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Project No. 16151-01

Mr. Michael Schlesinger
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Subject: ***Preliminary Geotechnical Evaluation for Proposed Approximately 331 Acre "Fleming Ranch" Development, City of Menifee, Riverside County, California***

In accordance with your request and authorization, LGC Geotechnical, Inc. has provided this preliminary geotechnical report that incorporates a response to a geotechnical comment, for the proposed approximately 331-acre residential and commercial development of the "Fleming Ranch" property located southeast of the intersection of Encanto Drive and Rouse Road in Menifee Valley, California. The site development plan dated November 14, 2017 (K&A, 2017) was used to present the project herein. The purpose of our study was to evaluate the existing onsite geotechnical conditions and to provide our preliminary geotechnical recommendations relative to the proposed residential development.

Should you have any questions regarding this report, please do not hesitate to contact our office. We appreciate this opportunity to be of service.

Respectfully Submitted,

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1.0 INTRODUCTION

1.1 Purpose and Scope of Services

This report presents the results of our preliminary geotechnical evaluation for the approximately 331-acre "Fleming Ranch" residential and commercial development proposed for the vacant land located east of Encanto Drive and south of Rouse Road in Menifee Valley, California. Refer to the Site Location Map and Conceptual Plan (Figure 1). The plan depicted is based on the K&A Engineering plan titled "Fleming Ranch Site Plan", dated November 14, 2017.

The purpose of our study was to provide our preliminary geotechnical evaluation relative to the proposed residential development. As part of our scope of work, we have: 1) reviewed available previous geotechnical reports and in-house geologic maps pertinent to the site (Appendix A); 2) performed a limited subsurface geotechnical evaluation of the site consisting of the excavation and sampling of five small-diameter borings ranging from approximately 4 to 11 feet below existing ground surface, 3) performed five falling head field percolation tests within selected hollow stem borings; 4) trenched 15 exploratory backhoe test pits, 5) drilled and collected data from 19 "air track" borings; 6) performed laboratory testing of select soil samples obtained during our subsurface evaluation, and 7) prepared this preliminary geotechnical summary report presenting our findings, preliminary conclusions and recommendations for the development of the proposed project.

A geotechnical review comment dated September 19, 2017 was received from City of Menifee geotechnical reviewers NV5 West, Inc. (2017). A response to comment letter was subsequently provided by LGC Geotechnical (2017b). This report has been updated to include our revised recommendations relative to our response.

1.2 Project Description

The subject site is a roughly rectangular-shaped parcel bound at the west by Encanto Drive (and the I-15 Freeway), at the north by Rouse Road, to the east by open space, and to the south by residential and commercial developments. The site is gently sloping, with the lowest area approximately 1,425 feet above mean sea level (msl) in the southwestern portion of the site, and the highest area approximately 1,650 feet above msl in the northeastern portion of the site. The site is currently vacant, lightly vegetated, with shallow drainage swales. Drainage is currently received across the western portion of the site from the residential tract located south of the site.

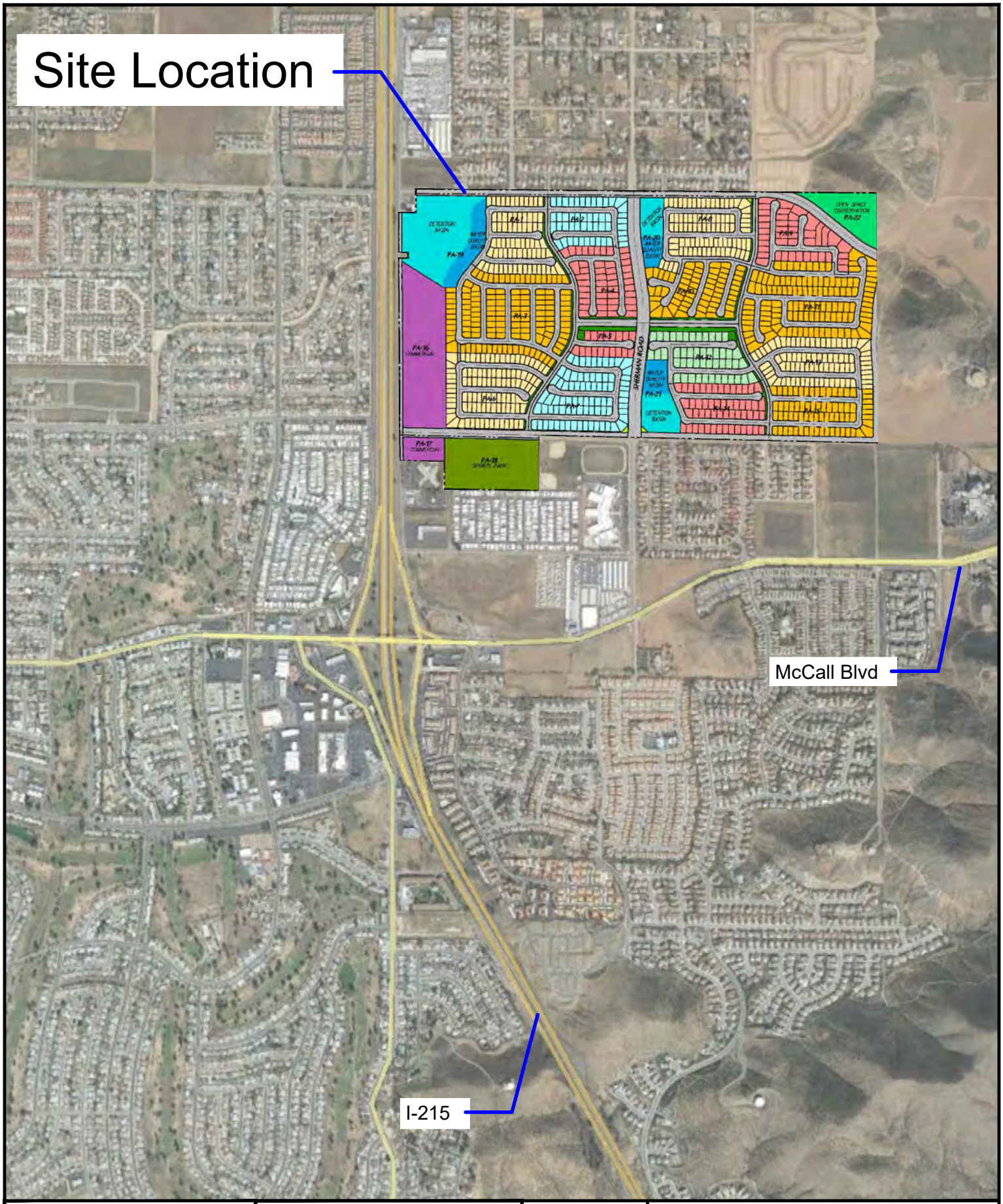
Based on the provided Conceptual Site Plan (refer to Site Location Map with Conceptual Plan, Figure 1), the proposed approximately 331-acre development will consist of approximately 1,080 residential lots, two parks, three water quality/detention basins, and commercial space to be accessed from Encanto Drive. Planned cut and fill to reach design grade (not including required remedial grading) is generally anticipated to be on the order of a few feet; however, specific areas are anticipated to require as much as 13 feet of cut or fill. Three water quality basins are proposed within the site: one at the north-central portion, one at the south-central portion and one along the northwestern portion of the site. Proposed slopes are anticipated to be 10 feet or less in overall height. The proposed development will be at-grade with anticipated relatively light building loads (column and wall loads maximum of 20 kips and 2 kips per lineal foot, respectively).

The recommendations given in this report are based upon at-grade structures with estimated structural loads and general grading information indicated above. LGC Geotechnical should be provided with any updated project information, plans and/or any structural loads when they become available, in order to either confirm or modify the recommendations provided herein.

1.3 Background

Previously, Zeiser Kling Consultants, Inc. (Zeiser), and Leighton and Associates, Inc. (Leighton) performed a limited geotechnical feasability study, and preliminary geotechnical investigation in 2004 and 2005, respectively. Data from Zeiser (2004) consists of eight small diameter borings ranging in depth from 4 to 26.5 feet below existing grade, 10 test pits ranging in depth from 5 to 15 feet below existing grade, and four seismic lines. Data from Leighton (2005) consists of eight small diameter borings ranging in depth from 20 to 51.5 feet below existing grade and results of laboratory testing of representative site materials. Laboratory testing by others included shear strength, hydrocollapse, maximum dry density (Modified Proctor), expansion index, consolidation parameters, No. 200 sieve, and corrosion suite (soluble sulfate content, pH, resistivity and chloride content).

Boring logs, trench logs, seismic refraction surveys and laboratory test results are compiled and included in this report. Results of laboratory testing is presented on boring logs (Appendix B) and in the appendix of laboratory testing results (Appendix C).



LGC Geotechnical, Inc.

FIGURE 1
Site Location Map
With Conceptual Plan

PROJECT NAME	Fleming Ranch
PROJECT NO.	16151-01
ENG. / GEOL.	KTM / DJB
SCALE	Not to Scale
DATE	November 2017

1.4 Subsurface Geotechnical Evaluation

A limited subsurface geotechnical evaluation of the site was performed by LGC Geotechnical, consisting of a combination of shallow backhoe test pits, hollow-stem auger borings, and air track borings. Fifteen exploratory backhoe test pits were excavated to depths of up to approximately 3 to 8 feet below existing ground surface and evaluated by an engineering geologist. The test pits were performed in order to characterize the near surface materials and estimate the depth of required earthwork removals during grading. Test pits were backfilled with a compaction wheel.

Six small-diameter exploratory hollow-stem borings (I-1 through I-5 and HS-1) were drilled. Five of the borings were drilled for the purpose of percolation testing. The borings were drilled by California Pacific Drilling, Inc., under subcontract to LGC Geotechnical, using a truck-mounted drill rig equipped with 8-inch-diameter hollow-stem augers. The depths of the borings ranged from approximately 4 to 11 feet below existing grade. An LGC Geotechnical representative observed the drilling operations, logged the borings, and collected soil samples for laboratory testing. Bulk samples of the near-surface soils were logged and collected for laboratory testing from select borings. Driven soil samples were collected by means of the Standard Penetration Test (SPT) and Modified California Drive (MCD) sampler. The MCD is a split-barrel sampler with a tapered cutting tip and lined with a series of 1-inch-tall brass rings. The SPT sampler (1.4-inch ID) and MCD sampler (2.4-inch ID, 3.0-inch OD) were driven using a 140-pound automatic hammer falling 30 inches to advance the sampler a total depth of 18 inches or until refusal. The raw blow counts for each 6-inch increment of penetration were recorded on the boring logs.

Air track borings were performed within the areas of existing visible rock outcroppings. In general, these are located within the northeastern and eastern portion of site. Air track borings are an effective method of evaluating rippability of rock by timing the rate of penetration. The time required to advance an air track boring is recorded for each foot of drilling. Refer to Section 2.5, rippability, for additional discussion. In addition, some air track borings were done in areas with surficial soil deposits to determine the shape of the subsurface contact between soil and rock below the soil.

The approximate locations of subsurface explorations are provided on the Geotechnical Map, Sheet 1. The boring logs, trench logs, and air track data from the previous and current subsurface investigations are provided in Appendix B.

1.5 Field Percolation Testing

Field percolation testing consisted of falling head (I-1 to I-5) tests was performed in general accordance with the guidelines set forth by the County of Riverside (2011). A 3-inch-diameter perforated PVC pipe was placed in the boreholes to approximate depths of the proposed basins and the annulus was backfilled with gravel to the surface. The infiltration wells were pre-soaked per the County guidelines. Based on the County of Riverside methodology, the observed infiltration rate, summarized in Table 1, has been normalized the three-dimensional flow that occurs within the field test to a one-dimensional flow out of the bottom of the boring only.

TABLE 1

Summary of Infiltration Testing

Boring/Infiltration Location	Observed Infiltration Rate* (in. /hr.)
I-1	0.0
I-2	0.1
I-3	0.0
I-4	1.2**
I-5	0.0

*Does not include required factors of safety for design, refer to Section 4.7.
**Anomolous result; not considered representative of onsite soil conditions.

The approximate location of the field infiltration tests are shown on the Geotechnical Map, Sheet 1, and the infiltration test data is provided in Appendix B.

1.6 Laboratory Testing

Representative bulk samples were retained for laboratory testing during our field evaluation. Laboratory testing included Atterberg Limits, expansion index, collapse/swell, corrosion (sulfate, chloride, pH and minimum resistivity) and R-Value.

The following is a summary of the laboratory test results:

- Two Atterberg Limit (liquid limit and plastic limit) tests were performed. Results indicated Plasticity Index values of 16 and 25.
- Expansion potential testing of four bulk samples indicated expansion index values ranging from 11 to 58, corresponding to “Very Low” to “Medium” expansion potential.
- A collapse test was performed. The plot is provided in Appendix C.
- Corrosion testing indicated soluble sulfate content of less than 0.01 percent, a chloride content of 22 parts per million (ppm), pH of 7.1 and a minimum resistivity of 978 ohm-centimeters.
- A near surface bulk sample resulted in an R-Value of 57.

A summary of the laboratory test results is presented in Appendix C.

2.0 GEOTECHNICAL CONDITIONS

2.1 Regional Geology

The subject site is generally located in the west-central portion of the broad San Bernardino Basin that is bound to the north by the San Gabriel Mountains and to the west by the Santa Ana Mountains. Regional topography is dominated by the presence of the northwest trending faults that define the mountains and hills of the Southern California region. Structurally, the site is located on the west-central portion of the Perris block of the northern Peninsular Ranges of Southern California. The 'Perris block' is bound by the Elsinore fault zone to the west and the San Jacinto fault zone to the east. Despite the surrounding proximal fault systems, the low relief of the Perris block has remained near unchanged and undeformed for hundreds of thousands of years (Doehring, 1971; Leighton, 2005; Menifee General Plan, 2012).

2.2 Site-Specific Geology

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The primary geologic units underlying the site are Quaternary old and Quaternary very old alluvial fan deposits, and Cretaceous gabbro and Mesozoic metasedimentary rock (undifferentiated rock formations) (Morton & Matti, 2001). The old and very old alluvial fan deposits consist of well indurated brownish coarse-grained conglomerate to sandy alluvium. Cretaceous gabbro is derived from Peninsular Ranges granitic batholith and likely intruded Mesozoic metasedimentary and metavolcanic rocks. The coarse-grained horneblende gabbro and hornblende-biotite granodiorite to tonalite (aka, "granitic rock") are exposed as weathered surficial boulders. It has been theorized that the granitic rock has isolated zones of much harder material than the weathered upper surface of the rock. Termed "corestones", they may be the hardened result of locally metamorphosed (via heat and pressure) granitic rock.

Refer to the Geotechnical Map, Sheet 1, for lateral extent of the site geologic units.

2.3 Generalized Subsurface Conditions

The field explorations indicate the site is primarily underlain by stiff to very stiff soil horizons consisting of sandy clay to silt layers, and dense silty sand layers underlain by bedrock and/or older alluvial fan deposits. The "older" soils cap the shallow bedrock that underlies the northeastern portion of the site. The granitic bedrock forms the rocky hills at the northeastern portion of the site and becomes gradually deeper going west. The thickening westward wedge of older soils was observed to be locally incised by very old drainage pathways. Based on our experience in these materials, sometimes the current drainage pattern obscures older incised drainage areas.

It should be noted that borings are only representative of the location and time where/when they are performed and varying subsurface conditions may exist outside of the performed location. In addition, subsurface conditions can change over time. The soil descriptions provided above should not be construed to mean that the subsurface profile is uniform and that soil is homogeneous within the project area. For details on the stratigraphy at the exploration locations, refer to Appendix B.

2.4 Groundwater

Groundwater was not encountered to the maximum depth of approximately 11 feet below existing ground surface during our subsurface evaluation. Previously groundwater was encountered at the site from 17 feet to 30 feet below existing grade (Leighton, 2005). The subsurface water was interpreted as perched or local groundwater derived from seasonal precipitation. Significant groundwater is not expected to be encountered during earthwork grading.

Seasonal fluctuations of groundwater elevations should be expected over time. In general, groundwater levels fluctuate with the seasons and local zones of perched groundwater may be present due to local seepage caused by irrigation and/or recent precipitation. Local perched groundwater conditions or surface seepage may develop once site development is completed.

2.5 Rippability

Air track borings have been excavated at the site as a means to characterize excavatability and rippability of crystalline bedrock at the eastern portion of the site. Data are presented in Appendix B and locations of borings are presented on the Geotechnical Map, Sheet 1. A frequently used guideline to equate rock rippability to drill penetration rate is that a penetration rate of approximately 0 to 20 seconds per foot (spf) generally indicates rippable material, 20 to 30 spf indicates marginally to non-rippable material, and greater than 30 spf indicates non-rippable rock. At the site, the majority of the near-surface bedrock is considered rippable to marginally rippable. Occasionally, corestones were encountered during the air track evaluation and appear to be several feet in diameter. However, they are known in this area to sometimes be larger. Seismic line surveys indicated scattered large corestones are present at variable depths. Corestones are generally irreducible by conventional earthwork equipment and will require removal, extra handling, and/or splitting.

Based upon our field observations and review of previous reports, we anticipate that near-surface bedrock and alluvium encountered near the surface will be readily excavatable with conventional earthwork equipment utilizing ‘standard-to-heavy ripping” techniques. In localized areas that expose bedrock corestones, “heavy ripping” techniques and/or splitting may be required. Resulting oversized rock fragments should follow the rock placement guidelines set forth in the General Earthwork and Grading Specifications, Appendix E.

2.6 Seismic Design Criteria

The site seismic characteristics were evaluated per the guidelines set forth in Chapter 16, Section 1613 of the 2016 California Building Code (CBC). Representative site coordinates of latitude 33.7252 degrees north and longitude -117.1797 degrees west, were utilized in our analyses. Please note that these coordinates are considered representative of the site for preliminary planning purposes, however their applicability must be verified with respect to a desired specific location within the site. The maximum considered earthquake (MCE) spectral response accelerations (S_{MS} and S_{M1}) and adjusted design spectral response acceleration parameters (S_{DS} and S_{D1}) for Site Class D are provided in Table 2 below.

Section 1803.5.12 of the 2016 CBC (per Section 11.8.3 of ASCE 7) states that the maximum considered earthquake geometric mean (MCE_G) Peak Ground Acceleration (PGA) should be used for

liquefaction potential. The PGA_M for the site is equal to 0.50g (USGS, 2015).

A deaggregation of the PGA based on a 2,475-year average return period indicates that an earthquake magnitude of 6.9 at a distance of approximately 16 km from the site would contribute the most to this ground motion (USGS, 2008).

TABLE 2

Seismic Design Parameters

Selected Parameters from 2016 CBC, Section 1613 - Earthquake Loads	**Seismic Design Values**
Site Class per Chapter 20 of ASCE 7	D
Risk-Targeted Spectral Acceleration for Short Periods (S_S)*	1.500g
Risk-Targeted Spectral Accelerations for 1-Second Periods (S_1)*	0.600g
Site Coefficient F_a per Table 1613.3.3(1)	1.0
Site Coefficient F_v per Table 1613.3.3(2)	1.5
Site Modified Spectral Acceleration for Short Periods (S_{MS}) for Site Class D [Note: $S_{MS} = F_aS_S$]	1.500g
Site Modified Spectral Acceleration for 1-Second Periods (S_{M1}) for Site Class D [Note: $S_{M1} = F_vS_1$]	0.900g
Design Spectral Acceleration for Short Periods (S_{DS}) for Site Class D [Note: $S_{DS} = (^2/_3)S_{MS}$]	1.000g
Design Spectral Acceleration for 1-Second Periods (S_{D1}) for Site Class D [Note: $S_{D1} = (^2/_3)S_{M1}$]	0.600g
Mapped Risk Coefficient at 0.2 sec Spectral Response Period, C_{RS} (per ASCE 7)	1.053
Mapped Risk Coefficient at 1 sec Spectral Response Period, C_{R1} (per ASCE 7)	1.032

* From USGS, 2017

2.7 Faulting

Prompted by damaging earthquakes in Northern and Southern California, State legislation and policies concerning the classification and land-use criteria associated with faults have been developed. Their purpose was to prevent the construction of urban developments across the trace of active faults, resulting in the Alquist-Priolo Earthquake Fault Zoning Act. Earthquake Fault Zones have been delineated along the traces of active faults within California. Where developments for human occupation are proposed within these zones, the State requires detailed fault evaluations be performed

so that engineering geologists can mitigate the hazards associated with active faulting by identifying the location of active faults and allowing for a setback from the zone of previous ground rupture.

The subject site is not located within an Alquist-Priolo Earthquake Fault Zone and no faults were identified on the site during our site evaluation. The possibility of damage due to ground rupture is considered low since no active faults are known to cross the site.

Secondary effects of seismic shaking resulting from large earthquakes on the major faults in the Southern California region, which may affect the site, include ground lurching, shallow ground rupture, soil liquefaction and dynamic settlement. These secondary effects of seismic shaking are a possibility throughout the Southern California region and are dependant on the distance between the site and causative fault and the onsite geology. The closest active fault is the Temecula segment of the Elsinore Fault Zone; an active, right-lateral, strike-slip fault, located approximately 10.7 miles southwest of the site. Some additional major active nearby faults that could produce these secondary effects include the Cucamonga, Elsinore, San Jacinto, and San Andreas Fault Zones, among others (CGS, 2007). A discussion of these secondary effects is provided in the following sections.

2.7.1 Liquefaction and Dynamic Settlement

Liquefaction is a seismic phenomenon in which loose, saturated, granular soils behave similarly to a fluid when subject to high-intensity ground shaking. Liquefaction occurs when three general conditions coexist: 1) shallow groundwater; 2) low density non-cohesive (granular) soils; and 3) high-intensity ground motion. Studies indicate that saturated, loose to medium dense, near-surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential. In general, cohesive soils are not considered susceptible to liquefaction, depending on their plasticity or Liquid Limit compared to in-situ moisture content. Effects of liquefaction on level ground include settlement, sand boils, and bearing capacity failures below structures. Dynamic settlement of dry loose sands can occur as the sand particles tend to settle and densify as a result of a seismic event.

The site is not located within a mapped zone for liquefaction potential (City of Menifee General Plan, 2012). Liquefaction analysis was performed on the 50-foot borings B-4 and B-5 performed by Leighton (Leighton, 2005) based on the seismic criteria (PGA_M) of the 2016 California Building Code (CBC) and high groundwater depth. Liquefaction potential was evaluated using the procedures outlined by NCEER (1997) and Youd et al., (2001). Due to the dense to very dense nature of soils based on SPT blow counts ($(N_1)_{60}$), site soils are not considered susceptible to liquefaction. The silt layer encountered in boring B-4 at 30 and 35 feet is not considered susceptible to liquefaction based on Bray's criteria for Liquid Limit (Bray & Sancio, 2006). Refer to liquefaction analysis provided in Appendix D.

Seismic settlement due to dry sands is estimated to be on the order of about ½-inch or less. Differential settlement may be estimated as ¼-inch settlement over a horizontal span of 40 feet

2.7.2 Lateral Spreading

Lateral spreading is a type of liquefaction-induced ground failure associated with the lateral displacement of surficial blocks of sediment resulting from liquefaction in a subsurface layer. Once liquefaction transforms the subsurface layer into a fluid mass, gravity plus the earthquake inertial forces may cause the mass to move downslope towards a free face (such as a river channel or an embankment). Lateral spreading may cause large horizontal displacements and such movement typically damages pipelines, utilities, bridges, and structures.

Due to the very low potential for liquefaction, the potential for lateral spreading is also considered very low.

3.0 CONCLUSIONS

Based on the results of our geotechnical evaluation, it is our opinion that the proposed development is feasible from a geotechnical standpoint, provided the following conclusions and recommendations are implemented.

The following is a summary of the primary geotechnical factors that may affect future development of the site:

- In general, site geotechnical conditions consist of dense older alluvial fan deposits over crystalline bedrock at the eastern half of the site, and old and very old fan deposit at the western half of the site. Borings in alluvial materials indicate primarily medium dense to dense sands, silts, and clays, with variable amounts of gravels, cobbles, and few boulders to the maximum explored depth of approximately 50 feet below current grade. The near-surface loose and compressible soils are not suitable for the planned improvements in their present condition (refer to Section 4.1).
- Granitic bedrock in the eastern portion of the site is anticipated to be rippable to marginally rippable with conventional earthwork equipment in good working order. Bedrock materials will be generally rippable to the required depths; however, oversize rock will be generated. Some areas of "heavy ripping" will be required, and "corestones" will be exposed that are generally irreducible with conventional techniques.
- Groundwater was not encountered during our subsurface evaluation to the maximum explored depth of approximately 11 feet below current grade. Groundwater was encountered in previous geotechnical investigations as shallow as 17 feet below existing grade. Regional groundwater is estimated to be approximately 50 feet below current grades (Leighton, 2005). Shallower groundwater is considered 'perched'.
- Active or potentially active faults are not known to exist on or immediately adjacent to the site. The main seismic hazard that may affect the site is ground shaking from one of the active regional faults. The subject site will likely experience strong seismic ground shaking during its design life.
- The site is not located in a mapped zone for liquefaction potential per the City of Menifee (2012b) and the potential for liquefaction is considered very low. Due to the dense to very dense nature of soils based on SPT blow counts, site soils are not considered susceptible to liquefaction. Seismic settlement due to dry sands is estimated to be on the order of about ½-inch or less. Differential settlement may be estimated as ¼ -inch settlement over a horizontal span of 40 feet
- Based on the results of preliminary laboratory testing, site soils are generally anticipated to have "Very Low to Low" expansion potential with potentially localized areas of "Medium" expansion potential. For preliminary design purposes, "Low" expansion potential may be used. Final design expansion potential should be determined at the completion of grading.
- The site contains oversized material (defined as rock larger than 8 inches in maximum dimension) and should be anticipated to be encountered during grading. From a geotechnical perspective, the existing onsite soils are suitable material for use as general fill, provided that they are relatively free from oversize material, construction debris, and significant organic material.
- Site contains clayey soils with high fines content that are not suitable for backfill of retaining walls. Therefore, import and/or potential select grading and stockpiling of on-site sandy soils meeting project recommendations will be required.
- Field testing resulted in infiltration rates ranging from no infiltration to 1.2 inches per hour in I-4. The infiltration rates do not include a factor of safety. It is our opinion that the results I-4 is an anomaly and not considered representative of the site. Site will consist of compacted fill over shallow dense formational soils

with very low permeability, and therefore the site is anticipated to have very low to non-existent infiltration rates after earthwork is completed.

4.0 PRELIMINARY RECOMMENDATIONS

The following recommendations are to be considered preliminary, and should be confirmed upon completion of grading and earthwork operations. In addition, they should be considered minimal from a geotechnical viewpoint, as there may be more restrictive requirements from the architect, structural engineer, building codes, governing agencies, or the owner.

It should be noted that the following geotechnical recommendations are intended to provide sufficient information to develop the site in general accordance with the 2016 CBC requirements. With regard to the potential occurrence of potentially catastrophic geotechnical hazards such as fault rupture, earthquake-induced landslides, liquefaction, etc. the following geotechnical recommendations should provide adequate protection for the proposed development to the extent required to reduce seismic risk to an "acceptable level." The "acceptable level" of risk is defined by the California Code of Regulations as "that level that provides reasonable protection of the public safety, though it does not necessarily ensure continued structural integrity and functionality of the project" [Section 3721(a)]. Therefore, repair and remedial work of the proposed improvements may be required after a significant seismic event. With regards to the potential for less significant geologic hazards to the proposed development, the recommendations contained herein are intended as a reasonable protection against the potential damaging effects of geotechnical phenomena such as expansive soils, fill settlement, groundwater seepage, etc. It should be understood, however, that although our recommendations are intended to maintain the structural integrity of the proposed development and structures given the site geotechnical conditions, they cannot preclude the potential for some cosmetic distress or nuisance issues to develop as a result of the site geotechnical conditions.

The geotechnical recommendations contained herein must be confirmed to be suitable or modified based on the geotechnical grading plan review and/or the actual as-graded conditions.

4.1 Site Earthwork

We anticipate that earthwork at the site will consist of the required earthwork removals, precise grading and construction of the proposed new improvements including residential structures, neighborhood amenities, subsurface utilities, interior streets, etc.

We recommend that earthwork onsite be performed in accordance with the following recommendations, future grading plan review report(s), the 2016 CBC/City of Menifee grading requirements, and the General Earthwork and Grading Specifications included in Appendix E. In case of conflict, the following recommendations shall supersede those included in Appendix E.

The following recommendations should be considered preliminary and may be revised within the future grading plan review report or based on the actual conditions encountered during site grading.

4.1.1 Site Preparation

Prior to grading of areas to receive structural fill or engineered improvements, the areas should be cleared of existing asphalt, surface obstructions, and demolition debris. Vegetation and debris should be removed and properly disposed of off-site. Holes resulting from the removal of

buried obstructions, which extend below proposed finish grades, should be replaced with suitable compacted fill material.

If cesspools or septic systems are encountered they should be removed in their entirety. The resulting excavation should be backfilled with properly compacted fill soils. As an alternative, cesspools can be backfilled with lean sand-cement slurry. Any encountered wells should be properly abandoned in accordance with regulatory requirements. At the conclusion of the clearing operations, a representative of LGC Geotechnical should observe and accept the site prior to further grading.

4.1.2 Removal Depths and Limits

In order to provide relatively uniform bearing conditions for the planned improvements, we recommend a minimum removal depth of approximately 2 to 6 feet below existing grade, or 1-foot below the deepest footing, whichever is deeper. Where practical, the envelope for removals should extend laterally a minimum distance of 5 feet beyond the edges of the proposed improvements. Refer to the Geotechnical Map, Sheet 1, for details.

For retaining walls, free-standing walls, and screen walls, removals should extend at least 2 feet beneath the existing grade or 1-foot beneath the base of foundations, whichever is deeper. Within pavement and hardscape areas, removals should extend to a depth of at least 2 feet below existing grades. Removals within areas of design cut (relative to pavement subgrade) should be performed to a depth that is a minimum of 2 feet below existing grades or 1-foot below pavement subgrade, whichever is deeper. In general, the envelope for over-excavation should extend laterally a minimum distance of 2 feet beyond the edges of the proposed improvements.

Local conditions may be encountered during excavation that could require additional removals beyond the above-noted minimums in order to obtain an acceptable subgrade. The actual depths and lateral extents of grading will be determined by the geotechnical consultant, based on subsurface conditions encountered during grading. Several methods will be utilized in determining the suitability of the material observed in the removal bottom excavations. Visual observation of material, how it performs as the construction equipment passes over it, probing and occasional field density testing of the removal bottoms will be performed by our field technician and/or field geologist. When field density test data is utilized for approval of native material, an in-place relative compaction of 85 percent or greater and a degree of saturation of 85 percent or greater will be considered suitable. Removal areas should be accurately staked in the field by the Project Surveyor.

4.1.3 Temporary Excavations

Temporary excavations should be performed in accordance with project plans, specifications, and all Occupational Safety and Health Administration (OSHA) requirements. Excavations should be laid back or shored in accordance with OSHA requirements before personnel or equipment are allowed to enter.

Based on our field evaluation, the majority of the site soils upper approximate 5 feet are anticipated to be OSHA Type "C" soils (refer to the attached boring logs). Soil conditions should be regularly evaluated during construction to verify conditions are as anticipated. The contractor shall be responsible for providing the "competent person" required by OSHA standards to evaluate soil conditions. Sandy soils are present and should be considered susceptible to caving. Close coordination with the geotechnical consultant should be maintained to facilitate construction while providing safe excavations. Excavation safety is the sole responsibility of the contractor.

Vehicular traffic, stockpiles, and equipment storage should be set back from the perimeter of excavations a distance equivalent to a 1:1 projection from the bottom of the excavation. Once an excavation has been initiated, it should be backfilled as soon as practical. Prolonged exposure of temporary excavations may result in some localized instability. Excavations should be planned so that they are not initiated without sufficient time to shore/fill them prior to weekends, holidays, or forecasted rain.

It should be noted that any excavation that extends below a 1:1 (horizontal to vertical) projection of an existing foundation will remove existing support of the structure foundation. If requested, temporary shoring parameters will be provided.

4.1.4 Removal Bottoms and Subgrade Preparation

Removal bottoms should consist of dense alluvial fan deposit or competent bedrock that has been observed and/or tested and accepted by the geotechnical consultant based on the removal criteria as outlined in preceding Section 4.1.2. In general, prior to fill placement, removal bottoms and any areas to receive compacted fill should be scarified to a minimum depth of 6 inches, brought to a near-optimum moisture condition, and re-compacted per project recommendations.

4.1.5 Material for Fill

From a geotechnical perspective, the onsite soils are generally considered suitable for use as general compacted fill, provided they are screened of organic materials, construction debris and oversized material (8 inches in greatest dimension). Generation of oversize material should be anticipated. For fill depths less than 10 feet below proposed finish grade, oversize material should be removed from site fills and/or crushed into smaller pieces (less than 8 inches in greatest dimension) and well-blended into fill soils. As an alternative, a deeper excavation may be performed in order to create an area with fill deeper than 10 feet for disposal of oversize material in accordance with Appendix E. Additionally, oversize material may be placed in "non-structural" areas such as proposed passive park areas. Oversize material placed in non-structural areas should be clearly delineated as "non-structural" and potential long-term settlement should be anticipated in these areas.

From a geotechnical viewpoint, any required import soils for general fill (i.e., non-retaining wall backfill) should consist of clean, granular soils of "Very Low" to "Low" expansion potential (expansion index 50 or less based on ASTM D 4829), and generally free of organic materials, construction debris and material greater than 8 inches in maximum dimension. Import

for required retaining wall backfill should meet the criteria outlined in the following paragraph. Source samples should be provided to the geotechnical consultant for laboratory testing a minimum of four working days prior to planned importation.

Retaining wall backfill should consist of sandy soils with a maximum of 35 percent fines (passing the No. 200 sieve) per American Society for Testing and Materials (ASTM) Test Method D1140 (or ASTM D6913/D422) and a "Very Low" expansion potential (EI of 20 or less per ASTM D4829). Soils should also be screened of organic materials, construction debris, and material greater than 3 inches in maximum dimension. The site may contain soils that are not suitable for retaining wall backfill due to their fines content or due to oversize materials, therefore select grading and stockpiling or import may be required by the contractor for obtaining suitable retaining wall backfill soil.

Aggregate base (crushed aggregate base or crushed miscellaneous base) should conform to the requirements of Section 200-2 of the Standard Specifications for Public Works Construction ("Greenbook") for untreated base materials (except processed miscellaneous base) or Caltrans Class 2 aggregate base.

4.1.6 Placement and Compaction of Fills

Material to be placed as fill should be brought to near-optimum moisture content (generally between optimum and 2 percent above optimum moisture content) and recompacted to at least 90 percent relative compaction (per ASTM D1557). Significant moisture conditioning of site soils will be required in order to achieve adequate compaction. 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 compacted thickness. Each lift should be thoroughly compacted and accepted prior to subsequent lifts. Generally, placement and compaction of fill should be performed in accordance with local grading ordinances and with observation and testing performed by the geotechnical consultant.

During backfill of excavations, the fill should be properly benched into firm and competent soils of temporary backcut slopes as it is placed in lifts.

Aggregate base material should be compacted to at least 95 percent relative compaction at or slightly above optimum moisture content per ASTM D1557. Subgrade below aggregate base should be compacted to at least 90 percent relative compaction per ASTM D1557 at or slightly above optimum moisture content.

4.1.7 Trench and Retaining Wall Backfill and Compaction

The onsite soils may generally be suitable as trench backfill, provided the soils are screened of material greater than 6 inches in diameter, and organic matter. If trenches are shallow or the use of conventional equipment may result in damage to the utilities, sand having a Sand Equivalent (SE), per Caltrans Test Method (CTM) 217, of 30 or greater may be used to bed and shade the pipes. Sand backfill within the pipe bedding zone may be densified by jetting or flooding and then tamping to ensure adequate compaction. Subsequent trench backfill should be compacted

in uniform thin lifts by mechanical means to at least the recommended minimum relative compaction (per ASTM D1557).

Retaining wall backfill should consist of sandy soils as outlined in preceding Section 4.1.5. The limits of select sandy backfill should extend at minimum ½ the height of the retaining wall or the width of the heel (if applicable), whichever is greater (Refer to Figure 2, Rear of Text). Retaining wall backfill soils should be compacted in relatively uniform thin lifts to at least 90 percent relative compaction (per ASTM D1557). Jetting or flooding of retaining wall backfill materials should not be permitted.

A representative from LGC Geotechnical should observe, probe, and test the backfill to verify compliance with the project recommendations.

4.1.8 Shrinkage and Bulking

Volumetric changes in earth quantities will occur when excavated onsite earth materials are replaced as properly compacted fill. The following is an estimate of shrinkage and bulking factors for the various geologic units found onsite.

TABLE 3

Estimated Shrinkage and Bulking

Soil Type	Allowance	Estimated Range
Alluvium (upper 5 feet)	Shrinkage	5% to 10%
Alluvium (below 5 feet)	Shrinkage/Bulking	5% to 5%
Bedrock (upper 5 feet, weathered)	Bulking	10%
Bedrock (below 5 feet, less weathered)	Bulking	20%

Subsidence due to earthwork equipment is expected to be on the order of 0.1 to 0.2 feet. It should be stressed that these values are only estimates and that actual shrinkage factors are extremely difficult to predict. The effective shrinkage of onsite soils will depend primarily on the type of compaction equipment and method of compaction used onsite by the contractor. Additionally, the onsite geology is very complex; the above estimates are generalized groupings of similar lithologies and should be expected to vary across the site and with depth. The above shrinkage estimates are intended as an aid for others in determining preliminary earthwork quantities. However, these estimates should be used with some caution since they are not absolute values.

Contingencies should be made for balancing earthwork quantities based on actual shrinkage and subsidence that occurs during grading. If importing/exporting a large volume of soils is not considered feasible or economical, we recommend a balance area be designated onsite that can fluctuate up or down based on the actual volume of soil. We recommend a “balance” area that can accommodate on the order of 5 percent (plus or minus) of the total grading volume be considered.

4.2 Preliminary Foundation Recommendations

Preliminary conventional and post-tensioned foundation recommendations are provided in the following sections. Allowable soil bearing and estimated static settlement are provided in Section 4.3. Estimated site dynamic settlement is provided in Section 2.7.1. Please note that the following foundation recommendations are preliminary and must be confirmed by LGC Geotechnical at the completion project plans (i.e., foundation, grading and site layout plans) as well as completion of earthwork. At the completion of grading, if soils with a different expansion potential (EI greater than 50) are encountered, updated geotechnical foundation recommendations will be provided.

4.2.1 Provisional Conventional Foundation Design Parameters

Conventional foundations may be designed in accordance with Wire Reinforcement Institute (WRI) procedure for slab-on-ground foundations per Section 1808 of the 2016 CBC to resist expansive soils. The following preliminary soil parameters may be used:

- Effective Plasticity Index: 20
- Climatic Rating: Cw = 15
- Reinforcement: Per structural designer.
- Minimum Perimeter Footing Depth: 15 inches below lowest adjacent grade.
- Moisture condition (presoak) slab subgrade to 100% of optimum moisture content to a minimum depth of 12 inches prior to trenching.

The recommended moisture content should be maintained up to the time of concrete placement.

4.2.2 Provisional Post-Tensioned Foundation Design Parameters

The geotechnical parameters provided in Table 4 (Refer to Section 4.2.3 below) may be used for post-tensioned slab foundations. These parameters have been determined in general accordance with the Post-Tensioning Institute (PTI) Standard Requirements for Design of Shallow Post-Tensioned Concrete Foundations on Expansive Soils referenced in Chapter 18 of the 2016 CBC. In utilizing these parameters, the foundation engineer should design the foundation system in accordance with the allowable deflection criteria of applicable codes and the requirements of the structural designer/architect. Other types of stiff slabs may be used in place of the CBC post-tensioned slab design provided that, in the opinion of the foundation structural designer, the alternative type of slab is at least as stiff and strong as that designed by the CBC/PTI method to resist expansive soils.

Our design parameters are based on our experience with similar residential projects and the anticipated nature of the soil (with respect to expansion potential). Please note that implementation of our recommendations will not eliminate foundation movement (and related distress) should the moisture content of the subgrade soils fluctuate. It is the intent of these recommendations to help maintain the integrity of the proposed structures and reduce (not eliminate) movement, based upon the anticipated site soil conditions. Should future

owners not properly maintain the areas surrounding the foundation, for example by overwatering, then we anticipate for highly expansive soils the maximum differential movement of the perimeter of the foundation to the center of the foundation to be on the order of a couple of inches. Soils of lower expansion potential are anticipated to show less movement.

4.2.3 Foundation Subgrade Preparation and Maintenance

Moisture conditioning of the subgrade soils is recommended prior to trenching the foundation. The recommendations specific to the anticipated site soil conditions are presented herein. The subgrade moisture condition of the building pad soils should be maintained at near-optimum moisture content up to the time of concrete placement. This moisture content should be maintained around the immediate perimeter of the slab during construction and up to occupancy of the homes.

The geotechnical parameters provided herein assume that if the areas adjacent to the foundation are planted and irrigated, these areas will be designed with proper drainage and adequately maintained so that ponding, which causes significant moisture changes below the foundation, does not occur. Our recommendations do not account for excessive irrigation and/or incorrect landscape design. Plants should only be provided with sufficient irrigation for life and not overwatered to saturate subgrade soils. Sunken planters placed adjacent to the foundation, should either be designed with an efficient drainage system or liners to prevent moisture infiltration below the foundation. Some lifting of the perimeter foundation beam should be expected even with properly constructed planters.

In addition to the factors mentioned above, future homeowners should be made aware of the potential negative influences of trees and/or other large vegetation. Roots that extend near the vicinity of foundations can cause distress to foundations. Future homeowners (and the owner's landscape architect) should not plant trees/large shrubs closer to the foundations than a distance equal to half the mature height of the tree or 20 feet, whichever is more conservative unless specifically provided with root barriers to prevent root growth below the house foundation.

It is the homeowner's responsibility to perform periodic maintenance during hot and dry periods to ensure that adequate watering has been provided to keep soils from separating or pulling back from the foundation. Future homeowners should be informed and educated regarding the importance of maintaining a constant level of soil-moisture. The homeowners should be made aware of the potential negative consequences of both excessive watering, as well as allowing potentially expansive soils to become too dry. Expansive soils can undergo shrinkage during drying, and swelling during the rainy winter season or when irrigation is resumed. This can result in distress to building structures and hardscape improvements. The builder should provide these recommendations to future homeowners.

TABLE 4

Provisional Geotechnical Parameters for Post-Tensioned Foundation Slab Design

Parameter	PT Slab with Perimeter Footing	PT Mat with Thickened Edge
Expansion Index	Low[1]	Low[1]
Thornthwaite Moisture Index	-20	-20
Constant Soil Suction	PF 3.9	PF 3.9
Center Lift Edge moisture variation distance, e_m Center lift, y_m	 9.0 feet 0.25 inch	 9.0 feet 0.3 inch
Edge Lift Edge moisture variation distance, e_m Edge lift, y_m	 5.5 feet 0.55 inch	 5.5 feet 0.66 inch
Modulus of Subgrade Reaction, k (assuming presoaking as indicated below)	150 pci	150 pci
Minimum perimeter footing/thickened edge embedment below finish grade	15 inches	6 inches

1. Assumed for preliminary design purposes. Further evaluation is needed at the completion of grading.
2. Presoak to 100% of optimum moisture content to a minimum depth of 12 inches prior to trenching.

4.2.4 Slab Underlayment Guidelines

The following is for informational purposes only since slab underlayment (e.g., moisture retarder, sand or gravel layers for concrete curing and/or capillary break) is unrelated to the geotechnical performance of the foundation and thereby not the purview of the geotechnical consultant. Post-construction moisture migration should be expected below the foundation. The foundation engineer/architect should determine whether the use of a capillary break (sand or gravel layer), in conjunction with the vapor retarder, is necessary or required by code. Sand layer thickness and location (above and/or below vapor retarder) should also be determined by the foundation engineer/architect.

4.3 Soil Bearing and Lateral Resistance

Provided our earthwork recommendations are implemented, an allowable soil bearing pressure of 2,000 pounds per square foot (psf) may be used for the design of footings having a minimum width of 12 inches and minimum embedment of 15 inches below lowest adjacent ground surface. This value may be increased by 400 psf for each additional foot of embedment and 400 psf for each additional foot of foundation width to a maximum value of 2,500 psf. These allowable bearing pressures are applicable for level (ground slope equal to or flatter than 5H:1V) conditions only. Bearing values indicated are for total dead loads and frequently applied live loads and may be increased by ⅓ for short duration loading (i.e., wind or seismic loads).

In utilizing the above-mentioned allowable bearing capacity, and provided our earthwork recommendations are implemented, foundation settlement due to static loads is anticipated to be 1 inch. Differential settlement may be taken as ½-inch over a horizontal span of 40 feet. Dynamic settlement is provided in Section 2.7.1.

Resistance to lateral loads can be provided by friction acting at the base of foundations and by passive earth pressure. For concrete/soil frictional resistance, an allowable coefficient of friction of 0.35 may be assumed with dead-load forces. An allowable passive lateral earth pressure of 270 psf per foot of depth (or pcf) to a maximum of 2,700 psf may be used for the sides of footings poured against properly compacted fill. Allowable passive pressure may be increased to 360 pcf (maximum of 3,600 psf) for short duration seismic loading. This passive pressure is applicable for level (ground slope equal to or flatter than 5H:1V) conditions. Frictional resistance and passive pressure may be used in combination without reduction. We recommend that the upper foot of passive resistance be neglected if finished grade will not be covered with concrete or asphalt. The provided allowable passive pressures are based on a factor of safety of 1.5 and 1.1 for static and seismic loading conditions, respectively.

4.4 Foundation Setback from Top-of-Slope and Bottom-of-Slope

Foundations should have adequate setback from top and bottom of slopes. Per the 2016 CBC, the minimum top-of-slope setback is H/3, with a maximum required setback of 40 feet, where H is the total height of the slope. This distance is measured horizontally from the outside bottom edge of the footing to the slope face. As an alternative to moving the building footprint, setback requirements may be accomplished by deepened footings or deep foundations.

The minimum bottom-of-slope setback is H/2, with a maximum required setback of 15 feet. Refer to Chapter 18 of the 2016 CBC.

4.5 Lateral Earth Pressures for Retaining Walls

The following lateral earth pressures may be used for the preliminary design of the subject site retaining walls up to approximately 6 feet in height.

Lateral earth pressures for approved sandy soils meeting indicated project requirements are provided below. Lateral earth pressures are provided as equivalent fluid unit weights, in psf per foot of depth (or pcf). These values do not contain an appreciable factor of safety, so the retaining wall designer should apply the applicable factors of safety and/or load factors during design. A soil unit weight of 125 pcf may be assumed for calculating the actual weight of soil over the wall footing.

The following lateral earth pressures are presented in Table 5 for approved granular soils a maximum of 35 percent fines (passing the No. 200 sieve per ASTM D1140) and an Expansion Index of 20 or less per ASTM D4829. The retaining wall designer should clearly indicate on the retaining wall plans the required sandy soil backfill. Please note that select grading and/or import will be required.

TABLE 5

Lateral Earth Pressures – Approved Onsite Sandy Soils

Conditions	Equivalent Fluid Unit Weight (pcf)
	Level Backfill
	Approved Soils
Active	35
At-Rest	55

The lateral earth pressures provided above may be increased by a factor of 1.5 for a 2:1 (horizontal to vertical) sloping backfill condition.

If the wall can yield enough to mobilize the full shear strength of the soil, it can be designed for "active" pressure. If the wall cannot yield under the applied load, the earth pressure will be higher. This would include 90-degree corners of retaining walls. Such walls should be designed for "at-rest." The equivalent fluid pressure values assume free-draining conditions. If conditions other than those assumed above are anticipated, the equivalent fluid pressure values should be provided on an individual-case basis by the geotechnical engineer.

Surcharge loading effects from any adjacent structures should be evaluated by the retaining wall designer. In general, structural loads within a 1:1 (horizontal to vertical) upward projection from the bottom of the proposed retaining wall footing will surcharge the proposed retaining wall. In addition to the recommended earth pressure, retaining walls adjacent to streets should be designed to resist a uniform lateral pressure of 100 pounds per square foot (psf) due to normal street vehicle traffic if applicable. The retaining wall designer should contact the geotechnical engineer for any required geotechnical input in estimating surcharge loads.

If required, the retaining wall designer may use a seismic lateral earth pressure increment of 5 pcf. This increment should be applied in addition to the provided static lateral earth pressure using a triangular distribution with the resultant acting at H/3 in relation to the base of the retaining structure (where H is the retained height). Per Section 1803.5.12 of the 2016 CBC, the seismic lateral earth pressure is applicable to structures assigned to Seismic Design Category D through F for retaining wall structures supporting more than 6 feet of backfill height. This seismic lateral earth pressure is estimated using the procedure outlined by the Structural Engineers Association of California (Lew, et al, 2010).

Retaining wall structures should be provided with appropriate drainage and appropriately waterproofed. To reduce, but not eliminate, saturation of near-surface (upper approximate 1-foot) soils in front of the retaining walls, the perforated subdrain pipe should be located as low as possible behind the retaining wall. The outlet pipe should be sloped to drain to a suitable outlet. In general, we do not recommend retaining wall outlet pipes be connected to area drains. If subdrains are connected to area drains, special care and information should be provided to homeowners to maintain these drains. Typical retaining wall drainage is illustrated in Figure 2. It should be noted that the recommended subdrain does not provide protection against seepage through the face of the wall and/or efflorescence. Efflorescence is generally a white crystalline powder (discoloration) that results when water containing soluble salts migrates over a period of time through the face of a retaining

wall and evaporates. If such seepage or efflorescence is undesirable, retaining walls should be waterproofed to reduce this potential.

Soil bearing and lateral resistance (friction coefficient and passive resistance) are provided in Section 4.3. Earthwork considerations (temporary backcuts, backfill, compaction, etc.) for retaining walls are provided in Section 4.1 (Site Earthwork) and the subsequent earthwork related sub-sections.

4.6 Control of Surface Water and Drainage Control

From a geotechnical perspective, we recommend that compacted finished grade soils adjacent to proposed residences be sloped away from the proposed residence and towards an approved drainage device or unobstructed swale. Drainage swales, wherever feasible, should not be constructed within 5 feet of buildings. Where lot and building geometry necessitates that the side yard drainage swales be routed closer than 5 feet to structural foundations, we recommend the use of area drains together with drainage swales. Drainage swales used in conjunction with area drains should be designed by the project civil engineer so that a properly constructed and maintained system will prevent ponding within 5 feet of the foundation. Code compliance of grades is not the purview of the geotechnical consultant.

Planters with open bottoms adjacent to buildings should be avoided. Planters should not be designed adjacent to buildings unless provisions for drainage, such as catch basins, liners, and/or area drains, are made. Overwatering must be avoided.

4.7 Subsurface Water Infiltration

Recent regulatory changes have occurred that mandate that storm water be infiltrated below grade rather than collected in a conventional storm drain system. Typically, a combination of methods are implemented to reduce surface water runoff and increase infiltration including; permeable pavements/pavers for roadways and walkways, directing surface water runoff to grass-lined swales, retention areas, and/or drywells, etc.

It should be noted that collecting and concentrating surface water for the purpose of intentionally infiltrating below grade, conflicts with the geotechnical engineering objective of directing surface water away from slopes, structures and other improvements. The geotechnical stability and integrity of a site is reliant upon appropriately handling surface water. In general, we do not recommend that surface water be intentionally infiltrated into the subsurface soils.

The developed site will consist of compacted fill over dense formational materials. As such, we do not recommend that surface water be intentionally infiltrated into subsurface soils at this site.

4.8 Preliminary Asphalt Concrete Pavement Sections

Preliminary testing indicated an R-Value of 57. The following provisional minimum asphalt concrete (AC) street sections are provided in Table 6 based on an assumed R-Value of 40 for Traffic Indices (TI) of 5.5 (or less) and 6.0. These recommendations must be confirmed with R-Value testing of representative near-surface soils at the completion of grading and after underground utilities have been

installed and backfilled. Final street sections should be confirmed by the project civil engineer based upon the final design Traffic Index. If requested, LGC Geotechnical will provide sections for alternate TI values.

TABLE 6

Paving Section Options

Assumed Traffic Index	5.5 or less	6.0
R -Value Subgrade	40	40
AC Thickness	4.0 inches	4.0 inches
Base Thickness	4.0 inches	5.0 inches

Due to anticipated construction traffic prior to the completion of the project, we recommend that the total thickness (base course and capping course) of asphalt concrete be placed at essentially the same time. Construction traffic loading on only the base course of the asphalt concrete will increase the potential for pavement distress. It should be noted that construction traffic such as concrete trucks will likely exceed traffic loading after completion of construction. An alternative (i.e., placement of the asphalt concrete capping course at the completion of construction) is to increase the total asphalt concrete thickness indicated above by 1-inch.

The thicknesses shown are for minimum thicknesses. Increasing the thickness of any or all of the above layers will reduce the likelihood of the pavement experiencing distress during its service life. The above recommendations are based on the assumption that proper maintenance and irrigation of the areas adjacent to the roadway will occur through the design life of the pavement. Failure to maintain a proper maintenance and/or irrigation program may jeopardize the integrity of the pavement.

Earthwork recommendations regarding aggregate base and subgrade are provided in the previous section “Site Earthwork” and the related sub-sections of this report.

4.9 Soil Corrosivity

Although not corrosion engineers (LGC Geotechnical is not a corrosion consultant), several governing agencies in Southern California require the geotechnical consultant to determine the corrosion potential of soils to buried concrete and metal facilities. We therefore present the results of our testing with regard to corrosion for the use of the client and other consultants, as they determine necessary.

Corrosion testing of a near-surface bulk sample indicated a soluble sulfate content of less than 0.01 percent, a chloride content of 22 parts per million (ppm), pH of 7.1 and a minimum resistivity of 978 ohm-centimeters. Based on Caltrans Corrosion Guidelines (Caltrans, 2015), soils are considered corrosive to structural elements if the pH is 5.5 or less, or the chloride concentration is 500 ppm or greater, or the sulfate concentration is 2,000 ppm (0.2 percent) or greater.

Based on laboratory sulfate test results, the near-surface soils have an exposure class of “S0” per ACI 318-14, Table 19.3.1.1 with respect to sulfates. This must be verified based on as-graded conditions.

4.10 Nonstructural Concrete Flatwork

Nonstructural concrete flatwork (such as walkways, bicycle trails, patio slabs, etc.) has a potential for cracking due to changes in soil volume related to soil-moisture fluctuations. To reduce the potential for excessive cracking and lifting, concrete may be designed in accordance with the minimum guidelines outlined in Table 7. These guidelines will reduce the potential for irregular cracking and promote cracking along construction joints, but will not eliminate all cracking or lifting. Thickening the concrete and/or adding additional reinforcement will further reduce cosmetic distress.

TABLE 7

Nonstructural Concrete Flatwork for Low Expansion Potential

	Homeowner Sidewalks	**Private Drives**	**Patios/Entryways**	**City Sidewalk Curb and Gutters**
Minimum Thickness (in.)	4 (nominal)	4 (full)	4 (full)	City/Agency Standard
Presoaking	Wet down prior to placing	Wet down prior to placing	Wet down prior to placing	City/Agency Standard
Reinforcement	—	No. 3 at 24 inches on centers	No. 3 at 24 inches on centers	City/Agency Standard
Thickened Edge (in.)	—	8 x 8	—	City/Agency Standard
Crack Control Joints	Saw cut or deep open tool joint to a minimum of 1/3 the concrete thickness	Saw cut or deep open tool joint to a minimum of 1/3 the concrete thickness	Saw cut or deep open tool joint to a minimum of 1/3 the concrete thickness	City/Agency Standard
Maximum Joint Spacing	5 feet	10 feet or quarter cut whichever is closer	6 feet	City/Agency Standard
Aggregate Base Thickness (in.)	—	—	—	City/Agency Standard

4.11 Pre-construction Documentation and Construction Monitoring

Existing developments surround portions of the site. A program of documentation and monitoring should be considered before the onset of any earthwork. LGC Geotechnical can perform these services at your request. This should include detailed documentation of the existing improvements, buildings, and utilities around the area of proposed grading, with particular attention to any distress that is already present prior to the start of work.

4.12 Geotechnical Plan Review

When available, grading and foundation plans should be reviewed by LGC Geotechnical in order to verify our geotechnical recommendations are implemented. Updated recommendations and/or additional field work may be necessary.

Grading, foundation and any other improvement plans and final project drawings should be reviewed by this office prior to construction to verify that our geotechnical recommendations, provided herein, have been appropriately incorporated. Additional or modified geotechnical recommendations may be required based on the proposed design.

4.13 Geotechnical Observation and Testing During Construction

The recommendations provided in this report are based on limited subsurface observations and geotechnical analysis. The interpolated subsurface conditions should be verified in the field during construction by a representative of LGC Geotechnical. Geotechnical observation and testing is required per Section 1705 of the 2016 CBC.

Geotechnical observation and/or testing should be performed by LGC Geotechnical at the following stages:

- During grading (removal bottoms, fill placement, etc);
- During utility trench and retaining wall backfill and compaction;
- After presoaking building pads and other concrete-flatwork subgrades, and prior to placement of aggregate base or concrete;
- Preparation of pavement subgrade and placement of aggregate base;
- After building and wall footing excavation and prior to placing reinforcement and/or concrete; and
- When any unusual soil conditions are encountered during any construction operation subsequent to issuance of this report.

5.0 LIMITATIONS

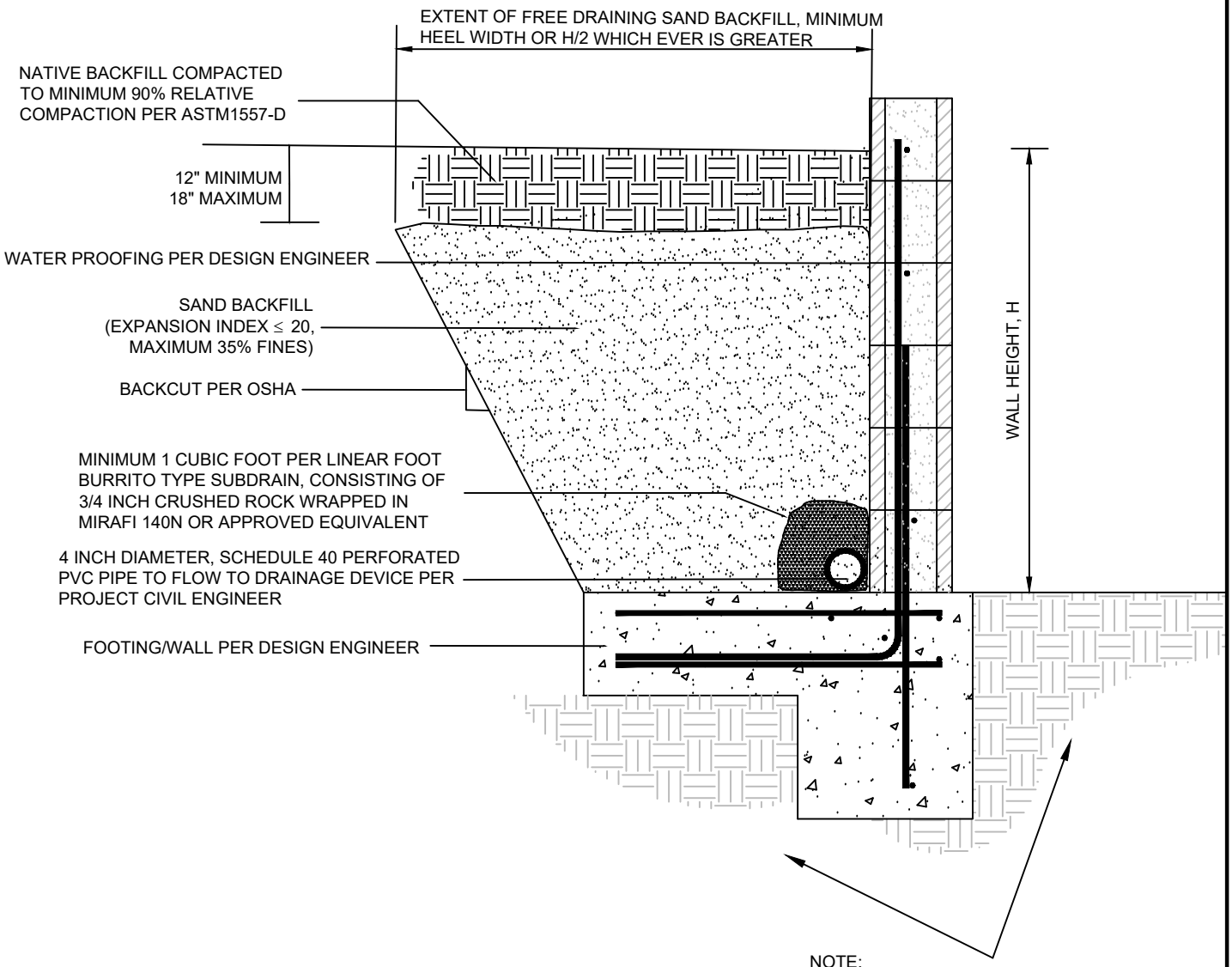
Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

This report is based on data obtained from limited observations of the site, which have been extrapolated to characterize the site. While the scope of services performed is considered suitable to adequately characterize the site geotechnical conditions relative to the proposed development, no practical evaluation can completely eliminate uncertainty regarding the anticipated geotechnical conditions in connection with a subject site. Variations may exist and conditions not observed or described in this report may be encountered during grading and construction.

This report is issued with the understanding that it is the responsibility of the owner, or of his/her representative, to ensure that the information and recommendations contained herein are brought to the attention of the other consultants (at a minimum the civil engineer, structural engineer, landscape architect) and incorporated into their plans. The contractor should properly implement the recommendations during construction and notify the owner if they consider any of the recommendations presented herein to be unsafe, or unsuitable.

The findings of this report are valid as of the present date. However, changes in the conditions of a site can and do occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. The findings, conclusions, and recommendations presented in this report can be relied upon only if LGC Geotechnical has the opportunity to observe the subsurface conditions during grading and construction of the project, in order to confirm that our preliminary findings are representative for the site. This report is intended exclusively for use by the client, any use of or reliance on this report by a third party shall be at such party's sole risk.

In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and modification.



LGC Geotechnical, Inc.

FIGURE 2
Retaining Wall Backfill Detail

PROJECT NAME	Fleming Ranch
PROJECT NO.	16151-01
ENG. / GEOL.	DJB / KTM
SCALE	Not to Scale
DATE	November 2017

Appendix A
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APPENDIX A

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Appendix B
Field Exploration Data

Geotechnical Boring Log Borehole I-1

Date: 2/2/2017	**Drilling Company:** Cal Pac
Project Name: Fleming Ranch	**Type of Rig:** Track Mounted Rig
Project Number: 16151-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1425' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By SHH
Sampled By SHH
Checked By KTM

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1420	0	B-1	SPT-1	3 5 7			CL-ML	@2' Silty CLAY: dark brown, moist, stiff	
	5		SPT-2	4 5 9			CL	@4' Sandy CLAY: dark brown, moist, very stiff	
1415	10							Total Depth = 6' Groundwater Not Encountered Set with 3" Perforated PVC Pipe on 2/2/2017; Backfilled with Cuttings on 2/3/2017	
1410	15								
1405	20								
1400	25								
	30								

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS 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 THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 2/6/2017

Geotechnical Boring Log Borehole I-2

Date: 2/2/2017	**Drilling Company:** Cal Pac
Project Name: Fleming Ranch	**Type of Rig:** Track Mounted Rig
Project Number: 16151-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1426' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By SHH
Sampled By SHH
Checked By KTM

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1425	0		SPT-1	3 3 6			CL	@2.5' CLAY: dark brown, moist, stiff	
	5	B-1							
1420			SPT-2	7 11 12			SM	@6' Silty SAND: brown, moist, medium dense	
	10							Total Depth = 8' Groundwater Not Encountered Set with 3" Perforated PVC Pipe on 2/2/2017; Backfilled with Cuttings on 2/3/2017	
1415									
	15								
1410									
	20								
1405									
	25								
1400									
	30								

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 2/6/2017

Geotechnical Boring Log Borehole I-3

Date: 2/2/2017	**Drilling Company:** Cal Pac
Project Name: Fleming Ranch	**Type of Rig:** Track Mounted Rig
Project Number: 16151-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1426' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By SHH
Sampled By SHH
Checked By KTM

Elevation (ft)	Depth (ft)	Sample Number	Blow Count	USCS Symbol	DESCRIPTION	Type of Test
1425	0					
		SPT-1	3 7 12	CL	@2.5' CLAY: dark brown, moist, very stiff	
	5					
1420		SPT-2	14 23 29	SM	@6' Silty SAND: light brown, moist, very dense	
	10				Total Depth = 8' Groundwater Not Encountered Set with 3" Perforated PVC Pipe on 2/2/2017; Backfilled with Cuttings on 2/3/2017	
1415						
1410	15					
1405	20					
1400	25					
	30					

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS 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 THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 2/6/2017

Geotechnical Boring Log Borehole I-4

Date: 2/2/2017 | **Drilling Company:** Cal Pac

Project Name: Fleming Ranch | **Type of Rig:** Track Mounted Rig

Project Number: 16151-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~1442' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By SHH
Sampled By SHH
Checked By KTM

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1440	0	B-1	R-1	12 40 50/6"			SP-SM	@2.5' SAND with SILT: gray to white, dry to slightly moist, very dense	
	5		SPT-1	17 28 34			SP	@5' SAND: gray, dry, very dense	
1435			SPT-2	17 50/6"				@7.5' SAND: olive brown to gray, dry, very dense	
	10								
1430								Total Depth = 11' Groundwater Not Encountered Set with 3" Perforated PVC Pipe on 2/2/2017; Backfilled with Cuttings on 2/3/2017	
	15								
1425									
	20								
1420									
	25								
1415									
	30								

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS 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 THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 2/6/2017

Geotechnical Boring Log Borehole I-5

Date: 2/2/2017	**Drilling Company:** Cal Pac
Project Name: Fleming Ranch	**Type of Rig:** Track Mounted Rig
Project Number: 16151-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1450' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By SHH
Sampled By SHH
Checked By KTM

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0								
			R-1	12 15 18			SC	@2.5' Clayey SAND: red to dark brown, moist, medium dense	
1445	5	B-1	R-2	13 27 33			SM	@5' Silty SAND: dark brown, moist, dense	
			R-3	11 19 22			SM/ SP-SM	@7.5' Silty SAND to SAND with SILT: orange, moist, dense	
1440	10							Total Depth = 10' Groundwater Not Encountered Set with 3" Perforated PVC Pipe on 2/2/2017; Backfilled with Cuttings on 2/3/2017	
1435	15								
1430	20								
1425	25								
	30								

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS 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 THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 2/6/2017

Geotechnical Boring Log Borehole HS-1

Date: 2/2/2017 | **Drilling Company:** Cal Pac

Project Name: Fleming Ranch | **Type of Rig:** Track Mounted Rig

Project Number: 16151-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~1450' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By SHH
Sampled By SHH
Checked By KTM

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1445	0–5		R-1	13 16 25			SM	@4' Silty SAND: dark brown, moist, dense	
1440	5–10							Total Depth = 4' Groundwater Not Encountered Backfilled with Cuttings on 2/2/2017	
1435	10–15								
1430	15–20								
1425	20–25								
	25–30								

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS 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 THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
⏚	GROUNDWATER TABLE

TEST TYPES:

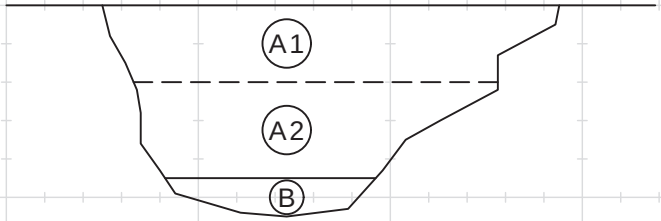
DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 2/6/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-1	
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A1	Quaternary Very Old Alluvial Fan Deposits @ 0' Silty CLAY with fine Sand: reddish brown, slightly moist to moist, loose to stiff with hard clods; rootlets; sand is off white and tabular; topsoil grades to well indurated soil	Qvof				
	A2	@ 2' - Silty CLAY with fine Sand: light reddish brown, moist, hard, lacks organics; very well indurated; sand content varies			B-1 @ 3-4'		
	B	Cretaceous Gabbro @ 4.5' - SAND: orange, moist, very dense; highly weathered gabbro (rock)	Kgb		B-2 @ 5'		

GRAPHICAL REPRESENTATION BELOW: Elevation : 1495 ' MSL Surface Slope: 0 deg. Trend: N60E



Total Depth: 5.5'
Groundwater: None
Backfilled with Compaction
Wheel: 12/21/2016

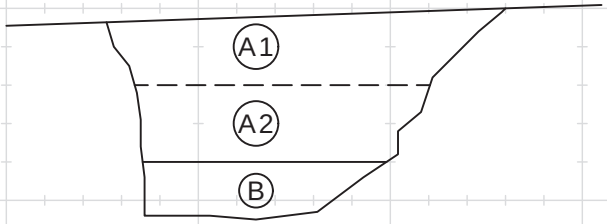
scale : 1 in = 5 ft

Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-2
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:
Equipment: Case Extendahoe	Location: See Geotechnical Map	

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A1	Quaternary Very Old Alluvial Fan Deposits @ 0' SILT, SAND, and CLAY: light brown, dry to moist, loose to stiff; porous (topsoil)	Qvof				
	A2	@ 2' Sandy CLAY: reddish brown, moist, very stiff to slightly hard; micropores; soil horizon with argyllic/rectilinear weathering; stoneline. Below grades to weathered bedrock					
	B	Cretaceous Gabbro @ 4' SAND: light orange and gray, moist, very dense; decomposed gabbro (rock); highly weathered; coarse grained	Kgb				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1481 ' MSL Surface Slope: 2 deg. Trend: N20W



Total Depth: 5.5'
Groundwater: None
Backfilled with Compaction
Wheel: 12/21/2016

scale : 1 in = 5 ft

Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-3	
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

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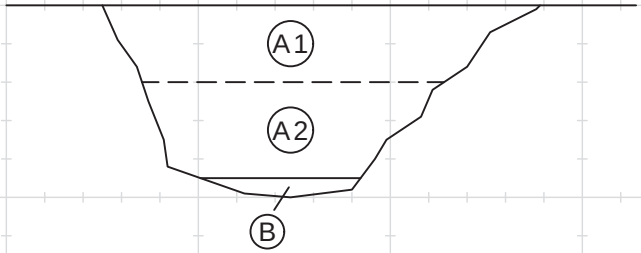
Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A1	Quaternary Very Old Alluvial Fan Deposits @ 0' Sandy CLAY: brown, dry to moist, loose with stiff zones; micro pores; slightly cemented; well indurated; rootlets; desiccated; tabular sand (topsoil).	Qvof				
	A2	@ 2' Sandy CLAY: reddish brown, moist, slightly hard; very well indurated; weathered.			B-1 @2.5' to 3'		
	B	Cretaceous Gabbro @ 4.5' Coarse SAND: light orange and gray mottled, moist, very dense; highly weathered; decomposed gabbro (rock); iron oxide	Kgb				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1470 ' MSL Surface Slope: 0 deg. Trend: N70E



Total Depth: 5'
Groundwater: None
Backfilled with Compaction
Wheel: 12/21/2016

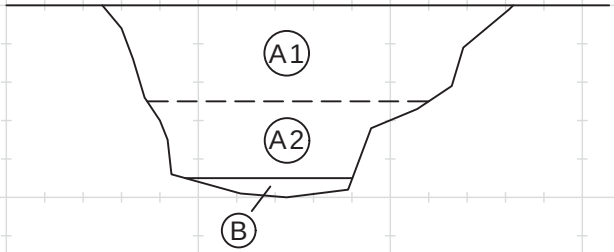
scale : 1 in = 5 ft

Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-4	
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A1	Quaternary Very Old Alluvial Fan Deposits @ 0' Sandy CLAY: light reddish brown, dry to slightly moist, loose to very stiff; rootlets; desiccated (topsoil)	Qvof				
	A2	@ 2.5' Sandy CLAY: brown to reddish brown, moist, slightly hard; well indurated; micropores; tabular, white, feldspathic sand grains					
	B	Cretaceous Gabbro @ 4.5' Coarse SAND: light orange and gray, slightly moist, very dense; highly weathered gabbro (rock)	Kgb				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1471 ' MSL Surface Slope: 0 deg. Trend: N30E



Total Depth: 5'
Groundwater: None
Backfilled with Compaction
Wheel: 12/21/2016

scale : 1 in = 5 ft

Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-5	
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

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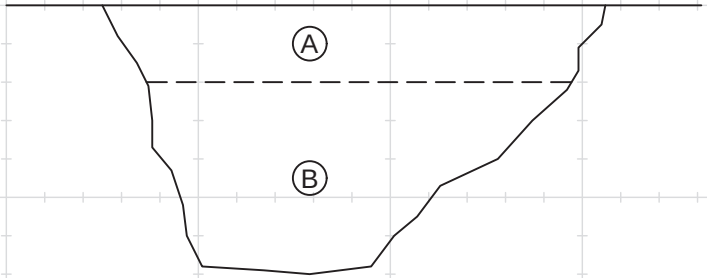
Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A B	Quaternary Very Old Alluvial Fan Deposits @ 0' Sandy CLAY with Silt: brown, slightly moist, loose to very stiff; rootlets; porous; desiccated (topsoil) @ 2' Clayey SAND to Sandy CLAY with scattered Gravel: light orangish brown and light reddish brown layers, moist, dense; caliche; stonelines	Qvof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1457 ' MSL Surface Slope: 0 deg. Trend: N70W



Total Depth: 7'
Groundwater: None
Backfilled with Compaction Wheel: 12/21/2016

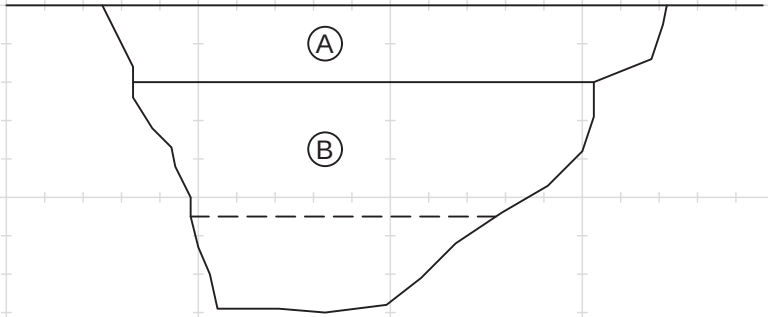
scale : 1 in = 5 ft

Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-6	
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A B	Quaternary Old Alluvial Fan Deposits @ 0' CLAY with Sand: brown, wet, soft; rootlets (topsoil) @2' Sandy CLAY to Clayey SAND: light reddish brown to orangish brown mottled, slightly moist, very dense; krotovina; rootlets; well-indurated; micropores; scattered subangular gravels @ 5.5' to T.D. - Moderate brown Clayey SILT with SAND, slightly moist, slightly to moderately dense. Few scattered rootlets to 8'	Qof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1443 ' MSL Surface Slope: 0 deg. Trend: N10W



Total Depth: 8'
Groundwater: None
Backfilled with Compaction
Wheel: 12/21/2016

scale : 1 in = 5 ft

Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-7	
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

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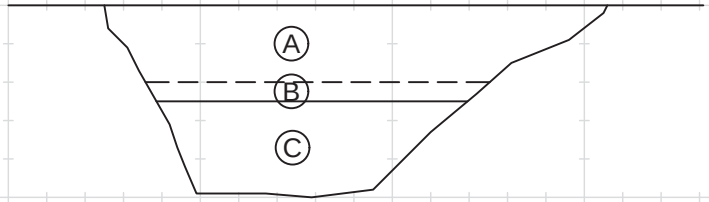
Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' Sandy CLAY: brown, slightly moist to moist, loose with very stiff zones; rootlets; desiccated upper zone (topsoil)	Qof				
	B	@ 2' Sandy CLAY: light reddish brown, slightly moist; very well indurated layer					
	C	Quaternary Very Old Alluvial Fan Deposits @ 2.5' - Cobbly SAND with Clay: light reddish brown with blue subangular clasts and subrounded plutonic clasts, moist, very dense; variable sand content	Qyof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1457 ' MSL Surface Slope: 0 deg. Trend: EW



Total Depth: 5'
Groundwater: None
Backfilled with Compaction Wheel: 12/21/2016

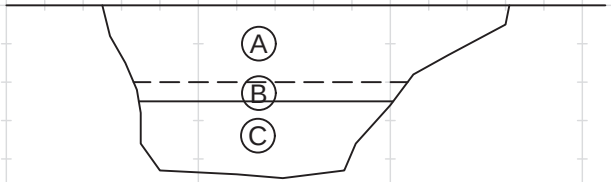
scale : 1 in = 5 ft

Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-8	LGC Geotechnical, Inc.
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' - Silty CLAY with Sand: light reddish brown, moist to very moist, soft; roots; increase stiffness with depth; micropores; well-indurated	Qof				
	B	@ 1.5' Sandy CLAY: light reddish brown, slightly moist; very well indurated layer; grades to old fan deposit					
	C	Quaternary Very Old Alluvial Fan Deposits @ 2' - Silty SAND with scattered Gravels: light brown mottled, slightly moist, very dense; very well-indurated; krotovina to 3'	Qvof		B-1 @3' to 5'		

GRAPHICAL REPRESENTATION BELOW: Elevation : 1436 ' MSL Surface Slope: 0 deg. Trend: N76E



Total Depth: 4.5'
Groundwater: None
Backfilled with Compaction
Wheel: 1/4/2017

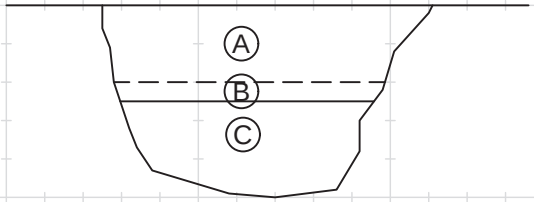
scale : 1 in = 5 ft

Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-9
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:
Equipment: Case Extendahoe	Location: See Geotechnical Map	

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' - Sandy CLAY: moderate brown, very moist grades to slightly moist, dense; micropores, (topsoil)	Qof				
	B	@ 1' Sandy CLAY: light reddish brown, slightly moist; very well indurated layer; grades to old fan deposit					
	C	Quaternary Very Old Alluvial Fan Deposits @ 2' Silty SAND with scattered Gravels: light reddish brown mottled, slightly moist, very dense; very well-indurated; krotovina to 3'; subangular gravels up to 3" in diameter	Qvof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1429 ' MSL Surface Slope: 0 deg. Trend: N15W



Total Depth: 5'
Groundwater: None
Backfilled with Compaction
Wheel: 1/4/2017

scale : 1 in = 5 ft

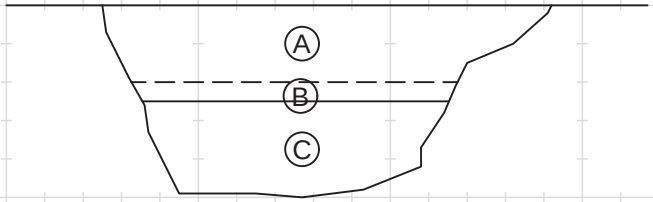
Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-10	
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' Sandy CLAY to Clayey SAND: moderate reddish brown, very moist grades to slightly moist, medium dense; micropores, (topsoil)	Qof		B-1 @0'-2'		
	B	@ 2.5' Sandy CLAY: light reddish brown, slightly moist; very well indurated layer; excavates to old fan deposit					
	C	Quaternary Very Old Alluvial Fan Deposits @ 3' - Clayey SAND with scattered Gravels: light reddish brown mottled, moist, dense; well-indurated	Qvof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1427 ' MSL Surface Slope: 0 deg. Trend: NS



Total Depth: 5'
Groundwater: None
Backfilled with Compaction Wheel: 1/4/2017

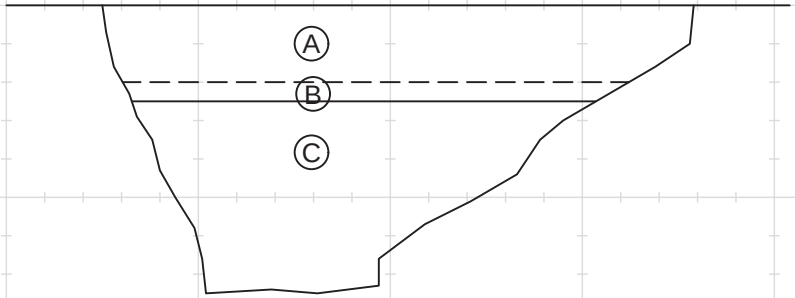
scale : 1 in = 5 ft

Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-11	LGC Geotechnical, Inc.
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' Silty CLAY with Sand: moderate brown to dark brown, moist, soft to stiff; rootlets; minor soil development; poorly indurated, (topsoil)	Qof				
	B	@ 2' Sandy CLAY: light orange brown and offwhite, slightly moist; very well indurated layer; subhorizontal stoneline; subhoriztonal caliche banding					
	C	Quaternary Very Old Alluvial Fan Deposits @ 2' SILT with some Sand: light yellowish brown, dry to slightly moist, stiff; caliche stringers; few scattered pores; slightly indurated; induration increases with depth	Qvof		B-1 @5' to 6'		

GRAPHICAL REPRESENTATION BELOW: Elevation : 1433 ' MSL Surface Slope: 0 deg. Trend: EW



Total Depth: 7.5'
Groundwater: None
Backfilled with Compaction
Wheel: 1/4/2017

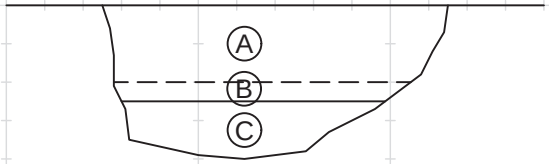
scale : 1 in = 5 ft

Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-12
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:
Equipment: Case Extendahoe	Location: See Geotechnical Map	

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' Silty CLAY with Sand: brown, moist to very moist, loose to slightly hard; rootlets; (topsoil) Argyllic Soil Horizon	Qof				
	B	@ 2' Rectilinear weathering Quaternary Very Old Alluvial Fan Deposits	Qvof				
	C	@ 2.5' Clayey SAND: moderate brown, slightly moist, hard; very well-indurated; lacks pores; tabular sand consisting of feldspar crystals					

GRAPHICAL REPRESENTATION BELOW: Elevation : 1424 ' MSL Surface Slope: 0 deg. Trend: N50W



Total Depth: 4'
Groundwater: None
Backfilled with Compaction
Wheel: 1/4/2017

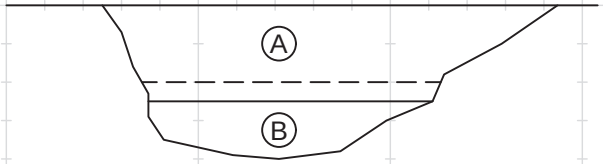
scale : 1 in = 5 ft

Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-13	
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' Silty CLAY with Sand: brown, very moist, loose to very stiff; rootlets; minor soil development; well-indurated; desiccation cracks	Qof				
	B	@ 2' Rectilinear weathering, old soil horizon					
	C	Quaternary Very Old Alluvial Fan Deposits @ 2.5' Clayey SAND: moderate reddish brown, moist, very dense; very well-indurated; faint root casts; tabular sand consisting of feldspar crystals	Qvof		B-1 @3'-4'		

GRAPHICAL REPRESENTATION BELOW: Elevation : 1431 ' MSL Surface Slope: 0 deg. Trend: EW



Total Depth: 4'
Groundwater: None
Backfilled with Compaction
Wheel: 1/4/2017

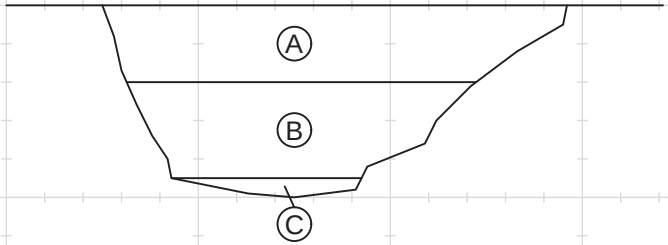
scale : 1 in = 5 ft

Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-14
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:
Equipment: Case Extendahoe	Location: See Geotechnical Map	

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' Clayey SAND: brown, very moist, loose to hard; very well-indurated; desiccation cracks	Qof				
	B	@ 2' Clayey SAND with trace Gravel: light reddish brown mottled, slightly moist, very hard grades to very stiff at 3.5'; few scattered micropores to 4'; very well indurated; krotovina to 4'; blocky texture					
	C	Quaternary Very Old Alluvial Fan Deposits @ 4.5' SANDSTONE or very well indurated SAND: light gray, very dense, slightly moist	Qvof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1435 ' MSL Surface Slope: 0 deg. Trend: NS



Total Depth: 5'
Groundwater: None
Backfilled with Compaction
Wheel: 1/4/2017

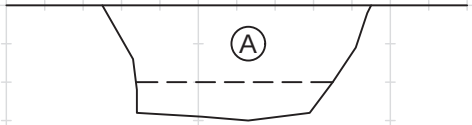
scale : 1 in = 5 ft

Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-15
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:
Equipment: Case Extendahoe	Location: See Geotechnical Map	

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' to 2' - Quaternary Old Fan Deposits (Qof): @ 0' - Sandy CLAY: moderate reddish brown, moist, loose to slightly hard, rootlets. @ 2' to 3' - Clayey SAND: moderate reddish brown, moist, very dense; well indurated; few root casts and micro pores; white, tabular, feldspar, sand grains. Refusal by backhoe.	Qof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1435 ' MSL Surface Slope: 0 deg. Trend: N15E



Total Depth: 3'
Groundwater: None
Backfilled with Compaction Wheel: 1/4/2017

scale : 1 in = 5 ft

Last Edited: 1/17/2017

Infiltration Test Data Sheet

LGC Geotechnical, Inc

131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

Project Name: Flemming Ranch

Project Number: 16151-01

Date: 2/2/2017

Boring Number: I-1

Test hole dimensions (if circular)	
Boring Depth (feet)*:	6
Boring Diameter (inches):	8
Pipe Diameter (inches):	3

*measured at time of test

Test pit dimensions (if rectangular)	
Pit Depth (feet):	
Pit Length (feet):	
Pit Breadth (feet):	

Minimum test Head (D_o):

(What the sounder tape should read) Boring Depth - (5 x Boring Radius) 4.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

*Pre-Test (Sandy Soil Criteria)**

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval (min)	Initial Depth to Water (feet)	Final Depth to Water (feet)	Total Change in Water Level (feet)	Greater Than or Equal to 0.5 feet (yes/no)
1	9:07	9:32	25.0	1.37	1.38	0.01	No
2	9:32	9:57	25.0	1.38	1.38	0	No

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

Main Test Data

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval, Δt (min)	Initial Depth to Water, D_o (feet)	Final Depth to Water, D_f (feet)	Change in Water Level, ΔD (feet)	Calculated Infiltration Rate(in/hr)
1	9:57	10:27	30.0	1.38	1.4	0.02	0.0
2	10:27	10:57	30.0	1.4	1.42	0.02	0.0
3	10:57	11:27	30.0	1.42	1.44	0.02	0.0
4	11:27	11:57	30.0	1.44	1.44	0	0.0
5	11:57	12:27	30.0	1.44	1.45	0.01	0.0
6	12:27	12:57	30.0	1.45	1.47	0.02	0.0
7	12:57	13:27	30.0	1.47	1.48	0.01	0.0
8	13:27	13:57	30.0	1.48	1.48	0	0.0
9	13:57	14:27	30.0	1.48	1.5	0.02	0.0
10	14:27	14:57	30.0	1.5	1.52	0.02	0.0
11	14:57	15:27	30.0	1.52	1.52	0	0.0
12	15:27	15:57	30.0	1.52	1.53	0.01	0.0

Calculated Infiltration Rate (No factors of safety)	**0.0**
Factor of Safety	**2.0**
Calculated Infiltration Rate (With Factor of Safety)	**0.0**

Sketch:

Notes:

Based on Guidelines from: Orange County 05/19/2011

Spreadsheet Revised on: 10/26/2016

LGC Geotechnical, Inc.

Infiltration Test Data Sheet

LGC Geotechnical, Inc

131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

Project Name: Flemming Ranch
Project Number: 16151-01
Date: 2/2/2017
Boring Number: I-2

Test hole dimensions (if circular)	
Boring Depth (feet)*:	8
Boring Diameter (inches):	8
Pipe Diameter (inches):	3

*measured at time of test

Test pit dimensions (if rectangular)	
Pit Depth (feet):	
Pit Length (feet):	
Pit Breadth (feet):	

Minimum test Head (D_o):

(What the sounder tape should read) Boring Depth - (5 x Boring Radius) 7.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

*Pre-Test (Sandy Soil Criteria)**

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval (min)	Initial Depth to Water (feet)	Final Depth to Water (feet)	Total Change in Water Level (feet)	Greater Than or Equal to 0.5 feet (yes/no)
1	9:00	9:25	25.0	6.35	6.37	0.02	No
2	9:25	9:50	25.0	6.37	6.4	0.03	No

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

Main Test Data

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval, Δt (min)	Initial Depth to Water, D_o (feet)	Final Depth to Water, D_f (feet)	Change in Water Level, ΔD (feet)	Calculated Infiltration Rate(in/hr)
1	9:50	10:20	30.0	6.4	6.44	0.04	0.1
2	10:20	10:50	30.0	6.44	6.48	0.04	0.1
3	10:50	11:20	30.0	6.48	6.53	0.05	0.1
4	11:20	11:50	30.0	6.53	6.58	0.05	0.1
5	11:50	12:20	30.0	6.58	6.61	0.03	0.1
6	12:20	12:50	30.0	6.61	6.66	0.05	0.1
7	12:50	13:20	30.0	6.66	6.7	0.04	0.1
8	13:20	13:50	30.0	6.7	6.74	0.04	0.1
9	13:50	14:20	30.0	6.74	6.78	0.04	0.1
10	14:20	14:50	30.0	6.78	6.83	0.05	0.1
11	14:50	15:20	30.0	6.83	6.87	0.04	0.1
12	15:20	15:50	30.0	6.87	6.9	0.03	0.1
						Calculated Infiltration Rate (No factors of safety)	**0.1**
						Factor of Safety	**2.0**
						Calculated Infiltration Rate (With Factor of Safety)	**0.0**

Sketch:

Notes: Pipe extends 1 foot above existing ground elevation; therefore, add 1 foot to boring depth when calculating minimum test head.

Based on Guidelines from: Orange County 05/19/2011

Spreadsheet Revised on: 10/26/2016

LGC Geotechnical, Inc.

Infiltration Test Data Sheet

LGC Geotechnical, Inc

131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

Project Name: Flemming Ranch
Project Number: 16151-01
Date: 2/2/2017
Boring Number: I-3

Test hole dimensions (if circular)	
Boring Depth (feet)*:	8
Boring Diameter (inches):	8
Pipe Diameter (inches):	3

*measured at time of test

Test pit dimensions (if rectangular)	
Pit Depth (feet):	
Pit Length (feet):	
Pit Breadth (feet):	

Minimum test Head (D_o):

(What the sounder tape should read) Boring Depth - (5 x Boring Radius) 6.6 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

*Pre-Test (Sandy Soil Criteria)**

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval (min)	Initial Depth to Water (feet)	Final Depth to Water (feet)	Total Change in Water Level (feet)	Greater Than or Equal to 0.5 feet (yes/no)
1	9:03	9:28	25.0	3.55	3.57	0.02	No
2	9:28	9:53	25.0	3.57	3.59	0.02	No

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

Main Test Data

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval, Δt (min)	Initial Depth to Water, D_o (feet)	Final Depth to Water, D_f (feet)	Change in Water Level, ΔD (feet)	Calculated Infiltration Rate(in/hr)
1	9:53	10:23	30.0	3.59	3.63	0.04	0.0
2	10:23	10:53	30.0	3.63	3.67	0.04	0.0
3	10:53	11:23	30.0	3.67	3.72	0.05	0.0
4	11:23	11:53	30.0	3.72	3.75	0.03	0.0
5	11:53	12:23	30.0	3.75	3.8	0.05	0.0
6	12:23	12:53	30.0	3.8	3.84	0.04	0.0
7	12:53	13:23	30.0	3.84	3.87	0.03	0.0
8	13:23	13:53	30.0	3.87	3.91	0.04	0.0
9	13:53	14:23	30.0	3.91	3.94	0.03	0.0
10	14:23	14:53	30.0	3.94	3.99	0.05	0.0
11	14:53	15:23	30.0	3.99	4.03	0.04	0.0
12	15:23	15:53	30.0	4.03	4.07	0.04	0.0

Calculated Infiltration Rate (No factors of safety)	**0.0**
Factor of Safety	**2.0**
Calculated Infiltration Rate (With Factor of Safety)	**0.0**

Sketch:

Notes:

Pipe extends 0.25 foot above existing ground elevation; therefore, add 0.25 foot to boring depth when calculating minimum test head.

Based on Guidelines from: Orange County 05/19/2011

Spreadsheet Revised on: 10/26/2016

LGC Geotechnical, Inc.

Infiltration Test Data Sheet

LGC Geotechnical, Inc

131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

Project Name: Flemming Ranch

Project Number: 16151-01

Date: 2/2/2017

Boring Number: I-4

Test hole dimensions (if circular)	
Boring Depth (feet)*:	11
Boring Diameter (inches):	8
Pipe Diameter (inches):	3

*measured at time of test

Test pit dimensions (if rectangular)	
Pit Depth (feet):	
Pit Length (feet):	
Pit Breadth (feet):	

Minimum test Head (D_o):

(What the sounder tape should read) Boring Depth - (5 x Boring Radius) 9.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

*Pre-Test (Sandy Soil Criteria)**

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval (min)	Initial Depth to Water (feet)	Final Depth to Water (feet)	Total Change in Water Level (feet)	Greater Than or Equal to 0.5 feet (yes/no)
1	8:32	8:57	25.0	9.75	11	1.25	Yes
2	8:58	9:23	25.0	9.45	9.67	0.22	No

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

Main Test Data

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval, Δt (min)	Initial Depth to Water, D_o (feet)	Final Depth to Water, D_f (feet)	Change in Water Level, ΔD (feet)	Calculated Infiltration Rate(in/hr)
1	9:23	9:53	30.0	9.67	10.08	0.41	1.3
2	9:53	10:23	30.0	9.57	9.86	0.29	0.8
3	10:23	10:53	30.0	9.57	9.96	0.39	1.1
4	10:53	11:23	30.0	9.63	10.02	0.39	1.2
5	11:23	11:53	30.0	9.63	10.03	0.4	1.2
6	11:53	12:23	30.0	9.72	10.13	0.41	1.3
7	12:23	12:53	30.0	9.53	9.85	0.32	0.9
8	12:53	13:23	30.0	9.72	10.12	0.4	1.3
9	13:23	13:53	30.0	9.61	10	0.39	1.1
10	13:53	14:23	30.0	9.55	9.85	0.3	0.8
11	14:23	14:53	30.0	9.69	10.11	0.42	1.3
12	14:53	15:23	30.0	9.7	10.09	0.39	1.2

Calculated Infiltration Rate (No factors of safety)	**1.2**
Factor of Safety	**2.0**
Calculated Infiltration Rate (With Factor of Safety)	**0.6**

Sketch:

Notes:

Based on Guidelines from: Orange County 05/19/2011

Spreadsheet Revised on: 10/26/2016

LGC Geotechnical, Inc.

Infiltration Test Data Sheet

LGC Geotechnical, Inc

131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

Project Name: Flemming Ranch

Project Number: 16151-01

Date: 2/2/2017

Boring Number: I-5

Test hole dimensions (if circular)	
Boring Depth (feet)*:	10
Boring Diameter (inches):	8
Pipe Diameter (inches):	3

*measured at time of test

Test pit dimensions (if rectangular)	
Pit Depth (feet):	
Pit Length (feet):	
Pit Breadth (feet):	

Minimum test Head (D_o):

(What the sounder tape should read) — Boring Depth - (5 x Boring Radius) — 9.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

*Pre-Test (Sandy Soil Criteria)**

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval (min)	Initial Depth to Water (feet)	Final Depth to Water (feet)	Total Change in Water Level (feet)	Greater Than or Equal to 0.5 feet (yes/no)
1	8:40	9:05	25.0	6.84	6.84	0	No
2	9:11	9:36	25.0	6.86	6.91	0.05	No

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

Main Test Data

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval, Δt (min)	Initial Depth to Water, D_o (feet)	Final Depth to Water, D_f (feet)	Change in Water Level, ΔD (feet)	Calculated Infiltration Rate(in/hr)
1	9:36	10:06	30.0	6.91	6.95	0.04	0.0
2	10:06	10:36	30.0	6.95	6.99	0.04	0.1
3	10:36	11:06	30.0	6.99	7.02	0.03	0.0
4	11:06	11:36	30.0	7.02	7.06	0.04	0.1
5	11:36	12:06	30.0	7.06	7.1	0.04	0.1
6	12:06	12:36	30.0	7.1	7.13	0.03	0.0
7	12:36	13:06	30.0	7.13	7.18	0.05	0.1
8	13:06	13:36	30.0	7.18	7.2	0.02	0.0
9	13:36	14:06	30.0	7.2	7.24	0.04	0.1
10	14:06	14:36	30.0	7.24	7.27	0.03	0.0
11	14:36	15:06	30.0	7.27	7.31	0.04	0.1
12	15:06	15:36	30.0	7.31	7.34	0.03	0.0
						Calculated Infiltration Rate (No factors of safety)	**0.0**
						Factor of Safety	**2.0**
						Calculated Infiltration Rate (With Factor of Safety)	**0.0**

Sketch:

Notes: Pipe extends 1 foot above existing ground elevation; therefore, add 1 foot to boring depth when calculating minimum test head.

Based on Guidelines from: Orange County 05/19/2011

Spreadsheet Revised on: 10/26/2016

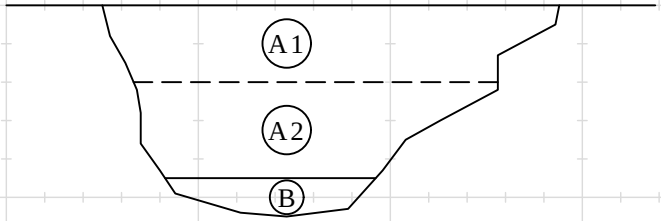
LGC Geotechnical, Inc.

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-1	
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A1	Quaternary Very Old Alluvial Fan Deposits @ 0' Silty CLAY with fine Sand: reddish brown, slightly moist to moist, loose to stiff with hard clods; rootlets; sand is off white and tabular; topsoil grades to well indurated soil	Qvof				
	A2	@ 2' - Silty CLAY with fine Sand: light reddish brown, moist, hard, lacks organics; very well indurated; sand content varies			B-1 @ 3-4'		
	B	Cretaceous Gabbro @ 4.5' - SAND: orange, moist, very dense; highly weathered gabbro (rock)	Kgb		B-2 @ 5'		

GRAPHICAL REPRESENTATION BELOW: Elevation : 1495 ' MSL Surface Slope: 0 deg. Trend: N60E



Total Depth: 5.5'
Groundwater: None
Backfilled with Compaction
Wheel: 12/21/2016

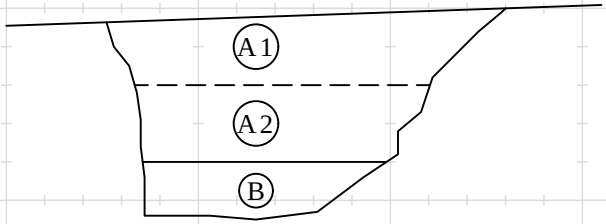
scale : 1 in = 5 ft

Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-2
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:
Equipment: Case Extendahoe	Location: See Geotechnical Map	

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A1	Quaternary Very Old Alluvial Fan Deposits @ 0' SILT, SAND, and CLAY: light brown, dry to moist, loose to stiff; porous (topsoil)	Qvof				
	A2	@ 2' Sandy CLAY: reddish brown, moist, very stiff to slightly hard; micropores; soil horizon with argyllic/rectilinear weathering; stoneline. Below grades to weathered bedrock					
	B	Cretaceous Gabbro @ 4' SAND: light orange and gray, moist, very dense; decomposed gabbro (rock); highly weathered; coarse grained	Kgb				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1481 ' MSL Surface Slope: 2 deg. Trend: N20W



Total Depth: 5.5'
Groundwater: None
Backfilled with Compaction
Wheel: 12/21/2016

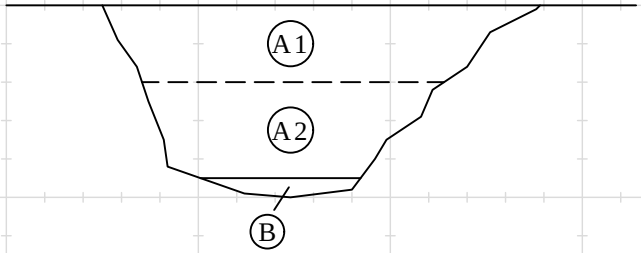
scale : 1 in = 5 ft

Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-3	
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A1	Quaternary Very Old Alluvial Fan Deposits @ 0' Sandy CLAY: brown, dry to moist, loose with stiff zones; micro pores; slightly cemented; well indurated; rootlets; desiccated; tabular sand (topsoil).	Qvof				
	A2	@ 2' Sandy CLAY: reddish brown, moist, slightly hard; very well indurated; weathered.			B-1 @2.5' to 3'		
	B	Cretaceous Gabbro @ 4.5' Coarse SAND: light orange and gray mottled, moist, very dense; highly weathered; decomposed gabbro (rock); iron oxide	Kgb				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1470 ' MSL Surface Slope: 0 deg. Trend: N70E



Total Depth: 5'
Groundwater: None
Backfilled with Compaction
Wheel: 12/21/2016

scale : 1 in = 5 ft

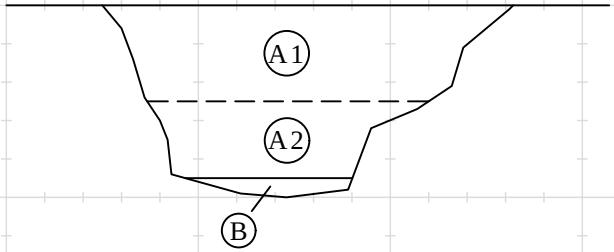
Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-4	
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A1	Quaternary Very Old Alluvial Fan Deposits @ 0' Sandy CLAY: light reddish brown, dry to slightly moist, loose to very stiff; rootlets; desiccated (topsoil)	Qvof				
	A2	@ 2.5' Sandy CLAY: brown to reddish brown, moist, slightly hard; well indurated; micropores; tabular, white, feldspathic sand grains					
	B	Cretaceous Gabbro @ 4.5' Coarse SAND: light orange and gray, slightly moist, very dense; highly weathered gabbro (rock)	Kgb				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1471 ' MSL Surface Slope: 0 deg. Trend: N30E



Total Depth: 5'
Groundwater: None
Backfilled with Compaction
Wheel: 12/21/2016

scale : 1 in = 5 ft

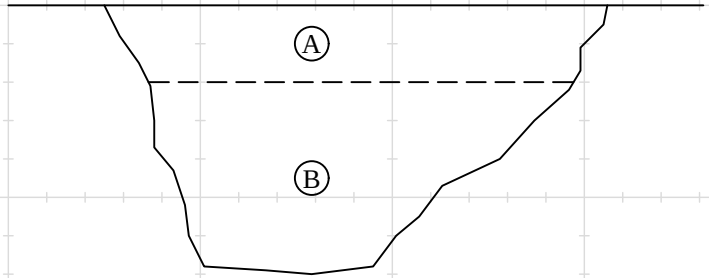
Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-5	
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A B	Quaternary Very Old Alluvial Fan Deposits @ 0' Sandy CLAY with Silt: brown, slightly moist, loose to very stiff; rootlets; porous; desiccated (topsoil) @ 2' Clayey SAND to Sandy CLAY with scattered Gravel: light orangish brown and light reddish brown layers, moist, dense; caliche; stonelines	Qvof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1457 ' MSL Surface Slope: 0 deg. Trend: N70W



Total Depth: 7'
Groundwater: None
Backfilled with Compaction
Wheel: 12/21/2016

scale : 1 in = 5 ft

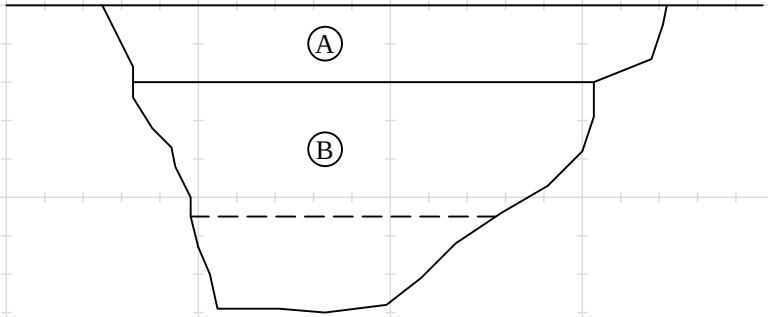
Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-6
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:
Equipment: Case Extendahoe	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A B	Quaternary Old Alluvial Fan Deposits @ 0' CLAY with Sand: brown, wet, soft; rootlets (topsoil) @2' Sandy CLAY to Clayey SAND: light reddish brown to orangish brown mottled, slightly moist, very dense; krotovina; rootlets; well-indurated; micropores; scattered subangular gravels @ 5.5' to T.D. - Moderate brown Clayey SILT with SAND, slightly moist, slightly to moderately dense. Few scattered rootlets to 8'	Qof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1443 ' MSL Surface Slope: 0 deg. Trend: N10W



Total Depth: 8'
Groundwater: None
Backfilled with Compaction
Wheel: 12/21/2016

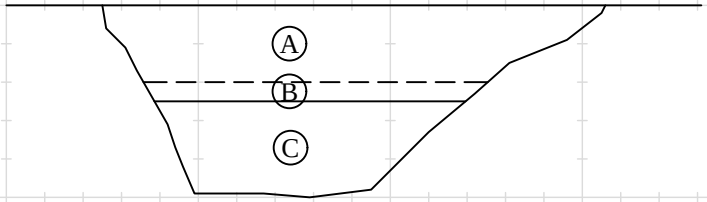
scale : 1 in = 5 ft

Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-7	
Project Number : 16151-01	Date : 12/21/2016	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' Sandy CLAY: brown, slightly moist to moist, loose with very stiff zones; rootlets; desiccated upper zone (topsoil)	Qof				
	B	@ 2' Sandy CLAY: light reddish brown, slightly moist; very well indurated layer					
	C	Quaternary Very Old Alluvial Fan Deposits @ 2.5' - Cobbly SAND with Clay: light reddish brown with blue subangular clasts and subrounded plutonic clasts, moist, very dense; variable sand content	Qyof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1457 ' MSL Surface Slope: 0 deg. Trend: EW



Total Depth: 5'
Groundwater: None
Backfilled with Compaction Wheel: 12/21/2016

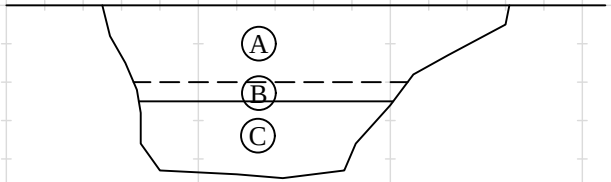
scale : 1 in = 5 ft

Last Edited: 1/4/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-8	
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' - Silty CLAY with Sand: light reddish brown, moist to very moist, soft; roots; increase stiffness with depth; micropores; well-indurated	Qof				
	B	@ 1.5' Sandy CLAY: light reddish brown, slightly moist; very well indurated layer; grades to old fan deposit					
	C	Quaternary Very Old Alluvial Fan Deposits @ 2' - Silty SAND with scattered Gravels: light brown mottled, slightly moist, very dense; very well-indurated; krotovina to 3'	Qvof		B-1 @3' to 5'		

GRAPHICAL REPRESENTATION BELOW: Elevation : 1436 ' MSL Surface Slope: 0 deg. Trend: N76E



Total Depth: 4.5'
Groundwater: None
Backfilled with Compaction
Wheel: 1/4/2017

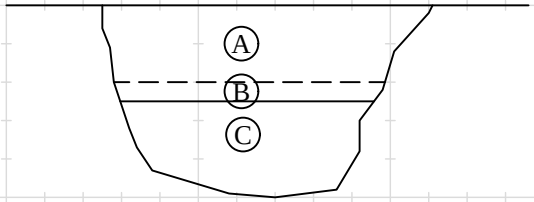
scale : 1 in = 5 ft

Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-9
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:
Equipment: Case Extendahoe	Location: See Geotechnical Map	

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' - Sandy CLAY: moderate brown, very moist grades to slightly moist, dense; micropores, (topsoil)	Qof				
	B	@ 1' Sandy CLAY: light reddish brown, slightly moist; very well indurated layer; grades to old fan deposit					
	C	Quaternary Very Old Alluvial Fan Deposits @ 2' Silty SAND with scattered Gravels: light reddish brown mottled, slightly moist, very dense; very well-indurated; krotovina to 3'; subangular gravels up to 3" in diameter	Qvof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1429 ' MSL Surface Slope: 0 deg. Trend: N15W



Total Depth: 5'
Groundwater: None
Backfilled with Compaction Wheel: 1/4/2017

scale : 1 in = 5 ft

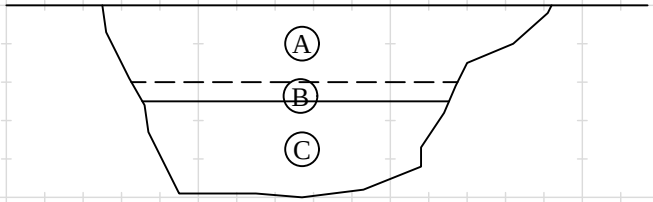
Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-10	
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' Sandy CLAY to Clayey SAND: moderate reddish brown, very moist grades to slightly moist, medium dense; micropores, (topsoil)	Qof		B-1 @0'-2'		
	B	@ 2.5' Sandy CLAY: light reddish brown, slightly moist; very well indurated layer; excavates to old fan deposit					
	C	Quaternary Very Old Alluvial Fan Deposits @ 3' - Clayey SAND with scattered Gravels: light reddish brown mottled, moist, dense; well-indurated	Qvof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1427 ' MSL Surface Slope: 0 deg. Trend: NS



Total Depth: 5'
Groundwater: None
Backfilled with Compaction Wheel: 1/4/2017

scale : 1 in = 5 ft

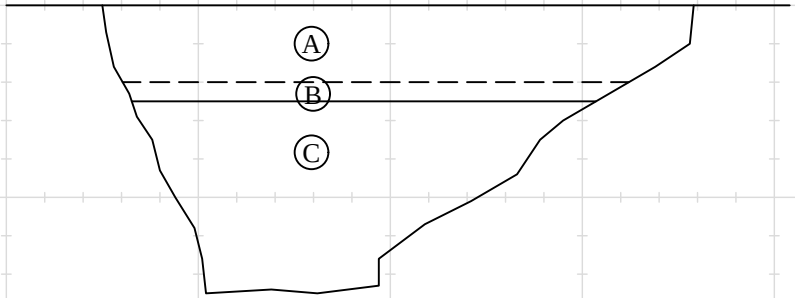
Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-11
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:
Equipment: Case Extendahoe	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' Silty CLAY with Sand: moderate brown to dark brown, moist, soft to stiff; rootlets; minor soil development; poorly indurated, (topsoil)	Qof				
	B	@ 2' Sandy CLAY: light orange brown and offwhite, slightly moist; very well indurated layer; subhorizontal stoneline; subhoriztonal caliche banding					
	C	Quaternary Very Old Alluvial Fan Deposits @ 2' SILT with some Sand: light yellowish brown, dry to slightly moist, stiff; caliche stringers; few scattered pores; slightly indurated; induration increases with depth	Qvof		B-1 @5' to 6'		

GRAPHICAL REPRESENTATION BELOW: Elevation : 1433 ' MSL Surface Slope: 0 deg. Trend: EW



Total Depth: 7.5'
Groundwater: None
Backfilled with Compaction
Wheel: 1/4/2017

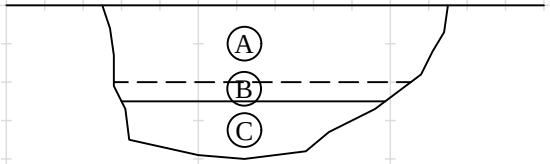
scale : 1 in = 5 ft

Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-12
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:
Equipment: Case Extendahoe	Location: See Geotechnical Map	

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' Silty CLAY with Sand: brown, moist to very moist, loose to slightly hard; rootlets; (topsoil) Argyllic Soil Horizon	Qof				
	B	@ 2' Rectilinear weathering Quaternary Very Old Alluvial Fan Deposits	Qvof				
	C	@ 2.5' Clayey SAND: moderate brown, slightly moist, hard; very well-indurated; lacks pores; tabular sand consisting of feldspar crystals					

GRAPHICAL REPRESENTATION BELOW: Elevation : 1424 ' MSL Surface Slope: 0 deg. Trend: N50W



Total Depth: 4'
Groundwater: None
Backfilled with Compaction
Wheel: 1/4/2017

scale : 1 in = 5 ft

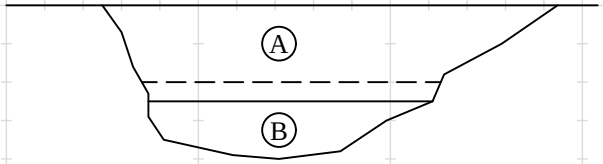
Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-13
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:
Equipment: Case Extendahoe	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' Silty CLAY with Sand: brown, very moist, loose to very stiff; rootlets; minor soil development; well-indurated; desiccation cracks	Qof				
	B	@ 2' Rectilinear weathering, old soil horizon					
	C	Quaternary Very Old Alluvial Fan Deposits @ 2.5' Clayey SAND: moderate reddish brown, moist, very dense; very well-indurated; faint root casts; tabular sand consisting of feldspar crystals	Qvof		B-1 @3'-4'		

GRAPHICAL REPRESENTATION BELOW: Elevation : 1431 ' MSL Surface Slope: 0 deg. Trend: EW



Total Depth: 4'
Groundwater: None
Backfilled with Compaction
Wheel: 1/4/2017

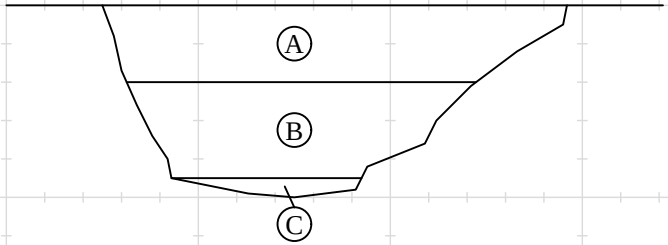
scale : 1 in = 5 ft

Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-14	LGC Geotechnical, Inc.
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' Clayey SAND: brown, very moist, loose to hard; very well-indurated; desiccation cracks	Qof				
	B	@ 2' Clayey SAND with trace Gravel: light reddish brown mottled, slightly moist, very hard grades to very stiff at 3.5'; few scattered micropores to 4'; very well indurated; krotovina to 4'; blocky texture					
	C	Quaternary Very Old Alluvial Fan Deposits @ 4.5' SANDSTONE or very well indurated SAND: light gray, very dense, slightly moist	Qvof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1435 ' MSL Surface Slope: 0 deg. Trend: NS



Total Depth: 5'
Groundwater: None
Backfilled with Compaction
Wheel: 1/4/2017

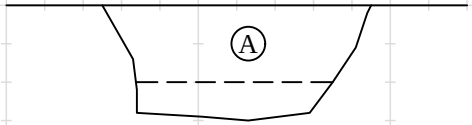
scale : 1 in = 5 ft

Last Edited: 1/17/2017

Project Name: Fleming Ranch	Logged By: KTM	Trench No: TP-15	
Project Number : 16151-01	Date : 1/4/2017	Engineering Properties:	
Equipment: Case Extendahoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	Quaternary Old Alluvial Fan Deposits @ 0' to 2' - Quaternary Old Fan Deposits (Qof): @ 0' - Sandy CLAY: moderate reddish brown, moist, loose to slightly hard, rootlets. @ 2' to 3' - Clayey SAND: moderate reddish brown, moist, very dense; well indurated; few root casts and micro pores; white, tabular, feldspar, sand grains. Refusal by backhoe.	Qof				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1435 ' MSL Surface Slope: 0 deg. Trend: N15E



Total Depth: 3'
Groundwater: None
Backfilled with Compaction
Wheel: 1/4/2017

scale : 1 in = 5 ft

Last Edited: 1/17/2017

GEOTECHNICAL BORING LOG B-1

Date 3-10-05 **Sheet** 1 **of** 2

Project Flemming Ranch **Project No.** 111461-002

Drilling Co. Redman **Type of Rig** CME75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1430' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By RM; Sampled By RM)	Type of Tests
1430	0		Bulk 2 @ 0-5'						QUATERNARY ALLUVIUM (Qal) @ Surface: Topsoil with heavy vegetation	CS, EI
				R1	20	117.6	16.1	CL	@ 2.5': Dark brown, very moist, stiff, sandy CLAY	
1425	5			R3	34	118.4	15.7		@ 5': Red-brown, very moist, very stiff, sandy CLAY	CN
				R4	59	121.5	14.5	SC	@ 7.5': Red-brown, moist, dense, clayey SAND	
1420	10			R5	48	105.6	27.5		@ 10': Red-brown, moist, medium dense, clayey SAND	
1415	15			S6	14			CL	@ 15': Brown, moist, stiff, sandy CLAY	
1410	20			R7	67/11"	108.5	11.2		UNDIFFERENTIATED GRANITIC BEDROCK (Kgr) @ 20': Brown, damp to moist, dense, highly weathered BEDROCK	
1405	25			S8	43				@ 25': Brown, moist, dense, weathered BEDROCK	
1400	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-1

Date 3-10-05 **Sheet** 2 **of** 2

Project Flemming Ranch **Project No.** 111461-002

Drilling Co. Redman **Type of Rig** CME75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1430' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1400	30			R9	50/6"				@ 30': Brown, very moist, dense, weathered BEDROCK	
1395	35								Refusal at 31' No Groundwater Encountered Backfilled with Spoils 3/10/05	
1390	40									
1385	45									
1380	50									
1375	55									
1370	60									

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

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-2

Date 3-10-05 **Sheet** 1 **of** 1
Project Flemming Ranch **Project No.** 111461-002
Drilling Co. Redman **Type of Rig** CME75
Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"
Elevation Top of Hole +/- 1440' **Location** See Map

Logged By RM
Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1440	0		Bulk 1 @ 0-5'						QUATERNARY ALLUVIUM (Qal) @ Surface: Topsoil with heavy vegetation	
				R2	65/12"	128.9	11.3	SM	@ 2.5': Brown, moist, dense, silty SAND with clay lens	HCO
1435	5			R3	50/5"	107.0	10.6		@ 5': Brown, moist, dense, silty SAND	HCO
									UNDIFFERENTIATED GRANITIC BEDROCK (Kgr)	
				R4	50/5"	114.1	7.5		@ 7.5': Gray, damp, dense, highly weathered BEDROCK	
1430	10			S5	50/5"		3.8		@ 10': Gray-brown, damp, very dense, weathered BEDROCK	
1425	15			S6	50/4"		3.5		@ 15': Gray, damp, very dense, weathered BEDROCK	
1420	20								Refusal @ 15'4" No Groundwater Encountered Backfilled with Spoils 3/10/05	
1415	25									
1410	30									

SAMPLE TYPES:
S SPT
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
C CORE SAMPLE

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-3

Date 3-10-05 **Sheet** 1 **of** 1

Project Flemming Ranch **Project No.** 111461-002

Drilling Co. Redman **Type of Rig** CME75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1480' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By RM; Sampled By RM)	Type of Tests
1480	0								QUATERNARY ALLUVIUM (Qal) @ Surface: Topsoil with vegetation	
			Bulk 1 @ 0-5'							EI
				R2	23	99.3	2.3	CL	@ 2.5': Red-brown, very moist, stiff, sandy CLAY	
1475	5			R3	22	109.3	8.4		@ 5': Brown, very moist, stiff CLAY	
								SM	UNDIFFERENTIATED GRANITIC BEDROCK (Kgr) @ 5.5': Gray-white, moist, very dense, highly weathered BEDROCK	MD
			Bulk 6 @ 5-10'							
				R4	70/10"	117.0	5.3		@ 7.5': Gray-white, moist, very dense, weathered BEDROCK	
1470	10			R5	50/6"	120.6	3.5		@ 10': Brown, moist, very dense, weathered BEDROCK	DS
1465	15			S7	80/10"				@ 15': Gray-brown, moist, very dense, weathered BEDROCK	
1460	20			R8	50/3"	105.2	3.9		@ 20': Gray-brown, moist, very dense, weathered BEDROCK	
				S9	50/2"					
1455	25								Refusal @ 24'2"' No Groundwater Encountered Backfilled with Spoils 3/10/05	
1450	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-4

Date 3-10-05 **Sheet** 1 **of** 2

Project Flemming Ranch **Project No.** 111461-002

Drilling Co. Redman **Type of Rig** CME75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1434' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								QUATERNARY ALLUVIUM (Qal) @ Surface: Topsoil with vegetation	MD, EI, DS
			Bulk 1 @ 0-5'	R2	16	115.3	17.3	CL	@ 2.5': Red-brown, very moist, stiff, sandy CLAY	
1430	5			R3	18	124.2	10.2		@ 5': Brown, very moist, stiff, sandy CLAY	CN
			Bulk 6 @ 5-10'	R4	61/12"	112.9	15.0	SC	@ 7.5': Brown, moist, dense, clayey SAND with gravel	
1425	10			R5	71/10"		21.6	SM	@ 10': Red-brown, moist, dense, silty SAND; sample possibly disturbed	
1420	15			R7	54	111.9	14.8		@ 15': Brown, very moist, dense, silty SAND; fine grained	
1415	20			S8	44		7.2		@ 20': Brown, damp to moist, dense, silty SAND; cementation	
1410	25			R9	87/11"	113.9	19.5		@ 25': Brown, moist, dense, silty SAND; trace clay, cementation	
1405	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-4

Date 3-10-05 **Sheet** 2 **of** 2
Project Flemming Ranch **Project No.** 111461-002
Drilling Co. Redman **Type of Rig** CME75
Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"
Elevation Top of Hole +/- 1434' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By RM; Sampled By RM)	Type of Tests
	30			S10	19		28.3	ML	@ 30': Red-brown, very moist, stiff, SILT with sand	-200
									@ 33': Gravel layer	
1400	35			S11	29		31.5	ML	@ 35': Red-brown, moist, very stiff, SILT with sand	AL
1395										
	40			S12	28		22.1		@ 40': Red-brown, moist, very stiff, SILT with sand	
1390										
	45			S13	44		23.2		@ 45': Red-brown, moist, hard, SILT with sand	
1385										
	50			S14	68		21.0		@ 50': Red-brown, moist, hard, SILT with sand	-200
1380										
	55								Total Depth 51.5' Groundwater Encountered @ 30' Backfilled with Spoils 3/10/05	
1375	60									

SAMPLE TYPES:
S SPT
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
C CORE SAMPLE

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-5

Date 3-10-05 **Sheet** 1 **of** 2

Project Flemming Ranch **Project No.** 111461-002

Drilling Co. Redman **Type of Rig** CME75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1465' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1465	0							CL	QUATERNARY ALLUVIUM (Qal) @ Surface: Topsoil with vegetation @ 0-2': Brown, very moist, sandy CLAY	
				R1	10	89.4	26.4	CL-ML	@ 2.5': Gray-white, very moist, medium stiff, silty CLAY	
1460	5			R2	30	114.2	17.8	SM	@ 5': Brown, moist, medium dense, silty SAND with clay	
				R3	52	110.0	17.9	SC	@ 7.5': Brown, moist, dense, clayey SAND	
1455	10			R4	50/6"	107.6	20.2		@ 10': Brown, moist, dense, clayey SAND; cementation	
1450	15			S5	85/11"			CL	@ 15': Brown, moist, hard, sandy CLAY	
1445	20			R6	71	111.3	19.7	SC	@ 20': Brown, moist, dense, clayey SAND	
1440	25			S7	22		29.1		@ 25': Brown, very moist, very stiff, clayey SAND	-200
1435	30									

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

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-5

Date 3-10-05 **Sheet** 2 **of** 2

Project Flemming Ranch **Project No.** 111461-002

Drilling Co. Redman **Type of Rig** CME75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1465' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By RM; Sampled By RM)	Type of Tests
1435	30			S8	23		29.3	SC	@ 30': Brown, very moist to wet, very stiff, clayey SAND	
1430	35			S9	70/11"		19.8	CL	@ 35': Brown, very moist, hard, sandy CLAY; trace gravel	
1425	40			S10	33		24.9	SC/CL	@ 40': Brown, very moist to wet, dense, clayey SAND to sandy CLAY with gravel	-200
1420	45			S11	30		23.2		@ 45': Brown, very moist, dense, clayey SAND with gravel	
1415	50			S12	50/4"		21.0	CL SM	@ 50': Brown, wet, hard CLAY UNDIFFERENTIATED GRANITIC BEDROCK (Kgr) @ 50.5': Gray-brown, wet, dense, highly weathered BEDROCK	
1410	55								Total Depth 50.5' Groundwater Encountered @ 27' Backfilled with Spoils 3/10/05	
1405	60									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-6

Date 3-10-05 **Sheet** 1 **of** 2
Project Flemming Ranch **Project No.** 111461-002
Drilling Co. Redman **Type of Rig** CME75
Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"
Elevation Top of Hole +/- 1430' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By RM, Sampled By RM)	Type of Tests
1430	0								QUATERNARY ALLUVIUM (Qal) @ Surface: Topsoil with vegetation; dark brown, very moist, lean CLAY	
				R1	63/12"	110.7	19.6	CL	@ 2.5': Dark brown, very moist, stiff, lean CLAY	
								SC	@ 3': Red-brown, moist, dense, clayey SAND	
1425	5			R2	79	110.7	19.8	CL	@ 5': Brown, moist, hard, sandy CLAY	
				S3	18	86.9	35.5		@ 7.5': Brown, moist, stiff, sandy CLAY	CN
1420	10			R4	43			ML	@ 10': Olive-brown, moist, very stiff SILT	
1415	15			S5	19				@ 15': Olive-brown, moist, stiff SILT	
								SM	@ 16': Gray, damp, medium dense, silty SAND	
1410	20			R7	75/12"	107.2	20.8	ML	@ 20': Olive-brown, moist, hard, sandy SILT	
1405	25			S8	47				@ 25': Olive-brown, moist, hard, sandy SILT	
				S9				SM	@ 26': Brown, moist, dense, silty SAND	
1400	30									

SAMPLE TYPES:
S SPT
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
C CORE SAMPLE

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-6

Date 3-10-05 **Sheet** 2 **of** 2

Project Flemming Ranch **Project No.** 111461-002

Drilling Co. Redman **Type of Rig** CME75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1430' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
									Logged By RM **Sampled By** RM	
1400	30			S10	65			ML	@ 30': Light olive-brown, moist, hard SILT	
				S11					@ 31': Brown, moist, hard, sandy SILT	
1395	35								Total Depth 31.5' No Groundwater Encountered Backfilled with Spoils 3/10/05	
1390	40									
1385	45									
1380	50									
1375	55									
1370	60									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-7

Date 3-10-05 **Sheet** 1 **of** 1

Project Flemming Ranch **Project No.** 111461-002

Drilling Co. Redman **Type of Rig** CME75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1460' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1460	0								QUATERNARY ALLUVIUM (Qal) @ Surface: Topsoil with vegetation	
				R1	70/11"	115.3	17.8	CL	@ 2.5': Dark brown, very moist, hard, lean CLAY @ 3': Brown, moist, hard, sandy CLAY	
1455	5			R2	70	99.4	22.7	SM	@ 5': Red-brown, moist, dense, silty SAND with clay	HCO
				R3	46	103.4	21.7		@ 7.5': Red-brown, moist, medium dense, silty SAND with clay and gravel; cementation	HCO
1450	10			S4	35		29.3	SC	@ 10': Red-brown, moist, dense, clayey SAND	
1445	15			R5	76	105.4	25.0	CL	@ 15': Brown, moist, hard, sandy CLAY with gravel	
1440	20			S6	41		19.8	SC	@ 20': Brown, very moist, dense, clayey SAND with gravel	-200
1435	25								Total Depth 21.5' Groundwater Encountered @ 17' Backfilled with Spoils 3/10/05	
1430	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-8

Date 3-10-05 **Sheet** 1 **of** 2

Project Flemming Ranch **Project No.** 111461-002

Drilling Co. Redman **Type of Rig** CME75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1450' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By RM; Sampled By RM)	Type of Tests
1450	0		Bulk 1 @ 0-5'						QUATERNARY ALLUVIUM (Qal) @ Surface: Topsoil with vegetation, occasional some cobble	CS
				R2	59	104.8	21.5	CL	@ 2.5': Dark brown, very moist, stiff, lean CLAY	
								SM	@ 3': Brown, moist, dense, silty SAND with clay	
1445	5			R3	78/10"	117.6	12.1		@ 5': Red-brown, moist, dense, silty SAND	
				R4	71/11"	113.6	13.8		@ 7.5': Red-brown, moist, dense, silty SAND	
1440	10			R5	81/11"	112.2	14.1		@ 10': Red-brown, moist, dense, silty SAND; cementation	
1435	15			S6	38		24.9	SC	@ 15': Brown, moist, dense, clayey SAND	
1430	20			R7	50/5"	113.6	15.4		@ 20': Brown, moist, dense, clayey SAND; traces of porosity	
1425	25			S8	42			CL	@ 25': Brown, very moist, hard, sandy CLAY	
1420	30									

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

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-8

Date 3-10-05 **Sheet** 2 **of** 2

Project Flemming Ranch **Project No.** 111461-002

Drilling Co. Redman **Type of Rig** CME75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1450' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
									Logged By RM **Sampled By** RM	
1420	30			S9	46			SC	@ 30': Brown, very moist, dense, clayey SAND with gravel	
1415	35								Total Depth 31.5' Groundwater Encountered @ 22' Backfilled with Spoils 3/10/05	
1410	40									
1405	45									
1400	50									
1395	55									
1390	60									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	[Project Name]	Boring No.:	B-1
Project Number:	[Project Number]	Driller:	[Driller Name]
		Drill Type:	Hollow-stem
Date Drilled:	1/1/01	Hammer Wt. / Drop:	140lb / 30in
Logged By:	[Name]	Ground Elev. [ft]:	100.0

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]	PID/FID [ppm]	Lab Tests	Remarks
				14 22	12 15	121	**Artificial Fill (Af)**: Sandy CLAY (CL): gray-brown, fine grained sand, slightly micaceous, moist, stiff	1.5	0	EI MAX SU DS	
95	5			8 12 14			**Alluvium (Qal)**: Poorly-graded SAND (SP): olive-brown, fine to medium grained, micaceous, moist, medium dense, slight hydrocarbon odor		6	GS	
(1)			(2)	(3)	(4)	(4)	(5)	(6)	(7)	(8)	(9)

(1) Elevation and Depth: Depth of boring below existing ground surface. Where the ground elevation is known, the Datum is Mean-Sea-Level (MSL) unless otherwise noted at the end of the log.

(2) Sample Type: See legend at the top of the log.

(3) Blows/6": The number of blows required to drive the sampler in 6-inch intervals, unless otherwise noted. The blow counts are reported as field blows (i.e. Not corrected to N_{60}). The samples are driven using a 140-pound hammer dropped 30-inches, unless otherwise noted above in the header and/or at the end of the log.

(4) Moisture Content and Dry Density: As estimated in the field or laboratory.

(5) Soil Description and Classification: The soil classification as determined from ASTM D 2987 (Unified Soil Classification System). The field classifications have been modified based on laboratory testing where appropriate. The soils are described as follows:

Group Name (U.S.C.S. Symbol): color, grain size, other descriptions (i.e. Mineral content, staining, interbedded soils), moisture, relative density/consistency, odor (if present).

(6) Pocket Penetrometer: The pocket penetrometer estimates the unconfined compression strength (in tons-per-square foot) using a calibrated spring. These results were measured in the field and/or the laboratory

(7) PID/FID: Measurements of Volatile Organic Soils as determined using a Photo-Ionization or Flame-Ionization Detector. (If measurement is taken)

(8) Lab Testing: Indicated laboratory testing performed on the samples (other than in-situ moisture content and dry density). The following codes apply:

MAX- Maximum Density/Optimum Moisture
GS- Grain-size distribution
WA- Percent Passing #200 Sieve
AL- Atterberg Limits
SE- Sand Equivalent

DS- Direct Shear
UC- Unconfined Compression
TX- Triaxial
  uu- unconsolidated, undrained
  cd- consolidated, drained
  cu- consolidated, undrained
CN- Consolidation

CP- Collapse Potential
PM- Permeability
RV- R-Value
SU- Sulfate Content
CO- Corrosion Series

(9) Remarks: Remarks regarding well construction, drilling issues (i.e. Slow drilling) and other concerns or remarks worth noting.

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EXPLANATION OF LOGS
Hollow-Stem and Straight-Flight Auger

LOG OF EXPLORATORY BORING

Project:	K. Hovnanian Fleming Ranch	Boring No.:	**MB-1**
Project Number:	03101-00	Driller:	Al-Roy Drilling
		Drill Type:	B-57
Date Drilled:	1/6/04	Hammer Wt. / Drop:	140lb / 30in
Logged By:	C. Spitzer	Ground Elev. [ft]:	---

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

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			15 28 37	12.4	117	**Alluvium (Qal):** @ 2-1/2 feet: Sandy CLAY (CL): reddish brown, moist, stiff.			
						Cretaceous-Mesozoic Bedrock (KgMz/Kgb): Granitoid Rock: light brown to gray, fine to medium grained, moderately weathered, weak, weathering of plagioclase and felspars to clay. Total Depth = 4 feet below ground surface (bgs). Practical Refusal at 4 feet. No groundwater encountered. Backfilled with cuttings.			

HS BA TP 03101-00HS.GPJ ZKCI.GDT 1/27/04

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LOG OF EXPLORATORY BORING

Project: **K. Hovnanian Fleming Ranch**
Project Number: **03101-00**
Date Drilled: **1/6/04**
Logged By: **C. Spitzer**

Boring No.: **MB-2**
Driller: **Al-Roy Drilling**
Drill Type: **B-57**
Hammer Wt. / Drop: **140lb / 30in**
Ground Elev. [ft]: **---**

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

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Alluvium (Qal):			
			10 36/4"	4.0	5	@ 2-1/2 feet: Sandy CLAY (CL): reddish brown, moist, very stiff.		EI	
5			40/6"	103.7	107	**Cretaceous-Mesozoic Bedrock (KgMz/Kgb):** Granitoid Rock: light brown to gray, fine to medium grained, moderately weathered, weak, weathering of plagioclase and felspars to clay.			
						Total Depth = 5-1/2 feet bgs. Practical Refusal at 5-1/2 feet. No groundwater encountered. Backfilled with cuttings.			

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LOG OF EXPLORATORY BORING

Project:	K. Hovnanian Fleming Ranch	Boring No.:	MB-3
Project Number:	03101-00	Driller:	Al-Roy Drilling
		Drill Type:	B-57
Date Drilled:	1/6/04	Hammer Wt. / Drop:	140lb / 30in
Logged By:	C. Spitzer	Ground Elev. [ft]:	—

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

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			13 18 25	20.0	88	**Alluvium (Qal):** @ 2-1/2 feet: Sandy CLAY (CL): reddish brown, fine to coarse sand, damp, stiff.			
5			6 14 16	15.0	103	**Older Alluvium (Qoa):** @3-1/2 feet: Silty SAND (SM): buff, coarse grained, dry, dense. @5 feet: Silty SAND (SM): buff, coarse grained, appears to be completely weathered granite, dry, dense.			
10			13 50/6"	20.3	101	@ 10 feet: Clayey SAND (SC): buff, coarse grained, high silt content, appears to be completely weathered granite, dry dense. Total Depth = 11 feet bgs. Practical Refusal at 11 feet. No groundwater encountered. Backfilled with cuttings.			

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LOG OF EXPLORATORY BORING

Project:	K. Hovnanian Fleming Ranch	Boring No.:	MB-4
Project Number:	03101-00	Driller:	Al-Roy Drilling
		Drill Type:	B-57
Date Drilled:	1/6/04	Hammer Wt. / Drop:	140lb / 30in
Logged By:	C. Spitzer	Ground Elev. [ft]:	—

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

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			9 13 16	11.6	105	**Alluvium (Qal):** @ 2-1/2 feet: Sandy CLAY (CL): reddish brown, fine to coarse sand and some gravel, damp, stiff.			
5			9 13 14	17.1	101	**Older Alluvium (Qoa):** @5 feet: Sandy CLAY (CL): reddish brown to brown, higher silt content than above, caliche stringers, damp, stiff.			
10			18 45/6"	13.8	107	**Cretaceous-Mesozoic Bedrock (KgMz/Kgb):** @ 10 feet: Granitoid Rock:reddish brown, coarse grained, moderately weathered, weak, weathering of plagioclase and felspars to clay. Total Depth = 11 feet bgs. Practical Refusal at 11 feet. No groundwater encountered. Backfilled with cuttings.			

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LOG OF EXPLORATORY BORING

Project: K. Hovnanian Fleming Ranch
Project Number: 03101-00
Date Drilled: 1/6/04
Logged By: C. Spitzer

Boring No.: MB-5
Driller: Al-Roy Drilling
Drill Type: B-57
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: —

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

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			17 17 18	11.9	113	**Alluvium (Qal):** @ 2-1/2 feet: Sandy CLAY (CL): reddish brown, coarse grained sand and some gravel, caliche present, damp to moist, very stiff.			
5			20 40	6.3	116	@5 feet: Clayey SAND (SC): reddish brown, coarse grained, predominantly quartz grains, damp, very dense.		CN	
						Older Alluvium (Qoa):			
10			13 46 50/5"	21.5	101	@ 10 feet: Silty SAND (SM): light brown, very fine grained, some laminations, partially lithified, damp to moist, very dense.			
15			20 50/6"	11.5	114	@ 15 feet: Clayey SAND (SC): reddish brown, coarse grained, sub angular to angular clasts, partially lithified, predominately quartz, plagioclase and feldspar grains, moist, very dense. Total Depth = 16 feet bgs. Practical Refusal at 16 feet. No groundwater encountered. Backfilled with cuttings.			

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LOG OF EXPLORATORY BORING

Project: K. Hovnanian Fleming Ranch
Project Number: 03101-00

Date Drilled: 1/6/04
Logged By: C. Spitzer

Boring No.: **MB-6**
Driller: Al-Roy Drilling
Drill Type: B-57
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: —

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

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			15 18 24	12.8	112	**Alluvium (Qal):** @ 2-1/2 feet: Sandy CLAY (CL): reddish brown, some gravel, caliche present, some root traces, damp, very stiff.		MAX	
5			28 37	9.3	111	@5 feet: Sandy CLAY (CL): reddish brown, coarse grained sand, dry, very stiff.		DS	
						Older Alluvium (Qoa):			
10			12 15 25	4.5	112	@ 10 feet: Clayey SAND (SC): light reddish brown, coarse grained, quartz and biotite rich, sun angular grains, dry, dense.			
			50/6"	12.9		@ 12 feet: Silty SAND (SM): light brown, fine grained, some iron staining, partially lithified, dry, very dense.			
						Total Depth = 12-1/2 feet bgs. Practical Refusal at 12-1/2 feet. No groundwater encountered. Backfilled with cuttings.			

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LOG OF EXPLORATORY BORING

Project: **K. Hovnanian Fleming Ranch**
Project Number: **03101-00**
Date Drilled: **1/6/04**
Logged By: **C. Spitzer**

Boring No.: **MB-7**
Driller: **Al-Roy Drilling**
Drill Type: **B-57**
Hammer Wt. / Drop: **140lb / 30in**
Ground Elev. [ft]: **—**

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

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Alluvium (Qal):			
			14 32 31	7.3	117	@ 2-1/2 feet: Sandy CLAY (CL): reddish brown, coarse grained sand, some rootlets and pinhole porosity, damp to moist, hard.		EI	
5			16 23 40	9.9	122	@5 feet: Sandy to Silty CLAY (CL): reddish brown, coarse grained sand, dry, hard.			
						Older Alluvium (Qoa):			
10			15 22 20	4.3	105	@ 10 feet: Silty SAND (SM): light brown, fine grained, dry, dense.			
15			30 50/3"	16.4	100	@ 15 feet: Silty SAND (SM): light brown, fine grained, higher silt content than above, slightly lithified, dry, dense.			
20			30 35	37.9	80	@ 20 feet: SILT (ML): brown, slightly sandy, micaceous, moist, very stiff.			
25			11 16 50/5"	86.0	101	@ 25 feet: Sandy SILT (ML): brown, sandstone cobble in waste barrel, micaceous, moist, very stiff.			
						Total Depth = 26-1/2 feet bgs. Practical Refusal at 26-1/2 feet. No groundwater encountered. Backfilled with cuttings.			

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LOG OF EXPLORATORY BORING

Project:	K. Hovnanian Fleming Ranch	Boring No.:	**MB-8**
Project Number:	03101-00	Driller:	Al-Roy Drilling
		Drill Type:	B-57
Date Drilled:	1/6/04	Hammer Wt. / Drop:	140lb / 30in
Logged By:	C. Spitzer	Ground Elev. [ft]:	—

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

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Alluvium (Qal):			
			24 50/6"	10.1	106	@ 2-1/2 feet: Sandy CLAY (CL): reddish brown, damp, stiff.			
						Cretaceous-Mesozoic Bedrock (KgMz/Kgb):			
						Granitoid Rock: brown to reddish brown, fine to medium grained, moderately weathered, weak.			
5			40	3.2	116	@ 5 feet: Weathered Granitoid Rock: brown to reddish brown, fine to medium grained, moderately weathered, weak.			
						Total Depth = 6 feet bgs. Practical Refusal at 6 feet. No groundwater encountered. Backfilled with cuttings.			

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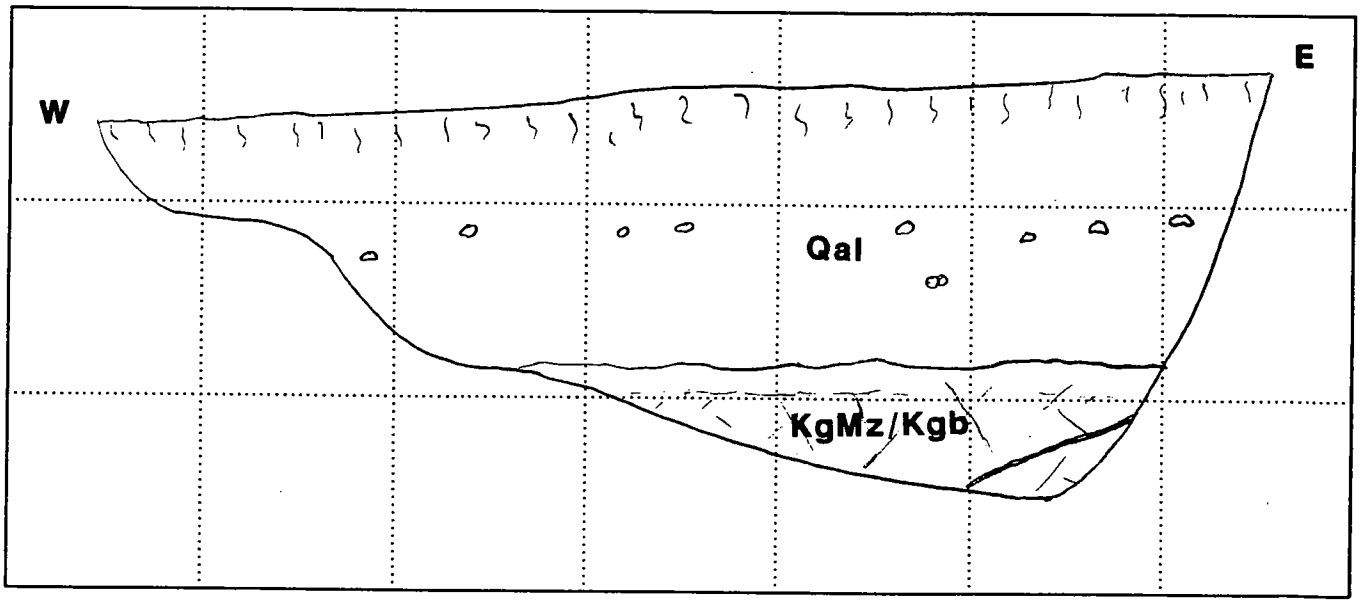
LOG OF EXPLORATORY TEST PIT

Project:	Fleming Ranch	Test Pit No.:	MT-1
Project Number:	03101-00	Contractor:	Al-Roy
		Backhoe:	Backhoe
Date Drilled:	1/9/04	Hammer Wt. / Drop:	140lb / 30in
Logged By:	MZ	Ground Elev. [ft]:	1468.0

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]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
1465	5			38/12"	9.3	108	J - N70E, 80S J- N60E, 35S B- N40E, 45N (mafic dike)	**Alluvium (Qal):** Sandy Clay (CL): Reddish-brown, damp, stiff, fine to coarse sand and trace fine gravel (igneous), abundant rootlets from 0'-3'. @3.5'-4.5' Porosity begins to increase, color changes to pale reddish-brown, increase in igneous rock fragments with depth. **Cretaceous-Mesozoic Bedrock (KgMz/Kgb)** Granitoid Rock: Light gray, pale brown and olive colored bedrock, phaneritic to porphrytic, friable, damp, irregular contact with overlying alluvium. @ 4.5'-5.5' Highly weathered bedrock, friable. @ 6' Mafic dike approximately 2" wide in trench, fine grained, hard. TD = 7', Trench Backfilled With Cuttings, No Groundwater Encountered, No Caving.	>4.5	MAX, SULF



HS BA TP 03101-00TP.GPJ ZKCI.GDT 1/27/04

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Scale: H 3 [ft]
V 3 [ft]

Pit Orientation: EW
Natural Slope Angle: 6

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

LOG OF EXPLORATORY TEST PIT

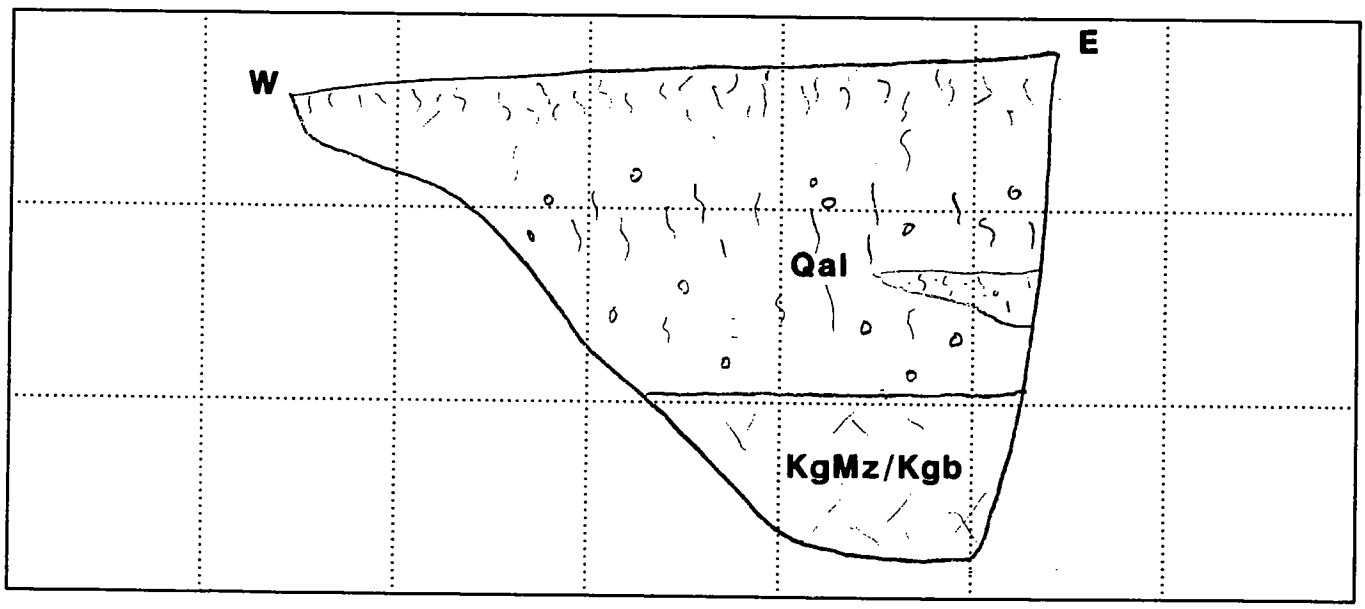
Project: **Fleming Ranch**
Project Number: **03101-00**

Test Pit No.: **MT-2**
Contractor: **Al-Roy**
Backhoe: **Backhoe**
Hammer Wt. / Drop: **140lb / 30in**
Ground Elev. [ft]: **1478.0**

Date Drilled: **1/9/04**
Logged By: **MZ**

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
1475	0			26/12"	10.5	113		**Alluvium (Qal):** Sandy Clay (CL): Reddish-brown, damp, stiff, abundant rootlets from 0' to 1.5'.	>4.5	
								@ 3' Porosity increases.		
								@ 3-5' sidewall of trench locally soft, fine to coarse sand and trace fine gravel channels in sandy clay.		
	5							@ 4' Alluvium color changes to olive, up to 1/4 inch diameter porosity.		
1470				20/12"			J - N70E, 63N	**Cretaceous-Mesozoic Bedrock (KgMz/Kgb):** Granitoid Rock: Light gray, pale brown and olive colored bedrock, porphrytic, jointed.		
								@ 5'-6' Highly weathered bedrock.		
								@ 6' Weathered granitoid rock, phaneritic, friable.		
								@ 6.5' Oxidized orange joints in weathered granitoid rock.		
								TD = 8', Trench Backfilled With Cuttings, No Groundwater Encountered, No Caving.		



HS BA TP 03101-00TP.GPJ ZKCI.GDT 1/29/04

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Scale: H 3 [ft]
V 3 [ft]

Pit Orientation: N70E
Natural Slope Angle: 5

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

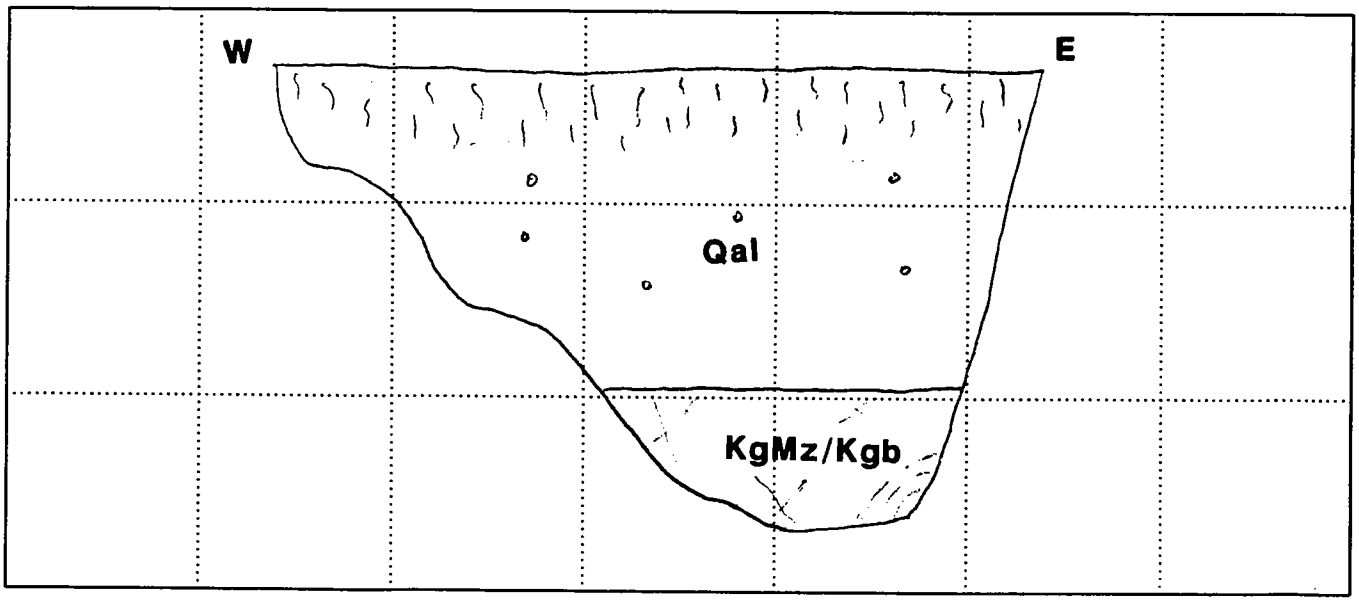
LOG OF EXPLORATORY TEST PIT

Project: **Fleming Ranch**
Project Number: **03101-00**
Date Drilled: **1/9/04**
Logged By: **MZ**

Test Pit No.: **MT-3**
Contractor: **Al-Roy**
Backhoe: **Backhoe**
Hammer Wt. / Drop: **140lb / 30in**
Ground Elev. [ft]: **1478.0**

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]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
1475	0							**Alluvium (Qal):** Sandy Clay (CL): Reddish brown, damp, stiff, abundant root hairs in upper 2', coarse sand to fine gravels (granitoid).		
				22/12"	17.2	110		@ 2'-5' Root porosity present up to 1/4".	>4.5	
	5						J - N10W, 75S	**Cretaceous-Mesozoic Bedrock (KgMz/Kgb):** Granitoid Rock: light to dark gray and pale brown, damp, friable, spheroidally weathered, jointing present, deeply weathered at contact at 5'.		
				28/12"				TD = 7', Trench Backfilled With Cuttings, No Groundwater Encountered, No Caving.		



HS BA TP 03101-00TP.GPJ ZKCI.GDT 1/27/04

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Scale: H 3 [ft]
V 3 [ft]

Pit Orientation: N75W
Natural Slope Angle: 0

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

LOG OF EXPLORATORY TEST PIT

Project:	**Fleming Ranch**	Test Pit No.:	**MT-4**
Project Number:	**03101-00**	Contractor:	**Al-Roy**
		Backhoe:	**Backhoe**
Date Drilled:	**1/9/04**	Hammer Wt. / Drop:	**140lb / 30in**
Logged By:	**MZ**	Ground Elev. [ft]:	**1461.0**

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]	Pocket Pen. [tsf]
1460	0					
			10/12"	8.5	94	>4.5
	5					
1455			25/12"			
			29/12"			
	10					
1450						

Alluvium (Qal):
Sandy Clay (CL): Reddish Brown, damp, soft, abundant root hairs and pinhole porosity in upper 2', caliche filled root hair traces.

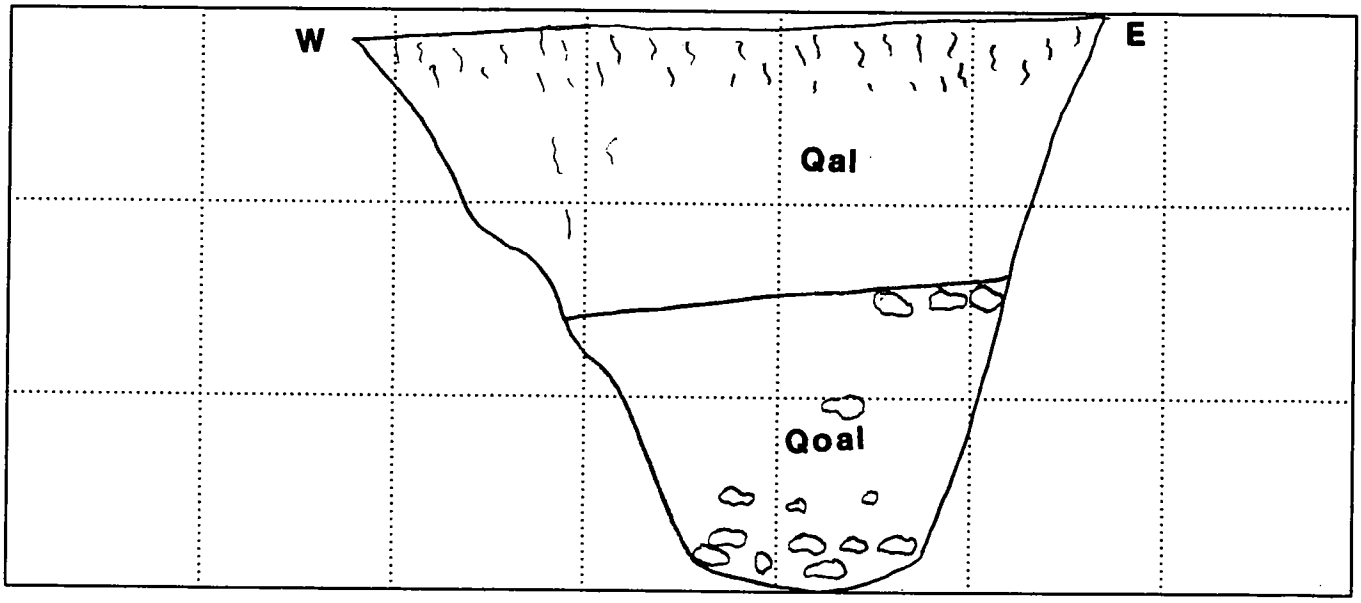
@ 2'-5' Soil becoming less sandy, moisture increasing.

Older Alluvium (Qoal):
Sandy Silt (ML) to Silty Sand (SM): Light reddish brown with light gray and olive caliche stringers abundant at contact with overlying alluvium, caliche common in infilled root pores up to 1/4 inch in diameter.

@ 7' Sandy Silt, damp, stiff, fine to coarse grained sand, coarse grained sand granitic in composition.

@ 9' Sandy Silt to Silty Sand, yellow brown, medium dense, damp, moisture increasing with depth.

@ 10'-12' Silty Sand, silt fraction decreasing, damp, igneous and metamorphic rock clasts abundant.
TD = 12', Trench Backfilled With Cuttings, No Groundwater Encountered, No Caving.



HS BA TP 03101-00TP.GPJ ZKCI.GDT 1/28/04

ZEISER KLING Consultants, Inc.

Scale: H 4 [ft] V 4 [ft]
Pit Orientation: EW
Natural Slope Angle: 2

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

LOG OF EXPLORATORY TEST PIT

Project: **Fleming Ranch**
Project Number: **03101-00**
Date Drilled: **1/9/04**
Logged By: **MZ**

Test Pit No.: **MT-5**
Contractor: **Al-Roy**
Backhoe: **Backhoe**
Hammer Wt. / Drop: **140lb / 30in**
Ground Elev. [ft]: **1442.0**

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]	Pocket Pen. [tsf]	Lab Tests
1440	0						MAX
			2/12"	16.5	113	>4.5	
	5		14/12"	14.7	115	>4.5	
1435			23/12"				
	10						

SOIL DESCRIPTION and CLASSIFICATION (USCS)

Alluvium (Qal):
Sandy Silt to Sandy Clay (ML-CL):

@ 0'-4' Sandy Silt to Sandy Clay (ML-CL), dark brown, very damp, very loose, abundant rootlets.

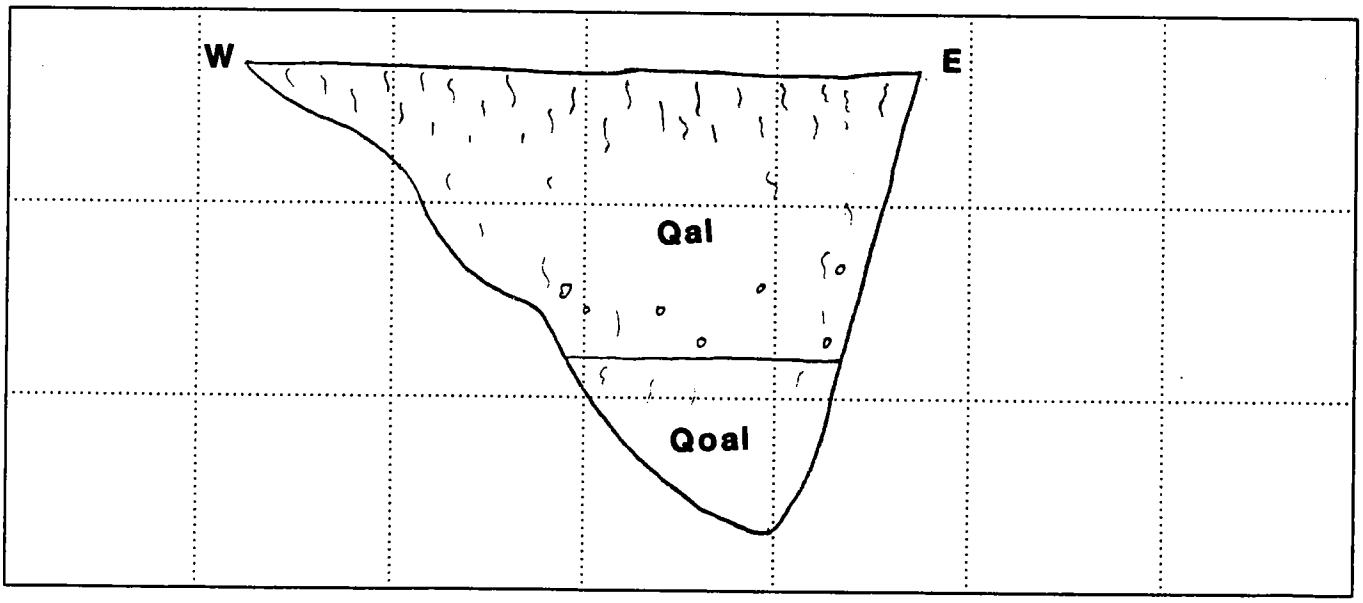
@ 4'-6' Clayey Sand (SC), reddish brown, very damp, medium dense, fine to coarse arkosic sand and fine gravels (igneous composition), trace metamorphic cobbles at 5' up to 6" in diameter, minor root hairs and porosity.

Older Alluvium (Qoal):
Sandy Silt (ML):

@ 7' Sandy Silt, very damp, stiff, minor pinhole porosity, micaceous, trenching becoming more difficult.

@ 10' Sandy Silt, moisture content increasing, stiff, minor pinhole porosity, micaceous, very hard trenching at 10'.

TD = 10, Trench Backfilled With Cuttings, No Groundwater Encountered, No Caving.



HS BA TP 03101-00TP.GPJ ZKCI.GDT 1/28/04

ZEISER KLING Consultants, Inc.

Scale: H 4 [ft]
V 4 [ft]

Pit Orientation: N75W
Natural Slope Angle: 0

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

LOG OF EXPLORATORY TEST PIT

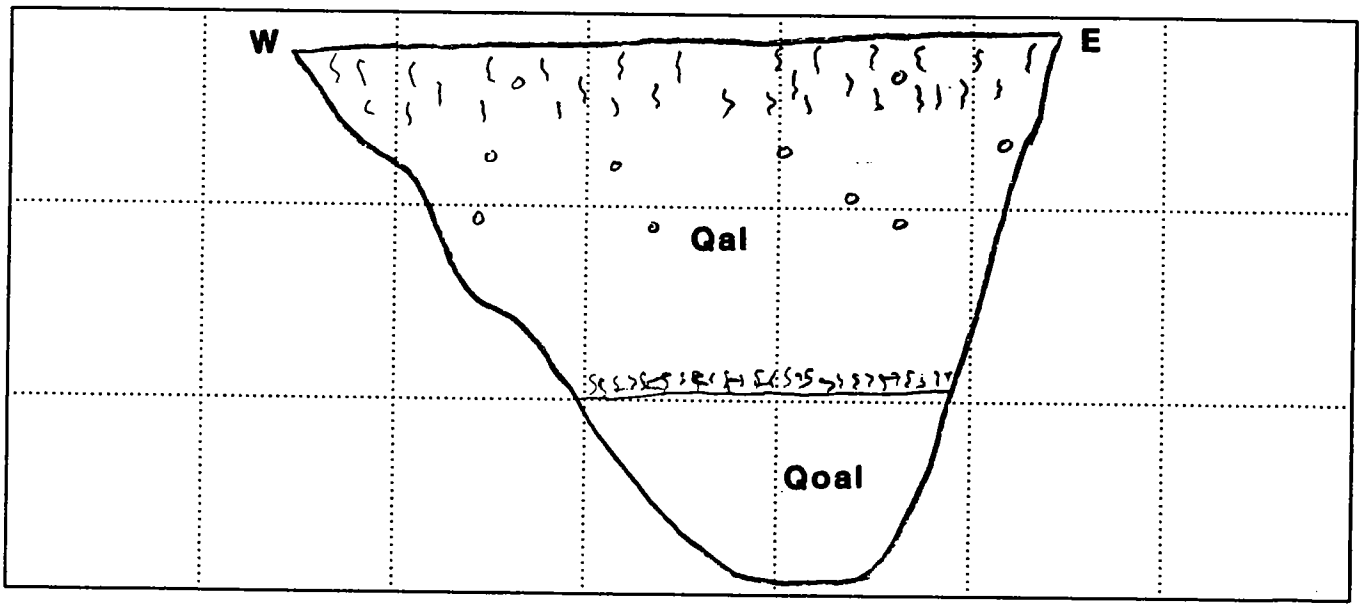
Project: **Fleming Ranch**
Project Number: **03101-00**

Test Pit No.: **MT-6**
Contractor: **Al-Roy**
Backhoe: **Backhoe**
Hammer Wt. / Drop: **140lb / 30in**
Ground Elev. [ft]: **1447.0**

Date Drilled: **1/13/04**
Logged By: **MZ**

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]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
1445							**Alluvium (Qal):** Sandy to Silty Clay (CL): @ 0-3' Sandy to silty clay, reddish brown and yellowish brown, damp, abundant rootlets, gravelly layer at 2.5'-3' with igneous and metamorphic clasts.		
	5		26/12"	16.5	109		@ 2.5'-3' Sandy to Silty Clay, yellow brown and reddish brown, damp, stiff, pinhole porosity, caliche stringers to 1/8" diameter, fine to coarse sand.	>4.5	SULF
							@ 4.5-5.5' Mottled horizon of yellow brown and reddish brown sandy to silty clay.		
1440			34/12"				**Older Alluvium (Qoal):** Silty Sand (SM) to Sandy Silt (ML): Yellow brown, damp, stiff, pinhole porosity, trace rootlets, caliche filled pores to 3/8", caliche stringers to 1/8", some layers of coarse sand to fine gravel.		
							@ 6'-6.4' Caliche layer at contact with overlying Qal with abundant pinhole porosity, relatively soft, root pores to 1/2" diameter. TD = 8.5', Trench Backfilled With Cuttings, No Groundwater Encountered, No Caving.		



HS BA TP 03101-00TP.GPJ ZKCI.GDT 1/29/04

ZEISER KLING Consultants, Inc.

Scale: H 3 [ft]
V 3 [ft]

Pit Orientation: N80W
Natural Slope Angle: 2

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

LOG OF EXPLORATORY TEST PIT

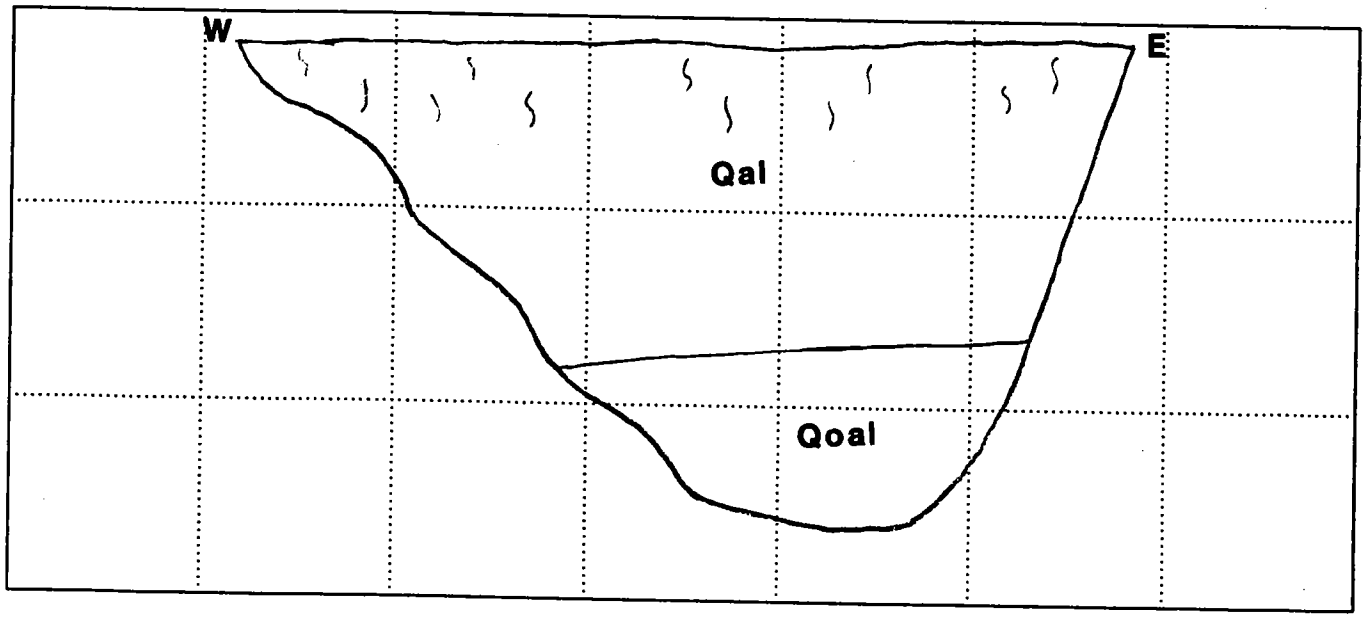
Project: **Fleming Ranch**
Project Number: **03101-00**

Date Drilled: **1/9/04**
Logged By: **MZ**

Test Pit No.: **MT-7**
Contractor: **Al-Roy**
Backhoe: **Backhoe**
Hammer Wt. / Drop: **140lb / 30in**
Ground Elev. [ft]: **1439.0**

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]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
1435	0						**Alluvium (Qal):** Sandy Silt (ML) to Sandy Clay (CL): Brown, damp, firm, minor to abundant root hairs, abundant porosity.		
			18/12"	8.9	93		@ 3' Trace coarse gravel fragments, igneous in composition.	>4.5	
	5						@ 4.5' Mottled yellow brown silt and brown sandy silt layer with pinhole porosity.		
			20/12"	7.1	104		**Older Alluvium (Qoal):** @ 7' Silty Sand (SM): Yellow brown, damp, medium dense, porosity to 1/4" diameter.	>4.5	
			18/12"				@ 10' Sandy Silt (ML): Yellow brown, damp, hard, porosity to 1/16".		
1430	10								
			43/12"				TD = 10', Trench Backfilled With Cuttings, No Groundwater Encountered, No Caving.		



HS BA TP 03101-00TP.GPJ ZKCI.GDT 1/20/04

ZEISER KLING Consultants, Inc.

Scale: H 3 [ft]
V 4 [ft]

Pit Orientation: N80W
Natural Slope Angle: 2

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

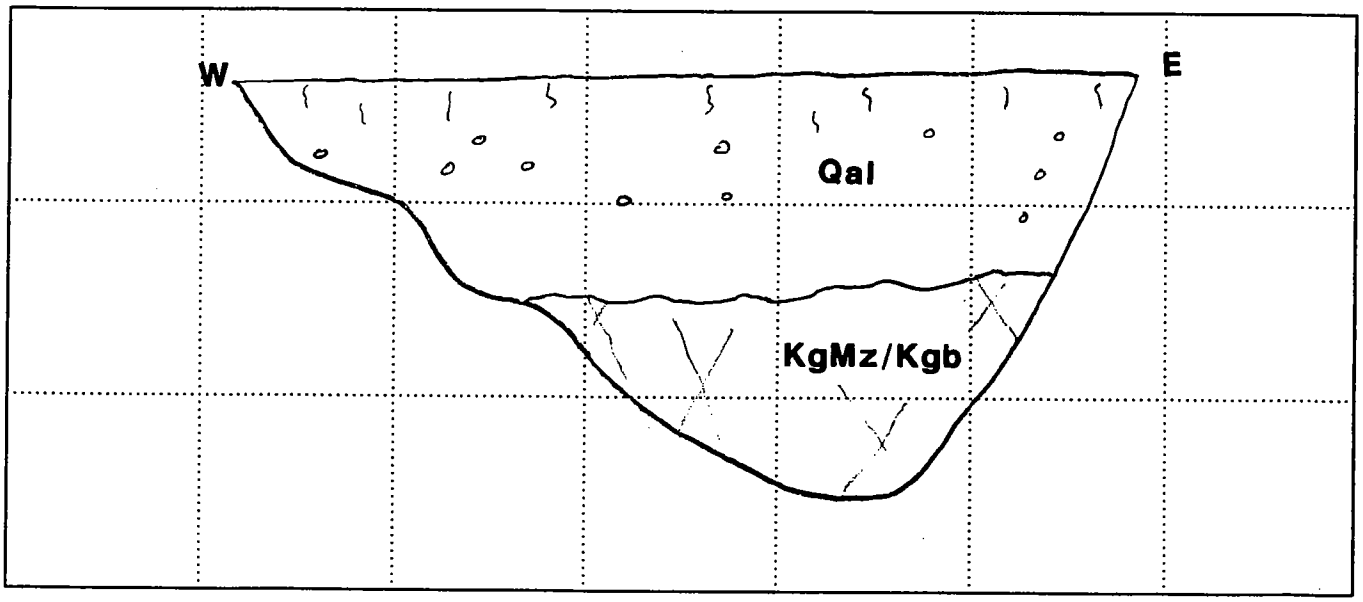
LOG OF EXPLORATORY TEST PIT

Sheet 1 of 1

Project:	**Fleming Ranch**	Test Pit No.:	**MT-8**
Project Number:	**03101-00**	Contractor:	**Al-Roy**
		Backhoe:	**Backhoe**
Date Drilled:	**1/9/04**	Hammer Wt. / Drop:	**140lb / 30in**
Logged By:	**MZ**	Ground Elev. [ft]:	**1443.0**

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]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
1440	0			22/12"	11.2	113		**Alluvium (Qal):** Silty to Sandy Clay (CL): Dark brown, damp, firm to stiff, abundant pinhole porosity, minor root hairs, trace coarse sand to fine gravel present.	>4.5	CN
	5							**Cretaceous-Mesozoic Bedrock (KgMz/Kgb):** Granitoid Rock: Phaneritic with porphrytic plagioclase, dark gray, damp, 1/16" wide shears of yellow silt common in trench, bedrock friable.		
								TD = 6.5', Trench Backfilled With Cuttings, No Groundwater Encountered, No Caving.		



HS BA TP 03101-00TP.GPJ ZKCI.GDT 1/27/04

ZEISER KLING Consultants, Inc.

Scale: H 3 [ft]
V 3 [ft]

Pit Orientation: N80W
Natural Slope Angle: 2

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

LOG OF EXPLORATORY TEST PIT

Sheet 1 of 1

Project:	Fleming Ranch	Test Pit No.:	MT-9
Project Number:	03101-00	Contractor:	Al-Roy
		Backhoe:	Backhoe
Date Drilled:	1/13/04	Hammer Wt. / Drop:	140lb / 30in
Logged By:	MZ	Ground Elev. [ft]:	1445.0

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]	Geologic Notes	Pocket Pen. [tsf]	Lab Tests
1440	5		14/12"	18.4	87		4.5	DS
1435	10		35/12"					
1430	15							

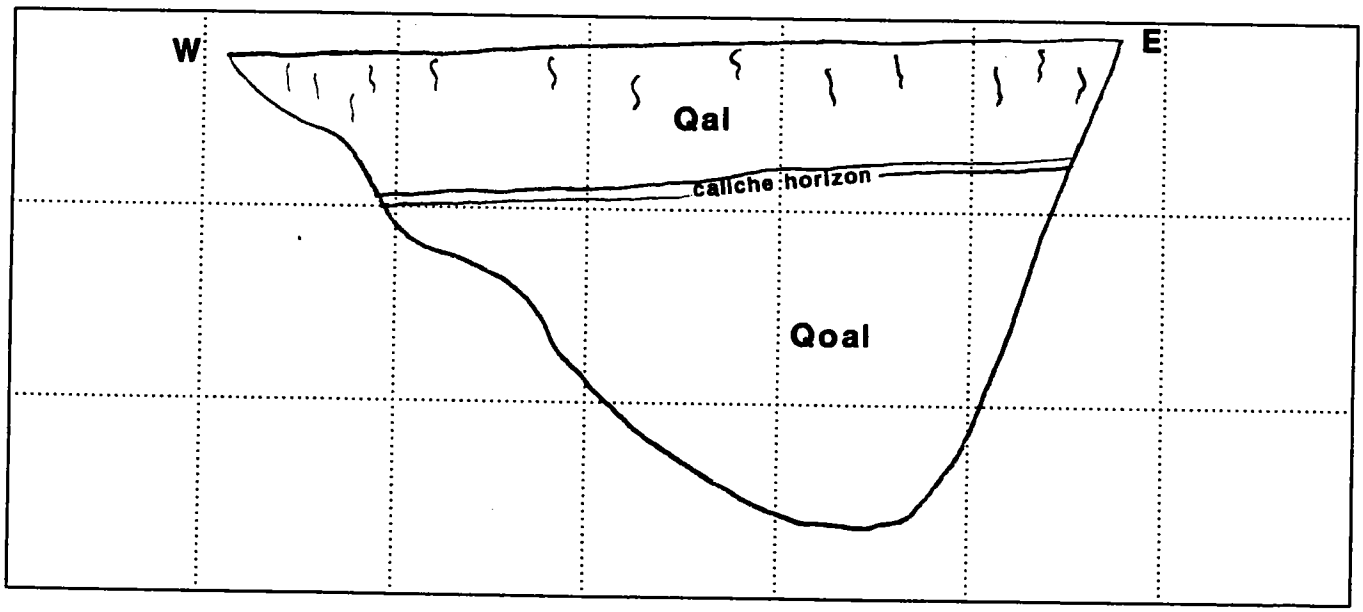
SOIL DESCRIPTION and CLASSIFICATION (USCS)

Alluvium (Qal):
Silty to Sandy Clay (CL): Brown, damp, firm, locally abundant caliche, minor coarse sand to fine gravel, root hairs and pinhole porosity abundant.

Older Alluvium (Qoal):
@ 4'-4.5' Caliche Horizon: slightly damp, soft, white.

@ 5' Sandy Clay (CL) to Clayey Sand (SC): Yellow brown, damp, stiff to medium dense, minor porosity, locally abundant caliche stringers from 1/4" to 1/2" in diameter, fine gravels of igneous composition, micaceous.
@ 7' -15' porosity ranges from pinhole to 1/32".

TD = 15', Trench Backfilled With Cuttings, No Groundwater Encountered, No Caving.



HS BA TP 03101-00TP.GPJ ZKCI.GDT 1/29/04

ZEISER KLING Consultants, Inc.

Scale: H 3 [ft] V 6 [ft]

Pit Orientation: EW
Natural Slope Angle: 3

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

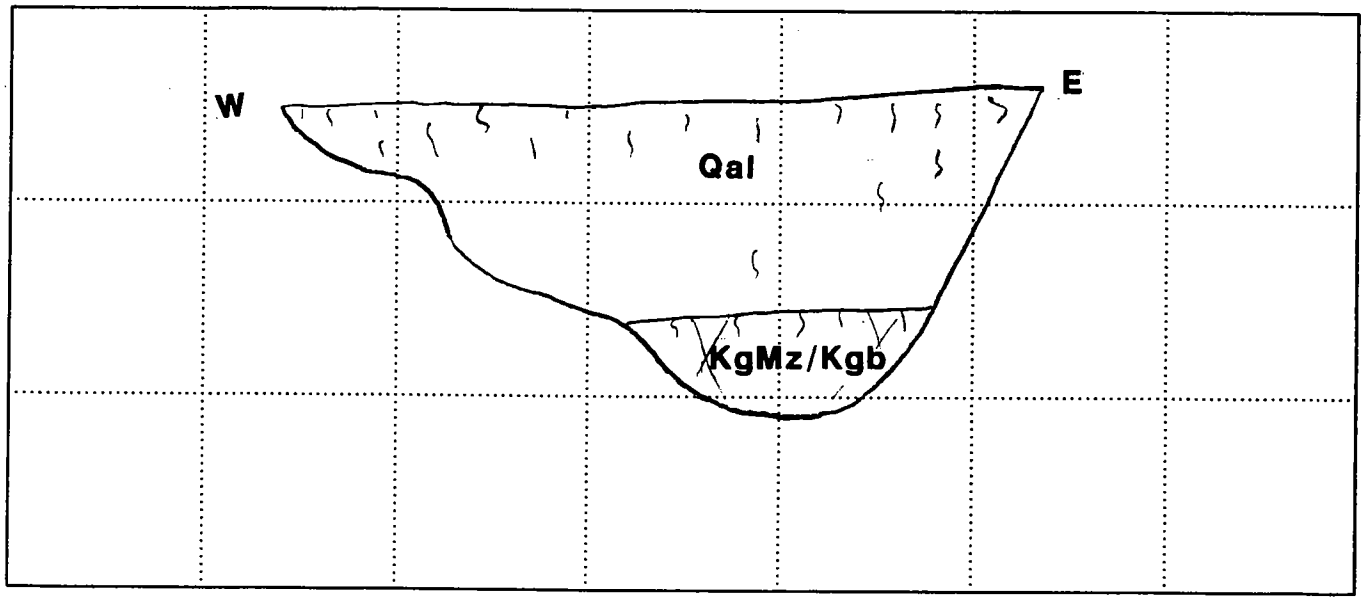
LOG OF EXPLORATORY TEST PIT

Sheet 1 of 1

Project:	Fleming Ranch	Test Pit No.:	**MT-10**
Project Number:	03101-00	Contractor:	Al-Roy
		Backhoe:	Backhoe
Date Drilled:	1/13/04	Hammer Wt. / Drop:	140lb / 30in
Logged By:	MZ	Ground Elev. [ft]:	1457.0

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]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
1455	0							**Alluvium (Qal):** Sandy Clay (CL): Red brown, damp, stiff, rootlets present, pinhole porosity.		
				31/12"	11.7	110			>4.5	
	5							**Cretaceous-Mesozoic Bedrock (KgMz/Kgb):** Granitoid Rock: Red brown to yellow brown, weathered and very friable, damp, rootlets present from 3.5' to 4' below ground surface. @ 4'-5' Bedrock becoming hard.		
								TD = 5', Trench Backfilled With Cuttings, No Groundwater Encountered, No Caving.		



HS BA TP 03101-00TP.GPJ ZKCI.GDT 1/27/04

ZEISER KLING Consultants, Inc.

Scale: H 3 [ft] V 3 [ft]

Pit Orientation: N80E
Natural Slope Angle: 3

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

APPENDIX C

SEISMIC REFRACTION SURVEY REPORT

Sub Surface Surveys

215 So. Highway 101, Suite 203 P.O. Box 1152 Solana Beach, CA 92075
Telephone: (858) 481-8949 Facsimile: (858) 481-8998 E mail: geop@subsurfacesurveys.com

January 27, 2004

Zeiser Kling Consultants, Inc.
1221 E Dyer Road.
Santa Ana, CA 92705

Project No. 04-010

Attn: **Chris Spitzer**

re: Seismic refraction investigation, Menifee, CA

This brief letter report is to present the findings of a seismic refraction survey carried out in agricultural fields on the south side of Rouse Road approximately one mile east of Freeway I-215 in Menifee, California (Fig. 1) on January 13, 2004. The survey consists of four lines. Lines 1, 2 and 3 consists of two spreads, and line 4 is made up of a single spread. Purpose of the survey was to determine rippability of the granitic rocks, and to identify possible core rocks along the lines, if present.

A Bison 9024, 24 channel seismograph system, was applied to the task. This instrument has DIFP, digital instantaneous floating point. This translates into a computer-controlled seismograph that records incoming signals at all instrument settings, and the records are analyzed by the computer, which then outputs optimum, balanced traces with maximum informational content.

Survey Design – The Line Location map (Fig. 2) shows the positions and layout directions of the four refraction lines. Their positions relative to the terrain and cultural features are exhibited. Generally the lines, except for line 4, extend from the flattish farm land on to the adjacent hills where bedrock is exposed.

All spreads were laid out in the "standard" arrangement, namely 10 foot geophone intervals with 10 foot off end shots forward and reverse. In addition to the off end shots three split spread shots (hammer blows) were fired. A mid split spread, between geophones 12 and 13, and two asymmetrical split spreads, between geophones 6 and 7, and 18 and 19, completed the five shots per spread. There is a 20 foot interval between geophones 12 & 13, and there is a one geophone overlap on the back-to-back two spread lines. The two spread geologic models for lines 1, 2 and 3, can be placed end-to-end, with one geophone overlap, to create a continuous structure section.

Source was a heavy duty sledge hammer with an inertial switch. The hammer was slammed onto a metal plate that was coupled to the ground. Definitive energy arrivals were recorded at the far offset geophones that effectively defeated the ambient "noise," although noise from wind was moderate and traffic noise was minuscule. But nearby construction noise was moderate. Vertical stacking was carried out to build energy and to serve as a "noise" abatement strategy. Elevations of all shot and geophone positions were surveyed in, and then input into the modeling program. Elevation of the forward shot point was arbitrarily taken to be zero feet, and then all

Menifee, California, United States

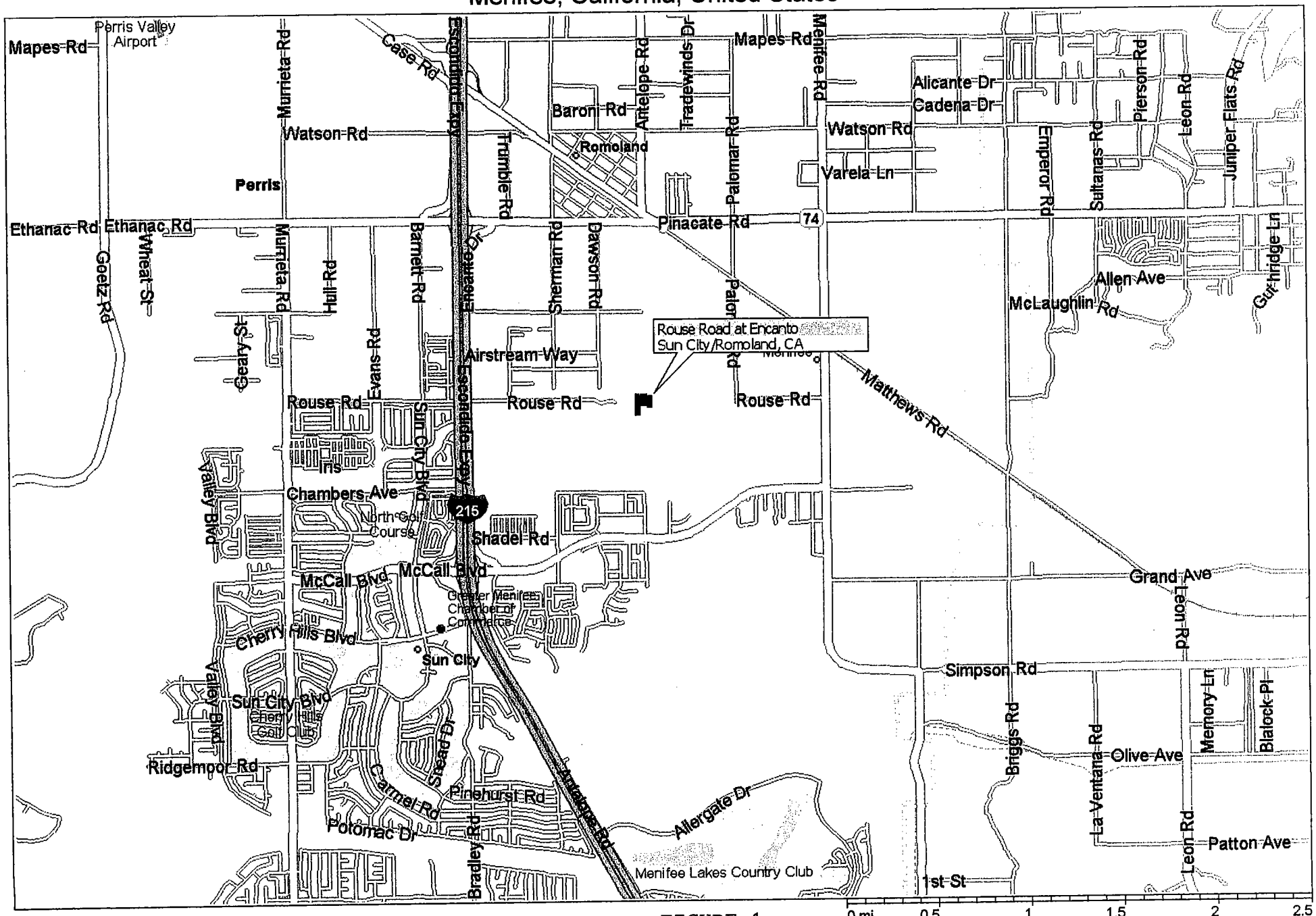


FIGURE 1

Seismic Survey -- Line Location Map

Fleming Ranch Project -- Menifee Valley, California

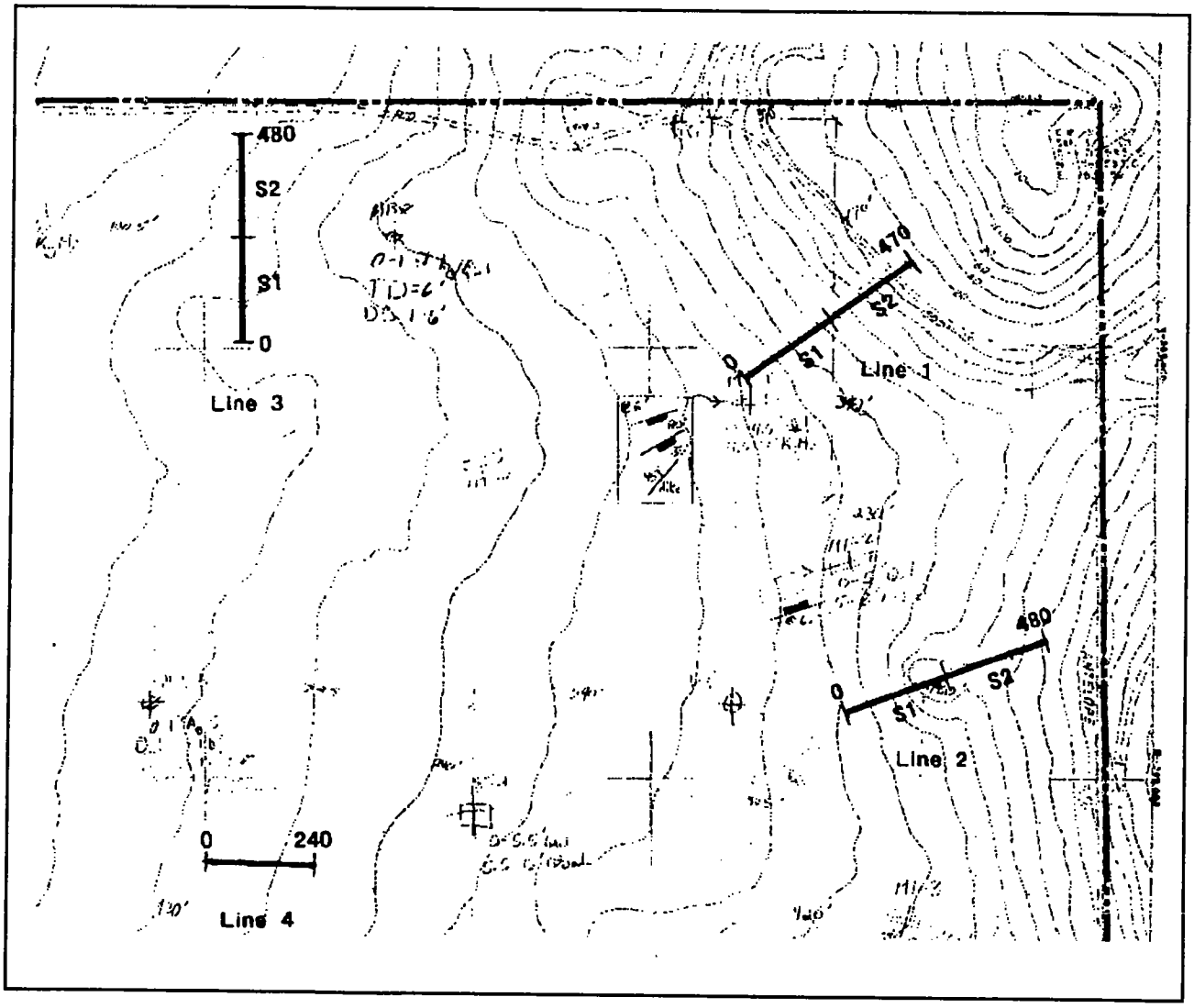


FIGURE 2

other elevations along the given line were relative to the assumed value at the forward shot point. Utilizing a detailed topographic map, the relative elevations were converted to absolute. Stakes were planted in the ground at the positions of the off end shots.

The site is within the Peninsula Ranges Batholith. The batholith is a composite of granite clan intrusive bodies. Metamorphosed host rocks and roof pendants, generally metaigneous rocks, are found here and there. The batholith is bimodal; small basic igneous instrusives are present less frequently. Basic igneous rocks have been mapped nearby, and some velocities determined from the data acquired indicates that basic rocks may be in the subsurface under some lines, possibly under line 1.

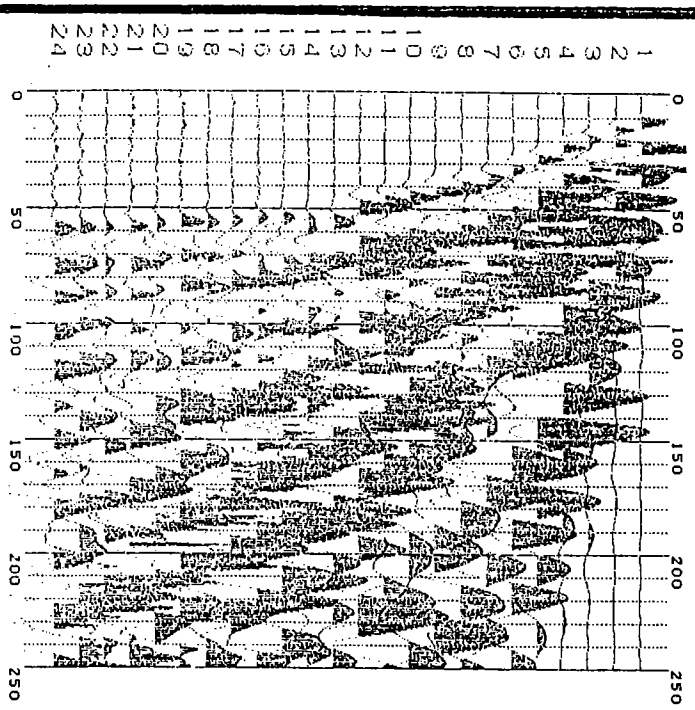
Brief Description of the Geophysical Method Applied – Seismic refraction investigates the subsurface by generating arrival time and offset distance information to determine the path and velocity of an elastic disturbance in the ground. The disturbance is created by shot, hammer, weight drop, or some comparable method for putting impulsive energy into the ground. Detectors are laid out at regular intervals in a line to measure the first arrival energy and the time of its arrival. The data are plotted in time-distance graphs, from which velocity of, and depth to, layers can be calculated. This is possible because rays (a continuum point on an expanding wave front) of the disturbance wave follows a direct route and is the first arrival energy at the close-in geophones. And the rays are refracted across layer boundaries where there is a difference in elastic and density properties. The critically refracted ray travels along the layer interface, at the speed of the lower layer, and continuously "feeds" energy back to the surface, to be successively detected by the line of geophones.

Shot are normally reversed from one end of the line to the other, to determine whether or not the layering is horizontal or dipping. And the split spread shot gives redundancy to improve the interpretation. The acquired data are computationally intense. A ray-tracing computer program, SIPT2 in this instance, is used to iteratively honor all refracting surfaces, velocities, and to be able to consider a large number of layers, where they are present. A first energy arrival picking program, with such features as zoom, filtering, time stretching, separation of traces, AGC and balancing of traces, is also applied.

Interpretation – Monitor records are produced in the field with each shot (e.g. Fig. 3). These are prints of the raw data as it comes in to the recorder. They show the quality of the data, so that the operator can determine whether or not the data are pickable, or shots need to be repeated. Two representative monitor records are illustrated, a forward off end shot and a mid split spread shot, from line 2 spread 1 and line 4, respectively. All arrivals are seen to be pickable on these raw records, although some noise, especially on the far offset traces, is present. With a computer aided picking program, having filtering, gain, trace separation, etc., there were no intractable difficulties in picking the times of first energy arrivals on any of the records.

More of the shooting parameters are listed below the monitor records (Fig. 3).

The first pick information, geophone positions, shot locations and geometry of the spreads are input to a routine that produces a time-distance plot (e.g. line 4 data, Fig. 4). The eight curves express the wave arrivals from the five shots, one forward, one reverse, and three split spreads. The split spreads, however, produce two curves each going in opposite directions. The data, at the line 4 location, show a somewhat irregular and asymmetrical four-layer case, as is apparent from the four generalized straight lines superimposed on the forward off end curve. Three layer



BISON 9000 SERIES

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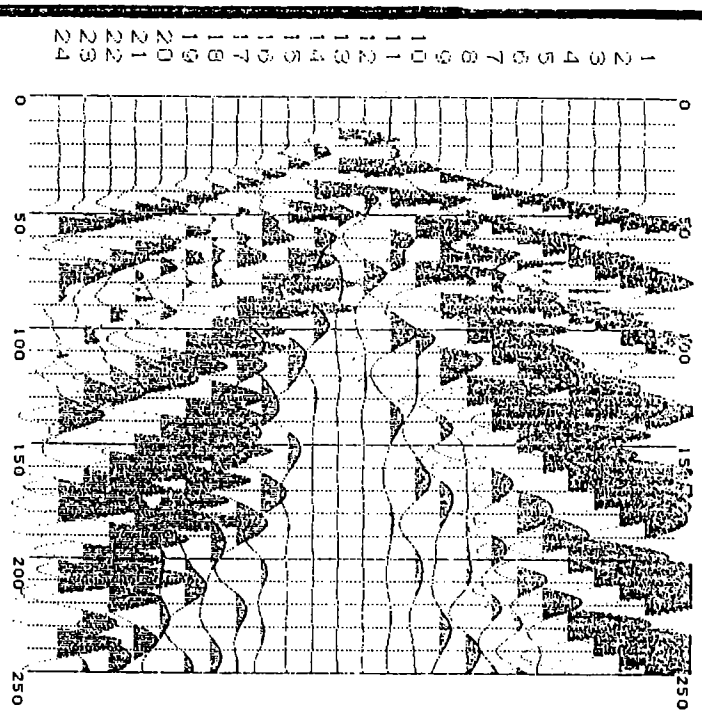
Sample rt .500ms Stacks 0003
Delay(ms) 0 DFhc Out
Channels 24 DFlc Out
Samples 000500
Rec len 250ms Agc Off
Time scale = 10.0 (ms)/division.

P	CH	GN	STK	EX	P	CH	GN	STK	EX
+	01	M	0003	14	+	13	M	0003	07
+	02	M	0003	12	+	14	M	0003	07
+	03	M	0003	11	+	15	M	0003	06
+	04	M	0003	10	+	16	M	0003	06
+	05	M	0003	09	+	17	M	0003	06
+	06	M	0003	09	+	18	M	0003	06
+	07	M	0003	09	+	19	M	0003	05
+	08	M	0003	09	+	20	M	0003	06
+	09	M	0003	08	+	21	M	0003	05
+	10	M	0003	08	+	22	M	0003	06
+	11	M	0003	07	+	23	M	0003	05
+	12	M	0003	06	+	24	M	0003	05



BISON 9000 SERIES

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Delay(ms) 0 DFhc Out
Channels 24 DFlc Out
Samples 000500
Rec len 250ms Agc Off
Time scale = 10.0 (ms)/division.

P	CH	GN	STK	EX	P	CH	GN	STK	EX
+	01	M	0002	06	+	13	M	0002	13
+	02	M	0002	06	+	14	M	0002	12
+	03	M	0002	06	+	15	M	0002	11
+	04	M	0002	06	+	16	M	0002	10
+	05	M	0002	07	+	17	M	0002	09
+	06	M	0002	07	+	18	M	0002	09
+	07	M	0002	08	+	19	M	0002	08
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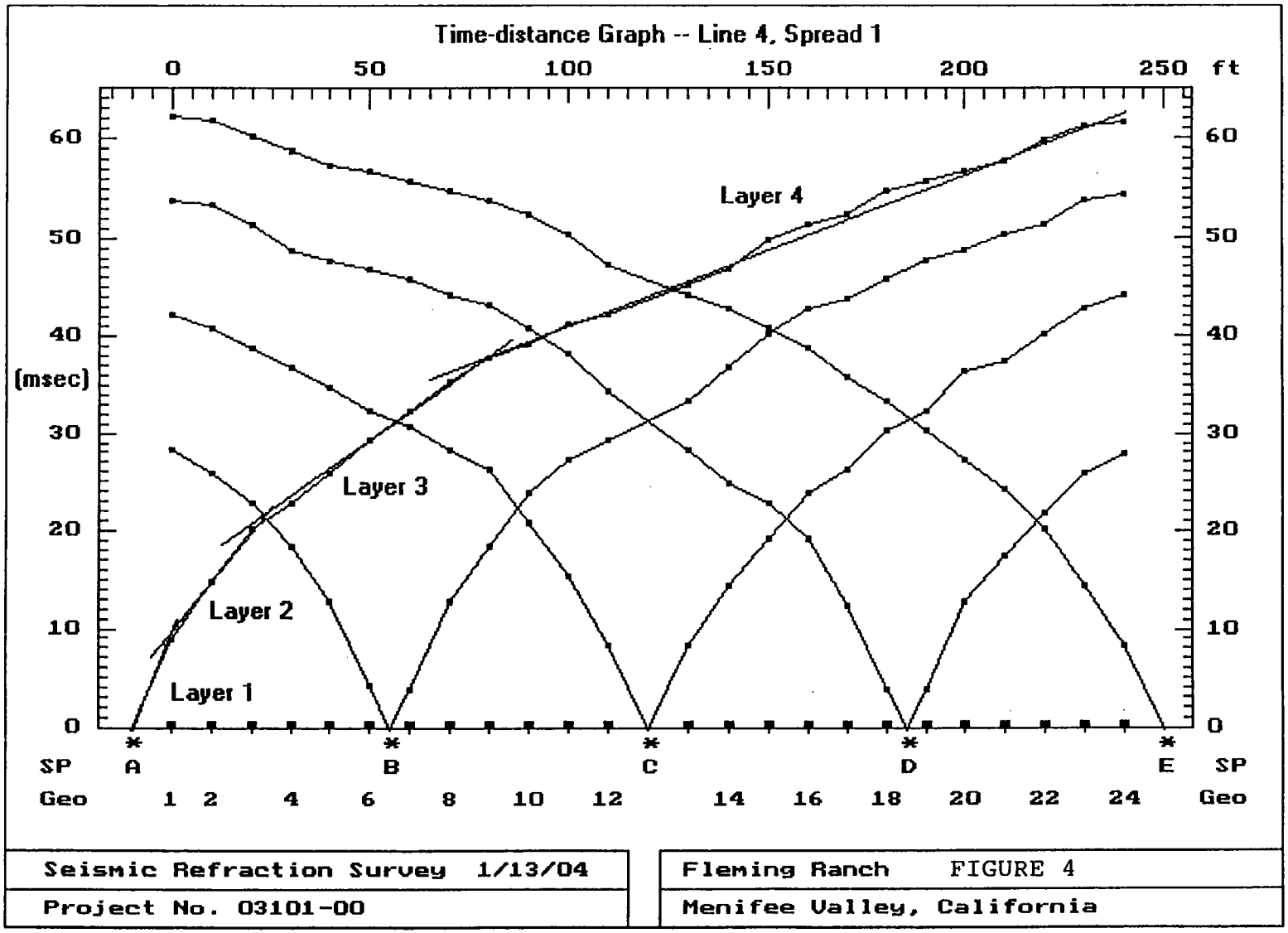
+	09	M	0002	10	+	21	M	0002	07
+	10	M	0002	11	+	22	M	0002	07
+	11	M	0002	12	+	23	M	0002	07
+	12	M	0002	13	+	24	M	0002	06

FIGURE 3



Seismic Refraction Survey 1/13/04	Fleming Ranch FIGURE 4
Project No. 03101-00	Menifee Valley, California

cases are revealed under the other three lines.

The minor asymmetry and irregularity of the group of curves indicates that the layers are not entirely uniform and horizontal. The topmost layer under the lines, is seen to be relatively thin, but thickens somewhat locally. Minor undulations in the curves, based on the raw data, are, to some extent, explained by the fact that elevation corrections are not yet applied to the data in the time-distance plot. And some of the irregularity is explained by lateral velocity changes. Minor variations in the positions of the "dog-legs" in the several curves are mostly an expression of the laterally changing thickness of the upper layers.

Models were calculated for the four lines, with models of all seven spreads illustrated (Figs. 5-11). It is seen that the topmost soil/colluvium layer is generally thin, but variable, averaging approximately 7 feet but ranging from 1 to 15 feet. Average velocity is in the order of 1400 ft/sec, with low variation. There does not appear to have been any blade work carried out that would have had a bearing on thickness distribution of layer 1, although farm cultivation has stirred the top of the layer. Several core rocks may be present.

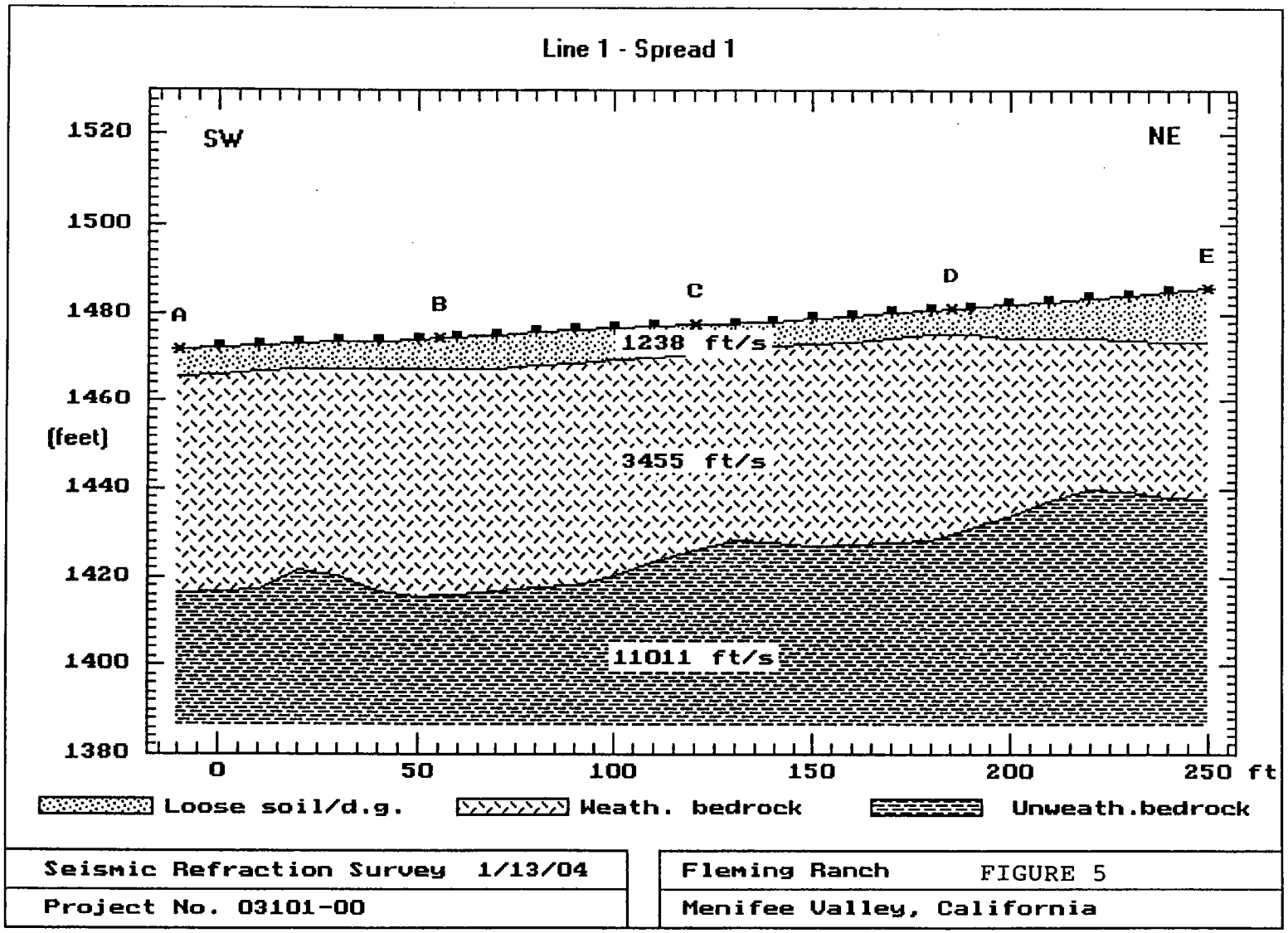
The second layer under the first three lines, based on velocity values, appears to be the same material under all lines, namely weathered granite clan rocks. It has an average thickness, where sampled, of approximately 40 feet. Average velocity of layer 2 is in the order of 3350 ft/sec, with low to moderate variation. Locally, under lines 1 and 2, there are measurable hard spots. These are illustrated on the models and they may be core rocks. Still, the velocities suggest these rocks are still in the rippable range. The relatively low overall velocities doubtlessly indicate that the rock in layer 2 is significantly weathered.

The deepest layer investigated has an average velocity of about 9900 ft/sec. Variation is moderate, when the velocity of the deepest layer under line 4 is considered. These velocities are typical of unweathered granitic clan rocks in this area. Inasmuch as rectilinear fracturing is part of the core rock development process, allowing air and water access to deeper levels, the beginnings of the process are within the upper part of the unweathered rock. Core rock velocities are more related to layer 2, but maintain a mechanical strength a little greater than typical layer 2 velocities, even where they protrude through layer 1 and are seen at the surface. Line 1, at least in part, may extend over basic igneous rocks in the subsurface; this possibility is suggested by the abnormally high velocity of over 11,000 ft/sec.

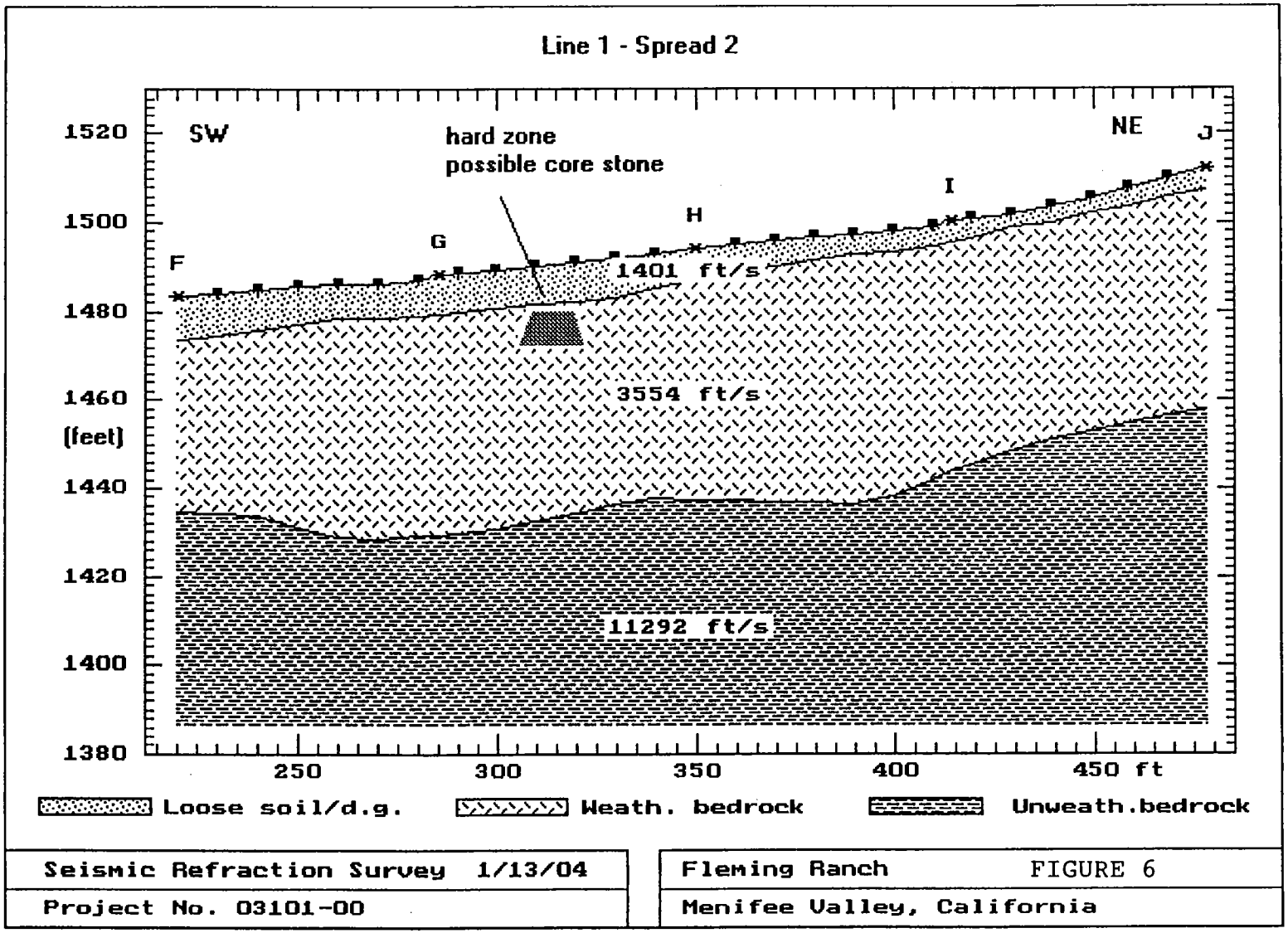
Line 4 is unlike the other three lines in having four layers instead of three. The second layer is apparently unique to line 4. The location of line 4 is out in the plowed field away from the rock outcroppings in the hills. This layer's velocity is more like the topmost layer; it is probably an older soil/colluvium, which was not developed near the hills.

A photograph is illustrated (Fig. 12) showing the terrain, vegetation, agricultural activity, relief, an example of the layout and exposed rock in the adjacent hill. The view is "looking" northeast along line 1. This view illustrates the transition from thicker soil to shallow bedrock.

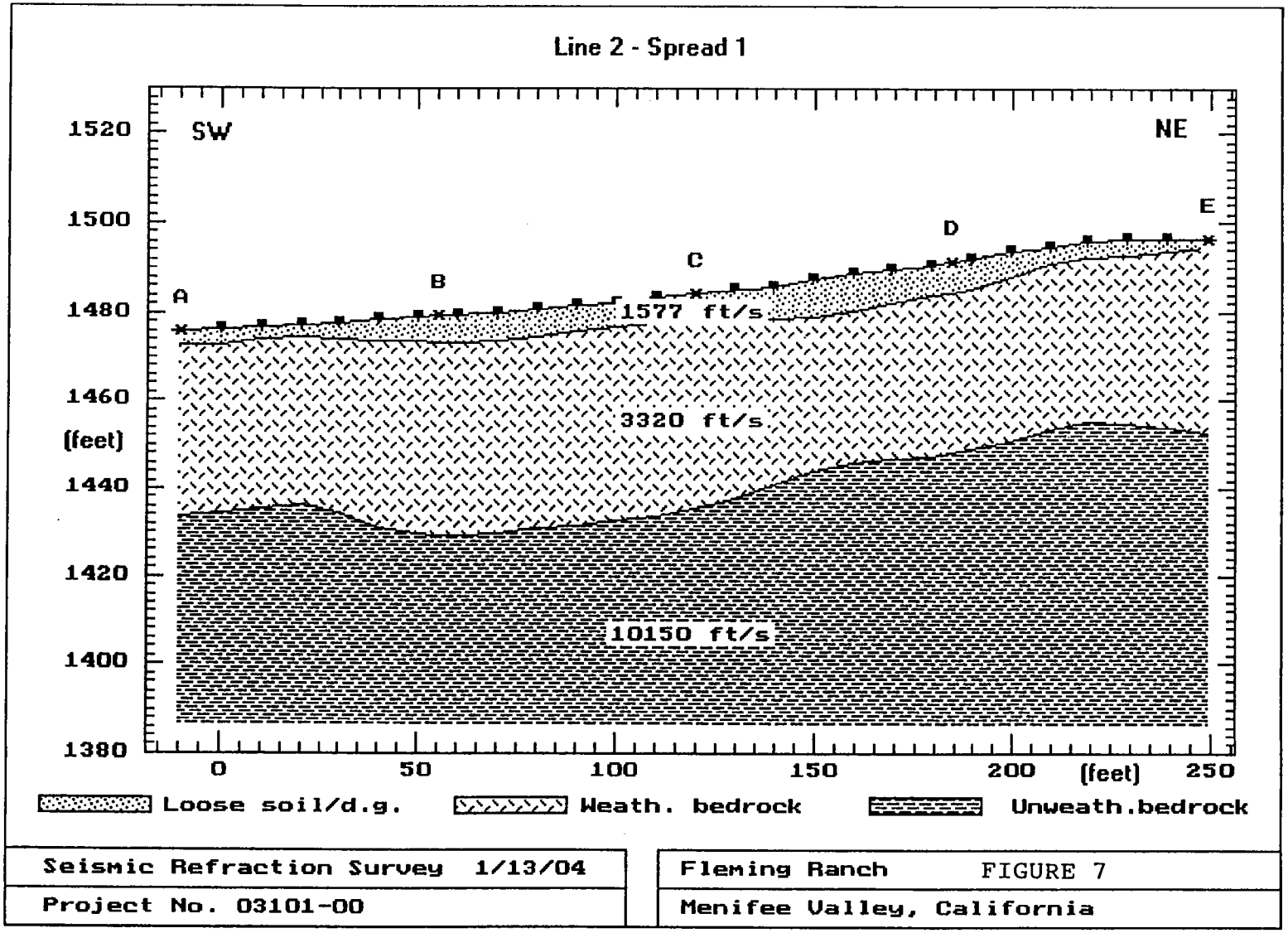
It is clear from the Caterpillar Rippability Chart (Fig. 13) that layers 1 and 2 (and layer 3 under line 4) are rippable everywhere sampled, although hard locales associated with some core rock development may cause some difficulty. Nevertheless, the hard spots are still rippable, apparently. For planning purposes the deepest layer should be considered non-rippable everywhere. The Caterpillar Chart is empirical, but is based on thousands of samples of velocity



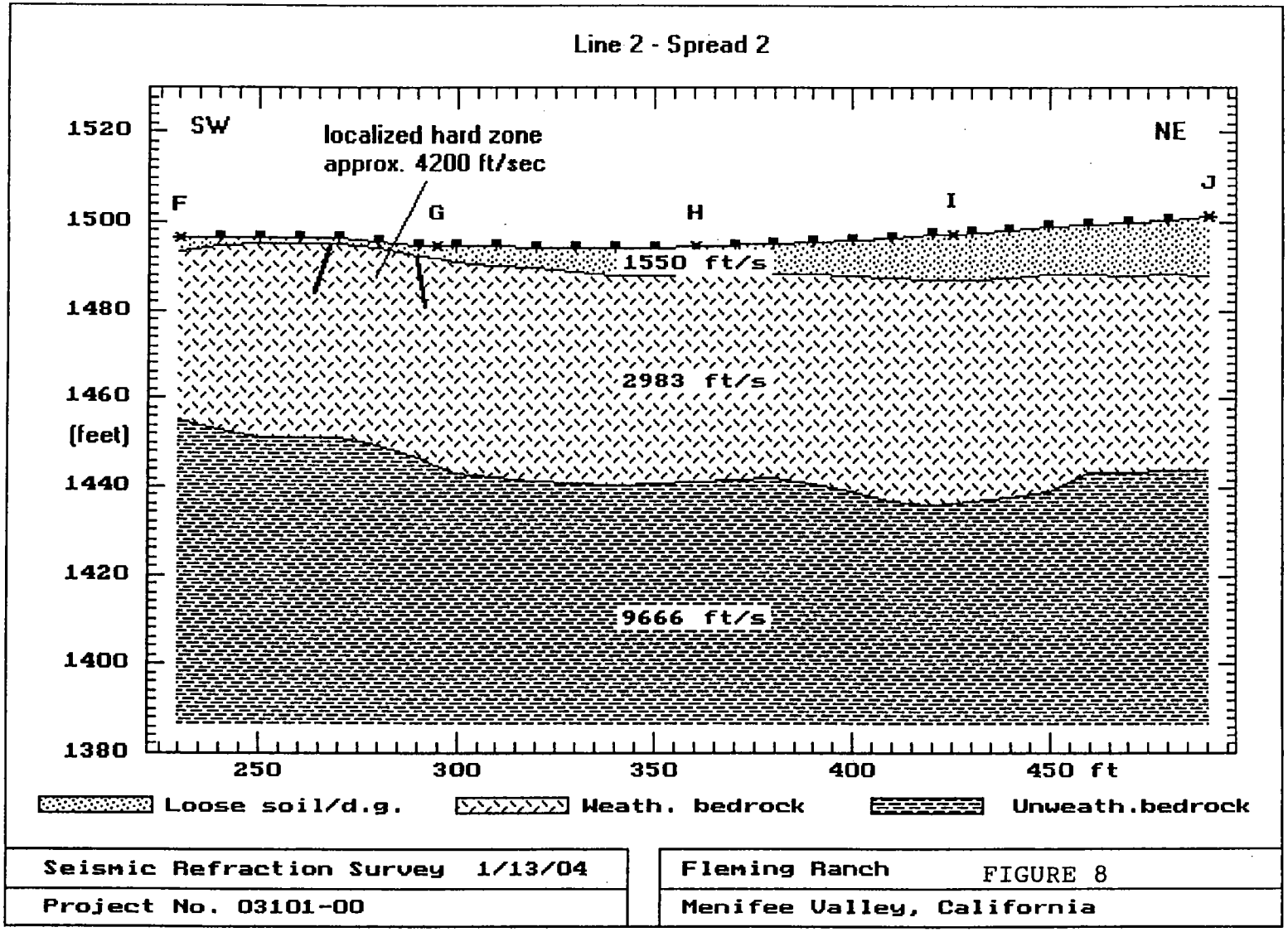
Seismic Refraction Survey 1/13/04	Fleming Ranch FIGURE 5
Project No. 03101-00	Menifee Valley, California



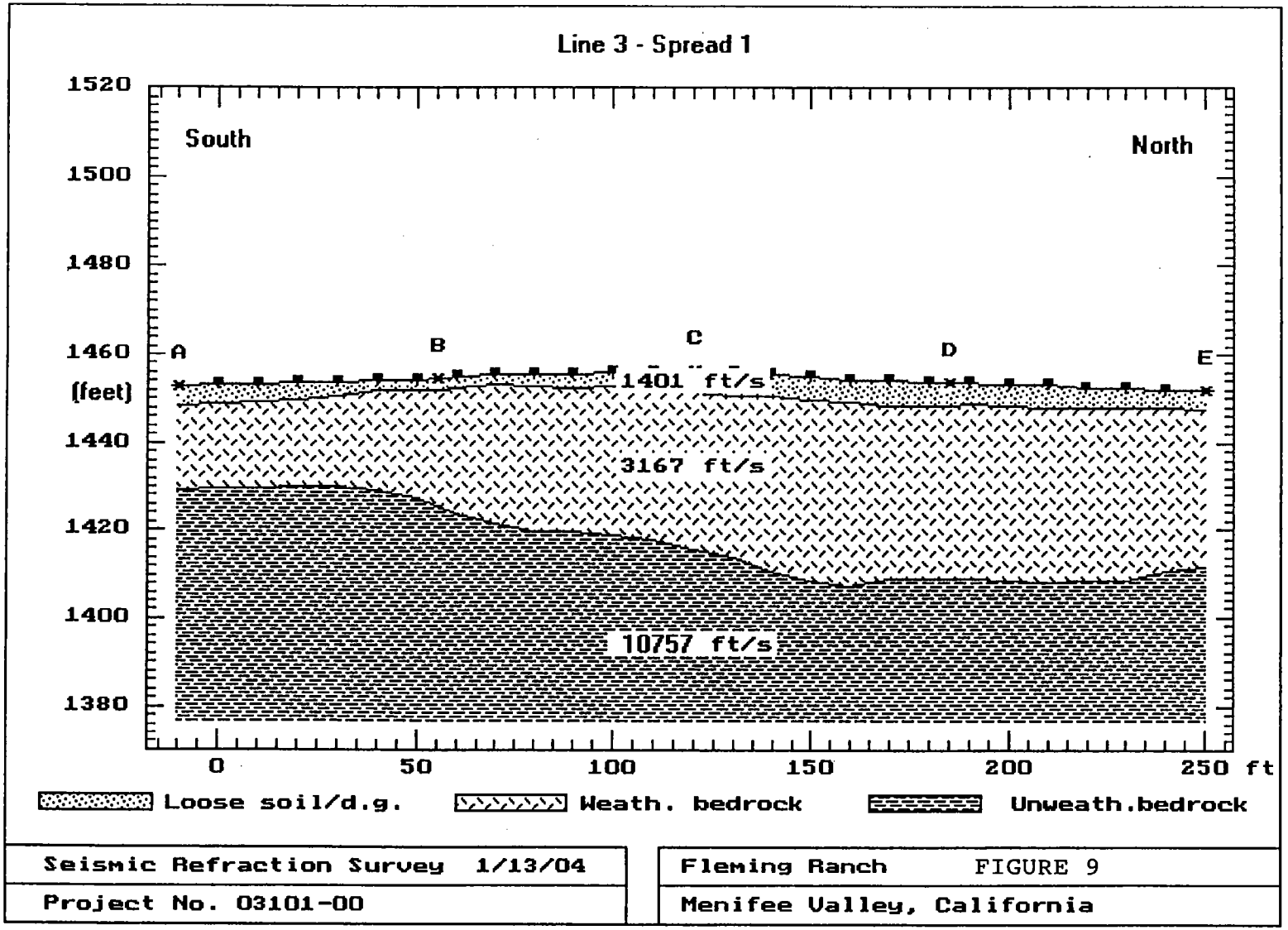
Seismic Refraction Survey 1/13/04	Fleming Ranch FIGURE 6
Project No. 03101-00	Menifee Valley, California



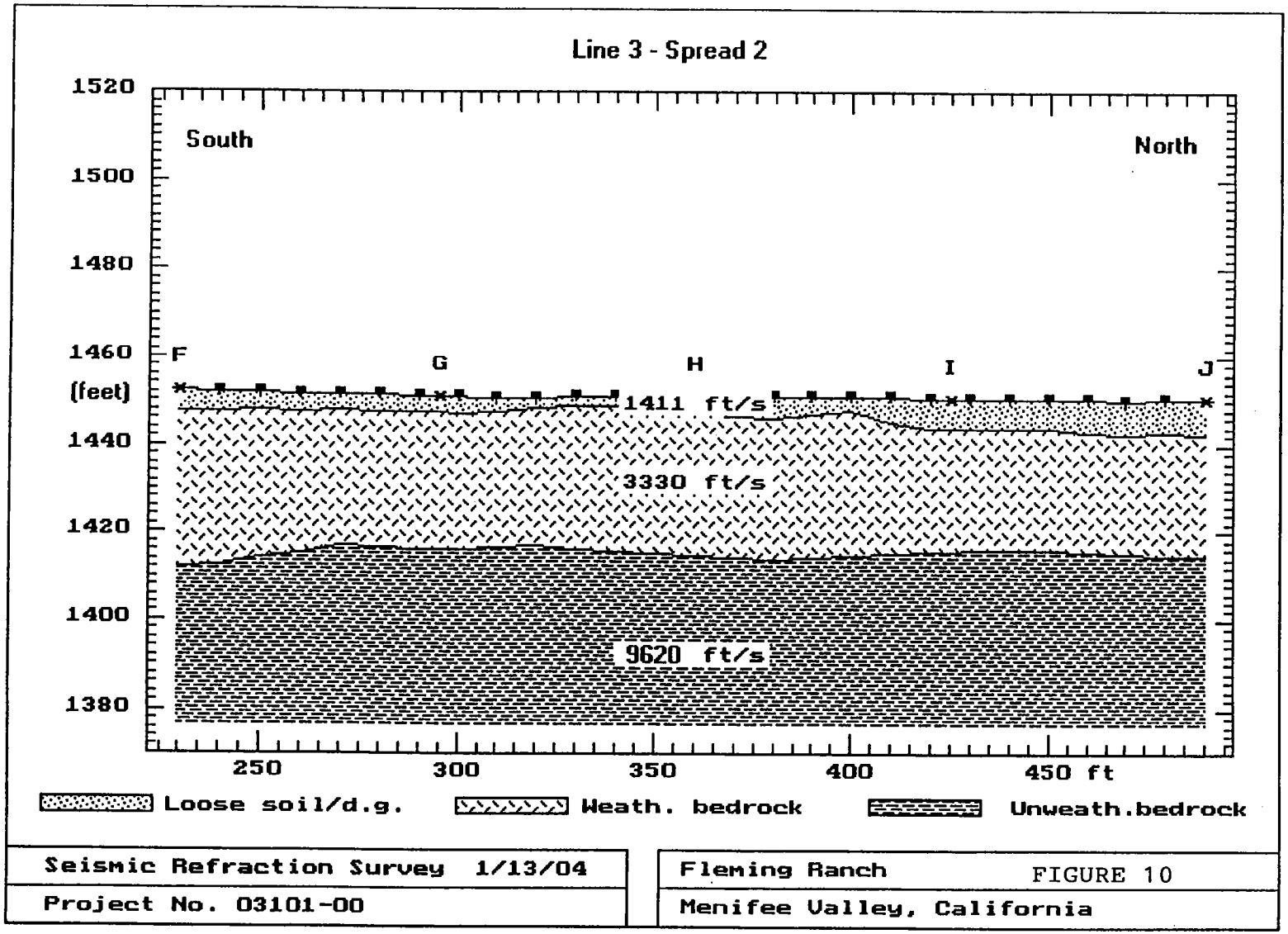
Seismic Refraction Survey 1/13/04	Fleming Ranch FIGURE 7
Project No. 03101-00	Menifee Valley, California



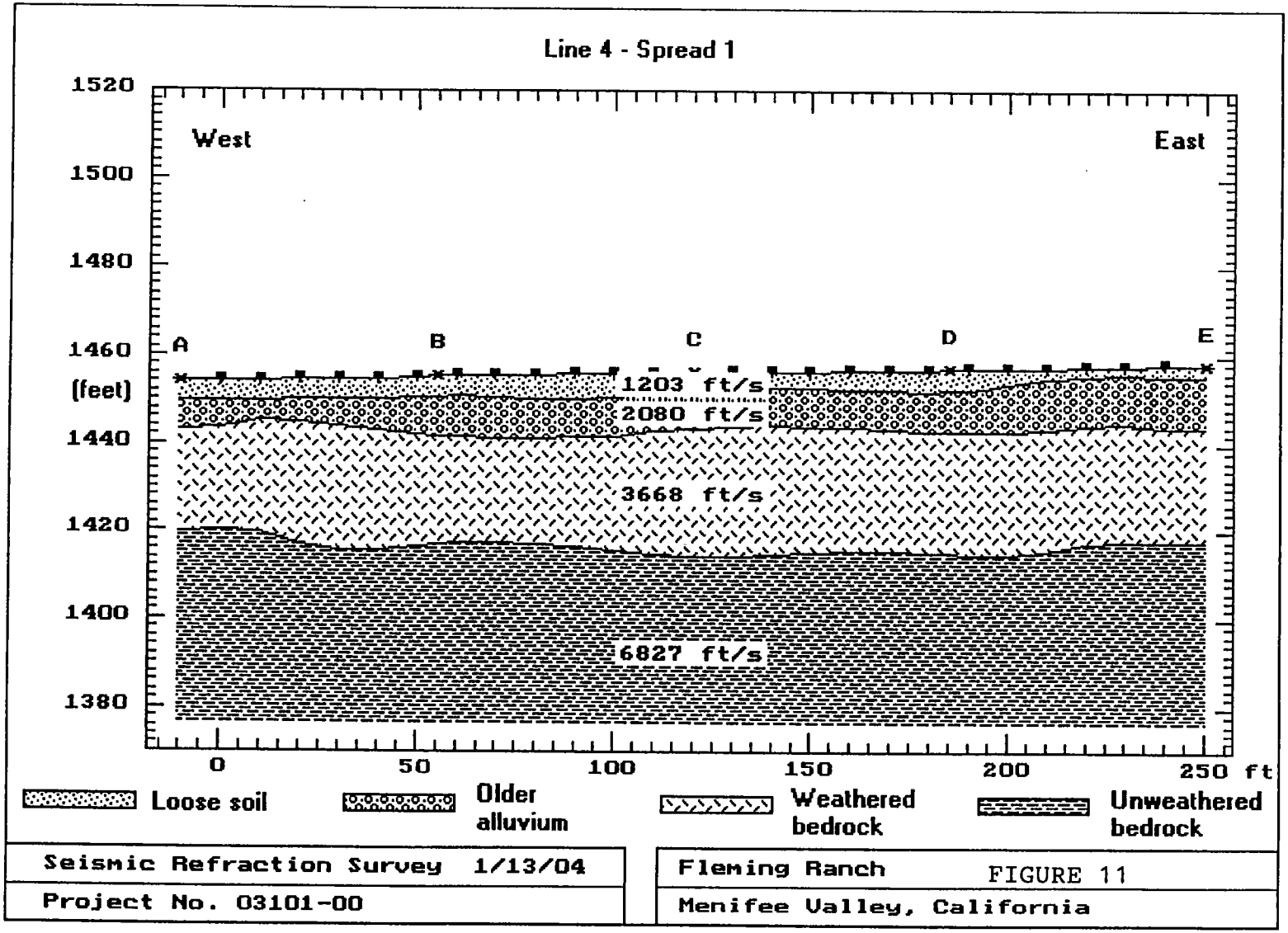
Seismic Refraction Survey 1/13/04	Fleming Ranch FIGURE 8
Project No. 03101-00	Menifee Valley, California



Seismic Refraction Survey 1/13/04	Fleming Ranch FIGURE 9
Project No. 03101-00	Menifee Valley, California



Seismic Refraction Survey 1/13/04	Fleming Ranch FIGURE 10
Project No. 03101-00	Menifee Valley, California



Seismic Refraction Survey 1/13/04	Fleming Ranch FIGURE 11
Project No. 03101-00	Menifee Valley, California

Seismic Survey Photograph

Fleming Ranch -- Menifee Valley, California

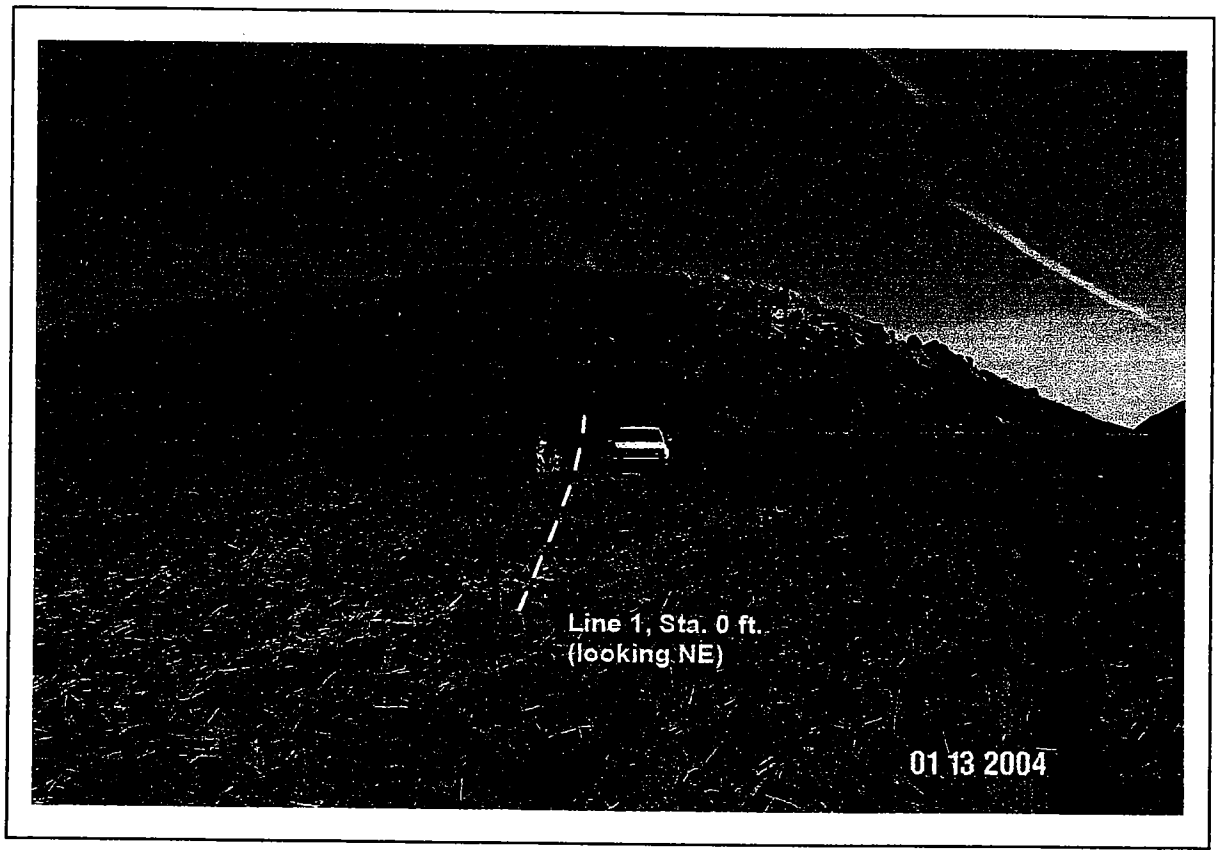


FIGURE 12

vs rippability in terms of performance of various sized Cats. The chart illustrated is for a D9 Caterpillar.

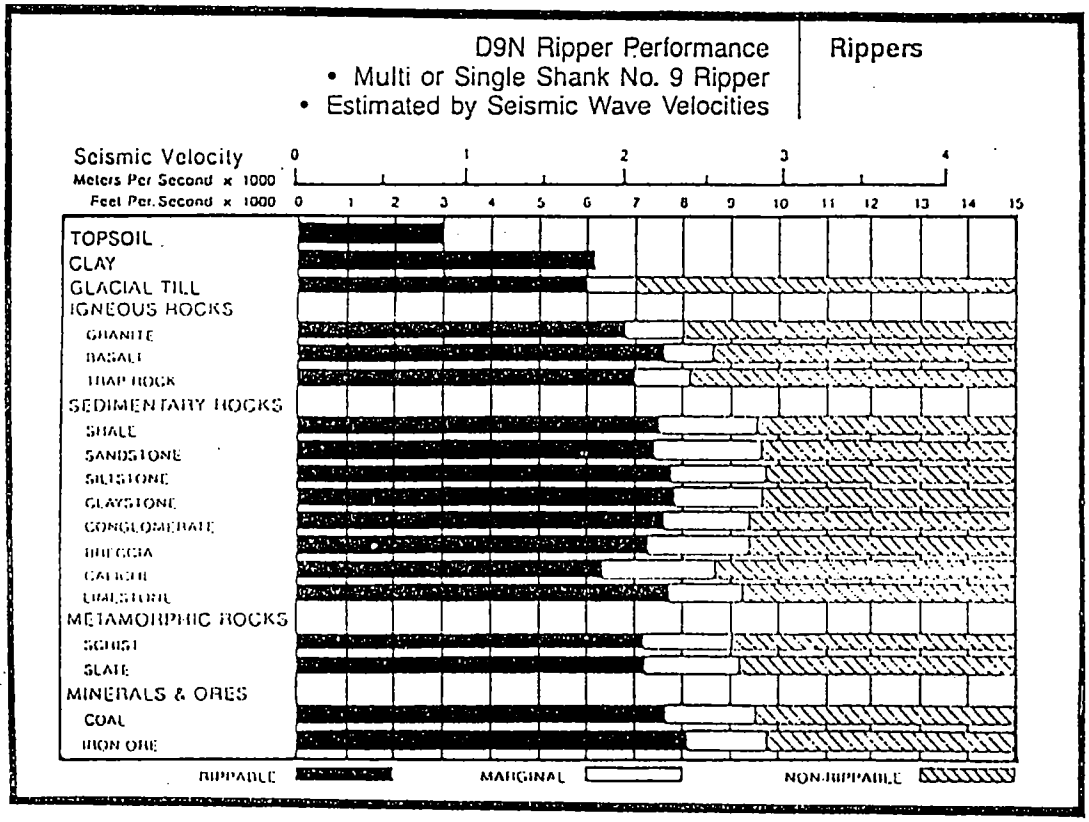


Figure 13. Caterpillar rippability chart.

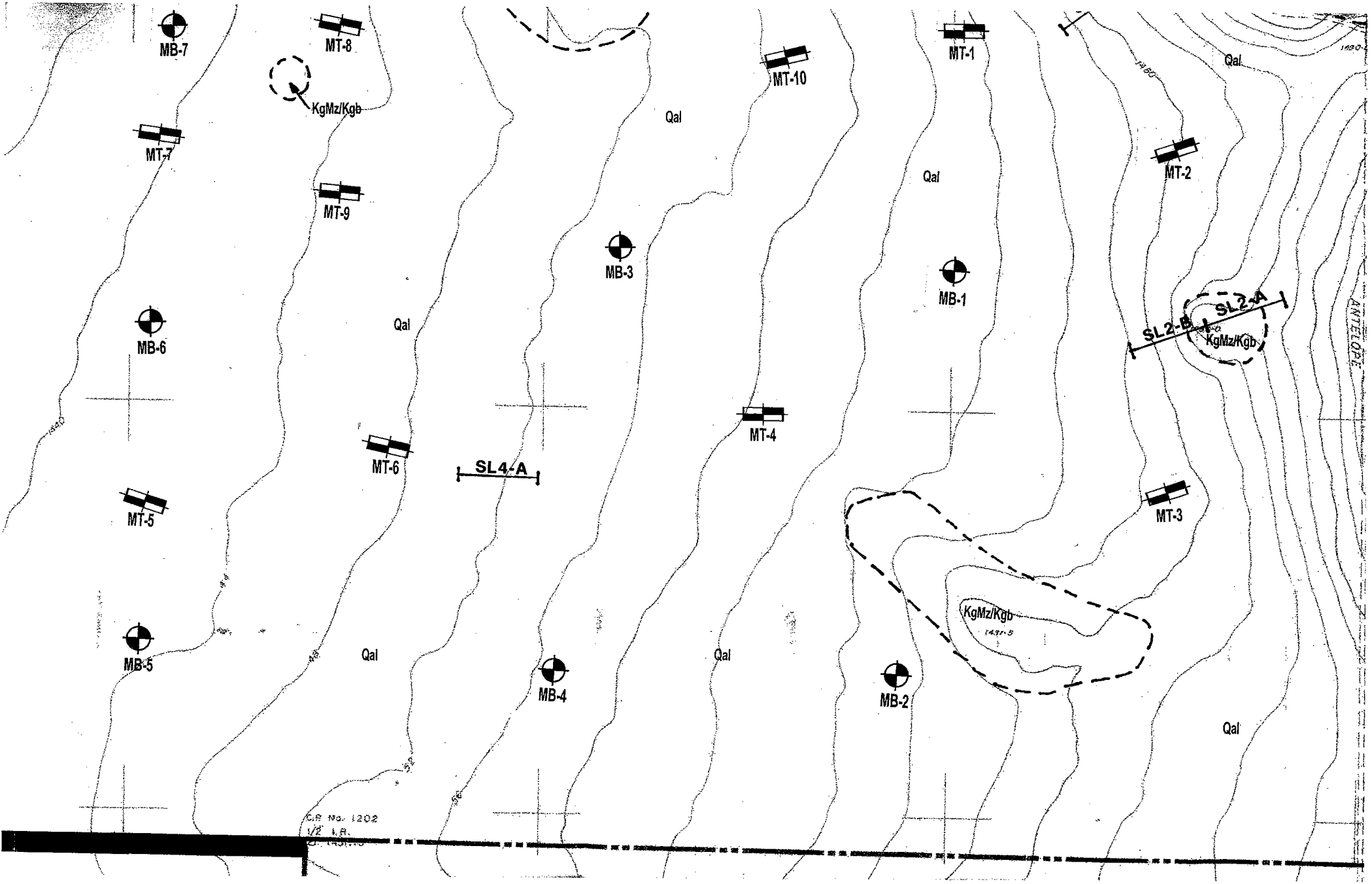
Conclusions – The seismic data, where acquired, appears to indicate that ripping can be generally accomplished in both layers 1 and 2 (and layer 3 under line 4), although local hard spots may require bigger equipment. Layer 3, the deepest layer is non-rippable, everywhere sampled. Depth to the top of layer 3 is at a minimum of 24 feet under line 3. If cut slopes are no deeper than 20 feet, as reported, the non-rippable rock, where sampled, should not be encountered.

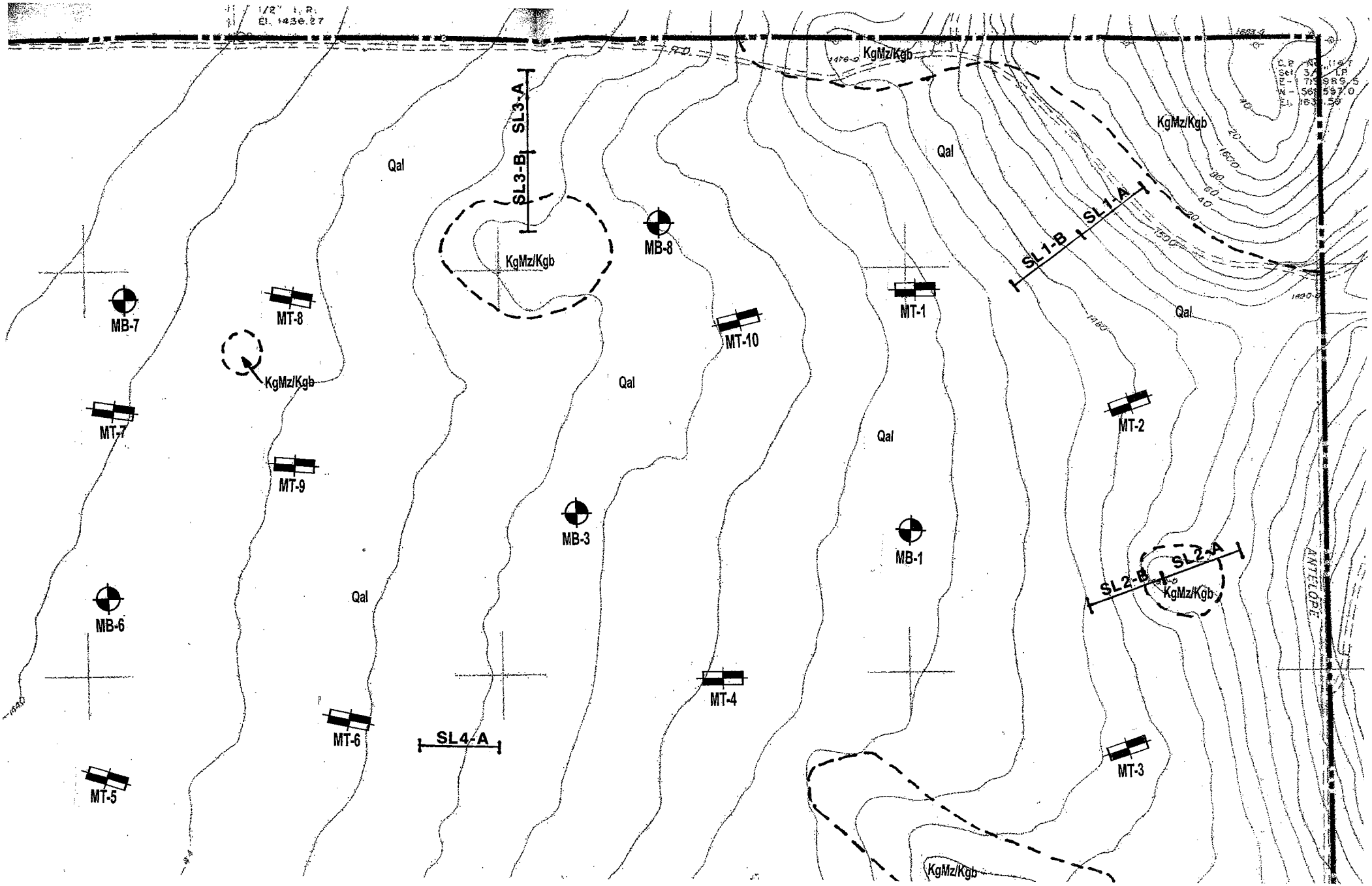
SubSurface Surveys professional personnel are trained and experienced and have completed thousands of projects since the company's inception in 1988. It is our policy to work diligently to bring this training and experience to bear to acquire quality data sets, which in turn, can provide clues useful in formulating our interpretations. Still, non-uniqueness of interpretations, methodological limitations, and non-target interferences are prevailing problems. SubSurface Surveys makes no guarantee either expressed or implied regarding the accuracy of the interpretations presented. And, in no event will SubSurface Surveys be liable for any direct, indirect, special, incidental, or consequential damages resulting from interpretations present herewith.

All data acquired in this project are in confidential file in the office. They are available for review by authorized persons at any time. The opportunity to participate in this project is very much appreciated. Please call, if there are questions.

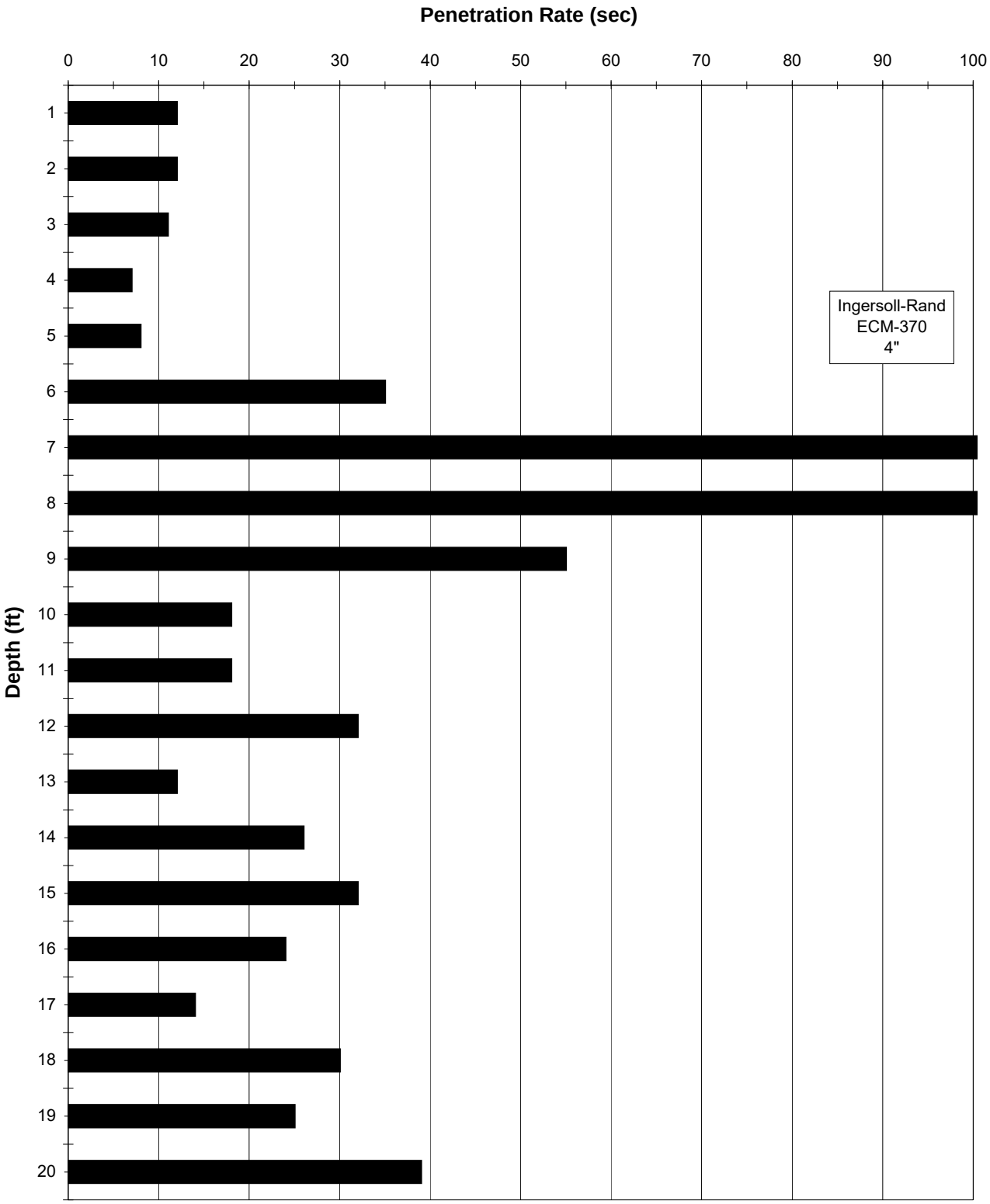
Gary W. Crosby

Gary W. Crosby, PhD, GP 960


MB-7
MT-8
KgMz/Kgb
MT-7
MT-9
MB-6
MT-6
SL4-A
MT-5
MB-5
MB-4
MT-10
Qal
MB-3
MT-4
MT-1
MB-1
MT-2
SL2-A
SL2-B
KgMz/Kgb
MT-3
KgMz/Kgb
MB-2
Qal
C.R No. 1202
V/2 I.R.


1/2" I.P.
El. 1436.27
R.D.
KgMz/Kgb
SL3-A
SL3-B
Qal
MB-8
MB-7
MT-8
MT-1
SL1-B
SL1-A
MT-10
KgMz/Kgb
Qal
MT-7
MT-2
MT-9
Qal
MB-3
MB-1
SL2-A
SL2-B
KgMz/Kgb
MB-6
Qal
MT-4
MT-6
SL4-A
MT-3
MT-5
KgMz/Kgb
ANTELOPE

AT-1


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
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3
4
5
6
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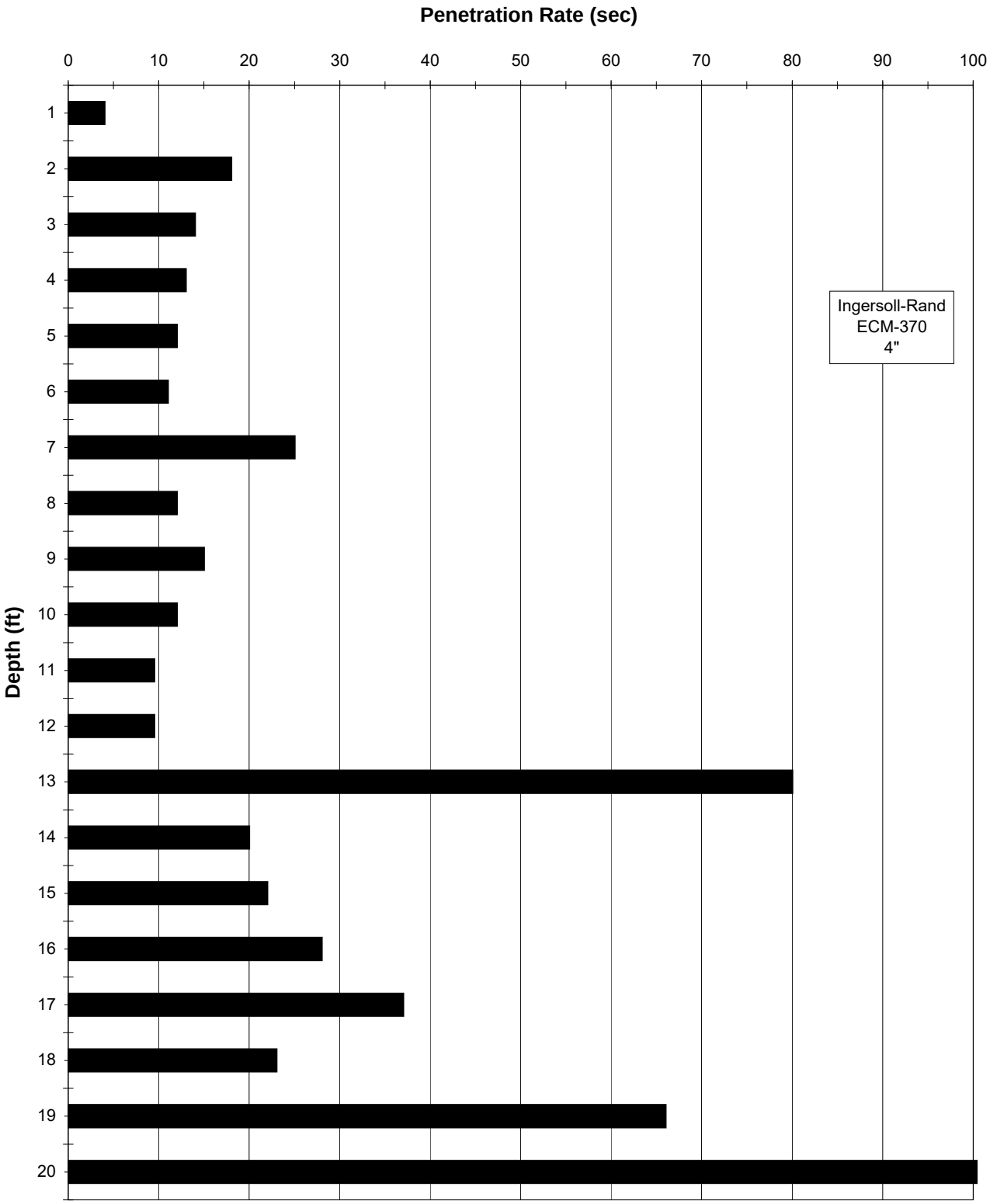
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

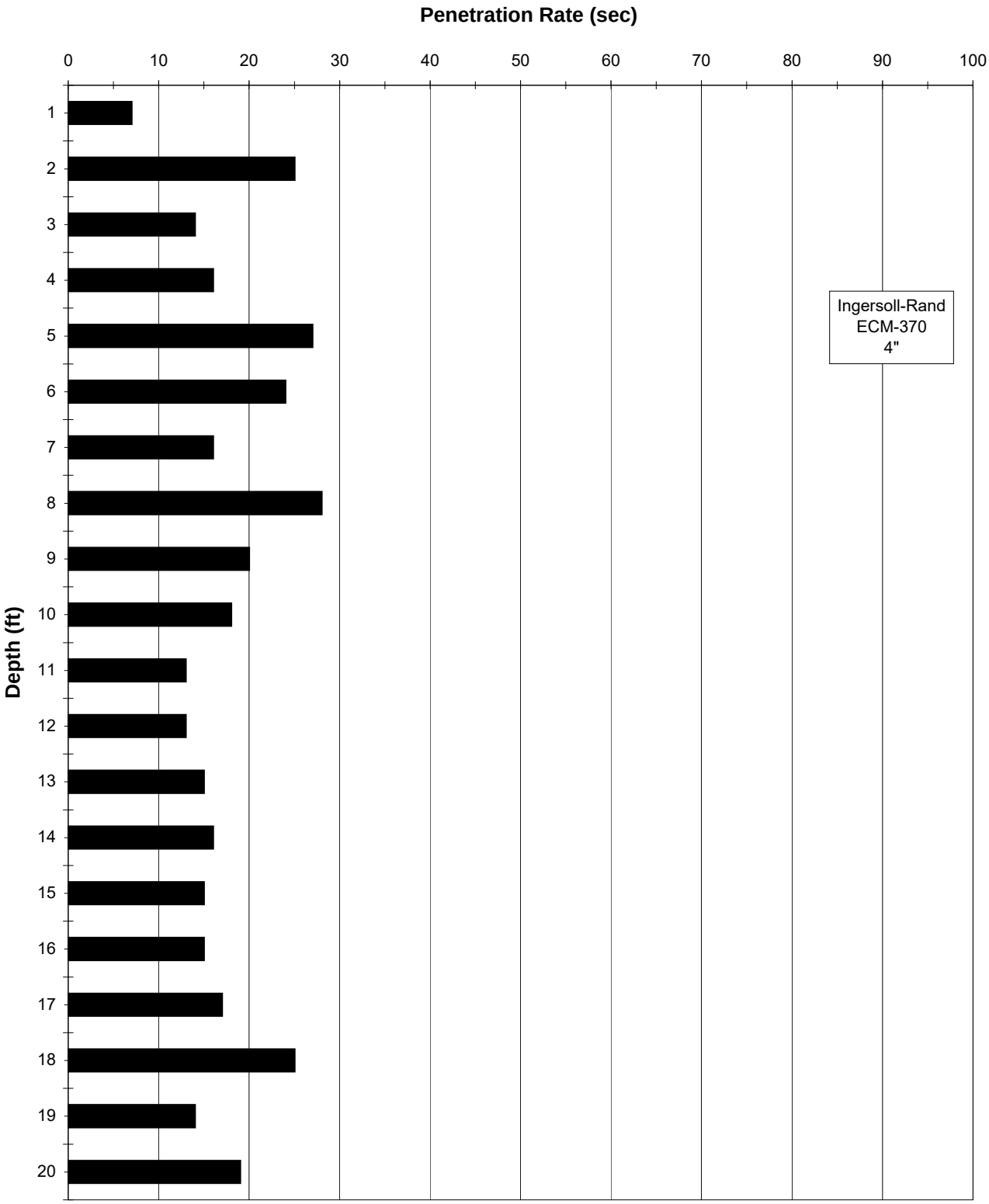
AT-1		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	-	12
2	24	12
3	35	11
4	42	7
5	50	8
6	85	35
7	290	205
8	485	195
9	540	55
10	-	18
11	576	18
12	608	32
13	620	12
14	646	26
15	678	32
16	702	24
17	716	14
18	746	30
19	771	25
20	810	39

AT-2


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

AT-2		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	4	4
2	22	18
3	36	14
4	49	13
5	61	12
6	72	11
7	97	25
8	109	12
9	124	15
10	136	12
11	-	9.5
12	155	9.5
13	235	80
14	255	20
15	277	22
16	305	28
17	342	37
18	365	23
19	431	66
20	612	181
21	747	135
22	-	26.5
23	800	26.5
24	823	23
25	835	12
26	858	23
27	914	56
28	935	21
29	960	25
30	993	33

AT-3


Penetration Rate (sec)
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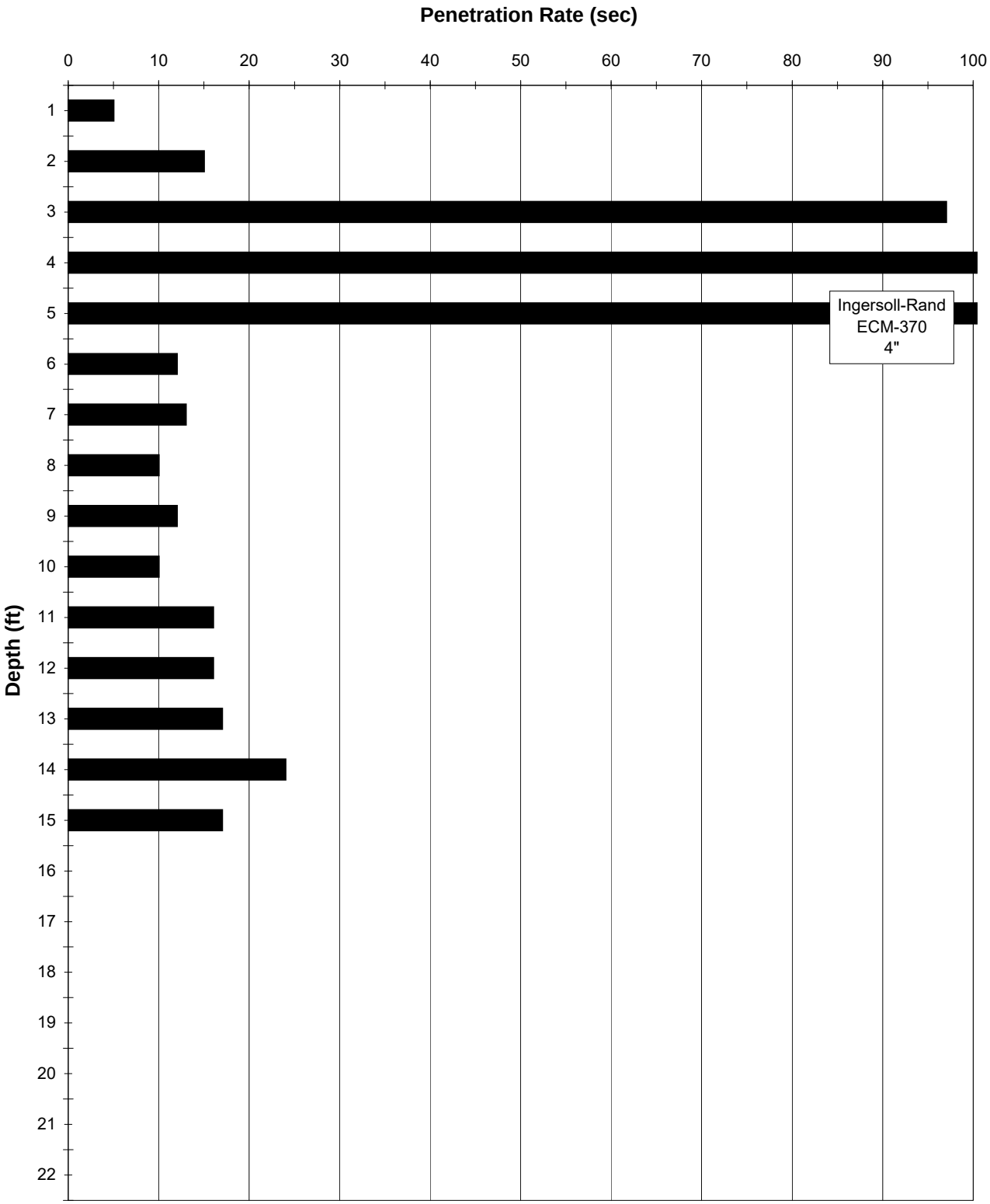
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

AT-3		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	7	7
2	32	25
3	46	14
4	62	16
5	89	27
6	113	24
7	129	16
8	157	28
9	177	20
10	195	18
11	-	13
12	221	13
13	236	15
14	252	16
15	267	15
16	282	15
17	299	17
18	324	25
19	338	14
20	357	19
21	373	16
22	-	8
23	389	8
24	450	61
25	480	30
26	520	40
27	560	40
28	600	40
29	626	26
30	678	52

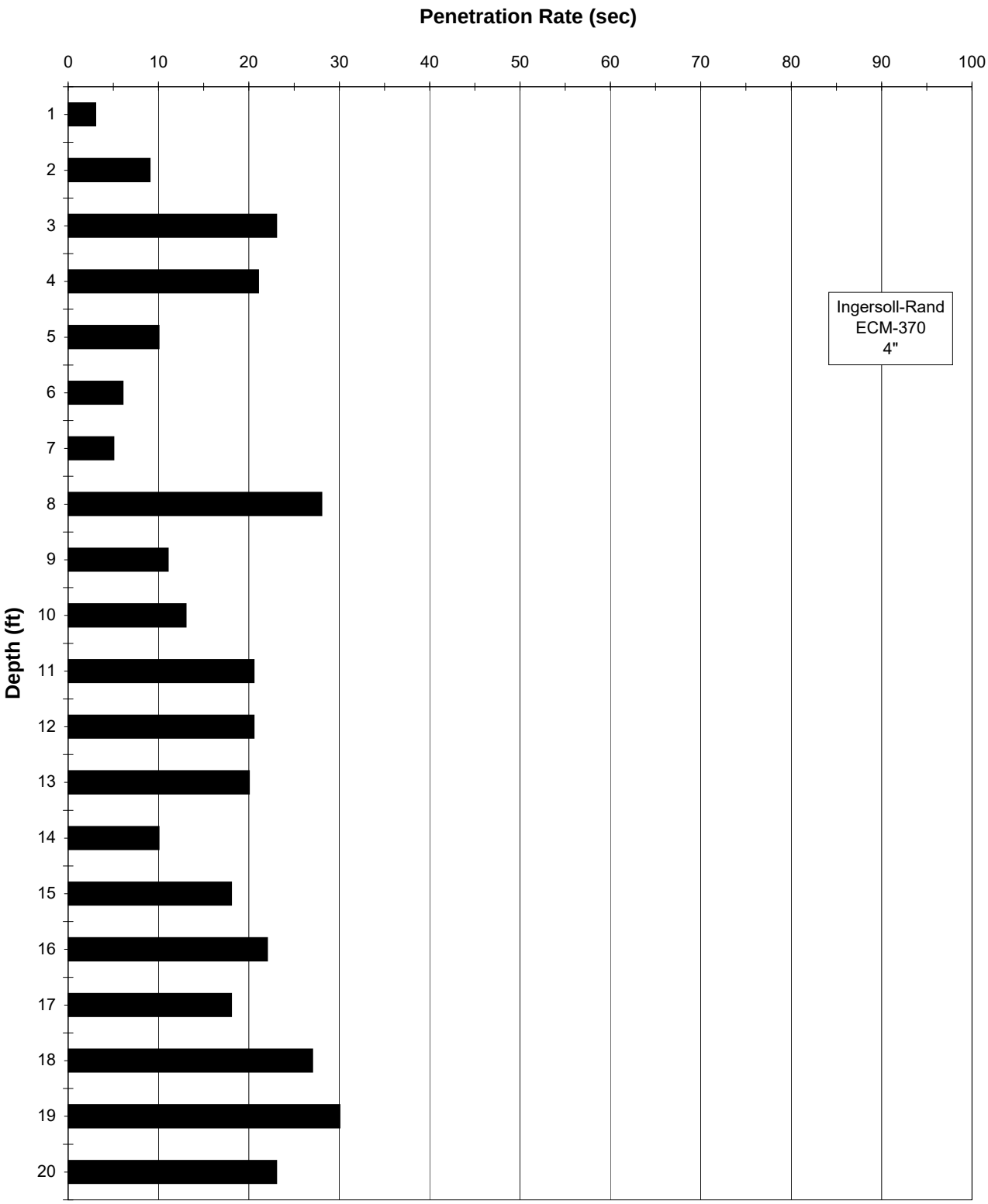
AT-4


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
Ingersoll-Rand
ECM-370
4"

AT-4		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	5	5
2	20	15
3	117	97
4	380	263
5	510	130
6	522	12
7	535	13
8	545	10
9	557	12
10	567	10
11	-	16
12	599	16
13	616	17
14	640	24
15	657	17

657

AT-5


Penetration Rate (sec)
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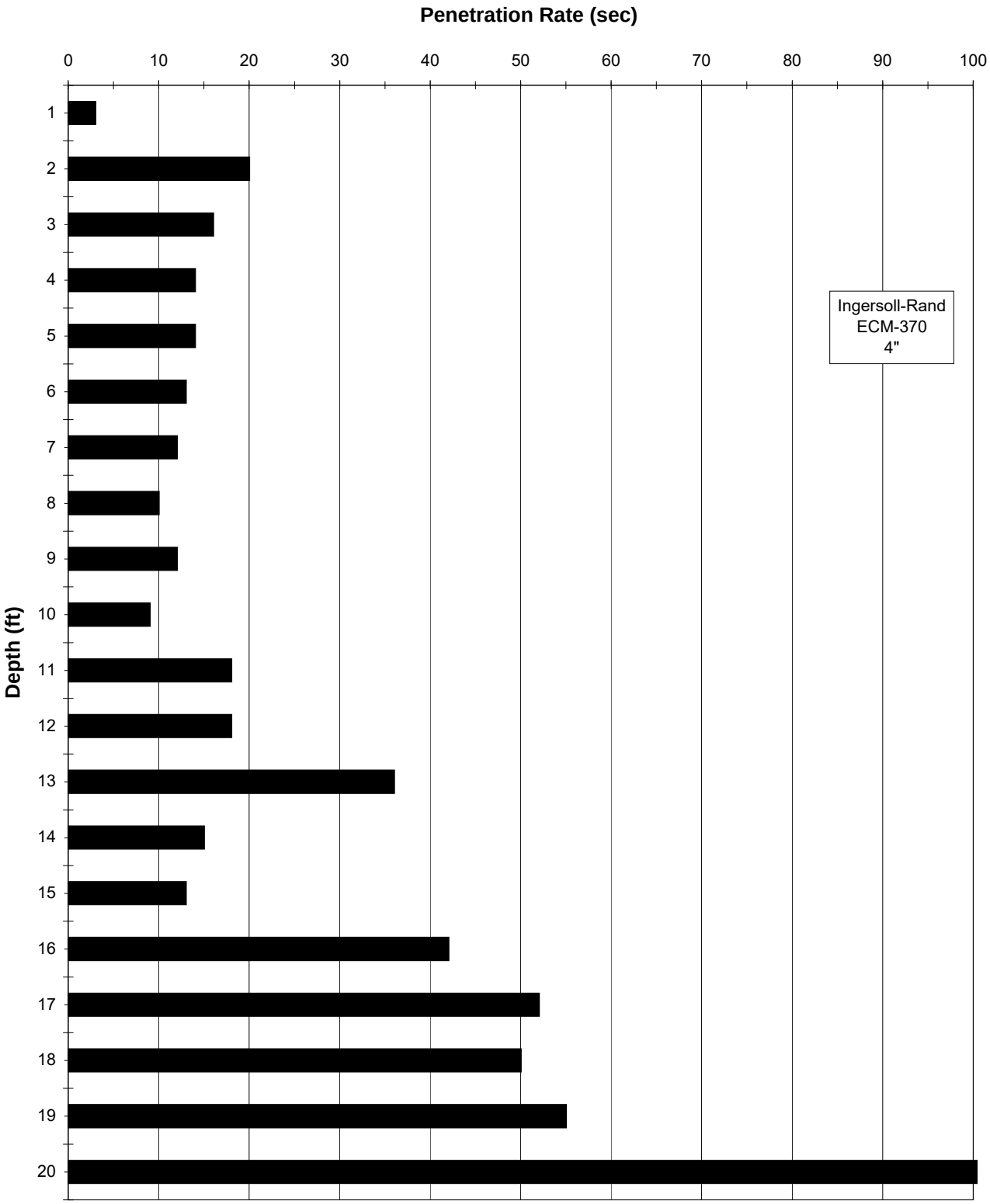
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

AT-5		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	3	3
2	12	9
3	35	23
4	56	21
5	66	10
6	72	6
7	77	5
8	105	28
9	116	11
10	129	13
11	-	20.5
12	170	20.5
13	190	20
14	200	10
15	218	18
16	240	22
17	258	18
18	285	27
19	315	30
20	338	23
21	387	49
22	396	9
23	-	18.3
24	-	18.3
25	451	18.3

450.9

AT-6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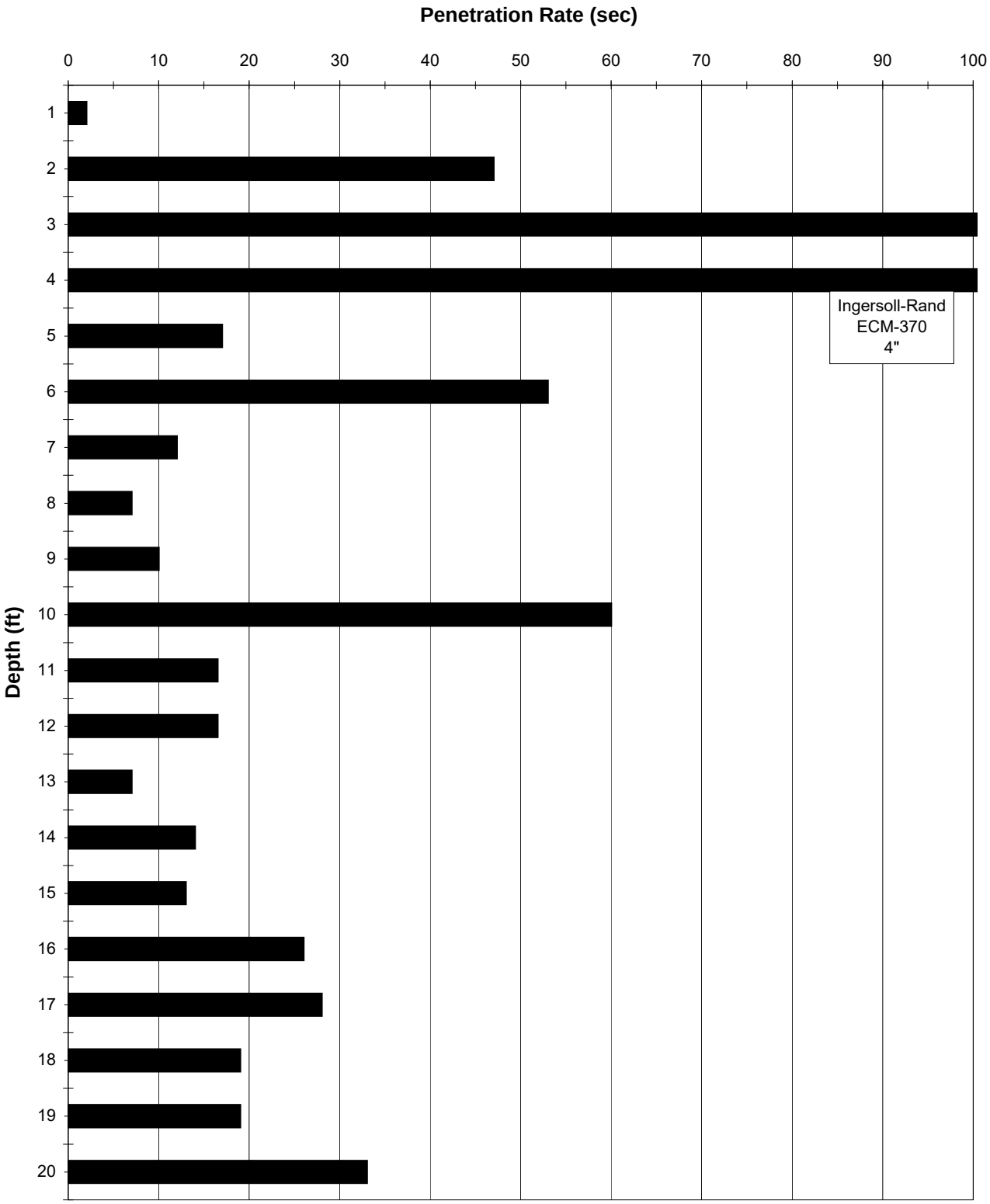
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

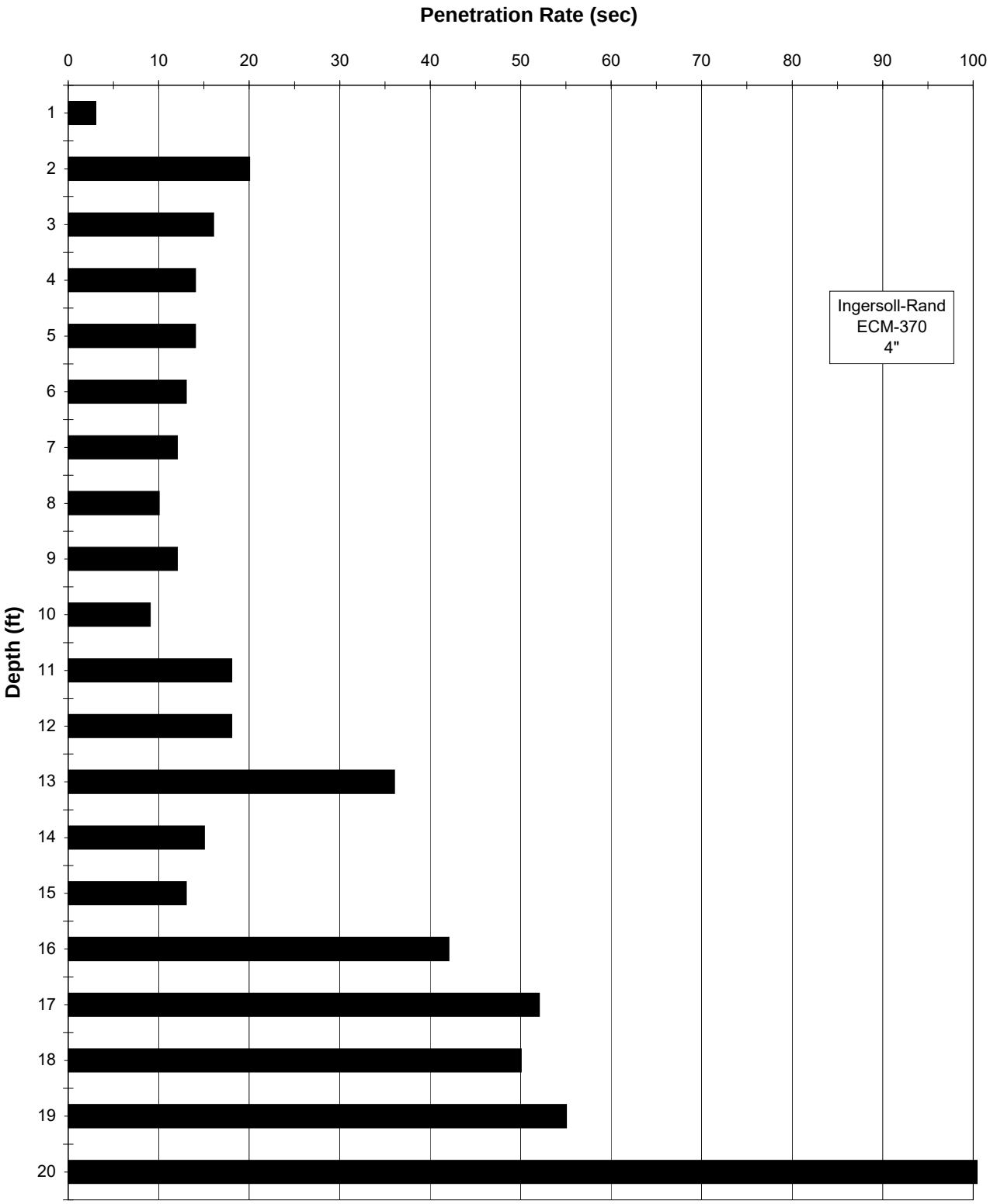
AT-6		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	3	3
2	23	20
3	39	16
4	53	14
5	67	14
6	80	13
7	92	12
8	102	10
9	114	12
10	123	9
11	-	18
12	159	18
13	195	36
14	210	15
15	223	13
16	265	42
17	317	52
18	367	50
19	422	55
20	536	114

AT-7


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

AT-7		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	2	2
2	49	47
3	275	226
4	493	218
5	510	17
6	563	53
7	575	12
8	582	7
9	592	10
10	652	60
11	-	16.5
12	685	16.5
13	692	7
14	706	14
15	719	13
16	745	26
17	773	28
18	792	19
19	811	19
20	844	33

AT-8


Penetration Rate (sec)
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10
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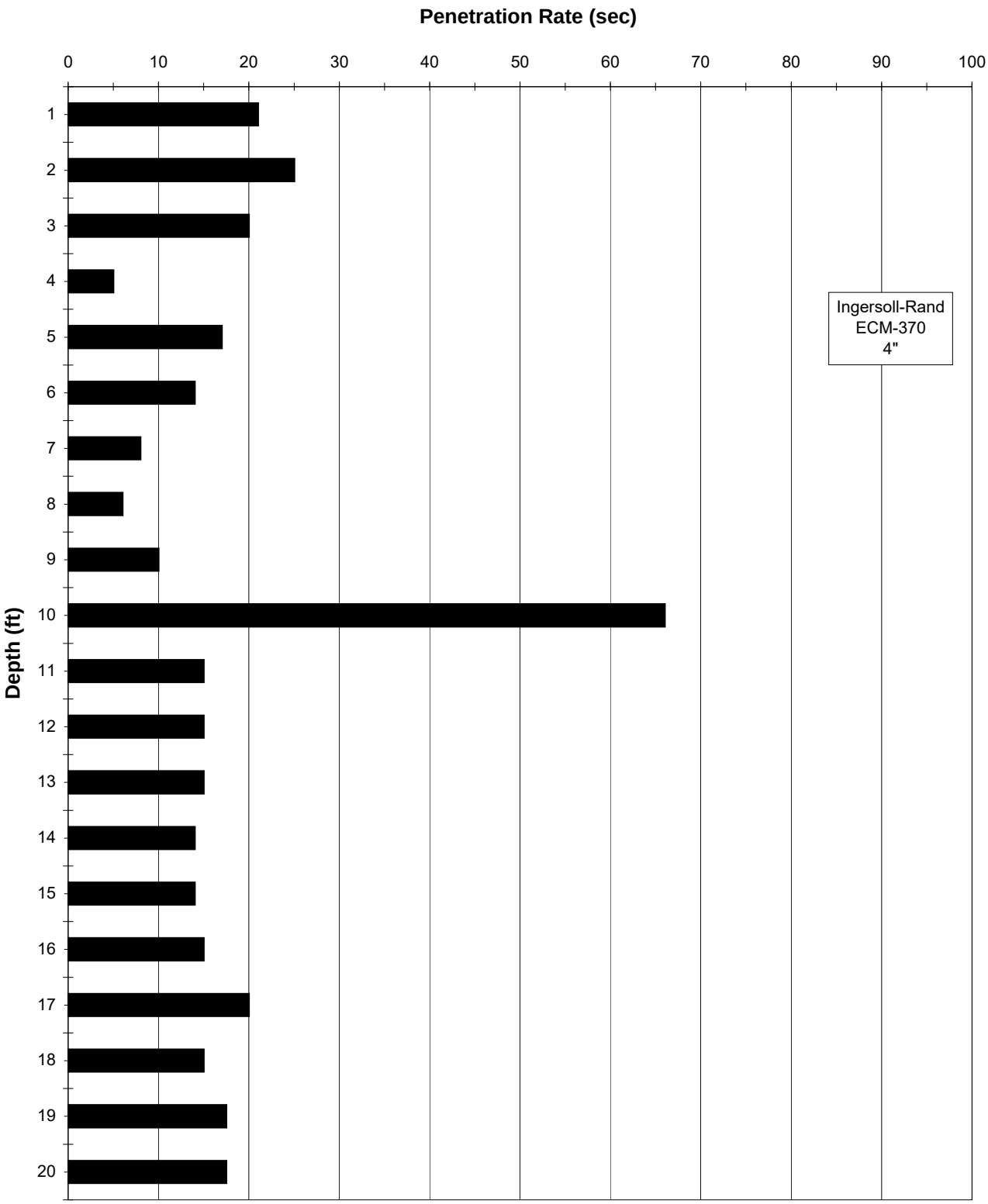
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

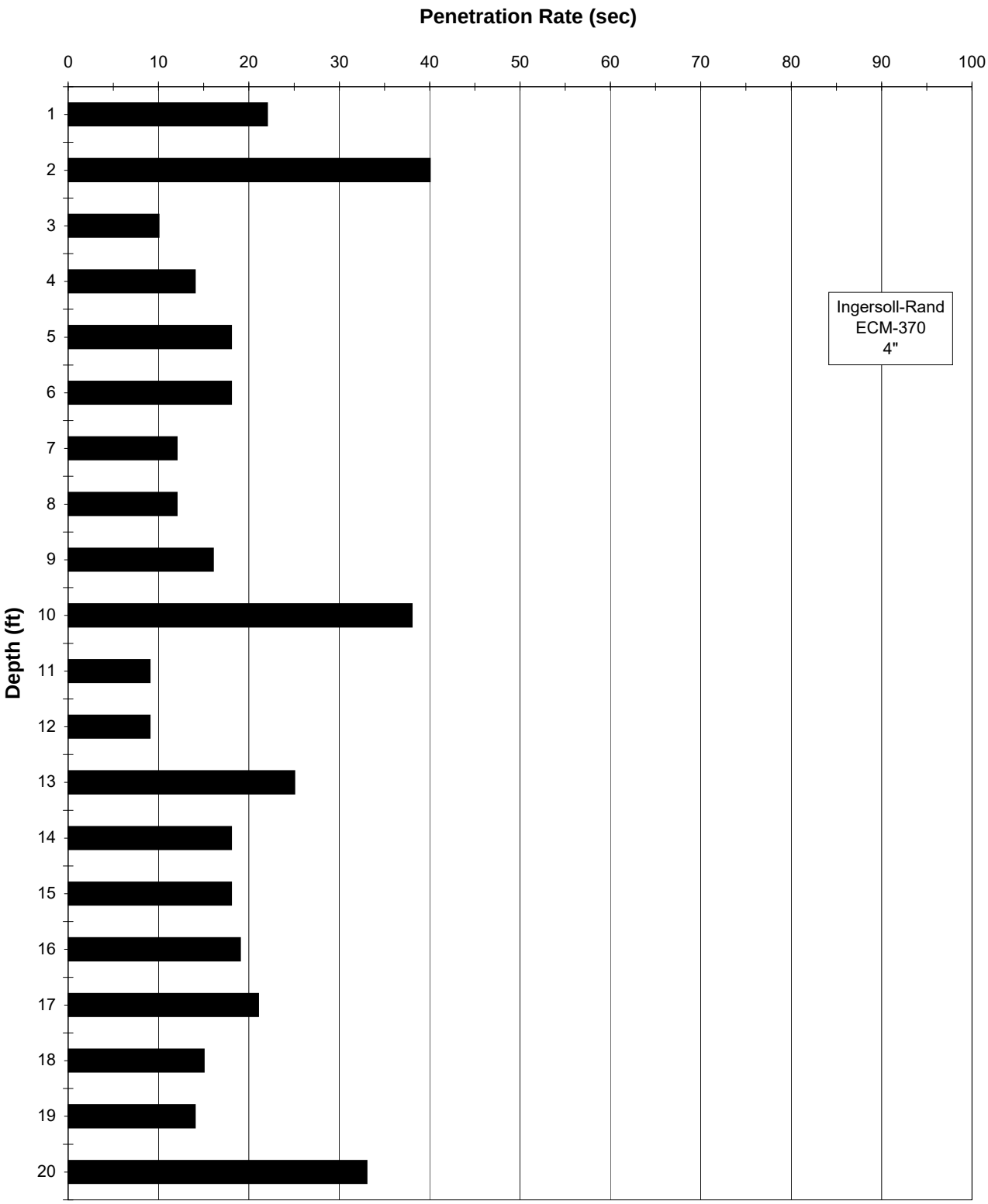
AT-8		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	3	3
2	23	20
3	39	16
4	53	14
5	67	14
6	80	13
7	92	12
8	102	10
9	114	12
10	123	9
11	-	18
12	159	18
13	195	36
14	210	15
15	223	13
16	265	42
17	317	52
18	367	50
19	422	55
20	536	114

AT-9


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

AT-9		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	21	21
2	46	25
3	66	20
4	71	5
5	88	17
6	102	14
7	110	8
8	116	6
9	126	10
10	192	66
11	-	15
12	222	15
13	237	15
14	251	14
15	265	14
16	280	15
17	300	20
18	315	15
19	-	17.5
20	350	17.5

AT-10


Penetration Rate (sec)
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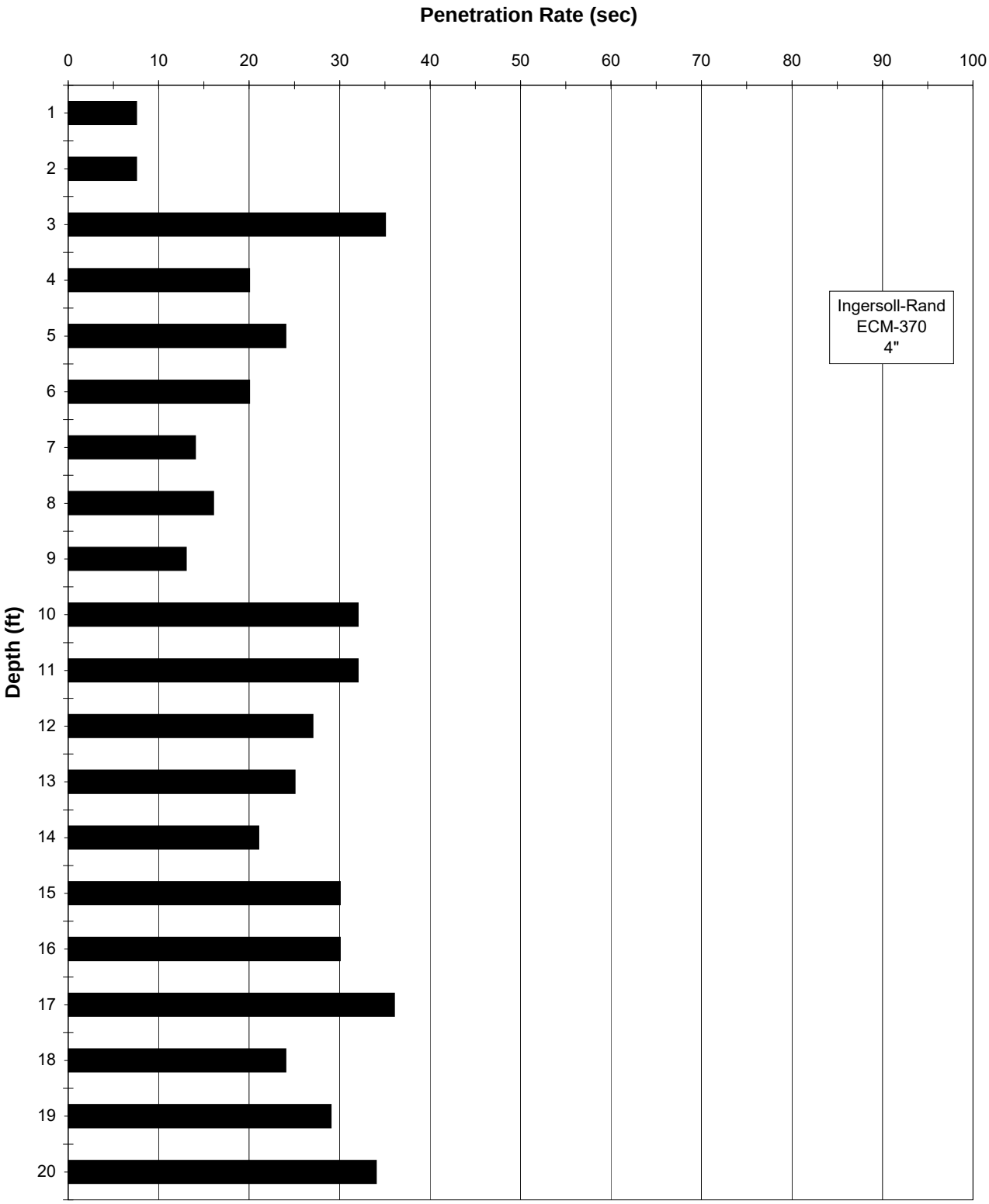
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

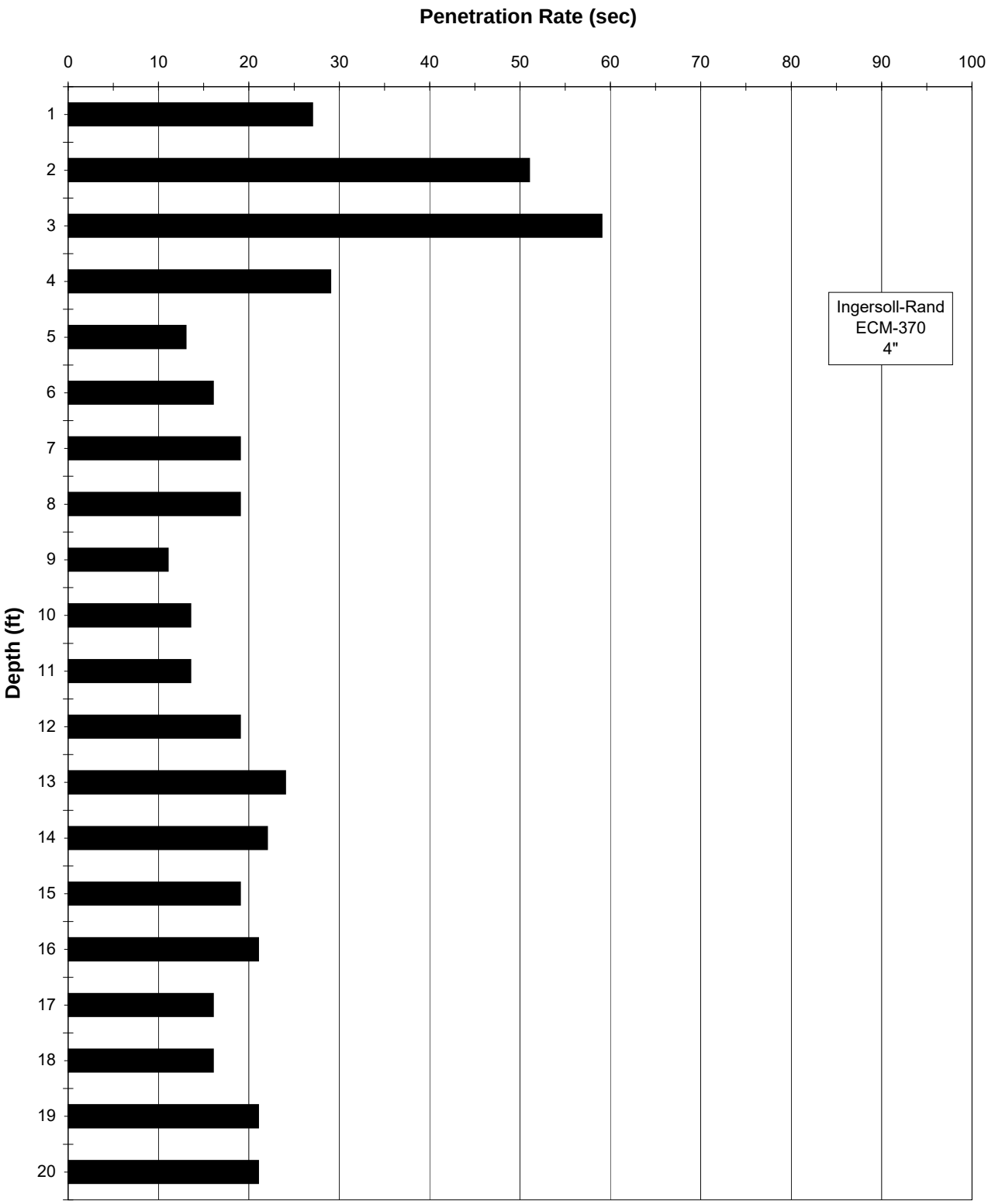
AT-10		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	22	22
2	62	40
3	72	10
4	86	14
5	104	18
6	122	18
7	134	12
8	146	12
9	162	16
10	200	38
11	-	9
12	218	9
13	243	25
14	261	18
15	279	18
16	298	19
17	319	21
18	334	15
19	348	14
20	381	33
21	-	15
22	-	15
23	-	15
24	441	15
25	462	21

AT-11


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

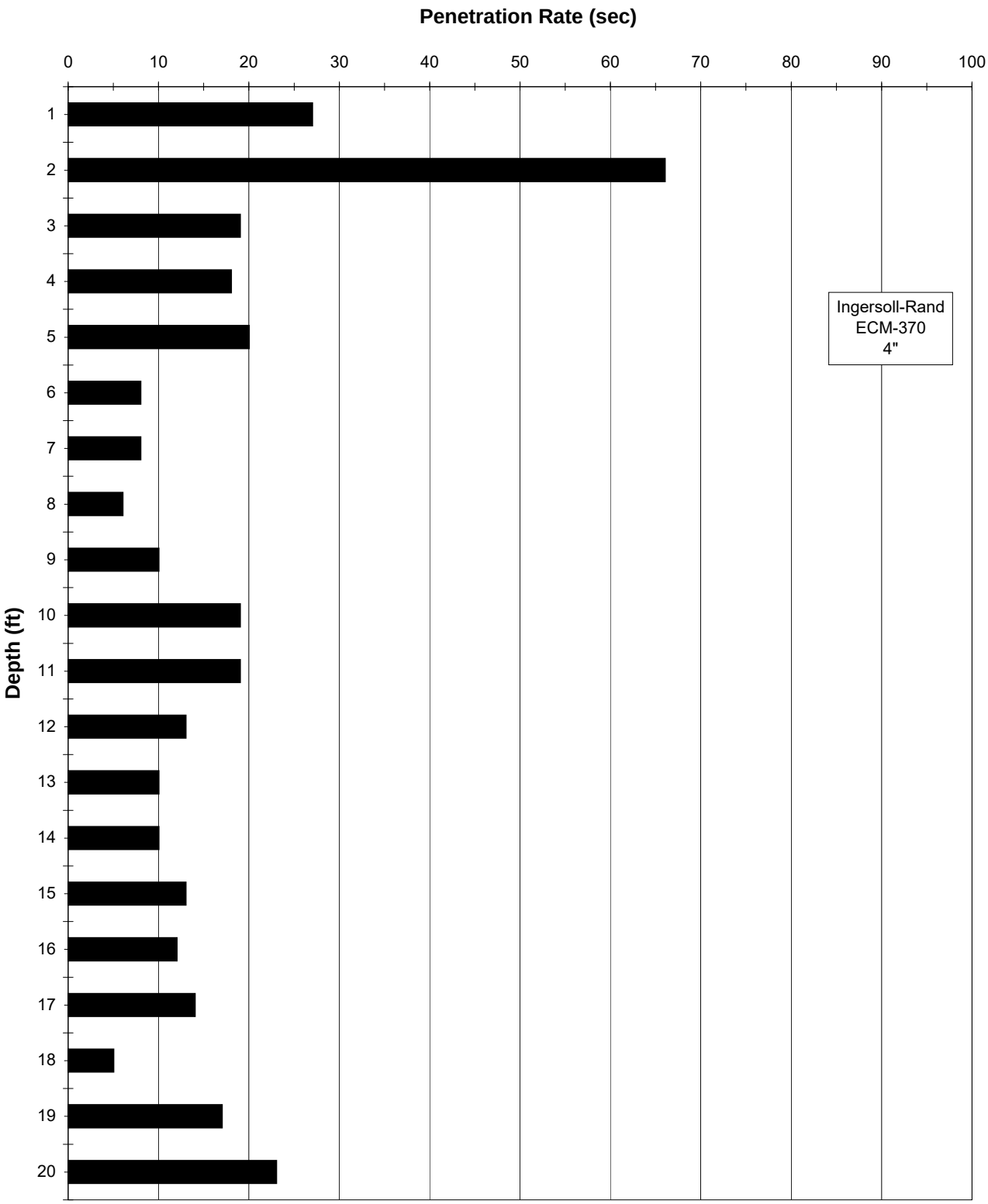
AT-11		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	-	7.5
2	15	7.5
3	50	35
4	70	20
5	94	24
6	114	20
7	128	14
8	144	16
9	157	13
10	-	32
11	221	32
12	248	27
13	273	25
14	294	21
15	324	30
16	354	30
17	390	36
18	414	24
19	443	29
20	477	34

AT-12


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

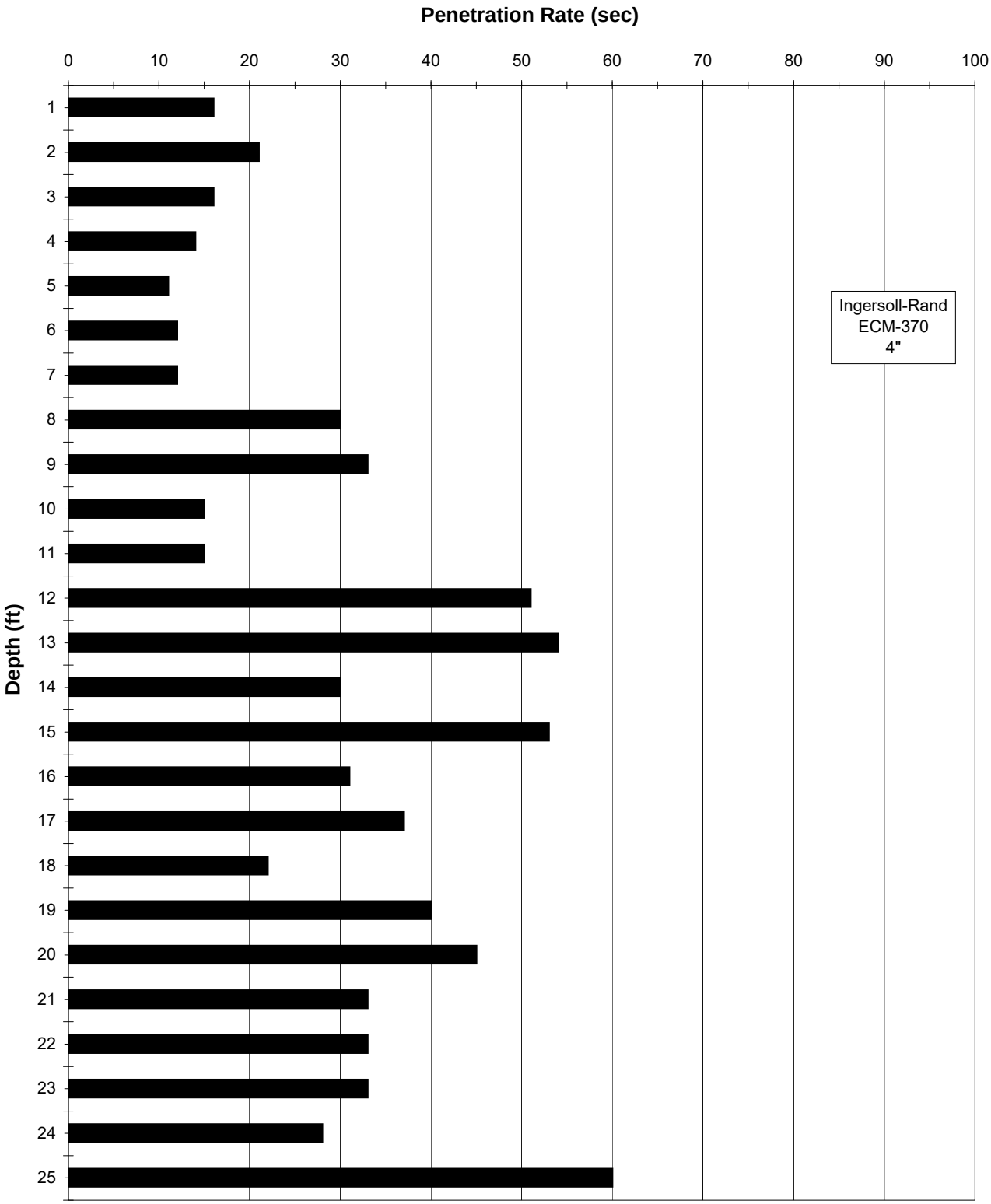
AT-12		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	27	27
2	78	51
3	137	59
4	166	29
5	179	13
6	195	16
7	214	19
8	233	19
9	244	11
10	-	13.5
11	271	13.5
12	290	19
13	314	24
14	336	22
15	355	19
16	376	21
17	392	16
18	408	16
19	429	21
20	450	21
21	-	18
22	-	18
23	504	18
24	531	27
25	560	29
26	580	20
27	604	24
28	628	24
29	654	26

AT-13


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

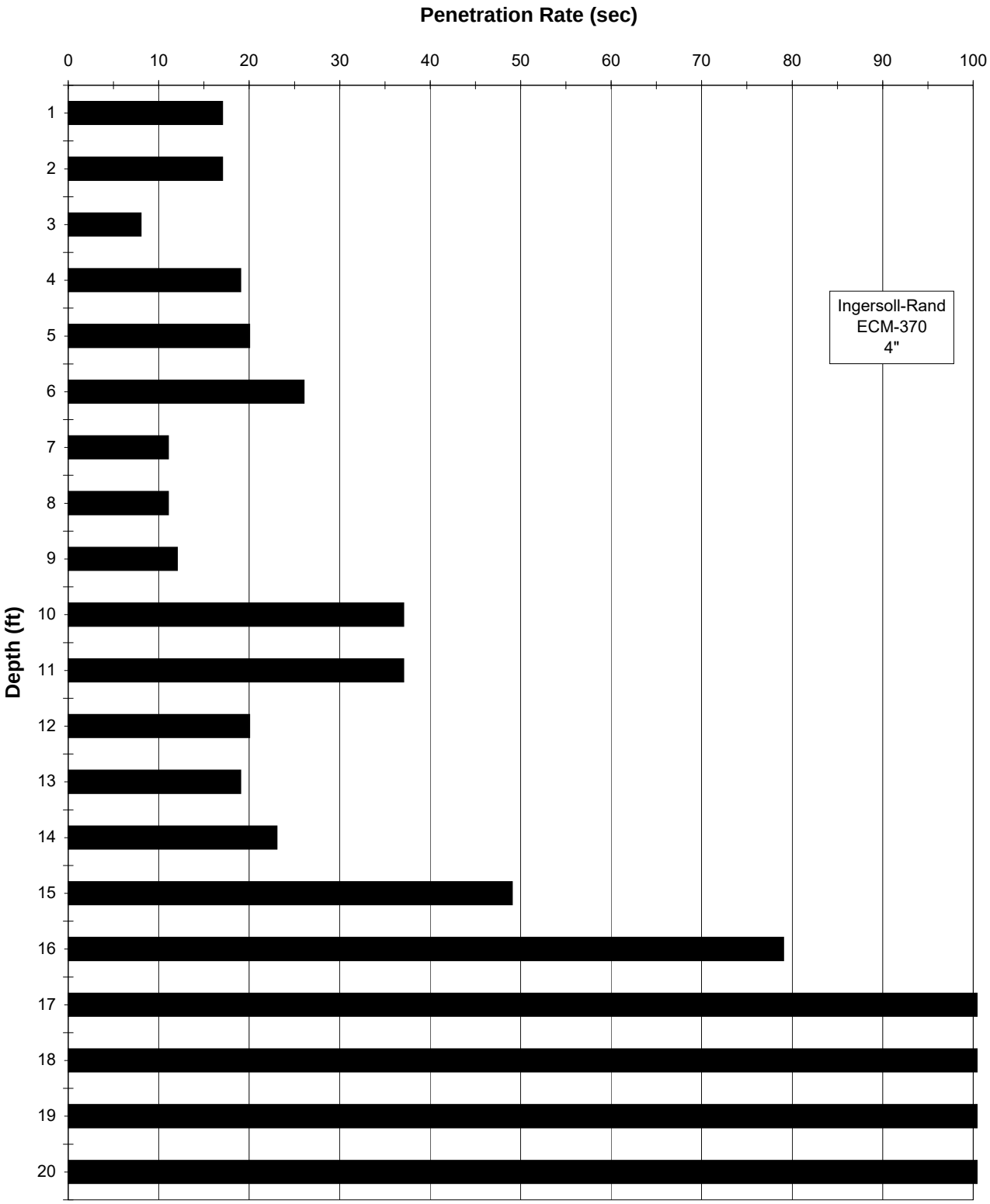
AT-13		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	27	27
2	93	66
3	112	19
4	130	18
5	150	20
6	158	8
7	166	8
8	172	6
9	182	10
10	-	19
11	220	19
12	233	13
13	243	10
14	253	10
15	266	13
16	278	12
17	292	14
18	297	5
19	314	17
20	337	23
21	-	41.3
22	-	41.3
23	461	41.3
24	493	32
25	522	29

AT-14


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
Ingersoll-Rand
ECM-370
4"

AT-14		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	16	16
2	37	21
3	53	16
4	67	14
5	78	11
6	90	12
7	102	12
8	132	30
9	165	33
10	-	15
11	195	15
12	246	51
13	300	54
14	330	30
15	383	53
16	414	31
17	451	37
18	473	22
19	513	40
20	558	45
21	-	33
22	-	33
23	657	33
24	685	28
25	745	60

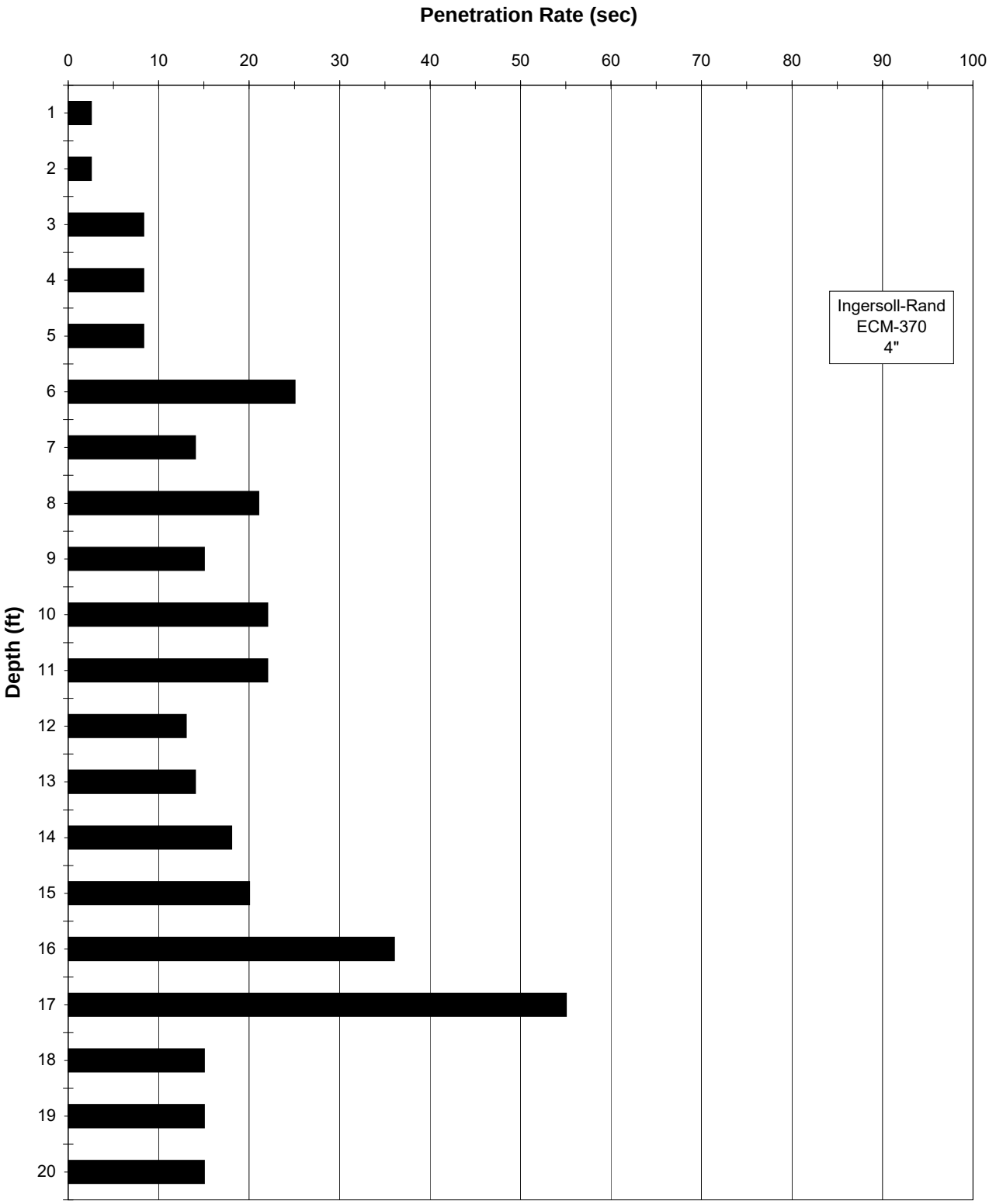
AT-15


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

AT-15		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	17	17
2	34	17
3	42	8
4	61	19
5	81	20
6	107	26
7	118	11
8	129	11
9	141	12
10	-	37
11	215	37
12	235	20
13	254	19
14	277	23
15	326	49
16	405	79
17	553	148
18	845	292
19	1403	558
20	1857	454
21	-	167.6
22	-	167.6
23	2360	167.6
24	2445	85
25	2480	35

2479.8

AT-16


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
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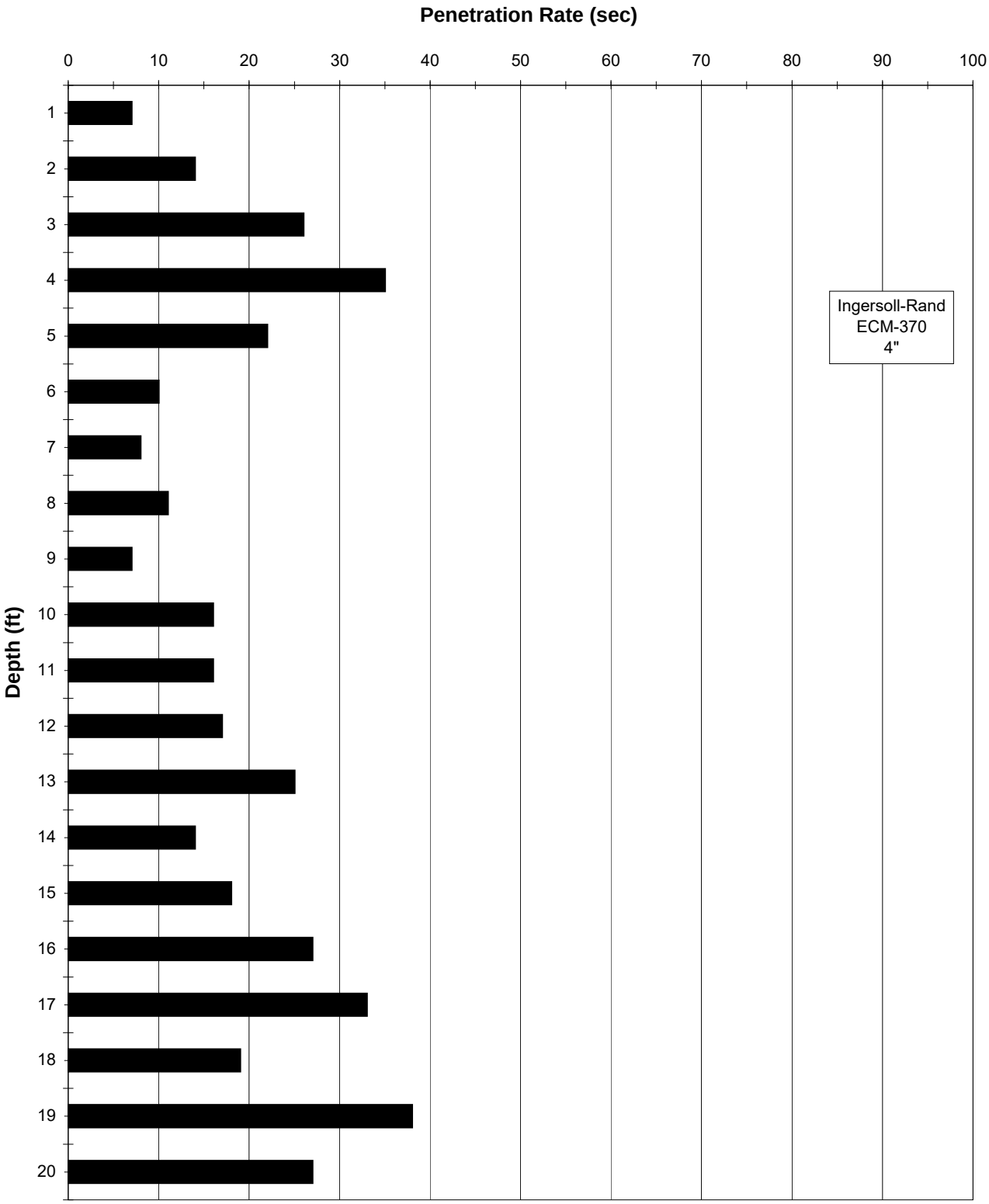
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

AT-16		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	-	2.5
2	5	2.5
3	-	8.3
4	-	8.3
5	30	8.3
6	55	25
7	69	14
8	90	21
9	105	15
10	-	22
11	149	22
12	162	13
13	176	14
14	194	18
15	214	20
16	250	36
17	305	55
18	-	15
19	-	15
20	350	15
21	-	8.3
22	-	8.3
23	375	8.3
24	398	23
25	429	31

428.8

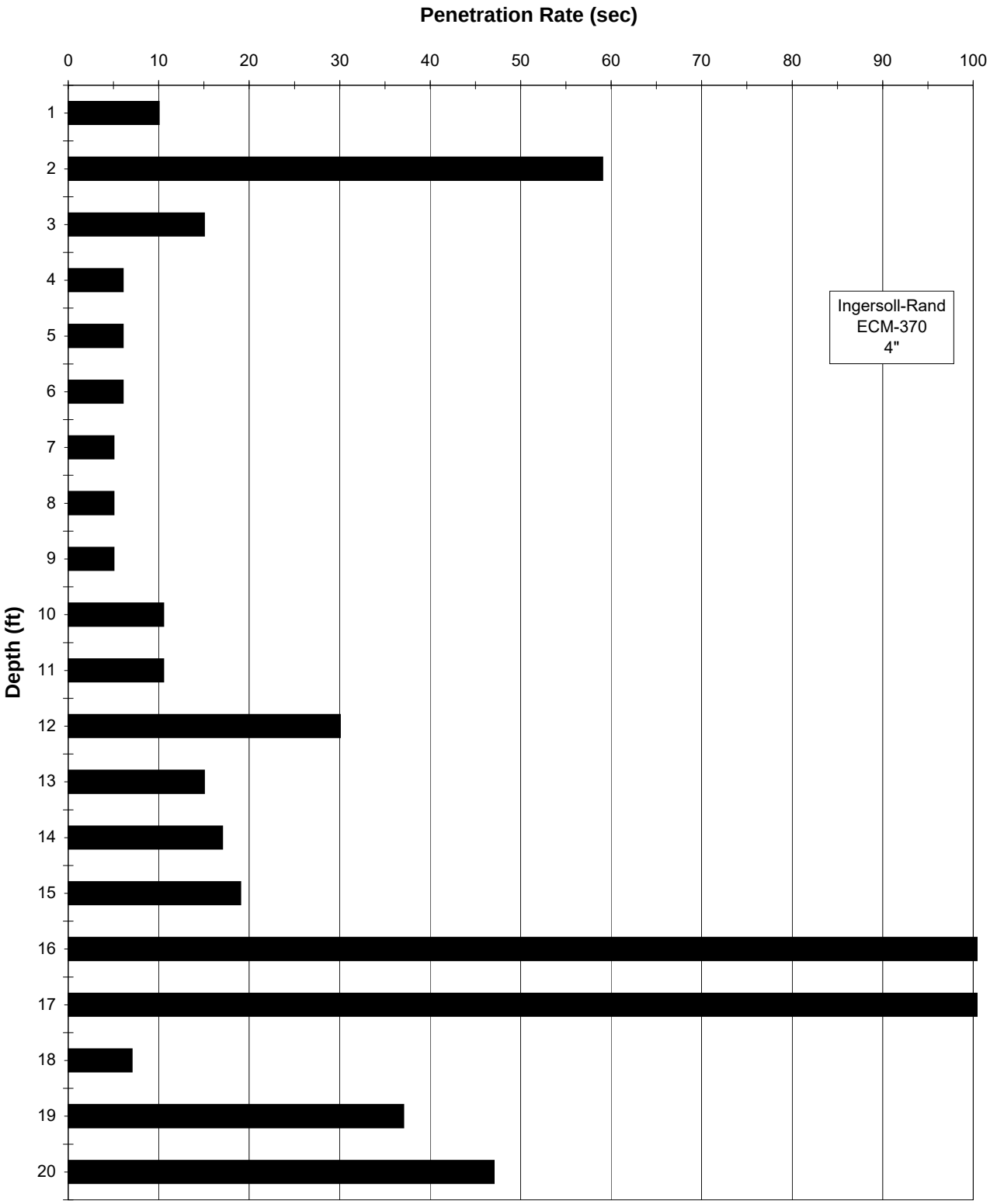
AT-17


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

AT-17		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	7	7
2	21	14
3	47	26
4	82	35
5	104	22
6	114	10
7	122	8
8	133	11
9	140	7
10	-	16
11	172	16
12	189	17
13	214	25
14	228	14
15	246	18
16	273	27
17	306	33
18	325	19
19	363	38
20	390	27
21	-	19.3
22	-	19.3
23	448	19.3
24	484	36
25	530	46
26	545	15
27	577	32
28	598	21
29	760	162
30	804	44

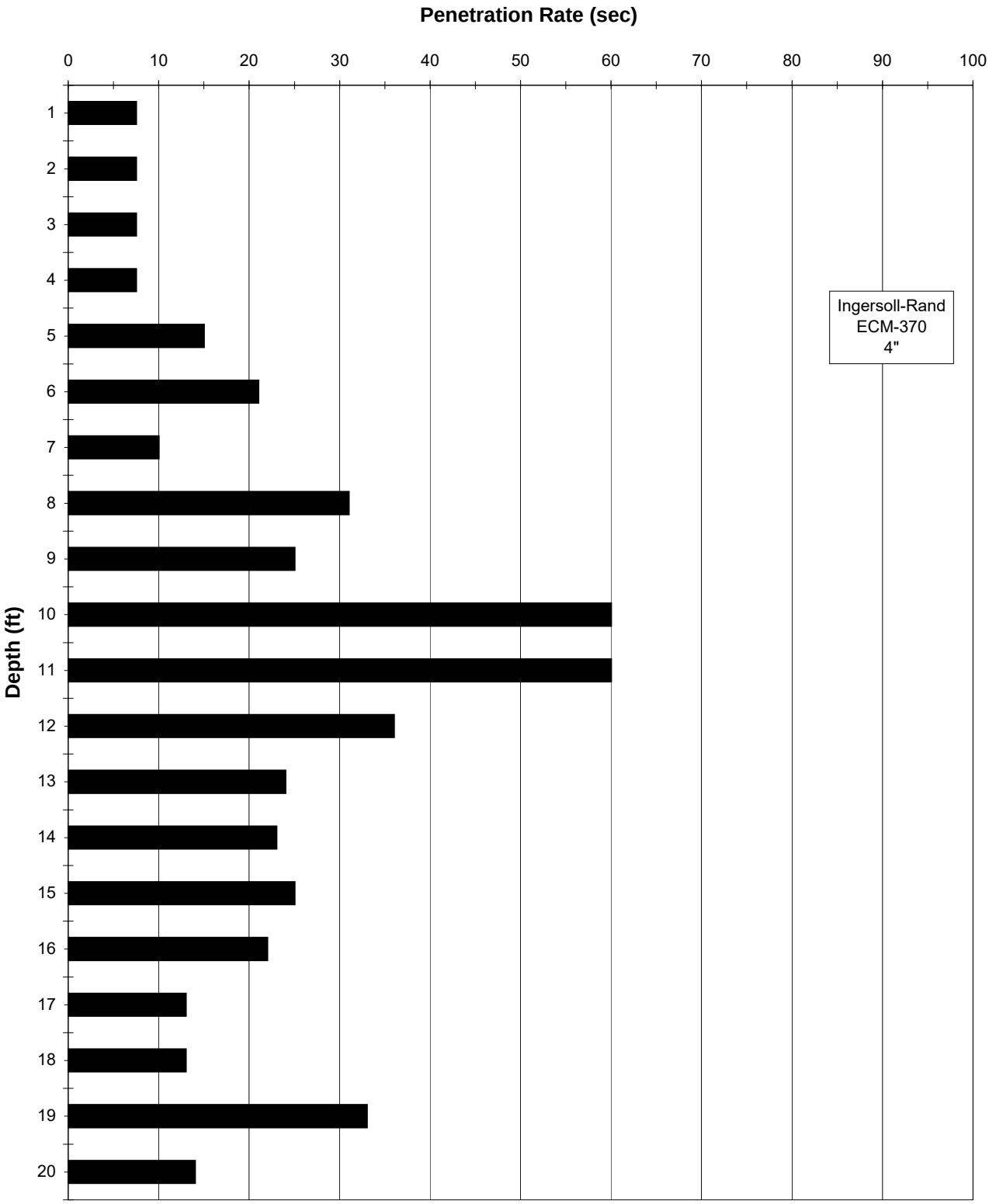
803.9

AT-18


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

AT-18		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	10	10
2	69	59
3	84	15
4	-	6
5	-	6
6	102	6
7	-	5
8	-	5
9	117	5
10	-	10.5
11	138	10.5
12	168	30
13	183	15
14	200	17
15	219	19
16	345	126
17	503	158
18	510	7
19	547	37
20	594	47
21	-	143
22	-	143
23	1023	143
24	1043	20
25	1080	37
26	1124	44
27	1160	36
28	1493	333
29	1753	260
30	1860	107

AT-19


Penetration Rate (sec)
0
10
20
30
40
50
60
70
80
90
100
Depth (ft)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Ingersoll-Rand
ECM-370
4"

AT-19		
Depth (ft)	**Total Time (sec)**	**Penetration Rate (sec)**
1	-	7.5
2	-	7.5
3	-	7.5
4	30	7.5
5	45	15
6	66	21
7	76	10
8	107	31
9	132	25
10	-	60
11	252	60
12	288	36
13	312	24
14	335	23
15	360	25
16	382	22
17	-	13
18	408	13
19	441	33
20	455	14

Appendix C
Laboratory Test Results

APPENDIX C

Laboratory Test Results

The laboratory testing program was directed towards providing quantitative data relating to the relevant engineering properties of the soils. Samples considered representative of site conditions were tested in general accordance with American Society for Testing and Materials (ASTM) procedure and/or California Test Methods (CTM), where applicable. The following summary is a brief outline of the test type and a table summarizing the test results.

Atterberg Limits: The liquid and plastic limits ("Atterberg Limits") were determined per ASTM D4318 for engineering classification of fine-grained material and presented in the table below. The USCS soil classification indicated in the table below is based on the portion of sample passing the No. 40 sieve and may not necessarily be representative of the entire sample. The plots are provided in this Appendix.

Sample Location	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	USCS Soil Classification
T-8 @ 3-5 ft	33	17	16	CL
T-10 @ 0-2 ft	39	14	25	CL

Expansion Index: The expansion potential of selected representative samples was evaluated by the Expansion Index Test per ASTM D4829.

Sample Location	Expansion Index	Expansion Potential*
T-5 @ 5-7 ft	15	Very Low
T-8 @ 3-5 ft	11	Very Low
T-10 @ 0-2 ft	58	Medium
T-13 @ 3-4 ft	52	Medium

* Per ASTM D4829

Collapse/Swell Potential: A collapse test was performed per ASTM D4546. A sample (2.4 inches in diameter and 1-inch in height) was placed in a consolidometer and loaded to their approximate in-situ effective stress. The curve is presented in this Appendix.

Laboratory Test Results

Laboratory Compaction: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM D1557. The results of these tests are presented in the table below.

Sample Location	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
T-5 @ 0-2 ft	Light Brown Sandy Clay	113.0	15.0

Soluble Sulfates: The soluble sulfate contents of selected samples were determined by standard geochemical methods (CTM 417). The test results are presented in the table below.

Sample Location	Sulfate Content, %
T-8 @ 3-5 ft	< 0.01

Chloride Content: Chloride content was tested per CTM 422. The results are presented below.

Sample Location	Chloride Content, ppm
T-8 @ 3-5 ft	22

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in general accordance with CTM 643 and standard geochemical methods. The results are presented in the table below.

Sample Location	pH	Minimum Resistivity (ohms-cm)
T-8 @ 3-5 ft	7.1	978

R-value Test: R-value test was performed in general accordance with California Test Method 301. The plot is attached.

Sample No.	R-Value
T-8 @ 3-5 ft	57

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Fleming Ranch	Tested By:	G. Bathala	Date:	01/19/17
Project No. :	16151-01	Input By:	J. Ward	Date:	01/24/17
Boring No.:	T-8	Checked By:	J. Ward		
Sample No.:	B-1	Depth (ft.)	3-5		
Soil Identification:	Strong brown clayey sand (SC)				

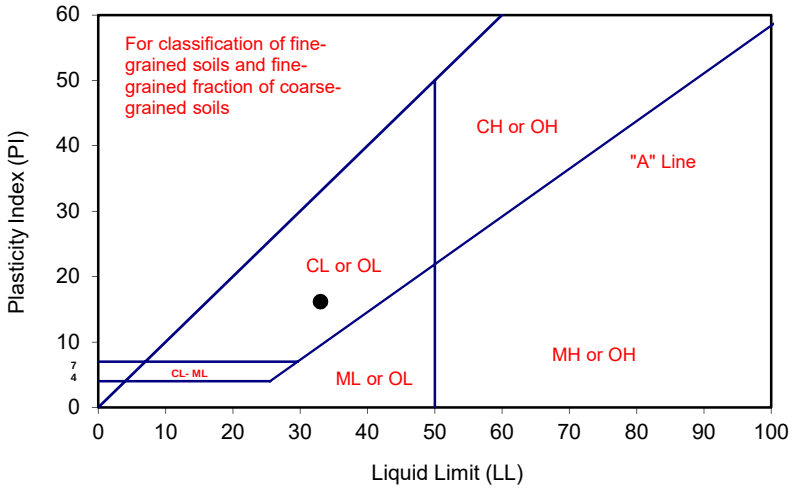
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			32	25	17	
Wet Wt. of Soil + Cont. (g)	38.18	31.20	38.66	26.46	39.88	
Dry Wt. of Soil + Cont. (g)	37.22	30.26	35.16	23.25	36.18	
Wt. of Container (g)	31.56	24.63	24.31	13.54	25.24	
Moisture Content (%) [Wn]	16.96	16.70	32.26	33.06	33.82	

Liquid Limit	**33**
Plastic Limit	**17**
Plasticity Index	**16**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 9.49

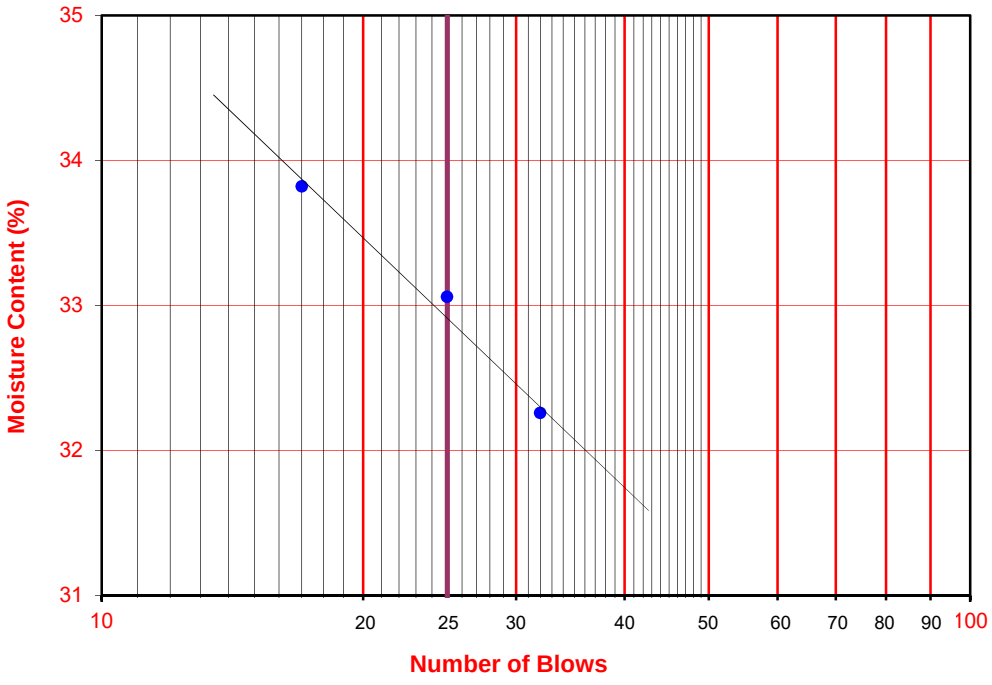
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$

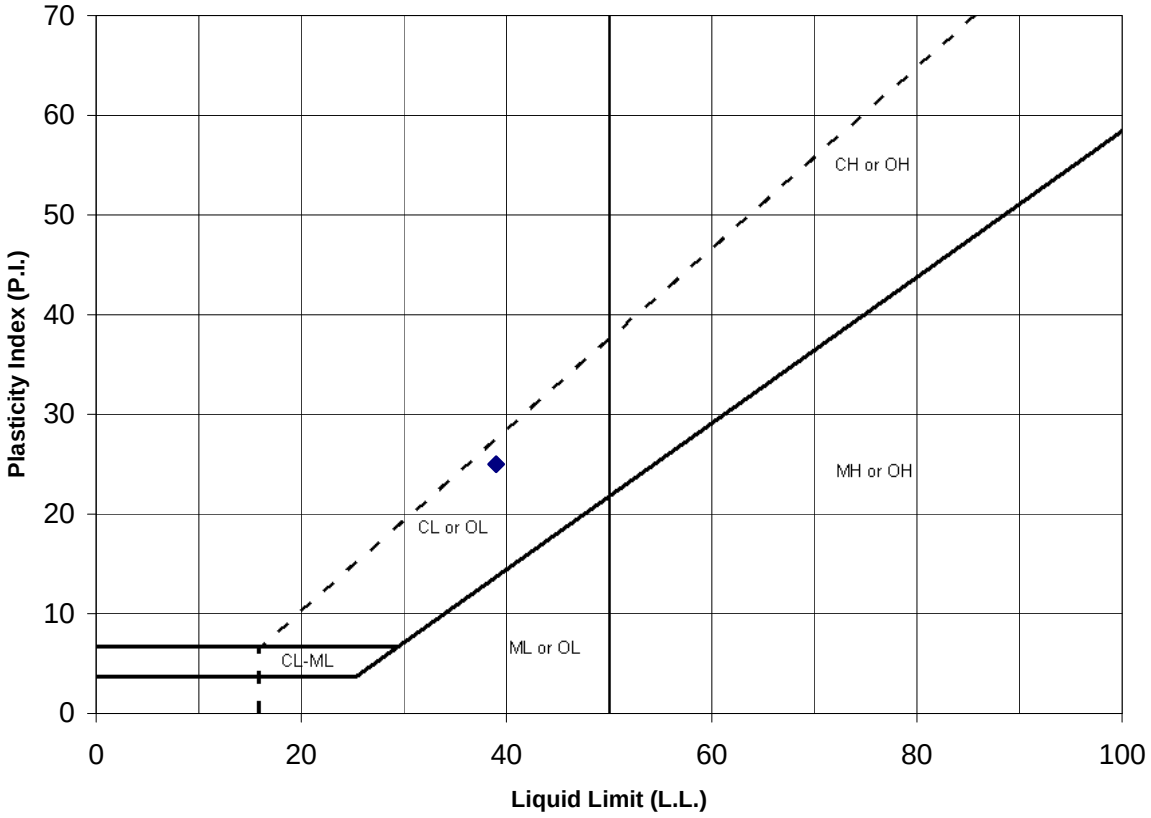


PROCEDURES USED

	Wet Preparation
	Multipoint - Wet
X	Dry Preparation
	Multipoint - Dry
X	Procedure A
	Multipoint Test
	Procedure B
	One-point Test



PLASTICITY CHART - CLASSIFICATION OF FINE-GRAINED SOILS



Symbol	Location.:	Sample No.:	Depth (ft)	Passing No. 200 Sieve (%)	Liquid Limit (%) LL	Plastic Limit (%) PL	Plasticity Index (%) PI	USCS
◆	T-10	B-1	0-2'	-	39	14	25	CL

LGC Geotechnical, Inc.

ATTERBERG LIMITS
(ASTM D 4318)

Project Number: 16151-01
Date: Dec-16

Fleming Ranch

Location	Sample No.	Depth (ft)	Molding Moisture Content (%)	Initial Dry Density (pcf)	Final Moisture Content (%)	Expansion Index	Expansion Classification[1]
T-5	B-2	5'-7'	12.9	103.7	25.4	15	Very Low
T-10	B-1	0-2'	10.1	109.6	21.2	58	Medium
T-13	B-1	3'-4'	9.5	117.7	21.3	52	Medium

LGC Geotechnical, Inc.

EXPANSION INDEX
(ASTM D 4829)

Project Number: 16151-01
Date: Dec-16

Fleming Ranch

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	Fleming Ranch	Tested By:	S. Felter	Date:	01/19/17
Project No.:	16151-01	Checked By:	J. Ward	Date:	01/24/17
Boring No.:	T-8	Depth (ft.):	3-5		
Sample No.:	B-1				
Soil Identification:	Strong brown clayey sand (SC)				

Dry Wt. of Soil + Cont. (g)	1000.00
Wt. of Container No. (g)	0.00
Dry Wt. of Soil (g)	1000.00
Weight Soil Retained on #4 Sieve	0.00
Percent Passing # 4	100.00

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0105
Wt. Comp. Soil + Mold (g)	575.80	413.15
Wt. of Mold (g)	200.10	0.00
Specific Gravity (Assumed)	2.70	2.70
Container No.	O	O
Wet Wt. of Soil + Cont. (g)	759.30	613.25
Dry Wt. of Soil + Cont. (g)	678.00	535.58
Wt. of Container (g)	0.00	200.10
Moisture Content (%)	11.99	23.15
Wet Density (pcf)	113.3	123.3
Dry Density (pcf)	101.2	100.1
Void Ratio	0.666	0.683
Total Porosity	0.400	0.406
Pore Volume (cc)	82.7	84.9
Degree of Saturation (%) [S_{meas}]	**48.6**	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.)
01/19/17	10:10	1.0	0	0.1470
01/19/17	10:20	1.0	10	0.1470
Add Distilled Water to the Specimen				
01/19/17	10:40	1.0	20	0.1570
01/20/17	6:24	1.0	1204	0.1575
01/20/17	7:30	1.0	1270	0.1575

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**11**

ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

ASTM D 4546

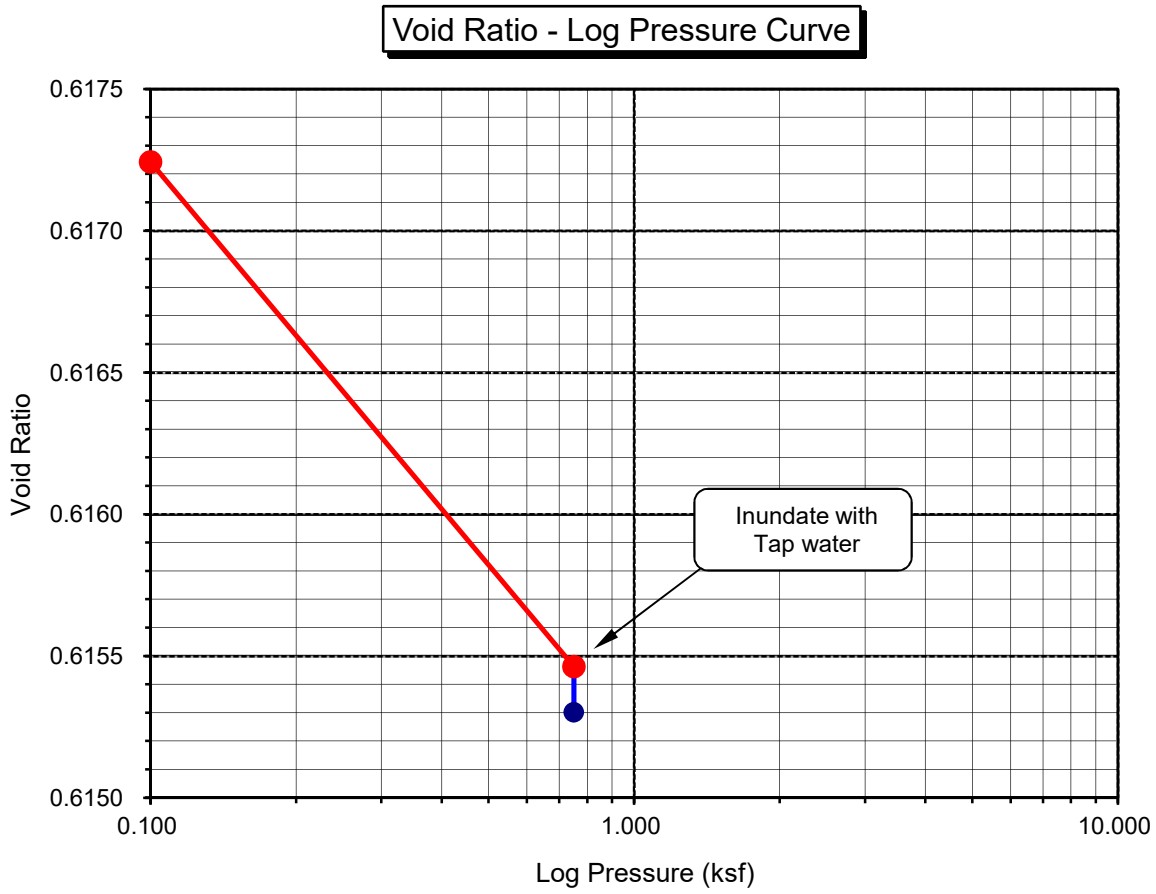
Project Name:	Fleming Ranch		Tested By:	G. Bathala	Date: 01/19/17
Project No.:	16151-01		Checked By:	J. Ward	Date: 01/25/17
Boring No.:	T-11		Sample Type:	Carved ring	
Sample No.:	B-1		Depth (ft.)	5-6	
Sample Description:	Brown silt'stone' with sand (ML)s				

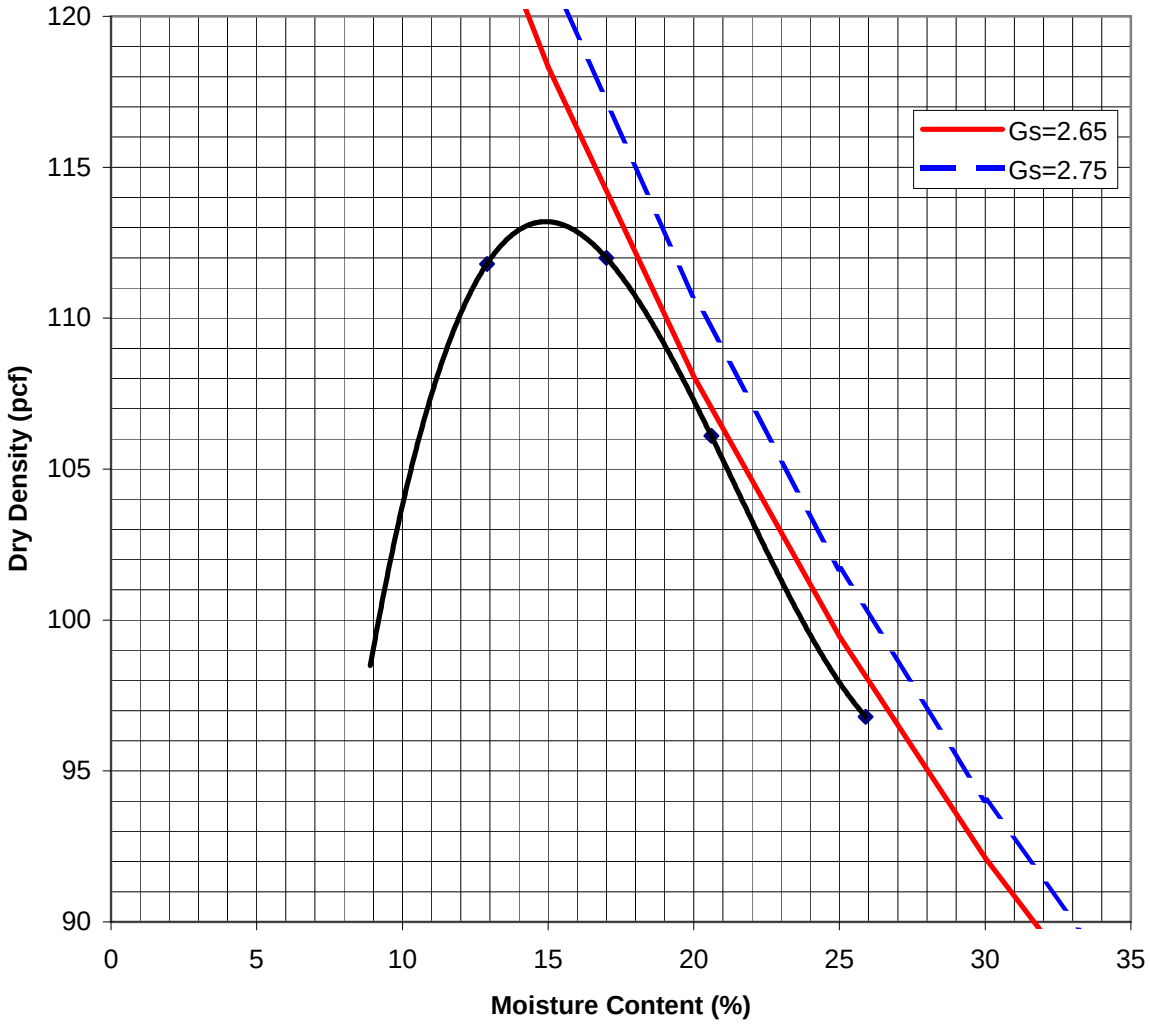
Initial Dry Density (pcf):	104.2
Initial Moisture (%):	7.47
Initial Length (in.):	1.0000
Initial Dial Reading:	0.2549
Diameter(in):	2.415

Final Dry Density (pcf):	104.4
Final Moisture (%) :	18.7
Initial Void Ratio:	0.6176
Specific Gravity(assumed):	2.70
Initial Saturation (%)	32.6

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.100	0.2546	0.9998	0.00	-0.03	0.6172	-0.03
0.750	0.2514	0.9966	0.21	-0.34	0.6155	-0.13
H2O	0.2513	0.9965	0.21	-0.35	0.6153	-0.14

Percent Swell (+) / Settlement (-) After Inundation = -0.01





Location:	Sample No.:	Depth (ft)	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
TP-5	**B-2**	**5-7'**	**Light Brown Sandy Clay**	**113.0**	**15.0**

LGC Geotechnical, Inc.

LABORATORY COMPACTION
(ASTM D 1557)

Project Number: 16151-01
Date: Dec-16

Fleming Ranch

TESTS for SULFATE CONTENT
CHLORIDE CONTENT and pH of SOILS

Project Name: Fleming Ranch Tested By : G. Berdy Date: 01/18/17

Project No. : 16151-01 Data Input By: J. Ward Date: 01/24/17

Boring No.	T-8			
Sample No.	B-1			
Sample Depth (ft)	3-5			
Soil Identification:	Strong brown SC			
Wet Weight of Soil + Container (g)	202.69			
Dry Weight of Soil + Container (g)	189.86			
Weight of Container (g)	66.39			
Moisture Content (%)	10.39			
Weight of Soaked Soil (g)	100.17			

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	14			
Crucible No.	10			
Furnace Temperature (°C)	860			
Time In / Time Out	9:45/10:30			
Duration of Combustion (min)	45			
Wt. of Crucible + Residue (g)	22.3543			
Wt. of Crucible (g)	22.3523			
Wt. of Residue (g) (A)	0.0020			
PPM of Sulfate (A) x 41150	82.30			
PPM of Sulfate, Dry Weight Basis	**92**			

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	**22**			

pH TEST, DOT California Test 643

pH Value	**7.14**			
Temperature °C	20.1			

SOIL RESISTIVITY TEST

DOT CA TEST 643

Project Name:	Fleming Ranch		Tested By :	G. Berdy	Date: 01/18/17
Project No. :	16151-01		Data Input By:	J. Ward	Date: 01/24/17
Boring No.:	T-8		Depth (ft.) :	3-5	
Sample No. :	B-1				

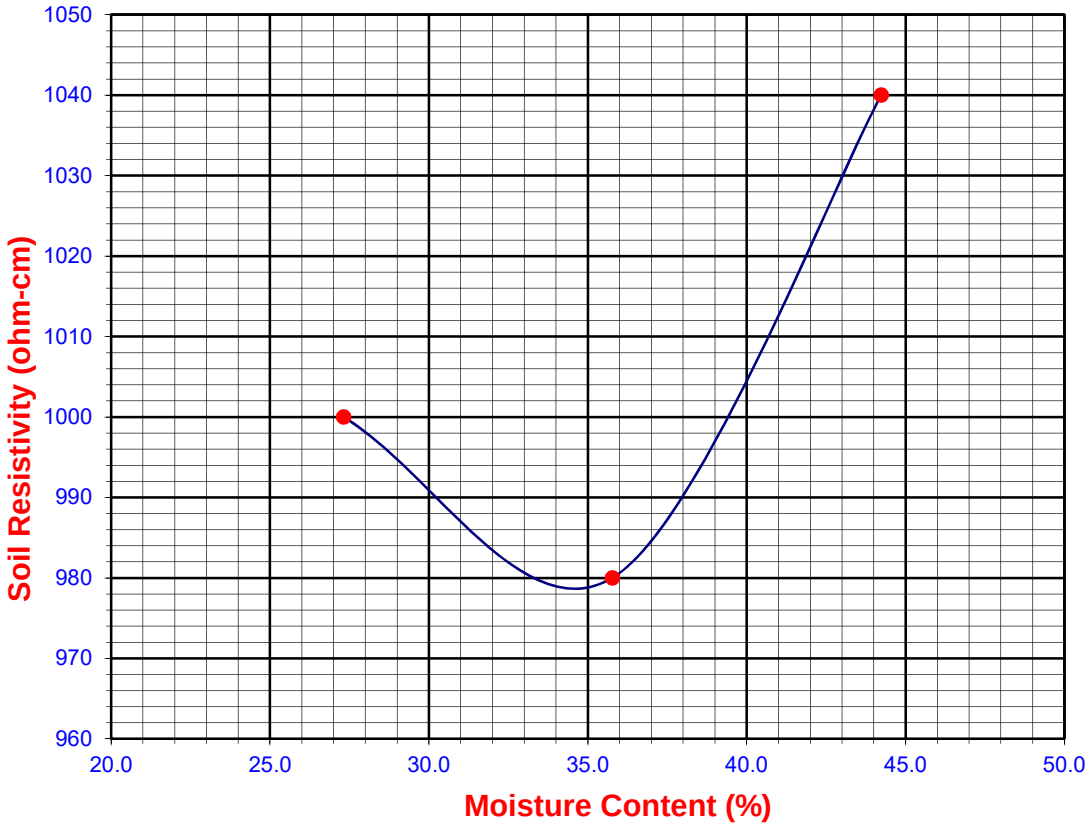
Soil Identification:* Strong brown SC

*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	20	27.31	1000	1000
2	30	35.77	980	980
3	40	44.24	1040	1040
4				
5				

Moisture Content (%) (MCi)	10.39
Wet Wt. of Soil + Cont. (g)	202.69
Dry Wt. of Soil + Cont. (g)	189.86
Wt. of Container (g)	66.39
Container No.	
Initial Soil Wt. (g) (Wt)	130.47
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	
978	**34.6**	**92**	**22**	**7.14**	**20.1**



R-VALUE TEST RESULTS

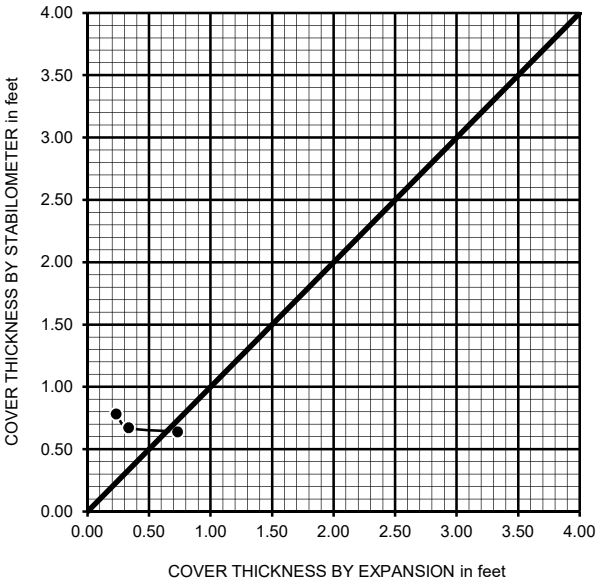
DOT CA Test 301

PROJECT NAME:	Fleming Ranch	PROJECT NUMBER:	16151-01
BORING NUMBER:	T-8	DEPTH (FT.):	3-5
SAMPLE NUMBER:	B-1	TECHNICIAN:	S. Felter
SAMPLE DESCRIPTION:	Strong brown clayey sand (SC)	DATE COMPLETED:	1/23/2017

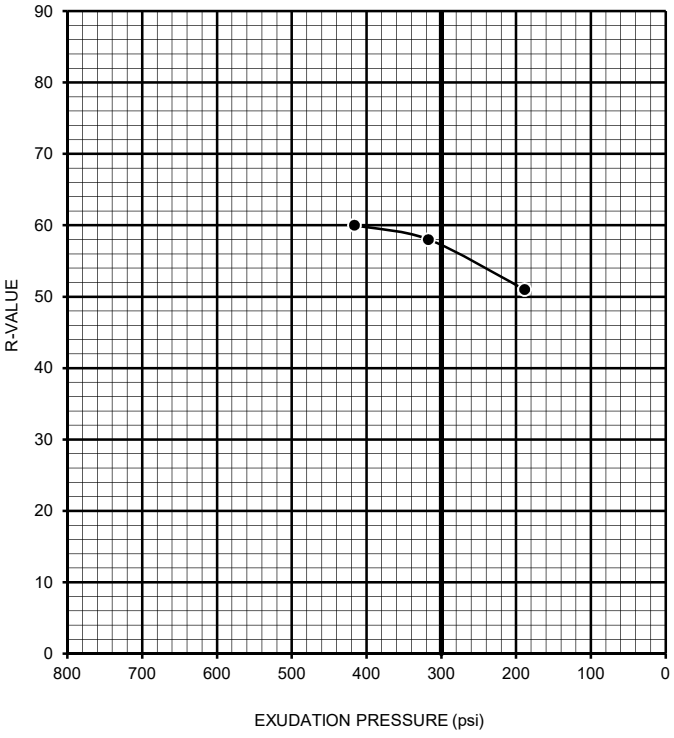
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	17.0	17.6	18.0
HEIGHT OF SAMPLE, Inches	2.49	2.48	2.56
DRY DENSITY, pcf	114.0	115.6	112.2
COMPACTOR PRESSURE, psi	300	225	150
EXUDATION PRESSURE, psi	416	317	189
EXPANSION, Inches x 10exp-4	22	10	7
STABILITY Ph 2,000 lbs (160 psi)	43	47	58
TURNS DISPLACEMENT	4.58	4.31	4.48
R-VALUE UNCORRECTED	60	58	50
R-VALUE CORRECTED	60	58	51

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.	0.64	0.67	0.78
EXPANSION PRESSURE THICKNESS, ft.	0.73	0.33	0.23

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	61
R-VALUE BY EXUDATION:	57
EQUILIBRIUM R-VALUE:	57

APPENDIX C

Laboratory Testing Procedures and Test Results

Atterberg Limits: The Atterberg Limits were determined in accordance with ASTM Test Method D423 for engineering classification of the fine-grained materials and presented in the lab data sheet herein.

Grain Size Test: Percent Passing the No. 200 Sieve: Percent soil particle finer than 0.075 mm was evaluated for subgrade soils in general accordance with ASTM 1140.

Hydrocollapse Tests: Hydrocollapse test was performed in accordance with ASTM Test Method D4546 on selected, relatively undisturbed ring sample. A sample was placed in a consolidometer and loads were applied in geometric progression. The percent hydrocollapse for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The hydrocollapse pressure curve is presented in the lab test data sheets herein.

Direct Shear Tests: Direct shear tests were performed in accordance with ASTM Test Method D3080 on selected relatively undisturbed and remolded samples which were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box, and reloading the sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1 hour prior to application of shearing force. The samples were tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of less than 0.001 to 0.5 inches per minute (depending upon the soil type). The test results are presented in the lab test data sheets herein.

Expansion Index Tests: The expansion potential of selected materials was evaluated in accordance with ASTM Test Method D4829. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached.). The test results are presented in the lab test data sheets herein.

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed in accordance with ASTM Test Method D2937 on relatively undisturbed samples obtained from the test borings and/or trenches. The results of these tests are presented in the boring and/or trench logs. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples.

Laboratory Testing (continued)

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed in accordance with ASTM Test Method D2937 on relatively undisturbed samples obtained from the test borings and/or trenches. The results of these tests are presented in the boring and/or trench logs. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples.

Maximum Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the test data sheets herein.

Consolidation Tests: Consolidation tests were performed on selected, relatively undisturbed ring samples in accordance with ASTM D 2435. Samples were placed in a consolidometer and loads were applied in geometric progression. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The consolidation pressure curves are presented in the test data sheets herein.

Chloride Content, Sulfate Content, Minimum Resistivity and pH Tests: Chloride content, Sulfate Content, Minimum resistivity and pH tests were performed in general accordance with California Test Method 422, 417, and 532. The results are presented in the test data sheets herein.

Leighton and Associates, Inc.

ATTERBERG LIMITS
ASTM D 4318

Project Name:	FLEMMING RANCH	Tested By:	JMD	Date:	3/23/05
Project No. :	111461-002	Input By:	JMD	Date:	3/23/05
Boring No.:	B-4	Checked By:	PRC	Date:	3/24/05
Sample No.:	S-11	Depth (ft.)	35		
Sample Description:	ML, BROWN LEAN SILT				

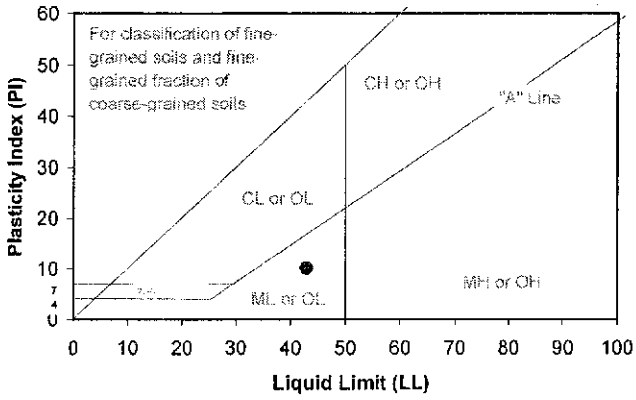
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			39	23	10	
Wet Wt. of Soil + Cont. (gm)	32.54	22.97	37.59	32.22	35.98	
Dry Wt. of Soil + Cont. (gm)	27.14	19.90	29.80	25.82	27.88	
Wt. of Container (gm)	10.95	10.68	10.82	10.83	10.85	
Moisture Content (%) [Wn]	33.4	33.3	41.0	42.7	47.6	

Liquid Limit	43
Plastic Limit	33
Plasticity Index	10
Classification	ML

PI at "A" - Line = 0.73(LL-20) =

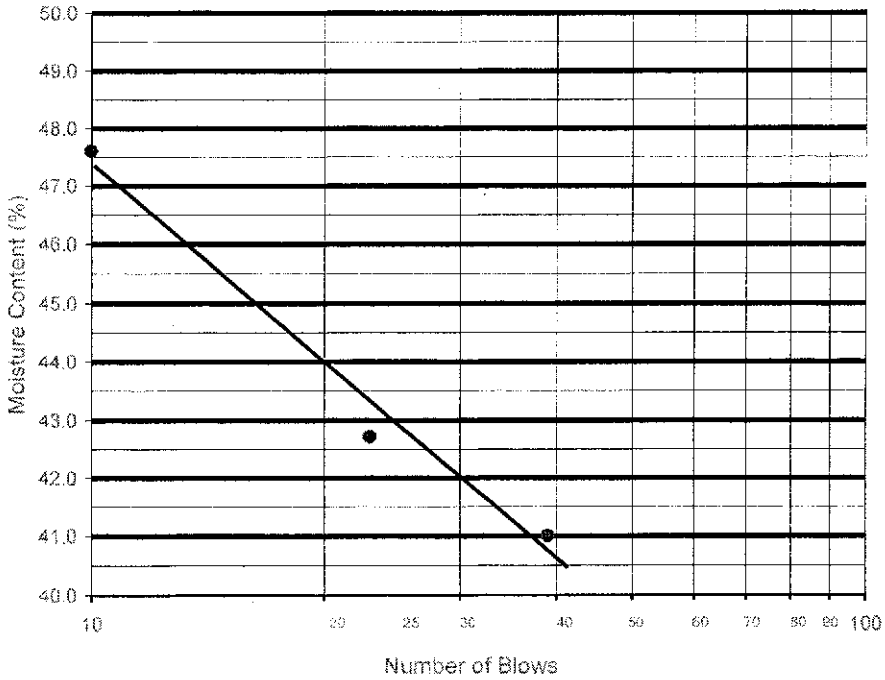
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- ☐ Wet Preparation
  Multipoint - Wet
- ☒ Dry Preparation
  Multipoint - Dry
- ☒ Procedure A
  Multipoint Test
- ☐ Procedure B
  One-point Test



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Boring No.	B-4	B-4	B-5	B-5	B-7			
Sample No.	S-10	S-14	S-7	S-10	S-6			
Depth (ft.)	30	50	25	40	20			
Sample Type	SPT	SPT	SPT	SPT	SPT			
Visual Soil Classification	s(CL)	s(CL)	SM	SM	s(CL)			
Moisture Correction								
Wet Weight of Soil + Container (gm.)	206.8	289.0	278.8	265.7	276.7			
Dry Weight of Soil + Container (gm.)	179.2	252.0	240.7	231.2	235.9			
Weight of Container (gm)	82.8	83.9	85.1	80.9	84.5			
Moisture Content (%)	28.6	22.0	24.5	23.0	26.9			
Container No.:	G	F	E	C	D			
Sample Dry Weight Determination								
Weight of Sample + Container (gm.)	206.8	289.0	278.8	265.7	276.7			
Weight of Container (gm.)	82.8	83.9	85.1	80.9	84.5			
Weight of Dry Sample (gm.)	96.4	168.1	155.6	150.3	151.4			
Container No.:	G	F	E	C	D			
After Wash								
Dry Weight of Sample + Container (gm)	109.9	150.4	185.1	156.2	122.6			
Weight of Container (gm)	82.8	83.9	85.1	80.9	84.5			
Dry Weight of Sample (gm)	27.1	66.5	100.0	75.3	38.1			
% Passing No. 200 Sieve	**72**	**60**	**36**	**50**	**75**			
% Retained No. 200 Sieve	28	40	64	50	25			

PERCENT PASSING No. 200 SIEVE
ASTM D 1140

Leighton and Associates, Inc.

Project Name: FLEMMING RANCH

Project No.: 111461-002

Client Name:

Tested By: RGO Date: 3/15/05

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Leighton and Associates, Inc.

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

Project Name:	FLEMMING RANCH		Tested By:	JMD	Date: 3/15/05
Project No.:	111461-002		Checked By:	JMD	Date: 3/22/05
Boring No.:	B-2		Sample Type:	IN SITU	
Sample No.:	R-2		Depth (ft.)	2.5	
Sample Description:	SM, BROWN SILTY SAND				

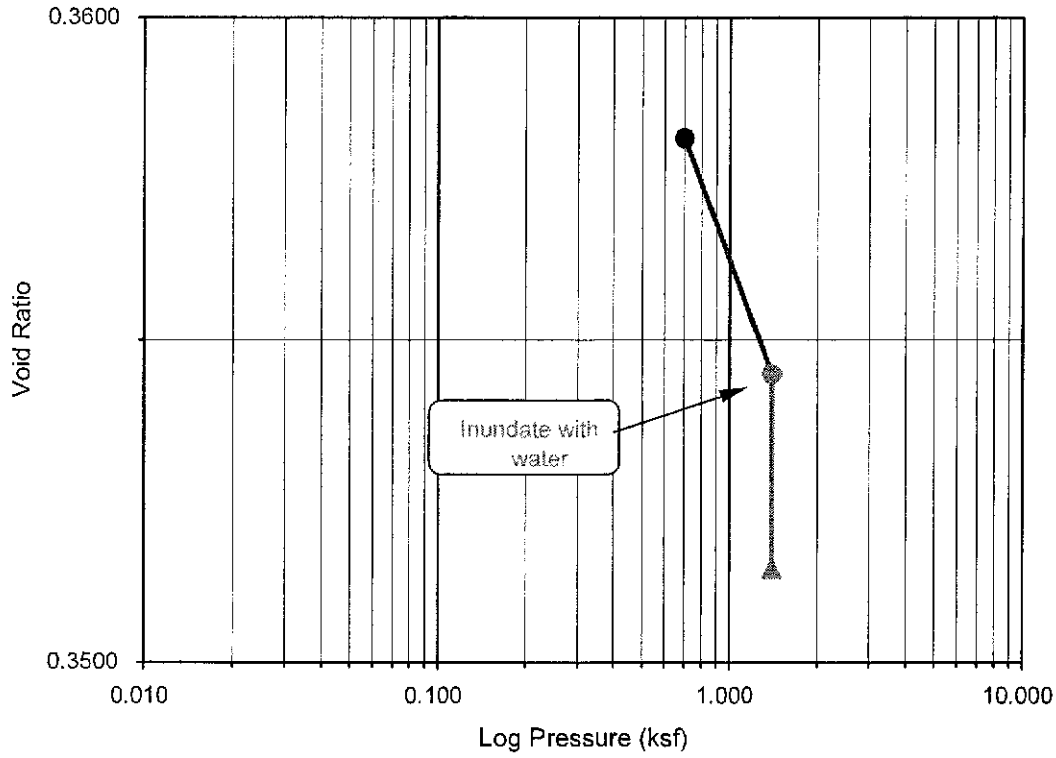
Initial Dry Density (pcf):	123.7
Initial Moisture (%):	8.8
Initial Length (in.):	1.0000
Initial Dial Reading:	0.0500
Diameter(in):	2.416

Final Dry Density (pcf):	124.7
Final Moisture (%) :	12.0
Initial Void ratio:	0.3632
Specific Gravity(assumed):	2.70
Initial Saturation (%)	65.5

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.700	0.0537	0.9963	0.00	-0.37	0.3581	-0.37
1.400	0.0564	0.9936	0.00	-0.64	0.3545	-0.64
H2O	0.0586	0.9914	0.00	-0.86	0.3515	-0.86

Percent Swell / Settlement After Inundation = -0.22

Void Ratio - Log Pressure Curve



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Leighton and Associates, Inc.

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

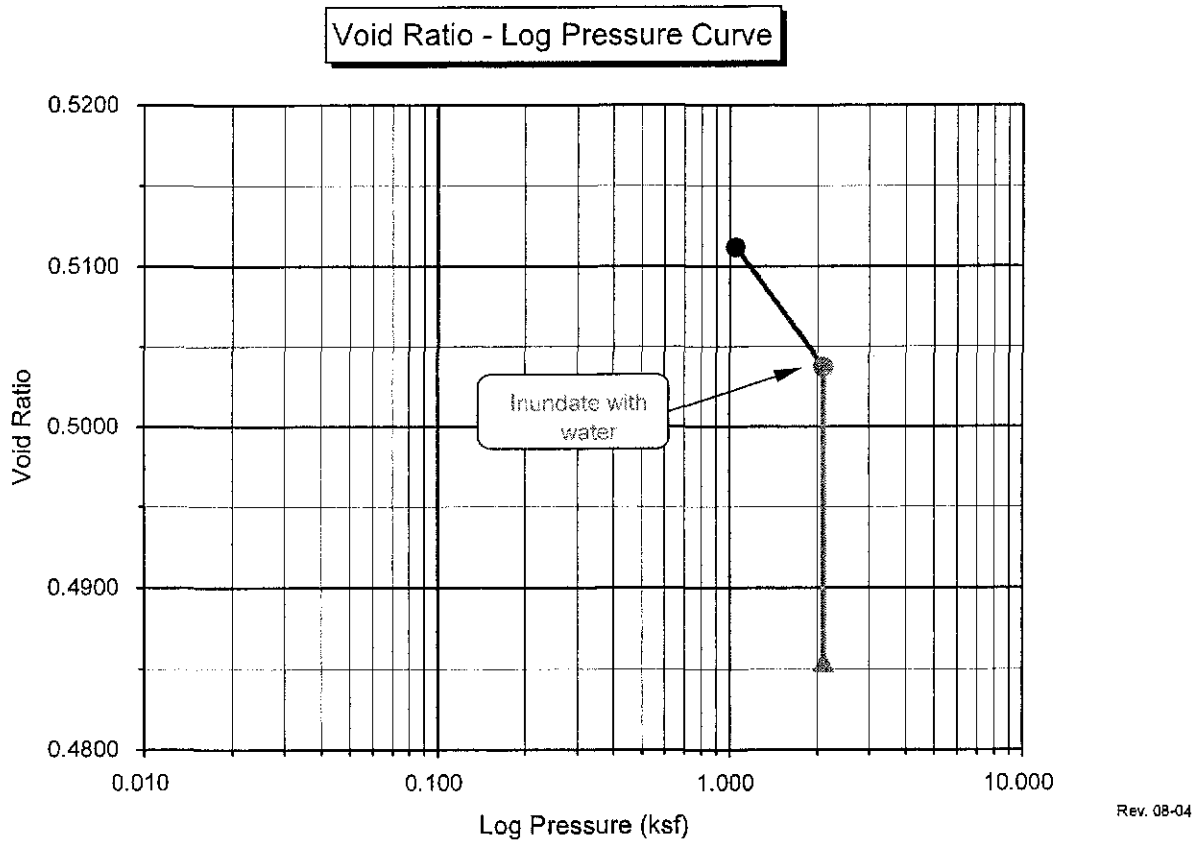
Project Name:	FLEMMING RANCH	Tested By:	JMD	Date:	3/15/05
Project No.:	111461-002	Checked By:	JMD	Date:	3/22/05
Boring No.:	B-2	Sample Type:	IN SITU		
Sample No.:	R-3	Depth (ft.)	5		
Sample Description:	SM, BROWN SILTY SAND				

Initial Dry Density (pcf):	110.6
Initial Moisture (%):	6.3
Initial Length (in.):	1.0000
Initial Dial Reading:	0.0500
Diameter(in):	2.416

Final Dry Density (pcf):	113.5
Final Moisture (%) :	16.0
Initial Void ratio:	0.5240
Specific Gravity(assumed):	2.70
Initial Saturation (%)	32.5

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
1.050	0.0584	0.9916	0.00	-0.84	0.5112	-0.84
2.100	0.0633	0.9867	0.00	-1.33	0.5037	-1.33
H2O	0.0753	0.9747	0.00	-2.53	0.4854	-2.53

Percent Swell / Settlement After Inundation = -1.22



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One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

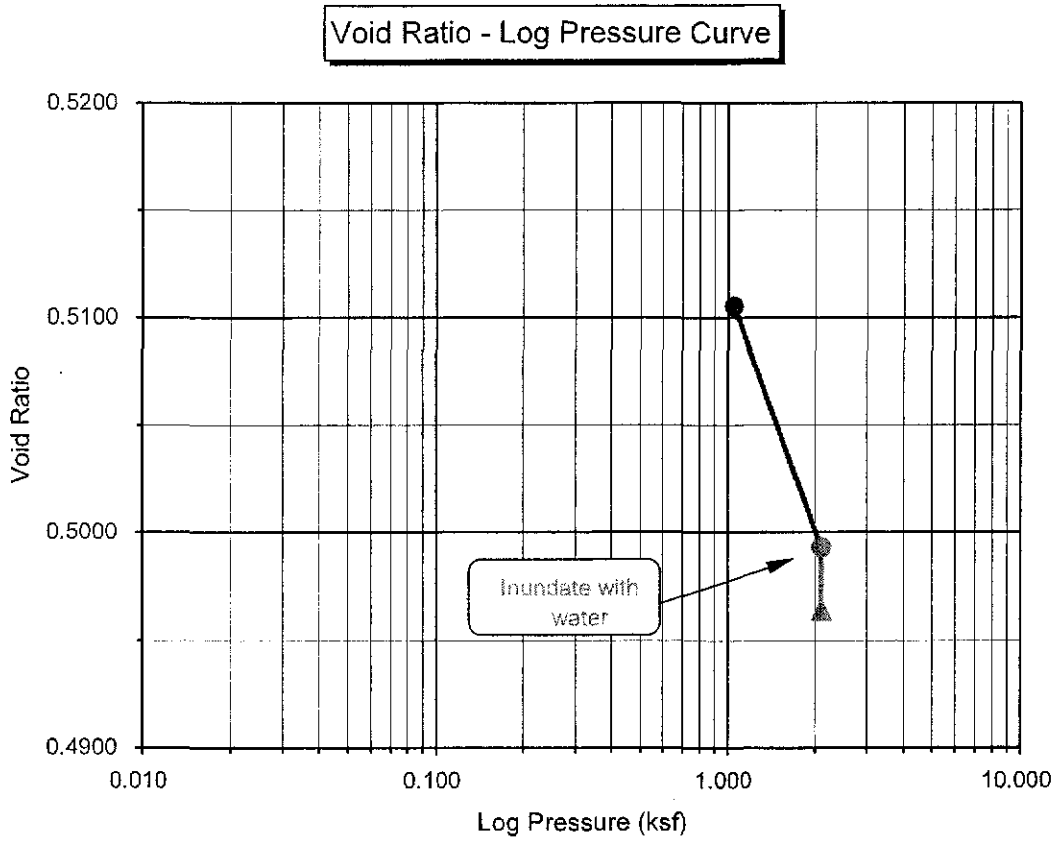
Project Name:	FLEMMING RANCH	Tested By:	JMD	Date:	3/15/05
Project No.:	111461-002	Checked By:	JMD	Date:	3/22/05
Boring No.:	B-7	Sample Type:	IN SITU		
Sample No.:	R-3	Depth (ft.)	7.5		
Sample Description:	SM, BROWN SILTY SAND				

Initial Dry Density (pcf):	110.9
Initial Moisture (%):	14.6
Initial Length (in.):	1.0000
Initial Dial Reading:	0.0500
Diameter(in):	2.416

Final Dry Density (pcf):	112.6
Final Moisture (%) :	16.5
Initial Void ratio:	0.5205
Specific Gravity(assumed):	2.70
Initial Saturation (%)	75.8

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
1.050	0.0566	0.9934	0.00	-0.66	0.5105	-0.66
2.100	0.0640	0.9860	0.00	-1.40	0.4993	-1.40
H2O	0.0659	0.9841	0.00	-1.59	0.4964	-1.59

Percent Swell / Settlement After Inundation = -0.19



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One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

Project Name: FLEMMING RANCH
Project No.: 111461-002
Boring No.: B-7
Sample No.: R-4
Sample Description: SM, BROWN SILTY SAND

Tested By: JMD Date: 3/15/05
Checked By: JMD Date: 3/22/05
Sample Type: IN SITU
Depth (ft.) 5

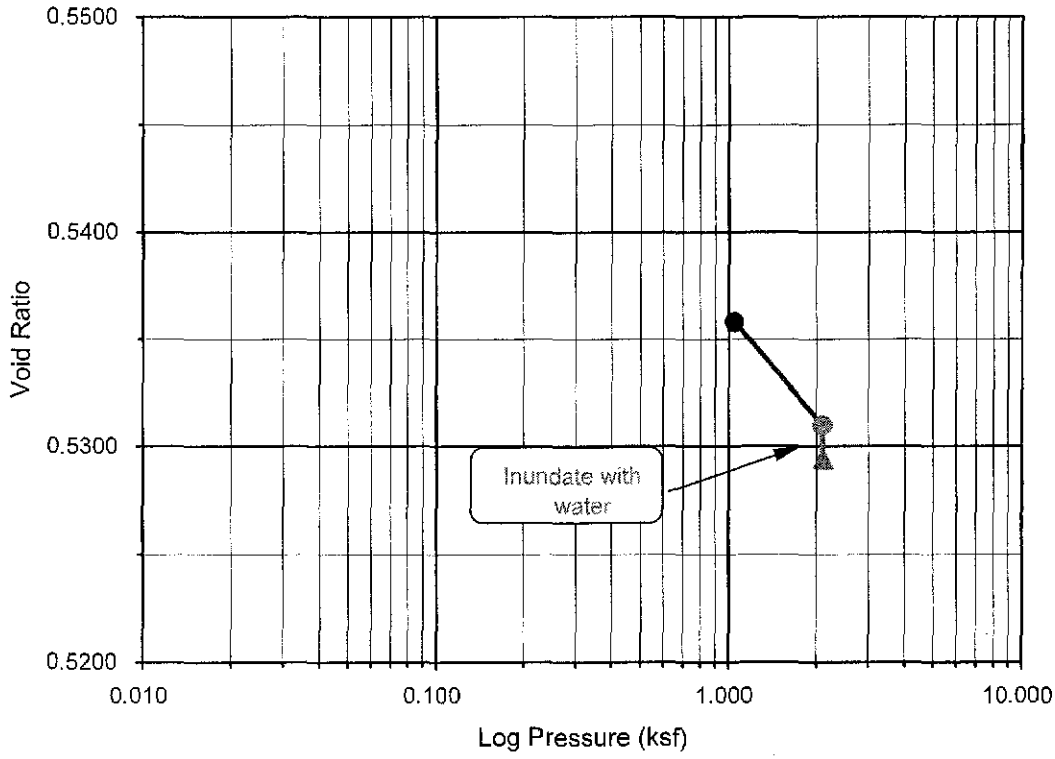
Initial Dry Density (pcf):	109.1
Initial Moisture (%):	17.2
Initial Length (in.):	1.0000
Initial Dial Reading:	0.0500
Diameter(in):	2.416

Final Dry Density (pcf):	110.2
Final Moisture (%) :	16.8
Initial Void ratio:	0.5449
Specific Gravity(assumed):	2.70
Initial Saturation (%)	85.3

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
1.050	0.0559	0.9941	0.00	-0.59	0.5358	-0.59
2.100	0.0590	0.9910	0.00	-0.90	0.5310	-0.90
H2O	0.0600	0.9900	0.00	-1.00	0.5294	-1.00

Percent Swell / Settlement After Inundation = -0.10

Void Ratio - Log Pressure Curve



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COMPACTION TEST

ASTM D 1557

Project Name:	FLEMMING RANCH	Tested By :	AJP	Date:	3/15/05
Project No.:	111461-002	Calculated By :	PRC	Date:	3/15/05
Boring No.:	B-3	Depth (ft.):	5-10		
Sample No. :	B-6				
Sample Description	SM, BROWN SILTY SAND				

Preparation Method: [ ] Moist [X] Dry [X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03344 *Ram Weight 10 LBS Drop 18 inches*

	Moisture Added	100	50	0	150		
TEST NO.		1	2	3	4		
Wt. Comp. Soil + Mold	(gm.)	5884	5913	5798	5822		
Wt. of Mold	(gm.)	3639	3639	3639	3639		AS
Net Wt. of Soil	(gm.)	2245	2274	2159	2183		REC'D
Wet Wt. of Soil + Cont.	(gm.)	127.5	131.2	123.6	125.7		123.6
Dry Wt. of Soil + Cont.	(gm.)	116.7	122.1	117.0	113.3		117.0
Wt. of Container	(gm.)	12.0	12.0	12.0	12.0		12.0
Moisture Content	(%)	10.3	8.3	6.3	12.2		6.3
Wet Density	(pcf)	148.0	149.9	142.3	143.9		
Dry Density	(pcf)	134.2	138.5	133.9	128.2		

Maximum Dry Density (pcf) 139.0 **Optimum Moisture Content (%)** 8.5

PROCEDURE USED

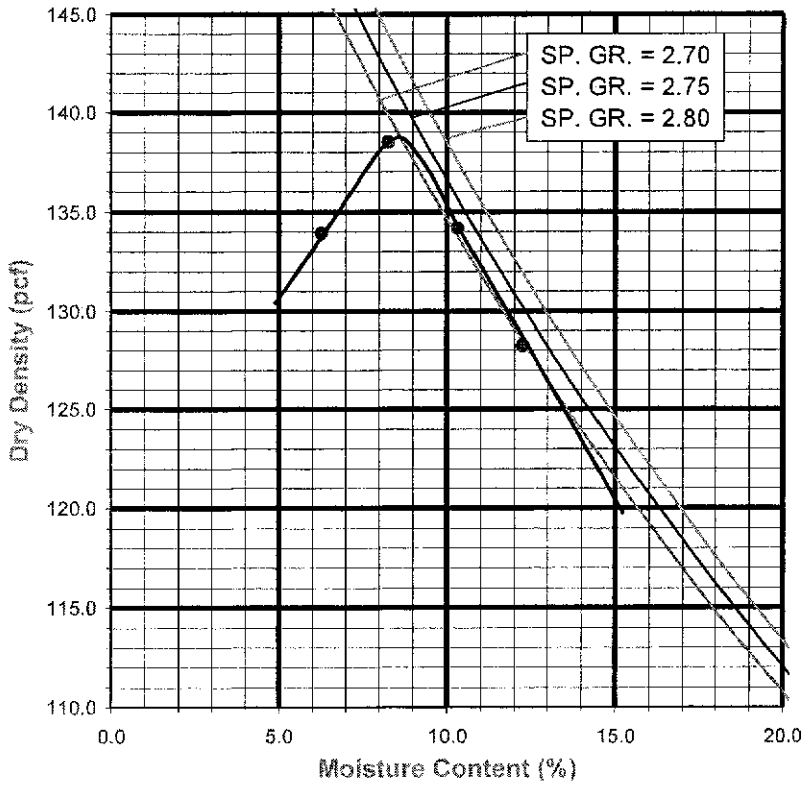
[ ] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold: 4 in. (101.6 mm) diamete
Layers: 5 (Five
Blows per layer: 25 (twenty-five
May be used if No. 4 retained <20%

[X] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold: 4 in. (101.6 mm) diamete
Layers: 5 (Five
Blows per layer: 25 (twenty-five
Use if + No. 4 >20% and +3/8 in. <20%

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold: 6 in. (152.4 mm) diamete
Layers: 5 (Five
Blows per layer: 56 (fifty-six
Use if +3/8 in. >20% and +¾ in. <30%

Particle-Size Distribution:
GR:SA:FI

Atterberg Limits:
LL,PL,PI



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Leighton and Associates, Inc.

COMPACTION TEST

ASTM D 1557

Project Name:	FLEMMING RANCH	Tested By :	AJP	Date:	3/15/05
Project No.:	111461-002	Calculated By :		Date:	
Boring No.:	B-4	Depth (ft.):	0-5		
Sample No. :	B-1				
Sample Description	CL, BROWN LEAN CLAY				

Preparation Method: [ ] Moist [X] Dry — [X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft^3) 0.03344 *Ram Weight 10 LBS Drop 18 inches*

Moisture Added		100	150	200	50		
TEST NO.		1	2	3	4		
Wt. Comp. Soil + Mold	(gm.)	5575	5656	5654	5601		
Wt. of Mold	(gm.)	3639	3639	3639	3639		AS
Net Wt. of Soil	(gm.)	1936	2017	2015	1962		REC'D
Wet Wt. of Soil + Cont.	(gm.)	129.0	121.7	123.1	124.4		122.6
Dry Wt. of Soil + Cont.	(gm.)	117.8	109.4	109.0	108.4		115.8
Wt. of Container	(gm.)	12.0	12.0	12.0	12.0		12.0
Moisture Content	(%)	10.6	12.6	14.5	16.6		6.6
Wet Density	(pcf)	127.6	133.0	132.8	129.3		
Dry Density	(pcf)	115.4	118.1	116.0	110.9		

Maximum Dry Density (pcf) 118.5 **Optimum Moisture Content (%)** 13.0

PROCEDURE USED

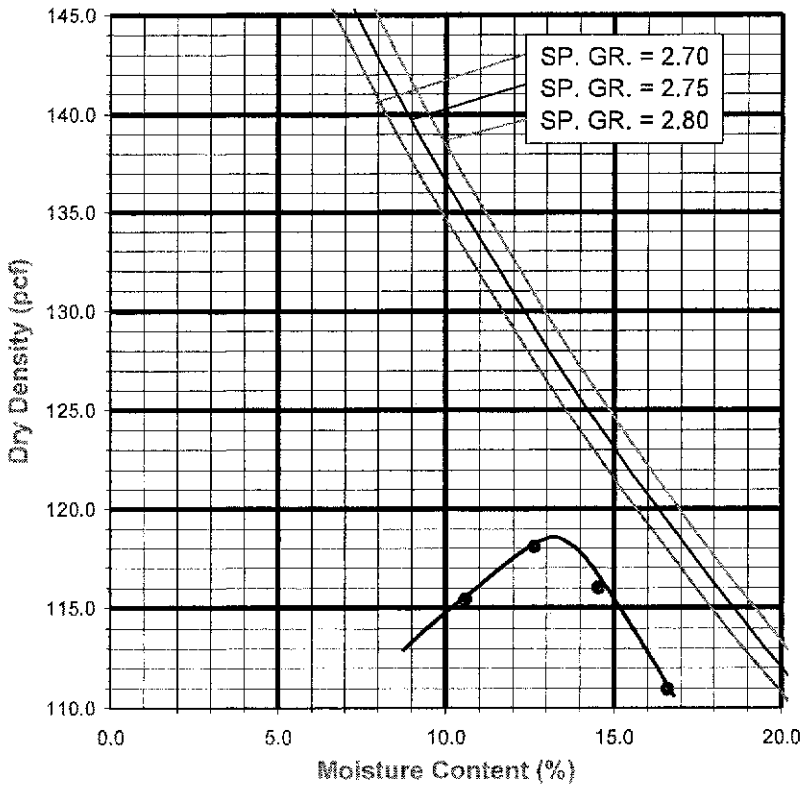
[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold: 4 in. (101.6 mm) diameter
Layers: 5 (Five)
Blows per layer: 25 (twenty-five)
May be used if No. 4 retained <20%

[ ] **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 + No. 4 >20% and +3/8 in. <20%

[ ] **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. >20% and +¾ in. <30%

Particle-Size Distribution:
GR:SA:FI

Atterberg Limits:
LL,PL,PI



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Leighton and Associates, Inc.

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	FLEMMING RANCH		Tested By: AJP		Date: 3/25/05
Project No. :	111461-002		Checked By: PRC		Date: 3/28/05
Boring No.:	B-1		Depth (ft.) 0-5		
Sample No. :	B-2		Location:		
Sample Description:	CL, BROWN LEAN CLAY				

Dry Wt. of Soil + Cont. (gm.)	20000.0
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	20000.0
Weight Soil Retained on #4 Sieve	0.0
Percent Passing # 4	100.0

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0332
Wt. Comp. Soil + Mold (gm.)	595.9	628.2
Wt. of Mold (gm.)	202.3	202.3
Specific Gravity (Assumed)	2.70	2.70
Container No.	E-16	E-16
Wet Wt. of Soil + Cont. (gm.)	312.9	628.2
Dry Wt. of Soil + Cont. (gm.)	280.8	351.4
Wt. of Container (gm.)	12.9	202.3
Moisture Content (%)	12.0	21.2
Wet Density (pcf)	118.7	128.3
Dry Density (pcf)	106.0	105.9
Void Ratio	0.590	0.643
Total Porosity	0.371	0.391
Pore Volume (cc)	76.8	83.7
Degree of Saturation (%) [S meas]	**54.9**	**89.0**

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.)
3/25/05	12:43	1.0	0	1.0000
3/25/05	12:53	1.0	10	0.4994
	Add Distilled Water to the Specimen			
3/28/05	8:45	1.0	4072	0.5332
3/28/05	9:45	1.0	4132	0.5332

Expansion Index (EI meas) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	33.8
Expansion Index (EI)$_{50}$ = EI meas - (50 -S meas)x((65+EI meas) / (220-S meas))	**37**

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Leighton and Associates, Inc.

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	FLEMMING RANCH	Tested By: JMD	Date: 3/15/05
Project No. :	111461-002	Checked By: JMD	Date: 3/22/05
Boring No.:	B-3	Depth (ft.) 0-5	
Sample No. :	B-1	Location:	
Sample Description:	SM, REDDISH BROWN SILTY SAND		

Dry Wt. of Soil + Cont. (gm.)	2227.0
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	2227.0
Weight Soil Retained on #4 Sieve	50.0
Percent Passing # 4	97.8

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	0.9918
Wt. Comp. Soil + Mold (gm.)	586.1	607.3
Wt. of Mold (gm.)	198.8	198.8
Specific Gravity (Assumed)	2.70	2.70
Container No.	E-4	E-4
Wet Wt. of Soil + Cont. (gm.)	313.0	607.3
Dry Wt. of Soil + Cont. (gm.)	289.5	357.0
Wt. of Container (gm.)	13.0	198.8
Moisture Content (%)	8.5	14.4
Wet Density (pcf)	116.8	123.1
Dry Density (pcf)	107.7	107.5
Void Ratio	0.566	0.553
Total Porosity	0.361	0.356
Pore Volume (cc)	74.8	73.1
Degree of Saturation (%) [S meas]	**40.6**	**70.6**

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.)
3/15/05	13:20	1.0	0	1.0000
3/15/05	13:30	1.0	10	0.4985
	Add Distilled Water to the Specimen			
3/16/05	7:30	1.0	1080	0.4918
3/16/05	8:30	1.0	1140	0.4918

Expansion Index (EI meas) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	-6.7
Expansion Index (EI)$_{50}$ = EI meas - (50 -S meas)x((65+EI meas) / (220-S meas))	**0**

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Leighton and Associates, Inc.

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	FLEMMINING RANCH		Tested By: JMD	Date:	3/15/05
Project No. :	111461-002		Checked By:	Date:	3/15/05
Boring No.:	B-4		Depth (ft.) 0-5		
Sample No. :	B-1		Location:		
Sample Description:	CL, DARK BROWN LEAN CLAY				

Dry Wt. of Soil + Cont. (gm.)	10000.0
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	10000.0
Weight Soil Retained on #4 Sieve	0.0
Percent Passing # 4	100.0

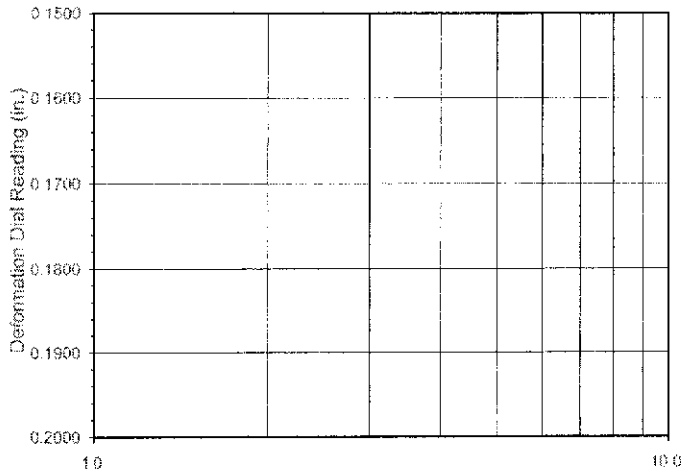
MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0357
Wt. Comp. Soil + Mold (gm.)	577.1	616.1
Wt. of Mold (gm.)	178.5	178.5
Specific Gravity (Assumed)	2.70	2.70
Container No.	E-5	E-5
Wet Wt. of Soil + Cont. (gm.)	312.0	616.1
Dry Wt. of Soil + Cont. (gm.)	282.3	359.1
Wt. of Container (gm.)	12.0	178.5
Moisture Content (%)	11.0	21.9
Wet Density (pcf)	120.2	131.8
Dry Density (pcf)	108.3	108.2
Void Ratio	0.556	0.612
Total Porosity	0.357	0.380
Pore Volume (cc)	74.0	81.4
Degree of Saturation (%) [S meas]	**53.4**	**96.5**

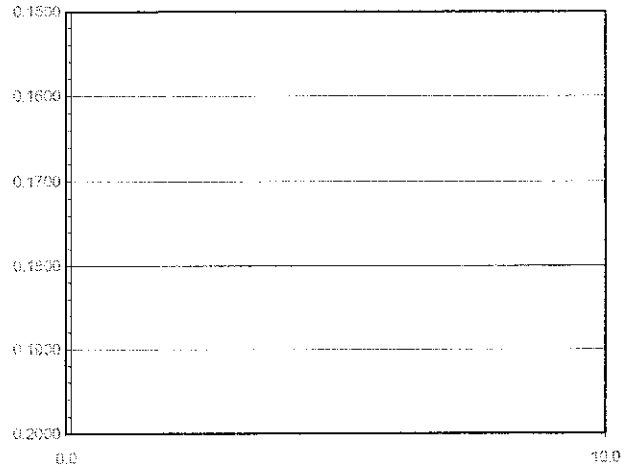
SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

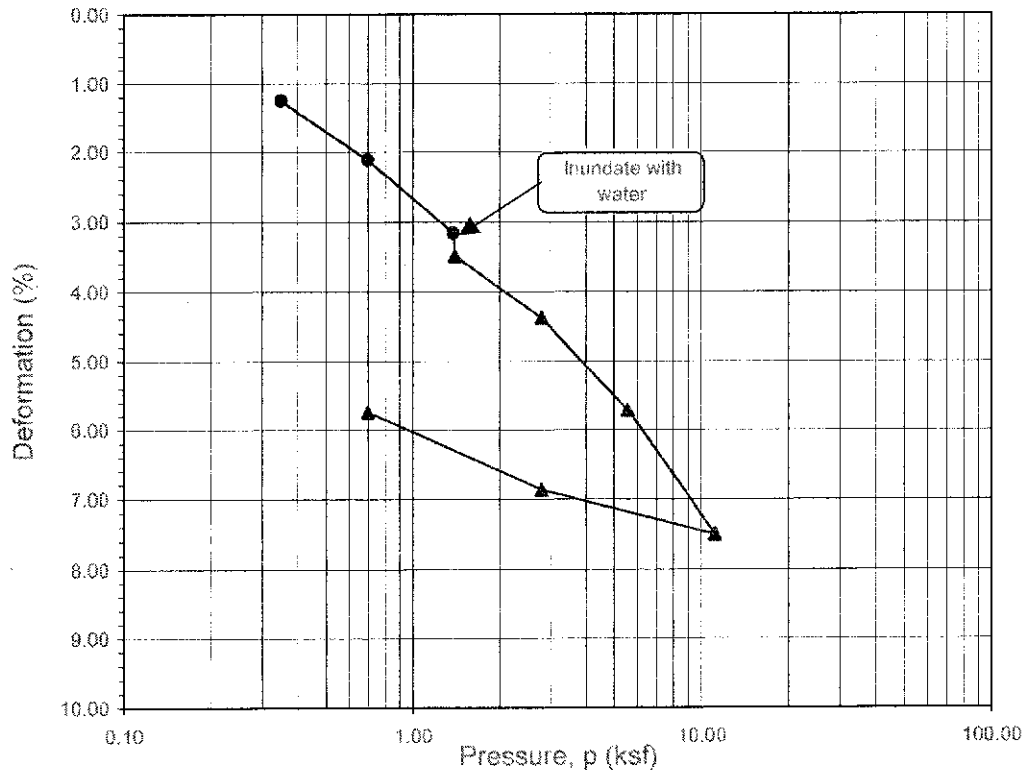
Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
3/15/05	12:48	1.0	0	1.0000
3/15/05	12:58	1.0	10	0.4983
	Add Distilled Water to the Specimen			
3/16/05	7:30	1.0	1112	0.5357
3/16/05	8:30	1.0	1172	0.5357

Expansion Index (EI meas) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	37.4
Expansion Index (EI)$_{50}$ = EI meas - (50 -S meas)x((65+EI meas) / (220-S meas))	**39**

Rev. 08-04







Boring No.	Sample No.:	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-1	**R-3**	**5**	**12.6**	**12.6**	**120.2**	**127.6**	**0.402**	**0.321**	**85**	**106**

Sample Description:

SM, BROWN SILTY SAND

Project No.:	111461-002
Project Name:	FLEMMING RANCH

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ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

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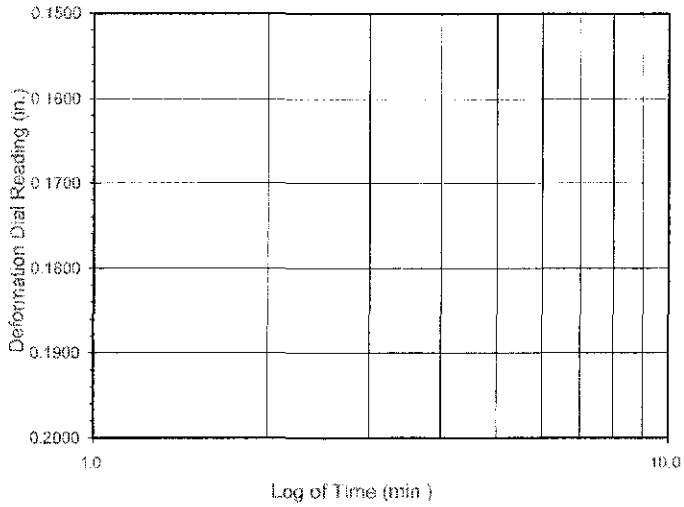

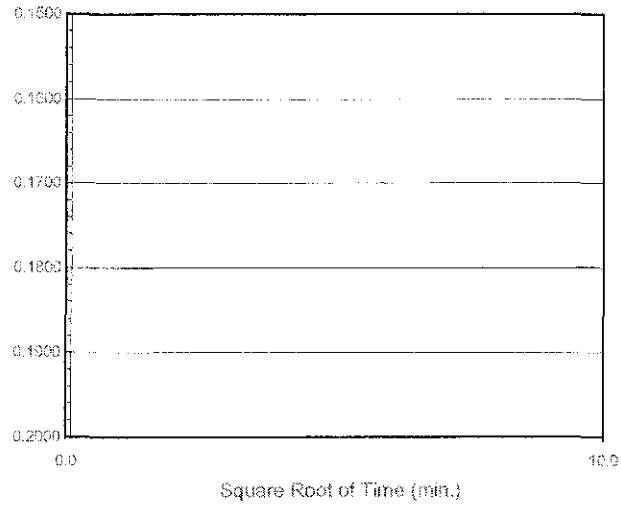

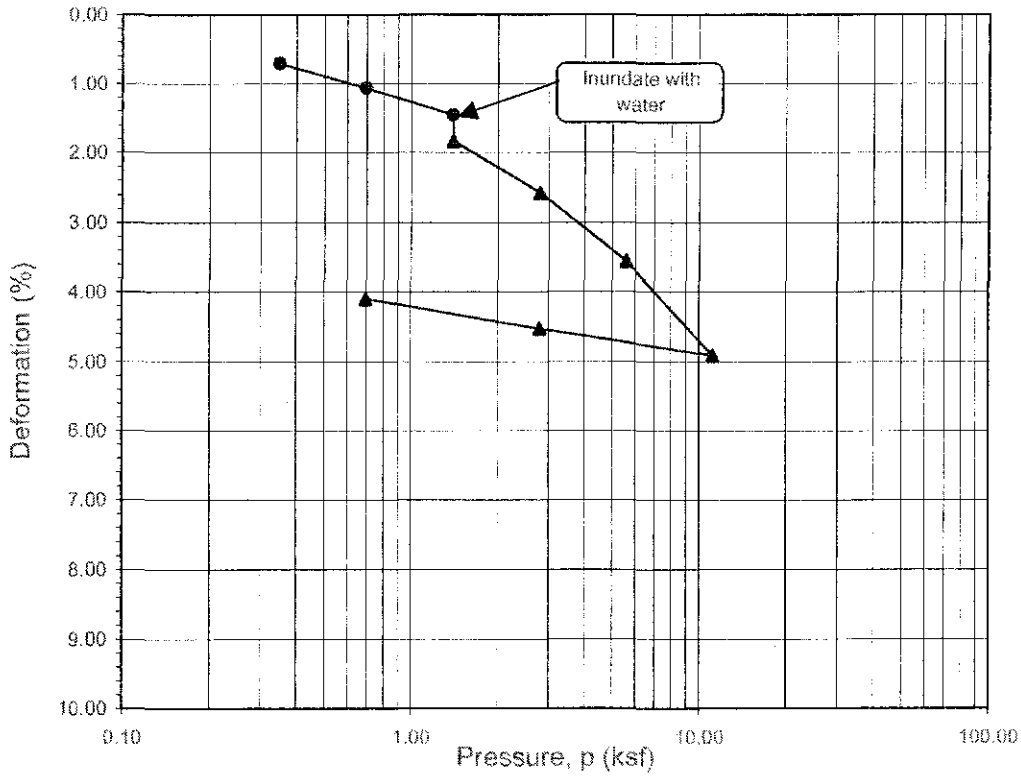

Boring No.	Sample No.:	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-4	**R-3**	**5**	**10.7**	**11.6**	**126.4**	**131.8**	**0.334**	**0.279**	**86**	**113**

Sample Description:

SM, BROWN SILTY SAND

Project No.:	111461-002
Project Name:	FLEMMING RANCH

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

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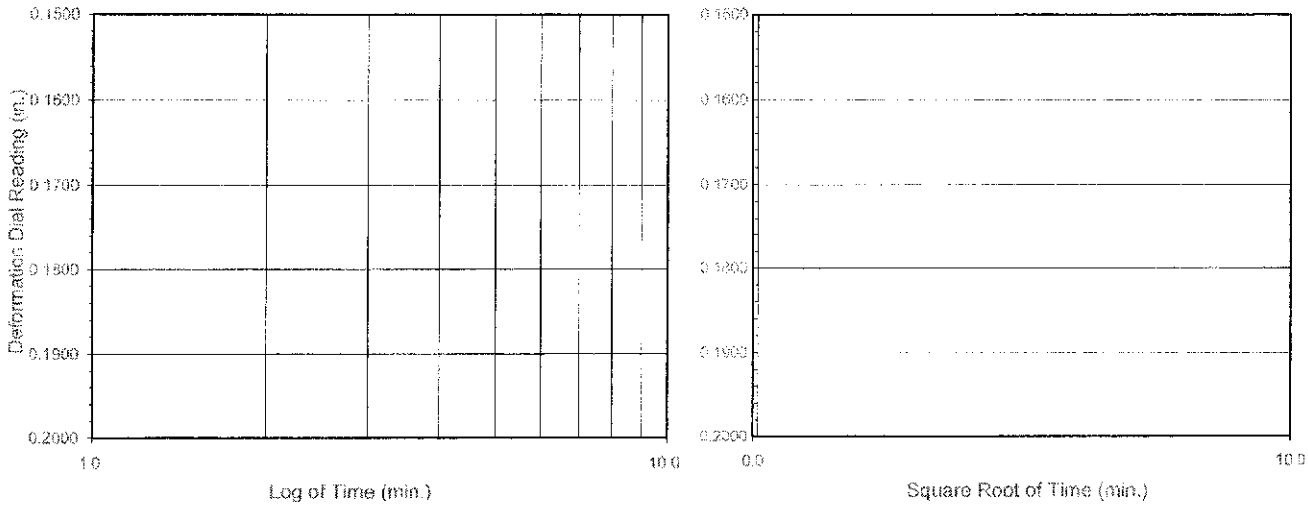

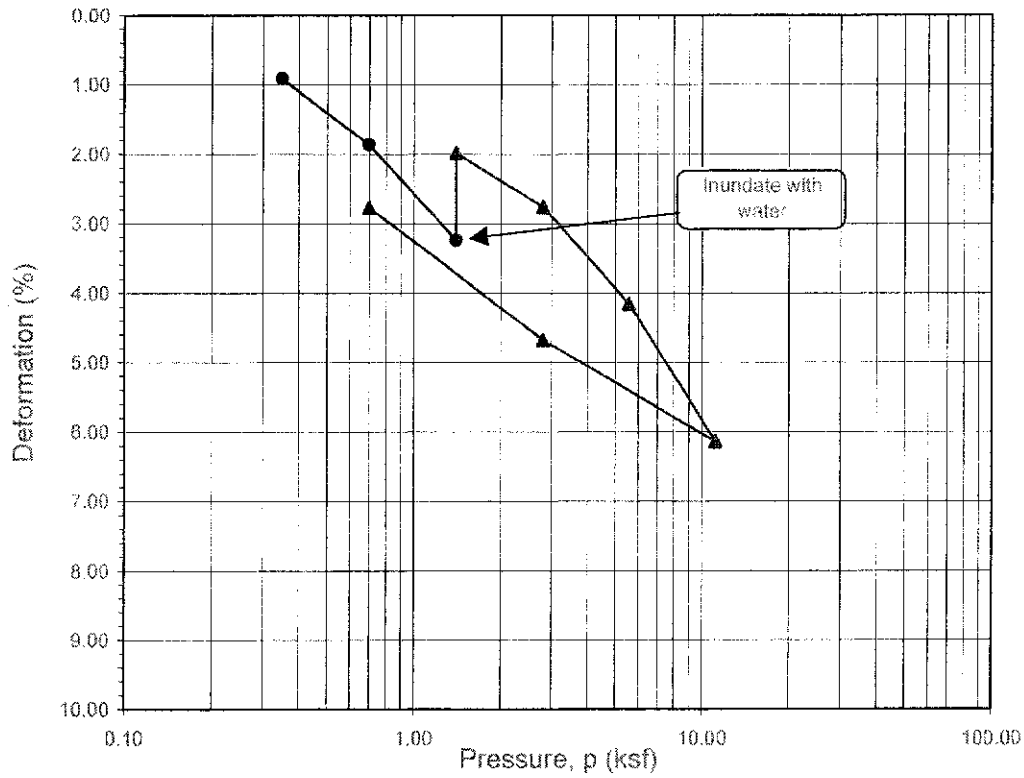

Boring No.	Sample No.:	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-6	**R-4**	**10**	**16.5**	**18.3**	**100.8**	**103.7**	**0.672**	**0.626**	**66**	**79**

Sample Description:

ML, BROWN LEAN SILT

Project No.:	111461-002
Project Name:	FLEMMING RANCH

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ASTM D 2435

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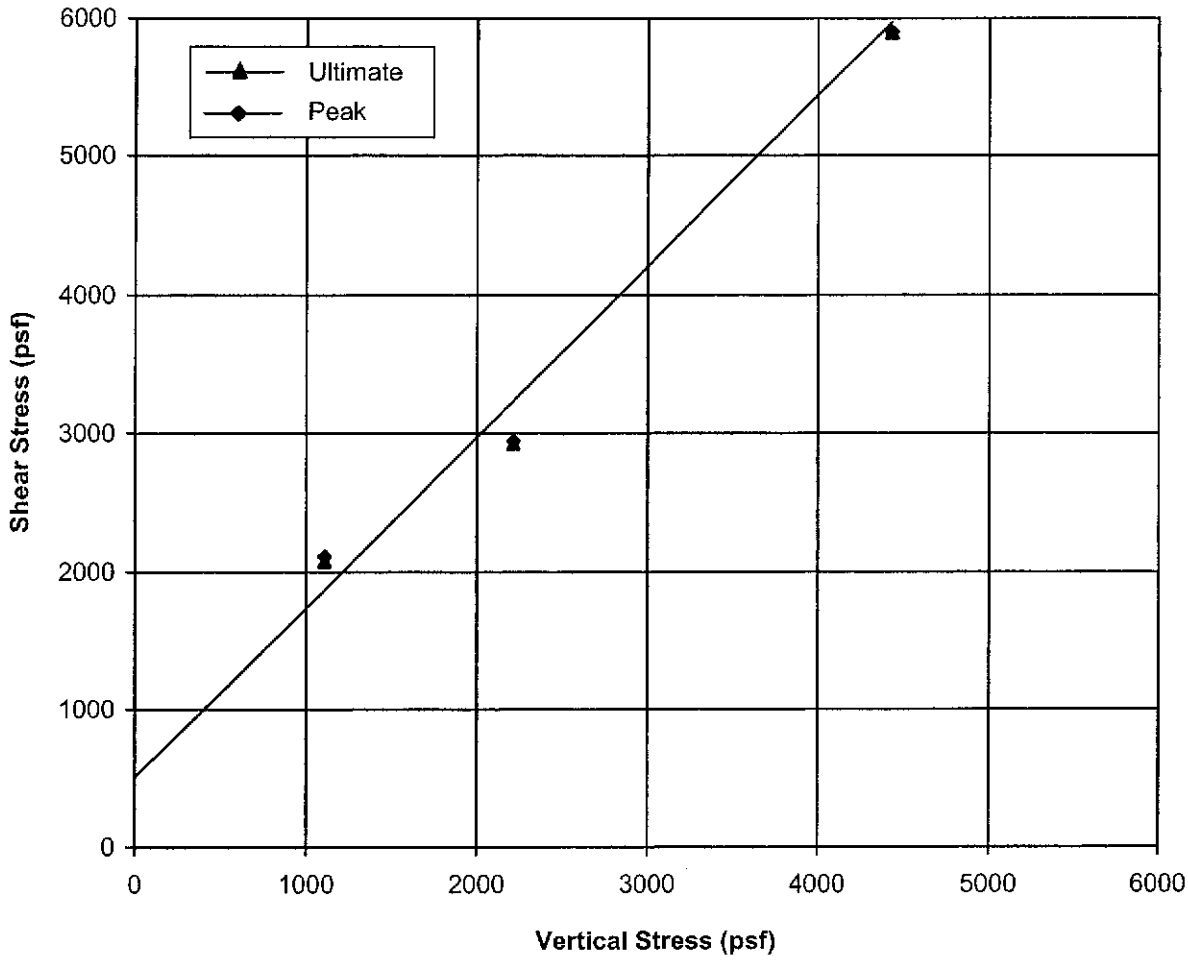


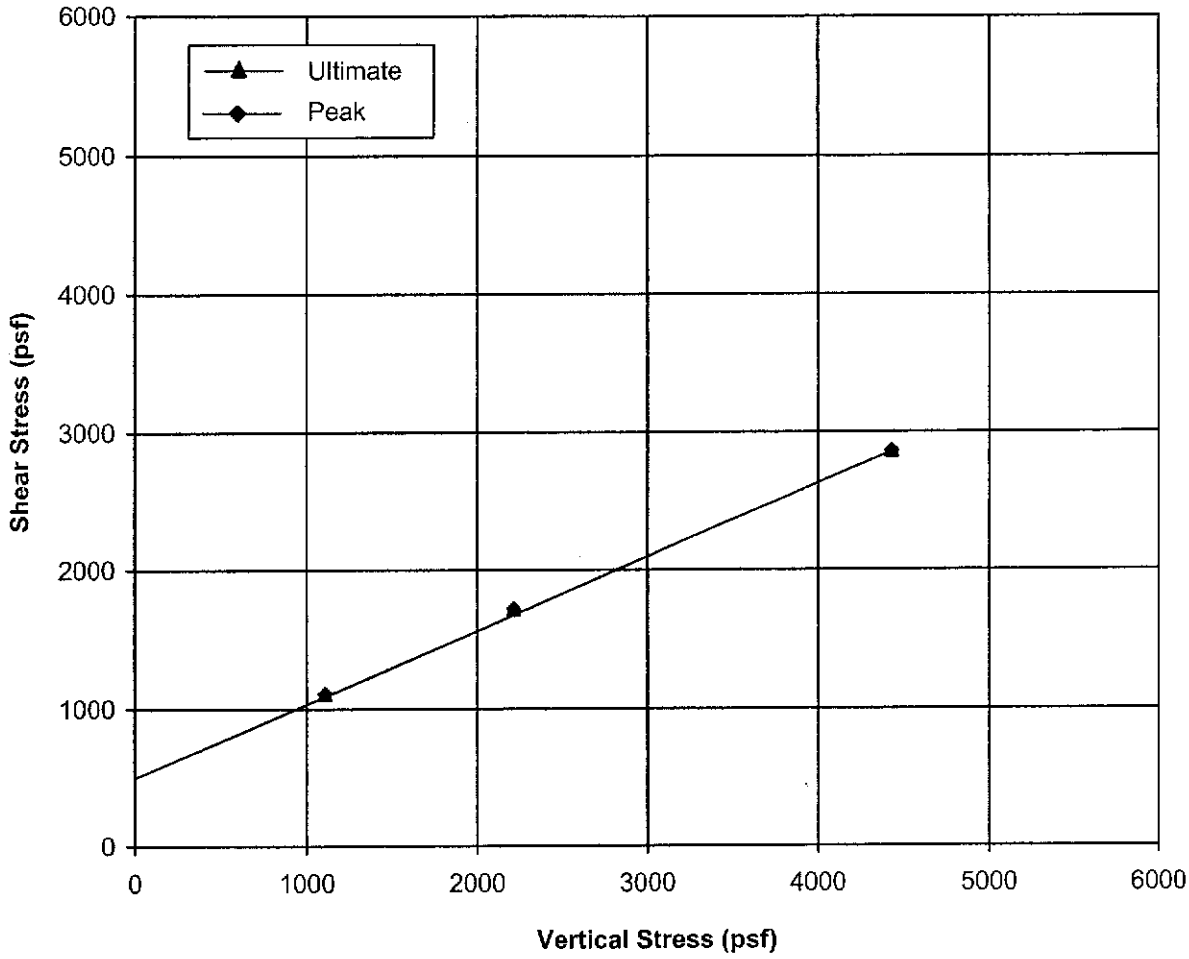
Boring Location	**B-3**
Sample Depth (feet)	**10**
Sample Description	**SM, BROWN SILTY SAND**
Sample Method	**Ring**
Initial Average Dry Density	**115.7** pcf

Average Strength Parameters

Friction Angle, ϕ'_{peak} (deg)	**51**
Cohesion, c'_{peak} (psf)	**500**
Friction Angle, ϕ'_{ult} (deg)	**51**
Cohesion, c'_{ult} (psf)	**500**

DIRECT SHEAR SUMMARY

Project No.	111461-002
Project Name	Flemming Ranch
Date	March 24, 2005



Boring Location	**B-4**
Sample Depth (feet)	**0-5**
Sample Description	**CL, Brown Lean Clay**
Sample Method	**Remolded to 90 percent relative compaction**
Initial Average Dry Density	**106.6** pcf

Average Strength Parameters

Friction Angle, ϕ'_{peak} (deg)	**28**
Cohesion, c'_{peak} (psf)	**500**
Friction Angle, ϕ'_{ult} (deg)	**28**
Cohesion, c'_{ult} (psf)	**500**

DIRECT SHEAR SUMMARY

Project No.	111461-002
Project Name	Flemming Ranch
Date	March 24, 2005

Leighton and Associates, Inc.

SOIL RESISTIVITY TEST
DOT CA TEST 532 / 643

Project Name: FLEMMING RANCH
Project No. : 111461-002
Boring No.: B-1
Sample No. : B-2
Visual Soil Identification: CL

Tested By : AJP Date: 3/21/05
Data Input By: AJP Date: 3/21/05
Checked By: JMD Date: 3/22/05
Depth (ft.) : 0-5

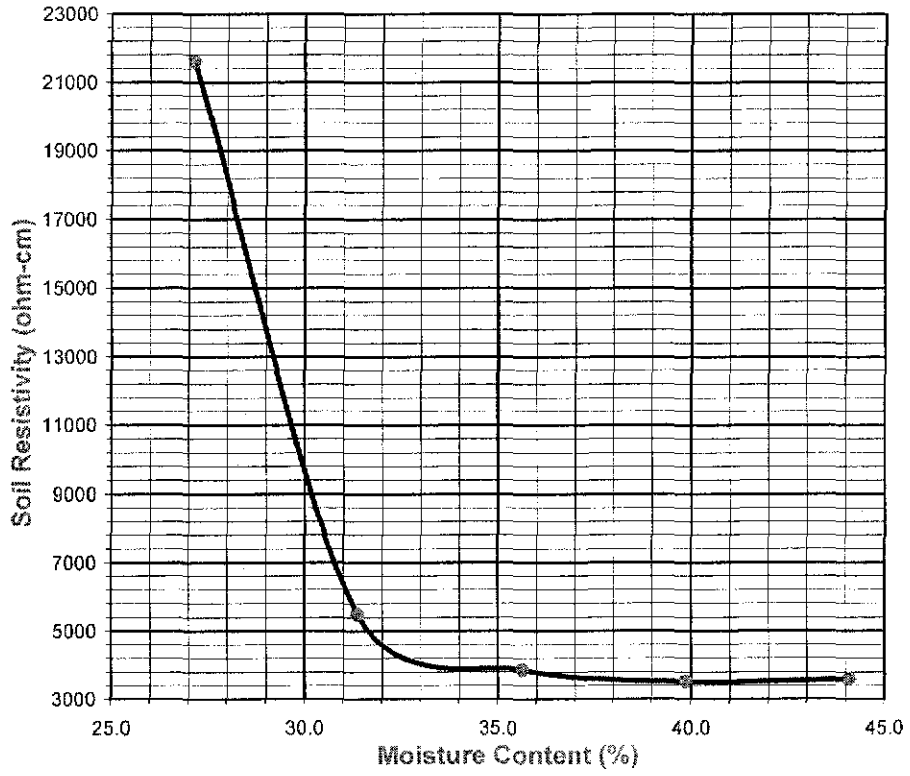
Initial Moisture Content (%)

Wet Wt. of Soil + Cont. (gm.)	120.00
Dry Wt. of Soil + Cont. (gm.)	110.00
Wt. of Container (gm.	12.00
Moisture Content (%) (MC	10.20

Initial Soil Weight (gm)(Wt)	1300.0
Box Constant:	6.75

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

Remolded Specimen	Moisture Adjustments				
Water Added (ml) (Wa)	200	250	300	350	400
Adj. Moisture Content (MC)	27.16	31.40	35.64	39.87	44.11
Resistance Rdg. (ohm)	3200	810	570	520	530
Soil Resistivity (ohm-cm)	21587	5464	3845	3508	3575



Minimum Resistivity	Moisture Content	Sulfate Content	Chloride Content	Soil
DOT CA Test 532 / 643		DOT CA Test 417 Part	DOT CA Test	DOT CA Test
3508	39.9	150	1559	8.04

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Leighton and Associates, Inc.

SOIL RESISTIVITY TEST
DOT CA TEST 532 / 643

Project Name: FLEMMING RANCH
Project No. : 111461-002
Boring No.: B-8
Sample No. : B-1
Visual Soil Identification: CL

Tested By : AJP Date: 3/21/05
Data Input By: AJP Date: 3/21/05
Checked By: JMD Date: 3/22/05
Depth (ft.) : 0-5

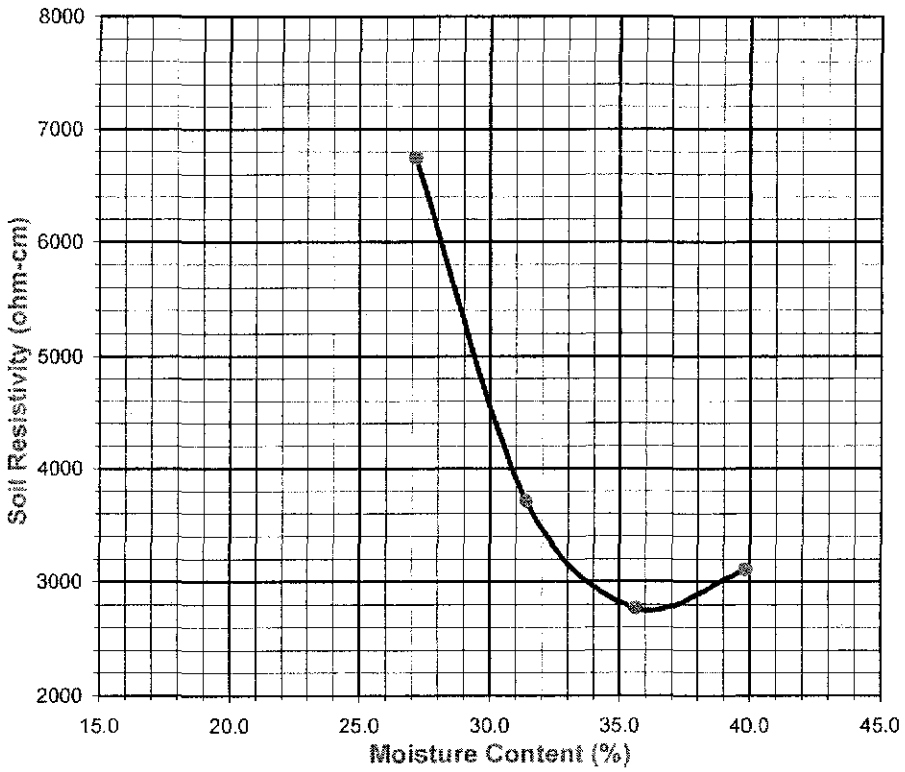
Initial Moisture Content (%)

Wet Wt. of Soil + Cont. (gm.)	120.0
Dry Wt. of Soil + Cont. (gm.)	110.0
Wt. of Container (gm.	12.0
Moisture Content (%) (MC	10.2

Initial Soil Weight (gm)(Wt)	1300.0
Box Constant:	6.75

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

Remolded Specimen	Moisture Adjustments				
Water Added (ml) (Wa)	200	250	300	350	
Adj. Moisture Content (MC)	27.16	31.40	35.64	39.87	
Resistance Rdg. (ohm)	1000	550	410	460	
Soil Resistivity (ohm-cm)	6746	3710	2766	3103	



Minimum Resistivity	Moisture Content	Sulfate Content	Chloride Content	Soil pH
DOT CA Test 532 / 643		DOT CA Test 417 Part	DOT CA Test	DOT CA
2766	35.6	<150	200	7.90

Rev. 08-04

Appendix D
Liquefaction Analysis

LIQUEFACTION EVALUATION

Based on *Proceeding of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils*, Technical Report NCEER-97-0022, December 31, 1997

Seismic Event		**Profile Constants**		**Depth to GWT**		**Project Name**	Fleming Ranch
Moment Magnitude	6.9	Total Unit Weight (lb/ft^3)	130	During Investigation (ft)	30	**Project Number**	16151-01
Peak Ground Acceleration	0.50 g	Unit Weight of Water (lbs/ft^3)	62.4	During Design Event (ft)	17	**Boring**	B-4 (L&A, 2005)

Determination of Cyclic Resitance Ratio

Sampling Data					During Investigation			Sampling Correction Factors											
		Blow Count		Thickness	Total Stress	Pore Pressure	Effective	Sampler	SPT	Overburden	Energy	Borehole	Rod Length	Sampler Type		Fines			
Depth (ft)	Depth (m)	SPT	Rings	(ft)	Stress (psf)	Pressure (psf)	Stress (psf)	Diameter	N_m	C_N	C_E	C_B	C_R	C_S	$(N_1)_{60}$	Content	$(N_1)_{60cs}$	K_σ	$CRR_{7.5}$
2.5	0.8		16	2.5	455	0	455	0.62	9.92	1.70	1.25	1.00	0.75	1.00	15.81	50	**23.97**	1.000	0.267
5	1.5		18	2.5	780	0	780	0.62	11.16	1.64	1.25	1.00	0.75	1.00	17.12	50	**25.54**	1.000	0.292
7.5	2.3		61	2.5	1105	0	1105	0.62	37.82	1.37	1.25	1.00	0.75	1.00	48.74	15	**53.58**	1.000	SPT >30 NF
10	3.0		71	2.5	1430	0	1430	0.62	44.02	1.21	1.25	1.00	0.75	1.00	49.87	15	**54.76**	1.000	SPT >30 NF
15	4.6		54	5	2080	0	2080	0.62	33.48	1.00	1.25	1.00	0.85	1.00	35.64	15	**39.85**	0.996	SPT >30 NF
20	6.1	44		5	2730	0	2730	1.00	44.00	0.87	1.25	1.00	0.95	1.10	50.26	15	**55.18**	0.949	SPT >30 NF
25	7.6		87	5	3380	0	3380	0.62	53.94	0.79	1.25	1.00	0.95	1.00	50.34	15	**55.26**	0.909	SPT >30 NF
30	9.1	19		5	4030	0	4030	1.00	19.00	0.72	1.25	1.00	0.95	1.10	17.86	72	**26.44**	0.873	0.269
35	10.7	29		5	4680	312	4368	1.00	29.00	0.69	1.25	1.00	1.00	1.10	27.57	50	**38.08**	0.855	SPT >30 NF
40	12.2	28		5	5330	624	4706	1.00	28.00	0.67	1.25	1.00	1.00	1.10	25.64	50	**35.77**	0.839	SPT >30 NF
45	13.7	44		5	5980	936	5044	1.00	44.00	0.64	1.25	1.00	1.00	1.10	38.93	50	**51.71**	0.824	SPT >30 NF
50	15.2	68		5	6630	1248	5382	1.00	68.00	0.62	1.25	1.00	1.00	1.10	58.24	60	**74.89**	0.810	SPT >30 NF
				50															

Determination of Cyclic Stress Ratio

Sampling Data					During Design Event						
		Blow Count			Total Stress	Pore Pressure	Effective				
Depth (ft)	Depth (m)	SPT	Rings	Thickness	Stress (psf)	Pressure (psf)	Stress (psf)	r_d	CSR	MSF	FS
2.5	0.76		16	2.5	325	0	325	0.99615	0.323749	1.238	Above GWT
5	1.52		18	2.5	650	0	650	0.99024	0.321827	1.238	Above GWT
7.5	2.29		61	2.5	975	0	975	0.98456	0.319982	1.238	Above GWT
10	3.05		71	2.5	1300	0	1300	0.97914	0.318221	1.238	Above GWT
15	4.57		54	5	1950	0	1950	0.96856	0.314781	1.238	Above GWT
20	6.10	44		5	2600	187.2	2412.8	0.9569	0.33512	1.238	Corr. SPT>30
25	7.62		87	5	3250	499.2	2750.8	0.94183	0.361645	1.238	Corr. SPT>30
30	9.14	19		5	3900	811.2	3088.8	0.92058	0.377762	1.238	Bray-fine
35	10.67	29		5	4550	1123.2	3426.8	0.89062	0.384324	1.238	Bray-fine
40	12.19	28		5	5200	1435.2	3764.8	0.85103	0.382025	1.238	Corr. SPT>30
45	13.72	44		5	5850	1747.2	4102.8	0.80363	0.372405	1.238	Corr. SPT>30
50	15.24	68		5	6500	2059.2	4440.8	0.75271	0.358068	1.238	Corr. SPT>30

LIQUEFACTION EVALUATION

Based on *Proceeding of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils*, Technical Report NCEER-97-0022, December 31, 1997

Seismic Event		**Profile Constants**		**Depth to GWT**		**Project Name**	Fleming Ranch
Moment Magnitude	6.9	Total Unit Weight (lb/ft^3)	130	During Investigation (ft)	27	**Project Number**	16151-01
Peak Ground Acceleration	0.50 g	Unit Weight of Water (lbs/ft^3)	62.4	During Design Event (ft)	17	**Boring**	B-5 (L&A, 2005)

Determination of Cyclic Resitance Ratio

Sampling Data					During Investigation			Sampling Correction Factors											
		Blow Count		Thickness	Total Stress	Pore Pressure	Effective	Sampler	SPT	Overburden	Energy	Borehole	Rod Length	Sampler Type		Fines			
Depth (ft)	Depth (m)	SPT	Rings	(ft)	Stress (psf)	Pressure (psf)	Stress (psf)	Diameter	N_m	C_N	C_E	C_B	C_R	C_S	$(N_1)_{60}$	Content	$(N_1)_{60cs}$	K_σ	$CRR_{7.5}$
2.5	0.8		10	2.5	455	0	455	0.62	6.20	1.70	1.25	1.00	0.75	1.00	9.88	50	**16.86**	1.000	0.182
5	1.5		30	2.5	780	0	780	0.62	18.60	1.64	1.25	1.00	0.75	1.00	28.53	15	**32.40**	1.000	SPT >30 NF
7.5	2.3		52	2.5	1105	0	1105	0.62	32.24	1.37	1.25	1.00	0.75	1.00	41.55	15	**46.04**	1.000	SPT >30 NF
10	3.0		50	2.5	1430	0	1430	0.62	31.00	1.21	1.25	1.00	0.75	1.00	35.12	15	**39.31**	1.000	SPT >30 NF
15	4.6	85		5	2080	0	2080	1.00	85.00	1.00	1.25	1.00	0.85	1.10	99.53	50	**124.44**	0.996	SPT >30 NF
20	6.1		71	5	2730	0	2730	0.62	44.02	0.87	1.25	1.00	0.95	1.00	45.72	35	**59.70**	0.949	SPT >30 NF
25	7.6	22		5	3380	0	3380	1.00	22.00	0.79	1.25	1.00	0.95	1.10	22.59	36	**32.10**	0.909	SPT >30 NF
30	9.1	23		5	4030	187.2	3842.8	1.00	23.00	0.74	1.25	1.00	0.95	1.10	22.15	35	**31.49**	0.882	SPT >30 NF
35	10.7	70		5	4680	499.2	4180.8	1.00	70.00	0.71	1.25	1.00	1.00	1.10	68.02	50	**86.62**	0.865	SPT >30 NF
40	12.2	33		5	5330	811.2	4518.8	1.00	33.00	0.68	1.25	1.00	1.00	1.10	30.84	50	**42.01**	0.848	SPT >30 NF
45	13.7	30		5	5980	1123.2	4856.8	1.00	30.00	0.66	1.25	1.00	1.00	1.10	27.05	35	**37.35**	0.833	SPT >30 NF
50	15.2	50		5	6630	1435.2	5194.8	1.00	50.00	0.63	1.25	1.00	1.00	1.10	43.59	50	**57.30**	0.818	SPT >30 NF
				50															

Determination of Cyclic Stress Ratio

Sampling Data					During Design Event						
		Blow Count			Total Stress	Pore Pressure	Effective				
Depth (ft)	Depth (m)	SPT	Rings	Thickness	Stress (psf)	Pressure (psf)	Stress (psf)	r_d	CSR	MSF	FS
2.5	0.76		10	2.5	325	0	325	0.99615	0.323749	1.238	Above GWT
5	1.52		30	2.5	650	0	650	0.99024	0.321827	1.238	Above GWT
7.5	2.29		52	2.5	975	0	975	0.98456	0.319982	1.238	Above GWT
10	3.05		50	2.5	1300	0	1300	0.97914	0.318221	1.238	Above GWT
15	4.57	85		5	1950	0	1950	0.96856	0.314781	1.238	Above GWT
20	6.10		71	5	2600	187.2	2412.8	0.9569	0.33512	1.238	Corr. SPT>30
25	7.62	22		5	3250	499.2	2750.8	0.94183	0.361645	1.238	Corr. SPT>30
30	9.14	23		5	3900	811.2	3088.8	0.92058	0.377762	1.238	Corr. SPT>30
35	10.67	70		5	4550	1123.2	3426.8	0.89062	0.384324	1.238	Corr. SPT>30
40	12.19	33		5	5200	1435.2	3764.8	0.85103	0.382025	1.238	Corr. SPT>30
45	13.72	30		5	5850	1747.2	4102.8	0.80363	0.372405	1.238	Corr. SPT>30
50	15.24	50		5	6500	2059.2	4440.8	0.75271	0.358068	1.238	Corr. SPT>30

Appendix E
General Earthwork & Grading Specifications for Rough Grading

General Earthwork and Grading Specifications for Rough Grading

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 a qualified Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultant 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.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to confirm that the attained level of compaction is being accomplished as specified. 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 project 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 “equipment” 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 personnel will be available for observation and testing. 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. It is the contractor's sole responsibility to provide proper fill compaction.

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). 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. The contractor is responsible for all hazardous waste relating to his work. The Geotechnical Consultant does not have expertise in this area. If hazardous waste is a concern, then the Client should acquire the services of a qualified environmental assessor.

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 over-excavated as specified in the following section. Scarification shall continue until soils are broken down and free of oversize material and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Over-excavation

In addition to removals and over-excavations 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 over-excavated 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. Please see the Standard Details for a graphic illustration. 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 over-excavated 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 the geotechnical consultant. 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, and the Standard Details. 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 The Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

7.2 All bedding and backfill of utility trenches shall be done 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

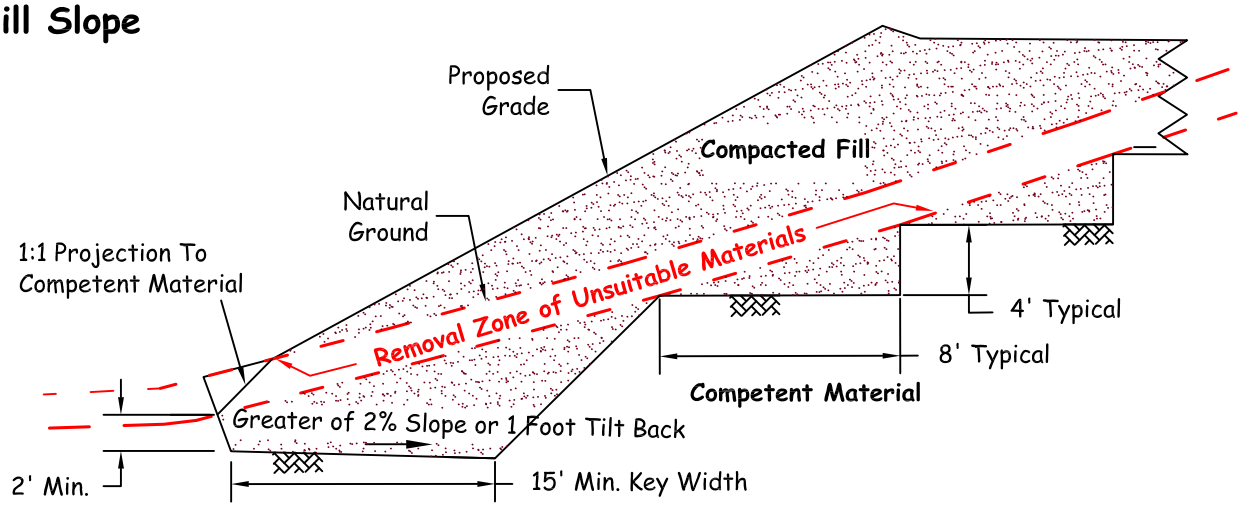
the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of maximum from 1 foot above the top of the conduit to the surface.

7.3 The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

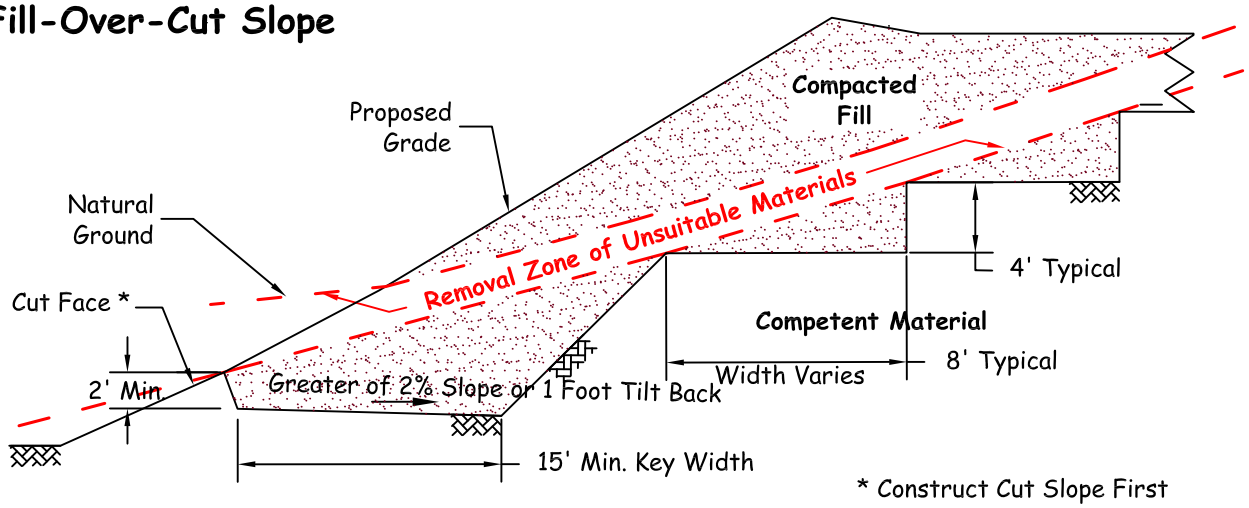
7.4 The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

7.5 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.

Fill Slope

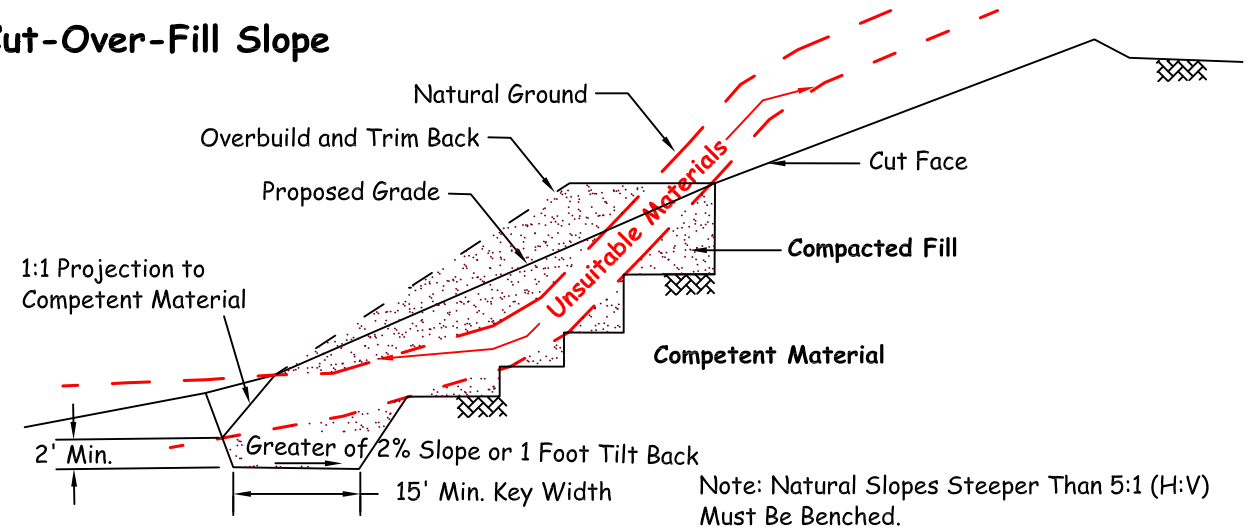


Fill-Over-Cut Slope



* Construct Cut Slope First

Cut-Over-Fill Slope



Note: Natural Slopes Steeper Than 5:1 (H:V) Must Be Benched.

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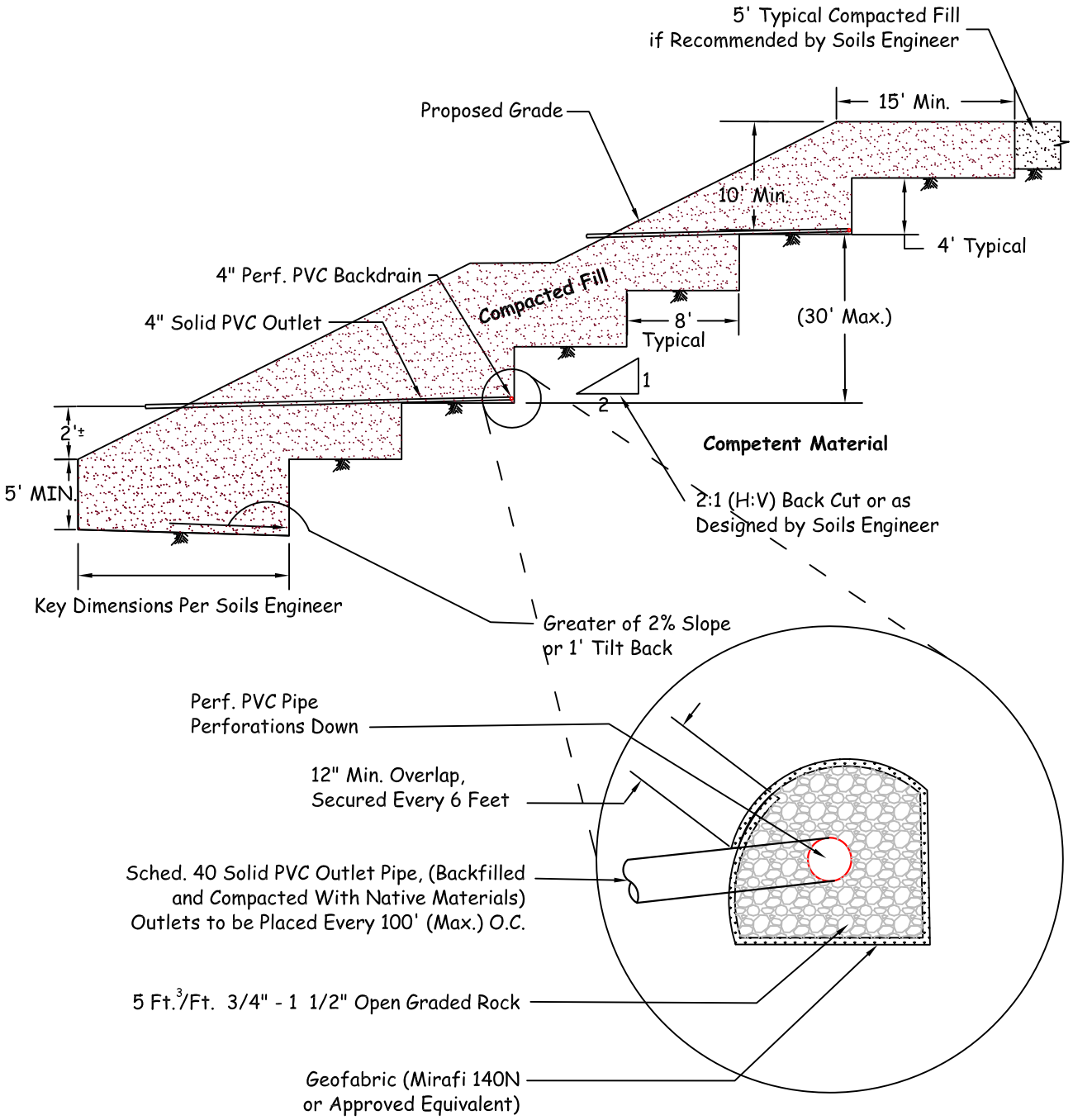
KEYING AND BENCHING



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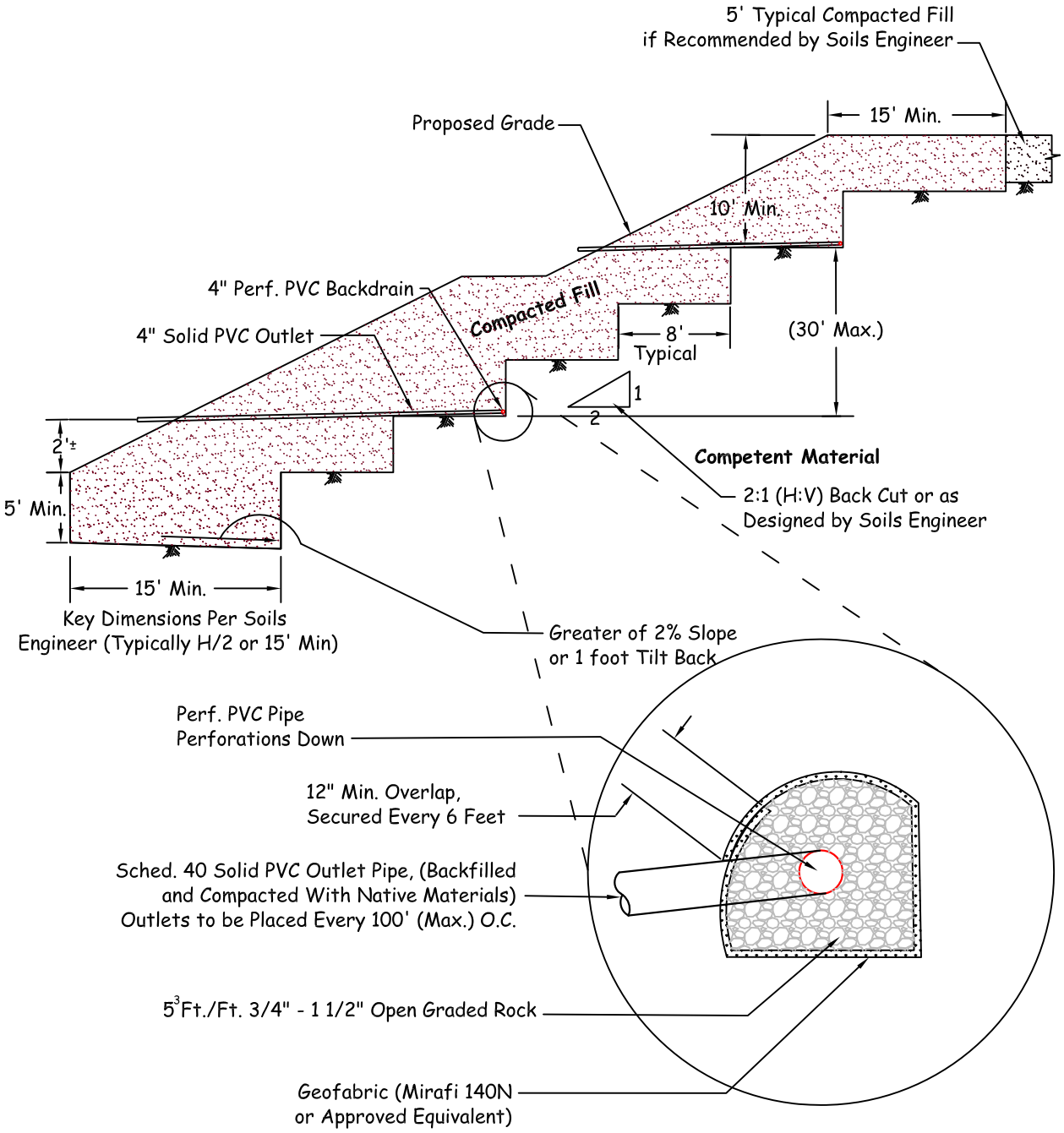
TYPICAL BUTTRESS DETAIL



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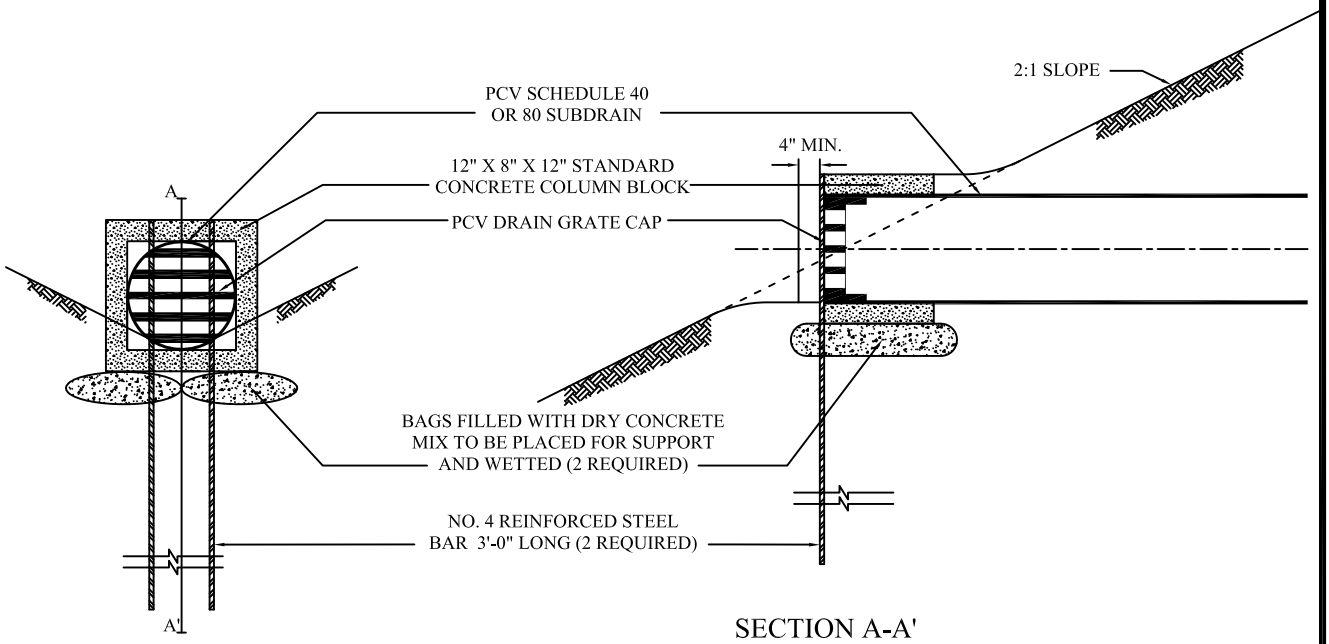
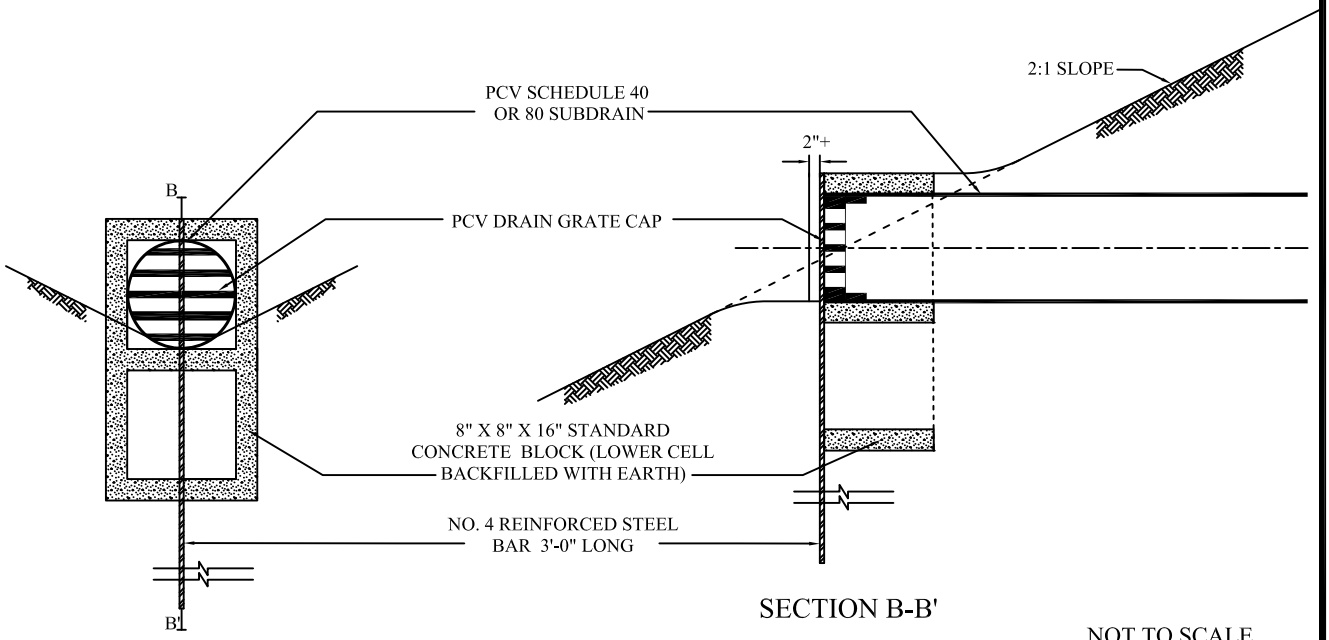
TYPICAL STABILIZATION FILL DETAIL

SUBDRAIN OUTLET MARKER -6" & 8" PIPE



SECTION A-A'

SUBDRAIN OUTLET MARKER -4" PIPE



SECTION B-B'

NOT TO SCALE

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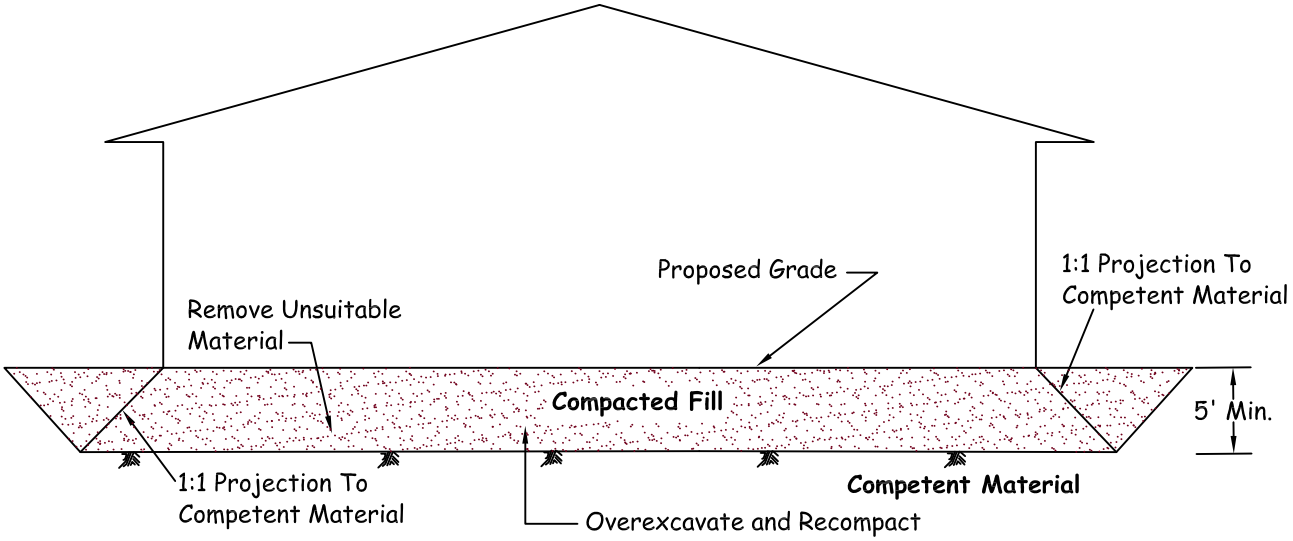
SUBDRAIN OUTLET MARKER DETAIL

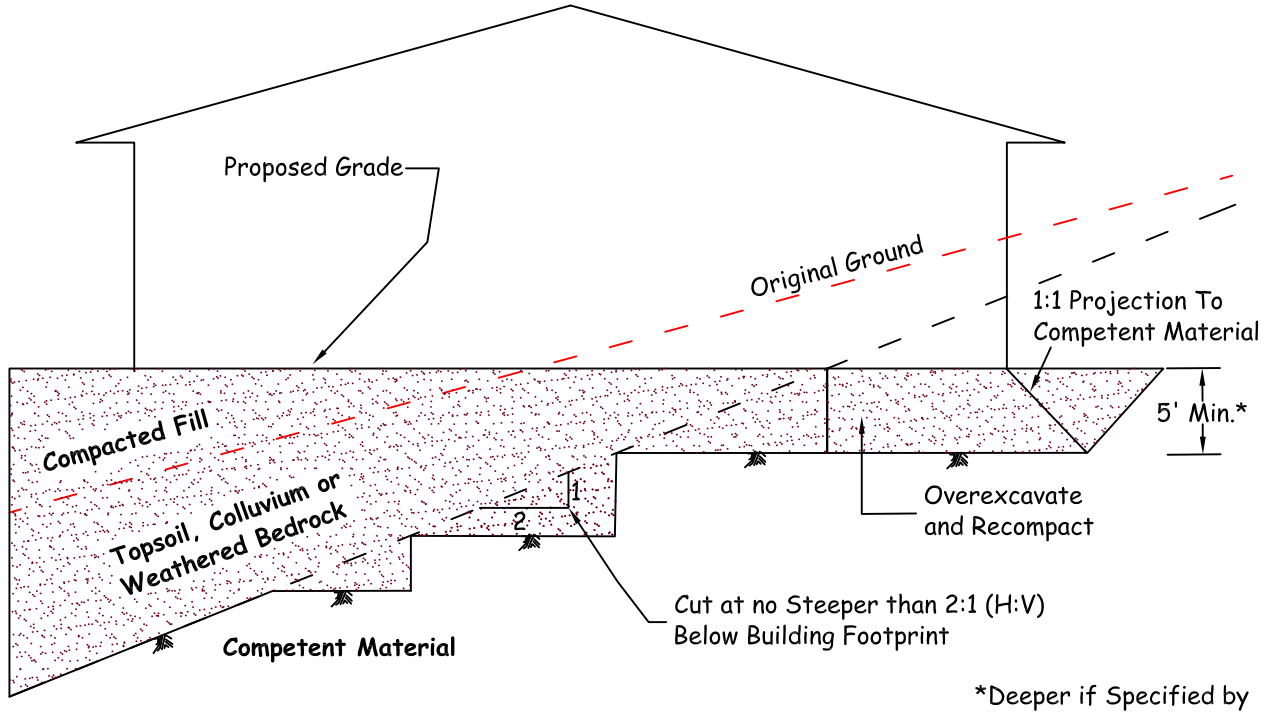
Cut Lot
(Exposing Unsuitable Soils at Design Grade)



Note 1: Removal Bottom Should be Graded With Minimum 2% Fall Towards Street or Other Suitable Area (as Determined by Soils Engineer) to Avoid Ponding Below Building

Note 2: Where Design Cut Lots are Excavated Entirely Into Competent Material, Overexcavation May Still be Required for Hard-Rock Conditions or for Materials With Variable Expansion Characteristics.

Cut/Fill Transition Lot



*Deeper if Specified by Soils Engineer

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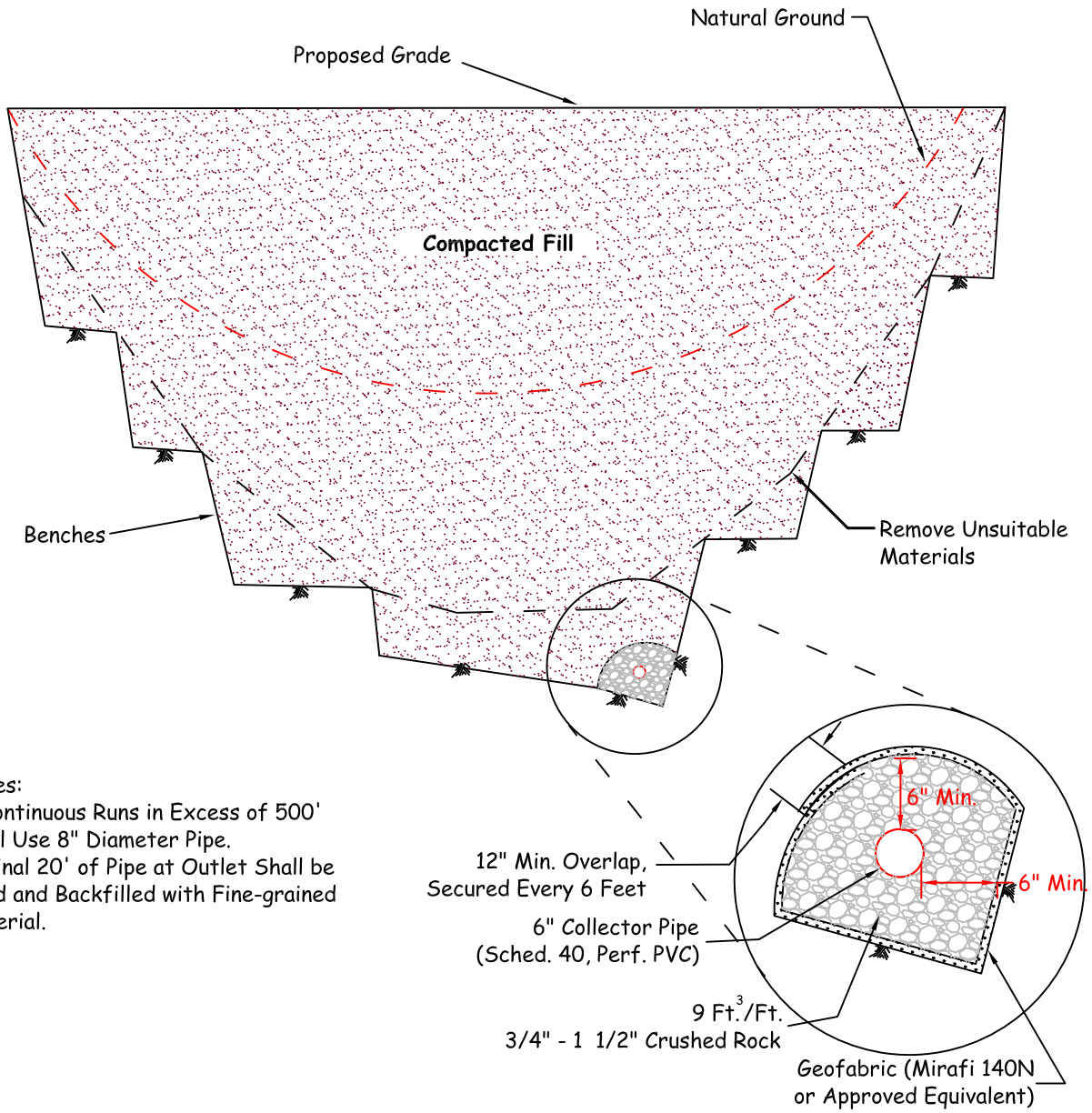
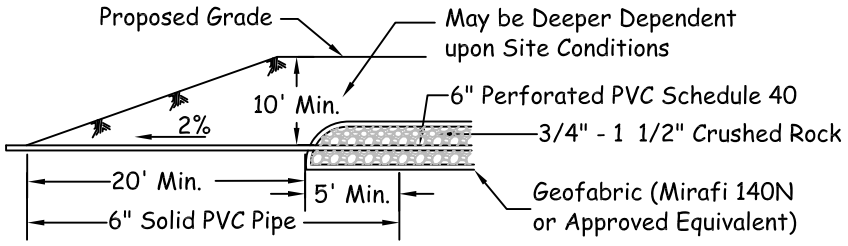
CUT AND TRANSITION LOT OVEREXCAVATION DETAIL



Notes:
1) Continuous Runs in Excess of 500' Shall Use 8" Diameter Pipe.
2) Final 20' of Pipe at Outlet Shall be Solid and Backfilled with Fine-grained Material.

Proposed Outlet Detail



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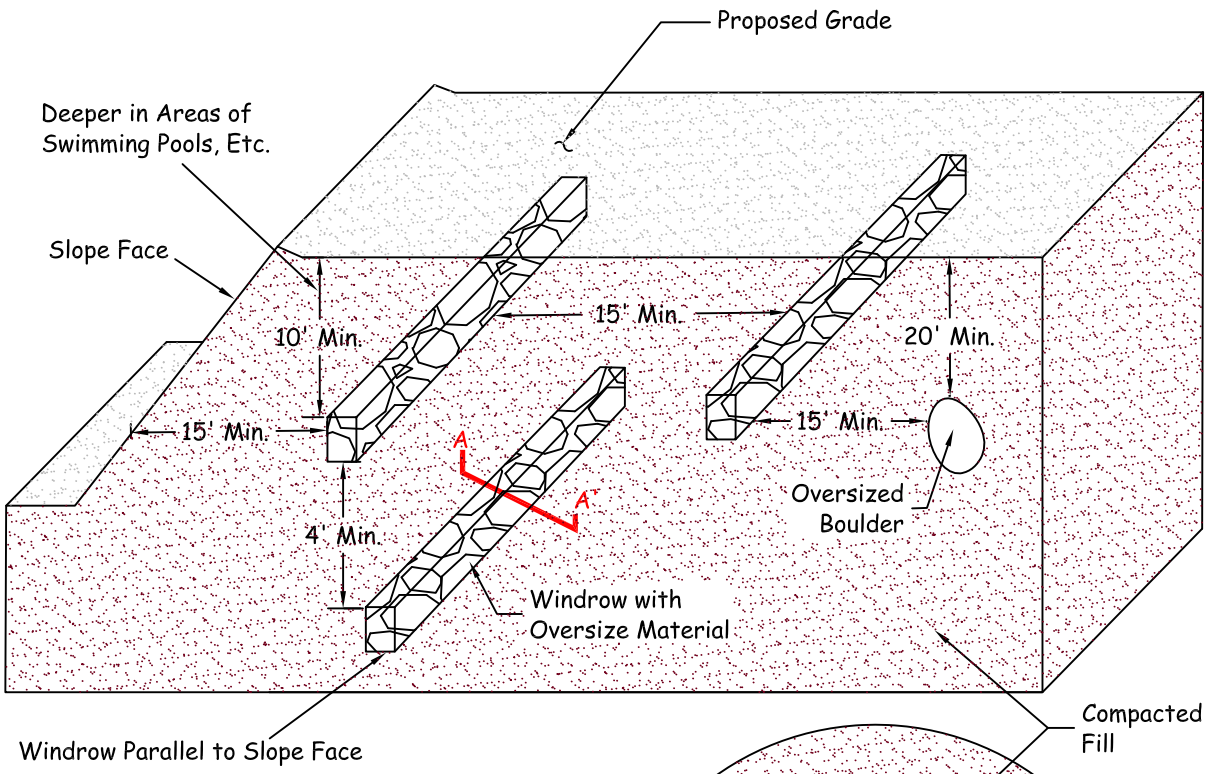
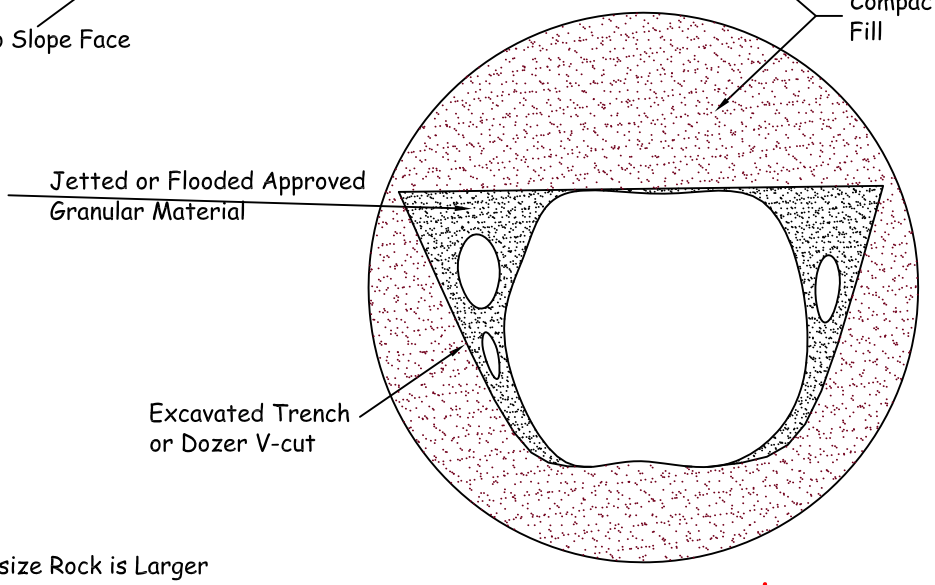
CANYON SUBDRAINS





Note: Oversize Rock is Larger
than 8" in Maximum Dimension.

Section A-A'

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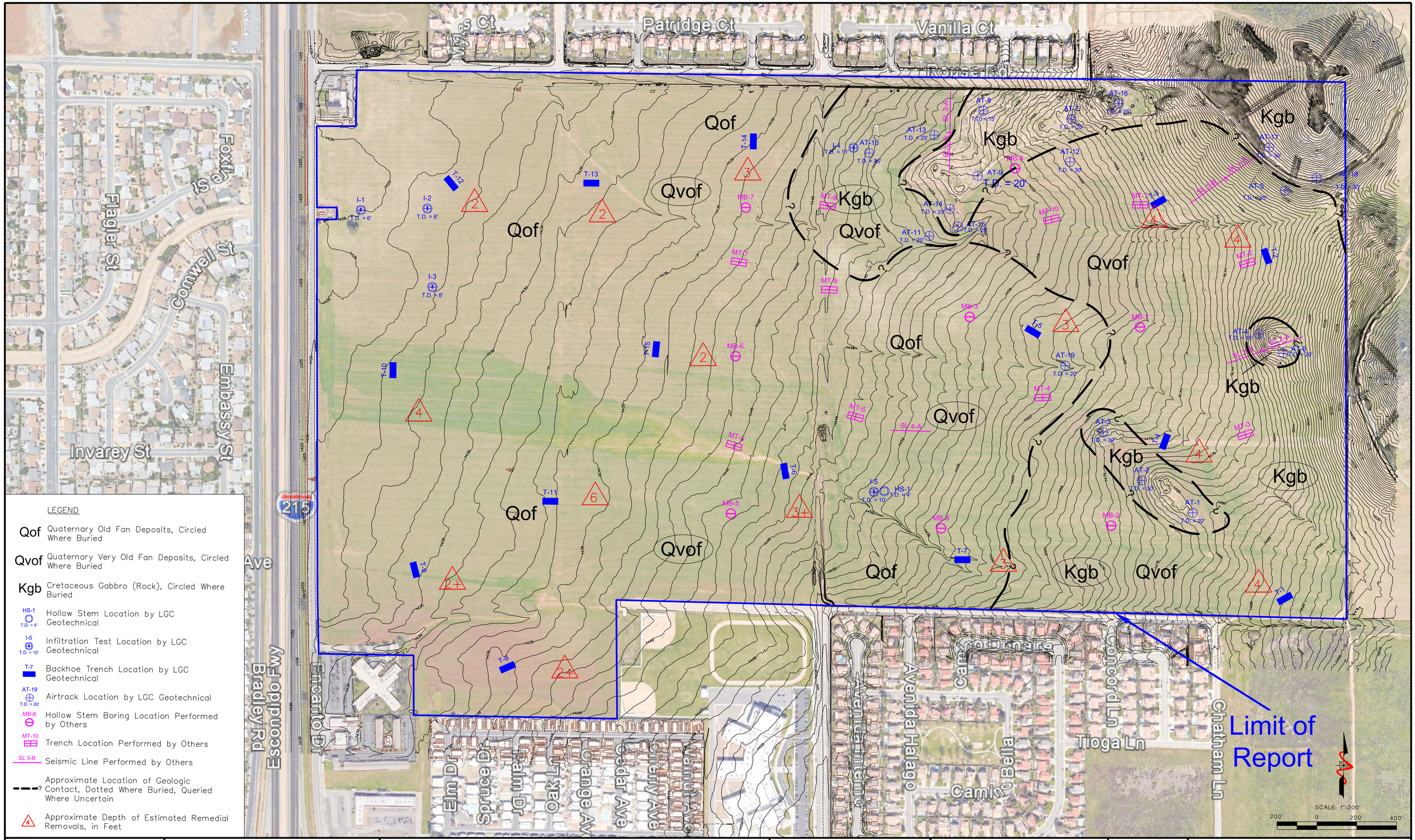
OVERSIZE ROCK DISPOSAL DETAIL



LEGEND

Qof	Quaternary Old Fan Deposits, Circled Where Buried
Qvof	Quaternary Very Old Fan Deposits, Circled Where Buried
Kgb	Cretaceous Gabbro (Rock), Circled Where Buried
HS-1 T.D. = 4'	Hollow Stem Location by LGC Geotechnical
I-5 T.D. = 10'	Infiltration Test Location by LGC Geotechnical
T-7	Backhoe Trench Location by LGC Geotechnical
AT-19 T.D. = 20'	Airtrack Location by LGC Geotechnical
MB-8	Hollow Stem Boring Location Performed by Others
MT-10	Trench Location Performed by Others
SL 3-B	Seismic Line Performed by Others
---?	Approximate Location of Geologic Contact, Dotted Where Buried, Queried Where Uncertain
4	Approximate Depth of Estimated Remedial Removals, in Feet

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Geotechnical Map

CLIENT:
Newport and Pacific Land
100 Bayview Circle, Suite 2200
Newport beach, CA 92660

CIVIL ENGINEER:
K & A Engineering, Inc.
357 N. Sheridon Street, # 117
Corona, CA 92880

PROJECT NAME	Fleming Ranch
PROJECT NO.	16151-01
ENG. / GEOL.	DJB/KTM
SCALE	1" = 200'
DATE	March 2017

SHEET 1 of 1