UPDATE
GEOTECHNICAL REPORT

THE CROSBY ENCLAVE AT
RANCHO SANTA FE
SAN DIEGO COUNTY, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

CALIFORNIA WEST COMMUNITIES
CARLSBAD, CALIFORNIA

JUNE 17, 2011
PROJECT NO. 04424-42-58

Project No. 04424-42-58
June 17, 2011

California West Communities
5927 Priestly Drive
Carlsbad, California 92008

Attention: Mr. Mike Lake

Subject: UPDATE GEOTECHNICAL REPORT
THE CROSBY ENCLAVE AT RANCHO SANTA FE
SAN DIEGO COUNTY, CALIFORNIA

Dear Mr. Lake:

In accordance with your request, we have prepared this update geotechnical report for the subject project. The accompanying report presents the results of our study, conclusions, and recommendations pertaining to geotechnical aspects of the proposed development.

Original grading for the property was completed in May 2001. Additional grading to reconstruct a slope occurred in March 2005. Compacted fill, terrace deposits, and Santiago Peak Volcanics formation underlie the site. The site is considered suitable for construction and support of proposed residential structures, provided the recommendations contained in this update report are followed.

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

Very truly yours,

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UPDATE GEOTECHNICAL REPORT

1. PURPOSE AND SCOPE

This report presents the results of an update geotechnical study for the Crosby Enclave at Rancho Santa Fe located in San Diego County, California (see Vicinity Map, Figure 1). The purpose of this report is to provide updated grading and foundation design recommendations.

The scope of the study included a review of:

1. *Report of Testing and Observation Services During Site Grading, Bing Crosby Boulevard, Stations 10+00 to 23+00 and Lot 256, Tract No. 5073-1; Permit No. L-3054, San Diego County, California*, prepared by Geocon Incorporated, dated June 8, 2005 (Project No. 004424-42-10A).

2. *Base Map, Crosby Enclave, County of San Diego*, prepared by Hunsaker & Associates plot date June 14, 2011.

2. SITE AND PROJECT DESCRIPTION

The project consists of Lot 269 of the Santa Fe Valley (Crosby Estates) project. The property was previously identified as Lot 256. The site is bounded by Del Dios Highway to the north, Bing Crosby Boulevard to the west and south, and open space land to the east.

The site is sheet graded with current elevations ranging from approximately 197 feet above Mean Sea Level (MSL) at the west end of the property to near 180 feet MSL at the east end. A detention basin has been constructed at the east end of the site with a bottom elevation approximately 177 feet MSL. Existing cut and fill slopes, with 2:1 (horizontal to vertical) inclinations, were graded on the north and south sides of the site. The northern slope is both cut and fill with heights ranging from approximately 15 feet to 30 feet. The southern slope also contains both cut and fill with heights of less than 5 feet at the west end of the property to approximately 55 feet at the east end.

Currently, the site is occupied with a construction trailer occupied by Starwood – Santa Fe Valley Partners. Landscaping, consisting of tress, exists in the western portion of the property. The existing slopes surrounding the property have been landscaped.

We understand proposed development will consist of the construction of 13, single-family residential lots with a paved cul-de-sac street and utilities. Retaining walls are planned along the northern perimeter of the site with heights of approximately 4 feet. Grading plans were not available, however, we expect proposed new grades will result in cuts and fills from existing sheet grades on the order of 5 feet or less.

The locations and descriptions of the site and proposed improvements are based on a site reconnaissance, observations during previous site grading, a review of the referenced reports and grading plans, and our understanding of project development. If project details vary significantly from those described herein, Geocon Incorporated should be contacted to review and revise this report.

3. PREVIOUS SITE GRADING

Original mass grading for the site was completed in May 2001 during grading operations for Santa Fe Valley. Grading resulted in a sheet-graded lot with cuts and fills of approximately 35 feet and 45 feet, respectively. The deepest fill is located in a canyon cleanout at the east end of the property. Fills up to approximately 10 feet were placed along the south side of the sheet-graded pad. A desilting basin was constructed at the east end of the lot. Cut and fill slopes were created along the north and south sides of the property. A subdrain was installed at the base of the eastern canyon cleanout. The subdrain consisted of a 6-inch diameter perforated pipe surrounded in gravel and wrapped in filter fabric. The subdrain was outlet to open space to the south. Subdrains were also installed on the north slope to help mitigate seepage. A drain was installed at the toe of the slope. The approximate locations of the subdrains are shown on Figure 2. Grading resulted in a cut-fill transition along the southern portion of the sheet-graded pad.

A second phase of grading occurred on the property in March 2005 to repair a portion of the slope along the south side of the site. The slope experienced movement as a result of saturated slope zone materials. The source of the water was a subdrain system above a brow ditch that was not properly draining. The slope was repaired by removing failed slope zone soils and replacing them with a compacted fill buttress. A subdrain was installed at the base of the buttress and was outlet to the toe of the slope and connected to a slope toe drain that outlets to a V-ditch at the east end of the site.

Geocon Incorporated performed compaction testing and observation services during previous grading. A summary of observations, compaction test results, and professional opinions pertaining to the grading are presented in the as-graded report (Reference 1). In summary, grading for the property consisted of removing compressible surficial soil, placing compacted fill, and performing cuts to the design finish sheet-grade elevations.

During grading operations, Geocon Incorporated observed compaction procedures and performed in-place density tests to evaluate the dry density and moisture content of the fill materials. Geocon performed in-place density tests in general conformance with ASTM Test Method D 2922 (nuclear). In general, the in-place density test results indicate that the fill soil has a dry density of at least 90 percent of the laboratory maximum dry density at the locations tested. The results of the in-place dry density and moisture content tests and the approximate test locations are presented in the grading report (Reference 1).

4. SOIL AND GEOLOGIC CONDITIONS

Grading resulted in the site being underlain by compacted fill, native terrace deposits, and the Santiago Peak Volcanics formation. Test pits were recently excavated on the sheet graded pad to evaluate rippability characteristics for utility installation. Geocon Incorporated observed the excavation of the test pits and prepared trench excavation logs (Appendix A). Based on information from the test pits, approximately 2 feet of undocumented fill is present in the western portion of the property. The remaining site area was found to be as reported in Geocon's as graded report. The approximate lateral extent of soil and geologic units on the property based on recent trenching and previous grading are shown on the Geologic Map (Figure 2).

4.1 Undocumented Fill Soils (Qudf)

Based on recent exploratory trenching and our site reconnaissance, some fill (approximately 1 to 2 feet thick) exists in the western end of the property. Geologic maps prepared after grading show this area being having native terrace deposits at sheet-grade elevations. The approximate area of undocumented fill is shown on Figure 2. Undocumented fill is unsuitable for support of structural improvements and will need to be removed and recompacted during regrading.

4.2 Compacted Fill (Qcf)

Compacted fill placed during previous grading of Santa Fe Valley development exists on the southern and eastern sides of the property, and on a portion of the north slope. The compacted fill was observed and tested as part of Geocon's compaction testing and observation services for Santa Fe Valley. Geocon's as-graded report (Reference 1) summarizes compaction test results and observations during previous grading. The compacted fill is considered suitable in its present condition for support of additional fill and/or proposed improvements, with exception of the upper approximately 12 to 18 inches, which is expected to require scarification, moisture conditioning, and compaction prior to placement of additional fill or settlement sensitive improvements.

4.3 Terrace Deposits (Qt)

Terrace deposits are exposed at grade on the northern half of the property. The terrace deposits consists of dense, clayey sand. The terrace deposits are expected to have a "low" expansion potential. The terrace deposits are suitable for support of structural loads and/or fill.

4.4 Santiago Peak Volcanics (Jsp)

The Jurassic-age Santiago Peak Volcanics formation underlies the fill and terraced deposits, and is exposed on the lower portion of the southern slope. This unit consists of moderately fractured, metamorphosed volcanic and sedimentary rocks that are slightly to moderately weathered. Excavations within the Santiago Peak Volcanics formation generally generates a high percentage of

angular, cobble-sized rock fragments with silt and clay. The Santiago Peak Volcanics formation is suitable for support of structural loads.

To evaluate the rippability characteristics of the metavolcanic rock on the property, exploratory excavations were excavated using a Caterpillar 320 DL excavator. Excavations extended to depths of 6 to 15 feet below existing pad grade. Refusal to the excavator was not encountered to the depths explored.

5. GROUNDWATER

Seepage was encountered in the northern cut slope during grading. Drains were installed on the slope and at the slope toe to intercept the seepage. Minor seepage was also encountered at the base of the undocumented fill in Trench T-1. We do not expect groundwater to adversely impact the development of the property. Undercut pads should be sloped to the street at least 1 percent to preclude the buildup of water. It is not uncommon for groundwater or seepage conditions to develop where none previously existed. Groundwater elevations are dependent on seasonal precipitation, irrigation, land use, among other factors, and vary as a result. Proper surface drainage will be important to future performance of the project.

6. GEOLOGIC HAZARDS

6.1 Faulting and Seismicity

A review of the referenced geologic materials and our knowledge of the general area indicate that the site is not underlain by active, potentially active, or inactive faults. An active fault is defined by the California Geological Survey (CGS) as a fault showing evidence for activity within the last 11,000 years. The site is not located within State of California Earthquake Fault Zone.

The computer program *EZ-FRISK* (Version 7.52) located 12 known active faults within a search radius of 50 miles from the property. The nearest known active fault is the Rose Canyon Fault, located approximately 9.5 miles west of the site, is the dominant source of potential ground motion. Earthquakes that might occur on the Rose Canyon Fault Zone or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated maximum earthquake magnitude and peak ground acceleration for the Rose Canyon Fault are 7.2 and 0.23 g, respectively. Table 6.1.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the Rose Canyon Fault and other faults in relation to the site location. We used acceleration attenuation relationships developed by Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2008) NGA acceleration-attenuation relationships in our analysis.

TABLE 6.1.1
DETERMINISTIC SPECTRA 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)
Rose Canyon	9.5	7.2	0.22	0.20	0.23
Newport-Inglewood (offshore)	17	7.1	0.15	0.12	0.13
Coronado Bank	24	7.6	0.15	0.11	0.13
Elsinore – Julian	24	7.1	0.12	0.09	0.09
Elsinore – Temecula	25	6.8	0.10	0.08	0.07
Earthquake Valley	35	6.5	0.06	0.05	0.04

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 mapped Quaternary fault is proportional to the faults slip rate. The program accounts for earthquake magnitude as a function of fault rupture length, 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 6.1.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.1.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2007 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2008 (g)
2% in a 50 Year Period	0.43	0.42	0.48
5% in a 50 Year Period	0.33	0.31	0.35
10% in a 50 Year Period	0.26	0.25	0.26

The California Geologic Survey (CGS) has a program that calculates the ground motion for a 10 percent of probability of exceedence in 50 years based on an average of several attenuation relationships. Table 6.1.3 presents the calculated results from the *Probabilistic Seismic Hazards Mapping Ground Motion* Page from the CGS website.

TABLE 6.1.3
PROBABILISTIC SITE PARAMETERS FOR SELECTED FAULTS
CALIFORNIA GEOLOGIC SURVEY

Calculated Acceleration (g) Firm Rock	Calculated Acceleration (g) Soft Rock	Calculated Acceleration (g) Alluvium
0.24	0.26	0.30

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 2010 California Building Code (CBC) guidelines or guidelines currently adopted by the City of San Diego.

6.2 Liquefaction and Seismically Induced Settlement

The risk associated with soil liquefaction hazard at the site is low due to the dense nature of the on-site sols and lack of permanent, shallow groundwater.

6.3 Ground Rupture

The risk associated with ground rupture hazard is very low due to the absence of active faults at the subject site.

6.4 Landslides

Based on our review of published geologic maps for the site vicinity, it is our opinion landslides are not present at the property or at a location that could impact the site.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 We did not encounter soil or geologic conditions during previous geotechnical investigations and grading operations, which in our opinion, would preclude the continued development of the property as presently planned, provided that the recommendations of this report are followed.

7.1.2 The site is underlain by undocumented fill, compacted fill, terrace deposits, and the Santiago Peak Volcanics formation. Geocon Incorporated observed the placement of compacted fill during previous grading on the property and performed in-place density tests to evaluate the dry density and moisture content of the fill soil. In general, in-place density test results indicate that the fill soil has a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content at the locations tested. The compacted fill is suitable for support of additional structural fill and/or loads from the proposed development. However, processing, moisture conditioning, and compaction of the upper 12 to 18 inches of existing fill will be required during regrading. In addition, removals of approximately 2 feet are expected where undocumented fill is present and in the existing desilting basin to remove soft accumulated soils.

7.1.3 Where building pads are underlain by cut-fill transitions, the building pads should be graded such that at least the upper 3 feet or 1 foot of materials below the bottom of the deepest footing, which ever results in a deeper excavation, is comprised of properly compacted fill. The undercuts should be sloped to drain away from the building pads and toward the street or deeper fill areas.

7.1.4 With the exception of possible strong seismic shaking, no geologic hazards were observed or are known to exist on the site that would affect the site. No special seismic design considerations, other than those recommended herein, are required.

7.1.5 The planned structures can be supported on conventional shallow foundation system founded in properly compacted fill.

7.2 Excavation and Soil Characteristics

7.2.1 Excavation of the existing fill and terrace deposits will require moderate to heavy effort using conventional heavy-duty equipment during grading. Excavations in the Santiago Peak Volcanics formation are expected to require a very heavy effort to excavate. Exploratory trenches performed with a Cat 320 DL extended to depths up to 15 feet. Excavations, particularly those for deeper utilities, will generate oversize rock. Due to the

lack of deep fill areas, oversize rock generated from excavations should be exported from the site.

7.2.2 Based on observations and laboratory expansion tests during previous grading, the near surface soils encountered at the site are considered to be "non-expansive/expansive" (expansion index [EI] of 20 or less/greater than 20) as defined by 2010 California Building Code (CBC) Section 1803.5.3. Table 7.2 presents soil classifications based on the expansion index. Additional Expansion Index tests should be performed at the completion of regrading to evaluate the expansion potential of the upper 3 to 4 feet of soil within the areas of proposed structures and improvements.

TABLE 7.2
SOIL CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	Expansion Classification
0 – 20	Very Low
21 – 50	Low
51 – 90	Medium
91 – 130	High
Greater Than 130	Very High

7.2.3 In general, on-site soils tested during grading of Santa Fe Valley indicated the soils predominately possess "negligible" sulfate exposure to concrete structures as defined by 2010 CBC Section 1904.3 and ACI 318-08 Sections 4.2 and 4.3. 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. We recommend samples of on-site soils be tested to evaluate sulfate concentrations at the completion of regrading.

7.2.4 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.

7.3 Grading

7.3.1 Grading should be performed in accordance with the attached *Recommended Grading Specifications* contained in Appendix B. Where the recommendations of this section conflict with those of Appendix B, the recommendations of this section take precedence.

Earthwork should be observed and fill tested for dry density and moisture content by Geocon Incorporated.

7.3.2 Prior to commencing grading operations, a preconstruction meeting should be held at the site with the owner or developer, grading contractor, city representative, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

7.3.3 Site preparation should begin with the removal of deleterious matter and vegetation. The depth of removal should be such that materials to be used in fills are generally free of organic matter. Material generated during stripping operations and/or site demolition should be exported from the site.

7.3.4 Undocumented fill should be removed and recompacted. The lateral extent of the undocumented fill is unknown, but expected to be limited to the western portion of the property. A representative of Geocon Incorporated should be on-site during regrading to establish undocumented fill removal limits.

7.3.5 In areas of existing compacted fill the upper 12 to 18 inches of existing soil should be removed, moisture conditioned as necessary, and compacted prior to placing additional fill or constructing improvements. Where cuts in existing fill are in excess of 1 foot, the upper 12 inches of soil at proposed finish grade should be scarified, moisture conditioned, and recompacted.

7.3.6 In areas where planned grading will result in a cut-fill transition on the building pad, the pad should be undercut to a depth of at least 3 feet below finish pad grade, or 1-foot below the bottom of the deepest footing (whichever is greater) and replaced with compacted fill. The excavation bottom should be sloped toward the street or rear of the building pad to promote drainage.

7.3.7 All loose, soft, and/or saturated soil should be removed from the desilting basin and the basin filled with compacted fill. We expect removal depths of at least 2 feet below existing grade will be required. Benching into the sides of the existing slope will be required to remove soft or disturbed soil. The existing basin storm drain inlet and pipe should be removed and the resulting excavation backfilled with compacted fill.

7.3.8 After preparation of the ground surface, the site should be brought to design elevations with fill compacted in layers. The on-site soil is considered suitable for use as fill provided it is generally free from vegetation, debris and other deleterious matter. Layers of fill

should not be thicker than will allow for adequate bonding and compaction. Fill, including wall and trench backfill, and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM Test Procedure D 1557.

7.3.9 Imported fill soil (if necessary) should consist of granular material with a "very low" to "low" expansion potential (EI of 50 or less) free of deleterious material and stones larger than 3 inches and should be compacted as recommended herein. Geocon Incorporated should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to determine its suitability as fill material.

7.4 Slopes

7.4.1 No new slopes are planned for this project. All slopes should be planted, drained, and maintained to reduce erosion. Slope irrigation should be kept to a minimum to just support the vegetative cover. Surface drainage should not be allowed to flow over the top of the slope.

7.5 Subdrains

7.5.1 Considering the expected shallow fill depths, subdrains are not required for the project.

7.6 Seismic Design Criteria

7.6.1 We used the computer program *Seismic Hazard Curves and Uniform Hazard Response Spectra*, provided by the USGS. Table 7.6 summarizes site-specific design criteria obtained from the 2010 California Building Code (CBC; Based on the 2009 International Building Code [IBC]), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. Lots underlain by native formational soil or fills less than 15 feet thick should be designed using a Site Class C. Lots where the fill thickness is greater than 15 feet should be designed using a Site Class D.

TABLE 7.6
2010 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value		2010 CBC Reference
Site Class	C	D	Table 1613.5.2
Spectral Response – Class B (short), S_S	1.049	1.051 g	Figure 1613.5(3)
Spectral Response – Class B (1 sec), S_1	0.387	0.387 g	Figure 1613.5(4)
Site Coefficient, F_A	1.0	1.081	Table 1613.5.3(1)
Site Coefficient, F_V	1.413	1.625	Table 1613.5.3(2)
Maximum Considered Earthquake Spectral Response Acceleration (short), S_{MS}	1.049	1.134 g	Section 1613.5.3 (Eqn 16-36)
Maximum Considered Earthquake Spectral Response Acceleration – (1 sec), S_{M1}	0.548	0.630 g	Section 1613.5.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.699	0.756 g	Section 1613.5.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.365	0.420 g	Section 1613.5.4 (Eqn 16-39)

7.6.2 Conformance to the criteria in Table 7.6 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

7.7 Foundations and Concrete Slab-on-Grade

7.7.1 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 7.7.1.

TABLE 7.7.1
FOUNDATION CATEGORY CRITERIA

Foundation Category	Maximum Fill Thickness, T (Feet)	Differential Fill Thickness, D (Feet)	Expansion Index (EI)
I	$T<20$	--	$EI \leq 50$
II	$20 \leq T<50$	$10 \leq D<20$	$50<EI \leq 90$
III	$T \geq 50$	$D \geq 20$	$90<EI \leq 130$

7.7.2 We will provide final foundation categories for each building or lot will be provided after finish pad grades have been achieved and we perform laboratory testing of the subgrade soil.

7.7.3 Table 7.7.2 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems. A typical footing detail is provided on Figure 3.

TABLE 7.7.2
CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	Two No. 4 bars, one top and one bottom	6 x 6 - 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars, two top and two bottom	No. 3 bars at 24 inches on center, both directions
III	24	Four No. 5 bars, two top and two bottom	No. 3 bars at 18 inches on center, both directions

7.7.4 The embedment depths presented in Table 7.7.2 should be measured from the lowest adjacent pad grade for both interior and exterior footings. The conventional foundations should have a minimum width of 12 inches and 24 inches for continuous and isolated footings, respectively.

7.7.5 The concrete slab-on-grade should be a minimum of 4 inches thick for Foundation Categories I and II and 5 inches thick for Foundation Category III.

7.7.6 Concrete slabs on grade should be underlain by 4 inches of clean sand (3 inches for a 5-inch-thick slab) to reduce the potential for differential curing, slab curl, and cracking. A vapor retarder should be placed near the middle of the sand bedding beneath slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials . The project architect or developer should specify the vapor retarder used based on the type of floor covering that will be installed. The vapor retarder design should be consistent with the guidelines presented in Section 9.3 of the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06).

7.7.7 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 should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI), Third Edition, as required by the 2007 California Building Code (CBC Section 1805.8). Although this procedure was developed for expansive soil conditions, we understand 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 on Table 7.7.3 for the particular Foundation Category designated. The parameters presented in Table 7.7.3 are based on the guidelines presented in the PTI, Third Edition design manual.

TABLE 7.7.3
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI), Third Edition 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

7.7.8 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 at least 6 inches below the clean sand or crushed rock layer.

7.7.9 If the structural engineer proposes a post-tensioned foundation design method other than PTI, Third Edition:

- The deflection criteria presented in Table 7.7.3 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.

7.7.10 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 1805 of the 2007 CBC. If post-tensioned foundations are planned, an alternative, commonly accepted design method (other than PTI Third Edition) 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.

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

7.7.12 Our experience indicates post-tensioned slabs are susceptible to excessive edge lift, 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 placement of the reinforcing tendons in the top of the slab and the resulting eccentricity after tensioning could reduce the ability of the system to mitigate edge lift. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

7.7.13 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.

7.7.14 Category I, II, or III foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). This bearing pressure may be increased by one-third for transient loads due to wind or seismic forces. The estimated maximum total and differential settlement for the planned structures due to foundation loads is 1 inch and ½ inch, respectively.

7.7.15 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.

7.7.16 For Foundation Category III, consideration should be given to using interior stiffening beams and connecting isolated footings and/or increasing the slab thickness. 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.

7.7.17 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.

7.7.18 Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal:vertical), special foundations 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, building 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. An acceptable alternative to deepening the footings would be the use of a post-tensioned slab and foundation system or increased footing and slab reinforcement. 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 that would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

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

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

7.8 Conventional Retaining Walls

7.8.1 Retaining walls that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid having a density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at no steeper than 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall are sandy soils with suitable shear characteristics and an EI of 50 or less. Laboratory tests should be performed on soils to be used as wall backfill to assess their suitability for use.

7.8.2 Where walls are restrained from movement at the top and are 10 feet or less in height, an additional uniform pressure of 7H psf should be added to the above active soil pressure.

7.8.3 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The above recommendations assume a properly compacted free-draining backfill material (EI of 50 or less) with no hydrostatic forces or imposed surcharge load. Figure 4 presents a 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.

7.8.4 In general, wall foundations founded in properly compacted fill or formational materials should possess a minimum depth and width of one foot and may be designed for an

allowable soil bearing pressure of 2,000 psf, provided the soil within three feet below the base of the wall has an expansion index of 90 or less. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is expected.

7.8.5 The structural engineer should determine the seismic design category for the project and if retaining walls need to incorporate seismic lateral loads. A seismic load of 12H should be used for design. 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 top of the wall. We used a horizontal peak ground acceleration of 0.28g calculated using S_{DS}/2.5 USGS and applying a pseudo-static coefficient of 0.33.

7.8.6 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 10 feet. In the event that walls higher than 10 feet or other types of walls are planned, Geocon Incorporated should be consulted for additional recommendations.

7.9 Lateral Loads

7.9.1 For resistance to lateral loads, an allowable passive earth pressure equivalent to a fluid density of 300 pcf is recommended for footings or shear keys poured neat against properly compacted fill or formational soil. The allowable passive pressure assumes a horizontal surface extending away from the base of the wall at least 5 feet or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance. An allowable friction coefficient of 0.35 may be used for resistance to sliding between soil and concrete. This friction coefficient may be combined with the allowable passive earth pressure when determining resistance to lateral loads.

7.10 Slope Maintenance

7.10.1 Slopes that are steeper than 3:1 (horizontal:vertical) may, under conditions which are both difficult to prevent and predict, be susceptible to near surface (surficial) slope instability. The instability is typically limited to the outer three 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. It should be noted that 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.

7.11 Site Drainage

7.11.1 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 2010 CBC 1803.3 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.

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

7.11.3 If detention basins, bioswales, retention basins, water infiltration or low impact development (LID) devices are being considered, Geocon Incorporated should be retained to provide recommendations pertaining to the geotechnical aspects of possible impacts and design. Distress may be caused to planned improvements and properties located hydrologically downstream. The distress depends on the amount of water to be detained, its residence time, soil permeability, and other factors. We have not performed a hydrogeology study at the site. Downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other impacts as a result of water infiltration.

7.11.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. We recommend that drains to collect excess irrigation water and transmit it to drainage structures, or impervious above-grade planter boxes be used. In addition, where landscaping is planned adjacent to the pavement, we recommended construction of a cutoff

wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material.

7.12 Grading and Foundation Plan Review

7.12.1 Geocon Incorporated should review the project grading and foundation plans prior to final design submittal to check if additional analysis 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. 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 of 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 are 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

GEOCON
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GEOTECHNICAL CONSULTANTS
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TR / AML		DSK/GTYPD

VICINITY MAP

THE CROSBY ENCLAVE AT RANCHO SANTA FE
SAN DIEGO COUNTY, CALIFORNIA

DATE 06 - 17 - 2011	PROJECT NO. 04424 - 42 - 58	FIG. 1

THE CROSBY ENCLAVE AT RANCHO SANTA FE
SAN DIEGO COUNTY, CALIFORNIA

DEL DIOS HIGHWAY

COUNTY OF SAN DIEGO TRACT NO. 5073-5
MAP NO. 14351

Qt
275
Qcf
Qcf
Qt
T-1
Qudf
T-2
T-3
T-4
T-5
Qt
269
Qt
Qcf
Qcf
Jsp
Qcf
Qcf
Jsp
Qcf
OUTLETS INTO
V-DITCH
Qcf
Jsp
284
BING CROSBY
BOULEVARD
Qcf
Qcf
277

GEOCON LEGEND

Qudf .....UNDUCOMENTED FILL
Qcf .....COMPACTED FILL
Qt .....TERRACE DEPOSITS
Jsp .....SANTIAGO PEAK VOLCANICS
.....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
T-5 .....APPROX. LOCATION OF EXPLORATORY TRENCH
.....APPROX. LOCATION OF SUBDRAIN (Perforated)
.....APPROX. LOCATION OF SUBDRAIN (Non-Perforated)

APPROX. SCALE: 1" = 80'

SITE PLAN

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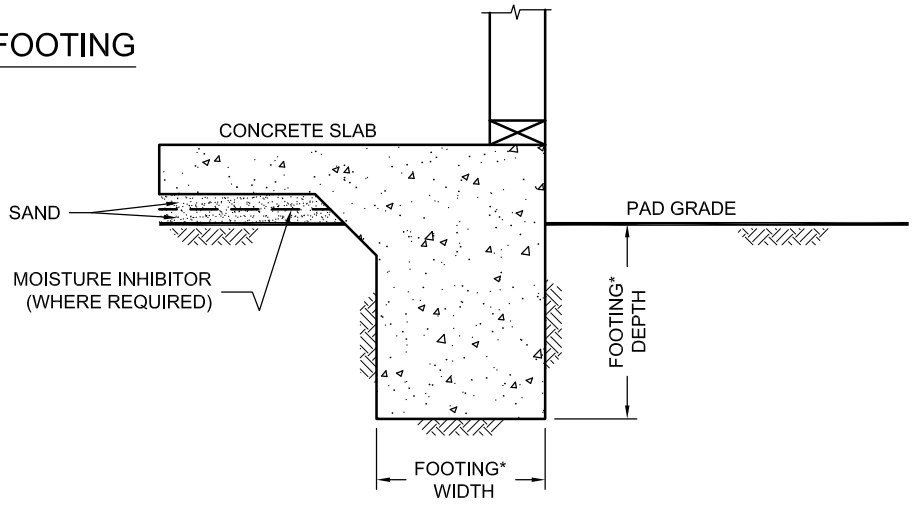
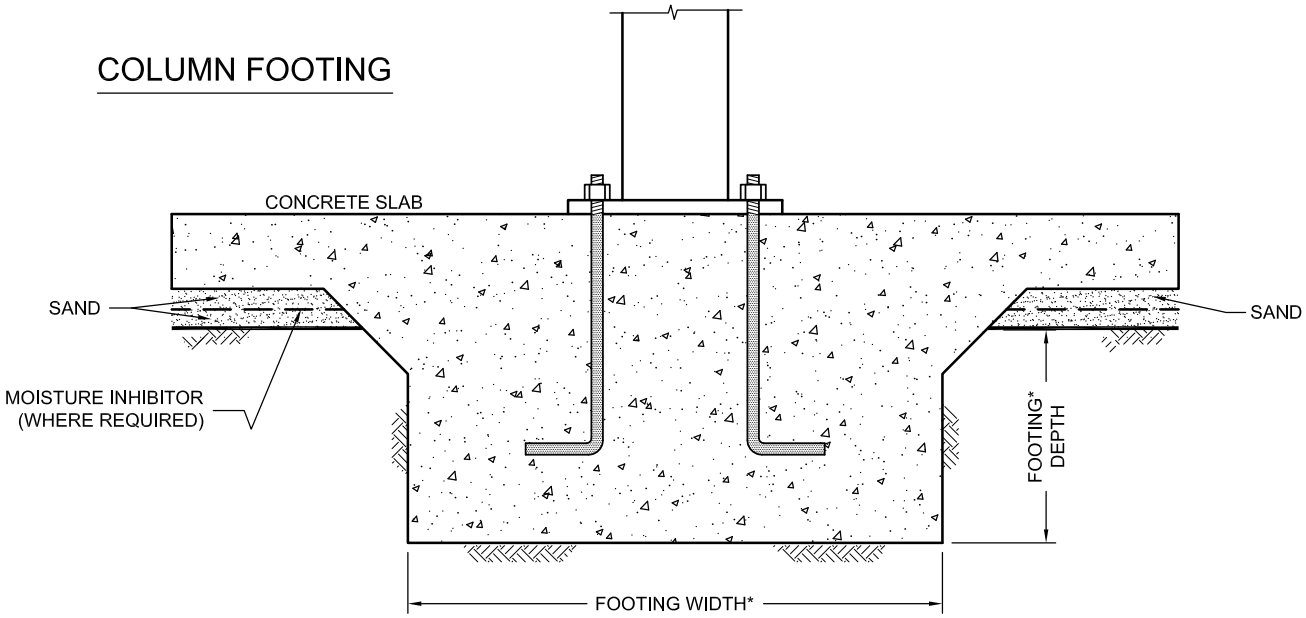
PROJECT NO. 04424 - 42 - 58
FIGURE 2
DATE 06 - 17 - 2011

Y:\PROJECTS\04424-42-58 (Crosby Enclave)\SHEETS\04424-42-58 Map.dwg

WALL FOOTING



COLUMN FOOTING



NO SCALE

*....SEE REPORT FOR FOUNDATION WITDH AND DEPTH RECOMMENDATION

WALL / COLUMN FOOTING DIMENSION DETAIL

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THE CROSBY ENCLAVE AT RANCHO SANTA FE
SAN DIEGO COUNTY, CALIFORNIA

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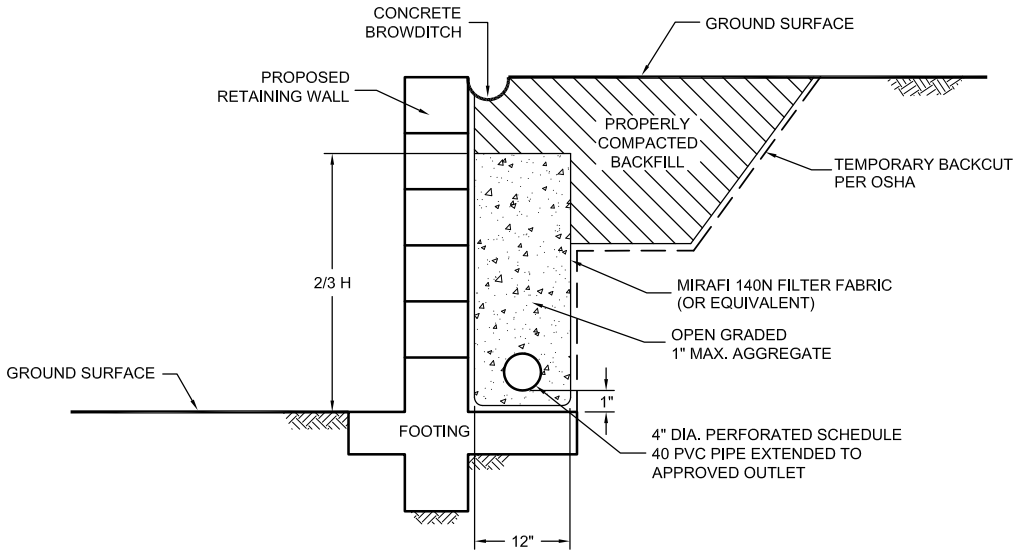
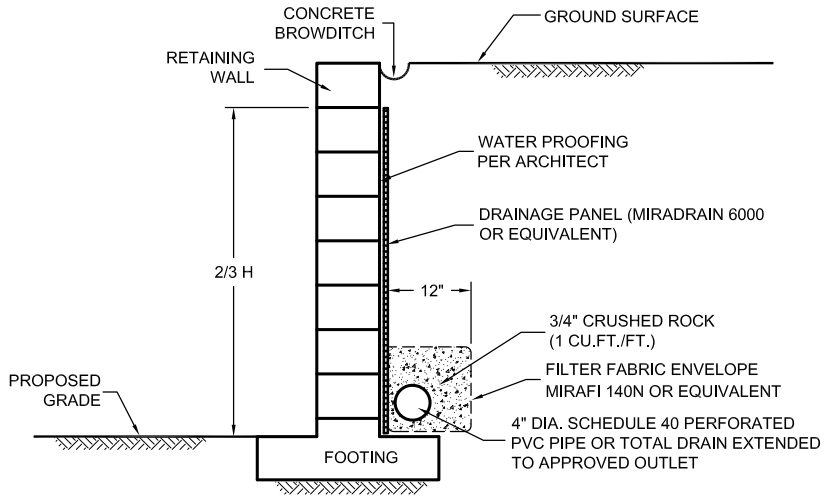
DATE 06 - 17 - 2011	PROJECT NO. 04424 - 42 - 58	FIG. 3

COLFOOT2.DWG/aml





NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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DATE 06 - 17 - 2011	PROJECT NO. 04424 - 42 - 58	FIG. 4

RWDD7

APPENDIX A

APPENDIX A

EXPLORATORY TRENCHING

Exploratory trenching was performed March 1, 2011, using a Caterpillar 320 DL excavator. The approximate locations of the exploratory trenches are shown on the Geologic Map, Figure 2. Trench logs are presented on Figures A-1 through A-5. The trench locations were determined in the field using existing reference points. Therefore, actual trench locations may deviate slightly.

The soil encountered in the trenches were visually examined, 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). The logs depict the soil and geologic conditions observed.

PROJECT NO. 04424-42-58

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 1 ELEV. (MSL.) _____ DATE COMPLETED 03-01-2011 EQUIPMENT CAT 320 DL BY: G. CANNON	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**UNDOCUMENTED FILL** Dense, moist, brown, Clayey, fine to medium SAND, with gravel and cobble			
2			▽					
					WEATHERED METAMORPHIC ROCK Moderately weathered, strong, highly jointed, METAMORPHIC ROCK			
4								
6								
8								
10								
12								
					TRENCH TERMINATED AT 13 FEET			

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

04424-42-58.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.

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PROJECT NO. 04424-42-58

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 2 ELEV. (MSL.) _____ DATE COMPLETED 03-01-2011 EQUIPMENT CAT 320 DL BY: G. CANNON	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL** Loose, dry, gray, Gravelly, Silty, fine to coarse SAND			
				SC	**OLD TERRACE DEPOSITS** Dense, moist, red brown, Clayey, fine to medium SAND			
2								
4								
6					**WEATHERED METAMORPHIC ROCK** Moderately weathered, strong, highly jointed, METAMORPHIC ROCK			
8								
10								
12								
14								
					TRENCH TERMINATED AT 15 FEET			

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

04424-42-58.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. 04424-42-58

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 3** ELEV. (MSL.) _____ DATE COMPLETED **03-01-2011** EQUIPMENT **CAT 320 DL** BY: **G. CANNON**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**METAMORPHIC ROCK** Highly weathered, weak, highly jointed, METAMORPHIC ROCK			
2								
					Moderately weathered, strong, highly jointed, METAMORPHIC ROCK			
4								
6								
8								
10								
12								
					TRENCH TERMINATED AT 13 FEET			

04424-42-58.GPJ

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

SAMPLE SYMBOLS

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

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

GEOCON

PROJECT NO. 04424-42-58

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 4 ELEV. (MSL.) _____ DATE COMPLETED 03-01-2011 EQUIPMENT CAT 320 DL BY: G. CANNON	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**OLD TERRACE DEPOSIT** Dense, moist, red brown, Clayey, fine to coarse SAND, trace gravel			
2					**SANTIAGO PEAK VOLCANIC** Highly weathered, very weak, METAMORPHIC ROCK			
4								
6								
8					-Becomes hard to excavates			
10			▽					
12					TRENCH TERMINATED AT 12 FEET			

04424-42-58.GPJ

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

SAMPLE SYMBOLS

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

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

GEOCON

PROJECT NO. 04424-42-58

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 5 ELEV. (MSL.) _____ DATE COMPLETED 03-01-2011 EQUIPMENT CAT 320 DL BY: G. CANNON	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**OLD TERRACE DEPOSITS** Dense, moist, red brown, Clayey, fine to coarse SAND			
2								
4					-Numerous cobbles and boulders of fresh Santiago Peak Volcanic			
6					TRENCH TERMINATED AT 6 FEET			

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

04424-42-58.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.

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APPENDIX B

APPENDIX B

RECOMMENDED GRADING SPECIFICATIONS

FOR

THE CROSBY ENCLAVE AT RANCHO SANTA FE
SAN DIEGO COUNTY, CALIFORNIA

PROJECT NO. 04424-42-58

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 Incorporated. 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, 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

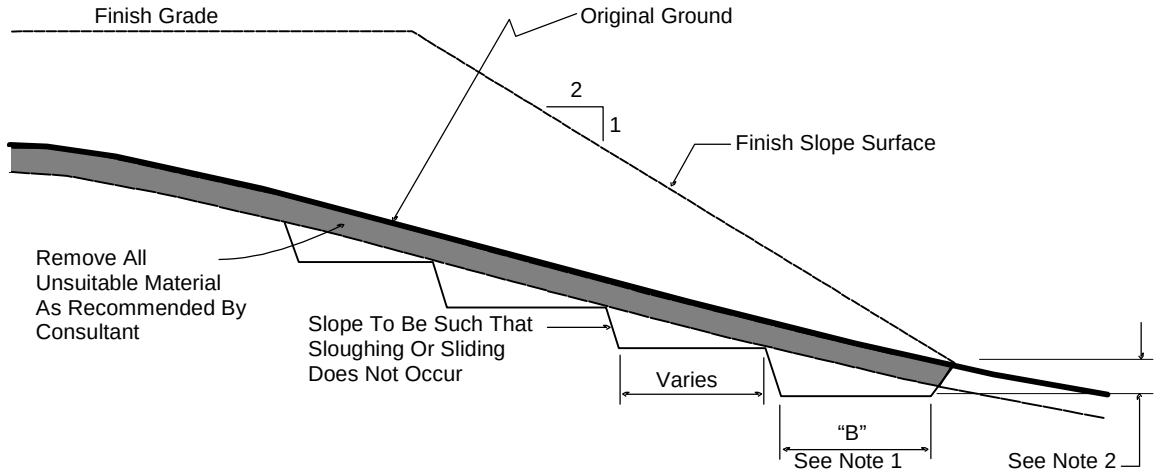
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material 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 Any asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

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

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

TYPICAL BENCHING DETAIL



No Scale

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

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

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

5. COMPACTION EQUIPMENT

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

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

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

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

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

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557-02.

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 1557-02. 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 1196-93, 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. OBSERVATION AND TESTING

7.1 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.

7.2 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.

7.3 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.

7.4 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.

7.5 The Consultant should observe the placement of subdrains, to verify that the drainage devices have been placed and constructed in substantial conformance with project specifications.

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

7.6.1 Soil and Soil-Rock Fills:

7.6.1.1 Field Density Test, ASTM D 1556-02, *Density of Soil In-Place By the Sand-Cone Method.*

7.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938-08A, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

7.6.1.3 Laboratory Compaction Test, ASTM D 1557-02, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

7.6.1.4. Expansion Index Test, ASTM D 4829-03, *Expansion Index Test*.

7.6.2 Rock Fills

7.6.2.1 Field Plate Bearing Test, ASTM D 1196-93 (Reapproved 1997) *Standard Method for Nonreparative Static Plate Load Tests of Soils and Flexible Pavement Components, For Use in Evaluation and Design of Airport and Highway Pavements.*

8. PROTECTION OF WORK

8.1 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.

8.2 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.

9. CERTIFICATIONS AND FINAL REPORTS

9.1 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.

9.2 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.