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April 11, 2006

Work Order 102453-RT

Attention: Mr. Jasch Janowicz

Subject: **UPDATED PRELIMINARY GEOTECHNICAL REPORT AND RESPONSE TO COUNTY OF LOS ANGELES GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION REVIEW SHEETS**
Proposed Lyons Canyon Ranch Development
Tentative Tract Map No. 53653
Lyons Canyon/Santa Clarita Area
COUNTY OF LOS ANGELES, CALIFORNIA

References: (See Appendix I)

Gentlemen:

Pursuant to your request, presented herein is this firm's Updated Preliminary Geotechnical Report and Response to County of Los Angeles Geotechnical and Materials Engineering Division (GMED) Review Sheets (Appendix VI) for the proposed Lyons Canyon Ranch development (Tentative Tract No. 53653). The major soils engineering/geologic issues considered within this document include:

- Unsuitable soil removals;
- Plan cut, fill and natural slope stability;
- Liquefaction potential;
- Hydrocollapse potential;
- Engineering and excavation characteristics of onsite earth materials;
- Preliminary foundation design parameters;
- Slope and lot maintenance recommendations.

This report is subject to review by the controlling authorities for the above subject project. Pacific Soils Engineering, Inc., (PSE) appreciates the opportunity to provide you with geotechnical consulting services. If you have any questions or should you require additional information, please contact the undersigned at (714) 220-0770.

Respectfully submitted,
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1.0 INTRODUCTION

1.1 Purpose and Scope

The purpose of this report was to evaluate the proposed development concept indicated on the latest Tentative Tract Map for Tract No. 53653 and in light of the indicated geologic and soils engineering conditions, present geotechnical recommendations for the design and construction of the project. In addition, this firm has provided responses to County of Los Angeles Department of Public Works, GMED Geologic (7-7-05, 8-25-05 and 1-12-06) and Soils Engineering (7-12-05, 9-13-05 and 1-17-06) review sheets (Appendix VI).

Specific items evaluated as part of the scope of this report include fill and cut slope stability, natural slope stability, liquefaction potential, hydrocollapse potential, unsuitable soil removals, as well as engineering and excavation characteristics of the earth materials. Preliminary foundation recommendations and slope and lot maintenance considerations are also presented herein.

The following is a summary of the scope of this report:

1) Review of existing geotechnical and geologic data relative to the subject site.
2) Limited review of aerial photographs of the site and surrounding areas.
3) Geologic field mapping/reconnaissance.
4) Excavation of seven (7) exploratory backhoe pits.
5) Laboratory testing of selected material samples collected from one of the Exploratory Pits.
6) Plotting of geotechnical information on the accompanying Tentative Tract Map, dated March 24, 2006, prepared by Diamond West Engineering, Inc., at a scale of 1 inch equals 100 feet (Plates F-1 and F-2, in pocket).
7) Analysis of the data collected.
8) Formulation of conclusions and preliminary recommendations based on results of field, office and laboratory studies.
9) Responding to GMED Geologic and Soils Engineering Review sheets.
10) Preparation of this report.

1.2 Report Limitations

The conclusions and recommendations in this report are based on the data developed during the field investigation(s), on a review of the referenced reports, and on the Tentative Tract Map provided by Diamond West Engineering, Inc.

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.

2.0 PROJECT DESCRIPTION

2.1 Site Location and Description

The project study area is located westerly adjacent to The Old Road between Lyons Avenue and Calgrove Boulevard in an unincorporated area in the County of Los Angeles (Figure I; next page). The L-shaped site encompasses approximately 235± acres. The southerly and westerly portions of the project site are bound by undeveloped land. The northerly portion of the site is bound by existing residential and commercial properties and the Old Road bounds the easterly portion of the site. Site access is currently obtained from various locked gates located along The Old Road.

Lyons Canyon trends easterly across the southwesterly portion of the site and turns northerly in the central and northern portions. This broad, flat canyon is approximately 400± feet wide in the northeasterly portion and narrows to approximately 120± feet in the southwesterly portion. Numerous tributary canyons "branch" out from Lyons Canyon and extend to the southerly property boundary. Several canyons are located along the easterly portion of the project and range from 100± to 300± feet wide at the terminus with The Old Road. The southwest portion of the project encompasses the northern ridges and canyons of Towsley Canyon.

The canyon floors are covered with native grasses, shrubs and trees. Natural slopes are typically covered with moderately dense to dense shrubs. Ridges within the northerly portion of the site generally trend west to northwest, while ridges within the southerly portion range northwesterly to northeasterly. Surface drainage is primarily directed easterly in Lyons Canyon. Along the southerly boundary, drainage is directed to the south into Towsley Canyon. Elevations within the subject property range between 1820± feet in the southerly portion to 1310± feet in the

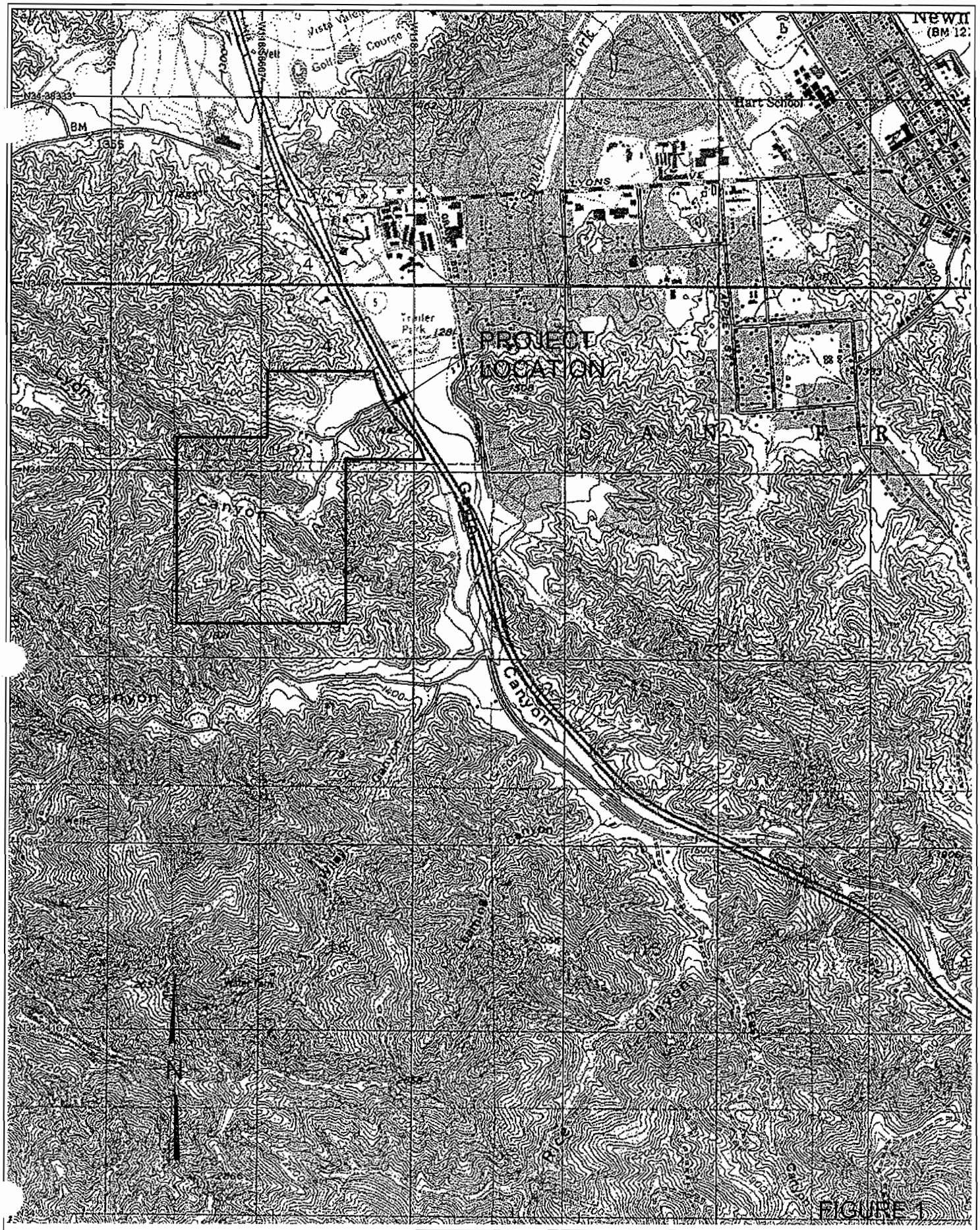

FIGURE 1

SITE LOCATION MAP

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northeasterly portion. Natural slope gradients vary from 3:1 (horizontal:vertical) near the base of natural slopes to nearly vertical along some ridge crests.

Various dirt trails and/or partially paved roads exist along the canyon bottoms and ridgelines and an existing bridge crosses one of the canyons. Other existing onsite improvements encountered during this firm's field investigation programs include various minor foundations for structure/buildings, wooden power poles and a previously abandoned oil well.

2.2 Proposed Development

The Tentative Map provided this firm indicates a total of 107 lots: 93 are proposed single-family residential lots, one multi-family lot (93 units), a fire station lot, one park site, five open space lots and six basin lots.

Cut and fill grading techniques will be used to accommodate the proposed development. Fill slopes are designed to slope ratios of 2-horizontal to 1-vertical (2:1) or flatter. Cut slopes are designed to slope ratios of 1½:1, 2:1, and flatter. The highest 1½:1 cut slope is a 150± foot southeast-facing slope above "A" Street. The highest proposed 2:1 cut slope is a 75± foot northeasterly facing slope above Lots 70 and 71. The highest 2:1 fill slope is a 75± foot northerly facing slope below Lots 13 through 15. The maximum plan excavation is roughly 200± feet, while the maximum depth of plan fill is on the order of 75± feet.

It is anticipated that the proposed residential structures will consist of one- and two-story wood frame and stucco covered structures supported by slab-on-grade foundation systems. The type of proposed multi-family and fire station structures are not known at this time. These proposed development plans should be provided to this firm for analysis.

3.0 GEOTECHNICAL INVESTIGATIONS AND LABORATORY TESTING

3.1 Field Investigations

Field investigations on the subject site have been performed by this firm in June, July and November 2001, April and May 2002, January 2004, December 2005 and January 2006. Geologic reconnaissance of the project site was conducted to obtain structural information and to map surficial contacts of exposed geologic units. The subsurface exploration programs included twenty (20) bucket auger borings (B-1 through B-6, B-6B, B-7 through B-14, B-14B and B-101 through B-104); six (6) rotary wash borings (RW-1 through RW-6); ninety-eight trackhoe excavated pits (EP-1 through EP-47, EP-101 through EP-144, and EP-201 through EP-207); four (4) Cone Penetration Test (CPT) soundings (CPT-1 through CPT-4); and two (2) "combination" CPT/SPT exploratory borings (CPT/SPT-1 and CPT/SPT-2). The exploratory borings and pits were observed, logged and selectively sampled by representatives of this firm's staff. Logs of the exploratory borings are presented on Plates A-1 through A-50 and the exploratory pit logs are presented in Table II in Appendix I. The approximate locations of the exploratory borings, exploratory pits and CPT soundings are shown on the accompanying Geotechnical Maps (Plates F-1 and F-2, in pocket).

3.2 Laboratory Testing

To assist in a preliminary evaluation of the geotechnical properties of the site, laboratory testing was performed on selected, representative "bulk" and relatively "undisturbed" ring samples obtained during this firm's field investigations. Laboratory tests on samples collected during this firm's subsurface field investigations consisted of in-situ moisture-density determinations, maximum dry density/ optimum moisture content, grain size, shear strength, consolidation characteristics, expansion index and chemical testing. A further description of the tests performed is presented in Appendix I. Laboratory data obtained for this report are contained in Table I in Appendix I.

4.0 GEOLOGIC CONDITIONS

4.1 Geologic and Geomorphic Setting

The site is located in the eastern portion of the East Ventura Basin in which marine and non-marine sedimentary rocks were deposited from Tertiary through Quaternary time with interim periods of non-deposition. The East Ventura Basin is bounded on the north by Alamo Mountain and the San Gabriel fault, on the east by the Whitney Canyon fault, to the south a fault complex consisting of the Oak Ridge fault and Santa Susana fault are considered the southern boundary, while Sespe Creek roughly defines the western limits. Rocks in the Lyons Canyon area consist primarily of Pliocene shallow marine claystone, siltstone and sandstone of the Pico Formation overlain by and interfingered with upper Pliocene-lower Pleistocene terrestrial and shallow marine mudstone and sandstone of the Saugus Formation - Sunshine Ranch Member.

Tectonic activity within the East Ventura Basin since the deposition of the Saugus Formation includes movement along the San Gabriel and Santa Susana fault systems combined with activity along numerous small complementary faults. Rocks in the Lyons Canyon area follow a general east-west aligned fold complex with limbs inclined northerly at moderate to steep angles. Some localized areas exhibit overturned strata inclined southerly at steep angles.

4.2 Stratigraphy

4.2.1 Soil (no map symbol)

Chemical weathering and physical decomposition of surface materials has produced a soil mantle across much of the site that varies in depth from a few inches to several feet. Soil is predominantly a dark brown to brown silty sand that is dry, loose, and porous. In flatter slope areas underlain by bedrock, a weathered profile exists below the soil. This weathered zone averages approximately 2 to 3 feet in thickness with locally deeper weathering in some areas.

4.2.2 Surficial Slump (indicated by a squiggled arrow)

Surficial slumping on the order of one to two (1 to 2±) feet in thickness has been identified on the upper portions of slopes in the southwest portion of the project. These areas were denuded of the natural vegetation cover during a brushfire in October 2003, and then saturation from rains in March 2005 resulted in surficial slumping.

4.2.3 Artificial Fill (map symbol: af)

Artificial fill (map symbol af) has been identified along the easterly portion of the project site and is associated with the construction of The Old Road. This material consists of locally generated soil and rock material. In addition, artificial fill associated with previous oil field activities and road construction including recent road and drill pad construction is located throughout the project site. Estimated thickness ranges from a few feet to as much as ten (10±) of feet.

4.2.4 Rock Fall Debris (map symbol: Qrf)

Rock fall debris has been identified within Lyons Canyon in the central portion of the project site. This material consists of cobbles and boulders (up to several feet across) in a fine- to coarse-grained silty sand matrix derived from weathered bedrock materials. Accumulations of this material are generally located at the base of nearly vertical to vertical bedrock outcrops. It is interpreted that these accumulations are derived from weathered bedrock that has eroded or "tumbled" into the adjacent canyon. Rock fall debris may range in thickness from a few feet to several tens of feet and may be interbedded with some alluvial material.

4.2.5 Colluvium (map symbol: Qcol)

Colluvium materials are varied accumulations of loose soil and weathered rock debris along slope flanks and the upper reaches of the tributary draws. Generally consisting of silty to clayey sands with varying amounts of rock fragments, these materials are interpreted to have moved short

distances downslope by sheetwash or creep. Colluvial thickness generally ranges from a few feet to greater than twenty (20±) feet.

4.2.6 Alluvium (map symbol: Qal)

Stream-laid alluvial deposits are located in the canyon areas. This material consists of silty, clayey and fine- to coarse-grained sands, with abundant lenses of gravel and cobbles. Alluvium thickness varies from a few feet in some of the narrow canyons to as much as seventy (70±) feet near the mouth of Lyons Canyon in the northeasterly portion of the project. Active stream channels on the order of three to five (3 to 5±) feet in depth and several feet across have eroded/incised the canyon bottoms throughout the project site.

4.2.7 Saugus Formation – Sunshine Ranch Member (map symbol: Tsr)

Bedrock exposed in the northerly portion of the project site has been assigned to the Plio-Pleistocene Saugus Formation – Sunshine Ranch Member. This material consists of thin-bedded to massive, cross-bedded, occasionally lenticular, moderately hard to hard, mudstone, siltstone and very fine- to coarse-grained sandstone with some interbedded pebble and cobble conglomerate. The coarser-grained sedimentary beds are well indurated and form bold outcrops. The upper Saugus Formation is considered to be part of a large alluvial fan complex, while portions of the Sunshine Ranch Member consist of a finer-grained facies of probable marine to brackish water origin.

4.2.8 Pico Formation (map symbol: Tp)

Bedrock exposed in the southerly portion of the project site has been assigned to the Pliocene Pico Formation. This material consists of generally laminated to sometimes massive, moderately hard to hard micaceous siltstone and claystone with some interbedded fine-grained sandstone. Occasional hard to very hard concretionary lenses that range in size from small isolated pods to layers several inches thick are charac-

teristic of this formation. The Pico Formation is considered to be a shallow marine, clastic deposit.

4.3 Geologic Structure

The site is located on the northern limb of the generally east-west trending Pico Anticline. The Pico Anticline is part of a fold complex, including the Oat Mountain Syncline, associated with activity along the Santa Susana fault and subsequent uplift of the Santa Susana Mountains. These tectonic events, including movement along the San Gabriel, Holster and several supplementary faults, has folded the sedimentary rocks in the Santa Clarita area.

The localized geologic structure within the project site can be defined as a homocline that generally dips north to northeast at moderate to steep angles with localized overturned bedding. Based on review of published documents, there are no known active faults that traverse the site. Additionally, review of aerial photographs, recent geologic field mapping/reconnaissance and subsurface investigation, conducted for this study revealed no apparent evidence indicating that active faults traverse the site.

4.4 Groundwater

In the main canyon area groundwater was encountered in the exploratory borings at depths ranging from fifty-three to sixty-seven (53 to 67±) feet below the existing ground surface. Groundwater was not encountered in the main canyon area in January 2004. Boring B-4, located in the southwesterly portion of the main canyon, encountered a (interpreted) perched water level at a depth of fourteen (14±) feet.

4.5 Seismic Hazards

Earthquakes have occurred in the Los Angeles region and will, undoubtedly, occur in the future. Figures 1 and 2 (Appendix II) illustrate recorded epicenters of earthquakes within the Southern California region. The project site is, as is all of Los Angeles County, in a seismically active region. Figures 3 and 4 (Appendix II) illustrate approximate locations of major fault traces within the Southern California

region. Forty-seven (47) faults have been identified within a 100-kilometer radius from the project site (Table A, Appendix II). Design and construction of the structures should be in accordance with the applicable state and local codes pertaining to both primary and secondary seismic hazards.

Primary earthquake hazards include both surface rupture and ground motion (shaking). Secondary hazards resulting from major earthquakes include liquefaction, seismically induced flooding, and seismically induced landsliding.

4.5.1 Primary Hazards

4.5.1.1 Surface Rupture

Surface rupture is offset of the ground surface by the causative fault during seismic activity. As previously indicated, no known active faults traverse the subject site. As such, the potential for surface rupture on this site is considered low.

4.5.1.2 Ground Motion (Shaking)

The site is not within an Alquist-Priolo Earthquake Fault Zone, and no active faults have been mapped onsite. The study site is, however, in seismically active southern California (Figures 1 through 4, Appendix II). Thus, moderate to strong ground motions resulting from future regional earthquakes could occur during the life of the project. Current engineering standards, as well as the prevailing building codes and regulations, require that seismic considerations be incorporated into site designs and analyses. Accordingly, this firm has performed a FRISKSP (by T. Blake, 2000) probabilistic free-field peak ground acceleration (PGA) assessment of the site that is useful for some engineering designs (such as CBC 2001, Section 1631 Dynamic Lateral Force Procedure). The results of this assessment are presented in Section 7.1.3.

Design of future improvements should be based on current design practices for similar works in the area. It is the purview of the

engineer, based upon information presented herein, to select suitable seismic parameters. As an aid to parameter selection, the 2001 CBC seismic coefficients are given in Section 7.1.4.

4.5.2 Secondary Hazards

4.5.2.1 Liquefaction

Seismic agitation of loose, saturated sands and silty sands can result in a build-up of pore water pressures. If these pore water pressures are sufficient to overcome overburden stresses, a temporary quick condition known as liquefaction can result. Portions of the site are within a zone determined by the State of California as requiring an investigation for liquefaction. As such, we have performed a liquefaction potential evaluation of the site. The results of this analysis are discussed in Section 6.7.

4.5.2.2 Seismically Induced Flooding

Seismically induced flooding normally includes flooding due to a tsunami (seismic sea wave), a seiche (wave generated in an enclosed body of water), or failure of a dam/reservoir retention structure upstream of the site. The site is located approximately twenty-five (25±) miles from the Pacific Ocean and separated by the Santa Monica and Simi Mountains. Easterly adjacent Castaic Lake is separated from the project site by a prominent northwesterly trending ridgeline. In addition, there are no known up canyon dams or reservoirs. As such, the potential for seismically induced flooding is considered nil.

4.5.2.3 Seismically Induced Landsliding

The site is located within a hillside region. As part of the preparation of this report, this firm performed stability analyses of selected proposed cut, proposed fill and natural slopes within and adjacent to the proposed grading limits depicted on the Tentative

Tract Map. Pseudostatic slope stability analyses were performed in accordance with County of Los Angeles guidelines for preparation of geotechnical reports (Reference 16). The results of these calculations (included herein) meet or exceed County of Los Angeles minimum requirements for both static and pseudostatic conditions.

5.0 ENGINEERING MATERIALS CHARACTERISTICS

5.1 Material Properties

5.1.1 Excavation Characteristics

Based upon the observations made as part of the field investigation, it is anticipated that the materials which will be encountered during construction of the proposed development will primarily include alluvium/colluvium and Saugus and Pico Formation bedrock. It is this firm's opinion that the majority of onsite materials can be excavated with conventional earth-moving equipment. However, some alluvial materials may be overly moist (to saturated) due to existing groundwater levels. Heavy ripping may be required in some bedrock cut areas. Generation of oversized materials (greater than eight inches in diameter) should be anticipated from fill materials generated from alluvium and bedrock cuts. Oversized materials should be addressed as recommended herein (Section 6.13.6).

5.1.2 Earthwork Adjustments

Based upon limited in-situ moisture/density testing of selected samples collected during the field investigation, the following average earthwork adjustment factors are estimated:

Geologic Unit	Map Symbol	Adjustment Factor
Alluvium/Colluvium	Qal	5 - 15% shrink
Saugus Formation	Tsr	0 - 3% shrink to 0 – 7% bulk
Pico Formation	Tp	5 to 15% bulk

It is anticipated that after removal operations are completed, moisture conditioning and recompaction of the exposed alluvial soils (where left in place), will result in a 1± inch subsidence in the main canyon area. Where complete removal of alluvial material occurs, subsidence of the underlying bedrock should be negligible.

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.

5.1.3 Expansion Potential

Based upon test results conducted on selected samples, the coarser-grained rock from the Saugus Formation and alluvial materials derived from it are anticipated to possess expansion potential ranging from "very low" to "low", while the finer-grained Saugus deposits, the Pico Formation and alluvial materials derived from them are anticipated to possess expansion potential ranging from "low" to "high" when tested in accordance with UBC Standard 18-2 and classified in accordance with Table 18-I-B. Claystone/mudstone within the Saugus and Pico Formations may possess expansion potential in the "medium" to "high" range.

5.1.4 Shear Strength Characteristics

Based on the results of laboratory testing and engineering analyses, the following residual shear strength parameters were utilized for this study and are summarized below and presented graphically on the indicated plates in Appendix I:

SHEAR STRENGTH PARAMETERS			
Material	Cohesion, C (psf)	Friction Angle, ϕ (degrees)	Plate
Compacted Fill (90% R.C.)	350	31	B-1
Sunshine Ranch Member (Tsr)	350	35	B-2
Pico Formation (Tp)	450	42	B-3
Alluvium/Colluvium (Qal/Qcol)	250	15	*

* Estimated.

5.1.5 Chemical and Resistivity (Corrosivity) Testing

Sulfate and resistivity testing of various soil samples have been conducted and the results are presented in Table I of Appendix I. Selected samples obtained during the fieldwork for this report were tested for soluble sulfates and chloride content by KYH Company. Resistivity (corrosivity) and pH testing of samples obtained as part of this investigation were performed by this firm.

Sulfate testing of selected material samples from the exploratory excavations indicate that onsite materials are anticipated to possess "negligible" to "moderate" amounts of soluble sulfates when classified in accordance with U.B.C. Table 19-A-4.

Testing of selected material samples from exploratory excavations indicate the onsite materials are anticipated to be "mildly corrosive" to "corrosive" toward onsite ferrous improvements.

5.2 Groundwater

In the easterly portions of Lyons Canyon groundwater was encountered in the exploratory borings at depths ranging fifty-three to sixty-seven (53 to 67±) feet below the existing ground surface (June 2001). Groundwater was not encountered in the main canyon area in January 2004. Boring B-4, located in the southwesterly portion of the main canyon, encountered a (interpreted) perched water level at a depth of fourteen (14±) feet. As such, groundwater is not anticipated to significantly affect the unsuitable material removal operations. In the upper canyon areas where complete alluvial removals are recommended and in the vicinity of Boring B-4, localized saturated zones may be encountered where water is perched in a coarse-grained lens or on the underlying bedrock. The occurrence of this perched water is considered minor and it is anticipated that conventional earthmoving equipment can be used to excavate these materials.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The subject property is considered feasible from a geotechnical standpoint for the proposed development, provided that the conclusions and recommendations presented herein and applicable Code requirements are incorporated into the design and construction of the project. Presented below are specific issues identified by this study as possibly impacting site development. Recommendations to mitigate these issues are presented in the text of this report, with graphic presentation of the recommendations on the enclosed plans and cross-sections, where appropriate.

6.1 Cut Slopes

Cut slopes that are oriented in the same direction and undercut (daylight) planar bedding structure are typically remediated by overexcavation and replacement with engineered buttress fills. Given that bedding generally dips to the north-northeast at moderate to steep angles, daylighted bedding on cut slopes is not anticipated. Therefore, buttress fills are not anticipated at this preliminary stage of development. If bedding conditions exposed during grading indicate shallower (adverse) bedding inclinations, remedial grading in the form of compacted fill buttresses may be required. Where adverse conditions are encountered, factors such as slope height, geometry of the superjacent topography and orientation of bedding are used as guidelines in defining the anticipated remediation.

Where adverse bedding plane considerations are not the critical factor, cut slopes which expose fractured or faulted bedrock, alluvium or colluvium should be rehabilitated with a stabilization fill founded on a keyway a minimum of 15 feet wide, or equivalent in width to one-half the ascending slope height, whichever is greater. A typical stabilization detail is presented on Plate G-3 (Appendix IV).

Geologic observation during grading operations will be necessary to evaluate if actual/exposed conditions are similar to anticipated conditions. Should unanticipated, adverse geologic conditions be exposed, a re-evaluation of slope stability should be conducted.

The northeasterly facing 2:1 cut slope located on Lots 71 and 72, which is on the order of 75± feet in height, is the highest proposed cut slope in the Pico Formation (map symbol Tp) and is displayed on Cross-Section 2-2'. Global stability analyses of this cut slope have been performed (Plates D-7 through D-12; Appendix I) and indicate factors-of-safety in excess of County of Los Angeles minimums.

The southeast facing 1½:1 cut slope located northwesterly of "A" Street, which is on the order of (150±) feet in height, is the highest proposed cut slope in the Saugus Formation – Sunshine Ranch Member (map symbol Tsr) and is displayed on Cross-Section 1-1'. Global stability analyses of this cut slope have been performed (Plates D-1 through D-6; Appendix I) and indicate factors-of-safety in excess of County of Los Angeles minimums.

6.2 Fill Slopes

Fill slopes, when properly constructed at a slope ratio of 2:1 and flatter, are considered to be grossly stable. The highest designed 2:1 fill slope is on the order of (76±) feet in height (Cross-Section 3-3'). Gross stability calculations are presented on Plates D-13 through D-18 in Appendix I and indicate factors-of-safety in excess of County of Los Angeles minimums. Typical fill slope construction details are presented on Plates G-5 and G-6 (Appendix IV).

6.3 Natural Slopes

Steep, natural slopes to heights approaching 200± feet exist onsite as depicted on Cross-Section 4-4'. Global stability analyses of these slopes which are presented on Plates D-19 through D-36 in Appendix I indicate factors-of-safety in excess of County of Los Angeles minimums. Mapped rock fill (Qrf) areas are located within debris basin open areas, away from proposed residential development.

6.4 Surficial Slope Stability

Surficial stability analyses of the proposed 2:1 fill slopes, 1½:1 cut slopes and natural slopes are presented on Plates D-49 through D-51 in Appendix I. The analyses indicate factors-of-safety in excess of County of Los Angeles minimums. However, it is imperative that proper planting, irrigation and maintenance be

continually per-formed on completed graded slopes in an effort to maintain surficial slope stability.

6.5 Hydrocollapse Potential

As discussed in Section 6.6 below, removals of alluvium subject to potential hydrocollapse will be performed to competent bedrock within the majority of the site. An exception to this occurs in the area along "A" Street from its intersection with "F" Street and 600± feet southwest. Alluvial depths in this area are on the order of 50± feet. Based on our review of the boring logs and lab data, it is our opinion that the upper 25± feet of alluvium should be removed in this area. The alluvial materials to be left in-place below the removals in this area were evaluated for hydrocollapse potential as described below.

Of the soils samples upon which consolidometer/hydrocollapse testing was performed, the samples from Borings B-2, B-3, B-4, RW-3, RW-4, and B-103 were considered representative of the area. Of these, only the consolidation graphs of the soil samples of Boring B-2 at 50 feet, B-3 at 30 feet, and B-103 at 25 feet were used in the analyses for potential hydrocollapse. The other graphs presented data on soil samples that were either too shallow (B-3 at 15 feet, B-4 at 10 feet, RW-5 at 15 feet, and B-103 at 15 feet) or possibly disturbed as inferred from the Boring Logs (RW-3 at 25 feet) which indicated that cobbles were encountered in the boring at this depth. The cobbles could have interfered with the sampling process to the extent that the hydrocollapse value indicated on the graph is considered unreliable. Assuming a 25 foot removal in this area (and replacement with compacted fill), and subsequent saturation of the alluvium left in-place, a maximum total hydrocollapse potential of roughly 2 inches is estimated. For design, a differential settlement value related to hydrocollapse on the order of 1-inch over a horizontal distance of 30 feet may be considered.

The above hydrocollapse values pertain to the area described above. It is anticipated that complete alluvial removals will be performed with all other canyons (including tributary canyons). This would eliminate the hydrocollapse potential of alluvial soils in those areas.

6.6 Unsuitable Material Removals

All existing soil, colluvium, rock fall debris, unsuitable alluvium, and weathered bedrock in programmed fill areas or where exposed in shallow cut areas should be removed to firm alluvium or bedrock and be observed by the project engineering geologist/soils engineer. As described in Section 6.5, in the 600± foot section along "A" Street, alluvial removals may be limited to the upper 25± feet of materials below existing grade. Alluvium in the western and eastern portions of Lyons Canyon including all tributary canyons and draws should be removed to fresh, relatively unweathered bedrock prior to the placement of fill material. The removal operations could encounter wet materials which may require special handling, such as top loading of scrappers and/or trucks. Anticipated depths of removals range from 5 feet to 70± feet. Approximate depths of removal are shown on the accompanying Geotechnical Maps. The actual extent of removals can best be determined in the field during grading when observation and evaluation can be performed by the engineering geologist/soils engineer or his authorized representative.

6.7 Liquefaction/Dynamic Settlement

Liquefaction occurs when dynamic loading of a saturated sand or silt causes pore-water pressures to increase to levels where grain-to-grain contact is lost and the material temporarily behaves as a viscous fluid. Liquefaction can cause settlement of the ground surface, settlement and tilting of engineered structures, flotation of buoyant buried structures and fissuring of the ground surface. A common manifestation of liquefaction is the formation of sand boils – short-lived fountains of soil and water that emerge from fissures or vents and leave freshly deposited, conical mounds of sand or silt on the ground surface.

By definition, soils must be saturated for liquefaction to occur. As a consequence, selection of a groundwater level for use in liquefaction analyses is a critical element in estimating the liquefaction and associated dynamic settlement of a site. Some agencies require historic high groundwater levels be used for such analyses. This firm's attempts to obtain groundwater level information did not yield data specific to

Lyons Canyon. Within the main canyon, groundwater was encountered at depths of fifty-three and sixty-seven (53± and 67±) feet in Borings B-1 and B-2, respectively. In the absence of specific historic data, groundwater levels corresponding to 20 feet below existing ground along the 600± foot section of "A" Street were used in estimating the liquefaction and dynamic settlement potential within this area. Per Section 6.6, except for this area, all other potentially liquefiable materials will be removed and replaced with compacted fill.

The exploratory excavations performed within the subject "A" Street section indicate that, to the depths explored, the near-surface soils consist predominately of silty sands with some gravel and isolated fine-grained lenses. The liquefaction and dynamic settlement analysis for this area used SPT N-values generated from rotary wash Boring RW-3 that was performed in the area. The CPT soundings in the main canyon encountered refusal, likely on gravel/cobbles, at depths shallower than the "assumed" groundwater depth (see discussion above) used in the liquefaction and dynamic settlement potential estimations and therefore the data collected from the soundings were not used in estimating the liquefaction potential.

Liquefaction analyses were performed on the coarse-grained lenses utilizing equivalent Standard Penetration Test (SPT) $N_1(60)_{cs}$ blow count values. Fines content corrections to the blow counts were made using data generated from grain size analyses of samples retrieved from the SPT sampler. The $N_1(60)_{cs}$ values were utilized to determine the cyclic stress ratio needed to cause initial liquefaction for an assumed Magnitude 6.6 design earthquake (Appendix II). A probabilistic acceleration of 0.94g (Appendix II) was utilized to calculate the induced cyclic shear stress (Table IV, Appendix III).

These liquefaction calculations indicated that some of the coarse-grained zones exhibited a factor-of-safety of less than 1.0. However, the depth of these lenses suggests that surface manifestation is unlikely.

Seismically induced, post-liquefaction settlement of these coarse-grained lenses was also analyzed. Results indicated seismically induced settlement on the order

of approximately 1-1/3 inches in the coarse-grained lenses of the 600+ foot "A" Street area. These calculations utilized the methods set forth by Seed and Tokimatsu in a 1987 article titled *Evaluation of Settlements in Sands Due to Earthquake Shaking* (Reference 3 of Appendix I). As part of the removals recommended for this area of on the order of 25 feet (Section 6.6), approximately five feet of the potentially liquefiable material will be removed. As such, potential dynamic settlement of the materials to be left in-place is estimated to be approximately one inch.

In April 1991, the State of California enacted the Seismic Hazards Mapping Act (Public Resources Code, Division 2, Chapters 7-8). The purpose of the Act is to protect the public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure. The Act defines mitigation as ". . . those measures that are consistent with established practice and reduce seismic risk to acceptable levels." Acceptable level of risk is defined as "that level that provides reasonable protection of the public safety, though it does not necessarily ensure continued structural integrity and functionality of the project [California Code of Regulations; Section 3721 (a)]."

In the context of that Act, mitigation of the liquefaction potential at this site to appropriate levels of risk can either be accomplished through appropriate foundation and subsurface improvement design and/or ground improvement techniques. Surface manifestation (sand boils, ground fissures, etc.) due to liquefaction at depth is considered unlikely, however, the calculated (estimated) value for seismically induced settlement is on the order of one (1) inch under the assumed design earthquake and provided the recommended removals are performed. Reference 13 suggests that ½ of the maximum settlement value should be used for estimating localized differential settlement. As such, consideration should be given to using a dynamic differential settlement value of roughly ½-inch over a distance of 30-horizontal feet for the material to be left in-place in the 600± foot "A" Street area.

6.8 Zones of Special Foundation Design Considerations

The current development scheme depicted on the Tentative Map indicates established "Limits of Grading" and it is this firm's understanding that numerous oak trees and other native vegetation may be programmed to remain in-place. Consequently, graded areas adjacent to "Limits of Grading" in canyon areas and adjacent to the trees may be impacted by the inability to remove alluvial materials within the structural influence of the planned compacted fill prisms. These areas may be subject to increased settlement potential and could require specially designed foundation systems and exterior improvements, enhanced drainage patterns, and be subject to increased levels of site maintenance to address/correct resultant surface movements. The geometry of these zones will be a function of the depth of removal and thickness of compacted fill placed to achieve design grades. Additional evaluation of these areas should be performed at the Grading Plan Review stage.

6.9 Overexcavation of Building Pads and Cut Fill Transitions

Due to the variability in expansion potential of the onsite bedrock, overexcavation of all cut lots which expose either the Pico or Saugus Formations will be required within building pad areas. Design cut lots within the Saugus Formation should be overexcavated a minimum five (5) feet and replaced with a compacted fill section. Design cut lots within the Pico Formation should be overexcavated a minimum of eight (8) feet due to the steeply dipping orientation of this unit. Deeper overexcavations may be required based on exposed conditions.

In order to reduce the differential settlement potential on lots with cut/fill transitions, the cut portion of transition lots shall be overexcavated to a depth equal to 1/3 of the deepest fill section within the building pad area, to a maximum depth of 15 feet (minimum depth of 5 feet in the Saugus Formation and 8 feet in the Pico Formation). A typical cut/fill transition detail is presented on Plate G-4 (Appendix V). The soils engineer/engineering geologist should be consulted with regard to exposed conditions after undercutting in order to evaluate the need for and

disposition of subsurface drainage requirements, which could include sloping of the overexcavation bottoms and/or installation of subdrains.

6.10 Pipelines, Oil and/or Water Wells, Cesspools and Septic Tanks

Review of oilfield maps in References 4 and 14 indicates one (1) oil well is located in the central portion of the project site. The Sun Drilling Company constructed the "Ayers" drill site in 1961 with a total depth of 9,785 feet and subsequently abandoned the well. The location of the well site was observed during the field reconnaissance investigation and the approximate location of this site is illustrated on the accompanying Geotechnical Maps. Oil well abandonment and venting procedures are not within this firm's purview. Oil and/or water wells encountered within the areas proposed for development should be abandoned/ destroyed in accordance with local and State of California Code requirements.

Cesspools and septic tanks, if encountered, should be removed to a minimum of five (5) feet below existing grade or finished grade, whichever is lower. The portion of cesspools not removed should be pumped of their contents and filled with washed concrete sand, thoroughly jetted into place or, if in the influence zone of structures, with a lean 3-sack slurry mix. The remaining cavities should be filled with compacted fill as specified herein.

6.11 Canyon Subdrains

Canyon subdrains will be required. Proposed subdrain locations are shown on the accompanying Geotechnical Maps. Final determination of drain locations will be made in the field based on exposed conditions. Drains should be constructed in accordance with Plates G-1 and G-2 (Appendix IV). In some instances, removal geometry and available subdrain outlet elevations may require placement of a canyon subdrain "ring" around the perimeter of a given cleanout excavation. Compacted fill materials placed below the subdrain "ring" should be placed at a 93 percent (minimum) relative compaction standard. In order to daylight canyon subdrains, it may be necessary to "run" the lower portion of the subdrain through compacted fill. Non-perforated pipe should be used in compacted fill and a con-

crete head wall should be constructed at the perforated/non-perforated transition as per Plates G-14 and G-15 (Appendix IV).

6.12 Settlement Monitoring

Alluvial materials are programmed to remain in place in the easterly portions of Lyons Canyon. In light of the potential magnitude of post-grading settlements in this area, a settlement-monitoring program should be performed at the completion of rough grading and prior to construction. In addition, deep fill areas (i.e. fill thickness in excess of 40 vertical feet) should be placed on a settlement monitoring program. Typical settlement monitor details are included on Plates G-12 and G-12a (Appendix IV).

6.13 Earthwork Considerations

6.13.1 Compaction Standards

All fill and processed natural ground should be compacted to a minimum relative compaction of 90 (or 93) percent, as determined by ASTM Test Method: D-1557-91. A 93 percent minimum relative compaction standard should be implemented on fill materials placed at depths greater than forty (40±) feet below finish grade and where fill materials are placed below subdrain pipes. Compaction should be achieved at slightly above optimum moisture content. Mixing and moisture conditioning are anticipated to be required in order to achieve the required moisture conditions.

6.13.2 Observation of Excavations

All removal bottoms shall be observed and approved by the project engineering geologist and/or soils engineer prior to fill placement. In addition, all removal bottoms and keyways should be survey located.

6.13.3 Treatment of Removal Bottoms

At completion of unsuitable soil removals and excavation of any required keyways, the exposed bottom shall be scarified to a minimum depth of

eight (8) inches, moisture-conditioned to slightly above optimum and compacted to the standards set forth in this report.

6.13.4 Fill Placement

After removals, scarification, and compaction of exposed materials are completed, additional fill may be placed. Fills shall be placed in thin lifts (maximum 8 inches in bulk thickness), properly moisture conditioned, and compacted as grading progresses until final grades are attained.

6.13.5 Mixing

In order to prevent layering of different soil types and/or different moisture contents, mixing of materials may be necessary. The mixing should be accomplished prior to and as part of compaction of each fill lift. Discing may be required when either excessively dry or wet materials are encountered. Where rocks are included in the fill, they should be mixed with suitable excavated materials to eliminate voids.

6.13.6 Oversized Materials

Past experience with grading of the projects in this area indicate the generation of oversized rock materials is likely to occur. Rocks greater than eight (8) inches in diameter may be utilized in compacted fills provided the rocks are not placed in the uppermost ten (10) feet of the compacted fill section, nor in concentrated pockets and there is a sufficient percentage of fine material surrounding the rock. Oversized rock up to three feet in height and six feet in width can be placed in windrows with a minimum equipment width (15 feet) separating each windrow. Granular fill should be thoroughly flooded into the rock voids and covered with a minimum, two-foot compacted fill blanket. Successive windrows should be staggered and none should be placed within ten (10) feet of finished grade or closer than fifteen (15) feet to compacted fill slope surfaces. Details of placement of oversized rock are shown on Plate G-10 (Appendix IV). Per Los Angeles County Department of Public Works, Materials

Engineering Division, windrows shall be survey located and the approximate location and elevation shall be presented on a Final Geologic Map. Deeper "clear" zones may be required where deep utilities are proposed.

The above requirements also apply to inert construction debris (concrete, brick, etc.) as encountered on the site provided that the materials proposed for incorporation into the compacted fill section have been observed and approved by the project soils engineer.

6.13.7 Import Soils

Import soils, as required, should consist of clean, compactible materials having soils engineering properties similar to those on-site and should be free of trash, debris or other objectionable materials.

PLANS AND SPECIFICATIONS SHOULD INDICATE THAT THE GRADING CONTRACTOR SHALL NOTIFY THE PROJECT SOILS ENGINEER NOT LESS THAN 72 HOURS (3 BUSINESS DAYS) IN ADVANCE OF THE LOCATION OF ANY SOILS PROPOSED FOR IMPORT. EACH PROPOSED IMPORT SOURCE SHALL BE SAMPLED BY THE GEOTECHNICAL ENGINEER/GEOLOGIST, TESTED AND APPROVED PRIOR TO DELIVERY OF SOILS FOR USE ON THE SITE.

6.13.8 Haul Roads

Haul roads traversing compacted fill areas should be coordinated and planned to avoid or minimize generation of loose spill fill thereon. When this condition is unavoidable, close coordination with the project soils engineer and his representative will be required to eliminate intermingling of engineered and non-engineered fill.

6.13.9 Testing of Compacted Artificial Fill

Fill should be tested at the time of placement to ascertain that the required project compaction and moisture content specifications are achieved. A laboratory testing program for representative "bulk" samples of fill materials should run concurrently with grading operations.

6.13.10 Final Reports

The results of the observations and testing of all earthwork should be presented in a final rough grade geotechnical report following the completion of earthwork and grading. The report should include a Geologic Map.

7.0 DESIGN RECOMMENDATIONS

7.1 Structural Design

It is anticipated that one- and two-story, wood frame and stucco residential structures with shallow foundations may be constructed on the lots. Maximum anticipated wall loads are expected to be less than 2 kips per foot.

The types of proposed construction relative to the multi-family housing and fire station were not provided to this firm for review. As these plans are developed, they should be provided to the Geotechnical Engineer for review.

Upon the completion of rough grading, finish grade samples should be collected and tested so as to provide specific recommendations as they relate to individual lots. These test results and corresponding design recommendations will be presented in a Final Rough Grading Geotechnical Report. Final foundation design recommendations should be made based upon specific structure-sitings, loading conditions, and as-graded soil conditions. For preliminary purposes, the following foundation design requirements relative to the residential portions of the site are presented.

7.1.1 Foundation Design

Based upon the hillside nature of the project and the expansion potential of the onsite soils, this firm recommends the utilization of post-tensioned slabs, mat-slabs or other foundation system(s) for the residential structures designed to account for site specific geotechnical conditions. Minimum foundation recommendations which should be incorporated into the design and construction of the proposed structures utilizing a post-tensioned slab-on-grade foundation system are as follows:

- Design and construction of the proposed foundations systems should be undertaken by firms that are experienced in this field. It is the responsibility of the foundation design engineer to select the design methodology and properly design the foundation systems for the soils conditions indicated herein. The slab designer should provide deflection potential to the project architect/structural engineer for incorporation into the design of the structure.

- For design purposes, a bearing capacity of 1,000 psf may be used at the surface for compacted fill. A bearing capacity of 1,500 psf may be used at embedment depth of 18 inches. A bearing capacity of 2,000 psf may be used at embedment depths of 24 and/or 30 inches.

- In designing to resist horizontal loads, a lateral bearing of 250 lbs./sq.ft. per foot of embedment, to a minimum of 2,000 lbs./sq.ft. and a friction coefficient of 0.35 may be used where slabs or footings are cast against firm compacted fill. Friction and lateral bearing may be combined as allowed by Code. The above values may be increased one-third for resisting seismic or wind forces.

- Post-tensioned slabs, where used, should incorporate a perimeter-thickened edge to reduce the potential for moisture infiltration, seasonal moisture fluctuation, and associated differential heave/settlement around the slab perimeter. The minimum depth of the thickened edge should be 12 inches for construction on lots grouped into the "very low" to "low" expansion potential category, 18 inches for construction on lots grouped into the "medium" expansion potential category, and 24 inches for construction on lots grouped into the "high" expansion potential category. The minimum embedment depth should be measured from lowest adjacent grade within 5 feet of the structure for both single and two-story structures.

- Thickened perimeter edges of the post-tensioned slab foundation systems, where utilized, should be reinforced with a minimum of one No. 4 bar, placed near the bottom of the thickened edge.

- If the project foundation design engineer elects to use the PTI foundation design procedures presented in the UBC, additional design parameters can be presented.

- Isolated exterior post/column footings should be tied back to the main foundation system in at least two (2) orthogonal directions.

- A moisture and vapor retarding system should be placed below all slabs-on-grade in living areas and other portions of the structures considered to be moisture sensitive. The retarder should be of suitable composition,

thickness, strength and low permeance to effectively prevent the migration of water and reduce the transmission of water vapor to acceptable levels. Historically, a 10-mil plastic membrane, such as Visqueen placed between 2 to 4 inches of clean sand, has been used for this purpose. The use of this system or other systems, materials, or techniques can be considered, at the discretion of the designer, provided the system reduces the vapor transmission rates to acceptable levels.

It is essential to prevent damage to the "Visqueen" membrane. Care should be utilized when placing the membrane on subgrade to prevent damage. Sharp fragments should be removed from the subgrade surface and penetration of the membrane with screed guides should be avoided. The membrane should be properly lapped and sealed as well as sealed around all plumbing lines and other openings.

- To reduce moisture penetration beneath the slab-on-grade areas, utility trenches should be backfilled with lean concrete or concrete slurry where they intercept the foundation perimeter. As an alternative, the utility trenches can be backfilled with on-site materials compacted to a minimum 90 percent of the applicable laboratory maximum dry density.

- Slab subgrade (including exterior concrete flatwork) should be moisture-conditioned to 125 percent of optimum moisture on lots classified as having "very low" to "low" expansion potential and 140 percent of optimum on lots classified as having "medium" to "high" expansion potential. Moisture conditioning should extend to a depth of 12 inches prior to placing concrete. Excavations should not be allowed to significantly dry out from the time of excavation to the placement of concrete.

Verification of expansive soils should be made as final grades are achieved. The above recommendations should be considered preliminary and subject to review, pending verification of expansive soil characteristics and graded conditions at the conclusion of grading operations.

7.1.2 Differential Settlement Design Value

In addition to the potential effects of expansive soils, the proposed residential structures should be designed in anticipation of differential settlements on the order of 1 inch in 30 feet.

7.1.3 Probabilistic Ground Acceleration

No evidence of active faulting was observed during recent field investigations and no active faults are known to exist along or to cross the site. Therefore, the probability of primary surface rupture and/or deformation at the site is considered very low. Ground shaking hazards caused by earthquakes along active regional faults, however, do exist. Consistent with current practices in the study region and per CGS Note 48 (CGS, 2004), PSE, Inc. computed probabilistic analyses to provide levels of hypothetical free-field peak ground acceleration for a finite period. In sum, the analyses yielded a PGA of 0.94g as that which has a 10 percent probability of being exceeded within a 50-year span (475-year return period), and 1.11g for that with a 10 percent chance of exceedance in 100 years (949-year return period). A complete seismic analysis is presented in Appendix II of this report.

The calculated free-field PGA should not necessarily be used in empirical engineering formulas currently in use to determine earthquake-resistant engineering design. It has been noted that a single peak of intense motion (maximum peak acceleration) might contribute less to cumulative damage potential then multiple cycles of less intense shaking. The California Geological Survey (CGS), formerly California Division of Mines and Geology (CDMG), cautions that the seismic coefficient "k" is not equivalent to peak ground acceleration, and that peak ground acceleration should not be used in pseudostatic slope stability analyses. *In particular, the free-field PGA given above is not equivalent to the seismic coefficients contained in the 2001 CBC seismic design criteria, and is not intended to be substituted therein.*

Design of future improvements should be based on current design practices for similar works in the area. It is the purview of the design engineer, based upon information presented herein, to select suitable

seismic parameters. As an aid to parameter selection, the 2001 CBC seismic coefficients are presented herein in Section 7.1.4.

7.1.4 2001 CBC Seismic Design Parameters

Presented below is a summary of the seismic data obtained from the 2001 Edition of the California Building Code , as it would pertain to the subject project. The site is located within two (2) kilometers of seismic source B-faults (Santa Susana, Holser, and San Gabriel Fault) with an assumed Soil Profile type -S_D.

Table 7.1. 4 - SEISMIC DESIGN PARAMETERS
Proposed Lyons Canyon Ranch Development
Tentative Tract Map No. 53653
Lyons Canyon/Santa Clarita Area
COUNTY OF LOS ANGELES, CALIFORNIA

Seismic Parameter	Design Value	2001 CBC – Chapter 16 Table No.
Seismic Source Type	B	16-U
Assumed Soil Profile Type	S_D	16-J
Seismic Zone Factor (Z)	0.4	16-Q
Seismic Coefficient (C_a)	$0.44(N_a)$	16-Q
Seismic Coefficient (C_v)	$0.64(N_v)$	16-R
Near-Source Factors (N_a)	1.3	16-S
Near-Source Factors (N_v)	1.6	16-T

7.1.5 Deepened Footings and Setbacks

In order to reduce the effects of creep, foundations that are adjacent to descending natural and/or design slopes should be deepened in accordance with specifications of the County of Los Angeles Building Code which indicates that structures should be set back from the top of slope a minimum horizontal distance of one-third the descending slope height (H/3) with a minimum of 5 feet and a maximum of 40 feet. This setback should be measured horizontally from the bottom outside edge of footing to the slope face. Deepened footings, therefore, may be required for structures that are located near descending slopes. If deepened footings are required, consideration should be given to increasing the minimum required lot

overexcavation as recommended in Section 6.3. This recommendation should be evaluated based on conditions exposed during grading.

Backyard improvements, such as patio slabs, pools, perimeter walls, etc., should also be designed in consideration of potential creep on descending slopes. Footings for perimeter walls at the top of natural slopes should be founded in competent/unweathered bedrock. These wall-footing excavations should be observed by the project soils engineer/engineering geologist.

7.1.6 Chemical Design Considerations

Preliminary test results (by others) indicate the onsite soils tested contain "negligible" to "moderate" sulfate concentrations. Structural concrete should be designed by qualified professionals in accordance with the requirements of Table 19-A-4 of the UBC, considering both the minimum compressive strength and water/cement ratio requirements for the anticipated sulfate exposure levels.

In addition, preliminary test results indicate onsite soils are "mildly corrosive" to "corrosive" toward ferrous materials.

Material samples from the soil types being utilized as compacted fill during mass grade operations should be tested for chemicals and properties (i.e. sulfates, pH, chloride, and resistivity) that are deleterious to construction materials.

Consideration should be given to consulting a corrosion engineer for a more detailed evaluation, and attendant recommendations.

7.1.7 Miscellaneous Foundation Recommendations

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.

To minimize moisture penetration beneath the slab-on-grade areas, utility trenches should be backfilled with lean concrete or concrete slurry where they intercept the perimeter footing (immediately below perimeter thickened edges). As an alternative, such excavations may be backfilled with on-site soils, moisture conditioned to over optimum moisture, and compacted to a minimum of 90 percent relative compaction.

Provisions for the control of shrinkage cracks should be incorporated into design/construction of the proposed foundations.

7.2 Other Design and Construction Recommendations

7.2.1 Site Drainage

Positive drainage, away from structures, should be provided and maintained. Homeowners and/or residents should be made aware that they are responsible for maintenance and cleaning of all drainage terraces, downdrains and other devices that have been installed to reduce ground saturation, and to promote structure and slope stability.

7.2.2 Concrete Flatwork and Lot Improvements

In an effort to minimize shrinkage cracking, concrete flatwork should be constructed of uniformly cured, low slump concrete and should contain sufficient control/contraction joints (typically spaced at 8± feet, maximum).

Additional provisions need to be incorporated into the design and construction of all improvements exterior to the proposed structures (pools spas, walls, patios, walkways, planters, etc.) to account for the hillside nature of the project as well as being designed to account for potential expansive soil conditions. Design considerations on any given lot may need to include provisions for differential bearing materials (bedrock vs. compacted fill), ascending/descending slope conditions, bedrock structure, perched (irrigation) water, special surcharge loading conditions, potential expansion soil pressure and differential settlement/heave, among others.

All exterior improvements should be designed and constructed by qualified professionals utilizing appropriate design methodologies, which account for the on-site soils and geologic conditions. The above considerations should be used when designing, constructing and evaluating long-term performance of the exterior improvements on the lots.

7.2.3 Debris Basins

A number of debris basins are proposed for this project. Slope stability analysis was performed for a basin with proposed 2:1 slope for "full basin" and "rapid drawdown" conditions (see Cross-Section 5-5'). The calculations, presented on Plates D-37 through D-48, indicate factors-of-safety in excess of County minimums.

7.2.4 Storm Drain Pipeline

Flexible pipe joints should be utilized at cut/fill transition areas which expose bedrock and compacted fill materials. Given the hillside nature of the project, it is anticipated this condition will occur.

7.2.5 Utility Trench Excavation

All utility trenches should be shored or laid back in accordance with applicable OSHA standards. Excavations in bedrock areas should be made in consideration of underlying geologic structure. The project soils engineer/ geologist should be consulted on these issues during construction.

7.2.6 Utility Trench Backfill

Mainline and lateral utility trench backfill should be compacted to at least 90 percent of the applicable maximum density as determined ASTM Test Method:D-1557-91. Onsite soils will typically not be considered suitable for use as bedding material but will be suitable for use in backfill, provided oversized materials are removed. Compaction should be accomplished by mechanical means. Jetting of native soils will not be acceptable.

Under-slab trenches should also be compacted to project specifications. If native soils are used, mechanical compaction is recommended. If select granular backfill (SE>30) is utilized, compaction by flooding will be acceptable. The soil engineer should be notified for inspection prior to placement of the membrane and slab reinforcement. The use of a double layer of mesh across under-slab plumbing trenches is considered an acceptable alternative to compaction or sand backfill.

8.0 SLOPE AND LOT MAINTENANCE

8.1 Slope Planting

Slope planting should consist of ground cover, shrubs, and trees, which possess deep, dense root structures that require a minimum of irrigation. It is the responsibility of the homeowner and/or resident to maintain such planting.

8.2 Slope Irrigation

The homeowner and/or resident is responsible for installation of proper irrigation systems, as well as maintenance and repair of such systems. Leaks should be repaired immediately. Sprinklers should be adjusted to provide maximum uniform coverage with a minimum of water usage and overlap. Overwatering with consequent wasteful runoff and serious ground saturation should be avoided. If automatic sprinkler systems are installed, their use must be adjusted to account for natural rainfall conditions.

8.3 Lot Drainage

Design fine grade elevations should be maintained through the life of the structure. If design fine grade elevations are altered, adequate area drains should be installed in order to provide rapid discharge of water, away from the structures and slope areas.

8.4 Burrowing Animals

Homeowners and/or residents should undertake a program for the elimination of burrowing animals. This should be an ongoing program in order to maintain slope stability.

9.0 FUTURE PLAN REVIEWS

This report represents a geotechnical review of the 100-scale Tentative Tract Map, dated March 24, 2006, for the proposed Lyons Canyon Ranch Development. Pertinent recommendations contained in this report should be considered for incorporation into the project grading plans and construction specifications. To prevent the possible separation of such information, this report should be included as a referenced portion of all phases of the project development. As the project design progresses, site specific geologic and geotechnical issues need to be incorporated into design and construction of the project. Consequently, future plan reviews may be necessary and may include:

- Revisions to the Tentative Tract Map
- Rough Grading plans
- Precise Grading plans
- Foundation plans – single-family residential, multi-family housing and fire station
- Retaining wall plans

These plans should be forwarded to the project soils engineer/geologist for evaluation and comment, as necessary.

10.0 CLOSURE

The proposed grading indicated on Tentative Tract Map No. 53653 will be free from the hazards associated with landsliding, settlement and slippage provided that the grading construction is performed in an acceptable manner in accordance with applicable Code requirements and recommendations contained herein. Further, the completed grading will not have a detrimental effect on the geologic stability of neighboring offsite properties.

The conclusions and recommendations in this report are based on the data developed during this investigation, on a review of the referenced reports, and on the Tentative Tract Map, dated March 24, 2006, provided by Diamond West Engineering, Inc. 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.

APPENDIX I

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APPENDIX I

REFERENCES

1. United States Geological Survey (U.S.G.S.), 1952, Oat Mountain, California, 7½ Minute Quadrangle, SE/4 Santa Susana 15' Quadrangle, N3415-W11830/7.5, photo revised 1969.

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APPENDIX I

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17. Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California; by ASCE Los Angeles Section Geotechnical Group, published by Southern California Earthquake Center, February 2002.

18. Preliminary Geotechnical Investigation, Proposed Lyons Canyon Ranch Development, Tentative Tract Map No. 53653, Lyons Canyon/Santa Clarita Area, County of Los Angeles, California; by Pacific Soils Engineering, Inc., dated June 28, 2002 (W.O. 102453).

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20. County of Los Angeles Department of Public Works, Geotechnical and Materials Engineering Division, Geologic Review Sheet, Tentative Tract Map 53653, Santa Clarita, dated July 7, 2005 (copy attached; see Appendix VI).

21. County of Los Angeles Department of Public Works, Geotechnical and Materials Engineering Division, Soils Engineering Review Sheet, Tentative Map (Tract) 53653, Santa Clarita, dated July 12, 2005 (copy attached; see Appendix VI).

22. County of Los Angeles Department of Public Works, Geotechnical and Materials Engineering Division, Geologic Review Sheet, Tentative Tract Map 53653, Santa Clarita, dated August 25, 2005 (copy attached; see Appendix VI).

23. County of Los Angeles Department of Public Works, Geotechnical and Materials Engineering Division, Soils Engineering Review Sheet, Tentative Map (Tract) 53653, Santa Clarita, dated September 13, 2005 (copy attached; see Appendix VI).

24. County of Los Angeles Department of Public Works, Geotechnical and Materials Engineering Division, Geologic Review Sheet, Tentative Tract Map 53653, Santa Clarita, dated January 12, 2006 (copy attached; see Appendix VI).

25. County of Los Angeles Department of Public Works, Geotechnical and Materials Engineering Division, Soils Engineering Review Sheet, Tentative Map (Tract) 53653, Santa Clarita, dated January 17, 2006 (copy attached; see Appendix VI).

AERIAL PHOTO REVIEW

Date of Flight	Frame Numbers
May 20, 1977	31 through 33

APPENDIX I

FIELD INVESTIGATION AND LABORATORY TESTING

The investigation performed as part of this report included review of existing published geologic reports and maps of the area; review of available aerial photographs; geologic mapping/reconnaissance of the site; and subsurface field investigation programs. Geologic reconnaissance and field mapping, which focussed towards obtaining structural information and surface contacts of exposed geologic units, was conducted in June, July and November 2001, April and May 2002, January 2004, December 2005 and January 2006. Subsurface field investigation programs, that were performed within the same time frames, emphasized obtaining geologic and geotechnical data in order to assess the physical and chemical properties of the on-site materials. The subsurface programs included the excavation of twenty (20) bucket-auger borings (B-1 through B-6, B-6B, B-7 through B-14, B-14B and B-101 through B-104); ninety-eight (98) exploratory backhoe pits (EP-1 through EP-47, EP-101 through EP-144 and EP-201 through EP-207); six (6) rotary-wash borings (RW-1 through RW-6); and two (2) combination rotary wash borings/CPT Soundings (CPT/SPT-1 and CPT/SPT-2).

The borings were excavated utilizing either a truck-mounted 30-inch diameter bucket auger drill rig or a 4½-inch diameter truck mounted rotary wash drill rig. The exploratory pits were excavated utilizing a track-mounted backhoe with a 24-inch bucket. A representative of this firm's geologic/engineering staff observed, logged and selectively sampled the exploratory borings and pits at the time of the excavations. The logs of these excavations appear in Table II and on Plates A-1 through A-50 (Appendix I). The approximate locations of these exploratory excavations are shown on the accompanying Geotechnical Maps (Plates F-1 and F-2; in pocket).

In order to assess the physical and chemical properties of onsite earth materials, representative "bulk" and relatively "undisturbed" ring samples were obtained from the subsurface excavations and transported to our laboratory for testing. The relatively "undisturbed" ring samples collected were obtained by advancing a modified "California" type sampling spoon through the earth materials by repeated blows from either a Kelly Bar (drill rig drilling bar) for the bucket auger borings, a 400-pound hammer for the rotary wash borings, or a 30 pound drive block on the hand sampler. The sampling spoon is lined with brass rings, each one, 1 inch in height by 2.50 inches

inside diameter for the bucket auger borings and 2.42 inches inside diameter for the rotary wash borings. Additionally, in the rotary wash borings, small plastic bag bulk soil samples were obtained utilizing a 2-inch outside diameter Standard Penetration Test (SPT) sampler that was advanced using a 140-pound hammer free falling 30 inches. Relatively "undisturbed" ring samples and "bulk" samples were taken to our laboratory in airtight containers. The results of the in-place moisture-density determinations from the sampling program are presented on the boring logs (Plates A-1 through A-50). All other information obtained from selected "undisturbed" ring samples and selected "bulk" samples collected and tested pertaining to this part of the investigation is contained in Table I, on Plates B-1 through B-3 and C-1 through C-19 (Appendix I).

Portions of the project site have been included in the State of California Seismic Hazards Zone (Reference 11) for liquefaction potential. As such, four (4) standard Cone Penetration Testing soundings (CPT-1 through CPT-4) were performed in an attempt to aid in site-specific evaluation of liquefaction potential. Gregg In-situ, Inc. under periodic observation from a representative of this firm's geologic staff conducted the CPT soundings in June and July 2001. A truck-mounted, integrated electronic cone system that recorded parameters of tip resistance, sleeve friction and dynamic pore pressure which are simultaneously printed and electronically stored for future analysis and reference was used. The approximate locations of the CPT soundings are illustrated on the accompanying Geotechnical Maps (Plates F-1 and F-2; in pocket).

Due to refusal at relatively shallow depths for CPT soundings CPT-1 through CPT-4, two (2) additional excavations were conducted in July 2001 (CPT/SPT-1 and CPT/SPT-2). These excavations were performed with a truck-mounted top head rotary drill rig with a 4½-inch diameter drill bit, with an electronic system that recorded parameters including bit load, flush pressure, revolutions per minute, rotation pressure and rate of penetration. Small plastic bag bulk soil samples were obtained from the excavations utilizing a 2-inch outside diameter Standard Penetration Test (SPT) sampler advanced by 140-pound hammer free falling 30 inches. This drill rig also possessed the capability to perform Cone Penetration Testing (CPT) soundings. The intention of this "combination" SPT/CPT system was to drill through gravelly lenses within the alluvium, and utilize the CPT capabilities in the finer-grained materials. A representative of this firm's geologic staff observed, logged and selectively sampled the borings at the time of excavation. The

boring logs are presented in Appendix I. The approximate location of these excavations is illustrated on the accompanying Geotechnical Maps (Plates F-1 and F-2; in pocket).

Laboratory tests on samples collected during the subsurface field investigation consisted of in-situ moisture-density determinations, maximum dry density/optimum moisture content, grain size, shear strength, consolidation characteristics, expansion index and chemical testing. A brief description of the laboratory tests is presented below.

Moisture Density Determination

The unit dry weight and natural moisture content were determined for selected "undisturbed" ring samples. The results of these tests are included on the Geotechnical Boring Logs (Plates A-1 through A-50).

Grain Size Determination

Grain size analyses were performed on the minus No. 10 sieve portion of selected representative bulk samples. The tests were performed utilizing hydrometer test methods. The results of these tests were used as an aid in soil classification and are presented in Table I of Appendix I.

Shear Strength Determination

Shear tests were performed on selected remolded and "undisturbed" ring samples of the predominant soil types with a direct shear machine of the strain control type in which the rate of strain in 0.05 inches per minute. Specimens were inundated for approximately 24 hours in a confined condition and then subjected to shear under various normal loads. Results of these tests are summarized on Plates B-1 through B-3 in Appendix I.

Consolidation Tests

Consolidation tests were performed in accordance with procedures outlined in ASTM:D-2435. Testing was performed on 19 relatively "undisturbed" ring samples of the onsite earth materials.

The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. Hydroconsolidation (collapse) and expansion characteristics were also evaluated by monitoring the change in volume with saturation while the

specimen was confined under a constant normal stress. Consolidation test results are shown on Plates C-1 through C-19 in Appendix I.

Expansive Soils Characteristics

Expansion characteristics were evaluated on selected representative near surface bulk samples in accordance with Uniform Building Code Expansion Index Test (UBC Standard 18-2). The results of these tests are presented in Table I in Appendix I.

Corrosivity Analyses

Selected soil samples were analyzed for determination of pH and resistivity. The electrical resistivity of a soil is a measure of its resistance to the flow of electrical current. Corrosion of buried metal is an electrochemical process in which the amount of metal loss due to corrosion is directly proportioned to the flow of electrical current (DC) from the metal into the soil. The soil's resistivity decreases and, therefore, its corrosivity increase primarily as its moisture and chemical contents increase.

A commonly accepted correlation between electrical resistivity and corrosivity toward ferrous metals is:

Soil Resistivity in ohm-centimeters	Corrosivity Category
0 to 1,000	severely corrosive
1,000 to 2,000	corrosive
2,000 to 10,000	moderately corrosive
over 10,000	mildly corrosive

The results of the corrosivity analyses are presented in Table I in Appendix I.

Chemical Testing

Testing for soluble sulfates and chlorides was performed (by others) on selected bulk samples. The results of these tests are included in Table I in Appendix I.

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TABLE I

SUMMARY OF LABORATORY TEST DATA

Boring	Depth (ft.)	Description	ASTM D-1557		Direct Shear			Expansion Index (UBC 18-2)	Grain Size Analysis				Chemical Analyses				Other Tests
			Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Cohesion (psf)	Friction Angle ,Ø, (degrees)	Test Conditions		% Gravel +#4	% Sand	% Silt	% Clay	Sulfate* (% by wt.)	Chlorides* (% by wt.)	pH	Resistivity (ohm-cm.)	
B-1	10	Yellowish Brown Sandy Silt							0	30	52	18					Consol. Plate C-1
B-1	20	Yellowish Brown Silty Sand							0	72	20	8					Consol. Plate C-2
B-1	50	Yellowish Brown Silty Sand							29	54	11	6					Consol. Plate C-3
B-2	10	Yellowish Brown Silty Sand	123.4	10.7	See Plate B-1		R/S	2	0	51	38	11	<0.001		7.6	6,663	
B-2	50	Yellowish Brown Gravelly Sand							17	69	8	6					Consol. Plate C-4
B-3	15	Yellowish Brown Silty Sand							4	91	3	2					Consol. Plate C-5
B-3	30	Yellowish Brown Silty Sand							14	67	14	4					Consol. Plate C-6
B-4	10	Yellowish Brown Sandy Silt							0	43	42	15					Consol. Plate C-7
B-6B	10	Yellowish Brown Sandy Siltstone	120.4	11.2	See Plate B-1		R/S	20	10	25	53	12	0.016		8.1	1,988	
B-6B	15	Light Gray Sandy Siltstone			See Plate B-2		U/S		0	22	68	10					
B-7	5	Yellowish Brown Silty Sand			See Plate B-2		U/S		2	85	8	5					
B-7	5	Yellowish Brown Silty Sand	127.8	8.5	See Plate B-1		R/S	17	9	53	22	16	<0.001		7.1	13,300	
B-8	20	Light Olive Silty Sandstone			See Plate B-2		U/S		1	59	28	12					
B-9	20	Yellowish Brown Silty Sand							2	60	27	11					Consol. Plate C-8
B-9	40	Olive Gray Silty Sandstone			See Plate B-2		U/S		2	68	20	10					
B-10	30	Olive Gray Sandy Siltstone	118.4	13.1	See Plate B-1		R/S	26	0	43	42	15	0.127	0.005	7.2	1,130	
B-10	30	Olive Gray Sandy Siltstone			See Plate B-3		U/S		0	35	52	13					
B-11	30	Grey Siltstone	117.6	12.0	See Plate B-1		R/S	110	0	1	58	41	0.143	0.002			
B-11	40	Gray Siltstone			See Plate B-3		U/S		0	1	52	47					
B-11	60	Gray Siltstone			See Plate B-3		U/S		0	0	57	43					

* Test performed by others.

Direct Shear Test Conditions: R = Remolded; U = Undisturbed
S = Saturated; N = Natural Moisture

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TABLE I

SUMMARY OF LABORATORY TEST DATA

Boring	Depth (ft.)	Description	ASTM D-1557		Direct Shear			Expansion Index (UBC 18-2)	Grain Size Analysis				Chemical Analyses				Other Tests
			Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Cohesion (psf)	Friction Angle ,Ø, (degrees)	Test Conditions		% Gravel +#4	% Sand	% Silt	% Clay	Sulfate* (% by wt.)	Chlorides* (% by wt.)	pH	Resistivity (ohm-cm.)	
B-12	30	Gray Sandy Siltstone	114.9	13.1	See Plate B-1		R/S	42	0	16	63	21	0.164	0.003	7.6	660	
B-12	30	Gray Sandy Siltstone			See Plate B-3		U/S		0	13	67	20					
B-13	20	Gray Sandy Siltstone	114.9	14.9	See Plate B-1		R/S	15	0	29	57	14	<0.001	0.001	7.5	7,340	
B-13	20	Gray Sandy Siltstone			See Plate B-2		U/S		0	29	58	13					
B-13	50	Gray Silty Sandstone	128.9	8.8	See Plate B-1		R/S	0	0	68	19	13	<0.001	0.003	7.8	8,000	
RW-1	10	Brown Silty Sand							6	64	24	6					
RW-1	15	Brown Silty Sand							13	68	13	6					
RW-1	20	Brown Sandy Gravel							57	32	8	3					
RW-1	25	Brown Gravelly Sand							33	58	7	2					
RW-1	30	Brown Silty Sand							1	68	23	8					Consol Plate C-9
RW-1	35	Brown Gravelly Sand							25	60	11	4					
RW-1	40	Brown Gravelly Sand							33	45	15	7					
RW-1	45	Brown Gravelly Sand							35	54	7	4					
RW-2	10	Brown Silty Sand							0	68	25	7					
RW-2	21	Reddish Brown Gravelly Sand							36	42	16	6					
RW-2	25	Brown Sandy Silt							6	41	41	12					
RW-2	30	Brown Silty Sand							15	48	27	10					
RW-2	35	Light Brown Silty Sand							12	57	22	9					
RW-2	45	Brown Silty Sand							11	76	10	3					
RW-3	10	Light Brown Sandy Silt							0	35	52	13					

* Test performed by others.

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			Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Cohesion (psf)	Friction Angle ,Ø, (degrees)	Test Conditions		% Gravel +#4	% Sand	% Silt	% Clay	Sulfate* (% by wt.)	Chlorides* (% by wt.)	pH	Resistivity (ohm-cm.)	
RW-3	15	Light Brown Silty Sand							14	60	21	5					
RW-3	20	Light Brown Gravelly Sand							26	67	6	1					
RW-3	25	Light Brown Gravelly Sand							0	58	30	12					Consol. Plate C-10
RW-3	30	Light Brown Silty Sand							9	64	18	9					
RW-3	35	Light Brown Gravelly Sand							31	59	8	2					
RW-3	40	Light Brown Gravelly Silty Sand							27	48	16	9					
RW-3	45	Light Brown Sandy Silt							3	46	39	12					
RW-4	10	Light Brown Silty Sand							0	52	35	14					
RW-5	10	Dark Brown Silty Sand							4	51	34	11					
RW-5	15	Dark Brown Silty Sand							0	65	22	13					Consol. Plate C-11
RW-5	20	Brown Silty Sand							0	63	23	14					
RW-5	25	Gray Sandy Silt							0	40	45	15					
RW-5	30	Gray Silty Sand							6	57	29	8					
RW-5	35	Brownish Gray Silty Sandstone							49	31	12	8					
RW-6	10	Gravelly Silty Sand							29	39	24	8					
RW-6	15	Gravelly Silty Sand							35	50	11	4					
CPT/SPT-1	30	Gravelly Sand							24	57	13	6					
CPT/SPT-1	70	Gravelly Sand							27	58	11	4					
CPT/SPT-1	80	Gravelly Sand							32	53	9	6					
CPT/SPT-2	5	Silty Sand							0	57	30	13					

* Test performed by others.

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SUMMARY OF LABORATORY TEST DATA

Boring	Depth (ft.)	Description	ASTM D-1557		Direct Shear			Expansion Index (UBC 18-2)	Grain Size Analysis				Chemical Analyses				Other Tests
			Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Cohesion (psf)	Friction Angle ,Ø, (degrees)	Test Conditions		% Gravel +#4	% Sand	% Silt	% Clay	Sulfate* (% by wt.)	Chlorides* (% by wt.)	pH	Resistivity (ohm-cm.)	
CPT/SPT-2	10	Sandy Clay							0	43	37	20					
CPT/SPT-2	15	Clayey Sand							5	60	22	13					
CPT/SPT-2	20	Gravelly Sand							34	46	13	7					
CPT/SPT-2	30	Silty Sand							5	74	16	5					
CPT/SPT-2	40	Silty Sand							2	77	18	3					
B-101	5	Tan Sandy Silt	116.2	15.0					0	16	58	26	<0.001		7.3	2,710	
B-101	15	Silty Sand							0	62	25	13					Consol. Plate C-12
B-102	15	Silty Sand							0	53	30	17					Consol. Plate C-13
B-102	25	Poorly Graded Sand with Silt							0	88	7	5					Consol. Plate C-14
B-103	15	Silty Sand							0	58	29	13					Consol. Plate C-15
B-103	25	Silty Sand							0	78	17	5					Consol. Plate C-16
B-104	10	Tan Sandy Silt	118.9	12.6					0	27	59	14	<0.001		7.2	3,690	
B-104	15	Poorly Graded Sand with Silt							0	88	10	2					
B-104	20	Silty Sand							0	50	40	10					Consol. Plate C-17
B-104	28	Silty Sand							0	52	35	13					Consol. Plate C-18
B-104	38	Silty Sand							0	77	18	5					Consol. Plate C-19
EP-205	6	Silty Sand			350	37	U,S	--	0	66	27	7					
EP-205	10	Lean Clay			350	35	U,S	100	0	5	62	33					

* Test performed by others.

Direct Shear Test Conditions: R = Remolded; U = Undisturbed
S = Saturated; N = Natural Moisture

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-1	0 to 6	COLLUVIUM (Qcol): Silty Sand to Sandy Silt; fine- to medium-grained, moderate yellowish brown, dry to slightly moist at depth, loose to moderately dense/soft to firm, abundant roots and rootlets.	
	6 to 8	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Sandstone; fine- to medium-grained, olive gray, slightly moist, moderately hard to hard, abundant white carbonate stringers, moderately weathered top 1± foot.	
		Total Depth 8 feet. No water, no caving.	
EP-2	0 to 15	ALLUVIUM (Qal): Silty Sand; fine- to coarse-grained with pebbles and cobbles, moderate yellowish brown, dry to slightly moist at depth, loose to moderately dense at depth, abundant roots and rootlets.	
		Total Depth 15 feet No water, no caving.	
EP-3	0 to 2½	SOIL: Silty Sand to Sandy Silt; fine- to medium-grained, moderate yellowish brown, dry, loose/soft, abundant roots and rootlets.	
	2½ to 8	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Sandstone; fine- to medium-grained, light olive, slightly moist, top 2± feet highly weathered and loose with abundant roots and rootlets, moderately hard at depth, massive.	
		Total Depth 8 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-4	0 to 5	COLLUVIUM (Qcol): Silty Sand; fine- to medium-grained with pebbles and some cobbles, moderate yellowish brown, dry to slightly moist at depth, loose to moderately dense, abundant roots and rootlets.	
	5 to 9	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Sandstone; fine- to coarse-grained with pebbles and cobbles, light yellowish gray, slightly moist, moderately hard, some interbedded pebbles lenses, generally massive. Bedding Attitude: @ 7 feet, N40W, 42NE Total Depth 9 feet. No water, no caving.	
EP-5	0 to 8	ALLUVIUM (Qal): Silty Sand; fine- to coarse-grained with pebbles and cobbles, moderate yellowish brown, dry to slightly moist at depth, loose to moderately dense at depth, abundant root, and rootlets.	
	8 to 10	Cobbly Sand; medium- to coarse-grained with pebbles, slightly moist, loose to moderately dense, roots to depth.	
	10 to 13	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Sandstone; fine- to medium-grained, light olive gray, slightly moist, moderately hard, slight to moderate weathering, massive. Total Depth 13 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-6	0 to 2	SOIL: Silty Sand; fine- to coarse-grained with pebbles and cobbles, moderate yellowish brown, dry, loose, abundant roots and rootlets.	
	2 to 4	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Cobble Conglomerate; coarse-grained Sand matrix, slightly moist, moderately hard.	
	4 to 7	Siltstone; light bluish gray, slightly moist, moderately hard, laminated.	
		Bedding Attitude: @ 5 feet, N50W, 37 NE	
		Total Depth 7 feet.	
EP-7	0 to ½	SOIL: Silty Sand; fine- to coarse-grained with pebbles and cobbles, moderate yellowish brown, dry, loose, abundant roots and rootlets.	
	½ to 2	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Pebble Conglomerate; medium- to coarse-grained Sand matrix, slightly moist, loose, abundant roots.	
	2 to 5	Silty Sandstone; fine- to medium-grained, light yellowish gray, slightly moist, moderately hard, abundant roots.	
		Bedding Attitude: @ 3 feet, N60W, 35 NE	
		Total Depth 5 feet.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-8	0 to 1	SOIL: Sandy Silt; light to moderate yellowish brown, dry, soft, abundant roots and rootlets.	
	1 to 3	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Sandy Siltstone; light olive gray, slightly moist, moderately hard, abundant white carbonate, highly jointed, slightly laminated, generally massive.	
	3 to 5	Claystone; reddish brown, moist, moderately hard, highly jointed, abundant white carbonate along joints.	
		Bedding Attitude: @ 4 feet, N70W, 45NE	
		Total Depth 5 feet. No water, no caving.	
EP-9	0 to 6	COLLUVIUM (Qcol): Silty Sand; fine- to coarse-grained with pebbles and cobbles, dark yellowish brown, dry to slightly moist at depth, loose to moderately dense at depth, abundant root and rootlets.	
	6 to 9	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Pebble and Cobble Conglomerate; medium to coarse-grained Sand matrix, slightly moist, moderately hard, poorly indurated.	
	9 to 12	Silty Sandstone; fine-grained, light olive gray, slightly moist, moderately hard, moderately indurated, moderately bedded.	
		Bedding Attitude: @ 10 feet, N60W, 45NE	
		Total Depth 12 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-10	0 to 2	SOIL: Sandy Silt; yellowish brown, moist, firm, abundant roots and rootlets.	
	2 to 5	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Clayey Siltstone; light olive gray, moist, moderately hard, massive, slightly fractured; overlies Silty Sandstone; fine-grained, light yellowish gray, slightly moist, moderately hard, slightly bedded, generally massive. Bedding Attitude: @ 3 feet, N45W, 47NE Total Depth 5 feet. No water, no caving.	
EP-11	0 to 3	ALLUVIUM (Qal): Silty Sand; fine- to medium-grained, moderate yellowish brown, top 2± feet dry and loose, slightly moist to moderately dense at depth, abundant root and rootlets, porous.	
	3 to 20	Pebbly Sand; fine- to coarse-grained with cobbles, light to moderate yellowish brown, slightly moist to moist, moderately dense. Total Depth 20 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-12	0 to 3	SOIL: Sandy Silt to Silty Sand; fine to coarse-grained with pebbles and cobbles, moderate yellowish brown, dry to slightly moist, soft/loose, abundant roots and rootlets.	
	3 to 10	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Pebble and Cobble Conglomerate; fine- to coarse-grained Sand matrix, slightly moist, moderately hard, poorly to moderately indurated, moderately bedded. Bedding Attitudes: @ 5 feet, N50W, 44NE @ 8 feet, N45W, 42NE Total Depth 10 feet. No water, no caving.	
EP-13	0 to 6	COLLUVIUM (Qcol): Silty Sand; fine- to coarse-grained with pebbles and some cobbles, moderate to dark yellowish brown, dry to slightly moist, loose to moderately dense, porous, abundant roots and rootlets.	
	6 to 9	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Pebble and Cobble Conglomerate; medium- to coarse-grained Sand matrix, slightly moist, moderately hard, moderately indurated, moderately bedded. Bedding Attitude: @ 8 feet, N50W, 46NE Total Depth 9 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-14	0 to 6	COLLUVIUM (Qcol): Silty Sand; fine- to medium-grained, dark yellowish brown, dry to slightly moist, loose to moderately dense, porous, abundant roots and rootlets.	
	6 to 8	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Clayey Siltstone; olive to light olive gray, moist, soft to moderately hard, massive, abundant white carbonate.	
		Total Depth 8 feet. No water, no caving.	
EP-15	0 to 2½	SOIL: Silty Sand; fine- to medium-grained, dark yellowish brown, dry to slightly moist, loose, porous, abundant roots and rootlets, gopher holes.	
	2½ to 7	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Sandstone; fine- to medium-grained with pebbles, yellowish orange, slightly moist, moderately hard, slightly bedded; some interbedded lenses of pebbles and cobbles with scour-fill basal contacts.	
		Approximate Bedding Attitude: @ 5 feet, N50W, 38NE	
		Total Depth 7 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-16	0 to 3	SOIL: Silty Sand to Sandy Silt; fine to medium-grained, moderate yellowish brown, dry to slightly moist, loose/soft, abundant roots and rootlets.	
	3 to 5	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Pebble Conglomerate; medium- to coarse-grained Sand matrix, slightly moist, loose, highly weathered, abundant roots. @ 5 feet, Claystone; 1 to 4± inch thick layer, mottled moderate yellowish brown and olive gray, moist, soft, flaky, some polished surfaces, discontinuous layer.	
	5 to 9	Sandstone; fine-grained, light olive gray, slightly moist, moderately hard, highly weathered, abundant joints, abundant roots along joints. Bedding Attitude: @ 5 feet, N60W, 32NE Total Depth 9 feet. No water, no caving.	
EP-17	0 to ½	SOIL: Sandy Silt; dark yellowish brown, dry, soft, abundant roots and rootlets.	
	½ to 8	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Sandstone; fine- to medium-grained, light yellowish gray, slightly moist, moderately hard to hard, top 1± foot moderately weathered, slight to moderate bedding with some rootlets along bedding planes. Bedding Attitudes: @ 3 feet, N65W, 43NE @ 6 feet, E-W, 49N Total Depth 8 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-18	0 to 2	SOIL: Silty Sand; fine- to coarse-grained with pebbles and some cobbles, light to moderate yellowish brown, dry, loose, abundant roots and rootlets.	
	2 to 7	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Silty Sandstone; fine-grained, mottled reddish orange and olive gray, moist, hard, top 2± feet slightly jointed, moderately bedded.	
		Bedding Attitude: @ 5 feet, N60W, 40SW	
		Total Depth 7 feet. No water, no caving.	
EP-19	0 to ½	SOIL: Silty Sand; fine-grained, light to moderate yellowish brown, dry, loose, abundant roots and rootlets.	
	½ to 6	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Sandstone; fine-grained, light olive gray, slightly moist, moderately hard to hard, moderately bedded.	
		Bedding Attitude: @ 4½ feet, N65W, 40NE	
		Total Depth 6 feet. No water, no caving.	
EP-20	0 to 9	ALLUVIUM (Qal): Cobbly Sand; fine- to coarse-grained with abundant pebbles, light yellowish brown, top 2± feet dry and loose, slightly moist to moist and moderately dense to depth, some cobbles up to 12± inches diameter, abundant roots and rootlets to depth. Severe caving throughout.	
		Total Depth 9 feet No water, caving from 0 to 9 feet.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-21	0 to 13	ALLUVIUM (Qal): Silty Sand to Sandy Silt; fine- to medium-grained with some pebbles and cobbles; moderate yellowish brown, top 2± feet dry and loose, slightly moist to moist and moderately dense to depth, poorly consolidated, some roots to depth.	
	13 to 14	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Pebble and Cobble Conglomerate; medium to coarse-grained Sand matrix, moist, moderately hard to hard, weathered.	
		Total Depth 14 feet No water, no caving.	
EP-22	0 to 7	ALLUVIUM (Qal): Silty Sand; fine- to medium-grained with some pebbles, dark yellowish brown, top 2± feet loose and dry, slightly moist to moist and moderately dense to depth, basal cobbles, abundant roots and rootlets.	
	7 to 10	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Siltstone; moderate yellowish brown, moist, moderately hard, laminated, moderately fractured, some tectonic shears along bedding, some roots and rootlets.	
	10 to 12	Silty Sandstone; very fine- to fine-grained, olive gray, slightly moist to moist, moderately hard, slightly fractured.	
		Bedding Attitude: @ 10 feet, N60W, 40NE	
		Total Depth 12 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-23	0 to 1	SOIL: Silty Sand; fine- to coarse-grained with pebbles, dark yellowish brown, dry, loose, abundant roots and rootlets.	
	1 to 5	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Sandstone; fine- to medium-grained, pale yellowish gray, slightly moist, moderately hard to hard, some rootlets from 1 to 3± feet in depth. Bedding Attitude: @ 4 feet, N60W, 45NE Total Depth 5 feet. No water, no caving.	
EP-24	0 to 1	SOIL: Silty Sand; fine- to coarse-grained with pebbles and cobbles, dark yellowish brown, dry, loose, abundant roots and rootlets.	
	1 to 4	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Pebble and Cobble Conglomerate; medium- to coarse-grained Sand matrix, slightly moist, moderately hard to hard, few roots to depth.	
	4 to 5	Sandstone; fine- to medium-grained, light yellowish gray, slightly moist, moderately hard, moderately bedded. Bedding Attitude: @ 4½ feet, N60W, 40NE Total Depth 5 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-25	0 to 2½	COLLUVIUM (Qcol): Silty Sand to Sandy Silt; very fine- to fine-grained with some isolated pebbles, moderate to dark yellowish brown, dry to slightly moist, loose/soft, abundant roots and rootlets, porous.	
	2½ to 5	Clayey Silt; moderate to dark yellowish brown, slightly moist, soft to firm, porous, abundant caliche.	
	5 to 9	PICO FORMATION (Tp): Clayey Siltstone; mottled pale olive gray and light brown, slightly moist, moderately firm, laminated to ½±-inch thick bedding, weathered to a depth of 7± feet. Bedding Attitudes: @ 6 feet, N50E, 32SE @ 8 feet, N80E, 35SE Total Depth 9 feet. No water, no caving.	
EP-26	0 to 1½	SOIL: Silty Sand to Sandy Silt; very fine- to fine-grained, moderate yellowish brown, dry to slightly moist, loose, abundant roots and rootlets, porous.	
	1½ to 6	PICO FORMATION (Tp): Clayey Siltstone; pale olive, slightly moist, moderately firm, laminated to massive 2±-inch thick bedding, weathered with roots and caliche to a depth of 3½ feet. Bedding Attitudes: @ 4 feet, N30W, 40NE @ 4½ feet, N10W, 30NE @ 5 feet, N30E, 29SE Total Depth 6 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-27	0 to 1	SOIL: Silty Sand to Sandy Silt; very fine- to fine-grained moderate yellowish brown, dry to slightly moist, loose/soft, abundant roots and rootlets.	
	1 to 5	PICO FORMATION (Tp): Sandy Siltstone; fine-grained, pale olive gray, slightly moist, moderately hard, 1 to 6± inch thick laminated beds; jointed/fractured, interbedded with Clayey Siltstone; pale olive to olive gray, moderately firm, laminated to 3±-inch thick massive beds; top 1½± feet highly weathered. Bedding Attitudes: @ 4 feet, N50W, 39NE Total Depth 5 feet. No water, no caving.	
EP-28	0 to 1	SOIL: Sandy Silt; very fine- to fine-grained, pale to moderate yellowish brown, dry, loose, abundant roots and rootlets.	
	1 to 7	PICO FORMATION (Tp): Interbedded Silty Sandstone; very fine- to fine-grained, pale olive, slightly moist, moderately hard, 2 to 6±-inch laminated bedding; with Clayey Siltstone, pale to dark olive, slightly moist to moist, moderately firm, laminated to 2±-inch thick bedding; top 3± feet highly weathered and abundant roots. Bedding Attitudes: @ 5 feet, EW, 49N @ 6 feet, N70E, 73NW Total Depth 7 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-29	0 to 11	ALLUVIUM (Qal): Silty Sand to Sandy Silt; very fine- to fine-grained, moderate yellowish brown, dry to slightly moist at 6± feet to depth, loose/soft to moderately dense/firm with depth.	
	11 to 12	PICO FORMATION (Tp): Silty Claystone; dark olive green, moist, moderately firm to firm, laminated to ½±-inch thick bedding.	
		Total Depth 12 feet. No water; no caving.	
EP-30	0 to 14	COLLUVIUM (Qcol): Clayey to Sandy Silt; very fine-grained Sand, pale to moderate yellowish brown, dry to slightly moist, soft, porous, abundant rootlets and roots.	
		Total Depth 14 feet. No water, no caving.	
EP-31	0 to 1	SOIL: Clayey To Sandy Silt; very fine- to fine-grained, dark yellowish brown, slightly moist to moist, soft, porous, abundant roots and rootlets.	
	1 to 2	PICO FORMATION (Tp): Claystone; mottled olive gray and light brown, slightly moist to moist, moderately firm, highly weathered, abundant roots.	
	2 to 3	Silty Sandstone; light gray lenses 3 to 4± inches thick at top and bottom with light brown core, slightly moist, moderately hard, massive, scour-fill bottom, flat top.	
	3 to 4	Silty Sandstone to Sandy Siltstone; pale olive gray, slightly moist, firm, highly weathered, blocky, abundant caliche.	
	4 to 5	Sandy to Clay Siltstone; pale to dark olive gray, slightly moist to moist, moderately hard, laminated to ½±-inch bedding.	
		Bedding Attitudes: @ 3 feet, N80W, 59SW (overturned) @ 4 feet, N65W, 35SW (overturned)	
		Total Depth 5 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-32	0 to 5	COLLUVIUM (Qcol): Sandy Silt; very fine-grained Sand, pale to moderate yellowish brown, dry to slightly moist, soft, abundant rootlets.	
	5 to 8	PICO FORMATION (Tp): Silty Sandstone; very fine- to fine-grained, pale to olive gray, slightly moist to moist, moderately hard, laminated to 3±-inch beds.	
		Bedding Attitude: @ 6 feet, N70E, 54NW	
		Total Depth 8 feet. No water, no caving.	
EP-33	0 to 12	COLLUVIUM (Qcol): Sandy Silt; very fine- to fine-grained Sand, pale yellowish brown, dry to slightly moist, loose/soft, abundant rootlets, 2± foot diameter boulder at 2± feet.	
		No water, no caving.	
EP-34	0 to ½	SOIL: Clayey Silt; moderate yellowish brown, dry, loose, abundant roots and rootlets.	
	½ to 4	PICO FORMATION (Tp): Silty Sandstone; very fine- to fine-grained, pale to olive gray, slightly moist, moderately firm, highly weathered, abundant roots and rootlets.	
	4 to 6	Silty Sandstone; fine-grained, pale olive gray, slightly moist, moderately hard, massive.	
		Bedding Attitudes: @ 3 feet, N45E, 65SE (overturned) @ 5 feet, N70E, 59SE (overturned)	
		Total Depth 6 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-35	0 to 14	ALLUVIUM (Qal): Silty Sand to Sandy Silt; very fine- to fine- with some medium-grained, moderate yellowish orange, top 2± feet dry and loose/soft, slightly moist to moist and moderately dense/firm at depth, slightly porous, pocket of pebbles and cobbles @ 12± feet. Total Depth 14 feet. No water, no caving.	
EP-36	0 to ½	SOIL: Sandy Silt; very fine-grained Sand, moderate yellowish brown, dry, soft, abundant roots and rootlets.	
	½ to 6	PICO FORMATION (Tp): Silty Sandstone; very fine- to fine-grained, pale olive gray, slightly moist, moderately hard, laminated to 3±-inch bedding, upper 3± feet slightly creep affected.	
	6 to 8	Silty Sandstone, fine-grained, pale olive gray, slightly moist, moderately hard, massive. Bedding Attitudes: @ 2 feet, N10E, 50NW @ 4 feet, N30W, 30SW Total Depth 8 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-37	0 to ½	SOIL: Sandy Silt; very fine-grained, moderate yellowish brown, dry, loose, abundant roots and rootlets.	
	½ to 5	PICO FORMATION (Tp): Silty Sandstone; very fine- to fine-grained, pale olive gray, slightly moist, moderately hard, laminated to 1± inch bedding, possibly creep affected.	
	5 to 7	Silty Sandstone; fine-grained, pale olive, slightly moist, moderately hard to hard, massive.	
		Bedding Attitudes: @ 2 feet, N10E, 36NW @ 5 feet, N50E, 42 NW	
		Total Depth 7 feet. No water, no caving.	
EP-38	0 to ½	SOIL: Silty Sand; fine- to medium-grained, moderate to dark yellowish brown, dry, loose, porous, abundant roots and rootlets..	
	½ to 2	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Silty Sandstone; medium- to very coarse-grained with pebbles and cobbles of quartzite and granitics (Mt. Lowe), pale yellowish orange, slightly moist, moderately hard, poorly cemented, slightly layered generally massive.	
	2 to 6	PICO FORMATION (Tp): Sandy Siltstone; very fine-grained, moderate yellowish brown, slightly moist, moderately hard/firm, slightly laminated, generally massive.	
		Contact Attitude: @ 2 feet, N65W, 67NE Bedding Attitude: @ 4 feet, N55W, 54NE	
		Total Depth 6 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-39	0 to 17	COLLUVIUM (Qcol): Sandy Silt; very fine-grained Sand, moderate yellowish brown, dry to slightly moist at depth, soft to firm at depth, wet at bottom. Total Depth 17 feet. No water, no caving.	
EP-40	0 to 9	ALLUVIUM (Qal): Silty Sand to Sandy Silt; fine-grained, moderate yellowish brown, dry to slightly moist at depth, loose/soft to moderately dense/firm at depth, roots to 5± feet in depth.	
	9 to 10	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Silty Sandstone; fine- to medium-grained, yellowish gray, moist, hard, massive. Total Depth 10 feet. No water, no caving.	
EP-41	0 to 1	SOIL: Silty Sand; fine- to coarse-grained, dark yellowish brown, dry, loose, abundant roots and rootlets.	
	1 to 3	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Pebbly Sandstone; medium- to very coarse-grained, yellowish gray, slightly moist, moderately hard, abundant roots, normal grading.	
	3 to 5	Silty Sandstone; fine- to medium-grained, yellowish gray, slightly moist, moderately hard, massive. Bedding Attitude: @ 3 feet, N70W, 32NE Total Depth at 5 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-42	0 to 1½	SOIL: Silty Sand; fine- to coarse-grained with pebbles and cobbles, dark yellowish brown, dry, loose, abundant roots and rootlets.	
	1½ to 6	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Silty Sandstone; fine- to medium-grained, mottled yellowish gray and light brown, slightly moist, hard, ¼ to 3±-inch beds. @ 4 feet; 6± inch thick carbonaceous layer, brownish black, abundant sulfur deposits. Bedding Attitude: @ 4 feet, N65W, 28NE Total Depth 6 feet. No water, no caving.	
EP-43	0 to 1½	SOIL: Sandy Silt; very fine-grained, dark yellowish brown, dry to slightly moist, soft, abundant rootlets.	
	1½ to 6	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Silty Sandstone; very fine- to fine-grained, pale olive gray, slightly moist, moderately hard to hard, slightly bedded generally massive. Bedding Attitude: @ 4 feet, N70W, 45NE Total Depth 6 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-44	0 to 1	SOIL: Sandy Silt to Silty Sand; very fine- to fine-grained, moderate to dark yellowish brown, slightly moist, soft/loose, abundant roots and rootlets.	
	1 to 5	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Silty Sandstone; fine- to medium-grained with some coarse-grained layers with pebbles, pale yellowish gray, slightly moist, moderately hard, bedded. Bedding Attitude: @ 4 feet, N60W, 43NE Total Depth 5 feet. No water, no caving.	
EP-45	0 to 7	ALLUVIUM (Qal): Silty Sand; very fine- to medium-grained, pale to moderate yellowish brown, dry to slightly moist at depth, loose to moderately dense at depth.	
	7 to 14	Pebbly Sand; medium- to coarse-grained with cobbles, moderate yellowish brown, moist, moderately dense. Total Depth 14 feet. No water, no caving.	

TABLE II

LOG OF EXPLORATORY PITS

Exploratory Pits	Depth (feet)	Description	Logged by: CRN Date Logged: 07/05/01
EP-46	0 to 2½	SOIL: Silty Sand; fine- to coarse-grained, dark yellowish brown, dry, loose, abundant roots and rootlets.	
	2½ to 9	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Pebbly Sandstone, medium- to coarse-grained with cobbles, yellowish orange, slightly moist, moderately hard to hard, bedded.	
		Bedding Attitudes: @ 5 feet, N55W, 36NE @ 8 feet, N40W, 32NE	
		Total Depth 9 feet. No water, no caving.	
EP-47	0 to 5	COLLUVIUM (Qcol): Silty Sand; fine- to coarse-grained with pebbles, dark yellowish brown, dry, loose to moderately dense, abundant roots and rootlets.	
	5 to 9	SAUGUS FORMATION – SUNSHINE RANCH MEMBER (Tsr): Pebbly Sandstone; medium- to coarse-grained with pebbles and cobbles, yellowish gray, slightly moist, moderately hard to hard, slightly layered, generally massive, some scour in fill structures.	
		Bedding Attitude – Approximate: @ 8 feet, N50W, 30NE	
		Total Depth 9 feet. No water, no caving.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-26-04 By: CRN
EP-101	0 to 2	SOIL: Sandy Silt; fine-, dark yellowish brown, slightly moist, loose, soft, abundant roots, and rootlets.	
	2 to 7	PICO FORMATION (Tp): Clayey Siltstone; pale yellowish green, slightly moist, moderately hard, massive to slightly bedded.	
		Attitude: Bedding @ 4 feet, N30E 50 SE	
		Total Depth 7 feet.	
EP-102	0 to 7	COLLUVIUM (Qcol): Sandy Silt to Silty Sand; fine-grained, moderate to light yellowish brown to yellowish green at depth, slightly moist, loose, abundant roots and rootlets.	
	7 to 9	PICO FORMATION (Tp): Clayey Siltstone; pale yellowish green, slightly moist, moderately hard, massive to slightly bedded, moderately weathered.	
		Attitude: Bedding @ 8 feet, N70E 41 SE	
		Total Depth 9 feet.	
EP-103	0 to 2	SOIL: Sandy Silt; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	2 to 6	PICO FORMATION (Tp): Sandy Siltstone; fine-grained, pale yellowish green, dry to slightly moist, moderate hard, massive, upper 3 to 4± feet highly weathered with abundant roots and rootlets.	
		Total Depth 6 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-26-04 By: CRN
EP-104	0 to 2	SOIL/COLLUVIUM (Qcol): Clayey Silt; moderate yellowish brown, slightly moist, soft, abundant roots and rootlets.	
	2 to 7	PICO FORMATION (Tp): Sandy Siltstone; fine-grained, pale yellowish green, dry to slightly moist, moderate hard, massive, weathered 2± feet, some shell fragments, some roots to depth.	
		Total Depth 7 feet.	
EP-105	0 to 5	COLLUVIUM (Qcol): Sandy to Clayey Silt; moderate yellowish brown to pale yellowish green, slightly moist, loose, abundant roots and rootlets.	
	5 to 8	PICO FORMATION (Tp): Sandy Siltstone; fine-grained, pale yellowish green, dry to slightly moist, moderate hard, massive, weathered 2± feet, some shell fragments, some roots to depth.	
		Total Depth 8 feet.	
EP-106	0 to 10	COLLUVIUM (Qcol): Sandy to Clayey Silt; moderate yellowish brown to pale yellowish green, slightly moist, loose, abundant roots and rootlets.	
	10 to 12	PICO FORMATION (Tp): Clayey Siltstone; pale yellowish green, slightly moist, moderately hard, massive, moderately weathered, some white carbonate.	
		Total Depth 12 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-26-04 By: CRN
EP-107	0 to 1	SOIL: Sandy to Clayey Silt; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	1 to 7	PICO FORMATION (Tp): Silty Sandstone; fine-grained, pale yellowish green, slightly moist, moderately hard, laminated to ½± inch bedding, top 2± feet highly weathered with abundant roots and rootlets, some white carbonate. Attitude: Bedding @ 6 feet, N50E 53NW Total Depth 7 feet.	
EP-108	0 to 1	SOIL: Sandy to Clayey Silt; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	1 to 6	PICO FORMATION (Tp): Silty Sandstone; fine-grained, pale yellowish green, slightly moist, moderately hard to hard at depth, slightly bedded, generally massive, upper 2± feet highly weathered with abundant roots. Attitude: Bedding @ 5 feet, N10E 56NW Total Depth 6 feet.	
EP-109	0 to 2	SOIL: Sandy to Clayey Silt; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	2 to 7	PICO FORMATION (Tp): Silty Sandstone; fine-grained, pale yellowish green, slightly moist, moderately hard, laminated to ½± inch bedding, top 2± feet highly weathered. Attitude: Bedding @ 6 feet, N80E 36NW Total Depth 7 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-26-04 By: CRN
EP-110	0 to 2	SOIL: Silty Sand to Sandy Silt; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	2 to 8	PICO FORMATION (Tp): Silty to Clayey Sandstone; fine-grained, pale yellowish green, slightly moist, moderately hard, laminated to ½± inch bedding, top 2± feet highly weathered. Attitude: Bedding @ 6 feet, E-W 57N Total Depth 8 feet.	
EP-111	0 to 7	COLLUVIUM (Qcol): Silty to Clayey Sand; fine-grained, dark to moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	7 to 9	PICO FORMATION (Tp): Silty Sandstone; fine- with some medium-grained, pale yellowish green, slightly moist, moderately hard, slightly bedded, generally massive. Attitude: Bedding @ 8 feet, N50W 47NE Total Depth 9 feet.	
EP-112	0 to 1	SOIL: Silty Sand to Sandy Silt; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	1 to 6	PICO FORMATION (Tp): Silty Sandstone; fine-grained, pale yellowish green, slightly moist, moderately hard, top 2 to 3± feet highly weathered. Attitude: Bedding @ 5 feet, N60E 52NE Total Depth 6 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-26-04 By: CRN
EP-113	0 to 2	SOIL: Silty Sand to Sandy Silt; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	2 to 7	PICO FORMATION (Tp): Silty Sandstone; fine-grained, pale yellowish green, slightly moist, moderately hard, slightly bedded, generally massive.	
		Total Depth 7 feet.	
EP-114	0 to 6	COLLUVIUM (Qcol): Silty to Clayey Sand; fine-grained, dark yellowish brown to moderate yellowish brown at depth, slightly moist, loose, abundant roots and rootlets.	
	6 to 8	PICO FORMATION (Tp): Silty Claystone; mottled olive and moderate reddish brown, moist, firm, generally massive, abundant white carbonate.	
		Attitude: Bedding @ 7 feet, N70W 46NE	
		Total Depth 8 feet.	
EP-115	0 to 3	SOIL: Sandy to Clayey Silt; fine-grained, moderate yellowish brown, moist, loose, abundant roots and rootlets.	
	3 to 7	PICO FORMATION (Tp): Clayey Sandstone; fine-grained, pale olive, slightly moist to moist, moderately hard, laminated to massive, top 2± feet highly weathered with abundant white carbonate.	
		Attitude: Bedding @ 5 feet, EW33N	
		Total Depth 7 feet.	
EP-116	0 to 2	SOIL: Silty Sand; very fine- to fine-grained, moderate yellowish brown, moist, loose, abundant roots and rootlets.	
	2 to 9	PICO FORMATION (Tp): Silty Sandstone; very fine- to fine-grained, some interbeded, medium- to coarse-grained Sand with pebbles, pale yellowish gray, dry to slightly moist, medium hard, generally massive.	
		Attitude: Bedding @ 7 feet, E-W 37N	
		Total Depth 9 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-26-04 By: CRN
EP-117	0 to ½	SOIL: Silty Sand to Sandy Silt; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	½ to 6	PICO FORMATION (Tp): Silty Sandstone; very fine- to fine-grained, pale yellowish green, slightly moist, moderately hard, slightly bedded, massive, some shell fragments.	
		Total Depth 6 feet.	
EP-118	0 to 4	SOIL/COLLUVIUM (Qcol): Silty Sand to Sandy Silt; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	4 to 6	PICO FORMATION (Tp): Clayey Sandstone; fine-grained, moderate yellowish green, slightly moist, moderate hard, slightly bedded, generally massive.	
		Attitude: Approximate Bedding @ 5 feet; E-W 27N	
		Total Depth 6 feet.	
EP-119	0 to 2	SOIL: Silty Sand to Sandy Silt; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	2 to 8	PICO FORMATION (Tp): Clayey Sandstone; fine-grained, moderate yellowish brown, slightly moist, loose, laminated to ½± inch bedding.	
		Attitude: Bedding @ 6 feet, N70W 55NE	
		Total Depth 8 feet.	
EP-120	0 to 5	COLLUVIUM (Qcol): Silty to Clayey Sand; fine-grained, moderate yellowish brown, slightly moist to moist, loose, abundant roots and rootlets.	
	5 to 7	PICO FORMATION (Tp): Clayey Siltstone; pale olive, slightly moist, moderately hard, massive, top 1± foot highly weathered with abundant white carbonate.	
		Total Depth 7 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-26-04 By: CRN
EP-121	0 to 1	SOIL: Silty Sand; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	1 to 6	PICO FORMATION (Tp): Clayey Siltstone; fine-grained, pale yellowish, slightly moist, moderately hard to hard at depth, ½± inch bedding.	
		Attitude: Bedding @ 4 feet, E-W 40N	
		Total Depth 6 feet.	
EP-122	0 to 1	SOIL: Silty Sand; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	1 to 6	PICO FORMATION (Tp): Clayey Siltstone; fine-, pale yellowish, slightly moist, moderately hard to hard at depth, laminated to ½± inch bedding.	
		Attitude: Bedding @ 5 feet, N80E 46NW	
		Total Depth 6 feet.	
EP-123	0 to 1	SOIL: Sandy Silt to Silty Sand; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	1 to 7	PICO FORMATION (Tp): Sandy Siltstone; fine-grained, pale olive, slightly moist, moderately hard, laminated to ½± inch bedding, top 2± feet highly weathered.	
		Attitude: Bedding @ 5 feet, N70E 48NW	
		Total Depth 7 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-26-04 By: CRN
EP-124	0 to ½	SOIL: Sandy Silt to Silty Sand; fine-grained, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	½ to 6	PICO FORMATION (Tp): Silty Sandstone; very fine- to fine-grained, pale yellowish green, slightly moist, moderately hard, laminated to ½± inch bedding, top 2± feet highly weathered. Attitude: Bedding @ 4 feet, N70E 52NE Joint @ 4 feet, N25E Vertical Total Depth 6 feet.	
EP-125	0 to 1	SOIL: Sandy Silt to Silty Sand; fine- to coarse-grained with some pebbles and cobbles, moderate yellowish brown, slightly moist, loose, abundant roots and rootlets.	
	1 to 5	PICO FORMATION (Tp): Silty Sandstone; fine-grained, pale yellowish grey, dry to slightly moist, moderately hard to hard at depth, some thinly interlayered medium- to coarse-grained Sand lenses, generally massive. Attitude: Bedding @ 4 feet, N80W 52NE Total Depth at 5 feet.	
EP-126	1 to 3	SOIL/COLLUVIUM (Qcol): Silty Sand to Sand, Silt; fine-grained, moderate yellow brown, slightly moist, loose, abundant roots and rootlets.	
	3 to 7	PICO FORMATION (Tp): Sandy Siltstone; fine-grained Sand, pale yellowish green, dry to slightly moist, moderately hard, ½± inch bedding, top 2± feet highly weathered with abundant white carbonate. Attitude: Bedding @ 6 feet, N80E 36NW Total Depth 7 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-26-04 By: CRN
EP-127	0 to 9	COLLUVIUM (Qcol): Silty Sand to Sand, Silt; fine-grained, moderate yellow brown, slightly moist, loose, abundant roots and rootlets.	
	9 to 10	PICO FORMATION (Tp): Silty Claystone; olive, moist, moderately firm to firm, some white carbonate.	
		Total Depth 10 feet.	
EP-128	0 to 4	COLLUVIUM/ALLUVIUM (Qcol/Qal): Silty Sand to Sandy Silt; fine-grained, moderate yellow brown, moist, loose to medium dense with depth, some roots and rootlets.	
	4 to 6	PICO FORMATION (Tp): Claystone; olive, moist, moderately firm, laminated to 1± inch bedding, slightly plastic, some white carbonate.	
		Attitude: Bedding @ 5 feet, N60W 52NE	
		Total Depth 6 feet.	
EP-129	0 to 5	COLLUVIUM/ALLUVIUM (Qcol/Qal): Silty Sand to Sandy Silt; fine-grained with some basal cobbles, moderate yellow brown, moist, loose to medium dense with depth, some roots and rootlets.	
	5 to 7	PICO FORMATION (Tp): Claystone; olive, moist, moderately firm, laminated to 1± inch bedding, slightly plastic, some white carbonate.	
		Attitude: Bedding @ 6 feet, N60W 42NE	
		Total Depth 7 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-27-04 By: CRN
EP-130	0 to 1	SOIL: Silty Sand to Sandy, Silt; fine-grained, moderate yellow brown, slightly moist, loose, abundant roots and rootlets.	
	1 to 7	PICO FORMATION (Tp): Sandy Siltstone to Silty Sandstone; very fine- to fine-grained, pale yellowish green, slightly moist, moderately hard, laminated to ½± inch bedding, top 2 to 3± feet highly weathered with some roots and rootlets. Attitude: Bedding @ 6 feet, N30E 33NW Total Depth 7 Feet.	
EP-131	0 to 1½	SOIL: Silty Sand to Sandy, Silt; fine-grained, moderate yellow brown, slightly moist, loose, abundant roots and rootlets.	
	1½ to 6	PICO FORMATION (Tp) (south side of pit): Silty Claystone; mottled olive and moderate yellowish brown, slightly moist, moderately hard, laminated to 1± inch bedding, highly jointed/fractured, some roots and rootlets to depths. Attitude: Bedding @ 5 feet, N40E 48NW FAULT (2 to 3+ inches thick zone): Silty Sand; fine-grained, pale grey, dry, loose, some roots. Attitude: Fault @ 5 feet, N60W Vertical	
	1½ to 6	PICO FORMATION (Tp) (north side of pit): Silty Sandstone; fine-grained, layered pale grey and pale olive, slightly moist, moderately hard, 1 to 6± inch bedding, top 2± feet moderately weathered. Attitude: Bedding @ 5 feet, N60W Vertical Total Depth 6 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-27-04 By: CRN
EP-132	0 to 1	SOIL: Clayey Silt; moderate yellow brown, slightly moist, loose, abundant roots, rootlets and white carbonate.	
	1 to 7	PICO FORMATION (Tp): Interbedded Silty Claystone; mottled olive and moderate yellowish brown, slightly moist, moderately hard, laminated to 1± inch bedding; with Silty Sandstone, fine-grained, pale olive, slightly moist, moderately hard, 2 to 3± inch bedding, top 3± inch bedding, top 3± feet highly weathered. Attitudes: Bedding @ 5 feet, N60W Vertical Bedding @ 6 feet, N30W Vertical Total Depth 7 feet.	
EP-133	0 to ½	SOIL: Clayey Silt; moderate yellow brown, slightly moist, loose, abundant roots, rootlets and white carbonate.	
	½ to 6	PICO FORMATION (Tp): Sandy Siltstone; very fine- to fine-grained, pale yellowish green, slightly moist, moderately hard, laminated to 1± inch bedding, top 2± feet highly weathered with abundant rootlets and some white carbonate. Attitude: Bedding @ 5 feet, N60E 69NW Total Depth 6 feet.	
EP-134	0 to 3	SOIL: Clayey Silt with Sand; fine-grained, moderate yellow brown, slightly moist, loose, abundant roots, rootlets and white carbonate.	
	3 to 5	PICO FORMATION (Tp): Silty Sandstone; fine- to coarse-grained, pale grey, dry, moderately hard, massive, abundant shells.	
	5 to 8	Silty Claystone; mottled olive and moderate yellow brown, slightly moist, moderately hard, slightly bedded generally massive. Attitude: Bedding @ 7 feet, N50W 58NE Total Depth 8 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-27-04 By: CRN
EP-135	0 to 2½	SOIL: Sandy Silt; fine-grained, moderate yellow brown, dry to slightly moist, loose, abundant roots and rootlets.	
	2½ to 7	PICO FORMATION (Tp): Silty Sandstone; moderate yellow brown, slightly moist, loose, top 2± feet highly weathered with roots and rootlets.	
		Attitude: Bedding @ 6 feet, N60W 49NE	
		Total Depth 7 feet.	
EP-136	0 to 1	SOIL: Sandy Silt; fine-grained, moderate yellow brown, dry to slightly moist, loose, abundant roots and rootlets.	
	1 to 8	PICO FORMATION (Tp): Silty Claystone; moderate yellow brown, slightly moist, loose, top 3± feet highly weathered, with roots and rootlets; some interbedded Silty Sandstone, fine-grained, pale to moderate yellowish grey, dry, moderately hard, 1 to 2± inch bedding.	
		Attitude: Bedding @ 7 feet, N40W 72SW	
		Total Depth 8 feet.	
EP-137	0 to 5	SOIL/COLLUVIUM (Qcol): Sandy Silt to Silty Sand; fine-grained, moderate yellow brown, dry to slightly moist, loose, abundant roots and rootlets.	
	5 to 12	PICO FORMATION (Tp): Silty Claystone; moderate yellow brown, slightly moist, loose, top 3± feet highly weathered, with roots and rootlets; some interbedded Silty Sandstone, fine-grained, pale to moderate yellowish grey, dry, moderately hard, 1 to 2± inch bedding.	
		Attitude: Bedding @ 11 feet, N50W 52NE	
		Total Depth 12 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-27-04 By: CRN
EP-138	0 to 7	SAUGUS FORMATION-SUNSHINE RANCH MEMBER (Tsr): Silty Sandstone; fine- to coarse-grained with pebbles and cobbles, pale yellowish brown to pale grey, slightly moist, moderately hard, slightly bedded generally massive with some scour fill structure. Attitude: Bedding @ 6 feet, N40W 37NE Note: Soil removed by dozer during recent fire fighting operations. Total Depth 7 feet.	
EP-139	0 to ½	SOIL: Silty Sand; fine- to coarse-grained with pebbles and cobbles, moderate yellowish brown, slightly moist, loose, some roots and rootlets.	
	½ to 5	SAUGUS FORMATION-SUNSHINE RANCH MEMBER (Tsr): Silty Sandstone; fine- to coarse-grained with pebbles and cobbles, pale yellowish brown to pale grey, slightly moist, moderately hard, slightly bedded generally massive with some scour fill structure. Attitude: Approximate Bedding @ 4 feet E-W 30N Total Depth 5 feet.	
EP-140	0 to ½	SOIL: Silty Sand; fine- to coarse-grained with pebbles and cobbles, moderate yellowish brown, slightly moist, loose, some roots and rootlets.	
	½ to 6	SAUGUS FORMATION-SUNSHINE RANCH MEMBER (Tsr): Silty Sandstone; fine- to coarse-grained with pebbles and cobbles, pale yellowish brown to pale grey, slightly moist, moderately hard, slightly bedded generally massive with some scour fill structure. Attitude: Bedding @ 5 feet, N80E 28NW Total Depth 6 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-27-04 By: CRN
EP-141	0 to 3	SOIL: Silty to Clayey Sand; very fine- to medium-grained with some pebbles, dark yellowish brown, moist, soft, some roots and rootlets.	
	3 to 8	SAUGUS FORMATION-SUNSHINE RANCH MEMBER (Tsr): Gravelly Sandstone; fine- to coarse-grained with pebbles and cobbles, some boulders up to 18± inches, pale yellowish brown, slightly moist, moderately hard, massive, matrix supported, top 2± feet highly weathered.	
		Total Depth 8 feet.	
EP-142	0 to 3	SOIL/COLLUVIUM (Qcol): Silty Sand; fine- to coarse-grained with pebbles and cobbles, moderate to dark yellow brown, moist, loose some roots and rootlets.	
	3 to 9	SAUGUS FORMATION-SUNSHINE RANCH MEMBER (Tsr): Gravelly Sandstone; fine- to coarse-grained with pebbles and cobbles, pale yellowish grey to pale grey, slightly moist, moderately hard, massive with interlayered pebbles and cobbles lenses.	
		Attitude: Bedding @ 8 feet, E-W 33N	
		Total Depth 9 feet.	
EP-143	0 to ½	SOIL: Silty Sand; fine- to medium-grained, moderate yellowish brown, slightly moist, loose, some roots and rootlets. Note: Some soil removed during recent fire fighting operations.	
	½ to 6	SAUGUS FORMATION-SUNSHINE RANCH MEMBER (Tsr): Silty Sandstone; fine- to medium-grained, pale grey, slightly moist, moderately hard, slightly bedded generally massive.	
		Attitude: Bedding @ 4 feet, N60W 32NE	
		Total Depth 6 feet.	

TABLE II

EXPLORATORY PITS

Log No.	Depth (ft.)	Description	Logged: 1-27-04 By: CRN
EP-144	0 to 5	SOIL/COLLUVIUM (Qcol): Silty Sand; fine- to medium-grained, moderate yellow brown, slightly moist to moist, loose, abundant roots and rootlets.	
	5 to 9	SAUGUS FORMATION-SUNSHINE RANCH MEMBER (Tsr): Pebbly Sandstone; fine- to coarse-grained, pale grey, slightly moist, moderately hard, massive with some interlayered pebble and cobbles lenses.	
		Attitude: Bedding @ 7 feet, N70W 32NE	
		Total Depth 9 feet.	

TABLE I

EXPLORATORY TRENCH LOGS

Log No.	Depth (ft.)	Description	Logged: 1-31-06 By: RHS
EP-201	0 to 2	SOIL: Sandy Clay; dark yellowish brown, slightly moist, firm, rootlets common, clusters of small bi-valve shells.	
	2 to 9	SAUGUS FORMATION - SUNSHINE RANCH MEMBER (Tsr): Sandy Siltstone; light olive gray with reddish brown stain, dry, soft, highly fractured, weathered.	
	@ 9	Fine- to medium-grained Sandstone, pinkish gray, soft, poorly cemented, some pebbles, probable cross-bed.	
		Bedding Attitude: N65E, 28NW	
		Total Depth 9 feet.	
EP-202	0 to 2	SAUGUS FORMATION - SUNSHINE RANCH MEMBER (Tsr): Fine- to medium-grained Sandstone, pinkish gray, dry, soft, many pebbles and small cobbles.	
	2 to 5	Sandy Siltstone, pale yellowish brown, slightly moist, soft, moderately fractured, rootlet to depth.	
	5 to 6	Sandstone, pinkish gray, dry, soft.	
		Bedding Attitude: N55W, 35NE	
		Total Depth 6 feet.	
EP-203	0 to 2	SOIL: Sandy Silt; dark yellowish brown, slightly moist, stiff, many pebbles.	
	2 to 4½	SAUGUS FORMATION - SUNSHINE RANCH MEMBER (Tsr): Fine- to medium-grained Sandstone, pinkish gray, slightly moist, soft, poorly cemented.	
	4½ to 7	Siltstone, light olive gray, slightly moist, soft to moderately hard.	
		Bedding Attitude: N80E, 45NW	
		Total Depth 7 feet.	

RHS:cp-2453RT04logs

TABLE I

EXPLORATORY TRENCH LOGS

Log No.	Depth (ft.)	Description	Logged: 1-31-06 By: RHS
EP-204	0 to 6½	SAUGUS FORMATION - SUNSHINE RANCH MEMBER (Tsr): Fine- to coarse-grained Sandstone, soft to moderately hard, dry, poorly cemented, pebble and small cobble beds and lenses.	
		Bedding Attitude: EW, 40N	
		Total Depth 6½ feet.	
EP-205	0 to 2	SOIL: Silty Clay; dark yellowish brown, moist, stiff, porous.	
	2 to 10	SAUGUS FORMATION - SUNSHINE RANCH MEMBER (Tsr): Sandy Siltstone, light olive gray, slightly moist, soft to moderately hard at depth, white carbonate pods common.	
	@ 6 & 8	Silty Sandstone; very light olive gray, slightly moist, moderately hard, 6 to 12 inch thick interbeds.	
		Bedding Attitude: N85W, 30NE	
		Ring and Bulk samples at 6 and 10 feet.	
		Total Depth 8 feet.	
EP-206	0 to ¼	SOIL: Sandy Silt; moderate yellowish brown, dry, firm, porous.	
	¼ to 5	SAUGUS FORMATION - SUNSHINE RANCH MEMBER (Tsr): Fine- to medium-grained Sandstone, pinkish gray, dry, soft to moderately hard, poorly cemented, roots to depth.	
	@ 3	8 to 10-inch thick Silty Sandstone-pebble conglomerate, grayish orange, dry, soft, one small cobble.	
		Bedding Attitude: N70W, 45NE	
		Total Depth 5 feet.	

RHS:cp-2453RT04logs

TABLE I

EXPLORATORY TRENCH LOGS

Log No.	Depth (ft.)	Description	Logged: 1-31-06 By: RHS
EP-207	0 to ½	SOIL: Sandy Silt; dark yellowish brown, moist, firm, abundant rootlets.	
	½ to 3½	PICO FORMATION (Tp): Silty Sandstone; very pale orange to yellowish gray, slightly moist, soft, red brown stain common.	
		Bedding Attitude: N55W, 40NE	
		Total Depth 3½ feet.	

RHS:cp-2453RT04logs

TABLE III

SUMMARY OF SLOPE STABILITY ANALYSES AND MITIGATION

Cross-Section	Location	Condition	Mitigation*	Keyway Dimensions*	Factor-of-Safety*		Calculations (on Plates D-1 thur D-48
					Static	Pseudostatic	
1-1'	"A" Street	150 (±) Foot High 1½:1 Cut Slope in Tsr	N/A	N/A	1.57	1.18	Plates D-1 thru D-6
2-2'	Lots 71 & 72	75 (±) Foot High 2:1 Cut Slope in Tp	N/A	N/A	2.73	1.94	Plates D-7 thru D-12
3-3'	Lots 12 thru 16	76 (±) Foot High 2:1 Fill Slope	H/2 Keyway	See Cross-Section	2.22	1.58	Plates D-13 thru D-18
4-4'	Lots 39 & 46	Natural Slopes	N/A	N/A	2.26 (A)	1.64 (A)	Plates D-19 thru D-24
					2.32 (B)	1.70 (B)	Plates D-25 thru D-30
					2.12 (B)	1.66 (B)	Plates D-31 thru D-36
5-5'	Lot 104 (Debris Basin Lot E)	2:1 Fill Slope Within Debris Basin	N/A	N/A	3.43 (F)	1.84 (F)	Plates D-37 thru D-42
					1.96 (RD)	1.31 (RD)	Plates D-43 thru D-48

* H = Slope Height; N/A = Not Applicable; (A) = Above Pad; (B) = Below Pad; (F) = Full Basin; and (RD) = Rapid Drawdown.

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	6/20/01	GROUND ELEV.	1317	BORING DESIG.	B-1
DATE FINISHED	6/20/01	GW DEPTH (FT)	67	LOGGED BY	CRN
DRILLER	Ledezma Drilling	DRIVE WT.	See Note	NOTE	0-24' 3548#; 24-47' 2577#; 47-73' 1648#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
0	1315					**ALLUVIUM (Qal):** Sandy Silt to Silty Sand; very fine- to fine-grained, moderate yellowish brown, slightly moist, firm/moderately dense.				
5		R/B	1				7.3	102.0	31	
	1310									
10		R	1				7.0	96.4	25	
	1305									
15		R	1			Sandy Silt to Silty Sand; very fine- to fine-grained, moderate yellowish brown, slightly moist, firm/moderately dense, some interbedded pebble lenses.	10.2	102.4	44	
	1300									
20		R/B	1			Silty Sand; fine- to coarse-grained with some pebbles and few cobbles, moderate to dark yellowish brown, moist, moderately dense.	4.9	112.2	26	
	1295									
25										
	1290									
30		B				Silty Sand; fine- to coarse-grained with pebbles and cobbles, moderate yellowish brown, slightly moist to moist, moderately dense to dense.				
	1285									
35										
	1280									

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- GROUNDWATER LEVEL
- WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-1

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	6/20/01	GROUND ELEV.	1317	BORING DESIG.	B-1
DATE FINISHED	6/20/01	GW DEPTH (FT)	67	LOGGED BY	CRN
DRILLER	Ledezma Drilling	DRIVE WT.	See Note	NOTE	0-24' 3548#; 24-47'
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		2577#; 47-73' 1648#

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
45	1275									
	1270									
50		R/B	15			Pebbly Sand; fine- to very coarse-grained with abundant cobbles, moderate to dark yellowish brown, moist, dense.	4.6	126.4	37	
	1265									
55		R	5			Silty Sand; very fine- to fine-grained, moderate yellowish brown, moist, dense.	11.6	118.7	78	
	1260					Pebbly Sand; fine- to very coarse-grained with abundant cobbles, moderate to dark yellowish brown, moist, dense.				
60										
	1255									
65						Some interlayered lenses of Silty Sand (described at 55 feet).				
	1250					Water at 67± feet, caving from 65 to 68± feet.				
						Total Depth 68 feet. Water at 67 feet. Caving from 65 to 68 feet. Hole backfilled with native materials and tamped.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER LEVEL
- WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-2

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	6/20/01	GROUND ELEV.	1325	BORING DESIG.	B-2
DATE FINISHED	6/20/01	GW DEPTH (FT)	53	LOGGED BY	CRN
DRILLER	Ledezma Drilling	DRIVE WT.	See Note	NOTE	0-24' 3548#; 24-47'
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		2577#; 47-73' 1648#

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	1325					**ALLUVIUM (Qal):** Silt; moderate yellowish brown, dry to slightly moist, soft to firm at depth.				
5	1320									
10	1315	R/B	1			Silty Sand; very fine- to fine-grained, moderate yellowish brown, slightly moist, moderately dense, some interlayered lenses of coarse-grained Sand and Pebbles, some small organic pods.	7.7	102.0	32	
15	1310									
20	1305	R	1				8.7	105.0	40	
25	1300					Increasing pebbles and some cobbles.				
30	1295	R/B	9			Pebbly Sand; fine- to very coarse-grained, pale yellowish brown, slightly moist, moderately dense.	3.7	121.6	27	
35	1290									
	1285									

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- GROUNDWATER LEVEL
- WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-3

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	6/20/01	GROUND ELEV.	1325	BORING DESIG.	B-2
DATE FINISHED	6/20/01	GW DEPTH (FT)	53	LOGGED BY	CRN
DRILLER	Ledezma Drilling	DRIVE WT.	See Note	NOTE	0-24' 3548#; 24-47'
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		2577#; 47-73' 1648#

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	1285	R	8			Silty Sand; fine- to very coarse-grained with pebbles, moderate yellowish brown, slightly moist to moist, dense.	6.8	122.2	51	
45	1280	B								
50	1275	R	6			Sand; fine- to coarse-grained with pebbles, pale to moderate yellowish brown, moist, moderately dense to dense.	5.5	135.5	61	
						Water at 53± feet. Caving from 52 to 54+ feet. Total Depth 54 feet. Water at 53 feet. Caving from 52 to 54 feet. Hole backfilled with native materials and tamped.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- ▼ GROUNDWATER LEVEL
- ► WATER SEEP
- C CONTACT
- B BEDDING
- F FAULT
- J JOINTING
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-4

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	6/20/01	GROUND ELEV.	1331	BORING DESIG.	B-3
DATE FINISHED	6/20/01	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Ledezma Drilling	DRIVE WT.	See Note	NOTE	0-24' 3548#; 24-47' 2577#; 47-73' 1648#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
0	1330					**ALLUVIUM (Qal):** Silty Sand; very fine- to fine-grained, pale yellowish brown, dry, loose.				
						Silty Sand; fine- to coarse-grained with pebbles and cobbles, pale to moderate yellowish brown, dry to slightly moist, loose to moderately dense.				
5	1325									
10	1320	B				1 to 2± feet thick boulder lense with 6 to 12± inch boulders.				
						Silty Sand; fine to coarse-grained with pebbles and cobbles, pale to moderate yellowish brown, slightly moist, moderately dense.				
15	1315	R	1				2.3	106.7	11	
20	1310	R/B	2			Silty Sand; very fine- to fine-grained with pebbles, moderate yellowish brown, slightly moist to moist, moderately dense.	5.7	115.3	35	
25	1305					Silty Sand; fine- to coarse-grained with pebbles and cobbles, moderate yellowish brown, slightly moist, moderately dense.				
30	1300	R	3			Silty Sand; very fine- to fine-grained with pebbles, moderate yellowish brown, slightly moist to moist, moderately dense.	4.9	114.1	28	
35	1295									

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER LEVEL
WATER SEEP
B BEDDING
J JOINTING
C CONTACT
F FAULT
S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-5

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	6/20/01	GROUND ELEV.	1331	BORING DESIG.	B-3
DATE FINISHED	6/20/01	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Ledezma Drilling	DRIVE WT.	See Note	NOTE	0-24' 3548#; 24-47'
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		2577#; 47-73' 1648#

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	1290	R/B	6				10.4	115.0	63	
45	1285					**SAUGUS FORMATION-SUNSHINE RANCH MEMBER (Tsr):** Sandstone; very fine- to fine-grained, medium light gray, slightly moist, moderately hard to hard.				
50	1280	R/B	18			Siltstone; mottled olive gray and light gray, slightly moist, hard.	15.7	115.7	97	
						Total Depth 51 feet. No water and no caving. Hole backfilled with native materials and tamped.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- ▼ GROUNDWATER LEVEL
- ► WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-6

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	6/20/01	GROUND ELEV.	1342	BORING DESIG.	B-4
DATE FINISHED	6/20/01	GW DEPTH (FT)	14	LOGGED BY	CRN
DRILLER	Ledezma Drilling	DRIVE WT.	See Note	NOTE	0-24' 3548#; 24-47'
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		2577#; 47-73' 1648#

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
0	1340					**ALLUVIUM (Qal):** Silty Sand; fine- to coarse-grained with pebbles, dark yellowish brown, slightly moist to moist, moderately dense.				
5	1335				►	Silty Sand to Sandy Silt; very fine-grained with few pebbles, dark yellowish brown, slightly moist to moist, moderately dense. Water seep and caving from 7 to 9± feet.				
10		R/B	1				19.8	108.3	96	
	1330									
15					▼	Pebbly Sand; coarse-grained with abundant cobbles, dark yellowish brown, wet, moderately dense. Water at 14± feet, caving from 14 to 16± feet.				
						Total Depth 16 feet. Water and caving at 7 to 9 feet and 14 to 16 feet. Hole backfilled with native materials and tamped.				

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE [T] TUBE SAMPLE

▼ GROUNDWATER LEVEL
► WATER SEEP [C] CONTACT [B] BEDDING [F] FAULT [J] JOINTING [S] SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-7

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	6/20/01	GROUND ELEV.	1388	BORING DESIG.	B-5
DATE FINISHED	6/20/01	GW DEPTH (FT)	15	LOGGED BY	CRN
DRILLER	Ledezma Drilling	DRIVE WT.	See Note	NOTE	0-24' 3548#; 24-47;
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		2577#; 47-73' 1648#

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
0	1385					**ALLUVIUM (Qal):** Silty Sand to Sandy Silt; very fine- to fine-grained, moderate yellowish brown, dry and loose/soft within top 3±, feet becoming slightly moist and moderately dense/firm at depth.				
5										
	1380									
10		R/B	Push		►	Water seep at 10± feet.				
	1375									
15					▼	Water at 15± feet. Caving from 14 to 16± feet. Total Depth 16 feet. Water at 10 and 15 feet. Caving from 14 to 16 feet. Hole backfilled with native materials tamped.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ GROUNDWATER LEVEL
► WATER SEEP
B BEDDING
J JOINTING
C CONTACT
F FAULT
S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-8

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	6/20/01	GROUND ELEV.	1384	BORING DESIG.	B-6
DATE FINISHED	6/20/01	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Ledezma Drilling	DRIVE WT.	See Note	NOTE	0-24' 3548#; 24-47'
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		2577#; 47-73' 1648#

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	1380					**ALLUVIUM (Qal):** Silty Sand to Sandy Silt; very fine- to fine-grained with some pebbles and some cobbles, dark yellowish brown, dry and loose/soft within top 1 to 3± feet, becoming slightly moist to moist and moderately dense/firm at depth. Top 3± feet is porous.				
5		R/B	Bounce			Boulders; 1± foot in diameter. No sample due to rocks.				
						Refusal Total Depth 7 feet. No water and no caving. Refusal due to rocks. Hole backfilled with native materials and tamped.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- ▼ GROUNDWATER LEVEL
- ► WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-9

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch	BORING DESIG.	B-6B
DATE STARTED	6/25/01	GROUND ELEV.	1385	LOGGED BY	CRN
DATE FINISHED	6/25/01	GW DEPTH (FT)		NOTE	0-24' 3548#; 24-47'
DRILLER	Ledezma Drilling	DRIVE WT.	See Note		2577#; 47-73' 1648#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	1385					**ALLUVIUM (Qal):** Silty Sand to Sandy Silt; fine- to coarse-grained with pebbles, moderate to dark yellowish brown, top 1± foot dry and loose/soft, becoming moist and moderately dense/firm at depth.				
5	1380	R	2			2 to 3± foot thick,boulder lenses; 2-1/2 foot diameter boulder at 6± feet in depth.	9.1	116.9	58	
10	1375	R/B	6 for 6"			**SAUGUS FORMATION-SUNSHINE RANCH MEMBER (Tsr):** Weathered Silty Sandstone; very fine- to fine-grained, mottled moderate brown and medium light gray, moist, moderately hard, poorly indurated.	13.4	123.0	98	
15	1370	B R	11 for 6"			Silty Sandstone; very fine- to fine-grained, medium light gray, moist, moderately hard, moderately indurated.	13.4	120.6	91	
						Total Depth 16 feet. No water, no caving. Hole backfilled with native materials and tamped.				

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE
- [T] TUBE SAMPLE

▼ GROUNDWATER LEVEL
► WATER SEEP
[B] BEDDING
[J] JOINTING
[C] CONTACT
[F] FAULT
[S] SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-10

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	6/25/01	GROUND ELEV.	1388	BORING DESIG.	B-7
DATE FINISHED	6/25/01	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Ledezma Drilling	DRIVE WT.	See Note	NOTE	0-24' 3548#; 24-47'
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		2577#; 47-73' 1648#

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						COLLUVIUM/ALLUVIUM (Qal): Silty Sand; fine- to coarse-grained with pebbles and some cobbles, moderate yellowish brown, dry and loose top 3± feet, slightly moist and moderately dense at depth, abundant roots and rootlets throughout.				
	1385					1± inch thick yellowish red lense at contact.				
5		R/B	4		C: N75W 44NE	**SAUGUS FORMATION- SUNSHINE RANCH MEMBER (Tsr):** Silty Sandstone; fine- to coarse-grained with pebbles and some cobbles, grayish orange, slightly moist, hard, moderately to well indurated, slight to moderate bedding.	4.6	114.8	27	
	1380									
					B: N80W 41NE	1± foot thick, scour/infill structure - infill with fine-grained Sand (attitude from top of Sand infill).				
10		R/B	4 for 3" Bounce				3.4	121.9	25	
	1375									
					B: N70W 54NE	2± foot thick,scour/infill structure - infill with fine-grained Sand (attitude from top of infill).				
15										
					B: N80W 50NE	Silty Sandstone; fine-grained, light gray, slightly moist, hard, well indurated.				
	1370					Used ripper and core bucket from 18 to 19± feet. Refusal at 19+ feet. Total Depth 19 feet. No water, no caving. Hole backfilled with native materials and tamped.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER LEVEL
- WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-11

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch	BORING DESIG.	B-8
DATE STARTED	6/25/01	GROUND ELEV.	1353	LOGGED BY	CRN
DATE FINISHED	6/25/01	GW DEPTH (FT)	19	NOTE	0-24' 3548#; 24-47'
DRILLER	Ledezma Drilling	DRIVE WT.	See Note		2577#; 47-73' 1648#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
0						**COLLUVIUM/ALLUVIUM (Qal):** Silty Sand to Sandy Silt; fine- to coarse-grained with pebbles, cobbles, some clay pods, slightly moist to moist, loose/soft to moderately dense/firm at depth.				
	1350									
5										
	1345									
10						Increasing pebbles and cobbles.				
	1340									
15		R/B	6				10.7	122.3	81	
	1335					▼ Water at 19 feet.				
20		R	10			**SAUGUS FORMATION-SUNSHINE RANCH MEMBER (Tsr):** Silty Sandstone to Sandy Siltstone; very fine- to fine-grained, light olive, moist, moderately hard, moderately to well indurated, thinly bedded to laminated, weathered.	14.1	121.5	98	
		B								
	1330									
25						Silty Sandstone; fine to coarse-grained, medium light gray, slightly moist, hard, moderately to well indurated.	9.8	122.0	73	
						Total Depth 26 feet. Water at 19 feet. No caving. Hole backfilled.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ GROUNDWATER LEVEL
► WATER SEEP
B BEDDING
J JOINTING
C CONTACT
F FAULT
S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-12

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	6/25/01	GROUND ELEV.	1327	BORING DESIG.	B-9
DATE FINISHED	6/25/01	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Ledezma Drilling	DRIVE WT.	See Note	NOTE	0-24' 3548#; 24-47'
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		2577#; 47-73' 1648#

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
0	1325					**ALLUVIUM (Qal):** Silty Sand; fine- to coarse-grained with pebbles and cobbles, moderate yellowish brown, top 6± feet dry to moist at depth, loose top 3± feet to moderately dense at depth.				
5	1320									
10		R/B	Push			Sandy Silt to Silty Sand; fine-grained, moderate to dark yellowish brown, moist, firm/moderately dense, porous, abundant rootlets.	13.9	115.1	84	
15	1315									
20	1310	R	1			Silty Sand; fine- to medium-grained, moderate to dark yellowish brown, moist, moderately dense, micaceous.	12.1	111.7	64	
25	1305									
30	1300	R/B	Push			Silty Sand to Sandy Silt; fine- to coarse-grained with some pebbles, moderate yellowish brown, moist to very moist, moderately dense, micaceous.	18.0	112.0	100	
35	1295									
	1290	B				**SAUGUS FORMATION-SUNSHINE RANCH MEMBER (Tsr):** Silty Sandstone; fine to medium-grained, light olive gray, moist, moderately hard, moderately indurated, slightly				

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE
- [T] TUBE SAMPLE

- GROUNDWATER LEVEL
- WATER SEEP
- [B] BEDDING
- [J] JOINTING
- [C] CONTACT
- [F] FAULT
- [S] SHEAR

PACIFIC SOILS ENGINEERING, INC.

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	6/25/01	GROUND ELEV.	1327	BORING DESIG.	B-9
DATE FINISHED	6/25/01	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Ledezma Drilling	DRIVE WT.	See Note	NOTE	0-24' 3548#; 24-47'
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		2577#; 47-73' 1648#

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		R	5			to moderately weathered.	10.0	117.9	63	
	1285					Total Depth 41 feet. No water, no caving. Hole backfilled with native materials and tamped.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER LEVEL
- WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-14

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch	BORING DESIG.	B-10
DATE STARTED	4/25/02	GROUND ELEV.	1635	LOGGED BY	CRN
DATE FINISHED	4/26/02	GW DEPTH (FT)		NOTE	0-27' 4500#; 27-52' 3500#; 52-80' 2500#; 80-104' 1000#
DRILLER	Dave's Drilling	DRIVE WT.	See Note		
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	1635	B				**PICO FORMATION (Tp):** Sandy Siltstone; very fine-grained Sand, pale yellowish brown, slightly moist, hard, fossiliferous (abundant bi-valves); interbedded with Silty Sandstone; very fine- to fine-grained, pale yellowish brown, slightly moist, hard, scour-fill into Siltstone; both units jointed with caliche infill, both units laminated to 8± inch thick bedding.				
					B: N75W 46NE					
5	1630									
10	1625	R/B	4 for 5"			Interbedded Silty Sandstone; fine-grained, pale yellowish to grayish orange, slightly moist to moist, hard; with Sandy Siltstone; mottled grayish orange and pale olive gray, slightly moist to moist, hard; both units laminated to 2± inch thick bedding.	8.8	115.4	54	
					B: B80W 54NE					
					B: N85W 53NE					
15	1620					Some interlayered Silty Claystone; olive gray, moist, moderately firm to firm, laminated, 1 to 2±mm thick layers, some caliche along bedding.				
20	1615	R/B	5 for 4"		B: B80W 45NE	Silty Sandstone; fine- to medium-grained, light gray with light brown staining, slightly moist, hard, laminated to 1/4± inch thick bedding./	5.8	108.0	29	
25	1610				B: N70W 51NE	Some isolated cobble lenses, quartzite and gneissic composition.				
30	1605	R/B	8 for 8"		B: N70W 50NE	Sandy to Clayey Siltstone; very fine-grained Sand; light olive gray, moist, moderately hard to hard, laminated to 1/4± inch thick bedding, some gypsum strands along bedding up to 1/4± inch thick. Some isolated Clay lenses and pods; dark brownish black, moist, moderately firm to firm, concentrated along bedding planes.	11.0	116.4	69	
35	1600				B: N65W 49NE	Claystone layer; 1/4± inch thick, olive gray, moist, soft, abundant well formed, gypsum crystals.				
	1595									

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ GROUNDWATER LEVEL
► WATER SEEP
B BEDDING
J JOINTING
C CONTACT
F FAULT
S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-15

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/25/02	GROUND ELEV.	1635	BORING DESIG.	B-10
DATE FINISHED	4/26/02	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Dave's Drilling	DRIVE WT.	See Note	NOTE	0-27' 4500#; 27-52' 3500#; 52-80' 2500#; 80-104' 1000#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	1595	R	8 for 6"		B: N80W 47NE	Sandy Siltstone; fine-grained Sand; olive gray, moist, hard, some laminated to 1/4± inch bedding, generally massive, with abundant cross-cutting gypsum seams. Cobble layers; 1± foot thick, set in pebbly sand matrix, medium- to very coarse-grained, moist, moderately hard to hard, quartzite cobbles and pebbles.	10.0	121.2	73	
45	1590				B: N85W 57NE	Silty Sandstone; fine-grained, reddish brown, slightly moist to moist, hard; interlayered with Sandy Siltstone; very fine- to fine-grained Sand, moist, moderately firm to firm, some very firm layers, laminated; both units 6 to 12 inch beds.				
50	1585	R/B	8 for 5"			Silty Sandstone; fine-grained, pale olive gray, moist, hard.	7.2	113.1	41	
					B: N70W 49NE	Pebble lense; medium- to very coarse-grained Sand matrix, quartzite pebbles, mottled reddish to light brown and pale olive gray, slightly moist, very hard, slightly concretionary.				
55	1580				B: N75W 50NE	Some isolated Clay lenses and pods along bedding, 1± inch thick to 6± inches long, medium- to very coarse-grained Sand matrix, quartzite pebbles, mottled reddish to light brown and pale olive gray, slightly moist, very hard, slightly concretionary.				
60	1575	R	10 for 5"			Silty Sandstone; layered fine- to medium-grained, pale olive gray, moist, hard, friable; interbedded with Sandy to Clayey Siltstone, olive gray, moist, hard, laminated to 1/2± inch thick bedding. Siltstone concretion; 1± inch thick, light to olive gray, slightly moist, very hard, massive, slightly jointed with light brown staining along joints.	7.3	113.0	42	
					B: N80E 47NW					
65	1570				B: E-W 51N	Some gypsum along bedding; up to 1/4± inch thick.				
						Clayey Sandstone; very fine- to fine-grained, layered, pale yellowish brown to olive gray, moist, hard, friable, generally massive, some gypsum strands.				
70	1565	R/B	10 for 5"				12.1	109.6	63	
					B: B80W 48NE					
75	1560					Clayey Siltstone to Clayey Sandstone layers; 1± foot thick, very fine-grained, medium light to medium gray, moist, hard, micaceous, massive.				
					B: N75W 48NE	Silty Sandstone; very fine- to fine-grained, medium light to medium gray, moist, hard, micaceous, laminated to 1± inch thick bedding.				
	1555									

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- ▼ GROUNDWATER LEVEL
- ► WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-16

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch	BORING DESIG.	B-10
DATE STARTED	4/25/02	GROUND ELEV.	1635	LOGGED BY	CRN
DATE FINISHED	4/26/02	GW DEPTH (FT)		NOTE	0-27' 4500#; 27-52' 3500#; 52-80' 2500#; 80-104' 1000#
DRILLER	Dave's Drilling	DRIVE WT.	See Note		
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	1555	R/B	20 for 4"			No sample recovery at 80 feet.				
85	1550				B: E-W 52N	Gradational color change to light olive gray.				
90	1545	R	25 for 4"			Silty Sandstone; very fine- to fine-grained, light olive gray, slightly moist, hard, massive to very slightly bedded with some cross-bedding. No sample recovery at 92 feet.				
						Some isolated bi-valve shells to depth.				
95	1540				B: E-W 50N (Approx.)					
100	1535	R	25 for 4"							
						Total Depth 101 feet. No water, no caving. Hole backfilled with native				

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE
- [T] TUBE SAMPLE

▼ GROUNDWATER LEVEL
► WATER SEEP
[B] BEDDING
[J] JOINTING
[C] CONTACT
[F] FAULT
[S] SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-17

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/26/02	GROUND ELEV.	1582	BORING DESIG.	B-11
DATE FINISHED	4/26/02	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Dave's Drilling	DRIVE WT.	See Note	NOTE	0-27' 4500#; 27-52' 3500#; 52-80' 2500#; 80-104' 1000#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						PICO FORMATION (Tp):				
	1580				B: N50W 45SN J: N60E Vertical J: N10W 62NE	Sandy Siltstone; very fine-grained Sand, layered light to olive gray and light brown, slightly moist, moderately hard to hard, laminated to 1/2+ inch thick bedding, jointed/weathered, abundant roots.				
5					F: N80W 62NE F: N50W 63SW	Fault Gouge: 1/4 to 1/2+ inch thick, plastic Clay layer; olive gray, moist, soft to firm, flaky, abundant roots and rootlets.				
	1575									
10		R/B	5				13.0	119.4	89	
					J: N45W 78SW F: N55E 65NW	Fault Gouge: plastic Clay layer; olive gray, moist, soft, flaky, abundant roots.				
	1570									
15					B: N50E 48NW					
	1565									
						Some medium sized bi-valves.				
					B: N40E 49NW					
20		R/B	5 for 6"			Sandy Siltstone; very fine-grained Sand, medium dark gray, slightly moist, hard, massive, some isolated small to medium bi-valves.	13.2	122.3	99	
	1560									
25					J: N50W 86SW J: N40E 66NW	Clay lined joint 1-2 mm thick. Gypsum lined joint 2-3 mm thick.				
	1555									
30		R/B	8 for 6"			Sandy Siltstone; very fine-grained Sand, greenish gray, slightly moist, firm, massive, fossiliferous (small bi-valves); interlayered plastic with Silty Sandstone, medium gray, slightly moist, hard, slightly layered to massive; some Interlayered Claystone, medium dark to dark gray, moist, soft to moderately firm, laminated, flaky.	12.2	123.5	95	
	1550				B: N60W 75SW					
35										
	1545					Some isolated concretionary pods, 2 to 6+ inches in diameter, very hard.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER LEVEL
- WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-18

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/26/02	GROUND ELEV.	1582	BORING DESIG.	B-11
DATE FINISHED	4/26/02	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Dave's Drilling	DRIVE WT.	See Note	NOTE	0-27' 4500#; 27-52' 3500#; 52-80' 2500#; 80-104' 1000#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		R	8 for 6"		B: N20E 55NW	Clayey to Sandy Siltstone; very fine-grained Sand, greenish to dark greenish gray, slightly moist, firm, laminated to massive.	12.3	119.7	85	
	1540									
45					B: N60W 55SW (Approx.)					
	1535					Hard drilling.				
50		R/B	10 for 6"			Clayey Siltstone; medium dark gray, slightly moist, firm, slightly laminated, generally massive.	11.9	122.1	89	
	1530				B: N55W 75SW					
55										
	1525				B: N20W 67NE (Approx.)	Siltstone concretion lense; 8 to 10± inches thick, very hard, massive.				
60		R	15 for 6"			Clayey Siltstone; olive gray, slightly moist, firm, slightly laminated, generally massive, few small bi-valve shells.	10.5	121.0	76	
	1520				B: N60W Vertical	Ripple marks, small amplitude.				
65					B: N50W 52SW					
	1515				B: N50W 43SW					
70		R	15 for 5"		B: N80E 59SE	Sandy Siltstone; very fine-grained Sand, medium dark gray, slightly moist, hard, slightly laminated to 1/2± inch thick bedding, generally massive. Clay lense; 2 to 3± inches thick, medium dark gray, moist, soft, pliable.	10.3	105.0	47	
	1510									
75					B: N80W 75SW					
	1505									

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER LEVEL
- WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/26/02	GROUND ELEV.	1582	BORING DESIG.	B-11
DATE FINISHED	4/26/02	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Dave's Drilling	DRIVE WT.	See Note	NOTE	0-27' 4500#; 27-52' 3500#; 52-80' 2500#; 80-104' 1000#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		R	25 for 3.5"				10.8	120.8	78	
	1500					Total Depth 81 feet. No water, no caving. Hole backfilled with native materials and tamped.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- ▼ GROUNDWATER LEVEL
- ► WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-20

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch	BORING DESIG.	B-12
DATE STARTED	4/29/02	GROUND ELEV.	1557	LOGGED BY	CRN
DATE FINISHED	4/29/02	GW DEPTH (FT)		NOTE	0-27' 4500#; 27-52' 3500#; 52-80' 2500#; 80-104' 1000#
DRILLER	Dave's Drilling	DRIVE WT.	See Note		
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						PICO FORMATION (Tp):				
	1555				B: N60W 57NE	Sandy Siltstone; very fine- to fine-grained Sand; yellowish brown, slightly moist to moist, moderately hard, laminated to 1/2± inch thick bedding; interlayered with Silty Sandstone; fine-grained, mottled moderate yellowish brown and pale olive, slightly moist, moderately hard, laminated to 1/2± inch thick bedding; abundant caliche, both units highly to moderately weathered.				
5										
	1550				B: N80E 72NW	Abundant penecontemporaneous deformation.				
10		R/B	5 for 10"				12.9	117.6	84	
	1545					Sandy Siltstone; very fine-grained Sand; light olive gray, slightly moist to moist, moderately hard to hard, slightly laminated generally massive; some interlayered Silty Sandstone, fine-grained, layered yellowish gray and light brown, slightly moist, moderately hard to hard, laminated to 1/4± inch thick bedding; some fine-grained gypsum along bedding bottom of "high to moderate" weathering zone.				
15					B: N50W 65NE					
	1540									
20		R/B			B: N70W 73NE	Clayey Siltstone; mottled light to olive gray and moderate brown, slightly moist to moist, moderately hard to hard, massive, micaceous, some fine-rained gypsum strands.	14.6	115.8	90	
	1535					Silty Sandstone to Clayey Siltstone; very fine-grained Sand, medium dark gray, slightly moist, hard, massive, some small isolated bi-valves and gastropods.				
25										
	1530									
30					B: E-W 64N (Approx.)					
		R/B	10 for 10"			Sandy Siltstone; very fine-grained, medium dark gray, slightly moist to moist, hard, slightly laminated, generally massive, slightly fossiliferous, micaceous.	12.6	123.0	97	
	1525									
35										
	1520									

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- ▼ GROUNDWATER LEVEL
- ► WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-21

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/29/02	GROUND ELEV.	1557	BORING DESIG.	B-12
DATE FINISHED	4/29/02	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Dave's Drilling	DRIVE WT.	See Note	NOTE	0-27' 4500#; 27-52' 3500#; 52-80' 2500#; 80-104' 1000#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
					B: N70W 69NE	Sandy Siltstone to Silty Sandstone; very fine-grained Sand, medium dark gray, slightly moist to moist, hard, slightly laminated generally massive, slightly fossiliferous, micaceous; some interlayered Silty Sandstone, very fine-grained, light gray, slightly moist, hard, and Claystone, brownish to olive black, moist, moderately firm, laminated.	14.2	118.6	95	
	1515									
45					B: N50W 57NE (Approx.)					
	1510									
50		R/B	8 for 8"			Silty sandstone; very fine- to fine-grained, medium dark to olive gray, slightly moist, hard, slightly laminated, generally massive, micaceous, slightly fossiliferous.	13.4	120.8	96	
	1505									
55										
	1500									
60		R/B	15 for 8"		B: N60W 63NE	Silty Sandstone; very fine- to fine-grained, medium dark gray, slightly moist, hard, slightly laminated, generally massive, micaceous, slightly fossiliferous; some interbedded Claystone lenses, 1 to 2± thick, brownish to olive black, moist, moderately firm to firm, laminated.	13.2	120.6	94	
	1495				B: N60W 53NE	Silty Sandstone lense; 8± inches thick, light to medium light gray, fine-grained, moist, moderately hard, fossiliferous; underlain by 1 to 2± inch thick soft Claystone lense.				
65										
	1490				B: N50W 52NE					
70		R	15 for 8"			Silty Sandstone; very fine- to fine-grained, medium dark gray, slightly moist, hard, slightly laminated, generally massive, micaceous, slightly fossiliferous.	13.0	122.1	97	
	1485									
75					B: N25W 77NE					
	1480									

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE
- [T] TUBE SAMPLE

▼ GROUNDWATER LEVEL
► WATER SEEP
[B] BEDDING
[J] JOINTING
[C] CONTACT
[F] FAULT
[S] SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-22

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch	BORING DESIG.	B-12
DATE STARTED	4/29/02	GROUND ELEV.	1557	LOGGED BY	CRN
DATE FINISHED	4/29/02	GW DEPTH (FT)		NOTE	0-27' 4500#; 27-52' 3500#; 52-80' 2500#; 80-104' 1000#
DRILLER	Dave's Drilling	DRIVE WT.	See Note		
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		R/B	20 for 6"				13.3	108.9	68	
	1475				B: N65W 46NE	Silty Sandstone lense; interbedded with Sandy Siltstone, dark gray, slightly moist, hard, slightly lamainted, generally massive, 1/2 to 1± inch thick beds.				
85					B: N50W 63NE					
	1470									
90		R	25 for 5"				12.3	104.8	56	
						Total Depth 91 feet. No water, no caving. Hole backfilled with native materials and tamped.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER LEVEL
- WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-23

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	5/1/02	GROUND ELEV.	1445	BORING DESIG.	B-13
DATE FINISHED	5/1/02	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Dave's Drilling	DRIVE WT.	See Note	NOTE	0-27' 4500#; 27-52' 3500#; 52-80' 2500#; 80-104' 1000#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	1445					**SAUGUS FORMATION - SUNSHINE RANCH MEMBER (Tsr):** Silty Sandstone; fine- to coarse-grained with pebbles, very pale orange to pale yellowish brown, dry, moderately hard to hard, abundant scour-infill, normal grading.				
					B: N80E 55NW					
5	1440									
10	1435	R/B	5 for 5"		B: N80E 39NW	Silty Sandstone; fine- to coarse-grained, pale yellowish brown, dry to slightly moist, moderately hard to hard.	4.5	116.1	28	
					B: N70E 50NW	Some interlayered Clayey Siltstone layers; 6± inches thick, pale olive gray, moist, moderately hard, laminated.				
15	1430									
						1 foot thick lense of 6 to 8± inch diameter cobbles, scour/infill with lower contact into underlying Siltstone.				
20	1425	R/B	5 for 6"			Sandy Siltstone; very fine- to fine-grained, pale olive gray, moist, moderately hard to hard, slightly laminated generally massive.	11.1	120.1	78	
25	1420									
					B: E-W 40N	Silty Sandstone; fine- to coarse-grained with some pebble lenses, grayish orange to light olive gray, slightly moist to moist, moderately hard to hard, abundant scour-fill, graded bedding, cross-bedding.				
30	1415	R	8 for 6"				5.1	105.6	24	
35	1410				B: N80W 43NE					
	1405									

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- GROUNDWATER LEVEL
- WATER SEEP
- B BEDDING
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-24

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	5/1/02	GROUND ELEV.	1445	BORING DESIG.	B-13
DATE FINISHED	5/1/02	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Dave's Drilling	DRIVE WT.	See Note	NOTE	0-27' 4500#; 27-52' 3500#; 52-80' 2500#; 80-104' 1000#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		R/B	8 for 6"			Silty Sandstone; very fine- to fine-grained, pale olive gray, slightly moist to moist, moderately hard to hard; some interlayered Silty Sandstone, fine- to coarse-grained with pebbles, grayish orange, slightly moist, moderately hard to hard.	3.8	112.5	21	
45	1400					Silty Sandstone; fine- to coarse-grained with pebbles and cobbles, moderate yellowish to moderate brown, moist, moderately hard to hard.				
50	1395	B	N/R			Discontinuous Paleosol; Silty Sand to Sandy Silt, fine- to coarse-grained dark yellowish brown, moist, soft, 6± inches thick. Silty Sandstone; fine- to coarse-grained with pebbles and cobbles, some boulders up to 10± inches, moderate yellowish to moderate brown, moist, moderately hard to hard, massive 50/50± clast-matrix supported. @ 50 feet; no sample recovery due to cobbles.				
55	1390									
60	1385	R/B	10 for 5"			Silty Sandstone; fine- to coarse-grained with pebbles and some cobbles, moderate yellowish to moderate brown, moist, hard. FAULT ZONE: Clayey Siltstone; dusky blue green, moist, moderately hard to hard, massive, some polished surfaces, some scour-infill with overlying Sandstone.	7.5	112.7	43	
65	1380					FAULT: Claystone; olive gray, moist, moderately firm, slightly pliable, abundant polished surfaces and striations, laminated to 1± inch thick bedding. @ 66'; Trend and plunge of striations on fault plane: N60E 42W.				
70	1375	R/B	10 for 10"			Silty Sandstone; very fine- to fine-grained, light olive gray, moist, moderately hard, laminated to 2± inch, massive bedding. Silty Sandstone; fine- to coarse-grained with pebbles and cobbles, moderate yellowish brown, moist, moderately hard, scour-infill, generally massive, matrix supported.	14.6	119.0	99	
75	1370	B				Total Depth 78 feet. No water, no caving. Hole backfilled with native materials and tamped.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-25

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	5/2/02	GROUND ELEV.	1338	BORING DESIG.	B-14
DATE FINISHED	5/2/02	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Dave's Drilling	DRIVE WT.	See Note	NOTE	0-27' 4500#; 27-52' 3500#; 52-80' 2500#; 80-104' 1000#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
5	1333	B				**SOIL:** Sandy Silt; very fine- to fine-grained, pale to moderate yellowish brown, dry, very loose, abundant rootlets. **ALLUVIUM (Qal):** Sandy Silt to Silty Sand; very fine- to medium-grained with pebbles and cobbles, pale yellowish brown, dry, loose. Silty Sand; fine- to coarse-grained with pebbles and cobbles, some boulders up to 10± inches, moderate to dark yellowish brown, slightly moist, loose to moderately dense, stratified cobbles consist of gneiss, granite and sandstone, some quartzite. Increase moisture content to slightly moist. Boulder lense; 2-1/2 to 3± feet in diameter, moderate to major caving. Total Depth 8 feet. No water. Moderate to major caving 5 to 8± feet. Hole backfilled.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-26

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	5/2/02	GROUND ELEV.	1338	BORING DESIG.	B-14B
DATE FINISHED	5/2/02	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	Dave's Drilling	DRIVE WT.	See Note	NOTE	0-27' 4500#; 27-52' 3500#; 52-80' 2500#; 80-104' 1000#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						SOIL: Silty Sand to Sandy Silt; very fine- to fine-grained, pale yellowish brown, dry, very loose, abundant rootlets and gopher holes.				
						ALLUVIUM (Qal): Pebbly to cobbly Sand; fine- to coarse-grained, pale to moderate yellowish brown, dry, loose to moderately dense, stratified, some boulders to 10± inches.				
5	1333					Increase moisture to: slightly moist.				
		B				Boulder layer; up to 3± feet in diameter, moderate caving.				
						Increase moisture to: slightly moist to moist.				
10	1328					Boulder layer; up to 2± feet in diameter, predominantly Sandstone and Pebbly Sandstone, some granite.				
		B				Clayey Siltstone layer; 1 to 2± inch thick, mottled moderate yellowish brown and pale olive, moist to wet (perched/saturated), soft.				
15	1323					Boulder layer, need rippers/core to continue. Refusal.				
						Total Depth 14 feet.				
						No water. Moderate caving throughout.				
						Refusal - Boulders.				
						Hole backfilled.				
20	1318									
25	1313									
30	1308									
35	1303									

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-27

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/4/02	GROUND ELEV.	1323	BORING DESIG.	RW-1
DATE FINISHED	4/4/02	GW DEPTH (FT)		LOGGED BY	TMD
DRILLER	A & W Drilling	DRIVE WT.	See Note	NOTE	140# for SPT; 400# for ring sample
TYPE OF DRILL RIG	Rotary Wash	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						ALLUVIUM (Qal):				
5	1318	SPT	11			Silty Sand; brown with pebbles, slightly moist, medium dense.				
10	1313	SPT	11			Silty Sand; brown with pebbles, slightly moist, medium dense.				
15	1308	SPT	16			Silty Sand; brown with pebbles, slightly moist, medium dense.				
20	1303	SPT	26			Silty Sand; light brown with pebbles, slightly moist, medium dense.				
25	1298	SPT	60			Gravelly Sand; brown, slightly moist, very dense.				
30	1293	R	25			Silty Sand; fine- to medium-grained, light brown, moist, medium dense, 2± feet thick layer.	12.0	108.4	61	
35	1288	SPT	40			Sand; fine- to medium-grained, brown with gravel, moist, dense.				
						Very firm drilling.				

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE
- [T] TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-28

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/4/02	GROUND ELEV.	1323	BORING DESIG.	RW-1
DATE FINISHED	4/4/02	GW DEPTH (FT)		LOGGED BY	TMD
DRILLER	A & W Drilling	DRIVE WT.	See Note	NOTE	140# for SPT; 400# for ring sample
TYPE OF DRILL RIG	Rotary Wash	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		SPT	34			Gravelly Sand; fine- to medium-grained, brown, slightly moist, dense, some silt.				
45	1278	SPT	17 for 12"			Gravelly Sand; fine- to medium-grained, brown, moist, dense.				
						SAUGUS FORMATION - SUNSHINE RANCH MEMBER (Tsr):				
50	1273	SPT	75 for 6"			Harder drilling. Sandstone; medium- to coarse-grained with gravel, grayish brown.				
55	1268	SPT	75 for 5"			Silty Sandstone; fine- to coarse-grained with gravel, grayish brown. 6 to 8 inch cobble layer.				
60	1263	SPT	50 for 1"			No recovery.				
65	1258	R	50 for 4"			Sandstone; medium- to coarse-grained, brown, hard. Total Depth 65 feet. No apparent water or caving. Hole backfilled.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
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ASCE - Expansion Index
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GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/4/02	GROUND ELEV.	1318	BORING DESIG.	RW-2
DATE FINISHED	4/4/02	GW DEPTH (FT)	69	LOGGED BY	TMD
DRILLER	A & W Drilling	DRIVE WT.	See Note	NOTE	140# for SPT; 400# for ring sample
TYPE OF DRILL RIG	Rotary Wash	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						ALLUVIUM (Qal):				
5	1313	SPT	4			Sandy Silt; fine-grained, brown, slightly moist, soft.				
10	1308	SPT	16			Silty Sand; brown, slightly moist, medium dense, fine- to medium-grained with small pebbles, sample from spoils screen.				
15	1303	SPT	36			Slightly Silty Sand; brown, moist, dense, fine- to medium-grained with pebbles, sample obtained by driving ring sampler 6".				
20	1298					Cobbles.				
		SPT	22			Gravelly Silty Sand; fine- to coarse-grained, red/brown, slightly most, medium dense, with pebbles.				
25	1293	SPT	18			Sandy Silt; brown, slightly moist, very stiff.				
30	1288	SPT	19			Silty Sand to Sandy Silt; fine-grained Sand, light brown, moist, very stiff.				
35	1283	SPT	35			Silty Sand; fine- to coarse-grained, with gravel, light brown, slightly moist, dense.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-30

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/4/02	GROUND ELEV.	1318	BORING DESIG.	RW-2
DATE FINISHED	4/4/02	GW DEPTH (FT)	69	LOGGED BY	TMD
DRILLER	A & W Drilling	DRIVE WT.	See Note	NOTE	140# for SPT; 400# for ring sample
TYPE OF DRILL RIG	Rotary Wash	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		R	32			Sand; fine to coarse-grained brown, slightly moist, dense, soil retrieved from sampler tip with large rock fragment.				
45	1273	R	28			Sand; with gravel, medium to coarse-grained, red brown, slightly moist, slightly dense, Siltstone fragments in sampler tip.	11.0	121.7	81	
50	1268	SPT	57 for 6"			Silty Sand; fine to coarse-grained with gravel, light brown, slightly moist, very dense, sample may be from side of boring.				
55	1263	SPT	22			Sandy to Silty Clay; dark brown, moist, very stiff, soil obtained by driving ring sampler 6".				
60	1258	SPT	18			Sandy to Silty Clay; dark brown, moist, very stiff, soil obtained by driving ring sampler 6".				
65	1253	SPT	15			Sandy Silty Clay; fine-grained Sand, light brown, slightly moist, stiff, soil obtained by driving ring sampler 6".				
70	1248	SPT	32			**SAUGUS FORMATION-SUNSHINE RANCH MEMBER (Tsr):** slightly Sandy Silty Clay; fine-grained Sand, grayish brown, soil obtained by driving ring sampler 6".				
75	1243	SPT	22 for 12"			Silty Sandstone; gray. Total Depth 75 feet. Water at 69 feet. No apparent caving. Hole backfilled.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
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PACIFIC SOILS ENGINEERING, INC.

PLATE A-31

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch	BORING DESIG.	RW-3
DATE STARTED	4/4/02	GROUND ELEV.	1330	LOGGED BY	TMD
DATE FINISHED	4/5/02	GW DEPTH (FT)	54	NOTE	140# for SPT; 400# for ring sample
DRILLER	A & W Drilling	DRIVE WT.	See Note		
TYPE OF DRILL RIG	Rotary Wash	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						ALLUVIUM (Qal):				
5	1325	SPT	19			Sandy Silt; fine-grained, light brown, slightly moist, very stiff.				
10	1320	SPT	20			Sandy Silt; fine-grained, light brown, slightly moist, very stiff.				
15	1315	SPT	14			Silty Sand; fine- to coarse-grained, light brown, slightly moist, medium dense.				
20	1310	SPT	30			Gravelly Sand; medium- to coarse-grained, light brown, slightly moist, dense.				
25	1305	R	17			Gravelly Sand; medium- to coarse-grained, light brown, slightly moist, medium dense.	8.1	111.0	44	
30	1300	SPT	50 for 11"			Silty Sand; medium- to coarse-grained, with gravel, light brown, slightly moist, very dense.				
35	1295	SPT	48			Gravelly Sand; medium- to coarse-grained, with silt, light brown, slightly moist, dense.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-32

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/4/02	GROUND ELEV.	1330	BORING DESIG.	RW-3
DATE FINISHED	4/5/02	GW DEPTH (FT)	54	LOGGED BY	TMD
DRILLER	A & W Drilling	DRIVE WT.	See Note	NOTE	140# for SPT; 400# for ring sample
TYPE OF DRILL RIG	Rotary Wash	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		SPT	30 for 11"			Silty Sand; medium- to coarse-grained, with gravel, light brown, slightly moist, very dense.				
45	1285	SPT	19			Sandy Silt; fine-grained, light brown, slightly moist, very stiff.				
50	1280	SPT	50 for 10.5"			Slightly Silty Sand; fine-grained, reddish brown, moist, very dense.				
55	1275	SPT	31			Sandy Silty Clay; fine-grained, light brown, moist, hard, soil obtained from ring sampler, driven 6".				
60	1270	SPT	75 for 5"			**SAUGUS FORMATION - SUNSHINE RANCH MEMBER (Tsr):** Slightly Clayey Sand; medium- to coarse-grained, gray.				
65	1265	R	60 for 6"			Sandstone; medium to coarse-grained; gray. No sample retrieved. Total Depth 65 feet. Groundwater at 54 feet. No apparent caving. Hole backfilled.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-33

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/5/02	GROUND ELEV.	1408	BORING DESIG.	RW-4
DATE FINISHED	4/5/02	GW DEPTH (FT)		LOGGED BY	TMD
DRILLER	A & W Drilling	DRIVE WT.	See Note	NOTE	140# for SPT; 400# for ring sample
TYPE OF DRILL RIG	Rotary Wash	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						ALLUVIUM (Qal):				
5	1403	SPT	7			Sandy Silty Clay; fine-grained Sand, light brown, slightly moist, firm.				
10	1398	SPT	11			Silty Sand; light brown, slightly moist, medium dense.				
15	1393	SPT	35 for 11"			**SAUGUS FORMATION - SUNSHINE RANCH MEMBER** (Tsr): Slightly Clayey Siltstone; grayish brown, weathered.				
20	1388	R	75 for 11"			Very fine Sandy Siltstone; gray, hard. Total Depth 20 feet. No apparent groundwater or caving. Hole backfilled.	14.5	119.3	100	

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-34

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/5/02	GROUND ELEV.	1348	BORING DESIG.	RW-5
DATE FINISHED	4/5/02	GW DEPTH (FT)	17	LOGGED BY	TMD
DRILLER	A & W Drilling	DRIVE WT.	See Note	NOTE	140# for SPT; 400# for ring sample
TYPE OF DRILL RIG	Rotary Wash	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT. URATION (%)	OTHER TESTS
						ALLUVIUM (Qal):				
5	1343	SPT	17			Silty Sand; fine-grained, light brown, slightly moist, medium dense.				
10	1338	SPT	8			Silty Sand to Sandy Silt; dark brown, moist, loose.				
15	1333	R	5			Silty Sand; fine- to medium-grained, dark brown, slightly moist, slightly dense. ▼	17.3	112.9	99	
20	1328	SPT	6			Clayey to Silty Sand; brown, moist, loose.				
25	1323	SPT	10			Clayey to Sandy Silt; gray, very moist, stiff.				
						Some gravel.				
30	1318	SPT	50 for 8"			Silty fine- to medium-grained Sand; gray, moist, very dense.				
35	1313	SPT	57			**SAUGUS FORMATION - SUNSHINE RANCH MEMBER (Tsr):** Silty Sandstone/Sandy Siltstone; brown/gray.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/5/02	GROUND ELEV.	1348	BORING DESIG.	RW-5
DATE FINISHED	4/5/02	GW DEPTH (FT)	17	LOGGED BY	TMD
DRILLER	A & W Drilling	DRIVE WT.	See Note	NOTE	140# for SPT; 400# for ring sample
TYPE OF DRILL RIG	Rotary Wash	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		R	50 for 10"			Silty Sandstone; medium- to coarse-grained, gray, hard. Total Depth 40 feet. No apparent caving. Groundwater at 17 feet. Hole backfilled.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
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ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-36

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	4/5/02	GROUND ELEV.	1379	BORING DESIG.	RW-6
DATE FINISHED	4/5/02	GW DEPTH (FT)	18	LOGGED BY	TMD
DRILLER	A & W Drilling	DRIVE WT.	See Note	NOTE	140# for SPT; 400# for ring sample
TYPE OF DRILL RIG	Rotary Wash	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						ALLUVIUM (Qal):				
5	1374	SPT	6			Silty Sand; brown, slightly moist, loose.				
10	1369	SPT	14			Gravelly Sand; fine- to medium-grained, brown, some silt, slightly moist, medium dense.				
15	1364	SPT	23			Gravelly Sand; fine- to medium-grained, with some silt, reddish brown, very moist, medium dense.				
20	1359	R	11			**SAUGUS FORMATION - SUNSHINE RANCH MEMBER (Tsr):** Silty medium- to coarse-grained Sand; red brown, with gravel, ring sample disturbed.				
25	1354	R	50 for 6"			Sandy Siltstone; very fine-grained Sand, bluish gray, hard. Total Depth 25 feet. No apparent caving. Water at 17.5 feet. Hole backfilled.	15.6	116.6	99	

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
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PACIFIC SOILS ENGINEERING, INC.

PLATE A-37

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch	BORING DESIG.	CPT/SPT-1
DATE STARTED	7/31/01	GROUND ELEV.	1317	LOGGED BY	CRN
DATE FINISHED	7/31/01	GW DEPTH (FT)		NOTE	Combo Rig - Truck Mounted, 4-1/2" Rotary Wash, SPT & CPT
DRILLER	Gregg In-Situ	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	See Note	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						ALLUVIUM (Qal): (Note: See adjacent exploratory boring B-1 for descriptive log of Alluvium from 0 to 70± feet).				
5	1312					Begin CPT.				
10	1307									
15	1302									
20	1297					Stop CPT - Drill through gravelly layers.				
25	1292					Begin CPT - Stop CPT - (Unable to advance) Drill through gravelly layers.				
30	1287	SPT	50 for 5"			Begin CPT - Stop CPT (6± inches of advancement). Drill through gravelly layers.				
35	1282									

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch	BORING DESIG.	CPT/SPT-1
DATE STARTED	7/31/01	GROUND ELEV.	1317	LOGGED BY	CRN
DATE FINISHED	7/31/01	GW DEPTH (FT)		NOTE	Combo Rig - Truck Mounted, 4-1/2" Rotary Wash, SPT & CPT
DRILLER	Gregg In-Situ	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	See Note	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						Begin CPT.				
						Stop CPT. Drill through gravelly layers.				
45	1272					Pebbles in auger tip.				
50	1267					Gravel lense. Begin CPT.				
						Stop CPT. Drill through gravelly layers.				
55	1262									
60	1257					Begin CPT.				
						Stop CPT. Drill through gravelly layers.				
65	1252									
70	1247	SPT	102 for 4"			Gravelly Sand; medium to coarse-grained with pebbles, moderate yellowish brown, moist to wet, dense, interlayered pebble lenses.				
75	1242									

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch	BORING DESIG.	CPT/SPT-1
DATE STARTED	7/31/01	GROUND ELEV.	1317	LOGGED BY	CRN
DATE FINISHED	7/31/01	GW DEPTH (FT)		NOTE	Combo Rig - Truck Mounted, 4-1/2" Rotary Wash, SPT & CPT
DRILLER	Gregg In-Situ	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	See Note	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		SPT	70			SAUGUS FORMATION - SUNSHINE RANCH MEMBER (Tsr): Silty Sandstone; fine to coarse-grained with some pebbles, yellowish gray, moist to wet, moderately hard.				
85	1232									
90	1227	SPT	50 for 2"			Gravelly Sandstone to Pebbly Conglomerate; medium to very coarse-grained, light to medium gray, moist, moderately hard.				
95	1222									
						Claystone; 1 to 2± foo thick layer/lense, olive gray, moist to wet, soft to firm.				
100	1217	SPT	50 for 3"			@ 100 feet; No recovery of SPT sample.				
						Total Depth 101± feet. Hole backfilled with on-site cuttings.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
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GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	7/31/01	GROUND ELEV.	1363	BORING DESIG.	CPT/SPT-2
DATE FINISHED	7/31/01	GW DEPTH (FT)	15	LOGGED BY	CRN
DRILLER	Gregg In-Situ	DRIVE WT.	140 lbs.	NOTE	Combo Rig - Truck Mounted, 4-1/2" Rotary Wash, SPT & CPT
TYPE OF DRILL RIG	See Note	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						ALLUVIUM (Qal):				
		SPT	10			Silt; dark yellowish brown, moist, soft to moderately firm.				
5	1358									
10	1353	SPT	3			Sandy Clay; fine-grained, moderate yellowish brown, moist, soft to moderately firm.				
15	1348	SPT	13			▼ Clayey Sand; fine- to medium- with some coarse-grained, olive gray, moist to wet, moderately dense.				
20	1343	SPT	3			**SAUGUS FORMATION - SUNSHINE RANCH MEMBER (Tsr):** Clayey Sandstone; fine- to very coarse-grained with pebbles, medium dark gray, moist, moderately hard to hard.				
25	1338					Begin CPT.				
30	1333	SPT	50 for 3"			Stop CPT. Silty Sandstone; fine- to coarse-grained, medium gray, slightly moist, hard to very hard.				
35	1328									

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
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CONS - Consolidation

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Canyon Ranch		
DATE STARTED	7/31/01	GROUND ELEV.	1363	BORING DESIG.	CPT/SPT-2
DATE FINISHED	7/31/01	GW DEPTH (FT)	15	LOGGED BY	CRN
DRILLER	Gregg In-Situ	DRIVE WT.	140 lbs.	NOTE	Combo Rig - Truck Mounted, 4-1/2" Rotary Wash, SPT & CPT
TYPE OF DRILL RIG	See Note	DROP	30 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		SPT	50 for 3"			Silty Sandstone; fine- to coarse-grained, medium gray, slightly moist, hard to very hard. Total Depth 41 feet. Groundwater at 15 feet. No apparent caving. Hole backfilled.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Ranch	BORING DESIG.	B-101
DATE STARTED	1/13/04	GROUND ELEV.	1315	LOGGED BY	CRN
DATE FINISHED	1/13/04	GW DEPTH (FT)		NOTE	0-24', 3548;:#; 24-47',
DRILLER	JN Drilling	DRIVE WT.	See Note		2577#; 47-75', 1648#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						ALLUVIUM (Qal): Silty to Clayey Sand; fine-grained, few pebbles, dark yellowish brown, moist, loose to medium dense, abundant roots and rootlets.				
5	1310	R/B	Push			Sandy Silt; very fine- to fine-grained Sand, moderate yellowish brown, slightly moist, very loose, slightly porous, some white carbonate.	10.0	82.4	26	
10	1305	R	Push for 6" 1 for 6"			Sand Silt; very fine- to fine-grained Sand, moderate yellowish brown, slightly moist, very loose, slightly porous, some white carbonate, some rootlets.	5.1	103.0	22	
15	1300	R	1			Silty Sand; fine- with some medium-grained, few pebbles, moderate to dark yellowish brown, slightly moist, loose.	6.2	107.3	29	
20	1295	R/B	1			Silty Sand; fine- to coarse-grained with some pebbles, moderate yellowish brown, slightly moist, loose.	6.2	105.1	28	
25	1290					Gravelly Sand; fine- to coarse-grained with pebbles and cobbles, few boulders to 1± foot, light to moderate yellowish brown, slightly moist, loose to medium dense; interlayered with Sand lenses, medium- to coarse-grained, light yellowish brown, slightly moist, loose to medium dense.				
30	1285	B				Increase abundance of cobbles and boulders (8 to 12± inches).				
35	1280	B				34 to 36± feet, some raveling in coarse-grained material, change to cork screw auger.				
						SAUGUS FORMATION-SUNSHINE RANCH FORMATION MEMBER (Tsr): Pebble and Cobble Conglomerate; medium- to very coarse-grained Sand matrix; pale yellowish gray, dry to slightly moist, hard to very hard.				

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-43

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Ranch		
DATE STARTED	1/13/04	GROUND ELEV.	1315	BORING DESIG.	B-101
DATE FINISHED	1/13/04	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	JN Drilling	DRIVE WT.	See Note	NOTE	0-24', 3548#; 24-47', 2577#; 47-75', 1648#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						Total Depth 40± feet. No water. Some raveling 34 to 36± feet. Hole backfilled.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-44

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Ranch	BORING DESIG.	B-102
DATE STARTED	1/13/04	GROUND ELEV.	1323	LOGGED BY	CRN
DATE FINISHED	1/13/04	GW DEPTH (FT)		NOTE	0-24', 3548:;#; 24-47',
DRILLER	JN Drilling	DRIVE WT.	See Note		2577#; 47-75', 1648#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						SOIL: Sandy Silt; very fine- to fine- with some medium-grained Sand, dark yellowish brown, moist, very loose, abundant roots and rootlets.				
						ALLUVIUM (Qal): Sand Silt; very fine- to fine-grained Sand, moderate yellowish brown, slightly moist to moist, loose.				
5	1318	R/B	1			Sandy Silt to Silty Sand; fine- to medium- with some coarse-grained Sand and pebbles, dry to slightly moist, loose, porous, some rootlets.	4.8	100.7	19	
10	1313	R	Push			Sandy Silt to Silty Sand; fine- to medium- with some coarse-grained Sand and pebbles, dry to slightly moist, very loose, porous, some rootlets.	9.4	105.1	42	
15	1308	R	Push			Sandy Silt to Silty Sand; fine- to medium- with some coarse-grained Sand and pebbles, moderate yellowish brown, slightly moist to moist, very loose.	9.8	106.8	46	
20	1303	R/B	1			Sandy Silt to Silty Sand; fine- to medium- with some coarse-grained Sand and pebbles, colour change to moderate yellowish brown, moisture increase to slightly moist to moist, dry to slightly moist, loose.	8.1	107.0	38	
25	1298	R/B	2			Silty Sand; fine- to coarse-grained with pebbles, pale to moderate yellowish brown, slightly moist, loose to medium dense.	3.0	115.6	18	
30	1293					Increase abundance of pebbles and cobbles.				
		R	3			Pebbly to Cobbly Sand; fine- to coarse-grained, pale to moderate yellowish brown, slightly moist to moist, medium dense; Interlayered with Silty Sand; fine- to coarse-grained with pebbles, pale to moderate yellowish brown, slightly moist, medium dense.	3.8	118.3	24	
		B								
35	1288					Change to cork-screw auger due to abundant cobbles and boulders (up to 12± inches). 34 to 38± feet, moderate to severe raveling of coarse-grained materials.				
						SAUGUS FORMATION-SUNSHINE RANCH FORMATION MEMBER (Tsr)(?): Clayey to Sandy Silt; fine-grained Sand; moderate yellowish brown, moist, soft.				

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Ranch		
DATE STARTED	1/13/04	GROUND ELEV.	1323	BORING DESIG.	B-102
DATE FINISHED	1/13/04	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	JN Drilling	DRIVE WT.	See Note	NOTE	0-24', 3548;;#; 24-47',
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		2577#; 47-75', 1648#

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						(weathered Tsr?). "Hard Drilling" at auger tip/refusal.				
						Total Depth 38 feet.				
						No water.				
						Moderate to severe raveling 34 to 38± feet.				
						Hole backfilled.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Ranch		
DATE STARTED	1/13/04	GROUND ELEV.	1324	BORING DESIG.	B-103
DATE FINISHED	1/13/04	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	JN Drilling	DRIVE WT.	See Note	NOTE	0-24', 3548;#; 24-47',
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		2577#; 47-75', 1648#

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						ALLUVIUM (Qal): Sandy Silt; very fine- to fine-grained Sand, dark to moderate yellowish brown, moist, very loose, abundant roots and rootlets.				
5	1319	R	Push			Silty Sand; fine- to medium-grained, moderate yellowish brown, slighty moist, very loose.	4.0	103.1	17	
						Increase abundance of pebbles.				
10	1314	R	Push			Silty Sand; fine- to coarse-grained with pebbles, moderate yellowish brown, slighty moist, loose to medium dense.	8.6	104.8	38	
						Some cobbles and boulders (up to 12± inches).				
15	1309	R	Push			Silty Sand; fine- to medium-grained with some pebbles, moderate yellowish brown, slightly moist, loose to medium dense.	8.9	107.4	42	
20	1304	R	1			Silty Sand; fine- to medium-grained with some pebbles, moderate yellowish brown, slightly moist, loose.	11.1	104.8	49	
25	1299	R	1			Silty Sand; fine- to coarse-grained with pebbles, pale to moderate yellowish brown, slightly moist, loose.	4.8	114.9	28	
30	1294	R	3			Silty Sand; fine- to coarse-grained with pebbles and cobbles, pale to moderate yellowish brown, slightly moist, medium dense.	6.3	111.6	33	
35	1289					Pebbly to cobbly Sand; fine- to coarse-grained, moderate yellowish brown, slightly moist, medium dense to dense.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-47

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Ranch		
DATE STARTED	1/13/04	GROUND ELEV.	1324	BORING DESIG.	B-103
DATE FINISHED	1/13/04	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	JN Drilling	DRIVE WT.	See Note	NOTE	0-24', 3548;#; 24-47',
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		2577#; 47-75', 1648#

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		B				Pebbly to cobbly Sand; fine- to coarse-grained with some boulders up to 12± inches, moderate yellowish brown, slightly moist, dense.				
45	1279					Increase abundant of cobbles and boulders.				
						SAUGUS FORMATION-SUNSHINE RANCH FORMATION MEMBER (Tsr): Pebble and Cobble Conglomerate; fine to very coarse-grained Sand matrix, pale yellowish gray, dry to slighty moist, hard.				
						Total Depth 49 feet. No water. No caving. Hole backfilled.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-48

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Ranch		
DATE STARTED	1/13/04	GROUND ELEV.	1315	BORING DESIG.	B-104
DATE FINISHED	1/13/04	GW DEPTH (FT)		LOGGED BY	CRN
DRILLER	JN Drilling	DRIVE WT.	See Note	NOTE	0-24', 3548#; 24-47', 2577#; 47-75', 1648#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						ALLUVIUM (Qal): Silty Sand; fine- to coarse-grained with pebbles and cobbles, pale yellowish brown, slightly moist, loose to medium dense. Sandy Silt; very fine- to fine-grained Sand, moderate yellowish brown, moist, loose.				
5	1310	R	1			Silty Sand; very fine- to fine-grained Sand, moderate yellowish brown, moist, loose.	6.8	103.8	29	
10	1305	R/B	2			Silty Sand; fine- to coarse-grained with pebbles and cobbles, pale yellowish brown, slightly moist, medium dense.	6.4	100.4	25	
15	1300	R	3			Silty Sand; fine- to coarse-grained with pebbles and some cobbles, moderate yellowish brown, slightly moist, medium dense.	2.4	120.7	16	
20	1295	R	1			Silty Sand; fine- to medium-grained and pebbles, moderate yellowish brown, slightly moist, medium dense.	6.3	103.4	27	
25	1290	B				Pebbly to Cobbly Sand; fine- to coarse-grained, moderate yellowish brown, slightly moist to moist, medium dense. Some boulders up to 12± inches.				
		R	2			Silty Sand; fine- to medium-grained and pebbles, moderate yellowish brown, slightly moist, medium dense.	6.9	108.2	33	
30	1285	B								
		R	3			Interlayered 1± foot: Pebbly to cobbly Sand; medium- to very coarse-grained, moderate yellowish gray, slightly moist, medium dense. Silty Sand; fine- to coarse-grained with pebbles, moderate yellowish brown, slightly moist, medium dense.	3.5	107.7	17	
35	1280	R	2			Interlayered 1± foot: Pebbly to cobbly Sand; medium- to very coarse-grained, moderate yellowish gray, slightly moist, medium dense.	4.0	111.1	21	

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-49

GEOTECHNICAL BORING LOG

PROJECT NO.	102453-T	PROJECT NAME	Lyons Ranch	BORING DESIG.	B-104
DATE STARTED	1/13/04	GROUND ELEV.	1315	LOGGED BY	CRN
DATE FINISHED	1/13/04	GW DEPTH (FT)		NOTE	0-24', 3548;,#; 24-47',
DRILLER	JN Drilling	DRIVE WT.	See Note		2577#; 47-75', 1648#
TYPE OF DRILL RIG	30" Bucket Auger	DROP	12 inches		

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
45	1270	R/B	3			Silty Sand; fine- to coarse-grained with pebbles, moderate yellowish brown, slightly moist, medium dense. Interlayered 1± foot: Pebbly to Cobbly Sand; medium- to very coarse-grained, moderate yellowish gray, slightly moist, medium dense.	4.3	108.3	21	
50	1265	R	4			Silty Sand; very fine- to medium-grained with some pebbles, moderate yellowish brown, slightly moist, medium dense.	8.4	104.0	37	
						Pebbly to cobbly Sand; fine- to coarse-grained, pale to moderate yellowish brown, slightly moist, medium dense.				
55	1260					Silty Sand; fine- to very coarse-grained with pebbles and cobbles, moderate yellowish brown, slightly moist to moist, medium dense.				
60	1255									
65	1250	B				Silty Sand; fine- to very coarse-grained with pebbles and cobbles, moderate yellowish brown, slightly moist to moist, medium dense. Pebbly to cobbly Sand; fine- to coarse-grained, pale to moderate yellowish brown, slightly moist, medium dense.				
70	1245					**SAUGUS FORMATION-SUNSHINE RANCH FORMATION MEMBER (Tsr):** Pebble and cobble Conglomerate; medium to coarse-grained Sand matrix, pale yellowish gray, dry to slighty moist, hard. Total Depth 70 feet. No water. No caving. Hole backfilled.				

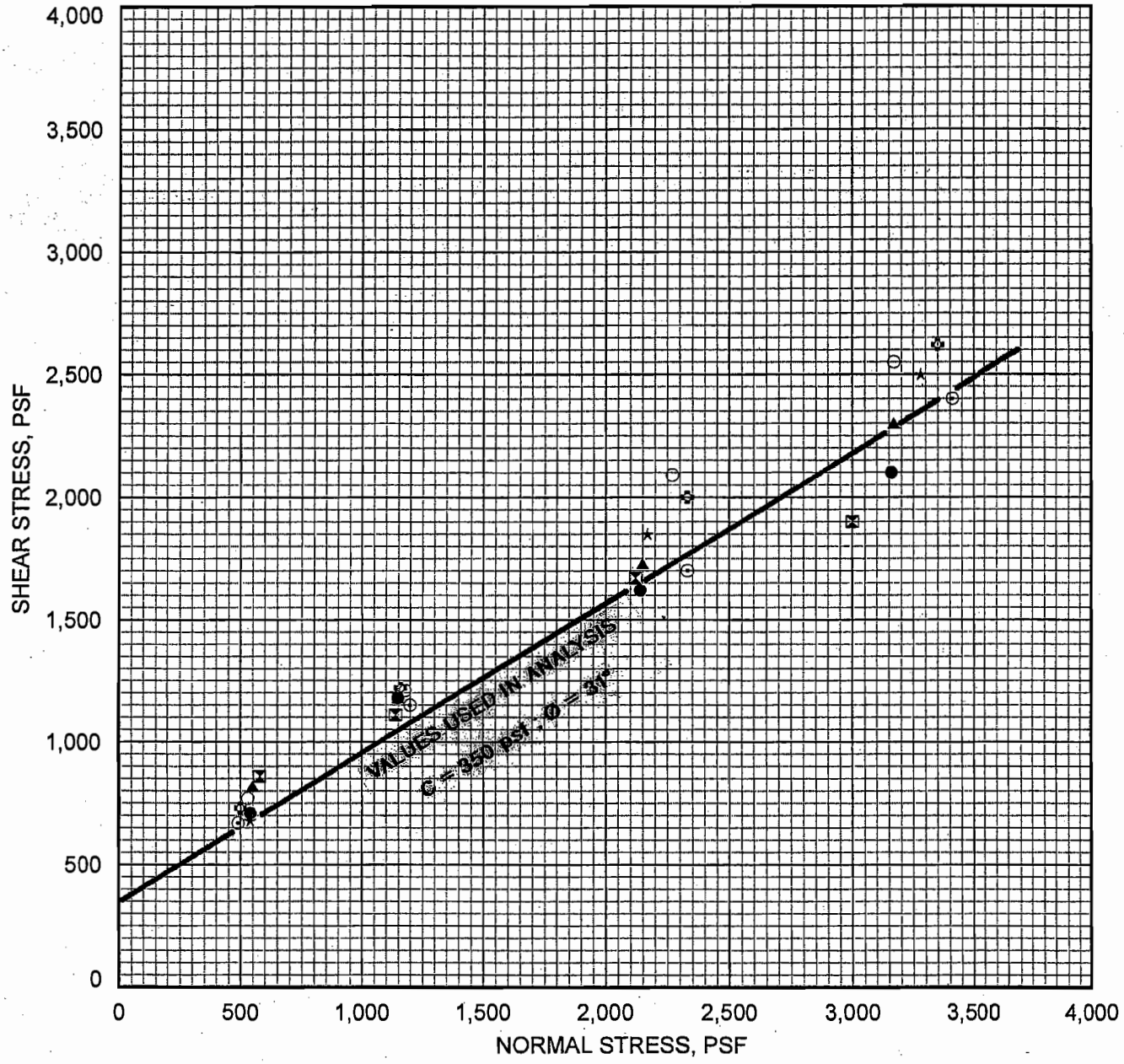
SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE A-50

DIRECT SHEAR TEST
REMOLDED



ENGINEERED FILL (90% R.C.)	COHESION	psf.
	FRICTION ANGLE	degrees

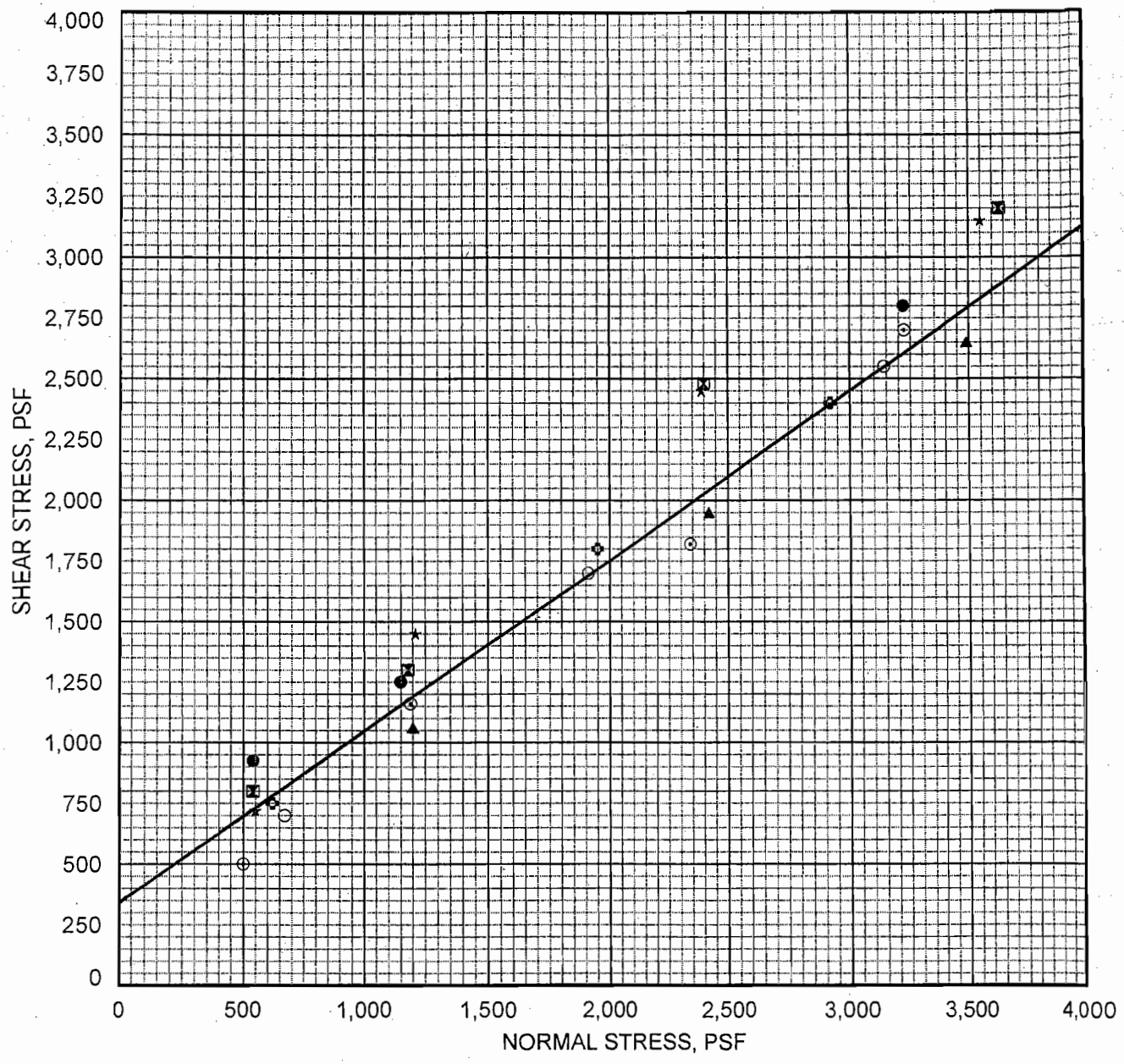
symbol	boring	depth (ft.)	symbol	boring	depth (ft.)
●	B-10	30.0			
⊠	B-11	30.0			
▲	B-12	30.0			
★	B-13	50.0			
⊙	B-2	10.0			
✿	B-6B	10.0			
○	B-7	5.0			

DIRECT SHEAR TEST

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T **PLATE B-1**

DIRECT SHEAR TEST
Undisturbed/Saturated



BEDROCK, SUNSHINE RANCH MEMBER (Tsp)	COHESION	350 psf.
	FRICTION ANGLE	35 degrees

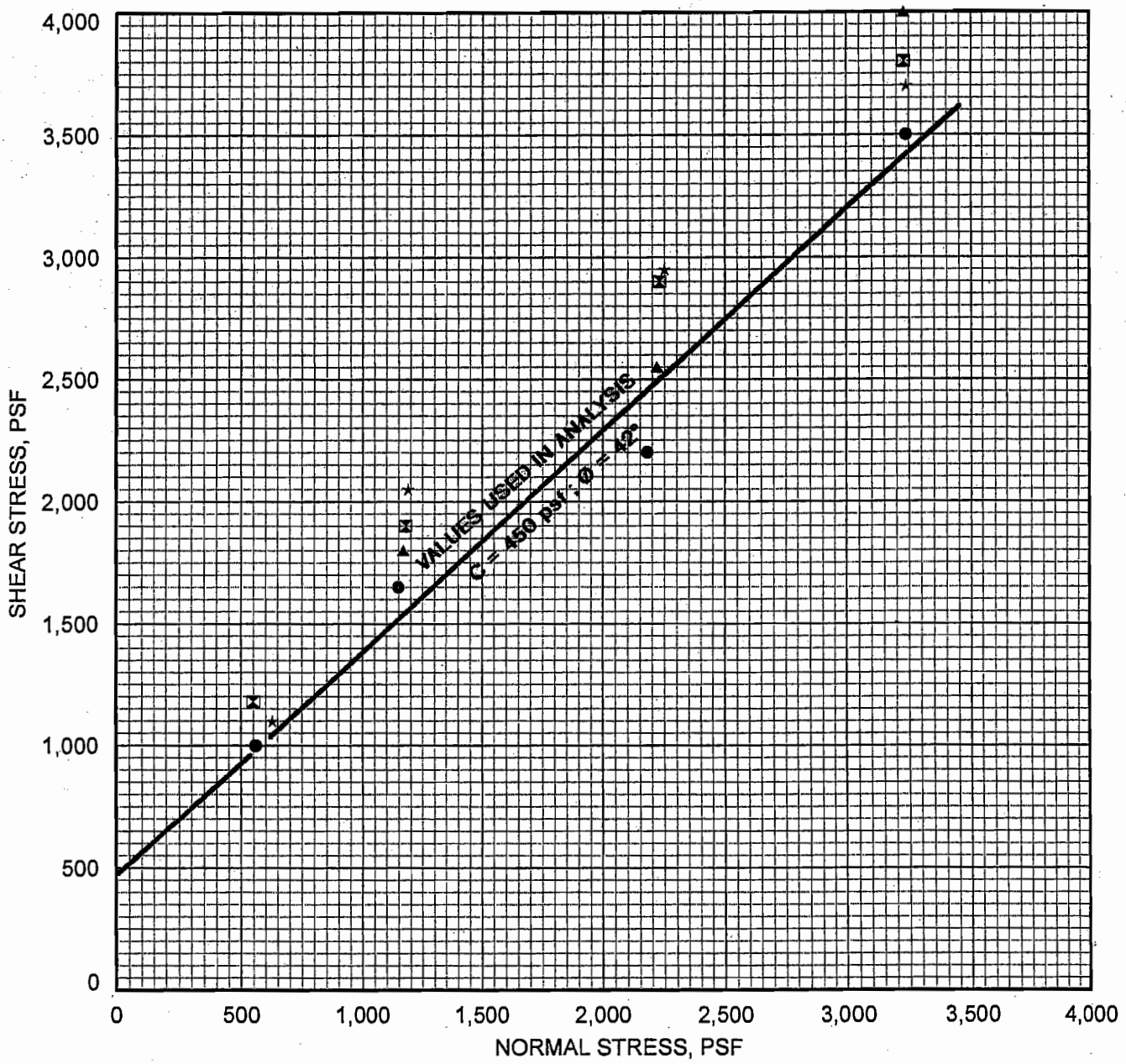
symbol	boring	depth (ft.)	symbol	boring	depth (ft.)
●	B-13	20.0			
⊠	B-6B	15.0			
▲	B-7	5.1			
★	B-8	20.0			
⊙	B-9	40.0			
✿	EP-205	6.0			
○	EP-205	10.0			

DIRECT SHEAR TEST

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-RT PLATE B-2

DIRECT SHEAR TEST
"UNDISTURBED"



PICO FORMATION (Tp)	COHESION	psf.
	FRICTION ANGLE	degrees

symbol	boring	depth (ft.)	symbol	boring	depth (ft.)
●	B-10	30.1			
⊠	B-11	40.0			
▲	B-11	60.0			
★	B-12	30.1			

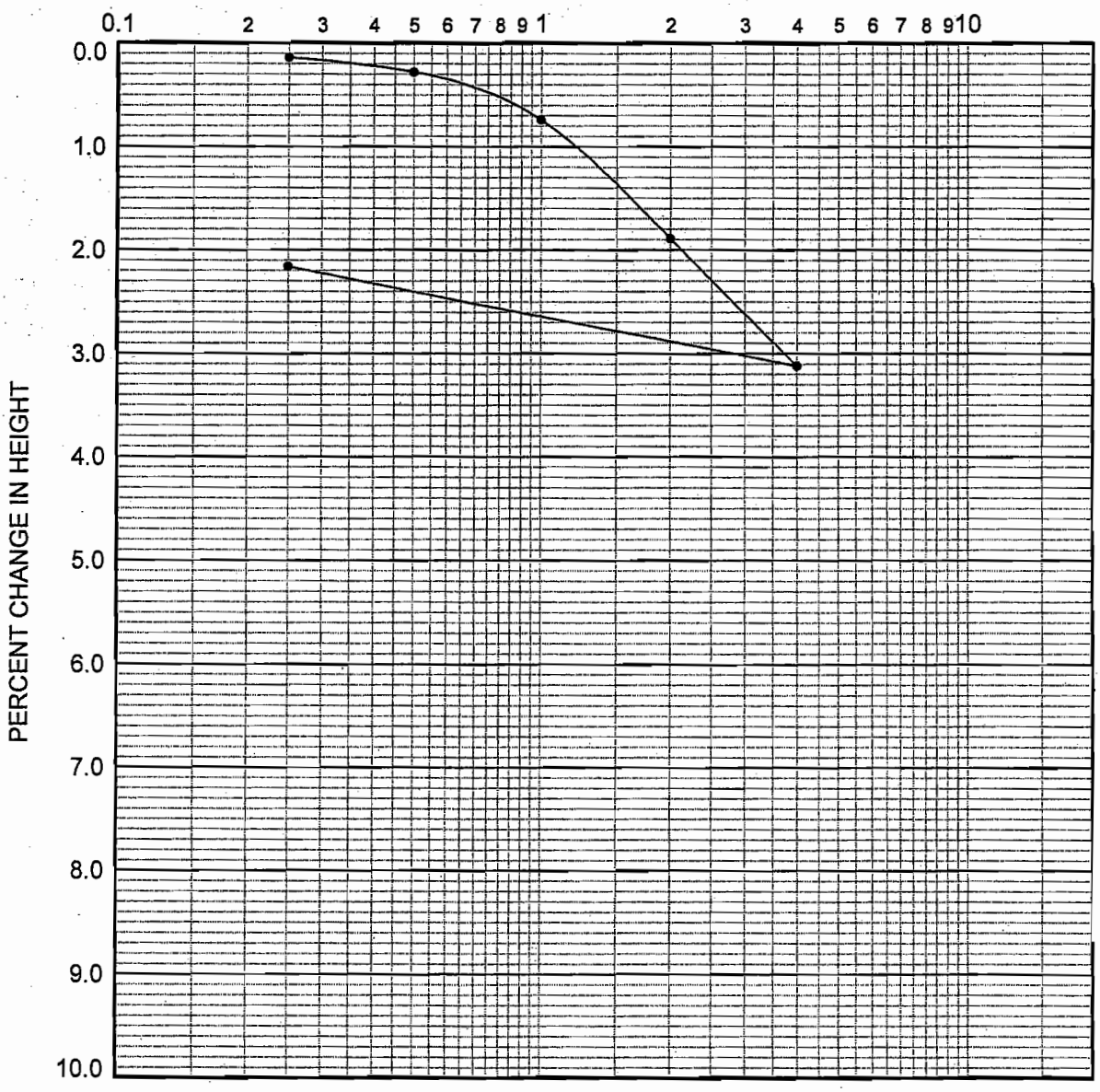
DIRECT SHEAR TEST

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T

PLATE B-3

COMPRESSIVE STRESS IN TSF



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-1	10.0	96.4	7.0			

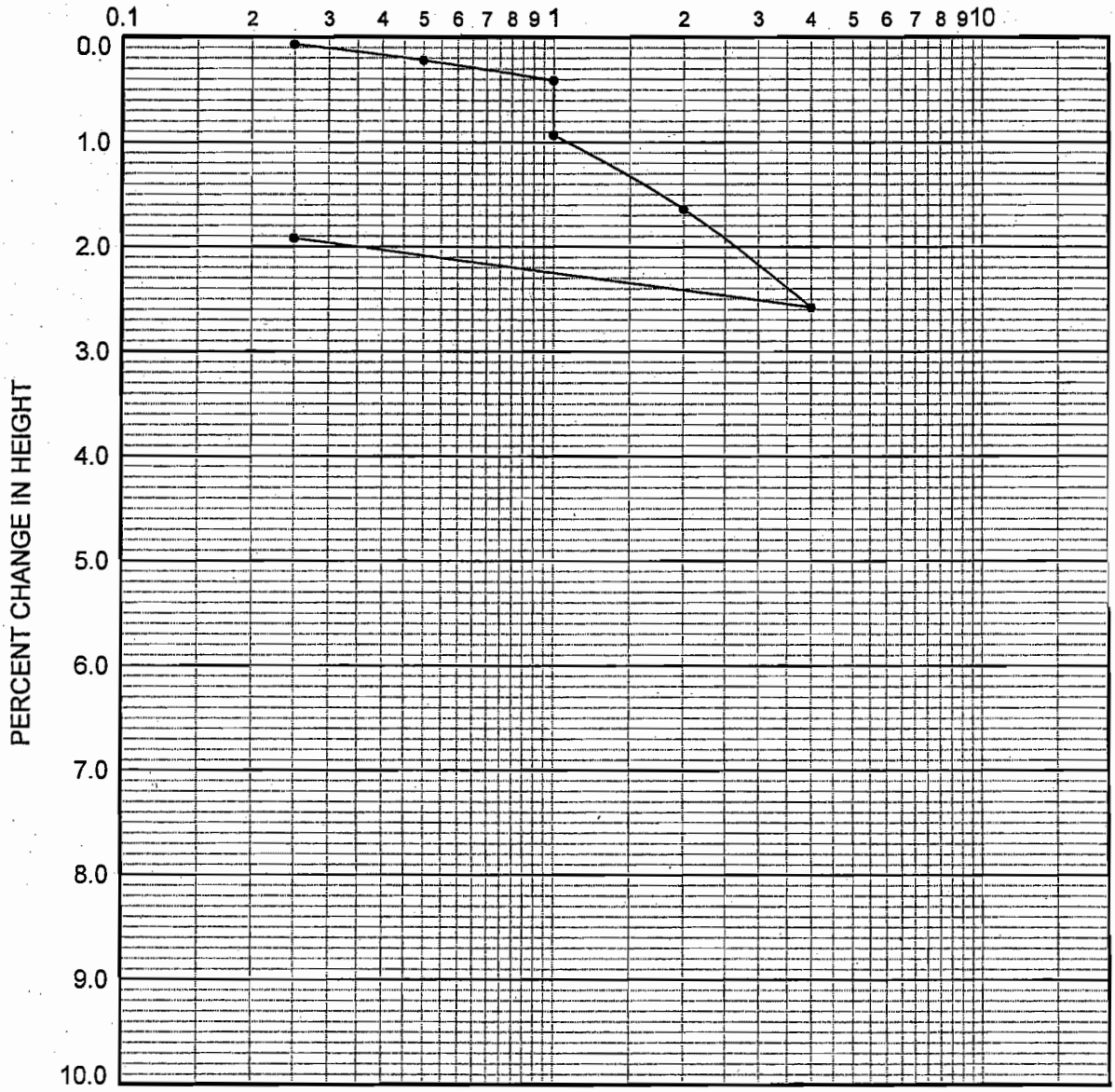
WATER ADDED AT 1/2 TSF.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-1

COMPRESSIVE STRESS IN TSF



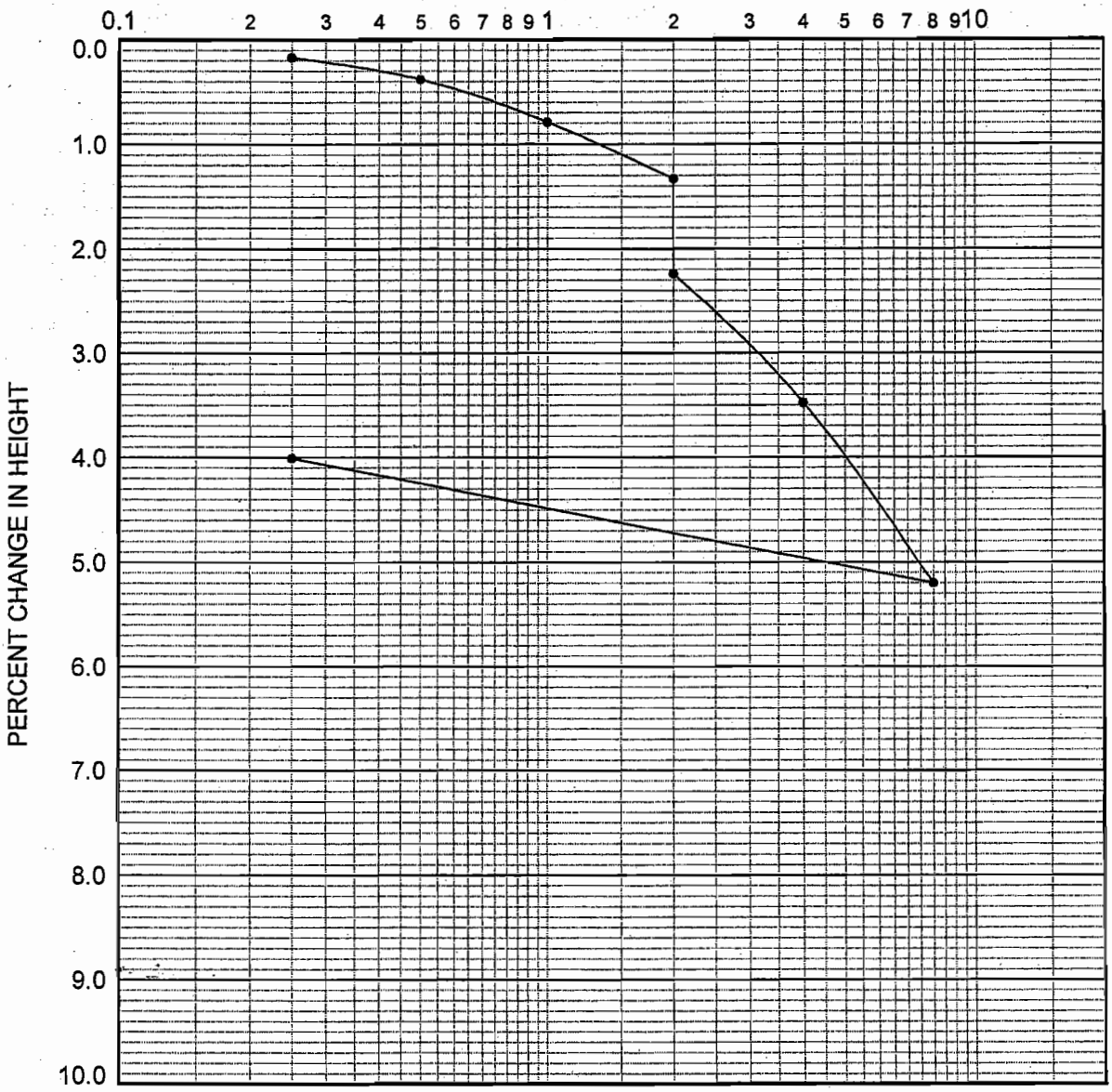
Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-1	20.0	112.2	4.9			

WATER ADDED AT 1 TSF.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-2



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-1	50.0	126.4	4.6	—		

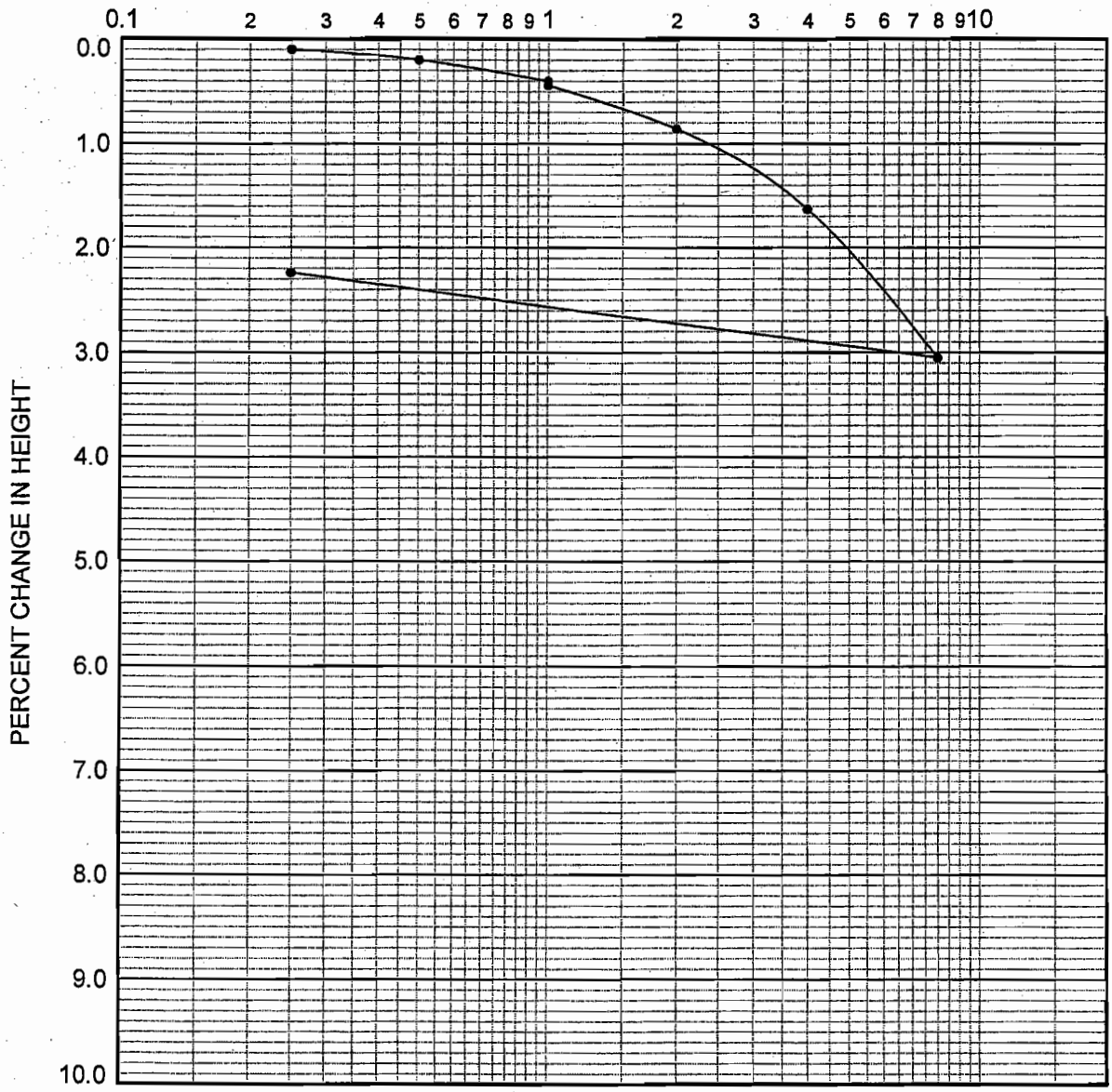
WATER ADDED AT 2 TSF.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY: CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-3

COMPRESSIVE STRESS IN TSF



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-2	50.0	135.5	5.5		–	

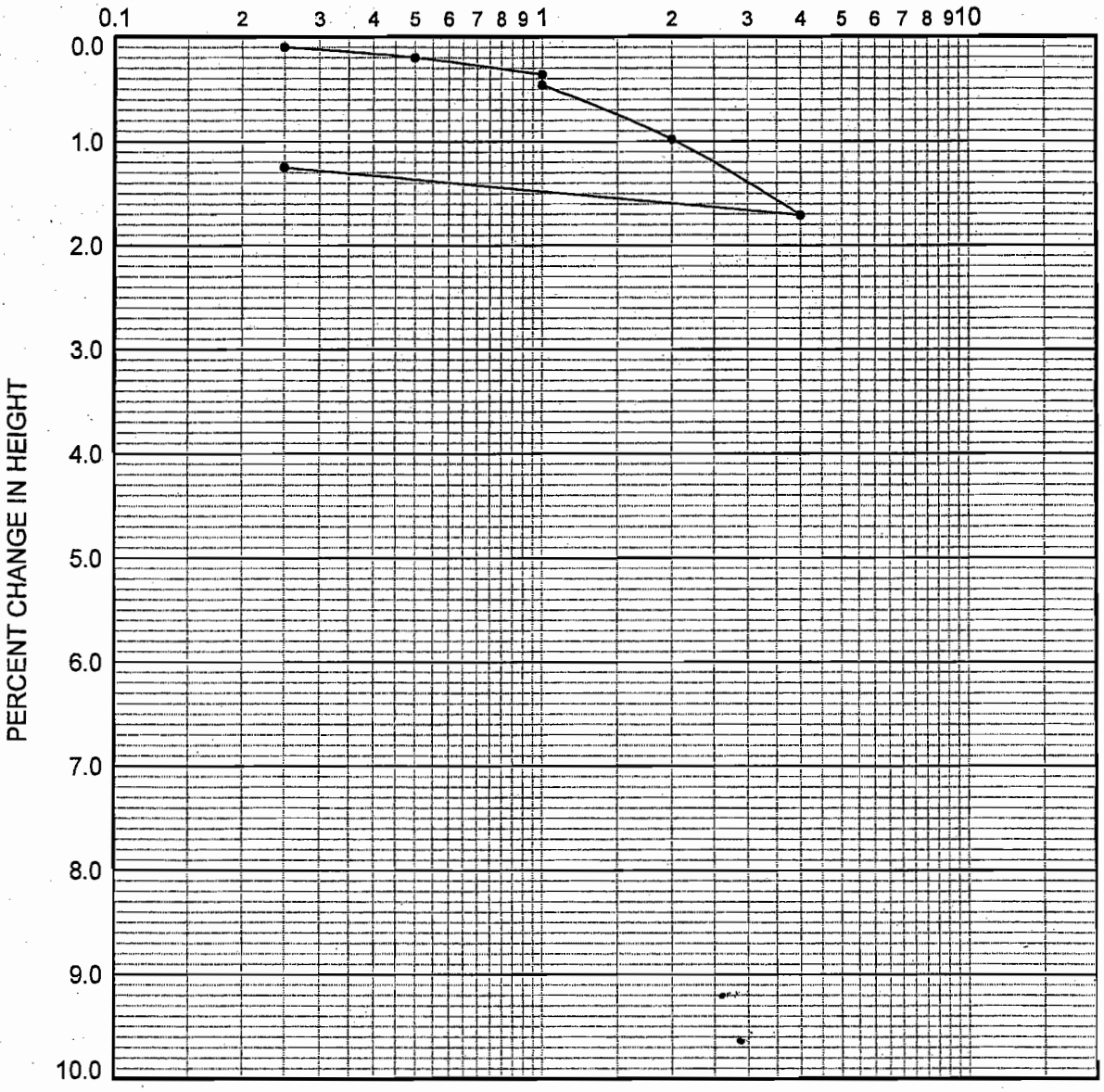
WATER ADDED AT 2 TSF.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-4

COMPRESSIVE STRESS IN TSF



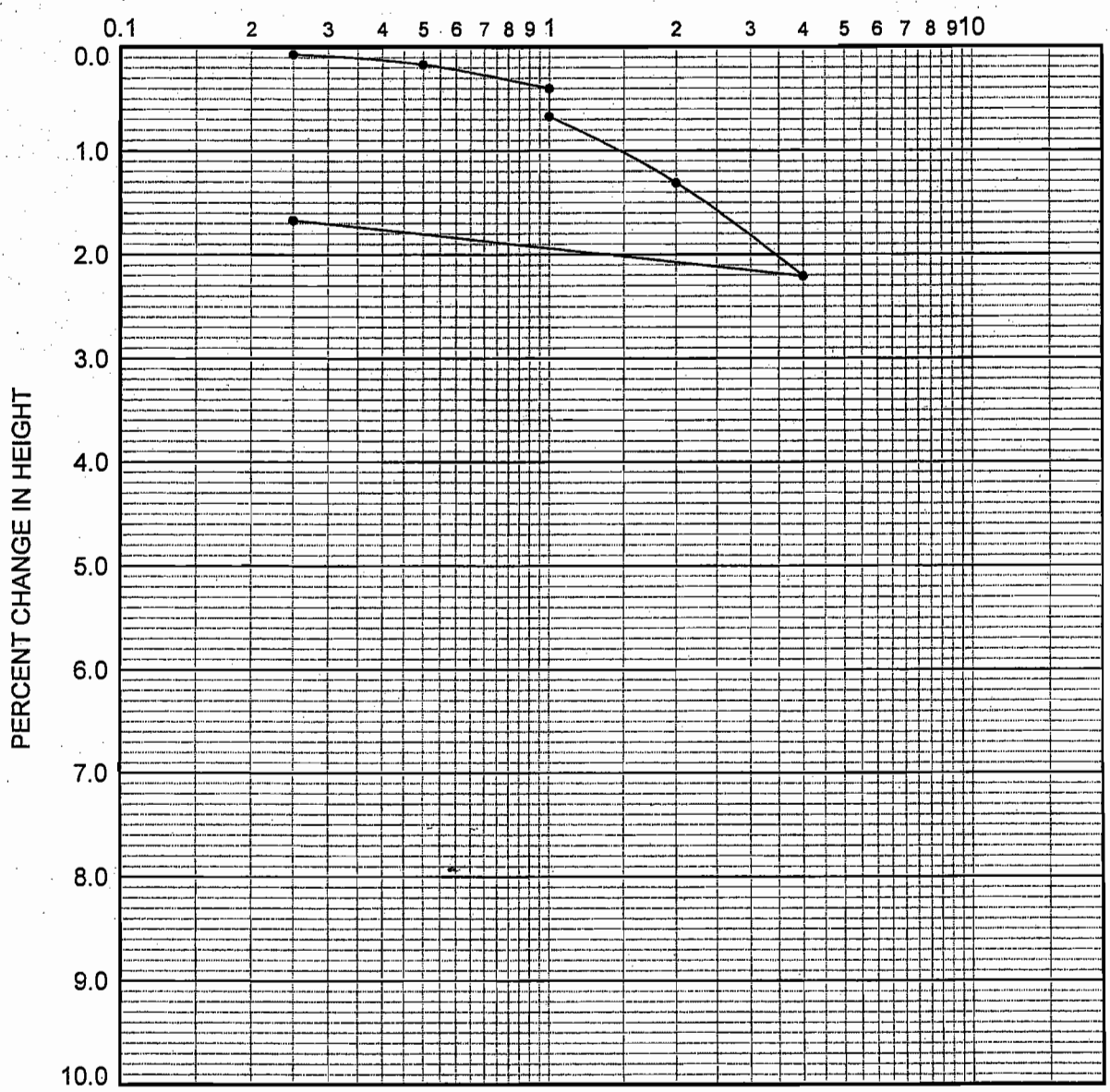
Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-3	15.0	106.7	2.3			—

WATER ADDED AT 1 TSF.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-5



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-3	30.0	114.1	4.9			

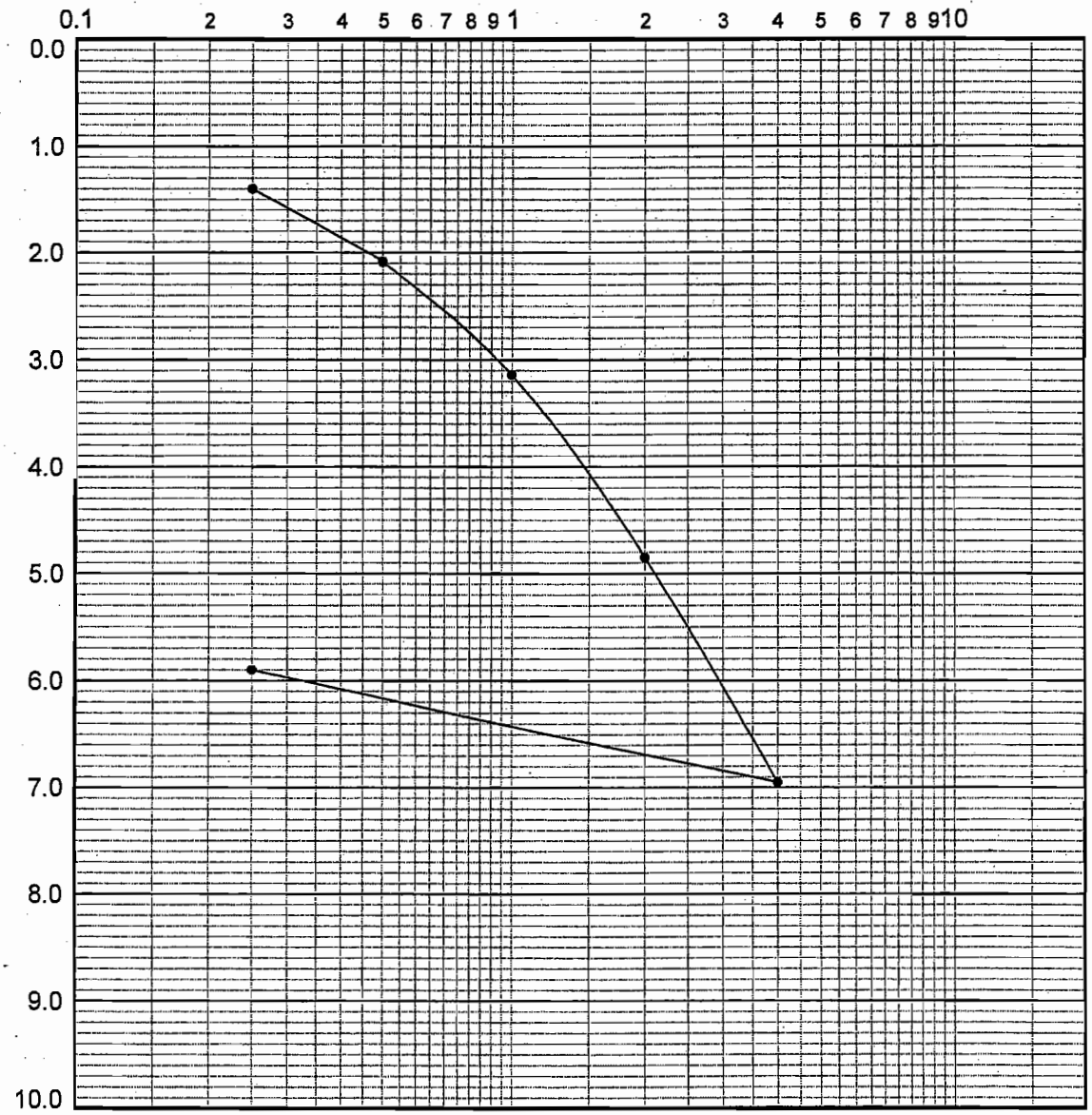
WATER ADDED AT 1 TSF.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-6

COMPRESSIVE STRESS IN TSF



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-4	10.0	108.3	19.8			

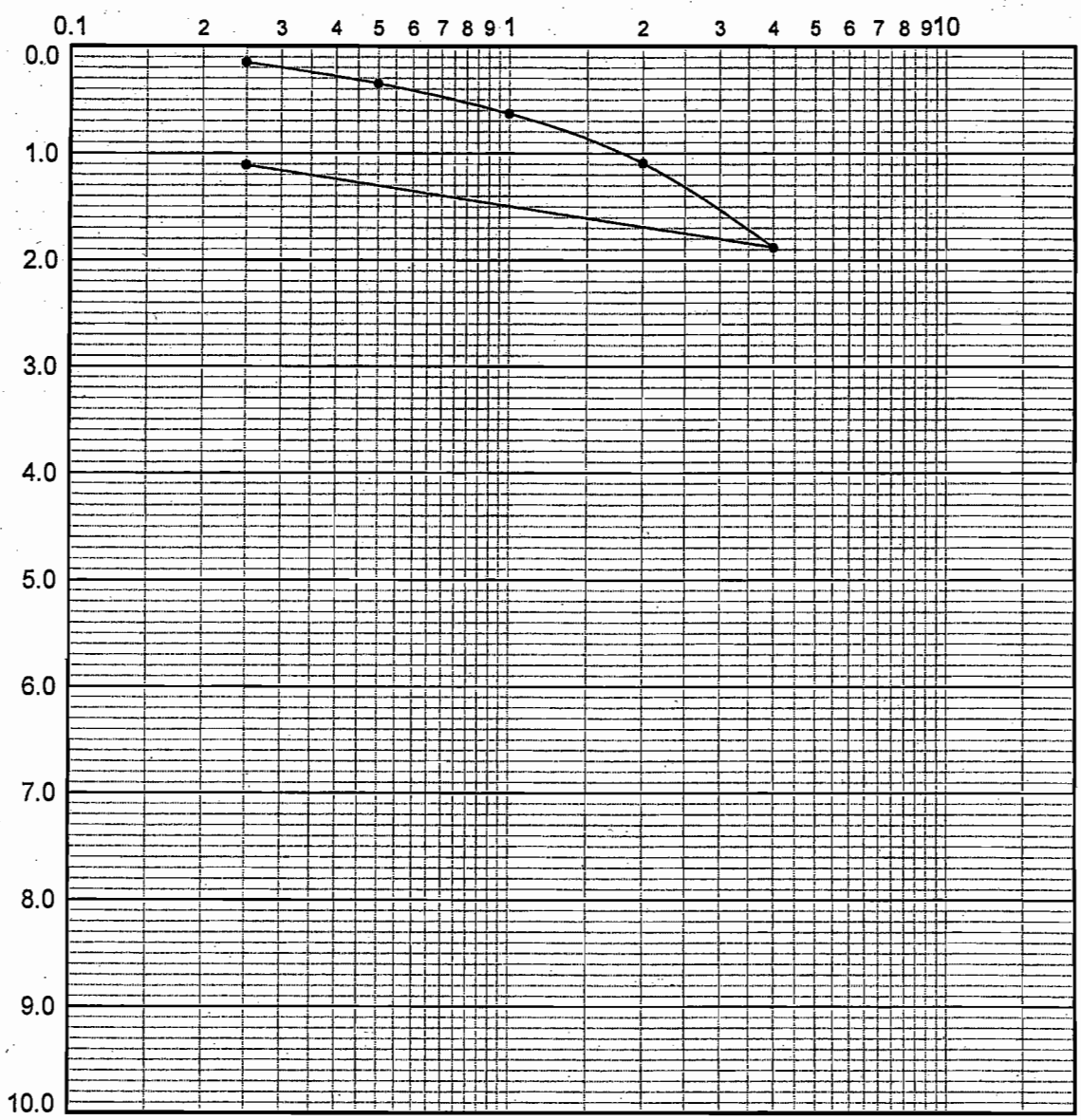
WATER ADDED AT 1/2 TSF.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-7

COMPRESSIVE STRESS IN TSF



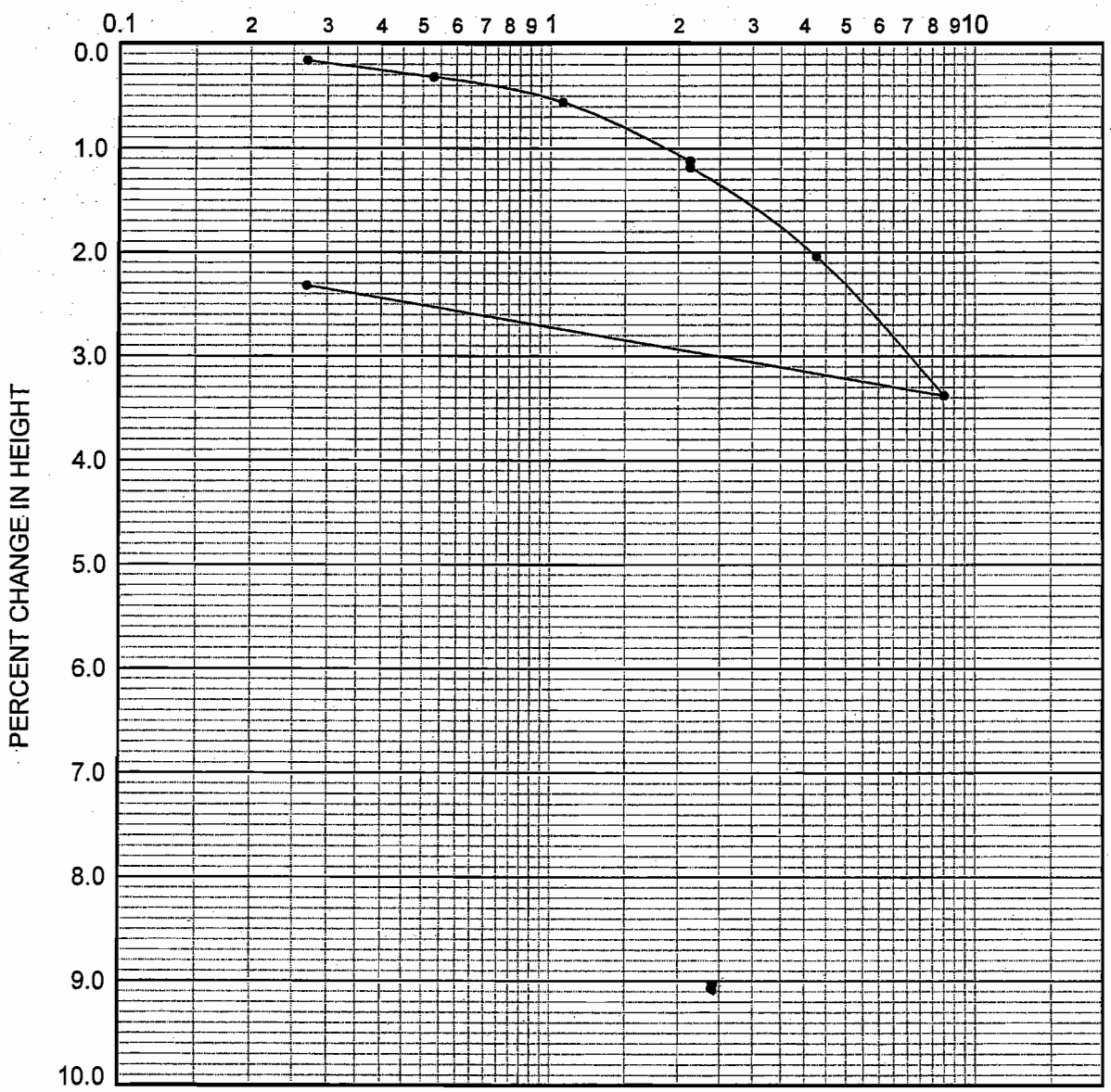
Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-9	20.0	111.7	12.1			

WATER ADDED AT 1 TSF.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-8



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
RW-1	30.0	108.4	12.0			

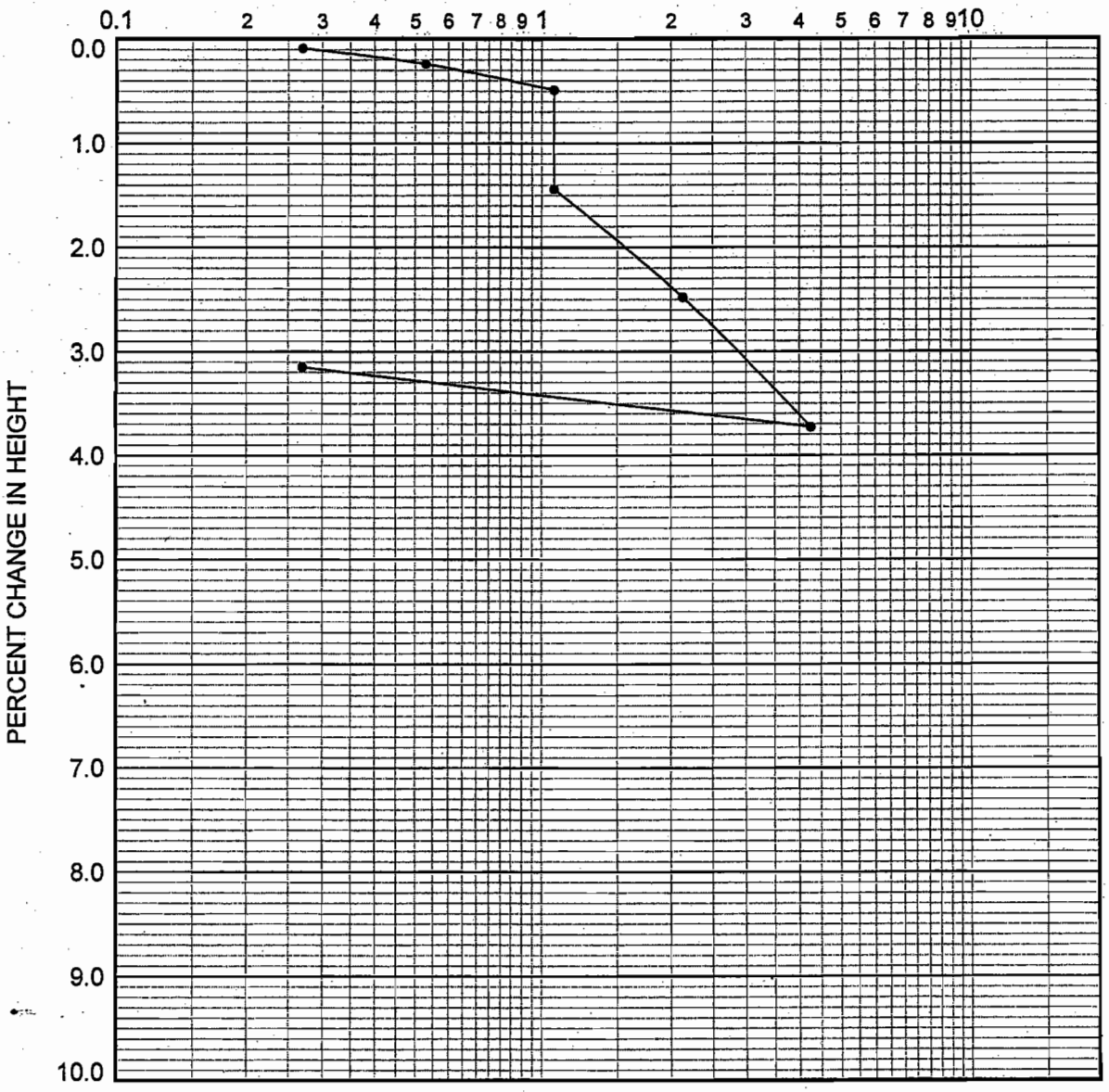
WATER ADDED AT 2.13 TSF.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-9

COMPRESSIVE STRESS IN TSF



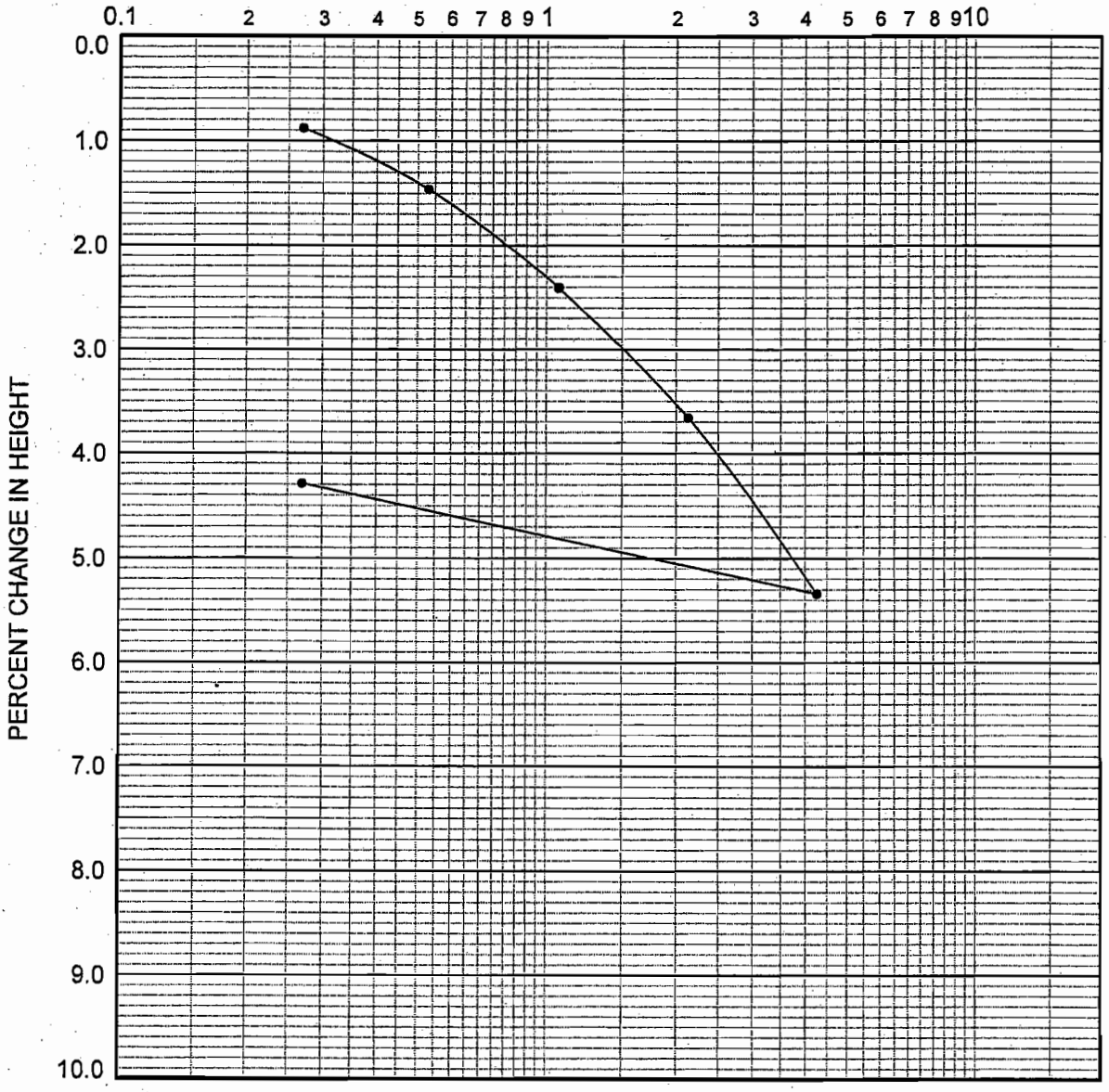
Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
RW-3	25.0	111.0	8.1			

WATER ADDED AT 1.07 TSF.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-10



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
RW-5	15.0	112.9	17.3			

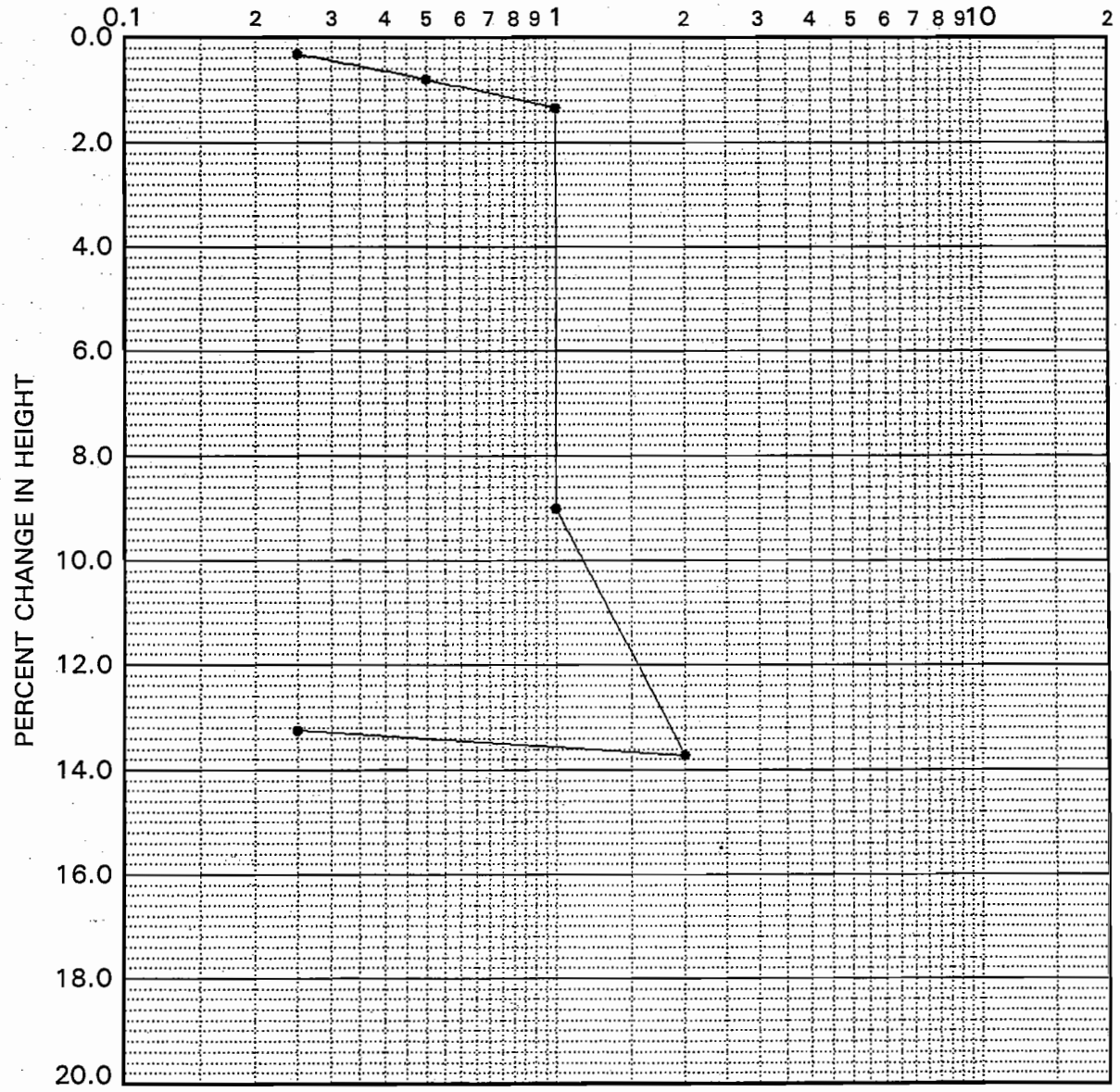
WATER ADDED AT 1.07 TSF.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-11

COMPRESSIVE STRESS IN TSF



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-101	15.0					

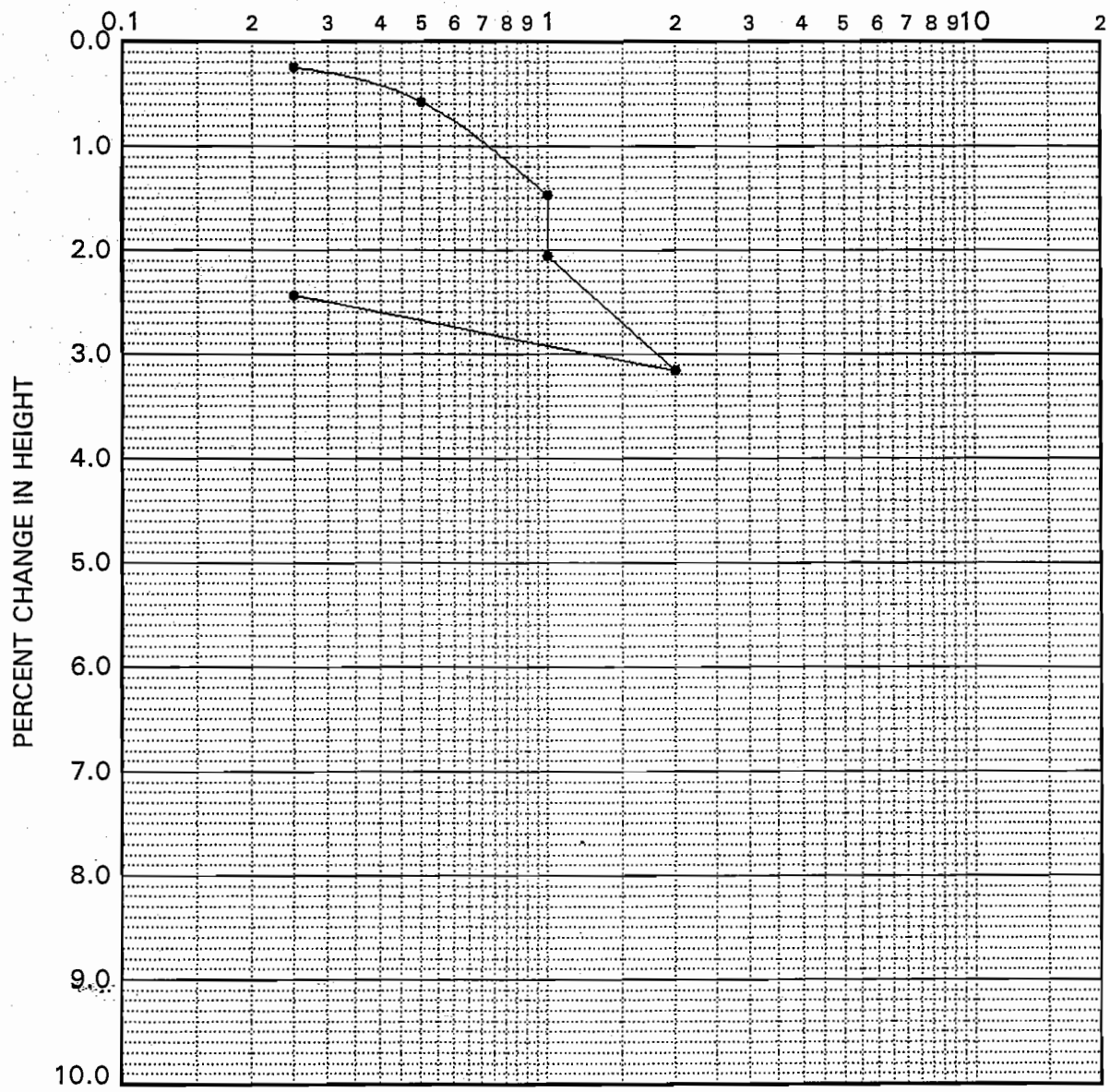
WATER ADDED AT

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630-714-220-0770

W.O. 102453-T PLATE C-12

COMPRESSIVE STRESS IN TSF



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-102	15.0					

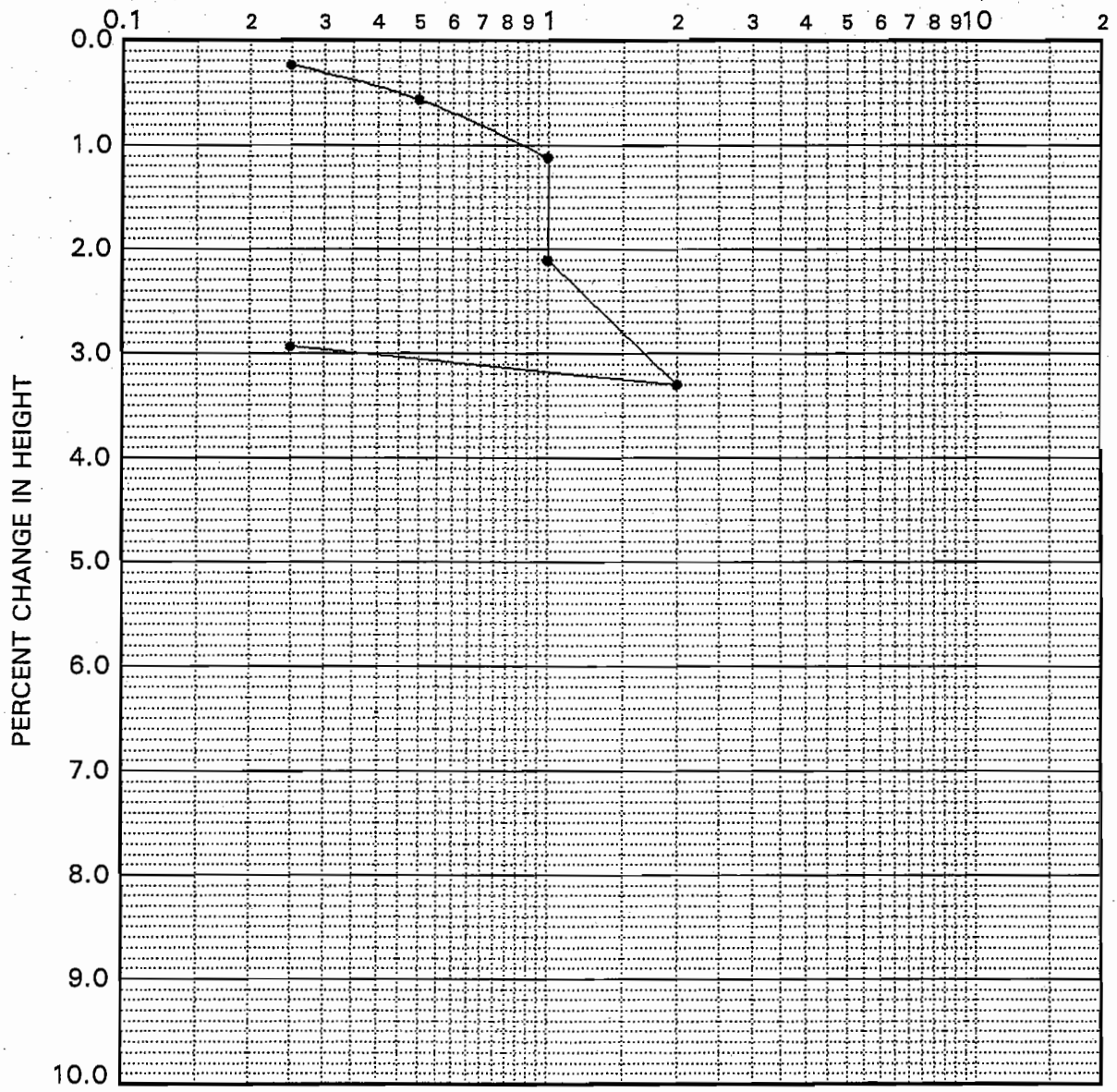
WATER ADDED AT

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-13

COMPRESSIVE STRESS IN TSF



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-102	25.0					

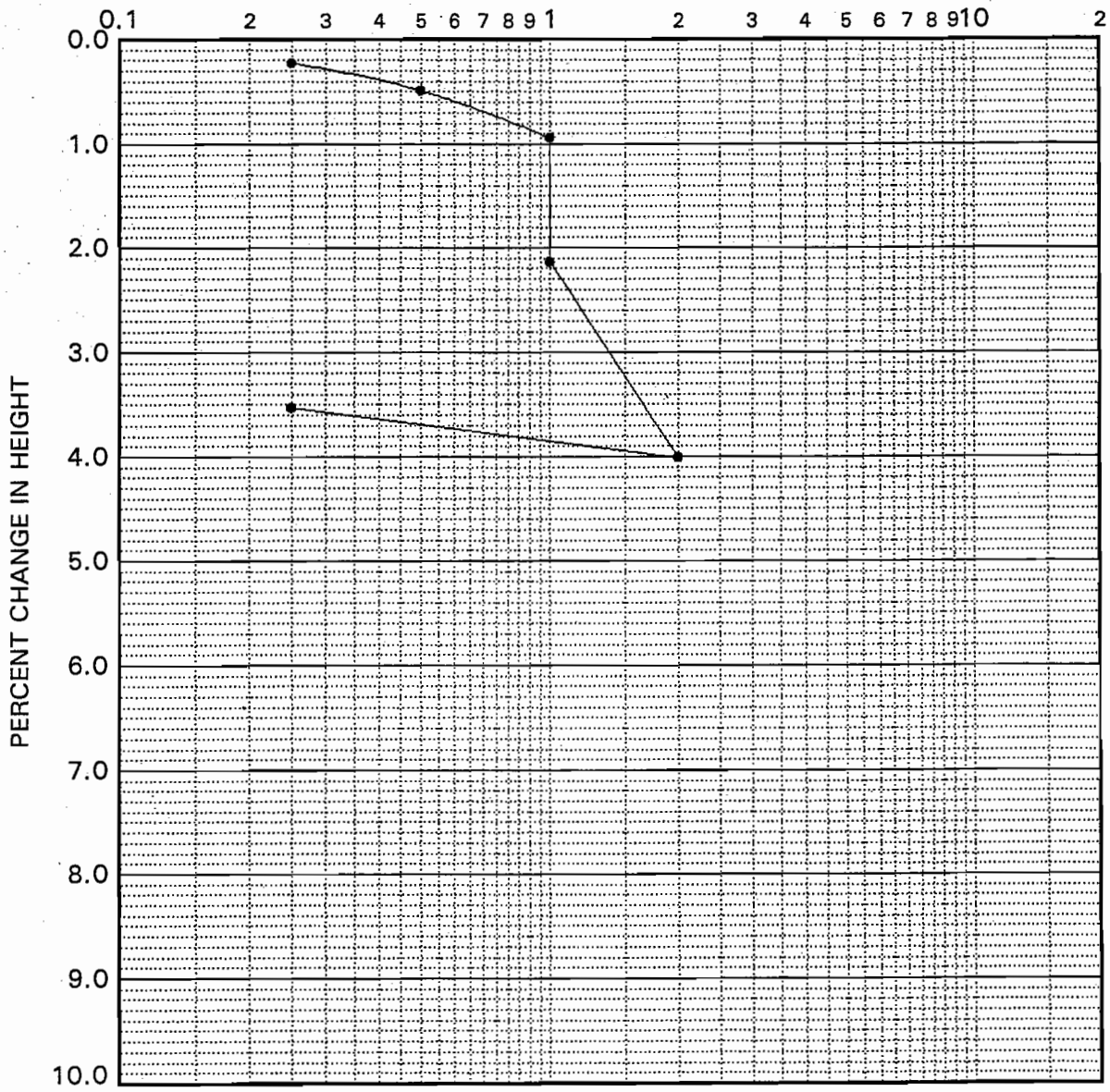
WATER ADDED AT

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-14

COMPRESSIVE STRESS IN TSF



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-103	15.0					

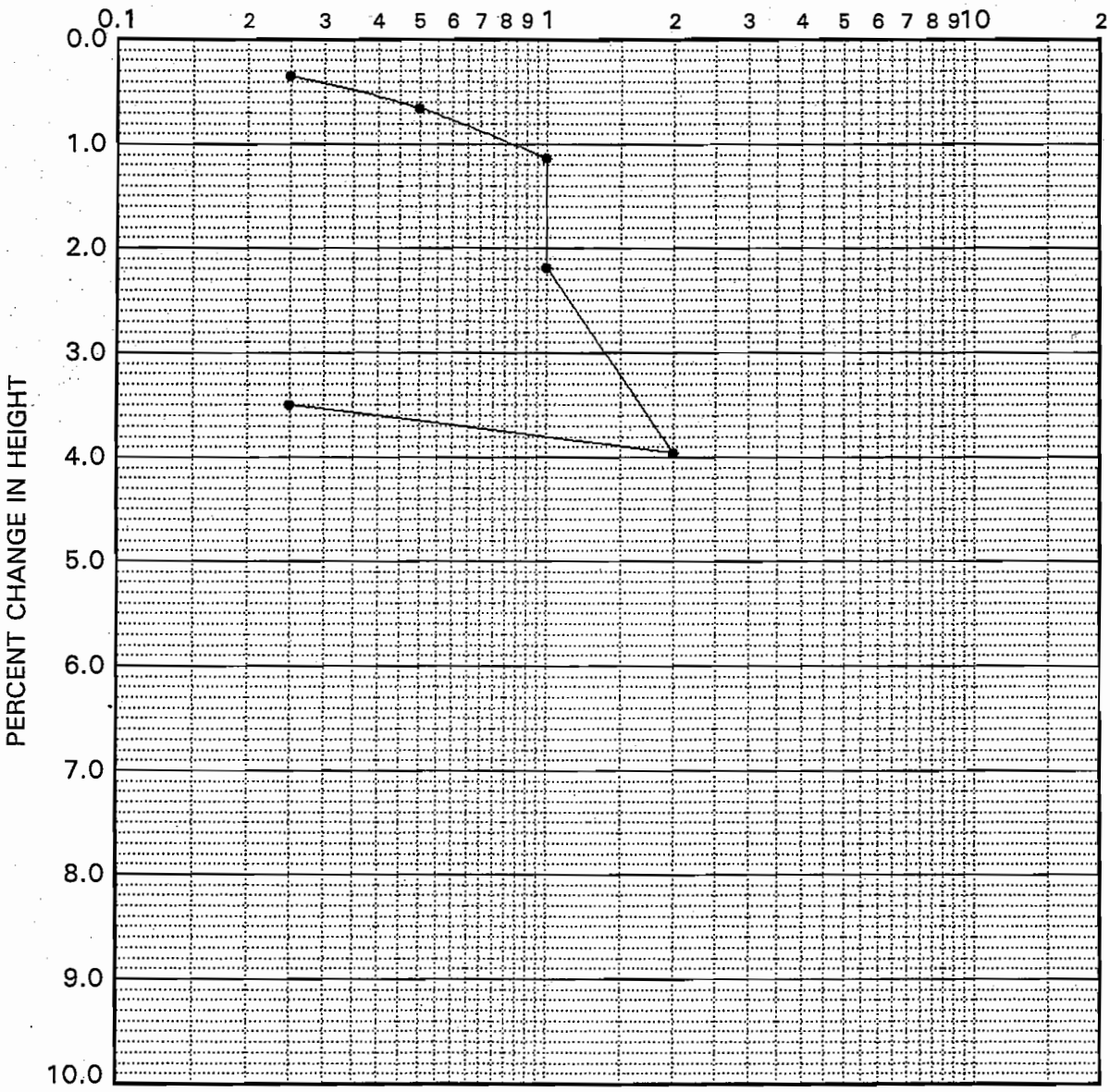
WATER ADDED AT

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-15

COMPRESSIVE STRESS IN TSF



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-103	25.0					

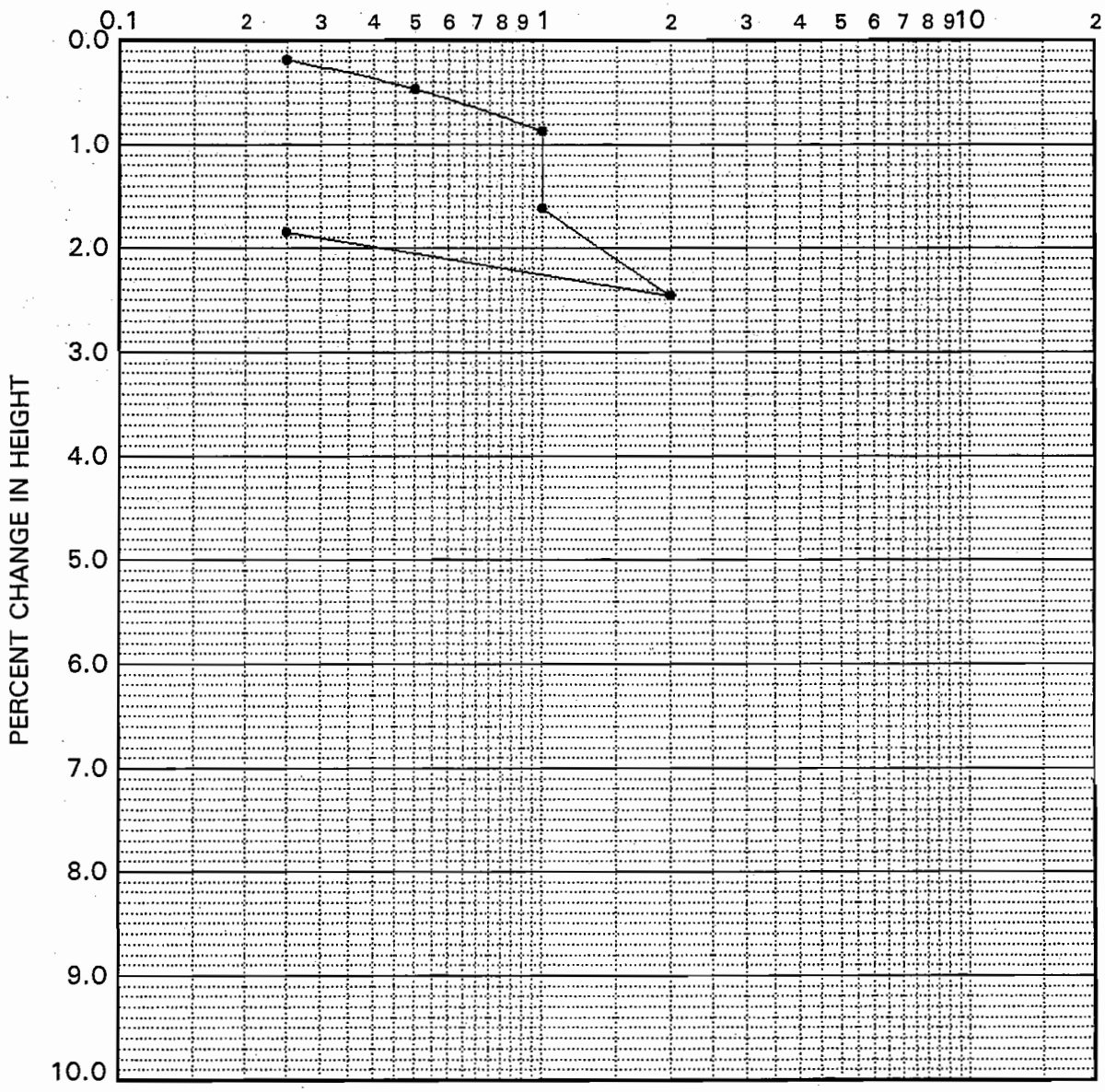
WATER ADDED AT

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-16

COMPRESSIVE STRESS IN TSF



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-104	20.0					

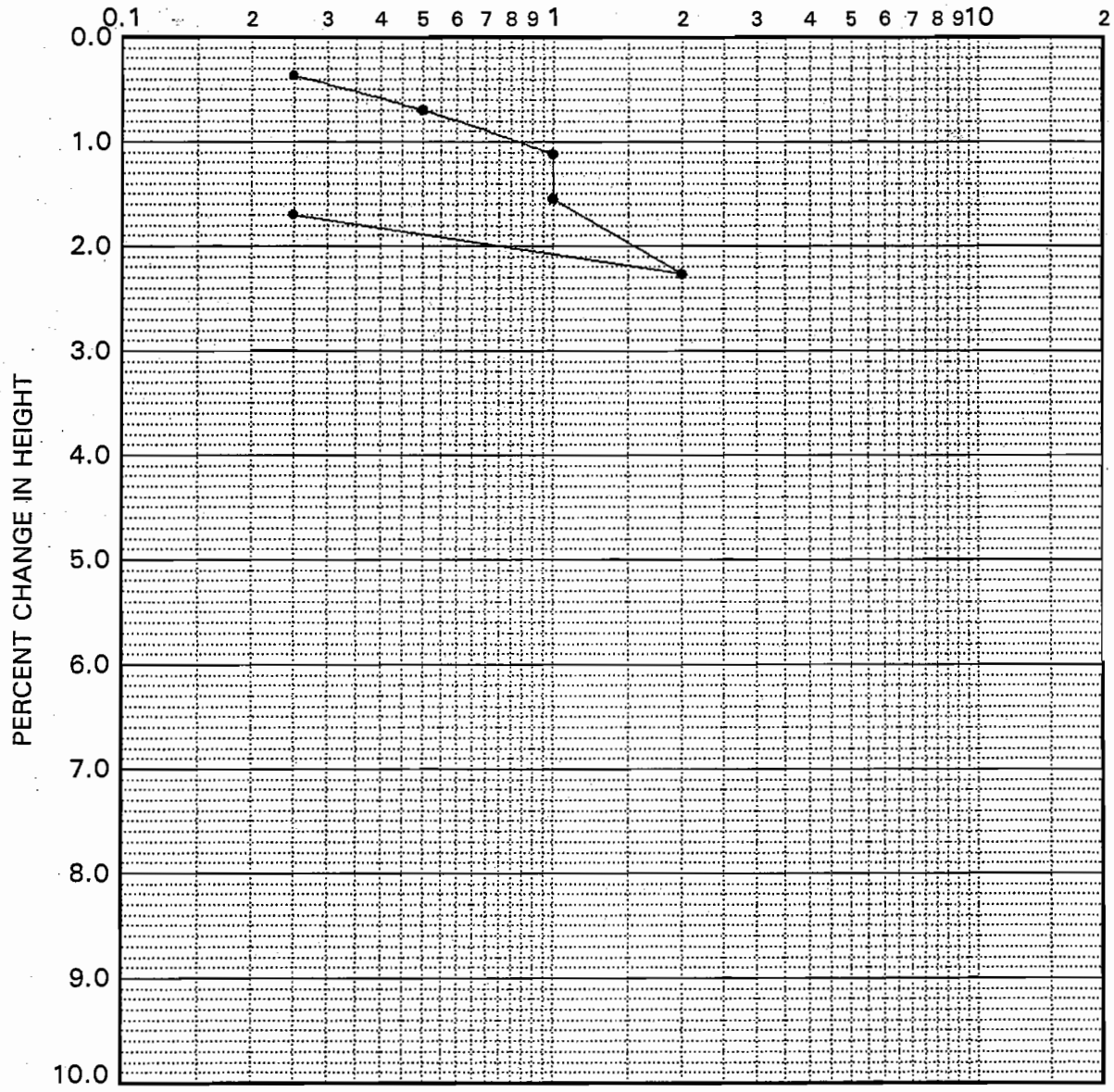
WATER ADDED AT

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-17

COMPRESSIVE STRESS IN TSF



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-104	28.0					

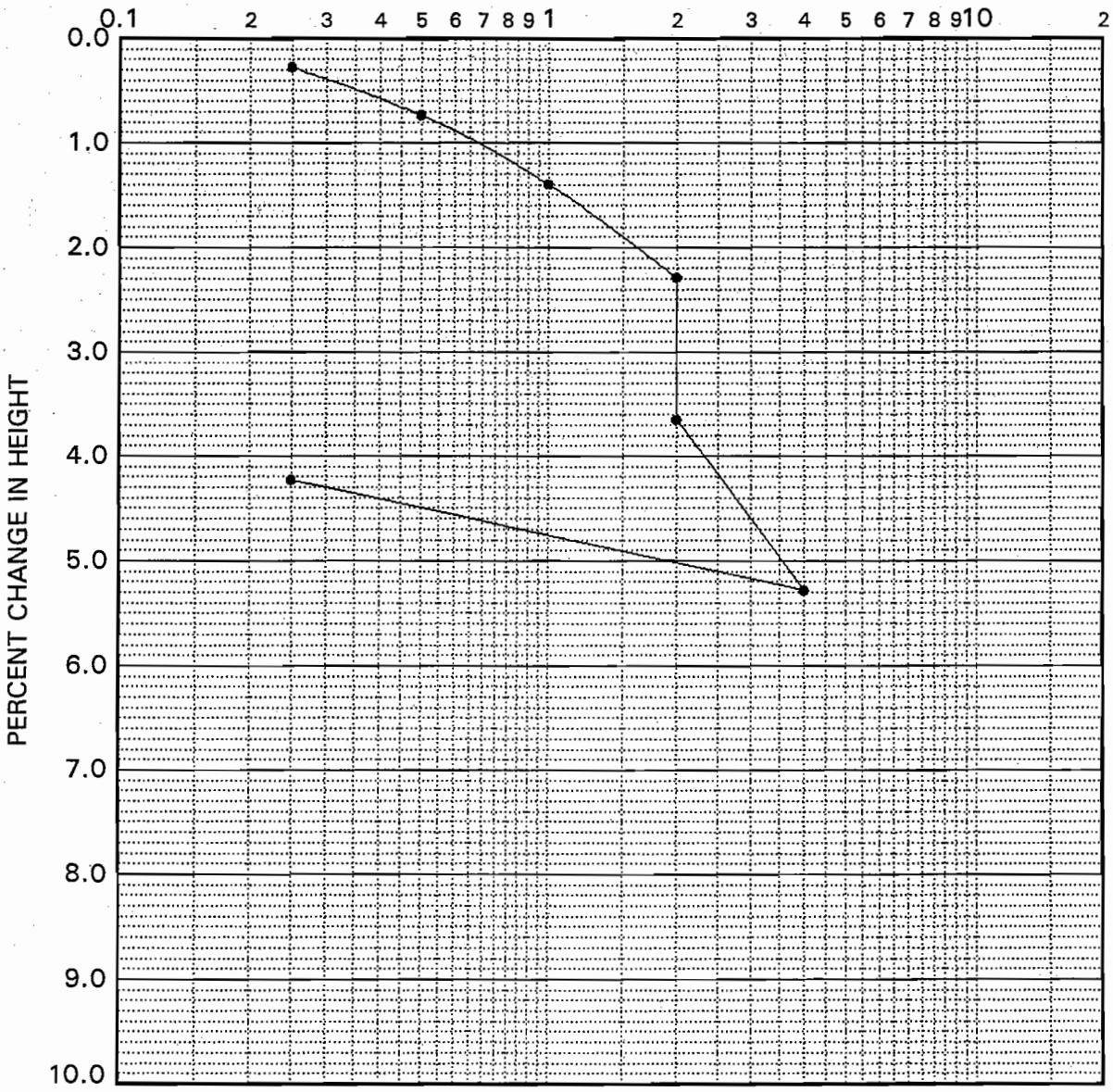
WATER ADDED AT

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-18

COMPRESSIVE STRESS IN TSF



Boring	Depth(ft.)	Dry Density	in situ Moist.	-200 sieve	Group Symbol	Typical Names
B-104	38.0					

WATER ADDED AT

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WY. CYPRESS, CA 90630 714-220-0770

W.O. 102453-T PLATE C-19

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 3/6/2006
Time of Run:
Run By:
Input Data Filename: C:1-1's.
Output Filename: C:1-1's.OUT
Unit System: English
Plotted Output Filename: C:1-1's.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 1-1' 1 1/2:1 CUT SLOPE
(Tsr) W.O. 102453-RT

BOUNDARY COORDINATES
19 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	110.00	40.00	110.00	1
2	40.00	110.00	78.00	140.00	1
3	78.00	140.00	88.00	140.00	1
4	88.00	140.00	132.00	170.00	1
5	132.00	170.00	142.00	170.00	1
6	142.00	170.00	182.00	200.00	1
7	182.00	200.00	192.00	200.00	1
8	192.00	200.00	236.00	230.00	1
9	236.00	230.00	250.00	230.00	1
10	250.00	230.00	290.00	260.00	1
11	290.00	260.00	310.00	260.00	1
12	310.00	260.00	340.00	270.00	1
13	340.00	270.00	370.00	282.00	1
14	370.00	282.00	387.00	282.00	1
15	387.00	282.00	396.00	286.00	1
16	396.00	286.00	403.00	289.00	1
17	403.00	289.00	415.00	290.00	1
18	415.00	290.00	445.00	258.00	1
19	445.00	258.00	470.00	240.00	1

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	130.0	130.0	350.0	35.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
3000 Trial Surfaces Have Been Generated.
300 Surfaces Initiate From Each Of 10 Points Equally Spaced
Along The Ground Surface Between X = 40.00(ft)
and X = 88.00(ft)
Each Surface Terminates Between X = 290.00(ft)
and X = 440.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
30.00(ft) Line Segments Define Each Trial Failure Surface.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 3000
Failure Surface Specified By 12 Coordinate Points

Point	X-Surf	Y-Surf

PLATE D-1

No.	(ft)	(ft)
1	40.00	110.00
2	69.37	116.14
3	98.26	124.20
4	126.57	134.13
5	154.16	145.90
6	180.93	159.46
7	206.74	174.75
8	231.50	191.69
9	255.08	210.23
10	277.41	230.27
11	298.36	251.74
12	305.43	260.00

Circle Center At X = -38.1 ; Y = 558.1 and Radius, 454.9

Factor of Safety

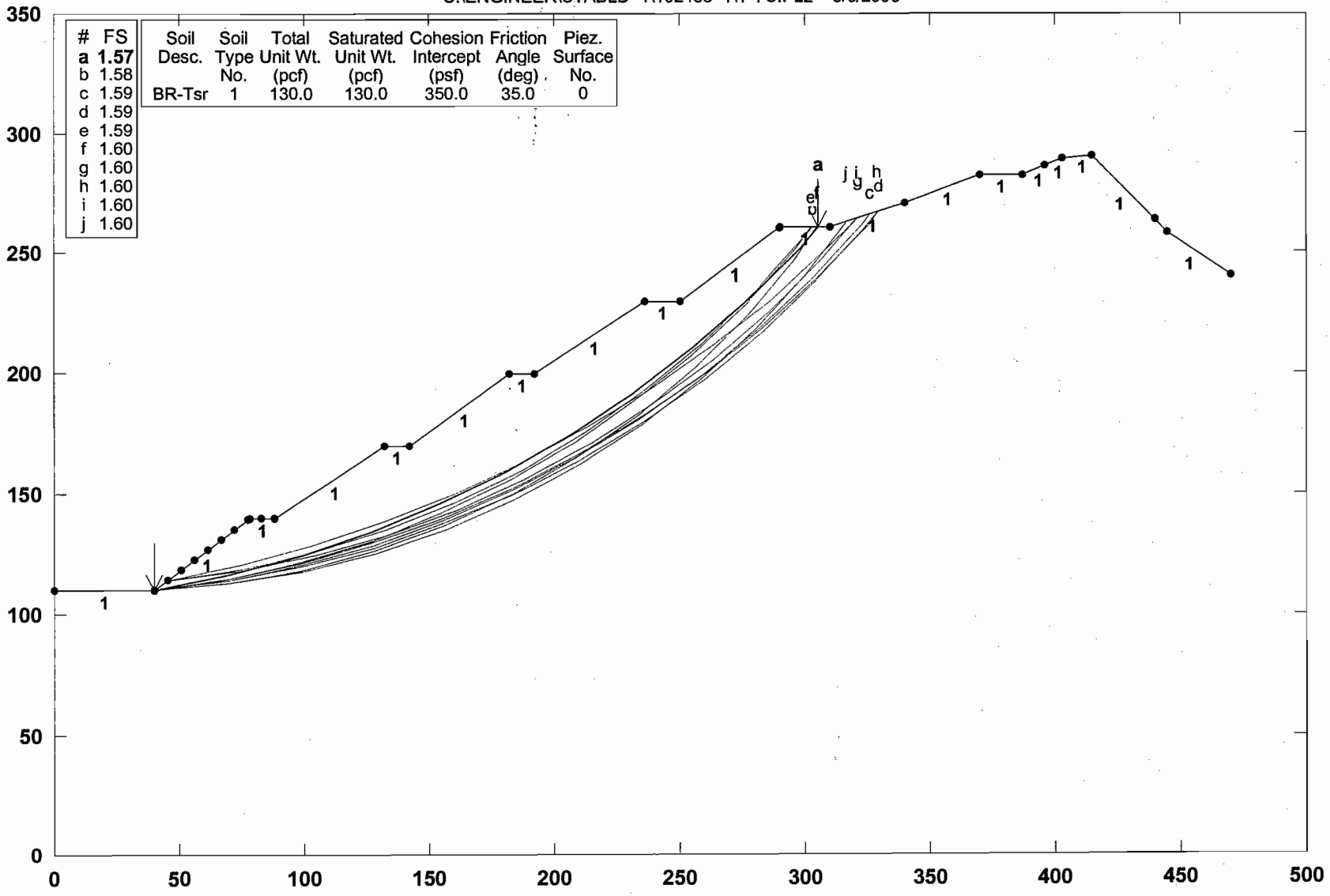
*** **1.571** ***

Individual data on the 20 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	29.4	32527.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	8.6	21604.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	10.0	26074.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	10.3	27661.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	28.3	101136.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	5.4	23192.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	10.0	40843.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	12.2	49421.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	26.8	126900.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	1.1	5558.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	10.0	48024.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	14.7	66381.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	24.8	113500.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	4.5	20497.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	14.0	53264.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	5.1	15648.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	22.3	63646.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	12.6	30379.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	8.4	13640.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	7.1	3796.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION 1-1' 1 1/2:1 CUT SLOPE (Tsr) W.O. 102453-RT

C:\ENGINEER\STABLD~1\102453~1\1-1'S.PL2 3/6/2006



#	FS
a	**1.57**
b	1.58
c	1.59
d	1.59
e	1.59
f	1.60
g	1.60
h	1.60
i	1.60
j	1.60

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
BR-Tsr	1	130.0	130.0	350.0	35.0	0

GSTABL7 v.2 FSmin=1.57

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

PLATE D-3

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 3/6/2006
Time of Run:
Run By:
Input Data Filename: C:1-1'p.
Output Filename: C:1-1'p.OUT
Unit System: English
Plotted Output Filename: C:1-1'p.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 1-1' 1 1/2:1 CUT SLOPE
(Tsr) W.O. 102453-RT

BOUNDARY COORDINATES
19 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	110.00	40.00	110.00	1
2	40.00	110.00	78.00	140.00	1
3	78.00	140.00	88.00	140.00	1
4	88.00	140.00	132.00	170.00	1
5	132.00	170.00	142.00	170.00	1
6	142.00	170.00	182.00	200.00	1
7	182.00	200.00	192.00	200.00	1
8	192.00	200.00	236.00	230.00	1
9	236.00	230.00	250.00	230.00	1
10	250.00	230.00	290.00	260.00	1
11	290.00	260.00	310.00	260.00	1
12	310.00	260.00	340.00	270.00	1
13	340.00	270.00	370.00	282.00	1
14	370.00	282.00	387.00	282.00	1
15	387.00	282.00	396.00	286.00	1
16	396.00	286.00	403.00	289.00	1
17	403.00	289.00	415.00	290.00	1
18	415.00	290.00	445.00	258.00	1
19	445.00	258.00	470.00	240.00	1

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	130.0	130.0	350.0	35.0	0.00	0.0	0

A Horizontal Earthquake Loading Coefficient
Of0.150 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure = 0.0(psf)
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	40.00	110.00
2	69.37	116.14
3	98.26	124.20
4	126.57	134.13
5	154.16	145.90
6	180.93	159.46

PLATE D-4

7	206.74	174.75
8	231.50	191.69
9	255.08	210.23
10	277.41	230.27
11	298.36	251.74
12	305.43	260.00

Janbu's Empirical Coefficient (fo) = 1.038

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *

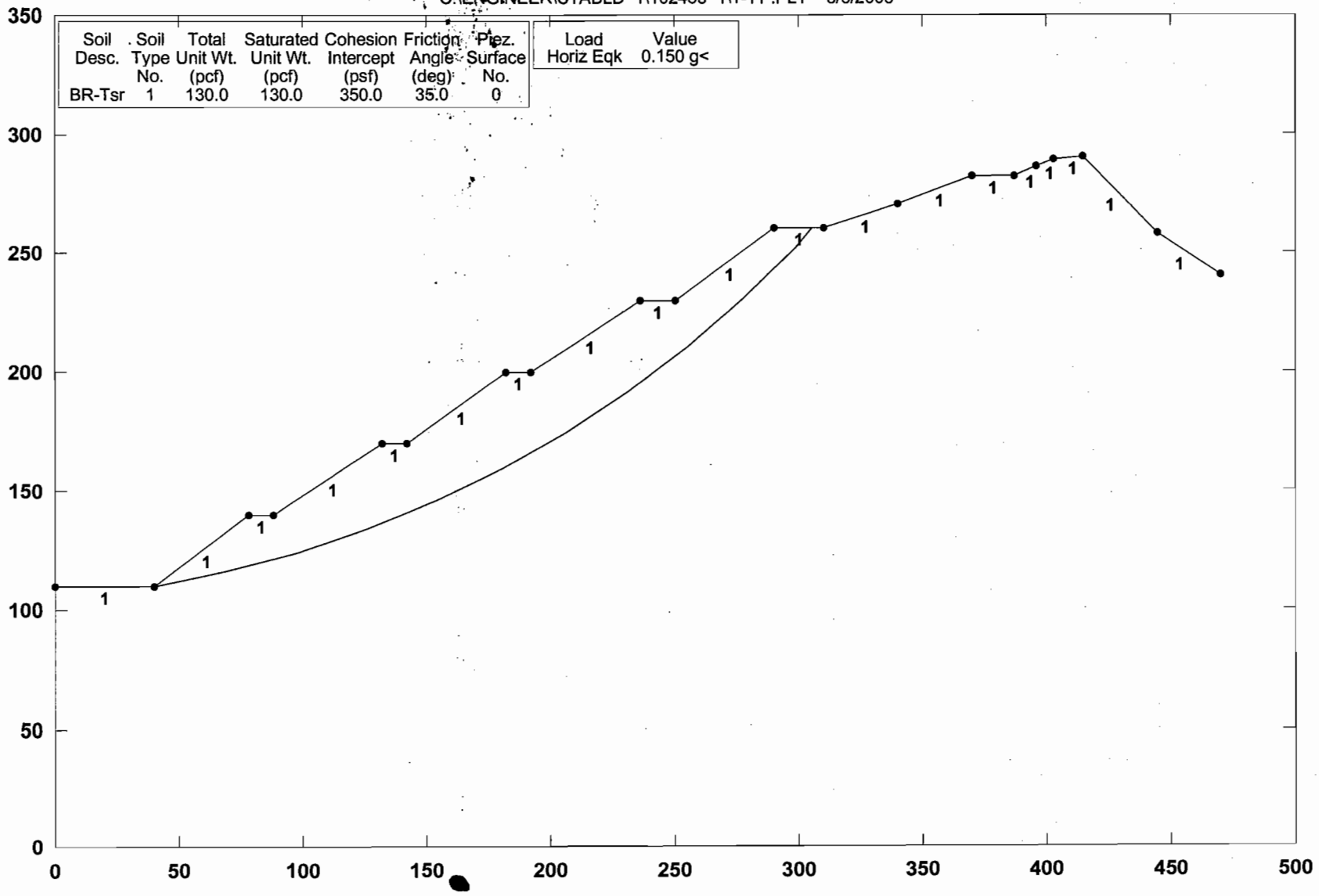
Factor Of Safety For The Preceding Specified Surface = 1.179

Table 1 - Individual Data on the 20 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	29.4	32543.3	0.0	0.0	0.0	0.0	4881.5	0.0	0.0
2	8.6	21596.1	0.0	0.0	0.0	0.0	3239.4	0.0	0.0
3	10.0	26074.6	0.0	0.0	0.0	0.0	3911.2	0.0	0.0
4	10.3	27648.3	0.0	0.0	0.0	0.0	4147.2	0.0	0.0
5	28.3	101140.5	0.0	0.0	0.0	0.0	15171.1	0.0	0.0
6	5.4	23196.3	0.0	0.0	0.0	0.0	3479.4	0.0	0.0
7	10.0	40846.7	0.0	0.0	0.0	0.0	6127.0	0.0	0.0
8	12.2	49405.9	0.0	0.0	0.0	0.0	7410.9	0.0	0.0
9	26.8	126949.7	0.0	0.0	0.0	0.0	19042.5	0.0	0.0
10	1.1	5539.3	0.0	0.0	0.0	0.0	830.9	0.0	0.0
11	10.0	48027.3	0.0	0.0	0.0	0.0	7204.1	0.0	0.0
12	14.7	66379.1	0.0	0.0	0.0	0.0	9956.9	0.0	0.0
13	24.8	113530.0	0.0	0.0	0.0	0.0	17029.5	0.0	0.0
14	4.5	20479.0	0.0	0.0	0.0	0.0	3071.8	0.0	0.0
15	14.0	53267.8	0.0	0.0	0.0	0.0	7990.2	0.0	0.0
16	5.1	15633.1	0.0	0.0	0.0	0.0	2345.0	0.0	0.0
17	22.3	63671.5	0.0	0.0	0.0	0.0	9550.7	0.0	0.0
18	12.6	30373.0	0.0	0.0	0.0	0.0	4556.0	0.0	0.0
19	8.4	13632.5	0.0	0.0	0.0	0.0	2044.9	0.0	0.0
20	7.1	3795.9	0.0	0.0	0.0	0.0	569.4	0.0	0.0

CROSS-SECTION 1-1' 1 1/2:1 CUT SLOPE (Tsr) W.O. 102453-RT

C:\ENGINEER\STABLD~1\102453~1\1-1'P.PLT 3/6/2006



GSTABL7 v.2 FSmin=1.18

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

PLATE D-6

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 3/31/2006
Time of Run:
Run By:
Input Data Filename: C:2-2's.
Output Filename: C:2-2's.OUT
Unit System: English
Plotted Output Filename: C:2-2's.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 2-2' 2:1 CUT SLOPE (Tp)
W.O. 102453-RT

BOUNDARY COORDINATES
11 Top Boundaries
11 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	70.00	40.00	70.00	1
2	40.00	70.00	90.00	95.00	1
3	90.00	95.00	100.00	95.00	1
4	100.00	95.00	152.00	125.00	1
5	152.00	125.00	160.00	125.00	1
6	160.00	125.00	222.00	153.00	1
7	222.00	153.00	246.00	156.00	1
8	246.00	156.00	298.00	179.00	1
9	298.00	179.00	340.00	188.00	1
10	340.00	188.00	407.00	190.00	1
11	407.00	190.00	435.00	185.00	1

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	130.0	130.0	450.0	42.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
400 Surfaces Initiate From Each Of 5 Points Equally Spaced
Along The Ground Surface Between X = 35.00(ft)
and X = 45.00(ft)
Each Surface Terminates Between X = 220.00(ft)
and X = 430.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
20.00(ft) Line Segments Define Each Trial Failure Surface.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 2000
Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	40.00	70.00
2	60.00	70.15
3	79.92	71.90
4	99.64	75.24
5	119.03	80.14
6	137.97	86.58
7	156.33	94.51

PLATE D-7

8	173.99	103.89
9	190.85	114.65
10	206.79	126.73
11	221.72	140.04
12	235.53	154.50
13	235.71	154.71

Circle Center At X = 48.1 ; Y = 319.7 and Radius, 249.8

Factor of Safety

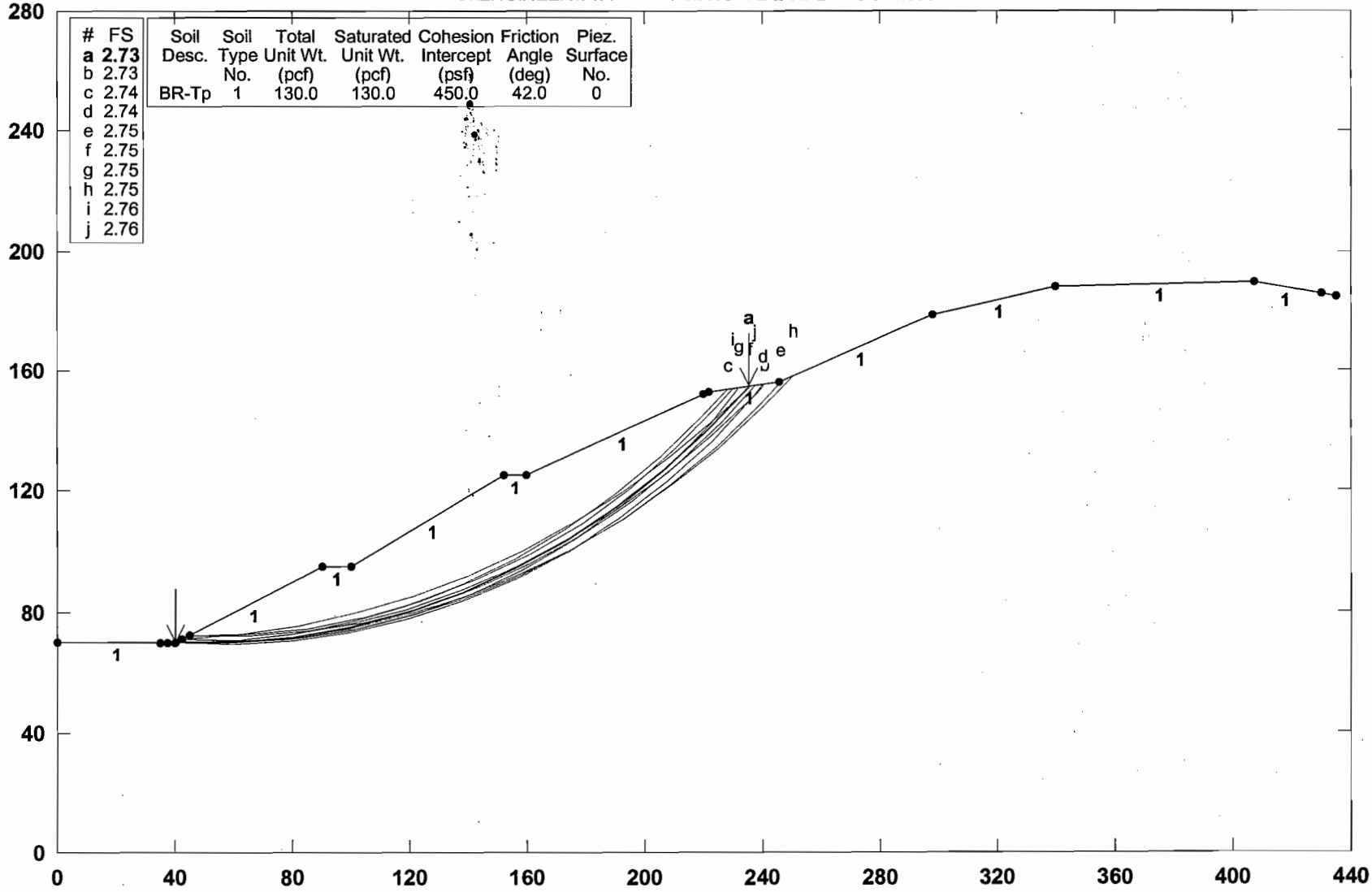
*** **2.732** ***

Individual data on the 17 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	20.0	12805.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	19.9	36148.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	10.1	25845.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	9.6	25799.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.4	915.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	19.0	56305.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	18.9	69126.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	14.0	57173.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	4.3	17672.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	3.7	14094.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	14.0	50898.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	16.9	56664.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	15.9	45276.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	14.9	31284.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.3	462.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	13.5	11315.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION 2-2' 2:1 CUT SLOPE (Tp) W.O. 102453-RT

C:\ENGINEER\STABLD~1\102453~1\2-2'S.PL2 3/31/2006



GSTABL7 v.2 FSmin=2.73

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

PLATE D-9

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 3/31/2006
Time of Run:
Run By:
Input Data Filename: C:2-2'P.
Output Filename: C:2-2'P.OUT
Unit System: English
Plotted Output Filename: C:2-2'P.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 2-2' 2:1 CUT SLOPE (Tp)
W.O. 102453-RT

BOUNDARY COORDINATES
11 Top Boundaries
11 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	70.00	40.00	70.00	1
2	40.00	70.00	90.00	95.00	1
3	90.00	95.00	100.00	95.00	1
4	100.00	95.00	152.00	125.00	1
5	152.00	125.00	160.00	125.00	1
6	160.00	125.00	222.00	153.00	1
7	222.00	153.00	246.00	156.00	1
8	246.00	156.00	298.00	179.00	1
9	298.00	179.00	340.00	188.00	1
10	340.00	188.00	407.00	190.00	1
11	407.00	190.00	435.00	185.00	1

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	130.0	130.0	450.0	42.0	0.00	0.0	0

A Horizontal Earthquake Loading Coefficient
Of0.150 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure = 0.0(psf)
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	40.00	70.00
2	60.00	70.15
3	79.92	71.90
4	99.64	75.24
5	119.03	80.14
6	137.97	86.58
7	156.33	94.51
8	173.99	103.89
9	190.85	114.65
10	206.79	126.73
11	221.72	140.04
12	235.53	154.50
13	235.71	154.71

Janbu's Empirical Coefficient (fo) = 1.047

PLATE D-10

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *

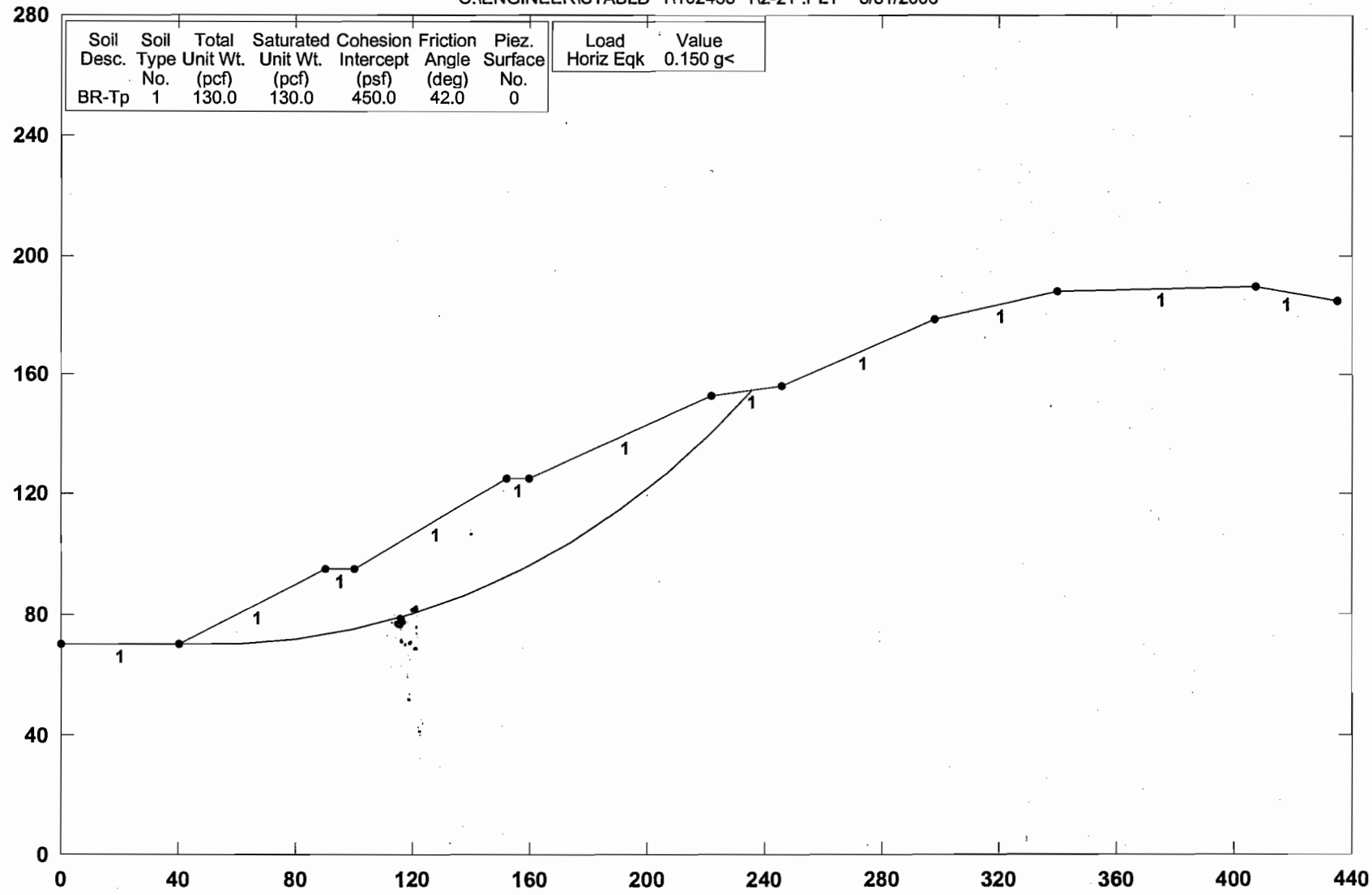
Factor Of Safety For The Preceding Specified Surface = 1.940

Table 1 - Individual Data on the 17 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	20.0	12805.0	0.0	0.0	0.0	0.0	1920.8	0.0	0.0
2	19.9	36137.9	0.0	0.0	0.0	0.0	5420.7	0.0	0.0
3	10.1	25849.4	0.0	0.0	0.0	0.0	3877.4	0.0	0.0
4	9.6	25786.3	0.0	0.0	0.0	0.0	3867.9	0.0	0.0
5	0.4	922.6	0.0	0.0	0.0	0.0	138.4	0.0	0.0
6	19.0	56291.0	0.0	0.0	0.0	0.0	8443.6	0.0	0.0
7	18.9	69144.3	0.0	0.0	0.0	0.0	10371.6	0.0	0.0
8	14.0	57166.5	0.0	0.0	0.0	0.0	8575.0	0.0	0.0
9	4.3	17689.2	0.0	0.0	0.0	0.0	2653.4	0.0	0.0
10	3.7	14081.8	0.0	0.0	0.0	0.0	2112.3	0.0	0.0
11	14.0	50895.1	0.0	0.0	0.0	0.0	7634.3	0.0	0.0
12	16.9	56669.4	0.0	0.0	0.0	0.0	8500.4	0.0	0.0
13	15.9	45260.2	0.0	0.0	0.0	0.0	6789.0	0.0	0.0
14	14.9	31282.0	0.0	0.0	0.0	0.0	4692.3	0.0	0.0
15	0.3	464.1	0.0	0.0	0.0	0.0	69.6	0.0	0.0
16	13.5	11308.0	0.0	0.0	0.0	0.0	1696.2	0.0	0.0
17	0.2	2.2	0.0	0.0	0.0	0.0	0.3	0.0	0.0

CROSS-SECTION 2-2' 2:1 CUT SLOPE (Tp) W.O. 102453-RT

C:\ENGINEER\STABLD~1\102453~1\2-2'P.PLT 3/31/2006



GSTABL7 v.2 FSmin=1.94

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

PLATE D-12

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 2/10/2006
Time of Run:
Run By:
Input Data Filename: C:3-3'S.
Output Filename: C:3-3'S.OUT
Unit System: English
Plotted Output Filename: C:3-3'S.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 3-3' 2:1 FILL SLOPE
W.O. 102453-RT

BOUNDARY COORDINATES
7 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	65.00	10.00	65.00	1
2	10.00	65.00	90.00	95.00	1
3	90.00	95.00	100.00	95.00	1
4	100.00	95.00	158.00	125.00	1
5	158.00	125.00	166.00	125.00	1
6	166.00	125.00	200.00	140.00	1
7	200.00	140.00	300.00	140.00	1

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	130.0	130.0	350.0	31.0	0.00	0.0	0

Searching Routine Will Be Limited To An Area Defined By 9 Boundaries
Of Which The First 9 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)
1	0.00	40.00	27.00	55.00
2	27.00	55.00	55.00	71.00
3	55.00	71.00	75.00	71.00
4	75.00	71.00	115.00	88.00
5	115.00	88.00	140.00	90.00
6	140.00	90.00	200.00	108.00
7	200.00	108.00	235.00	120.00
8	235.00	120.00	268.00	125.00
9	268.00	125.00	300.00	128.00

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
4000 Trial Surfaces Have Been Generated.
400 Surfaces Initiate From Each Of 10 Points Equally Spaced
Along The Ground Surface Between X = 10.00(ft)
and X = 100.00(ft)
Each Surface Terminates Between X = 166.00(ft)
and X = 275.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
12.00(ft) Line Segments Define Each Trial Failure Surface.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 4000
Failure Surface Specified By 11 Coordinate Points

PLATE D-13

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	95.00
2	112.00	94.83
3	123.96	95.77
4	135.79	97.79
5	147.38	100.90
6	158.64	105.05
7	169.47	110.21
8	179.78	116.35
9	189.49	123.41
10	198.51	131.32
11	206.73	140.00

Circle Center At X = 107.8 ; Y = 225.5 and Radius, 130.8

Factor of Safety

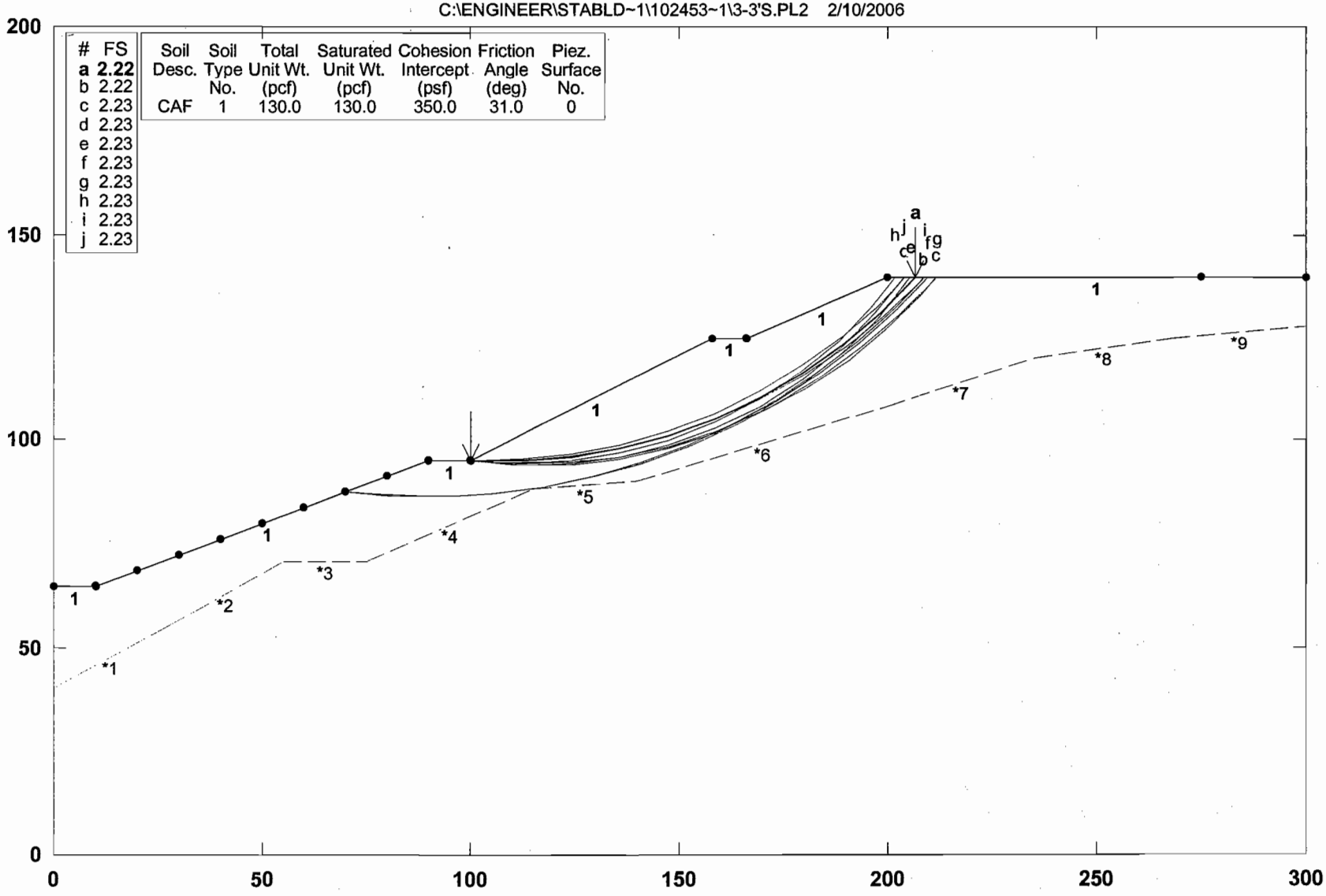
*** **2.221** ***

Individual data on the 13 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.0	4970.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	12.0	13997.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	11.8	21023.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	11.6	25867.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	10.6	26777.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.6	1674.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	7.4	17407.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	3.5	7394.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	10.3	20810.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	9.7	16836.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	9.0	11708.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	1.5	1465.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	6.7	3107.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION 3-3' 2:1 FILL SLOPE W.O. 102453-RT

C:\ENGINEER\STABLD~1\102453~1\3-3'S.PL2 2/10/2006



GSTABL7 v.2 FSmin=2.22

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

PLATE D-15

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

Analysis Run Date: 2/10/2006
Time of Run:
Run By:
Input Data Filename: C:3-3'P.
Output Filename: C:3-3'P.OUT
Unit System: English
Plotted Output Filename: C:3-3'P.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 3-3' 2:1 FILL SLOPE
W.O. 102453-RT

BOUNDARY COORDINATES
7 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	65.00	10.00	65.00	1
2	10.00	65.00	90.00	95.00	1
3	90.00	95.00	100.00	95.00	1
4	100.00	95.00	158.00	125.00	1
5	158.00	125.00	166.00	125.00	1
6	166.00	125.00	200.00	140.00	1
7	200.00	140.00	300.00	140.00	1

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	130.0	130.0	350.0	31.0	0.00	0.0	0

Searching Routine Will Be Limited To An Area Defined By 9 Boundaries
Of Which The First 9 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)
1	0.00	40.00	27.00	55.00
2	27.00	55.00	55.00	71.00
3	55.00	71.00	75.00	71.00
4	75.00	71.00	115.00	88.00
5	115.00	88.00	140.00	90.00
6	140.00	90.00	200.00	108.00
7	200.00	108.00	235.00	120.00
8	235.00	120.00	268.00	125.00
9	268.00	125.00	300.00	128.00

A Horizontal Earthquake Loading Coefficient
Of0.150 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure = 0.0(psf)
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	95.00
2	112.00	94.83
3	123.96	95.77
4	135.79	97.79
5	147.38	100.90

PLATE D-16

6	158.64	105.05
7	169.47	110.21
8	179.78	116.35
9	189.49	123.41
10	198.51	131.32
11	206.73	140.00

Janbu's Empirical Coefficient (fo) = 1.049

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *

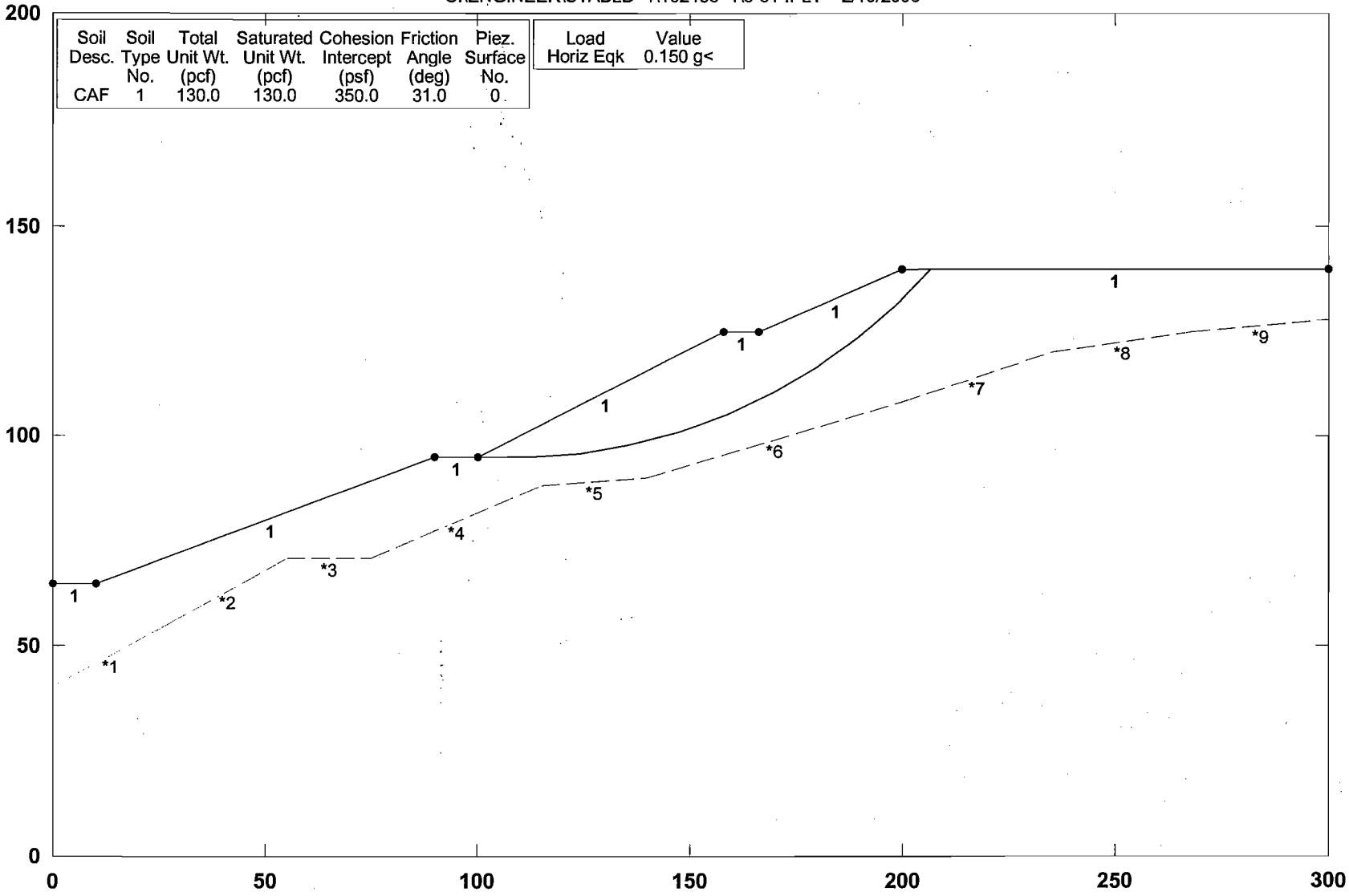
Factor Of Safety For The Preceding Specified Surface = 1.577

Table 1 - Individual Data on the 13 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.0	4974.0	0.0	0.0	0.0	0.0	746.1	0.0	0.0
2	12.0	13993.2	0.0	0.0	0.0	0.0	2099.0	0.0	0.0
3	11.8	21027.1	0.0	0.0	0.0	0.0	3154.1	0.0	0.0
4	11.6	25861.8	0.0	0.0	0.0	0.0	3879.3	0.0	0.0
5	10.6	26778.6	0.0	0.0	0.0	0.0	4016.8	0.0	0.0
6	0.6	1669.7	0.0	0.0	0.0	0.0	250.4	0.0	0.0
7	7.4	17410.5	0.0	0.0	0.0	0.0	2611.6	0.0	0.0
8	3.5	7390.0	0.0	0.0	0.0	0.0	1108.5	0.0	0.0
9	10.3	20808.3	0.0	0.0	0.0	0.0	3121.3	0.0	0.0
10	9.7	16840.7	0.0	0.0	0.0	0.0	2526.1	0.0	0.0
11	9.0	11711.8	0.0	0.0	0.0	0.0	1756.8	0.0	0.0
12	1.5	1465.3	0.0	0.0	0.0	0.0	219.8	0.0	0.0
13	6.7	3108.8	0.0	0.0	0.0	0.0	466.3	0.0	0.0

CROSS-SECTION 3-3' 2:1 FILL SLOPE W.O. 102453-RT

C:\ENGINEER\STABLD~1\102453~1\3-3'P.PLT 2/10/2006



GSTABL7 v.2 FSmin=1.58

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

PLATE D-18

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
****

Analysis Run Date: 2/10/2006
Time of Run:
Run By:
Input Data Filename: C:4-4'AS.
Output Filename: C:4-4'AS.OUT
Unit System: English
Plotted Output Filename: C:4-4'AS.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 4-4' NAT. SLOPE ABOVE PAD
W.O. 102453-RT

BOUNDARY COORDINATES
12 Top Boundaries
15 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	50.00	45.00	50.00	1
2	45.00	50.00	64.00	60.00	2
3	64.00	60.00	82.00	72.00	2
4	82.00	72.00	154.00	105.00	2
5	154.00	105.00	175.00	120.00	2
6	175.00	120.00	200.00	132.00	2
7	200.00	132.00	260.00	165.00	2
8	260.00	165.00	270.00	170.00	2
9	270.00	170.00	290.00	170.00	2
10	290.00	170.00	352.00	150.00	2
11	352.00	150.00	367.00	149.00	2
12	367.00	149.00	400.00	140.00	2
13	0.00	18.00	20.00	25.00	2
14	20.00	25.00	38.00	35.00	2
15	38.00	35.00	45.00	50.00	2

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	130.0	130.0	350.0	31.0	0.00	0.0	0
2	130.0	130.0	450.0	42.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
400 Surfaces Initiate From Each Of 5 Points Equally Spaced
Along The Ground Surface Between X = 40.00(ft)
and X = 50.00(ft)
Each Surface Terminates Between X = 82.00(ft)
and X = 352.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
20.00(ft) Line Segments Define Each Trial Failure Surface.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 2000
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	45.00	50.00
2	64.94	51.53

3	84.75	54.26
4	104.36	58.19
5	123.70	63.30
6	142.69	69.57
7	161.27	76.98
8	179.36	85.51
9	196.90	95.11
10	213.83	105.76
11	230.09	117.41
12	245.60	130.03
13	260.33	143.57
14	274.21	157.97
15	284.47	170.00

Circle Center At X = 29.8 ; Y = 379.6 and Radius, 330.0

Factor of Safety

*** 2.260 ***

Individual data on the 21 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	19.0	10551.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.9	1080.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	17.1	30177.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2.8	6645.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	19.6	54886.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	19.3	65194.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	19.0	71665.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	11.3	44953.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	7.3	30293.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	13.7	62260.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	4.4	20731.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	17.5	82091.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	3.1	14153.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	13.8	61857.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	16.3	68650.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	15.5	58683.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	14.4	45648.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.3	924.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	9.7	23883.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	4.2	7769.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	10.3	8023.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION 4-4' NAT. SLOPE ABOVE PADW.O. 102453-RT

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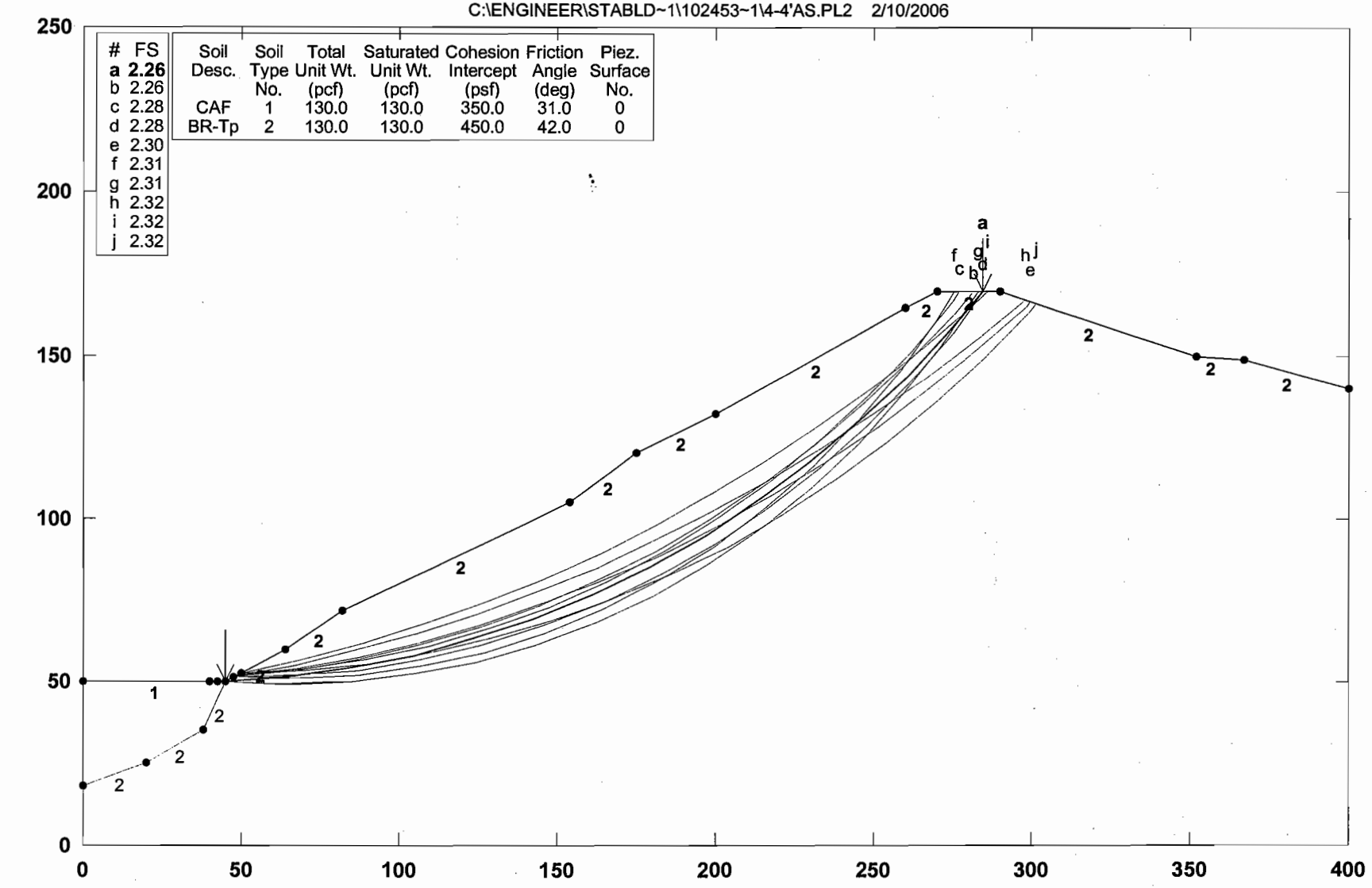

GSTABL7 v.2 FSmin=2.26

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

PLATE D-21

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 2/10/2006
Time of Run:
Run By:
Input Data Filename: C:4-4'AP.
Output Filename: C:4-4'AP.OUT
Unit System: English
Plotted Output Filename: C:4-4'AP.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 4-4' NAT. SLOPE ABOVE PAD
W.O. 102453-RT

BOUNDARY COORDINATES
12 Top Boundaries
15 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	50.00	45.00	50.00	1
2	45.00	50.00	64.00	60.00	2
3	64.00	60.00	82.00	72.00	2
4	82.00	72.00	154.00	105.00	2
5	154.00	105.00	175.00	120.00	2
6	175.00	120.00	200.00	132.00	2
7	200.00	132.00	260.00	165.00	2
8	260.00	165.00	270.00	170.00	2
9	270.00	170.00	290.00	170.00	2
10	290.00	170.00	352.00	150.00	2
11	352.00	150.00	367.00	149.00	2
12	367.00	149.00	400.00	140.00	2
13	0.00	18.00	20.00	25.00	2
14	20.00	25.00	38.00	35.00	2
15	38.00	35.00	45.00	50.00	2

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	130.0	130.0	350.0	31.0	0.00	0.0	0
2	130.0	130.0	450.0	42.0	0.00	0.0	0

A Horizontal Earthquake Loading Coefficient
Of0.150 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure = 0.0(psf)
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	45.00	50.00
2	64.94	51.53
3	84.75	54.26
4	104.36	58.19
5	123.70	63.30
6	142.69	69.57
7	161.27	76.98
8	179.36	85.51
9	196.90	95.11

10	213.83	105.76
11	230.09	117.41
12	245.60	130.03
13	260.33	143.57
14	274.21	157.97
15	284.47	170.00

Janbu's Empirical Coefficient (fo) = 1.045

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *

Factor Of Safety For The Preceding Specified Surface = 1.645

Table 1 - Individual Data on the 21 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	19.0	10549.5	0.0	0.0	0.0	0.0	1582.4	0.0	0.0
2	0.9	1077.7	0.0	0.0	0.0	0.0	161.7	0.0	0.0
3	17.1	30179.4	0.0	0.0	0.0	0.0	4526.9	0.0	0.0
4	2.8	6635.1	0.0	0.0	0.0	0.0	995.3	0.0	0.0
5	19.6	54884.8	0.0	0.0	0.0	0.0	8232.7	0.0	0.0
6	19.3	65206.8	0.0	0.0	0.0	0.0	9781.0	0.0	0.0
7	19.0	71664.8	0.0	0.0	0.0	0.0	10749.7	0.0	0.0
8	11.3	44965.9	0.0	0.0	0.0	0.0	6744.9	0.0	0.0
9	7.3	30305.7	0.0	0.0	0.0	0.0	4545.9	0.0	0.0
10	13.7	62256.2	0.0	0.0	0.0	0.0	9338.4	0.0	0.0
11	4.4	20724.7	0.0	0.0	0.0	0.0	3108.7	0.0	0.0
12	17.5	82069.8	0.0	0.0	0.0	0.0	12310.5	0.0	0.0
13	3.1	14173.9	0.0	0.0	0.0	0.0	2126.1	0.0	0.0
14	13.8	61835.6	0.0	0.0	0.0	0.0	9275.3	0.0	0.0
15	16.3	68683.7	0.0	0.0	0.0	0.0	10302.6	0.0	0.0
16	15.5	58663.8	0.0	0.0	0.0	0.0	8799.6	0.0	0.0
17	14.4	45661.2	0.0	0.0	0.0	0.0	6849.2	0.0	0.0
18	0.3	929.4	0.0	0.0	0.0	0.0	139.4	0.0	0.0
19	9.7	23880.4	0.0	0.0	0.0	0.0	3582.1	0.0	0.0
20	4.2	7779.3	0.0	0.0	0.0	0.0	1166.9	0.0	0.0
21	10.3	8022.8	0.0	0.0	0.0	0.0	1203.4	0.0	0.0

CROSS-SECTION 4-4' NAT. SLOPE ABOVE PADW.O. 102453-RT

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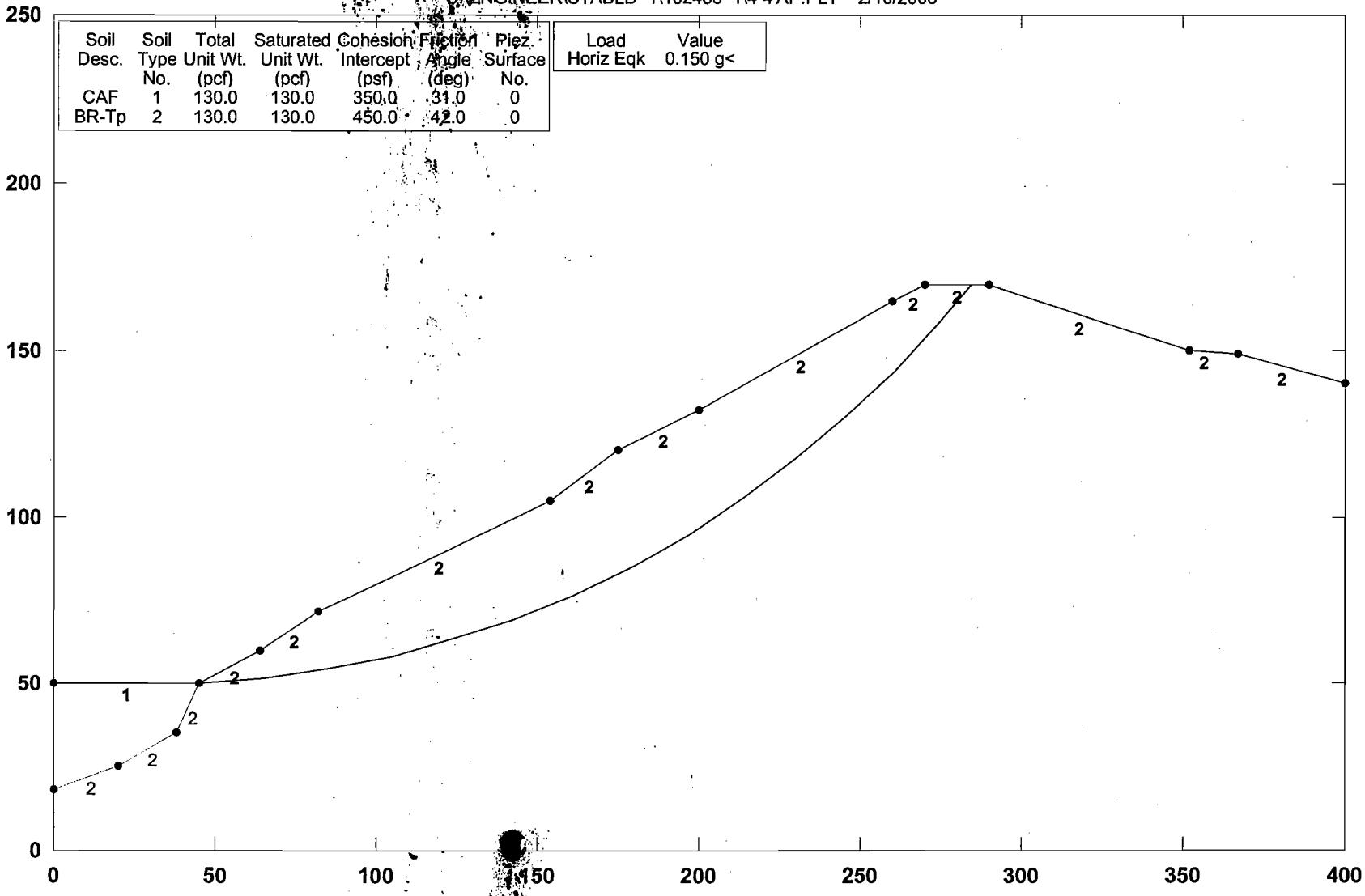
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CAF	1	130.0	130.0	350.0	31.0	0
BR-Tp	2	130.0	130.0	450.0	42.0	0

Load	Value
Horiz Eqk	0.150 g<



GSTABL7 v.2 FSmin=1.64

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

PLATE D-24

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 2/10/2006
Time of Run:
Run By:
Input Data Filename: C:4-4'BS.
Output Filename: C:4-4'BS.OUT
Unit System: English
Plotted Output Filename: C:4-4'BS.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 4-4' NAT. SLOPE BELOW PAD
W.O. 102453-RT

BOUNDARY COORDINATES
11 Top Boundaries
15 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	90.00	21.00	93.00	1
2	21.00	93.00	40.00	100.00	1
3	40.00	100.00	58.00	102.00	1
4	58.00	102.00	93.00	113.00	1
5	93.00	113.00	114.00	120.00	1
6	114.00	120.00	123.00	127.00	2
7	123.00	127.00	170.00	152.00	2
8	170.00	152.00	207.00	164.00	2
9	207.00	164.00	228.00	180.00	2
10	228.00	180.00	242.00	200.00	2
11	242.00	200.00	400.00	200.00	2
12	0.00	70.00	30.00	80.00	2
13	30.00	80.00	70.00	92.00	2
14	70.00	92.00	105.00	110.00	2
15	105.00	110.00	114.00	120.00	2

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	250.0	15.0	0.00	0.0	0
2	130.0	130.0	450.0	42.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
4000 Trial Surfaces Have Been Generated.
400 Surfaces Initiate From Each Of 10 Points Equally Spaced
Along The Ground Surface Between X = 20.00(ft)
and X = 120.00(ft)
Each Surface Terminates Between X = 242.00(ft)
and X = 352.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
18.00(ft) Line Segments Define Each Trial Failure Surface.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 4000
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.56	107.52
2	93.55	108.07

PLATE D-25

3	111.46	109.89
4	129.19	112.97
5	146.66	117.31
6	163.78	122.87
7	180.46	129.64
8	196.62	137.57
9	212.17	146.62
10	227.05	156.76
11	241.17	167.92
12	254.46	180.06
13	266.86	193.11
14	272.53	200.00

Circle Center At X = 77.0 ; Y = 360.4 and Radius, 252.9

Factor of Safety

*** **2.324** ***

Individual data on the 22 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	17.4	5182.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.5	330.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	9.6	7164.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	1.9	1698.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	6.5	6857.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	2.5	3106.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	9.0	14492.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	6.2	13041.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	17.5	44958.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	17.1	53509.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	6.2	21203.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	10.5	35589.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	16.2	51277.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	10.4	29326.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	5.2	14026.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	14.9	42386.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	1.0	2781.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	13.2	45691.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.8	3362.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	12.5	41518.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	12.4	21624.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	5.7	2542.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION 4-4' NAT. SLOPE BELOW PADW.O. 102453-RT

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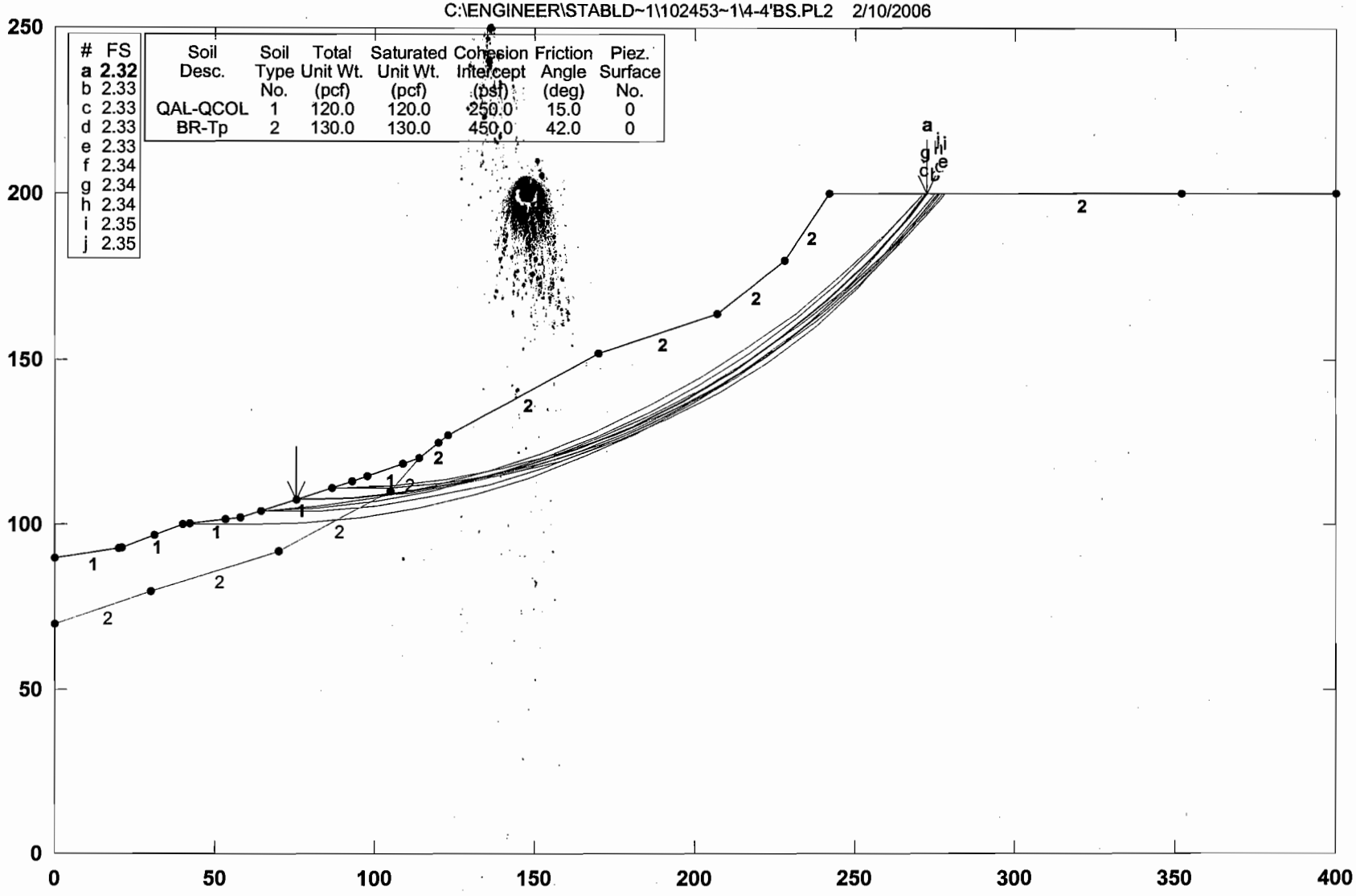

GSTABL7 v.2 FSmin=2.32

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

PLATE D-27

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 2/10/2006
Time of Run:
Run By:
Input Data Filename: C:4-4'BP.
Output Filename: C:4-4'BP.OUT
Unit System: English
Plotted Output Filename: C:4-4'BP.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 4-4' NAT. SLOPE BELOW PAD
W.O. 102453-RT

BOUNDARY COORDINATES
11 Top Boundaries
15 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	90.00	21.00	93.00	1
2	21.00	93.00	40.00	100.00	1
3	40.00	100.00	58.00	102.00	1
4	58.00	102.00	93.00	113.00	1
5	93.00	113.00	114.00	120.00	1
6	114.00	120.00	123.00	127.00	2
7	123.00	127.00	170.00	152.00	2
8	170.00	152.00	207.00	164.00	2
9	207.00	164.00	228.00	180.00	2
10	228.00	180.00	242.00	200.00	2
11	242.00	200.00	400.00	200.00	2
12	0.00	70.00	30.00	80.00	2
13	30.00	80.00	70.00	92.00	2
14	70.00	92.00	105.00	110.00	2
15	105.00	110.00	114.00	120.00	2

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	250.0	15.0	0.00	0.0	0
2	130.0	130.0	450.0	42.0	0.00	0.0	0

A Horizontal Earthquake Loading Coefficient
Of0.150 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure = 0.0(psf)
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.56	107.52
2	93.55	108.07
3	111.46	109.89
4	129.19	112.97
5	146.66	117.31
6	163.78	122.87
7	180.46	129.64
8	196.62	137.57
9	212.17	146.62

10	227.05	156.76
11	241.17	167.92
12	254.46	180.06
13	266.86	193.11
14	272.53	200.00

Janbu's Empirical Coefficient (fo) = 1.048

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *

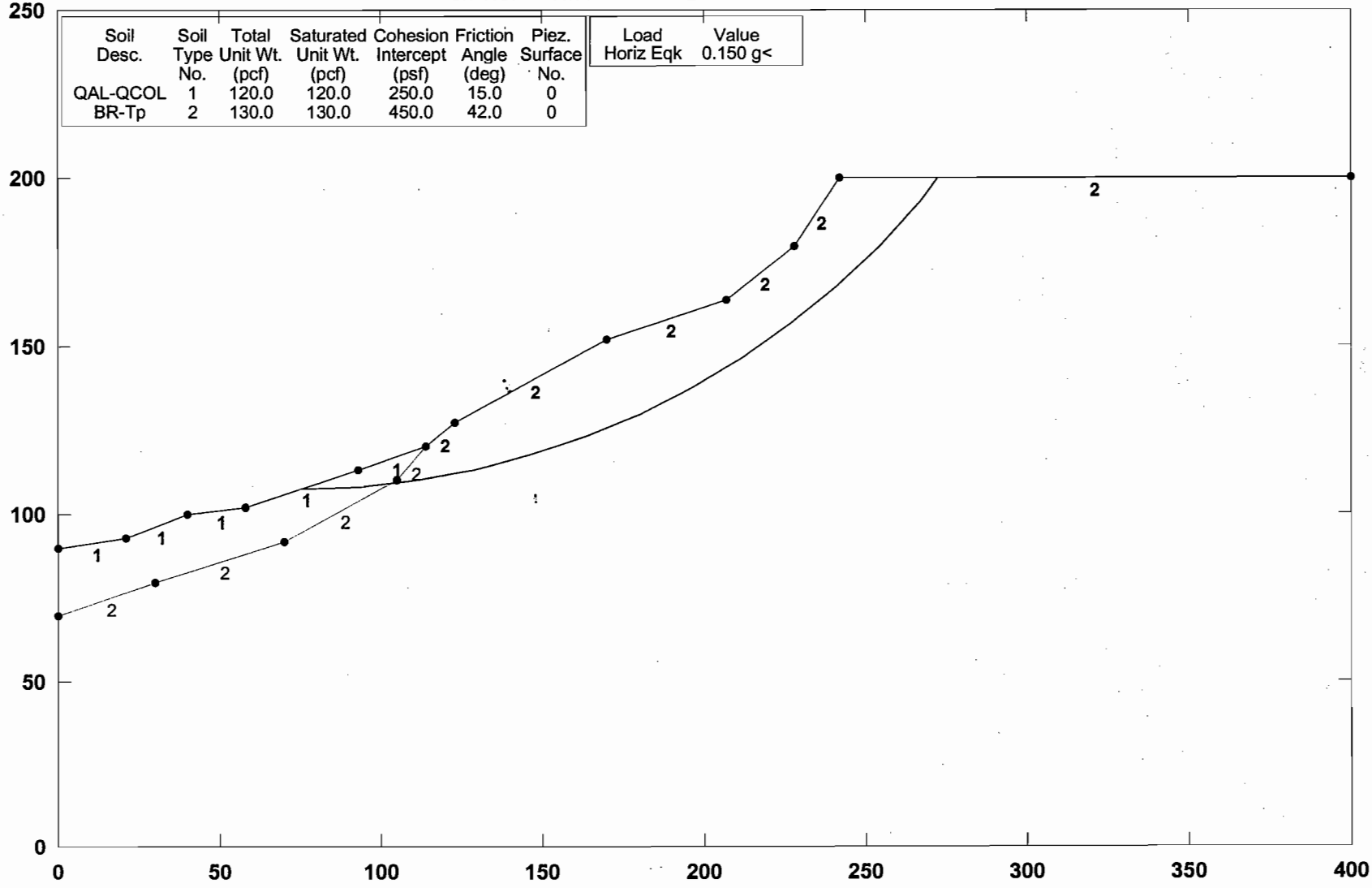
Factor Of Safety For The Preceding Specified Surface = 1.696

Table 1 - Individual Data on the 22 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	17.4	5176.4	0.0	0.0	0.0	0.0	776.5	0.0	0.0
2	0.6	332.0	0.0	0.0	0.0	0.0	49.8	0.0	0.0
3	9.6	7165.4	0.0	0.0	0.0	0.0	1074.8	0.0	0.0
4	1.9	1690.2	0.0	0.0	0.0	0.0	253.5	0.0	0.0
5	6.5	6860.9	0.0	0.0	0.0	0.0	1029.1	0.0	0.0
6	2.5	3100.6	0.0	0.0	0.0	0.0	465.1	0.0	0.0
7	9.0	14492.8	0.0	0.0	0.0	0.0	2173.9	0.0	0.0
8	6.2	13047.3	0.0	0.0	0.0	0.0	1957.1	0.0	0.0
9	17.5	44965.1	0.0	0.0	0.0	0.0	6744.8	0.0	0.0
10	17.1	53521.9	0.0	0.0	0.0	0.0	8028.3	0.0	0.0
11	6.2	21196.2	0.0	0.0	0.0	0.0	3179.4	0.0	0.0
12	10.5	35598.1	0.0	0.0	0.0	0.0	5339.7	0.0	0.0
13	16.2	51276.3	0.0	0.0	0.0	0.0	7691.4	0.0	0.0
14	10.4	29317.3	0.0	0.0	0.0	0.0	4397.6	0.0	0.0
15	5.2	14016.0	0.0	0.0	0.0	0.0	2102.4	0.0	0.0
16	14.9	42397.4	0.0	0.0	0.0	0.0	6359.6	0.0	0.0
17	0.9	2779.1	0.0	0.0	0.0	0.0	416.9	0.0	0.0
18	13.2	45699.0	0.0	0.0	0.0	0.0	6854.8	0.0	0.0
19	0.8	3356.5	0.0	0.0	0.0	0.0	503.5	0.0	0.0
20	12.5	41516.9	0.0	0.0	0.0	0.0	6227.5	0.0	0.0
21	12.4	21625.0	0.0	0.0	0.0	0.0	3243.8	0.0	0.0
22	5.7	2539.3	0.0	0.0	0.0	0.0	380.9	0.0	0.0

CROSS-SECTION 4-4' NAT. SLOPE BELOW PADW.O. 102453-RT

C:\ENGINEER\STABLD~1\102453~1\4-4'BP.PLT 2/10/2006



GSTABL7 v.2 FSmin=1.70

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

PLATE D-30

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                              *** GSTABL7 ***
                    ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
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*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
*******************************************************************************
Analysis Run Date:        2/10/2006
Time of Run:
Run By:
Input Data Filename:      C:4-4'BUS.
Output Filename:          C:4-4'BUS.OUT
Unit System:              English
Plotted Output Filename:  C:4-4'BUS.PLT
PROBLEM DESCRIPTION:  CROSS-SECTION 4-4'  NAT. SLOPE BELOW PAD
                                W.O. 102453-RT
BOUNDARY COORDINATES
   11 Top   Boundaries
   15 Total Boundaries
Boundary     X-Left     Y-Left     X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1          0.00      90.00      21.00      93.00         1
    2         21.00      93.00      40.00     100.00         1
    3         40.00     100.00      58.00     102.00         1
    4         58.00     102.00      93.00     113.00         1
    5         93.00     113.00     114.00     120.00         1
    6        114.00     120.00     123.00     127.00         2
    7        123.00     127.00     170.00     152.00         2
    8        170.00     152.00     207.00     164.00         2
    9        207.00     164.00     228.00     180.00         2
   10        228.00     180.00     242.00     200.00         2
   11        242.00     200.00     400.00     200.00         2
   12          0.00      70.00      30.00      80.00         2
   13         30.00      80.00      70.00      92.00         2
   14         70.00      92.00     105.00     110.00         2
   15        105.00     110.00     114.00     120.00         2
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.   (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
   1   120.0    120.0     250.0     15.0    0.00       0.0       0
   2   130.0    130.0     450.0     42.0    0.00       0.0       0
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
4000 Trial Surfaces Have Been Generated.
 400 Surfaces Initiate From Each Of 10 Points Equally Spaced
 Along The Ground Surface Between  X = 207.00(ft)
                                 and  X = 228.00(ft)
 Each Surface Terminates Between   X = 242.00(ft)
                                 and   X = 352.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =      0.00(ft)
 18.00(ft) Line Segments Define Each Trial Failure Surface.
       * * Safety Factors Are Calculated By The Modified Bishop Method * *
       Total Number of Trial Surfaces Evaluated =  4000
       Failure Surface Specified By  5 Coordinate Points
         Point      X-Surf      Y-Surf
          No.        (ft)        (ft)
           1        207.00      164.00
           2        224.26      169.12
```

PLATE D-31

3 239.41 178.83
4 251.26 192.38
5 254.81 200.00

Circle Center At X = 197.6 ; Y = 227.3 and Radius, 64.0

Factor of Safety

*** **2.115** ***

Individual data on the 6 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	17.3	9010.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3.7	4017.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	11.4	19246.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2.6	6005.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	9.3	15539.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	3.6	1758.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION 4-4' NAT. SLOPE BELOW PADW.O. 102453-RT

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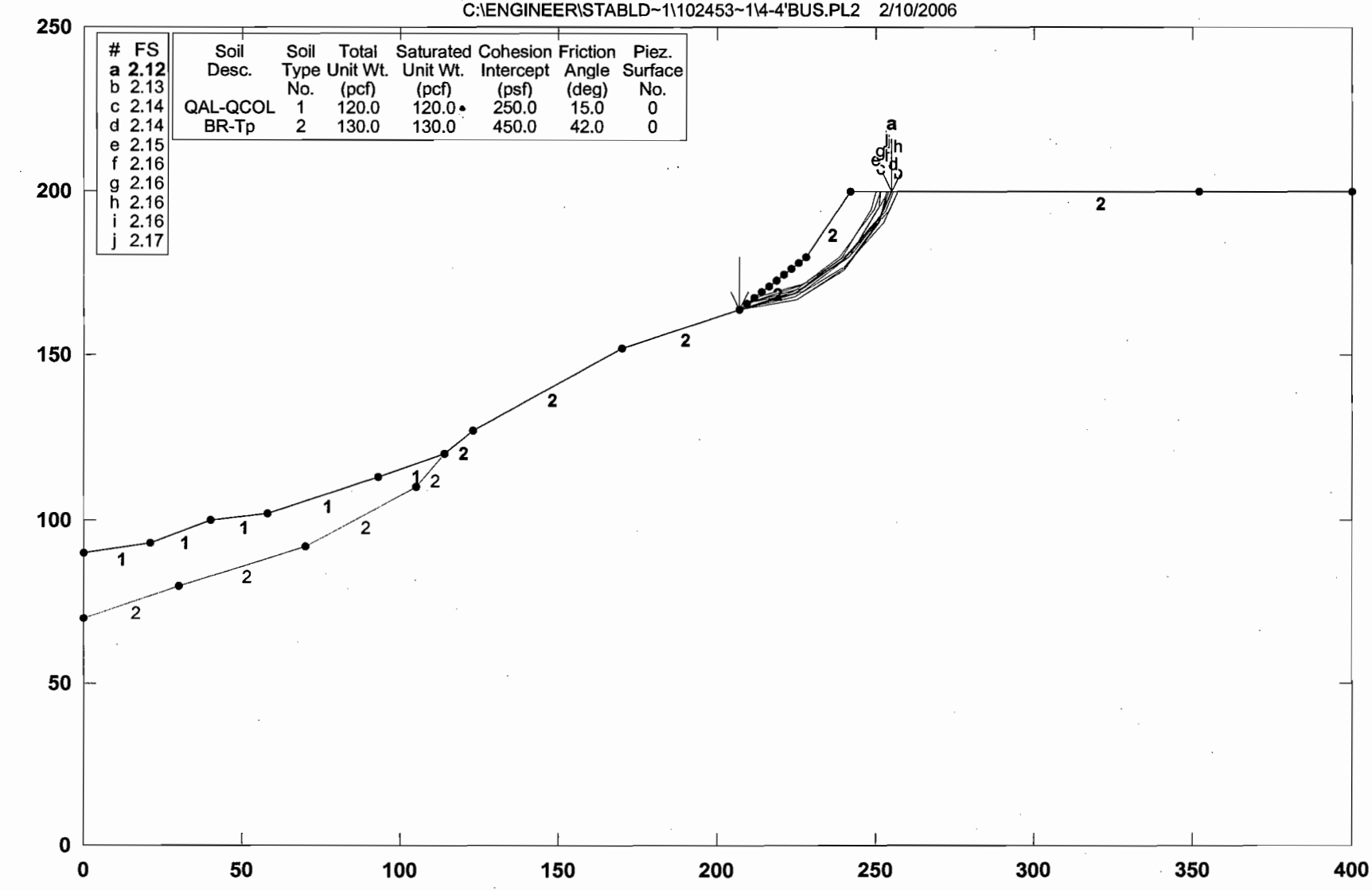

#	FS
a	**2.12**
b	2.13
c	2.14
d	2.14
e	2.15
f	2.16
g	2.16
h	2.16
i	2.16
j	2.17

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
QAL-QCOL	1	120.0	120.0	250.0	15.0	0
BR-Tp	2	130.0	130.0	450.0	42.0	0

GSTABL7 v.2 FSmin=2.12

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

PLATE D-33

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 2/10/2006
Time of Run:
Run By:
Input Data Filename: C:4-4'BUP.
Output Filename: C:4-4'BUP.OUT
Unit System: English
Plotted Output Filename: C:4-4'BUP.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 4-4' NAT. SLOPE BELOW PAD
W.O. 102453-RT

BOUNDARY COORDINATES
11 Top Boundaries
15 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	90.00	21.00	93.00	1
2	21.00	93.00	40.00	100.00	1
3	40.00	100.00	58.00	102.00	1
4	58.00	102.00	93.00	113.00	1
5	93.00	113.00	114.00	120.00	1
6	114.00	120.00	123.00	127.00	2
7	123.00	127.00	170.00	152.00	2
8	170.00	152.00	207.00	164.00	2
9	207.00	164.00	228.00	180.00	2
10	228.00	180.00	242.00	200.00	2
11	242.00	200.00	400.00	200.00	2
12	0.00	70.00	30.00	80.00	2
13	30.00	80.00	70.00	92.00	2
14	70.00	92.00	105.00	110.00	2
15	105.00	110.00	114.00	120.00	2

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	250.0	15.0	0.00	0.0	0
2	130.0	130.0	450.0	42.0	0.00	0.0	0

A Horizontal Earthquake Loading Coefficient
Of0.150 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure = 0.0(psf)
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	207.00	164.00
2	224.26	169.12
3	239.41	178.83
4	251.26	192.38
5	254.81	200.00

Janbu's Empirical Coefficient (fo) = 1.052
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 1.661
Table 1 - Individual Data on the 6 Slices

PLATE D-34

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	17.3	9009.4	0.0	0.0	0.0	0.0	1351.4	0.0	0.0
2	3.7	4014.4	0.0	0.0	0.0	0.0	602.2	0.0	0.0
3	11.4	19248.0	0.0	0.0	0.0	0.0	2887.2	0.0	0.0
4	2.6	6006.5	0.0	0.0	0.0	0.0	901.0	0.0	0.0
5	9.3	15546.1	0.0	0.0	0.0	0.0	2331.9	0.0	0.0
6	3.6	1758.3	0.0	0.0	0.0	0.0	263.7	0.0	0.0

CROSS-SECTION 4-4' NAT. SLOPE BELOW PADW.O. 102453-RT

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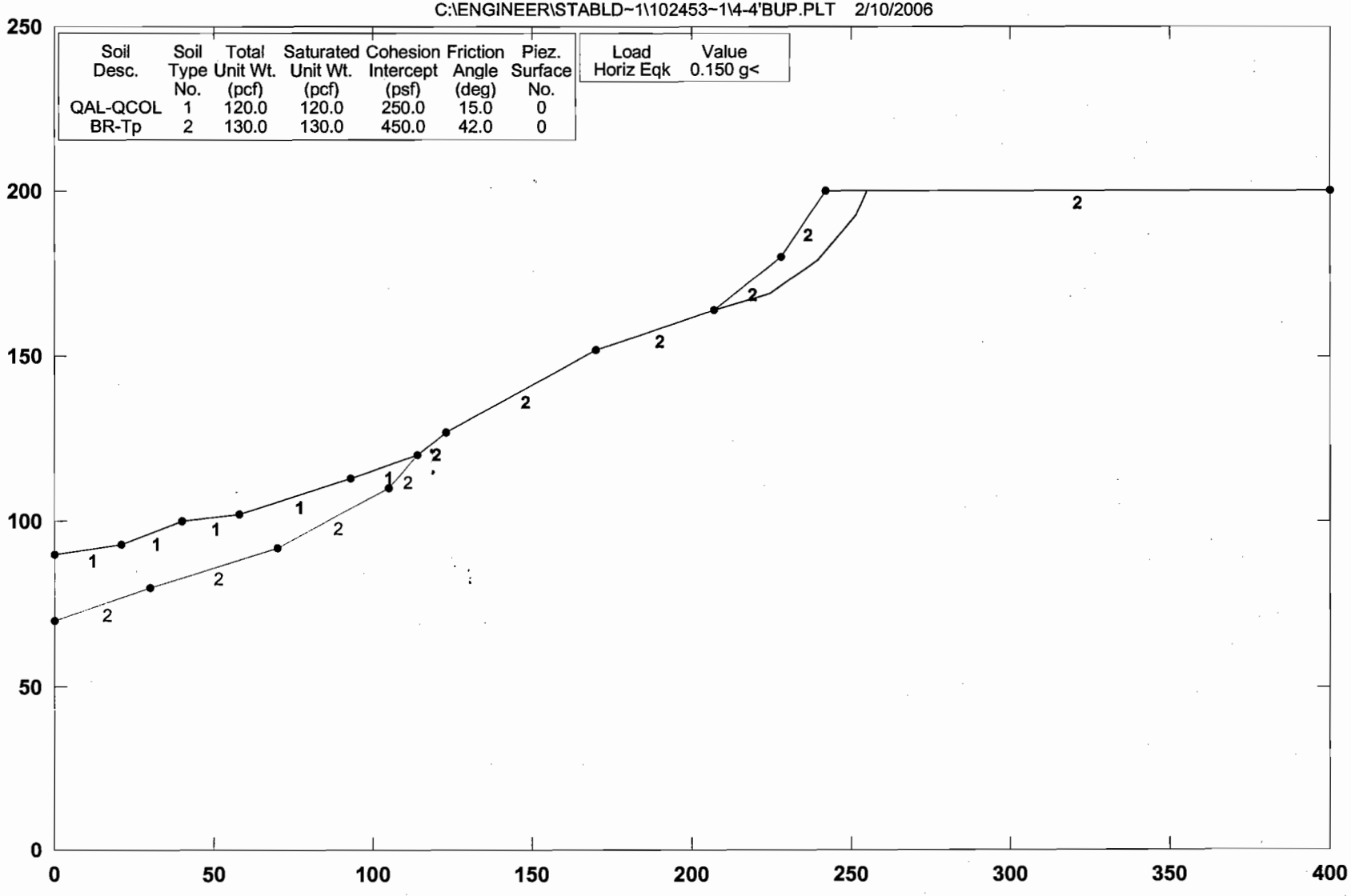
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
QAL-QCOL	1	120.0	120.0	250.0	15.0	0
BR-Tp	2	130.0	130.0	450.0	42.0	0

Load	Value
Horiz Eqk	0.150 g<



GSTABL7 v.2 FSmin=1.66

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

PLATE D-36

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                              *** GSTABL7 ***
                        ** GSTABL7 by Garry H. Gregory, P.E. **
    ** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
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 ********************************************************************************
                       SLOPE STABILITY ANALYSIS SYSTEM
          Modified Bishop, Simplified Janbu, or GLE Method of Slices.
          (Includes Spencer & Morgenstern-Price Type Analysis)
          Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
          Nonlinear Undrained Shear Strength, Curved Phi Envelope,
          Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
          Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
 ********************************************************************************
 Analysis Run Date:        2/14/2006
 Time of Run:
 Run By:
 Input Data Filename:      C:5'fbs.
 Output Filename:          C:5'fbs.OUT
 Unit System:              English
 Plotted Output Filename:  C:5'fbs.PLT
 PROBLEM DESCRIPTION:  CROSS-SECTION 5-5'    FULL BASIN
                       W.O. 102453-RT
 BOUNDARY COORDINATES
     5 Top   Boundaries
     5 Total Boundaries
 Boundary     X-Left     Y-Left     X-Right    Y-Right    Soil Type
    No.         (ft)       (ft)       (ft)       (ft)     Below Bnd
     1          0.00     105.00      20.00     100.00         1
     2         20.00     100.00     122.00      95.00         1
     3        122.00      95.00     185.00     120.00         1
     4        185.00     120.00     195.00     123.00         1
     5        195.00     123.00     320.00     110.00         1
ISOTROPIC SOIL PARAMETERS
  1 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
   1   130.0    130.0     350.0     31.0    0.00       0.0      1
 1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED
 Unit Weight of Water =  62.40
 Piezometric Surface No.  1 Specified by  3 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1          0.00      120.00
     2        185.00      120.00
     3        320.00      107.00
Searching Routine Will Be Limited To An Area Defined By  2 Boundaries
 Of Which The First  2 Boundaries Will Deflect Surfaces Upward
 Boundary     X-Left     Y-Left     X-Right    Y-Right
    No.         (ft)       (ft)       (ft)       (ft)
     1          0.00      85.00     170.00      42.00
     2        170.00      42.00     320.00      30.00
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
4000 Trial Surfaces Have Been Generated.
 400 Surfaces Initiate From Each Of 10 Points Equally Spaced
 Along The Ground Surface Between  X = 118.00(ft)
                                and  X = 126.00(ft)
 Each Surface Terminates Between   X = 185.00(ft)
                                and   X = 300.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =      0.00(ft)
  5.00(ft) Line Segments Define Each Trial Failure Surface.
       * * Safety Factors Are Calculated By The Modified Bishop Method * *
       Total Number of Trial Surfaces Evaluated =  4000
       Failure Surface Specified By 20 Coordinate Points
```

PLATE D-37

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.56	95.02
2	126.33	93.55
3	131.21	92.42
4	136.15	91.65
5	141.13	91.23
6	146.13	91.17
7	151.12	91.47
8	156.08	92.12
9	160.97	93.13
10	165.79	94.49
11	170.49	96.19
12	175.06	98.22
13	179.47	100.57
14	183.70	103.24
15	187.73	106.20
16	191.54	109.44
17	195.10	112.94
18	198.41	116.69
19	201.43	120.67
20	202.45	122.23

Circle Center At X = 144.5 ; Y = 160.8 and Radius, 69.6

Factor of Safety

*** **3.428** ***

Individual data on the 23 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.4	3.3	693.1	726.1	0.0	0.0	0.0	0.0	0.0
2	4.3	925.7	7024.2	7296.9	0.0	0.0	0.0	0.0	0.0
3	4.9	2976.8	7297.4	8428.4	0.0	0.0	0.0	0.0	0.0
4	4.9	4878.8	6754.0	8724.9	0.0	0.0	0.0	0.0	0.0
5	5.0	6582.5	6154.0	8910.9	0.0	0.0	0.0	0.0	0.0
6	5.0	8047.9	5510.4	8985.6	0.0	0.0	0.0	0.0	0.0
7	5.0	9243.2	4836.8	8948.5	0.0	0.0	0.0	0.0	0.0
8	5.0	10144.5	4146.8	8799.7	0.0	0.0	0.0	0.0	0.0
9	4.9	10737.4	3454.1	8540.1	0.0	0.0	0.0	0.0	0.0
10	4.8	11016.6	2771.9	8171.1	0.0	0.0	0.0	0.0	0.0
11	4.7	10985.7	2112.7	7694.4	0.0	0.0	0.0	0.0	0.0
12	4.6	10658.2	1488.3	7112.6	0.0	0.0	0.0	0.0	0.0
13	4.4	10055.9	909.4	6428.6	0.0	0.0	0.0	0.0	0.0
14	4.2	9209.2	385.1	5646.0	0.0	0.0	0.0	0.0	0.0
15	1.3	2709.4	22.5	1639.6	0.0	0.0	0.0	0.0	0.0
16	2.7	5399.6	0.0	3087.2	0.0	0.0	0.0	0.0	0.0
17	3.8	6718.7	0.0	3645.5	0.0	0.0	0.0	0.0	0.0
18	3.5	5106.0	0.0	2432.9	0.0	0.0	0.0	0.0	0.0
19	0.1	134.3	0.0	54.7	0.0	0.0	0.0	0.0	0.0
20	3.3	3437.0	0.0	1257.9	0.0	0.0	0.0	0.0	0.0
21	1.4	917.2	0.0	147.7	0.0	0.0	0.0	0.0	0.0
22	1.6	580.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	1.0	109.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION 5-5' FULL BASIN W.O. 102453-RT

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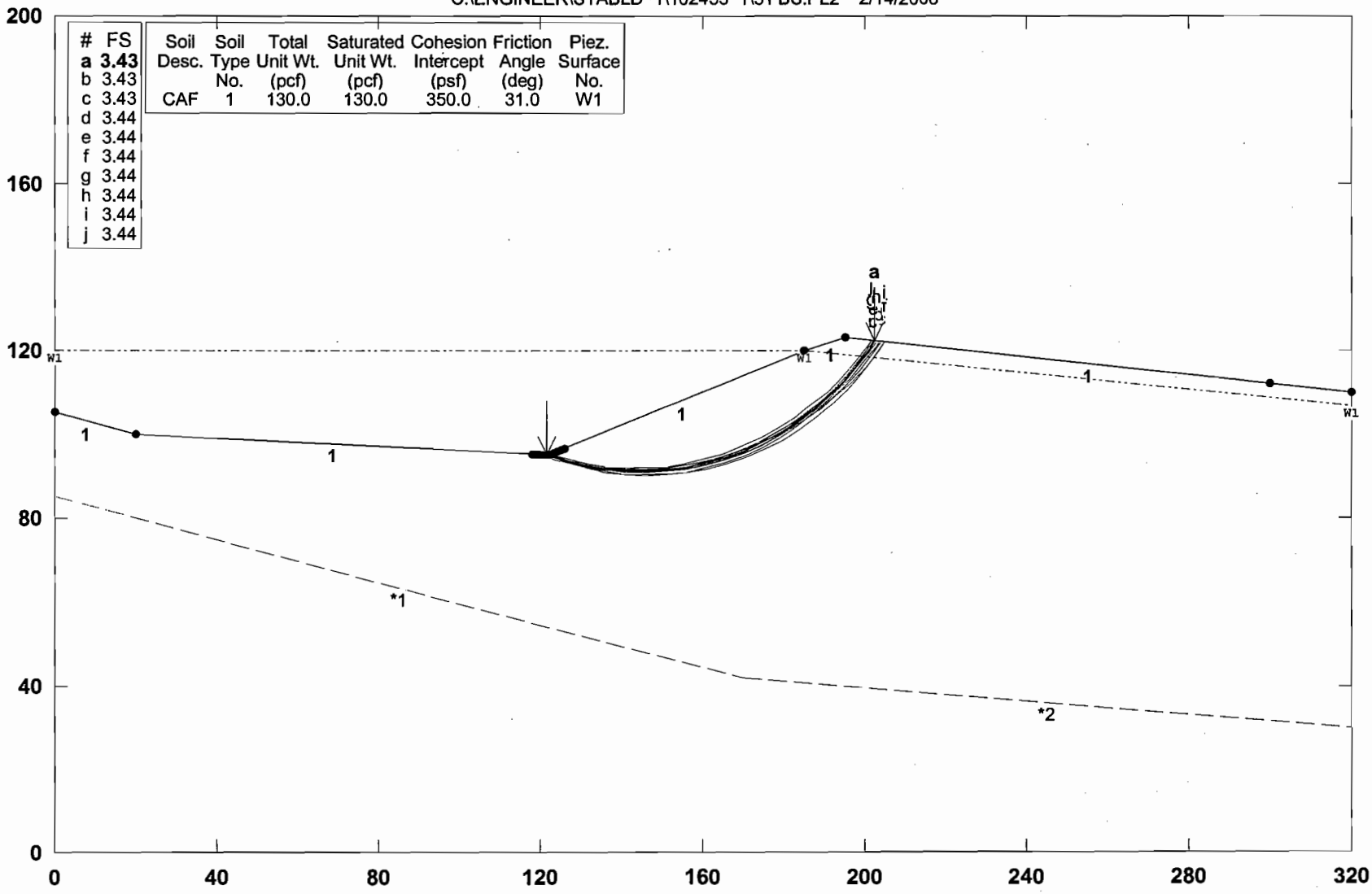

#	FS
a	**3.43**
b	3.43
c	3.43
d	3.44
e	3.44
f	3.44
g	3.44
h	3.44
i	3.44
j	3.44

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CAF	1	130.0	130.0	350.0	31.0	W1

GSTABL7 v.2 FSmin=3.43

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

PLATE D-39

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 2/14/2006
Time of Run:
Run By:
Input Data Filename: C:5'fbp.
Output Filename: C:5'fbp.OUT
Unit System: English
Plotted Output Filename: C:5'fbp.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 5-5' FULL BASIN
W.O. 102453-RT

BOUNDARY COORDINATES
5 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	105.00	20.00	100.00	1
2	20.00	100.00	122.00	95.00	1
3	122.00	95.00	185.00	120.00	1
4	185.00	120.00	195.00	123.00	1
5	195.00	123.00	320.00	110.00	1

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	130.0	130.0	350.0	31.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED
Unit Weight of Water = 62.40
Piezometric Surface No. 1 Specified by 3 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	120.00
2	185.00	120.00
3	320.00	107.00

Searching Routine Will Be Limited To An Area Defined By 2 Boundaries
Of Which The First 2 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)
1	0.00	85.00	170.00	42.00
2	170.00	42.00	320.00	30.00

A Horizontal Earthquake Loading Coefficient
Of0.150 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure = 0.0(psf)
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.56	95.02
2	126.33	93.55
3	131.21	92.42
4	136.15	91.65
5	141.13	91.23

6	146.13	91.17
7	151.12	91.47
8	156.08	92.12
9	160.97	93.13
10	165.79	94.49
11	170.49	96.19
12	175.06	98.22
13	179.47	100.57
14	183.70	103.24
15	187.73	106.20
16	191.54	109.44
17	195.10	112.94
18	198.41	116.69
19	201.43	120.67
20	202.45	122.23

Janbu's Empirical Coefficient (fo) = 1.065

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *

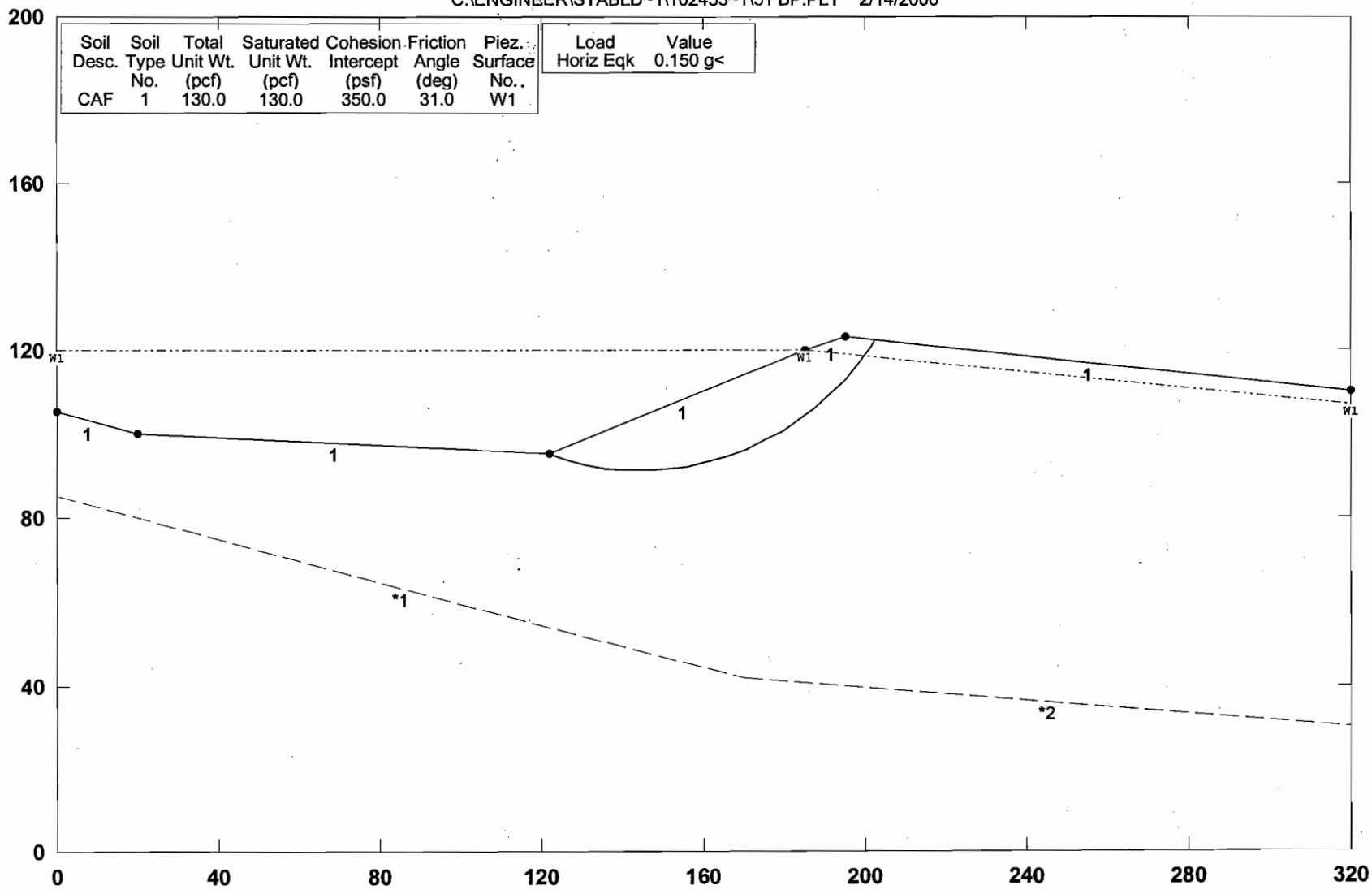
Factor Of Safety For The Preceding Specified Surface = 1.837

Table 1 - Individual Data on the 23 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.4	3.3	686.9	719.7	0.0	0.0	0.5	0.0	0.0
2	4.3	923.8	7017.5	7290.1	0.0	0.0	138.6	0.0	0.0
3	4.9	2982.6	7310.1	8444.0	0.0	0.0	447.4	0.0	0.0
4	4.9	4880.7	6753.9	8724.5	0.0	0.0	732.1	0.0	0.0
5	5.0	6579.6	6150.5	8906.6	0.0	0.0	986.9	0.0	0.0
6	5.0	8049.2	5510.5	8986.2	0.0	0.0	1207.4	0.0	0.0
7	5.0	9241.1	4835.5	8946.4	0.0	0.0	1386.2	0.0	0.0
8	5.0	10152.2	4149.1	8804.2	0.0	0.0	1522.8	0.0	0.0
9	4.9	10723.7	3448.9	8529.4	0.0	0.0	1608.5	0.0	0.0
10	4.8	11034.8	2776.1	8184.7	0.0	0.0	1655.2	0.0	0.0
11	4.7	10979.4	2111.0	7690.8	0.0	0.0	1646.9	0.0	0.0
12	4.6	10660.4	1488.4	7112.9	0.0	0.0	1599.1	0.0	0.0
13	4.4	10053.1	908.7	6425.0	0.0	0.0	1508.0	0.0	0.0
14	4.2	9205.2	384.8	5648.1	0.0	0.0	1380.8	0.0	0.0
15	1.3	2708.2	22.5	1638.8	0.0	0.0	406.2	0.0	0.0
16	2.7	5398.8	0.0	3086.7	0.0	0.0	809.8	0.0	0.0
17	3.8	6721.5	0.0	3645.1	0.0	0.0	1008.2	0.0	0.0
18	3.5	5100.8	0.0	2430.0	0.0	0.0	765.1	0.0	0.0
19	0.1	131.4	0.0	53.5	0.0	0.0	19.7	0.0	0.0
20	3.3	3443.4	0.0	1259.2	0.0	0.0	516.5	0.0	0.0
21	1.4	916.8	0.0	148.0	0.0	0.0	137.5	0.0	0.0
22	1.6	578.3	0.0	0.0	0.0	0.0	86.8	0.0	0.0
23	1.0	110.1	0.0	0.0	0.0	0.0	16.5	0.0	0.0

CROSS-SECTION 5-5' FULL BASIN W.O. 102453-RT

C:\ENGINEER\STABLD~1\102453~1\5'FBP.PLT 2/14/2006



GSTABL7 v.2 FSmin=1.84

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

PLATE D-42

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 2/14/2006
Time of Run:
Run By:
Input Data Filename: C:5'RDS.
Output Filename: C:5'RDS.OUT
Unit System: English
Plotted Output Filename: C:5'RDS.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 5-5' RAPID DRAWDOWN
W.O. 102453-RT

BOUNDARY COORDINATES
5 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	105.00	20.00	100.00	1
2	20.00	100.00	122.00	95.00	1
3	122.00	95.00	185.00	120.00	1
4	185.00	120.00	195.00	123.00	1
5	195.00	123.00	320.00	110.00	1

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	130.0	130.0	350.0	31.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED
Unit Weight of Water = 62.40
Piezometric Surface No. 1 Specified by 5 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	104.00
2	20.00	99.00
3	122.00	94.00
4	185.00	119.00
5	320.00	106.00

Searching Routine Will Be Limited To An Area Defined By 2 Boundaries
Of Which The First 2 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)
1	0.00	85.00	170.00	42.00
2	170.00	42.00	320.00	30.00

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
4000 Trial Surfaces Have Been Generated.
400 Surfaces Initiate From Each Of 10 Points Equally Spaced
Along The Ground Surface Between X = 118.00(ft)
and X = 126.00(ft)
Each Surface Terminates Between X = 185.00(ft)
and X = 300.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
5.00(ft) Line Segments Define Each Trial Failure Surface.
* * Safety Factors Are Calculated By The Modified Bishop Method * *

PLATE D-43

Total Number of Trial Surfaces Evaluated = 4000
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.67	95.07
2	125.39	93.44
3	130.23	92.18
4	135.16	91.30
5	140.13	90.81
6	145.13	90.71
7	150.12	91.00
8	155.08	91.67
9	159.96	92.73
10	164.75	94.17
11	169.42	95.97
12	173.93	98.13
13	178.25	100.64
14	182.37	103.47
15	186.26	106.62
16	189.89	110.06
17	193.24	113.77
18	196.29	117.73
19	199.03	121.91
20	199.37	122.55

Circle Center At X = 143.9 ; Y = 154.9 and Radius, 64.2

Factor of Safety
*** 1.955 ***

Individual data on the 24 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.3	34.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.8	74.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	2.6	655.0	0.0	151.4	0.0	0.0	0.0	0.0	0.0
4	4.8	2830.5	0.0	1017.4	0.0	0.0	0.0	0.0	0.0
5	4.9	4800.9	0.0	1890.6	0.0	0.0	0.0	0.0	0.0
6	5.0	6565.1	0.0	2660.3	0.0	0.0	0.0	0.0	0.0
7	5.0	8074.1	0.0	3321.9	0.0	0.0	0.0	0.0	0.0
8	5.0	9288.4	0.0	3871.3	0.0	0.0	0.0	0.0	0.0
9	5.0	10179.7	0.0	4305.2	0.0	0.0	0.0	0.0	0.0
10	4.9	10730.8	0.0	4620.9	0.0	0.0	0.0	0.0	0.0
11	4.8	10936.5	0.0	4816.6	0.0	0.0	0.0	0.0	0.0
12	4.7	10803.7	0.0	4891.1	0.0	0.0	0.0	0.0	0.0
13	4.5	10350.7	0.0	4843.9	0.0	0.0	0.0	0.0	0.0
14	4.3	9607.2	0.0	4675.3	0.0	0.0	0.0	0.0	0.0
15	4.1	8613.2	0.0	4386.3	0.0	0.0	0.0	0.0	0.0
16	2.6	5104.4	0.0	2741.3	0.0	0.0	0.0	0.0	0.0
17	1.3	2303.6	0.0	1290.4	0.0	0.0	0.0	0.0	0.0
18	3.6	5937.9	0.0	3219.4	0.0	0.0	0.0	0.0	0.0
19	3.4	4381.1	0.0	2004.8	0.0	0.0	0.0	0.0	0.0
20	1.8	1791.3	0.0	575.4	0.0	0.0	0.0	0.0	0.0
21	1.3	1014.5	0.0	142.5	0.0	0.0	0.0	0.0	0.0
22	0.1	74.3	0.0	1.2	0.0	0.0	0.0	0.0	0.0
23	2.6	957.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0.3	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION 5-5' RAPID DRAWDOWN W.O. 102453-RT

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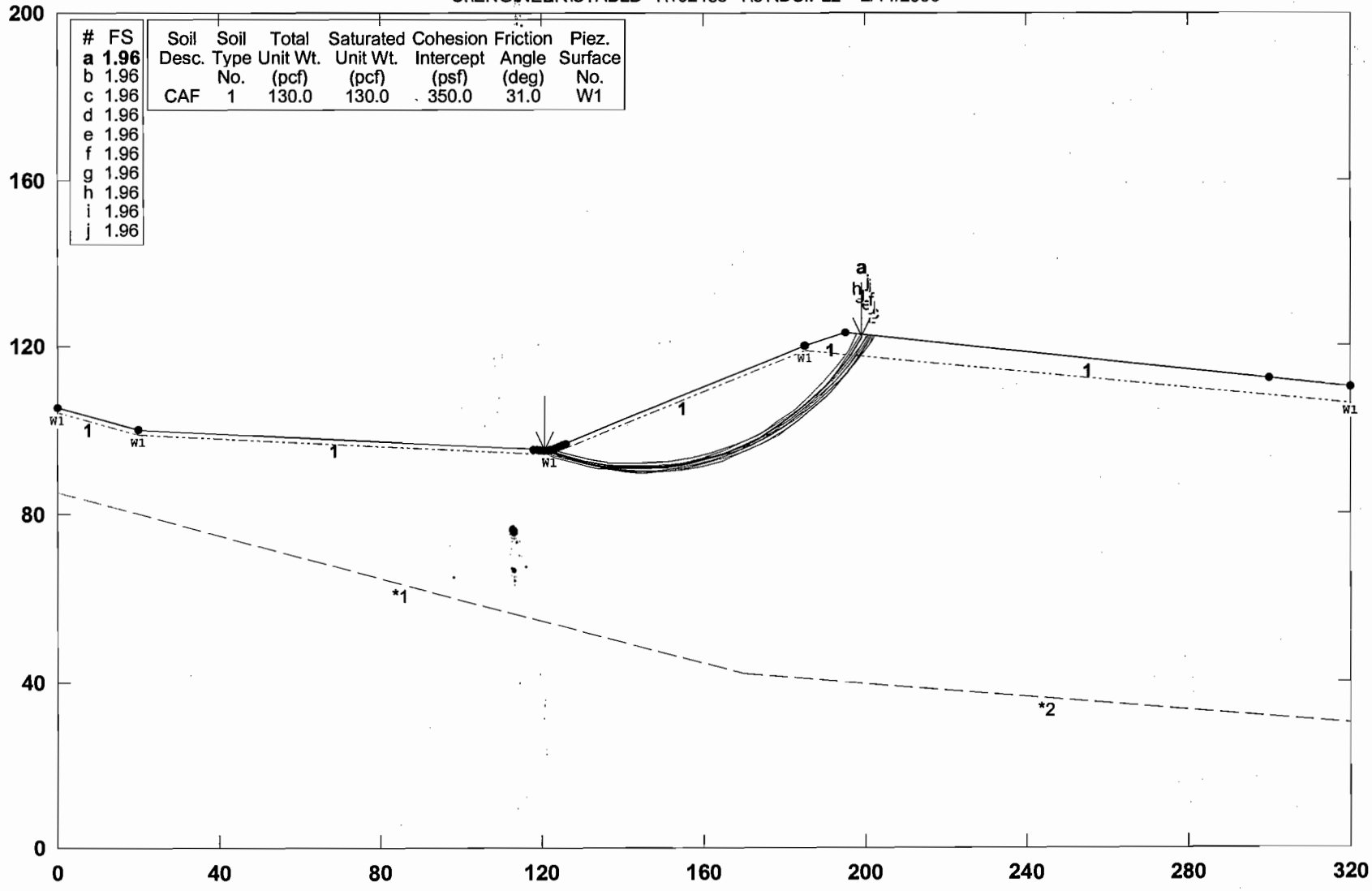

GSTABL7 v.2 FSmin=1.96

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

PLATE D-45

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 2/14/2006
Time of Run:
Run By:
Input Data Filename: C:5'RDP.
Output Filename: C:5'RDP.OUT
Unit System: English
Plotted Output Filename: C:5'RDP.PLT
PROBLEM DESCRIPTION: CROSS-SECTION 5-5' RAPID DRAWDOWN
W.O. 102453-RT

BOUNDARY COORDINATES
5 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	105.00	20.00	100.00	1
2	20.00	100.00	122.00	95.00	1
3	122.00	95.00	185.00	120.00	1
4	185.00	120.00	195.00	123.00	1
5	195.00	123.00	320.00	110.00	1

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	130.0	130.0	350.0	31.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED
Unit Weight of Water = 62.40
Piezometric Surface No. 1 Specified by 5 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	104.00
2	20.00	99.00
3	122.00	94.00
4	185.00	119.00
5	320.00	106.00

Searching Routine Will Be Limited To An Area Defined By 2 Boundaries
Of Which The First 2 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)
1	0.00	85.00	170.00	42.00
2	170.00	42.00	320.00	30.00

A Horizontal Earthquake Loading Coefficient
Of0.150 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure = 0.0(psf)
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.67	95.07
2	125.39	93.44
3	130.23	92.18

PLATE D-46

4	135.16	91.30
5	140.13	90.81
6	145.13	90.71
7	150.12	91.00
8	155.08	91.67
9	159.96	92.73
10	164.75	94.17
11	169.42	95.97
12	173.93	98.13
13	178.25	100.64
14	182.37	103.47
15	186.26	106.62
16	189.89	110.06
17	193.24	113.77
18	196.29	117.73
19	199.03	121.91
20	199.37	122.55

Janbu's Empirical Coefficient (fo) = 1.068

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *

Factor Of Safety For The Preceding Specified Surface = 1.309

Table 1 - Individual Data on the 24 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.3	34.0	0.0	0.0	0.0	0.0	5.1	0.0	0.0
2	0.8	74.2	0.0	0.0	0.0	0.0	11.1	0.0	0.0
3	2.6	652.5	0.0	150.6	0.0	0.0	97.9	0.0	0.0
4	4.8	2828.6	0.0	1016.7	0.0	0.0	424.3	0.0	0.0
5	4.9	4809.4	0.0	1894.2	0.0	0.0	721.4	0.0	0.0
6	5.0	6560.1	0.0	2658.4	0.0	0.0	984.0	0.0	0.0
7	5.0	8077.2	0.0	3323.2	0.0	0.0	1211.6	0.0	0.0
8	5.0	9285.3	0.0	3870.1	0.0	0.0	1392.8	0.0	0.0
9	5.0	10192.9	0.0	4310.1	0.0	0.0	1528.9	0.0	0.0
10	4.9	10718.3	0.0	4616.2	0.0	0.0	1607.7	0.0	0.0
11	4.8	10937.1	0.0	4818.1	0.0	0.0	1640.6	0.0	0.0
12	4.7	10819.0	0.0	4895.9	0.0	0.0	1622.9	0.0	0.0
13	4.5	10355.4	0.0	4845.6	0.0	0.0	1553.3	0.0	0.0
14	4.3	9591.7	0.0	4672.0	0.0	0.0	1438.8	0.0	0.0
15	4.1	8614.6	0.0	4384.6	0.0	0.0	1292.2	0.0	0.0
16	2.6	5109.1	0.0	2744.1	0.0	0.0	766.4	0.0	0.0
17	1.3	2306.2	0.0	1292.0	0.0	0.0	345.9	0.0	0.0
18	3.6	5937.7	0.0	3219.4	0.0	0.0	890.7	0.0	0.0
19	3.3	4378.7	0.0	2003.5	0.0	0.0	656.8	0.0	0.0
20	1.8	1790.0	0.0	575.0	0.0	0.0	268.5	0.0	0.0
21	1.3	1013.0	0.0	142.1	0.0	0.0	151.9	0.0	0.0
22	0.1	73.9	0.0	1.2	0.0	0.0	11.1	0.0	0.0
23	2.6	960.3	0.0	0.0	0.0	0.0	144.0	0.0	0.0
24	0.3	14.8	0.0	0.0	0.0	0.0	2.2	0.0	0.0

CROSS-SECTION 5-5' RAPID DRAWDOWN W.O. 102453-RT

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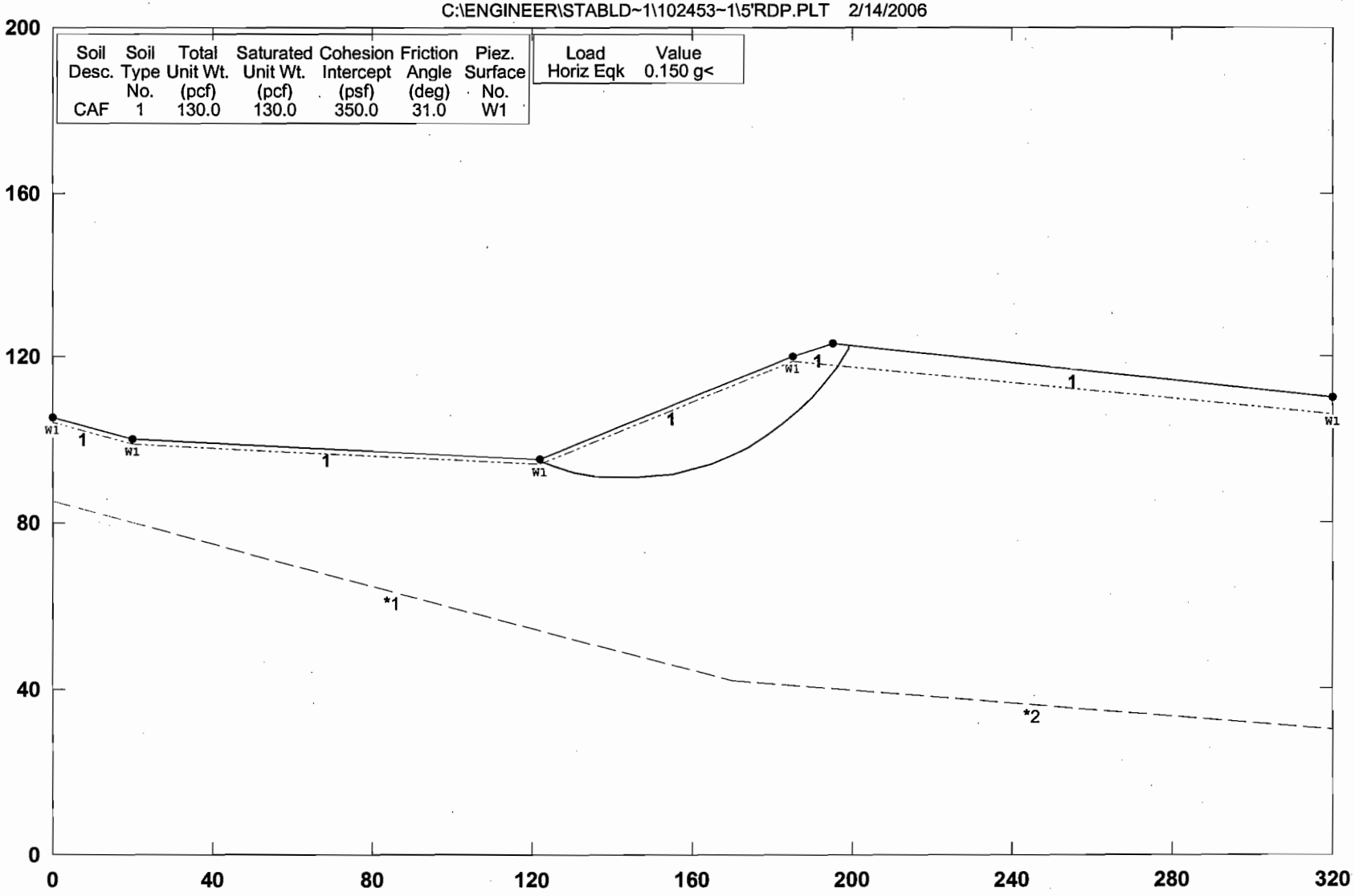


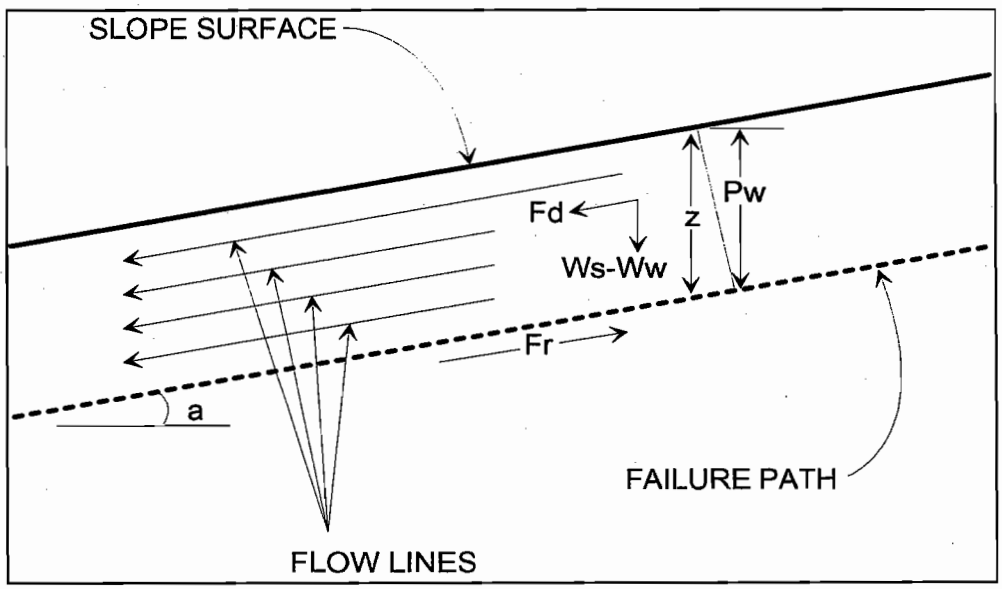
GSTABL7 v.2 FSmin=1.31

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

PLATE D-48

SURFICIAL STABILITY ANALYSIS



Assume: (1) Saturation To Slope Surface
(2) Sufficient Permeability To Establish Water Flow

Pw = Water Pressure Head=(z)(cos^2(a))
Ws = Saturated Soil Unit Weight
Ww = Unit Weight of Water (62.4 lb/cu.ft.)
u = Pore Water Pressure=(Ww)(z)(cos^2(a))
z = Layer Thickness
a = Angle of Slope
phi = Angle of Friction
c = Cohesion
Fd = (0.5)(z)(Ws)(sin(2a))
Fr = (z)(Ws-Ww)(cos^2(a))(tan(phi)) + c
Factor of Safety (FS) = Fr/Fd

2:1 Fill Slope

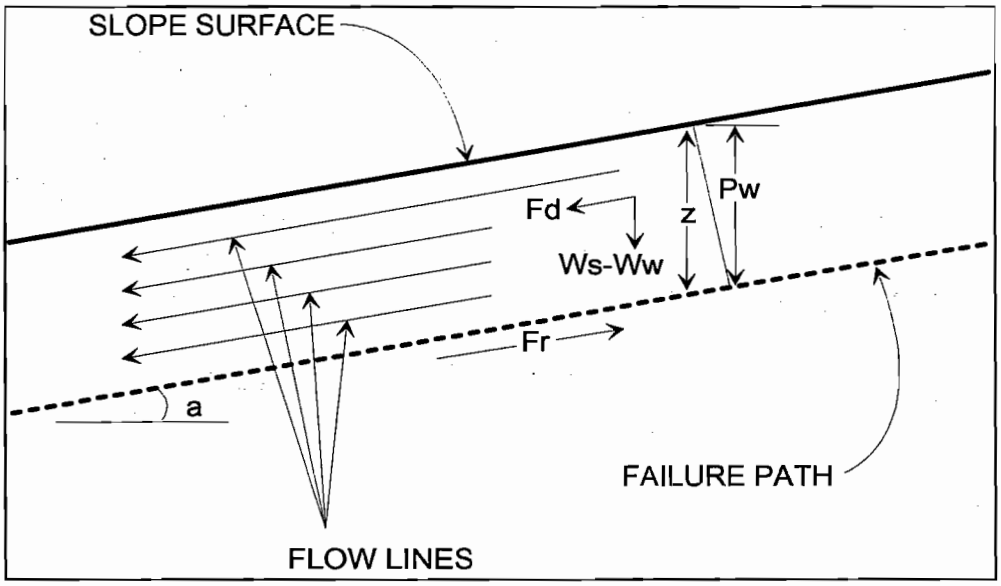
Given:

Ws (pcf)	z (ft)	a (degrees)	a (radians)	phi (degrees)	phi (radians)	c (psf)
130	4	26.6	0.464259	31	0.541053	350

Calculations:

Pw	u	Fd	Fr	**FS**
3.20	199.56	208.19	479.90	**2.31**

SURFICIAL STABILITY ANALYSIS



Assume: (1) Saturation To Slope Surface
(2) Sufficient Permeability To Establish Water Flow

Pw = Water Pressure Head=(z)(cos^2(a))
Ws = Saturated Soil Unit Weight
Ww = Unit Weight of Water (62.4 lb/cu.ft.)
u = Pore Water Pressure=(Ww)(z)(cos^2(a))
z = Layer Thickness
a = Angle of Slope
phi = Angle of Friction
c = Cohesion
Fd = (0.5)(z)(Ws)(sin(2a))
Fr = (z)(Ws-Ww)(cos^2(a))(tan(phi)) + c
Factor of Safety (FS) = Fr/Fd

1 1/2:1 Cut Slope

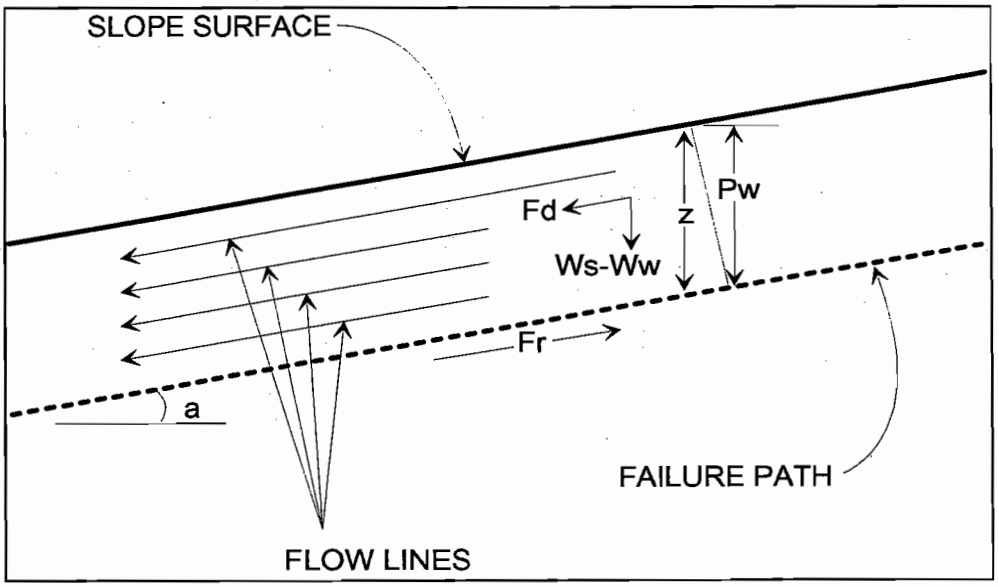
Given:

Ws (pcf)	z (ft)	a (degrees)	a (radians)	phi (degrees)	phi (radians)	c (psf)
130	4	33.6	0.586432	35	0.610867	350

Calculations:

Pw	u	Fd	Fr	**FS**
2.78	173.16	239.68	481.35	**2.01**

SURFICIAL STABILITY ANALYSIS



Assume: (1) Saturation To Slope Surface
(2) Sufficient Permeability To Establish Water Flow

Pw = Water Pressure Head=(z)(cos^2(a))
Ws = Saturated Soil Unit Weight
Ww = Unit Weight of Water (62.4 lb/cu.ft.)
u = Pore Water Pressure=(Ww)(z)(cos^2(a))
z = Layer Thickness
a = Angle of Slope
phi = Angle of Friction
c = Cohesion
Fd = (0.5)(z)(Ws)(sin(2a))
Fr = (z)(Ws-Ww)(cos^2(a))(tan(phi)) + c
Factor of Safety (FS) = Fr/Fd

2:1 Natural Slope

Given:

Ws (pcf)	z (ft)	a (degrees)	a (radians)	phi (degrees)	phi (radians)	c (psf)
120	4	26.5	0.462513	15	0.2618	250

Calculations:

Pw	u	Fd	Fr	**FS**
3.20	199.91	191.67	299.44	**1.56**

April 11, 2006
Work Order 102453-RT

APPENDIX II

SEISMIC GROUND MOTION ASSESSMENT

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SEISMIC GROUND MOTION ASSESSMENT

Introduction

The 1933 Long Beach, 1971 San Fernando, 1992 Landers, and 1994 Northridge earthquakes particularly illustrate both regional seismicity and the need to incorporate seismic considerations into project design. Current standards of practice and regulatory agencies dictate such (for example, the State of California Seismic Hazards Mapping Act (SHMA) of 1990 (Division 2, Chapter 7.8, Public Resources Code). Specifically, some areas of the study site are within a zone requiring a liquefaction study as mandated by the California Division of Mines and Geology (CDMG, 1998), as shown on the USGS Oat Mountain 7.5-minute quadrangle. This appendix therefore provides herein *probabilistic* estimates of free-field peak horizontal ground accelerations (PGA) that hypothetically could be generated by earthquakes along regional and local seismogenic faults, that are essential to assessment of hypothetical site effects such as liquefaction and dynamic settlement, and that may also be applicable to some structural design methods. The PGA estimates given in this appendix are based on guidelines set forth in the California Building Code (CBC;ICBO, 2001), CDMG (1997) and Martin and Lew (1999), and the California Geological Survey Note 48 (CGS, 2006).

Selection of the appropriate design seismic parameters depends upon the kinds of geotechnical or structural analyses (for example, static or dynamic), the kind and sensitivity (for example, schools, hospitals, essential services facilities vs. normal-risk) of proposed structures, and the level of "acceptable risk" deemed suitable for the project. Normal-risk structures usually include those where the CBC (ICBO, 2001) concern is primarily life and safety during an earthquake, rather than structural performance after a major earthquake Fire Stations, however, fall into to category where any but the most superficial failure is intolerable (Krinitzsky, 1995). Accordingly, the study site requires the estimation of two levels of ground motion: 1) the Design-Basis Earthquake (**DBE**) that is the PGA has a 10-percent chance of being exceeded in 50-years; and 2) the Upper-Bound Earthquake (**UBE**) that has a 10-percent chance of being exceeded in 100-years.

This firm reviewed published and unpublished literature about regional active faults, and about the potential for, and possible magnitudes of future seismic events along those faults. Also, articles

that empirically relate proximity of postulated earthquakes to possible on-site PGA were reviewed. In this Appendix, principal regional active faults and earthquakes are briefly described, and the methodology used to estimate PGA is then spelled out.

Active Faults

Several definitions of an active fault--in this case seismogenically active--have evolved over the years (Ziony and Yerkes, 1985). For this discussion, an active fault as defined by the California Council on Intergovernmental Relations in the General Plans Guidelines, 1974, is:

> "A fault that has moved in recent geologic time and which is likely to move again in the relatively near future. For geologic purposes, there are no precise limits to recent movement or probable future movement that define an "active fault". Definitions for planning purposes extend on the order of 10,000 years or more back and 100 years or more forward. The exact time limits for planning purposes are usually defined in relation to uses and structures."

Known seismogenically active faults closest to the site are: 1) frontal faults that have elevated the San Gabriel/Santa Monica Mountains and associated foothills relative to the Los Angeles basin (including the blind thrust fault responsible for the January 17, 1994 Northridge earthquake, 2) the San Gabriel fault, 3) the Garlock fault, 4) the Newport-Inglewood, 5) the San Andreas, and 5) faults of the western Transverse Ranges. Figures 1 through 4 (following text) portray major regional earthquakes and regional active faults, respectively. Certainly, earthquakes along other than the aforementioned faults could induce ground motion onsite. However, the listed active fault systems are noted because of their proximity, and hence their generally recognized potential for producing moderate to strong ground motion at the subject site.

Following is an abbreviated discussion of major fault systems of which many of the faults shown on Figure 1 are part.

San Gabriel/Santa Monica Mountains Frontal Fault Systems

This system of generally north-dipping reverse and thrust faults, possibly emanating as ramps from near-horizontal deep-seated decollements (Davis, et al. 1989; Hauksson, 1992, 1995; Shaw and Suppe, 1996; Shaw and Shearer, 1999), extends from the San Andreas fault zone (near Cajon Pass) on the east to offshore California westerly of the Channel Islands. Late Quaternary

displacement along this fault system is responsible for the growth of the San Gabriel/Santa Monica Mountains (Transverse ranges) in geologically recent (including Holocene) times (e.g., Dolan et al., 1995; Crook and others, 1987; Petersen, et al., 1996).

The frontal fault system is composed of numerous individual fault strands or salients generally about 16 to 33 kilometers long (Dolan, et al., 1995; Crook and others, 1987); some of which reach the surface and some of which do not ("blind thrusts"). The particular salients proximal to the subject site (see Figure 1) are the "Northridge blind thrust fault" (1.4-miles), the Santa Susana fault (3.5-miles), the Holser fault (3.5-miles), and San Fernando fault (7-miles).

North Los Angeles Thrust Belt

In the late 1980's, the North Los Angeles thrust belt was postulated and since substantiated by seismic and geologic evidence (Davis, et al., 1989; Hauksson, 1992; Bullard and Lettis, 1993; Shaw and Shearer, 1999). In essence, this compressive belt of active folding and thrusting in the north Los Angeles basin stems from convergence of the continental and oceanic crustal plates. The belt is marked by blind south-vergent thrust faults and associated anticlines expressed as the low hills that ring the north Los Angeles area. Investigators (Hauksson 1992; Celebi and others, 1988) report that the 1987 Whittier earthquake and its aftershocks occurred along this thrust belt. The aforementioned investigators associate this belt with a ramp, the Elysian Park Thrust, emanating from a deep-seated decollement. Although the thrust faults are considered "blind" and probably not capable of ground rupture, they are nonetheless seismogenic and are considered capable of producing moderate earthquakes. Because this belt is wide and somewhat "amorphous", it is therefore uncertain exactly where earthquake epicenters could occur along the belt (hence floating earthquakes). The fault is about 35-miles south of the site.

Newport-Inglewood Fault Zone

Segments of the predominantly right-lateral Newport-Inglewood fault zone lie about 25-miles south of the site where they either merge with or are cut by the aforementioned frontal fault or thrust belt systems. Strike-slip movement along southern segments of this fault zone produced the March 10, 1933 "Long Beach" earthquake (Magnitude 6.4). Additionally, numerous smaller earthquakes have been recorded along various segments of this fault zone.

San Andreas Fault Zone

The San Andreas fault zone can be traced continuously from Point Arena in northern California to the eastern side of the Salton Sea where it is concealed by alluvium. Earthquake epicenters from the Salton Sea south to the Gulf of California suggest that the fault zone continues into the gulf (Richter, 1958). Thus, the fault zone is over 1,000 kilometers long. This fault is, of course, considered capable of producing a great (say magnitude Mw7.5 or larger) earthquake in southern California.

The great 1857 Fort Tejon earthquake (magnitude 8±) ruptured the ground surface from the vicinity of Cholame to somewhere between Cajon Pass and San Gorgonio Pass (Working Group, 1995), a distance of about 335 kilometers. Offset stream channels in the Carrizo Plain indicate that horizontal offset may have been as much as 10 meters. Recent investigators (Weldon and Sieh, 1985) suggest that it may be possible that the 1857 segment and a southerly adjacent segment (to about Indio, California) could compose one event; such would encompass about 600 kilometers miles of break.

The subject site is approximately 22-miles southwest of the fault.

Western Transverse Ranges Faults

These faults are parts of a complex system of mainly thrust faults that have either elevated blocks within the western Transverse Ranges or that may be thrust ramps within the ranges (Huftile and Yeats, 1995). Many authors (for example, Davis, et al., 1989) suggest that many of these faults are associated with one or a few deep-seated decollements resultant from continental-oceanic plates convergence. In general, this complex system is considered active and thus capable of generating moderate to strong earthquakes. PSE names the following faults for this study on the basis of their proximity and ubiquitous (hence, representative) areal distribution. PSE emphasizes that these faults represent mainly structural zones and that other blind thrusts associated with those zones could also generate earthquakes. Among the proximal faults within the western Transverse Ranges are the Oak Ridge, Pine Mountain, San Cayetano, Santa Ynez, Simi and White Wolf faults. These and similar western Transverse Ranges faults are incorporated into calculations of PGA.

Garlock Fault Zone

This fault zone displays a topographic expression similar to that of the San Andreas and is presumed also to be a vertical shear zone. However, its movement is predominately left-lateral as indicated by offset stream channels and a deformed piedmont fan. Displaced older alluvium indicates that this fault has been active since the upper Pleistocene, as do small (4.0 to 4.9 magnitude) aligned earthquakes.

The subject site is approximately 35-miles south of the Garlock fault zone.

San Gabriel Fault Zone

This fault is about 3- to 4-miles east of the site Weber, 1979, 1982). The seismicity of the right-lateral San Gabriel fault zone is equivocal relative to its potential for causing damaging earthquakes. The zone apparently has no instrumentally measured record of seismic activity since instruments were installed in 1932 (Weber, 1979, 1982). The 6.0 magnitude Pico Canyon earthquake of 1893 may be related to movement along the San Gabriel fault zone, but more probably, because its epicenter would appear to be in the Santa Susana Mountains, the causative fault is probably the Santa Susana or an associated western Transverse Ranges fault.

Weber (1982) suggests that the fault zone is a structural zone wherein lesser strike slip movement accompanied by dip slip has persisted into the Holocene. Weber (1982) further states "it is believed that the fault zone now is active". Cotton and Seward (1984) and Cotton, et al., (1983) have identified the "master" trace of the San Gabriel fault zone (within the Honor Rancho segment that is characterized by 3 to 20 meters wide zones of faulted and disrupted sediments (Saugus Formation and Holocene alluvium less than 8000 years BP) in trenches placed near the mouth of San Francisquito Canyon, north of the Santa Clara River in the Valencia area. Further the State of California and Petersen, et al. (1996) consider the fault active and assign it a maximum magnitude of Mw7.

Regional Historical Earthquakes

The site, as is all of southern California, is within a seismically active region. For example, the epicenter of the February 9, 1971, Mw6.6 San Fernando earthquake was 8-miles northeast of site; and the January 17, 1994, Mw6.7 Northridge epicenter was about 10-miles south of the site.

The former earthquake occurred on the San Fernando fault, and the latter on a blind thrust, both associated with the San Gabriel/Santa Monica frontal fault systems.

The 1987 Mw5.9 Whittier earthquake was centered about 35-miles southeast of the site along elements of the North Los Angeles thrust belt. The 1991 Mw5.8 Sierra Madre earthquake occurred about 45-miles southeast, along an element of the San Gabriel frontal fault system (Hauksson and Jones, 1994). Figures 1 and 2 depict the site relative to post-1900 southern California earthquakes greater than Mw4.

Soil Profile Types

Among the variables in the attenuation formulae are the physical properties of the site earth materials. The areas requiring a liquefaction potential investigation are underlain by alluvium. Based on the subject investigation, alluvium deep soil profiles are typical of the study areas, and thus should be used to calculate PGA.

Probabilistic Peak Horizontal Ground Acceleration (PGA)

In recent years, particularly since 1998, the standard for seismic hazard (in this case PGA) assessment has increasingly become probabilistic-driven. That is, the State of California (for example, Petersen et al., 1996, 1999; CDMG, 1997; Martin and Lew, 1999; R. Sydnor, personal communication, 2000), and the California Building Code of 2001 (ICBO, 2001) have directed the industry toward or required probabilistic ground motion analyses. The rationale and basis for that direction is beyond the scope of this document; the reader is so referred to the listed investigators.

Probabilistic methods of seismic risk determination attempt to account for uncertainties or likelihood in recurrence intervals, sizes, and locations of hypothetical earthquakes; and are increasingly used for engineering analyses (Blake, 2000; Martin and Lew, 1999). Probabilistic analyses thus provide levels of hypothetical free-field ground acceleration for a finite exposure period. For example, a commonly accepted level of risk is the aforementioned **DBE**. That PGA estimate is sufficient for most geotechnical/or structural engineering analyses, but the State of California (California Division of Mines and Geology, 1993; California Building Code, 2001, and the California Geological Survey, 2006) requires that the more conservative **UBE** also be assessed for essential service structures.

One useful probabilistic methodology is FRISKSP computer software that was derived from public domain USGS software; as modified by Blake (2000). Details of the mechanics for FRISKSP can be obtained from Blake, and are not recited herein. The fault inventory used to calculate hypothetical free-field probabilistic ground motions by FRISKSP for the subject site is in essence the same as the California Geological Survey's 2002 fault model (CAO et al., 2003) adapted and modified by Blake (2004) for use in FRISKSP. FRISKSP selected forty-seven (47) such faults within a 100-km (62-mi.) radius (Table A, following text), including the near-field Northridge blind thrust, Santa Susana, Holser, and San Gabriel faults. For comparison, three attenuation relationships, Boore, et al. (1997), Campbell (1997, revised in 1999), and Sadigh et al. (1997), using alluvium soil type profiles, were used to compute probabilistic horizontal free-field peak ground accelerations (Figures 5 through 7).

Following the 1994 Northridge earthquake that occurred along a "blind thrust" fault, several investigators (for example, Abrahamson and Somerville, 1996; Somerville, et al., 1996) reported that peak horizontal accelerations generated by thrust faults are 20- to 30-percent higher than for strike-slip faults; and that in the case of dipping faults, the position of a particular site on either the hanging wall or footwall of a causative reverse fault played a greater role in increased ground acceleration than directivity. That is, in 1994, accelerations in alluvium were up to 50 percent greater on the hanging wall than what would have been predicted by using the many mean peak horizontal ground acceleration attenuation curves (Abrahamson and Somerville, 1996). To account for such, the attenuation relationships used for this assessment incorporate the differences in amplitude among reverse, thrust and strike-slip faults. In addition, the derived hypothetical accelerations represent the one standard deviation, which captures over a 50 percent increase in derived peak ground acceleration.

Table B presents the calculated horizontal ground accelerations representing the 10 percent change of exceedence in 50 and 100-years (DBE and UBE).

TABLE B

Investigators	475-Yr. Return	949-Yr. Return
Boore, et al., 1997	1.01g	1.22g
Campbell, 1997, Revised 1999	0.94g	1.09g
Sadigh, et. al., 1997	0.86g	1.03g
Average	0.94g	1.11g

Figure 8 presents the results of deaggregation of the sources of PGA per Blake (2000). A predominant earthquake magnitude of Mw6.6 is considered reasonable.

Closure

The PGA results are based upon many unavoidable geological and statistical uncertainties, but yet are consistent with current standard-of-practice (Petersen, et al., 1996; Martin and Lew, 1999). As engineering seismology evolves, as more fault-specific geological data are gathered, and as legislative action continues, increased certainty and different methodologies may also evolve. Further, predictions of times of occurrence, locations and magnitudes of as well as ground response to, future earthquakes are tenuous and subjective. Only probabilities and/or possibilities can be assessed on the basis of the existing geologic data, limited historical and seismic records; and empirical relationships among fault lengths, distances between the faults and the study site, and ground acceleration. However, enough seismic events of magnitude 6.0 or greater have occurred regionally (Figures 1 and 2) to indicate that such events could recur within the life of the subject development.

APPENDIX II

EARTHQUAKE EPICENTER MAP

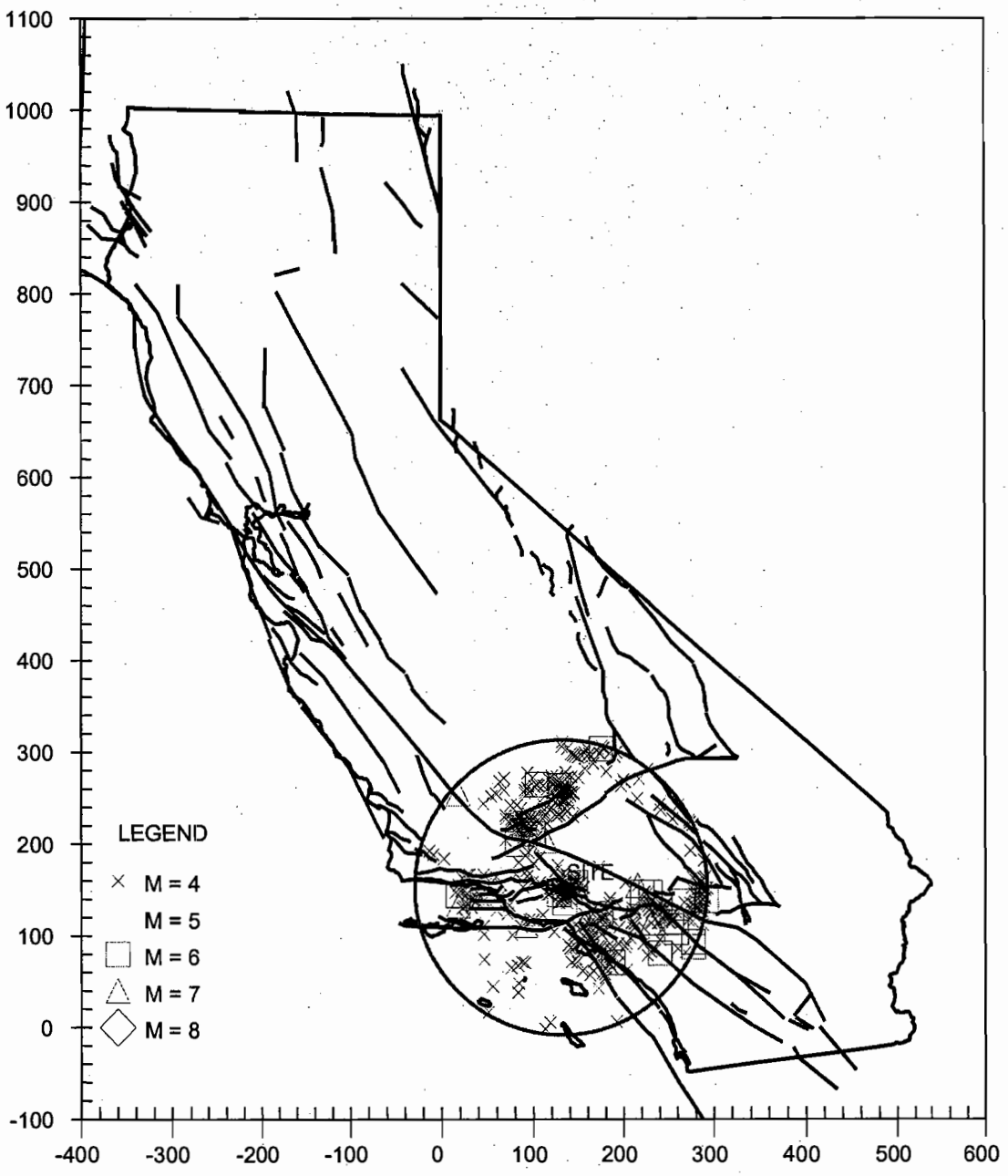

Figure 1

APPENDIX II

EARTHQUAKE EPICENTER MAP

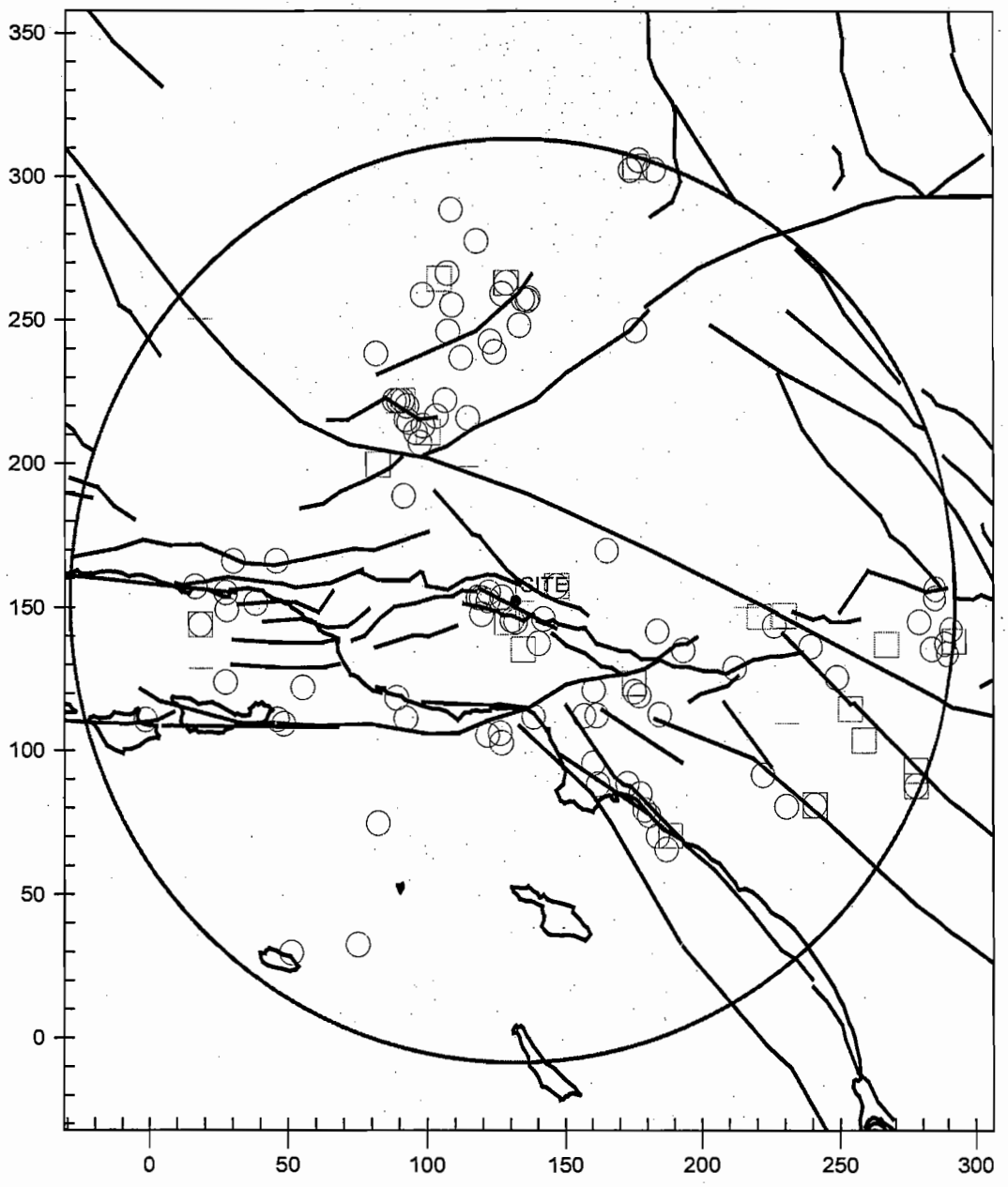

Figure 2

APPENDIX II

CALIFORNIA FAULT MAP

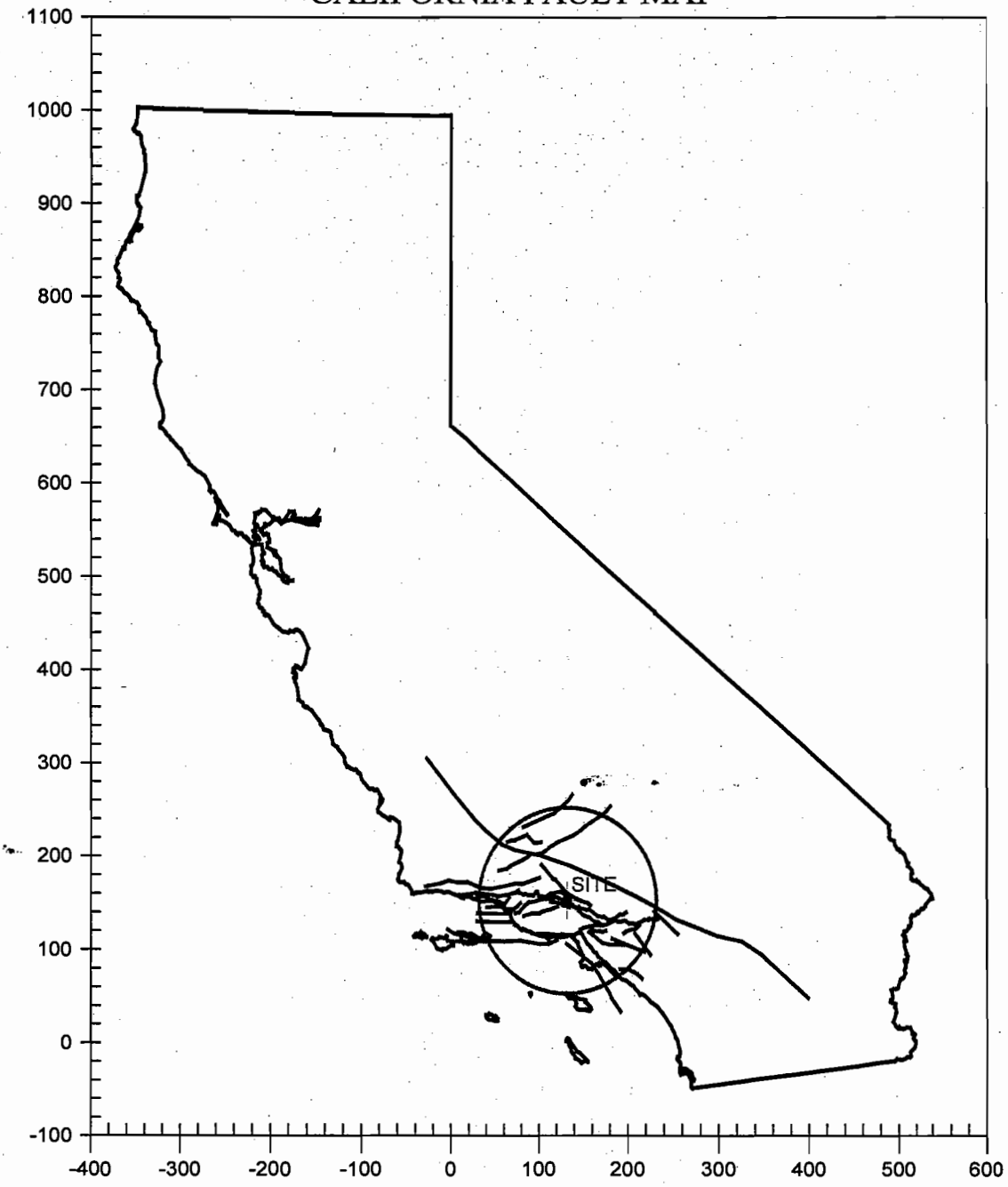

Figure 3

APPENDIX II

CALIFORNIA FAULT MAP

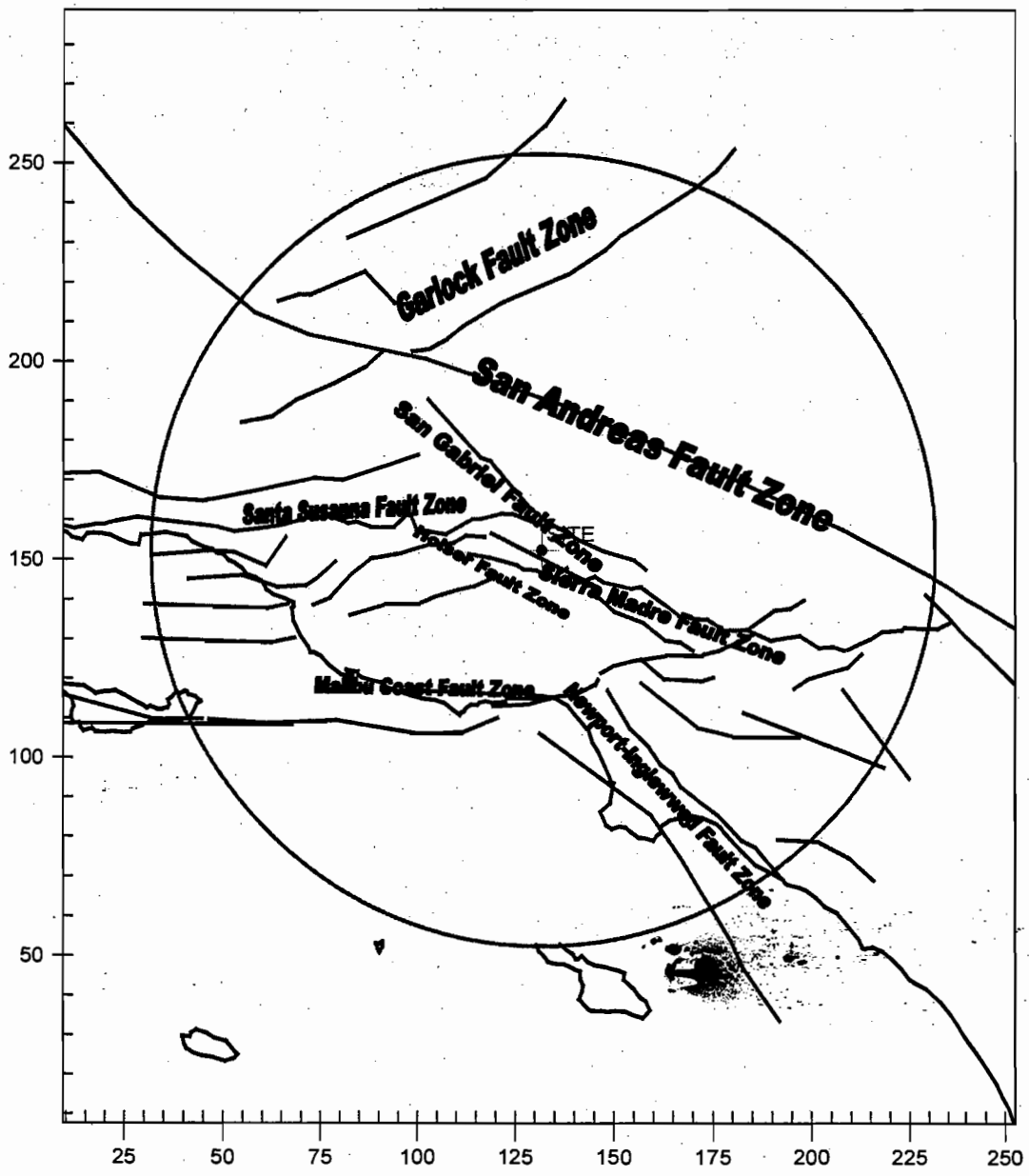

Figure 4

APPENDIX II

PROBABILITY OF EXCEEDANCE

BOORE ET AL(1997) (250)

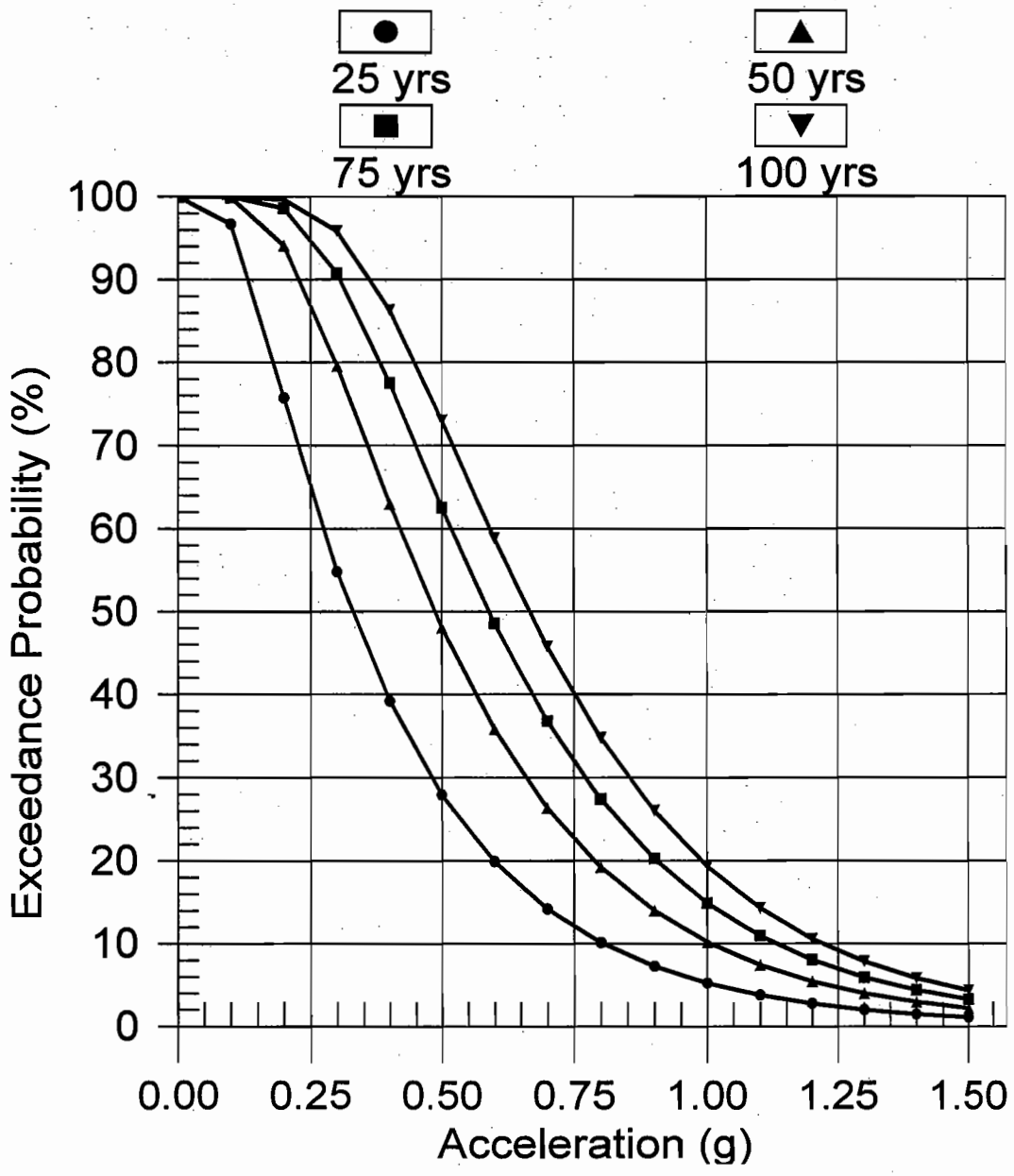

Figure 5

APPENDIX II

PROBABILITY OF EXCEEDANCE

CAMPELL (1997 Rev.) AL

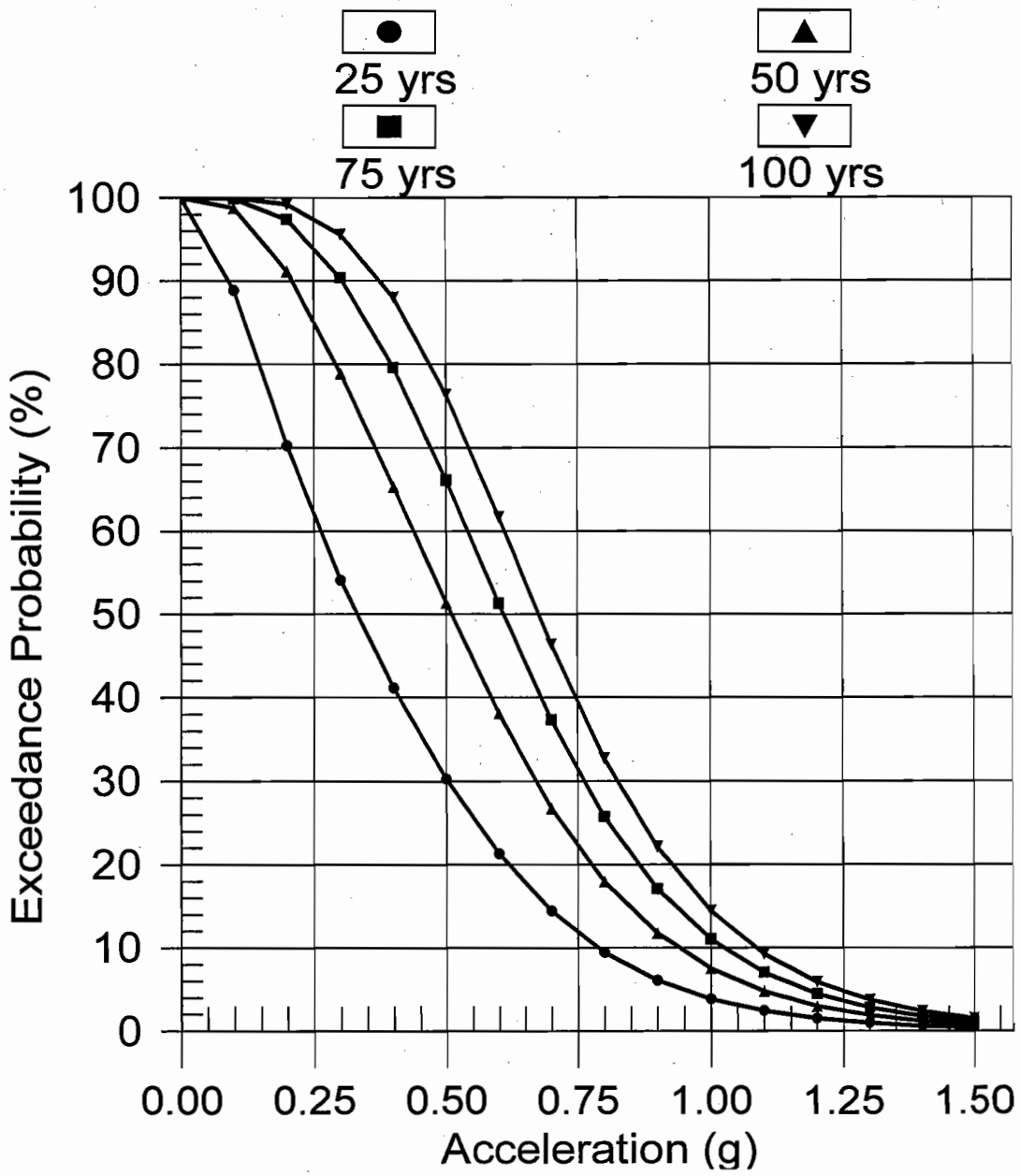

Figure 6

APPENDIX II

PROBABILITY OF EXCEEDANCE

SADIGH ET AL. (1997) DEEP SOIL

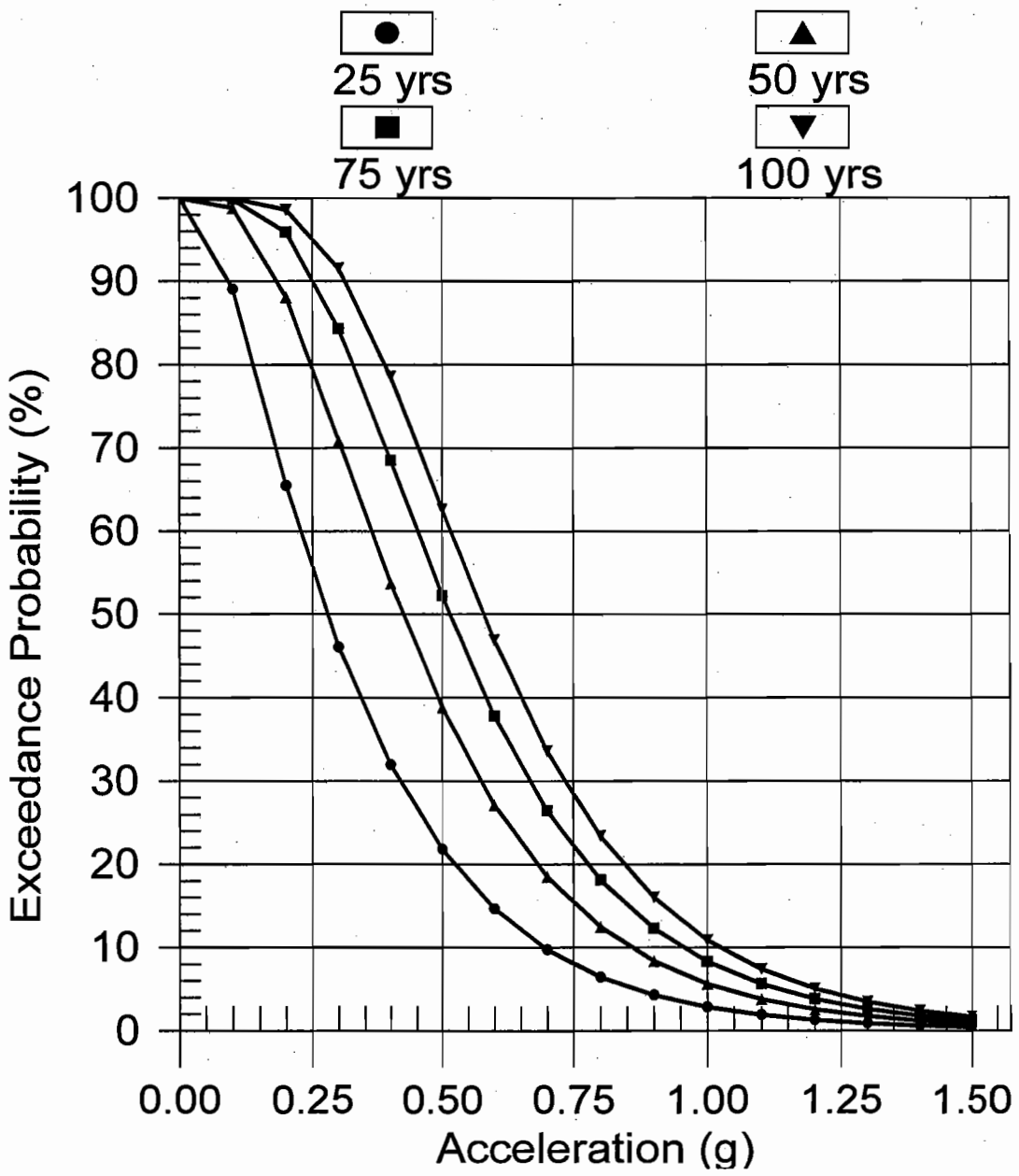

Figure 7

APPENDIX II

HAZARD CONTRIBUTIONS

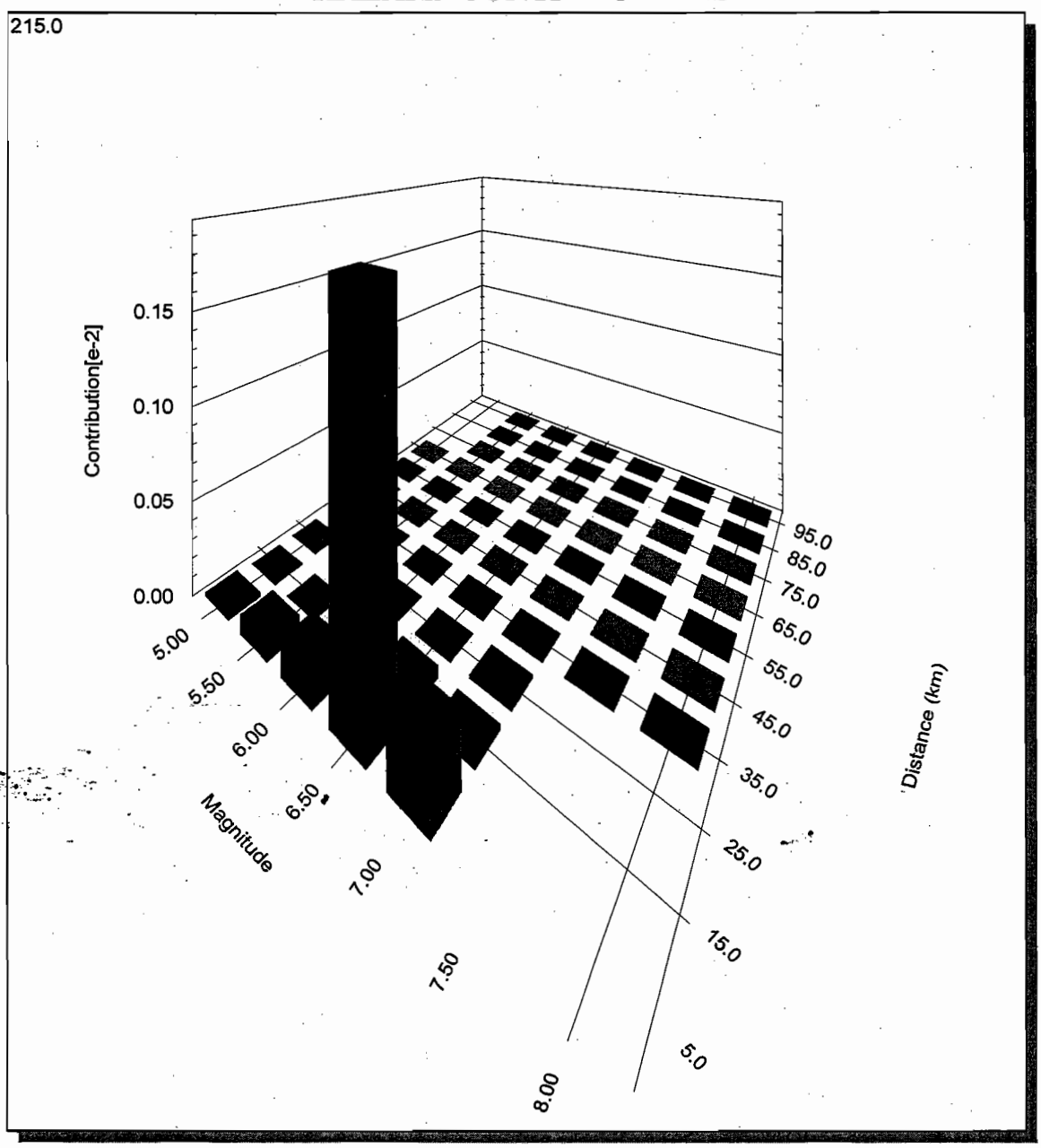

Figure 8

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CLOSEST DISTANCES BETWEEN SITE AND FAULT RUPTURES

TABLE A

NO.	FAULT NAME	CD_1DRP	CD_2DRP	CDIST	CLODIS	CD_EPI	CD_HYPO
1	NORTHRIDGE (E. Oak Ridge)	2.3	2.3	5.5	5.5	3.1	6.5 km
2	HOLSER	5.5	0.7	5.0	5.0	1.8	5.4 km
3	SANTA SUSANA	5.6	0.0	4.6	4.6	0.0	4.6 km
4	SAN GABRIEL	6.6	6.6	6.6	6.6	6.6	6.7 km
5	SIERRA MADRE (San Fernando)	10.7	7.8	9.4	9.4	8.9	10.3 km
6	OAK RIDGE (Onshore)	15.0	14.8	15.0	15.0	15.9	16.1 km
7	VERDUGO	17.8	17.6	17.7	17.7	18.7	18.8 km
8	SAN CAYETANO	19.7	19.7	19.7	19.7	20.8	20.8 km
9	SIMI-SANTA ROSA	23.3	23.2	23.3	23.3	24.3	24.4 km
10	SIERRA MADRE	26.7	24.5	25.6	25.6	25.6	26.7 km
11	HOLLYWOOD	34.8	30.0	32.7	32.7	30.3	32.7 km
12	SANTA MONICA	35.0	31.6	33.8	33.8	32.0	33.9 km
13	SAN ANDREAS - Mojave	35.7	35.7	35.7	35.7	35.7	35.7 km
14	SAN ANDREAS - 1857 Rupture	35.7	35.7	35.7	35.7	35.7	35.8 km
15	MALIBU COAST	37.0	33.6	35.7	35.7	33.9	35.7 km
16	SAN ANDREAS - Carrizo	37.2	37.2	37.2	37.2	37.5	37.5 km
17	SANTA YNEZ (East)	39.7	37.8	39.2	39.2	38.6	39.9 km
18	NEWPORT-INGLEWOOD (L.A.Basin)	41.2	41.2	41.2	41.2	42.3	42.3 km
19	RAYMOND	41.7	39.2	40.9	40.9	40.2	41.7 km
20	PALOS VERDES	44.2	44.2	44.2	44.2	44.9	44.9 km
21	ANACAPA-DUME	44.4	31.1	36.7	36.7	32.4	37.5 km
22	ELYSIAN PARK THRUST	49.8	47.3	49.5	49.5	48.5	50.6 km
23	VENTURA - PITAS POINT	53.1	53.1	53.1	53.1	54.1	54.1 km
24	COMPTON THRUST	55.9	47.8	48.9	48.9	49.3	50.2 km
25	CLAMSHELL-SAWPIT	56.0	45.9	47.6	47.6	47.2	48.7 km
26	M.RIDGE-ARROYO PARIDA-SANTA ANA	56.4	56.4	56.4	56.4	57.6	57.6 km
27	GARLOCK (West)	59.3	59.3	59.3	59.3	59.3	59.4 km
28	BIG PINE	64.6	64.6	64.6	64.6	64.6	64.7 km
29	WHITTIER	65.7	65.7	65.7	65.7	66.8	66.8 km
30	RED MOUNTAIN	65.9	65.9	65.9	65.9	66.9	66.9 km
31	MONTALVO-OAK RIDGE TREND	66.7	66.7	66.9	66.9	67.8	68.0 km
32	OAK RIDGE(Blind Thrust Offshore)	67.4	67.4	67.6	67.6	68.6	68.8 km
33	PLEITO THRUST	70.1	60.2	60.5	60.5	61.5	61.7 km
34	SAN JOSE	72.7	69.8	70.9	70.9	70.5	71.5 km
35	CHANNEL IS. THRUST (Eastern)	78.0	65.2	66.9	66.9	66.5	68.0 km
36	CUCAMONGA	81.3	72.9	74.0	74.0	74.2	75.2 km
37	CHINO-CENTRAL AVE. (Elsinore)	83.9	80.7	82.2	82.2	81.9	83.1 km
38	WHITE WOLF	92.2	81.7	83.7	83.7	82.2	84.0 km
39	SAN ANDREAS - Southern	95.5	95.5	95.5	95.5	96.4	96.4 km
40	SAN ANDREAS - San Bernardino	95.5	95.5	95.5	95.5	96.4	96.4 km
41	SANTA CRUZ ISLAND	97.0	97.0	97.0	97.0	98.0	98.0 km
42	SAN JACINTO-SAN BERNARDINO	97.9	97.9	97.9	97.9	98.7	98.7 km
43	SANTA YNEZ (West)	98.9	98.9	98.9	98.9	99.9	100.0 km

EXPLANATION

CD_1DRP = Closest distance to projection of rupture area along fault trace.
CD_2DRP = Closest distance to surface projection of the rupture area.
CDIST = Closest distance to seismogenic rupture.
CLODIS = Closest distance to subsurface rupture.
CD_EPI = Closest epicentral distance.
CD_HYPO = Closest hypocentral distance.

APPENDIX III

LIQUEFACTION AND DYNAMIC

SETTLEMENT CALCULATIONS

Work Order 102453-RT
Boring RW-3
amax 0.94
magnitude 6.6 Magnitud

groundwater depth (ft.) 20
borehole diameter (in.) 6
hammer energy ratio 0.85

overburden

depth		soil unit wt.	measured blows/ft.	total σ_{vo}		effec	Volumetric Strain	Dynamic Settlement
ft	m	pcf	N_m	psf	tsf	psf	(%)	(in.)
5	1.524	125	19	625	0.3125	625	-	-
10	3.048	125	20	1250	0.625	1250	-	-
15	4.572	125	14	1875	0.9375	1875	-	-
20	6.096	125	30	2500	1.25	2500	0.89	0.534
25	7.62	125	17	3125	1.5625	2813	1.36	0.816
30	9.144	125	50	3750	1.875	3126	-	-
35	10.67	125	48	4375	2.1875	3439	-	-
40	12.19	125	30	5000	2.5	3752	-	-
45	13.72	125	19	5625	2.8125	4065	-	-
50	15.24	125	50	6250	3.125	4378	-	-
55	16.76	125	31	6875	3.4375	4691	Low susceptibility to liquefaction - see Boring Log description	

Total	1.35	inches

April 11, 2006
Work Order 102453-RT

APPENDIX IV

EARTHWORK SPECIFICATIONS AND

TYPICAL GRADING/CONSTRUCTION DETAILS

PACIFIC SOILS ENGINEERING, INC.

EARTHWORK SPECIFICATIONS

These specifications present 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 prevailing grading codes or ordinances of the controlling agency.

I. GENERAL

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

B. The project Soils Engineer and Engineering Geologist or their representatives shall provide testing services and geotechnical consultation during the duration of the project.

C. All clearing, grubbing, stripping and site preparation for the project shall be accomplished by the Contractor to the satisfaction of the Soils Engineer.

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

E. 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 proper compaction of fills.

II. SITE PREPARATION

A. Excessive vegetation and all deleterious material shall be disposed of offsite as required by the Soils Engineer. Existing fill, soil, alluvium or rock materials determined by the Soils Engineer as being unsuitable for placement in compacted fills shall be removed and wasted 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 removals as described above have been accomplished, excavation of earth materials deemed unsuitable in their natural, in-place condition, shall be removed as recommended by the Soils Engineer/Engineering Geologist.

B. After the removals as delineated in Item II, A above, the exposed surfaces shall be disced or bladed by the Contractor to the satisfaction of the Soils Engineer. The prepared ground surfaces shall then be brought to the specified moisture condition, mixed as required, and compacted and tested as specified. In areas where it is necessary to obtain the approval of the controlling agency, prior to placing fill, it will be the Contractor's responsibility to notify the proper authorities.

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

III. COMPACTED FILLS

A. Any material imported or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable by the Soils Engineer. Deleterious material not disposed of during clearing or demolition shall be removed from the fill as directed by the Soils Engineer.

B. Rock or rock fragments less than eight 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 Soils Engineer.

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

D. All fills, including onsite and import materials to be used for fill, shall be tested in the laboratory by the Soils Engineer. Proposed import materials shall be approved prior to importation.

E. The fill materials shall be placed by the Contractor in layers that when compacted shall not exceed six inches. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to obtain a near uniform moisture condition and a uniform blend of materials.

All compaction shall be achieved at optimum moisture content or above, as determined by the applicable laboratory standard. No upper limit on the moisture content is necessary; however, the Contractor must achieve the necessary compaction and will be alerted when the material is too wet and compaction cannot be attained.

F. Where the moisture content of the fill material is below the limit specified by the Soils Engineer, water shall be added and the materials shall be blended until a uniform moisture content, within specified limits, is achieved. Where the moisture content of the fill material is above the limits specified by the Soils Engineer, the fill materials shall be aerated by discing, blading or other satisfactory methods until the moisture content is within the limits specified.

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

In the absence of specific recommendations by the Soils Engineer to the contrary, the compaction standard shall be ASTM:D 1557-91.

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

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

J. 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 Soils Engineer and Engineering Geologist.

K. The Contractor shall be required to maintain the specified minimum relative compaction out to the finish slope face of the fill slopes, buttresses, and stabilization fills as directed by the Soils 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, or by direct compaction of the slope face with suitable equipment, or by any other procedure which produces the designated result.

L. Fill-over-cut slopes shall be properly keyed through topsoil, colluvium or creep material into rock or firm material; and the transition shall be stripped of all soil or unsuitable materials prior to placing fill.

The cut portion should be made and evaluated by the Engineering Geologist prior to placement of fill above.

M. Pad areas in natural ground and cut shall be approved by the Soils Engineer. Finished surfaces of these pads may require scarification and recompaction.

IV. CUT SLOPES

A. The Engineering Geologist shall inspect all cut slopes and shall be notified by the Contractor when cut slopes are started.

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

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

D. Unless other specified in the soils or geological reports, no cut slope shall be excavated higher or steeper than that allowed by the ordinances of the controlling governmental agencies.

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

V. GRADING CONTROL

A. Fill placement shall be observed by the Soils Engineer and/or his representative during the progress of grading.

Field density tests shall be made by the Soils Engineer or his representative to evaluate the compaction and moisture compliance of each layer of fill. Density tests shall be performed at intervals not to exceed two feet of fill height. Where sheepsfoot rollers are used, the soil 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 Soils Engineer or his representative.

B. Where tests indicate that the density of any layer of fill, or portion thereof, is below the required relative compaction, or improper moisture is in evidence, the particular layer or portion shall be reworked until the required density and/or moisture content has been attained. No addi-

tional fill shall be placed over an area until the last placed lift of fill has been tested and found to meet the density and moisture requirements and that lift approved by the Soils Engineer.

C. Where the work is interrupted by heavy rains, fill operations shall not be resumed until field observations and tests by the Soils Engineer indicate the moisture content and density of the fill are within the limits previously specified.

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

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

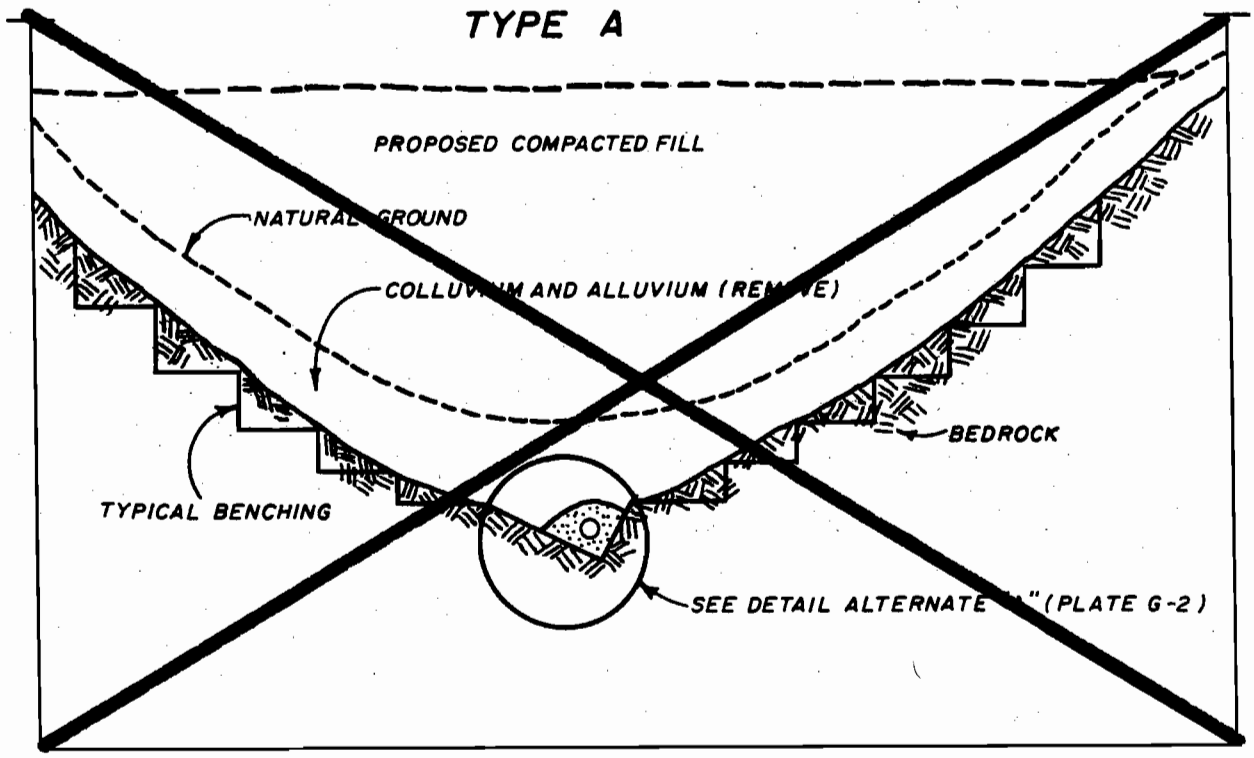
F. After completion of grading and after the Soils Engineer and Engineering Geologist have finished their observations of the work, final reports shall be submitted. No further excavation or filling shall be undertaken without prior notification of the Soils Engineer and/or Engineering Geologist.

VI. SLOPE PROTECTION

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

CANYON SUBDRAIN DETAIL

TYPE A



TYPE B

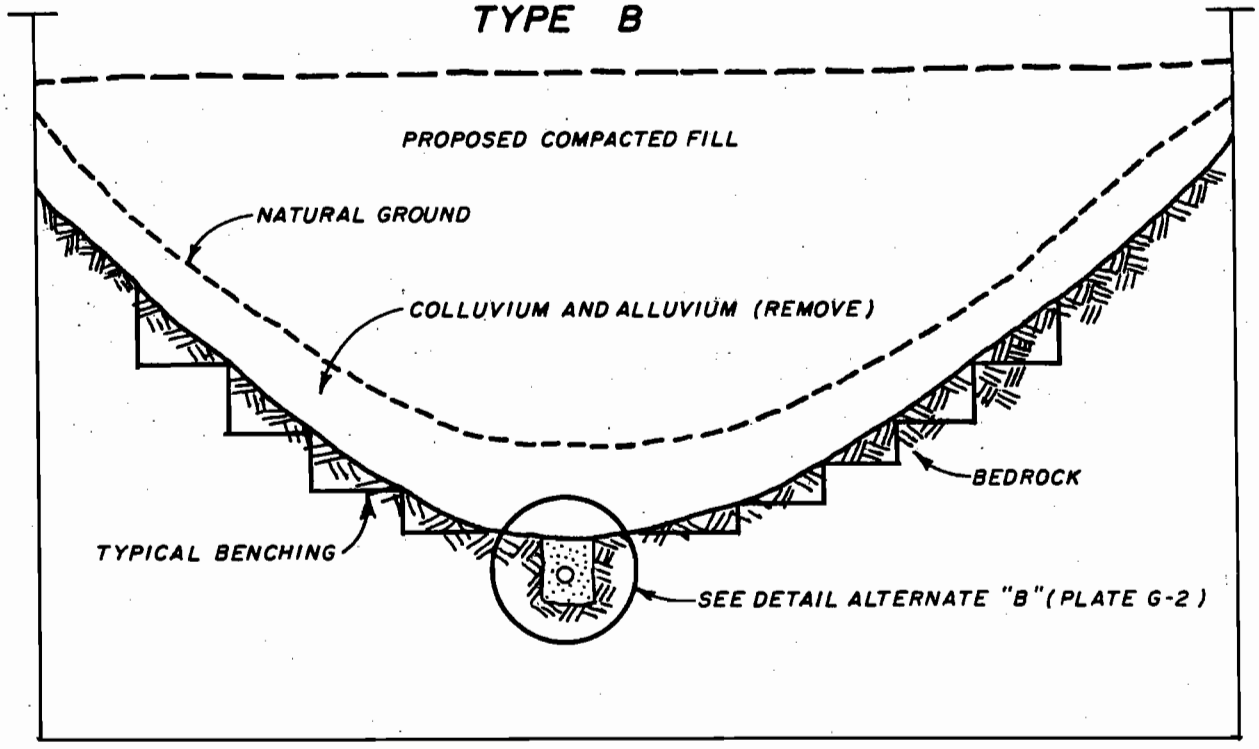
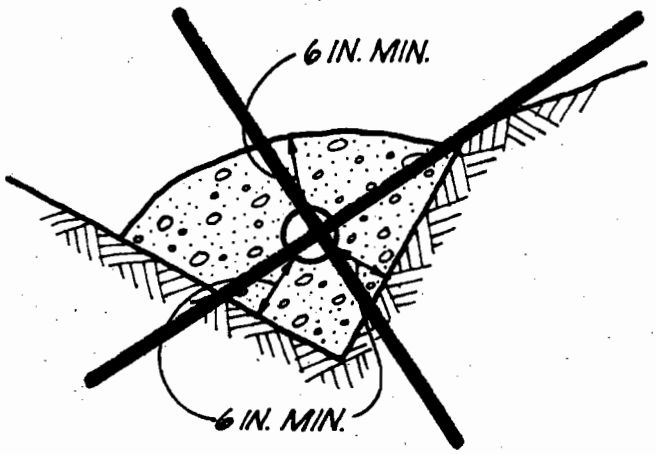
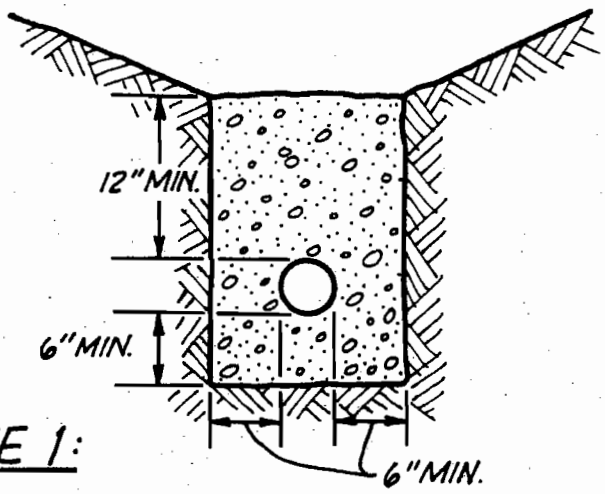


PLATE G-1

PACIFIC SOILS ENGINEERING, INC.

W.O. 102453-RT DATE 4/11/06





ALTERNATIVE 1:

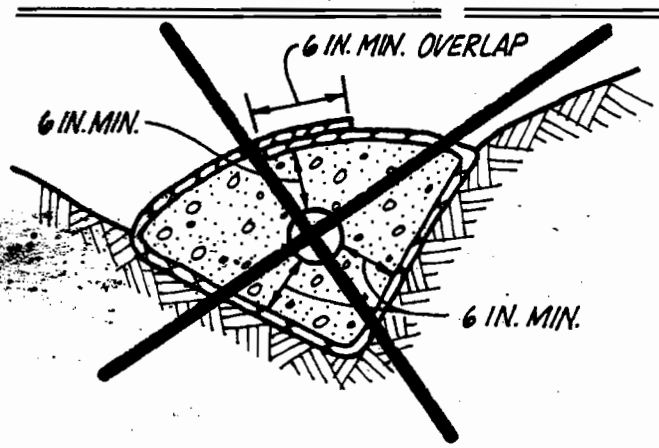
PIPE AND FILTER MATERIAL

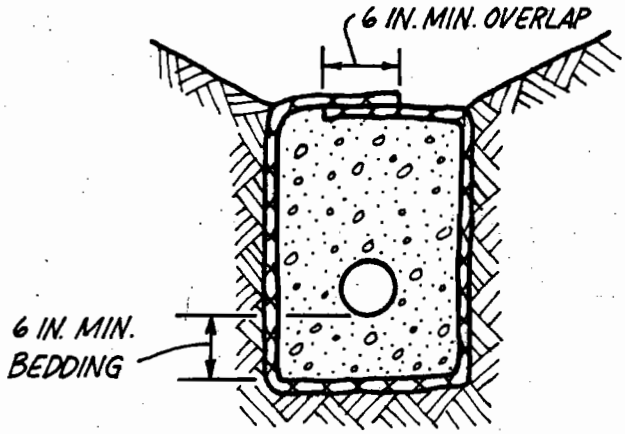
FILTER MATERIAL: MIN. VOLUME OF 9 FT.^{3}/LIN. FT. OF EQUAL MIXTURE OF NO. 2 AND NO. 3 ROCK. PIPE: 6 IN. ABS OR PVC PIPE OR APPROVED SUBSTITUTE WITH A MIN. OF 8 1/4 IN. PERFORATIONS PER LINEAL FT. IN BOTTOM HALF OF PIPE.

ASTM D2751, SDR 35 OR
ASTM D1527, SCHD. 40

ASTM D3034, SDR 35 OR
ASTM D1785, SCHD. 40

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





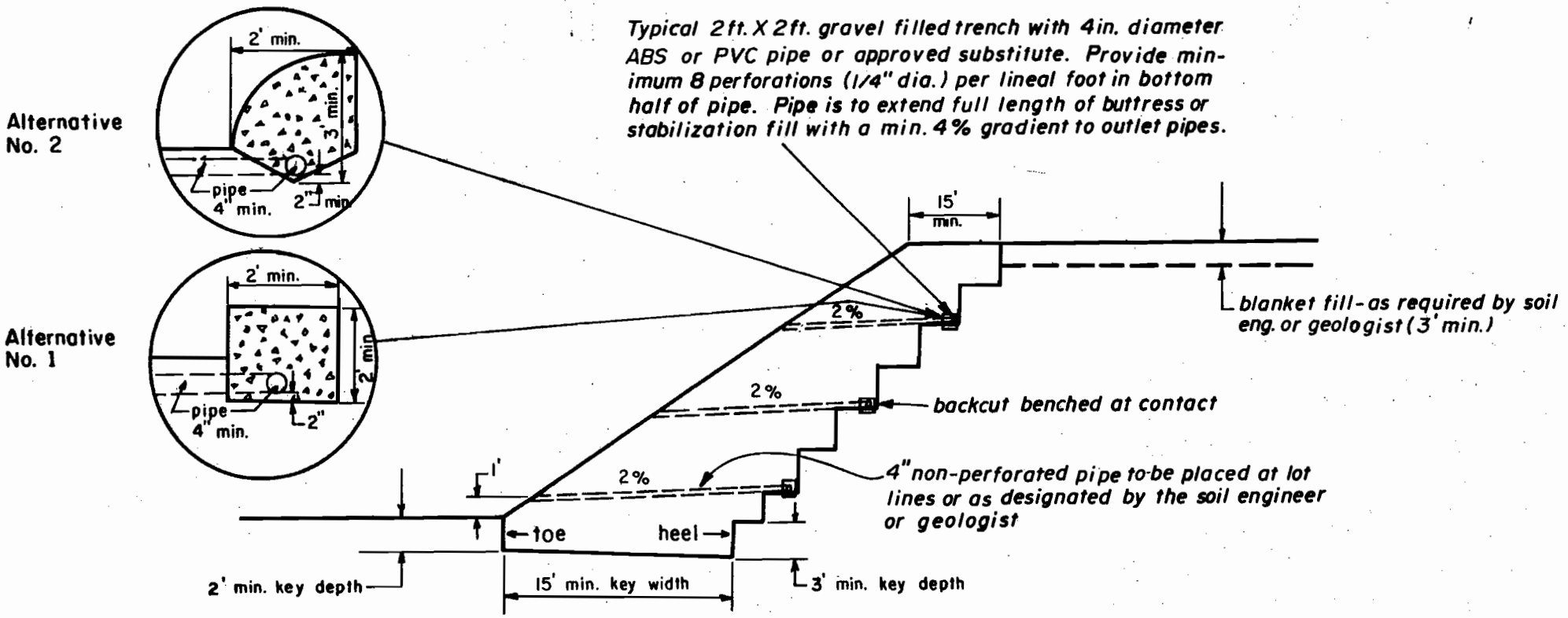
ALTERNATIVE 2:

PERFORATED PIPE SURROUNDED WITH ROCK & FILTER FABRIC

FILTER MATERIAL: MIN. VOLUME OF 9 FT^3/LIN. FT. OF 3/4 IN. MAX. ROCK
PIPE: 6 IN. DIA. ABS OR PVC PIPE OR APPROVED SUBSTITUTE WITH A MIN. OF 8 1/4 IN. DIA. PERFORATIONS PER LINEAL FT. IN BOTTOM HALF OF PIPE
FILTER FABRIC: MIRAFI 140 FILTER FABRIC OR APPROVED EQUIVALENT

Plate G-2

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WAY CYPRESS, CALIFORNIA (714) 220-0770
W.O. 102453-RT DATE 4/11/06



NOTES:

1. ABS - ASTM D 2751, SDR 35 or ASTM D1527 Sched. 40
   PVC - ASTM D 3034, SDR 35 or ASTM D1785 Sched. 40
2. Outlets to be provided every 100 ft. and joined to perf. backdrain pipe by L or T's. Min. 2% gradient.
3. Gravel trench to be filled with approximately equal mixture of no. 2 and no. 3 rock.
4. The necessity for upper stages of backdrains shall be determined in the field by the soil engineer or geologist. Upper stage outlets should be emptied onto paved terrace drains

STABILIZATION / BUTTRESS FILL DETAIL

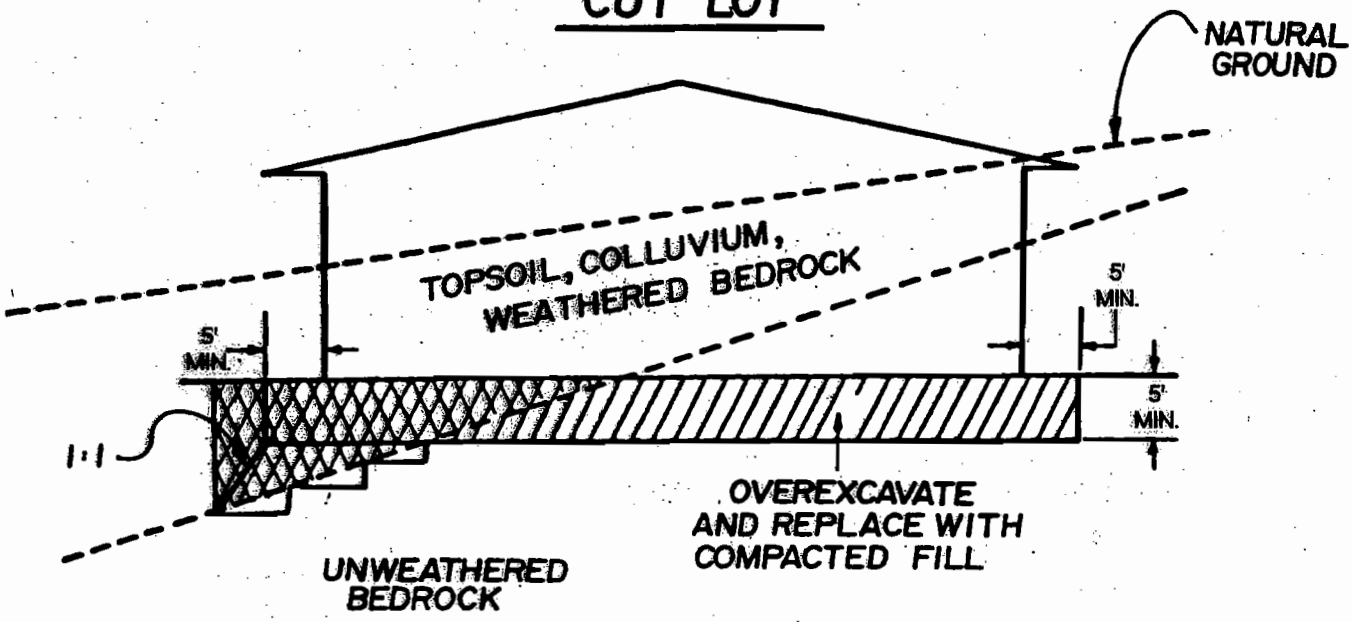
PLATE G-3

PACIFIC SOILS ENGINEERING, INC.

W.O. 102453-RT DATE 4/11/06

TYPICAL TRANSITION LOT DETAIL

CUT LOT



CUT-FILL LOT (TRANSITION)

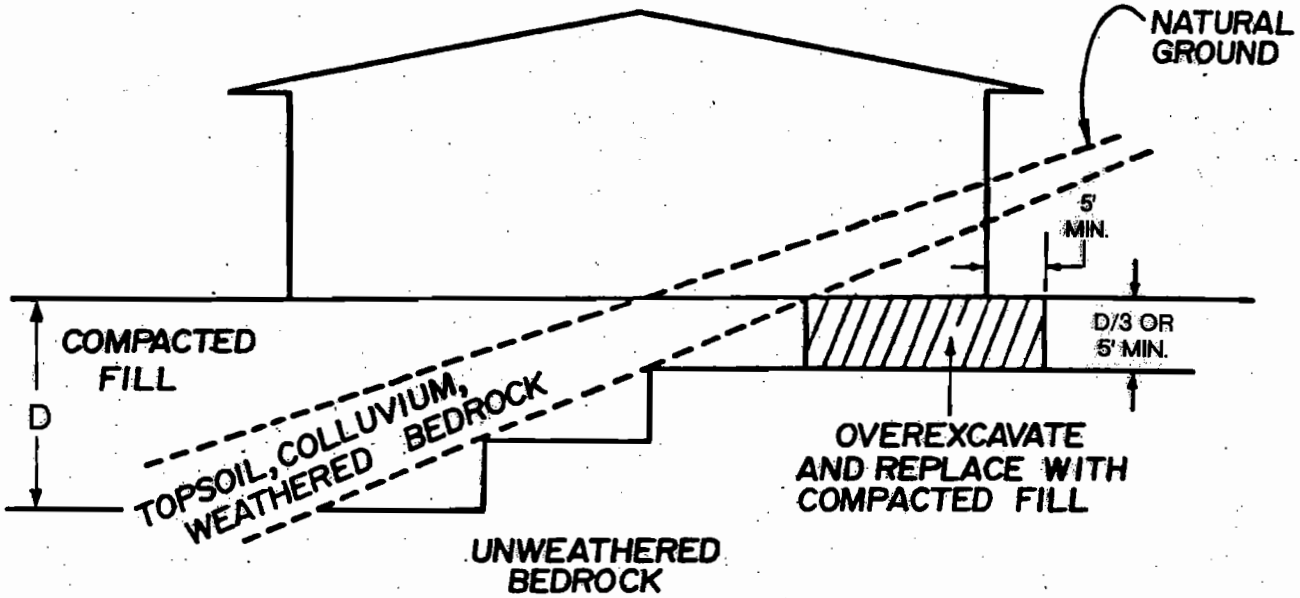


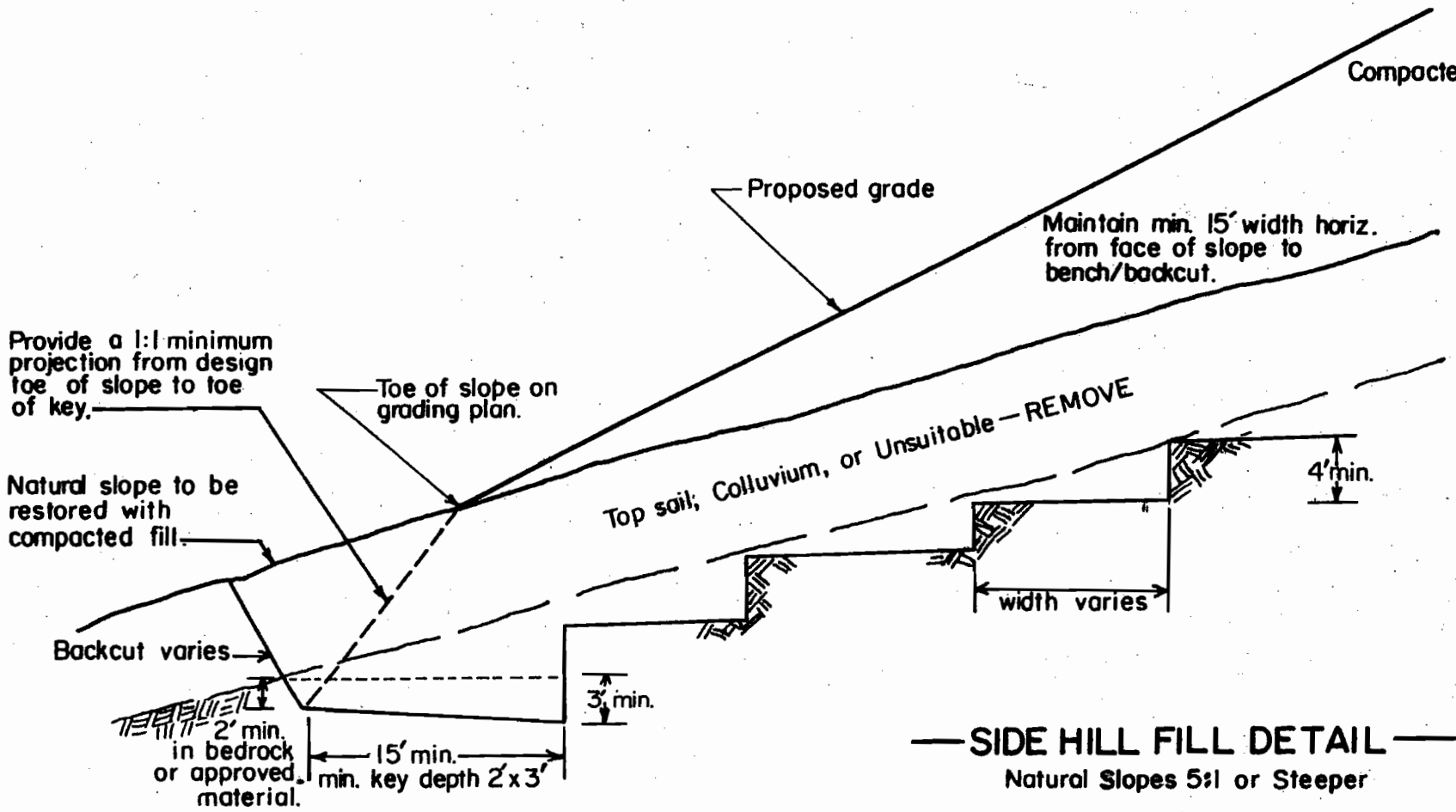
PLATE G-4

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WAY CYPRESS, CALIFORNIA (714)220-0770

W.O. 102453-RT DATE 4/11/06

NOTE: 1) Where natural slope gradient is 5:1 or less, see Plate G-6. Where the natural slope approaches or exceeds the design slope ratio, special recommendations will be provided by the soil engineer.

2) The need for and disposition of drains will be determined by the soil engineer based upon exposed conditions.



SIDE HILL FILL DETAIL

Natural Slopes 5:1 or Steeper

PLATE G-5

PACIFIC SOILS ENGINEERING, INC.

W.O. 102453-RT DATE 4/11/06

Detail for Fill Slope Toeing Out on Flat Alluviated Canyon

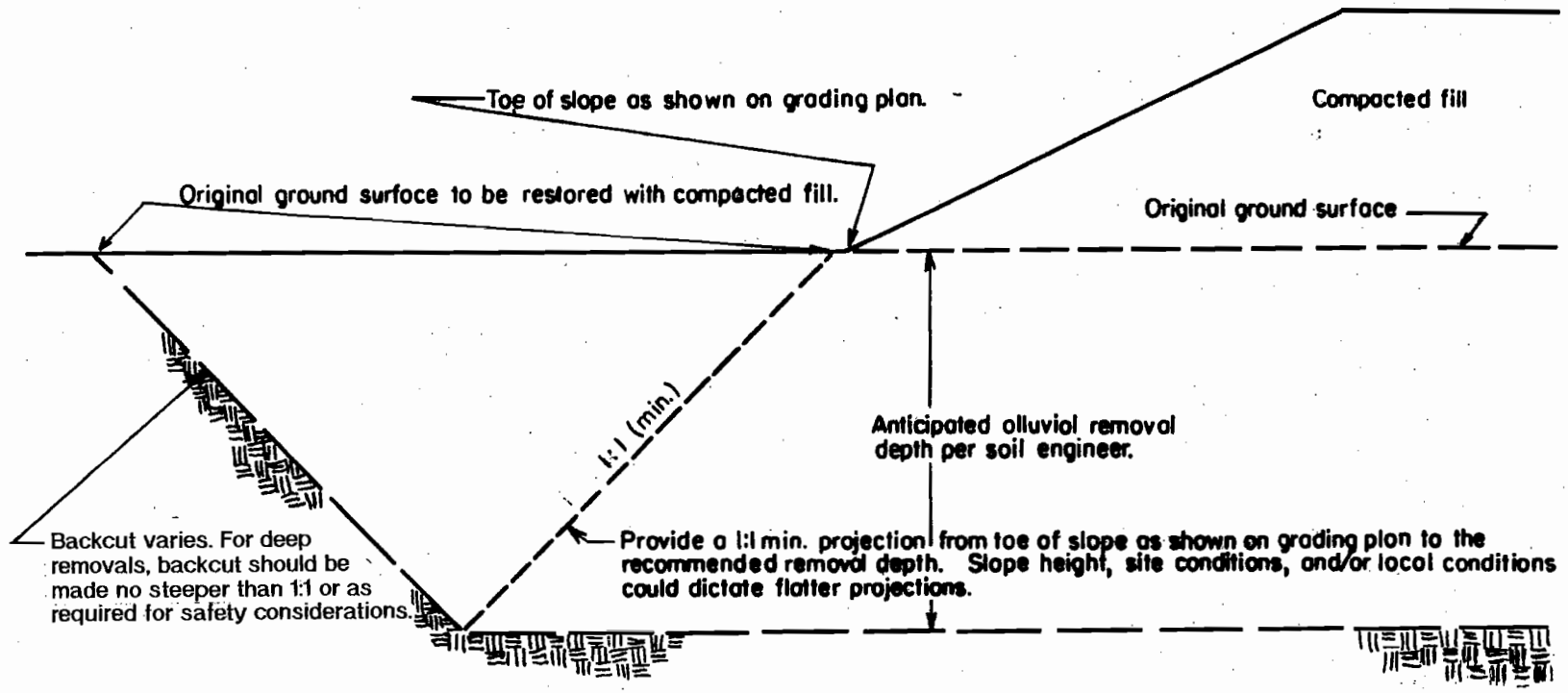
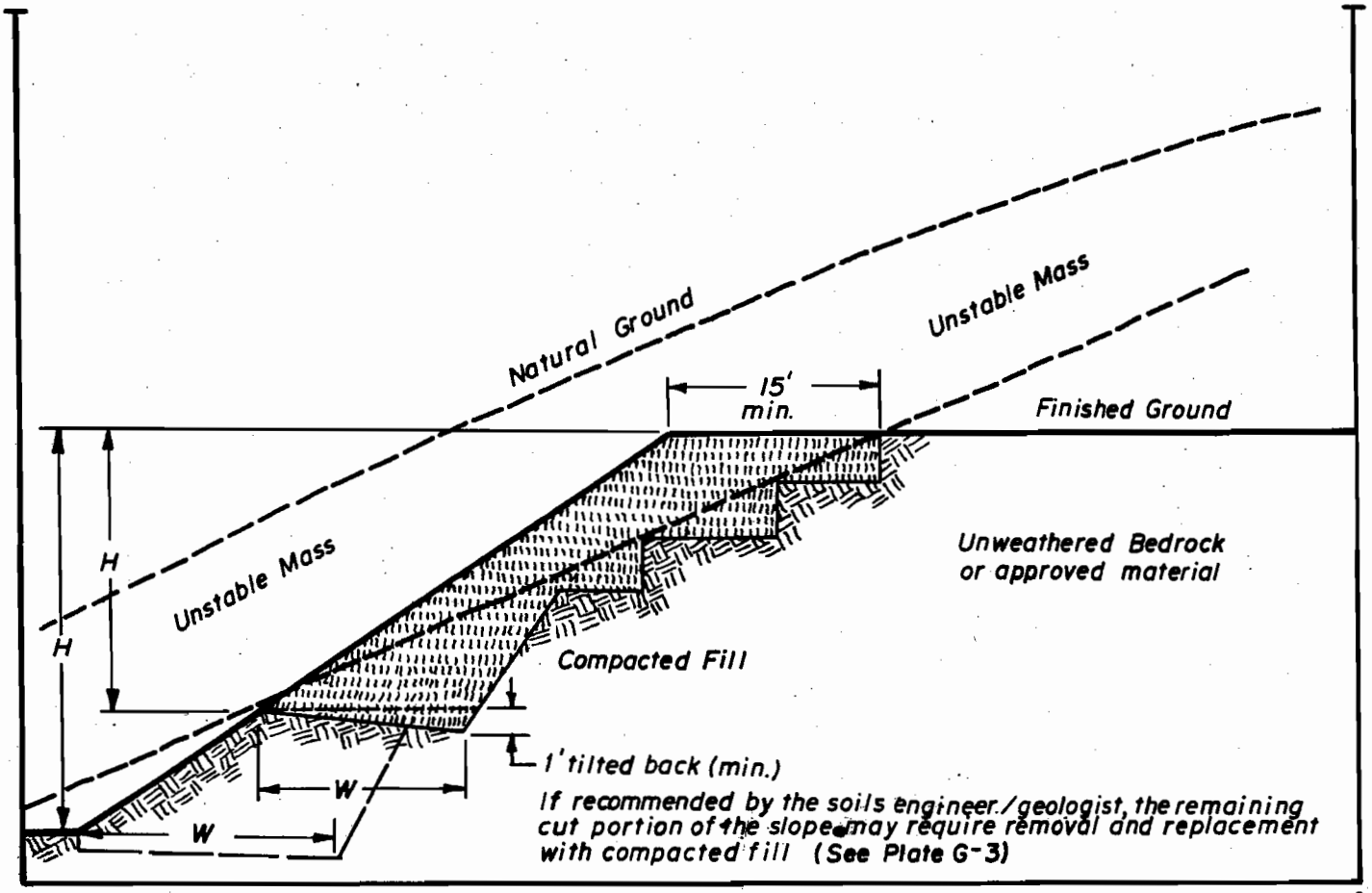


Plate G-6

PACIFIC SOILS ENGINEERING, INC.

W.O. 102453-RT DATE 4/11/06

Selective Grading Detail for Stabilization Fill
Unstable Material Exposed in Portion of Cut Slope



NOTE:

1. Subdrains are not required unless specified.
2. "W" shall be equipment width (15') for slope heights less than 25 feet. For slopes greater than 25 feet "W" shall be determined by the project soils engineer/geologist. At no time shall "W" be less than H/2.

PLATE G-7

PACIFIC SOILS ENGINEERING, INC.

W.O. 102453-RT DATE 4/11/06

Skin Fill On Natural Ground

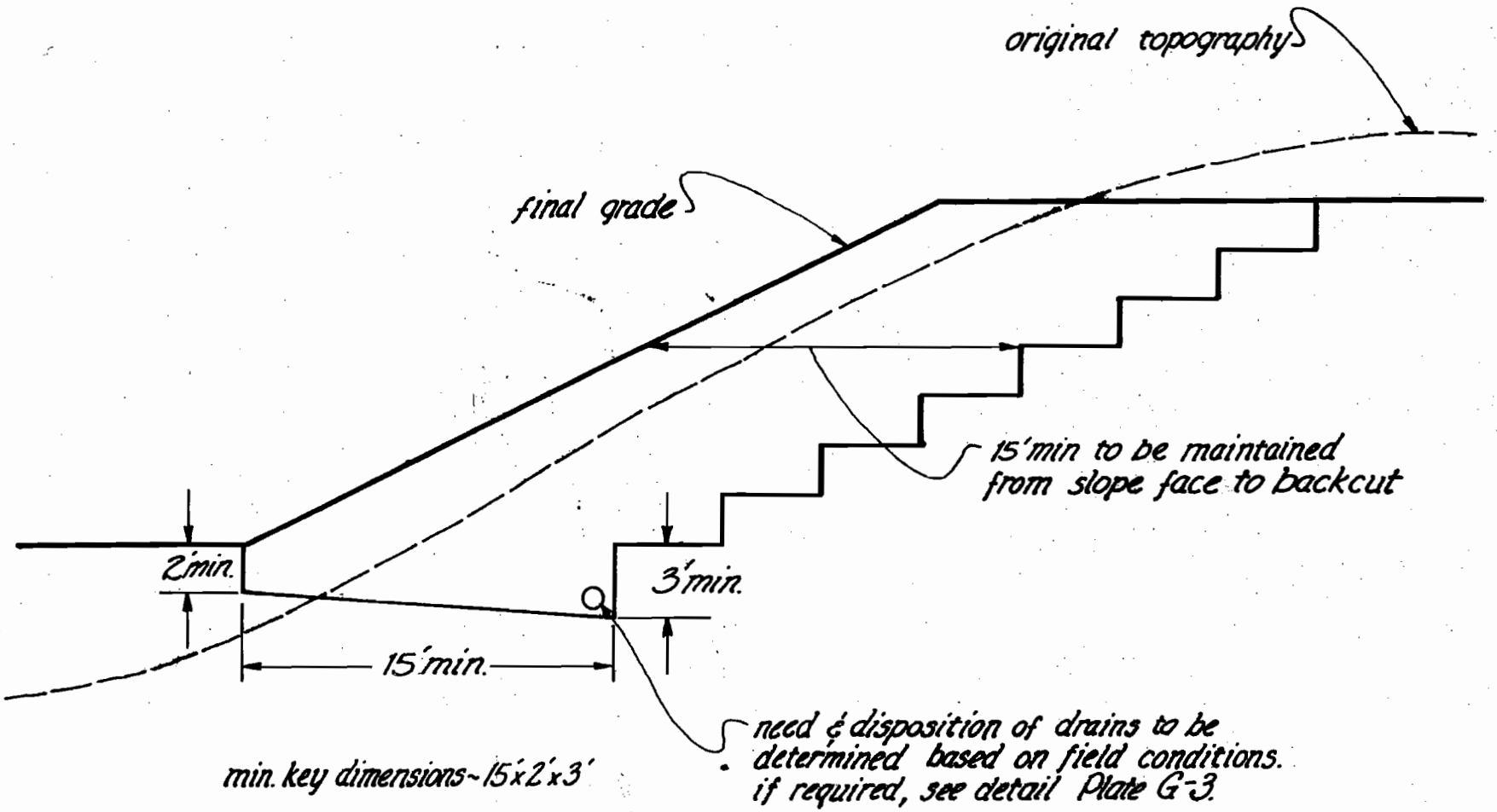


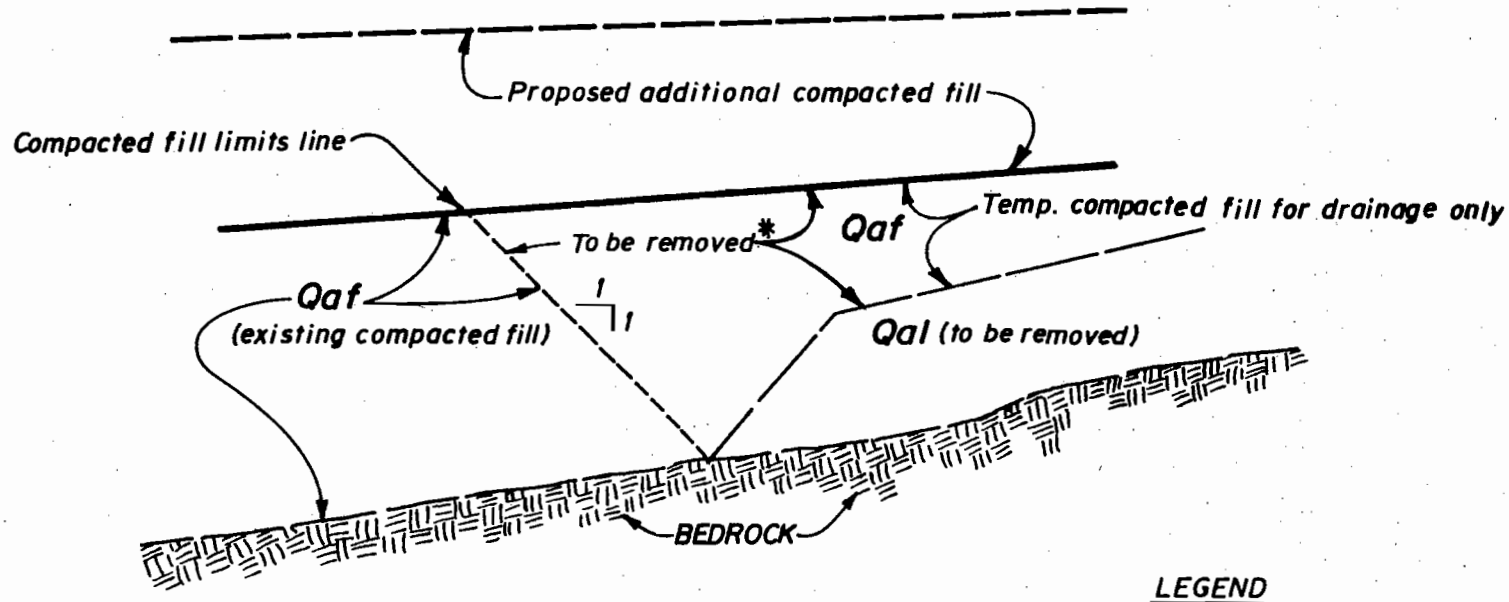
PLATE G-8

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WAY CYPRESS, CALIFORNIA (714) 220-0770

W.O. 102453-RT **DATE** 4/11/06

REMOVAL ADJACENT TO EXISTING FILL

ADJOINING CANYON FILL



LEGEND

Qaf Artificial fill

Qal Alluvium

*before placing additional compacted fill

CROSS-SECTION B-B'

(Typ. up-canyon)

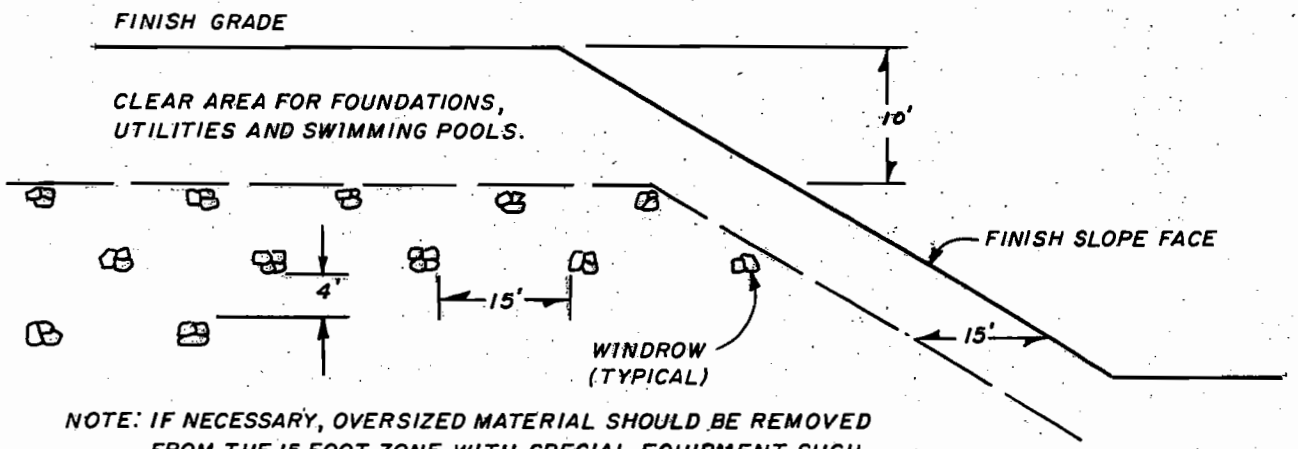
Not to scale

PLATE G-9

PACIFIC SOILS ENGINEERING, INC.

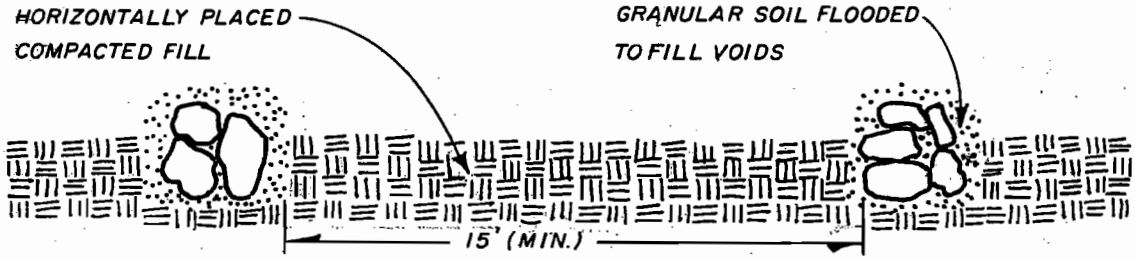
W.O. 102453-RT DATE 4/11/06

ROCK DISPOSAL DETAIL



NOTE: IF NECESSARY, OVERSIZED MATERIAL SHOULD BE REMOVED FROM THE 15 FOOT ZONE WITH SPECIAL EQUIPMENT, SUCH AS A ROCK RAKE, PRIOR TO PLACING THE NEXT FILL LIFT.

TYPICAL WINDROW DETAIL (END VIEW)



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

PROFILE VIEW

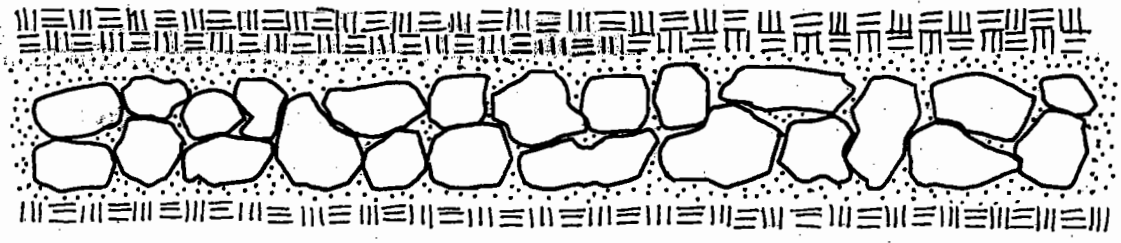
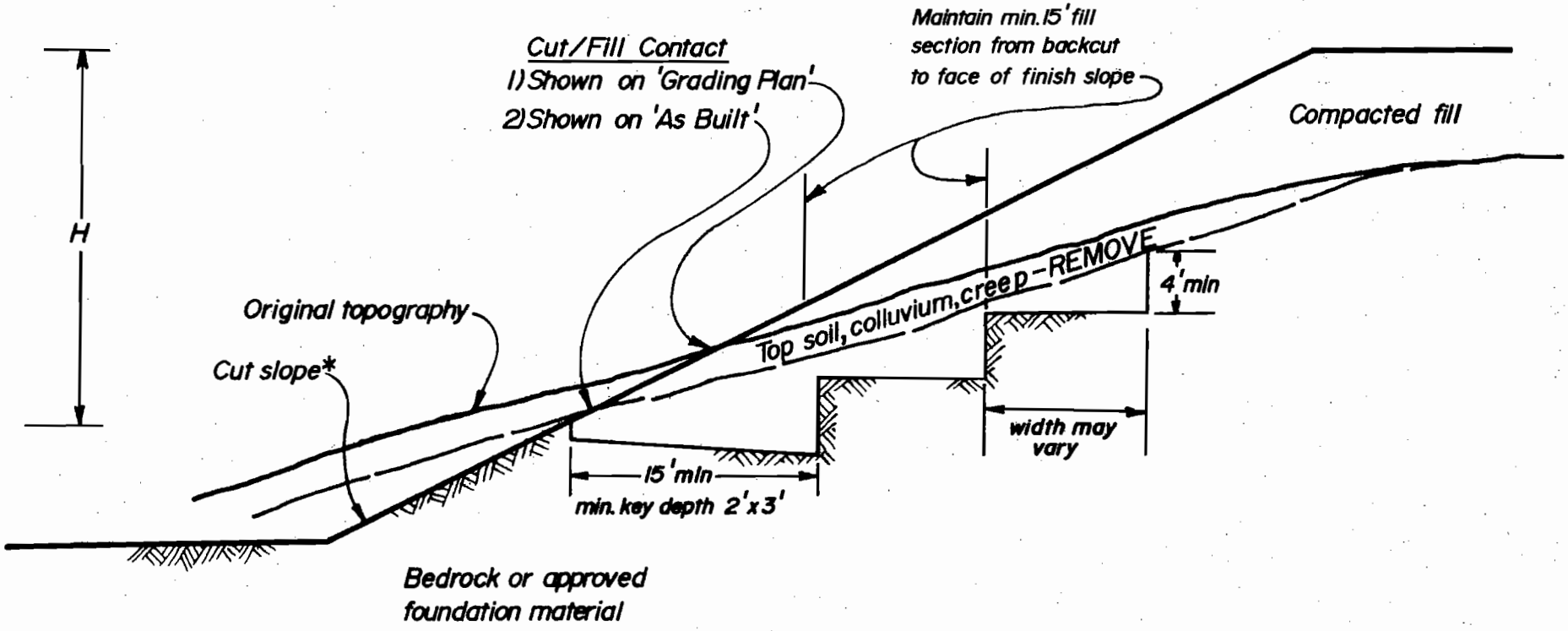


PLATE G-10

PACIFIC SOILS ENGINEERING, INC.

W.O. 102453-RT DATE 4/11/06



* The cut portion of the slope should be excavated and evaluated by the Engineering Geologist/Soils Engineer prior to constructing the fill portion.

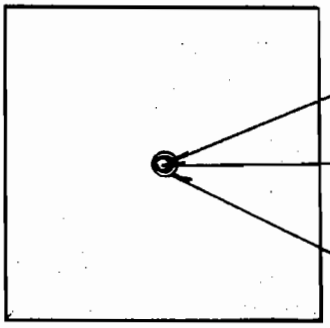
FILL OVER CUT DETAIL

PLATE G-11

PACIFIC SOILS ENGINEERING, INC.

W.O. 102453-RT DATE 4/11/06

SETTLEMENT PLATE DETAIL

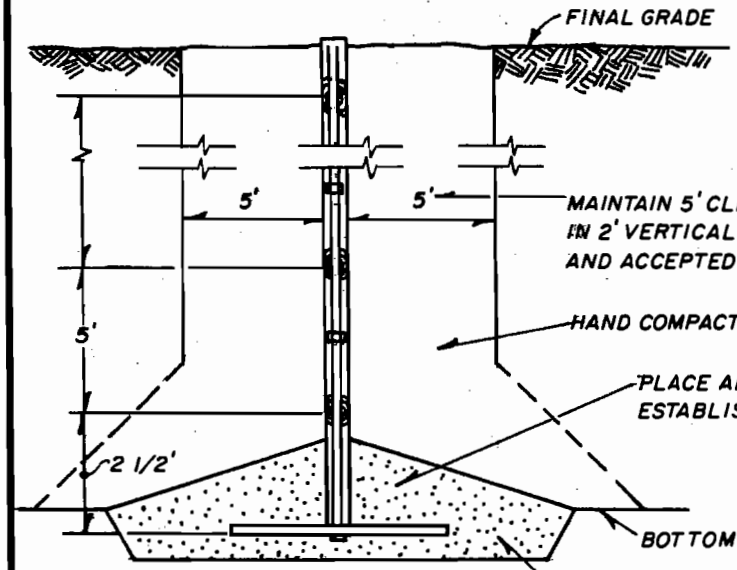


2' X 2' X 1/4" STEEL PLATE

STANDARD 3/4" PIPE NIPPLE, WELDED TOP AND UNDERSIDE OF PLATE.

3/4" Ø X 5' LONG GALVANIZED PIPE, STANDARD PIPE THREADS TOP AND BOTTOM. EXTENSIONS THREADED BOTH ENDS AND ADDED IN 5' INCREMENTS.

3" Ø SCHEDULE 40 PVC, ADD IN 5' INCREMENTS WITH GLUE JOINTS.



MAINTAIN 5' CLEARANCE OF HEAVY EQUIPMENT. HAND COMPACT IN 2' VERTICAL INCREMENTS OR ALTERNATIVE SUITABLE TO AND ACCEPTED BY SOILS ENGINEER.

HAND COMPACT INITIAL 5' (VERTICAL) WITHIN 10' HORIZONTAL.

PLACE AND HAND COMPACT INITIAL 2' OF FILL PRIOR TO ESTABLISHING INITIAL READING.

BOTTOM OF CLEANOUT

PROVIDE A MIN. 1' THICKNESS OF SAND/GRAVEL BEDDING.

NOTE

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 SOILS 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 SOILS ENGINEER AND SHALL BE RESPONSIBLE FOR RESTORING THE SETTLEMENT PLATES TO WORKING ORDER.

PLATE G-12

PACIFIC SOILS ENGINEERING, INC.

W.O. 102453-RT DATE 4/11/06

SURFACE SETTLEMENT MONUMENT DETAIL

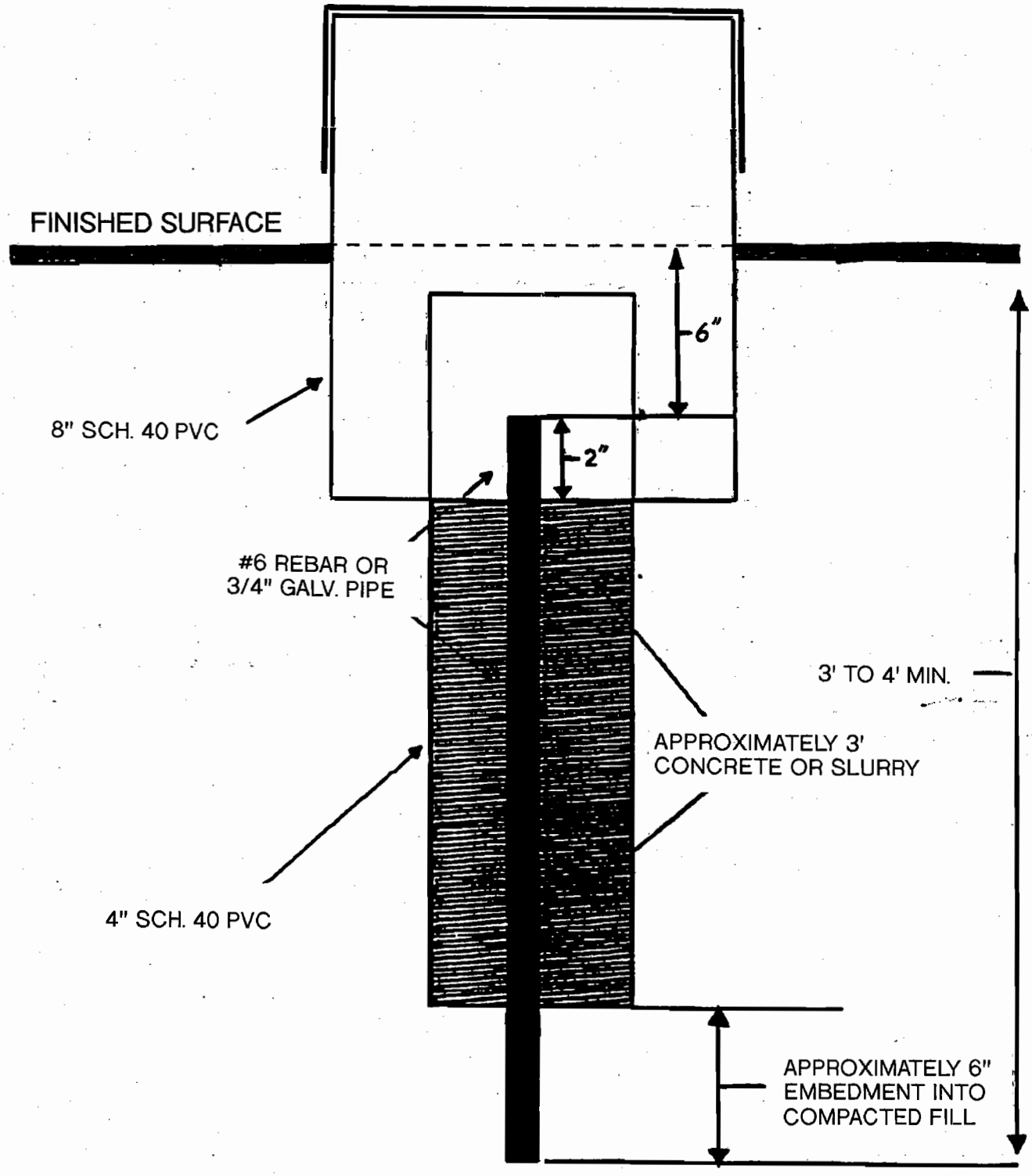


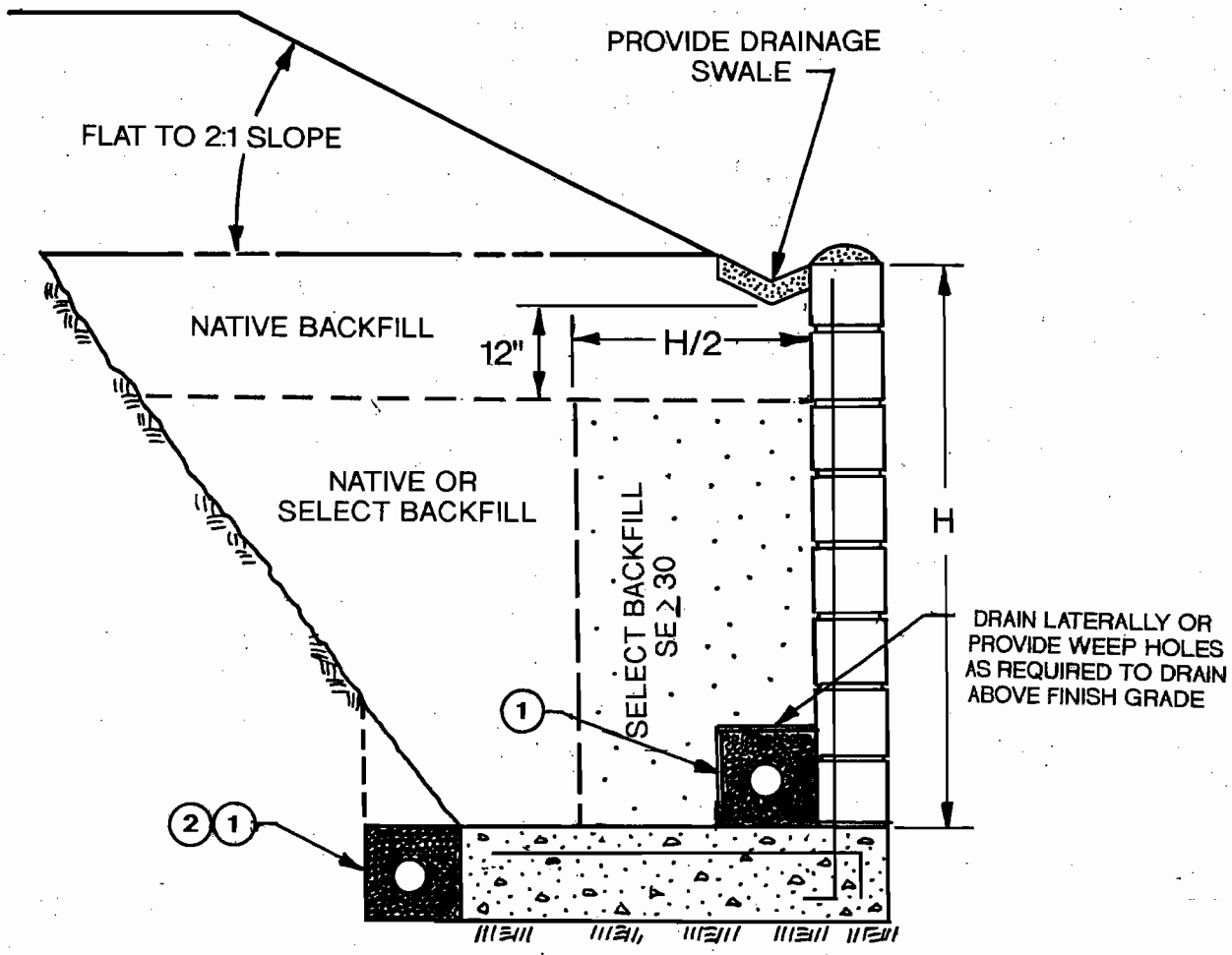
PLATE G-12a

PACIFIC SOILS ENGINEERING, INC.
10553 PROGRESS WAY CYPRESS, CALIFORNIA (714) 220-0770

W.O. 102453-RT **DATE** 4/11/06

TYPICAL

RETAINING WALL BACKFILL



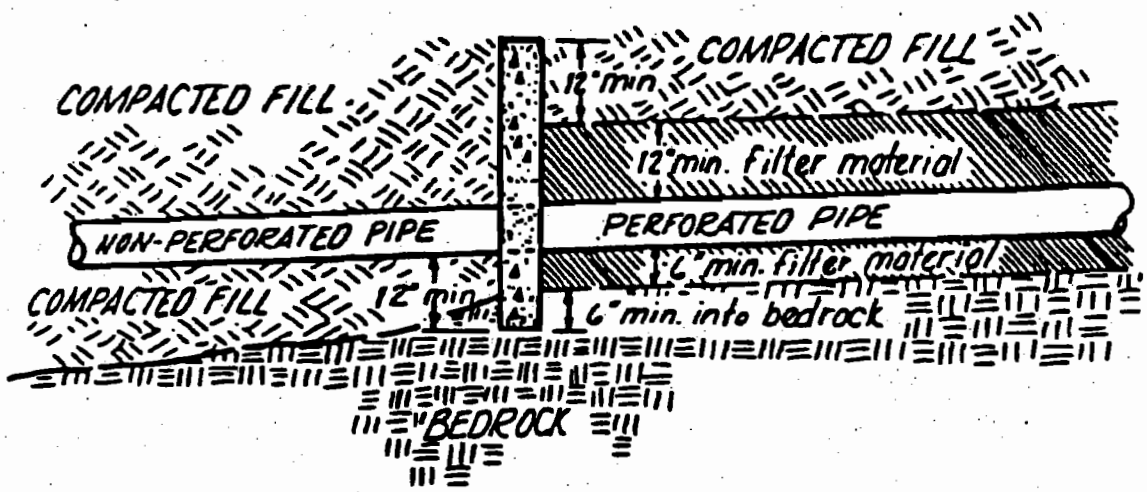
(1) 4-INCH PERFORATED PVC, SCHEDULE 40 OR APPROVED ALTERNATE. PLACE PERFORATION DOWN AND SURROUND WITH A MINIMUM OF 1 CUBIC FOOT PER LINEAL FOOT OF 3/4 INCH ROCK OR APPROVED ALTERNATE. ENCAPSULATE IN MIRAFI 140, OR EQUIVALENT

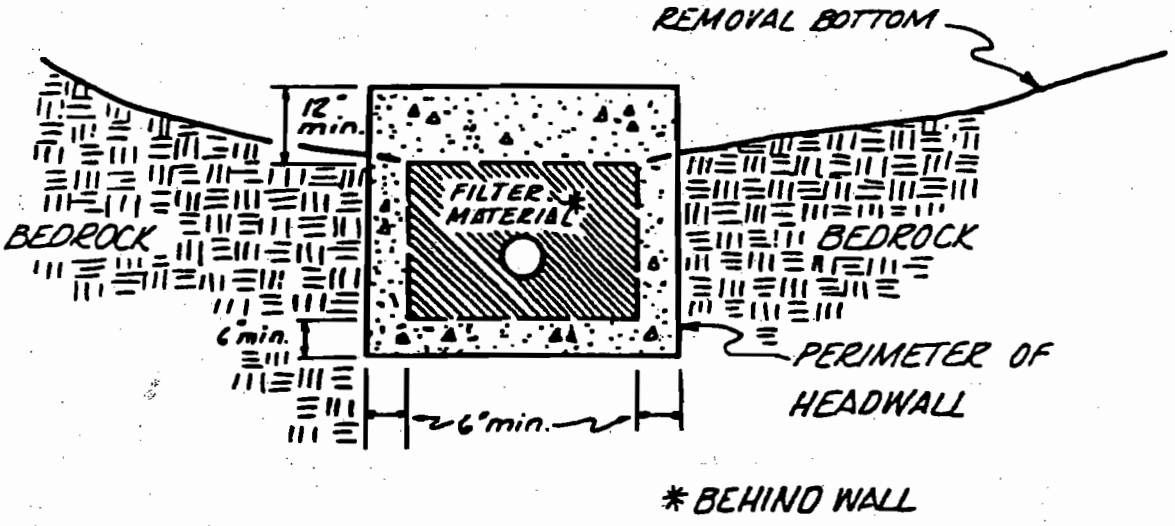
(2) PLACE DRAIN AS SHOWN WHERE PROVISIONS FOR DRAINAGE THROUGH THE WALL CANNOT BE ACCOMMODATED

PLATE G-13 NOT TO SCALE

PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WAY CYPRESS, CALIFORNIA (714) 220-0770

W.O. 102453-RT **DATE** 4/11/06





TYPICAL
CONCRETE HEADWALL
DETAIL

PLATE G-14

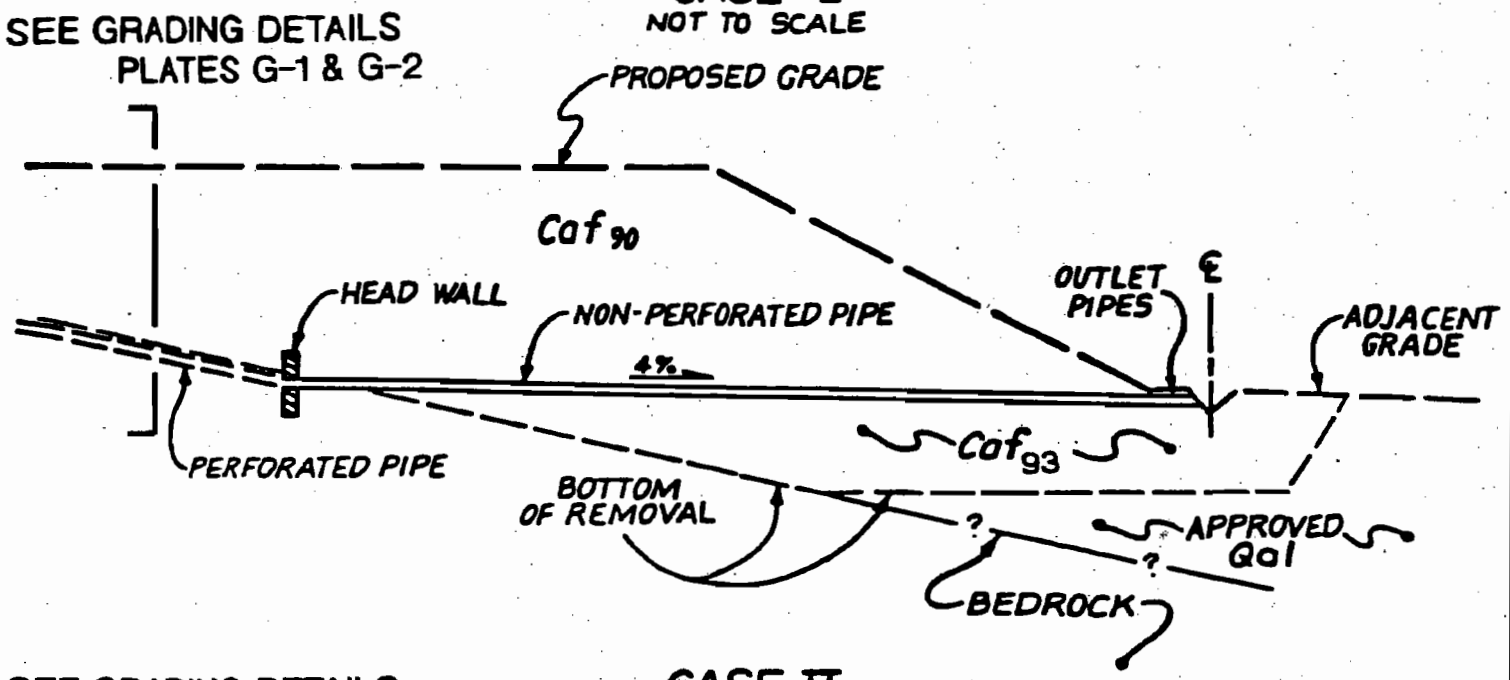
PACIFIC SOILS ENGINEERING, INC.
10653 PROGRESS WAY CYPRESS, CALIFORNIA (714) 220-0770

W.O. 102453-RT DATE 4/11/06

TYPICAL CANYON SUBDRAIN OUTLET DETAIL

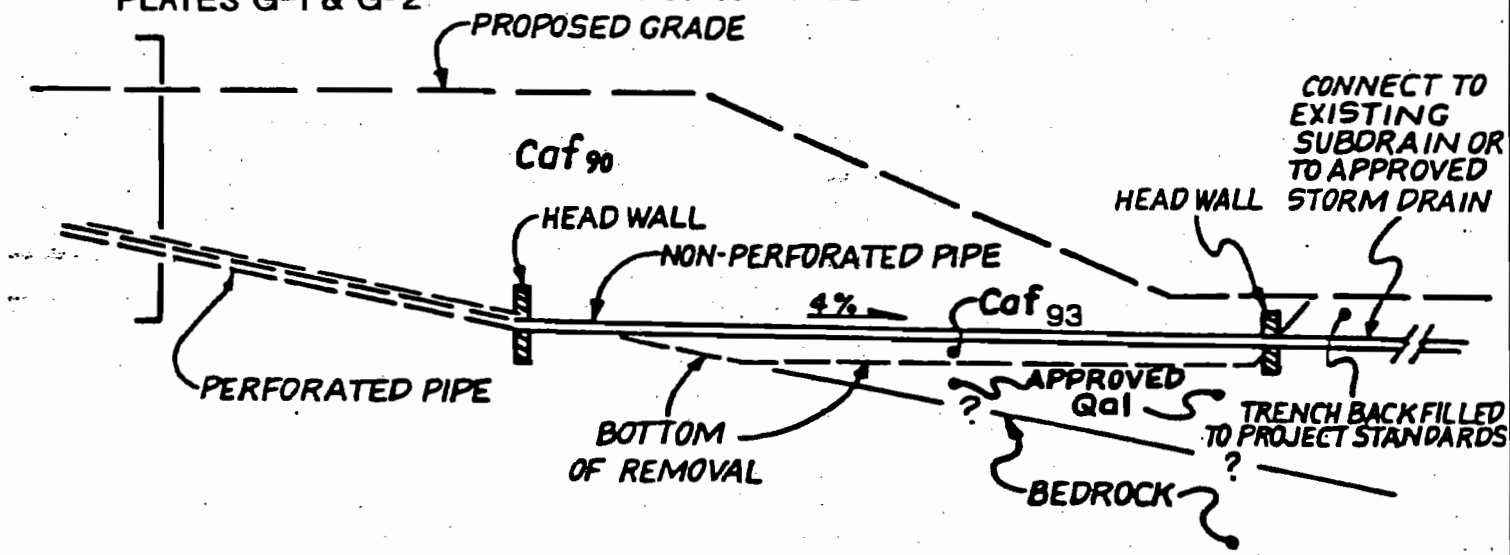
CASE I

NOT TO SCALE



CASE II

NOT TO SCALE



LEGEND:

Caf_{90} COMPACTED FILL TO 90% OF LABORATORY MAXIMUM

Caf_{93} COMPACTED FILL TO 93% OF LABORATORY MAXIMUM

PLATE G-15

PACIFIC SOILS ENGINEERING, INC.
10553 PROGRESS WAY CYPRESS, CALIFORNIA (714) 220-0770

W.O. 102453-RT DATE 4/11/06

April 11, 2006
Work Order 102453-RT

APPENDIX V

HOMEOWNER'S MAINTENANCE AND IMPROVEMENTS CONSIDERATIONS

APPENDIX V

HOMEOWNER'S MAINTENANCE AND IMPROVEMENTS CONSIDERATIONS

Expansive Soils

Some of the earth materials, which may be moved as part of the site grading, may be identified as being expansive in nature. As such, these materials are susceptible to large volume changes upon variations in their moisture content. These soils will swell upon the introduction of water and shrink upon drying. The forces associated with these volume changes can have significant negative impacts (in the form of differential movement) on foundations, walkways, and other lot improvements.

Homeowners purchasing property and living in an area containing expansive soils must assume a certain degree of responsibility for homeowner improvements and for maintaining conditions around their home. Provisions should be incorporated into the design and construction of homeowner improvements to account for the expansive nature of the on-site soils material. Lot maintenance and landscaping should also be conducted in consideration of expansive soil characteristics. Of primary importance is minimizing the moisture variation below all lot improvements. Such design, construction and homeowner maintenance provisions may include:

- Employing contractors for homeowner improvements who design and build in recognition of local building code and specific site soils conditions.
- Establishing and maintaining positive drainage away from all foundations, walkways, driveways, patios, and other hardscape improvements.
- Avoiding the construction of raised planters adjacent to structural improvements. Alternatively, planter sides/bottoms can be sealed with an impermeable membrane and drained away from the improvements via subdrains into approved disposal areas.
- Sealing and maintaining construction/control joints within concrete slabs and walkways to reduce the potential for moisture infiltration into the subgrade soils.
- Utilizing landscaping schemes with vegetation that requires minimal watering. Alternatively, watering should be done in a uniform manner as equally as possible on all sides of the foundation, keeping the soil "moist" but not allowing the soil to become saturated.
- Maintaining positive drainage away from structures.

- Roof gutters are considered an effective means of drainage. The roof gutters, if installed, should be outletted in such a way that positive drainage away from all structures and planters is maintained.
- Avoiding the placement of trees closer to the proposed structures than a distance of one-half the mature height of the tree. Alternate placement of trees (closes to the structures) may be performed based on recommendations from a qualified landscape architect.
- Observation of the soil conditions around the perimeter of the structure during extremely hot/dry or unusually wet weather conditions so that modifications can be made in irrigation programs to maintain relatively constant moisture conditions.

Sulfates

During the preliminary geotechnical investigation for the project, selected soil samples were tested for the presence of soluble sulfates. The samples were found to have sulfate concentrations, which were in the "negligible" range of sulfate exposure as classified in accordance with Table 19-A-4 of the UBC.

Homeowners and/or residents should be cautioned against the import and use of certain inorganic fertilizers, soil amendments, and/or other soils from offsite sources in the absence of specific information relating to their chemical composition. Some fertilizers have been known to leach sulfate compounds into soils otherwise containing "negligible" sulfate concentrations and increase the sulfate concentrations in near-surface soils to significant levels. In some cases, concrete improvements constructed in soils containing high levels of soluble sulfates may be affected by deterioration and loss of strength.

Site Drainage

- The homeowner and/or resident should be made aware of the potential problems, which may develop when drainage is altered through construction of retaining walls, swimming pools, paved walkways, patios, etc. Ponded water, drainage over the slope face, leaking irrigation systems, overwatering or other conditions that could lead to ground saturation must be avoided.
- No water should be allowed to flow over the slopes. No alteration of pad gradients should be allowed that will prevent pad and roof runoff from being directed to approved disposal areas.

- As part of site maintenance by the homeowner and/or resident, all roof and pad drainage should be directed away from slopes and around structures to approved disposal areas. All berms constructed and compacted as part of fine grading and should be maintained by the resident. The recommended drainage patterns established at the time of the fine grading should be maintained throughout the life of the structure. No alterations to these drainage patterns should be made unless designed by qualified professionals in compliance with local code requirements.

Slope Drainage

- The homeowner and/or resident should be made aware of the importance of maintaining and cleaning all interceptors' ditches, drainage terraces, downdrains and any other drainage devices installed to promote slope stability.

- Backdrain and subdrain outlet pipes, that may protrude through slope surfaces at the completion of grading operations, are designed to conduct subsurface water away from compacted fill sections and buttress/ stabilization fills. These pipes, in conjunction with the graded features, are designed to promote project stability and must be protected in-place and not altered or damaged in any way.

Planting and Irrigation

- Seeding and planting of the slopes should be planned to achieve, as rapidly as possible, a well-established and deep-rooted vegetal cover requiring minimal watering.

- It should be the responsibility of the landscape architect to provide such plants initially and of the residents to maintain such planting. Alteration of such a planting scheme is at the resident's risk.

- The homeowner and/or resident is responsible for proper irrigation and for maintenance and repair of properly installed irrigation systems. Leaks should be fixed immediately.

Burrowing Animals

The homeowner and/or resident must undertake a program to eliminate burrowing animals. This must be an ongoing program in order to promote slope stability.

Homeowner Improvements

Homeowner and/or resident improvements (pools, spas, patio slabs, retaining walls, planters, etc.) should be designed to account for the nature of the project. Design considerations on any given lot may need to include provisions for differential bearing materials, ascending/descending slope conditions, perched (irrigation) water, special surcharge loading conditions, and long-term creep/settlement.

All homeowner and/or resident improvements should be designed and constructed by qualified professionals utilizing appropriate design methodologies which account for the on-site soils and geologic conditions. Each lot and proposed improvement should be evaluated on an individual basis.

Slope Setbacks

Manufactured cut and fill slopes are proposed onsite to maximum heights of 150± and 75± feet, respectively. In addition, natural slopes may exist above or below some pad areas. Both natural and manufactured slopes may be subject to long-term settlement and creep that can manifest itself in the form of both horizontal and vertical movement. These movements typically are produced as a result of weathering, erosion, gravity forces, and other natural phenomenon. A setback adjacent to slopes is required by most building codes, including the Uniform Building Code. This zone is intended to locate and support the residential structures away from these slopes and onto soils that are not subject to the potential adverse effects of these natural phenomena. The homeowner and/or resident may wish to construct patios, walls, walkways, planters, swimming pools, spas, etc. within this zone. Such facilities may be sensitive to settlement and creep and should not be constructed within the setback zone unless properly engineered. It is suggested that plans for such improvements be designed by a professional engineer who is familiar with hillside grading ordinances and design and construction requirements associated with hillside conditions. In addition, we recommend that the designer and contractor familiarize themselves with the site-specific geologic and geotechnical conditions on the specific lot.

April 4, 2006
Work Order 102453-RT

APPENDIX VI

Response to County of Los Angeles

Geotechnical and Materials Engineering Division

Geologic Review Sheets

(dated 7-7-05, 8-25-05 and 1-12-06)

and

Soils Engineering Review Sheets

(dated 7-12-05, 9-13-05 and 1-17-06)

APPENDIX VI

Response to County of Los Angeles Department of Public Works, GMED Geologic (7-7-05, 8-25-05 and 1-12-06) and Soils Engineering (7-12-05, 9-13-05 and 1-17-06) Review Sheets

Presented herein are Pacific Soils Engineering, Inc. (PSE) responses to the County of Los Angeles Department of Public Works, GMED, Geologic and Soils Engineering Review Sheets (References 20 through 25 of Appendix I) regarding this firm's geotechnical report (Reference 19). As the most recent Tentative Tract Map, dated March 24, 2006 has superceded the previous plans, this firm's geotechnical comments and responses to Los Angeles County Review sheets will refer to this most recent plan. In the interest of clarity, the County's remarks/conditions are reiterated below and are followed by this firm's response.

I. Response to Geologic Review Sheet dated 7-7-05

LACDPWGMED Remark:

"*1. An engineering geology report is required to evaluate the feasibility of the proposed subdivision.*"

PSE Response:

The preceding Preliminary Geotechnical Report is intended to satisfy this requirement.

LACDPWGMED Remark:

"*2. Based on the State of California Seismic Hazard Maps, the subject site is located in an area with a potential for liquefaction and may be subject to secondary effects of seismic shaking. The above requested report must address the potential for liquefaction and ground failure. The report must comply with the provisions of the "Manual for Preparation of Geotechnical Reports" prepared by the County of Los Angeles, Department of Public Works, and is available on the internet at* http://ladpw.org/med/Manual.pdf. *Provide this office with two (2) original copies of the report for review and distribution to the State of California.*

All parameters and data utilized in the liquefaction analysis must comply the requirements of the Geotechnical and Materials Engineering Division's Administrative Manual memo G045.0."

PSE Response:

The requested information is contained within the attached Preliminary Geotechnical Report. Two copies of this report are provided for LAC review.

LACDPWGMED Remark:

"3. The Soils Engineering review dated 7-12-05 is attached."

PSE Response:

Comments noted. Please see this firm's response to the Soils Engineering review sheet in Section III of this reply.

II. Response to Geologic Review Sheets dated 8-25-05 and 1-12-06

LACDPWGMED Remark:

"1. Provide a geotechnical map that is based on the latest version of the Tentative Map."

PSE Response:

The accompanying Geotechnical Map(s) (Plates F-1 and F-2; in pocket) is based on the most recent version of the Tentative Map, dated March 24, 2006.

LACDPWGMED Remark:

"2. Evaluate debris flow potential for each building area located below a swale or steep natural slope. Provide mitigation recommendations as necessary."

PSE Response:

The residential daylight fill lots situated below swales or steep natural slopes are located in the eastern and south central portions of the development. Oriented with their backyards nearest to the ascending swale/slope, the affected lots in this category are Lots 75 and 76 in the east (Plate F-1) and Lots 44 through 48 in the south (Plate F-2).

The subject natural slopes face north to northeast and are commonly inclined at a 1½ to 2:1 (±) ratio, with localized steeper gradients near some crests and flatter inclinations in their lower reaches. Although bedding dips to the north, the inclinations are moderate to steep. Slope stability calculations on a representative natural slope above Lots 44 and 45 (Cross-Section 4-4'

in attached Preliminary Geotechnical Report) produced factors-of-safety in excess of County minimum standards.

Soil thicknesses exposed in onsite exploratory pits generally ranged between ½ foot to 3 feet. This range was common for soil on gentle to moderately inclined slopes overlying both Saugus-Sunshine Ranch and Pico bedrock. Colluvial deposits were noted up to 17 feet near an alluvial contact, but commonly range from 4 to 7 feet along gentle slopes (2½:1 to 6:1 gradients) in smaller canyons or near the base of steeper slopes.

Taking into consideration the low adjacent gradients and/or average soil thicknesses, this firm believes that excessive debris flow potential is minimal in the areas of the indicated daylight fill lots, and that planning quantities calculated by Diamond West from the Los Angeles County Debris Production Maps should be adequate for design purposes. It is also felt that the recommended concrete drains and/or splash walls between the natural slopes and proposed yard area of the indicted fill lots, should provide adequate/sufficient mitigation for potential localized water/ soil flow. Additional debris flow evaluations should be made at the grading plan review stage when lot grades and configurations are better defined.

LACDPWGMED Remark:

"3. Clearly, indicate area on the geotechnical map where stability analyses of steep natural slopes did not yield calculated factors-of-safety in excess of minimum requirements. Provide mitigation recommendations as necessary."

PSE Response:

As clarified during a recent conversation with Mr. Geir Mathisen, Los Angeles County Geologist, this remark was made to elicit a plan specific evaluation within proposed development areas. As discussed in the attached Preliminary Geotechnical Report, Cross-Section 4-4' depicts the highest natural slope above proposed residential lots. The attendant slope stability calculation exceeds Los Angeles County minimum standards.

LACDPWGMED Remark:

"4. The Soils Engineering review dated 9-13-05 is attached."

PSE Response:

See Part IV herein for this firm's responses to the Soils Engineering Review Sheet Remarks.

III. Response to Soils Engineering Review Sheet dated 7-12-05

LACDPWGMED Remark:

"1. Provide a soils report, with sufficient subsurface data, pertinent test results and analyses, which addresses and evaluates the site and the proposed development. The report must comply with the provisions of "Manual for Preparation of Geotechnical Reports" prepared by County of Los Angeles, Department of Public Works. The Manual is available on the internet at the following address: http://ladpw.org/construction/manual.pdf. *"*

PSE Response:

The preceding Preliminary Geotechnical Report is intended to satisfy this request.

LACDPWGMED Remark:

"2. The site is located within a mapped liquefaction area, per the State of California Seismic Hazard Zone Map, Oat Mountain Quadrangle. Therefore, provide data and analyses to determine liquefaction potential of the on-site soils. Also, evaluate the potential for seismically induced settlement (dry and saturated soils), lateral spreading, surface manifestation, etc. The analyses must be performed for soils within the upper 50 feet, as a minimum, for shallow foundation, or greater depth where deep foundation and/or subterranean structure is proposed. The historic-high water table shall be used in the analyses, unless other information is provided which indicates a higher or lower level is appropriate. Recommend mitigation as necessary. The liquefaction data and analyses must conform to the State of California Division of Mines and Geology "Special Publication 117", dated 1997 and "Recommended Procedure For Implementation of DMG Special Publication 117", dated March 1999."

PSE Response:

The preceding Preliminary Geotechnical Report is intended to satisfy this request.

LACDPWGMED Remark:

"3. Provide static, seismic and surficial slope stability analyses for all slopes steeper than 2:1 gradient, as necessary. Also, provide a geotechnical cross-section, for each section analyzed, showing the critical failure plane used in the analyses. Indicate the various shear strength parameters used in the analyses, in the appropriate segments of each failure plane. Show locations of the cross-sections used in slope stability

analyses on the geotechnical map. Recommend mitigation if factors-of-safety are below County minimum standards."

PSE Response:

Cross-Section 4-4' was drawn for the natural slope areas. The calculations, presented on Plates D-19 through D-36, indicate factors-of-safety in excess of County minimums. The cross-section is shown on the Geotechnical Map.

LACDPWGMED Remark:

"4. Address the debris flow potential on the subject site as necessary. Recommend mitigation measures as necessary."

PSE Response:

Please see this firm's response to Remark #2 in Part II of this section.

LACDPWGMED Remark:

"5. Provide chemical test results (sulfate, chloride, resistivity, etc.) for the on-site soils to address the presence of chemicals deleterious to concrete and ferrous materials. The chemical tests must be in accordance with California Test Methods, Department of Transportation, or equivalent (aqueous solution tests, such as EPA Tests or similar methods are not acceptable for determination of determination of resistivity). Resistivity tests must be performed on soils in a saturated condition."

PSE Response:

Please see Page 13 and Table I in Appendix I of the preceding Preliminary Geotechnical Report.

LACDPWGMED Remark:

"6. Show the following on the geotechnical maps:
- *a. Approximate limits and depth of removal and recompaction of unsuitable soils, as necessary.*
- *b. Grading required for construction of buttress/stabilization fills, as necessary.*
- *c. Location of all buttress/stabilization fill keyways, as necessary.*
- *d. Location of "Restricted Use Area(s)/Building Setback(s)", as necessary.*
- *e. All recommended mitigation measures."*

PSE Response:

Pertinent requested items are indicated on the enclosed Geotechnical Map (Plates F-1 and F-2).

LACDPWGMED Remark:

"7. Requirements of the Geology Section are attached."

PSE Response:

The geology section review remarks and this firm's responses are contained in Part I of this Appendix.

LACDPWGMED Remark:

"8. Include a copy of this review sheet with your response."

PSE Response:

Copies of the Geology and Soils Engineering Review Sheets are included as Plates VI-1 through VI-6.

IV. Response to Soils Engineering Review Sheets dated 9-13-05 and 1-17-06

LACDPWGMED Remark:

"1. The Tentative Map dated by Regional Planning 6/2/05 does not conform with the geotechnical maps of the submitted report. Provide geotechnical maps and tentative map which conform, as requested by the Geology Section."

PSE Response:

See response to Remark No. 1 in Part III above.

LACDPWGMED Remark:

*"2. On Page 20 of the submitted report it states that the calculated (estimated) value for the seismically inducted settlement ranged from ¼ to ¾ inches. The substantiating liquefaction analyses for these reported values were not provided within the copies of the submitted report. Therefore as previously requested, provide the substantiating liquefaction analyses and evaluate the potential for seismically induced settlement **(dry and saturated soils)**, lateral spreading, surface manifestation, etc. The analyses must be performed for soils within the upper 50 feet, as a minimum, for shallow foundation, or greater depth where deep foundation and/or subterranean structure is proposed. The historic-high water table shall be used in the analyses, unless other information is provided which indicates a higher or lower level is appropriate. Recommend mitigation as necessary. The liquefaction data and analyses must conform to the State of California Division of Mines and Geology "Special Publication 117", dated 1997 and "Recommended Procedure For Implementation of DMG Special Publication 117", dated March 1999."*

PSE Response:

The requested information is contained within the attached Preliminary Geotechnical Report.

LACDPWGMED Remark:

"3. Provide the correlations between CPT/SPT utilized within the liquefaction analyses, as necessary. Provide references as necessary."

PSE Response:

Cone Penetration Test data were not used for the liquefaction analyses presented in the attached Preliminary Geotechnical Report. Thus, CPT/SPT correlations are considered moot.

LACDPWGMED Remark:

"4. The CPT interpretations in Appendix III of the submitted report indicates several layers classified as Clay, Silt, and Clayey Silt. Provide substantiating data/test and references to verify that the soils layers classified as Clay, Silt, and Clayey Silt are non-liquefiable, e.g. "Chinese Criteria" (Seed and Idriss, 1982, etc.), as necessary."

PSE Response:

The CPT interpretations in Appendix III of the submitted report were not used for the liquefaction analyses presented therein, nor were they used in the liquefaction analyses presented in the attached Preliminary Geotechnical Report as discussed herein. Thus, the requested information is considered moot. Further, the interpreted CPT data are not included in the attached Preliminary Geotechnical Report.

LACDPWGMED Remark:

"5. Address potential debris flow(s) from natural slopes and/or swales (i.e. surficial creep, Qcol, etc.) located adjacent to proposed development, as requested by the Geology Section. Recommend mitigation measures as necessary."

PSE Response:

See response to Remark No. 2 in Part II above.

LACDPWGMED Remark:

"6. On the submitted geotechnical maps, several debris basins are shown on the subject site. Provide slope stability analyses considering rapid drawdown condition for debris basins with slopes steeper than 3:1 gradient and designed with outlet structures, as necessary. Also, provide a geotechnical cross-section, for each section analyzed, showing the critical failure plane used in the analyses. Indicate the various shear strength parameters used in the analyses, in the appropriate segments of each failure plane. Show locations of the cross-sections used in slope stability analyses on the geotechnical map. Recommend mitigation if factors-of-safety are below County minimum standards."

PSE Response:

Cross-Section 5-5' was drawn through the highest 2:1 fill slope within the debris basin on Lot 100. The slope stability calculations, presented on Plates D-37 through D-48 of Appendix I, indicate factors-of-safety in excess of County minimums for a "full" basin and "rapid drawdown" conditions. The shear strength parameters utilized in the analyses are shown on the cross-section which is located on the accompanying Geotechnical Map.

LACDPWGMED Remark:

"7. Show the following on the geotechnical map:

a. Location of all proposed settlement monuments.
b. All recommended mitigation measures."

PSE Response:

The preliminary location of proposed settlement monuments and this firm's recommended mitigation measures are shown on the accompanying Geotechnical Maps (Plates F-1 and F-2; in pocket).

LACDPWGMED Remark:

"8. Requirements of the Geology Section are attached."

PSE Response:

See Part II above for this firm's responses to the Geology Section's Review Sheet.

LACDPWGMED Remark:

"9. Include a copy of this review sheet with your response."

PSE Response:

Copies of all the Geology and Soils Engineering Review Sheets accompany this transmittal (see Plates VI-1 through VI-6).

Sheet 1 of 1

County of Los Angeles Department of Public Works
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION
GEOLOGIC REVIEW SHEET
900 So. Fremont Ave., Alhambra, CA 91803
TEL. (626) 458-4925

DISTRIBUTION
__ Geologist
__ Soils Engineer
1 GMED File
1 Subdivision

TENTATIVE TRACT MAP 53653 **TENTATIVE MAP DATED** 6/2/05
SUBDIVIDER Warner Bros. Entertainment, Inc. **LOCATION** Santa Clarita
ENGINEER Daly Owens Group
GEOLOGIST ---------- **REPORT DATE** ----------
SOILS ENGINEER ---------- **REPORT DATE** ----------

The Regional Planning Commission, developer, and engineer are advised that:

PRIOR TO RECOMMENDING APPROVAL OF THE TENTATIVE TRACT OR PARCEL MAP:

1. An engineering geology report is required to evaluate the feasibility of the proposed subdivision.

2. Based on the State of California Seismic Hazard Maps, the subject site is located in an area with a potential for liquefaction and may be subject to secondary effects of seismic shaking. The above requested report must address the potential for liquefaction and ground failure. The report must comply with the provisions of the "Manual for Preparation of Geotechnical Reports" prepared by the County of Los Angeles, Department of Public Works, and is available on the Internet at http://ladpw.org/med/Manual.pdf . Provide this office with two (2) original copies of the report for review and distribution to the State of California.

   All parameters and data utilized in the liquefaction analysis must comply the requirements of the Geotechnical and Materials Engineering Division's Administrative Manual memo G045.0.

   The Soils Engineering review dated 7/12/05 is attached.

NOTE Provide a copy of this review with your resubmittal

Prepared by _____ Reviewed by _____ Date 7/7/05
Geir R. Mathisen

P:\MyFiles\Geir\Geology Review\Review Sheets\District 8.2\Tracts\53653_TM.doc
9/31/04

PLATE VI-1

County of Los Angeles Department of Public Works
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION
GEOLOGIC REVIEW SHEET
900 So. Fremont Ave., Alhambra, CA 91803
TEL. (626) 458-4925

DISTRIBUTION
1 Geologist
__ Soils Engineer
1 GMED File
1 Subdivision

TENTATIVE TRACT MAP 53653 **TENTATIVE MAP DATED** 6/2/05
SUBDIVIDER Warner Bros. Entertainment, Inc. **LOCATION** Santa Clarita
ENGINEER Daly Owens Group
GEOLOGIST & SOILS ENGINEER Pacific Soils Engineering, Inc. **REPORT DATE** 3/10/04

The Regional Planning Commission, developer, and engineer are advised that:

PRIOR TO RECOMMENDING APPROVAL OF THE TENTATIVE TRACT OR PARCEL MAP:

1. Provide a geotechnical map that is based on the latest version of the Tentative Map.
2. Evaluate debris flow potential for each building area located below a swale or steep natural slope. Provide mitigation recommendations as necessary.
3. Clearly, indicate area on the geotechnical map where stability analyses of steep natural slopes did not yield calculated factors-of-safety in excess of minimum requirements. Provide mitigation recommendations as necessary.
4. The Soils Engineering review dated 9/13/05 is attached.

NOTE Provide a copy of this review with your resubmittal

Prepared by _____ Reviewed by _____ Date 8/25/05
Geir R. Mathisen

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8/31/04

PLATE VI-2

County of Los Angeles Department of Public Works
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION
GEOLOGIC REVIEW SHEET
900 So. Fremont Ave., Alhambra, CA 91803
TEL. (626) 458-4925

DISTRIBUTION
1 Geologist
_ Soils Engineer
1 GMED File
1 Subdivision

TENTATIVE TRACT MAP 53653 **TENTATIVE MAP DATED** 12/14/05 (Revised)
SUBDIVIDER Warner Bros. Entertainment, Inc. **LOCATION** Santa Clarita
ENGINEER Daly Owens Group
GEOLOGIST & SOILS ENGINEER Pacific Soils Engineering, Inc. **REPORT DATE** 3/10/04

The Regional Planning Commission, developer, and engineer are advised that:

PRIOR TO RECOMMENDING APPROVAL OF THE TENTATIVE TRACT OR PARCEL MAP:

As previously requested:

1. Provide a geotechnical map that is based on the latest version of the Tentative Map.
2. Evaluate debris flow potential for each building area located below a swale or steep natural slope. Provide mitigation recommendations as necessary.
3. Clearly, indicate area on the geotechnical map where stability analyses of steep natural slopes did not yield calculated factors-of-safety in excess of minimum requirements. Provide mitigation recommendations as necessary.
4. The Soils Engineering review dated 1/17/06 is attached.

NOTE Provide a copy of this review with your resubmittal

Prepared by Geir R. Mathisen Reviewed by _____ Date 1/12/06

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8/31/04

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

SOILS ENGINEERING REVIEW SHEET

Address: 900 S. Fremont Ave., Alhambra, CA 91803
Telephone: (626) 458-4925
Fax: (626) 458-4913

District Office 8.2
Job Number LX001129
Sheet 1 of 1

DISTRIBUTION:
___ Drainage
___ Grading
___ Geo/Soils Central File
___ District Engineer
___ Geologist
___ Soils Engineer
___ Engineer/Architect

Tentative Map (Tract)	53653
Location	Santa Clarita
Developer/Owner	Warner Bros., Entertainment
Engineer/Architect	Daly Owens Group
Soils Engineer	-----
Geologist	-----

Review of:
Tentative Map (Tract) Dated by Regional Planning 6/2/05

ACTION:
Tentative Map feasibility is not recommended for approval.

REMARKS:

1. Provide a soils report, with sufficient subsurface exploration data, pertinent test results and analyses, which addresses and evaluates the site and the proposed development. The report must comply with the provisions of "**Manual for Preparation of Geotechnical Reports**" prepared by County of Los Angeles, Department of Public Works. The Manual is available on the Internet at the following address: ***http://ladpw.org/construction/manual.pdf***

2. The site is located within a mapped liquefiable area, per the State of California Seismic Hazard Zone Map, Oat Mountain Quadrangle. Therefore, provide data and analyses to determine liquefaction potential of the on-site soils. Also, evaluate the potential for seismically induced settlement (dry and saturated soils), lateral spreading, surface manifestation, etc. The analyses must be performed for soils within the upper 50 feet, as a minimum, for shallow foundation, or greater depth where deep foundation and/or subterranean structure is proposed. The historic-high water table shall be used in the analyses, unless other information is provided which indicates a higher or lower level is appropriate. Recommend mitigation as necessary. The liquefaction data and analyses must conform to the State of California Division of Mines and Geology "Special Publication 117", dated 1997 and "Recommended Procedure For Implementation of DMG Special Publication 117", dated March 1999.

3. Provide static, seismic and surficial slope stability analyses for all slopes steeper than 2:1 gradient, as necessary. Also, provide a geotechnical cross section, for each section analyzed, showing the critical failure plane used in the analyses. Indicate the various shear strength parameters used in the analyses, in the appropriate segments of each failure plane. Show locations of the cross sections used in slope stability analyses on the geotechnical map. Recommend mitigation if factors of safety are below County minimum standards.

4. Address the debris flow potential on the subject site as necessary. Recommend mitigation measures as necessary.

5. Provide chemical test results (sulfate, chloride, resistivity, etc.) for the on-site soils to address the presence of chemicals deleterious to concrete and ferrous materials. The chemical tests must be in accordance with California Test Methods, Department of Transportation, or equivalent (aqueous solution tests, such as EPA Tests or similar methods are not acceptable for determination of resistivity). Resistivity tests must be performed on soils in a saturated condition.

6. Show the following on the geotechnical maps:
   a. Approximate limits and depth of removal and recompaction of unsuitable soils, as necessary.
   b. Grading required for construction of buttress/stabilization fills, as necessary.
   c. Location of all buttress/stabilization fill keyways, as necessary.
   d. Location of "Restricted Use Area(s)"/"Building Setback(s)", as necessary.
   e. All recommended mitigation measures.

7. Requirements of the Geology Section are attached.

8. Include a copy of this review sheet with your response.

REGISTERED PROFESSIONAL ENGINEER
YOSHIYA MORISAKU
No. 57587
Exp. 6/30/07
STATE OF CALIFORNIA

Reviewed by _____ Date 7/12/05

NOTICE: **Public safety, relative to geotechnical subsurface exploration, shall be provided in accordance with current codes for excavations, inclusive of the Los Angeles County Code, Chapter 11.48, and the State of California, Title 8, Construction Safety Orders.**
P:\Yosh\53653TentT

PLATE VI-4

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

SOILS ENGINEERING REVIEW SHEET

ddress: 900 S. Fremont Ave., Alhambra, CA 91803
Telephone: (626) 458-4925
Fax: (626) 458-4913

District Office 8.2
Job Number GMTR & LX001129
Sheet 1 of 1

Review No. 1

DISTRIBUTION:
1 Drainage
1 Grading
1 Geo/Soils Central File
District Engineer
1 Geologist
1 Soils Engineer
1 Engineer/Architect

Tentative Map (Tract)	53653
Location	Santa Clarita
Developer/Owner	Warner Brothers Entertainment Inc.
Engineer/Architect	Daly Owens Group
Soils Engineer	Pacific Soils Engineering, Inc. (102453-T)
Geologist	Same as above

Review of:
Tentative Map (Tract) Dated By Regional Planning 6/2/05
Soils Engineering and Geologic Report Dated **3/10/04**
Previous review sheet dated 7/12/05

ACTION:
Tentative Map feasibility is not recommended for approval.

REMARKS:

1. The Tentative Map dated by Regional Planning 6/2/05 does not conform with the geotechnical maps of the submitted report. Provide geotechnical maps and tentative map which conform, as requested by the Geology Section.

2. On Page 20 of the submitted report it states that the calculated (estimated) value for the seismically induced settlement ranged from ¼ to ¾ inches. The substantiating liquefaction analyses for these reported values were not provided within the copies of the submitted report. Therefore as previously requested, provide the substantiating liquefaction analyses and evaluate the potential for seismically induced settlement (**dry and saturated soils**), lateral spreading, surface manifestation, etc. The analyses must be performed for soils within the upper 50 feet, as a minimum, for shallow foundation, or greater depth where deep foundation and/or subterranean structure is proposed. The historic-high water table shall be used in the analyses, unless other information is provided which indicates a higher or lower level is appropriate. Recommend mitigation as necessary. The liquefaction data and analyses must conform to the State of California Division of Mines and Geology "Special Publication 117", dated 1997 and "Recommended Procedure For Implementation of DMG Special Publication 117", dated March 1999.

3. Provide the correlations between CPT/SPT utilized within the liquefaction analyses, as necessary. Provide references as necessary.

4. The CPT interpretations in Appendix III of the submitted report indicate several layers classified as Clay, Silt, and Clayey Silt. Provide substantiating data/test and references to verify that the soils layers classified as Clay, Silt, and Clayey Silt are non-liquefiable, e.g. "Chinese Criteria" (Seed and Idriss, 1982, etc.), as necessary.

5. Address potential debris flow(s) from natural slopes and/or swales (i.e. surficial creep, Qcol, etc.) located adjacent to proposed development, as requested by the Geology Section. Recommend mitigation measures as necessary.

6. On the submitted geotechnical maps, several debris basins are shown on the subject site. Provide slope stability analyses considering rapid drawdown condition for debris basins with slopes steeper than 3:1 gradient and designed with outlet structures, as necessary. Also, provide a geotechnical cross section, for each section analyzed, showing the critical failure plane used in the analyses. Indicate the various shear strength parameters used in the analyses, in the appropriate segments of each failure plane. Show locations of the cross sections used in slope stability analyses on the geotechnical map. Recommend mitigation if factors of safety are below County minimum standards.

7. Show the following on the geotechnical map:
   a. Location of all proposed settlement monuments.
   b. All recommended mitigation measures.

8. Requirements of the Geology Section are attached.

9. Include a copy of this review sheet with your response.

REGISTERED PROFESSIONAL ENGINEER
YOSHIYA MORISAKU
No. 67587
Exp. 6/30/07
CIVIL
STATE OF CALIFORNIA

Reviewed by Yoshiya Morisaku Date 9/13/05

NOTICE: Public safety, relative to geotechnical subsurface exploration, shall be provided in accordance with current codes for excavations, inclusive of the Los Angeles County Code, Chapter 11.48, and the State of California, Title 8, Construction Safety Orders.
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PLATE VI-5

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

SOILS ENGINEERING REVIEW SHEET

Address: 900 S. Fremont Ave., Alhambra, CA 91803
Telephone: (626) 458-4925
Fax: (626) 458-4913

District Office 8.2
Job Number LX001129
Sheet 1 of 1

DISTRIBUTION:
1 Drainage
1 Grading
1 Geo/Soils Central File
. District Engineer
1 Geologist
1 Soils Engineer
1 Engineer/Architect

Tentative Map (Tract)	53653
Location	Santa Clarita
Developer/Owner	Warner Brothers Entertainment Inc.
Engineer/Architect	Daly Owens Group
Soils Engineer	Pacific Soils Engineering, Inc. (102453-T)
Geologist	Same as above

Review of:
Revised Tentative Map (Tract) Dated By Regional Planning **12/14/05**
Soils Engineering and Geologic Report Dated 3/10/04
Previous review sheet dated 9/28/05

ACTION:
Tentative Map feasibility is not recommended for approval.

REMARKS:

As Previously Requested:

1. The Tentative Map dated by Regional Planning 9/6/05 does not conform with the geotechnical maps of the submitted report. Provide geotechnical maps and tentative map which conform, as requested by the Geology Section.

2. On Page 20 of the submitted report it states that the calculated (estimated) value for the seismically induced settlement ranged from ¼ to ¾ inches. The substantiating liquefaction analyses for these reported values were not provided within the copies of the submitted report. Therefore as previously requested, provide the substantiating liquefaction analyses and evaluate the potential for seismically induced settlement (**dry and saturated soils**), lateral spreading, surface manifestation, etc. The analyses must be performed for soils within the upper 50 feet, as a minimum, for shallow foundation, or greater depth where deep foundation and/or subterranean structure is proposed. The historic-high water table shall be used in the analyses, unless other information is provided which indicates a higher or lower level is appropriate. Recommend mitigation as necessary. The liquefaction data and analyses must conform to the State of California Division of Mines and Geology "Special Publication 117", dated 1997 and "Recommended Procedure For Implementation of DMG Special Publication 117", dated March 1999.

3. Provide the correlations between CPT/SPT utilized within the liquefaction analyses, as necessary. Provide references as necessary.

4. The CPT interpretations in Appendix III of the submitted report indicate several layers classified as Clay, Silt, and Clayey Silt. Provide substantiating data/test and references to verify that the soils layers classified as Clay, Silt, and Clayey Silt are non-liquefiable, e.g. "Chinese Criteria" (Seed and Idriss, 1982, etc.), as necessary.

5. Address potential debris flow(s) from natural slopes and/or swales (i.e. surficial creep, Qcol, etc.) located adjacent to proposed development, as requested by the Geology Section. Recommend mitigation measures as necessary.

6. On the submitted geotechnical maps, several debris basins are shown on the subject site. Provide slope stability analyses considering rapid drawdown condition for debris basins with slopes steeper than 3:1 gradient and designed with outlet structures, as necessary. Also, provide a geotechnical cross section, for each section analyzed, showing the critical failure plane used in the analyses. Indicate the various shear strength parameters used in the analyses, in the appropriate segments of each failure plane. Show locations of the cross sections used in slope stability analyses on the geotechnical map. Recommend mitigation if factors of safety are below County minimum standards.

7. Show the following on the geotechnical map:
   a. Location of all proposed settlement monuments.
   b. All recommended mitigation measures.

8. Requirements of the Geology Section are attached.

9. Include a copy of this review sheet with your response.

REGISTERED PROFESSIONAL ENGINEER
YOSHIYA MORISAKU
No. 67687
Exp. 6/30/07
STATE OF CALIFORNIA

Reviewed by _____ Date 1/17/06
Yoshiya Morisaku

NOTICE: Public safety, relative to geotechnical subsurface exploration, shall be provided in accordance with current codes for excavations, inclusive of the Los Angeles County Code, Chapter 11.48, and the State of California, Title 8, Construction Safety Orders.
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PLATE VI-6