APPENDIX D11

Geotechnical Report, dated June 22, 2015

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June 22, 2015
Project Number 1-0159

Attention: Ms. Lisa Gordon

Subject: ***UPDATED GEOTECHNICAL REPORT***
Emerald Meadows Ranch Project
Rubidoux area of the County of Riverside, California

References: See Appendix A

Dear Ms. Gordon

Presented herein is Alta California Geotechnical, Inc.'s. (Alta) updated geotechnical report for the Emerald Meadows Ranch project, located in the Rubidoux area of the County of Riverside, California. The conclusions and recommendations presented in this report are based on Alta's recent subsurface investigation, review of the Parcel Map (Plate 1) and review of the referenced reports.

Alta's review of the data and parcel map indicates that the proposed development is feasible, from a geotechnical standpoint, provided that the recommendations presented in this report are incorporated into the grading and improvement plans and implemented during site development. Included in this report are:

- Discussion of the site geotechnical conditions;
- Liquefaction analysis;
- Unsuitable soil removal and grading recommendations;
- Geotechnical site construction recommendations;
- Foundation design parameters.

If you have any questions or should you require any additional information, please contact the undersigned at (951) 509-7090. Alta appreciates the opportunity to provide geotechnical consulting services for your project.

Sincerely,
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1.0 INTRODUCTION

This report contains Alta California Geotechnical, Inc.'s (Alta's) findings, conclusions and geotechnical recommendations for the development of the proposed Emerald Meadows Ranch project.

1.1 Purpose

The purpose of this report is to examine the existing geotechnical conditions and evaluate their impact on the proposed residential development that is conceptually depicted on the enclosed parcel map (Plate 1). This report is suitable for use in calculating engineer's construction cost estimates and developing grading plans for the proposed development.

1.2 Scope of Work

Alta's *Scope of Work* for this geotechnical investigation includes the following:

- Reviewing the referenced reports pertinent to the subject site;
- Incorporating data generated from previous field investigations and laboratory analyses conducted by Converse Consultants (2003) and Zeiser Kling Consultants, Inc. (2005) into this report;
- Conducting seven (7) Cone Penetration Test (CPT) soundings to a maximum depth of 50 feet below the existing surface (Appendix B);
- Evaluating geologic and laboratory data to develop recommendations for site grading, foundations, and utilities;
- Conducting a liquefaction analysis;
- Preparing this report and accompanying exhibits.

1.3 Report Limitations

The conclusions and recommendations in this report are based on the information generated during this investigation, our review of the referenced reports and our review of the enclosed parcel map (Plate 1). The materials immediately adjacent to or beneath those observed may have different characteristics than those observed and no representations are made as to the

quality or extent of materials not observed. It is anticipated that additional review/recommendations will be required from the project geotechnical consultant as the project progresses and grading plans become available.

2.0 PROJECT DESCRIPTION

2.1 Site Location and Existing Conditions

The overall Emerald Ranch project is an irregular-shaped property consisting of approximately 245 acres, and is located south of the 60 freeway, northwest of the Santa Ana River, and southeast of Rubidoux Blvd in the Rubidoux area, Riverside County, California (Plate 1). There are several single-family residential structures within the overall site boundary, some of which will remain in-place during development. The majority of the site is vacant and covered with weeds and brush. There is an earth berm that runs approximately north-south in the eastern portion of the project. Various dirt roads are present onsite. The berm for the Santa Ana River is present along the eastern property boundary. The so called Jurupa Ditch appears to be a man-made surface-drainage feature carved along the distinct break in topography which trends southwest-northeast through the central portion of the site.

Alta's review of historic aerial photographs (Historic Aerials.com, 2015), shows that much of the site has been utilized for agricultural purposes. The berm for the Santa Ana River was constructed between 1948 and 1959. The site has remained largely unchanged since 1966, with the exception of the addition of some single-family residential structures.

2.2 Proposed Development

The proposed development consists of a school, commercial, parks, and residential lots with associated interior streets and infrastructure. It is Alta's understanding that Tentative Tract Maps 32972 and 32973 were previously approved for residential developments. Tentative Tract Maps 32974, 32975,

32976 are also for residential developments, however, these tracts were not previously approved. Plans for the commercial sites, school and park sites have not been completed.

Alta anticipates that conventional cut and fill-grading techniques will be used to develop the site for the construction of wood-framed, single-family structures with shallow foundations and reinforced concrete slabs-on-grade, and associated improvements. Other types of structures for schools and commercial building are also anticipated and geotechnical parameters for those types of structures should be provided when planning dictates.

3.0 SITE INVESTIGATION

3.1 Previous Subsurface Investigation and Laboratory Testing

The subsurface investigations by Converse Consultants (2003) and Zeiser Kling Consultants, Inc. (2006) included: 1) drilling, logging and sampling of ten (10) mud rotary borings, twenty-three (23) hollow-stem auger borings, twenty-three (23) test pits and three (3) cone penetration test borings. The approximate locations of these borings are shown on enclosed Plate 1.

Laboratory testing was performed by Converse Consultants (2003) and Zeiser Kling Consultants, Inc. on relatively "undisturbed" ring samples and bulk samples obtained during their field investigation. Their test results are included in Appendices C-1 and C-2.

3.2 Current Subsurface Investigation

Alta conducted a subsurface investigation of the Emerald Meadows Ranch property on June 2, 2015, consisting of conducting seven (7) cone penetrometer (CPT) soundings up to a depth of 50 feet. The locations of the CPT soundings are shown on the attached Plate 1 and the logs are presented in Appendix B of this report.

4.0 GEOLOGIC CONDITIONS

4.1 Geologic and Geomorphic Setting

Regionally, the site is located in the Peninsular Ranges geomorphic province, which characterizes the southwest portion of southern California. The Peninsular Ranges province is composed of plutonic and metamorphic rock, lesser amounts of Tertiary volcanic and sedimentary rock, and Quaternary drainage in-fills and sedimentary veneers. The proposed project is located in the Riverside sub-block (Jennings and Bryant, 2010), which is bounded by the Elsinore fault zone to the west and by the San Jacinto fault zone to the east.

4.2 Stratigraphy

A digital preparation of geologic mapping by Dibble and Morton (2004) depicts the site to be underlain by Pleistocene-age older alluvium deposits and Holocene-age younger alluvium. Alta's site mapping also indicate that discrete prisms of undocumented artificial fill are present onsite. The geologic units are briefly described below. Their approximate distribution is shown on the enclosed Plate 1.

4.2.1 Artificial Fill - Undocumented (map symbol afu)

The undocumented artificial fills are comprised of berm/levee fills and agriculture fills. It consists of dark brown and yellow brown, fine grained silty sands to poorly graded sands with rocks and gravel. For more details refer to the referenced reports.

4.2.2 Younger Alluvium (map symbol Qya)

Younger alluvium deposits consisted of silty, clayey, and poorly graded sands with gravel and sandy silts. These deposits are associated with the modern Santa Ana River and are found chiefly southeast of the Jurupa Ditch. Thicknesses range from one (1) to greater than 50 feet. These deposits generally increase in thickness towards the Santa Ana River.

4.2.3 Older Alluvium (map symbol Qoa)

The older alluvium encountered onsite consisted of silty, clayey, and poorly graded sands with gravel and sandy silts in a moist, medium to very dense condition. These deposits are deposits are associated with the ancient Santa Ana River. They are exposed on the ground surface northwest of the Jurupa Ditch and underlie the younger alluvium east of the Jurupa Ditch. The Jurupa Ditch itself appears to be a made-made drainage feature that has been carved along the distinct geomorphic break in slope which originally formed by the down cutting and dissection of the older alluvium.

4.3 Geologic Structure

4.3.1 Tectonic Framework

Jennings (1985) defined eight structural provinces within California that have been classified by predominant regional fault trends and similar fold structure. These provinces are in turn divided into blocks and sub-blocks that are defined by "major Quaternary faults". These blocks and sub-blocks exhibit similar structural features. Within this framework, the subject site is located within Structural Province I, which is controlled by the dominant northwest trend of the San Andreas Fault and is divided into two blocks, the Coast Range Block and the Peninsular Range Block. The Peninsular Range Block, on which this site is located, is characterized by a series of parallel, northwest trending faults that exhibit right lateral dip-slip movement. These faults are terminated by the Transverse Range block to the north and extend southward into the Baja Peninsula. These northwest trending faults divide the Peninsular Range block into eight sub-blocks. The Riverside Sub-block, one of the eight sub-blocks, is

bound on the west by the Elsinore fault zone and on the east by the San Jacinto fault zone.

4.3.2 Regionally Mapped Active Faults

Several large, active fault systems, including the Elsinore, San Jacinto, Cucamonga and San Andreas faults, occur in the region surrounding the subject site. These fault systems have been studied extensively and in a large part control the geologic structure of southern California.

4.3.3 Geologic Structure

Based upon our site investigation and literature review, the onsite older and younger alluvial deposits have not been folded, faulted or fractured. The deposits are typically massive with erosion/infill contacts and repeating fining upwards sequences.

4.4 Groundwater and Flooding

Groundwater was encountered during this firm's current subsurface investigation as shallow as fifteen feet below the existing ground surface in the development area. Zeiser Kling (2005) noted water ranging from seven (7) to sixteen (16) feet below the ground surface in the development area. Groundwater depths generally increase with distance from the Santa Ana River.

The eastern portion of the site lies within the 500 year flood plain zone. Localized flooding could occur along the Jurupa Ditch. The evaluation of flood hazards is within the preview of the design civil engineer.

4.5 Earthquake Hazards

The subject site is located in southern California, which is a tectonically active area. The type and magnitude of seismic hazards affecting a site are dependent on the distance to the causative fault and the intensity and magnitude of the seismic event. The seismic hazard may be primary, such as surface rupture

and/or ground shaking, or secondary, such as liquefaction and/or ground lurching.

4.5.1 Local and Regional Faulting

Based upon Alta's review of air photos, literature research and site geologic mapping "active" faults (movement occurring < 11,00 years ago) are considered to be absent from the site. The nearest know active fault is the San Jacinto fault, which is located approximately 7.3 miles from the project. Alquist-Priolo Special Zones are also absent from the site (Hart 1994). As such, the probability of primary surface rupture or deformation at the site is considered unlikely.

Ground shaking hazards caused by earthquakes along the San Jacinto fault and other active regional faults, including "blind thrust faults" do exist. Periodic ground shaking caused by movement along faults is likely to be felt onsite during the design life of the project. The 2013 California Building Code requires use-modified spectral accelerations and velocities for most structural designs. Seismic design parameters using soil profile types identified in the 2013 California Building Code are presented in Section 7.3.

4.5.2 Liquefaction

Seismic agitation of relatively loose saturated sands, silty sands, and some silts can result in a buildup of pore pressure. If the pore pressure exceeds the overburden stresses, a temporary quick condition known as liquefaction can occur. Liquefaction effects can manifest in several ways including: 1) loss of bearing; 2) lateral spread; 3) dynamic settlement; and 4) flow failure. Lateral spreading has typically been the most damaging mode of failure.

In general, the more recent that a sediment has been deposited, the more likely it will be susceptible to liquefaction. Other factors that must be considered are: groundwater, confining stresses, relative density, and the intensity and duration of seismically-induced ground shaking.

Portions of the younger alluvium have been determined to be potentially liquefiable, while the older alluvium is generally resistant to liquefaction. Alta performed seven (7) CPT-soundings in the subject area in order to supplement the previous subsurface information onsite.

As stated below in Section 6.1.2.2 of this report, the upper ten (10) feet of the younger alluvium should be removed and recompacted at the site. However, it is possible that groundwater may be encountered prior to achieving the ten foot removal, which will limit the final removal depth (See section 6.1.2.2). For the purposes of our liquefaction analyses presented in Appendix D, Alta has assumed that groundwater will be encountered at five (5) feet, which will subsequently limit removals to five (5) feet. This is intended to represent a worst-case condition.

Alta analyzed both CPT data and SPT data from the borings onsite. The results of our analysis are presented in Section D. Proposed fill loads were utilized in the calculations, based on the available plans.

The results of our findings are discussed below under the headings of the specific types of liquefaction which can be manifested during seismic shaking. Our conclusions are primarily based on the CPT data, since the CPT soundings provide a continuous profile of the underlying soils. The SPT data from the borings were utilized to verify the CPT data. Conclusions and recommendations regarding the effects of liquefaction are presented in Section 6.2.

- **Loss of Bearing:**

  Liquefaction can potentially cause foundation bearing failure due to ground softening and near-failure in bearing. Based on the removal recommendations presented in this report, Alta anticipates that the potential for loss of bearing will be minimal.

- **Lateral Spreading:**

  The lateral displacement of surficial blocks of sediment can occur as a result of liquefaction in a subsurface layer. The most pervasive forms of lateral spreading typically involve sites located near a "free-face" (large slopes, channels, etc.), however, it has been noted that lateral spreading can occur on sites with gently sloping (1% or more) ground, such as the subject site.

  Determination of the potential for lateral spread is based on the presence of potentially liquefiable soil layers underneath the structures, the presence of lateral confinement, and various analyses such as empirical modeling. Bartlett, Hansen and Youd (2002) states that sites underlain by soils with $(N1)_{60}$ values 15 and greater do not experience significant displacements from earthquakes with magnitudes less than 8. Based on correlations between $(N1)_{60}$ values and CPT data, the majority of the existing soils 10-feet below the existing ground surface with liquefaction potential as determined in our analysis (Appendix D), have an $(N1)_{60}$ value greater than 15. As such, based on the $(N1)_{60}$ values and the recommended remedial grading (Section 6.1.2.1), conducting the recommended removals and utilizing post-tension slabs can reduce the potential for lateral spreading to affect the proposed structures to an acceptable level of risk as defined by the State of California.

  As noted in Section 6.1.2.2, unsuitable soil removals may not reach the recommended ten (10) foot minimum if saturated conditions/groundwater are encountered. The project geotechnical consultant should review lateral spread conditions with respect to achievable removals as the design progresses. Measuring groundwater levels prior to grading operations would be useful in determining the achievable (with conventional grading methodology) removal depths.

- **Settlement:**

  Settlement due to seismic shaking can occur as a result of both liquefaction of saturated sediments or rearrangement of dry sand particles. Our settlement analysis was performed utilizing CPT data, verified by the SPT data, to analyze the potential amount of settlement. A description of Alta's analysis and calculations are presented in Appendix D of this report. A groundwater level of 5 feet below existing ground surface was assumed. Due to the continuous profile provided by the CPT data, our analysis was controlled by that data. In summary, the analysis showed that the amount of settlement due to liquefaction varies but can be as much as 3.7 inches.

- **Flow Failure:**

  Due to the relatively flat nature of the site, and the relatively horizontal deposition of the underlying deposits, the potential for flow failure onsite is considered low.

4.5.3 Surface Rupture

Surface rupture is a break in the ground surface during or as a consequence of seismic activity. Based on the distance to the nearest mapped active fault and our review of historic aerial photographs (HistoricAerials.com, 2015), the potential for surface rupture at the site may be considered remote.

4.5.4 Dry Sand Settlement

Dry sand settlement is the process of non-uniform settlement of the ground surface during a seismic event. Portions of the younger alluvium above the groundwater table may be subject to dry sand settlement. However, upon completion of the recommended unsuitable soil removals (Section 6.1.2), the potential for this type of settlement is anticipated to be minimal.

4.S.S Seismically Induced Landsliding

Due to a lack of slopes within or around the property seismically induced landsliding is not anticipated to pose a danger to the site.

S.0 ENGINEERING PROPERTIES AND ANALYSIS

S.1 Materials Properties

Presented herein is a general discussion of the engineering properties of the onsite materials that will be encountered during construction of the proposed project. Descriptions of the soil (Unified Soil Classification System) and in-place moisture/density results are presented on the boring logs in Appendices B-1 and B-2.

S.1.1 Excavation Characteristics

Based on the data provided from the previous subsurface investigations, it is our opinion that the majority of the on-site materials possess favorable excavation characteristics. Utility trenches deeper than 10 feet below the existing ground surface may encounter groundwater/saturated conditions.

S.1.2 Hydro-Consolidation

Hydro-consolidation is the effect of introducing water into soil that is prone to collapse. Upon loading and initial wetting, the soil structure and apparent strength are altered resulting in almost immediate settlement. That settlement can have adverse impacts on engineered structures, particularly in areas where it is manifested differentially. Differential settlements are typically associated with differential wetting, irregularities in the subsurface soil conditions, or irregular loading patterns.

Based on a review of the previous testing conducted by Converse (2003), upon completion of the unsuitable soil removals recommended in

Section 6.1.2, the potential for hydro-collapse to occur at the site is anticipated to be minimal and within foundation design tolerances.

5.1.3 Compressibility

The undocumented artificial fill and upper portions of the younger and older alluvium onsite are considered compressible and unsuitable to support the proposed improvements. Removal recommendations are presented in Section 6.1.2.

5.1.4 Shear Strength Characteristics

The values presented in Table 5-1 are based on previous laboratory testing (Appendices C and C-1) and our previous experience in the area.

TABLE 5-1
Shear Strength Characteristics

Geologic Unit	Cohesion, C (psf)	Friction Angle, ϕ (degrees)
Engineered Artificial Fill	200	30
Older Alluvium (Qoa)	100	30

5.1.S Expansion Potential

Based on the soil types encountered during the previous investigations and our previous experience with similar soil types, it is anticipated that the majority of materials onsite are "very low" to "low" in expansion potential (0≤EI≤50) when tested per ASTM D: 4829, although some "medium" expansion material may be present.

5.1.6 Earthwork Adjustments

The values presented in Table 5-2 are deemed appropriate for estimating purposes and may be used in an effort to balance earthwork quantities. As is the case with every project, contingencies should be made to adjust the earthwork balance when grading is in-progress and actual conditions are better defined. Subsidence of 0.1 feet for every ten (10) feet of fill placed over the younger alluvium should be anticipated.

TABLE 5-2 Earthwork Adjustment Factors		
Geologic Unit	**Adjustment Factor Range**	**Recommended Average**
Undocumented artificial fill	Shrink 18 to 20%	18%
Younger Alluvium	Shrink 9 to 11%	10%
Older alluvium	Shrink 5 to 7%	6%

5.1.7 Chemical Analyses

Chemical testing was performed during the previous investigation (Converse, 2003) on a sample of material underlying the proposed site. Soluble sulfate test results indicate that the soluble sulfate concentrations of the soils tested are classified as negligible per ACI 318-11 per the 2013 CBC (Category S0). Resistivity testing indicates that the soils are "mildly corrosive" to buried metals (per Romanoff, 1989). Negligible chloride concentrations were detected onsite.

5.1.8 Pavement Support Characteristics

The onsite soils can be expected to provide moderate to good pavement support characteristics. R-value testing was conducted during the previous investigation (Zeiser Kling, 2005), the R-values of 40 to 50 were produced by the majority of onsite earth materials. Specific testing should be conducted upon completion of grading and be used as a basis for design of pavement.

5.2 Engineering Analysis

Presented below is a general discussion of the engineering analysis methods that were utilized to develop the conclusions and recommendations presented in this report.

5.2.1 Bearing Capacity and Lateral Earth Pressures

Ultimate bearing capacity values were obtained using the graphs and formula presented in NAVFAC DM-7.1. Allowable bearing was

determined by applying a factor of safety of at least 3 to the ultimate bearing capacity. Static lateral earth pressures were calculated using Rankine methods for active and passive cases. If it is desired to use Coulomb forces, a separate analysis specific to the application can be conducted.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on Alta's findings during our subsurface investigation, the previous field investigations, the previous laboratory test results, our staff's previous experience in the area, and a review of the proposed parcel map, it is Alta's opinion that the development of the site is feasible from a geotechnical perspective. Presented below are recommendations that should be incorporated into site development and construction plans.

6.1 General Earthwork Recommendations

All grading shall be accomplished under the observation and testing of the project geotechnical consultant in accordance with the recommendations contained herein and the County of Riverside criteria.

6.1.1 Site Preparation

Vegetation, construction debris, manure, and other deleterious materials are unsuitable as structural fill material and should be disposed of off-site prior to commencing grading/construction.

6.1.2 Unsuitable Soil Removals

Presented below are the unsuitable soil removal recommendations for the onsite geologic units which should be accomplished prior to the placement of engineered fill or improvements. Removal bottoms should be observed by the Project Geotechnical Consultant to make a final determination that suitable, competent soils have been exposed. Removals should be completed as per Plate G-1 and G-2 (Appendix F).

6.1.2.1 Artificial Fill-Undocumented (map symbol afu)

Artificial fills are found throughout the site, as shown on the enclosed Plate 1. All undocumented artificial fill onsite should be removed and recompacted to project specifications.

6.1.2.2 Younger Alluvium (map symbol Qya)

Due to the potential for liquefaction (as discussed in Sections 4.5.2 and 6.3), it is recommended to remove the upper portions of the younger alluvium at least ten (10) feet below existing grade. If saturated alluvium/groundwater is encountered above the ten (10) foot minimum, removal operations may cease at that point, although the project geotechnical consultant should review the liquefaction calculations to determine if additional recommendations are required to support the proposed improvements (See Section 4.5.2).

6.1.2.3 Older Alluvium (map symbol Qoa)

The upper three (3) feet of the older alluvium is highly weathered and not suitable for the support of compacted fill. As such, this material should be removed and recompacted to project specifications prior to the placement of engineered fill. Per the County of Riverside requirements, removal bottoms within the older alluvium should be tested to determine that the exposed soils have a relative compaction of 85% of the laboratory maximum density (per ASTM test method D-1557). Both observations and tests must be accomplished to determine that suitable bottoms have been exposed.

6.1.3 Over-excavation

Lots should be underlain by a minimum of three (3) feet of compacted fill. As such, cut lots and the cut portion of transition lots should be over-excavated a minimum of three (3) feet in areas where the recommended removals do not provide the minimum amount of compacted fill. Over-excavations should be observed and approved by the Project Geotechnical Consultant in the field during grading.

6.1.4 Compaction Standards

All fill and processed natural ground shall be compacted to a minimum relative compaction of 90 percent, as determined by ASTM Test Method: D-1557. Fill material should be moisture conditioned to optimum moisture or above, and as generally discussed in Alta's Earthwork Specification Section presented in Appendix E. Compaction shall be achieved with the use of sheepsfoot rollers or similar kneading type equipment. Mixing and moisture conditioning will be required in order to achieve the recommended moisture conditions.

6.1.5 Groundwater/Seepage

The previous investigations indicated the groundwater was as high as seven (7) feet below the existing ground surface. The unsuitable soil removal recommendations presented in Section 6.1.2, are intended to limit the impact of groundwater on the grading operations. Care should be taken by the contractor to not exceed the recommended removal depths or else stabilization of the bottoms (utilizing crushed rock or geogrid) may be required.

Depending on the depth of utilities, groundwater may be encountered during onsite construction.

6.1.6 Documentation of Removals

All removal/overexcavation bottoms should be observed and approved by the project Geotechnical Consultant prior to fill placement. Removal bottoms and undercuts should be surveyed after approval by the geotechnical consultant prior to the placement of fill. Staking should be provided in order to verify undercut locations and depths.

6.1.7 Treatment of Removal Bottoms

At the completion of removals/over-excavation, the exposed removal bottom should be ripped to a minimum depth of eight inches, moisture-conditioned to above optimum moisture content and compacted in-place to the project standards. If saturated soils are encountered during removal operations, stabilization of the removal bottom may be required prior to fill placement. Typical stabilization measures include the placement of crushed rock, geotextiles, or soil cement.

6.1.8 Fill Placement

After removals, scarification, and compaction of in-place materials are completed, additional fill may be placed. Fill should be placed in eight-inch bulk maximum lifts, moisture conditioned to optimum moisture content or above, compacted and tested as grading/construction progresses until final grades are attained.

6.1.9 Benching

Where the natural slope is steeper than 5-horizontal to 1-vertical and where designated by the project Geotechnical Consultant, compacted fill material shall be keyed and benched into competent bedrock or firm artificial fill.

6.1.10 Mixing

Mixing of materials may be necessary to prevent layering of different soil types and/or different moisture contents. The mixing should be accomplished prior to and as part of compaction of each fill lift.

6.1.11 Import Soils

Import soils, if necessary, should consist of clean, low expansive, structural quality, compactable materials similar to the on-site soils and should be free of trash, debris or other objectionable materials. The project Geotechnical Consultant should be notified not less than 72 hours in advance of the locations of any soils proposed for import. Import sources should be sampled, tested, and approved by the project Geotechnical Consultant at the source prior to the importation of the soils to the site. The project Civil Engineer should include these requirements on plans and specifications for the project.

6.1.12 Fill Slope Construction

Fill slopes should be overfilled to an extent determined by the contractor, but not less than two (2) feet measured perpendicular to the slope face, so that when trimmed back to the compacted core a minimum 90 percent relative compaction is achieved.

Compaction of each fill lift should extend out to the temporary slope face. Back-rolling during mass filling at intervals not exceeding four (4) feet in height is recommended, unless more extensive overfilling is undertaken.

As an alternative to overfilling, fill slopes may be built to the finish slope face in accordance with the following recommendations:

1. Compaction of each fill lift should extend to the face of the slopes.

2. Back-rolling during mass grading should be undertaken at intervals not exceeding four (4) feet in height. Back-rolling at more frequent intervals may be required.
3. Care should be taken to avoid spillage of loose materials down the face of any slopes during grading. Spill fill will require complete removal prior to compaction, shaping, and grid rolling.
4. At completion of mass filling, the slope surface should be watered, shaped, and compacted by track walking with a D-8 bulldozer, or equivalent, such that compaction to project standards is achieved to the slope face.

Proper seeding and planting of the slopes should follow as soon as practical to inhibit erosion and deterioration of the slope surfaces. Proper moisture control will enhance the long-term stability of the finish slope surface.

6.1.13 Utility Trenches

6.1.13.1 Excavation

Utility trenches should be supported, either by laying back excavations or shoring, in accordance with applicable OSHA standards. In general, existing site soils are classified as Soil Types "B'" and "C" per OSHA standards. Upon completion of the recommended removals and recompaction, the artificial fill will be classified as Soil Type "B". The Project Geotechnical Consulting should be consulted if geologic conditions vary from what is presented in this report. As noted in Section 6.1.7, groundwater may be encountered in utility line excavations. Flatter backcuts or shoring may be required depending on the depth of the utility lines.

6.1.13.2 Backfill

Trench backfill should be compacted to at least 90 percent of maximum dry density as determined by ASTM D-1557. Onsite soils will not be suitable for use as bedding material but will be suitable for use in backfill provided oversized materials are removed. No surcharge loads should be imposed above excavations. This includes spoil piles, lumber, concrete trucks, or other construction materials and equipment. Drainage above excavations should be directed away from the banks. Care should be taken to avoid saturation of the soils. Compaction should be accomplished by mechanical means. Jetting of native soils will not be acceptable.

6.1.14 Backcut Stability

Temporary backcuts, if required during unsuitable soil removals, should be made no steeper than 1:1 without review and approval of the geotechnical consultant. Flatter backcuts may be necessary where geologic conditions dictate and where minimum width dimensions are to be maintained.

Care should be taken during remedial grading operations in order to minimize risk of failure. Should failure occur, complete removal of the disturbed material will be required.

In consideration of the inherent instability created by temporary construction backcuts for stabilization fills and removals, it is imperative that grading schedules are coordinated to minimize the unsupported exposure time of these excavations. Once started these excavations and subsequent fill operations should be maintained to completion without

intervening delays imposed by avoidable circumstances. In cases where five-day workweeks comprise a normal schedule, grading should be planned to avoid exposing at-grade or near-grade excavations through a non-work weekend. Where improvements may be affected by temporary instability, either on or offsite, further restrictions such as slot cutting, extending work days, implementing weekend schedules, and/or other requirements considered critical to serving specific circumstances may be imposed.

6.2 Slope Stability

The following is a preliminary discussion of slope stability onsite. It is anticipated that engineered fill slopes on the project will be designed at a slope ratio of 2:1 (horizontal:vertical) or flatter to vertical heights of up to roughly 20 feet. Fill slopes up to that height, when properly engineered and constructed with onsite materials, are expected to be grossly stable as designed. Keys should be constructed at the toe of all fill slopes towing on existing or cut grade. Fill keys should have a minimum width equal to fifteen (15) feet or one-half (1/2) the height of the ascending slope, whichever is greater.

It is anticipated that cut slopes within alluvium onsite will need to be replaced with stabilization fills as generally depicted on Plates G-8, G-9 and G-10 (Appendix F). Proposed cut slopes within the older alluvium should be analyzed by the project geotechnical consultant. If adverse bedding, fracture or joint patterns, or other unstable geological conditions are exposed, the cut slopes may need to be replaced with a drained stabilization fill.

There is an existing slope in older alluvium along the northwestern portion of the project. Based on previous calculations (Zeiser, 2005) and our review of the available data, this slope should be grossly stable in its current state. As plans

progress, the stability of this slope should be reviewed with respect to the proposed design.

For fill over cut slopes, the cut slope portion should be evaluated prior to the placement of fill. Fill over cut slopes should be constructed in general conformance with Plate G-7 (Appendix F).

Alta recommends that rough grading plans be reviewed for issues regarding cut slope and fill-over-cut slope stability and remediation. Additional analysis and recommendations will be required as the project progresses and grading plans become available.

6.3 Liquefaction

As discussed in Section 4.5.2 of this report, there is a potential for liquefaction to occur at the site during seismic shaking. More specifically, liquefaction could cause differential settlement and/or lateral spreading at the site. Alta's calculations indicate that as much as 3.7 inches of vertical settlement may occur. Typically, half to two thirds of that settlement should be considered differential (California Division of Mines and Geology, 2008, Special Publication 117a). For lightly-loaded, well-constructed structures underlain by a non-liquefiable layer over the liquefiable layers, such as will be developed at the site, the ultimate differential settlement across the structure may be more limited (Idriss and Boulinger, 2008). In consideration of the proposed removal and recompaction of the upper soils, and the relatively uniform thickness of the liquefiable layers under an individual residential structure, it is Alta's opinion that a differential settlement of 2-inches in 40 feet can be utilized in the design.

Based on the potential for liquefaction to occur onsite, Alta recommends, that in addition to the recommended removals, the proposed structures utilize a post-tensioned slab system.

Conducting unsuitable soil removals and utilizing post-tensioned slabs are intended to reduce the effects of liquefaction on the structures to acceptable levels of risk. However, settlement and lateral spread can still affect other improvements onsite, such as pavement and utilities. Further discussion on this topic is presented in Section 7.11.

6.4 Infiltration

Infiltration testing has not been conducted onsite. However, based on the relatively shallow groundwater, liquefaction potential, recommended unsuitable soil removals, and the density of the older alluvium, utilizing infiltration-type storm water systems would be difficult for the site. Further review of WQMP systems should be conducted by the project geotechnical consultant as the design for the site progresses.

7.0 DESIGN CONSIDERATIONS

7.1 Structural Design

For the residential developments, it is anticipated that a one to two-story, wood-frame and masonry residential structure with slab on-grade and shallow foundations will be constructed. Specific foundation design recommendations should be provided for other development types once plans are available.

Upon the completion of rough grading, finish grade samples should be collected and tested in order to provide specific recommendations as they relate to the individual building pad. These test results and corresponding design recommendations should be presented in a final rough grading report. Final slab and foundation design recommendations should be made based upon specific structure sitings, loading conditions, and as-graded soil conditions.

Structures underlain by younger alluvium should utilize a post-tensioned slab (Section 6.2). Structures underlain by older alluvium may utilize either conventional or post-tensioned slabs.

It is anticipated that the majority of onsite soils will possess "very low" to "low" expansion potential when tested in general accordance with ASTM Test Method D: 4829, although some medium expansive soils may be present.

7.1.1 Foundations

Foundations may be preliminary designed based on the values presented in Table 7-1 below.

Table 7-1
Foundation Design Parameters*

Allowable Bearing	2000 lbs/ft^2 (assuming a minimum footing width and embedment of 12 inches).
Lateral Bearing	250 lbs/ft^2 at a depth of 12 inches plus 250 lbs/ft^2 for each additional 12 inches of embedment to a maximum of 2000 lbs/ft^2
Sliding Coefficient	0.35
Differential Settlement	Dynamic: Differential = 2 inches in 40 feet (Structures Underlain by Younger Alluvium) Differential = ½ inch in 40 feet (Structures Underlain by Older Alluvium) Static: Differential = 1/2 inch in 40 feet

*These values may be increased as allowed by Code to resist transient loads such as wind or seismic. Building code and structural design considerations may govern depth and reinforcement requirements and should be evaluated.

7.1.2 Post-Tensioned Slabs/Foundation Design Recommendations

Post-tensioned slabs for the project may be preliminarily designed utilizing the parameters presented in Tables 7-1 and 7-2. The parameters presented herein are based on methodology provided in the Design of Post-Tensioned Slabs-On-Ground, Third Edition, by the Post-Tensioning Institute, in accordance with the 2013 CBC.

TABLE 7-2
POST-TENSION SLAB DESIGN PARAMETERS

Category	Expansion Potential	Minimum Embedment	Edge Lift		Center Lift	
			Em (ft)	Ym (inch)	Em (ft)	Ym (inch)
I	Very Low to Low	12 inches*	5.4	0.61	9.0	0.26
II	Medium	18 inches*	5.2	1.10	9.0	0.46

Slab Subgrade Moisture	
Category I	Minimum 110% of optimum moisture to a depth of 12 inches prior to pouring concrete
Category II	Minimum 120% of optimum moisture to a depth of 12 inches prior to pouring concrete

Embedment*

The minimum footing embedments presented herein are based on expansion indexes. The structural engineer should determine minimum embedments based on the number of floors supported by the footings, the structural loading, and the requirements of the latest California Building Code. If mat slabs are utilized, alternate embedment depths can be provided.

Moisture Barrier

A moisture barrier should be provided in accordance with the recommendations presented in Section 7.2

The parameters presented herein are based on procedures presented in the Design of Post-Tensioned Slabs-On-Ground, Third Edition. No corrections for vertical barriers at the edge of the slab, or for adjacent vegetation have been assumed. The design parameters are based on o Constant Suction Value of 3.9 pF.

7.1.3 Conventional Foundation System

Based on the onsite soils conditions and information supplied by the CBC 2013, conventional foundation systems may be designed in accordance with Tables 7-1 and 7-3.

TABLE 7-3
CONVENTIONAL FOUNDATION DESIGN PARAMETERS

Expansion Potential	***Very Low to Low***	***Medium***
Soil Category	I	II
Design Plasticity Index	12	20
Minimum Footing Embedment	12 inches*	18 inches*
*The minimum footing embedments presented herein are based on expansion indexes. The structural engineer should determine minimum embedments based on the number of floors supported by the footings, the structural loading, and the requirements of the latest California Building Code.		
Minimum Footing Width	12-inches-The structural engineer should determine the minimum footing width based on loading and the latest California Building Code.	
Minimum Footing Reinforcement	No. 4 rebar, one (1) on top, one (1) on bottom	No. 4 rebar, two (2) on top, two (2) on bottom
Minimum Slab Thickness	4 inches (actual)	4 inches (actual)
Minimum Slab Reinforcement	No. 3 rebar spaced 18 inches on center, each way	No. 3 rebar spaced 15 inches on center, each way
Under-Slab Requirement	See Section 7.2	See Section 7.2
Slab Subgrade Moisture	Minimum of 110 percent of optimum moisture to a depth of 12 inches prior to placing concrete.	Minimum of 120 percent of optimum moisture to a depth of 12 inches prior to placing concrete.
Footing Embedment Adjacent to Swales and Slopes	If exterior footings adjacent to drainage swales are to exist within five (5) feet horizontally of the swale, the footing should be embedded sufficiently to assure embedment below the swale bottom is maintained. Footings adjacent to slopes should be embedded such that at least five- (5) feet is provided horizontally from edge of the footing to the face of the slope.	
Garages	A grade beam reinforced continuously with the garage footings shall be constructed across the garage entrance, tying together the ends of the perimeter footings and between individual spread footings. This grade beam should be embedded at the same depth as the adjacent perimeter footings. A thickened slab, separated by a cold joint from the garage beam, should be provided at the garage entrance. Minimum dimensions of the thickened edge shall be six (6) inches deep. Footing depth, width and reinforcement should be the same as the structure. Slab thickness, reinforcement and under-slab treatment should be the same as the structure.	

7.2 Moisture Barrier

A moisture and vapor retarding system should be placed below the slabs-on-grade in portions of the structure considered to be moisture sensitive and should be capable of effectively preventing the migration of water and reducing the transmission of water vapor to acceptable levels. Historically, a 10-mil plastic membrane, such as Visqueen, placed between one to four inches of clean sand, has been used for this purpose. The use of this system or other systems can be considered, at the discretion of the designer, provided the system reduces the vapor transmission rates to acceptable levels.

7.3 Seismic Design

The following seismic design parameters are presented to be code compliant to the California Building Code (2013). The site has been identified as "D" site class in accordance with CBC, 2013, Table 1613.5.3 (1). Utilizing this information, the computer program USGS Seismic Design Maps Version 3.1.0 and ASCE 7-10 criterion, the spectral response accelerations are as follows.

Table 7-3
Seismic Design Parameters
Latitude 34.0005° N and Longitude -117.3942° W

Ss (period 0.2 sec)	1.500
SMs (period 0.2 sec)	1.500
SDs (period 0.2 sec)	1.000
S1 (period 1.0 sec)	0.600
SM1 (period 1.0 sec)	0.900
SD1 (period 1.0 sec)	0.600

These parameters should be verified by the structural engineer. Additional parameters should be determined by the structural engineer based on the Occupancy Category of the proposed structures.

7.4 Retaining Wall Design

Retaining walls should be founded on compacted fill and should be backfilled with granular soils that allow for drainage behind the wall. Foundations may be designed in accordance with the recommendations presented in Table 7-1, above. Unrestrained walls, free to rotate at least 0.001 radians, may be designed to resist lateral pressures imposed by a fluid with a unit weight determined in accordance with the Table 7-4 below. The table also presents design parameters for restrained (at-rest) retaining walls. These parameters may be used to design retaining walls that may be considered as restrained due to the method of construction or location (corner sections of unrestrained retaining walls).

TABLE 7-4
Equivalent Fluid Pressures for 90% Compacted Fill

Backfill	Active (psf/ft)	At-Rest (psf/ft)
Level	35	55

Per the requirements of the 2013 CBC, the seismic force acting on the retaining walls may be resolved utilizing the formula $19H^2$ lb/lineal ft (H=height of the wall). This force acts at approximately 0.67H above the base of the wall.

- Restrained retaining walls should be designed for "at-rest" conditions.
- The design loads presented in the above table are to be applied on the retaining wall in a horizontal fashion and as such friction between wall and retained soils should not be allowed in the retaining wall analyses.
- Additional allowances should be made in the retaining wall design to account for the influence of construction loads, temporary loads, and possible nearby structural footing loads.
- Select backfill should be granular, structural quality backfill with a Sand Equivalent of 20 or better and an ASCE Expansion Index of 20 or less. The backfill must encompass the full active wedge area; otherwise, the values presented in the Native Backfill column must be used for the design. Native

backfill should have an ASCE Expansion Index of 50 or less. The upper one foot of backfill should be comprised of native on-site soils (see Plate A).

- The wall design should include waterproofing (where appropriate) and backdrains or weep holes for relieving possible hydrostatic pressures. The backdrain should be comprised of a 4-inch perforated PVC pipe in a 1 ft. by 1 ft., ¾-inch gravel matrix, wrapped with a geofabric. The backdrain should be installed with a minimum gradient of 2 percent and should be outletted to an appropriate location. For subterranean walls this may include drainage by sump pumps.
- No backfill should be placed against concrete until minimum design strengths are achieved in compression tests of cylinders.

It should be noted that the passive resistance values presented in Table 7-1 are based on level conditions at the toe. Modified design parameters can be presented for retaining walls with descending slope conditions at the toe. Further, the allowable bearing presented in Table 7-1 is based on a level condition. Other conditions should be evaluated on a case by case basis.

7.5 Fence and Garden Walls

Block walls, if used, should be embedded a minimum of 2 feet below the lowest adjacent grade. In the vicinity of descending slopes, the foundations should be embedded to provide for a minimum distance of H/6 (where H is the height of the slope) from the face of the slope to the outside edge of the bottom of the footing (to a maximum of 20 feet).

Construction joints (not more than 20 feet apart) should be included in the block wall construction. Side yard walls should be structurally separated from the rear yard wall.

7.6 Footing Excavations

Soils from the footing excavations should not be placed in slab-on-grade areas unless properly compacted and tested. The excavations should be cleaned of all

loose/sloughed materials and be neatly trimmed at the time of concrete placement.

7.7 Exterior Slabs and Walkways

Exterior concrete slabs and walkways should be designed and constructed in consideration of the following recommendations.

7.7.1 Subgrade Compaction

The subgrade below exterior concrete slabs should be compacted to a minimum of 90 percent relative compaction as determined by ASTM Test Method: D 1557.

7.7.2 Subgrade Moisture

The subgrade below concrete slabs should be moisture conditioned to a minimum of 110 percent of optimum moisture content (low expansion) or 120 percent of optimum moisture (medium expansion) prior to concrete placement.

7.7.3 Concrete Slab Thickness

Concrete flatwork and driveways should be designed utilizing four-inch minimum thickness.

7.7.4 Concrete Slab Reinforcement

Utilization of reinforcement for flatwork and driveways is subject to a cost/benefit analysis. Reinforcement will decrease the amount of cracking that may occur in flatwork, however, planning for occasional repairs may be more cost effective. Utilizing closely spaced control joints is likely more cost-effective than utilizing reinforcement. The majority of the soils onsite are classified as very low to medium in expansion potential. Consideration should be given to reinforcing flatwork with irregular (non-square/rectangular) shapes.

7.7.5 Control Joints

Weakened plane joints should be installed on walkways at intervals of approximately eight feet (maximum) or less. Exterior slabs should be designed to withstand shrinkage of the concrete.

7.8 Concrete Design

As stated in Section 5.1.5, negligible concentrations of sulfates were detected in the onsite soils. Therefore, the use of sulfate resistant concrete is not required per ACI 318-11 at this time. Post-grading conditions should be evaluated and final recommendations made at that time.

7.9 Corrosion

Based on preliminary testing, the onsite soils are mildly corrosive to buried metal objects. Buried ferrous metals should be protected against the effects of corrosive soils in accordance with the manufacture's recommendations. Typical measures may include using non-corrosive backfill, protective coatings, wrapping, plastic pipes, or a combination of these methods. A corrosion engineer should be consulted if specific design recommendations are required by the improvement designer.

Per ACI 318-11, an exposure class of C1 would be applicable to metals encased in concrete (rebar in footings) due to being exposed to moisture from surrounding soils.

7.10 Pavement Design

Pavement sections for the proposed streets should be designed based on laboratory testing conducted on samples taken from the soil subgrade. Preliminarily, based on an assumed R-Value of 40 and a traffic index of 5.0, the streets may be designed utilizing a pavement section of 3-inches of asphalt over 6.0-inches of aggregate base. This section should be verified upon the completion of grading, based on R-Value testing.

Construction of the streets should be accomplished in accordance with the current criteria of the County of Riverside and under the observation and testing of the Project Geotechnical Consultant.

Prior to the placement of base material, the subgrade should be suitably moisture conditioned, processed and compacted to a minimum 95 percent of the laboratory maximum density (ASTM: D 1557) to at least twelve (12) inches below subgrade. After subgrade compaction, the exposed grade should then be "proof"-rolled with heavy equipment to ensure the grade does not "pump" and is verified as non-yielding. Aggregate base material should be placed on the compacted subgrade and compacted in-place to a minimum 95 percent of the laboratory standard obtained per ASTM: D 1557.

7.11 Improvement Design Recommendations

As noted in Section 6.2, there is a potential for liquefaction to occur in the underlying soils which may cause differential settlement and limited lateral spread. A combination of removals and structural design has been proposed to protect the structures onsite, however, other improvements, such as utility lines and street pavement may be affected by liquefaction. Consideration should be given to designing utility lines with flexible connections to assist in accommodating the potential settlement/lateral spread in accordance with applicable codes to provide safeguards against earthquake-induced movement.

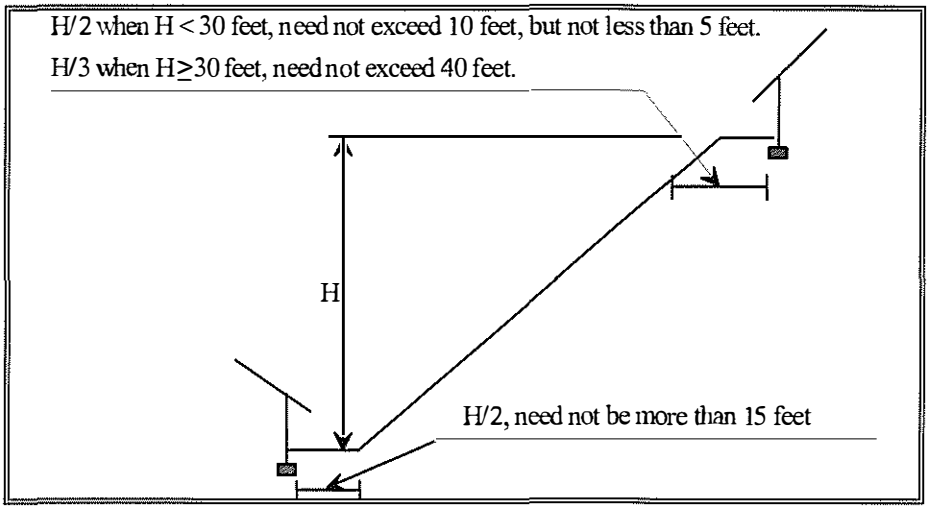
7.12 Site Drainage

Positive drainage away from the proposed structures should be provided and maintained. Roof, pad and lot drainage should be collected and directed away from the structures toward approved disposal areas through drainage terraces, gutters, down drains, and other devices. Design fine grade elevations should be maintained through the life of the structure or if design fine grade elevations are altered, adequate area drains should be installed in order to provide rapid

discharge of water, away from structures. Residents or Homeowner Associations should be made aware that they are responsible for maintenance and cleaning of all drainage terraces, down drains, and other devices that have been installed to promote site and structure drainage.

7.13 Deepend Footings and Setbacks

It is generally recognized that improvements constructed in proximity to properly constructed slopes can, over a period of time, be affected by natural processes including gravity forces, weathering of surficial soils and long term (secondary) settlement. Most building codes, including the California Building Code (CBC), require that structures be set back or footings deepened, where subject to the influence of these natural processes. For the subject site, where foundations for residential structures are to exist in proximity to slopes, the footings should be embedded to satisfy the requirements presented in the following figure.



Consideration of these natural processes should be undertaken in the design and construction of other improvements. Homeowners are advised to consult with qualified geotechnical engineers, designers, and contractors in the design and

construction of future improvements. Each lot and proposed improvement should be evaluated in relation to the specific site conditions, accounting for the hillside nature and specific soil conditions. Suggested homeowner and improvement considerations are provided in the Appendix of this report.

8.0 FUTURE PLAN REVIEWS

This report represents a geotechnical review of the parcel map. As the project design progresses, site specific geologic and geotechnical issues should be considered in the design and construction of the project. Consequently, future plan reviews may be necessary. These reviews may include reviews of:

- Grading Plans
- Foundation Plans
- Utility Plans

These plans should be forwarded to the project Geotechnical Consultant for review.

9.0 CLOSURE

9.1 Geotechnical Review

For the purposes of this report, multiple working hypotheses were established for the project, utilizing the available data and the most probable model is used for the analysis. Future information collected during the proposed grading operations is intended to evaluate the hypothesis and as such, some of the assumptions summarized in this report may need to be changed. Some modifications of the grading recommendations may become necessary, should the conditions encountered in the field differ from the conditions hypothesized in this report.

Plans and sections of the project specifications should be reviewed by Alta, to evaluate conformance with the intent of the recommendations contained in this report. If the project description or final design varies from that described in

herein, Alta must be consulted regarding the applicability of the recommendations contained herein and whether any changes are required. Alta accepts no liability for any use of its recommendations if the project description or final design varies and Alta is not consulted regarding the alterations.

9.2 Limitations

This report is based on the following: 1) the project as presented on the attached plan; 2) the information obtained from the subsurface investigation at the approximate locations indicated on the plan included herein; 3) laboratory test results; and 4) from the information presented in the referenced reports. The findings and recommendations are based on the results of the subsurface investigation, laboratory testing, and office analysis combined with an interpolation and extrapolation of conditions between and beyond the subsurface excavation locations. However, the materials adjacent to or beneath those observed may have different characteristics than those observed and no precise representations are made as to the quality or extent of the materials not observed. The findings are also based on information from previous investigations/geotechnical reports contained in the references. The results reflect an interpretation of the direct evidence obtained. Work performed by Alta has been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical profession currently practicing in the same locality under similar conditions. No other representation, either expressed or implied, and no warranty or guarantee is included or intended.

The recommendations presented in this report are based on the assumption that an appropriate level of field review will be provided by a geotechnical consultant who is familiar with the design and site geologic conditions. That field review shall be sufficient to confirm that geotechnical and geologic conditions exposed

during grading are consistent with the geologic representations and corresponding recommendations presented in this report.

The conclusions and recommendations included in this report are applicable to the specific design of this project as discussed in this report. They have no applicability to any other project or to any other location and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of Alta.

Alta has no responsibility for construction means, methods, techniques, sequences, procedures, safety precautions, programs in connection with the construction, acts or omissions of the CONTRACTOR or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the final design drawings and specifications.

APPENDIX A

REFERENCES

APPENDIX A

Selected References

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APPENDIX B

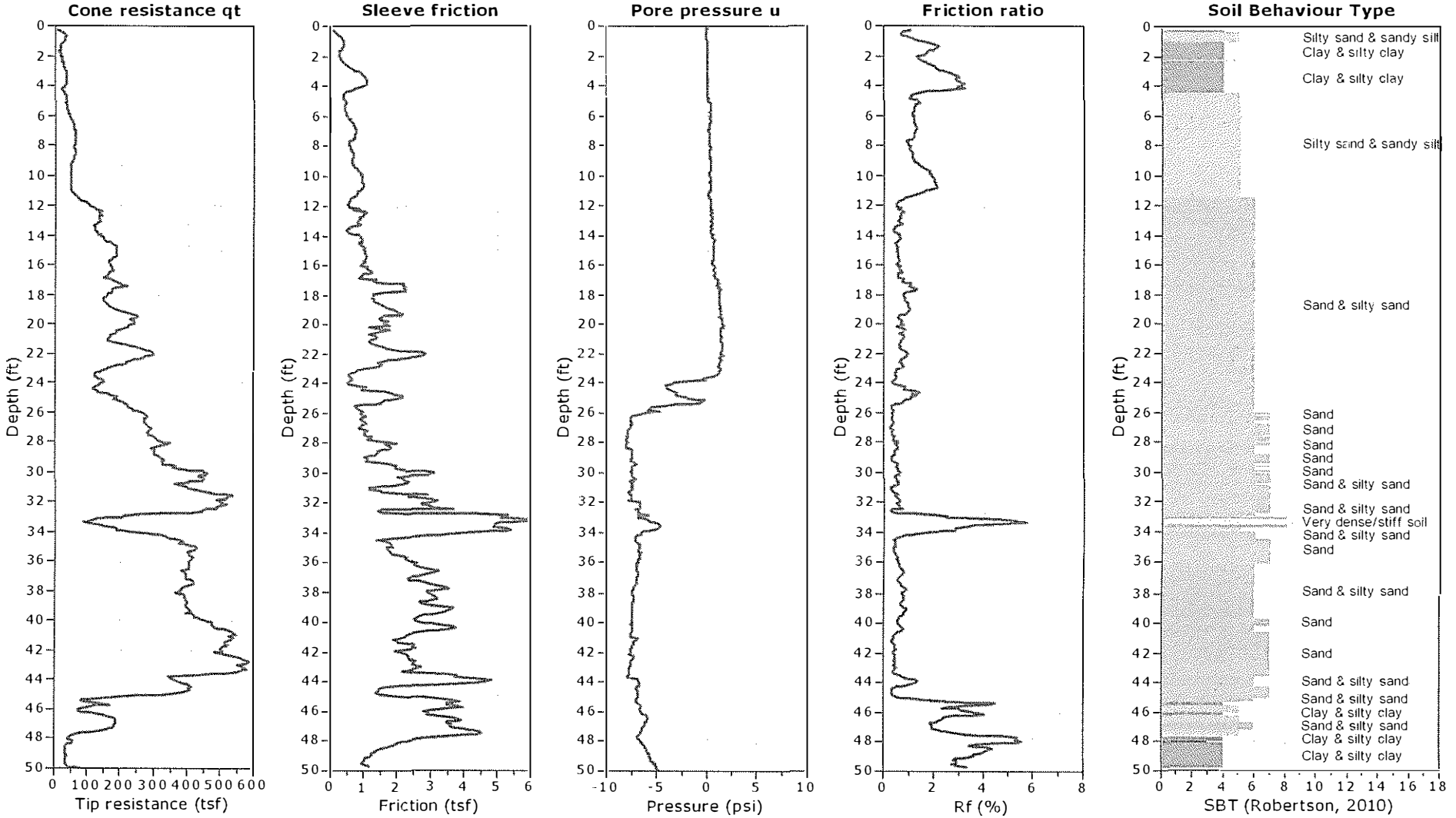
Subsurface Investigation

Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT: CPT-1

Project: **Alta California Geotechnical, Inc./Emerald Ranch**
Location: **Hall Ave & 30th St Rubidoux, CA**

Total depth: 50.12 ft, Date: 6/2/2015
Cone Type: Vertek

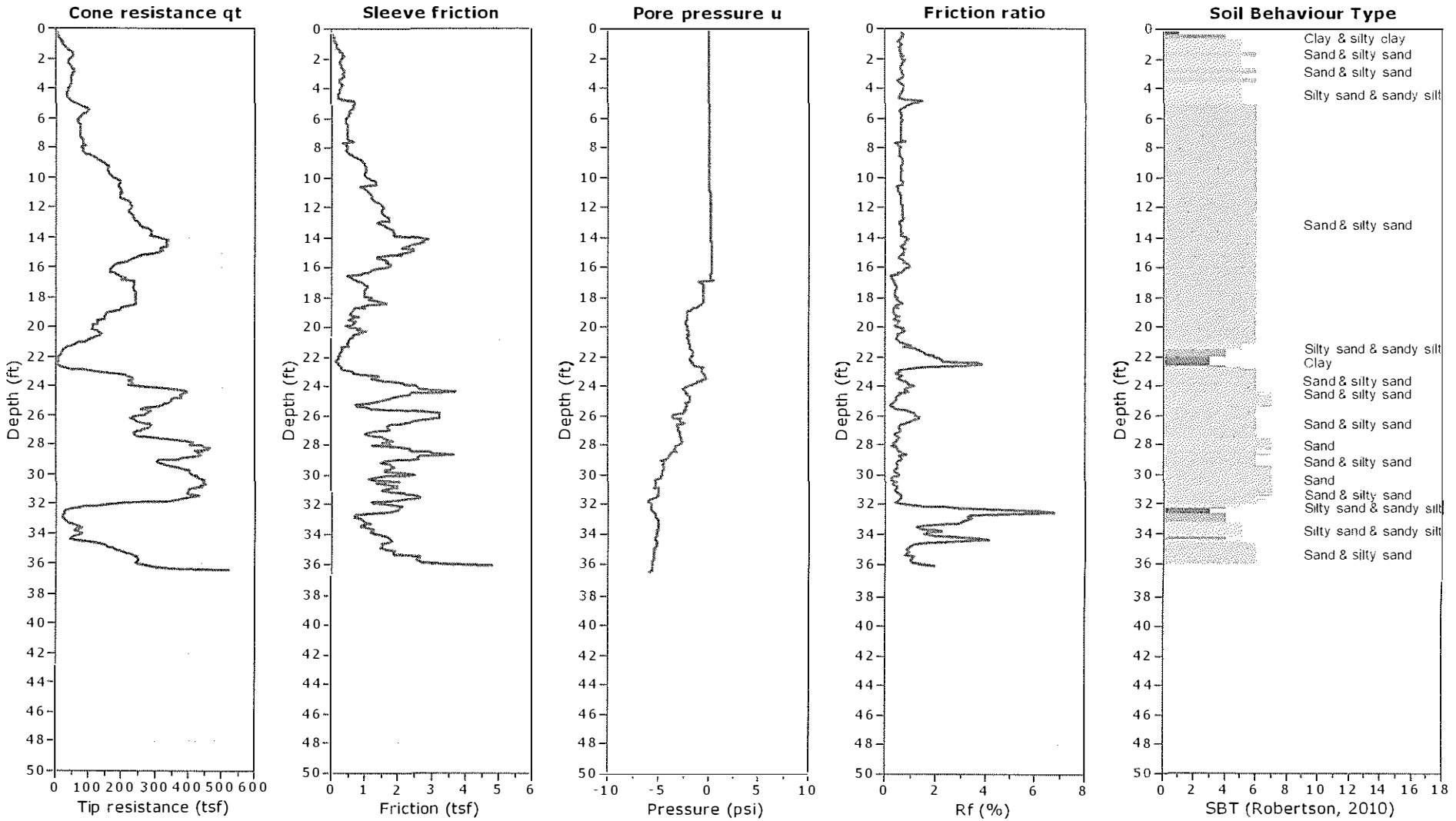


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CPT: CPT-2

Project: **Alta California Geotechnical, Inc./Emerald Ranch**
Location: **Hall Ave & 30th St Rubidoux, CA**

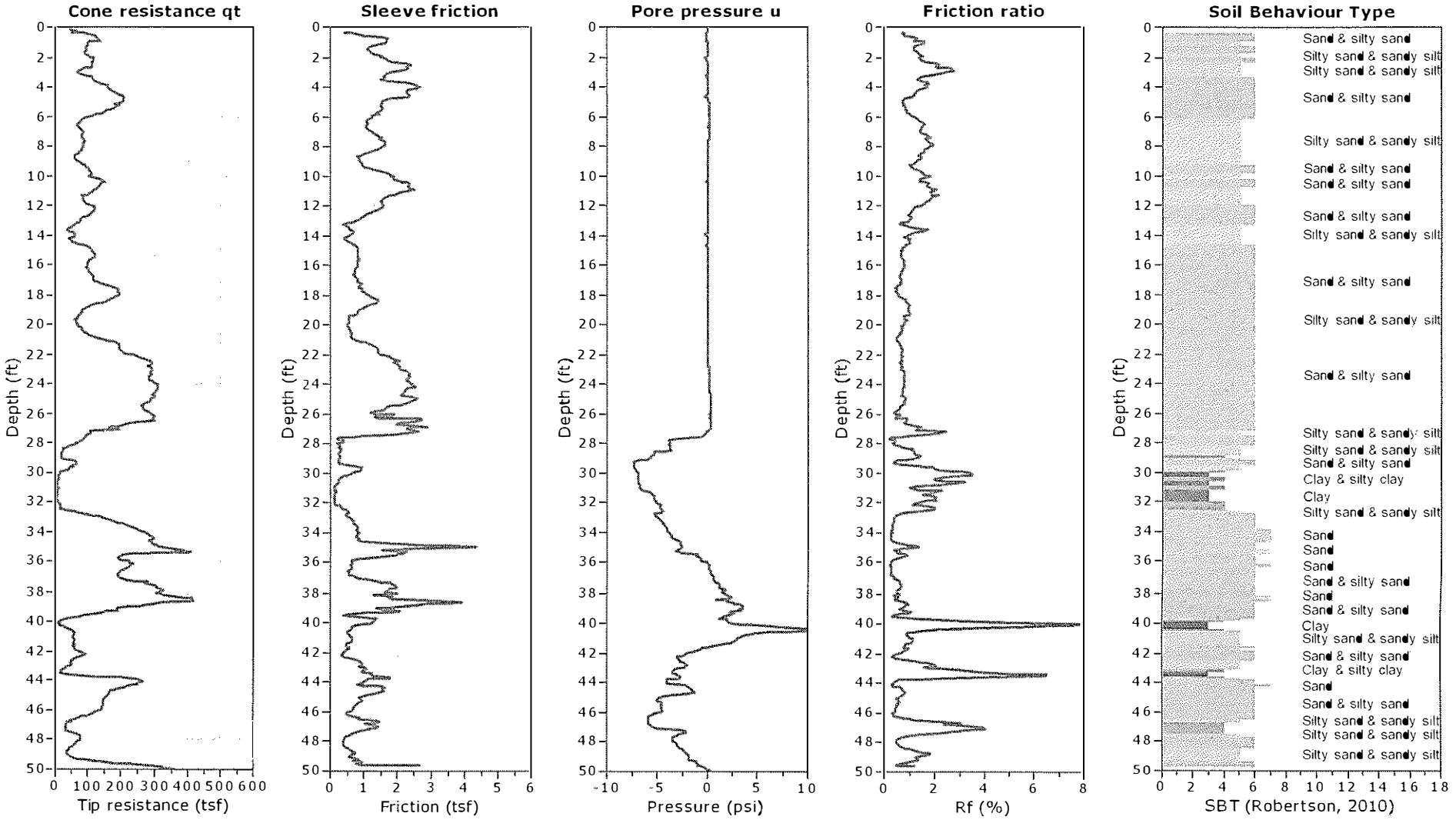
Total depth: 36.41 ft, Date: 6/2/2015
Cone Type: Vertek



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www.kehoetesting.com

Project: **Alta California Geotechnical, Inc./Emerald Ranch**
Location: **Hall Ave & 30th St Rubidoux, CA**

CPT: CPT-3
Total depth: 50.02 ft, Date: 6/2/2015
Cone Type: Vertek

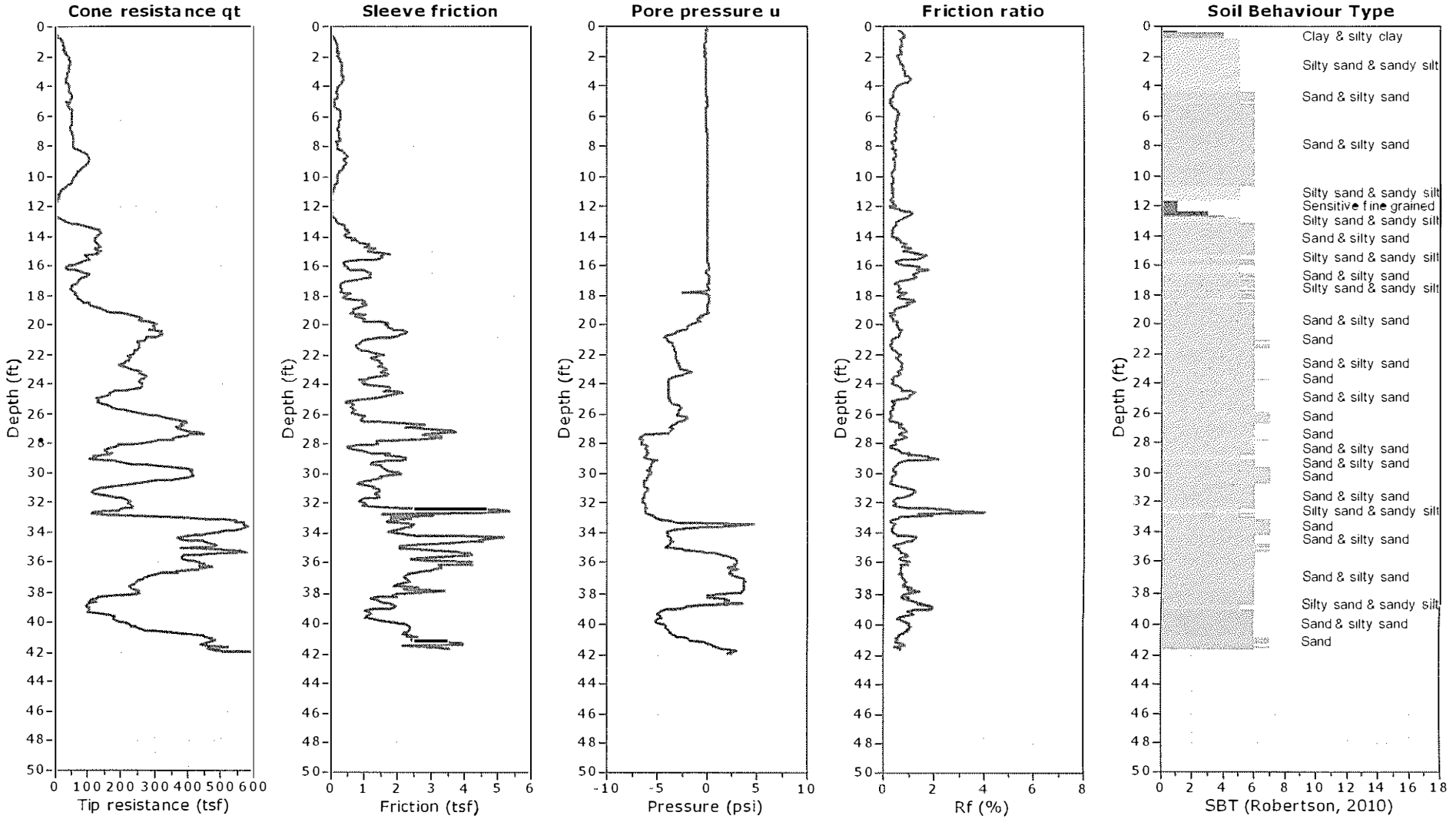


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CPT: CPT-4

Project: **Alta California Geotechnical, Inc./Emerald Ranch**
Location: **Hall Ave & 30th St Rubidoux, CA**

Total depth: 41.96 ft, Date: 6/2/2015
Cone Type: Vertek

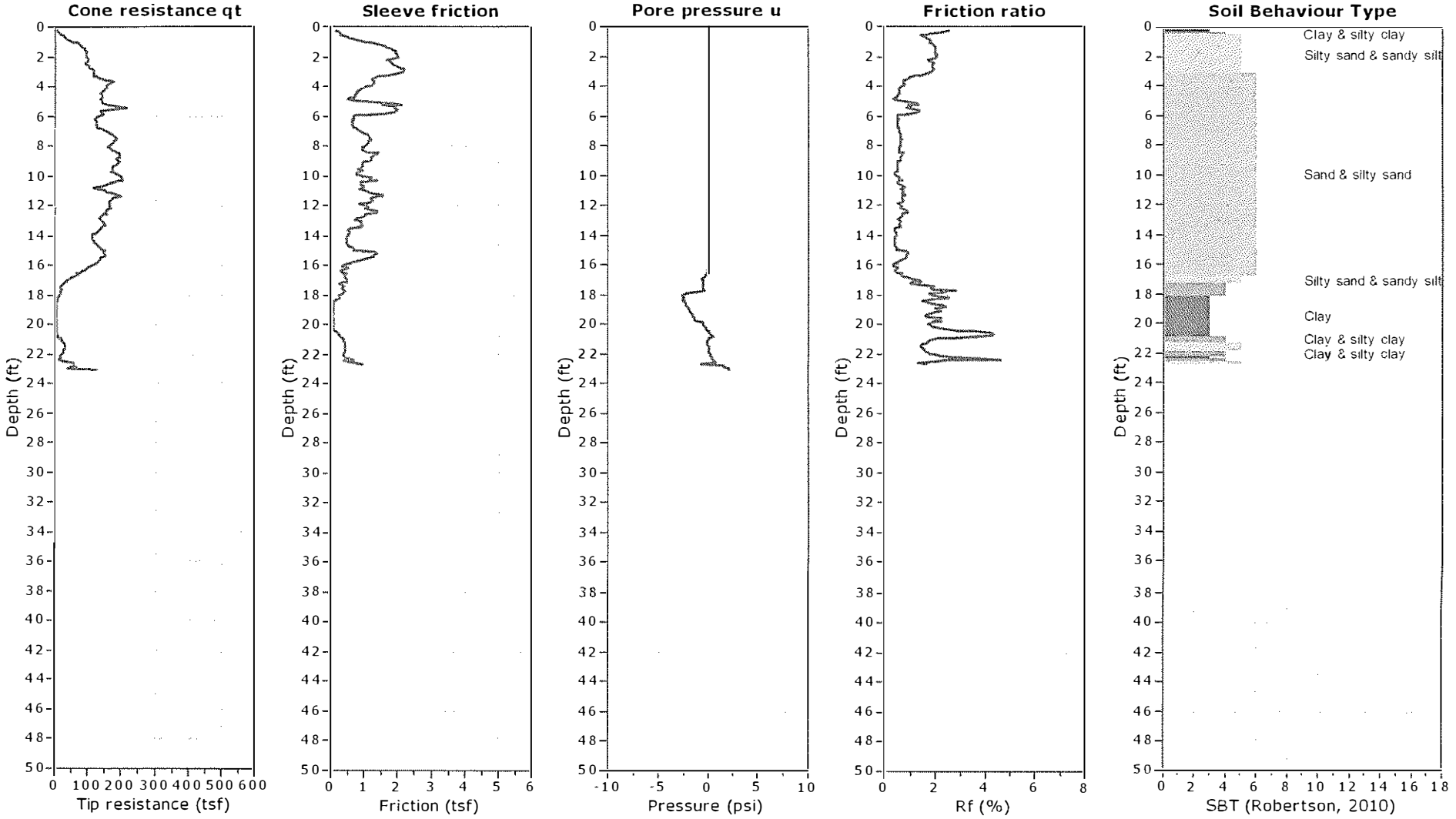


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CPT: CPT-5

Project: **Alta California Geotechnical, Inc./Emerald Ranch**
Location: **Hall Ave & 30th St Rubidoux, CA**

Total depth: 23.08 ft, Date: 6/2/2015
Cone Type: Vertek

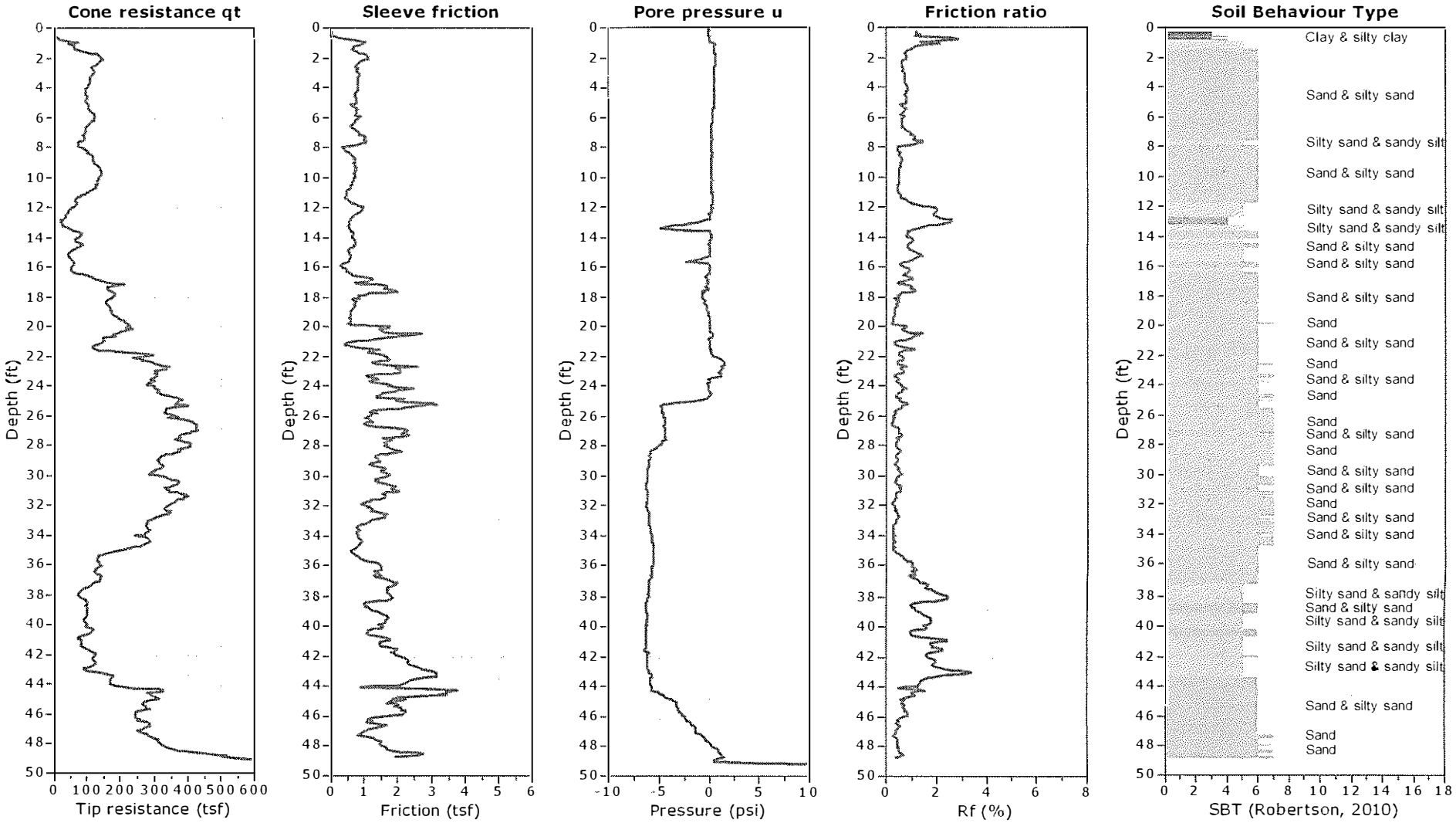


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CPT: CPT-6

Project: **Alta California Geotechnical, Inc./Emerald Ranch**
Location: **Hall Ave & 30th St Rubidoux, CA**

Total depth: 49.18 ft, Date: 6/2/2015
Cone Type: Vertek

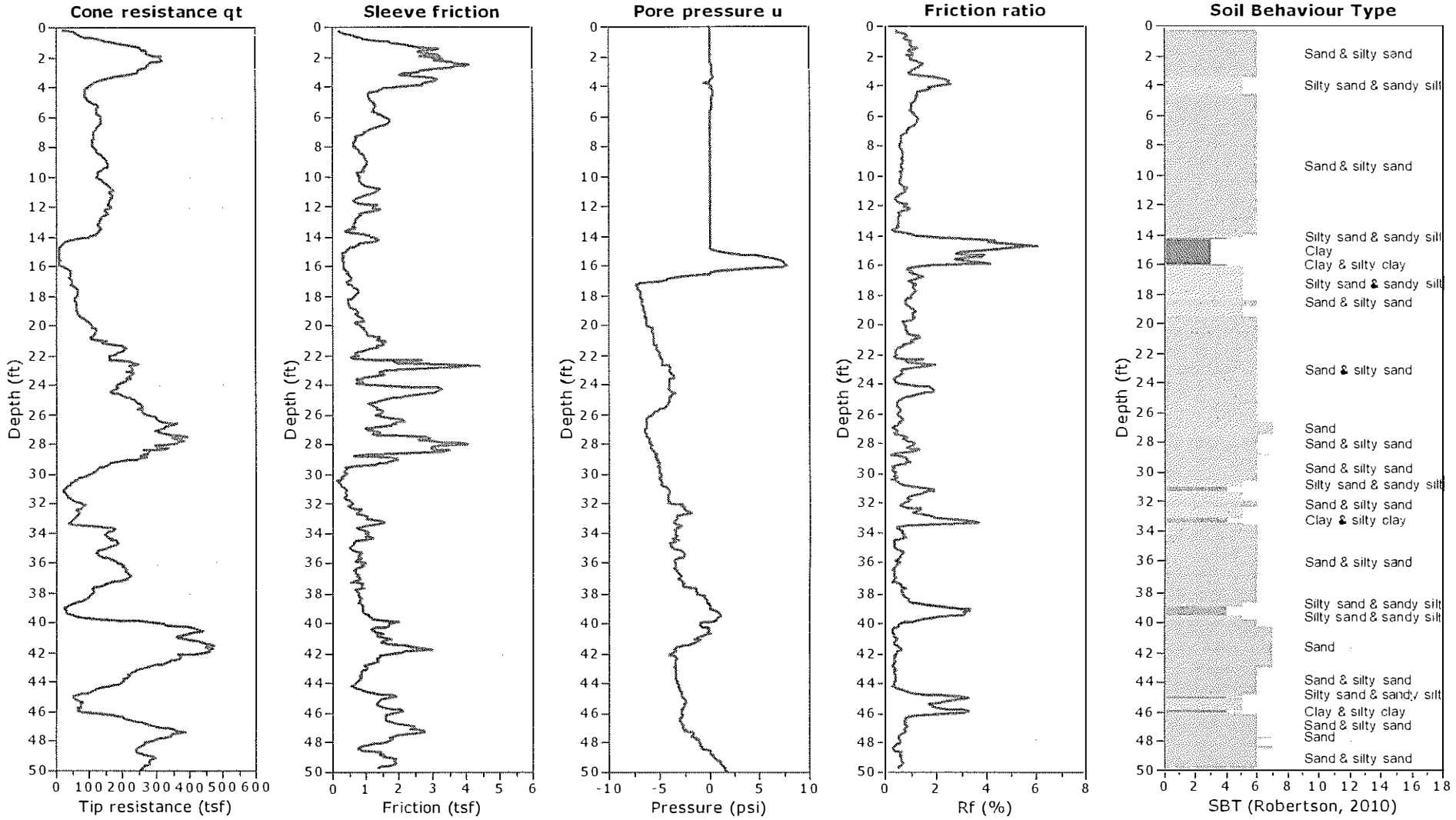


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CPT: CPT-7

Project: **Alta California Geotechnical, Inc./Emerald Ranch**
Location: **Hall Ave & 30th St Rubidoux, CA**

Total depth: 50.12 ft, Date: 6/2/2015
Cone Type: Vertek



APPENDIX B-1

Previous Subsurface Investigation (Zeiser, 2005)

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-1
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	2/24/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS/EN	Ground Elev. [ft]:	786.0

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]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
785						**Younger Alluvium (Qya): 0 to 23 Feet**			
			2/12" 1/6"			@ 2.5 Feet: Poorly-graded SAND (SP): Tan, coarse grained, moist, loose.			
	5		2 3 2					WA	
780			4 5 4	8.2	103	@ 7.5 Feet: Poorly-graded SAND (SP): Light grayish brown, fine grained, moist, loose.			
	10		8 7 10			@ 10 Feet: Poorly-graded SAND (SP): Tan, coarse grained sand, some coarse gravel, moist, loose.		WA	
775			5 5 4	6.4	113	@ 12.5 Feet: (Poor recovery) Poorly-graded SAND (SP): Tan, coarse grained sand, minor amounts of coarse gravel, moist, loose.			
	15		14 13 14			@ 15 Feet: (Poor recovery) Poorly-graded SAND (SP): Tan, coarse grained sand, more coarse gravel than above, moist, medium dense.		WA	
770			14 10 10	5.3	130	@ 17.5 Feet: Poorly-graded SAND (SP): Tan, coarse grained sand, more gravel than above, gravel ranges from fine to coarse, gravel is granitic, grains are rounded to subangular, moist, loose.			
	20		12 10 7			@ 20 Feet: Poorly-graded SAND (SP): Tan, coarse grained sand, gravel ranges from fine to coarse, gravel is granitic, grains are rounded to subangular, saturated, loose.		WA	
765						**Older Alluvium (Qoa): 23 to 51-1/2 Feet**			
	25		24 27 27			@ 25 Feet: No recovery. Assumed same as above. Fine gravel dominates cuttings.		WA	
760									

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project: EMR
Project Number: 05026-00

Boring No.: ZB-1
Driller: C&L
Drill Type: Mud Rotary
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: 786.0

Date Drilled: 2/24/05
Logged By: CS/EN

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
755				10 11 25			@ 30 Feet: Poorly-graded GRAVEL (GP): some coarse sand, wet, dense.		WA	
750	35			9 7 11			@ 35 Feet: SILT (ML): Brown, some fine sand, some minor bedding, some gravel above, wet, loose to medium dense.		WA	
							@ 38 Feet: Gravel chatter.			
745	40			23 17 23			@ 40 Feet: Poorly-graded SAND (SP): fine to medium grained sand, gravel, wet, dense.		WA	
740	45			33 31 50			@ 45 Feet: Poorly-graded SAND (SP): fine to medium grained sand, some minor gravel, wet, dense.		GS	
							@ 47 Feet: Gravel chatter.			
735	50			32 12 15			@ 50 Feet: Poorly-graded GRAVEL (GP): gravel and coarse sand, high plasticity silt at bottom 3", wet, medium dense.			
							Total depth of borehole is 51 1/2 feet, groundwater encountered at 11 feet and caved to 11 feet after drilling. Backfilled with cuttings and chips, capped with grout.			

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-2
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	2/24/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS/EN	Ground Elev. [ft]:	797.0

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]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
795						**Younger Alluvium (Qya): 0 to 18 Feet**			
			5 4 6	10.7	92	@ 2.5 Feet: Poorly-graded SAND (SP): Tan, fine to medium grained, moist to very moist, loose.			
	5		3 4 6			@ 5 Feet: Poorly-graded SAND (SP): Tan, fine to coarse grained, medium grains dominate, higher coarse fraction at tip, moist, loose.		WA	
790						@ 7.5 Feet: No recovery. Assumed same as above.			
			4 4 5	15.2	91	▽@ 8.5 Feet: Silty SAND to sandy SILT(SM-ML): Light to medium brown, fine to medium grained sand, wet, loose.			
	10		5 7 10			@ 10 Feet: Poorly-graded SAND (SP): Tan, fine to very coarse sand, fine-medium grains dominate, higher coarse fraction at tip, wet, medium dense.		WA	
785									
	15		7 6 7			@15 Feet: Poorly-graded SAND (SP): Tan, coarse sand with gravel, wet, loose.		WA	
780						@16.5 Feet: Gravel chatter.			
						Older Alluvium (Qoa): 18 to 50 1/2 Feet			
	20		21 21 26			@ 20 Feet: Poorly-graded SAND (SP): dark gray to white, coarse sand with gravel, wet, medium dense.		WA	
775									
	25		30 36 21			@ 25 Feet: Poorly-graded SAND (SP): Light brown, fine to medium grained sands, grades up to 70% gravel, wet, medium dense to dense.		WA	
770									

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project: EMR
Project Number: 05026-00
Date Drilled: 2/24/05
Logged By: CS/EN

Boring No.: ZB-2
Driller: C&L
Drill Type: Mud Rotary
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: 797.0

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
765				20 21 50			@ 30 Feet: Silty SAND (SM): Brown, thin lenses of sand or gravel 1" thick, gravel fine to coarse, wet, medium dense to dense.		WA	
760	35			14 17 17			@ 35 Feet: Poorly-graded SAND (SP): Brown, fine to medium grained sand with a small fraction of silt, fine to coarse grained gravel lens at top of sample, wet, medium dense.		WA	
755	40			7 8 14			@ 40 Feet: SILT (ML): Brown, silts with fine sands, micaceous, wet, loose to medium dense.		GS	
750	45									
	50			60/5"			@ 50 Feet: No recovery. Possible weathered bedrock based on cuttings.		WA	
							Total depth of borehole was 50 1/2 feet, groundwater encountered at 9 feet. Backfilled with cuttings and chips, capped with grout.			

HS BA TP 05025-00.GPJ ZKCI.GDT 4/5/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project: EMR
Project Number: 05026-00
Date Drilled: 2/25/05
Logged By: CS/EN

Boring No.: ZB-3
Driller: C&L
Drill Type: Mud Rotary
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: 789.0

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Younger Alluvium (Qya): 0 to 24 Feet			
				7 12 23	7.5	105	@ 2.5 Feet: SILT (ML): Brown, fine grained sand, sand dominate in tip of sample, damp to moist, medium dense.			
785	5			10 13 16			@ 5 Feet: Poorly-graded SAND (SP): Tan, fine to coarse sand, higher coarse fraction at tip, very moist, medium dense.			
				2 1 3	31.1	86	@ 7.5 Feet: Poorly-graded SAND (SP): Medium brown, fine grained, iron oxidation present, moist, medium dense.			
780	10			4 5 4			@ 10 Feet: Poorly-graded SAND (SP): Tan, fine to coarse sand, iron oxidation present, wet, loose.		GS	
775	15						@15 Feet: No recovery. Assumed same as above.			
				1 5 9			@ 16 Feet: Poorly-graded SAND (SP): Tan, fine to coarse sand, iron oxidation present, wet, loose.			
							@18 Feet: Gravel in cuttings.			
770	20			15 14 15			@ 20 Feet: Poorly-graded SAND (SP): Tan, fine to coarse sand, minor angular gravel in top of sample, iron oxidation present, wet, medium dense.			
765	25						**Older Alluvium (Qya): 24 to 75 1/2 Feet**			
				20 26 25			@ 26 Feet: Poorly-graded SAND (SP): Gray, medium to coarse sand, 15% fine gravel and 2% coarse gravel at top and bottom of sample, wet, medium dense.			
760										

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-3
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	2/25/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS/EN	Ground Elev. [ft]:	789.0

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				29 47 37			@ 30 Feet: Poorly-graded SAND (SP): Coarse sand, 20% fine angular gravel, 10% coarse angular gravel, wet, dense.			
							@ 33 Feet: Significant amounts of gravel in cuttings.			
755	35									
							@ 38 Feet: Gravel appears to dissipate.			
750										
	40			32 22 19			@ 40 Feet: Poorly-graded SAND (SP): Coarse sand, 20% fine angular gravel, 10% coarse angular gravel, 1" thick silt layer at bottom of drive, wet, medium dense.			
745										
	45									
740										
	50			20 37 46			@ 50 Feet: Poorly-graded SAND (SP): Coarse sand, higher gravel content than above, wet, dense.			
735										
	55									
730										

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project: EMR
Project Number: 05026-00

Boring No.: ZB-3
Driller: C&L
Drill Type: Mud Rotary
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: 789.0

Date Drilled: 2/25/05
Logged By: CS/EN

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				36 50/5"			@ 60 Feet: Poorly-graded SAND (SP): Coarse sand, 20% fine angular gravel, wet, dense to very dense.			
725	65									
720	70			27 50/4"			@ 70 Feet: Poorly-graded GRAVEL (GP): fine gravel, some 1" sand layers at top and bottom, wet, medium dense to very dense.			
715	75			50/5"			@ 75 Feet: Poorly-graded GRAVEL (GP): fine gravel, wet, medium dense to very dense.			
							Total depth of borehole was 75 1/2 feet, groundwater encountered at 7 feet. Backfilled with cuttings and chips, capped with grout.			

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

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LOG OF EXPLORATORY BORING

Project: EMR
Project Number: 05026-00
Date Drilled: 2/25/05
Logged By: CS/EN

Boring No.: ZB-4
Driller: C&L
Drill Type: Mud Rotary
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: 783.5

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

Elevation [ft]	Depth [ft]	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
					Younger Alluvium (Qya): 0 to 31 1/2 Feet			
780		1 1 2	17.4	100	@ 2.5 Feet: Silty SAND (SM): Dark brown, fine to medium sand, damp, very loose.			
	5	4 5 10			@ 5 Feet: Poorly-graded SAND (SP): Tan, fine to medium grained, medium grains dominate, rounded coarse gravel in tip, very moist, loose.			
775		4 5 6	3.7	86	@ 7.5 Feet: Poorly-graded SAND (SP): Tan, fine to medium grained, medium grains dominate, disturbed sample, very moist, loose.			
	10	4 6 10			@ 10 Feet: Poorly-graded SAND (SP): Tan, fine to medium grained, medium grains dominate, very moist, loose.			
770								
	15	5 5 6			@ 15 Feet: Poorly-graded SAND (SP): Tan, fine to medium grained, medium grains dominate, some coarse gravel, poor recovery, very moist, loose.			
765								
	20	4 6 6			@ 20 Feet: Poorly-graded SAND (SP): Tan, fine to medium grained, medium grains dominate, very moist, loose.			
760								
	25							
755								

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

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LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-4
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	2/25/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS/EN	Ground Elev. [ft]:	783.5

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				8 14 23			@ 30 Feet: Lost sampler. Assumed same as above.			
750							Stepped out 10 feet south to boring designated ZB-4A. Total depth of borehole 31 1/2 feet, groundwater measured at 9 feet on the morning of 2-28-05. Backfilled with cuttings and chips, capped with grout.			

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-4A
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	2/28/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS/EN	Ground Elev. [ft]:	783.5

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
780	0						**Younger Alluvium (Qya): 0 to 34 Feet** Borehole ZB-4 drilled to 31 1/2 feet. ZB-4A drilled directly to 30 feet. Material from 0 to 30 feet in ZB-4A assumed to be the same as in ZB-4.			
775	5									
770	10						▽			
765	15									
760	20									
755	25									

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-4A
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	2/28/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS/EN	Ground Elev. [ft]:	783.5

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				7 7 7			@ 30 Feet: Poorly-graded SAND (SP): Brown, coarse grained sand with some gravel, gravel up to 1", wet, medium dense.			
750							**Older Alluvium (Qoa): 34 to 60-1/2 Feet**			
	35						@ 35 Feet: Gravel chatter abundant.			
745										
	40			22 20 22			@ 40 Feet: Poorly-graded SAND (SP): Gray, fine to medium grained sand with minor amounts of gravel, wet, medium dense.			
740							@ 43 Feet: Gravel chatter abundant.			
	45									
735										
	50			50/5"			@ 50 Feet: Poor recovery. Poorly Graded GRAVEL (GP): Granitic material in cuttings, assumed to be same as above material making up the matrix. Gravel coarse to fine grained, wet, very dense. Gravel chatter from 50 feet to 60 feet.			
730										
	55									
725										

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-4A
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	2/28/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS/EN	Ground Elev. [ft]:	783.5

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				50/6"			@ 60 Feet: No recovery. Poorly Graded GRAVEL (GP): Assumed same as above.			
720							Total depth of borehole was 60-1/2 feet. Groundwater encountered at 9 feet. Backfilled with cuttings and chips, capped with grout.			

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-5
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	2/28/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS/EN	Ground Elev. [ft]:	790.0

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]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Younger Alluvium (Qya): 0 to 34 Feet			
			3 4 6			@ 2.5 Feet: Silty SAND (SM): Medium brown, fine to medium grained sand with silt, some organics, damp, loose.			
785	5		10 12 14			@ 5 Feet: Silty SAND (SM): Medium brown, fine to medium grained sand with less silt than above, damp, medium dense.			
			2 1 5			@ 7.5 Feet: Silty SAND (SM): Medium brown, fine to medium grained sand with more silt than above, damp, medium dense.			
780	10		2 2 2			@ 10 Feet: No recovery. Assumed to be same as above.			
			Push 4 4			@ 12 Feet: Silty SAND (SM): Medium brown, fine to medium grained sand with silt, damp, loose, bottom half of sample: Poorly-graded SAND (SP): tan, fine to coarse grained, damp to moist, loose.			
775	15		5 4 7	3.3	103	@ 15 Feet: Poorly-graded SAND (SP): Medium to coarse grained, some oxide staining, moist to damp, loose.			
770	20		9 11 11			@ 20 Feet: Poorly-graded SAND (SP): Brown, medium to coarse grained sand, some gravel at top of sample, wet, medium dense. @ 22 Feet: Moderate chatter.			
765	25		16 10 9			@ 25 Feet: Poorly-graded SAND (SP): Tan, medium to coarse sand some fine gravel interspersed at top 2", wet, loose.			

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-5
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	2/28/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS/EN	Ground Elev. [ft]:	790.0

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				15 15 12			@ 30 Feet: Poorly-graded SAND (SP): Coarse grained, minor amounts of fine gravel, wet, dense.			
755	35						**Older Alluvium (Qoa): 34 to 56 Feet** @ 35 Feet: Minor chatter.			
							@ 37 Feet: Moderate chatter.			
750	40			50/6"			@ 40 Feet: Poorly-graded GRAVEL (GP): Tan, fine to coarse grained, wet, very dense, poor recovery.			
745	45									
740	50			27 27 26			@ 50 Feet: Poorly-graded SAND (SP): Olive, coarse grained sand with fine (20%) to coarse (5%) gravel, wet, medium dense.			
735	55			Bounce			@ 56 Feet: Practical refusal. No recovery. Assumed same as above. Total depth of borehole was 56 feet. Groundwater encountered at 13 feet. Backfilled with cuttings and chips, capped with grout.			

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-6
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	3/1/05	Hammer Wt. / Drop:	140lb/ 30in
Logged By:	CS	Ground Elev. [ft]:	784.0

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]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Younger Alluvium (Qya): 0 to 24 Feet			
			1 1 1	7.3	93	@ 2.5 Feet: Silty SAND (SM): light brown, fine grained, moist, loose.			
780	5		4 3 4			@ 5 Feet: Poorly Graded SAND (SP): brown, medium to coarse grained, damp, loose.		GS	
			1 1 3	16.7	90	@ 7.5 Feet: Silty SAND (SM): brown, fine to very fine grained, moist, loose.			
775	10		7 8 13			@ 10 Feet: Poorly Graded SAND (SP): brown, medium to coarse grained, very moist, medium dense.			
			8 10 14	1.9	102	▽ @ 12.5 Feet: Poorly Graded SAND (SP): brown, medium to coarse grained, minor amounts of coarse gravel, very moist, medium dense.			
770	15		14 10 11			@ 15 Feet: Poorly Graded SAND (SP): brown, medium to coarse grained, more coarse gravel than above, wet, medium dense. @17 feet: minor chatter.			
765	20		15 14 13			@ 20 Feet: Poorly Graded SAND (SP): brown, medium to coarse grained, less gravel than at 15 feet, wet, medium dense.			
760	25		27 17 17			**Older Alluvium (Qya): 24 to 50 3/4 Feet** @ 25 Feet: Poorly Graded SAND (SP): brown, medium to coarse grained, more gravel than at 20 feet, wet, medium dense.			
755									

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-6
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	3/1/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS	Ground Elev. [ft]:	784.0

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				8 50/6"			Overdrilled 30 feet to 32 feet. @ 32 Feet: Poorly-graded Gravel (GP): brown to mottled gray, fine grained gravel, wet, very dense.			
-750	35									
-745	40			10 10 12			@ 40 Feet: No recovery. Drilled to 42 feet. Assumed same as above.			
				15 12 21			@ 42 feet: Clay (CL): brown, sandy, some coarse gravel, wet, stiff.		WA	
-740	45									
-735	50			48 50/3"			@ 50 Feet: Clayey SAND (SC): light brown, fine grained, wet, very dense.		WA	
							Total depth of borehole was 50 3/4 feet. Groundwater encountered at 12 1/2 feet. Backfilled with cuttings and chips, capped with grout.			

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project: EMR
Project Number: 05026-00
Date Drilled: 3/1/05
Logged By: CS

Boring No.: ZB-7
Driller: C&L
Drill Type: Mud Rotary
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: 790.0

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

Elevation [ft]	Depth [ft]	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Pocket Pen. [tsf]	Lab Tests	Remarks
		3 2 4	30.1	80			
785	5	3 3 5				GS	
		2 3 4	27.5	83			
780	10	2 4 5					
775	15	8 7 8					
770	20	4 3 12					
765	25	18 18 23					

SOIL DESCRIPTION and CLASSIFICATION (USCS)

Younger Alluvium (Qya): 0 to 24 Feet

@ 2.5 Feet: Silty SAND (SM): brown, very fine grained, moist, loose.

@ 5 Feet: Silty SAND (SM): brown, very fine grained, moist, loose.

@ 7.5 Feet: Silty SAND (SM): brown, very fine grained, less silt than above, moist, loose.

@ 10 Feet: Silty SAND (SM): brownish gary, fine grained, minor stratification, moist, loose.

@ 12.5 Feet: Poorly graded SAND (SP): light brown, coarse grained, minor amounts of gravel, minor oxidation, moist, medium dense.

@ 15 Feet: Poorly Graded SAND (SP): brown, coarse grained, wet, medium dense.

@ 17 feet: minor chatter

@ 20 Feet: Poorly Graded SAND (SP): brown, coarse grained, some clay and some coarse gravel, wet, medium dense.

@22 feet: minor chatter.

Older Alluvium (Qoa): 24 to 51 1/2 Feet

@ 25 Feet: Poorly Graded SAND (SP): brown, coarse grained, less clay and gravel than at 20 feet, wet, medium dense.

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project: EMR
Project Number: 05026-00

Boring No.: ZB-7
Driller: C&L
Drill Type: Mud Rotary
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: 790.0

Date Drilled: 3/1/05
Logged By: CS

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				12 16 10			@ 30 Feet: Poorly Graded SAND (SP): brown, fine to medium grained, less gravel than at 25 feet, wet, medium dense.			
755	35									
750	40			32 27 20			@ 40 Feet: Poorly Graded SAND (SP): brown, fine grained, less gravel than above, wet, medium dense. @ 42 feet:moderate chatter.			
745	45									
740	50			9 28 20			@ 50 Feet: Poorly Graded SAND (SP): brown, coarse grained, some fine gravel.			
							Total depth of borehole was 51 1/2 feet. Groundwater encountered at 12 1/2 feet. Backfilled with cuttings and chips, capped with grout.			

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-8
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	3/2/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS	Ground Elev. [ft]:	789.0

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]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Younger Alluvium (Qya): 0 to 19 Feet			
785			3 3 3	3.7	99	@ 2.5 Feet: Silty SAND (SM): light brown, fine grained, some minor oxidation, moist, loose.			
	5		4 4 5			@ 5 Feet: Silty SAND (SM): light brown, fine grained, some minor oxidation, moist, loose.			
780			4 5 6	6.5	98	@ 7.5 Feet: Poorly graded SAND (SP): light brown, fine to medium grained, minor amounts of silt, minor oxidation, moist, loose.			
	10		4 5 6			@ 10 Feet: Poorly graded SAND (SP): light brown, coarse to medium grained, minor oxidation, moist, medium dense.			
775			6 6 10	3.2	101	▽ @ 12.5 Feet: Silty SAND (SM): tan, fine grained, some oxidation, moist, medium dense.			
	15		6 9 12			@ 15 Feet: Poorly Graded SAND (SP): brown, coarse grained, more gravel than above, wet, medium dense.			
770						**Older Alluvium (Qoa): 19 to 51 1/2 Feet**			
	20		14 19 20			@ 20 Feet: Poorly Graded SAND (SP): brown, coarse grained, more gravel than above, wet, dense.			
765									
	25		20 17 20			@ 25 Feet: Poorly Graded SAND (SP): brown, medium grained, more gravel than above, wet, dense. @ 27 feet: minor chatter.			
760									

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-8
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	3/2/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS	Ground Elev. [ft]:	789.0

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
755	35			10 24 25			Over drilled to 34 feet. @ 34 Feet: Poorly Graded SAND (SP): brown, coarse grained, minor amounts of clay, wet, dense.			
750	40			22 15 20			@ 40 Feet: No recovery. Gravel in shoe. Assumed same as above. @ 43 feet:moderate chatter.			
745	45									
740	50			39 40 32			@ 50 Feet: Poorly Graded SAND (SP): brown, coarse grained, higher gravel content than at 34 feet, wet, dense.			
							Total depth of borehole was 51 1/2 feet. Groundwater encountered at 12 1/2 feet. Backfilled with cuttings and chips, capped with grout.			

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-9
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	3/2/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	EN	Ground Elev. [ft]:	783.0

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]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Younger Alluvium (Qya): 0 to 24 Feet			
780			1/12" 2/6"	5.7	95	@ 2.5 Feet: Silty SAND (SM): brown, fine grained, very silty, moist, very loose.			
	5		3 2 1			@ 5 Feet: Poor recovery. Silty SAND (SM): brown, fine grained, very silty, moist, very loose.			
775			1/12" 2/6"	41.3	77	@ 7.5 Feet: Sandy SILT (ML): brown to gray, fine grained sand, moist, soft.			
	10		4 4 6			@ 10 Feet: Silty SAND (SM): brown to light brown, fine grained, some oxidation, moist, loose.			
770			7 11 15			@ 12.5 Feet: Poorly graded SAND (SP): light brown, fine to medium grained, moist, medium dense. ▽			
	15		8 9 15			@ 15 Feet: Poorly Graded SAND (SP): brown, fine to medium grained, minor amount of gravel, wet, medium dense.			
765									
	20		7 9 13			@ 20 Feet: Poorly Graded SAND (SP): brown, fine to medium grained, fine gravel, wet, medium dense.		GS	
760									
	25		8 27 25			**Older Alluvium (Qya): 24 to 51 Feet** @ 25 Feet: Poorly Graded SAND (SP): brown, fine to medium grained, more fine gravel than above, wet, medium dense. @27 feet: minor chatter.			
755									

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project: EMR
Project Number: 05026-00

Boring No.: ZB-9
Driller: C&L
Drill Type: Mud Rotary
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: 783.0

Date Drilled: 3/2/05
Logged By: EN

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				12 27 28			@ 30 Feet: Poorly Graded SAND (SP): brown, fine to medium grained, fine gravel, wet, medium dense.			
750	35									
745										
	40			35 43 30			@ 40 Feet: Poorly Graded SAND (SP): brown, fine to medium grained, less gravel than above, wet, medium dense.			
740										
	45									
735										
	50			37 50/5"			@ 50 Feet: Poorly Graded SAND (SP): brown, fine to medium grained, less gravel than above, wet, medium dense.			

Total depth of borehole was 51 feet. Groundwater encountered at 14 feet. Backfilled with cuttings and chips, capped with grout.

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project: EMR
Project Number: 05026-00

Boring No.: ZB-10
Driller: C&L
Drill Type: Mud Rotary
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: 787.0

Date Drilled: 3/3/05
Logged By: EN

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density. [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
785							**Older Alluvium (Qoa): 0 to 51 1/2 Feet**			
				2 2 5			@ 2.5 Feet: Silty SAND (SM): dark brown, fine grained, minor amounts of fine gravel, moist, loose.			
	5			4 6 7			@ 5 Feet: Silty SAND (SM): dark brown, fine grained, moist, loose.			
780				5 6 13			@ 7.5 Feet: Silty SAND (SM): gray to white, fine grained, moist, loose to medium dense.			
	10			11 13 14			@ 10 Feet: Silty SAND (SM): brown, fine grained, moist, medium dense.			
775				10 14 25						
	15			36 50/5"			@ 15 Feet: Silty SAND (SM): tan, fine grained, moist, some oxidation, medium dense, over Poorly Graded SAND (SP): brown, coarse grained, fine gravel, wet, dense.			
770										
	20			30 50/5"			@ 20 Feet: Poor recovery. Poorly Graded SAND (SP): brown, coarse grained, minor amounts of fine gravel, wet, very dense.			
765										
	25			26 37 50/5"			@ 25 Feet: Poorly Graded SAND (SP): tan, coarse grained, fine gravel, wet, very dense.			
760										

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	EMR	Boring No.:	ZB-10
Project Number:	05026-00	Driller:	C&L
		Drill Type:	Mud Rotary
Date Drilled:	3/3/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	EN	Ground Elev. [ft]:	787.0

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
755	35			50/6"			@ 30 Feet: Poor recovery. Poorly Graded SAND (SP): brown, coarse grained, minor amounts of fine gravel, wet, very dense. @ 32 feet: minor chatter.			
750	40			30 25 29			@ 40 Feet: Poorly Graded SAND (SP): brown, medium to coarse grained, minor amounts of fine gravel, wet, very dense.			
745	45									
740	50			23 19 27			@ 50 Feet: Poorly Graded SAND (SP): brown, medium to coarse grained, 1 inch thick silty sand layer in tip, 4.5 inch clay layer in top of sampler, minor amounts of fine gravel, wet, very dense. Total depth of borehole was 51 1/2 feet. Groundwater encountered at 16 feet. Backfilled with cuttings and chips, capped with grout.			

HS BA TP 05026-00.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	Emerald Meadows Ranch	Boring No.:	B-1
Project Number:	05026-02	Driller:	2R Drilling
		Drill Type:	Hollowstem
Date Drilled:	3/22/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	JNR/AHM	Ground Elev. [ft]:	791.8

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Younger Alluvium (Qya): 0 to 40.75 Feet			
790				6 6 10	3.8	94	@ 2.5 Feet: Poorly-graded SAND (SP): Light brown, fine to medium grained, damp, loose.			
	5			5 4 5	11.0	110	@ 5 Feet: Poorly-graded SAND (SP): Grayish brown, fine to coarse grained, some fine gravel, damp, loose.			
785				6 8 14	4.9	104	@ 7.5 Feet: Poorly-graded SAND (SP): Gray, medium to coarse grained, some fine gravel, damp to moist, medium dense.			
	10			4 5 4			@ 10 Feet: Poorly-graded SAND (SP): Grayish brown, medium to coarse grained, some fine gravel, wet, loose.			
780				6 11 17	15.9	110	@ 12.5 Feet: Poorly-graded SAND (SP): Gray, medium to coarse grained, some fine gravel, moist, medium dense.			
	15			7 16 20			@ 15 Feet: Poorly-graded SAND (SP): Gray, medium to coarse grained, some fine gravel, moist, dense.			
775				15 23 20	8.8	130	@ 17.5 Feet: Poorly-graded SAND (SP): Dark gray, fine to medium grained w/ some coarse, some fine gravel, wet, dense.			
	20			7 8 12			**Sand Heave:** Begins at 20 to 30 Feet below ground surface. @ 20 Feet: Poorly-graded SAND (SP): Dark gray, fine to coarse grained, some gravel, wet, medium dense.			
770										
	25			8 17 25			@ 25 Feet: Poorly-graded SAND (SP): Dark gray, medium to coarse grained, trace of silt, some fine gravel, wet, dense.			
765										

HS BA TP 05026-02.GPJ ZKCI.GDT 4/8/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	Emerald Meadows Ranch	Boring No.:	B-1
Project Number:	05026-02	Driller:	2R Drilling
		Drill Type:	Hollowstem
Date Drilled:	3/22/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	JNR/AHM	Ground Elev. [ft]:	791.8

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				17 32 34			**Younger Alluvium (Qya):0 to 40.75 Feet** *(continued)* @ 30 Feet: Poorly-graded SAND (SP): Brown to gray, fine to coarse grained, trace of silt, wet, very dense.			
760										
	35			9 13 24			@ 35 Feet: Poorly-graded SAND (SP): Grayish brown, fine to coarse grained, some gravel, wet, dense.			
755										
	40			4 5 12			@ 40 Feet: Poorly-graded SAND (SP): Gray to brown, fine to medium grained, trace of silt, some fine gravel, wet, medium dense.		AL,WA	
750							**Older Alluvium (Qoa):**40.75 to 51.5 Feet **@ 40.75 Feet Sandy SILT (ML): Brown, trace of clay, damp to moist, medium dense.**			
	45			20 21 20			@ 45 Feet: Silty SAND (SM): Brown, very fine grained, some gravel, wet, dense.		WA	
745										
	50			6 30 33			@ 50 Feet: Clayey SILT (ML): Brown, trace of clay, dry to damp, very dense.		AL,GS	
							Total depth of borehole is 51 1/2 feet, groundwater encountered at 9 feet. Backfilled with cuttings.			

HS BA TP 05026-02.GPJ ZKCI.GDT 4/6/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	Emerald Meadows Ranch	Boring No.:	B-2
Project Number:	05026-01	Driller:	2R Drilling
		Drill Type:	Hollowstem
Date Drilled:	3/22/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	JNR	Ground Elev. [ft]:	792.0

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Younger Alluvium (Qya):0 to 35 Feet			
790				3 4 4	26.5	86	@ 2.5 Feet: Silty SAND (SM): Dark brown, very fine grained, damp, soft.	1.50		
	5			2 2 2			@ 5 Feet: Poorly-graded SAND (SP): Light grayish brown to brown, fine to medium grained, damp, soft.			
785				4 5 6	15.7	92	@ 7.5 Feet: Silty SAND (SM): Brown to dark brown, very fine grained, damp, soft.	2.00		
	10			2 3 4			@ 10 Feet: Silty SAND (SM): Dark grayish brown, some oxidation, very fine grained, damp, soft.		WA	
780				4 6 6	30.1	93	@ 12.5 Feet: Silty SAND (SM): Brown to dark brown, very fine grained, damp, firm.	0.75		
	15			2 2 3			@ 15 Feet: Poorly-graded SAND (SP): Dark gray, fine grained, some oxidation, wet, loose.			
775							▽			
	20			5 9 8			**Sand Heave:** Begins at 20 to 30 Feet below ground surface. @ 20 Feet: Poorly-graded SAND (SP): Dark gray, fine to coarse grained, some fine gravel, wet, medium dense.			
770										
	25			5 7 11			@ 25 Feet: Poorly-graded SAND (SP): Dark grayish brown, fine grained w/some coarse, trace of silt, some fine gravel, wet, medium dense.			
765										

HS BA TP 05026-01 A.GPJ ZKCI.GDT 4/5/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	Emerald Meadows Ranch	Boring No.:	B-2
Project Number:	05026-01	Driller:	2R Drilling
		Drill Type:	Hollowstem
Date Drilled:	3/22/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	JNR	Ground Elev. [ft]:	792.0

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				9 14 12			@ 30 Feet: Poorly-graded SAND (SP): Dark gray, fine to medium grained, some gravel, wet, medium dense.			
760										
	35			6 9 14			@ 35 Feet: Silty SAND (SM): Dark brown, very fine grained, wet, medium dense.			
755										
	40			8 8 9			@ 40 Feet: Clayey SILT (ML): Brown, oxidation, dry to damp, stiff.		AL,GS	
750										
	45			22 50/5"			@ 45 Feet: Poorly-graded SAND (SP): Light grayish brown, fine to coarse grained, some gravel, wet, very dense.			
745										
	50			7 12 32			@ 50 Feet: Poorly-graded SAND (SP): Brown, medium to coarse grained, some gravel, wet, dense.			
							Total depth of borehole is 51 1/2 feet, groundwater encountered at 17.5 feet. Backfilled with cuttings.			

HS BA TP 05026-01 A.GPJ ZKCI.GDT 4/5/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project: **Emerald Meadows Ranch**
Project Number: **05026-01**
Date Drilled: **3/22/05**
Logged By: **JNR**

Boring No.: **B-3**
Driller: **2R Drilling**
Drill Type: **Hollowstem**
Hammer Wt. / Drop: **140lb / 30in**
Ground Elev. [ft]: **812.5**

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Older Alluvium (Qoa):			
810				2 4 7	12.0	106	@ 2.5 Feet: Silty SAND (SM): Brown, very fine grained, loose to medium dense, dry to damp.	2.00		
	5			5 5 4			@ 5 Feet: Silty SAND (SM): Brown, very fine grained, loose to medium dense, dry to damp.			
805				10 15 30	3.0	112	@ 7.5 Feet: Silty SAND (SM): Light grayish brown, very fine grained w/little medium grains, dense, dry to damp.			
	10			4 5 9			@ 10 Feet: Silty SAND (SM): Light grayish brown, very fine grained, medium dense, dry.			
800				14 14 19	5.6	107	@ 12.5 Feet: Silty SAND (SM): Light grayish brown, very fine grained, dense, dry.		CN	
	15			5 7 8			@ 15 Feet: Silty SAND (SM): Light grayish brown, very fine grained, medium dense, dry.		WA	
795										
	20			5 7 9			@ 20 Feet: Silty SAND (SM): Light grayish brown, very fine grained, medium dense, dry.			
790										
	25			4 8 6			@ 25 Feet: Silty SAND (SM): Light grayish brown, very fine grained, medium dense, damp.			
785										

HS BA TP 05026-01 A.GPJ ZKCI.GDT 4/5/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	Emerald Meadows Ranch	Boring No.:	B-3
Project Number:	05026-01	Driller:	2R Drilling
		Drill Type:	Hollowstem
Date Drilled:	3/22/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	JNR	Ground Elev. [ft]:	812.5

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				9 22 25			@ 30 Feet: Poorly-graded SAND (SP): Light brown, fine grained w/some coarse, some fine gravel, dense, dry.			
780										
	35			21 34 50/5"			@ 35 Feet: Poorly-graded SAND (SP): Light brown, fine grained w/some coarse, some fine gravel, very dense, dry.			
775										
	40			4 9 13			@ 40 Feet: Silty SAND (SM): Brown, very fine grained, medium dense, damp.			
							Total depth of borehole is 41 1/2 feet, groundwater not encountered. Backfilled with cuttings.			

HS BA TP 05026-01 A.GPJ ZKCI.GDT 4/5/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	Emerald Meadows Ranch	Boring No.:	B-4
Project Number:	05026-01	Driller:	2R Drilling
		Drill Type:	Hollowstem
Date Drilled:	3/22/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	JNR	Ground Elev. [ft]:	830.0

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Older Alluvium (Qal):			
				3 4 5	5.7	104	@ 2.5 Feet: Silty SAND (SM): Light reddish brown, very fine grained, loose, dry to damp.		WA	
825	5			2 4 3			@ 5 Feet: Silty SAND (SM): Light reddish brown, very fine grained, loose, dry to damp.			
				7 10 10	8.2	112	@ 7.5 Feet: Silty SAND (SM): Light reddish brown, very fine grained, loose, dry to damp.			
820	10			3 3 3			@ 10 Feet: Silty SAND (SM): Light reddish brown, very fine grained, loose, damp.			
				4 8 12	7.0	104	@ 12.5 Feet: Silty SAND (SM): Light reddish brown, very fine grained, medium dense, damp		CN	
815	15			4 5 7			@ 15 Feet: Silty SAND (SM): Light reddish brown, very fine grained, loose, damp.			
810	20			7 9 15			@ 20 Feet: Poorly-graded SAND (SP): Light brown, very fine grained, medium dense, dry.			
805	25			9 9 6			@ 25 Feet: Poorly-graded SAND (SP): Light brown, fine medium grained w/some coarse, very few gravel, medium dense, dry to damp.			

HS BA TP 05026-01 A.GPJ ZKCI.GDT 4/5/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project: **Emerald Meadows Ranch**
Project Number: **05026-01**

Date Drilled: **3/22/05**
Logged By: **JNR**

Boring No.: **B-4**
Driller: **2R Drilling**
Drill Type: **Hollowstem**
Hammer Wt. / Drop: **140lb / 30in**
Ground Elev. [ft]: **830.0**

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				9 8 9			@ 30 Feet: Poorly-graded SAND (SP): Light brown, fine medium grained, medium dense, dry.			
795	35			6 8 9			@ 35 Feet: Poorly-graded SAND (SP): Light brown, very fine grained, medium dense, dry to damp.			
790	40			14 21 21			@ 40 Feet: Silty SAND (SM): Light brown, very fine grained, dense, dry to damp.			
							Total depth of borehole is 41 1/2 feet, groundwater not encountered. Backfilled with cuttings.			

HS BA TP 05026-01 A.GPJ ZKCI.GDT 4/5/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	Emerald Meadows Ranch	Boring No.:	B-5
Project Number:	05026-01	Driller:	2R Drilling
		Drill Type:	Hollowstem
Date Drilled:	3/24/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS	Ground Elev. [ft]:	817.4

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

Elevation [ft]	Depth [ft]	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
					Fill: Upper 1-2 Feet			
815		5 8 19	18.0	105	**Older Alluvium (Qoa):** 2 to 41.5 Feet @ 2.5 Feet: Silty SAND w/clay (SM): Gray to reddish brown, fine to medium grained, some fine gravel, moist, dense.	4.25		
	5	7 8 13	4.0	108	@ 5 Feet: Silty SAND (SM): Reddish brown, fine to medium grained, damp to moist, medium dense.			
810		2 2 3			@ 7.5 Feet: Silty SAND (SM): Reddish brown, fine to medium grained, more silty than above, damp, loose.			
	10	7 10 20	4.2	108	@ 10 Feet: Silty SAND (SM): Reddish brown, fine to medium grained, some minor caliche stringers, damp, medium dense.			
805		5 6 6			@ 12.5 Feet: Silty SAND (SM): Yellowish brown, fine to medium grained, some minor caliche stringers, damp, medium dense.			
	15	12 10 19	2.6	117	@ 15 Feet: Silty SAND (SM): Yellowish brown, fine to medium grained, some minor caliche stringers, fine gravel, damp, medium dense.			
800		8 12 17			@ 17.5 Feet: Silty SAND (SM): Gray, fine to medium grained, some minor caliche stringers, fine gravel, damp, medium dense.			
	20	12 22 28	2.5	112	@ 18 Feet: Poorly-graded SAND (SP): Gray to brown, fine to medium grained, some minor caliche stringers, fine gravel, moist, medium dense. @ 20 Feet: Poorly-graded SAND (SP): Gray, fine to medium grained, some minor caliche stringers, more fine gravel than above, damp, medium dense.			
795								
	25	3 5 6			@ 25 Feet: SILT (ML): Light brown, slightly sandy, damp, stiff.		GS	
790								

HS BA TP 05026-01 A.GPJ ZKCI.GDT 4/5/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project: Emerald Meadows Ranch
Project Number: 05026-01
Date Drilled: 3/24/05
Logged By: CS

Boring No.: B-5
Driller: 2R Drilling
Drill Type: Hollowstem
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: 817.4

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
				9 10 14	13.6	93	@ 30 Feet: SILT (ML): Light brown, slightly sandy, micaceous, damp, stif .	4.00	CN	
785										
	35			2 4 9			@ 35 Feet: SILT (ML) to Silty SAND (SM): Light brown, fine grained sand, more sandy, micaceous, some oxidation, damp, stiff to medium dense.			
780										
	40			6 15 22	19.0	101	@ 40 Feet: Silty SAND (SM) to Sandy SILT (ML): Light brown, very fine grained, some oxidation, damp, medium dense.	4.00	TX	
							Total depth of borehole is 41 1/2 feet, groundwater not encountered. Back illed with cuttings.			

HS BA TP 05026-01 A.GPJ ZKCI.GDT 4/5/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	Emerald Meadows Ranch	Boring No.:	B-6
Project Number:	05026-01	Driller:	2R Drilling
		Drill Type:	Hollowstem
Date Drilled:	3/24/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS	Ground Elev. [ft]:	835.6

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

Elevation [ft]	Depth [ft]	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
835						**Fill:** Upper 3-4 Feet			
			6 10 9	5.4	120	**Older Alluvium (Qoa):** 2 to 41.5 Feet @ 2.5 Feet: Silty SAND (SM): Reddish brown, fine to coarse grained, some porosity, moist, medium dense.			
830	5		11 10 8			@ 5 Feet: Silty SAND (SM): Light brown, fine to medium grained, caliche stringers, damp to moist, medium dense.		WA	
			7 13 19	1.6	101	@ 7.5 Feet: Silty SAND (SM) to Poorly-graded SAND (SP): Reddish brown, fine to medium grained, dry, medium dense.			
825	10		6 12 15			@ 10 Feet: Poorly-graded SAND (SP): Light brown, coarse grained, dry to damp, medium dense.			
			11 20 24	1.3	98	@ 12.5 Feet: Poorly-graded SAND (SP): Light brown, coarse grained, some fine to medium gravel, dry to damp, medium dense.			
820	15		9 17 19			@ 15 Feet: Poorly-graded SAND (SP): Light brown, coarse grained, less fine to medium gravel than above, dry to damp, medium dense.			
			12 20 25	1.5	103	@ 17.5 Feet: Poorly-graded SAND (SP): Light brown, coarse grained, more fine to medium gravel than above, dry to damp, medium dense.		DS	
815	20		15 21 30			@ 20 Feet: Poorly-graded SAND (SP): Light brown, fine to medium grained, fine to medium gravel than above, dry to damp, medium dense.			
810	25		23 42 50	2.8	110	@ 25 Feet: Poorly-graded GRAVEL w/sand (GP): Coarse grained sand, damp, very dense.			

HS BA TP 05026-01 A.GPJ ZKCI.GDT 4/5/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	Emerald Meadows Ranch	Boring No.:	B-6
Project Number:	05026-01	Driller:	2R Drilling
		Drill Type:	Hollowstem
Date Drilled:	3/24/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS	Ground Elev. [ft]:	835.6

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
805				23 40 37			@ 30 Feet: Poorly-graded SAND w/gravel (SP): Reddish brown, medium to coarse grained, dry, very dense.			
800	35			50/5.5"	2.7	115	@ 35 Feet: Poorly-graded SAND w/gravel (SP): Reddish brown, medium to coarse grained, minor amounts of silt, dry, very dense.			
795	40			22 33 44			@ 40 Feet: Poorly-graded SAND w/gravel (SP): Reddish brown, fine grained, minor amounts of silt, dry, very dense.			
							Total depth of borehole is 41 1/2 feet, groundwater not encountered. Backfilled with cuttings.			

HS BA TP 05026-01 A.GPJ ZKCI.GDT 4/5/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project: Emerald Meadows Ranch
Project Number: 05026-01
Date Drilled: 3/24/05
Logged By: CS

Boring No.: B-7
Driller: 2R Drilling
Drill Type: Hollowstem
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: 831.0

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Fill: Upper 1-2 Feet			
830										
				6 8 8	4.4	107	**Older Aluvium (Qoa):** 2 to 41.5 Feet @ 2.5 Feet: Silty SAND (SM): Reddish brown, fine grained, damp to moist, loose to medium dense.			
	5			3 2 2			@ 5 Feet: Silty SAND (SM): Reddish brown, fine grained, more silt than above, damp to moist, loose.			
825										
				3 4 8	4.1	106	@ 7.5 Feet: Silty SAND (SM): Reddish brown, fine grained, more silt than above, micaceous, damp to moist, loose.			
	10			3 5 5			@ 10 Feet: Silty SAND (SM): Reddish brown, fine grained, very silty, micaceous, damp to moist, loose.			
820										
				5 8 12	4.7	104	@ 12.5 Feet: Silty SAND (SM): Reddish brown, fine grained, very silty, some oxidation, micaceous, damp to moist, loose.			
	15			4 6 6			@ 15 Feet: Silty SAND (SM): Reddish brown, fine grained sand, damp to moist, firm.		WA	
815										
				7 16 20	7.1	111	@ 17.5 Feet: Silty SAND (SM): Reddish brown, fine grained, damp to moist, medium dense.	>5.00		
	20			7 9 9			@ 20 Feet: Poorly-graded SAND (SP): Reddish brown, fine to medium grained, moist, medium dense.			
810										
	25			15 19 28	3.5	107	@ 25 Feet: Poorly-graded SAND (SP): Reddish brown, fine grained, some gravel, moist, medium dense.			
805										

HS BA TP 05026-01 A.GPJ ZKCI.GDT 4/5/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	Emerald Meadows Ranch	Boring No.:	B-7
Project Number:	05026-01	Driller:	2R Drilling
		Drill Type:	Hollowstem
Date Drilled:	3/24/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	CS	Ground Elev. [ft]:	831.0

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
800				15 18 19			@ 30 Feet: Poorly-graded SAND (SP): Reddish brown, fine grained, some gravel, silt lenses, moist, medium dense.			
795	35			7 11 16	12.5	100	@ 35 Feet: SILT (ML): Light brown, very fine grained sand, slightly sandy, moist, stiff.	3.00	WA	
790	40			7 8 11			@ 40 Feet: SILT (ML): Light brown, very fine grained sand, more sandy than above, moist, stiff.			
							Total depth of borehole is 41 1/2 feet, groundwater not encountered. Backfilled with cuttings.			

HS BA TP 05026-01 A.GPJ ZKCI.GDT 4/5/05

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	**Emerald Meadows Ranch**	Boring No.:	**B-8**
Project Number:	**05026-02**	Driller:	**2R Drilling**
		Drill Type:	**Hollowstem**
Date Drilled:	**3/24/05**	Hammer Wt. / Drop:	**140lb / 30in**
Logged By:	**CS**	Ground Elev. [ft]:	**792.1**

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

Elevation [ft]	Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
							Older Alluvium (Qoa): 0 to 26.5 Feet			
790				5 5 6	10.2	119	@ 2.5 Feet: Silty to Sandy CLAY (CL): Reddish brown, fine to coarse grained, moist, loose.			
	5			3 3 4			@ 5 Feet: Silty to Sandy CLAY (CL): Reddish brown, medium grained, moist, loose.			
785				6 10 11	2.0	106	@ 7.5 Feet: Poorly-graded SAND (SP): Gray, medium to coarse grained, slightly silty, moist, dense.			
	10			4 6 10			@ 10 Feet: Sandy SILT (ML): Gray, very fine grained sand, damp, very stiff.		WA	
780				10 10 14	24.5	87	@ 12.5 Feet: Sandy SILT (ML): Gray, very fine grained sand, pinhole porosity, damp, very stiff.	>4.50		
	15			2 4 6			@ 15 Feet: Silty SAND (SM): Brownish gray, very fine to fine grained sand, damp, loose to medium dense.			
775				6 11 12	30.2	93	@ 17.5 Feet: Sandy SILT (ML): Grayish brown, fine grained sand, some oxidation, moist, stiff.	4.00		
	20			4 5 9			@ 20 Feet: Sandy SILT (ML): Grayish brown, fine grained sand w/some coarse, some oxidation, moist, stiff.			
770										
	25			40 50/3"	7.5	103	@ 25 Feet: Poorly-graded GRAVEL w/sand (GP): Gray, wet, very dense.			
							Total depth of borehole is 26 1/2 feet, groundwater encountered at 26 feet below ground surface with caving at 26 feet. Backfilled with cuttings.			

HS BA TP 05026-02.GPJ ZKCI.GDT 4/7/05

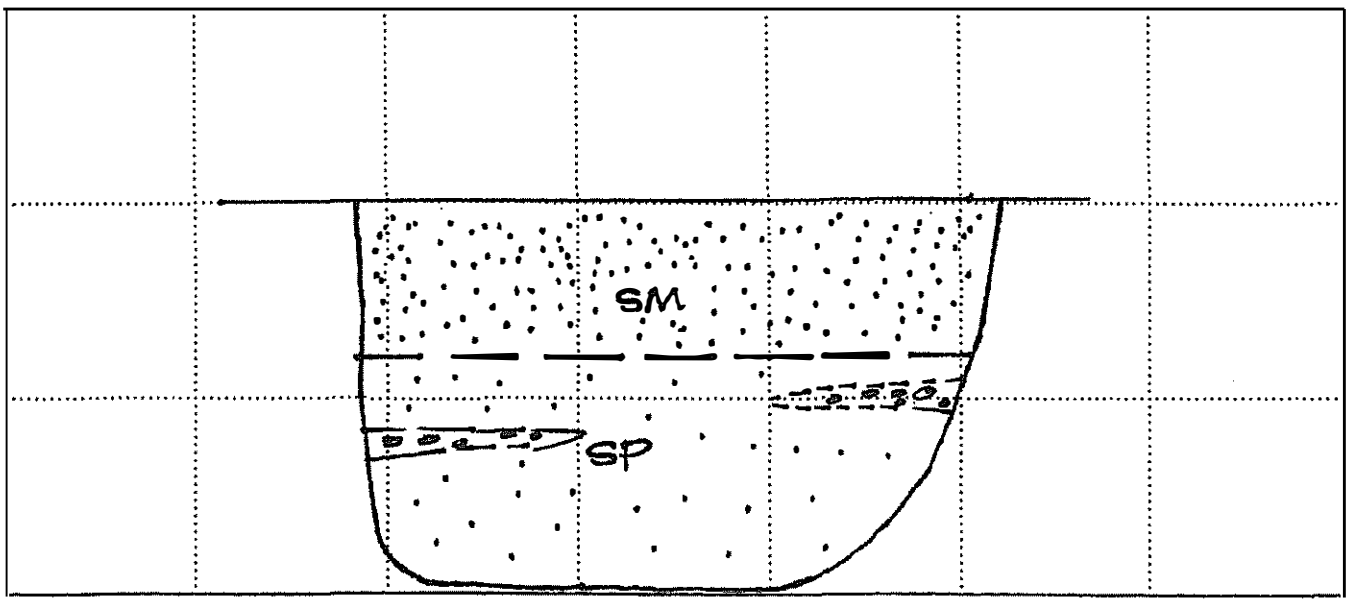
ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY TEST PIT

Project:	**Emerald Meadows Ranch**	Test Pit No.:	**ZT-1**
Project Number:	**05026-00**	Contractor:	**AC BACKHOE**
		Backhoe:	**Backhoe**
Date Drilled:	**2/24/05**	Hammer Wt. / Drop:	**140lb / 30in**
Logged By:	**AHM**	Ground Elev. [ft]:	**785.4**

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
785								**Younger Alluvium** (Qya):		
				3 12	10.0	91		@2 feet: Silty SAND (SM): olive brown, fine grained, slightly porous, pin-hole porosity, some rootlets, damp, very loose.		
				4 12	6.1	103		@4 feet: Poorly Graded SAND w/Some Gravel (SP): yellow brown, fine to medium grained, damp, loose.		
780	5									
				4 12	5.4	96		@8 feet: Poorly Graded SAND w/Some Gravel (SP): yellow brown, medium to coarse grained, damp, loose.		Max
	10							Total Depth: 10 feet below ground surface. No groundwater encountered. Caving occurred past 8 ft. Backfilled with natural cuttings.		



HS BA TP 05026-00 TP.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: N30E
Natural Slope Angle: 0

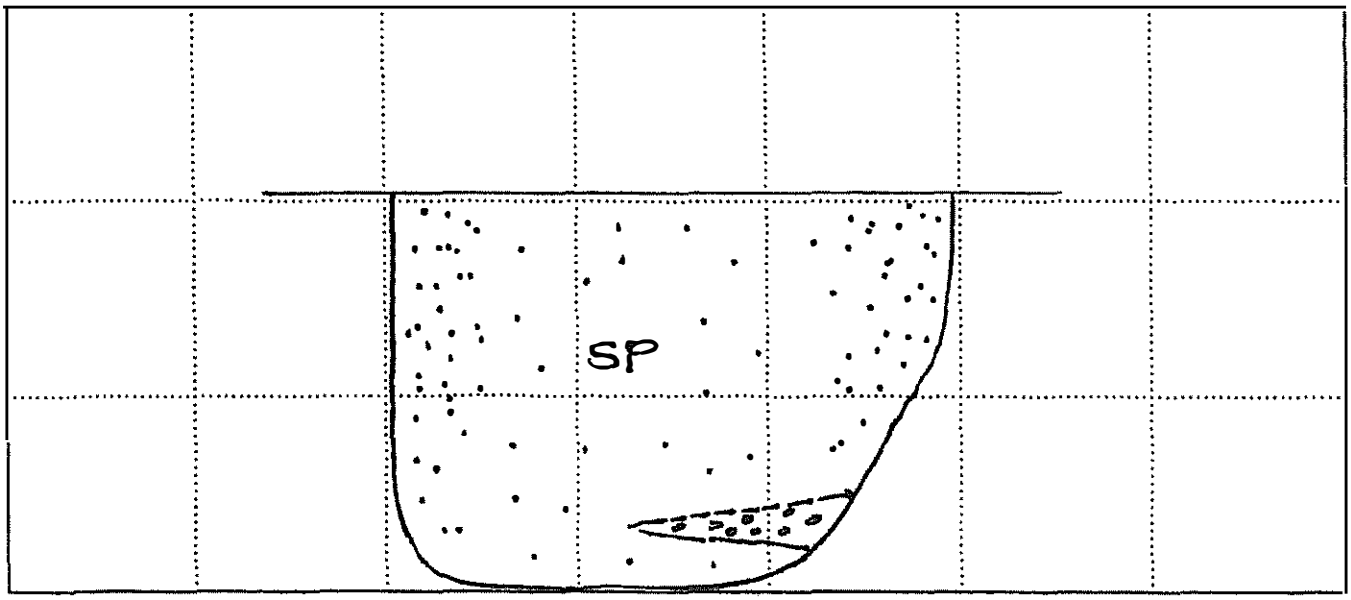
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	Emerald Meadows Ranch	Test Pit No.:	ZT-2
Project Number:	05026-00	Contractor:	AC BACKHOE
		Backhoe:	Backhoe
Date Drilled:	2/24/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	AHM	Ground Elev. [ft]:	783.5

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
780	0			2 12	6.7	95		**Younger Alluvium** (Qya): @2 feet: Poorly Graded SAND (SP): olive brown, fine to medium grained, porous, some rootlets, damp, very loose.		
	5			3 12	14.5	91		@5 feet: Poorly Graded SAND (SP): olive brown, fine to medium grained, porous, some rootlets, damp, very loose.		
775				7 12	6.2	100		@8 feet: Poorly Graded SAND (SP): yellow brown, medium to coarse grained, 6 inch gravel lense pinches in east wall, damp, loose.		
	10							Total Depth: 10 feet below ground surface. No groundwater encountered. Caving occurred at 4 ft. Backfilled with natural cuttings.		



HS BA TP 05026-00 TP.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: N10E
Natural Slope Angle: 0

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

LOG OF EXPLORATORY TEST PIT

Project:	Emerald Meadows Ranch	Test Pit No.:	ZT-3
Project Number:	05026-00	Contractor:	AC BACKHOE
		Backhoe:	Backhoe
Date Drilled:	2/24/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	AHM	Ground Elev. [ft]:	782.6

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
780	0		3 12	17.8	77			Max, DS
	5		5 12	24.8	104			
775			8 12	2.9	95			
	10							

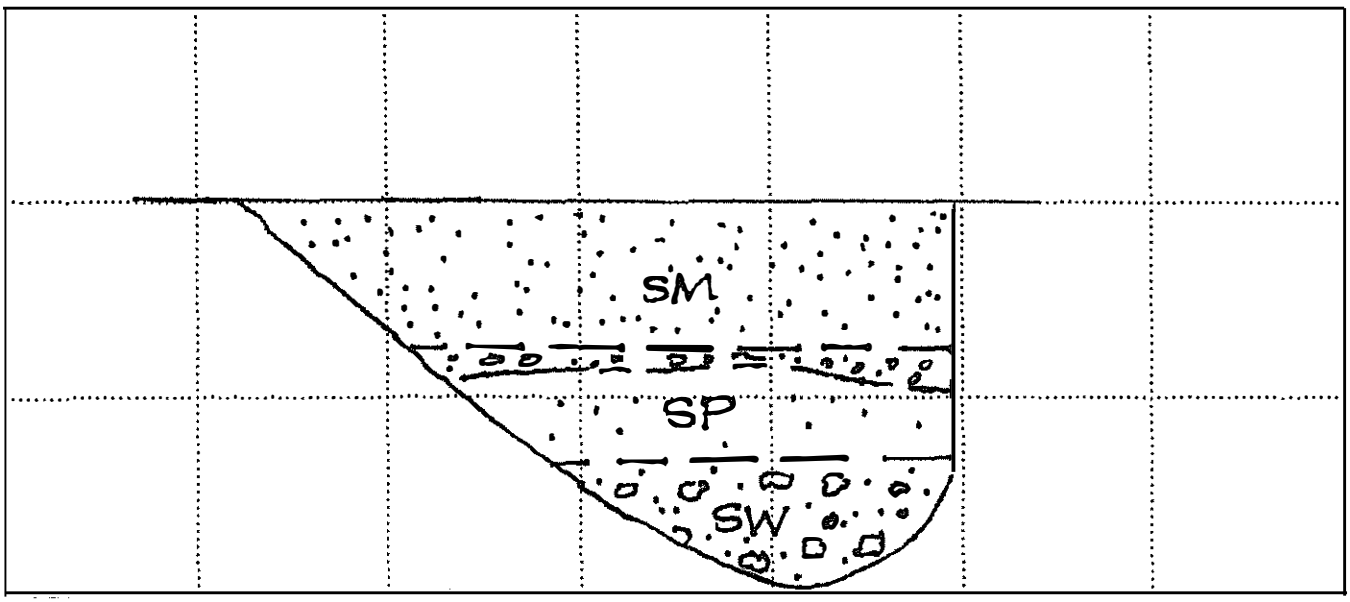
SOIL DESCRIPTION and CLASSIFICATION (USCS)

Younger Alluvium (Qya):

@1 foot: Silty SAND (SM): olive brown, fine grained, slightly porous, rootlets, damp, loose.

@4 feet: Silty SAND (SM): yellow to olive brown, fine to medium grained, slightly porous, damp, loose.
@4.25 feet: Poorly Graded SAND (SP): yellow to olive brown, fine to medium grained, damp, loose.
@5 feet: 2 inch thick cobble lense running east to west.
@7 foot: Well Graded SAND (SW):olive brown, fine grained, damp, loose.

Total Depth: 10 feet below ground surface.
No groundwater encountered.
Caving occurred at 5 ft.
Backfilled with natural cuttings.



HS BA TP 05026-00 TP.GPJ ZKCI.GDT 3/9/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: N78W
Natural Slope Angle: 0

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

LOG OF EXPLORATORY TEST PIT

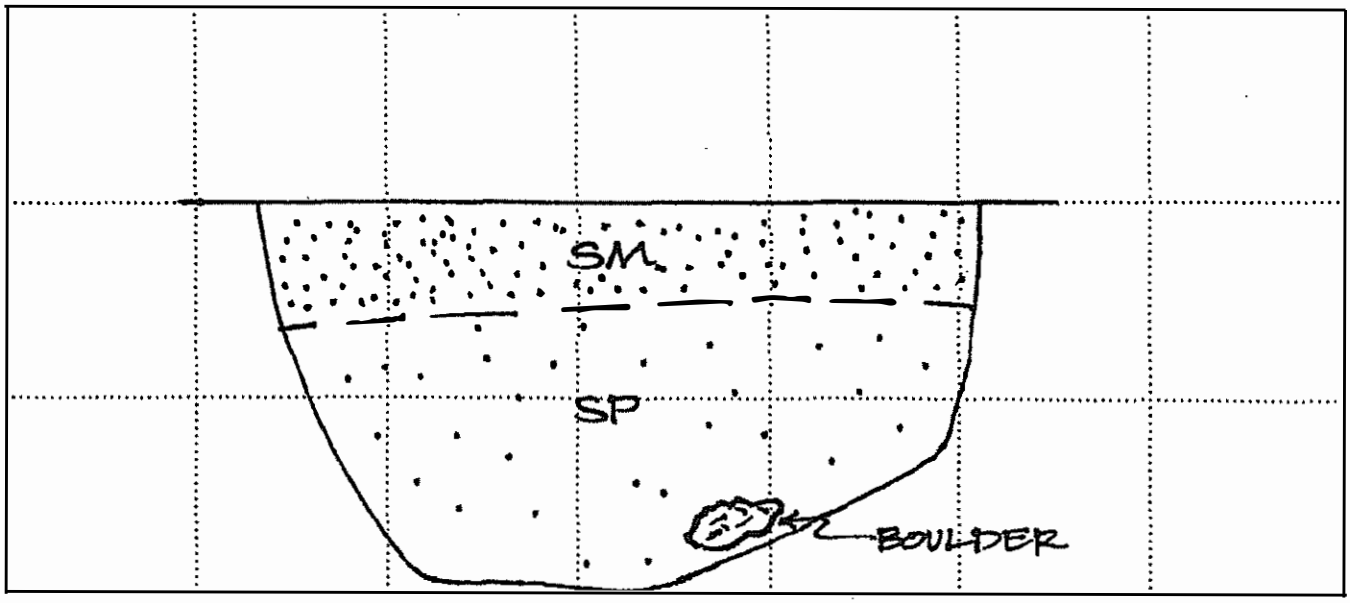
Sheet 1 of 1

Project:	Emerald Meadows Ranch	Test Pit No.:	ZT-4
Project Number:	05026-00	Contractor:	AC BACKHOE
		Backhoe:	Backhoe
Date Drilled:	2/24/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	AHM	Ground Elev. [ft]:	784.4

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
							Younger Alluvium (Qya):		
			3 12	6.4	98		@2 feet: Silty SAND (SM): olive brown, fine grained, slightly porous, damp to moist, very loose.		
780	5		5 12	10.0	93		@5 feet: Poorly Graded SAND w/some gravel (SM): yellow brown, medium to coarse grained, slightly porous, rootlets, moist, loose. @7 feet: Large boulder.		
775	10		8 12	7.0	91		@9 feet: Poorly Graded SAND w/some gravel (SM): yellow brown, coarse grained, slightly porous, rootlets, moist, loose.		

Total Depth: 10 feet below ground surface.
No groundwater encountered.
Backfilled with natural cuttings.



HS BA TP 05026-00 TP.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: N20E
Natural Slope Angle: 0

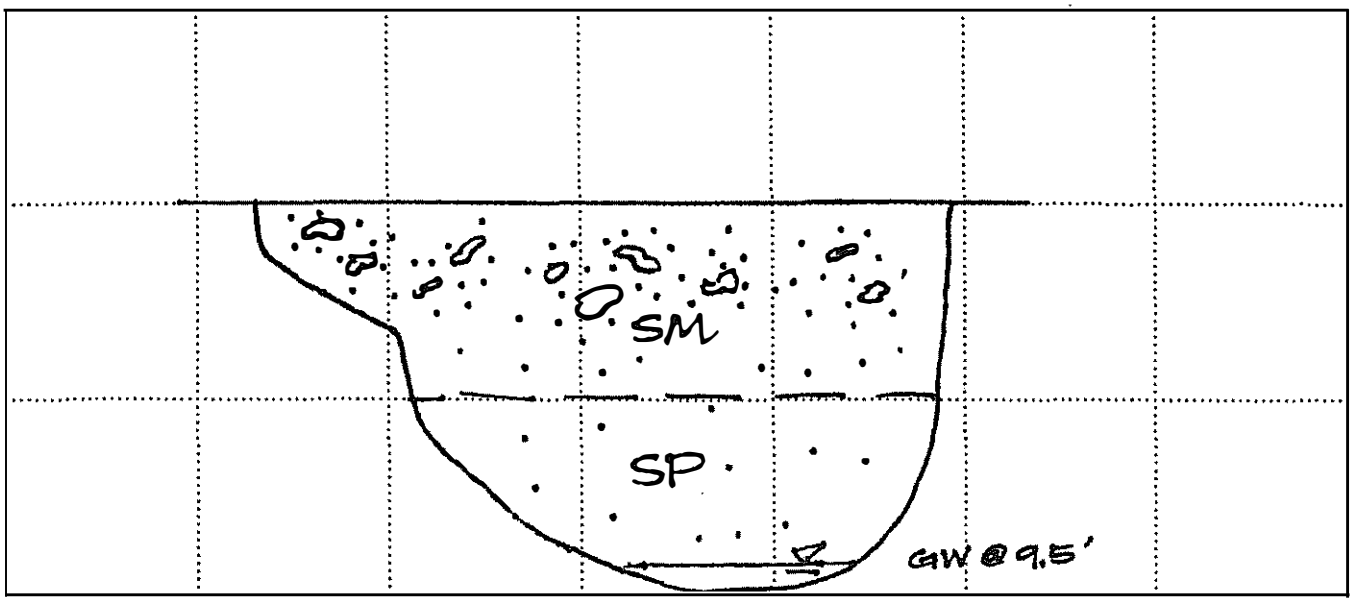
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	Emerald Meadows Ranch	Test Pit No.:	ZT-5
Project Number:	05026-00	Contractor:	AC BACKHOE
		Backhoe:	Backhoe
Date Drilled:	2/24/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	AHM	Ground Elev. [ft]:	788.6

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]	Geolo ic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
785	0			5 12	4.6	105		**Younger Alluvium** (Qya): @2 feet: Silty SAND (SM): yellow brown, fine to medium grained, some cobbles, damp, loose.		
	5			5 12	5.5	99		@5 feet: Poorly Graded SAND (SP): yellow brown, fine to medium grained, damp, loose.		
780				7 12	4.2	108		@9 feet: Poorly Graded SAND (SP): yellow brown, fine to medium grained, wet, loose.		
	10							Total Depth: 10 feet below ground surface. Groundwater encountered at 9.5 feet bgs. Caving occurred at 6 ft. Backfilled with natural cuttings.		



HS BA TP 05026-00 TP.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft] V 5 [ft]

Pit Orientation: N15E
Natural Slope Angle: 0

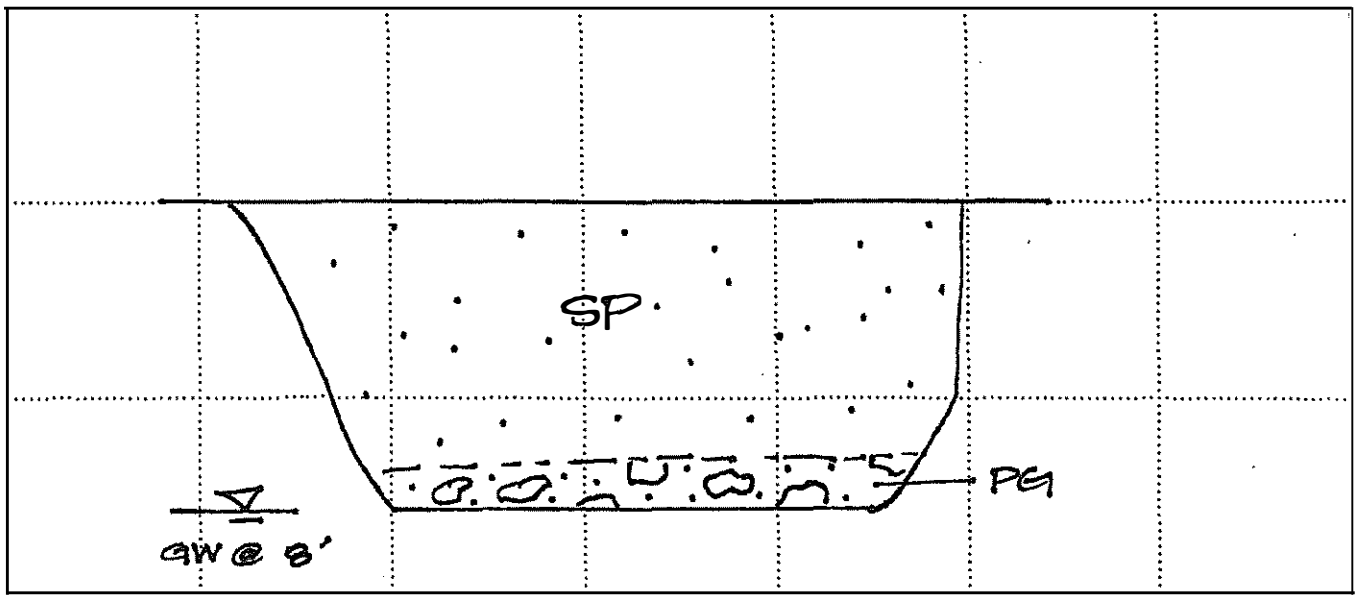
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	**Emerald Meadows Ranch**	Test Pit No.:	**ZT-6**
Project Number:	**05026-00**	Contractor:	**AC BACKHOE**
		Backhoe:	**Backhoe**
Date Drilled:	**2/24/05**	Hammer Wt. / Drop:	**140lb / 30in**
Logged By:	**AHM**	Ground Elev. [ft]:	**789.4**

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
785	5			5 12	7.2	102		**Younger Alluvium** (Qya): @1 foot: Poorly Graded SAND (SP): yellow brown, medium to coarse grained, slightly porous, damp to moist, loose.		
				7 12	7.3	98		@5 feet: Poorly Graded SAND (SP): yellow brown, coarse grained, damp to moist, loose.		
								@8 feet: Poorly Graded GRAVEL (GP): cobble and gravel in sandy matrix 8 to 24 inch thick.		
								Total Depth: 9 feet below ground surface. Groundwater encountered at 8 feet bgs. Caving occurred at 3 ft. Backfilled with natural cuttings.		



H5 BA TP 05026-00 TP.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: N38E
Natural Slope Angle: 0

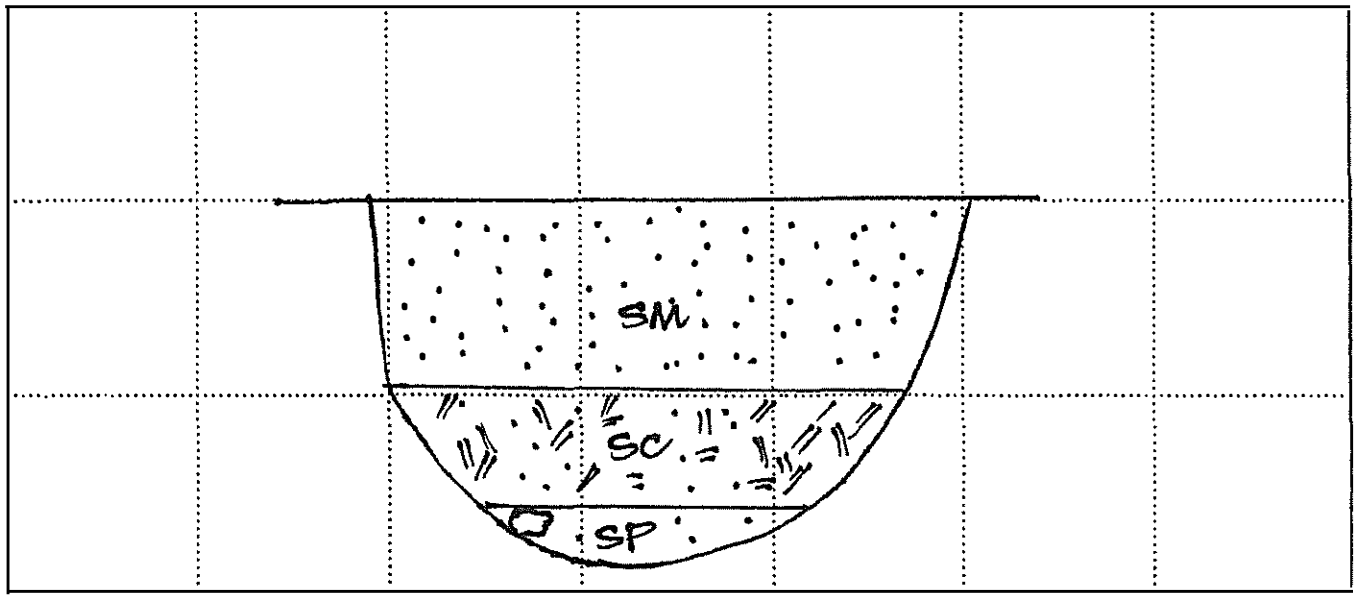
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	Emerald Meadows Ranch	Test Pit No.:	ZT-7
Project Number:	05026-00	Contractor:	AC BACKHOE
		Backhoe:	Backhoe
Date Drilled:	2/24/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	AHM	Ground Elev. [ft]:	789.3

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
785	5			5 12	18.7	93		**Younger Alluvium** (Qya): @1 foot: Silty SAND (SM): brown, fine grained, some pin-hole pores, damp, loose.		
				6 12	30.0	86		@2 feet: Clayey SAND (SC): dark brown, fine grained, pin-hole porosity, damp, loose.		
				5 12	5.8	96		@8 feet: Poorly Graded SAND (SP): yellow brown, medium grained, some boulders, damp to moist, loose. Total Depth: 9 feet below ground surface. No groundwater encountered. Backfilled with natural cuttings.		



HS BA TP 05026-00 TP.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft] V 5 [ft]

Pit Orientation: N10W
Natural Slope Angle: 0

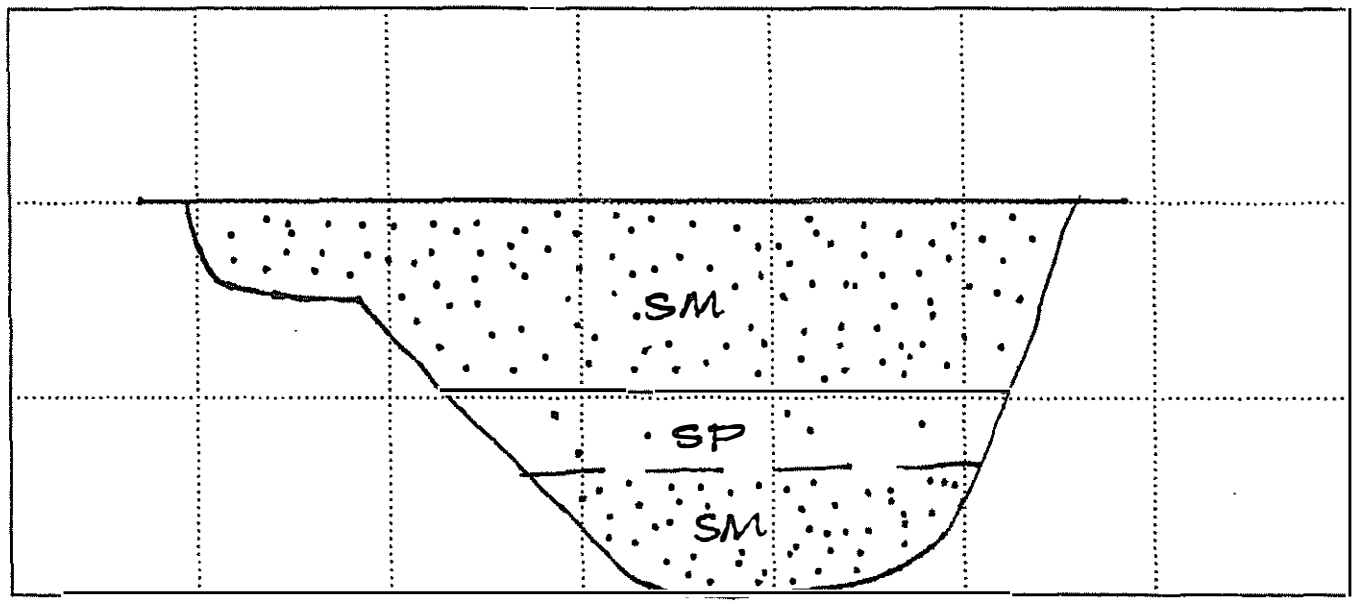
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	Emerald Meadows Ranch	Test Pit No.:	ZT-8
Project Number:	05026-00	Contractor:	AC BACKHOE
		Backhoe:	Backhoe
Date Drilled:	3/1/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	AHM	Ground Elev. [ft]:	788.2

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
785	5			5	10.1	98		**Younger Alluvium** (Qya): @2 feet: Silty SAND (SM): brown, medium grained, slightly porous, rootlets, damp, loose.		Max
				4	25.7	85		@5 feet: Poorly Graded SAND (SP): yellow brown, medium grained, damp, loose.		
780				3	9.3	98		@7 feet: Silty SAND (SM): dark brown, fine grained, slightly porous, damp, loose. @8 feet: Poorly Graded SAND (SP): yellow brown, medium grained, damp, loose.		
	10							Total Depth: 10 feet below ground surface. No groundwater encountered. Backfilled with natural cuttings.		



HS BA TP 05026-00 TP.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft] V 5 [ft]

Pit Orientation: N5E
Natural Slope Angle: 0

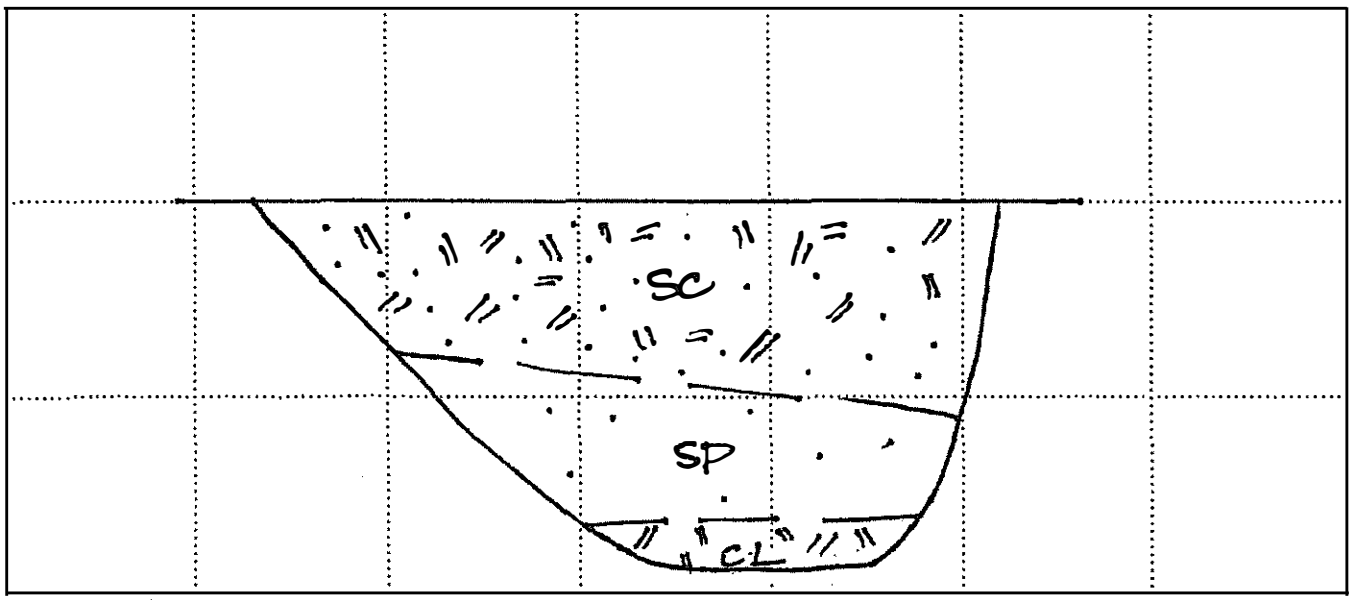
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	Emerald Meadows Ranch	Test Pit No.:	ZT-9
Project Number:	05026-00	Contractor:	AC BACKHOE
		Backhoe:	Backhoe
Date Drilled:	3/1/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	AHM	Ground Elev. [ft]:	787.3

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]	Geolo ic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
785				4	26.6	74		**Younger Alluvium** (Qya):		
	5			5	11.8	99		@2 feet: Clayey SAND (SC): dark brown, fine grained, pin-hole porosity, rootlets, dry to damp, loose.		
780				3	34.5	84		@5 feet: Poorly Graded SAND (SP): yellow brown, medium grained, damp, loose.		
								@8 feet: Silty CLAY (CL): dark brown, fine grained, very porous, damp, soft.		
								Total Depth: 9 feet below ground surface. No groundwater encountered. Backfilled with natural cuttings.		



HS BA TP 05026-00 TP.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: N
Natural Slope Angle: 0

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

LOG OF EXPLORATORY TEST PIT

Project:	Emerald Meadows Ranch	Test Pit No.:	ZT-10
Project Number:	05026-00	Contractor:	AC BACKHOE
		Backhoe:	Backhoe
Date Drilled:	3/1/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	AHM	Ground Elev. [ft]:	785.3

Standard Spilt Spoon | Shelby Tube | Water Level ATD
Califomia | Bulk Sample | Static Water Table

Elevation [ft]	Depth [ft]	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Pocket Pen. [tsf]	Lab Tests
785	0					
		2	10.2	80		Max, DS
780	5	3	9.7	82		
		10	10.2	94		
	10					

SOIL DESCRIPTION and CLASSIFICATION (USCS)

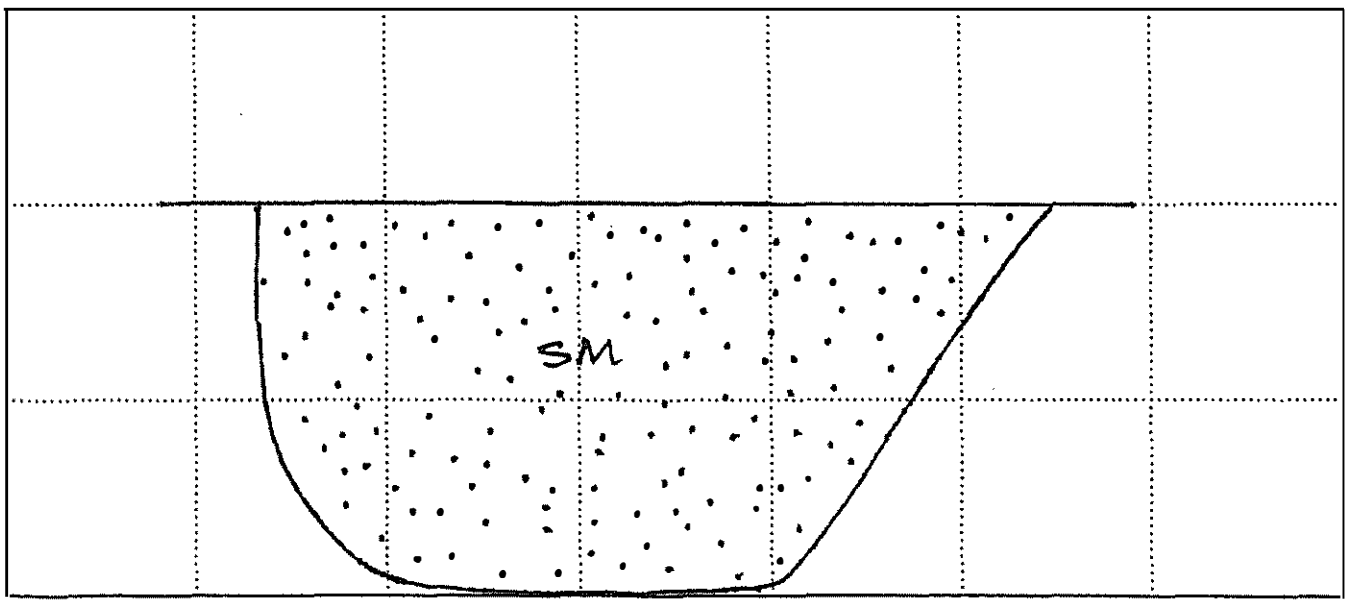
Younger Alluvium (Qya):

@2 feet: Silty SAND (SM): light brown, fine to medium grained, pin-hole porosity, rootlets, damp, very loose.

@5 feet: Silty SAND (SM): light brown, fine grained, slightly porous, damp, loose.

@9 feet: Silty SAND (SM): olive brown, fine grained, slightly porous, iron oxide staining, damp to moist, medium dense.

Total Depth: 10 feet below ground surface.
No groundwater encountered.
Backfilled with natural cuttings.



HS BA TP 05026-00 TP.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: N80W
Natural Slope Angle: 0

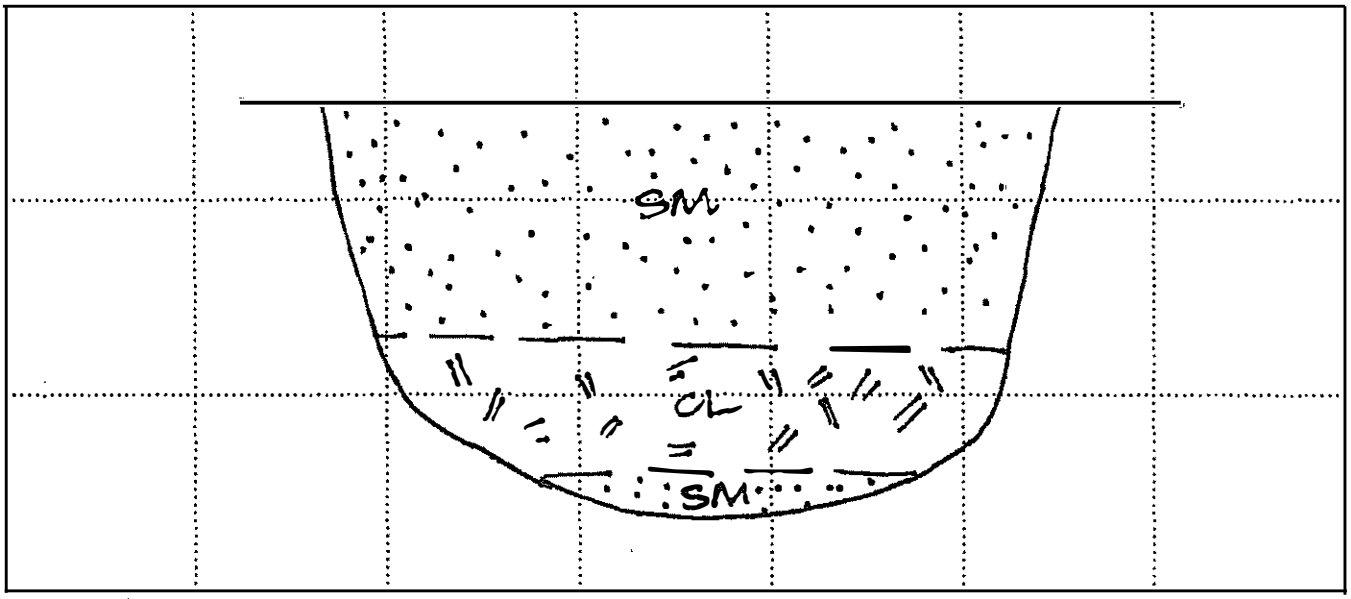
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	Emerald Meadows Ranch	Test Pit No.:	ZT-11
Project Number:	05026-00	Contractor:	AC BACKHOE
		Backhoe:	Backhoe
Date Drilled:	3/1/05	Hammer Wt. / Drop:	140lb / 30In
Logged By:	AHM	Ground Elev. [ft]:	782.2

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
780				2	19.6	76		**Younger Alluvium** (Qya):		
								@2 feet: Silty SAND (SM): dark brown, fine grained, pin-hole porosity, rootlets, moist, very loose.		
	5			3	22.1	78		@4 feet: Silty SAND (SM): light brown, fine grained, slightly porous, moist, loose.		
775				3	28.4	112		@7 feet: Silty CLAY (CL): olive brown, fine grained, slightly porous, moist, soft.		
	10			3	15.9	92		@10 feet: Silty SAND (SM): olive brown, fine to medium grained, pin-hole porosity, iron oxidation, moist, loose.		
								Total Depth: 11 feet below ground surface. No groundwater encountered. Backfilled with natural cuttings.		



HS BA TP 05026-00 TP.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft] V 5 [ft]

Pit Orientation: N45W
Natural Slope Angle: 0

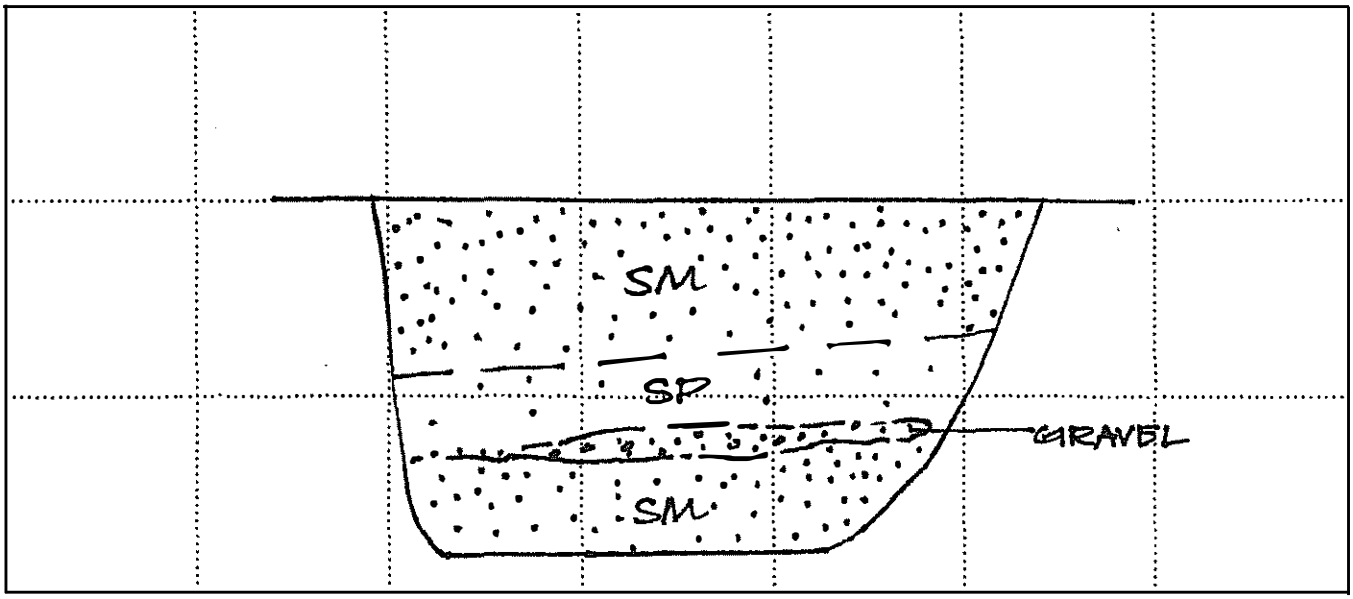
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	Emerald Meadows Ranch	Test Pit No.:	ZT-12
Project Number:	05026-00	Contractor:	AC BACKHOE
		Backhoe:	Backhoe
Date Drilled:	3/1/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	AHM	Ground Elev. [ft]:	792.4

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
790				7	11.2	106		**Older Alluvium** (Qoa): @2 feet: Silty SAND (SM): red brown, medium grained, pin-hole porosity, rootlets, moist, loose.		Max
	5			8	7.2	109		@5 feet: Poorly Graded SAND w/some gravel (SP): yellow brown, medium grained, moist, loose.		
785				6	7.4	98		@8 feet: Silty SAND (SM): olive brown, fine grained, moist, loose.		
								Total Depth: 9 feet below ground surface. No groundwater encountered. Backfilled with natural cuttings.		



HS BA TP 05026-00 TP.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: N65W
Natural Slope Angle: 0

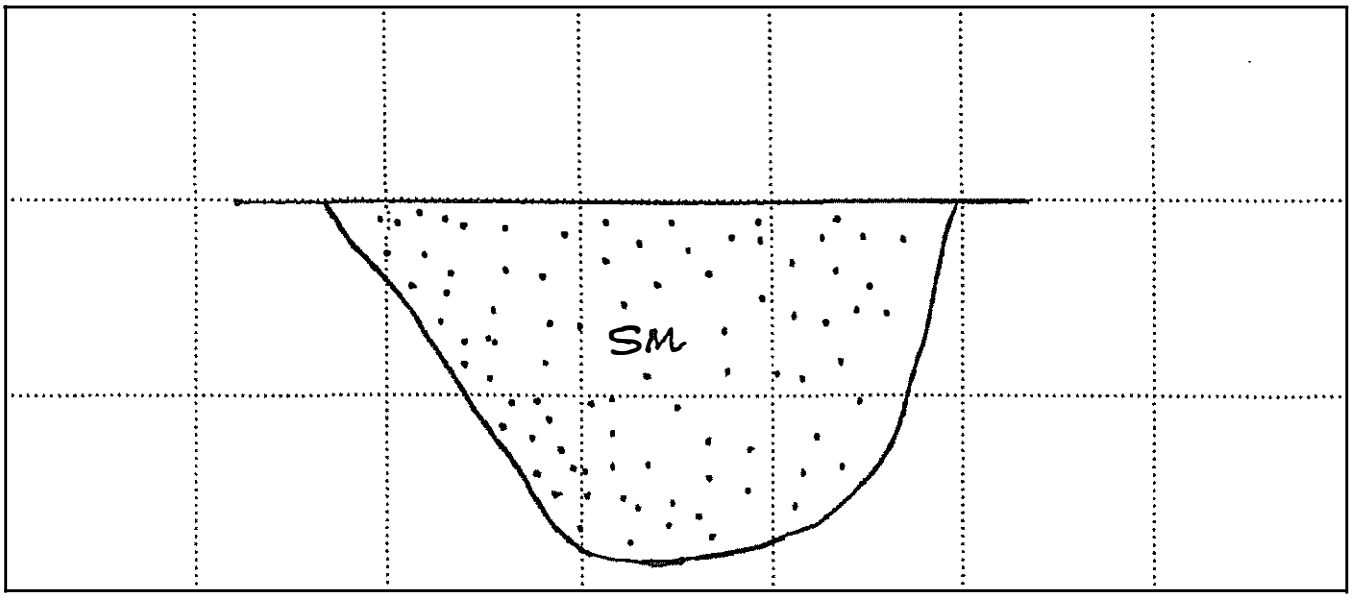
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	Emerald Meadows Ranch	Test Pit No.:	ZT-13
Project Number:	05026-00	Contractor:	AC BACKHOE
		Backhoe:	Backhoe
Date Drilled:	3/1/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	AHM	Ground Elev. [ft]:	787.5

Standard Split Spoon | Shelby Tube | Water Level ATD
California | Bulk Sample | S atic 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
785				6 12	11.4	108		**Older Alluvium** (Qoa): @2 feet: Silty SAND (SM): yellow brown, fine grained, slightly porous, moist, loose.		
	5			6 12	10.4	106		@6 feet: Silty SAND (SM): yellow brown, fine grained, slightly porous, moist, loose.		
780				6 12	12.6	101		@8 feet: Silty SAND (SM): yellow brown, fine grained, slightly porous, moist, loose. Total Depth: 9 feet below ground surface. No groundwater encountered. Backfilled with natural cuttings.		



HS BA TP 05026-00 TP.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: N10E
Natural Slope Angle: 0

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

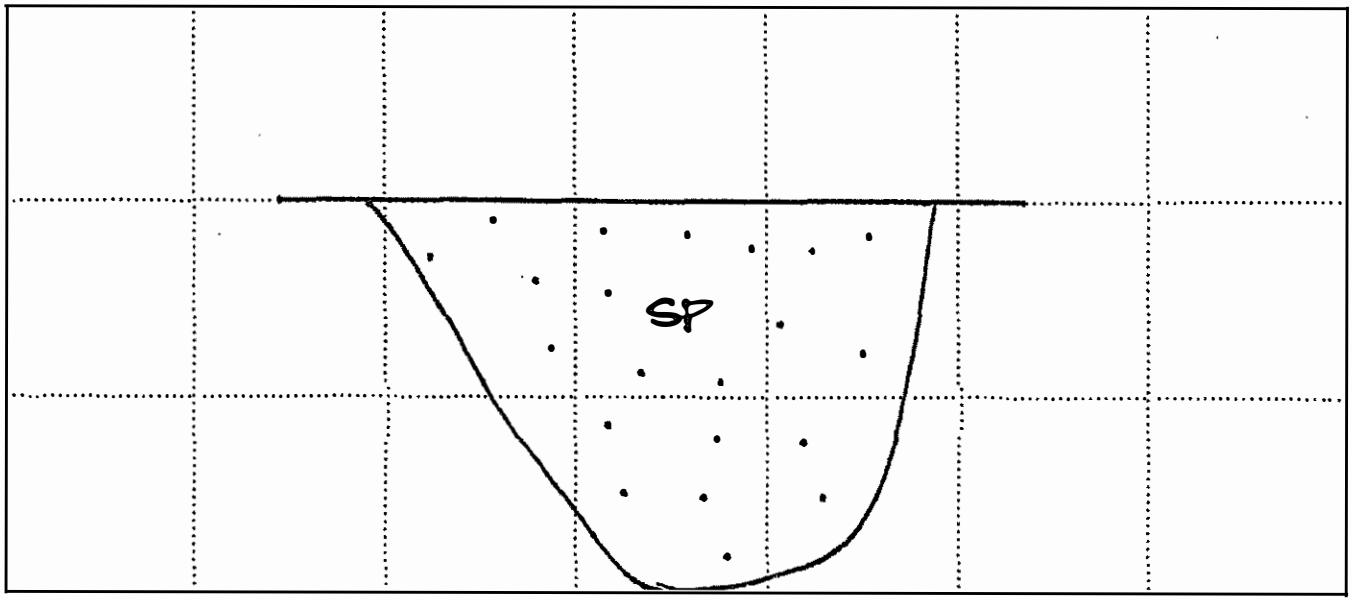
LOG OF EXPLORATORY TEST PIT

Sheet 1 of 1

Project:	Emerald Meadows Ranch	Test Pit No.:	ZT-14
Project Number:	05026-00	Contractor:	AC BACKHOE
		Backhoe:	Backhoe
Date Drilled:	3/1/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	AHM	Ground Elev. [ft]:	792.0

Standard Split Spoon | Shelby Tube | Water Level ATD
Callfornia | 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
790				4	4.5	97		**Older Alluvium** (Qoa):		Max
								@2 feet: Poorly Graded SAND (SP): olive brown, medium grained, rootlets, caliche straining, moist, loose.		
	5			4	7.5	94		@5 feet: Poorly Graded SAND (SP): yellow brown, medium grained, iron oxidation, moist, loose.		
785										
				4	7.5	100		@9 feet: Poorly Graded SAND (SP): yellow brown, medium grained, iron oxidation, moist, loose.		
	10							Total Depth: 10 feet below ground surface. No groundwater encountered. Backfilled with natural cuttings.		



HS BA TP 05026-00 TP.GPJ ZKCI.GDT 3/8/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: N50E
Natural Slope Angle: 0

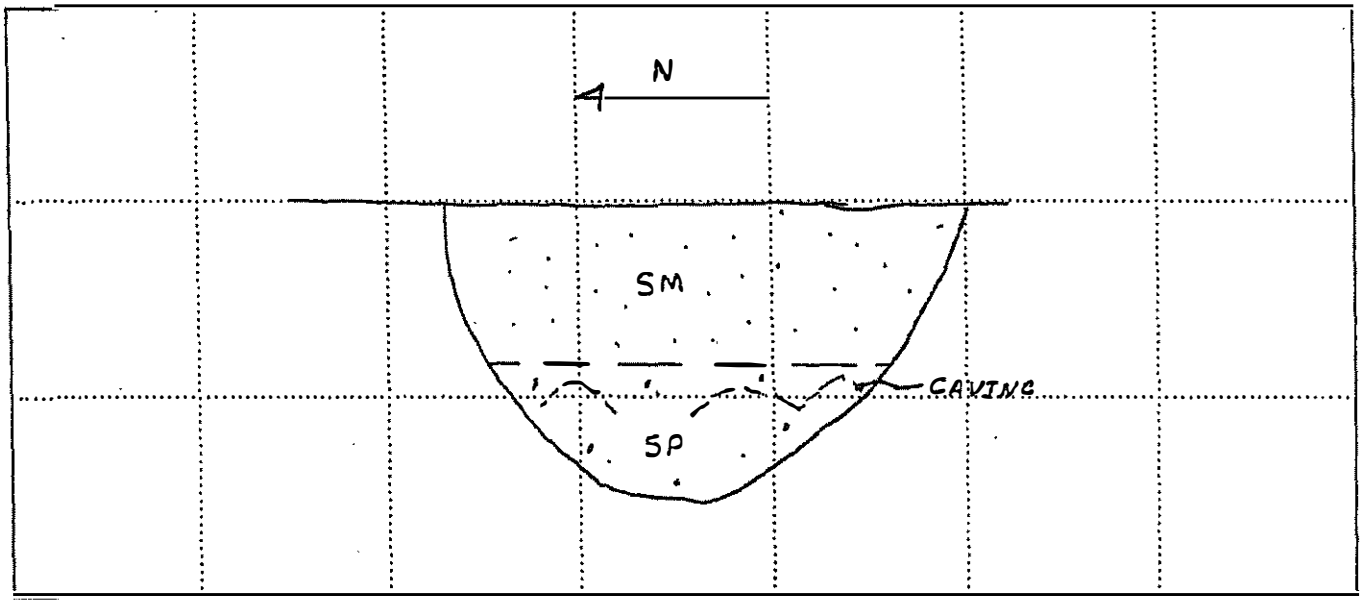
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	**Emerald Meadows Ranch**	Test Pit No.:	**T-1**
Project Number:	**05026-02**	Contractor:	**American**
		Backhoe:	**Case Super E**
Date Drilled:	**3/25/05**	Hammer Wt. / Drop:	
Logged By:	**C.S.**	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]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
				5.6	94		**Younger Alluvium (Qya): 0 to 8 Feet** 0 to 4-1/2 feet: Silty SAND (SM): reddish brown to grayish brown, fine grained, organics and rootlets un upper 6 inches, moist, loose.		
				11.6	90				
5							4-1/2 to 8 feet: Poorly graded SAND (SP): light brown, coarse grained, some oxidation, some gravel up to 2 inches in diameter, moist, loose. Heavy caving at 5 feet.		
							Total depth: 8 feet below ground surface. No groundwater encountered. Heavy sidewall caving at 5 feet. Excavation stopped for safety reasons. Backfilled with cuttings.		



HS BA TP 05026-02TP.GPJ ZKCI.GDT 3/29/05

ZEISER KLING Consultants Inc

Scale: H 5 [ft] V 5 [ft]

Pit Orientation: N-S
Natural Slope Angle: 0

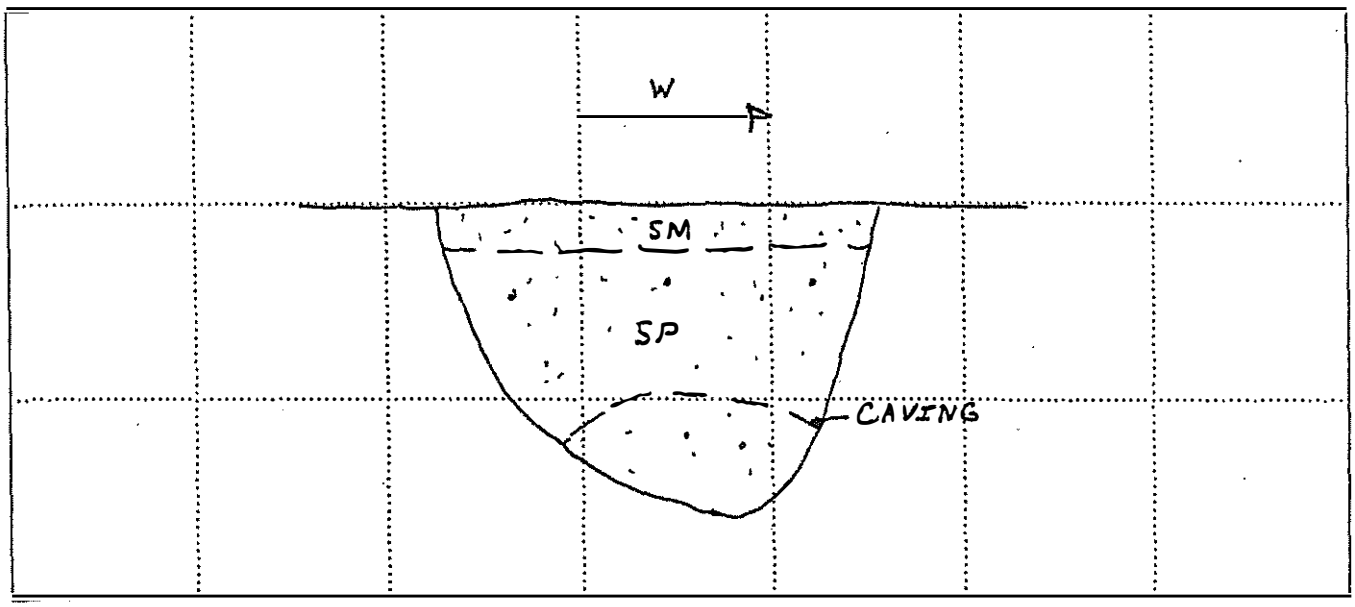
B - Bedding Plane
J - Joint
C - Contact
F - Fault

LOG OF EXPLORATORY TEST PIT

Project:	**Emerald Meadows Ranch**	Test Pit No.:	**T-2**
Project Number:	**05026-02**	Contractor:	**American**
		Backhoe:	**Case Super E**
Date Drilled:	**3/25/05**	Hammer Wt. / Drop:	
Logged By:	**C.S.**	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]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
				1.5	103		**Younger Alluvium (Qya): 0 to 8 Feet** 0 to 1 foot: Silty SAND (SM): brown, fine to medium grained, organics and rootlets in upper 6 inches, moist, loose. 1 to 8 feet: Poorly graded SAND (SP): light brown, coarse grained, some oxidation, some gravel up to 2 inches in diameter, several rip-up clasts of silt, moist, loose.		
				5.2	95				Max
5							Heavy caving at 5 feet. Relative density change.		
							Total depth: 8 feet below ground surface. No groundwater encountered. Heavy sidewall caving at 5 feet. Excavation stopped for safety reasons. Backfilled with cuttings.		



HS BA TP 05026-02TP.GPJ ZKCI.GDT 3/29/05

ZEISER KLING Consultants Inc.

Scale: H 5 [ft] V 5 [ft]

Pit Orientation: E-W
Natural Slope Angle: 0

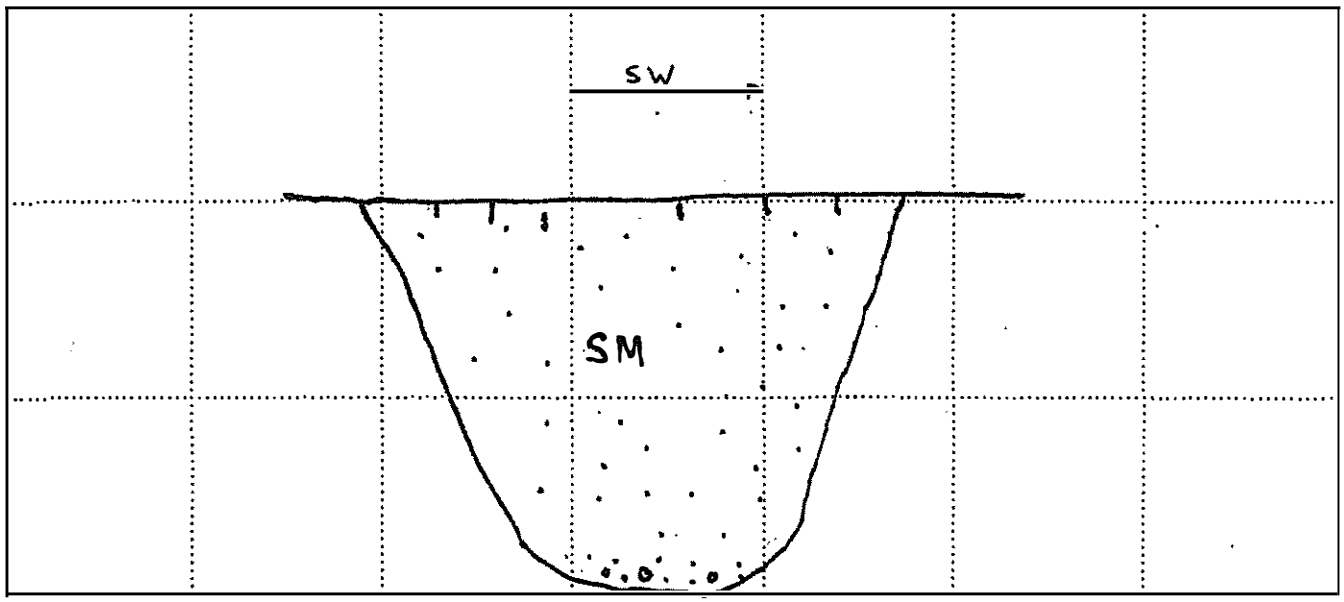
B - Bedding Plane
J - Joint
C - Contact
F - Fault

LOG OF EXPLORATORY TEST PIT

Project:	**Emerald Meadows Ranch**	Test Pit No.:	**T-3**
Project Number:	**05026-01**	Contractor:	**American**
		Backhoe:	**Case Super E**
Date Drilled:	**3/25/05**	Hammer Wt. / Drop:	
Logged By:	**C.S.**	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]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
				6.0	103		**Older Alluvium (Qoa): 0 to 10 Feet** 0 to 9 feet: Silty SAND (SM): reddish brown, fine grained, some minor amounts of clay, minor porosity, rootlets to approximately 1 foot, moisture decreasing with depth, moist at 1 foot to slightly moist at 9 feet, loose to medium dense.		
				7.3	106				Max
5									
							9-10 feet: Silty SAND (SM): light brown, coarse grained, minor amounts of gravel, slightly moist, medium dense.		
10							Total depth: 10 feet below ground surface. No groundwater encountered. No caving. Backfilled with cuttings.		



HS BA TP 05026-01TP.GPJ ZKCI.GDT 3/29/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: NE-SW
Natural Slope Angle: 2SE

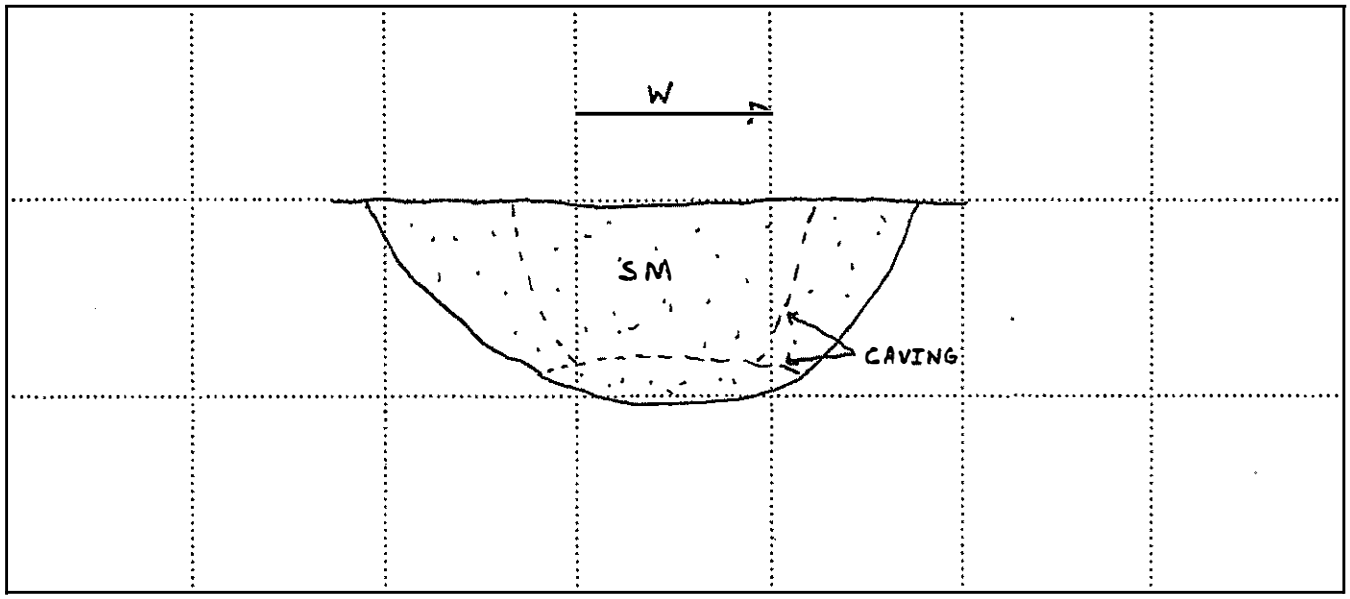
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	**Emerald Meadows Ranch**	Test Pit No.:	**T-4**
Project Number:	**05026-01**	Contractor:	**American**
		Backhoe:	**Case Super E**
Date Drilled:	**3/25/05**	Hammer Wt. / Drop:	
Logged By:	**C.S.**	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]	Geolo ic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
				2.9	99		**Older Alluvium (Qoa): 0 to 5 Feet** 0 to 5 feet: Silty SAND (SM): reddish brown, fine to medium grained, slightly porous, rootlets to approximately 1 foot, moist, loose.		
				4.0	98				
5				4.2	101		Total depth: 5 feet below ground surface. No groundwater encountered. Heavy sidewall caving at 5 feet. Excavation stopped for safety reasons. Backfilled with cuttings.		



HS BA TP 05026-01TP.GPJ ZKCI.GDT 3/29/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: E-W
Natural Slope Angle: 2E

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

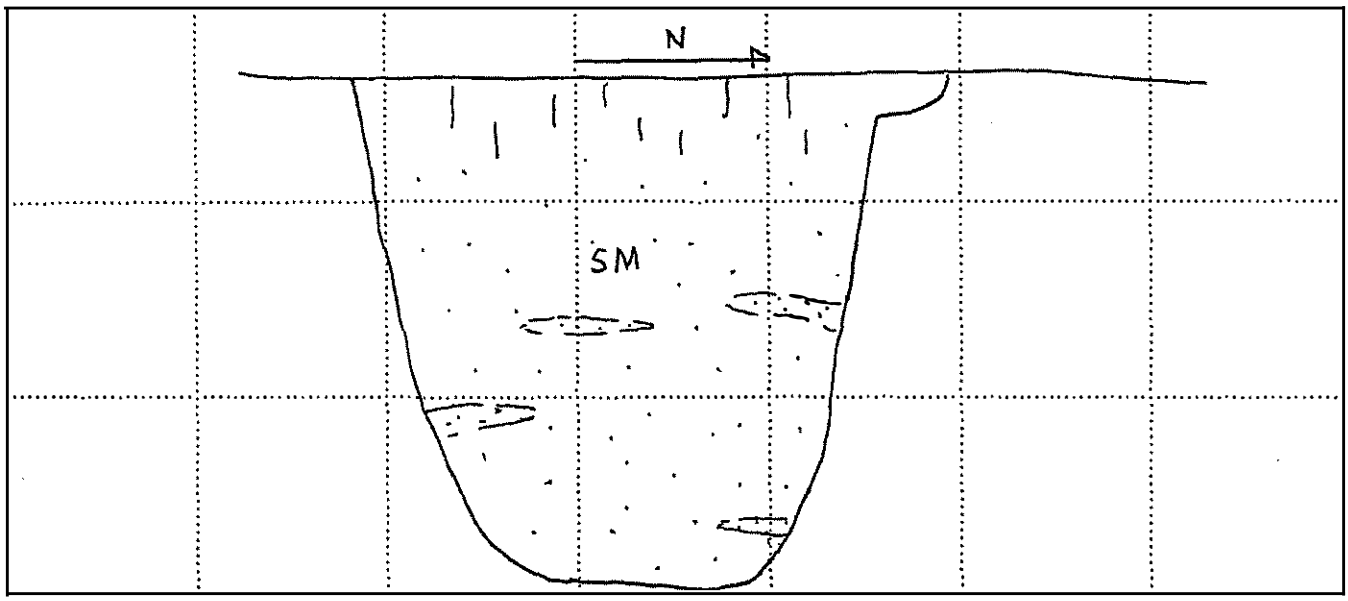
LOG OF EXPLORATORY TEST PIT

Project:	**Emerald Meadows Ranch**	Test Pit No.:	**T-5**
Project Number:	**05026-02**	Contractor:	**American**
		Backhoe:	**Case Super E**
Date Drilled:	**3/25/05**	Hammer Wt. / Drop:	
Logged By:	**C.S.**	Ground Elev. [ft]:	---

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

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
5				5.1	97		**Older Alluvium (Qoa): 0 to 13 Feet** 0 to 13 feet: Silty SAND (SM): dark reddish brown, fine to medium grained, rootlets to approximately 3 feet, slight porosity, some inter-lenses of brown medium grained sand, silt content decreasing with depth, moist, loose to medium dense.		Max, RV
				8.8	100				
				10.6	109				
10									

Total depth: 13 feet below ground surface.
No groundwater encountered.
No caving.
Backfilled with cuttings.



HS BA TP 05026-02TP.GPJ ZKCI.GDT 3/29/05

ZEISER KUNG Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: N-S
Natural Slope Angle: 0

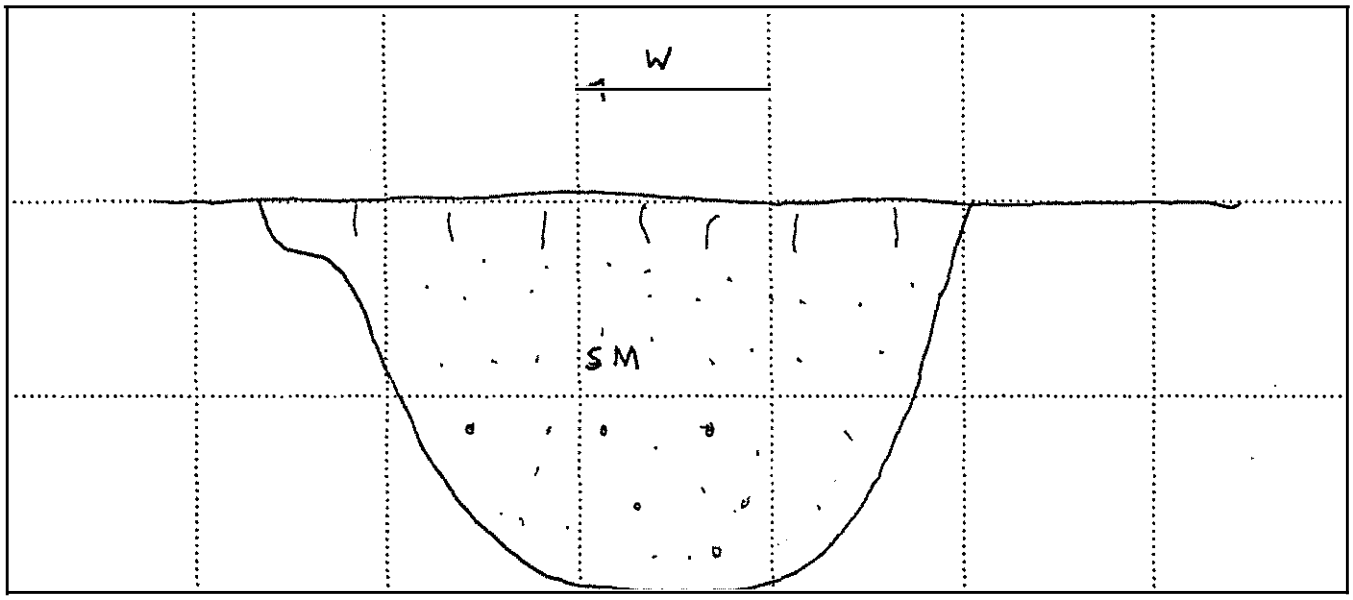
B - Bedding Plane
J - Joint
C - Contact
F - Fault

LOG OF EXPLORATORY TEST PIT

Project:	**Emerald Meadows Ranch**	Test Pit No.:	**T-6**
Project Number:	**05026-02**	Contractor:	**American**
		Backhoe:	**Case Super E**
Date Drilled:	**3/25/05**	Hammer Wt. / Drop:	
Logged By:	**C.S.**	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]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
5				6.3	98		**Older Alluvium (Qoa): 0 to 10 Feet** 0 to 10 feet: Silty SAND (SM): dark reddish brown, fine to medium grained, rootlets to approximately 3-1/2 feet, minor porosity, some minor amounts of gravel, rip-up clasts of clayey sand present, becomes coarser grained at 5 feet, moist, loose to medium dense.		
				7.6	104				
				9.1	103				
10							Total depth: 10 feet below ground surface. No groundwater encountered. No caving. Backfilled with cuttings.		



HS BA TP 05026-02TP.GPJ ZKCI.GDT 3/29/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft] V 5 [ft]

Pit Orientation: E-W
Natural Slope Angle: 0

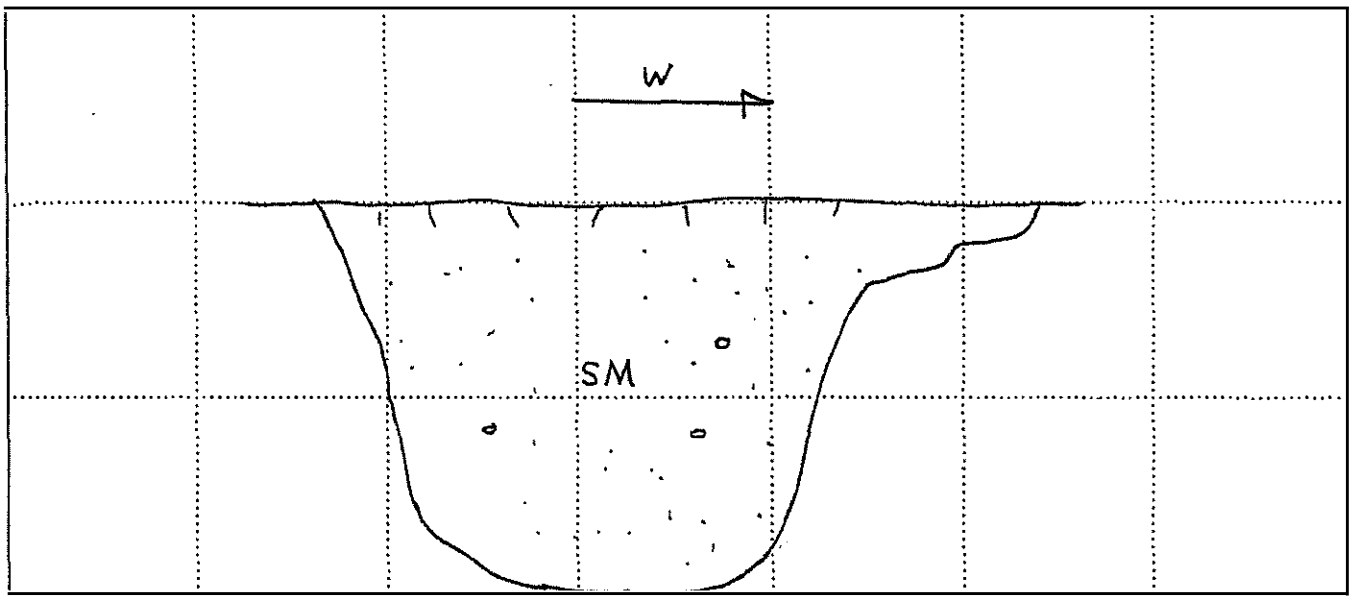
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	**Emerald Meadows Ranch**	Test Pit No.:	**T-7**
Project Number:	**05026-02**	Contractor:	**American**
		Backhoe:	**Case Super E**
Date Drilled:	**3/25/05**	Hammer Wt. / Drop:	
Logged By:	**C.S.**	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]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
				5.8	105		**Older Alluvium (Qoa): 0 to 10 Feet** 0 to 10 feet: Silty SAND (SM): dark reddish brown, medium grained, rootlets to approximately 1 foot, minor porosity, some minor amounts of gravel, silt content decreases with depth, moist, loose to medium dense.		
				7.1	106				
5				7.3	105				
10							Total depth: 10 feet below ground surface. No groundwater encountered. No caving. Backfilled with cuttings.		



HS BA TP 05026-02TP.GPJ ZKCI.GDT 3/29/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: E-W
Natural Slope Angle: 0

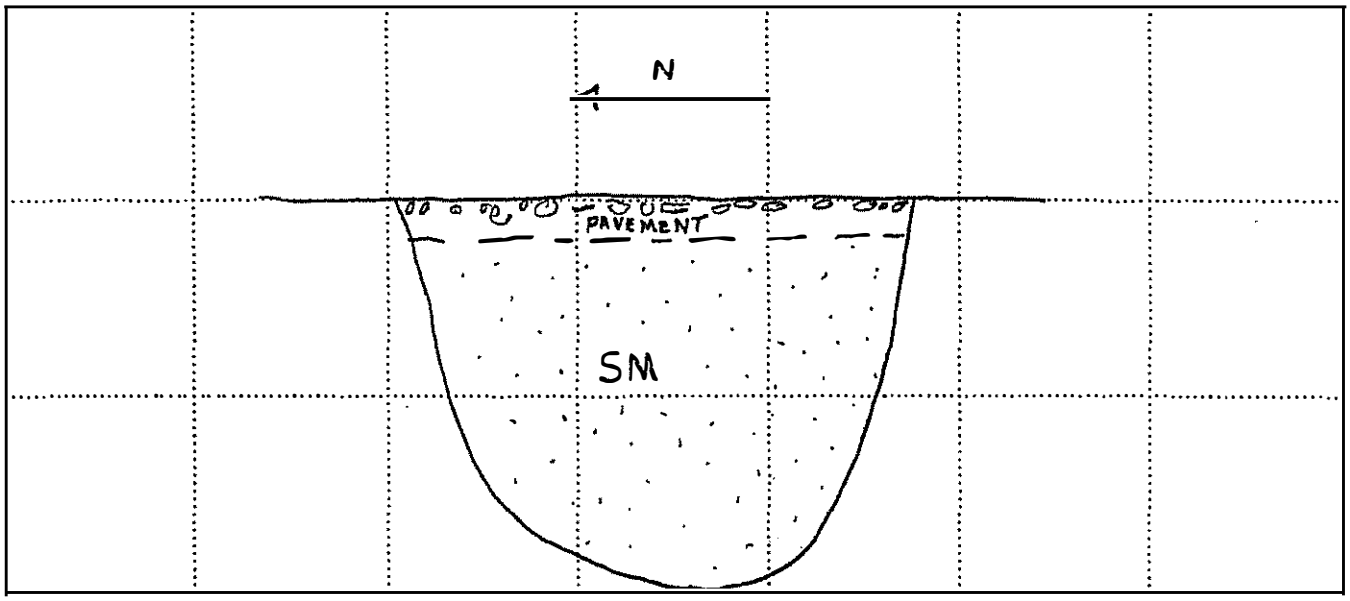
B - Bedding Plane
J - Joint
C - Contact
F - Fault
S - Shear

LOG OF EXPLORATORY TEST PIT

Project:	**Emerald Meadows Ranch**	Test Pit No.:	**T-8**
Project Number:	**05026-01**	Contractor:	**American**
		Backhoe:	**Case Super E**
Date Drilled:	**3/25/05**	Hammer Wt. / Drop:	
Logged By:	**C.S.**	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]	Geologic Notes	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests
							Pavement: 0 to 1 Foot 0 to 1 foot: Asphalt: approximately 6 inches over sand base, highly weathered and degraded. **Older Alluvium (Qoa): 1 to 10 Feet** 1 to 10 feet: Silty SAND (SM): reddish brown, fine to medium grained, grain size increases with depth, moist to dry, medium dense.		
				4.9	105				
5				3.7	104				
10							Total depth: 10 feet below ground surface. No groundwater encountered. No caving. Backfilled with cuttings.		



HS BA TP 05026-01TP.GPJ ZKCI.GDT 3/29/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft] V 5 [ft]

Pit Orientation: N-S
Natural Slope Angle: 0

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

LOG OF EXPLORATORY TEST PIT

Project:	Emerald Meadows Ranch	Test Pit No.:	T-9
Project Number:	05026-01	Contractor:	American
		Backhoe:	Case Super E
Date Drilled:	3/25/05	Hammer Wt. / Drop:	
Logged By:	C.S.	Ground Elev. [ft]:	---

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

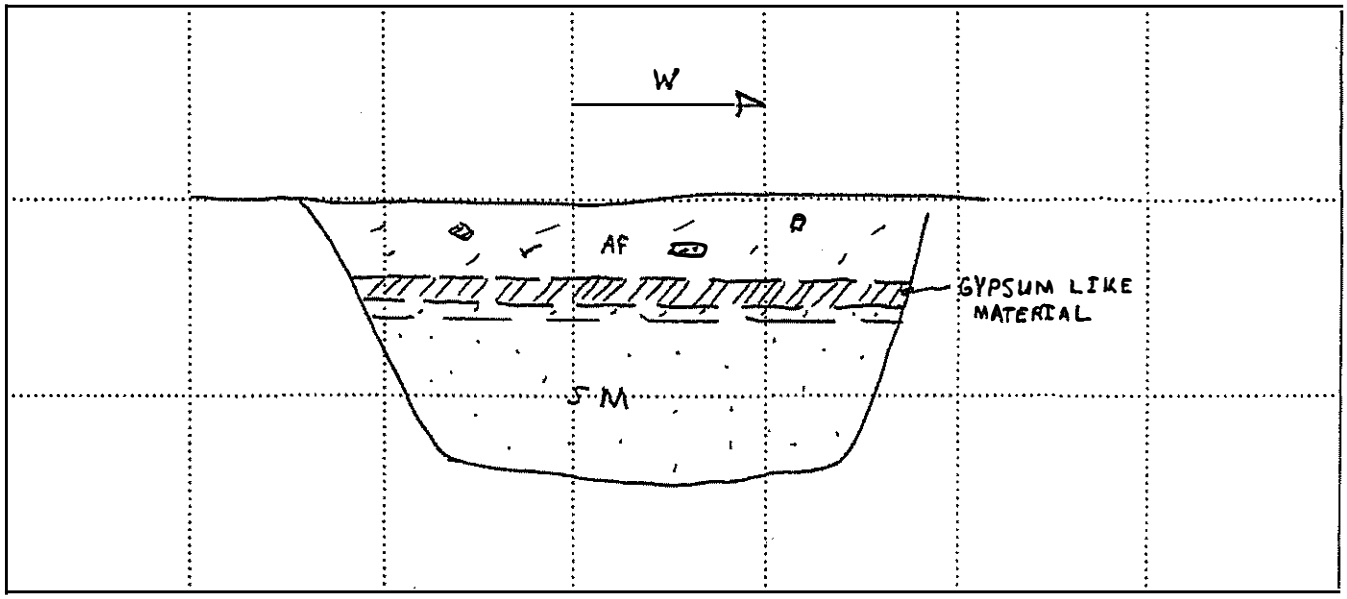
Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	Geologic Notes	Pocket Pen. [tsf]	Lab Tests
				16.4	101			
5				3.8	99			Max, DS

SOIL DESCRIPTION and CLASSIFICATION (USCS)

Artificial Fill (Qafu): 0 to 3-1/2 Feet
0 to 3-1/2 feet: Silty SAND (SM): mottled gray, brown and black, approximately 1 foot thick seam of gypsum like material at 2 feet, wood, nails and other debris present to 3-1/2 feet, moist, medium dense.

Older Alluvium (Qoa): 3-1/2 to 7 Feet
3-1/2 to 7 feet: Silty SAND (SM): reddish brown, fine to medium grained, moist, medium dense.

Total depth: 7 feet below ground surface.
No groundwater encountered.
No caving.
Backfilled with cuttings.



HS BA TP 05026-01TP.GPJ ZKCI.GDT 3/29/05

ZEISER KLING Consultants, Inc.

Scale: H 5 [ft]
V 5 [ft]

Pit Orientation: E-W
Natural Slope Angle: 0

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

APPENDIX B-1

Previous Subsurface Investigation (Converse, 2003)

Log of Boring No. BH - 1

Dates Drilled: 08/18/2003 Logged by: DG Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): 13.0

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM (Qal) **SAND (SP):** fine-grained, some silt, gray.						ca, er
					6/8/12	3	95	
5					4/4/5	5	98	col
		SILTY SAND (SM): fine-grained, light brown.						
10		**SAND (SP):** fine- to medium-grained, with some coarse-grained sand, some silt, gray.			5/9/11			
15					3/2/8			
20		- fine- to coarse-grained with some gravel up to 3/4" in maximum dimension			3/6/12			
25					3/11/21			
		SILTY SAND (SM): fine- to medium-grained, with inner layers of fine- to coarse-grained sand, gray.						
30					2/4 7			
		End of boring at 31.5 feet. Groundwater encountered at 13.0 feet. Boring backfill with soil cuttings on 08/18/03.						

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
A - 2

Log of Boring No. BH - 2

Dates Drilled: 08/18/2003 Logged by: DG Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): 10.5

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal) **SILTY SAND (SM):** fine-grained, light brown.						
		SAND (SP): fine- to coarse-grained, with some gravel up to 1/4" in maximum dimension, trace silt, gray.	■		8/15/15	5	92	
5			■		4/8/16	2	105	
10		▽	■		9/12/17	19	109	
15			☒		1/2/4			
20		- with some gravel up to 1" in maximum dimension	☒		5/13/24			
25			☒		7/11/20			
30			☒		6/31/32			
		End of boring at 31.5 feet. Groundwater encountered at 10.5 feet. Boring backfill with soil cuttings on 08/18/03.						

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
A - 3

Log of Boring No. BH - 3

Dates Drilled: 08/18/2003 Logged by: DG Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): 10.0

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		SAND WITH SILT (SP-SM): fine- to medium-grained, with some coarse-grained sand and few gravel up to 1/4" in maximum dimension, gray.	■	▨	4/9/14	1	113	
5		- fine- to medium-grained, no gravel	■		8/14/17	4	99	col
10		▽	■		8/8/10	19	105	
15		- fine-grained, light gray	⊠		3/3/5			wa (6.0%)
20			■		3/3/6	28	96	
		SILTY SAND (SM): fine-grained, some silt, dark gray.						
25		**SAND WITH SILT (SP-SM):** fine- to coarse-grained, with gravel up to 1/2" in maximum dimension, light brown.	⊠		4/5/7			wa (7.6%)
30			■		18/41/50 (5"	10	126	

Converse Consultants

Project Name: EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No. 03-81-214-01

Drawing No. A - 4a

Log of Boring No. BH - 3

Dates Drilled: 08/18/2003 Logged by: DG Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): 10.0

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		SAND WITH SILT (SP-SM): fine- to coarse-grained, with occasional gravel up to 1" in maximum dimension, trace silt, light brown.	X		8/20/20			wa (3.7%)
40			■		9/27/42	13	122	
45		- with minor gravel up to 3/4" in maximum dimension	X		7/18/28			wa (5.7%)
50			■		16/50 (5")	9	132	
		End of boring at 51.5 feet. Groundwater encountered at 10.0 feet. Boring backfill with soil cuttings on 08/18/03.						

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
A - 4b

Log of Boring No. BH - 4

Dates Drilled: 08/18/2003 Logged by: DG Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): 11.5

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal)						
		SAND (SP): fine-grained, trace silt, gray.	■		5/11/12	2	102	col
5			■		8/13/16	3	97	
10		▽	■		4/4/5	19	104	
15			■		11/20/20	16	107	
20			■		8/8/9	24	96	
		End of boring at 21.5 feet. Groundwater encountered at 11.5 feet. Boring backfill with soil cuttings on 08/18/03.						

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
A - 5

Log of Boring No. BH - 5

Dates Drilled: 08/18/2003 Logged by: DG Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): 11.5

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM (Qal) **SAND (SP):** fine-grained, trace silt, gray.	■	▨	12/14/11	2	105	
5			■		4/7/7	4	102	col
10		- some fine- to medium-grained	■		3/4/13	3	102	
15		- fine- to medium-grained with gravel up to 1/2" in maxiumum dimension	■		8/10/10	7		dist.
20			■		5/19/14	10	118	
		End of boring at 21.5 feet. Groundwater encountered at 11.5 feet. Boring backfill with soil cuttings on 08/18/03.						

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
A - 6

Log of Boring No. BH - 6

Dates Drilled: 08/18/2003 Logged by: DG Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): 11.5

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM (Qal) **SAND (SP):** fine-grained, trace silt, gray.	■		8/12/16	3	105	
5		- fine- to medium-grained	■		7/9/12	2	96	
10		- fine- to coarse-grained with gravel up to 1/2" in maximum dimension	■		10/16/23	4	111	
15			■		5/8/15	11	113	
20		- fine- to coarse-grained with gravel up to 1" in maximum dimension	■		4/9/17	10	110	
		End of boring at 21.5 feet. Groundwater encountered at 11.5 feet. Boring backfill with soil cuttings on 08/18/03.						

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
A - 7

Log of Boring No. BH - 7

Dates Drilled: 08/18/2003 Logged by: DG Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): 15.0

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM (Qal) **SILTY SAND (SM):** fine- to coarse-grained, gray.						max
			■		5/8/11	3	85	
5			■		5 7/10	3	101	col
10		- decrease silt content	■		4/6/9	9	90	
15		**SAND (SP):** fine- to coarse-grained, with some gravel up to 1/4" in maximum dimension, trace silt, gray.			5/8/10			
20			☒		3/8/16			
		End of boring at 21.5 feet. Groundwater encountered at 15.0 feet. Boring backfill with soil cuttings on 08/18/03.						

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
A - 8

Log of Boring No. BH - 8

Dates Drilled: 08/19/2003 Logged by: RDD Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): 15.0

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal) **SILTY SAND (SM):** fine-grained, trace gravel, yellow brown to brown gray.	■	▨	4/5/8	6	84	
5		**SAND (SP):** fine- to medium-grained, trace silt, yellow brown.	■	▨	4/8/12	2	96	col
10		- fine- to coarse-grained, gray brown speckled	■		4/7/8	2	97	
15		- few gravel	■		8/13/19	2	106	
20			■		10/14/17	13	111	
25		**SILTY SAND (SM):** fine-grained, yellow brown.	⊠		2/2/5			wa (44.4%)
30		**SAND (SP):** medium- to coarse-grained, some fine-grained, trace silt, yellow brown.	■		10/28/25	13	118	

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
A - 9a

Log of Boring No. BH - 8

Dates Drilled: 08/19/2003 Logged by: RDD Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): 15.0

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM (Qal) **SAND (SP):** medium- to coarse-grained, some fine-grained, trace silt, yellow brown.	X		4/5/10			wa (4.5%)
		SILTY SAND (SM): fine- to coarse-grained, some gravel, brown.						
40			■		16/50 (5")	19	109	
		SAND (SP): fine- to coarse-grained, trace silt and gravel, yellow brown.	X		10/16/32			wa (4.0%)
50					13/50 (6")			
		End of boring at 51.0 feet. Groundwater encountered at 15.0 feet. Boring backfill with soil cuttings on 08/19/03.						

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
A - 9b

Log of Boring No. BH - 9

Dates Drilled: 08/19/2003 Logged by: RDD Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal) **SILTY SAND (SM):** fine-grained, yellow brown.						
		SAND (SP): fine- to medium-grained, trace silt, yellow brown.	■		4/4/7	3	99	col
5			■		4/4/8	16	94	
10			■		6/6/10	18	101	
15		**SILT (ML):** trace fine-grained sand, dark gray. **SAND WITH SILT (SP-SM):** fine- to medium-grained, gray.	■		5/6/6	21	86	
20			■		8/14/22	23	100	
		End of boring at 21.5 feet. Groundwater not encountered during drilling. Boring backfill with soil cuttings on 08/19/03.						

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
A - 10

Log of Boring No. BH -10

Dates Drilled: 08/19/2003 Logged by: RDD Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): 17.0

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal)						
		SAND (SP): fine- to medium-grained, yellow brown.	■		4/7/8	2	99	
5		- yellow to gray	■	▨	2/4/7	2	96	col
10			■		5/9/19	5	103	col
15		- few gravel, gray brown	■		13/17/19	12	109	
		SILTY SAND (SM): fine- to medium-grained, some gravel, gray brown.	■		4/8/12	30	93	
25		**SILT (ML):** fine-grained sand, micaceous, olive to brown.	⊠		3/3/4			wa (82.5%)
		End of boring at 26.5 feet. Groundwater encountered at 17.0 feet. Boring backfill with soil cuttings on 08/19/03.						

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No
03-81-214-01

Drawing No.
A - 11

Log of Boring No. BH -11

Dates Drilled: 08/19/2003 | Logged by: RDD | Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER | Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A | Depth to Water (ft): 19.0

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal)						
		SAND (SP): fine- to medium-grained, trace silt, yellow brown.	■	▨	3/4/6	1	94	
5		- red brown	■	▨	3/5/7	2	93	col
		SILTY SAND (SM): fine-grained, gray brown.						
10			■		3/5/10	18	101	col
15			■		8/20/17	16		dist.
		SAND (SP): fine- to coarse-grained, some silt, trace gravel, yellow brown.						
20			■		10/25/20	9	117	
25			☒		4/9/12			
		End of boring at 26.5 feet. Groundwater encountered at 19.0 feet. Boring backfill with soil cuttings on 08/19/03.						

Converse Consultants

Project Name: EMERALD MEADOWS RANCH, Rubidoux, California, For: Pacific Properties

Project No. 03-81-214-01

Drawing No. A - 12

Log of Boring No. BH -12

Dates Drilled: 08/19/2003 | Logged by: RDD | Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER | Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A | Depth to Water (ft): 17.0

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal)						
		SAND (SP): fine-grained, some silt, yellow brown.	■		3/5/7	5	96	
5			■		5/6/6	3	102	
		SILT (ML): fine-grained sand, mottling, micaceous, olive brown.						
10			■		3/5/12	32	88	wa (60.6%)
		SAND (SP): medium- to coarse-grained, trace silt, yellow brown.						
15			■		5/8/12	12		dist. wa (4.3%)
20			⊠		3/5/14			wa (3.2%)
		End of boring at 21.5 feet. Groundwater encountered at 17.0 feet. Boring backfill with soil cuttings on 08/18/03.						

Converse Consultants

Project Name: **EMERALD MEADOWS RANCH**
Rubidoux, California
For: Pacific Properties

Project No.: **03-81-214-01**

Drawing No.: **A - 13**

Log of Boring No. BH -13

Dates Drilled: 08/19/2003 Logged by: RDD Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal)						
		SAND (SP): fine- to medium-grained, some silt, red brown.						
5			■		5/10/12	2	104	
10			■		5/9/13	3	106	
15			■		6/10/16	3	109	
		End of boring at 16.5 feet. Groundwater not encountered during drilling. Boring backfill with soil cuttings on 08/19/03.						

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
A - 14

Log of Boring No. BH -14

Dates Drilled: 08/19/2003 Logged by: RDD Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		FILL (Af) **SILTY SAND (SM):** fine- to medium-grained, trace gravel and asphalt debris, red brown to brown.						
5			■		24/26/40	6	130	
		- chatler						
10			■	▨	17/27/21	12	126	
		- concrete rubble						
15		**SAND TO SILTY SAND (SP-SM):** fine- to medium-grained, red brown.	■		40/50 (2")	7	111	
		ALLUVIUM (Qal) **SAND (SP):** fine- to medium-grained, trace silt, red brown.						
20			■		8/12/14	5	113	
25								
		End of boring at 26.5 feet. Groundwater not encountered during drilling. Boring backfill with soil cuttings on 08/19/03.						

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
A - 15

Log of Boring No. BH -15

Dates Drilled: 08/19/2003 Logged by: RDD Checked By: RJR

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): 26.0

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal)						
		SAND (SP): fine-grained, trace silt, yellow brown.						
5			■	▨	11/16/23	4	112	
10			■	▨	13/22/23	6	100	
15			■		11/27/36	10	104	
20		**GRAVELLY SAND (SP):** fine- to coarse-grained, gravel up to 1.25" in maximum dimension, brown. - chatter	■		36/50 (6")			dist. wa 2.6%)
25		**SILT (ML):** trace fine-grained sand, micaceous, yellow brown.	■		19/18/15	28	97	wa (85.1%)
30		**SAND (SP):** medium- to coarse-grained, trace silt and gravel, yellow to gray brown.	☒		19/20/35			
		End of boring at 31.5 feet. Groundwater encountered at 26.0 feet. Boring backfill with soil cuttings on 08/19/03.						

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
A - 16

HOLGUIN, FAHAN & ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS
948 North Lemon Street, Orange, CA 92867 (714)-210-5971 FAX (714) 210-5975

August 20, 2003

Mr. Roy Rushing
Converse Consultants
10391 Corporate Drive
Redlands, CA 92374

PROJECT NAME: CPT Testing at Emerald Meadows;
PROJECT NO.: 03-81-214-01

Dear Mr. Rushing:

Enclosed please find copies of the cone penetrometer testing (CPT) data for the above referenced project along with a copy of the corresponding invoice.

The cone penetrometer testing conducted for this project consisted of pushing an instrumented cone-tipped probe into the ground while simultaneously recording the resistance to penetration at the cone tip and along the friction sleeve.

The cone penetrometer testing described in this report was conducted in general accordance with the current ASTM specifications (ASTM D5778-95 and D3441-94) using an electronic cone penetrometer.

The CPT equipment operated by Holguin, Fahan & Associates, Inc. (HFA) consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to continuously push the cone and rods into the soil at a rate of 20-mm per second (approximately four feet per minute) while the cone tip resistance and sleeve friction resistance are recorded every 50-mm (approximately two inches) and stored in digital form. A specially designed all wheel drive 23-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the test equipment.

The cone penetrometer assembly used for this project consists of a conical tip and a cylindrical friction sleeve. The conical tip has a 60° apex angle and a diameter of 35.6-mm (1.40-inch) resulting in a projected cross-sectional area of 10 cm^2 (1.5 square inches). The cylindrical friction sleeve is 133-mm (5.25-inch) in length and has an outside diameter of 35.8-mm (1.41-inch), resulting in a surface area of 150 cm^2 (23 square inches).

The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurement of cone tip and friction sleeve resistance during penetration. Continuous electric signals from the strain gauges are transmitted by a shielded cable in the sounding rods to the PC-based data acquisition hardware in the CPT truck. The sounding log is also displayed on a monitor.

The CPT data processing is performed using the truck mounted computer based data acquisition and

presentation system. The computer generated graphical logs include cone resistance, friction resistance, friction ratio, and pore pressure ratio versus depth at a user selectable scale.

Soil behavior type interpretations are based on the following reference: Robertson, P.K. and Campanella, R.C., 1989, "Guidelines for Geotechnical Design using the Cone Penetrometer Test and CPT with Pore Pressure Measurement." Soil Mechanics series No. 120, Civil Engineering Department, University of British Columbia, Vancouver, B.C., V6T 1Z4, September 1989.

Interpretations and plotting has been done using HFA's proprietary data interpretation and presentation software. It is important to note that the data is not averaged. All interpretations are point interpretations at the corresponding depth listed.

It is also important to note that the soil behavior type correlations are based on a combination of theory, field research, research performed under laboratory conditions, and literature review. The information presented in the tabulated and/or graphical logs should, therefore, be viewed as a guideline rather than as precise measurements.

Some care is recommended when using the soil behavior type interpretations. If a tabulation depth happens to fall on a soil layer interface, or a seam of soil differing from the rest of the layer, the tabulated data can be misleading. The solution to this problem is the proper use of the graphical CPT logs. The tip and sleeve penetration resistance logs are the primary source of profile description; the soil behavior type logs are supplemental. The graphical logs of tip and sleeve resistance should be examined and layer boundaries delineated in accordance with the project requirements. The soil behavior type interpretations are only representative of the response of the soil to the large shear deformations imposed during cone penetration. This is not necessarily a prediction of grain size distribution. However, it has been found that the interpreted soil behavior types generally agree well with the soil types defined in accordance with the grain size distribution methods such as used in the Unified Soil Classification System.

Limitations

Holguin, Fahan & Associates, Inc. (HFA) presents the attached data in accordance with ASTM Standards D5778-95 and D3441-94 and generally accepted cone penetrometer testing practices and standards. The attached data further relates only to the specific project and location discussed in the data. Judgement may be required to verify the CPT soil behavior interpretations.

The "Client" may distribute this data or excerpts therefrom provided the following statement is prominently displayed and included with the distribution:

"Neither CLIENT nor HFA make any guarantee or warranty, express or implied,

regarding this data. THE USE OF THIS INFORMATION SHALL BE AT THE USER'S SOLE RISK REGARDLESS OF ANY FAULT OR NEGLIGENCE OF THE CLIENT OR HFA."

Please feel free to call if you have any questions.

Respectfully submitted,

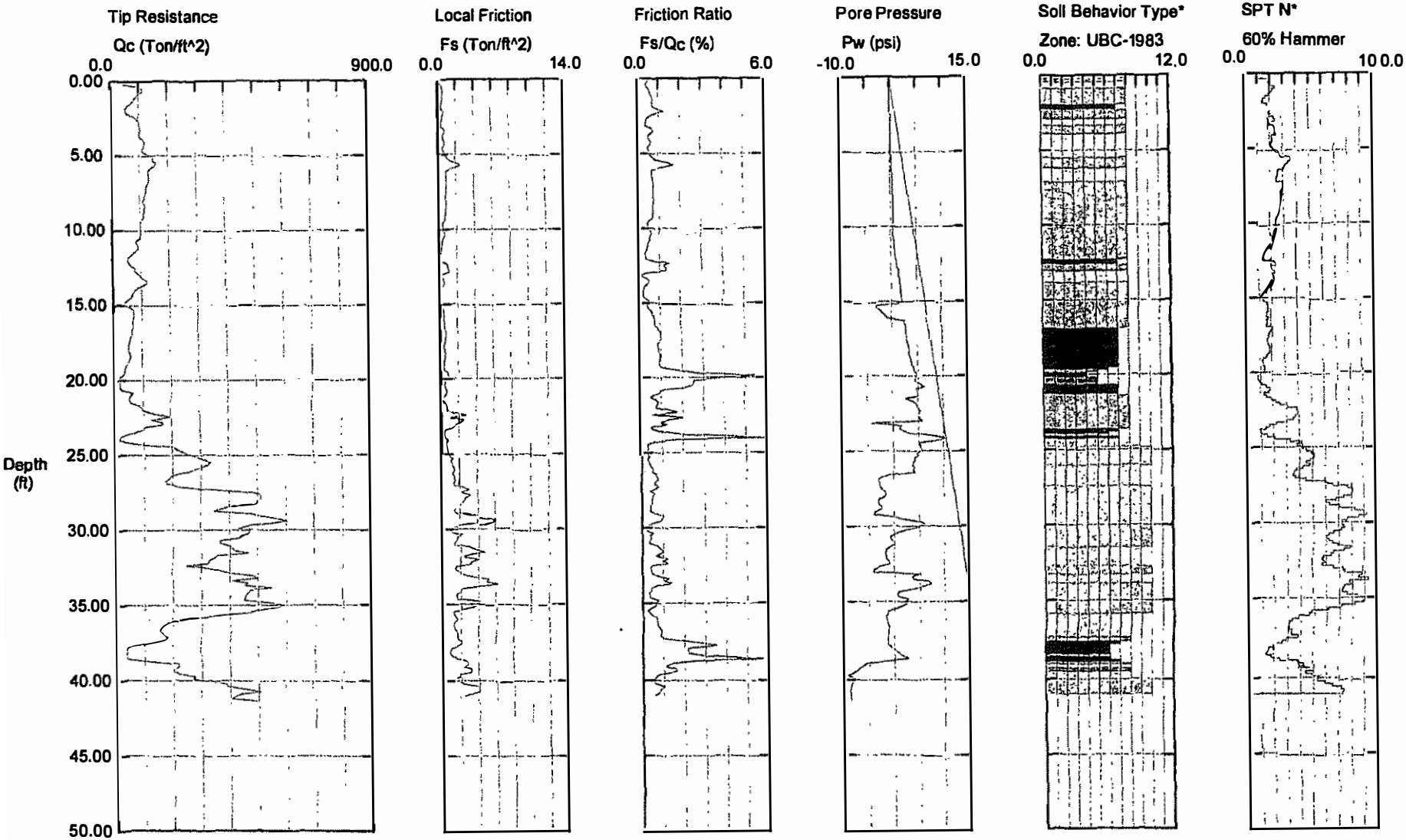
Amanda Hancock
CPT Operations Manager
Holguin, Fahan & Associates, Inc.

:AH\Enclosures

Converse Consultants

Operator: Bobby
Sounding: CPT-01
Cone Used: 409

CPT Date/Time: 08-18-03 09:09
Location: EMERALD MEADOWS
Job Number: 03-81-214-01



Maximum Depth = 41.34 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

SDF110

CPT INTERPRETATIONS

SOUNDING : CPT-01 PROJECT No.: 0000
PROJECT : HORSE RANCH CONE/RIG : 409/BH-ML/R#1
DATE/TIME: 08-18-03 09:09

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	116.61	.46	SAND	23	37	81		
.300	.98	92.03	.63	SAND to SILTY SAND	23	37	74		
.450	1.48	72.95	.75	SAND to SILTY SAND	18	29	67		49.5
.600	1.97	54.05	.94	SILTY SAND to SANDY SILT	18	29	59		47.0
.750	2.46	94.05	.62	SAND to SILTY SAND	24	38	75		48.5
.900	2.95	100.53	.40	SAND	20	32	76		48.0
1.050	3.44	101.10	.76	SAND to SILTY SAND	25	40	77		47.5
1.200	3.94	118.63	.49	SAND	24	38	81		47.5
1.350	4.43	115.30	.57	SAND	23	37	80		47.0
1.500	4.92	140.00	.57	SAND	28	45	86		47.5
1.650	5.41	161.25	.84	SAND	32	52	90		47.5
1.800	5.91	132.99	1.15	SAND to SILTY SAND	33	53	85		46.5
1.950	6.40	135.63	.66	SAND	27	43	85		46.0
2.100	6.89	129.53	.75	SAND	26	41	84		46.0
2.250	7.38	125.62	.72	SAND	25	39	83		45.5
2.400	7.87	117.19	.74	SAND to SILTY SAND	29	44	81		44.5
2.550	8.37	117.80	.71	SAND to SILTY SAND	29	42	81		44.5
2.700	8.86	110.22	.71	SAND to SILTY SAND	28	39	79		44.0
2.850	9.35	103.48	.66	SAND to SILTY SAND	26	35	77		43.5
3.000	9.84	100.49	.48	SAND to SILTY SAND	25	33	75		43.0
3.150	10.33	99.53	.63	SAND to SILTY SAND	25	33	75		43.0
3.300	10.83	89.72	.49	SAND to SILTY SAND	22	29	71		42.5
3.450	11.32	81.28	.39	SAND to SILTY SAND	20	26	68		42.0
3.600	11.81	55.41	.32	SAND to SILTY SAND	14	18	57		39.5
3.750	12.30	66.64	1.43	SILTY SAND to SANDY SILT	22	28	62		40.0
3.900	12.80	88.44	1.33	SAND to SILTY SAND	22	27	70		42.0
4.050	13.29	119.88	.35	SAND	24	29	78		43.0
4.200	13.78	86.96	.32	SAND to SILTY SAND	22	26	69		42.0
4.350	14.27	66.22	.18	SAND to SILTY SAND	17	20	61		39.5
4.500	14.76	39.24	.39	SILTY SAND to SANDY SILT	13	16	45		38.0
4.650	15.26	69.00	.38	SAND to SILTY SAND	17	20	61		39.5
4.800	15.75	69.96	.61	SAND to SILTY SAND	17	21	61		39.5
4.950	16.24	70.51	.74	SAND to SILTY SAND	18	21	61		39.5
5.100	16.73	65.37	.86	SAND to SILTY SAND	16	19	59		39.0
5.250	17.22	55.81	.99	SILTY SAND to SANDY SILT	19	21	54		38.5
5.400	17.72	51.16	.84	SILTY SAND to SANDY SILT	17	19	51		38.5
5.550	18.21	57.32	.90	SILTY SAND to SANDY SILT	19	21	54		38.5
5.700	18.70	50.90	.92	SILTY SAND to SANDY SILT	17	19	51		38.0
5.850	19.19	38.16	.96	SILTY SAND to SANDY SILT	13	14	42		37.0
6.000	19.69	27.24	2.85	CLAYEY SILT to SILTY CLAY	14	15		1.7	
6.150	20.18	16.10	2.55	CLAYEY SILT to SILTY CLAY	8	9		1.0	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 10.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-01

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	24.71	2.05	SANDY SILT to CLAYEY SILT	10	11		1.9	
6.450	21.16	49.69	.66	SILTY SAND to SANDY SILT	17	18	49		38.0
6.600	21.65	83.19	.85	SAND to SILTY SAND	21	22	63		39.5
6.750	22.15	123.24	1.33	SAND to SILTY SAND	31	33	75		42.0
6.900	22.64	128.87	1.99	SILTY SAND to SANDY SILT	43	45	76		42.0
7.050	23.13	104.35	1.22	SAND to SILTY SAND	26	27	69		41.0
7.200	23.62	41.81	1.22	SILTY SAND to SANDY SILT	14	14	43		37.0
7.350	24.11	32.70	1.61	SANDY SILT to CLAYEY SILT	13	13		2.5	
7.500	24.61	217.89	.34	SAND	44	44	90		44.0
7.650	25.10	284.43	.26	GRAVELLY SAND to SAND	47	48	97		45.5
7.800	25.59	322.45	.34	GRAVELLY SAND to SAND	54	54	100		46.0
7.950	26.08	258.36	.53	SAND	52	52	94		44.5
8.100	26.57	187.38	.73	SAND	37	37	85		43.5
8.250	27.07	220.97	.62	SAND	44	44	89		44.0
8.400	27.56	505.82	.42	GRAVELLY SAND to SAND	84	83	100		47.0
8.550	28.05	495.58	.50	GRAVELLY SAND to SAND	83	81	100		47.0
8.700	28.54	372.29	.40	GRAVELLY SAND to SAND	62	60	100		46.0
8.850	29.04	510.60	.64	GRAVELLY SAND to SAND	85	82	100		47.0
9.000	29.53	548.43	.88	GRAVELLY SAND to SAND	91	88	100		
9.150	30.02	470.79	.23	GRAVELLY SAND to SAND	78	75	100		46.5
9.300	30.51	434.20	.37	GRAVELLY SAND to SAND	72	69	100		46.5
9.450	31.00	395.41	.31	GRAVELLY SAND to SAND	66	62	100		46.0
9.600	31.50	465.13	1.00	SAND	93	87	100		46.5
9.750	31.99	328.15	1.26	SAND	66	61	99		45.0
9.900	32.48	310.68	.48	GRAVELLY SAND to SAND	52	48	97		45.0
10.050	32.97	481.36	.47	GRAVELLY SAND to SAND	80	74	100		46.5
10.200	33.46	465.13	1.04	SAND	93	85	100		46.5
10.350	33.96	471.27	.44	GRAVELLY SAND to SAND	79	72	100		46.5
10.500	34.45	455.87	.34	GRAVELLY SAND to SAND	76	69	100		46.0
10.650	34.94	592.71	.64	GRAVELLY SAND to SAND	99	89	100		
10.800	35.43	475.52	.24	GRAVELLY SAND to SAND	79	71	100		46.5
10.950	35.93	234.10	.65	SAND	47	42	88		43.5
11.100	36.42	161.06	.69	SAND	32	29	77		42.0
11.250	36.91	172.93	.88	SAND	35	31	79		42.0
11.400	37.40	127.49	1.64	SAND to SILTY SAND	32	28	70		40.0
11.550	37.89	42.30	2.18	SANDY SILT to CLAYEY SILT	17	15		2.7	
11.700	38.39	35.65	3.03	CLAYEY SILT to SILTY CLAY	18	16		2.2	
11.850	38.88	218.91	1.30	SAND to SILTY SAND	55	47	85		43.0
12.000	39.37	194.94	1.62	SAND to SILTY SAND	49	42	82		42.5
12.150	39.86	268.05	.56	SAND	54	46	91		43.5
12.300	40.35	390.76	1.03	SAND	78	67	100		45.0
12.450	40.85	440.38	.74	GRAVELLY SAND to SAND	73	62	100		45.5

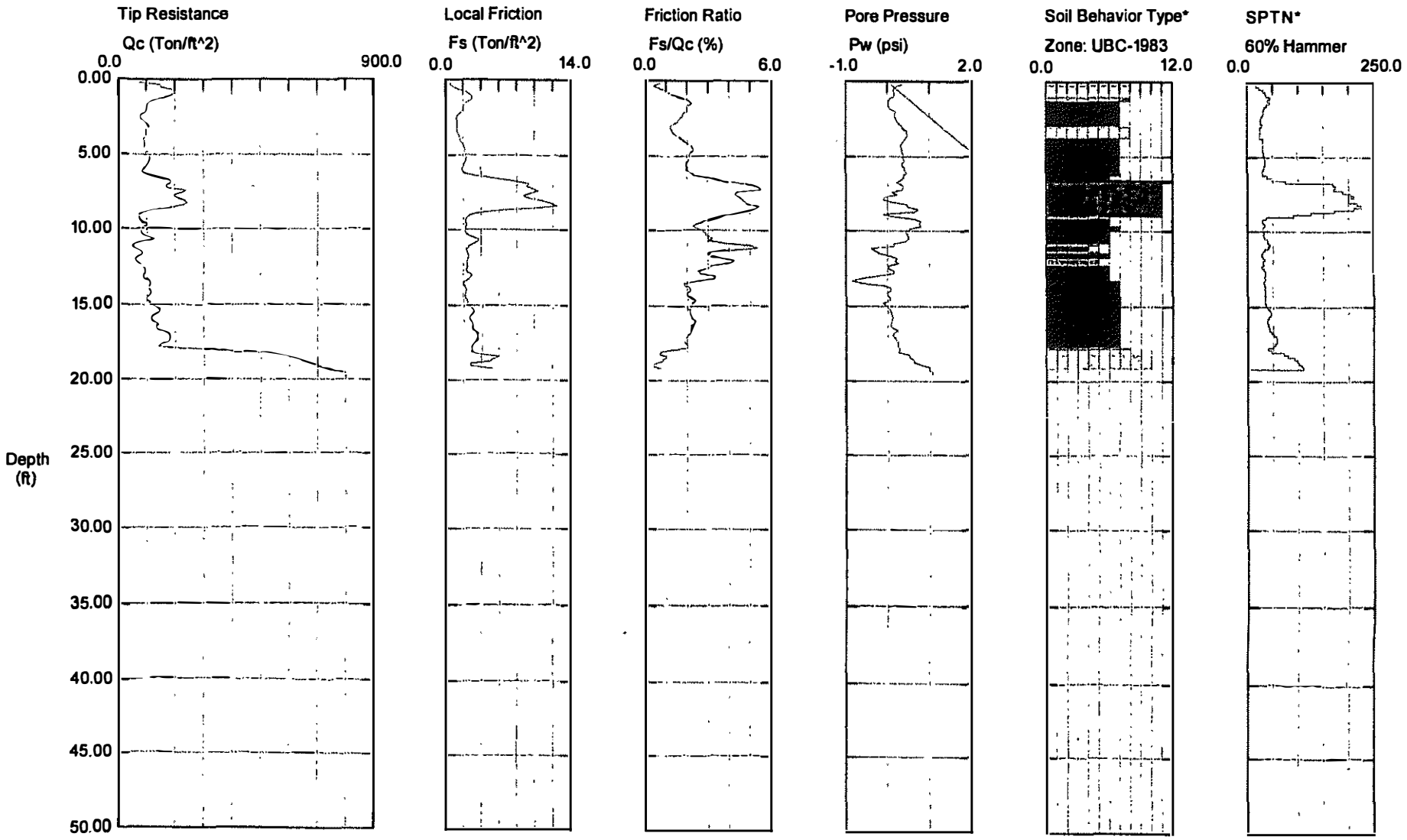
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 10.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

Converse Consultants

Operator: Bobby
Sounding: CPT-02
Cone Used: 409

CPT Date/Time: 08-18-03 10:35
Location: EMERALD MEADOWS
Job Number: 03-81-214-01



Maximum Depth = 19.52 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

SDF111

CPT INTERPRETATIONS

SOUNDING : CPT-02
PROJECT : EMERALD MEADOWS
DATE/TIME: 08-18-03 10:35
PROJECT No.: 03-81-214-01
CONE/RIG : 409/BH-ML/R#1

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	153.07	.65	SAND	31	49	89		
.300	.98	189.46	1.50	SAND to SILTY SAND	47	76	95		
.450	1.48	110.54	2.22	SILTY SAND to SANDY SILT	37	59	79		
.600	1.97	97.30	2.03	SILTY SAND to SANDY SILT	32	52	76		49.5
.750	2.46	76.01	1.67	SILTY SAND to SANDY SILT	25	41	68		47.5
.900	2.95	101.13	1.24	SAND to SILTY SAND	25	40	77		48.0
1.050	3.44	101.23	1.31	SAND to SILTY SAND	25	40	77		47.5
1.200	3.94	91.18	1.79	SILTY SAND to SANDY SILT	30	49	74		46.5
1.350	4.43	94.71	2.24	SILTY SAND to SANDY SILT	32	50	75		46.0
1.500	4.92	108.92	2.11	SILTY SAND to SANDY SILT	36	58	79		46.5
1.650	5.41	109.84	2.04	SILTY SAND to SANDY SILT	37	59	79		46.0
1.800	5.91	91.80	2.01	SILTY SAND to SANDY SILT	31	49	74		45.0
1.950	6.40	118.61	3.10	SANDY SILT to CLAYEY SILT	47	76		7.0	
2.100	6.89	186.08	5.03	*VERY STIFF FINE GRAINED	100	100			
2.250	7.38	239.66	4.34	*VERY STIFF FINE GRAINED	100	100			
2.400	7.87	204.99	4.59	*VERY STIFF FINE GRAINED	100	100			
2.550	8.37	229.57	5.40	*VERY STIFF FINE GRAINED	100	100			
2.700	8.86	88.19	4.20	CLAYEY SILT to SILTY CLAY	44	62		5.2	
2.850	9.35	77.48	2.88	SANDY SILT to CLAYEY SILT	31	42		4.5	
3.000	9.84	92.41	2.42	SILTY SAND to SANDY SILT	31	41	73		43.0
3.150	10.33	81.90	2.87	SANDY SILT to CLAYEY SILT	33	43		4.8	
3.300	10.83	89.84	3.74	CLAYEY SILT to SILTY CLAY	45	58		5.2	
3.450	11.32	58.17	3.99	CLAYEY SILT to SILTY CLAY	29	37		3.4	
3.600	11.81	68.26	3.74	CLAYEY SILT to SILTY CLAY	34	43		4.0	
3.750	12.30	74.46	3.24	SANDY SILT to CLAYEY SILT	30	37		4.3	
3.900	12.80	93.65	2.64	SANDY SILT to CLAYEY SILT	37	47		6.2	
4.050	13.29	99.43	2.48	SILTY SAND to SANDY SILT	33	41	73		42.5
4.200	13.78	105.29	2.11	SILTY SAND to SANDY SILT	35	43	74		42.5
4.350	14.27	108.07	2.05	SILTY SAND to SANDY SILT	36	43	75		42.5
4.500	14.76	108.60	2.27	SILTY SAND to SANDY SILT	36	43	74		42.5
4.650	15.26	144.85	2.09	SILTY SAND to SANDY SILT	48	57	82		44.0
4.800	15.75	117.78	2.20	SILTY SAND to SANDY SILT	39	46	76		42.5
4.950	16.24	139.56	2.17	SILTY SAND to SANDY SILT	47	54	81		43.5
5.100	16.73	161.48	2.16	SILTY SAND to SANDY SILT	54	62	85		44.0
5.250	17.22	180.64	2.00	SILTY SAND to SANDY SILT	60	69	88		44.5
5.400	17.72	140.87	2.03	SILTY SAND to SANDY SILT	47	53	80		43.0
5.550	18.21	528.04	.69	GRAVELLY SAND to SAND	88	99	100		
5.700	18.70	644.67	.77	GRAVELLY SAND to SAND	100	100	100		
5.850	19.19	713.80	.75	GRAVELLY SAND to SAND	100	100	100		

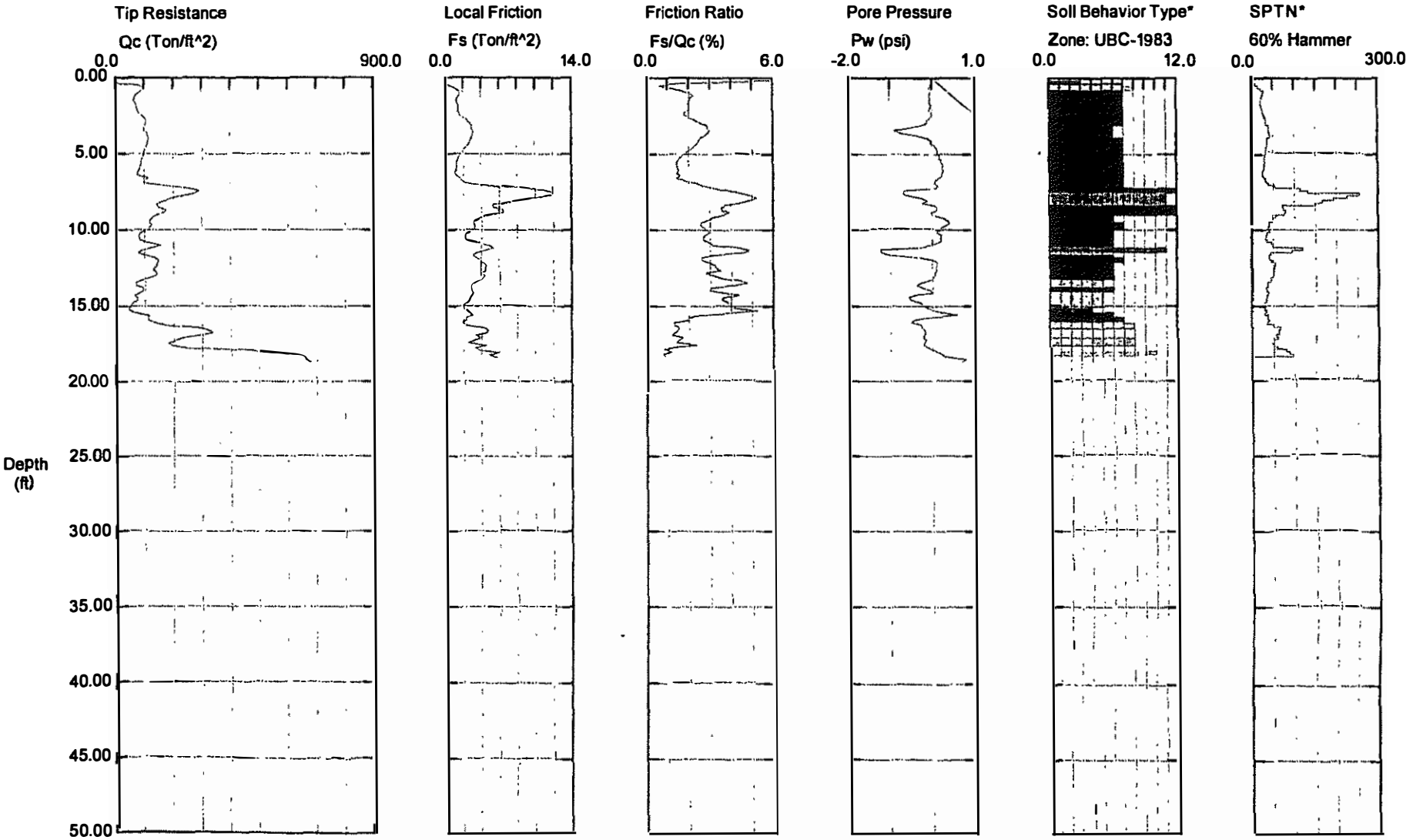
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 10.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

Converse Consultants

Operator: Bobby
Sounding: CPT-02A
Cone Used: 409

CPT Date/Time: 08-18-03 11:05
Location: EMERALD MEADOWS
Job Number: 03-81-214-01



Maximum Depth = 18.70 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

SDF112

CPT INTERPRETATIONS

SOUNDING : CPT-02A
PROJECT : EMERALD MEADOWS
DATE/TIME: 08-18-03 11:05

PROJECT No.: 03-81-214-01
CONE/RIG : 409/BH-ML/R#1

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	84.15	.59	SAND to SILTY SAND	21	34	71		
.300	.98	81.54	1.99	SILTY SAND to SANDY SILT	27	43	70		
.450	1.48	63.71	2.03	SILTY SAND to SANDY SILT	21	34	63		49.0
.600	1.97	74.42	2.05	SILTY SAND to SANDY SILT	25	40	68		48.5
.750	2.46	89.99	1.81	SILTY SAND to SANDY SILT	30	48	73		48.5
.900	2.95	106.12	2.50	SILTY SAND to SANDY SILT	35	57	78		48.0
1.050	3.44	102.00	2.95	SANDY SILT to CLAYEY SILT	41	65		6.0	
1.200	3.94	114.11	2.54	SILTY SAND to SANDY SILT	38	61	80		47.5
1.350	4.43	109.77	2.29	SILTY SAND to SANDY SILT	37	59	79		46.5
1.500	4.92	100.49	1.82	SILTY SAND to SANDY SILT	33	54	76		46.0
1.650	5.41	89.12	1.47	SILTY SAND to SANDY SILT	30	48	73		45.0
1.800	5.91	84.07	1.46	SILTY SAND to SANDY SILT	28	45	71		44.5
1.950	6.40	76.16	1.58	SILTY SAND to SANDY SILT	25	41	69		44.0
2.100	6.89	95.98	2.36	SILTY SAND to SANDY SILT	32	51	75		44.5
2.250	7.38	290.25	3.81	*SAND to CLAYEY SAND	100	100			
2.400	7.87	194.62	5.20	*VERY STIFF FINE GRAINED	100	100			
2.550	8.37	140.77	3.72	SANDY SILT to CLAYEY SILT	56	81		8.3	
2.700	8.86	165.18	3.92	*SAND to CLAYEY SAND	83	100			
2.850	9.35	120.42	2.90	SANDY SILT to CLAYEY SILT	48	66		7.1	
3.000	9.84	120.76	2.66	SILTY SAND to SANDY SILT	40	54	81		44.0
3.150	10.33	80.07	2.76	SANDY SILT to CLAYEY SILT	32	42		5.3	
3.300	10.83	113.15	3.00	SANDY SILT to CLAYEY SILT	45	59		6.6	
3.450	11.32	92.54	4.84	*VERY STIFF FINE GRAINED	93	100			
3.600	11.81	134.08	2.61	SILTY SAND to SANDY SILT	45	57	82		44.0
3.750	12.30	142.00	3.21	SANDY SILT to CLAYEY SILT	57	71		8.3	
3.900	12.80	141.19	2.78	SILTY SAND to SANDY SILT	47	58	83		44.0
4.050	13.29	85.98	4.38	CLAYEY SILT to SILTY CLAY	43	53		5.0	
4.200	13.78	91.52	3.03	SANDY SILT to CLAYEY SILT	37	45		5.3	
4.350	14.27	64.31	4.35	CLAYEY SILT to SILTY CLAY	32	39		3.7	
4.500	14.76	60.02	3.83	CLAYEY SILT to SILTY CLAY	30	36		3.5	
4.650	15.26	44.25	5.25	CLAY	44	52		2.6	
4.800	15.75	110.77	1.97	SILTY SAND to SANDY SILT	37	43	74		42.5
4.950	16.24	181.77	1.27	SAND to SILTY SAND	45	53	88		44.5
5.100	16.73	334.75	1.33	SAND	67	77	100		47.0
5.250	17.22	210.73	1.49	SAND to SILTY SAND	53	60	92		45.0
5.400	17.72	246.97	1.31	SAND	49	56	96		45.5
5.550	18.21	640.42	.76	GRAVELLY SAND to SAND	100	100	100		

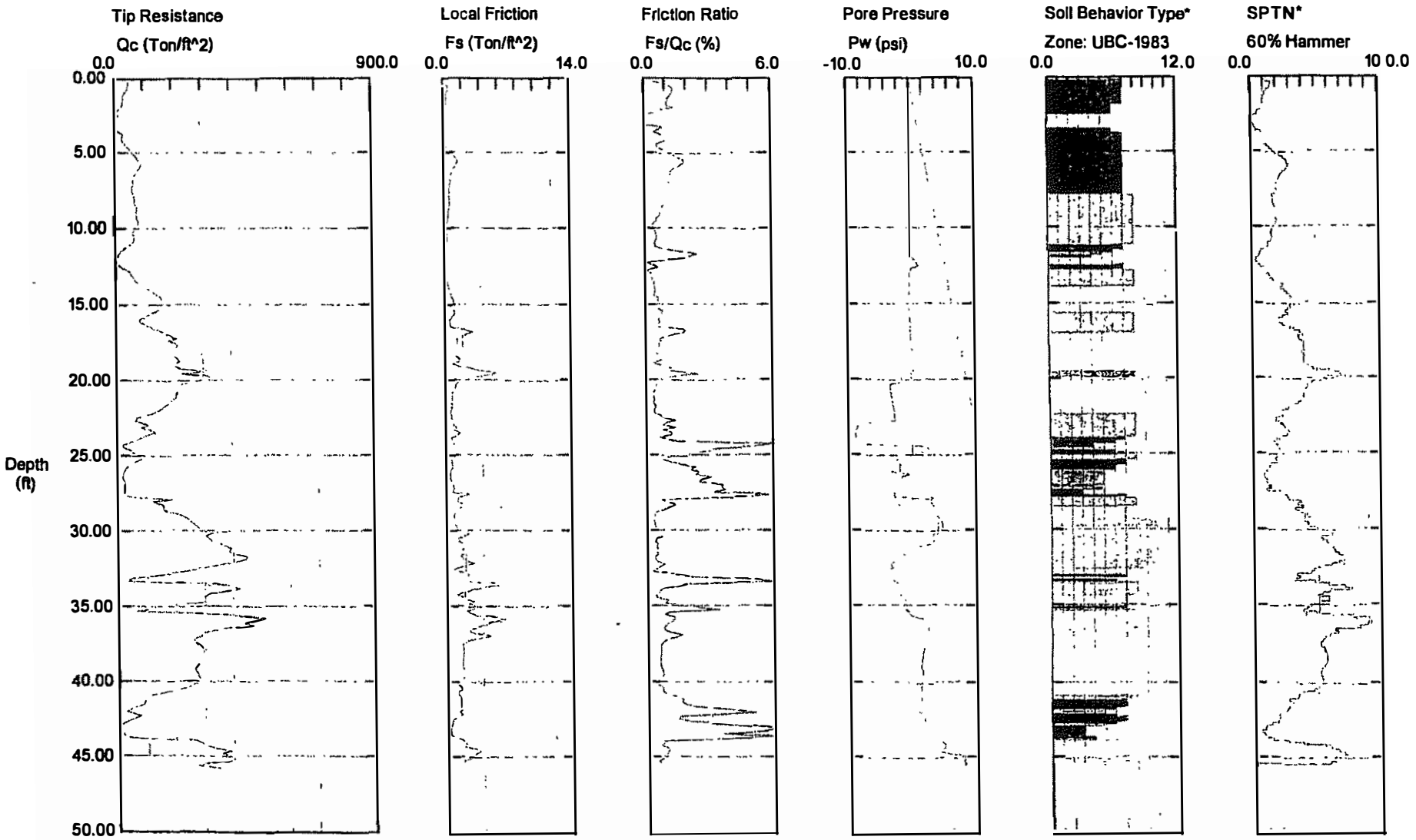
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 10.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

Converse Consultants

Operator: Bobby
Sounding: CPT-03
Cone Used: 409

CPT Date/Time: 08-18-03 12:04
Location: EMERALD MEADOWS
Job Number: 03-81-214-01



Maximum Depth = 45.77 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

SDF113

CPT INTERPRETATIONS

SOUNDING : CPT-03
PROJECT : EMERALD MEADOWS
DATE/TIME: 08-18-03 12:04

PROJECT No.: 03-81-214-01
CONE/RIG : 409/BH-ML/R#1

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	50.20	1.25	SILTY SAND to SANDY SILT	17	27	57		
.300	.98	33.78	1.41	SILTY SAND to SANDY SILT	11	18	45		48.0
.450	1.48	31.14	1.17	SILTY SAND to SANDY SILT	10	17	43		46.0
.600	1.97	19.55	1.41	SANDY SILT to CLAYEY SILT	8	13		1.6	
.750	2.46	16.51	-.13		0	0			48.5
.900	2.95	4.04	-.37		0	0			48.0
1.050	3.44	6.69	.73	SENSITIVE FINE GRAINED	3	5		.6	
1.200	3.94	28.62	1.01	SILTY SAND to SANDY SILT	10	15	40		42.0
1.350	4.43	40.30	.64	SILTY SAND to SANDY SILT	13	21	50		42.5
1.500	4.92	57.64	1.20	SILTY SAND to SANDY SILT	19	31	61		44.0
1.650	5.41	82.88	1.91	SILTY SAND to SANDY SILT	28	44	71		45.0
1.800	5.91	89.04	1.56	SILTY SAND to SANDY SILT	30	47	73		45.0
1.950	6.40	71.32	1.25	SILTY SAND to SANDY SILT	24	38	67		43.5
2.100	6.89	65.09	1.24	SILTY SAND to SANDY SILT	22	34	64		43.0
2.250	7.38	60.53	1.06	SILTY SAND to SANDY SILT	20	31	62		42.0
2.400	7.87	68.51	.97	SAND to SILTY SAND	17	25	65		42.5
2.550	8.37	69.79	.99	SAND to SILTY SAND	17	25	66		42.5
2.700	8.86	76.31	.75	SAND to SILTY SAND	19	27	69		42.5
2.850	9.35	78.90	.59	SAND to SILTY SAND	20	27	69		42.5
3.000	9.84	76.18	.38	SAND to SILTY SAND	19	25	67		42.0
3.150	10.33	62.69	.58	SAND to SILTY SAND	16	21	61		40.5
3.300	10.83	64.18	.54	SAND to SILTY SAND	16	21	62		40.5
3.450	11.32	28.32	.84	SILTY SAND to SANDY SILT	9	12	38		37.0
3.600	11.81	7.82	2.15	CLAY to SILTY CLAY	5	7		.6	
3.750	12.30	5.57	.36	SENSITIVE FINE GRAINED	3	3		.5	
3.900	12.80	50.03	.26	SAND to SILTY SAND	13	16	53		39.0
4.050	13.29	65.14	.34	SAND to SILTY SAND	16	20	61		40.0
4.200	13.78	100.87	.46	SAND to SILTY SAND	25	31	73		42.5
4.350	14.27	142.49	.46	SAND	28	34	82		44.0
4.500	14.76	162.48	.61	SAND	32	39	86		44.5
4.650	15.26	154.51	.62	SAND	31	37	84		44.0
4.800	15.75	100.06	.73	SAND to SILTY SAND	25	29	72		42.0
4.950	16.24	94.99	.60	SAND to SILTY SAND	24	28	70		42.0
5.100	16.73	159.89	2.01	SILTY SAND to SANDY SILT	53	61	84		44.0
5.250	17.22	213.55	.65	SAND	43	49	93		45.0
5.400	17.72	216.19	.68	SAND	43	49	93		45.0
5.550	18.21	197.45	.48	SAND	39	44	90		44.5
5.700	18.70	219.16	.74	SAND	44	49	93		45.0
5.850	19.19	220.03	1.23	SAND	44	49	92		45.0
6.000	19.69	312.72	1.44	SAND to SILTY SAND	78	86	100		46.0
6.150	20.18	227.77	.56	SAND	46	50	93		45.0

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf.
ASSUMED DEPTH OF WATER TABLE = 10.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-03

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	215.74	.39	SAND	43	47	91		44.5
6.450	21.16	208.94	.34	SAND	42	45	90		44.5
6 600	21.65	166.20	.48	SAND	33	35	83		43.5
6.750	22.15	122.96	.38	SAND	25	26	74		42.0
6.900	22.64	61.48	1 43	SILTY SAND to SANDY SILT	20	22	54		38.5
7.050	23.13	88.40	1.43	SILTY SAND to SANDY SILT	29	31	65		39.5
7.200	23.62	102.42	1.2I	SAND to SILTY SAND	26	27	69		40.5
7.350	24.11	39.43	2.13	SANDY SILT to CLAYEY SILT	16	16		2.5	
7.500	24.61	46.25	3.07	CLAYEY SILT to SILTY CLAY	23	24		3.0	
7.650	25.10	88.93	.72	SAND to SILTY SAND	22	23	64		39.5
7.800	25.59	41.49	1.63	SILTY SAND to SANDY SILT	14	14	42		36.5
7.950	26.08	19.31	2.45	CLAYEY SILT to SILTY CLAY	10	10		1.2	
8.100	26.57	17.06	2.58	CLAYEY SILT to SILTY CLAY	9	8		1.0	
8.250	27.07	22.75	3.56	CLAY to SILTY CLAY	15	15		1.4	
8 400	27.56	20.99	12.39	CLAY	21	21		1.3	
8.550	28.05	116.00	1.01	SAND to SILTY SAND	29	28	71		40.5
8.700	28.54	156.83	.82	SAND	31	30	79		42.5
8.850	29.04	234.12	.35	SAND	47	45	90		44.0
9.000	29.53	267.28	.35	GRAVELLY SAND to SAND	45	43	94		44.5
9.150	30.02	296.71	.82	SAND	59	57	97		45.0
9.300	30.51	317.23	.42	GRAVELLY SAND to SAND	53	50	99		45.0
9.450	31.00	376.20	.45	GRAVELLY SAND to SAND	63	59	100		46.0
9.600	31.50	403.42	.50	GRAVELLY SAND to SAND	67	63	100		46.0
9.750	31.99	421.88	.45	GRAVELLY SAND to SAND	70	65	100		46.0
9.900	32.48	277.05	.40	SAND	55	51	94		44.5
10.050	32.97	113.30	2.12	SILTY SAND to SANDY SILT	38	35	68		39.5
10.200	33.46	294.60	1.88	SAND to SILTY SAND	74	67	95		44.5
10.350	33.96	371.40	.58	GRAVELLY SAND to SAND	62	56	100		45.5
10.500	34.45	302.72	.62	SAND	61	55	96		44.5
10.650	34.94	189.02	1.95	SILTY SAND to SANDY SILT	63	57	82		42.5
10.800	35.43	278.75	.99	SAND	56	50	93		44.0
10.950	35.93	481.64	1.24	SAND	96	86	100		46.5
11.100	36.42	390.93	.75	SAND	78	69	100		45.5
11.250	36.91	292.01	1.64	SAND to SILTY SAND	73	64	94		44.0
11.400	37.40	268.53	.70	SAND	54	47	92		44.0
11.550	37.89	295.28	.60	SAND	59	52	94		44.0
11.700	38.39	298.70	.57	SAND	60	52	94		44.0
11.850	38.88	277.63	.57	SAND	56	48	92		44.0
12.000	39.37	270.60	.69	SAND	54	47	91		44.0
12.150	39.86	284.32	.59	SAND	57	49	93		44.0
12.300	40.35	245.59	.66	SAND	49	42	88		43.0
12 450	40.85	141.58	.86	SAND to SILTY SAND	35	30	72		40.0
12.600	41.34	93.92	1.60	SILTY SAND to SANDY SILT	31	26	60		38.5
12.750	41.83	43.47	3.84	CLAYEY SILT to SILTY CLAY	22	18		2.4	
12.900	42.32	77.99	1.49	SILTY SAND to SANDY SILT	26	22	55		38.0
13.050	42.81	15.00	4.01	CLAY	15	13		.8	
13.200	43.31	6.33	5.58	CLAY	6	5		.3	
13.350	43.80	41.38	3.68	CLAYEY SILT to SILTY CLAY	21	17		2.3	
13.500	44.29	307.58	.59	SAND	62	51	94		44.0
13.650	44.78	359.10	.85	SAND	72	59	98		44.5

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 10.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-03

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	390.27	.44	GRAVELLY SAND to SAND	65	53	100		44.5

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 10.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

APPENDIX C-1

Previous Laboratory Testing (Zeiser, 2005)

APPENDIX D

LABORATORY TEST PROCEDURES

VISUAL CLASSIFICATION OF SOILS

As a part of the routine laboratory soil testing, the soil samples are visually classified in accordance with the Unified Soil Classification System by experienced laboratory technicians. If necessary, in order to verify the visual classification, selected samples are classified utilizing the results of Standard Classification tests performed in accordance with ASTM D2487-00.

MOISTURE AND DENSITY TESTING

Moisture content and dry density determinations were performed on relatively undisturbed samples obtained from the exploratory excavations. The results of these tests are presented on the borings logs (Appendix B). Where applicable, only moisture content is determined from "undisturbed" or disturbed samples.

MAXIMUM DRY DENSITY TESTS

The maximum dry density and optimum moisture content of selected earth materials were determined in general accordance with ASTM D1557-02. The results of these tests are presented in the Laboratory Summary below.

DIRECT SHEAR TESTS

Direct shear tests were performed in general accordance with ASTM D3080-98 on selected remolded samples that were pre-soaked for a minimum of 24 hours. The samples were then tested under various normal loads with a different specimen being used for each normal load. The samples were sheared in a motor driven, strain-controlled direct shear testing apparatus at a strain rate of 0.01 and 0.05 inches per minute. The results of this test are presented in the Laboratory Summary.

GRAIN SIZE DISTRIBUTION

Representative samples were dried, weighed, and soaked in water until individual soil particles were separated, and then washed on the No. 200 sieve. That portion of the material retained on the No. 200 sieve was oven-dried and then run through a standard set of sieves in accordance with ASTM D422-63. The grain size distribution curves are attached to the Laboratory Summary.

APPENDIX D (CONT'D)

LABORATORY TEST PROCEDURES

PERCENT PASSING NO. 200 SIEVE

Representative samples were dried, weighed, and soaked in water until individual soil particles were separated, and then washed on the No. 200 sieve. That portion of the material retained on the No. 200 sieve was oven-dried and weighed in accordance with ASTM D1140-00 to determine the percentage of fines. The results of this test are presented in the Laboratory Summary.

R-VALUE

The suitability of selected soil samples for support of flexible pavement was evaluated by conducting stabilometer resistance (R-Value) testing. R-value testing was performed in accordance with California Standard Test Method No. 301. The results of this test are presented below in the Laboratory Summary and graphically as an attachment in this Appendix.

SOLUBLE SULFATE

The soluble sulfate contents of selected samples are determined in accordance with the California Test Method Number 417. Soils with 700 ppm (0.07 percent) or greater concentration may be highly corrosive to metals. In addition, sulfate content is a factor considered in planning for concrete mix design and placement. The results of this test are presented in the Laboratory Summary below.

ATTERBERG LIMITS

The Atterberg limits were performed in general accordance with (ASTM D4318-00 and are used frequently in soil classification and identification. The soil descriptions defined by the United Soil Classification System (USCS) are based on these limits. Fine-grained soils are classified in the laboratory by performing several tests that define the plastic and liquid limits. The results of these tests are presented in this Appendix.

APPENDIX D (CONT'D)

LABORATORY TEST RESULTS

Maximum Dry Density

Sample Location	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture Content (percent)
ZT-1 @ 8'-10'	Yellowish Brown Silty Sand (SM/SP)	113.5	14.0
ZT-3 @ 0'-3'	Brown Silty Fine Sand to Sandy Silt (SM/ML)	106.0	14.0
ZT-8 @ 0'-3'	Brown Silty Fine Sand (SM)	120.0	10.0
ZT-10 @ 0'-3'	Brown Silty Fine Sand (SM)	117.0	11.0
ZT-12 @ 0'-3'	Dark Brown Clayey Sand (SC)	130.5	9.0
ZT-14 @ 0'-3'	Brown Silty Fine Sand (SM)	115.0	11.5
T-2 @ 0 - 8'	Light Brown Silty Sand (SM/SP)	112.5	14.5
T-3 @ 0'-6'	Brown Silty Fine Sand (SM)	121.5	9.5
T-5 @ 0 - 5'	Dark Brown Silty Sand to Sandy Silt (SM/ML)	129.5	10.0
T-9 @ 4'-7'	Dark Brown Silty Fine Sand (SM)	121.0	10.0

Atterberg Limits Test

Sample Location	Soil Description	Liquid Limit	Plastic Limit	Plasticity Index
B-1 @ 40'	Brown Clayey Silt (ML)	Non-Plastic	Non-Plastic	Non-Plastic
B-1 @ 50'	Brown Lean Clay (CL)	31	19	12

APPENDIX D (CONT'D)

LABORATORY TEST RESULTS

Direct Shear

Sample Location	Soil Description	Cohesion (psf)	Friction Angle (degrees)
ZT-3 @ 0'-3'	Brown Silty Fine Sand to Sandy Silt (SM/ML)	100	32
ZT-10 @ 0'-3'	Brown Silty Fine Sand (SM)	200	29
T-9 @ 4'-7'	Dark Brown Silty Fine Sand (SM)	200	30
B-6 @ 17.5'	Brown Poorly Graded Fine Sand (SP)	100	30

R-Value

Sample Location	Soil Description	Percent Passing #200 Sieve	R-Value (By exudation)
T-5 @ 0 – 5'	Grayish Brown Sandy Silt (ML)	48.5	50
ZT-7 @ 0'-3'	Brown Silt (SM/ML)	94.4	41

Soluble Sulfate

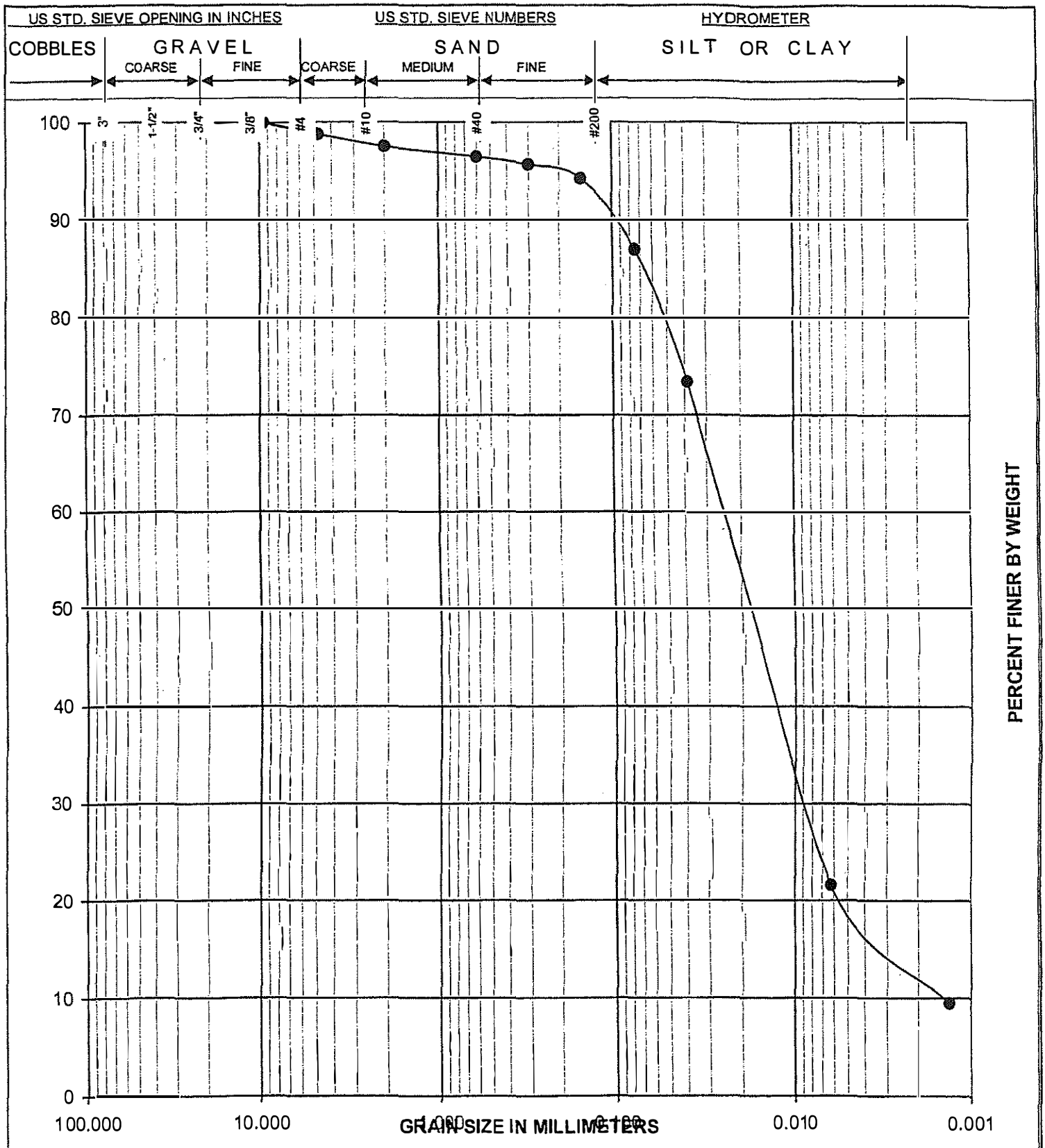
Sample Location	Soil Description	Soluble Sulfate (Percent)
ZT-7 @ 0'-3'	Brown Silt (ML)	0.0045 (45 ppm)
ZT-11 @ 0'-3'	Brown Sandy Silt (ML)	0.0055 (55 ppm).

APPENDIX D (CONT'D)

LABORATORY TEST RESULTS

Percent Passing #200 Sieve

Sample Location	Soil Description	Percent Passing #200 Sieve
ZB-1 @ 5'	Grayish Brown Poorly Graded Sand (SP)	2.3
ZB-1 @ 10'	Grayish Brown Poorly Graded Sand with Silt(SP-SM)	5.5
ZB-1 @ 15'	Grayish Brown Poorly Graded Sand with Silt and Gravel (SP-SM)	5.9
ZB-1 @ 15'	Grayish Brown Poorly Graded Sand with Silt and Gravel (SP-SM)	5.9
ZB-1 @ 20'	Grayish Brown Poorly Graded Sand with Silt(SP-SM)	11.7
ZB-1 @ 25'	Grayish Brown Poorly Graded Sand with Silt(SP-SM)	8.9
ZB-1 @ 30'	Brown Poorly Graded Gravel with Sand (GP)	2.2
ZB-1 @ 35'	Grayish Brown Sandy Silt with Gravel (ML)	78.5
ZB-1 @ 40'	Brown Poorly Graded Sand with Silt and Gravel (SP-SM)	9.0
ZB-2 @ 5'	Brown Poorly Graded Sand with Silt(SP-SM)	8.0
ZB-2 @ 10'	Dark Brown Poorly Graded Sand with Silt(SP-SM)	7.9
ZB-2 @ 15'	Dark Brown Poorly Graded Gravel with Sand (GP)	4.9
ZB-2 @ 20'	Dark Brown Poorly Graded Gravel with Sand (GP)	4.3
ZB-2 @ 25'	Dark Brown Poorly Graded Sand with Gravel (SP)	7.7
ZB-2 @ 30'	Brown Silty Sand with Gravel (SM)	26.7
ZB-2 @ 35'	Brown Poorly Graded Sand with Gravel (SP)	6.6
ZB-2 @ 50'	Brown Silty Sand with Gravel (SM)	26.2
ZB-6 @ 42'	Brown Sandy Clay (CL)	78.2
ZB-6 @ 50'	Brown Silty Sand with Gravel (SM)	13.6
ZB-7 @ 40'	Brown Silty Sand with Gravel (SM)	32.0
B-1 @ 40'	Grayish Brown Sandy Silt (ML)	56.9
B-1 @ 45'	Grayish Brown Silty to Clayey Sand (SM/SC)	24.3
B-2@ 10	Grayish Brown Silty Fine Sand (SM)	32.2
B-3 @ 15'	Grayish Brown Silty Fine Sand (SM)	37.6
B-5 @ 40'	Grayish Brown Fine Sandy Silt (ML)	71.2
B-6 @ 5'	Grayish Brown Silty Fine Sand (SM)	41.5
B-7 @ 15'	Grayish Brown Silty Fine Sand (SM)	34.4
B-7 @ 35'	Grayish Brown Fine Sandy Silt (ML)	80.7
B-8 @ 20'	Grayish Brown Sandy Silt (ML)	80.8



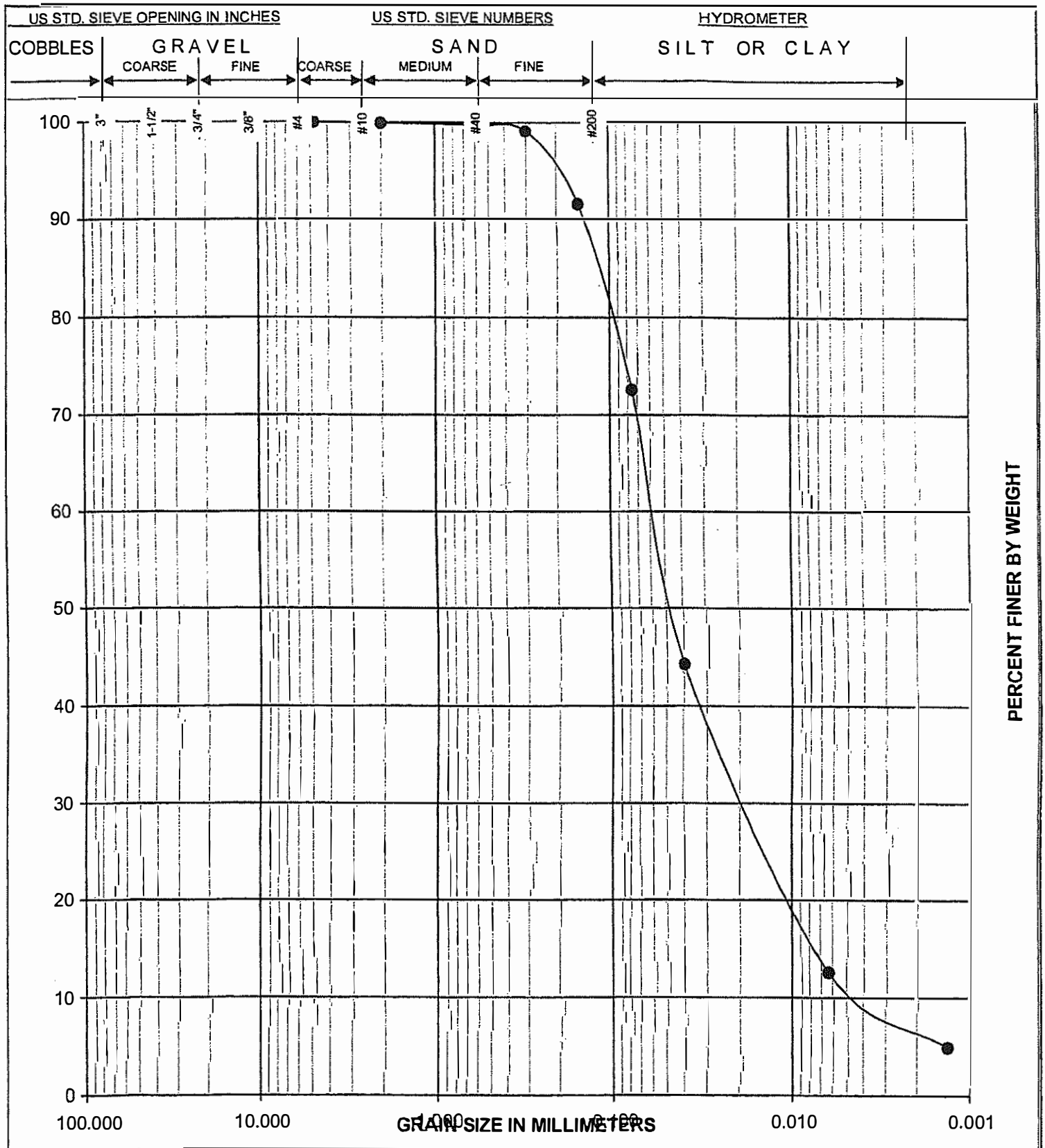
PROJECT NUMBER : 05026-02

PROJECT NAME : EMERALD MEADOWS

SAMPLE NO.	DEPTH	SYMBOL	CLASSIFICATION	NAT.W%	LL	PL	PI
B-2	40'	ML	BROWN FINE SANDY SILT		34	27	7

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GRAIN - SIZE CURVE



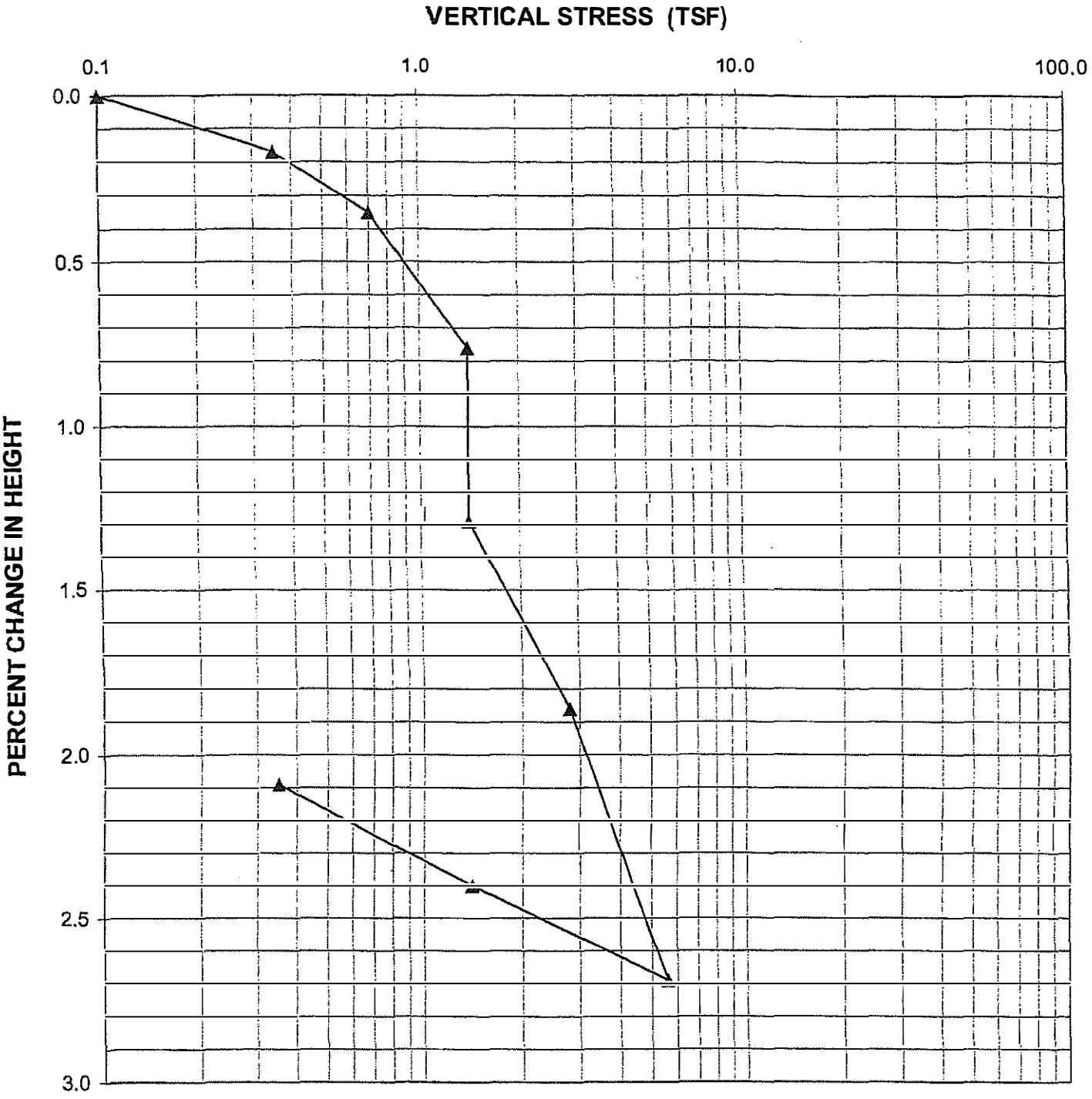
PROJECT NUMBER : 05026-01

PROJECT NAME : EMERALD MEADOWS

SAMPLE NO.	DEPTH	SYMBOL	CLASSIFICATION	NAT.W%	LL	PL	PI
B-5	25'	ML	BROWN FINE SANDY SILT				

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GRAIN - SIZE CURVE



PROJECT NO.: 05026-01

SOIL DESCRIPTIONS: LT. BROWN SILTY FINE SAND (SM)

BORING NO./LOCATION : B-3

DEPTH / ELEV. : 12.5'

LIQUID LIMIT :

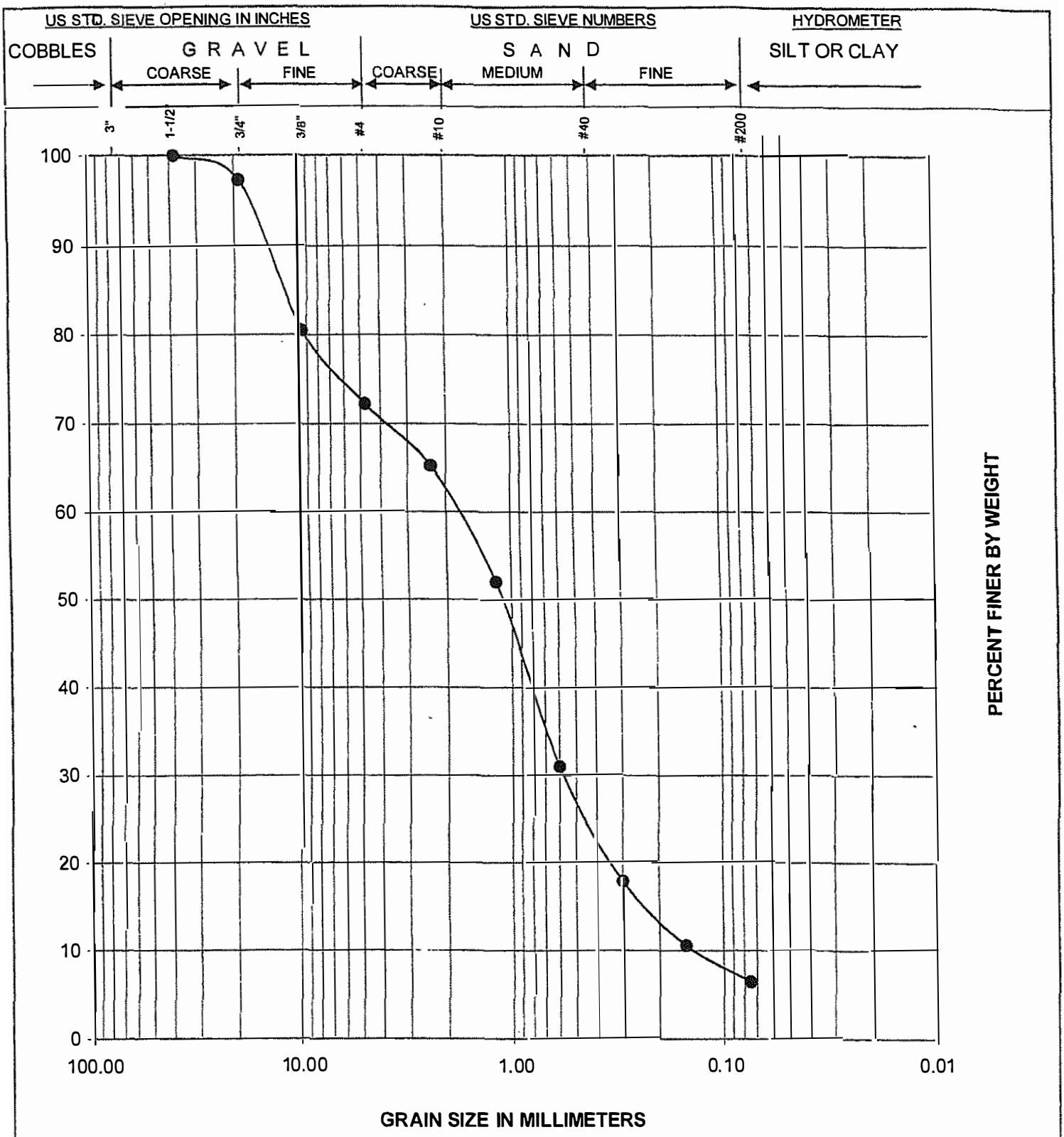
SPECIFIC GRAVITY : 2.7 Assumed

PLASTIC LIMIT:

	SPECIMEN HT. (INCHES)	MOISTURE CONT. (%)	DRY DENSITY (PCF)	SATURATION (%)	VOID RATIO
INITIAL	1.0000	5.4	107.5	25.6	0.567
FINAL	0.9791	19.5	109.8	98.3	0.535

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CONSOLIDATION TEST CURVE



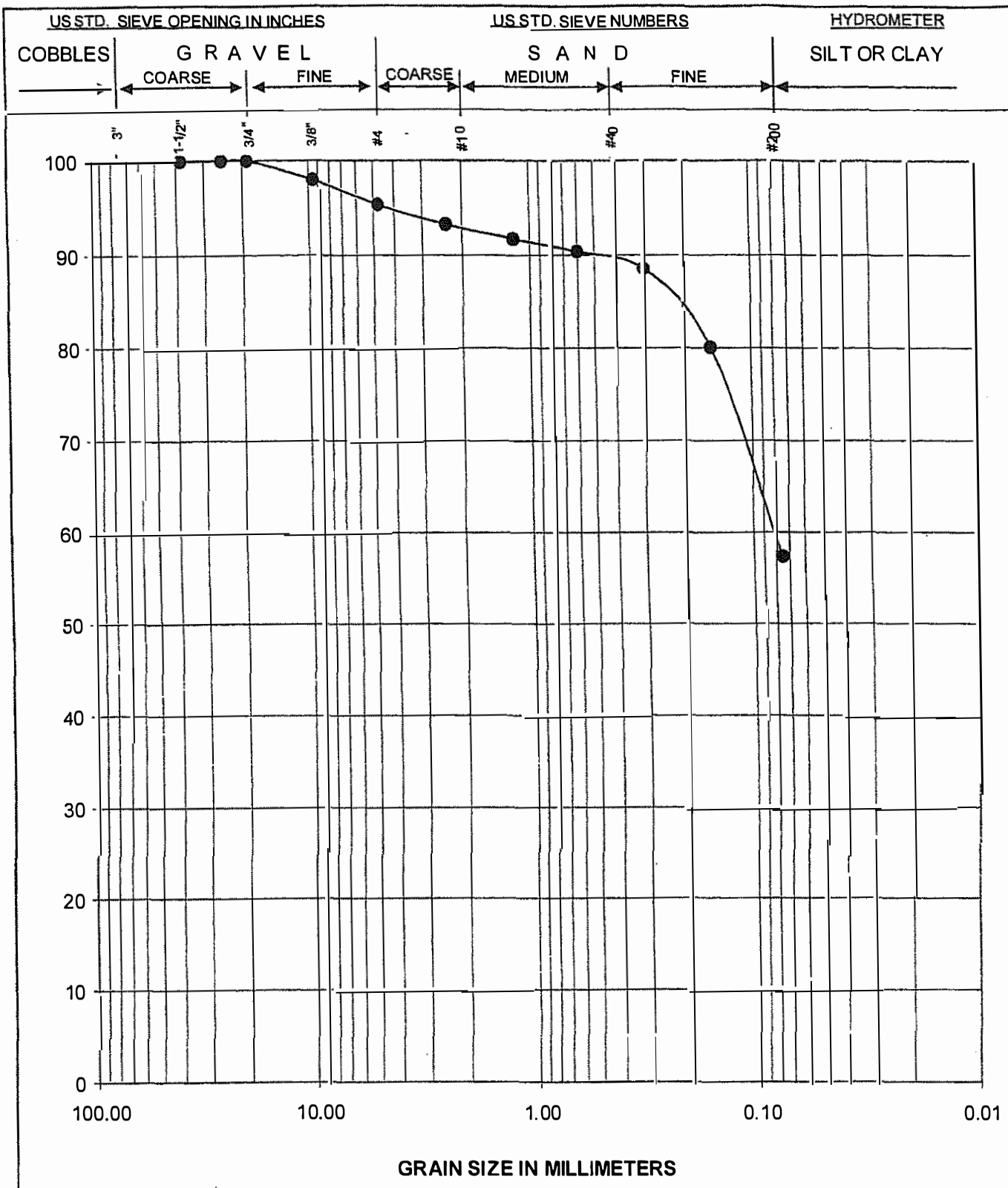
PROJECT NUMBER : 05025-00

PROJECT NAME : EMERALD MEADOWS

SAMPLE NO.	DEPTH	SYMBOL	CLASSIFICATION	NAT.W%	LL	PL	PI
ZB-1	45'	SW-SM	GRAYISH BR. POORLY GRADED GRAVEL W/ SILT & SAND		-	-	-

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GRAIN - SIZE CURVE



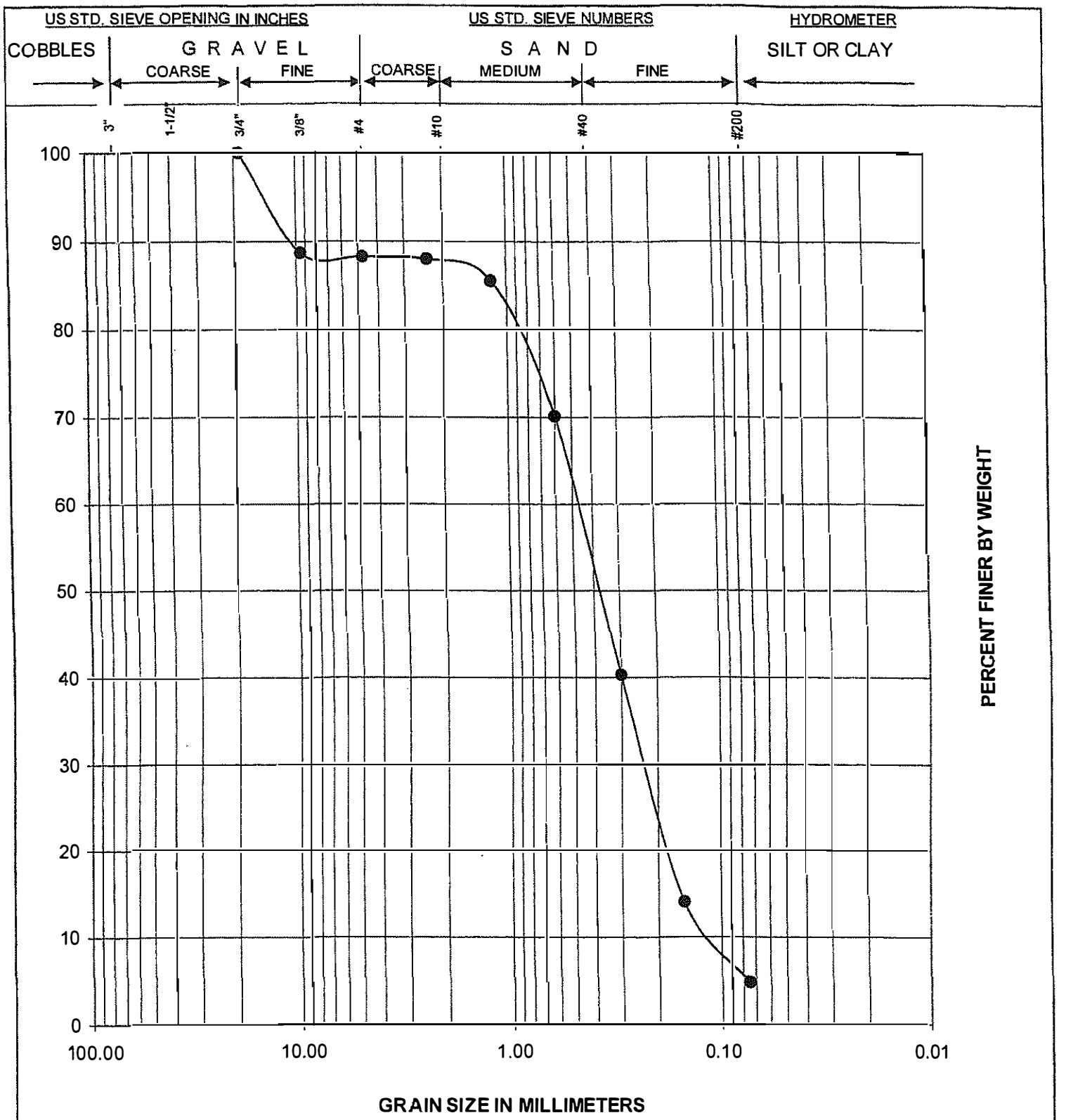
PROJECT NUMBER : 05026-00

PROJECT NAME : EMERALD MEADOWS

SAMPLE NO.	DEPTH	SYMBOL	CLASSIFICATION	NAT.W%	LL	PL	PI
ZB-2	40'	ML	GRAYISH BROWN FINE SANDY SILT		-	-	-

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GRAIN - SIZE CURVE



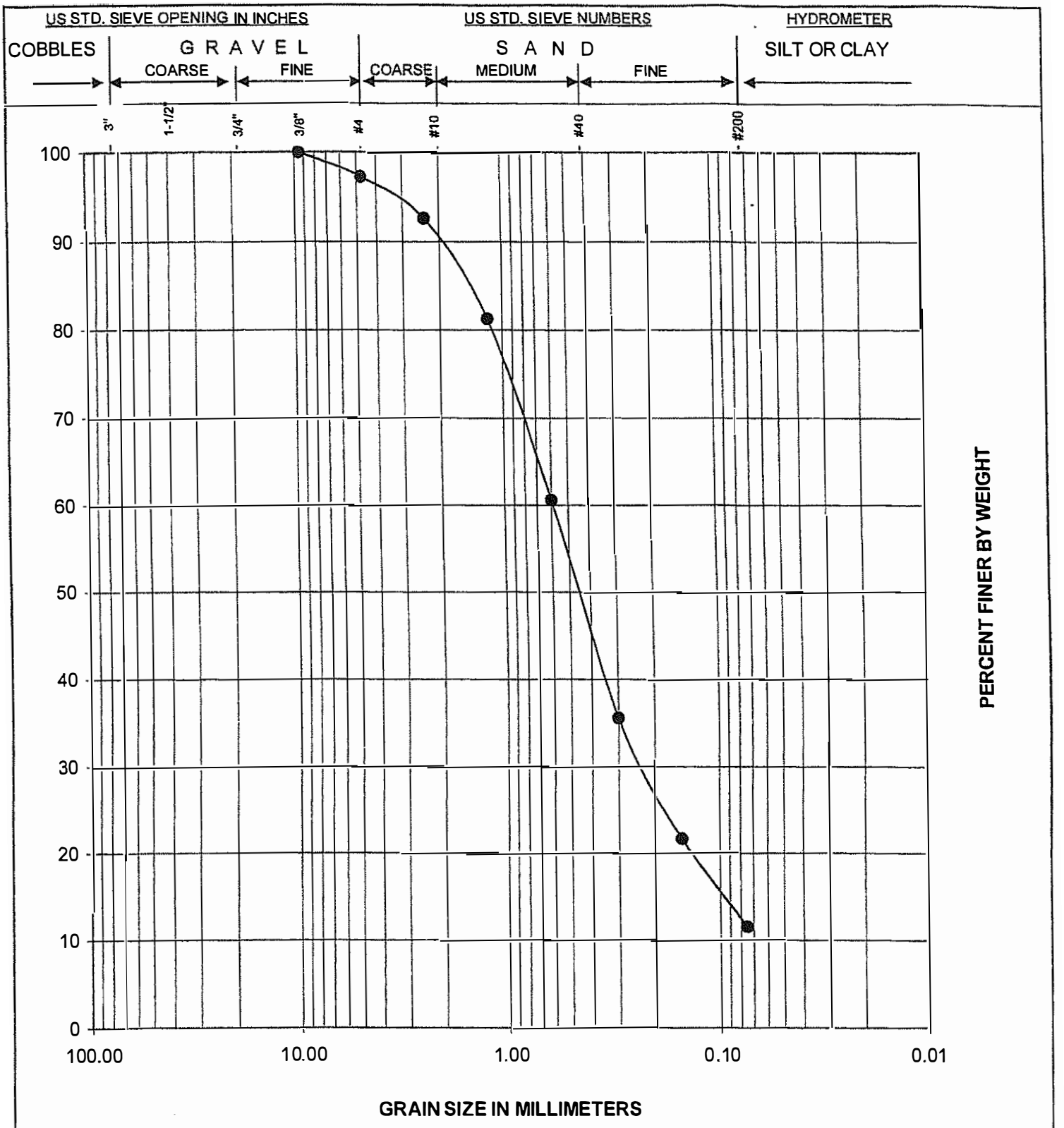
PROJECT NUMBER : 05026-00

PROJECT NAME : EEMERALD MEADOWS

SAMPLE NO.	DEPTH	SYMBOL	CLASSIFICATION	NAT.W%	LL	PL	PI
ZB-3	10'	SP	GRAYISH BR. POORLY GRADED GRAVEL W/ SILT & SAND		-	-	-

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GRAIN - SIZE CURVE



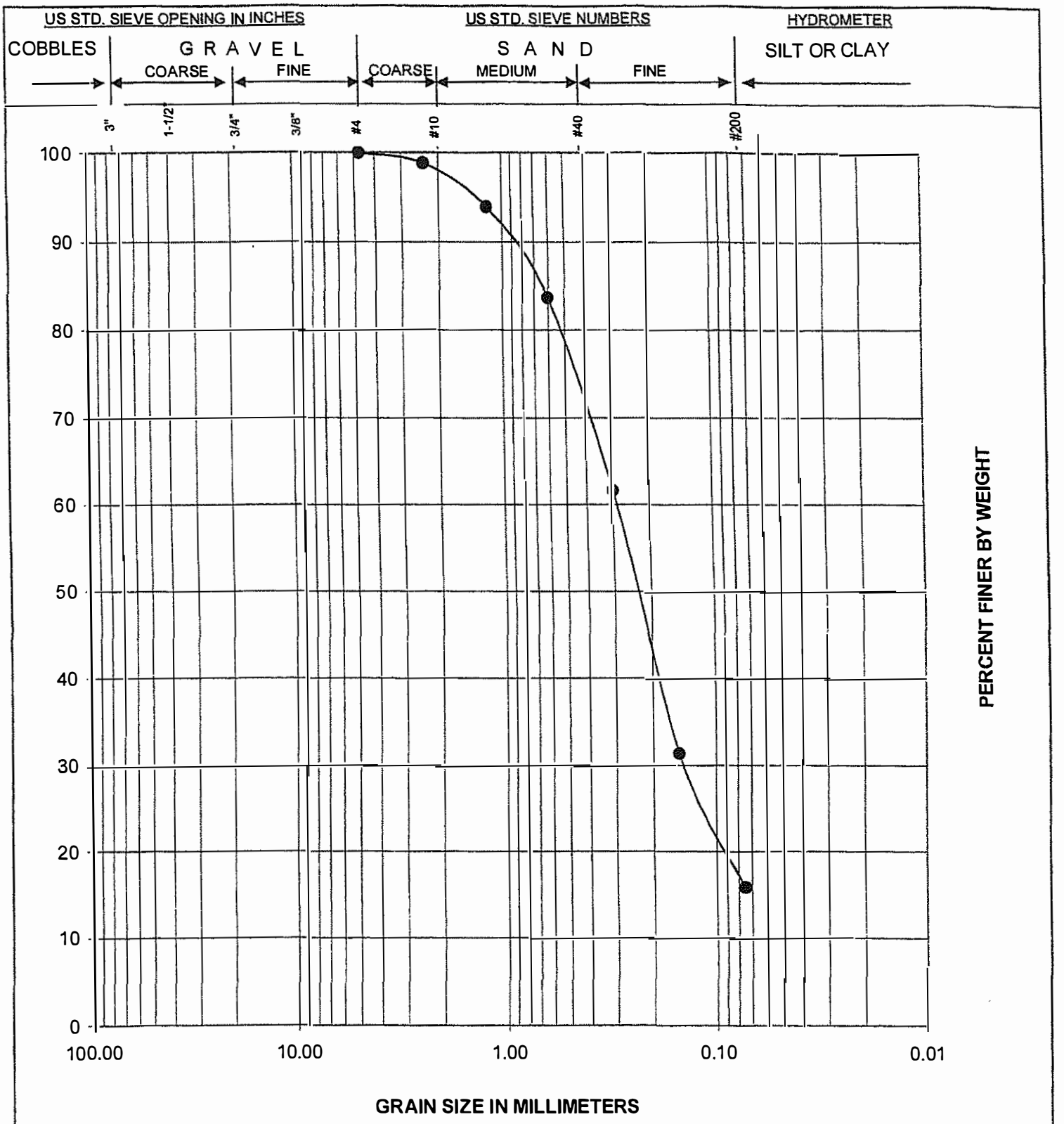
PROJECT NUMBER : EMERALD MEADOWS

PROJECT NAME : 05026-00

SAMPLE NO.	DEPTH	SYMBOL	CLASSIFICATION	NAT.W%	LL	PL	PI
ZB-6	5'	SW-SM	GRAYISH BR. WELL GRADED SAND WITH SILT		-	-	-

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GRAIN - SIZE CURVE



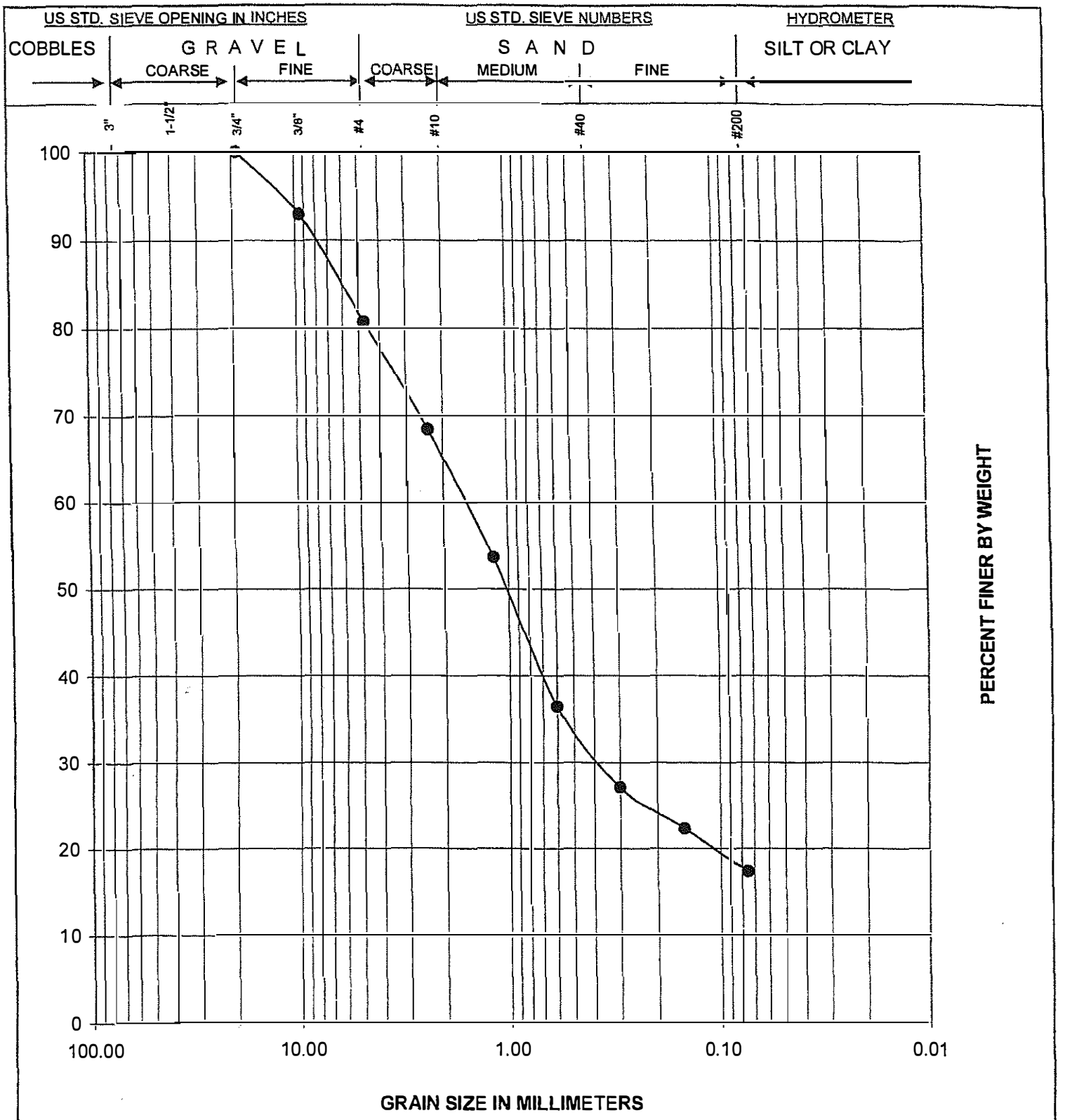
PROJECT NUMBER : EMERALD MEADOWS

PROJECT NAME : 05026-00

SAMPLE NO.	DEPTH	SYMBOL	CLASSIFICATION	NAT.W%	LL	PL	PI
ZB-7	5'	SM	GRAYISH BR. POORLY GRADED GRAVEL W/ SILT & SAND		-	-	-

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GRAIN - SIZE CURVE



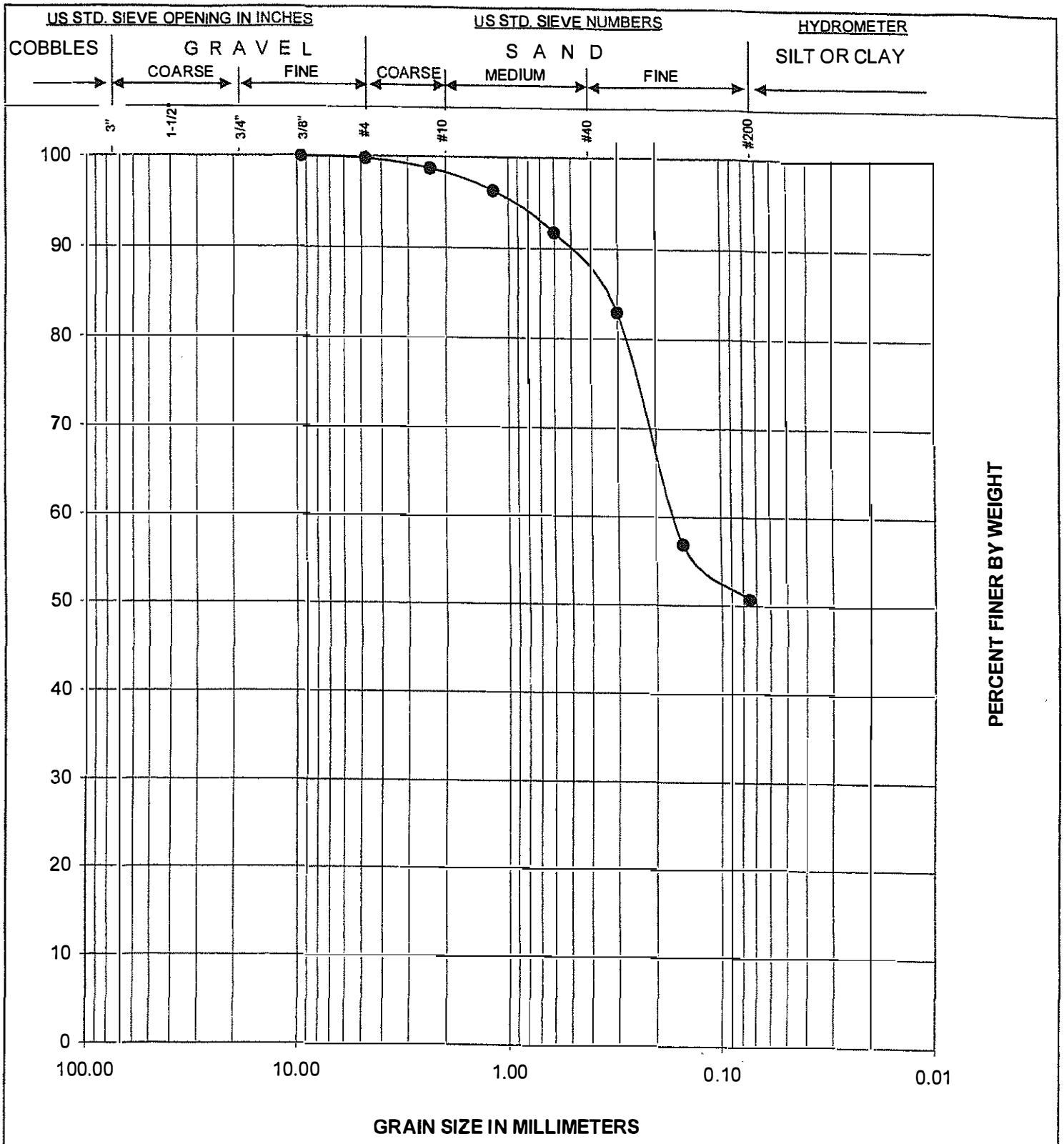
PROJECT NUMBER : 05026-00

PROJECT NAME : EMERALD MEADOWS

SAMPLE NO.	DEPTH	SYMBOL	CLASSIFICATION	NAT.W%	LL	PL	PI
ZB-9	20'	SM	GRAYISH BR. POORLY GRADED GRAVEL W/ SILT & SAND		-	-	-

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GRAIN - SIZE CURVE



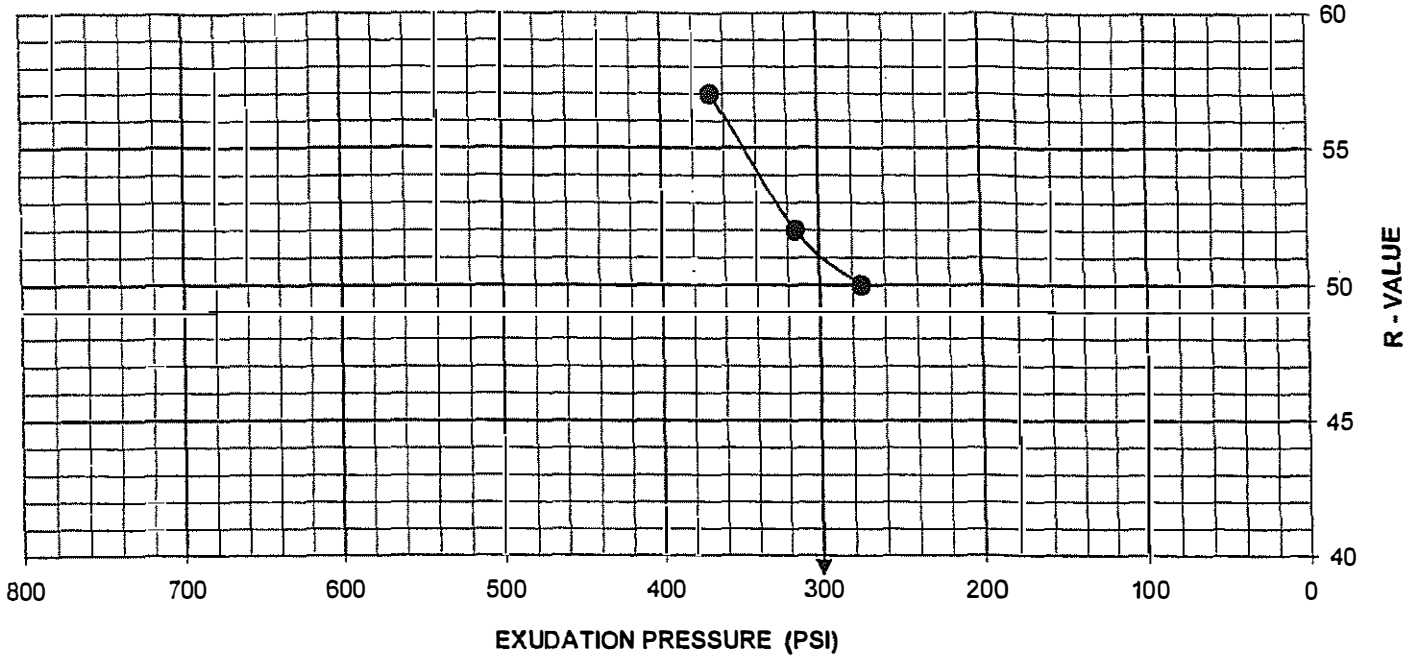
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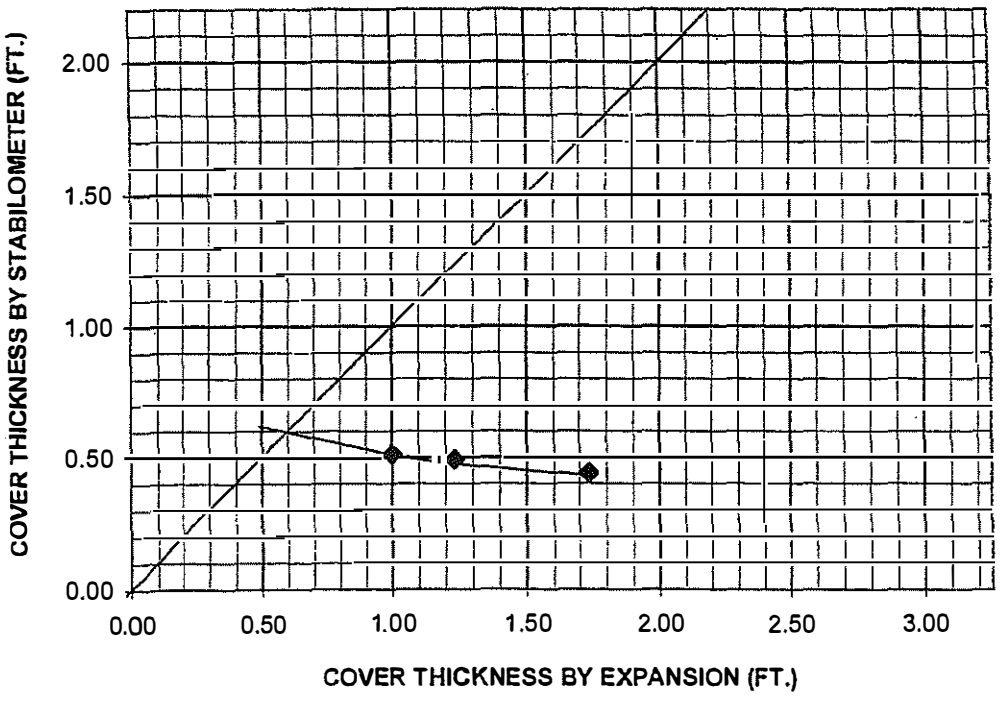
PROJECT NAME : EMERALD MEADOWS

SAMPLE NO.	DEPTH	SYMBOL	CLASSIFICATION	NAT.W%	LL	PL	PI
ZB-10	5'	CL	GRAYISH BR. POORLY GRADED GRAVEL W/ SILT & SAND		-	-	-

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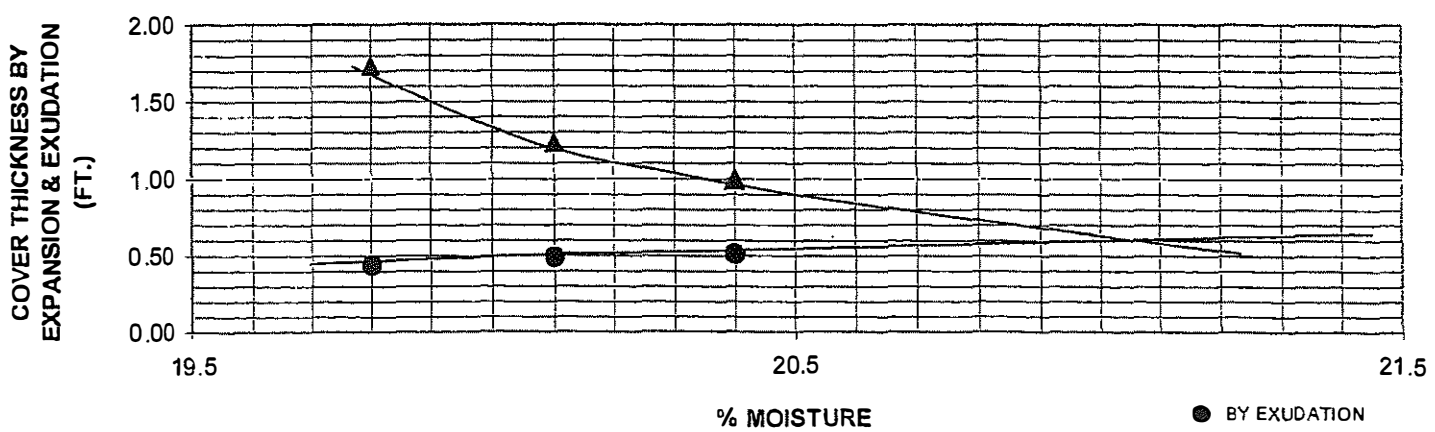
GRAIN - SIZE CURVE





R - VALUE CURVES

05026-00	
PROJECT NUMBER	
EMERALD MEADOWS	
PROJECT NAME	
ZT-7 @ 6' - 9'	
SAMPLE NO. / LOCATION	
R - VALUES :	
BY EXUDATION	51
BY EXPANSION	41
COVER THICKNESS (FT.)	0.60



PROJECT NO. : 05026-00 DATE : 9-Mar-05

PROJECT NAME : EMERALD MEADOWS TESTED BY: RB

SAMPLE NO. / LOCATION : ZT-7 @ 6' - 9' SAMPLED BY:

SAMPLE DESCRIPTIONS / CLASSIFICATION : BROWN SILT (ML)

TRIAL NO.		1	2	3	4
MOLD NUMBER		8	7	11	10
WATER ADDED	(ML)	10	15	20	
COMPACTOR PRESSURE	(PSI)	350	350	350	
GROSS WEIGHT	(GMS)	3089	3108	3121	
TARE WEIGHT	(GMS)	2130	2121	2132	
SAMPLE WET WEIGHT	(GMS)	959	987	989	
EXUDATION PRESSURE	(PSI)	368	315	275	
SAMPLE HEIGHT	(IN.)	2.41	2.49	2.50	
EXPANSION	($IN.x10^{-4}$)	52	37	30	
STABILITY @ 160 PSI (2000 LBS) / @ 80 PSI (1000 LBS)		47 | 28	54 | 30	59 | 32	|
TURNS DISPLACEMENT		4.26	4.45	4.31	
R-VALUE UNCORRECTED		59	52	50	
R-VALUE CORRECTED		57	52	50	
MOISTURE CONTENT	(%)	19.8	20.1	20.4	
DRY DENSITY	(PCF)	100.6	100.0	99.6	
ASSUMED TRAFFIC INDEX		4.0	4.0	4.0	
G.E. BY STABILITY		0.44	0.49	0.51	
G.E. BY EXPANSION		1.73	1.23	1.00	
R-VALUE @ EQUILIBRIUM	(BY EXPANSION)	41			
Gf		1.25			

REMARKS : (-)#200 SIEVE = 94.4 %

CHECKED BY:

DATE :

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

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R - VALUE DATA

APPENDIX C-2

Previous Laboratory Testing (Converse, 2003)

APPENDIX B

LABORATORY TESTING PROGRAM

Geotechnical tests were conducted in the Converse laboratory on representative samples for the purpose of evaluating physical properties. The test results are presented in the logs of borings and are included in this Appendix A, *Field Exploration*. A summary of the various laboratory tests conducted is presented below.

Amounts of Material In Soils Finer Than The No. 200 Sieve

Thirteen (13) selected samples were tested in accordance with the ASTM Standard D1140-92 test method to determine the amounts of materials finer than U.S. Standard Sieve No. 200. This information is summarized in the table below.

Table No. B-1, Percent Finer than #200 Sieve Results

Boring No.	Depth (ft)	Soil Classification	Percent Finer Than No. 200 Sieve (%)
BH-3	15	Sand with silt (SP-SM)	6.0
BH-3	25	Sand with silt (SP-SM)	7.6
BH-3	35	Sand (SP)	3.7
BH-3	45	Sand with silt (SP-SM)	5.7
BH-8	25	Silty Sand (SM)	44.4
BH-8	35	Sand (SP)	4.5
BH-8	45	Sand (SP)	4.0
BH-10	25	Silt (ML)	82.5
BH-12	10	Silt (ML)	60.6
BH-12	15	Sand (SP)	4.3
BH-12	20	Sand (SP)	3.2
BH-15	20	Sand (SP)	2.6
BH-15	25	Silt (ML)	85.1

Laboratory Maximum Density Test

One (1) laboratory maximum density-moisture content relationship test was performed on a representative bulk sample. The test was conducted in accordance with the ASTM Standard D1557-00 laboratory procedure. The test result is presented on Drawing No. B-1, *Moisture-Density Relationship Results*.

Collapse Tests

To evaluate the moisture sensitivity (collapse potential) of the encountered soils, eleven (11) ring samples were loaded up to approximately two kips per square foot (ksf), allowed to stabilize under load, and then submerged. The results of these tests are summarized in the table below.

Table No. B-2, Summary of Collapse Test Results

Sample Location/Depth	Percent Collapse
BH-1/5'	0.4
BH-3/5'	0.4
BH-4/2'	0.8
BH-5/5'	0.4
BH-7/5'	2.0
BH-8/5'	0.6
BH-9/2'	0.4
BH-10/5'	0.2
BH-10/10'	0.2
BH-11/5'	0.7
BH-11/10'	0.0

Soil Corrosivity

A representative soil sample was tested to determine the minimum electrical resistivity, pH, and chemical content, including soluble sulfate and chloride concentrations. The purposes of these tests are to determine the corrosion potential of site soils when placed in contact with common construction materials. These tests were performed by M. J. Schiff & Associates, Inc., Claremont, California. Test result is summarized on the following table and at the end of this appendix.

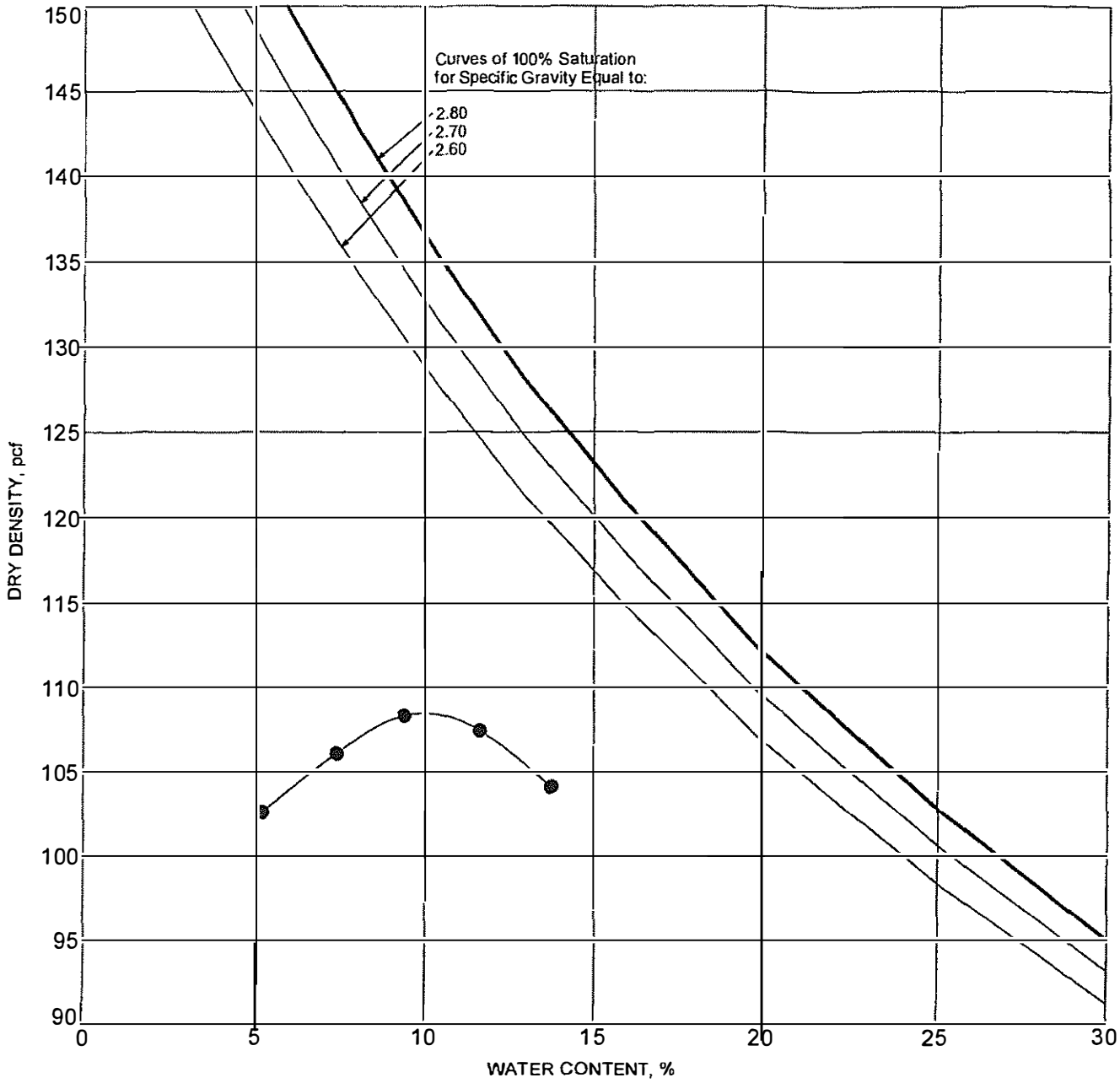
Table No. B-3, Corrosivity Test Results

Boring No.	Depth (feet)	pH	Chloride (mg/kg)	Sulfate (mg/kg)	Min. Resistivity (Saturated) ohm-cm
BH-1	0-5	8.2	ND*	ND	15,000

*Note: ND= Not Detected

Sample Storage

Soil samples presently stored in our laboratory will be discarded 30 days after the date of this report unless this office receives a specific request to retain the samples for a longer period.



SYMBOL	BORING NO.	DEPTH (ft)	DESCRIPTION	ASTM TEST METHOD	OPTIMUM WATER, %	MAXIMUM DRY DENSITY, pcf
●	BH - 7	0 - 5'	SILTY SAND (SM), gray	A	11.0	110.0

MOISTURE-DENSITY RELATIONSHIP RESULTS

Converse Consultants

Project Name
EMERALD MEADOWS RANCH
Rubidoux, California
For: Pacific Properties

Project No.
03-81-214-01

Drawing No.
B - 1

M. J. Schiff & Associates, Inc.
Consulting Corrosion Engineers - Since 1959
431 W. Baseline Road
Claremont, CA 91711
Phone: (909) 626-0967 Fax: (909) 626-3316
E-mail lab@mjschiff.com
website: mjschiff.com

Table 1 - Laboratory Tests on Soil Samples

200 Acre Site Rubidoux
Your #03-81-214-01, MJS&A #03-0993LAB
22-Aug-03

Sample ID			BH-1 @ 0-5'
Resistivity		**Units**	
as-received		ohm-cm	110,000
saturated		ohm-cm	15,000
pH			8.2
Electrical Conductivity		mS/cm	0.08
Chemical Analyses			
Cations			
calcium	Ca^{2+}	mg/kg	92
magnesium	Mg^{2+}	mg/kg	7
sodium	Na^{1+}	mg/kg	ND
Anions			
carbonate	CO_3^{2-}	mg/kg	ND
bicarbonate	HCO_3^{1-}	mg/kg	281
chloride	Cl^{1-}	mg/kg	ND
sulfate	SO_4^{2-}	mg/kg	ND
Other Tests			
ammonium	NH_4^{1+}	mg/kg	na
nitrate	NO_3^{1-}	mg/kg	na
sulfide	S^{2-}	qual	na
Redox		mv	na

Electrical conductivity in millisiemens/cm and chemical analysis were made on a 1:5 soil-to-water extract.
mg/kg= milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

APPENDIX D

Liquefaction Calculations

APPENDIX D

LIQUEFACTION ANALYSIS

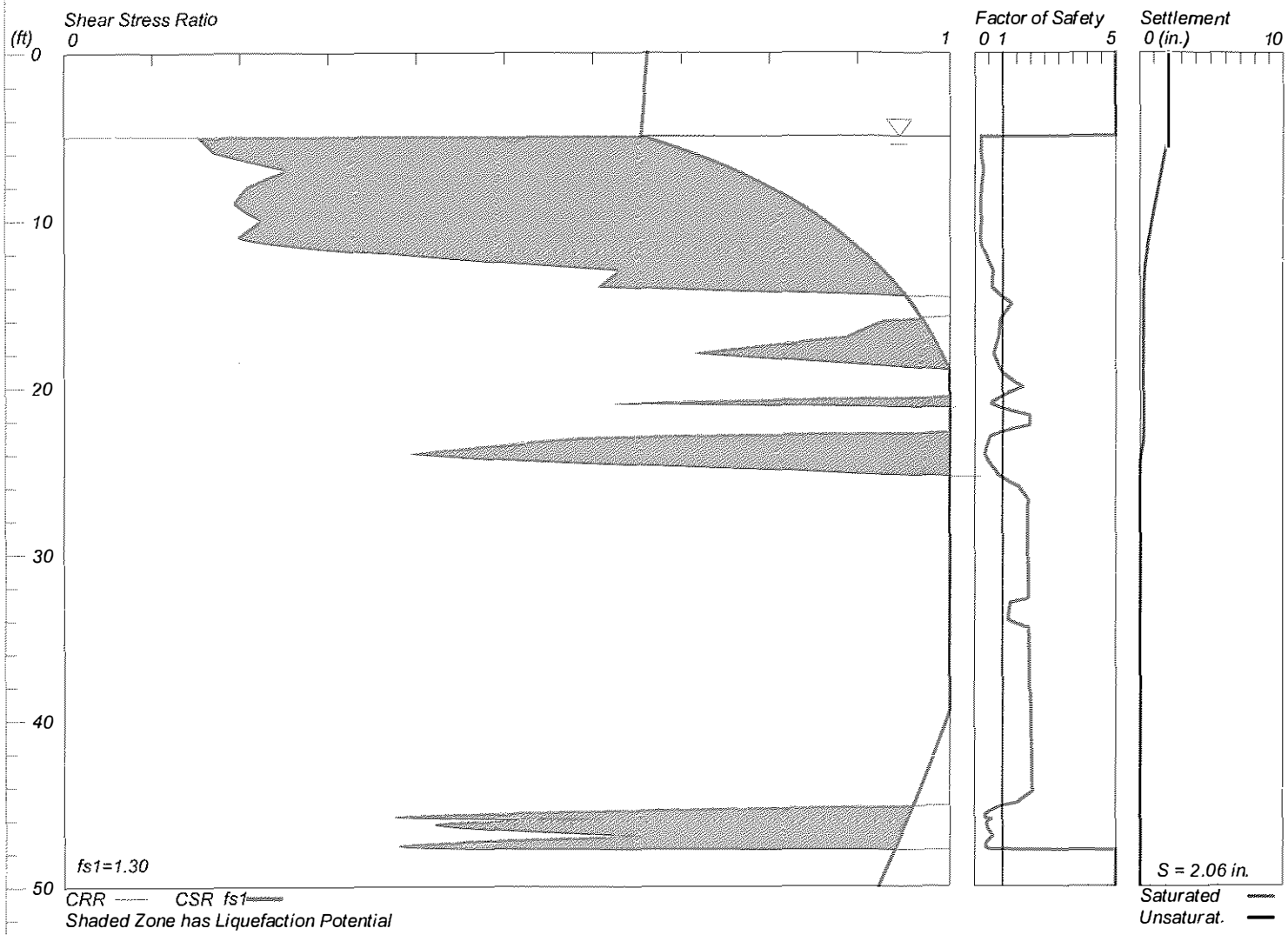
Liquefaction analysis were performed for the site based on CPT data presented in the attached report by Kehoe Testing & Engineering, 2015, and CPT and SPT data from the previous subsurface investigations (Zeiser, 2005) and (Converse, 2003). The Ishihara/Yoshimine method was used to analyze dynamic settlement for the CPT data. The calculations used the following constants: 0.783g for site acceleration, 7.6 for the magnitude of the earthquake, and a groundwater depth of 5 feet below existing grade. A factor of safety of 1.3 was utilized. The results are presented on Plates D-1 through D-22.

LIQUEFACTION ANALYSIS

Emerald Ranch

Hole No.=CPT-1 Water Depth=5 ft

Magnitude=7.61
Acceleration=0.783g



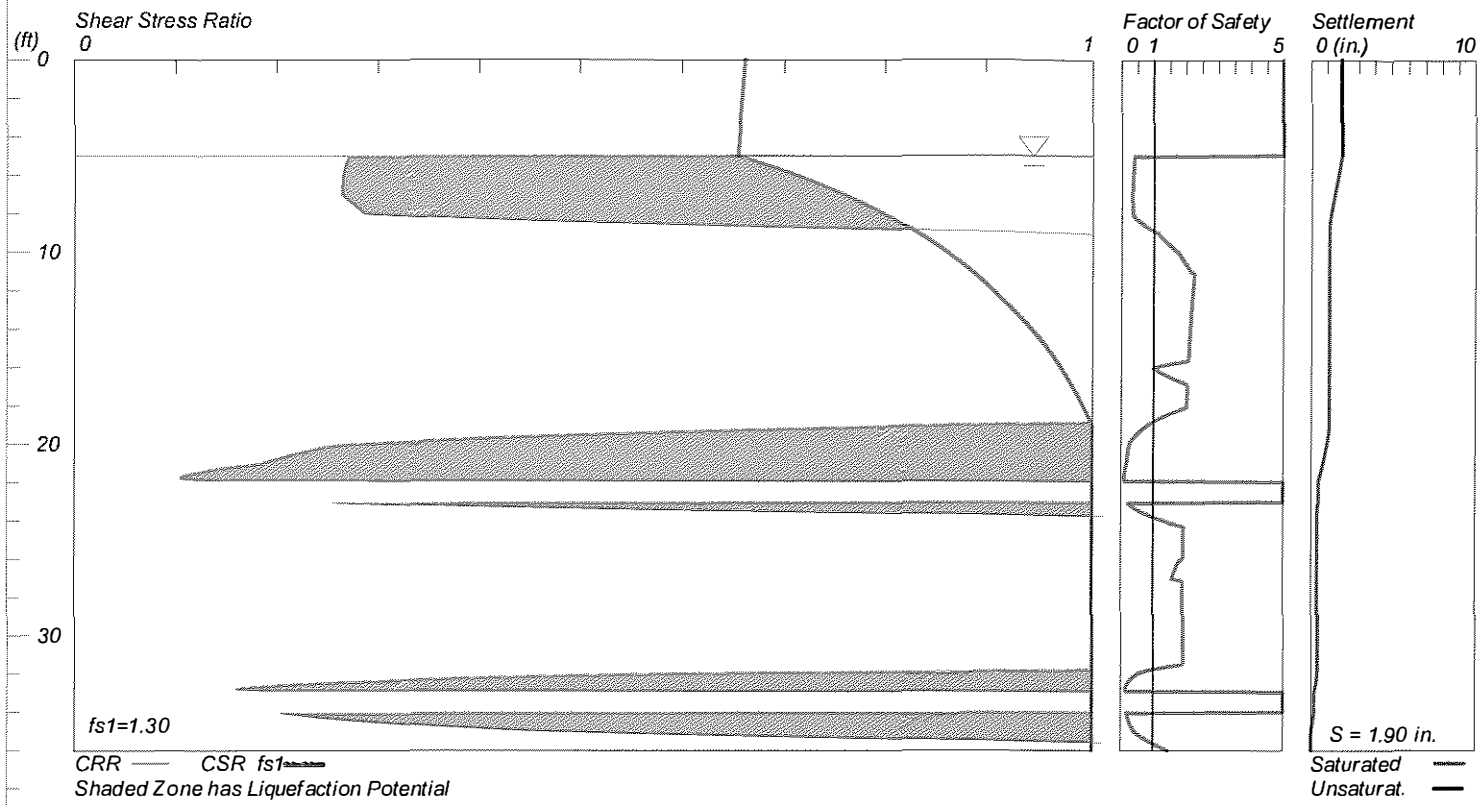
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LIQUEFACTION ANALYSIS

Emerald Ranch

Hole No.=CPT-2 Water Depth=5 ft

Magnitude=7.61
Acceleration=0.783g



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LIQUEFACTION ANALYSIS

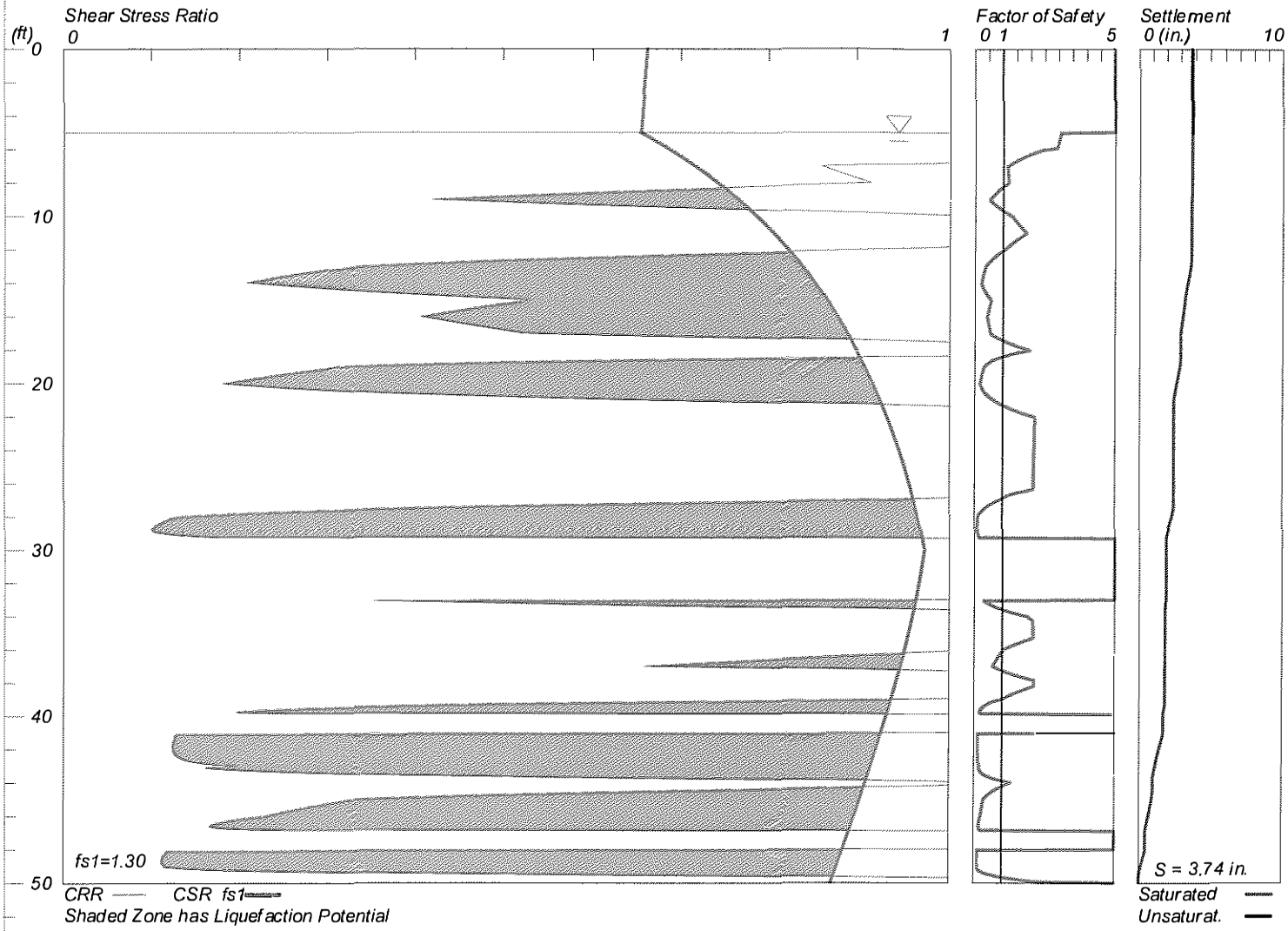
Emerald Ranch

Hole No.=CPT-3 Water Depth=5 ft

Ground Improvement of Fill=4 ft

Magnitude=7.61

Acceleration=0.783g



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LIQUEFACTION ANALYSIS

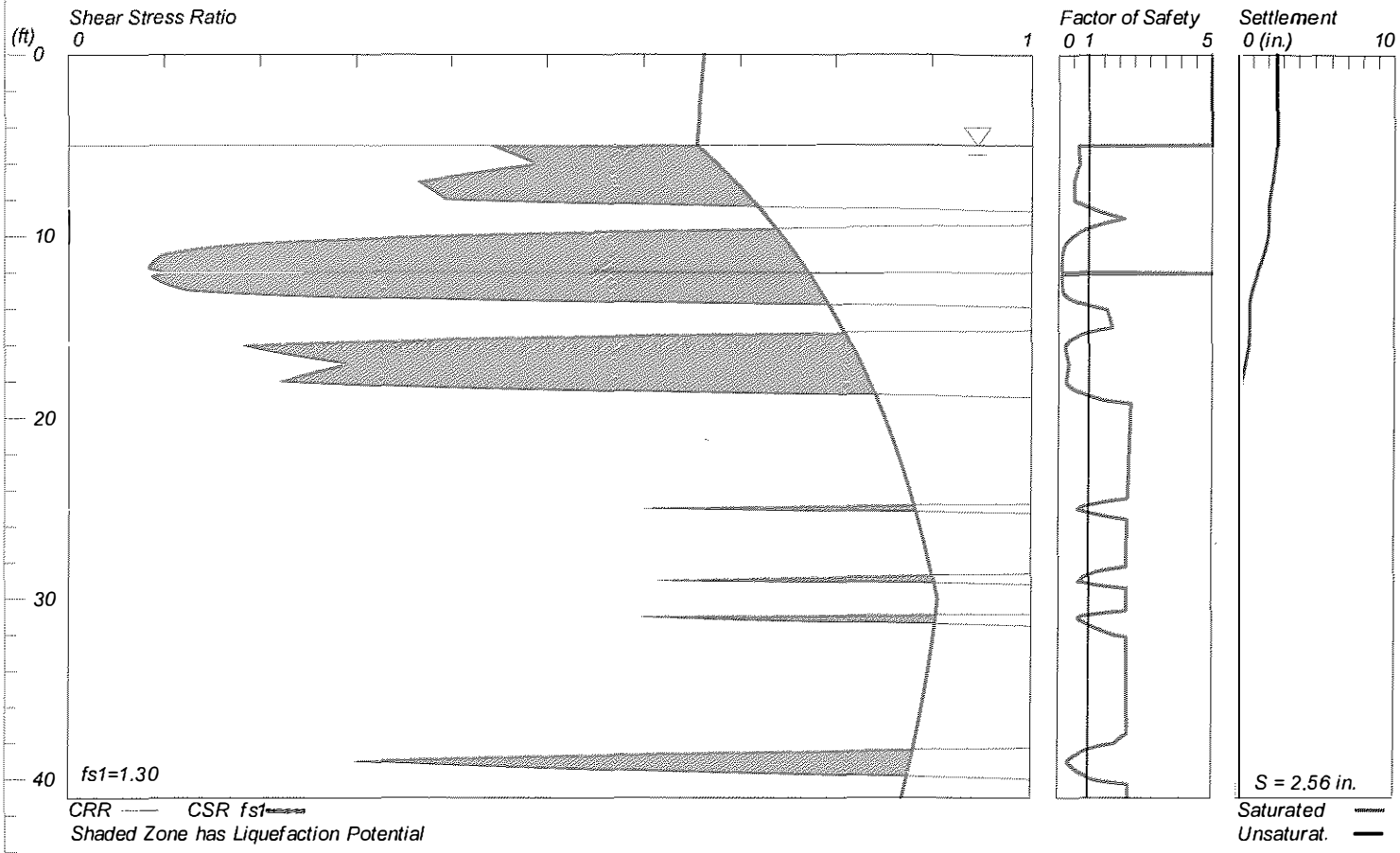
Emerald Ranch

Hole No.=CPT-4 Water Depth=5 ft

Ground Improvement of Fill=9 ft

Magnitude=7.61

Acceleration=0.783g



50

60

70

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LIQUEFACTION ANALYSIS

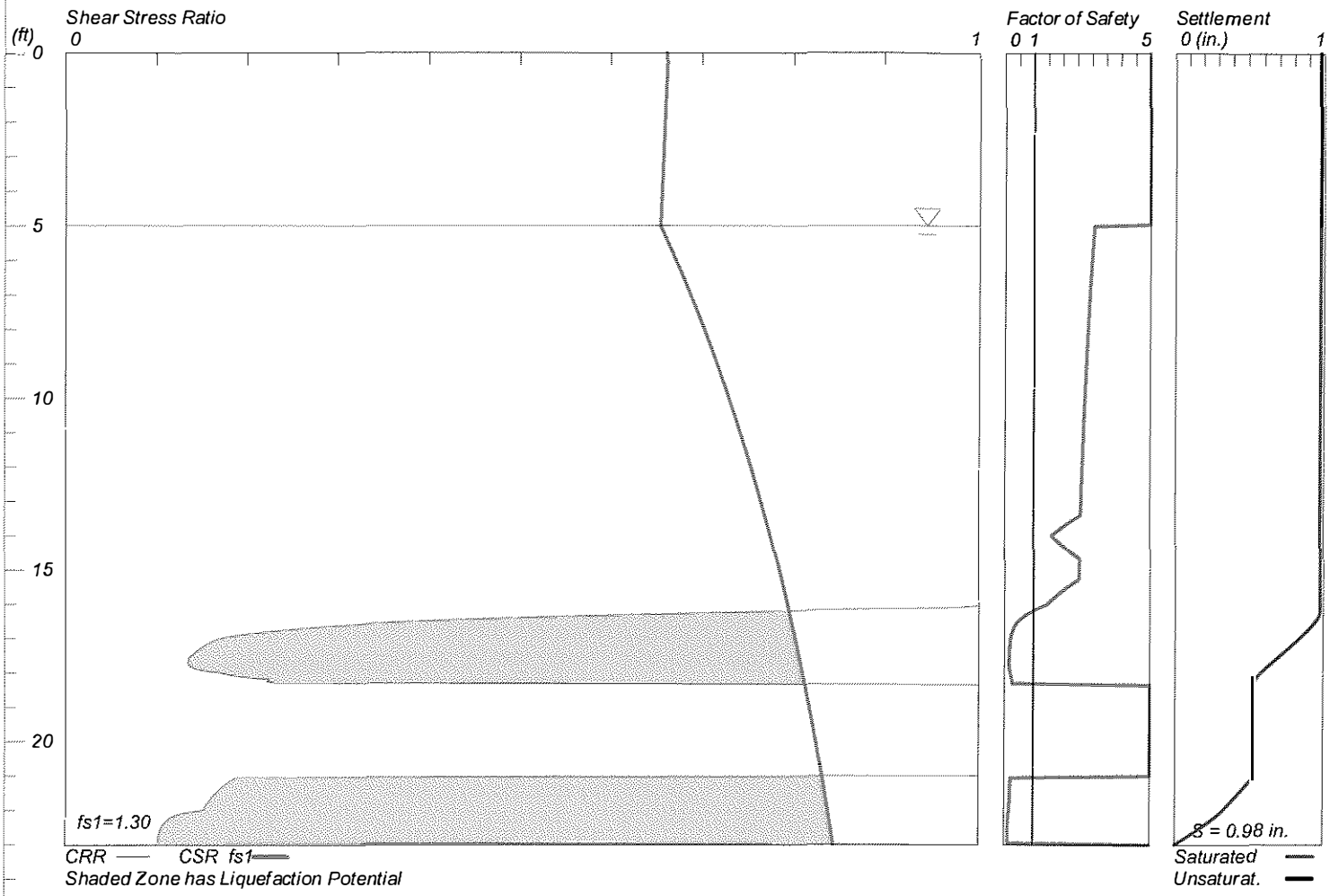
Emerald Ranch

Hole No.=CPT-5 Water Depth=5 ft

Ground Improvement of Fill=12 ft

Magnitude=7.61

Acceleration=0.783g



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LIQUEFACTION ANALYSIS

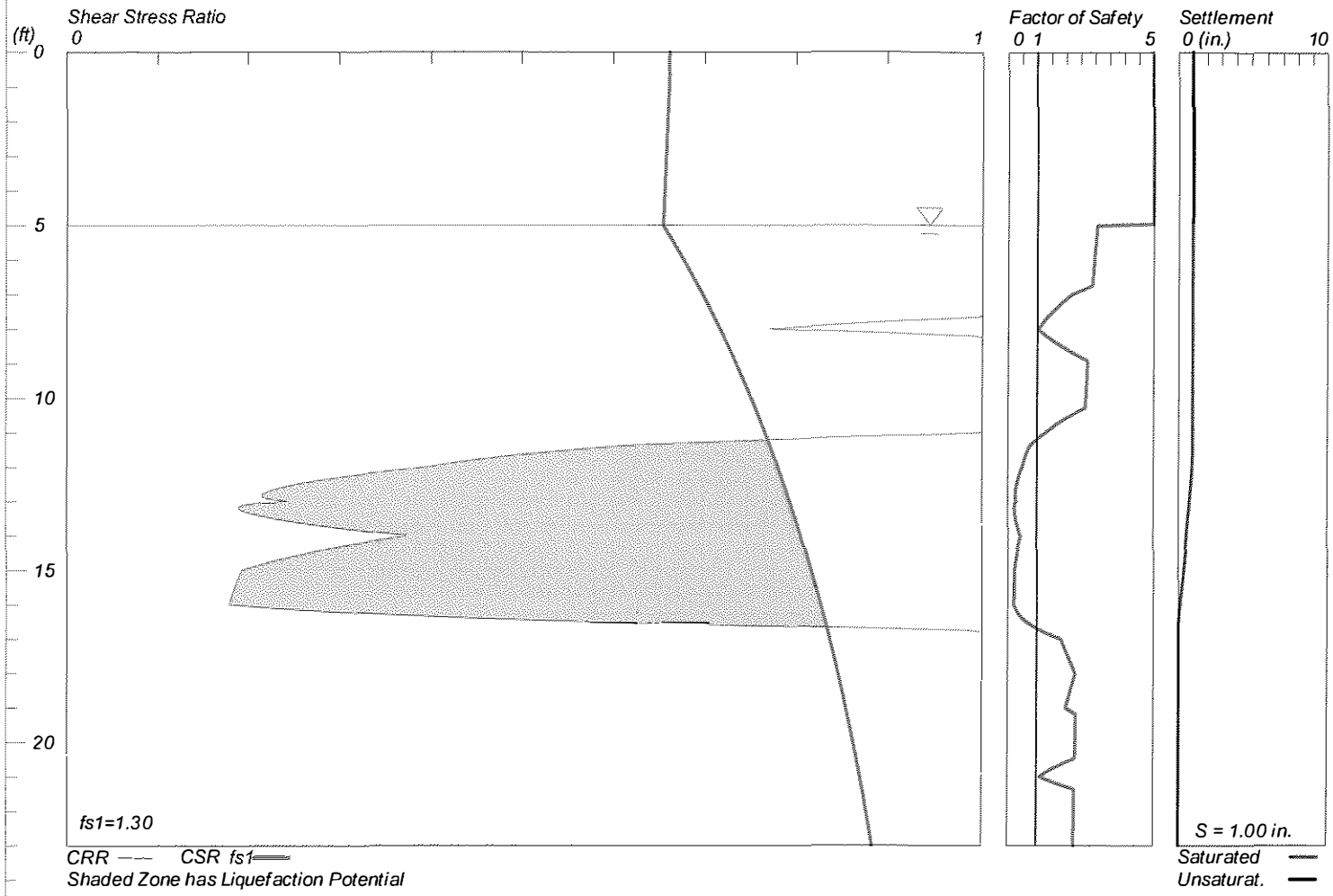
Emerald Ranch

Hole No.=CPT-6 Water Depth=5 ft Surface Elev.=49

Ground Improvement of Fill=8 ft

Magnitude=7.61

Acceleration=0.783g



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LIQUEFACTION ANALYSIS

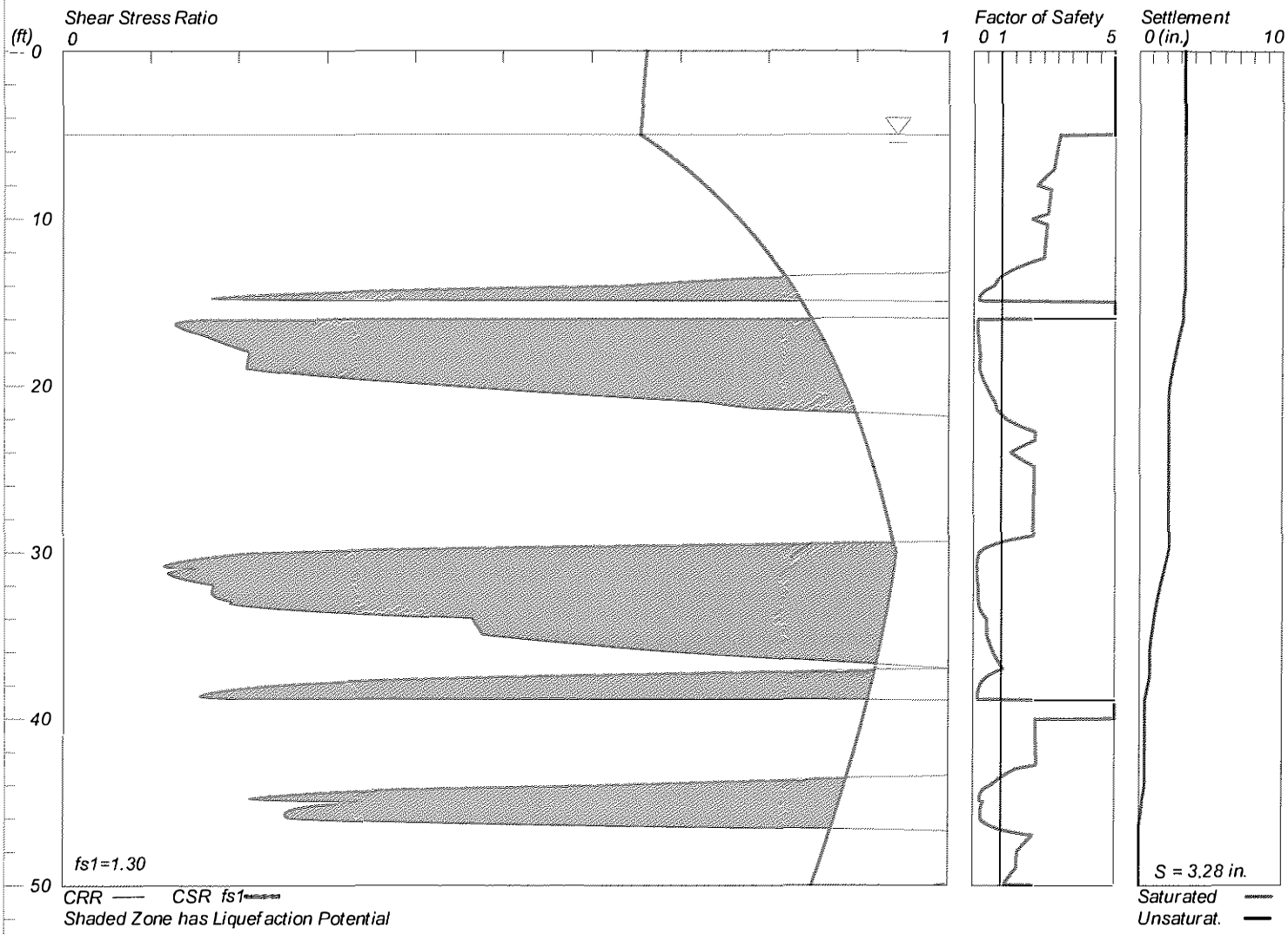
Emerald Ranch

Hole No.=CPT-7 Water Depth=5 ft

Ground Improvement of Fill=6 ft

Magnitude=7.61

Acceleration=0.783g



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LIQUEFACTION ANALYSIS

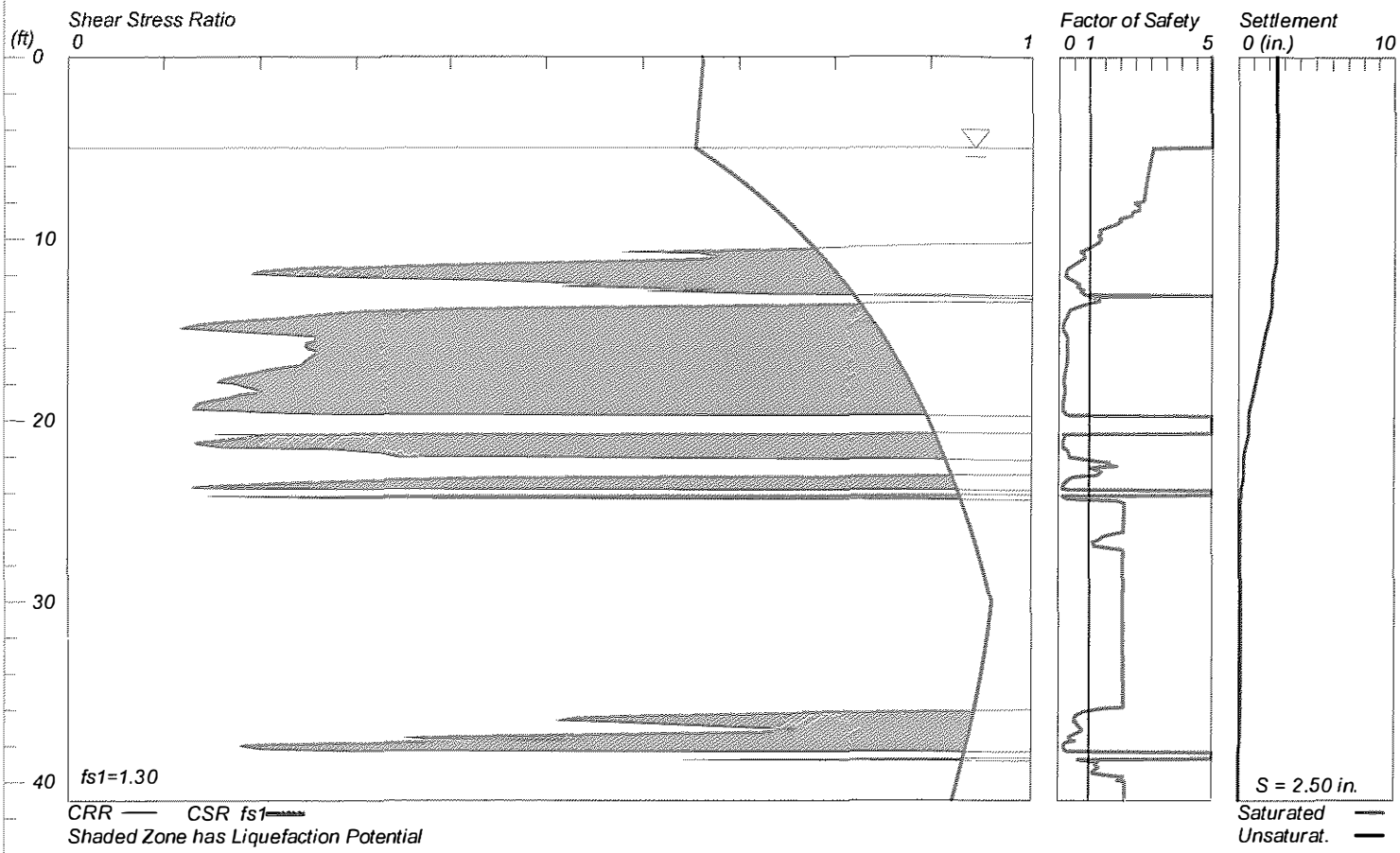
Rubidox Residential

Hole No.=CPT-1 Converse Water Depth=5 ft

Ground Improvement of Fill=6 ft

Magnitude=7.61

Acceleration=0.783g



50

60

70

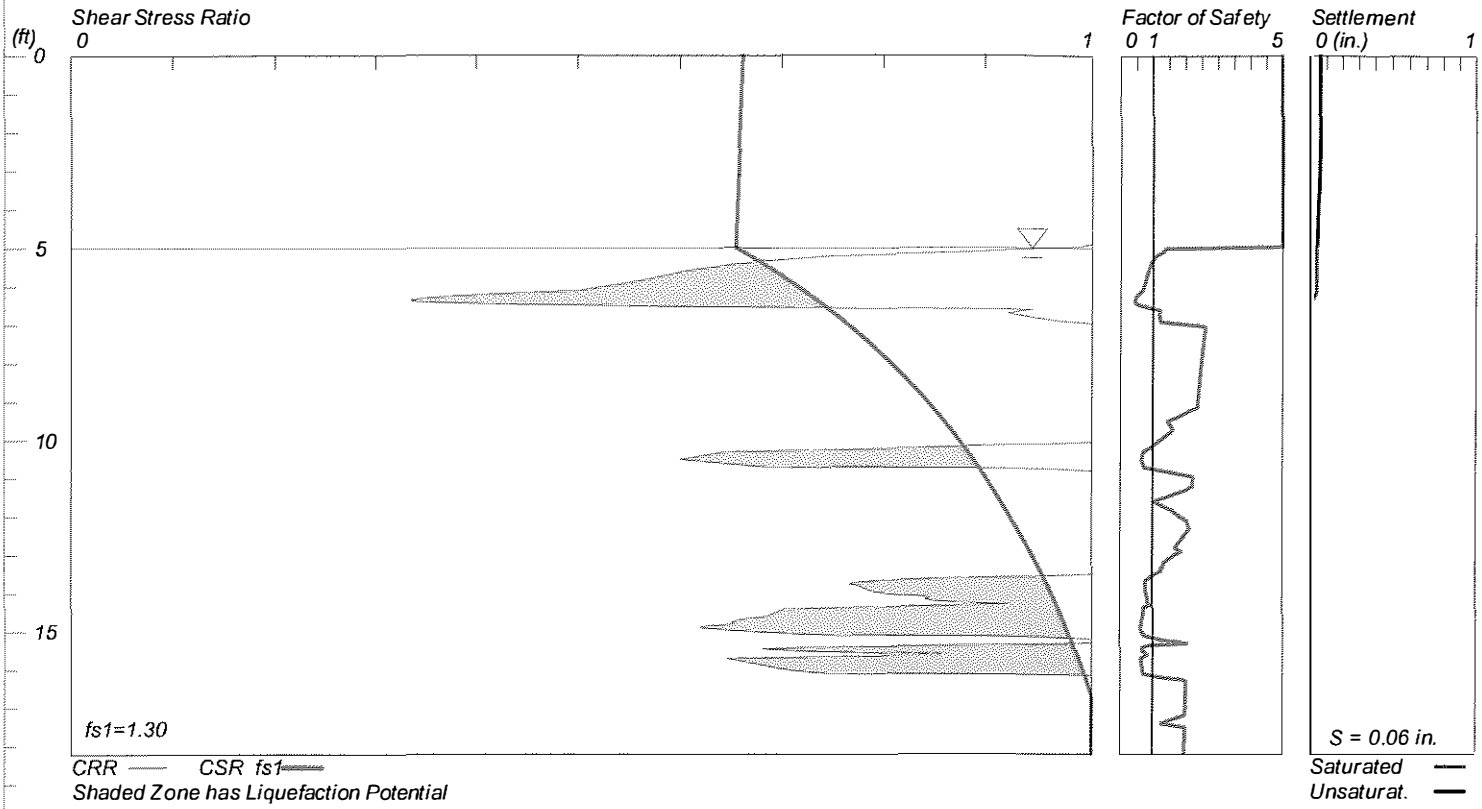
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LIQUEFACTION ANALYSIS

Rubidox Residential

Hole No.=CPT-2 Converse Water Depth=5 ft

Magnitude=7.61
Acceleration=0.783g



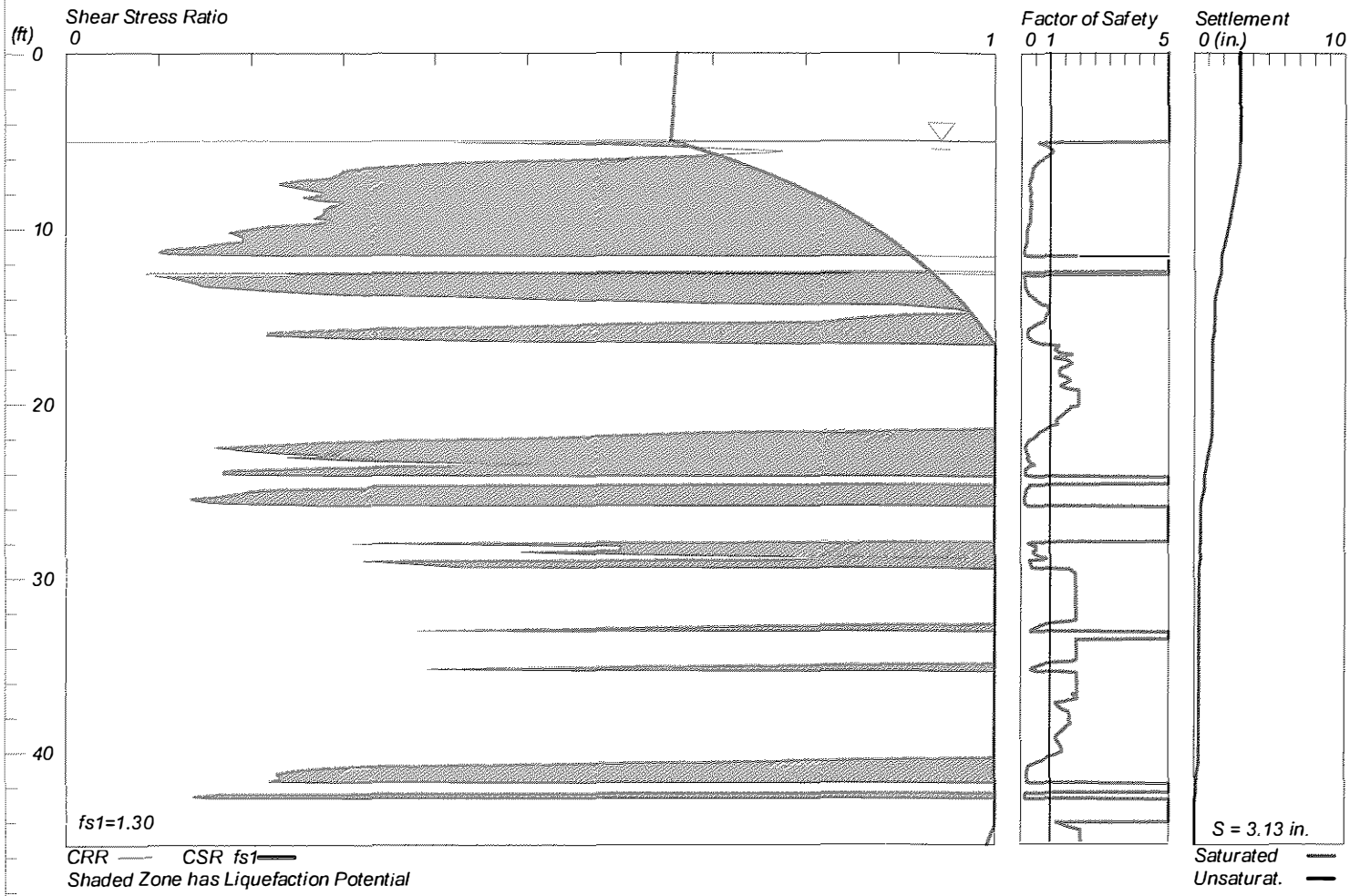
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LIQUEFACTION ANALYSIS

Rubidox Residential

Hole No.=CPT-3 Converse Water Depth=5 ft

Magnitude=7.61
Acceleration=0.783g



50
60
70

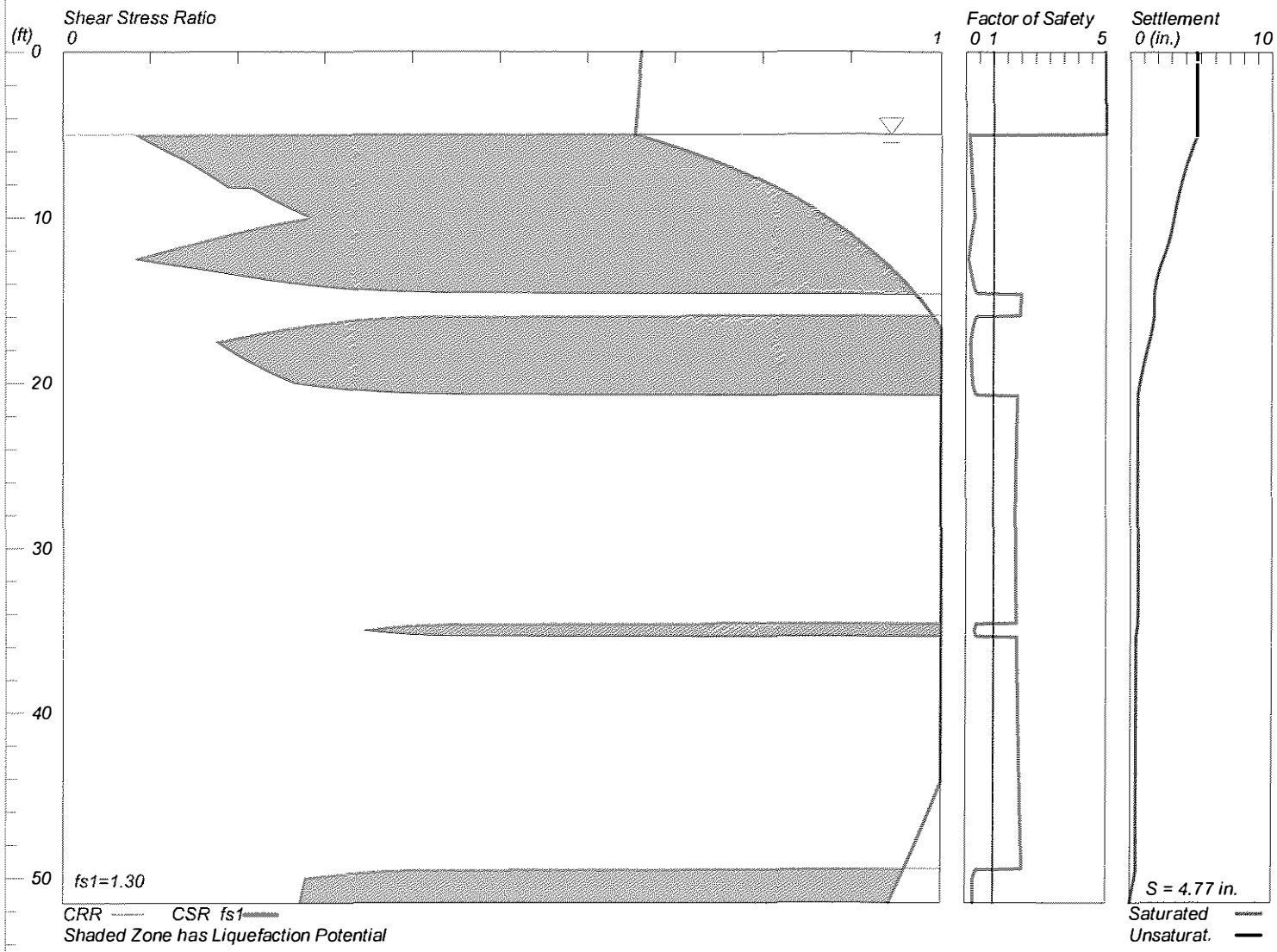
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LIQUEFACTION ANALYSIS

Rubidox Residential

Hole No.=ZB-1 Water Depth=5 ft

Magnitude=7.61
Acceleration=0.783g



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LIQUEFACTION ANALYSIS

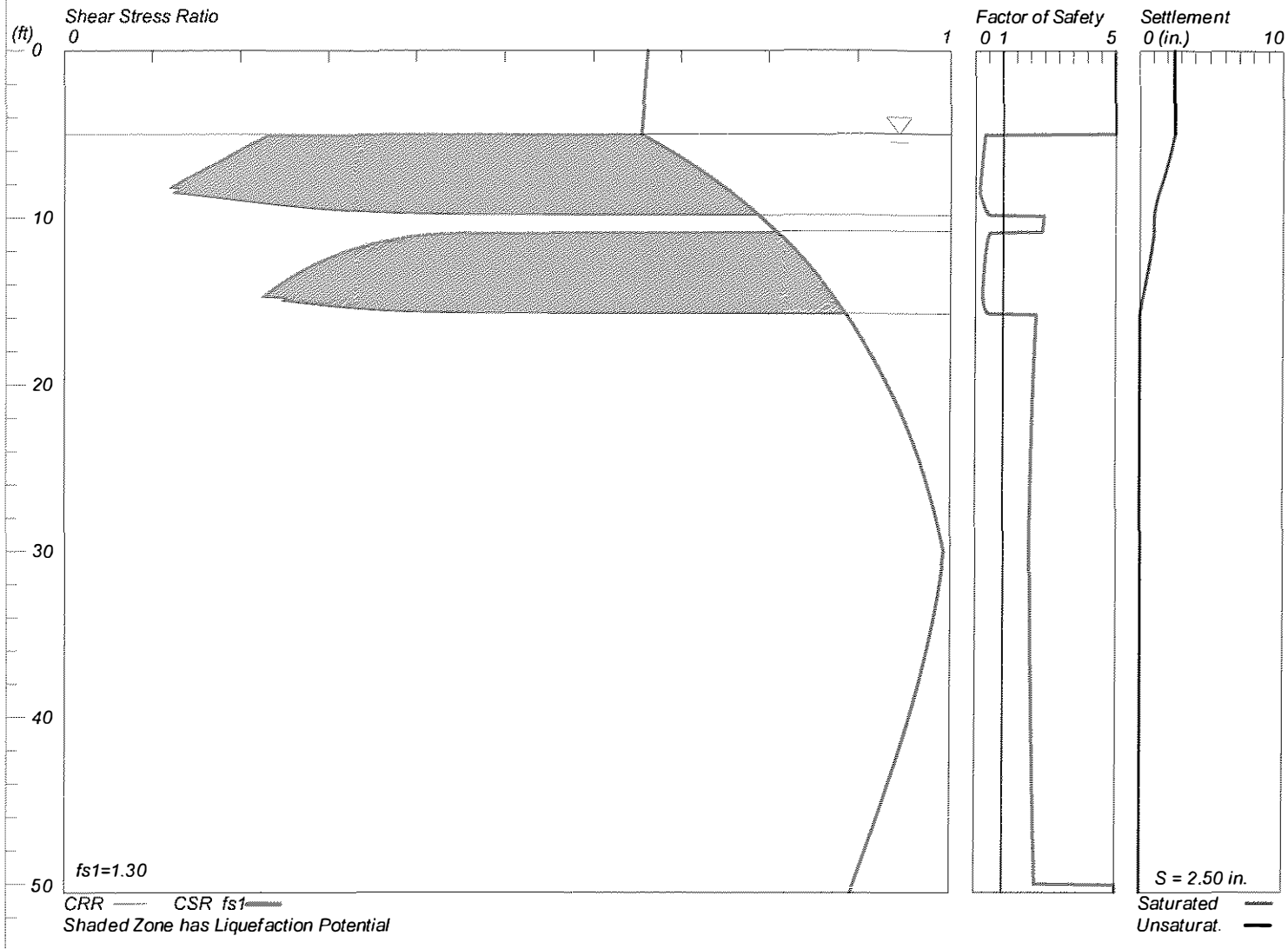
Rubidox Residential

Hole No.=ZB-2 Water Depth=5 ft

Ground Improvement of Fill=4 ft

Magnitude=7.61

Acceleration=0.783g



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LIQUEFACTION ANALYSIS

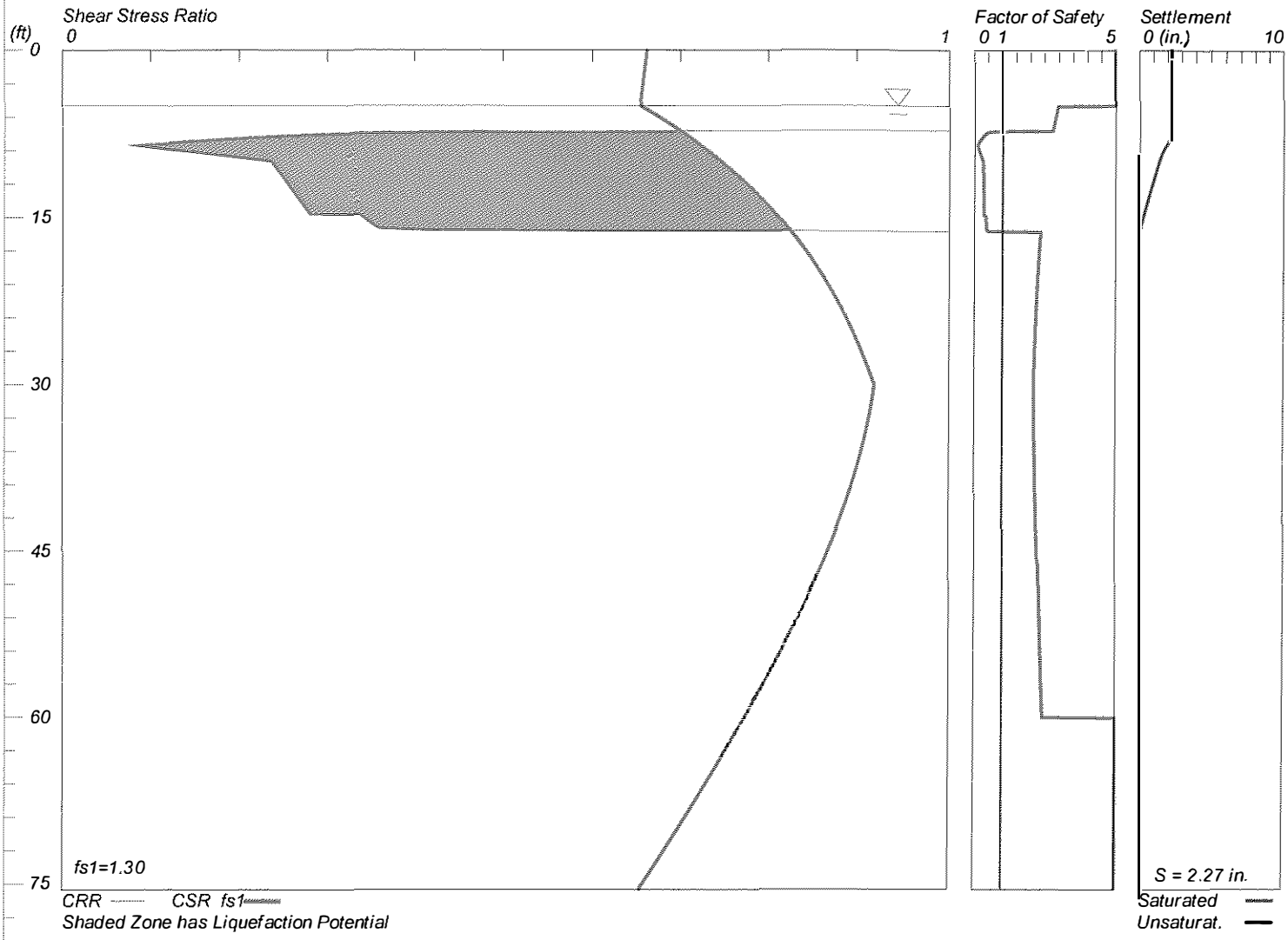
Rubidox Residential

Hole No.=ZB-3 Water Depth=5 ft

Ground Improvement of Fill=9 ft

Magnitude=7.61

Acceleration=0.783g



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LIQUEFACTION ANALYSIS

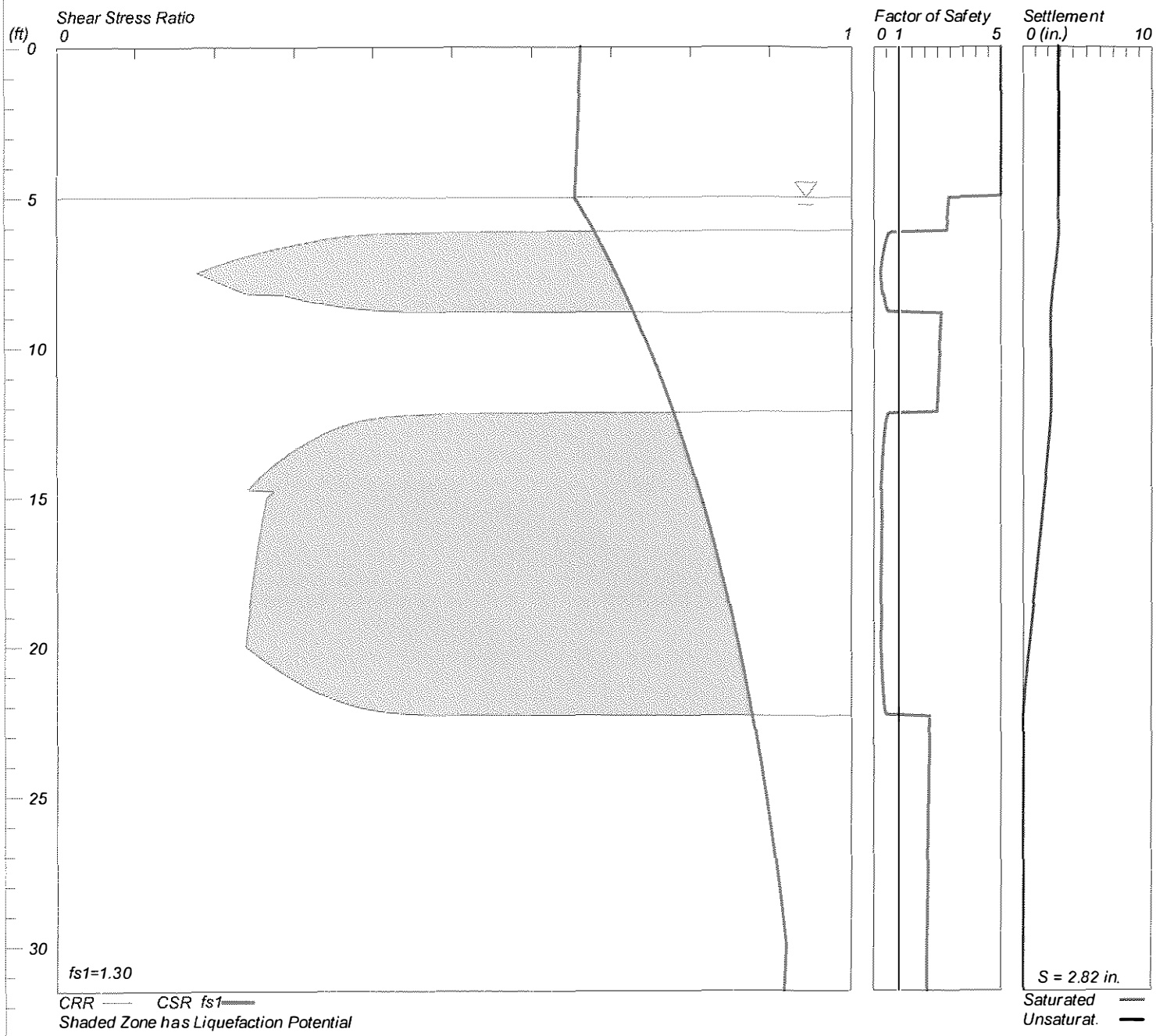
Rubidox Residential

Hole No.=ZB-4 Water Depth=5 ft

Ground Improvement of Fill=9 ft

Magnitude=7.61

Acceleration=0.783g



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LIQUEFACTION ANALYSIS

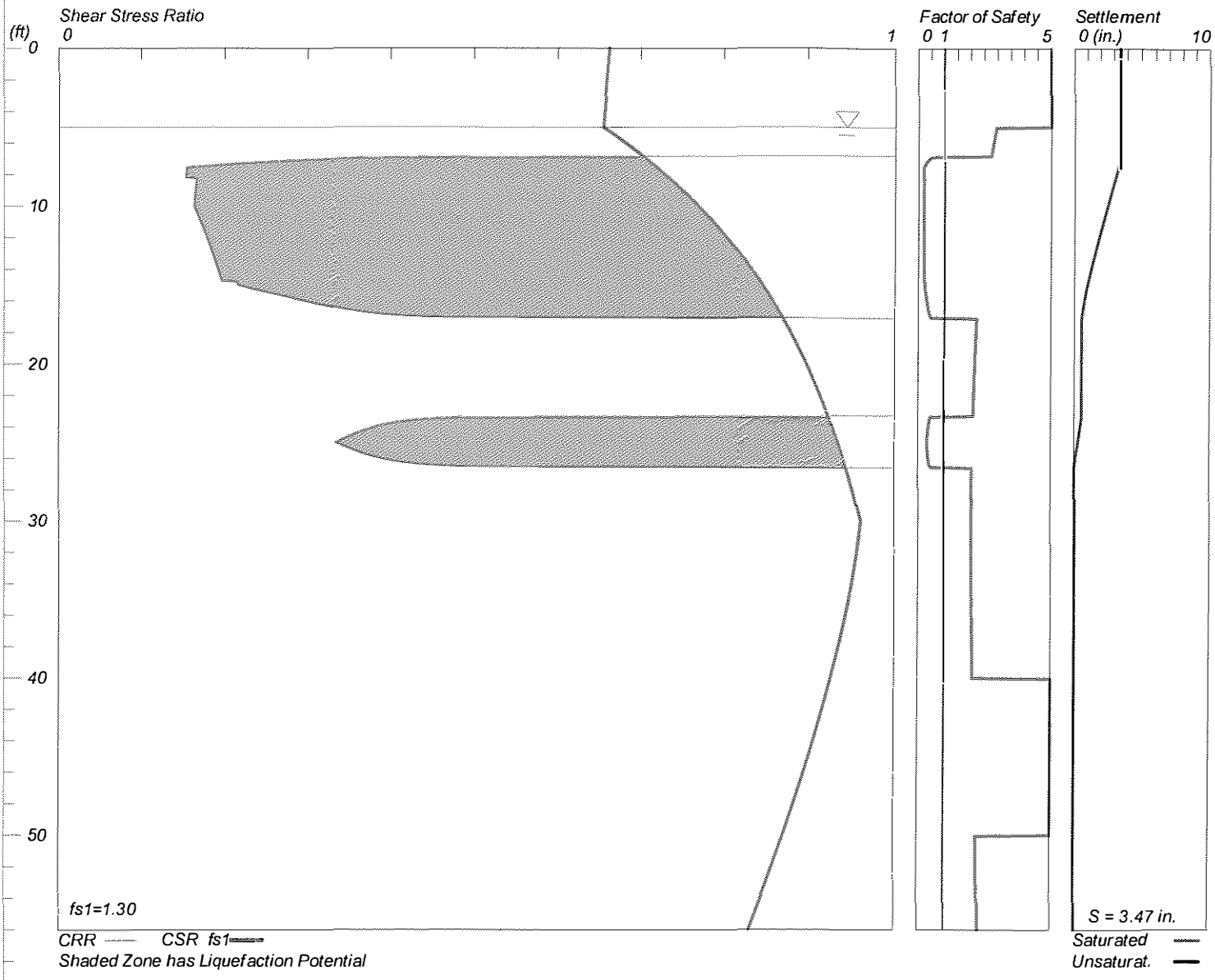
Rubidox Residential

Hole No.=ZB-5 Water Depth=5 ft

Ground Improvement of Fill=6 ft

Magnitude=7.61

Acceleration=0.783g



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LIQUEFACTION ANALYSIS

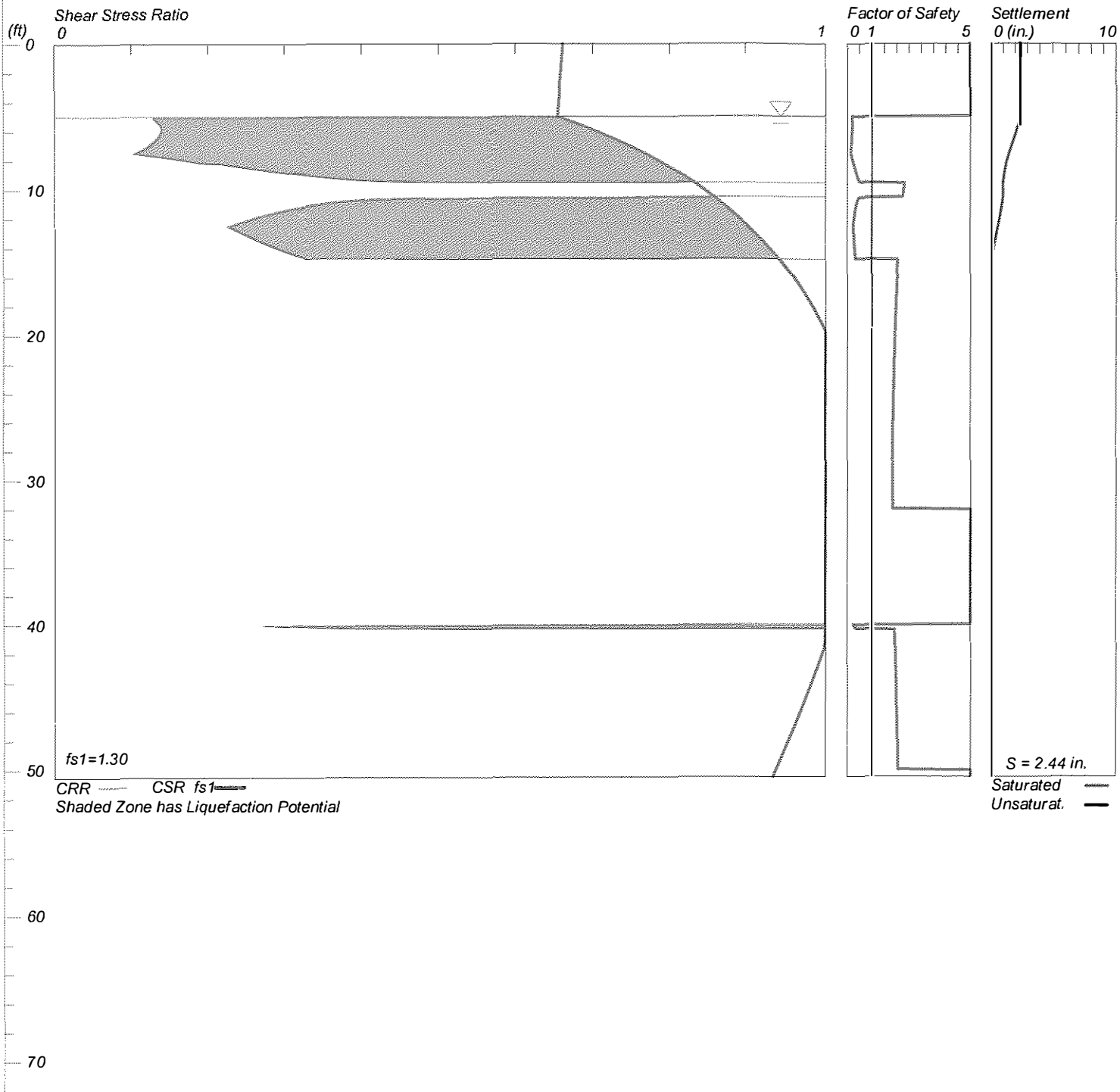
Rubidox Residential

Hole No.=ZB-6 Water Depth=5 ft

Ground Improvement of Fill=1 ft

Magnitude=7.61

Acceleration=0.783g



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LIQUEFACTION ANALYSIS

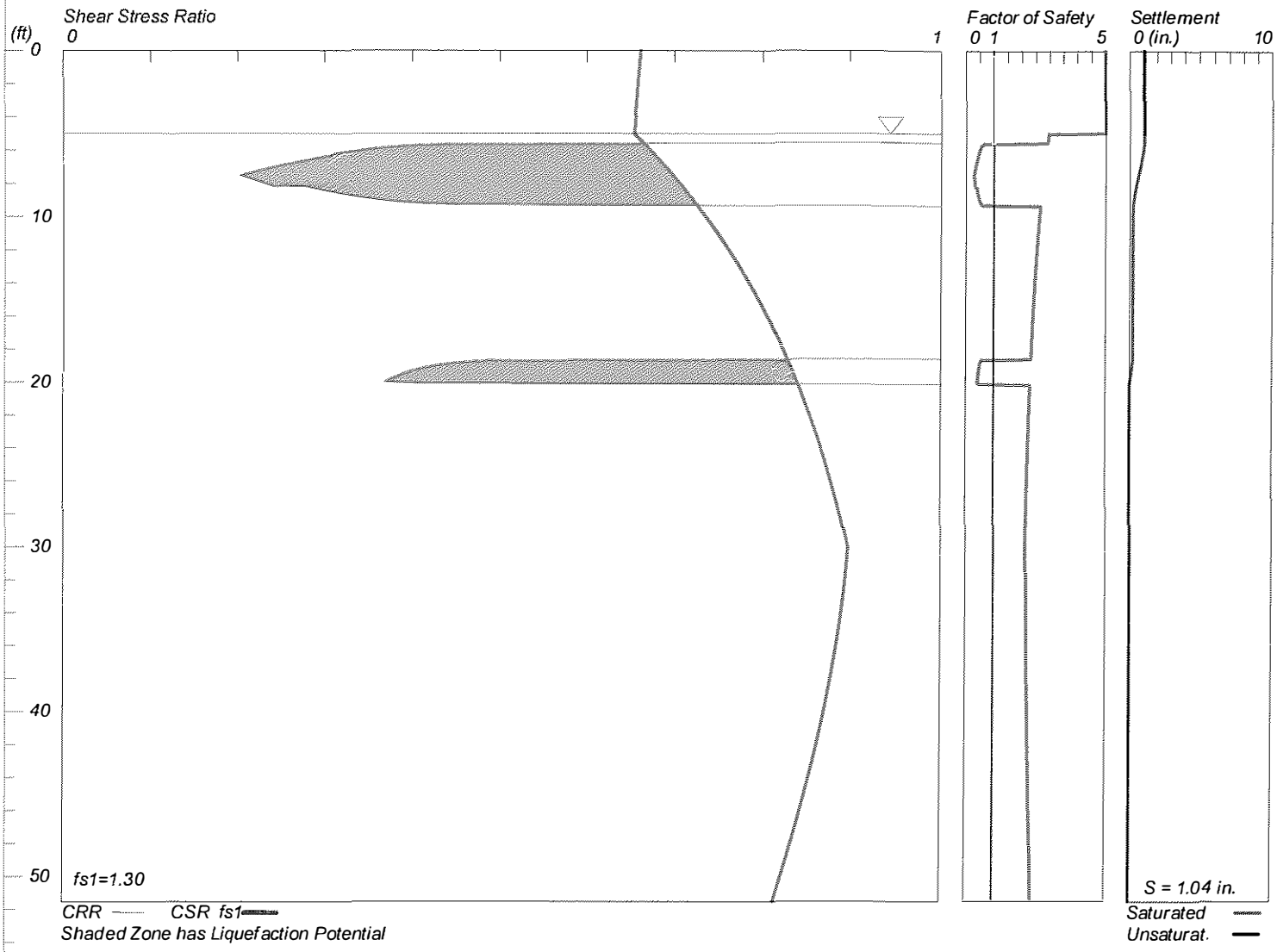
Rubidox Residential

Hole No.=ZB-7 Water Depth=5 ft

Ground Improvement of Fill=11 ft

Magnitude=7.61

Acceleration=0.783g



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LIQUEFACTION ANALYSIS

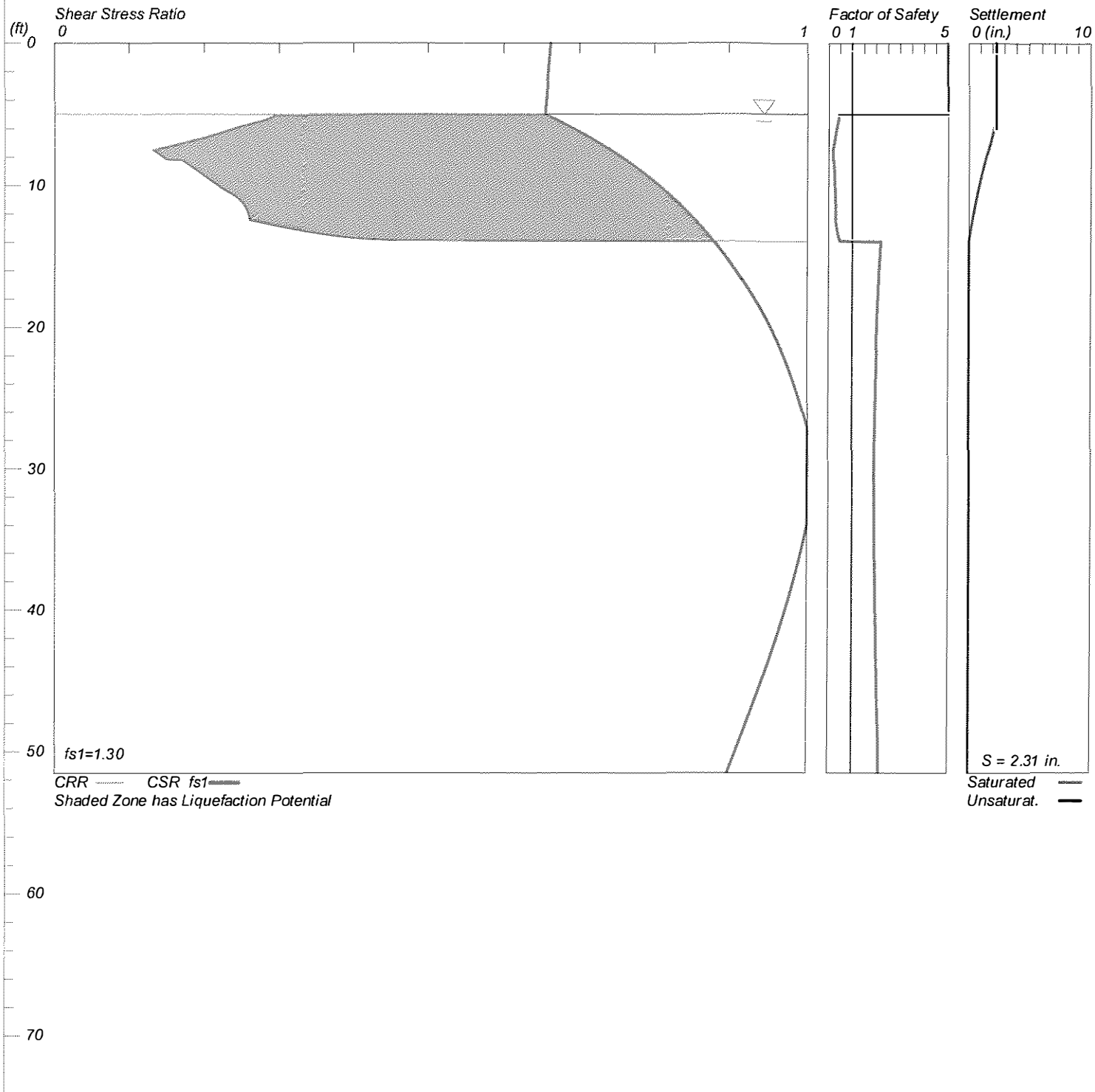
Rubidox Residential

Hole No.=ZB-8 Water Depth=5 ft

Ground Improvement of Fill=3 ft

Magnitude=7.61

Acceleration=0.783g



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LIQUEFACTION ANALYSIS

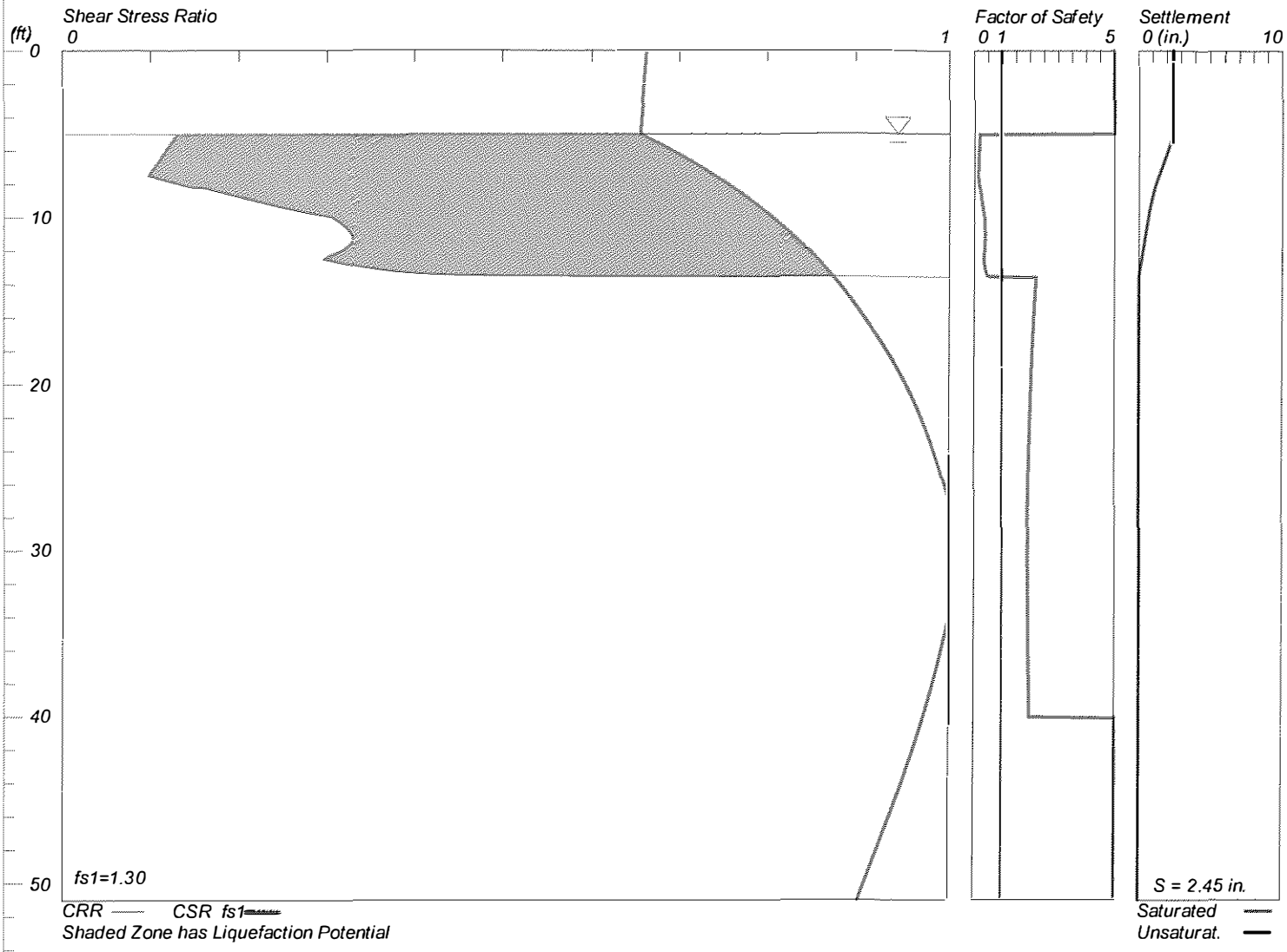
Rubidox Residential

Hole No.=ZB-9 Water Depth=5 ft

Ground Improvement of Fill=3 ft

Magnitude=7.61

Acceleration=0.783g



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LIQUEFACTION ANALYSIS

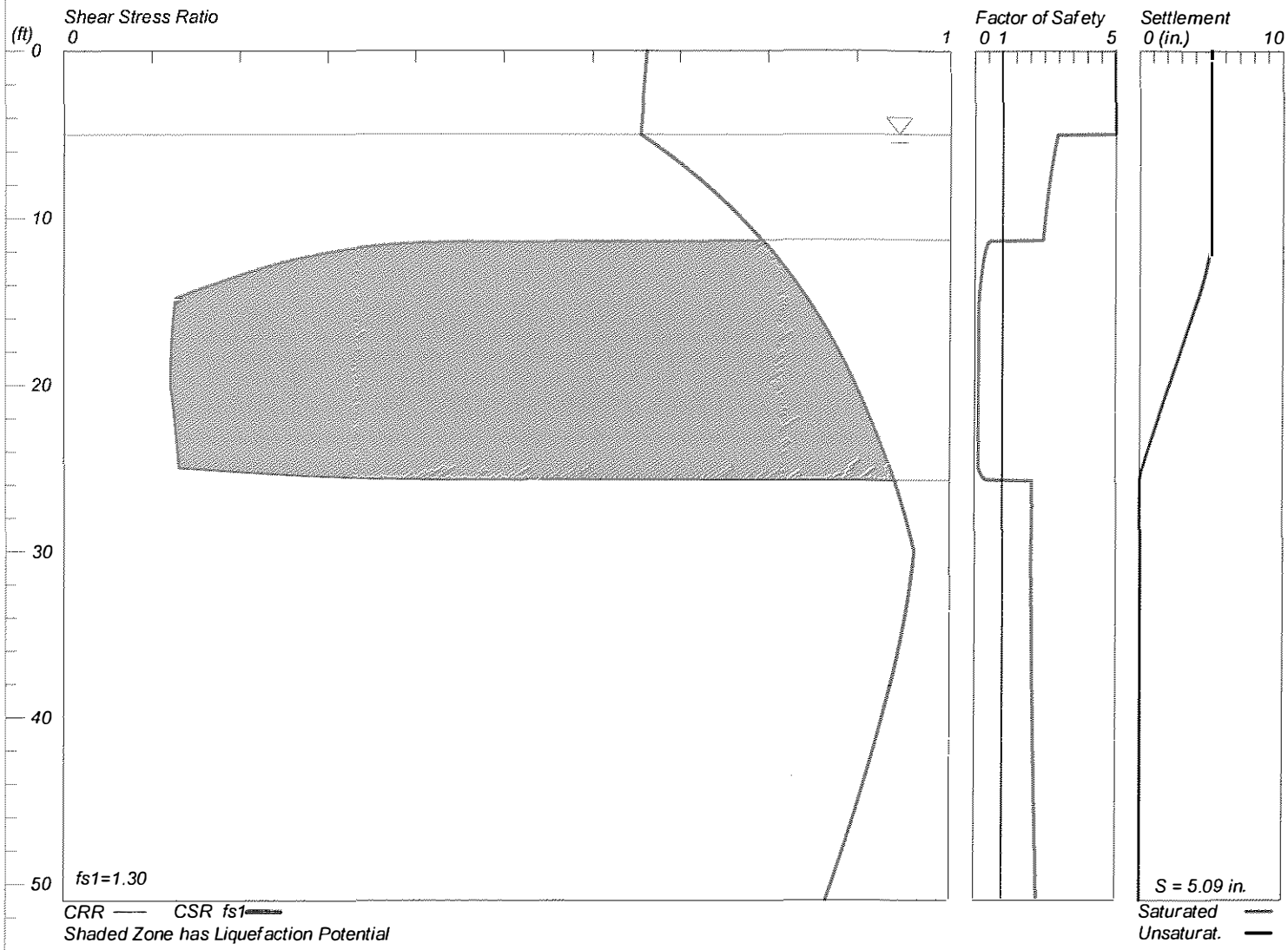
Rubidox Residential

Hole No.=BH-3 Water Depth=5 ft

Ground Improvement of Fill=6 ft

Magnitude=7.61

Acceleration=0.783g



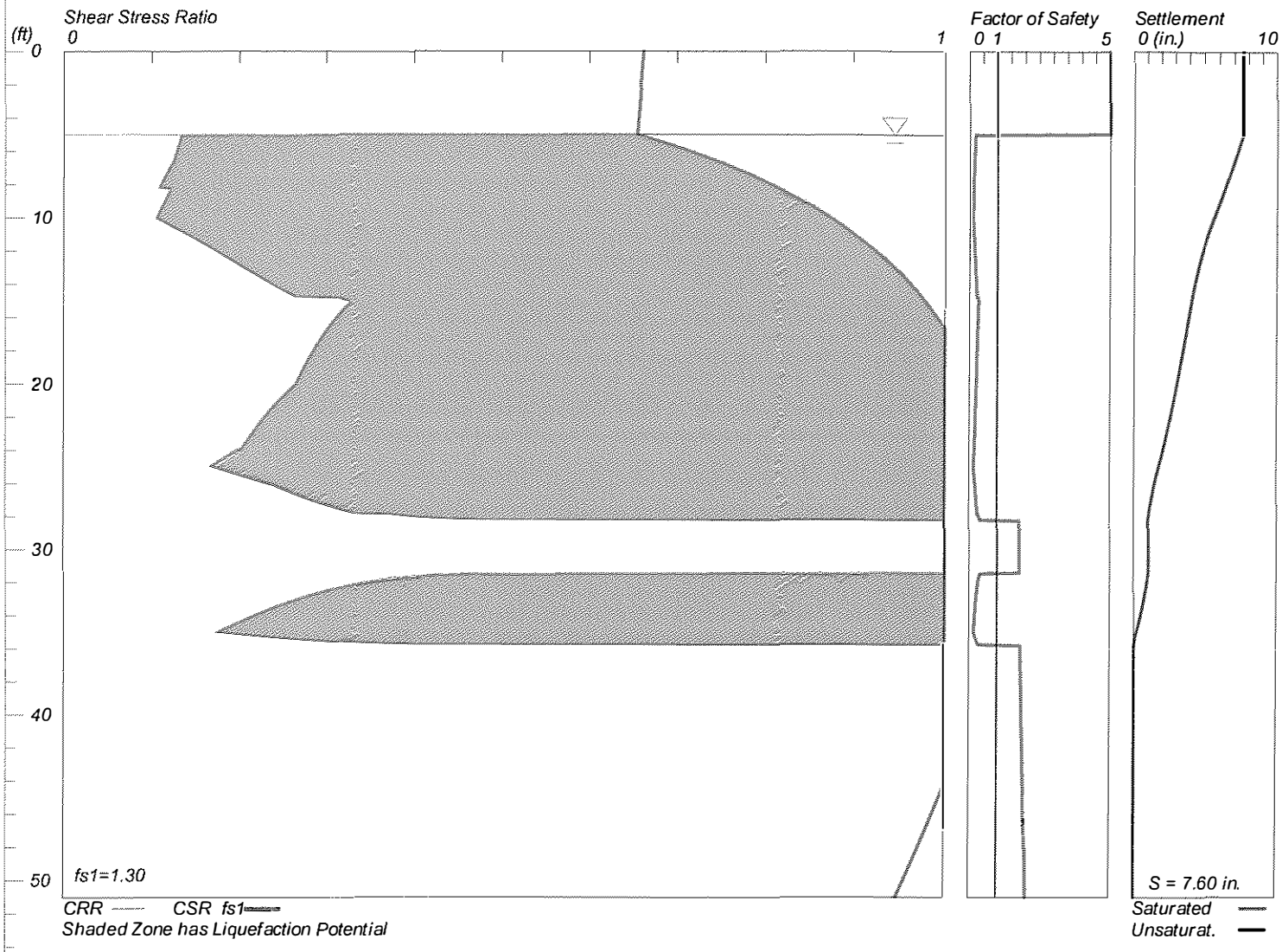
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LIQUEFACTION ANALYSIS

Rubidox Residential

Hole No.=BH-8 Water Depth=5 ft

Magnitude=7.61
Acceleration=0.783g



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LIQUEFACTION ANALYSIS

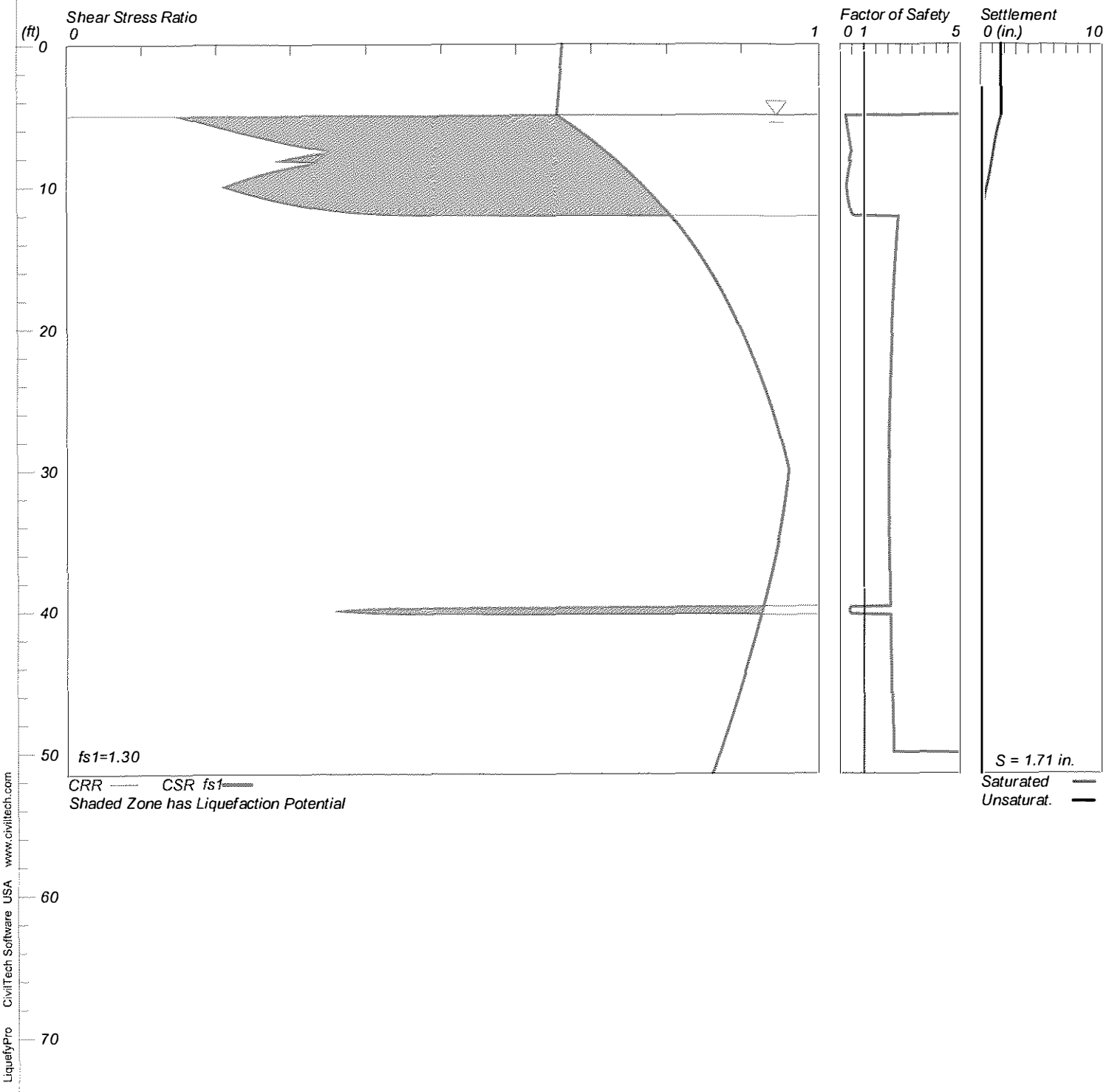
Rubidox Residential

Hole No.=B-1 Water Depth=5 ft

Ground Improvement of Fill=6 ft

Magnitude=7.61

Acceleration=0.783g



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APPENDIX E

Earthwork Specifications

ALTA CALIFORNIA GEOTECHNICAL, INC.
EARTHWORK SPECIFICATIONS

These specifications present the generally accepted standards and minimum earthwork requirements for the development of the project. These specifications shall be the project guidelines for earthwork except where specifically superceded in preliminary geology and soils reports, grading plan review reports or by the prevailing grading codes or ordinances of the controlling agency.

A. GENERAL

1. The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications.

2. The project Geotechnical Engineer and Engineering Geologist, or their representatives, shall provide observation and testing services, and Geotechnical consultation for the duration of the project.

3. All clearing, grubbing, stripping and site preparation for the project shall be accomplished by the Contractor to the satisfaction of the Geotechnical Engineer/Engineering Geologist.

4. It is the Contractor's responsibility to prepare the ground surface to receive fill to the satisfaction of the Geotechnical Engineer and to place, spread, mix, moisture condition, and compact the fill in accordance with the job specifications and as required by the Geotechnical Engineer. The Contractor shall also remove all material considered by the Geotechnical Engineer to be unsuitable for use in the construction of engineered fills.

5. The Contractor shall have suitable and sufficient equipment in operation to handle the amount of fill being placed. When necessary, equipment will be shut down temporarily in order to permit the proper preparation of fills.

B. PREPARATION OF FILL AREAS

1. Excessive vegetation and all deleterious material should be disposed of offsite as required by the Geotechnical Engineer.

   Existing fill, soil, alluvium or rock materials determined by the Geotechnical Engineer as being unsuitable for placement in compacted fills shall be removed and hauled from the site. Where applicable, the Contractor may obtain the approval of the Soils Engineer and the controlling authorities for the project to

dispose of the above described materials, or a portion thereof, in designated areas onsite.

After removal of the deleterious materials have been accomplished, earth materials deemed unsuitable in their natural, in-place condition, shall be removed as recommended by the Geotechnical Engineer/Engineering Geologist.

2. Upon achieving a suitable bottom for fill placement, the exposed removal bottom shall be disced or bladed by the Contractor to the satisfaction of the Geotechnical Engineer. The prepared ground surfaces shall then be brought to the specified moisture content mixed as required, and compacted and tested as specified. In localities where it is necessary to obtain the approval of the controlling agency prior to placing fill, it will be the Contractor's responsibility to contact the proper authorities to visit the site.

3. Any underground structure such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines or other structures not located prior to grading are to be removed or treated in a manner prescribed by the Geotechnical Engineer and/or the controlling agency for the project.

C. **ENGINEERED FILLS**

1. Any material imported or excavated on the property may be utilized as fill, provided the material has been determined to be suitable by the Geotechnical Engineer. Deleterious materials shall be removed from the fill as directed by the Geotechnical Engineer.

2. Rock or rock fragments less than twelve inches in the largest dimension may be utilized in the fill, provided they are not placed in concentrated pockets and the distribution of the rocks is approved by the Geotechnical Engineer.

3. Rocks greater than twelve inches in the largest dimension shall be taken offsite, or placed in accordance with the recommendations of the Geotechnical Engineer in areas designated as suitable for rock disposal.

4. All materials to be used as fill, shall be tested in the laboratory by the Geotechnical Engineer. Proposed import materials shall be approved by the Geotechnical Engineer 48 hours prior to importation.

5. The fill materials shall be placed by the Contractor in lifts, that when compacted, shall not exceed six inches. Each lift shall be spread evenly and shall be

thoroughly mixed to achieve a near uniform moisture condition and a uniform blend of materials.

All compaction shall be achieved at or above the optimum moisture content, as determined by the applicable laboratory standard. The Contractor will be notified if the fill materials are too wet or too dry to achieve the required compaction standard.

6. When the moisture content of the fill material is below the limit specified by the Geotechnical Engineer, water shall be added and the materials shall be blended until a uniform moisture content, within specified limits, is achieved. When the moisture content of the fill material is above the limits specified by the Geotechnical Engineer, the fill materials shall be aerated by discing, blading, mixed with dryer fill materials, or other satisfactory methods until the moisture content is within the specified limits.

7. Each fill lift shall be compacted to the minimum project standards, in compliance with the testing methods specified by the controlling governmental agency, and in accordance with recommendations of the Geotechnical Engineer.

   In the absence of specific recommendations by the Geotechnical Engineer to the contrary, the compaction standard shall be the most recent version of ASTM:D 1557.

8. Where a slope receiving fill exceeds a ratio of five-horizontal to one-vertical, the fill shall be keyed and benched through all unsuitable materials into sound bedrock or firm material, in accordance with the recommendations and approval of the Geotechnical Engineer.

9. Side hill fills shall have a minimum key width of 15 feet into bedrock or firm materials, unless otherwise specified in the soil report and approved by the Geotechnical Engineer in the field.

10. Drainage terraces and subdrainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency and/or with the recommendations of the Geotechnical Engineer and Engineering Geologist.

11. The Contractor shall be required to maintain the specified minimum relative compaction out to the finish slope face of fill slopes, buttresses, and stabilization fills as directed by the Geotechnical Engineer and/or the governing agency for the project. This may be achieved by either overbuilding the slope and cutting

back to the compacted core; by direct compaction of the slope face with suitable equipment; or by any other procedure which produces the required result.

12. The fill portion of fill-over-cut slopes shall be properly keyed into rock or firm material; and the fill area shall be stripped of all soil or unsuitable materials prior to placing fill.

    The design cut portion of the slope should be made first and evaluated for suitability by the Engineering Geologist prior to placement of fill in the keyway above the cut slope.

13. Pad areas in cut or natural ground shall be approved by the Geotechnical Engineer. Finished surfaces of these pads may require scarification and recompaction, or over excavation as determined by the Geotechnical Engineer.

D. CUT SLOPES

1. The Engineering Geologist shall observe all cut slopes and shall be notified by the Contractor when cut slopes are to be started.

2. If, during the course of grading, unforeseen adverse or potentially adverse geologic conditions are encountered, the Engineering Geologist and Soil Engineer shall investigate, analyze and make recommendations to remediate these problems.

3. Non-erodible interceptor swales shall be placed at the top of cut slopes that face the same direction as the superjacent, prevailing drainage.

4. Unless otherwise specified in specific geotechnical reports, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.

5. Drainage terraces shall be constructed in compliance with the ordinances of the controlling governmental agencies, and/or in accordance with the recommendations of the Geotechnical Engineer or Engineering Geologist.

E. GRADING CONTROL

1. Fill placement shall be observed and tested by the Geotechnical Engineer and/or his representative during grading.

   Field density tests shall be made by the Geotechnical Engineer and/or his representative to evaluate the compaction and moisture compliance of each fill lift. Density tests shall be conducted at intervals not to exceed two feet of fill

height. Where sheepsfoot rollers are used, the fill may be disturbed to a depth of several inches. Density determinations shall be taken in the compacted material below the disturbed surface at a depth determined by the Geotechnical Engineer or his representative.

2. Where tests indicate that the density of any layer of fill, or portion thereof, is below the required relative compaction, or improper moisture content is in evidence, that particular layer or portion thereof shall be reworked until the required density and/or moisture content has been attained. Additional fills shall not be placed over an area until the previous lift of fill has been tested and found to meet the density and moisture requirements for the project and the previous lift is approved by the Geotechnical Engineer.

3. When grading activities are interrupted by heavy rains, fill operations shall not be resumed until field observations and tests by the Geotechnical Engineer indicate the moisture content and density of the fill are within the specified limits.

4. During construction, the Contractor shall properly grade all surfaces to maintain good drainage and prevent the ponding of water. The Contractor shall take remedial action to control surface water and to prevent erosion of graded areas until such time as a permanent drainage and erosion devices have been installed.

5. Observation and testing by the Geotechnical Engineer and/or his representative shall be conducted during filling and compacting operations in order that he will be able to state in his opinion that all cut and filled areas are graded in accordance with the approved specifications.

6. Upon the completion of grading activities and after the Geotechnical Engineer and Engineering Geologist have finished their observations of the work, final reports shall be submitted. No further excavation or fill placement shall be undertaken without prior notification of the Geotechnical Engineer and/or Engineering Geologist.

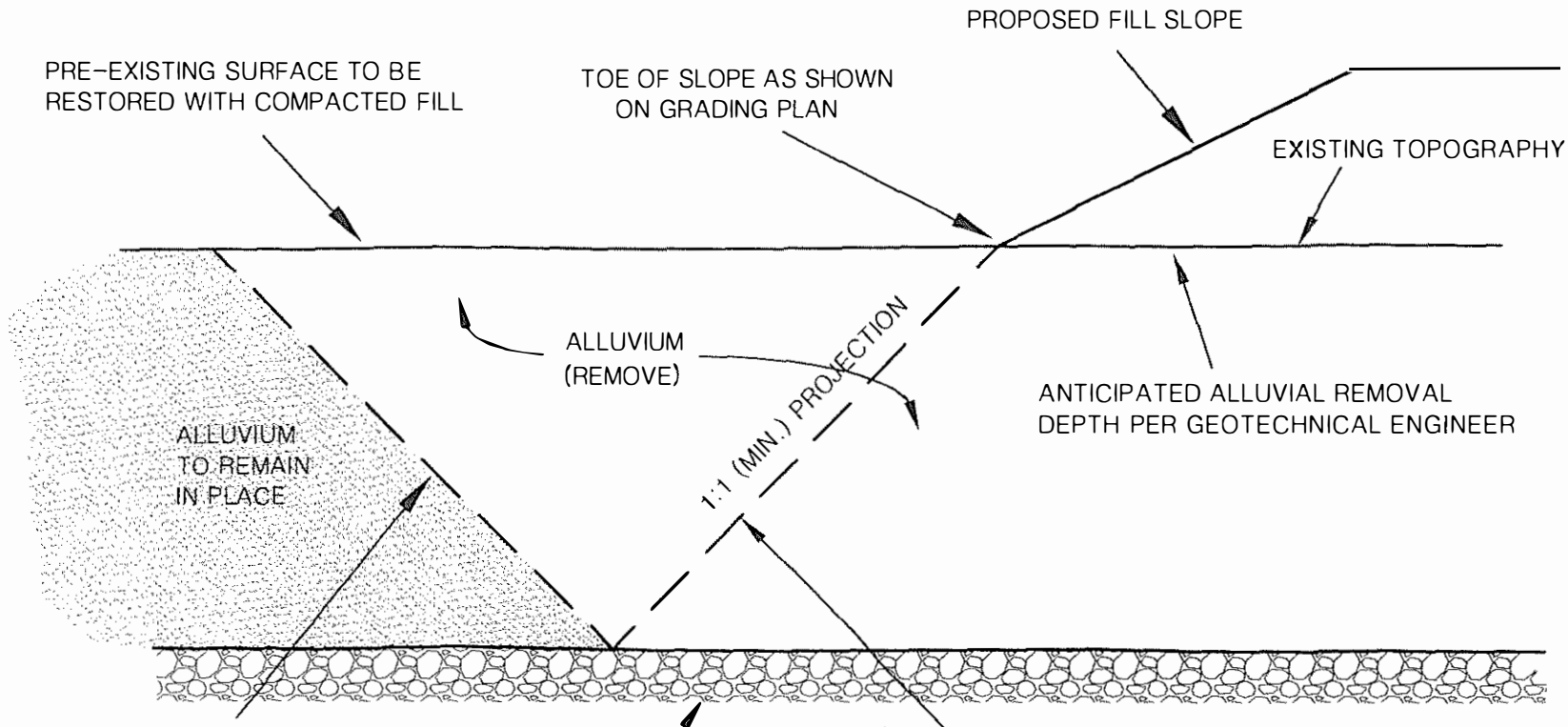
F. FINISHED SLOPES

All finished cut and fill slopes shall be planted and irrigated and/or protected from erosion in accordance with the project specifications, governing agencies, and/or as recommended by a landscape architect.

APPENDIX F

Grading Details

DETAIL FOR FILL SLOPE TOEING OUT ON FLAT ALLUVIATED CANYON

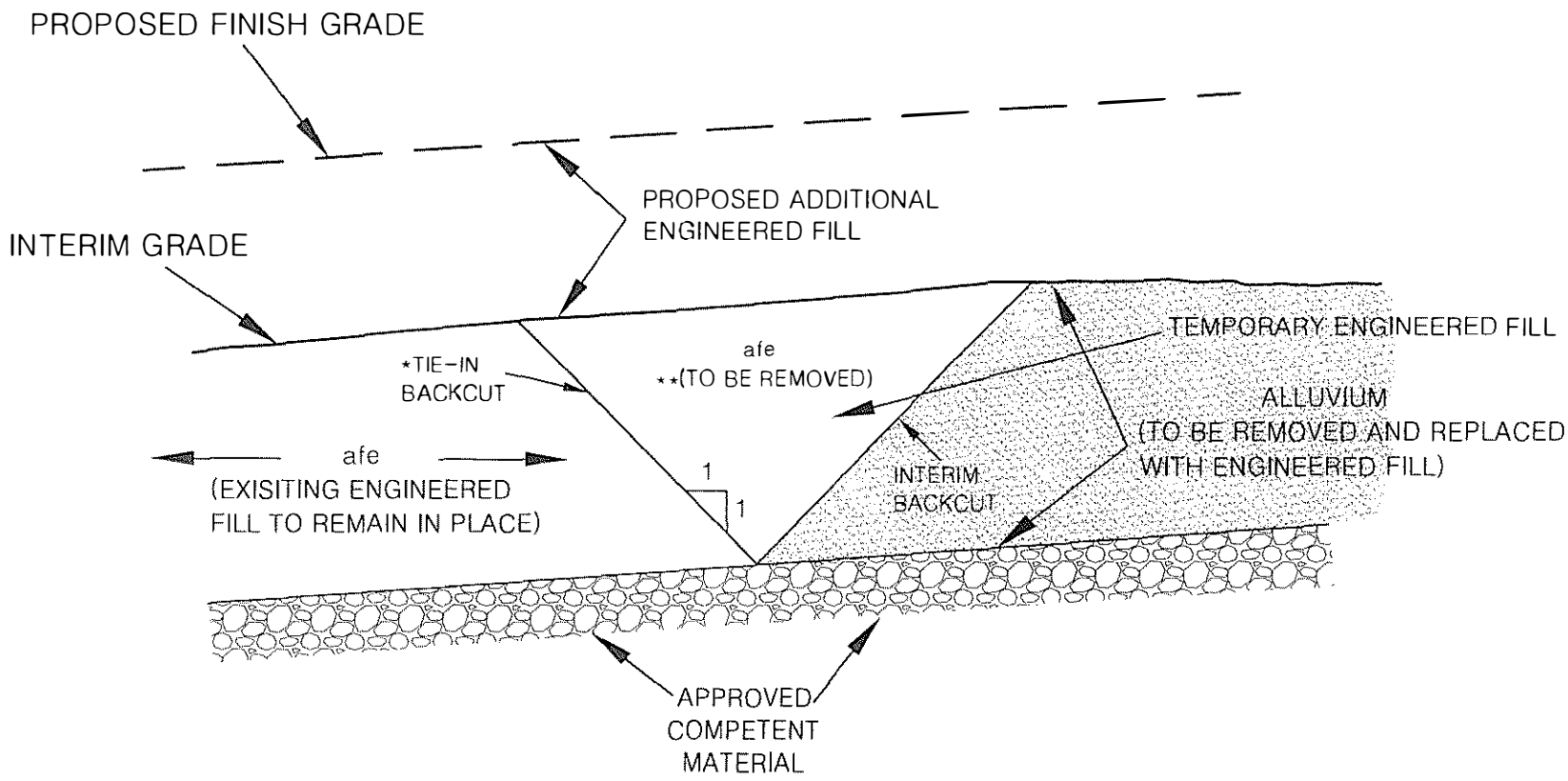


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VER. 3/12

PLATE G-1

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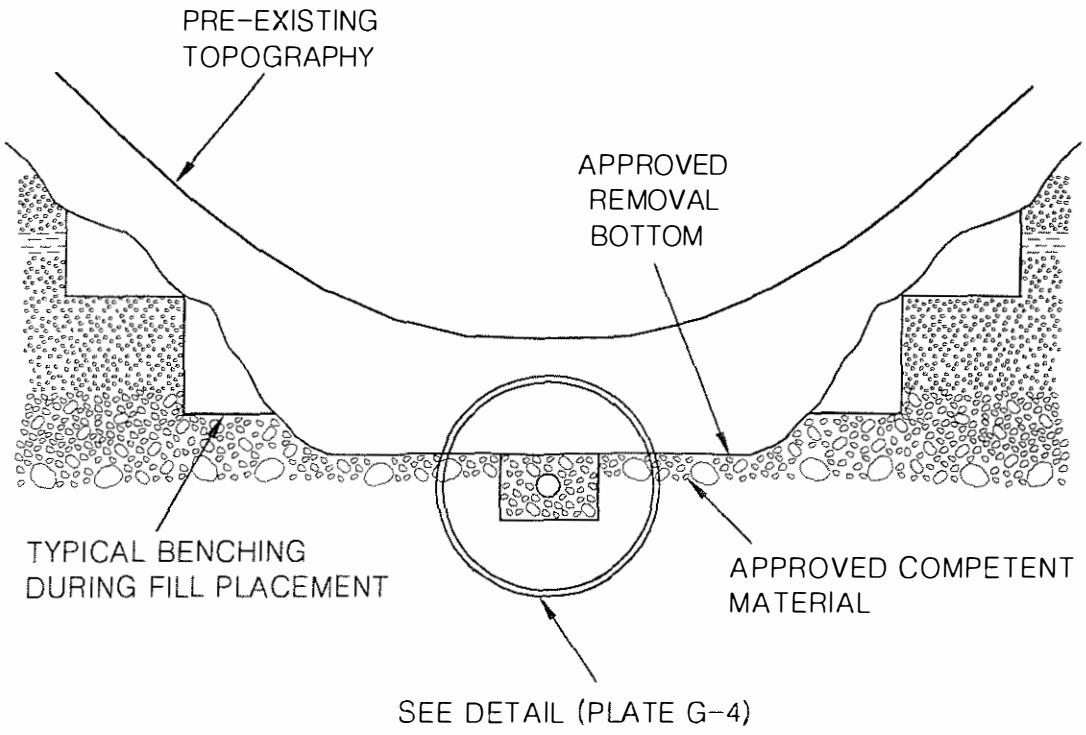
REMOVAL ADJACENT TO EXISTING FILL



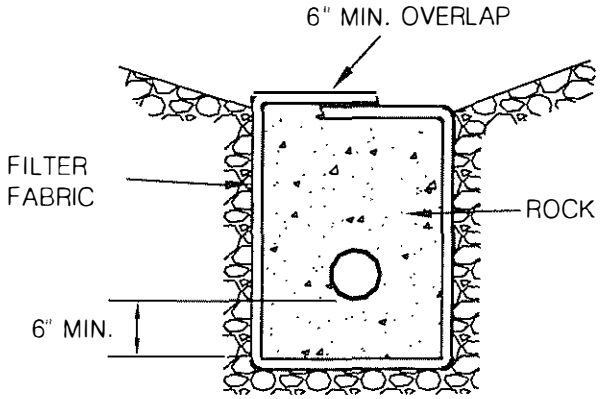
*INITIATE 1:1 TIE-IN BACKCUT TO INTERCEPT TOE OF INTERIM BACKCUT

**AS PART OF TIE-IN FOR ADDITIONAL ENGINEERED FILL

CANYON SUBDRAIN



CANYON SUBDRAIN DETAIL

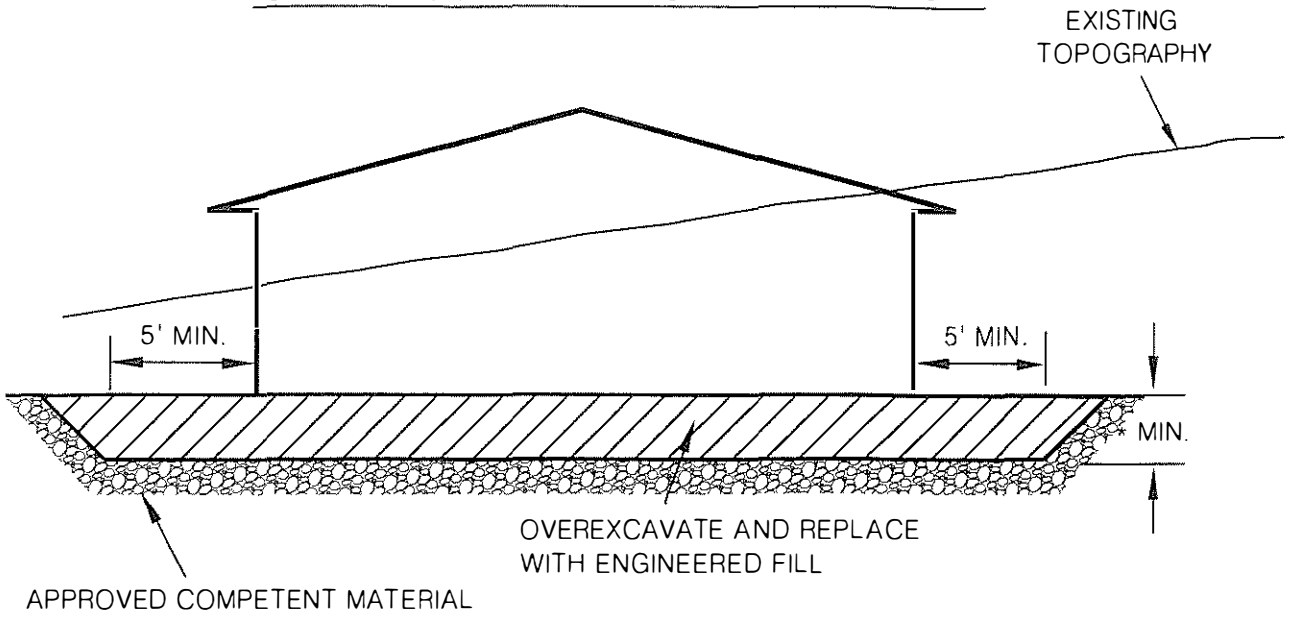


PERFORATED PIPE SURROUNDED WITH ROCK AND FILTER FABRIC

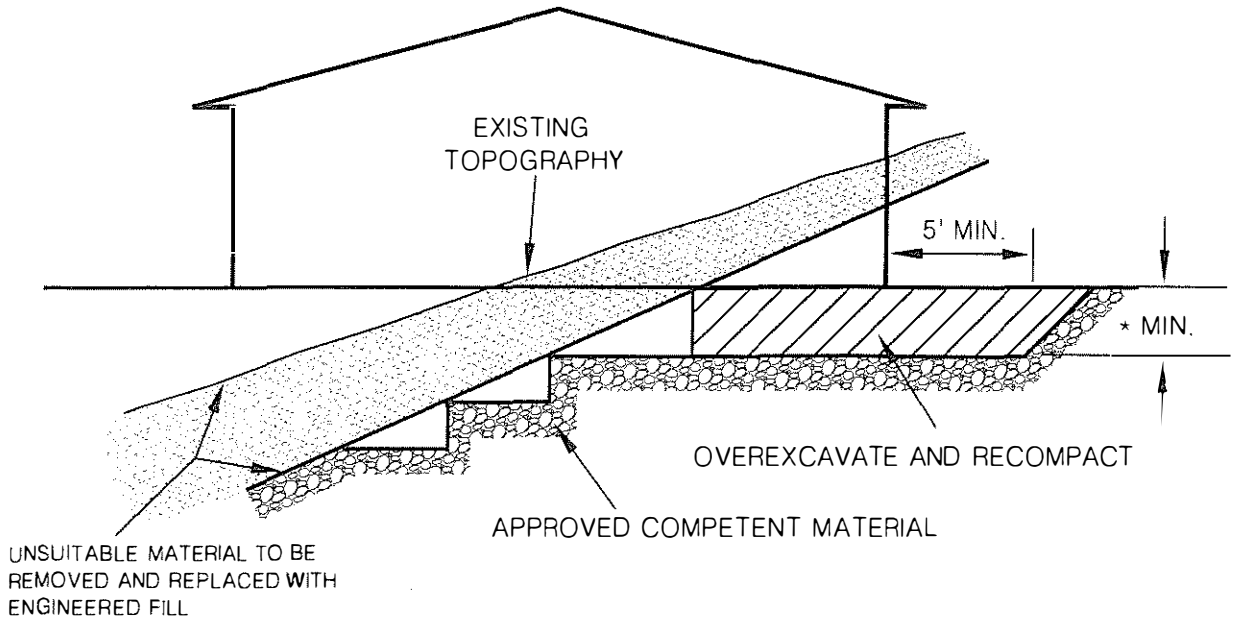
ROCK: MIN. VOLUME OF 9 CU.FT. PER LINEAR FT. OF 3/4 IN. MAX. ROCK
PIPE: 6 IN. ABS OR PVC PIPE WITH A MINIMUM OF 8 PERFORATIONS (1/4-IN. DIA.) PER LINEAL FT. IN BOTTOM HALF OF PIPE ASTM D2751, SDR 35, OR ASTM D3034 OR ASTM D1527, SCHD. 40 ASTM D1785, SCHD. 40
FILTER FABRIC: MiRAFI 140 FILTER FABRIC OR APPROVED EQUIVALENT

NOTE: FOR CONTINUOUS RUN IN EXCESS OF 500. FT USE 8 IN. DIA. PIPE

OVEREXCAVATION CUT LOT



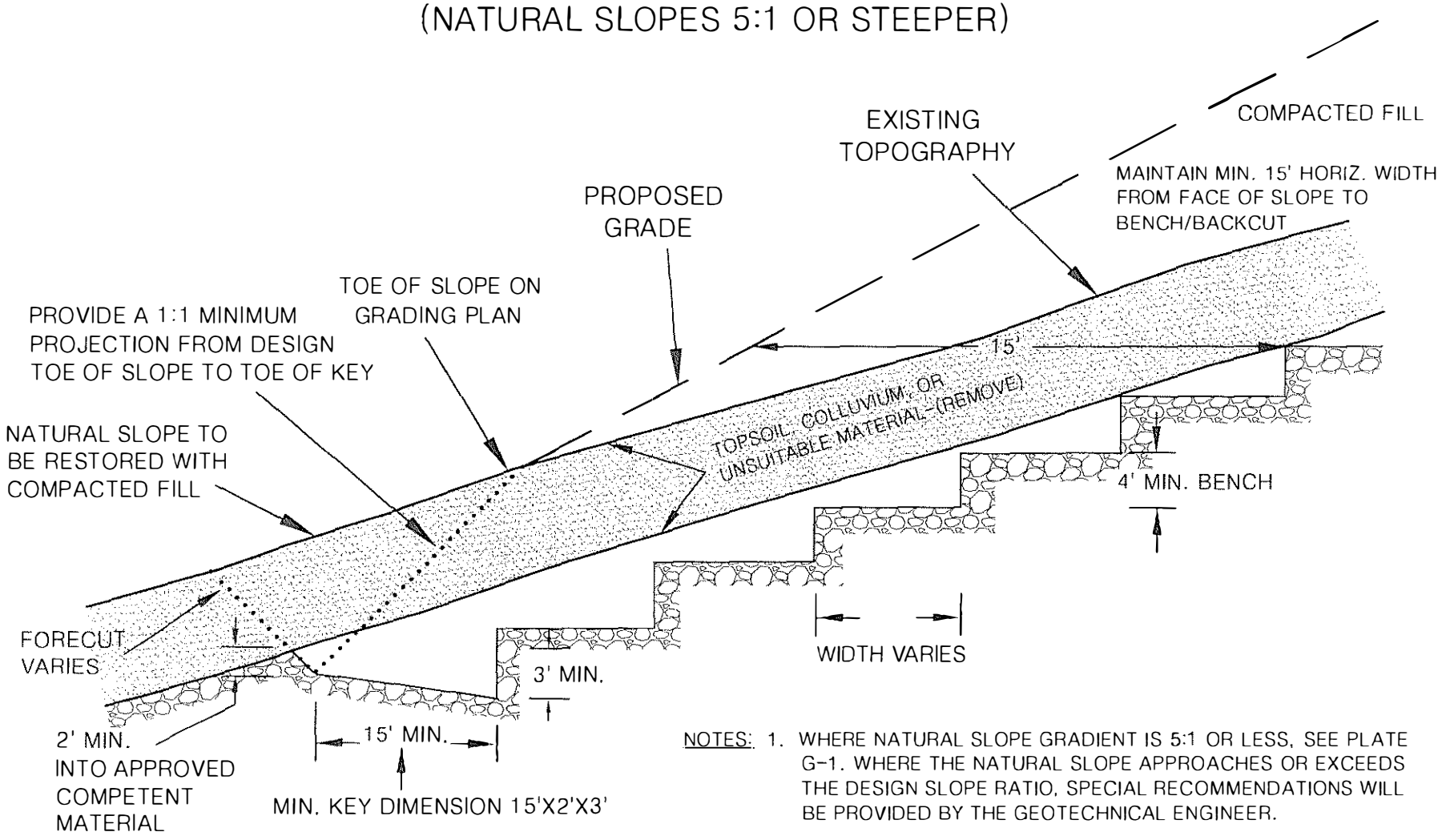
CUT-FILL LOT (TRANSITION)



*NOTE ALL BUILDING PADS SHALL BE OVER EXCAVATED TO A MINIMUM OF 1/3 OF THE MAXIMUM DEPTH OF FILL BELOW THE BUILDING PAD TO A MAXIMUM OF 17 FEET (SEE PLATE G-16)

SIDE HILL SLOPE FILL DETAIL

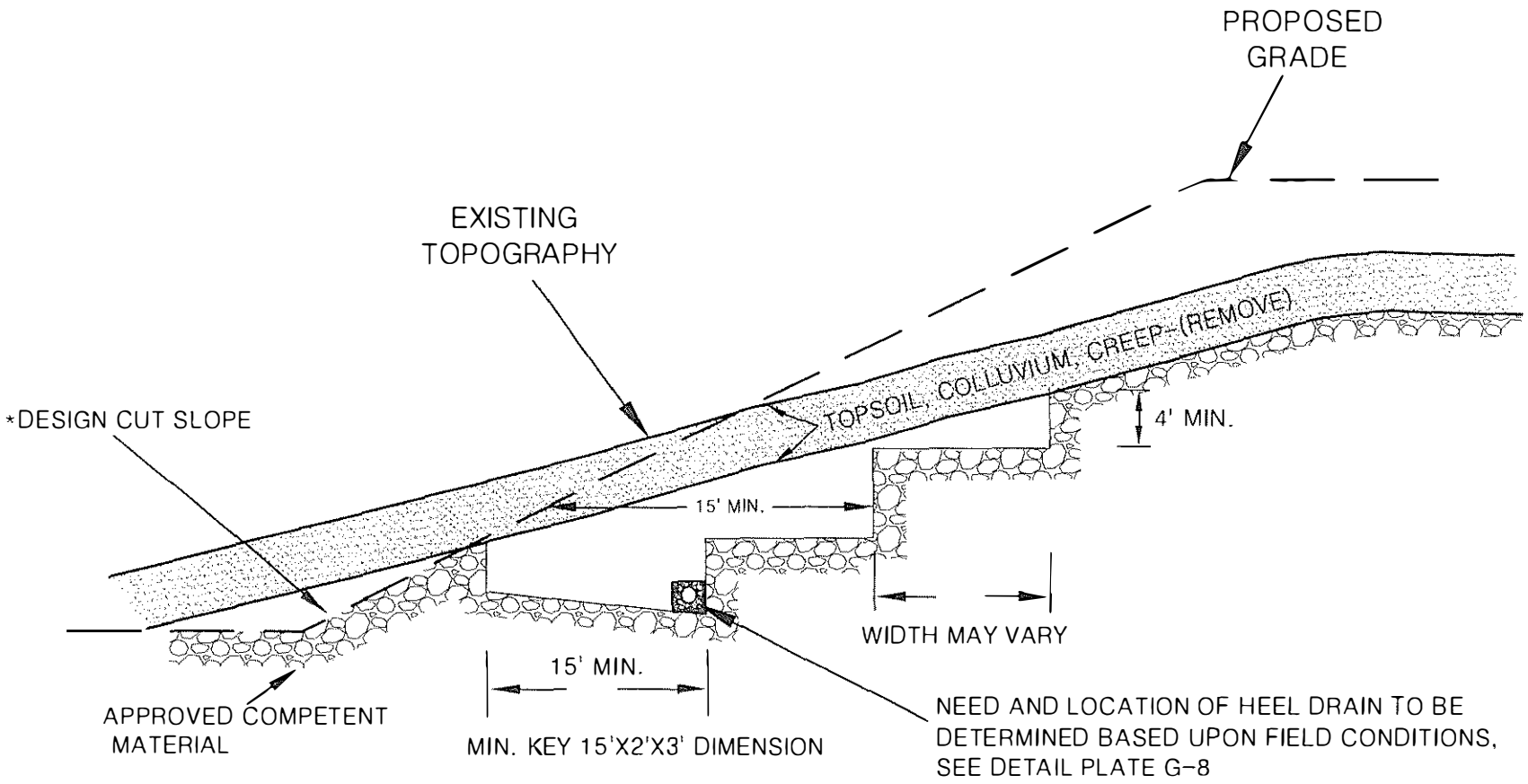
(NATURAL SLOPES 5:1 OR STEEPER)



NOTES: 1. WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, SEE PLATE G-1. WHERE THE NATURAL SLOPE APPROACHES OR EXCEEDS THE DESIGN SLOPE RATIO, SPECIAL RECOMMENDATIONS WILL BE PROVIDED BY THE GEOTECHNICAL ENGINEER.

2. THE NEED FOR AND PLACEMENT OF DRAINS WILL BE DETERMINED BY THE GEOTECHNICAL ENGINEER OR GEOLOGIST BASED UPON EXPOSED FIELD CONDITIONS.

FILL OVER CUT SLOPE DETAIL

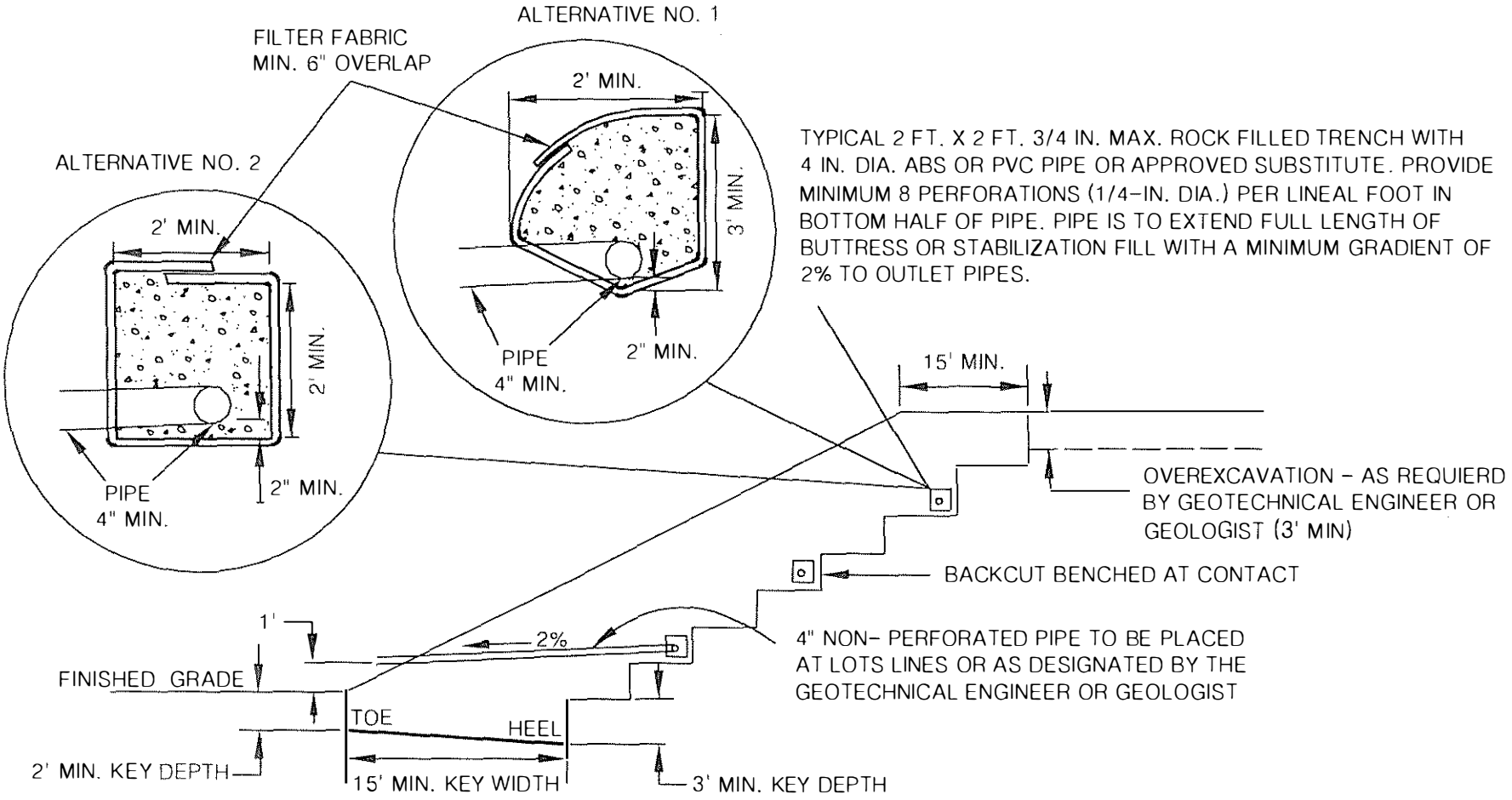


*THE CUT PORTION OF THE SLOPE SHOULD BE EXCAVATED AND EVALUATED BY THE ENGINEERING GEOLOGIST/GEOTECHNICAL ENGINEER PRIOR TO CONSTRUCTING THE FILL SLOPE

STABILIZATION/BUTTRESS FILL BACKDRAIN

NOTE:

1. ASTM D2751, SDR 35, OR ASTM D3034 OR ASTM D1527, SCHD. 40 ASTM D1785, SCHD. 40
2. SOLID PIPE OUTLETS TO BE PROVIDED EVERY 100 FT. AND JOINED TO PERFORATED BACKDRAIN PIPE WITH "L" OR "T"s. MIN. 2% GRADIENT.
3. GRAVEL TRENCH TO BE FILLED WITH 3/4 IN. MAXIMUM ROCK
4. THE NECESSITY FOR UPPER TIER BACKDRAINS SHALL BE DETERMINED IN THE FIELD BY THE GEOTECHNICAL ENGINEER OR GEOLOGIST. UPPER TIER OUTLETS SHOULD DRAIN INTO PAVED TERRACE DRAINS.



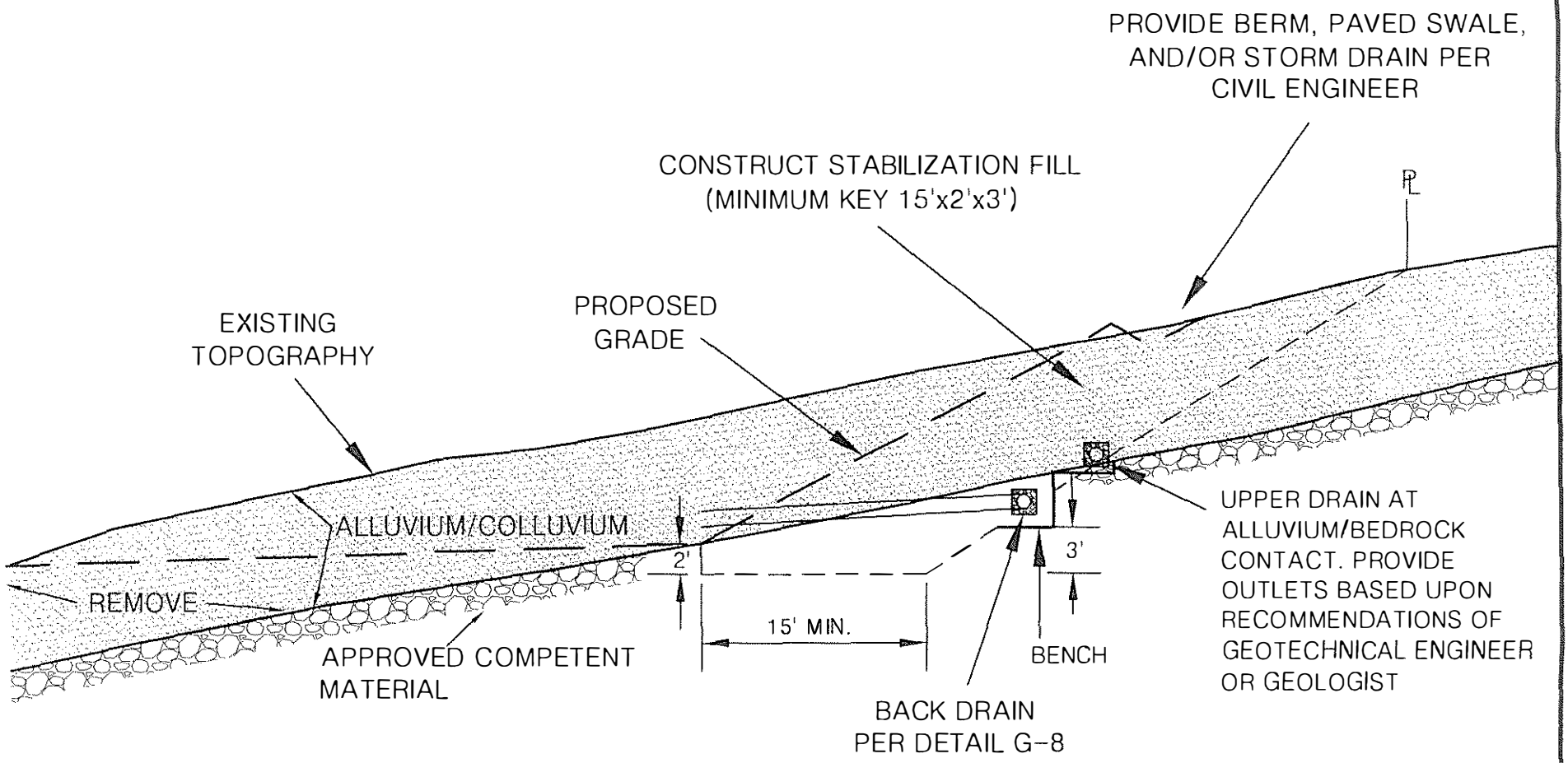
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PLATE G-8

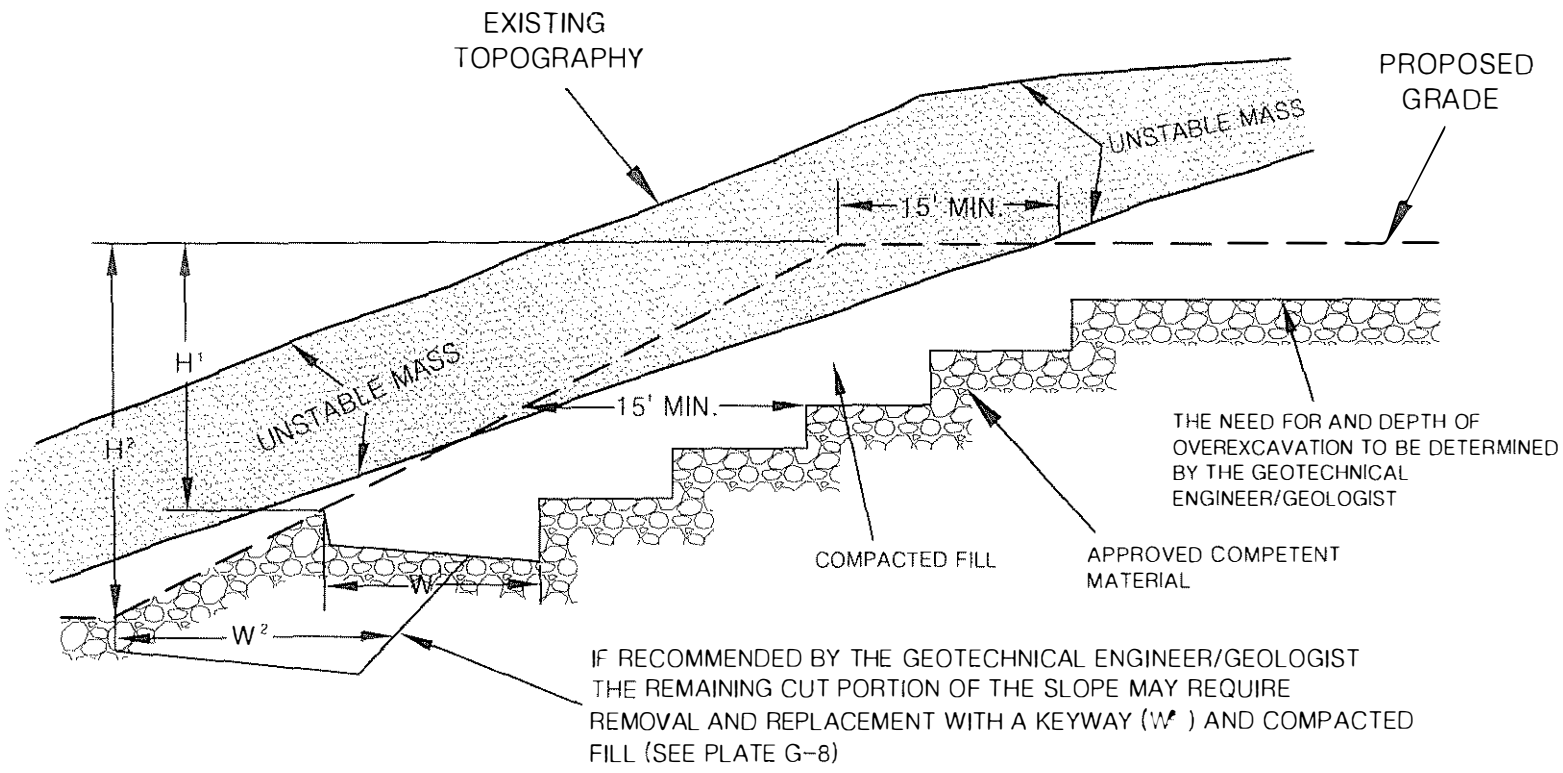
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STABILIZATION FILL

(UPSLOPE ALLUVIATED AREA)



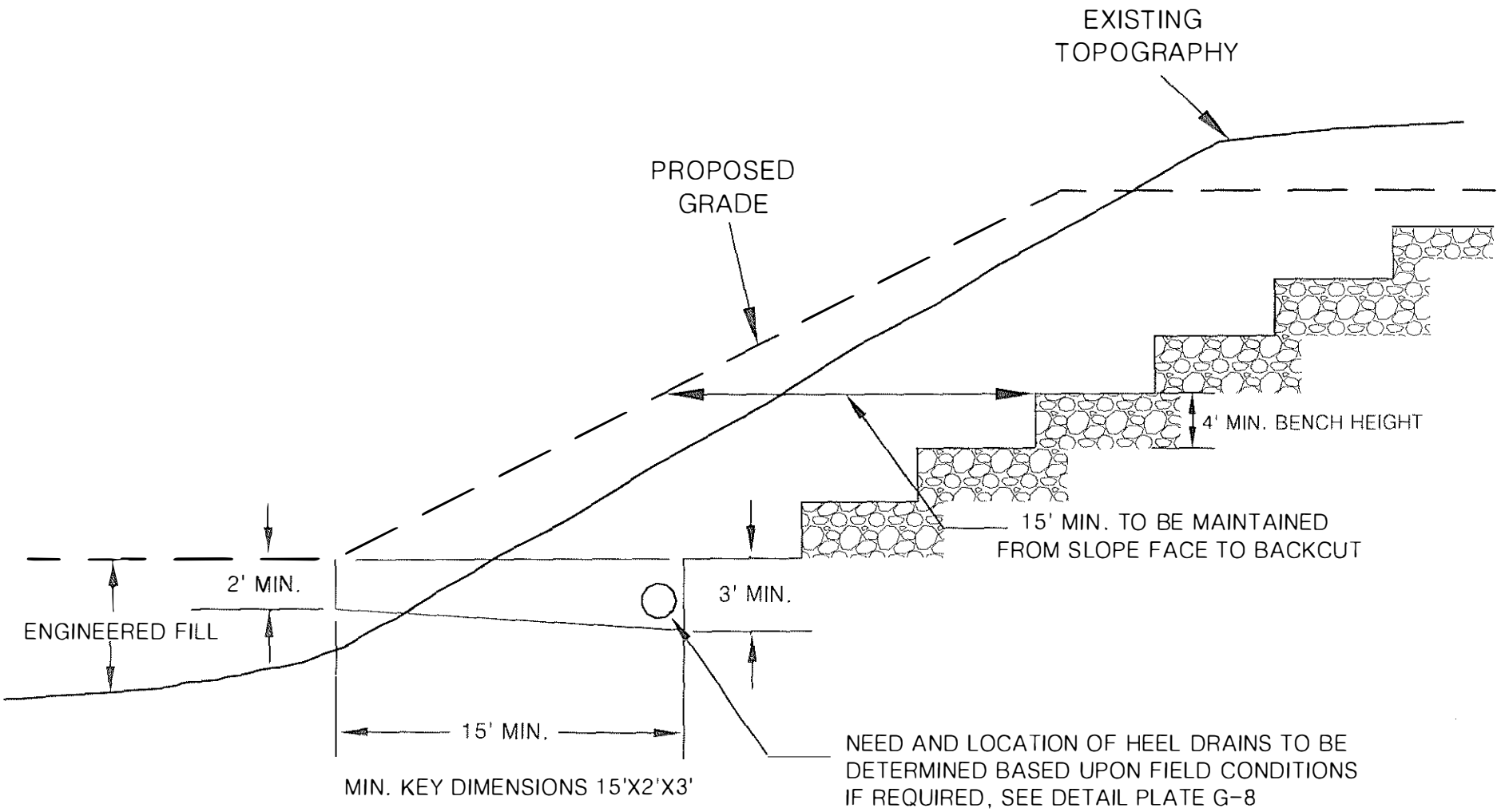
SELECTIVE GRADING DETAIL FOR STABILIZATION FILL
UNSTABLE MATERIAL EXPOSED IN PORTION OF CUT SLOPE



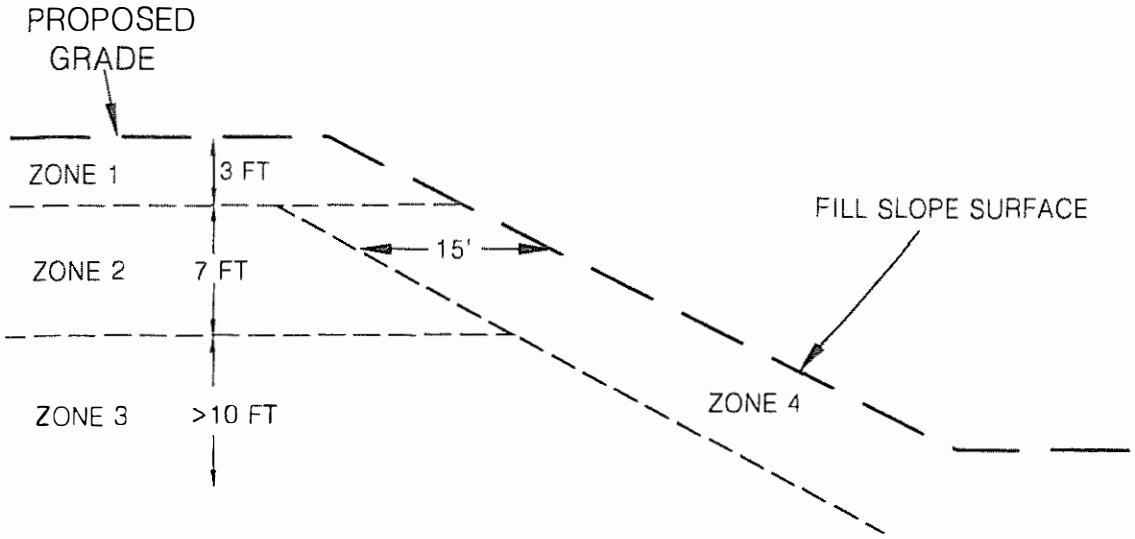
NOTES: 1. BACKDRAINS ARE NOT REQUIRED UNLESS SPECIFIED.

2. "W" SHALL BE EQUIPMENT WIDTH (15') FOR SLOPE HEIGHT LESS THAN 25 FEET. FOR SLOPES GREATER THAN 25 FEET, "W" SHALL BE DETERMINED BY THE PROJECT GEOTECHNICAL ENGINEER/GEOLOGIST. AT NO TIME SHALL "W" BE LESS THAN H/2.

SKIN FILL SLOPE OVER NATURAL GROUND



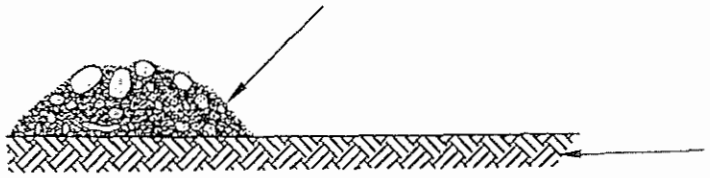
DETAIL FOR MAXIMUM PARTICLE DIMENSION



ZONE	DEPTH	PARTICLE MAX. DIMENSION	PLACEMENT METHOD
1	0-3 ft.	≤0.5 ft.	STANDARD OR CONVENTIONAL COMPACTION METHODS (SEE EARTHWORK SPECIFICATIONS)
2	3-10 ft.	≤2.0 ft.	ROCK BLANKETS (SEE PLATE G-13)
3	>10 ft.	≤8.0 ft.	ROCK BLANKETS (PLATE G-13) ROCK WINDROW (PLATE G-14) INDIVIDUAL ROCK BURIED (PLATE G-15)
4	15 HORIZONTAL FEET FROM FILL SLOPE FACE	≤1.0 ft.	STANDARD OR CONVENTIONAL COMPACTION METHODS (SEE EARTHWORK SPECIFICATIONS)

ROCK BLANKET DETAILS

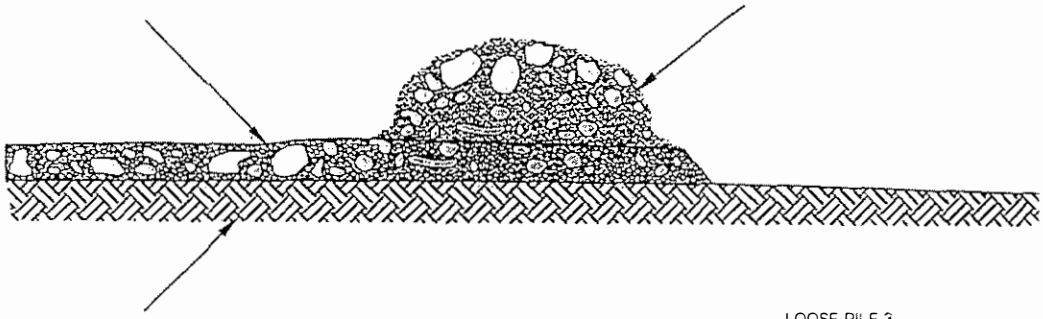
LOOSE PILE 1
LOOSE, DUMPED ROCK, GRAVEL AND SAND MIXTURE REMOVE FRAGMENTS LARGER THAT 2 FEET FOR ISOLATED BURIAL (PLATE G-15) OR WINDROW (PLATE G-10)



APPROVED BOTTOM, OR TOP OF PREVIOUSLY APPROVED BLANKET FILL

COMPACT PILE 1
SPREAD LOOSE PILE FORWARD WITH HEAVY TRACKED DOZER (D-8 OR LARGER). HEAVILY WATER, TRACK, AND APPLY ADDITIONAL SAND AND GRAVEL AS NECESSARY TO FILL VOIDS AND CREATE A DENSE MATRIX OF ROCK, COBBLES, GRAVEL AND SAND (2 FOOT MAXIMUM THICKNESS)

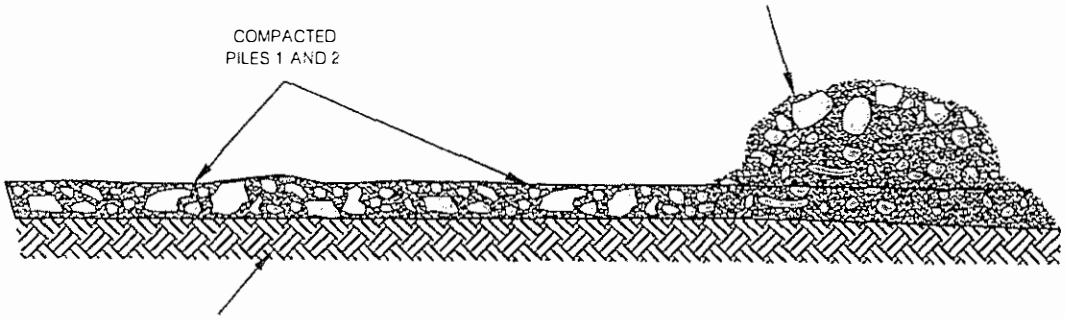
LOOSE PILE 2
DUMP SUCCESSIVE PILES OF LOOSE ROCK, GRAVEL AND SAND MIXTURE ON FORWARD EDGE OF PREVIOUSLY COMPACTED LIFT WITH TRUCKS AND/OR SCRAPERS. USE PREVIOUS LIFT TO ACCESS AND FURTHER COMPACT PILE 1.



APPROVED BOTTOM, OR TOP OF PREVIOUSLY APPROVED BLANKET FILL

LOOSE PILE 3
DUMP SUCCESSIVE PILES OF LOOSE ROCK, GRAVEL AND SAND MIXTURE ON FORWARD EDGE OF PREVIOUSLY COMPACTED LIFT WITH TRUCKS AND/OR SCRAPERS. USE PREVIOUS LIFT TO ACCESS AND FURTHER COMPACT EXISTING BLANKET.

COMPACTED PILES 1 AND 2

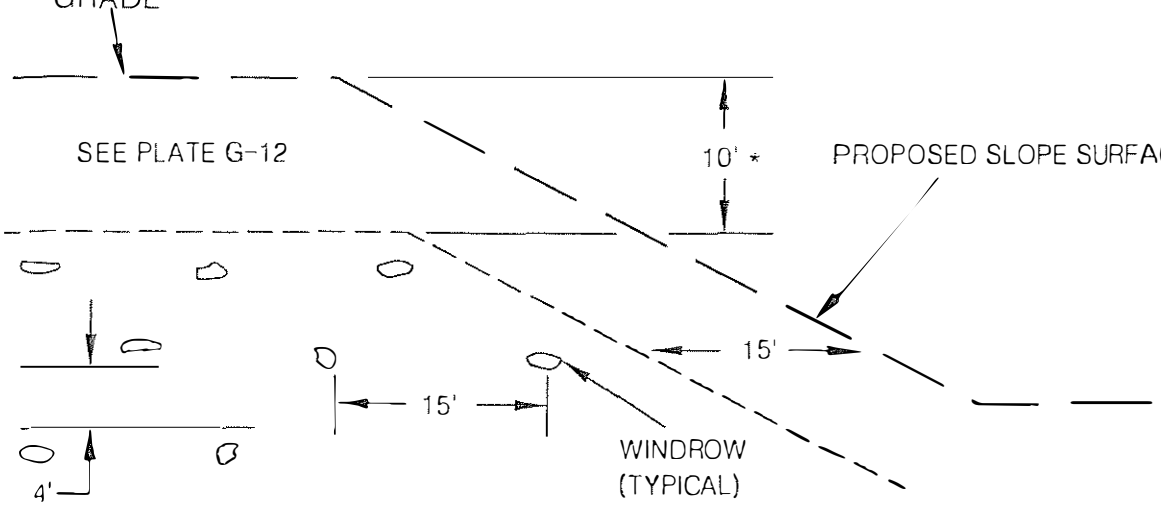


APPROVED BOTTOM, OR TOP OF PREVIOUSLY APPROVED BLANKET FILL

OBSERVATION TESTING AND APPROVAL PROCEDURES

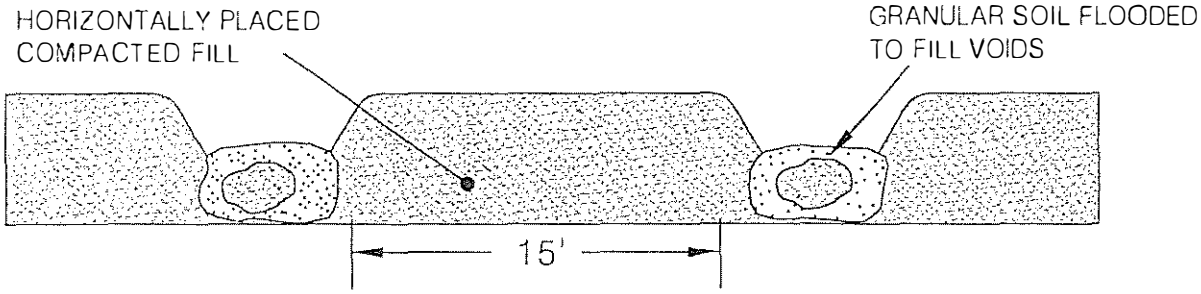
OBSERVE EQUIPMENT. SCRAPERS AND TRUCKS SHOULD BE FULLY SUPPORTED ON BLANKET WITHOUT SIGNIFICANT YIELDING. EXCAVATE TEST/OBSERVATION PITS TO CONFIRM EXISTENCE OF MIXTURE OF VARIOUS PARTICLE SIZES, WITHOUT SIGNIFICANT VOIDS, AND FORMING A DENSE, COMPACTED FILL MATRIX. TEST BY ASTM D1556, D2922 AND/OR D3017 WHEN APPROPRIATE. RECORD LIMITS AND ELEVATION OF BLANKET. ALL FILL AND COMPACTION OPERATIONS TO BE CONDUCTED UNDER THE OBSERVATION OF THE GEOTECHNICAL ENGINEER. SUBSEQUENT LIFTS TO BE APPLIED ONLY AFTER OBSERVATION AND CONFIRMATION OF SUITABILITY OF FILL AND RELEASE BY THE GEOTECHNICAL ENGINEER. BLANKETS TO BE CONSTRUCTED IN ACCORDANCE WITH PLATE G-12.

ROCK WINDROW DETAIL



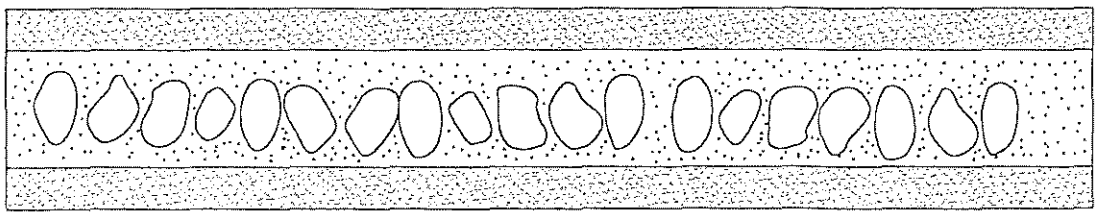
NOTE: OVERSIZED MATERIAL SHOULD BE REMOVED FROM THE 15' CLEAR ZONES WITH SPECIAL EQUIPMENT, SUCH AS A ROCK RAKE, PRIOR TO PLACING THE NEXT FILL LIFT.
*VARIANCES TO THE ABOVE ROCK HOLD DOWN MAY BE GRANTED SUBJECT TO APPROVAL BY THE OWNER, GEOTECHNICAL ENGINEER, AND GOVERNING AGENCY

TYPICAL WINDROW DETAIL (END VIEW)

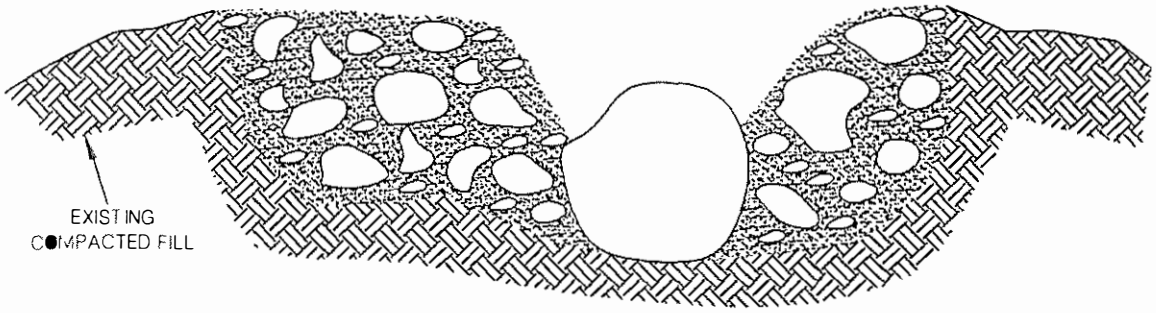


NOTE: COMPACTED FILL SHALL BE BROUGHT UP TO A HIGHER ELEVATION ALONG EACH WINDROW SO GRANULAR SOIL CAN BE FLOODED IN A "TRENCH CONDITION".

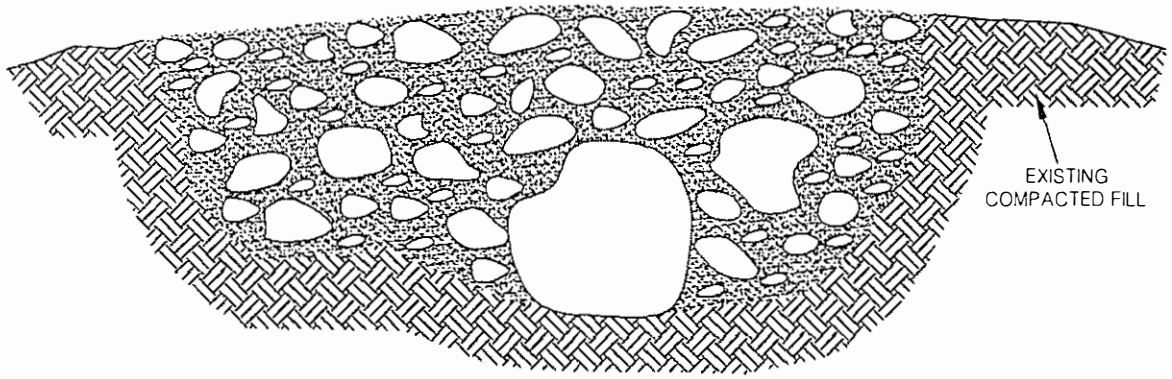
PROFILE VIEW



ISOLATED ROCK BURIAL DETAILS

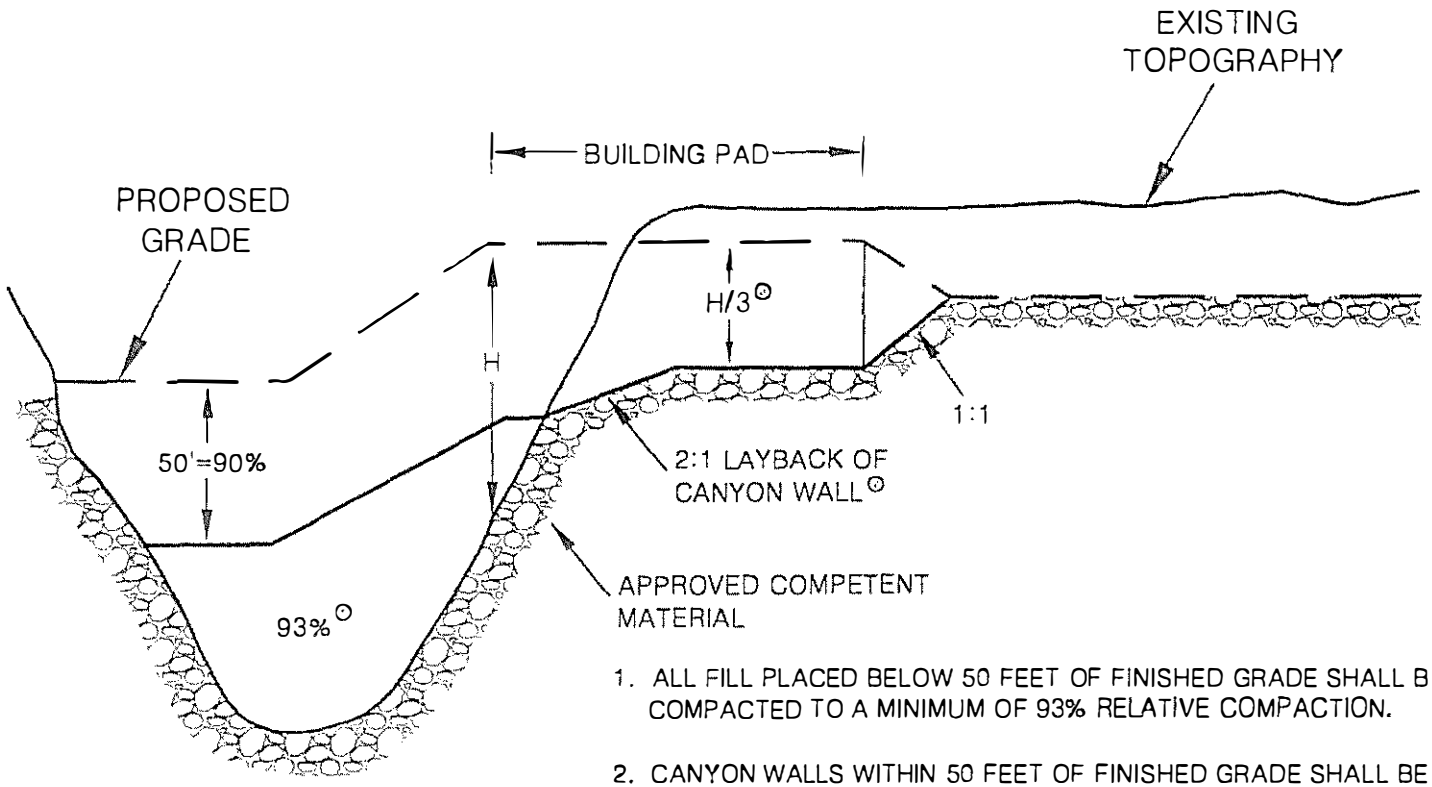


EXCAVATE HOLE INTO EXISTING FILL PRISM, PLACE BOULDER (< 8 feet in maximum dimension) INTO EXISTING COMPACTED FILL. SURROUND WITH SAND, GRAVEL, COBBLES AND WATER HEAVILY. TRACK WITH D8 OR LARGER EQUIPMENT UNTIL RESULTING FILL FULLY SUPPORTS EQUIPMENT. OBSERVE AND/OR TEST IN ACCORDANCE WITH ASTM D1556, D2922 OR D3017. ROCKS LARGER THAN 8 FEET SHALL BE FURTHER REDUCED IN SIZE BY SECONDARY BREAKING.



RELATIVE COMPACTION VS. DEPTH

CANYON WALL LAY BACK
DIFFERENTIAL FILL OVEREXCAVATION DETAILS



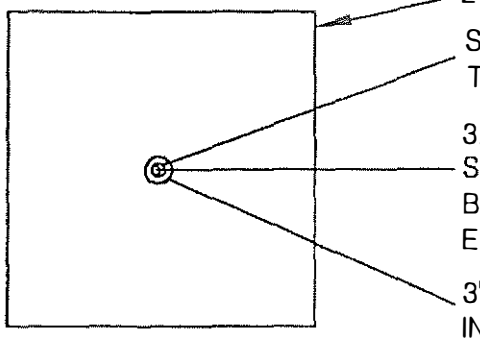
1. ALL FILL PLACED BELOW 50 FEET OF FINISHED GRADE SHALL BE COMPACTED TO A MINIMUM OF 93% RELATIVE COMPACTION.

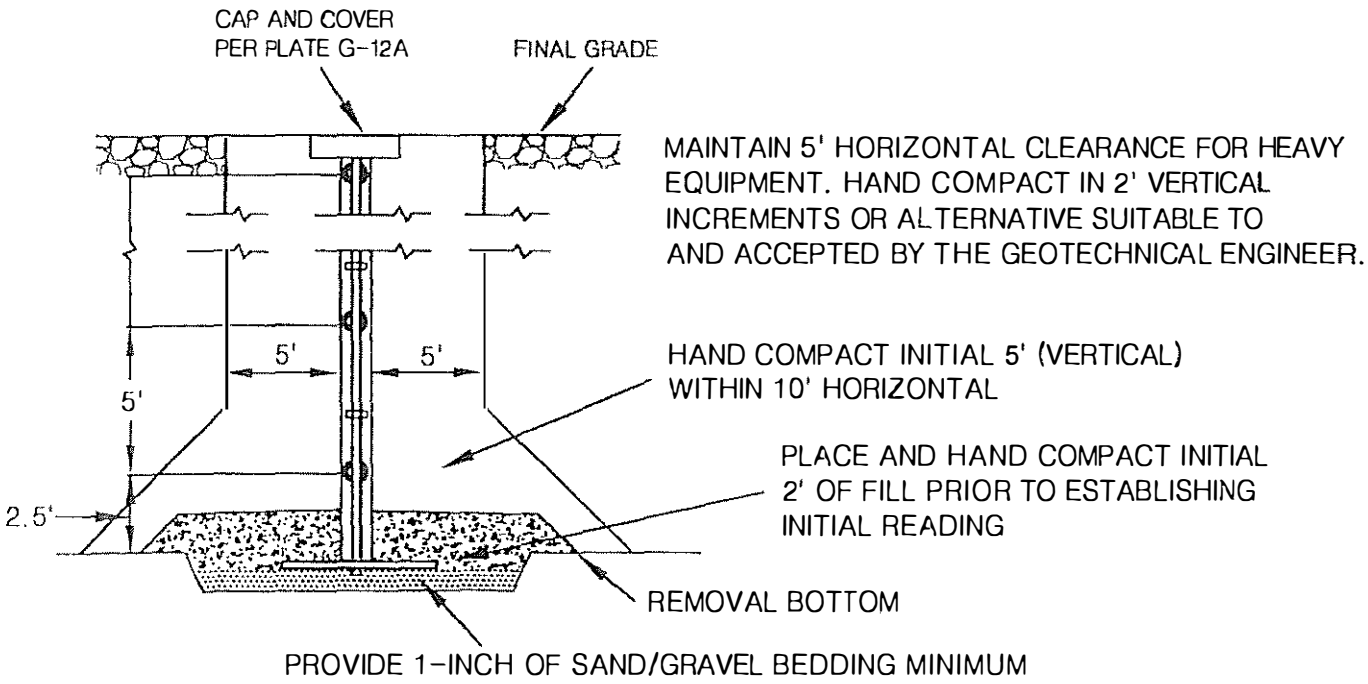
2. CANYON WALLS WITHIN 50 FEET OF FINISHED GRADE SHALL BE LAID BACK TO A SLOPE RATIO OF 2:1 OR FLATTER.

3. ALL BUILDING PADS SHALL BE OVER EXCAVATED TO A MINIMUM OF 1/3 OF THE MAXIMUM DEPTH OF FILL BELOW THE BUILDING PAD TO A MAXIMUM OF 17 FEET.

4. IF THE 2:1 LAY BACK OF THE CANYON WALL IS IMPRACTICAL, THEN AS AN ALTERNATIVE THE INCREASED COMPACTION STANDARDS IN NOTE 1 SHOULD BE EXTENDED UP TO H/3 AND THE LAY BACK WILL NOT BE REQUIRED.

SETTLEMENT PLATE DETAIL





NOTES:

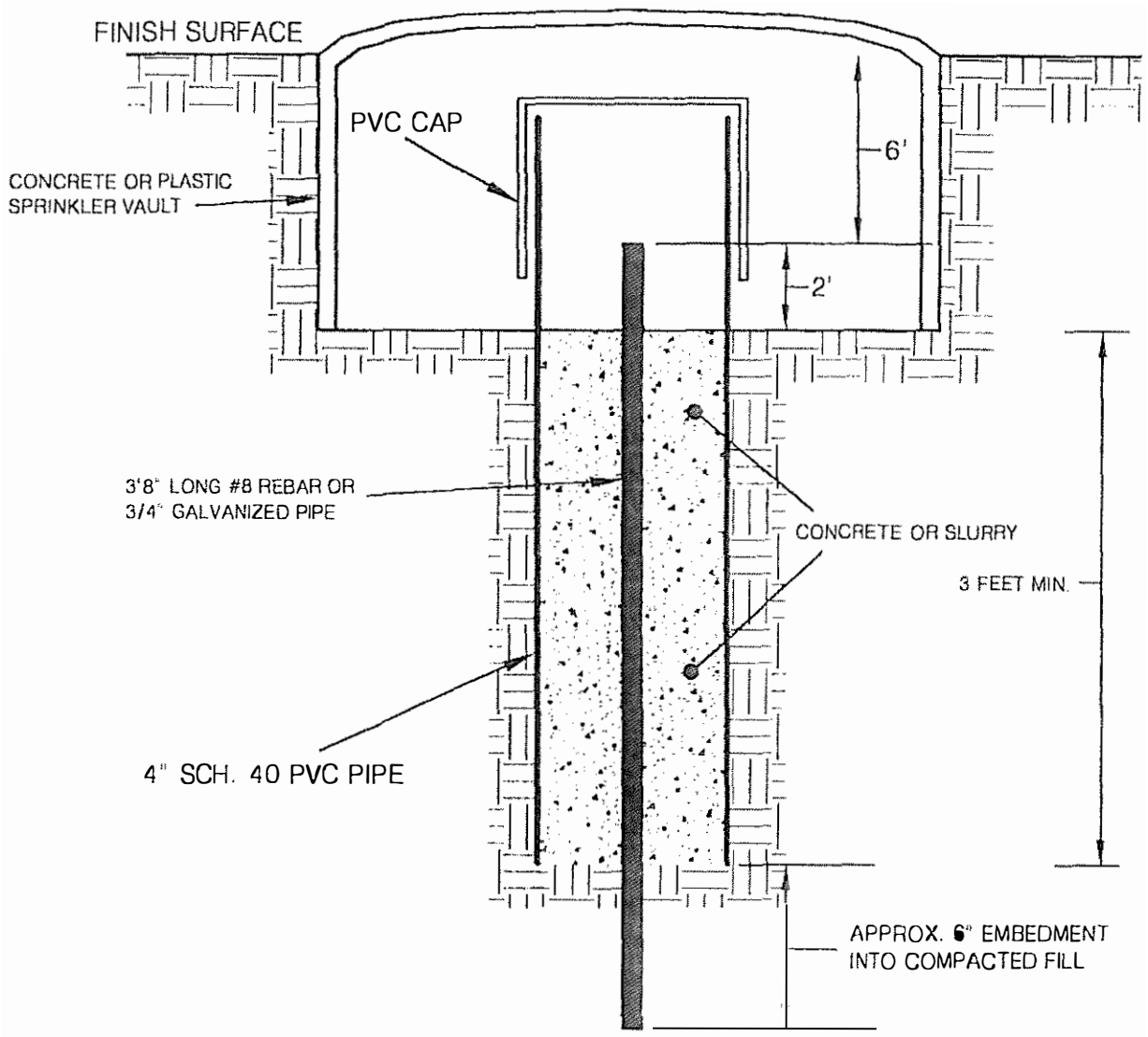
1) LOCATIONS OF SETTLEMENT PLATES SHALL BE CLEARLY MARKED AND READILY VISIBLE (RED FLAGGED) TO EQUIPMENT OPERATORS.

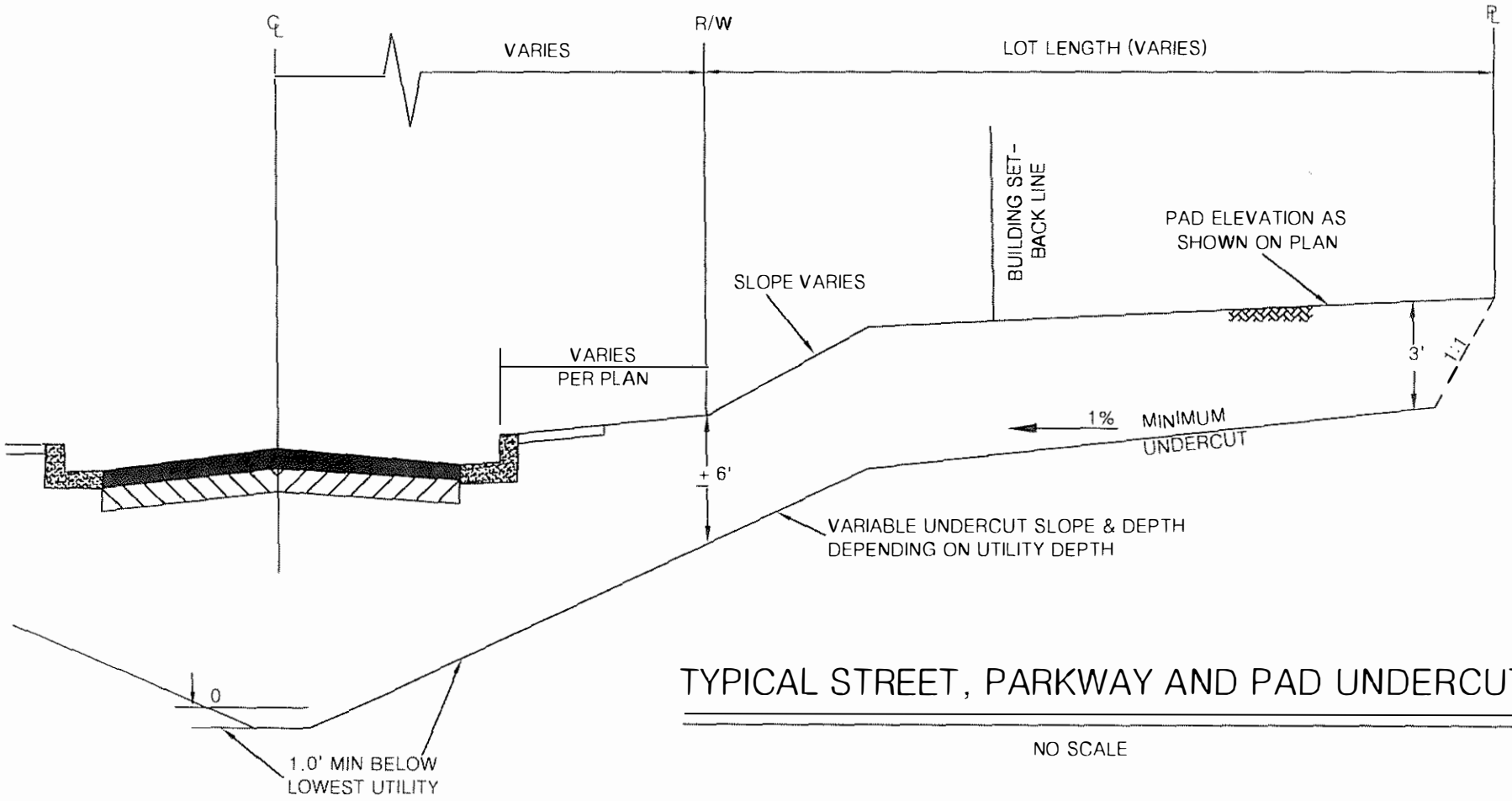
2) CONTRACTOR SHALL MAINTAIN 10' HORIZONTAL CLEARANCE FOR HEAVY EQUIPMENT WITHIN 5' (VERTICAL) OF PLATE BASE. FILL WITHIN CLEARANCE AREA SHALL BE HAND COMPACTED TO PROJECT SPECIFICATIONS OR COMPACTED BY ALTERNATIVE APPROVED BY THE GEOTECHNICAL ENGINEER.

3) AFTER 5' (VERTICAL) OF FILL IS IN PLACE, CONTRACTOR SHALL MAINTAIN 5' HORIZONTAL EQUIPMENT CLEARANCE. FILL IN CLEARANCE AREA SHALL BE HAND COMPACTED (OR APPROVED ALTERNATIVE) IN VERTICAL INCREMENTS NOT TO EXCEED 2 FEET.

4) IN THE EVENT OF DAMAGE TO SETTLEMENT PLATE OR EXTENSION RESULTING FROM EQUIPMENT OPERATING WITHIN PRESCRIBED CLEARANCE AREA, CONTRACTOR SHALL IMMEDIATELY NOTIFY GEOTECHNICAL ENGINEER AND SHALL BE RESPONSIBLE FOR RESTORING THE SETTLEMENT PLATE AND EXTENSION RODS TO WORKING ORDER.

SURFACE SETTLEMENT MONUMENT DETAIL





TYPICAL STREET, PARKWAY AND PAD UNDERCUT

NO SCALE

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VER. 3/13

PLATE G-19

PATH: \\LS-WTGL96E\share\Alta California Geotechnical\Drafting\GRADING DETAILS\G-19.dwg

IN THE UNINCORPORATED TERRITORY OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

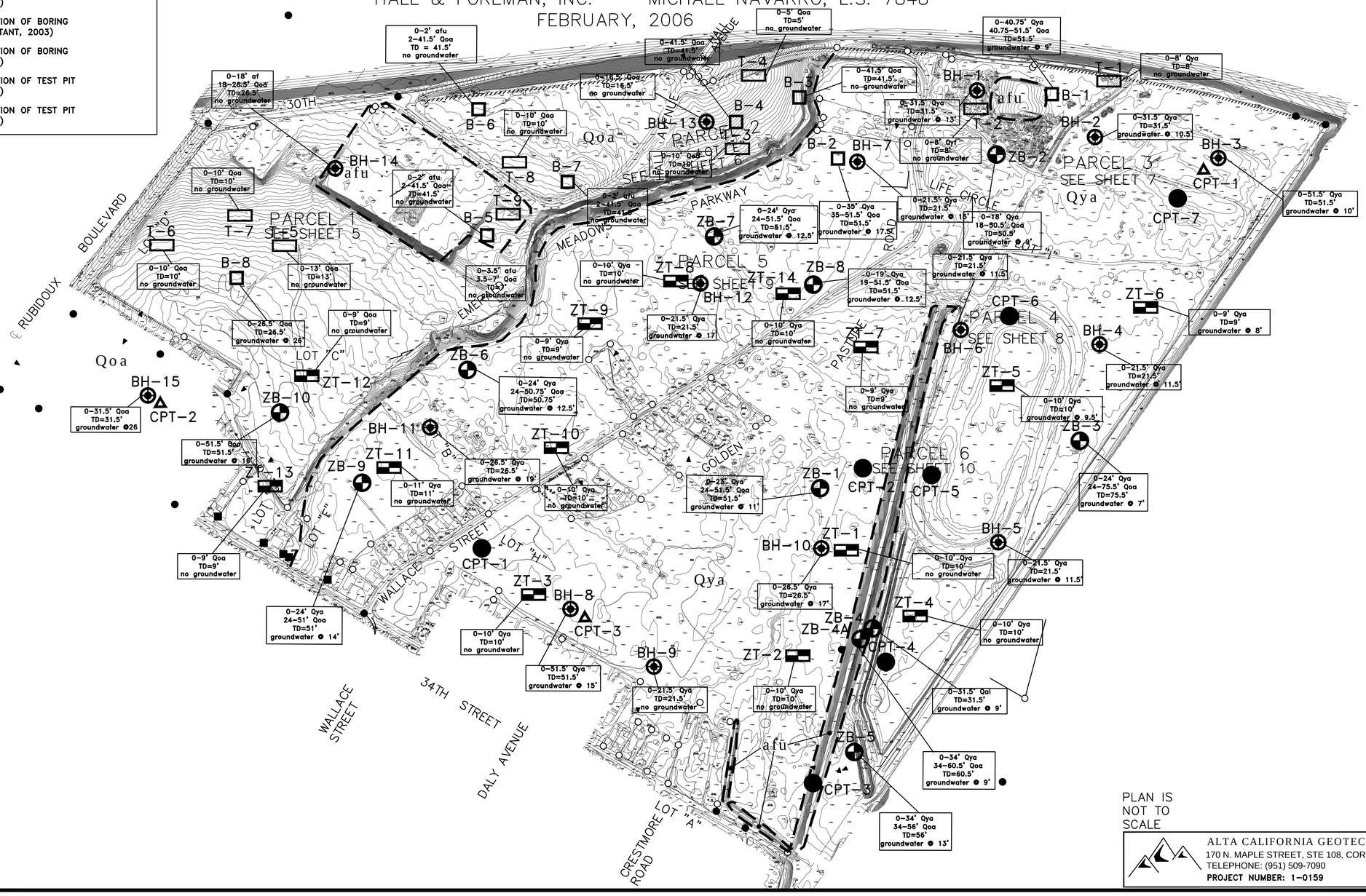
PARCEL MAP NO. 32971

HALL & FOREMAN, INC. MICHAEL NAVARRO, L.S. 7848

FEBRUARY, 2006

LEGEND

- afu — ARTIFICIAL FILL –UNDOCUMENTED
- Qya — YOUNGER ALLUVIUM
- Qoa — OLDER ALLUVIUM
- APPROXIMATE LOCAITON OF GEOLOGIC CONTACT
- CPT–7 — APPROXIMATE LOCATION OF CONE PENETRATION TEST (ALTA 2015)
- CPT–1 — APPROXIMATE LOCATION OF CONE PENETRATION TEST (CONVERSE CONSULTANT, 2003)
- ZB–7 — APPROXIMATE LOCATION OF MUD ROTARY BORING (ZEISER KING, 2005)
- BH–3 — APPROXIMATE LOCATION OF BORING (CONVERSE CONSULTANT, 2003)
- B–1 — APPROXIMATE LOCATION OF BORING (ZEISER KING, 2005)
- T–1 — APPROXIMATE LOCATION OF TEST PIT (ZEISER KING, 2005)
- ZT–1 — APPROXIMATE LOCATION OF TEST PIT (ZEISER KING, 2005)



PLAN IS NOT TO SCALE

PLATE 1

ALTA CALIFORNIA GEOTECHNICAL, INC.
170 N. MAPLE STREET, STE 108, CORONA, CA 92880
TELEPHONE: (951) 509-7090

PROJECT NUMBER: 1–0159 DATE: 6/22/15