

GEOTECHNICAL INVESTIGATION

SOUTH VILLAGE STORAGE VALLEY CENTER ROAD AND OLD ROAD VALLEY CENTER, CALIFORNIA



GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

DEVELYN LLC
VALLEY CENTER, CALIFORNIA

OCTOBER 31, 2023
PROJECT NO. G3194-42-01



Project No. G3194-42-01
October 31, 2023

Develyn LLC
P.O. Box 366
Valley Center, California 92082

Attention: Mr. Dave Bohorquez

Subject: GEOTECHNICAL INVESTIGATION
SOUTH VILLAGE STORAGE
VALLEY CENTER ROAD AND OLD ROAD
VALLEY CENTER, CALIFORNIA

Dear Mr. Bohorquez:

In accordance with your request and authorization of our proposal (LG-23286 dated June 19, 2023), we herein submit the results of our geotechnical investigation for the subject project. We performed our investigation to evaluate the underlying soil and geologic conditions, potential geologic hazards, and to assist in the design of the proposed buildings and associated improvements.

The accompanying report presents the results of our study and conclusions and recommendations pertaining to geotechnical aspects of the proposed project. The site is suitable for the proposed buildings and improvements provided the recommendations in this report are incorporated into the design and construction of the planned project.

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

Very truly yours,

GEOCON INCORPORATED

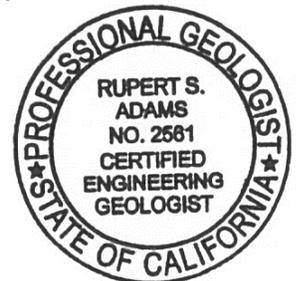
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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the proposed South Village Storage development located in Valley Center, California (see Vicinity Map).



Vicinity Map

The purpose of this geotechnical investigation was to evaluate the surface and subsurface soil conditions, general site geology, and to identify geotechnical constraints that could affect development of the property including faulting, liquefaction, and seismic shaking. We provide recommendations for remedial grading, shallow foundations, concrete slab on grade, concrete flatwork, pavement, and retaining walls.

The scope of this investigation included our review of readily available, pertinent, geologic literature; field work; engineering analyses; and preparing this report.

Field work consisted of excavating 17 exploratory trenches to a maximum depth of about 13 feet; performing 6 infiltration tests; sampling soil; and performing laboratory tests on selected soil samples.

Appendix A presents the test pit logs and details of the field investigation. The details of the laboratory testing and a summary of the test results are shown in Appendix B. Appendix C presents a summary of our storm-water-management investigation.

2. SITE AND PROJECT DESCRIPTION

The project site is located northwest of the intersection of Valley Center Road and Old Road in Valley Center, California. The irregularly shaped property is bound to the southwest by single-family residences, the northeast by Valley Center Road, the north by undeveloped land, and the south by Old Road. The property is currently being used for truck and automobile parking and storage of construction materials. A residential house occupies the central portion of the property. A gas station and store (Valley Center Oil Corp.) is located within the southeast corner of the property. Dirt roads, parking lots, trees and vegetation are present throughout the property. The property generally slopes to the west with elevation ranging from about 1,300 to 1,335 feet Mean Sea Level (MSL). The figure below shows the current site development.



Current Site Development

We have reviewed Alidade Engineering (2023) and understand that the project will consist of constructing eight storage-unit buildings (Buildings A through H). Additional improvements include access driveways, roadway connections to Valley Center Road and Old Road, BMP basins, and utilities. The gas station and store will remain. Grading will consist of cuts from existing grade around 17 feet

and fills up to about 18 feet. Storm water basins are planned at the northwest and southeast portions of the property.

The locations, site descriptions, and proposed development are based on our site reconnaissance, review of published geologic literature, field investigations, and discussions with project personnel. If development plans differ from those described herein, we should be contacted for review of the plans and possible revisions to this report.

3. SOIL AND GEOLOGIC CONDITIONS

During our investigation we encountered two surficial soil units, consisting of undocumented fill and topsoil, and one formational unit consisting of Cretaceous-age granitic rock. The occurrence, distribution, and description of each unit encountered is shown on the Geologic Map, Figure 1 and on the test pit logs in Appendix A. The Geologic Cross-Section, Figure 2, shows the approximate subsurface relationship between the geologic units. We prepared the geologic cross-section by interpolating between the exploratory trenches. Actual geotechnical conditions could vary from those illustrated. The surficial soils and geologic unit are described below.

3.1 Undocumented Fill

We encountered approximately 1 to 11.5 feet of undocumented fill at various locations on the property. Undocumented fill could be present in unexplored areas. The undocumented fill consisted of loose to medium dense, dry to moist, silty to clayey sand with gravel, cobble, and trash debris. The undocumented fill is not suitable in its current condition to support foundations or structural fill and should be completely removed during grading. The undocumented fill soil can be reused as fill provided it is free of roots and debris.

3.2 Topsoil (unmapped)

Topsoil was encountered at grade or below undocumented fill to depths ranging from approximately 1.5 to 4 feet below existing grades. The topsoil encountered consisted of loose, silty sand and stiff, sandy silt. The topsoil is not suitable to support settlement sensitive improvements and should be removed and replaced with properly compacted fill within structural improvement areas. The topsoil can be reused as fill during grading operations provided it is free of roots and debris.

3.3 Granitic Rock (Kgr)

We encountered Cretaceous-age granitic rock (mapped as undivided granodiorite (Kgd) and Valley Center Monzogranite (Kvc) in Kennedy and Tan, 2007) below undocumented fill and the topsoil. The granitic rock encountered varied from weak to very strong, completely to moderately weathered rock, and possesses a “very low” to “low” expansion index (expansion index of 50 or less). Several areas of

exposed granitic rocks were observed at the ground surface. We expect the proposed grading will require blasting or rock breaking in cut areas. Buried corestones and zones of strong rock should be expected during grading and construction operations. The granitic rock is suitable to support proposed fill and structural loads.

4. GROUNDWATER

We did not encounter groundwater during our field investigation. We do not expect groundwater will be encountered during construction of the planned development; however, it is not uncommon for groundwater or seepage conditions to develop where none previously existed. Groundwater and seepage are dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project.

5. GEOLOGIC HAZARDS

5.1 Ground Rupture

The USGS (2016) and Kennedy and Tan (2007) shows that there are no mapped Quaternary faults crossing or trending toward the property. The site is not located within a currently established Alquist-Priolo Earthquake Fault Zone (CEG, 2021a).

There are no active faults, potentially active faults, inactive faults, presumed inactive faults, or activity unknown faults at the site or trending toward the site. The risk associated with ground rupture hazard is low.

5.2 Seismicity

Considerations important in seismic design include frequency and duration of motion and soil conditions underlying the site. Seismic design of structures should be evaluated in accordance with the 2022 California Building Code currently adopted by the local agency. The risk associated with strong seismic ground motion hazard is high; however, the risk is no greater than that for the site vicinity.

5.3 Liquefaction

The risk associated with seismically induced soil liquefaction hazard is low due to the density and age of the underlying geologic units.

5.4 Landslides

No evidence of landsliding was observed during our investigation. Kennedy and Tan (2007) does not map any landslides at the subject site or in areas that could affect the site. The risk associated with ground movement hazard due to landsliding is low.

5.5 Seiches and Tsunamis

The site is not mapped within a State of California tsunami hazard zone (CGS, 2021b). The site is not located near a large body of water. The risk associated with flooding due to tsunami or seiche hazard is low.

5.6 Flooding

The site is not mapped in a Special Flood Hazard Area as defined by FEMA (2020). The risk of inundation hazard due to flooding is low.

6. RIPPABILITY

We excavated exploratory test pits TP-1 through TP-7 with a CAT 430F rubber tire backhoe in proposed cut areas underlain by granitic rock and encountered practical refusal at depths ranging from 4 to 7.5 feet below existing grade. Proposed cuts to achieve planned grades are up to approximately 18 feet; therefore, we expect blasting may be required in portions of the cut area. In addition, the presence of corestones and zones of strong, rock will require specialized rock-breaking equipment.

Additional evaluation of rippability using air-percussion borings, seismic-refraction surveys, or large track-hoe-excavated test pits should be considered to further evaluate rock rippability characteristics once finalized grading plans are available.

Proposed cuts in rock areas may generate rocks greater than 12 inches in dimension which will require special handling and placement procedures during grading operations or off-site disposal. The grading contractor should perform additional investigation to determine the rippability characteristics of the rock for estimating purposes.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

- 7.1.1 We did not encounter soil or geologic conditions during our exploration that would preclude the proposed development, provided the recommendations presented herein are followed and implemented during design and construction. We will provide supplemental recommendations if we observe variable or undesirable conditions during construction, or if the proposed construction will differ from that anticipated herein.
- 7.1.2 With the exception of possible moderate to strong seismic shaking, we did not observe or know of significant geologic hazards on the site that would adversely affect the proposed project.
- 7.1.3 The undocumented fill and topsoil are potentially compressible and unsuitable to support settlement-sensitive improvements and will require removal and recompaction as properly compacted fill. Granitic rock is suitable to support proposed fill and structural loads.
- 7.1.4 The presence of hard rock within proposed cut areas will require special consideration during site development. Excavations will encounter heavy ripping conditions with conventional heavy-duty equipment and possible blasting to achieve finish grade. In addition, heavy ripping and blasting will generate oversize materials that will require special handling and fill placement procedures. Oversize materials should be placed in accordance with Appendix D of this report.
- 7.1.5 An earthwork analysis should be performed to evaluate if there is an adequate volume of fill area available to accommodate the anticipated volume of blasted/oversize materials. This study should consider the proposed grading, rock placement requirements and include proposed undercutting of pads and streets. Consideration should be given to stockpiling select materials to be utilized for capping.
- 7.1.6 We did not encounter groundwater during our subsurface exploration and we do not expect it to be a constraint to project development; however, seepage within the existing soils may be encountered during the grading operations, especially during the rainy seasons.
- 7.1.7 Proper drainage should be maintained to preserve the engineering properties of the soil. Recommendations for site drainage are provided herein.
- 7.1.8 We do not expect the planned development will destabilize or result in the settlement of adjacent properties.

7.2 Excavation and Soil Characteristics

- 7.2.1 Excavation of the undocumented fill, topsoil, and weathered portion of the granitic rock should be possible with moderate to heavy effort using conventional heavy-duty equipment. Excavation of moderately weathered granitic rock will require very heavy effort and will generate oversized rock material. Rocks greater than 12-inches in dimension generated during grading will require special handling, placement, or disposal. Blasting and/or rock breaking techniques will likely be required in portions of the cut areas. Oversize rock should be placed in accordance with *Recommended Grading Specifications* (Appendix D). Oversize rock may require breakage to acceptable sizes or exportation from the property. Placement of oversize rock within the area of proposed underground utilities should not be permitted. The grading and improvement contractors should review this report and evaluate the proper equipment to use for the planned excavations.
- 7.2.2 The soil encountered in the field investigation is considered both “non-expansive” (Expansion Index [EI] of 20 or less) and “expansive” (EI greater than 20) as defined by 2022 California Building Code (CBC) Section 1803.5.3. We expect most of the soil encountered possess a “very low” to “low” expansion potential (EI of 50 or less) in accordance with ASTM D 4829. Table 7.2 presents soil classifications based on the expansion index.

**TABLE 7.2
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX**

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2022 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

- 7.2.3 We performed a laboratory test on a sample of the site soil to evaluate the percentage of water-soluble sulfate content. Appendix B presents test results, which indicate the on-site soils at the location tested possesses “S0” sulfate exposure to concrete structures as defined by 2022 CBC Section 1904 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Over time, landscaping activities (i.e., addition of fertilizers and other additives) may affect the water-soluble sulfate concentration.

7.2.4 Geocon Incorporated does not practice in the field of corrosion engineering; therefore, further evaluation by a corrosion engineer may be needed if improvements susceptible to corrosion are planned.

7.3 Grading

7.3.1 Grading should be performed in accordance with the recommendations provided in this report; the Recommended Grading Specifications contained in Appendix D; and the County of San Diego grading ordinance. Geocon Incorporated should observe the grading operations on a full-time basis and provide testing during the fill placement.

7.3.2 A preconstruction conference should be held at the site with the agency inspector, developer, grading and underground contractors, civil engineer, and geotechnical engineer in attendance. Special soil handling and the grading plans can be discussed at that time.

7.3.3 Site preparation should begin with the removal of deleterious material, debris, vegetation, asphalt concrete, and concrete. The depth of vegetation removal should be such that soil exposed in cut areas or to be used as fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site. Asphalt and concrete should not be mixed with the fill.

7.3.4 Abandoned foundations and buried utilities should be removed and the resultant depressions and trenches backfilled with properly compacted soil.

7.3.5 All compressible soil deposits, including undocumented fill and topsoil, within areas where structural improvements and/or structural fill are planned, should be removed to expose firm competent Granitic Rock and properly compacted prior to placing additional fill and/or structural loads.

7.3.6 Grading operations should be scheduled to permit the placement of oversize material in deeper fill areas and to cap building pads with granular materials having a “very low” to “low” expansive potential (EI of 50 or less).

7.3.7 Where practical, the upper 5 feet of all building pads (cut or fill) should be comprised of soil with a “very low” to “low” expansion potential. Cobbles, rock fragments, and concretions greater than 6 inches in maximum dimension should not be placed within 3 feet of finish grade in building pad areas.

- 7.3.8 Cut pads exposing hard rock that cannot be excavated with normal excavation equipment should be undercut at least 3 feet or 1 foot below the deepest footing (whichever is deeper) to facilitate excavation of foundations. The undercut area should be replaced with properly compacted “very low” to “low” expansive soil. The base of the undercuts should be sloped towards the deeper fill areas. The undercut should extend to at least 5 feet beyond the building footprint, where practical.
- 7.3.9 Where grading results in a cut to fill transition within the building pad, the cut portion of the pad should be undercut at least 3 feet or 1 foot below the deepest footing (whichever is deeper) and replaced with properly compacted “very low” to “low” expansive soil. The base of the undercuts should be sloped towards the deeper fill area on the pad. The undercut should extend to at least 5 feet beyond the building footprint, where practical. As an alternative to undercutting cut to fill transitions, the footings can be deepened to extend through the fill to bear on the underlying granitic rock.
- 7.3.10 Undercutting of street areas and utilities should be performed in cut areas or areas where utilities will extend through the fill into Granitic Rock to facilitate excavation of underground utilities. Undercuts should extend to a depth of at least 2 feet below the utility. If subsurface improvements or landscape zones are planned outside these areas, consideration should be given to undercutting these areas as well.
- 7.3.11 Oversize material (defined as material greater than 12 inches in nominal dimension) could be generated during ripping and blasting of Granitic Rock. Placement of oversize material within fills should be conducted in accordance with the recommendations in Appendix D. Grading operations on the site should be scheduled such that oversize materials are placed in deeper fills and at least 5 feet below finish pad grade and 2 feet below the deepest utilities.
- 7.3.12 Capping material on building pads in fill areas or undercut areas should be at least 3 feet thick or 1 foot below the deepest footing (whichever is deeper). The capping material should consist of soil fill with an approximate maximum particle dimension of 6 inches with a minimum of 40 percent soil passing the ¾-inch sieve and should have at least 20 percent of the soil passing the No. 4 screen. The grading contractor should take necessary steps to manage the available soils to cap the project.
- 7.3.13 In structural improvement areas outside of the proposed building pads, undocumented fill, and topsoil should be removed to the granitic rock and replaced with properly compacted fill. The excavations should extend at least 3 feet laterally outside of the improvement area, where practical.

7.3.14 Table 7.3.1 provides a summary of the remedial grading recommendations.

**TABLE 7.3.1
SUMMARY OF REMEDIAL GRADING RECOMMENDATIONS**

Area	Remedial Grading Excavation Requirements
Building Pads	Remove undocumented fill and topsoil to expose granitic rock. Undercut building pads in areas of hard rock or if grading results in a cut to fill transition.
Site Development	Remove undocumented fill and topsoil to granitic rock and replace with properly compacted fill. In areas of utilities, undercut hard rock below the utility to facilitate installation.
Lateral Grading Limits	5 Feet Outside of Building Pad
	3 Feet Outside of Improvement Areas
Exposed Bottoms of Excavations	Scarify Upper 12 Inches

7.3.15 A representative of Geocon should be on-site during excavations to evaluate the limits of the remedial grading.

7.3.16 The on-site soils are suitable for use as fill, provided they are free from vegetation, debris, and other deleterious material. Prior to placing fill the removal bottom should be scarified, moisture conditioned, and recompact. Fill should be placed in layers no greater than 6 to 8 inches in loose thickness and no thicker than will allow for adequate bonding and compaction. Fill, including backfill and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM Test Procedure D 1557. Fill soil placed below optimum moisture content will require moisture conditioning prior to placing additional fill. The upper 12 inches of subgrade soil underlying pavement should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content shortly before paving operations.

7.3.17 Imported fill should consist of the characteristics presented in Table 7.3.2. Geocon Incorporated should be provided with samples of the proposed import soil to perform laboratory testing prior to importation to the site.

**TABLE 7.3.2
SUMMARY OF IMPORT FILL RECOMMENDATIONS**

Soil Characteristic	Values
Expansion Potential	“Very Low” to “Low” (Expansion Index of 50 or less)
Particle Size	Maximum Dimension Less Than 3 Inches
	Generally Free of Debris

7.4 Subdrains

7.4.1 With the exception of retaining wall drains, we do not expect the installation of other subdrains.

7.5 Temporary Excavations

7.5.1 Geocon Incorporated is not responsible for site safety and the stability of the proposed excavations. It is the contractor’s responsibility to ensure that all excavations, temporary slopes, and trenches are properly constructed and maintained in accordance with applicable OSHA guidelines. The excavation sidewalls should not be allowed to become saturated or to dry out. Surcharge loads should not be allowed within a distance equal to the height of the excavation. The excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

7.6 Seismic Design Criteria – 2022 California Building Code

7.6.1 Table 7.6.1 summarizes site-specific design criteria obtained from the 2022 California Building Code (CBC; Based on the 2021 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. We used SEAOC (2019) to calculate the seismic design parameters. The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2022 CBC and Table 20.3-1 of ASCE 7-16. The values presented herein are for the risk-targeted maximum considered earthquake (MCE_R).

**TABLE 7.6.1
2022 CBC SEISMIC DESIGN PARAMETERS**

Parameter	Value	2022 CBC Reference
Site Class	C	Section 1613.2.2
MCE _R Ground Motion Spectral Response Acceleration – Class B (short), \dot{S}_S	1.067g	Figure 1613.2.1(1)
MCE _R Ground Motion Spectral Response Acceleration – Class B (1 sec), \dot{S}_1	0.384g	Figure 1613.2.1(3)
Site Coefficient, F_A	1.2	Table 1613.2.3(1)
Site Coefficient, F_V	1.5	Table 1613.2.3(2)
Site Class Modified MCE _R Spectral Response Acceleration (short), S_{MS}	1.28g	Section 1613.2.3 (Eqn 16-20)
Site Class Modified MCE _R Spectral Response Acceleration – (1 sec), S_{M1}	0.576g	Section 1613.2.3 (Eqn 16-21)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.854g	Section 1613.2.4 (Eqn 16-22)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.384g	Section 1613.2.4 (Eqn 16-23)

*See following paragraph.

7.6.2 Table 7.6.2 presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

**TABLE 7.6.2
ASCE 7-16 PEAK GROUND ACCELERATION**

Parameter	Value	ASCE 7-16 Reference
Mapped MCE _G Peak Ground Acceleration, PGA	0.464g	Figure 22-9
Site Coefficient, F_{PGA}	1.2	Table 11.8-1
Site Class Modified MCE _G Peak Ground Acceleration, PGA_M	0.557g	Section 11.8.3 (Eqn 11.8-1)

7.6.3 Conformance to the criteria in Tables 7.6.1 and 7.6.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur in the event of a large earthquake. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

7.6.4 The values presented herein assume a Risk Category of II and result in a Seismic Design Category D. The project structural engineer and architect should evaluate the appropriate Risk Category and Seismic Design Category for the planned structures. Table 7.6.3 presents a summary of the risk categories in accordance with ASCE 7-16.

**TABLE 7.6.3
ASCE 7-16 RISK CATEGORIES**

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

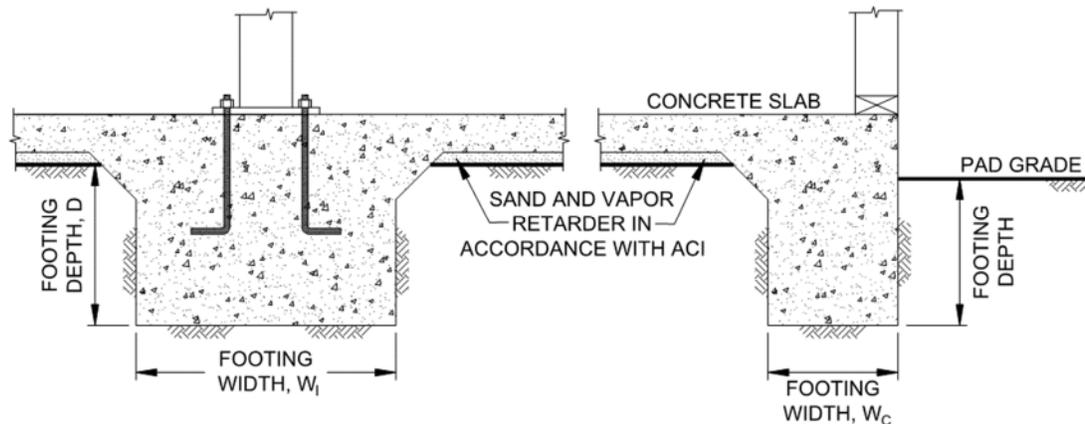
7.7 Shallow Foundations

7.7.1 The proposed structures can be supported on a shallow foundation system founded entirely on granitic rock or entirely on properly compacted fill. Foundations for the structures should consist of continuous strip footings or isolated spread footings. Table 7.7 provides a summary of the foundation design recommendations.

**TABLE 7.7
SUMMARY OF FOUNDATION RECOMMENDATIONS – BUILDINGS A THROUGH H**

Parameter	Value
Minimum Continuous Foundation Width, W_c	12 inches
Minimum Isolated Foundation Width, W_I	24 inches
Minimum Foundation Depth, D	18 Inches Below Lowest Adjacent Grade
Minimum Concrete Reinforcement	4 No. 5 Bars, 2 at the Top and 2 at the Bottom
Allowable Bearing Capacity (Compacted Fill)	2,500 psf
Allowable Bearing Capacity (Granitic Rock)	8,000 psf
Bearing Capacity Increase	500 psf per Foot of Depth
	300 psf per Foot of Width
Maximum Allowable Bearing Capacity (Compacted fill)	4,000 psf
Maximum Allowable Bearing Capacity (Granitic Rock)	10,000 psf
Estimated Total Settlement	1-Inch
Estimated Differential Settlement	½ Inch in 40 Feet
Footing Size Used for Settlement	6-Foot Square
Design Expansion Index	50 or less

- 7.7.2 The foundations should be embedded in accordance with the recommendations herein and the Wall/Column Footing Dimension Detail. The embedment depths should be measured from the lowest adjacent pad grade for both interior and exterior footings. Footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.



Wall/Column Footing Dimension Detail

- 7.7.3 The bearing capacity values presented herein are for dead plus live loads and may be increased by one-third for transient loads due to wind or seismic forces.
- 7.7.4 We should observe the foundation excavations prior to the placement of reinforcing steel to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. Foundation modifications may be required if unexpected soil conditions are encountered.
- 7.7.5 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.8 Concrete Slabs On Grade

- 7.8.1 Concrete slabs on grade for the structures should be constructed in accordance with Table 7.8.

**TABLE 7.8
MINIMUM CONCRETE-SLAB-ON-GRADE RECOMMENDATIONS**

Parameter	Value
Minimum Concrete Slab Thickness	5 inches
Minimum Concrete Reinforcement	No. 3 Bars 18 Inches on Center, Both Directions
Typical Slab Underlayment	3 to 4 Inches of Sand/Gravel/Base
Design Expansion Index	50 or less

- 7.8.2 A vapor retarder should underlie slabs that could receive moisture-sensitive floor coverings or be used to store moisture-sensitive materials. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute’s (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). The membrane should be installed in a manner that prevents puncture in accordance with manufacturer’s recommendations and ASTM requirements. The project architect or developer should specify the vapor retarder used based on the type of floor covering that will be installed and if the structure will possess a humidity-controlled environment.
- 7.8.3 The project foundation engineer, architect, or developer should determine the thickness of the slab bedding. It is common to have 3 to 4 inches of sand in the southern California region. We should be contacted to provide recommendations if the bedding sand is thicker than 6 inches.
- 7.8.4 The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab. The foundation design engineer should present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the specifications presented on the foundation plans.
- 7.8.5 Concrete slabs should be provided with adequate crack-control joints, construction joints and expansion joints. American Concrete Institute (ACI) guidelines should be used to establish crack-control spacing. Crack-control joints should be spaced at intervals no greater than 12 feet. Additional reinforcement, concrete admixtures, and closer crack-control-joint spacing should be considered where bare-concrete finished floors are planned.
- 7.8.6 Subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisturized to maintain a moist condition as would be expected in any such concrete placement.

7.8.7 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 expected loads.

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

7.9 Exterior Concrete Flatwork

7.9.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations presented in Table 7.9. The recommended concrete reinforcement would help reduce potential cracking.

**TABLE 7.9
MINIMUM CONCRETE FLATWORK RECOMMENDATIONS**

Expansion Index, EI	Minimum Steel Reinforcement* Options	Minimum Thickness
EI ≤ 90	6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh	4 Inches
	No. 3 Bars 18 inches on center, Both Directions	

*In excess of 8 feet square.

7.9.2 The subgrade soil should be properly moisturized and compacted prior to the placement of steel and concrete. The subgrade soil should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM D 1557.

7.9.3 Even with the incorporation of the recommendations presented in this report, the exterior concrete flatwork could experience uplift due to expansive soil. Flatwork should be structurally connected to the curbs, where practical, to reduce potential offsets between the curbs and the flatwork.

- 7.9.4 Concrete flatwork should be provided with crack-control joints to control shrinkage cracking. American Concrete Institute (ACI) guidelines should be taken into consideration when establishing crack-control spacing.
- 7.9.5 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 verified prior to placing concrete. Base materials will not be required below concrete improvements.
- 7.9.6 Where exterior flatwork abuts the structure at entrant or exit points, the exterior slab should be dowelled into the structure's foundation stem wall. This recommendation is intended to reduce potential differential elevations resulting from settlement or heave of the flatwork. Dowelling details should be designed by the project structural engineer.
- 7.9.7 The recommendations presented herein are intended to reduce potential cracking of exterior slabs resulting from differential movement. Even with the incorporation of the recommendations presented herein, slabs on grade could still crack. The occurrence of concrete shrinkage cracks is independent of the soil-support characteristics. Their occurrence could be 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. Portland Concrete Association (PCA) and American Concrete Institute (ACI) provide guidelines for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

7.10 Retaining Walls

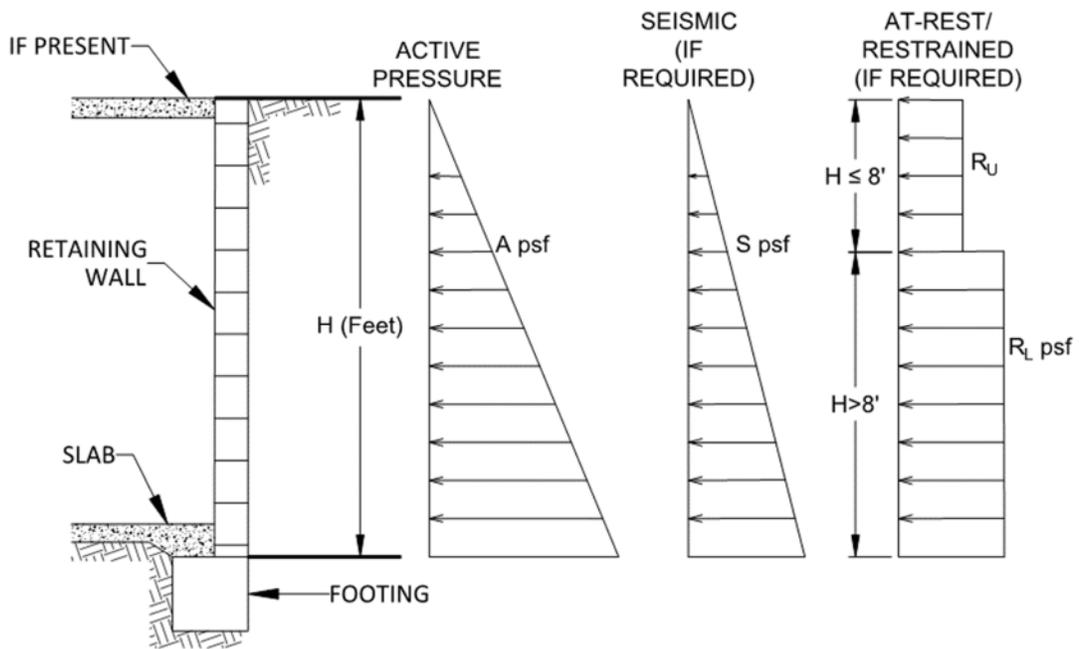
- 7.10.1 Retaining walls should be designed using the values presented in Table 7.10.1. Soil with an expansion index (EI) of greater than 50 should not be used as backfill behind retaining walls.

**TABLE 7.10.1
RETAINING WALL DESIGN RECOMMENDATIONS**

Parameter	Value
Active Soil Pressure, A (Fluid Density, Level Backfill)	35 pcf
Active Soil Pressure, A (Fluid Density, 2:1 Sloping Backfill)	50 pcf
Seismic Pressure, S	15H psf
At-Rest/Restrained Walls Additional Uniform Pressure, R_U (0 to 8 Feet High)	7H psf
At-Rest/Restrained Walls Additional Uniform Pressure, R_L (8+ Feet High)	13H psf
Expected Expansion Index for the Subject Property	$EI \leq 50$

H equals the height of the retaining portion of the wall

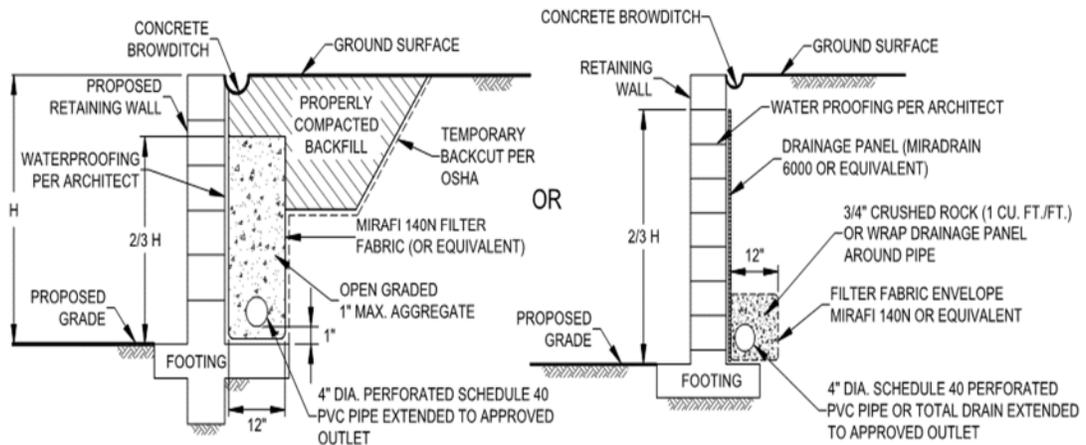
7.10.2 The project retaining walls should be designed as shown in the Retaining Wall Loading Diagram.



Retaining Wall Loading Diagram

7.10.3 Unrestrained walls are those that are allowed to rotate more than $0.001H$ (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top (at-rest condition), an additional uniform pressure should be applied to the wall. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added to the upper 10 feet of the retaining wall.

- 7.10.4 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613 of the 2022 CBC or Section 11.6 of ASCE 7-16. For structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2022 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall.
- 7.10.5 It is not necessary to consider active pressure on the keyway.
- 7.10.6 Drainage openings through the base of the wall should not be used where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted granular (EI of 90 or less) free-draining backfill material with no hydrostatic forces or imposed surcharge load. The retaining wall should be properly drained as shown in the Typical Retaining Wall Drainage Detail. If conditions different than those described are expected, or if specific drainage details are desired, Geokon Incorporated should be contacted for additional recommendations.



Typical Retaining Wall Drainage Detail

- 7.10.7 In general, wall foundations should be designed in accordance with Table 7.10.2. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, retaining wall foundations should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

TABLE 7.10.2
SUMMARY OF RETAINING WALL FOUNDATION RECOMMENDATIONS

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

7.10.8 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls. Geocon Incorporated should be consulted for additional recommendations if other types of walls (such as soil nail walls or soldier pile walls) are planned.

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

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

7.11 Lateral Loading

7.11.1 Table 7.11 should be used to help design the proposed structures and improvements to resist lateral loads for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive

pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in the design for passive resistance.

**TABLE 7.11
SUMMARY OF LATERAL LOAD DESIGN RECOMMENDATIONS**

Parameter	Value
Passive Pressure Fluid Density	350 pcf
Coefficient of Friction (Concrete and Soil)	0.35
Coefficient of Friction (Along Vapor Barrier)	0.2 to 0.25*

*Per manufacturer's recommendations.

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

7.12 MSE Retaining Wall Recommendations

7.12.1 We recommend the following geotechnical parameters be used in the design of mechanically stabilized earth (MSE) retaining walls.

**TABLE 7.12
GEOTECHNICAL DESIGN PARAMETERS**

Parameter	Reinforced Zone	Retained Zone	Foundation Zone
Angle of Internal Friction	32 degrees	32 degrees	32 degrees
Cohesion	100 psf	100 psf	100 psf
Moist Unit Weight	130 pcf	130 pcf	130 pcf

7.12.2 The shear strength values provided in Table 7.12 for the reinforced zone assume that granular materials will be used as backfill. Once proposed backfill materials are identified and/or stockpiled, sufficient samples should be collected and subjected to laboratory testing to assess the soils suitability for use as wall backfill. Results should be provided to the designer to re-evaluate stability of the walls. Dependent upon test results, the designer may require modifications to the original wall design (e.g., longer geogrid embedment lengths).

7.12.3 Backfill materials within the reinforced zone should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to or slightly above optimum moisture content in accordance with ASTM D 1557. This is applicable to the entire embedment length

of the geogrid reinforcement. Typically, wall designers specify that heavy compaction equipment be excluded from within 3 feet of the face of the wall; however, smaller equipment (e.g., walk-behind, self-driven compactors or hand whackers) should be used to compact the materials without causing deformation of the wall. If the designer specifies no compactive effort for this zone, the materials are essentially not properly compacted and the geogrid within the uncompacted zone should not be relied upon for reinforcement and overall embedment lengths should be increased to account for the difference.

- 7.12.4 The wall should be provided with drainage system sufficient enough to prevent excessive seepage through the wall and water at the base of the wall to prevent hydrostatic pressures behind the wall.

- 7.12.5 The site plan shows buildings located adjacent to the top of proposed MSE retaining walls. The walls should be designed to accommodate surcharge loading from the buildings. Additionally, the owner should be aware that geosynthetic reinforcement must elongate to develop full tensile resistance. This elongation generally results in movement at the top of the wall. The amount of movement is dependent upon the height of the wall (e.g., higher walls rotate more), construction, and the type of geosynthetic used. In addition, over time reinforced-earth retaining walls have been known to exhibit creep and can undergo additional movement. Given this condition, the owner should be aware that structures and pavement placed within the reinforced and retained zones of the wall may undergo movement and should be designed to accommodate this movement.

7.13 Preliminary Pavement Recommendations

- 7.13.1 We calculated the flexible pavement sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) using an estimated Traffic Index (TI) of 5.0, 5.5, 6.0, and 7.0 for parking stalls, driveways, medium truck traffic areas, and heavy truck traffic areas, respectively. The project civil engineer should review the pavement designations to determine appropriate locations for pavement thickness. The final pavement sections should be based on the R-Value of the subgrade soil encountered at final subgrade elevation. We have used an assumed R-Value of 50 for the subgrade soil (maximum value recommended in the Caltrans manual) and 78 for base materials. Table 7.12.1 presents the preliminary flexible pavement sections.

**TABLE 7.12.1
PRELIMINARY FLEXIBLE PAVEMENT SECTION**

Location	Assumed Traffic Index	Assumed Subgrade R-Value	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Parking Stalls for Automobiles and Light-Duty Vehicles	5.0	50	3	4
Driveways for Automobiles and Light-Duty Vehicles	5.5	50	3	4
Medium Truck Traffic Areas	6.0	50	3.5	4
Driveways for Heavy Truck Traffic	7.0	50	4	4.5

7.13.2 Prior to placing base materials, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned as necessary, and recompacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. Similarly, the base material should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

7.13.3 Aggregate base should conform to Section 26-1.02B of the *Standard Specifications for The State of California Department of Transportation (Caltrans)* with a ¾-inch maximum size aggregate. Asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Greenbook)*.

7.13.4 A rigid Portland cement concrete (PCC) pavement section should be placed in roadway aprons and cross gutters. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330-21 *Commercial Concrete Parking Lots and Site Paving Design and Construction – Guide*. Table 6.12.2 provides the traffic categories and design parameters used for the calculations for 20-year design life.

**TABLE 7.12.2
TRAFFIC CATEGORIES**

Traffic Category	Description	Reliability (%)	Slabs Cracked at End of Design Life (%)
A	Car Parking Areas and Access Lanes	60	15
D	Truck Traffic and Fire Lanes	75	15

- 7.13.5 We used the parameters presented in Table 7.12.3 to calculate the pavement design sections. We should be contacted to provide updated design sections, if necessary.

**TABLE 7.12.3
RIGID PAVEMENT DESIGN PARAMETERS**

Design Parameter	Design Value
Modulus of Subgrade Reaction, k	190 pci
Modulus of Rupture for Concrete, M_R	500 psi
Concrete Compressive Strength	3,000 psi
Concrete Modulus of Elasticity, E	3,150,000 psi

- 7.13.6 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 7.12.4.

**TABLE 7.12.4
RIGID VEHICULAR PAVEMENT RECOMMENDATIONS**

Traffic Category	Trucks Per Day	Portland Cement Concrete, T (Inches)
A = Car Parking Areas and Access Lanes	10	5
D = Heavy Duty Trucks/Fire Lane	50	6

- 7.13.7 The PCC vehicular pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content.
- 7.13.8 The trash-truck pad should be large enough such that all wheels are on the concrete pad during the loading operations.
- 7.13.9 Adequate joint spacing based on ACI guidelines should be incorporated into the design and construction of the rigid pavement.
- 7.13.10 Reinforcing steel will not be necessary within the concrete pavement.
- 7.13.11 Perimeter curbs adjacent to landscape areas should extend at least 6 inches below the bottom of the pavement aggregate base. In lieu of extending the perimeter curb, an impermeable liner should be installed.

- 7.13.12 Concrete flatwork should be structurally connected to the curbs to help reduce potential offsets between the curbs and the flatwork.
- 7.13.13 To control the location and spread of concrete shrinkage cracks, crack-control joints should be included in the design of the concrete-pavement slab. Crack-control joints should be sealed with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be in accordance with ACI guidelines.
- 7.13.14 Construction joints should be provided at the interface between areas of concrete placed at different times during construction. The project structural engineer should provide details for load transfer.
- 7.13.15 Concrete curb/gutter should be placed on soil subgrade compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Cross-gutters should be placed on subgrade soil compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Base materials should not be placed below the curb/gutter, or cross-gutters so water is not able to migrate from the adjacent parkways to the pavement sections. Where flatwork is located directly adjacent to the curb/gutter, the concrete flatwork should be structurally connected to the curbs to help reduce the potential for offsets between the curbs and the flatwork.

7.14 Site Drainage and Moisture Protection

- 7.14.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2022 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.
- 7.14.2 Underground utilities should be leak free. Utility and irrigation lines should be checked appropriately 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.
- 7.14.3 Landscaping planters adjacent to paved areas are not advised due to potential surface or irrigation water infiltration into the pavement subgrade and base courses. Area drains to

collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered.

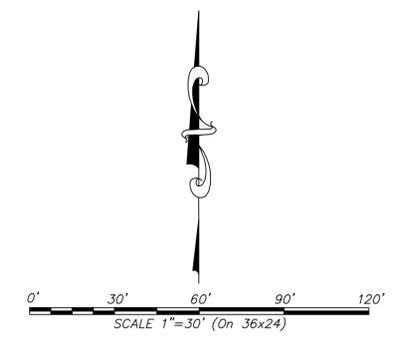
- 7.14.4 We have prepared a storm water management investigation and it is included in Appendix C herein.

7.15 Grading and Foundation Plan Review

- 7.15.1 Geocon Incorporated should review the grading and building foundation plans for the project prior to final design submittal to evaluate if 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.

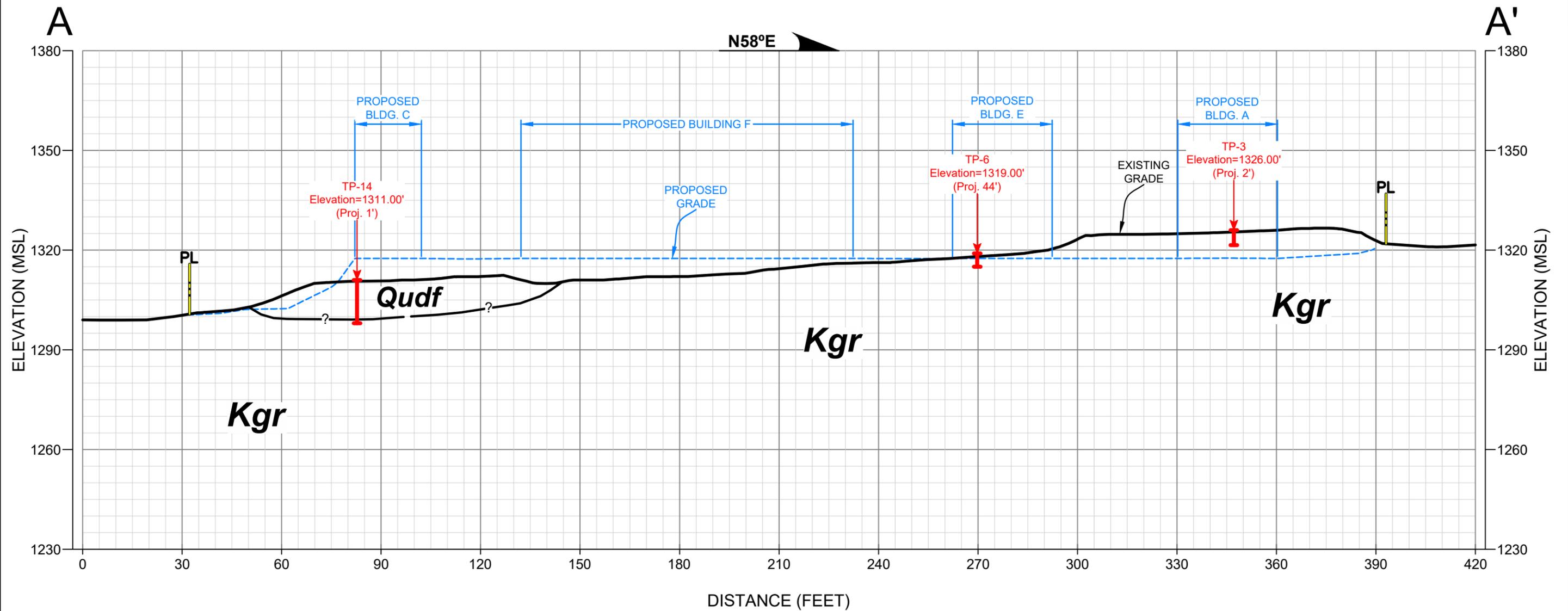


- GEOCON LEGEND**
- UNDOCUMENTED FILL
 - GRANITIC ROCK (Dotted Where Buried)
 - APPROX. LOCATION OF INFILTRATION TEST
 - APPROX. LOCATION OF TEST PIT
 - (1.5) DEPTH TO GRANITIC ROCK (in Feet)
 - APPROX. LOCATION OF GEOLOGIC CROSS-SECTION
 - APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
 - APPROX. LOCATION OF GRANITIC ROCK OUTCROP (Requiring Rock Breaking) EXPOSED AT EXISTING GRADE

GEOLOGIC MAP
 SOUTH VILLAGE STORAGE
 VALLEY CENTER, CALIFORNIA

GEOCON <small>INCORPORATED</small> GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS 6940 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974 PHONE 658-558-6900 - FAX 658-558-6159		SCALE 1" = 30' PROJECT NO. G3194 - 42 - 01	DATE 10 - 31 - 2023 FIGURE 1
	SHEET 1 OF 1		1

Printed 10/31/2023 9:51 AM | By: JONATHAN WILKINS | File Location: Y:\PROJECTS\G3194-42-01 South Village Storage\Sheets\G3194-42-01 GeoMap.dwg



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 30' (Vert. = Horiz.)

GEOCON LEGEND

Qudf	UNDOCUMENTED FILL
Kgr	GRANITIC ROCK (Dotted Where Buried)
TP-14 ↓	APPROX. LOCATION OF TEST PIT
~?	APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

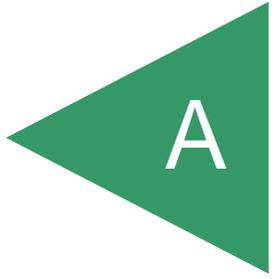
GEOCON
INCORPORATED

GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 297.4
PHONE 858 558-6900 - FAX 858 558-6159
PROJECT NO. G3194 - 42 - 01
FIGURE 2
DATE 10 - 31 - 2023

GEOLOGIC CROSS - SECTION

APPENDIX

A



APPENDIX A

FIELD INVESTIGATION

We performed the trenching operations on October 2, 2023. The approximate locations of the exploratory test pits are shown on the Geologic Map, Figure 1 and the test pit logs are presented in this appendix.

The trenches were excavated to a maximum depth of approximately 13 feet below existing grade using a CAT 430F backhoe. The infiltration-test borings were drilled to depths of approximately 4 to 5 feet.

We collected bulk soil samples from the trench excavations. The type of sample is noted on the test pit logs.

We visually examined, classified, and logged the soil encountered in the test pits in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). The logs depict the soil and geologic conditions observed and the depth at which samples were obtained.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT TP 1		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1330'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u>		BY: <u>R. ADAMS</u>		
MATERIAL DESCRIPTION									
0				SM	UNDOCUMENTED FILL (Qudf) Loose, dry to damp, light brown to grayish brown, Silty, fine to coarse SAND; some rock fragments up to 24" -Single 48" diameter rock fragment				
2									
4				SM	TOPSOIL Loose, damp, dark brown, Silty, fine to coarse SAND				
						GRANITIC ROCK (Kgr) Very strong to extremely strong, moderately to slightly weathered, coarse grained, leucocratic GRANITIC ROCK REFUSAL AT 5 FEET No groundwater encountered Backfilled 10-02-2023			

Figure A-1,
Log of Test Pit TP 1, Page 1 of 1

G3194-42-01.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.

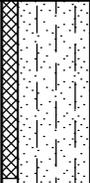
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT TP 2		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1327'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u>		BY: <u>R. ADAMS</u>		
MATERIAL DESCRIPTION									
0	TP2-1			SM	UNDOCUMENTED FILL (Qudf) Loose, dry to damp, grayish-brown, Silty, fine to coarse SAND; rock fragments up to 48"; trace trash (glass, wood, plastic pots, rebar)				
2									
					GRANITIC ROCK (Kgr) Very strong, moderately weathered, grayish brown, coarse grained, leucocratic GRANITIC ROCK				
4					REFUSAL AT 4 FEET No groundwater encountered Backfilled 10-02-2023				

Figure A-2,
Log of Test Pit TP 2, Page 1 of 1

G3194-42-01.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)	TEST PIT TP 3		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1326'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u>		BY: <u>R. ADAMS</u>		
MATERIAL DESCRIPTION									
0	TP3-1				GRANITIC ROCK (Kgr) Moderately strong to strong, moderately weathered, grayish-white, GRANITIC ROCK; excavates to a Silty, fine to coarse SAND with rock fragments up to 18" diameter				
2									
4					REFUSAL AT 4.5 FEET No groundwater encountered Backfilled 10-02-2023				

Figure A-3,
Log of Test Pit TP 3, Page 1 of 1

G3194-42-01.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)	TEST PIT TP 4		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1321'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u> BY: <u>R. ADAMS</u>				
MATERIAL DESCRIPTION									
0				SM	UNDOCUMENTED FILL (Qudf) Loose, dry, grayish brown, Silty, fine to coarse SAND				
2	TP4-1			SM	TOPSOIL Medium dense, dry to damp, reddish-brown, Silty, fine to coarse SAND; slightly porous				
4	TP4-2				GRANITIC ROCK (Kgr) Moderately weak to moderately strong, highly to moderately weathered, leucocratic GRANITIC ROCK; excavates to a Silty, fine to coarse SAND with no oversize				
6					PRACTICAL REFUSAL AT 6 FEET No groundwater encountered Backfilled 10-02-2023				

Figure A-4,
Log of Test Pit TP 4, Page 1 of 1

G3194-42-01.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)	TEST PIT TP 5		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1318'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u> BY: <u>R. ADAMS</u>				
MATERIAL DESCRIPTION									
0		■		SM	3" RECYCLED ASPHALT CONCRETE (RAP)				
		⊠			UNDOCUMENTED FILL (Qudf) Loose, moist, dark brown, Silty, fine to coarse SAND				
2		+ + + + + + + +			GRANITIC ROCK (Kgr) Weak to moderately weak, highly to moderately weathered, leucocratic GRANITIC ROCK				
		+ + + +			Strong, moderately weathered, GRANITIC ROCK; tops of core stones apparent at bottom of test pit				
					REFUSAL AT 3.8 FEET No groundwater encountered Backfilled 10-02-2023				

Figure A-5,
Log of Test Pit TP 5, Page 1 of 1

G3194-42-01.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.

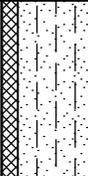
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT TP 6			PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1319'</u>	DATE COMPLETED <u>10-02-2023</u>	EQUIPMENT <u>CAT 430F BACKHOE</u> BY: <u>R. ADAMS</u>			
					MATERIAL DESCRIPTION					
0	TP6-1			SM	TOPSOIL Loose, moist, dark brown, Silty, fine SAND; trace clay, few 6"-20" rock fragments					
2					GRANITIC ROCK (Kgr) Weak, completely to highly weathered, orangish-brown, GRANITIC ROCK; excavates to a Silty, fine to coarse SAND (saprolite) with clay					
4					REFUSAL 2-4 FEET (contact with slightly weathered rock varies) No groundwater encountered Backfilled 10-02-2023					

Figure A-6,
Log of Test Pit TP 6, Page 1 of 1

G3194-42-01.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)	TEST PIT TP 7		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1314'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u>		BY: <u>R. ADAMS</u>		
MATERIAL DESCRIPTION									
0		++			GRANITIC ROCK (Kgr) Weak, completely weathered, orangish-brown, GRANITIC ROCK; excavates to a coarse SAND				
2		++			-Becomes whitish-gray				
4		++							
6	TP7-1	++			-Becomes moderately weak, highly weathered				
					PRACTICAL REFUSAL AT 7.5 FEET No groundwater encountered Backfilled 10-02-2023				

Figure A-7,
Log of Test Pit TP 7, Page 1 of 1

G3194-42-01.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)	TEST PIT TP 8		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1307'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u>		BY: <u>R. ADAMS</u>		
MATERIAL DESCRIPTION									
0				SM	UNDOCUMENTED FILL (Qudf) Loose, moist, gray, Silty, fine to coarse SAND; trace plastic				
2				SM	TOPSOIL Loose, moist, dark reddish-brown, Silty, fine SAND; trace clay				
4					GRANITIC ROCK (Kgr) Weak, highly weathered, orangish-brown to whitish brown, GRANITIC ROCK; excavates to a coarse sand with no oversize -Becomes moderately weak to moderately strong, moderately weathered				
6									
					PRACTICAL REFUSAL AT 7 FEET No groundwater encountered Backfilled 10-02-2023				

Figure A-8,
Log of Test Pit TP 8, Page 1 of 1

G3194-42-01.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)	TEST PIT TP 9		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1310'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u>		BY: <u>R. ADAMS</u>		
MATERIAL DESCRIPTION									
0				SM	UNDOCUMENTED FILL (Qudf) Loose, moist, grayish-brown to brown, Silty, fine SAND; wood and plastic debris				
2				SM	TOPSOIL Loose, moist, dark brown, Silty, fine SAND; trace clay, some roots				
4					GRANITIC ROCK (Kgr) Weak, completely weathered, yellowish-brown, GRANITIC ROCK; excavates to a Silty, fine to coarse SAND with no oversize				
6					-Becomes moderately weak and weathered				
8					PRACTICAL REFUSAL AT 8 FEET No groundwater encountered Backfilled 10-02-2023				

Figure A-9,
Log of Test Pit TP 9, Page 1 of 1

G3194-42-01.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)	TEST PIT TP 10		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1310'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u> BY: <u>R. ADAMS</u>				
MATERIAL DESCRIPTION									
0					6"-8" thick RECYCLED ASPHALT GROUNDING (RAP)				
				SM	TOPSOIL Loose, moist, dark reddish-brown, Silty, fine to medium SAND				
2					GRANITIC ROCK (Kgr) Strong, moderately to slightly weathered, grayish-white, GRANITIC ROCK. Degree of weathering and rock strength varies in test pit from moderately weak to strong and highly to slightly weathered. Corestone at north end of test pit				
4									
6									
					PRACTICAL REFUSAL AT 7 FEET (south end) Refusal at 2.5 feet (north end on corestone) No groundwater encountered Backfilled 10-02-2023				

Figure A-10,
Log of Test Pit TP 10, Page 1 of 1

G3194-42-01.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)	TEST PIT TP 12		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1315'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u> BY: <u>R. ADAMS</u>				
0				SM	MATERIAL DESCRIPTION UNDOCUMENTED FILL (Qudf) Loose, dry to damp, light brown, Silty, fine SAND; little 6-12" rock fragments -At 10", hit plastic leach line-abandoned				
					TRENCH TERMINATED AT 20" No groundwater encountered Backfilled 10-02-2023				

Figure A-12,
Log of Test Pit TP 12, Page 1 of 1

G3194-42-01.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)	TEST PIT TP 13		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1315'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u>		BY: <u>R. ADAMS</u>		
MATERIAL DESCRIPTION									
0				SC	UNDOCUMENTED FILL (Qudf) Loose to medium dense, moist, dark brown, Clayey, fine SAND; trace rock fragments up to 8"; some plastic and concrete debris				
2				SC	TOPSOIL Medium dense, moist, dark brown, Clayey SAND; some pinhole porosity (saprolite)				
4					GRANITIC ROCK (Kgr) Weak to moderately weak, completely weathered, orangish brown to grayish brown, GRANITIC ROCK; excavates to a Silty, fine to coarse SAND, no oversize				
6					<p>TRENCH TERMINATED AT 6 FEET</p> <p>No groundwater encountered</p> <p>Backfilled 10-02-2023</p>				

Figure A-13,
Log of Test Pit TP 13, Page 1 of 1

G3194-42-01.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)	TEST PIT TP 14		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1311'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u>		BY: <u>R. ADAMS</u>		
MATERIAL DESCRIPTION									
0				SM	UNDOCUMENTED FILL (Qudf) Loose, moist, brown, Silty, fine SAND; trace clay, concrete debris up to 36" (sidewalk), some plastic				
2									
4					-Caving due to concrete removal				
6					-Plastic bottles, metal debris, rebar, masonry, greater than or equal to 50% construction debris				
8									
10									
12		+			GRANITIC ROCK (Kgr) Weak, completely weathered, reddish-brown, GRANITIC ROCK; excavates to a Silty, fine to coarse SAND				
					TRENCH TERMINATED AT 13 FEET No groundwater encountered Backfilled 10-02-2023				

Figure A-14,
Log of Test Pit TP 14, Page 1 of 1

G3194-42-01.GPJ

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

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DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT TP 15		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1303'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u> BY: <u>R. ADAMS</u>				
					MATERIAL DESCRIPTION				
0	TP15-1				2"-5" RECYCLED ASPHALT CONCRETE				
2				CL	TOPSOIL/SAPROLITE Stiff, moist, gray, Sandy CLAY; few roots				
4					GRANITIC ROCK (Kgr) Weak to moderately weak, highly weathered, grayish black, GRANITIC ROCK; excavates to a Silty, fine SAND with few rock fragments up to 6" diameter				
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled 10-02-2023				

Figure A-15,
Log of Test Pit TP 15, Page 1 of 1

G3194-42-01.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)	TEST PIT TP 16			PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1299'</u>	DATE COMPLETED <u>10-02-2023</u>	EQUIPMENT <u>CAT 430F BACKHOE</u> BY: <u>R. ADAMS</u>			
MATERIAL DESCRIPTION										
0				SC	2"-3" RECYCLED ASPHALT CONCRETE (RAP)					
					TOPSOIL Loose, moist, brownish-black, Clayey, fine SAND; trace silt, abundant roots					
2										
4					GRANITIC ROCK (Kgr) Weak, completely weathered, brown, GRANITIC ROCK; excavates to a Silty, fine SAND, no oversize fragments					
6	TP16-1				-Becomes moderately weak, highly to moderately weathered					
					TRENCH TERMINATED AT 7.5 FEET No groundwater encountered Backfilled 10-02-2023					

Figure A-16,
Log of Test Pit TP 16, Page 1 of 1

G3194-42-01.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.

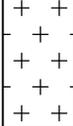
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT TP 17		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>1306'</u>	DATE COMPLETED <u>10-02-2023</u>			
					EQUIPMENT <u>CAT 430F BACKHOE</u> BY: <u>R. ADAMS</u>				
MATERIAL DESCRIPTION									
0				SM	TOPSOIL Loose, damp to moist, dark brown, Silty, fine SAND; trace clay				
2					GRANITIC ROCK (Kgr) Very strong, slightly weathered GRANITIC ROCK				
					REFUSAL AT 1-3 FEET (varies) No groundwater encountered Backfilled 10-02-2023				

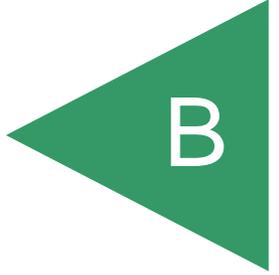
Figure A-17,
Log of Test Pit TP 17, Page 1 of 1

G3194-42-01.GPJ

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

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

APPENDIX



APPENDIX B

LABORATORY TESTING

We performed laboratory tests in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected soil samples for maximum density/optimum moisture content, expansion index, water-soluble sulfate, pH and resistivity, chloride, R-Value, and direct shear strength. The results of our laboratory tests are presented herein.

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.)
TP3-1	Grayish brown, Silty, fine to coarse SAND; trace gravel	122.3	10.6
TP4-2	Brown, Silty, fine to coarse SAND	123.1	11.1

SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	2022 CBC Expansion Classification	ASTM Soil Expansion Classification
	Before Test	After Test				
TP4-1	7.5	12.5	119.4	10	Non-Expansive	Very Low
TP15-1	9.8	19.9	110.7	42	Expansive	Low

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

Sample No.	Depth (feet)	Geologic Unit	Water-Soluble Sulfate (%)	ACI 318 Sulfate Exposure
TP7-1	5-7	Kgr	0.001	S0

SUMMARY OF LABORATORY CHLORIDE TEST RESULTS AASHTO T 291

Sample No.	Depth (Feet)	Geologic Unit	Chloride Ion Content (ppm)	Chloride Ion Content (%)
TP7-1	5-7	Kgr	71	0.007

**SUMMARY OF LABORATORY POTENTIAL OF
HYDROGEN (PH) AND RESISTIVITY TEST RESULTS
CALIFORNIA TEST NO. 643**

Sample No.	Depth (Feet)	Geologic Unit	pH	Minimum Resistivity (ohm-centimeters)
TP7-1	5-7	Kgr	6.7	11,000

**SUMMARY OF LABORATORY RESISTANCE VALUE (R-VALUE) TEST RESULTS
ASTM D 2844**

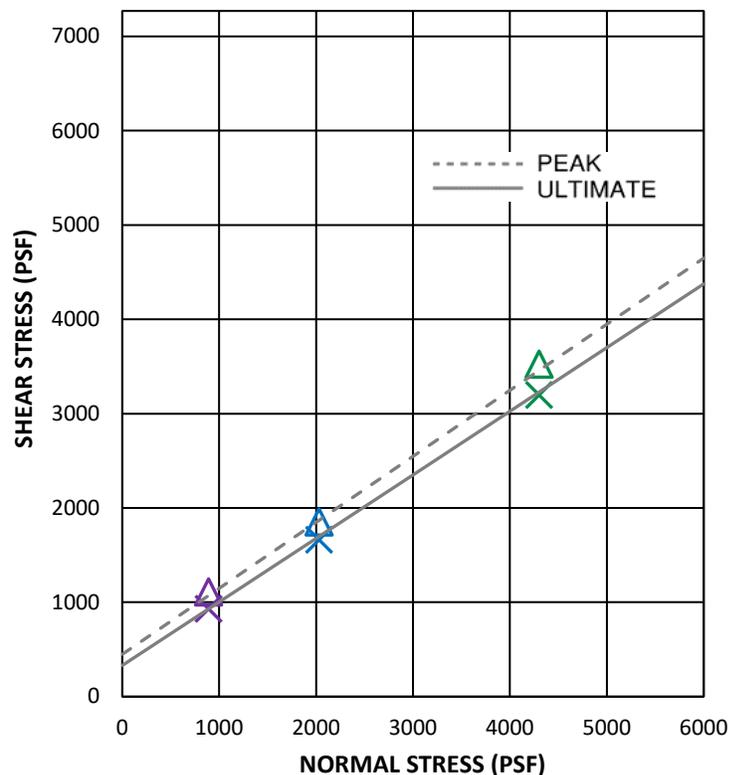
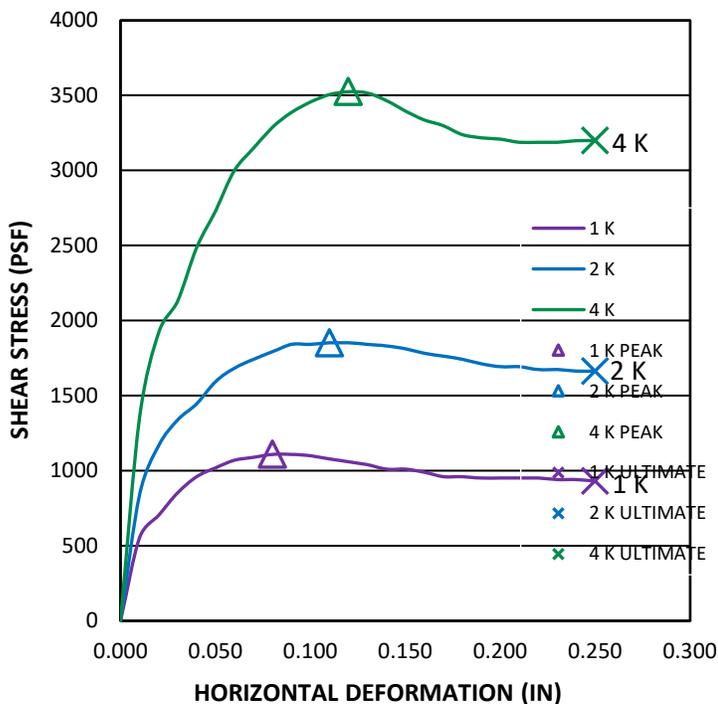
Sample No.	Depth (Feet)	Description (Geologic Unit)	R-Value
TP4-2	4-6	Grayish brown, Silty SAND (Kgr)	72

SAMPLE NO.: TP3-I GEOLOGIC UNIT: Kgd/Kvc
 SAMPLE DEPTH (FT): 1'-4' NATURAL/REMODELED: R

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
ACTUAL NORMAL STRESS (PSF):	890	2030	4300	--
WATER CONTENT (%):	10.8	10.5	10.2	10.5
DRY DENSITY (PCF):	110.2	110.4	110.8	110.5

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
WATER CONTENT (%):	15.6	15.8	15.5	15.6
PEAK SHEAR STRESS (PSF):	1109	1852	3525	--
ULT.-E.O.T. SHEAR STRESS (PSF):	931	1664	3198	--

RESULTS		
PEAK	COHESION, C (PSF)	450
	FRICTION ANGLE (DEGREES)	35
ULTIMATE	COHESION, C (PSF)	330
	FRICTION ANGLE (DEGREES)	34



DIRECT SHEAR - AASHTO T-236

SOUTH VILLAGE STORAGE

PROJECT NO.: G3194-42-01

GEOCON
INCORPORATED



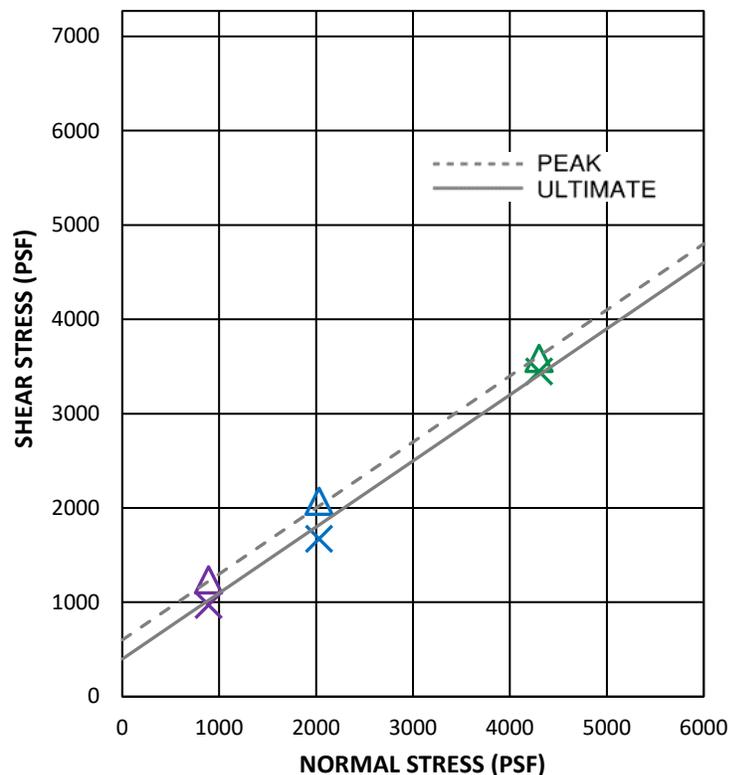
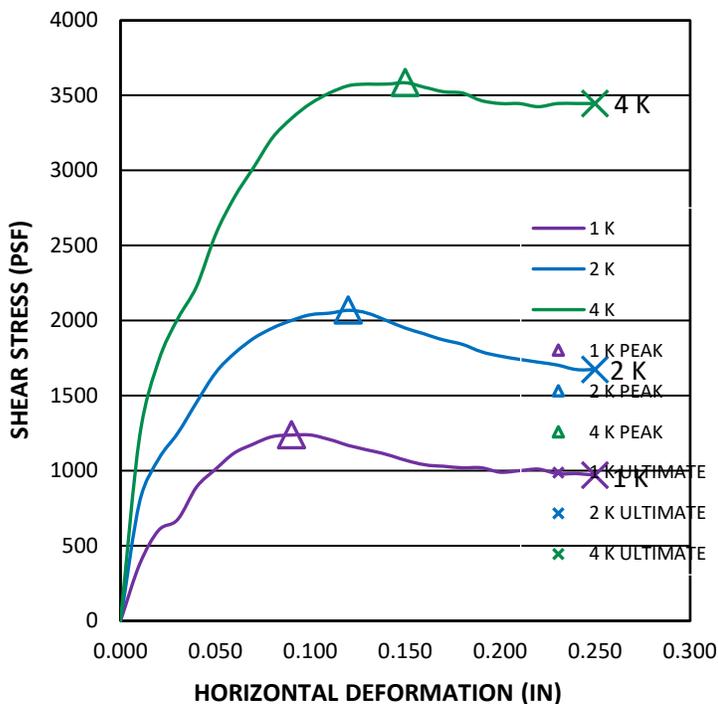
GEOTECHNICAL CONSULTANTS
 6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
 PHONE 858 558-6900 - FAX 858 558-6159

SAMPLE NO.: TP4-2 GEOLOGIC UNIT: Kgd/Kvc
 SAMPLE DEPTH (FT): 4'-6' NATURAL/REMOVED: R

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
ACTUAL NORMAL STRESS (PSF):	890	2030	4300	--
WATER CONTENT (%):	11.4	10.5	10.8	10.9
DRY DENSITY (PCF):	110.8	111.9	111.0	111.2

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
WATER CONTENT (%):	14.5	14.5	14.3	14.4
PEAK SHEAR STRESS (PSF):	1238	2070	3585	--
ULT.-E.O.T. SHEAR STRESS (PSF):	970	1674	3446	--

RESULTS		
PEAK	COHESION, C (PSF)	600
	FRICTION ANGLE (DEGREES)	35
ULTIMATE	COHESION, C (PSF)	400
	FRICTION ANGLE (DEGREES)	35



DIRECT SHEAR - AASHTO T-236

SOUTH VILLAGE STORAGE

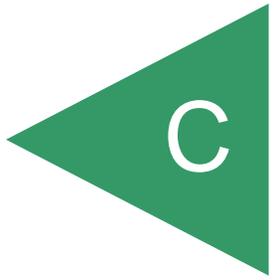
PROJECT NO.: G3194-42-01

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GEOTECHNICAL CONSULTANTS
 6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
 PHONE 858 558-6900 - FAX 858 558-6159

APPENDIX



APPENDIX C

STORM WATER MANAGEMENT INVESTIGATION

We understand storm water management devices are being proposed in accordance with the 2020 County of San Diego BMP Design Manual. If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff occurs, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

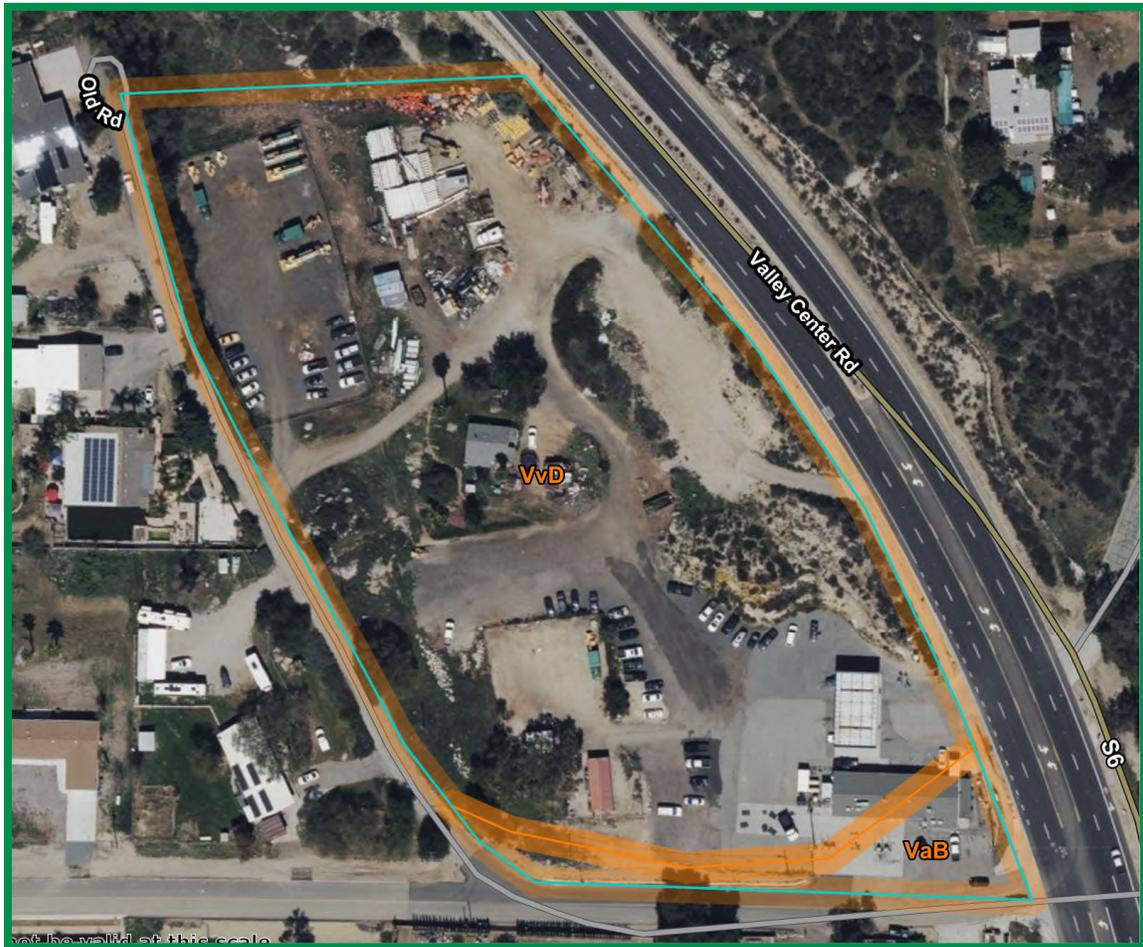
Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, possesses general information regarding the existing soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table C-1 presents the descriptions of the hydrologic soil groups. In addition, the USDA website also provides an estimated saturated hydraulic conductivity for the existing soil.

**TABLE C-1
HYDROLOGIC SOIL GROUP DEFINITIONS**

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

The Hydrologic Soil Group Map presents output from the USDA website showing the limits of the soil units.



Hydrologic Soil Group Map

Table C-2 presents the information from the USDA website for the subject property.

**TABLE C-2
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP**

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	ksAT of Most Limiting Layer (Inches/ Hour)
Visalia sandy loam, 2 to 5 percent slopes	VaB	7	A	1.98 – 5.95
Vista rocky coarse sandy loam, 5 to 15 percent slopes	VvD	93	B	1.98 – 5.95

Infiltration Testing

We performed infiltration tests at the locations shown on the Geologic Map, Figure 1. Table C-3 presents the results of the infiltration tests. Data sheets are attached. We applied an estimated feasibility factor of safety of

2.0 to our estimated infiltration rates to provide input on the Worksheet. Soil infiltration rates from in-situ tests can vary significantly from one location to another due to the heterogeneous characteristics inherent to most soil.

**TABLE C-3
INFILTRATION TEST RESULTS**

Test No.	Geologic Unit	Test Elevation (feet, MSL)	Field-Saturated Hydraulic Conductivity/Infiltration Rate, k_{sat} (inch/hour)	Infiltration Rate ¹ (inch/hour)
A-1	Kgr	1293	0.141	0.071
A-2	Kgr	1295	0.337	0.168
A-3	Kgr	1295	0.606	0.303
A-4	Kgr	1296	0.623	0.311
A-5	Kgr	1298	1.643	0.821
A-6	Kgr	1298	0.353	0.177
Average			0.617	0.309

¹ Using a Factor of Safety of 2.

GEOTECHNICAL CONSIDERATIONS

Groundwater Elevations

We did not encounter groundwater during our investigation to depths of 13 feet below existing grades. It is not uncommon for shallow seepage conditions to develop where none previously existed when sites are irrigated or infiltration is implemented. Groundwater and seepage are dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project.

New or Existing Utilities

Utilities are located on and adjacent to the property and adjacent roadways. Therefore, full and partial infiltration within the areas near these utilities should be considered infeasible. Setbacks for infiltration should be incorporated if infiltration were to be considered. The setback for infiltration devices should be a minimum of 10 feet and a 1:1 plane of 1 foot below the closest edge of the deepest adjacent utility.

Existing and Planned Structures

Existing residential and commercial buildings and roadway structures exist on and adjacent to the site. Water should not be allowed to infiltrate in areas where it could affect the neighboring properties and existing structures, improvements, and roadways. Mitigation for existing structures consists of not allowing

water infiltration within a lateral distance of at least 10 feet from the new or existing foundations and properly lines.

Soil or Groundwater Contamination

We are unaware of contaminated soil on the property. Therefore, infiltration associated with this risk is considered unrestricted. In addition, groundwater mounding would not be a concern due to the lack of a near surface groundwater table.

CONCLUSIONS AND RECOMMENDATIONS

Infiltration Rates

Our test results indicated relatively moderate infiltration rates, with an average rate of 0.617 in/hr, which can be used as the corrected infiltration rate on Table D.2-1 of the County of San Diego Storm Water Manual. Table C-4 below provides the information from Table D.2-1 of the storm water manual.

**TABLE C-4
ELEMENTS FOR DETERMINATION OF DESIGN INFILTRATION RATES
(TABLE D.2-1 OF APPENDIX D)**

Item	Value	Unit
Initial Infiltration Rate: Identify per Section D.2.1	0.617	in/hr
Corrected Infiltration Rate: Identify per Section D.2.2	0.617	in/hr
*Safety Factor: Identify per Section D.2.3	2	unitless
Design Infiltration Rate: Corrected Infiltration Rate ÷ Safety Factor	0.309	in/hr

*The final Safety Factor should be determined by the civil engineer.

Infiltration Restrictions

We have evaluated the proposed basins with respect to the infiltration restrictions contained in Table D.1-1 in Appendix D of the County of San Diego Storm Water Manual. Table C-5 below provides the information.

**TABLE C-5
INFILTRATION RESTRICTIONS FOR BASIC INFILTRATION ANALYSIS
(TABLE D.1-1 OF APPENDIX D)**

Restriction Element		Is Element Applicable? (Yes/No)
Mandatory Considerations	BMP is within 100' of Contaminated Soils	No
	BMP is within 100' of Industrial Activities Lacking Source Control	No
	BMP is within 100' of Well/Groundwater Basin	No
	BMP is within 50' of Septic Tanks/Leach Fields	No
	BMP is within 10' of Structures/Tanks/Walls	No
	BMP is within 10' of Sewer Utilities	No
	BMP is within 10' of Seasonal High Groundwater	No
	BMP is within Hydric Soils	No
	BMP is within Highly Liquefiable Soils and has Connectivity to Structures	No
	BMP is within 1.5 Times the Height of Adjacent Steep Slopes ($\geq 25\%$)	No
	County Staff has Assigned "Restricted" Infiltration Category	No
Optional Considerations	BMP is within Predominantly Type D Soil	No
	BMP is within 5' of Property Line	No
	BMP is within Fill Depths of $\geq 5'$ (Existing or Proposed)	No
	BMP is within 10' of Underground Utilities	No
	BMP is within 250' of Ephemeral Stream	No
Result	Based on examination of the best available information, I have not identified any restrictions above.	X
	Based on examination of the best available information, I have identified one or more restrictions above.	

Storm Water Evaluation Conclusion

Based on the information in Table C-5, there are no restrictions identified and the site is considered "unrestricted" for infiltration based on the County's guideline. Infiltration tests performed within the upper portions of the granitic rock indicate a moderate to high infiltration rate of 0.309 inches per hour (with a factory of safety of 2).

Storm Water Management Devices

Liners and subdrains should be incorporated into the design and construction of the planned storm water devices, where needed. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride, PVC) to prevent water migration. The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should

be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

Storm Water Standard Worksheets

**TABLE C-6
FACTOR OF SAFETY WORKSHEET
(TABLE D.2-3 OF APPENDIX D)**

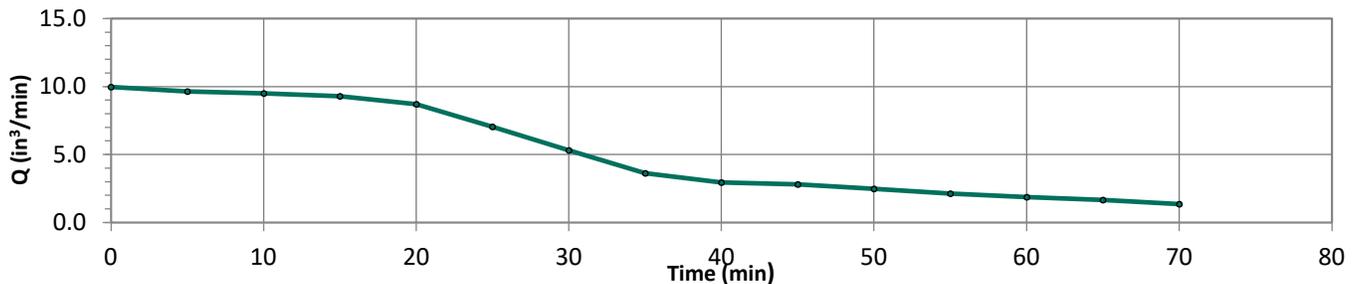
Suitability Assessment Factor Category	Assigned Weight (w)	Factor Value (v)	Product (p = w x v)
Infiltration Testing Method	0.25	2	0.50
Soil Texture Class	0.25	2	0.50
Soil Variability	0.25	2	0.50
Depth to Groundwater	0.25	1	0.25
Suitability Assessment Safety Factor, $S_A = \sum p$			1.75

*The project civil engineer should complete Worksheet D.2-3 using the data on this table.

TEST NO.: A-1 GEOLOGIC UNIT: Kgr EXCAVATION ELEVATION (MSL, FT): 1298.5

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	11
BOREHOLE DEPTH (FT):	5.3
TEST/BOTTOM ELEVATION (MSL, FT):	1293
MEASURED HEAD HEIGHT (IN):	3.0
CALCULATED HEAD HEIGHT (IN):	4.9
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	1.625
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.141
FACTORED INFILTRATION RATE (IN/HR):	0.071



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	1.800	49.85	9.969
3	5.00	1.740	48.18	9.637
4	5.00	1.715	47.49	9.498
5	5.00	1.675	46.38	9.277
6	5.00	1.570	43.48	8.695
7	5.00	1.270	35.17	7.034
8	5.00	0.960	26.58	5.317
9	5.00	0.655	18.14	3.628
10	5.00	0.530	14.68	2.935
11	5.00	0.505	13.98	2.797
12	5.00	0.445	12.32	2.465
13	5.00	0.385	10.66	2.132
14	5.00	0.335	9.28	1.855
15	5.00	0.300	8.31	1.662
16	5.00	0.245	6.78	1.357

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AARDVARK PERMEAMETER TEST RESULTS

SOUTH VILLAGE STORAGE

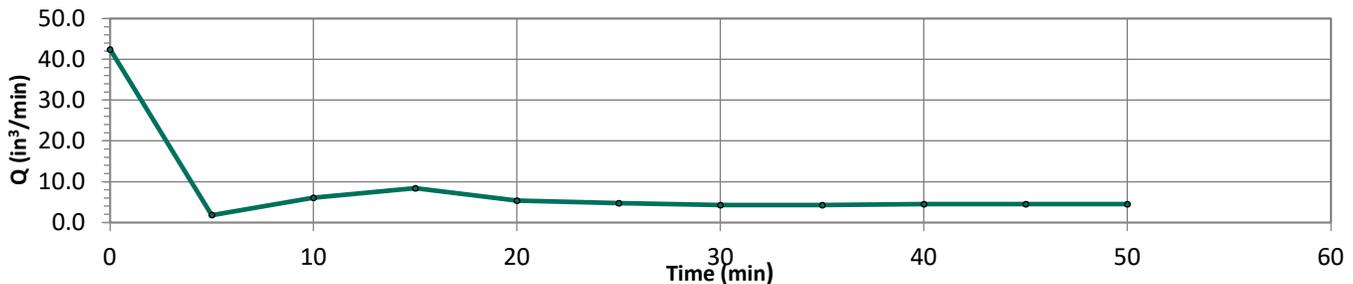
PROJECT NO.:

G3194-42-01

TEST NO.: A-2 GEOLOGIC UNIT: Kgr EXCAVATION ELEVATION (MSL, FT): 1299

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	11
BOREHOLE DEPTH (FT):	4.5
TEST/BOTTOM ELEVATION (MSL, FT):	1295
MEASURED HEAD HEIGHT (IN):	4.0
CALCULATED HEAD HEIGHT (IN):	4.8
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	4.495
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.337
FACTORED INFILTRATION RATE (IN/HR):	0.168



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	7.665	212.26	42.452
3	5.00	0.330	9.14	1.828
4	5.00	1.090	30.18	6.037
5	5.00	1.515	41.95	8.391
6	5.00	0.975	27.00	5.400
7	5.00	0.855	23.68	4.735
8	5.00	0.765	21.18	4.237
9	5.00	0.770	21.32	4.265
10	5.00	0.810	22.43	4.486
11	5.00	0.810	22.43	4.486
12	5.00	0.815	22.57	4.514

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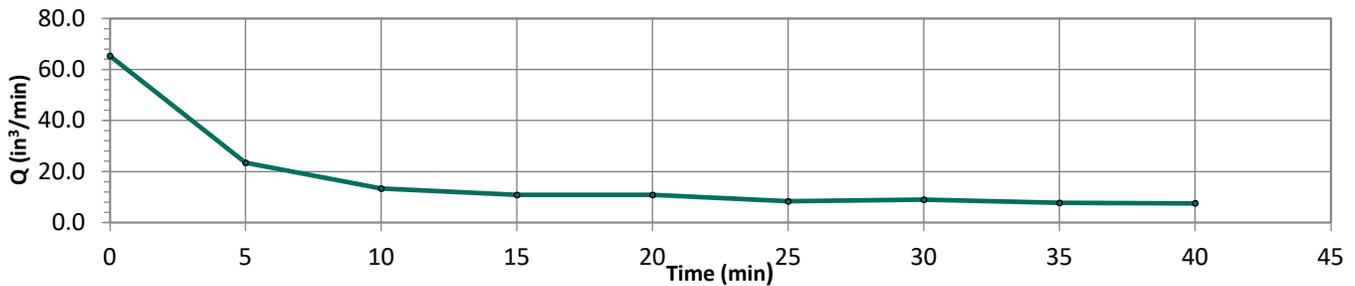
PROJECT NO.:

G3194-42-01

TEST NO.: **A-3** GEOLOGIC UNIT: **Kgr** EXCAVATION ELEVATION (MSL, FT): **1300**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	11
BOREHOLE DEPTH (FT):	5.0
TEST/BOTTOM ELEVATION (MSL, FT):	1295
MEASURED HEAD HEIGHT (IN):	4.0
CALCULATED HEAD HEIGHT (IN):	4.8
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	8.086
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.606
FACTORED INFILTRATION RATE (IN/HR):	0.303



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	11.795	326.63	65.326
3	5.00	4.230	117.14	23.428
4	5.00	2.405	66.60	13.320
5	5.00	1.950	54.00	10.800
6	5.00	1.950	54.00	10.800
7	5.00	1.500	41.54	8.308
8	5.00	1.620	44.86	8.972
9	5.00	1.400	38.77	7.754
10	5.00	1.360	37.66	7.532

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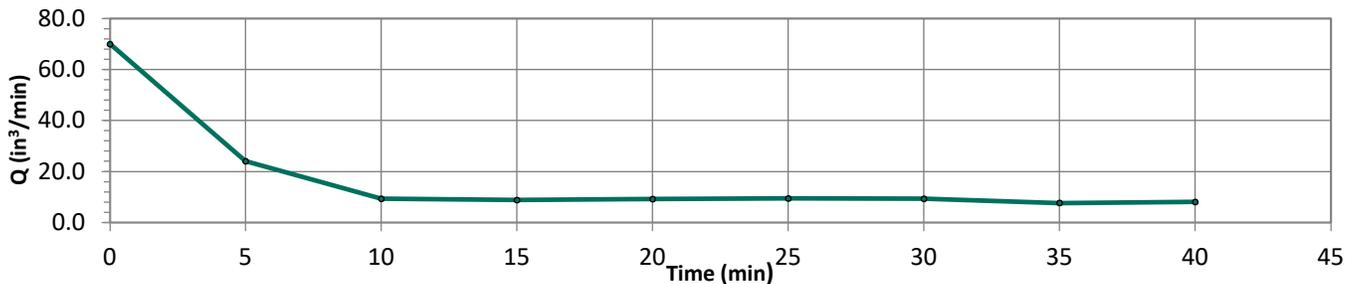
PROJECT NO.:

G3194-42-01

TEST NO.: A-4 GEOLOGIC UNIT: Kgr EXCAVATION ELEVATION (MSL, FT): 1301

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	11
BOREHOLE DEPTH (FT):	4.8
TEST/BOTTOM ELEVATION (MSL, FT):	1296
MEASURED HEAD HEIGHT (IN):	4.0
CALCULATED HEAD HEIGHT (IN):	4.9
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	8.317
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.623
FACTORED INFILTRATION RATE (IN/HR):	0.311



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	12.640	350.03	70.006
3	5.00	4.340	120.18	24.037
4	5.00	1.680	46.52	9.305
5	5.00	1.590	44.03	8.806
6	5.00	1.660	45.97	9.194
7	5.00	1.705	47.22	9.443
8	5.00	1.675	46.38	9.277
9	5.00	1.380	38.22	7.643
10	5.00	1.450	40.15	8.031

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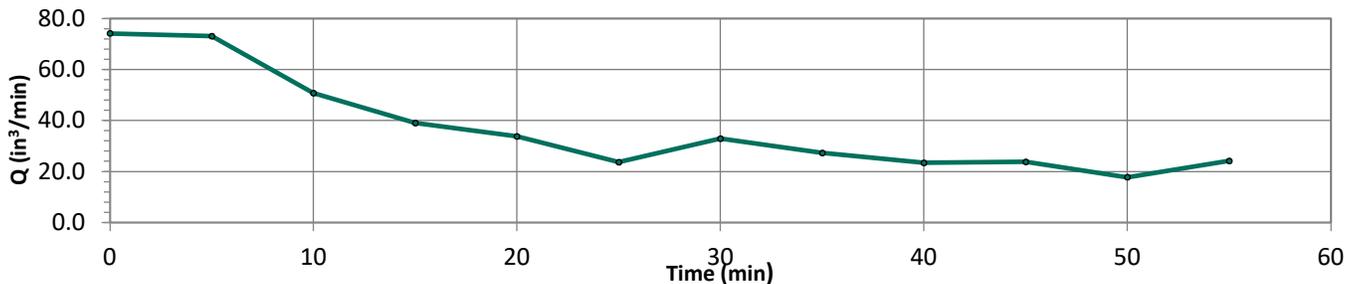
PROJECT NO.:

G3194-42-01

TEST NO.: A-5 GEOLOGIC UNIT: Kgr EXCAVATION ELEVATION (MSL, FT): 1302

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	11
BOREHOLE DEPTH (FT):	4.4
TEST/BOTTOM ELEVATION (MSL, FT):	1298
MEASURED HEAD HEIGHT (IN):	4.0
CALCULATED HEAD HEIGHT (IN):	4.8
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	21.932
FIELD-SATURATED INFILTRATION RATE (IN/HR):	1.643
FACTORED INFILTRATION RATE (IN/HR):	0.821



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	13.400	371.08	74.215
3	5.00	13.210	365.82	73.163
4	5.00	9.175	254.08	50.815
5	5.00	7.055	195.37	39.074
6	5.00	6.105	169.06	33.812
7	5.00	4.270	118.25	23.649
8	5.00	5.955	164.91	32.982
9	5.00	4.930	136.52	27.305
10	5.00	4.225	117.00	23.400
11	5.00	4.295	118.94	23.788
12	5.00	3.215	89.03	17.806
13	5.00	4.370	121.02	24.203

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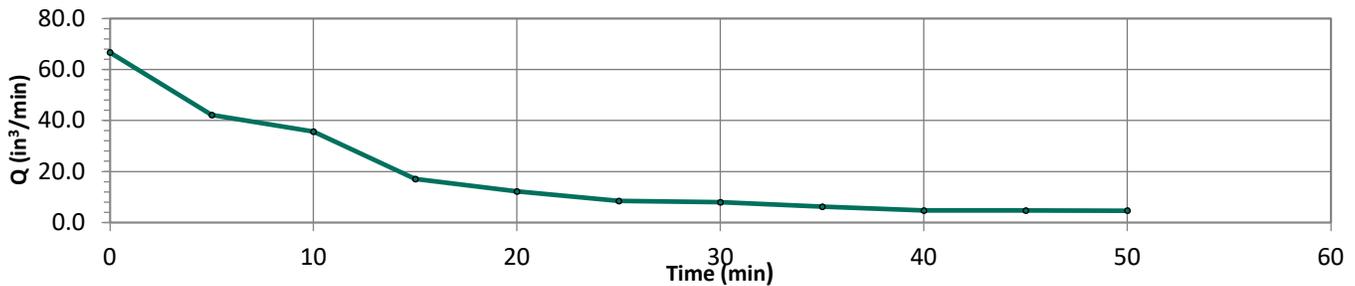
PROJECT NO.:

G3194-42-01

TEST NO.: A-6GEOLOGIC UNIT: KgrEXCAVATION ELEVATION (MSL, FT): 1302

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	11
BOREHOLE DEPTH (FT):	4.2
TEST/BOTTOM ELEVATION (MSL, FT):	1298
MEASURED HEAD HEIGHT (IN):	4.0
CALCULATED HEAD HEIGHT (IN):	4.7
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	4.717
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.353
FACTORED INFILTRATION RATE (IN/HR):	0.177



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	12.045	333.55	66.711
3	5.00	7.605	210.60	42.120
4	5.00	6.450	178.62	35.723
5	5.00	3.090	85.57	17.114
6	5.00	2.210	61.20	12.240
7	5.00	1.525	42.23	8.446
8	5.00	1.435	39.74	7.948
9	5.00	1.125	31.15	6.231
10	5.00	0.850	23.54	4.708
11	5.00	0.860	23.82	4.763
12	5.00	0.845	23.40	4.680

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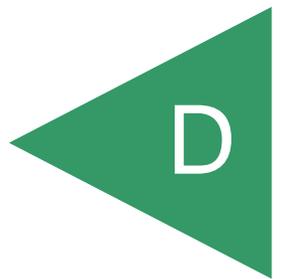
AARDVARK PERMEAMETER TEST RESULTS

SOUTH VILLAGE STORAGE

PROJECT NO.:

G3194-42-01

APPENDIX



APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

SOUTH VILLAGE STORAGE
VALLEY CENTER ROAD AND OLD ROAD
VALLEY CENTER, CALIFORNIA

PROJECT NO. G3194-42-01

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 $\frac{3}{4}$ 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 $\frac{3}{4}$ 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.

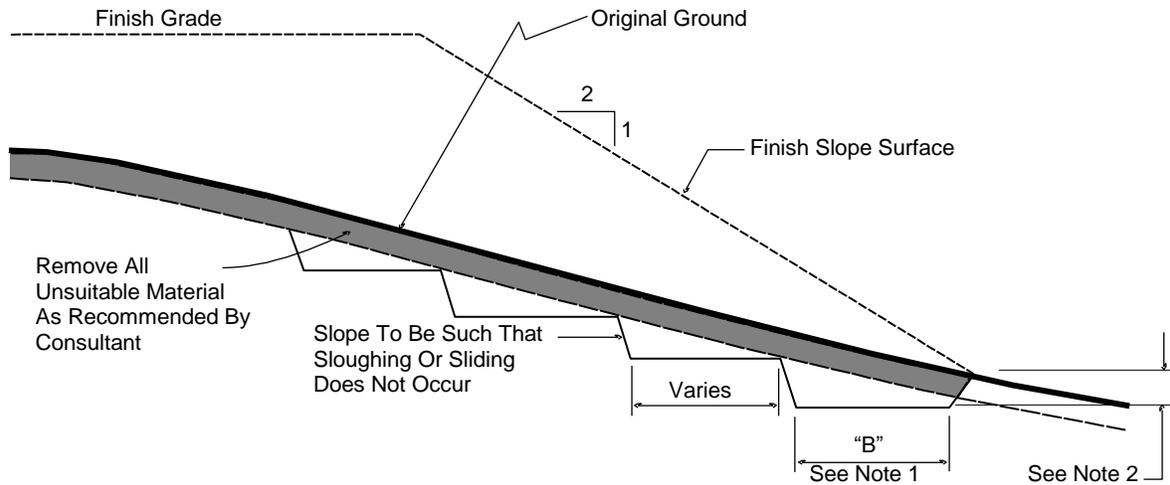
- 3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker 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



No Scale

- DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.
- (2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

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

5. COMPACTION EQUIPMENT

- 5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.
- 5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

- 6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:
- 6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.
- 6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.
- 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

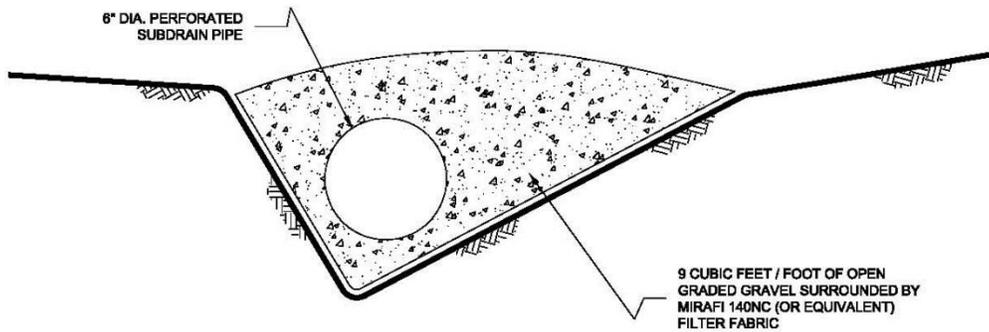
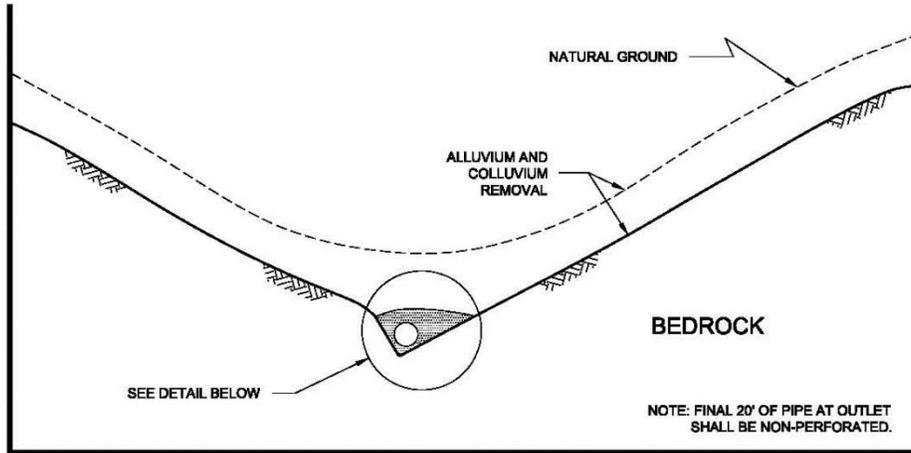
variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

- 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



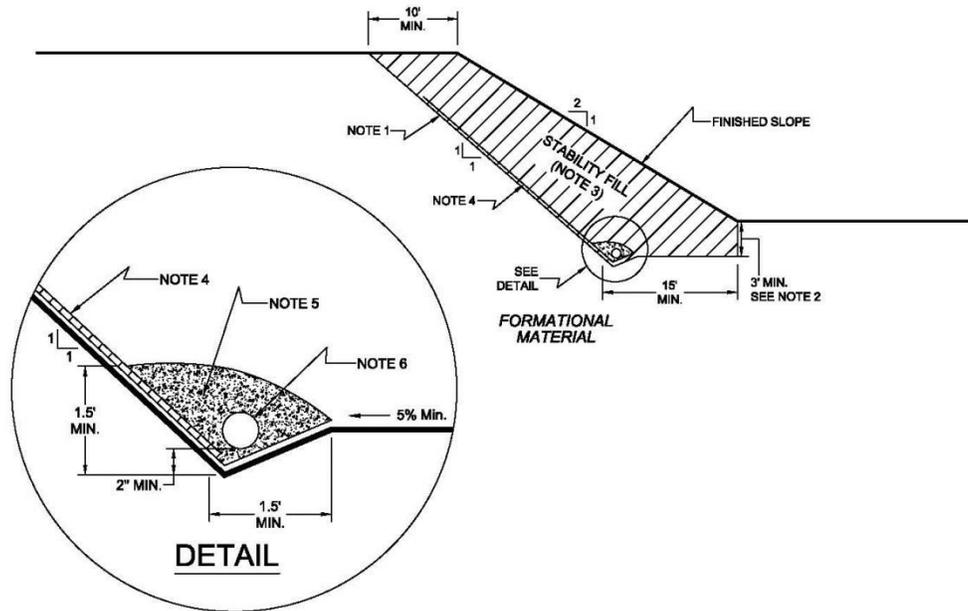
NOTES:

- 1.....8-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 larger) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

- 1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).
- 2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.
- 3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.
- 4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.
- 5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).
- 6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

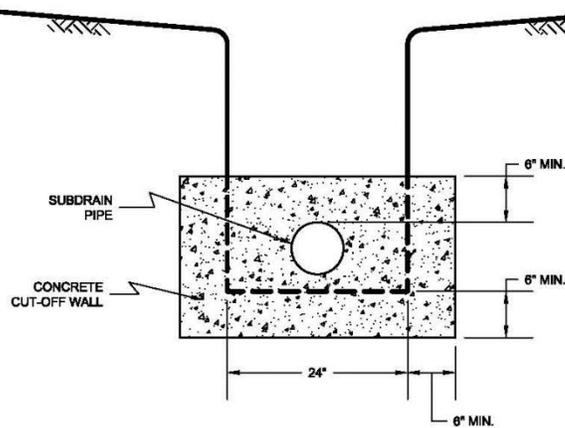
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock fill* or *soil-rock fill* areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock fill* drains should be constructed using the same requirements as canyon subdrains.

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

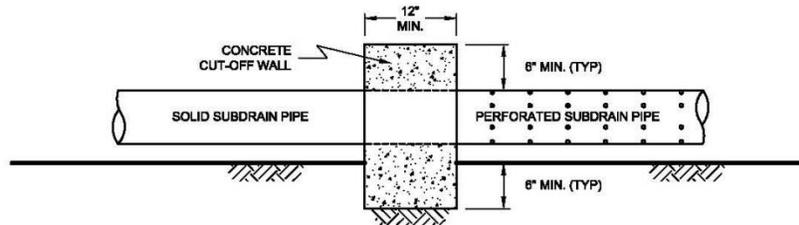
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW

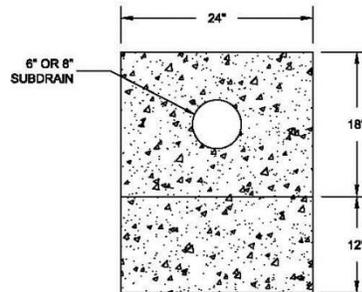


NO SCALE

7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

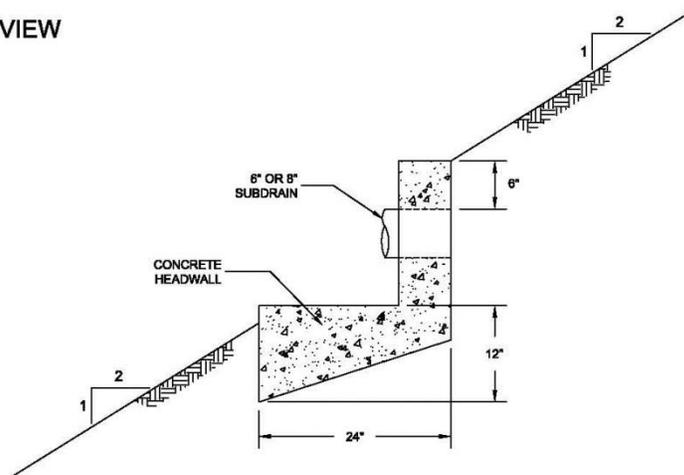
TYPICAL HEADWALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW



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

NO SCALE

- 7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an “as-built” map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

- 8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.
- 8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.
- 8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.
- 8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.
- 8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.
- 8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

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

- 8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth)*.
- 8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.
- 8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

- 9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.
- 9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

- 10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.
- 10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

- Alidade Engineering (2023), *Conceptual Grading Plan, South Villate Storage, Valley Center, California*, dated August 3, 2023.
- CGS (2021a), *EQ Zapp: California Earthquake Hazards Zone Application*, web application that queries California Geological Survey mapped earthquake hazard zones, <https://www.conservation.ca.gov/cgs/geohazards/eq-zapp>, accessed October 2023.
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- FEMA (2020), *Flood Insurance Rate Map (FIRM), Map Number 06073C0810G, effective date May 16, 2012*, <http://www.fema.gov/portal/home>, accessed October 2023.
- Kennedy, M. P., and Tan, S. S. (2007), *Geologic Map of the Oceanside 30' x 60' Quadrangle, California*, USGS Regional Geologic Map Series, 1:100,000 Scale, Map No. 2.
- SEAOC (2019), *OSHDP Seismic Design Maps*: web application that uses USGS data to retrieve seismic design data, Structural Engineers Association of California website, <http://seismicmaps.org/>, accessed October 2023.
- USGS (2016), *Quaternary Fault and Fold Database of the United States*: U.S. Geological Survey website, <https://www.usgs.gov/programs/earthquake-hazards/faults>, accessed October 2023.