Appendix F

Geology

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

TRANSMITTAL

To: Meridian Park, LLC
567 San Nicolas Drive, Suite 270
Newport Beach, California 92660

March 15, 2016

Project No: 11227.001

Attention: Mr. Jeff Gordon

Transmitted:		*The Following:*		*For:*	
X	Mail/Overnight	____	Draft Report	X	Your Use
____	Courier	X	Final Report	____	As Requested
____	Pick Up	____	Extra Report		
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		____	Other		

Subject: **Geotechnical Exploration Update, Proposed Meridian South Campus Phase 1, Tract No. 30857-7, County of Riverside, California**

LEIGHTON CONSULTING, INC.

By: Robert F. Riha, CEG / Simon I. Saiid, GE

Distribution: (3) Addressee (plus PDF copy via email)
(1) Kimley-Horn, Attn: Davie Cowan (PDF via email)

GEOTECHNICAL EXPLORATION UPDATE
PROPOSED MERIDIAN SOUTH CAMPUS PHASE 1
TRACT NO. 30857-7
COUNTY OF RIVERSIDE, CALIFORNIA

Prepared for

MERIDIAN PARK, LLC
567 San Nicolas Drive, Suite 270
Newport Beach, California 92660

Project No. 11227.001

February 11, 2016

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

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February 11, 2016

Project No. 11227.001

Meridian Park, LLC
Waypoint Property Group
567 San Nicolas Drive, Suite 270
Newport Beach, California 92660

Attention: Mr. Jeff Gordon

Subject: Geotechnical Exploration Update
Proposed Meridian South Campus Phase 1, Tract No. 30857-7
West of Village West Drive and South of Van Buren Boulevard
County of Riverside, California

In accordance with your request, we are pleased to provide this update geotechnical report for the subject project summarizing our geotechnical findings, conclusions and recommendations regarding the design and construction of the proposed development. This update report is a stand-alone document and includes all pertinent information from the previous studies and can be considered as the geotechnical/geologic engineering report for this site. Based on the results of our findings and conclusions, it is our opinion that the site is suitable for the intended use provided the recommendations included in herein are implemented during design and construction phases of development. However, it should be noted that additional geotechnical evaluations and/or reviews will be required based on final site development and/or grading plans.

If you have any questions regarding this report, please do not hesitate to contact the undersigned. We appreciate this opportunity to be of service on this project.

Respectfully submitted,
LEIGHTON CONSULTING, INC.

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1.0 INTRODUCTION

1.1 Purpose and Scope

This geotechnical exploration is for the proposed commercial development, Tract No. 30857-7, located generally south of Van Buren Boulevard and west of Village West Drive, County of Riverside, California (see Figure 1). Our scope of services for this exploration included the following:

- Review of available site-specific geologic information and Mass Grading Plan, (Kimley-Horn, 2015).
- A site reconnaissance and excavation of 12 exploratory back-hoe test pits. Approximate locations of these test pits are depicted on the *Geotechnical Map*. The logs are presented in Appendix A.
- Conduct a geophysical study to further evaluate rippability of onsite bedrock with 5 seismic refraction lines. Approximate locations of the seismic lines are depicted on the *Geotechnical Map*. The geophysical report is included as Appendix A.
- Perform 12 percolation tests within selected basin areas to provide preliminary infiltration rates for the onsite soil/rock. The percolation tests extend to depths of 2 to 20 feet below existing ground surface (BGS). Approximate locations of these percolation tests are depicted on the *Geotechnical Map*. The logs and test data are presented in Appendix A.
- Geotechnical laboratory testing of selected soil samples collected during this exploration. Test results are presented in Appendix B.
- Geotechnical engineering analyses performed or as directed by a California registered Geotechnical Engineer (GE) and reviewed by a California Certified Engineering Geologist (CEG).
- Preparation of this report which presents our geotechnical conclusions and recommendations regarding the proposed structures.

This report is not intended to be used as an environmental assessment (Phase I or other), or foundation plan review.

1.2 Project and Site Description

The project site is located generally south of Van Buren Boulevard, east of Ferguson Avenue, north of 12th Street, and west of Village West Drive, in the County of Riverside, California (*see* Figure 1, *Site Location Map*). Topographically, the property contains low rolling hills with the highest portion of the site in the northwest corner with an elevation of approximately 1,755 feet MSL and the lowest portion of the site with an elevation of approximately 1,613 feet MSL in the northeast area. Drainage is generally to the north and northeast by sheet flow into moderately developed onsite drainage swales, which flow to the well-established drainage along Van Buren Boulevard. The site is currently undeveloped with the exception of three abandoned concrete slabs within the southern portion of proposed Lot 80. We understand that these structures were associated with the former military base activities (Zeiser Kling, 2008).

Existing nearby improvements include Plummer Road within the eastern area of the site, Van Buren Boulevard to the north. The Ben Clark Training Center is adjacent to the central southern property boundary. The property to the west of the site is currently vacant with residential developments further beyond. The northern boundary abuts up to an existing conservation easement. A landfill (closed) is present between Plummer Road and Village West Drive along the eastern boundary of the subject site.

We understand that site development currently includes four large industrial buildings ranging in size from 470,000 to 1,007,000 square-feet (SF) and various future lots ranging in size from approximately 5 to 95 acres to host office/commercial and industrial buildings. The site plans also indicate several water quality retention basins which vary in size and location. Based on the review of the provided grading plans, site grading is expected to have cut/fill thickness on the order of 26 to 30 feet, plus remedial grading, where applicable. Although no structural loads or foundations plans are developed yet, we anticipate the structural loads to range up to 200 kips for isolated columns/pads and 10 kips/lineal-foot for continuous wall footings. If site development significantly differs from the assumptions made herein, the recommendations included in this report should be subject to further evaluation.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

Our field exploration for this update report consisted of the excavation of twelve (12) back-hoe test pits located generally within areas not previously explored and in areas of planned building footprints to provide basis for foundation and pavement design. In addition, Twelve (12) percolation/infiltration tests were conducted within selected drainage basins to provide preliminary infiltration rates for onsite soil/rock. During exploration, disturbed/bulk samples were collected for further laboratory testing and evaluation. Approximate locations of these explorations are depicted on the *Geotechnical Map* (see Plate 1). Sampling was conducted by a staff geologist from our firm. After logging and sampling, the excavations were loosely backfilled with spoils generated during excavation. The exploration logs from this exploration and previous investigations are included in Appendix A.

2.2 Laboratory Testing

Laboratory tests were performed on representative bulk samples to provide a basis for development of remedial earthwork and geotechnical design parameters. The laboratory testing program included expansion index, R-value and soluble sulfate content, sieve analysis, sand equivalence, and corrosion suite. The results of our laboratory testing from this exploration and previous investigations are presented in Appendix B.

2.3 Previous Geologic/Geotechnical Studies

Based on our review of provided documents, Zeiser Kling Consultants, Inc. (ZKCI), performed a geotechnical/ geologic investigation in 2008 and incorporated relevant data from a previous investigation performed by Inland Foundation Engineering Inc. (IFEI) in 2002. The ZKCI report provided a comprehensive evaluation of site conditions and provided preliminary geotechnical recommendations site development. All pertinent field and laboratory information from the previous studies were reviewed and incorporated into this report. The relevant logs of borings/test pits/seismic lines are included in Appendix A and the laboratory test results are included in Appendix B.

3.0 GEOTECHNICAL AND GEOLOGIC FINDINGS

3.1 Regional Geology

The site is located within a prominent natural geomorphic province in southwestern California known as the Peninsular Ranges. This province is characterized by steep, elongated ranges and valleys that trend northwestward. More specifically, the proposed site is located within the relatively stable Perris Block.

The Perris Block, approximately 20 miles by 50 miles in extent, is bounded by the San Jacinto Fault Zone to the northeast, the Elsinore Fault Zone to the southwest. The Perris Block has had a complex tectonic history, apparently undergoing relative vertical land-movements of several thousand feet in response to movement on the Elsinore and San Jacinto Fault Zones. Thin sedimentary and volcanic materials locally mantle crystalline bedrock, consisting of the Val Verde Tonalite (Kvt) and lesser amounts of Cretaceous granitic dikes (Kg).

3.2 Site Specific Geology

3.2.1 Earth Materials

Our field exploration, observations, and review of the pertinent literature indicate that materials on the site include the following units; undocumented artificial fill, top soil/colluvium, alluvium, older alluvium, and granitic Val Verde Tonalite (Kvt). For the engineering purposes of this report, we have grouped the upper near surface soil materials into one unit, Topsoil/Colluvium. These units are discussed in the following sections in order of increasing age. A more detailed description of each unit is provided on the logs of borings in Appendix A.

- **Undocumented Artificial Fill (mapped as Afu):** Undocumented artificial fill on this site is generally associated with existing Plummer Road, 12th Street, underlying concrete slabs on Lot 80, and various access roadways and erosion control berms. Additional undocumented fill may be encountered at or below surface that was not identified during our exploration. The observed artificial fill generally consists of silty sand (SM) with various amounts of grave and trace of clay.
- **Topsoil/Colluvium (not a mapped unit):** Topsoil and colluvial materials are expected to mantle the majority of the site. The topsoil generally consists of a thin surface layer (up to 3 feet in depth). Colluvium is generally encountered on slopes mantling the bedrock to a maximum depth of approximately 6 feet below the existing ground surface in some areas. Encountered materials appear to be generally porous, have a low

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expansion potential, and consist of loose, light to dark brown silty sand (SM).

- **Younger Alluvium (mapped as Qal):** Younger alluvial soils were generally observed within the upper 3 to 10 feet within the drainage swales and low lying area near Village West Drive. As encountered, these soils appear to generally consist of silty to clayey sand (SM/SC). Based on the results of our laboratory testing, these materials are expected to possess low expansion potential (EI<51).
- **Older Alluvium (not a mapped unit):** Older alluvial soils were locally observed within the upper 3 to 12.5 feet, at various locations across the site. As encountered, these soils appear to have individual layers that vary in color, moisture content, density and composition. Unit layers are typically composed of brown to reddish brown, moist, medium dense to dense, silty sand (SM) and lessor silty/clayey sand (SM/SC) with abundant iron oxide staining, caliche, scattered pebbles, mottling, and minor porosity. Isolated pockets of thicker older alluvial soils should be anticipated. This older alluvium appears to be generally dense and is expected to generally possess a low expansion potential (EI<51).
- **Val Verde Tonalite (Kvt):** The Val Verde Tonalite (Cretaceous granite) was encountered near surface across the majority of the site with the exception of TP-11 (this study) and B-69, B-71, TP-6, (Zeiser Kling, 2008). In those explorations, the Tonalite was encountered at depths ranging from 8 to 10.5 feet below ground surface. As observed during the field exploration, the condition of the near-surface bedrock varies from that of completely disintegrated rock that has become a dense soil-like deposit to that of moderately weathered rock. Where encountered, the bedrock is generally massive and can be expected to range from readily rippable to non-rippable depending on the degree of weathering. The less weathered granitic rock is anticipated to generate sand, gravel, cobble, and possibly oversize boulders. The weathered bedrock produced fine to coarse sand with silt and gravel size rock fragments. The weathered bedrock is expected to be generally suitable for re-use as compacted fill. It should be anticipated that deep cuts in the western portions of the site may generate boulders or core stones (greater than 12 inches) that will require special placement described later in Section 5.2 of this report.

3.3 Groundwater and Surface Water

Groundwater was not encountered during this update exploration to a maximum depth explored of approximately 25 feet below the existing ground surface. However, groundwater was encountered in the northeastern portion of the property

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in the previous investigation in B-69A, B-70, and B-74 at depths ranging from 18 to 25 feet, and in the northwestern portion of the property in B-26 at a depth of 11.6 feet (Zeiser Kling, 2008).

The groundwater encountered within the Tonalite bedrock is likely associated with a joint/fracture system and if encountered during grading and/or utility installation; would likely be associated with localized seepages along these joints and fractures. Groundwater may be encountered during grading and canyon subdrains are recommended in the canyon fill areas. In addition, groundwater seepage may appear in cut slopes exposing joints and fractures or earth materials of contrasting permeabilities. Mitigation of possible seepage within building pads or cut-slope areas can be provided on an individual basis after evaluation by the geotechnical consultant during grading operations. Surface water was not observed onsite during our field reconnaissance.

3.4 Landslides/Debris Flow and Rockfalls

No evidence of on-site landslides/debris flow or rock fall was observed during our field investigation. Thick deposits of surficial soils typically associated with landsliding or debris flows are not present. Relatively thick surficial soils are located only in the relatively flat, low-lying portions of the site and, therefore, are not considered prone to landsliding. One prominent rock outcrop will remain onsite in the open space Lot “U” located in the north western portion of the site. Due to the planned grading, the distance of planned residences from the rock out crop and the gentle natural slope between rocks and future residences, the rock fall hazard is considered very low. The potential for rock fall due to either erosion or seismic ground shaking is considered very low. Other soils susceptible to slumping (i.e. such as thick colluvium) will be removed and compacted during the course of grading.

3.5 Rippability

Based on our review of the geotechnical exploration and the seismic refraction survey conducted by Southwest Geophysics (See, Appendix A), we anticipate the bedrock in most of the site to be rippable to the proposed design grades with conventional heavy earth moving equipment in good operating conditions (Caterpillar D9L or D10 with single shank ripper and rock teeth). Localized marginally rippable to unrippable rock may be encountered, particularity in the areas of excavations deeper than 15 to 25 feet such as the larger cuts in the western portion of the site. Other areas may also encounter buried core stones or non-rippable rock within the design excavation depths or during excavation of the underground utility trenches. In addition, due to differential weathering of the bedrock materials, very heavy ripping and/or other specialized excavation techniques may be required to maintain desired excavation rates. For proposed building pads and utility trenches in marginally rippable to non-rippable rock areas, it may be desirable to over-excavate at least 2 feet below the bottom of proposed utility trenches or 4 to 5 feet below pad grade to facilitate future trenching operations. Pad overexcavation should be sloped a minimum of 1 percent towards the deeper fills or streets.

The California Building Code and County of Riverside require that no oversize rock (>12-inches) be placed within 10 feet of the surface of a structural fill and/or building pad. The grading plan should be carefully reviewed during grading to verify that oversized rocks are buried below a 10-foot fill cap.

Generally, oversize rock (maximum dimension of 12 inches or more) will require windrowing, individual burial, or other special placement methods at a minimum depth of 10 feet below finish grade elevation as further described in Appendix D. In addition, an adequate supply of granular fill material will be needed for placement around the rocks. A grading contractor with experience in the handling and placement of oversize rock should be selected for this project.

3.6 Regional Faulting and Fault Activity

The subject site, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional fault systems such as the San Andreas, San Jacinto, and Elsinore Fault Zones. Based on published geologic hazard maps, this site is not located within a currently designated Alquist-Priolo (AP) Earthquake Fault Zone; nor is located within a County Fault Zone.

3.7 Seismic Coefficients per 2013 CBC

Strong ground shaking can be expected at the site during moderate to severe earthquakes in this general region. This is common to virtually all of Southern California. Intensity of ground shaking at a given location depends primarily upon earthquake magnitude, site distance from the source, and site response (soil type) characteristics. The site-specific seismic coefficients provided in this section are based on an interactive tool/program currently available on USGS website. Based on ASCE 7-10 as the Design Code Reference Document and site Class **C**, the seismic coefficients for this site are as listed in the following table:

Table 1. 2013 CBC Seismic Coefficients

CBC Categorization/Coefficient		Design Value (g)
Site Longitude (-117.2970)	Site Latitude (33.88074)	
Site Class Definition	C	
Mapped Spectral Response Acceleration at 0.2s Period, S_s		**1.50**
Mapped Spectral Response Acceleration at 1s Period, S_1		**0.60**
Short Period Site Coefficient at 0.2s Period, F_a		**1.00**
Long Period Site Coefficient at 1s Period, F_v		**1.30**
Adjusted Spectral Response Acceleration at 0.2s Period, S_{MS}		**1.50**
Adjusted Spectral Response Acceleration at 1s Period, S_{M1}		**0.78**
Design Spectral Response Acceleration at 0.2s Period, S_{DS}		***1.00***
Design Spectral Response Acceleration at 1s Period, S_{D1}		***0.52***

* g- Gravity acceleration

The results of the analysis also indicate that the adjusted Peak Ground Acceleration (PGA_M) for this site is 0.5g.

3.8 Secondary Seismic Hazards

Ground shaking can induce "secondary" seismic hazards such as liquefaction, dynamic densification, lateral spreading, flooding, seiche/tsunami, collapsible soils, and ground rupture, as discussed in the following subsections:

3.8.1 Dynamic Settlement (Liquefaction and/or Dry Settlement)

Due to the lack of shallow groundwater and relatively dense nature of underlying materials, dynamic settlement (Liquefaction and/or Dry Settlement) is not considered a geologic hazard on this site.

3.8.2 Lateral Spreading

Due to the lack of shallow groundwater and relatively dense nature of underlying materials lateral spreading is not considered a geologic hazard on this site.

3.8.3 Flooding

The site is not within a flood plain and potential for flooding is considered very low for this site.

3.8.4 Seiche and Tsunami

Due to the site location and lack of nearby open bodies of water, the possibility of the affects due to seiches or tsunami is considered non-existent.

3.8.5 Collapsible Soils

Laboratory testing indicates that the onsite soils (alluvium and older alluvium) are expected to possess a slight collapse potential. Based on the remedial grading recommendations to remove and compact the near surface soils (Section 4.2.1), this geologic hazard on this site is considered very low.

3.8.6 Expansive Soils

Limited laboratory testing indicated that onsite soils generally possess a very low expansion potential (EI<21). However, localized deposits of older alluvial soils may possess low expansion potential (EI<51). The mitigation for this geologic hazard is presented in Section 4.2.4 of this report.

3.8.7 Ground Rupture

Since this site is not located within a mapped Fault Zone, the possibility of ground surface-fault-rupture is very low at this site.

3.9 Slope Stability

The proposed 2:1 (horizontal to vertical) cut slopes with maximum height of about 15 feet (Lot 81) in the weathered bedrock will be grossly stable under static and seismic conditions. Slope faces in highly weathered bedrock are inherently subject to erosion, particularly if exposed to rainfall and irrigation. Landscaping and slope maintenance should be conducted as soon as possible in order to increase long-term surficial stability.

Cut slopes within the bedrock may expose localized unstable zones due to fractures and seepage of groundwater. If unstable conditions are encountered during grading as identified by the geotechnical consultant, a stabilization fill may be considered as depicted in Appendix D.

The proposed 2:1 fill slopes with maximum height of about 31 feet (Lot 7) constructed with onsite soils are considered to be grossly stable.

3.10 Percolation/Infiltration Testing

Twelve percolation tests were performed in designated areas within the site (see, Plate 1) in general accordance with the procedures of the Riverside County Flood Control and Water Conservation District (RCFC&WCD) Design Handbook (RCFC, 2011). Percolation tests were performed at depths ranging from 2 to 25 feet below existing ground surface. The results of the percolation tests are included in Appendix A. The results are determined in minutes-per-inch drop and converted to infiltration rates (in/hr) using the Prochet Method. Based on the results of our testing and for preliminary design purposes, Table 2 below presents anticipated infiltration rates based on depth. Additional testing will be needed to verify the preliminary rates below and comply with County requirements as to the required number of tests per basin.

Table 2. Range of Infiltration Rates

Depth BGS (ft)	Range of Infiltration Rates (in/hr)	Soil Conditions/ Classification
0-7	1.0-1.8	Topsoil / Val Verde Tonalite
7-12	0.4-0.6	Val Verde Tonalite
12-17	0.2-0.4	Val Verde Tonalite
17-22	0.1-0.2	Val Verde Tonalite
22<	<0.1	Val Verde Tonalite

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 General

Based on the results of this exploration, it is our opinion that the site is suitable for the proposed development from a geotechnical viewpoint. Grading of the site should be in accordance with our recommendations included in this report and future recommendations and evaluations made during construction by the geotechnical consultant.

4.2 Earthwork

Earthwork should be performed in accordance with the General Earthwork and Grading Specifications in Appendix D as well as the following recommendations. The recommendations contained in Appendix D, are general grading specifications provided for typical grading projects and some of the recommendations may not be strictly applicable to this project. The specific recommendations contained in the text of this report supersede the general recommendations in Appendix D.

The contract between the developer and earthwork contractor should be worded such that it is the responsibility of the contractor to place fill properly in accordance with the recommendations of this report, the specifications in Appendix D, applicable County Grading Ordinances, notwithstanding the testing and observation of the geotechnical consultant during construction.

4.2.1 Site Preparation and Remedial Grading

Prior to grading, the proposed structural improvement areas (i.e. all-structural fill areas, pavement areas, buildings, etc.) should be cleared of surface and subsurface pipelines and obstructions. Heavy vegetation, roots and debris should be disposed of offsite. Any onsite wells or septic waste system should be removed or abandoned in accordance with the Riverside Country Department of Environmental Health. Voids created by removal of buried/unsuitable materials should be backfilled with properly compacted soil in general accordance with the recommendations of this report.

The near surface soils (including topsoil/colluvium, artificial fill, younger alluvium, and upper 2 to 3 feet of older alluvium) are potentially compressible in their present state and may settle under the surcharge of fills or foundation loading. As such, these materials should be removed in all settlement-sensitive areas including building pads, pavement, and slopes. The depth of removal should extend into underlying dense older alluvium or bedrock, but not generally expected to exceed a depth of 3 to 10 feet. Dense competent older alluvium should be non-porous and possess a minimum of 85 percent relative compaction (based on ASTM D1557). Acceptability of all removal bottoms should be reviewed by an engineering geologist or geotechnical engineer and documented in the as-graded geotechnical report. The removal limit should be established by a 1:1 (horizontal:vertical) projection from the edge of fill soils supporting structural fill or settlement-sensitive structures downward and outward to competent material identified by the geotechnical consultant. This may require remedial grading that extends beyond the limits of design grading. Removal will also include benching into competent material as the fills rise. Areas adjacent to existing property limits or protected habitat areas may require special considerations and monitoring. Steeper temporary slopes in these areas may be considered.

After completion of the recommended removal of unsuitable soils and prior to fill placement, the exposed surface should be scarified to a minimum depth of 8-inches, moisture conditioned as necessary to optimum moisture content and compacted using heavy compaction equipment to an unyielding condition. All structural fill should be compacted throughout to 90 percent of the ASTM D 1557 laboratory maximum density, at or slightly above optimum moisture.

4.2.2 Cut/Fill Transition and Streets

In order to mitigate the impact of underlying cut/fill transition conditions, we recommend overexcavation of the cut portion underlying building pads during grading to a minimum depth of 3 feet below finish pad elevation or 3 feet below bottom of footings, whichever is deeper. This overexcavation does not include scarification or preprocessing prior to placement of fill. Overexcavation should encompass the entire building limits a horizontal distance equal to the depth of overexcavation or to a minimum distance of 5 feet, whichever is greater. Overexcavation bottoms should be sloped as needed to reduce the accumulation of subsurface water.

We further recommend that streets located in the dense bedrock be overexcavated to a depth of 2 feet below the deepest utility and then brought back up to design grades with compacted fill.

4.2.3 Structural Fills

The onsite soils are generally suitable for re-use as compacted fill, provided they are free of debris and organic matter. Fills placed within 10 feet of finish pad grades or slope faces should contain no rocks over 12 inches in maximum dimension. In addition, encountered clayey soils layers (EI>21), if any, should be placed at a depth greater than 5 feet below finished grades.

Areas to receive structural fill and/or other surface improvements should be scarified to a minimum depth of 8 inches, conditioned to at least optimum moisture content, and recompacted. Fill soils should be placed at a minimum of 90 percent relative compaction (based on ASTM D1557) at or above optimum moisture content. Placement and compaction of fill should be performed in accordance with local grading ordinances under the observation and testing of the geotechnical consultant. The optimum lift thickness to produce a uniformly compacted fill will depend on the type and size of compaction equipment used. In general, fill should be placed in uniform lifts not exceeding 8 inches in thickness.

Fill slope keyways will be necessary at the toe of all fill slopes and at fill-over-cut contacts. Keyway schematics, including dimensions and subdrain recommendations, are provided in Appendix C. All keyways should be excavated into dense bedrock or dense older alluvium as determined by the geotechnical engineer. The cut portions of all slope and keyway excavations should be geologically mapped and approved by a geologist prior to fill placement.

Fills placed on slopes steeper than 5:1 (horizontal:vertical) should be benched into dense soils (see Appendix C for benching detail). Benching should be of sufficient depth to remove all loose material. A minimum bench height of 2 feet into approved material should be maintained at all times.

4.2.4 Suitability of Site Soils for Fills

Topsoil and vegetation layers, root zones, and similar surface materials should be striped and stockpiled or removed from the site. Existing fill should be considered suitable for re-use as compacted fills provided the recommendations contained herein are followed. Fill materials with expansion index greater than 21 should not be used in upper 3 feet of subgrade soils below building pad. If cobbles and boulders larger than 6-inches in largest diameter are encountered or produced during grading, these oversized cobbles and boulders should be reduced to less than 6 inches or placed in structural fill as outlined in Appendix D.

4.2.5 Import Soils

Import soils and/or borrow sites, if needed, should be evaluated by us prior to import. Import soils should be uncontaminated, granular in nature, free of organic material (loss on ignition less-than 2 percent), have very low expansion potential (E<21) and have a low corrosion impact to the proposed improvements.

4.2.6 Utility Trenches

Utility trenches should be backfilled with compacted fill in accordance with the *Standard Specifications for Public Works Construction,* ("Greenbook"), 2015 Edition. Fill material above the pipe zone should be placed in lifts not exceeding 8 inches in uncompacted thickness and should be compacted to at least 90 percent relative compaction (ASTM D 1557) by mechanical means only. Site soils may generally be suitable as trench backfill provided these soils are screened of rocks over 1½ inches in diameter and organic matter. If imported sand is used as backfill, the upper 3 feet in building and pavement areas should be compacted to 95 percent. The upper 6 inches of backfill in all pavement areas should be compacted to at least 95 percent relative compaction.

Where granular backfill is used in utility trenches adjacent to moisture sensitive subgrades and foundation soils, we recommend that a cut-off "plug" of impermeable material be placed in these trenches at the perimeter of buildings, and at pavement edges adjacent to irrigated landscaped areas. A "plug" can consist of a 5-foot long section of clayey soils with more than 35-percent passing the No. 200 sieve, or a Controlled Low Strength Material (CLSM) consisting of one sack of Portland-cement plus one sack of bentonite per cubic-yard of sand. CLSM should generally conform to requirements of the "Greenbook". This is intended to reduce the likelihood of water permeating trenches from landscaped areas, then seeping along permeable trench backfill into the building and pavement subgrades, resulting in wetting of moisture sensitive subgrade earth materials under buildings and pavements.

Excavation of utility trenches should be performed in accordance with the project plans, specifications and the *California Construction Safety Orders* (latest Edition). The contractor should be responsible for providing a "competent person" as defined in Article 6 of the *California Construction Safety Orders*. Contractors should be advised that sandy soils (such as fills generated from the onsite alluvium) could make excavations particularly unsafe if all safety precautions are not properly implemented. In addition, excavations at or near the toe of slopes and/or parallel to slopes may be highly unstable due to the increased driving force and load on the trench wall. Spoil piles from the excavation(s) and construction equipment should be kept away from the sides of the trenches. Leighton Consulting, Inc. does not consult in the area of safety engineering.

4.2.7 Shrinkage

The volume change of excavated onsite soils upon recompaction is expected to vary with materials, density, insitu moisture content, and location and compaction effort. The in-place and compacted densities of soil materials vary and accurate overall determination of shrinkage and bulking cannot be made. Therefore, we recommend site grading include, if possible, a balance area or ability to adjust grades slightly to accommodate some variation. Based on our geotechnical laboratory results, we expect recompaction shrinkage (when recompacted to an average 92 percent of ASTM D1557) and estimate the following earth volume changes will occur during grading:

Topsoil/Colluvium/Alluvium	Approximately 10% shrinkage, +/- 5%
Bedrock	Approximately 5% bulking, +/- 3%
Subsidence (overexcavation bottom processing)	Approximately 0.1 feet

4.2.8 Drainage

All drainage should be directed away from structures and pavements by means of approved permanent/temporary drainage devices. Adequate storm drainage of any proposed pad should be provided to avoid wetting of foundation soils. Irrigation adjacent to buildings should be avoided when possible. As an option, sealed-bottom planter boxes and/or drought resistant vegetation should be used within 5-feet of buildings.

4.3 Foundation Design

Shallow spread or continuous footings bearing on a newly placed properly compacted fill are anticipated for the proposed structures.

4.3.1 Design Parameters – Spread/Continuous Shallow Footings

Footings should be embedded at least 12-inches below lowest adjacent grade for the proposed structure. Footing embedment should be measured from lowest adjacent finished grade, considered as the top of interior slabs-on-grade or the finished exterior grade, excluding landscape topsoil, whichever is lower. Footings located adjacent to utility trenches or vaults should be embedded below an imaginary 1:1 (horizontal:vertical) plane projected upward and outward from the bottom edge of the trench or vault, up towards the footing.

- **Bearing Capacity**: For footings on newly placed, properly compacted fill soil, an allowable vertical bearing capacity of 2,000 pounds-per-square-foot (psf) should be used. These footings should have a minimum base width of 18 inches for continuous wall footings and a minimum bearing area of 3 square feet (1.75-ft by 1.75-ft) for pad foundations. The bearing pressure value may be increased by 250 psf for each additional foot of embedment or each additional foot of width to a maximum vertical bearing value of 3,500 ps. Additionally, these bearing values may be increased by one-third when considering short-term seismic or wind loads. A modulus of subgrade reaction, K of 200 PCI may be used to relative dense bedrock or onsite soil compacted to minimum 90% relative compaction.

- **Lateral loads**: Lateral loads may be resisted by friction between the footings and the supporting subgrade. A maximum allowable frictional resistance of 0.35 may be used for design. In addition, lateral resistance may be provided by passive pressures acting against foundations poured neat against properly compacted granular fill. We recommend that an allowable passive pressure based on an equivalent fluid pressure of 350 pounds-per-cubic-foot (pcf) be used in design. These friction and passive values have already been reduced by a factor-of-safety of 1.5.

4.3.2 Settlement Estimates

For settlement estimates, we assumed that column loads will be no larger than 200 kips, with bearing wall loads not exceeding 10 kips per foot of wall. If greater column or wall loads are required, we should re-evaluate our foundation recommendation, and re-calculate settlement estimates.

Buildings located on compacted fill soils as required per Section 4.2.1 above should be designed in anticipation of 1 inch of total static settlement and 0.5-inch of static differential settlement within a 40 foot horizontal run.

4.4 Vapor Retarder

It has been a standard of care to install a moisture-vapor retarder underneath all slabs where moisture condensation is undesirable. Moisture vapor retarders may retard but not totally eliminate moisture vapor movement from the underlying soils up through the slabs. Moisture vapor transmission may be additionally reduced by use of concrete additives. Leighton Consulting, Inc. does not practice in the field of moisture vapor transmission evaluation/mitigation. Therefore, we recommend that a qualified person/firm be engaged/consulted with to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. This person/firm should provide recommendations for mitigation of potential adverse impact of moisture vapor transmission on various components of the structure as deemed appropriate.

However, based on our experience, the standard of practice in Southern California has evolved over the last 15 to 20 years into a construction of a vapor retarder system that generally consisted of a membrane (such as 15-mil thick), underlain by a capillary break consisting of 4 inches of clean ½-inch-minimum gravel or 2-inch sand layer (SE>30). The structural engineer/architect or concrete contractor often require a sand layer be placed over the membrane (typically 2-inch thick layer) to help in curing and reduction of curling of concrete. If such sand layer is placed on top of the membrane, the contractor should not allow the sand to become wet prior to concrete placement (e.g., sand should not be placed if rain is expected).

In conclusion, the construction of the vapor barrier/retarder system is dependent on several variables which cannot be all geotechnically evaluated and/or tested. As such, the design of this system should be a design team/owner decision taking into consideration finish flooring materials and manufacture's installation requirements of proposed membrane. Moreover, we recommend that the design team also follow ACI Committee 302 publication for "Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials" (ACI 302.2R-06) which includes a flow chart that assists in determining if a vapor barrier/retarder is required and where it is to be placed.

4.5 Retaining Walls

Retaining wall earth pressures are a function of the amount of wall yielding horizontally under load. If the wall can yield enough to mobilize full shear strength of backfill soils, then the wall can be designed for "active" pressure. If the wall cannot yield under the applied load, the shear strength of the soil cannot be mobilized and the earth pressure will be higher. Such walls should be designed for "at rest" conditions. If a structure moves toward the soils, the resulting resistance developed by the soil is the "passive" resistance. Retaining walls backfilled with non-expansive soils can be designed using the following equivalent fluid pressures:

Table 3. Retaining Wall Design Earth Pressures (Static, Drained)

Loading Conditions	Equivalent Fluid Density (pcf)	
	Level Backfill	2:1 Backfill
Active	37	55
At-Rest	55	90
Passive*	350	150 (2:1, sloping down)

* This assumes level condition in front of the wall will remain for the duration of the project, not to exceed 3,500 psf at depth.

Unrestrained (yielding) cantilever walls should be designed for the active equivalent-fluid weight value provided above for very low to low expansive soils that are free draining. In the design of walls restrained from movement at the top (non-yielding) such as basement or elevator pit/utility vaults, the at-rest equivalent fluid weight value should be used. Total depth of retained earth for design of cantilever walls should be measured as the vertical distance below the ground surface measured at the wall face for stem design, or measured at the heel of the footing for overturning and sliding calculations. Should a sloping backfill other than a 2:1 (horizontal:vertical) be constructed above the wall (or a backfill is loaded by an adjacent surcharge load), the equivalent fluid weight values provided above should be re-evaluated on an individual case basis by us. Non-standard wall designs should also be reviewed by us prior to construction to check that the proper soil parameters have been incorporated into the wall design.

All retaining walls should be provided with appropriate drainage. The outlet pipe should be sloped to drain to a suitable outlet. Wall backfill should be non-expansive (EI $\leq$ 21) sands compacted by mechanical methods to a minimum of 90 percent relative compaction (ASTM D 1557). Clayey site soils should not be used as wall backfill. Walls should not be backfilled until wall concrete attains the 28-day compressive strength and/or as determined by the Structural Engineer that the wall is structurally capable of supporting backfill. Lightweight compaction equipment should be used, unless otherwise approved by the Structural Engineer.

4.6 Sulfate Attack

Based on past experience in this area, the onsite soils are expected to possess negligible sulfate content. Type II soils or equivalent may be used. Further testing should be performed at the completion of site grading to confirm such conditions.

4.7 Preliminary Pavement Design

Our preliminary pavement design is based on an R-value of 43 and the Caltrans Highway Design Manual. For planning and estimating purposes, the pavement sections are calculated based on Traffic Indexes (TI) as indicated in Table below:

Table 4. Asphalt Pavement Sections

General Traffic Condition	Traffic Index (TI)	Asphalt Concrete (inches)	Aggregate Base* (inches)
Automobile Parking Lanes	4.5	3.0	4.0
	5.0	3.0	4.0
Truck Access & Driveways	6.0	3.0	6.0
	6.5	3.5	6.0

Appropriate Traffic Index (TI) should be selected or verified by the project civil engineer and actual R-value of the subgrade soils will need to be verified after completion of site grading to finalize the pavement design. Pavement design and construction should also conform to applicable local, county and industry standards. The Caltrans pavement section design calculations were based on a pavement life of approximately 20 years with periodic flexible pavement maintenance.

Where applicable, we recommend that a minimum of 6 inches of PCC pavement be used in high impact load areas or if to be subjected to truck traffic. The PCC pavement should be placed on a minimum 6-inch aggregate base. The PCC pavement may be placed directly on a compacted subgrade with an R-Value of 40 or higher. The PCC pavement should have a minimum of 28-day flexural strength of 650 psi. Other requirements of Caltrans Standard Specifications regarding mixing and placing of concrete should be followed.

The upper 6 inches of the subgrade soils should be moisture-conditioned to near optimum moisture content, compacted to at least 95 percent relative compaction (ASTM D1557) and kept in this condition until the pavement section is constructed. Minimum relative compaction requirements for aggregate base should be 95 percent of the maximum laboratory density as determined by ASTM D1557. If applicable, aggregate base should conform to the "Standard Specifications for Public Works Construction" (green book) current edition <u>or</u> Caltrans Class 2 aggregate base.

If pavement areas are adjacent to heavily watered landscape areas, some deterioration of the subgrade load bearing capacity and pavement failure may result. Moisture control measures such as deepened curbs or other moisture barrier materials may be used to prevent the subgrade soils from becoming saturated. The use of concrete cutoff or edge barriers should be considered when pavement is planned adjacent to either open (unfinished) or irrigated landscaped areas.

5.0 GEOTECHNICAL CONSTRUCTION SERVICES

Geotechnical review is of paramount importance in engineering practice. Poor performances of many foundation and earthwork projects have been attributed to inadequate construction review. We recommend that Leighton Consulting, Inc. be provided the opportunity to review the grading plan and foundation plan(s) prior to bid.

Reasonably-continuous construction observation and review during site grading and foundation installation allows for evaluation of the actual soil conditions and the ability to provide appropriate revisions where required during construction. Geotechnical conclusions and preliminary recommendations should be reviewed and verified by Leighton Consulting, Inc. during construction, and revised accordingly if geotechnical conditions encountered vary from our findings and interpretations. Geotechnical observation and testing should be provided:

- After completion of site demolition and clearing,
- During over-excavation of compressible soil,
- During compaction of all fill materials,
- After excavation of all footings and prior to placement of concrete,
- During utility trench backfilling and compaction, and
- When any unusual conditions are encountered.

Additional geotechnical exploration and analysis may be required based on final development plans, for reasons such as significant changes in proposed structure locations/footprints. We should review grading (civil) and foundation (structural) plans, and comment further on geotechnical aspects of this project.

6.0 LIMITATIONS

This report was based in part on data obtained from a limited number of observations, site visits, soil excavations, samples and tests. Such information is, by necessity, incomplete. The nature of many sites is such that differing soil or geologic conditions can be present within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, our findings, conclusions and recommendations presented in this report are based on the assumption that we (Leighton Consulting, Inc.) will provide geotechnical observation and testing during construction as the Geotechnical Engineer of Record for this project. Please refer to Appendix D, GBA's *Important Information About This Geotechnical-Engineering Report*, prepared by the Geoprofessional Business Association (GBA) presenting additional information and limitations regarding geotechnical engineering studies and reports.

This report was prepared for the sole use of Client and their design team, for application to design of the proposed maintenance building, in accordance with generally accepted geotechnical engineering practices at this time in California. Any unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify Leighton Consulting, Inc. from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of Leighton Consulting, Inc.

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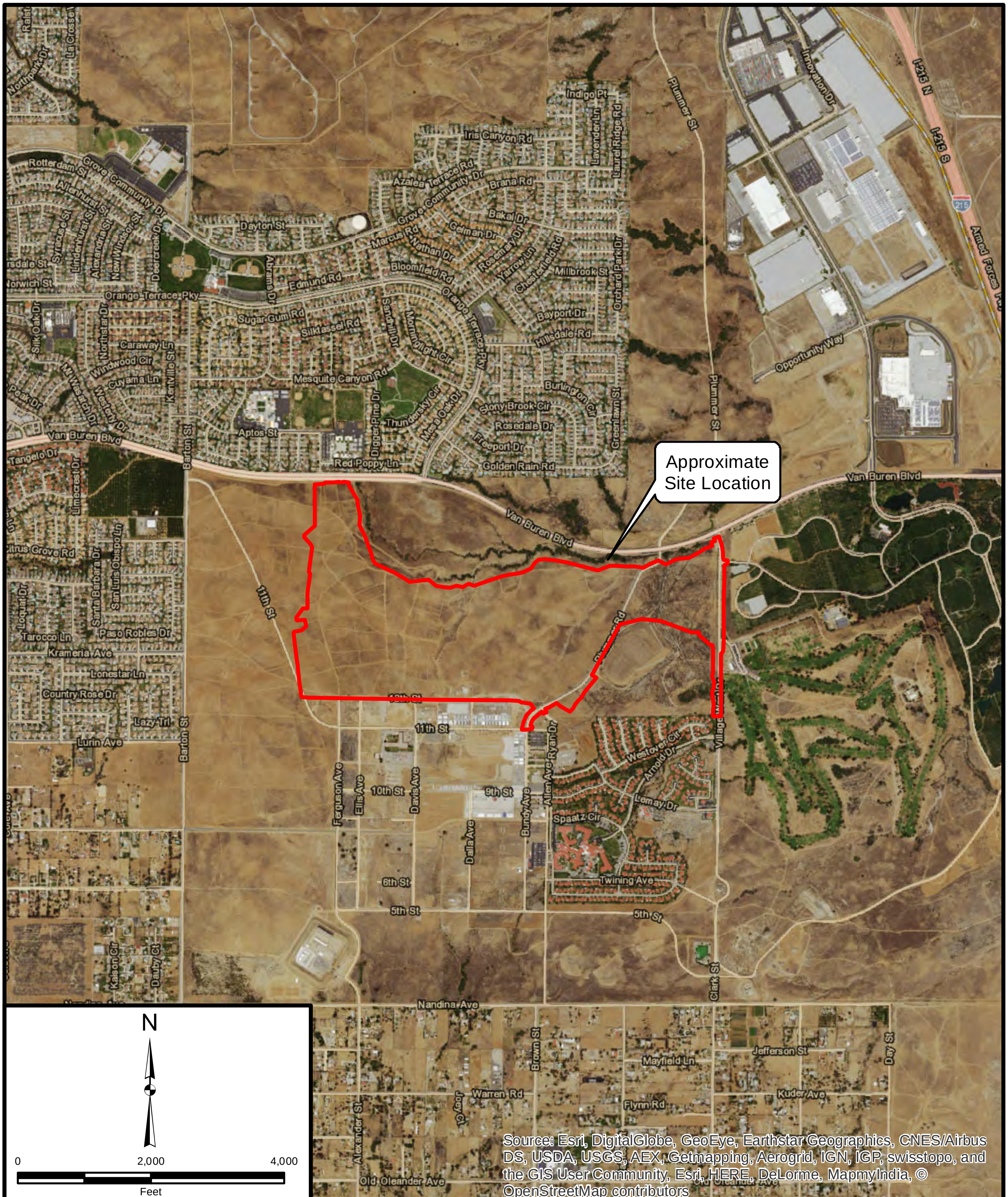

Project: 11227.001	Eng/Geol: SIS/RFR
Scale: 1 " = 2,000 '	Date: February 2016

Base Map: ESRI ArcGIS Online 2016
Thematic Information: Leighton
Author: Leighton Geomatics (mmurphy)

SITE LOCATION MAP

Proposed eridian South Campus Phase 1
Tract No. 30857-7
County of Riverside, California

Figure 1

Leighton

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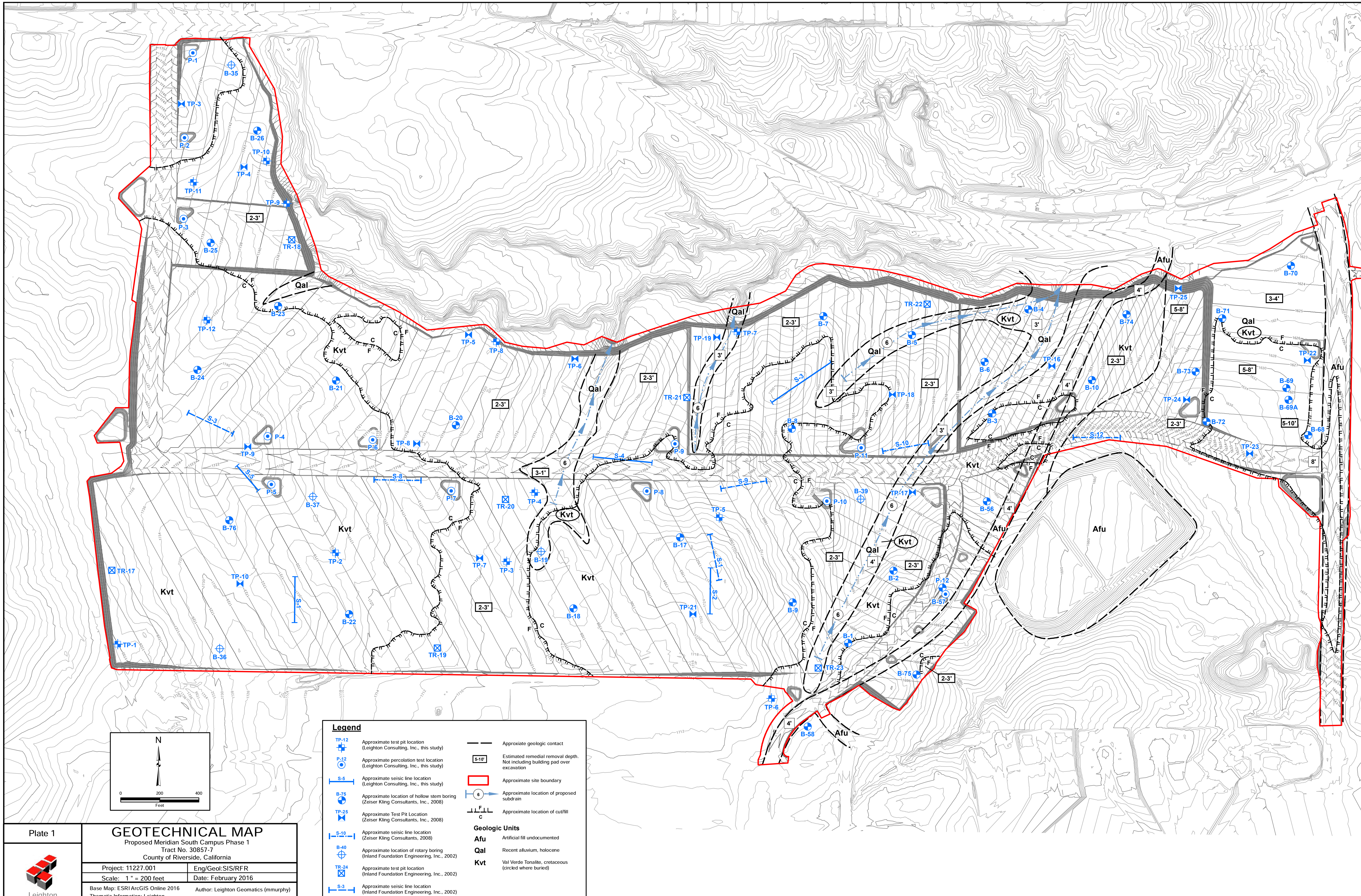

N
0
200
400
Feet
Legend
TP-12 Approximate test pit location (Leighton Consulting, Inc., this study)
P-12 Approximate percolation test location (Leighton Consulting, Inc., this study)
S-5 Approximate seisic line location (Leighton Consulting, Inc., this study)
B-75 Approximate location of hollow stem boring (Zeiser Kling Consultants, Inc., 2008)
TP-25 Approximate Test Pit Location (Zeiser Kling Consultants, Inc., 2008)
S-10 Approximate seisic line location (Zeiser Kling Consultants, 2008)
B-40 Approximate location of rotary boring (Inland Foundation Engineering, Inc., 2002)
TR-24 Approximate test pit location (Inland Foundation Engineering, Inc., 2002)
S-3 Approximate seisic line location (Inland Foundation Engineering, Inc., 2002)
Approxiate geologic contact
5-10' Estimated remedial removal depth. Not including building pad over excavation
Approximate site boundary
6 Approximate location of proposed subdrain
F C Approximate location of cut/fill
Geologic Units
Afu Artificial fill undocumented
Qal Recent alluvium, holocene
Kvt Val Verde Tonalite, cretaceous (circled where buried)
Plate 1
GEOTECHNICAL MAP
Proposed Meridian South Campus Phase 1
Tract No. 30857-7
County of Riverside, California
Project: 11227.001
Eng/Geol:SIS/RFR
Scale: 1 " = 200 feet
Date: February 2016
Base Map: ESRI ArcGIS Online 2016
Thematic Information: Leighton
Author: Leighton Geomatics (mmurphy)
Leighton
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APPENDIX A

LOGS OF EXPLORATORY BORINGS /TEST PITS AND PERCOLATION TEST RESULTS

(This and previous studies)

APPENDIX A-1

LOGS OF EXPLORATORY TEST PITS (This Study)

Encountered earth materials were logged and sampled in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D 2488). Representative soil samples were transported to our in-house Temecula laboratory for geotechnical testing. After logging and sampling, our borings were backfilled with spoils generated during drilling.

The attached subsurface exploration logs and related information depict subsurface conditions only at the locations indicated and at the particular date designated on these logs. Subsurface conditions at other locations may differ from conditions occurring at these logged locations. Passage of time may result in altered subsurface conditions due to environmental changes. In addition, any stratification lines on these logs represent an approximate boundary between sampling intervals and soil types; and transitions may be gradual.

LOG OF TEST PITS

PROJECT NO. 11227.001
CLIENT: Meridian Park, LLC

LOGGED BY: BSS
DATE: 1/20/16

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
TP-1	B1 @ 2'-7'		SM SW-SM	<u>Topsoil/Colluvium</u> 0'-1.2' SILTY SAND loose to medium dense, dark brown, moist, fine to medium sand, few mica, some rootlets, some clay <u>Val Verde Tonalite (Kvt)</u> 1.2'-10' Recovered as well- to poorly-graded SAND with silt, dense, light brownish gray, dry to moist, fine to coarse sand, micaceous, friable, highly weathered Total Depth 10' backfilled with spoils 1/20/16

LOG OF TEST PITS

PROJECT NO. 11227.001
CLIENT: Meridian Park, LLC

LOGGED BY: BSS
DATE: 1/20/16

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
TP-2			SM SW-SM	Topsoil/Colluvium 0'-1.8' SILTY SAND loose to dense, light brown, moist, fine to medium sand, few mica, slight rootlets Val Verde Tonalite (Kvt) 1.8'-12' Recovered as well-graded SAND with silt, dense, light yellowish brown, dry to moist, fine to coarse sand, some gravel and weathered cobbles, micaceous, friable, highly weathered Total Depth 12' backfilled with spoils 1/20/16

LOG OF TEST PITS

PROJECT NO. 11227.001 **LOGGED BY: BSS**
CLIENT: Meridian Park, LLC **DATE: 1/20/16**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
TP-3	B1 @ 4'-8'		SM SW-SM	<u>Topsoil/Colluvium</u> 0'-1.5' SILTY SAND loose to medium dense, ;light brown, dry to moist, fine to medium sand, few mica, slight gravel <u>Val Verde Tonalite (Kvt)</u> 1.5'-10' Recovered as well-graded SAND with silt, dense, light orange brown, dry to moist, fine to coarse sand, some gravel, some mica, friable, moderately weathered, at 8.5' becomes very dense, highly weathered Total Depth 10' backfilled with spoils 1/20/16

LOG OF TEST PITS

PROJECT NO. 11227.001 **LOGGED BY: BSS**
CLIENT: Meridian Park, LLC **DATE: 1/20/16**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
TP-4	B1 @ 1'-4'		SM SW-SM	Topsoil/Colluvium 0'-4.2' CLAYEY SAND loose to medium dense, light orange brown, dry to moist, fine sand, some rootlets Val Verde Tonalite (Kvt) 4.2'-14' Recovered as well-graded SAND, dense, light brownish gray, dry to moist, fine to coarse sand with silt and gravel, micaceous, friable, highly weathered, at 10' becomes highly weathered Total Depth 14' backfilled with spoils 1/20/16

LOG OF TEST PITS

PROJECT NO. 11227.001 **LOGGED BY: BSS**
CLIENT: Meridian Park, LLC **DATE: 1/20/16**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
TP-5			 SM SM SW-SM	Topsoil/Colluvium 0'-0.8' SILTY SAND, loose, dark brown, moist, fine to medium sand, some rootlets 0.8'-2.2' SILTY SAND, loose to medium dense, light brown, dry to moist, fine to medium sand, few mica, some clay Val Verde Tonalite (Kvt) 2.2'-13' Recovered as well-graded SAND with silt, dense, light orange brown, dry to moist, fine to coarse sand with gravel, micaceous, friable, highly weathered Total Depth 13' backfilled with spoils 1/20/16

LOG OF TEST PITS

PROJECT NO. 11227.001
CLIENT: Meridian Park, LLC

LOGGED BY: BSS
DATE: 1/20/16

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
TP-6	B1 @ 4'-8'		 SM SM SW-SM	Topsoil/Colluvium 0'-0.5' SILTY SAND, loose, dark brown, moist, fine to medium sand, some rootlets 0.5'-3' SILTY SAND, loose to medium dense, reddish brown, moist, fine to course sand, few mica Val Verde Tonalite (Kvt) 3'-12' Recovered as well-graded SAND with silt, dense, light reddish brown, moist, fine to coarse sand, few gravel, friable, highly weathered, at 8.5' becomes highly weathered Total Depth 12' backfilled with spoils 1/20/16

LOG OF TEST PITS

PROJECT NO. 11227.001 | **LOGGED BY: BSS**
CLIENT: Meridian Park, LLC | **DATE: 1/20/16**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
TP-7			SM SW-SM	Topsoil/Colluvium 0'-0.5' SILTY SAND, loose, dark brown, dry to moist, fine to medium sand, some rootlets, some clay Val Verde Tonalite (Kvt) 0.5'-12' Recovered as well-graded SAND with silt, dense, light brownish gray, dry to moist, fine to coarse sand, few gravel, few mica, friable, highly weathered, at 7.5' becomes moderately weathered, dry Total Depth 12' backfilled with spoils 1/20/16

LOG OF TEST PITS

PROJECT NO. 11227.001
CLIENT: Meridian Park, LLC

LOGGED BY: BSS
DATE: 1/20/16

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
TP-8				Topsoil/Colluvium
			SM	0'-0.5' SILTY SAND, loose, dark brown, dry to moist, fine to medium sand, some rootlets, few mica
			SM	0.5'-1.8' SILTY SAND, loose to medium dense, brown, dry to moist, fine to course sand, few mica, some gravel
				Val Verde Tonalite (Kvt)
	B1 @ 7'-10'		SW-SM	1.8'-12' Recovered as well-graded SAND, dense, light orange brown, moist, fine to coarse sand with silt, few gravel, micaceous, friable, highly weathered
				Total Depth 12' backfilled with spoils 1/20/16

LOG OF TEST PITS

PROJECT NO. 11227.001
CLIENT: Meridian Park, LLC

LOGGED BY: BSS
DATE: 1/20/16

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
TP-9				Topsoil/Colluvium
			SM	0'-0.5' SILTY SAND, loose, dark brown, moist, fine to medium sand, few rootlets, few mica, few gravel
			SM	0.5'-3' SILTY SAND, medium dense, light brown, dry to moist, fine to medium sand, few mica, some gravel
				Val Verde Tonalite (Kvt)
			SW-SM	3'-12' Recovered as well-graded SAND, dense, light brownish gray, dry to moist, fine to coarse sand, some clay with white calcium carbonate, friable, highly weathered
				Total Depth 12' backfilled with spoils 1/20/16

LOG OF TEST PITS

PROJECT NO. 11227.001 **LOGGED BY: BSS**
CLIENT: Meridian Park, LLC **DATE: 1/20/16**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
TP-10	B1 @ 1'-12'		 SM SM SW-SM	Topsoil/Colluvium 0'-0.8' SILTY SAND, loose, dark brown, moist, fine to medium sand, some rootlets 0.8'-3.3' SILTY SAND, medium dense, light brown, dry to moist, fine to medium sand, some mica Val Verde Tonalite (Kvt) 3.3'-12' Recovered as well-graded SAND, dense, light brownish gray, moist, fine to coarse sand with some silt and gravel, micaceous, friable, highly weathered, at 10' becomes moderately weathered Total Depth 12' backfilled with spoils 1/20/16

LOG OF TEST PITS

PROJECT NO. 11227.001 **LOGGED BY: BSS**
CLIENT: Meridian Park, LLC **DATE: 1/20/16**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
TP-11	B1 @ 1'-3'		SM SC-SM SW-SM	Topsoil/Colluvium 0'-1' SILTY SAND, loose, dark brown, moist, fine sand, few rootlets Older Alluvium (Qalo) 1'-9' SILTY SAND with clay, very dense, light orange brown, dry to moist, fine to medium sand, some mica, few gravel Val Verde Tonalite (Kvt) 9'-10' Recovered as well-graded SAND with silt, dense, light gray, dry to moist, fine to coarse sand, micaceous, friable, highly weathered Total Depth 10' backfilled with spoils 1/20/16

LOG OF TEST PITS

PROJECT NO. 11227.001
CLIENT: Meridian Park, LLC

LOGGED BY: BSS
DATE: 1/20/16

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
TP-12			 SM SM SW-SM	Topsoil/Colluvium 0'-0.5' SILTY SAND, loose, dark brown, moist, fine sand, some rootlets 0.5'-2.2' SILTY SAND, loose to medium dense, brown, moist, fine to medium sand, few gravel and mica Val Verde Tonalite (Kvt) 2.2'-10' Recovered as well-graded SAND, dense to very dense, light gray, dry to moist, fine to coarse sand with some silt and gravel, micaceous, friable, highly weathered Total Depth 10' backfilled with spoils 1/20/16

APPENDIX A-2

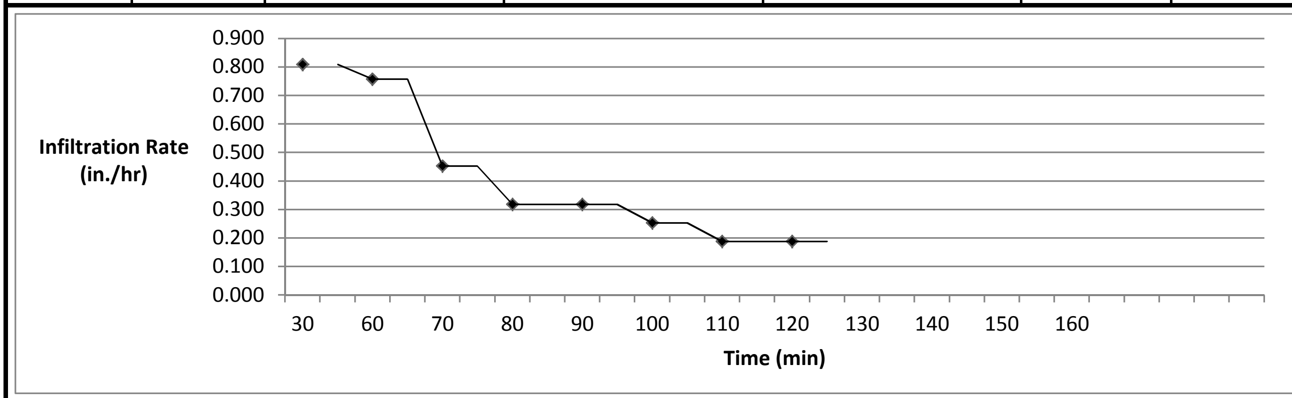
RESULTS OF PERCOLATION TESTING (This Study)

Encountered earth materials were logged and sampled in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D 2488). Representative soil samples were transported to our in-house Temecula laboratory for geotechnical testing. After logging and sampling, our borings were backfilled with spoils generated during drilling.

The attached subsurface exploration logs and related information depict subsurface conditions only at the locations indicated and at the particular date designated on these logs. Subsurface conditions at other locations may differ from conditions occurring at these logged locations. Passage of time may result in altered subsurface conditions due to environmental changes. In addition, any stratification lines on these logs represent an approximate boundary between sampling intervals and soil types; and transitions may be gradual.

Test Hole Number:	P-1	Project	Meridian South Campus	
Date Excavated:	1/27/2016	Project Number	11227.001	
Tested by:	AWS	Date Tested	1/28/2016	
Soil Unit:	Val Verde Tonalite (Kvt)	Depth of Test Hole (in.)	180	
USCS Soil Type:	N/A	Diameter (in.)	8	Sunny ~70 °

Time	Δt (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
7:51:00 8:21:00	30.00	142.80	150.00	7.20	0.809	4.167
8:21:00 8:51:00	30.00	140.40	147.60	7.20	0.758	4.167
8:51:00 9:21:00	30.00	142.80	147.00	4.20	0.453	7.143
9:21:00 9:51:00	30.00	142.80	145.80	3.00	0.318	10.000
9:51:00 10:21:00	30.00	142.80	145.80	3.00	0.318	10.000
10:21:00 10:51:00	30.00	142.80	145.20	2.40	0.253	12.500
10:51:00 11:21:00	30.00	142.80	144.60	1.80	0.188	16.667
11:21:00 11:51:00	30.00	142.80	144.60	1.80	0.188	16.667



* Based on Prochet Method

Percolation Test Data

P-1

Project Number: 11227.001

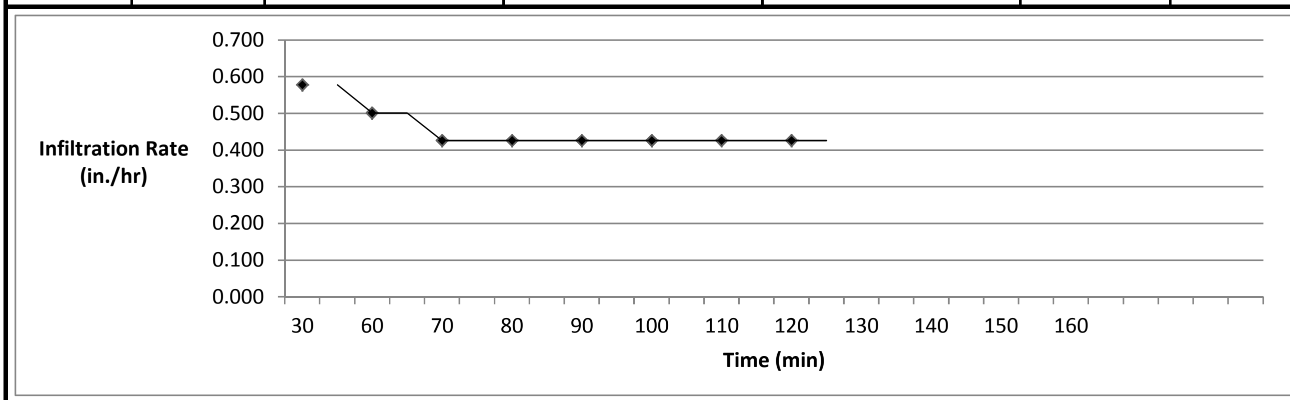
Project Name: *Meridian South Campus*

Date: Feb-16

Leighton

Test Hole Number:	P-2	Project	Meridian South Campus	
Date Excavated:	1/27/2016	Project Number	11227.001	
Tested by:	AWS	Date Tested	1/28/2016	
Soil Unit:	Val Verde Tonalite (Kvt)	Depth of Test Hole (in.)	120	
USCS Soil Type:	N/A	Diameter (in.)	8	Sunny ~70 °

Time	Δt (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
8:02:00 8:32:00	30.00	86.40	91.20	4.80	0.578	6.250
8:32:00 9:02:00	30.00	86.40	90.60	4.20	0.501	7.143
9:02:00 9:32:00	30.00	86.40	90.00	3.60	0.426	8.333
9:32:00 10:02:00	30.00	86.40	90.00	3.60	0.426	8.333
10:02:00 10:32:00	30.00	86.40	90.00	3.60	0.426	8.333
10:32:00 11:02:00	30.00	86.40	90.00	3.60	0.426	8.333
11:02:00 11:32:00	30.00	86.40	90.00	3.60	0.426	8.333
11:32:00 12:02:00	30.00	86.40	90.00	3.60	0.426	8.333



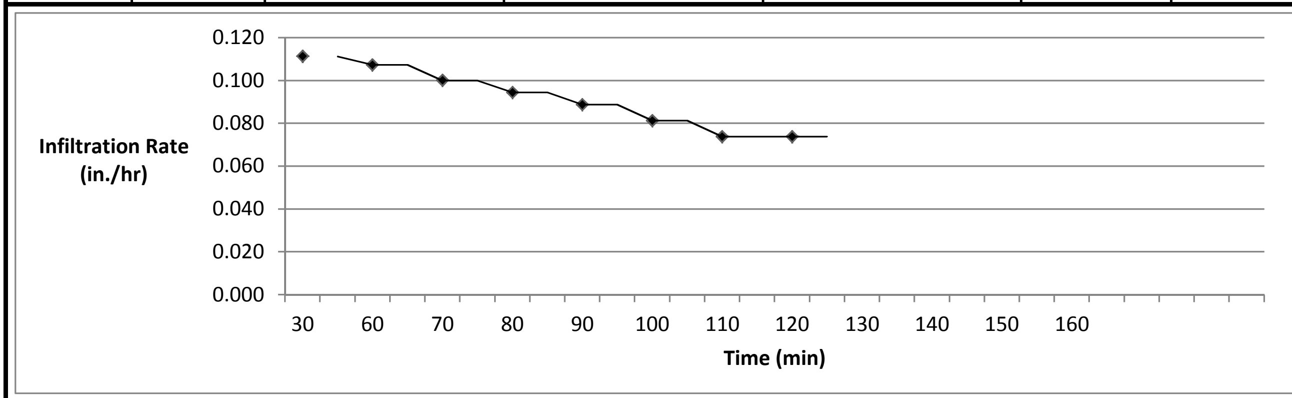
* Based on Prochet Method

Percolation Test Data	Project Number:	11227.001
P-2	Project Name:	*Meridian South Campus*
	Date:	Feb-16

Leighton

Test Hole Number:	P-3	Project	Meridian South Campus	
Date Excavated:	1/27/2016	Project Number	11227.001	
Tested by:	AWS	Date Tested	1/28/2016	
Soil Unit:	Val Verde Tonalite (Kvt)	Depth of Test Hole (in.)	240	
USCS Soil Type:	N/A	Diameter (in.)	8	Sunny ~70 °

Time	Δt (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
8:14:00 8:44:00	30.00	176.40	178.20	1.80	0.111	16.667
8:44:00 9:14:00	30.00	174.00	175.80	1.80	0.107	16.667
9:14:00 9:44:00	30.00	174.00	175.68	1.68	0.100	17.857
9:44:00 10:14:00	30.00	175.20	176.76	1.56	0.095	19.231
10:14:00 10:44:00	30.00	176.40	177.84	1.44	0.089	20.833
10:44:00 11:14:00	30.00	176.40	177.72	1.32	0.081	22.727
11:14:00 11:44:00	30.00	176.40	177.60	1.20	0.074	25.000
11:44:00 12:14:00	30.00	176.40	177.60	1.20	0.074	25.000



* Based on Prochet Method

Percolation Test Data

P-3

Project Number: 11227.001

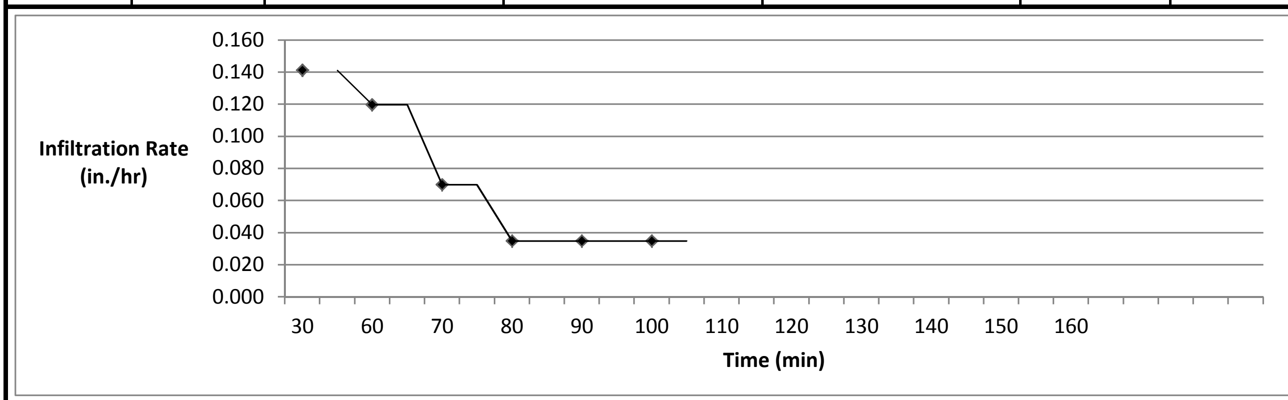
Project Name: *Meridian South Campus*

Date: Feb-16

Leighton

Test Hole Number:	P-4	Project	Meridian South Campus	
Date Excavated:	1/27/2016	Project Number	11227.001	
Tested by:	AWS	Date Tested	1/28/2016	
Soil Unit:	Val Verde Tonalite (Kvt)	Depth of Test Hole (in.)	300	
USCS Soil Type:	N/A	Diameter (in.)	8	Sunny ~70 °

Time	Δt (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
12:12:00 12:42:00	30.00	232.80	235.20	2.40	0.141	12.500
12:42:00 1:12:00	30.00	232.80	234.84	2.04	0.120	14.706
1:12:00 1:42:00	30.00	232.80	234.00	1.20	0.070	25.000
1:42:00 2:12:00	30.00	232.80	233.40	0.60	0.035	50.000
2:12:00 2:42:00	30.00	232.80	233.40	0.60	0.035	50.000
2:42:00 3:12:00	30.00	232.80	233.40	0.60	0.035	50.000

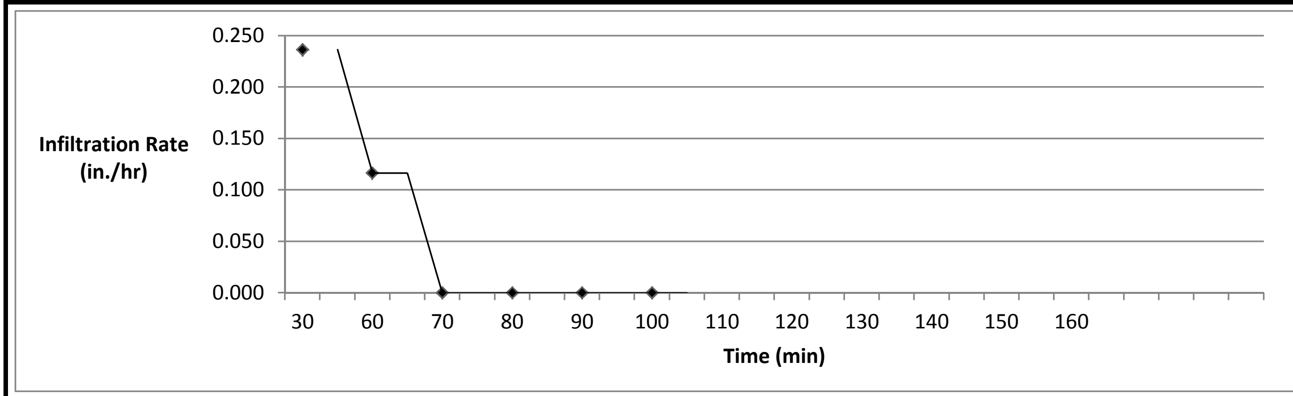


* Based on Prochet Method

Percolation Test Data P-4	***Project Number:*** 11227.001 ***Project Name:*** *Meridian South Campus* ***Date:*** Feb-16	Leighton

Test Hole Number:	P-5	Project	Meridian South Campus	
Date Excavated:	1/27/2016	Project Number	11227.001	
Tested by:	AWS	Date Tested	1/28/2016	
Soil Unit:	Val Verde Tonalite (Kvt)	Depth of Test Hole (in.)	300	
USCS Soil Type:	N/A	Diameter (in.)	8	Sunny ~70 °

Time	Δt (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
12:17:00 12:47:00	30.00	218.40	223.20	4.80	0.236	6.250
12:47:00 1:17:00	30.00	218.40	220.80	2.40	0.117	12.500
1:17:00 1:47:00	30.00	218.40	218.40	0.00	0.000	0.000
1:47:00 2:17:00	30.00	218.40	218.40	0.00	0.000	0.000
2:17:00 2:47:00	30.00	218.40	218.40	0.00	0.000	0.000
2:47:00 3:17:00	30.00	218.40	218.40	0.00	0.000	0.000

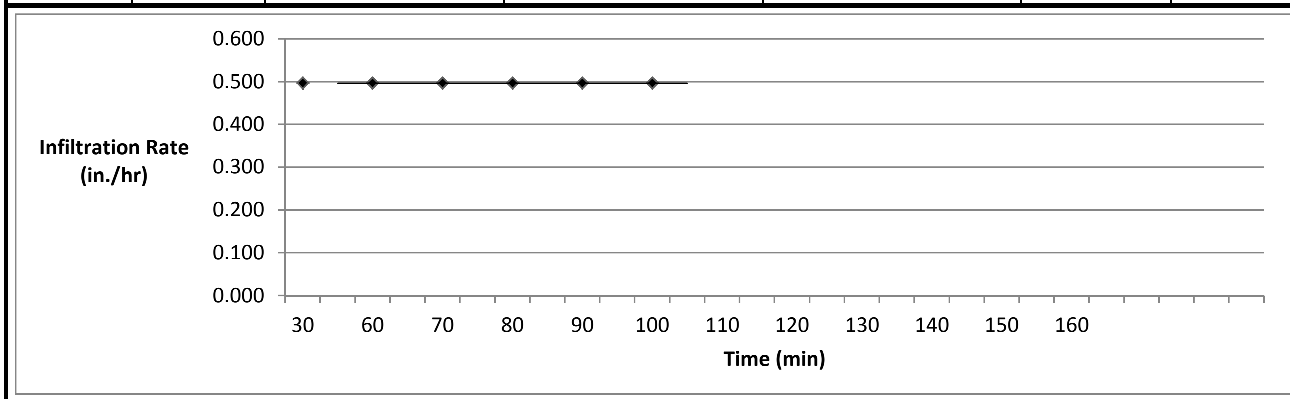


* Based on Prochet Method

Percolation Test Data P-5	***Project Number:***	11227.001	Leighton
	Project Name:	*Meridian South Campus*	
	Date:	Feb-16	

Test Hole Number:	P-6	Project	Meridian South Campus
Date Excavated:	1/27/2016	Project Number	11227.001
Tested by:	AWS	Date Tested	1/28/2016
Soil Unit:	Val Verde Tonalite (Kvt)	Depth of Test Hole (in.)	120
USCS Soil Type:	N/A	Diameter (in.)	8 · Sunny ~70 °

Time	Δt (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate inches/hour*	Infiltration/Percolation Rate minute/inch
12:27:00 12:57:00	30.00	91.20	94.80	3.60	0.497	8.333
12:57:00 1:27:00	30.00	91.20	94.80	3.60	0.497	8.333
1:27:00 1:57:00	30.00	91.20	94.80	3.60	0.497	8.333
1:57:00 2:27:00	30.00	91.20	94.80	3.60	0.497	8.333
2:27:00 2:57:00	30.00	91.20	94.80	3.60	0.497	8.333
2:57:00 3:27:00	30.00	91.20	94.80	3.60	0.497	8.333



* Based on Prochet Method

Percolation Test Data

P-6

Project Number: 11227.001

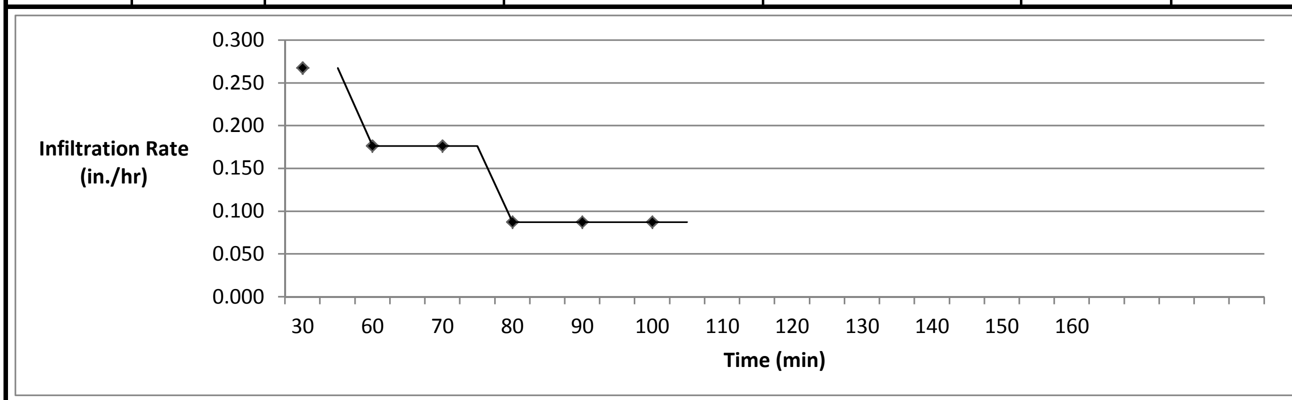
Project Name: *Meridian South Campus*

Date: Feb-16

Leighton

Test Hole Number:	P-7	Project	Meridian South Campus	
Date Excavated:	1/27/2016	Project Number	11227.001	
Tested by:	AWS	Date Tested	1/28/2016	
Soil Unit:	Val Verde Tonalite (Kvt)	Depth of Test Hole (in.)	120	
USCS Soil Type:	N/A	Diameter (in.)	8	Sunny ~70 °

Time	Δt (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
12:33:00 1:03:00	30.00	94.20	96.00	1.80	0.268	16.667
1:03:00 1:33:00	30.00	94.20	95.40	1.20	0.176	25.000
1:33:00 2:03:00	30.00	94.20	95.40	1.20	0.176	25.000
2:03:00 2:33:00	30.00	94.20	94.80	0.60	0.087	50.000
2:33:00 3:03:00	30.00	94.20	94.80	0.60	0.087	50.000
3:03:00 3:33:00	30.00	94.20	94.80	0.60	0.087	50.000



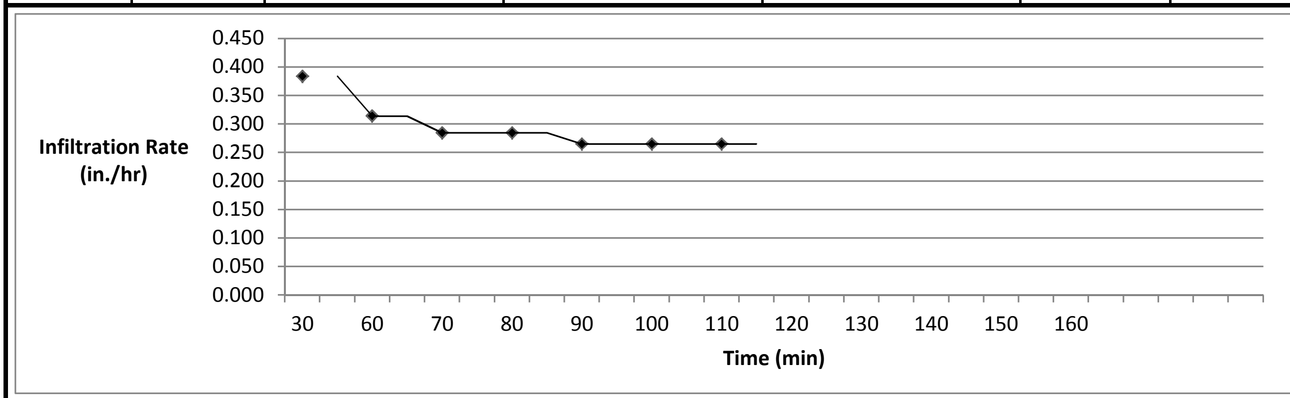
* Based on Prochet Method

Percolation Test Data		
P-7	***Project Number:***	11227.001
	Project Name:	*Meridian South Campus*
	Date:	Feb-16

Leighton

Test Hole Number:	P-8	Project	Meridian South Campus	
Date Excavated:	1/27/2016	Project Number	11227.001	
Tested by:	AWS	Date Tested	1/29/2016	
Soil Unit:	Val Verde Tonalite (Kvt)	Depth of Test Hole (in.)	240	
USCS Soil Type:	N/A	Diameter (in.)	8	Sunny ~70 °

Time	Δt (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
11:53:00 12:23:00	30.00	189.60	194.40	4.80	0.384	6.250
12:23:00 12:53:00	30.00	189.60	193.56	3.96	0.314	7.576
12:53:00 1:23:00	30.00	189.60	193.20	3.60	0.285	8.333
1:23:00 1:53:00	30.00	189.60	193.20	3.60	0.285	8.333
1:53:00 2:23:00	30.00	189.60	192.96	3.36	0.265	8.929
2:23:00 2:53:00	30.00	189.60	192.96	3.36	0.265	8.929
2:53:00 3:23:00	30.00	189.60	192.96	3.36	0.265	8.929

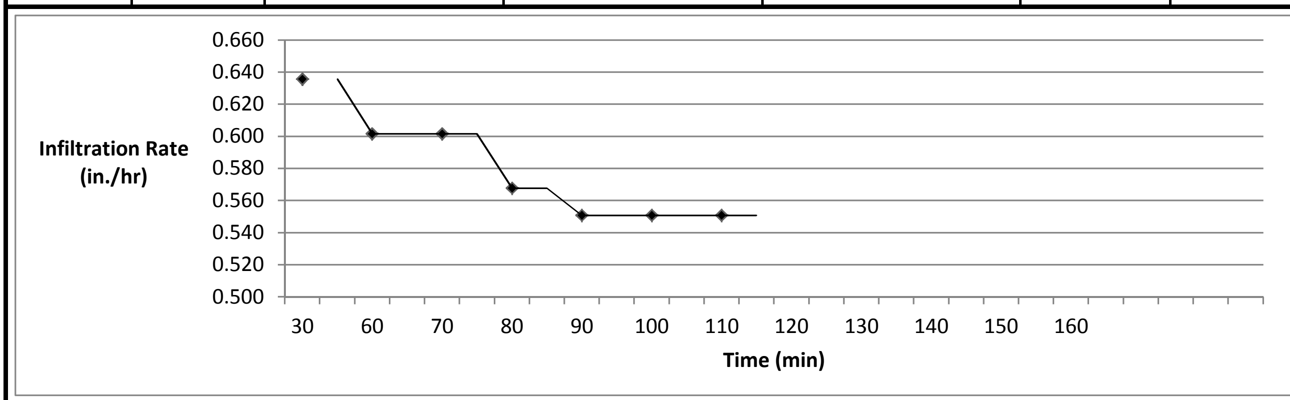


* Based on Prochet Method

Percolation Test Data		
P-8	***Project Number:*** 11227.001	Leighton
	Project Name: *Meridian South Campus*	
	Date: Feb-16	

Test Hole Number:	P-9	Project	Meridian South Campus	
Date Excavated:	1/27/2016	Project Number	11227.001	
Tested by:	AWS	Date Tested	1/29/2016	
Soil Unit:	Val Verde Tonalite (Kvt)	Depth of Test Hole (in.)	120	
USCS Soil Type:	N/A	Diameter (in.)	8	Sunny ~70 °

Time	Δt (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
12:03:00 12:33:00	30.00	89.40	94.20	4.80	0.636	6.250
12:33:00 1:03:00	30.00	89.40	93.96	4.56	0.602	6.579
1:03:00 1:33:00	30.00	89.40	93.96	4.56	0.602	6.579
1:33:00 2:03:00	30.00	89.40	93.72	4.32	0.568	6.944
2:03:00 2:33:00	30.00	89.40	93.60	4.20	0.551	7.143
2:33:00 3:03:00	30.00	89.40	93.60	4.20	0.551	7.143
3:03:00 3:33:00	30.00	89.40	93.60	4.20	0.551	7.143

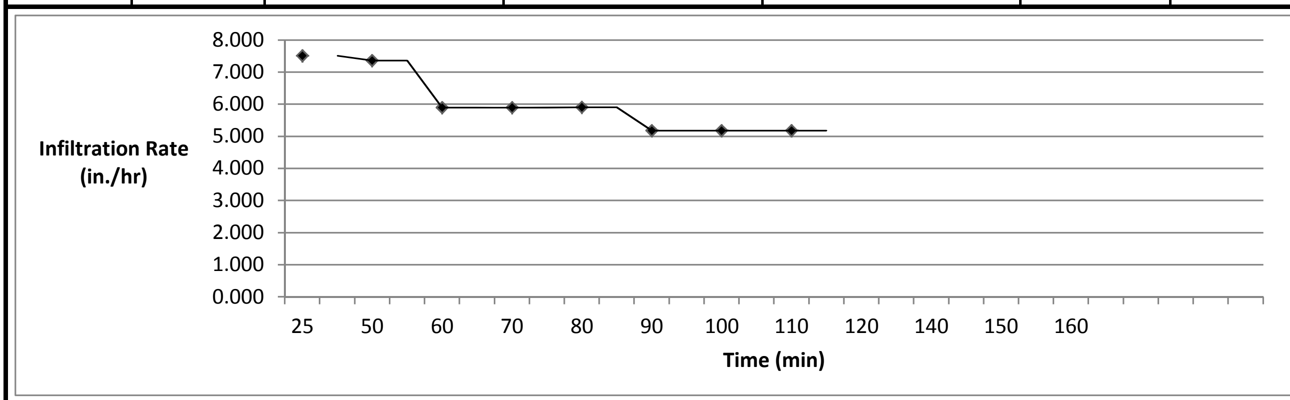


* Based on Prochet Method

Percolation Test Data P-9	Project Number: 11227.001 Project Name: Meridian South Campus Date: Feb-16	Leighton

Test Hole Number:	P-10	Project	Meridian South Campus	
Date Excavated:	1/27/2016	Project Number	11227.001	
Tested by:	AWS	Date Tested	1/29/2016	
Soil Unit:	Val Verde Tonalite (Kvt)	Depth of Test Hole (in.)	60	
USCS Soil Type:	N/A	Diameter (in.)	8	Sunny ~70 °

Time	Δt (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
7:59:00 8:24:00	25.00	45.60	60.00	14.40	7.513	1.736
8:24:00 8:49:00	25.00	46.80	60.00	13.20	7.367	1.894
8:49:00 8:59:00	10.00	46.80	52.80	6.00	5.902	1.667
8:59:00 9:09:00	10.00	46.80	52.80	6.00	5.902	1.667
9:09:00 9:19:00	10.00	45.60	52.08	6.48	5.909	1.543
9:19:00 9:29:00	10.00	46.80	52.20	5.40	5.184	1.852
9:29:00 9:39:00	10.00	46.80	52.20	5.40	5.184	1.852
9:39:00 9:49:00	10.00	46.80	52.20	5.40	5.184	1.852



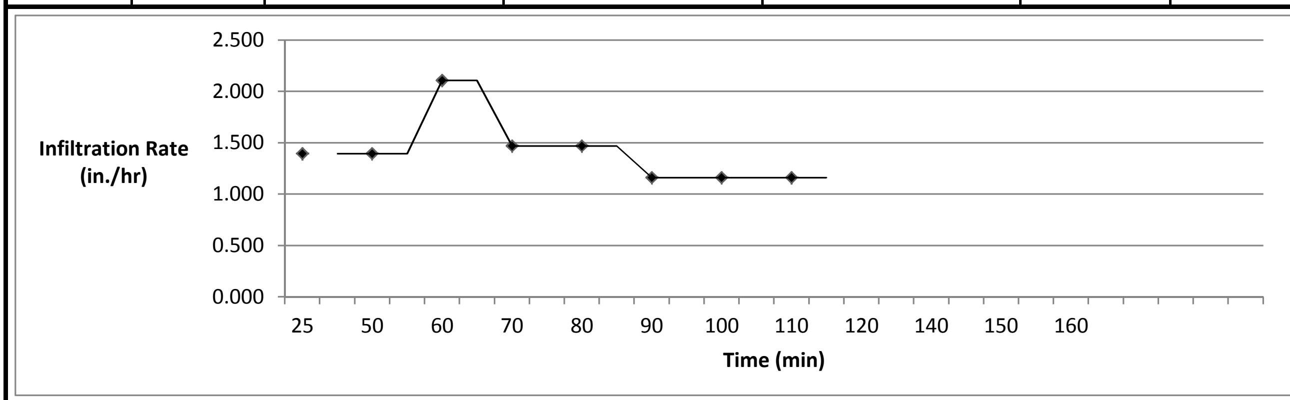
* Based on Prochet Method

Percolation Test Data		
P-10	***Project Number:***	11227.001
	Project Name:	*Meridian South Campus*
	Date:	Feb-16

Leighton

Test Hole Number:	P-11	Project	Meridian South Campus
Date Excavated:	1/27/2016	Project Number	11227.001
Tested by:	AWS	Date Tested	1/29/2016
Soil Unit:	Alluvium (Qal)	Depth of Test Hole (in.)	24
USCS Soil Type:	SM	Diameter (in.)	8 Sunny ~70 °

Time	Δt (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
7:54:00 8:19:00	25.00	0.00	6.60	6.60	1.396	3.788
8:19:00 8:44:00	25.00	0.00	6.60	6.60	1.396	3.788
8:44:00 8:54:00	10.00	0.00	4.20	4.20	2.109	2.381
8:54:00 9:04:00	10.00	0.00	3.00	3.00	1.469	3.333
9:04:00 9:14:00	10.00	0.00	3.00	3.00	1.469	3.333
9:14:00 9:24:00	10.00	0.00	2.40	2.40	1.161	4.167
9:24:00 9:34:00	10.00	0.00	2.40	2.40	1.161	4.167
9:34:00 9:44:00	10.00	0.00	2.40	2.40	1.161	4.167

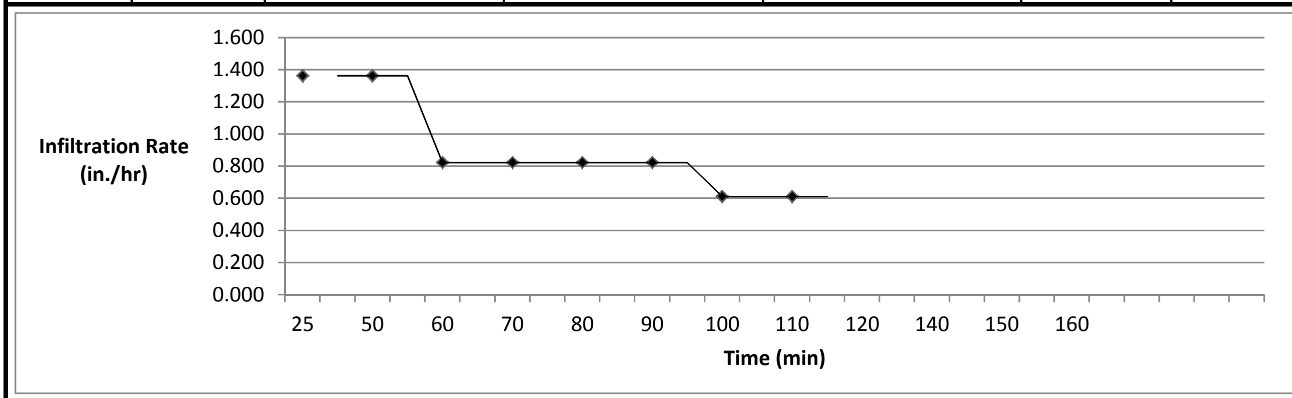


* Based on Prochet Method

Percolation Test Data	***Project Number:***	11227.001	Leighton
P-11	***Project Name:***	*Meridian South Campus*	
	Date:	Feb-16	

Test Hole Number:	**P-12**	**Project**	**Meridian South Campus**
Date Excavated:	**1/27/2016**	**Project Number**	**11227.001**
Tested by:	**AWS**	**Date Tested**	**1/29/2016**
Soil Unit:	**Val Verde Tonalite (Kvt)**	**Depth of Test Hole (in.)**	**120**
USCS Soil Type:	**N/A**	**Diameter (in.)**	**8** — **Sunny ~70 °**

Time	Δt (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate inches/hour*	Infiltration/Percolation Rate minute/inch
9:57:00 – 10:22:00	25.00	85.80	94.80	9.00	1.363	2.778
10:22:00 – 10:47:00	25.00	85.80	94.80	9.00	1.363	2.778
10:47:00 – 10:57:00	10.00	85.80	88.20	2.40	0.823	4.167
10:57:00 – 11:07:00	10.00	85.80	88.20	2.40	0.823	4.167
11:07:00 – 11:17:00	10.00	85.80	88.20	2.40	0.823	4.167
11:17:00 – 11:27:00	10.00	85.80	88.20	2.40	0.823	4.167
11:27:00 – 11:37:00	10.00	85.80	87.60	1.80	0.612	5.556
11:37:00 – 11:47:00	10.00	85.80	87.60	1.80	0.612	5.556



* Based on Prochet Method

Percolation Test Data

P-12

Project Number: 11227.001

Project Name: *Meridian South Campus*

Date: Feb-16

Leighton

GEOTECHNICAL BORING LOG P-1

Project No.	11227.001	**Date Drilled**	1-27-16
Project	Meridian South Campus	**Logged By**	AWS
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1748'
Location	See Plate 1	**Sampled By**	AWS

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	**Topsoil / Colluvium** SILTY SAND, light reddish brown, slightly moist, fine sand SILTY SAND, reddish brown, moist, fine sand	
									Val Verde Tonalite (Kut)	
1745										
	5							SW	Highly Weathered: breaks into SAND, yellow to light brown, moist, fine to coarse sand	
1740										
	10								@ 10' harder drilling, drilling more difficult	
1735				S1	25 50/5"				WEATHERED BEDROCK, light red to gray, moist	
	15								Total Depth 15' Backfilled 1/28/16 -proposed basin bottom at ~1735.4	
1730										
	20									
1725										
	25									
1720										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG P-2

Project No.	11227.001	**Date Drilled**	1-27-16
Project	Meridian South Campus	**Logged By**	AWS
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1745'
Location	See Plate 1	**Sampled By**	AWS

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
1745	0							SM	**Topsoil / Colluvium** SILTY SAND, light red to light brown, slightly moist, fine sand SILTY SAND, reddish brown, moist, fine sand	
								SW	**Val Verde Tonalite (Kut)** HIGHLY WEATHERED breaks into SAND, gray, moist, fine to coarse sand	
1740	5									
									@ 7' harder drilling	
				S1	50/5"				WEATHERED BEDROCK, gray, moist	
1735	10									
									Total Depth 10' Backfilled 1/28/16 -Proposed Basin Bottom @ 1735.9	
1730	15									
1725	20									
1720	25									
1715	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG P-3

Project No.	11227.001	**Date Drilled**	1-27-16
Project	Meridian South Campus	**Logged By**	AWS
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1733'
Location	See Plate 1	**Sampled By**	AWS

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	**Topsoil / Colluvium** SILTY SAND, light brown, moist, fine to coarse sand	
									Val Verde Tonalite (Kut)	
1730								SW	Highly Weathered: breaks into SAND, yellow to light gray, moist, fine to coarse sand	
	5									
1725										
	10								@ 10' harder drilling	
1720										
	15									
1715										
				S1	28 50/4"				WEATHERED BEDROCK, reddish yellow to gray, moist	
	20									
									Total Depth 20' Backfilled 1/28/16 -Proposed Basin Bottom @ 1731.0	
1710										
	25									
1705										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

***** This log is a part of a report by Leighton and should not be used as a stand-alone document. *****

GEOTECHNICAL BORING LOG P-4

Project No.	11227.001	**Date Drilled**	1-27-16
Project	Meridian South Campus	**Logged By**	AWS
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1740'
Location	See Plate 1	**Sampled By**	AWS

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
1740	0							SM	**Topsoil / Colluvium** SILTY SAND, light red to light brown, dry, fine sand	
								SW	**Val Verde Tonalite (Kut)** Highly Weathered: breaks into SAND, reddish brown, moist, fine to coarse sand	
1735	5									
									Highly Weathered: breaks into SAND, yellow to dark gray, moist, fine to coarse sand	
1730	10									
									@ 11' harder drilling Highly Weathered: breaks into SAND, yellow to dark gray, moist, fine to coarse sand	
1725	15									
1720	20									
				S1	50/3"				WEATHERED BEDROCK, dark gray, moist	
1715	25									
									Total Depth 25' Backfilled 1/28/16 -Proposed Basin Bottom @ 1718.8	
1710	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG P-5

Project No.	11227.001	**Date Drilled**	1-27-16
Project	Meridian South Campus	**Logged By**	AWS
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1739'
Location	See Plate 1	**Sampled By**	AWS

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	**Topsoil / Colluvium** SILTY SAND, light red to light brown, dry, fine sand	
1735										
	5							SW	**Val Verde Tonalite (Kut)** Highly Weathered: breaks into SAND, reddish gray, moist, fine to coarse sand	
1730										
	10								Highly Weathered: breaks into SAND, dark gray, moist, fine to coarse sand	
									@12' harder drilling	
1725										
	15									
1720										
	20									
1715				S1	50/3"				WEATHERED BEDROCK, dark gray, slightly moist	
	25								Total Depth 25' Backfilled 1/28/16 -Proposed Basin Bottom @ 1714.6	
1710										
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG P-6

Project No.	11227.001	**Date Drilled**	1-27-16
Project	Meridian South Campus	**Logged By**	AWS
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1721'
Location	See Plate 1	**Sampled By**	AWS

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	**<u>Topsoil / Colluvium</u>** SILTY SAND, light brown, moist, fine sand	
1720										
								SW	**<u>Val Verde Tonalite (Kut)</u>** Highly Weathered: breaks into SAND, yellow to light gray, moist, fine to coarse sand @ 4' harder drilling	
	5									
1715										
				S1	48 50/4"				WEATHERED BEDROCK, grayish green, moist	
	10									
1710									Total Depth 10' Backfilled 1/28/16 - Proposed Basin Bottom @ 1716.1	
	15									
1705										
	20									
1700										
	25									
1695										
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG P-7

Project No.	11227.001	**Date Drilled**	1-27-16
Project	Meridian South Campus	**Logged By**	AWS
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1715'
Location	See Plate 1	**Sampled By**	AWS

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
1715	0							SM	**Topsoil / Colluvium** SILTY SAND, reddish brown, moist, fine sand	
								SW	**Val Verde Tonalite (Kut)** Highly Weathered: breaks into SAND, yellow to light gray, moist, fine to coarse sand	
1710	5								@ 5' harder drilling	
				S1	28 50/5"				WEATHERED BEDROCK, very dense, reddish gray, moist	
1705	10								Total Depth 10' Backfilled 1/28/16 -Proposed Basin Bottom @ 1706.7	
1700	15									
1695	20									
1690	25									
1685	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG P-8

Project No.	11227.001	**Date Drilled**	1-27-16
Project	Meridian South Campus	**Logged By**	AWS
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1714'
Location	See Plate 1	**Sampled By**	AWS

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	**Topsoil / Colluvium** SILTY SAND, light red to light brown, slightly moist, fine sand	
								SW	**Val Verde Tonalite (Kut)** Highly Weathered: breaks into SAND, light red to light brown, slightly moist, fine to coarse sand	
1710	5								@ 6' harder drilling	
1705	10								Highly Weathered: breaks into SAND, gray, moist, fine to coarse sand	
1700	15									
1695				S1	48 50/4"				WEATHERED BEDROCK, very dense, gray, moist	
	20								Total Depth 20' Backfilled 1/29/16 -Proposed Basin Bottom @ 1698.0	
1690	25									
1685	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG P-9

Project No.	11227.001	**Date Drilled**	1-27-16
Project	Meridian South Campus	**Logged By**	AWS
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1700'
Location	See Plate 1	**Sampled By**	AWS

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
1700	0							SM	**Topsoil / Colluvium** SILTY SAND, light red to light brown, moist, fine sand	
								SW	**Val Verde Tonalite (Kut)** Highly Weathered: breaks into SAND, light gray to light red, moist, fine to coarse sand	
1695	5								@ 5' harder drilling	
				S1	35 50/3"				WEATHERED BEDROCK, very dense, light gray, moist	
1690	10								Total Depth 10' Backfilled 1/29/16 -Proposed Basin Bottom @ 1698.3	
1685	15									
1680	20									
1675	25									
1670	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG P-10

Project No.	11227.001	**Date Drilled**	1-27-16
Project	Meridian South Campus	**Logged By**	AWS
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1692'
Location	See Plate 1	**Sampled By**	AWS

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	**Topsoil / Colluvium** SILTY SAND, light red to light brown, moist, fine to coarse sand	
1690								SW	**Val Verde Tonalite (Kut)** Highly Weathred: breaks into SAND, light gray, moist, fine to coarse sand	
				S1	16 29 29				Weathered Bedrock, dense, light gray, moist	
	5									
1685									Total Depth 5' Backfilled 1/29/16 - Proposed Basin Bottom @ 1690.0	
	10									
1680										
	15									
1675										
	20									
1670										
	25									
1665										
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG P-11

Project No.	11227.001	**Date Drilled**	1-27-16
Project	Meridian South Campus	**Logged By**	AWS
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1676'
Location	See Plate 1	**Sampled By**	AWS

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
	0							SM	**Topsoil / Colluvium** SILTY SAND, light brown, moist, fine to coarse sand	
1675				S1	3 6 9				SILTY SAND, loose to medium dense, reddish brown, moist, fine sand	
									Total Depth 2' Backfilled 1/29/16 -Proposed Basin Bottom @ 1680.0	
	5									
1670										
	10									
1665										
	15									
1660										
	20									
1655										
	25									
1650										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
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- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG P-12

Project No.	11227.001	**Date Drilled**	1-27-16
Project	Meridian South Campus	**Logged By**	AWS
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1705'
Location	See Plate 1	**Sampled By**	AWS

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
1705	0							SM	**Topsoil / Colluvium** SILTY SAND, brown, moist, fine sand	
								SW	**Val Verde Tonalite (Kut)** Highly Weathered: breaks into SAND, light gray, slightly moist, fine to coarse sand	
1700	5									
				S1	7 13 27				WEATHERED BEDROCK, medium dense, light gray, slightly moist	
1695	10									
									Total Depth 10' Backfilled 1/29/16 -Proposed Basin Bottom @ 1691.4	
1690	15									
1685	20									
1680	25									
1675	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

APPENDIX A-3

RESULTS OF SEISMIC REFRACTION SURVEY (This Study)

SEISMIC REFRACTION SURVEY
MERIDIAN PARK
RIVERSIDE, CALIFORNIA

PREPARED FOR:

Leighton Consulting, Inc.
41715 Enterprise Circle North, Suite 103
Temecula, CA 92590

PREPARED BY:

Southwest Geophysics, Inc.
8057 Raytheon Road, Suite 9
San Diego, CA 92111

February 8, 2016
Project No. 116035

SOUTHWEST GEOPHYSICS, INC.
YOUR SUBSURFACE SOLUTION

February 8, 2016
Project No. 116035

Mr. Bob Riha
Leighton Consulting, Inc.
41715 Enterprise Circle North, Suite 103
Temecula, CA 92590

Subject: Seismic Refraction Survey
Meridian Park
Riverside, California

Dear Mr. Riha:

In accordance with your authorization, we have performed a seismic refraction survey pertaining to the proposed Meridian Park located in Riverside, California. Specifically, our survey consisted of performing a seismic P-wave refraction survey at the project site. The purpose of our study was to develop subsurface P-wave velocity profiles of the areas surveyed. Our services were conducted on January 20, 2016. This data report presents our survey methodology, equipment used, analysis, and results.

We appreciate the opportunity to be of service on this project. Should you have any questions related to this report, please contact the undersigned at your convenience.

Sincerely,
SOUTHWEST GEOPHYSICS, INC.

Aaron T. Puente
Project Geologist/Geophysicist

Hans van de Vrugt, C.E.G., P.Gp.
Principal Geologist/Geophysicist

REGISTERED GEOPHYSICIST
Hans van de Vrugt
No 1012
Exp. 2/29/16
STATE OF CALIFORNIA

ATP/HV/hv

Distribution: Addressee (electronic)

TABLE OF CONTENTS

1. INTRODUCTION

In accordance with your authorization, we have performed a seismic refraction survey pertaining to the proposed Meridian Park located in Riverside, California (Figure 1). Specifically, our survey consisted of performing a seismic P-wave refraction survey at the project site. The purpose of our study was to develop subsurface P-wave velocity profiles of the areas surveyed. Our services were conducted on January 20, 2016. This data report presents our survey methodology, equipment used, analysis, and results.

2. SCOPE OF SERVICES

Our scope of services included:

- Performance of five seismic P-wave profiles (SL-1 through SL-5).
- Compilation and analysis of the data collected.
- Preparation of this data report presenting our results and conclusions.

3. SITE AND PROJECT DESCRIPTION

The project site is located along the north side of 12th Street, roughly in between its intersections with Plummer Road and Ferguson Avenue in Riverside, California (Figure 1). In general the area is undeveloped and relatively flat with some low rolling hills (Figure 2). Several outcrops of granitic rock and remnant boulders were observed in the project area. Vegetation in the area of the lines consists of annual grass. Figure 3 depicts the general site conditions in the area of the lines.

Based on our discussions with you, it is our understanding that four large industrial buildings and various future lots are proposed at the site. In addition, several water retention basins are planned. Grading at the site will likely include cuts and fills with cuts up to 30 feet deep.

4. SURVEY METHODOLOGY AND ANALYSIS

A seismic P-wave (compression wave) refraction survey was conducted at the site to characterize the subsurface conditions with respect to seismic P-wave velocity in the areas surveyed. The seismic refraction method uses first-arrival times of refracted seismic waves to estimate the thicknesses and seismic velocities of subsurface layers. Seismic P-waves generated at the surface, using a hammer and plate, are refracted at boundaries separating materials of contrasting velocities. These refracted seismic waves are then detected by a series of surface vertical component 14Hz geophones and recorded with a 24-channel Geometrics Geode seismograph. The trav-travel times of the seismic P-waves are used in conjunction with the shot-to-geophone distances to obtain thickness and velocity information on the subsurface materials.

Five seismic lines (SL-1 through SL-5) were conducted in the study area. The general locations and lengths of the lines were selected by you. Shot points (signal generation locations) were conducted along the lines at the ends, midpoint, and intermediate points between the ends and the midpoint.

The seismic refraction theory requires that subsurface velocities increase with depth. A layer having a velocity lower than that of the layer above will not generally be detectable by the seismic refraction method and, therefore, could lead to errors in the depth calculations of subsequent layers. In addition, lateral variations in velocity, such as those caused by core stones, intrusions or boulders can also result in the misinterpretation of the subsurface conditions. In general, the effective depth of evaluation for a seismic refraction traverse is approximately one-third to one-fifth the length of the spread.

In general, the seismic P-wave velocity of a material can be correlated to rippability (see Table 1 below), or to some degree “hardness.” Table 1 is based on published information from the Caterpillar Performance Handbook (Caterpillar, 2011) as well as our experience with similar materials, and assumes that a Caterpillar D-9 dozer ripping with a single shank is used. We emphasize that the cutoffs in this classification scheme are approximate and that rock characteristics, such as fracture spacing and orientation, play a significant role in determining rock quality or rippability.

Table 1 – Rippability Classification	
Seismic P-wave Velocity	**Rippability**
0 to 2,000 feet/second	Easy
2,000 to 4,000 feet/second	Moderate
4,000 to 5,500 feet/second	Difficult, Possible Blasting
5,500 to 7,000 feet/second	Very Difficult, Probable Blasting
Greater than 7,000 feet/second	Blasting Generally Required

5. DATA ANALYSIS

The collected data were processed using SIPwin (Rimrock Geophysics, 2003), a seismic interpretation program, and analyzed using SeisOpt Pro (Optim, 2008). SeisOpt Pro uses first arrival picks and elevation data to produce subsurface velocity models through a nonlinear optimization technique called adaptive simulated annealing. The resulting velocity model provides a tomography image of the estimated geologic conditions. Both vertical and lateral velocity information is contained in the tomography model. Changes in layer velocity are revealed as gradients rather than discrete contacts, which typically are more representative of actual conditions.

6. RESULTS AND CONCLUSIONS

As previously indicated, five seismic traverses were conducted as part of our study and Figures 4a through 4e present the velocity models generated from our analysis. Based on the results it appears that the study areas are underlain by low velocity materials (e.g., colluvium and topsoil) in the near surface and granitic rock at depth. Distinct vertical and lateral velocity variations are evident in the models. Moreover, the degree of bedrock weathering and the depth to bedrock appears to be highly variable across the study areas. In addition, remnant boulders appear to be present in the subsurface.

Based on the refraction results, variability in the excavatability (including depth of rippability) of the subsurface materials should be expected across the project area. Furthermore, blasting may be required depending on the excavation depth, location, equipment used, and desired rate of production. In addition, oversized materials should be expected. A contractor with excavation experience in similar difficult conditions should be consulted for expert advice on excavation methodology, equipment and production rate.

7. LIMITATIONS

The field evaluation and geophysical analyses presented in this report have been conducted in general accordance with current practice and the standard of care exercised by consultants performing similar tasks in the project area. No warranty, express or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be present. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface surveying will be performed upon request.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Southwest Geophysics, Inc. should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document. This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties’ sole risk.

8. SELECTED REFERENCES

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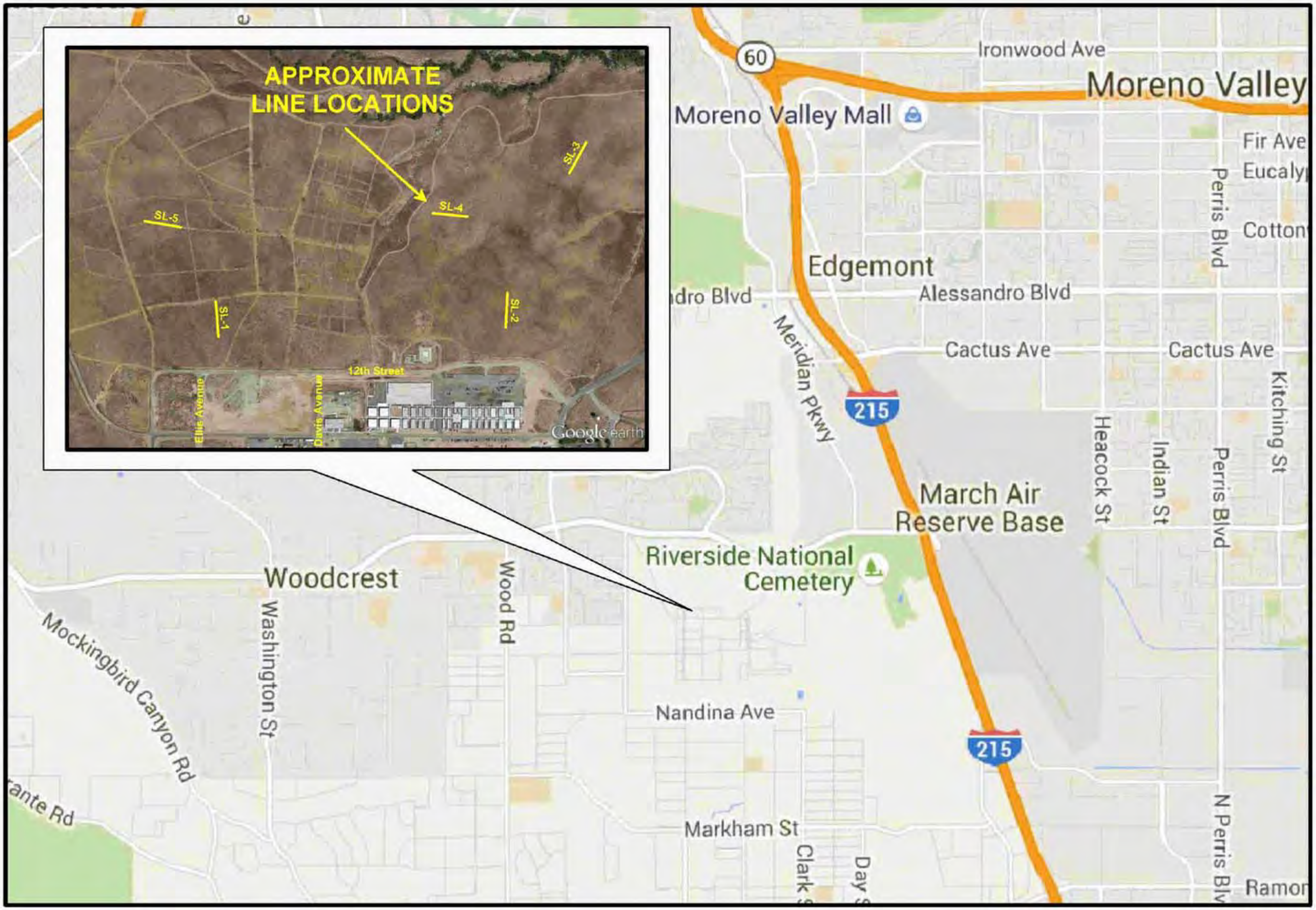


SITE LOCATION MAP

N

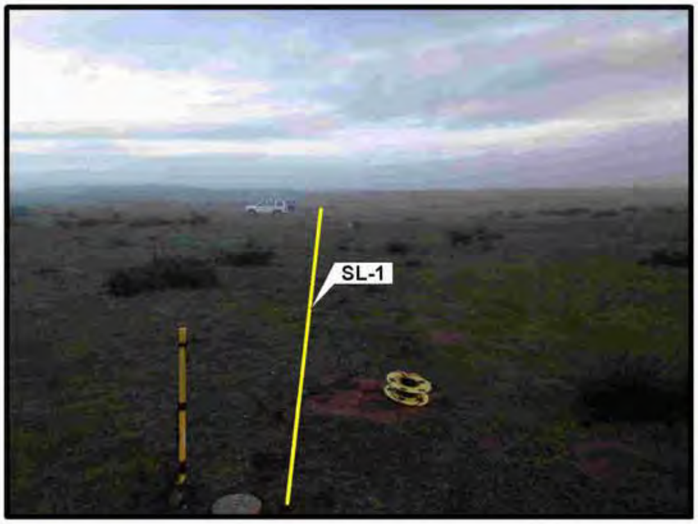
Meridian Park
Riverside, California

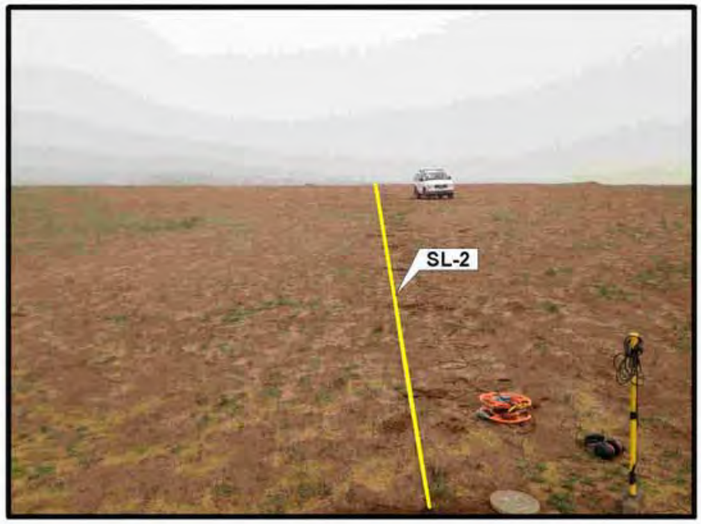
Project No.: 116035 | Date: 02/16

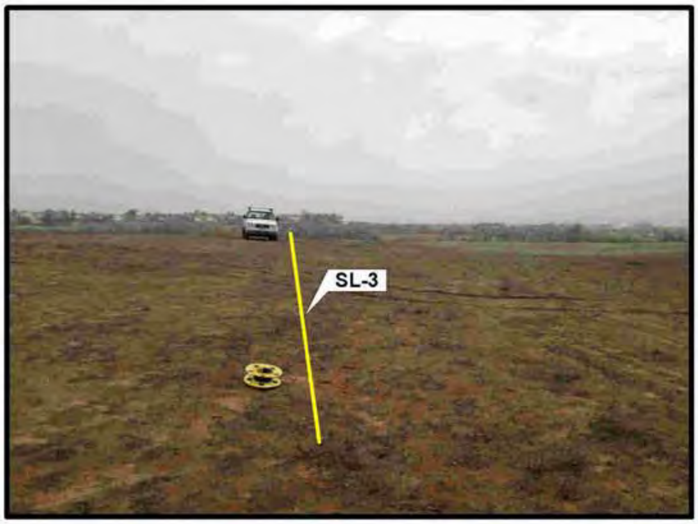
SOUTHWEST GEOPHYSICS INC.

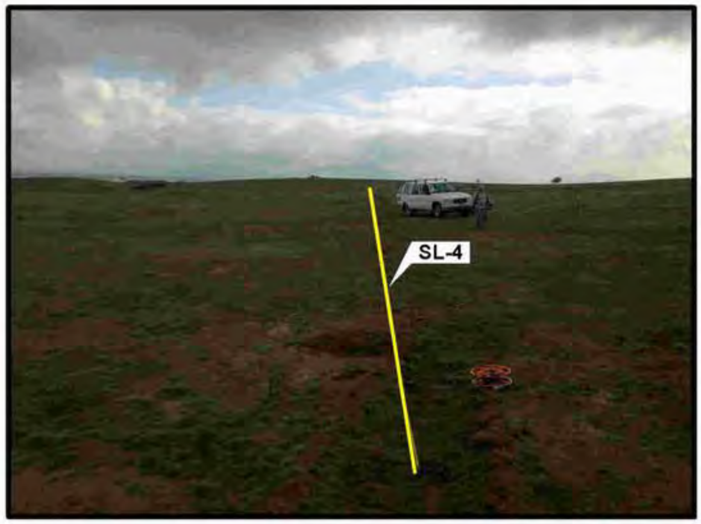
Figure 1

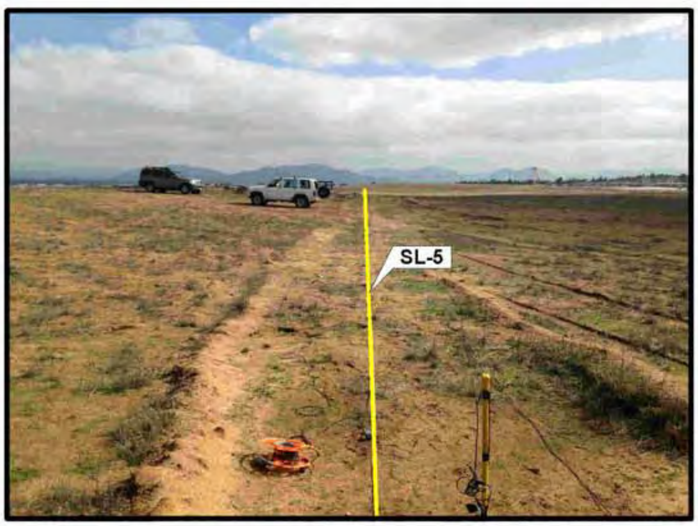
LINE LOCATION MAP (SL-1 through SL-5)	N	Meridian Park Riverside, California	SOUTHWEST GEOPHYSICS INC. Figure 2	0 400 800 approximate scale in feet
		Project No.: 116035 Date: 02/16		





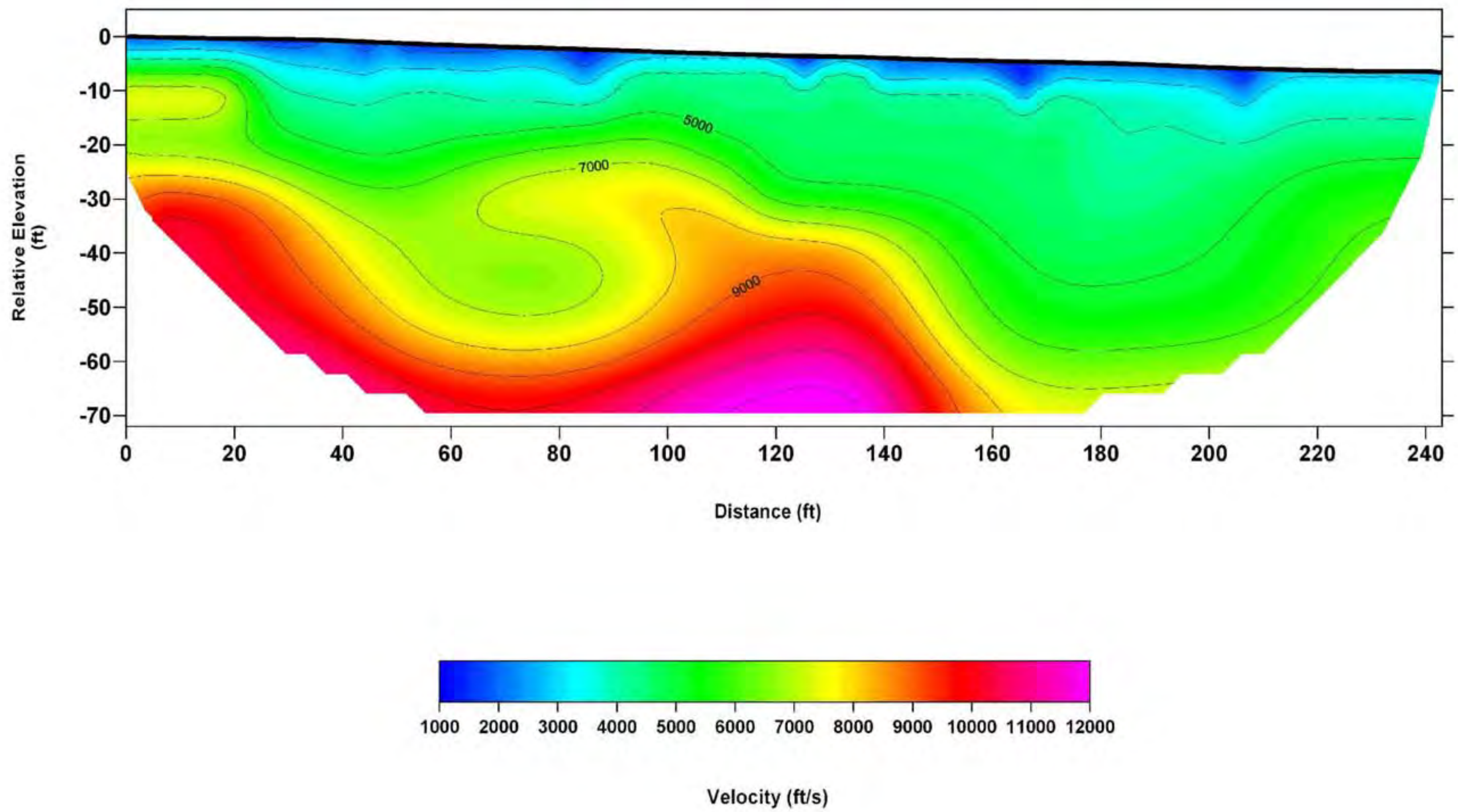






SITE PHOTOGRAPHS	Meridian Park Riverside, California Project No.: 116035 Date: 02/16	SOUTHWEST GEOPHYSICS INC. Figure 3

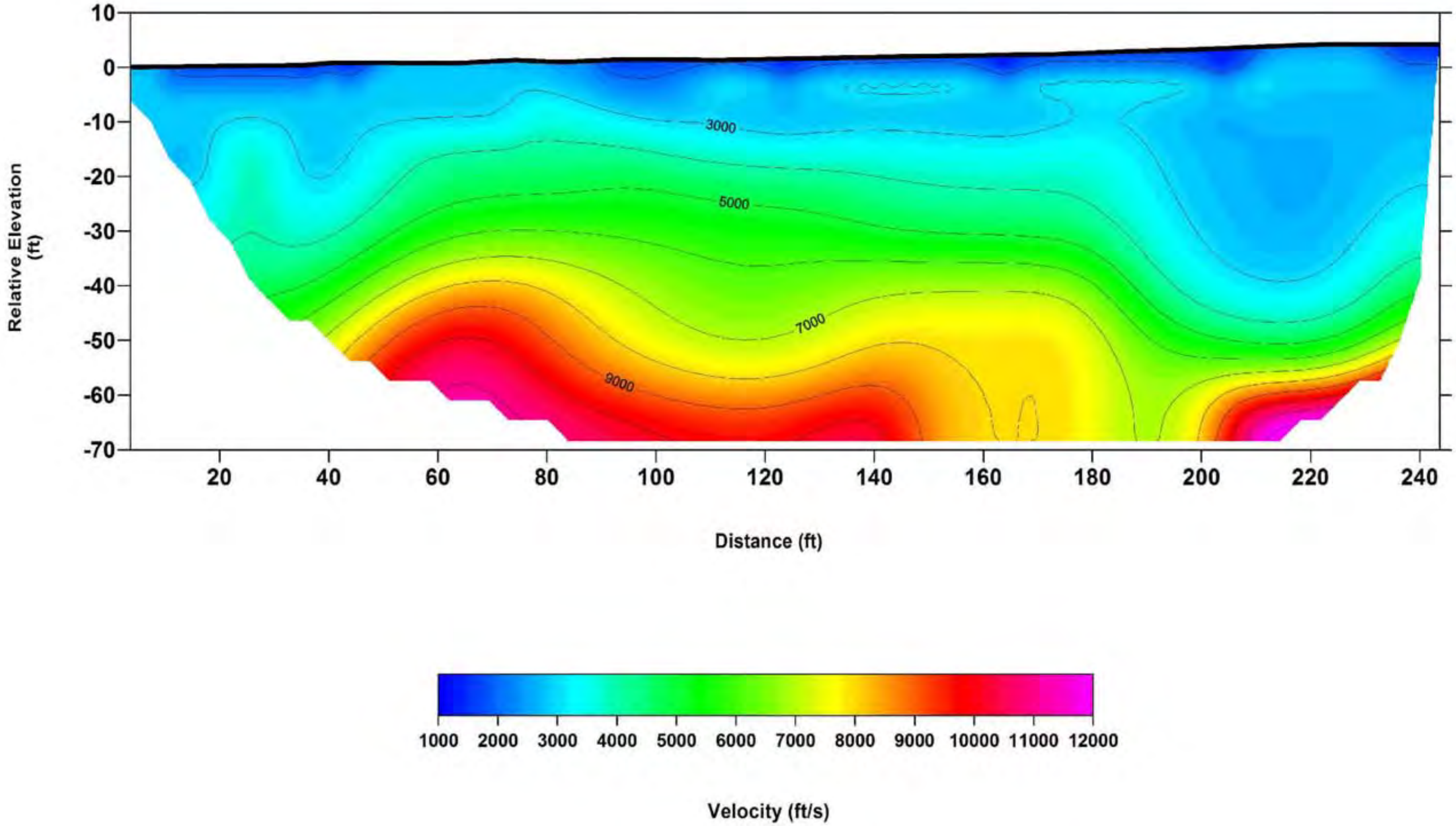
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-1	Meridian Park Riverside, California		SOUTHWEST GEOPHYSICS INC. Figure 4a
	Project No.: 116035	Date: 02/16	

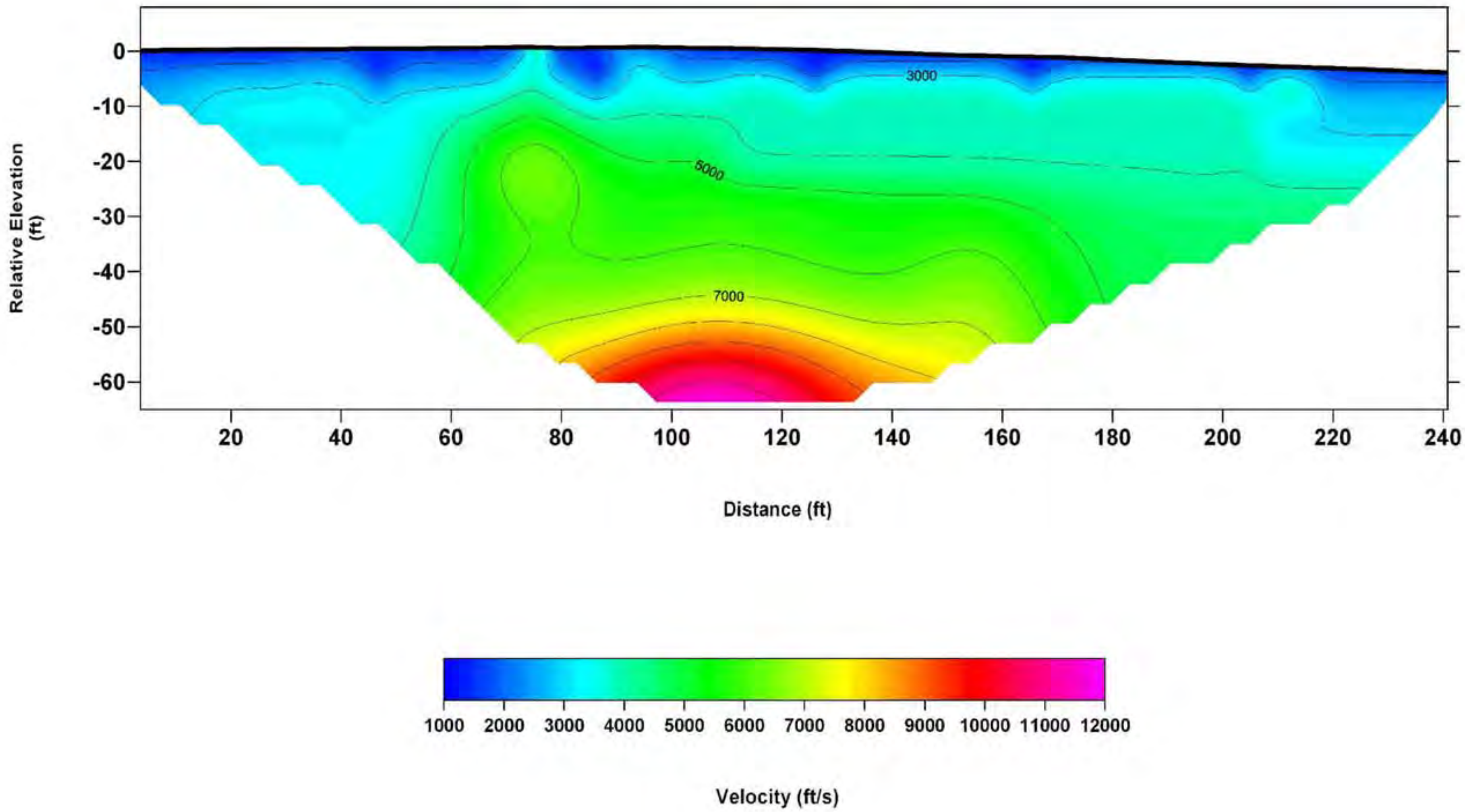
Note: Contour Interval = 1,000 feet per second

TOMOGRAPHY MODEL



SEISMIC PROFILE SL-2	Meridian Park Riverside, California	SOUTHWEST GEOPHYSICS INC. Figure 4b	**Note: Contour Interval = 1,000 feet per second**
	Project No.: 116035 / Date: 02/16		

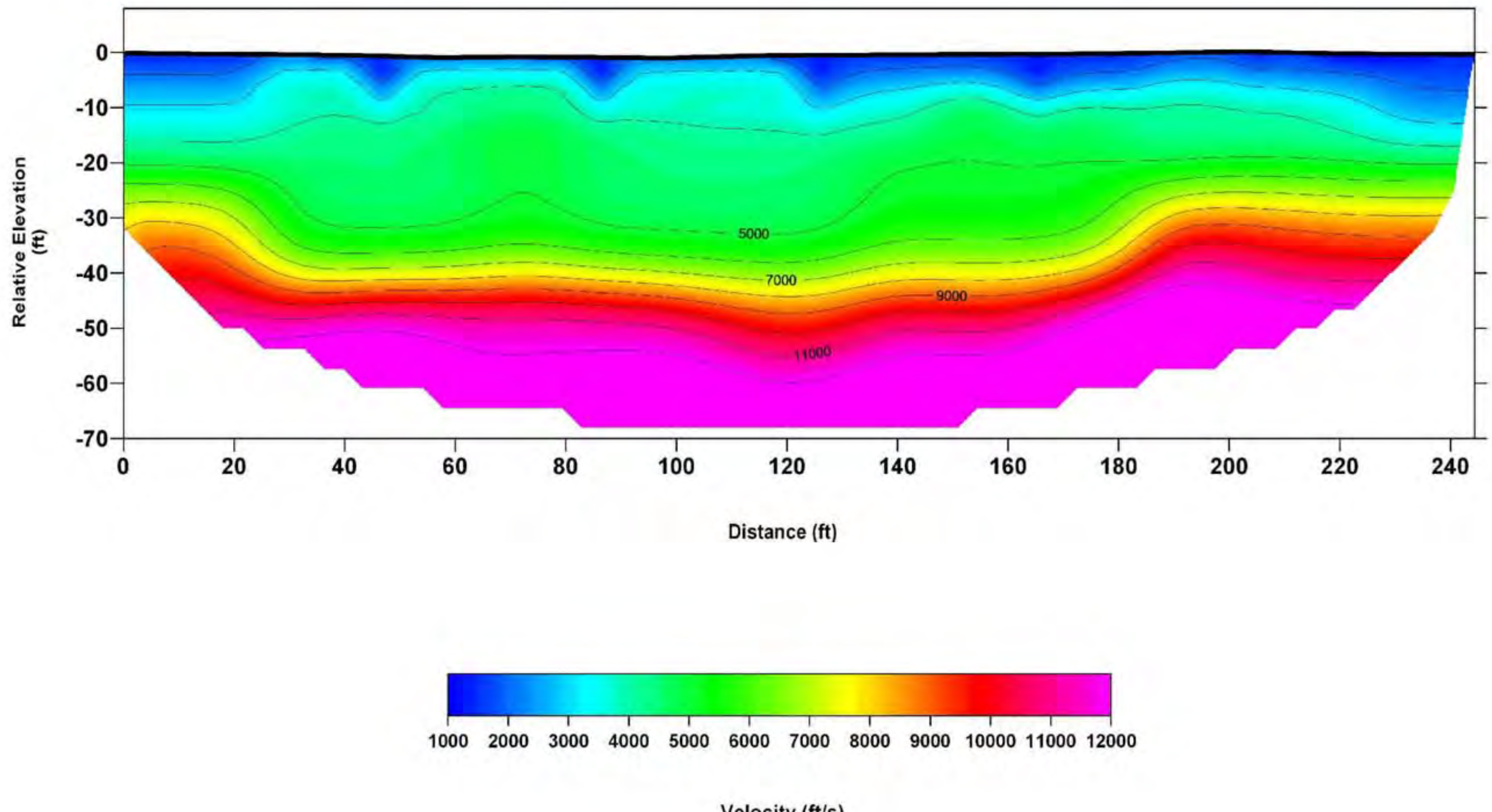
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-3	Meridian Park Riverside, California Project No.: 116035 — Date: 02/16	SOUTHWEST GEOPHYSICS INC. Figure 4c

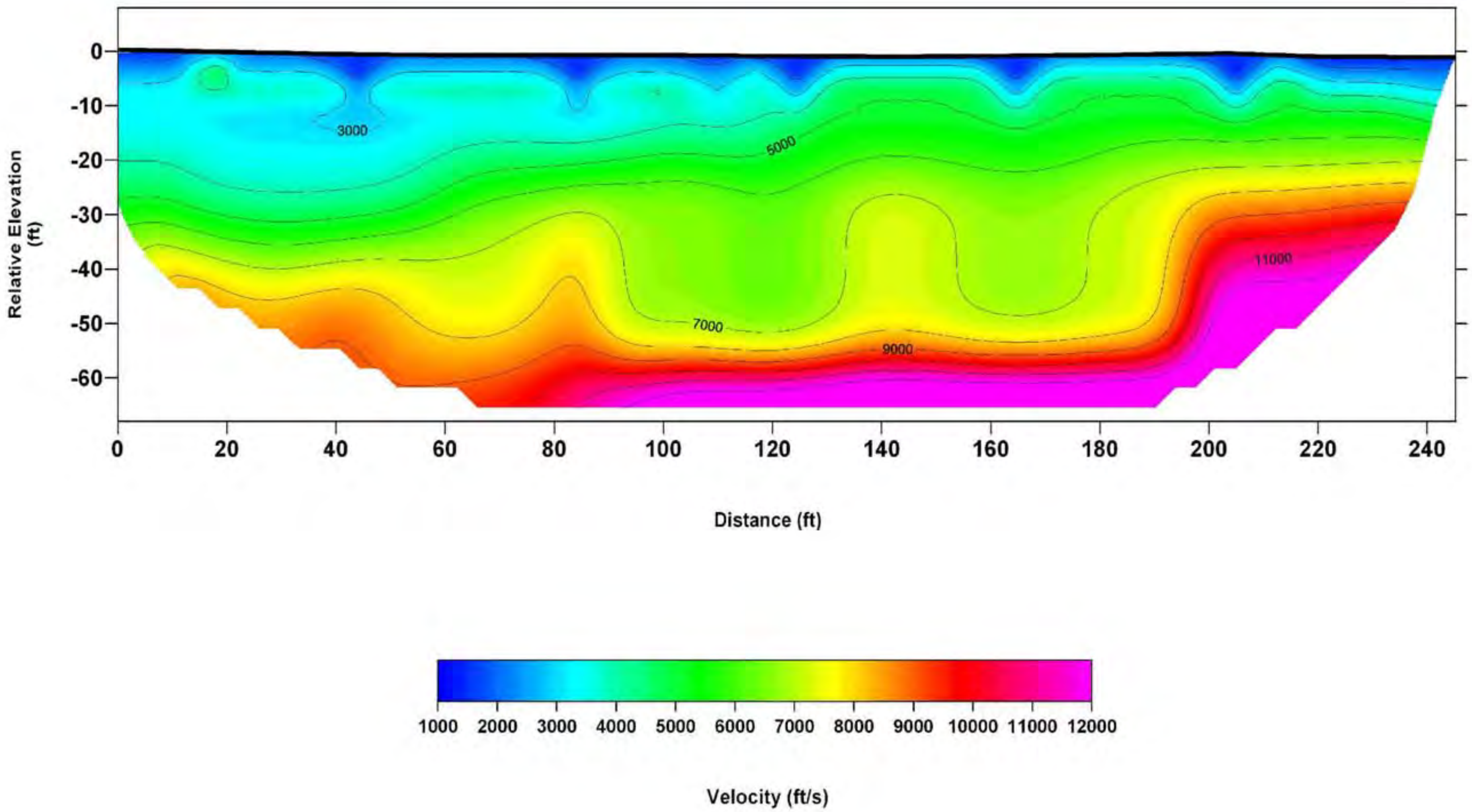
Note: Contour Interval = 1,000 feet per second

TOMOGRAPHY MODEL



SEISMIC PROFILE SL-4	Meridian Park Riverside, California	SOUTHWEST GEOPHYSICS INC. Figure 4d	**Note: Contour Interval = 1,000 feet per second**
	Project No.: 116035 / Date: 02/16		

TOMOGRAPHY MODEL



SEISMIC PROFILE SL-5	Meridian Park Riverside, California	SOUTHWEST GEOPHYSICS INC. Figure 4e
	Project No.: 116035 / Date: 02/16	

Note: Contour Interval = 1,000 feet per second

APPENDIX A-4

LOGS OF EXPLORATORY BORINGS /TEST PITS AND RESULTS OF SEISMIC REFRACTION SURVEY (Previous Studies by Zeiser Kling and Inland Foundation)

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-1**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/5/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1710.0

Sample types: Standard Split Spoon; Shelby Tube; California; Bulk Sample. Water Level ATD; Static Water Table.

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			Bulk				**Topsoil (No Map Symbol):** Silty SAND (SM): Red-brown, damp to moist, very dense, micaceous, fine grained, organics.			
			California	41 50/6"	4.3	132	**Val Verde Tonalite (Kvt):** Bedrock: Rust brown, moderately to severly weathered, weak to moderately strong, heavy oxidation.			
1705	5						@ 5 Feet: Soft, micaceous, fine to medium grained.			
			California	25 50/5"	7.3	129	@ 7 Feet: Rust brown, moderately strong, moderately weathered.			
1700	10									
			California	50/4"	2.6	107	@ 12 Feet: Gray-white.			
1695	15									
			Standard Split Spoon	50/5"						
1690	20									
			California	50/3"	1.6	110				
1685	25									
			Standard Split Spoon	50/3"						

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LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-1
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/5/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1710.0

Sample types: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Val Verde Tonalite (Kvt): Bedrock: Rust brown, moderately to severly weathered, weak to moderately strong, heavy oxidation. *(continued)*			
			California	50/3"	5.3	117	@ 32 Feet: Damp.			
							Total Depth = 32 Feet 3 Inches No Groundwater Encountered Backfilled with Cuttings			

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-2**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/5/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1700.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			California	8 21 50/5"	4.0	129	**Val Verde Tonalite (Kvt):** Bedrock: Granite, rust brown, dry, weak, heavy oxidation, severely weathered.			
1695	5		California	50/3"	5.1	104	@ 5 Feet: More fine grained, completely weathered.			
1690	10		California	50/6"	4.1	120	@ 10 Feet: Coarse grained, less oxidized, severely weathered.			
1685	15		California	50/3"	2.1	115	@ 15 Feet: Less oxidized than before, moderately weathered.			
1680	20		Standard Split Spoon	50/5"						
1675	25		California	50/2"			@ 25 Feet: No Recovery			

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-2**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/5/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1700.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Val Verde Tonalite (Kvt): Bedrock: Granite, rust brown, dry, weak, heavy oxidation, severely weathered. *(continued)*			
1665	35			50/3"			@ 35 Feet: Granite, rust-brown, dry, weak, less oxidation, coarse grained, moderately weathered.			
							Total Depth = 35 Feet 3 Inches No Groundwater Encountered Backfilled with Cuttings			

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LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-3
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/5/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1678.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Older Alluvium (Qoal): Silty SAND (SM): Red-brown, damp, medium dense to dense, micaceous, fine grained, organics.			
			California	18 50/6"	7.0	132	**Val Verde Tonalite (Kvt):** Bedrock: Brown, moderately strong, moderately weathered.			
1675										
	5		California	50/6"	2.7	109				
1670										
	10		California	50/5"	5.1	110	@ 10 Feet: Pink-gray, moderately weathered, friable to weak.			
1665										
	15		California	50/5"	3.7	116	@ 15 Feet: Gray-white, friable. Recovered as poorly graded sand.			
1660										
	20		Standard Split Spoon	14 16 27			@ 20 Feet: Pink-brown.			
1655										
	25		California	50/4"	4.0	105	@ 25 Feet: Gray. Recovered as poorly graded sand. Poor recovery of sample.			
							Total Depth = 25 Feet 4 Inches No Groundwater Encountered Backfilled with cuttings.			

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-4
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/5/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1648.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			California	50/5"	2.2	129	**Older Alluvium (Qoal):** Silty SAND (SM): Brown, moist, very dense, micaceous, fine to medium sand.			Shoe: Med. Sand
1645							**Val Verde Tonalite (Kvt):** Bedrock: Light brown, moderately weathered, weak. Recovered as poorly graded sand.			
	5		California	50/5"	2.5	123	@ 5 Feet: Light gray, slighty weathered, weak. Recovered as poorly graded sand.			Shoe: Med. Sand
1640										
	10		California	50/5"	2.8	121	@ 10 Feet: Olive gray, increased mica content, friable, moderately weathered. Recovered as poorly graded sand.			Shoe: Fine to Med. Sand
1635										
	15		California	50/5"	3.9	111	@ 15 Feet: Light gray. Recovered as poorly graded sand.			Shoe: Fine to Med. Sand

Total Depth = 15 Feet 5 Inches
No Groundwater Encountered
Backfilled with cuttings.

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-5**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/5/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1666.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1665			California	13 18 33	11.0	125	**Recent Alluvium (Qal):** Silty SAND (SM): Light brown, dry, dense, pinhole porosity, micaceous, medium grained, rootlets, trace of clay.		CN	
							Val Verde Tonalite (Kvt): Bedrock: Rust-brown, moderately weathered, weak. Recovered as poorly graded sand.			
1660	5		California	13 50/5"	7.2	122	@ 5 Feet: Light gray, moderately weathered, weak.			
1655	10		California	50/4"	3.7	105	@ 10 Feet: Quartz-rich layer: white, damp, friable, poorly cemented, becomes more coarse-grained towards bottom, light brown, severely weathered, friable.			
1650	15		California	50/4"	3.3	113	@ 15 Feet: Green-gray, slightly weathered, weak.			
1645	20		Standard Split Spoon	50/5"			@ 20 Feet: Green-gray, slightly weathered, friable.			
							∇			
	25		California	50/3" 50/3"			@ 25 Feet: No recovery in rings. @ 25.5 Feet: Green-gray, slightly weathered friable, wet.			

Total Depth = 25 Feet 6 Inches
Groundwater Encountered at 23 Feet 7 Inches
Backfilled with cuttings.

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LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-6
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/5/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1664.0

Sample types: Standard Split Spoon; Shelby Tube; California; Bulk Sample. Water Level ATD; Static Water Table.

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Older Alluvium (Qoal): Silty SAND (SM): Brown, damp, very dense, micaceous.			
			California	32 50/6"	4.9	137	**Val Verde Tonalite (Kvt):** Bedrock: Brown to green, severely weathered, weak. Recovered as silty sand.			
1660										
	5		California	27 50/6"	12.1	122	@ 5 Feet: Yellow-orange, moderately weathered, weak. Recovered as silty sand.			
1655										
	10		California	50/4"	2.4	114	@ 10 Feet: Light to yellow-orange, friable to weak. Recovered as poorly graded sand.			
1650										
	15		California	50/4"	2.2	118	@ 15 Feet: Light gray, slightly weathered, weak.			
1645										
	20		Standard Split Spoon	50/4"						
1640										
	25		California	50/3"	2.9	124	@ 25 Feet: Olive-gray, heavy mica content, completely weathered, friable.			
1635							∇			

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LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-6
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/5/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1664.0

Sample legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				50/4"			@ 30 Feet: Light gray.			
							Total Depth = 30 Feet 4 Inches Groundwatered Encountered at 29 Feet 3 Inches Backfilled with cuttings.			
1630										

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LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	LNR/South Campus	Boring No.:	B-7
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/5/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1681.5

Sample types: Standard Split Spoon; Shelby Tube; California; Bulk Sample. Water Level ATD; Static Water Table.

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1680			California	22 24 50/6"	7.6	134	**Val Verde Tonalite (Kvt):** Bedrock: Orange-brown, dry, moderately weathered, weak. Recovered as poorly graded sand.			
	5		California	22 50/5"	2.7	121	@ 5 Feet: Yellow-orange, damp, severely weathered.			
1675										
	10		California	50/5"	3.2	121	@ 10 Feet: Brown.			
1670										
	15		Standard Split Spoon	33 50/3"						
							Total Depth = 15 Feet 9 Inches No Groundwater Encountered Backfilled with cuttings.			

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-8
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/5/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1688.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
	0				**Recent Alluvium (Qal):** Silty to Clayey SAND (SC-SM): Light brown, damp, loose, pinhole porosity, caliche stringers, slightly micaceous.			
1685		5 5 5	8.7	113			CN MAX	
	5							
	7	33 50/4"	5.3	133	**Val Verde Tonalite (Kvt):** Bedrock: Yellow-orange, damp, severely weathered, friable. Recovered as poorly graded sand.			
1680	10							
	12	50/3"	2.0	115	@ 12 Feet: Olive-gray, moderately weathered, weak. Recovered as silty sand.			
1675	15							
	17	50/4"						

Total Depth = 17 Feet 4 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-9
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/5/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1707.5

Sample types: Standard Split Spoon; Shelby Tube; California; Bulk Sample. Water Level ATD; Static Water Table.

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Older Alluvium (Qoal): Silty SAND (SM): Brown, moist, very dense, micaceous, rootlets, fine to medium sand.			
			California	16 50/5"	1.9	134	**Val Verde Tonalite (Kvt):** Bedrock: Yellow-orange, severely weathered, friable. Recovered as poorly graded sand.			
1705										
	5		California	50/5"	2.0	120	@ 5 Feet: Yellow-orange to light gray, severely weathered, friable.			
1700										
	10		California	50/4"	1.6	113	@ 10 Feet: Olive gray. Recovered as silty sand.			
1695										
	15		Standard Split Spoon	50/4"			@ 15 Feet: No Recovery			
1690										
	20		Standard Split Spoon	50/4"						

Total Depth = 20 Feet 4 Inches
No Groundwater Encountered
Backfilled with Cuttings

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LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-10**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/6/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1654.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			California	37 50/4"	3.3	134	**Val Verde Tonalite (Kvt):** Bedrock: Yellow-orange, severely weathered, friable. Recovered as poorly graded gravel.			
1650	5		California	50/6"	2.1	121	@ 5 Feet: Moderately weathered. Recovered as poorly graded sand with silt and gravel.			
1645	10		California	50/4"	1.3	116	@ 10 Feet: Olive-gray, moderately weathered.			
1640	15		Bulk / California	50/6"	1.4	121	@ 15 Feet: Light gray, slightly weathered.		MAX	
1635	20		Standard Split Spoon	50/4"						
1630	25		Standard Split Spoon	50/2"			@ 25 Feet: No Recovery			

Total Depth = 25 Feet 2 Inches
No Groundwater Encountered
Caving Encountered to 10 Feet

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-17**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/7/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1721.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1720		Bulk				**Topsoil:** Silty SAND (SM): Light brown, moist, loose to medium dense, micaceous, rootlets, becomes more firm towards bottom of sample w/increase in clay content.			
		California	9 10 7	10.7	107				
	5					**Val Verde Tonalite (Kvt):** Bedrock: Rusty-gray, severely weathered, slightly weak. Recovered as poorly graded sand.			
1715		California	50/4"	5.5	113				
1710	10	California	50/3"	5.6	111				
1705	15	Bulk						WA, DS, MAX	
		California	50/5"	6.0	112	@ 17 Feet: Friable. Recovered as silty sand.			
1700	20	Standard Split Spoon	50/4"			@ 22 Feet: Less weathered.			
1695	25	California / Standard Split Spoon	50/3" 50/2"			@ 27 Feet: No recovery. @ 27 Feet 5 Inches: No recovery.			

Total Depth = 27 Feet 6 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-18
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/7/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1705.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Older Alluvium (Qoal):			
			California	50/5"	7.7	112	Clayey SAND (SC): Red-brown, moist, very dense, micaceous, rootlets, caliche stringers.			
							Val Verde Tonalite (Kvt): Bedrock: Yellowish-gray, severely weathered, friable. Recovered as poorly graded sand.			
1700	5		California	50/4"	5.5	108	@ 5 Feet: Brown-gray, severely weathered, fraible.			
1695	10		California	50/5"	2.7	115	@ 10 Feet: Yellowish-orange, more micaceous.			
1690	15		Standard Split Spoon	50/5"			@ 15 Feet: Yellow-gray, moderately weathered, weak.			

Total Depth = 15 Feet 5 Inches
No Groundwater Encountered
Backfilled with Cuttings

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LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	LNR/South Campus	Boring No.:	**B-20**
Project Number:	07100-01	Driller:	2R Dilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/7/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1714.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			California	37 50/3"	13.3	128	**Topsoil (No Map Symbol):** Clayey SAND (SC): Light brown, moist, very dense, micaceous, rootlets, earthy.	≥4.50(t)		
							Val Verde Tonalite (Kvt): Bedrock: Yellow-gray, severely weathered, slightly weak. Recovered as poorly graded sand.			
1710										
	5		California	50/6"	5.2	108	@ 5 Feet: Yellow-gray, severely weathered, friable.			
1705										
	10		California	50/6"	2.2	116	@ 10 Feet: Light gray, moderately weathered, friable.			
1700										
	15		Standard Split Spoon	50/5"			@ 15 Feet: Friable to weak.			

Total Depth = 15 Feet 5 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project: LNR/South Campus
Project Number: 07100-01
Date Drilled: 2/7/08
Logged By: SMW

Boring No.: B-21
Driller: 2R Dilling
Drill Type: Hollow Stem Auger
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: 1725.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				28 50/3"	9.1	117	Topsoil (No Map Symbol): Silty SAND (SM): Brown, moist, dense to very dense ,micaceous, rootlets, earthy.		DS, MAX	
							Val Verde Tonalite (Kvt): Bedrock: Yellow-brown, severely weathered, friable. Recovered as poorly graded sand.			
1720	5			50/6"	4.9	115	@ 5 Feet: Yellow-gray, severely weathered, friable.			
1715	10			50/5"	2.9	113	@ 10 Feet: Yellowish-gray.			
1710	15			50/5"	2.1	112	@ 15 Feet: Light gray, moderately weathered.			

Total Depth = 15 Feet 5 Inches
No Groundwater Encountered
Backfilled with Cuttings

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-22
Project Number:	07100-01	Driller:	2R Dilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/7/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1726.0

Standard Split Spoon · Shelby Tube · Water Level ATD · California · Bulk Sample · Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1725			California	10 21 50/5"	6.0	131	**Topsoil (No Map Symbol):** Silty SAND (SM): Brown, damp to moist, medium dense, micaceous, rootlets.			
							Val Verde Tonalite (Kvt): Bedrock: Yellow-gray, severely weathered, slightly weak.			
	5		California	50/4"	4.1	111	@ 5 Feet: Yellow-gray, severely weathered, friable. Recovered as poorly graded sand.			
1720										
	10		California	50/6"	2.1	112	@ 10 Feet: Light gray.			
1715			Bulk Sample							
	15		Standard Split Spoon	32 50/4"			@ 15 Feet: Moderately weathered.			

Total Depth = 15 Feet 10 Inches
No Groundwater Encountered
Backfilled with Cuttings

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LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	LNR/South Campus	Boring No.:	**B-23**
Project Number:	07100-01	Driller:	2R Dilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/7/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1726.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1725							**Older Alluvium (Qoal):** Silty SAND (SM): Red-brown, slightly damp, dense, micaceous, rootlets towards top of sample.			
			California	9 21 50/5"	6.8	122				
							Val Verde Tonalite (Kvt): Bedrock: Brown-gray, severely wathered, friable. Recovered as poorly graded sand.			
	5									
1720										
			California	50/5"	4.3	110	@ 7 Feet: Gray-brown, severely weathered, friable.			
	10									
1715										
			California	50/4"	4.1	107	@ 12 Feet: Yellow-dark gray.			
	15									
1710										
			Standard Split Spoon	30 50/5"						
							Total Depth = 17 Feet 11 Inches No Groundwater Encountered Backfilled with Cuttings			

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LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	LNR/South Campus	Boring No.:	B-24
Project Number:	07100-01	Driller:	2R Dilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/7/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1740.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Recent Alluvium (Qal): Silty SAND (SM): Brown, moist, very dense, slightly micaceous, rootlets.			
			California	50/6"	11.8	120				
							Val Verde Tonalite (Kvt): Bedrock: Yellow-orange, completely weathered, friable. Recovered as poorly graded sand.			
1735	5		California	50/5"	3.2	112	@ 5 Feet: Light gray, severely weathered, friable.			
1730	10		California	50/5"	2.5	113	@ 10 Feet: Olive-gray.			
1725	15		Standard Split Spoon	50/5"			@ 15 Feet: Light gray.			

Total Depth = 15 Feet 5 Inches
No Groundwater Encountered
Backfilled with Cuttings

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-25
Project Number:	07100-01	Driller:	2R Dilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/7/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1733.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Older Alluvium (Qoal):			
			California	17 50/5"	6.9	126	Silty SAND (SM): Light brown, damp, very dense, slightly micaceous, rootlets in upper 6 inches, becomes drier with depth.			
1730										
							Val Verde Tonalite (Kvt):			
	5		California	38 50/3"	5.0	125	Bedrock: Yellow-dark gray, completely weathered, friable. Recovered as poorly graded sand. @ 5 Feet 6 Inches: Severely weathered.			
1725										
	10		California	50/6"	5.1	116	@ 10 Feet: Yellow-gray.			
1720										
	15		Standard Split Spoon	50/6"			@ 15 Feet: Light gray.			

Total Depth = 15 Feet 6 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-26
Project Number:	07100-01	Driller:	2R Dilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/7/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1732.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
					Older Alluvium (Qoal): Silty SAND (SM): Light brown, damp, dense, slightly micaceous, pinhole porosity, rootlets in upper 12 inches of sample.			
1730		12 26 50/4"	7.9	130				
					Val Verde Tonalite (Kvt): Bedrock: Yellow-gray, severely weathered, slightly weak. Recovered as poorly graded sand.			
	5							
1725		50/6"	5.1	114	@ 7 Feet: Yellow-gray, severely weathered, friable.			
	10							
1720		50/5"	4.9	115	@ 12 Feet: Yellow-gray, slightly moist.			
	15							
1715		34 50/4"			@ 17 Feet: Yellow-gray, wet, moderately weathered.			

Total Depth = 17 Feet 10 Inches
Groundwater Encountered at 15 Feet 6 Inches
(After 30 min. at 11 Feet 7 Inches)
Backfilled with Cuttings

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LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-56**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/13/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1677.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
		Bulk Sample				**Topsoil (No Map Symbol):** Silty SAND (SM): Light brown, moist, dense, pinhole porosity, micaceous, fine to medium grained sand.			
1675		California	7 14 24	6.7	124				
	5								
						Val Verde Tonalite (Kvt): Bedrock: Yellow-black, damp, severely weathered, moderately strong. Recovered as poorly graded sand.			
1670		California	36 50/3"	5.3	120				
	10								
1665		California	50/4"	2.8	113	@ 12 Feet: Light gray, moderately weathered. Recovered as silty sand.			
		Bulk Sample						RV, MAX	
	15								
1660		Standard Split Spoon	50/5"						
						Total Depth = 17 Feet 4 Inches No Groundwater Encountered Backfilled with Cuttings			

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LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	LNR/South Campus	Boring No.:	**B-57**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/13/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1656.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1655			California	10 12 8	5.9	112	**Val Verde Tonalite (Kvt):** Bedrock: Red-brown, slightly moist, completely weathered, weak, highly oxidized. Recovered as silty sand.			
1650	5		California	22 50/6"	2.6	127	@ 5 Feet: Yellowish-black, slightly moist, severely weathered. Recovered as well graded sand.			
1645	10		California	36 50/6"	3.3	127	@ 10 Feet: Damp.			
	15		Standard Split Spoon	50/4"			@ 15 Feet: Slightly damp. Total Depth = 15 Feet 4 Inches No Groundwater Encountered Backfilled with Cuttings			

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-58**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/13/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1708.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				7 9 11	4.8	98	**Topsoil:** Silty SAND (SM): Light brown, damp, medium dense, porous, rootlets, slightly micaceous.			
1705										
	5			20 50/5"	4.0	127	**Val Verde Tonalite (Kvt):** Bedrock: Yellow-brown, damp, severely weathered, slightly weak, slightly oxidized. Recovered as well graded sand.			
1700										
	10			50/5"	3.8	123	@ 10 Feet: Yellowish-gray.			
1695										
	15			50/6"						
							Total Depth = 15 Feet 6 Inches No Groundwater Encountered Backfilled with Cuttings			

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LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-68**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/13/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1629.0

Sample type legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Topsoil (No Map Symbol): Silty SAND (SM): Light brown, damp, loose to medium dense, slightly micaceous, pinhole porosity.			
			California	5 7 7	3.4	110				
1625							**Recent Alluvium (Qal):** Silty SAND (SM): Light brown, damp, loose, slightly micaceous, pinhole porosity, fine to medium grained sand.			
	5		California	4 4 5	3.9	109				
1620							**Val Verde Tonalite (Kvt):** Bedrock: Light tan, damp, medium to coarse grained, weak, moderately weathered.			
	10		California	50/3"	2.3	116				
1615										
	15		California	50/5"	3.3	122	@ 15 Feet: Light olive-gray. Recovered as well graded sand.			
1610										
	20		Standard Split Spoon	50/6"						

Total Depth = 15 Feet 11 Inches
No Groundwater Encountered
Backfilled with Cuttings

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LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-69**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/14/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1631.0

Sample types: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Recent Alluvium (Qal):			
1630			California	8 16 22	6.8	122	Silty to Clayey SAND (SM-SC): Light brown, slightly moist, dense, caliche stringers, fine to medium grained.			
1625	5		California	7 11 13	4.8	112	@ 5 Feet: Rootlets, medium grained, pinhole porosity.			
1620	10		California	7 14 47	4.7	129	**Val Verde Tonalite (Kvt):** Bedrock: Yellowish-brown, completely to severely weathered, moderately strong. Recovered as well graded sand.		GS	
	15			50/1"			@ 15 Feet: No Recovery - Auger Refusal			

Total Depth = 15 Feet
No Groundwater Encountered
Practical Refusal
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-69A**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/14/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1631.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1630							SEE B-69 FOR UPPER STRATA DESCRIPTION			
1625	5									
1620	10									
1615	15			50/2.5"	2.3	120	**Val Verde Tonalite (Kvt):** Bedrock: Brown-gray, moderately to severely weathered, moderately strong. Recovered as well graded sand.			
1610	20			27 50/3.5"			@ 20 Feet: Yellowish-gray, moderately weathered. Recovered as poorly graded sand.			
1605	25			50/2"	6.8	122	@ 25 Feet: Light gray, moist to wet.			

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LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-69A**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/14/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1631.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				50/4"			**Val Verde Tonalite (Kvt):** Bedrock: Brown-gray, moderately to severely weathered, moderately strong. Recovered as well graded sand. *(continued)* @ 30 Feet: Brown-gray, wet, slightly weathered, strong.			
1600										
	35			50/1"	11.6	121	@ 35 Feet: Dark gray, wet, strong.			
1595										
	40			50/2"						
1590										
	45			50/1.5"			@ 45 Feet: No Recovery			

Total Depth = 45 Feet 1.5 Inches
Groundwater Encountered at 25 Feet 3 Inches
(After 20 min. at 22 Feet 6 Inches)
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-70
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/14/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1621.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1590				50/6"			**Val Verde Tonalite (Kvt):** Bedrock: Yellowish-gray, slightly damp, moderately weathered, weak. Recovered as well graded sand. *(continued)* @ 30 Feet: Brown-dark gray, wet.			
1585	35			50/2.5"	12.8	117	@ 35 Feet: Light olive gray, slightly weathered, friable.			
	40			19 50/5"			@ 40 Feet: Dark gray, moderately weathered.			

Total Depth = 40 Feet 11 Inches
Groundwater Encountered at 25 Feet 6 Inches
(After 20 min. at 24 Feet 7 Inches)
Backfilled with Cuttings

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LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-71**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/14/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1625.0

Legend (Sample Type): Standard Split Spoon; Shelby Tube; California; Bulk Sample. Water Level ATD; Static Water Table.

Elevation [ft]	Depth [ft]	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Topsoil (No Map Symbol): Silt to Silty SAND (ML-SM): Light yellowish-brown, damp, medium dense, micaceous, some caliche stringers, some pinhole porosity, fine grained sand.			
		California	6 7 7	8.5	111			CN	
						Older Alluvium (Qoal): Silty SAND (SM): Yellowish-orange, dense, more pinhole porosity, some coarse sand, damp, some caliche stringers.			
1620	5	California	16 23 20	5.9	113			CN	
						Val Verde Tonalite (Kvt): Bedrock: Light yellowish-gray, dry, severely weathered, weak. Recovered as well graded sand.			
1615	10	California	50/5.5"	3.5	115				
1610	15	California	50/5.5"	4.7	119	@ 15 Feet: Greenish-gray, slightly moist, moderately weathered.			
1605	20	Standard Split Spoon	50/6"			@ 20 Feet: Yellowish-green grey.			

Total Depth = 20 Feet 6 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project: LNR/South Campus
Project Number: 07100-01
Date Drilled: 2/14/08
Logged By: SMW

Boring No.: B-72
Driller: 2R Drilling
Drill Type: Hollow Stem Auger
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: 1638.0

Sample types: Standard Split Spoon; Shelby Tube; California; Bulk Sample. Water Level ATD; Static Water Table.

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			California	50/5"	9.0	116	**Older Alluvium (Qoal):** Silty SAND (SM): Red-brown, moist, very dense, micaceous, abundant rootlets, becomes more dry towards bottom of sample, trace of clay.			
1635							**Val Verde Tonalite (Kvt):** Bedrock: Yellowish-green, moderately weathered, weak. Recovered as well graded sand.			
	5		California	50/6"	6.0	119				
1630										
	10		California	23 50/3"	6.9	122	@ 10 Feet: Quartz-rich layer; light tan, poorly cemented, fine to medium grained, damp, contains greenish-red clay at top of sample.			
1625							Total Depth = 13 Feet No Groundwater Encountered Practical Refusal Backfilled with Cuttings			

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-73
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/14/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1633.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Recent Alluvium (Qal): Well-Graded SAND (SW): Light brown, damp, dense, pinhole porosity, micaceous, some caliche, medium to coarse sand.			
1630			California	14 22 26	2.8	117	**Val Verde Tonalite (Kvt):** Bedrock: Red-orange, damp, completely weathered, weak. Recovered as well graded sand.			
	5									
			California	50/4.5"	3.8		@ 7 Feet: Yellowish-green, damp, moderately weathered, friable.			
1625										
	10									
			California	41 50/3"	6.0	121	@ 12 Feet: Quartz-rich layer; light tannish-yellow, moist, fine to medium grained, well cemented, slightly weathered, strong to very strong.			
1620										
	15									
			Standard Split Spoon	50/4"			@ 17 Feet: No Recovery			
							Total Depth = 17 Feet 4 Inches No Groundwater Encountered Backfilled with Cuttings			

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	LNR/South Campus	Boring No.:	**B-74**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/14/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1640.0

Sample types: Standard Split Spoon; Shelby Tube; California; Bulk Sample. Water Level ATD; Static Water Table.

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Val Verde Tonalite (Kvt):			
			California	16 38 50/4"	2.3	134	Bedrock: Yellowish-dark gray, slightly damp, moderately weathered, rootlets in upper 6 inches, weak to moderately strong. Recovered as well graded sand.			
1635	5		California	50/5"	2.3	123	@ 5 Feet: No rootlets, dry.			
1630	10		California	50/4"	1.8	122	@ 10 Feet: Damp.			
1625	15			50/2"	2.9	112	@ 15 Feet: Quartz-rich layer; yellowish-light gray, moist, poorly cemented, fine to medium grained, some coarse grains.			
1620	20		Standard Split Spoon	50/5"			@ 20 Feet: Olive-gray, wet, moderately weathered, friable, more coarse grained.			

Total Depth = 20 Feet 5 Inches
Groundwater Encountered at 18 Feet 8 Inches
(After 10 min. at 18 Feet)
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-75
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/14/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1700.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			California	12 31 50/5"	4.6	135	**Val Verde Tonalite (Kvt):** Bedrock: Brownish-dark gray, dry, moderately weathered, some rootlets, moderately strong. Recovered as well graded sand.			
1695	5		California	50/5"	4.2	116	@ 5 Feet: Yellowish-green, slightly damp.			
1690	10		California	50/5"	2.4	144	@ 10 Feet: Yellowish-dark gray, slightly moist, weak.			
1685	15		California	50/3"	2.0	113	@ 15 Feet: Yellowish-light gray, damp. Recovered as poorly graded sand.			
1680	20		Standard Split Spoon	33 50/6"			@ 20 Feet: Light grayish-green, slightly weathered. Recovered as well graded sand.			

Total Depth = 20 Feet 11.5 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-76**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/12/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1737.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Topsoil (No Map Symbol): Clayey SAND (SC): Light brown, damp, very dense, fine to medium grained, micaceous.			
1735			California	11 26 50/4"	9.6	129	**Val Verde Tonalite (Kvt):** Bedrock: Yellow-gray, severely weathered, weak. Recovered as poorly graded sand.		GS	
	5		California	50/6"	3.6	124	@ 5 Feet: Yellow-gray, severely weathered, weak.			
1730										
	10		California	36 50/4"			@ 10 Feet: No Recovery			
1725										
	15		Standard Split Spoon	30 50/5"			@ 15 Feet: Light gray, moderately weathered, weak.			

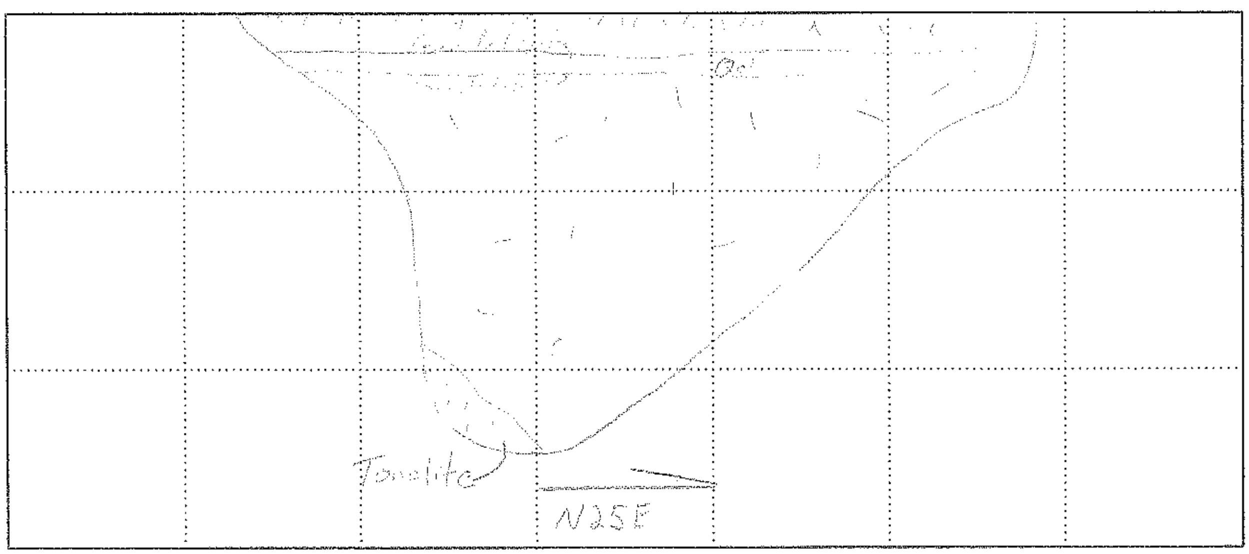
Total Depth = 15 Feet 11 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	**TP-3**
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/6/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1750.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL: 0 to 1 foot: Clayey to Sandy SILT (ML): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist , soft. 1 to 1.5 feet: Same as above: Blocky, few rootlets (less than 1/16-inch in diameter), damp to moist, firm. **ALLUVIUM (Qal):** 1.5 to 2 feet: Sandy CLAY (CL): Mottled brown and orange brown, fine to medium sand, well-graded, oxidized, damp to moist, firm to stiff. Interlayers of Clayey SAND (SC) fine to coarse sand, well-graded. **VAL VERDE TONALITE (Kvt):** 2 to 10.3 feet: Recovered as Sandy CLAY to Clayey SAND (CL-SC): Reddish brown, fine to coarse sand, well-graded, highly oxidized, severely weathered, porous, moist, firm, friable.		
1745	5									
1740	10							Total Depth = 10.3 feet. No groundwater or caving encountered. Backfilled on 2/6/2008.		



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Pit Orientation: N25E

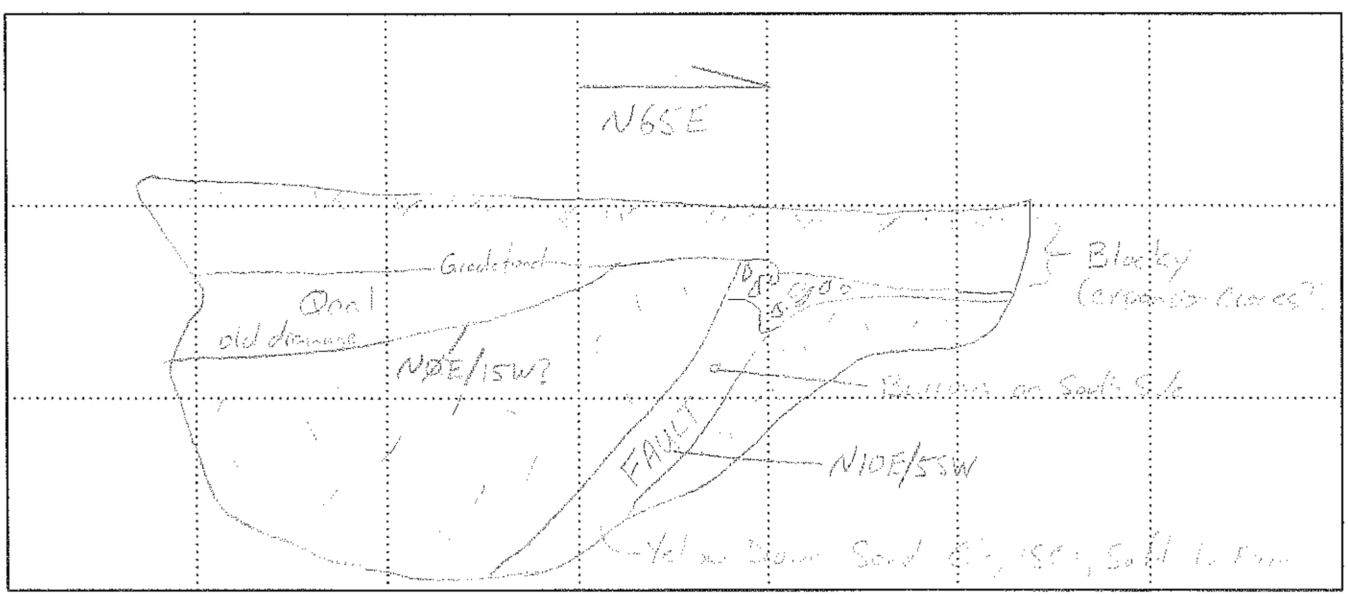
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	**TP-4**
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/6/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1730.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL: Clayey to Sandy SILT (ML): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist to wet, very soft. Note: approximately		
								1.25 to 1.3 feet: Same as above: Blocky, few rootlets (less than 1/16-inch in diameter), damp to moist, firm.		
								OLDER ALLUVIUM (Qoal): 1.3 to 1.5 feet: Sandy CLAY (CL): Mottled brown and orange brown, fine to medium sand, well-graded, oxidized, damp to moist, firm to stiff.		
1725	5							**VAL VERDE TONALITE (Kvt):** 1.5 to 8.5 feet: Recovered as Silty SAND (SM): Orange-brown, fine to coarse sand, well-graded, oxidized, severely weathered, very micaceous, moist, friable.		
							F: N10E/ 65W	**GOUGE:** Sandy CLAY (CL): yellow brown, moist to damp with depth, soft to firm with depth.		
								Total Depth = 8.5 feet. No groundwater or caving encountered. Backfilled on 2/6/2008.		



HS BA TP 07100-01 TEST PITS.GPJ ZKCI.GDT 4/22/08

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Pit Orientation: N65E

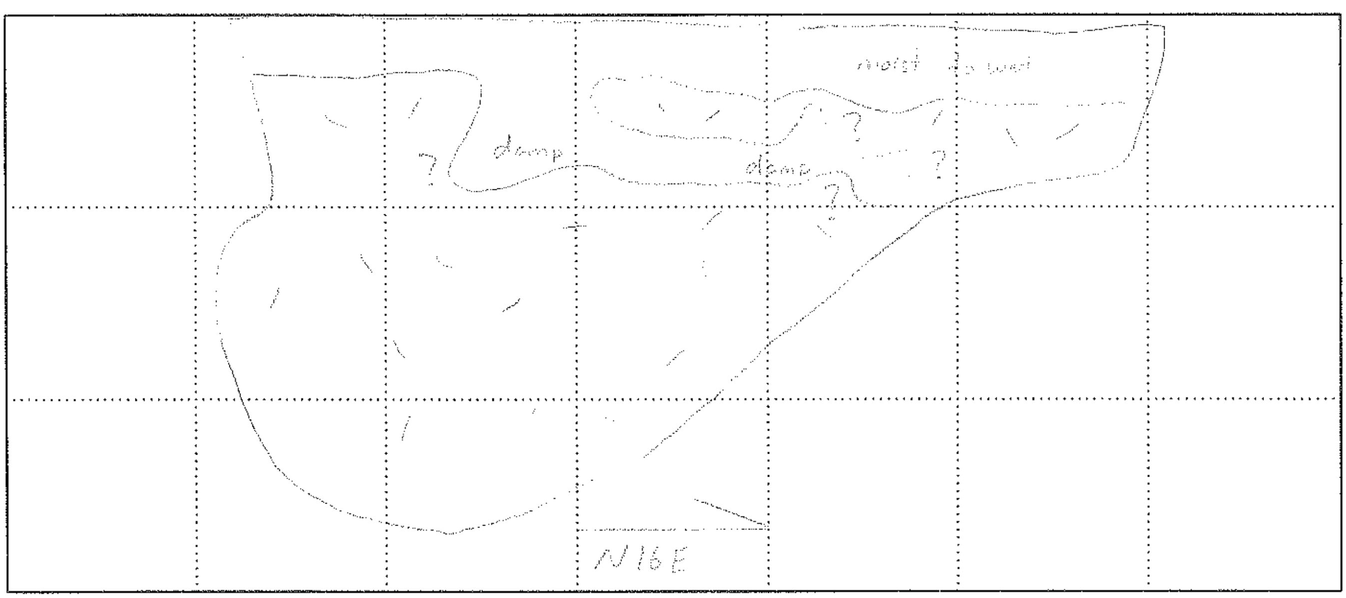
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	TP-5
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/6/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1718.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL: 0 to 1 foot: Sandy CLAY (CL): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist to wet, very soft.		
1715								**VAL VERDE TONALITE (Kvt):** 1 to 1.25 feet: Recovered as Sandy CLAY to Clayey SAND (CL-SC): Reddish brown, fine to coarse sand, well-graded, highly oxidized, severely weathered, porous, moist, firm, very friable.		
	5							1.25 to 4 feet: Same as above: Animal burrow and tunnels of various sizes filled with Clayey to Sandy SILT (ML): Dark brown, fine to coarse sand, slightly micaceous to micaceous, porous, bioturbated, damp, soft.		
1710								Major burrow network (1 to 1.5 feet thick) filled with Sandy CLAY (CL)as above, but damp.		
	10							4 to 10.6 feet: Same as above, moderately weathered, weak.		
								Total Depth = 10.6 feet. No groundwater or caving encountered. Backfilled on 2/6/2008.		



HS BA TP 07100-01 TEST PITS.GPJ ZKCI.GDT 4/22/08

ZEISER KLING Consultants, Inc.

Pit Orientation: N15E

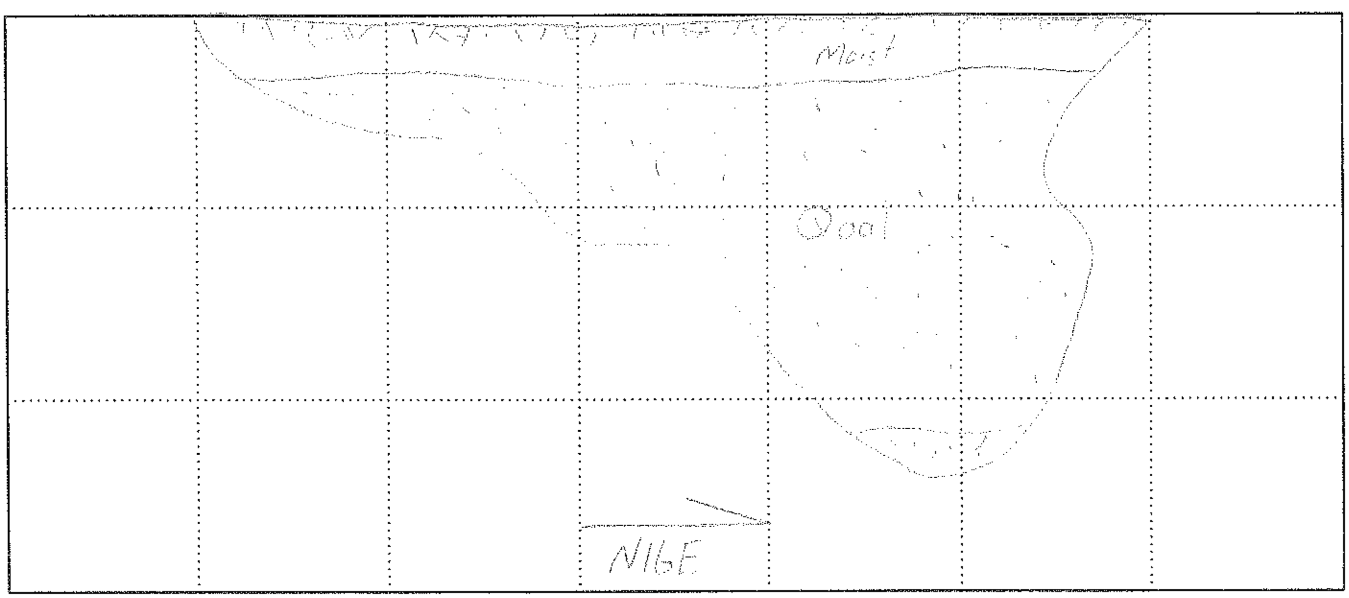
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	**LNR/South Campus**	Test Pit No.:	**TP-6**
Project Number:	**07100-01**	Contractor:	**G&M Backhoe**
		Backhoe:	**430E 4X4**
Date Drilled:	**2/6/08**	Hammer Wt. / Drop:	
Logged By:	**ANM**	Ground Elev. [ft]:	**1694.0**

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL: 0 to 1 foot: Sandy CLAY (CL): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist to wet, very soft. 1 to 1.75 feet: Same as above: Blocky, few rootlets (less than 1/16-inch in diameter), damp, firm.		
1690	5							**OLDER ALLUVIUM (Qoal):** 1.75 to 9 feet: Sandy CLAY(CL): Brown, fine to medium sand, moderately graded, damp, stiff.		
1685	10							**VAL VERDE TONALITE (Kvt):** 9 to 10 feet: Recovered as Silty SAND (SM): Orange-brown, fine to coarse sand, well-graded, oxidized, moderately weathered, very micaceous, damp to moist, friable to weak.		
								Total Depth = 10 feet. No groundwater or caving encountered. Backfilled on 2/6/2008.		



HS BA TP 07100-01 TEST PITS.GPJ ZKCI.GDT 4/22/08

ZEISER KLING Consultants, Inc.

Pit Orientation: N15E

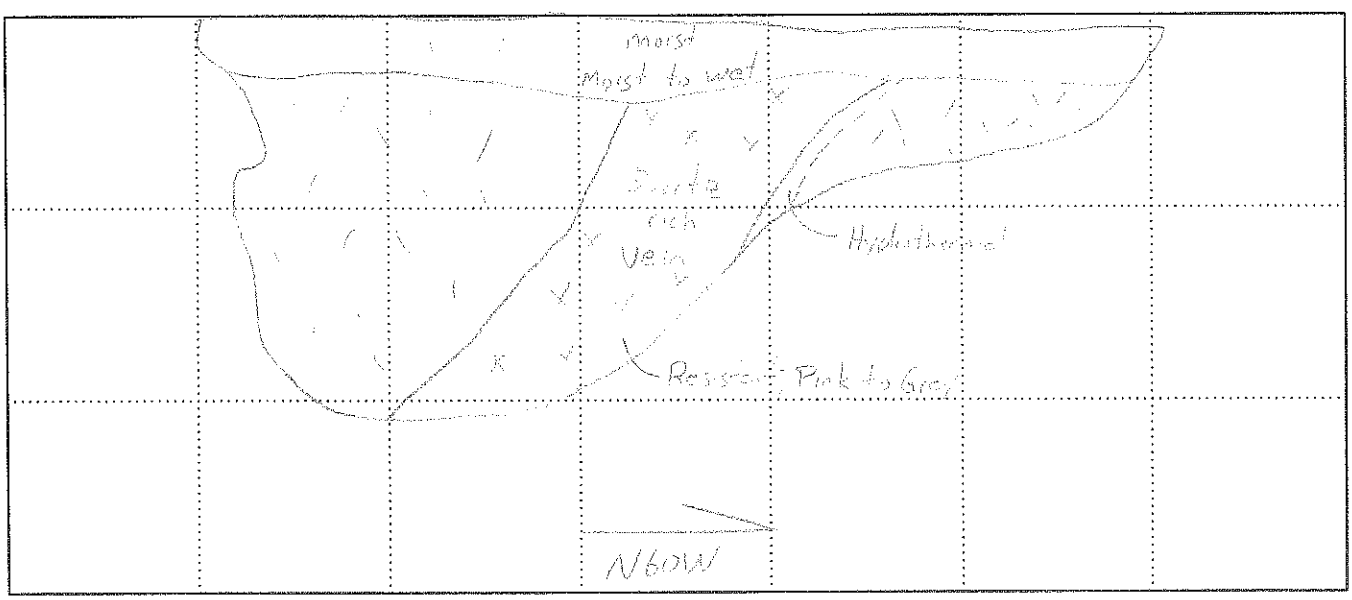
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	TP-7
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/6/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1710.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL: 0 to 1.25 feet: Sandy CLAY (CL): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist to wet, very soft. 1.25 to 2 feet: Same as above: Few rootlets (less than 1/16-inch in diameter), moist, soft to firm.		
1705	5							**VAL VERDE TONALITE (Kvt):** 2 to 9.1 feet: Recovered as Silty SAND (SM): Orange-brown, fine to coarse sand, well-graded, oxidized, severely to moderately weathered, very micaceous, moist, friable. 3 to 4 foot thick dike. Pink to gray, fine to coarse sand with gravel, damp to moist, friable to weak.		
								Total Depth = 9.1 feet. No groundwater or caving encountered. Backfilled on 2/6/2008.		



ZEISER KLING Consultants, Inc.

Pit Orientation: N60W

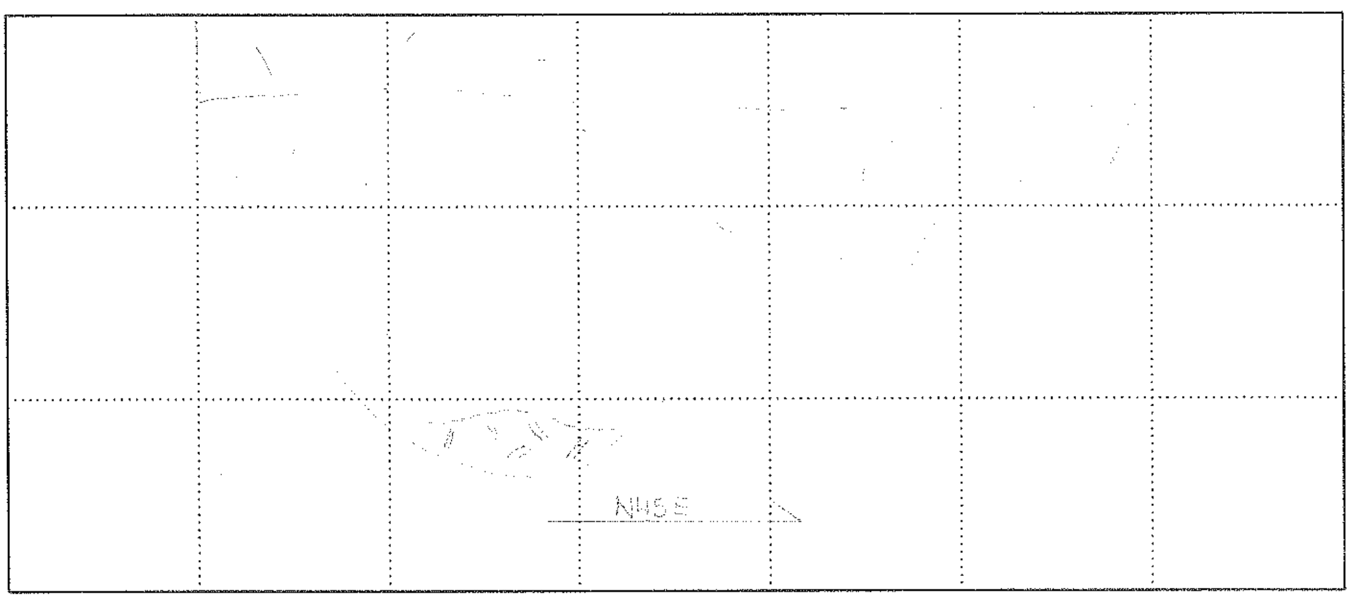
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	**TP-8**
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/6/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1718.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL: 0 to 1 foot: Sandy CLAY (CL): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist to wet, very soft.		
1715								1 to 1.75 feet: Same as above: Blocky, few rootlets (less than 1/16-inch in diameter), damp, firm.		
	5							**VAL VERDE TONALITE (Kvt):** 1.75 to 9.5 feet: Recovered as Silty SAND (SM): Orange-brown, fine to coarse sand, well-graded, oxidized, severely to moderately weathered, very micaceous, moist, friable to weak.		
1710										
								9.5 to 9.75 feet: Bluish gray, fine to coarse sand, well-graded, moderately weathered, very micaceous (biotite-rich), damp to moist, weak.		
								Total Depth = 9.75 feet. No groundwater or caving encountered. Backfilled on 2/6/2008.		



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Pit Orientation: N45E

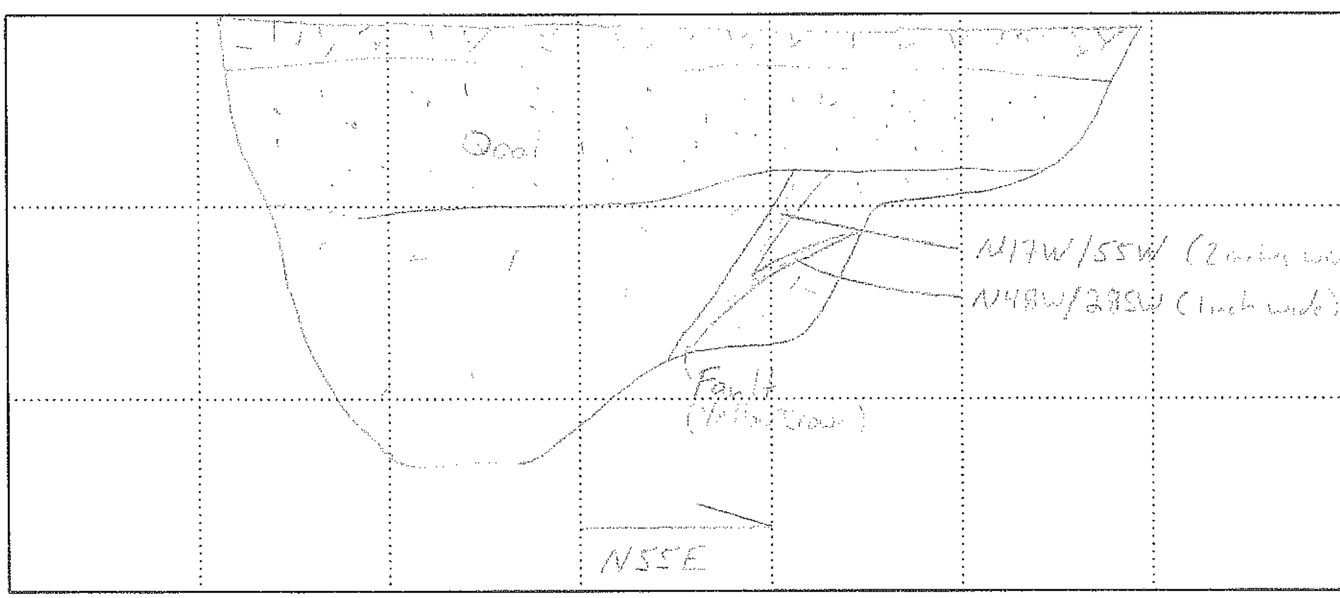
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	**TP-9**
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/6/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1744.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL: 0 to 1 foot: Sandy CLAY (CL): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist to wet, very soft.		
1740								**OLDER ALLUVIUM (Qoal):** 1 to 4 feet: Sandy CLAY to Clayey SAND (CL-SC): Mottled brown and reddish brown, fine to coarse sand, well-graded, oxidized, porous, damp to moist, firm to stiff.		
	5							**VAL VERDE TONALITE (Kvt):** 4 to 9.5 feet: Recovered as Silty SAND (SM): Orange-brown, fine to coarse sand, well-graded, oxidized, severely to moderately weathered, very micaceous, moist, friable to weak.		
1735							F: N17W/ 55W F: N48W/ 28SW	**GOUGE:** Sandy CLAY (CL): Yellow brown, moist to damp with depth, soft to firm with depth.		
								Total Depth = 9.5 feet. No groundwater or caving encountered. Backfilled on 2/6/2008.		



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Pit Orientation: N55E

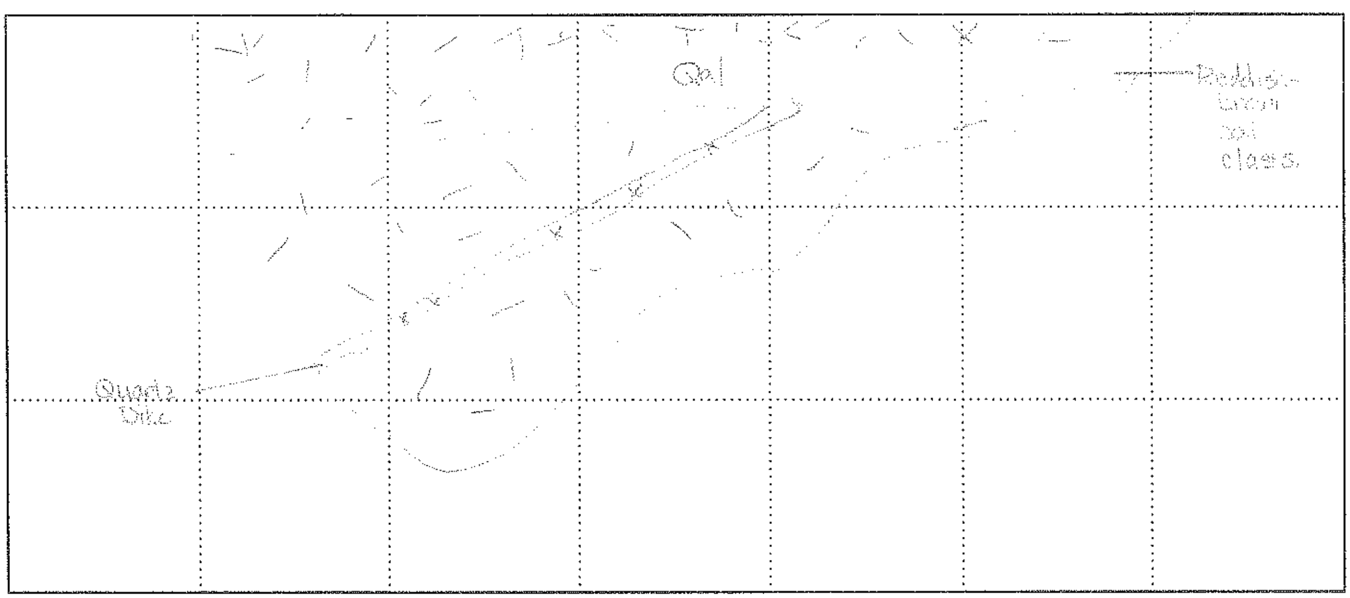
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	**TP-10**
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/6/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1732.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL: 0 to 0.75 feet: Sandy CLAY (CL): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist to wet, very soft.		
1730								**ALLUVIUM (Qal):** 1 to 1.3 feet: Sandy CLAY to Clayey SAND (CL-SC): Mottled brown and reddish brown, fine to coarse sand, well-graded, highly oxidized, severely weathered, porous, moist, firm.		
	5							**VAL VERDE TONALITE (Kvt):** 1.3 to 9.75 feet: Recovered as Silty SAND (SM): Orange brown, fine to coarse sand, well-graded, oxidized, severely to moderately weathered, very micaceous, with 0.2 foot thick quartz dike, moist, friable.		
1725										
								Total Depth = 9.75 feet. No groundwater or caving encountered. Backfilled on 2/6/2008.		



HS BA TP 07100-01 TEST PITS.GPJ ZKCI.GDT 4/22/08

ZEISER KLING Consultants, Inc.

Pit Orientation: N65E

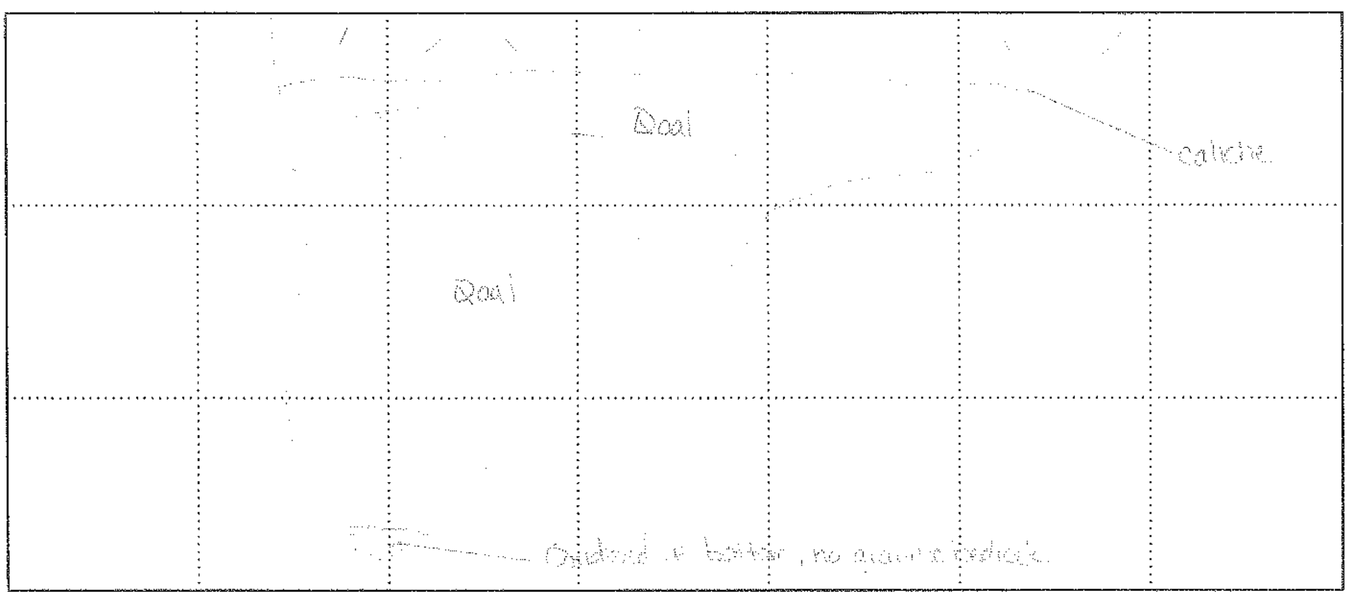
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	**TP-16**
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/7/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1654.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL:		
								0 to 0.9 feet: Clayey SAND (SC): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist, very soft.		
1650								0.9 to 1.5 feet: Same as above: Blocky, few rootlets (less than 1/16-inch in diameter), resistant caliche zone at bottom contact, damp to moist, firm.		
	5							**ALLUVIUM (Qal):**		
								1.5 to 2.25 feet: Sandy CLAY (CL): Orange brown, fine to medium sand, well-graded, oxidized, damp to moist, firm to stiff.		
								2.25 to 3.5 feet: Same as Above: Mottled orange brown and olive gray, damp, stiff.		
1645								**OLDER ALLUVIUM (Qoal):**		
	10							3.5 to 11 feet: Sandy CLAY (CL): Olive gray, fine to medium sand, minor coarse sand, moderatley graded, slightly oxidized, damp to moist, stiff.		
								11 to 12 feet: Same as above, oxidized, moist, firm to stiff.		
								Total Depth = 12 feet. No groundwater or caving encountered. Backfilled on 2/7/2008.		



ZEISER KLING Consultants, Inc.

Pit Orientation: N45W

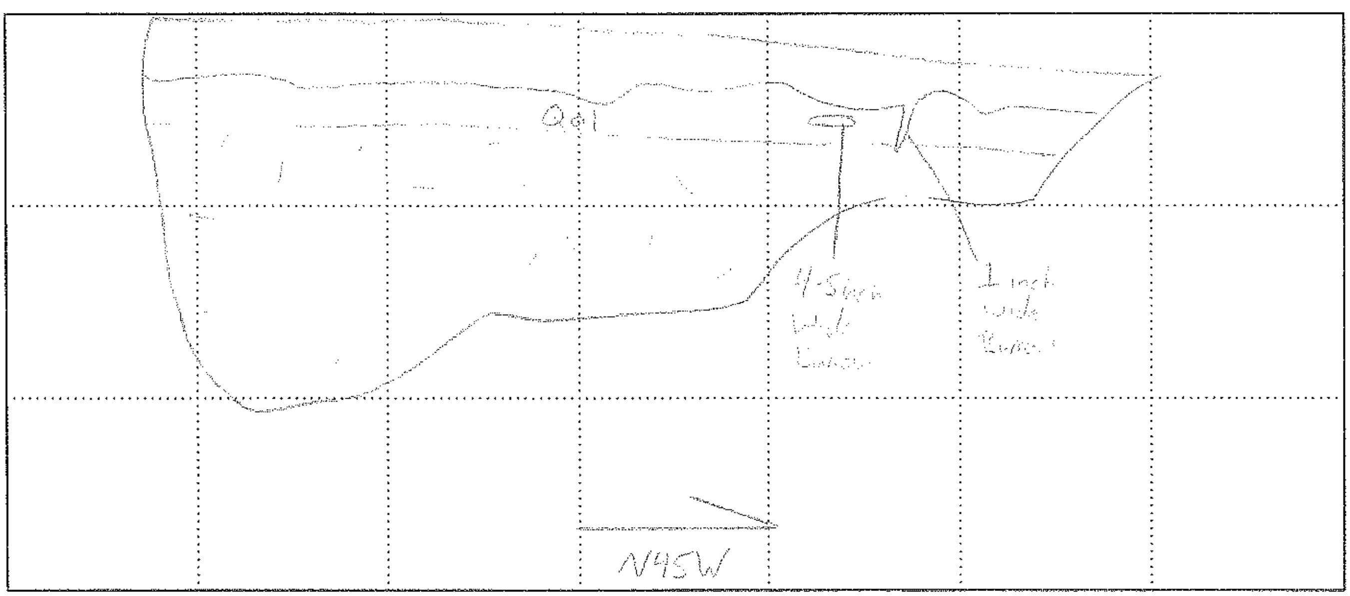
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	**TP-17**
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/7/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1674.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL: 0 to 0.5 feet: Sandy CLAY (CL): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist to wet, very soft.		
								ALLUVIUM (Qal): 0.5 to 1 foot: Sandy CLAY (CL): Mottled brown and reddish brown, fine to medium sand, highly oxidized, porous, few roots (less than 1/16-inch diameter), moist, firm.		
1670	5							**VAL VERDE TONALITE (Kvt):** 1 to 2 feet: Recovered as Silty SAND (SM): Orange brown, fine to coarse sand, well-graded, oxidized, severely weathered, very micaceous, moist, friable. Burrows 2 to 9 feet: Same as above, moderately weathered, damp to moist, weak.		
1665								Total Depth = 9 feet. No groundwater or caving encountered. Backfilled on 2/7/2008.		



ZEISER KLING Consultants, Inc.

Pit Orientation: N45W

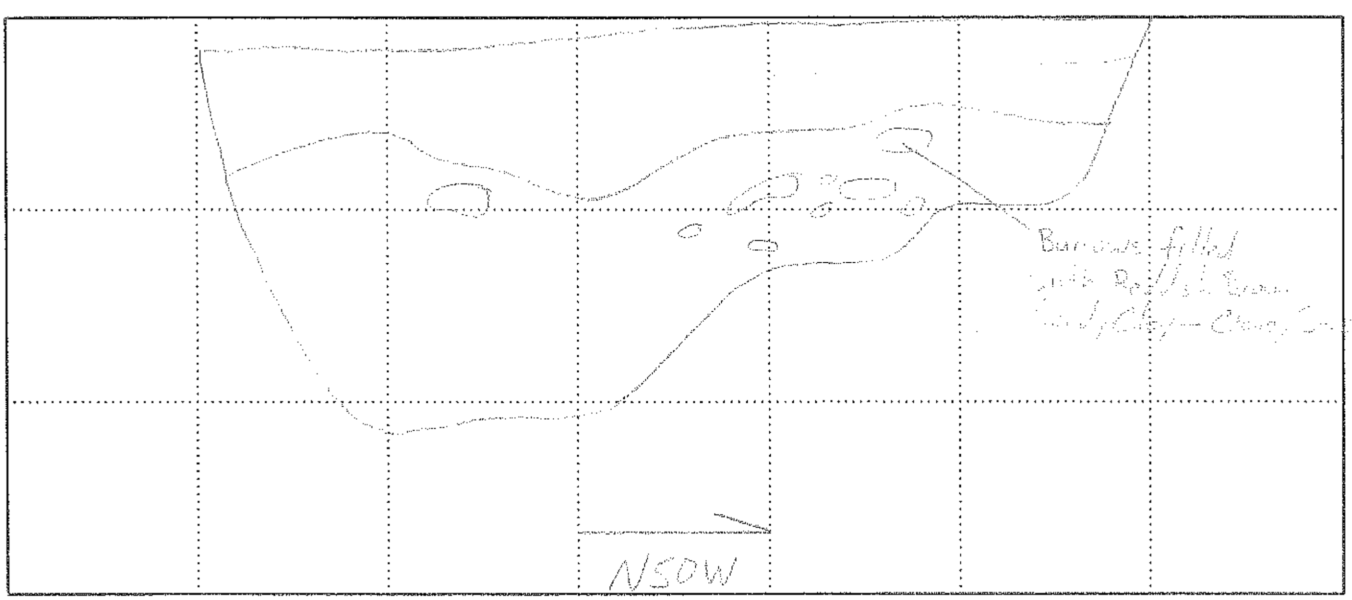
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	**LNR/South Campus**	Test Pit No.:	**TP-18**
Project Number:	**07100-01**	Contractor:	**G&M Backhoe**
		Backhoe:	**430E 4X4**
Date Drilled:	**2/7/08**	Hammer Wt. / Drop:	
Logged By:	**ANM**	Ground Elev. [ft]:	**1682.0**

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
1680								**TOPSOIL:** 0 to 0.75 feet: Clayey SAND (SC): Dark brown, fine to medium sand, micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist to wet, very soft.		
								ALLUVIUM (Qal): 0.75 to 2 feet: Sandy CLAY to Clayey SAND (CL-SC): Mottled brown and reddish brown, fine to coarse sand, well-graded, highly oxidized, porous, moist, firm.		
	5							**VAL VERDE TONALITE (Kvt):** 2 to 5 feet: Recovered as Silty SAND (SM): Orange brown, fine to coarse sand, well-graded, oxidized, severely weathered, very micaceous, moist, friable.		
1675								Burrows throughout (0.5 to 1 foot thick) filled with Sandy CLAY to Clayey SAND (CL-SC)as above. 5 to 7.25 feet: Same as above, moderately weathered, damp to moist, weak.		
								Total Depth = 7.25 feet. No groundwater or caving encountered. Backfilled on 2/7/2008.		

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table



HS BA TP 07100-01 TEST PITS.GPJ ZKCI.GDT 4/22/08

ZEISER KLING Consultants, Inc.

Pit Orientation: N50W

B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

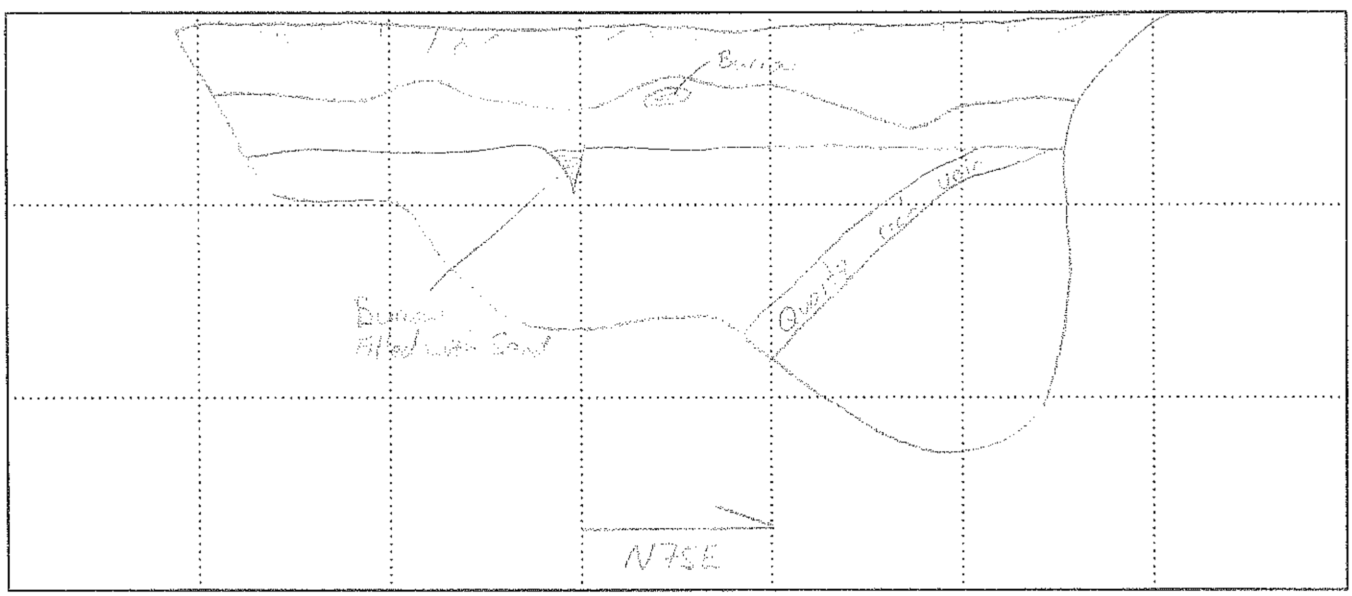
LOG OF EXPLORATORY TEST PIT

Sheet 1 of 1

Project:	LNR/South Campus	Test Pit No.:	**TP-19**
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/7/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1684.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
1680	5							**TOPSOIL:** 0 to 1 foot: Clayey to Silty SAND (SC-SM): Dark brown, fine to medium sand, micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist to wet, very soft. **ALLUVIUM (Qal):** 1 to 2.2 feet: Sandy CLAY (CL): Mottled brown and reddish brown, fine to coarse sand, well-graded, highly oxidized, porous, moist, stiff. Approximatly 0.5 foot thick burrow filled with Clayey to Silty SAND (SC-SM) as above but dry to damp. **VAL VERDE TONALITE (Kvt):** 2.2 to 4.5 feet: Recovered as Silty SAND (SM): Orange brown, fine to coarse sand, well-graded, oxidized, severely weathered, very micaceous, moist, friable. 4.5 to 8.75 feet: Same as above, gray to brown, moderately weathered, damp to moist, weak. Total Depth = 8.75 feet. No groundwater or caving encountered. Backfilled on 2/7/2008.		



HS BA TP 07100-01 TEST PITS.GPJ ZKCI.GDT 4/22/08

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Pit Orientation: N75E

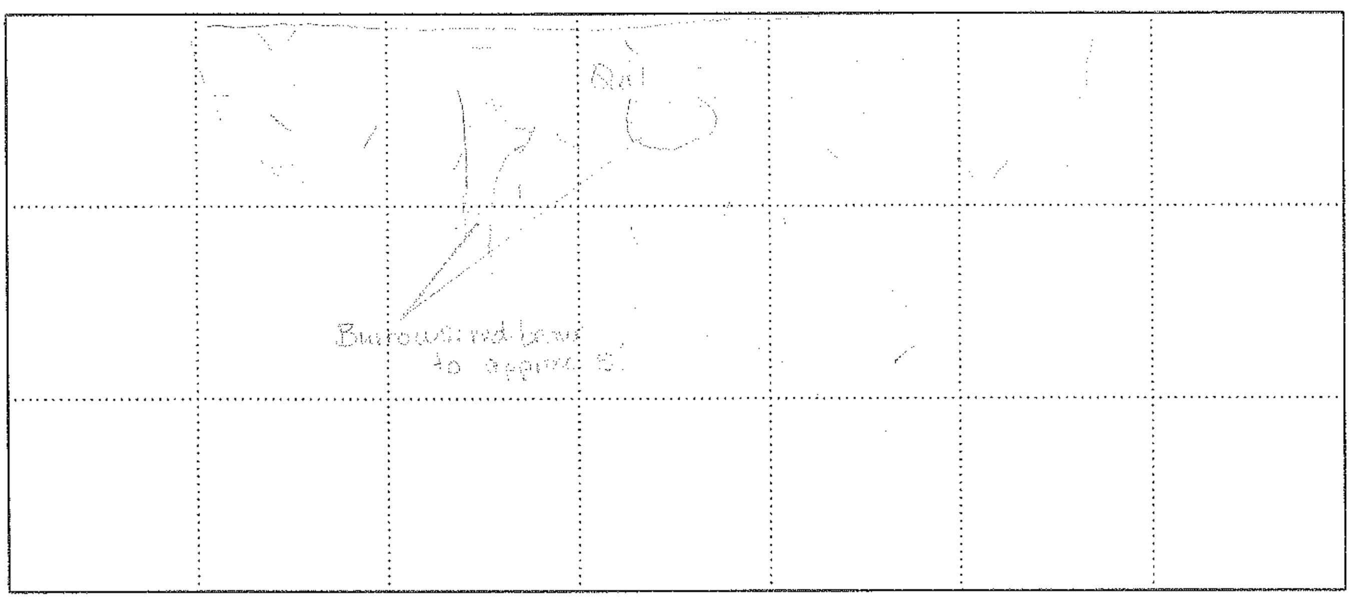
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	**TP-21**
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/7/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1724.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
1720	5						Mica. = Micaceous	**TOPSOIL:** 0 to 0.75 feet: Sandy CLAY to Clayey SAND (CL-SC): Dark brown, fine to medium sand, slightly mica. to mica., porous, highly bioturbated, numerous rootlets (less than 1/8" diameter), moist to wet, very soft. **ALLUVIUM (Qal):** 0.75 to 1.5 feet: Sandy CLAY to Clayey SAND (CL-SC): Mottled brown and reddish brown, fine to coarse sand, well-graded, highly oxidized, blocky, porous, moist, firm. **VAL VERDE TONALITE (Kvt):** 1.5 to 4.5 feet: Recovered as Silty SAND (SM): Orange-brown, fine to coarse sand, well-graded, oxidized, severely weathered, very mica., moist, friable. Burrows (0.5 to 1 foot thick) filled with Sandy CLAY to Clayey SAND (CL-SC) as above. 4.5 to 6 feet: Same as above, slightly oxidized, moderately weathered, damp to moist, weak. 6 to 8.25 feet: Same as above, brown to gray, moderately weathered, damp to moist, weak. Total Depth = 8.25 feet. No groundwater or caving encountered. Backfilled on 2/7/2008.		



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Pit Orientation: N15E

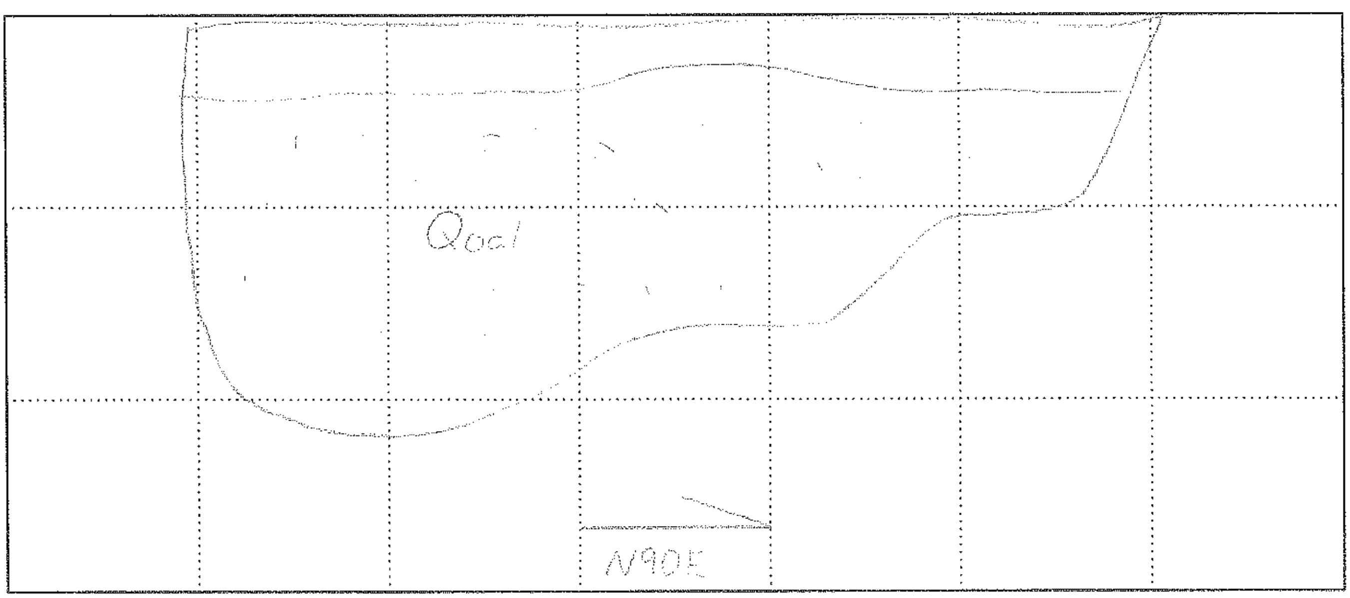
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	**TP-22**
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/7/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1627.0

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL: 0 to 1 foot: Sandy CLAY (CL): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist, soft.		
1625								1 to 1.25 feet: Same as above: mottled reddish brown to brown, blocky, few rootlets (less than 1/16-inch in diameter), damp to moist, firm to stiff.		
								OLDER ALLUVIUM (Qoal): 1.25 to 4.5 feet: Sandy CLAY to Clayey SAND (CL-SC): Reddish brown, fine to coarse sand, well-graded, highly oxidized, porous, damp, stiff to hard.		
	5							4.5 to 7.5 feet: Same as above: Operator calls difficult to dig.		
1620										
								Total Depth = 7.5 feet. No groundwater or caving encountered. Backfilled on 2/7/2008.		

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table



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Pit Orientation: N90E

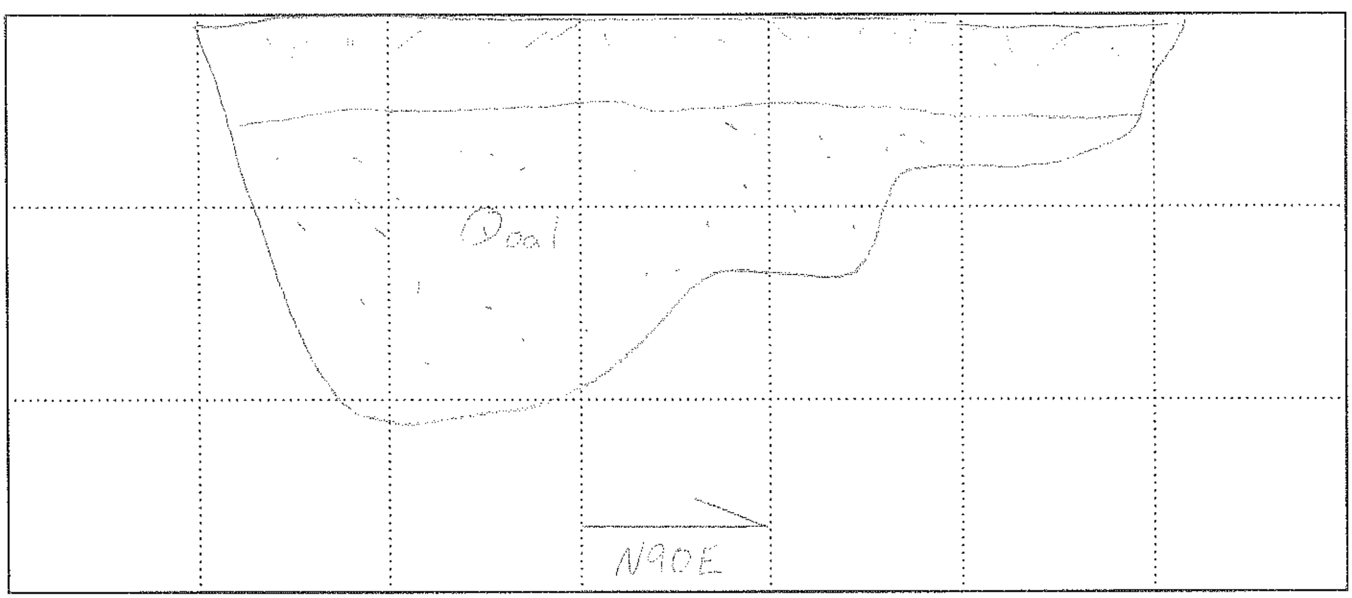
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	**TP-23**
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/7/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1638.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL: 0 to 1 foot: Sandy CLAY (CL): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist, soft.		
1635								**ALLUVIUM (Qal):** 1 to 1.75 feet: Same as above: mottled reddish brown to brown, blocky, few rootlets (less than 1/16-inch in diameter), damp to moist, firm to stiff.		
	5							**OLDER ALLUVIUM (Qoal):** 1.75 to 8.5 feet: Silty SAND (SM): Reddish brown, fine to coarse sand, well-graded, highly oxidized, porous, damp, stiff to hard. 0.5 to 1 foot thick interlayers of Clayey to Sandy SILT (ML): Orange brown to gray, damp to moist, stiff.		
1630								Total Depth = 8.5 feet. No groundwater or caving encountered. Backfilled on 2/7/2008.		



Pit Orientation: N90E

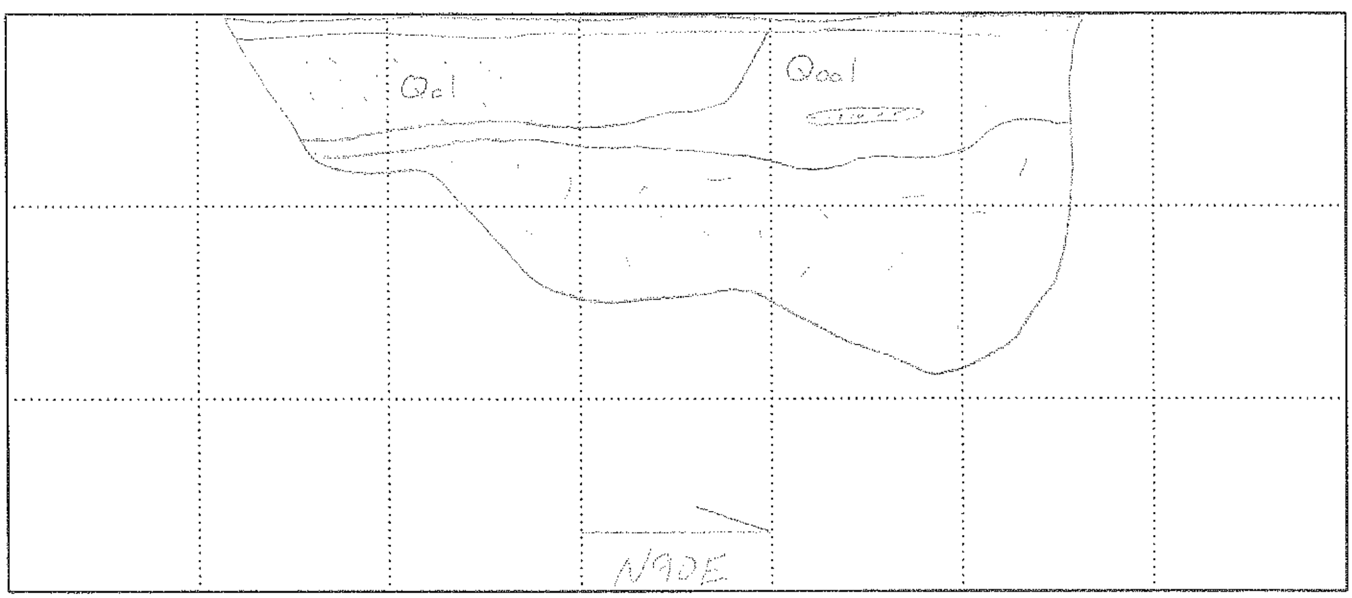
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	TP-24
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/7/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1635.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL: 0 to 0.4 feet: Clayey SAND (SC): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist, soft.		
								OLDER ALLUVIUM (Qoal): 0.4 to 2.5 feet: Silty SAND (SM): Reddish brown, fine to coarse sand, well-graded, highly oxidized, porous, damp, stiff to hard. Interlayers of Clayey to Sandy SILT (ML): Orange brown to gray, fine to medium sand, moist, stiff.		
1630	5							**VAL VERDE TONALITE (Kvt):** 2.5 to 2.75 feet: Recovered as Silty SAND (SM): Orange brown, fine to coarse sand, well-graded, oxidized, moderately weathered, very micaceous, damp, friable. 2.75 to 7.75 feet: Same as above: Dry.		
								Total Depth = 7.75 feet. No groundwater or caving encountered. Backfilled on 2/7/2008.		



HS BA TP 07100-01 TEST PITS.GPJ ZKCI.GDT 4/22/08

ZEISER KLING Consultants, Inc.

Pit Orientation: N90E

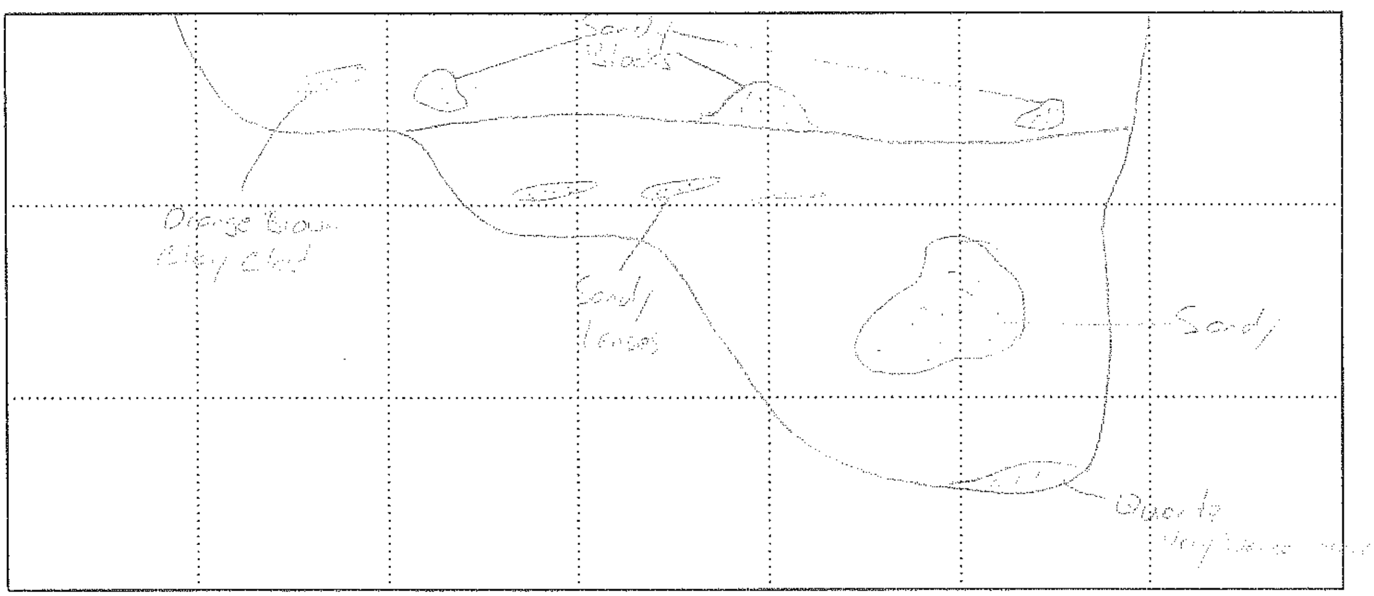
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	**TP-25**
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/7/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1624.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
	0–2							**TOPSOIL:** 0 to 2 feet: Clayey to Sandy SILT (ML): Dark brown, fine to coarse sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist to wet, very soft.		
1620	5							**ALLUVIUM (Qal):** 2 to 2.15 feet: CLAY (CL): Black to very dark gray, continous, moist to wet, soft. Note: Caving observed below this depth. 2.15 to 10 feet: Clayey to Sandy SILT (ML): Very dark brown, fine to coarse sand, very porous, moist to saturated, soft. @ 2.5 feet: 1 to 2 inch thick semi-continuous lenses of Silty SAND (SM): Dark brown to gray, fine to medium sand, very porous, moist to saturated, soft.		
1615	10							Total Depth = 10 feet. No groundwater. Caving encountered. Backfilled on 2/7/2008.		



HS BA TP 07100-01 TEST PITS.GPJ ZKCI.GDT 4/22/08

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Pit Orientation: N50W

B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

Elevation:	1556.5	Date(s) Drilled:	5/1/02
Drilling Method:	Rotary Auger	Logged by:	DL
Drilling Rig:	CME-55	Hammer Type:	Auto-trip
Boring Diameter:	8-inches	Hammer Weight:	140 lb.
		Hammer Drop:	30-inches

SUMMARY OF SUBSURFACE CONDITIONS

This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered and is representative of interpretations made during drilling. Contrasting data derived from laboratory analysis may not be reflected in these representations.

DEPTH (ft)	GRAPHIC	USCS	DESCRIPTION	SAMPLES: DRIVE SAMPLE	SAMPLES: BULK SAMPLE	SAMPLES: SAMPLE TYPE	BLOWS/6"	MOISTURE (%)	DRY UNIT WT. (pcf)	RELATIVE COMPACTION (%)
		SM	**SILTY SAND**, fine to medium grained with trace clay, light brown, slightly moist, medium dense to dense.							
		SM	**SILTY SAND**, fine to medium grained with clay, brown, slightly moist, dense, very well cemented.	X		SS	22 22	8	124	
5		SM	**SILTY SAND**, fine to medium grained with trace clay, red-brown, slightly moist, medium dense to dense, moderately cemented, friable.	X		SS	31 38	14	119	
				X		SS	16 27	13	123	
10		SM	**SILTY SAND**, fine grained with trace medium, brown, moist, medium dense to dense.	X		SPT	16 25	21		
15		SW	**SAND**, fine to coarse grained with silt, brown, slightly moist, medium dense to dense.	X		SPT	24 27	6		
20		SM	**SILTY SAND**, fine to coarse grained with trace clay, red-brown, moist, medium dense, slightly cemented.	X		SPT	19 27	11		
			End of boring at 22 feet. No groundwater or mottling encountered.							

LOG OF BORING B-35

Elevation:	1744.4	Date(s) Drilled: 5/3/02	Logged by:	DL
Drilling Method:	Rotary Auger		Hammer Type:	Auto-trip
Drilling Rig:	CME-55		Hammer Weight:	140 lb.
Boring Diameter:	8-inches		Hammer Drop:	30-inches

DEPTH (ft)	GRAPHIC	USCS	SUMMARY OF SUBSURFACE CONDITIONS This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered and is representative of interpretations made during drilling. Contrasting data derived from laboratory analysis may not be reflected in these representations.	SAMPLES: DRIVE SAMPLE	SAMPLES: BULK SAMPLE	SAMPLES: SAMPLE TYPE	BLOWS/6"	MOISTURE (%)	DRY UNIT WT. (pcf)	RELATIVE COMPACTION (%)
		SM	SILTY SAND, fine to medium grained with clay, brown, slightly moist, loose to medium dense.							
		BR	BEDROCK, Granitic, red-brown, medium dense to dense, highly to slightly weathered.			SS	21 26	5		
5						SPT	12 16	4		
10										
			End of boring at 13 feet. Auger refusal. No groundwater or mottling encountered.							

LOG OF BORING B-36

Elevation:	1729.4	Logged by:	DL
Date(s) Drilled:	5/3/02	Hammer Type:	Auto-trip
Drilling Method:	Rotary Auger	Hammer Weight:	140 lb.
Drilling Rig:	CME-55	Hammer Drop:	30-inches
Boring Diameter:	8-inches		

SUMMARY OF SUBSURFACE CONDITIONS

This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered and is representative of interpretations made during drilling. Contrasting data derived from laboratory analysis may not be reflected in these representations.

DEPTH (ft)	GRAPHIC	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE SAMPLE	SAMPLES: BULK SAMPLE	SAMPLES: SAMPLE TYPE	BLOWS/6"	MOISTURE (%)	DRY UNIT WT. (pcf)	RELATIVE COMPACTION (%)
		SM	SILTY SAND, fine to medium grained with trace clay, light brown, slightly moist, loose to medium dense.							
		BR	BEDROCK, Granitic, red-brown, dense, highly to slightly weathered.							
5										
10			- harder drilling -							
			End of boring at 13 feet. Auger refusal. No groundwater or mottling encountered.							

LOG OF BORING B-37

Elevation:	1730.0	Date(s) Drilled:	5/3/02
Drilling Method:	Rotary Auger	Logged by:	DL
Drilling Rig:	CME-55	Hammer Type:	Auto-trip
Boring Diameter:	8-inches	Hammer Weight:	140 lb.
		Hammer Drop:	30-inches

SUMMARY OF SUBSURFACE CONDITIONS

This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered and is representative of interpretations made during drilling. Contrasting data derived from laboratory analysis may not be reflected in these representations.

DEPTH (ft)	USCS	DESCRIPTION	SAMPLE TYPE	BLOWS/6"	MOISTURE (%)	DRY UNIT WT. (pcf)	RELATIVE COMPACTION (%)
	SM	SILTY SAND, fine to medium grained, brown, dry, loose to medium dense.			6	114	
	BR	BEDROCK, Granitic, red-brown, dense, highly to moderately weathered.	SS	11 16			
5			SS	21 50/6"	4		
10							
15		- harder drilling -					
20		End of boring at 20 feet. No groundwater or mottling encountered.					

Elevation:	1634.0	Date(s) Drilled:	5/3/02
Drilling Method:	Rotary Auger	Logged by:	DL
Drilling Rig:	CME-55	Hammer Type:	Auto-trip
Boring Diameter:	8-inches	Hammer Weight:	140 lb.
		Hammer Drop:	30-inches

SUMMARY OF SUBSURFACE CONDITIONS

This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered and is representative of interpretations made during drilling. Contrasting data derived from laboratory analysis may not be reflected in these representations.

DEPTH (ft)	GRAPHIC	USCS	SUMMARY OF SUBSURFACE CONDITIONS	DRIVE SAMPLE	BULK SAMPLE	SAMPLE TYPE	BLOWS/6"	MOISTURE (%)	DRY UNIT WT. (pcf)	RELATIVE COMPACTION (%)
0		SM	SILTY SAND, fine to coarse grained with trace clay, brown, dry, loose to medium dense.			B				
						SS	8 13	6	102	
		BR	BEDROCK, Granitic, grasy-brown, dense, highly to moderately weathered.					5		
5						SPT	23 50/5"			
10						SPT	29 50/5"	3		
15			- very hard drilling -							
20			End of boring at 20 feet. No groundwater or mottling encountered.							

LOG OF TRENCH TR-17

Elevation: 1743.5
Excavation Method:
Equipment: BACKHOE

Logged by: MAT
Date(s) : 5/17/02

DEPTH (ft)	GRAPHIC	USCS	SUMMARY OF SUBSURFACE CONDITIONS This summary applies only at the location of the trench and at the time of digging. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	REMARKS
1		SM	SILTY SAND, fine to medium grained, brown, dry, loose, relatively porous, blocky with root mat in the upper 0.2 feet.	
2 3			SILTY CLAY, fine grained with trace fine sand, dark brown, slightly moist, stiff to very stiff, well-cemented, indurated, blocky.	
4 5		BR	GRANITE, decomposed, moderately weathered, black-brown, moist, dense to very dense.	
			End of Trench. No groundwater, mottling or refusal encountered.	

LOG OF TRENCH TR-18

Elevation: 1722.5

Excavation Method:

Equipment: BACKHOE

Logged by: MAT

Date(s) : 5/17/02

DEPTH (ft)	GRAPHIC	USCS	SUMMARY OF SUBSURFACE CONDITIONS This summary applies only at the location of the trench and at the time of digging. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	REMARKS
1		SM	SILTY SAND, fine to medium grained with trace clay, brown, dry, loose, relatively porous, blocky, root mat in upper 0.3 feet.	
2		SM	SILTY SAND, fine to medium grained with clay, dark brown, slightly moist, medium dense, well-cemented, indurated, blocky.	
3 4 5 6 7 8		BR	GRANITE, decomposed, moderately weathered, black-brown, moist, medium dense to dense.	
			End of Trench. No groundwater, mottling or refusal encountered.	

LOG OF TRENCH TR-19

Elevation: 1716.2
Excavation Method:
Equipment: BACKHOE

Logged by: MAT
Date(s) : 5/17/02

DEPTH (ft)	GRAPHIC	USCS	SUMMARY OF SUBSURFACE CONDITIONS This summary applies only at the location of the trench and at the time of digging. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	REMARKS
1		SM	<u>SILTY SAND</u>, fine to medium grained with clay, brown, dry to slightly moist, loose, somewhat porous, well-cemented, blocky, some caliche stringers, root mat in the upper 0.1 feet.	
2 3 4 5		BR	<u>GRANITE</u>, decomposed with trace clay, moderately weathered, black-pink-brown, slightly moist to moist, dense to very dense.	
			End of Trench. No groundwater, mottling or refusal encountered.	

LOG OF TRENCH TR-20

Elevation: 1704.0

Excavation Method:

Equipment: BACKHOE

Logged by: MAT

Date(s) : 5/17/02

DEPTH (ft)	GRAPHIC	USCS	SUMMARY OF SUBSURFACE CONDITIONS This summary applies only at the location of the trench and at the time of digging. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	REMARKS
1		SM	SILTY SAND, fine to medium grained with trace clay, brown, dry to slightly moist, loose to medium dense, somewhat porous, blocky, root mat in the upper 0.1 feet.	
2 3 4 5 6 7 8 9		BR	GRANITE, decomposed, moderately weathered, pink-black-brown, slightly moist to moist, dense to very dense.	
			End of Trench. No groundwater, mottling or refusal encountered.	

LOG OF TRENCH TR-21

Elevation: 1688.3
Excavation Method:
Equipment: BACKHOE

Logged by: MAT
Date(s) : 5/17/02

SUMMARY OF SUBSURFACE CONDITIONS

This summary applies only at the location of the trench and at the time of digging. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

DEPTH (ft)	GRAPHIC	USCS	SUMMARY OF SUBSURFACE CONDITIONS	REMARKS
0–1		SM	SILTY SAND, fine to medium grained, brown, dry, loose, moderately porous, blocky, root mat in the top 0.1 feet.	
1–2.2		SM	SILTY SAND, fine to medium grained with clay, dark brown, slightly moist to moist, medium dense, well-cemented, some caliche stringers, blocky.	
2.2–8		BR	GRANITE, decomposed, moderately weathered, pink-brown, moist, dense to very dense.	
8			End of Trench. No groundwater, mottling or refusal encountered.	

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Geotechnical Investigation
March Business Park
Riv. County, CA
Project No. L235-[illegible]

Figure No. A-37

LOG OF TRENCH TR-22

Elevation: 1655.0
Excavation Method:
Equipment: BACKHOE

Logged by: MAT
Date(s) : 5/17/02

DEPTH (ft)	GRAPHIC	USCS	SUMMARY OF SUBSURFACE CONDITIONS This summary applies only at the location of the trench and at the time of digging. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	REMARKS
		SM	SILTY SAND, fine to medium grained with trace clay, brown, dry to slightly moist, loose, well-cemented, medium porosity, blocky, some caliche stringers, root mat in the top 0.1 feet.	
1				
2				
3		SM	SILTY SAND, fine to medium grained with clay, dark brown, moist, medium dense, well-cemented, blocky.	
		BR	GRANITE, decomposed, moderately weathered, pink-brown, moist, very dense.	
4				
			End of Trench. No groundwater, mottling or refusal encountered.	

LOG OF TRENCH TR-23

Elevation: 1697.6

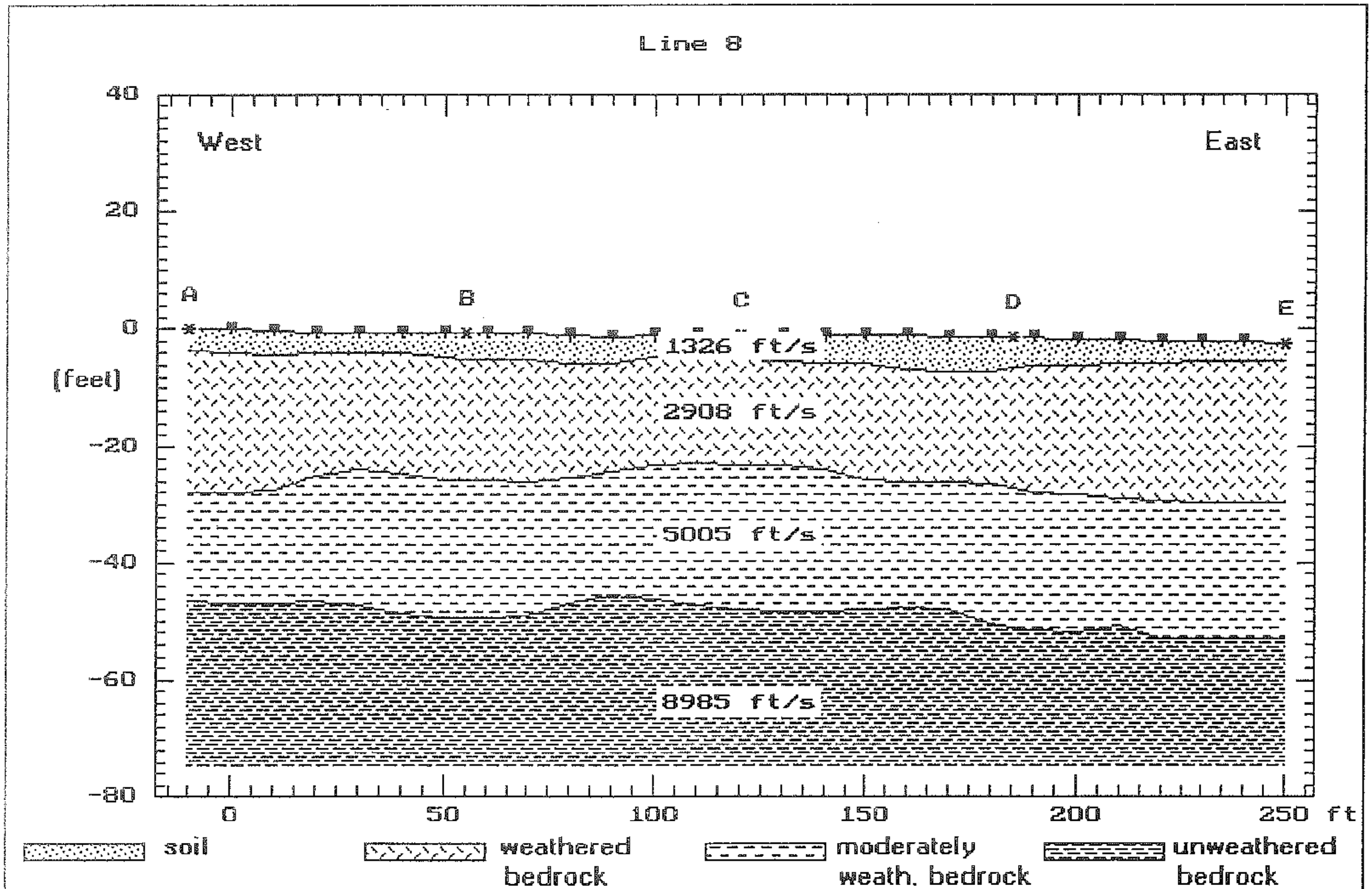
Excavation Method:

Equipment: BACKHOE

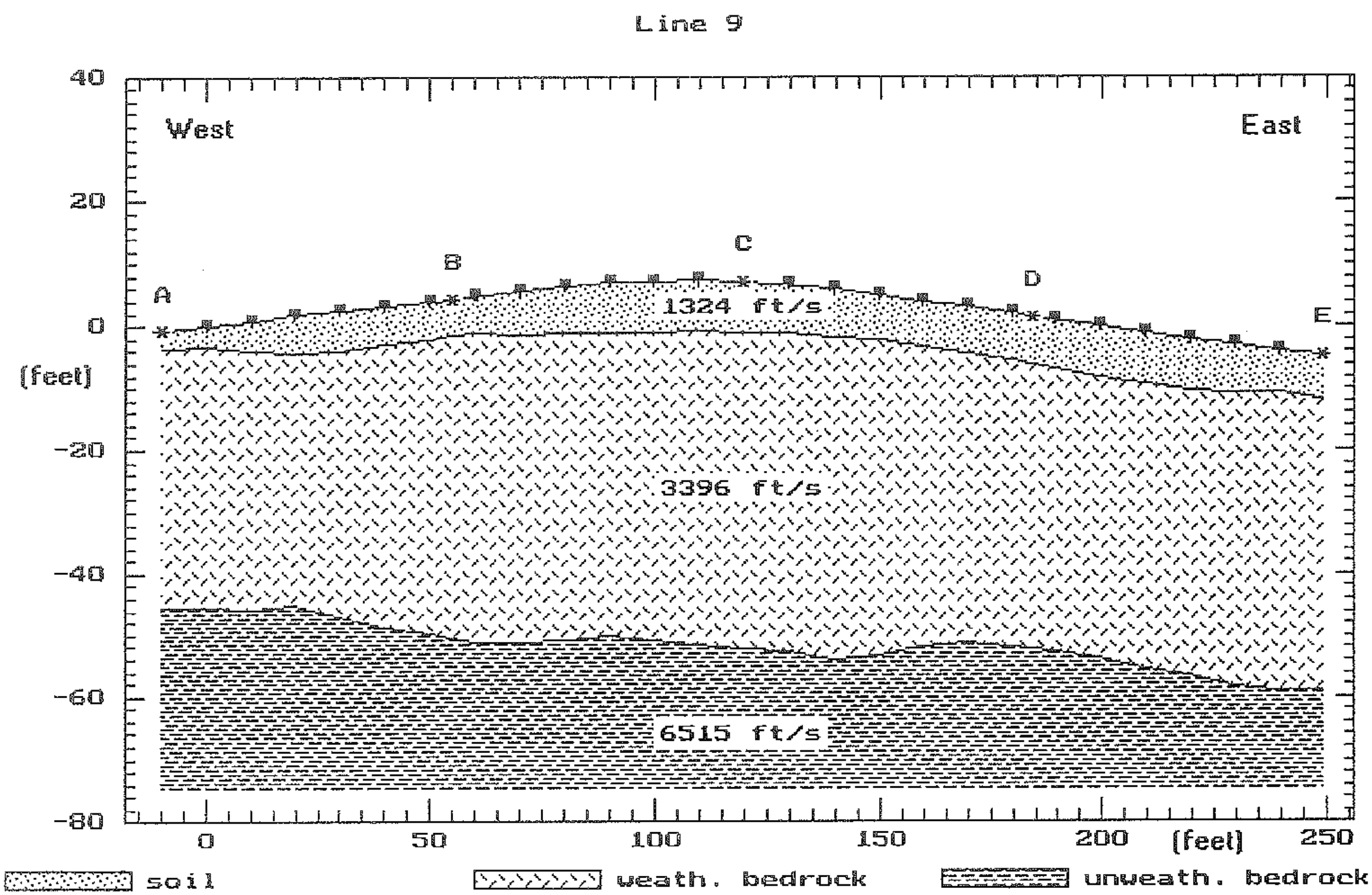
Logged by: MAT

Date(s) : 5/17/02

DEPTH (ft)	GRAPHIC	USCS	SUMMARY OF SUBSURFACE CONDITIONS This summary applies only at the location of the trench and at the time of digging. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	REMARKS
1 2		SM	SILTY SAND, fine to medium grained, brown, dry to slightly moist, loose to medium dense, relatively porous, well-cemented, blocky, root mat in the upper 0.2 feet.	
3 4 5 6 7 8		BR	GRANITE, decomposed, moderately weathered, black-brown, moist, medium dense to very dense.	
			End of Trench. No groundwater, mottling or refusal encountered.	

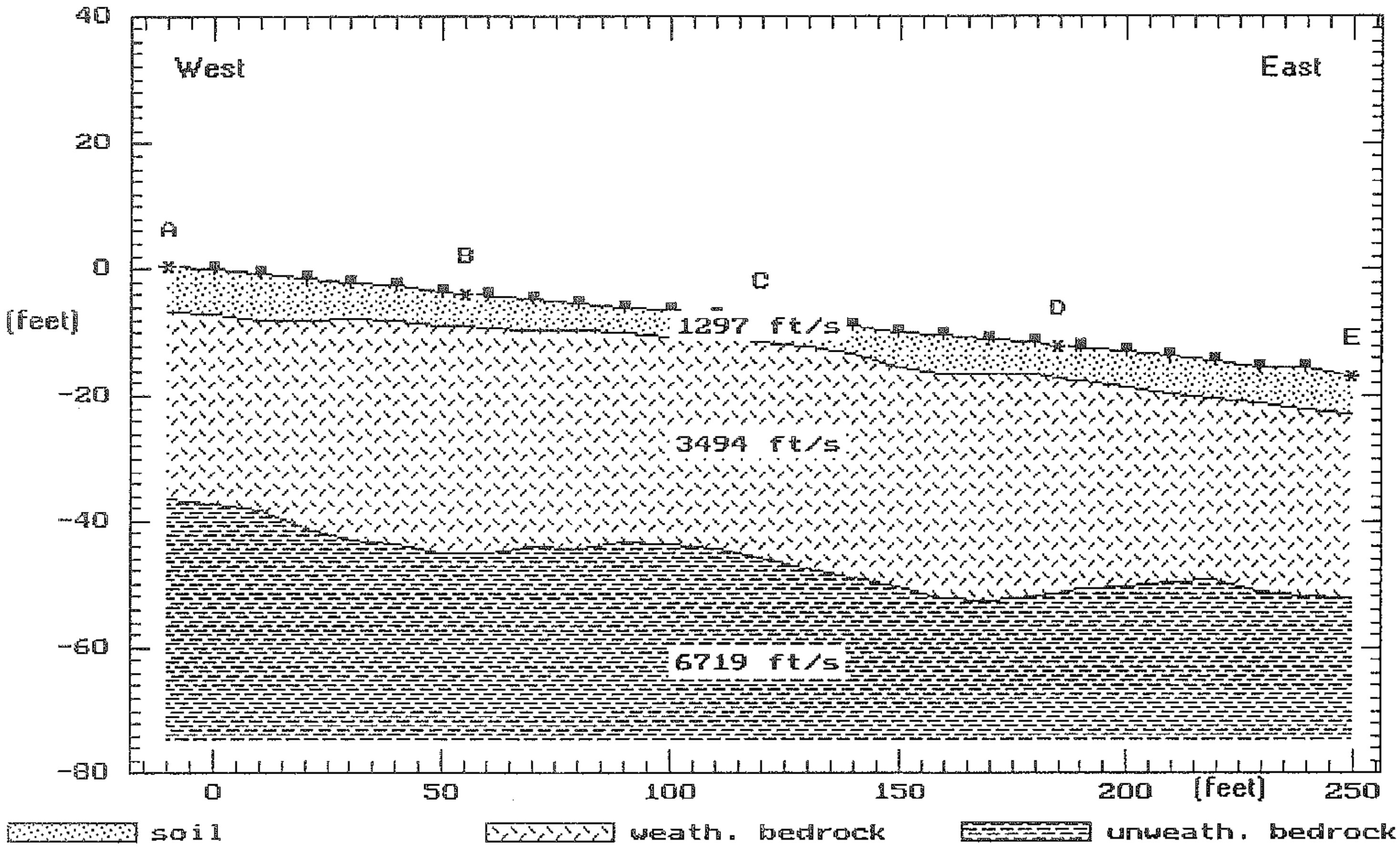


Seismic Refraction Survey 2/12/08	LNR South Campus
ZKCI Project No. 07100-01	Riverside, California

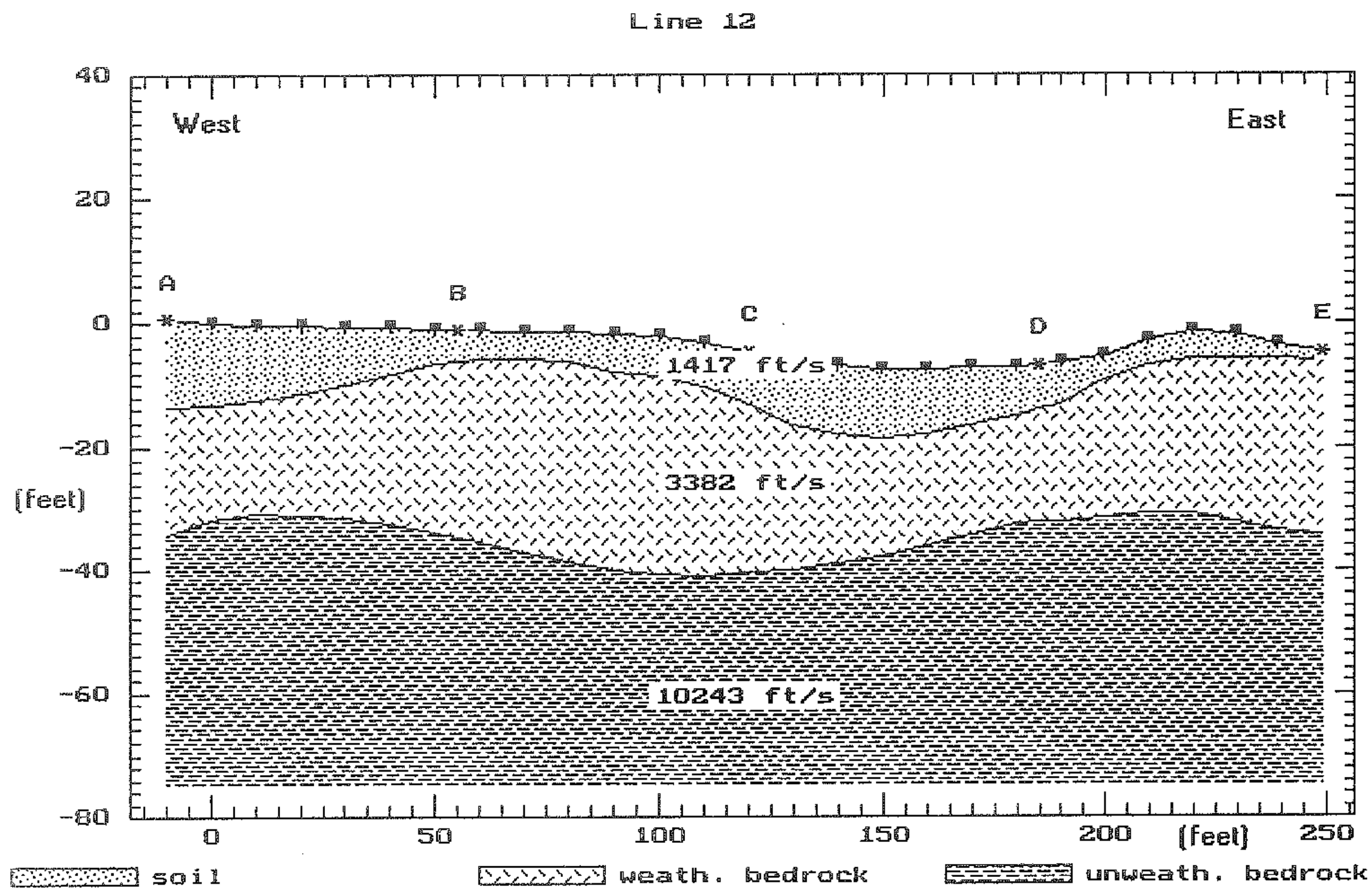


Seismic Refraction Survey 2/12/08	LNR South Campus
ZKCI Project No. 07100-01	Riverside, California

Line 10



Seismic Refraction Survey 2/12/08	LNR South Campus
ZKCI Project No. 07100-01	Riverside, California

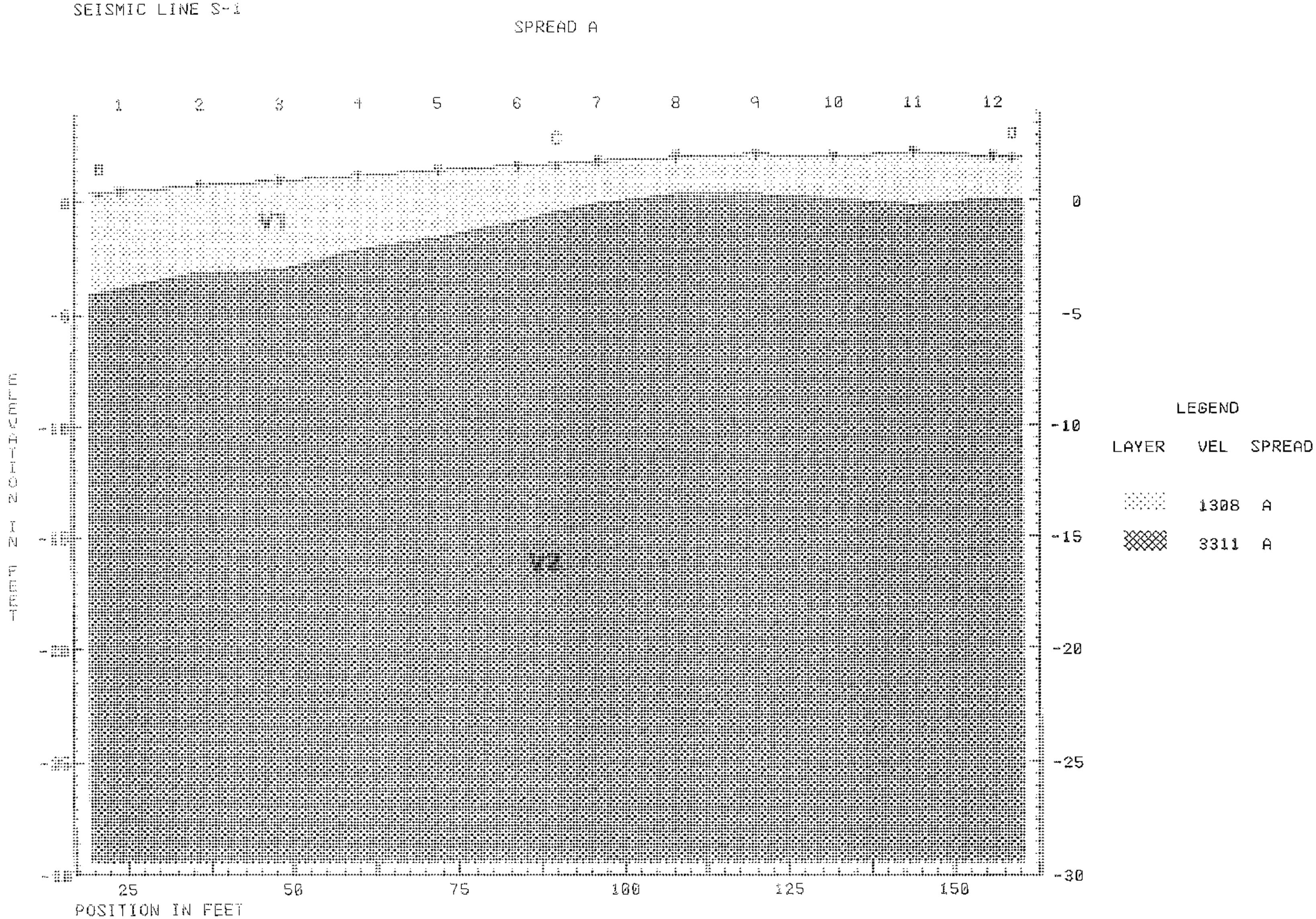


Seismic Refraction Survey 2/12/08	LNR South Campus
ZKCI Project No. 07100-01	Riverside, California

VELOCITY MODELING PROFILE S-1

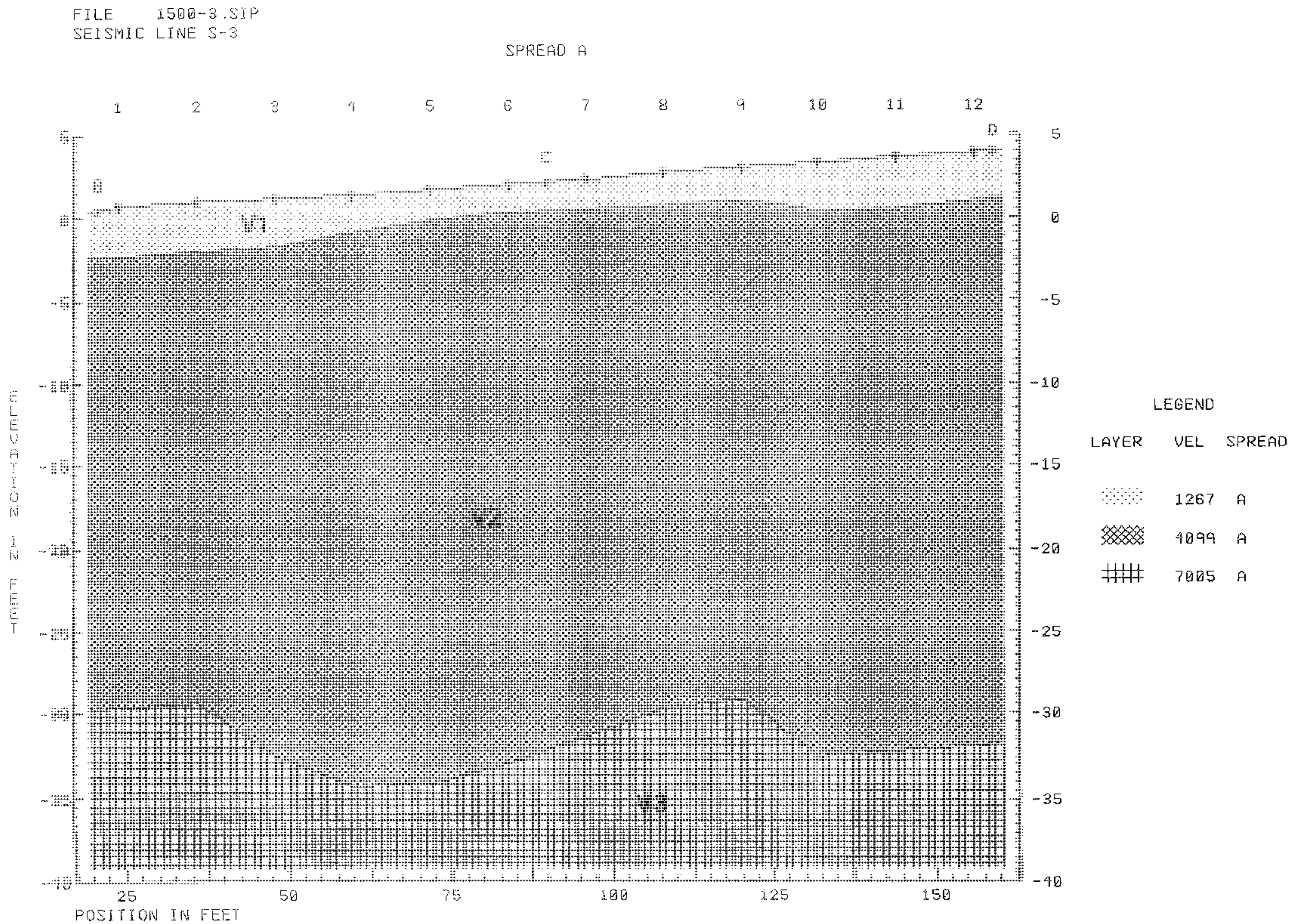
South 13° East →

FILE 1500-1A.SIP
SEISMIC LINE S-1



VELOCITY MODELING PROFILE S-3

North 65° West →



APPENDIX B-1

RESULTS OF GEOTECHNICAL LABORATORY TESTING (This Study)

Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	Meridian South Campus	Tested By:	F. Mina	Date:	1/28/16
Project No. :	11227.001	Checked By:	M. Vinet	Date:	1/29/16
Boring No.:	TP-4	Depth:	1.0 - 4.0		
Sample No. :	B-1	Location:	N/A		
Sample Description:	Silty Sand (SM), brown.				

Dry Wt. of Soil + Cont. (gm.)	5000.5
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	5000.5
Weight Soil Retained on #4 Sieve	4.2
Percent Passing # 4	99.9

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	0.9991
Wt. Comp. Soil + Mold (gm.)	607.6	624.2
Wt. of Mold (gm.)	190.0	190.0
Specific Gravity (Assumed)	2.70	2.70
Container No.	10	10
Wet Wt. of Soil + Cont. (gm.)	517.1	624.2
Dry Wt. of Soil + Cont. (gm.)	494.9	386.7
Wt. of Container (gm.)	217.1	190.0
Moisture Content (%)	8.0	12.3
Wet Density (pcf)	126.0	130.8
Dry Density (pcf)	116.6	116.5
Void Ratio	0.445	0.444
Total Porosity	0.308	0.308
Pore Volume (cc)	63.8	63.6
Degree of Saturation (%) [S meas]	**48.5**	**74.7**

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
1/28/16	12:30	1.0	0	0.5000
1/28/16	12:40	1.0	10	0.5000
	Add Distilled Water to the Specimen			
1/29/16	9:30	1.0	1250	0.4991
1/29/16	10:30	1.0	1310	0.4991

Expansion Index (EI meas)	=	((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	-0.9
Expansion Index (Report)	=	Nearest Whole Number or Zero (0) if Initial Height is > than Final Height	**0**

Rev. 03-08

Leighton

EXPANSION INDEX of SOILS
ASTM D 4829

Project Name:	Meridian South Campus	Tested By:	F. Mina	Date:	1/28/16
Project No. :	11227.001	Checked By:	M. Vinet	Date:	1/29/16
Boring No.:	TP-11	Depth:	1.0 - 3.0		
Sample No. :	B-1	Location:	N/A		
Sample Description:	Clayey Sand (SC), brown.				

Dry Wt. of Soil + Cont. (gm.)	3000.2
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	3000.2
Weight Soil Retained on #4 Sieve	28.2
Percent Passing # 4	99.1

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0283
Wt. Comp. Soil + Mold (gm.)	596.3	635.4
Wt. of Mold (gm.)	209.7	209.7
Specific Gravity (Assumed)	2.70	2.70
Container No.	11	11
Wet Wt. of Soil + Cont. (gm.)	517.2	635.4
Dry Wt. of Soil + Cont. (gm.)	486.0	346.4
Wt. of Container (gm.)	217.2	209.7
Moisture Content (%)	11.6	22.9
Wet Density (pcf)	116.6	128.2
Dry Density (pcf)	104.5	104.4
Void Ratio	0.613	0.659
Total Porosity	0.380	0.397
Pore Volume (cc)	78.7	84.5
Degree of Saturation (%) [S meas]	**51.1**	**93.8**

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
1/28/16	13:30	1.0	0	0.5000
1/28/16	13:40	1.0	10	0.4995
	Add Distilled Water to the Specimen			
1/29/16	9:30	1.0	1190	0.5283
1/29/16	10:30	1.0	1250	0.5283

Expansion Index (EI meas) =	((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	28.8
Expansion Index (Report) =	Nearest Whole Number or Zero (0) if Initial Height is > than Final Height	**29**

Rev. 03-08

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SAND EQUIVALENT TEST

ASTM D 2419 / DOT CA Test 217

Project Name:	Meridian South Campus	Tested By:	AJH	Date:	1/27/16
Project No. :	11227.001	Computed By:	AJH	Date:	1/27/16
Client:	Meridian Park, LLC.	Checked By:	MRV	Date:	1/29/16

Boring No.	Sample No.	Depth (ft.)	Soil Description	T1	T2	T3	T4	R1	R2	SE	Average SE
TP-6	B-1	4.0 - 8.0	SW-SM	09:00	09:10	09:12	09:32	11.0	3.6	33	**33**
				09:02	09:12	09:14	09:34	10.1	3.2	32	

T1 = Starting Time

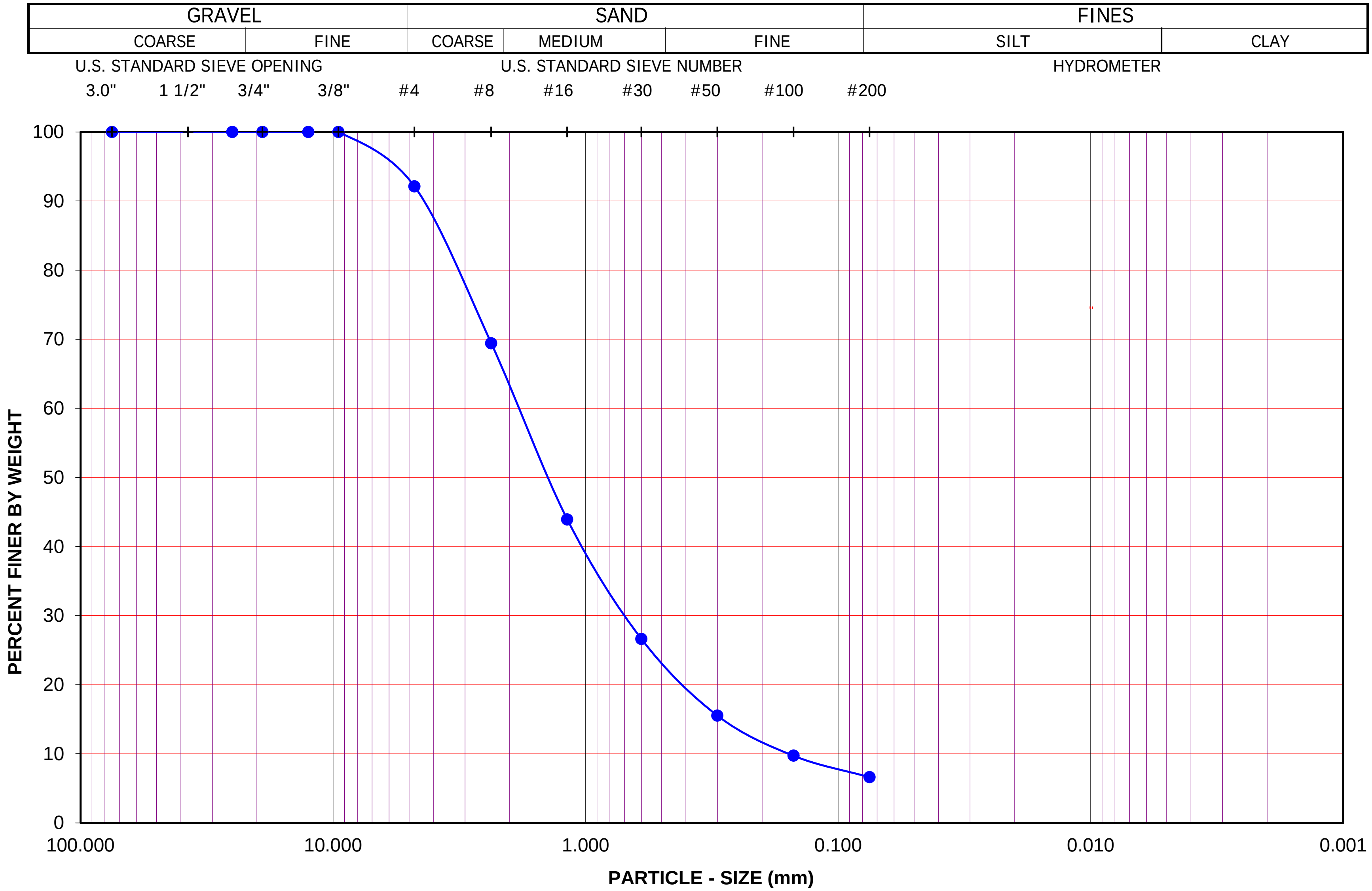
T2 = (T1 + 10 min) Begin Agitation

T3 = Settlement Starting Time

T4 = (T3 + 20 min) Take Clay Reading (R1)

Sand Equivalent = R2 / R1 * 100

Record SE as Next Higher Integer



Project Name: Meridian South Campus

Project No.: 11227.001

Exploration No.: TP-1   Sample No.: B-1

Depth (feet): 2.0 - 7.0   Soil Type : SW-SM

Soil Identification: Well-Graded Sand with Silt (SW-SM), light brown.

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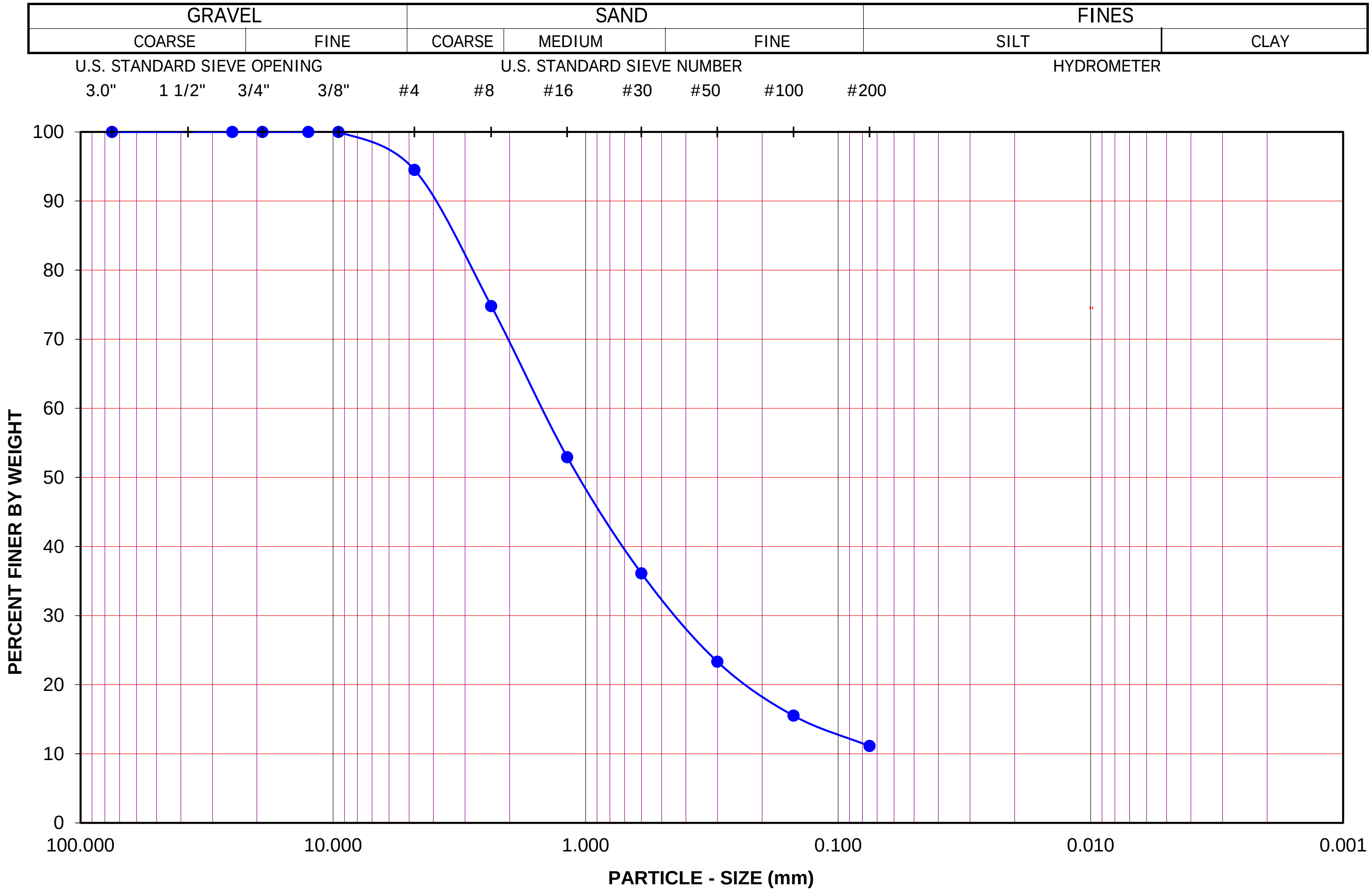
PARTICLE - SIZE DISTRIBUTION ASTM D 6913

GR:SA:FI : (%)   8 : 85 : 7

Jan-16

Sieve; TP-1, B-1 (1-20-16)



Project Name: Meridian South Campus

Project No.: 11227.001

Exploration No.: TP-6   Sample No.: B-1

Depth (feet): 4.0 - 8.0   Soil Type : SW-SM

Soil Identification: Well-Graded Sand with Silt (SW-SM), light brown.

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 6913

GR:SA:FI : (%) 6 : 83 : 11

Jan-16

Sieve; TP-6, B-1 (1-20-16)

SOIL RESISTIVITY TEST

DOT CA TEST 643

Leighton

Project Name:	Meridian South Campus	Tested By :	G. Berdy Date: 02/04/16
Project No. :	11227.001	Data Input By:	J. Ward Date: 02/08/16
Boring No.:	TP-11	Depth (ft.) :	1.0 - 3.0
Sample No. :	B-1		

Soil Identification:* Clayey Sand (SC), brown

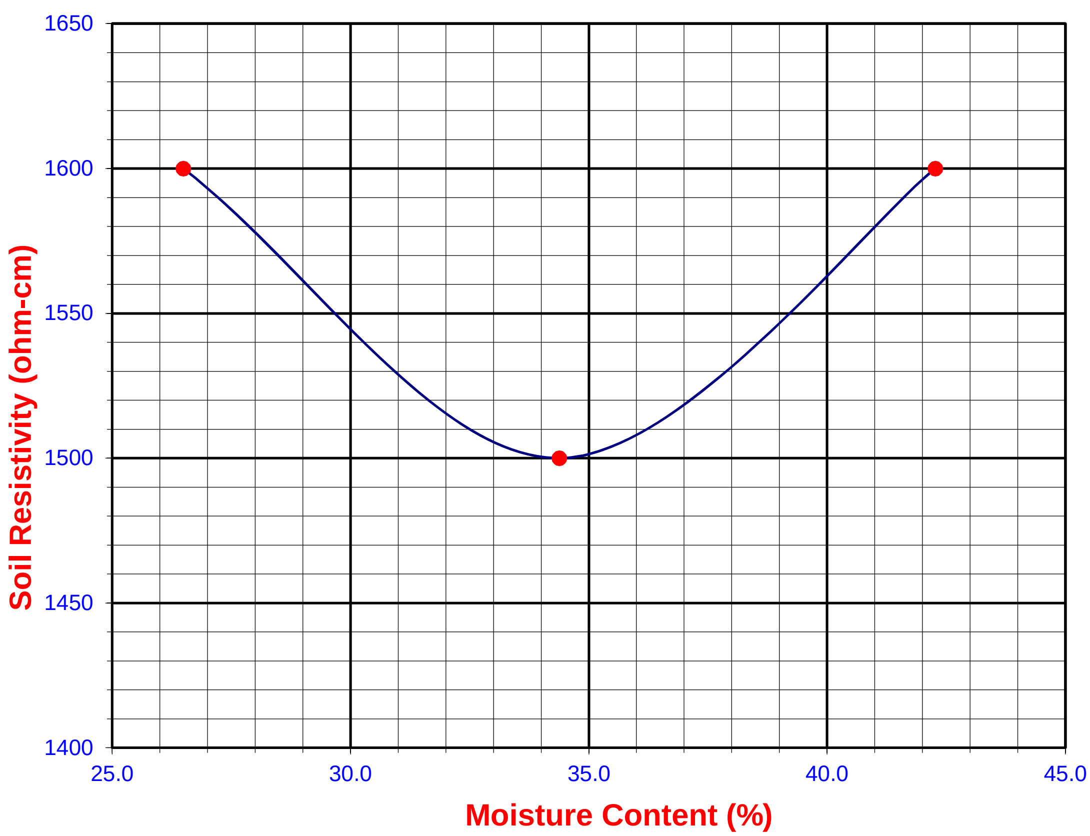
*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	30	26.49	1600	1600
2	40	34.38	1500	1500
3	50	42.27	1600	1600
4				
5				

Moisture Content (%) (MCi)	2.83
Wet Wt. of Soil + Cont. (g)	187.44
Dry Wt. of Soil + Cont. (g)	184.08
Wt. of Container (g)	65.34
Container No.	
Initial Soil Wt. (g) (Wt)	130.36
Box Constant	1.000

$MC = (((1+Mci/100)x(Wa/Wt+1))-1)x100$

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH: pH	Soil pH: Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
1500	**34.4**	**N/A**	**N/A**	**N/A**	**N/A**



Leighton

Soluble Sulfates
(Hach Sulfate Test Kit)

Project Name: Meridian South Campus
Project Number: 11227.001
Date: 1/29/16
Technician: M. Vinet

Sample Identification		Dilution	Reading (PPM) Water Fraction		Tube Reading	% Sulfates
Boring No.:	TP-4	3 :1	3		125	**0.0375**
Sample No:	B-1		=	375		
Depth (ft.):	1.0 - 4 .0					
Boring No.:	TP-6	3 :1	3		55	**0.0165**
Sample No:	B-1		=	165		
Depth (ft.):	4.0 - 8.0					

Leighton

TESTS for SULFATE CONTENT
CHLORIDE CONTENT and pH of SOILS

Project Name: Meridian Campus South — Tested By : M. Vinet — Date: 1/29/16

Project No. : 11227.0070 — Data Input By: M. Vinet — Date: 1/29/16

Boring No.	TP-1				
Sample No.	B-1				
Sample Depth (ft)	1.0 - 3.0				
Visual Soil Classification	SC				
Wet Weight of Soil + Container (g)	100.0				
Dry Weight of Soil + Container (g)	100.0				
Weight of Container (g)	0.0				
Moisture Content (%)	0.0				
Weight of Soaked Soil (g)	100.0				

SULFATE CONTENT, Hach Kit Method

Dillution : 1	3				
Water Fraction (ml)	25				
Tube Reading	55				
PPM Sulfate	165				
% Sulfate	0.0165				

CHLORIDE CONTENT, AASHTO T-291

ml of Chloride Soln. For Titration (B)	30				
ml of AgNO3 Soln. Used in Titration (C)	0.4				
PPM of Chloride (C -0.2) * Titre (1) * 1000 / 10g	6				
PPM of Chloride, Dry Wt. Basis	**6**				

pH TEST, ASTM D-4972

Container No.	A				
Temperature (C°)	17.2				
pH Value (METHOD A)	**7.49**				

R-VALUE TEST RESULTS

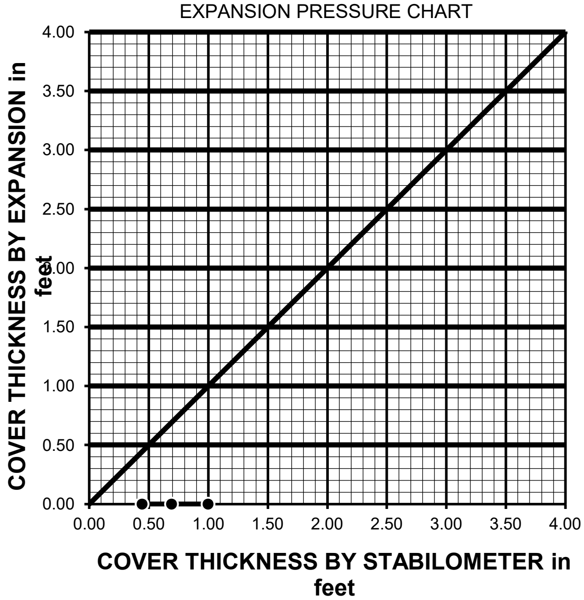
ASTM D 2844

Project Name:	Meridian South Campus	Date:	1/28/16
Project Number:	11227.001	Technician:	M. Vinet
Boring Number:	TP-1	Depth (ft.):	2.0 - 7.0
Sample Number:	B-1	Sample Location:	N/A
Sample Description:	Well-Graded Sand with Silt (SW-SM), light brown.		

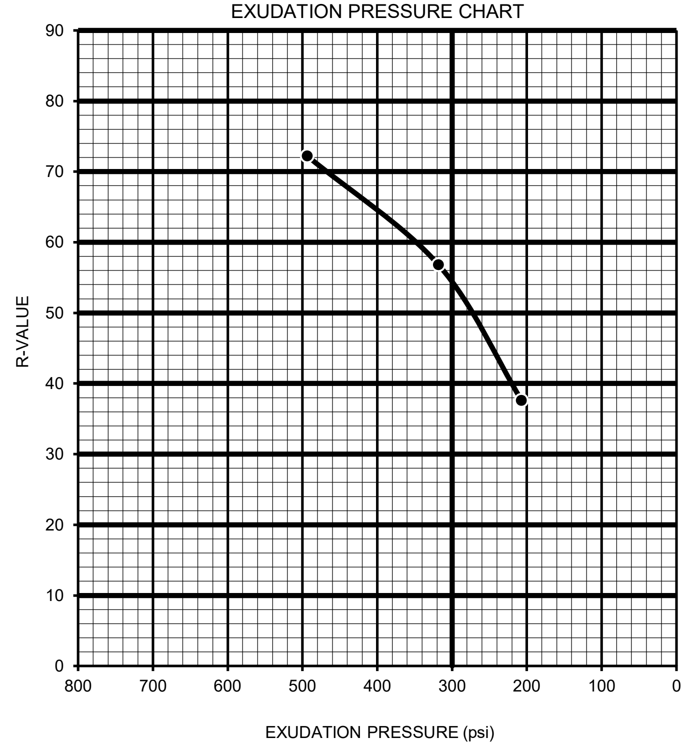
TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	9.7	10.7	11.8
HEIGHT OF SAMPLE, Inches	2.46	2.49	2.48
DRY DENSITY, pcf	129.6	127.3	128.3
COMPACTOR AIR PRESSURE, psi	350	350	300
EXUDATION PRESSURE, psi	493	318	207
EXPANSION, Inches x 10exp-4	0	0	0
STABILITY Ph 2,000 lbs (160 psi)	30	47	75
TURNS DISPLACEMENT	4.17	4.57	4.70
R-VALUE UNCORRECTED	72	57	38
R-VALUE CORRECTED	72	57	38

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.44	0.69	1.00
EXPANSION PRESSURE THICKNESS, ft.	0.00	0.00	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	N/A
R-VALUE BY EXUDATION:	55
EQUILIBRIUM R-VALUE:	55

Rev. 08-04

R-VALUE TEST RESULTS

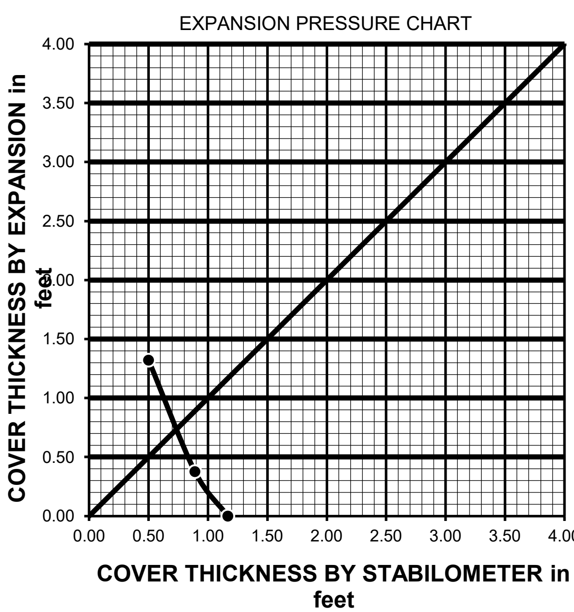
ASTM D 2844

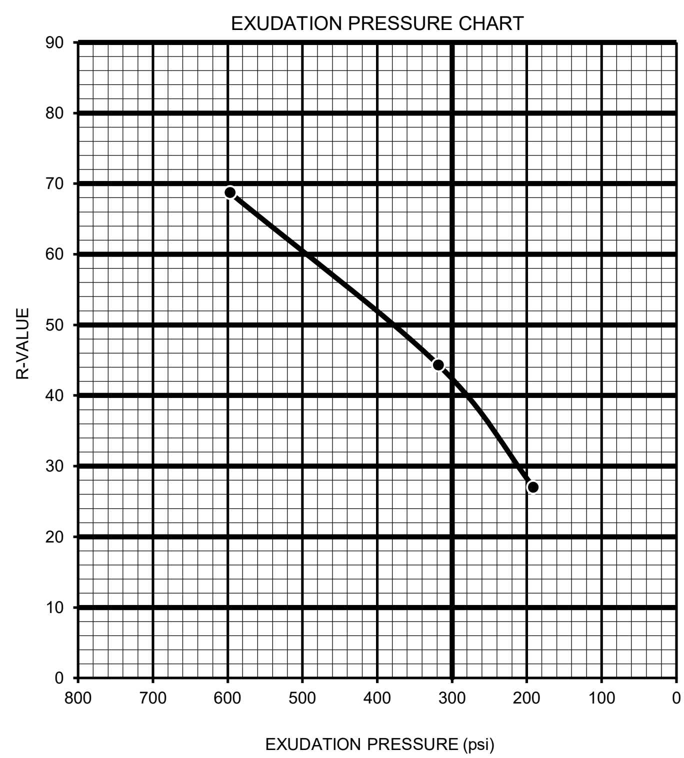
Leighton

Project Name:	Meridian South Campus	Date:	1/28/16
Project Number:	11227.001	Technician:	M. Vinet
Boring Number:	TP-4	Depth (ft.):	1.0 - 4.0
Sample Number:	B-1	Sample Location:	N/A
Sample Description:	Silty Sand (SM), brown.		

TEST SPECIMEN	**A**	**B**	**C**
MOISTURE AT COMPACTION %	8.8	9.9	10.9
HEIGHT OF SAMPLE, Inches	2.46	2.51	2.57
DRY DENSITY, pcf	128.8	127.1	123.3
COMPACTOR AIR PRESSURE, psi	350	350	250
EXUDATION PRESSURE, psi	597	318	191
EXPANSION, Inches x 10exp-4	35	10	0
STABILITY Ph 2,000 lbs (160 psi)	33	58	87
TURNS DISPLACEMENT	4.38	5.52	6.21
R-VALUE UNCORRECTED	69	44	25
R-VALUE CORRECTED	69	44	27

DESIGN CALCULATION DATA	**a**	**b**	**c**
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.50	0.89	1.17
EXPANSION PRESSURE THICKNESS, ft.	1.32	0.38	0.00





R-VALUE BY EXPANSION:	53
R-VALUE BY EXUDATION:	43
EQUILIBRIUM R-VALUE:	43

APPENDIX B-2

RESULTS OF GEOTECHNICAL LABORATORY TESTING (Previous Studies)

Project Number : 07100-01 | Tested by RB | Date 5-Mar-08

Project Name : LNR / SO. CAMPUS | Sampled by ______ | Date ______

Sample No. B - 17 | Depth/Elev. 15 - 17' | Location / Source : ______

Sample Descriptions / Visual Classification : GRAYISH BROWN SILTY SAND (SM)

WEIGHTS		SIEVE		WEIGHT RETAINED (g)	% RETAINED	% PASSING
WET (g)	DRY (g)	Size	Opening (mm)			
-	396.8	#200	0.075	337.85	85.1	14.9

INITIAL MOISTURE CONTENT	
Dish No.	
Wet Weight + Tare (g)	
Dry Weight + Tare (g)	
Tare (g)	
Moisture Content (%)	

DESCRIPTIONS OF SAND & GRAVEL PARTICLES		
Shape	Rounded	
	Angular	X
Hardness	Hard & Durable	
	Soft	
	Weathered & Friable	X

MAXIMUM PARTICLE SIZE		#4
TEST METHOD	A (Non - Dispersed)	X
	B (Dispersed)	

Remarks : SAMPLE WAS PRE-SCREENED ON #4 SIEVE FOR COMPACTION TEST

Maximum Particle Size (mm.)	Standard Sieve Size	Recommended Minimum Mass of Specimen, (g)
≤ 2	# 10	20
4.75	# 4	100
9.50	3/8"	500
19.0	3/4"	2500
37.5	1-1/2"	10000
75.0	3"	50000

ZEISER KLING CONSULTANTS, INC.
1221 E. Dyer Road, Suite 105; Santa Ana, CA 92705
Tel: (714) 755-1355; Fax: (714) 755-1366

MATERIAL FINER THAN # 200 SIEVE
(ASTM D1140-00 / C117-95)

Project Number :	07100-01	Tested by RMC	Date 11-Mar-08
Project Name :	LNR / SO. CAMPUS	Sampled by	Date

Sample No. B-69 Depth/Elev. 10' Location:

Sample Descriptions / Classification : BROWN SILTY TO CLAYEY SAND (SM/SC)

HYDROMETER ANALYSIS (ASTM STD HYDROMETER 152H)

Temp.(^{0}C)	Hydro.Rdg.Cor.	K Value	Hygroscopic Moisture		Wt.of Air Dry Sample, (g)	-
			Wet Weight of Soil,(g)		Wt.of Oven Dry Sample, (g)	-
			Dry Weight of Soil,(g)		Material Passing Sieve No.	10
			Moisture Content,(%)			

Specific Gravity (γ) = 2.7 (Assumed) Correction Factor (α) = 0.99

Date	Time	Elapsed Time(min)	Temp. (^{0}C)	R'	C	R	% P	% P Corrected	L (cm)	k Value	L/T (cm/min)	Diameter (mm)
		0.25										
		0.50										
		1.00										
		2.00										
		4.00										
		5.00										
		15.0										
		30.0										
		60.0										
		240.0										
		1440.0										

N/A

SIEVE ANALYSIS

Sieve Size	Sieve Opening (mm)	Weight Retained Individual (g)	Weight Retained Cummulative (g)	Cummulative % Retained	Cummulative % Passing	Specification % Passing
3"	75.0					
2"	50.0					
1-1/2"	38.1					
1"	25.0					
3/4"	19.0					
1/2"	12.5					
3/8"	9.5		0.00	0.0	100.0	
#4	4.75		11.20	2.5	97.5	
#8	2.36		89.40	19.8	80.2	
#10	2.00					
#16	1.18		142.30	31.5	68.5	
#30	0.600		195.90	43.4	56.6	
#50	0.300		252.30	55.8	44.2	
#100	0.150		301.10	66.6	33.4	
#200	0.075		340.50	75.4	24.6	

Total Wt. of Dry Soil,(g)	451.79

	Moist	Dry
(+)#10 Sieve,(g)	-	-
(-)#10 Sieve,(g)	-	-

Sand & Gravel Particle Descriptions

Shape	Rounded	
	Angular	X
Hardness	Hard & Durable	
	Soft	
	Weathered & Friable	X

D_{10}	0.085	D_{60}	0.64
D_{30}	0.23		
Coefficient of Uniformity,C_u			7.53
Coefficient of Curvature,C_c			0.97

Remarks :

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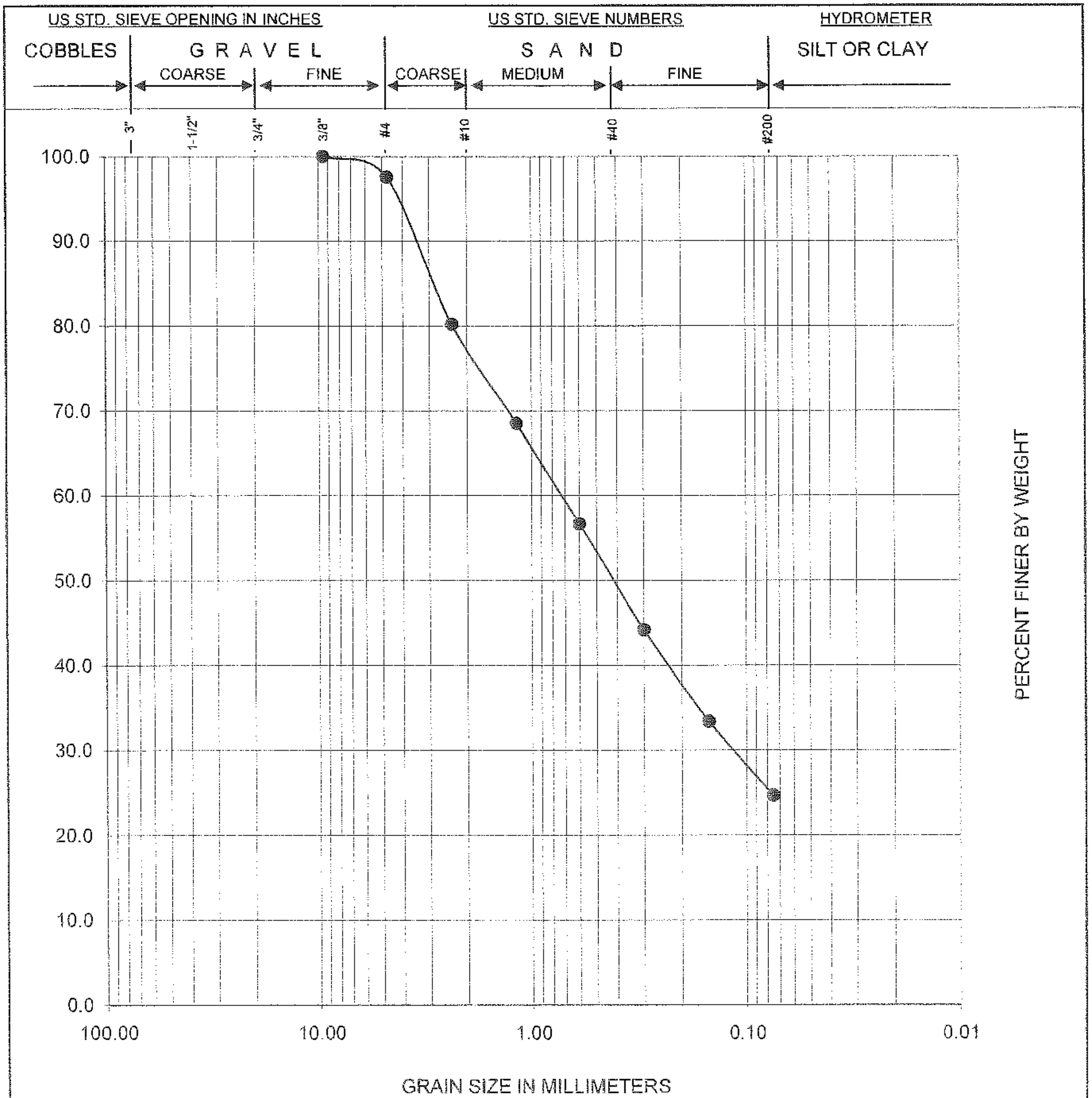
GRAIN - SIZE ANALYSIS



PROJECT NUMBER : 07100-01

PROJECT NAME : LNR / SO. CAMPUS

SAMPLE NO.	DEPTH	SYMBOL	CLASSIFICATION	NAT.W%	LL	PL	PI
B-69	10'	SM/SC	BROWN SILTY TO CLAYEY SAND		-	-	-

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GRAIN - SIZE CURVE

JOB NAME :	LNR / SO. CAMPUS	JOB NUMBER:	07100-01
SAMPLE NUMBER :		TESTED BY :	RMC
SAMPLE LOCATION :	B-8 @ 2' - 4'	DATE :	25-Feb-08

SAMPLE DESCRIPTIONS / CLASSIFICATION : DK. BROWN SILTY TO CLAYEY SAND (SM/SC)

TEST STANDARD	ASTM D-698 - 00			**ASTM D 1557-02**		
METHOD	A	B	C	A	B	C

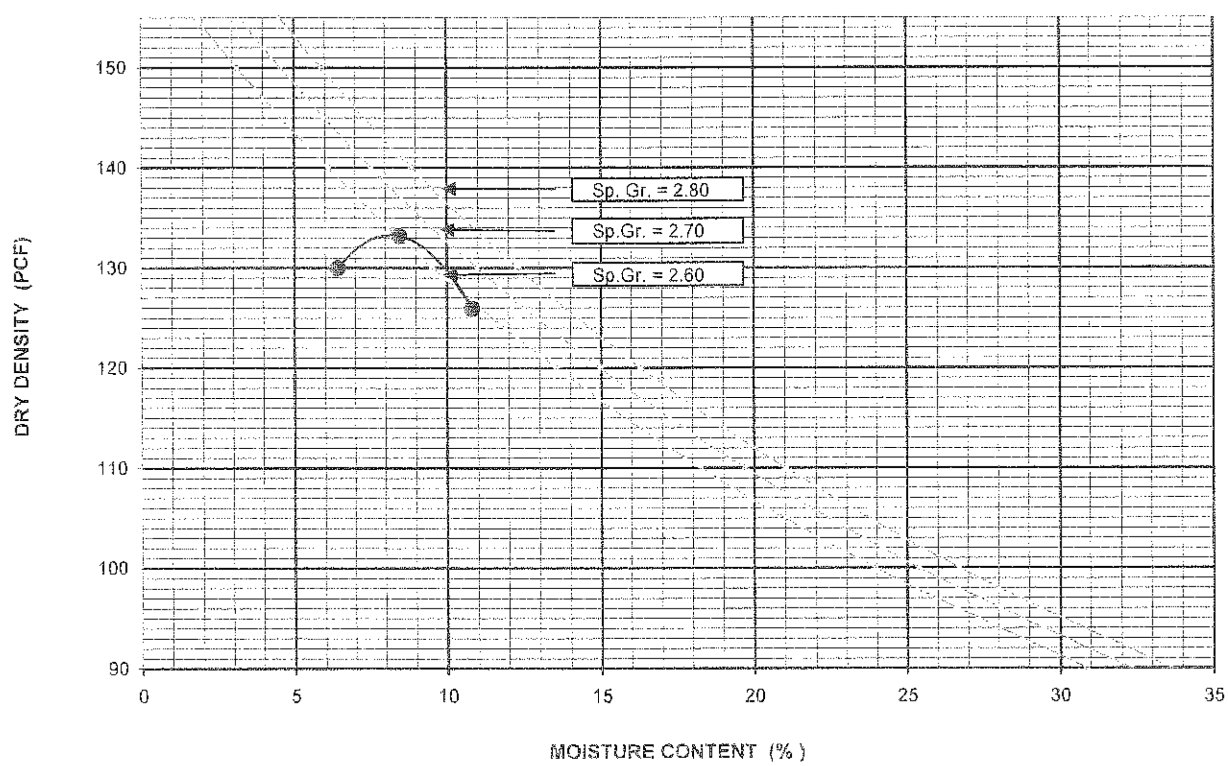
TRIAL NUMBER	1	2	3	4	5
WATER ADDED (ML)	-	0	70		
WT. SOIL + MOLD (GMS)	4142	4235	4160		
WT.OF MOLD (GMS)	2051	2051	2051		
WT. OF WET SOIL (GMS)	2091	2184	2109		
WET DENSITY (PCF)	138.3	144.4	139.5		
CAN NUMBER	R11	R14	R12		
WET SOIL + TARE (GMS)	673.37	736.87	781.64		
DRY SOIL + TARE (GMS)	644.13	693.80	723.90		
TARE (GMS)	188.42	184.69	189.25		
DRY SOIL (GMS)	455.71	509.11	534.65		
WATER (GMS)	29.24	43.07	57.74		
MOISTURE CONTENT (%)	6.4	8.5	10.8		
DRY DENSITY (PCF)	130.0	133.2	125.9		

DIAMETER OF MOLD:	4	In.
VOLUME OF MOLD:	0.0333	Cu.Ft.
SCALPED ON SIEVE SIZE/NO.:	#4	
PERCENT RETAINED,(%) :	-	
MAXIMUM DRY DENSITY:	**133.5**	Pcf.
OPT. MOIST. CONTENT :	**8.0**	%

FOR OVERSIZE CORRECTION (ASTM D4718):

%,Finer Fraction =	-	% Moisture =	-
%,Oversize Fraction =	-	Assumed Sp.Gr.	2.64
Corrected MDD of Total Materials,(PCF) =	-		
Corrected OMC of Total Materials, (%) =	-		

REMARKS :



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MAXIMUM DENSITY TEST

JOB NAME :	L N R/ SO. CAMPUS	JOB NUMBER:	07100-00
SAMPLE NUMBER :		TESTED BY :	RB
SAMPLE LOCATION :	B - 10 @ 14 - 15'	DATE :	8-Feb-08

SAMPLE DESCRIPTIONS / CLASSIFICATION : GRAYISH BR. POORLY GRADED SAND WITH SILT & GRAVEL(SP/SM)

TEST STANDARD	ASTM D-698 - 00			**ASTM D 1557-02**		
METHOD	A	B	C	**A**	B	C

TRIAL NUMBER	1	2	3	4	5
WATER ADDED (ML)	0	75	150	225	
WT. SOIL + MOLD (GMS)	4083	4189	4274	4243	
WT.OF MOLD (GMS)	2055	2055	2055	2055	
WT. OF WET SOIL (GMS)	2028	2134	2219	2188	
WET DENSITY (PCF)	134.1	141.1	146.8	144.7	
CAN NUMBER		I			
WET SOIL + TARE (GMS)	300.78	302.92	303.07	304.74	
DRY SOIL + TARE (GMS)	293.82	288.69	280.94	275.10	
TARE (GMS)	0.00	0.00	0.00	0.00	
DRY SOIL (GMS)	293.82	288.69	280.94	275.10	
WATER (GMS)	6.96	14.23	22.13	29.64	
MOISTURE CONTENT (%)	2.4	4.9	7.9	10.8	
DRY DENSITY (PCF)	131.0	134.5	136.0	130.6	

DIAMETER OF MOLD: 4 In.

VOLUME OF MOLD: 0.0333 Cu.Ft.

SCALPED ON SIEVE SIZE/NO.: #4

PERCENT RETAINED,(%) : -

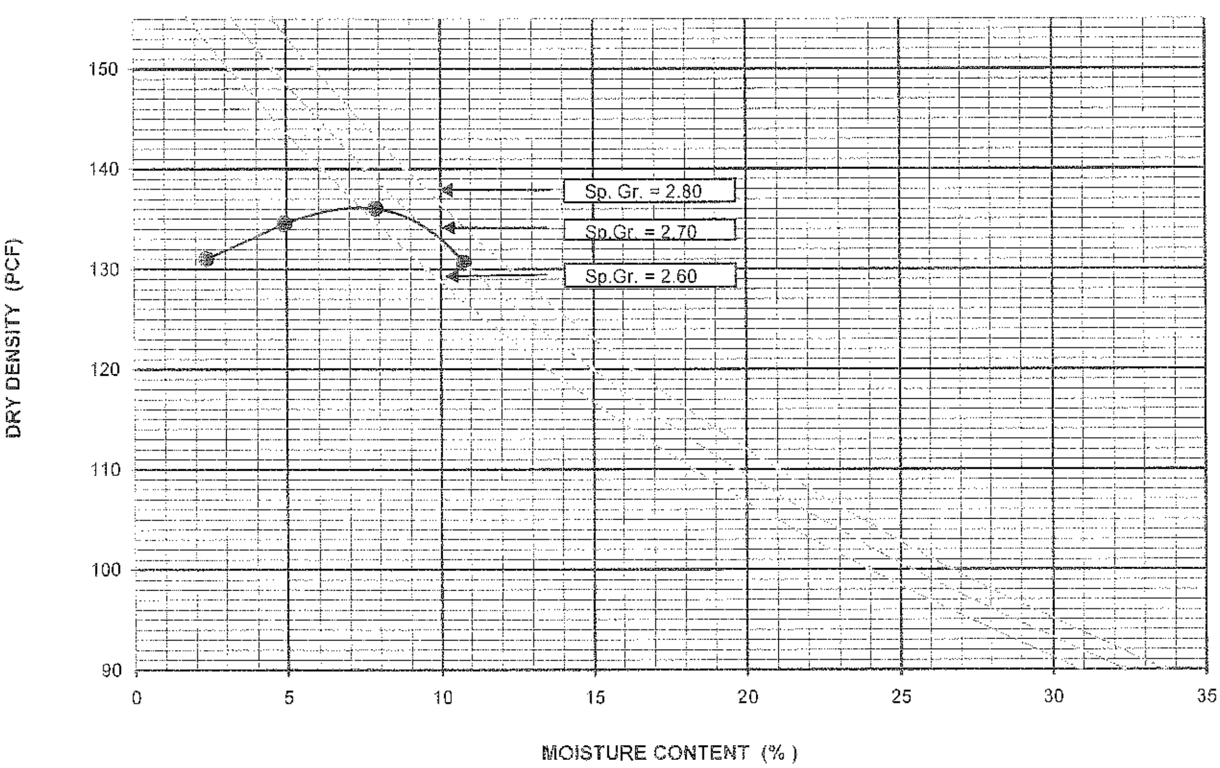
MAXIMUM DRY DENSITY: 136.5 Pcf.

OPT. MOIST. CONTENT : 7.5 %

FOR OVERSIZE CORRECTION (ASTM D4718):

%,Finer Fraction =	-	% Moisture =	-
%,Oversize Fraction =	-	Assumed Sp.Gr.	2.64
Corrected MDD of Total Materials,(PCF) =			-
Corrected OMC of Total Materials, (%) =			-

REMARKS :



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MAXIMUM DENSITY TEST

JOB NAME :	LNR / SO CAMPUS		JOB NUMBER:	07100-01
SAMPLE NUMBER :			TESTED BY :	RB
SAMPLE LOCATION :	B - 17 @ 15 - 17'		DATE :	11-Feb-08
SAMPLE DESCRIPTIONS / CLASSIFICATION :	GRAYISH BROWN SITLY SAND (D.G)(SM)			

TEST STANDARD	ASTM D-698 - 00			ASTM D 1557-02		
METHOD	A	B	C	A	B	C

TRIAL NUMBER	1	2	3	4	5
WATER ADDED (ML)	0	50	100	150	
WT. SOIL + MOLD (GMS)	4159	4275	4280	4218	
WT.OF MOLD (GMS)	2055	2055	2055	2055	
WT. OF WET SOIL (GMS)	2104	2220	2225	2163	
WET DENSITY (PCF)	139.2	146.8	147.2	143.1	
CAN NUMBER	A	Z I	Y	K	
WET SOIL + TARE (GMS)	686.11	795.30	787.61	794.61	
DRY SOIL + TARE (GMS)	667.15	759.60	742.01	738.71	
TARE (GMS)	188.40	191.92	196.21	198.77	
DRY SOIL (GMS)	478.75	567.68	545.80	539.94	
WATER (GMS)	18.96	35.70	45.60	55.90	
MOISTURE CONTENT (%)	4.0	6.3	8.4	10.4	
DRY DENSITY (PCF)	133.9	138.1	135.8	129.6	

DIAMETER OF MOLD: 4 In.

VOLUME OF MOLD: 0.0333 Cu.Ft.

SCALPED ON SIEVE SIZE/NO.: #4

PERCENT RETAINED,(%) : -

MAXIMUM DRY DENSITY: 138.5 Pcf.

OPT. MOIST. CONTENT : 6.5 %

FOR OVERSIZE CORRECTION (ASTM D4718):

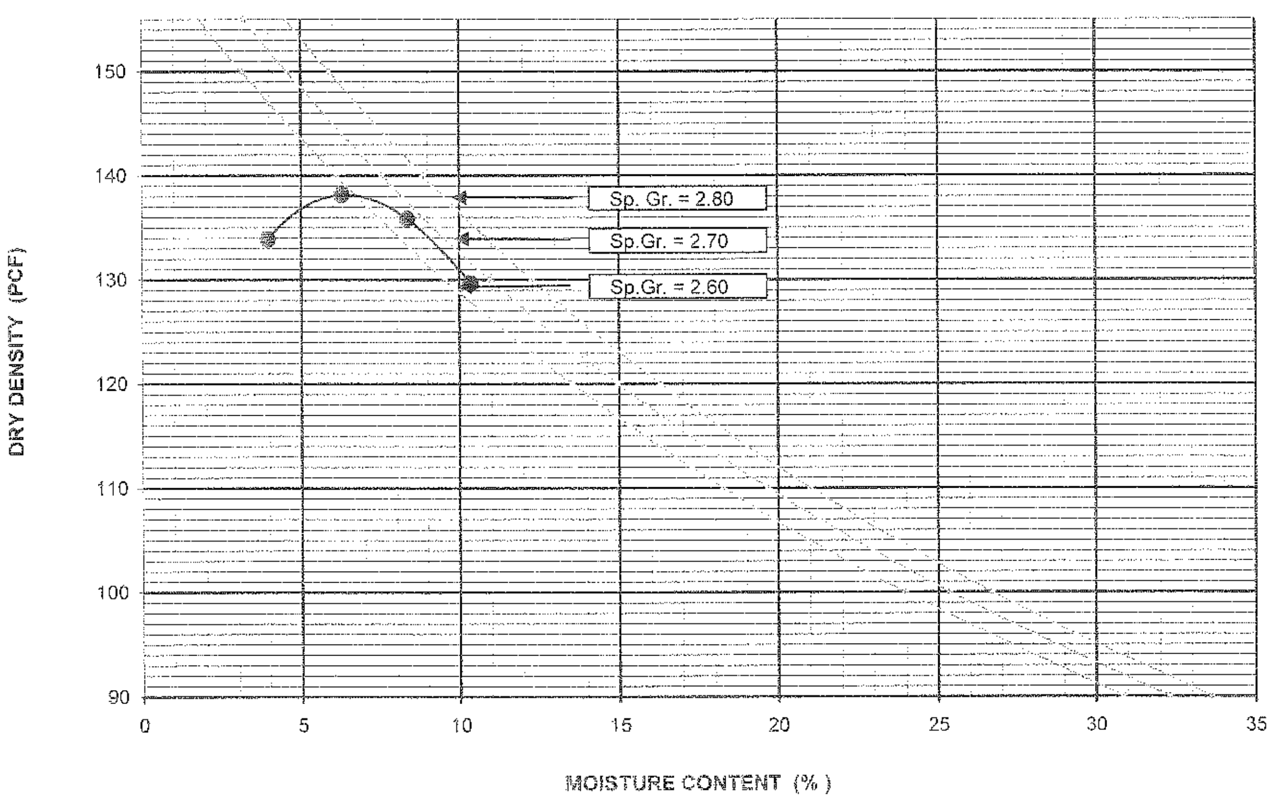
%,Finer Fraction = - % Moisture = -

%,Oversize Fraction = - Assumed Sp.Gr. 2.64

Corrected MDD of Total Materials,(PCF) = -

Corrected OMC of Total Materials, (%) = -

REMARKS :



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MAXIMUM DENSITY TEST

JOB NAME :	LNR / SO. CAMPUS	JOB NUMBER:	07100-01
AMPLE NUMBER :		TESTED BY :	RMC
SAMPLE LOCATION :	B-21 @ 0 - 2'	DATE :	25-Feb-08
SAMPLE DESCRIPTIONS / CLASSIFICATION :	LT. GRAYISH BROWN SILTY SAND (SM)		

TEST STANDARD	ASTM D-698 - 00			ASTM D 1557-02		
METHOD	A	B	C	**A**	B	C

RIAL NUMBER	1	2	3	4	5
ATER ADDED (ML)	-	0	70	140	
WT. SOIL + MOLD (GMS)	4080	4157	4193	4172	
T.OF MOLD (GMS)	2051	2051	2051	2051	
T. OF WET SOIL (GMS)	2029	2106	2142	2121	
WET DENSITY (PCF)	134.2	139.3	141.7	140.3	
AN NUMBER	Y	K	A	R2	
WET SOIL + TARE (GMS)	747.53	765.85	691.91	740.15	
DRY SOIL + TARE (GMS)	714.97	726.03	649.29	686.15	
ARE (GMS)	196.21	198.70	188.41	187.49	
DRY SOIL (GMS)	518.76	527.33	460.88	498.66	
ATER (GMS)	32.56	39.82	42.62	54.00	
OISTURE CONTENT (%)	6.3	7.6	9.2	10.8	
DRY DENSITY (PCF)	126.3	129.5	129.7	126.6	

DIAMETER OF MOLD:	4	In.
VOLUME OF MOLD:	0.0333	Cu.Ft.
SCALPED ON SIEVE SIZE/NO.:	#4	
PERCENT RETAINED,(%) :	-	
MAXIMUM DRY DENSITY:	**130.0**	Pcf.
OPT. MOIST. CONTENT :	**8.5**	%

FOR OVERSIZE CORRECTION (ASTM D4718):

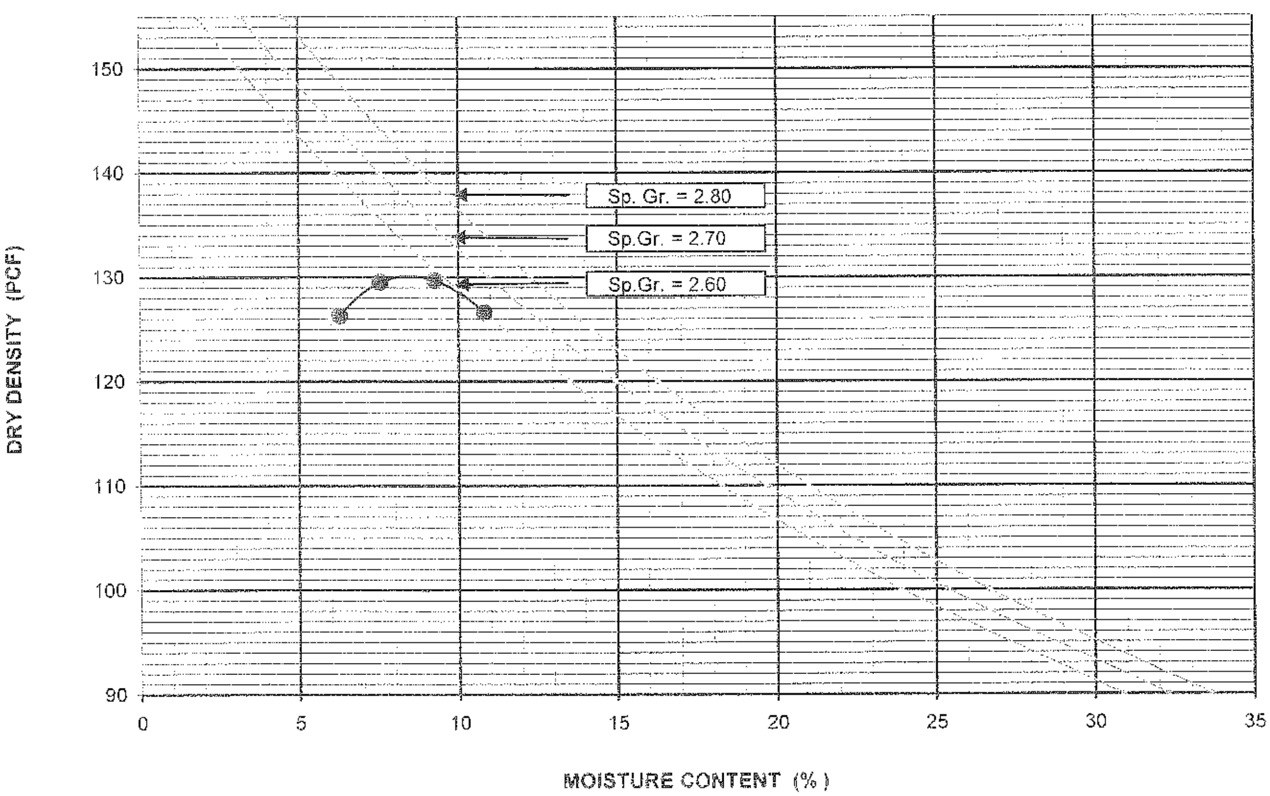
%,Finer Fraction = - % Moisture = -

%,Oversize Fraction = - Assumed Sp.Gr. 2.64

Corrected MDD of Total Materials,(PCF) = -

Corrected OMC of Total Materials, (%) = -

REMARKS :



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MAXIMUM DENSITY TEST

JOB NAME :	LNR / SO. CAMPUS		JOB NUMBER:	07100-01
SAMPLE NUMBER :			TESTED BY :	RB
SAMPLE LOCATION :	B - 56 @ 12 - 14'		DATE :	15-Feb-08
SAMPLE DESCRIPTIONS / CLASSIFICATION :	GRAYISH BROWN SILTY SAND (SM)			

TEST STANDARD	ASTM D-698 - 00			**ASTM D 1557-02**		
METHOD	A	B	C	**A**	B	C

TRIAL NUMBER	1	2	3	4	5
WATER ADDED (ML)	0	50	100	150	
WT. SOIL + MOLD (GMS)	4091	4175	4238	4230	
WT.OF MOLD (GMS)	2055	2055	2055	2055	
WT. OF WET SOIL (GMS)	2036	2120	2183	2175	
WET DENSITY (PCF)	134.7	140.2	144.4	143.8	
PAN NUMBER	Y	N	A	K	
WET SOIL + TARE (GMS)	754.21	774.05	795.88	778.15	
DRY SOIL + TARE (GMS)	733.41	738.05	749.16	723.20	
TARE (GMS)	196.22	191.61	188.40	198.78	
DRY SOIL (GMS)	537.19	546.44	560.76	524.42	
WATER (GMS)	20.80	36.00	46.72	54.95	
MOISTURE CONTENT (%)	3.9	6.6	8.3	10.5	
DRY DENSITY (PCF)	129.6	131.5	133.3	130.2	

DIAMETER OF MOLD:	4	In.
VOLUME OF MOLD:	0.0333	Cu.Ft.
SCALPED ON SIEVE SIZE/NO.:	#4	
PERCENT RETAINED,(%) :	-	
MAXIMUM DRY DENSITY:	**133.5**	Pcf.
OPT. MOIST. CONTENT :	**8.5**	%

FOR OVERSIZE CORRECTION (ASTM D4718):

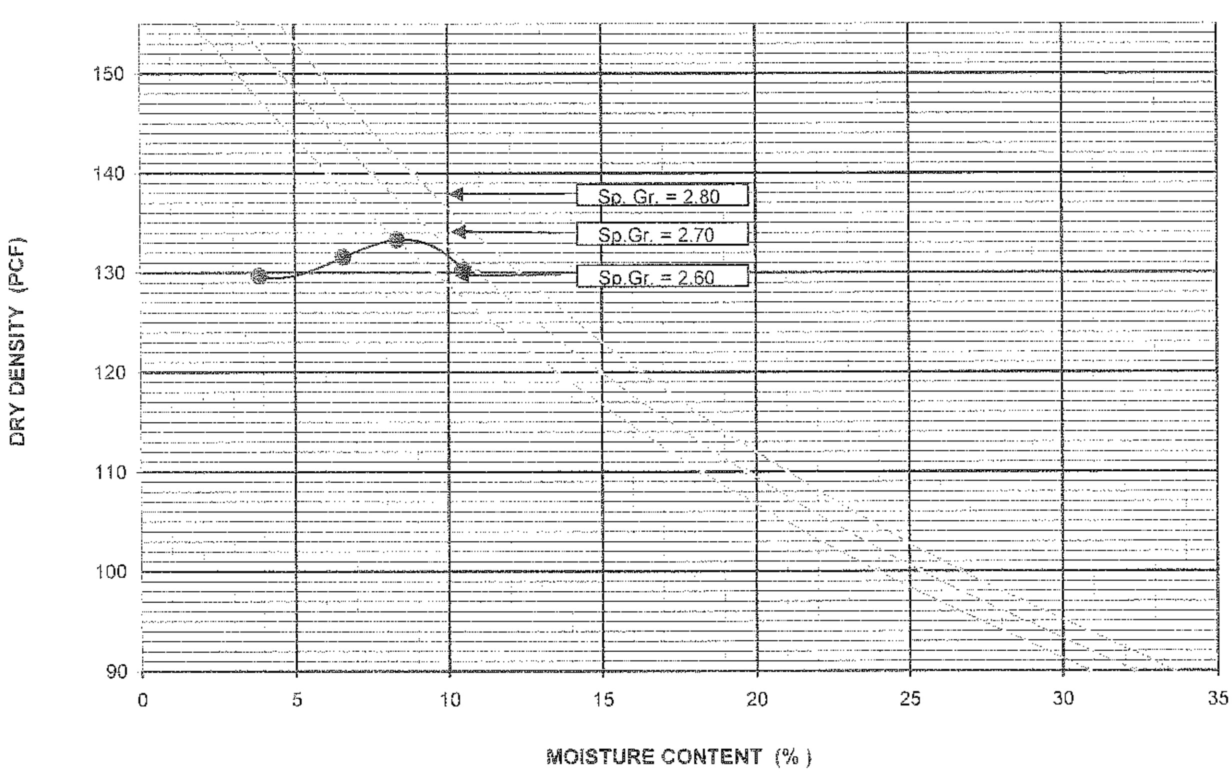
%,Finer Fraction = - % Moisture = -

%,Oversize Fraction = - Assumed Sp.Gr. 2.64

Corrected MDD of Total Materials,(PCF) = -

Corrected OMC of Total Materials, (%) = -

REMARKS :



ZEISER KLING CONSULTANTS, INC. 1221 E. Dyer Road, Suite 105; Santa Ana, CA 92705 Tel: (714) 755-1355; Fax: (714) 755-1366	MAXIMUM DENSITY TEST

Project Name :	LNR / SO. CAMPUS	Date :	6-Mar-08
Project No. :	07100-01	Tested By :	RMC
Sample Location :	B-21	Depth :	0 - 2 (ft.)
Sample Descriptions / Classification :	GRAYISH BROWN SILTY SAND (SM)		

Applied Normal Load (ksf)	1.0		2.0		4.0	
Shear Stress,(Peak) (ksf)	0.720		1.236		2.328	
Shear Stress,(Ultimate) (ksf)	0.629		1.200		2.316	
Density and Saturation	Initial	Final	Initial	Final	Initial	Final
Wet Weight of Soil + Ring (gms)	197.79	206.79	197.65	206.63	197.71	204.2
Dry Weight of Soil + Ring (gms)		185.85		185.74		185.80
Weight of Water (gms)	-	20.94	-	20.89	-	18.40
Weight of Ring (gms)	-	45.42	-	45.58	-	45.64
Weight of Dry Soil (gms)	-	140.43	-	140.16	-	140.16
Moisture Content (%)	8.5	14.9	8.5	14.9	8.5	13.1
Wet Density (pcf)	127.2	134.7	127.0	134.4	127.0	132.4
Dry Density (pcf)	-	117.2	-	117.0	-	117.0
Specific Gravity,G_s (Assumed)	2.68					
Thickness of Specimen, (in.)	1.00					
Degree of Saturation, (%)	53.4	93.6	53.0	93.0	53.0	81.9
Void Ratio	-	0.427	-	0.429	-	0.429

Lateral Displacement, d_h 0.3600 (in.)

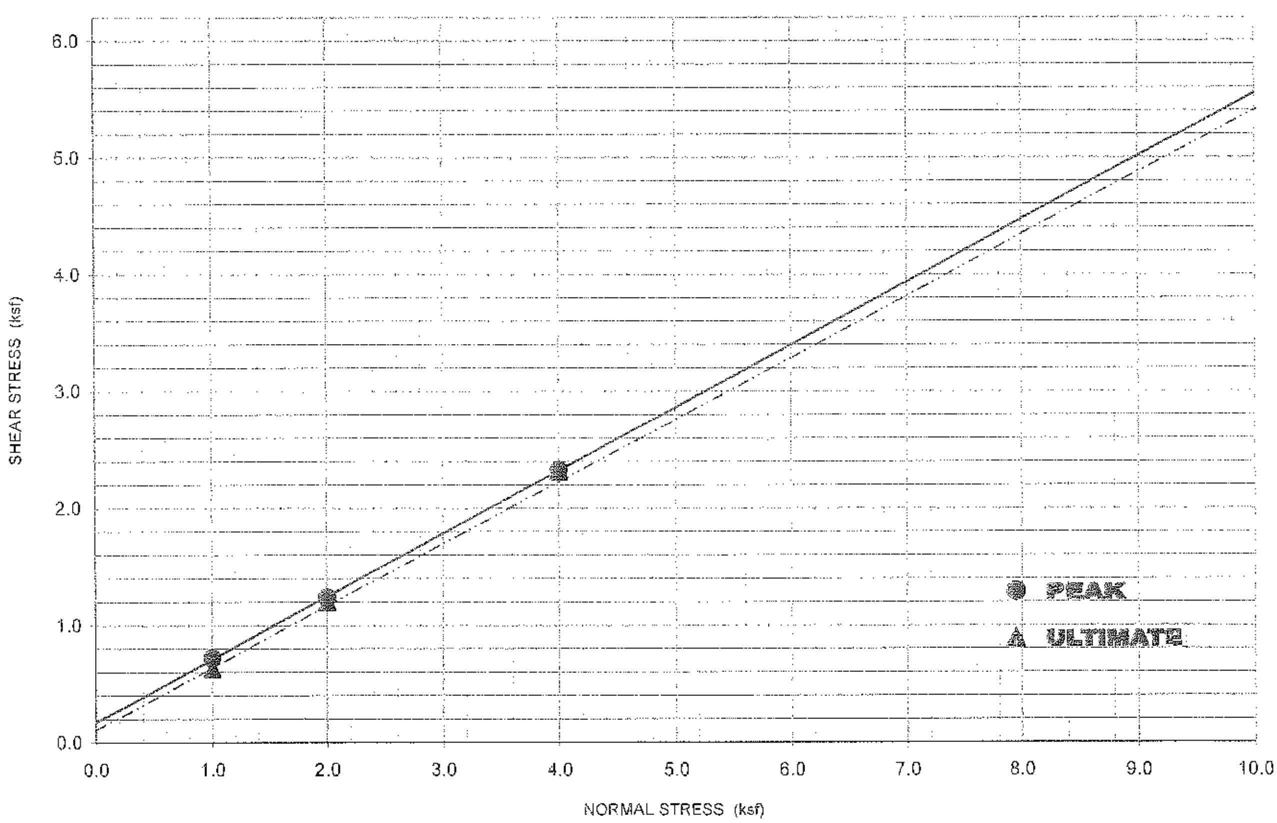
Displacement Rate,d_r 0.05 (in./min.)

Elapsed Time of Test, t_e 7.20 (min.)

	PEAK	ULTIMATE
Cohesion,c (psf)	200	100
Friction Angle, ϕ	29	29

Remarks :

"REMOLDED TO 90% R.C. @ OPT."



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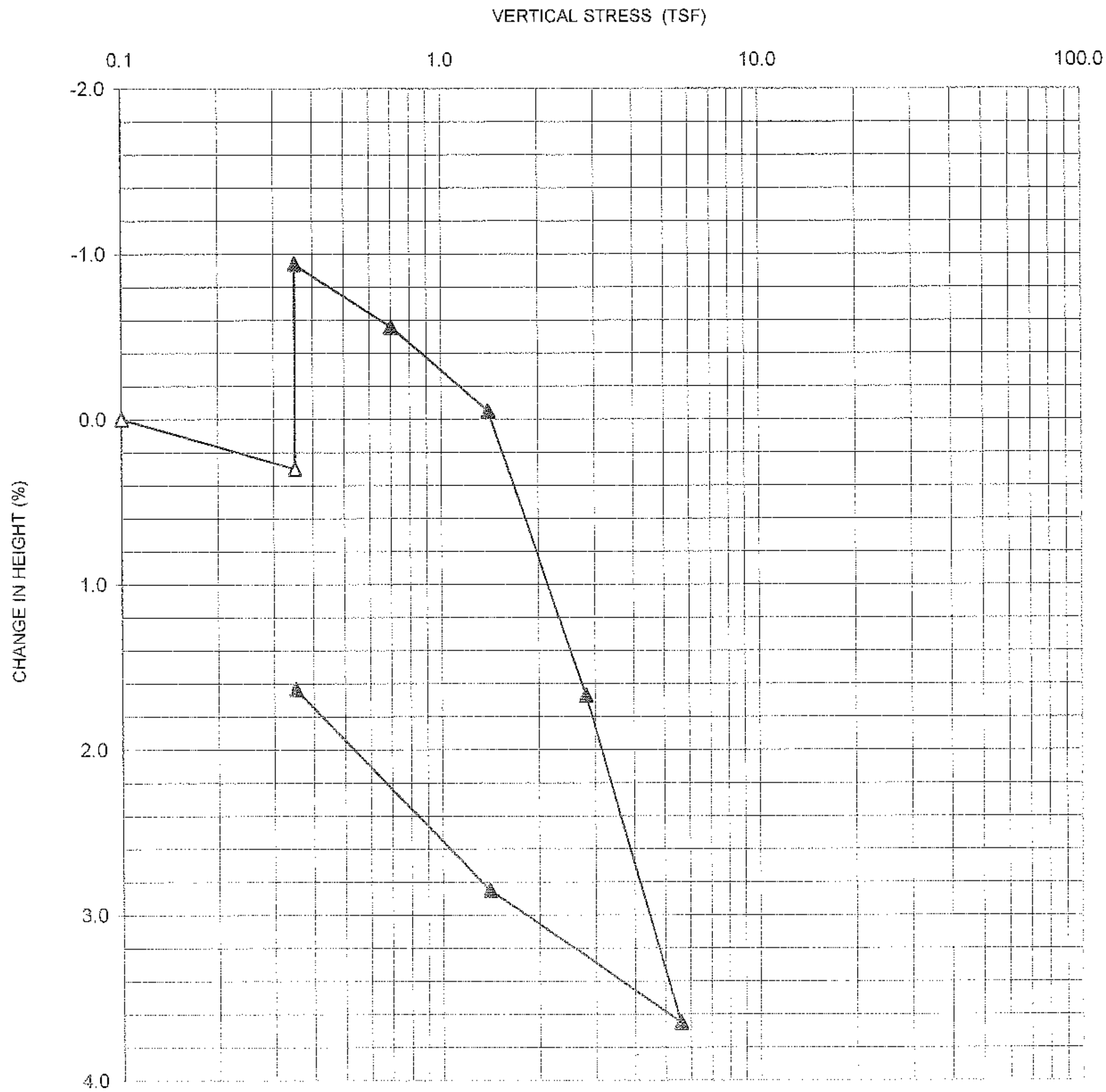
DIRECT SHEAR TEST

(ASTM D3080-04)



PROJECT NO.: 07100-01

SOIL DESCRIPTIONS: DK. GRAYISH BROWN SANDY CLAY (CL)

BORING NO./LOCATION : B-5

DEPTH / ELEV. : 1'

LIQUID LIMIT : -

SPECIFIC GRAVITY : 2.68 (Assumed)

PLASTIC LIMIT: -

	SPECIMEN HEIGHT (INCHES)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SATURATION (%)	VOID RATIO
INITIAL	1.0000	9.7	121.9	69.7	0.372
FINAL	0.9837	13.8	123.9	105.6	0.350

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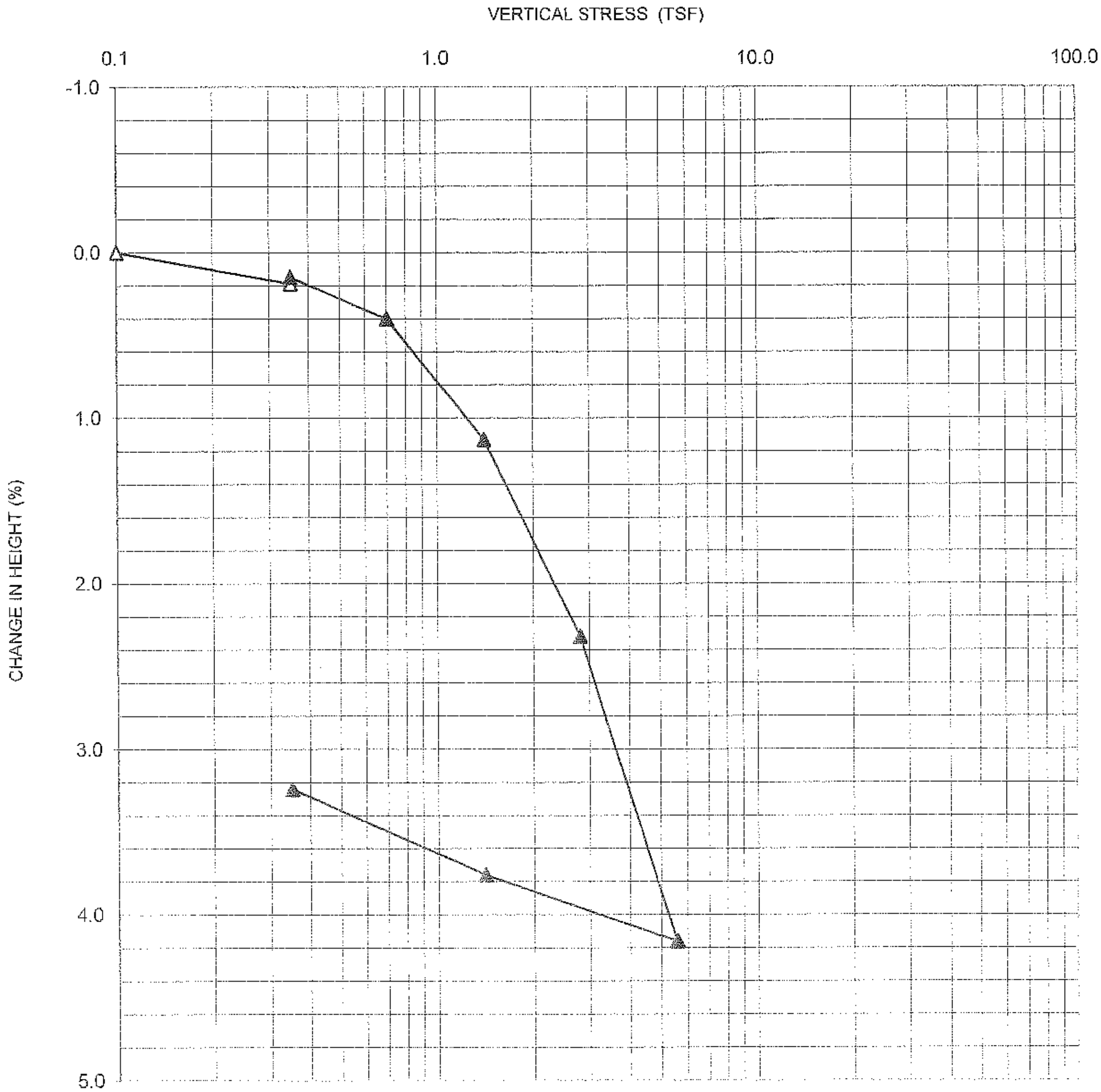
CONSOLIDATION TEST CURVE



PROJECT NO.: 07100-01

SOIL DESCRIPTIONS: DK. BROWN SILTY TO CLAYEY SAND (SM/SC)

BORING NO./LOCATION : B-8

DEPTH / ELEV. : 2'

LIQUID LIMIT : -

SPECIFIC GRAVITY : 2.68 (Assumed)

PLASTIC LIMIT: -

	SPECIMEN HEIGHT (INCHES)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SATURATION (%)	VOID RATIO
INITIAL	1.0000	7.6	112.7	42.1	0.484
FINAL	0.9676	16.5	116.4	101.6	0.436

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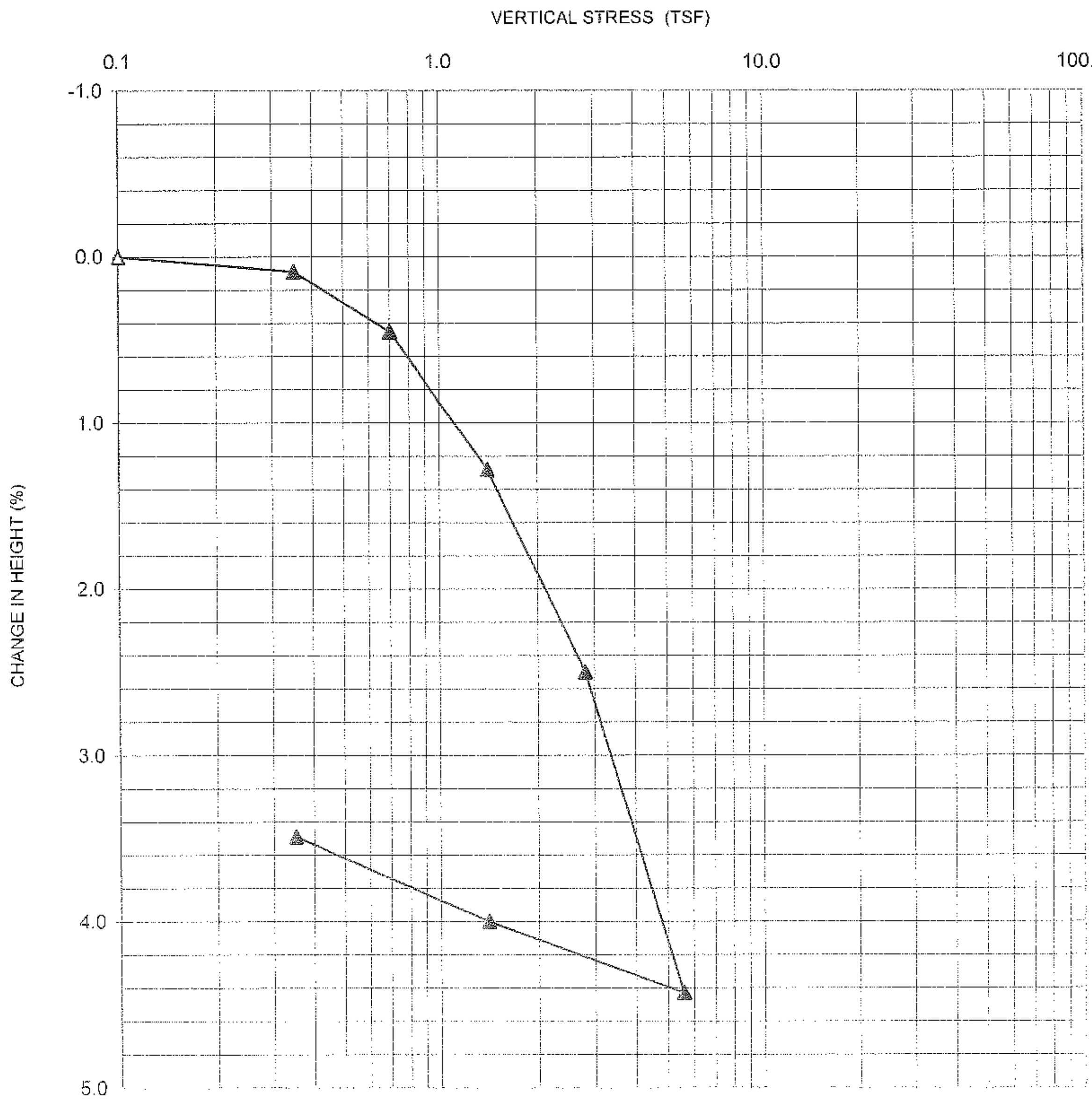
CONSOLIDATION TEST CURVE



PROJECT NO.: 07100-01

SOIL DESCRIPTIONS: LT. BROWN SILT TO SILTY SAND (ML/SM)

BORING NO./LOCATION : B-71

DEPTH / ELEV. : 1'

LIQUID LIMIT : -

SPECIFIC GRAVITY : 2.68 (Assumed)

PLASTIC LIMIT: -

	SPECIMEN HEIGHT (INCHES)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SATURATION (%)	VOID RATIO
INITIAL	1.0000	8.7	110.9	45.7	0.508
FINAL	0.9651	17.4	114.8	102.2	0.456

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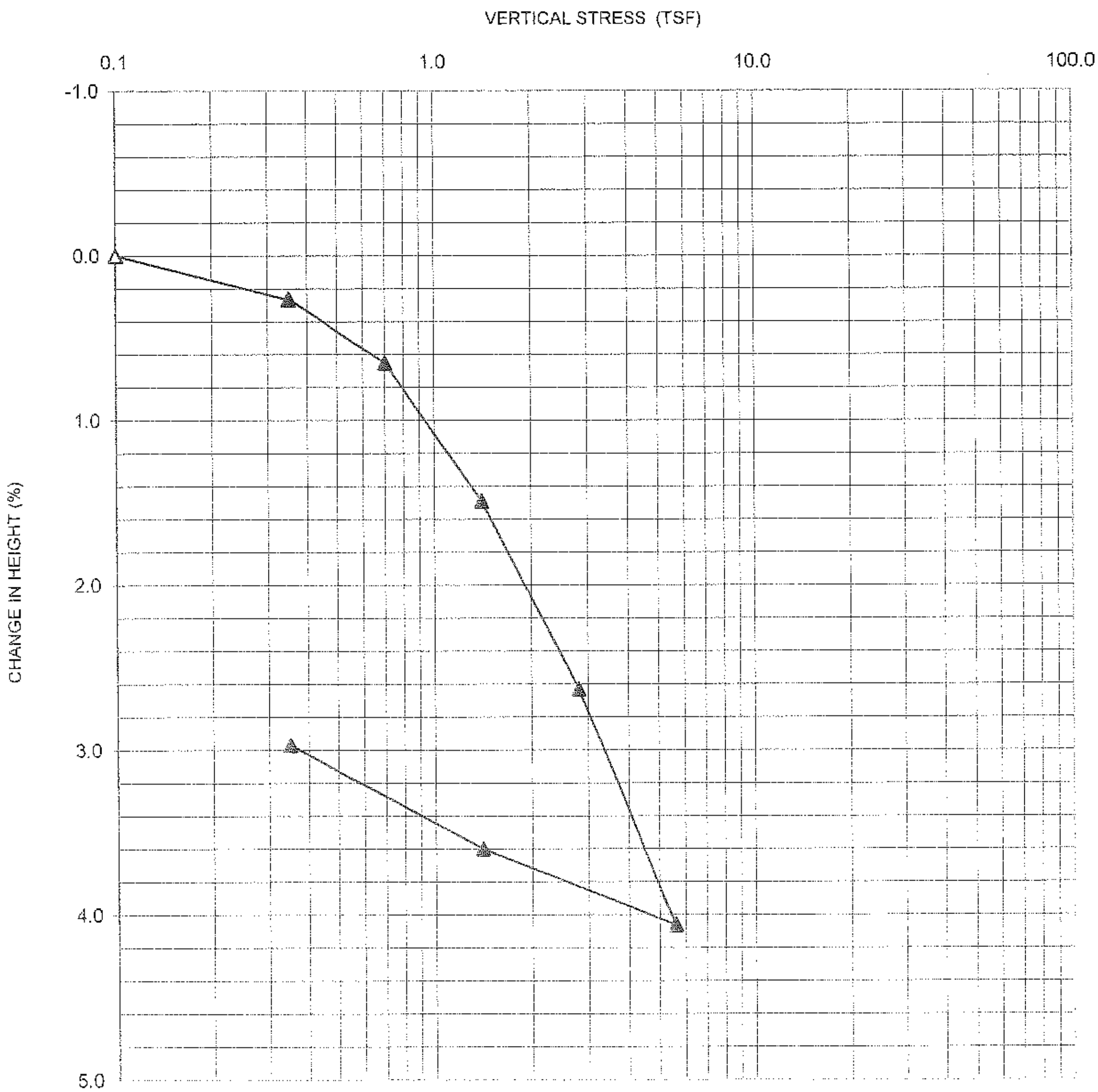
CONSOLIDATION TEST CURVE



PROJECT NO.: 07100-01

SOIL DESCRIPTIONS: LT. BROWN SILT TO SILTY SAND (ML/SM)

BORING NO./LOCATION : B-71

DEPTH / ELEV. : 5'

LIQUID LIMIT : -

SPECIFIC GRAVITY : 2.68 (Assumed)

PLASTIC LIMIT: -

	SPECIMEN HEIGHT (INCHES)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SATURATION (%)	VOID RATIO
INITIAL	1.0000	6.9	114.2	39.7	0.464
FINAL	0.9703	16.2	117.7	102.8	0.421

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CONSOLIDATION TEST CURVE

PROJECT NO. : 07100-01 DATE : 4-Mar-08

PROJECT NAME : LNR/SO. CAMPUS TESTED BY: RB

SAMPLE NO. / LOCATION : B-56 @ 12' - 14' SAMPLED BY:

SAMPLE DESCRIPTIONS / CLASSIFICATION : GRAYISH BROWN SILTY SAND (SM)

TRIAL NO.		1		2		3		4	
MOLD NUMBER		AC1		3		9			
WATER ADDED	(ML)	80		85		90			
COMPACTOR PRESSURE	(PSI)	350		350		350			
GROSS WEIGHT	(GMS)	3282		3279		3284			
TARE WEIGHT	(GMS)	2118		2117		2133			
SAMPLE WET WEIGHT	(GMS)	1164		1162		1151			
EXUDATION PRESSURE	(PSI)	308		269		234			
SAMPLE HEIGHT	(IN.)	2.48		2.48		2.46			
EXPANSION	(IN.x10^{-4})	5		2		1			
STABILITY @ 160 PSI (2000 LBS) / @ 80 PSI (1000 LBS)		48	32	52	34	56	35		
TURNS DISPLACEMENT		3.51		3.62		3.74			
R-VALUE UNCORRECTED		62		59		55			
R-VALUE CORRECTED		62		59		55			
MOISTURE CONTENT	(%)	9.5		9.8		10.1			
DRY DENSITY	(PCF)	129.9		129.3		128.8			
ASSUMED TRAFFIC INDEX		4.0		4.0		4.0			
G.E. BY STABILITY		0.39		0.42		0.46			
G.E. BY EXPANSION		0.17		0.07		0.03			
R-VALUE @ EQUILIBRIUM	(BY EXUDATION)	61							
Gf		1.25							

REMARKS : (-)#200 SIEVE = 16.9 %

CHECKED BY:

DATE :

THE DATA ABOVE IS BASED UPON PROCESSING AND TESTING OF SAMPLES "AS RECEIVED" FROM THE FIELD
TEST PROCEEDURES IN GENERAL CONFORMANCE TO LATEST REVISIONS OF CA TEST METHOD 301.

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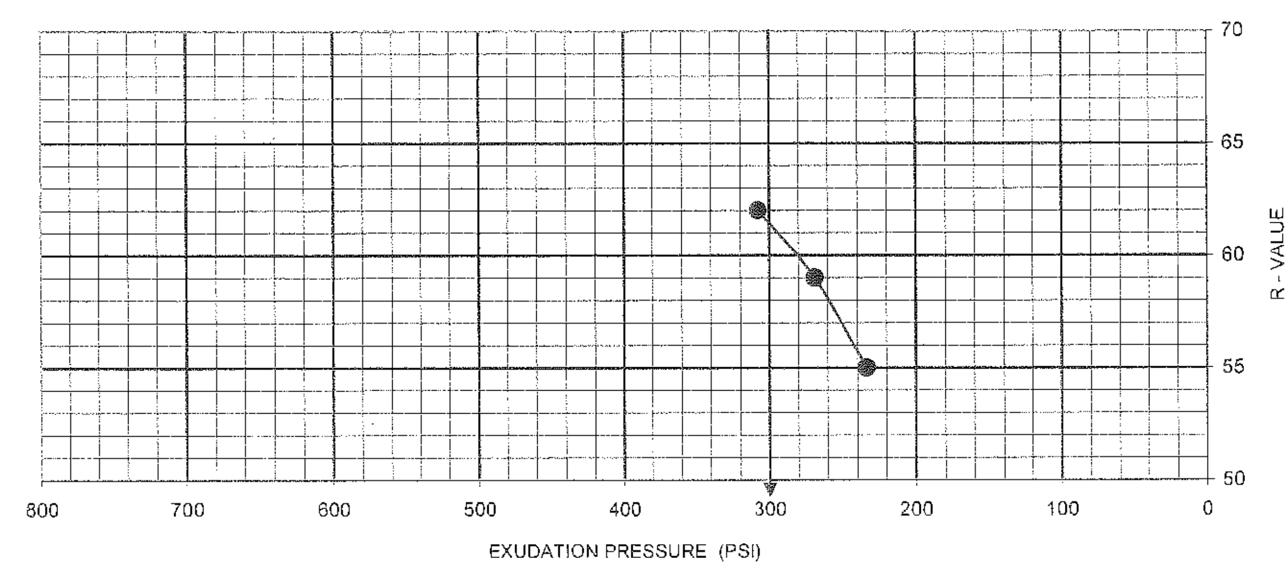
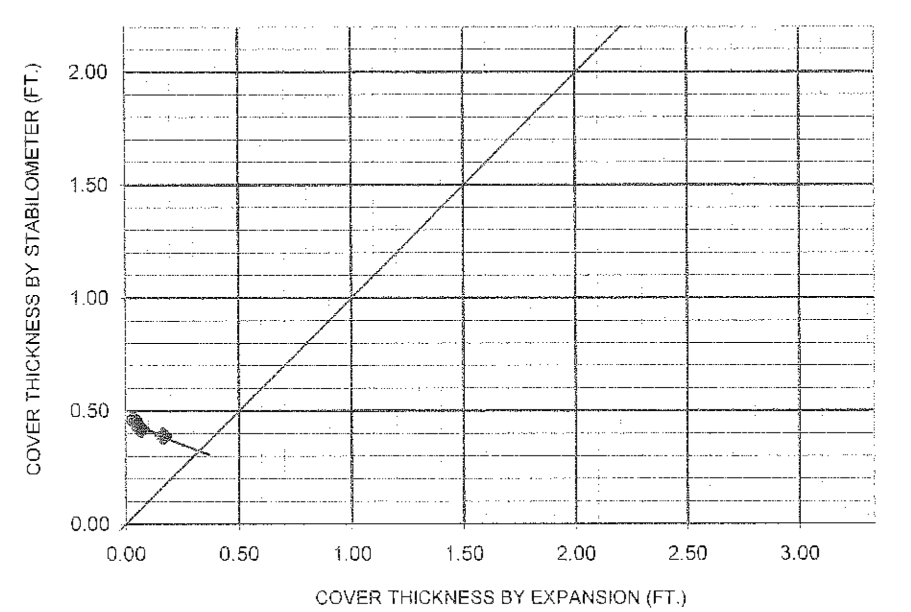
Tel: (714) 755-1355; Fax: (714) 755-1366

R - VALUE DATA





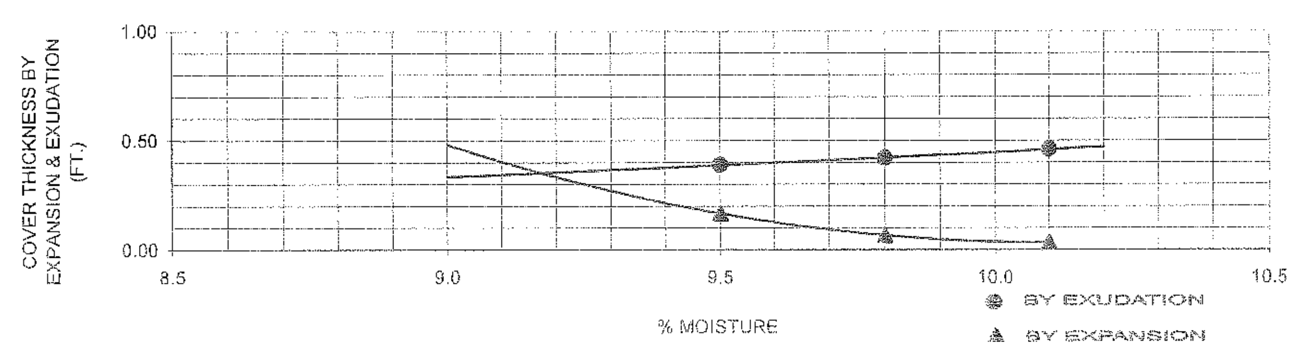
R - VALUE CURVES

07100-01
PROJECT NUMBER

LNR/SO. CAMPUS
PROJECT NAME

B-56 @ 12' - 14'
SAMPLE NO. / LOCATION

R - VALUES	
R-VALUE BY EXUDATION	61
R-VALUE BY EXPANSION	66
COVER THICKNESS (ft.)	0.35



APPENDIX C

EARTHWORK AND GRADING SPECIFICATIONS

APPENDIX C

EARTHWORK AND GRADING SPECIFICATIONS

TABLE OF CONTENTS

STANDARD DETAILS

C-1.0 GENERAL

C-1.1 Intent

These Earthwork and Grading Guide Specifications are for grading and earthwork shown on the current, approved grading plan(s) and/or indicated in the Leighton Consulting, Inc. geotechnical report(s). These Guide Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the project-specific recommendations in the geotechnical report shall supersede these Guide Specifications. Leighton Consulting, Inc. shall provide geotechnical observation and testing during earthwork and grading. Based on these observations and tests, Leighton Consulting, Inc. may provide new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

C-1.2 Role of Leighton Consulting, Inc.

Prior to commencement of earthwork and grading, Leighton Consulting, Inc. shall meet with the earthwork contractor to review the earthwork contractor's work plan, to schedule sufficient personnel to perform the appropriate level of observation, mapping and compaction testing. During earthwork and grading, Leighton Consulting, Inc. shall observe, map, and document subsurface exposures to verify geotechnical design assumptions. If observed conditions are found to be significantly different than the interpreted assumptions during the design phase, Leighton Consulting, Inc. shall inform the owner, recommend appropriate changes in design to accommodate these observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include (1) natural ground after clearing to receiving fill but before fill is placed, (2) bottoms of all "remedial removal" areas, (3) all key bottoms, and (4) benches made on sloping ground to receive fill.

Leighton Consulting, Inc. shall observe moisture-conditioning and processing of the subgrade and fill materials, and perform relative compaction testing of fill to determine the attained relative compaction. Leighton Consulting, Inc. shall provide *Daily Field Reports* to the owner and the Contractor on a routine and frequent basis.

C-1.3 The Earthwork Contractor

The earthwork contractor (Contractor) shall be qualified, experienced and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Guide Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing grading and backfilling in accordance with the current, approved plans and specifications.

The Contractor shall inform the owner and Leighton Consulting, Inc. of changes in work schedules at least one working day in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that Leighton Consulting, Inc. is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish earthwork and grading in accordance with the applicable grading codes and agency ordinances, these Guide Specifications, and recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of Leighton Consulting, Inc., unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, adverse weather, etc., are resulting in a quality of work less than required in these specifications, Leighton Consulting, Inc. shall reject the work and may recommend to the owner that earthwork and grading be stopped until unsatisfactory condition(s) are rectified.

C-2.0 PREPARATION OF AREAS TO BE FILLED

C-2.1 Clearing and Grubbing

Vegetation, such as brush, grass, roots and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies and Leighton Consulting, Inc.. Care should be taken not to encroach upon or otherwise damage native and/or historic trees designated by the Owner or appropriate agencies to remain. Pavements, flatwork or other construction should not extend under the “drip line” of designated trees to remain.

Leighton Consulting, Inc. shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 3 percent of organic materials (by dry weight: ASTM D 2974-00). Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area. As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

C-2.2 Processing

Existing ground that has been declared satisfactory for support of fill, by Leighton Consulting, Inc., shall be scarified to a minimum depth of 6 inches (15 cm). Existing ground that is not satisfactory shall be overexcavated as specified in the following Section C-2.3. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

C-2.3 Overexcavation

In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by Leighton Consulting, Inc. during grading. All undocumented fill soils under proposed structure footprints should be excavated

C-2.4 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), (>20 percent grade) the ground shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet (4.5 m) wide and at least 2 feet (0.6 m) deep, into competent material as evaluated by Leighton Consulting, Inc.. Other benches shall be excavated a minimum height of 4 feet (1.2 m) into competent material or as otherwise recommended by Leighton Consulting, Inc.. Fill placed on ground sloping flatter than 5:1 (horizontal to vertical units), (<20 percent grade) shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

C-2.5 Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by Leighton Consulting, Inc. as suitable to receive fill. The Contractor shall obtain a written acceptance (*Daily Field Report*) from Leighton Consulting, Inc. prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

C-3.0 FILL MATERIAL

C-3.1 Fill Quality

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by Leighton Consulting, Inc. prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to Leighton Consulting, Inc. or mixed with other soils to achieve satisfactory fill material.

C-3.2 Oversize

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 6 inches (15 cm), shall not be buried or placed in fill unless location, materials and placement methods are specifically accepted by Leighton Consulting, Inc.. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 feet (3 m) measured vertically from finish grade, or within 2 feet (0.61 m) of future utilities or underground construction.

C-3.3 Import

If importing of fill material is required for grading, proposed import material shall meet the requirements of Section C-3.1, and be free of hazardous materials ("contaminants") and rock larger than 3-inches (8 cm) in largest dimension. All import soils shall have an Expansion Index (EI) of 20 or less and a sulfate content no greater than (≤) 500 parts-per-million (ppm). A representative sample of a potential import source shall be given to Leighton Consulting, Inc. at least four full working days before importing begins, so that suitability of this import material can be determined and appropriate tests performed.

C-4.0 FILL PLACEMENT AND COMPACTION

C-4.1 Fill Layers

Approved fill material shall be placed in areas prepared to receive fill, as described in Section C-2.0, above, in near-horizontal layers not exceeding 8 inches (20 cm) in loose thickness. Leighton Consulting, Inc. may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers, and only if the building officials with the appropriate jurisdiction approve. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

C-4.2 Fill Moisture Conditioning

Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM) Test Method D 1557.

C-4.3 Compaction of Fill

After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density as determined by ASTM Test Method D 1557. For fills thicker than 15 feet (4.5 m), the portion of the fill deeper than 15 feet below proposed finish grade shall be compacted to 95 percent of the ASTM D 1557 laboratory maximum density. Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

C-4.4 Compaction of Fill Slopes

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet (1 to 1.2 m) in fill elevation, or by other methods producing satisfactory results acceptable to Leighton Consulting, Inc.. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of the ASTM D 1557 laboratory maximum density.

C-4.5 Compaction Testing

Field-tests for moisture content and relative compaction of the fill soils shall be performed by Leighton Consulting, Inc.. Location and frequency of tests shall be at our field representative(s) discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

C-4.6 Compaction Test Locations

Leighton Consulting, Inc. shall document the approximate elevation and horizontal coordinates of each density test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that Leighton Consulting, Inc. can determine the test locations with sufficient accuracy. Adequate grade stakes shall be provided.

C-5.0 EXCAVATION

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by Leighton Consulting, Inc. during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by Leighton Consulting, Inc. based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by Leighton Consulting, Inc. prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by Leighton Consulting, Inc..

C-6.0 TRENCH BACKFILLS

C-6.1 Safety

The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations. Work should be performed in accordance with Article 6 of the *California Construction Safety Orders*, 2003 Edition or more current (see also: http://www.dir.ca.gov/title8/sb4a6.html).

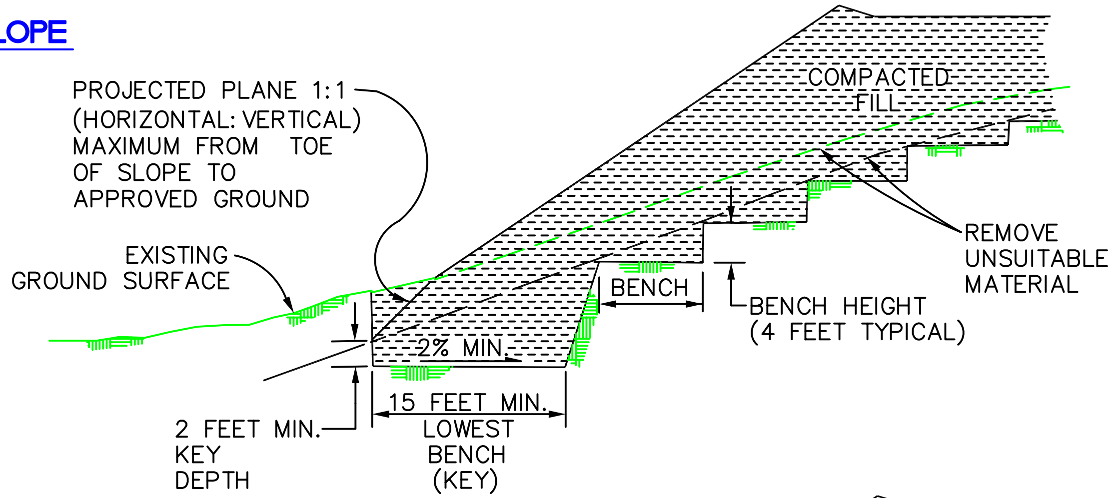
C-6.2 Bedding and Backfill

All utility trench bedding and backfill shall be performed in accordance with applicable provisions of the 2009 Edition of the *Standard Specifications for Public Works Construction* (Green Book). Bedding material shall have a Sand Equivalent greater than 30 (SE>30). Bedding shall be placed to 1-foot (0.3 m) over the top of the conduit, and densified by jetting in areas of granular soils, if allowed by the permitting agency. Otherwise the pipe bedding zone should be backfilled with Controlled Low Strength Material (CLSM) consisting of at least one sack of Portland cement per cubic-yard of sand, and conforming to Section 201-6 of the 2009 Edition of the *Standard Specifications for Public Works Construction* (Green Book). Backfill over the bedding zone shall be placed and densified mechanically to a minimum of 90 percent of relative compaction (ASTM D 1557) from 1 foot (0.3 m) above the top of the conduit to the surface. Backfill above the pipe zone shall **not** be jetted. Jetting of the bedding around the conduits shall be observed by Leighton Consulting, Inc. and backfill above the pipe zone (bedding) shall be observed and tested by Leighton Consulting, Inc..

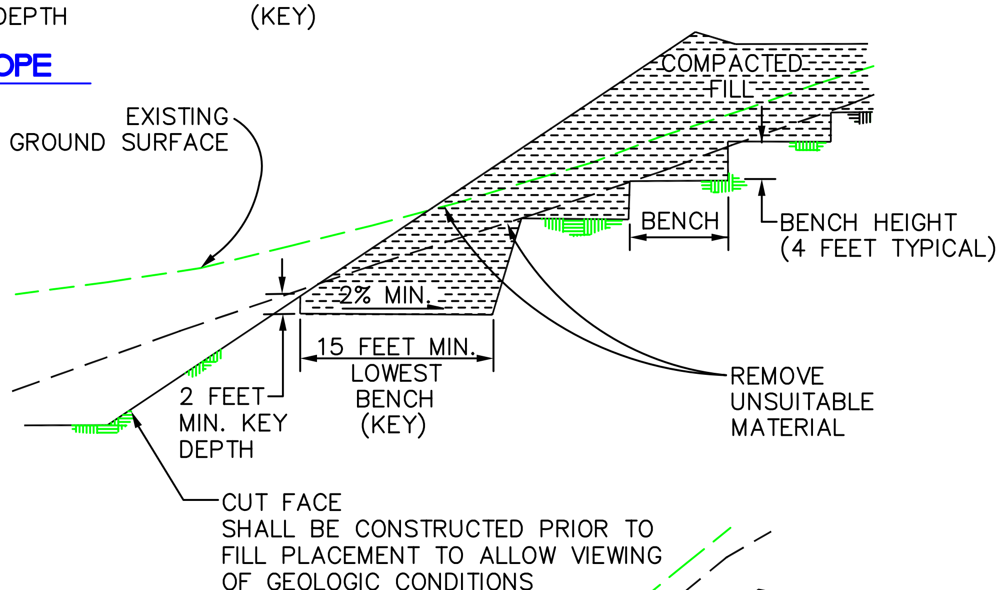
C-6.3 Lift Thickness

Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to Leighton Consulting, Inc. that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method, and only if the building officials with the appropriate jurisdiction approve.

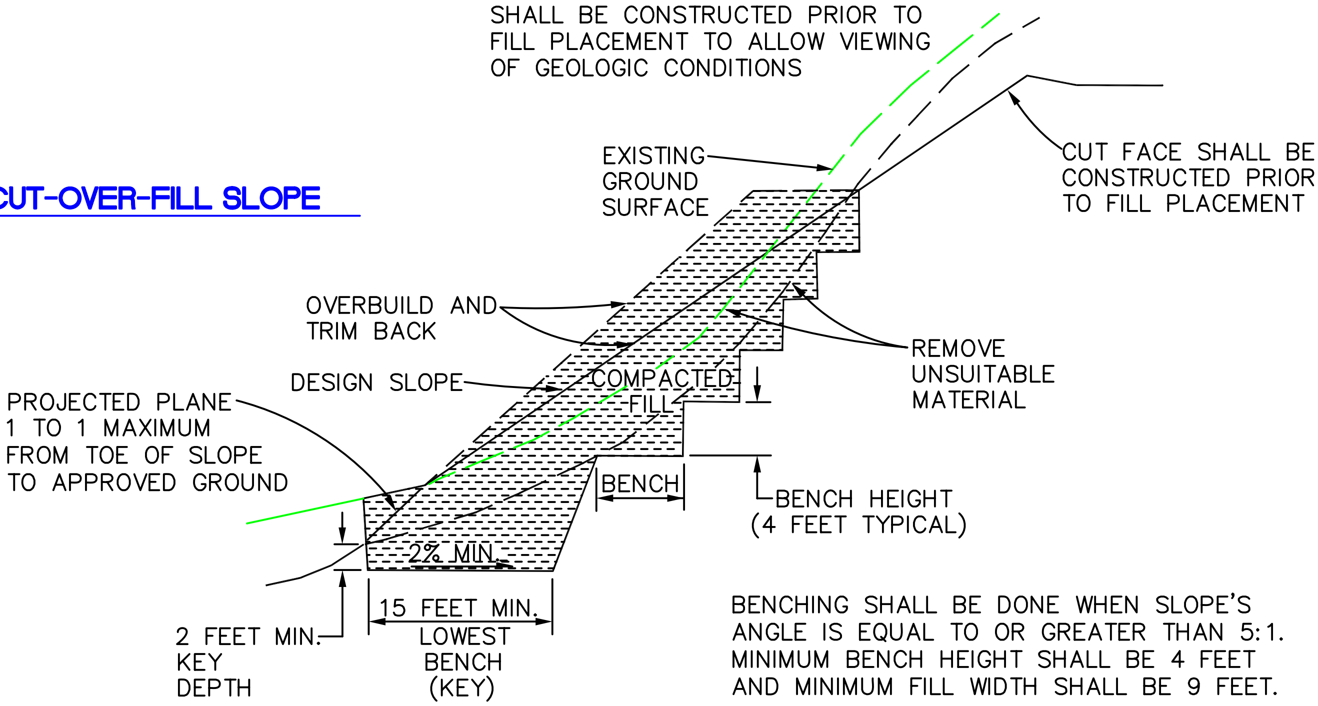
FILL SLOPE



FILL-OVER-CUT SLOPE

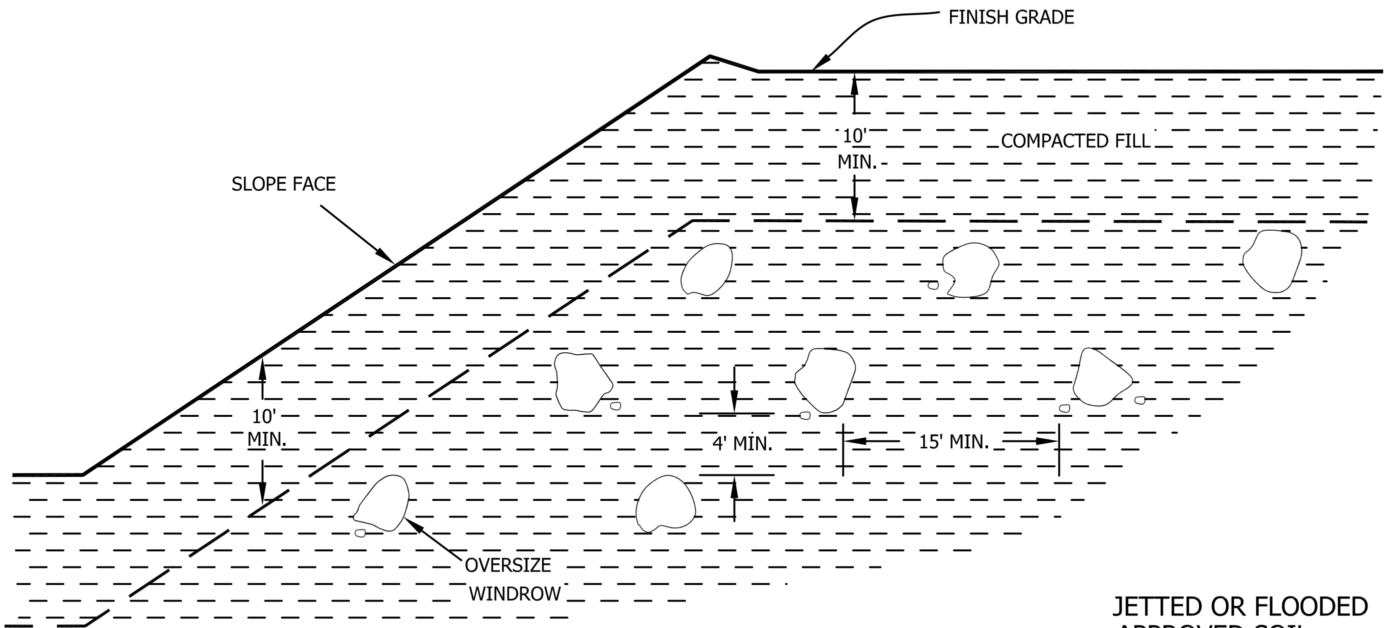


CUT-OVER-FILL SLOPE

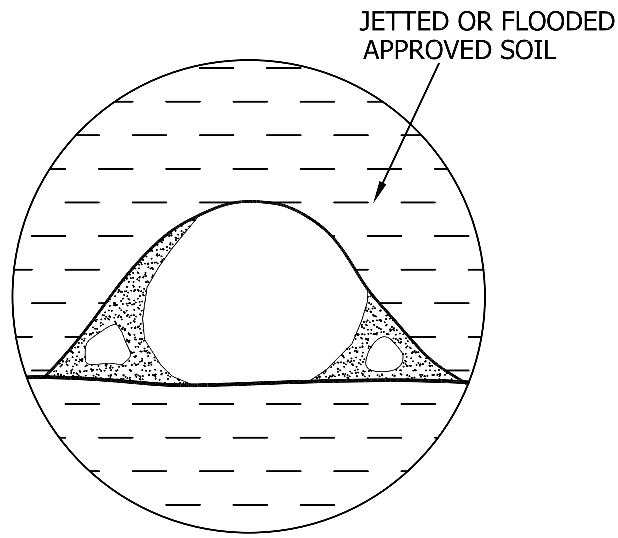


BENCHING SHALL BE DONE WHEN SLOPE'S ANGLE IS EQUAL TO OR GREATER THAN 5:1. MINIMUM BENCH HEIGHT SHALL BE 4 FEET AND MINIMUM FILL WIDTH SHALL BE 9 FEET.

KEYING AND BENCHING	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS A	Leighton

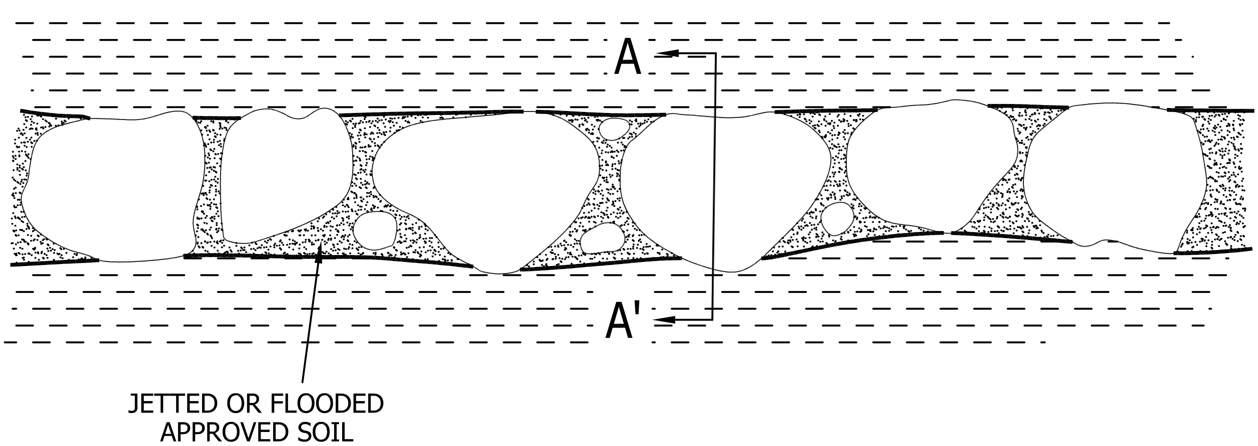


- Oversize rock is larger than 8 inches in largest dimension.
- Backfill with approved soil jetted or flooded in place to fill all the voids.
- Do not bury rock within 10 feet of finish grade.
- Windrow of buried rock shall be parallel to the finished slope face.



SECTION A-A'

PROFILE ALONG WINDROW



OVERSIZE ROCK DISPOSAL	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS B	Leighton

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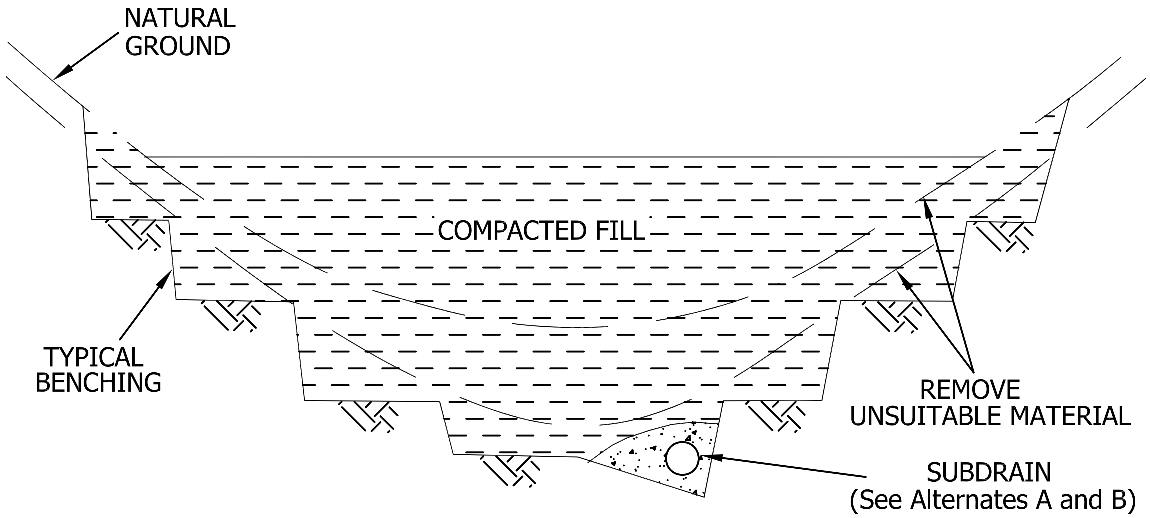
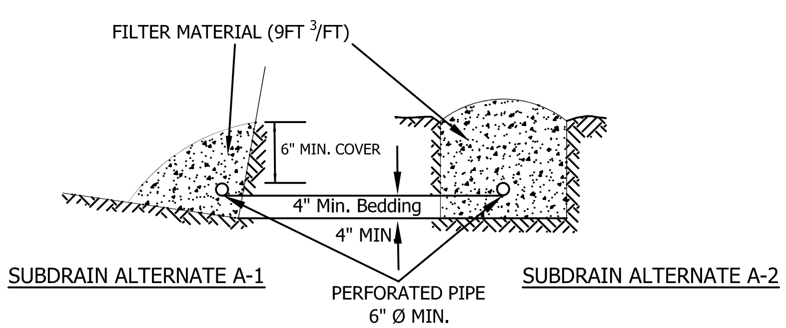


SUBDRAIN ALTERNATE A

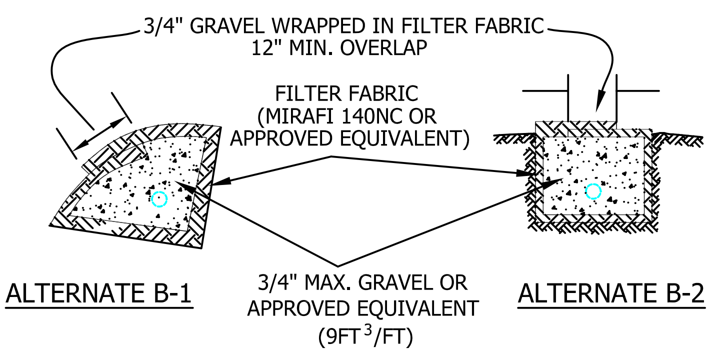


FILTER MATERIAL

FILTER MATERIAL SHALL BE CLASS 2 PERMEABLE MATERIAL PER STATE OF CALIFORNIA STANDARD SPECIFICATION, OR APPROVED ALTERNATE. CLASS 2 GRADING AS FOLLOWS:

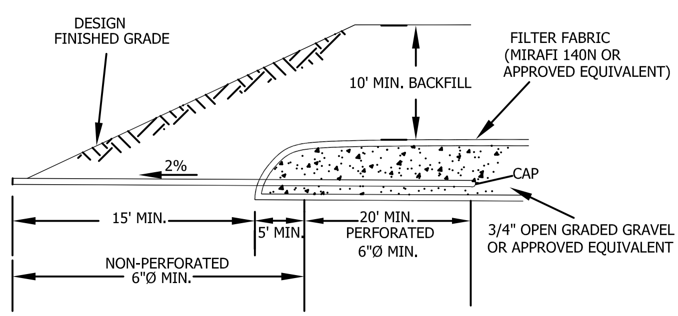
Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

SUBDRAIN ALTERNATE B



○ PERFORATED PIPE IS OPTIONAL PER GOVERNING AGENCY'S REQUIREMENTS

DETAIL OF CANYON SUBDRAIN TERMINAL



CANYON SUBDRAIN	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS C	Leighton

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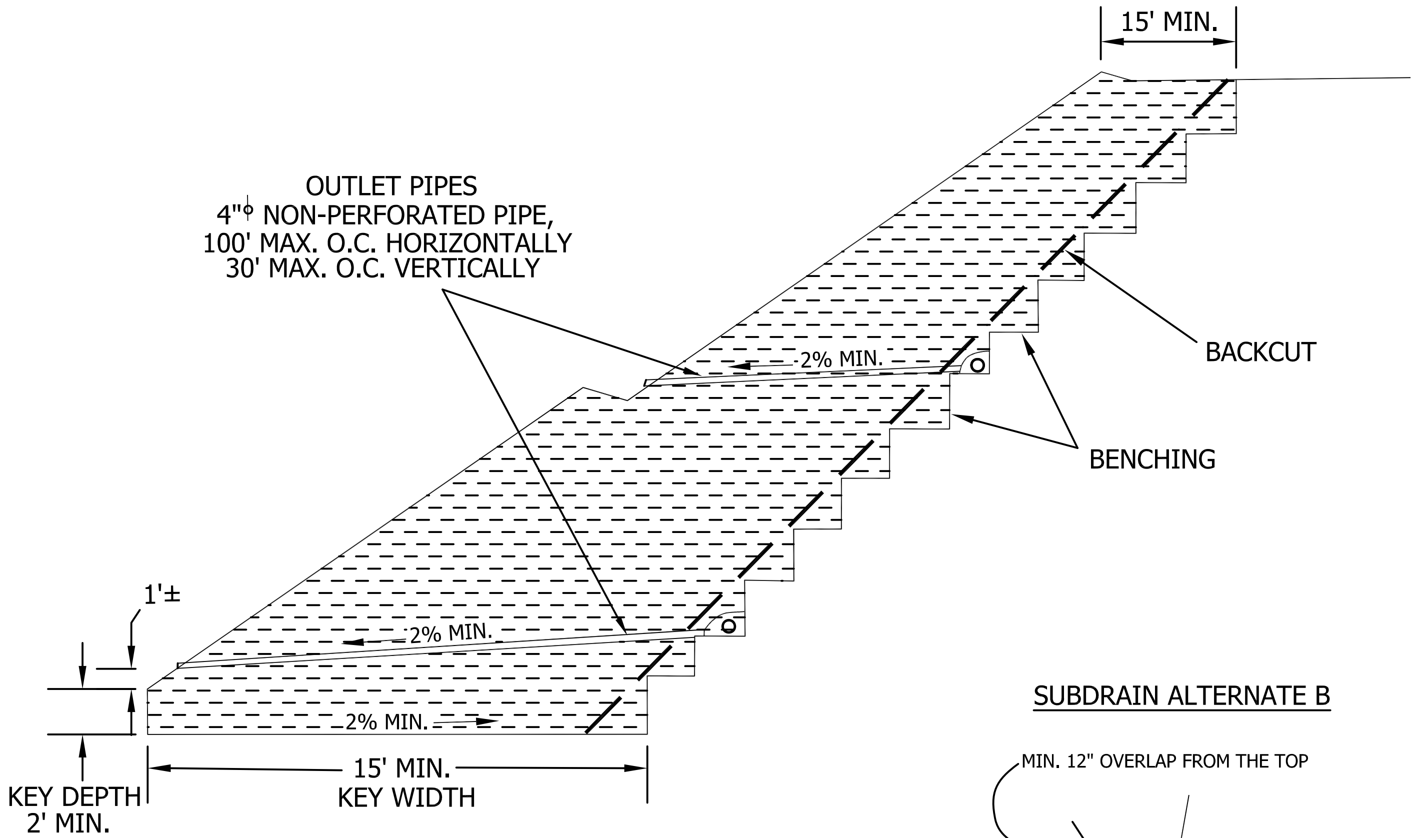
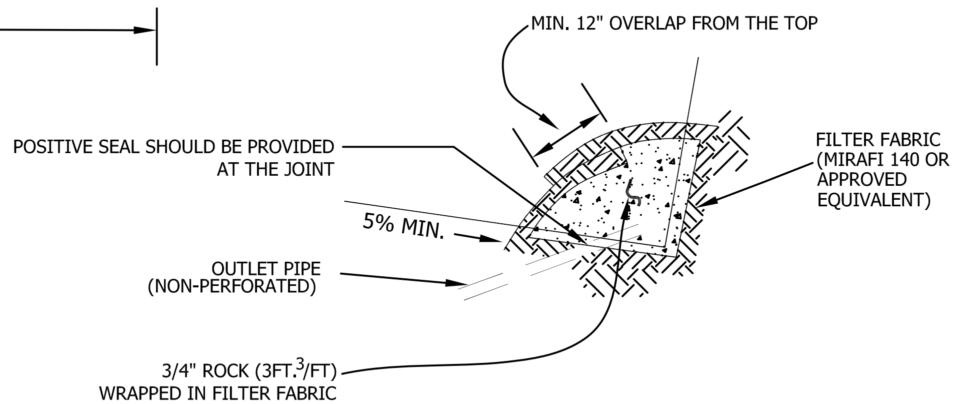
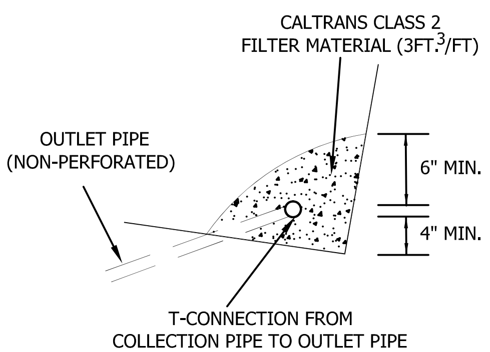


SUBDRAIN ALTERNATE B



SUBDRAIN ALTERNATE A



- SUBDRAIN INSTALLATION - Subdrain collector pipe shall be installed with perforations down or, unless otherwise designated by the geotechnical consultant. Outlet pipes shall be non-perforated pipe. The subdrain pipe shall have at least 8 perforations uniformly spaced per foot. Perforation shall be 1/4" to 1/2" if drilled holes are used. All subdrain pipes shall have a gradient at least 2% towards the outlet.
- SUBDRAIN PIPE - Subdrain pipe shall be ASTM D2751, ASTM D1527 (Schedule 40) or SDR 23.5 ABS pipe or ASTM D3034 (Schedule 40) or SDR 23.5 PVC pipe.
- All outlet pipe shall be placed in a trench and, after fill is placed above it, rodded to verify integrity.

BUTTRESS OR REPLACEMENT FILL SUBDRAINS	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS D	Leighton

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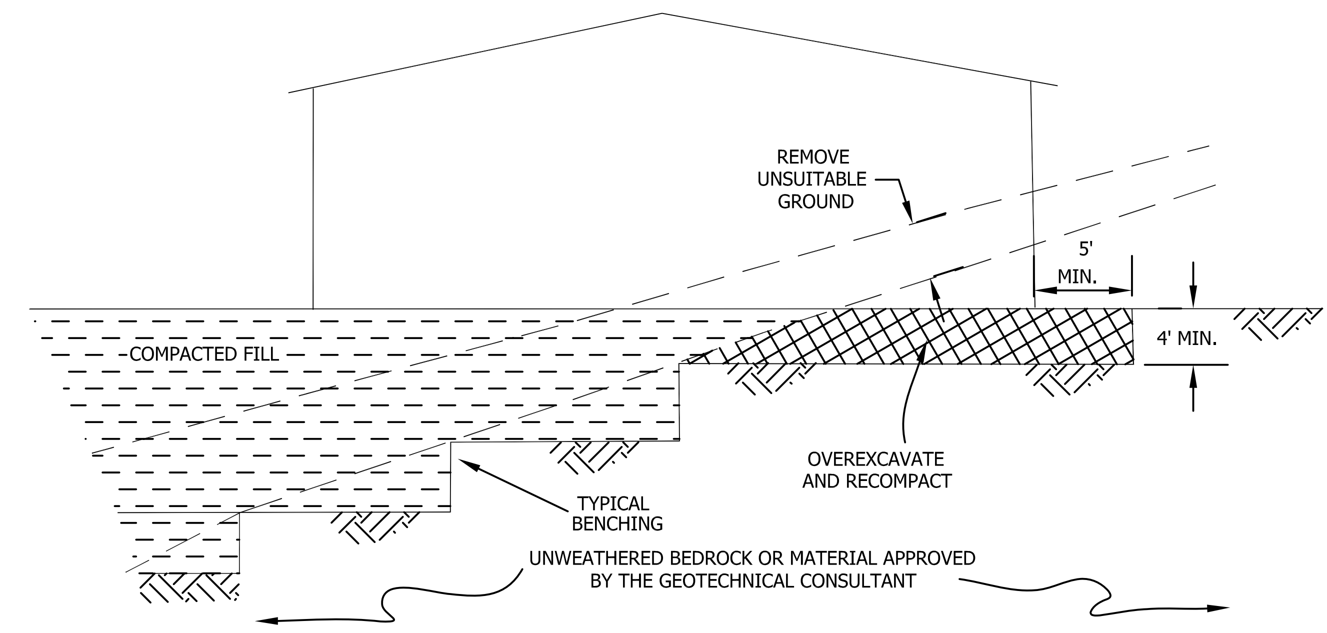
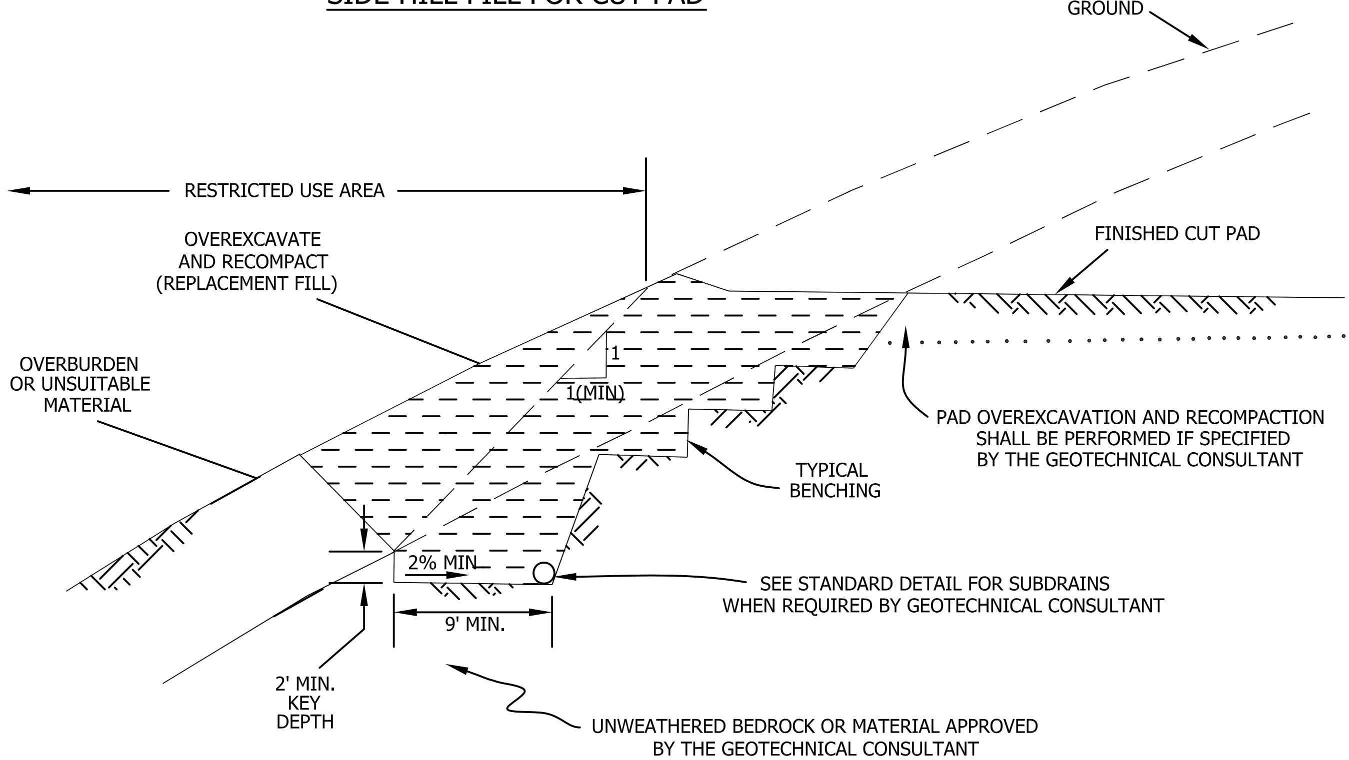
CUT-FILL TRANSITION LOT OVEREXCAVATION



SIDE HILL FILL FOR CUT PAD



TRANSITION LOT FILLS AND SIDE HILL FILLS	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS E	Leighton

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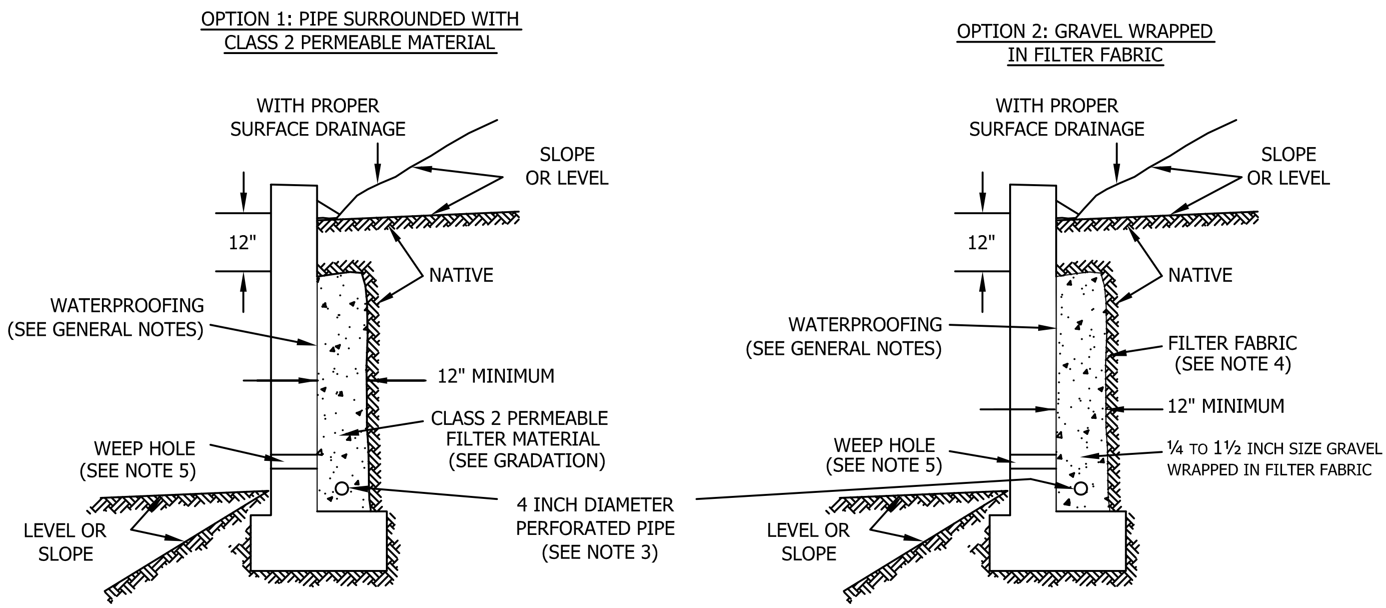
SUBDRAIN OPTIONS AND BACKFILL WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50



Class 2 Filter Permeable Material Gradation
Per Caltrans Specifications

Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

GENERAL NOTES:

* Waterproofing should be provided where moisture nuisance problem through the wall is undesirable.
* Water proofing of the walls is not under purview of the geotechnical engineer
* All drains should have a gradient of 1 percent minimum
*Outlet portion of the subdrain should have a 4-inch diameter solid pipe discharged into a suitable disposal area designed by the project engineer. The subdrain pipe should be accessible for maintenance (rodding)
*Other subdrain backfill options are subject to the review by the geotechnical engineer and modification of design parameters.

Notes:
1) Sand should have a sand equivalent of 30 or greater and may be densified by water jetting.
2) 1 Cu. ft. per ft. of 1/4- to 1 1/2-inch size gravel wrapped in filter fabric
3) Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down. Perforations should be 3/8 inch in diameter placed at the ends of a 120-degree arc in two rows at 3-inch on center (staggered)
4) Filter fabric should be Mirafi 140NC or approved equivalent.
5) Weephole should be 3-inch minimum diameter and provided at 10-foot maximum intervals. If exposure is permitted, weepholes should be located 12 inches above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to be discharged through the curb face or equivalent should be provided. For a basement-type wall, a proper subdrain outlet system should be provided.
6) Retaining wall plans should be reviewed and approved by the geotechnical engineer.
7) Walls over six feet in height are subject to a special review by the geotechnical engineer and modifications to the above requirements.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL FOR WALLS 6 FEET OR LESS IN HEIGHT

WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

Leighton

Figure

APPENDIX D

GBA - IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGINEERING REPORT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GBC GEOTECHNICAL BUSINESS COUNCIL *of the Geoprofessional Business Association*

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GEOTECHNICAL EXPLORATION
PROPOSED MERIDIAN PARK SOUTH CAMPUS-PHASE II
COUNTY OF RIVERSIDE, CALIFORNIA

Prepared for

MERIDIAN PARK, LLC
1156 North Mountain Avenue
Upland, California 91786

Project No. 11227.019

September 16, 2019

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

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September 16, 2019

Project No. 11227.019

Meridian Park, LLC
1156 North Mountain Avenue
Upland, California 91786

Attention: Mr. Timothy Reeves

Subject: Geotechnical Exploration
Proposed Meridian Park South Campus-Phase II
East of Barton Road and South of Van Buren Boulevard
County of Riverside, California

In accordance with your request, we are pleased to provide this geotechnical exploration report for the subject project summarizing our geotechnical findings, conclusions and recommendations regarding the design and construction of the proposed development. This report also includes pertinent information from previous studies relevant to this site. Based on the results of our findings and conclusions, it is our opinion that the site is suitable for the intended use provided the recommendations included in herein are implemented during design and construction phases of development. However, it should be noted that additional geotechnical evaluations and/or reviews will be required based on final site development and/or grading plans.

If you have any questions regarding this report, please do not hesitate to contact the undersigned. We appreciate this opportunity to be of service on this project.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

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1.0 INTRODUCTION

1.1 Purpose and Scope

This geotechnical exploration is for the proposed commercial development referred to as Meridian Park South Campus-Phase II, located generally southeast of the intersection of Van Buren Boulevard and Barton Road, County of Riverside, California (see Figure 1). Our scope of services for this exploration included the following:

- Review of available site-specific geologic information and Conceptual Site Development Plan by DRC Engineering.
- A site reconnaissance and excavation of eight (8) exploratory borings. Approximate locations of these geotechnical borings along with previous borings/test pits are depicted on the *Geotechnical Map (Plate 1)*. The logs of exploratory borings and test pits are presented in Appendix A.
- Percolation testing within selected basin areas of planned Building "D" to provide preliminary infiltration rates for the onsite soil/ rock. The 4 percolation tests extended to depths of 8 to 12 feet below ground surface (BGS) to target possible basin invert elevations. Approximate locations of these percolation tests are depicted on Plate 1. The logs and test data are presented in Appendix A.
- Perform a supplemental geophysical study to further evaluate rippability of onsite bedrock with ten (10) seismic refraction lines. Approximate locations of the seismic lines area depicting on Plate 1. The geophysical seismic survey performed by Southwest Geophysics, Inc., is included as Appendix C.
- Geotechnical laboratory testing of selected soil samples collected during this exploration. Test results are presented in Appendix B.
- Geotechnical engineering analyses performed or as directed by a California registered Geotechnical Engineer (GE) and reviewed by a California Certified Engineering Geologist (CEG).
- Preparation of this report which presents our geotechnical conclusions and recommendations regarding the proposed structures.

This report is not intended to be used as an environmental assessment (Phase I or other), or foundation plan review.

1.2 Site and Project Description

The site is located generally southeast of the intersection of Van Buren Boulevard and Barton Road, in the County of Riverside, California (see Figure 1, Site Location Map). Topographically, the site generally slopes north and south to a central draining low area which ultimately flows in a westerly direction. The site is currently undeveloped vacant land covered with small vegetative growth and seasonal weeds. Some previous grading (excavation) was performed in the southeast portion of the site as a borrow pit for Phase I site grading and construction of a retention basin.

We understand that site development includes several commercial buildings ranging in size from 6,000 to 25,000 square-feet (SF) to large warehouse buildings ranging from 242,000 to 750,000 SF. The site plans also indicate two water quality retention basins and other improvements such as parking stalls and main entrance. Grading plans were not provided as of the date of this report; however, we anticipate cut and fill grading of up to 25 feet and 15 feet respectively, to create finish site grades. If site development plans significantly differ from those described herein, the report should be subject to further review and evaluation.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

Our field exploration consisted of the excavation of eight (8) hollow stem borings located throughout the site to provide basis for site grading and foundation and pavement design. In addition, four (4) percolation/infiltration tests were conducted within designated drainage basin/retention areas for Building “D” to provide preliminary infiltration rates for onsite soil/rock. During exploration, disturbed/bulk samples were collected for further laboratory testing and evaluation. A geophysical seismic refraction study was performed in selected areas of the site to evaluate depth to bedrock and rippability characteristics. Approximate locations of these and previous filed explorations are depicted on the *Geotechnical Map* (see Plate 1). Sampling was conducted by a staff geologist from our firm. After logging and sampling, the excavations were loosely backfilled with spoils generated during excavation. The exploration logs from this and previous explorations are provided in Appendix A.

2.2 Laboratory Testing

Laboratory tests were performed on representative bulk samples to provide a basis for development of earthwork control and foundation design. The laboratory testing program included maximum density and moisture content relationship, expansion index, R-value and soluble sulfate content. The results of our laboratory testing from this and previous explorations are presented in Appendix B.

2.3 Previous Geologic/Geotechnical Studies

This site is part of the overall Meridian South Campus project/Tract No. 30857, which was previously evaluated by Zeiser Kling Consultants, Inc. (ZKCI) in 2008 and Inland Foundation Engineering Inc. (IFEI) in 2002. The ZKCI report provided a preliminary evaluation of site conditions and geotechnical recommendations for site development. Pertinent field and laboratory information from the previous studies were reviewed and incorporated into this report.

3.0 GEOTECHNICAL AND GEOLOGIC FINDINGS

3.1 Regional Geology

The site is located within a prominent natural geomorphic province in southwestern California known as the Peninsular Ranges. This province is characterized by steep, elongated ranges and valleys that trend northwestward. More specifically, the proposed site is located within the relatively stable Perris Block.

The Perris Block, approximately 20 miles by 50 miles in extent, is bounded by the San Jacinto Fault Zone to the northeast, the Elsinore Fault Zone to the southwest. The Perris Block has had a complex tectonic history, apparently undergoing relative vertical land-movements of several thousand feet in response to movement on the Elsinore and San Jacinto Fault Zones. Thin sedimentary and volcanic materials locally mantle crystalline bedrock, consisting of the Val Verde Tonalite (Kvt) and lesser amounts of Cretaceous granitic dikes (Kg).

3.2 Site Specific Geology

3.2.1 Earth Materials

Our field exploration, observations, and review of the pertinent literature indicate that the site include is underlain by localized artificial fill, top soil/colluvium/ alluvium, older alluvium, and granitic rock (Val Verde Tonalite bedrock). For engineering and remedial grading purposes, we refer later in this report to the upper near surface artificial fill, topsoil/colluvium/alluvium as overburden soil. A more detailed description of each unit is provided on the logs of borings in Appendix A.

- **Undocumented Artificial Fill (not mapped):** Where encountered, undocumented artificial fill is generally associated with existing gravel access roads. Localized pockets of artificial fill that were not identified during our exploration may also be encountered elsewhere on this site below surface.
- **Topsoil/Colluvium (not mapped):** These materials are expected to mantle the majority of the site and generally extend to a maximum depth of 2 to 3 feet BGS. Encountered materials generally consist of silty to clayey sand (SM/SC) and appear to be relatively porous and have very low expansion potential (EI<21).
- **Alluvium (Qal):** these materials are expected to exist within drainage or low-laying areas of the site. The alluvium generally extends to a depth of 5 feet BGS. Encountered materials generally consist of silty to clayey sand

(SM/SC) and appear to be relatively porous and have very low expansion potential (EI<21).

- **Val Verde Tonalite (Kvt):** The Val Verde Tonalite (Cretaceous granite) was encountered in all borings underlying the surficial units. As observed during the field exploration and adjacent site grading, the near-surface bedrock varies from that of completely disintegrated rock that has become a dense soil-like deposit to that of non-weathered rock. This bedrock is expected to range from readily rippable (upper 15 to 20 feet) to non-rippable depending on the degree of weathering and depth. The weathered bedrock is expected to produce fine to coarse sand with silt and gravel size rock fragments that are generally suitable for re-use as compacted fill. However, it should be anticipated that cuts generally greater than 10 to 20 feet or shallow near surface core stones may generate boulders (greater than 12 inches) that will require special placement described later in Section 3.5 of this report.

3.3 Groundwater and Surface Water

Groundwater was not encountered during this exploration to a maximum depth explored of approximately 25 feet below existing ground surface. Groundwater seepage may appear in cut slopes exposing joints and fractures or earth materials of contrasting permeabilities. Mitigation of possible seepage within building pads or cut-slope areas can be provided on an individual basis after evaluation by the geotechnical consultant during grading operations. Surface water was not observed onsite during our exploration.

3.4 Landslides/Debris Flow and Rockfalls

No evidence of on-site landslides/debris flow or rock fall was observed during our field investigation. Due to the lack of elevated rock exposure, the potential for rock fall due to either erosion or seismic ground shaking is considered nil.

3.5 Rippability

Based on our geotechnical exploration and adjacent site grading observations, we anticipate the onsite bedrock to be generally rippable to depths of 10 to 20 feet with conventional heavy earth moving equipment in good operating conditions (Caterpillar D9L or D10 with single shank ripper and rock teeth). Localized marginally rippable to unrippable core stones may be encountered at shallower depths and near the surface. In addition, due to differential weathering of the bedrock materials, very heavy ripping and/or other specialized excavation techniques may be required to maintain desired excavation rates. For proposed building pads, below ground storm water retention tanks and utility trenches in marginally rippable to non-rippable rock areas, it may be desirable to over-excavate at least 2 feet below the bottom of proposed utility or 3 feet below pad grade to facilitate future trenching or excavation operations.

The California Building Code and County of Riverside require that no oversize rock (>12-inches) be placed within 10 feet of the surface of a structural fill and/or building pad. The grading plan should be carefully reviewed during grading to verify that oversized rocks are buried below a 10-foot fill cap.

Generally, oversize rock (maximum dimension of 12 inches or more) will require windrowing, individual burial, or other special placement methods at a minimum depth of 10 feet below finish grade elevation as further described in Appendix D. In addition, an adequate supply of granular fill material will be needed for placement around the rocks. A grading contractor with experience in the handling and placement of oversize rock should be selected for this project.

3.6 Regional Faulting and Fault Activity

The subject site, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional fault systems such as the San Andreas, San Jacinto, and Elsinore Fault Zones. Based on published geologic hazard maps, this site is not located within a currently designated Alquist-Priolo (AP) Earthquake Fault Zone; nor is located within a County Fault Hazard Zone.

3.7 Seismic Coefficients per 2016 CBC

Strong ground shaking can be expected at the site during moderate to severe earthquakes in this general region. This is common to virtually all of Southern California. Intensity of ground shaking at a given location depends primarily upon earthquake magnitude, site distance from the source, and site response (soil type) characteristics. The site-specific seismic coefficients provided in this section are based on an interactive tool/program currently available on USGS website. Based on ASCE 7-10 as the Design Code Reference Document and site Class **C**, the seismic coefficients for this site are as listed in the following table:

Table 1. 2016 CBC Seismic Coefficients

CBC Categorization/Coefficient		Design Value (g)
Site Longitude (-117.31026)	Site Latitude (33.88452)	
Site Class Definition	C	
Mapped Spectral Response Acceleration at 0.2s Period, S_s		**1.50**
Mapped Spectral Response Acceleration at 1s Period, S_1		**0.60**
Short Period Site Coefficient at 0.2s Period, F_a		**1.00**
Long Period Site Coefficient at 1s Period, F_v		**1.30**
Adjusted Spectral Response Acceleration at 0.2s Period, S_{MS}		**1.50**
Adjusted Spectral Response Acceleration at 1s Period, S_{M1}		**0.78**
Design Spectral Response Acceleration at 0.2s Period, S_{DS}		***1.00***
Design Spectral Response Acceleration at 1s Period, S_{D1}		***0.52***

* g- Gravity acceleration

The results of the analysis also indicate that the adjusted Peak Ground Acceleration (PGA_M) for this site is 0.5g.

3.8 Secondary Seismic Hazards

Ground shaking can induce “secondary” seismic hazards such as liquefaction, dynamic densification, lateral spreading, flooding, seiche/tsunami, collapsible soils, and ground rupture, as discussed in the following subsections:

3.8.1 Dynamic Settlement (Liquefaction and/or Dry Settlement)

Due to the lack of shallow groundwater and relatively dense nature of underlying bedrock materials, dynamic settlement (Liquefaction and/or Dry Settlement) is not considered a geologic hazard on this site.

3.8.2 Lateral Spreading

Due to the lack of shallow groundwater and relatively dense nature of underlying materials lateral spreading is not considered a geologic hazard on this site.

3.8.3 Flooding

The site is not within a flood plain and potential for flooding is considered very low for this site.

3.8.4 Seiche and Tsunami

Due to the site location and lack of nearby open bodies of water, the possibility of the affects due to seiches or tsunami is considered very low.

3.8.5 Collapsible Soils

Laboratory testing, from previous site investigation (Leighton, 2016) indicates that the onsite soils (alluvium and older alluvium) are expected to possess a slight collapse potential. Based on the remedial grading recommendations to remove and compact the near surface soils (Section 4.2.1), this geologic hazard on this site is considered very low.

3.8.6 Expansive Soils

Limited laboratory testing indicated that onsite soils generally possess a very low expansion potential (EI<21).

3.8.7 Ground Rupture

Since this site is not located within a mapped Fault Zone, the possibility of ground surface-fault-rupture is very low at this site.

3.9 Percolation/Infiltration Testing

Four percolation tests were performed in designated areas within the site (see, Plate 1) in general accordance with the procedures of the Riverside County Flood Control and Water Conservation District (RCFC&WCD) Design Handbook (RCFC, 2011). Percolation tests were performed at depth of 6 feet BGS and extended into onsite granitic rock. The results of the percolation tests are included in Appendix A. The results are determined in minutes-per-inch drop and converted to infiltration rates (in/hr) using the Porchet Method. Based on the results of our testing and as summarized in Table 2 below, the onsite granitic rock possess very low infiltration rates (<0.6 inch/hr). Additional testing should be expected to verify the preliminary rates below and comply with County requirements as to the required number of tests per basin. No factor of safety is applied to these rates.

Table 2. Range of Infiltration Rates

Test Hole #	Location	Depth BGS (ft)	Infiltration Rate (inches/hour)	Soil Description
P-1	See Plate 1	12	0.05	Granitic rock
P-2	See Plate 1	8	0.46	Granitic rock
P-3	See Plate 1	12	0.59	Granitic rock
P-4	See Plate 1	12	0.59	Granitic rock

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 General

Based on the results of this exploration, it is our opinion that the site is suitable for the proposed development from a geotechnical viewpoint. Grading of the site should be in accordance with our recommendations included in this report and future recommendations and evaluations made during construction by the geotechnical consultant.

4.2 Earthwork

Earthwork should be performed in accordance with the General Earthwork and Grading Specifications in Appendix D as well as the following recommendations. The recommendations contained in Appendix D, are general grading specifications provided for typical grading projects and some of the recommendations may not be strictly applicable to this project. The specific recommendations contained in the text of this report supersede the general recommendations in Appendix D.

The contract between the developer and earthwork contractor should be worded such that it is the responsibility of the contractor to place fill properly in accordance with the recommendations of this report, the specifications in Appendix D, applicable County Grading Ordinances, notwithstanding the testing and observation of the geotechnical consultant during construction.

4.2.1 Site Preparation and Remedial Grading

Prior to grading, the proposed structural improvement areas (i.e. all-structural fill areas, pavement areas, buildings, etc.) should be cleared of surface and subsurface pipelines and obstructions. Heavy vegetation, roots and debris should be disposed of offsite. Any onsite wells or septic waste system should be removed or abandoned in accordance with the Riverside Country Department of Environmental Health. Voids created by removal of buried/unsuitable materials should be backfilled with properly compacted soil in general accordance with the recommendations of this report.

The near surface soils (artificial fill, topsoil, and colluvium/alluvium) are potentially compressible in their present state and may settle under the surcharge of fills or foundation loading. If not removed by proposed grading, these materials should be removed and recompacted in all settlement-sensitive areas including building pads, pavement, and slopes. The depth of removal should extend into underlying dense bedrock generally expected at a depth of 3 to 5 feet BGS.

Acceptability of all removal bottoms should be reviewed by an engineering geologist or geotechnical engineer and documented in the as-graded geotechnical report. The removal limit should be established by a 1:1 (horizontal:vertical) projection from the edge of fill soils supporting structural fill or settlement-sensitive structures downward and outward to competent material identified by the geotechnical consultant. This may require remedial grading that extends beyond the limits of design grading. Removal will also include benching into competent material as the fills rise. Areas adjacent to existing property limits or protected habitat areas may require special considerations and monitoring. Steeper temporary slopes in these areas may be considered.

4.2.2 Structural Fills

The onsite soils are generally suitable for re-use as compacted fill, provided they are free of debris and organic matter. Fills placed within 10 feet of finish pad grades or slope faces should contain no rocks over 12 inches in maximum dimension. In addition, encountered expansive clayey soils layers (EI>21) should be placed at a depth greater than 3 feet below finished pad grades or street subgrade.

Areas to receive structural fill and/or other surface improvements should be scarified to a minimum depth of 8 inches, conditioned to at least optimum moisture content, and recompacted. Fill soils should be placed at a minimum of 90 percent relative compaction (based on ASTM D1557) at or above optimum moisture content. Placement and compaction of fill should be performed in accordance with local grading ordinances under the observation and testing of the geotechnical consultant. The optimum lift thickness to produce a uniformly compacted fill will depend on the type and size of compaction equipment used. In general, fill should be placed in uniform lifts not exceeding 8 inches in thickness.

Fill slope keyways will be necessary at the toe of all fill slopes and at fill-over-cut contacts. Keyway schematics, including dimensions and subdrain recommendations, are provided in Appendix D. All keyways should be excavated into dense bedrock or dense older alluvium as determined by the geotechnical engineer. The cut portions of all slope and keyway excavations should be geologically mapped and approved by a geologist prior to fill placement.

Fills placed on slopes steeper than 5:1 (horizontal:vertical) should be benched into dense soils (see Appendix D for benching detail). Benching should be of sufficient depth to remove all loose material. A minimum bench height of 2 feet into approved material should be maintained at all times.

4.2.3 Import Soils

Import soils and/or borrow sites, if needed, should be evaluated by us prior to import. Import soils should be uncontaminated, granular in nature, free of organic material (loss on ignition less-than 2 percent), have very low expansion potential (E<21) and have a low corrosion impact to the proposed improvements.

4.2.4 Utility Trenches

Utility trenches should be backfilled with compacted fill in accordance with the *Standard Specifications for Public Works Construction,* ("Greenbook"), 2018 Edition. Fill material above the pipe zone should be placed in lifts not exceeding 8 inches in uncompacted thickness and should be compacted to at least 90 percent relative compaction (ASTM D 1557) by mechanical means only. Site soils may generally be suitable as trench backfill provided these soils are screened of rocks over 1½ inches in diameter and organic matter. If imported sand is used as backfill, the upper 3 feet in building and pavement areas should be compacted to 95 percent. The upper 6 inches of backfill in all pavement areas should be compacted to at least 95 percent relative compaction.

Where granular backfill is used in utility trenches adjacent to moisture sensitive subgrades and foundation soils, we recommend that a cut-off "plug" of impermeable material be placed in these trenches at the perimeter of buildings, and at pavement edges adjacent to irrigated landscaped areas. A "plug" can consist of a 5-foot long section of clayey soils with more than 35-percent passing the No. 200 sieve, or a Controlled Low Strength Material (CLSM) consisting of one sack of Portland-cement plus one sack of bentonite per cubic-yard of sand. CLSM should generally conform to requirements of the "Greenbook". This is intended to reduce the likelihood of water permeating trenches from landscaped areas, then seeping along permeable trench backfill into the building and pavement subgrades, resulting in wetting of moisture sensitive subgrade earth materials under buildings and pavements.

Excavation of utility trenches should be performed in accordance with the project plans, specifications and the *California Construction Safety Orders* (latest Edition). The contractor should be responsible for providing a "competent person" as defined in Article 6 of the *California Construction Safety Orders*. Contractors should be advised that sandy soils (such as fills generated from the onsite alluvium) could make excavations particularly unsafe if all safety precautions are not properly implemented. In addition, excavations at or near the toe of slopes and/or parallel to slopes may be highly unstable due to the increased driving force and load on the trench wall. Spoil piles from the excavation(s) and construction equipment should be kept away from the sides of the trenches. Leighton Consulting, Inc. does not consult in the area of safety engineering.

4.2.5 Shrinkage

The volume change of excavated onsite soils upon recompaction is expected to vary with materials, density, insitu moisture content, and location and compaction effort. The in-place and compacted densities of soil materials vary and accurate overall determination of shrinkage and bulking cannot be made. Therefore, we recommend site grading include, if possible, a balance area or ability to adjust grades slightly to accommodate some variation. Based on our geotechnical laboratory results, we expect recompaction shrinkage (when recompacted to an average 92 percent of ASTM D1557) and estimate the following earth volume changes will occur during grading:

- Topsoil/Colluvium/Alluvium: ~ 5-15% shrinkage
- Weathered Bedrock (upper 20 ft) ~ 5% shrinkage to 10% bulking

4.2.6 Drainage

All drainage should be directed away from structures and pavements by means of approved permanent/temporary drainage devices. Adequate storm drainage of any proposed pad should be provided to avoid wetting of foundation soils. Irrigation adjacent to buildings should be avoided when possible. As an option, sealed-bottom planter boxes and/or drought resistant vegetation should be used within 5-feet of buildings.

4.3 Foundation Design

4.3.1 Design Parameters – Spread/Continuous Shallow Footings

Footings should be embedded at least 12-inches below lowest adjacent grade for the proposed structure. Footing embedment should be measured from lowest adjacent finished grade, considered as the top of interior slabs-on-grade or the finished exterior grade, excluding landscape topsoil, whichever is lower. Footings located adjacent to utility trenches or vaults should be embedded below an imaginary 1:1 (horizontal:vertical) plane projected upward and outward from the bottom edge of the trench or vault, up towards the footing.

- **Bearing Capacity**: For footings on newly placed, properly compacted fill soil, an allowable vertical bearing capacity of 2,000 pounds-per-square-foot (psf) should be used. These footings should have a minimum base width of 18 inches for continuous wall footings and a minimum bearing area of 3 square feet (1.75-ft by 1.75-ft) for pad foundations. The bearing pressure value may be increased by 250 psf for each additional foot of embedment or each additional foot of width to a maximum vertical bearing value of 4,000 psf. Additionally, these bearing values may be increased by one-third when considering short-term seismic or wind loads. A modulus of subgrade reaction, K of 200 PCI may be used to relative dense bedrock or onsite soil compacted to minimum 90% relative compaction.

- **Lateral loads**: Lateral loads may be resisted by friction between the footings and the supporting subgrade. A maximum allowable frictional resistance of 0.35 may be used for design. In addition, lateral resistance may be provided by passive pressures acting against foundations poured neat against properly compacted granular fill. We recommend that an allowable passive pressure based on an equivalent fluid pressure of 350 pounds-per-cubic-foot (pcf) be used in design. These friction and passive values have already been reduced by a factor-of-safety of 1.5.

4.3.2 Settlement Estimates

For settlement estimates, we assumed that column loads will be no larger than 150 kips, with bearing wall loads not exceeding 10 kips per foot of wall. If greater column or wall loads are required, we should re-evaluate our foundation recommendation, and re-calculate settlement estimates.

Buildings located on compacted fill soils as required per Section 4.2.1 above should be designed in anticipation of 1 inch of total static settlement and 0.5-inch of static differential settlement within a 40 foot horizontal run.

4.4 Vapor Retarder

It has been a standard of care to install a moisture-vapor retarder underneath all slabs where moisture condensation is undesirable. Moisture vapor retarders may retard but not totally eliminate moisture vapor movement from the underlying soils up through the slabs. Moisture vapor transmission may be additionally reduced by use of concrete additives. Leighton Consulting, Inc. does not practice in the field of moisture vapor transmission evaluation/mitigation. Therefore, we recommend that a qualified person/firm be engaged/consulted with to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. This person/firm should provide recommendations for mitigation of potential adverse impact of moisture vapor transmission on various components of the structure as deemed appropriate.

However, based on our experience, the standard of practice in Southern California has evolved over the last 15 to 20 years into a construction of a vapor retarder system that generally consisted of a membrane (such as 15-mil thick), underlain by a capillary break consisting of 4 inches of clean ½-inch-minimum gravel or 2-inch sand layer (SE>30). The structural engineer/architect or concrete contractor often require a sand layer be placed over the membrane (typically 2-inch thick layer) to help in curing and reduction of curling of concrete. If such sand layer is placed on top of the membrane, the contractor should not allow the sand to become wet prior to concrete placement (e.g., sand should not be placed if rain is expected).

In conclusion, the construction of the vapor barrier/retarder system is dependent on several variables which cannot be all geotechnically evaluated and/or tested. As such, the design of this system should be a design team/owner decision taking into consideration finish flooring materials and manufacture's installation requirements of proposed membrane. Moreover, we recommend that the design team also follow ACI Committee 302 publication for "Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials" (ACI 302.2R-06) which includes a flow chart that assists in determining if a vapor barrier/retarder is required and where it is to be placed.

4.5 Retaining Walls

Retaining wall earth pressures are a function of the amount of wall yielding horizontally under load. If the wall can yield enough to mobilize full shear strength of backfill soils, then the wall can be designed for "active" pressure. If the wall cannot yield under the applied load, the shear strength of the soil cannot be mobilized and the earth pressure will be higher. Such walls should be designed for "at rest" conditions. If a structure moves toward the soils, the resulting resistance developed by the soil is the "passive" resistance. Retaining walls backfilled with non-expansive soils can be designed using the following equivalent fluid pressures:

Table 3. Retaining Wall Design Earth Pressures (Static, Drained)

Loading Conditions	Equivalent Fluid Density (pcf)	
	Level Backfill	2:1 Backfill
Active	36	55
At-Rest	55	90
Passive*	350	150 (2:1, sloping down)

* This assumes level condition in front of the wall will remain for the duration of the project, not to exceed 3,500 psf at depth.

Unrestrained (yielding) cantilever walls should be designed for the active equivalent-fluid weight value provided above for very low to low expansive soils

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that are free draining. In the design of walls restrained from movement at the top (non-yielding) such as basement or elevator pit/utility vaults, the at-rest equivalent fluid weight value should be used. Total depth of retained earth for design of cantilever walls should be measured as the vertical distance below the ground surface measured at the wall face for stem design, or measured at the heel of the footing for overturning and sliding calculations. Should a sloping backfill other than a 2:1 (horizontal:vertical) be constructed above the wall (or a backfill is loaded by an adjacent surcharge load), the equivalent fluid weight values provided above should be re-evaluated on an individual case basis by us. For walls exceeding 6 feet with level backfill, a uniform pressure distribution of 11H (psf) or incremental earth pressures of 22 pounds-per-cubic-foot (pcf) may be considered to estimate seismic lateral pressures acting against such retaining walls. Non-standard wall designs should also be reviewed by us prior to construction to check that the proper soil parameters have been incorporated into the wall design.

All retaining walls should be provided with appropriate drainage. The outlet pipe should be sloped to drain to a suitable outlet. Wall backfill should be non-expansive (EI $\leq$ 21) sands compacted by mechanical methods to a minimum of 90 percent relative compaction (ASTM D 1557). Clayey site soils should not be used as wall backfill. Walls should not be backfilled until wall concrete attains the 28-day compressive strength and/or as determined by the Structural Engineer that the wall is structurally capable of supporting backfill. Lightweight compaction equipment should be used, unless otherwise approved by the Structural Engineer.

4.6 Sulfate Attack

Based on past experience in this area, the onsite soils are expected to possess negligible sulfate content. Type II soils or equivalent may be used. Further testing should be performed at the completion of site grading to confirm such conditions.

4.7 Preliminary Pavement Design

Our preliminary pavement design is based on an R-value of 17 and the Caltrans Highway Design Manual. For planning and estimating purposes, the asphalt concrete pavement sections are calculated based on Traffic Indexes (TI) as indicated in Table below:

Table 4. Asphalt Pavement Sections

General Traffic Condition	Traffic Index (TI)	Asphalt Concrete (inches)	Aggregate Base* (inches)
Automobile Parking Lanes	4.5	3.0	6.0
	5.0	3.5	6.5
Truck Access & Driveways	6.0	4.0	9.0
	6.5	4.0	11.0

Appropriate Traffic Index (TI) should be selected or verified by the project civil engineer and actual R-value of the subgrade soils will need to be verified after completion of site grading to finalize the pavement design. Pavement design and construction should also conform to applicable local, county and industry standards. The Caltrans pavement section design calculations were based on a pavement life of approximately 20 years with periodic flexible pavement maintenance.

Where PCC pavement is planned, the following table provides sections based on the design standards presented in the ACI "Guide for the Design and construction of Concrete Parking Lots" (ACI 330R-08), R-value test results, and the provided Average Daily Truck Traffic Indices (ADTT). The ADTT index is provided by Client/civil engineer.

PAVEMENT SECTIONS

Street	ADTT	R-Value	PCC (Inches)
Heavy Truck Traffic - *Category D **Construction Note 14	>700	17	8.0
Moderate Truck Traffic/Parking - *Category C **Construction Note 1	≤ 300		7.0
Auto Parking/Traffic - *Category A **Construction Note 15	≤ 10		6.0

- **Traffic Categories ACI 330, Table 3.3*
- *** Pavement area designations per DRC Precise Grade Plan Construction Notes.*

The above recommended concrete sections are based on properly compacted fill soils with a very low expansion potential (EI<21) and R-Value greater than 17. All utility trenches should be compacted to 90 percent relative compaction and pavement subgrade (upper 12-inches) uniformly compacted (non-yielding) to 95 percent of the laboratory maximum dry density (ASTM D1557) and at/or slightly above optimum moisture content. Compaction should extend a minimum of 12-inches beyond formlines. Slab edges and construction joint details provided by ACI should be followed. Slab edges that will be subject to through going traffic should be tapered from the heaviest traffic load into the lessor traffic load area a minimum of 3 feet. The PCC pavement should have a minimum of 28-day compressive strength of 3250 psi. Construction and crack control joints should be designed per structural engineer's requirements and/or ACI or ACPA guidelines.

The upper 6 inches of the subgrade soils should be moisture-conditioned to near optimum moisture content, compacted to at least 95 percent relative compaction (ASTM D1557) and kept in this condition until the pavement section is constructed. Minimum relative compaction requirements for aggregate base should be 95 percent of the maximum laboratory density as determined by ASTM D1557. If applicable, aggregate base should conform to the "Standard Specifications for Public Works Construction" (green book) current edition or Caltrans Class 2 aggregate base.

If pavement areas are adjacent to heavily watered landscape areas, some deterioration of the subgrade load bearing capacity and pavement failure may result. Moisture control measures such as deepened curbs or other moisture barrier materials may be used to prevent the subgrade soils from becoming saturated. The use of concrete cutoff or edge barriers should be considered when pavement is planned adjacent to either open (unfinished) or irrigated landscaped areas.

5.0 GEOTECHNICAL CONSTRUCTION SERVICES

Geotechnical review is of paramount importance in engineering practice. Poor performances of many foundation and earthwork projects have been attributed to inadequate construction review. We recommend that Leighton Consulting, Inc. be provided the opportunity to review the grading plan and foundation plan(s) prior to bid.

Reasonably-continuous construction observation and review during site grading and foundation installation allows for evaluation of the actual soil conditions and the ability to provide appropriate revisions where required during construction. Geotechnical conclusions and preliminary recommendations should be reviewed and verified by Leighton Consulting, Inc. during construction, and revised accordingly if geotechnical conditions encountered vary from our findings and interpretations. Geotechnical observation and testing should be provided:

- After completion of site demolition and clearing,
- During over-excavation of compressible soil,
- During compaction of all fill materials,
- After excavation of all footings and prior to placement of concrete,
- During utility trench backfilling and compaction, and
- When any unusual conditions are encountered.

Additional geotechnical exploration and analysis may be required based on final development plans, for reasons such as significant changes in proposed structure locations/footprints. We should review grading (civil) and foundation (structural) plans, and comment further on geotechnical aspects of this project.

6.0 LIMITATIONS

This report was based in part on data obtained from a limited number of observations, site visits, soil excavations, samples and tests. Such information is, by necessity, incomplete. The nature of many sites is such that differing soil or geologic conditions can be present within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, our findings, conclusions and recommendations presented in this report are based on the assumption that we (Leighton Consulting, Inc.) will provide geotechnical observation and testing during construction as the Geotechnical Engineer of Record for this project. Please refer to Appendix D, GBA's *Important Information About This Geotechnical-Engineering Report*, prepared by the Geoprofessional Business Association (GBA) presenting additional information and limitations regarding geotechnical engineering studies and reports.

This report was prepared for the sole use of Client and their design team, for application to design of the proposed maintenance building, in accordance with generally accepted geotechnical engineering practices at this time in California. Any unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify Leighton Consulting, Inc. from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of Leighton Consulting, Inc.

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Project: 11227.019	Eng/Geol: SIS/RFR
Scale: 1 " = 2,000 '	Date: September 2019
Base Map: ESRI ArcGIS Online 2019	
Author: Leighton Geomatics (mmurphy)	

SITE LOCATION MAP

Proposed Meridian Park South Campus Phase II

County of Riverside, California

Figure 1

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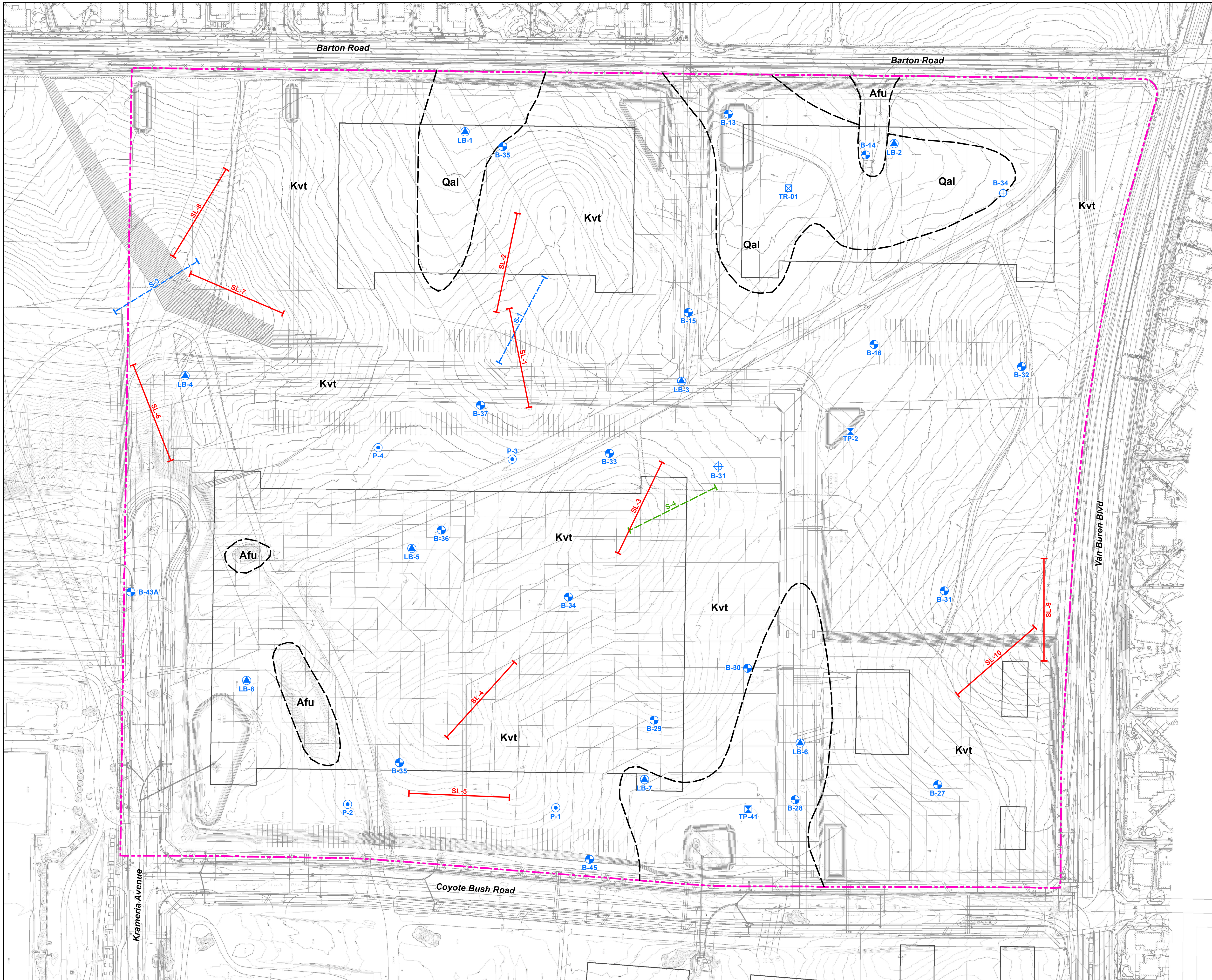
Map Saved as V:\Drafting\11227\019\Maps\11227-019_F01_SLM_2019-08-12.mxd on 8/29/2019 10:26:34 AM



Legend

LB-8	Approximate location of boring (This study)
P-4	Approximate location of percolation test (This study)
B-43	Approximate location of hollow stem boring (Zeiser Kling Consultants, Inc., 2008)
TP-41	Approximate Test Pit Location (Zeiser Kling Consultants, Inc., 2008)
B-34	Approximate location of rotary boring (Inland Foundation Engineering, Inc., 2002)
TR-01	Approximate test pit location (Inland Foundation Engineering, Inc., 2002)
SL-10	Approximate location of seismic line location (this study)
S-7	Approximate seisic line location (Zeiser Kling Consultants, 2008)
S-4	Approximate seisic line location (Terra Geosciences, 2002)
	Approxiate geologic contact
	Approximate site boundary

Geologic Units

Afu	Undocumented Fill, Stockpile
Qal	Recent alluvium, holocene
Kvt	Val Verde Tonalite, cretaceous (circled where buried)

N

0 100 200
Feet

GEOTECHNICAL MAP

Proposed Meridian Park South Campus Phase II
County of Riverside, California

Plate 1

Project: 11227.019	Eng/Geol: SIS/RFR
Scale: 1 " = 100 feet	Date: September 2019

Base Map: Conceptual Utility Map by drc Engineering, Inc., dated 8/1/2019.

Author: Leighton Geomatics (mmurphy) | Map Saved as V:\Drafting\11227\019\Maps\11227-019_P01_GM_2019-08-12.mxd on 8/29/2019 11:02:21 AM

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APPENDIX A-1

LOGS OF EXPLORATORY BORINGS (This and Previous Studies)

Encountered earth materials were logged and sampled in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D 2488). Representative soil samples were transported to our in-house Temecula laboratory for geotechnical testing. After logging and sampling, our borings were backfilled with spoils generated during drilling.

The attached subsurface exploration logs and related information depict subsurface conditions only at the locations indicated and at the particular date designated on these logs. Subsurface conditions at other locations may differ from conditions occurring at these logged locations. Passage of time may result in altered subsurface conditions due to environmental changes. In addition, any stratification lines on these logs represent an approximate boundary between sampling intervals and soil types; and transitions may be gradual.

GEOTECHNICAL BORING LOG LB-1

Project No.	11227.019	**Date Drilled**	8-12-19
Project	Meridian	**Logged By**	JTD
Drilling Co.	California Pacific Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1748'
Location	See Boring Location Map	**Sampled By**	JTD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
	0			B-1				SM/ML	**Quaternary Alluvium (Qal)**; SILTY SAND to SANDY SILT, light brown, slightly moist, fine to coarse grained sand	SA
1745				R-1	6 6 10	119	13	SC	CLAYEY SAND, dark reddish brown, moist, fine to coarse sand	
	5			R-2	50/6"	112	8		**Granitic Bedrock (Kgr)**; Severely weathered, recovered as: Well-graded SAND with SILT, dense, dark grayish brown, moist, fine to coarse grained sand	
1740										
	10			R-3	54/6"				Highly weathered, recovered as: Well-graded SAND, dense, dark grayish brown, moist, fine to coarse grained sand	
1735										
	15			R-4	50/5"				no recovery	
									Drilled to 15.42' Sampled to 15.42' Groundwater not encountered Backfilled with cuttings	
1730										
	20									
1725										
	25									
1720										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG LB-2

Project No.	11227.019	**Date Drilled**	8-12-19
Project	Meridian	**Logged By**	JTD
Drilling Co.	California Pacific Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1746'
Location	See Boring Location Map	**Sampled By**	JTD

SOIL DESCRIPTION: This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
1745	0			B-1				SM/ML	**Quaternary Alluvium (Qal)**; SILTY SAND to SANDY SILT with GRAVEL, light brown, slightly moist, fine to coarse grained sand	MD, EI, RV
				R-1	17 24 31	117	8	SC	CLAYEY SAND, dense, reddish brown, moist, fine to coarse grained sand	
1740	5			R-2	11 21 41	131	8		**Granitic Bedrock (Kgr)**; Severely weathered, recovered as: CLAYEY SAND with GRAVEL, dense, dark grayish brown, moist, fine to coarse grained sand with fine gravel	
1735	10			R-3	50/5"	108	5		Highly weathered, recovered as: Well-graded SAND with CLAY (or SILTY CLAY), dense, dark grayish brown, moist, fine to coarse grained sand	
1730	15			R-4	50/6"				Well-graded SAND with GRAVEL, dense, grayish brown, moist, fine to coarse grained sand with fine gravel	
									Drilled to 15.5' Sampled to 15.5' Groundwater not encountered Backfilled with cuttings	
1725	20									
1720	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LB-3

Project No.	11227.019	**Date Drilled**	8-12-19
Project	Meridian	**Logged By**	JTD
Drilling Co.	California Pacific Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1751'
Location	See Boring Location Map	**Sampled By**	JTD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							GW-GM	**Artificial Fill (Af)**; Well-graded GRAVEL with SILT and SAND, light gray, slightly moist, fine to coarse grained sand with gravel to 2"	
1750								SC	**Quaternary Alluvium (Qal)**; CLAYEY SAND, dark brown, moist, fine to coarse grained sand	
				R-1	4 8 21	108	5		CLAYEY SAND, medium dense, dark reddish brown, moist, fine to coarse grained sand	
	5			R-2	23 50/5"				**Granitic Bedrock (Kgr)**; Highly weathered, recovered as: Well-graded SAND with SILT, dense, dark grayish brown, slightly moist, fine to coarse grained sand	
1745										
	10			R-3	50/6"	125	4		Well-graded SAND with SILT and GRAVEL, dense, dark grayish brown, moist, fine to coarse grained sand with fine gravel	
1740										
	15			R-4	50/5"				Well-graded SAND with GRAVEL, dense, light brownish gray, moist, fine to coarse grained sand with fine gravel	
1735										
	20			R-5	50/6"				Well-graded SAND, dense, light gray, slightly moist, fine to coarse grained sand	
1730									Drilled to 20.5' Sampled to 20.5' Groundwater not encountered Backfilled with cuttings	
	25									
1725										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-4

Project No.	11227.019	**Date Drilled**	8-12-19
Project	Meridian	**Logged By**	JTD
Drilling Co.	California Pacific Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1759'
Location	See Boring Location Map	**Sampled By**	JTD

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0								**Granitic Bedrock (Kgr)**; Highly weathered, recovered as: Well-graded SAND with GRAVEL, light gray, slightly moist, fine to coarse grained sand with fine gravel	
									Well-graded SAND with SILT, light brownish gray, moist, fine to coarse grained sand	
1755	5			R-1 B-1	50/4"	111	2		Well-graded SAND, dense, dark grayish brown, moist, fine to coarse grained sand	CR
1750	10			R-2	50/4"				Well-graded SAND with SILT, dense, light brownish gray, slightly moist, fine to coarse grained sand	
1745	15			R-3	50/3"				Well-graded SAND, dense, light gray, slightly moist, fine to coarse grained sand, limited recovery	
1740	20			R-4	50/3"				Well-graded SAND with GRAVEL, dense, light gray, slightly moist, fine to coarse grained sand with fine gravel	
1735	25			R-5	50/5"				no recovery	
									Drilled to 25.42' Sampled to 25.42' Groundwater not encountered Backfilled with cuttings	
1730	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-5

Project No.	11227.019	**Date Drilled**	8-12-19
Project	Meridian	**Logged By**	JTD
Drilling Co.	California Pacific Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1750'
Location	See Boring Location Map	**Sampled By**	JTD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
1750	0			B-1				SM	**Quaternary Alluvium (Qal)**; SILTY SAND, light gray, slightly moist, fine to coarse grained sand	
				R-1	5 15 28	116	6	SC	CLAYEY SAND, medium dense, dark brown, moist, fine to coarse grained sand	
1745	5			R-2	25 50/6"				**Granitic Bedrock (Kgr)**; Highly weathered, recovered as: Well-gradded SAND with SILT, dense, dark grayish brown, moist, fine to coarse grained sand	
1740	10			R-3	20 50/6"	116	10		Severely weathered, recovered as: SILTY SAND, dense, light brown, moist, fine to coarse grained sand	
1735	15			R-4	24 50/6"				Highly weathered, recovered as: Well-graded SAND with SILT, dense, light gray, slightly moist, fine to coarse grained sand	
									Drilled to 16' Sampled to 16' Groundwater not encountered Backfilled with cuttings	
1730	20									
1725	25									
1720	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LB-6

Project No.	11227.019	**Date Drilled**	8-12-19
Project	Meridian	**Logged By**	JTD
Drilling Co.	California Pacific Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1743'
Location	See Boring Location Map	**Sampled By**	JTD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							SM	**Quaternary Alluvium (Qal)**; SILTY SAND, light brown, slightly moist, fine to coarse grained sand	
1740				R-1	17 50/6"	121	8	SC	CLAYEY SAND, dense, dark brown, moist, fine to coarse grained sand	
	5			R-2	50/6"				**Granitic Bedrock (Kgr)**; Highly weathered, recovered as: SILTY SAND, dense, light brownish gray, slightly moist, fine to coarse grained sand	
1735										
	10			R-3	37 50/3"	128	6		Moderately weathered, recovered as: Well-graded SAND with SILT, dense, dark grayish brown, moist, fine to coarse grained sand	
1730										
	15			R-4	50/6"				Well-graded SAND, dense, gray, moist, fine to coarse grained sand	
									Drilled to 15.5' Sampled to 15.5' Groundwater not encountered Backfilled with cuttings	
1725										
	20									
1720										
	25									
1715										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LB-7

Project No.	11227.019	**Date Drilled**	8-12-19
Project	Meridian	**Logged By**	JTD
Drilling Co.	California Pacific Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1743'
Location	See Boring Location Map	**Sampled By**	JTD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0			B-1			4.2	SM/SC	**Quaternary Alluvium (Qal)**; SILTY to CLAYEY SAND with GRAVEL, light brown, slightly moist, fine to coarse grained sand R=18	RV
1740				R-1	12 25 50	120	6		**Granitic Bedrock (Kgr)**; Highly weathered, recovered as: Well-graded SAND with SILT, dense, light brown, slightly moist, fine to coarse grained sand	
	5			R-2	50/6"	103	5		Well-graded SAND with SILT, dense, grayish brown, moist, fine to coarse grained sand	
1735										
	10			R-3	50/5"				Well-graded SAND with SILT, dense, dark grayish brown, moist, fine to coarse grained sand	
1730										
	15			R-4	50/6"				Well-graded SAND, dense, light gray, slightly moist, fine to coarse grained sand	
									Drilled to 15.5' Sampled to 15.5' Groundwater not encountered Backfilled with cuttings	
1725										
	20									
1720										
	25									
1715										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG LB-8

Project No.	11227.019	**Date Drilled**	8-12-19
Project	Meridian	**Logged By**	JTD
Drilling Co.	California Pacific Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1743'
Location	See Boring Location Map	**Sampled By**	JTD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0								**Quaternary Alluvium (Qal)**; Well-graded SAND with SILT, light gray, slightly moist, fine to coarse grained sand	
1740				R-1	9 17 30	118	5	SC	CLAYEY SAND, medium dense, reddish brown, moist, fine to coarse grained sand	
	5			R-2	25 50/5"	122	5		**Granitic Bedrock (Kgr)**; Highly weathered, recovered as: Well-graded SAND with SILT, dense, dark grayish brown, moist, fine to coarse grained sand	
1735										
	10			R-3	50/6"				Well-graded SAND with SILT, dense, dark grayish brown, moist, fine to coarse grained sand	
1730										
	15			R-4	50/5"				no recovery	
									Drilled to 15.5' Sampled to 15.5' Groundwater not encountered Backfilled with cuttings	
1725										
	20									
1720										
	25									
1715										
	30									

SAMPLE TYPES:
B BULK SAMPLE
C CORE SAMPLE
G GRAB SAMPLE
R RING SAMPLE
S SPLIT SPOON SAMPLE
T TUBE SAMPLE

TYPE OF TESTS:
-200 % FINES PASSING
AL ATTERBERG LIMITS
CN CONSOLIDATION
CO COLLAPSE
CR CORROSION
CU UNDRAINED TRIAXIAL
DS DIRECT SHEAR
EI EXPANSION INDEX
H HYDROMETER
MD MAXIMUM DENSITY
PP POCKET PENETROMETER
RV R VALUE
SA SIEVE ANALYSIS
SE SAND EQUIVALENT
SG SPECIFIC GRAVITY
UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG P-1

Project No.	11227.019	**Date Drilled**	8-12-19
Project	Meridian	**Logged By**	JTD
Drilling Co.	California Pacific Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1750'
Location	See Boring Location Map	**Sampled By**	JTD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
1750	0							SM	SILTY SAND, light brown, slightly moist, fine to coarse grained sand, **Quaternary Alluvium (Qal)**; SILTY SAND, light brown, slightly moist, fine to coarse grained sand	
									Granitic Bedrock (Kgr); Moderately weathered, recovered as: Well-graded SAND with SILT, grayish brown, slightly moist, fine to coarse grained sand	
1745	5									
1740	10			S-1	31 50/4"				Well-graded SAND with SILT, dense, dark grayish brown, moist, fine to coarse grained sand	-200
									Drilled to 12' Sampled to 12' Groundwater not encountered Backfilled with cuttings	
1735	15									
1730	20									
1725	25									
1720	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG P-2

Project No. 11227.019
Project Meridian
Drilling Co. California Pacific Drilling
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map

Date Drilled 8-12-19
Logged By JTD
Hole Diameter 8"
Ground Elevation 1750'
Sampled By JTD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
1750	0							SC	**Quaternary Alluvium (Qal)**; CLAYEY SAND, reddish brown, slightly moist, fine to coarse grained sand	
									Granitic Bedrock (Kgr); Highly weathered, recovered as: Well-graded SAND with SILT, grayish brown, moist, fine to coarse grained sand	
1745	5									
				S-1	17 50/5"				Well-graded SAND with SILT, dense, dark grayish brown, moist, fine to coarse grained sand	
									Drilled to 8' Sampled to 8' Groundwater not encountered Backfilled with cuttings	
1740	10									
1735	15									
1730	20									
1725	25									
1720	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG P-3

Project No.	11227.019	**Date Drilled**	8-12-19
Project	Meridian	**Logged By**	JTD
Drilling Co.	California Pacific Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1756'
Location	See Boring Location Map	**Sampled By**	JTD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							SM	**Quaternary Alluvium (Qal)**; SILTY SAND with GRAVEL, light gray, slightly moist, fine to coarse grained sand	
1755								SC-SM	SILTY, CLAYEY SAND with GRAVEL, dark brown, moist, fine to coarse grained sand with fine gravel	
									Granitic Bedrock (Kgr); Well-graded SAND with CLAY (or SILTY CLAY), light brown, moist, fine to coarse grained sand	
	5								Well-graded SAND with SILT, gray, moist, fine to coarse grained sand	
1750										
	10									
1745				S-1	17 50/5"				Well-graded SAND with GRAVEL, dense, light gray, slightly moist, fine to coarse grained sand with fine gravel	
									Drilled to 12' Sampled to 12' Groundwater not encountered Backfilled with cuttings	
	15									
1740										
	20									
1735										
	25									
1730										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG P-4

Project No.	11227.019	**Date Drilled**	8-12-19
Project	Meridian	**Logged By**	JTD
Drilling Co.	California Pacific Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1755'
Location	See Boring Location Map	**Sampled By**	JTD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
1755	0							SW-SM	**Quaternary Alluvium (Qal)**; Well-graded SAND with SILT and GRAVEL, grayish brown, slightly moist, fine to coarse grained sand with fine gravel	
									Well-graded SAND with SILT, dark brown, moist, fine to coarse grained sand	
1750	5								**Granitic Bedrock (Kgr)**; Highly weathered, recovered as: Well-graded SAND with SILT, dark brown, moist, fine to coarse grained sand	
1745	10									
				S-1					Well-graded SAND with SILT, grayish brown, moist, fine to coarse grained sand	-200
									Drilled to 12' Sampled to 12' Groundwater not encountered Backfilled with cuttings	
1740	15									
1735	20									
1730	25									
1725	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-13**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/6/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1741.0

Standard Split Spoon · Shelby Tube · Water Level ATD · California · Bulk Sample · Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1740			California	2 7 13	7.9	114	**Undocumented Artificial Fill (Afu):** Clayey SAND (SC): Mottled gray-brown, damp, medium dense, some fine sand, slight micaceous, some caliche stringers, pinhole porosity.		MAX	
1735	5		California	7 15 28	13.2	122	Silty SAND (SM): Light brown, moist, medium dense, micaceous, grades to bedrock, yellow-orange, damp, severely weathered, friable.		CN	
							Val Verde Tonalite (Kvt): Bedrock: Yellow-orange, dry, severely weathered, friable. Recovered as poorly graded sand.			
1730	10									
							∇ (Water Level ATD)			
			Bulk Sample							
1725	15		Standard Split Spoon	17 27 37	3.2	131	@ 15 Feet: Slightly to moderately weathered.			

Total Depth = 16 Feet 6 Inches
Caving Encountered at 12 Feet 6 Inches
Groundwater Encountered at 13 Feet 6 Inches
Perforated Pipe and Gravel Installed on 2-6-08 for Percolation Testing

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-14
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/6/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1746.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1745							**Undocumented Artificial Fill (Afu):** Silty SAND (SM): Light brown, dry, very dense, slightly micaceous, pinhole porosity, caliche stringers.			
			California	16 25 50/5"	7.4	122				
	5									
1740							**Val Verde Tonalite (Kvt):** Bedrock: Yellowish-orange, severely weathered, weak. Quartz vein in tip of shoe: milky white, fractured, fractures lined with yellow-orange clay.			
			California	28 50/4"	7.6	130				
	10									
1735										
			California	25 50/5"	5.4	132	@ 12 Feet: Light gray, weak to friable. Recovered as poorly graded sand.			
	15									
1730							∇			
			Standard Split Spoon	25 50/5"						

Total Depth = 17 Feet 11 Inches
Groundwater Encountered at 16 Feet 2 Inches
Caving Encountered to 13 Feet

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-15**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/6/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1750.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Topsoil (No Map Symbol): Clayey SAND (SC): Light brown, damp, caliche stringers.			
			California	11 19 39	10.6	121				
							Val Verde Tonalite (Kvt): Bedrock: Yellowish-orange, moderately weathered, weak. Recovered as poorly graded sand.			
1745	5		California	35 30 50/4"	5.8	135				
1740	10		California	30 50/5"	4.5	127	@ 10 Feet: Light brown.			
1735	15		Standard Split Spoon	25 50/5"			@ 15 Feet: Light gray.			
							Total Depth = 15 Feet 11 Inches No Groundwater Encountered Backfilled with Cuttings			

HS BA TP 07100-01 LNR_SOUTH CAMPUS BORING LOGS.GPJ ZKCI.GDT 4/21/08

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-16**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/6/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1752.0

Sample type legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Older Alluvium (Qoal): Clayey SAND (SC): Red-brown, damp, very dense, slightly micaceous.			
			California	21 50/5"	8.1	130				
1750							**Val Verde Tonalite (Kvt):** Bedrock: Light brown, moderately weathered, moderately strong. Recovered as silty sand.			
	5		California	50/6"	4.7	121	@ 5 Feet: Light brown, severely weathered, friable.			
1745										
	10		California	50/6"	3.4	124	@ 10 Feet: Yellow-orange, weak.			
1740										
	15		Standard Split Spoon	50/6"	3.6	117	@ 15 Feet: Light gray, moderately weathered, weak.			

Total Depth = 15 Feet 6 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	LNR/South Campus	Boring No.:	**B-27**
Project Number:	07100-01	Driller:	**2R Dilling**
		Drill Type:	**Hollow Stem Auger**
Date Drilled:	2/8/07	Hammer Wt. / Drop:	**140lb / 30in**
Logged By:	SMW	Ground Elev. [ft]:	**1752.0**

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Val Verde Tonalite (Kvt):			
1750				25 42 50/5"	6.7	127	Bedrock: Pink-gray, dry, completely weathered, weak, rootlets towards top of sample. Recovered as silty sand.			
	5			50/5"	4.7	122	@ 5 Feet: Brown-gray, damp towards top of sample. Recovered as poorly graded sand.			
1745										
	10			50/6"	3.6	118	@ 10 Feet: Damp, quartz-rich layer: tan, damp, hard, poorly cemented, contains yellow-brown 1mm clay seams, fine grained.			
1740										
	15			50/6"			@ 15 Feet: Yellow-gray, dry, severely weathered, friable.			
							Total Depth = 15 Feet 6 Inches No Groundwater Encountered Backfilled with Cuttings			

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	LNR/South Campus	Boring No.:	**B-28**
Project Number:	07100-01	Driller:	**2R Drilling**
		Drill Type:	**Hollow Stem Auger**
Date Drilled:	2/8/08	Hammer Wt. / Drop:	**140lb / 30in**
Logged By:	SMW	Ground Elev. [ft]:	**1741.0**

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1740			California	25 30 50/5"	8.4	131	**Recent Alluvium (Qal):** Clayey SAND (SC): Brown, moist, dense, micaceous, rootlets, medium sand. **Val Verde Tonalite (Kvt):** Bedrock: Brown-green, severely weathered, weak. Recovered as poorly graded sand.			
1735	5		California	35 50/5"	4.9	137	@ 5 Feet: Brown-green, severely weathered, weak.			
1730	10		California / Bulk Sample	50/5"	3.3	110	@ 10 Feet: Yellow-gray. Recovered as silty sand.		MAX	
	15		Standard Split Spoon	50/4"			@ 15 Feet: Light gray. Total Depth = 15 Feet 4 Inches No Groundwater Encountered Backfilled with Cuttings			

HS BA TP 07100-01 LNR_SOUTH CAMPUS BORING LOGS.GPJ ZKCI.GDT 4/21/08

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	LNR/South Campus	Boring No.:	B-29
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/8/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1749.0

Sample legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			California	50/6"	4.3	122	**Older Alluvium (Qoal):** Silty SAND (SM): Red-brown, moist, very dense, micaceous, pinhole porosity, some rootlets.			
							Val Verde Tonalite (Kvt): Bedrock: Brown-gray, moderately weathered, slightly weak. Recovered as poorly graded sand.			
1745										
	5		California	24 50/4"	4.2	129	@ 5 Feet: Yellow-gray, moderately weathered, friable.			
1740										
	10		California	20 50/6"	5.3	129				
1735										
	15				1.9	116	@15 Feet: Recovered as silty sand.			
1730										
	20		Standard Split Spoon	35 50/3"			@ 20 Feet: Light gray			

Total Depth = 20 Feet 9 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-30
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/8/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1746.0

Sample types: Standard Split Spoon; Shelby Tube; California; Bulk Sample. Water Level ATD; Static Water Table.

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1745							**Topsoil:** Clayey SAND (SC): Red-brown, slightly moist, loose, micaceous, some rootlets in upper 6", pinhole porosity. Grades to bedrock in lower 6".			
			California	9 23 50/4"	14.3	114	**Val Verde Tonalite (Kvt):** Bedrock: Yellow-orange, dry, completely weathered, friable. Recovered as poorly graded sand.			
1740	5									
			California	18 32 50/5"	6.6	129	@ 7 Feet: Pink-gray, severely weathered, weak.			
1735	10									
			California	13 39 50/4"	7.8	124	@ 12 Feet: Brown-gray, severely weathered, weak.			
1730	15									
			Standard Split Spoon	8 5 11			@ 17 Feet: Quartz-rich layer: yellow-gray, wet, poorly cemented, fine grained.			

Total Depth = 18 Feet 6 Inches
Groundwater Encountered at 16 Feet 10 Inches
(After 10 min. 17 Feet 9 Inches)
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-31
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/8/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1762.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Topsoil (No Map Symbol):			
			California	20 50/5"	17.4	118	Silty SAND (SM): Light brown, moist, dense, micaceous, earthy, pinhole porosity, rootlets.			
1760							**Val Verde Tonalite (Kvt):** Bedrock: Yellow-brown, completely weathered, weak. Recovered as poorly graded sand.			
	5		California	50/5"	3.2	117	@ 5 Feet: Yellow-gray, severely weathered, friable.			
1755										
	10		California	30 50/4"	2.3	129	@ 10 Feet: Light gray, moderately weathered, weak.			
1750										
	15		Standard Split Spoon	35 50/3"			@ 15 Feet: Moderately strong.			

Total Depth = 15 Feet 9 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-32**
Project Number:	07100-01	Driller:	**2R Drilling**
		Drill Type:	**Hollow Stem Auger**
Date Drilled:	2/8/08	Hammer Wt. / Drop:	**140lb / 30in**
Logged By:	SMW	Ground Elev. [ft]:	**1764.0**

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			Bulk Sample / California	14 30 50/5'	4.7	134	**Val Verde Tonalite (Kvt):** Bedrock: Brown-gray, severely weathered, completely weathered in upper 6 inches, moderately strong. Recovered as poorly graded sand.			
1760										
	5		California / Bulk Sample	20 50/5"	2.5	131	@ 5 Feet: Brown-green, moderately weathered, severely weathered in upper 6 inches.			
1755										
	10		California	38 50/5"	2.8	123	@ 10 Feet: Light gray.			
1750										
	15		Standard Split Spoon	30 50/3"						

Total Depth = 15 Feet 9 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-33**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/8/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1756.0

Sample types: Standard Split Spoon; Shelby Tube; California; Bulk Sample. Water Level ATD; Static Water Table.

Elevation [ft]	Depth [ft]	Sample Type	Blows/6"	Moisture Content [%]	Dry Density [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Topsoil: Clayey SAND (SC): Red-brown, slightly moist, very dense, micaceous, rootlets in upper 6 inches, fine to medium grained. Grades to bedrock for last 6 inches.			
1755		California	7 24 45	10.2	124	**Val Verde Tonalite (Kvt):** Bedrock: Brown-gray, severely weathered, dry, moderately strong. Recovered as poorly graded sand.			
1750	5	California	30 50/4"	5.1	129	@ 5 Feet: Yellow-green, damp, slightly weak. Recovered as silty sand.			
1745	10	Shelby Tube	50/2"	3.2		@ 10 Feet: Orthoclase(?) vein: light tan, dry, strong, fresh, fractured, some fractures lined with yellow clay.			
	15	Standard Split Spoon	35 50/3"			@ 15 Feet: Brown-gray, moderately weathered, moderately strong. Recovered as poorly graded sand.			

Total Depth = 15 Feet 9 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	LNR/South Campus	Boring No.:	**B-34**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/8/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1760.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			California	34 50/2"	7.1	130	**Topsoil (No Map Symbol):** Clayey SAND (SC): Red-brown, moist, dense to very dense, micaceous, rootlets.			
							Val Verde Tonalite (Kvt): Bedrock: Yellow-brown, friable, completely weathered. Recovered as poorly graded sand. @ 1 Foot 9 Inches: Severely weathered.			
1755	5		California	50/4"	3.2	111	@ 5 Feet: Yellow-gray, moderately weathered, friable.			
1750	10		California	50/4"	2.8	122	@ 10 Feet: Light gray.			
1745	15		California	50/3"	2.4	111	@ 15 Feet: Increased mica content towards top of sample. Recovered as silty sand.			
1740	20		Standard Split Spoon	20 50/4"			@ 20 Feet: Yellow-gray. Recovered as poorly graded sand.			
							Total Depth = 20 Feet 10 Inches No Groundwater Encountered Backfilled with Cuttings			

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-35**
Project Number:	07100-01	Driller:	**2R Drilling**
		Drill Type:	**Hollow Stem Auger**
Date Drilled:	2/8/08	Hammer Wt. / Drop:	**140lb / 30in**
Logged By:	SMW	Ground Elev. [ft]:	**1757.0**

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
	0		Bulk / California	4 11 28	4.7	121	**Val Verde Tonalite (Kvt):** Bedrock: Red-brown, completely weathered, weak. Recovered as poorly graded sand.			
1755										
	5		California	50/6"	3.7	120	@ 5 Feet: Yellow-green, severely weathered, moderately strong.			
1750										
	10		California	28 50/4"	3.7	133				
1745										
	15		Standard Split Spoon	35 50/4"			@ 15 Feet: Yellow-gray			
1740										
	20		California	50/4"	2.9	115	@ 20 Feet: Light gray.			
1735										
	25		Standard Split Spoon	50/5"			@ 25 Feet: Brown-green, 2mm-wide red-brown clay seam in tip of shoe.			

Total Depth = 25 Feet 5 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-36**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/11/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1752.0

Sample types: Standard Split Spoon; Shelby Tube; California; Bulk Sample. Water Level ATD; Static Water Table.

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Topsoil (No Map Symbol): Silty SAND (SM): Light brown, slightly damp, very dense, pinhole porosity, rootlets, fine-grained sand.			
1750			California	9 22 37	6.8	125	**Val Verde Tonalite (Kvt):** Bedrock: Pink-gray, severely weathered, weak. Recovered as poorly graded sand.			
	5		California	22 50/6"	6.5	132	@ 5 Feet: Brown-green, severely weathered, moderately strong.			
1745										
	10		California	40 50/5"	5.4	131	@ 10 Feet: Yellow-green, moderately weathered, moderately strong.			
1740										
	15		Standard Split Spoon	28 25 50/5"			@ 15 Feet: Light gray, slightly weathered.			

Total Depth = 16 Feet 5 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-37**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/11/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1760.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			California	9 14 16	8.1	122	**Topsoil (No Map Symbol):** Clayey SAND (SC): Red-brown, slightly moist, medium dense to dense, micaceous, rootlets in top 6 inches, pinhole porosity.			
1755	5		California	50/6"	5.3	118	**Val Verde Tonalite (Kvt):** Bedrock: Yellow-gray, damp, severely weathered, weak. Recovered as poorly graded sand. @ 5 Feet: Brown-green, severely weathered, moderately strong.			
1750	10		California	50/6"	5.0	117				
1745	15		California	50/5"	3.0	116	@ 15 Feet: Light gray, moderately weathered.			
1740	20		Standard Split Spoon	50/6"						

Total Depth = 20 Feet 6 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	B-38
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/11/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1751.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1750			Bulk; California	20 37 50/5"	4.9	135	**Val Verde Tonalite (Kvt):** Bedrock: Brown-gray, dry, moderately weathered, moderately strong. Severely weathered in upper 6 inches, pinhole porosity. Recovered as poorly graded sand.			
	5		California	50/5"	5.0	107	@ 5 Feet: Yellow-gray, weak.			
1745										
	10		Bulk; California	50/3"	6.5	101	@ 10 Feet: Severely weathered. Recovered as silty sand.			
							Total Depth = 10 Feet 2 Inches Practical Refusal No Groundwater Encountered Backfilled with Cuttings			

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-39**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/11/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1765.0

Sample types: Standard Split Spoon; Shelby Tube; California; Bulk Sample. Water Level ATD; Static Water Table.

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Topsoil (No Map Symbol): Clayey SAND (SC): Red-brown, moist, micaceous, rootlets.			
							Val Verde Tonalite (Kvt):			
			California	10 50/3"	14.3	105	Bedrock: Brown-gray, severely weathered, slightly weak. Recovered as poorly graded sand.			
1760	5									
			California	50/5"	3.7	120	@ 7 Feet: Yellow-gray, severely weathered, friable, dry.			
1755	10									
			California	31 50/1"	3.2	123	@ 12 Feet: Light gray, moderately weathered, weak.			
1750	15									
			Standard Split Spoon	50/5"						

Total Depth = 17 Feet 5 Inches
No Groundwater Encountered
Backfilled with Cuttings

HS BA TP 07100-01 LNR_SOUTH CAMPUS BORING LOGS.GPJ 2KCI.GDT 4/21/08

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	LNR/South Campus	Boring No.:	B-40
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/11/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1770.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Val Verde Tonalite (Kvt): Bedrock: Yellow-orange, completely weathered, moderately strong. Recovered as silty sand.			
			California	14 25 50/4"	13.1	106				
1765	5									
			California	40 50/5"	3.9	126	@ 7 Feet: Yellow-gray, severely weathered, friable, dry. Recovered as poorly graded sand.			
1760	10									
			California	31 50/5"	4.6	117	@ 12 Feet: Yellow-gray, weak.			
1755	15									
			Standard Split Spoon	35 50/6"			@ 17 Feet: Light gray, moderately weathered, moderately strong.			
							Total Depth = 17 Feet 5 Inches No Groundwater Encountered Backfilled with Cuttings			

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LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-41**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/11/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1767.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
	0					**Topsoil (No Map Symbol):** Silty SAND (SM): Light brown, damp, dense, slightly micaceous, rootlets in upper 6 inches, earthy.			
1765		California	20 50/5"	9.0	120	**Val Verde Tonalite (Kvt):** Bedrock: Pink-gray, dry, moderately weathered, weak. Recovered as poorly graded sand.			
	5			4.9	125	@ 5 Feet: Yellow-green, severely weathered, weak.			
1760									
	10	California	18 50/6"	5.1	130	@ 10 Feet: Yellow-gray, damp, severely weathered, weak, upper 6 inches is more fine grained.			
1755									
	15	California	30 50/3"	4.6	118	@ 15 Feet: Slightly damp, moderately weathered.			
1750									
	20	Standard Split Spoon	25 50/5"						
1745									
	25	California	50/5"	3.5	124	@ 25 Feet: Slightly weathered.			

Total Depth = 25 Feet 5 Inches
No groundwater encountered
Backfilled with Cuttings

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LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-42**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/11/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1749.0

Sample type legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Topsoil (No Map Symbol): Silty SAND (SM): Light brown, damp, medium dense to dense, micaceous, rootlets.			
			California	35 50/2"	5.2	120	**Val Verde Tonalite (Kvt):** Bedrock: Quartz-rich, tan, dry, poorly consolidated, very fine grained. Recovered as sandy clay.			
			Bulk Sample						MAX, GS	
1745	5		California	50/4"	1.5		@ 5 Feet: Slight increase in grain size. Recovered as poorly graded sand.			
1740	10		California	50/5"	3.0	122	@ 10 Feet: Yellow-gray, moderately weathered, weak, increase in grain size, less quartz.			
1735	15		Standard Split Spoon	50/5"			@ 15 Feet: Light gray.			

Total Depth = 15 Feet 5 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	**LNR/South Campus**	Boring No.:	**B-43**
Project Number:	**07100-01**	Driller:	**2R Drilling**
		Drill Type:	**Hollow Stem Auger**
Date Drilled:	**2/11/08**	Hammer Wt. / Drop:	**140lb / 30in**
Logged By:	**SMW**	Ground Elev. [ft]:	**1754.0**

Sample types: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Topsoil (No Map Symbol): Clayey SAND (SC): Red-brown, moist, medium grained, micaceous, pinhole porosity.			
			California	8 20 38	7.3	131	**Val Verde Tonalite (Kvt):** Bedrock: Brown-gray, severely weathered, weak.			
1750										
	5									
							Total Depth = 7 Feet Practical Refusal No Groundwater Encountered Backfilled with Cuttings			

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-43A**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/11/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1754.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							SEE B-43 FOR UPPER STRATA DESCRIPTION			
1750	5									
			California	50/5"	6.1	123	**Val Verde Tonalite (Kvt):** Bedrock: Brown-gray, severely weathered, weak, orange-brown oxidation. Recovered as poorly graded sand.			
1745	10									
			California	50/5"	4.5	114	@ 12 Feet: Yellow-gray, damp, severely weathered, weak.			
1740	15									
			Standard Split Spoon	38 50/4"			@ 17 Feet: Slightly yellow-light gray.			
							Total Depth = 17 Feet 10 Inches No Groundwater Encountered Backfilled with Cuttings			

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	LNR/South Campus	Boring No.:	**B-44**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/11/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1742.0

Sample types: Standard Split Spoon; Shelby Tube; California; Bulk Sample. Water Level ATD; Static Water Table.

Elevation [ft]	Depth [ft]	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Topsoil (No Map Symbol): Silty SAND (SM): Light brown, damp, medium dense, slightly micaceous, porous, rootlets.			
1740		California	7 10 14	6.3	105		>4.50		
	5	California	12 50/6"	5.2	133	@ 5 Feet: Light brown, slightly damp, hard, slightly micaceous.			
						Val Verde Tonalite (Kvt): Bedrock: Yellow-green, severely weathered, weak. Recovered as poorly graded sand.			
1735									
	10	California	50/4"	5.2	124	@ 10 Feet: Yellow-gray, severely weathered, weak.			
1730									
	15	Standard Split Spoon	30 50/4"			@ 15 Feet: Light gray, moderately weathered, moderately strong.			
						Total Depth = 15 Feet 11 Inches No Groundwater Encountered Backfilled with Cuttings			

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	LNR/South Campus	Boring No.:	**B-45**
Project Number:	07100-01	Driller:	**2R Drilling**
		Drill Type:	**Hollow Stem Auger**
Date Drilled:	2/11/08	Hammer Wt. / Drop:	**140lb / 30in**
Logged By:	SMW	Ground Elev. [ft]:	**1737.0**

Legend: Standard Split Spoon; Shelby Tube; California; Bulk Sample; Water Level ATD; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Val Verde Tonalite (Kvt):			
1735			California	13 30 50/3"	5.3	135	Bedrock: Brown-gray, slightly moist, completely weathered, weak. Recovered as poorly graded sand.			
	5		California	34 50/4"	4.7	135	@ 5 Feet: Brown-green, slightly moist, severely weathered.			
1730										
	10		California	50/5"	3.3	116	@ 10 Feet: Yellow-gray, moderately weathered.			
1725										
	15		California	50/5"	2.5	122	@ 15 Feet: Light gray.			
1720										
	20		Standard Split Spoon	50/5.5"			@ 20 Feet: Yellow-gray.			

Total Depth = 20 Feet 5.5 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-46**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/12/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1767.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Topsoil (No Map Symbol): Silty SAND (SM): Red-brown, moist, micaceous, rootlets.			
1765			California	25 50/5"	5.4	120	**Val Verde Tonalite (Kvt):** Bedrock: Pink-gray, severely weathered, weak. Recovered as poorly graded sand.			
	5		California	25 38 36	3.8	135	@ 5 Feet: Brown-gray, severely weathered, weak.			
1760										
	10		California	35 50/5"	3.6	126	@ 10 Feet: Moderately weathered.			
1755										
	15		California	50/6"	3.9	113	@ 15 Feet: Yellow-gray.			
1750										
	20		Standard Split Spoon	30 50/6"						

Total Depth = 21 Feet
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-47**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/12/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1776.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1775							**Topsoil (No Map Symbol):** Silty SAND (SM): Light brown, slightly moist, micaceous, rootlets.			
			California	37 50/2"	9.8	117	**Val Verde Tonalite (Kvt):** Bedrock: Yellow-gray, damp, severely weathered. Recovered as poorly graded sand.			
1770	5									
			California	48 50/3"	4.2	121				
1765	10									
			California	27 50/4"	2.8	115	@ 12 Feet: Light gray, slightly moist, moderately weathered.			
1760	15									
			Standard Split Spoon	45 50/4"			@ 17 Feet: Slightly damp.			
1755	20									
			California	50/4"			@ 22 Feet: No Recovery			
1750	25									
			Standard Split Spoon	50/4"			@ 27 Feet: Light gray, moderately weathered.			

LOG OF EXPLORATORY BORING

Project:	LNR/South Campus	Boring No.:	**B-47**
Project Number:	07100-01	Driller:	2R Drilling
		Drill Type:	Hollow Stem Auger
Date Drilled:	2/12/08	Hammer Wt. / Drop:	140lb / 30in
Logged By:	SMW	Ground Elev. [ft]:	1776.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
1745							**Val Verde Tonalite (Kvt):** Bedrock: Yellow-gray, damp, severely weathered. Recovered as poorly graded sand. *(continued)*			
				50/1"			@ 32 Feet: No Recovery			
	35									
1740										
				50/4"			@ 37 Feet: Light gray.			

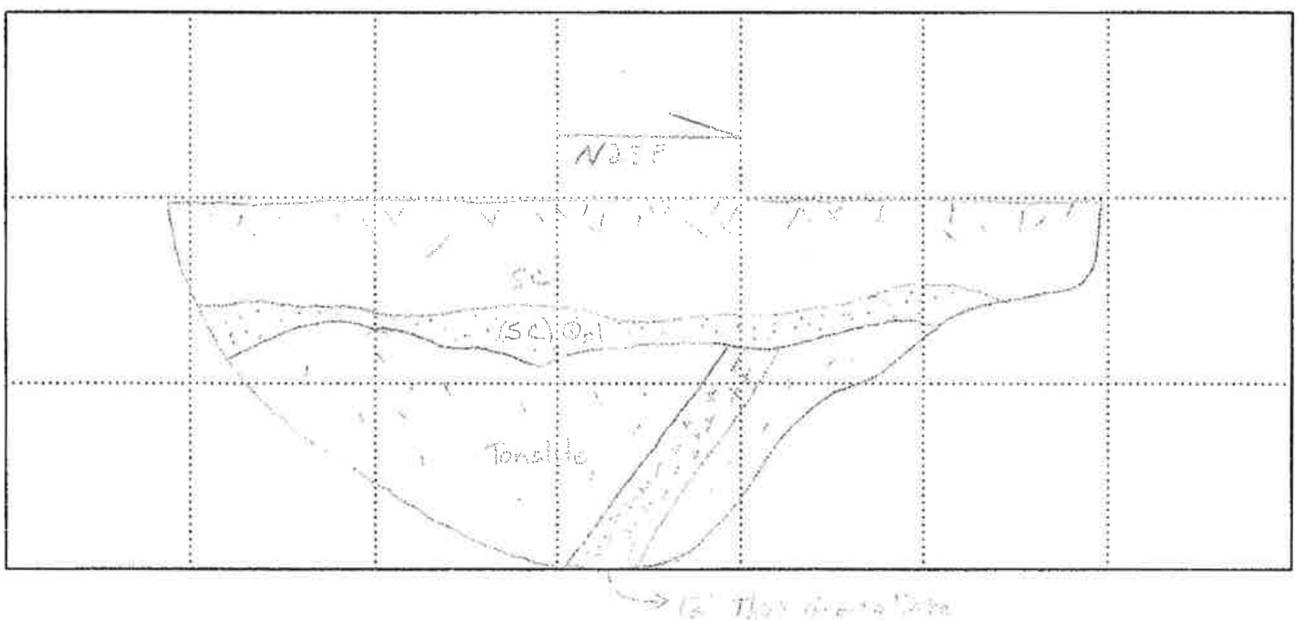
Total Depth = 37 Feet 4 Inches
No Groundwater Encountered
Backfilled with Cuttings

LOG OF EXPLORATORY TEST PIT

Project:	**LNR/South Campus**	Test Pit No.:	**TP-1**
Project Number:	**07100-01**	Contractor:	**G&M Backhoe**
		Backhoe:	**430E 4X4**
Date Drilled:	**2/6/08**	Hammer Wt. / Drop:	
Logged By:	**ANM**	Ground Elev. [ft]:	**1778.0**

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
								TOPSOIL:		
								0 to 0.75 feet:Sandy CLAY (CL): Dark brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/8-inch diameter), moist to wet, very soft.		
1775								0.75 to 1.7 feet: Same as above: Blocky, few rootlets (less than 1/16-inch in diameter), damp to moist, firm.		
								ALLUVIUM (Qal):		
	5							1.7 to 2.3 feet: Sandy CLAY to Clayey SAND (CL-SC): Mottled brown and reddish brown, fine to coarse sand, well-graded, highly oxidized, porous, moist, firm.		
								VAL VERDE TONALITE (Kvt):		
								2.3 to 8 feet: Recovered as Silty SAND (SM): Orange-brown, fine to coarse sand, well-graded, oxidized, moderately weathered, very micaceous, moist, friable.		
1770								Moderately dipping 1 foot thick quartz dike. Light orange, fine to coarse sand with gravel, damp to moist, friable to weak.		
								@ 7 feet: Operator calls resistant.		
								Total Depth = 8 feet.		
								No groundwater or caving encountered.		
								Backfilled on 2/6/2008.		



HS BA TP 07100-01 TEST PITS.GPJ ZKCI.GDT 4/22/08

ZEISER KLING Consultants, Inc.

Pit Orientation: N25E

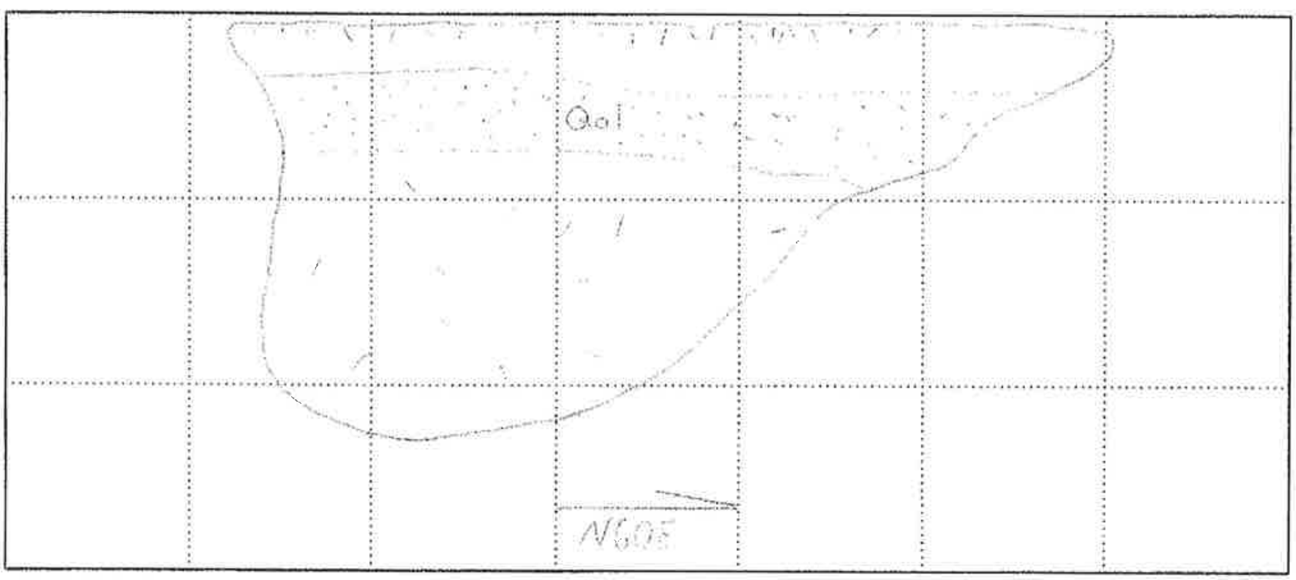
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	LNR/South Campus	Test Pit No.:	**TP-2**
Project Number:	07100-01	Contractor:	G&M Backhoe
		Backhoe:	430E 4X4
Date Drilled:	2/6/08	Hammer Wt. / Drop:	
Logged By:	ANM	Ground Elev. [ft]:	1752.0

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
1750								**TOPSOIL:** 0 to 1 foot: Sandy CLAY (CL): Brown, fine to medium sand, slightly micaceous to micaceous, porous, highly bioturbated, numerous rootlets (less than 1/16-inch diameter), moist, very soft. 1 to 1.6 feet: Same as above: Blocky, damp to moist, firm. Note: Abrupt transition to below.		
	5							**ALLUVIUM (Qal):** 1.6 to 3.3 feet: Sandy CLAY (CL): Mottled brown and reddish brown, fine to coarse sand, well-graded, highly oxidized, porous, damp, stiff.		
1745								**VAL VERDE TONALITE (Kvt):** 3.3 to 8.75 feet: Recovered as Silty SAND (SM): Orange brown, fine to coarse sand, well-graded, oxidized, severely to moderately weathered, very micaceous, moist, friable.		
								Total Depth = 8.75 feet. No groundwater or caving encountered. Backfilled on 2/6/2008.		



ZEISER KLING Consultants, Inc.

Pit Orientation: N60E

B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF BORING B-31

Elevation:	1759.9	Date(s) Drilled:	5/3/02
Drilling Method:	Rotary Auger	Logged by:	DL
Drilling Rig:	CME-55	Hammer Type:	Auto-trip
Boring Diameter:	8-inches	Hammer Weight:	140 lb.
		Hammer Drop:	30-inches

SUMMARY OF SUBSURFACE CONDITIONS

This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered and is representative of interpretations made during drilling. Contrasting data derived from laboratory analysis may not be reflected in these representations.

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLE TYPE	BLOWS/6"	MOISTURE (%)	DRY UNIT WT. (pcf)	RELATIVE COMPACTION (%)
	SC	CLAYEY SAND, fine to medium grained, brown, moist, medium dense to dense.	B				
	BR	BEDROCK, Granitic, red-brown, dense, highly to moderately weathered.	SS		10	120	
5			SPT		5		
10							
15							
20		- harder drilling -					
25		End of boring at 25 feet. No groundwater or mottling encountered.					

LOG OF BORING B-34

Elevation:	1751.9	Date(s) Drilled:	5/3/02
Drilling Method:	Rotary Auger	Logged by:	DL
Drilling Rig:	CME-55	Hammer Type:	Auto-trip
Boring Diameter:	8-inches	Hammer Weight:	140 lb.
		Hammer Drop:	30-inches

SUMMARY OF SUBSURFACE CONDITIONS

This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered and is representative of interpretations made during drilling. Contrasting data derived from laboratory analysis may not be reflected in these representations.

DEPTH (ft)	GRAPHIC	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE SAMPLE	SAMPLES: BULK SAMPLE	SAMPLES: SAMPLE TYPE	BLOWS/6"	MOISTURE (%)	DRY UNIT WT. (pcf)	RELATIVE COMPACTION (%)
		SC	CLAYEY SAND, fine to medium grained, red-brown, moist, medium dense, well cemented.			SS	16 19	23	92	
5		SM	SILTY SAND, fine to coarse grained with clay, brown, slightly moist, medium dense, moderately cemented, friable.			SS	16 19	7	117	
		BR	BEDROCK, Granitic, red-brown, dense, highly to moderately weathered.			SS	50/6"	8	103	
10										
15										
20			End of boring at 20 feet. No groundwater or mottling encountered.							

[illegible] FOUNDATION ENGINEERING, INC.

Geotechnical Investigation [illegible]

Figure No. [illegible]

LOG OF TRENCH TR-01

Elevation: 1743.7
Excavation Method:
Equipment: BACKHOE

Logged by: MAT
Date(s) : 5/17/02

DEPTH (ft)	GRAPHIC	USCS	SUMMARY OF SUBSURFACE CONDITIONS This summary applies only at the location of the trench and at the time of digging. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	REMARKS
1 2		SM	SILTY SAND, fine to medium grained, medium brown, dry, loose, blocky, low porosity, root mat in the upper 0.3 feet.	
3		SM	SILTY SAND, fine to medium grained with clay, dark brown, moist, medium dense, blocky with caliche stringers.	
4 5 6		BR	GRANITE, decomposed, moderately weathered, red-brown, moist, dense to very dense.	
			End of Trench. No groundwater, mottling or refusal encountered.	

APPENDIX A-2

RESULTS OF PERCOLATION TESTING (This Study)

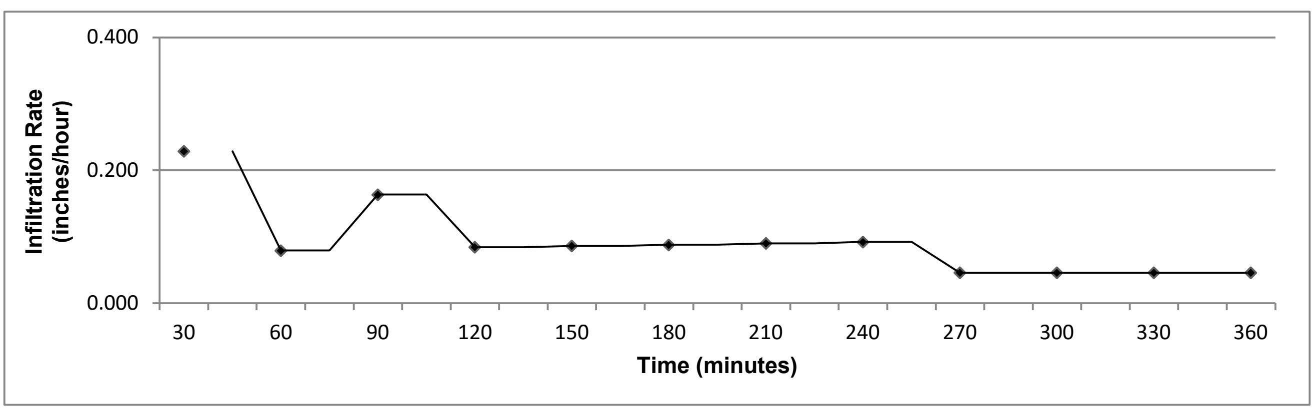
Encountered earth materials were logged and sampled in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D 2488). Representative soil samples were transported to our in-house Temecula laboratory for geotechnical testing. After logging and sampling, our borings were backfilled with spoils generated during drilling.

The attached subsurface exploration logs and related information depict subsurface conditions only at the locations indicated and at the particular date designated on these logs. Subsurface conditions at other locations may differ from conditions occurring at these logged locations. Passage of time may result in altered subsurface conditions due to environmental changes. In addition, any stratification lines on these logs represent an approximate boundary between sampling intervals and soil types; and transitions may be gradual.

Test Hole Number: P-1
Date Excavated: 8/12/2019
Tested by: JTD
Soil Unit: Granitic Bedrock
USCS Soil Type: W-graded SAND & SILT (SW-SM)

Project: Meridian NWC
Project Number: 11227.019
Date Tested: 8/13/2019
Test Hole Depth (inches): 144
Test Hole Diameter (inches): 8
Sunny ~95 °

Time	Δt (minutes)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
7:24:00 7:54:00	30.00	119.00	120.50	1.50	0.229	20.000
7:54:00 8:24:00	30.00	120.50	121.00	0.50	0.079	60.000
8:24:00 8:54:00	30.00	121.00	122.00	1.00	0.163	30.000
8:54:00 9:24:00	30.00	122.00	122.50	0.50	0.084	60.000
9:24:00 9:54:00	30.00	122.50	123.00	0.50	0.086	60.000
9:54:00 10:24:00	30.00	123.00	123.50	0.50	0.088	60.000
10:24:00 10:54:00	30.00	123.50	124.00	0.50	0.090	60.000
10:54:00 11:24:00	30.00	124.00	124.50	0.50	0.092	60.000
11:24:00 11:54:00	30.00	124.00	124.25	0.25	0.046	120.000
11:54:00 12:24:00	30.00	124.00	124.25	0.25	0.046	120.000
12:24:00 12:54:00	30.00	124.00	124.25	0.25	0.046	120.000
12:54:00 1:24:00	30.00	124.00	124.25	0.25	0.046	120.000



*Based on Porchet Method: http://rcflood.org/downloads/NPDES/Documents/LIDManual/Appendix%20A_Infiltration_Testing.pdf

Project Name: Meridian NWC
Riverside, California

Project No.: 11227.019

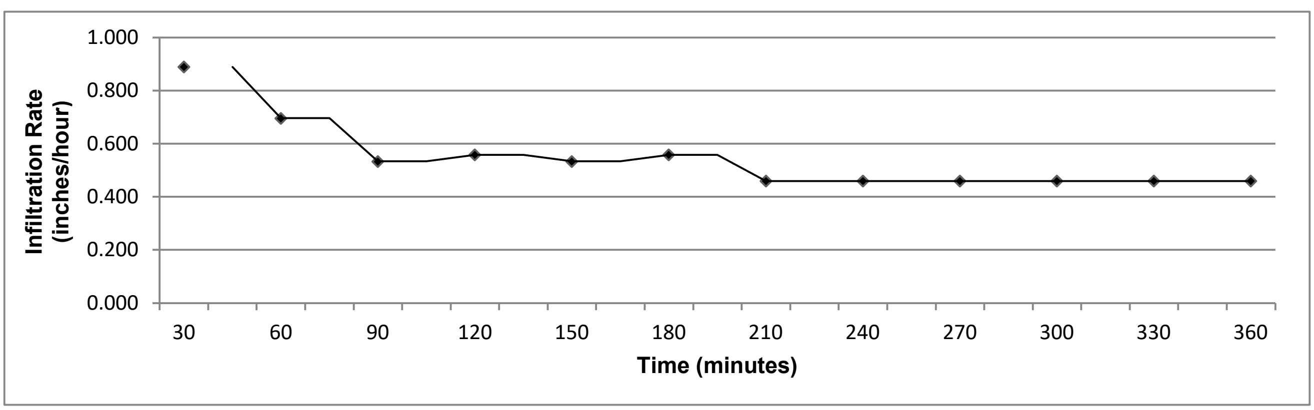
PERCOLATION TEST
P-1

Test Hole Number: P-2
Date Excavated: 8/12/2019
Tested by: JTD
Soil Unit: Granitic Bedrock
USCS Soil Type: W-graded SAND & SILT (SW-SM)

Project: Meridian NWC
Project Number: 11227.019
Date Tested: 8/13/2019
Test Hole Depth (inches): 96
Test Hole Diameter (inches): 8

Sunny ~95 °

Time	Δt (minutes)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
7:10:00 7:40:00	30.00	73.00	78.00	5.00	0.889	6.000
7:40:00 8:10:00	30.00	73.00	77.00	4.00	0.696	7.500
8:10:00 8:40:00	30.00	74.00	77.00	3.00	0.533	10.000
8:40:00 9:10:00	30.00	75.00	78.00	3.00	0.558	10.000
9:10:00 9:40:00	30.00	74.00	77.00	3.00	0.533	10.000
9:40:00 10:10:00	30.00	75.00	78.00	3.00	0.558	10.000
10:10:00 10:40:00	30.00	75.00	77.50	2.50	0.460	12.000
10:40:00 11:10:00	30.00	75.00	77.50	2.50	0.460	12.000
11:10:00 11:40:00	30.00	75.00	77.50	2.50	0.460	12.000
11:40:00 12:10:00	30.00	75.00	77.50	2.50	0.460	12.000
12:10:00 12:40:00	30.00	75.00	77.50	2.50	0.460	12.000
12:40:00 1:10:00	30.00	75.00	77.50	2.50	0.460	12.000



*Based on Porchet Method: http://rcflood.org/downloads/NPDES/Documents/LIDManual/Appendix%20A_Infiltration_Testing.pdf

PERCOLATION TEST
P-2

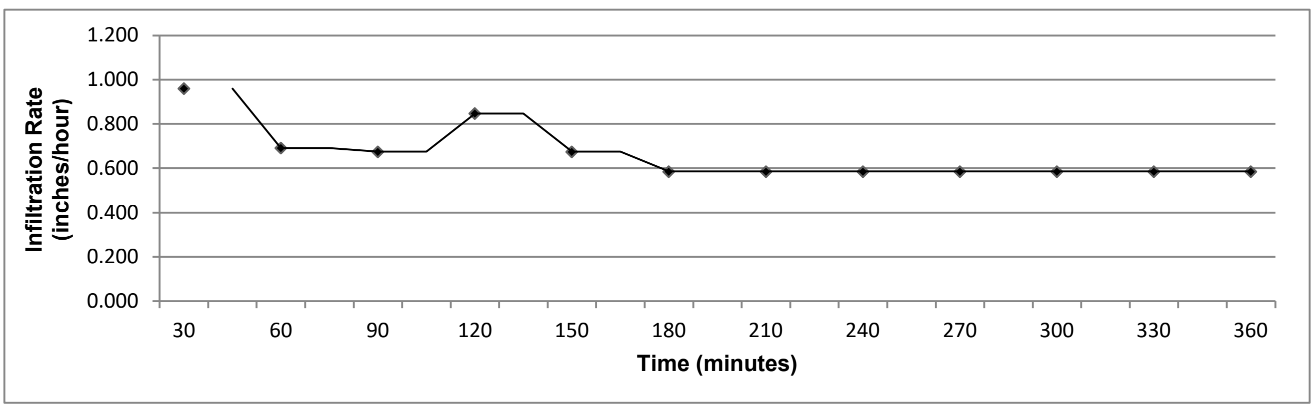
Project Name: Meridian NWC
Riverside, California

Project No.: 11227.019

Test Hole Number:	P-3	**Project:**	Meridian NWC
Date Excavated:	8/12/2019	**Project Number:**	11227.019
Tested by:	JTD	**Date Tested:**	8/13/2019
Soil Unit:	Granitic Bedrock	**Test Hole Depth (inches):**	144
USCS Soil Type:	W-graded SAND & SILT (SW-SM)	**Test Hole Diameter (inches):**	8

Sunny ~95 °

Time	Δt (minutes)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
7:19:00 – 7:49:00	30.00	118.00	124.00	6.00	0.960	5.000
7:49:00 – 8:19:00	30.00	124.00	127.50	3.50	0.691	8.571
8:19:00 – 8:49:00	30.00	123.50	127.00	3.50	0.675	8.571
8:49:00 – 9:19:00	30.00	122.50	127.00	4.50	0.847	6.667
9:19:00 – 9:49:00	30.00	123.50	127.00	3.50	0.675	8.571
9:49:00 – 10:19:00	30.00	124.00	127.00	3.00	0.585	10.000
10:19:00 – 10:49:00	30.00	124.00	127.00	3.00	0.585	10.000
10:49:00 – 11:19:00	30.00	124.00	127.00	3.00	0.585	10.000
11:19:00 – 11:49:00	30.00	124.00	127.00	3.00	0.585	10.000
11:49:00 – 12:19:00	30.00	124.00	127.00	3.00	0.585	10.000
12:19:00 – 12:49:00	30.00	124.00	127.00	3.00	0.585	10.000
12:49:00 – 1:19:00	30.00	124.00	127.00	3.00	0.585	10.000



*Based on Porchet Method: http://rcflood.org/downloads/NPDES/Documents/LIDManual/Appendix%20A_Infiltration_Testing.pdf

Project Name: Meridian NWC
Riverside, California

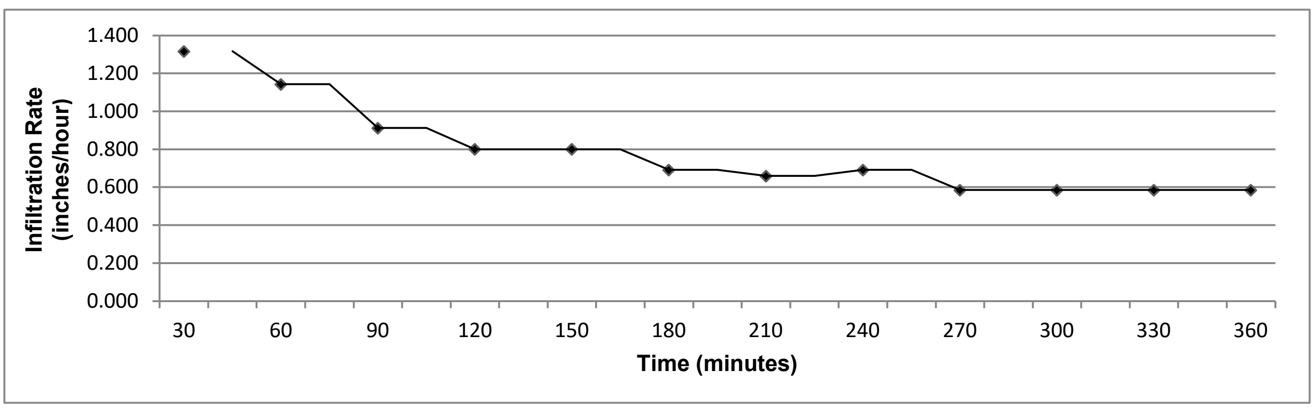
PERCOLATION TEST
P-3

Project No.: 11227.019

Test Hole Number:	P-4	**Project:**	Meridian NWC
Date Excavated:	8/12/2019	**Project Number:**	11227.019
Tested by:	JTD	**Date Tested:**	8/13/2019
Soil Unit:	Granitic Bedrock	**Test Hole Depth (inches):**	144
USCS Soil Type:	W-graded SAND & SILT (SW-SM)	**Test Hole Diameter (inches):**	8

Sunny ~95 °

Time	Δt (minutes)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration/Percolation Rate	
					inches/hour*	minute/inch
7:15:00 7:45:00	30.00	123.00	129.50	6.50	1.316	4.615
7:45:00 8:15:00	30.00	124.00	129.50	5.50	1.143	5.455
8:15:00 8:45:00	30.00	124.00	128.50	4.50	0.911	6.667
8:45:00 9:15:00	30.00	124.00	128.00	4.00	0.800	7.500
9:15:00 9:45:00	30.00	124.00	128.00	4.00	0.800	7.500
9:45:00 10:15:00	30.00	124.00	127.50	3.50	0.691	8.571
10:15:00 10:45:00	30.00	123.00	126.50	3.50	0.659	8.571
10:45:00 11:15:00	30.00	124.00	127.50	3.50	0.691	8.571
11:15:00 11:45:00	30.00	124.00	127.00	3.00	0.585	10.000
11:45:00 12:15:00	30.00	124.00	127.00	3.00	0.585	10.000
12:15:00 12:45:00	30.00	124.00	127.00	3.00	0.585	10.000
12:45:00 1:15:00	30.00	124.00	127.00	3.00	0.585	10.000



*Based on Porchet Method: http://rcflood.org/downloads/NPDES/Documents/LIDManual/Appendix%20A_Infiltration_Testing.pdf

Project Name: Meridian NWC
Riverside, California

PERCOLATION TEST
P-4

Project No.: 11227.019

APPENDIX B

RESULTS OF GEOTECHNICAL LABORATORY TESTS

Leighton

PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS

ASTM D 6913

Project Name:	Meridian Park S NWC	Tested By:	FLM	Date:	08/25/19
Project No.:	11227.019	Checked By:	MRV	Date:	08/26/19
Boring No.:	LB-1	Depth (feet):	0 - 5.0		
Sample No.:	B-1				
Soil Identification:	Sandy Silt s(ML), Dark Reddish Brown.				

		Moisture Content of Total Air - Dry Soil	
Container No.:	MILL.	Wt. of Air-Dry Soil + Cont. (g)	1103.9
Wt. of Air-Dried Soil + Cont.(g)	1103.9	Wt. of Dry Soil + Cont. (g)	1072.7
Wt. of Container (g)	666.6	Wt. of Container No.______ (g)	666.6
Dry Wt. of Soil (g)	406.1	Moisture Content (%)	7.7

After Wet Sieve	Container No.	MILL.
	Wt. of Dry Soil + Container (g)	871.1
	Wt. of Container (g)	666.6
	Dry Wt. of Soil Retained on # 200 Sieve (g)	204.5

U. S. Sieve Size (in.)	U. S. Sieve Size (mm.)	Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
3"	75.000		100.0
1"	25.000		100.0
3/4"	19.000		100.0
1/2"	12.500		100.0
3/8"	9.500		100.0
#4	4.750	0.0	100.0
#8	2.360	4.5	98.9
#16	1.180	28.5	93.0
#30	0.600	67.9	83.3
#50	0.300	116.3	71.4
#100	0.150	162.3	60.0
#200	0.075	200.7	50.6
PAN			

GRAVEL: **0 %**

SAND: **49 %**

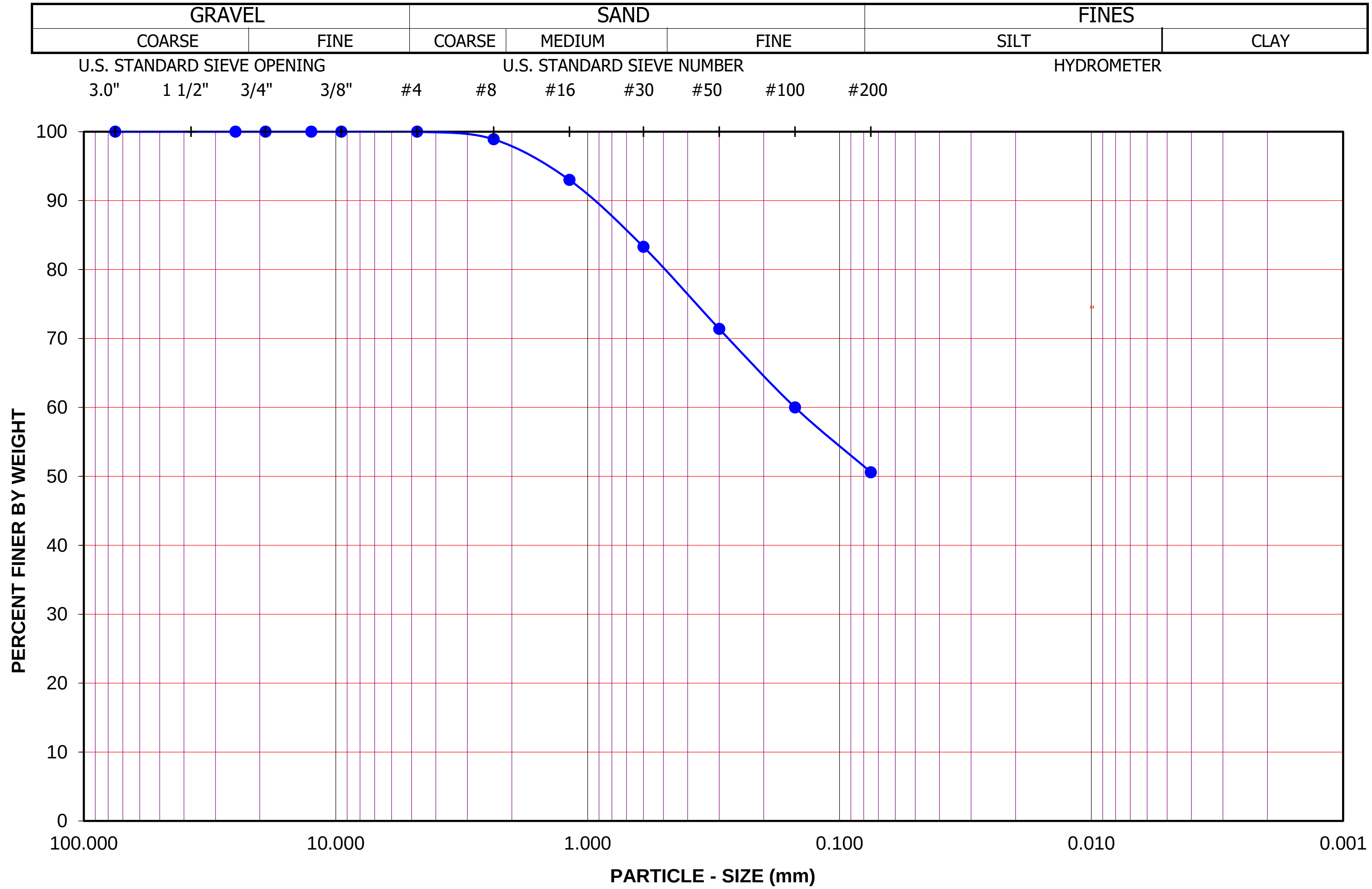
FINES: **51 %**

GROUP SYMBOL: **s(ML)**

$Cu = D60/D10 =$ N/A

$Cc = (D30)^2/(D60*D10) =$ N/A

Remarks:



Project Name: Meridian Park S NWC

Project No.: 11227.019

Boring No.: LB-1 Sample No.: B-1

Depth (feet): 0 - 5.0 Soil Type : s(ML)

Soil Identification: Sandy Silt s(ML), Dark Reddish Brown.

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 6913

GR:SA:FI : (%) 0 : 49 : 51

Aug-19

Sieve; LB-1, B-1 (08-12-19)

Boring No.	P-1	P-4						
Sample No.	S-1	S-1						
Depth (ft.)	10.5	11.0 - 12.0						
Sample Type	SPT	SPT						
Visual Soil Classification	SW - SM	SW-SM						
Soak Time (min)	10	10						
Moisture Correction								
Wet Weight of Soil + Container (gm.)	771.1	795.6						
Dry Weight of Soil + Container (gm.)	760.8	784.1						
Weight of Container (gm)	420.8	419.6						
Moisture Content (%)	3.0	3.2						
Container No.:	MLB	NIKE						
Sample Dry Weight Determination								
Weight of Sample + Container (gm.)	760.8	784.1						
Weight of Container (gm.)	420.8	419.6						
Weight of Dry Sample (gm.)	340.0	364.5						
Container No.:	MLB	NIKE						
After Wash								
Dry Weight of Sample + Container (gm)	731.6	735.7						
Weight of Container (gm)	420.8	419.6						
Dry Weight of Sample (gm)	310.8	316.1						
% Passing No. 200 Sieve	**9**	**13**						
% Retained No. 200 Sieve	91	87						

PERCENT PASSING No. 200 SIEVE
ASTM D 1140

Leighton

Project Name: Meridian Park S NWC
Project No.: 11227.019
Client Name: Meridian Park, LLC
Tested By: F. Mina Date: 8/24/19

Rev. 08-04

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Leighton

Project Name:	Meridian Park S NWC	Tested By:	F. Mina	Date:	08/24/19
Project No.:	11227.019	Input By:	M. Vinet	Date:	08/26/19
Boring No.:	LB-2	Depth (ft.):	0 - 5.0		
Sample No.:	B-1				
Soil Identification:	Silty, Clayey Sand (SC-SM), Dark Reddish Brown.				

Preparation Method: [X] Moist [ ] Dry — [X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03340 — *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	5595	5684	5726	5679		
Weight of Mold (g)	3578	3578	3578	3578		
Net Weight of Soil (g)	2017	2106	2148	2101		
Wet Weight of Soil + Cont. (g)	875.3	795.6	1036.0	1032.3		
Dry Weight of Soil + Cont. (g)	853.5	770.4	983.6	970.0		
Weight of Container (g)	420.0	420.7	415.0	418.7		
Moisture Content (%)	5.0	7.2	9.2	11.3		
Wet Density (pcf)	133.1	139.0	141.8	138.7		
Dry Density (pcf)	126.8	129.7	129.8	124.6		

Maximum Dry Density (pcf) 130.2 **Optimum Moisture Content (%)** 8.3

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

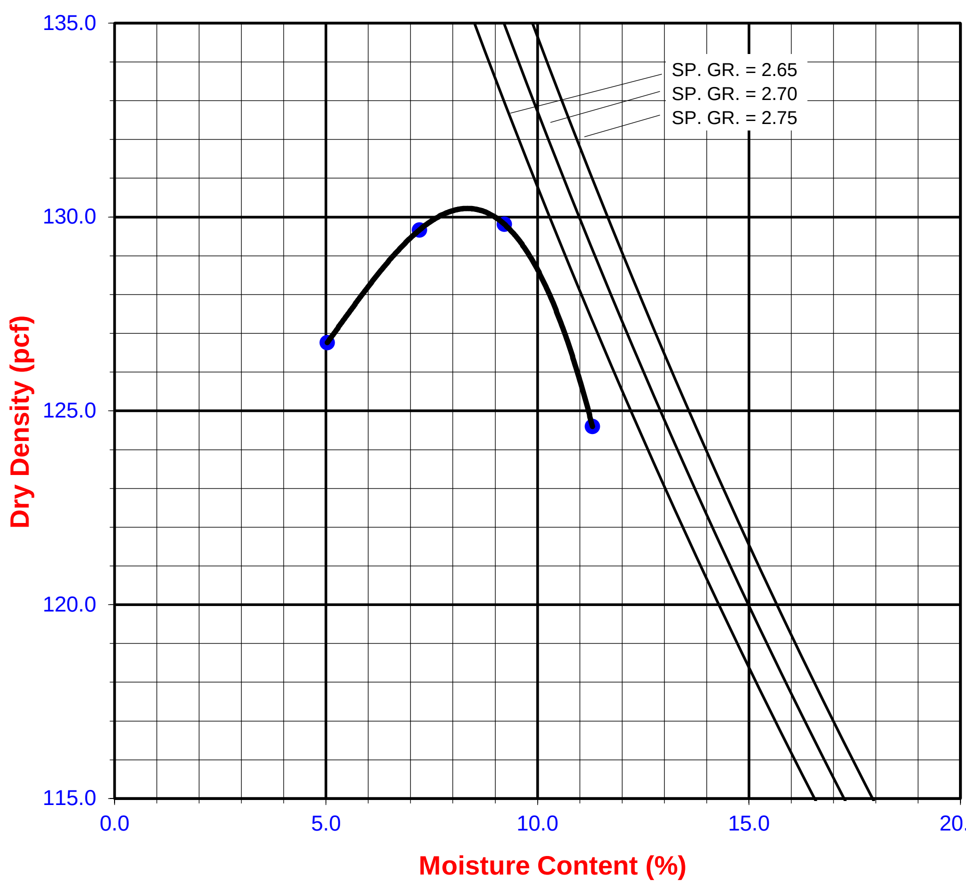
[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	Meridian Park S NWC	Tested By: F. Mina	Date: 8/24/19
Project No. :	11227.019	Checked By: M. Vinet	Date: 8/26/19
Boring No.:	LB-2	Depth: 0 - 5.0	
Sample No. :	B-1	Location: N/A	
Sample Description:	Silty, Clayey Sand (SC-SM), Dark Reddish Brown.		

Dry Wt. of Soil + Cont. (gm.)	3917.8
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	3917.8
Weight Soil Retained on #4 Sieve	23.6
Percent Passing # 4	99.4

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0201
Wt. Comp. Soil + Mold (gm.)	597.6	625.4
Wt. of Mold (gm.)	177.9	177.9
Specific Gravity (Assumed)	2.70	2.70
Container No.	7	7
Wet Wt. of Soil + Cont. (gm.)	350.4	625.4
Dry Wt. of Soil + Cont. (gm.)	328.2	388.6
Wt. of Container (gm.)	50.4	177.9
Moisture Content (%)	8.0	15.2
Wet Density (pcf)	126.6	132.3
Dry Density (pcf)	117.2	114.9
Void Ratio	0.438	0.467
Total Porosity	0.305	0.318
Pore Volume (cc)	63.1	67.2
Degree of Saturation (%) [S meas]	**49.3**	**87.6**

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
8/24/19	16:30	1.0	0	0.5000
8/24/19	16:40	1.0	10	0.5000
	Add Distilled Water to the Specimen			
8/25/19	9:00	1.0	980	0.5201
8/25/19	10:00	1.0	1040	0.5201

Expansion Index (EI meas)	=	((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	20.1
Expansion Index (Report)	=	Nearest Whole Number or Zero (0) if Initial Height is > than Final Heigh	**20**

Rev. 03-08

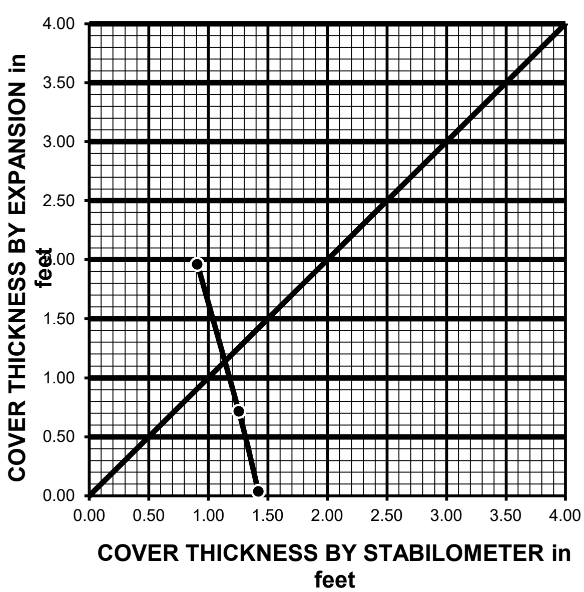
R-VALUE TEST RESULTS
ASTM D 2844

Project Name:	Meridian Park S NWC	Date:	8/24/19
Project Number:	11227.019	Technician:	F. Mina
Boring Number:	LB-2	Depth (ft.):	0 - 5.0
Sample Number:	B-1	Sample Location:	N/A
Sample Description:	Silty, Clayey Sand (SC-SM), Dark Reddish Brown.		

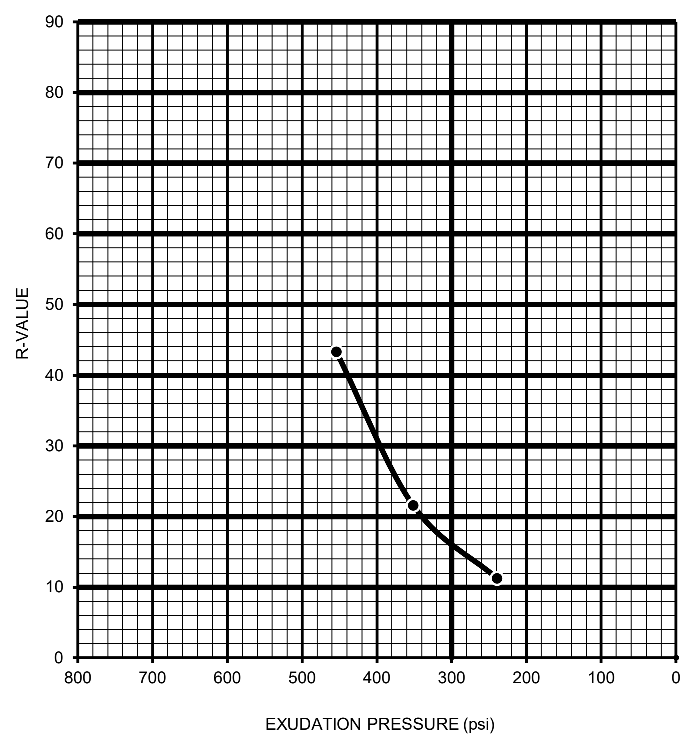
TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	13.9	15.0	16.1
HEIGHT OF SAMPLE, Inches	2.48	2.52	2.53
DRY DENSITY, pcf	111.2	112.2	108.3
COMPACTOR AIR PRESSURE, psi	150	125	100
EXUDATION PRESSURE, psi	454	352	239
EXPANSION, Inches x 10exp-4	52	19	1
STABILITY Ph 2,000 lbs (160 psi)	72	110	131
TURNS DISPLACEMENT	4.00	4.13	4.37
R-VALUE UNCORRECTED	43	22	11
R-VALUE CORRECTED	43	22	11

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.91	1.25	1.42
EXPANSION PRESSURE THICKNESS, ft.	1.96	0.72	0.04

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	30
R-VALUE BY EXUDATION:	16
EQUILIBRIUM R-VALUE:	16

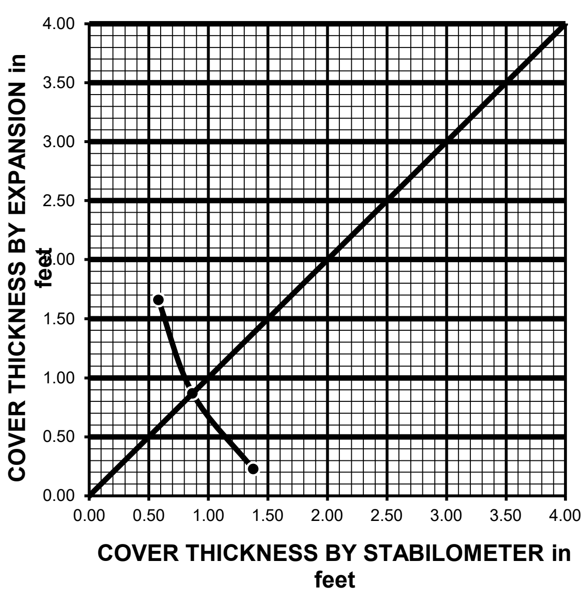
R-VALUE TEST RESULTS
ASTM D 2844

Project Name:	Meridian Park S NWC	Date:	8/24/19
Project Number:	11227.019	Technician:	F. Mina
Boring Number:	LB-7	Depth (ft.):	0 - 5.0
Sample Number:	B-1	Sample Location:	N/A
Sample Description:	Silty, Clayey Sand (SC-SM), Dark Reddish Brown.		

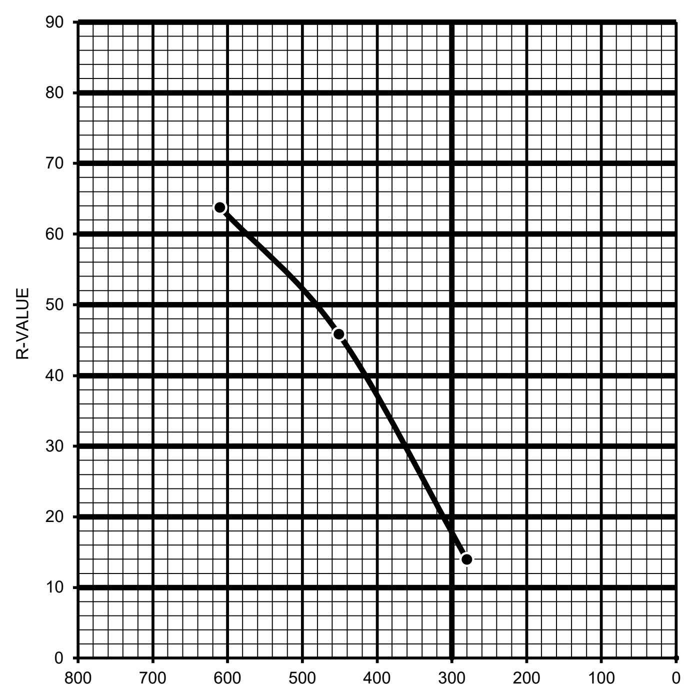
TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	9.9	10.4	11.4
HEIGHT OF SAMPLE, Inches	2.53	2.49	2.55
DRY DENSITY, pcf	113.1	114.2	116.7
COMPACTOR AIR PRESSURE, psi	175	150	125
EXUDATION PRESSURE, psi	610	451	280
EXPANSION, Inches x 10exp-4	44	23	6
STABILITY Ph 2,000 lbs (160 psi)	38	62	121
TURNS DISPLACEMENT	4.56	4.67	4.97
R-VALUE UNCORRECTED	64	46	14
R-VALUE CORRECTED	64	46	14

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.58	0.87	1.38
EXPANSION PRESSURE THICKNESS, ft.	1.66	0.87	0.23

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	50
R-VALUE BY EXUDATION:	18
EQUILIBRIUM R-VALUE:	18

Leighton

Soluble Sulfates
(Hach Sulfate Test Kit)

Project Name: Meridian Park S NWC
Project Number: 11227.019
Date: 8/25/19
Technician: F. Mina

Sample Identification		Dilution	Reading (PPM)			% Sulfates
			Water Fraction		Tube Reading	
Boring No.:	LB-4	3 :1	3		<50	**<0.0150**
Sample No:	B-1		=	<150		
Depth (ft.):	5.0 - 10.0					

APPENDIX C

SEISMIC REFRACTION SURVEY

SEISMIC REFRACTION STUDY
MERIDIAN SOUTH CAMPUS PHASE 2
RIVERSIDE, CALIFORNIA

PREPARED FOR:
41715 Enterprise Circle N., Suite 103
Temecula, CA 92590

PREPARED BY:
Southwest Geophysics, LLC
6280 Riverdale Street, Suite 200
San Diego, CA 92120

September 13, 2019
Project No. 119431

SOUTHWEST GEOPHYSICS LLC
YOUR SUBSURFACE SOLUTION

September 13, 2019
Project No. 119431

Mr. Jeffrey DeLand
Leighton Consultants, Inc.
41715 Enterprise Circle N., Suite 103
Temecula, CA 92590

Subject: Seismic Refraction Study
Meridian South Campus Phase 2
Riverside, California

Dear Mr. DeLand:

In accordance with your authorization, we have performed a seismic refraction study pertaining to the Meridian South Campus Phase 2 project located in Riverside, California. Specifically, our evaluation consisted of performing ten seismic P-wave refraction traverses at the project site. The purpose of our study was to develop subsurface velocity profiles of the areas studied, and to assess the apparent rippability of the subsurface materials. Our field services were conducted on August 15, 2019. This data report presents our methodology, equipment used, analysis, and results.

We appreciate the opportunity to be of service on this project. Should you have any questions please contact the undersigned at your convenience.

Sincerely,
SOUTHWEST GEOPHYSICS, LLC

Aaron T. Puente
Project Geologist/Geophysicist

Patrick F. Lehrmann, P.G., P.Gp.
Principal Geologist/Geophysicist

REGISTERED GEOPHYSICIST
PATRICK F. LEHRMANN
No. 1043
Exp. 1/31/20
STATE OF CALIFORNIA

ATP/PFL/pfl

Distribution: Addressee (electronic)

TABLE OF CONTENTS

1. INTRODUCTION

In accordance with your authorization, we have performed a seismic refraction study pertaining to the Meridian South Campus Phase 2 project located in Riverside, California (Figure 1). Specifically, our evaluation consisted of performing ten seismic P-wave refraction traverses at the project site. The purpose of our study was to develop subsurface velocity profiles of the areas studied, and to assess the apparent rippability of the subsurface materials. Our field services were conducted on August 15, 2019. This data report presents our methodology, equipment used, analysis, and results.

2. SCOPE OF SERVICES

Our scope of services included:

- Performance of ten seismic P-wave refraction lines at the project site.
- Compilation and analysis of the data collected.
- Preparation of this data report presenting our results and conclusions.

3. SITE AND PROJECT DESCRIPTION

The project site is located at the southeast corner of Van Buren Boulevard and Barton Street in Riverside, California (Figure 1). The study area is comprised of small rolling hills and dirt roads. The site has recently been cleared of vegetation and slightly plowed/ripped at the surface. Figures 2 and 3 depict the general site conditions in the areas of the seismic traverses.

Based on our discussions with you, it is our understanding that your office is conducting a geotechnical evaluation pertaining to the project. We also understand the results from our study may be used in the formulation of grading, design and construction parameters for the project.

4. STUDY METHODOLOGY

A seismic P-wave (compression wave) refraction study was conducted at the project site to evaluate the rippability characteristics of the subsurface materials and to develop subsurface velocity profiles of the areas studied. The seismic refraction method uses first-arrival times of refracted seismic waves to estimate the thicknesses and seismic velocities of subsurface layers. Seismic P-waves generated at the surface, using a hammer and plate, are refracted at boundaries separating materials of contrasting velocities. These refracted seismic waves are then detected by a series of surface vertical component 14-Hz geophones and recorded with a 24-channel Geometrics Geode seismograph. The travel times of the seismic P-waves are used in conjunction with the shot-to-geophone distances to obtain thickness and velocity information on the subsurface materials.

Ten seismic lines (SL-1 through SL-10) were conducted at the site. The general locations and lengths of the lines were selected by your office. Shot points (signal generation locations) were conducted along the lines at the ends, midpoint, and intermediate points between the ends and the midpoint.

The seismic refraction theory requires that subsurface velocities increase with depth. A layer having a velocity lower than that of the layer above will not generally be detectable by the seismic refraction method and, therefore, could lead to errors in the depth calculations of subsequent layers. In addition, lateral variations in velocity, such as those caused by core stones, intrusions or boulders can also result in the misinterpretation of the subsurface conditions. In general, the effective depth of evaluation for a seismic refraction traverse is approximately one-third to one-fifth the length of the spread.

In general, the seismic P-wave velocity of a material can be correlated to rippability (see Table 1 below), or to some degree “hardness.” Table 1 is based on published information from the Caterpillar Performance Handbook (Caterpillar, 2011) as well as our experience with similar materials, and assumes that a Caterpillar D-9 dozer ripping with a single shank is used. We emphasize that the cutoffs in this classification scheme are approximate and that rock characteristics, such as fracture spacing and orientation, play a significant role in determining rock quality or rippability. The rippability of a mass is also dependent on the excavation equipment used and the skill and experience of the equipment operator.

For trenching operations, the rippability values should be scaled downward. For example, velocities as low as 3,500 feet/second may indicate difficult ripping during trenching operations. In addition, the presence of boulders, which can be troublesome in narrow trenching operations, should be anticipated.

Table 1 – Rippability Classification	
Seismic P-wave Velocity	**Rippability**
0 to 2,000 feet/second	Easy
2,000 to 4,000 feet/second	Moderate
4,000 to 5,500 feet/second	Difficult, Possible Blasting
5,500 to 7,000 feet/second	Very Difficult, Probable Blasting
Greater than 7,000 feet/second	Blasting Generally Required

It should be noted that the rippability cutoffs presented in Table 1 are slightly more conservative than those published in the Caterpillar Performance Handbook. Accordingly, the above classification scheme should be used with discretion, and contractors should not be relieved of making their own independent evaluation of the rippability of the on-site materials prior to submitting their bids.

5. DATA ANALYSIS

The collected data were processed using SIPwin (Rimrock Geophysics, 2003), a seismic interpretation program, and analyzed using SeisOpt Pro (Optim, 2008). SeisOpt Pro uses first arrival picks and elevation data to produce subsurface velocity models through a nonlinear optimization technique called adaptive simulated annealing. The resulting velocity model provides a tomography image of the estimated geologic conditions. Both vertical and lateral velocity information is contained in the tomography model. Changes in layer velocity are revealed as gradients rather than discrete contacts, which typically are more representative of actual conditions.

6. RESULTS AND CONCLUSIONS

As previously indicated, ten seismic traverses were conducted as part of our study. Figures 4a through 4j present the velocity models generated from our analysis. Based on the results it appears that the project site is underlain by low velocity materials (i.e., topsoil, fill, etc.) in the near surface and higher velocity materials, likely bedrock, at depth. Distinct vertical and lateral velocity variations are evident in the models. Moreover, the degree of weathering and the depth to possible bedrock appears to be variable across the study area. In addition, remnant boulders appear to be present in the subsurface in some areas.

Based on the refraction results, variability in the excavatability (including depth of rippability) of the subsurface materials should be expected across the project area. Furthermore, blasting may be required depending on the excavation depth, location, equipment used, and desired rate of production. In addition, oversized materials should be expected. A contractor with excavation experience in similar difficult conditions should be consulted for expert advice on excavation methodology, equipment and production rate.

7. LIMITATIONS

The field evaluation and geophysical analyses presented in this report have been conducted in general accordance with current practice and the standard of care exercised by consultants performing similar tasks in the project area. No warranty, express or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be present. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface surveying will be performed upon request.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Southwest Geophysics should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document. This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

8. SELECTED REFERENCES

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Mooney, H.M., 1976, Handbook of Engineering Geophysics, dated February.

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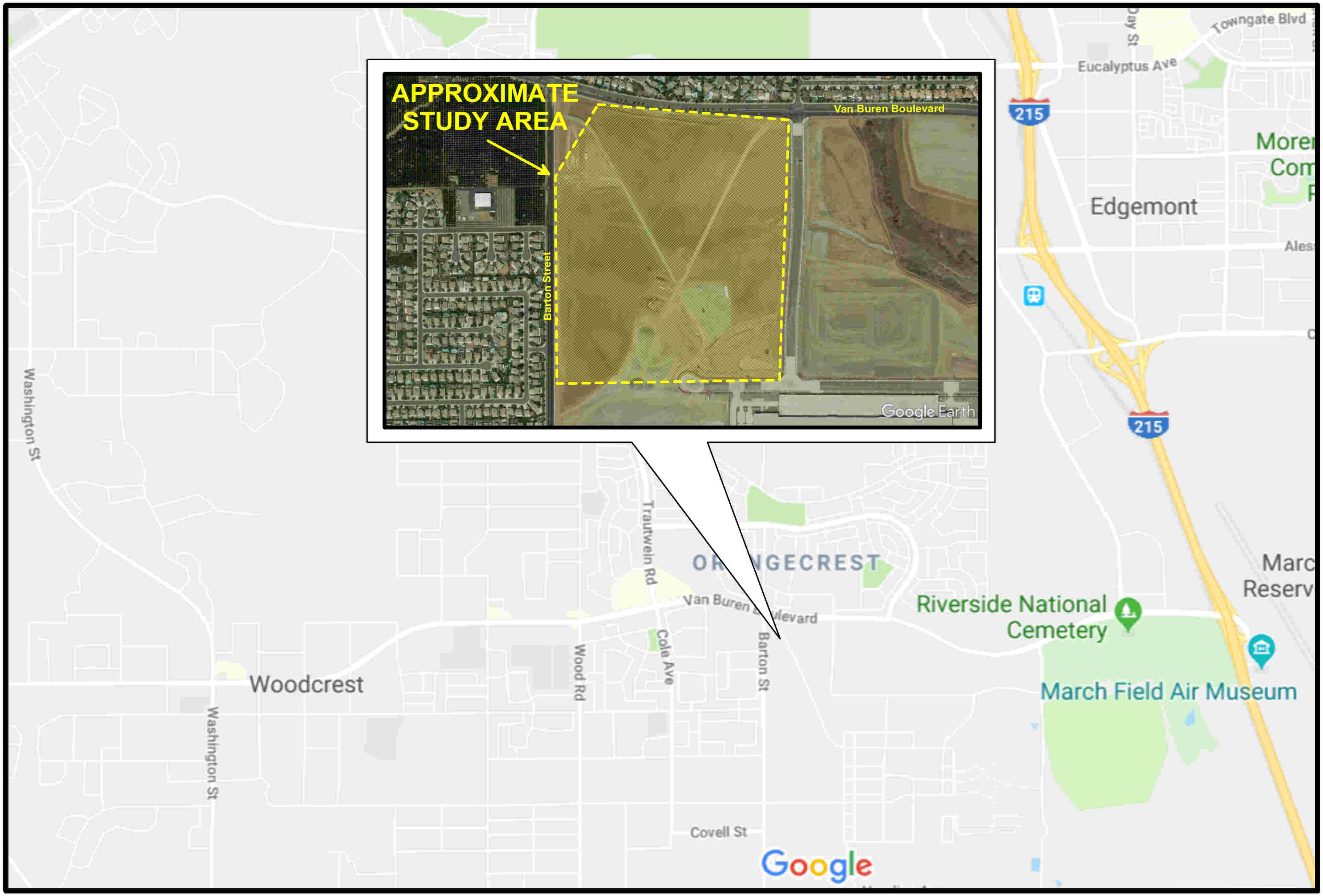
Telford, W.M., Geldart, L.P., Sheriff, R.E., and Keys, D.A., 1976, Applied Geophysics, Cambridge University Press.



SITE LOCATION MAP	N	Meridian South Campus Phase 2 Riverside, California	SOUTHWEST GEOPHYSICS LLC Figure 1
		Project No.: 119431 / Date: 09/19	

SEISMIC LINE LOCATION MAP

N

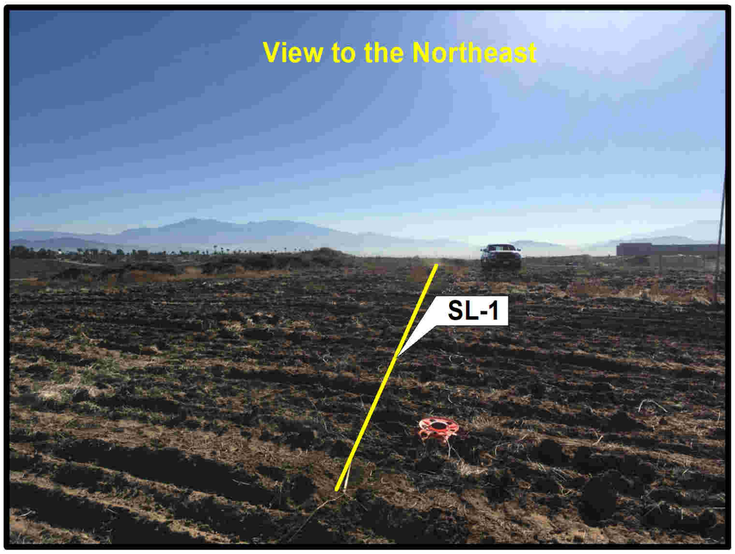
Meridian South Campus Phase 2
Riverside, California

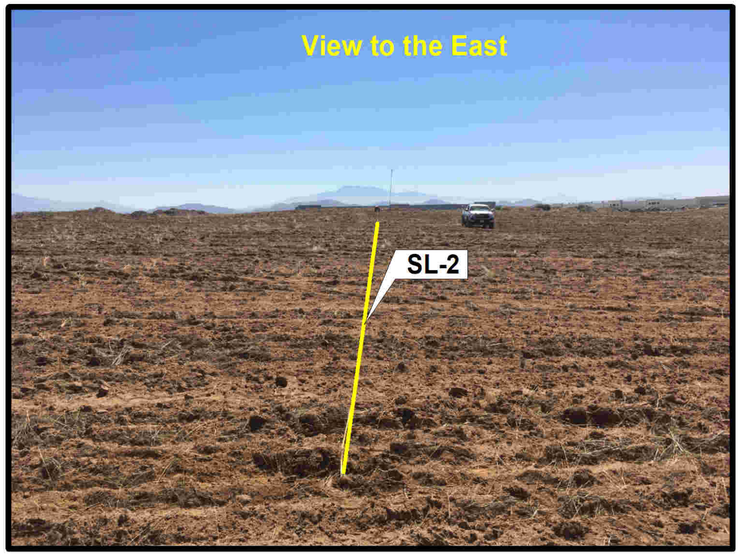
Project No.: 119431 | Date: 09/19

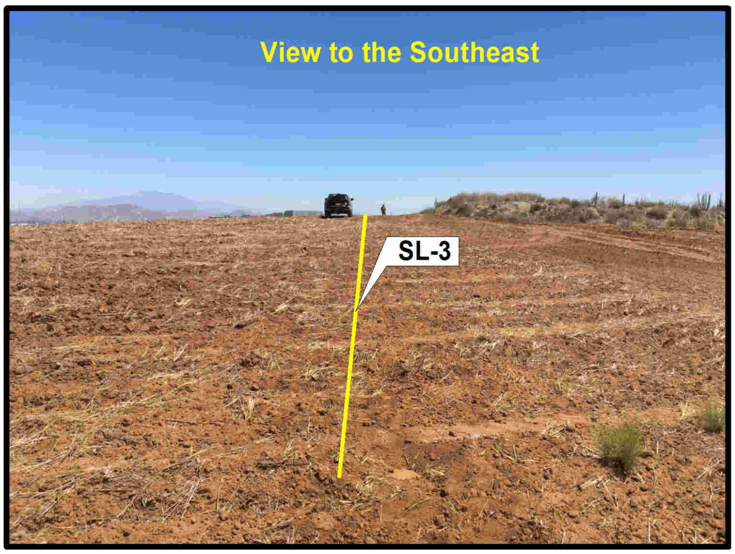
SOUTHWEST GEOPHYSICS LLC

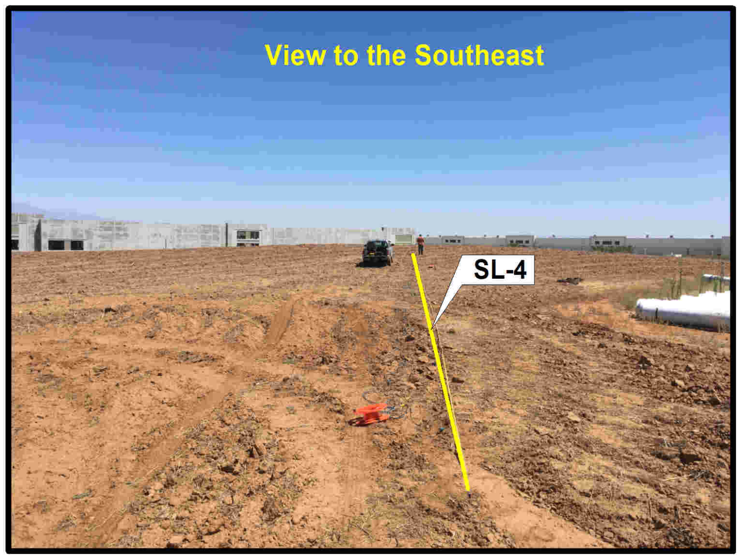
Figure 2

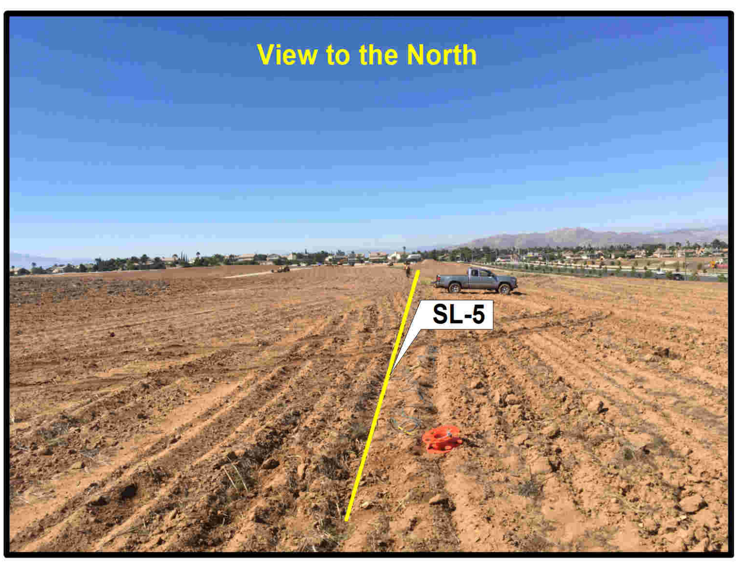
0 400 800
approximate scale in feet



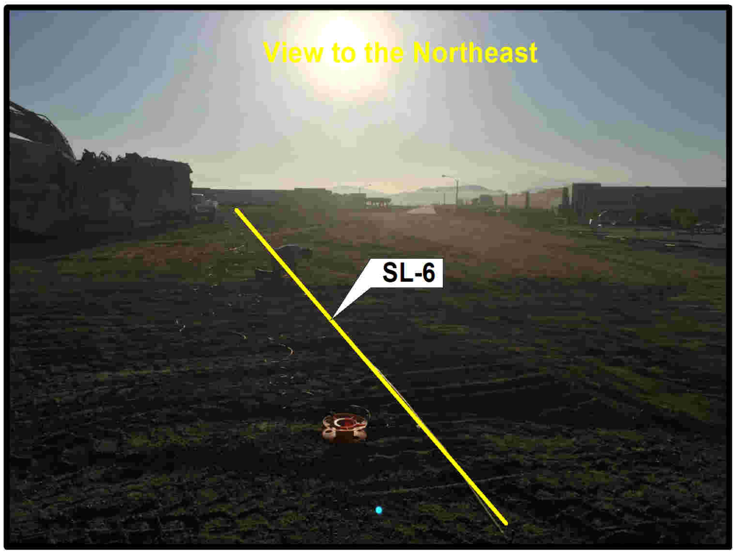


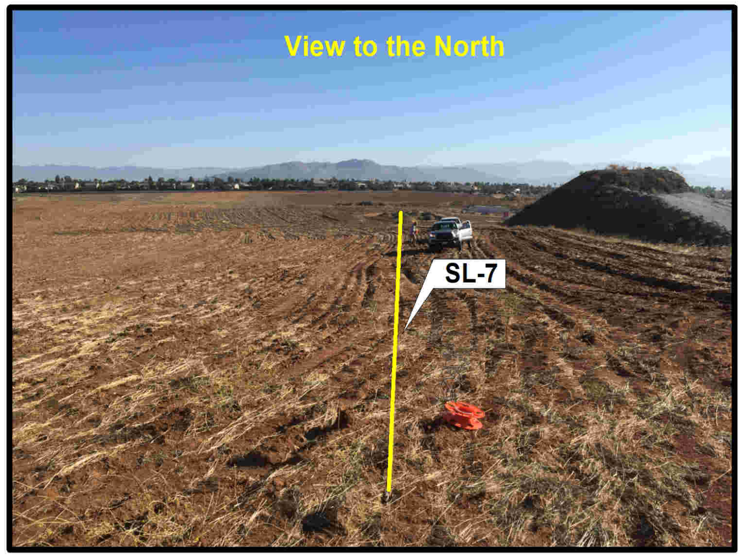


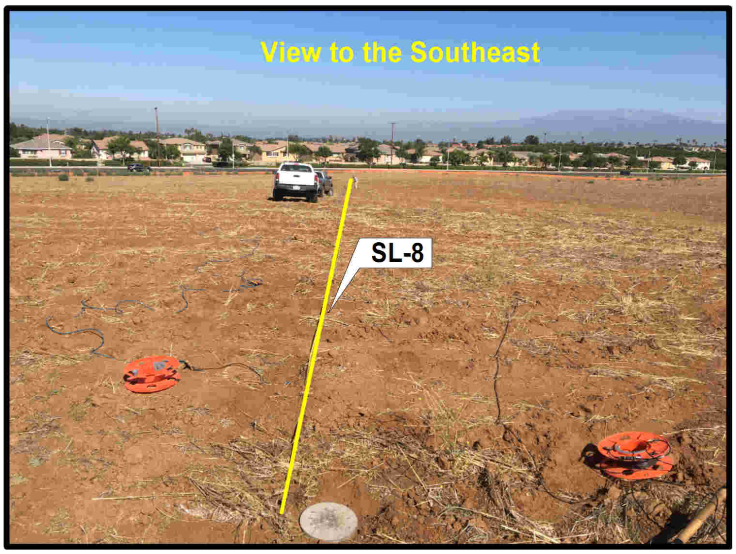


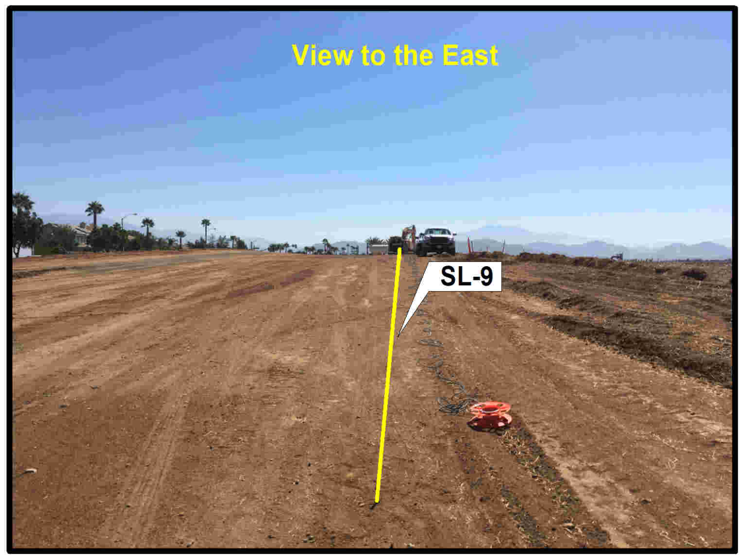


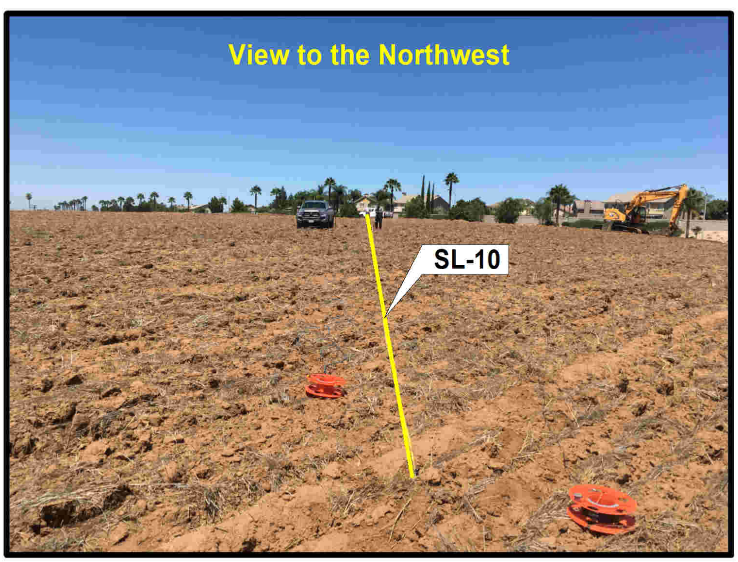
SITE PHOTOGRAPHS **(SL-1 through SL-5)**	Meridian South Campus Phase 2 Riverside, California Project No.: 119431 · Date: 09/19	SOUTHWEST GEOPHYSICS LLC Figure 3a







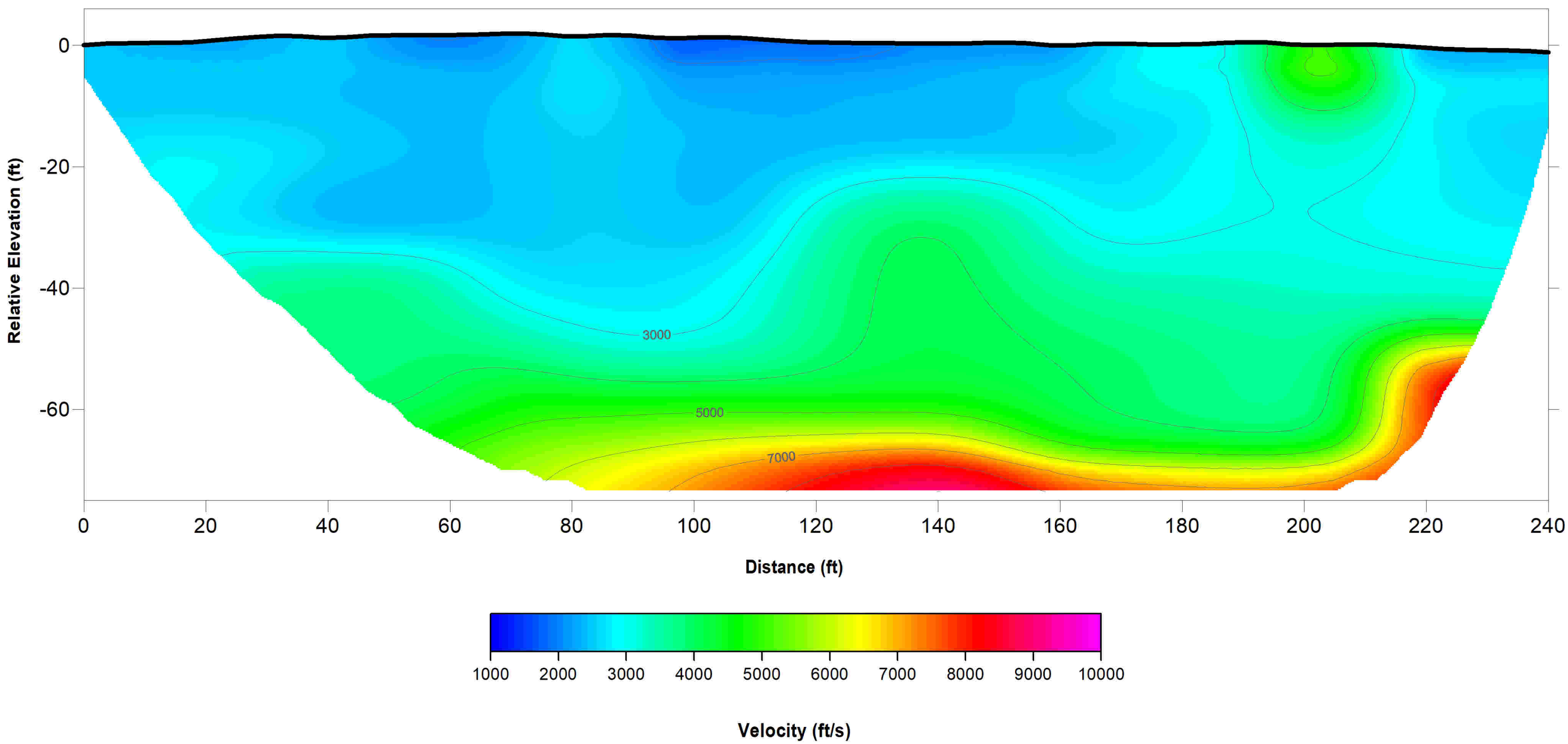




SITE PHOTOGRAPHS **(SL-6 through SL-10)**	Meridian South Campus Phase 2 Riverside, California	SOUTHWEST GEOPHYSICS LLC
	Project No.: 119431 | Date: 09/19	Figure 3b

TOMOGRAPHY MODEL

SL-1

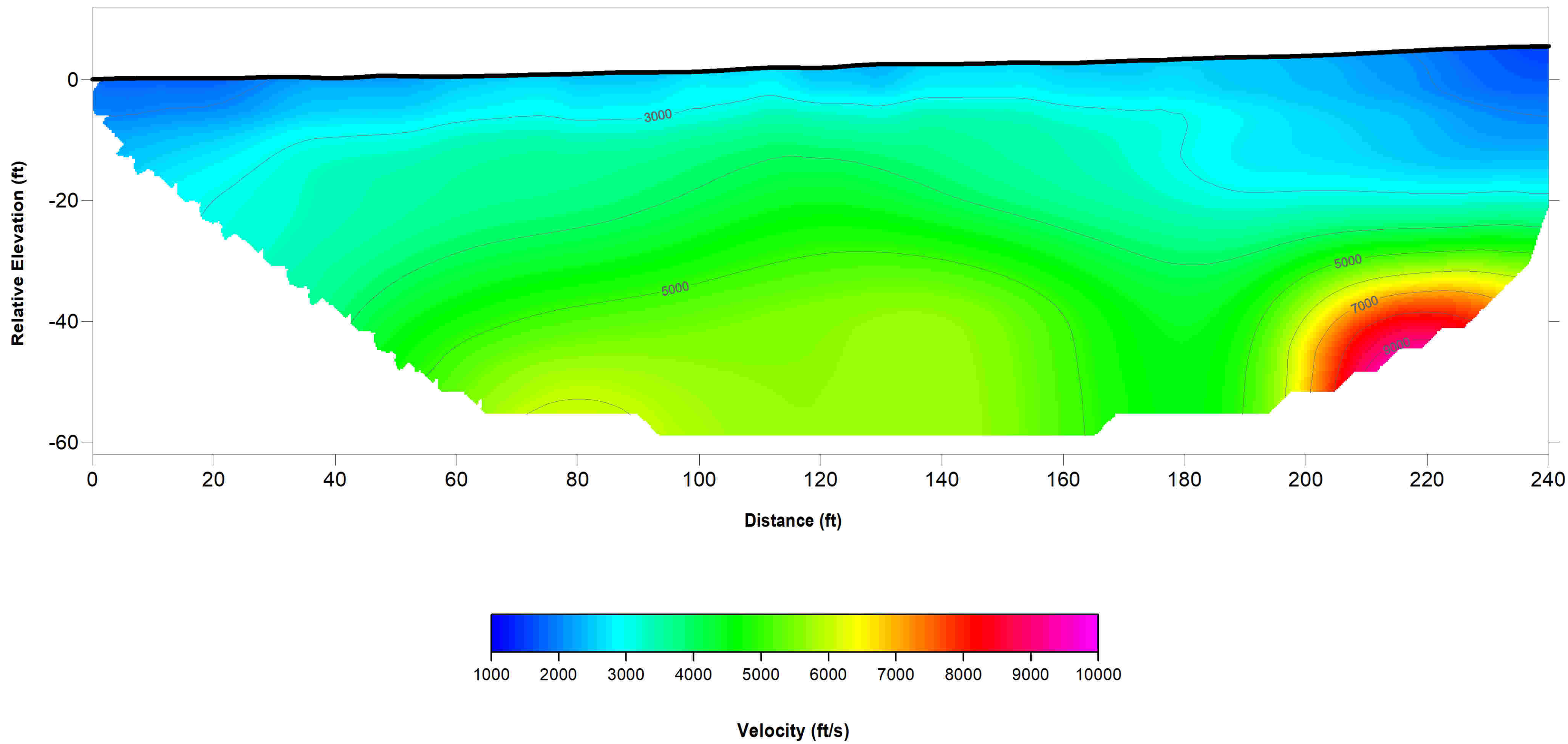


Note: Contour Interval = 1,000 feet per second

P-WAVE PROFILE	Meridian South Campus Phase 2 Riverside, CA Project No.: 119431 — Date: 09/19	SouthWest Geophysics LLC Figure 4a

TOMOGRAPHY MODEL

SL-2

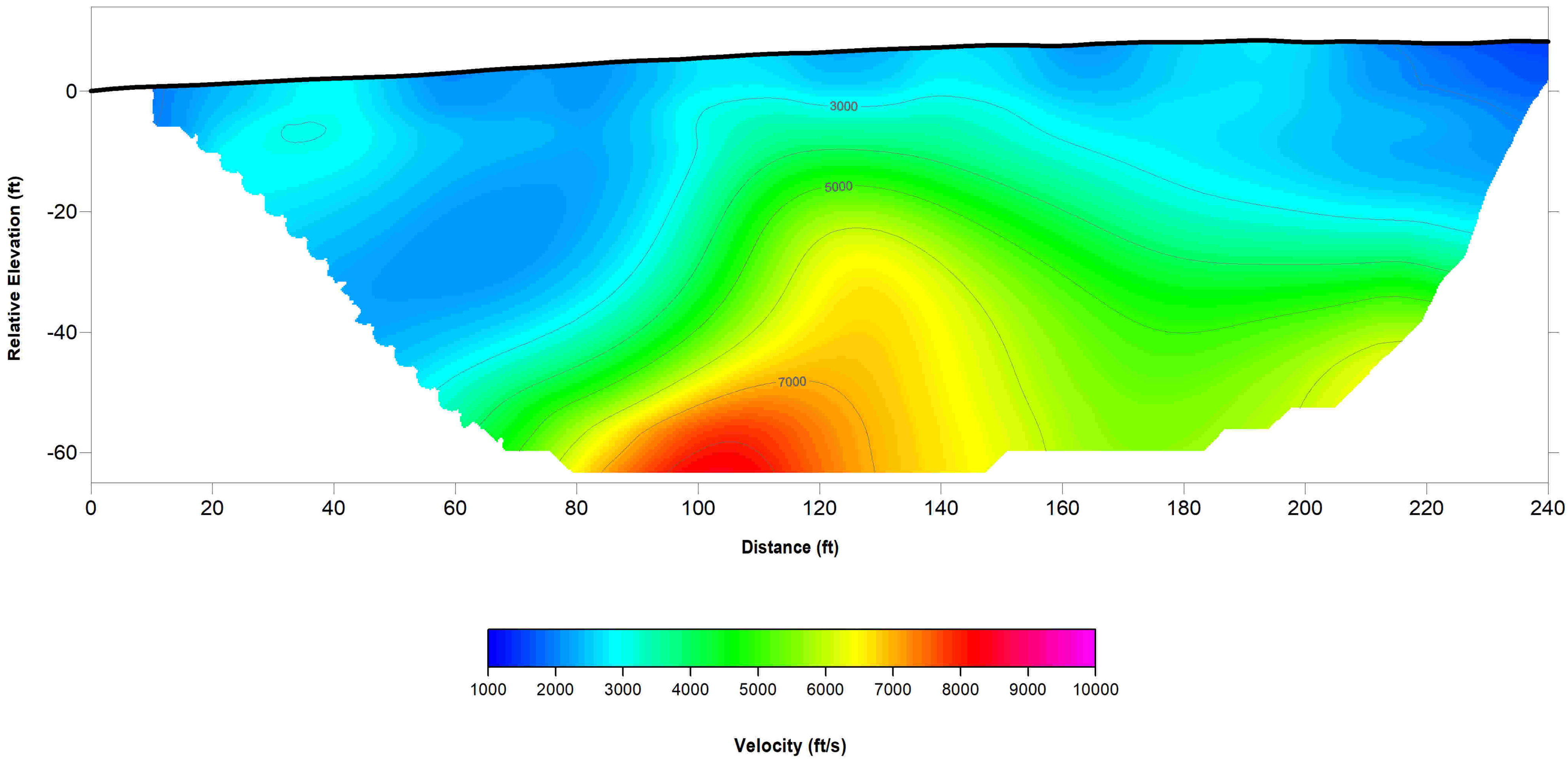


Note: Contour Interval = 1,000 feet per second

P-WAVE PROFILE	Meridian South Campus Phase 2 Riverside, CA Project No.: 119431 Date: 09/19	SOUTHWEST GEOPHYSICS LLC Figure 4b

TOMOGRAPHY MODEL

SL-3

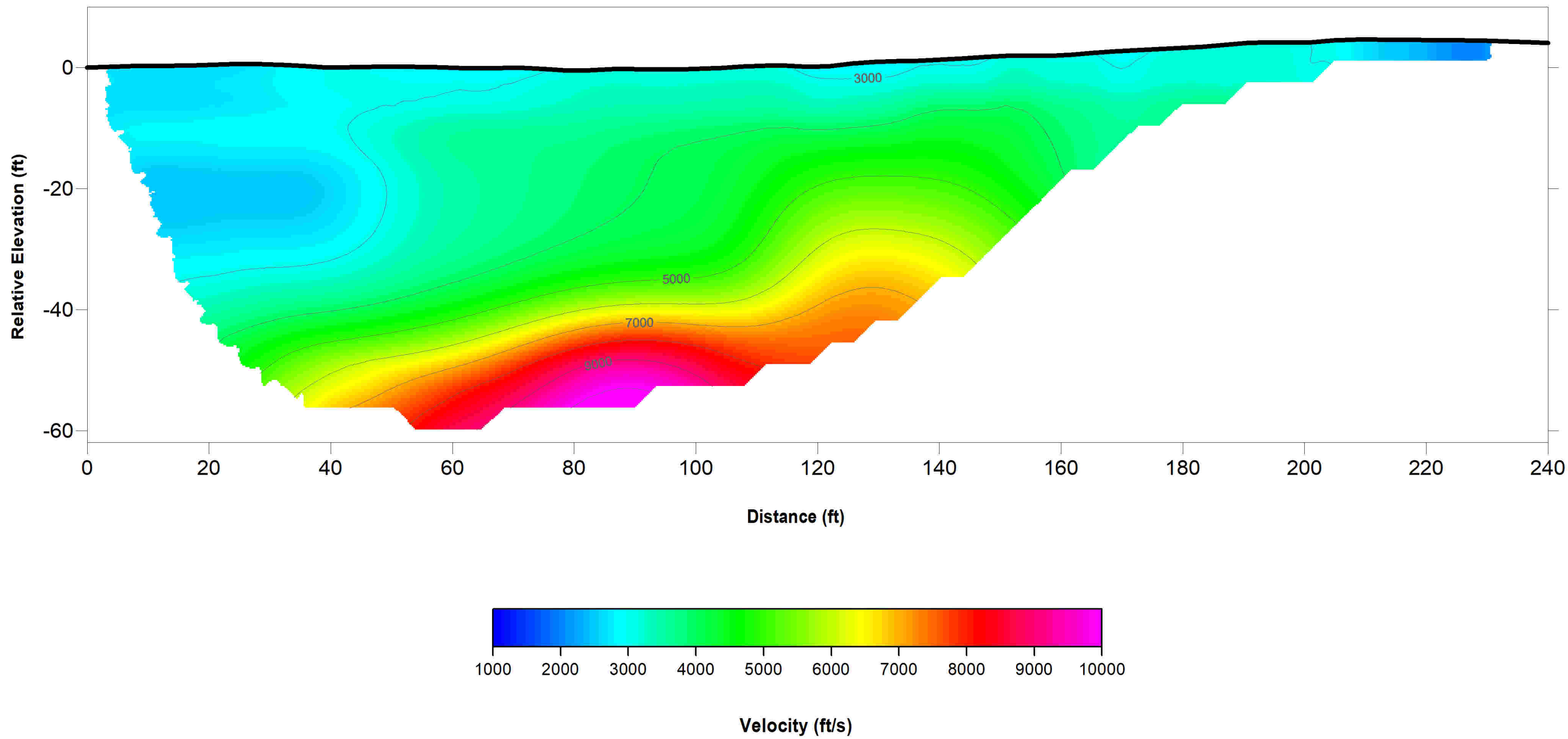


Note: Contour Interval = 1,000 feet per second

P-WAVE PROFILE	Meridian South Campus Phase 2 Riverside, CA Project No.: 119431 Date: 09/19	SOUTHWEST GEOPHYSICS LLC Figure 4c

TOMOGRAPHY MODEL

SL-4

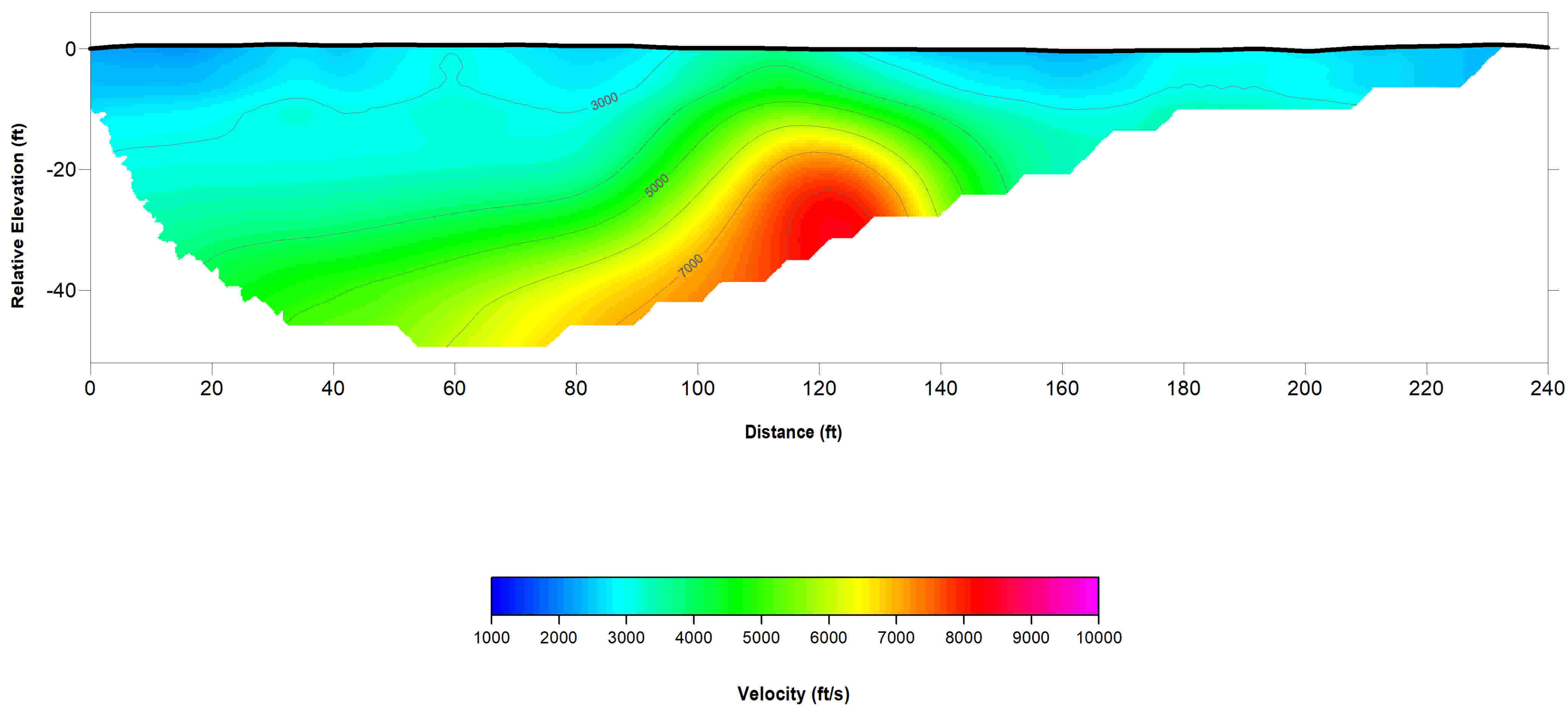


Note: Contour Interval = 1,000 feet per second

P-WAVE PROFILE	Meridian South Campus Phase 2 Riverside, CA		SouthWest Geophysics LLC Figure 4d
	Project No.: 119431	Date: 09/19	

TOMOGRAPHY MODEL

SL-5

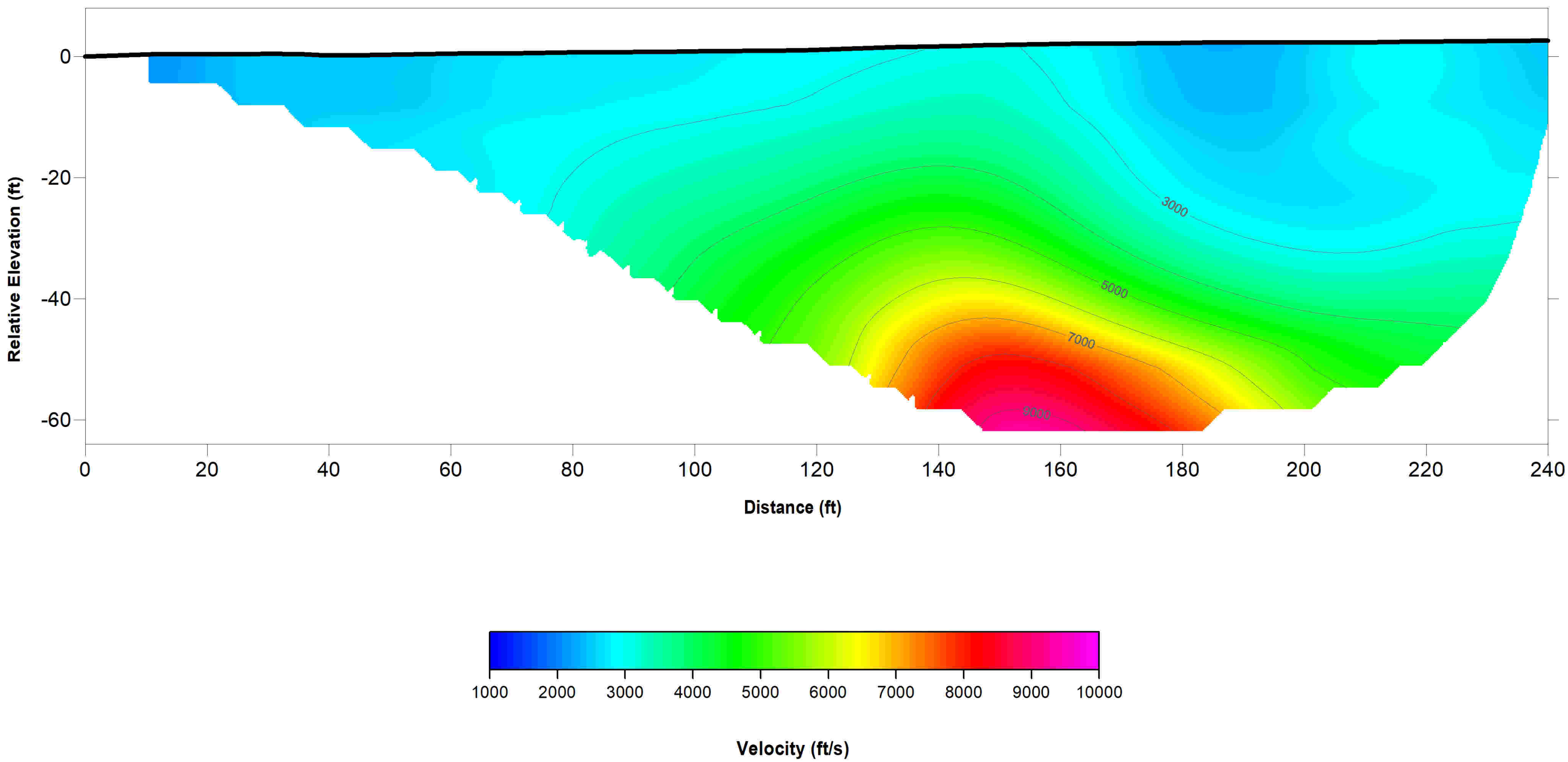


Note: Contour Interval = 1,000 feet per second

P-WAVE PROFILE	Meridian South Campus Phase 2 Riverside, CA Project No.: 119431 Date: 09/19	SOUTHWEST GEOPHYSICS LLC Figure 4e

TOMOGRAPHY MODEL

SL-6

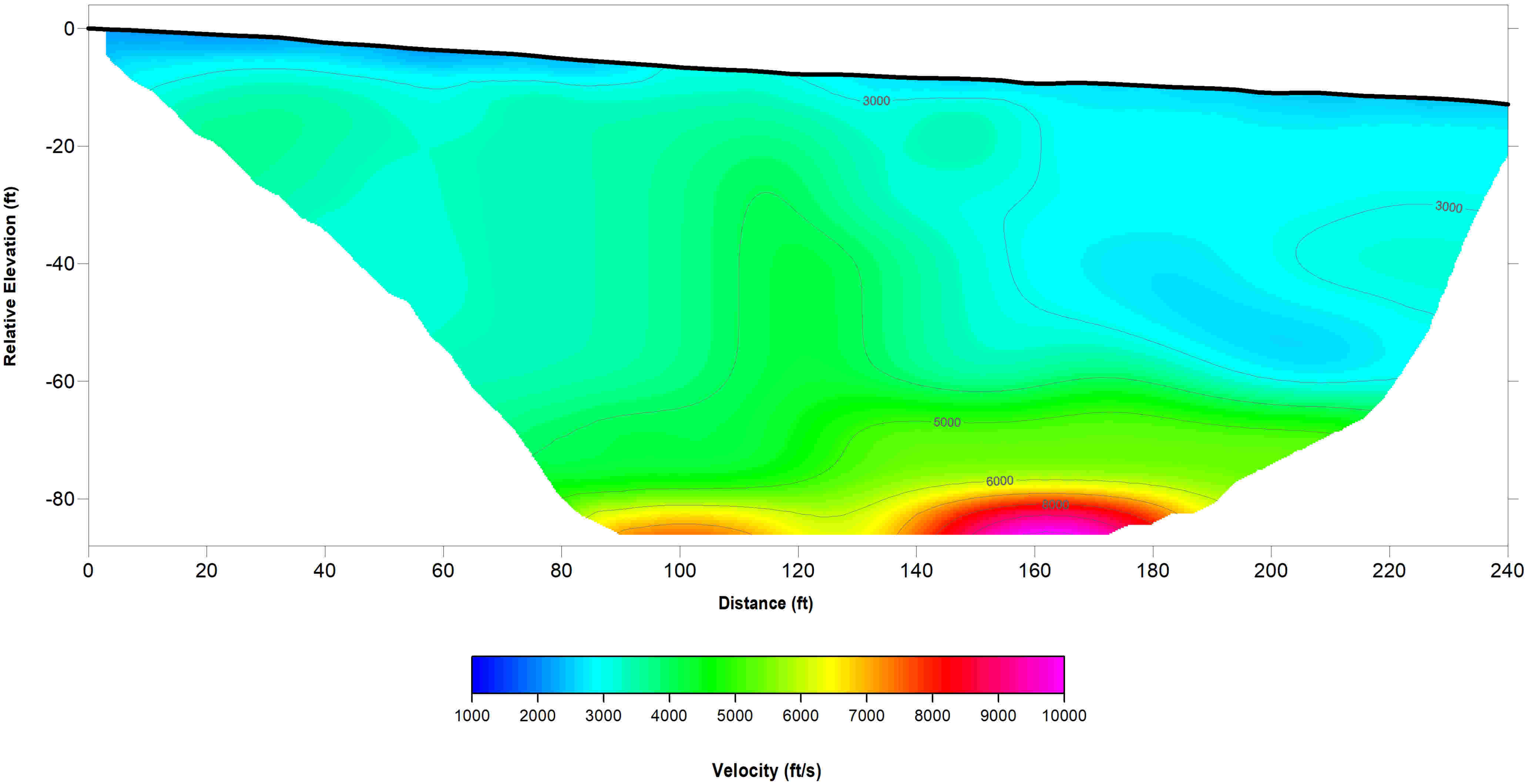


Note: Contour Interval = 1,000 feet per second

P-WAVE PROFILE	Meridian South Campus Phase 2 Riverside, CA Project No.: 119431 Date: 09/19	SOUTHWEST GEOPHYSICS LLC Figure 4f

TOMOGRAPHY MODEL

SL-7

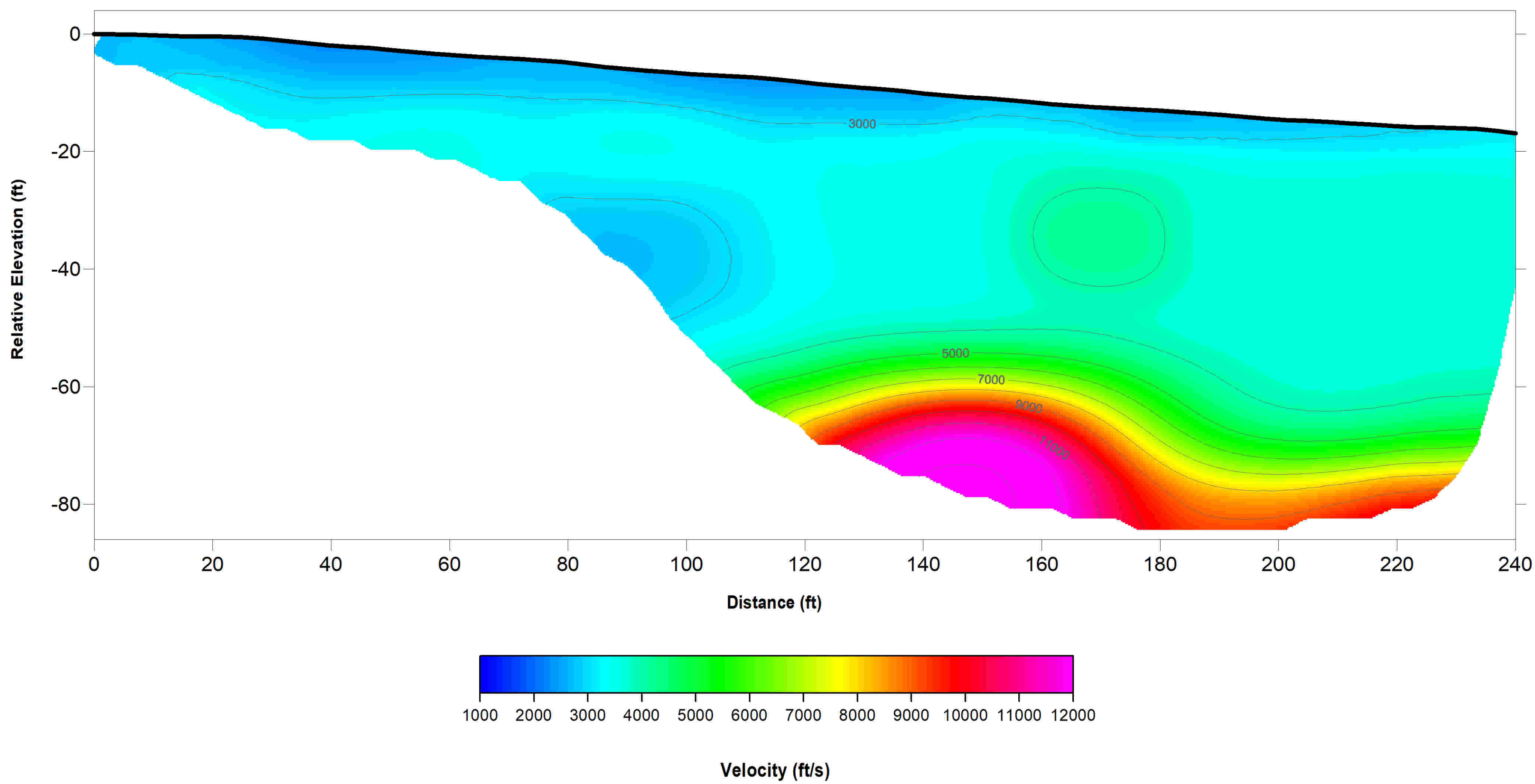


Note: Contour Interval = 1,000 feet per second

P-WAVE PROFILE	Meridian South Campus Phase 2 Riverside, CA Project No.: 119431 Date: 09/19	SOUTHWEST GEOPHYSICS LLC Figure 4g

TOMOGRAPHY MODEL

SL-8

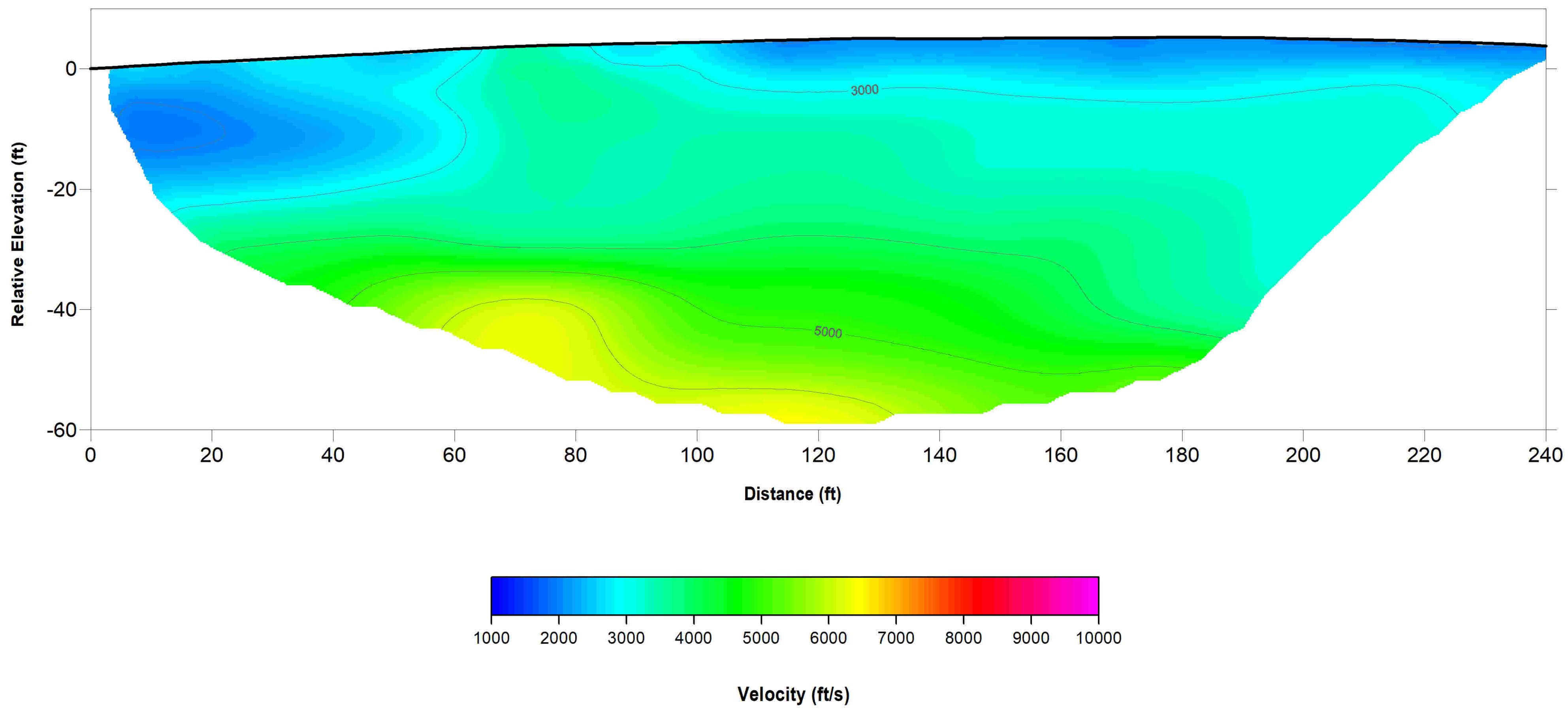


Note: Contour Interval = 1,000 feet per second

P-WAVE PROFILE	Meridian South Campus Phase 2 Riverside, CA Project No.: 119431 Date: 09/19	SouthWest Geophysics LLC Figure 4h

TOMOGRAPHY MODEL

SL-9



Note: Contour Interval = 1,000 feet per second

P-WAVE PROFILE	Meridian South Campus Phase 2 Riverside, CA		SOUTHWEST GEOPHYSICS LLC Figure 4i
	Project No.: 119431	Date: 09/19	

TOMOGRAPHY MODEL

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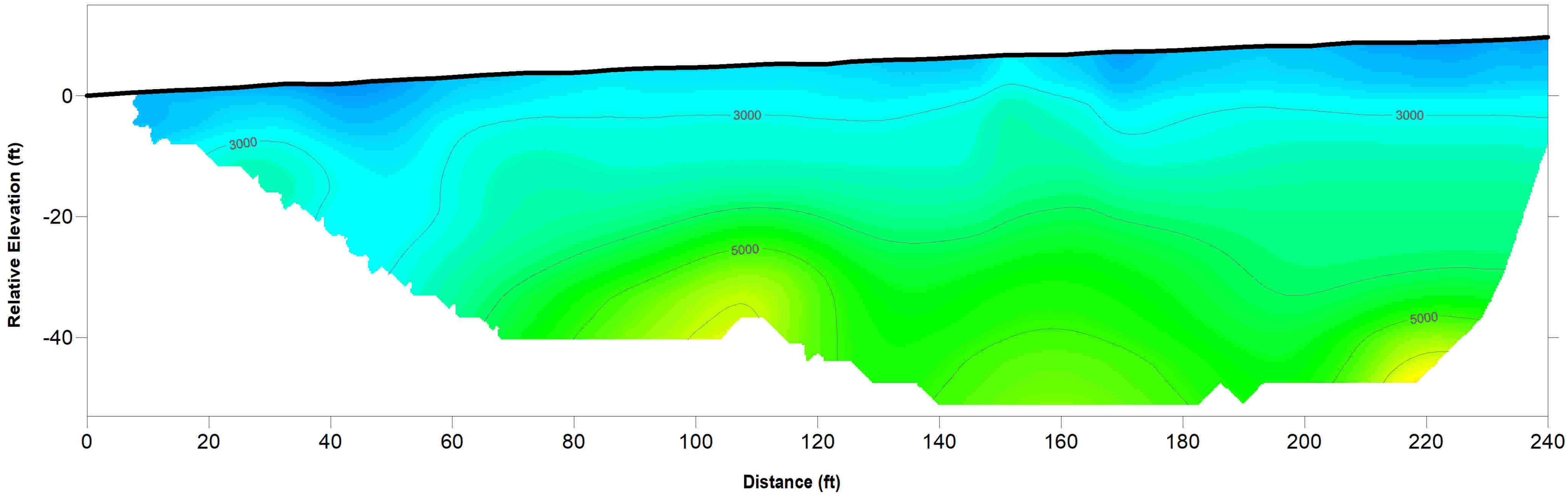
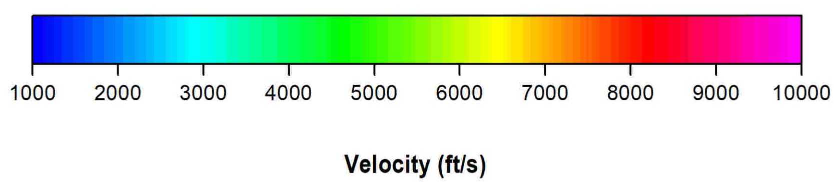
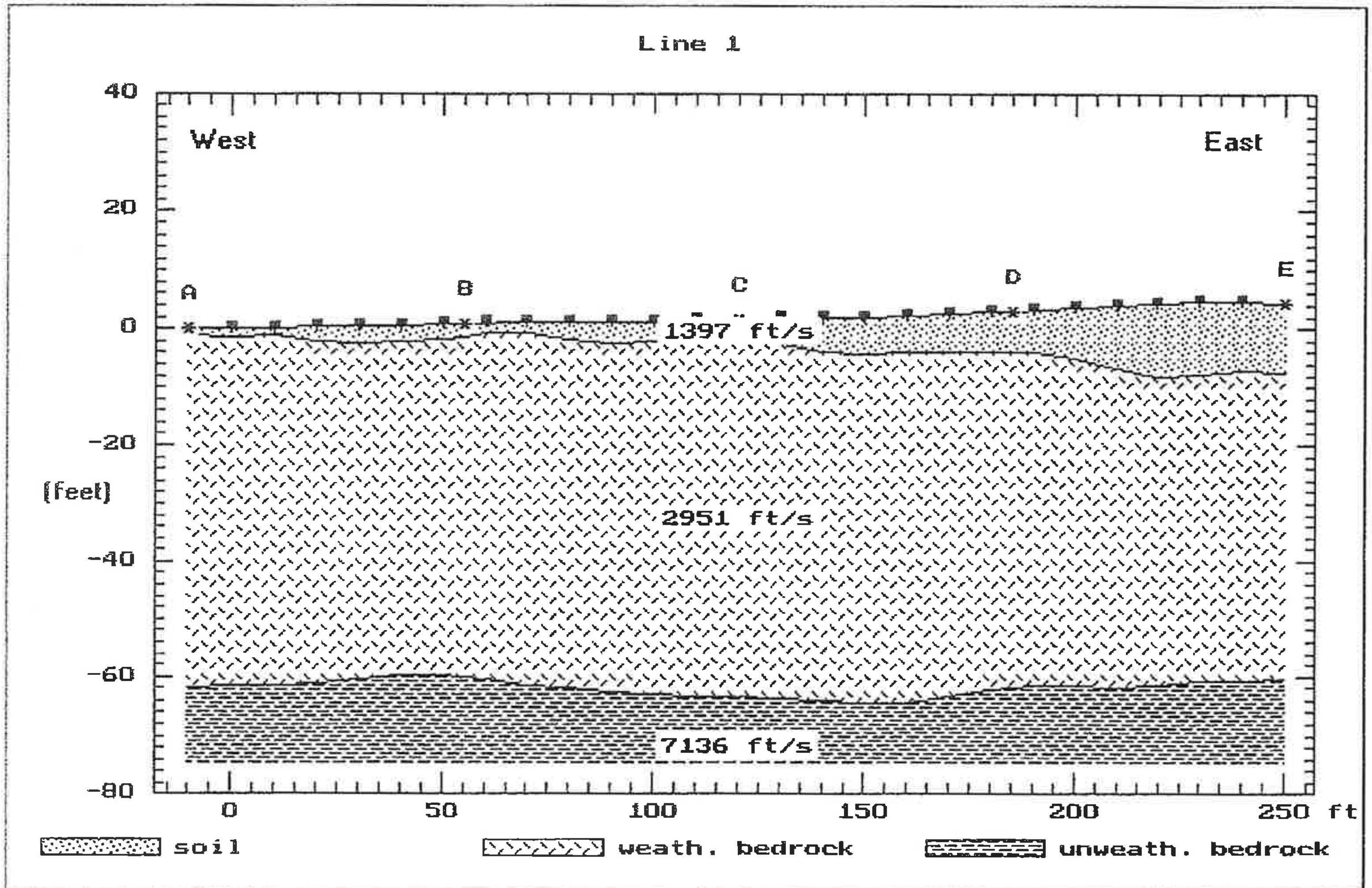


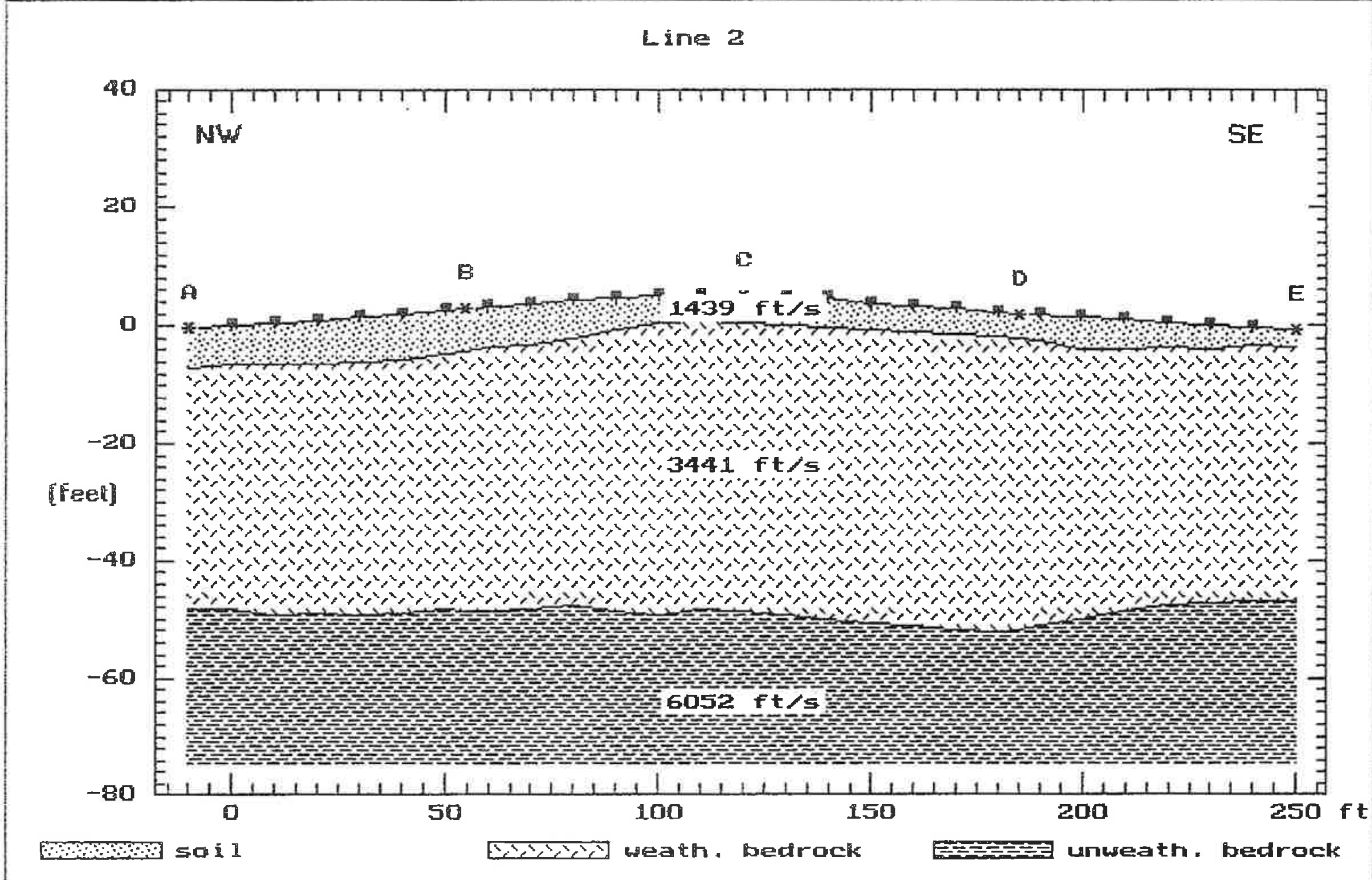


Note: Contour Interval = 1,000 feet per second

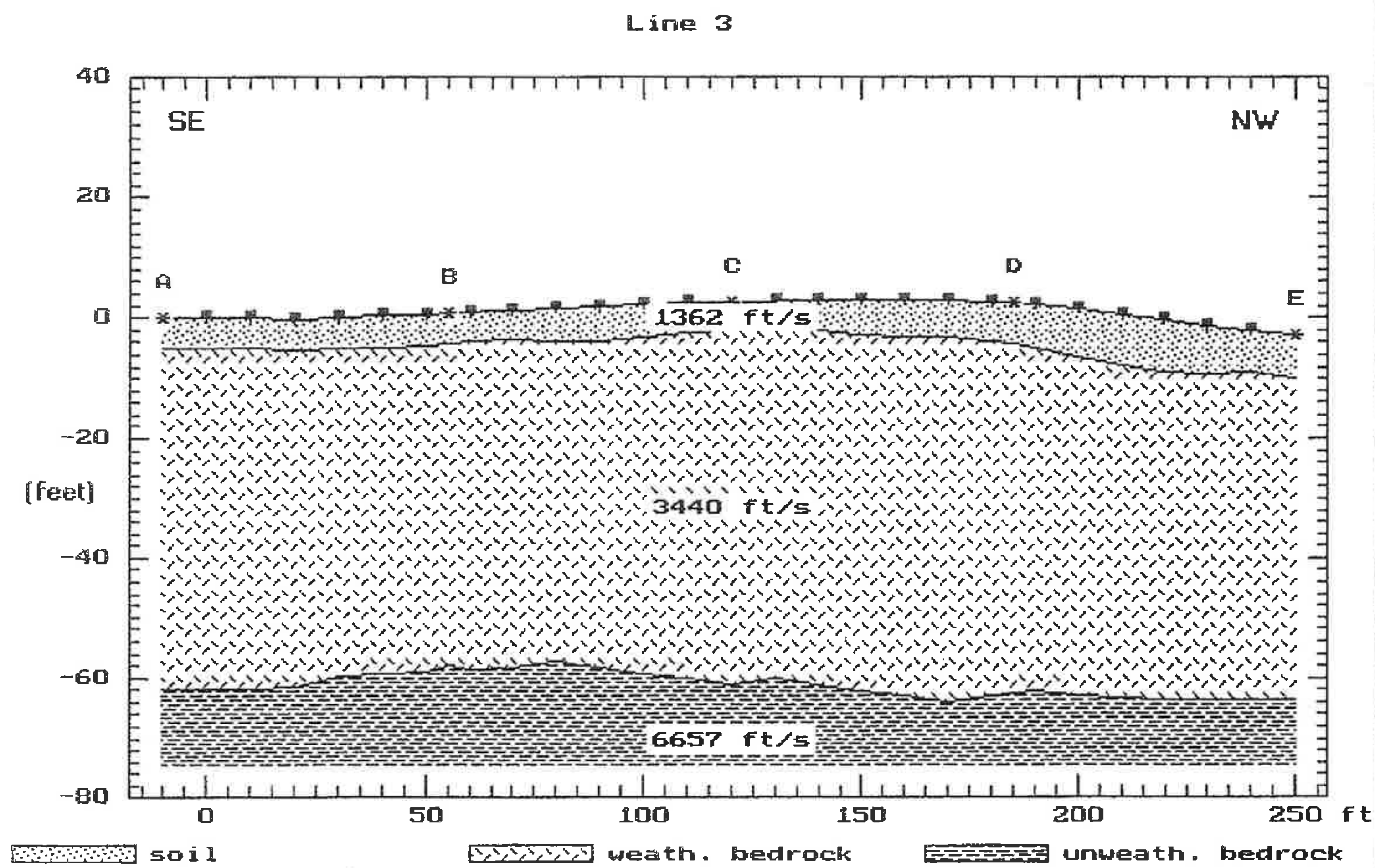
P-WAVE PROFILE	Meridian South Campus Phase 2 Riverside, CA		SouthWest Geophysics LLC Figure 4j
	Project No.: 119431	Date: 09/19	



Seismic Refraction Survey 2/12/08	LNR South Campus
ZKCI Project No. 07100-01	Riverside, California



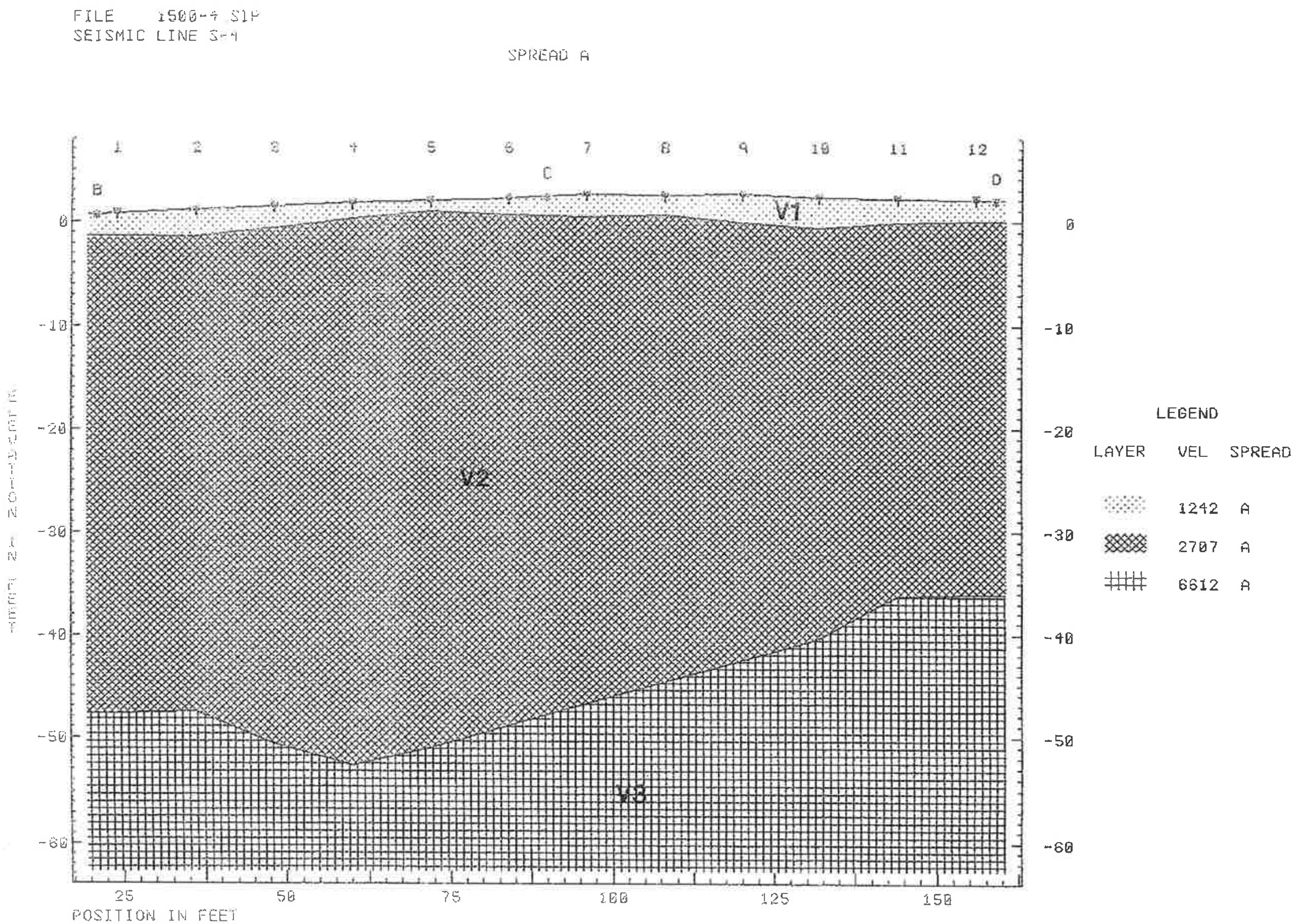
Seismic Refraction Survey 2/12/08	LNR South Campus
ZKCI Project No. 07100-01	Riverside, California



Seismic Refraction Survey 2/12/08	LNR South Campus
ZKCI Project No. 07100-01	Riverside, California

VELOCITY MODELING PROFILE S-4

South 27° East →



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APPENDIX D

EARTHWORK AND GRADING SPECIFICATIONS

APPENDIX D

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

TABLE OF CONTENTS

Standard Details

1.0 General

1.1 Intent

These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 The Geotechnical Consultant of Record

Prior to commencement of work, the owner shall employ the Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultants shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor

The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing

Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

2.2 Processing

Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Overexcavation

In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import

If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers

Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning

Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557).

4.3 Compaction of Fill

After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.

4.5 Compaction Testing

Field-tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing

Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations

The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 Safety

The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations.

7.2 Bedding and Backfill

All bedding and backfill of utility trenches shall be performed in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of relative compaction from 1 foot above the top of the conduit to the surface.

The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

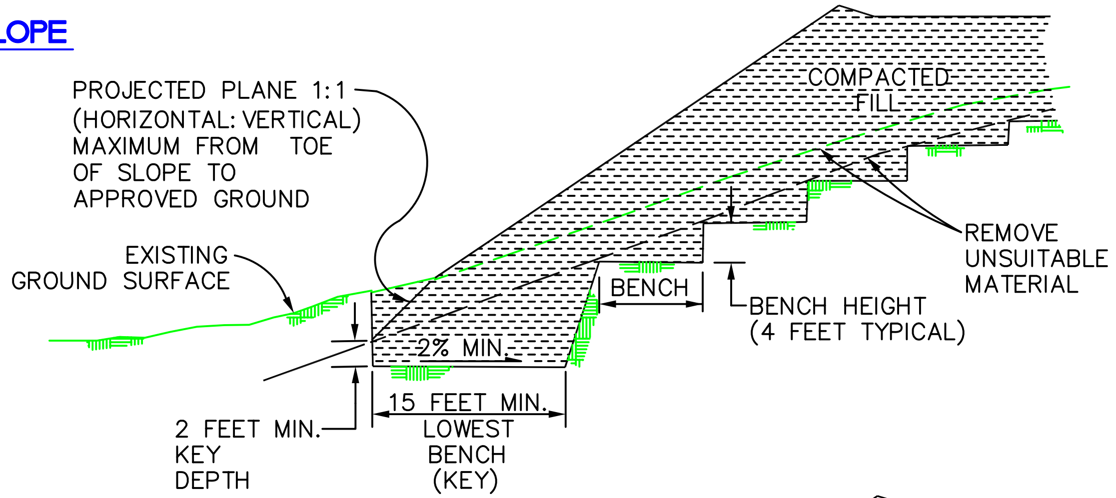
7.3 Lift Thickness

Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

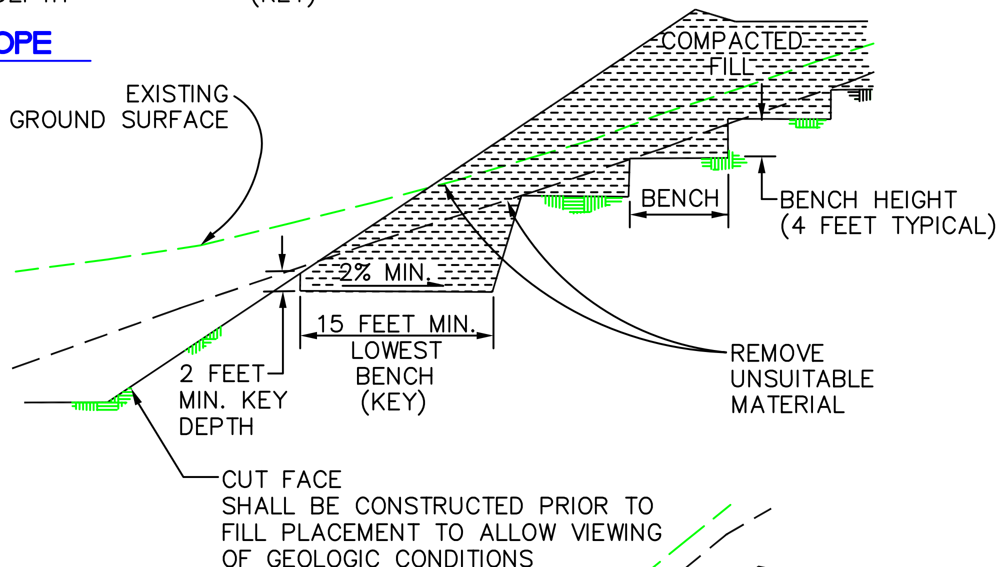
7.4 Observation and Testing

The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

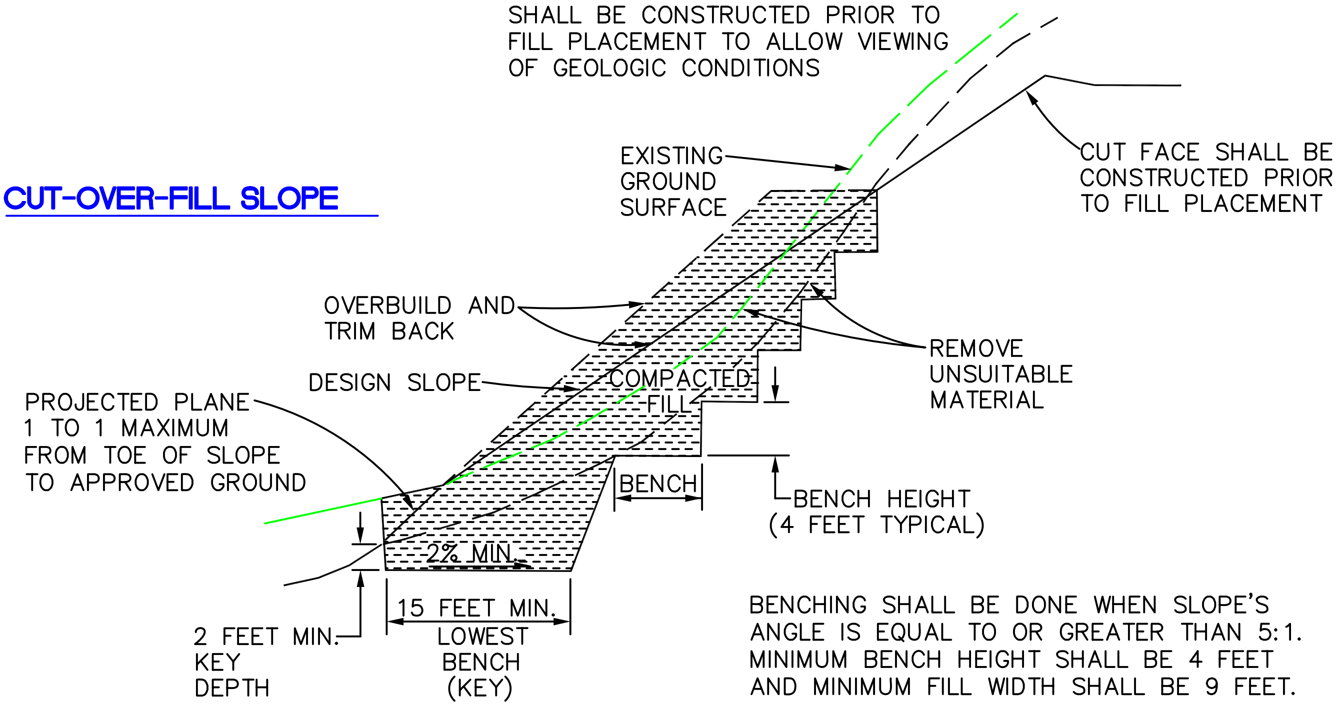
FILL SLOPE



FILL-OVER-CUT SLOPE

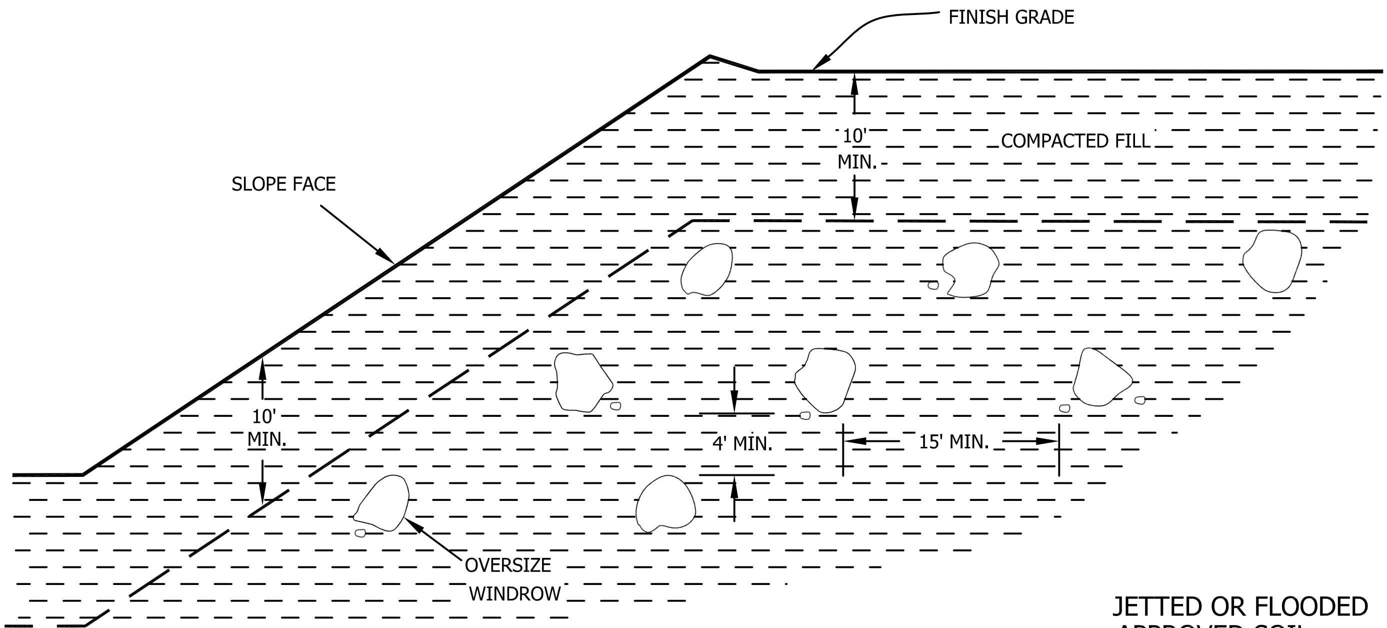


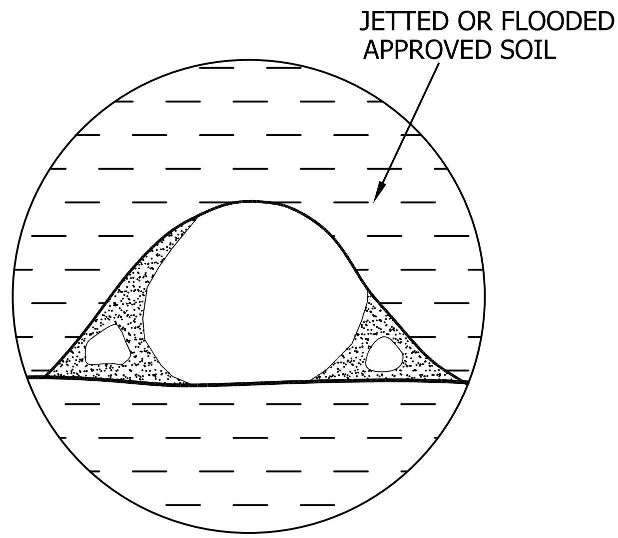
CUT-OVER-FILL SLOPE



BENCHING SHALL BE DONE WHEN SLOPE'S ANGLE IS EQUAL TO OR GREATER THAN 5:1. MINIMUM BENCH HEIGHT SHALL BE 4 FEET AND MINIMUM FILL WIDTH SHALL BE 9 FEET.

KEYING AND BENCHING	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS A	Leighton

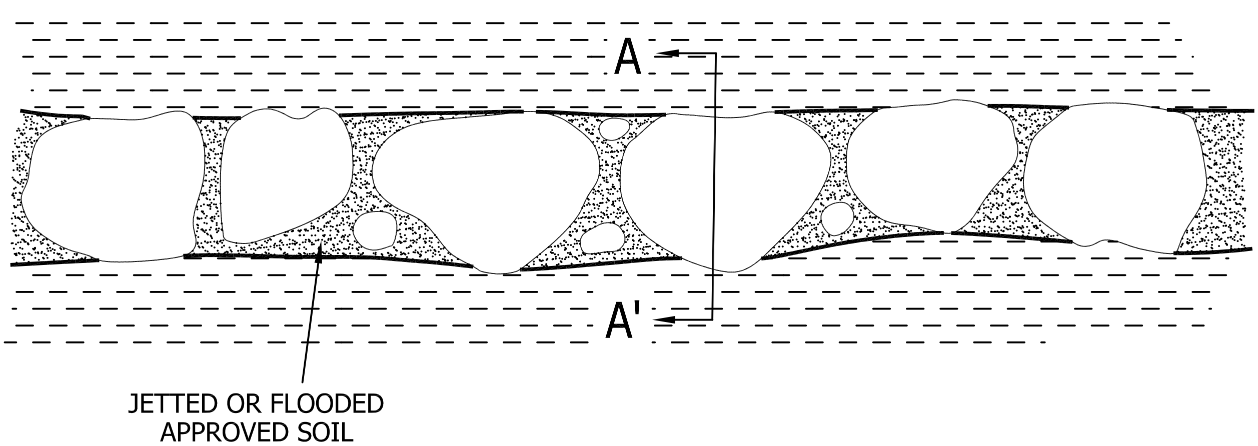




SECTION A-A'

- Oversize rock is larger than 8 inches in largest dimension.
- Backfill with approved soil jetted or flooded in place to fill all the voids.
- Do not bury rock within 10 feet of finish grade.
- Windrow of buried rock shall be parallel to the finished slope face.

PROFILE ALONG WINDROW



OVERSIZE ROCK DISPOSAL	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS B	Leighton

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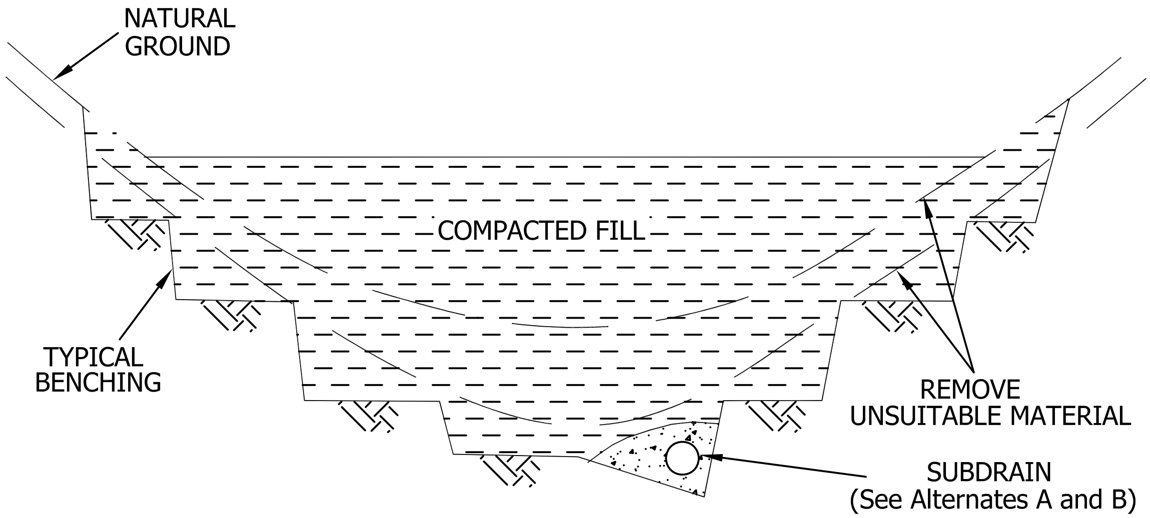
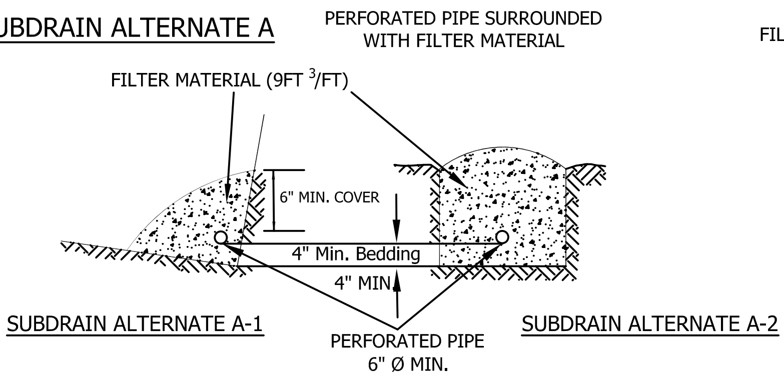


SUBDRAIN ALTERNATE A

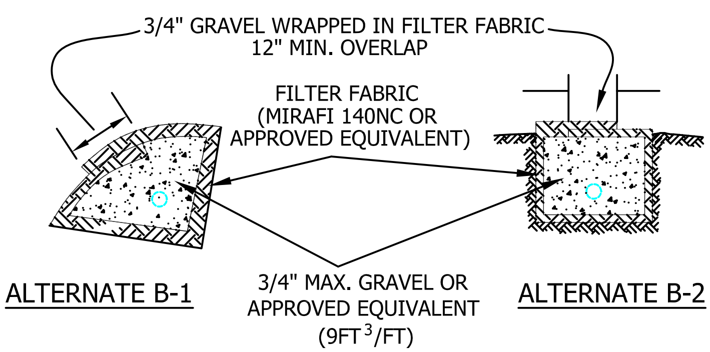


FILTER MATERIAL

FILTER MATERIAL SHALL BE CLASS 2 PERMEABLE MATERIAL PER STATE OF CALIFORNIA STANDARD SPECIFICATION, OR APPROVED ALTERNATE. CLASS 2 GRADING AS FOLLOWS:

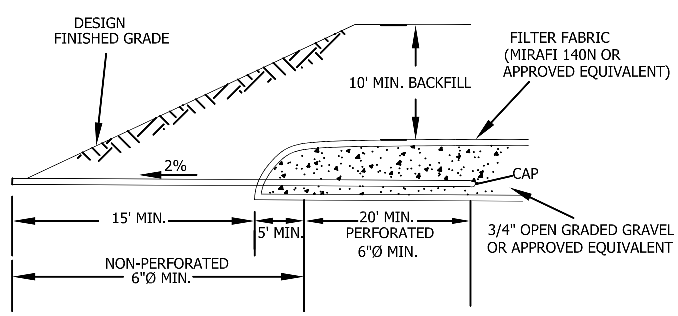
Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

SUBDRAIN ALTERNATE B



PERFORATED PIPE IS OPTIONAL PER GOVERNING AGENCY'S REQUIREMENTS

DETAIL OF CANYON SUBDRAIN TERMINAL



CANYON SUBDRAIN	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS C	Leighton

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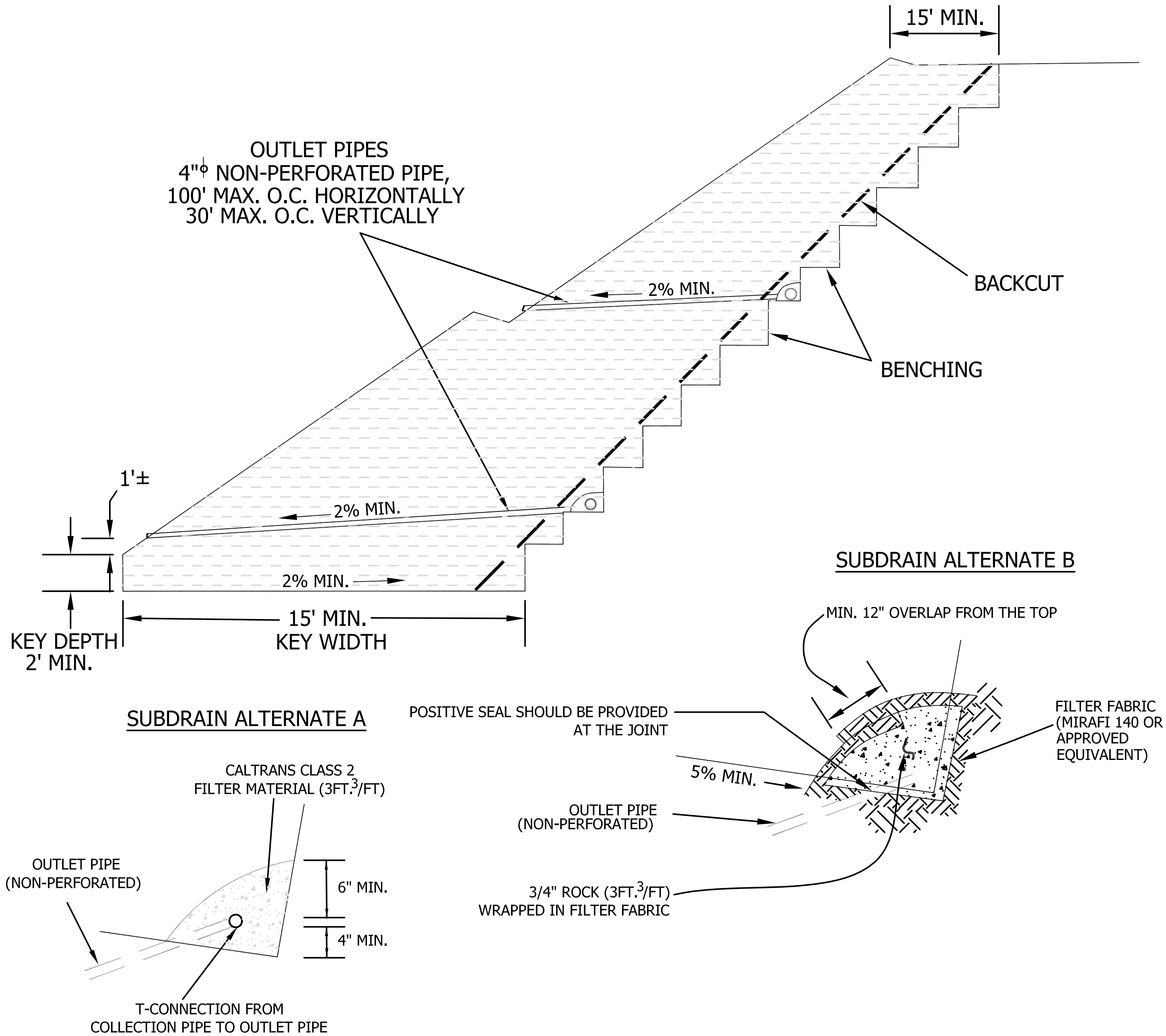

- SUBDRAIN INSTALLATION - Subdrain collector pipe shall be installed with perforations down or, unless otherwise designated by the geotechnical consultant. Outlet pipes shall be non-perforated pipe. The subdrain pipe shall have at least 8 perforations uniformly spaced per foot. Perforation shall be 1/4" to 1/2" if drilled holes are used. All subdrain pipes shall have a gradient at least 2% towards the outlet.
- SUBDRAIN PIPE - Subdrain pipe shall be ASTM D2751, ASTM D1527 (Schedule 40) or SDR 23.5 ABS pipe or ASTM D3034 (Schedule 40) or SDR 23.5 PVC pipe.
- All outlet pipe shall be placed in a trench and, after fill is placed above it, rodded to verify integrity.

BUTTRESS OR REPLACEMENT FILL SUBDRAINS	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS D	Leighton

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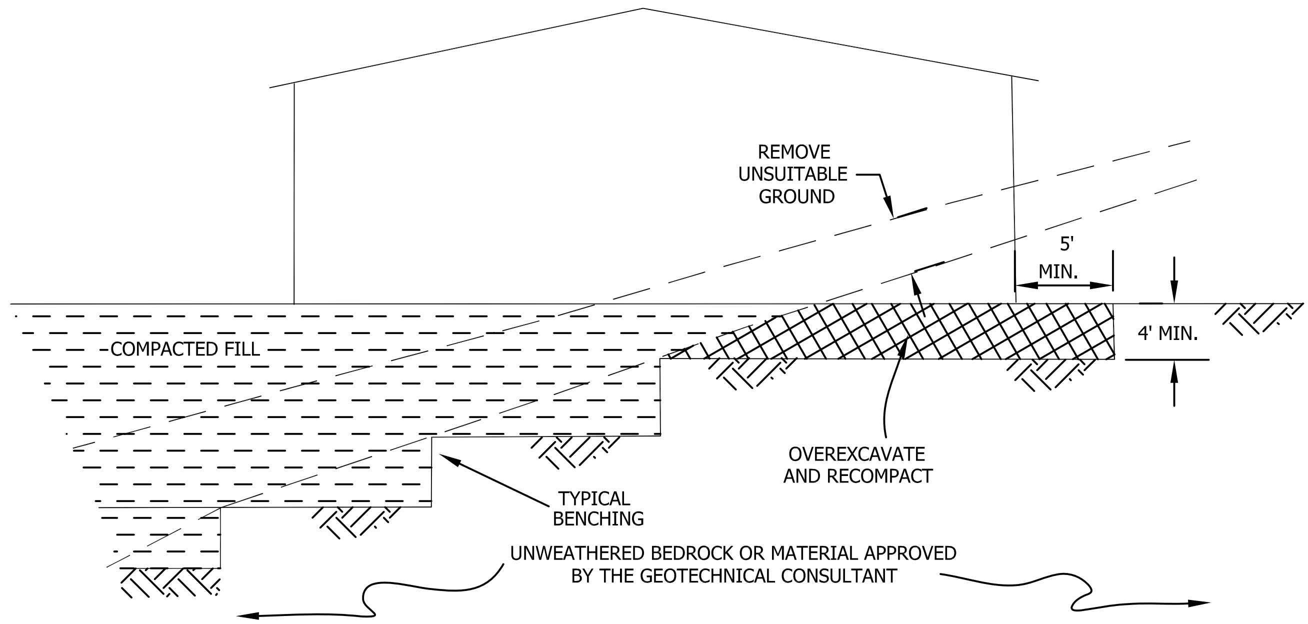
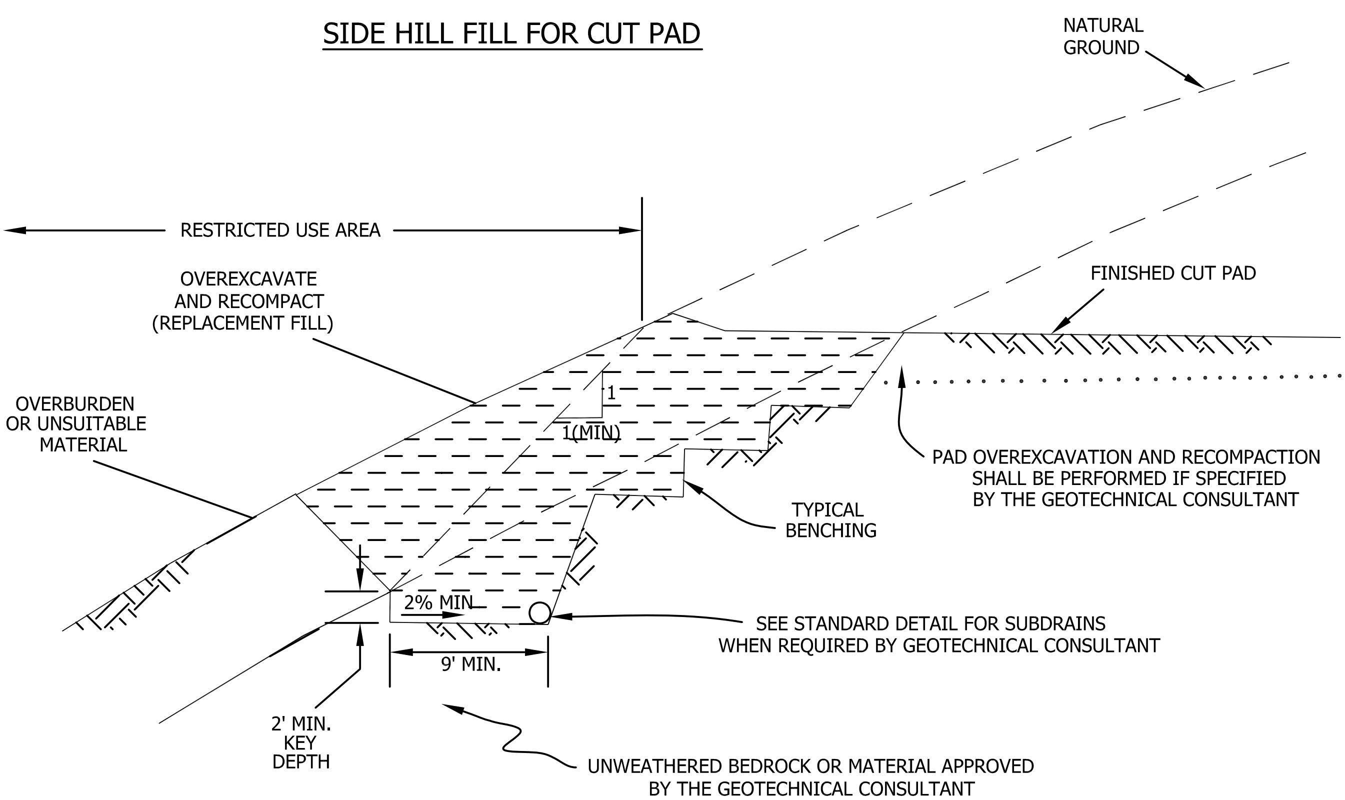
CUT-FILL TRANSITION LOT OVEREXCAVATION



SIDE HILL FILL FOR CUT PAD



TRANSITION LOT FILLS AND SIDE HILL FILLS	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS E	Leighton

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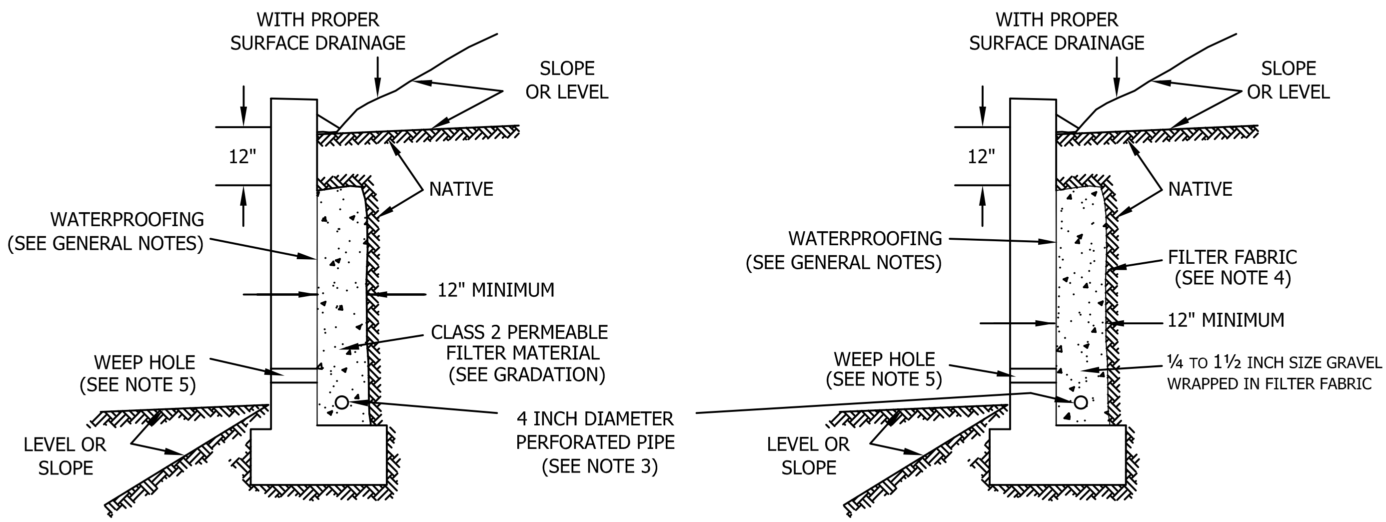
SUBDRAIN OPTIONS AND BACKFILL WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

OPTION 1: PIPE SURROUNDED WITH CLASS 2 PERMEABLE MATERIAL

OPTION 2: GRAVEL WRAPPED IN FILTER FABRIC



Class 2 Filter Permeable Material Gradation
Per Caltrans Specifications

Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

GENERAL NOTES:

* Waterproofing should be provided where moisture nuisance problem through the wall is undesirable.
* Water proofing of the walls is not under purview of the geotechnical engineer
* All drains should have a gradient of 1 percent minimum
*Outlet portion of the subdrain should have a 4-inch diameter solid pipe discharged into a suitable disposal area designed by the project engineer. The subdrain pipe should be accessible for maintenance (rodding)
*Other subdrain backfill options are subject to the review by the geotechnical engineer and modification of design parameters.

Notes:
1) Sand should have a sand equivalent of 30 or greater and may be densified by water jetting.
2) 1 Cu. ft. per ft. of 1/4- to 1 1/2-inch size gravel wrapped in filter fabric
3) Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down. Perforations should be 3/8 inch in diameter placed at the ends of a 120-degree arc in two rows at 3-inch on center (staggered)
4) Filter fabric should be Mirafi 140NC or approved equivalent.
5) Weephole should be 3-inch minimum diameter and provided at 10-foot maximum intervals. If exposure is permitted, weepholes should be located 12 inches above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to be discharged through the curb face or equivalent should be provided. For a basement-type wall, a proper subdrain outlet system should be provided.
6) Retaining wall plans should be reviewed and approved by the geotechnical engineer.
7) Walls over six feet in height are subject to a special review by the geotechnical engineer and modifications to the above requirements.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL FOR WALLS 6 FEET OR LESS IN HEIGHT

WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

Leighton

APPENDIX E

GBA - IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGINEERING REPORT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL
BUSINESS
ASSOCIATION

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GEOTECHNICAL EXPLORATION
PROPOSED VILLAGE WEST DRIVE EXTENSION
RIVERSIDE COUNTY, CALIFORNIA

Prepared for

MERIDIAN PARK
1156 N. Mountain Avenue
Upland, California 91785-0670

Project No. 11227.021

February 3, 2020

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

February 3, 2020

Project No. 11227.021

Meridian Park
1156 N. Mountain Avenue
Upland, California 91785-0670

Attention: Mr. Timothy Reeves

Subject: Geotechnical Exploration
Proposed Village West Drive Extension
Riverside County, California

In accordance with your authorization and our proposal dated January 15, 2020, we are pleased to present herewith our geotechnical exploration for the subject project. This report presents our findings and provides geotechnical recommendations for design and construction.

Based on the results of our exploration, the proposed road alignment is underlain by alluvium and granitic bedrock. The alluvium varies from silty sand to clayey sand with R-value ranging from 19 to 70. The granitic rock appears to be highly weathered and generally excavatable/rippable within the depth explored.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call our office.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

PROFESSIONAL ENGINEER SIMON I SAIID 2641 GEOTECHNICAL STATE OF CALIFORNIA

Simon I. Saiid, GE 2641
Principal Engineer

Robert F. Riha, CEG 1921
Senior Principal Geologist

REGISTERED GEOLOGIST ROBERT F. RIHA No. 1921 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

Distribution: (1) Addressee (electronic PDF copy)

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1.0 INTRODUCTION

1.1 Site and Project Description

The proposed Village West Drive extension is located within the unincorporated area of Riverside County on the west side of the General Archie Gold Golf Course between Lemay Drive and Nandina Avenue (see Figure 1). This roadway extension is partially paved and currently loops around the east side of an existing above ground water tank at approximately Station 36+00 (see Figure 2). Overhead power lines and associated poles are located along the western shoulder of existing roadway from about station 27+00 to 36+80. Existing Village West Drive is currently a two lane roadway (one lane in each direction). The existing pavement appears to be in a relatively good condition to approximately 200 feet south of Lemay Drive (or ~Station 27+00). The existing pavement south of Station 27+00 is in a poor condition with severe alligator cracking and potholes.

Based on review of the Conceptual Plan (DRC, 2019), the planned roadway improvements include:

- Rough grading to complete the widening and partial re-alignment. Existing pavement is expected to be completely removed due to proposed new road profile and re-alignment.
- Removal/relocation of above ground steel water tank and several power poles.
- Grading will consist of up to 6 feet of excavation and 12 feet of fill.
- Construction of storm drain culverts at three locations.
- Construction of new curb and gutter and roadway pavement.

1.2 Purpose and Scope

The purpose of our exploration is to: (1) evaluate geotechnical engineering characteristics of the earth materials along the roadway alignment, and (2) provide geotechnical recommendations for design and construction of the proposed improvements. More specifically and as described in our proposal, the scope of our work included the following tasks:

- <u>Background Review</u>: We reviewed readily available, relevant, geotechnical/ geologic reports and maps pertinent to the project.
- <u>Field Exploration</u>: Our field exploration consisted of twelve (12) backhoe test pits excavated, sampled and logged along accessible areas of the roadway alignment.

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- Geotechnical Laboratory Tests: Geotechnical laboratory tests were performed on selected soil samples collected during our field exploration. This laboratory testing program was designed to evaluate general physical and engineering characteristics of the encountered soils.
- Engineering Analysis: Data obtained from our background review, field exploration, and geotechnical laboratory testing program was evaluated to develop geotechnical conclusions and recommendations.
- Report Preparation: Results of this evaluation have been summarized in this report, presenting our findings, conclusions and recommendations.

This report does not address the potential for encountering hazardous materials along the roadway. Important information about limitations of geotechnical reports, in general, is presented in Appendix C, *GBA Important Information About This Geotechnical Report.*

1.3 Field Exploration

Our field exploration consisted of the excavation of twelve (12) backhoe test pits at accessible areas along the proposed alignment. Prior to drilling, we located and marked exploration locations for coordination with Underground Service Alert (USA). Our field exploration was performed on January 23, 2020. Approximate locations of the test pits are depicted on the Test Pit Location Plan (Figure 2). The exploratory test pits were generally excavated as close as practical to proposed alignment; however, some explorations were offset to avoid conflicts with existing underground utilities and asphalt pavement. During the exploration, bulk samples were obtained from the test pits for laboratory testing and evaluation. Sampling was conducted by a staff geologist from our office. The collected samples were transported to our laboratory for testing. Test pits were backfilled with native soils. The test pit logs are presented in Appendix A.

1.4 Laboratory Testing

Laboratory tests were performed on representative samples to provide a basis for development of geotechnical conclusions and recommendations. Selected samples were tested to determine the following parameters: maximum dry density and optimum moisture content, R-value, soluble sulfate and chloride content, pH and resistivity. The results of our laboratory testing and summaries of the testing procedures are presented in Appendix B.

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2.0 GEOTECHNICAL AND GEOLOGIC FINDINGS

A summary of our findings from research of pertinent literature, site-specific field exploration, geotechnical laboratory testing and engineering analysis, is discussed in this section.

2.1 Regional Geology

The site is located within a prominent natural geomorphic province in southwestern California known as the Peninsular Ranges. This province is characterized by steep, elongated ranges and valleys that trend northwestward. More specifically, the proposed site is located within the relatively stable Perris Block.

The Perris Block, approximately 20 miles by 50 miles in extent, is bounded by the San Jacinto Fault Zone to the northeast, the Elsinore Fault Zone to the southwest. The Perris Block has had a complex tectonic history, apparently undergoing relative vertical land-movements of several thousand feet in response to movement on the Elsinore and San Jacinto Fault Zones. Thin sedimentary and volcanic materials locally mantle crystalline bedrock, consisting of the Val Verde Tonalite (Kvt).

2.2 Subsurface Conditions

Our field exploration and review of pertinent literature indicates that the Val Verde Tonalite bedrock along the proposed alignment is generally covered with varying thicknesses of artificial fill associated with existing roadway and alluvial deposits. Detailed descriptions of the earth materials encountered in each excavation are provided in Appendix A.

2.2.1 Artificial Fill

Artificial fill is expected as typical embankment fill associated with existing roadway, culvert crossings and existing water tank pad. The fill thickness is expected to vary from several inches to less than 5 feet. The fill is likely generated from near or onsite sources (i.e. alluvium/weathered bedrock) and consist of silty sand (SM) with varying amounts of gravel.

2.2.2 Topsoil/Colluvium

A thin veneer of topsoil/colluvial deposits was encountered in most test pits and is expected to generally be less than 1 foot in thickness. The topsoil/colluvium generally consisted of loose silty sand with gravel (SM).

2.2.3 Alluvium Deposits

Alluvial deposits were encountered in most test pits to a maximum depth of 6 feet (T-6). The observed alluvium generally consisted of loose to medium dense, red-brown to dark brown silty sand to clayey sand with interbedded poorly to well-graded sand and sandy clay layers. The Expansion Index (EI) of the clayey sand soils is expected to be very low (EI=21). The R-value of these materials is expected to range from 19 to 40.

2.2.4 Granitic Bedrock/Val Verde Tonalite (Kvt).

Granitic bedrock was encountered as shallow as 6 inches BGS in T-8 and as deep as 6 feet BGS in T-6. The granitic bedrock is highly weathered/completely weathered in the upper 2 to 3 feet. Some bedrock boulders/outcropping are exposed near the existing water tank at approximately station 38+00 to 40+00. The bedrock is expected to range from readily rippable/excavatable to locally non-rippable depending on the degree of weathering and presence of core stones. This weathered bedrock is likely to produce fine to coarse sand with gravel size rock fragments and is expected to be generally suitable for re-use as compacted fill. However, it should be anticipated that deeper excavations of the alignment may encounter undulating/less weathered bedrock surfaces that may be very difficult to excavate and generate boulders or core stones (greater than 12 inches).

2.3 Surface and Groundwater

No surface water was observed along the alignment except for the existing offsite pond along the west side of the alignment between Station 44+00 to 48+00. Groundwater conditions can fluctuate seasonally and may also be directly-impacted by other factors not observed at the time of our field explorations or groundwater seepage may appear in excavations exposing earth materials of contrasting permeabilities.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 General

The proposed roadway appears feasible from a geotechnical viewpoint provided that the following recommendations are incorporated into the design and construction phases of development.

3.2 Earthwork Considerations

Earthwork associated with the proposed roadway should be performed in accordance with applicable County or JPA Standards, "Standard Specifications for Public Works Construction" (Green Book, latest edition) and the recommendations included in the text of this report.

3.2.1 Subgrade Preparation

Prior to grading, the proposed roadway alignment should be cleared of surface and subsurface obstructions including heavy vegetation, roots and existing pavement. After clearing and grubbing, the following remedial grading should be performed:

Existing Roadway: Prior to any filling or new pavement construction, all existing pavement (AC and AB) should be removed to allow for scarification and recomapction of subgrade. Some locally deeper removal/over-excavation (OX) may be required to achieve stable subgrade.

Widening and/or New Pavement: Prior to any filling or new pavement construction, all artificial fill, topsoil, and 3 feet of alluvium should be removed and recompacted. Some locally deeper removal of alluvium may be required such as in drainage swale located at Test Pit T-6. The exposed removal bottom should be approved by the geotechnical consultant and then scarified, moisture conditioned and compacted prior to placing fill. Subgrade preparation/treatment should extend for the entire width of the roadway including sidewalks, medians and pavements, etc.

After completion of remedial grading and fill placement described above, the upper 6 inches of the final subgrade soils, where applicable, should be moisture-conditioned to near optimum moisture content, compacted to at least 95 percent relative compaction (ASTM D1557) and kept in this condition until the pavement section is constructed. Minimum relative compaction requirements for aggregate base should be 95 percent of the maximum laboratory density as determined by ASTM D1557. Excavations should be performed in accordance with the project plans, specifications, and all applicable OSHA requirements.

3.2.2 Fill Materials

Onsite soils (EI<21 and R-value>19) should generally be suitable as fill materials for street subgrade provided they are free of rocks over 3 inches in diameter and organic matter. The existing asphalt material may be crushed to 3-inch minus and used as part of the fill matrix. Any crushed asphalt should be blended with native soils to produce a well-mixed fill source. Fill should be compacted in uniform horizontal lifts by mechanical means to at least 90 percent relative compaction as determined per ASTM D 1557 (Modified Proctor) or as required per County standard specifications.

3.2.3 Import Soils

Import soils and/or borrow sites, if needed, should be evaluated by the geotechnical consultant prior to import. Import soils should be uncontaminated, granular in nature, free of organic material (loss on ignition less-than 2 percent), have a very low expansion potential (EI<21) and R-value greater than 20, if to be used in upper 12 inches of street subgrade.

3.2.4 Trench Backfill

For any planned pipe new or re-located pipes, prior to backfilling trenches, pipes should be bedded in and covered with a uniform, granular material that has a Sand Equivalent (SE) of 30 or greater, and a gradation meeting requirements of the pipe manufacturer and District Standards. A minimum cover of 12 inches of bedding material should be provided above the top of the pipe. Pipe bedding should be water-densified in-place. Some onsite soils (SW materials) with SE greater than 30 may be suitable for this purpose.

3.2.5 Shrinkage

Change in volume of excavated and recompacted soil varies according to initial density, which is a function of soil type and location. This volume change is represented as a percentage increase (bulking) or decrease (shrinkage) in volume of fill after removal and recompaction. Field and laboratory data used in our calculations included laboratory-measured maximum dry densities for soil types encountered at this site relative to measured, in-place densities of soils sampled. We estimate that shrinkage due to recompaction of soils will vary with depth (shrinkage typically decreases with depth). We suggest an estimated shrinkage ranging from 5 to 15 percent for the alluvial materials.

3.3 Bearing Capacity and Earth Pressures

For any planned culvert crossings or ancillary structures, a net allowable bearing capacity of 2,000 psf, or a modulus of subgrade reaction of 150 pci may be used. A minimum base width of 18 inches for continuous footings and a minimum bearing area of 3 square feet (1.75 ft by 1.75 ft) for pad foundations should be used. Additionally, an increase of one-third may be applied when considering short-term live loads (e.g. seismic and wind).

3.4 Preliminary Pavement Design

The preliminary pavement design provided below is based on the Caltrans Highway Design Manual and applicable County standards. Per the referenced street improvement plans, this portion of Village West Drive is to receive a minimum of 0.50-feet HMA over 0.67-feet AB layer. Based on the results of our laboratory testing on 3 representative samples of site soils, the subgrade R-Value is expected to range from 19 to 71 depending on location and proposed street profile. As such, in cut areas and where subgrade consist of granitic rock, the pavement section should default to the required minimum pavement section. In fill areas or where subgrade consist of at least 12 inches of onsite soils (assume R-value of 20), a pavement section of 0.50-feet HMA over 1.4-feet AB is required for this road segment. Actual R-value of the subgrade soils will need to be verified after completion of site grading and thickness of required AB should be adjusted accordingly.

Pavement design and construction should also conform to applicable County and industry standards. The Caltrans pavement section design calculations were based on a pavement life of approximately 20 years with a normal amount of flexible pavement maintenance.

3.5 Corrosivity Testing

Caltrans *Corrosion Guidelines* (Caltrans, 2018) state that a site is considered to be corrosive to foundation elements or underground structures if one or more of the following conditions exist for the soil and/or water samples taken at the site:

- Chloride concentration greater than or equal to 500 ppm
- Sulfate concentration greater than or equal to 1,500 ppm
- pH of 5.5 or less

Based on our laboratory testing on a representative soil sample, the onsite soils are considered to be corrosive to foundation elements or underground structures. Any ferrous pipe can be protected by polyethylene bags, tape or coatings, di-electric fittings, concrete encasement or other means to separate the pipe from wet onsite soils. Further testing of import and site soil corrosivity could be performed and specific recommendations for corrosion protection may need to be provided by a qualified corrosion engineer.

3.6 Construction Observation

Observation and testing should be performed by Leighton's representatives during excavation/construction. It should be anticipated that the substrata exposed during construction may vary from that encountered in the test borings. Reasonably continuous construction observation and review during the proposed improvements allows for evaluation of the actual soil conditions and the ability to provide appropriate revisions where required during construction.

Recommendations are based on information available at the time our report was prepared and may change as plans are developed, or if supplemental subsurface exploration is authorized. Leighton Consulting, Inc. should review improvements plans, when available, and comment further on geotechnical aspects of the project. Geotechnical observation and testing should be conducted during excavation and all phases of construction. Geotechnical conclusions and preliminary recommendations should be reviewed and verified by us (Leighton Consulting, Inc.) during construction, and revised accordingly if geotechnical conditions encountered vary from our findings and interpretations.

4.0 LIMITATIONS

This report was necessarily based in part upon data obtained from a limited number of observances, site visits, soil samples, tests, analyses, histories of occurrences, spaced subsurface explorations and limited information on historical events and observations. Such information is necessarily incomplete. The nature of many sites is such that differing characteristics can be experienced within small distances and under various climatic conditions. Changes in subsurface conditions can and do occur over time. This exploration was performed with the understanding that the project as described in Section 1.1 of this report.

This report was prepared for Meridian Park based on Meridian Park needs, directions, and requirements at the time of our investigation. This report is not authorized for use by, and is not to be relied upon by any party except Meridian Park, and its successors and assigns as owner of the property, with whom Leighton Consulting, Inc. has contracted for the work. Use of or reliance on this report by any other party is at that party's risk. Unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify Leighton Consulting, Inc. from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of Leighton Consulting, Inc.

The client is referred to Appendix C regarding important information provided by the Geoprofessional Business Association (GBA) on geotechnical engineering studies and report and their applicability.

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Project: 11227.021	Eng/Geol: SIS/RFR
Scale:1 " = 2,000 '	Date: January 2020

Base Map: ESRI ArcGIS Online 2020
Thematic Information: Leighton
Author: Leighton Geomatics (btran)

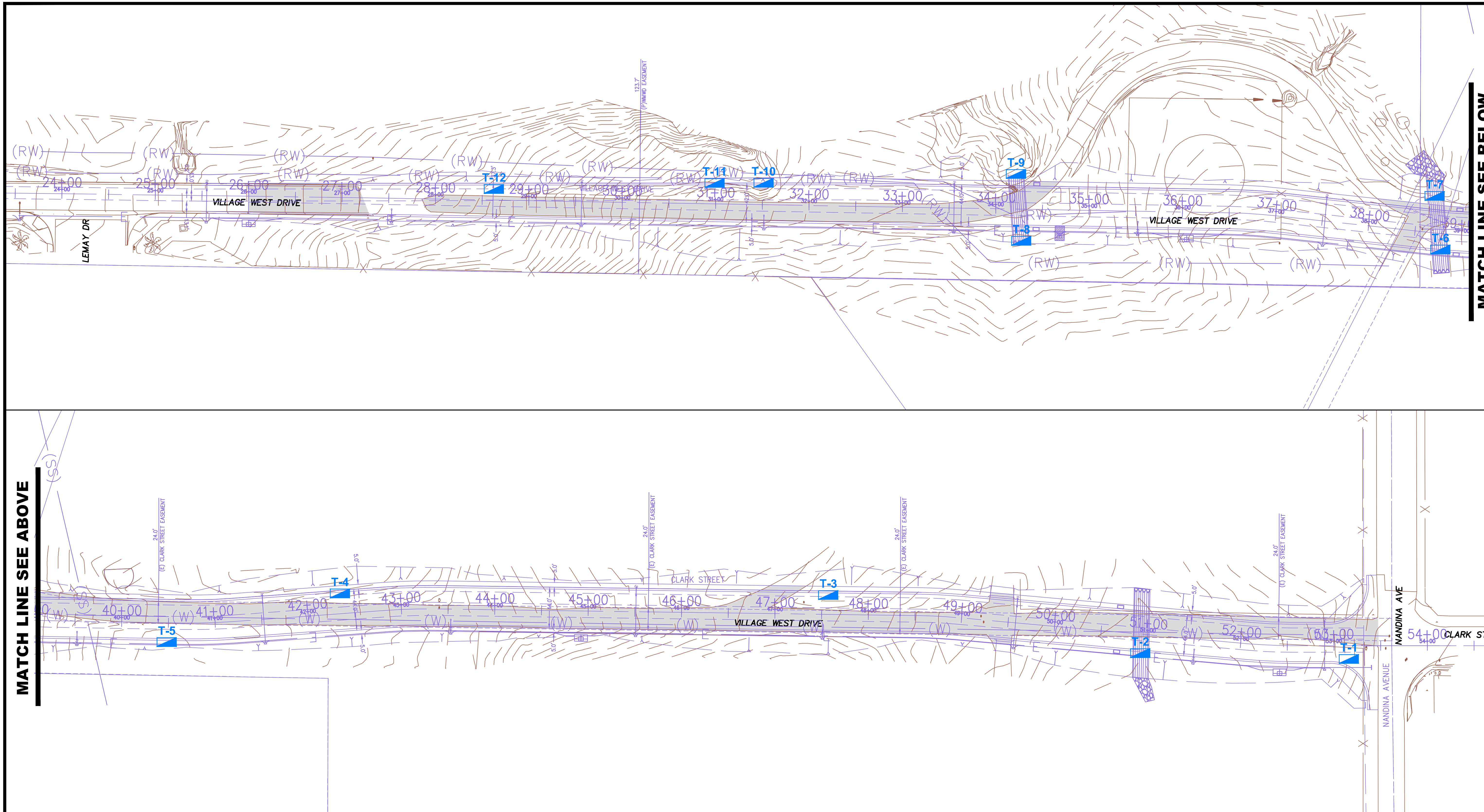
SITE LOCATION MAP

Proposed Village West Drive Extension
Riverside County California

Figure 1

Leighton

Map Saved as V:\Drafting\11227\021\Maps\11227-021_F01_SLM_2020-01-27.mxd on 1/27/2020 4:30:30 PM



LEGEND

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SCALE FEET

T-12 APPROXIMATE LOCATION OF BACKHOE TEST PIT

TEST PIT LOCATION MAP

Proposed Village West Drive Extension
Riverside County California

Figure 2

Leighton

Proj: 11227.021	Eng/Geol: SIS/RFR
Scale: 1"=100'	Date: January 2020

Drafted By: BQT Checked By: BQT

APPENDIX A

Field Exploration / Logs of Exploratory Test Pits

Our field exploration consisted of excavating 12 backhoe test pits on January 23, 2020. Prior to drilling, we marked proposed exploration locations for coordination with Underground Service Alert (USA). Test Pit locations are depicted on Plate 1.

Bag (or bulk) samples were obtained from soil cuttings. Types of samples obtained from each location are shown on the trench logs at corresponding depths. The test pits were backfilled with soil cuttings obtained during the excavation. Representative earth-material samples obtained from these subsurface explorations were transported to our Temecula geotechnical laboratory for evaluation and appropriate testing.

The attached subsurface exploration logs and related information depict subsurface conditions only at the locations indicated and at the particular date designated on the logs. Subsurface conditions at other locations may differ from conditions occurring at these locations. The passage of time may result in altered subsurface conditions due to environmental changes. In addition, any stratification lines on the logs represent the approximate boundary between soil types and the transition may be gradual.

LOG OF TEST PITS

PROJECT NO. 11227.021 **LOGGED BY: JTD**
CLIENT: Meridian Park, LLC **DATE: 1/23/2020**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
T-1	B-1 @ 1'-2'		SM SM	<u>Topsoil/Colluvium</u> 0'-0.5' SILTY SAND loose dark brown, moist, fine to coarse grained sand, roots <u>Quaternary Alluvium (Qal)</u> 0.5-2.0' SILTY SAND, loose, dark grayish brown, moist, fine to coarse grained sand, few gravel and cobble to 6" <u>Val Verde Tonalite (Kvt)</u> 2.0'-4.0' Severely Weathered, recovered as: SILTY SAND with GRAVEL, medium dense, dark grayish brown, moist, fine to coarse grained sand with fine gravel 4.0'-7.0' Less weathered, recovered as: Well-Graded SAND with GRAVEL, light grayish brown, slightly moist, fine to coarse grained sand with fine gravel Total Depth 7' backfilled with spoils 1/23/2020

LOG OF TEST PITS

PROJECT NO. 11227.021 **LOGGED BY: JTD**
CLIENT: Meridian Park, LLC **DATE: 1/23/2020**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
T-2	B-1 @ 2'-3'		 SM SM SM/SC 	<u>Topsoil</u> 0'-0.5' SILTY SAND with GRAVEL, loose, light brown, moist, fine to coarse grained sand with fine gravel <u>Quaternary Alluvium (Qal)</u> 0.5'-1.5' SILTY SAND, medium dense, light brown, moist, fine to medium grained sand <u>Older Alluvium (Qalo)</u> 1.5'-3.0' SILTY to CLAYEY SAND, dense, dark yellowish brown, moist, fine to medium grained sand <u>Val Verde Tonalite (Kvt)</u> 3.0'-5.0' Highly weathered, recovered as: Well-graded SAND with GRAVEL, dense, light grayish brown, slightly moist, fine to coarse grained sand with fine gravel, difficult excavation Total Depth 5' backfilled with spoils 1/23/2020

LOG OF TEST PITS

PROJECT NO. 11227.021 **LOGGED BY: JTD**
CLIENT: Meridian Park, LLC **DATE: 1/23/2020**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
T-3	B-1 @ 3'-4'	RV=70	SM	Topsoil/Colluvium 0'-1.0' SILTY SAND, medium dense, brown, slightly moist, fine to coarse grained sand, few roots Val Verde Tonalite (Kvt) 1.0'-7.0' Highly weathered, recovered as: Well-graded SAND with GRAVEL, dense, light grayish brown, slightly moist, fine to coarse grained sand with fine gravel, friable, easily excavatable Total Depth 7' backfilled with spoils 1/23/2020

LOG OF TEST PITS

PROJECT NO. 11227.021
CLIENT: Meridian Park, LLC

LOGGED BY: JTD
DATE: 1/23/2020

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
T-4	B-1 @ 2'-3'		SM SM	Topsoil 0'-1.0' SILTY SAND, loose, grayish brown, moist, fine to coarse grained sand, roots Quaternary Alluvium (Qal) 1.0'-3.0' SILTY SAND, medium dense, yellowish brown, moist, fine to coarse grained sand Val Verde Tonalite (Kvt) 3.0'-6.5' Highly weathered, recovered as: SILTY SAND with GRAVEL, dense, grayish brown, slightly moist, fine to coarse grained sand with fine gravel, friable, becoming moderately weathered at 5' Total Depth 6.5' backfilled with spoils 1/23/2020

LOG OF TEST PITS

PROJECT NO. 11227.021 **LOGGED BY: JTD**
CLIENT: Meridian Park, LLC **DATE: 1/23/2020**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
T-5				<u>Topsoil/Colluvium</u>
			SM	0'-0.5' SILTY SAND with GRAVEL, loose, grayish brown, moist, fine to coarse grained sand with fine gravel, few roots
				<u>Quaternary Alluvium (Qal)</u>
			SM	0.5'-2.0' SILTY SAND, dense, yellowish brown, moist, fine to coarse grained sand, old utility wire observed in trench
				<u>Val Verde Tonalite (Kvt)</u>
				2.0'-5.0' Moderately weathered, recovered as: SILTY SAND with GRAVEL, dense, grayish brown, slightly moist, fine to coarse grained sand with fine gravel, difficult excavation at 4'
				Total Depth 5' backfilled with spoils 1/23/2020
				Note: 2" AC/6" native fill adjacent to trench

LOG OF TEST PITS

PROJECT NO. 11227.021 **LOGGED BY: JTD**
CLIENT: Meridian Park, LLC **DATE: 1/23/2020**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
T-6	B-1 @ 3'-4'	MD: 129.9 @ 9% EI=0 RV=19 corrosion	SM SC SM	Quaternary Alluvium (Qal) 0'-2.0' SILTY SAND, loose, dark brown, moist, fine to coarse grained sand, roots 2.0'-5.0' CLAYEY SAND, loose, dark reddish brown, moist, fine to coarse grained sand 5.0'-6.0' SILTY SAND, loose, dark grayish brown, moist, fine to coarse grained sand Val Verde Tonalite (Kvt) 6.0'-7.5' Highly weathered, recovered as: Well-graded SAND with GRAVEL, dense, light grayish brown, slightly moist, fine to coarse grained sand with fine gravel, difficult excavation Total Depth 7.5' backfilled with spoils 1/23/2020

LOG OF TEST PITS

PROJECT NO. 11227.021 **LOGGED BY: JTD**
CLIENT: Meridian Park, LLC **DATE: 1/23/2020**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
T-7	B-1 @ 1'-2' B-2 @ 6'-9'		SC/SM CL	<u>Topsoil/Colluvium</u> 0'-0.5' SILTY/CLAYEY SAND, loose, dark brown, moist, fine to coarse grained sand <u>Quaternary Alluvium (Qal)</u> 0.5'-2.5' SANDY Lean CLAY, loose, dark reddish brown, moist, fine to coarse grained sand <u>Val Verde Tonalite (Kvt)</u> 2.5'-4.0' Severely weathered, recovered as: SILTY/CLAYEY SAND with GRAVEL, dense, grayish brown, moist, fine to coarse grained sand with fine gravel 4.0'-9.0' Highly weathered, recovered as: Well-graded SAND with GRAVEL, dense, grayish brown, moist, fine to coarse grained sand with fine gravel, becomes moderately weathered at 9.0', difficult to excavate Total Depth 10' backfilled with spoils 1/23/2020

LOG OF TEST PITS

PROJECT NO. 11227.021 **LOGGED BY: JTD**
CLIENT: Meridian Park, LLC **DATE: 1/23/2020**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
T-8	B-1 @ 3'-4'		SM	Topsoil/Colluvium 0'-0.5' SILTY SAND with GRAVEL, medium dense, grayish brown, slightly moist, fine to coarse grained sand with fine gravel, roots Val Verde Tonalite (Kvt) 0.5'-4.0' Moderately weathered, recovered as: Well-graded SAND with GRAVEL, dense, light gray, slightly moist, fine to coarse grained sand with fine gravel, difficult excavation at 2' Backhoe refusal @ 4.0' backfilled with spoils 1/23/2020

LOG OF TEST PITS

PROJECT NO. 11227.021
CLIENT: Meridian Park, LLC

LOGGED BY: JTD
DATE: 1/23/2020

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
T-9			SM	Topsoil/Colluvium 0'-1.0' SILTY SAND, loose, reddish brown, moist, fine to coarse grained sandssss Val Verde Tonalite (Kvt) 1.0'-2.0' Highly weathered, recovered as: Well-graded SAND with GRAVEL, dense, grayish brown, slightly moist, fine to coarse grained sand with fine gravel and cobbles to 6" Backhoe refusal @ 2' backfilled with spoils 1/23/2020

LOG OF TEST PITS

PROJECT NO. 11227.021 **LOGGED BY: JTD**
CLIENT: Meridian Park, LLC **DATE: 1/23/2020**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
T-10	B-1 @ 2'-3'	MD: 119.9 @12.5% RV=19	 SM SC SM	Topsoil/Colluvium 0'-1.0' SILTY SAND, loose, dark brown, moist, fine to coarse grained sand, roots Quaternary Alluvium (Qal) 1.0'-3.0' CLAYEY SAND, loose, dark reddish brown, moist, fine to coarse grained sand 3.0'-5.0' SILTY SAND, medium dense, reddish brown, moist, fine to coarse grained sand Val Verde Tonalite (Kvt) 5.0'-7.0' Moderately weathered, recovered as: Well-graded SAND with GRAVEL, dense, light gray, slightly moist, fine to coarse grained sand with fine gravel and few angular cobbles to 8", becomes slightly weathered at 6' Total Depth 7' backfilled with spoils 1/23/2020

LOG OF TEST PITS

PROJECT NO. 11227.021 **LOGGED BY: JTD**
CLIENT: Meridian Park, LLC **DATE: 1/23/2020**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
T-11			 SM SM	Topsoil/Colluvium 0'-0.5' SILTY SAND, loose, dark brown, moist, fine to coarse grained sand, roots Quaternary Alluvium (Qal) 0.5'-2.5' SILTY SAND with GRAVEL, loose, dark yellowish brown, moist, fine to coarse grained sand with fine gravel Val Verde Tonalite (Kvt) 2.5'-6.5' Highly weathered, recovered as: Well-graded SAND with GRAVEL, dense, slightly moist, fine to coarse grained sand with gravel to 1", friable Total Depth 6.5' backfilled with spoils 1/23/2020

LOG OF TEST PITS

PROJECT NO. 11227.021 **LOGGED BY: JTD**
CLIENT: Meridian Park, LLC **DATE: 1/23/2020**

TEST PIT#	SAMPLE TYPE & DEPTH	LAB TEST	USCS	DESCRIPTION
T-12	B-1 @ 1'-2'		SM SM	Topsoil/Colluvium 0'-1.0' SILTY SAND, loose, dark yellowish brown, moist, fine to coarse grained sand, roots Quaternary Alluvium (Qal) 1.0'-3.5' SILTY SAND, loose, dark brown, moist, fine to medium grained sand Val Verde Tonalite (Kvt) 3.5'-4.0' Highly weathered, recovered as: SILTY SAND, dense, dark grayish brown, moist, fine to coarse grained sand 4.0'-7.0' Recovered as: Well-graded SAND with GRAVEL, dense, light gray, slightly moist, fine to coarse grained sand with fine gravel Total Depth 7' backfilled with spoils 1/23/2020

APPENDIX B

Results of Laboratory Testing

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Leighton

Project Name:	Meridian Village West Dr. Ext	Tested By:	G. Davila	Date:	01/28/20
Project No.:	11227.021	Input By:	M. Vinet	Date:	01/29/20
Boring No.:	T-6	Depth (ft.):	3.0 - 4.0		
Sample No.:	B-1				
Soil Identification:	Silty, Clayey Sand (SC-SM), Dark Reddish Brown.				

Preparation Method: [X] Moist [ ] Dry — [X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03340 — *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	5680	5722	5656			
Weight of Mold (g)	3571	3571	3571			
Net Weight of Soil (g)	2109	2151	2085			
Wet Weight of Soil + Cont. (g)	881.3	750.0	845.0			
Dry Weight of Soil + Cont. (g)	837.8	709.4	782.3			
Weight of Container (g)	280.7	277.3	278.9			
Moisture Content (%)	7.8	9.4	12.5			
Wet Density (pcf)	139.2	142.0	137.6			
Dry Density (pcf)	129.1	129.8	122.4			

Maximum Dry Density (pcf) **129.9** **Optimum Moisture Content (%)** **9.0**

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

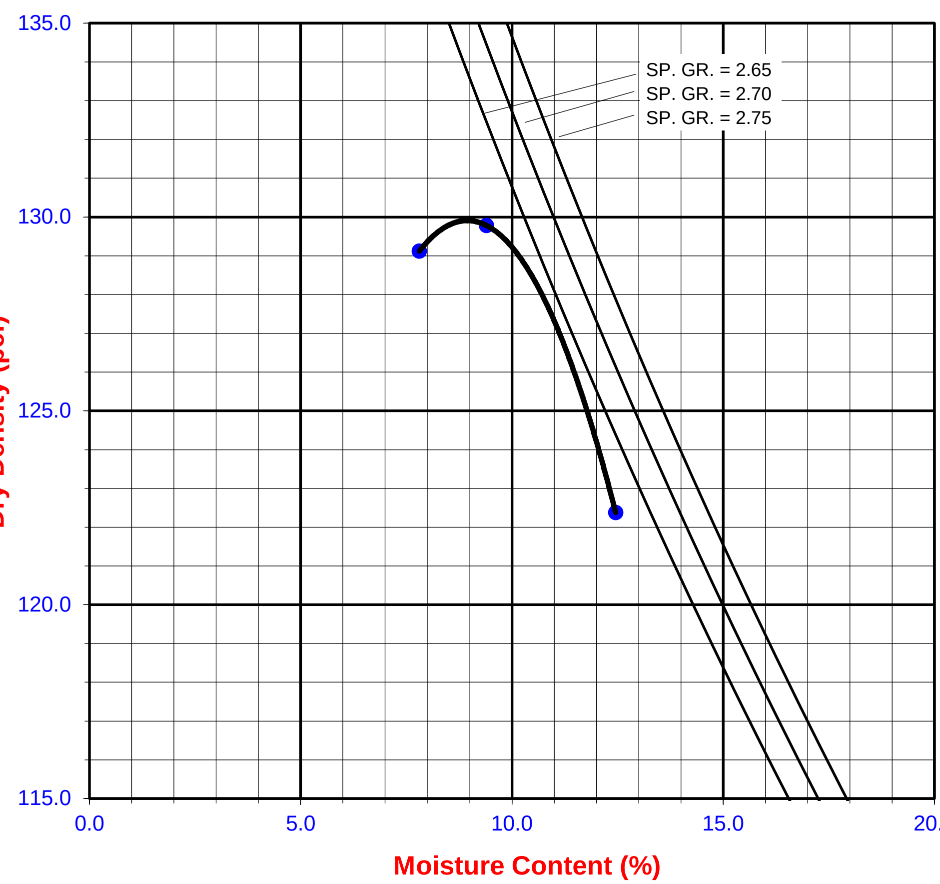
[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Leighton

Project Name:	Meridian Village West Dr. Ext	Tested By:	G. Davila	Date:	01/28/20
Project No.:	11227.021	Input By:	M. Vinet	Date:	01/29/20
Boring No.:	T-10	Depth (ft.):	2.0 - 3.0		
Sample No.:	B-1				
Soil Identification:	Silty, Clayey Sand (SC-SM), Dark Reddish Brown.				

Preparation Method: [X] Moist [ ] Dry — [X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03340 *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	5543	5586	5624	5612		
Weight of Mold (g)	3571	3571	3571	3571		
Net Weight of Soil (g)	1972	2015	2053	2041		
Wet Weight of Soil + Cont. (g)	980.2	850.1	1027.5	921.2		
Dry Weight of Soil + Cont. (g)	920.9	792.8	940.3	835.0		
Weight of Container (g)	279.8	278.1	278.0	278.5		
Moisture Content (%)	9.2	11.1	13.2	15.5		
Wet Density (pcf)	130.2	133.0	135.5	134.7		
Dry Density (pcf)	119.1	119.7	119.7	116.6		

Maximum Dry Density (pcf) 119.9 **Optimum Moisture Content (%)** 12.5

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

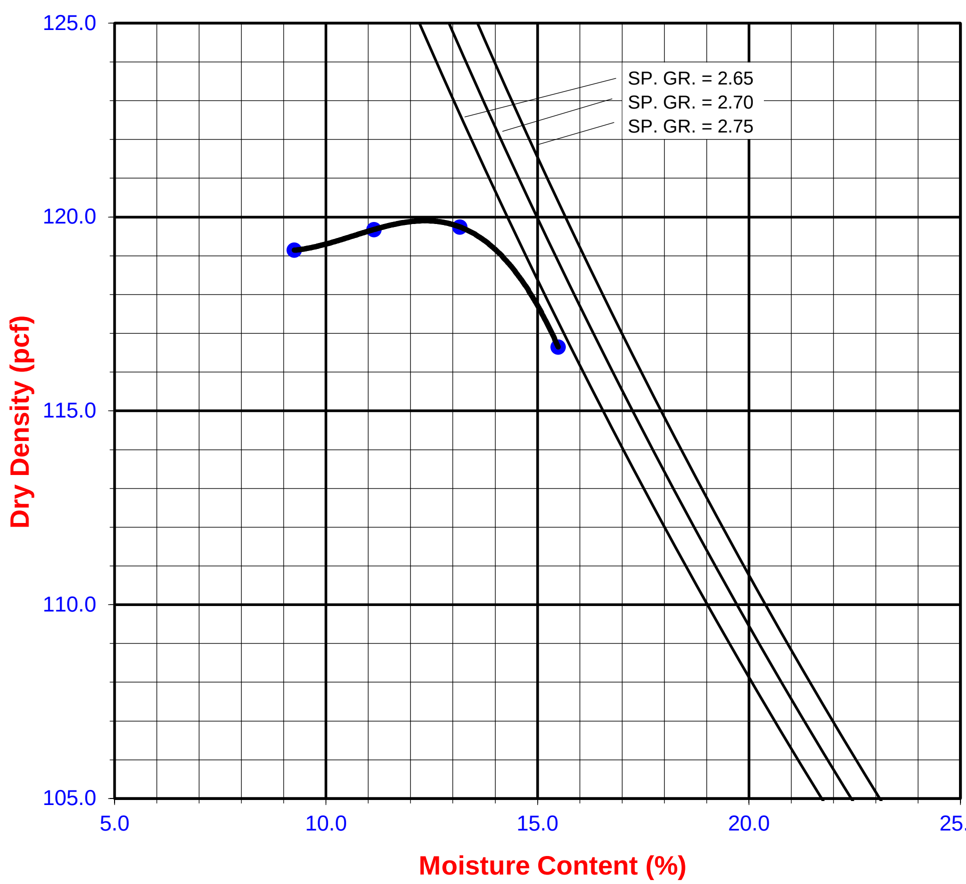
[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



Compaction; T-10, B-1 (01-23-20)

Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	Meridian Village West Dr. Ext.	Tested By:	M. Vinet	Date:	1/28/20
Project No. :	11227.021	Checked By:	M. Vinet	Date:	1/29/20
Boring No.:	T-6	Depth:	3.0 - 4.0		
Sample No. :	B-1	Location:	N/A		
Sample Description:	Silty, Clayey Sand (SC-SM), Dark Reddish Brown.				

Dry Wt. of Soil + Cont. (gm.)	2522.3
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	2522.3
Weight Soil Retained on #4 Sieve	19.6
Percent Passing # 4	99.2

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	0.9951
Wt. Comp. Soil + Mold (gm.)	604.2	631.0
Wt. of Mold (gm.)	190.3	190.3
Specific Gravity (Assumed)	2.70	2.70
Container No.	10	10
Wet Wt. of Soil + Cont. (gm.)	628.5	631.0
Dry Wt. of Soil + Cont. (gm.)	605.0	381.5
Wt. of Container (gm.)	328.5	190.3
Moisture Content (%)	8.5	15.5
Wet Density (pcf)	124.9	133.6
Dry Density (pcf)	115.1	115.6
Void Ratio	0.465	0.458
Total Porosity	0.317	0.314
Pore Volume (cc)	65.7	64.7
Degree of Saturation (%) [S meas]	**49.3**	**91.5**

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
1/28/20	12:35	1.0	0	0.5000
1/28/20	12:45	1.0	10	0.5000
	Add Distilled Water to the Specimen			
1/29/20	7:00	1.0	1095	0.4951
1/29/20	8:00	1.0	1155	0.4951

Expansion Index (EI meas) =	((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	-4.9
Expansion Index (Report) =	Nearest Whole Number or Zero (0) if Initial Height is > than Final Height	**0**

Rev. 03-08

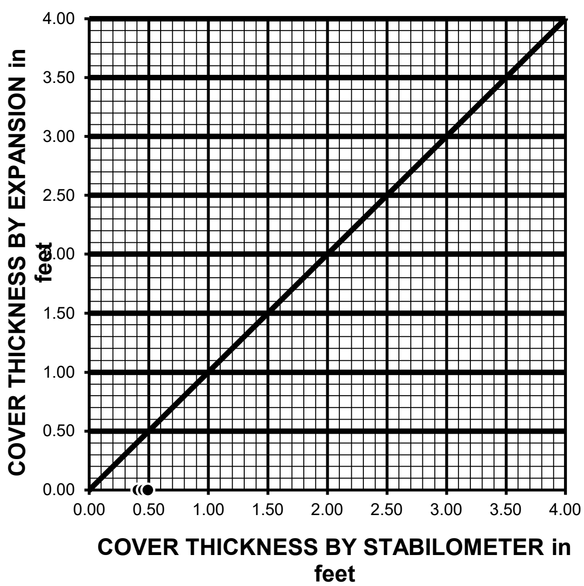
R-VALUE TEST RESULTS
ASTM D 2844

Project Name:	Meridian Village West Dr. Ext.	Date:	1/27/20
Project Number:	11227.021	Technician:	F. Mina
Boring Number:	T-3	Depth (ft.):	3.0 - 4.0
Sample Number:	B-1	Sample Location:	N/A
Sample Description:	Well Graded Sand with Silt (SW-SM), Dark Yellowish Brown		

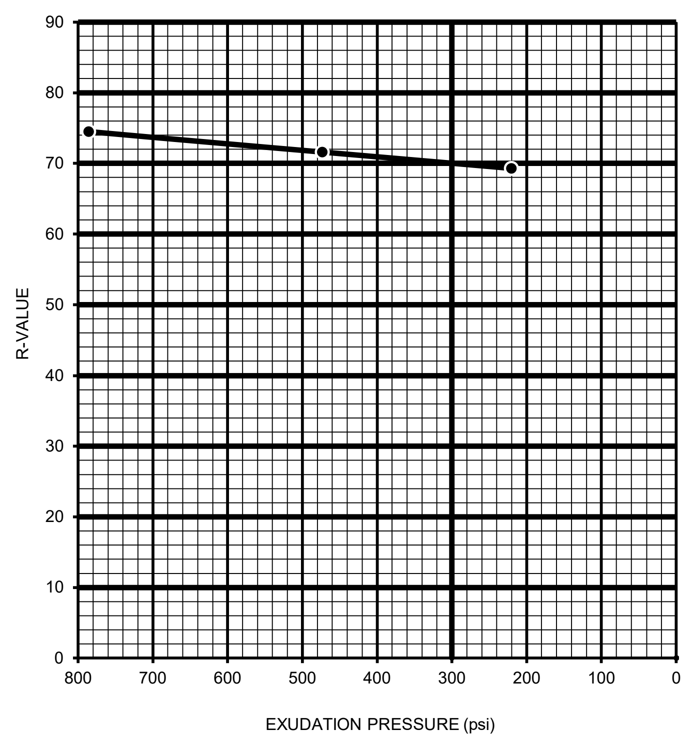
TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	8.5	9.5	10.5
HEIGHT OF SAMPLE, Inches	2.49	2.55	2.55
DRY DENSITY, pcf	116.0	118.3	117.7
COMPACTOR AIR PRESSURE, psi	350	350	350
EXUDATION PRESSURE, psi	786	473	220
EXPANSION, Inches x 10exp-4	0	0	0
STABILITY Ph 2,000 lbs (160 psi)	23	25	27
TURNS DISPLACEMENT	5.10	5.35	5.45
R-VALUE UNCORRECTED	74	72	69
R-VALUE CORRECTED	74	72	69

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.41	0.45	0.49
EXPANSION PRESSURE THICKNESS, ft.	0.00	0.00	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	N/A
R-VALUE BY EXUDATION:	70
EQUILIBRIUM R-VALUE:	70

R-VALUE TEST RESULTS
ASTM D 2844

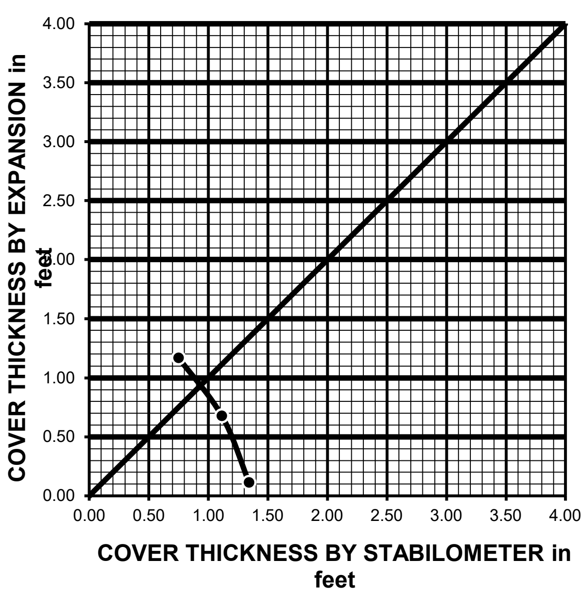
Leighton

Project Name:	Meridian Village West Dr. Ext.	Date:	1/27/20
Project Number:	11227.021	Technician:	F. Mina
Boring Number:	T-6	Depth (ft.):	3.0 - 4.0
Sample Number:	B-1	Sample Location:	N/A
Sample Description:	Silty, Clayey Sand (SC-SM), Dark Reddish Brown		

TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	9.7	10.7	11.8
HEIGHT OF SAMPLE, Inches	2.49	2.55	2.50
DRY DENSITY, pcf	117.2	117.1	105.5
COMPACTOR AIR PRESSURE, psi	150	125	100
EXUDATION PRESSURE, psi	717	477	259
EXPANSION, Inches x 10exp-4	31	18	3
STABILITY Ph 2,000 lbs (160 psi)	54	87	117
TURNS DISPLACEMENT	4.32	4.78	4.78
R-VALUE UNCORRECTED	53	31	16
R-VALUE CORRECTED	53	31	16

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.75	1.11	1.34
EXPANSION PRESSURE THICKNESS, ft.	1.17	0.68	0.11

EXPANSION PRESSURE CHART



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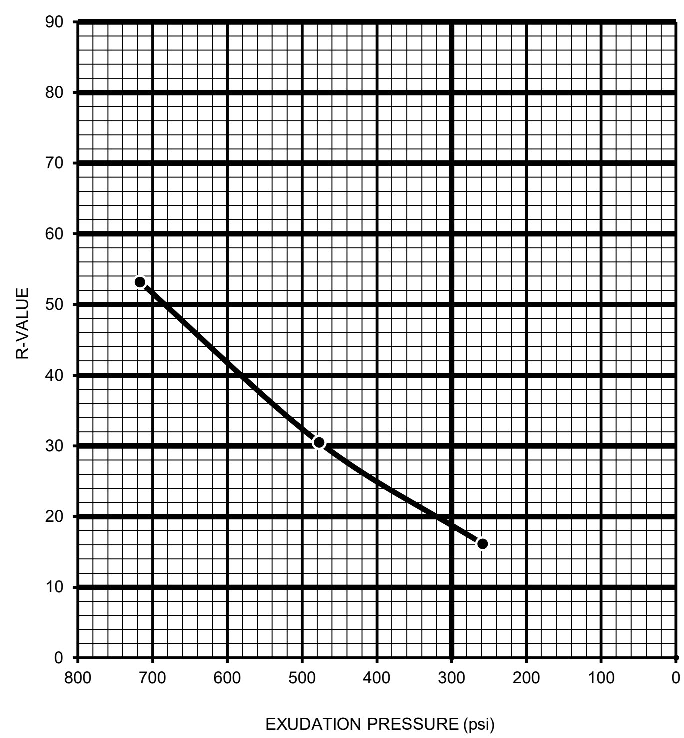


R-VALUE BY EXPANSION:	41
R-VALUE BY EXUDATION:	19
EQUILIBRIUM R-VALUE:	19

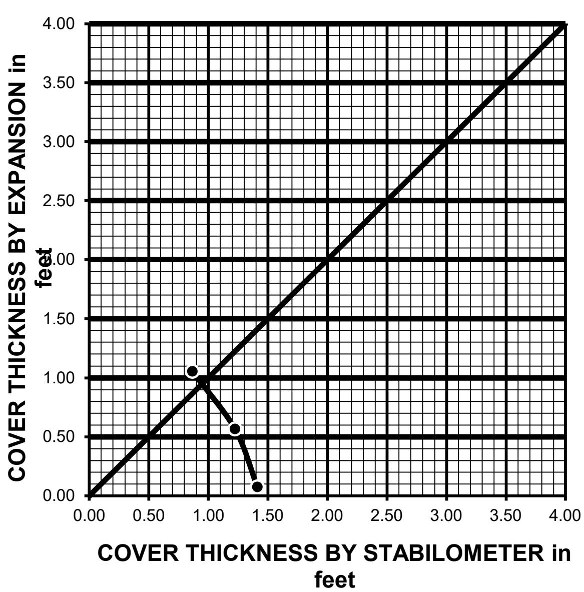
R-VALUE TEST RESULTS
ASTM D 2844

Project Name:	Meridian Village West Dr. Ext.	Date:	1/27/20
Project Number:	11227.021	Technician:	F. Mina
Boring Number:	T-10	Depth (ft.):	2.0 - 3.0
Sample Number:	B-1	Sample Location:	N/A
Sample Description:	Silty, Clayey Sand (SC-SM), Dark Reddish Brown		

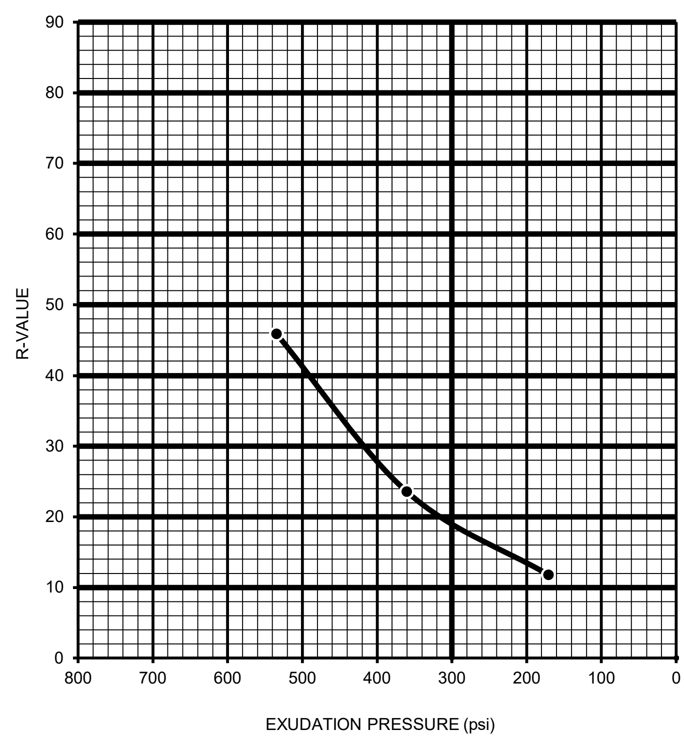
TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	11.7	12.8	13.9
HEIGHT OF SAMPLE, Inches	2.52	2.55	2.53
DRY DENSITY, pcf	116.8	116.8	115.9
COMPACTOR AIR PRESSURE, psi	150	125	100
EXUDATION PRESSURE, psi	535	360	171
EXPANSION, Inches x 10exp-4	28	15	2
STABILITY Ph 2,000 lbs (160 psi)	64	101	127
TURNS DISPLACEMENT	4.42	4.74	4.87
R-VALUE UNCORRECTED	46	24	12
R-VALUE CORRECTED	46	24	12

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.87	1.22	1.41
EXPANSION PRESSURE THICKNESS, ft.	1.06	0.57	0.08

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	41
R-VALUE BY EXUDATION:	19
EQUILIBRIUM R-VALUE:	19

TESTS for SULFATE CONTENT CHLORIDE CONTENT and pH of SOILS

Leighton

Project Name:	Meridian Village West Dr. Ext	Tested By :	M. Vinet	Date: 01/29/20
Project No. :	11227.021	Data Input By:	M. Vinet	Date: 01/29/20

Boring No.	T-6			
Sample No.	B-1			
Sample Depth (ft)	3.0 - 4.0			
Soil Identification:	Silty, Clayey Sand (SC-SM)			
Wet Weight of Soil + Container (g)	100.00			
Dry Weight of Soil + Container (g)	100.00			
Weight of Container (g)	0.00			
Moisture Content (%)	0.00			
Weight of Soaked Soil (g)	100.00			

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	1			
Crucible No.	1			
Furnace Temperature (°C)	850			
Time In / Time Out	Timer			
Duration of Combustion (min)	45			
Wt. of Crucible + Residue (g)	25.2228			
Wt. of Crucible (g)	25.2199			
Wt. of Residue (g) (A)	0.0029			
PPM of Sulfate (A) x 41150	119.34			
PPM of Sulfate, Dry Weight Basis	**119**			

CHLORIDE CONTENT, DOT California Test 422

ml of Extract For Titration (B)	30			
ml of AgNO3 Soln. Used in Titration (C)	0.4			
PPM of Chloride (C -0.2) * 100 * 30 / B	20			
PPM of Chloride, Dry Wt. Basis	**20**			

pH TEST, DOT California Test 643

pH Value	**5.42**			
Temperature °C	21.0			

SOIL RESISTIVITY TEST

DOT CA TEST 643

Leighton

Project Name:	Meridian Village West Dr. Ext	Tested By :	M. Vinet	Date:	01/29/20
Project No. :	11227.021	Data Input By:	M. Vinet	Date:	01/29/20
Boring No.:	T-6	Depth (ft.) :	3.0 - 4.0		
Sample No. :	B-1				

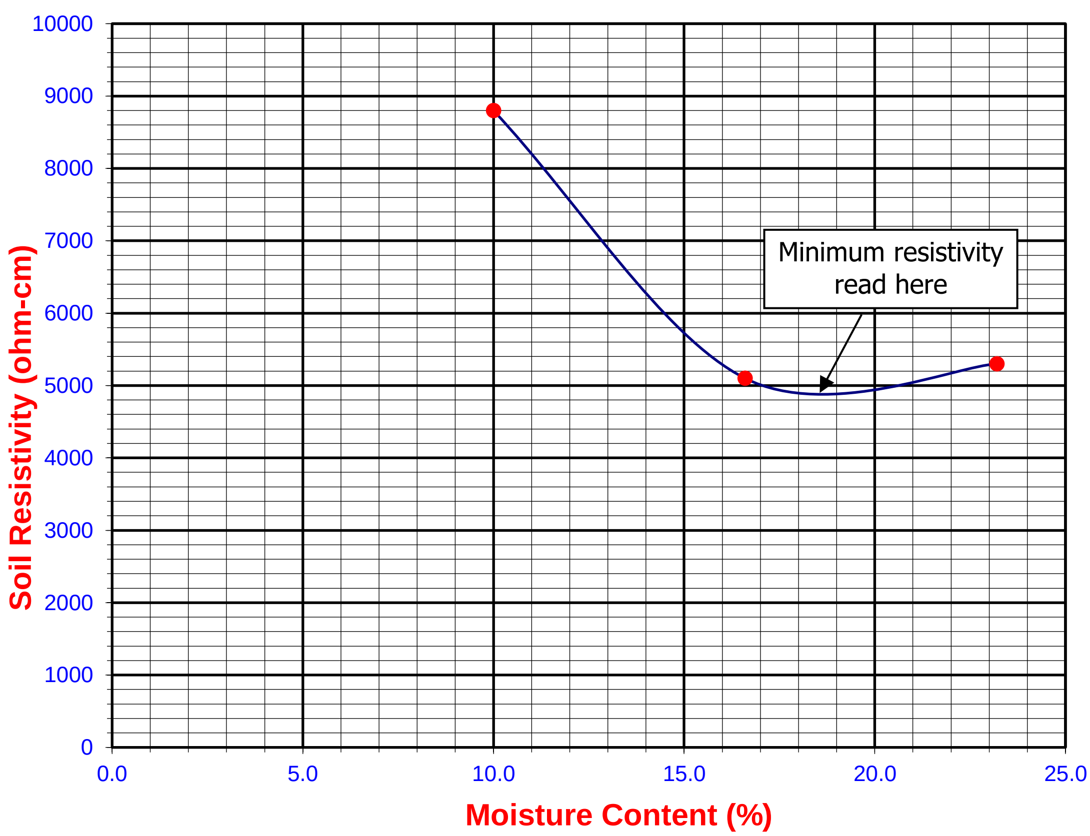
Soil Identification:* Silty, Clayey Sand (SC-SM)

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	50	10.00	8800	8800
2	83	16.60	5100	5100
3	116	23.20	5300	5300
4				
5				

Moisture Content (%) (MCi)	0.00
Wet Wt. of Soil + Cont. (g)	100.00
Dry Wt. of Soil + Cont. (g)	100.00
Wt. of Container (g)	0.00
Container No.	A
Initial Soil Wt. (g) (Wt)	500.00
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
4850	**18.5**	**119**	**20**	**5.42**	**21.0**



APPENDIX C

GBA Important Information About This Geotechnical Report

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:
- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:
- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

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