GEOCON
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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G1931-32-01
December 29, 2015

Westmont Development LP
7660 Fay Avenue, Suite N
La Jolla, California 92037

Attention: Mr. Andrew Plant

Subject: GEOTECHNICAL INVESTIGATION
WESTMONT OF LA MESA
LA MESA, CALIFORNIA

Dear Mr. Plant:

In accordance with your request, we have performed a geotechnical investigation to address the proposed senior care facility located in La Mesa, California. The results of our study indicate that the site can be developed as planned, provided the recommendations of this report are followed.

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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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical study for the proposed Westmont of La Mesa project located in La Mesa, California (see *Vicinity Map*, Figure 1). The purpose of the study was to investigate the soil and geologic conditions at the site, as well as evaluate geotechnical constraints, if any, that may impact areas of proposed development. This report provides recommendations relative to the geotechnical engineering aspects of developing the property as presently proposed based on the conditions encountered during this study.

The scope of the investigation included a review of aerial photographs, satellite imagery, and readily available published and unpublished geologic literature. The scope also included performing a field investigation, laboratory testing of soils collected at the site and preparation of this report.

The field investigation was conducted on December 15, 2015, and consisted of performing a site reconnaissance by an engineering geologist and excavating twelve exploratory trenches. The trenches were performed to evaluate the soil and geologic units within the areas of planned development. Details of the field exploration, as well as descriptive trench logs, are presented in Appendix A.

Laboratory tests were performed on selected representative soil samples obtained during the field investigation to evaluate the pertinent physical and chemical properties of the soils encountered. A summary of the laboratory test results are presented in Appendix B.

The exhibit used as a base map to depict the trench locations consists of a reproducible copy of a compilation of digital information provided by Lenity Architecture (*Site Plan,* Figure 2). The plan depicts the proposed conceptual development superimposed on an aerial image of the property. We added the approximate locations of the exploratory trenches and other notable features observed during our field reconnaissance. The conclusions and recommendations presented herein are based on an analysis of the data obtained from the field investigation, laboratory tests, and our experience with similar soil and geologic conditions.

2. SITE AND PROJECT DESCRIPTION

The senior care facility is proposed northeast of the undercrossing of Murray Drive and State Highway SR-125 in La Mesa, California. Our review of 1953 aerial photos indicates the site was once a residential neighborhood with surrounding open space. The historical satellite imagery dating back to 1994, indicates the site was sheet graded sometime after 1996 in several phases and was most recently leased to a general contractor for use as a staging area for the Grossmont Hospital expansion project.

Improvements observed on site include an approximately 150-foot long, 16-foot high, mechanically stabilized earth (MSE) retaining wall located along the southwestern edge of the site, two desiliting basins located along the southern portion of the site and a hardened construction entrance off of Murray Drive. In general, the property drains from north to south.

We understand that the approximately 3.3-acre site will be graded to accommodate a three-story, 197,675-square-foot retirement care facility with 140 assisted living suites, 36 memory care suites, and 74 parking stalls. A pool is planned in the southern portion of the site, however, no subterranean parking or basements are planned. The proposed grading for the project is not known at this time, however, based on the relatively flat site, cuts and fills are anticipated to be 3 feet or less.

3. SOIL AND GEOLOGIC CONDITIONS

One surficial soil type and one geologic formation was encountered during the field investigation. The surficial deposit consists of undocumented fill and the geologic formation consists of the Stadium Conglomerate. The surficial soil and geologic unit are discussed below in order of increasing age.

3.1 Undocumented Fill

Undocumented fill deposits were encountered in each of the exploratory trenches and varied in thickness between ½ and 4½ feet. The fill generally consists of medium dense, moist, silty, fine- to medium-grained sands with varying amounts of gravel and cobble size rock fragments up to 10 inches in size. A thin layer (less than 6 inches) of aggregate base has been placed across the majority of the site, likely by the previous general contractor that leased the property for a construction staging area.

The embankment placed in conjunction with the approximately 16-foot high MSE wall located along the southwestern boundary (shown on Figure 2) could not be evaluated without removing an existing chain link fence and disturbing the wall reinforcement. However, the wall appears to be performing adequately and is located outside of any proposed improvements for the project.

An inquiry was made with the City of La Mesa in order to obtain any as-graded reports for the embankments placed on site, however, we received no response. Therefore, because no documentation is available, we have assumed the fill deposits were placed without geotechnical observation and have been classified as “undocumented”. These deposits are unsuitable in their present condition and will require removal and compaction in the areas proposed to be graded and/or where settlement sensitive improvements are planned.

3.2 Stadium Conglomerate

The Eocene-age Stadium Conglomerate was encountered at existing grade and underlying the undocumented fill deposits across the site. As encountered in exploratory trenches, this deposit generally consists of dense to very dense, white to light brown, sandy to clayey, gravel and cobble conglomerate with interbedded silty sands. In general, the trenches advanced through this unit encountered moderate difficulty and refusal due to cemented layers (Trench T-1); therefore, moderate to heavy ripping should be anticipated during grading or underground improvement construction within the Stadium Conglomerate.

4. GROUNDWATER

Groundwater was not encountered during the field investigation and is not anticipated to significantly impact project development as presently proposed. However, it is not uncommon for groundwater or seepage conditions to develop where none previously existed.

5. GEOLOGIC HAZARDS

5.1 Faulting and Seismicity

Based on our reconnaissance 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 Rose Canyon Fault zone and the Newport-Inglewood Fault, located approximately 10 miles west of the site, are the closest known active faults. The CGS considers a fault seismically active when evidence suggests seismic activity within roughly the last 11,000 years. The CGS has included portions of the Rose Canyon Fault zone within an Alquist-Priolo Earthquake Fault Zone.

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 Faults, located approximately 10 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. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Newport Inglewood Fault are 7.5 and 0.25g, respectively. 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 USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 acceleration-attenuation relationships.

TABLE 5.1.1
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)
Newport-Inglewood	10	7.5	0.23	0.20	0.25
Rose Canyon	10	6.9	0.19	0.18	0.19
Coronado Bank	22	7.4	0.15	0.11	0.12
Palos Verdes Connected	22	7.7	0.16	0.12	0.15
Elsinore	32	7.85	0.13	0.09	0.12
Earthquake Valley	37	6.8	0.07	0.06	0.05

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

TABLE 5.1.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2007 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2008 (g)
2% in a 50 Year Period	0.35	0.35	0.39
5% in a 50 Year Period	0.25	0.25	0.27
10% in a 50 Year Period	0.19	0.19	0.19

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) guidelines currently adopted by the City of La Mesa.

The site could be subjected to moderate to severe ground shaking in the event of a major earthquake on any of the referenced faults or other faults in Southern California. With respect to seismic shaking, the site is considered comparable to the surrounding developed area.

5.2 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless, groundwater is encountered within 50 feet of the surface, and soil densities are less than about 70 percent of the maximum dry densities. If all four criteria are met, a seismic event could result in a rapid increase in pore water pressure from the earthquake-generated ground accelerations. The potential for liquefaction at the site is considered to be negligible due to the dense formational material encountered, remedial grading recommended, and lack of a shallow groundwater condition.

5.3 Landslides

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

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 The site is underlain by undocumented fill that is unsuitable in its present condition and will require remedial grading where improvements are planned. The actual extent of unsuitable soil removal will be determined in the field by the geotechnical engineer and/or engineering geologist.

6.1.3 The embankment associated with the MSE wall located along the southwestern boundary will not require remedial grading provided no structural improvements are planned above or adjacent to the wall that would impact its integrity. Geocon Incorporated should review the grading plans for the project prior to final design submittal to evaluate whether or not additional analyses and/or recommendations are required.

6.2 Excavation and Soil Characteristics

6.2.1 Excavation of the undocumented fill should be possible with light to moderate effort using conventional heavy-duty equipment. Excavations within the Stadium Conglomerate will require moderate to very heavy effort due to the high cobble percentage and random occurrence of highly cemented zones. Oversize material (12-inches or greater) and cemented chunks of conglomerate may be generated that will require special handling and placement in deeper fill areas or exportation depending on the availability of suitable fill areas.

6.2.2 The soil encountered in the field investigation is considered to be "expansive" (expansion index [EI] of 90 or less) as defined by 2013 California Building Code (CBC) Section 1803.5.3. Table 6.2 presents soil classifications based on the expansion index. The soil materials collected and tested for expansion index indicate a "very low" to "medium" expansion potential (expansion index of 90 or less).

TABLE 6.2
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	Expansion Classification	2013 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

6.3 Corrosion

6.3.1 Laboratory tests were performed on soil samples to evaluate the water-soluble sulfate content (California Test No. 417), pH and minimum resistivity (California Test Method 643), and Chloride Ion Content (AASHTO T291-94) to generally evaluate the corrosion potential to structures in contact with soil. The results of the laboratory tests are summarized in Appendix B. The results should be considered for design of concrete, underground structures and metallic pipes.

6.3.2 Results from the laboratory water-soluble sulfate content tests indicate that the materials at the locations tested possesses *Not Applicable* and *S0* sulfate exposure to concrete structures as defined by 2013 CBC Section 1904 and ACI 318-11 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. Table 6.3 presents a summary of concrete requirements set forth by 2013 CBC Section 1904 and ACI 318.

TABLE 6.3
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Sulfate Severity	Exposure Class	Water-Soluble Sulfate (SO_4) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight	Minimum Compressive Strength (psi)
Not Applicable	S0	$SO_4 < 0.10$	--	--	2,500
Moderate	S1	$0.10 \le SO_4 < 0.20$	II	0.50	4,000
Severe	S2	$0.20 \le SO_4 \le 2.00$	V	0.45	4,500
Very Severe	S3	$SO_4 > 2.00$	V+Pozzolan or Slag	0.45	4,500

6.3.3 Geocon Incorporated does not practice in the field of corrosion engineering; therefore, further evaluation by a corrosion engineer may be needed to incorporate the necessary precautions to avoid premature corrosion of underground pipes and buried metal in direct contact with the soils.

6.4 Grading

6.4.1 All grading should be performed in accordance with the attached *Recommended Grading Specifications* (Appendix C). Where the recommendations of this section conflict with Appendix C, 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 La Mesa 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. The depth of removal should be such that material exposed in cut areas or soils to be used as fill are relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

6.4.5 All undocumented fill and any other surficial deposits (i.e. topsoil, colluvium) present within areas where structural improvements are planned should be removed to firm natural ground and properly compacted prior to placing additional fill and/or structural loads. The actual extent of unsuitable soil removals will be determined in the field during grading by the geotechnical engineer and/or engineering geologist.

6.4.6 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.

6.4.7 Oversize material (defined as material greater than 12 inches in nominal dimension) may be generated during grading within the Stadium Conglomerate. The placement of oversize material should be in accordance with the recommendations in Appendix C, at least 3 feet below finish grade and a minimum of 2 feet below all utilities.

6.4.8 Where practical, the upper 3 feet of the building pads should be comprised of soil with a "very low" to "low" expansion potential. The more highly expansive fill soils should be placed in the deeper fill areas and properly compacted, if encountered. "Very low" to "low" expansive soils are defined by the 2013 California Building Code (CBC) Section 1803.5.3 as those soils that have an Expansion Index of 50 or less.

6.4.9 The bedrock portion of cut/fill transitions exposed in building pads should be undercut at least 3 feet and replaced with properly compacted granular materials having a "low" to "very low" expansion potential. The lateral limits of the undercut should extend a minimum of 5 feet outside the building footprint. Alternatively, consideration may be given to deepening footings through the compacted fill and supporting the proposed structure entirely on the Stadium Conglomerate. The deepened portion of the footing excavations may be filled with a 2-sack cement slurry to bottom of planned footing elevation.

6.4.10 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.

6.4.11 Import fill (if necessary) should consist of granular materials with a "very low" to "low" expansion potential (EI of 50 or less) free of deleterious material or stones larger than 3 inches and should be compacted as recommended above. 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.

6.5 Seismic Design Criteria

6.5.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 6.5.1 summarizes site-specific design criteria obtained from the 2013 California Building Code (CBC; Based on the 2012 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The building structure and improvements should be designed using a Site Class C. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2013 CBC and Table 20.3-1 of ASCE 7-10. The values presented in Table 6.5.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 6.5.1
2013 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2013 CBC Reference
Site Class	C	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.866g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.336g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.053	Table 1613.3.3(1)
Site Coefficient, F_V	1.464	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	0.913g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	0.492g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.608g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.328g	Section 1613.3.4 (Eqn 16-40)

6.5.2 Table 6.5.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 6.5.2
2013 CBC SITE ACCELERATION DESIGN PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.331g	Figure 22-7
Site Coefficient, F_{PGA}	1.069	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.354g	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 if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

6.6 Foundations

6.6.1 The proposed structure can be supported on a shallow foundation system founded entirely in compacted fill. Foundations for the structure should consist of continuous strip footings and/or isolated spread footings. Continuous footings should be at least 12 inches wide and extend at least 18 inches below lowest adjacent pad grade. Isolated spread footings should have a minimum width of 2 feet and should extend at least 18 inches below lowest adjacent pad grade. Steel reinforcement for continuous footings should consist of at least four No. 4 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. A footing dimension detail, depicting the depth to lowest adjacent grade, is presented in Figure 3.

6.6.2 The minimum reinforcement recommended above is based on soil characteristics only (Expansion Index of 90 or less) and is not intended to replace reinforcement required for structural considerations.

6.6.3 The recommended allowable bearing capacity for foundations with minimum dimensions described above and bearing in compacted fill is 2,000 pounds per square foot (psf). This allowable soil bearing pressure may be increased by an additional 500 psf for each additional foot of depth and 300 psf for each additional foot of width, to a maximum allowable bearing capacity of 4,000 psf. The values presented above are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

6.6.4 Footings that must be placed within 7 feet of the top of slopes should be extended in depth such that the outer bottom edge of the footing is at least 7 feet horizontally inside the face of the slope.

6.6.5 Static settlement of the building founded on properly compacted fill is expected to be less than 1-inch. Differential static settlement is expected to be one-half of the total settlement.

6.6.6 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 structure. The post-tensioned system 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 2013 California Building Code (CBC Section 1808.6). 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 on Table 6.6. The parameters presented in Table 6.6 are based on the guidelines presented in the PTI, Third Edition design manual.

TABLE 6.6
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI),Third Edition Design Parameters	
Thornthwaite Index	-20
Equilibrium Suction	3.9
Edge Lift Moisture Variation Distance, e_M (feet)	5.1
Edge Lift, y_M (inches)	1.10
Center Lift Moisture Variation Distance, e_M (feet)	9.0
Center Lift, y_M (inches)	0.47

6.6.7 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.

6.6.8 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. Current PTI design procedures primarily address the potential center lift of slabs but, because of the placement of the reinforcing tendons in the top of the slab, the resulting eccentricity after tensioning reduces 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.

6.6.9 During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints be allowed to form between the footings/grade beams and the slab during the construction of the post-tension foundation system.

6.6.10 The exposed foundation and slab subgrade soil should be moisture conditioned to maintain a moist condition as would be expected in any such concrete placement. The elevated moisture content should be maintained until concrete placement.

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

6.6.12 Foundation excavations should be observed by the geotechnical engineer (a representative of Geocon Incorporated) prior to the placement of reinforcing steel and concrete to verify that the exposed soil conditions are consistent with those anticipated and have been extended to appropriate bearing strata. If unanticipated soil conditions are encountered, foundation modifications may be required.

6.7 Concrete Slabs-on-Grade

6.7.1 Concrete slabs-on-grade for the structure should be at least 5 inches thick and reinforced with No. 3 steel reinforcing bars at 24 inches on center in both horizontal directions.

6.7.2 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). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. 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.

6.7.3 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. Typically, concrete slabs on grade are underlain by 4 inches of clean sand (or crushed rock), with the vapor inhibitor placed at the midpoint. 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.

6.7.4 As a substitute, the layer of clean sand (or crushed rock) beneath the vapor inhibitor recommended in the previous section can be omitted if a vapor inhibitor that meets or exceeds the requirements of ASTM E 1745 (Class A), and that exhibits permeance not greater than 0.012 perm (measured in accordance with ASTM E 96) is used. This vapor inhibitor may be placed directly on properly compacted fill or formational materials. The vapor inhibitor should be installed in general conformance with ASTM E 1643 and the manufacturer's recommendations. Two inches of clean sand should then be placed on top of the vapor inhibitor to reduce the potential for differential curing, slab curl, and cracking. Floor coverings should be installed in accordance with the manufacturer's recommendations.

6.7.5 The concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting vehicle, equipment and storage loads.

6.7.6 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 should be reinforced with 6x6-6/6 welded wire mesh or No. 3 reinforcing bars at 24 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.

6.7.7 Proper moisture conditioning of subgrade soil supporting flatwork and concrete pavement is critical to reduce the effects of expansive soils. Prior to concrete placement, the upper 1 foot of subgrade should be scarified, moisture conditioned, and compacted to at least 90 percent of the maximum dry density at slightly over optimum moisture content in sidewalk areas and at least 95 percent for subgrade supporting pavement. Soils placed below optimum moisture content should be reworked and retested prior to placing concrete. It is imperative that the moisture content be maintained until the concrete pour.

6.7.8 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 exhibit some cracking. 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. Crack-control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Cement 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 Preliminary Pavement Recommendations

6.8.1 The pavement recommendations presented herein are based on an R-Value of 18. Final pavement sections should be calculated once subgrade elevations have been attained and R-Value testing on actual subgrade samples is performed. Asphalt concrete pavement thicknesses were calculated using procedures outlined in the *California Highway Design Manual* (Caltrans). We expect the majority of traffic will consist of automobile and delivery truck traffic and periodic trash and fire truck traffic. Summarized on Table 6.8 are recommended pavement sections for various traffic indices. The architect, civil engineer, or developer should determine the appropriate Traffic Index (TI) for the traffic loading expected on the project. In our opinion, a TI of 4.5 is appropriate for parking stalls and a TI of 5 or 6 for parking areas.

TABLE 6.8
FLEXIBLE PAVEMENT SECTION RECOMMENDATIONS

Location	Traffic Index	R-Value	Asphalt Concrete Thickness (inches)	Class 2 Aggregate Base Thickness (inches)
Parking Lot	4.5	18	3	6
	5.0	18	3	7.5
	5.5	18	3	9.5
	6.0	18	3.5	10
	7.0	18	3.5	13.5

6.8.2 The subgrade soils for pavement areas should be compacted to a minimum relative compaction of 95 percent at or slightly above the optimum moisture content. The depth of subgrade compaction should be approximately 12 inches.

6.8.3 Class 2 base should conform to Section 26-1-02B of the *Standard Specifications for The State of California Department of Transportation (Caltrans)* and should be compacted to a minimum of 95 percent of the maximum dry density at near optimum moisture content. The asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Greenbook).*

6.8.4 The performance of asphalt concrete pavements is highly dependent upon providing positive surface drainage away from the edge of the pavement. Ponding of water on or adjacent to the pavement will likely result in pavement distress and subgrade failure. If planter islands are proposed, the perimeter curb should extend at least 12 inches below proposed subgrade elevations. In addition, the surface drainage within the planter should be such that ponding will not occur.

6.8.5 Our experience indicates that even with these provisions, a groundwater condition can develop as a result of increased irrigation, landscaping and surface runoff.

6.9 Retaining Walls

6.9.1 The structural engineer should determine the seismic design category for the project. If the project possesses a seismic design category of D, E, or F, the proposed retaining walls should be designed with seismic lateral pressure. A seismic load of 18H should be used for design on walls that support more than 6 feet of backfill in accordance with Section 1803.5.12 of the 2013 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. We used the peak site acceleration, PGA_M, of 0.354g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

6.9.2 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid with a density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at no steeper than 2.0 to 1.0, 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 possess an Expansion Index of less than 50.

6.9.3 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining wall portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, an additional uniform pressure of 7H psf should be added to the above active soil pressure.

6.9.4 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be 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 granular

(EI less than 50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. A typical retaining wall drain detail is shown as Figure 4. If conditions different than those described are anticipated, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

6.9.5 Retaining wall footings should be at least 12 inches wide and 12 inches below lowest adjacent grade. An allowable bearing capacity for retaining wall footings founded in compacted fill can be taken as 2,000 psf.

6.9.6 Footings that must be placed within seven feet of the top of slopes should be extended in depth such that the outer bottom edge of the footing is at least seven feet horizontally inside the face of the slope.

6.9.7 To resist lateral loads, a passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot (pcf) should be used for the design of footings or shear keys poured neat against properly compacted granular fill soils. The allowable passive pressure assumes a horizontal surface extending at least 5 feet away from the base of the wall or three times the height of 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 the design for passive resistance.

6.9.8 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.35 should be used for the design. This friction coefficient may be combined with the allowable passive earth pressure when determining resistance to lateral loads.

6.9.9 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of approximately 12 feet. In the event that walls higher than 12 feet or other types of walls are planned, such as crib-type walls, Geocon Incorporated should be consulted for additional recommendations.

6.10 Storm Water Management

6.10.1 If low-impact development (LID) integrated management practices (IMP's) are being considered, Geocon should review the design and provide specific geotechnical recommendations to reduce the potential adverse impacts to both on and off-site properties.

6.10.2 If not property 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. Based on our experience with similar soil conditions, infiltration IMP's are considered infeasible due to the poor percolation characteristics of the bedrock. Down-gradient and adjacent properties/improvements may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other impacts as a result of water infiltration.

6.10.3 Due to the site geologic conditions, a heavy duty, non-permeable liner is recommended beneath any hydro-modification areas or IMP's where water infiltration into the underlying soils is planned. If permeable pavers are planned, the design should include a subdrain to prevent subgrade saturation and pavement distress. The strength and thickness of the membrane, and construction method should be adequate to assure that the liner will not be compromised throughout the life of the system. In addition, civil engineering provisions should be implemented to assure that the capacity of the system is never exceeded resulting in over topping or malfunctioning of the device. The system should also include a long-term maintenance program or periodic cleaning to prevent clogging of the filter media or drain envelope. Geocon Incorporated has no opinion regarding the design of the filtration system or its effectiveness. A typical bioretention basin detail is presented as Figure 5. A subdrain cut-off wall detail is shown as Figure 6. A typical subdrain outlet headwall detail is provided as Figure 7.

6.11 Site Drainage and Moisture Protection

6.11.1 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 2013 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.

6.11.2 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 Plan Review

6.12.1 Geocon Incorporated should review the 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

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WESTMONT OF LA MESA
LA MESA, CALIFORNIA

TR / CW		DSK/GTYPD	DATE 12 - 29 - 2015	PROJECT NO. G1931 - 32 - 01	FIG. 1

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T-12 ....APP

(4.5) ....APP
(IN F

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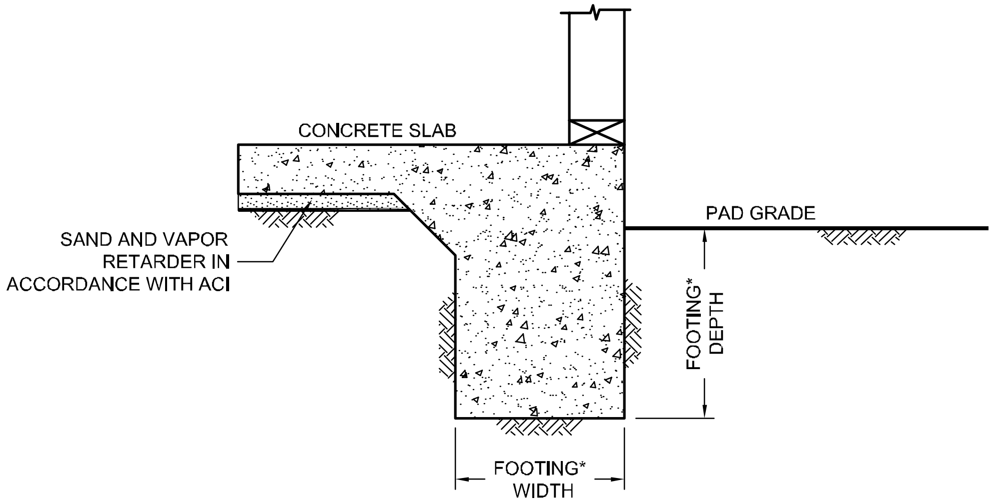

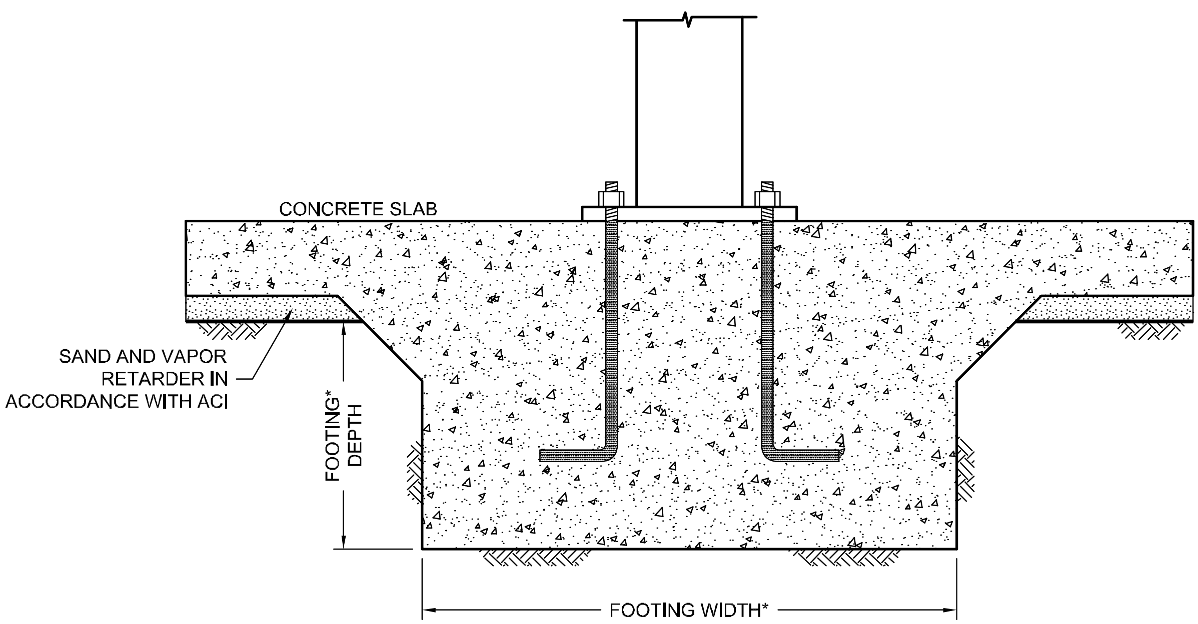

*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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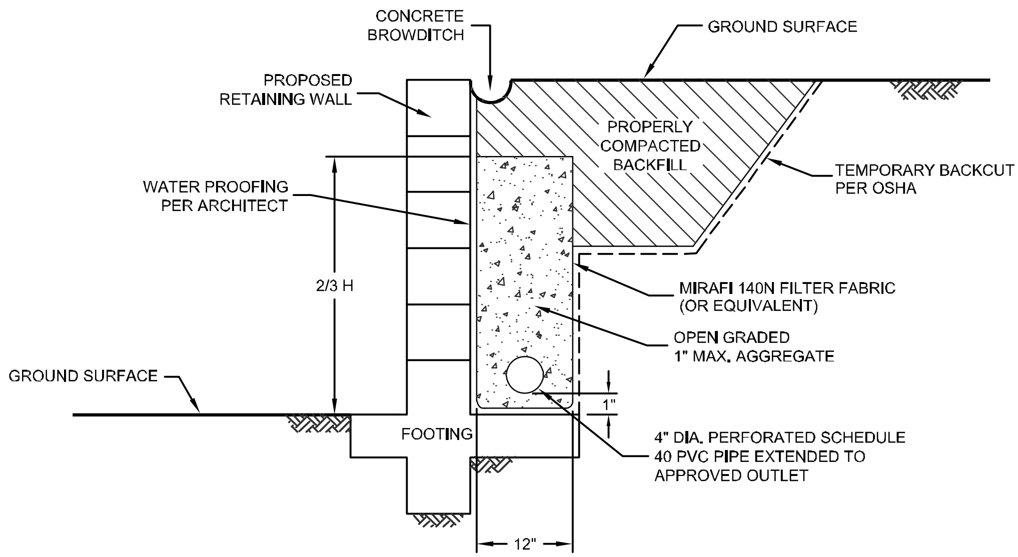
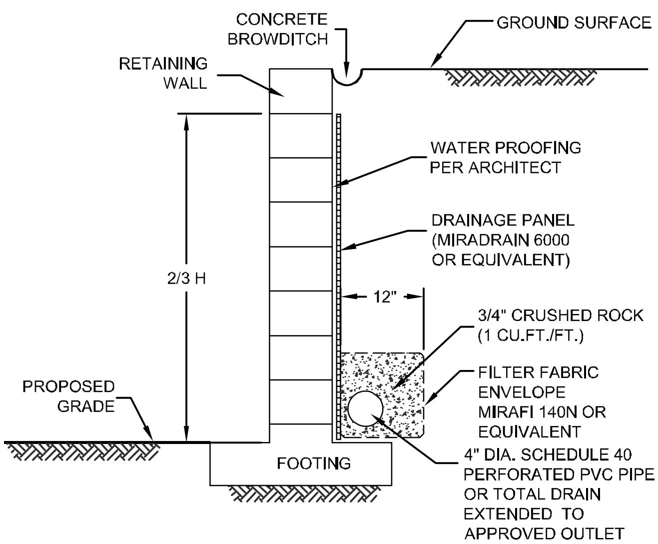
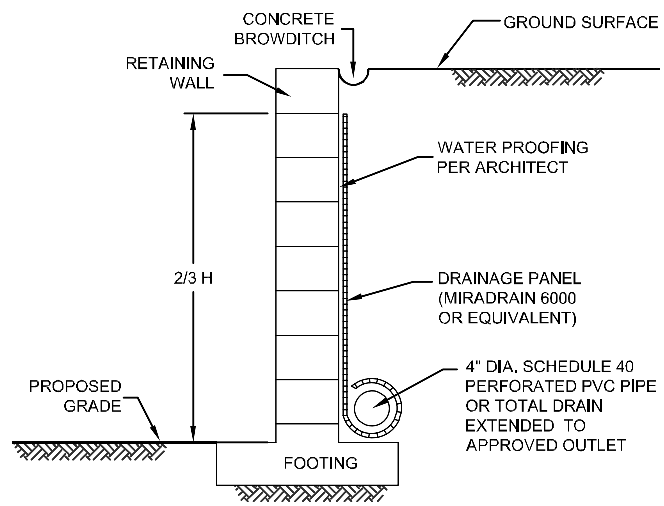
TR / CW		DSK/GTYPD	DATE 12 - 29 - 2015	PROJECT NO. G1931 - 32 - 01	FIG. 3







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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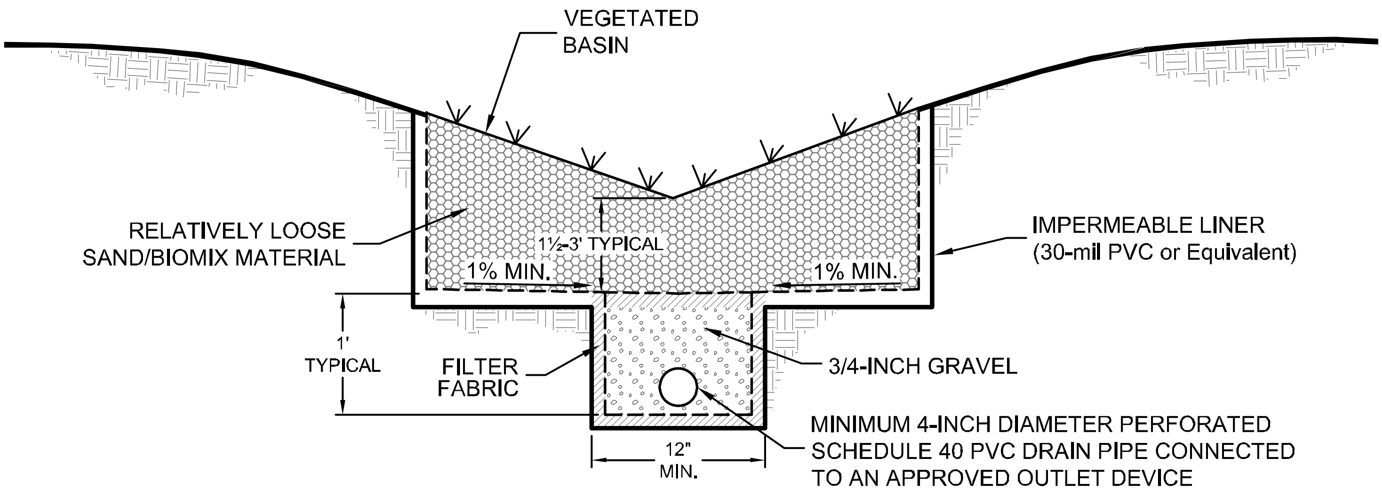
TR / CW		DSK/GTYPD	DATE 12 - 29 - 2015	PROJECT NO. G1931 - 32 - 01	FIG. 4



NOTE: CLASS II PERMEABLE BASE MAY BE USED AS AN ALTERNATIVE TO 3/4" GRAVEL AND FILTER FABRIC.

NO SCALE

TYPICAL BIORETENTION BASIN DETAIL

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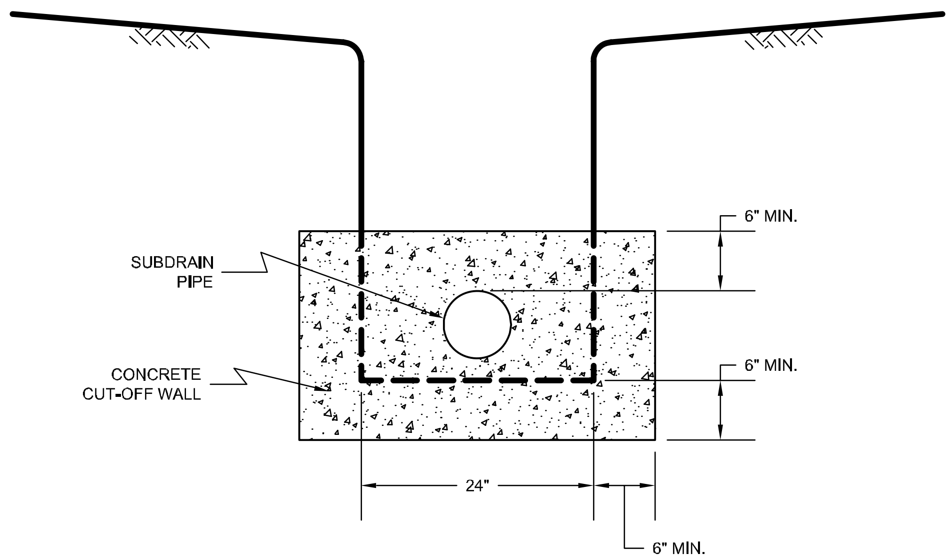
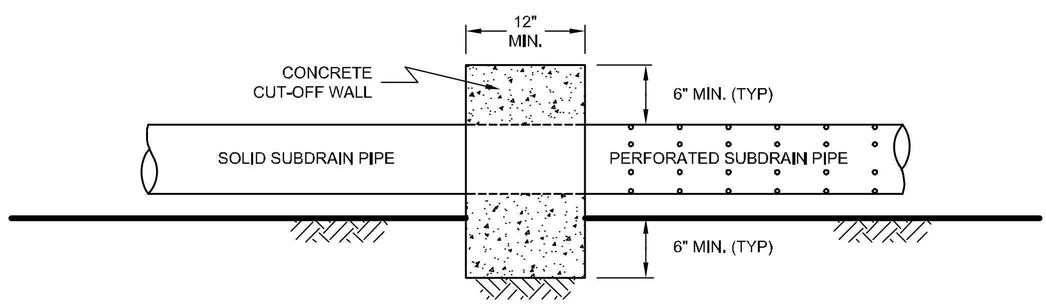
TR / CW		DSK/GTYPD	DATE 12 - 29 - 2015	PROJECT NO. G1931 - 32 - 01	FIG. 5

FRONT VIEW



NO SCALE

SIDE VIEW



NO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL DETAIL

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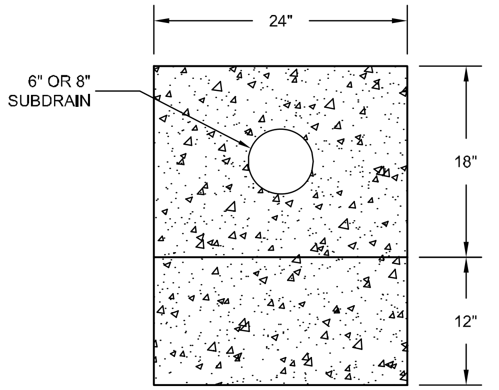
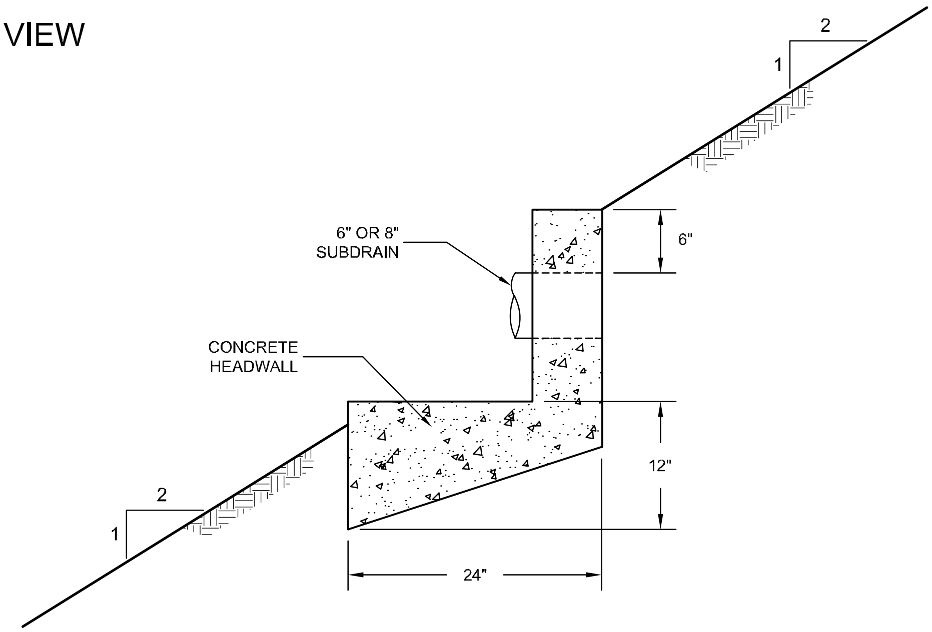
TR / CW		DSK/GTYPD	DATE 12 - 29 - 2015	PROJECT NO. G1931 - 32 - 01	FIG. 6

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE
OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

SUBDRAIN OUTLET HEADWALL DETAIL

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TR / CW		DSK/GTYPD	DATE 12 - 29 - 2015	PROJECT NO. G1931 - 32 - 01	FIG. 7

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The field investigation was performed on December 15, 2015, and consisted of a visual site reconnaissance and excavating twelve exploratory trenches (Trench Nos. T-1 through T-12) at various locations across the subject site. The approximate locations of the trenches are shown on the *Site Plan*, Figure 2.

The exploratory trenches performed by Hillside Excavating were advanced to depths of 4 to 6 feet using a John Deere 410G rubber tire backhoe equipped with a 24-inch-wide bucket. Bulk samples were obtained for laboratory testing.

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

PROJECT NO. G1931-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 1 ELEV. (MSL.)_______ DATE COMPLETED 12-15-2015 EQUIPMENT RUBBER TIRE BACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	T1-1			SM	**UNDOCUMENTED FILL** Medium dense, damp to moist, dark brown to light brown, Silty, fine to medium SAND with some gravel and trace asphalt chunks			
2								
4								
				GM	**STADIUM CONGLOMERATE** Very dense, damp, light brown, fine to medium, Sandy CONGLOMERATE with 50-60% gravel size rock fragments up to 8-inches; cemented			
					REFUSAL AT 5 FEET			

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

G1931-32-01.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 2

ELEV. (MSL.)________ DATE COMPLETED 12-15-2015

EQUIPMENT RUBBER TIRE BACKHOE BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL** Medium dense, moist, light brown to dark brown, Silty, fine to medium SAND with 10% gravel and cobble size rock fragments up to 6-inches			
2					-Abandoned 2-inch gray conduit pipe present at 2 feet			
4				GM/GC	**STADIUM CONGLOMERATE** Very dense, damp, light brown, fine to coarse, Sandy to Clayey CONGLOMERATE with 50-60% gravel and cobble size rock fragments up to 4-inches			
					TRENCH TERMINATED AT 5.5 FEET			

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

G1931-32-01.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 3

ELEV. (MSL.)________ DATE COMPLETED **12-15-2015**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	**4-inches of AGGREGATE BASE**			
				SM	**UNDOCUMENTED FILL** Medium dense, moist, light brown, Silty, fine to medium SAND with 20% gravel and cobble size rock fragments up to 6-inches			
2				GM/GC	**STADIUM CONGLOMERATE** Dense to very dense, damp, light brown, fine to coarse, Sandy to Clayey CONGLOMERATE with 50-60% gravel and cobble size rock fragments up to 6-inches			
	T3-1							
4								
					TRENCH TERMINATED AT 5.5 FEET			

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

G1931-32-01.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.

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TRENCH T 4

ELEV. (MSL.)________ DATE COMPLETED **12-15-2015**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	**2-inches of AGGREGATE BASE**			
				SM	**UNDOCUMENTED FILL** Medium dense, moist, light brown, Silty, fine to medium SAND with some gravel			
				GM/GC	**STADIUM CONGLOMERATE** Dense to very dense, damp, light brown, fine to coarse, Sandy to Clayey CONGLOMERATE with 50-60% gravel and cobble size rock fragments up to 6-inches			
2								
4					TRENCH TERMINATED AT 4 FEET			

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

G1931-32-01.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.

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PROJECT NO. G1931-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 5 ELEV. (MSL.)_______ DATE COMPLETED 12-15-2015 EQUIPMENT RUBBER TIRE BACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				GM	**2-inches of AGGREGATE BASE**			
				SM	**UNDOCUMENTED FILL** Medium dense, moist, light brown, Silty, fine to medium SAND with some gravel			
2 4				GM/GC	**STADIUM CONGLOMERATE** Dense to very dense, damp, light brown, fine to coarse, Sandy to Clayey CONGLOMERATE with 50-60% gravel and cobble size rock fragments up to 6-inches			
					TRENCH TERMINATED AT 5 FEET			

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

G1931-32-01.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 6

ELEV. (MSL.)_______ DATE COMPLETED **12-15-2015**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	**6-inches of AGGREGATE BASE**			
				SM	**STADIUM CONGLOMERATE** Dense, damp, white, Silty, fine to medium SANDSTONE			
2				GM	Dense, damp, white, fine to medium, Sandy CONGLOMERATE with 50-60% gravel and cobble size rock fragments up to 4-inches			
4				SM	Dense, damp, light gray, Silty, fine to medium SANDSTONE			
				GM	Dense, damp, white, fine to medium, Sandy CONGLOMERATE with 50-60% gravel and cobble size rock fragments up to 4-inches			
6					TRENCH TERMINATED AT 6 FEET			

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

G1931-32-01.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 7

ELEV. (MSL.)________ DATE COMPLETED **12-15-2015**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL** Medium dense, moist, light brown, Silty, fine to medium SAND with 10% gravel and cobble size rock fragments up to 6-inches			
				SM	**STADIUM CONGLOMERATE** Dense, damp, white, Silty, fine to medium SANDSTONE			
2								
				GM	Dense, damp, white, fine to coarse, Sandy CONGLOMERATE with 50-60% gravel and cobble size rock fragments up to 8-inches			
4								
6					TRENCH TERMINATED AT 6 FEET			

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

G1931-32-01.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.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 8 ELEV. (MSL.)_______ DATE COMPLETED 12-15-2015 EQUIPMENT RUBBER TIRE BACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL** Medium dense, moist, light brown, Silty, fine to medium SAND with 20-25% gravel and cobble size rock fragments up to 10-inches			
2				GM	**STADIUM CONGLOMERATE** Dense to very dense, damp, white, fine to medium, Sandy CONGLOMERATE with 50-60% gravel and cobble size rock fragments up to 10-inches			
4								
6					TRENCH TERMINATED AT 6 FEET			

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

G1931-32-01.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 9

ELEV. (MSL.)_______ DATE COMPLETED **12-15-2015**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	**6-inches of AGGREGATE BASE**			
	T9-1			SM	**STADIUM CONGLOMERATE** Dense, damp, white, Silty, fine to medium SANDSTONE			
2								
				GM	Dense to very dense, damp, white, fine to coarse, Sandy CONGLOMERATE with 50-60% gravel and cobble size rock fragments up to 8-inches			
4								
6					TRENCH TERMINATED AT 6 FEET			

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

G1931-32-01.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. G1931-32-01

TRENCH T 10

ELEV. (MSL.)________ DATE COMPLETED **12-15-2015**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL** Medium dense, moist, gray and brown, Silty, fine to medium SAND with 20-25% gravel			
2				GM	**STADIUM CONGLOMERATE** Dense to very dense, damp, light brown to gray, fine to medium, Sandy CONGLOMERATE with 50-60% gravel and cobble size rock fragments up to 10-inches			
4								
6					TRENCH TERMINATED AT 6 FEET			

Figure A-10,
Log of Trench T 10, Page 1 of 1

G1931-32-01.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. G1931-32-01

TRENCH T 11

ELEV. (MSL.)________ DATE COMPLETED **12-15-2015**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T11-1			GM	**3-inch of AGGREGATE BASE**			
				SM/SC	**UNDOCUMENTED FILL** Medium dense, moist, brown, Silty/Clayey, fine to medium SAND with 10% gravel and cobble size rock fragments up to 6-inches			
2				SM	**STADIUM CONGLOMERATE** Dense, damp, white, Silty, fine to medium SANDSTONE			
4				GM	Dense to very dense, damp, white, fine to medium, Sandy CONGLOMERATE with 50-60% gravel and cobble size rock fragments up to 10-inches			
6					TRENCH TERMINATED AT 6 FEET			

Figure A-11,
Log of Trench T 11, Page 1 of 1

G1931-32-01.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 12

ELEV. (MSL.)________ DATE COMPLETED **12-15-2015**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL** Loose to medium dense, moist, brown, Silty, fine to medium SAND with 10-15% gravel			
2				GM	**STADIUM CONGLOMERATE** Dense, damp, white, fine to medium, Sandy CONGLOMERATE with 50-60% gravel and cobble size rock fragments up to 10-inches			
4					-Lower cohesion from 3-4 feet			
					TRENCH TERMINATED AT 5.5 FEET			

Figure A-12,
Log of Trench T 12, Page 1 of 1

G1931-32-01.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

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 bulk samples were tested for maximum dry density and optimum moisture content, pH, resistivity, chloride ion content, water-soluble sulfate content, R-value, and expansion characteristics. The results of our laboratory tests are summarized on Tables B-I through B-VII.

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

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T3-1	Light brown, fine to coarse, Sandy GRAVEL	133.9	7.9
T9-1	Light gray to white, Silty, fine to medium SAND	122.9	11.9

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

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion – Peak (psf)	Angle of Shear Resistance – Peak (degrees)
*T3-1	121.1	7.7	435	33
*T9-1	109.1	11.6	770	24

*Sample was remolded to 90 percent relative density at near optimum moisture content.

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

Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
T1-1	9.4	15.6	111.2	8
T3-1	10.1	21.7	108.6	53
T9-1	9.9	19.3	108.7	22

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

Sample No.	Water Soluble Sulfate (%)
T1-1	0.042
T3-1	0.024
T9-1	0.026

TABLE B-V
SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (PH) AND RESISTIVITY TEST RESULTS

Sample No.	pH	Resistivity (ohm centimeters)
T1-1	7.2	690
T3-1	7.6	570
T9-1	6.7	700

TABLE B-VI
SUMMARY OF LABORATORY CHLORIDE ION CONTENT TEST RESULTS

Sample No.	Chloride Ion Content (%)	Chloride Ion Content (ppm)
T1-1	0.048	484
T3-1	0.084	843
T9-1	0.070	703

TABLE B-VII
SUMMARY OF LABORATORY RESISTANCE (R-VALUE) TEST RESULTS

Sample No.	Description	R-Value
T11-1	Light brown, Silty, fine to medium SAND with little gravel	18

APPENDIX C

APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

FOR

WESTMONT OF LA MESA
LA MESA, CALIFORNIA

PROJECT NO. G1931-32-01

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

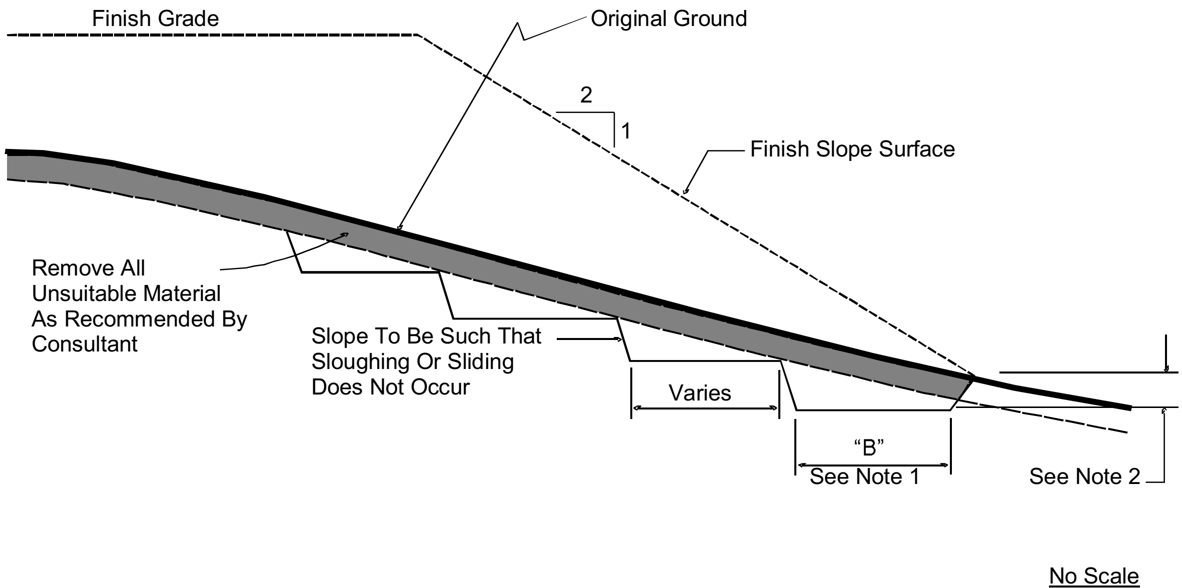
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material 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.

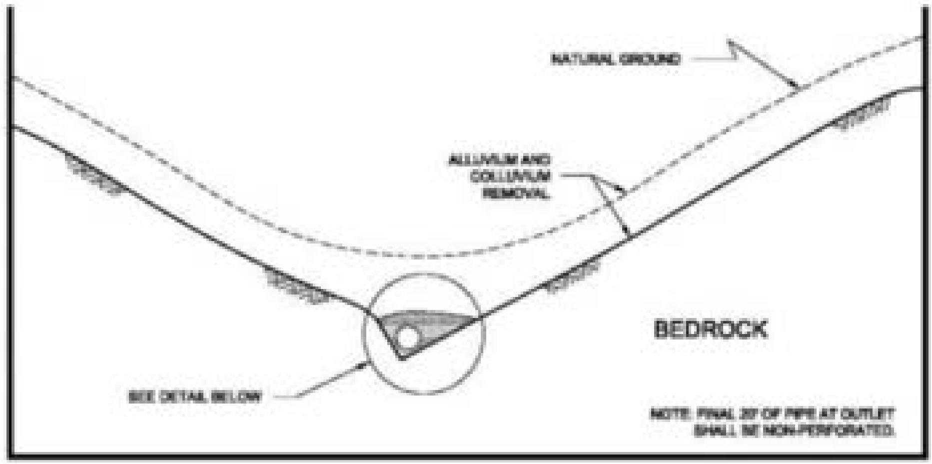
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant 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.

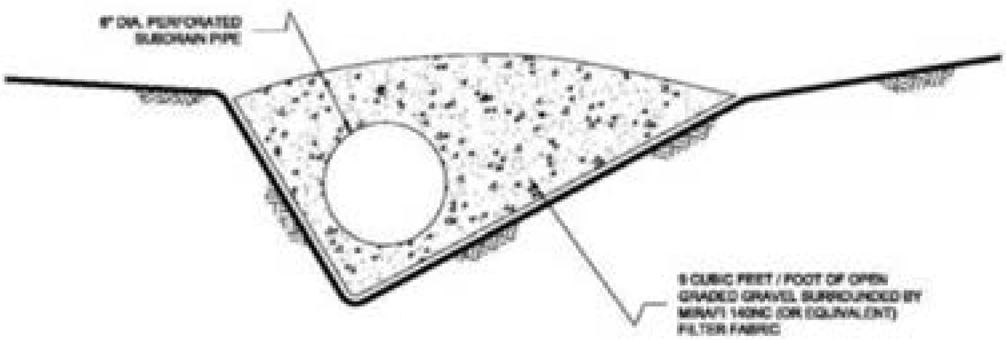
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

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:

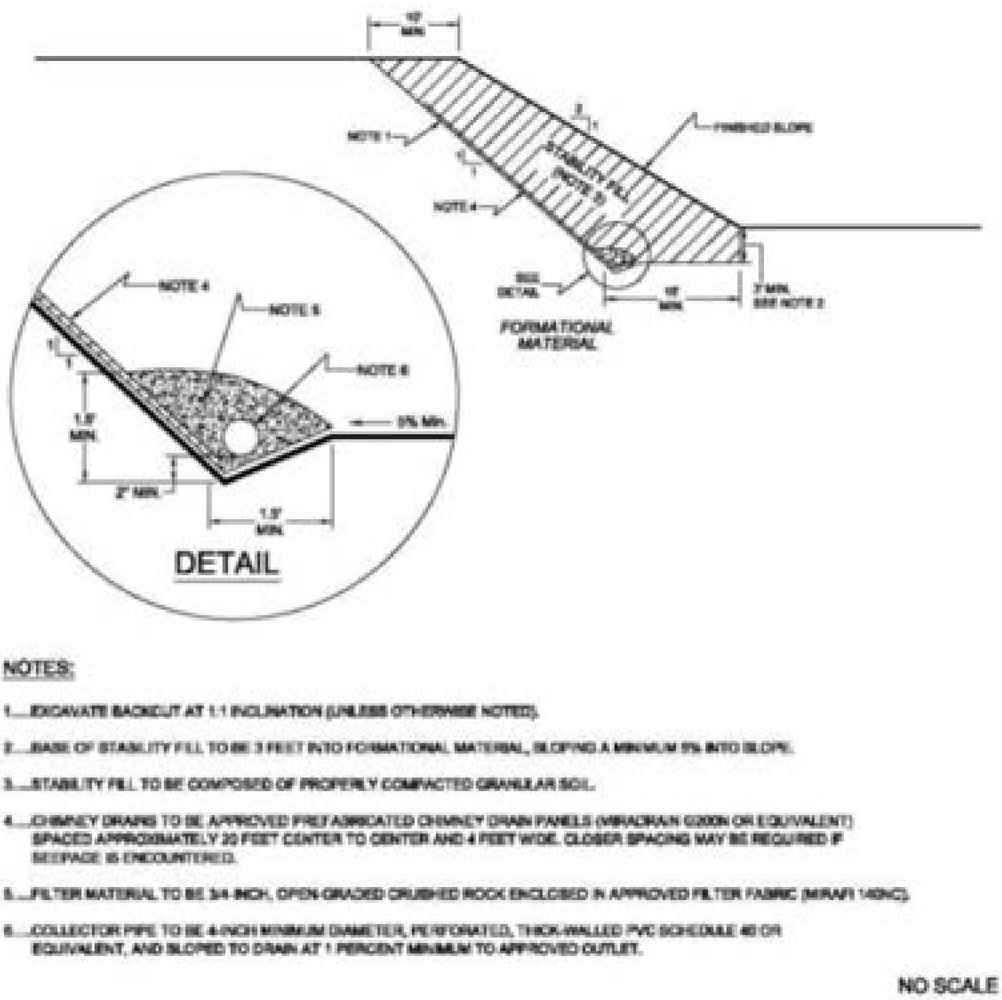
1.....6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

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

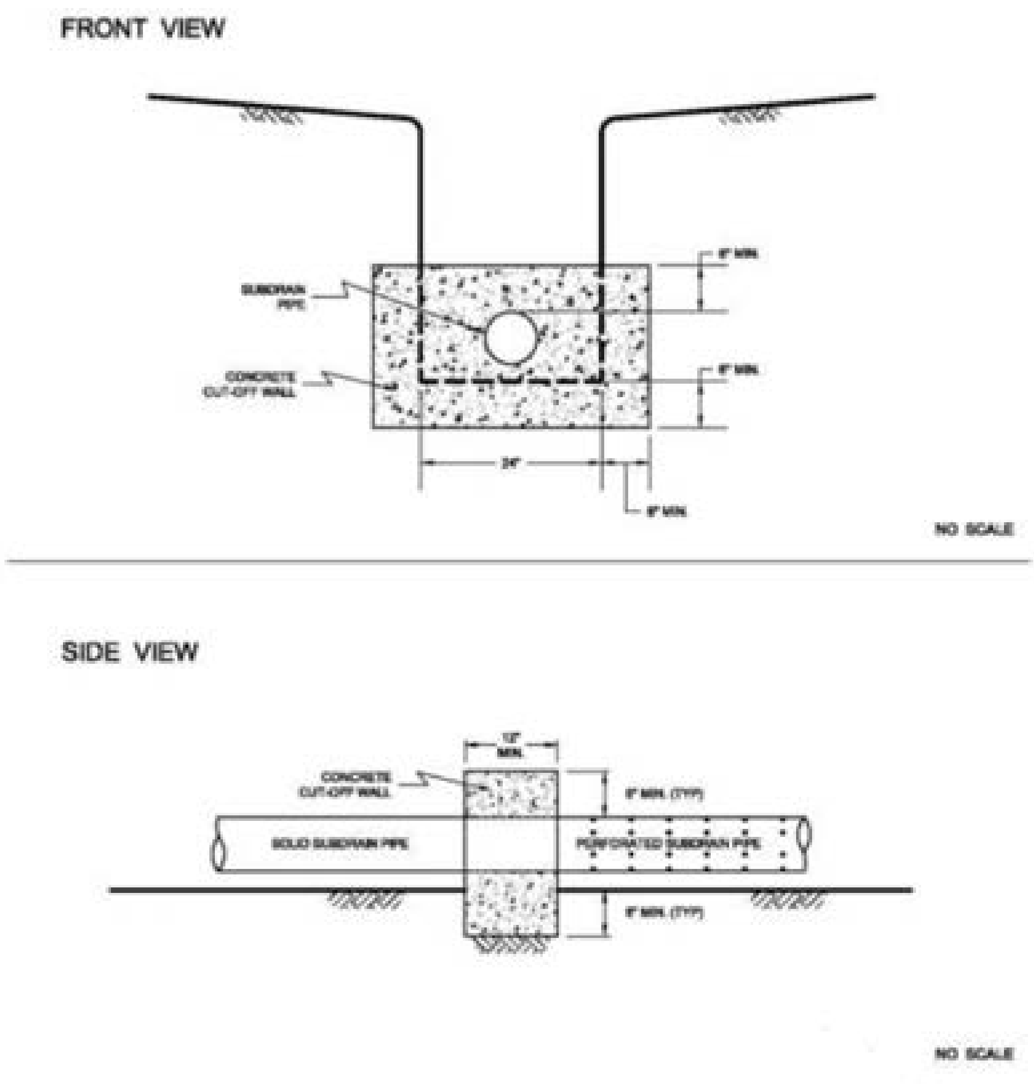


7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 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.

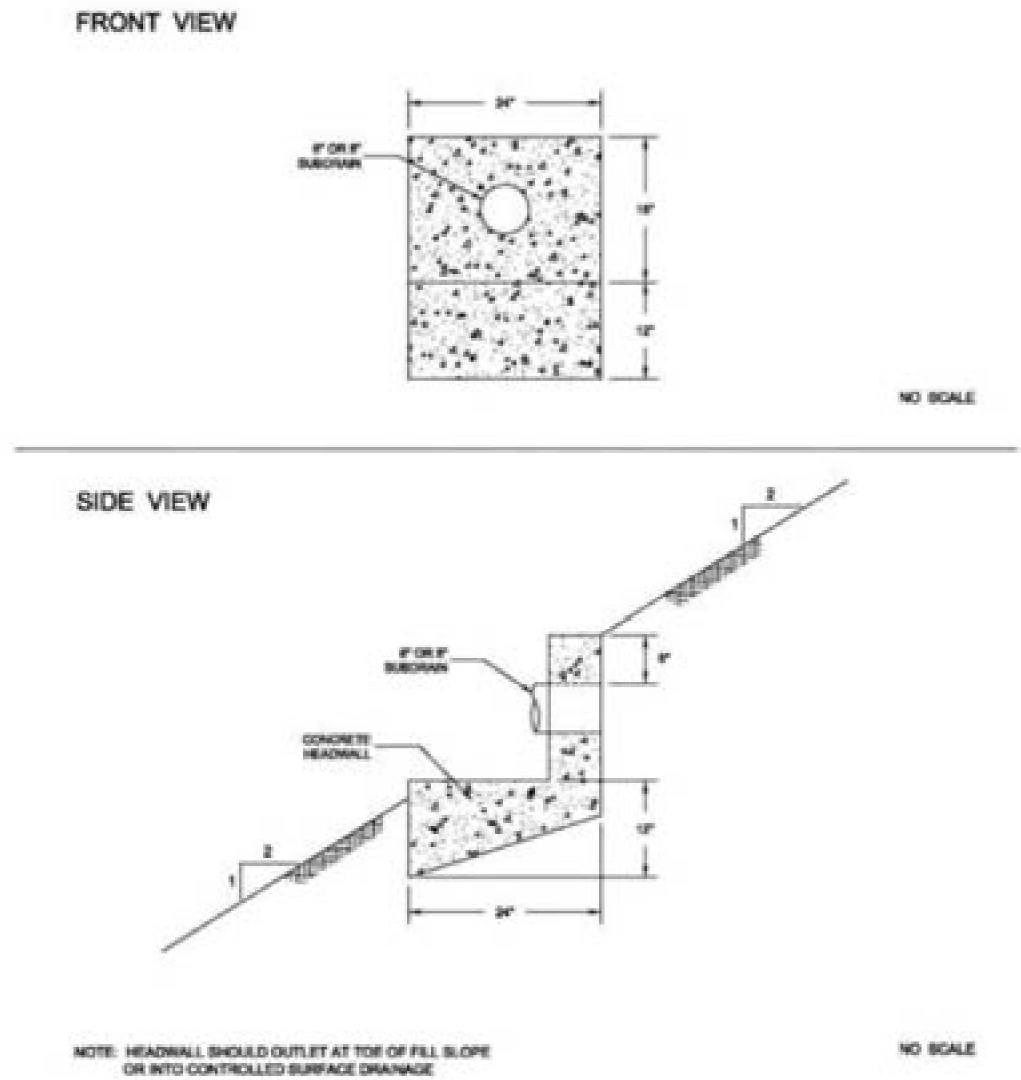
7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

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.

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4. California Department of Water Resources, Water Data Library. http://www.water.ca.gov/waterdatalibrary.

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11. USGS computer program, *Seismic Hazard Curves and Uniform Hazard Response Spectra.*

12. United States Department of Agriculture, *1953 Stereoscopic Aerial Photographs, Flight AXN-10M,* Photos Nos. 11 and 12 (scale 1:20,000).