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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G1933-42-05
June 16, 2021

BDM Investments, LLC
9523 La Jolla Farms Road
La Jolla, California 92031

Attention: Mr. Michael Shoemaker

Subject: RESPONSE TO CITY REVIEW COMMENTS/UPDATE LETTER
BDM MIX-USE
(HANDLER COMMERCIAL)
DRAWING NO. 39191-19-D
OTAY MESA ROAD AND CORPORATE CENTER DRIVE
SAN DIEGO, CALIFORNIA

References:
1. *Geotechnical Investigation, Handler Commercial, Drawing No. 39191-19-D, Otay Mesa Road and Corporate Center Drive, San Diego, California,* prepared by Geocon Incorporated, dated December 29, 2017 (Project No. G1933-42-02).

2. *Development Plans: BDM Mixed-Use Discretionary Submittal Set, 5400 Otay Mesa Road, San Diego, California, 92154,* prepared by Joseph Wong Design Associates, Incorporated, dated September 2020 (their job no. 3443).

4. *City of San Diego Review Comments, Handler Commercial, Project No. L64A-0003B LDR*-Geology, dated October 2, 2020.

Dear Mr. Shoemaker:

In accordance with the request of Mr. Daniel E. Rehm with Hunsaker and Associates San Diego, Inc., we have prepared this letter to respond to City of San Diego review comments (Reference 4). The review comments specific to geotechnical engineering aspects are provided below followed by our responses.

Comment No. 2: *Submit an addendum geotechnical report or update letter that specifically addresses the proposed development for purpose of environmental review and the following.*

Response: This document constitutes an update letter.

Comment No. 3 *Provide an updated geologic/geotechnical map that shows the distribution of fill and geologic units, location of exploratory excavations and current development/project on a topographic base map.*

Response: The updated geologic/geotechnical map is attached as Figure 1.

Comment No. 4: *Provide updated geologic/geotechnical cross-sections representative of the site conditions which depict the existing and proposed grades based on the current proposed development/project.*

Response: Updated geologic/geotechnical cross-sections are attached in Figure No. 2.

Comment No. 5: *The project's geotechnical consultant should provide a conclusion regarding if the proposed development will destabilize or result in settlement of adjacent property or the City Right-of-Way.*

Response: Proposed development will not destabilize or result in settlement of adjacent property or City Right-of-Way.

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

Very truly yours,

GEOCON INCORPORATED

Raul R. Garcia
GE 2842

RRG:arm

(e-mail) Addressee
(e-mail) Hunsaker and Associates San Diego, Inc.
Attention: Mr. Daniel E. Rehm

GEOLOGIC MAP

HANDLER COMMERCIAL
SAN DIEGO, CALIFORNIA

GEOCON
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858.558.6900 - FAX 858.558.6159

SCALE	DATE
1" = 40'	06 - 16 - 2021
PROJECT NO	FIGURE
G1933 - 42 - 05	1
SHEET 1 OF 1	

0' 40' 80' 120' 160'
SCALE 1"=40' (On 42x30)

GEOCON LEGEND

- Qcf — COMPACTED FILL
- Qvop — VERY OLD PARALIC DEPOSITS (Dashed Where Buried)
- 505 — Approx. ELEVATION OF BOTTOM OF FILL
- T-10 — Approx. LOCATION OF TRENCH
- B — Approx. LOCATION OF GEOLOGIC CROSS-SECTION
- 510 — ORIGINAL GRADE ELEVATION
- 500 — EXISTING GRADE ELEVATION

HWY 905

HIGHWAY 905

PRIVATE DRIVE 'B'

FINN DRIVE

LOT A

PRIVATE DRIVE 'F'

PRIVATE DRIVE 'E'

PRIVATE DRIVE 'D'

PRIVATE DRIVE 'C'

OTAY MESA ROAD

CONCORDIA CENTER DRIVE

EMERALD CREST COURT

AFFORDABLE PARKING

BLDG 1

BLDG 2

BLDG 3

BLDG 4

BLDG 5

T-1 T-2 T-3 T-4 T-5 T-6 T-7 T-8 T-9 T-10

Qcf/Qvop

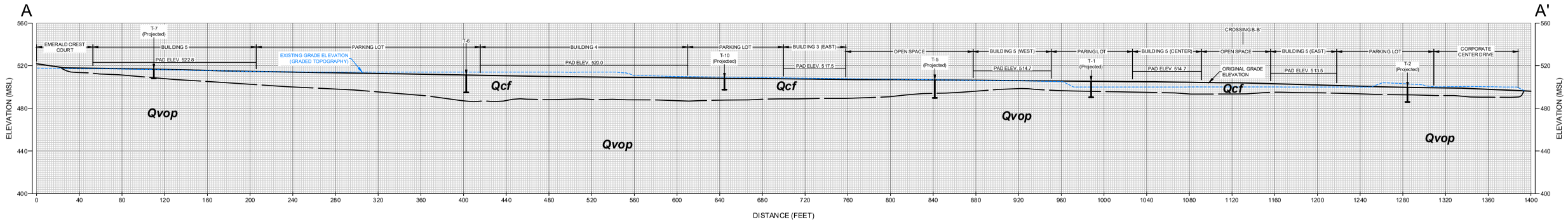
A A'

B B'

POR. SE 1/4, SW 1/4, SEC. 29

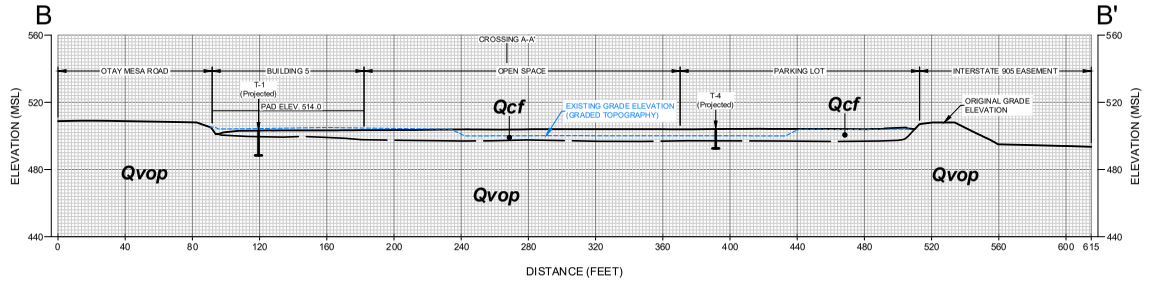
NW 1/4 NW 1/4 SEC. 32, T. 18S, R. 1W

MAP 13882



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 40' (Vert. = Horiz.)

GEOCON LEGEND

Qcf ..... COMPACTED FILL

Qvop ..... VERY OLD PARALIC DEPOSITS (Dotted Where Buried)

..... APPROX. LOCATION OF GEOLOGIC CONTACT

513.5 ..... APPROX. CONFIGURATION OF PROPOSED GRADE ELEVATION

T-10 ..... APPROX. LOCATION OF TRENCH

GEOLOGIC CROSS - SECTIONS A-A' & B-B'

HANDLER COMMERCIAL
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 8 5 8.5 5 8 - 6 9 0 0 - FAX 8 5 8.5 5 8 - 6 1 5 9

SCALE 1" = 40'
DATE 06 - 16 - 2021
PROJECT NO. G1933 - 42 - 05
FIGURE 2
SHEET 1 OF 1

Plotted:06/16/2021 7:49 AM | By: JONATHAN WILSON | File Location: P:\PROJECTS\G1933-42-05 Handler Commercial\SOURCE\SECTIONS\G1933-42-05 Profiles.dwg

UPDATE
GEOTECHNICAL INVESTIGATION

HANDLER COMMERCIAL
DRAWING NO. 39191-19-D
OTAY MESA ROAD AND
CORPORATE CENTER DRIVE
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

DR. GERALD HANDLER
LA JOLLA, CALIFORNIA

DECEMBER 29, 2017
PROJECT NO. G1933-42-02

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G1933-42-02
December 29, 2017

Dr. Gerald Handler
9523 La Jolla Farms Road
La Jolla, California 92031

Subject: UPDATE GEOTECHNICAL INVESTIGATION
HANDLER COMMERCIAL
DRAWING NO. 39191-19-D
OTAY MESA ROAD AND CORPORATE CENTER DRIVE
SAN DIEGO, CALIFORNIA

Dear Dr. Handler:

In accordance with your request and our Proposal No. LG-17418, dated November 28, 2017, we herein submit the results of our update geotechnical investigation for the subject site. We understand that Rick Engineering took over the project, since Michael Baker International is no longer the Civil Engineer of Record, therefore this update report presents in essence the same general recommendations of our original geotechnical investigation (Reference No. 6). The accompanying report presents the findings and conclusions from our study. Based on the results of our study, it is our opinion that the subject site can be developed as proposed, provided the recommendations of this report are followed.

This report presents recommendations that should be incorporated into design and construction. The recommendations are based on proposed grades indicated on the grading plan referenced herein.

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

Very truly yours,

GEOCON INCORPORATED

Raul R. Garcia
GE 2842

Garry W. Cannon
CEG 2201
RCE 56468

RRG:GWC:dmc

(2) Addressee
(2) Rick Engineering Company
Attention: Mr. Phay Thammavong

6960 Flanders Drive ■ San Diego, California 92121-2974 ■ Telephone 858.558.6900 ■ Fax 858.558.6159

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UPDATE GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our update geotechnical investigation for the proposed Handler Commercial development, located in the Otay Mesa area of San Diego, California (see Vicinity Map, Figure 1). The purpose of this update geotechnical report was to evaluate subsurface geologic conditions at the site and based on the conditions encountered, provide conclusions and recommendations pertaining to the geotechnical aspects of proposed commercial/retail development.

The scope of the investigation consisted of a site reconnaissance, subsurface investigation, laboratory testing, engineering analyses, review of aerial photographs, readily available published and unpublished geologic and geotechnical reports pertaining to the site (see List of References), and the preparation of this report.

The original field investigation was performed on December 17, 2015, and consisted of a geologic reconnaissance and excavating ten exploratory trenches as shown on the Geologic Map (Figure 2). Logs of the exploratory trenches and other details of the field investigation are presented in Appendix A.

Laboratory tests were performed on selected representative samples obtained at various depths in the trenches to evaluate pertinent physical properties for engineering analyses. A discussion regarding laboratory procedures and methods are presented in Appendix B.

The conclusions and recommendations that follow are based on analysis of the data obtained from our analysis of the laboratory test results, and our experience with similar soil and geologic conditions.

2. SITE AND PROJECT DESCRIPTION

The site consists of a 13-acre parcel located on the south side of Otay Mesa Road, between Emerald Crest Court and Corporate Center Drive, in the west section of Otay Mesa area of San Diego, California. The rectangular-shaped site is bordered to the north by Otay Mesa Road, to the west by a future residential development, to the south by Interstate 905 Right of Way and to the east by an open space area. Existing improvements consist of underground lines along Otay Mesa Road. Review of 1953 aerial photographs indicates that the historical land use was agriculture.

The site is relatively flat, sloping toward the east, from an approximate elevation of 520 feet above Mean Sea Level (MSL) at the west end to an approximate elevation of 502 feet MSL at the east section.

We understand that project development will consist of grading the site to construct: five sheet-graded lots; six detention basins; and Streets A, B, and C. We assume that the lots will be regraded at a later time once specific site plans are developed.

Based on the existing topography and review of the grading plan prepared by Rick Engineering Company (Reference No. 8), we expect that grading will include removal and recompaction of existing undocumented fill and topsoil and cuts and fills of less than approximately 2 feet to construct sheet-graded lots, Streets A, B, and C, and improvements associated with the widening of Otay Mesa Road. Cuts on the order of 5 feet are proposed to construct the detention basins.

We expect that the proposed buildings once specific grading plans are developed will be supported on conventional continuous and spread footings with slab-on-grade floors.

The location and descriptions contained herein are based on our site reconnaissance and the *Grading Plans for Handler Commercial,* prepared by Rick Engineering Company, received via e-mail December 20, 2017. If project details vary significantly from those described, Geocon Incorporated should be notified prior to final submittal for review and possible revision of the recommendations presented herein.

3. SOIL AND GEOLOGIC CONDITIONS

We encountered three surficial soil types during our investigation. The surficial soils consist of undocumented fill, topsoil, and Very Old Paralic Deposits. The soils units are discussed below. The occurrence and distribution of the units encountered, including descriptions of the units are shown on the exploratory trench logs in Appendix A. The approximate lateral extent of the geologic conditions is presented on the Geologic Map, Figure 2. The subsurface relationship between the units is presented on the Geologic Cross-Sections A-A′ and B-B′, Figure 3. We prepared the geologic cross sections using interpolation between, and extrapolation beyond, exploratory trenches; therefore, actual geologic conditions may vary from those illustrated.

3.1 Undocumented Fill (Qudf)

Undocumented fill was encountered in the vicinity of trench T-2 to a depth of approximately 3 feet. The undocumented fill is characterized as medium dense, moist, light brown to brown, clayey sand with gravel. The undocumented fill is unsuitable to receive structural fill and/or improvements, and remedial grading should be implemented as recommended in the grading section of this report.

3.2 Topsoils (Not Mapped)

Topsoils, 1 to 4 feet thick, mantle the entire property. These soils are characterized as soft, damp to moist, dark brown, slightly sandy clays with gravel. Topsoils exhibit variable density and moisture content and are unsuitable to receive additional structural fill soil or settlement-sensitive structures. Therefore, remedial grading measures in the form of removal and compaction, as indicated herein, are required.

3.3 Very Old Paralic Deposits (Qvop)

Pleistocene-age Very Old Paralic Deposits were encountered underlying the topsoil across the site. This material was formerly mapped as Quaternary Terrace Deposits. This unit typically consists of two fairly distinct layers composed of an upper clayey, silty sand layer overlying a lower, coarse-grained, granular soil layer. The upper layer consists of approximately 3 to 8 feet of dense, reddish brown, very clayey, silty, fine- to very coarse-grained sand with gravel. The lower layer consists of dense to very dense, clayey to very clayey sandy gravel with varying amounts of cobble. Portions of the lower unit have up to 30 percent rounded cobbles and boulders up to approximately 18 inches in dimension. Experience in the area indicates that some of the sandy soil layers are partially cemented, while other lenses are cohesionless. The Very Old Paralic Deposits (upper clayey sand layer and the lower sandy gravel layer) possess a *low* to *medium* expansion potential and typically poor pavement support characteristics.

4. GROUNDWATER/SEEPAGE

No groundwater or seepage was encountered in the exploratory trenches excavated during our field investigation. The on-site clayey soils possess low permeability characteristics and are susceptible to perching water near the surface. Perched groundwater conditions should be expected to occur seasonally and may affect site grading if grading operations are performed during or shortly after the rainy season. Groundwater is not expected to impact the site; however, if grading operations are performed during the rainy season, saturated conditions, and extensive moisture conditioning operations should be expected. Proper surface drainage of irrigation water and precipitation will be critical to future performance of the project.

5. GEOLOGIC HAZARDS

5.1 Geologic Hazard Category

The *City of San Diego Seismic Safety Study, Geologic Hazard and Faults,* Map Sheet No. 7 defines the site with a *Hazard Category 53: Level or Sloping Terrain-unfavorable geologic structure, low to moderate risk.*

5.2 Faulting and Seismicity

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

According to the computer program *EZ-FRISK* (Version 7.62), six known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. Based on this database, the nearest known active fault is the Newport-Inglewood/Rose Canyon Fault, located approximately 8 miles west of the site and is the dominant source of potential ground motion. Earthquakes that might occur on the Newport-Inglewood/Rose Canyon Fault or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood/Rose Canyon Fault are 7.5 and 0.31g, respectively. Table 5.2.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the 6 most dominant faults in relationship to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 acceleration-attenuation relationships.

TABLE 5.2.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2007 (g)
Newport-Inglewood/Rose Canyon	8	7.5	0.28	0.24	0.31
Rose Canyon	8	6.9	0.25	0.22	0.25
Coronado Bank	15	7.4	0.21	0.15	0.19
Palos Verdes Connected	15	7.7	0.23	0.17	0.22
Elsinore	44	7.85	0.13	0.09	0.11
Earthquake Valley	48	6.8	0.08	0.05	0.04

We used the computer program *EZ-FRISK* to perform a probabilistic seismic hazard analysis. *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults slip rate. The program accounts for earthquake magnitude as a function of fault rupture length, and site acceleration estimates are made using the

earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 in the analysis. Table 5.2.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 5.2.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2007 (g)
2% in a 50 Year Period	0.44	0.36	0.42
5% in a 50 Year Period	0.32	0.27	0.30
10% in a 50 Year Period	0.24	0.21	0.22

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

5.3 Landslides

No landslides were encountered at the site or mapped in an area that could impact the property. Landslides are mapped outside and to the southwest and northeast of the site. The risk associated with landslide hazard is low for this project.

5.4 Soil Liquefaction

Soil liquefaction occurs within relatively loose, cohesionless sands located below the water table that are subjected to ground accelerations from earthquakes. Due to the anticipated depth to groundwater (≥50 feet) and dense nature of the surficial soils at the site, the risk associated with liquefaction hazard at the site is low.

5.5 Tsunamis and Seiches

The site is located approximately 8 miles east of the Pacific Ocean at an elevation of approximately 510 feet above Mean Sea Level (MSL). No large bodies of water are located upstream of the site. The risk associated with inundation hazard due to tsunamis or seiches is low.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

6.1.1 In our opinion, the site is suitable for the proposed development, provided the recommendations presented herein are implemented in design and construction of the project.

6.1.2 Our field investigation indicates that the site is underlain by undocumented fill, topsoil, and Very Old Paralic Deposits. Subsurface conditions observed in our trenches are expected to be fairly consistent across the site; however, some variation in subsurface conditions between trench locations should be expected.

6.1.3 Groundwater was not encountered during the excavation of the exploratory trenches. It is our opinion that groundwater or seepage-related problems are unlikely. However, surface water should be directed into properly designed drainage structures and away from pavement edges, buildings, and other moisture-sensitive improvements.

6.1.4 No significant geologic hazards are known to exist on the site or in the vicinity that would adversely affect the proposed project.

6.1.5 The referenced project plans indicate that site grading will generate cuts and fills of less than approximately 2 feet, to achieve proposed grade elevations on the sheet-graded lots.

6.1.6 Undocumented fill and topsoil are unsuitable in their present condition to receive additional fill soils or support settlement-sensitive structures; therefore, the remedial grading recommendations presented in the *Grading* section should be followed. We estimate remedial grading removal depths on the order 2 to 4 feet for the undocumented fill and topsoil.

6.1.7 The clayey topsoil, which comprises the majority of the surficial deposits, exhibits *high* expansion potential. To mitigate expansion potential of the topsoil, we recommend either removal of highly expansive soil and replacement with a 3- to 5-foot cap of *low*- to *medium*-expansive materials or lime treatment. Recommendations for both of these options are provided herein.

6.1.8 The deeper Very Old Paralic Deposits consist predominately of clayey, silty sand and gravelly sand. This material has *low* to *medium* expansion characteristics and would be beneficial material for use in capping lots and streets. In order to get sufficient quantities of on-site materials to cap the site, removal and stockpiling of clayey topsoil followed by mining of the underlying Very Old Paralic Deposits would be required.

6.2 Soil and Excavation Characteristics

6.2.1 Excavations of the *in situ* soils should be suitable with moderate effort using heavy-duty grading equipment. Layers of cohesionless sand (if encountered within the Very Old Paralic Deposits) will require special attention with respect to the stability of excavations during trenching for utility lines. Planned excavations into the Very Old Paralic Deposits may be difficult due to localized cemented zones, cobbles, and boulders. The presence of cobbles and boulders could require special excavation methods. Cuts in excess of 5 to 10 feet could generate oversize rocks.

6.2.2 Excavation and compaction difficulties may be experienced if grading operations are performed when the clayey soils are very wet or very dry. Extensive moisture conditioning may be required if either case is encountered.

6.2.3 The soils encountered in the field investigation are considered to be expansive (expansion index [EI] greater than 20 as defined by 2013 California Building Code (CBC) Section 1803.5.3. The undocumented fill and the clayey sands and sandy gravels of the Very Old Paralic Deposits possess *low* to *medium* expansion potential. (Expansion Index <90). Existing topsoil possesses *high* expansion potential. (Expansion Index >91). Table 6.2.1 presents soil classifications based on the expansion index.

TABLE 6.2.1
SOIL CLASSIFICATION BASED ON EXPANSION INDEX

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

6.2.4 We performed laboratory tests on a sample of the site materials to evaluate water-soluble sulfate content. Results from the laboratory water-soluble sulfate content tests are presented in Appendix B and indicate that the near-surface on-site materials at the locations tested possess *not applicable* sulfate exposure to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-11 Sections 4.2 and 4.3. Table 6.2.2 presents a summary of concrete requirements set forth by 2016 CBC and ACI 318. ACI guidelines should be followed when determining the type of concrete to be used. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the

site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 6.2.2
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Sulfate Severity	Exposure Class	Water-Soluble Sulfate % by Weight	Cement Type	Maximum Water to Cement Ratio by Weight	Minimum Compressive Strength (psi)
Not Applicable	S0	0.00-0.10	I or II	--	2,500
Moderate	S1	0.10-0.20	II	0.50	4,000
Severe	S2	0.20-2.00	V	0.45	4,500
Very Severe	S3	> 2.00	V + pozzolan or slag	0.45	4,500

6.2.5 We performed laboratory tests on samples of the near-surface site materials to evaluate the corrosion potential to subsurface metal structures as part of our geotechnical investigation. The laboratory test results are presented in Table B-IV. The laboratory tests were performed in accordance with California Test Method No. 643. Minimum resistivity test results indicated a low to moderate corrosion potential with respect to buried metal pipes.

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

6.3 Temporary Excavations

6.3.1 Temporary excavations should be constructed in conformance with OSHA requirements. The onsite fill soil should be considered Type B soil in accordance with OSHA requirements. The Very Old Paralic Deposits should be considered Type A. In general, special shoring requirements will not be necessary if temporary excavations are less than 3 feet high. Temporary excavation depths greater than 3 feet should be laid back at an appropriate inclination or shored. The soils exposed in these excavations should not become saturated or allowed to dry. Surcharge loads should not be permitted within a distance equal to the depth of the excavation from the top of the excavation. The top of 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.

6.4 Grading Recommendations

6.4.1 Based on the plans, grading will result in cuts and fills from existing grade of approximately 2 feet or less to construct the proposed sheet grades. Because of the limited depth of fills planned, we expect grading will result in expansive clay soils near finish grade elevations. Therefore, we recommend select grading occur to provide a 3- to 5-foot-thick cap of *low*- to *medium*-expansive soil. To provide the select cap, we recommend one of the following options: (1) mine the underlying *low* to *medium* expansive Very Old Paralic Deposits to provide sufficient soil to cap the site; (2) perform lime treatment to reduce the expansive potential of the clayey soils; (3) import select *low*-expansive soils to cap the site. Each of these options is discussed below.

6.5 Grading Option 1 – Replacement of Expansive Soils (Mining)

6.5.1 Extensive mining studies have been conducted in the area by Geocon Incorporated. Based on nearby past projects, stripping the topsoil and clayey Very Old Paralic Deposits (if encountered) and mining the underlying sands and gravels is usually more cost effective than lime treatment or importing *low*-expansive soil for capping purposes. The Expansion Index laboratory tests performed in the underlying clayey-sands and gravels yielded Expansion Indices of 30, 46, and 70, indicating that mining is a feasible option, since these soils possess *low* to *medium* expansion potential.

6.5.2 For the mining option, we recommend that sufficient *low*- to *medium*-expansive (EI less than 90) material be excavated to provide a minimum cap of 5 feet in building pads and 3 feet in streets. The project Civil Engineer should determine the lot(s) to be mined. It is estimated that approximately 65,000 cubic yards of *high*-expansive clayey topsoil is present on site that will require burying within the mined excavation. The mined areas should be sized so that overexcavated *high*-expansive soil can be placed in the mined area and covered with at least 5 feet of soil with an Expansion Index less than 90. Fine grading plans for the mined areas where expansive soils are buried should be designed to maintain the 5-foot cap of *low*- to *medium*-expansive soil.

6.6 Grading Option 2 – Lime-Treated Soils

6.6.1 Lime treatment of the on-site clay can be used to reduce the expansion potential of the on-site soils. Lime treatment would also result in reduced structural pavement sections as compared to those required for untreated soils.

6.6.2 Lime-treatment operations typically treat 12-inch thick soil layers. As such, overexcavation and stockpiling will be required to process, lime treat, place and compact the treated soils. The initial excavation should extend through the undocumented fill and topsoil until sandy

soil of the Very Old Paralic Deposits are exposed. The base of the excavation should be scarified to a depth of 12 inches, moisture conditioned to 1 to 3 percent above optimum moisture content and recompacted to at least 90 percent of laboratory maximum dry density as determined by ASTM D 1557.

6.6.3 Excavated and stockpiled soils should then be mixed with quick lime by dry weight, uniformly moisture conditioned to 1 to 3 percent above optimum moisture content, placed in 6-to 8-inch thick layers and compacted to at least 90 percent relative compaction. Typical lime content for clays in the Otay Mesa is approximately 5 percent quick lime.

6.6.4 Application of lime, mixing, placing, and compacting should be performed in accordance with procedures contained in Section 24 of the Caltrans Manual and Section 301-5 of the Standard Specifications for Public Works Construction (Green Book).

6.6.5 The above recommended lime percentages are based on laboratory tests results conducted for nearby projects on Otay Mesa with similar soil conditions. If lime treatment will be used, representative samples of the clayey materials should be obtained and subjected to laboratory testing with varying lime contents to determine the optimum percentage to achieve stabilization. For preliminary criteria, lime treatment should result in a Plasticity Index (PI) of 15 or less and an Expansion Index of less than 50.

6.7 Grading Option 3 – Import Select Soil for Capping

6.7.1 We expect this option will result in excavation and exporting of undocumented fill and topsoil and importing of select fill to cap the site. Imported fill soil should consist of granular materials with a *low* expansion potential (EI less than 50), free of deleterious material or stones larger than 3 inches. Geocon Incorporated should be notified of the import source in order to perform laboratory testing on the proposed import soil prior to its arrival at the site to check its suitability as fill material.

6.8 Grading – General

6.8.1 All grading should be performed in accordance with the *Recommended Grading Specifications* contained in Appendix C and the *City of San Diego Grading Ordinance*. Where the recommendations of this section conflict with Appendix C, the recommendations of this section take precedence.

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

6.8.3 A preconstruction conference with the developer, contractor, civil engineer, and geotechnical engineer in attendance should be held at the site prior to the beginning of grading operations. Special soil handling requirements can be discussed at that time.

6.8.4 Grading of the site should commence with the removal of all vegetation and existing improvements (if any) from the area to be graded. Deleterious material should be exported from the site and should not be mixed with the fill soils.

6.8.5 Abandoned foundations and buried utilities (if encountered) should be removed and resulting depressions and/or trenches filled with properly compacted material as part of the remedial grading.

6.8.6 All undocumented fill soil and topsoil should be removed and compacted. We expect removal depths on the order of 2 to 4 feet. Select grading should occur such that the upper 5 feet in building pads and 3 feet in streets is comprised of soils with an Expansion Index of 90 or less.

6.8.7 The ground surface of areas to receive fill should be scarified to a depth of at least 12 inches, moisture conditioned, and compacted to at least 90 percent of the maximum dry density at or slightly above optimum moisture content as determined by the current version of ASTM D 1557.

6.8.8 Structural fill should be compacted in layers. Layers should be no thicker than will allow for adequate bonding and compaction. All fill, backfill, and scarified ground surfaces should be compacted to a dry density of at least 90 percent of maximum dry density near to slightly above optimum moisture content, as determined in accordance with ASTM Test Procedure D 1557. Where clayey soils are used as fill, the soil should be compacted at a moisture content of approximately 3 to 6 percent above optimum moisture content. Fill areas with in-place density test results indicating moisture contents less than optimum will require additional moisture conditioning prior to placing additional fill.

6.8.9 Oversized materials (larger than 12 inches in dimension) will likely be generated during grading and mining operations. Material placed within the upper 3 feet from finish subgrade elevation should consist of soil fill with an approximate maximum particle dimension of 6 inches.

6.8.10 Overexcavation may be required in some locations to establish the compacted mat of *low*- to *medium*-expansive materials. Where possible, the overexcavation should also extend at least 3 feet beyond proposed surface improvements and 5 feet beyond building pads.

6.8.11 Dependent upon the in situ moisture content of the clay, special equipment (i.e. discs and/or sheepsfoot compactors) may be required to place, mix, and properly compact the expansive materials.

6.9 Slope Stability

6.9.1 Permanent cut and fill slopes should be no steeper than 2:1 (horizontal:vertical).

6.9.2 All cut slope excavations should be observed during grading operations by the project engineering geologist to verify that soil and geologic conditions do not differ significantly from those anticipated.

6.9.3 The outer 15 feet of fill slopes should be composed of properly compacted granular fill or lime treated soils to reduce the potential for surficial sloughing. In general, soils with an Expansion Index of less than 90 and at least 35 percent sand size particles should be acceptable as granular fill. Slopes should be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed 4 feet and should be track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished slope.

6.9.4 All slopes should be landscaped with drought-tolerant vegetation having variable root depths and requiring minimal landscape irrigation. In addition, all slopes should be drained and properly maintained to reduce erosion. Slope planting should generally consist of drought-tolerant plants having a variable root depth. Slope watering should be kept to a minimum to just support the plant growth. A landscape architect should be contacted to provide recommendations for vegetation planned on slopes constructed with lime treated soils.

6.10 Slope Maintenance

6.10.1 Slopes steeper than 3:1 (horizontal:vertical) may, under conditions that are both difficult to prevent and predict, be susceptible to near-surface (surficial) slope instability. The instability is typically limited to the outer three feet of the slope and usually does not directly impact the improvements on pad areas above or below the slope. The occurrence of surficial instability is more prevalent on fill slopes and is generally preceded by a period of heavy rainfall, excessive irrigation or the migration of subsurface seepage. Disturbance and/or loosening of the surficial soils, as might result from root growth, soil expansion or excavation for irrigation lines and slope planting, may also be a significant contributing factor to surficial instability. We recommend that, to the maximum extent practical, (a) disturbed/loosened surficial soils be either removed or properly compacted, (b) irrigation systems be periodically

inspected and maintained to eliminate leaks and excessive irrigation, and (c) surface drains on and adjacent to slopes be periodically maintained to preclude ponding or erosion. Although the incorporation of the above recommendations should reduce the potential for surficial slope instability, it will not eliminate the possibility, and it may be necessary to rebuild or repair a portion of the project's slopes in the future.

6.11 Seismic Design Criteria

6.11.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 6.11.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2012 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The actual building type and/or location is not available. For preliminary purposes, the building structures and improvements should be designed using a Site Class D. Once final grading plans with specific building locations are available, Geocon Incorporated should be contacted to provide specific seismic design criteria. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10. The values presented in Table 6.11.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 6.11.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	D	Table 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.859g	Figure 1613..3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.326g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.157	Table 1613.3.3(1)
Site Coefficient, F_V	1.748	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	0.993g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	0.570g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.662g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.380g	Section 1613.3.4 (Eqn 16-40)

6.11.2 Table 6.11.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 6.11.2
2016 CBC SITE ACCELERATION DESIGN PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.344g	Figure 22-7
Site Coefficient, F_{PGA}	1.156	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.398g	Section 11.8.3 (Eqn 11.8-1)

6.11.3 Conformance to the criteria in Tables 6.11.1 and 6.11.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

6.12 Foundation Recommendations

6.12.1 We are providing the following recommendations for preliminary budgeting purposes. Once final grading plans and building type and locations are available, Geocon Incorporated should be contacted to provide finalized foundation recommendations. Continuous footings or isolated spread footings for one- and/or two-story structures should be at least 12 inches wide and should extend at least 18 inches below lowest adjacent pad grade into properly compacted fill soils. Isolated spread footings for one- and/or two-story structures should be at least 2 feet wide and extend 18 inches below lowest adjacent pad grade into properly compacted fill soils. Figure 4 presents a footing dimension detail. Minimum continuous footing reinforcement for one- and/or two-story structures should consist of four No. 4 steel-reinforcing bars placed horizontally in the footings; two near the top and two near the bottom.

6.12.2 The recommended dimensions and steel reinforcement presented above are based on soil characteristics only and are not intended to be in lieu of reinforcement necessary to satisfy structural loading. Actual reinforcement of the foundations should be designed by the project structural engineer.

6.12.3 The recommended allowable bearing capacity for foundations designed as recommended above is 2,500 pounds per square foot for 18-inch-deep footings. This value is for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

6.12.4 Footing excavations should be observed by a representative of Geocon Incorporated prior to placing reinforcing steel to verify that soil conditions are similar to those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.

6.13 Concrete Slabs-on-Grade

6.13.1 Interior concrete slabs-on-grade should be at least 5 inches thick. Where heavy concentrated floor loads are anticipated, the slab thickness should be increased to 6 inches and should be underlain by 4 inches of Class 2 base material compacted to at least 95 percent relative compaction.

6.13.2 Minimum reinforcement of slabs-on-grade should consist of No. 3 reinforcing bars placed at 18 inches on center in both horizontal directions. The concrete slabs-on-grade should also be doweled into the foundation system to prevent vertical movement between the slabs, footings, and walls.

6.13.3 The concrete slab-on-grade recommendations are minimums based on soil support characteristics only. We recommend that the project structural engineer evaluate the structural requirements of the concrete slabs for supporting equipment and storage loads.

6.13.4 A vapor retarder should underlie slabs that may receive moisture-sensitive floor coverings or may 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). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements in a manner that prevents puncture. The project architect or developer should specify the type of vapor retarder used based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

6.13.5 The project foundation engineer, architect, and/or developer should determine the thickness of bedding sand below the slab. In general, 3 to 4 inches of sand bedding is typically used. Geocon should be contacted to provide recommendations if the bedding sand is thicker than 6 inches.

6.13.6 All exterior concrete flatwork not subject to vehicular traffic should be a minimum of 4 inches thick and conform to the following recommendations. Slab panels in excess of 8 feet square should be reinforced with 6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh to reduce the potential for cracking. In addition, all concrete flatwork should be provided with crack-control joints to reduce and/or control shrinkage cracking. Crack-control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack-control spacing. Subgrade soils for exterior slabs should be compacted in accordance with criteria presented in the grading section of this report. The subgrade soils should not be allowed to dry prior to placing concrete.

6.13.7 The recommendations presented herein are intended to reduce the potential for cracking of slabs and foundations as a result of differential soil movement. However, even with the incorporation of these recommendations, foundations and slabs-on-grade will still exhibit some cracking. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack-control joints and proper concrete placement and curing. Crack-control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Cement Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

6.14 Lateral Loads for Retaining Walls

6.14.1 Retaining walls 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 and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pcf. Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. Expansive soil should not be used as backfill material behind retaining walls. Soil placed for retaining wall backfill should have an Expansion Index less than 50. Existing soils exhibited a *low* to *high* expansion potential. Therefore, we expect select grading or import of *low*-expansive granular soil will be required for retaining wall backfill.

6.14.2 Where walls are restrained from movement at the top, an active soil pressure equivalent to the pressure exerted by a fluid density of 60 pcf should be used for horizontal backfill. 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 (unit weight 125 pcf).

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

6.14.4 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the structures adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI of less than 50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. A typical retaining wall drainage detail is presented on Figure 5, attached. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

6.14.5 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a 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 2013 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 19H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.398g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

6.14.6 To resist lateral loads, a passive pressure equivalent to the pressure exerted by a fluid density of 300 pcf should be used for design of footings or shear keys poured neat against properly compacted granular fill soils. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

6.14.7 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.4 should be used for design. To resist lateral loads, the passive resistance can be combined with friction.

6.14.8 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 8 feet. In the event that walls higher than 8 feet are planned, Geocon Incorporated should be consulted for additional recommendations.

6.15 Preliminary Pavement Recommendations

6.15.1 The following recommendations are for preliminary purposes and are provided for private driveways and parking areas. The final pavement section design will depend upon soil conditions exposed at subgrade elevation and the results of additional Resistance Value (R-Value). The following preliminary pavement section recommendations for existing mined soils are based on an assumed R-Value of 10. We are also presenting pavement sections with lime-treated subgrade. Sections are presented for both flexible (asphalt concrete) and rigid (Portland cement concrete) pavement.

6.15.2 The pavement sections for public streets (Streets A, B, C, and the widening of Otay Mesa Road) will be determined by the City of San Diego Engineering Department. The final pavement sections of public streets will be dependent on the traffic index designated by the City of San Diego Engineering Department and the R-Value laboratory test results of the exposed subgrade soils.

TABLE 6.15.1
PRELIMINARY FLEXIBLE PAVEMENT SECTIONS – MINED SUBGRADE SOIL

Location	Assumed Traffic Index (TI)	Assumed R-Value	Asphalt Concrete Thickness (inches)	Class 2 Aggregate Base Thickness (inches)
Parking stalls for automobiles and light-duty vehicles	4.5	10	3	7
Driveways for automobiles and light-duty vehicles	5.5	10	4	11
Driveways and parking areas for heavy-duty trucks and fire lanes	7.0	10	4	14.5

TABLE 6.15.2
PRELIMINARY RIGID PAVEMENT SECTIONS – MINED SUBGRADE SOIL

Location	Average Daily[1] Truck Traffic (ADTT assumed)	Assumed R-Value	Portland Cement Concrete[2] (inches)	Class 2 Aggregate Base Thickness (inches)
Parking stalls[3] for automobiles and light-duty vehicles	25-100	10	5	4
Driveways[3] for automobiles and light-duty vehicles	300-500	10	6†	4
Driveways and parking areas for heavy-duty trucks and fire lanes	100-500	10	7‡	6

TABLE 6.15.3
PRELIMINARY FLEXIBLE PAVEMENT SECTIONS – LIME-TREATED SUBGRADE

Location	Assumed Traffic Index (TI)	Assumed R-Value	Asphalt Concrete Thickness (inches)	Class 2 Aggregate Base Thickness (inches)
Parking stalls for automobiles and light-duty vehicles	4.5	50	3	4
Driveways for automobiles and light-duty vehicles	5.5	50	4	4
Driveways and parking areas for heavy-duty trucks and fire lanes	7.0	50	4	5

TABLE 6.15.4
PRELIMINARY RIGID PAVEMENT SECTIONS – LIME-TREATED SUBGRADE

Location	Average Daily[1] Truck Traffic (ADTT assumed)	Assumed R-Value	Portland Cement Concrete[2] (inches)	Class 2 Aggregate Base Thickness (inches)
Parking stalls[3] for automobiles and light-duty vehicles	25-100	50	5	4*
Driveways[3] for automobiles and light-duty vehicles	300-500	50	6†	4*
Driveways and parking areas for heavy-duty trucks and fire lanes	100-500	50	7‡	4*

[1]ADTT values have been assumed for planning purposes herein and should be confirmed by the design team during future plan development.

[2]Concrete shall have a minimum $M_R \geq 600$ psi**.** This analysis assumes the construction of concrete shoulders.

[3]Parking stalls and driveways assume typical light truck and car traffic.

†Slabs should be reinforced with No. 3 reinforcing bars at 24 inches on center in both horizontal directions.

‡Slabs should be reinforced with No. 4 reinforcing bars at 24 inches on center in both horizontal directions.

*Placement of aggregate base to reduce potential of shrinkage cracks on concrete.

6.15.3 The subgrade soils should be compacted to a minimum relative compaction of 95 percent at near the optimum moisture content. The depth of subgrade compaction should be approximately 12 inches.

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

6.15.5 Where trash bin enclosures are planned within asphalt paved areas, we recommend that the pavement sections be equivalent to the heavy-duty truck categories presented in the respective tables. The concrete should extend into the roadway sufficiently so that all wheels of the trash truck are on the concrete when loading.

6.15.6 Rigid Portland cement concrete sections were evaluated using methods suggested by the American Concrete Institute *Guide for Design and Construction of Concrete Parking Lots (ACI330R-08).*

6.15.7 Construction joints should be provided at a maximum spacing of 12 feet each way to control shrinkage. Installation of these types of joints should be made immediately after concrete finishing.

6.15.8 Construction jointing, doweling, and reinforcing should be provided in accordance with recommendations of the American Concrete Institute.

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

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

6.16 Bio-Retention Basin and Bio-Swale Recommendations

6.16.1 The site is underlain by clayey soil and the Very Old Parlic Deposits that are generally composed of clay and very clayey sand with gravel. Based on our experience with the on-site soils and infiltration testing in nearby projects, the onsite soil have very low permeability and generally very low infiltration characteristics. It is our opinion the existing soil is unsuitable for infiltration of storm water runoff.

6.16.2 Any bio-retention basins, bioswales, and bio-remediation areas should be designed by the project civil engineer and reviewed by Geocon Incorporated. Typically, bioswales consist of a surface layer of vegetation underlain by clean sand. A subdrain should be provided beneath the sand layer. Water should not be allowed to infiltrate adjacent to the planned improvements. We recommend that retention basins, be properly lined to prevent water infiltration into the underlying soil. Prior to discharging into the storm drain pipe or other approved outlet structure, a seepage cutoff wall should be constructed at the interface between the subdrain and storm drainpipe. The concrete cut-off wall should extend at least 6 inches beyond the perimeter of the gravel-packed subdrain system. Figure 6 presents a typical bioswale detail.

6.16.3 The landscape architect should be consulted to provide the appropriate plant recommendations if a vegetated swale is to be implemented. If drought resistant plants are not used, irrigation may be required.

6.17 Drainage and Maintenance

6.17.1 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 2016 CBC 1803.3 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into storm drains and conduits that carry runoff away from the proposed structure.

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

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

6.18 Foundation and Grading Plan Review

6.18.1 Geocon Incorporated should review the grading plans and foundation plans prior to final design submittal to determine if additional analysis and/or recommendations are required.

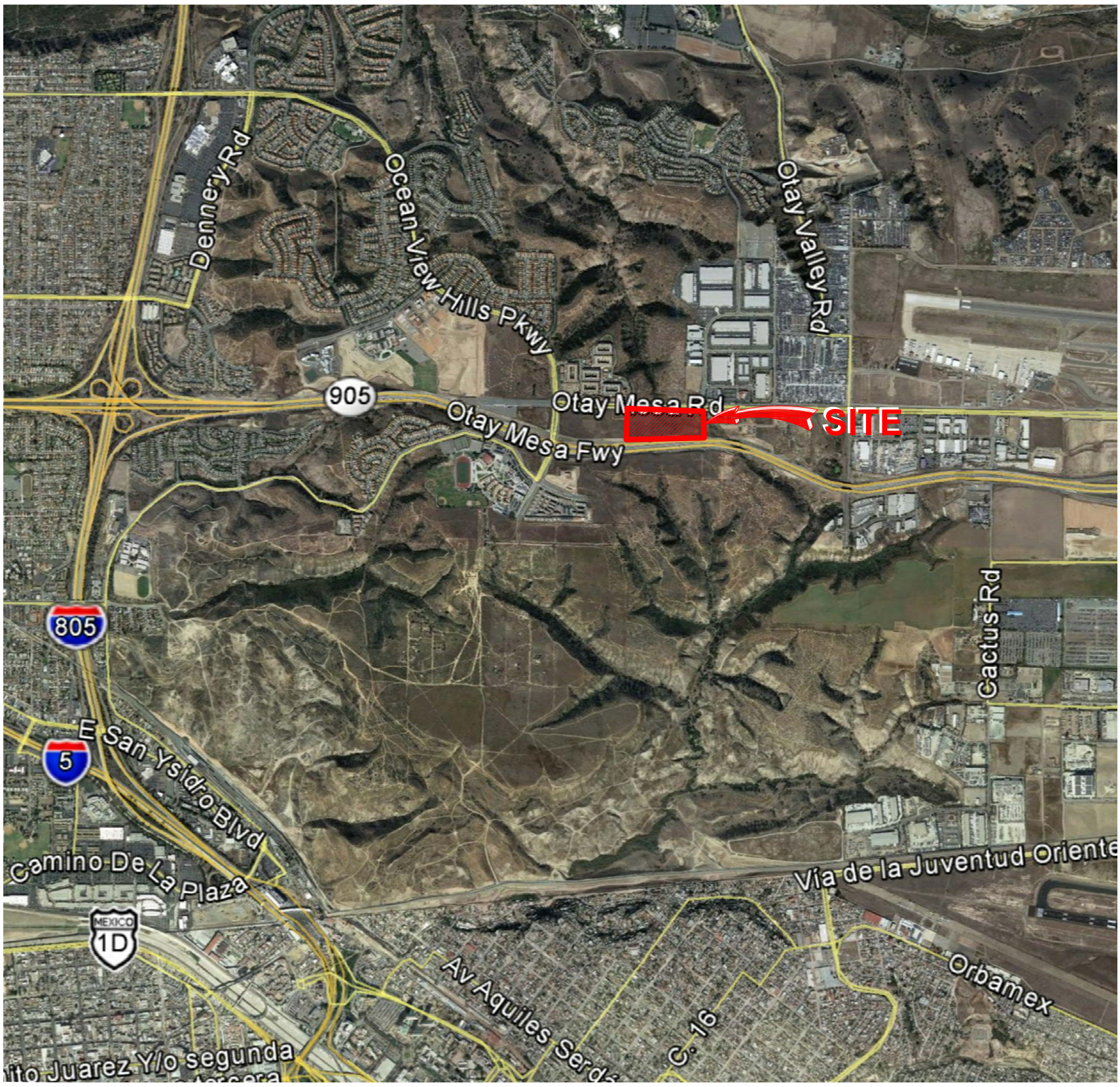
LIMITATIONS AND UNIFORMITY OF CONDITIONS

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

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

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

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



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N

NO SCALE

VICINITY MAP

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PHONE 858 558-6900 - FAX 858 558-6159

HANDLER COMMERCIAL
SAN DIEGO, CALIFORNIA

RRG / CW		DSK/GTYPD

DATE 12 - 29 - 2017	PROJECT NO. G1933 - 42 - 02	FIG. 1

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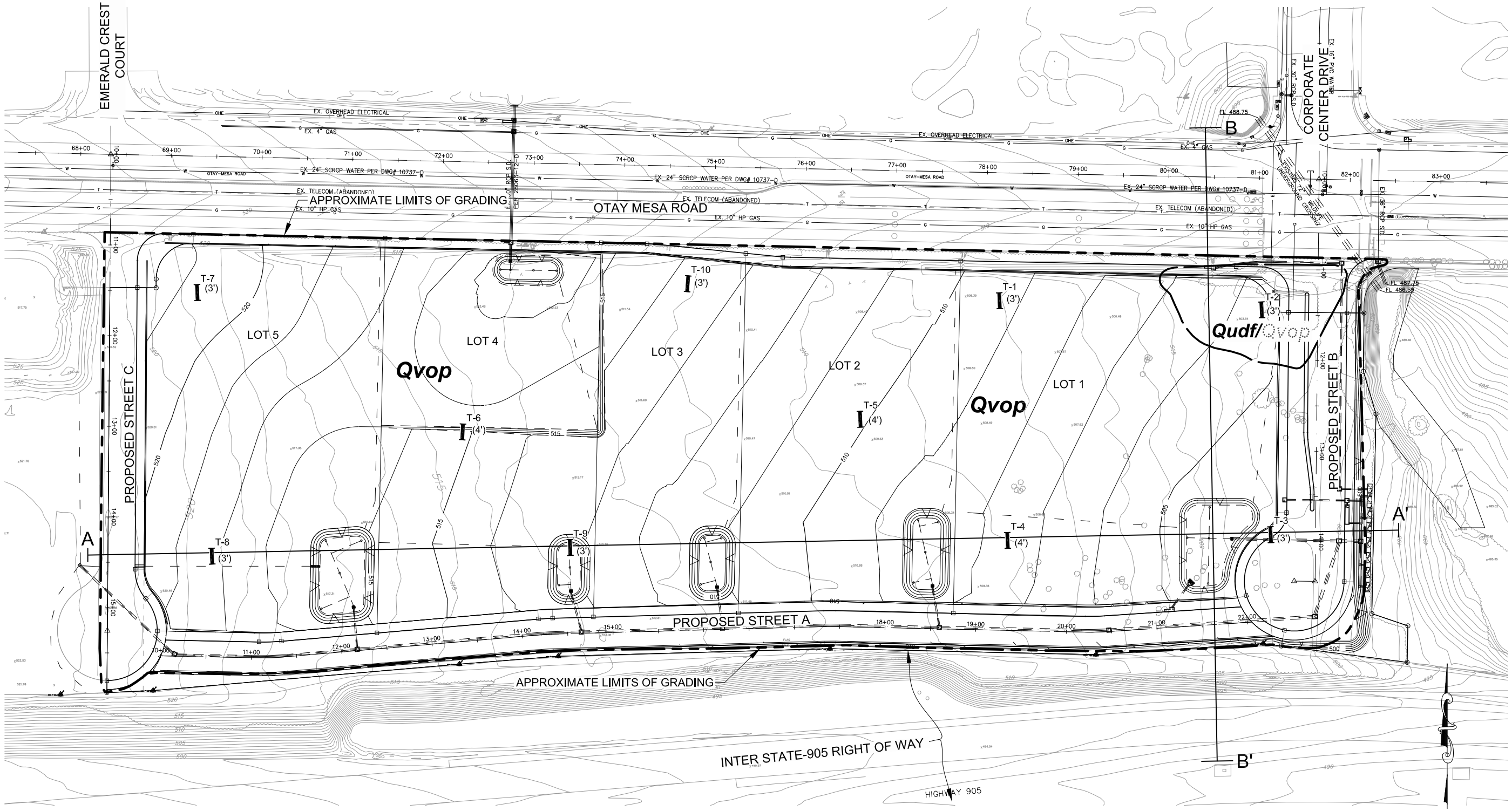

0' 50' 100' 150' 200'

SCALE 1"= 50'

GEOCON LEGEND

Qudf .....UNDOCUMENTED FILL

Qvop .....VERY OLD PARALIC DEPOSITS (Dotted Where Buried)

T-10 .....APPROX. LOCATION OF EXPLORATORY TRENCH

(4') .....DEPTH TO VERY OLD PARALIC DEPOSITS

B B' .....APPROX. LOCATION OF CROSS SECTION

.....APPROX. LOCATION OF GEOLOGIC CONTACT

GEOLOGIC MAP

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SCALE	1" = 50'	DATE	12 - 29 - 2017
PROJECT NO.	G1933 - 42 - 02	FIGURE	2
SHEET	1 OF 1		

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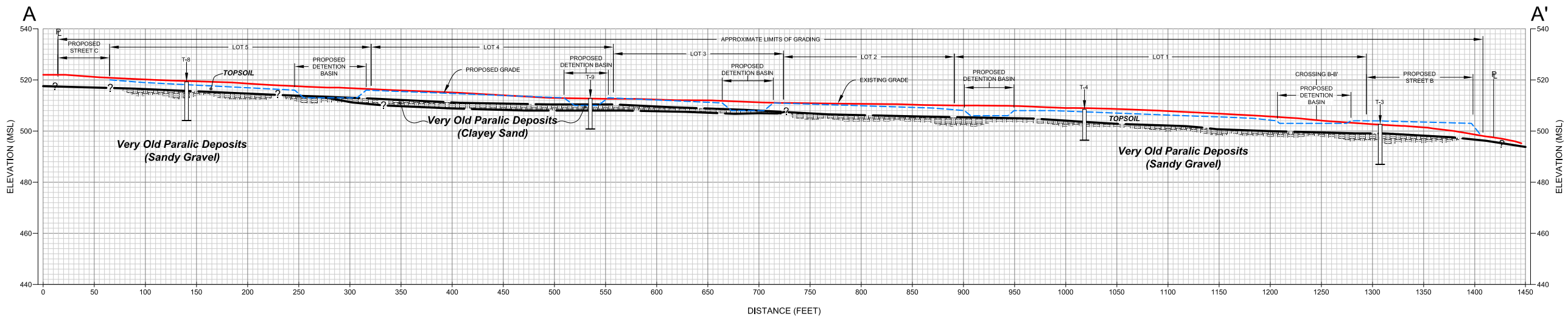

GEOLOGIC CROSS-SECTION A-A'

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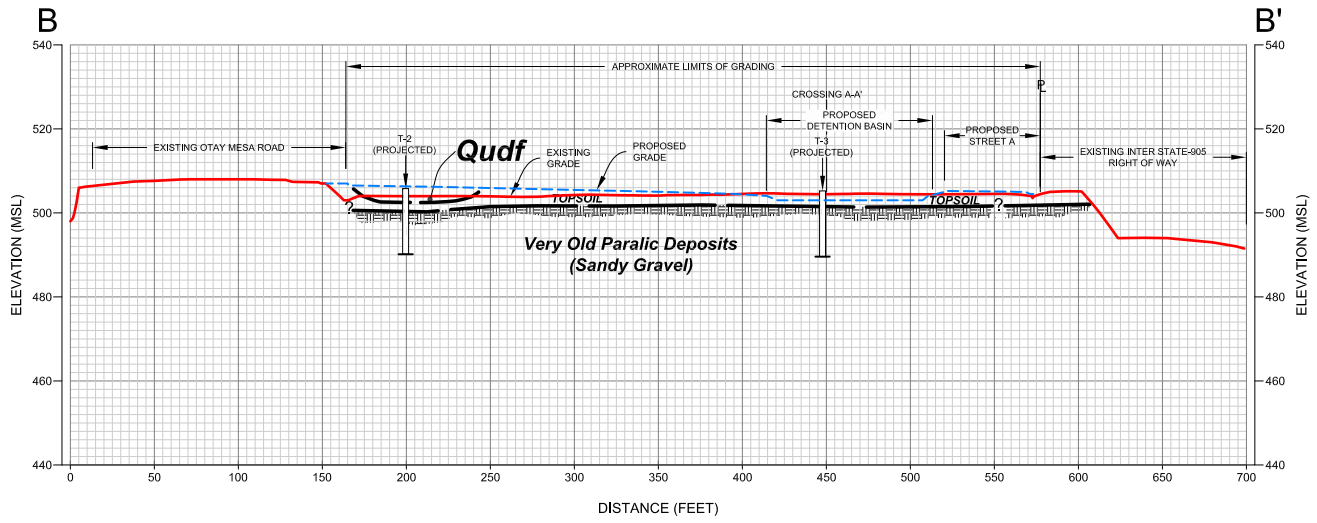
1" = 20' (Vertical)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 50' (Horizontal)
1" = 20' (Vertical)

GEOCON LEGEND

Qudf ..... UNDOCUMENTED FILL

T-9 ..... APPROX. LOCATION OF TRENCH

..... APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

GEOLOGIC CROSS - SECTION

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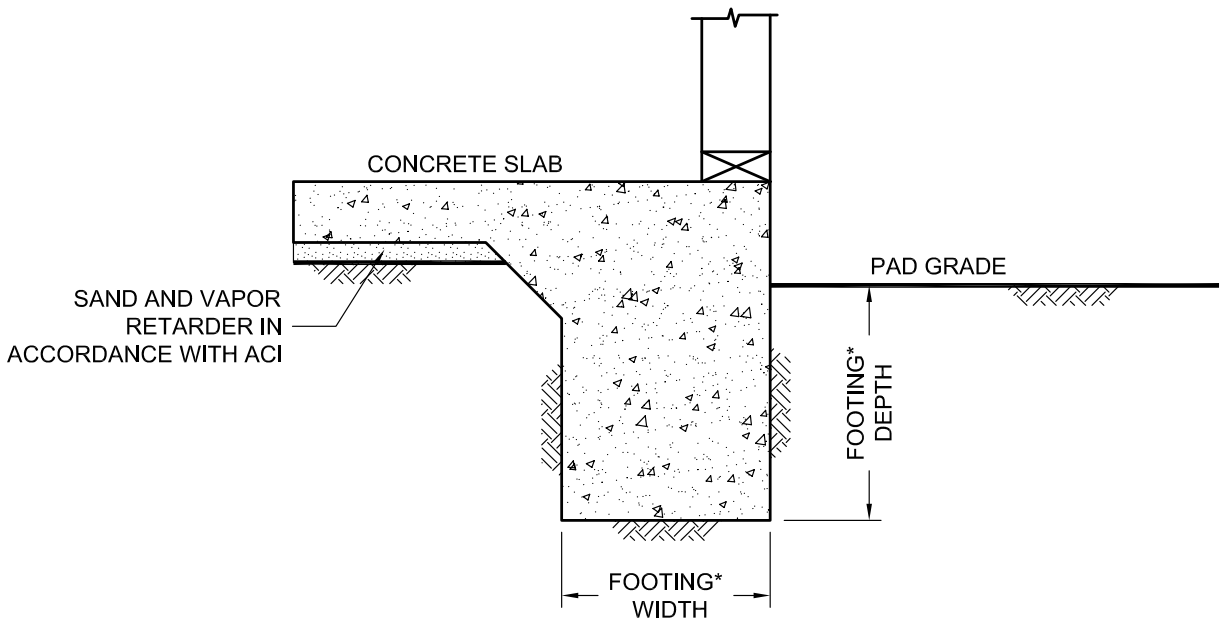
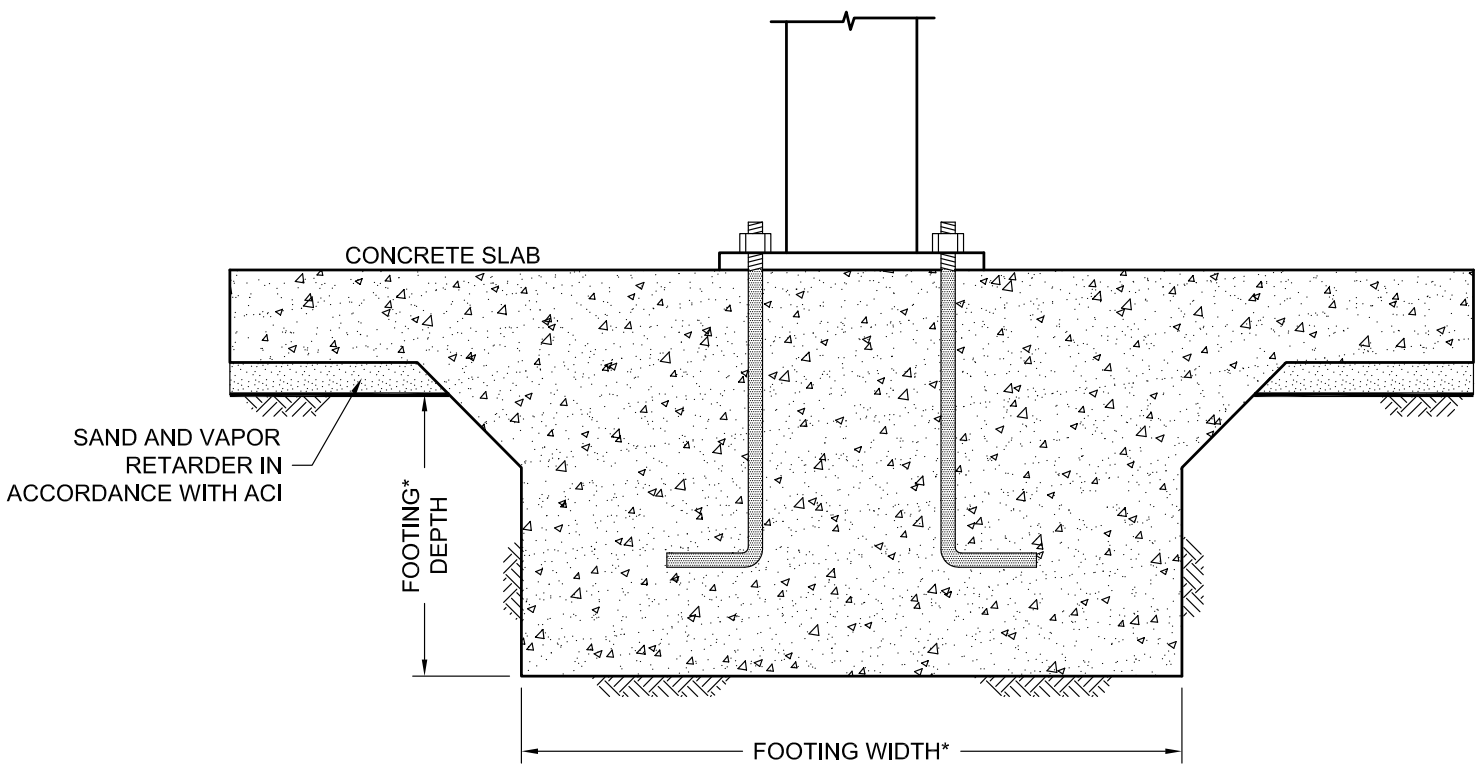
SCALE	1" = 50'	DATE	12 - 29 - 2017
PROJECT NO.	G1933 - 42 - 02	FIGURE	3
SHEET	1 OF 1		

Plotted:01/02/2018 7:08AM | By:RUBEN AGUILAR | File: I:\esjobs\Y\PROJECTS\G1933-42-02 Handler Commercial\SHEETS\G1933-42-02_CROSS-SECTION.dwg





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

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

GEOCON
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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
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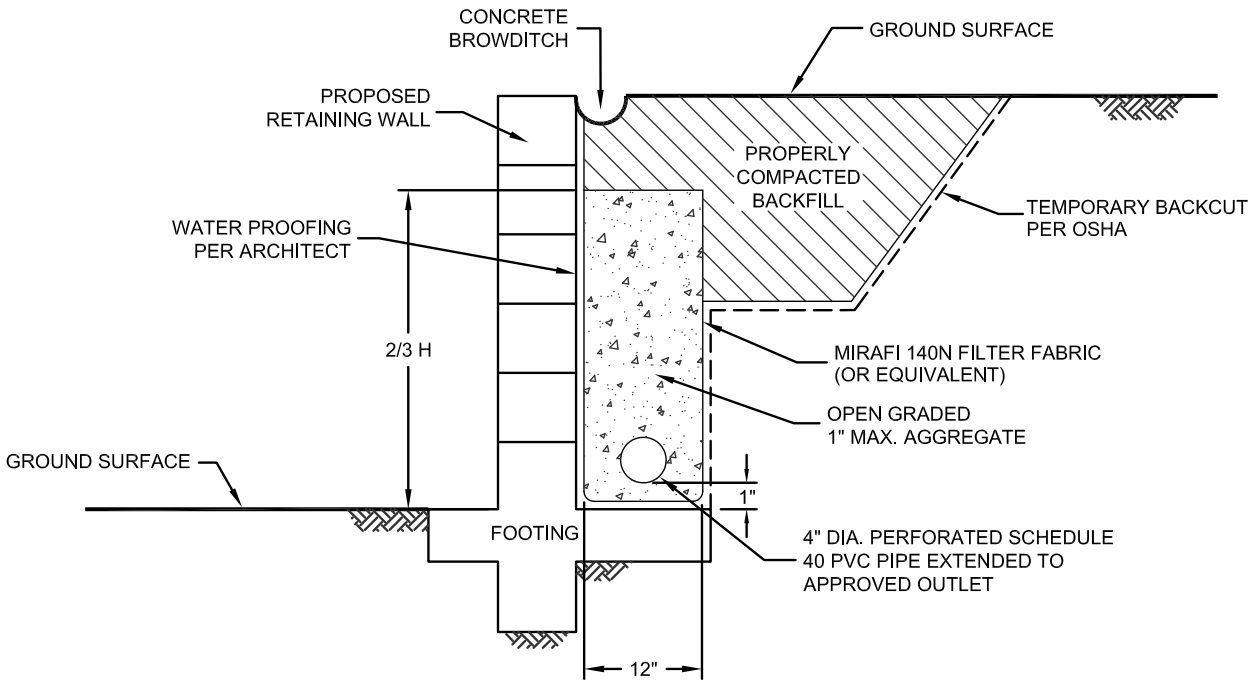
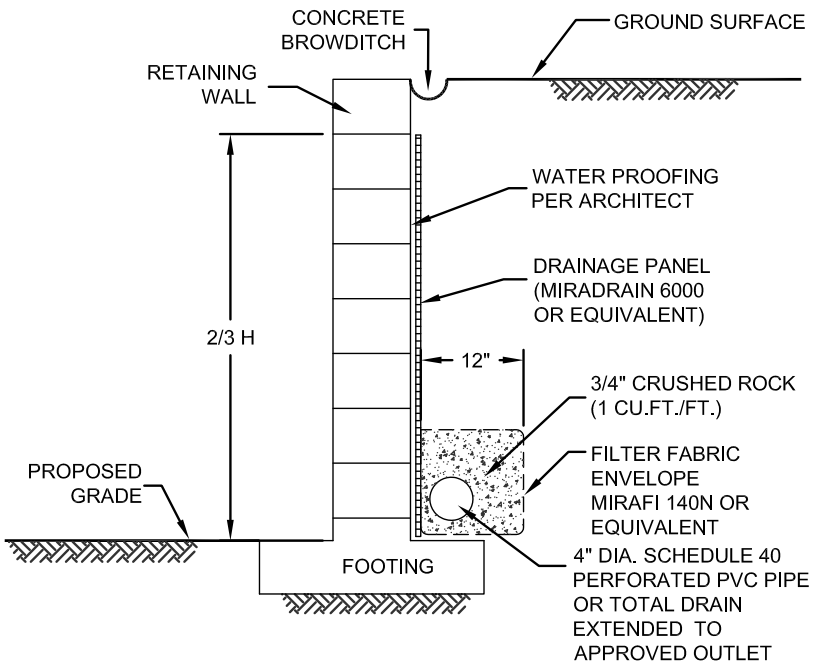
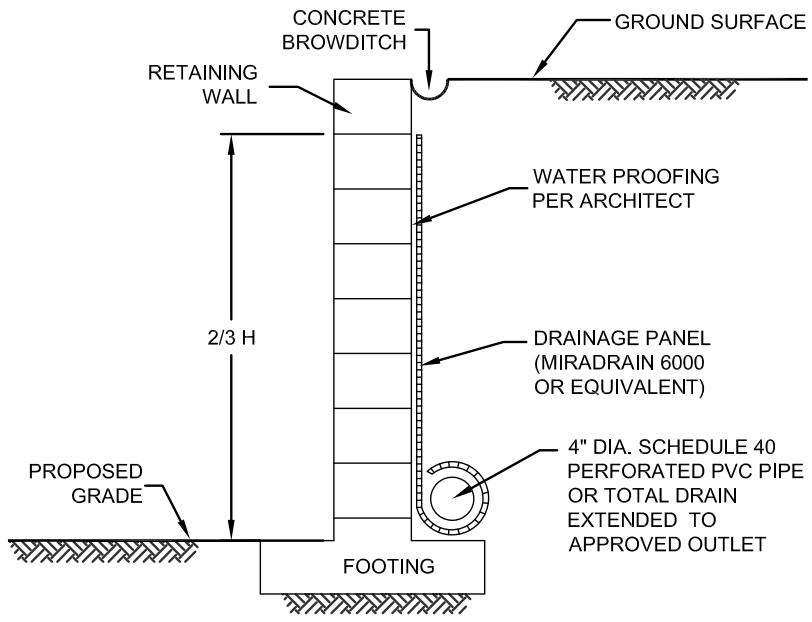
HANDLER COMMERCIAL
SAN DIEGO, CALIFORNIA

RRG / CW		DSK/GTYPD	DATE 12 - 29 - 2017	PROJECT NO. G1933 - 42 - 02	FIG. 4

Plotted:12/28/2017 3:34PM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\G1933-42-02 Handler Commercial\DETAILS\Wall-Column Footing Dimension Detail (COLFOOT2).dwg







NOTE :

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

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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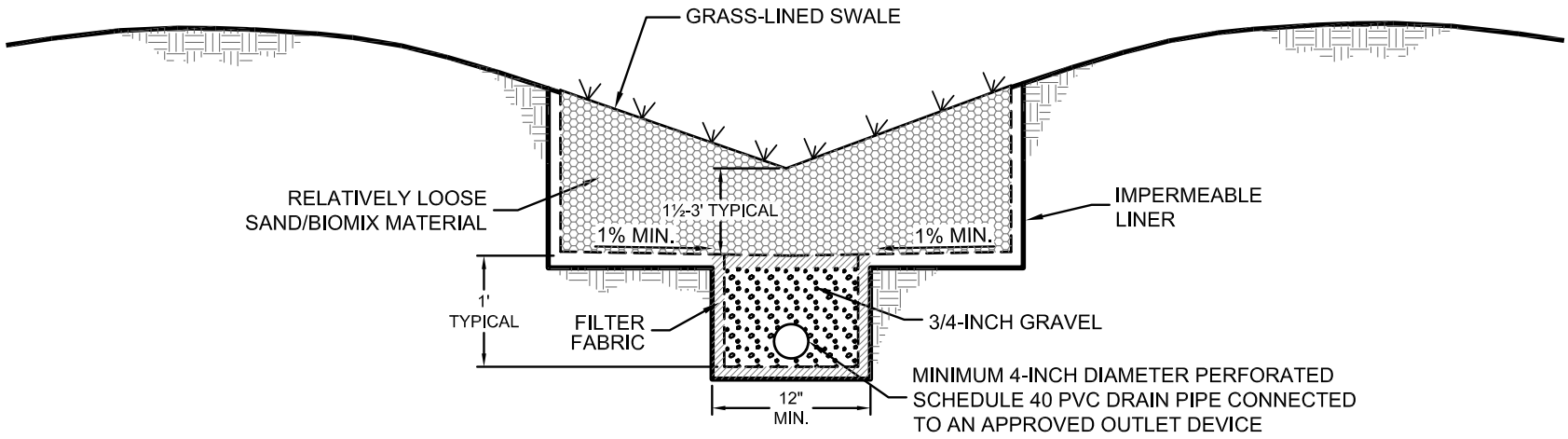
SAN DIEGO, CALIFORNIA

RRG / CW		DSK/GTYPD	DATE 12 - 29 - 2017	PROJECT NO. G1933 - 42 - 02	FIG. 5

Plotted:12/28/2017 3:36PM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\G1933-42-02 Handler Commercial\DETAILS\Typical Retaining Wall Drainage Detail (RWDD7A).dwg



NO SCALE

TYPICAL BIORETENTION BASIN DETAIL

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RRG / CW		DSK/GTYPD

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SAN DIEGO, CALIFORNIA

DATE 12 - 29 - 2017	PROJECT NO. G1933 - 42 - 02	FIG. 6

Plotted:12/28/2017 3:35PM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\G1933-42-02 Handler Commercial\DETAILS\VSBD_2 (Bioswale).dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The field investigation was performed on December 17, 2015, and consisted of a site reconnaissance by and the excavation ten exploratory trenches at the approximate locations shown on the Geologic Map, Figure 2.

The samples were returned to our laboratory for testing. The exploratory trenches were excavated to depths ranging from 8 to 17 feet utilizing a John Deere rubber-tire backhoe equipped with a 24-inch-wide bucket. Disturbed bulk and chunk samples were obtained.

The soil conditions encountered in the trenches were visually examined, classified, and logged in general accordance with the American Society for Testing and Materials (ASTM) *Practice for Description and Identification of Soils (Visual-Manual Procedure D 2488)*. During the investigation, the soils encountered were continuously examined, visually classified, and logged. Logs of the test trenches are presented on Figures A-1 through A-10 in Appendix A. The logs depict the depths and descriptions of the various soil types encountered and include the depths at which samples were obtained.

PROJECT NO. G1933-42-02

TRENCH T 1

ELEV. (MSL.) **507'** DATE COMPLETED **12-17-2015**

EQUIPMENT **JD 550** BY: **J. LAYOG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T1-1			CH	**TOPSOIL** Soft to medium stiff, wet, dark brown, slightly Sandy CLAY			
4	T1-2			SC	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense, moist, yellowish brown, Silty, Clayey, fine to coarse SAND; with gravel, some cobble			
6	T1-3			GM	Dense to very dense, damp to moist, light brown, Silty, medium to coarse Sandy GRAVEL with cobble up to 18 inches in diameter			
12	T1-4			GC	Very dense, moist, brown, Clayey, fine to very coarse Sandy, GRAVEL			
					TOTAL DEPTH 15 FEET No groundwater encountered Backfilled on 12-17-2015			

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

G1933-42-02.GPJ

SAMPLE SYMBOLS

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

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

GEOCON

PROJECT NO. G1933-42-02

TRENCH T 2

ELEV. (MSL.) **503'** DATE COMPLETED **12-17-2015**

EQUIPMENT **JD 550** BY: **J. LAYOG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL (Qudf)** Medium dense, moist, light brown to brown, Silty, fine to coarse SAND; with gravel and cobble, some construction debris			
2	T2-1			CH	**TOPSOIL** Soft, moist, dark brown, slightly Sandy CLAY with gravel and cobble			
4				SC	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense to very dense, moist, reddish brown, Clayey, slightly Silty medium coarse SAND; with gravel and cobble			
6	T2-2							
8	T2-3			GC	Very dense, moist, light brown and olive, Clayey, slightly Silty, medium to very coarse SAND; with gravel in a matrix of cobble, trace of rocks up to 20 inches in dimension			
10								
12								
14					TOTAL DEPTH 14.5 FEET No groundwater encountered Backfilled on 12-17-2015			

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

G1933-42-02.GPJ

SAMPLE SYMBOLS

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

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

GEOCON

PROJECT NO. G1933-42-02

TRENCH T 3

ELEV. (MSL.) **503'** DATE COMPLETED **12-17-2015**

EQUIPMENT **JD 550** BY: **J. LAYOG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
	T3-1			CH	**TOPSOIL** Medium stiff, moist, dark brown, fine to coarse Sandy CLAY; some gravel			
2								
				SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense to very dense, moist, light brown, Silty, slightly Clayey, medium coarse, SAND; with gravel and cobble			
4								
	T3-2							
6								
				GM	Very dense, moist, olive, fine to very coarse Sandy GRAVEL with cobble few rocks up to 18 inches in diameter			
8								
10								
12								
14								
					TOTAL DEPTH 15 FEET No groundwater encountered Backfilled on 12-17-2015			

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

G1933-42-02.GPJ

SAMPLE SYMBOLS

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

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

GEOCON

PROJECT NO. G1933-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 4** ELEV. (MSL.) **509'** DATE COMPLETED **12-17-2015** EQUIPMENT **JD 550** BY: **J. LAYOG**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	T4-1			CH	**TOPSOIL** Soft, loose to medium dense, moist, dark brown, Clayey, fine to medium SAND; trace gravel -Becomes brown			
4	T4-2			SC	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense, damp to moist, light brown, Clayey, slightly Silty, fine to coarse SAND; trace clay, trace gravel			
6				GM	Very dense, moist, light brown, Silty, Clayey, medium coarse Sandy, GRAVEL with cobble			
10					TOTAL DEPTH 10 FEET No groundwater encountered Backfilled 12-17-2015			

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

G1933-42-02.GPJ

SAMPLE SYMBOLS

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

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

GEOCON

PROJECT NO. G1933-42-02

TRENCH T 5

ELEV. (MSL.) **510'** DATE COMPLETED **12-17-2015**

EQUIPMENT **JD 550** BY: **J. LAYOG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
	T5-1			CH	**TOPSOIL** Soft, moist, dark brown, slightly Sandy CLAY			
2								
4				SC	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense, damp, pale reddish brown and olive, Clayey, fine to medium SAND			
	T5-2							
6								
				SM	Medium dense to dense, damp to moist, pale reddish brown and olive, Silty, fine to coarse SAND; trace gravel			
8	T5-3							
10				GC	Damp, light brown to yellowish brown, Clayey, Silty, fine to very coarse Sandy GRAVEL; with cobble, few rocks up to 18 inches in diameter			
	T5-4							
12					-Becomes moist			
14					-Becomes very dense			
16								
					TOTAL DEPTH 17 FEET No groundwater encountered Backfilled on 12-17-2015			

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

G1933-42-02.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)

... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1933-42-02

TRENCH T 6

ELEV. (MSL.) **415'** DATE COMPLETED **12-17-2015**

EQUIPMENT **JD 550** BY: **J. LAYOG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T6-1			CH	**TOPSOIL** Medium stiff, moist, dark brown, slightly Sandy CLAY			
4	T6-2			SC	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense, moist, pale reddish brown and light gray, Clayey, slightly Silty, medium coarse SAND; with gravel, trace cobble			
8	T6-3			SM	Very dense, damp, light brownish gray, Silty, fine to coarse SAND; with gravel			
12	T6-4			GM	Very dense, moist, light reddish brown, Silty, Clayey, fine to very coarse Sandy GRAVEL; with cobble, trace of rocks up to 18 inches in diameter			
16					TOTAL DEPTH 16 FEET No groundwater encountered Backfilled on 12-17-2015			

G1933-42-02.GPJ

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

SAMPLE SYMBOLS

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

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

GEOCON

PROJECT NO. G1933-42-02

TRENCH T 7

ELEV. (MSL.) **519'** DATE COMPLETED **12-17-2015**

EQUIPMENT **JD 550** BY: **J. LAYOG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TOPSOIL** Medium soft, moist, medium to dark brown, slightly Sandy CLAY			
2								
4	T7-1			SC	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense, moist, light brown to yellowish brown, Clayey, slightly Silty, medium coarse SAND; with gravel and cobble, calcium carbonate observed at contact			
6					-Becomes very dense			
8					TOTAL DEPTH 8 FEET No groundwater encountered Backfilled on 12-17-2015			

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

G1933-42-02.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)

... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1933-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 8** ELEV. (MSL.) **520'** DATE COMPLETED **12-17-2015** EQUIPMENT **JD 550** BY: **J. LAYOG**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CH	**TOPSOIL** Medium soft, moist, dark brown, trace gravel, slightly Sandy CLAY			
4				SC	**VERY OLD PARALIC DEPOSITS (Qvop)** Medium dense, moist, light brown, Clayey, slightly Silty, fine to coarse SAND; with gravel and cobble			
6	T8-1			SM	Dense, moist, light brown, Silty, fine to coarse SAND; trace silt, trace gravel			
8				GC	Dense, moist, pale reddish brown and light brown, Clayey, Silty, fine to very coarse Sandy GRAVEL with cobble			
10					-Becomes very dense			
12								
14								
					TOTAL DEPTH 15 FEET No groundwater encountered Backfilled on 12-17-2015			

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

G1933-42-02.GPJ

SAMPLE SYMBOLS

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

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

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PROJECT NO. G1933-42-02

TRENCH T 9

ELEV. (MSL.) **513'** DATE COMPLETED **12-17-2015**

EQUIPMENT **JD 550** BY: **J. LAYOG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TOPSOIL** Medium stiff, moist, dark brown, slightly Sandy CLAY			
2								
4	T9-1			SC	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense, damp, yellowish brown to brown, Clayey, slightly Silty, fine to medium SAND; trace clay			
6				GC	Dense, damp to moist, light brown, Clayey, medium to very coarse Sandy GRAVEL; with cobble			
8								
10					-Becomes very dense			
12					TOTAL DEPTH 12 FEET No groundwater encountered Backfilled on 12-17-2015			

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

G1933-42-02.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)

... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1933-42-02

TRENCH T 10

ELEV. (MSL.) _____ DATE COMPLETED **12-17-2015**

EQUIPMENT **JD 550** BY: **J. LAYOG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TOPSOIL** Medium stiff, moist, dark brown, Clayey, slightly Sandy CLAY			
2					-Trace gravel			
4	T10-1			SC	**VERY OLD PARALIC DEPOSITS (Qvop)** Dense, moist, yellowish brown and olive, Clayey, slightly Silty, fine to coarse SAND; trace gravel			
6				GC	Very dense, moist, light brown and yellowish brown, Clayey, medium to very coarse Sandy GRAVEL; with cobble			
8								
10					TOTAL DEPTH 10 FEET No groundwater encountered Backfilled on 12-17-2015			

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

G1933-42-02.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL | ... STANDARD PENETRATION TEST | ... DRIVE SAMPLE (UNDISTURBED)

... DISTURBED OR BAG SAMPLE | ... CHUNK SAMPLE | ... WATER TABLE OR SEEPAGE

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

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APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected relatively undisturbed samples were tested for their in-place dry density, moisture content and shear strength characteristics.

Portions of the bulk samples were remolded to determine the maximum dry density and optimum moisture content. Direct shear tests were performed on samples remolded to approximately 90 percent of maximum dry density at near optimum moisture content and on relatively undisturbed samples. Expansion Index, and Resistance-Value tests of the different soil types encountered were also performed. In addition, select soil samples were tested for pH, minimum resistivity, water-soluble sulfates and ion chlorides content.

The results of the laboratory tests are summarized in tabular and graphical form in Appendix B. In-place moisture-density relationships are also presented on the logs of test trenches.

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

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T1-1	Dark brown, slightly Sandy CLAY with Gravel	118.7	12.0
T5-4	Light brown to yellowish brown, Clayey, fine to very coarse SAND with Gravel and Cobble	126.2	10.9

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

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
T1-1*	106.4	12.8	680	22
T5-4*	113.3	11.0	370	27

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

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

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Type of Soil	Expansion Potential
	Before Test	After Test				
T1-1	13.5	31.8	95.3	106	Topsoil	High
T5-2	11.0	22.1	104.6	46	Very Old Paralic Deposits	Low
T5-3	10.0	19.7	108.2	30	Very Old Paralic Deposits	Low
T6-1	12.8	29.2	97.6	96	Topsoil	High
T7-1	12.5	23.1	103.1	70	Very Old Paralic Deposits	Medium

TABLE B-IV
SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (PH)
AND MINIMUM RESISTIVITY TEST RESULTS
CALIFORNIA TEST NO. 673

Sample No.	pH	Minimum Resistivity (ohm-centimeters)
T4-2	8.1	860
T8-1	8.1	2,700

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

Sample No.	Water-Soluble Sulfate (%)	Sulfate Severity
T4-2	0.003	Not Applicable
T8-1	0.001	Not Applicable

TABLE B-VI
SUMMARY OF LABORATORY CHLORIDE ION CONTENT TEST RESULTS
CALIFORNIA TEST NO. 422

Sample No.	Chloride Ion Content (%)
T4-2	0.015
T8-1	0.009

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

Sample No.	R-Value
T3-1	5
T7-1	10

APPENDIX C

APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

FOR

HANDLER COMMERCIAL
DRAWING NO. 39191-19-D
OTAY MESA ROAD AND CORPORATE CENTER DRIVE
SAN DIEGO, CALIFORNIA

PROJECT NO. G1933-42-02

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

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

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

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

2. DEFINITIONS

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

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9

and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

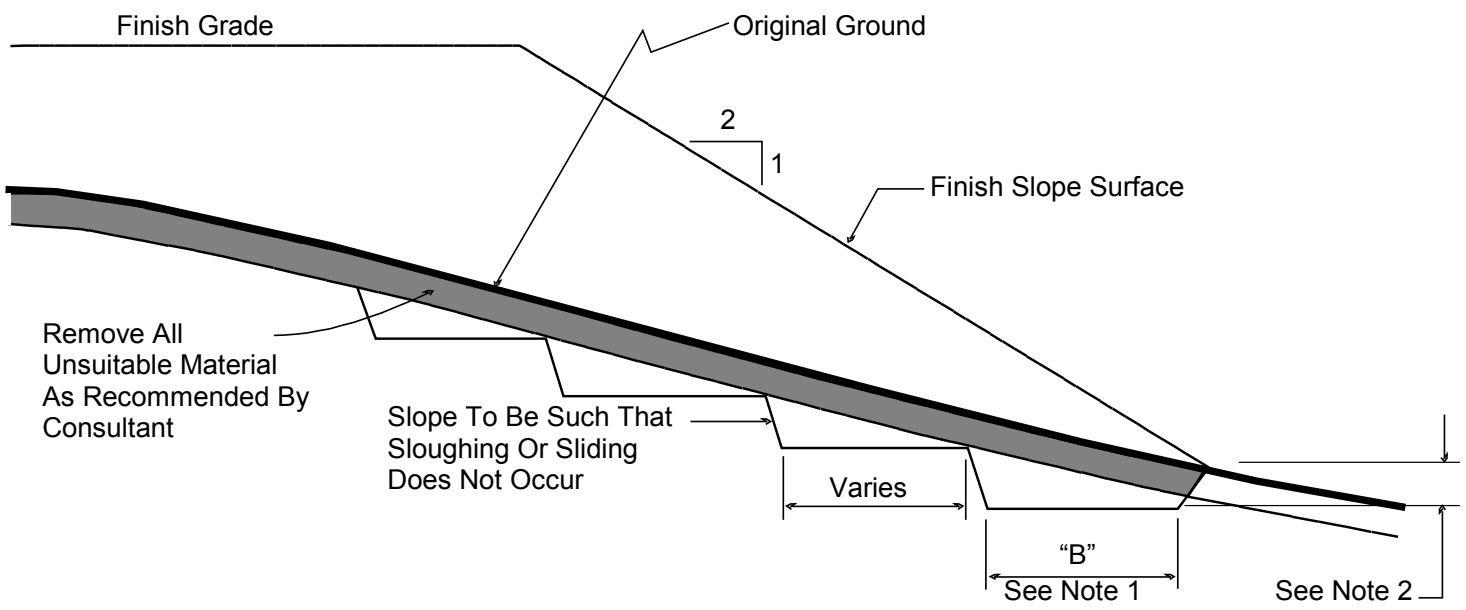
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

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

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

TYPICAL BENCHING DETAIL



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.

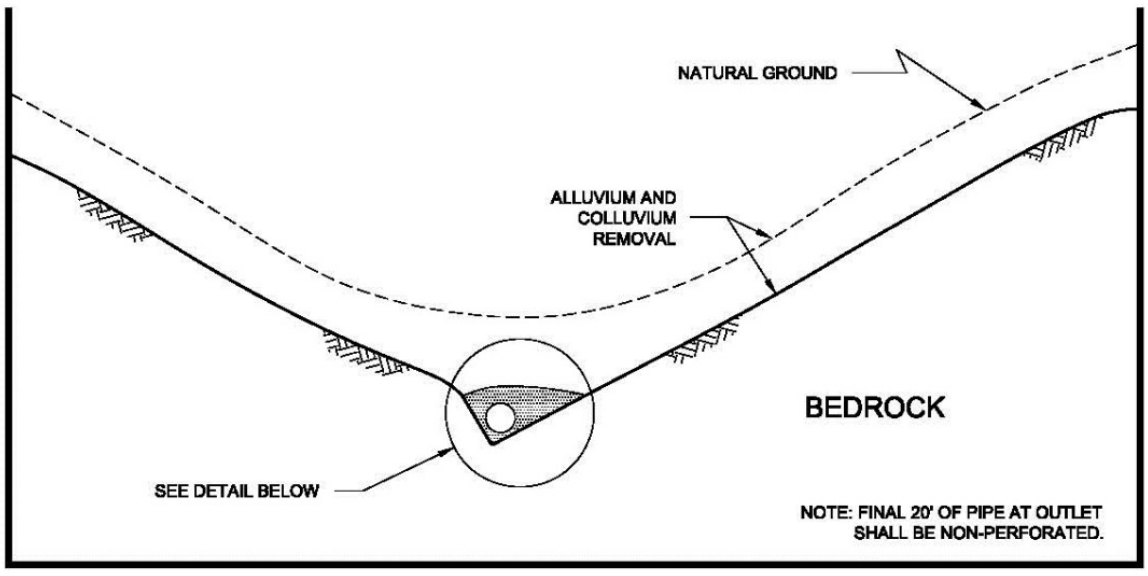
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant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

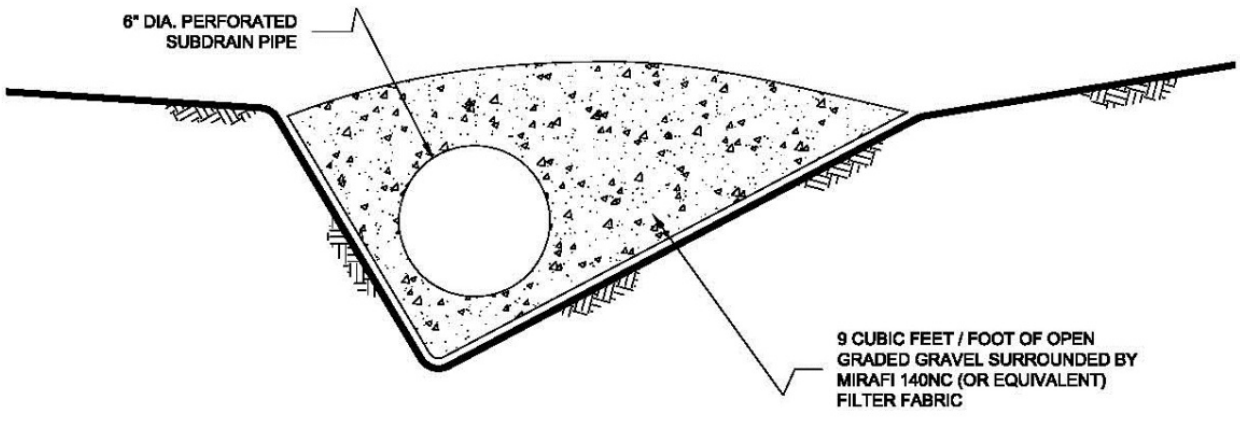
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

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





NO SCALE

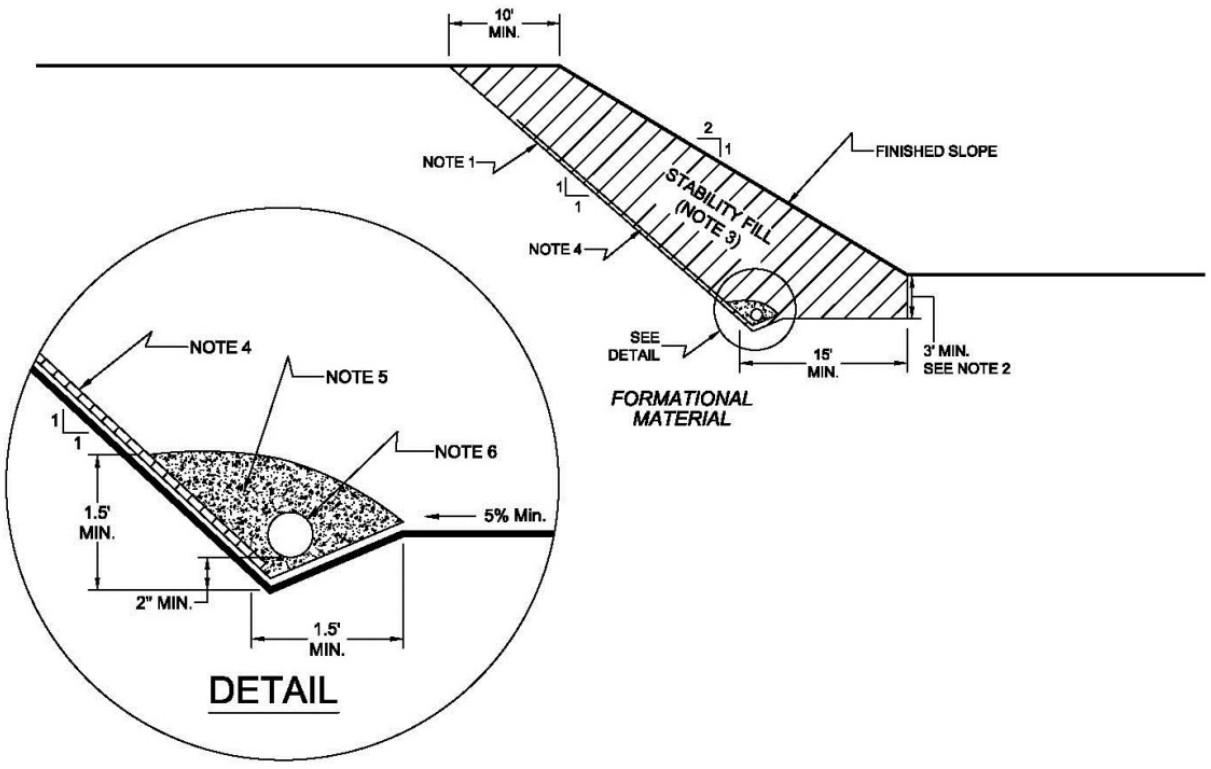
NOTES:

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.

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

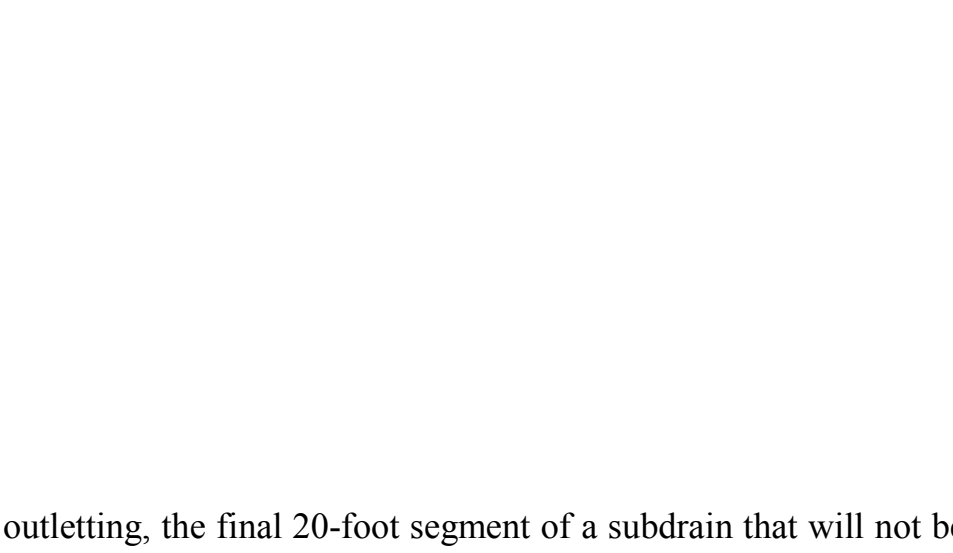
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing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

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

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

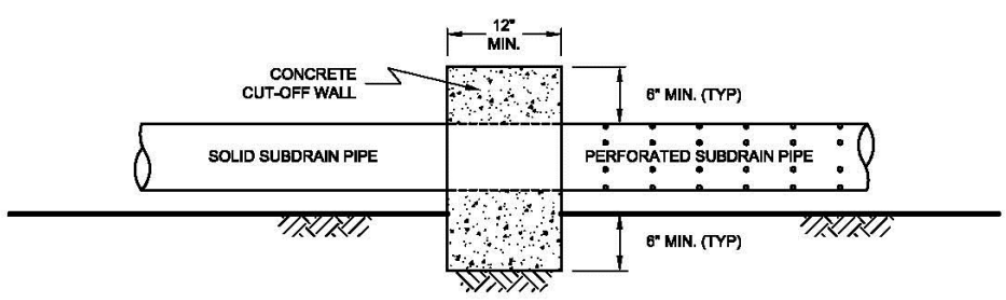
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW

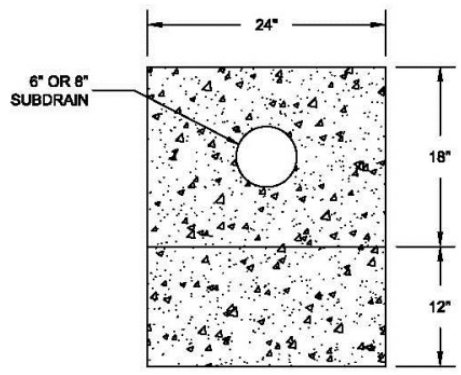


NO SCALE

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

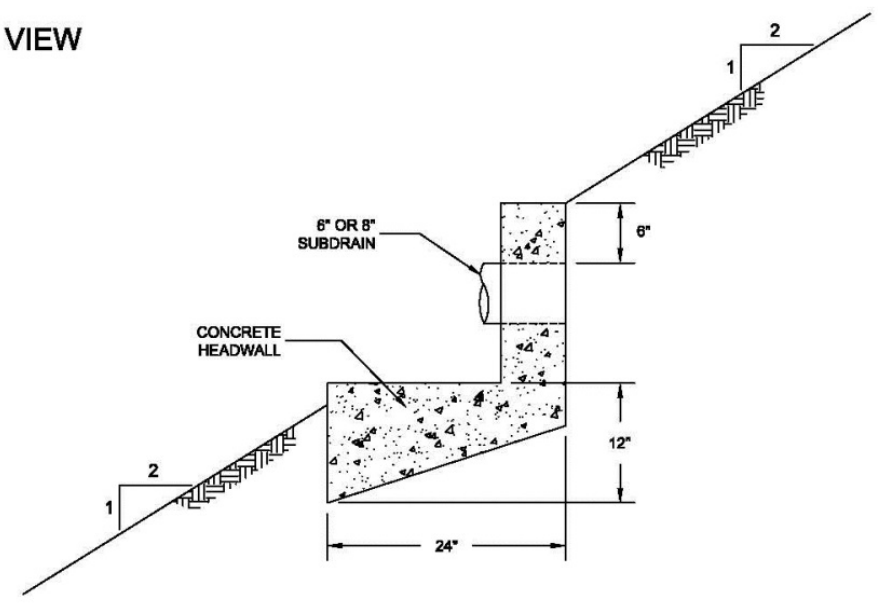
TYPICAL HEADWALL DETAIL

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.

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7. *Grading Plan for Handler Commercial, Sheet 1, scale 1 inch equals 50 feet,* prepared by Michael Baker International, undated.

8. *Grading Plans for Handler Commercial,* prepared by Rick Engineering Company, received via e-mail, December 20, 2017.

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11. Kennedy, Michael P., and S. Tan Siang, *Geology of National City, Imperial Beach, and Otay Mesa Quadrangles, Southern San Diego Metropolitan Area, California,* 1977.

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