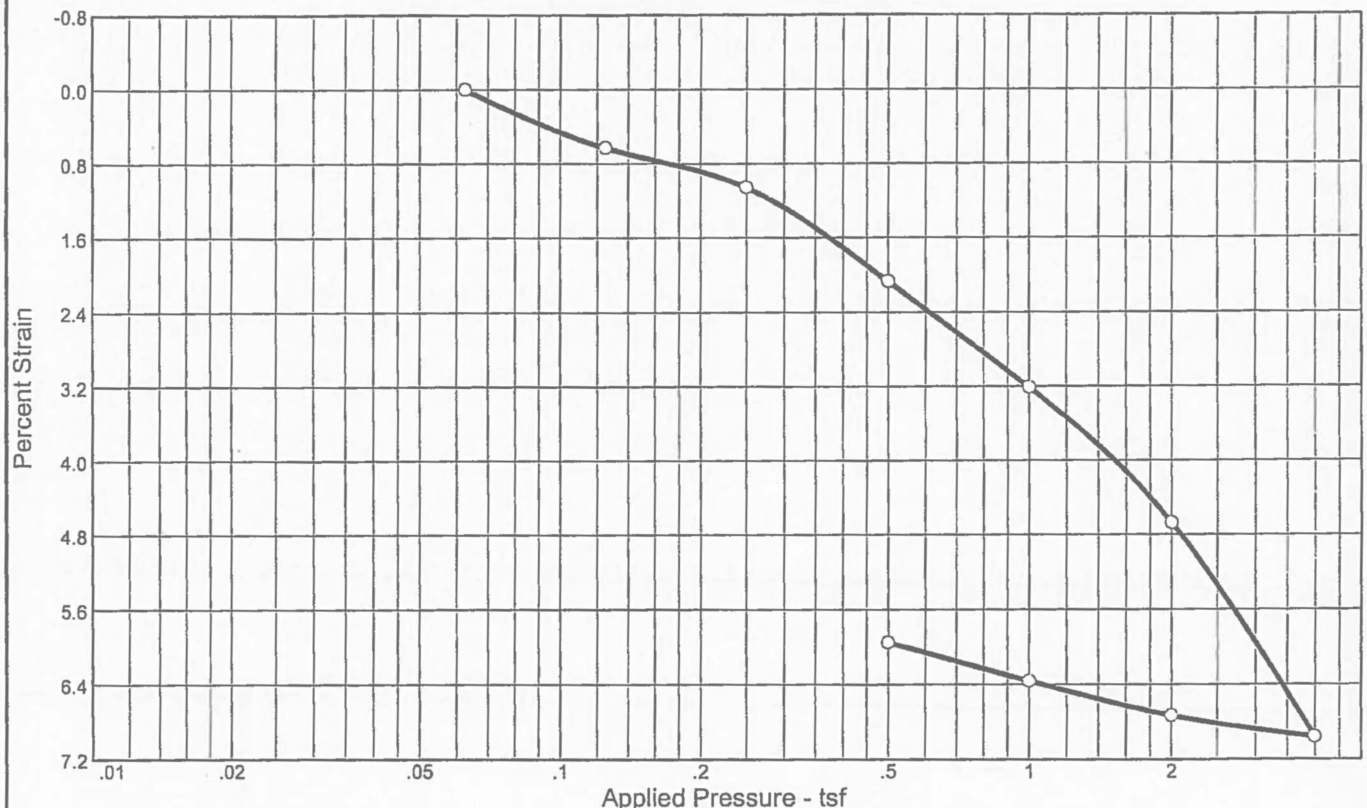
Remarks:

CONSOLIDATION TEST REPORT

GeoTek, Inc.

Plate C-1

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (tsf)	C_v (ft.^{2}/day)	C_α	No.	Load (tsf)	C_v (ft.^{2}/day)	C_α	No.	Load (tsf)	C_v (ft.^{2}/day)	C_α
2	0.13	2.48									
3	0.25	0.35									
4	0.50	0.19									
5	1.00	0.29									
6	2.00	0.34									
7	4.00	1.26									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	Initial Void Ratio
Saturation	Moisture								
96.5 %	18.9 %	109.0			2.65		0.84	0.12	0.518

MATERIAL DESCRIPTION	USCS	AASHTO
Brown Fine Sandy Clay		

Project No. 2975 SD3 **Client:** William Lyon Homes

Project: Carlton Oaks

Location: B10-4 @ 10'

Remarks:

CONSOLIDATION TEST REPORT

GeoTek, Inc.

Plate C-2

GEO TEK, INC.

EXPANSION INDEX TEST

(ASTM D4829)

Project Name:	William Lyon Homes	*Tested/ Checked By:*	AS Lab No 2117
Project Number:	2975 SD3	*Date Tested:*	2/8/2006
		Sample Source:	B4 - 1@ 2' - 5'
		Sample Description:	Brown Clayey Fine to Coarse Sand

Ring Id 12 Ring Dia. " 4" Ring l 1"

Loading weight: 5516. grams

DENSITY DETERMINATION

A	Weight of compacted sample & ring	**764**
B	Weight of ring	370
C	Net weight of sample	394
D	Wet Density, lb / ft3 (C*0.3016)	118.8
E	Dry Density, lb / ft3 (D/1.F)	**107.5**

SATURATION DETERMINATION

F	Moisture Content, %	**10.5**
G	(E*F)	1129.2
H	(E/167.232)	0.64
I	(1.-H)	0.36
J	(62.4*I)	22.3
K	(G/J)= L % Saturation	**50.7**

READINGS

DATE	TIME	READING	
2/8/2006	11:20	0.198	Initial
2/8/2006	11:30	0.198	10 min/Dry
2/8/2006	11:31	0.198	1 min/Wet
2/8/2006	11:36	0.199	5 min/Wet
2/8/2006	1:10	0.206	Random
2/9/2006	8:00	0.208	Final

FINAL MOISTURE

Weight of wet sample & tare	Weight of dry sample & tare	Tare	% Moisture
243.8	213.5	21.4	**15.8%**

EXPANSION INDEX = 10

(@50% SATURATION)

GEO TEK, INC.

EXPANSION INDEX TEST

(ASTM D4829)

Project Name:	William Lyon Homes	***Tested/ Checked By:***	AS Lab No 2117
Project Number:	2975 SD3	***Date Tested:***	2/8/2006
		Sample Source:	B10 - 1 @ 2. 5'
		Sample Description:	Dark Greenish Brown Clayey Sand

Ring Id 12 Ring Dia. " 4" Ring l 1"

Loading weight: 5516. grams

DENSITY DETERMINATION

A	Weight of compacted sample & ring	**766.3**
B	Weight of ring	370
C	Net weight of sample	396.3
D	Wet Density, lb / ft3 (C*0.3016)	119.5
E	Dry Density, lb / ft3 (D/1.F)	**108.2**

SATURATION DETERMINATION

F	Moisture Content, %	**10.5**
G	(E*F)	1135.7
H	(E/167.232)	0.65
I	(1.-H)	0.35
J	(62.4*I)	22.0
K	(G/J)= L % Saturation	**51.5**

READINGS

DATE	TIME	READING	
2/8/2006	11:20	0.041	Initial
2/8/2006	11:30	0.041	10 min/Dry
2/8/2006	11:31	0.041	1 min/Wet
2/8/2006	11:36	0.042	5 min/Wet
2/8/2006	1:10	0.046	Random
2/9/2006	8:00	0.050	Final

FINAL MOISTURE

Weight of wet sample & tare	Weight of dry sample & tare	Tare	% Moisture
200.1	172.5	16	**17.6%**

EXPANSION INDEX = 10

(@50% SATURATION)

MAXIMUM DENSITY CURVE

Curve No.: A

Project No.: 2975 SD3 **Date:** 2/7/06
Project: Carlton Oaks

Location: B4-2
Elev./Depth: 2' to 5'
Remarks:

MATERIAL DESCRIPTION

Description: Dark Brown Fine to Coarse Sand w/Gravel

Classifications - **USCS:** **AASHTO:**
Nat. Moist. = **Sp.G. =**
Liquid Limit = **Plasticity Index =**
% > No.4 = % **% < No.200 =**

TEST RESULTS
Maximum dry density = 128.5 pcf
Optimum moisture = 9 %

Test specification:
ASTM D 1557-00 Method A Modified

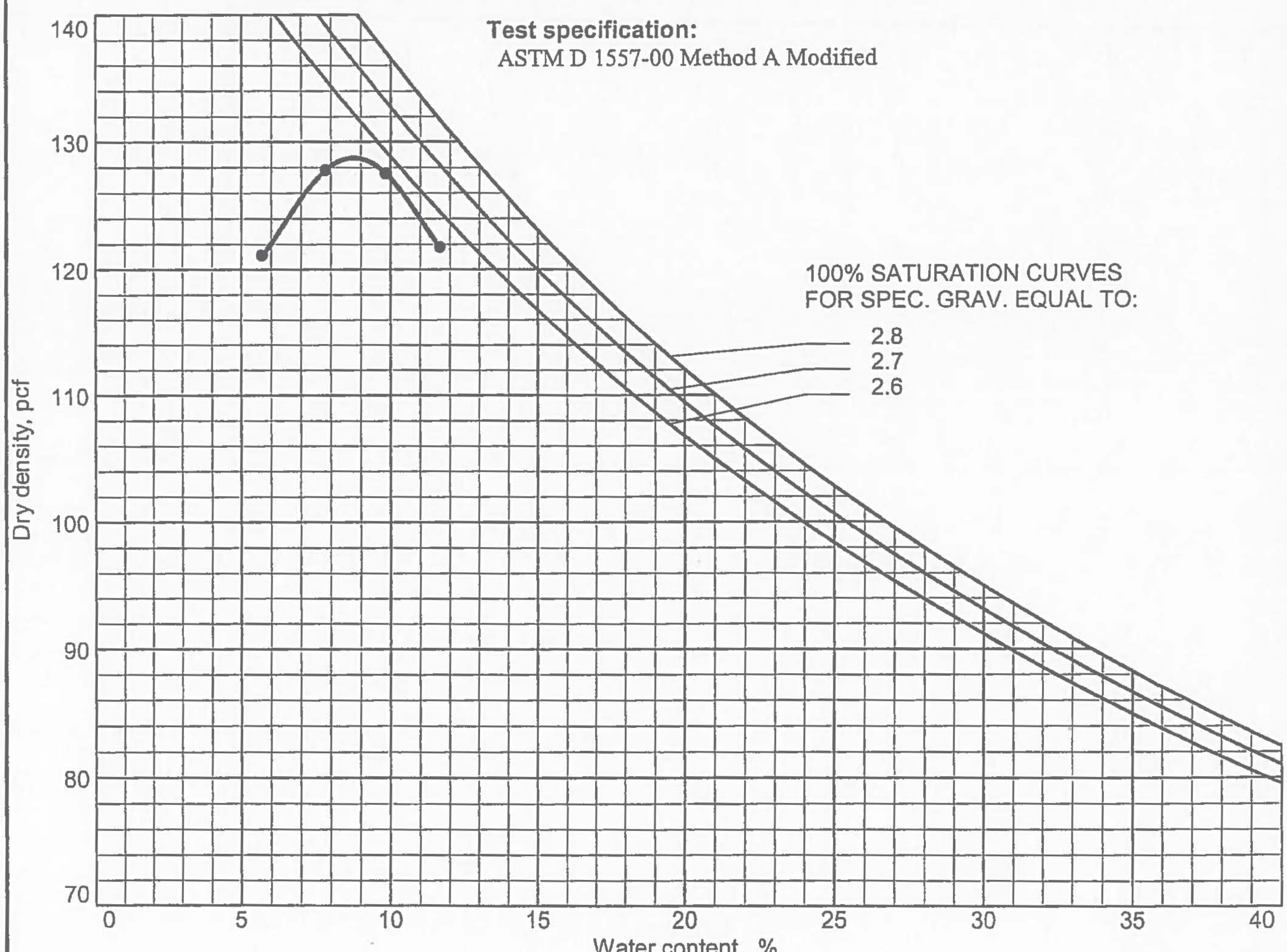
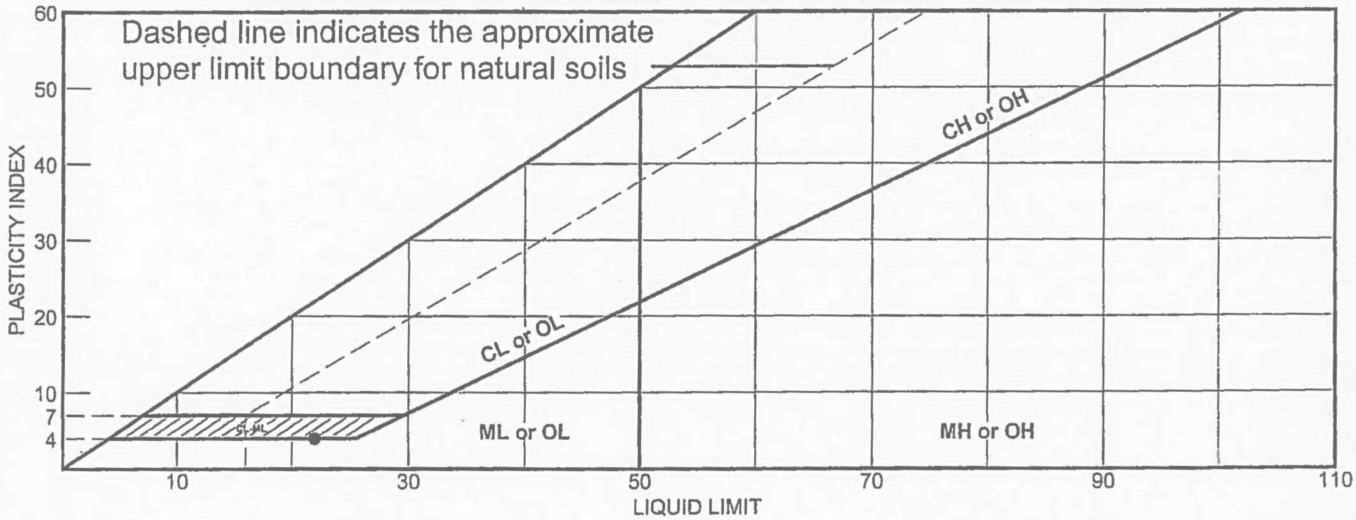
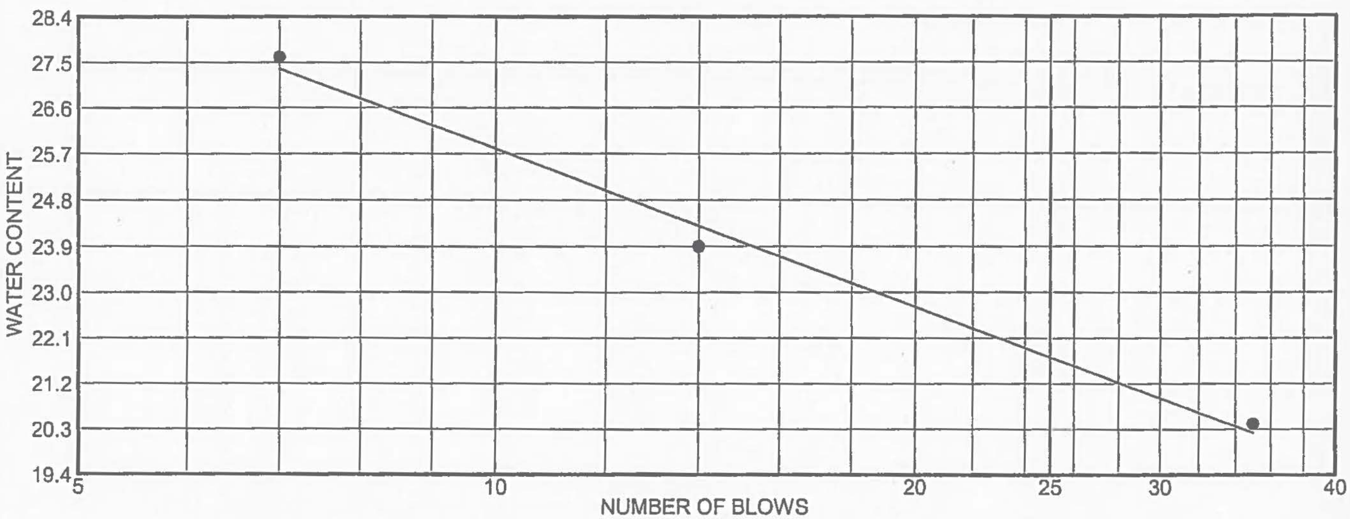


Plate MD-1

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Clayey Sand	22	18	4			

Project No. 2975 SD3 **Client:** William Lyon Homes

Project: Carlton Oaks

● **Location:** B14-1 @ 15 Feet

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

GeoTek, Inc.

Plate PI-1

SIEVE ANALYSIS of COARSE & FINE AGGREGATE

GEO TEK, INC.

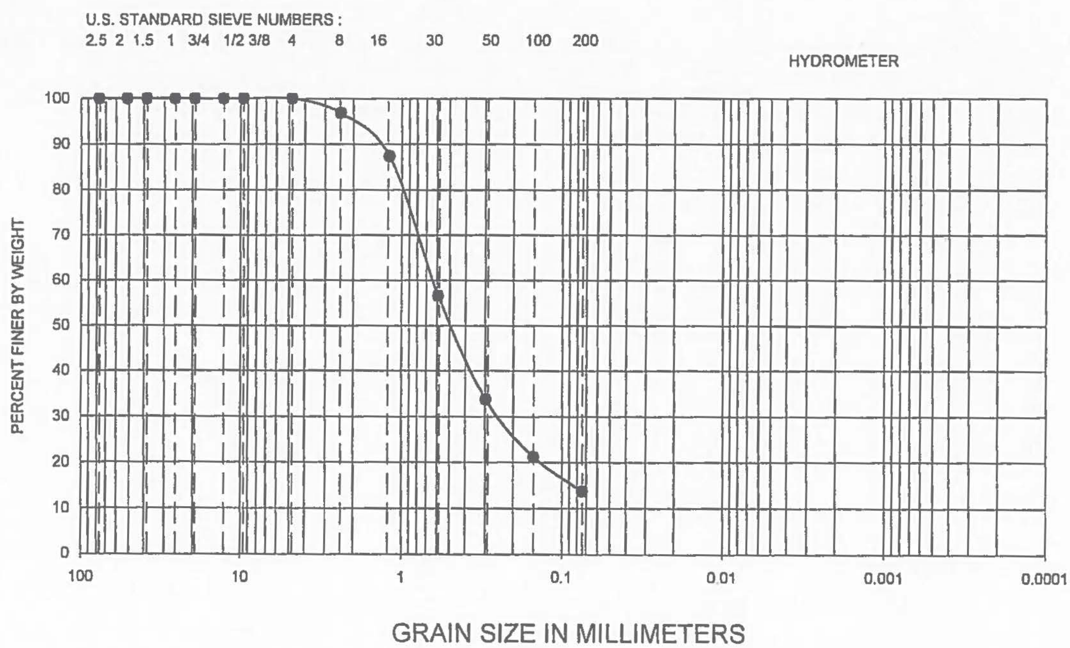
CLIENT:	William Lyon Homes	LAB NO.:	2117
PROJECT:	Carlton Oaks	PROJECT: NO.:	2975 SD3
MATERIAL LOCATION:	B4 @ 15'	DATE:	2/8/2006

SAMPLE DESCRIPTION Brown Clayey Sand

TOTAL WT. SAMPLE (DRY)	257.7 Dry	WT. COARSE (+) # 4	0	Dry	WT COARSE %	0.0
Wet Wt. Before Wash (-)#4	309.8 Wet	WT. FINE (-) # 4	309.8	Wet	WT FINE %	100.0
Dry Wt. Before Wash (-)#4	257.7 Dry		257.7	Dry	-200%	13.7
			0.202	Moisture Content (- # 4)		

Sieve Size	WEIGHT RETAINED Ind	Cum		% RETAINED Ind	Cum		Combined % Passing	Specs.
3"/75mm		0			0		100	
2"/50mm		0			0		100	
1.5"/37.5mm		0			0		100	
1"/25mm		0			0		100	
.75"/19mm		0			0		100	
.5"/12.5mm		0			0		100	
.375"/9.5mm		0			0		100	
#4/4.75mm		0			0		100	
#8		8.1		(3)	(97)		97	
#16		32.6		(13)	(87)		87	
#30		112		(43)	(57)		57	
#50		170.6		(66)	(34)		34	
#100		202.9		(79)	(21)		21	
#200		222.3		(86)	(14)		13.7	
PAN								
WASH		35.4						

Notes:
all weights are in grams



GEO TEK, INC.

SIEVE ANALYSIS of COARSE & FINE AGGREGATE

AASHTO R18

CLIENT: William Lyon Homes — LAB NO.: 2117

PROJECT: Carlton Oaks — PROJECT: NO.: 2117

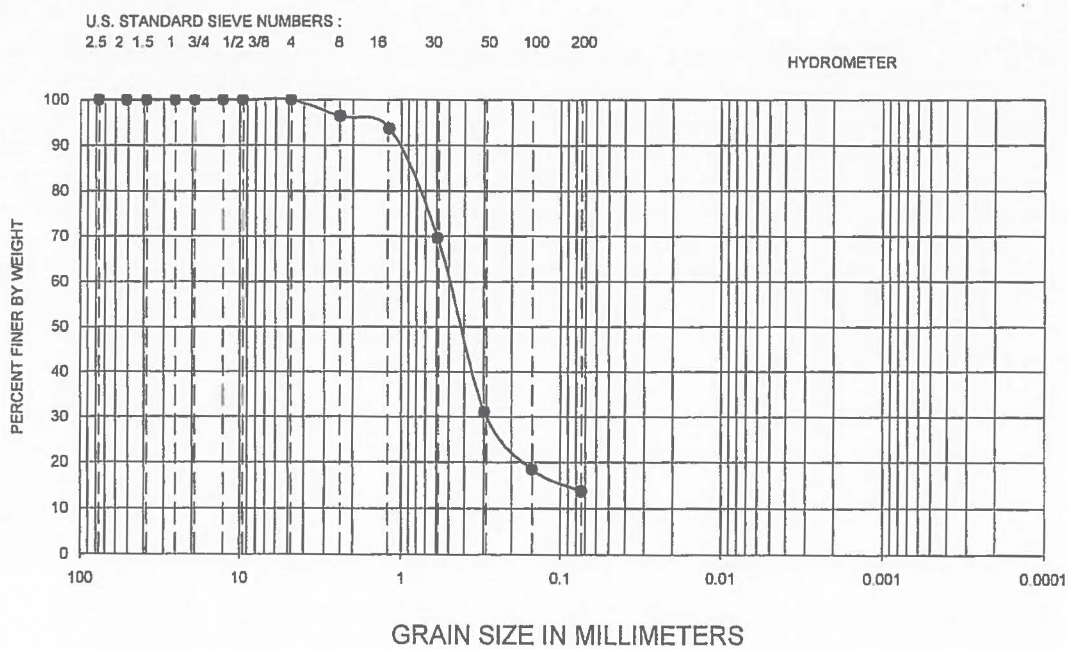
MATERIAL LOCATION: B10 @ 15' — DATE: 2/8/2006

SAMPLE DESCRIPTION Brown Silty Fine to Coarse Sand

TOTAL WT. SAMPLE (DRY)	296.5 Dry	WT. COARSE (+) # 4	0	Dry	WT COARSE %	0.0
Wet Wt. Before Wash (-)#4	379.5 Wet	WT. FINE (-) # 4	379.5	Wet	WT FINE %	100.0
Dry Wt. Before Wash (-)#4	296.5 Dry		296.5	Dry	-200%	13.8
			0.28	Moisture Content (- # 4)		

Sieve Size	WEIGHT RETAINED Ind	WEIGHT RETAINED Cum		% RETAINED Ind	% RETAINED Cum		Combined % Passing	Specs.
3"/75mm		0			0		100	
2"/50mm		0			0		100	
1.5"/37.5mm		0			0		100	
1"/25mm		0			0		100	
.75"/19mm		0			0		100	
.5"/12.5mm		0			0		100	
.375"/9.5mm		0			0		100	
#4/4.75mm		0			0		100	
#8		10.5		(4)	(96)		96	
#16		18.7		(6)	(94)		94	
#30		90.1		(30)	(70)		70	
#50		204.3		(69)	(31)		31	
#100		241.7		(82)	(18)		18	
#200		255.6		(86)	(14)		13.8	
PAN								
WASH		40.9						

Notes:
all weights are in grams



GEO TEK, INC.

SIEVE ANALYSIS of COARSE & FINE AGGREGATE

AASHTO R18

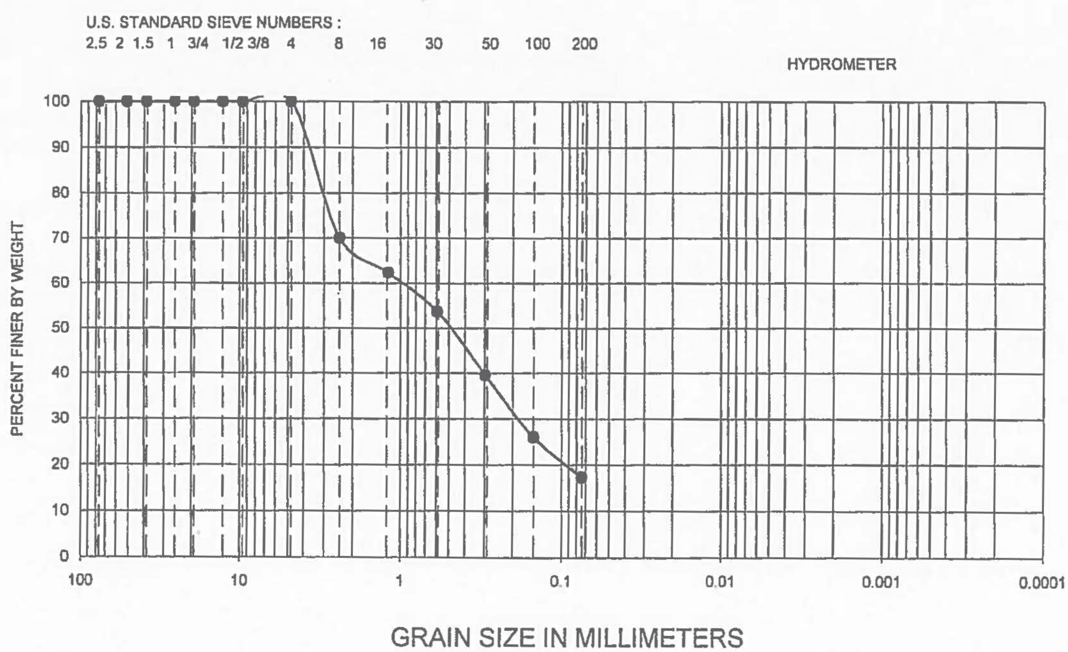
CLIENT:	William Lyon Homes	LAB NO.:	2117
PROJECT:	Carlton Oaks	PROJECT: NO.:	2117
MATERIAL LOCATION:	B14 @ 15'	DATE:	2/8/2006

SAMPLE DESCRIPTION Brown Clayey Sand

TOTAL WT. SAMPLE (DRY)	128.2 Dry	WT. COARSE (+) # 4	0	Dry	WT COARSE %	0.0
Wet Wt. Before Wash (-)#4	150.4 Wet	WT. FINE (-) # 4	150.4	Wet	WT FINE %	100.0
Dry Wt. Before Wash (-)#4	128.2 Dry		128.2	Dry	-200%	17.3
			0.173	Moisture Content (- # 4)		

Sieve Size	WEIGHT RETAINED Ind	WEIGHT RETAINED Cum		% RETAINED Ind	% RETAINED Cum		Combined % Passing	Specs.
3"/75mm		0			0		100	
2"/50mm		0			0		100	
1.5"/37.5mm		0			0		100	
1"/25mm		0			0		100	
.75"/19mm		0			0		100	
.5"/12.5mm		0			0		100	
.375"/9.5mm		0			0		100	
#4/4.75mm		0			0		100	
#8		38.4		(30)	(70)		70	
#16		48.3		(38)	(62)		62	
#30		59.4		(46)	(54)		54	
#50		77.4		(60)	(40)		40	
#100		94.7		(74)	(26)		26	
#200		106		(83)	(17)		17.3	
PAN								
WASH		22.2						

Notes:
all weights are in grams



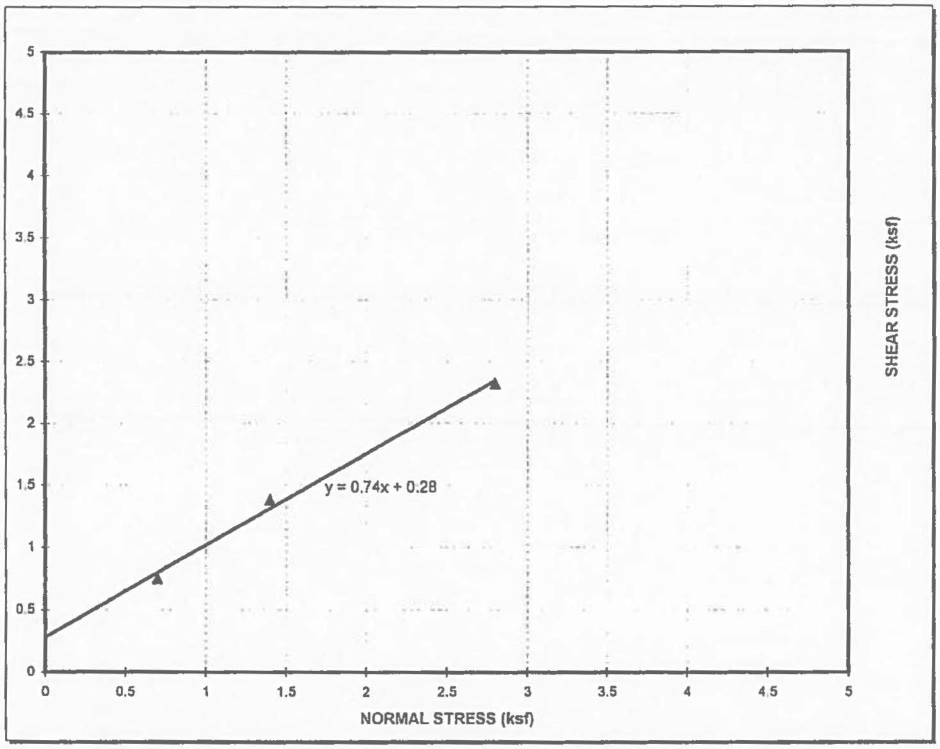
GEO TEK, INC.

DIRECT SHEAR TEST

Project Name: Carlton Oaks
Project Number: 2975 SD3

Sample Source: B4-1 @ 2 - 5'
Date Tested: 02/09/06

Soil Description: Brown Fine to Coarse Sand



Shear Strength: $\Phi = 36.5^{o}$, $C = 0.28$ ksf

Test No.	Load (ksf)	Water Content (%)	Dry Density (pcf)
1	0.7	9	115.7
2	1.4	9	115.5
3	2.8	9	115.6

Note: Saturated in shear box

Notes:
1 - The soil specimen used in the shear box were remolded "ring" samples.
2 - Shear strength calculated at 5% of load.
3 - The tests were ran at a shear rate of 0.03 in/min.

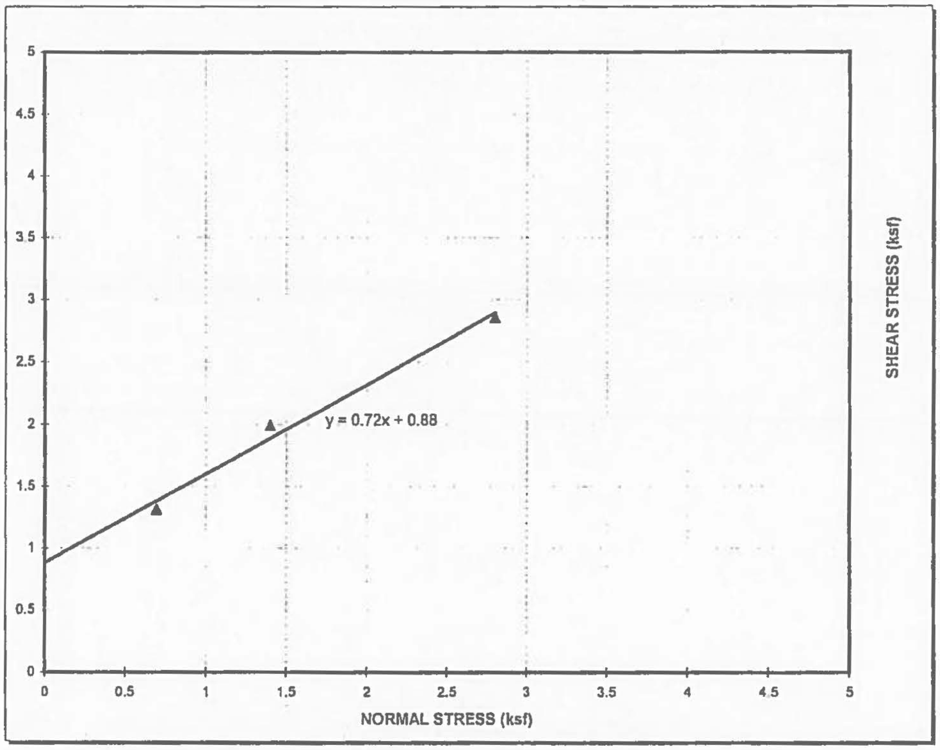
GEO TEK, INC.

DIRECT SHEAR TEST

Project Name: Carlton Oaks
Project Number: 2975 SD3

Sample Source: B14-2 @ 5'
Date Tested: 02/09/06

Soil Description: Brown Clayey Sand



Shear Strength: $\Phi = 35.8^{o}$, C = 0.88 ksf

Test No.	Load (ksf)	Water Content (%)	Dry Density (pcf)
1	0.7	14.7	113.7
2	1.4	14.7	112.5
3	2.8	14.7	111.1

Note: Saturated in shear box

Notes:
1 - The soil specimen used in the shear box were "ring" samples collected during the field investigation.
2 - Shear strength calculated at 5% of load.
3 - The tests were ran at a shear rate of 0.03 in/min.

LABORATORY REPORT

Telephone (619) 425-1993 Fax 425-7917 Established 1928

CLARKSON LABORATORY AND SUPPLY INC.
350 Trousdale Dr. Chula Vista, Ca. 91910 www.clarksonlab.com
ANALYTICAL AND CONSULTING CHEMISTS

Date: February 9, 2006
Purchase Order Number: 2975-SD3
Sales Order Number: 82550
Account Number: GEOT

To:
--
GeoTek,Inc.
1384 Poinsetta Avenue, Suite A
Vista, CA 92083
Attention: David Cliff

Laboratory Number: SO9639 Customers Phone: 760-599-0509
Fax: 760-599-0593

Sample Designation:
--
One soil sample received on 2/8/06 taken from
2975-SD3 marked as follows:

ANALYSIS: Water Soluble Sulfate California Test 417

Sample	SO_4%
B4-2 @ 2-5'	0.004

Jeff Shannon

Jeff Shannon

GEO TEK, INC.

1384 Poinsettia Ave., Suite A, Vista, CA 92083
(760) 599-0509 FAX (760) 599-0593

SOIL RESISTIVITY

(California Test 643)

Project Name:	William Lyon Homes	*Tested/ Checked By:*	DC Lab No 2117
Project Number:	2975-SD3	*Date Tested:*	2/9/2006
		Sample Source:	B4-1 @ 2 to 5 ft
		Sample Description:	Brown Fine to Coarse Sand

A Determing the soil's pH 7.2

	Water Added (mL)	Measured Res from Nil. 400 (ohms-cm)
B	100	2100
C	50	1800
D	20	1700
E	20	1600
F	20	1650
G		
H		
I		
J		

Minimum Resistivity = 1600

24.8 years to perforation for a 18 gauge metal culvert.
32.3 years to perforation for a 16 gauge metal culvert.
39.8 years to perforation for a 14 gauge metal culvert.
54.7 years to perforation for a 12 gauge metal culvert.
69.6 years to perforation for a 10 gauge metal culvert.
84.5 years to perforation for a 8 gauge metal culvert.

APPENDIX D

APPENDIX D

PREVIOUSLY REPORTED BORING LOGS
AND LABORATORY TEST RESULTS
PERFORMED BY GEOTEK INCORPORATED

FOR

CARLTON OAKS GOLF COURSE
RESIDENTIAL NORTH AND RESIDENTIAL WEST SITES
SANTEE, CALIFORNIA

PROJECT NO. G2290-32-01

LEGEND TO FIELD TESTING AND SAMPLING

A - FIELD TESTING AND SAMPLING PROCEDURES

The Standard Penetration Test (SPT)
The SPT is performed in accordance with ASTM Test Method D 1586-99. The SPT 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 split-barrel sampler has an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The samples of earth materials collected in the sampler are typically classified in the field, bagged, sealed and transported to the laboratory for further testing.

The Modified Split-Barrel Sampler (Ring)
The Ring sampler is driven into the ground in accordance with ASTM Test Method D 3550-84. 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.

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

Small Bulk Samples
These samples are normally airtight plastic bags that are typically less than 5 pounds in weight of representative earth materials collected from the field by means of the split spoon sampler, hand digging or exploratory cuttings. These samples are primarily used for determining natural moisture content and classification indices.

B - BORING LOG LEGEND

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

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

(Additional denotations and symbols are provided on the logs of borings)

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-1

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
					3" Asphalt			
					Artificial Fill			
				SC	Red-brown, moist, loose, clayey SAND with gravel			
	SPT	1 1 3	B1-1		-Same	8.3		
5	SPT	2 2 2	B1-2	SM	Red-brown, damp, loose, silty SAND with gravel; trace clay	11.1		
	Ring	3 6 7	B1-3		-Same; becomes brown to red-brown	8.3	114.3	
10	Ring	9 22 46	B1-4	SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Brown to orange-browm, moist, dense, silty to clayey SAND with gravel	13.8	115.7	
					Orange-brown, moist, medium dense, clayey f-c SAND, trace well rounded small gravels			
15	SPT	7 10 13	B1-5			15.4		
					Boring Terminated at 16.5 Feet No Groundwater Encountered Excavation 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
SR = Sulfate/Resisitivity Test
EI = Expansion Index
SH = Shear Test
SA = Sieve Analysis
HC= Hydrocollasped test
RV = R-Value Test
MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-2

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
					3" Asphalt			
				SC	**Artificial Fill** Brown, moist, medium dense, clayey SAND with gravel and rock fragments			
	SPT	4 4 6	B2-1		-Same	12.5		
					-Becomes rockier			
5	Ring	8 5 13	B2-2	CL	Dark brown, moist, medium dense, silty to sandy CLAY with gravel and rock fragments	23	102.6	
	SPT	17 13 10	B2-3	SM/SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Orange-brown, moist, medium dense, silty to clayey SAND with gravel and rock fragments; limited recovery	9.8		
10	Ring	7 15 16	B2-4	SM	Orange-brown, moist, medium dense, silty fine SAND with clay; micaceous, trace medium sand	20.1	107.7	
				CL	-Becomes sandy CLAY with silt			
	Small Bulk		B2-5	CL	**Friars Formation** Pale greenish gray, moist, stiff, silty CLAYSTONE with fine sand			
15	SPT	8 14 21	B2-6	SC/CL	-becomes dense, clayey fine SANDSTONE with silt interbedded with silty CLAYSTONE with fine sand			
					-Same			
20	Ring	17 27 25/3"	B2-7	SP	-becomes dense to very dense, fine SAND; trace silt and clay			
					Boring Terminated at 21.5 Feet No Groundwater Encountered Excavation 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= Hydrocollasped test
MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: *B-3*

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
				SM	**Artificial Fill** Dark brown, wet, loose, silty f-m SAND with clay; concrete debris			
					-Difficult drilling, abundant concrete with rebar			
5					-Same			
		11 16 20	B3-1	SM	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, damp to moist, dense, silty f-m SAND with gravel and rock fragments -Becomes very rocky	5.8		
10		9 16 16	B3-2	SM/SC	Brown to red-brown, wet to saturated, dense, silty to clayey f-c SAND with gravel and rock fragments -Abundant rounded cobbles in cuttings	12.8		
				SM	-Becomes silty f-c SAND with clay			
15		10 20 24	B3-3		Red-brown, saturated, medium dense, silty f-c SAND with clay	23.8		
				SC	**Friars Formation** Pale greenish gray, moist, dense, clayey fine SANDSTONE with silt			
20		27 40 50/5"	B3-4		-Same, very dense	19.1		
25		17 56/6"	B3-5		-Same, interbedded with SILTSTONE/CLAYSTONE			
30					(continued)			

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= Hydrocollasped test	MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: *B-3 continued*

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
30	SPT	14 18 27	B3-6	ML/CL	**continued** Pale greenish gray, moist, hard, CLAYSTONE/SILTSTONE interbedded with dense, silty to clayey fine SANDSTONE			
					Boring Terminated at 31.5 Feet Groundwater Encountered at 10 Feet Excavation Backfilled with Bentonite Grout			
35								
40								
45								
50								
55								
60								

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= Hydrocollasped test; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

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
				SM	**Artificial Fill** Brown, moist to wet, loose, silty f-m SAND with gravel and rock fragments; trace clay			
	SPT	8 11 25/3"	B4-1	SC	Brown to red-brown, medium dense, moist, clayey f-c SAND with gravel and rock fragments	8		
	Large Bulk		B4-2		-Difficult drilling, very rocky			
5								
				SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, wet to saturated, medium dense, clayey f-c SAND with gravel and rock fragments	Water Table		
	SPT	8 15 14	B4-3			13.5		
10	Ring	43 50/5"	B4-4		Same, dense to very dense	9.3	117.2	
15	Ring	10 11 13	B4-5	SP	Red-brown, saturated, medium dense, f-m SAND with silt; trace clay			
				ML/CL	**Friars Formation** Pale greenish gray, wet, very stiff, fine sandy CLAYSTONE to clayey SILTSTONE with fine sand			
20	SPT	8 8 9	B4-6		-Same			
25	SPT	8 9 14	B4-7	ML	Pale greenish gray, moist, very stiff, clayey SILTSTONE with fine sand	24.1		
30					**(continued)**			

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= Hydrocollasped test | MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: *B-4 continued*

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
30	SPT	8 9 15	B4-8	ML/CL	**Continued** Gray, moist, very stiff, silty CLAYSTONE to clayey SILTSTONE with fine sand			
35	SPT	18 17 24			-Becomes hard; trace fine sand			
					Boring Terminated at 36.5 Feet Groundwater Encountered at 7 Feet Excavation Backfilled with Bentonite Grout			
40								
45								
50								
55								
60								

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= Hydrocollasped test; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-5

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
					Artficial Fill			
				SM	Brown, moist, loose, silty f-m SAND with clay; some gravel and rock fragments			
					Terrace Deposits/Older Alluvium (undifferentiated)			
	SPT	11 18 18	B5-1	SC	Red-brown, moist, dense, clayey SAND with gravel and rock fragments	11.5		
5					-Difficult drilling, very rocky			
					-Becomes wet to saturated @ 7' Perched groundwater	▽		
					-Same			
10	SPT	9 12 20	B5-2	SM	Red-brown, saturated, dense, silty f-c SAND with clay, gravel and rock fragments	14.2		
					Friars Formation			
				ML/CL	Pale greenish gray, moist, very stiff, CLAYSTONE/SILTSTONE; trace fine sand			
15	SPT	5 9 12	B5-3		-Same			
20	SPT	8 12 18	B5-4		-Same, become hard; minor caliche spottings			
					Boring Terminated at 21.5 Feet Groundwater Encountered at 7 Feet Excavation Backfilled with Bentonite			
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= Hydrocollasped test	MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-6

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
				SM	**Artficial Fill** Brown, moist, loose, silty f-m SAND with gravel and rock fragments			
				SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, moist, medium dense, clayey SAND with gravel and rock fragments			
5	SPT	21 16 16	B6-1		-Same, becomes dense	2.6		
	Small Bulk		B6-2		-Difficult drilling, very rocky	8.1		
10	SPT	10 5 5	B6-3	CL	**Friars Formation** Pale greenish gray, moist to wet, stiff, silty CLAYSTONE with fine sand	25.1		
	SPT	6 8 12	B6-4		-Same, minor iron oxide staining			
15					Boring Terminated at 15 Feet No Groundwater Encountered Excavation 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= Hydrocollasped test; MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-7

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
				SM/SC	**Artficial Fill** Brown, moist, loose, silty to clayey f-m SAND with gravel			
				SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, moist, medium dense, clayey SAND with gravel and rock fragments			
5	SPT	10 15 18	B7-1		-Same, becomes dense	7.7		
					-Difficult drilling, very rocky			
					Refusal at 7.5 Feet No Groundwater Encountered Excavation Backfilled with Soil Cuttings			
10								
15								
20								
25								
30								

LEGEND

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

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

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-8

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
				SM/SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, moist, medium dense, silty to clayey SAND with gravel and rock fragments			
	SPT	13 20 21	B8-1		-Same, becomes dense, very rocky	6.3		
5	SPT	9 12 22	B8-2		-Same	11.2		
					@ 7' Perched groundwater	∇		
	SPT	13 36 50/5"	B8-3		-Same, becomes very dense	9.5	120.1	
10	SPT	8 6 5	B8-4	CL	**Friars Formation** Pale greenish gray, moist, stiff, silty CLAYSTONE with fine sand			
					Boring Terminated at 11.5 Feet Groundwater Encountered at 7 Feet Excavation Backfilled with Bentonite			
15								
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= Hydrocollasped test
MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-9

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
				SM/SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, moist, medium dense, silty to clayey SAND with gravel and rock fragments			
	SPT	9 15 15	B9-1		-Same, becomes dense	10.9		
5	SPT	6 9 16	B9-2	SC	-Becomes medium dense, clayey f-c SAND	13.5		
	SPT	15 27 28	B9-3		-Same, becomes dense to very dense; rocky	8.7		
10	SPT	13 11 14	B9-4	SC/CL	**Friars Formation** Pale greenish gray, moist, very stiff, clayey fine SANDSTONE with silt to silty CLAYSTONE with fine sand	17.8		
					Boring Terminated at 11.5 Feet No Groundwater Encountered Excavation Backfilled with Soil Cuttings			
15								
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= Hydrocollasped test; MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-10

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
				SM	**Artificial Fill** Dark brown, moist, loose, silty fine SAND; trace clay, roots			
	SPT	4 2 1	B10-1	SP	Brown, moist, very loose, f-m SAND with silt and rock fragments; trace gravel	13.9		
5	Ring	3 4		SC/CL	Grey-brown, moist, loose, clayey fine SAND to fine sandy CLAY			
		7	B10-2	SC	Dark brown, moist, loose, clayey f-c SAND	16.6	109.7	
	SPT	2 2 4	B10-3	CL	**Terrace Deposits/Older Alluvium (undifferentiated)** Brown to grey-brown mottled with iron oxide, wet, firm, fine sandy CLAY with silt	22.6		
10	Ring	3 6 7	B10-4		Brown mottled with iron oxide, moist, stiff, fine sandy CLAY -Grades to clayey fine SAND -Become rocky @ 14' Perched groundwater	▽		
15	SPT	2 6 5	B10-5	SP	Brown to red-brown, saturated, medium dense, f-m SAND with silt; trace clay	28.1		
				ML/CL	**Friars Formation** Pale greenish gray, moist, very stiff, clayey SILTSTONE with fine sand to fine sandy CLAYSTONE with silt			
20	Ring	8 14 26	B10-6		-Same; trace manganese oxide staining			
25	SPT	6 12 18	B10-7		-Same	21.6		
30					(Continued)			

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= Hydrocollasped test; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: *B-10 continued*

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
30	SPT	10 14 20	B10-8	ML/CL	**Continued** Pale greenish gray, moist, hard, clayey SILTSTONE with fine sand to fine sandy CLAYSTONE with silt			
					Boring Terminated at 31.5 Feet Groundwater Encountered at 14 Feet Excavation Backfilled with Bentonite Grout			
35								
40								
45								
50								
55								
60								

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= Hydrocollasped test; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-11

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
				SM	**Artficial Fill** Dark brown, moist, loose, silty fine SAND; trace clay, roots			
	SPT	2 2 2	B11-1		-Same; trace gravel and rock fragments	9.6		
5	Ring	3 6		SP	Red-brown, moist, loose, f-c SAND with silt, gravel, and rock fragments; trace clay			
		10	B11-2	SC	-Becomes clayey f-c SAND with silt; trace gravel and rock fragments	7.5	119.3	
	SPT	10 14 16	B11-3	SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Brown mottled with iron oxide, moist, dense, clayey fine SAND with silt; some m-c sand	14		
10	Ring	9 16 20	B11-4	SP/SC	Red-brown, moist, dense, clayey fine SAND interbedded clayey f-m SAND and f-m SAND; trace coarse sand	16.1		
					Boring Terminated at 11.5 Feet No Groundwater Encountered Excavation Backfilled with Soil Cuttings			
15								
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= Hydrocollasped test; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-12

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
				SM	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, dry to damp, medium dense, silty f-m SAND with gravel and rock fragments; roots			
	SPT	6 7 10	B12-1		-Same -Becomes brown to red-brown, silty f-c SAND with gravel and rock fragments; rootlets, minor pinhole porosity	7.9		
5	SPT	8 20 25/1"	B12-2		-Same, damp to moist, very rocky	9.6		
					Refusal at 6.5 Feet No Groundwater Encountered Excavation Backfilled with Soil Cuttings			
10								
15								
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= Hydrocollasped test; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-13

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
				SC	**Artficial Fill** Brown, moist, loose to medium dense, clayey f-m SAND; roots			
				SM	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, moist, medium dense, silty f-c SAND with gravel and rock fragments			
5	Ring	10 20 50/4"	B13-1	SM/SC	Red-brown, damp to moist, medium dense to dense, silty f-m SAND to clayey f-c SAND with gravel and rock fragments	11.7	117.5	
	SPT	20 27 25	B13-2	SC	Grey-brown mottled with iron oxide, moist, very dense, clayey fine SAND to clay f-c SAND with gravel and rock fragments			
10	SPT	17 10 14	B13-3		-Limited recovery	5.4		
	SPT	5 5 9	B13-4	CL	**Friars Formation** Olive-grey, moist, stiff, silty CLAYSTONE; trace sand and gravel, iron oxide and manganese oxide staining			
15	SPT	4 6 8	B13-5		Olive-grey, moist, stiff, silty CLAYSTONE			
					Boring Terminated at 16.5 Feet No Groundwater Encountered Excavation 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; SR = Sulfate/Resisitivity Test; EI = Expansion Index; SH = Shear Test; SA = Sieve Analysis; HC= Hydrocollasped test; RV = R-Value Test; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-14

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
				SC	**Artficial Fill** Brown, moist, very loose, clayey f-m SAND with silt			
	SPT	2 3 4	B14-1		Brown, moist, loose, clayey fine SAND -Becomes red-brown, clayey f-m SAND with silt	11.6		
5	Ring	5 12 24	B14-2	SC	**Terrace Deposits/Older Alluvium (undifferentiated)** Red-brown, moist, medium dense, clayey f-c SAND	14.7	117.8	
	SPT	5 7 8	B14-3	SC/CL CL	Brown to red-brown, moist, medium dense, interbedded clayey f-c SAND and sandy CLAY; iron oxide -Becomes silty CLAY with fine sand	19.6		
10	SPT	3 4 5	B14-4		Brown mottled with iron oxide, moist, stiff, silty CLAY with fine sand -Becomes wet	22.2		
15	SPT	6 3 3	B14-5	SC	Brown to red-brown, saturated, firm/loose, clayey fine SAND -Same; some gravel in cuttings	∇ 17.3		
20	SPT	3 11 26	B14-6	SW	Red-brown, saturated, dense, f-c SAND with silt; trace clay	19.8		
					Boring Terminated at 21.5 Feet Groundwater Encountered at 15 Feet Excavation Backfilled with Bentonite			
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= Hydrocollasped test	MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	William Lyon Homes	DRILLER:	CalPac Drilling	LOGGED BY:	PJ
PROJECT NAME:	Carlton Oaks	DRILL METHOD:	8" Hollow Stem	OPERATOR:	Elliot
PROJECT NO.:	2975SD3	HAMMER:	140"/30" Auto	RIG TYPE:	Mobile B-61
LOCATION:	See Boring Location Plan			DATE:	1/30/2006

BORING NO.: B-15

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
				SC/CL	**Artficial Fill** Brown, moist, loose, sandy CLAY to clayey f-c SAND with gravel and rock fragments			
	SPT	2 5 8	B15-1	CL	Dark brown to black, moist, stiff, sandy CLAY; caliche	20.8		
5	Ring	11 26 46	B14-2	SM	**Friars Formation** Pale greenish grey, moist, dense, silty fine SANDSTONE; trace clay -Same	19.3	105.8	
10	SPT	10 15		SM/SC	Olive-grey, moist, dense, silty to clayey fine SANDSTONE			
		17		ML	-Becomes pale green, clayey SILTSTONE			
					Boring Terminated at 11.5 Feet No Groundwater Encountered Excavation Backfilled with Soil Cuttings			
15								
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= Hydrocollasped test | MD = Maximum Density

SUMMARY OF LABORATORY TESTING

Classification

Soils were classified visually according to the Unified Soil Classification System (ASTM Test Method D2487). The soil classifications are shown on the logs of exploratory borings in Appendix A.

Grain size distribution (particle size analysis) was performed on selected samples in general accordance with ASTM D422. Results of the grain size analysis are included herein (see Plates SA-1 through SA-3).

Liquid limit, plastic limit and plasticity index were determined in general accordance with ASTM Test Method D4318. Results are shown on the logs of exploratory borings in Appendix A.

Moisture-Density Relations

Laboratory testing was performed on representative samples collected during the subsurface exploration. The laboratory maximum dry density and optimum moisture content for representative soil types were determined in general accordance with test method ASTM D1557. Test results are presented on Plate MD-1.

Sulfate Content

Analysis to determine the water-soluble sulfate content was performed in accordance with California Test No. 417. Results of the testing indicated 0.006% sulfate by weight, which is considered negligible as per Table 19-A-4 of the UBC. The results of the testing are included herein (see Plate SL-1).

pH and Resistivity

Representative surficial soil samples were collected and tested for pH and resistivity in general accordance with California Test 643. The results of the testing are included herein (see Plate SR-1).

Expansion Index

Expansion Index testing was performed on a representative near-surface samples. Testing was performed in general accordance with ASTM Test Method D4829. The results indicate an Expansion Index (EI) is 2 for the soil tested. This is considered a very low expansion potential in accordance with Table 18AI-B of the 2001 CBC. The results are shown on Plate EI-1 through EI-2.

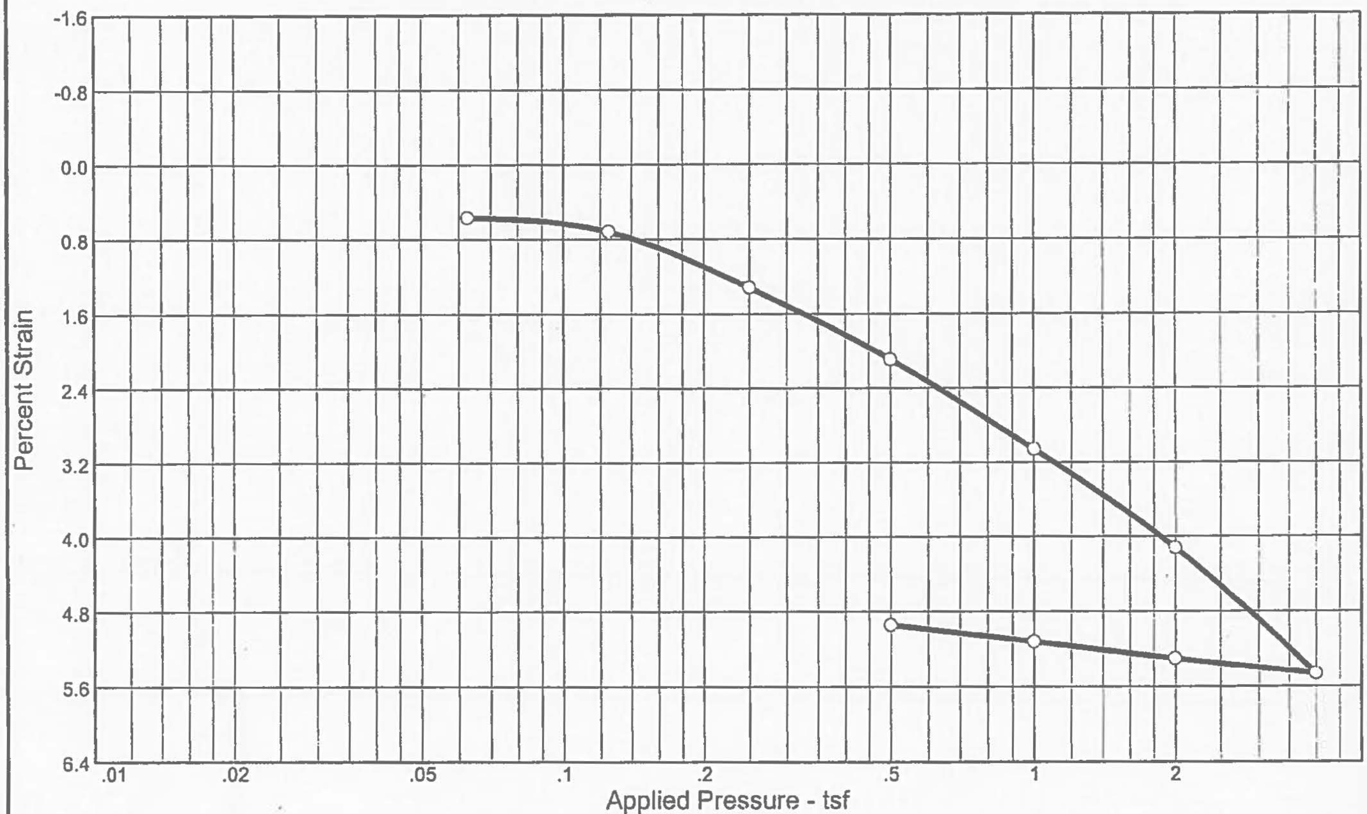
Direct Shear

Shear testing was performed in a direct shear machine of the strain-control type in general accordance with ASTM Test Method D3080. The rate of deformation is 0.03 inches per minute. The sample was sheared under varying confining loads in order to determine the coulomb shear strength parameters, angle of internal friction and cohesion. The shear test results are presented on Plates SH-1 and SH-2 included herein.

Consolidation

Settlement predictions of the soil's behavior under loads are made on the basis of the consolidation tests in general accordance with ASTM D 2435. The consolidation apparatus is designed to receive a one-inch high ring used in the California split-spoon sampler. Loads are applied in several increments in a geometric progression, and the resulting deformations are recorded at selected time intervals. Porous stones are placed in contact with the top and bottom of each specimen to permit addition and release of pore fluid. Samples are initially tested at natural moisture content then fully saturated at a normal load as indicated. The results are shown on Plates C-1 thru C-2.

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (tsf)	C_v (ft.^{2}/day)	C_α	No.	Load (tsf)	C_v (ft.^{2}/day)	C_α	No.	Load (tsf)	C_v (ft.^{2}/day)	C_α
2	0.13	3.64									
3	0.25	0.40									
4	0.50	1.71									
5	1.00	0.92									
6	2.00	0.43									
7	4.00	1.31									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	Initial Void Ratio
Saturation	Moisture								
100.2 %	20.2 %	107.9			2.65		0.43	0.07	0.534

MATERIAL DESCRIPTION	USCS	AASHTO
Yellowish Brown Silty Fine to Medium Sand		

Project No. 2975 SD3 **Client:** William Lyon Homes

Project: Carlton Oaks

Location: B4-5 @ 15 Feet

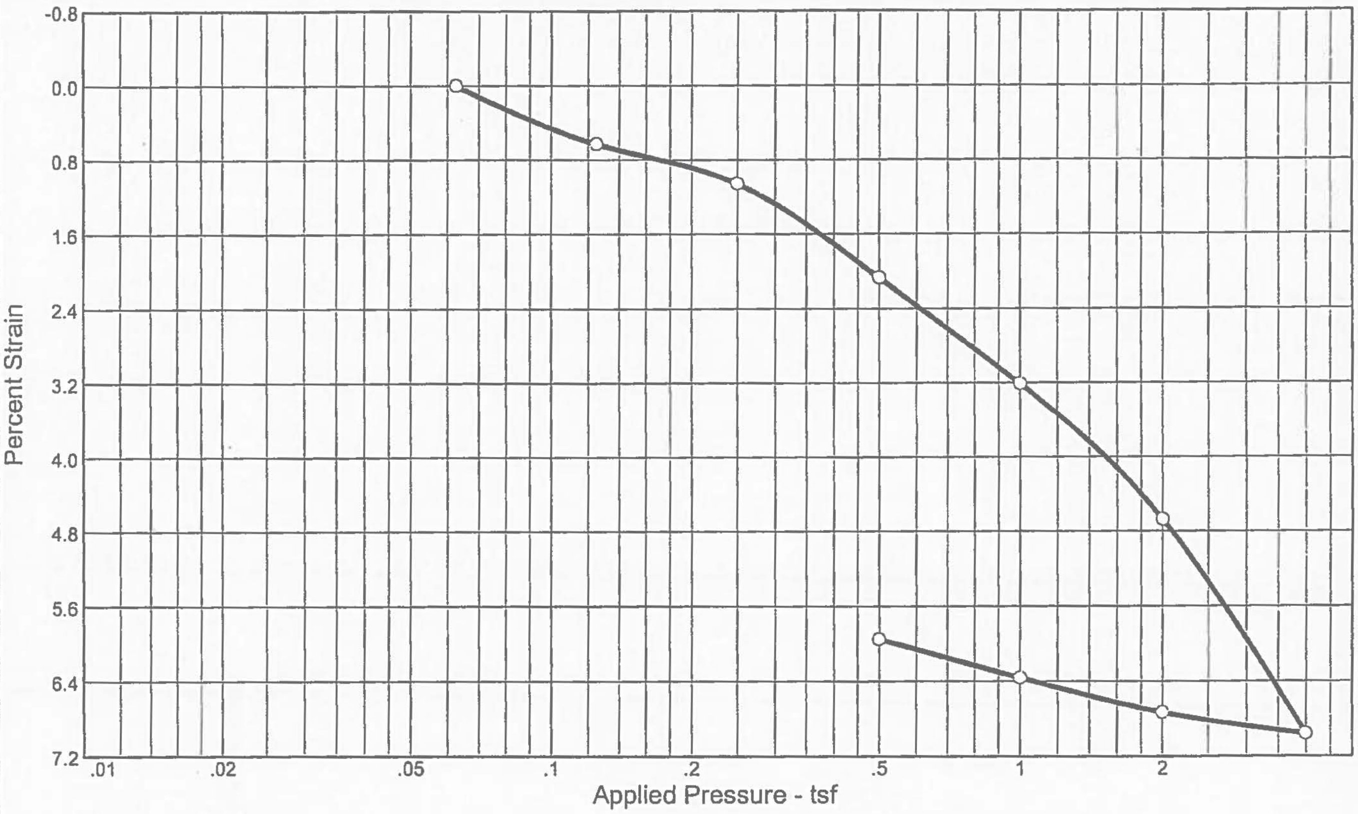
Remarks:

CONSOLIDATION TEST REPORT

GeoTek, Inc.

Plate C-1

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (tsf)	C_v ($ft.^2$/day)	C_α	No.	Load (tsf)	C_v ($ft.^2$/day)	C_α	No.	Load (tsf)	C_v ($ft.^2$/day)	C_α
2	0.13	2.48									
3	0.25	0.35									
4	0.50	0.19									
5	1.00	0.29									
6	2.00	0.34									
7	4.00	1.26									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	Initial Void Ratio
Saturation	Moisture								
96.5 %	18.9 %	109.0			2.65		0.84	0.12	0.518

MATERIAL DESCRIPTION	USCS	AASHTO
Brown Fine Sandy Clay		

Project No. 2975 SD3 **Client:** William Lyon Homes

Project: Carlton Oaks

Location: B10-4 @ 10'

CONSOLIDATION TEST REPORT

GeoTek, Inc.

Remarks:

Plate C-2

GEO TEK, INC.

EXPANSION INDEX TEST

(ASTM D4829)

Project Name:	William Lyon Homes	***Tested/ Checked By:***	AS Lab No 2117
Project Number:	2975 SD3	***Date Tested:***	2/8/2006
		Sample Source:	B4 - 1@ 2' - 5'
		Sample Description:	Brown Clayey Fine to Coarse Sand

Ring Id 12 Ring Dia. " 4" Ring I 1"

Loading weight: 5516. grams

DENSITY DETERMINATION

A	Weight of compacted sample & ring	**764**
B	Weight of ring	370
C	Net weight of sample	394
D	Wet Density, lb / ft3 (C*0.3016)	118.8
E	Dry Density, lb / ft3 (D/1.F)	**107.5**

SATURATION DETERMINATION

F	Moisture Content, %	**10.5**
G	(E*F)	1129.2
H	(E/167.232)	0.64
I	(1.-H)	0.36
J	(62.4*I)	22.3
K	(G/J)= L % Saturation	**50.7**

READINGS

DATE	TIME	READING	
2/8/2006	11:20	0.198	Initial
2/8/2006	11:30	0.198	10 min/Dry
2/8/2006	11:31	0.198	1 min/Wet
2/8/2006	11:36	0.199	5 min/Wet
2/8/2006	1:10	0.206	Random
2/9/2006	8:00	0.208	Final

FINAL MOISTURE

Weight of wet sample & tare	Weight of dry sample & tare	Tare	% Moisture
243.8	213.5	21.4	**15.8%**

EXPANSION INDEX = 10

(@50% SATURATION)

Plate EI-1

GEO TEK, INC.

EXPANSION INDEX TEST

(ASTM D4829)

Project Name:	William Lyon Homes	***Tested/ Checked By:***	AS Lab No 2117
Project Number:	2975 SD3	***Date Tested:***	2/8/2006
		Sample Source:	B10 - 1 @ 2. 5'
		Sample Description:	Dark Greenish Brown Clayey Sand

Ring Id 12 Ring Dia. " 4" Ring I 1"

Loading weight: 5516. grams

DENSITY DETERMINATION

A	Weight of compacted sample & ring	**766.3**
B	Weight of ring	370
C	Net weight of sample	396.3
D	Wet Density, lb / ft3 (C*0.3016)	119.5
E	Dry Density, lb / ft3 (D/1.F)	**108.2**

SATURATION DETERMINATION

F	Moisture Content, %	**10.5**
G	(E*F)	1135.7
H	(E/167.232)	0.65
I	(1.-H)	0.35
J	(62.4*I)	22.0
K	(G/J)= L % Saturation	**51.5**

READINGS

DATE	TIME	READING	
2/8/2006	11:20	0.041	Initial
2/8/2006	11:30	0.041	10 min/Dry
2/8/2006	11:31	0.041	1 min/Wet
2/8/2006	11:36	0.042	5 min/Wet
2/8/2006	1:10	0.046	Random
2/9/2006	8:00	0.050	Final

FINAL MOISTURE

Weight of wet sample & tare	Weight of dry sample & tare	Tare	% Moisture
200.1	172.5	16	**17.6%**

EXPANSION INDEX = 10

(@50% SATURATION)

MAXIMUM DENSITY CURVE

Curve No.: A

Project No.: 2975 SD3 **Date:** 2/7/06
Project: Carlton Oaks

Location: B4-2
Elev./Depth: 2' to 5'
Remarks:

MATERIAL DESCRIPTION

Description: Dark Brown Fine to Coarse Sand w/Gravel

Classifications - **USCS:** **AASHTO:**
Nat. Moist. = **Sp.G. =**
Liquid Limit = **Plasticity Index =**
% > No.4 = % **% < No.200 =**

TEST RESULTS
Maximum dry density = 128.5 pcf
Optimum moisture = 9 %

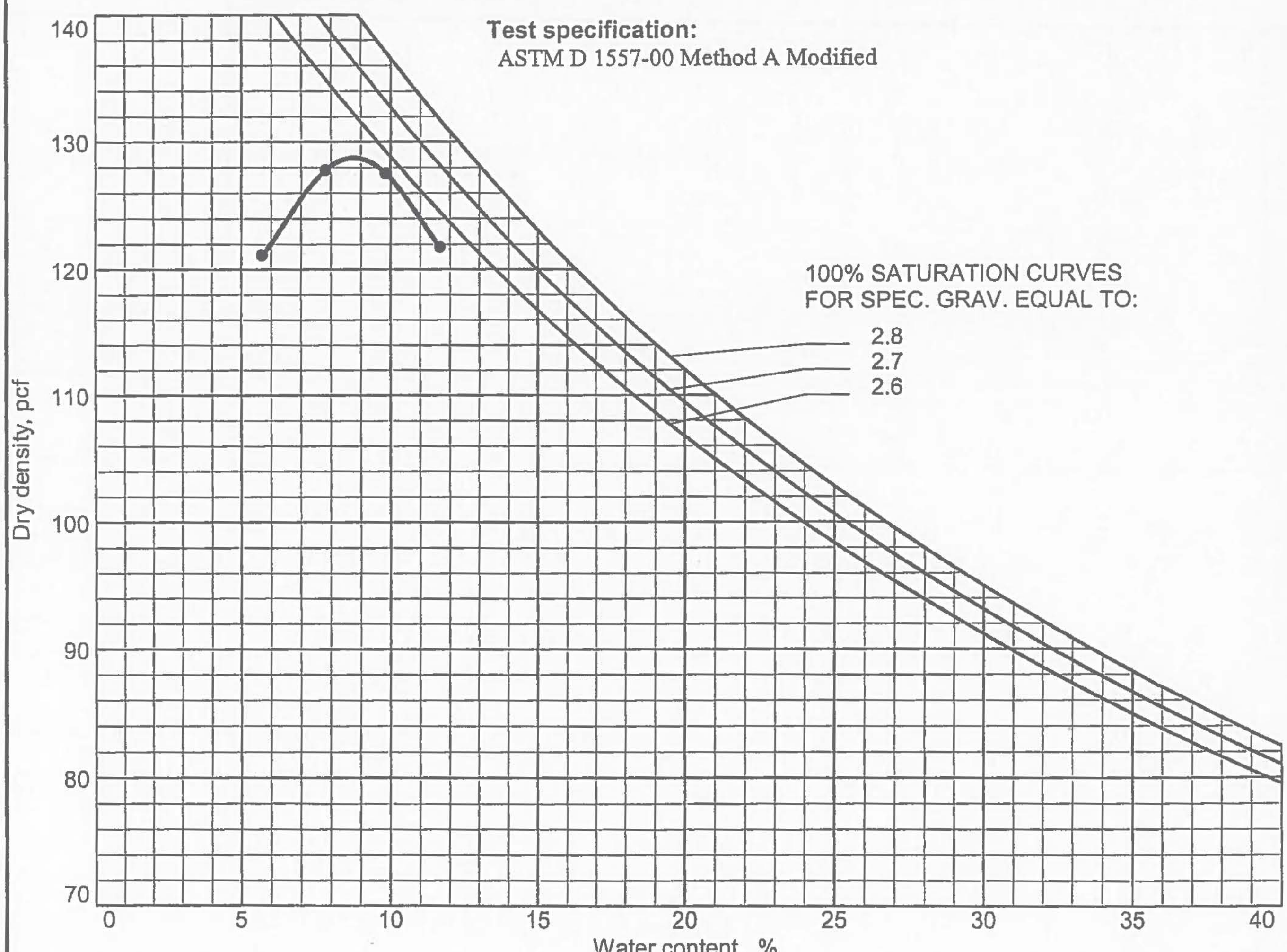
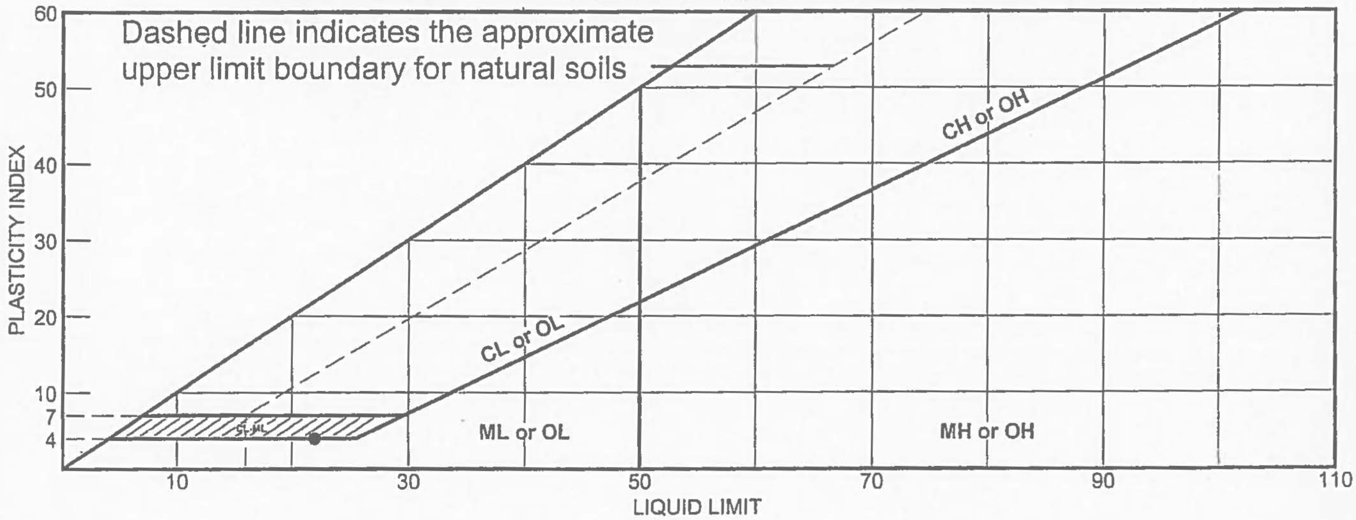
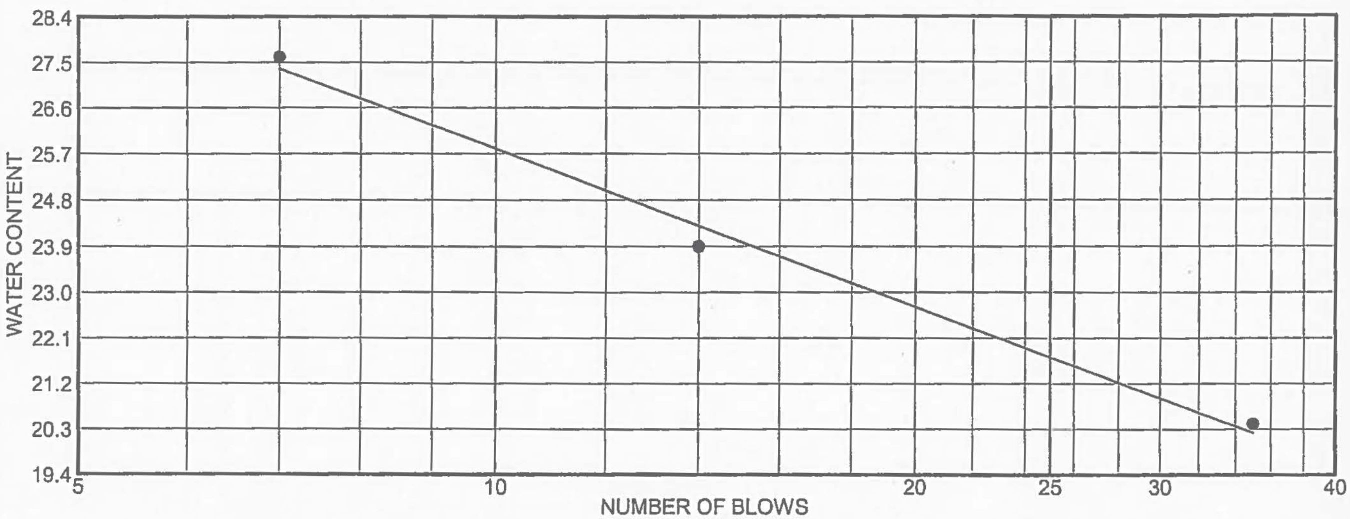


Plate MD-1

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Clayey Sand	22	18	4			

Project No. 2975 SD3 **Client:** William Lyon Homes

Project: Carlton Oaks

● **Location:** B14-1 @ 15 Feet

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

GeoTek, Inc.

Plate PI-1

GEO TEK, INC.

SIEVE ANALYSIS of COARSE & FINE AGGREGATE

CLIENT: William Lyon Homes — LAB NO.: 2117

PROJECT: Carlton Oaks — PROJECT: NO.: 2975 SD3

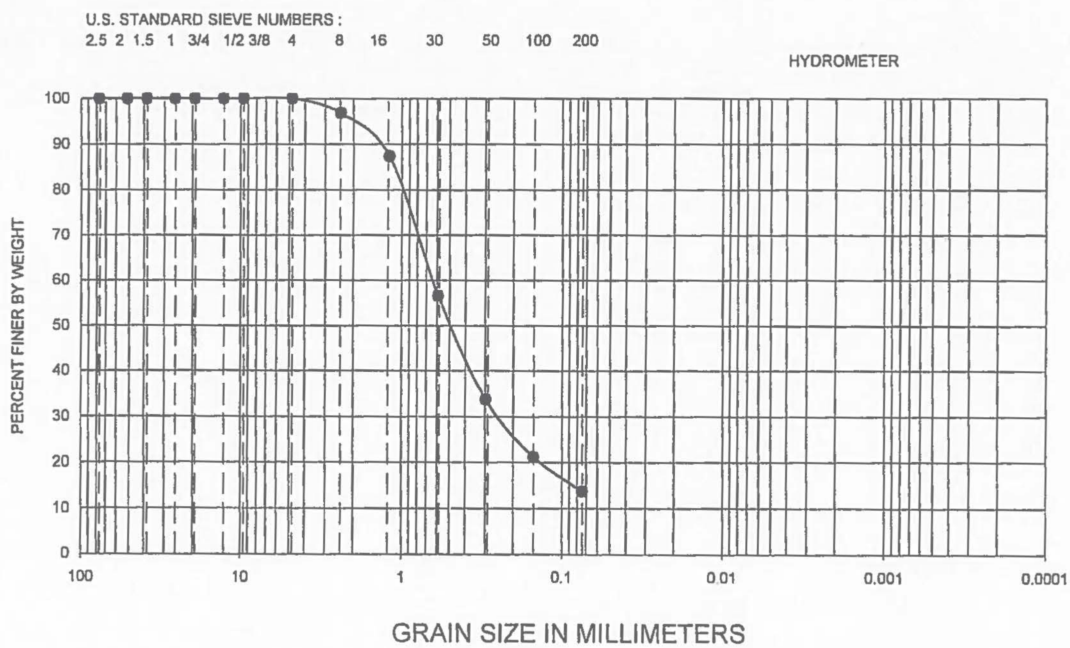
MATERIAL LOCATION: B4 @ 15' — DATE: 2/8/2006

SAMPLE DESCRIPTION Brown Clayey Sand

TOTAL WT. SAMPLE (DRY)	257.7 Dry	WT. COARSE (+) # 4	0	Dry	WT COARSE %	0.0
Wet Wt. Before Wash (-)#4	309.8 Wet	WT. FINE (-) # 4	309.8	Wet	WT FINE %	100.0
Dry Wt. Before Wash (-)#4	257.7 Dry		257.7	Dry	-200%	13.7
			0.202	Moisture Content (- # 4)		

Sieve Size	WEIGHT RETAINED Ind	WEIGHT RETAINED Cum		% RETAINED Ind	% RETAINED Cum		Combined % Passing	Specs.	
3"/75mm		0			0		100		
2"/50mm		0			0		100		
1.5"/37.5mm		0			0		100		
1"/25mm		0			0		100		
.75"/19mm		0			0		100		
.5"/12.5mm		0			0		100		
.375"/9.5mm		0			0		100		
#4/4.75mm		0			0		100		
#8		8.1		(3)	(97)		97		
#16		32.6		(13)	(87)		87		
#30		112		(43)	(57)		57		
#50		170.6		(66)	(34)		34		
#100		202.9		(79)	(21)		21		
#200		222.3		(86)	(14)		13.7		
PAN									
WASH		35.4							

Notes:
all weights are in grams



GEO TEK, INC.

SIEVE ANALYSIS of COARSE & FINE AGGREGATE

AASHTO R18

CLIENT: William Lyon Homes — LAB NO.: 2117

PROJECT: Carlton Oaks — PROJECT: NO.: 2117

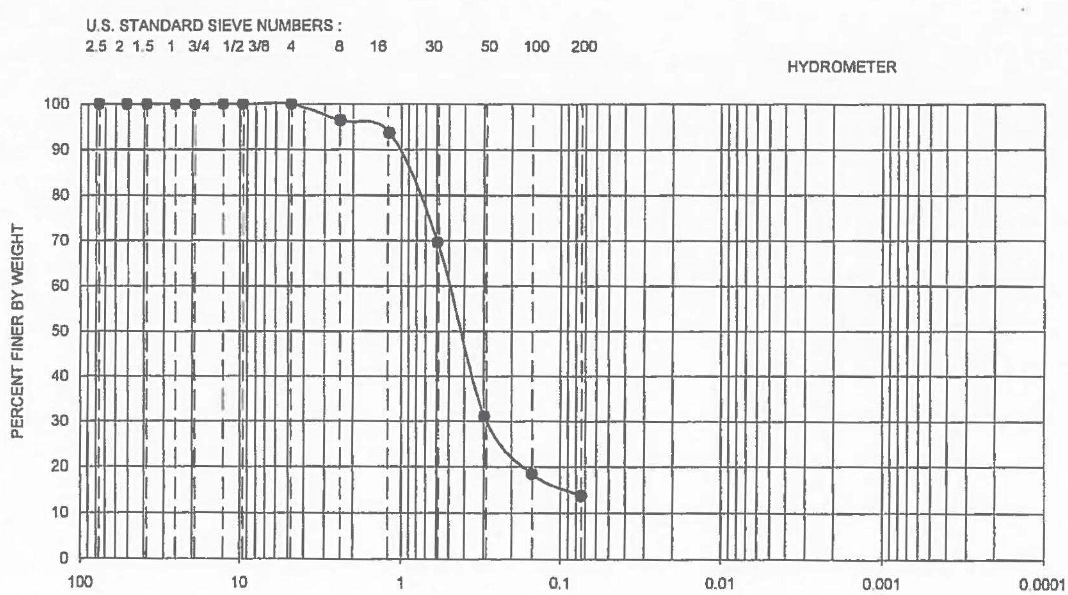
MATERIAL LOCATION: B10 @ 15' — DATE: 2/8/2006

SAMPLE DESCRIPTION Brown Silty Fine to Coarse Sand

TOTAL WT. SAMPLE (DRY)	296.5 Dry	WT. COARSE (+) # 4	0	Dry	WT COARSE %	0.0
Wet Wt. Before Wash (-)#4	379.5 Wet	WT. FINE (-) # 4	379.5	Wet	WT FINE %	100.0
Dry Wt. Before Wash (-)#4	296.5 Dry		296.5	Dry	-200%	13.8
			0.28	Moisture Content (- # 4)		

Sieve Size	WEIGHT RETAINED Ind	WEIGHT RETAINED Cum		% RETAINED Ind	% RETAINED Cum		Combined % Passing	Specs.
3"/75mm		0			0		100	
2"/50mm		0			0		100	
1.5"/37.5mm		0			0		100	
1"/25mm		0			0		100	
.75"/19mm		0			0		100	
.5"/12.5mm		0			0		100	
.375"/9.5mm		0			0		100	
#4/4.75mm		0			0		100	
#8		10.5		(4)	(96)		96	
#16		18.7		(6)	(94)		94	
#30		90.1		(30)	(70)		70	
#50		204.3		(69)	(31)		31	
#100		241.7		(82)	(18)		18	
#200		255.6		(86)	(14)		13.8	
PAN								
WASH		40.9						

Notes:
all weights are in grams



GRAIN SIZE IN MILLIMETERS

GEO TEK, INC.

SIEVE ANALYSIS of COARSE & FINE AGGREGATE

AASHTO R18

CLIENT: William Lyon Homes — LAB NO.: 2117

PROJECT: Carlton Oaks — PROJECT: NO.: 2117

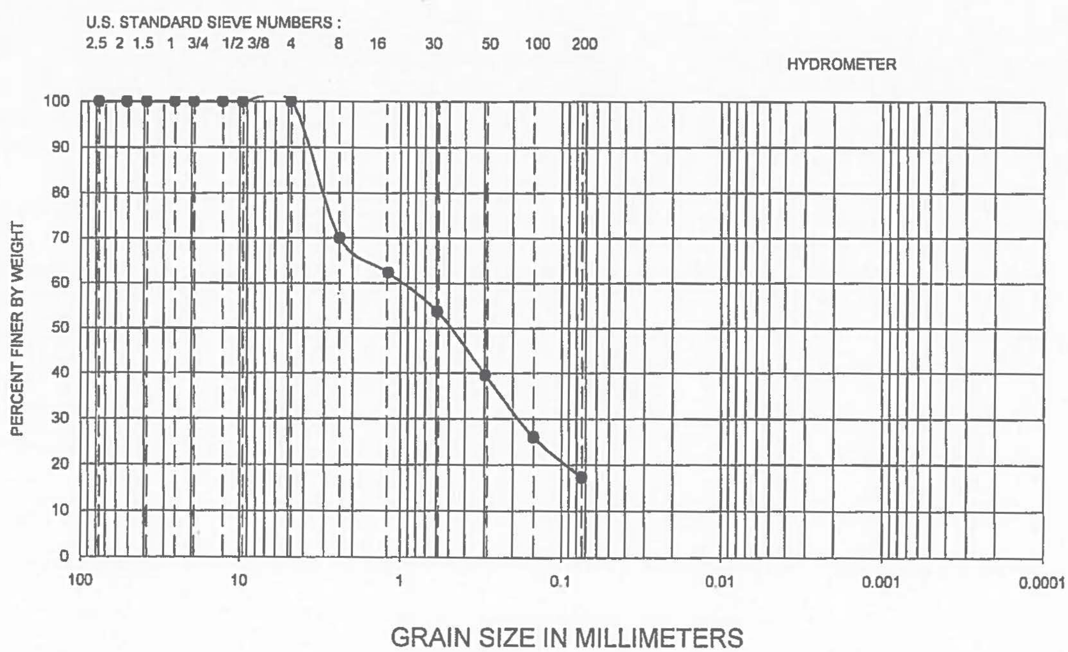
MATERIAL LOCATION: B14 @ 15' — DATE: 2/8/2006

SAMPLE DESCRIPTION Brown Clayey Sand

TOTAL WT. SAMPLE (DRY)	128.2 Dry	WT. COARSE (+) # 4	0	Dry	WT COARSE %	0.0
Wet Wt. Before Wash (-)#4	150.4 Wet	WT. FINE (-) # 4	150.4	Wet	WT FINE %	100.0
Dry Wt. Before Wash (-)#4	128.2 Dry		128.2	Dry	-200%	17.3
			0.173	Moisture Content (- # 4)		

Sieve Size	WEIGHT RETAINED Ind	WEIGHT RETAINED Cum		% RETAINED Ind	% RETAINED Cum		Combined % Passing	Specs.
3"/75mm		0			0		100	
2"/50mm		0			0		100	
1.5"/37.5mm		0			0		100	
1"/25mm		0			0		100	
.75"/19mm		0			0		100	
.5"/12.5mm		0			0		100	
.375"/9.5mm		0			0		100	
#4/4.75mm		0			0		100	
#8		38.4		(30)	(70)		70	
#16		48.3		(38)	(62)		62	
#30		59.4		(46)	(54)		54	
#50		77.4		(60)	(40)		40	
#100		94.7		(74)	(26)		26	
#200		106		(83)	(17)		17.3	
PAN								
WASH		22.2						

Notes:
all weights are in grams



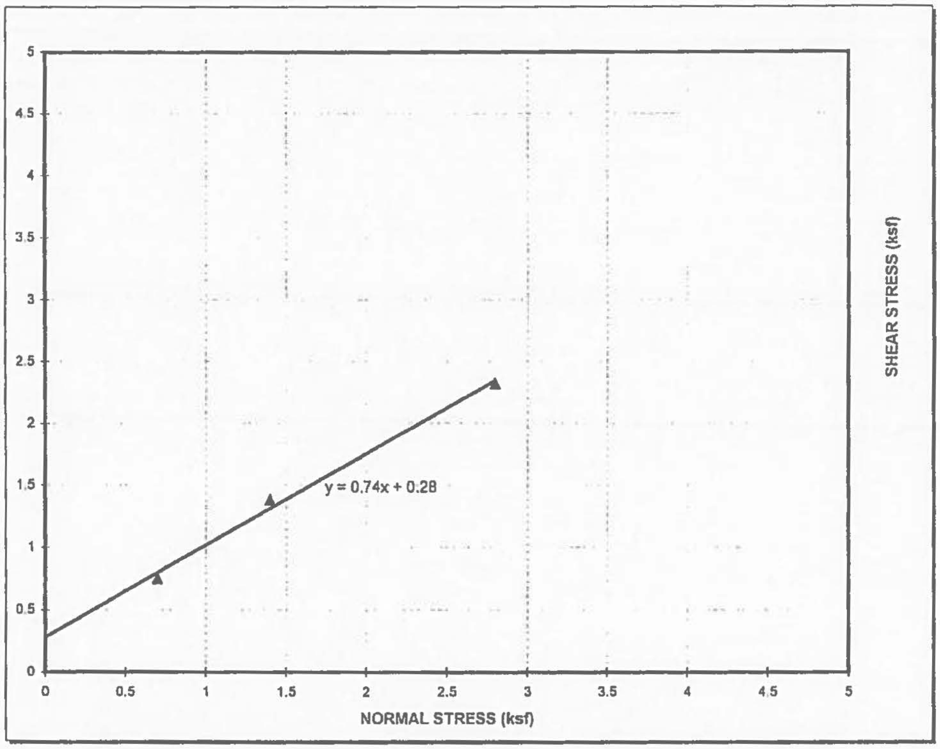
GEO TEK, INC.

DIRECT SHEAR TEST

Project Name: Carlton Oaks
Project Number: 2975 SD3

Sample Source: B4-1 @ 2 - 5'
Date Tested: 02/09/06

Soil Description: Brown Fine to Coarse Sand



Shear Strength: $\Phi = 36.5^{o}$, C = 0.28 ksf

Test No.	Load (ksf)	Water Content (%)	Dry Density (pcf)
1	0.7	9	115.7
2	1.4	9	115.5
3	2.8	9	115.6

Note: Saturated in shear box

Notes:
1 - The soil specimen used in the shear box were remolded "ring" samples.
2 - Shear strength calculated at 5% of load.
3 - The tests were ran at a shear rate of 0.03 in/min.

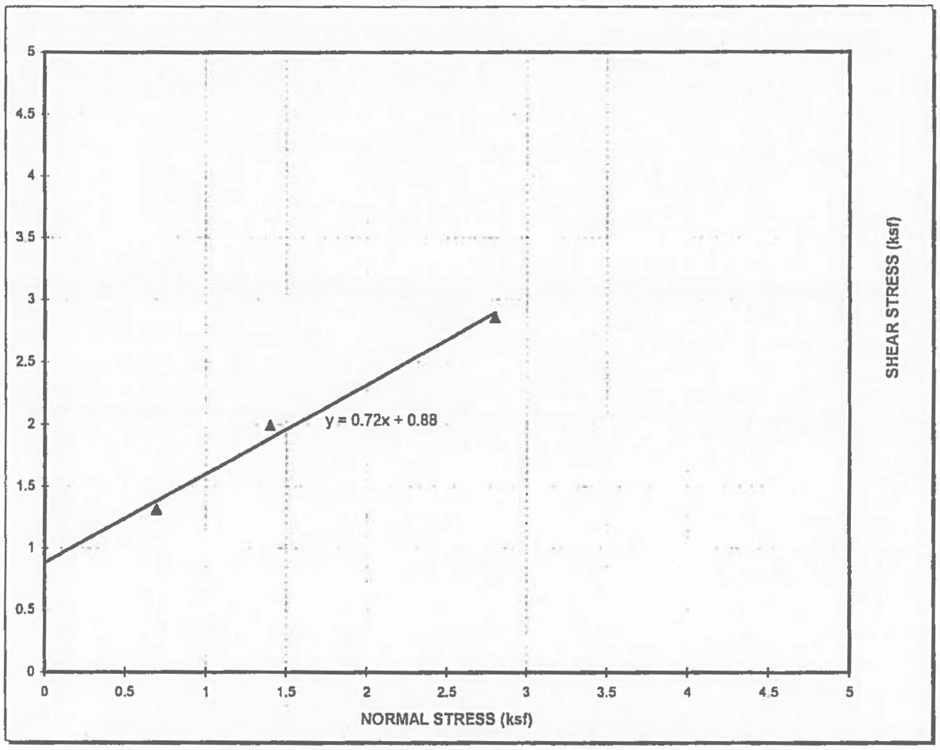
EK, INC.

DIRECT SHEAR TEST

Project Name: Carlton Oaks
Project Number: 2975 SD3

Sample Source: B14-2 @ 5'
Date Tested: 02/09/06

Soil Description: Brown Clayey Sand



Shear Strength: $\Phi =$ 35.8 ^{o} , C = 0.88 ksf

Test No.	Load (ksf)	Water Content (%)	Dry Density (pcf)
1	0.7	14.7	113.7
2	1.4	14.7	112.5
3	2.8	14.7	111.1

Note: Saturated in shear box

Notes:
1 - The soil specimen used in the shear box were "ring" samples collected during the field investigation.
2 - Shear strength calculated at 5% of load.
3 - The tests were ran at a shear rate of 0.03 in/min.

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A N A L Y T I C A L   A N D   C O N S U L T I N G   C H E M I S T S

Date: February 9, 2006
Purchase Order Number: 2975-SD3
Sales Order Number: 82550
Account Number: GEOT

To:
--
GeoTek,Inc.
1384 Poinsetta Avenue, Suite A
Vista, CA 92083
Attention: David Cliff

Laboratory Number: SO9639 Customers Phone: 760-599-0509
Fax: 760-599-0593

Sample Designation:
--
One soil sample received on 2/8/06 taken from
2975-SD3 marked as follows:

ANALYSIS: Water Soluble Sulfate California Test 417

Sample	SO_4%
B4-2 @ 2-5'	0.004

Jeff Shannon

Jeff Shannon

GEO TEK, INC.
1384 Poinsettia Ave., Suite A, Vista, CA 92083
(760) 599-0509 FAX (760) 599-0593

SOIL RESISTIVITY
(California Test 643)

Project Name:	William Lyon Homes	*Tested/ Checked By:*	DC Lab No 2117
Project Number:	2975-SD3	*Date Tested:*	2/9/2006
		Sample Source:	B4-1 @ 2 to 5 ft
		Sample Description:	Brown Fine to Coarse Sand

A Determing the soil's pH 7.2

	Water Added (mL)	Measured Res from Nil. 400 (ohms-cm)
B	100	2100
C	50	1800
D	20	1700
E	20	1600
F	20	1650
G		
H		
I		
J		

Minimum Resistivity = 1600

24.8 years to perforation for a 18 gauge metal culvert.
32.3 years to perforation for a 16 gauge metal culvert.
39.8 years to perforation for a 14 gauge metal culvert.
54.7 years to perforation for a 12 gauge metal culvert.
69.6 years to perforation for a 10 gauge metal culvert.
84.5 years to perforation for a 8 gauge metal culvert.

APPENDIX E

APPENDIX E

RECOMMENDED GRADING SPECIFICATIONS

FOR

CARLTON OAKS GOLF COURSE
RESIDENTIAL NORTH AND RESIDENTIAL WEST SITES
SANTEE, CALIFORNIA

PROJECT NO. G2290-32-01

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

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

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

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

2. DEFINITIONS

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

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

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

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

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

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

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

3. MATERIALS

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

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

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

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

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

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

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

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

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

4. CLEARING AND PREPARING AREAS TO BE FILLED

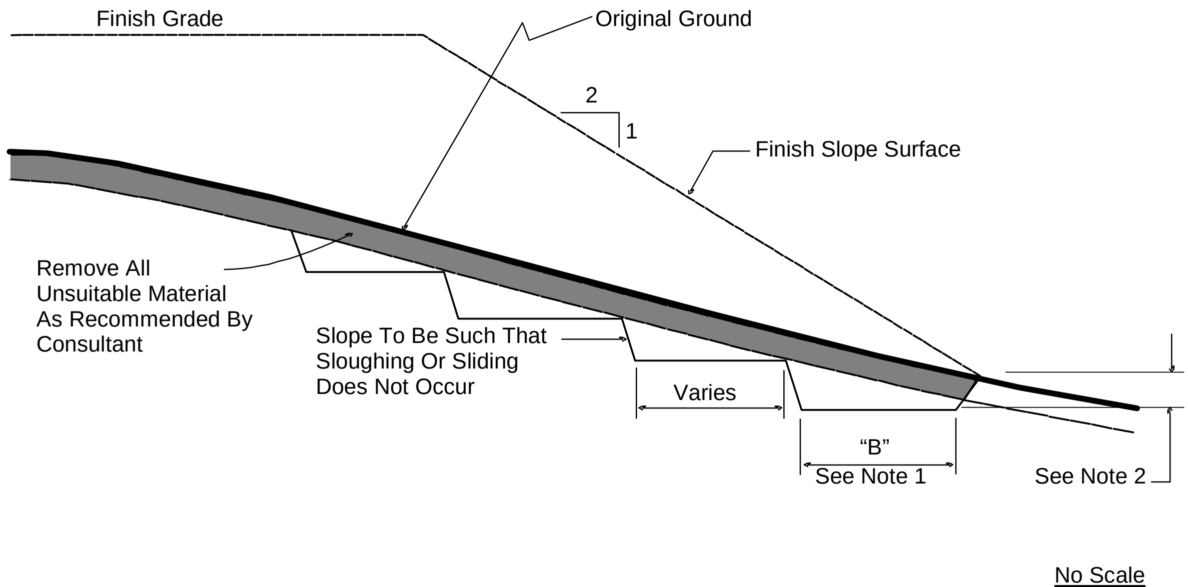
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material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

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

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

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

TYPICAL BENCHING DETAIL



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

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

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

5. COMPACTION EQUIPMENT

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

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

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

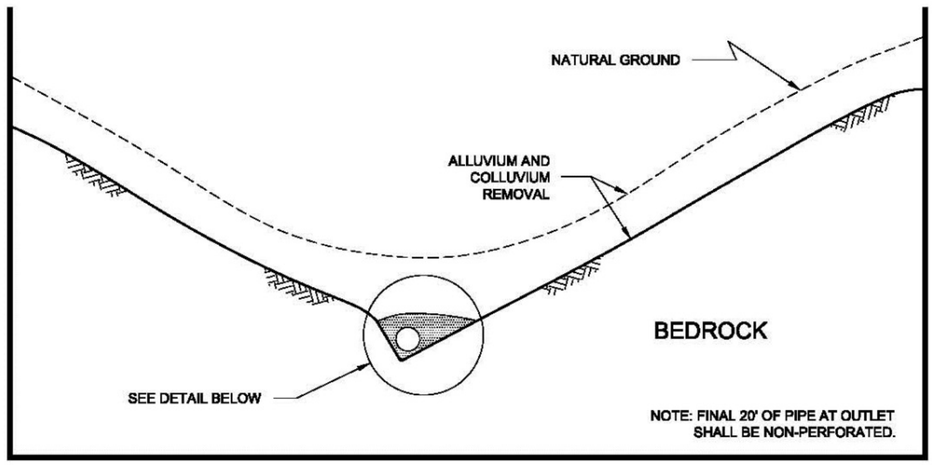
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant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

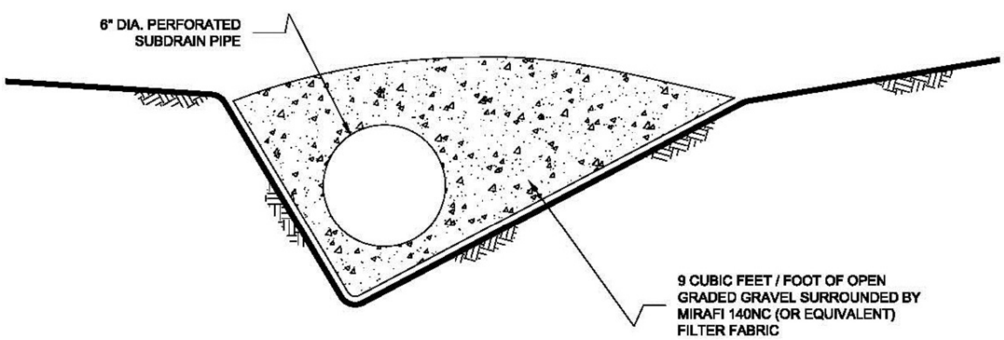
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

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

TYPICAL CANYON DRAIN DETAIL





NOTES:

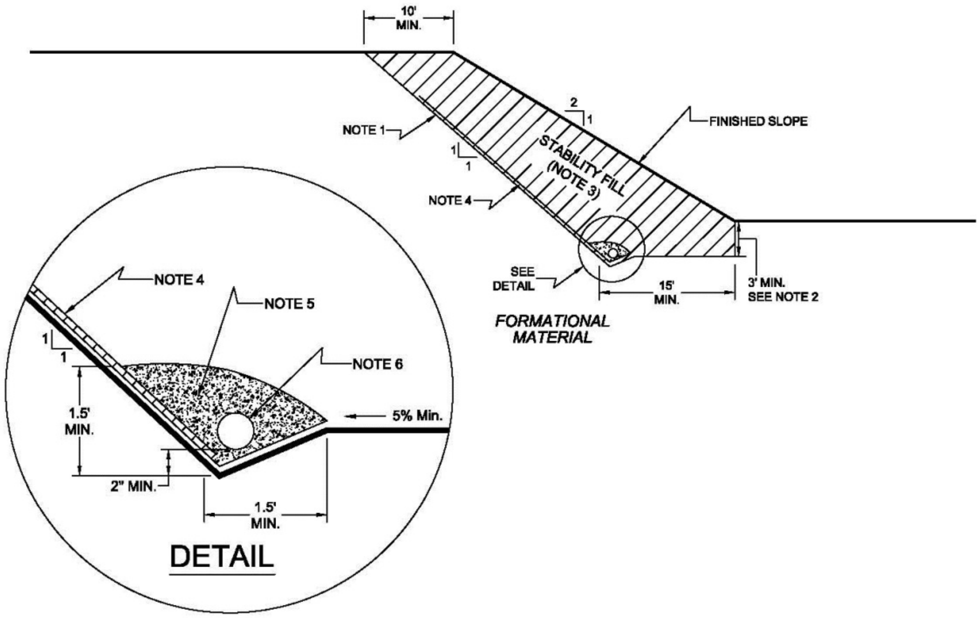
1......6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

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

NO SCALE

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

TYPICAL STABILITY FILL DETAIL



NOTES:

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

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

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

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

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

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

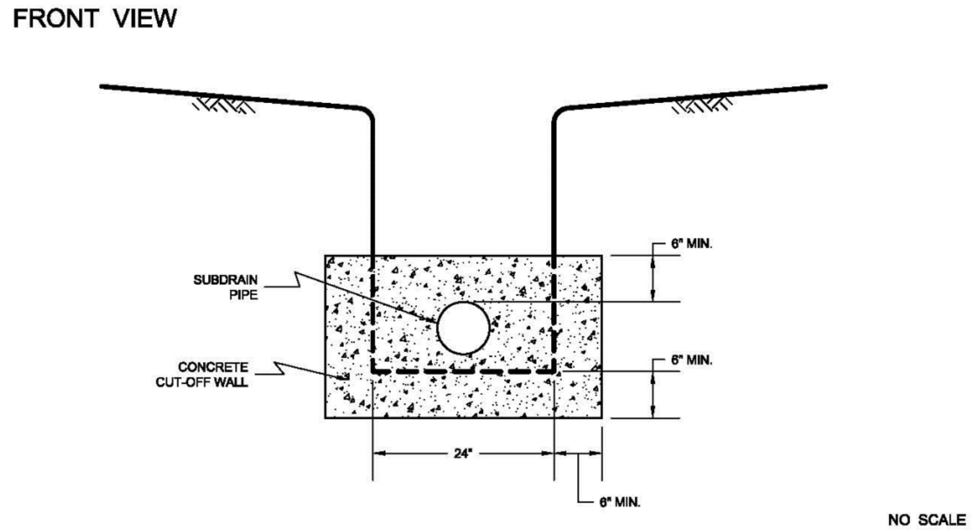
NO SCALE

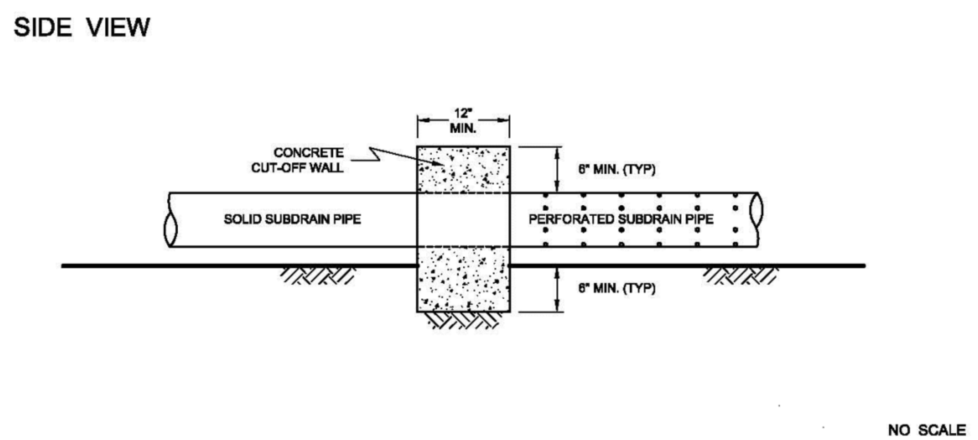
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing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

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

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

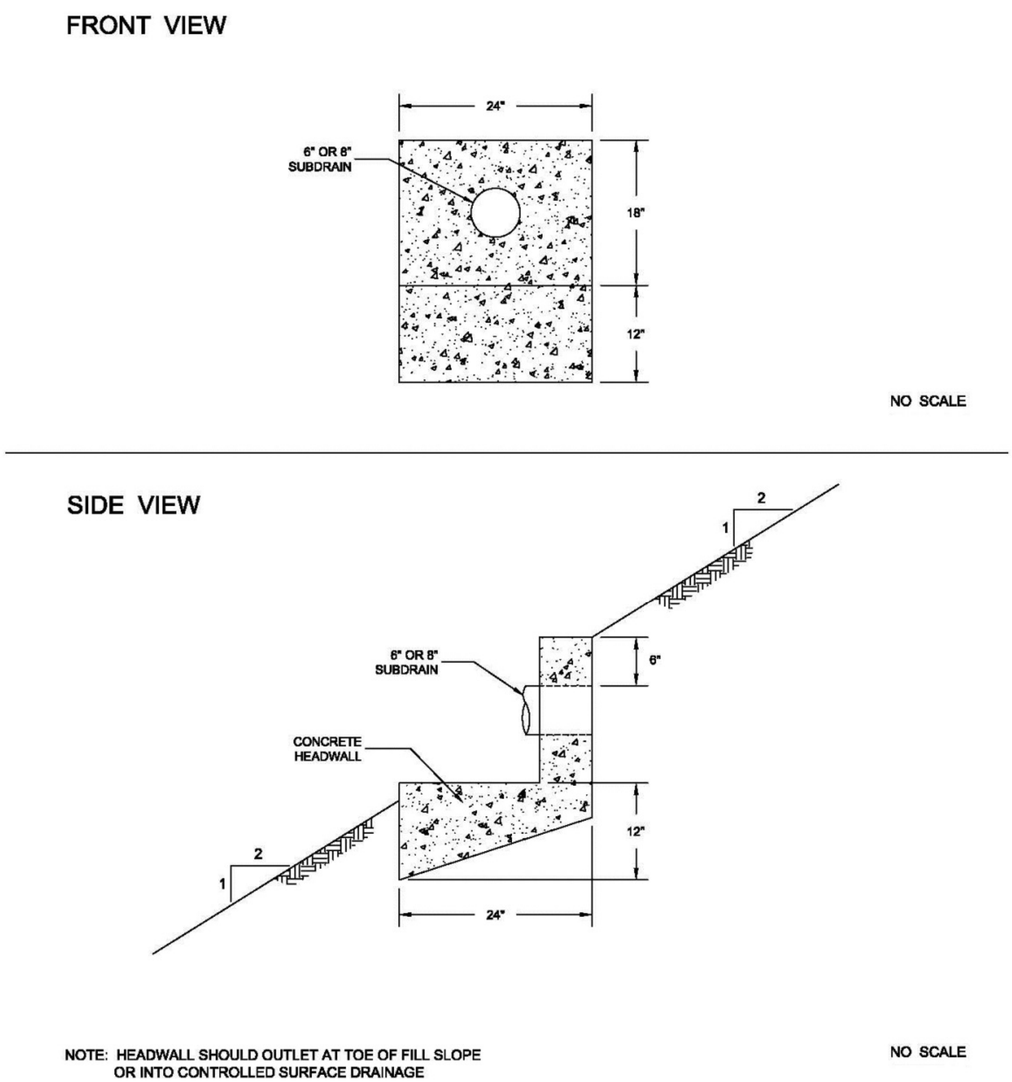
TYPICAL CUT OFF WALL DETAIL





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

TYPICAL HEADWALL DETAIL



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

8. OBSERVATION AND TESTING

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

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

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

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

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

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

8.6.1 Soil and Soil-Rock Fills:

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

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

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

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

9. PROTECTION OF WORK

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

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

10. CERTIFICATIONS AND FINAL REPORTS

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

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

LIST OF REFERENCES

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

2. ACI 318-14, Building Code Requirements for Structural Concrete and Commentary on Building Code Requirements for Structural Concrete, prepared by the American Concrete Institute, dated September 2014.

3. ACI 330-08, *Guide for the Design and Construction of Concrete Parking Lots,* American Concrete Institute, June 2008.

4. Anderson, J. G., T. K. Rockwell, and D. C. Agnew, *Past and Possible Future Earthquakes of Significance to the San Diego Region*: Earthquake Spectra, v. 5, no. 2, p. 299-333, 1989.

5. ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, dated 2017.

6. Boore, D. M., and G. M Atkinson (2008), *Ground-Motion Prediction for the Average Horizontal Component of PGA, PGV, and 5%-Damped PSA at Spectral Periods Between 0.01 and 10.0 S*, Earthquake Spectra, Volume 24, Issue 1, pages 99-138, February 2008.

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

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

9. California Geologic Survey (2008), Special Publication 117, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, Revised and Re-adopted September 11.

10. Campbell, K. W., and Y. Bozorgnia, *NGA Ground Motion Model for the Geometric Mean Horizontal Component of PGA, PGV, PGD and 5% Damped Linear Elastic Response Spectra for Periods Ranging from 0.01 to 10 s*, Preprint of version submitted for publication in the NGA Special Volume of Earthquake Spectra, Volume 24, Issue 1, pages 139-171, February 2008.

11. City of San Diego, *Seismic Safety Study, Geologic Hazards and Faults*, 2008 edition, Map Sheet 33.

12. Chiou, Brian S. J., and Robert R. Youngs, *A NGA Model for the Average Horizontal Component of Peak Ground Motion and Response Spectra*, preprint for article to be published in NGA Special Edition for Earthquake Spectra, Spring 2008.

LIST OF REFERENCES (Concluded)

13. County of San Diego, San Diego County Multi-Jurisdictional Hazard Mitigation Plan, San Diego, California, dated October 2017.

14. Federal Emergency Management Agency, *Flood Insurance Rate Map, San Diego County, Map No. 06073C1634, Panel 1634 of 2375*, dated June 19, 1997.

15. Geocon, Incorporated, *Geotechnical/Seismic Hazard Study for the Safety Element of the Santee General Plan, City of Santee, County of San Diego*, dated October 31, 2002 (Project No. 06828-32-01).

16. *http://www.water.ca.gov*.

17. *http://websoilsurvey.nrcs.usda.gov*.

18. *http://earthquake.usgs.gov/designmaps/us/application.php*.

19. Kennedy, M. P., and S. S. Tan, *Geologic Map of the San Diego 30'x60' Quadrangle, California*, USGS Regional Map Series, Scale 1:100,000, 2008.

20. Risk Engineering, *EZ-FRISK*, 2015.

21. Structural Engineers Association of California (SEAOC) and Office of Statewide Health Planning and Development (OSHPD), *Seismic Design Maps*, https://seismicmaps.org/, accessed January 11, 2019.

22. United States Department of Agriculture, *1953 Stereoscopic Aerial Photographs, Flight AXN-10M*, Photos Nos. 15 and 16 (scale 1:20,000).

23. Unpublished reports and maps on file with Geocon Incorporated.

24. USGS Topographic Map, *La Mesa Quadrangle, San Diego County, 7.5-Minute Series*, 1994.

25. USGS computer program, *Seismic Hazard Curves and Uniform Hazard Response Spectra.*