DRAFT ENVIRONMENTAL IMPACT REPORT

TECHNICAL APPENDICES
VOLUME II

The Keystone Project

THE
KEYSTONE

Prepared for:

City of Santa Clarita

Prepared By:

CHRISTOPHER A. JOSEPH & ASSOCIATES
Environmental Planning and Research

July, 2005

APPENDICES: VOLUME II

APPENDIX 5

Geologic and Geotechnical Report, Allan E. Seward Engineering Geology, Inc. (June 2004)

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

GEOLOGIC AND GEOTECHNICAL REPORT

Review of Tentative Tract Map (Dated April 1, 2004)
Vesting Tentative Tract 60258
City of Santa Clarita, California

VOLUME I OF II

Prepared for:

Synergy, A Land and Development Company
19200 Von Karman, Suite 600
Irvine, California 92612

Job No: 04-803S-4
Dated June 11, 2004

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TABLE OF CONTENTS

VOLUME I

TABLE OF CONTENTS

TABLE OF CONTENTS

VOLUME I

TABLE OF CONTENTS

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[1] Logs from report dated 4/4/03 for Tentative Tract 53425, prepared for Newhall Land.

TABLE OF CONTENTS

APPENDIX G - MAPS AND CROSS SECTIONS

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

June 11, 2004 Job No: 04-803S-4

Synergy, A Land & Development Company
19200 Von Karman, Suite 600
Irvine, California 92612

Attention: Mr. Rick Doremus

Subject: **GEOLOGIC AND GEOTECHNICAL REPORT**
Review of Tentative Tract Map (Dated April 1, 2004)

Project: Vesting Tentative Tract 60258
City of Santa Clarita, California

References: See at end of text

Gentlemen:

This report presents our opinions on the existing geologic and geotechnical conditions on the above-referenced tentative tract and their effects on the proposed development.

1.0 SCOPE OF INVESTIGATION

This investigation included the following:

1. Review of previous reports by this firm in the vicinity of the subject site.
2. Review of reports by others in the vicinity of the subject project (see References).
3. Review of Published reports and maps listed in the **References** section.
4. Review of the 2003 Munger Map Book, California-Alaska Oil & Gas Field.
5. Review of Alquist-Priolo Fault Rupture Hazard Zones in California (CDMG Special Publication 42).

27825 Smyth Drive, Valencia, California 91355 661-294-0065 FAX 661-294-0833

6. Review of the following aerial photographs:

DATED	PHOTO	SCALE	AGENCY
1928	C300: 211, 212, 213	1" = 1700'±	Fairchild
11/4/52	AXJ: 3K-95, 3K-96	1" = 1600'±	USDA
8/25/80	480-163, -164	1" = 4000'±	USDA
5/9/85	1, 2, 3	1" = 550'±	ESCO
11/20/98	1-1, 1-2, 2-4, 2-5	1" = 770'±	Robert Lung & Assoc.

7. Coordination with the Project Supervising Civil Engineer, Sikand Engineering.

8. Review of the site topography and the vesting tentative tract map design, dated April 1, 2004, provided to our office in computerized format (AutoCAD), prepared by Sikand Engineering. This computerized map was used as the base for our 100-scale Geologic/Geotechnical Map, **Sheet 1**, and 200-scale Geologic/Geotechnical Removal Map **Plate II**. We make no representations regarding the accuracy of the base map.

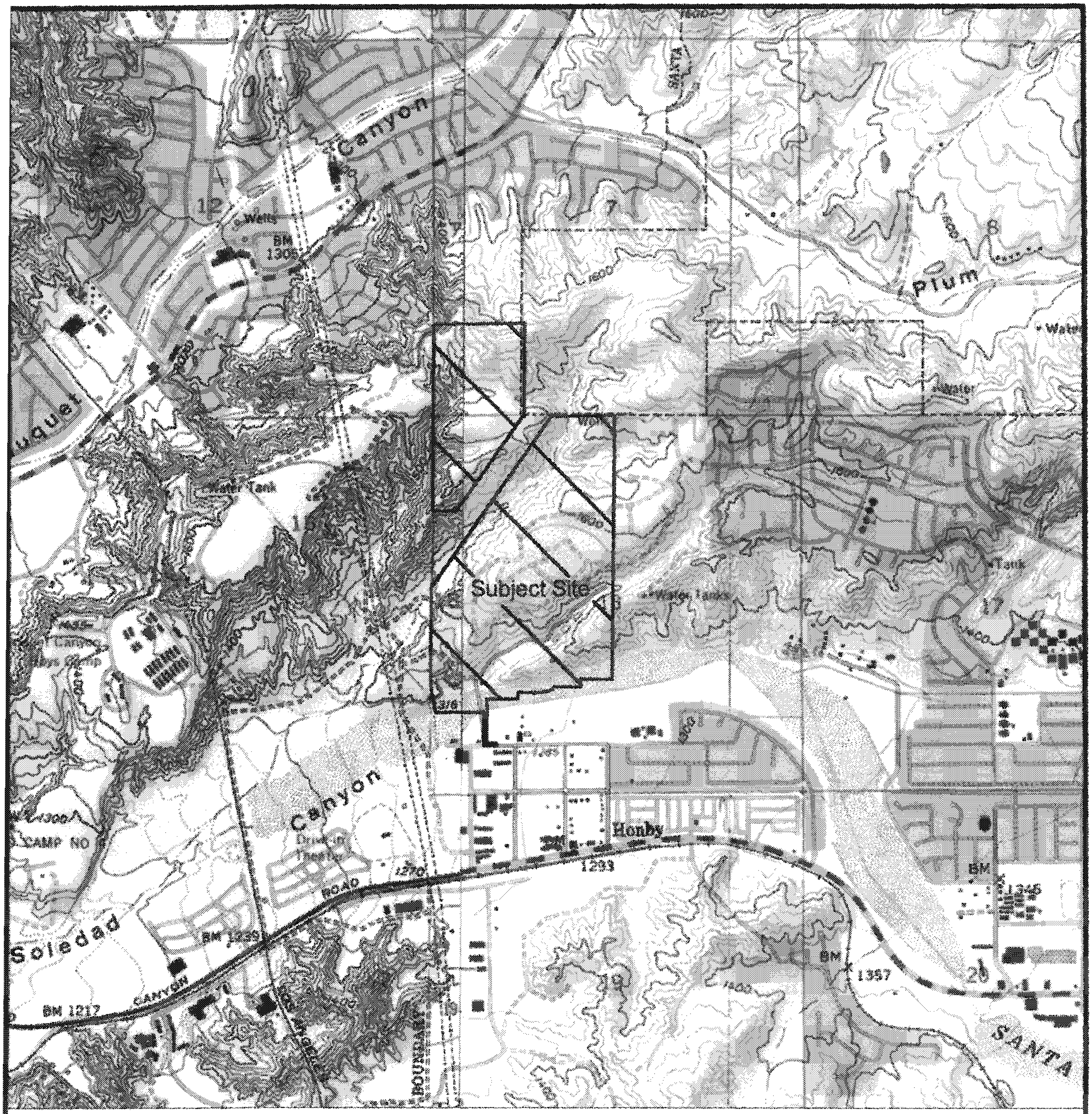
9. Geologic field mapping of the site.

10. Coordination with Underground Service Alert.

11. Excavation, sampling and logging of 17 bucket-auger borings drilled to a maximum depth of 90 feet.

12. Excavation, sampling and logging of 81 backhoe trenches excavated to a maximum depth of 14 feet.

13. Excavation and sampling and logging of one hand excavated boring to a depth of 16 feet.



Source: U.S. Geological Survey Newhall and Mint Canyon Quadrangles, Dated 1952, Photorevised 1969 and Dated 1960, Photorevised 1988 Respectively

Approximate Scale: 1"=2,000'

NOTE: THIS IS NOT A SURVEY OF THE PROPERTY

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

LOCATION MAP

Job No.: 04-803S-4
Date: 6/11/04

14. Laboratory testing of selected bulk and relatively undisturbed samples obtained in our subsurface investigations. Testing included dry density and moisture content of in-situ soils, percent minus #200 sieve, grain-size analysis, Atterberg limits, compaction, (modified Proctor), direct shear, hydroconsolidation, expansion index, sulfates, chlorides, pH and resistivity.

15. Evaluation of potential seismic ground motions at the site utilizing computer programs by Thomas Blake in accordance with current State Guidelines.

16. Geotechnical analysis of potential liquefaction, lateral spreading and seismic settlements based on our subsurface investigations, laboratory testing and potential seismic ground motion estimates.

17. Assessment of recommended grading removal depths based on weak soils, seismic settlements and proposed fill heights above the exiting ground surface.

18. Preparation of 16 geologic cross sections illustrating anticipated conditions for the proposed cut, fill and natural slopes.

19. Stability analyses of proposed cut slopes, fill slopes and natural slopes on the site.

20. Preparation of Geologic/Geotechnical Map, a Geologic/Geotechnical Removal Map, Location Map, drill hole logs, trench logs and pertinent figures.

21. Preparation of this report summarizing the results of our investigations and our conclusions and recommendations for the proposed development.

2.0 BACKGROUND

Large portions of the subject property were originally evaluated by this firm (AESEGI) in conjunction with Jeffrey S. Gordon Geotechnical Engineering (no longer in business) back in the mid eighties. Our report and Jeffrey S. Gordon Geotechnical Engineering report both dated November 13, 1986 addressed Tentative Tract 31236 which consisted of 125± acres. See references at the end of text for reviewed reports. All our data and data from Jeff Gordon Geotechnical Engineering has been incorporated into this study. Where appropriate, Jeffrey S. Gordon Geotechnical Engineering report data was incorporated into our evaluation. We have also included Geologic and Geotechnical data in the vicinity of the intersection of Newhall Ranch Road and Golden Valley Road from our April 4, 2003 report for the adjacent undeveloped Vesting Tentative Tract 53425.

Our recent investigation for the site was performed over a period of approximately one year.

3.0 SITE DESCRIPTION

The subject site consists of 247 acres and is bounded by the Santa Clara River to the south, developed Tract 44846 to the east, undeveloped land to the north and undeveloped Vesting Tentative Tract 53425 to the west. A northeast-southwest trending Los Angeles Department of Water and Power Easement (transmission lines) divides the site into two development areas. The main channel of the Santa Clara River is located at the southern portion of the property (see **Location Map**). The northern portion of the property includes the elevated areas characterized by southwest to southeast trending spur ridges that descend from plateaus elevated up to about 1780 feet. Elevations on the site range from approximately 1280 feet along the Santa Clara River to 1780 feet along the northerly portion of the site. Slopes range from gentle to moderately steep with the steepest slopes existing in the side canyons and swale areas. Details of the site topography are illustrated on the attached **Geologic/Geotechnical Map (Sheet 1)**. Although much of the property appears to remain in a natural state, the property has been disturbed by past grading associated with the aggregate mining activities. Additional minor grading has also been performed for the various access roads that traverse the site. Existing buildings are present within the canyon located where the existing DWP maintenance road is located at the western portion just north of the Golden Valley Road alignment. One oil well is located at the southwestern corner of the property.

4.0 PROPOSED DEVELOPMENT

The Tentative Tract Map for this site proposes 96 lots for single family residences, 4 multifamily lots, one industrial lot and one school site lot. The remaining lots are proposed graded slope lots and natural open space lots. Infrastructure for the project includes Golden Valley Road with associated smaller roadways providing access to the development. Existing Ermine Street, located at the eastern portion of the site is proposed to attach to Golden Valley Road. An alignment for a future walkway is illustrated along the northern margin of the Santa Clara River at the southern portion of the development. It is anticipated that mass grading by cut and fill techniques will be used to create level building pads at a variety of grades between the Santa Clara River and the crest of the ascending ridges.

5.0 GEOLOGIC SETTING

The site is situated in the western Transverse Ranges geomorphic province in the western portion of the Soledad Basin just north of the San Gabriel Fault zone. Numerous east-west trending folds and reverse faults that are the result of on-going compressional tectonics characterize this region. The Soledad Basin is roughly a rectangular-shaped southwesterly plunging synclinal structure that extends between the San Gabriel fault in the Newhall-Saugus area and the San Andreas Fault near Palmdale. A thick accumulation of Cenozoic sedimentary rocks has accumulated in this structural/depositional basin and has subsequently been faulted and folded by repeated tectonic deformation.

Much of the elevated portion of the property is mantled by accumulations of ancient river channel deposits deposited on a series of successively lower benches cut in the underlying Saugus Formation bedrock by the ancestral Santa Clara River. These depositional terrace deposits exhibit crude horizontal stratification. Quaternary alluvium covers the valley floors.

The Saugus Formation bedrock below much of the property has been uplifted and deformed by past tectonic forces such that the bedding planes are dipping towards the north at angles ranging from 3 to 17 degrees. The axial trace of a roughly east-west trending syncline is present north of the tract property boundary and a axial trace for a roughly east-west trending anticline is located just south of the tract property line in the vicinity of the proposed Golden Valley Road and Newhall Ranch Road intersection. The active San Gabriel Fault is located approximately 1.5 miles south of the site. For more detailed discussion on the fault, please see **Section 8 (Seismic Considerations)** of this report.

The subject property has been affected by slope movements that range in size from small debris flows and rockfalls to large, possibly deep-seated failures. Three landslides have been mapped on the site.

6.0 FIELD EXPLORATIONS

6.1 Surface Mapping

For this report, surface geologic mapping in conjunction with aerial photo interpretations was undertaken by personnel from Allan E. Seward Engineering Geology Inc. (AESEGI) using the proposed 100-scale Tentative Map as the base map. We also reviewed all our previous geologic/geotechnical data and reports by others in the vicinity of the project.

6.2 Subsurface Investigations

Our subsurface explorations included logging of rotary-wash, hollow-stem-auger, bucket-auger, hand excavated borings and trenches. Valley Well Drilling performed the rotary-wash drill holes. Tri-Valley Drilling excavated the bucket-auger drill holes and Quality Construction dug the hand-excavated boring, and D.E. Eddings excavated the trenches. The drill holes and trenches were logged and sampled by AESEGI personnel. Copies of all of our drill holes and trench logs are presented in **Appendix A**. The locations of the drill holes, trenches are shown on the **Geologic/Geotechnical Map (Sheet 1)**.

The drill hole logs included in **Appendix A** represent our interpretation of field data prepared for each boring by our geologic/engineering staff at the time of drilling, along with refinements based on inspection and laboratory test results. Unit boundaries shown in the graphic log column of our rotary-wash and hollow-stem-auger drill hole logs are approximate and may represent gradual transitions.

6.3 Sampling Procedures

California-Drive (relatively undisturbed ring samples) and Standard Penetration Test (SPT) samples were obtained in the exploratory drill and hand excavated holes at various depths (see logs in **Appendix A**). Recovered soil samples were sealed in plastic containers and brought to our laboratory for further classification and testing.

Bulk (disturbed) samples of the near surface soils and bedrock were obtained from cuttings developed during excavation of the exploratory drill holes and trenches. The bulk samples were collected for classification and testing purposes and represent a mixture of soils within the noted depths.

7.0 GENERALIZED GEOLOGIC/GEOTECHNICAL SUBSURFACE CONDITIONS AND SOIL PROPERTIES

7.1 Laboratory Program

After visual and tactile classification in the field, the soil samples were brought to our laboratory. The soil classifications were checked in accordance with the Unified Soils Classification System. The field logs were reviewed to assess which samples would be analyzed or tested further. The results of the field investigation and the laboratory tests were used as the basis for our analyses and recommendations presented in this report. Laboratory test results are presented in **Appendix B**.

7.2 Geologic Units

A general description of geologic units, including bedrock, terrace deposits, alluvium, slopewash, landslides, and artificial fill are presented below. Distribution of these units is shown on the Geologic/Geotechnical map.

7.2.1 Saugus Formation (TQs)

The bedrock encountered consists of sedimentary rocks of the late Pliocene to Pleistocene Saugus Formation. This section contains fluvial and transitional lithologies of the lower Saugus Formation, including light-gray sandstone and conglomerate, greenish-gray siltstone, silty sandstone and reddish-brown and brown sandy mudstone and mudstone. Low strength clay beds can be present within the reddish-brown mudstone units and are generally the result of original deposition. These clay layers were **not** encountered during our subsurface exploration for the site. The Saugus Formation is typically moderately indurated.

7.2.2 Quaternary Terrace Deposits (Qt)

At least three levels of Quaternary Terrace Deposits are present on the subject site. The contacts are very gradational and at the southerly portion of the site the Terrace Deposits contact is concealed by the presence of artificial fill (see **Geologic/Geotechnical Map**). These deposits consist primarily of poorly to well-bedded, light-gray to yellowish-orange sand, conglomerate and sandy silts. Large boulders up to approximately 4 feet in diameter occur throughout the terrace deposits but are generally concentrated at the basal contact. These deposits are typically friable to poorly indurated and are typically weathered to a depth of 5 to 8 feet. Bedding within the Terrace Deposits is generally horizontal to sub-horizontal and is typically non-continuous.

7.2.3 Quaternary Alluvium (Qal)

Recent river-channel deposits are present in the lower elevations of the property, largely underlying the immediate modern drainage and major tributaries of the Santa Clara River (see **Geologic/Geotechnical Map**). Based on the boring data obtained for the project, the alluvial deposits consist of unconsolidated interbeds of poorly graded sand, silty sand with gravels and boulders. The conditions of the alluvial soils present in each noted area are summarized below.

Alluvial areas in the vicinity of the proposed school site were explored by rotary wash borings RW-1, RW-2 and RW-3. The granular alluvial soils were found to predominantly range from medium dense to very dense with lenses of loose granular soils from the recommended removal depths up to 36 feet.

The alluvial area in the vicinity of hollow-stem auger borings HS-1 and HS-2 and hand boring HB-1 consist of interbeds of poorly graded sand with silt and gravel and silty sand which are medium dense to very dense.

The alluvium deposits have a dry densities ranging from 112 pcf to 144 pcf with moisture ranging from 1.3 to 21.2 percent.

7.2.4 Slopewash (Qsw)

Swales and side-canyons adjacent to the main drainage of the Santa Clara River commonly contain loose debris consisting of poorly sorted sand, silt and bedrock fragments. Igneous boulders and cobbles were encountered at locations where the Quaternary Terrace Deposits are present within or above the swabs on side canyons. This material has accumulated via daily surface wash and periodic debris flows and is present above levels where they are incorporated and reworked by modern stream flow. They are generally poorly consolidated. The maximum thickness of Slopewash encountered in our exploratory excavations was 14 feet. Slopewash has been noted on the geologic logs and is indicated on the **Geologic/Geotechnical Map** where it is estimated to be greater than 4 feet in thickness.

7.2.5 Residual Soil

Ungraded areas of the site are mantled by surface soils consisting of moderate- to yellowish-brown and yellowish-gray silty sand with scattered pebbles. This unit is noted on our geologic logs, but is not shown on the Geologic/Geotechnical Map.

7.2.6 Artificial Fill (af)

Existing non-compacted artificial fill on the property ranges from minor spill fills generated during past grading of minor roads to large fill areas associated with the past aggregate mining activities associated with the Fred Furnival gravel pit operations during the early 1950's (see Geologic/Geotechnical Map). Most of this fill associated with the past aggregate mining operations has been placed at the southerly portion of the property in the vicinity of the proposed school site. Within these fills are concentrations of cobbles and boulders within a matrix of silty sand, clayey sand, poorly graded sand and gravels. The artificial fills have dry densities ranging from 100 to 120 pcf with moistures ranging from 10.5 to 15.3 percent. In addition, fill is loose to very dense. In proposed fill areas, all artificial fill impacting the proposed development will be entirely removed prior to placement of compacted/certified fill material. If artificial fill is present below proposed cut grade elevations, it should be completely removed and replaced with certified engineered fill.

7.2.7 Mass Movement Deposits

7.2.7.1 Landslides (Qls)

Three landslides are present on the subject property, however they do not encroach into the proposed development areas but are located above the proposed trail/walkway at the southeastern portion of the site (see **Geologic/Geotechnical Map**). These landslides are typically translational type of failures within the Saugus Formation and Terrace Deposits. The landslides typically consist of highly fractured rock resting above a low strength slip surface. Voids created by dilation of the bedrock (grabens) are commonly backfilled with rock debris and colluvial material. Landslides were identified based on examination of field exposures and suggestive geomorphic features observed on aerial photographs and on topographic base map and confirmed via field explorations. Recommended mitigation measures for each landslide are discussed in the **Landslide Summary (Table 1)** located after the references.

7.3 Ground Water

Ground water beneath the project can be grouped into two categories: 1) ground water contained in the recent alluvium; and 2) ground water perched above low permeability layers in the Saugus Formation and the Quaternary Terrace Deposits.

7.3.1 Alluvial Aquifer

Historic ground water levels for the alluvium were interpolated for the site based on records from ground water wells in the immediate area as well as from ground water contours by Robson (1972) and water levels observed in exploratory excavations by this firm. These data indicate that historic ground water levels have risen to within 3.3 to 24.8 feet of the existing ground surface along the margins of the Santa Clara River. Since the site is elevated above the Santa Clara River it is conservatively estimated that the historic high ground water elevation was five feet below the existing elevation of the alluvial ground surface.

In the vicinity of the proposed school site, ground water was encountered in all of our rotary-wash borings at depths ranging from 6 to 27 feet and was at the surface within the adjacent canyon drainage. This water is present due to the presence of a storm drain outlet located up-canyon off site from the proposed school site.

With the exception of the observed surface water noted above, no active surface seeps or springs were observed during the recent field mapping of the site.

Recommended removal depths in the alluvium may encounter ground water within the alluvial canyon at the locations of the Rotary wash borings RW-1, RW-2 and RW-3. Dewatering may locally be required to complete the necessary removals. It should be noted that the ground water table will fluctuate up and down in response to natural recharge and pumping requirements.

7.3.2 Perched Ground Water in the Saugus Formation Bedrock and Quaternary Terrace Deposits

Perched ground water was encountered in the Saugus Formation bedrock and Quaternary terrace deposits within our bucket auger borings B-3, B-11 and B-12, at the elevated portions of the site. Perched ground water conditions can contribute to slope instability in proposed natural and proposed cut slopes. Where appropriate, ground water was used in our slope stability analysis for the project. All stability/buttress fills are required to have backdrains. Subdrains are required in fill areas.

7.4 Soil Compressibility and Hydroconsolidation

Based upon consolidation test data developed for this project, the **compressibility** of the subsurface soils below the recommended removals is considered to be typically low to moderate within the depths tested ranging from 4 feet to 36 feet. Based upon laboratory data developed for this project, **no significant hydroconsolidation effects** due to water incursion are expected at the site after the recommended removals are completed.

7.5 Potential Expansion of Onsite Materials

Per the laboratory testing data, the soils at the site are predominantly granular. The alluvial deposits, slopewash and Terrace Deposits typically have a (i.e. tests per Reference 8) very low to low expansion potential. Saugus Formation bedrock materials were identified at the site. The medium expansive materials typically consist of the siltstone and mudstone units.

7.6 Potential Corrosivity of Soils

7.6.1 Soils Electrical Resistivity and pH

Selected samples of on-site soils were tested for resistivity and pH. Soil electrical resistivity values of selected shallow soils suggest that on-site soils classifying (per Peabody, 1969) as moderately corrosive to ferrous metals exist at the site; pH data shows no significant acidity of tested soils. Test results are presented in **Appendix B**.

7.6.2 Soluble Sulfate and Chloride Content in Soils

Selected samples of on-site soils were collected and tested for sulfates and chloride contents. Based upon test results, concrete exposure to sulfates in shallow soils classifies as negligible (per 1997 UBC Classification). Test results are presented in **Appendix B**.

7.7 Soils Shear Strength

Direct Shear tests were performed on samples of on-site Alluvium (Qal), Terrace Deposits (Qt) and Saugus Formation sandstone (TQs) material. Remolded samples of on-site soils were also tested for proposed fill materials shear strength. Tests results are presented in **Appendix B**.

7.8 Rippability

The bedrock encountered at the site consists primarily of siltstone and sandstone of the Saugus Formation. This formation generally is graded using typical grading equipment and techniques. Heavy single-shank ripping may be required within the more indurated portions.

7.9 Sewage Disposal

It is our understanding that sewage disposal will be by public sanitary sewers.

7.10 Erosion Potential

The existing provisions in the Grading Ordinance for planting and irrigation of constructed slopes in conjunction with drainage recommendations provided in the section "Surface Drainage and Erosion Control," will be sufficient mitigation against potential erosion within the subject site.

7.11 Debris Flow Hazards

Review of the tentative tract map design, the topographic base map and field mapping of the site indicates that debris flow hazard exists both northeast and southwest of proposed cut slope CS-17and exists at the southern portion of the development above the future walkway/trail. Debris flow hazard is designated (dfh) (**color-coded PINK**) on the **Geologic/ Geotechnical Map**. The following mitigation measures are available to mitigate the potential for debris flow hazard:

1. Remove loose surficial material
2. Construct diverter slough walls
3. Construct impact walls
4. Construct debris basins
5. Control run-off
6. Plant selective deep-rooted vegetation

Alternative debris control devices are also shown on **Figure E10** within **Appendix E**. Appropriate mitigations/options will be addressed at the Final Map stage for the development.

8.0 SEISMIC CONSIDERATIONS

8.1 Introduction

The subject property is within the Transverse Ranges Geomorphic Province of Southern California. The Transverse Ranges consist of a series of west-trending mountains and intervening valleys, which is contrary to the northwest geomorphic trend that is typical of most of California and reflects the underlying structural (geologic) trend. These ranges are largely the result of north-south compression, which has resulted in east-west-trending folds and thrust faults. Associated faults in the vicinity of the site include the San Gabriel Fault, Santa Susana, Northridge (East Oakridge) and Sierra Madre (San Fernando) reverse/thrust faults. The January 17, 1994 Northridge (M6.8) Earthquake occurred on a south-dipping thrust fault which uplifted the Santa Susana Mountains at least 40 cm.

The Southern California region is traversed by the San Andreas Fault, which is a transform boundary between the Pacific Plate and the North American Plate. The San Andreas Fault is part of the San Andreas system of northwest-striking, right-lateral faults. The faults of this system are generally historically active, as evidenced by the June 28, 1992 Landers (M7.6) Earthquake (**See Fault and Earthquake Epicenter Location Map, Figure D1 in Appendix D**).

The Southern California region is seismically active and commonly experiences strong ground shaking resulting from earthquakes along active faults. Earthquakes along these faults are part of a continuous, naturally occurring process, which has contributed to the characteristic landscape of the region.

Three common types of geologic hazards may be produced during a seismic event (earthquake). These include:

1. Ground Rupture;
2. Ground Motion; and
3. Ground Failure

8.2 Ground Rupture

Review of the CDMG Special Publication 42 indicates that the nearest fault designated as an active fault zone under Alquist-Priolo criteria is the San Gabriel Fault located approximately 1.5 miles south of the site. This fault is a major structural element of Southern California. In the Newhall-Saugus area, the San Gabriel Fault is classified as active under Alquist–Priolo criteria and is included within an Alquist-Priolo Special Studies Zone by the State of California.

During our field mapping of the site, one minor fault was detected southeast of hollow-stem auger HS-2 within the Saugus Formation bedrock. The observed minor fault consists of approximately 0.25 inch thick of silty clay gouge lined with caliche with approximately 8 inches of apparent reverse separation. Review of the aerial photographs listed at the beginning of this report did not reveal any lineaments or other evidence of Holocene activity. No evidence of fault offset of the overlying Quaternary Terrace Deposits has also been observed.

8.3 Ground Motion

Potential ground motions from future earthquakes on nearby faults have been evaluated utilizing the procedures outlined in the California Department of Conservation, Division of Mines and Geology (CDCMG) Guidelines described in Special Publication 117. **Appendix D** summarizes our ground motion evaluation, which utilized fault parameters from Peterson et al. (1996) and computer programs by Thomas F. Blake. Based on our probabilistic analysis, a peak horizontal acceleration of 0.70g was estimated as the design basis ground motion (10% chance of exceedance in 50 years) for use in our liquefaction assessment of the site, excluding the proposed school site. The peak ground acceleration with a 10% probability of exceedance in 100 years (upper bound ground motion) was calculated to be 0.84g. This acceleration was used for the liquefaction assessment for the alluvium on school site. Our deaggregation analysis utilizing Boore, et al. (1997) indicates this acceleration would most likely be produced by a 6.5 M earthquake on the Santa Susana fault. The average magnitude-weighted (7.5) acceleration was found to be 0.49g for the design basis earthquake (see Table D-III).

8.4 Ground Failure

Ground Failure is a general term describing seismically induced secondary permanent ground deformation caused by strong ground motion. This includes liquefaction, lateral spreading, seismic settlement of poorly consolidated materials (dynamic densification), differential materials response, slope failures, sympathetic movement on weak bedding planes or non-causative faults, shattered ridge effects and ground lurching.

Potential secondary seismic hazards to Tentative Tract 60258 are described in **Appendix D**. The potential for liquefaction and seismic settlement are evaluated in detail in **Appendix C**. The potential for adverse impacts to the proposed development from liquefaction and other secondary seismic effects is considered to be low to non-existent provided that our recommendations are incorporated into the Grading Plan and implemented during construction.

9.0 GENERAL CONCLUSIONS AND RECOMMENDATIONS

9.1 Feasibility of Development

Tentative Tract 60258 is feasible for development from the standpoint of geology/geotechnical conditions subject to the following recommendations.

9.2 Earthworks Recommendations

9.2.1 Introduction

All grading shall be accomplished under the observation and testing of the Project Soils Engineer, Engineering Geologist and/or their authorized representatives in accordance with the recommendations contained herein, the current Uniform Building Code requirements and this firm's "Recommended Earthwork Specifications" (**Appendix E**).

9.2.2 Site Preparation

The purpose of site preparation is to clear and strip the site of organics (vegetation), topsoil, roots, undocumented artificial fill, rubble, construction debris and other unsuitable materials, as applicable, and to grade the site to provide a firm base for compacted fill. All organics should be removed from the site for proper disposal. Topsoil may either be separately stockpiled for later reuse as topsoil in landscaped areas or properly disposed of offsite. On-site rubble should be disposed of as discussed in the "Debris" section below. The geotechnical engineer and/or his representatives shall observe the excavated areas prior to placing compacted fill.

9.2.3 Removals and Benching

In order to provide a uniform firm bottom prior to placing fill, all unconsolidated alluvium, slopewash, colluvial soils and severely weathered terrace deposits and bedrock should be removed from areas to receive fill. The estimated depths of removals are 5 to 36 feet as shown on the **Geologic/Geotechnical Removal Map (Plate II)**. The exact depth and extent of necessary removals will be determined in the field during the grading operations when observations and more location-specific evaluations can be performed. Removal depths for these areas are based on our subsurface investigations and analyses (including liquefaction and cyclic settlement analyses) as well as geologic and geotechnical judgment.

All existing artificial fill (af) (i.e. uncertified fill) is considered unsuitable for support of proposed engineered fills and/or structures and must be removed and replaced with compacted fill. It is estimated that a thickness of up to 20 feet of artificial fill currently exists in the vicinity of the proposed school site (see Geologic/Geotechnical Map). Slopewash is present within the canyon swales and on drainage sideslopes as shown on the **Geologic/Geotechnical Map.** Slopewash typically interfingers with the alluvium as illustrated on the **Schematic Alluvial/Slopewash Detail, Figure E1** within **Appendix E**. Slopewash may locally be 4 to approximately 18 feet in thickness. Removals at the locations of exploratory trenches should be extended to the bottom of the trench backfill if the adjacent removal depths are shallower than the trench (see **Geologic/Geotechnical Map** for locations).

In areas to receive compacted fill where the surface gradient is steeper than 5:1 (H:V) the soil mantle, slopewash/colluvium and unsuitable material should be removed and such areas benched horizontally into competent material prior to our in conjunction with fill placement (See **Appendix E, Fill Over Natural Slope, Figure E2**).

9.2.4 Preparation of Removal Bottom Areas

After the ground surface to receive fill has been exposed, it shall be ripped to a minimum depth of six inches, brought to optimum moisture content or above and thoroughly mixed to obtain a near uniform moisture condition and uniform blend of materials, and then compacted to the required relative compaction per the latest ASTM D 1557 laboratory maximum density.

9.2.5 Dewatering During Removals

As previously discussed and depending on construction season, ground water may be encountered during grading removals to the recommended depths at the location of the proposed school site canyon. The grading contractor should be prepared to implement dewatering measures as necessary, to achieve the required removals.

Where recommended removals encounter ground water, water levels will probably have to be controlled by providing an adequate excavation bottom slope and sumps for pumping water out as the excavation proceeds, or ground water may be lowered by installing shallow dewatering well points prior to grading. Partial removals of soils above the water table and soil improvement below the water table (e.g. shallow compaction grouting) may be another option. Dewatering may be needed depending on the season when the removals are performed.

9.2.6 Over-Excavation

It is recommended that a minimum 5-foot thick over-excavation be performed on all cut-lots, transitional lots (transitions between bedrock, fill, terrace deposits and alluvium) and streets. This over-excavation will provide attenuation of potential differential settlements or differential material response to seismic events and provide a uniform base for structural support of buildings. If on a cut/fill transition lot the maximum depth of fill exceeds 15 feet, then the thickness of the fill cap should be one-third of the deepest fill thickness below any proposed structure [see **Appendix E, Cut Lot and Cut Fill Lot (Transitional), Figure E3**]. If excavation of the native soils (i.e. bedrock) exposes expansive materials, then the lot over-excavation should be deepened to 8 feet.

9.2.7 Fill Materials

Onsite soils that are free of debris, over-size rocks, topsoil and organic materials may be used as sources for compacted fills. Rock or similar irreducible material with a maximum dimension greater than eight (8) inches may not be placed in the certified compacted fill. Rocks or hard fragments larger than four (4) inches shall not compose more than 25 percent of the fill and/or lift. Any large rock fragments over eight (8) inches in size, may be incorporated into the fill as rockfill in windrows at specific locations per our rock disposal diagram (see **Figure E4**, in **Appendix E**). Where fill depths are too shallow to allow large rock disposal, special handling or removal may be required (see **"Recommended Earthwork Specifications," Appendix E**).

9.2.8 Fill Compaction

All fill material should be placed in uniform lifts not exceeding 8 inches in its loose state and compacted to a minimum of 90 percent relative compaction as determined based on the latest ASTM Test Designation D-1557. Additional field compaction requirements are presented in **Appendix E, "Recommended Earthwork Specifications"**. **Appendix E** also includes recommended specifications for placement of trench backfill.

For fills deeper than 40 feet, the portion of fill below 40 feet depth should be compacted to a minimum of 93 percent relative compaction. To ensure compliance, these areas should be delineated at the Grading Plan stage.

9.2.9 Proposed Fill Slopes

Fill slope inclination should not be steeper than 2:1 (h:v). The fill material within approximately one equipment width (typically 15 feet) of the slope face should be constructed with cohesive material obtained from on-site soils. The finished fill-slope face shall be constructed by over-building the slope and cutting back to the compacted fill material. Stability Fills are recommended where cut slope faces will expose fill-over bedrock, alluvium-over-bedrock or Quaternary Terrace Deposits over bedrock conditions. These fills should be constructed with a keyway at the toe of the fill slope with a minimum equipment width but not less than 15 feet, and a minimum depth of 3 feet into the firm undisturbed earth. Following completion of the keyway excavations, the project engineering geologist shall observe and approve the keyway bottom prior to backfilling with Certified Engineered Fill.

Where fill slopes are constructed above natural ground with a gradient of 5:1 (H:V) or steeper, all topsoil, slopewash/colluvium, and unsuitable material should be removed and a keyway should be constructed at the toe of the fill slope with a minimum width of 15 feet, and a minimum depth of 3 feet into firm undisturbed earth (see **Appendix E, Fill Slope Over Natural Slope diagram, Figure E5**). Following completion of the keyway excavations, the project Engineering Geologist/Geotechnical Engineer or his representative shall observe and approve the keyway bottom prior to backfilling with compacted fill.

Where fill slopes toe out on relatively level natural ground, the removals should be performed to a minimum 1:1 projection from the toe of slope to the recommended removal depth, (see **Appendix E, Fill Slope Toeing Out on Flat Alluviated Canyon, Figure E6**).

Where sliver fill-slopes are proposed, it is recommended that the slope be constructed with a minimum 15-foot width Stability Fill throughout, which is keyed in at the toe of slope (see **Appendix E, Stability/Buttress Fill and Backdrains Detail, Figure E7**).

9.2.10 Proposed Cut slopes

We have identified 18 proposed cut slopes (25± feet or higher) on the subject site and designated them as CS-1 through CS-18. The slope geometry, anticipated geologic conditions and recommended mitigation, if necessary, for each slope are presented in the Cut slope Summary (**Table 2**) located at the end of the text. It has been conservatively assumed for the purposes of stability analysis that weak bedding planes may occur anywhere in the proposed cut slopes. If any of the smaller proposed cut slopes (less than 25± feet in height) have adverse geologic of grading configurations (fill over cut) they can be mitigated if necessary with a standard 15 to 20-foot wide key (depending on the proposed cut slope height) and benching similar to a Stability Fill. A "Typical Fill above Cut slope" detail is shown on **Figure E8** within **Appendix E**.

All permanent cut slopes should be constructed at a slope ratio not steeper than 2:1 (horizontal to vertical). All permanent cut slopes exposing terrace deposits or alluvium should be constructed as a stability fills. Temporary cut slopes in competent rock may be constructed as steep as 1.5:1 (h:v). Potential unstable subsurface conditions exposed during construction, such as adverse bedding, joint planes, zones of weakness or exposed seepage, may require either flatter slopes than specified above or construction of benches. We recommend that an Engineering Geologist observe all backcuts during the grading operations and provide appropriate recommendations if necessary.

9.2.11 Natural Slopes

The natural slopes proposed on Tentative Tract 60258 have gradients ranging from 5:1 to 1.1:1 (h:v). All natural slopes that are relatively steep and have accumulations of soil and slopewash which are prone to debris flow hazard. We constructed Geologic Cross Sections where natural slopes and the underlying geologic conditions either above or below the proposed building pads warranted analysis.

A fill over natural slope condition is proposed along the southern edge of the proposed school site (Lot 102) above the Santa Clara River. The natural slope is approximately 90 feet high and has a 1.1:1 (h/v) slope gradient. Up to forty feet of fill is proposed on top of this natural slope. The geologic conditions are illustrated on cross section 3-3'. Slope stability analysis performed on this cross section (see

Appendix F) indicates this fill over natural slope satisfies the City of Santa Clarita factor of safety requirement for slope stability. However, due to the steepness and height of the descending natural slope and due to the fill over natural slope condition, it is recommended that a twenty foot horizontal bench be designed to set back the fill slope from the descending natural slope. It is recommended that this horizontal bench extend laterally a distance of approximately 450 feet. This recommended bench is color coded **YELLOW** on the **Geologic/Geotechnical Map** as well as on **Cross Section 3-3' Plate II**.

Slope stability analysis performed on cross section 5-5' illustrating the south east facing descending natural slope located easterly of proposed cut slope CS-5 indicates this natural slope satisfies the City of Santa Clarita factor of safety requirement for slope stability.

The 75 feet high approximately 1:1 (h/v) gradient natural slope is located westerly of lot 99 within the DWP easement. This natural slope is considered the most critical natural slope exposing Quaternary Terrace Deposits. The three dimensional geometry of the underlying geologic conditions is illustrated on cross section 13-13'. Slope stability analysis performed on this cross section indicates that this natural satisfies the City of Santa Clarita factor of safety requirement for slope stability.

9.2.12 Future Walkway Alignment

A future walkway alignment located at the southern portion of the development adjacent to the Santa Clara River. The tentative tract map does not illustrate specific grading design for this walkway (trail) alignment, however, tentative tract civil section D-D (See the Tentative Tract Map) illustrates three potential design conditions anticipated with respect to the site topography. All design conditions include embankment protection extending ± 8 feet below the Santa Clara River grade with the trail elevated 10 feet above river elevation. Condition 1 indicates a proposed retaining wall (up to 14 feet) above the walkway. Condition 2 indicates a 4:1 (h/v) gradient slope above the trail and condition 3 indicates a major drainage course condition. The following comments are provided relative to the anticipated geologic and geotechnical conditions in the vicinity of the future walkway/trail.

- The natural slope area is composed of primarily Saugus Formation bedrock with bedding planes dipping towards the north into the (slope face). This geometric configuration of the bedding planes is favorable with respect to this south facing natural slope.

- Constructed cross section 3-3' illustrates the steep natural slope located above the trail alignment. Stability analysis performed on this cross section with the added fill surcharge indicates the natural slope above the proposed trail satisfies the City of Santa Clarita factor of safety requirement for slope stability.
- The proposed walkway will be subject to surficial slope instability due to the steep (up to 1:1 h:v) natural slopes.
- The proposed walkway will subject to debris flow hazard along portions of the trail alignment.
- Due to the location of the trail with respect to the Santa Clara River, ground water may be encountered during the future recommended remedial removals for the proposed embankment protection.
- Additional investigation and evaluation will be required when site specific plans and details for the walkway are made available.

9.2.13 Restricted Use Areas

Landslides Qls-1, Qls-2 and Qls-3 presented within Table 1 should be included on the Final Map as a Restricted Use Area. It is our understanding that Landslides cannot be subdivided.

9.2.14 Exploratory Trench and Boring Backfill

All of the exploratory trenches and borings previously excavated for this project should be over-excavated and backfilled with compacted fill in accordance with the earthworks recommendations of this report.

9.3 Oil Wells

Review of the 2003 Munger Map book indicates that one oil well ("Furnival" #1) is present at the southern portion of the subject property. Oil well records on file with the California Department of Conservation, Division of Oil, Gas and Geothermal Resources (DOGGR) were obtained for this well. The DOGGR will require review of the original abandonment files relative to the proposed development and possibly require re-abandonment to the latest DOGGR requirements. We have included the abandonment records for this well after the text. For approximate location of this oil well, see the **Geologic/Geotechnical Map**.

If any leaking of undocumented oil wells are encountered during grading operations, their locations should be surveyed and the current well conditions evaluated immediately. Soils in the vicinity of oil wells could be contaminated with petroleum products spilled during operation of the wells. Wells may have associated mud pits which could also contain materials considered to be hazardous under current environmental regulations. If potentially hazardous materials are encountered during future grading operations, they should be assessed and mitigated.

9.4 Drainage Control

Ground water and soil moisture conditions can vary seasonally or for other reasons. It must be recognized that we do not and cannot have complete knowledge of the subsurface conditions at the site. It is possible that seepage could be encountered while stripping and excavating during site preparation at some areas (e.g. in drainages or along terrace/bedrock contacts on the site). Whenever seepage is observed, the condition must be evaluated by the Engineering Geologist and Geotechnical Engineer prior to covering with fill material.

9.4.1 Surface Drainage and Erosion Control

Surface drainage control design should include provisions for positive surface gradients to ensure that surface runoff is not permitted to pond, particularly above slopes or adjacent to building foundations or slabs. Surface runoff should be directed away from slopes and foundations and collected in lined ditches or drainage swales, via non-erodible drainage devices, which should discharge to paved roadways, or existing watercourses. If these facilities discharge onto natural ground, means should be provided to control erosion and to create sheet flow.

It should be expected that, even with the construction of carefully planned and designed erosion control measures, some erosion may occur during the first few wet seasons after the project is completed. Site grading should be inspected, particularly after heavy, prolonged rainfall, to identify erosion areas at an early stage. Maintenance work should be done as soon as practical to repair these areas and prevent their enlargement.

9.4.2 Subsurface Water Control

Fill slopes and stability fills, as applicable, should be provided with subsurface drainage as necessary for stability. A typical backdrain detail is shown on **Figure E7, Appendix E**. Also, subdrains along the bottom of canyon fills should be constructed. A typical canyon subdrain detail is presented on **Figure E9**.

9.5 Shrinkage, Bulking and Subsidence

The following bulking and shrinkage factors are based on judgment and in-situ densities compared to average of 94 percent relative to the maximum dry density as determined per the ASTM D 1557 test. For the materials encountered at the site, shrinkage (decrease in volume) or bulking of those materials, when excavated, placed and compacted as controlled fill is estimated to be as follows:

MATERIAL TYPE	SHRINKAGE (%)	BULKING (%)
Artificial Fill (af)	20-25%	
Alluvium (Qal)	15-18%	
Slopewash (SW)	15-20%	
Upper Qt (0-8' depth)[1]	12-15%	
Qt (>8' depth)	3-6%	
Upper TQs (0-3' depth)*	5-8%	
TQs (>3' depth)		2-5%

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[1] Denotes typical upper weathered zones in Terrace Deposits (Qt) and Saugus Formation (TQs) that are prone to shrinkage

The above shrinkage, bulking and subsidence factors are only approximations. The actual volume changes from cut to fill depend on the quality or degree of compaction. The Supervising Civil Engineer should design pad grades with sufficient flexibility to accommodate a possible shortage of fill of up to 10 percent of the total yardage graded.

It should be noted that Quaternary Terrace deposits will provide the majority of the total on-site fill materials.

9.6 Landscaping

All final grades should be sloped away from the building foundations to allow rapid removal of surface water runoff. No ponding of water should be allowed adjacent to the foundations. Plants and other landscaped vegetation requiring excessive watering should be avoided adjacent to the building foundations. Should landscaping be constructed, an effective water-tight barrier should be provided to prevent water from affecting the building foundations.

9.7 Foundation and Settlement Considerations

No specific building foundation designs have been provided at this time. The following general foundation criteria are provided for future design and planning consideration. The proposed Tentative Tract may generally involve the following foundation support conditions:

- Foundation support within certified engineered fill
- Foundation support within transition zones of cut and fill

The structural design should include seismic geotechnical parameters in accordance with UBC requirements for Seismic Zone 4. These parameters will be established at the Grading Plan stage in conformance.

Shallow spread footings for foundation support of residential structures can adequately be founded on engineered fill compacted as previously recommended. Support for heavier structures, if applicable, should be addressed at the Grading Plan stage. Minimum recommended continuous (wall) foundation dimensions are 12 inches width and 12 inches depth below lowest adjacent grade for single-story residential structures. Tentatively, an allowable bearing capacity of **1500 psf** can be used for (minimum-sized) shallow foundations constructed in certified compacted fill. This tentative allowable bearing value should be confirmed by further field and laboratory testing of the site soils before use in design. Lateral resistance of footing walls should be provided at the Grading Plan stage.

Figure E3 (Appendix E), "Cut Lot (Transitional)" and "Cut-Fill Lot (Transitional") provides a foundation grading detail for locations where foundations will straddle transition zones between cut and fill materials. If the remaining cut-fill transition is steep at depth below the building area, the geometry of the transition should be reviewed during grading operations by the soils engineer on a site specific basis to evaluate the need for additional overexcavation removals and/or additional foundation reinforcement. As a general guideline, steep cut/fill transitions would include slope gradients steeper than 4:1 (h:v) and overall variations in fill thickness of greater than 15 feet which occur within 20 feet of final pad grade.

To minimize significant settlements, it is recommended that the upper soils in areas to receive fills be removed and replaced with compacted fill. No specific foundation design loads are available at this time. Some settlements will be expected due to loads from high fills (e.g. thicker than 30 feet). Currently, locations of proposed thicker fills are: at the vicinity of Lots 10-21, 30-34, 38, 39, 42-56, 77, 97, 99, 102 and 102A. Most of the settlements due to the load of added fill will occur during and shortly after rough grading is complete. However, we are recommending settlement monitoring for some of the deeper fill area. Settlement monitoring program will be discussed during the 40 scale grading plan study.

At other areas, potential settlements in alluvium will be minimized by the removals and recompaction recommended in this report. Also, potential effects from localized seismically-induced settlements will be attenuated by the recompacted upper layers and proposed additional fills (see **Appendix C**).

9.8 Excavations, Shoring and Backfill Recommendations

Excavations deeper than 3.5 feet should conform to **safety** requirements for excavations as set forth in the State Construction Safety Orders enforced by the State Division of Industrial Safety, CAL OSHA. Temporary excavations 12 feet or lower shall be no steeper than 3/4:1 (h:v). For excavations to 20 feet in height, the bottom 3.5 feet may be vertical and the upper portion between 3.5 and 20 feet should be no steeper than 1.5:1 (h:v). Excavations not complying with these requirements should be shored.

It is strongly recommended that excavation walls in sands and dry soils be kept moist, but not saturated at all times.

Parameters for design of cantilever and braced shoring will be provided at the Grading Plan stage.

The bases of excavations or trenches should be firm and unyielding prior to foundations or utility construction. On-site materials other than topsoil or soils with roots or deleterious materials may be used for backfilling excavations. Densification (compaction) by jetting may be used for on site clean sands or imported equivalent of coarser sand provided they have a Sand Equivalent greater than or equal to 30 as determined by ASTM D2419 test method. Recommended specifications for placement of trench backfill are presented in **Appendix E**.

9.9 Expansive Soils Considerations

Soil expansion has been found to be a significant consideration for design and construction of foundations and concrete slabs-on-grade. The recommendations presented in the attached **Table E1, Minimum Foundation and Slab Recommendations for Expansive Soils**, in **Appendix E**, have been found to minimize the effects of soil expansion potential in Southern California when followed during project design and construction. It is anticipated that compacted fill from the onsite materials will have a very low to medium expansion potential. The expansion potential of the site soils exposed at rough grade should be tested again after site grading is complete and the final foundation design should be based on those expansion test results.

9.10 Hydroconsolidation Considerations

Based upon our hydroconsolidation test data, existing (non-vegetative) soils do not show significant hydroconsolidation characteristics.

9.11 Corrosivity and Chemical Attack Considerations

Soil corrosivity testing was performed for this study; test results are presented in **Appendix B**. As stated previously in this report, based on resistivity test data, on-site soils classify as severely corrosive to corrosive to buried metals per County of Los Angeles classification. Sulfate concentrations were negligible per UBC (1997) classification, and pH was near-neutral (ranging from x to x). Chloride concentrations were very low. Pending additional testing, either Type I or II cement may be considered for use in concrete placed in contact with the ground. Mitigating recommendations against soil corrosivity should be revised/expanded based on additional confirmatory tests that should be performed at the Grading Plan stage. Final recommendations for concrete will be in accordance with the latest UBC requirements, and a corrosion specialist should provide mitigating recommendations for potential corrosion of metals in contact with on-site soils.

9.12 Retaining Walls and Pavement Design

Retaining wall and pavement design(s) parameters will be provided at the Grading Plan stage.

10.0 18.03.100F STATEMENT (CITY OF SANTA CLARITA)

In compliance with Section 18.03.100f of the City of Santa Clarita Building Code and the California Building Code, it is the finding of this firm that the Vesting Tentative Tract Map 60258 dated April 1, 2004 will be safe against hazard from landslide, settlement or slippage and will not adversely affect off-site property provided all our recommendations provided in this report are followed.

11.0 GEOLOGIST/GEOTECHNICAL ENGINEER OF RECORD

This report has been prepared assuming that Allan E. Seward Engineering Geology, Inc. will refine all geology and geotechnically-related data for the Grading Plan stage of this project. If the recommendations contained in this report are to be utilized and expansion of the geology/geotechnical work is performed by others, the party performing the work must review this report and assume full responsibility for recommendations contained herein. That party would then assume the title of responsibility as "Geologist/Geotechnical Engineer of Record" for the specific work.

12.0 LIMITATIONS

This report has been prepared for the exclusive use of Synergy, A Land & Development Company and their design consultants for the specific site discussed herein. This report should not be considered transferable. Prior to use by others, we should be notified, as additional work may be required to update this report.

In the event that any modifications in the design or location of the proposed development, as discussed herein, are planned, the conclusions and recommendations contained in this report will require a written review by this firm with respect to the planned modifications.

In performing these professional services, we have used the degree of care and skill ordinarily exercised, under similar circumstances, by reputable engineering geologists and geotechnical engineers practicing in this or similar localities.

The analyses and interpretations presented in this report have been based on the results of pertinent field and laboratory soil investigations. It should be recognized that subsurface conditions can vary in time and laterally and with depth at a given site. Our conclusions and recommendations are based on the data available and our interpretation of the data based on our experience and background. Hence, our **conclusions** and **recommendations** are **professional opinions** and are **not meant** to be a control of nature; therefore, **no warranty** is herein **expressed** or **implied.**

It should be noted that faulting is normally confined to the area immediately adjacent to a known fault, or within a few feet of the last fault movement. Regardless of what criteria is used however, absolute assurance against future fault displacement or strong ground motion cannot be obtained in tectonically active areas. New faults can form, as the orientation and magnitude of deformational forces in the earth's crust change with time. Therefore, the location of new breaks or ground motions during a seismic event cannot be located or anticipated.

This report may not be duplicated without the written consent of this firm.

This opportunity to be of service is greatly appreciated. If you have any questions regarding this report please give us a call.

Respectfully submitted,

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The following attachments and appendices complete this report.

VOLUME I

Location Map	following page 2
References	
Summary of Landslides	Table 1
Summary of Cut slopes	Table 2
Well Abandonment Records	

APPENDIX A - SUBSURFACE LOGS

- Backhoe Trenches
    - T-3 thru T-39, T-42 thru T-46 (11/13/86)
    - T-47 thru T-81
- Bucket-Auger Borings
    - B-2 thru B-14 (11/13/86)
    - B-15 thru B-17
- Rotary-Wash Boring
    - RW-1 thru RW-3
    - RW-10[1] (4/4/03)

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[1] Logs from report dated 4/4/03 for Tentative Tract 53425, prepared for Newhall Land.

Distribution: (5) Synergy, A Land & Development Company
Attn: Mr. Rick Doremus
(2) Sikand Associates
Attn: Mr. Ron Horn
(3) City of Santa Clarita Plannning Department
Attn: Heather Werner

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1. **Geologic Report**
   Tentative Tract 31236 – Santa Catarina
   Canyon Country, California
   Dated: November 13, 1986 – JN: 6-803-4

2. **Geologic Clarification – Existing Conditions**
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   Canyon Country, California
   Dated: January 13, 1987 – JN: 7-803-4

3. **Geologic And Soils Approval - Revised Tentative Tract Map**
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4. **Geologic and Soils Engineering Review**
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   Canyon Country, California
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6. **Geologic Clarification – "Springs"**
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SUMMARY OF LANDSLIDES

LANDSLIDE NO.	MITIGATION
1	This landslide is located above the proposed walkway easterly of the proposed school site. A portion of this landslide is located off-site easterly of the tract boundary. This landslide is located in an area where it does not impact the proposed walkway and the proposed development and is safe for the use intended. At the completion of grading, this landslide will be designated as **Restricted Use Area** on the Final Map.
2	This landslide is located above the proposed walkway easterly of the proposed school site. A portion of this landslide is located off-site easterly of the tract boundary. This landslide is located in an area where it does not impact the proposed walkway and the proposed development and is safe for the use intended. At the completion of grading, this landslide will be designated as **Restricted Use Area** on the Final Map.
3	This landslide is located mostly off site easterly of the proposed school site proposed walkway. This landslide is located in an area where it does not impact the proposed walkway and the proposed development and is safe for the use intended. At the completion of grading, this landslide will be designated as **Restricted Use Area** on the Final Map.

SUMMARY OF CUT SLOPES

Proposed Cut slope CS-1

Location: Vicinity of Lot 102A

Direction Slope Faces: Southerly

Slope Parameters: 100± feet high with a 2:1 gradient

Cross Sections: 1-1'

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits over TQs bedrock dipping into the proposed cut slope face. Slope stability analysis on Cross Section 1-1' indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability. However, the Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable but surficially unstable**.

Mitigation Measures: **Stability fill required.**

Proposed Cut slope CS-2

Location: Vicinity of southern portion of Lot 102

Direction Slope Faces: Southerly

Slope Parameters: 70± feet high with a 2:1 gradient

Cross Sections: None; see section 1-1' for cut slope CS-1 for similar configuration.

Anticipated Geologic Conditions: TQs bedrock anticipated to be dipping 6-16° into the proposed cut slope face. Slope stability analysis performed on cross section 1-1' for proposed cut slope CS-1, which depicts similar but more critical geologic conditions indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability and therefore **grossly stable by inspection**.

Mitigation Measures: **No mitigation required.**

Proposed Cut slope CS-3

Location: Vicinity of the eastern portion of Lot 102

Direction Slope Faces: Semicircular facing south to southeast to east

Slope Parameters: 85± feet high with a 2:1 gradient

Cross Sections: 4-4'

Anticipated Geologic Conditions: South facing portion - TQs bedding anticipated to be dipping into the proposed cut slope face; Easterly facing portion – TQs bedding anticipated to be oriented neutral to dipping 4° out of the proposed cut slope In addition fill is proposed above the cut slope creating a fill over cut condition. Slope stability analysis performed on cross section 4-4' indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability and therefore **grossly stable as designed**. However, due to the fill over cut condition it is recommended that this slope be constructed as a stability fill.

SUMMARY OF CUT SLOPES

Mitigation Measures: **Stability Fill required.**

Proposed Cut slope CS-4

Location: Southeastern portion of the site within Lot 120

Direction Slope Faces: Westerly

Slope Parameters: 120± feet high with a 2:1 gradient

Cross Sections: 4-4'

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits over TQs bedrock dipping into to oriented neutral relative to the proposed cut slope face. Slope stability analysis performed on cross section 4-4'indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability. However the Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable but surficially unstable.**

Mitigation Measures: **Stability fill required.**

Proposed Cut slope CS-5

Location: South and adjacent to Golden Valley Road and north of lot 102

Direction Slope Faces: Southerly

Slope Parameters: 65± feet high with a 2:1 gradient

Cross Sections: 6-6'

Anticipated Geologic Conditions: Anticipated to expose TQs bedrock dipping into the proposed cut slope face. Portions of this cut slope may expose horizontally bedded Qt. The Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable by inspection but potentially surficially unstable if Quaternary Terrace Deposits are exposed within the proposed cut slope face.**

Mitigation Measures: **Stability fill may be required** for portions of the slope exposing Qt/TQs contacts.

Proposed Cut slope CS-6

Location: Vicinity of southwestern portion of Lot 100 at the intersection of Golden Valley Road and proposed "I" Street

Direction Slope Faces: Semicircular south to southwest to west

Slope Parameters: 60± feet high with a 2:1 gradient

Cross Sections: None;

SUMMARY OF CUT SLOPES

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits over TQs bedrock dipping into the proposed cut slope face. Slope stability analysis on cross section 1-1', which depicts similar but more critical geologic conditions, indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability. The Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable by inspection but surficially unstable**.

Mitigation Measures: **Stability fill required.**

Proposed Cut slope CS-7

Location: Vicinity of southern portion of Lot 123

Direction Slope Faces: South to southwest

Slope Parameters: 35± feet high with a 2:1 gradient

Cross Sections: None; see section 1-1' for cut slope CS-1 for similar configuration.

Anticipated Geologic Conditions: Anticipated to expose TQs bedrock dipping 3-9° into the proposed cut slope face. **Grossly stable by inspection**.

Mitigation Measures: **No Mitigation required.**

Proposed Cut slope CS-8

Location: Vicinity of southern portion of Lot 99

Direction Slope Faces: Southerly

Slope Parameters: 90± feet high with a 2:1 gradient

Cross Sections: 8-8'

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits over TQs bedrock dipping 3-9° into the proposed cut slope face. However, the Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable by inspection but surficially unstable**.

Mitigation Measures: **Stability fill required.**

Proposed Cut slope CS-9

Location: Vicinity of northeastern portion of Lot 100

Direction Slope Faces: Semicircular west to southwest to south

Slope Parameters: 50± feet high with a 2:1 gradient

Cross Sections: 7-7', 6-6'

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits over TQs bedrock dipping into the proposed cut slope face. Fill is proposed over the

SUMMARY OF CUT SLOPES

cut portion of the slope creating a fill over cut condition. Slope stability analysis performed on cross section 4-4', which depicts similar but more critical geologic conditions indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability. However the Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable but surficially unstable**.

Mitigation Measures: **Stability fill required.**

Proposed Cut slope CS-10

Location: Vicinity of northern portion of Lot 98

Direction Slope Faces: Southerly

Slope Parameters: 60± feet high with a 2:1 gradient

Cross Sections: 6-6'

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits. Slope stability analysis on cross section 11-11', which depicts similar but more critical geologic conditions, indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability. However the Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable but surficially unstable**.

Mitigation Measures: **Stability fill required.**

Proposed Cut slope CS-11

Location: Vicinity of northeastern portion of Lot 98 and westerly of Golden Valley Road

Direction Slope Faces: Westerly

Slope Parameters: 40± feet high with a 2:1 gradient

Cross Sections: 10-10', 11-11'

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits. Slope stability analysis performed on cross section 11-11' for cut slope CS-11 indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability. However the Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable but surficially unstable**.

Mitigation Measures: **Stability fill required.**

Proposed Cut slope CS-12

Location: Easterly of Lot 98

Direction Slope Faces: Westerly

SUMMARY OF CUT SLOPES

Slope Parameters: 65± feet high with a 2:1 gradient

Cross Sections: 10-10', 11-11'

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits. Slope stability analysis performed on cross section 11-11' for cut slope CS-11 indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability. However the Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable but surficially unstable**.

Mitigation Measures: **Stability fill required.**

Proposed Cut slope CS-13

Location: Eastern portion of Lot 97

Direction Slope Faces: Westerly

Slope Parameters: 35± feet high with a 2:1 gradient

Cross Sections: None; see section 11-11' for cut slope CS-12 for similar but more critical configuration.

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits. Slope stability analysis on cross section 11-11' for proposed cut slope CS-12, which depicts similar but more critical geologic conditions, indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability. However the Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable but surficially unstable**.

Mitigation Measures: **Stability fill required.**

Proposed Cut slope CS-14

Location: Northeastern portion of Lot 97

Direction Slope Faces: Westerly

Slope Parameters: 65± feet high with a 2:1 gradient

Cross Sections: 14-14'

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits. Slope stability analysis performed on cross section 11-11' for proposed Cut Slope CS-12, which depicts similar geologic conditions, indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability. However the Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable but surficially unstable**.

Mitigation Measures: **Stability fill required.**

SUMMARY OF CUT SLOPES

Proposed Cut slope CS-15

Location: North of Lots 1 through 10

Direction Slope Faces: Southerly

Slope Parameters: 35± feet high with a 2:1 gradient

Cross Sections: 15-15'

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits over TQs bedrock with bedding planes dipping into the proposed cut slope face. Fill is also proposed over portions of this cut slope creating a fill over cut condition. The Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable by inspection but surficially unstable.**

Mitigation Measures: **Stability fill required.**

Proposed Cut slope CS-16

Location: Within the DWP easement adjacent to proposed "B" Street

Direction Slope Faces: Northeasterly

Slope Parameters: 40± feet high with a 2.5:1 to 3:1 gradient

Cross Sections: 14-14'

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits. Slope stability analysis on cross section 11-11', which depicts similar but more critical geologic conditions, indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability. However the Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable but surficially unstable.**

Mitigation Measures: **Stability fill required.**

Proposed Cut slope CS-17

Location: Vicinity of northern portion of Lot 99

Direction Slope Faces: South to southeast

Slope Parameters: 75± feet high with a 2:1 gradient

Cross Sections: 12-12'

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits. Slope stability analysis on cross section 11-11' for proposed cut slope CS-12, which depicts similar geologic conditions, indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability. However the Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable but surficially unstable.**

SUMMARY OF CUT SLOPES

Mitigation Measures: **Stability fill required.**

Proposed Cut slope CS-18

Location: Vicinity of northeastern portion of Lot 97

Direction Slope Faces: Westerly

Slope Parameters: 25± feet high with a 2:1 gradient

Cross Sections: 14-14'

Anticipated Geologic Conditions: Anticipated to expose horizontally bedded Quaternary Terrace deposits. Slope stability analysis on cross section 11-11', which depicts similar but more critical geologic conditions, indicates this slope satisfies the City of Santa Clarita factor of safety requirement for slope stability. However the Quaternary Terrace Deposits are subject to surficial instability due to their friable and erosive nature and due to anticipated seepage at the Qt/TQs contact. **Grossly stable but surficially unstable**.

Mitigation Measures: **Stability fill required.**

FORM 159

STATE OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL AND GAS

REPORT OF WELL ABANDONMENT

Inglewood, California

February 25, 1964

Mr. B. C. DeSpain
P. O. Box 35
Newhall, California
Agent for B. C. DeSPAIN

DEAR SIR:

Your report of abandonment of Well No. "Furnivall" 1,
Sec. 18, T. 4 N., R. 15 W., S. B. B. & M., - - - field,
Los Angeles County, dated February 4, 1964, received February 6, 1964,
has been examined in conjunction with records filed in this office.

A review of the reports and records shows that the requirements of this Division, which are based on all information filed with it, have been fulfilled.

JLZ:es
cc - Mr. E. R. Murray-Aaron
Mr. B. C. DeSpain
Conservation Comm.
Production Dept.
Mr. L. A. Dutton
Fire Prevention Bureau
BOND NO. 3183635
Dated February 28, 1962

E. R. MURRAY-AARON
State Oil and Gas Supervisor

By
Deputy Supervisor

80396 9-53 8M SPO

Appendix A

TT 31236

JOB NO. 6-803-4

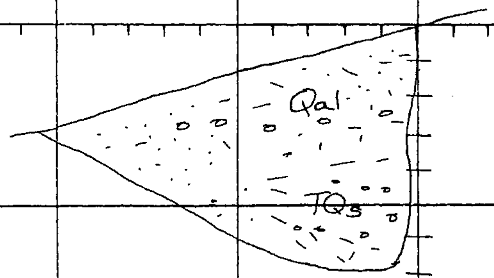
LOGGED BY PF

Trench Log No. 3

PROJECT PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 4' RECENT ALLUVIUM; Qal; Gray-brown sand and gravel 4' - 7' BEDROCK; TQs; Brown medium sandstone and conglomerate; dense; dry; massive N 10 W SCALE 1" = 5 Ft.				No Ground Water No Caving TD 7 Ft.



ALLAN E. SEWARD

JOB NO. 6-803-4
LOGGED BY PF

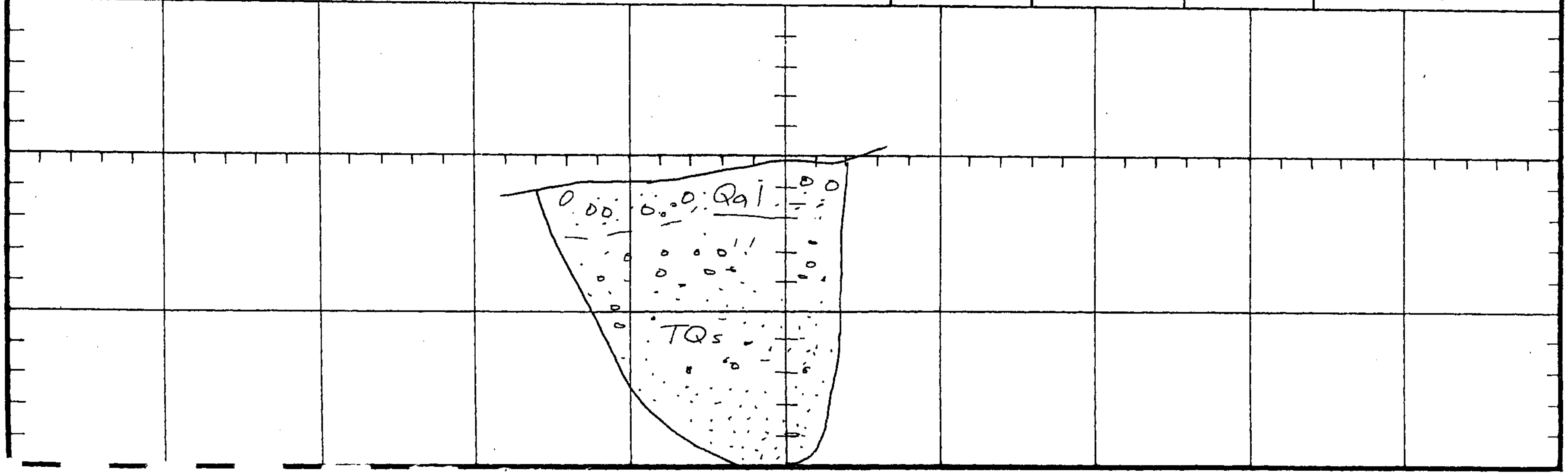
Trench Log No. 4

PROJECT TT 31236 PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 2'	RECENT ALLUVIUM; Qal; Brown sand and gravel; loose				
2' - 10'	BEDROCK; TQs; Gray to medium-brown pebbly sandstone; dense to very dense; dry to damp	N 80 E 7 NW			
					No Ground Water No Caving TD 10 Ft.

N 55 W

SCALE 1" = 5 Ft.



JOB NO. 6-803-4

LOGGED BY GF

Trench Log No. 5

TT 31236

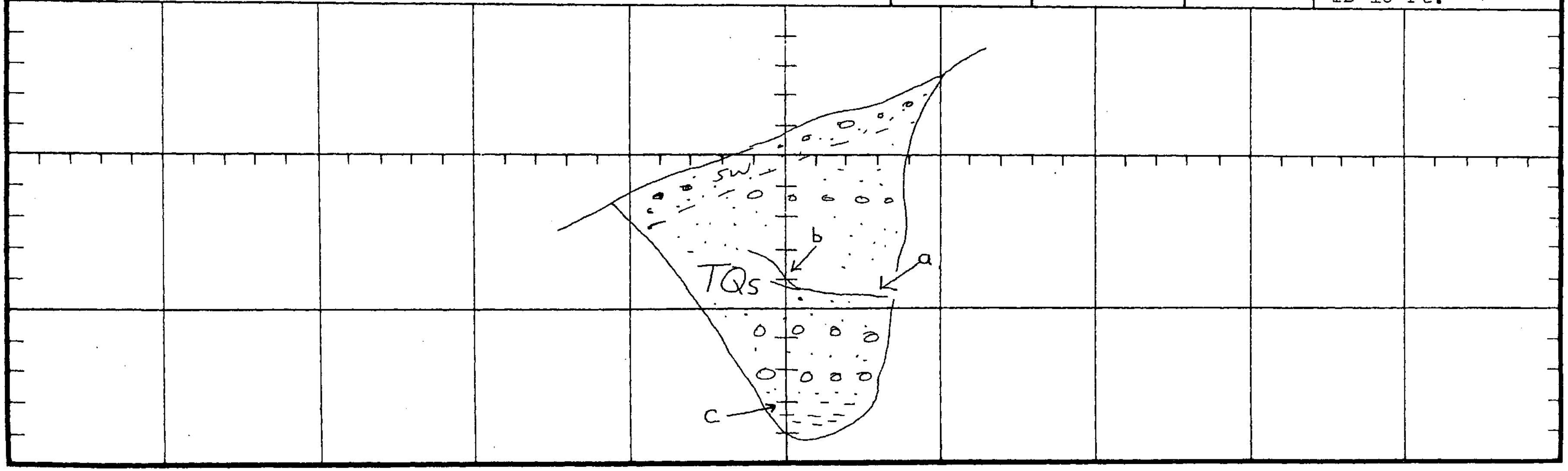
PROJECT PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 1'	SLOPEWASH; Medium-brown to tan sand with cobbles; loose				
1' - 10'	BEDROCK; (TQs); Gray-to light-brown; medium-to coarse sandstone and cobble conglomerate; dry; moderately dense; fine, silty sandstone at bottom of trench; damp; dense; ½" to ½" caliche-filled fractures both sub-parallel and oblique to bedding	c) N 55 E 10 W		a) N 60 E 26NW b) N 24 E 60SE	No Ground Water No Caving TD 10 Ft.

N 55 W

SCALE 1" = 5 Ft.



ALLAN E. SEWARD

JOB NO. 6-803-4

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Trench Log No. 6

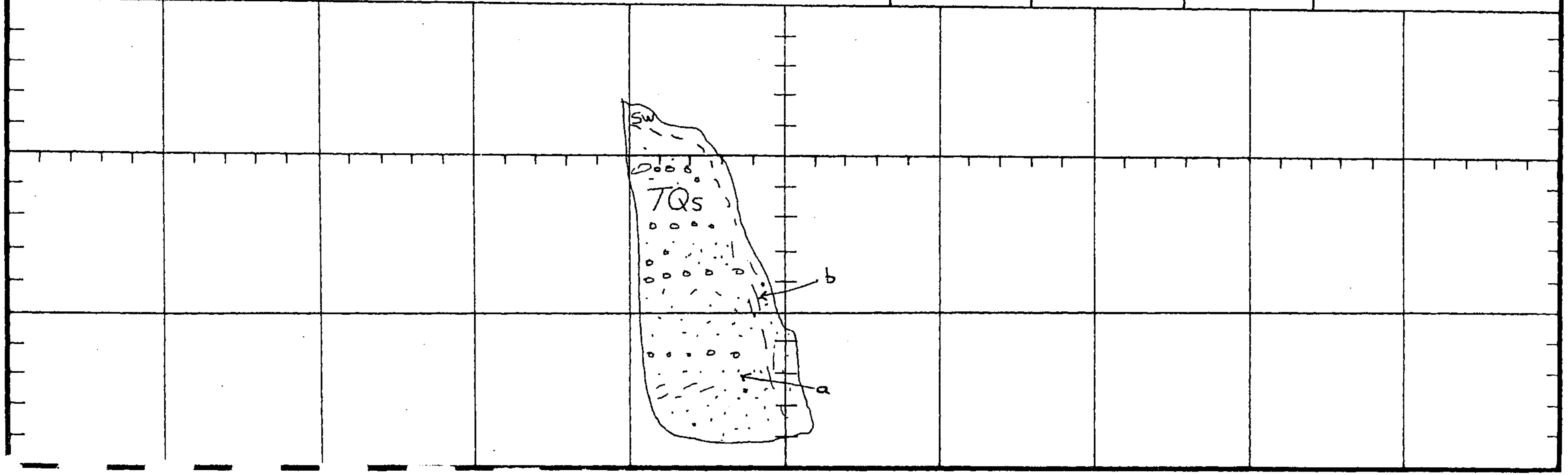
TT 31236

PROJECT PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 1.5'	SLOPEWASH; SW, Reddish-brown sand and gravel; moderately dense; dry				
1.5'-12'	BEDROCK; TQs; Light brown, medium-to coarse sandstone and pebble conglomerate; dense to very dense; dry; some caliche filled fractures parallel to slope	a) N 25 W 3 NE approx.		b) N 31 E 55 NW	
	N 70 W				No Ground Water No Caving TD 12 Ft.

SCALE 1" = 5 Ft.



JOB NO. 6-803-4
LOGGED BY GF

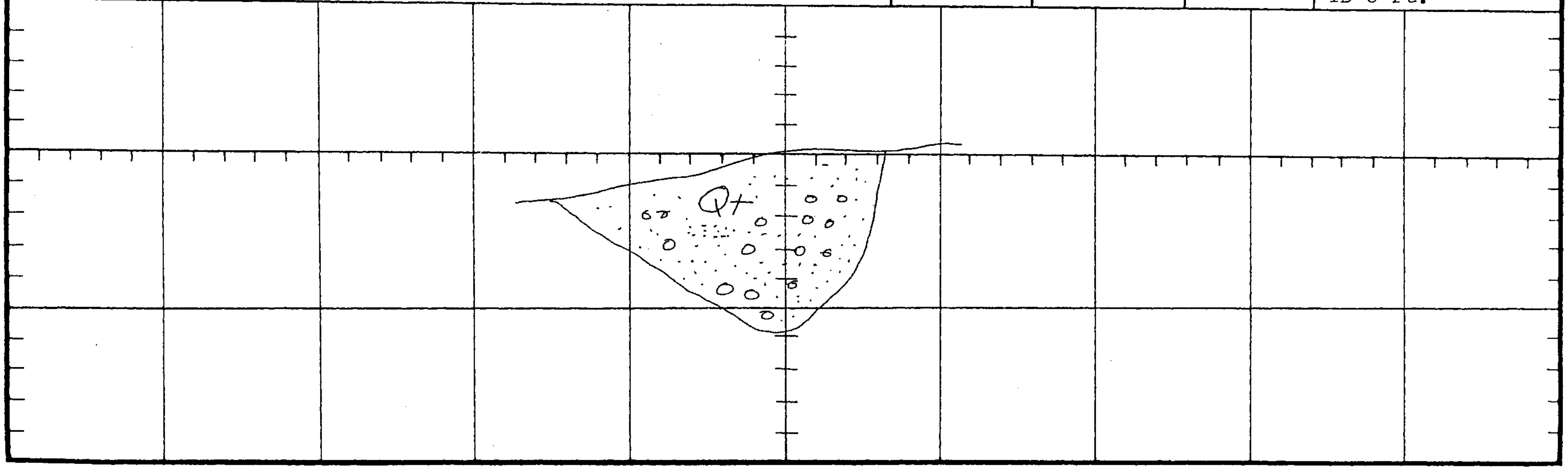
Trench Log No. 7

TT 31236
PROJECT PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 6' QUATERNARY TERRACE; Qt; Light-orange brown; cobble- to boulder conglomerate with minor coarse sand lenses; loose; dry				Unable to go deeper than 6' due to large boulders No Ground Water No Caving TD 6 Ft.

N 68 E

SCALE 1" = 5 Ft.



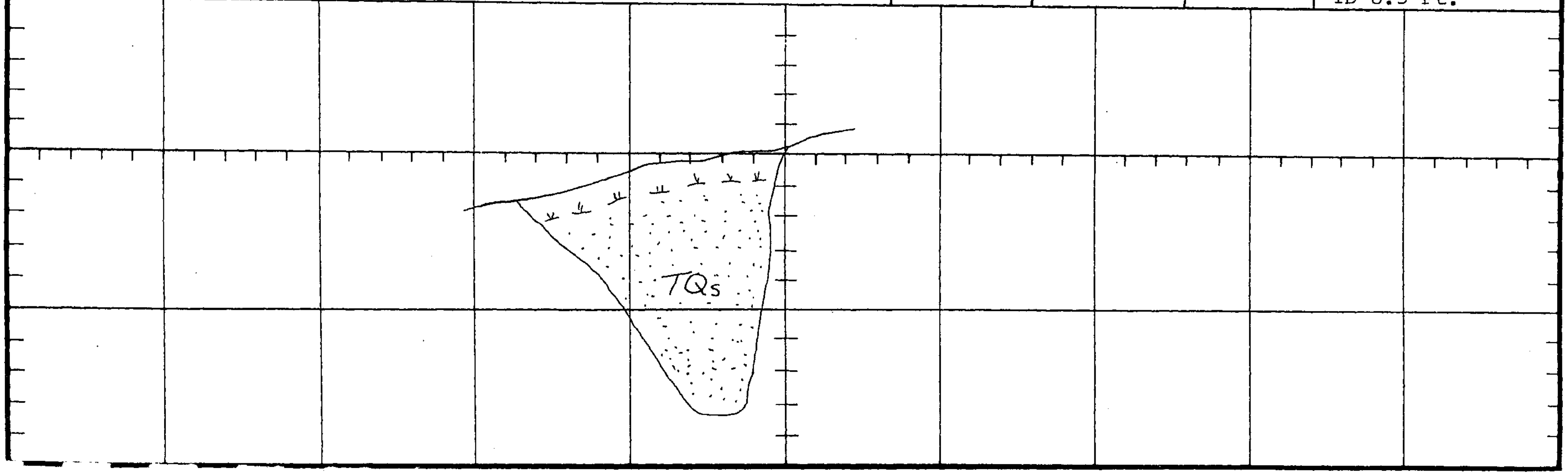
ALLAN E. SEWARD

JOB NO. 6-803-4
LOGGED BY PF

Trench Log No. 8

PROJECT TT 31236 PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 1' SOIL; Light brown sandy silt 1' - 8.5' BEDROCK; TQs; Brown to gray, fine to medium sandstone; dense; dry N 59 E SCALE 1" = 5 Ft.				No Ground Water No Caving TD 8.5 Ft.



JOB NO. 6-803-4

LOGGED BY GF

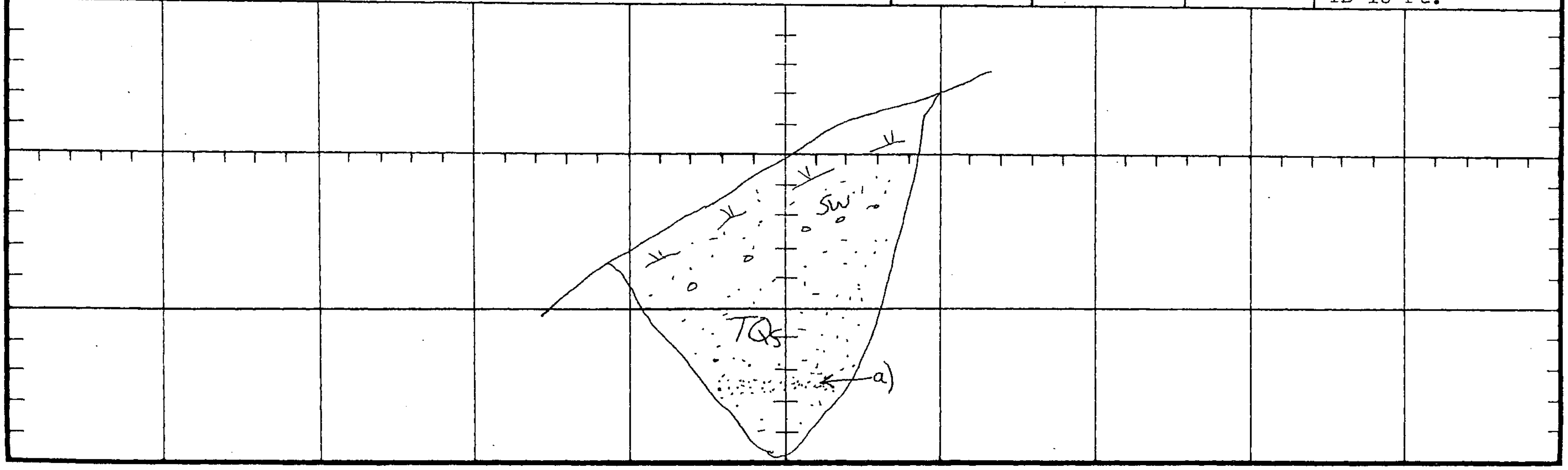
Trench Log No. 9

TT 31236

PROJECT PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 1'	SOIL; Medium-brown, fine-to medium silty sand with gravel; dry; loose				
1' - 3'	SLOPEWASH; Light-brown, fine-to coarse sand with pebbles and gravel; dry; moderately dense				
3' - 10'	BEDROCK; TQs; Light-to medium-brown; fine-to coarse silty sandstone; fractured; damp; moderately dense	a) N 85 E 9 NW approx.			
	N 60 W SCALE 1" = 5 Ft.				No Ground Water No Caving TD 10 Ft.



ALLAN E. SEWARD

JOB NO. 6-803-4
LOGGED BY GF

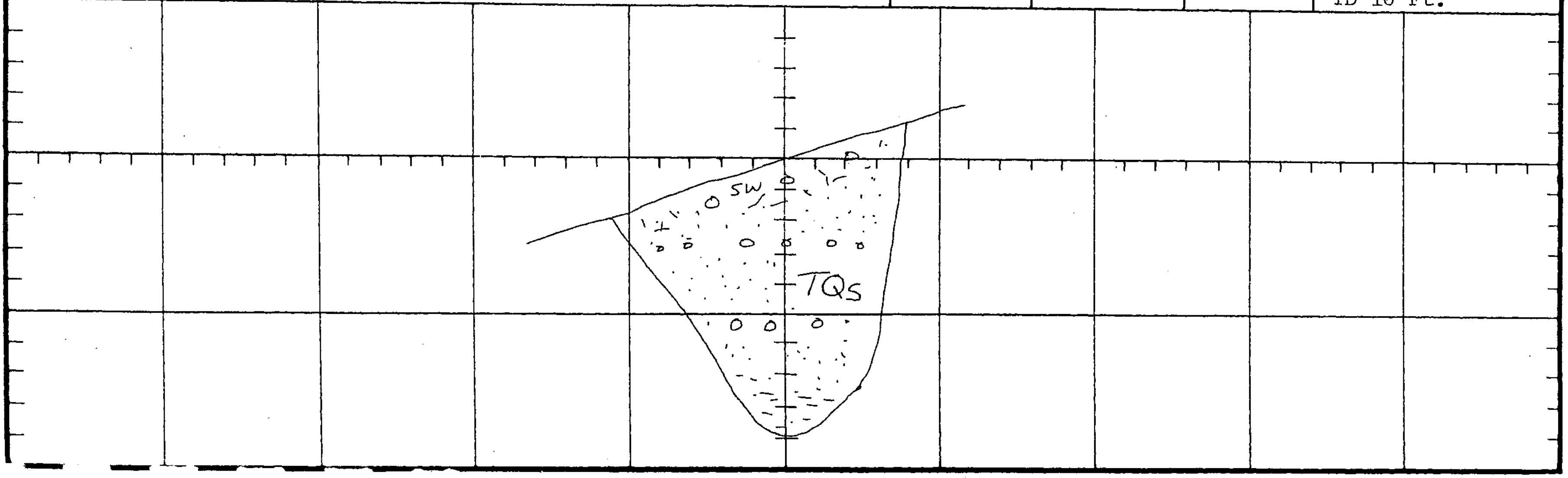
Trench Log No. 10

PROJECT TT 31236 PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 1'	SLOPEWASH; Tan-to light brown; fine-to coarse sand with gravel; loose; dry				
1' - 10'	BEDROCK; TQs; Light-brown; fine-to coarse sandstone with pebble-to cobble conglomerate lenses, with minor fine silty sandstone; dry to damp; moderately dense				No Ground Water No Caving TD 10 Ft.

N 25 W →

SCALE 1" = 5 Ft.



JOB NO. 6-803-4
LOGGED BY AES

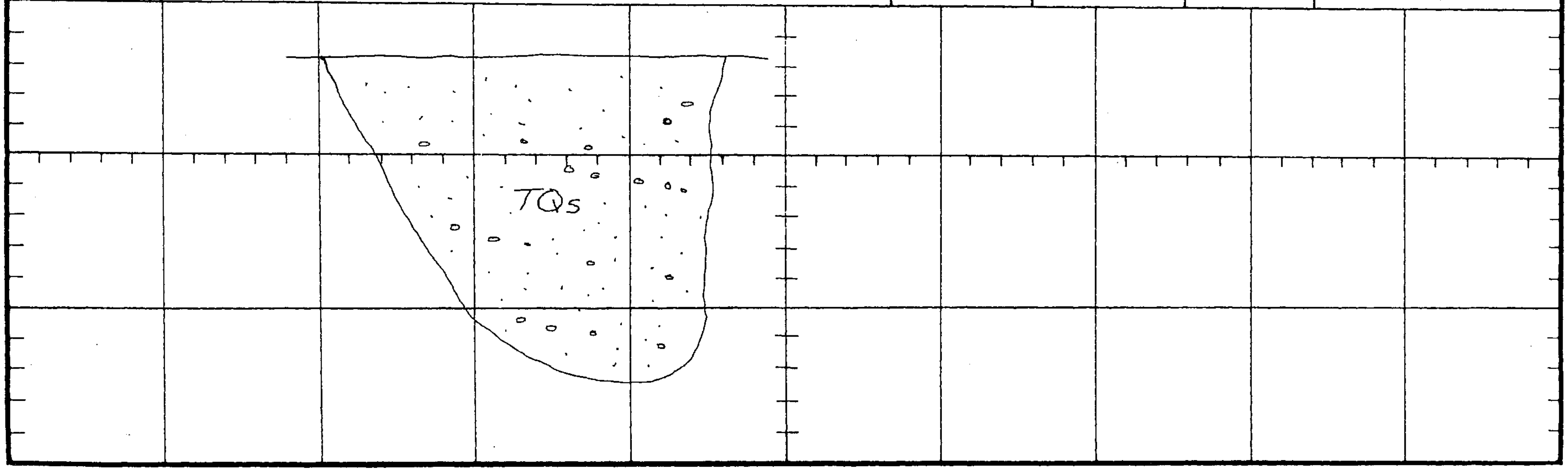
Trench Log No. 11

PROJECT TT 31236 PALMER - Santa Catarina
DATE November 13, 1986

	LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 10'	BEDROCK; TQs; Gray; massive pebbly sandstone and sandstone lenses of silty sandstone; dense to very dense; clay	N 80 W 10 N approx.			Excavated trenches 11 through 30 on 9/11/86 with crawlerhoe using 24" bucket On old road No Ground Water No Caving TD 10 Ft.

N 25 E

SCALE 1" = 5 Ft.



ALLAN E. SEWARD

JOB NO. 6-803-4

LOGGED BY AES

Trench Log No. 12

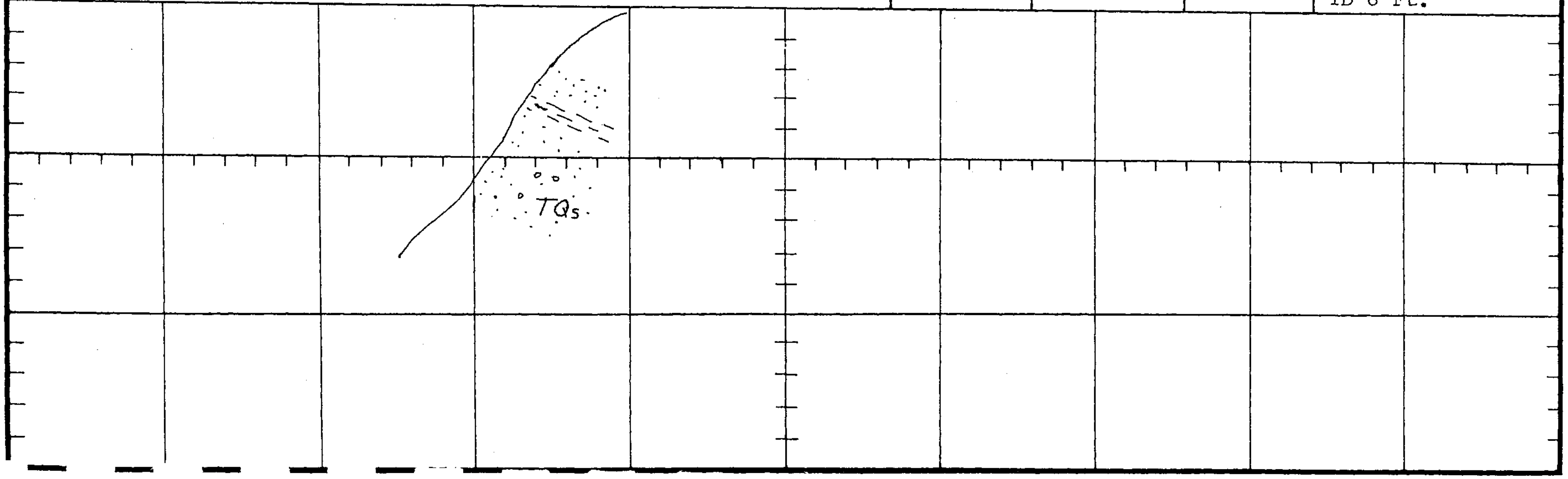
PROJECT TT 31236 PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 6'	BEDROCK; TQs; Gray massive pebbly sandstone; with interbedded reddish-brown clayey sandstone; dense to very dense; dry	N 80 E 6 N			Side existing road cut-slope No Ground Water No Caving TD 6 Ft.

N 30 W

SCALE 1" = 5 Ft.



AL E. WA

JOB NO. 6-803-4

LOGGED BY AES

Trench Log No. 13

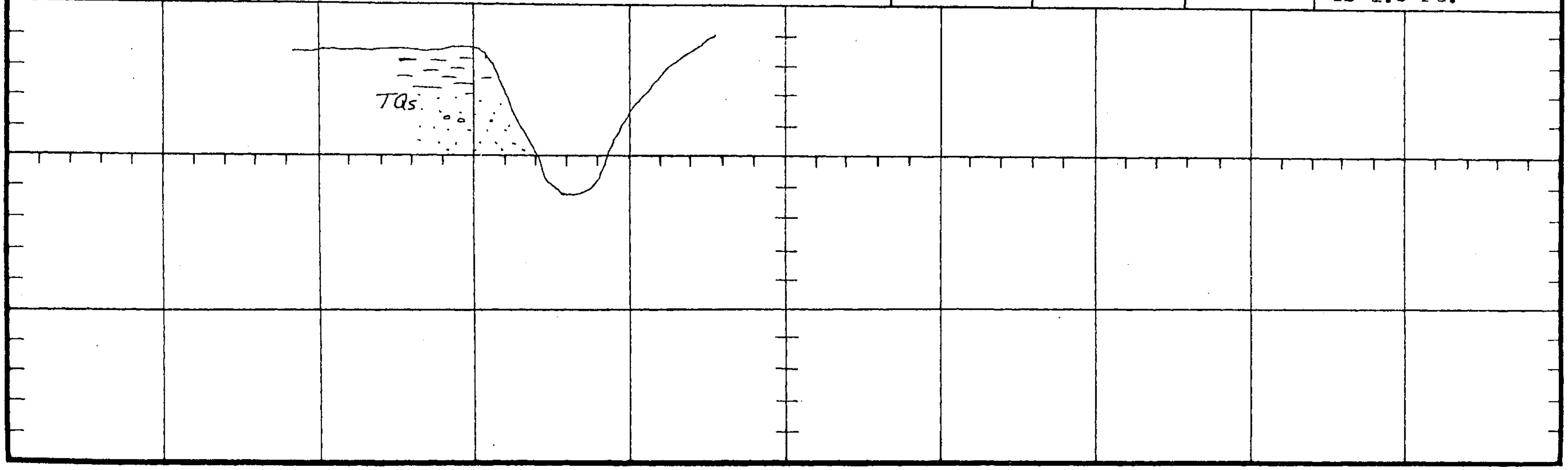
PROJECT TT 31236 PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 1.5' BEDROCK; TQs; Reddish-brown "Red bed"; clayey sandstone; fractured; dense; dry	N 78 E 5 N			On edge of erosion gully; no soil No Ground Water No Caving TD 1.5 Ft.

N 15 W

SCALE 1" = 5 Ft.



ALLAN E. SEWARD

JOB NO. 6-803-4
LOGGED BY AES

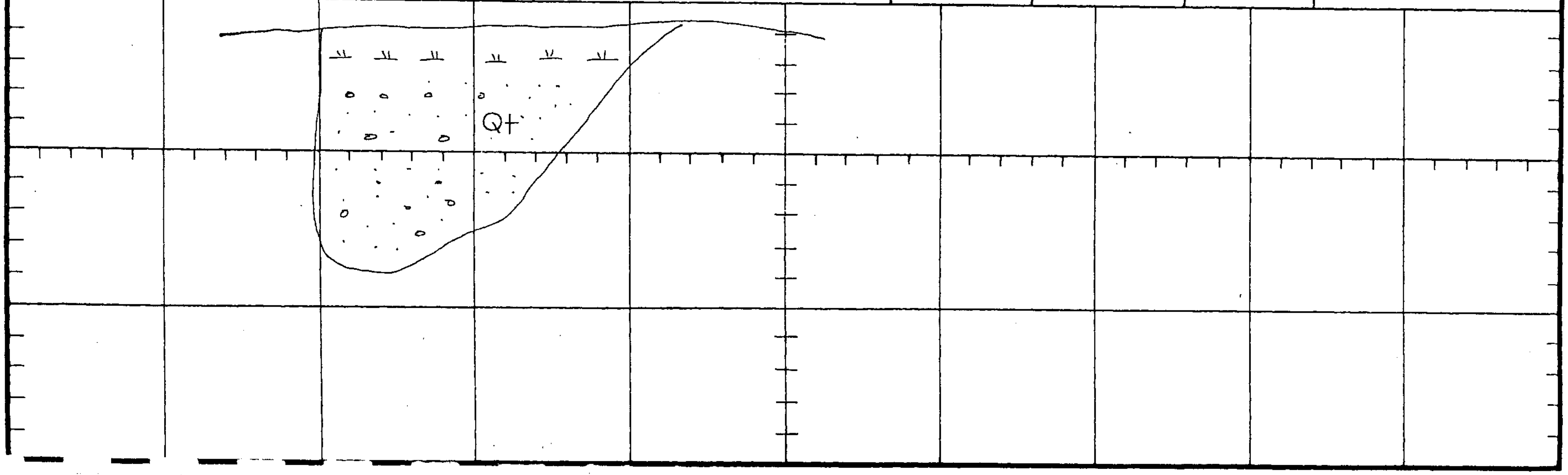
Trench Log No. 14

TT 31236
PROJECT PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 18"	SOIL; Light to moderate brown silty sands; "old" Qt soil zone; moderately dense; dry				
18" - 8'	QUATERNARY TERRACE; Qt; Moderate brown silty sandstone and silty pebbly sandstone; dense to very dense; vague stratification of gravel lense	Horizontal			No Ground Water No Caving TD 8 Ft.

N 20 E

SCALE 1" = 5 Ft.



AL E WA

JOB NO. 6-803-4
LOGGED BY AES

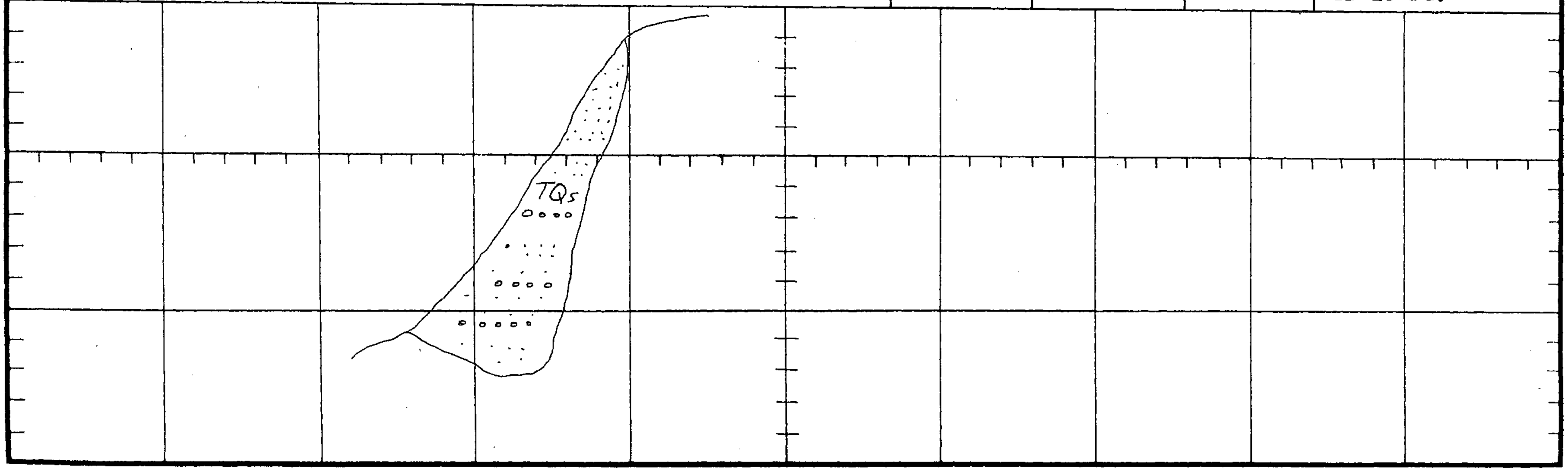
Trench Log No. 15

PROJECT TT 31236
PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 10' BEDROCK; TQs; Light gray sandstone and pebbly sandstone with interbedded fine sandstone beds, excellent stratification; dense to very dense; dry	N 88 W 5 N			Side existing road cut No Ground Water No Caving TD 10 Ft.

N 80 E

SCALE 1" = 5 Ft.



ALLAN E. SEWARD

JOB NO. 6-803-4
LOGGED BY AES

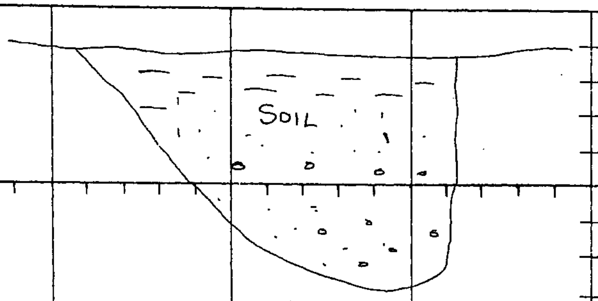
Trench Log No. 16

TT 31236
PROJECT PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 6' SOIL; Medium brown, clayey sand, "old" elevated Qt soil zone surface; moderately dense; dry; grades downward into reddish-brown pebbly sands and sandy gravel				Edge old Qt surface No Ground Water No Caving TD 6 Ft.

N 60 W

SCALE 1" = 5 Ft.



JOB NO. 6-803-4

LOGGED BY AES

Trench Log No. 17

TT 31236

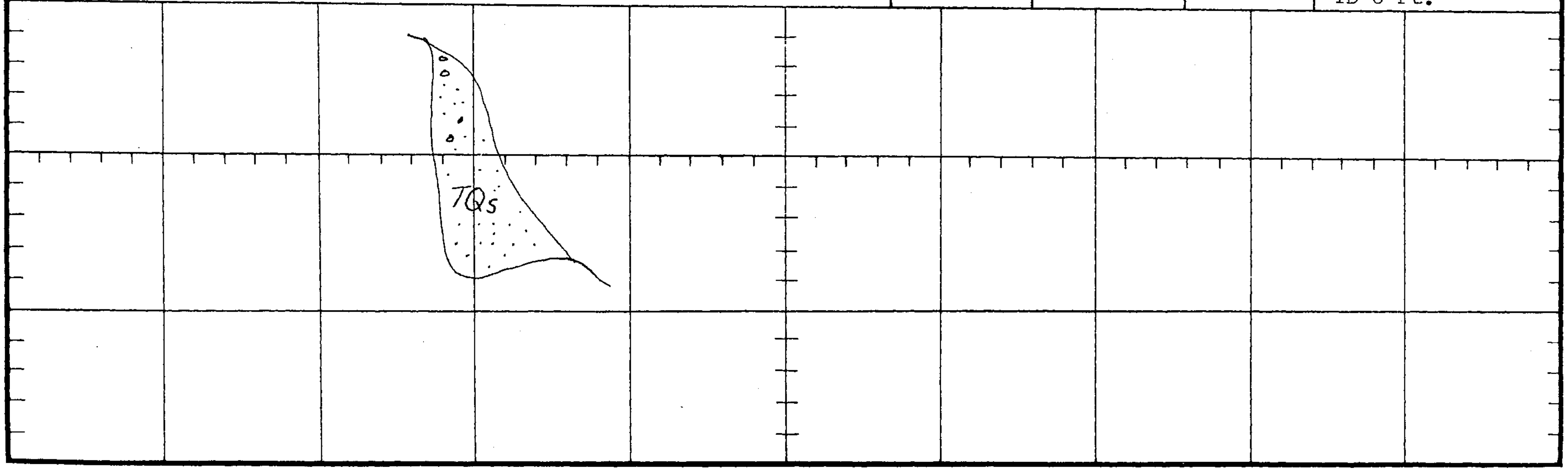
PROJECT PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 6'	BEDROCK; TQs; Gray, interbedded and pebbly sandstone; very dense; good stratification; dry	N 75 W 3 N			Side existing road cut No Ground Water No Caving TD 6 Ft.

N 72 E

SCALE 1" = 5 Ft.



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Trench Log No. 18

TT 31236

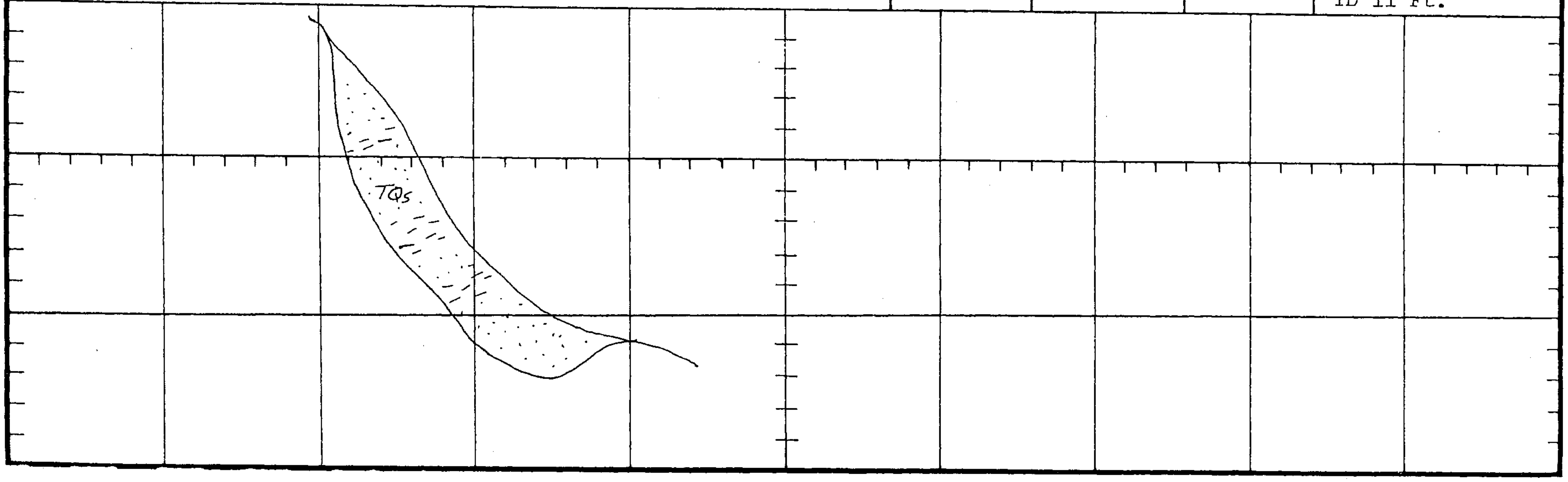
PROJECT PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 11' BEDROCK; TQs; Interbedded gray sandstone and reddish-brown silty sandstone; thin bed of clayey sandstone; dense; dry	N 80 W 9 N			On side existing road cut No Ground Water No Caving TD 11 Ft.

N 65 W

SCALE 1" = 5 Ft.



JOB NO. 6-803-4
LOGGED BY AES

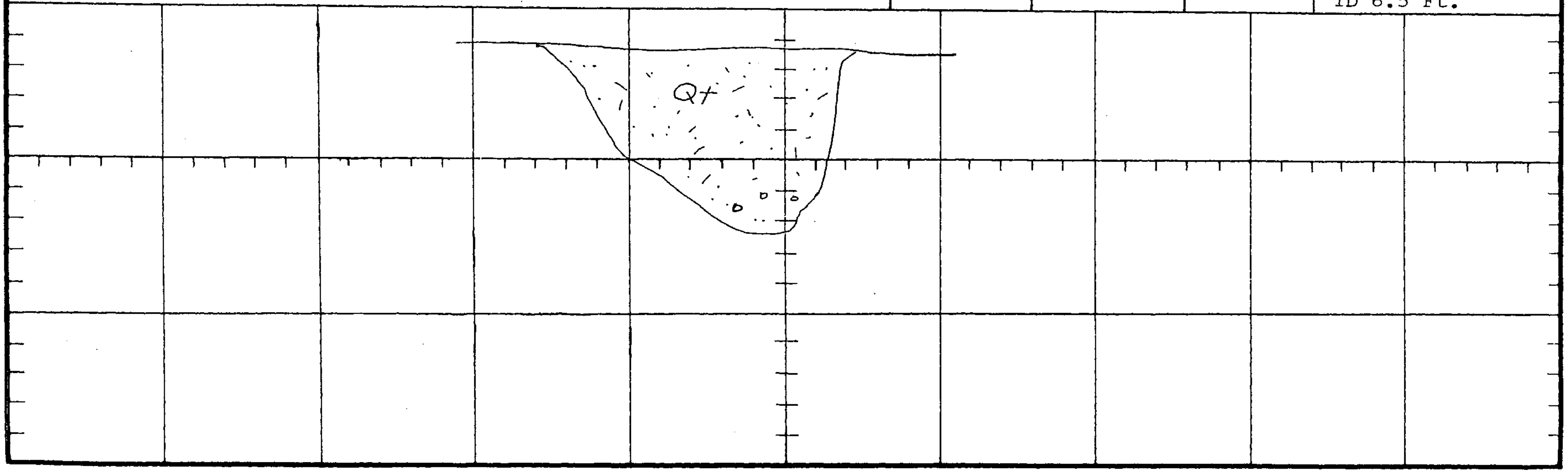
Trench Log No. 19

TT 31236
PROJECT PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 6.5' QUATERNARY TERRACE; Qt; Medium brown sandstone and pebbly sandstone; clasts to 2' with a brown clay silt to silty sandstone matrix; old re-worked Qt soil zones; thin lenses of clean gray sandstone; dense to very dense; dry				No Ground Water No Caving TD 6.5 Ft.

N 27 W

SCALE 1" = 5 Ft.



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JOB NO. 6-803-4
LOGGED BY AES/GF

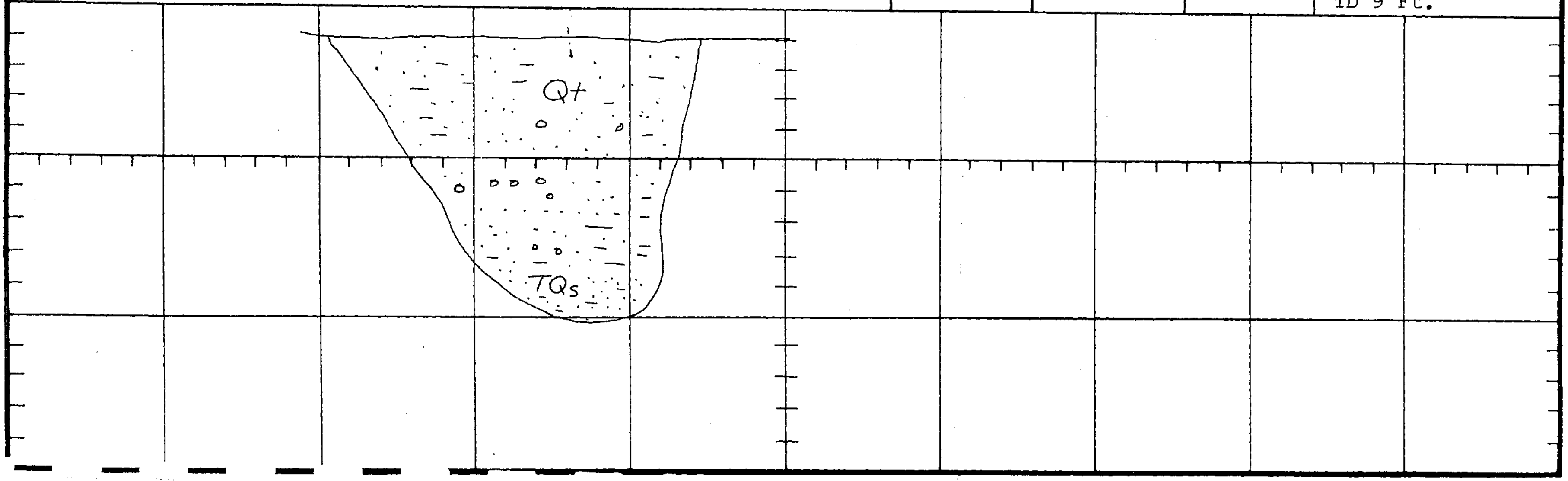
Trench Log No. 20

TT 31236
PROJECT PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 7'	QUATERNARY TERRACE; Qt; Light yellowish-brown; silty sandstone and conglomerate clasts to 8"; damp; friable sandstone and conglomerate at erosional basal contact	Horizontal			Lowest portion of quarry site; western end
7' - 9'	BEDROCK; TQs; Dark reddish-brown clayey sandstone ("Red Bed"); very dense; moist	Massive			
					No Ground Water No Caving TD 9 Ft.

N 58 E

SCALE 1" = 5 Ft.



TT 31236

JOB NO. 6-803-4

LOGGED BY AES

Trench Log No. 21

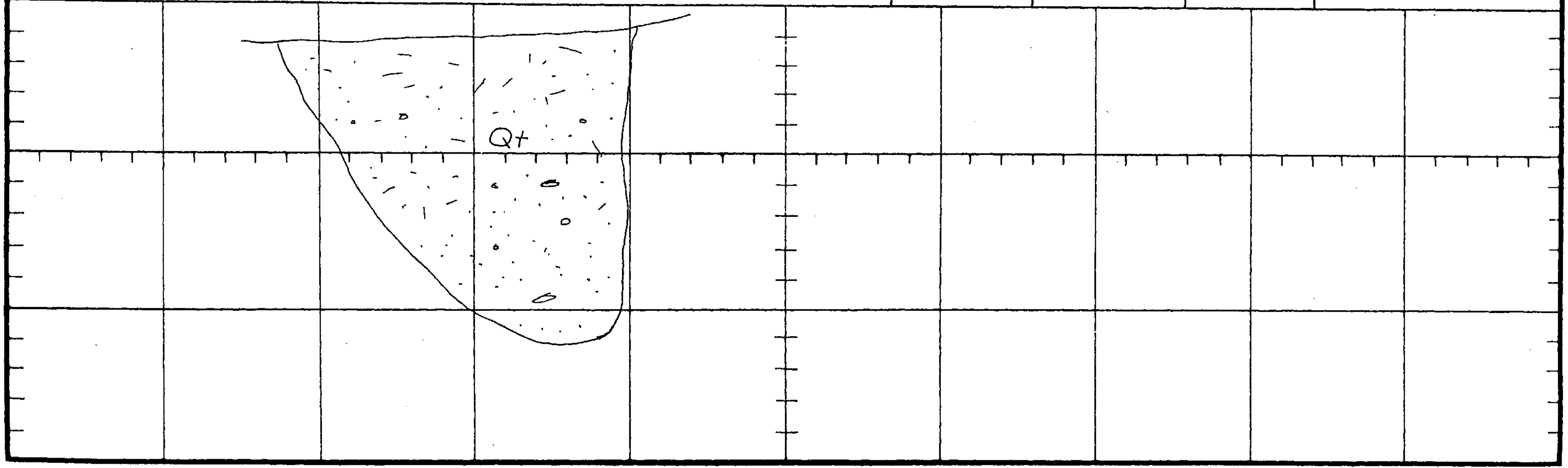
PROJECT PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 10.5'	QUATERNARY TERRACE; Qt; Medium brown sandstone and conglomerate (8" clasts) within clayey to silty sandstone matrix; old Qt soil zones that have been reworked; no distinct stratifications				NW corner property and quarry base May be near edge of old alluvial flood plain into old slopewash deposits? No Ground Water No Caving TD 10.5 Ft.

N 55 W

SCALE 1" = 5 Ft.



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JOB NO. 6-803-4

LOGGED BY GF

Trench Log No. 22

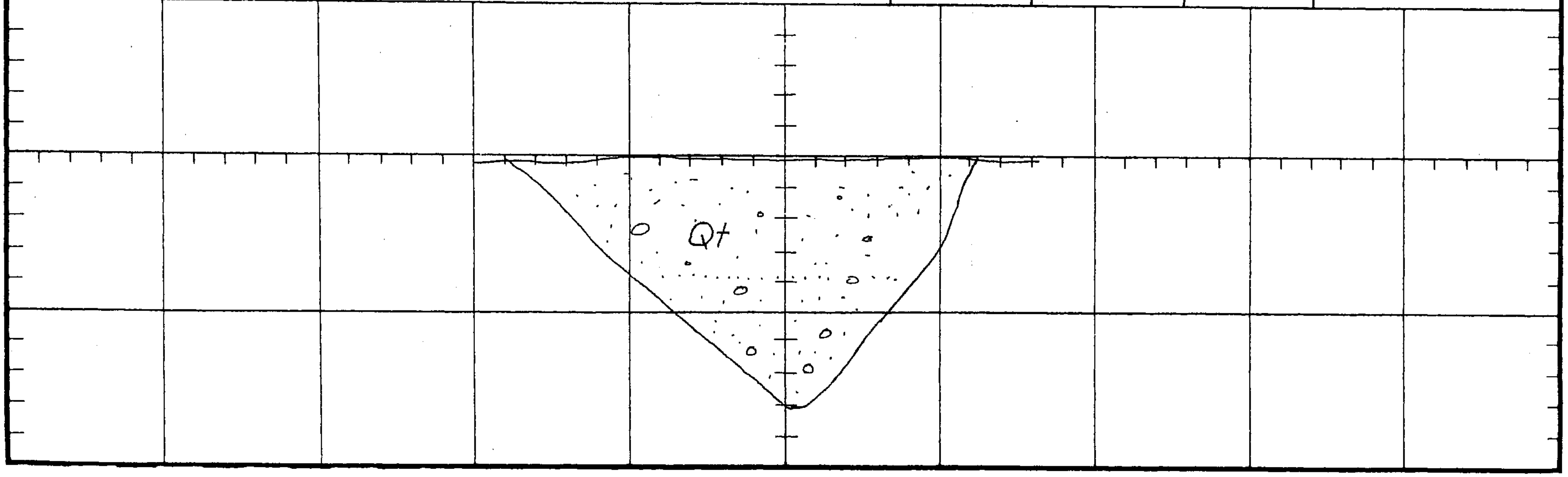
PROJECT TT 31236 PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 8'	QUATERNARY TERRACE; Qt; Light-to orange-brown; fine- to coarse silty sandstone with floating gravel and cobbles; damp; moderately dense; bedding horizontal in fine-grained layers	a) horizontal			No Ground Water No Caving TD 8 Ft.

N 49 W

SCALE 1" = 5 Ft.



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JOB NO. 6-803-4
LOGGED BY GF

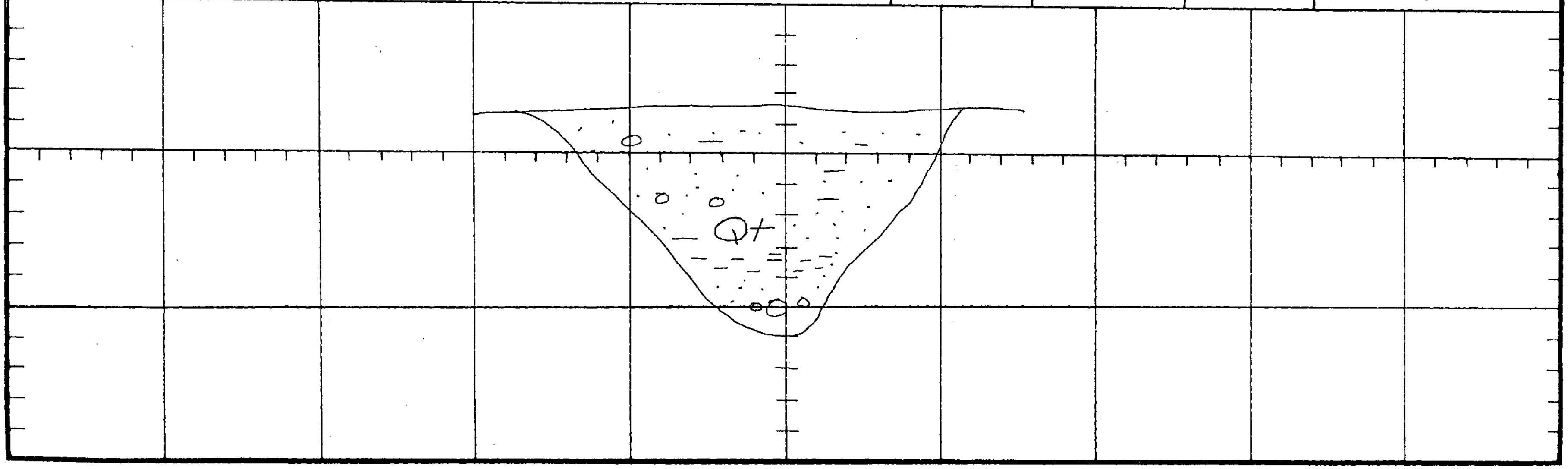
Trench Log No. 23

PROJECT PALMER - TT 31236 Santa Catarina
DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 8' QUATERNARY TERRACE; Qt; Light-brown; fine-to coarse silty sandstone with conglomerate lenses; dry; moderately dense to loose; bedding horizontal in fine-grained layers	a) horizontal			No Ground Water No Caving TD 8 Ft.

N 26 W

SCALE 1" = 5 Ft.



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JOB NO. 6-803-4
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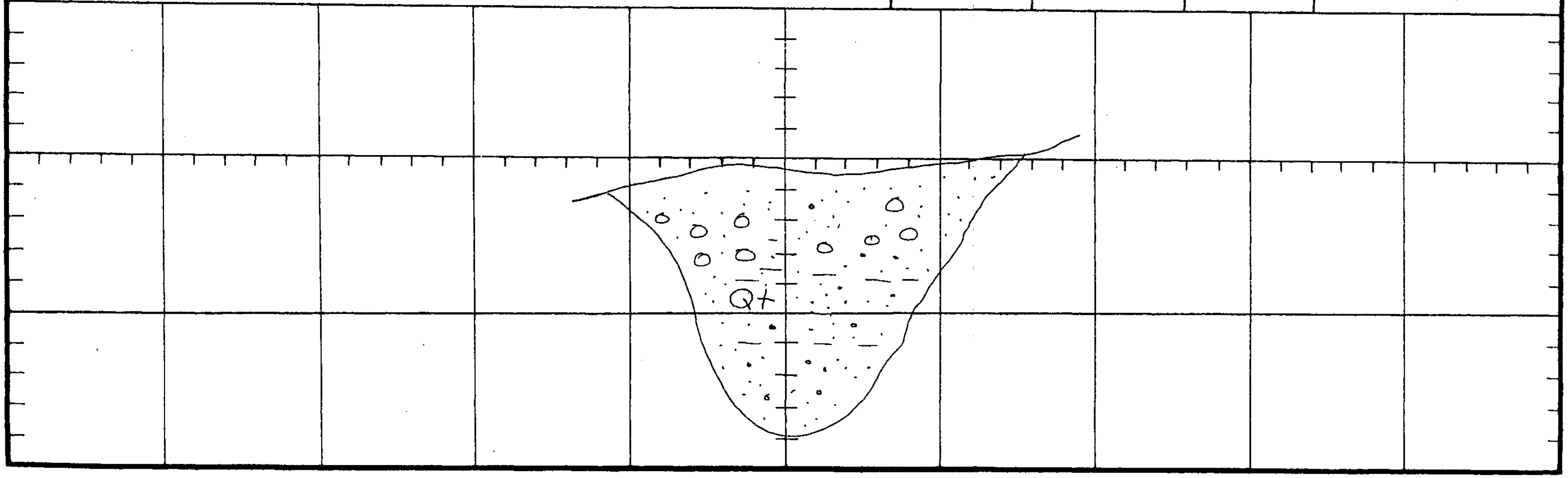
Trench Log No. 24

TT 31236
PROJECT PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 9.5 Ft. QUATERNARY TERRACE; Qt; Light-brown to red fine-to coarse silty sandstone, with conglomerate lense above; dry; moderately dense to loose; bedding horizontal in fine-grained layers	a) horizontal			No Ground Water No Caving TD 9.5 Ft.

N 15 E

SCALE 1" = 5 Ft.



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JOB NO. 6-803-4
LOGGED BY GF

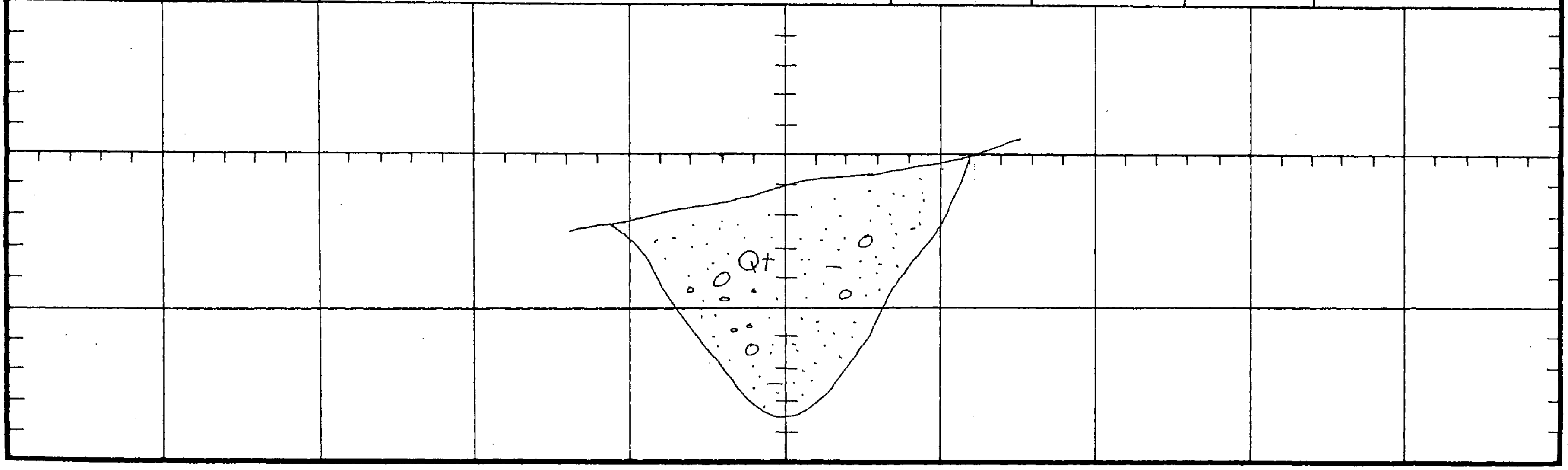
Trench Log No. 25

PROJECT TT 31236 PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 8.5'	QUATERNARY TERRACE; Qt; Orange-to medium brown; fine-to coarse silty sandstone, with isolated cobbles and abundant pebbles; grades orange-to medium-brown with depth; bedding horizontal in fine-grained layers	a) horizontal			No Ground Water No Caving TD 8.5 Ft.

N 35 E

SCALE 1" = 5 Ft.



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JOB NO. 6-803-4
LOGGED BY GF

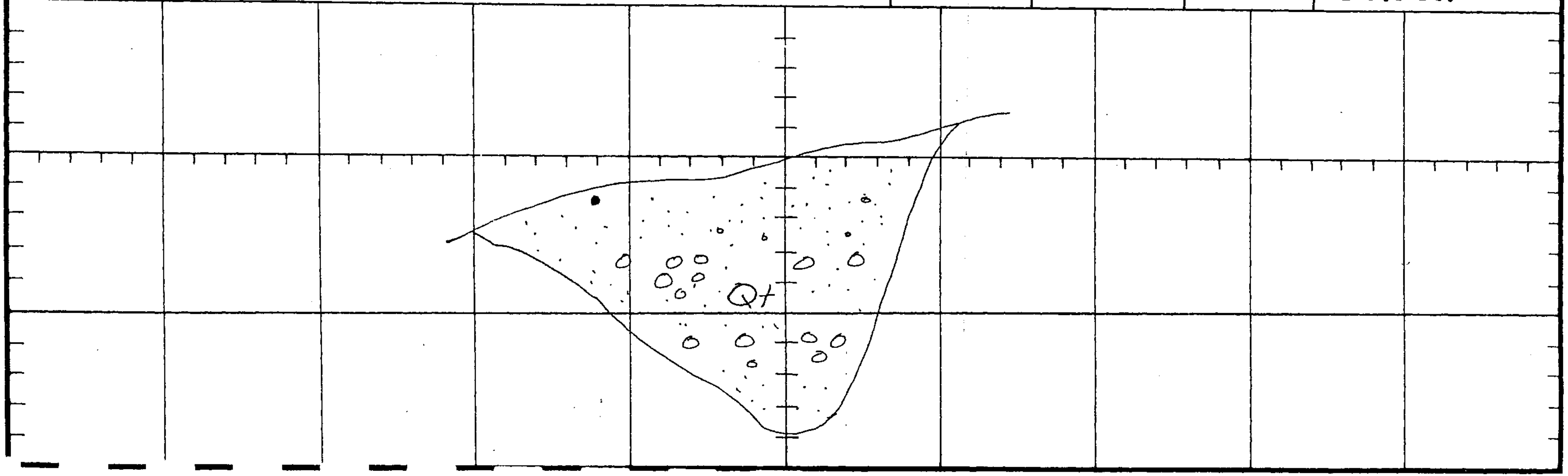
Trench Log No. 26

TT 31236
PROJECT PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 9.5'	QUATERNARY TERRACE; Qt; Light-brown to orange, fine- to coarse, sandstone, with cobble conglomerate lenses; intense orange (Fe) stain in bottom 2'; bedding horizontal in fine-grained layers				No Ground Water No Caving TD 9.5 Ft.

N 15 W

SCALE 1" = 5 Ft.



JOB NO. 6-803-4

LOGGED BY GF

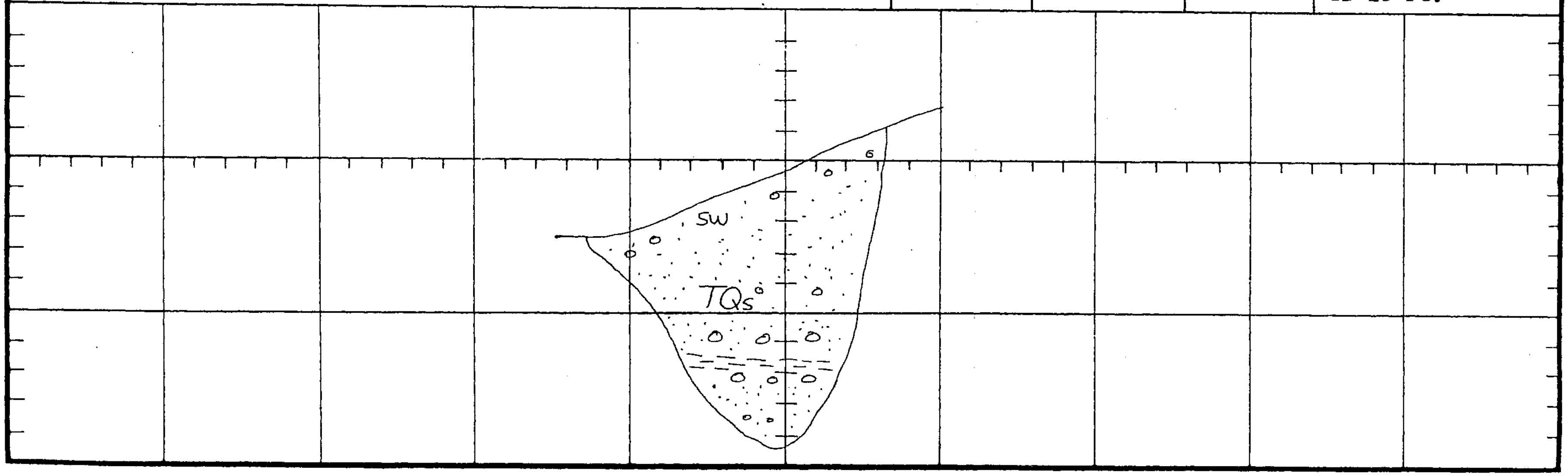
Trench Log No. 27

PROJECT TT 31236 PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 1.5' SLOPEWASH; SW; Fine-to medium grained sand with cobbles; dry; loose				
1.5'- 10' BEDROCK; TQs; Medium-brown to gray; medium-to coarse sandstone with cobble conglomerate lenses; conglomerate very dense; dry; sandstone moderately dense; dry to damp; isolated thin bed of very silty sandstone; near bottom of trench	a) horizontal			
N 10 W				No Ground Water No Caving TD 10 Ft.

SCALE 1" = 5 Ft.



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JOB NO. 6-803-4

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Trench Log No. 28

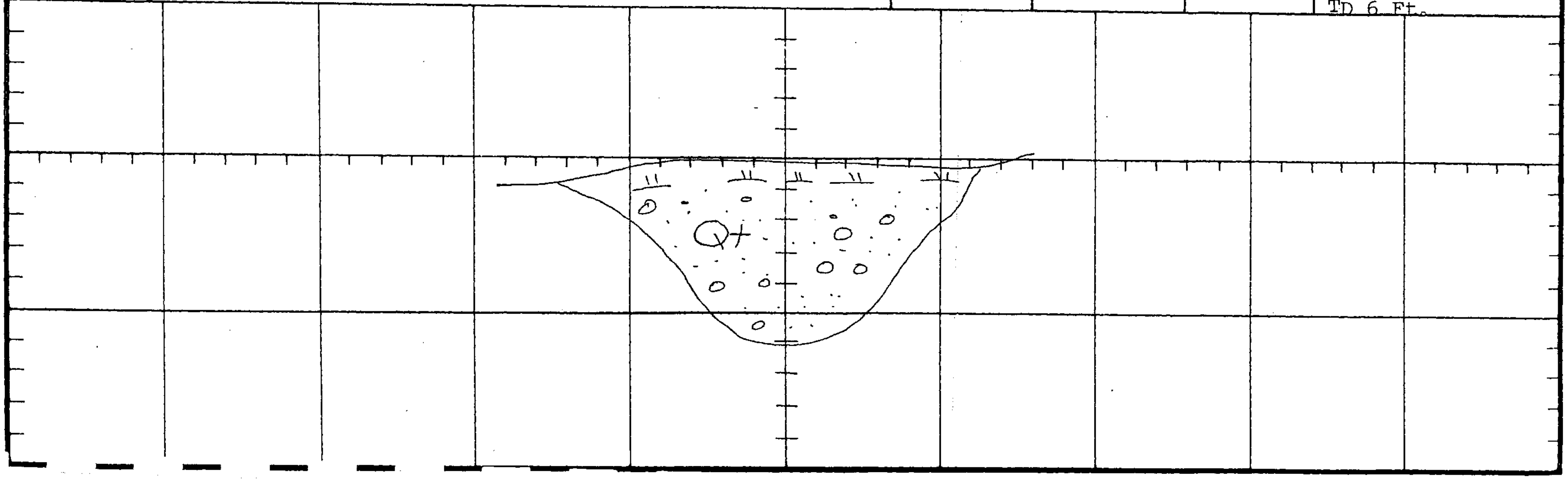
PROJECT TT 31236 PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 1'	SOIL; Medium-brown; fine-to medium silty sand with many cobbles; dry; loose				
1' - 6'	QUATERNARY TERRACE; Qt; Orange-brown; fine-to coarse sandstone with conglomerate lenses; cobbles to 8"; dry; moderately dense				No Ground Water No Caving TD 6 Ft.

N 27 E

SCALE 1" = 5 Ft.



TT 31236

JOB NO. 6-803-4

LOGGED BY GF

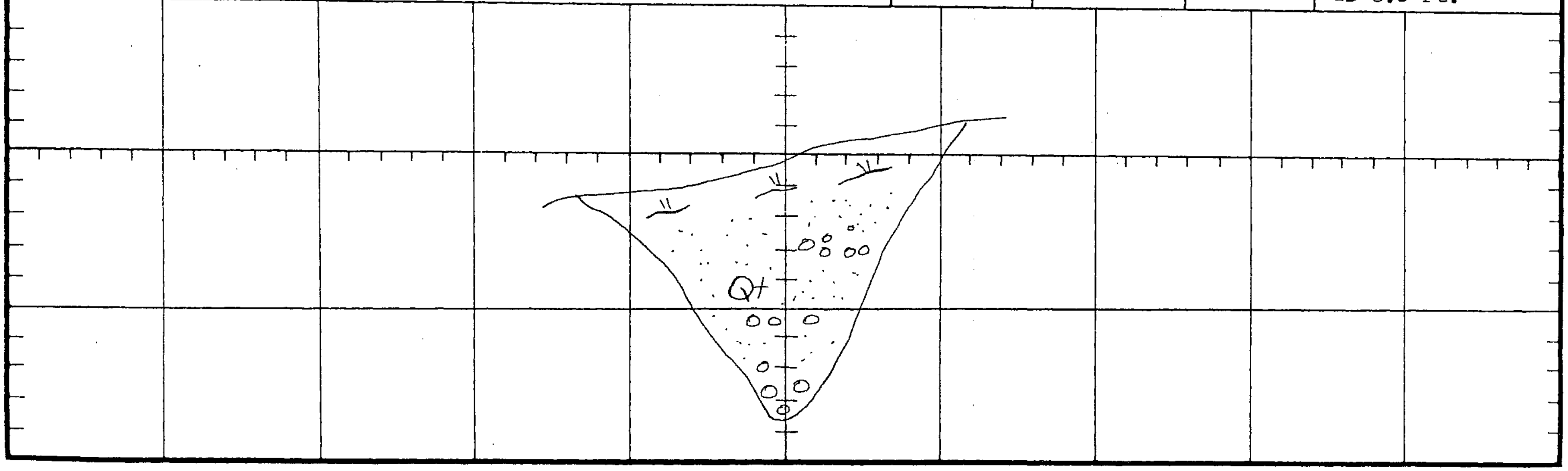
Trench Log No. 29

PROJECT PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 1'	SOIL; Medium-brown; fine-to medium sand with cobbles; dry; moderately dense				
1' - 8.5'	QUATERNARY TERRACE; Qt; Medium-to coarse sandstone with conglomerate lenses (clasts up to 18"); dry; moderately dense				
	N 10 W				No Ground Water No Caving TD 8.5 Ft.

SCALE 1" = 5 Ft.



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Trench Log No. 30

TT 31236

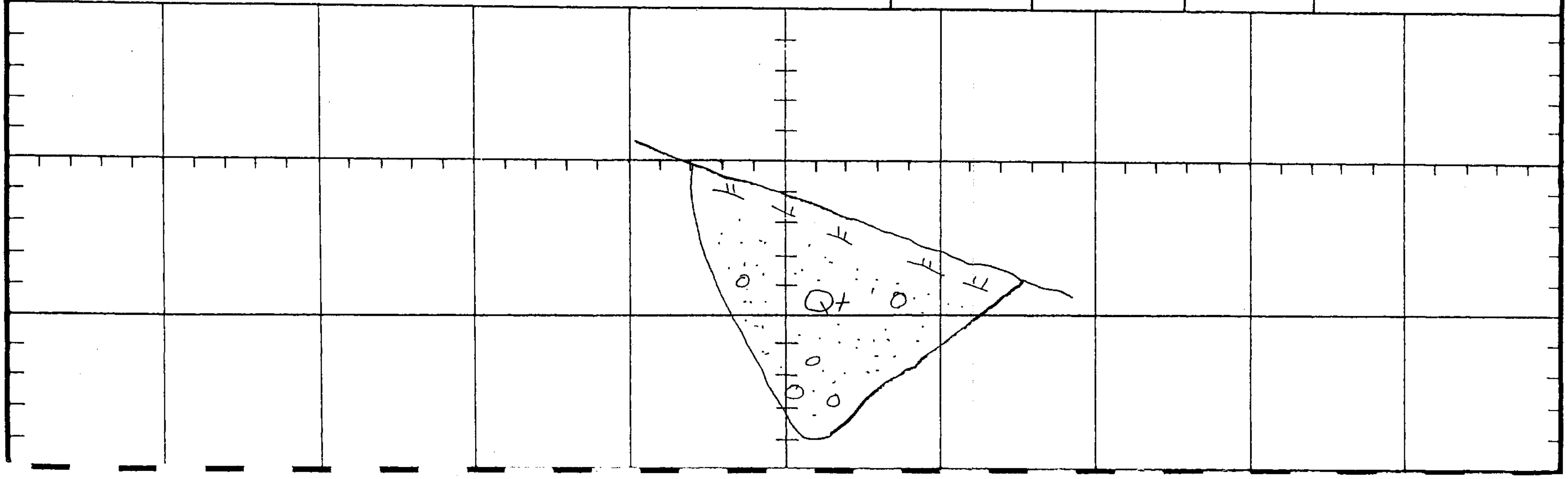
PROJECT PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 1'	SOIL; Reddish-brown; fine-to medium-silty sand with scattered cobbles and pebbles; dry; moderately dense				
1' - 9'	QUATERNARY TERRACE; Qt; Orange-brown; medium-to coarse sandstone with conglomerate lenses; cobbles up to 16" at base of trench; dry; moderately dense				No Ground Water No Caving TD 9 Ft.

N 65 W

SCALE 1" = 5 Ft.



JOB NO. 6-803-4

LOGGED BY GF

Trench Log No. 31

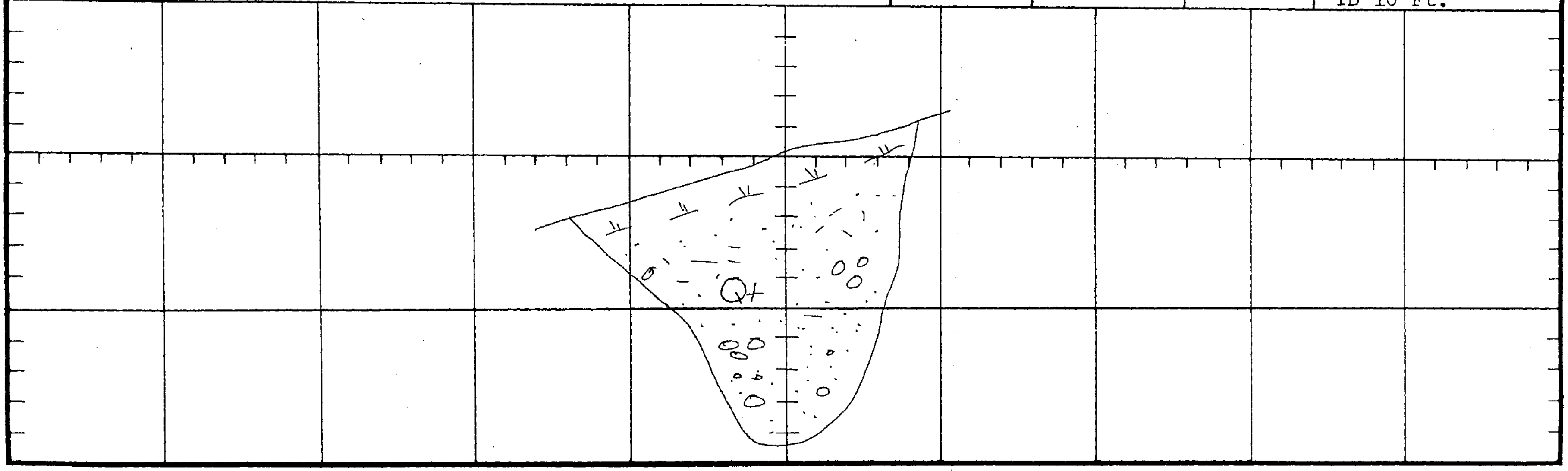
PROJECT TT 31236 PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 1'	SOIL; Medium-brown, fine- to coarse pebbly sand;				Trenches 31-43 excavated 9/11/86 with crawlerhoe with 24" rear-mounted bucket
1' - 10'	QUATERNARY TERRACE; Qt; Reddish-brown, medium- to coarse silty sandstone with cobbles (up to 8") conglomerate lenses; no distinct bedding				No Ground Water No Caving TD 10 Ft.

N 24 E

SCALE 1" = 5 Ft.



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JOB NO. 6-803-4
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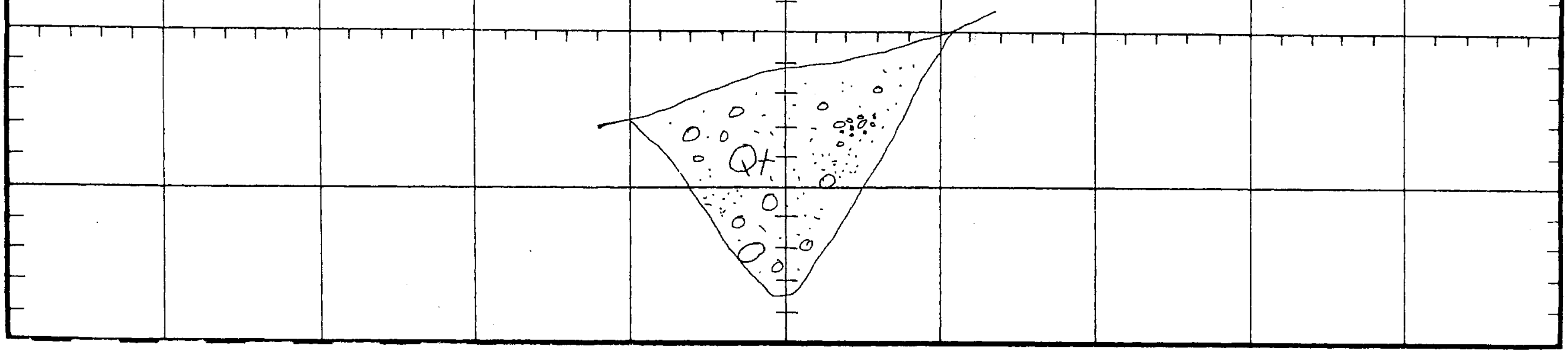
Trench Log No. 32

TT 31236
PROJECT PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 7½' QUATERNARY TERRACE: Qt; Reddish-brown, cobble conglomerate with pebble and sandstone lenses; dry; dense to very dense; cobbles to 16"; no distinct bedding N 5 W SCALE 1" = 5 Ft.				No Ground Water No Caving TD 7½ Ft.



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JOB NO. 6-803-4

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Trench Log No. 33

TT 31236

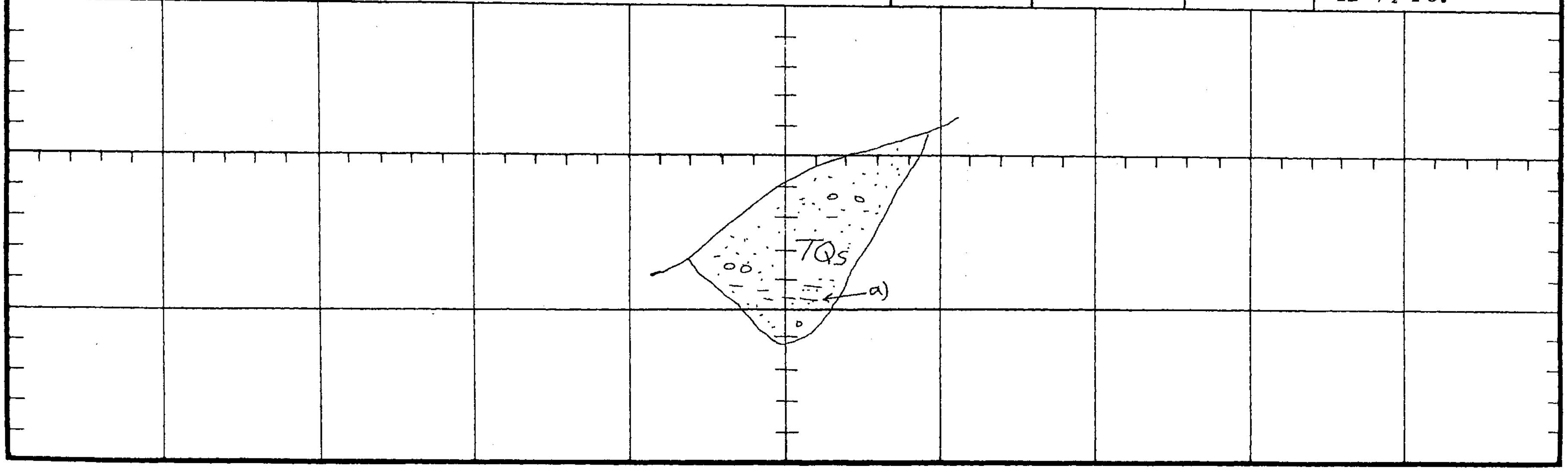
PROJECT PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 7½'	BEDROCK; TQs; Light-brown to gray; medium-to coarse sandstone with minor pebble lenses; dry; dense; single silty sandstone bed (2" thick)	a) N 55 W 9 NE			No Ground Water No Caving TD 7½ Ft.

S —— N

SCALE 1" = 5 Ft.



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JOB NO. 6-803-4

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Trench Log No. 34

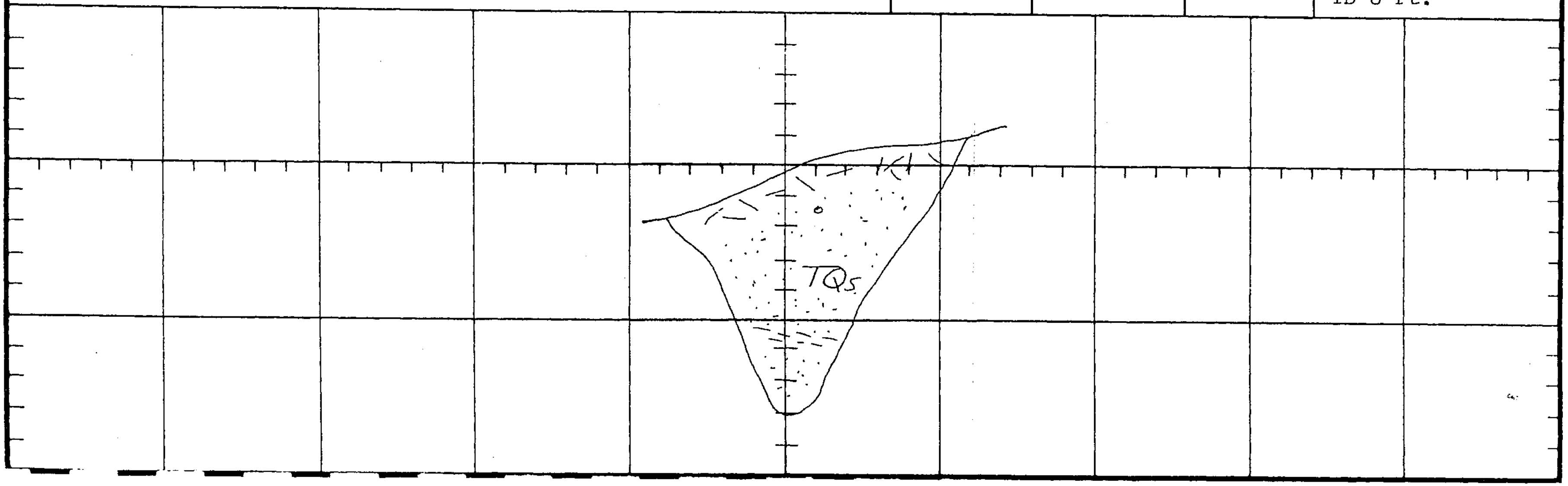
PROJECT TT 31236 PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 8'	BEDROCK; TQs; Light-brown to gray medium- to coarse sandstone with one (1) 2" silty sandstone bed; top 1' fractured; few isolated pebbles	a) N 75 E 16 NW			No Ground Water No Caving TD 8 Ft.

N 32 W

SCALE 1" = 5 Ft.



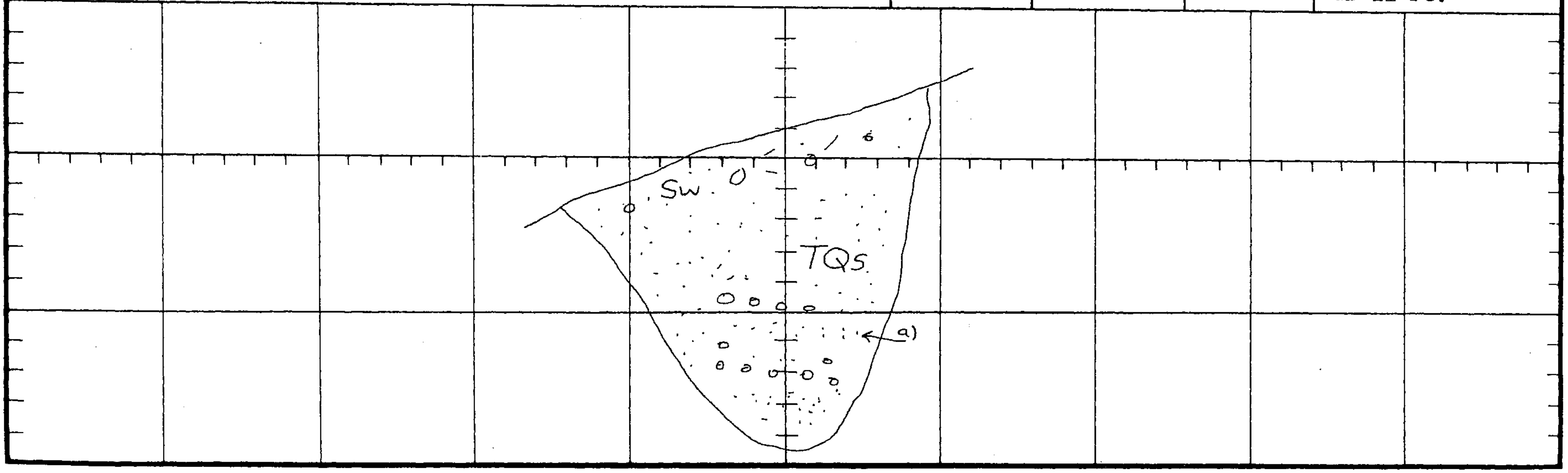
JOB NO. 6-803-4
LOGGED BY GF

Trench Log No. 35

TT 31236
PROJECT PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 4'	SLOPEWASH; Reddish-brown, fine-to coarse sand with cobbles (up to 5"); dry; loose				
4' - 11'	BEDROCK; TQs; Reddish-brown to gray, medium-to coarse sandstone with cobble conglomerate lenses; damp; moderately dense; grades reddish-brown to gray with depth	a) N 83 E 8 NW			
	N 3 W				No Ground Water No Caving TD 11 Ft.

SCALE 1" = 5 Ft.



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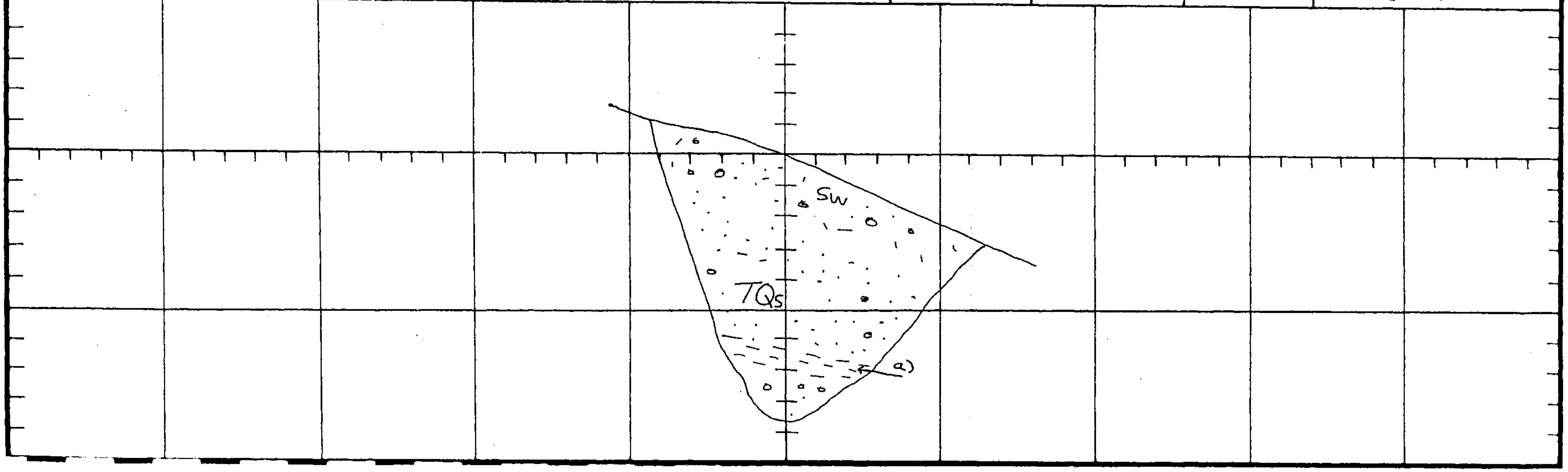
Trench Log No. 36

PROJECT TT 31236 PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 3'	SLOPEWASH; Orange-brown, fine-to medium silty sand with scattered cobbles; loose to moderately dense; dry				
3' - 8½'	BEDROCK; TQs; Medium-to coarse sandstone with 2" very silty sandstone horizon; abundant caliche stain; scattered cobbles	a) N 55 W 6 NE			
					No Ground Water No Caving TD 8½ Ft.

N 15 W

SCALE 1" = 5 Ft.



AL E WA

JOB NO. 6-803-4

LOGGED BY GF

Trench Log No. 37

TT 31236

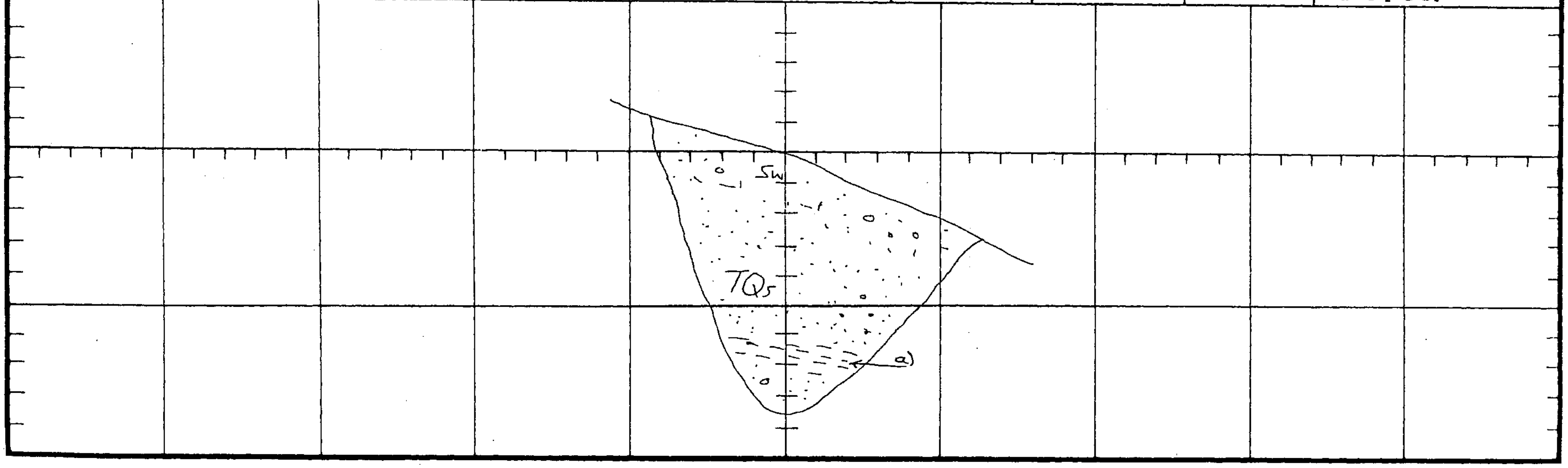
PROJECT PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 1'	SLOPEWASH; Light-brown to gray, fine-to coarse silty sand with cobbles and pebbles; loose; dry				
1' - 9½'	BEDROCK; TQs; Light-brown to gray (grades brown with depth); medium-to coarse sandstone with one silty sandstone (3" thick); moderately dense; damp to dry; scattered cobble conglomerate lenses	a) N 85 W 3 NE approx.			
					No Ground Water No Caving TD 9½ Ft.

N 40 W

SCALE 1" = 5 Ft.



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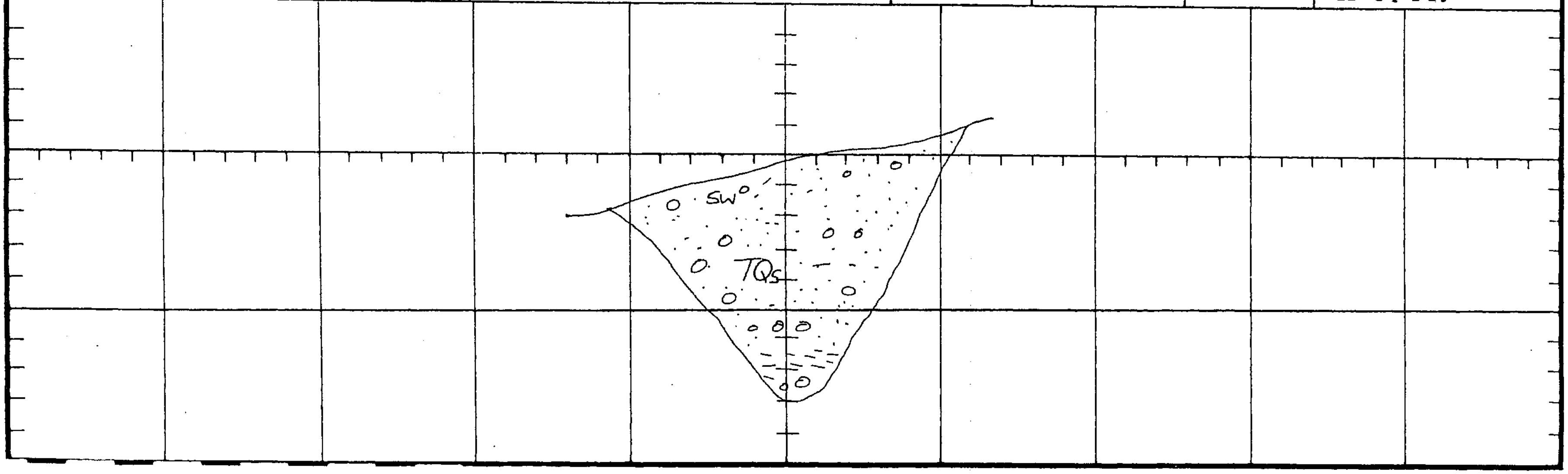
JOB NO. 6-803-4
LOGGED BY GF

Trench Log No. 38

PROJECT PALMER - TT 31236 Santa Catarina
DATE November 13, 1986

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 1'	SLOPEWASH; Sw; Gray, very coarse sand with cobbles and pebbles; loose; dry				
1' - 8½'	BEDROCK; TQs; Light-to medium brown, medium-to coarse sandstone with 1' silty sandstone bed at bottom of trench and scattered conglomerate lenses; moderately dense; damp to dry	N 75 E 6 NW			
	N 20 W				No Ground Water No Caving TD 8½ Ft.

SCALE 1" = 5 Ft.



AL E WA

JOB NO. 6-803-4

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Trench Log No. 39

TT 31236

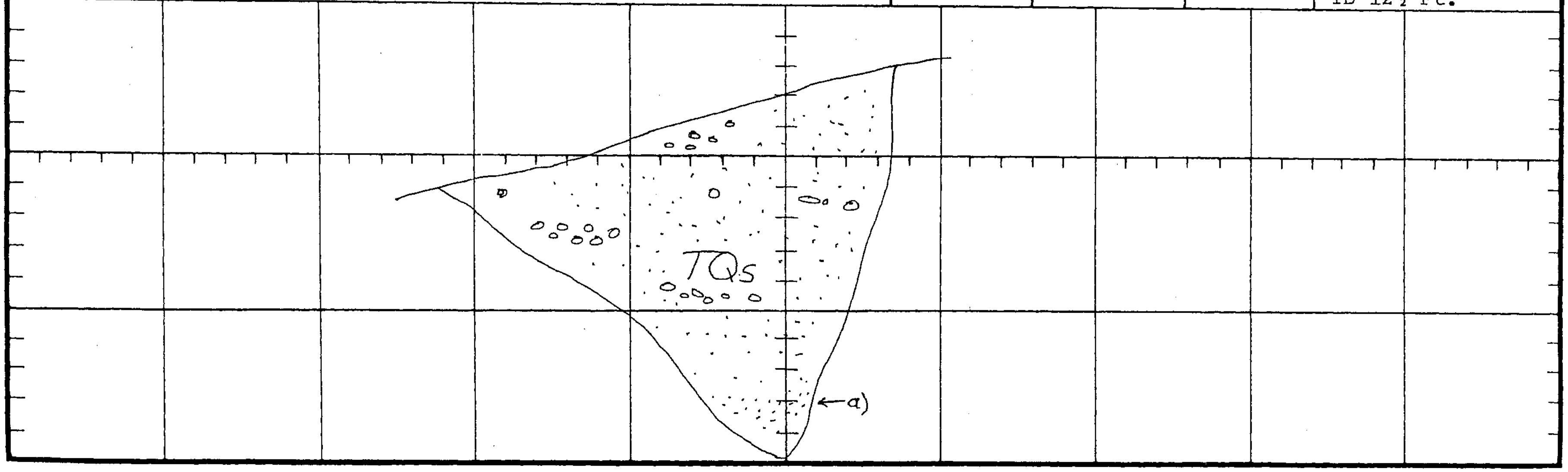
PROJECT PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 12½' BEDROCK; TQs; Gray-to light brown; fine-to coarse sandstone with scattered cobble conglomerate lenses; 1' layer of parallel-laminated medium sandstone at bottom; loose to moderately dense; dry to damp	N 85 E 6 NW			No Ground Water No Caving TD 12½ Ft.

N 45 W

SCALE 1" = 5 Ft.



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TT 31236

JOB NO. 6-803-4

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PROJECT PALMER - Santa Catarina

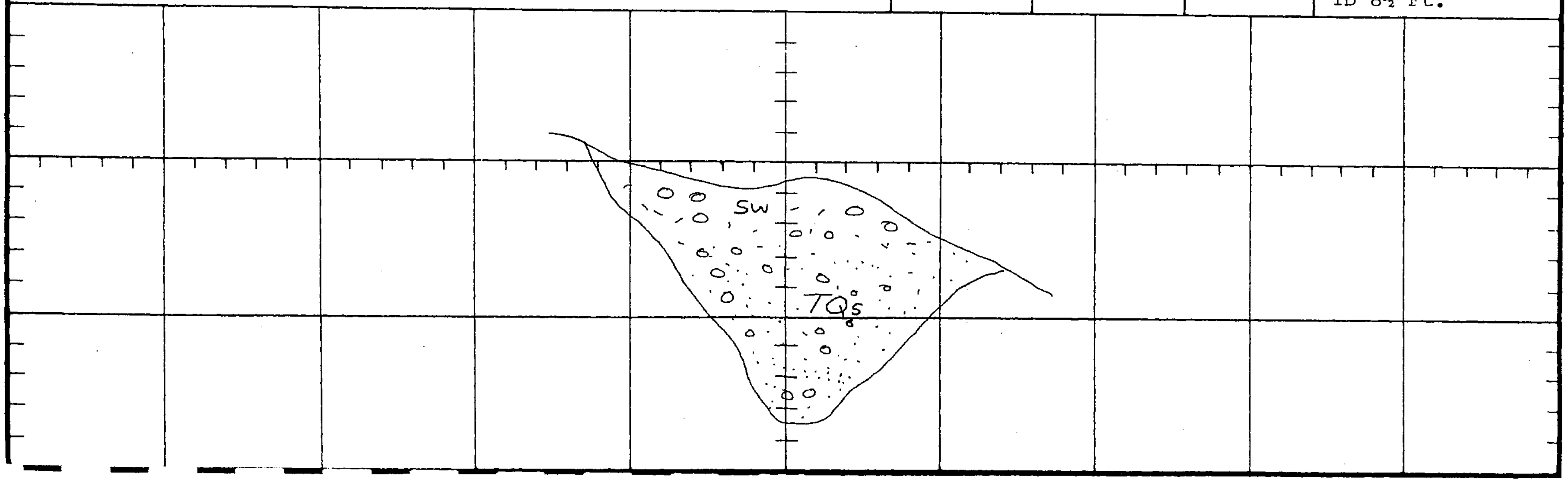
DATE November 13, 1986

Trench Log No. 42

LITHOLOGY		BEDDING	FAULTING	JOINTS	COMMENTS
0 - 2½'	SLOPEWASH' Light-brown, fine-to medium silty sand with gravel and scattered cobbles; loose; dry				
2½'- 8½'	BEDROCK; TQs; Light-brown to gray, medium-to coarse sandstone with minor conglomerate lenses; moderately dense; damp to moist	a) N 61 W 6 NE			
					No Ground Water No Caving TD 8½ Ft.

N 49 W

SCALE 1" = 5 Ft.



AL I E WA

JOB NO. 6-803-4

LOGGED BY GF

Trench Log No. 43

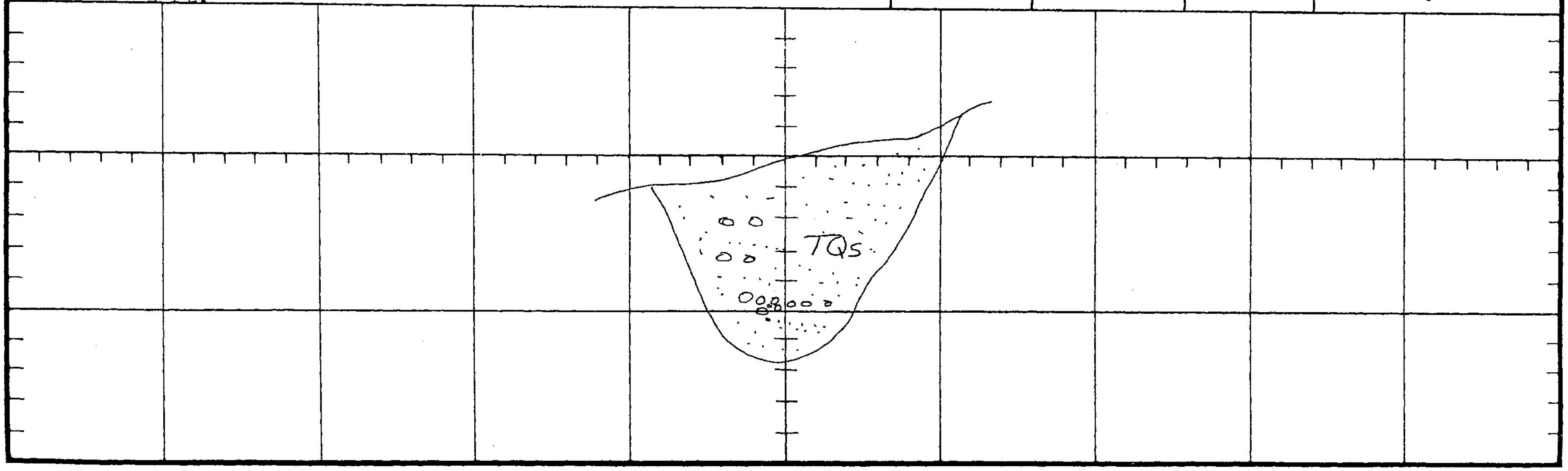
PROJECT TT 31236 PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 7' BEDROCK; TQs; Orange-brown to gray, medium-to coarse sandstone with conglomerate lenses; moderately dense to dense; damp to dry	a) N 76 W 8 NE			No Ground Water No Caving TD 7 Ft.

N 20 W

SCALE 1" = 5 Ft.



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JOB NO. 6-803-4

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Trench Log No. 44

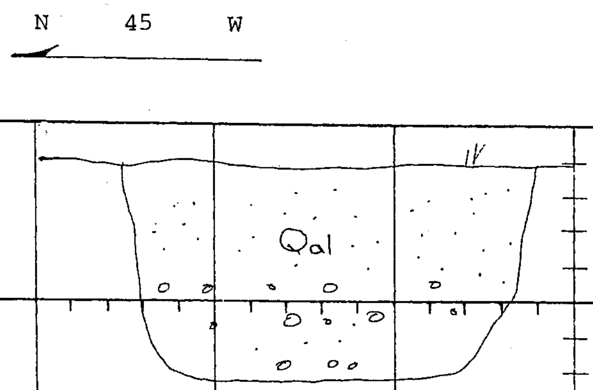
TT. 31236

PROJECT PALMER - Santa Catarina

DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 6' RECENT ALLUVIUM; Qal; Gray sand and gravel; clasts to 1½-inch diameter; flowing water; extensive caving; friable				Excavated trenches 44 through 46 on 10/1/86 using Extendo Hoe with 24" bucket Water flowing in stream to north @ 30" Ground Water Extensive Caving TD 6 Ft.

SCALE 1" = 5 Ft.



AL E WA

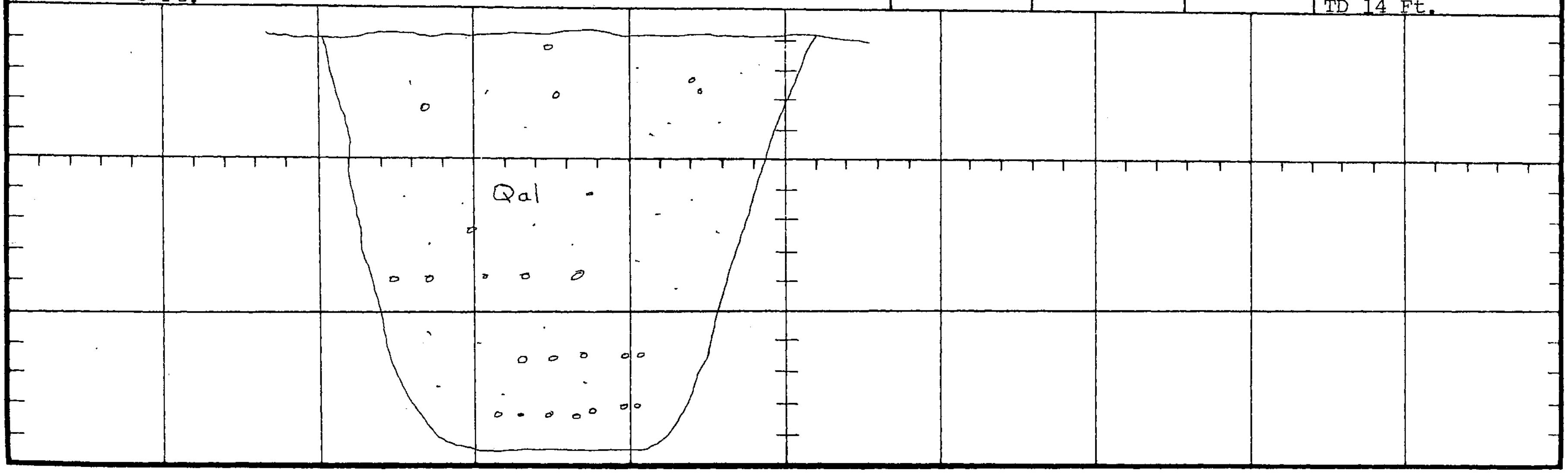
JOB NO. 6-803-4
LOGGED BY AES

Trench Log No. 45

PROJECT TT. 31236
PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 14' RECENT ALLUVIUM; Qal; Sand and gravel; @ 8 feet irregular lense of sorted gravel; clasts to 2-inch diameter; friable, extensive caving; moist to wet N 7 E				No Free Ground Water Extensive Caving TD 14 Ft.

SCALE 1" = 5 Ft.



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JOB NO. 6-803-4
LOGGED BY AES

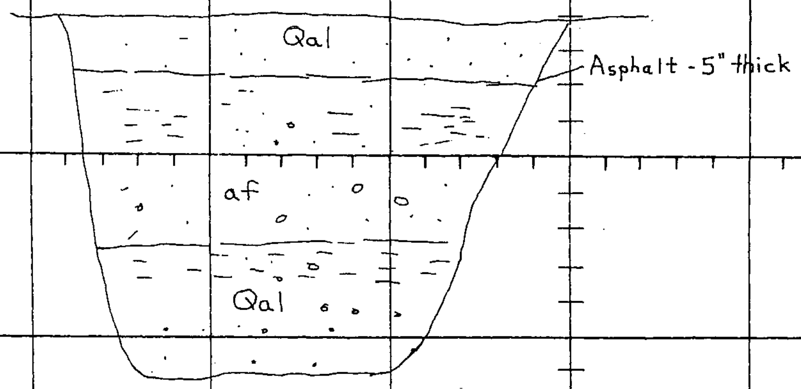
Trench Log No. 46

TT. 31236
PROJECT PALMER - Santa Catarina
DATE November 13, 1986

LITHOLOGY	BEDDING	FAULTING	JOINTS	COMMENTS
0 - 2' RECENT ALLUVIUM; Qal; Sand and gravel; loose; damp				Fill results of "old" mining (Quarry) operations
2' - 6' FILL; af; Black asphalt; irregular patches of silty sand; greenish gray silt, sand and gravel				
6' - 10' RECENT ALLUVIUM; Qal; Moderate brown silty sand and gravel; upper 2 feet "old" flood plain deposits, underlain by coarse sand and gravel; clasts to 3-inch diameter; damp to moist				No Ground Water No Caving TD 10 Ft.

N 25 E

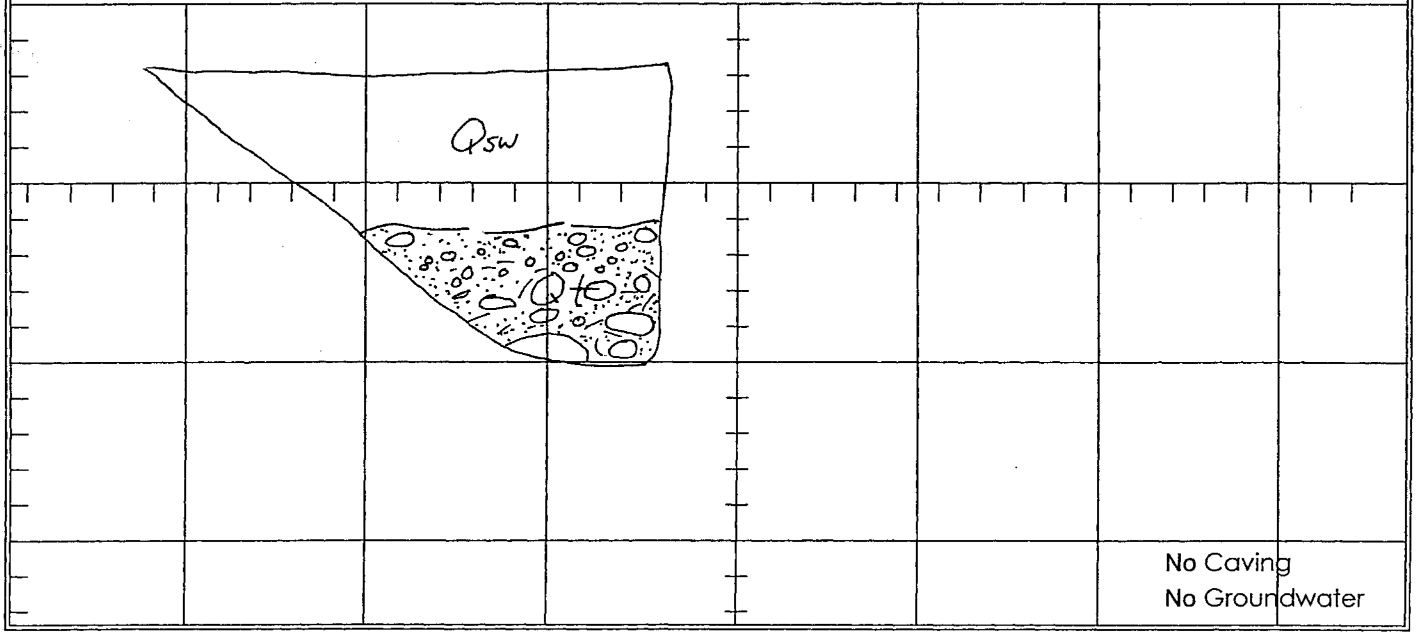
SCALE 1" = 5 Ft.



CLIENT: Synergy PROJECT: Tentative Tract 60258	JOB NO: 04-803S-4 DATE: 6/11/04 LOGGED BY: MJD EXCAVATED: 1/14/04	**TRENCH LOG NO. T-47**
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket	ELEVATION:	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SOIL/SLOPEWASH; soil/Qsw (0-5')** @ 0' Moderate- to reddish-brown silty clayey sand with pebbles and scattered cobbles; soft to moderately hard; dry to damp; voids; roothairs				
5					**QUATERNARY TERRACE; Qt (5-8.5')** @ 5' Cobble and boulder conglomerate in reddish- to orangish-brown clayey sandstone matrix; moderately hard; damp; massive, mostly well-rounded granitic cobbles and boulders; boulders up to 2' diameter Comments Refusal at 8'; large boulder				
10									
15									
20									

TOTAL DEPTH: 8.5 feet ←N11W SCALE: 1 inch = 5 feet



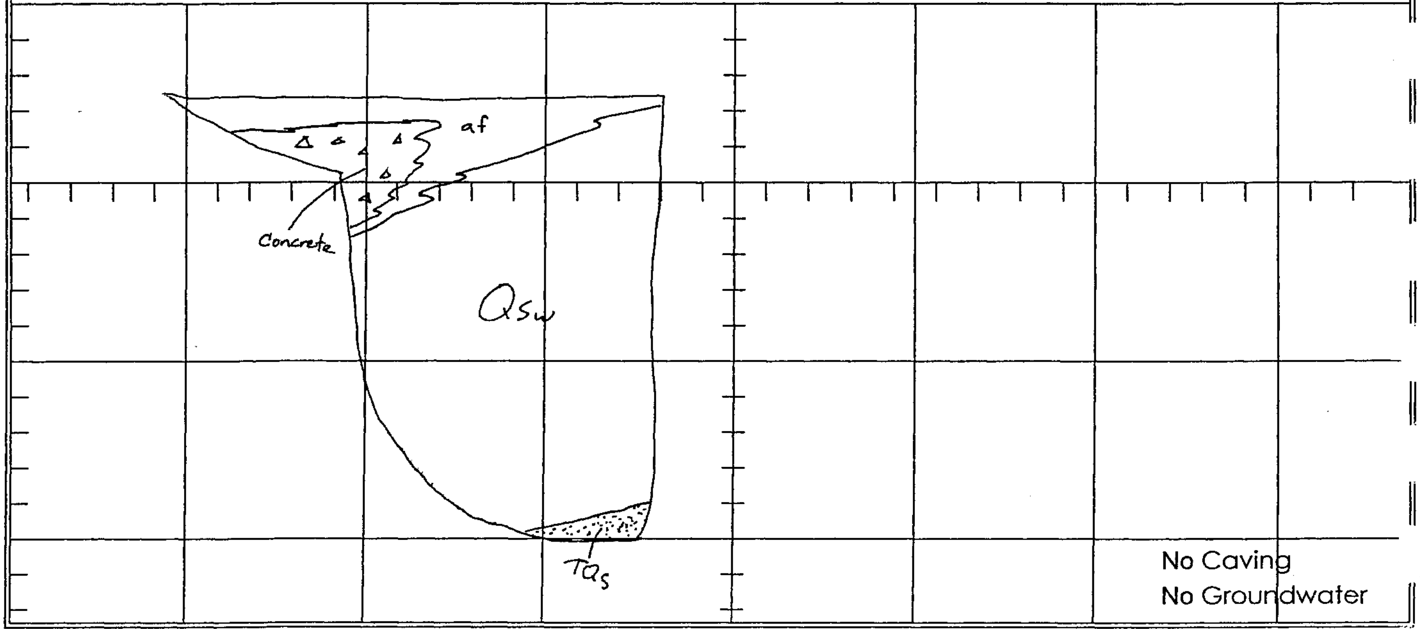
No Caving
No Groundwater

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC. Sheet 1 of 1

CLIENT: Synergy	JOB NO: 04-803S-4	**TRENCH LOG NO. T-48**
PROJECT: Tentative Tract 60258	DATE: 6/11/04	
	LOGGED BY: MJD	
	EXCAVATED: 1/14/04	
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket	ELEVATION:	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**<u>SLOPEWASH/ARTIFICIAL FILL</u>; Qsw/af (0-12')** @ 0' Moderate brown silty, clayey sand with pebbles and cobbles; soft to moderately hard; damp; roots; voids; concrete; trash				
5									
10					**<u>BEDROCK</u>; TQs (12-12.5')** @ 12' Yellowish-gray sandstone; hard; damp <u>Comments</u> Concrete dumped and unable to dig through; covers much of bottom area Surface logged				
15									
20									

TOTAL DEPTH: 12.5 feet N77W→ SCALE: 1 inch = 5 feet



No Caving
No Groundwater

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC. Sheet 1 of 1

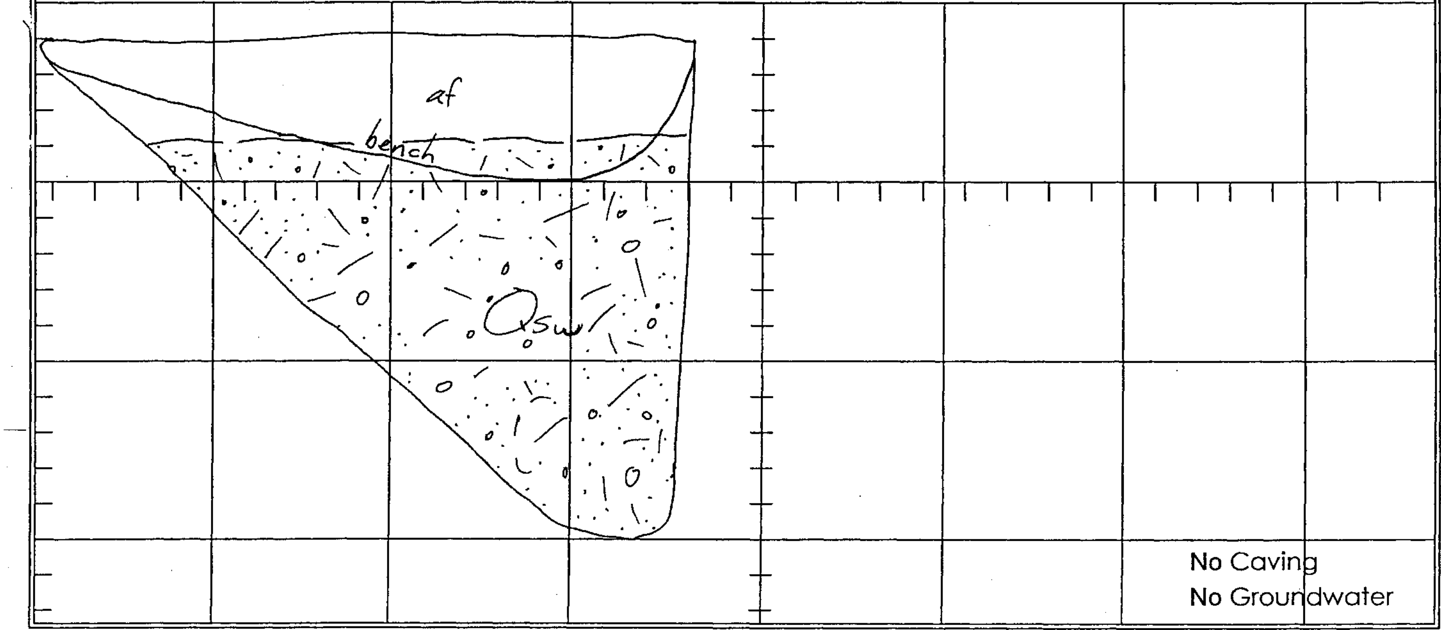
CLIENT: Synergy
PROJECT: Tentative Tract 60258
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 1/14/04
ELEVATION:

TRENCH LOG NO. T-49

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**ARTIFICIAL FILL; af (0-2.5')** @ 0' Light to moderate brown silty, clayey sand with pebbles and cobbles; soft; damp; trash; organics; gravel **SOIL/SLOPEWASH; soil/Qsw (2.5-14')** @ 2.5' Moderate to dark brown silty, clayey sand with pebbles and cobbles; soft; damp to moist; roots; voids; massive				
5									
10									
15					Comments Gravel layer at base of af Looks more like Qsw than Qal				
20									

TOTAL DEPTH: 14 feet N53W→ SCALE: 1 inch = 5 feet



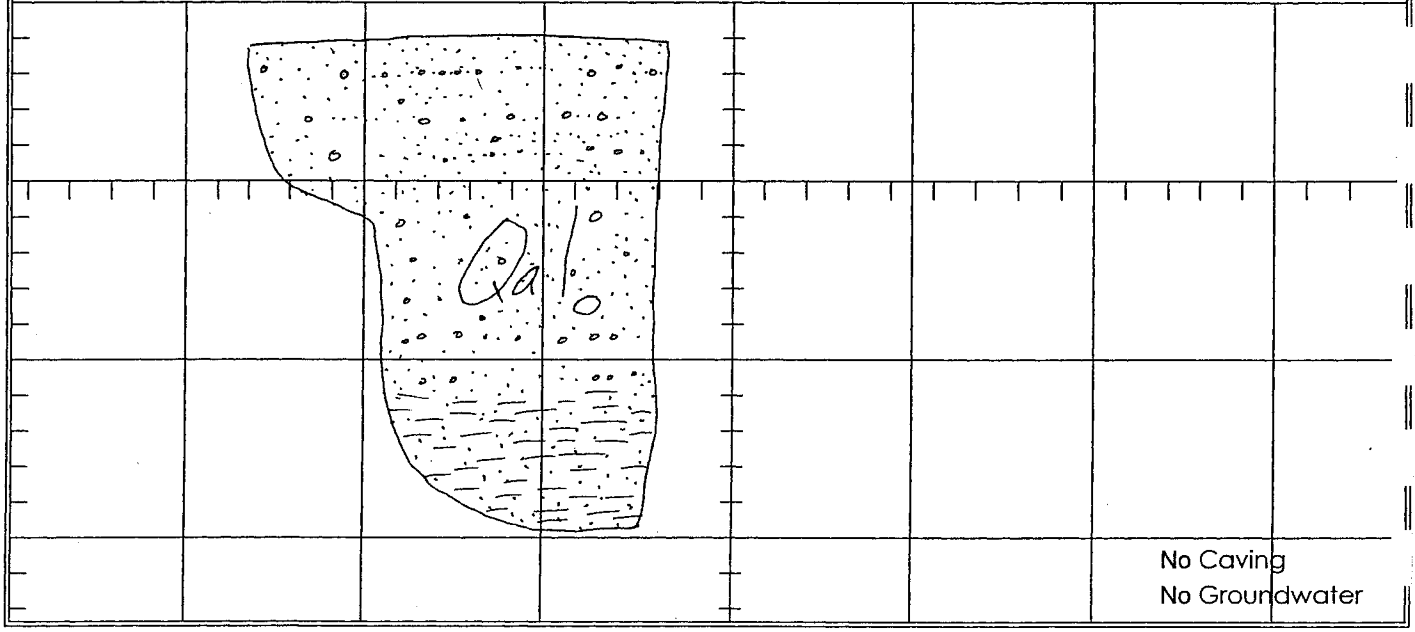
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC. Sheet 1 of 1

CLIENT: Synergy
PROJECT: Tentative Tract 60258
JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 1/14/04
ELEVATION:
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

TRENCH LOG NO. T-50

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**QUATERNARY ALLUVIUM; Qal (0-14')** @ 0' Light gray sand and pebbly sand; loose; damp to moist; scattered cobbles; well-bedded; laminated				
5									
10					@ 10' Interbedded light yellowish-brown to light brown silty and clayey fine-grained sand; medium dense; moist; laminated				
15					Comments Surface logged @ 10' dug much firmer per backhoe operator				
20									

TOTAL DEPTH: 14 feet ←N60E SCALE: 1 inch = 5 feet

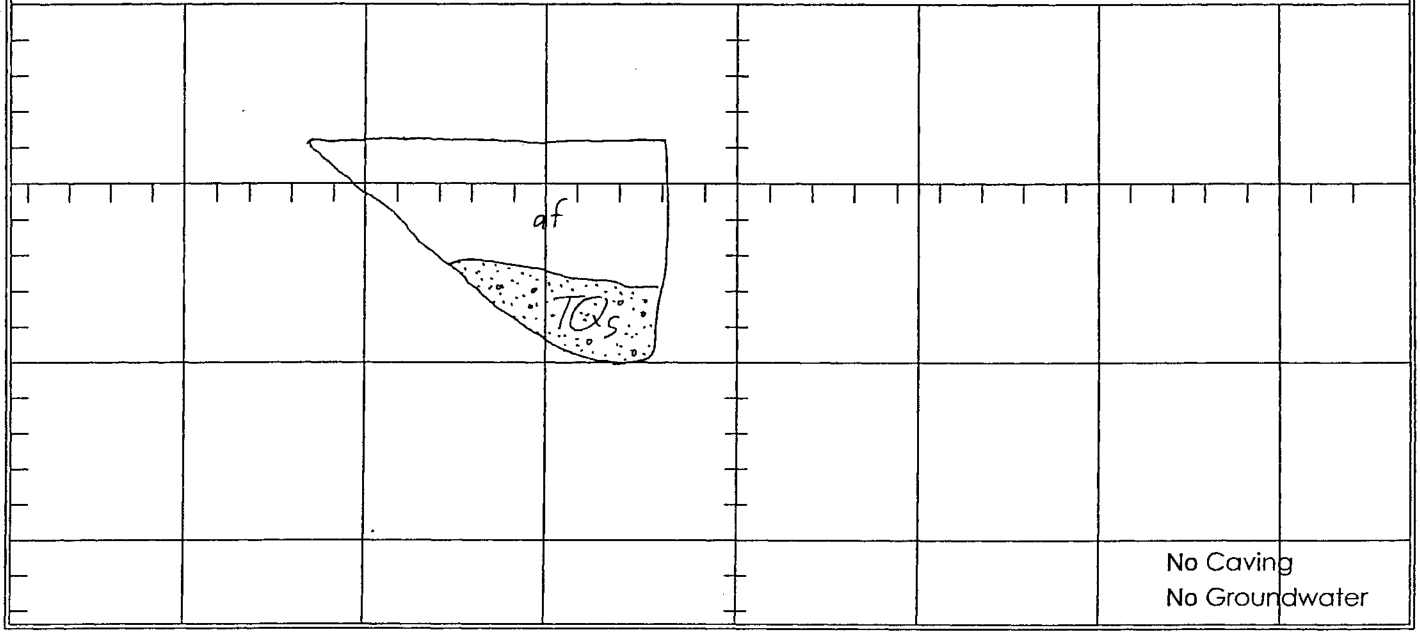


No Caving
No Groundwater

CLIENT: Synergy	JOB NO: 04-803S-4	**TRENCH LOG NO. T-51**
PROJECT: Tentative Tract 60258	DATE: 6/11/04	
	LOGGED BY: MJD	
	EXCAVATED: 1/14/04	
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket	ELEVATION:	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**ARTIFICIAL FILL; af (0-4')** @ 0' Moderate brown silty, pebbly sand with cobbles; soft; damp to moist; sharp irregular contact with TQs; gravel lenses				
5					**BEDROCK; TQs (4-6')** @ 4' Light gray pebbly sandstone; hard to very hard; damp; massive to very vaguely bedded Comments Very hard to dig				
10									
15									
20									

TOTAL DEPTH: 6 feet ←N75E SCALE: 1 inch = 5 feet



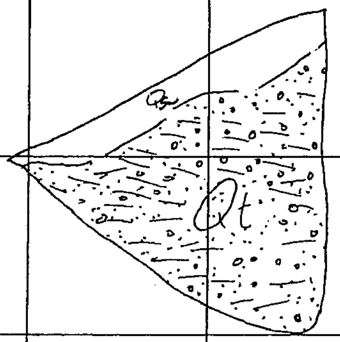
No Caving
No Groundwater

CLIENT: Synergy
PROJECT: Tentative Tract 60258
JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 1/14/04
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket
ELEVATION:

TRENCH LOG NO. T-52

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**<u>SLOPEWASH</u>; Qsw (0-1')** @ 0' Dark brown silty sand with pebbles and cobbles; soft; damp to moist; roots; voids **<u>QUATERNARY TERRACE</u>; Qt (1-9')** @ 1' Reddish- to orangish-brown clayey, pebbly sandstone with cobbles; moderately hard to hard; damp; crudely bedded to massive; local clast supported pebble lenses; moderately weathered to 5'				
5									
10									
15									
20									

TOTAL DEPTH: 9 feet
←N15E
SCALE: 1 inch = 5 feet



No Caving
No Groundwater

CLIENT: Synergy

PROJECT: Tentative Tract 60258

JOB NO: 04-803S-4

DATE: 6/11/04

LOGGED BY: MJD

EXCAVATED: 1/14/04

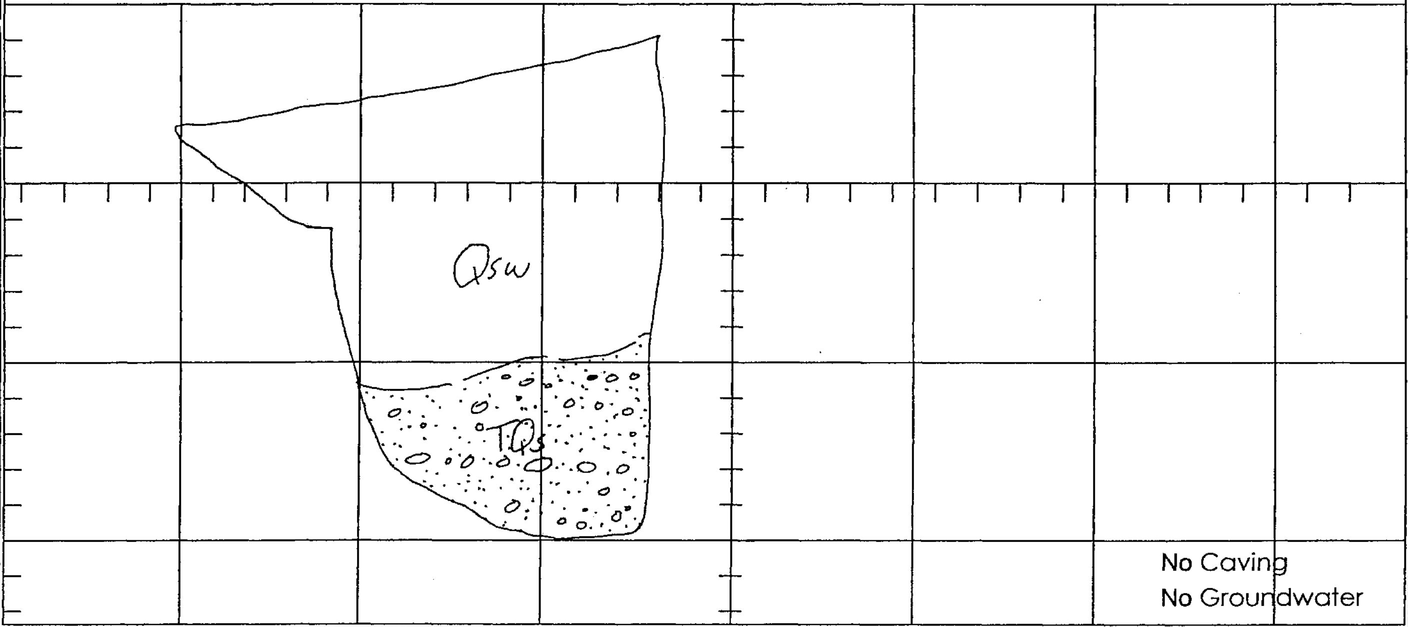
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

ELEVATION:

TRENCH LOG NO. T-53

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SLOPEWASH; Qsw (0-8')** @ 0' Moderate brown silty, clayey sand with pebbles and scattered cobbles; soft; damp; roots; voids				
5									
10					**BEDROCK; TQs (8-14')** @ 8' Yellowish-gray to light yellowish-brown sandstone and pebbly sandstone with cobbles and scattered boulders; loose; damp; crudely bedded				
15					Comments Minor belling in TQs Surface logged				
20									

TOTAL DEPTH: 14 feet ←N43W SCALE: 1 inch = 5 feet



No Caving
No Groundwater

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

Sheet 1 of 1

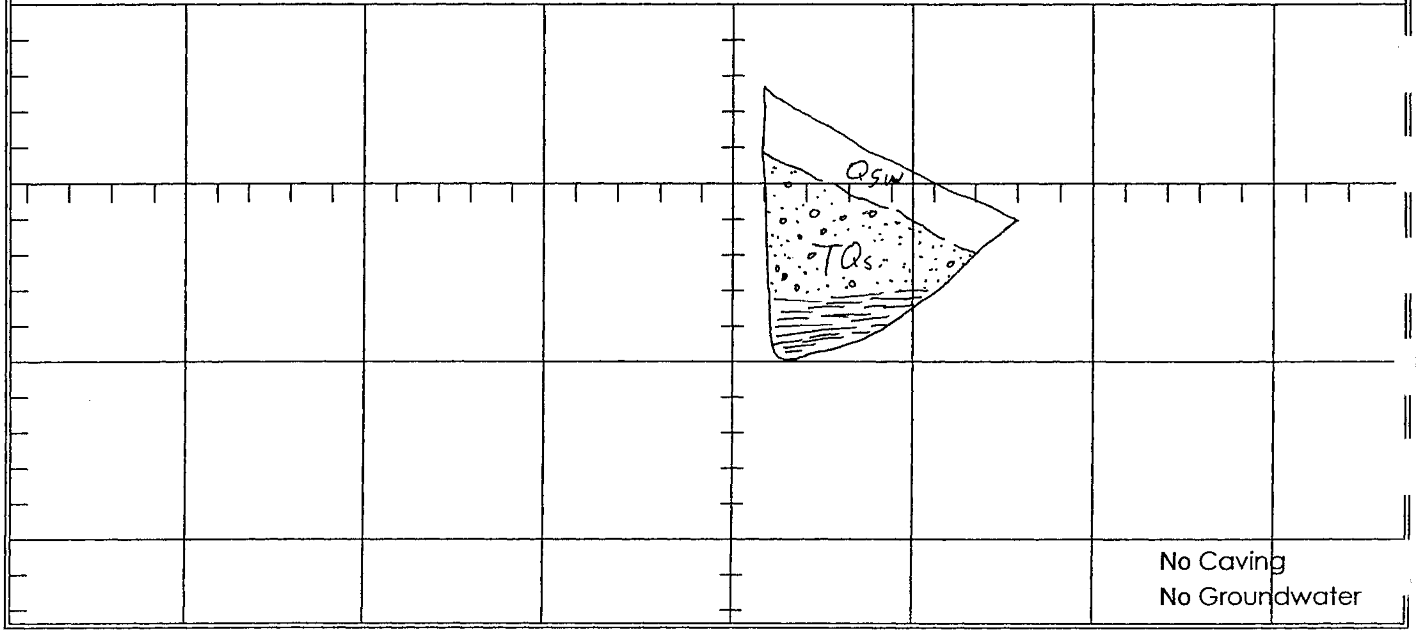
CLIENT: Synergy	JOB NO: 04-803S-4	**TRENCH LOG NO. T-54**
PROJECT: Tentative Tract 60258	DATE: 6/11/04	
	LOGGED BY: MJD	
	EXCAVATED: 1/14/04	
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket	ELEVATION:	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SLOPEWASH; Qsw (0-2')** @ 0' Light reddish-brown silty pebbly sand; soft; damp; roots; voids; scattered pebbles				
					BEDROCK; TQs (2-7.5') @ 2' Light yellowish-gray sandstone and light reddish- brown siltstone; moderately hard to hard; damp; slightly weathered; sandstone locally pebbly	B: N72E,7NW			
5									
					Comments Good attitude				
10									
15									
20									

TOTAL DEPTH: 7.5 feet

←N30E

SCALE: 1 inch = 5 feet



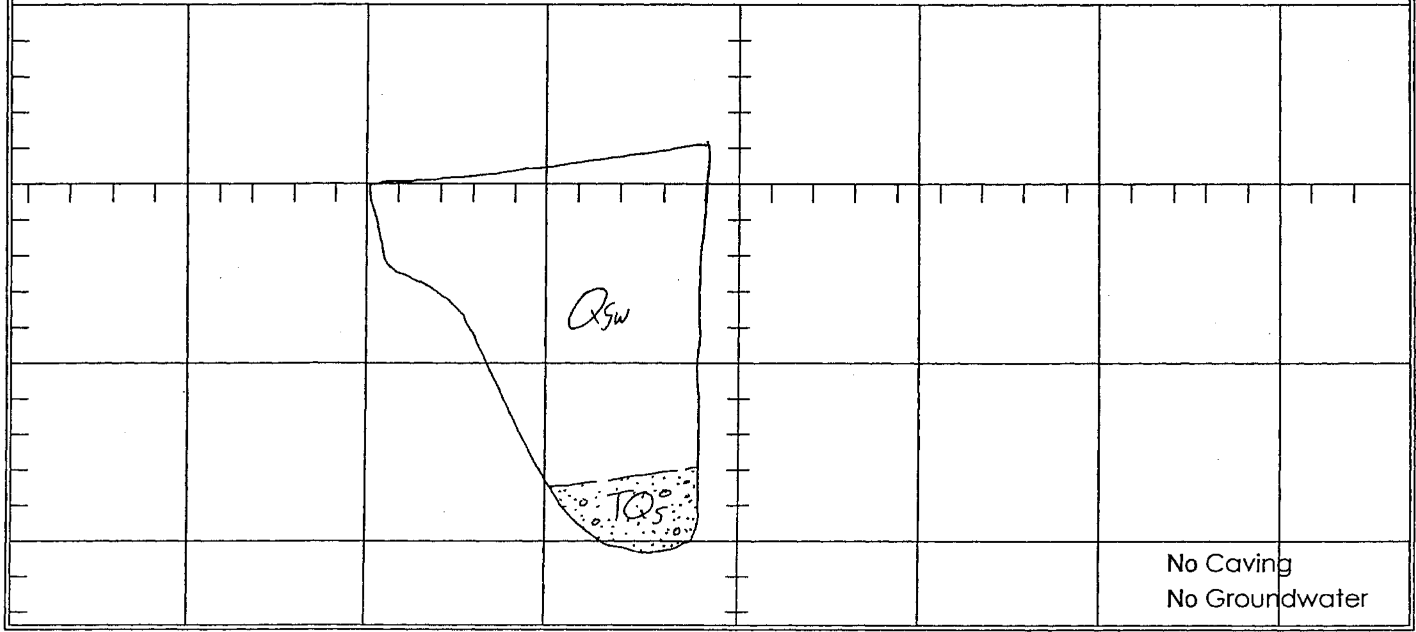
No Caving
No Groundwater

CLIENT: Synergy	JOB NO: 04-803S-4		
PROJECT: Tentative Tract 60258	DATE: 6/11/04		
	LOGGED BY: MJD		
	EXCAVATED: 1/14/04		
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket	ELEVATION:		

TRENCH LOG NO. T-55

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SLOPEWASH; Qsw (0-9')** @ 0' Light to moderate brown silty, pebbly sand with cobbles and boulders; soft; damp to wet; roots; voids				
5									
10					**BEDROCK; TQs (9-11')** @ 9' Light yellowish-gray pebbly sandstone; hard; damp				
15									
20									

TOTAL DEPTH: 11 feet N70E→ SCALE: 1 inch = 5 feet



No Caving
No Groundwater

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

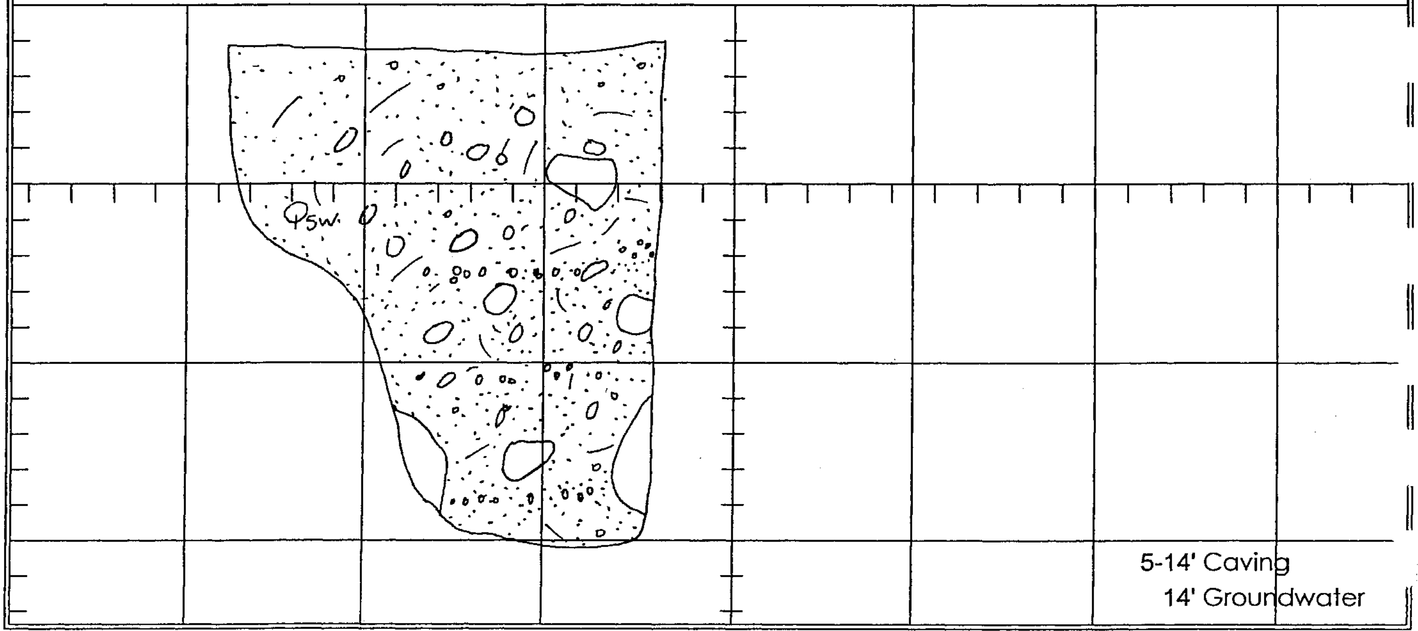
Sheet 1 of 1

CLIENT: Synergy
PROJECT: Tentative Tract 60258
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket
JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 1/14/04
ELEVATION:

TRENCH LOG NO. T-56

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SLOPEWASH; Qsw (0-14')** @ 0' Light to moderate brown to light yellowish-brown sand, silty sand and pebbly sand with cobbles and boulders; soft; damp to wet; 3' diameter boulders to 14'; water seepage at 14'; belling and caving at 5-14'; roots to 6'; locally bedded				
5				SM					Curve =B
10									
		▽			Comments Surface logged Bulk sample at 5-7'				
15									
20									

TOTAL DEPTH: 14 feet N4W→ SCALE: 1 inch = 5 feet



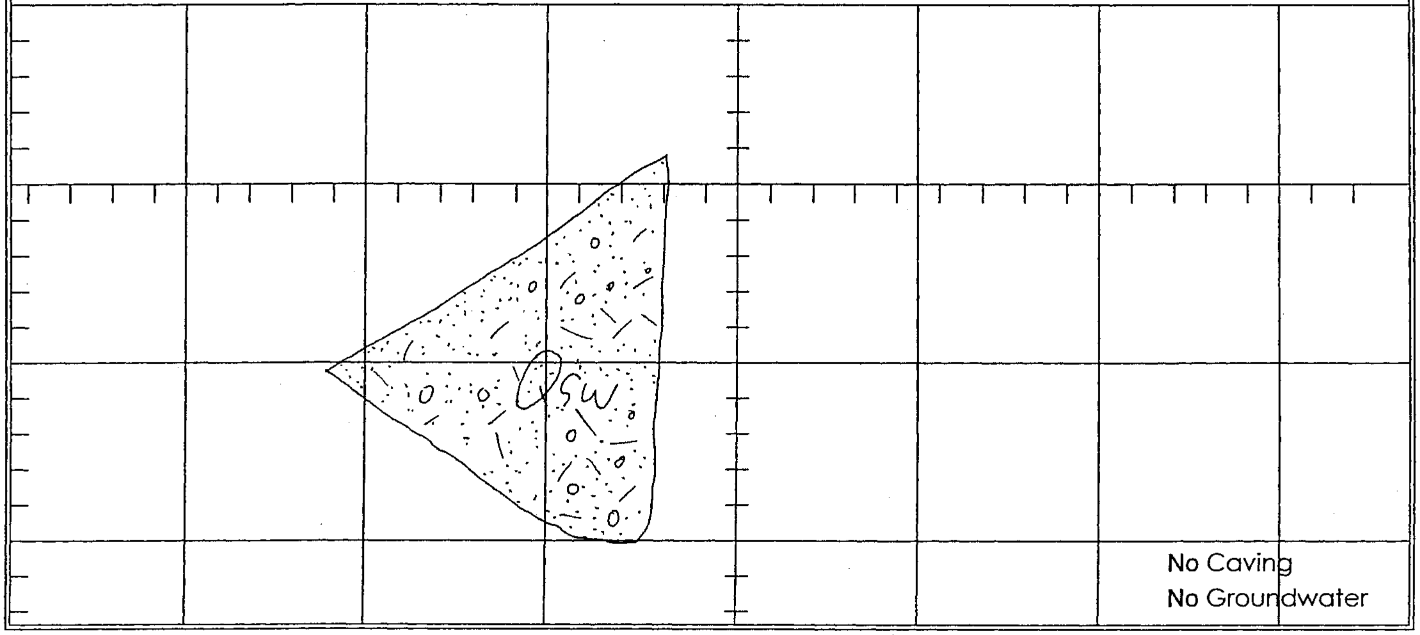
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC. Sheet 1 of 1

CLIENT: Synergy	JOB NO: 04-803S-4		
PROJECT: Tentative Tract 60258	DATE: 6/11/04		
	LOGGED BY: MJD		
	EXCAVATED: 1/14/04		
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket	ELEVATION:		

TRENCH LOG NO. T-57

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SLOPEWASH; Qsw (0-11')** @ 0' Moderate to light brown silty, pebbly sand with cobbles; soft to moderately hard; damp; massive; roots to 7'				
5									
10					Comments Weathered Qt?				
15									
20									

TOTAL DEPTH: 11 feet ←N60W SCALE: 1 inch = 5 feet



No Caving
No Groundwater

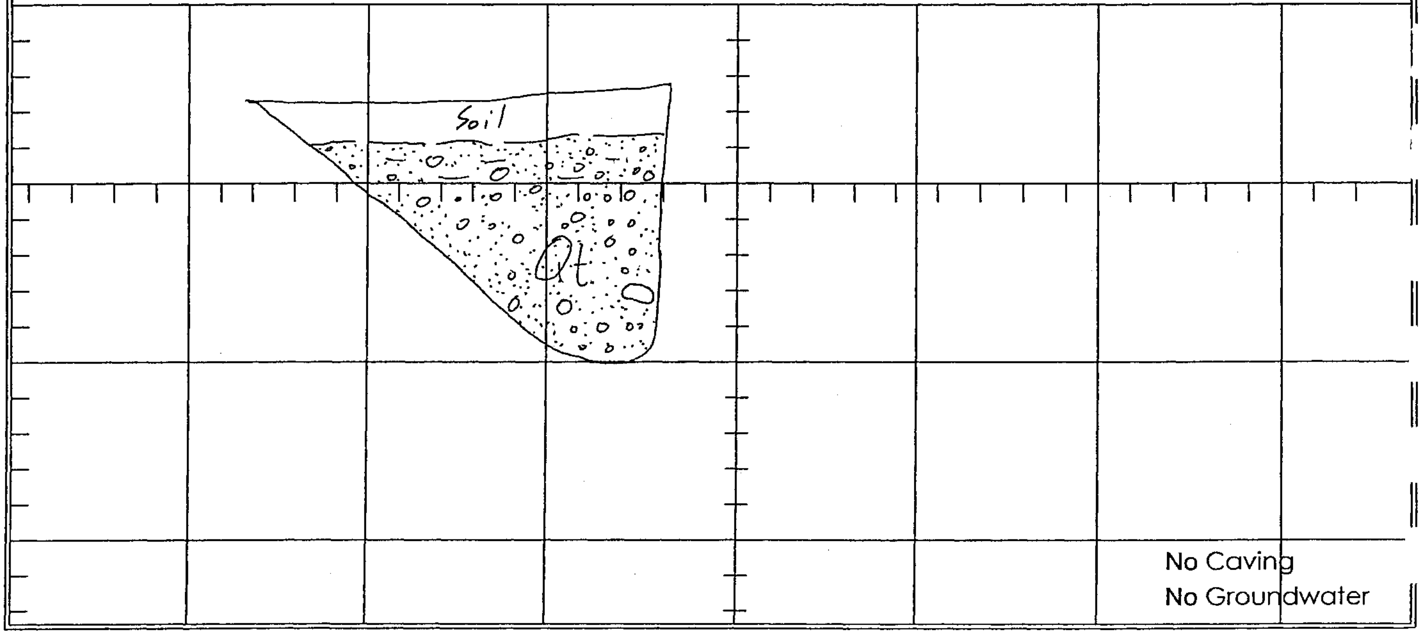
CLIENT: Synergy
PROJECT: Tentative Tract 60258
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 1/15/04
ELEVATION:

TRENCH LOG NO. T-58

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					<u>SOIL</u>; **soil (0-1.5')** @ 0' Reddish-brown silty, clayey sand/sandy clay; loose to medium dense; damp; roots; voids; scattered pebbles **<u>QUATERNARY TERRACE</u>; Qt (1.5-8')** @ 1.5' Grades to yellowish-brown to yellowish-gray pebbly sandstone with cobbles; loose to dense; damp; crudely bedded; cross-bedded; scattered boulders to 1' diameter; erosional scours; channels; locally clast supported; orange iron-staining <u>Comments</u> Moderately weathered to 6'	B: Horizontal			
5									
10									
15									
20									

TOTAL DEPTH: 8 feet ←N76W SCALE: 1 inch = 5 feet

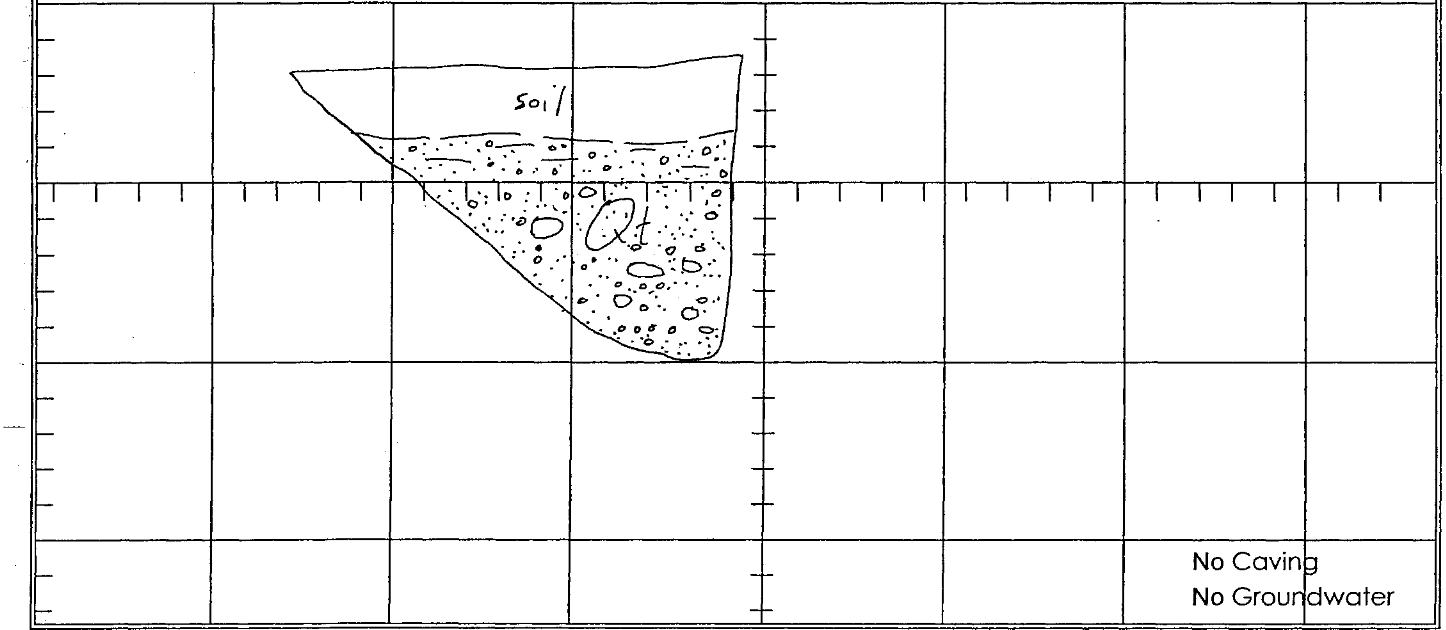


No Caving
No Groundwater

CLIENT: Synergy	JOB NO: 04-803S-4	# TRENCH LOG NO. T-59
PROJECT: Tentative Tract 60258	DATE: 6/11/04	
	LOGGED BY: MJD	
	EXCAVATED: 1/15/04	
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket	ELEVATION:	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS Moisture Content (%)	 Dry Density (pcf)	 Other Tests
0					**<u>SOIL</u>; soil (0-2')** @ 0' Reddish-brown silty, clayey sand/sandy clay; loose to medium dense; damp; roots; voids; scattered pebbles **<u>QUATERNARY TERRACE</u>; Qt (2-8.5')** @ 2' Grades to yellowish-brown to yellowish-gray pebbly sandstone with cobbles; loose to dense; damp; crudely bedded; cross-bedded; scattered boulders to 1' diameter; erosional scours; channels; locally clast supported; orange iron-staining				
5									
10					<u>Comments</u> Moderately weathered to 6'				
15									
20									

TOTAL DEPTH: 8.5 feet ←N86E SCALE: 1 inch = 5 feet



No Caving
No Groundwater

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC. Sheet 1 of 1

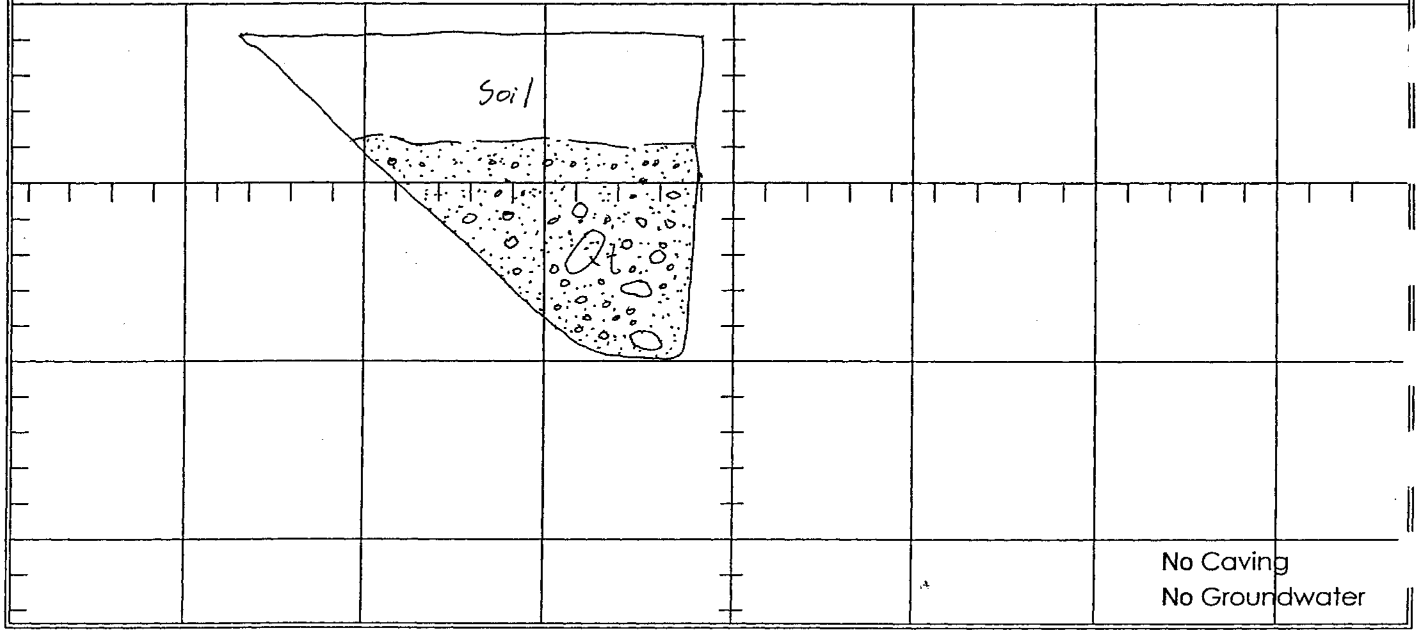
CLIENT: Synergy
PROJECT: Tentative Tract 60258
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 1/15/04
ELEVATION:

TRENCH LOG NO. T-60

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					<u>SOIL</u>; **soil (0-3')** @ 0' Reddish-brown silty, clayey sand/sandy clay; loose to medium dense; damp; roots; voids; scattered pebbles				
5					<u>QUATERNARY TERRACE</u>; **Qt (3-9')** @ 3' Grades to yellowish-brown to yellowish-gray pebbly sandstone with cobbles; loose to dense; damp; crudely bedded; cross-bedded; scattered boulders to 1' diameter; erosional scours; channels; locally clast supported; orange iron-staining	B:Horizontal			
10					<u>Comments</u> Moderately weathered to 7'				
15									
20									

TOTAL DEPTH: 9 feet ←N85W SCALE: 1 inch = 5 feet



No Caving
No Groundwater

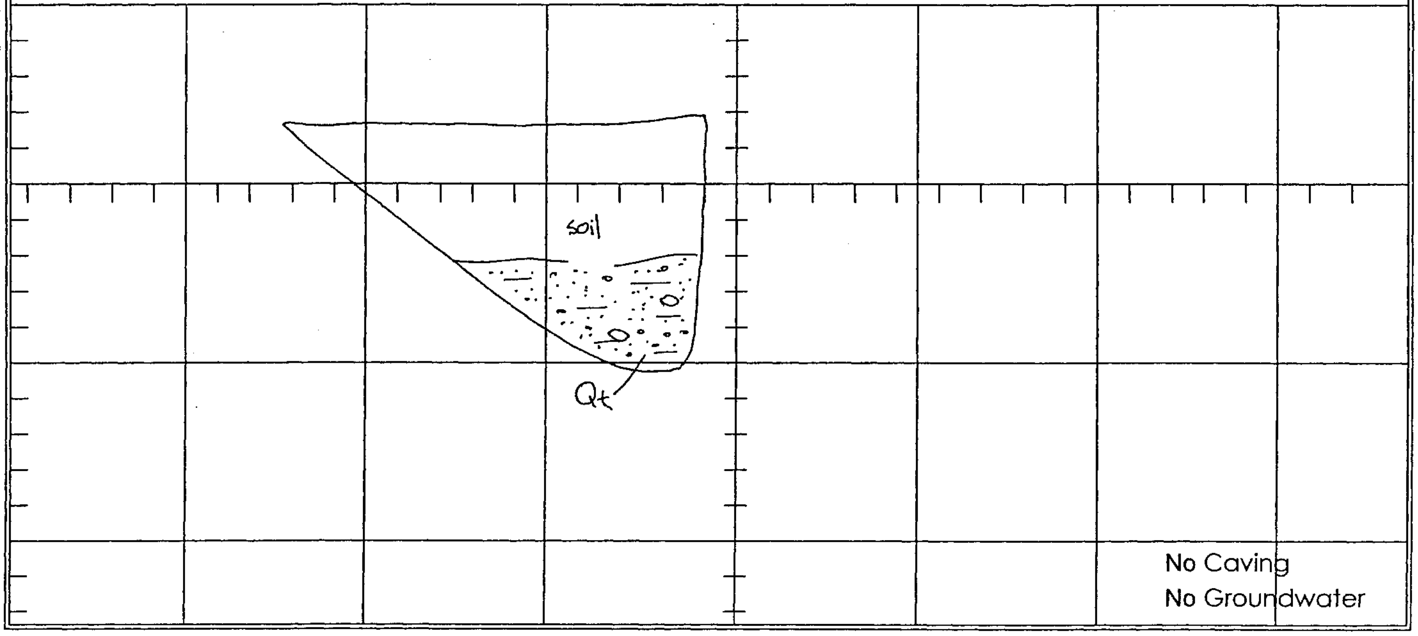
CLIENT: Synergy
PROJECT: Tentative Tract 60258
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 1/15/04
ELEVATION:

TRENCH LOG NO. T-61

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SOIL; soil (0-4')** @ 0' Moderately brown sandy silt/silty sand; soft; damp; roots; voids; scattered pebbles @ 1.5' Reddish-brown silty clayey sand/sandy clay; medium dense; damp; scattered pebbles; grades more sandy and pebbly with depth				
5					**QUATERNARY TERRACE; Qt (4-7')** @ 4' Grades to orangish-brown pebbly sandstone with clay and cobbles; medium dense to dense; damp; massive; orange iron-staining Comments Weathered to 6' Dug relatively hard				
10									
15									
20									

TOTAL DEPTH: 7 feet N14E→ SCALE: 1 inch = 5 feet



No Caving
No Groundwater

TRENCH LOG NO. T-62

CLIENT: Synergy

PROJECT: Tentative Tract 60258

EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

JOB NO: 04-803S-4

DATE: 6/11/04

LOGGED BY: MJD

EXCAVATED: 1/15/04

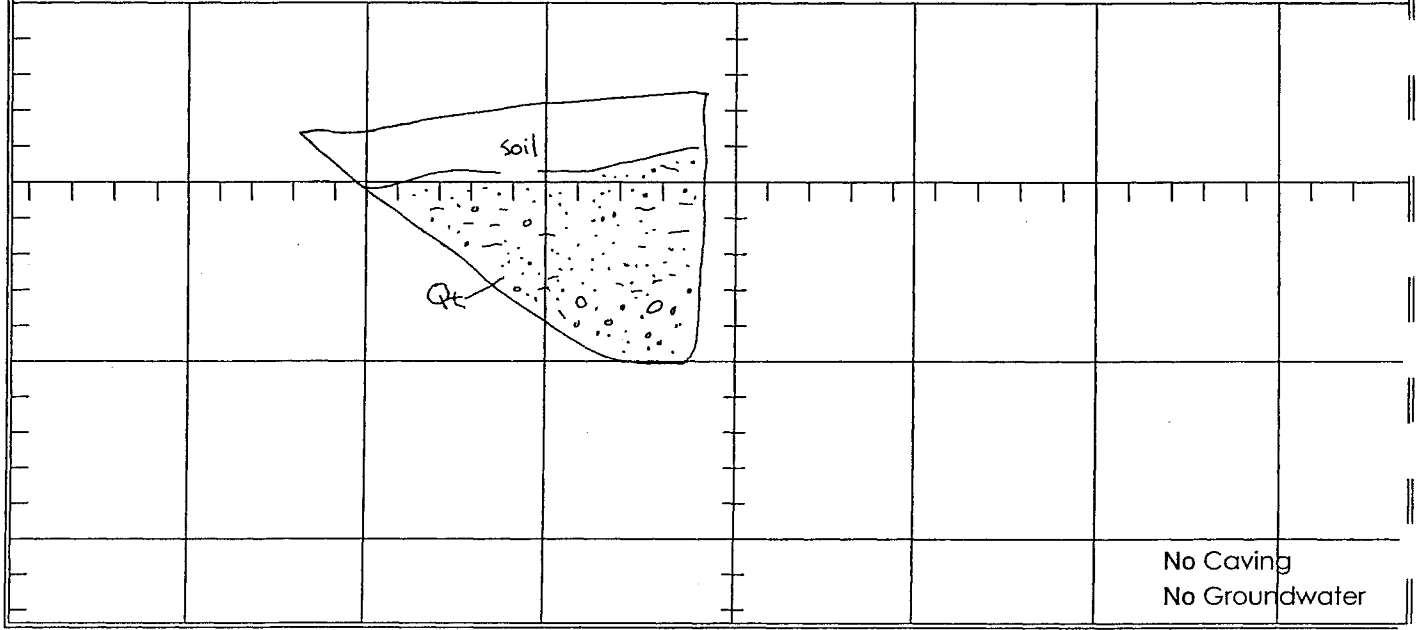
ELEVATION:

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SOIL; soil (0-1.5')** @ 0' Moderately brown silty clayey, pebbly sand with cobbles; loose; damp; roots; voids **QUATERNARY TERRACE; Qt (1.5-7.5')** @ 1.5' Grades to orangish-brown clayey pebbly sandstone with cobbles; moderately dense; massive to crudely bedded; cemented @ 4' No clay, locally clast supported; pebble lenses; moderately well-bedded @ 6' Yellowish-brown pebbly sandstone with cobbles Comments Weathered to 5' Hard digging	B:Apx. Horizontal			
5									
10									
15									
20									

TOTAL DEPTH: 7.5 feet

N39E→

SCALE: 1 inch = 5 feet



No Caving
No Groundwater

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

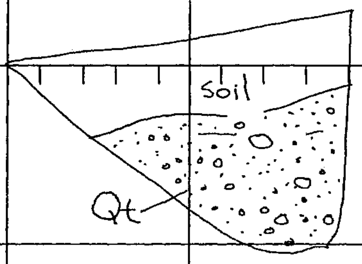
Sheet 1 of 1

TRENCH LOG NO. T-63

CLIENT: Synergy
PROJECT: Tentative Tract 60258
JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 1/15/03
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket
ELEVATION:

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SOIL; soil (0-2')** @ 0' Moderate to reddish-brown silty clayey pebbly sand; loose to medium dense; damp; scattered cobbles @ 1'; roots; voids **QUATERNARY TERRACE; Qt (2-6.5')** @ 2' Reddish-brown slightly clayey pebbly sand stone with cobbles; medium dense to dense; damp; massive to crudely bedded; orange iron-staining; locally clast supported	B:Horizontal			
5					Comments Cemented Hard Digging Moderately weathered to 4' Local roots to 5'				
10									
15									
20									

TOTAL DEPTH: 6.5 feet ←N2E SCALE: 1 inch = 5 feet



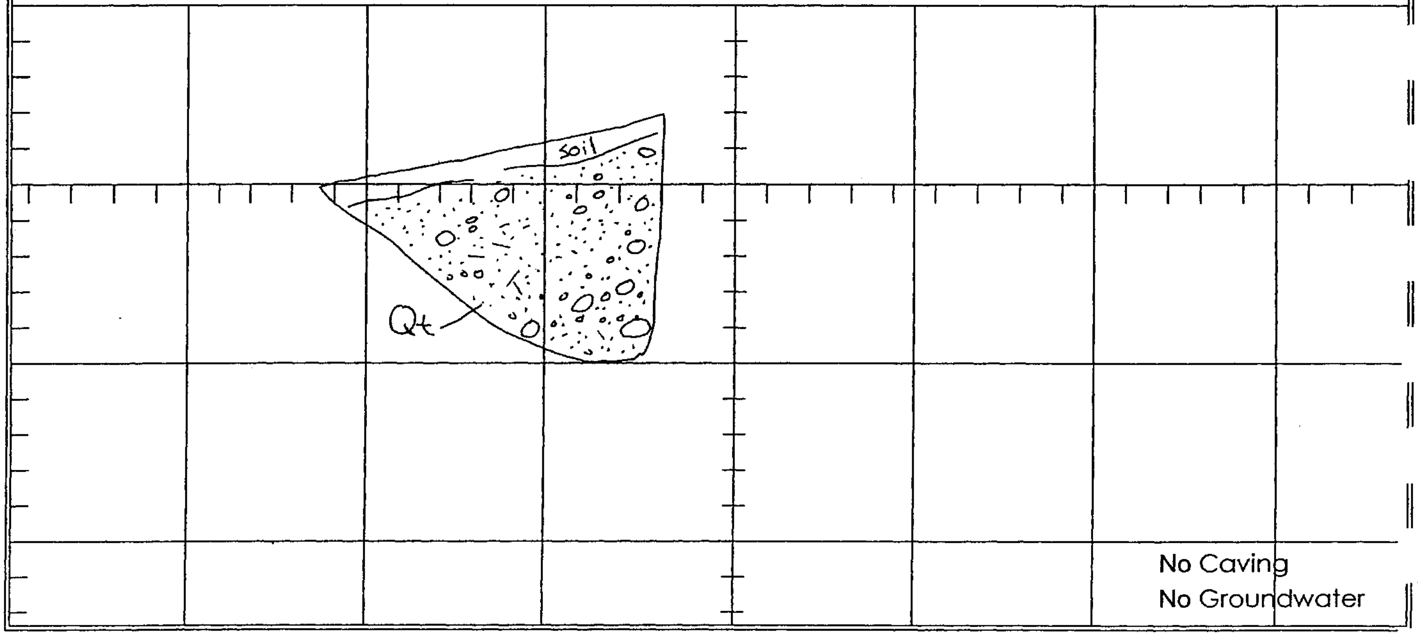
No Caving
No Groundwater

TRENCH LOG NO. T-64

CLIENT: Synergy
PROJECT: Tentative Tract 60258
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket
JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 1/15/04
ELEVATION:

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0 5 10 15 20					**<u>SOIL</u>; soil (0-0.5')** @ 0' Light brown silty, pebbly sand with cobbles; loose; damp; roots; voids **<u>QUATERNARY TERRACE</u>; Qt (0.5-7')** @ 0.5' Yellowish-gray to light yellowish-brown pebbly sandstone with cobbles; loose to medium dense; damp; clast supported pebbled lenses common; cross-bedded; local orange iron-staining; scattered boulders; well-bedded <u>Comments:</u> Friable Moderately weathered to 4'	B: Horizontal			

TOTAL DEPTH: 7 feet N80E→ SCALE: 1 inch = 5 feet



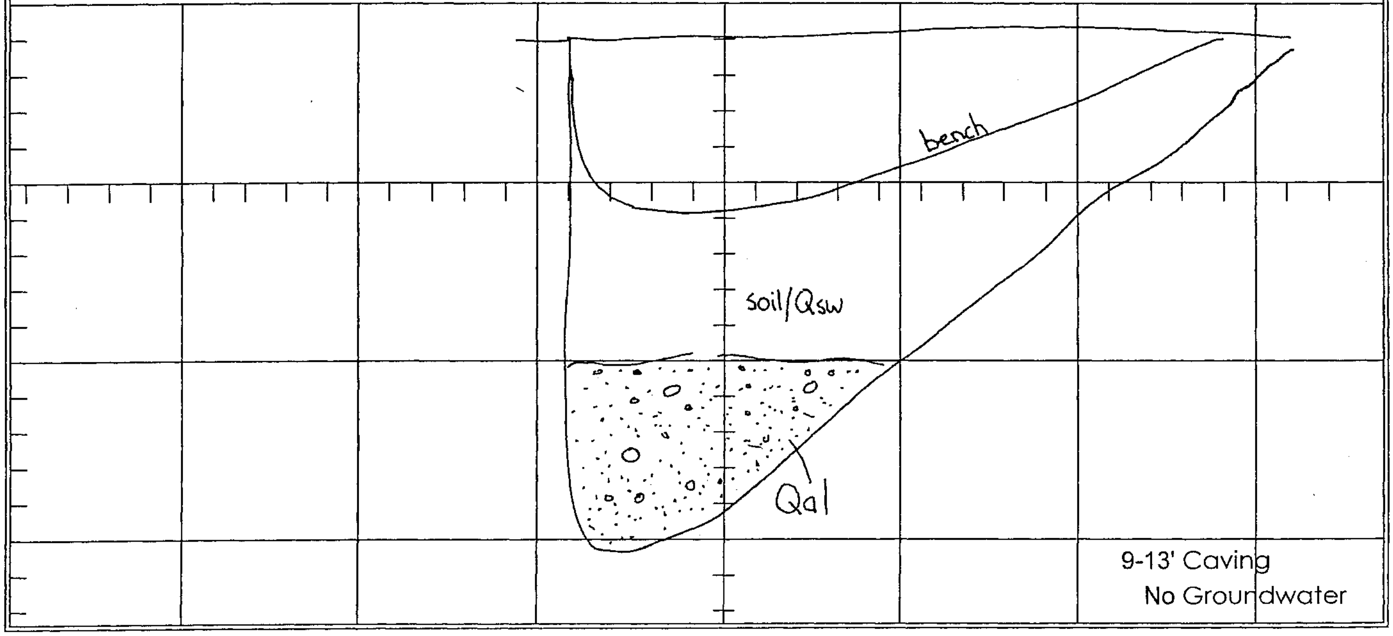
No Caving
No Groundwater

CLIENT: Synergy
PROJECT: Tentative Tract 60258
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket
JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 1/15/04
ELEVATION:

TRENCH LOG NO. T-65

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SOIL/SLOPEWASH; (0-9')** @ 0' Pale brown to light brown silty sand, sand and pebbly sand with scattered cobbles; dry to damp; crudely bedded; local gravel lenses; roots; voids				
5	■						2.9	110	
	■				**QUATERNARY ALLUVIUM; Qal (9-14')** @ 9' Yellowish-gray to light yellowish-brown sand and pebbly sand with cobbles; loose to medium dense; damp; friable; moderately well-bedded; channels; erosional scours; scattered boulders		4.3	95	
10									
	■				Comments Slightly belled out from 9-13' Highly weathered to 9' Bulk Sample @ 5-14'		2.4	107	Consol
15									
20									

TOTAL DEPTH: 14 feet ←N10E SCALE: 1 inch = 5 feet



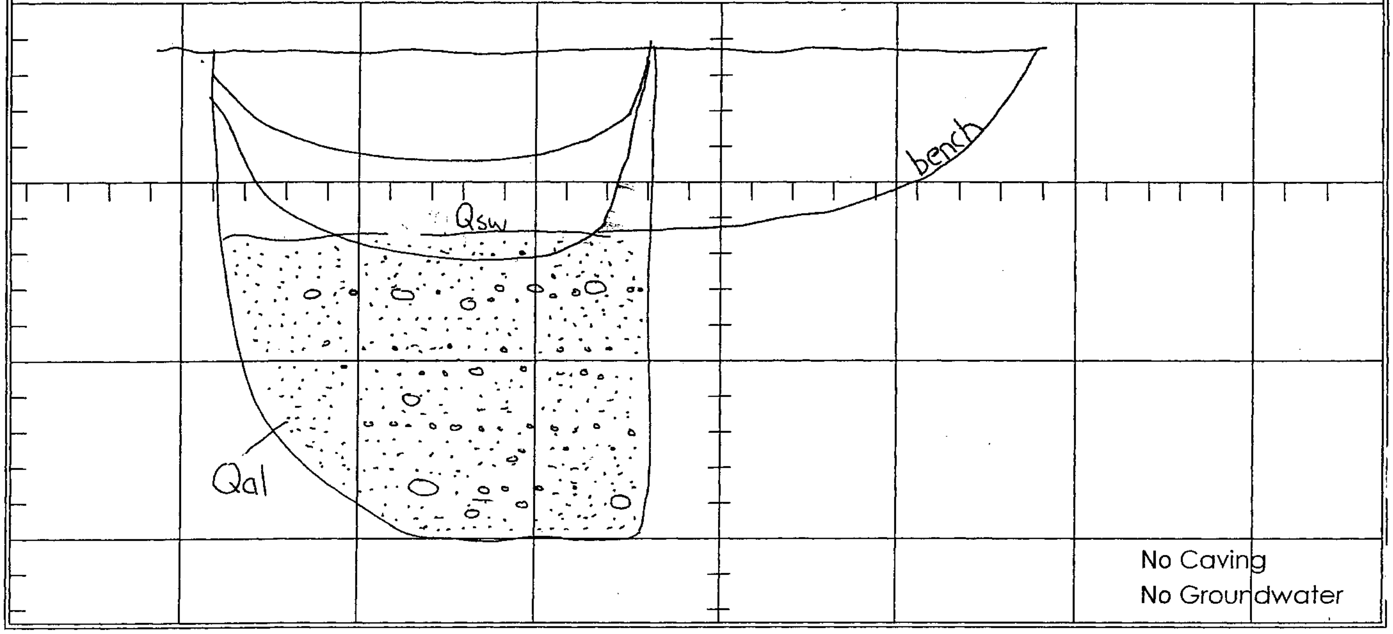
9-13' Caving
No Groundwater

CLIENT: Synergy
PROJECT: Tentative Tract 60258
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket
JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 1/15/04
ELEVATION:

TRENCH LOG NO. T-66

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SLOPEWASH; Qsw (0-5')** @ 0' Moderate brown to pale brown silty, pebbly sand with cobbles; loose; dry to damp; roots; voids; pebbly lenses				
5	⧄				**QUATERNARY ALLUVIUM; Qal (5-14')** @ 5' Light yellowish-brown to yellowish-gray pebbly sand and sand with cobbles; loose to medium dense; damp; moderately well-bedded; scattered boulders				
10	■						2.8	104	
	■				Comments CD @ 6' = too friable, lost sample CD @ 10' = friable, only 4 rings recovered CD @ 14' Bulk sample @ 0-14'		2.7	112	
15									
20									

TOTAL DEPTH: 14 feet N45E→ SCALE: 1 inch = 5 feet

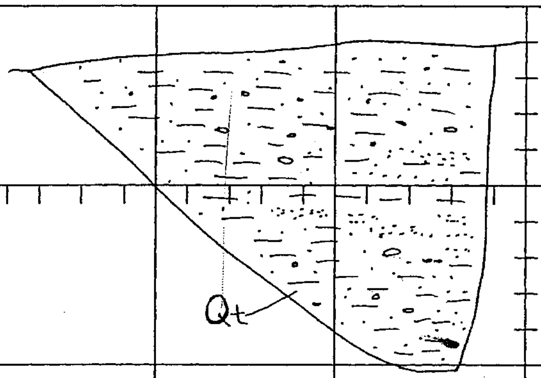


No Caving
No Groundwater

CLIENT: Synergy	JOB NO: 04-803S-4	**TRENCH LOG NO. T-67**
PROJECT: Tentative Tract 60258	DATE: 6/11/04	
	LOGGED BY: MJD	
	EXCAVATED: 5/6/04	
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket	ELEVATION:	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**QUATERNARY TERRACE DEPOSITS; Qt (0-9')** @ 0' Brown to reddish-brown sandy clay to clayey sandstone with pebbles and scattered cobbles; dense; damp to moist; voids and roots to 3.5'; pinhole voids to 9'; massive, structureless; local sandy lenses; local caliche				
5									
10									
15									
20									

TOTAL DEPTH: 9 feet ←N24E SCALE: 1 inch = 5 feet



No Caving
No Groundwater

CLIENT: Synergy

PROJECT: Tentative Tract 60258

JOB NO: 04-803S-4

DATE: 6/11/04

LOGGED BY: MJD

EXCAVATED: 5/6/04

EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

ELEVATION:

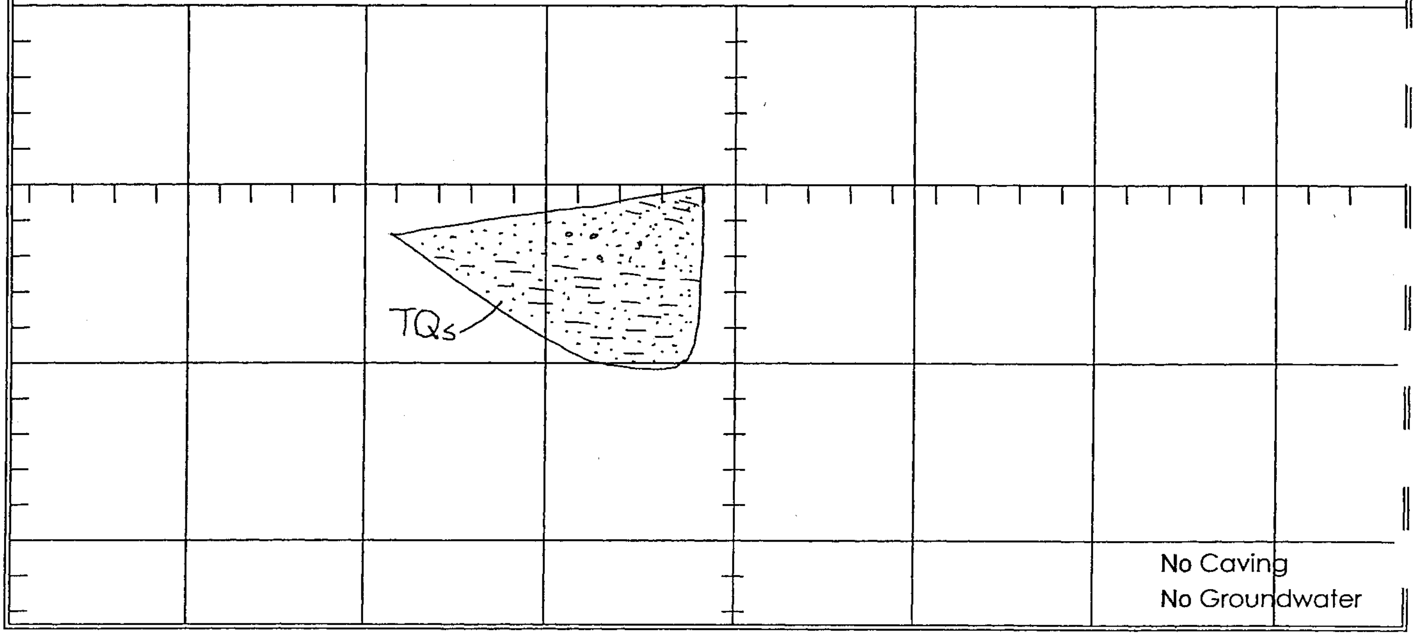
TRENCH LOG NO. T-68

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**BEDROCK; TQs (0-5')** @ 0' Reddish-brown sandy siltstone with silty sandstone and yellowish-gray pebbly sandstone; hard; damp; crudely bedded; erosional contact; slightly fractured; local caliche; scattered cobbles in sandstone	Apx B: N40E,6NW Contact			
5									
10									
15									
20									

TOTAL DEPTH: 5 feet

N8E→

SCALE: 1 inch = 5 feet



No Caving
No Groundwater

CLIENT: Synergy

PROJECT: Tentative Tract 60258

JOB NO: 04-803S-4

DATE: 6/11/04

LOGGED BY: MJD

EXCAVATED: 5/6/04

EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

ELEVATION:

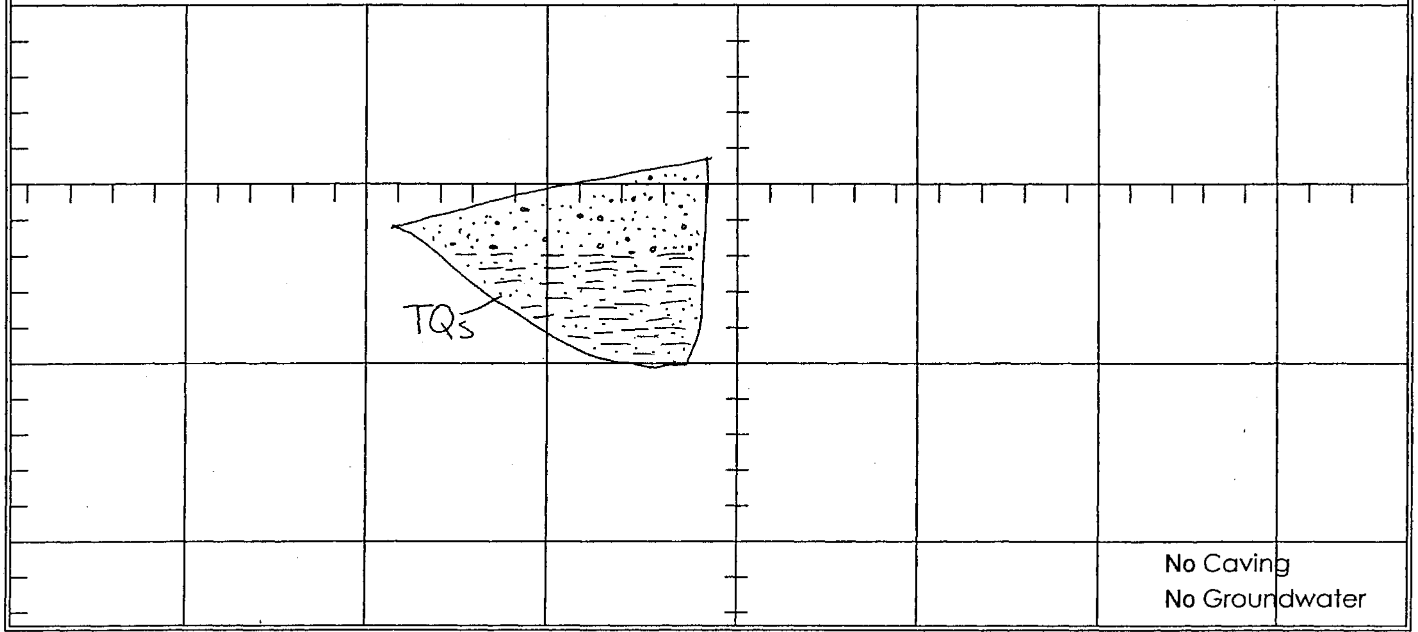
TRENCH LOG NO. T-69

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**BEDROCK; TQs (0-5.5')** @ 0' Yellowish-gray pebbly sandstone and reddish-brown sandy siltstone; moderately hard to hard; dry to damp; local caliche; highly weathered to 2'; scattered cobbles in sandstone	Apx. B: N24W,3NE			
5									
10									
15									
20									

TOTAL DEPTH: 5.5 feet

N15E→

SCALE: 1 inch = 5 feet



No Caving

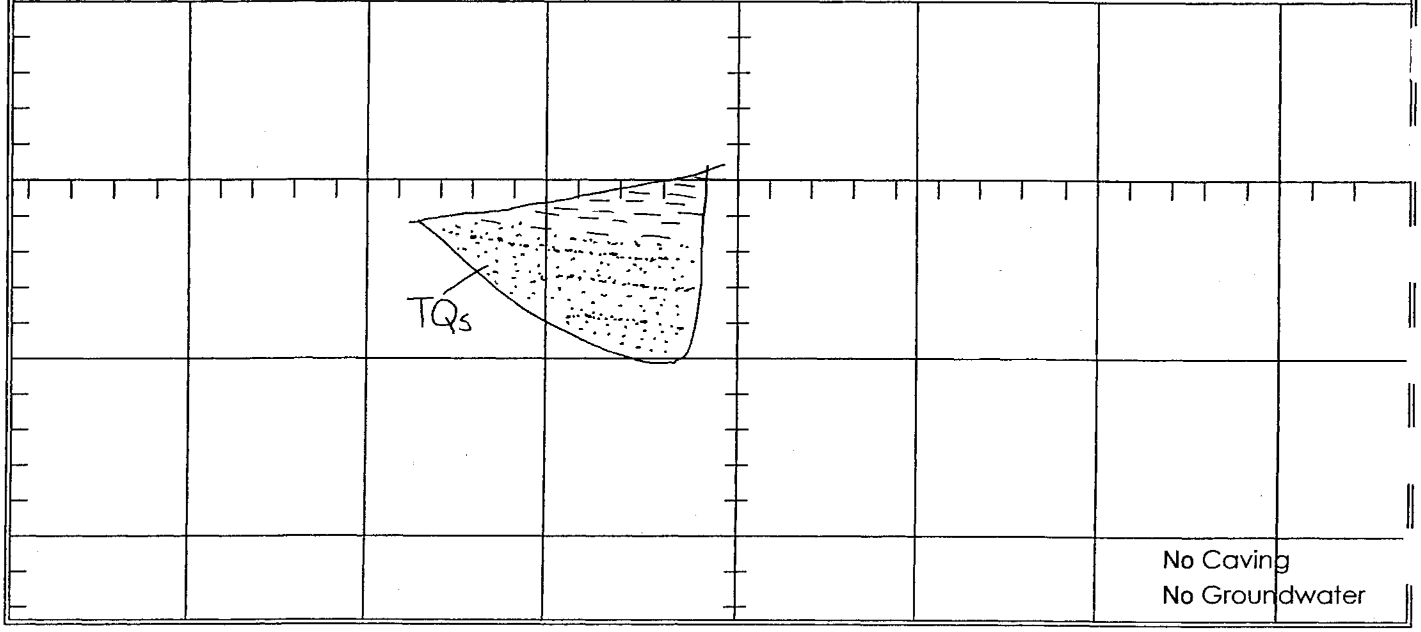
No Groundwater

CLIENT: Synergy
PROJECT: Tentative Tract 60258
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket
JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 5/6/04
ELEVATION:

TRENCH LOG NO. T-70

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**BEDROCK; TQs (0-5.5')** @ 0' Reddish-brown sandy siltstone and yellowish-gray sandstone and pebbly sandstone; moderately hard to hard; damp; local laminations; crudely bedded	B: N58E,8NW			
5									
10									
15									
20									

TOTAL DEPTH: 5.5 feet
N18E→
SCALE: 1 inch = 5 feet



No Caving
No Groundwater

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

Sheet 1 of 1

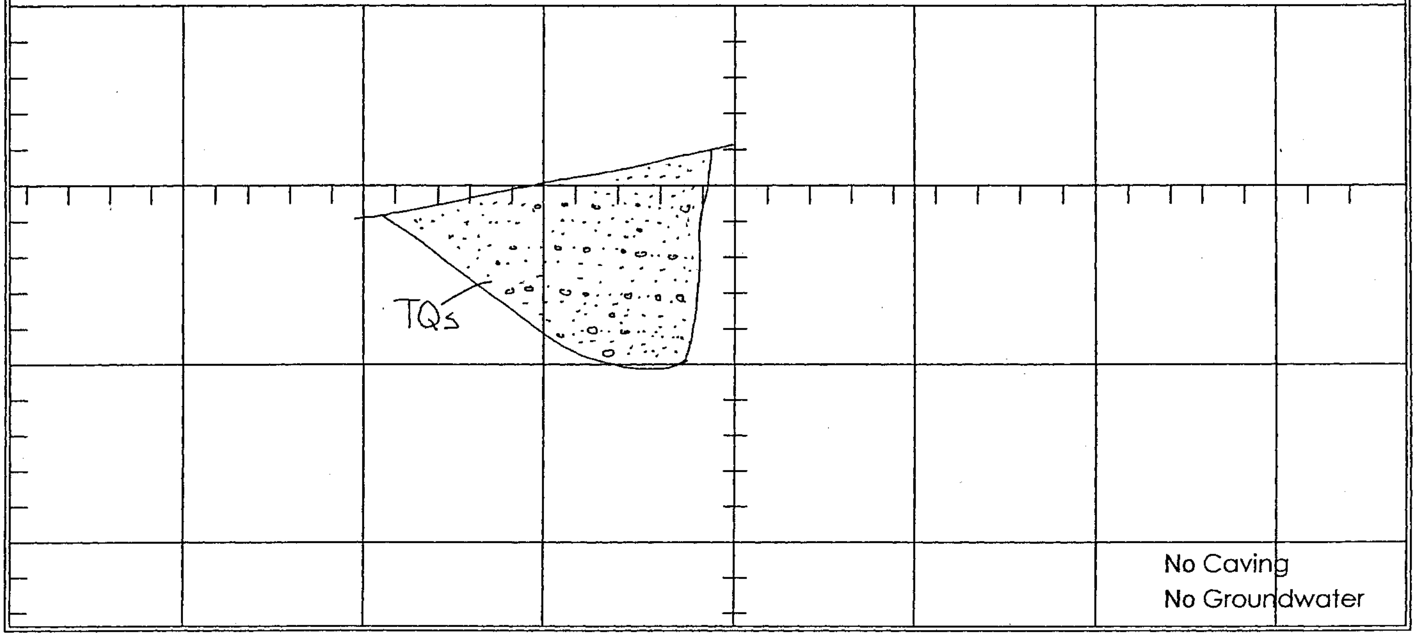
CLIENT: Synergy
PROJECT: Tentative Tract 60258
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 5/6/04
ELEVATION:

TRENCH LOG NO. T-71

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**<u>BEDROCK</u>; TQs (0-6')** @ 0' Light yellowish-brown sandstone and conglomerate; moderately hard to hard; damp; crudely bedded; scattered cobbles	Apx. B: N85W,3NE			
5					<u>COMMENTS</u>: Possible Qt?=very flat bedding Cobble and boulder lag at surface				
10									
15									
20									

TOTAL DEPTH: 6 feet N12E→ SCALE: 1 inch = 5 feet



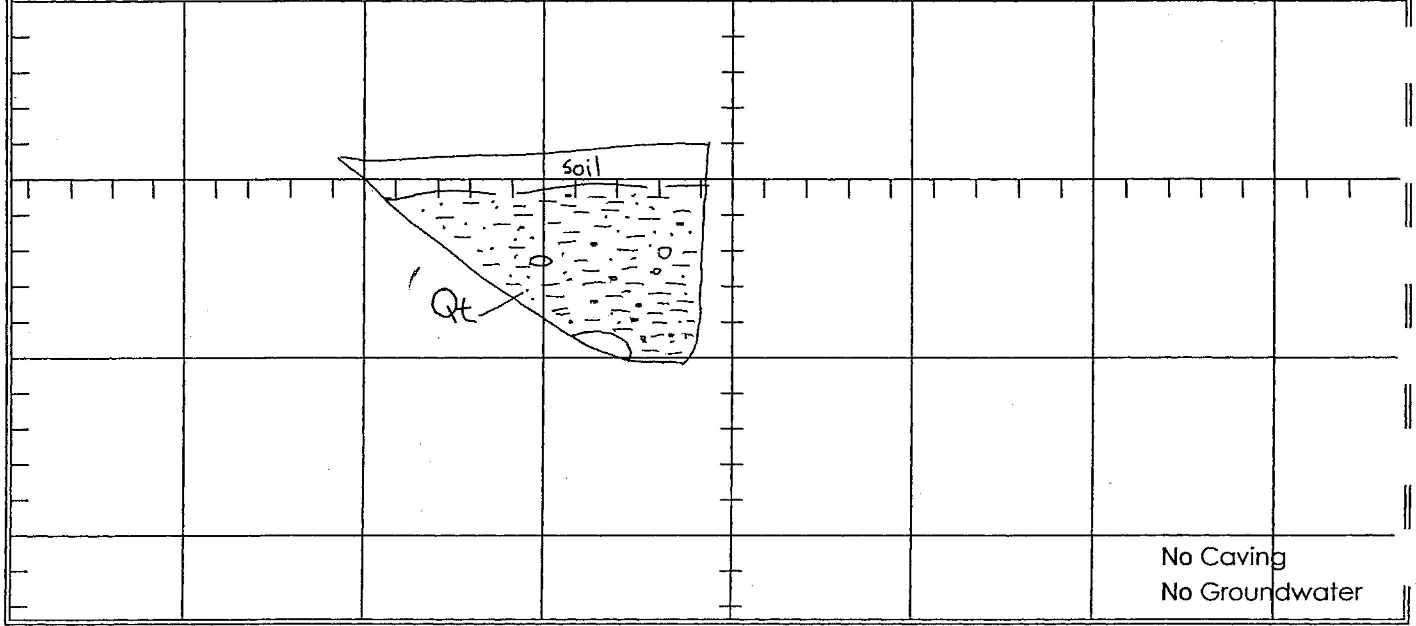
No Caving
No Groundwater

CLIENT: Synergy
PROJECT: Tentative Tract 60258
JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 5/6/04
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket
ELEVATION:

TRENCH LOG NO. T-72

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**<u>SOIL</u>; soil (0-1')** @ 0' Brown sandy clay with pebbles; soft; roothairs; voids **<u>QUATERNARY TERRACE DEPOSITS</u>; Qt (1-6')** @ 1' Grades to reddish-brown sandy, pebbly claystone with scattered cobbles; moderately hard to hard; massive; pinhole voids; grades sandier and pebblier with depth and lighter in color; slightly fractured; highly weathered to 4'; one boulder at 5.5'; minor caliche				
5									
10									
15									
20									

TOTAL DEPTH: 6 feet N67E→ SCALE: 1 inch = 5 feet



No Caving
No Groundwater

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

Sheet 1 of 1

CLIENT: Synergy
PROJECT: Tentative Tract 60258
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 5/6/04
ELEVATION:

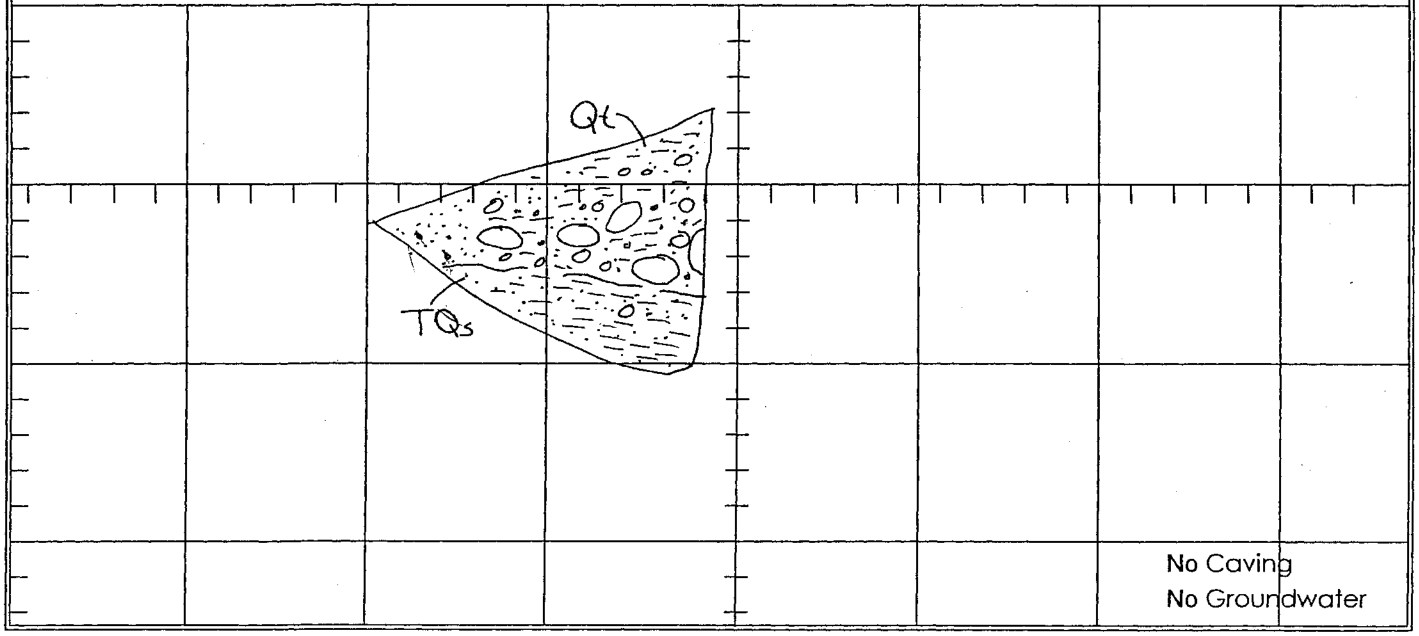
TRENCH LOG NO. T-73

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**<u>QUATERNARY TERRACE DEPOSITS</u>; Qt (0-5.5')** @ 0' Reddish-brown to brown pebbly, clayey sandstone with cobbles and boulders; moderately hard; damp; massive; common granite and anorthisite boulders; slightly erosional contact with bedrock below; less clay with depth				
5					**<u>BEDROCK</u>; TQs (5.5-7')** @ 5.5' Reddish-brown sandy siltstone; hard to very hard; dry; massive; scattered pebbles <u>COMMENTS</u>: Hard to dig at 5.5-7'	B:N80W,17NE			
10									
15									
20									

TOTAL DEPTH: 7 feet

N60E→

SCALE: 1 inch = 5 feet

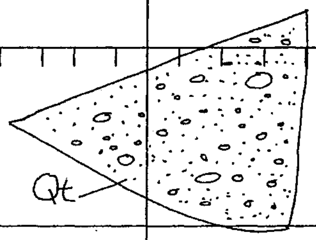


No Caving
No Groundwater

CLIENT: Synergy	JOB NO: 04-803S-4	**TRENCH LOG**	
PROJECT: Tentative Tract 60258	DATE: 6/11/04	**NO.** T-74	
	LOGGED BY: MJD		
	EXCAVATED: 5/14/04		
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket	ELEVATION:		

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**QUATERNARY TERRACE DEPOSITS; Qt (0-6')** @ 0' Orangish-brown silty, clayey, pebbly sandstone with cobbles; moderately hard; damp to moist; massive to crudely bedded; grades sandier with depth; clasts of schist, sandstone and siltstone	Apx. B: Subhorizontal			
5									
10									
15									
20									

TOTAL DEPTH: 6 feet N55E→ SCALE: 1 inch = 5 feet



No Caving
No Groundwater

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC. Sheet 1 of 1

CLIENT: Synergy

PROJECT: Tentative Tract 60258

EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

JOB NO: 04-803S-4

DATE: 6/11/04

LOGGED BY: MJD

EXCAVATED: 5/14/04

ELEVATION:

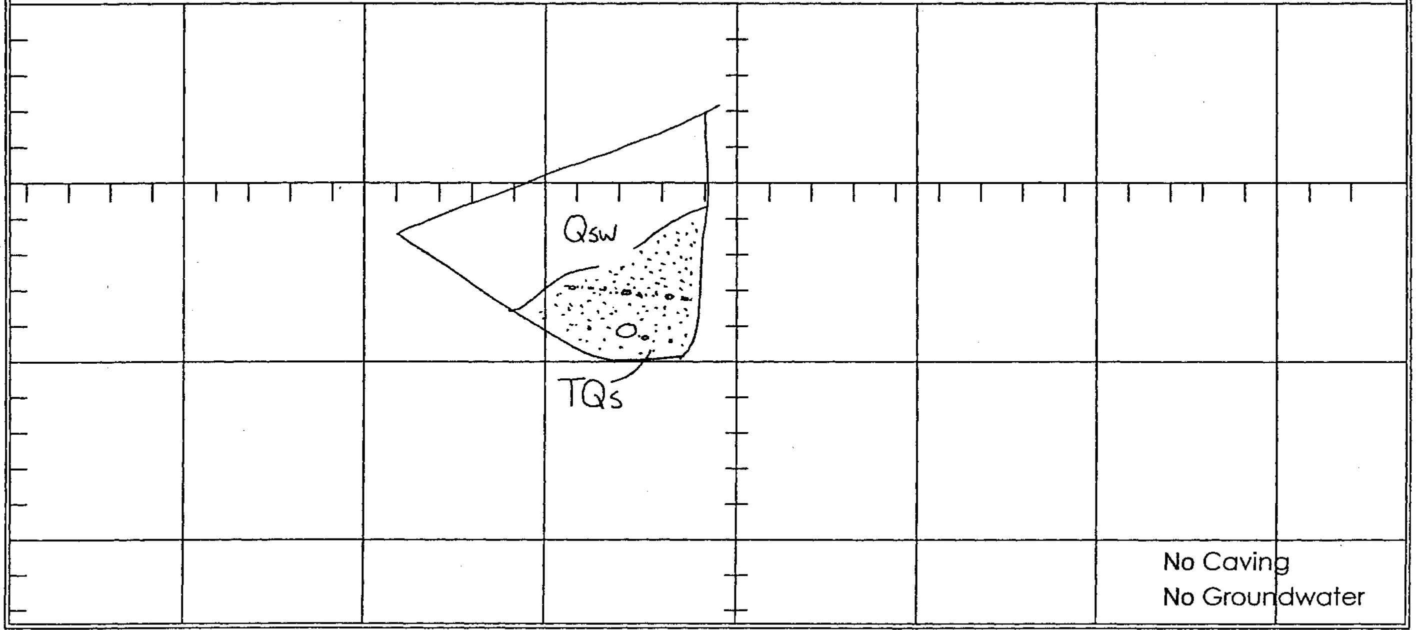
TRENCH LOG NO. T-75

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0 5 10 15 20					**<u>SLOPEWASH</u>; Qsw (0-2.5')** @ 0' Reddish-brown silty, clayey sand with pebbles and scattered cobbles; soft to medium dense; damp; roots; voids **<u>BEDROCK</u>; TQs (2.5-7')** @ 2.5' Light-gray sandstone; moderately hard to hard; damp; massive to vaguely bedded; local pebble lenses; scattered cobbles; slightly fractured <u>COMMENTS</u>: Cobble/boulder lag at surface	B: N73W,8NE			

TOTAL DEPTH: 7 feet

N42E→

SCALE: 1 inch = 5 feet



No Caving
No Groundwater

CLIENT: Synergy

PROJECT: Tentative Tract 60258

JOB NO: 04-803S-4

DATE: 6/11/04

LOGGED BY: MJD

EXCAVATED: 5/14/04

EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

ELEVATION:

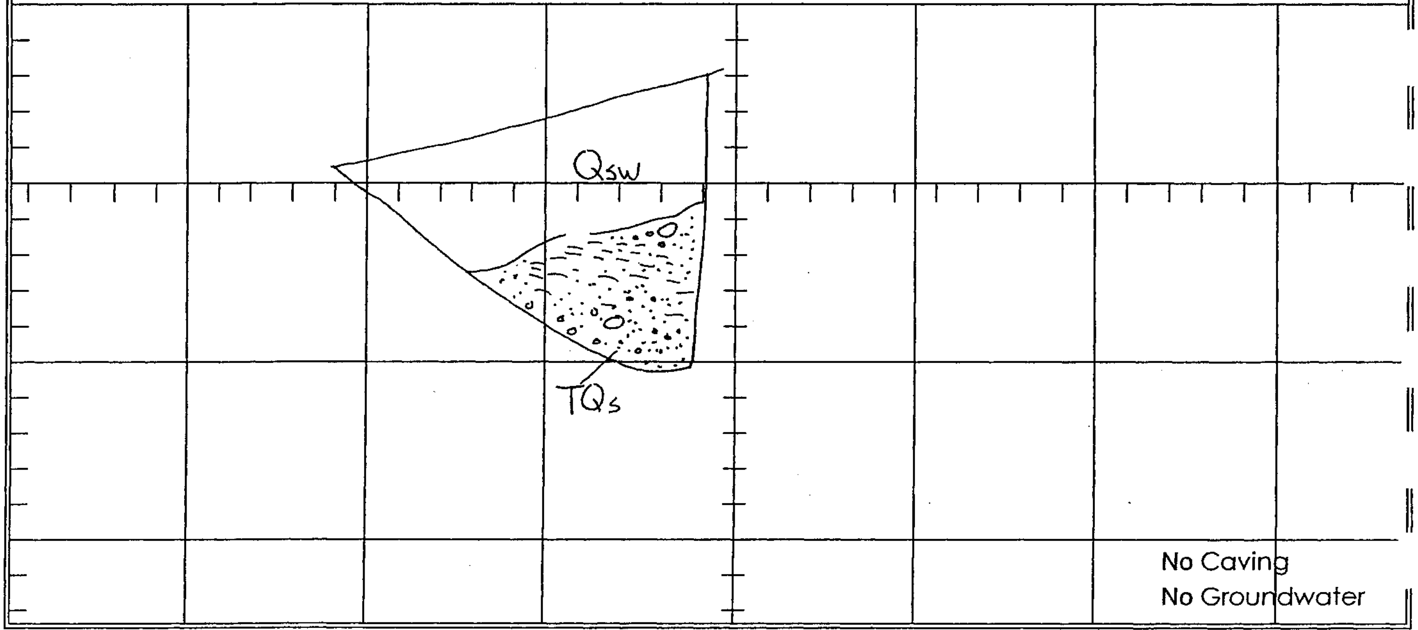
TRENCH LOG NO. T-76

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					<u>SLOPEWASH</u>; **Qsw (0-3.5')** @ 0' Brown to reddish-brown silty, clayey, pebbly sand with cobbles; soft to medium dense; dry to damp; roots; voids				
5					<u>BEDROCK</u>; **TQs (3.5-8')** @ 3.5' Yellowish-gray pebbly sandstone with cobbles and brown sandy siltstone; moderately hard to hard; damp; slightly fractured; crudely bedded; gradational contacts	Apx. B: N32W,6NE			
10					<u>COMMENTS</u>: Cobble/boulder lag at surface				
15									
20									

TOTAL DEPTH: 8 feet

N75E→

SCALE: 1 inch = 5 feet



No Caving

No Groundwater

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

Sheet 1 of 1

CLIENT: Synergy

PROJECT: Tentative Tract 60258

EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket

JOB NO: 04-803S-4

DATE: 6/11/04

LOGGED BY: MJD

EXCAVATED: 5/14/04

ELEVATION:

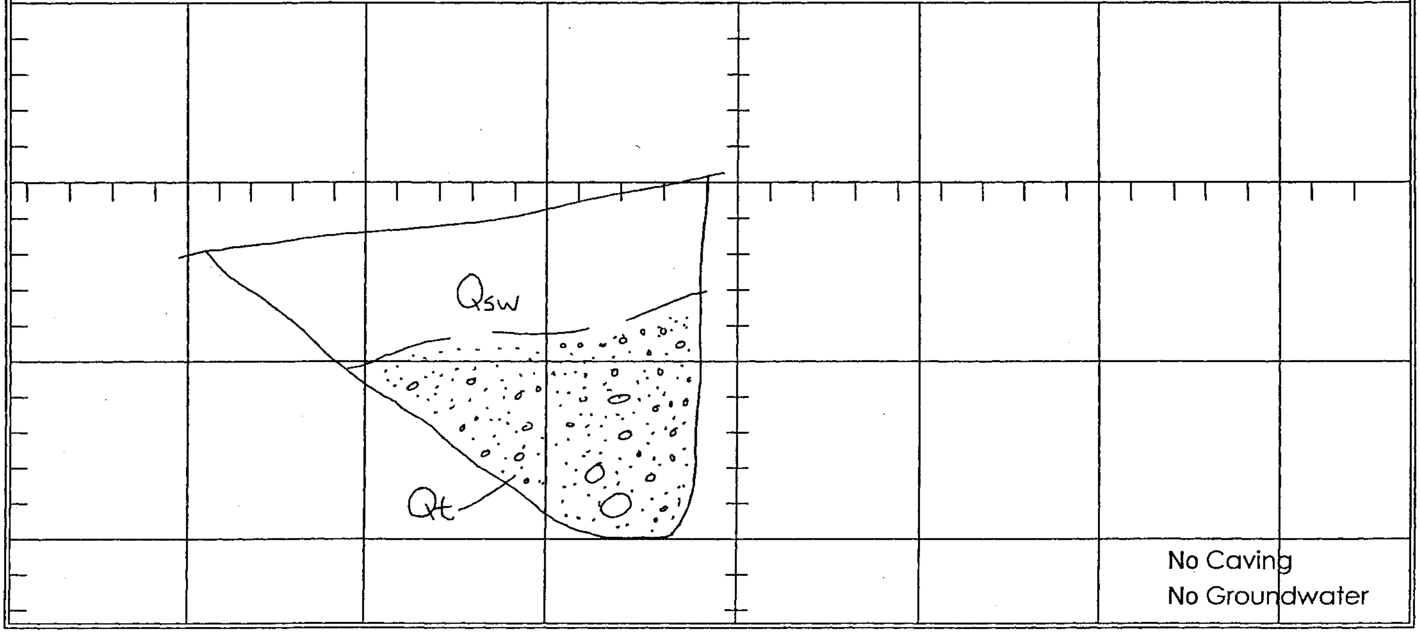
TRENCH LOG NO. T-77

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**<u>SLOPEWASH;</u> Qsw (0-3')** @ 0' Brown to reddish-brown silty, sandy clay to clayey sand with pebbles and scattered cobbles; soft to medium dense; dry to damp; roots; voids **<u>QUATERNARY TERRACE DEPOSITS;</u> Qt (3-10')** @ 3' Grades to reddish-brown silty, clayey, pebbly sandstone with cobbles; soft to medium dense; locally friable; damp; crudely bedded to massive; grades sandier with depth				
5									
10									
15									
20									

TOTAL DEPTH: 10 feet

N83W→

SCALE: 1 inch = 5 feet



No Caving
No Groundwater

TRENCH LOG NO. T-78

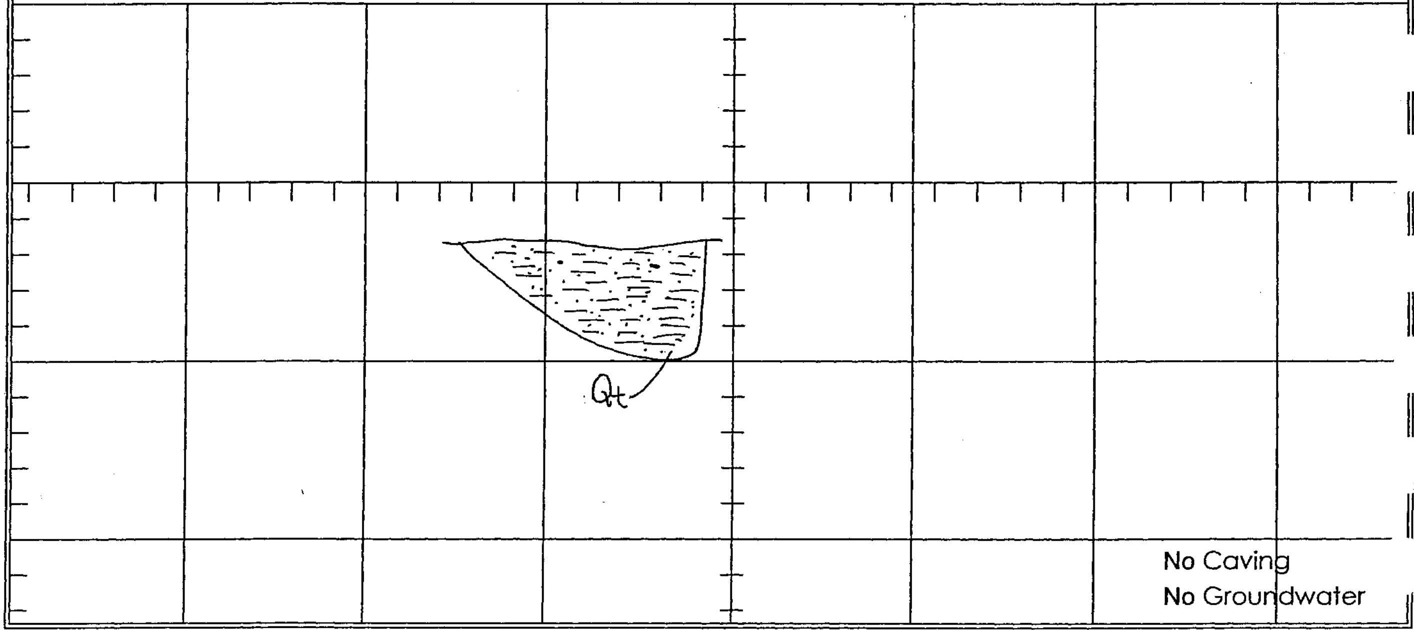
CLIENT: Synergy
PROJECT: Tentative Tract 60258
JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 5/14/04
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket
ELEVATION:

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**QUATERNARY TERRACE DEPOSITS; Qt (0-3.5')** @ 0' Reddish-brown sandy, silty claystone with pebbles; hard to very hard; dry to damp; massive COMMENTS: Too hard to dig deeper	B:Horizontal			
5									
10									
15									
20									

TOTAL DEPTH: 3.5 feet

N35W→

SCALE: 1 inch = 5 feet

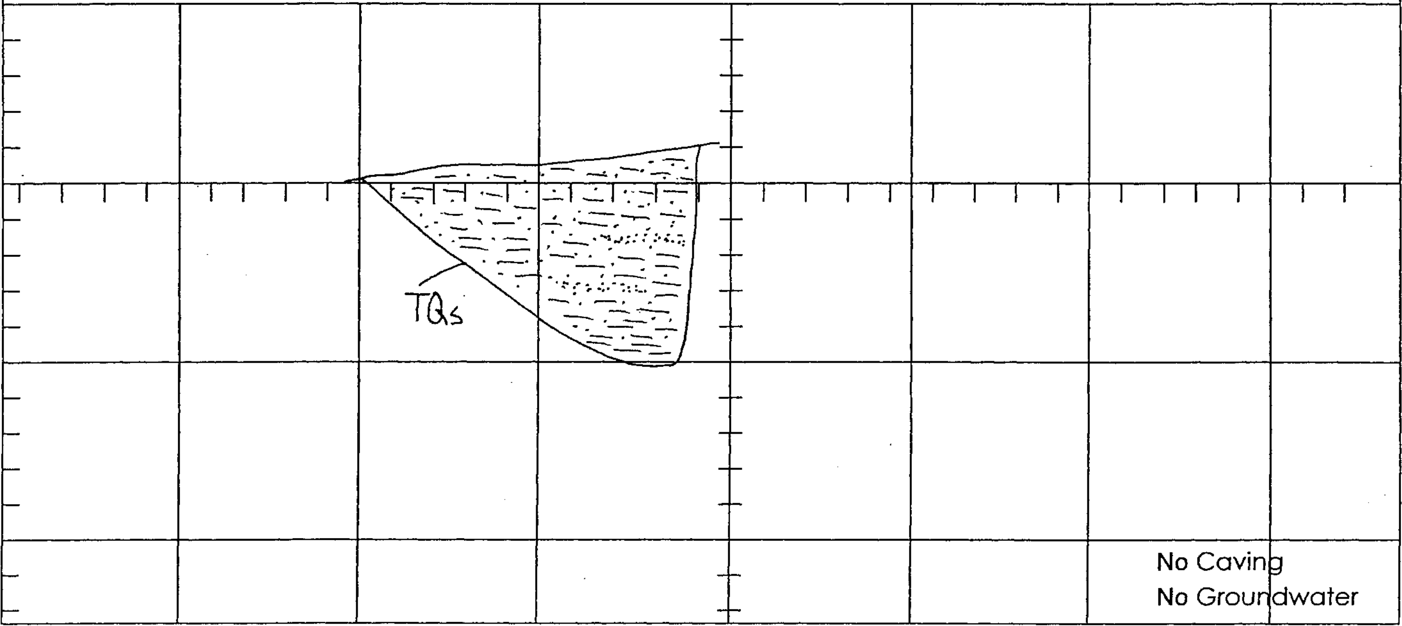


No Caving
No Groundwater

CLIENT: Synergy	JOB NO: 04-803S-4	**TRENCH LOG NO. T-79**	
PROJECT: Tentative Tract 60258	DATE: 6/11/04		
	LOGGED BY: MJD		
	EXCAVATED: 5/14/04		
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket	ELEVATION:		

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS		
							Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**BEDROCK; TQs (0-6')** @ 0' Reddish- to grayish-brown sandy siltstone; hard to very hard; dry to damp; scattered pebbles; local discontinuous sandy lenses; massive				
5					COMMENTS: Hard to dig				
10									
15									
20									

TOTAL DEPTH: 6 feet N37W→ SCALE: 1 inch = 5 feet



No Caving
No Groundwater

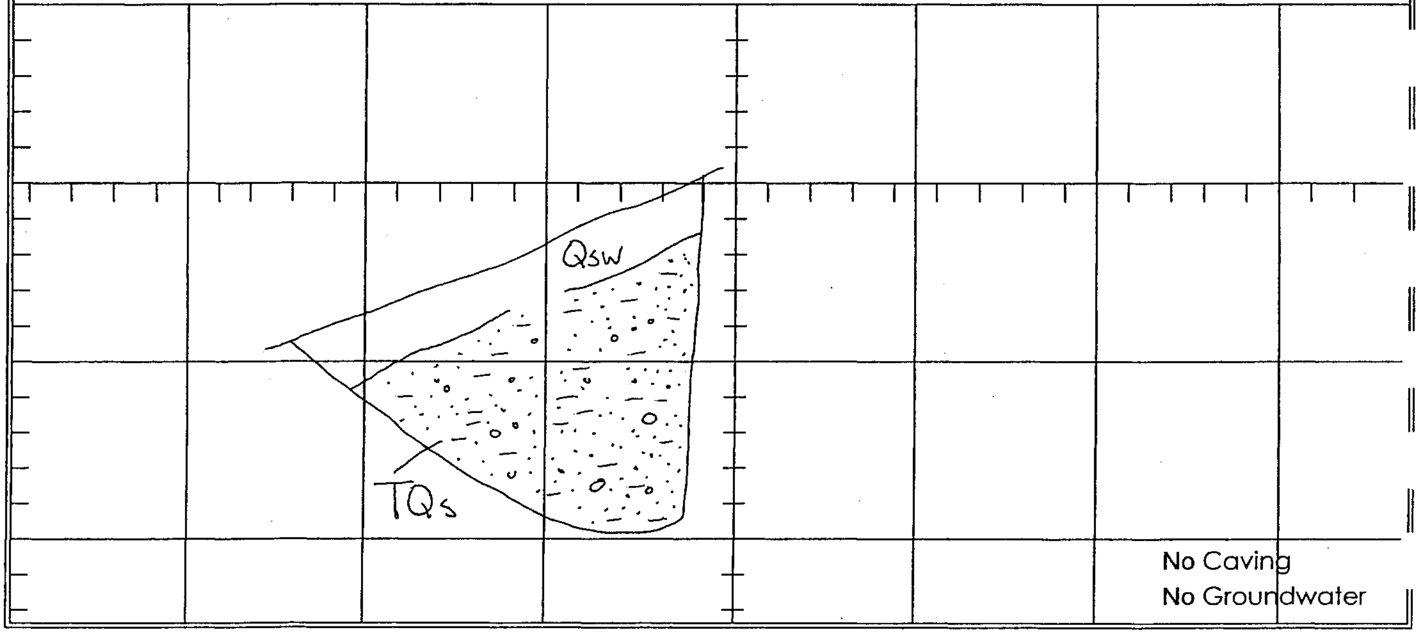
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC. Sheet 1 of 1

TRENCH LOG NO. T-80

CLIENT: Synergy
PROJECT: Tentative Tract 60258
JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 5/14/04
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket
ELEVATION:

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SLOPEWASH; Qsw (0-1.5')** @ 0' Brown silty, pebbly sand; soft; dry; roots; voids **BEDROCK; TQs (1.5-10')** @ 1.5' Yellowish- to grayish-brown silty, pebbly sandstone with scattered cobbles; moderately hard to hard; damp; massive, structureless; slightly fractured; highly weathered to 5'				
5									
10					COMMENTS: Cobble/boulder lag at surface (sort of odd - massive unit-possible Qt)				
15									
20									

TOTAL DEPTH: 10 feet
N23W→
SCALE: 1 inch = 5 feet



No Caving
No Groundwater

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

Sheet 1 of 1

CLIENT: Synergy
PROJECT: Tentative Tract 60258
JOB NO: 04-803S-4
DATE: 6/11/04
LOGGED BY: MJD
EXCAVATED: 5/14/04
EXCAVATION METHOD: Track-Mounted Backhoe w/24" bucket
ELEVATION:

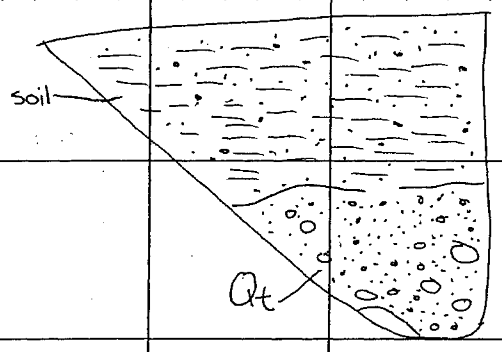
TRENCH LOG NO. T-81

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SOIL; soil (0-4.5')** @ 0' Reddish-brown silty, sandy clay with pebbles; soft to medium dense; dry to damp; roots; voids				
5					**QUATERNARY TERRACE DEPOSITS; Qt (4.5-9')** @ 4.5' Grades to orangish-brown pebbly, cobbly sandstone with boulders; loose; friable; damp; crudely bedded; highly weathered to 7'	B:Horizontal			
10									
15									
20									

TOTAL DEPTH: 9 feet

←Due N

SCALE: 1 inch = 5 feet



No Caving
No Groundwater

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

Sheet 1 of 1

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-2

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

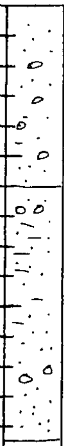
Elev. 1509 Location See Geologic Map Date 11/13/86

ATTITUDES | GRAPHIC LOG | LITHOLOGY | REMARKS

ATTITUDES

10 APPROX DIP 7N

GRAPHIC LOG



LITHOLOGY

0 - 6 Ft; QUATERNARY TERRACE; Qt;
Light brown, fine-to medium silty sandstone with scattered gravel; firm; dry to damp

6 - 14.5 Ft. BEDROCK; TQs;
Grayish-brown, medium-to coarse sandstone with scattered cobbles; firm; damp
@ 7 Ft. Fine silty sandstone; firm; damp (yellowish-red)

@ 11.5 Ft. Light yellowish brown

TOTAL DEPTH 14.5 Ft. (Elev. 1494.5 Ft.)
No Ground Water
No Caving

REMARKS

@ 7.5 Ft. Ring Sample. 7 blows, @ 2600#
@ 9 Ft. Bag Sample and Ring Sample. 8 blows

5
10
15
20
25
30
35
40
45
50

Sheet 1 of 1

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

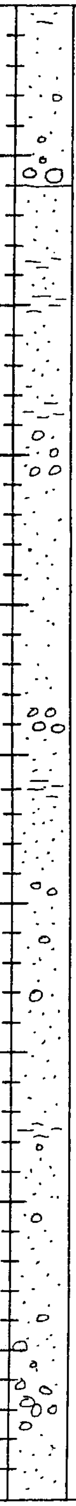
ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-3

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1512.5 Location See Geologic Map Date 11/13/86

	ATTITUDES	GRAPHIC LOG	LITHOLOGY	REMARKS
			0 - 6 Ft. QUATERNARY TERRACE; Qt; @ 0 Ft. Light brown, medium-to coarse, slightly silty sandstone with scattered cobbles; firm; dry to damp	Excavated on 9/15/86 through 9/16/86
5			6 - 71.8 Ft. BEDROCK; TQs; @ 6 Ft. Light brown, medium-to coarse sandstone; firm; damp	
			@ 9 Ft. Yellowish-red, fine silty sandstone	
10			@ 11 Ft. Fine-to medium sandstone; dense; zeolite — mottled	@ 10 Ft. Ring Sample 11 blows @ 11 Ft. Ring Sample 9 blows
	B-N78W, 7NE (approx.)		@ 13.5 Ft. Grades to light brown, fine silty sandstone	
15			@ 15 Ft. Medium-to coarse sandstone; grades loose; scattered cobbles and pebbles	
20				
				@ 24 Ft. Seepage
25			@ 25.5 Ft. Yellowish-brown, fine-to medium silty sandstone; dense @ 27 Ft. Fine, very silty sandstone @ 28.5 Ft. Light brown, medium-to coarse sandstone with pebbles and cobbles @ 29 Ft. Moist	26.5 to 27.6 Ft. Seepage @ 26.5 Ft. Bag Sample @ 28 Ft. Bag Sample @ 29 Ft. Seepage and slight caving
30				@ 30 Ft. Seepage @ 33 Ft. Ring Sample 1600 #, 19 blows
	B-N80W, 8NE		@ 33 Ft. Yellowish-red, zeolite-mottled	
35				@ 36 Ft. Seepage
40			@ 43 Ft. Grades less silty	
45			@ 46.5 Ft. to 48 Ft. Cobble conglomerate	@ 46 Ft. Slow drilling
	B-Horizontal		@ 48 Ft. Medium-brown, fine, very silty sandstone	@ 48 Ft. Ring Sample 800 #, 50/11"overdriven
50			@ 50 Ft. Yellowish-red, silty sandstone	

Sheet 1 of 2

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-3

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1512.5 Location See Geologic Map Date 11/13/86

	ATTITUDES	GRAPHIC LOG	LITHOLOGY	REMARKS
				@ 50 Ft. Ring Sample 50/9.5"
55			@ 55 Ft. Light-yellowish brown @ 56 Ft. Light-brown, fine-to coarse silty sandstone with pebbles and cobbles; damp to moist @ 59 Ft. Grades to yellowish-red, medium silty sandstone; damp	@ 59 Ft. Ring Sample 50/95"
60	B-N73E, 6-8N		@ 60 Ft. Grades to light-brown, fine-to medium silty sandstone @ 61 Ft. Grades to gray, medium-to coarse sandstone; moist	@ 64 Ft. Drilling stopped 9/15/86 Continued 9/16/86 Water up to 57.5 Ft.
65			@ 65.5 Ft. Grades reddish-brown @ 67 Ft. Light-to medium-brown, medium-to coarse sandstone with pebble conglomerate; wet; firm	
70				
75				
80				
85				
90			TOTAL DEPTH 71.8 Ft. (Elev. 1440.7) Perched Ground Water (See Remarks) Slight Caving @ 29 Ft.	
95				
100				

Sheet 2 of 2

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

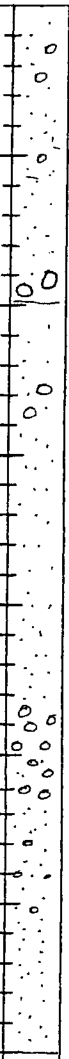
ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-4

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1516 Location See Geologic Map Date 11/13/86

	ATTITUDES	GRAPHIC LOG	LITHOLOGY	REMARKS
			0 - 10 Ft. QUATERNARY TERRACE; Qt @ 0 Ft. Light-brown, fine-to coarse sandstone with scattered pebbles; dry; firm	Boreholes B-4 to B-6 drilled 9/16/86
5			@ 5 Ft. Yellowish-red, slightly silty, fine-to medium sandstone; damp; zeolite-mottled, cobbles at base	@ 5 Ft. Bag Sample @ 5.5 Ft. Ring Sample 6 blows, 2600#
10	B-N74E, 7NW		10 - 35 Ft. BEDROCK; TQs; @ 10 Ft. Grayish-brown, slightly silty, fine-to coarse sandstone with cobble conglomerate; dense; calcite cemented @ 13 Ft. Cobbles to 8"	
15			@ 16 Ft. Grades reddish-brown, moderately dense @ 18 Ft. Grades light-brown with medium-brown stain	
20			@ 23.5 Ft. Cobble conglomerate	
25			@ 27 Ft. Grades less conglomeratic	
30	B-N65E, 7NW		@ 33 Ft. Grades reddish-brown	
35				
40			TOTAL DEPTH 35 Ft. (Elev. 1481 Ft.) No Ground Water No Caving	
45				
50				

Sheet 1 of 1

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

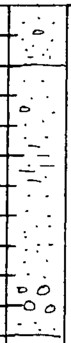
ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-5

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1436 Location See Geologic Map Date 11/13/86

ATTITUDES	GRAPHIC LOG	LITHOLOGY	REMARKS
		0 - 2 Ft. ARTIFICIAL FILL; af; @ 0 Ft. Light-brown, fine-to coarse silty sand with scattered pebbles; loose; dry 2 - 10 Ft. QUATERNARY TERRACE; Qt @ 2 Ft. Light-brown, fine-to medium silty sandstone; loose to moderately dense; dry @ 7 Ft. Grades yellowish-brown @ 10 Ft. Pebble conglomerate	Drilled to refusal @ 11 Ft.
		TOTAL DEPTH 11 Ft. (Elev. 1425 Ft.) No Ground Water No Caving	

Sheet 1 of 1

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-6

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1438 Location See Geologic Map Date 11/13/86

	ATTITUDES	GRAPHIC LOG	LITHOLOGY	REMARKS
			0 - 13 Ft. QUATERNARY TERRACE; Qt; @ 0 Ft. Light-brown, fine-to medium slightly silty sandstone, with minor conglomerate; dry; moderately dense	Drilled 9/16/86 through 9/17/86 Borings 6-8 drilled 9/17/86
5				
			@ 8 Ft. Grades silty and damp	
			@ 9 Ft. Grades very conglomeratic	
10				
			@ 13 Ft. Boulder conglomerate	
				14.5 to 18 Ft. Caving
15			@ 15 Ft. Grades to cobble conglomerate	
				Drilled to refusal @ 18 Ft.
20				
25				
30				
35				
40			TOTAL DEPTH 18 Ft. (Elev 1420 Ft.) No Ground Water Caving 14.5 to 18 Ft.	
45				
50				

Sheet 1 of 1

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

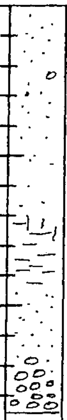
ALLAN E. SEWARD

DRILLING LOG

Project PALMER, Santa Catarina TT 31236 Boring No. B-7

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev.1404 Location See Geologic Map Date 11/13/86

ATTITUDES	GRAPHIC LOG	LITHOLOGY	REMARKS
0		0 - 13.5 Ft. QUATERNARY TERRACE; Qt @ 0 Ft. Reddish-brown, fine-to medium silty sandstone with pea-sized gravel; dry; moderately dense	
5		@ 7.5 Ft. Grades very silty and damp, with caliche-filled root tubes @ 9 Ft. Grades light-brown	@ 7.5 Ft. Ring (3 blows) and Bag Sample
10		@ 11 Ft. Grades less silty @ 12.5 Ft. Cobble conglomerate	@ 12.5 Ft. Very slow drilling 2 hrs, 1', cracked 24" core bucket Drilled to refusal @ 13.5 Ft.
15			
20			
25			
30			
35			
40		TOTAL DEPTH 13.5 Ft. (Elev. 1490 Ft.) No Ground Water No Caving	
45			
50			

Sheet 1 of 1

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-8

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1606 Location See Geologic Map Date 11/13/86

	ATTITUDES	GRAPHIC LOG	LITHOLOGY	REMARKS
			0 - 65 Ft. QUATERNARY TERRACE; Qt;	Drilled 9/17-9/18/86
			@ 0 Ft. Light-brown, fine-to coarse, very silty sandstone with pebbles; dry; dense	
5			@ 2 Ft. Cobble conglomerate	
			@ 4 Ft. Grades yellowish-brown, and less silty	
			@ 6 Ft. Grades less conglomeratic	
10			@ 11 Ft. Light-brown; damp	
15				
			@ 17.5 Ft. Pebble to cobble conglomerate	
20			@ 21 Ft. Grades medium-brown; silty	
25			@ 25 Ft. Yellow-brown, fine-to medium sandstone	
	Horizontal		@ 27 Ft. Very silty	@ 27 Ft. Ring Sample 6 blows 1600# Bag Sample
			@ 28 Ft. Grades less silty, and light-brown	
30			@ 30 Ft. Grades damp to moist	
			@ 34 Ft. Slightly silty, fine sandstone	@ 34 Ft. Ring Sample 5 blows
35				
			@ 38 Ft. Grades clayey, with orange-brown streaks	
40			@ 39 Ft. Grades silty	
			@ 41 Ft. Locally medium-brown	
	Horizontal		@ 43 Ft. Grades very silty	@ 43 Ft. Ring Sample 12 blows Bag Sample
45			@ 46 Ft. Grades less silty, and fine-to medium; damp	
			@ 47 Ft. Cobble conglomerate	@ 47 Ft. Caving
			@ 50 Ft. Grades to pebble conglomerate and very coarse	
50				

Sheet 1 of 2

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-8

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1606 Location See Geologic Map Date 11/13/86

	ATTITUDES	LITHOLOGY	REMARKS
55			
60			
	Horizontal	@ 64 Ft. Fine, silty sandstone @ 65 Ft. Very friable running sands	@ 65 Ft. Extensive caving Bag Sample (Ring destroyed) Terminated Drilling
65			
70			
75			
80		TOTAL DEPTH 65 Ft. (Elev. 1541 Ft.) No Ground Water Caving locally from 47 to 65 Ft. (especially @ 65 Ft.)	
85			
90			
95			
100			

Sheet 2 of 2

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-9

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1555 Location See Geologic Map Date 11/13/86

	ATTITUDES	GRAPHIC LOG	LITHOLOGY	REMARKS
			0 - 5 Ft. SOIL; @ 0 Ft. Medium-brown, fine-to medium-silty sand with gravel and cobbles; loose; dry	Borehole B-9 drilled 9/19/86, 9/22/86
5			5 - 33 Ft. QUATERNARY TERRACE; Qt @ 5 Ft. Reddish-brown, fine-to medium silty sandstone, damp	
10			@ 10 Ft. Grades medium-to coarse and less silty	
			@ 13.5 Ft. Grades light-brown and silty	@ 13.5 Ft. Ring and Bag Samples
15			@ 15 Ft. Cobble conglomerate with medium-to very coarse sandstone; dense	3 Blows
20			@ 20 Ft. Fine, very silty sandstone	@ 20 Ft. Ring Sample 19 Blows
				@ 23 Ft. Bag Sample
25			@ 25 Ft. Grades fine-to medium and less silty; loose	
			@ 26 Ft. Pebble-to cobble conglomerate; dry; loose to very loose	
30				
				31 to 33 Ft. Caving
35				
40			TOTAL DEPTH 33 Ft. (Elev. 1522 Ft.) No Ground Water Caving 31 - 33 Ft.	
45				
50				

Sheet 1 of 1

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

ALLAN E. SEWARD

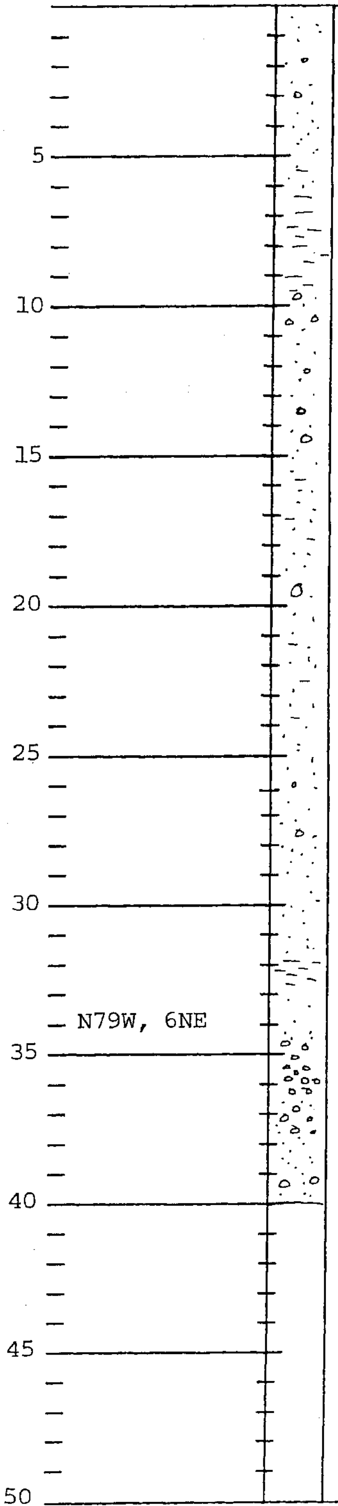
DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-10

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1524 Location See Geologic Map Date 11/13/86

ATTITUDES | GRAPHIC LOG | LITHOLOGY | REMARKS



0 - 23 Ft. QUATERNARY TERRACE, Qt
- @ 0 Ft. Light-brown, fine-to medium-silty sandstone, with scattered pebbles; loose; dry
- @ 6 Ft. Grades light-reddish brown, damp
- @ 7 Ft. Grades very silty; damp; slightly clayey; root tubes; dense
- @ 9 Ft. Grades light-brown with scattered cobbles and pebbles; less silty; no clay

23 - 40 Ft. BEDROCK; TQs
- @ 23 Ft. Grades yellowish-brown
- @ 26 Ft. Medium-brown
- @ 29 Ft. Grades light-brown
- @ 33 Ft. Grades silty
- @ 34 Ft. Grades to medium-to very coarse pebbly sandstone; less silty; moist
- @ 35 Ft. Pebble conglomerate
- @ 37 Ft. Grades to medium-to very coarse pebbly sandstone
- @ 38 Ft. Grades moist

TOTAL DEPTH 40 Ft. (Elev. 1484 Ft.)
No Ground Water
No Caving

REMARKS:

Borehole B-10 drilled 9/22/86

@ 7 Ft. 1 blow Ring Sample

@ 23 Ft. Qt - TQs contact gradational

@ 33 Ft. Ring Sample 8 blows 1600 #

Sheet 1 of 1

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

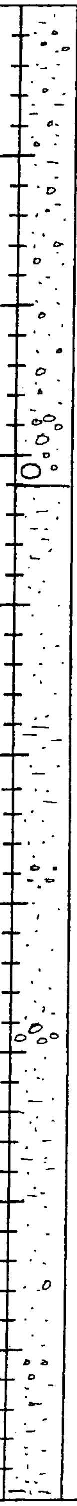
ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-11

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1523 Location See Geologic Map Date 11/13/86

	ATTITUDES	GRAPHIC LOG	LITHOLOGY	REMARKS
			0 - 16 Ft. QUATERNARY TERRACE, Qt	Borehole B-11 to B-12 drilled 9/23/86
			@ 0 Ft. Light-brown, fine-to medium silty sandstone with scattered pebbles; loose; dry	
			@ 4 Ft. Grades moderately dense; damp	
5				
			@ 6 Ft. Grades less silty	
10				
			@ 13 Ft. Grades moist	
			@ 14 Ft. Cobbles	
15			16 - 73 Ft. BEDROCK; TQs	
			@ 16 Ft. Tan, fine-to medium, slightly silty sandstone	
20				
				@ 22 Ft. Seepage
	N69W, 8NE		@ 24 Ft. Very silty to clayey	
25				
			@ 26 Ft. Grades medium-to coarse, silty	
			@ 29 Ft. Grades to light-brown, pebbly sandstone; damp	
30				
			@ 34 Ft. Scattered cobbles	@ 34 Ft. Seepage
35				
			@ 39 Ft. Grades reddish-brown, less silty	
40				
45			@ 45 Ft. Grades Grayish-brown	
			@ 45½ Ft. Scattered Cobbles	
			@ 47 Ft. Slightly silty, moist	
				@ 48 Ft. Seepage
50			@ 50 Ft. Fine-to medium, silty	

Sheet 1 of 2

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-11

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1523 Location See Geologic Map Date 11/13/86

	ATTITUDES	GRAPHIC LOG	LITHOLOGY	REMARKS
				@ 53 Ft. Seepage
55				
			@ 56 Ft. Less silty, medium-to coarse	
	N80W, 5NE (approx.)			
60				
				@ 61 - 65 Ft. Extensive Seepage
			@ 62 Ft. Grades to pebble conglomerate	
			@ 64 Ft. Grades light-brown, and to pebbly sandstone	
65				
70				
			@ 71 Ft. Very moist to wet	
75				
80				
85				
90				
95			TOTAL DEPTH 73 Ft. (Elev. 1450 Ft.) Perched Ground Water (See remarks) No Caving	
100				

Sheet 2 of 2

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-12

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1402 Location See Geologic Map Date 11/13/86

	ATTITUDES	GRAPHIC LOG	LITHOLOGY	REMARKS
			0 - 4 Ft. SOIL;	Drilled 9/23-24/86 Borings B-12 to B-14 drilled 9/24/86
			@ 0 Ft. Medium-brown, fine-to medium silty sand, with pebbles; loose dry	@ 2 Ft. Bag Sample
5			4 - 17 Ft. QUATERNARY TERRACE; Qt Reddish-brown, medium-to coarse sandstone with scattered pebbles; moderately dense; damp; caliche-stained	
			@ 8 Ft. Pebble-to cobble conglomerate; no caliche	
10			@ 10 Ft. Yellowish-brown, fine-to medium sandstone; grades less silty; scattered pebbles	@ 13 Ft. Caving
			@ 11.5 Ft. Pebble-to cobble conglomerate	
15			@ 16 Ft. Boulder conglomerate	
			17 - 52 Ft. BEDROCK; TQs	
			@ 17 Ft. Yellowish-brown, medium-to coarse pebbly sandstone	
20	N80E, 6NW (approx.)		@ 20 Ft. Medium-to coarse sandstone	
25			@ 26 Ft. Grades to pebbly sandstone	
			@ 28 Ft. Grades reddish-brown, and slightly silty	
30			@ 31 Ft. Grades yellowish-brown	
				@ 34 Ft. Seepage
35	N88E, 8NW		@ 35 Ft. Grades to pebbly sandstone	
			@ 39 Ft. Grades gray	
40			@ 40 Ft. Grades reddish-brown, and slightly clayey	
			@ 40.5 Ft. Grades yellowish-brown; moist	@ 40.5 Ft. Slow drilling
45			@ 45.5 Ft. Reddish-brown, fine-to medium silty to clayey sandstone; dense	
			@ 48 Ft. Grades light-brown; clayey; very dense	
50				@ 49 Ft. 13" Core and Bag Sample

Sheet 1 of 2

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-12

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1402 Location See Geologic Map Date 11/13/86

	ATTITUDES	GRAPHIC LOG	LITHOLOGY	REMARKS
			TOTAL DEPTH 52 Ft. (Elev. 1350 Ft.) Perched Ground Water (See remarks) Slight Caving @ 13 Ft.	
55				
60				
65				
70				
75				
80				
85				
90				
95				
100				

Sheet 2 of 2

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Cataraina TT 31236 Boring No. B-13

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1402 Location See Geologic Map Date 11/13/86

ATTITUDES GRAPHIC LOG LITHOLOGY REMARKS

0 - 10.5 Ft. QUATERNARY TERRACE; Qt

@ 0 Ft. Reddish-brown, fine-to medium silty sandstone; dry to damp; dense; caliche-mottled; scattered pebbles

@ 5 Ft. Light-brown, fine, very silty sandstone; no caliche

@ 8 Ft. Grades less silty

@ 9 Ft. Cobble conglomerate

Drilled to refusal @ 10.5 Ft.

TOTAL DEPTH 10.5 Ft. (Elev. 1391.5)

No Ground Water

No Caving

5
10
15
20
25
30
35
40
45
50

Sheet 1 of 1

B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

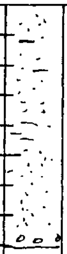
ALLAN E. SEWARD

DRILLING LOG

Project PALMER Santa Catarina TT 31236 Boring No. B-14

Method of Drilling 24" Bucket Auger Logged by GF Job No. 6-803-4

Elev. 1400 Location See Geologic Map Date 11/13/86

ATTITUDES	GRAPHIC LOG	LITHOLOGY	REMARKS
		0 - 8 Ft. QUATERNARY TERRACE; Qt @ 0 Ft. Reddish-brown, fine-to medium, slightly silty sandstone; damp; dense; caliche-mottled @ 4 Ft. Light-brown, fine-to medium, silty sandstone; no caliche @ 6 Ft. Grades medium-to coarse @ 8 Ft. Cobble conglomerate	Drilled to refusal @ 8 Ft.
		TOTAL DEPTH 8 Ft. (Elev. 1392 Ft.) No Ground Water No Caving	

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

Sheet 1 of 1

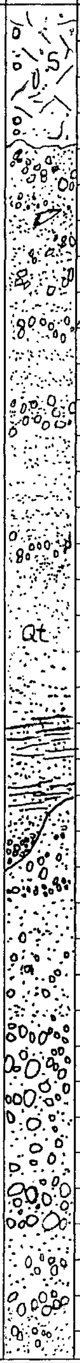
B-Bedding; F-Fault; J-Joint;
SP-Slide Plane; St-Striation; f-fracture

ALLAN E. SEWARD

DRILL HOLE LOG

CLIENT: Synergy
PROJECT: Tentative Tract 60258
DRILLING COMPANY: Tri-Valley/Ray
DRILLING METHOD: Bucket-Auger (114' Rig)
HAMMER TYPE: Telescoping Kelly Bar
DRIVING WEIGHTS: 0-28=5952 lbs; 23-55=3921 lbs; 55-84=2531 lbs; 84-114=1407 lbs
JOB NO.: 04-803S-4
DATE: 6/11/04
LOGGED BY: MAS
DRILLED: 2/13-2/16/04
HOLE DIA: 24"
AVERAGE DROP (in.): 12"
ELEVATION: 1622'

BORING NO. B-15

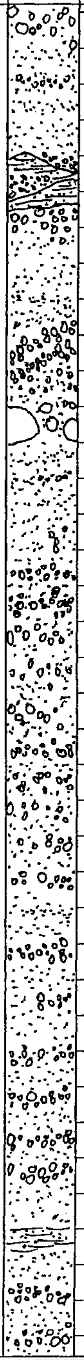


DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	Description Soils: description; consistency/density; moisture; color; other Bedrock: color, lithology; hardness; moisture; other	Remarks
0						**SOIL; s (0-4')** @ 0' pale reddish-brown silty clayey sand w/gravel; very dense; dry; roots, rootlets, pinhole voids	@ 0-15' bulk sample
4				Contact: Horizontal		**QUATERNARY TERRACE DEPOSITS; Qt (4-80')** @ 4' pale yellowish-brown to light brown sandstone w/gravel; dry to damp; gravelly channels	
5	■	2 3 4		131/1.9 B:Horizontal			
10	■	2 4		125/1.9			
15	■	3 8		B:Horizontal 133/4.7		@15.5 same; local finely laminated crossbeds	
20	■	1 3 5		B:Horizontal 117/13.1		@ 20' same; w/interbedded light brown sandy siltstone; stiff; damp	
22						@ 22' channel	
25				B:Horizontal			
30	■	6 10		Apx. B: Horizontal 130/3.6		@30' same; cobbles ≤ 6" in diameter	
35							

CLIENT: Synergy
PROJECT: Tentative Tract 60258
DRILLING COMPANY: Tri-Valley/Ray
DRILLING METHOD: Bucket-Auger (114' Rig)
HAMMER TYPE: Telescoping Kelly Bar
DRIVING WEIGHTS: 0-28=5952 lbs; 23-55=3921 lbs; 55-84=2531 lbs; 84-114=1407 lbs
JOB NO.: 04-803S-4
DATE: 6/11/04
LOGGED BY: MAS
DRILLED: 2/13-2/16/04
HOLE DIA: 24"
AVERAGE DROP (in.): 12"
ELEVATION: 1622'

DRILL HOLE LOG

BORING NO. B-15

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	Description Soils: description; consistency/density; moisture; color; other Bedrock: color, lithology; hardness; moisture; other	Remarks
40	■	5 13		129/2.0			
				B:Horizontal			
45							
				XB:N55E,26NW		@ 47' cross bedded	
50	■	6 10/3		118/3.3		@ 50' same; cobbles and some boulders ≤ 1.5	
				B:Horizontal			
55							
				B:Horizontal			
60	■	11/4"					
65							
70	■	13		116/2.5			
				B:Horizontal			
75							

CLIENT: Synergy
PROJECT: Tentative Tract 60258
DRILLING COMPANY: Tri-Valley/Ray
DRILLING METHOD: Bucket-Auger (114' Rig)
HAMMER TYPE: Telescoping Kelly Bar
DRIVING WEIGHTS: 0-28=5952 lbs; 23-55=3921 lbs; 55-84=2531 lbs; 84-114=1407 lbs

JOB NO.: 04-803S-4
DATE: 6/11/04
LOGGED BY: MAS
DRILLED: 2/13-2/16/04
HOLE DIA: 24"
AVERAGE DROP (in.): 12"
ELEVATION: 1622'

DRILL HOLE LOG

BORING NO. B-15

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	Description Soils: description; consistency/density; moisture; color; other Bedrock: color, lithology; hardness; moisture; other	Remarks
							
80				126/2.8		Total depth 80' No caving Ravelling @ 4-80' No groundwater	
85							
90							
95							
100							
105							
110							

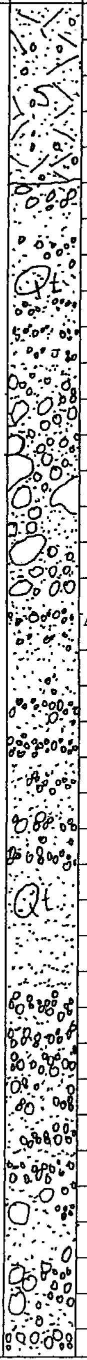
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

DRILL HOLE LOG

CLIENT: Synergy
PROJECT: Tentative Tract 60258
DRILLING COMPANY: Tri-Valley/Ry
DRILLING METHOD: Bucket-Auger (110' Rig)
HAMMER TYPE: Telescoping Kelly
DRIVING WEIGHTS: 0-28=5952 lbs; 28-55=3921 lbs; 55-84=2531 lbs; 84-114=1407 lbs

JOB NO.: 04-803S-4
DATE: 6/11/04
LOGGED BY: MAS
DRILLED: 2/16-2/19/2004
HOLE DIA: 24"
AVERAGE DROP (in.): 12"
ELEVATION: 1612'

BORING NO. B-16



DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	Description Soils: description; consistency/density; moisture; color; other Bedrock: color, lithology; hardness; moisture; other	Remarks
0					<u>SOIL</u>; (0-5') @ 0' pale reddish-brown silty clayey sand w/gravel; dense; dry; roots, rootlets, voids ≤ 1/8	@ 0-4 Bulk Sample
5	■	4 4 4	126/1.7		<u>QUATERNARY TERRACE DEPOSITS</u>; Qt (5-90') @ 5' light brown to pale; yellowish-brown silty sandstone w/gravel; dense; dry to damp; cobbles; gravel channels	
10	■	4 6 6	B:Horizontal 135/1.0			
15	■	4/2"	114/2.9			
			Apx. XB:N40E, 6SE			
20	■	2 6 8	130/3.2			
			B:Horizontal			
25						
			B:Horizontal			
30	■	5 10	134/2.5			
35						

DRILL HOLE LOG

CLIENT: Synergy
PROJECT: Tentative Tract 60258
DRILLING COMPANY: Tri-Valley/Ry
DRILLING METHOD: Bucket-Auger (110' Rig)
HAMMER TYPE: Telescoping Kelly
DRIVING WEIGHTS: 0-28=5952 lbs; 28-55=3921 lbs; 55-84=2531 lbs; 84-114=1407 lbs

JOB NO.: 04-803S-4
DATE: 6/11/04
LOGGED BY: MAS
DRILLED: 2/16-2/19/2004
HOLE DIA: 24"
AVERAGE DROP (in.): 12"
ELEVATION: 1612'

BORING NO. B-16

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	Description Soils: description; consistency/density; moisture; color; other Bedrock: color, lithology; hardness; moisture; other	Remarks
40	■	6 11		130/2.6			
				B:Horizontal		@ 42.5' light brown silty clay/clayey silt; stiff; damp	
45				B:Horizontal			
				XB:N45E 4SE			
50	■	12		121/3.7			
						@ 53' Pale yellowish-brown interbedded silty sandstone and sandy siltstone; stiff; damp	
55							
				B:Horizontal			
60	■	5 16		110/18.5			
				B:Horizontal			
65				B:Horizontal		@ 65' pale yellowish-brown sandstone; very dense; damp	
70	■	16		125/3.6			
75							

CLIENT: Synergy
PROJECT: Tentative Tract 60258
DRILLING COMPANY: Tri-Valley/Ry
DRILLING METHOD: Bucket-Auger (110' Rig)
HAMMER TYPE: Telescoping Kelly
DRIVING WEIGHTS: 0-28=5952 lbs; 28-55=3921 lbs; 55-84=2531 lbs; 84-114=1407 lbs

JOB NO.: 04-803S-4
DATE: 6/11/04
LOGGED BY: MAS
DRILLED: 2/16-2/19/2004
HOLE DIA: 24"
AVERAGE DROP (in.): 12"
ELEVATION: 1612'

DRILL HOLE LOG

BORING NO. B-16

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	Description Soils: description; consistency/density; moisture; color; other Bedrock: color, lithology; hardness; moisture; other	Remarks
80	■	14		B:Horizontal 113/3.1			
						@ 83' same; with finely laminated cross bedding	
85							
90	■	25		117/10.8		Total depth 90' No caving Ravelling: 4-40' No groundwater	
95							
100							
105							
110							

DRILL HOLE LOG

CLIENT: Synergy
PROJECT: Tentative Tract 60258
DRILLING COMPANY: Tri Valley/Mario
DRILLING METHOD: Bucket-Auger (114' 6×6)
HAMMER TYPE: Telescoping Kelly Bar
DRIVING WEIGHTS: 0-30=5952 lbs; 30-57=3921 lbs; 57-86=2531 lbs; 86-114=1407 lbs
JOB NO.: 04-803S-4
DATE: 6/11/04
LOGGED BY: MAS
DRILLED: 4/22-4/23/04
HOLE DIA: 24"
AVERAGE DROP (in.): 12"
ELEVATION: 1642'

BORING NO. B-17

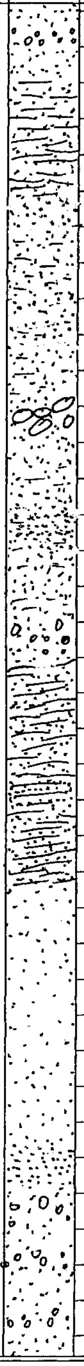
DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	Description Soils: description; consistency/density; moisture; color; other Bedrock: color, lithology; hardness; moisture; other	Remarks
						<u>SOIL</u>; (0-10') @ 0' Pale reddish brown silty clayey sand w/gravel, dry to damp; moderately dense; pinhole voids, roots and rootlets	
5							
10	■	3 3		107/7.4 B:Horizontal		<u>QUARTERNARY TERRACE;</u> Qt (10-20') @ 11' pale reddish brown to yellowish-brown clayey silty sandstone; dense, dry to damp; cross beds not well defined	
15						@ 15' same; interbedded light brown fine silty sandy claystone; clayey sandstone dense dry to damp	
				Apx. B: Horizontal		@ 17' same; pebbly	
20	■	3 3 4		105/7.5 B:Horizontal		<u>BEDROCK;</u> TQs (20-85') @ 21' light-brown silt sand; stiff; damp; (contact is well defined)	
25						@ 25' pale reddish-brown clayey sandstone; dense; damp	
						@ 28 same; light brown	
30	■	6 8 16		130/8.9		@ 30' pale light brown to tan silty sandstone; dense to very dense; damp	@ 30-35' bulk sample
35						@ 36' pale gray concretion; very hard	

DRILL HOLE LOG

CLIENT: Synergy
PROJECT: Tentative Tract 60258
DRILLING COMPANY: Tri Valley/Mario
DRILLING METHOD: Bucket-Auger (114' 6x6)
HAMMER TYPE: Telescoping Kelly Bar
DRIVING WEIGHTS: 0-30=5952 lbs; 30-57=3921 lbs; 57-86=2531 lbs; 86-114=1407 lbs

JOB NO.: 04-803S-4
DATE: 6/11/04
LOGGED BY: MAS
DRILLED: 4/22-4/23/04
HOLE DIA: 24"
AVERAGE DROP (in.): 12"
ELEVATION: 1642'

BORING NO. B-17

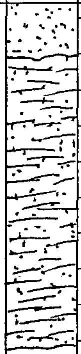


DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	Description Soils: description; consistency/density; moisture; color; other Bedrock: color, lithology; hardness; moisture; other	Remarks
			B:Horizontal			
40	■	6 4 16	B:Horizontal 124/ 12.9		@ 40' pale light brown to tan, silty sandstone; dense; damp	@ 10:55 AM grab bucket til 11:40 AM
					@ 44' light brown to light yellowish-brown; silty clayey sandstone w/ gravel; very dense; damp	
45						
					@ 49' cobbles	
50	■	7 27	128/4.8			@ 50' Rock in tip
55						
					@ 56' pale reddish-brown silty clayey sandstone; very dense; damp	
						@ 59' Small bulk
60	■	5 16 28	B:Horizontal 126/ 12.2		@ 60' light yellow to tan clayey sandstone; hard; damp	
65						
70						@ 70' Rock
	■	8 32	122/9.8			
75						

DRILL HOLE LOG

CLIENT: Synergy
PROJECT: Tentative Tract 60258
DRILLING COMPANY: Tri Valley/Mario
DRILLING METHOD: Bucket-Auger (114' 6×6)
HAMMER TYPE: Telescoping Kelly Bar
DRIVING WEIGHTS: 0-30=5952 lbs; 30-57=3921 lbs; 57-86=2531 lbs; 86-114=1407 lbs
JOB NO.: 04-803S-4
DATE: 6/11/04
LOGGED BY: MAS
DRILLED: 4/22-4/23/04
HOLE DIA: 24"
AVERAGE DROP (in.): 12"
ELEVATION: 1642'

BORING NO. B-17

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	Description Soils: description; consistency/density; moisture; color; other Bedrock: color, lithology; hardness; moisture; other	Remarks
				B:Horizontal		@ 77' pale reddish brown silty clayey sandstone; moderately dense; damp	
80							
	■	10 24		125/10.6			
85						Total depth 85' No groundwater No caving	
90							
95							
100							
105							
110							

DRILL HOLE LOG

CLIENT: Synergy
JOB NO.: 04-803S-4
PROJECT: Tentative Tract 60258
DATE: 6/11/04
LOGGED BY: KPC
DRILLING COMPANY: Valley Well Drilling
DRILLED: 4/7/04
DRILLING METHOD: Rotary-Wash
HOLE DIA: 5 1/4"
HAMMER TYPE: Safety Hammer
AVERAGE DROP (in.): 30"
DRIVING WEIGHTS: 140 lbs
ELEVATION 1290'

BORING NO. RW-1

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS			
						Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
0					**ARTIFICIAL FILL; af (0-8')**				
5	■	4 3 7		SC	@ 5' Clayey SAND; loose; moist; medium to grayish brown; small pebbles	10.5	120		
					QUATERNARY ALLUVIUM; Qal (8-35')				
10	◤	6 5 6		SM	@ 10' Silty SAND; loose to medium dense; moist; light gray			13	
15	◤	12 7 5			@ 15' -with gravel; medium dense; yellowish to grayish brown				
20	◤	9 12 17						14	
25	■	13 15 15				8.9	125		
30	◤	10 8 5			@ 30' -wet; yellowish brown				
35	◤	40 42 60			**BEDROCK; TQs (35-50')** @ 35' Poorly graded SANDSTONE with silt; very dense; wet; yellowish to grayish brown				

DRILL HOLE LOG

CLIENT:	Synergy	JOB NO.:	04-803S-4
PROJECT:	Tentative Tract 60258	DATE:	6/11/04
		LOGGED BY:	KPC
DRILLING COMPANY:	Valley Well Drilling	DRILLED:	4/7/04
DRILLING METHOD:	Rotary-Wash	HOLE DIA:	5 1/4"
HAMMER TYPE:	Safety Hammer	AVERAGE DROP (in.):	30"
DRIVING WEIGHTS:	140 lbs	ELEVATION	1290'

BORING NO. RW-1

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
40		60/4"			@ 40' -light gray to yellowish brown	21.2	112		
45		75/3"			@ 45' -light gray to grayish brown				
50		75/3"			@ 50' Silty SANDSTONE; very dense; wet; light gray to grayish brown				
					Total Depth 50' Ground Water @ 27'				
55									
60									
65									
70									
75									

CLIENT: Synergy	JOB NO.: 04-803S-4	**DRILL HOLE LOG**
PROJECT: Tentative Tract 60258	DATE: 6/11/04	
	LOGGED BY: KPC	
DRILLING COMPANY: Valley Well Drilling	DRILLED: 4/8/04	
DRILLING METHOD: Rotary-Wash	HOLE DIA: 5 1/4"	**BORING NO.** RW-2
HAMMER TYPE: Safety Hammer	AVERAGE DROP (in.): 30"	
DRIVING WEIGHTS: 140 lbs	ELEVATION 1300'	

DEPTH (feet)	BLOWS / 6"	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS			
				Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
0			**ARTIFICIAL FILL; af (0-9')**				
	14 27 27	SC	@ 3' Clayey SAND with gravel; very dense; dry; yellowish to grayish brown			19	
5							
	14 22 48		@ 6' -damp				
10	9 15 32	SP-SM	**QUATERNARY ALLUVIUM?; Qal? (9-48')** @ 9' Poorly graded SAND with silt; dense; damp yellowish to grayish brown; thin clay layer (2-3" thick)			7	
	10 18 28		@ 12' -medium dense; moist; yellowish brown	6.0	121		
15	11 10 18		@ 15' -yellowish to grayish brown				
	10 18 40	SP-SC	@ 18' Poorly graded SAND with clay; very dense; moist; light gray to light brown			6	
20							
	40/2"		@ 21' -light yellowish to grayish brown				
25	10 20 20		@ 24' -medium dense; yellowish to medium brown	4.6	144		
	10 15 29	SP	@ 27' Poorly graded SAND; dense; wet; light grayish brown			3	
30	10 70		@ 30' -very dense				
	10 10 16		@ 33' -medium dense				
35							
	10 50/3"		@ 36' -very dense; yellowish brown	7.0	125		

CLIENT: Synergy
PROJECT: Tentative Tract 60258
DRILLING COMPANY: Valley Well Drilling
DRILLING METHOD: Rotary-Wash
HAMMER TYPE: Safety Hammer
DRIVING WEIGHTS: 140 lbs

JOB NO.: 04-803S-4
DATE: 6/11/04
LOGGED BY: KPC
DRILLED: 4/8/04
HOLE DIA: 5 1/4"
AVERAGE DROP (in.): 30"
ELEVATION 1300'

DRILL HOLE LOG

BORING NO. RW-2

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS			
						Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
40	◤	14 50/5"	░		@ 39' -light yellowish to grayish brown			2	
	◤	5 9 12	░		@ 42' -medium dense				
45	◤	13 23 25	░		@ 45' -dense				
	◤	50/5"	░		@ 48' -very dense			5	
50					Total Depth 48' Ground Water @ 27'				
55									
60									
65									
70									
75									

DRILL HOLE LOG

CLIENT: Synergy
JOB NO.: 04-803S-4
PROJECT: Tentative Tract 60258
DATE: 6/11/04
LOGGED BY: KPC
DRILLING COMPANY: Valley Well Drilling
DRILLED: 4/7,8/04
DRILLING METHOD: Rotary-Wash
HOLE DIA: 5 1/4"
HAMMER TYPE: Safety Hammer
AVERAGE DROP (in.): 30"
DRIVING WEIGHTS: 140 lbs
ELEVATION 1310'

BORING NO. RW-3

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS			
						Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
0					**ARTIFICIAL FILL; af (0-14')**				
5		4 7 11		SP-SM	@ 5' Poorly graded SAND with wilt and gravel; medium dense; damp; grayish to medium brown			5	
10		5 9 10			@ 10' -no recovery				
		1 2 3			@ 12.5' -very loose; moist	15.3	100		
				CL	@ 13.5' Lean CLAY; soft; moist; medium to dark brown				
					QUATERNARY ALLUVIUM; Qal (14-30.5')				
15		11 14 21		SP-SM	@ 15' Poorly graded SAND with silt; medium dense; moist; yellowish brown	8.5	125	8	
20		24 29 14		SM	@ 20' Silty SAND with gravel; dense; moist; brown to yellowish brown				
25		12 50/4"			@ 25' -very dense; small cobbles				
30		43		SP	@ 30' Poorly graded SAND; very dense; moist; light gray to light brown @ 30.5 -refusal				
					Total Depth 30.5' Ground Water @ 6'				
35									

CLIENT: Newhall Land
PROJECT: Tentative Tract 53425, River Park
City of Santa Clarita, California
DRILLING COMPANY: Valley Well Drilling
DRILLING METHOD: Rotary Wash
HAMMER TYPE: Downhole
DRIVING WEIGHTS: 140 lbs.
JOB NO.: 03-1571-4
DATE: 4/4/03
LOGGED BY: DGG
DRILLED: 4/17/02
HOLE DIA: (5½" O.D.)
AVERAGE DROP (in.): 30"
ELEVATION 1264

DRILL HOLE LOG

BORING NO. RW-10

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS			
						Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
40	◢	14 12 14							
	◢	16 31 30			@ 42' - very dense				
45	◢	22 30 34			@ 45' - very dense; (with no gravel)				
	◢	12 16 14			@ 48' - medium-dense; (with no gravel)				
50									
	◢	10 14 18			@ 51' - (with no gravel) Total Depth 51 ft. (Elev. 1213) Groundwater @ 34 ft. (Caved) (Elev. 1230)			37	
55									
60									
65									
70									
75									

DRILL HOLE LOG

CLIENT:	Newhall Land	JOB NO.:	03-1571-4
PROJECT:	Tentative Tract 53425, River Park City of Santa Clarita, California	DATE:	4/4/03
		LOGGED BY:	DGG
DRILLING COMPANY:	Valley Well Drilling	DRILLED:	4/17/02
DRILLING METHOD:	Rotary Wash	HOLE DIA:	(5½" O.D.)
HAMMER TYPE:	Downhole	AVERAGE DROP (in.):	30"
DRIVING WEIGHTS:	140 lbs.	ELEVATION	1264

BORING NO. RW-10

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS			
						Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
0			░		**QUATERNARY ALLUVIUM; Qal, (0-51 ft.)**				
	■	6 6 9	░	SM	@ 3' Silty SAND; loose; moist; medium-brown	8.1	117		
5			░						
	■	12 12 12	░		@ 6' - medium-dense	7.2	117	23	
10	■	7 11 15	░		@ 9' - medium-dense; orangish-brown	5.8	122		
	■	14 18 19	░		@ 12' - medium-dense; orangish-brown	6.4	123	17	
15	⧅	7 8 8	░		@ 15' - no recovery				
	◢	8 9 10	▨	SC	@ 18' Clayey SAND; medium-dense; moist; orangish-brown			40	LL= 28 PI= 13
20			▨						
	◢	8 9 12	░	SM	@ 21' Silty SAND; medium-dense; moist; orangish-brown				
25	◢	7 8 12	░					33	
	◢	6 9 15	░						
30	◢	9 10 10	░						
	◢	5 19 19	▨	SM-SC	@ 33' Silty, clayey SAND; dense; moist; orangish- to grayish-brown				
35			▨						
	◢	12 16 18	░	SM	@ 36' Silty SAND with gravel; dense; moist; orangish- to grayish-brown			14	

CLIENT: Synergy
PROJECT: Tentative Tract 60258
DRILLING COMPANY: Valley Well Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: Automatic
DRIVING WEIGHTS: 140 lbs
JOB NO.: 04-803S-4
DATE: 6/11/04
LOGGED BY: KPC
DRILLED: 4/30/04
HOLE DIA: 8" O.D.
AVERAGE DROP (in.): 30
ELEVATION 1375'

DRILL HOLE LOG

BORING NO. HS-1

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS			
						Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
0					**QUATERNARY ALLUVIUM; Qal (0-34')**				
		50			@ 3' -no recovery; boulders				
5									
		21 31 40		SP-SM	@ 6' Poorly graded SAND with silt; very dense; dry; light gray to light brown			11	
		12 15 13			@ 9' -medium dense				
10									
		12 17 14		SM	@ 12' Silty SAND; dense; dry; light gray to light brown			25	
15		16 31 32		SP-SM	@ 15' Poorly graded SAND with silt; dense; slightly damp; yellowish to light grayish brown	1.3	119	6	
20		18 26 26		SM	@ 20' Silty SAND; very dense; damp; yellowish brown			13	
25		25 46 33		SP-SM	@ 25' Poorly graded SAND with silt; very dense; damp; yellowish brown			9	
30		25 40/3"		SM	@ 30' Silty SAND with gravel; very dense; damp; yellowish brown			13	
					@ 34' -refusal				
35					Total Depth 34' No Ground Water				

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

DRILL HOLE LOG

CLIENT: Synergy
PROJECT: Tentative Tract 60258
DRILLING COMPANY: Valley Well Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: Automatic
DRIVING WEIGHTS: 140 lbs
JOB NO.: 04-803S-4
DATE: 6/11/04
LOGGED BY: KPC
DRILLED: 4/30/04
HOLE DIA: 8" O.D.
AVERAGE DROP (in.): 30
ELEVATION 1410'

BORING NO. HS-2

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS			
						Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
0					**QUATERNARY ALLUVIUM; Qal (0-32')**				
		11 17 19		SM	@ 3' Silty SAND; dense; dry; light yellowish to grayish brown			14	Refusal @ 3'
5									
		10 17 24			@ 6' -medium dense; damp	6.3	124	15	
									Refusal @ 7'
		20 23 21			@ 9' -dense; medium brown			28	
10									
		7 17 25						12	
15		9/4"						16	
									Refusal @ 16'
20		23 50			@ 20' -very dense; yellowish brown	3.0	122	26	
25		16 25 25/2"			@ 25' -light yellowish brown			17	
30		30/4"			@ 30' -damp to moist; yellowish to orangish brown			22	
		20/3"							Refusal @ 32'
					Total Depth 32' No Ground Water				
35									

CLIENT: Newhall Land	JOB NO.: 03-1571-4	**DRILL HOLE LOG**	
PROJECT: Tentative Tract 53425, River Park City of Santa Clarita, California	DATE: 4/4/03		
	LOGGED BY: DGG		
DRILLING COMPANY: Valley Well Drilling	DRILLED: 4/12/02	**BORING NO.**	HS-2
DRILLING METHOD: Hollow-Stem-Auger	HOLE DIA: 8"O.D., 4¼ I.D.		
HAMMER TYPE: Downhole	AVERAGE DROP (in.): 30"		
DRIVING WEIGHTS: 140 lbs.	ELEVATION 1272		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS			
						Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
0					**QUATERNARY ALLUVIUM; Qal, (0-30 ft.)**				
	■	10 9 10		SM	@ 2' Silty SAND; medium-dense; damp; medium-brown	1.5	100		
5	■	8 10 13			@ 5' - medium to orangish-brown	4.7	115	12	Consol
	■	15 21 23			@ 8' - moist; medium to orangish-brown	2.9	122		
10									
	■	11 11 15		SP-SM	@ 11' Poorly graded SAND with silt; medium-dense; moist; orangish-brown	2.4	127		
15	◢	9 10 10		SM	@ 15' Silty SAND; medium-dense; moist; orangish-brown				
20	◢	9 10 12							
25	◢	10 10 11			@ 25' - medium to orangish-brown			33	
30	◢	12 14 18			@ 30' - dense				
					Total Depth 30 Ft. (Elev. 1242) No Groundwater				
35									

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

DRILL HOLE LOG

CLIENT: Newhall Land
PROJECT: Tentative Tract 53425, River Park
City of Santa Clarita, California
DRILLING COMPANY: Valley Well Drilling
DRILLING METHOD: Hollow-Stem-Auger
HAMMER TYPE: Downhole
DRIVING WEIGHTS: 140 lbs.

JOB NO.: 03-1571-4
DATE: 4/4/03
LOGGED BY: DGG
DRILLED: 4/12/02
HOLE DIA: 8"O.D., 4¼ I.D.
AVERAGE DROP (in.): 30"
ELEVATION 1284

BORING NO. HS-3

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
0					**QUATERNARY ALLUVIUM; Qal, (0-55 ft.)**				
	■	7 10 16		SM	@ 3' Silty SAND; medium-dense; moist; medium-brown	2.5	121		
5									
	■	19 28 22			@ 6' - light gray to orangish-brown	1.5	124		
10	■	11 16 21		SP-SM	@ 9' Poorly graded SAND with silt; medium-dense; moist; orangish-brown	2.1	123	8	
	■	15 15 17		SM	@ 12' Silty SAND; medium-dense; moist; orangish-brown	1.9	120	14	
15	◣	11 13 18		SP-SM	@ 15' Poorly graded SAND with silt and gravel; dense; moist; orangish-brown			12	
20	◣	10 15 26		SM	@ 20' Silty SAND; dense; moist; pale orangish-brown				
25	◣	11 12 12			@ 25' - medium-dense				
30	◣	15 13 15		SP-SM	@ 30' Poorly graded SAND with silt; medium-dense; pale orangish-brown				
35	◣	12 27 25		SM	@ 35' Silty SAND; dense; moist; pale orangish-brown				

CLIENT: Newhall Land

PROJECT: Tentative Tract 53425, River Park
City of Santa Clarita, California

DRILLING COMPANY: Valley Well Drilling

DRILLING METHOD: Hollow-Stem-Auger

HAMMER TYPE: Downhole

DRIVING WEIGHTS: 140 lbs.

JOB NO.: 03-1571-4

DATE: 4/4/03

LOGGED BY: DGG

DRILLED: 4/12/02

HOLE DIA: 8"O.D., 4¼ I.D.

AVERAGE DROP (in.): 30"

ELEVATION 1284

DRILL HOLE LOG

BORING NO. HS-3

						LABORATORY TESTS			
DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
40	◢	7 12 12			@ 40' - medium-dense				
45	◢	8 9 10			@ 45' - medium-dense; orangish-brown				
					@ 47' - hard drilling (47'-50')				
50	◢	10 9 8		SP-SM	@ 50' Poorly graded SAND with silt; medium-dense; moist; orangish-brown				
55	◢	7 12 13							
					Total Depth 55 Ft. (Elev. 1229) No Groundwater				
60									
65									
70									
75									

DRILL HOLE LOG

CLIENT: Newhall Land
JOB NO.: 03-1571-4
PROJECT: Tentative Tract 53425, River Park
City of Santa Clarita, California
DATE: 4/4/03
LOGGED BY: DGG
DRILLING COMPANY: Valley Well Drilling
DRILLED: 4/12/02
DRILLING METHOD: Hollow-Stem-Auger
HOLE DIA: 8"O.D., 4¼ I.D.
HAMMER TYPE: Downhole
AVERAGE DROP (in.): 30"
DRIVING WEIGHTS: 140 lbs.
ELEVATION 1298

BORING NO. HS-4

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS			
						Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
0					**QUATERNARY ALLUVIUM; Qal, (0-30 ft.)**				
	■	9 10 16		SM	@ 2' Silty SAND; medium-dense; damp; medium to orangish-brown	1.0	100		
5	■	10 12 17			@ 5' - pale orangish-brown	2.8	102	19	Consol
	■	12 18 21			@ 8' - pale orangish-brown	2.3	117		
10									
	■	32 35 38			@ 11' - dense; pale orangish-brown	1.6	127		
15	◣	13 18 15			@ 15' - dense; pale orangish-brown			35	
20	◣	16 16 20		SP-SM	@ 20' Poorly graded SAND with silt and gravel; dense; damp; pale orangish-brown			7	
25	◣	14 19 17		SM	@ 25' Silty SAND; dense; damp; orangish-brown			39	
30	◣	23 28 25		GP-GM	@ 30' Poorly graded GRAVEL with silt and sand; very dense; damp; grayish- to orangish-brown				
					Total Depth 30 feet (Elev. 1268) No Groundwater				
35									

DRILL HOLE LOG

CLIENT: Newhall Land
PROJECT: Tentative Tract 53425, River Park
City of Santa Clarita, California
DRILLING COMPANY: Valley Well Drilling
DRILLING METHOD: Hollow-Stem-Auger
HAMMER TYPE: Downhole
DRIVING WEIGHTS: 140 lbs.
JOB NO.: 03-1571-4
DATE: 4/4/03
LOGGED BY: DGG
DRILLED: 4/12/02
HOLE DIA: 8"O.D., 4¼ I.D.
AVERAGE DROP (in.): 30"
ELEVATION 1311

BORING NO. HS-5

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS			
						Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
0					**QUATERNARY ALLUVIUM; Qal, (0-50 ft.)**				
	■	14 24 26		SM	@ 3' Silty SAND; medium-dense; moist; medium-brown	2.6	126		
5									
	■	19 20 24			@ 6' - orangish- to medium-brown	6.3	109	19	Consol
10	■	9 14 18			@ 9' - orangish- to medium-brown	1.9	115		
	■	12 24 35			@ 12' - dense; orangish- to medium-brown	2.5	124		
15	◣	15 18 20			@ 15' - dense; light gray to pale orangish-brown				
20	◣	11 15 15			@ 20' - light gray to pale orangish-brown				
25	◣	13 16 26			@ 25' - with gravel; dense; light gray to pale orangish-brown				
30	◣	13 17 19			@ 30' - dense; light gray to pale orangish-brown			41	
35	◣	11 10 11			@ 35' - orangish-brown				
					@ 37' - hard drilling				

DRILL HOLE LOG

CLIENT: Newhall Land
PROJECT: Tentative Tract 53425, River Park
City of Santa Clarita, California
DRILLING COMPANY: Valley Well Drilling
DRILLING METHOD: Hollow-Stem-Auger
HAMMER TYPE: Downhole
DRIVING WEIGHTS: 140 lbs.
JOB NO.: 03-1571-4
DATE: 4/4/03
LOGGED BY: DGG
DRILLED: 4/12/02
HOLE DIA: 8"O.D., 4¼ I.D.
AVERAGE DROP (in.): 30"
ELEVATION 1311

BORING NO. HS-5

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS			
						Moisture Content (%)	Dry Density (pcf)	% fines	Other Tests
40	◢	10 10 15	▦		@ 40' - orangish-brown				
45	◢	13 17 20	▨	SP-SM	@ 45' Poorly graded SAND with silt; dense; damp; orangish-brown				
50	◢	25 26 30			@ 50' - with gravel; very dense Total Depth 50 Ft. (Elev. 1261) No Groundwater				
55									
60									
65									
70									
75									

CLIENT: Synergy
PROJECT: Tentative Tract 60258
DRILLING COMPANY: Quality Concrete Construction Company
DRILLING METHOD: Hand Excavated
HAMMER TYPE: N.A.
DRIVING WEIGHTS: N.A.

JOB NO.: 04-803S-4
DATE: 6/11/04
LOGGED BY: VCG
DRILLED: 5/5,6/04
HOLE DIA: 30"
AVERAGE DROP (in.): N.A.
ELEVATION: 1430'

DRILL HOLE LOG

BORING NO. HB-1

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	Description Soils: description; consistency/density; moisture; color; other Bedrock: color, lithology; hardness; moisture; other	Remarks
						**SLOPEWASH; Qsw (0-10')**	
	■			114/1.7		@ 3' Silty SAND with gravel and cobbles; medium dense to dense; moist; tan to light brown; voids	
5							
	■			115/2.2			
	■			105/8.8	SM		@ 9' Consol
10						**BEDROCK; TQs (10-16')** @ 10' Silty SANDSTONE; dense to very dense; moist; light yellowish brown to tan	
	■			118/8.9			
15							
	■			106/8.6		Total Depth 16' No Ground Water No Caving	
20							
25							
30							
35							

KEY TO SYMBOLS

Symbol	Description
UNITED SOIL CLASSIFICATION SYMBOLS	
▦	Poorly graded sand with silt
▥	Silty sand
▨	Clayey sand
□	Blank
▨	Poorly graded sand with clay
░	Poorly graded sand
▨	Lean clay
GROUND WATER DATA	
▼	GROUND WATER AFTER DRILLING
SAMPLE TYPE	
⧅	No Recovery
◩	STANDARD PENETRATION TEST Split barrel sampler in accordance with ASTM D-1558 Standard Test Method
■	CALIFORNIA DRIVE SAMPLE 2.42" I.D. sampler

Notes:

1. These logs are subject to the limitations, conclusions, and recommendations in this report.

2. Results of tests conducted on samples recovered are reported on the logs.

KEY TO SYMBOLS

Symbol	Description
UNITED SOIL CLASSIFICATION SYMBOLS	
▥	Silty sand
▦	Poorly graded sand with silt
▩	Poorly graded gravel with silt
▨	Silty clayey sand
SAMPLE TYPE	
■	CALIFORNIA DRIVE SAMPLE 2.42" I.D. sampler
◪	Dutch cone test
⧅	No Recovery

Notes:

1. These logs are subject to the limitations, conclusions, and recommendations in this report.

2. Results of tests conducted on samples recovered are reported on the logs.

CPT INTERPRETATIONS

SOUNDING : CPT-33
PROJECT : RIVER PARK
DATE/TIME: 03-11-02 13:45

PROJECT No.: 02-1571-4
CONE/RIG : 471/GO-KP/R#4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	.32	3.13	ORGANIC MATERIAL	0	1		.0	
.300	.98	29.15	.03	SILTY SAND to SANDY SILT	10	16	41		47.5
.450	1.48	36.60	.55	SILTY SAND to SANDY SILT	12	20	48		46.5
.600	1.97	27.68	1.23	SANDY SILT to CLAYEY SILT	11	18		2.2	
.750	2.46	29.45	1.22	SILTY SAND to SANDY SILT	10	16	41		43.5
.900	2.95	36.46	1.81	SANDY SILT to CLAYEY SILT	15	23		2.9	
1.050	3.44	44.47	1.57	SILTY SAND to SANDY SILT	15	24	53		44.0
1.200	3.94	36.84	1.06	SILTY SAND to SANDY SILT	12	20	48		42.5
1.350	4.43	27.77	1.33	SANDY SILT to CLAYEY SILT	11	18		2.2	
1.500	4.92	25.52	1.06	SANDY SILT to CLAYEY SILT	10	16		2.0	
1.650	5.41	38.58	1.22	SILTY SAND to SANDY SILT	13	21	49		41.0
1.800	5.91	46.74	2.14	SANDY SILT to CLAYEY SILT	19	30		3.1	
1.950	6.40	90.04	1.61	SILTY SAND to SANDY SILT	30	48	73		44.5
2.100	6.89	98.32	1.27	SAND to SILTY SAND	25	38	76		44.5
2.250	7.38	98.15	1.55	SILTY SAND to SANDY SILT	33	49	76		44.0
2.400	7.87	64.92	1.20	SILTY SAND to SANDY SILT	22	31	64		42.0
2.550	8.37	57.96	.72	SAND to SILTY SAND	14	20	61		41.0
2.700	8.86	54.17	.76	SILTY SAND to SANDY SILT	18	25	58		40.0
2.850	9.35	50.88	1.12	SILTY SAND to SANDY SILT	17	23	56		39.5
3.000	9.84	52.47	1.20	SILTY SAND to SANDY SILT	17	23	56		39.5
3.150	10.33	65.37	2.33	SANDY SILT to CLAYEY SILT	26	33		4.3	
3.300	10.83	44.21	1.95	SANDY SILT to CLAYEY SILT	18	22		2.9	
3.450	11.32	70.15	1.21	SILTY SAND to SANDY SILT	23	28	62		40.0
3.600	11.81	148.86	1.49	SAND to SILTY SAND	37	44	83		44.0
3.750	12.30	130.10	1.11	SAND to SILTY SAND	33	38	79		43.0
3.900	12.80	106.10	1.09	SAND to SILTY SAND	27	30	72		42.0
4.050	13.29	81.24	1.48	SILTY SAND to SANDY SILT	27	30	64		40.0
4.200	13.78	68.90	1.39	SILTY SAND to SANDY SILT	23	25	59		39.0
4.350	14.27	58.61	1.84	SILTY SAND to SANDY SILT	20	21	54		38.5
4.500	14.76	59.42	2.29	SANDY SILT to CLAYEY SILT	24	25		3.9	
4.650	15.26	50.52	2.57	SANDY SILT to CLAYEY SILT	20	21		3.3	
4.800	15.75	44.49	2.58	SANDY SILT to CLAYEY SILT	18	18		2.9	
4.950	16.24	43.66	2.59	SANDY SILT to CLAYEY SILT	17	18		2.8	
5.100	16.73	47.25	2.75	SANDY SILT to CLAYEY SILT	19	19		3.1	
5.250	17.22	31.31	5.49	CLAY	31	31		1.8	
5.400	17.72	51.82	2.72	SANDY SILT to CLAYEY SILT	21	20		3.4	
5.550	18.21	48.88	2.66	SANDY SILT to CLAYEY SILT	20	19		3.2	
5.700	18.70	50.73	2.76	SANDY SILT to CLAYEY SILT	20	19		3.3	
5.850	19.19	52.41	2.86	SANDY SILT to CLAYEY SILT	21	20		3.4	
6.000	19.69	63.80	2.52	SANDY SILT to CLAYEY SILT	26	23		4.2	
6.150	20.18	81.30	1.28	SILTY SAND to SANDY SILT	27	25	58		38.5

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 34.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-33

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	46.89	4.05	CLAYEY SILT to SILTY CLAY	23	21		2.7	
6.450	21.16	54.58	3.76	CLAYEY SILT to SILTY CLAY	27	24		3.1	
6.600	21.65	83.81	2.53	SANDY SILT to CLAYEY SILT	34	29		5.5	
6.750	22.15	93.48	2.48	SILTY SAND to SANDY SILT	31	27	61		38.5
6.900	22.64	87.02	2.21	SILTY SAND to SANDY SILT	29	25	59		38.0
7.050	23.13	75.87	2.62	SANDY SILT to CLAYEY SILT	30	26		5.0	
7.200	23.62	66.54	3.05	SANDY SILT to CLAYEY SILT	27	22		3.8	
7.350	24.11	75.42	2.03	SILTY SAND to SANDY SILT	25	21	54		37.5
7.500	24.61	79.22	2.59	SANDY SILT to CLAYEY SILT	32	26		5.2	
7.650	25.10	130.63	1.34	SAND to SILTY SAND	33	27	69		39.0
7.800	25.59	134.08	1.07	SAND to SILTY SAND	34	27	69		39.5
7.950	26.08	66.11	2.86	SANDY SILT to CLAYEY SILT	26	21		4.3	
8.100	26.57	34.65	5.02	CLAY	35	27		1.9	
8.250	27.07	31.06	5.02	CLAY	31	24		1.7	
8.400	27.56	58.19	3.44	CLAYEY SILT to SILTY CLAY	29	23		3.3	
8.550	28.05	277.52	1.17	SAND	56	43	89		43.0
8.700	28.54	134.52	1.43	SAND to SILTY SAND	34	26	68		39.0
8.850	29.04	77.71	2.03	SILTY SAND to SANDY SILT	26	20	52		37.0
9.000	29.53	107.27	2.07	SILTY SAND to SANDY SILT	36	27	61		38.0
9.150	30.02	60.25	4.25	CLAYEY SILT to SILTY CLAY	30	22		3.4	
9.300	30.51	126.73	1.36	SAND to SILTY SAND	32	23	65		38.5
9.450	31.00	74.40	3.40	SANDY SILT to CLAYEY SILT	30	22		4.3	
9.600	31.50	44.06	1.88	SANDY SILT to CLAYEY SILT	18	13		2.8	
9.750	31.99	39.45	4.03	CLAYEY SILT to SILTY CLAY	20	14		2.2	
9.900	32.48	50.07	3.40	CLAYEY SILT to SILTY CLAY	25	18		2.8	
10.050	32.97	69.28	1.34	SILTY SAND to SANDY SILT	23	16	47		36.0
10.200	33.46	99.85	2.03	SILTY SAND to SANDY SILT	33	23	57		37.5
10.350	33.96	111.26	1.63	SILTY SAND to SANDY SILT	37	26	60		38.0
10.500	34.45	128.38	1.50	SAND to SILTY SAND	32	22	64		38.0
10.650	34.94	96.66	1.50	SILTY SAND to SANDY SILT	32	22	56		37.0
10.800	35.43	85.85	1.82	SILTY SAND to SANDY SILT	29	20	52		36.5
10.950	35.93	104.72	1.86	SILTY SAND to SANDY SILT	35	24	58		37.5
11.100	36.42	140.22	1.47	SAND to SILTY SAND	35	24	66		38.5
11.250	36.91	167.43	1.18	SAND to SILTY SAND	42	29	71		39.0
11.400	37.40	171.32	1.73	SAND to SILTY SAND	43	29	72		39.0
11.550	37.89	144.89	1.07	SAND to SILTY SAND	36	25	67		38.5
11.700	38.39	156.66	1.40	SAND to SILTY SAND	39	27	69		38.5
11.850	38.88	169.75	1.18	SAND to SILTY SAND	42	29	71		39.0
12.000	39.37	148.71	1.38	SAND to SILTY SAND	37	25	67		38.5
12.150	39.86	191.69	1.39	SAND to SILTY SAND	48	32	74		39.0
12.300	40.35	119.01	1.81	SILTY SAND to SANDY SILT	40	27	61		37.5
12.450	40.85	131.14	1.30	SAND to SILTY SAND	33	22	63		38.0
12.600	41.34	93.50	2.87	SANDY SILT to CLAYEY SILT	37	25		5.4	
12.750	41.83	79.35	3.96	CLAYEY SILT to SILTY CLAY	40	26		4.5	
12.900	42.32	192.50	*****		0	0			39.5

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 34.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

CPT INTERPRETATIONS

SOUNDING : CPT-34A
PROJECT : RIVER PARK
DATE/TIME: 03-11-02 12:39

PROJECT No.: 02-1571-4
CONE/RIG : 471/GO-KP/R#4

PAGE 1 of 3

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	13.55	-.07		0	0			
.300	.98	28.17	.04	SILTY SAND to SANDY SILT	9	15	40		47.0
.450	1.48	42.32	.02	SAND to SILTY SAND	11	17	52		47.0
.600	1.97	36.63	.16	SILTY SAND to SANDY SILT	12	20	48		45.5
.750	2.46	22.09	.23	SILTY SAND to SANDY SILT	7	12	33		42.5
.900	2.95	37.39	.94	SILTY SAND to SANDY SILT	12	20	48		44.0
1.050	3.44	46.57	.77	SILTY SAND to SANDY SILT	16	25	54		44.0
1.200	3.94	68.54	.54	SAND to SILTY SAND	17	27	66		45.5
1.350	4.43	77.18	.91	SAND to SILTY SAND	19	31	69		45.5
1.500	4.92	84.04	1.23	SAND to SILTY SAND	21	34	71		45.0
1.650	5.41	96.05	1.74	SILTY SAND to SANDY SILT	32	51	75		45.5
1.800	5.91	95.01	1.43	SILTY SAND to SANDY SILT	32	51	75		45.0
1.950	6.40	107.50	2.47	SILTY SAND to SANDY SILT	36	57	78		45.0
2.100	6.89	81.50	2.05	SILTY SAND to SANDY SILT	27	42	70		43.5
2.250	7.38	89.46	1.89	SILTY SAND to SANDY SILT	30	45	73		44.0
2.400	7.87	106.33	1.34	SAND to SILTY SAND	27	39	78		44.0
2.550	8.37	119.14	1.23	SAND to SILTY SAND	30	42	81		44.5
2.700	8.86	120.22	1.47	SAND to SILTY SAND	30	41	81		44.0
2.850	9.35	114.40	1.42	SAND to SILTY SAND	29	38	79		44.0
3.000	9.84	117.70	1.37	SAND to SILTY SAND	29	38	79		43.5
3.150	10.33	108.43	1.28	SAND to SILTY SAND	27	34	76		43.0
3.300	10.83	127.30	.95	SAND to SILTY SAND	32	39	80		43.5
3.450	11.32	136.86	1.29	SAND to SILTY SAND	34	42	82		44.0
3.600	11.81	156.87	1.26	SAND to SILTY SAND	39	47	85		44.0
3.750	12.30	141.41	1.65	SAND to SILTY SAND	35	41	81		43.5
3.900	12.80	144.78	1.69	SAND to SILTY SAND	36	41	81		43.5
4.050	13.29	172.61	1.32	SAND to SILTY SAND	43	48	86		44.0
4.200	13.78	181.22	1.07	SAND	36	40	87		44.0
4.350	14.27	159.59	1.82	SILTY SAND to SANDY SILT	53	57	83		43.5
4.500	14.76	208.60	1.11	SAND	42	44	90		44.5
4.650	15.26	211.79	1.12	SAND	42	44	90		44.5
4.800	15.75	249.88	1.44	SAND to SILTY SAND	62	64	94		45.0
4.950	16.24	234.12	1.06	SAND	47	47	92		44.5
5.100	16.73	208.16	1.04	SAND	42	42	88		44.0
5.250	17.22	205.44	1.25	SAND to SILTY SAND	51	51	87		43.5
5.400	17.72	245.63	1.18	SAND	49	48	92		44.5
5.550	18.21	238.30	1.38	SAND to SILTY SAND	60	57	91		44.0
5.700	18.70	194.50	.94	SAND	39	37	84		43.0
5.850	19.19	238.77	1.11	SAND	48	45	90		44.0
6.000	19.69	206.67	1.78	SAND to SILTY SAND	52	48	85		43.0
6.150	20.18	216.53	1.79	SAND to SILTY SAND	54	49	86		43.0

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 34.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-34A

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	287.00	1.57	SAND to SILTY SAND	72	64	94		44.5
6.450	21.16	156.85	1.80	SILTY SAND to SANDY SILT	52	46	76		41.5
6.600	21.65	168.20	1.61	SAND to SILTY SAND	42	37	78		42.0
6.750	22.15	220.63	1.47	SAND to SILTY SAND	55	48	86		43.0
6.900	22.64	275.84	1.33	SAND	55	47	92		44.0
7.050	23.13	321.54	1.83	SAND to SILTY SAND	80	68	96		44.5
7.200	23.62	245.10	1.22	SAND	49	41	88		43.0
7.350	24.11	320.48	1.56	SAND to SILTY SAND	80	67	95		44.0
7.500	24.61	283.51	.95	SAND	57	47	91		43.5
7.650	25.10	147.50	1.58	SAND to SILTY SAND	37	30	72		39.5
7.800	25.59	196.73	1.18	SAND to SILTY SAND	49	40	80		42.0
7.950	26.08	240.75	1.25	SAND	48	38	86		42.5
8.100	26.57	235.22	1.93	SAND to SILTY SAND	59	47	85		42.5
8.250	27.07	247.99	1.16	SAND	50	39	86		42.5
8.400	27.56	231.23	1.31	SAND to SILTY SAND	58	45	84		42.0
8.550	28.05	252.69	1.24	SAND	51	39	86		42.5
8.700	28.54	308.11	.99	SAND	62	47	92		43.0
8.850	29.04	295.24	1.19	SAND	59	45	90		43.0
9.000	29.53	327.13	1.13	SAND	65	49	93		43.5
9.150	30.02	361.74	1.26	SAND	72	54	95		44.0
9.300	30.51	245.02	1.04	SAND	49	36	84		42.0
9.450	31.00	316.10	1.02	SAND	63	46	91		43.0
9.600	31.50	313.38	1.25	SAND	63	46	91		43.0
9.750	31.99	377.07	1.29	SAND	75	54	96		43.5
9.900	32.48	398.09	1.32	SAND	80	57	97		44.0
10.050	32.97	368.26	1.29	SAND	74	52	95		43.5
10.200	33.46	315.53	1.14	SAND	63	45	90		42.5
10.350	33.96	312.64	1.46	SAND to SILTY SAND	78	55	89		42.5
10.500	34.45	408.64	1.48	SAND	82	57	97		43.5
10.650	34.94	232.55	.75	SAND	47	32	81		41.0
10.800	35.43	116.46	1.58	SILTY SAND to SANDY SILT	39	27	61		38.0
10.950	35.93	78.20	1.14	SAND to SILTY SAND	20	14	49		36.0
11.100	36.42	79.16	1.69	SILTY SAND to SANDY SILT	26	18	50		36.0
11.250	36.91	124.43	1.46	SAND to SILTY SAND	31	21	62		38.0
11.400	37.40	96.03	1.55	SILTY SAND to SANDY SILT	32	22	55		37.0
11.550	37.89	78.22	1.69	SILTY SAND to SANDY SILT	26	18	49		36.0
11.700	38.39	94.73	1.77	SILTY SAND to SANDY SILT	32	21	54		36.5
11.850	38.88	76.52	1.75	SILTY SAND to SANDY SILT	26	17	48		36.0
12.000	39.37	73.23	2.09	SILTY SAND to SANDY SILT	24	16	47		35.5
12.150	39.86	105.50	2.18	SILTY SAND to SANDY SILT	35	24	57		37.0
12.300	40.35	152.41	1.25	SAND to SILTY SAND	38	26	68		38.5
12.450	40.85	151.54	1.68	SAND to SILTY SAND	38	25	67		38.5
12.600	41.34	95.41	1.40	SILTY SAND to SANDY SILT	32	21	54		36.5
12.750	41.83	98.98	2.51	SILTY SAND to SANDY SILT	33	22	55		36.5
12.900	42.32	202.42	1.19	SAND to SILTY SAND	51	34	75		39.5
13.050	42.81	190.88	1.39	SAND to SILTY SAND	48	32	74		39.0
13.200	43.31	103.21	1.98	SILTY SAND to SANDY SILT	34	23	56		37.0
13.350	43.80	142.66	1.44	SAND to SILTY SAND	36	23	65		38.0
13.500	44.29	122.24	1.46	SAND to SILTY SAND	31	20	61		37.5
13.650	44.78	97.81	2.03	SILTY SAND to SANDY SILT	33	21	54		36.5

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 34.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-34A

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	138.79	1.51	SAND to SILTY SAND	35	23	64		38.0
13.950	45.77	113.77	1.38	SAND to SILTY SAND	28	18	58		37.0
14.100	46.26	77.93	2.18	SILTY SAND to SANDY SILT	26	17	47		35.5
14.250	46.75	72.38	3.79	CLAYEY SILT to SILTY CLAY	36	23		4.1	
14.400	47.24	150.07	1.81	SILTY SAND to SANDY SILT	50	32	66		38.0
14.550	47.74	174.06	1.73	SAND to SILTY SAND	44	28	70		38.5
14.700	48.23	149.56	2.61	SILTY SAND to SANDY SILT	50	32	66		38.0
14.850	48.72	312.53	1.14	SAND	63	40	87		42.0
15.000	49.21	310.79	1.48	SAND to SILTY SAND	78	49	86		41.5
15.150	49.70	297.77	*****		0	0			.0

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*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 34.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

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*                          CPT INTERPRETATIONS                              *
*                                                                           *
*   SOUNDING : CPT-35A                         PROJECT No.: 02-1571-4       *
*   PROJECT  : RIVER PARK                      CONE/RIG : 471/GO-KP/R#4     *
*   DATE/TIME: 03-11-02 15:29                                               *
*                                                                           *
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                                                                PAGE 1 of 2
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DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	21.78	1.93	SANDY SILT to CLAYEY SILT	9	14		1.7	
.300	.98	21.78	1.97	SANDY SILT to CLAYEY SILT	9	14		1.7	
.450	1.48	19.31	1.61	SANDY SILT to CLAYEY SILT	8	12		1.5	
.600	1.97	54.98	.33	SAND to SILTY SAND	14	22	59		47.0
.750	2.46	100.83	1.62	SILTY SAND to SANDY SILT	34	54	77		48.5
.900	2.95	48.03	1.10	SILTY SAND to SANDY SILT	16	26	55		45.0
1.050	3.44	33.65	1.31	SILTY SAND to SANDY SILT	11	18	45		42.5
1.200	3.94	41.89	1.31	SILTY SAND to SANDY SILT	14	22	51		43.0
1.350	4.43	79.18	1.78	SILTY SAND to SANDY SILT	26	42	70		45.5
1.500	4.92	101.19	1.32	SAND to SILTY SAND	25	40	77		46.0
1.650	5.41	95.13	.62	SAND to SILTY SAND	24	38	75		45.5
1.800	5.91	111.49	.90	SAND to SILTY SAND	28	45	79		45.5
1.950	6.40	99.62	1.25	SAND to SILTY SAND	25	40	76		44.5
2.100	6.89	81.54	1.25	SILTY SAND to SANDY SILT	27	42	70		43.5
2.250	7.38	85.55	.88	SAND to SILTY SAND	21	32	72		43.5
2.400	7.87	103.93	1.50	SILTY SAND to SANDY SILT	35	50	77		44.0
2.550	8.37	118.21	1.07	SAND to SILTY SAND	30	42	81		44.5
2.700	8.86	76.23	.72	SAND to SILTY SAND	19	26	68		42.0
2.850	9.35	85.72	1.61	SILTY SAND to SANDY SILT	29	38	71		42.5
3.000	9.84	69.22	.95	SAND to SILTY SAND	17	23	64		41.0
3.150	10.33	97.34	.38	SAND to SILTY SAND	24	31	73		42.5
3.300	10.83	92.95	1.44	SILTY SAND to SANDY SILT	31	38	71		42.0
3.450	11.32	92.92	1.28	SAND to SILTY SAND	23	28	70		42.0
3.600	11.81	95.92	1.63	SILTY SAND to SANDY SILT	32	38	71		42.0
3.750	12.30	92.46	1.02	SAND to SILTY SAND	23	27	69		41.5
3.900	12.80	166.30	2.72	SILTY SAND to SANDY SILT	55	63	85		44.0
4.050	13.29	120.86	1.16	SAND to SILTY SAND	30	34	76		42.5
4.200	13.78	133.14	1.37	SAND to SILTY SAND	33	37	78		42.5
4.350	14.27	134.76	1.28	SAND to SILTY SAND	34	36	78		42.5
4.500	14.76	135.58	1.56	SAND to SILTY SAND	34	36	77		42.5
4.650	15.26	147.27	1.53	SAND to SILTY SAND	37	38	79		42.5
4.800	15.75	129.53	1.37	SAND to SILTY SAND	32	33	75		42.0
4.950	16.24	187.04	1.19	SAND to SILTY SAND	47	47	85		43.5
5.100	16.73	218.74	1.03	SAND	44	44	89		44.0
5.250	17.22	141.79	1.82	SILTY SAND to SANDY SILT	47	46	77		42.0
5.400	17.72	158.44	1.59	SAND to SILTY SAND	40	38	79		42.5
5.550	18.21	155.34	1.13	SAND to SILTY SAND	39	37	78		42.0
5.700	18.70	159.46	1.14	SAND to SILTY SAND	40	38	79		42.0
5.850	19.19	176.78	1.02	SAND	35	33	81		42.5
6.000	19.69	170.64	1.22	SAND to SILTY SAND	43	39	80		42.0
6.150	20.18	161.29	1.05	SAND to SILTY SAND	40	37	78		42.0

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 55.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-35A

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	143.47	1.32	SAND to SILTY SAND	36	32	74		41.0
6.450	21.16	130.44	2.32	SILTY SAND to SANDY SILT	43	39	71		40.0
6.600	21.65	143.81	1.28	SAND to SILTY SAND	36	32	74		40.5
6.750	22.15	173.23	1.06	SAND to SILTY SAND	43	38	79		42.0
6.900	22.64	226.45	1.57	SAND to SILTY SAND	57	49	86		43.0
7.050	23.13	243.34	1.10	SAND	49	41	88		43.0
7.200	23.62	210.68	.54	SAND	42	35	83		42.5

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*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 55.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

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*                      CPT INTERPRETATIONS                          *
*                                                                   *
*  SOUNDING : CPT-36                    PROJECT No.: 02-1571-4      *
*  PROJECT  : RIVER PARK                CONE/RIG : 471/GO-KP/R#4    *
*  DATE/TIME: 03-12-02 11:26                                        *
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PAGE 1 of 2

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	7.33	.82	SENSITIVE FINE GRAINED	4	6		.7	
.300	.98	28.09	.99	SILTY SAND to SANDY SILT	9	15	40		47.0
.450	1.48	54.41	1.02	SILTY SAND to SANDY SILT	18	29	59		48.0
.600	1.97	49.84	.79	SILTY SAND to SANDY SILT	17	27	56		46.5
.750	2.46	66.96	1.94	SILTY SAND to SANDY SILT	22	36	65		47.0
.900	2.95	76.84	1.51	SILTY SAND to SANDY SILT	26	41	69		46.5
1.050	3.44	123.50	.68	SAND	25	40	82		48.0
1.200	3.94	116.80	.99	SAND to SILTY SAND	29	47	81		47.5
1.350	4.43	113.13	1.90	SILTY SAND to SANDY SILT	38	60	80		46.5
1.500	4.92	109.22	.68	SAND to SILTY SAND	27	44	79		46.0
1.650	5.41	101.95	.73	SAND to SILTY SAND	25	41	77		45.5
1.800	5.91	130.61	.87	SAND to SILTY SAND	33	52	84		46.0
1.950	6.40	187.34	2.66	SILTY SAND to SANDY SILT	62	100	94		47.0
2.100	6.89	289.80	1.84	SAND to SILTY SAND	72	100	100		48.5
2.250	7.38	209.11	1.37	SAND to SILTY SAND	52	79	97		47.0
2.400	7.87	159.40	1.80	SAND to SILTY SAND	40	58	90		46.0
2.550	8.37	168.43	.80	SAND	34	48	91		46.0
2.700	8.86	138.88	.97	SAND to SILTY SAND	35	48	85		45.0
2.850	9.35	147.29	.85	SAND	29	39	86		45.0
3.000	9.84	154.87	.90	SAND	31	40	87		45.0
3.150	10.33	227.91	.95	SAND	46	58	97		46.0
3.300	10.83	190.50	.94	SAND	38	47	92		45.5
3.450	11.32	261.35	.59	SAND	52	63	100		46.5
3.600	11.81	264.90	.76	SAND	53	63	100		46.0
3.750	12.30	196.77	.84	SAND	39	46	91		45.0
3.900	12.80	160.76	.87	SAND	32	37	84		44.0
4.050	13.29	132.06	1.03	SAND to SILTY SAND	33	37	78		43.0
4.200	13.78	222.09	1.31	SAND to SILTY SAND	56	61	93		45.0
4.350	14.27	233.48	1.09	SAND	47	50	93		45.0
4.500	14.76	272.80	1.01	SAND	55	58	97		45.5
4.650	15.26	298.96	.95	SAND	60	62	100		46.0
4.800	15.75	210.47	1.91	SAND to SILTY SAND	53	54	89		44.0
4.950	16.24	219.23	2.09	SILTY SAND to SANDY SILT	73	74	90		44.0
5.100	16.73	211.64	2.49	SILTY SAND to SANDY SILT	71	70	88		44.0
5.250	17.22	176.86	1.94	SILTY SAND to SANDY SILT	59	58	83		43.0
5.400	17.72	149.67	1.41	SAND to SILTY SAND	37	36	78		42.0
5.550	18.21	153.43	2.66	SILTY SAND to SANDY SILT	51	49	78		42.0
5.700	18.70	119.27	2.88	SANDY SILT to CLAYEY SILT	48	45		6.9	
5.850	19.19	142.06	2.04	SILTY SAND to SANDY SILT	47	44	75		41.5
6.000	19.69	173.17	1.87	SAND to SILTY SAND	43	40	80		42.5
6.150	20.18	250.82	1.22	SAND	50	46	91		44.0

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 36.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-36

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	250.56	1.07	SAND	50	45	90		44.0
6.450	21.16	257.40	1.13	SAND	51	46	91		44.0
6.600	21.65	193.75	1.23	SAND to SILTY SAND	48	42	82		42.5
6.750	22.15	172.51	1.28	SAND to SILTY SAND	43	37	79		42.0
6.900	22.64	156.98	1.02	SAND to SILTY SAND	39	34	76		41.0
7.050	23.13	122.03	1.74	SILTY SAND to SANDY SILT	41	35	68		39.5
7.200	23.62	147.61	2.30	SILTY SAND to SANDY SILT	49	41	73		40.0
7.350	24.11	219.63	2.23	SILTY SAND to SANDY SILT	73	61	84		42.5

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*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 36.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

CPT INTERPRETATIONS

SOUNDING : CPT-37
PROJECT : RIVER PARK
DATE/TIME: 03-12-02 12:45

PROJECT No.: 02-1571-4
CONE/RIG : 471/GO-KP/R#4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	11.71	.77	SANDY SILT to CLAYEY SILT	5	7		1.2	
.300	.98	62.46	1.10	SILTY SAND to SANDY SILT	21	33	63		
.450	1.48	97.36	1.11	SAND to SILTY SAND	24	39	76		
.600	1.97	109.26	1.29	SAND to SILTY SAND	27	44	79		
.750	2.46	88.82	1.54	SILTY SAND to SANDY SILT	30	47	73		48.0
.900	2.95	90.57	1.55	SILTY SAND to SANDY SILT	30	48	73		47.5
1.050	3.44	96.24	1.47	SILTY SAND to SANDY SILT	32	51	75		47.0
1.200	3.94	113.55	2.15	SILTY SAND to SANDY SILT	38	61	80		47.0
1.350	4.43	177.20	2.84	SILTY SAND to SANDY SILT	59	94	93		48.5
1.500	4.92	155.98	1.02	SAND to SILTY SAND	39	62	89		47.5
1.650	5.41	165.37	1.83	SAND to SILTY SAND	41	66	91		47.5
1.800	5.91	154.83	1.49	SAND to SILTY SAND	39	62	89		47.0
1.950	6.40	164.56	2.85	SILTY SAND to SANDY SILT	55	88	91		46.5
2.100	6.89	156.19	1.04	SAND to SILTY SAND	39	61	89		46.5
2.250	7.38	170.11	.71	SAND	34	51	92		46.5
2.400	7.87	214.04	.95	SAND	43	62	98		47.0
2.550	8.37	183.26	.91	SAND	37	52	94		46.0
2.700	8.86	149.33	.74	SAND	30	41	88		45.0
2.850	9.35	130.59	.69	SAND	26	35	83		44.5
3.000	9.84	114.96	.77	SAND to SILTY SAND	29	37	79		43.5
3.150	10.33	121.58	2.17	SILTY SAND to SANDY SILT	41	51	79		43.5
3.300	10.83	143.74	1.79	SILTY SAND to SANDY SILT	48	59	84		44.0
3.450	11.32	146.42	1.50	SAND to SILTY SAND	37	44	83		44.0
3.600	11.81	245.08	.55	SAND	49	58	98		46.0
3.750	12.30	313.59	.87	SAND	63	73	100		46.5
3.900	12.80	145.55	1.68	SAND to SILTY SAND	36	42	82		43.5
4.050	13.29	135.41	1.45	SAND to SILTY SAND	34	38	79		43.0
4.200	13.78	139.79	.63	SAND	28	31	79		43.0
4.350	14.27	139.75	1.17	SAND to SILTY SAND	35	38	79		43.0
4.500	14.76	151.39	1.06	SAND to SILTY SAND	38	40	81		43.0
4.650	15.26	289.55	2.21	SILTY SAND to SANDY SILT	97	100	99		45.5
4.800	15.75	253.30	1.11	SAND	51	52	94		45.0
4.950	16.24	241.30	.78	SAND	48	49	93		44.5
5.100	16.73	258.25	2.74	SILTY SAND to SANDY SILT	86	86	94		44.5
5.250	17.22	205.82	1.19	SAND to SILTY SAND	51	51	87		43.5
5.400	17.72	223.64	1.12	SAND	45	43	89		44.0
5.550	18.21	166.33	1.34	SAND to SILTY SAND	42	40	80		42.5
5.700	18.70	150.77	1.61	SAND to SILTY SAND	38	36	77		42.0
5.850	19.19	143.23	2.28	SILTY SAND to SANDY SILT	48	44	75		41.5
6.000	19.69	106.71	2.45	SILTY SAND to SANDY SILT	36	33	66		39.5
6.150	20.18	119.78	1.91	SILTY SAND to SANDY SILT	40	36	69		40.0

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 37.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-37

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	196.20	2.56	SILTY SAND to SANDY SILT	65	59	83		42.5
6.450	21.16	201.34	1.64	SAND to SILTY SAND	50	45	84		42.5
6.600	21.65	177.20	1.27	SAND to SILTY SAND	44	39	80		42.0
6.750	22.15	152.96	1.24	SAND to SILTY SAND	38	33	75		41.0
6.900	22.64	188.53	1.47	SAND to SILTY SAND	47	40	81		42.0
7.050	23.13	181.92	1.30	SAND to SILTY SAND	45	39	79		42.0
7.200	23.62	187.83	1.28	SAND to SILTY SAND	47	39	80		42.0
7.350	24.11	202.23	1.27	SAND to SILTY SAND	51	42	82		42.0
7.500	24.61	179.35	1.05	SAND	36	30	78		41.5
7.650	25.10	96.56	1.47	SILTY SAND to SANDY SILT	32	26	60		38.0
7.800	25.59	64.75	2.30	SANDY SILT to CLAYEY SILT	26	21		4.2	
7.950	26.08	87.57	1.35	SILTY SAND to SANDY SILT	29	23	57		38.0
8.100	26.57	99.68	1.62	SILTY SAND to SANDY SILT	33	26	60		38.0
8.250	27.07	94.14	1.33	SAND to SILTY SAND	24	18	58		38.0
8.400	27.56	143.61	1.81	SILTY SAND to SANDY SILT	48	37	70		39.0
8.550	28.05	95.64	1.40	SILTY SAND to SANDY SILT	32	25	58		38.0
8.700	28.54	196.30	1.15	SAND	39	30	79		41.0
8.850	29.04	284.02	1.14	SAND	57	43	89		43.0
9.000	29.53	303.35	2.22	SAND to SILTY SAND	76	57	91		43.0
9.150	30.02	462.22	1.91	SAND to SILTY SAND	100	86	100		44.5
9.300	30.51	393.20	1.69	SAND to SILTY SAND	98	73	98		44.0
9.450	31.00	424.92	1.21	SAND	85	62	100		44.0
9.600	31.50	342.62	1.12	SAND	69	50	93		43.0
9.750	31.99	339.22	2.41	SILTY SAND to SANDY SILT	100	82	93		43.0
9.900	32.48	291.90	1.31	SAND	58	42	88		42.5
10.050	32.97	338.30	1.09	SAND	68	48	92		43.0
10.200	33.46	329.44	1.09	SAND	66	46	91		43.0
10.350	33.96	286.68	1.05	SAND	57	40	87		42.0
10.500	34.45	272.74	1.08	SAND	55	38	85		42.0
10.650	34.94	252.39	1.20	SAND	50	35	83		41.5
10.800	35.43	289.12	1.37	SAND	58	40	87		42.0
10.950	35.93	368.85	1.33	SAND	74	50	93		43.0
11.100	36.42	356.17	1.45	SAND	71	48	92		43.0
11.250	36.91	364.14	1.37	SAND	73	49	93		43.0
11.400	37.40	304.80	1.25	SAND	61	41	87		42.0
11.550	37.89	299.91	1.31	SAND	60	40	87		42.0
11.700	38.39	300.83	1.03	SAND	60	40	87		42.0
11.850	38.88	370.85	1.35	SAND	74	49	93		43.0
12.000	39.37	383.24	1.19	SAND	77	51	94		43.0
12.150	39.86	341.91	1.44	SAND	68	45	90		42.5
12.300	40.35	373.08	1.42	SAND	75	49	93		42.5
12.450	40.85	275.80	1.58	SAND to SILTY SAND	69	45	84		41.0
12.600	41.34	316.40	1.58	SAND to SILTY SAND	79	52	88		42.0
12.750	41.83	375.46	1.15	SAND	75	49	93		42.5

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 37.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

Appendix B

APPENDIX B

GEOTECHNICAL LABORATORY INVESTIGATION

1. General

a. The purpose of the laboratory investigation was to evaluate the geotechnical engineering characteristics of the various materials encountered during the field investigation. The investigation program was carried out employing, wherever practical, currently accepted test procedures of the American Society of Testing and Materials (ASTM) and California Test Standards.

b. Relatively undisturbed ring samples and bag samples were obtained during the course of the field investigation. Laboratory sample identification is by project name and number, drill hole number or trench number and depth.

c. Geotechnical laboratory testing is classified in two major subgroups:

- Index Properties Tests, and
- Geotechnical Engineering Properties Tests

d. We also performed soluble chloride and sulfate contents, resistivity and pH tests to evaluate the corrosivity potential of onsite soils and bedrock.

2. Index Properties Tests

The following Index Properties test were performed on native soils collected during the field exploration.

TEST TYPE	NO. OF TESTS PERFORMED	TESTING STANDARD
Moisture Content & Unit Weight	50	ASTM D 2216 and 2937
Percent-Finer Than #200 Sieve	29	ASTM D 1140
Particle-size Analysis	1	ASTM D 422

The purpose of each test is briefly described below.

a. The in-situ water content and dry unit weight of native soils provided an indication of their strength before additional testing was performed. These data, in conjunction with field blow count data, served in the selection of samples for additional testing. Test results are presented on the Drill Hole Logs within **Appendix A**.

APPENDIX B

b. Minus No. 200 wash-sieve analyses were performed on selected samples to evaluate only the percentage of fine particles smaller than 75 microns within the soil. These tests were conducted to aid in classifying the soils in accordance with the Unified Soil Classification System (USCS). Test results are presented on the Drill Hole Logs within **Appendix A**, and in other test reports within **this Appendix**.

c. A complete mechanical particle-size analyses of soil fractions larger than 75 microns (No. 200 sieve) was conducted to aid in classifying the soils in accordance with the Unified Soil Classification System (USCS). Test results are presented on **Figure B1.1** within **this Appendix**.

d. Soluble sulfates and chloride contents, resistivity and pH tests were conducted to access the potential corrosive effects of soils on concrete, ferrous and non-ferrous metals. Test results are presented in **Table B1** within **this Appendix**.

TEST TYPE	NO. OF TESTS PERFORMED	TESTING STANDARD
Sulfate-Content	2	Caltrans Test 417
Chloride-Content	1	Caltrans Test 422
Resistivity	2	Caltrans Test 643
pH	1	LaMotte

3. Geotechnical Engineering Properties Tests

The following Geotechnical Engineering Property Tests were performed on bulk samples or relatively undisturbed ring samples, as applicable, collected at this site.

TEST TYPE	NO. OF TESTS PERFORMED	TESTING STANDARD
Compaction (Modified Proctor)	2	ASTM D 1557
Consolidation	2	ASTM D 2435
Direct Shear	5	ASTM D 3080

The purpose of each test is briefly described below.

a. Compaction (Modified Proctor) tests were performed on selected samples to assess the moisture-density relationship of materials that may be used for recompaction at removal areas. Test results are presented on **Figures B2.1 and B2.2** within **this Appendix.**

APPENDIX B

b. Direct shear tests were performed on relatively undisturbed or remolded test specimens using a displacement-controlled direct shear machine. Samples were tested at normal pressures ranging from approximately 1000 psf to 10,000 psf in order to define both the peak and residual shear strength parameters. Each sample was consolidated under the normal load at saturated conditions and then sheared horizontally at a controlled displacement rate until a residual strength was attained. For remolded specimens, passing no. 4 sieve material was used. Test results are plotted on **Figures B3.1 through B3.5** within **this Appendix**.

c. One-dimensional consolidation tests were performed on selected ring samples to assess the soils compressibility characteristics by subjecting the specimens to loads ranging from 120 psf to 8,000 psf, and with the addition of water at loads near the overburden pressure. Tests results are plotted on **Figures B4.1 and B4.2** within **this Appendix.**

The following attachments completed this Appendix

LABORATORY TEST RESULTS

• Corrosion Test Results on Soil Samples	Table B1
• Summary of Shear Strength Test Data	Table B2
• Particle Size Distribution Test Report	Figure B1
• Compaction Test Reports	Figures B2.1 and B2.2
• Direct Shear Test Results	Figures B3.1 thru B3.5
• Consolidation Test Reports	Figures B4.1 and B4.2

APPENDIX B

CORROSION TEST RESULTS ON SOIL SAMPLES

Sample Location	B-15 @ 0-15'	B-16 @ 0-4'
Bedrock or Soil Type (USCS)	SM	SM

Resistivity (Ω · cm)	1760	3069
Corrosivity Potential[1]	Corrosive	Moderately Corrosive

Chemical Analyses

pH	-	7.2
Chloride Cl (ppm)	-	27
Sulfate SO_4 (%)	0.008	ND
Concrete exposure to sulfate[2]	Negligible	Negligible

ND = not detected

---

[1] Per County of Los Angeles Classification

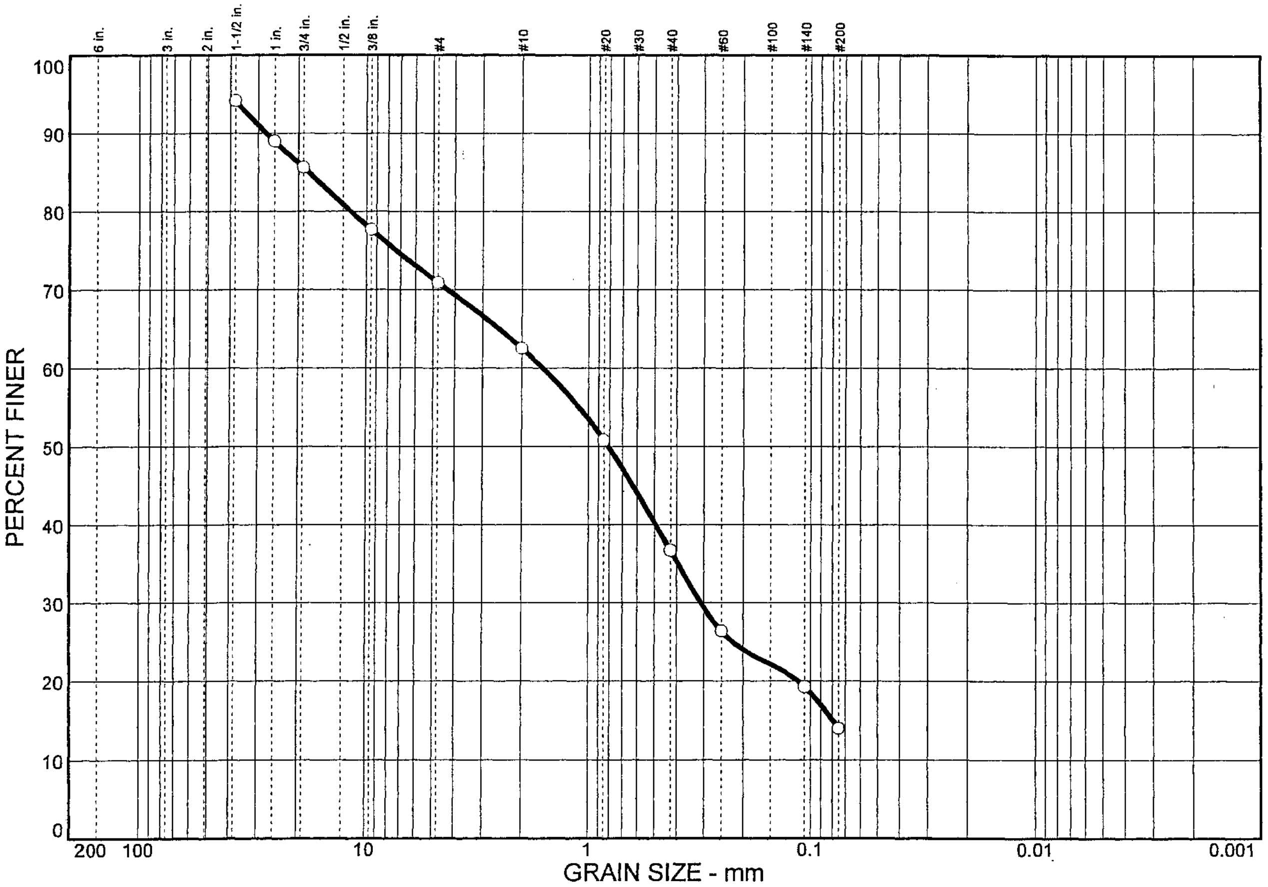
[2] Per 1997 UBC - Table 19-A-4

APPENDIX B

SUMMARY OF SHEAR STRENGTH TEST DATA

MATERIAL	BORING OR TEST PIT NO.	FIG. NO.	PEAK		RESIDUAL		UNIT WT. (PCF)
			COHESION (psf)	PHI ϕ	COHESION (psf)	PHI ϕ	
Terrace Deposits (Qt)	B-15 @ 15, 30, & 50′	B3.1	802	41.2	439	38.2	127
	B-16 @ 5, 15, & 30′	B3.2	1321	38.3	1093	34.1	125
Bedrock (TQs) Cross-Bedding	B-17 @ 60′	B3.3	1740	33.6	794	32.1	126
Quaternary Alluvium (Qal)	RW-2 @ 25′	B3.4	866	34.9	404	33.7	125
Compacted Fill (Cef)	T-56 @ 5-7′	B3.5	660	37.6	314	30.6	125

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○			14.8	8.4	25.8	22.7	14.0	

SOIL DATA

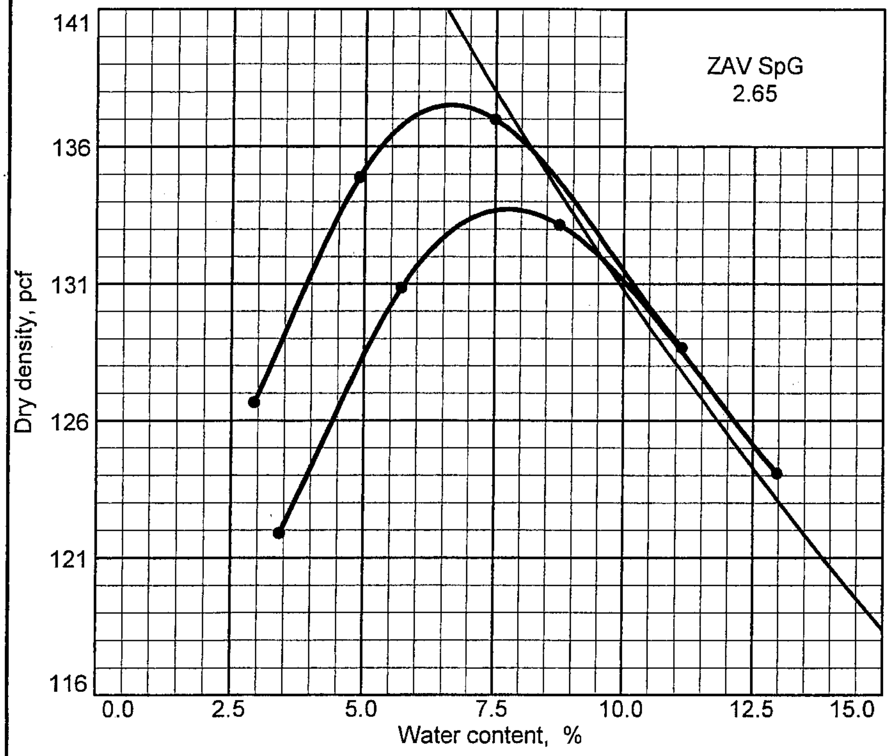
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	T-56		5-7	Dark brown silty sand with gravel	SM

PARTICLE SIZE DISTRIBUTION TEST REPORT

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.

Client: Synergy
Project: Tentative Tract 60258
Project No.: 04-803S-4 **Figure** B1

COMPACTION TEST REPORT



Curve No.
A

Test Specification:
ASTM D 1557-00 Method C Modified
Oversize correction applied to each point

Hammer Wt.: 10 lb.
Hammer Drop: 18 in.
Number of Layers: five
Blows per Layer: 56
Mold Size: .075 cu.ft.

Test Performed on Material Passing 3/4 in. **Sieve**

Soil Data

NM ______ **Sp.G.** 2.65
LL ______ **PI** ______
%>3/4 in. 14.3 **%<#200** 14.0
USCS SM **AASHTO** ______

TESTING DATA

	1	2	3	4	5	6
WM + WS	15.76	16.68	17.17	16.82		
WM	6.31	6.31	6.31	6.31		
WW + T #1	536.06	557.30	576.96	655.87		
WD + T #1	519.43	528.95	533.30	584.27		
TARE #1	32.34	31.77	33.91	31.96		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	2.9	4.9	7.5	11.1		
DRY DENSITY	126.7	134.9	137.0	128.7		

ROCK CORRECTED TEST RESULTS

Maximum dry density = 137.5 pcf

Optimum moisture = 6.5 %

Material Description

Dark brown silty sand with gravel

Project No. 04-803S-4 **Client:** Synergy
Project: Tentative Tract 60258

● **Source:** T-56 **Elev./Depth:** 5-7

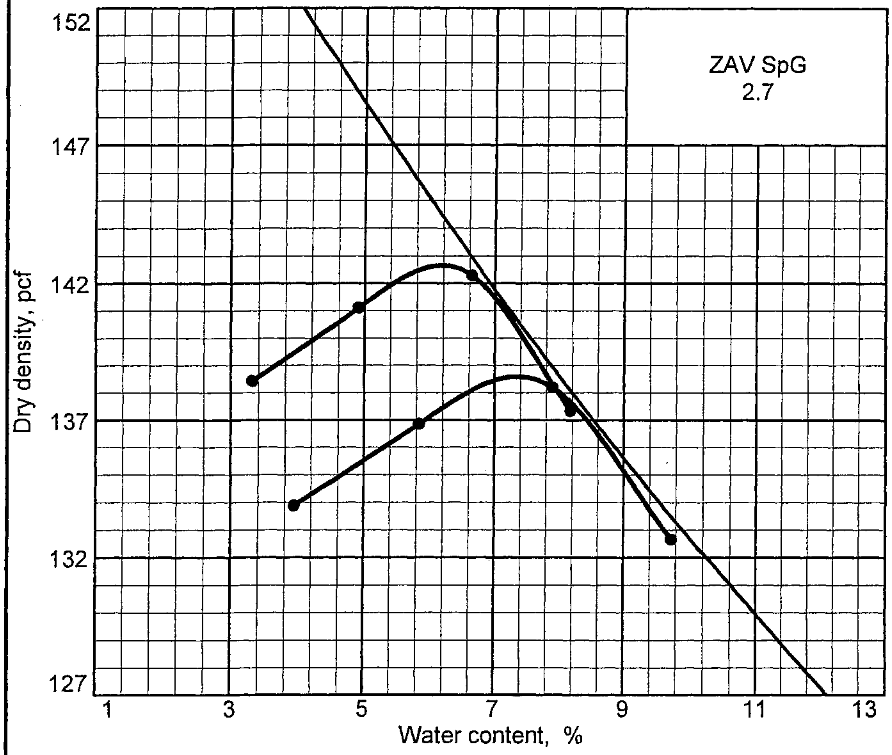
Remarks:

COMPACTION TEST REPORT

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

Figure B2.1

COMPACTION TEST REPORT



Curve No.

Test Specification:
ASTM D 1557-00 Method B Modified
Oversize correction applied to each point

Hammer Wt.: 10 lb.
Hammer Drop: 18 in.
Number of Layers: five
Blows per Layer: 25
Mold Size: .03333 cu.ft.
Test Performed on Material Passing 3/8 in. **Sieve**

Soil Data

NM ____ **Sp.G.** 2.7
LL ____ **PI** ____
%>3/8 in. 16.0 **%<#200** 11.9
USCS SM **AASHTO** ____

TESTING DATA

	1	2	3	4	5	6
WM + WS	9.09	9.28	9.42	9.30		
WM	4.45	4.45	4.45	4.45		
WW + T #1	411.65	432.99	471.01	492.36		
WD + T #1	397.16	410.87	438.85	451.51		
TARE #1	29.33	32.13	31.69	31.87		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	3.3	4.9	6.6	8.2		
DRY DENSITY	138.4	141.1	142.3	137.3		

ROCK CORRECTED TEST RESULTS	Material Description
Maximum dry density = 142.5 pcf Optimum moisture = 6 %	Yellowish brown silty sand

Project No. 04-803S-4 **Client:** Synergy
Project: Tentative Tract 60258

● **Source:** B-15 **Elev./Depth:** 0-15

Remarks:

COMPACTION TEST REPORT

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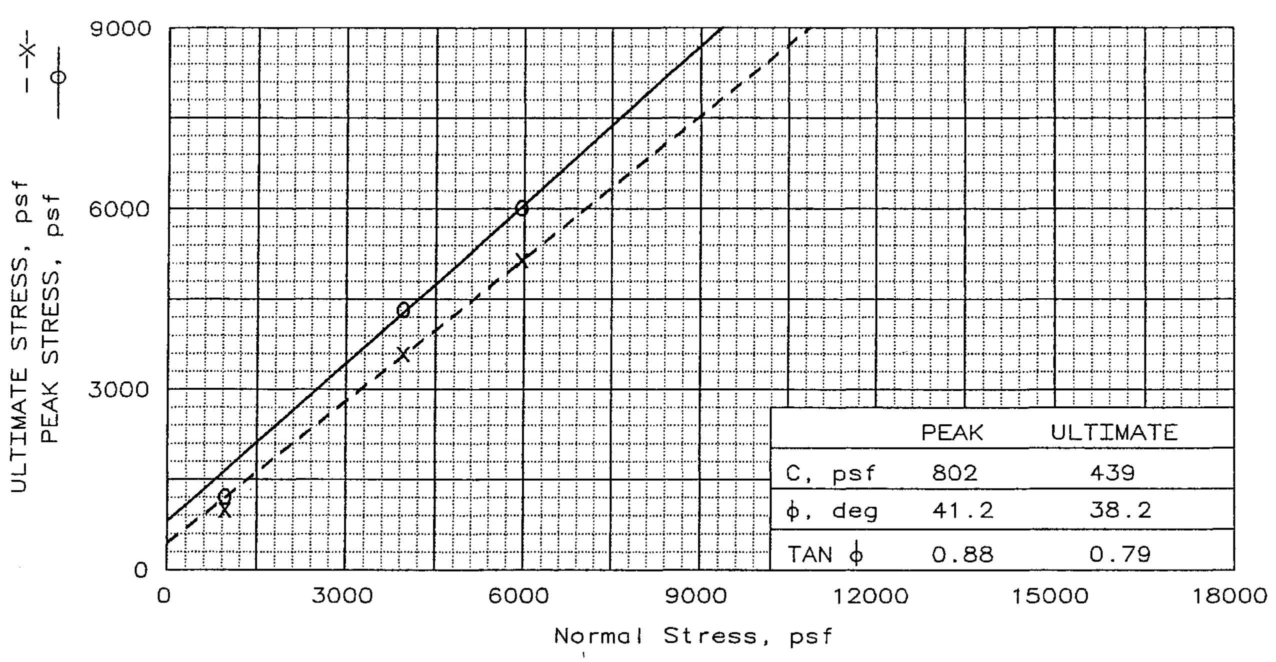
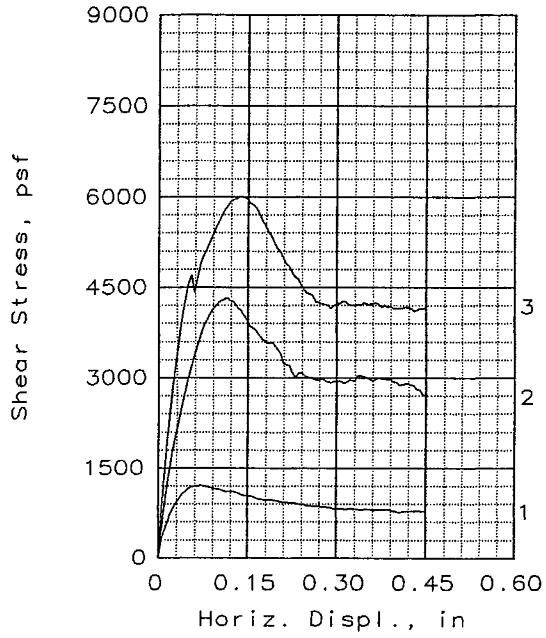
Figure B2.2



	PEAK	ULTIMATE
C, psf	802	439
ϕ, deg	41.2	38.2
TAN ϕ	0.88	0.79



	Sample No.:	1	2	3
INITIAL	WATER CONTENT, %	5.5	3.5	4.4
	DRY DENSITY, pcf	113.2	115.4	110.8
	SATURATION, %	31.7	21.1	23.8
	VOID RATIO	0.461	0.434	0.493
	DIAMETER, in	2.42	2.42	2.42
	HEIGHT, in	1.00	1.00	1.00
AT TEST	WATER CONTENT, %	16.5	13.6	17.2
	DRY DENSITY, pcf	115.2	121.6	113.6
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.437	0.360	0.456
	DIAMETER, in	2.42	2.42	2.42
	HEIGHT, in	0.98	0.95	0.98
	NORMAL STRESS, psf	1000	4000	6000
	PEAK STRESS, psf	1212	4320	6011
	DISPLACEMENT, in	0.07	0.12	0.14
	ULTIMATE STRESS, psf	996	3588	5148
	DISPLACEMENT, in	0.17	0.19	0.20
	Strain rate, in/min	0.0100	0.0100	0.0100

SAMPLE TYPE: Undisturbed
DESCRIPTION: Poorly graded SAND
(SP)

SPECIFIC GRAVITY= 2.65
REMARKS: Terrace Deposits (Qt)

Fig. No.: B3.1

CLIENT: Synergy

PROJECT: Tentative Tract 60258

SAMPLE LOCATION: B-15 @ 15, 30, & 50 ft

PROJ. NO.: 04-803S-4 DATE: 6/11/04

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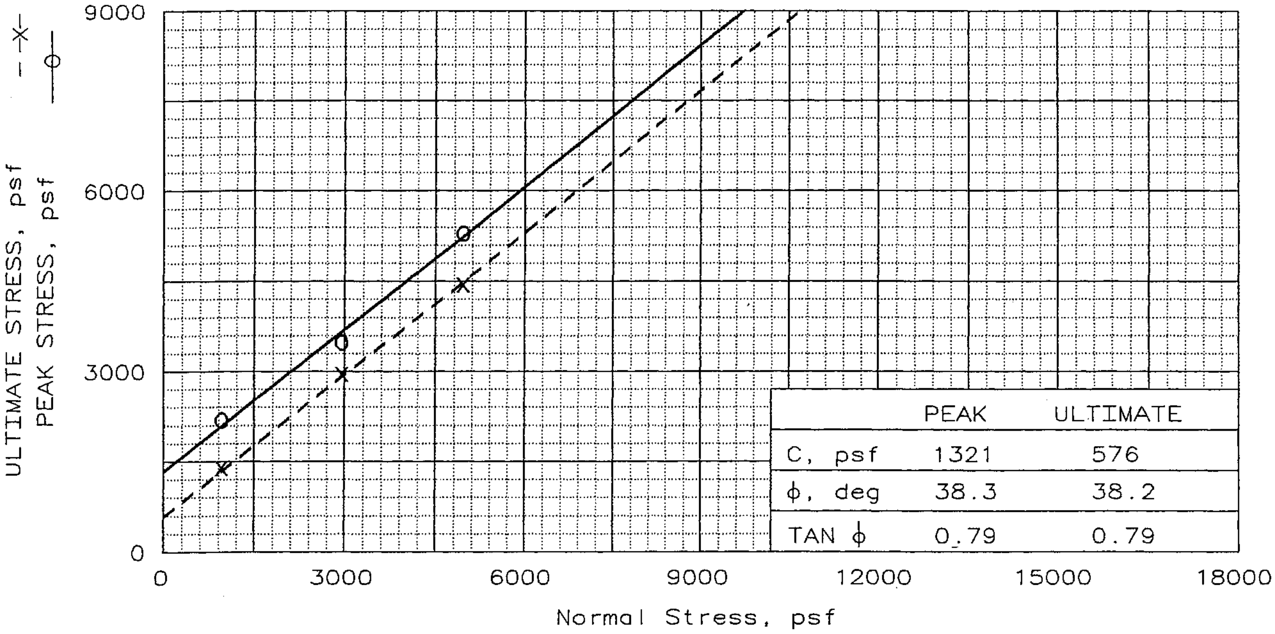
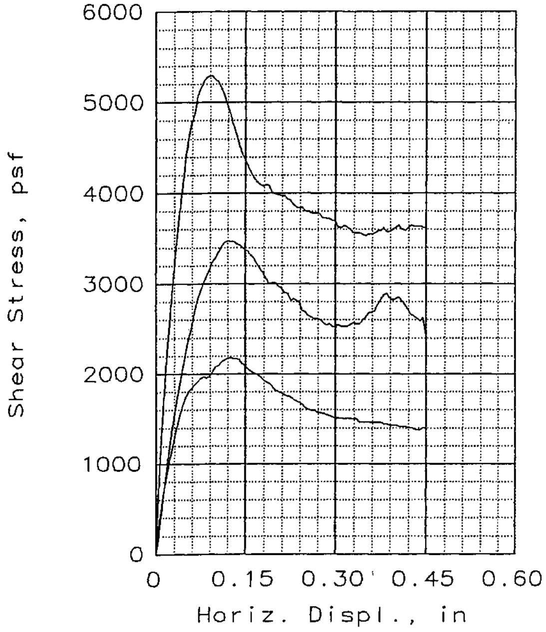


	PEAK	ULTIMATE
C, psf	1321	576
ϕ, deg	38.3	38.2
TAN ϕ	0.79	0.79



	SAMPLE NO.:	1	2	3
INITIAL	WATER CONTENT, %	2.8	5.4	2.8
	DRY DENSITY, pcf	148.5	110.4	130.3
	SATURATION, %	64.3	28.5	27.7
	VOID RATIO	0.114	0.499	0.269
	DIAMETER, in	2.42	2.42	2.42
	HEIGHT, in	1.00	1.00	1.00
AT TEST	WATER CONTENT, %	4.2	15.8	11.7
	DRY DENSITY, pcf	148.9	116.6	126.2
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.111	0.419	0.311
	DIAMETER, in	2.42	2.42	2.42
	HEIGHT, in	1.00	0.95	1.03
	NORMAL STRESS, psf	1000	3000	5000
	PEAK STRESS, psf	2184	3480	5292
	DISPLACEMENT, in	0.13	0.12	0.09
	ULTIMATE STRESS, psf	1392	2952	4440
	DISPLACEMENT, in	0.45	0.21	0.15
	Strain rate, %/min	0.01	0.01	0.01

SAMPLE TYPE: Undisturbed

DESCRIPTION: Poorly graded SAND (SP)

SPECIFIC GRAVITY= 2.65

REMARKS: Terrace Deposits (Qt)

Fig. No.: B3.2

CLIENT: Synergy

PROJECT: Tentative Tract 60258

SAMPLE LOCATION: B-16 @ 5, 15 & 30 ft

PROJ. NO.: 04-803S-4 DATE: 6/11/04

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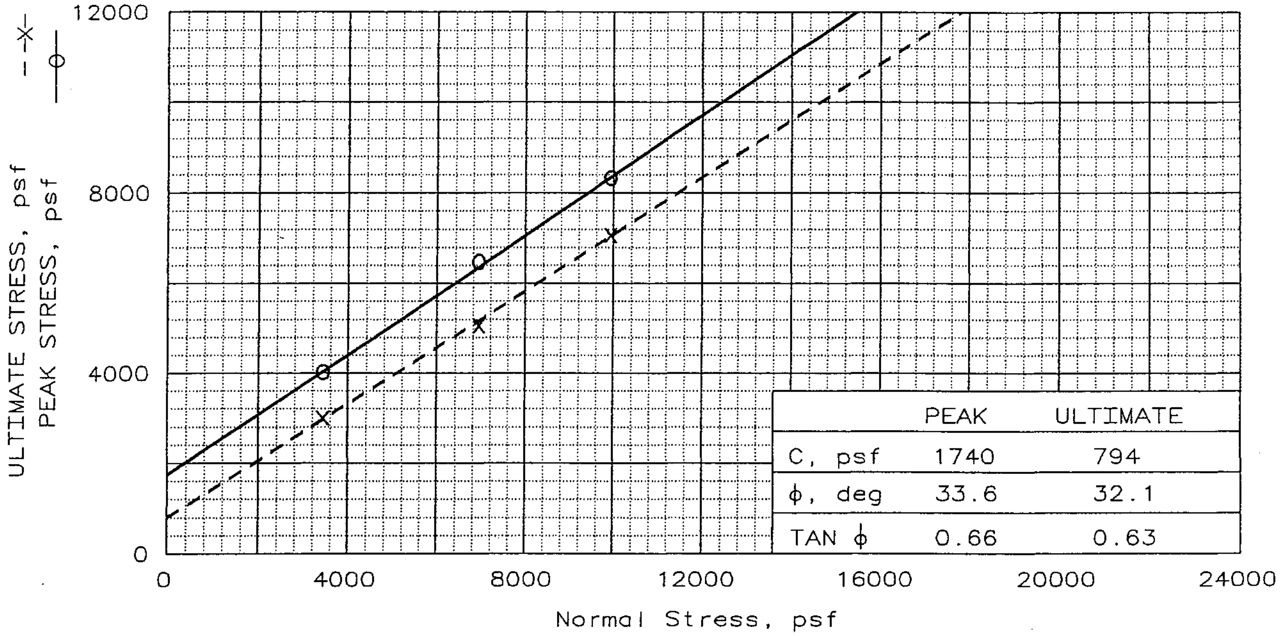
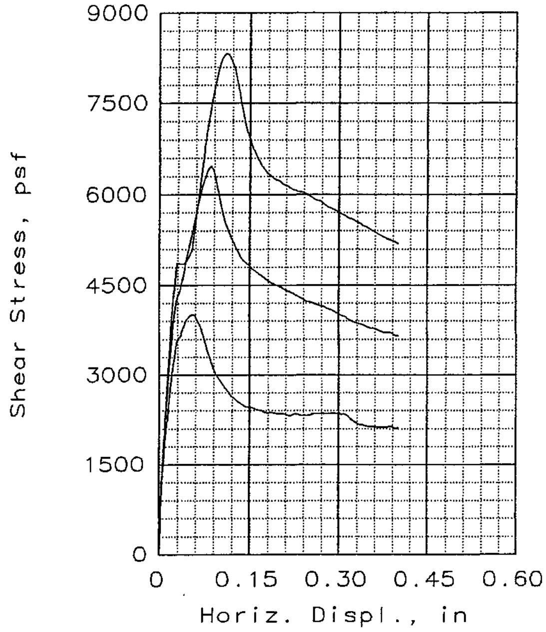


	PEAK	ULTIMATE
C, psf	1740	794
ϕ, deg	33.6	32.1
TAN ϕ	0.66	0.63



	SAMPLE NO.:	1	2	3
INITIAL	WATER CONTENT, %	13.2	13.7	13.4
	DRY DENSITY, pcf	120.4	118.7	121.1
	SATURATION, %	93.3	92.2	96.6
	VOID RATIO	0.374	0.394	0.367
	DIAMETER, in	2.42	2.42	2.42
	HEIGHT, in	1.00	1.00	1.00
AT TEST	WATER CONTENT, %	14.5	15.7	14.8
	DRY DENSITY, pcf	119.6	116.7	118.8
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.383	0.418	0.393
	DIAMETER, in	2.42	2.42	2.42
	HEIGHT, in	1.01	1.02	1.02
	NORMAL STRESS, psf	3500	7000	10000
	PEAK STRESS, psf	4020	6479	8327
	DISPLACEMENT, in	0.06	0.09	0.11
	ULTIMATE STRESS, psf	3000	5064	7067
	DISPLACEMENT, in	0.10	0.13	0.15
	Strain rate, %/min	0.01	0.01	0.01

SAMPLE TYPE: Undisturbed
DESCRIPTION: Clayey SANDSTONE
to sandy CLAYSTONE

SPECIFIC GRAVITY= 2.65
REMARKS: Bedrock (TQs)

CLIENT: Synergy

PROJECT: Tentative Tract 60258

SAMPLE LOCATION: B-17 @ 60 ft

PROJ. NO.: 04-803S-4 DATE: 6/11/04

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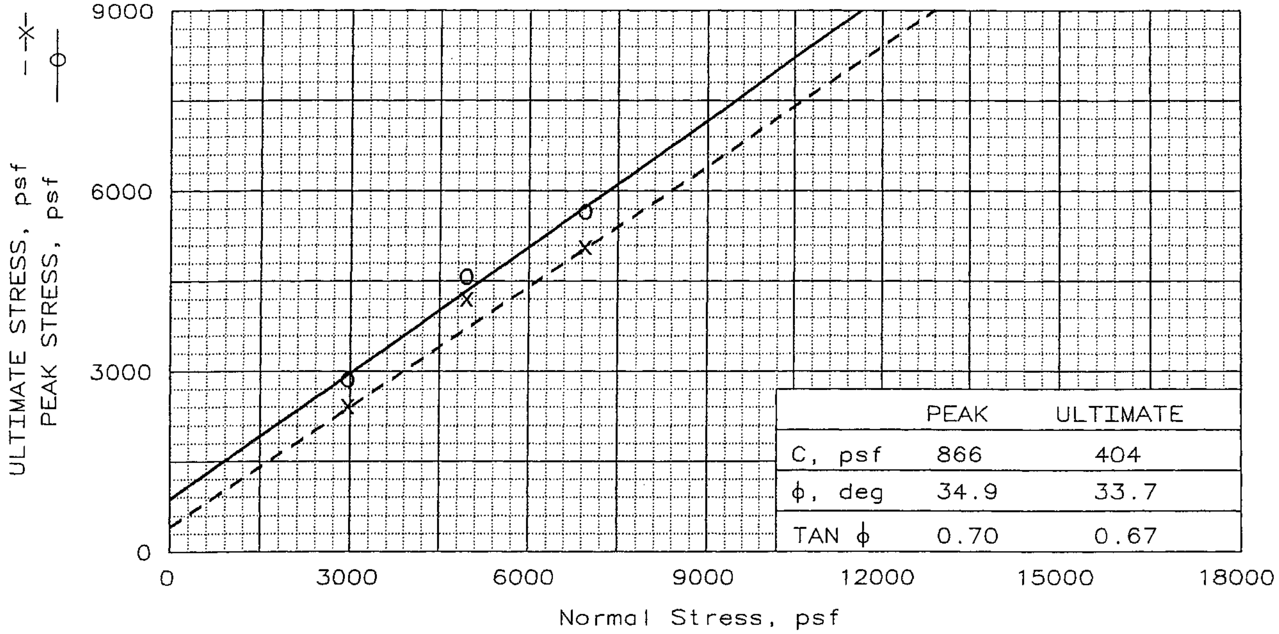
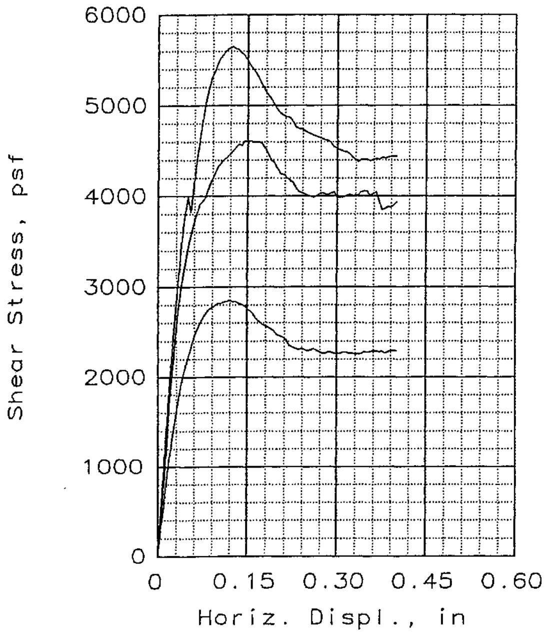
Fig. No.: B3.3



	PEAK	ULTIMATE
C, psf	866	404
ϕ, deg	34.9	33.7
TAN ϕ	0.70	0.67



	SAMPLE NO.:	1	2	3
INITIAL	WATER CONTENT, %	9.2	9.1	9.3
	DRY DENSITY, pcf	119.5	125.9	121.8
	SATURATION, %	63.2	76.4	69.0
	VOID RATIO	0.384	0.314	0.358
	DIAMETER, in	2.42	2.42	2.42
	HEIGHT, in	1.00	1.00	1.00
AT TEST	WATER CONTENT, %	13.8	12.5	14.5
	DRY DENSITY, pcf	121.1	124.2	119.6
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.366	0.332	0.384
	DIAMETER, in	2.42	2.42	2.42
	HEIGHT, in	0.99	1.01	1.02
	NORMAL STRESS, psf	3000	5000	7000
	PEAK STRESS, psf	2856	4572	5651
	DISPLACEMENT, in	0.12	0.14	0.13
	ULTIMATE STRESS, psf	2412	4200	5064
	DISPLACEMENT, in	0.22	0.22	0.19
	Strain rate, %/min	0.01	0.01	0.01

SAMPLE TYPE: Undisturbed
DESCRIPTION: Silty SAND (SM)

SPECIFIC GRAVITY= 2.65
REMARKS: Alluvium (Qal)

Fig. No.: B3.4

CLIENT: Synergy

PROJECT: Tentative Tract 60258

SAMPLE LOCATION: RW-1 @ 25 ft

PROJ. NO.: 04-803S-4 DATE: 6/11/04

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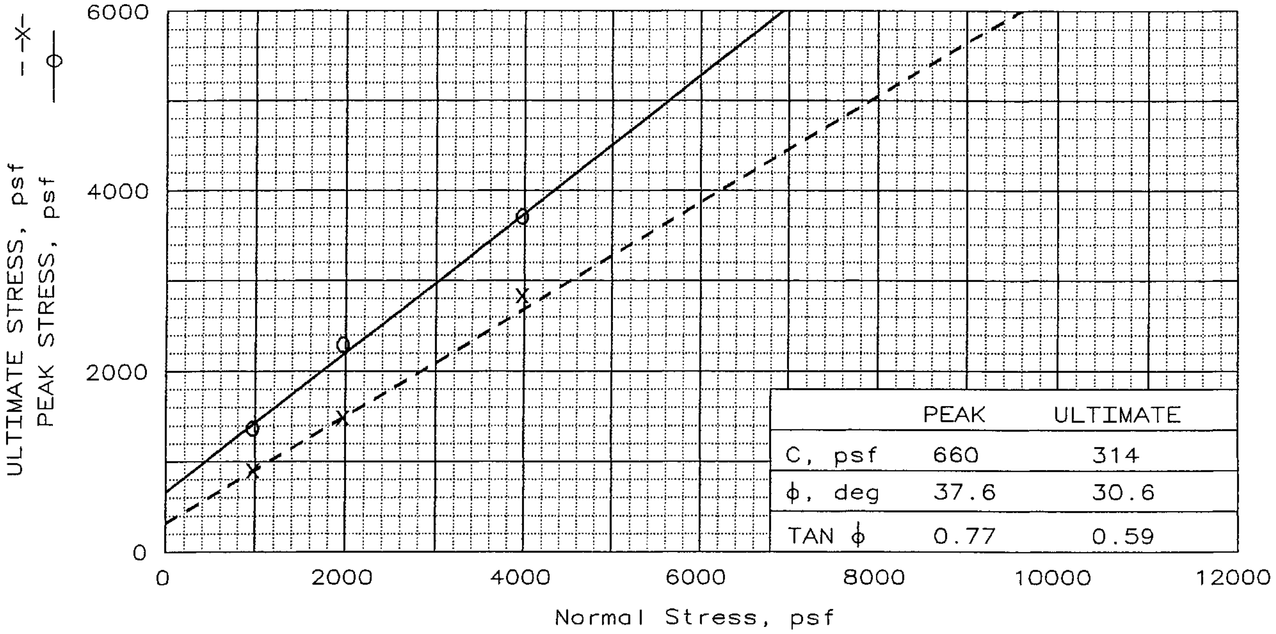
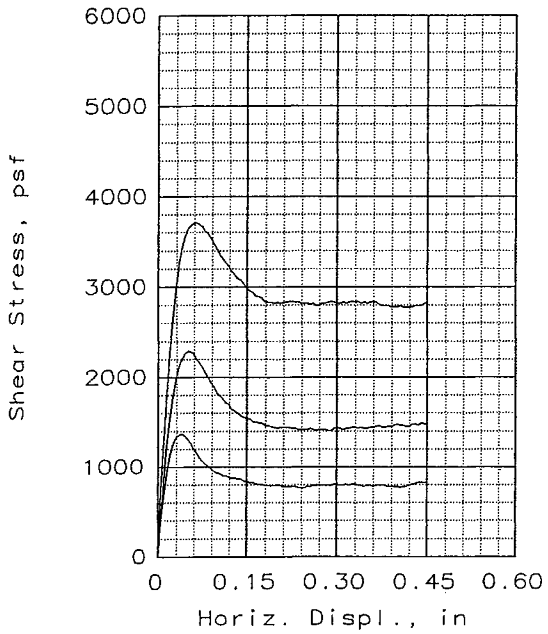


	PEAK	ULTIMATE
C, psf	660	314
ϕ, deg	37.6	30.6
TAN ϕ	0.77	0.59



	SAMPLE NO.:	1	2	3
INITIAL	WATER CONTENT, %	10.1	9.9	9.7
	DRY DENSITY, pcf	125.9	125.6	125.6
	SATURATION, %	85.4	82.9	81.1
	VOID RATIO	0.314	0.317	0.317
	DIAMETER, in	2.42	2.42	2.42
	HEIGHT, in	1.00	1.00	1.00
AT TEST	WATER CONTENT, %	12.1	12.4	12.5
	DRY DENSITY, pcf	125.3	124.6	124.2
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.321	0.328	0.332
	DIAMETER, in	2.42	2.42	2.42
	HEIGHT, in	1.01	1.01	1.01
NORMAL STRESS, psf		1000	2000	4000
PEAK STRESS, psf		1368	2292	3708
DISPLACEMENT, in		0.04	0.05	0.06
ULTIMATE STRESS, psf		900	1488	2832
DISPLACEMENT, in		0.12	0.45	0.45
Strain rate, %/min		0.01	0.01	0.01

SAMPLE TYPE: Remold
DESCRIPTION: Silty SAND (SM)

SPECIFIC GRAVITY= 2.65
REMARKS: Remolded to 90% MDD
(Qsw derived)

Fig. No.: B3.5

CLIENT: Synergy

PROJECT: Tentative Tract 60258

SAMPLE LOCATION: T-56 @ 5-7 ft

PROJ. NO.: 04-803S-4 DATE: 6/11/04

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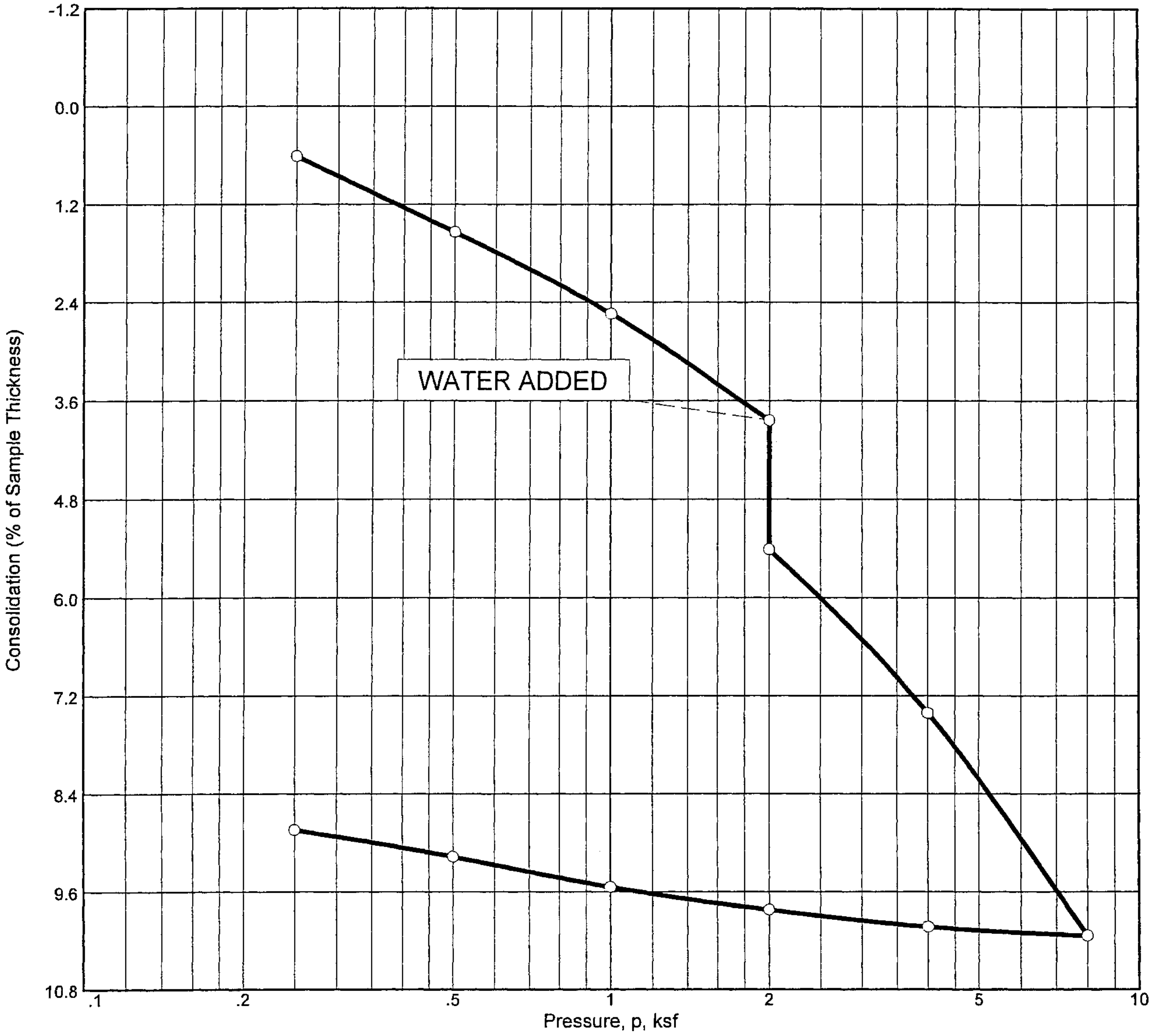
CHECKED BY
APPROVED BY
DRAWN BY
DATE

CONSOLIDATION TEST REPORT



SUMMARY OF TEST RESULTS

	DRY DENSITY (pcf)	MOISTURE CONTENT, (%)	SATURATION (%)	HEIGHT (in.)	VOID RATIO	SPECIFIC GRAVITY	C_c	P'_o (ksf)	P_c (ksf)	USCS
INITIAL	114.8	5.6	33.8	1.000	0.441	2.65	0.13	1.68	4.16	SP
FINAL	125.9	19.0	100.0	0.912	0.314					

Source: T-65

Elev./Depth: 14

Material Description: Sand and pebbly sand with cobbles

Remarks:

ALLAN E. SEWARD

ENGINEERING GEOLOGY, INC.

Client: Synergy

Project: Tentative Tract 60258

Job No.: 04-803S-4

Figure B4.1

Appendix C

APPENDIX C

LIQUEFACTION POTENTIAL ASSESSMENT AND EVALUATION OF EARTHQUAKE-INDUCED SETTLEMENTS

1.0 INTRODUCTION

We have completed our liquefaction and cyclic settlements evaluations of the subject property. The results of these evaluations affected the removals and recompaction recommended for the project. Thus, the recommended removal depths are based, in part, on upper non-liquefiable soil layers (including proposed fills to be placed above the existing ground surface), and/or cyclic settlements, or blow-count data from the borings (i.e. weak soils). The need for removals to mitigate static behavior of existing soils is evaluated in the main text of this report.

The combination of the removal, any existing non-liquefiable layer immediately beneath the removal, and the additional fill (as applicable) provided an ultimate cap of non-liquefiable soils at each location analyzed. These caps are sufficient (or much more than adequate at locations of proposed high fills) to mitigate liquefaction at these locations and to attenuate any effects from cyclic settlements remaining at depth.

2.0 DATA AND ASSUMPTIONS

Based on the probabilistic seismic hazard analyses (PSHA) presented in **Appendix D** of this report, a design basis earthquake (DBE) magnitude of 6.5 generating an estimated peak horizontal ground acceleration of 0.70g was considered for analysis for this report. A horizontal acceleration of 0.50g corresponding to an earthquake with a weighted magnitude of 7.5 was used for the liquefaction and earthquake-induced settlement analyses.

For the proposed school site, horizontal peak ground accelerations of 0.84g and 0.60g were used in the analyses.

Basic information included soil types, existing ground water levels and blow counts obtained from field data. These data are plotted versus depth on **Figures C1** through **C5, graphs (a)** and **(b)**.

For analysis, in the absence of well data, a conservative historic high ground water depth of 5 feet was used.

APPENDIX C

Seed et al. (1984) presents design curves based on field performance during earthquakes (cases where evidence of liquefaction has been observed), which provides a higher level of confidence in the analyses results. These curves distinctly separate liquefiable and non-liquefiable soil conditions. Therefore, liquefiable zones in this analysis are based upon the premise that liquefaction potential exists if the cyclic resistance ratio (CRR) against liquefaction is less than the earthquake-induced cyclic stress ratio; this is to say, a stress ratio factor of safety less than unity. The earthquake-induced settlement analysis also considers zones that may settle somewhat even though the factor of safety may be greater than one (i.e. a non-liquefaction condition).

3.0 ASSESSMENT OF LIQUEFACTION POTENTIAL

3.1 Method of Analysis

Liquefaction is a phenomenon whereby a saturated granular soil temporarily loses its strength because of the buildup of pore water pressure during seismic excitation. This loss of strength may cause structures founded on these soils to experience subsidence and/or lateral movement due to earthquakes.

Liquefaction potential analyses are performed by a method proposed by Seed, et al. (1984) as mentioned in Section 2 above. Some data provided by the liquefaction analyses are used for the evaluation of earthquake-induced settlements. Per Seed's method, the earthquake-induced stresses at any depth are estimated and compared with empirically based stresses (strength) for sites where liquefaction has occurred.

The calculation of available cyclic resistance ratios versus expected (seismically induced) cyclic shear stress ratios is based on existing soil data from CPTs, such as effective overburden pressure, blow count and percent fines. Corrected SPT blow count data are utilized to determine the strength/overburden pressure ratio for 7 ½ magnitude earthquakes. Correction of blow count for normalized overburden pressure is provided by Liao and Whitman (1986) by the equation C_n =SQRT(1/σ'_o), where σ'_o = effective overburden pressure in TSF. Based on data by Liao and Whitman, we interpret a maximum value of C_n of 2 and a minimum of 0.5. The formula for the corrected SPT "N" is: N_1=C_nN.

APPENDIX C

Correction for fines is provided following procedures of Youd & Idriss (NCEER, 1997). This correction provides equivalent blow count data for clean sand, which is ultimately used to assess strength against liquefaction.

The earthquake-induced horizontal stress is calculated per the following equation by Seed (1984):

Earthquake-induced stress = $\tau_{av} = 0.65\ (a_{max}/g)\ \sigma_o\, r_d$

Where a_{max}/g= ratio of peak ground acceleration and acceleration of gravity.

σ_o =Total overburden pressure
r_d = stress reduction factor to account for soil deformability

Theoretical factors of safety against liquefaction are calculated using corrected blow count data per Youd and Idriss (NCEER, 1997).

3.2 Results of Liquefaction Potential Assessment

Results of computerized calculations for the assessment of liquefaction potential are presented in the attached, **Figures C1 through C5, graphs (a), (b) and (c)**.

4.0 ESTIMATION OF EARTHQUAKE-INDUCED SETTLEMENTS

4.1 Method of Analysis

Earthquake-induced settlements were estimated using procedures presented by Tokimatsu and Seed (1987) for dry/moist soils (above the water table) and saturated sands. Settlement analyses were performed for the same location analyzed for liquefaction potential to estimate the possible range of settlements to be expected at the project site.

Volumetric strains for soils above the water table were estimated using blow count data and cyclic shear strain. **The volumetric strain was then doubled to account for multidirectional effects** (the volumetric strain data were originally obtained from one-dimensional laboratory testing). Seismic settlement was obtained by multiplying the thickness of the soil layer by the calculated volumetric strain.

APPENDIX C

Blow counts used in the settlement calculations above the water table were not corrected for fines content (but were corrected for other factors addressed in the liquefaction potential assessment). Although the referenced procedure applies to both silty and clean sands, the use of the blow counts without corrections for fines content produces more conservative results.

Seismic settlements for saturated sands were estimated using blow count data corrected for fines content (i.e. blow counts for equivalent clean sand were used) and other factors used for liquefaction analyses. The referenced procedure applies only to saturated clean sands.

Volumetric strain for saturated sands was estimated using the calculated earthquake-induced cyclic shear stress and corrected blow count. The seismic settlement was obtained by multiplying the thickness of the liquefied soil layer by the volumetric strain. The volumetric strain obtained from the design chart for saturated sands includes the multidirectional effect.

4.2 Results of Earthquake-Induced Settlement Analysis

The results of computerized cyclic settlement analyses are presented in **Figures C1** through **C5**, **graphs (d)**, and summarized in **Table C1**. Actual seismic settlements are expected to be less due to built-in conservatism in the procedures. A cumulative total settlement of 1.57 inches has been estimated at the location of RW-2. Considering the above results, together with the planned 36 foot removal and proposed additional 52 feet of recompacted fill resulting in a **cap of non-liquefiable soils of 86 feet**, the differential settlements are expected to be no greater than 0.43 inch in a horizontal distance of 30 feet (per CDMG SP 117).

Maximum cumulative total settlements of 3.87 inches and 3.20 inches have been estimated at the locations of RW-1 and RW-3, respectively. The proposed removal and recompaction of up to 34 of material feet and additional fill heights of up to 105 feet will eliminate potential differential settlements at these locations.

APPENDIX C

5.0 CONCLUSIONS

The results of the liquefaction assessment indicated that some liquefaction-prone zones exist in the alluvium on site, provided ground water rises to within the upper 5 feet below the existing ground surface. Recommended removals and recompaction will partly eliminate liquefiable zones at some locations.

Certified compacted fill used to replace proposed removals shown in the **Geologic/Geotechnical Map**, existing non-liquefiable soils immediately beneath the removals, and additional proposed fills above existing grade, will result in substantial caps (see **Table C1**) which are anticipated to mitigate any probability of surface manifestation and attenuate/mitigate effects from cyclic settlements due to soil replacement and/or expected bridging effects.

Based upon analytical procedures set forth by Bartlett & Youd (1995), **no lateral spreading** due to liquefaction is expected at this site for the following reasons:

- Alluvial subsurface soils are essentially horizontally layered.
- There is not a free-face toward which liquefied soils could move, and for the "ground surface condition" (Bartlett & Youd), granular soils with $N1_{(60)}$ less than 15 in the liquefaction-prone zones are few, isolated and thin (cumulative thickness <1m at applicable locations).
- It should be noted that the cyclic settlement calculations include multi-directional effects in the volumetric strains. Proposed removals and recompaction and additional fills will provide caps which will attenuate the effects of strains at depth.

6.0 RECOMMENDATIONS

Owing to the typically low magnitude of estimated conservative earthquake-induced differential settlements, and the proposed recompacted layers and additional fills resulting in significantly thick caps of non-liquefiable soils (see **Table C1**), special measures to further mitigate these settlements are considered to be unnecessary.

APPENDIX C

The following attachments are located within the Appendix.

APPENDIX C

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APPENDIX C

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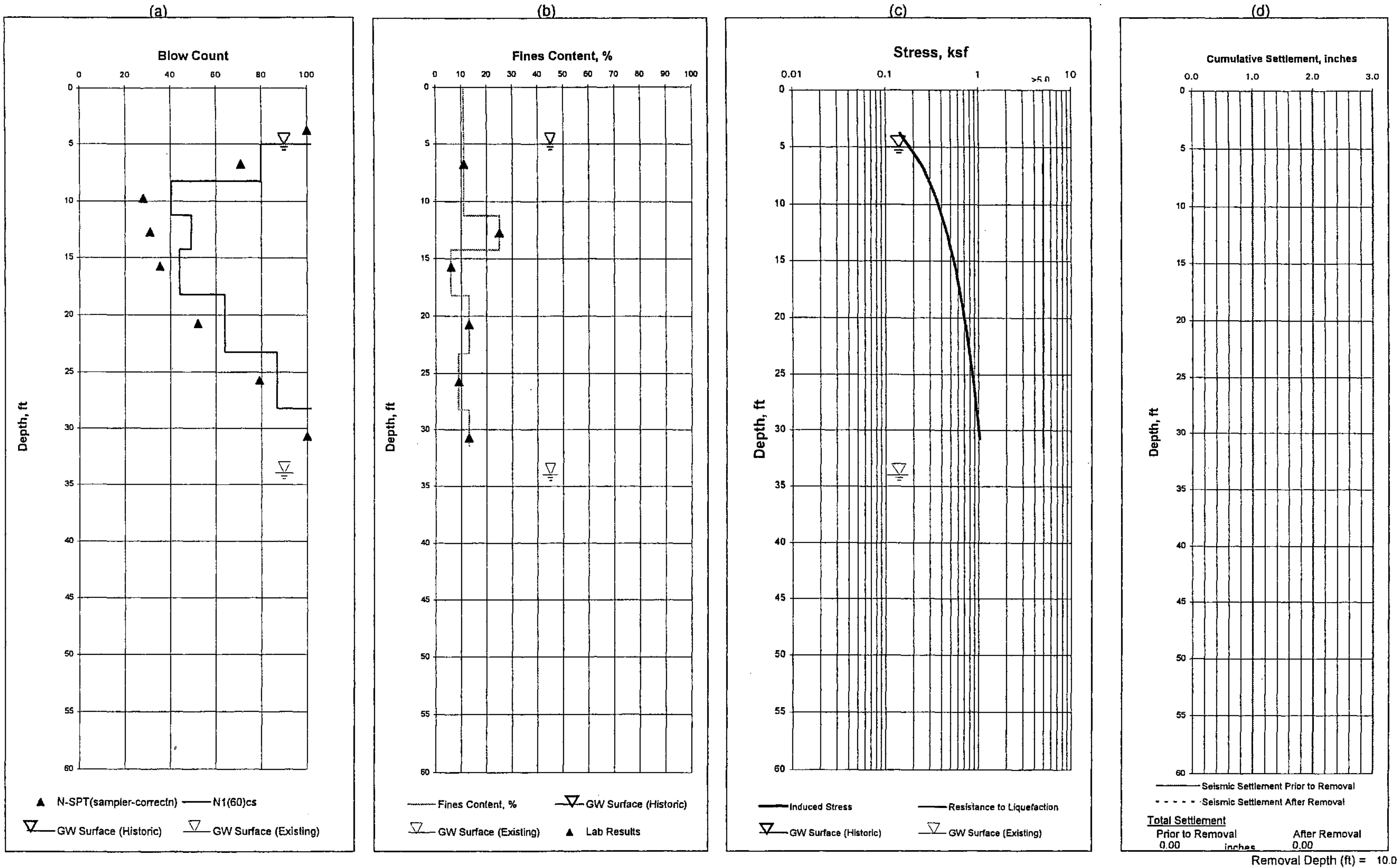
Location.......... **HS-1**
Elevation (MSL)........ 1375 ft

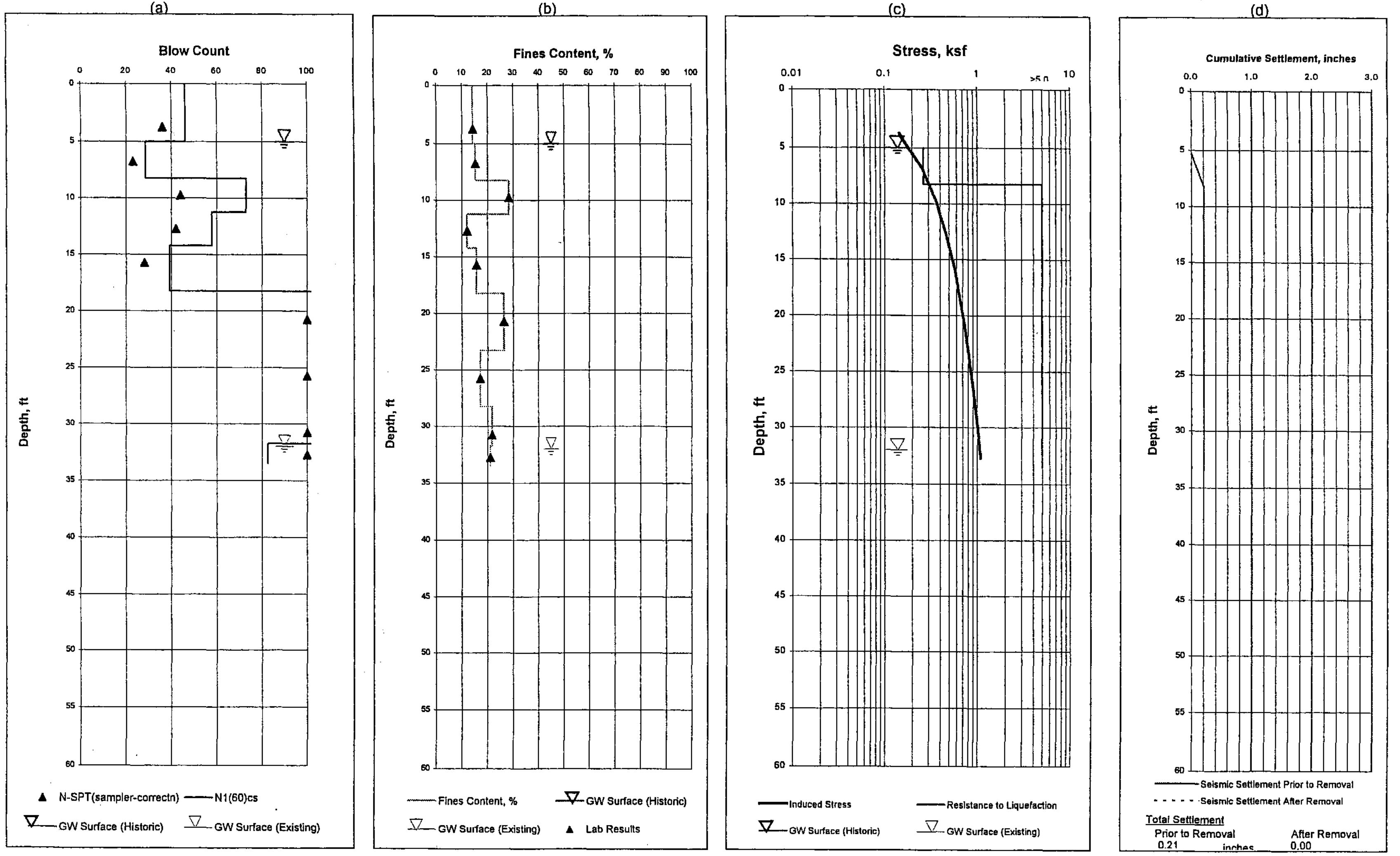


Allan E. Seward Engineering Geology, Inc.
Geological and Geotechnical Consultants

Analysis of Liquefaction Potential Based on N-Value from Boring Data

Project:	Tentative Tract 60258 Santa Clarita, CA	Weighted Gr. Acc. (M=7.5)..	0.50 g	Project No.	04-803S-4
		Design Gr. Acc.(M= 6.5)......	0.70 g	Figure No.	C-1
For:	Synergy	Magnification Factor...........	1	Date:	6-11-2004

Location.......... **HS-2**
Elevation (MSL)........ 1410ft

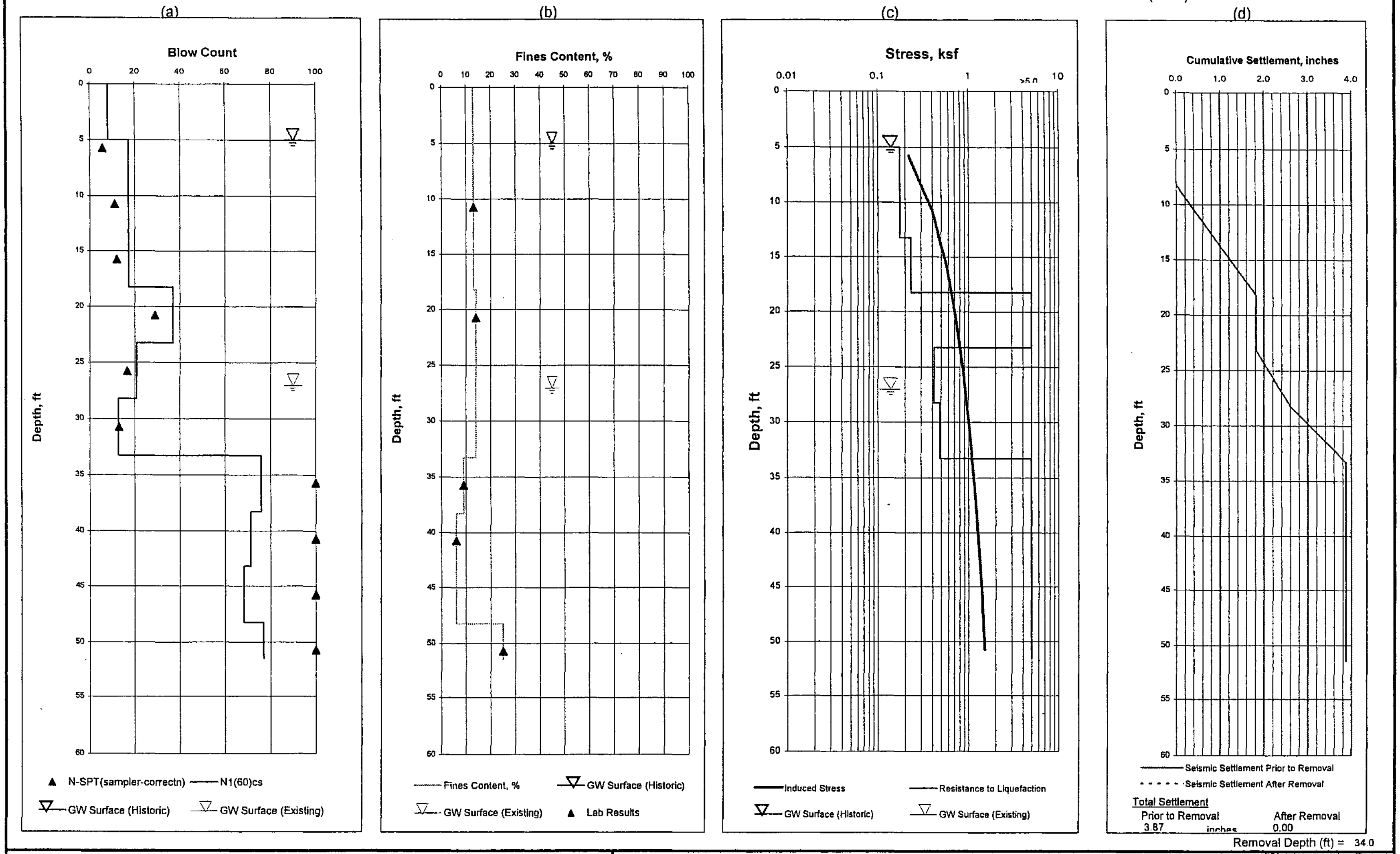


Allan E. Seward Engineering Geology, Inc.
Geological and Geotechnical Consultants

Analysis of Liquefaction Potential Based on N-Value from Boring Data

Project:	Tentative Tract 60258 Santa Clarita, CA	Weighted Gr. Acc. (M=7.5)..	0.50 g	Project No.	04-803S-4
		Design Gr. Acc.(M= 6.5)......	0.70 g	Figure No.	C-2
For:	Synergy	Magnification Factor...........	1	Date:	6-11-2004

Location.......... **RW-1**
Elevation (MSL)........ 1290ft



Total Settlement
Prior to Removal 3.87 inches
After Removal 0.00

Removal Depth (ft) = 34.0

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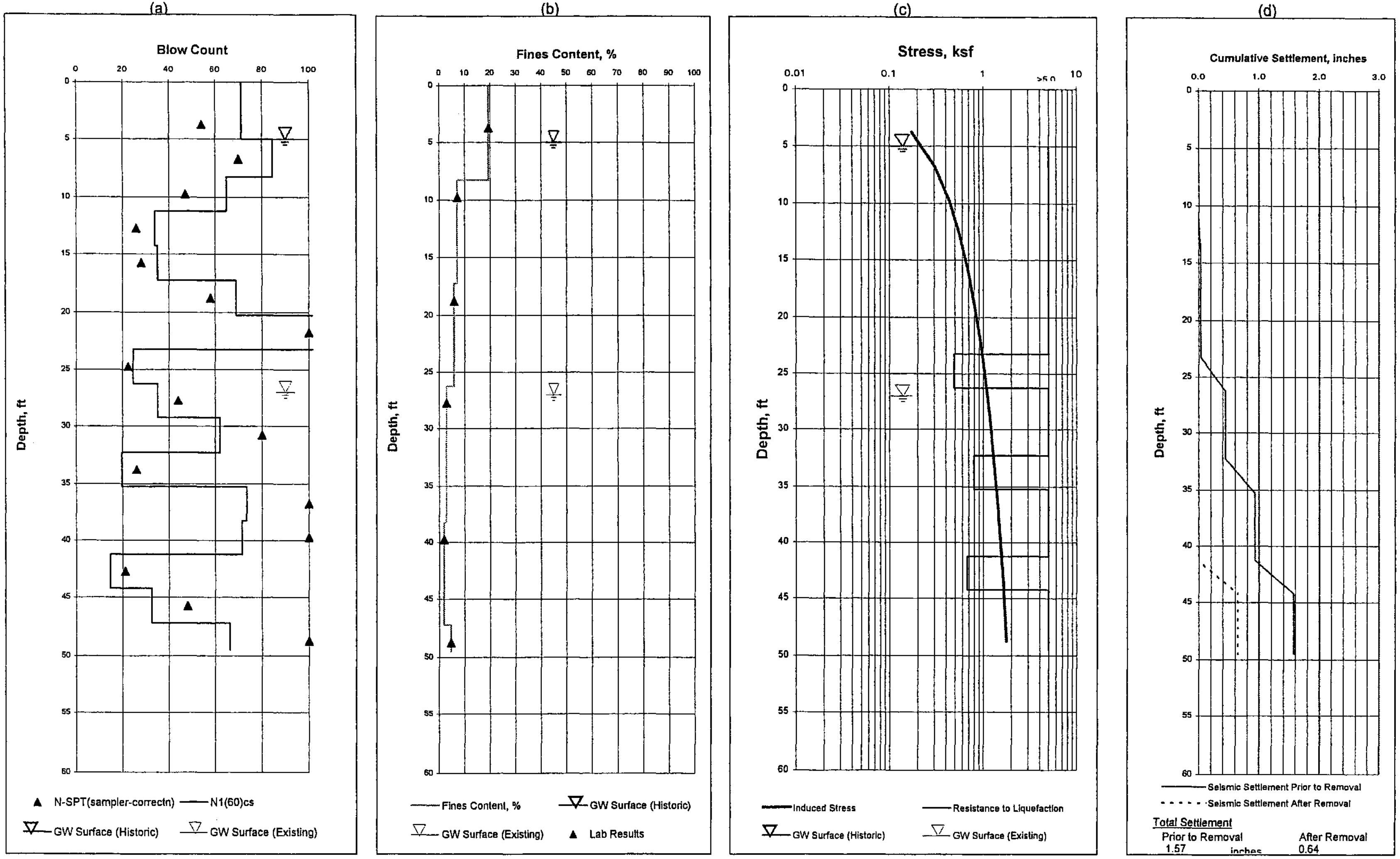
Analysis of Liquefaction Potential Based on N-Value from Boring Data

Project:	Tentative Tract 60258	Weighted Gr. Acc. (M=7.5)..	0.50 g	Project No.	04-803S-4
	Santa Clarita, CA	Design Gr. Acc.(M= 6.5)......	0.70 g	Figure No.	C-3
For:	Synergy	Magnification Factor...........	1	Date:	6-11-2004

Location.......... **RW-2**
Elevation (MSL)........ 1300ft



Removal Depth (ft) = 36.0

Allan E. Seward Engineering Geology, Inc.
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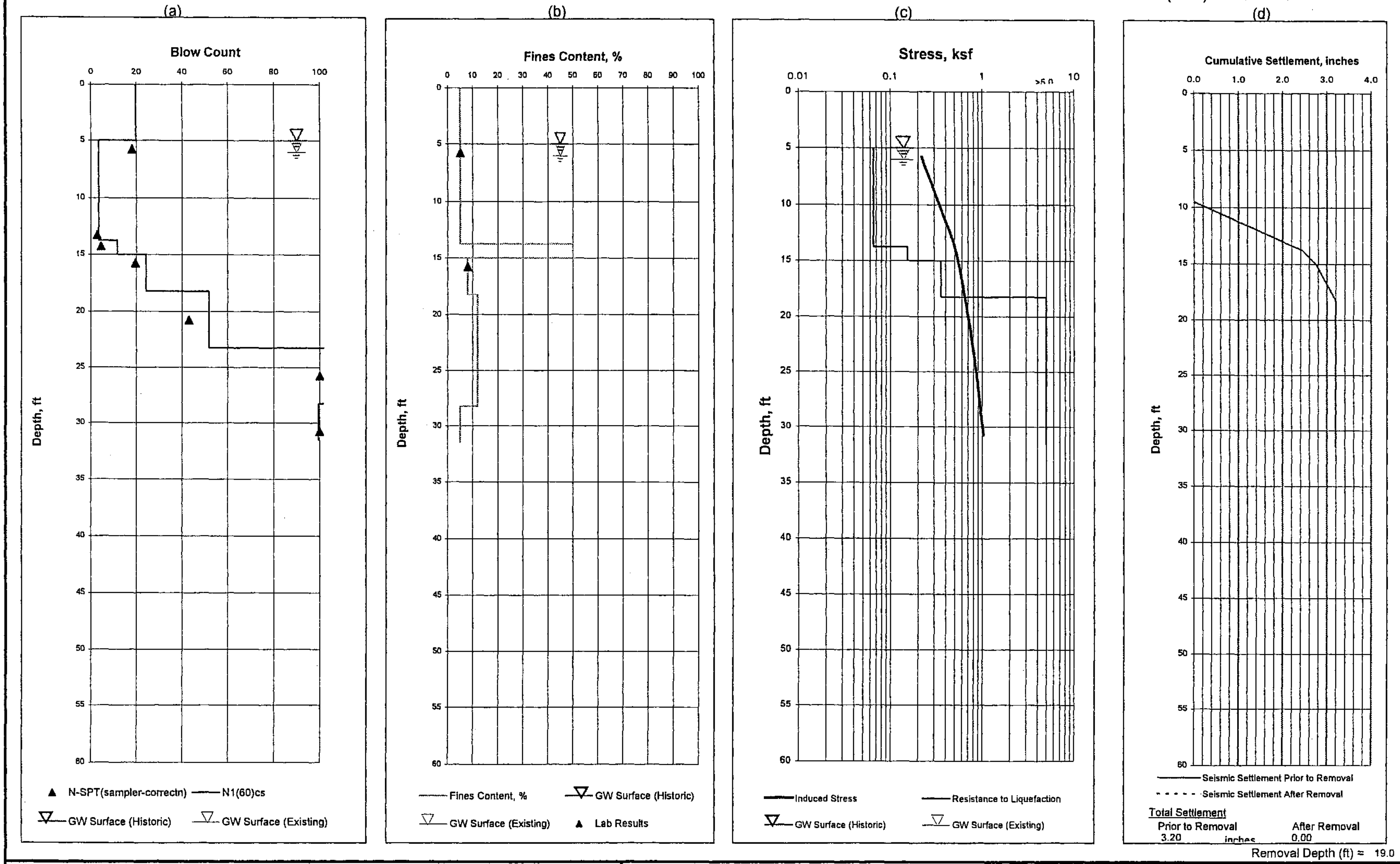
Analysis of Liquefaction Potential Based on N-Value from Boring Data

Project: Tentative Tract 60258
Santa Clarita, CA
For: Synergy

Weighted Gr. Acc. (M=7.5).. 0.60 g
Design Gr. Acc.(M= 6.5)...... 0.84 g
Magnification Factor........... 1

Project No.	04-803S-4
Figure No.	C-4
Date:	6-11-2004

Location.......... **RW-3**
Elevation (MSL)........ 1310ft



Allan E. Seward Engineering Geology, Inc.
Geological and Geotechnical Consultants

Analysis of Liquefaction Potential Based on N-Value from Boring Data

Project:	Tentative Tract 60258 Santa Clarita, CA	Weighted Gr. Acc. (M=7.5)..	0.50 g	Project No.	04-803S-4
		Design Gr. Acc.(M= 6.5)......	0.70 g	Figure No.	C-5
For:	Synergy	Magnification Factor...........	1	Date:	6-11-2004

Appendix D

APPENDIX C

SUMMARY OF CYCLIC SETTLEMENT ANALYSES AND REMOVALS (BASED ON RW & HS DATA)

Analyzed Location	Ground Surface Elevation (MSL) (Ft)	Depth to Existing Ground Water (Ft)	Depth to Historic High Ground Water (Ft)	Estimated Total Cyclic Settlement[a] (Prior to removal and recompaction) (Inch)	Proposed Fill Height (Ft)	Estimated Required Removal Depth[b] (Ft)	Estimated Total Cyclic Settlement (After removal and recompaction) (Inch)	Estimated Differential Cyclic Settlement[c] (After removal and recompaction) (Inch)	Ultimate Non-Liquefiable Cap (Removal and New Fill Included) (Ft)
HS-1	1375	-	5.0	0.00	-	5-10	0.00	-	-
HS-2	1410	-	5.0	0.21	80	5-10	0.00	0.00	90
RW-1	1290	27.0	5.0	3.87	52	34	0.00	0.00	79
RW-2	1300	27.0	5.0	1.57	105	36	0.64	0.43	141
RW-3	1310	6.0	5.0	3.20	95	19	0.00	0.00	114

a. Estimated total cyclic settlements based on seismic analysis.

b. Estimated removal depths are based on required (per Ishihara) upper non-liquefiable soil layers (including new fill), and/or cyclic settlements or adjacent borings or CPT blow count.

c. Based on CDMG Special Publication 117 and Los Angeles County-adopted Recommended Procedures for Implementation of CDMG Special Publication 117.

APPENDIX D

SEISMICITY

1.0 EVALUATION OF POTENTIAL SEISMIC HAZARDS

1.1 Ground Motion

1.1.1 Introduction

Ground motion is generated during an earthquake as two blocks of the earth's crust slip past each other. The intensity of ground motion at a specific site is controlled primarily by the magnitude of the earthquake and the distance from the epicenter and/or ground rupture area. Ground motion generally increases with increasing magnitude and is generally greatest near the epicenter and/or rupture area, and decreases (attenuates) with increasing distance. However, the ground motion measured at a given site is modified by a number of factors including focal depth, proximity to projected or actual fault rupture, fault mechanism, duration of shaking, local geologic structure, source direction of earthquake, underlying earth material characteristics, and topography. All of these factors make it difficult to accurately predict potential ground motions at a given site in the geologically and topographically complex Southern California area.

Current methods used to evaluate future potential ground motions are based on the review of historic earthquakes and statistical distributions of both rupture dimensions and ground motions generated during these earthquakes. Three primary procedures are currently in use to evaluate potential ground motions at a site:

1. Review of ground motions recorded during historic earthquakes
2. Deterministic seismic hazard analysis (DSHA)
3. Probabilistic seismic hazard analysis (PSHA)

Procedure number one involves the use of historically recorded earthquake magnitudes and ground accelerations to estimate accelerations, which have occurred at a given site during known earthquake events. Deterministic analysis (DSHA) utilizes maximum potential magnitude values for each significant fault to estimate maximum potential ground accelerations at a site without reference to a specific time frame. A probabilistic analysis (PSHA) evaluates potential earthquake magnitudes and accelerations based on historic earthquake data and interpreted slip rates for each fault to estimate potential accelerations anticipated within a particular time frame (return period) of interest.

Review of Guidelines for Evaluating and Mitigating Seismic Hazards in California (CDCDMG, 1997) indicates that potential ground motion should be evaluated using simple prescribed parameter values derived from published State maps (Petersen, et al., 1996; SHMA Quadrangle Maps) or by site specific probabilistic or deterministic analyses where sites are in close proximity to seismic sources. In accordance with current State guidelines for geotechnical and geologic reports, we have evaluated potential ground motions at the site with a probabilistic procedure, utilizing the computer program FRISKSP by Thomas Blake and compared our estimate with the Seismic Hazard Maps for the Newhall Quadrangle and Mint Canyon Quadrangle. Historic ground motions at the site have been estimated with the computer program EQSEARCH.

1.1.2 Earthquake Magnitude

Earthquake **magnitude** is a quantitative measure of the strength of an earthquake or the strain energy released by it, as determined by seismographic or geologic observations. It does not vary with distance or the underlying earth material. This differs from **intensity**, which is a qualitative measure of the effects a given earthquake has on people, structures, loose objects, and the ground at a specific location. Intensity generally increases with increasing magnitude and in areas underlain by unconsolidated materials, and decreases with distance from the epicenter. **Figure D2** gives the 1956 version of the Modified Mercalli intensity scale and the approximate magnitude necessary to generate the effects.

Review of criteria presented in CDCDMG Special Publication 117 indicates that probabilistic ground motions should be estimated based on maximum moment magnitude earthquakes for each fault of interest. In this report we have utilized the default magnitudes contained in the CDMGSCF.DAT file provided with Version 4.00 of the FRISKSP Program by Thomas Blake. These magnitudes were derived primarily from CDMG Open-File Report 96-08 (Peterson et al., 1996) and are based on historic displacements per seismic event or the rupture area-to-magnitude relationships of Wells and Coppersmith (1994). The maximum magnitudes for the significant faults within 50 km of the site are presented in **Table D2** under the AMMAX descriptor for each fault.

APPENDIX D

1.1.3 Ground Acceleration

Ground motion is typically reported with respect to the acceleration of gravity in units of g. Maximum, peak amplitudes in two perpendicular horizontal directions and the vertical axis are typically recorded during historic earthquakes on accelerograms.

Review of Sections 1804.5 and 1629A of the 1998 California Building Code (based on the 1997 UBC) and Chapter 4 of the CDCDMG 1997 Guidelines, indicates that an acceleration with a 10% chance of exceedance in 50 years (design basis earthquake ground motion) should be utilized for the evaluation of liquefaction potential for standard structures. This roughly correlates to a 475 year return period. An acceleration with a 10% chance of exceedance in 100 years (upper bound or maximum capable earthquake ground motions) should be utilized for liquefaction assessments of school sites and other essential facilities (CDCDMG Note 48). This statistically corresponds to a return period of 1000 years.

Site specific evaluation of potential ground motions requires the use of an attenuation relationship based on the observed attenuation of ground motions during historic earthquakes to estimate how ground acceleration will dissipate with increasing distance from the earthquake source. Review of CDCDMG Open-File Report 96-08 and SCEC Implementation Guidelines (Martin and Lew, 1999) indicates that design ground accelerations can be based on the equally weighted average of accelerations from three acceptable attenuation relationships. This procedure has been followed in our probabilistic analysis.

It should be emphasized that the ground acceleration values presented in our report are based on simplified curves of fault rupture area to magnitude, and ground motion attenuation relationships which represent averages of highly variable data measured during historic earthquakes. Predicted accelerations should be considered rough estimates rather than precise facts and, therefore, ground accelerations at the subject site from future seismic events may exceed the predicted accelerations. Due to the dip-slip nature of most of the faults in Southern California, vertical accelerations may equal horizontal accelerations. Ground motions may originate from virtually any direction due to the presence of major faults in all directions from the site.

APPENDIX D

1.1.4 Seismic Analysis – Tentative Tract 60258

1.1.4.1 Site Conditions

Most of the subject site is elevated above the Santa Clara River and is underlain by Quaternary Terrace Deposits and Saugus Formation Bedrock. Alluvial deposits are present on site in the low-lying areas within the Santa Clara River drainage and its tributary canyons where proposed Newhall Ranch Road and the southern portion of Golden Valley Road alignments and a school site are proposed. The Terrace deposits typically consist of friable fine-to very coarse-grained sandstone and pebbly sandstone with cobbles and boulders. The bedrock generally consists of sandstones and pebbly sandstones with interbeds of reddish-brown silty sandstones and mudstones (see **Geologic/Geotechnical Map**). To the depths explored, alluvium is comprised of interbeds of granular soils and fine-grained soils, but granular soils predominate. The upper soils will be removed and recompacted. Therefore, it is reasonable to classify the site as S_D per the Uniform Building Code ("Stiff Soil Profile"). For our analysis, we used soil profile type S_D.

1.1.4.2 Maximum Historic Accelerations

In order to provide a rough estimate of maximum ground motions which have occurred at the site from known, historic earthquakes, a site specific analysis using the computer program EQSEARCH (Version 3.00) by Thomas F. Blake was completed. This program utilizes a data base file that contains data on approximately 6000 events greater than magnitude 4 which have occurred in California between 1800 and 2000. This data was extracted primarily from the CDMG computerized earthquake catalog, Townley and Allen (1939) and the U.S. Geological Survey's Earthquake Data Base System. The attenuation relationship of Boore et al. (1997) with a random horizontal component and Site Class D Soil Classification was used to estimate the dissipation of ground motion from the epicenter to the subject site.

Table D1 summarizes the input parameters and a listing of earthquakes of magnitude 5 or greater which have occurred within 100 miles of the site, and the estimated ground motions produced at the site from each event. The locations of historic earthquakes near the subject site are shown on **Figure D1**. The largest

APPENDIX D

historic acceleration indicated by EQSEARCH for the alluvium at the site is 0.33g from the 1971 San Fernando Earthquake. Review of the contour map of accelerations for bedrock and soil sites prepared by Stewart et al. (1994) indicates a site ground acceleration of approximately 0.48g during the Northridge Earthquake (**Figure D3**).

1.1.4.3 Probabilistic Seismic Hazard Analysis

In order to provide a site specific, probabilistic seismic hazard analysis for the proposed development, the computer program FRISKSP (Version 4.00) by Thomas F. Blake was utilized. This program evaluates potential ground motions which may statistically occur within a time frame (return period) of interest. For this investigation a return period of 475 years and 1000 years were analyzed. Potential ground motions include a standard deviation to account for variability in observed ground motion attenuation.

The peak ground acceleration with a 10% probability of exceedance in 50 years (design basis ground motion) was calculated to be **0.70g** for the alluvial portions of the site (See Problem #1 Table D2). The peak ground acceleration with a 10% probability of exceedance in 100 years (upper bound ground motion) was calculated to be **0.84g** for the alluvium on the school site portion of the site (See Problem #1 Table D2). These accelerations were determined by using an unweighted average of the three accelerations indicated by the attenuation relationships of Boore et al. (1997) for a Site Class D, Sadigh et al. (1997) for deep soil, and Campbell and Bozorgnia (1997) for alluvium (see Summary of Calculated Accelerations **Table D3**). The Seismic Hazard Zone Reports for the Newhall Quadrangle (Open-File Report 97-11) and the Mint Canyon Quadrangle (Open-File Report 98-09) indicates a peak ground acceleration with a 10 percent probability of exceedance in 50 years to be **0.66g** for the alluvial portion of the site.

The dominant fault controlling maximum potential ground accelerations at the site is the Santa Susana Fault, with secondary impacts from the, San Gabriel, Northridge (East Oak Ridge) and Sierra Madre (San Fernando) Faults per analysis with Boore et al. (1997) (**see Table D2** for Summaries of Significant Faults). Site-fault distances for faults within 50 km of the site are summarized at the end of **Table D2**.

APPENDIX D

The FRISKSP program runs two problems for each attenuation relationship evaluated. The first evaluates potential accelerations, which may be generated within the return period of interest. The second problem normalizes potential accelerations to a 7.5 magnitude based on published empirical relationships because most liquefaction and settlement analyses are based on this standard magnitude. The acceleration is normalized to account for changes in duration for the same acceleration because larger, more distant earthquakes will produce ground motions with a longer duration (i.e. more cycles and more distress) than smaller, closer earthquakes. Where the design earthquake is smaller than a 7.5 magnitude, the normalized acceleration will be smaller than the design acceleration to account for the shorter duration of shaking from the design earthquake compared to the same acceleration from the larger 7.5 magnitude earthquake. The empirical relationship used for magnitude weighting in our analysis is from Youd and Idriss (1997). The average, magnitude-weighted acceleration was found to be **0.50g** for the design basis earthquake and **0.60g** for the upper bound earthquake (see **Table D3**).

1.1.5 Deaggregation of Fault Hazard

A probabilistic analysis evaluates a range of magnitudes from 5.0 to the maximum magnitude for each fault. However, the dominant magnitude which statistically generates the peak acceleration within a limited time period (e.g. 475 years) is typically less than the maximum magnitude for a given fault. We have, therefore, performed a deaggregation of fault hazard analysis with the PROBOUT Sub-Program of FRISKSP to evaluate what dominate magnitude-distance combination produces the design basis accelerations (DBA). We utilized the unweighted acceleration from Boore et al. (1997) of **0.84g** (DBA) for our deaggregation analyses. Review of the magnitude-distance contributions to hazard indicates that the dominant magnitude which generates the DBA acceleration is 6.5 as shown graphically in **Figure D4**.

1.1.6 Summary

The peak design basis ground acceleration value used in our liquefaction analysis was **0.70g** from a 6.5 magnitude earthquake on the Santa Susana Fault based on our probabilistic evaluation of the site. The peak upper bound acceleration used to assess the proposed school site was **0.84g** from a 6.5 magnitude earthquake.

APPENDIX D

Although research on earthquakes during the last forty years has greatly enhanced the level of understanding of earthquake faulting in California, the record is much too short to constrain behavior of all faults in Southern California and the attenuation characteristics of all areas relative to each future potential earthquakes. Predicted accelerations should, therefore, be considered **rough estimates** rather than precise facts and ground motions from future earthquakes may exceed the predicted accelerations. Neither the **Time, Location, nor Magnitude** of an earthquake can be accurately predicted at this time.

The proposed development is located in Southern California, which is in a geologically and seismically active region where large magnitude, potentially destructive earthquakes are common. Therefore, it is reasonable to assume that moderate or large magnitude earthquakes will affect the site during the life of a given structure. The current standards for construction provided in the California Building Code based on the 1997 Uniform Building Code are designed to safeguard against major failures and loss of life, but are not intended to limit damage, maintain functions or provide for easy repair. Per SEAOC, conformance to these recommendations does not constitute any kind of guarantee or assurance that significant structural damage will not occur in the event of a maximum level of earthquake ground motion. However, it is reasonable to expect that a well-planned and constructed structure will not collapse in a major earthquake and that protection of life is reasonably provided, but not with complete assurance.

1.2 Ground Failure

Ground failure is a general term describing seismically induced, secondary permanent ground deformation caused by strong ground motion. This includes liquefaction, lateral spreading, seismic settlement of poorly consolidated materials (dynamic densification), differential materials response, slope failures, sympathetic movement on weak bedding planes or non-causative faults, shattered ridge effects and ground lurching.

Seismic hazard maps for the Newhall Quadrangle (dated 2/1/98) and the Mint Canyon Quadrangle (3/25/99) indicates that the alluvial portions of Tentative Tract 60258 are in designated zones of required investigation to evaluate the potential for liquefaction and lateral spreading. The potential for liquefaction and seismic settlement has been evaluated in **Appendix C** of this report. Recommended measures to mitigate potential liquefaction and seismic settlements are provided in the earthworks recommendations and

APPENDIX D

foundation and settlement considerations of this report. Historic high ground water levels were assumed at a conservative depth of 5 feet below existing topography based on historical water well records available at the County of Los Angeles.

Differential materials response refers to the different responses various materials display when subjected to seismic waves. Where materials with different densities or strengths are in contact, differential response to the seismic energy may cause distress along the contact. The combination of dynamic compaction and differential settlement along with differential materials response is a source of future potential hazard along cut/fill and bedrock/alluvium contacts. It is, therefore, recommended that **lots** underlain by transitions between different material types (ex. bedrock to fill, bedrock to alluvium, etc.) be **over-excavated 5 feet** to minimize potential adverse impacts.

Earthquake-induced slope failures include activation and reactivation of landslides, rock falls, debris flows and surficial failures. Review of the SHMA maps for the Newhall and Mint Canyon Quadrangles indicate that much of the slope areas on the site are within designated areas requiring investigation to evaluate potential earthquake-induced landslides. Landslides have been mapped by this firm easterly of the proposed development above the proposed walkway/trail. Existing landslides which could potentially impact the proposed development have been evaluated and appropriate mitigation recommended as presented in this report. The stability of natural and constructed slopes which could potentially affect the proposed development has been evaluated and appropriate mitigation recommended. The potential for earthquake-induced slope failures to adversely impact the proposed development is considered negligible, provided that our Recommendations and those of the Supervising Civil Engineer are incorporated into the proposed design and implemented during construction.

The specific location of future potential sympathetic movement along weak planes such as inclined clay beds cannot be reliably predicted on a site specific basis at this time. Over-excavation of clay-rich bedding planes of the Saugus Formation and subsequent placement of a certified fill cap has been recommended to mitigate potential hazards from expansive material. This certified fill will also reduce potential hazards from potential secondary seismogenic movement along bedding planes.

Development is predominately located along the mesa areas of the site and is generally not proposed on ridgelines, therefore, potential hazards from shattered ridge affects are considered negligible.

APPENDIX D

The following attachments complete this Appendix

APPENDIX D

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                         *************************
                      *                         *
                      *     E Q S E A R C H     *
                      *                         *
                      *      Version 3.00       *
                      *                         *
                      *************************

                           ESTIMATION OF
                      PEAK ACCELERATION FROM
                  CALIFORNIA EARTHQUAKE CATALOGS


JOB NUMBER: 04-803S-4
                                                DATE: 01-14-2004

JOB NAME: VTTM 60258 - SYNERGY

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

MAGNITUDE RANGE:
   MINIMUM MAGNITUDE:  5.00
   MAXIMUM MAGNITUDE:  9.00

SITE COORDINATES:
   SITE LATITUDE:  34.4314
   SITE LONGITUDE:  118.4967

SEARCH DATES:
           START DATE:   1800
           END DATE:   2000

SEARCH RADIUS:
           100.0 mi
           160.9 km

ATTENUATION RELATION:   3) Boore et al. (1997) Horiz. - NEHRP D (250)
   UNCERTAINTY (M=Median, S=Sigma): M       Number of Sigmas:  0.0
   ASSUMED SOURCE TYPE:  DS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
   SCOND:   0  Depth Source:  A
   Basement Depth:  5.00 km     Campbell SSR:        Campbell SHR:
   COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km):  0.0
```

APPENDIX D

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                    -------------------------
                    EARTHQUAKE SEARCH RESULTS
                    -------------------------

-------------------------------------------------------------------------------
    |       |        |          |  TIME  |     |     | SITE  |SITE|  APPROX.
FILE|  LAT. |  LONG. |   DATE   |  (UTC) |DEPTH|QUAKE|  ACC. | MM |  DISTANCE
CODE| NORTH |  WEST  |          | H M Sec| (km)| MAG.|   g   |INT.|  mi  [km]
----+-------+--------+---------+-------+----+-------+---+-----------
DMG |34.4110|118.4010|02/09/1971|14 1 8.0|  8.0| 5.80| 0.241 | IX |  5.6(  9.1)
DMG |34.4110|118.4010|02/09/1971|14 244.0|  8.0| 5.80| 0.241 | IX |  5.6(  9.1)
DMG |34.4110|118.4010|02/09/1971|141028.0|  8.0| 5.30| 0.185 |VIII|  5.6(  9.1)
DMG |34.4110|118.4010|02/09/1971|14 041.8|  8.4| 6.40| 0.331 | IX |  5.6(  9.1)
GSP |34.3780|118.6180|01/19/1994|211144.9| 11.0| 5.10| 0.136 |VIII|  7.8( 12.6)
DMG |34.3080|118.4540|02/09/1971|144346.7|  6.2| 5.20| 0.132 |VIII|  8.9( 14.3)
GSB |34.3010|118.5650|01/17/1994|204602.4|  9.0| 5.20| 0.123 | VII|  9.8( 15.8)
GSP |34.3050|118.5790|01/29/1994|112036.0|  1.0| 5.10| 0.116 | VII|  9.9( 15.9)
GSP |34.3940|118.6690|06/26/1995|084028.9| 13.0| 5.00| 0.108 | VII| 10.1( 16.3)
DMG |34.3000|118.6000|04/04/1893|1940 0.0|  0.0| 6.00| 0.176 |VIII| 10.8( 17.4)
GSP |34.3690|118.6720|04/26/1997|103730.7| 16.0| 5.10| 0.109 | VII| 10.9( 17.5)
GSP |34.3770|118.6980|01/18/1994|004308.9| 11.0| 5.20| 0.107 | VII| 12.1( 19.4)
GSB |34.3790|118.7110|01/19/1994|210928.6| 14.0| 5.50| 0.120 | VII| 12.7( 20.5)
GSP |34.3260|118.6980|01/17/1994|233330.7|  9.0| 5.60| 0.121 | VII| 13.6( 21.9)
GSP |34.2310|118.4750|03/20/1994|212012.3| 13.0| 5.30| 0.101 | VII| 13.9( 22.3)
GSP |34.2130|118.5370|01/17/1994|123055.4| 18.0| 6.70| 0.198 |VIII| 15.2( 24.5)
DMG |34.5190|118.1980|08/23/1952|10 9 7.1| 13.1| 5.00| 0.071 | VI | 18.0( 29.0)
MGI |34.0800|118.2600|07/16/1920|18 8 0.0|  0.0| 5.00| 0.051 | VI | 27.8( 44.7)
MGI |34.0000|118.5000|11/19/1918|2018 0.0|  0.0| 5.00| 0.049 | VI | 29.8( 47.9)
DMG |34.0000|118.5000|08/04/1927|1224 0.0|  0.0| 5.00| 0.049 | VI | 29.8( 47.9)
GSP |34.2620|118.0020|06/28/1991|144354.5| 11.0| 5.40| 0.059 | VI | 30.5( 49.1)
T-A |34.8300|118.7500|11/27/1852| 0 0 0.0|  0.0| 7.00| 0.135 |VIII| 31.1( 50.0)
MGI |34.0000|118.3000|09/03/1905| 540 0.0|  0.0| 5.30| 0.054 | VI | 31.8( 51.2)
MGI |34.1000|118.1000|07/11/1855| 415 0.0|  0.0| 6.30| 0.091 | VII| 32.2( 51.8)
T-A |34.0000|118.2500|03/26/1860| 0 0 0.0|  0.0| 5.00| 0.045 | VI | 32.9( 53.0)
T-A |34.0000|118.2500|09/23/1827| 0 0 0.0|  0.0| 5.00| 0.045 | VI | 32.9( 53.0)
T-A |34.0000|118.2500|01/10/1856| 0 0 0.0|  0.0| 5.00| 0.045 | VI | 32.9( 53.0)
PAS |34.0730|118.0980|10/04/1987|105938.2|  8.2| 5.30| 0.052 | VI | 33.6( 54.1)
DMG |34.7000|119.0000|10/23/1916| 254 0.0|  0.0| 5.50| 0.057 | VI | 34.1( 54.9)
DMG |33.9500|118.6320|08/31/1930| 04036.0|  0.0| 5.20| 0.049 | VI | 34.1( 54.9)
PAS |34.0610|118.0790|10/01/1987|144220.0|  9.5| 5.90| 0.069 | VI | 35.0( 56.3)
PAS |33.9440|118.6810|01/01/1979|231438.9| 11.3| 5.00| 0.043 | VI | 35.3( 56.7)
PAS |33.9190|118.6270|01/19/1989| 65328.8| 11.9| 5.00| 0.042 | VI | 36.1( 58.2)
DMG |34.2000|117.9000|08/28/1889| 215 0.0|  0.0| 5.50| 0.053 | VI | 37.6( 60.5)
PAS |34.9430|118.7430|06/10/1988|23 643.0|  6.8| 5.40| 0.050 | VI | 38.0( 61.1)
DMG |34.8670|118.9330|09/21/1941|1953 7.2|  0.0| 5.20| 0.044 | VI | 39.0( 62.7)
DMG |34.9000|118.9000|10/23/1916| 244 0.0|  0.0| 6.00| 0.066 | VI | 39.6( 63.8)
DMG |34.0650|119.0350|02/21/1973|144557.3|  8.0| 5.90| 0.063 | VI | 39.8( 64.0)
MGI |34.0000|118.0000|12/25/1903|1745 0.0|  0.0| 5.00| 0.038 |  V | 41.1( 66.2)
DMG |34.9000|118.9500|08/01/1952|13 430.0|  0.0| 5.10| 0.040 |  V | 41.3( 66.5)
MGI |34.0000|119.0000|12/14/1912| 0 0 0.0|  0.0| 5.70| 0.055 | VI | 41.4( 66.6)
```

APPENDIX D

```
-------------------------------------------------------------------------------
    |       |        |          |  TIME   |     |     | SITE  |SITE|  APPROX.
FILE| LAT.  | LONG.  |   DATE   |  (UTC)  |DEPTH|QUAKE| ACC.  | MM |  DISTANCE
CODE| NORTH | WEST   |          | H M Sec | (km)| MAG.|   g   |INT.|  mi   [km]
----+-------+--------+----------+---------+-----+-----+-------+----+-------------
DMG |34.0000|119.0000|09/24/1827| 4 0 0.0|  0.0| 7.00| 0.108 | VII| 41.4( 66.6)
T-A |34.9200|118.9200|01/20/1857| 0 0 0.0|  0.0| 5.00| 0.038 |  V | 41.4( 66.7)
T-A |34.9200|118.9200|05/23/1857| 0 0 0.0|  0.0| 5.00| 0.038 |  V | 41.4( 66.7)
DMG |34.9500|118.8670|07/21/1952|121936.0|  0.0| 5.30| 0.044 | VI | 41.5( 66.8)
DMG |33.8500|118.2670|03/11/1933|1425 0.0|  0.0| 5.00| 0.037 |  V | 42.2( 68.0)
DMG |34.8000|119.1000|09/05/1883|1230 0.0|  0.0| 6.00| 0.063 | VI | 42.7( 68.7)
DMG |35.0000|118.8330|07/23/1952|181351.0|  0.0| 5.20| 0.040 |  V | 43.6( 70.2)
DMG |35.0000|118.8330|07/23/1952| 75319.0|  0.0| 5.40| 0.045 | VI | 43.6( 70.2)
DMG |34.9320|118.9760|03/01/1963| 02557.9| 13.9| 5.00| 0.036 |  V | 44.0( 70.8)
DMG |34.9410|118.9870|11/15/1961| 53855.5| 10.7| 5.00| 0.036 |  V | 44.9( 72.2)
DMG |33.7830|118.2500|11/14/1941| 84136.3|  0.0| 5.40| 0.042 | VI | 46.9( 75.5)
DMG |34.9830|118.9830|05/23/1954|235243.0|  0.0| 5.10| 0.036 |  V | 47.0( 75.7)
DMG |34.3700|117.6500|12/08/1812|15 0 0.0|  0.0| 7.00| 0.096 | VII| 48.4( 77.9)
DMG |35.0000|119.0000|02/16/1919|1557 0.0|  0.0| 5.00| 0.033 |  V | 48.5( 78.1)
DMG |35.0000|119.0000|07/21/1952|12 531.0|  0.0| 6.40| 0.070 | VI | 48.5( 78.1)
DMG |35.0000|119.0170|01/12/1954|233349.0|  0.0| 5.90| 0.053 | VI | 49.1( 79.0)
DMG |35.0000|119.0170|07/21/1952|115214.0|  0.0| 7.70| 0.137 |VIII| 49.1( 79.0)
DMG |33.7830|118.1330|10/02/1933| 91017.6|  0.0| 5.40| 0.041 |  V | 49.4( 79.4)
DMG |35.0000|119.0330|07/21/1952|12 2 0.0|  0.0| 5.60| 0.045 | VI | 49.7( 79.9)
GSP |34.1400|117.7000|02/28/1990|234336.6|  5.0| 5.20| 0.036 |  V | 49.7( 80.0)
DMG |35.1500|118.6330|01/27/1954|141948.0|  0.0| 5.00| 0.033 |  V | 50.2( 80.8)
DMG |35.1330|118.7670|07/21/1952|194122.0|  0.0| 5.50| 0.042 | VI | 50.8( 81.8)
DMG |34.3000|117.6000|07/30/1894| 512 0.0|  0.0| 6.00| 0.054 | VI | 51.9( 83.5)
DMG |35.1830|118.6500|07/21/1952|151358.0|  0.0| 5.10| 0.033 |  V | 52.6( 84.7)
DMG |33.7500|118.0830|03/11/1933| 323 0.0|  0.0| 5.00| 0.031 |  V | 52.7( 84.7)
DMG |33.7500|118.0830|03/13/1933|131828.0|  0.0| 5.30| 0.037 |  V | 52.7( 84.7)
DMG |33.7500|118.0830|03/11/1933| 910 0.0|  0.0| 5.10| 0.033 |  V | 52.7( 84.7)
DMG |33.7500|118.0830|03/11/1933| 230 0.0|  0.0| 5.10| 0.033 |  V | 52.7( 84.7)
DMG |33.7500|118.0830|03/11/1933| 2 9 0.0|  0.0| 5.00| 0.031 |  V | 52.7( 84.7)
DMG |35.2330|118.5330|07/21/1952|174244.0|  0.0| 5.10| 0.032 |  V | 55.4( 89.1)
DMG |34.2700|117.5400|09/12/1970|143053.0|  8.0| 5.40| 0.037 |  V | 55.7( 89.6)
DMG |33.7000|118.0670|03/11/1933| 51022.0|  0.0| 5.10| 0.031 |  V | 56.2( 90.4)
DMG |33.7000|118.0670|03/11/1933| 85457.0|  0.0| 5.10| 0.031 |  V | 56.2( 90.4)
DMG |34.1000|119.4000|05/19/1893| 035 0.0|  0.0| 5.50| 0.039 |  V | 56.4( 90.7)
DMG |35.2170|118.8170|07/23/1952|1317 5.0|  0.0| 5.70| 0.043 | VI | 57.2( 92.0)
DMG |34.5000|119.5000|08/05/1930|1125 0.0|  0.0| 5.00| 0.029 |  V | 57.3( 92.2)
DMG |34.5000|119.5000|06/29/1926|2321 0.0|  0.0| 5.50| 0.038 |  V | 57.3( 92.2)
DMG |34.3000|117.5000|07/22/1899|2032 0.0|  0.0| 6.50| 0.065 | VI | 57.5( 92.6)
DMG |33.6830|118.0500|03/11/1933| 658 3.0|  0.0| 5.50| 0.038 |  V | 57.6( 92.8)
GSP |35.2100|118.0660|07/11/1992|181416.2| 10.0| 5.70| 0.042 |  V | 59.0( 95.0)
GSP |35.1490|119.1040|05/28/1993|044740.6| 21.0| 5.20| 0.031 |  V | 60.3( 97.1)
DMG |35.3110|118.4990|07/25/1952|1313 8.2|  2.8| 5.00| 0.028 |  V | 60.7( 97.7)
DMG |35.3150|118.5160|07/25/1952|194323.7| 11.2| 5.70| 0.040 |  V | 61.0( 98.2)
DMG |35.3170|118.4940|07/25/1952|19 944.6|  5.5| 5.70| 0.040 |  V | 61.1( 98.4)
DMG |34.3670|119.5830|07/01/1941| 75054.8|  0.0| 5.90| 0.044 | VI | 62.0( 99.8)
```

APPENDIX D

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-------------------------------------------------------------------------------
    |       |        |          |  TIME  |     |     |  SITE |SITE|  APPROX.
FILE| LAT.  | LONG.  |   DATE   |  (UTC) |DEPTH|QUAKE|  ACC. | MM |  DISTANCE
CODE| NORTH |  WEST  |          | H M Sec| (km)| MAG.|   g   |INT.|  mi   [km]
----+-------+--------+----------+--------+-----+-----+-------+----+-------------
DMG |35.3000|118.8000|12/23/1905|2223 0.0|  0.0| 5.00| 0.028 | V  | 62.4(100.4)
DMG |35.3330|118.6000|07/31/1952|12 9 9.0|  0.0| 5.80| 0.042 | VI | 62.5(100.6)
DMG |33.6170|118.0170|03/14/1933|19 150.0|  0.0| 5.10| 0.029 | V  | 62.6(100.7)
PAS |33.6710|119.1110|09/04/1981|155050.3|  5.0| 5.30| 0.032 | V  | 63.2(101.7)
DMG |33.9860|119.4750|08/06/1973|232917.0| 16.9| 5.00| 0.027 | V  | 63.8(102.6)
DMG |33.6170|117.9670|03/11/1933| 154 7.8|  0.0| 6.30| 0.054 | VI | 63.9(102.8)
MGI |34.0000|117.5000|12/16/1858|10 0 0.0|  0.0| 7.00| 0.077 | VII| 64.2(103.4)
DMG |34.2000|117.4000|07/22/1899| 046 0.0|  0.0| 5.50| 0.035 | V  | 64.5(103.9)
DMG |34.0000|119.5000|02/18/1926|1818 0.0|  0.0| 5.00| 0.027 | V  | 64.6(103.9)
DMG |35.3670|118.5830|07/23/1952| 03832.0|  0.0| 6.10| 0.048 | VI | 64.8(104.2)
DMG |35.3670|118.5830|07/23/1952| 31923.0|  0.0| 5.00| 0.027 | V  | 64.8(104.2)
DMG |33.5750|117.9830|03/11/1933| 518 4.0|  0.0| 5.20| 0.029 | V  | 66.0(106.3)
DMG |35.3330|118.9170|08/22/1952|224124.0|  0.0| 5.80| 0.040 | V  | 66.6(107.2)
T-A |34.5000|119.6700|06/01/1893|12 0 0.0|  0.0| 5.00| 0.026 | V  | 67.0(107.7)
MGI |33.8000|117.6000|04/22/1918|2115 0.0|  0.0| 5.00| 0.026 | V  | 67.3(108.3)
MGI |34.4000|119.7000|03/25/1806| 8 0 0.0|  0.0| 5.00| 0.026 | V  | 68.6(110.3)
PAS |34.3470|119.6960|08/13/1978|225453.4| 12.8| 5.10| 0.027 | V  | 68.6(110.4)
DMG |35.3830|118.8500|07/29/1952| 7 347.0|  0.0| 6.10| 0.046 | VI | 68.7(110.5)
DMG |35.4000|118.8170|07/29/1952| 8 146.0|  0.0| 5.10| 0.027 | V  | 69.3(111.5)
MGI |34.1000|117.3000|07/15/1905|2041 0.0|  0.0| 5.30| 0.029 | V  | 72.0(115.9)
DMG |34.1180|119.7020|07/05/1968| 04517.2|  5.9| 5.20| 0.027 | V  | 72.1(116.0)
DMG |35.5000|118.7000|01/06/1905|1430 0.0|  0.0| 5.00| 0.024 | V  | 74.7(120.2)
MGI |34.3000|119.8000|07/03/1925|1638 0.0|  0.0| 5.30| 0.028 | V  | 74.8(120.4)
MGI |34.3000|119.8000|07/03/1925|1821 0.0|  0.0| 5.30| 0.028 | V  | 74.8(120.4)
DMG |34.3000|119.8000|06/29/1925|144216.0|  0.0| 6.25| 0.046 | VI | 74.8(120.4)
T-A |34.4200|119.8200|00/00/1862| 0 0 0.0|  0.0| 5.70| 0.034 | V  | 75.4(121.3)
DMG |33.6990|117.5110|05/31/1938| 83455.4| 10.0| 5.50| 0.031 | V  | 75.7(121.9)
DMG |34.2000|119.8000|12/21/1812|19 0 0.0|  0.0| 7.00| 0.068 | VI | 76.0(122.3)
DMG |34.0000|117.2500|07/23/1923| 73026.0|  0.0| 6.25| 0.045 | VI | 77.2(124.2)
DMG |33.7000|117.4000|04/11/1910| 757 0.0|  0.0| 5.00| 0.023 | IV | 80.5(129.6)
DMG |33.7000|117.4000|05/13/1910| 620 0.0|  0.0| 5.00| 0.023 | IV | 80.5(129.6)
DMG |33.7000|117.4000|05/15/1910|1547 0.0|  0.0| 6.00| 0.038 | V  | 80.5(129.6)
DMG |34.2000|117.1000|09/20/1907| 154 0.0|  0.0| 6.00| 0.038 | V  | 81.2(130.7)
DMG |35.6000|118.8000|06/30/1926|1331 0.0|  0.0| 5.00| 0.022 | IV | 82.5(132.7)
DMG |33.9000|117.2000|12/19/1880| 0 0 0.0|  0.0| 6.00| 0.037 | V  | 82.7(133.0)
DMG |34.2670|116.9670|08/29/1943| 34513.0|  0.0| 5.50| 0.027 | V  | 87.9(141.5)
DMG |33.2910|119.1930|10/24/1969| 82912.1| 10.0| 5.10| 0.022 | IV | 88.3(142.1)
GSP |34.3400|116.9000|11/27/1992|160057.5|  1.0| 5.30| 0.024 | V  | 91.2(146.8)
GSP |34.3690|116.8970|12/04/1992|020857.5|  3.0| 5.30| 0.024 | V  | 91.2(146.8)
DMG |34.1800|116.9200|01/16/1930| 034 3.6|  0.0| 5.10| 0.022 | IV | 91.6(147.4)
DMG |34.1800|116.9200|01/16/1930| 02433.9|  0.0| 5.20| 0.023 | IV | 91.6(147.4)
DMG |34.0000|120.0170|04/01/1945|234342.0|  0.0| 5.40| 0.025 | V  | 91.8(147.7)
DMG |35.7150|118.0740|03/15/1946|14 035.4|  0.0| 5.30| 0.024 | IV | 91.8(147.7)
DMG |35.7250|118.0550|03/15/1946|134935.9| 22.0| 6.30| 0.040 | V  | 92.7(149.2)
DMG |35.7140|117.9770|03/15/1946|191853.6|  0.0| 5.40| 0.025 | V  | 93.3(150.1)
```

APPENDIX D

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-------------------------------------------------------------------------------
    |       |        |          |  TIME   |     |      | SITE  |SITE|  APPROX.
FILE|  LAT. |  LONG. |   DATE   |  (UTC)  |DEPTH|QUAKE|  ACC. | MM |  DISTANCE
CODE| NORTH |  WEST  |          | H M Sec | (km)| MAG.|   g   |INT.|  mi   [km]
----+-------+--------+----------+--------+-----+-----+-------+----+--------------------
DMG |35.7450|118.0390|03/16/1946| 94617.9|  0.0| 5.10| 0.021 | IV |  94.3(151.8)
GSP |34.1950|116.8620|08/17/1992|204152.1| 11.0| 5.30| 0.023 | IV |  94.6(152.3)
DMG |35.7510|118.0290|03/15/1946|215433.4|  0.0| 5.20| 0.022 | IV |  94.9(152.7)
DMG |35.3000|119.8000|01/09/1857|16 0 0.0|  0.0| 7.90| 0.091 | VII|  95.1(153.1)
GSP |34.1630|116.8550|06/28/1992|144321.0|  6.0| 5.30| 0.023 | IV |  95.5(153.6)
GSP |34.2390|116.8370|07/09/1992|014357.6|  0.0| 5.30| 0.023 | IV |  95.6(153.8)
DMG |35.7530|117.9860|03/15/1946|1321 0.9|  0.0| 5.20| 0.022 | IV |  95.7(154.0)
DMG |33.8000|117.0000|12/25/1899|1225 0.0|  0.0| 6.40| 0.041 |  V |  96.0(154.5)
DMG |35.7780|118.0490|01/28/1961| 81246.2|  5.5| 5.30| 0.023 | IV |  96.4(155.1)
GSN |34.2030|116.8270|06/28/1992|150530.7|  5.0| 6.70| 0.048 | VI |  96.5(155.3)
DMG |35.7470|117.9080|03/18/1946|155042.6|  4.4| 5.30| 0.023 | IV |  96.7(155.7)
DMG |33.2670|119.4500|11/18/1947|2159 3.0|  0.0| 5.00| 0.019 | IV |  97.2(156.4)
DMG |33.7500|117.0000|06/06/1918|2232 0.0|  0.0| 5.00| 0.019 | IV |  97.7(157.2)
DMG |33.7500|117.0000|04/21/1918|223225.0|  0.0| 6.80| 0.050 | VI |  97.7(157.2)
DMG |34.1000|116.8000|10/24/1935|1448 7.6|  0.0| 5.10| 0.020 | IV |  99.5(160.1)
DMG |33.9500|116.8500|09/28/1946| 719 9.0|  0.0| 5.00| 0.019 | IV |  99.7(160.5)
DMG |35.6310|117.5130|09/17/1938|1423 4.1| -2.0| 5.00| 0.019 | IV |  99.8(160.5)

*******************************************************************************

-END OF SEARCH-   148 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH:   1800  TO  2000

LENGTH OF SEARCH TIME:   201  years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 5.6 MILES (9.1 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.9

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.331 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
  a-value=  1.519
  b-value=  0.377
  beta-value=  0.868





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```

APPENDIX D

```
TABLE OF MAGNITUDES AND EXCEEDANCES:
------------------------------------

  Earthquake | Number of Times | Cumulative
   Magnitude |    Exceeded     | No. / Year
  -----------+-----------------+-----------
      4.0    |       148       |   0.73632
      4.5    |       148       |   0.73632
      5.0    |       148       |   0.73632
      5.5    |        54       |   0.26866
      6.0    |        28       |   0.13930
      6.5    |        11       |   0.05473
      7.0    |         7       |   0.03483
      7.5    |         2       |   0.00995
```

APPENDIX D

SUMMARY TABLE OF FRISKSP PARAMETERS AND OUTPUT

```
*****************************************
*                                       *
*        FRISKSP - IBM-PC VERSION       *
*                                       *
*  Modified from *FRISK* (McGuire 1978) *
*   To Perform Probabilistic Earthquake *
*  Hazard Analyses Using Multiple Forms *
* of Ground-Motion-Attenuation Relations *
*                                       *
*   Modifications by:  Thomas F. Blake  *
*            - 1988-2000 -              *
*                                       *
*             VERSION 4.00              *
*           (Visual Fortran)            *
*****************************************


ANALYSIS PERFORMED FOR Synergy

JOB NO.: 04-803S-4

DATE:  1/15/04

DESCRIPTION:  SUMMARY OF FRISKSP.OUT FILES FOR BOORE ET AL. (1997), SADIGH ET AL. (1997) AND CAMPBELL & BOZORGNIA (1997)

Note:  Binary File Will Be Generated Only For First Attenuation Problem and First Site.

 IPR_FILE
  0

 IPLOT
  0

 SITE CONDITION
  0.00

 BASEMENT     DEPTH (km)
  5.00

 RHGA FACTOR     RHGA DIST (km)
```

APPENDIX D

```
    1.000          0.000

 NFLT  NSITE   NPROB   NATT    LCD
 19     1       2       6       1

Boore et al. (1997)
ATT      C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  1   -0.3130    0.5270    0.0000   -0.7780   -0.3710 1396.0000    5.5700  250.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
ATT     C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA   IRELAF      ICHK
  1    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.5200     35          0

ATT      C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  2   -0.1170    0.5270    0.0000   -0.7780   -0.3710 1396.0000    5.5700  250.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
ATT     C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA   IRELAF      ICHK
  2    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.5200     35          0

ATT      C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  3   -0.3130    0.5270    0.0000   -0.7780   -0.3710 1396.0000    5.5700  250.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
ATT     C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA   IRELAF      ICHK
  3    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.5200     35          0

ATT      C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  4   -0.1170    0.5270    0.0000   -0.7780   -0.3710 1396.0000    5.5700  250.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
ATT     C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA   IRELAF      ICHK
  4    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.5200     35          0

ATT      C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  5   -0.1170    0.5270    0.0000   -0.7780   -0.3710 1396.0000    5.5700  250.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
ATT     C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA   IRELAF      ICHK
  5    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.5200     35          0

ATT      C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  6   -0.1170    0.5270    0.0000   -0.7780   -0.3710 1396.0000    5.5700  250.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
ATT     C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA   IRELAF      ICHK
  6    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.5200     35          0

 PROBLEM DATA:

 BORE ET AL(1997) NEHRP D (250)1 AMPLITUDES:
     15        0.100    0.200    0.300    0.400    0.500    0.600    0.700    0.800    0.900    1.000
               1.100    1.200    1.300    1.400    1.500
```

APPENDIX D

```
     MAGNITUDE WEIGHTING FACTORS:     MWF:   0    MWF MAGNITUDE:     0.00

 BOORE ET AL(1997) NEHRP D (250)2 AMPLITUDES:
     15        0.100    0.200    0.300    0.400    0.500    0.600    0.700    0.800    0.900    1.000
               1.100    1.200    1.300    1.400    1.500

     MAGNITUDE WEIGHTING FACTORS:     MWF:   2    MWF MAGNITUDE:     7.50

 RISKS SPECIFIED:
   5     0.013900  0.010000  0.005000  0.002105  0.001000

 SITE COORDINATES:
   1     -118.4967   34.4314

SADIGH ET AL. (1997)
ATT         C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  1    -2.1700    1.0000    1.7000    0.0000    0.0000    0.0000    0.0000    1.5200    0.1600    0.0000    0.0000    0.0000    0.0000    0.0000
ATT        C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA    IRELAF      ICHK
  1     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    1.0000        25         0

ATT         C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  2    -1.9200    1.0000    1.7000    0.0000    0.0000    0.0000    0.0000    1.5200    0.1600    0.0000    0.0000    0.0000    0.0000    0.0000
ATT        C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA    IRELAF      ICHK
  2     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    1.0000        25         0

ATT         C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  3    -2.1700    1.0000    1.7000    0.0000    0.0000    0.0000    0.0000    1.5200    0.1600    0.0000    0.0000    0.0000    0.0000    0.0000
ATT        C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA    IRELAF      ICHK
  3     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    1.0000        25         0

ATT         C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  4    -1.9200    1.0000    1.7000    0.0000    0.0000    0.0000    0.0000    1.5200    0.1600    0.0000    0.0000    0.0000    0.0000    0.0000
ATT        C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA    IRELAF      ICHK
  4     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    1.0000        25         0

ATT         C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  5    -1.9200    1.0000    1.7000    0.0000    0.0000    0.0000    0.0000    1.5200    0.1600    0.0000    0.0000    0.0000    0.0000    0.0000
ATT        C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA    IRELAF      ICHK
  5     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    1.0000        25         0

ATT         C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  6    -1.9200    1.0000    1.7000    0.0000    0.0000    0.0000    0.0000    1.5200    0.1600    0.0000    0.0000    0.0000    0.0000    0.0000
```

APPENDIX D

```
ATT      C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA    IRELAF      ICHK
  6   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    1.0000      25           0

 PROBLEM DATA:

 SADIGH ET AL. (1997) DEEP SOIL 1 AMPLITUDES:
     15        0.100    0.200    0.300    0.400    0.500    0.600    0.700    0.800    0.900    1.000
               1.100    1.200    1.300    1.400    1.500

     MAGNITUDE WEIGHTING FACTORS:     MWF:  0   MWF MAGNITUDE:     0.00

 SADIGH ET AL. (1997) DEEP SOIL 2 AMPLITUDES:
     15        0.100    0.200    0.300    0.400    0.500    0.600    0.700    0.800    0.900    1.000
               1.100    1.200    1.300    1.400    1.500

     MAGNITUDE WEIGHTING FACTORS:     MWF:  2   MWF MAGNITUDE:     7.50

 RISKS SPECIFIED:
   5     0.013900  0.010000  0.005000  0.002105  0.001000

 SITE COORDINATES:
  1     -118.4967   34.4314

CAMPBELL AND BOZORGNIA (1997)
ATT       C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  1  -3.5120    0.9040   -1.3280    0.1490    0.6470    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
ATT      C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA    IRELAF      ICHK
  1   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    3.0000    1.0000      37           0

ATT       C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  2  -3.5120    0.9040   -1.3280    0.1490    0.6470    1.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
ATT      C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA    IRELAF      ICHK
  2   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    3.0000    1.0000      37           0

ATT       C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  3  -3.5120    0.9040   -1.3280    0.1490    0.6470    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
ATT      C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA    IRELAF      ICHK
  3   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    3.0000    1.0000      37           0

ATT       C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  4  -3.5120    0.9040   -1.3280    0.1490    0.6470    1.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
ATT      C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA    IRELAF      ICHK
```

APPENDIX D

```
  4   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    3.0000    1.0000      37         0

ATT      C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  5  -3.5120    0.9040   -1.3280    0.1490    0.6470    1.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
ATT     C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA    IRELAF      ICHK
  5   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    3.0000    1.0000      37         0

ATT      C1        C2        C3        C4        C5        C6        C7        C8        C9       C10       C11       C12       C13       C14
  6  -3.5120    0.9040   -1.3280    0.1490    0.6470    1.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
ATT     C15       C16       C17       C18       C19       C20       C21       C22       C23       PER     DSMIN      SIGA    IRELAF      ICHK
  6   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    3.0000    1.0000      37         0

 PROBLEM DATA:

 CAMP. & BOZ. (1997 Rev.) AL 1    AMPLITUDES:
     15        0.100    0.200    0.300    0.400    0.500    0.600    0.700    0.800    0.900    1.000
               1.100    1.200    1.300    1.400    1.500

      MAGNITUDE WEIGHTING FACTORS:     MWF:   0    MWF MAGNITUDE:     0.00

 CAMP. & BOZ. (1997 Rev.) AL 2    AMPLITUDES:
     15        0.100    0.200    0.300    0.400    0.500    0.600    0.700    0.800    0.900    1.000
               1.100    1.200    1.300    1.400    1.500

      MAGNITUDE WEIGHTING FACTORS:     MWF:   2    MWF MAGNITUDE:     7.50

 RISKS SPECIFIED:
   5     0.013900  0.010000  0.005000  0.002105  0.001000

 SITE COORDINATES:
  1    -118.4967    34.4314

FAULT INFORMATION:
 ------------------------------------------------------------------------------

 FAULT  1

 FAULT NAME:  SAN GABRIEL


 NFP    NRL   ATTENUATION CODES:
 10     10      1  3
```

APPENDIX D

```
 AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
 5.000   0.1000      1  1.0000  2.072  3.600  2.000  1.000

 NMAX AMMAX  PMAX
  1    7.00  1.00


   dmchar ampchar dmpchar
     0.50    6.50    1.00

 Slip Rate (  1.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.936E+13
 LOG10[Mo(m)]         = (1.50)m + (16.05)
   IMAX    AMMAX     PMAX      ARATE = EX-RATE + CH-RATE
      1  7.0000  1.0000    0.00616    0.00445    0.00171


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490      0.910      0.240

 FAULT SEGMENT COORDINATES
  1     -118.2802    34.3179
  2     -118.3118    34.3394
  3     -118.3904    34.3598
  4     -118.4577    34.3853
  5     -118.5587    34.4363
  6     -118.5975    34.4649
  7     -118.6873    34.5536
  8     -118.7026    34.5700
  9     -118.7312    34.5792
 10     -118.8761    34.7139

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
  1        0.0000     0.0000
```

APPENDIX D

```
 2       0.0000   13.0000

Computed Total Fault Area = 0.93E+03

----------------------------------------------------------------------------

FAULT  2

FAULT NAME:  HOLSER


NFP    NRL   ATTENUATION CODES:
 5     10      2  4

AMMIN    AMSTEP  IRATE    RATE    BETA    ECTR    ECDP    COEF
5.000    0.1000      1  0.4000   2.072   1.000   2.000   1.000

NMAX AMMAX  PMAX
 1    6.50  1.00


  dmchar ampchar dmpchar
    0.50    6.00    1.00

Slip Rate (  0.4000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area    - cm**2
0.280E+13
LOG10[Mo(m)]         = (1.50)m + (16.05)
  IMAX    AMMAX     PMAX      ARATE = EX-RATE + CH-RATE
     1  6.5000  1.0000    0.00212    0.00097    0.00115


IND_RL
     2

RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

FAULT SEGMENT COORDINATES
 1    -118.7533   34.4386
 2    -118.7345   34.4386
```

APPENDIX D

```
 3    -118.6741   34.4499
 4    -118.6427   34.4487
 5    -118.5483   34.4172

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1        0.0000    0.0000
 2        5.9000   12.7000

Computed Total Fault Area = 0.26E+03

-----------------------------------------------------------------------------

FAULT  3

FAULT NAME:  NORTHRIDGE (E. Oak Ridge)


NFP    NRL   ATTENUATION CODES:
 2     10      5  6

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  1.5000  2.072  1.500  2.000  1.000

NMAX AMMAX  PMAX
 1    6.90  1.00


  dmchar ampchar dmpchar
    0.50    6.40    1.00

Slip Rate (  1.5000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.360E+12
Input Fault Area    - cm**2
0.682E+13
LOG10[Mo(m)]        = (1.50)m + (16.05)
  IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
     1  6.9000  1.0000   0.00891   0.00602   0.00288
```

APPENDIX D

```
IND_RL
     2

RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

FAULT SEGMENT COORDINATES
 1    -118.7027   34.4057
 2    -118.4078   34.2781

NDP
  3
ORIGINAL FAULT CROSS SECTION
 1       0.0000    4.9900
 2       0.0000    5.0000
 3      16.3000   19.7000

Computed Total Fault Area = 0.67E+03

----------------------------------------------------------------------------

FAULT  4

FAULT NAME:  SANTA SUSANA


NFP    NRL   ATTENUATION CODES:
 8     10      2  4

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  5.0000  2.072  1.300  2.000  1.000

NMAX AMMAX  PMAX
 1    6.60  1.00


  dmchar ampchar dmpchar
    0.50    6.10    1.00

Slip Rate (  5.0000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area    - cm**2
```

APPENDIX D

```
0.432E+13
 LOG10[Mo(m)]          = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX      ARATE = EX-RATE + CH-RATE
      1  6.6000  1.0000   0.03249   0.01677   0.01573


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

 FAULT SEGMENT COORDINATES
  1    -118.4950   34.3242
  2    -118.4955   34.3242
  3    -118.5340   34.3030
  4    -118.5811   34.3204
  5    -118.6163   34.3229
  6    -118.6339   34.3330
  7    -118.7081   34.3506
  8    -118.7672   34.3594

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
  1        0.0000    0.0000
  2        9.2000   13.1000

 Computed Total Fault Area = 0.41E+03

 ----------------------------------------------------------------------------

 FAULT  5

 FAULT NAME:  SIERRA MADRE (San Fernando)


 NFP    NRL   ATTENUATION CODES:
  8     10      2  4

 AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
 5.000   0.1000      1  2.0000  2.072  0.900  2.000  1.000
```

APPENDIX D

```
 NMAX AMMAX  PMAX
  1    6.70  1.00


   dmchar ampchar dmpchar
     0.50    6.20    1.00

 Slip Rate (  2.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.324E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX    AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  6.7000  1.0000   0.00781   0.00447   0.00334


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

 FAULT SEGMENT COORDINATES
  1     -118.2940   34.2782
  2     -118.2951   34.2782
  3     -118.3196   34.2745
  4     -118.3956   34.2905
  5     -118.4189   34.3039
  6     -118.4520   34.2940
  7     -118.4778   34.3027
  8     -118.4790   34.3027

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
  1        0.0000    0.0000
  2       12.7000   12.7000

 Computed Total Fault Area = 0.33E+03

 ----------------------------------------------------------------------------
```

APPENDIX D

```
FAULT  6

FAULT NAME:  VERDUGO


NFP     NRL   ATTENUATION CODES:
 7      10       2  4

AMMIN    AMSTEP  IRATE    RATE   BETA   ECTR    ECDP    COEF
5.000    0.1000      1  0.5000  2.072  1.400  2.000  1.000

NMAX AMMAX  PMAX
 1    6.70  1.00


  dmchar ampchar dmpchar
    0.50    6.20    1.00

Slip Rate (  0.5000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area    - cm**2
0.522E+13
LOG10[Mo(m)]         = (1.50)m + (16.05)
  IMAX    AMMAX     PMAX      ARATE = EX-RATE + CH-RATE
     1  6.7000  1.0000    0.00315    0.00180    0.00135


IND_RL
     2

RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490      0.910      0.240

FAULT SEGMENT COORDINATES
 1    -118.1536   34.1313
 2    -118.1865   34.1496
 3    -118.2285   34.1551
 4    -118.2907   34.1971
 5    -118.3657   34.2227
 6    -118.4077   34.2538
 7    -118.4206   34.2612
```

APPENDIX D

```
NDP
  2
ORIGINAL FAULT CROSS SECTION
 1       0.0000    0.0000
 2      12.7000   12.7000

Computed Total Fault Area = 0.52E+03

--------------------------------------------------------------------------------

FAULT  7

FAULT NAME:  OAK RIDGE (Onshore)


NFP    NRL   ATTENUATION CODES:
 9     10      2  4

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  4.0000  2.072  2.500  2.000  1.000

NMAX AMMAX  PMAX
 1    6.90  1.00


  dmchar ampchar dmpchar
    0.50    6.40    1.00

Slip Rate (  4.0000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area     - cm**2
0.700E+13
LOG10[Mo(m)]          = (1.50)m + (16.05)
  IMAX   AMMAX     PMAX      ARATE = EX-RATE + CH-RATE
     1  6.9000  1.0000    0.02235    0.01511    0.00723


IND_RL
     2

RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240
```

APPENDIX D

```
FAULT SEGMENT COORDINATES
 1    -119.2050   34.2481
 2    -119.1582   34.2630
 3    -119.0974   34.3165
 4    -119.0402   34.3522
 5    -118.9589   34.3631
 6    -118.8805   34.3813
 7    -118.8104   34.3850
 8    -118.7742   34.4013
 9    -118.7227   34.3978

NDP
  3
ORIGINAL FAULT CROSS SECTION
 1       0.0000    1.0000
 2       0.0000    1.1000
 3       5.9000   13.7000

Computed Total Fault Area = 0.67E+03

-----------------------------------------------------------------------------

FAULT  8

FAULT NAME:  SAN CAYETANO


NFP    NRL   ATTENUATION CODES:
 9     10      2  4

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  6.0000  2.072  2.200  2.000  1.000

NMAX AMMAX  PMAX
 1    6.80  1.00


  dmchar ampchar dmpchar
    0.50    6.30    1.00

Slip Rate (  6.0000 mm/yr) Converted to Activity Rate:
```

APPENDIX D

```
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.660E+13
 LOG10[Mo(m)]         = (1.50)m + (16.05)
   IMAX    AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  6.8000  1.0000   0.03867   0.02422   0.01445


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

 FAULT SEGMENT COORDINATES
  1    -118.7621   34.4361
  2    -118.8313   34.4047
  3    -118.9130   34.4172
  4    -118.9281   34.4587
  5    -118.9382   34.4612
  6    -118.9835   34.4348
  7    -119.0690   34.4361
  8    -119.1067   34.4386
  9    -119.1708   34.4625

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
  1       0.0000    0.0000
  2       7.5000   13.0000

 Computed Total Fault Area = 0.60E+03

 ------------------------------------------------------------------------------

 FAULT  9

 FAULT NAME:  SIERRA MADRE


 NFP    NRL   ATTENUATION CODES:
 12     10       2  4
```

APPENDIX D

```
 AMMIN    AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
 5.000    0.1000      1  3.0000  2.072  2.800  2.000  1.000

 NMAX AMMAX  PMAX
  1    7.00  1.00


   dmchar ampchar dmpchar
     0.50    6.50    1.00

 Slip Rate (  3.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.103E+14
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  7.0000  1.0000   0.02034   0.01469   0.00565


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

 FAULT SEGMENT COORDINATES
  1    -117.7397   34.1231
  2    -117.7691   34.1317
  3    -117.8176   34.1323
  4    -117.8807   34.1470
  5    -117.9402   34.1501
  6    -118.0027   34.1752
  7    -118.0683   34.1758
  8    -118.1118   34.2010
  9    -118.1492   34.2028
 10    -118.2461   34.2279
 11    -118.2896   34.2751
 12    -118.2960   34.2751

 NDP
   2
```

APPENDIX D

```
ORIGINAL FAULT CROSS SECTION
 1       0.0000    0.0000
 2      12.7000   12.7000

Computed Total Fault Area = 0.11E+04

-----------------------------------------------------------------------------

FAULT 10

FAULT NAME:  SAN ANDREAS - Mojave


NFP    NRL   ATTENUATION CODES:
 3     10      1  3

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1 30.0000  2.072  4.900  2.000  0.500

NMAX AMMAX  PMAX
 1    7.10  1.00


  dmchar ampchar dmpchar
    0.50    6.60    1.00

Slip Rate ( 30.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.300E+12
 Input Fault Area    - cm**2
0.119E+14
 LOG10[Mo(m)]         = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  7.1000  1.0000   0.17754   0.13551   0.04202


 IND_RL
     2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA     SIG_RA  -3.490     0.910     0.240

 FAULT SEGMENT COORDINATES
```

APPENDIX D

```
 1    -118.5024   34.6989
 2    -118.0075   34.5116
 3    -117.5298   34.3106

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1       0.0000    0.0000
 2       0.0000   12.0000

Computed Total Fault Area = 0.12E+04

-----------------------------------------------------------------------------

FAULT 11

FAULT NAME:  SAN ANDREAS - 1857 Rupture


NFP    NRL   ATTENUATION CODES:
12     10      1  3

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1 34.0000  2.072 17.200  2.000  0.500

NMAX AMMAX  PMAX
 1    7.80  1.00


  dmchar ampchar dmpchar
    0.50    7.30    1.00

Slip Rate ( 34.0000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.300E+12
Input Fault Area    - cm**2
0.414E+14
LOG10[Mo(m)]        = (1.50)m + (16.05)
  IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
     1  7.8000  1.0000   0.22372   0.20895   0.01477
```

APPENDIX D

```
IND_RL
     2

RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490      0.910      0.240

FAULT SEGMENT COORDINATES
 1    -120.5605   36.0019
 2    -120.2928   35.7488
 3    -119.8632   35.3106
 4    -119.8598   35.3072
 5    -119.6673   35.1336
 6    -119.4061   34.9395
 7    -119.2103   34.8639
 8    -118.9010   34.8175
 9    -118.5075   34.7006
10    -118.5024   34.6989
11    -118.0075   34.5116
12    -117.5298   34.3106

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1       0.0000    0.0000
 2       0.0000   12.0000

Computed Total Fault Area = 0.41E+04

-----------------------------------------------------------------------------

FAULT 12

FAULT NAME:  SAN ANDREAS - Carrizo


NFP    NRL   ATTENUATION CODES:
 6     10      1  3

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000       1 34.0000  2.072  7.200  2.000  0.500

NMAX AMMAX  PMAX
 1    7.20  1.00
```

APPENDIX D

```
  dmchar ampchar dmpchar
    0.50    6.70    1.00

 Slip Rate ( 34.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.300E+12
 Input Fault Area    - cm**2
0.174E+14
 LOG10[Mo(m)]          = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  7.2000  1.0000   0.24626   0.19696   0.04930


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA     SIG_RA  -3.490     0.910     0.240

 FAULT SEGMENT COORDINATES
  1    -119.8598   35.3072
  2    -119.6673   35.1336
  3    -119.4061   34.9395
  4    -119.2103   34.8639
  5    -118.9010   34.8175
  6    -118.5075   34.7006

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
  1        0.0000    0.0000
  2        0.0000   12.0000

 Computed Total Fault Area = 0.17E+04

 -----------------------------------------------------------------------------

 FAULT 13

 FAULT NAME:  SIMI-SANTA ROSA
```

APPENDIX D

```
 NFP    NRL   ATTENUATION CODES:
  5     10      2  4

 AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
 5.000   0.1000      1  1.0000  2.072  1.500  2.000  1.000

 NMAX AMMAX  PMAX
  1    6.70  1.00


   dmchar ampchar dmpchar
     0.50    6.20    1.00

 Slip Rate (  1.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.450E+13
 LOG10[Mo(m)]         = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX      ARATE = EX-RATE + CH-RATE
      1  6.7000  1.0000    0.00543    0.00311    0.00232


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490      0.910      0.240

 FAULT SEGMENT COORDINATES
  1    -118.7982   34.2901
  2    -118.9084   34.2578
  3    -118.9364   34.2615
  4    -118.9680   34.2615
  5    -119.1147   34.2261

 NDP
   3
 ORIGINAL FAULT CROSS SECTION
  1       0.0000    1.0000
  2       0.0000    1.1000
  3       7.5000   14.0000
```

APPENDIX D

```
Computed Total Fault Area = 0.45E+03

-----------------------------------------------------------------------------

FAULT 14

FAULT NAME:  HOLLYWOOD


NFP    NRL   ATTENUATION CODES:
 4     10      2  4

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  1.0000  2.072  0.800  2.000  1.000

NMAX AMMAX  PMAX
 1    6.40  1.00


  dmchar ampchar dmpchar
    0.50    5.90    1.00

Slip Rate (  1.0000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area    - cm**2
0.238E+13
LOG10[Mo(m)]         = (1.50)m + (16.05)
  IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
     1  6.4000  1.0000   0.00575   0.00229   0.00346


IND_RL
     2

RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

FAULT SEGMENT COORDINATES
 1    -118.2302   34.1192
 2    -118.3170   34.1104
 3    -118.3723   34.0991
```

APPENDIX D

```
 4    -118.4063   34.0827

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1       0.0000    0.0000
 2       4.8000   13.2000

Computed Total Fault Area = 0.25E+03

--------------------------------------------------------------------------------

FAULT 15

FAULT NAME:  SANTA MONICA


NFP    NRL   ATTENUATION CODES:
 3     10      2  4

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  1.0000  2.072  1.400  2.000  1.000

NMAX AMMAX  PMAX
 1    6.60  1.00


  dmchar ampchar dmpchar
    0.50    6.10    1.00

 Slip Rate (  1.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.360E+12
 Input Fault Area    - cm**2
0.364E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
     1  6.6000  1.0000   0.00597   0.00308   0.00289


 IND_RL
     2
```

APPENDIX D

```
RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

FAULT SEGMENT COORDINATES
 1    -118.4085   34.0814
 2    -118.5244   34.0263
 3    -118.6855   33.9896

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1       0.0000    0.0000
 2       3.4000   12.6000

Computed Total Fault Area = 0.35E+03

----------------------------------------------------------------------------

FAULT 16

FAULT NAME:  SANTA YNEZ (East)


NFP    NRL   ATTENUATION CODES:
 6     10      1  3

AMMIN    AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  2.0000  2.072  3.400  2.000  1.000

NMAX AMMAX  PMAX
 1    7.00  1.00


  dmchar ampchar dmpchar
    0.50    6.50    1.00

Slip Rate (  2.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.884E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
```

APPENDIX D

```
   IMAX    AMMAX     PMAX      ARATE = EX-RATE + CH-RATE
      1  7.0000   1.0000    0.01164    0.00840    0.00323


 IND_RL
     2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

 FAULT SEGMENT COORDINATES
  1    -119.6298   34.4939
  2    -119.5091   34.4864
  3    -119.3783   34.5065
  4    -119.1972   34.5367
  5    -119.1167   34.5317
  6    -118.9055   34.5870

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
  1       0.0000    0.0000
  2       2.3000   12.8000

 Computed Total Fault Area = 0.89E+03

 ----------------------------------------------------------------------------

 FAULT 17

 FAULT NAME:  RAYMOND


 NFP    NRL   ATTENUATION CODES:
  4     10      2  4

 AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
 5.000   0.1000      1  0.5000  2.072  1.000  2.000  1.000

 NMAX AMMAX  PMAX
  1    6.50  1.00
```

APPENDIX D

```
  dmchar ampchar dmpchar
    0.50    6.00    1.00

 Slip Rate (  0.5000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.273E+13
 LOG10[Mo(m)]         = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX      ARATE = EX-RATE + CH-RATE
      1  6.5000  1.0000   0.00259   0.00118   0.00140


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

 FAULT SEGMENT COORDINATES
  1    -118.0051   34.1670
  2    -118.0579   34.1444
  3    -118.1258   34.1293
  4    -118.2227   34.1217

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
  1       0.0000    0.0000
  2       3.4000   12.6000

 Computed Total Fault Area = 0.26E+03

 ----------------------------------------------------------------------------

 FAULT 18

 FAULT NAME:  MALIBU COAST


 NFP    NRL   ATTENUATION CODES:
  4     10      2  4
```

APPENDIX D

```
AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  0.3000  2.072  1.800  2.000  1.000

NMAX AMMAX  PMAX
 1    6.70  1.00


  dmchar ampchar dmpchar
    0.50    6.20    1.00

Slip Rate (  0.3000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area    - cm**2
0.481E+13
LOG10[Mo(m)]         = (1.50)m + (16.05)
  IMAX    AMMAX     PMAX      ARATE = EX-RATE + CH-RATE
     1  6.7000   1.0000   0.00174    0.00100    0.00074


IND_RL
     2

RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA     SIG_RA  -3.490     0.910     0.240

FAULT SEGMENT COORDINATES
 1    -118.5333   34.0299
 2    -118.6339   34.0412
 3    -118.6666   34.0387
 4    -118.9332   34.0513

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1        0.0000    0.0000
 2        3.4000   12.6000

Computed Total Fault Area = 0.48E+03

-----------------------------------------------------------------------------

FAULT 19
```

APPENDIX D

```
 FAULT NAME:  NEWPORT-INGLEWOOD (L.A.Basin)


 NFP    NRL   ATTENUATION CODES:
  5     10      1  3

 AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
 5.000   0.1000      1  1.0000  2.072  3.200  2.000  1.000

 NMAX AMMAX  PMAX
  1    6.90  1.00


   dmchar ampchar dmpchar
     0.50    6.40    1.00

 Slip Rate (  1.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.832E+13
 LOG10[Mo(m)]         = (1.50)m + (16.05)
   IMAX    AMMAX     PMAX      ARATE = EX-RATE + CH-RATE
      1  6.9000  1.0000    0.00664    0.00449    0.00215


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA       B_RA    SIG_RA  -3.490      0.910      0.240

 FAULT SEGMENT COORDINATES
  1     -118.3723   34.0337
  2     -118.1862   33.8073
  3     -118.1510   33.7822
  4     -118.1208   33.7746
  5     -117.9246   33.6061

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
```

APPENDIX D

```
 1       0.0000    0.0000
 2       0.0000   13.0000

Computed Total Fault Area = 0.83E+03

------------------------------------------------------------------------------------------------------

SITE 1 COORDINATES: -118.4967  34.4314

BOORE ET AL(1997) NEHRP D (250)Problem # 1
    AMPLITUDES (g):     0.1000E+000.2000E+000.3000E+000.4000E+000.5000E+000.6000E+000.7000E+000.8000E+000.9000E+000.1000E+01
    LN (AMPLITUDE):       -2.30      -1.61      -1.20      -0.92      -0.69      -0.51      -0.36      -0.22      -0.11       0.00
  FAULT    1 E(NO/YR)   0.4359E-020.2694E-020.1782E-020.1212E-020.8305E-030.5709E-030.3936E-030.2726E-030.1899E-030.1331E-03
  FAULT    2 E(NO/YR)   0.1904E-020.1283E-020.7874E-030.4696E-030.2789E-030.1669E-030.1012E-030.6228E-040.3893E-040.2472E-04
  FAULT    3 E(NO/YR)   0.6747E-020.3558E-020.1912E-020.1046E-020.5804E-030.3276E-030.1884E-030.1105E-030.6609E-040.4027E-04
  FAULT    4 E(NO/YR)   0.2921E-010.2040E-010.1342E-010.8667E-020.5568E-020.3586E-020.2327E-020.1524E-020.1009E-020.6761E-03
  FAULT    5 E(NO/YR)   0.7039E-020.4971E-020.3390E-020.2296E-020.1547E-020.1042E-020.7040E-030.4782E-030.3273E-030.2258E-03
  FAULT    6 E(NO/YR)   0.1945E-020.7566E-030.2930E-030.1185E-030.5055E-040.2271E-040.1070E-040.5258E-050.2685E-050.1418E-05
  FAULT    7 E(NO/YR)   0.9756E-020.3116E-020.1092E-020.4133E-030.1678E-030.7244E-040.3302E-040.1577E-040.7857E-050.4059E-05
  FAULT    8 E(NO/YR)   0.1757E-010.5116E-020.1593E-020.5407E-030.1994E-030.7911E-040.3345E-040.1495E-040.7009E-050.3428E-05
  FAULT    9 E(NO/YR)   0.8103E-020.2562E-020.9247E-030.3649E-030.1548E-030.6977E-040.3313E-040.1646E-040.8503E-050.4548E-05
  FAULT   10 E(NO/YR)   0.2657E-010.7030E-020.2127E-020.7084E-030.2566E-030.1001E-030.4161E-040.1829E-040.8443E-050.4067E-05
  FAULT   11 E(NO/YR)   0.1476E-010.4819E-020.2082E-020.9491E-030.4474E-030.2182E-030.1101E-030.5734E-040.3078E-040.1698E-04
  FAULT   12 E(NO/YR)   0.1856E-010.3825E-020.9994E-030.3019E-030.1019E-030.3767E-040.1500E-040.6363E-050.2849E-050.1337E-05
  FAULT   13 E(NO/YR)   0.2249E-020.5343E-030.1372E-030.3954E-040.1269E-040.4463E-050.1698E-050.6904E-060.2973E-060.1345E-06
  FAULT   14 E(NO/YR)   0.2704E-020.5696E-030.1266E-030.3219E-040.9284E-050.2978E-050.1045E-050.3951E-060.1593E-060.6794E-07
  FAULT   15 E(NO/YR)   0.2424E-020.4977E-030.1118E-030.2885E-040.8437E-050.2741E-050.9727E-060.3718E-060.1514E-060.6513E-07
  FAULT   16 E(NO/YR)   0.1931E-020.2958E-030.5741E-040.1346E-040.3669E-050.1128E-050.3828E-060.1409E-060.5554E-070.2322E-07
  FAULT   17 E(NO/YR)   0.9586E-030.1678E-030.3317E-040.7746E-050.2089E-050.6339E-060.2121E-060.7700E-070.2995E-070.1236E-07
  FAULT   18 E(NO/YR)   0.6321E-030.1233E-030.2698E-040.6835E-050.1970E-050.6320E-060.2218E-060.8397E-070.3390E-070.1447E-07
  FAULT   19 E(NO/YR)   0.9233E-030.1099E-030.1764E-040.3581E-050.8693E-060.2427E-060.7582E-070.2596E-070.9600E-080.3789E-08
  TOTAL      E(NO/YR)   0.1583E+000.6243E-010.3092E-010.1722E-010.1022E-010.6306E-020.3995E-020.2584E-020.1700E-020.1136E-02
  TOTAL RISK            0.1464E+000.6053E-010.3044E-010.1707E-010.1017E-010.6287E-020.3987E-020.2581E-020.1699E-020.1136E-02

    AMPLITUDES (g):     0.1100E+010.1200E+010.1300E+010.1400E+010.1500E+01
    LN (AMPLITUDE):        0.10       0.18       0.26       0.34       0.41
  FAULT    1 E(NO/YR)   0.9400E-040.6687E-040.4792E-040.3460E-040.2517E-04
  FAULT    2 E(NO/YR)   0.1593E-040.1042E-040.6907E-050.4637E-050.3152E-05
  FAULT    3 E(NO/YR)   0.2497E-040.1575E-040.1009E-040.6557E-050.4321E-05
  FAULT    4 E(NO/YR)   0.4581E-030.3138E-030.2173E-030.1520E-030.1074E-03
  FAULT    5 E(NO/YR)   0.1572E-030.1104E-030.7821E-040.5588E-040.4027E-04
```

APPENDIX D

```
 FAULT   6 E(NO/YR)      0.7726E-060.4325E-060.2482E-060.1457E-060.8733E-07
 FAULT   7 E(NO/YR)      0.2167E-050.1191E-050.6721E-060.3884E-060.2293E-06
 FAULT   8 E(NO/YR)      0.1740E-050.9129E-060.4934E-060.2739E-060.1558E-06
 FAULT   9 E(NO/YR)      0.2508E-050.1422E-050.8261E-060.4908E-060.2976E-06
 FAULT  10 E(NO/YR)      0.2034E-050.1052E-050.5610E-060.3074E-060.1726E-06
 FAULT  11 E(NO/YR)      0.9615E-050.5571E-050.3298E-050.1992E-050.1225E-05
 FAULT  12 E(NO/YR)      0.6533E-060.3311E-060.1733E-060.9339E-070.5165E-07
 FAULT  13 E(NO/YR)      0.6358E-070.3123E-070.1588E-070.8321E-080.4484E-08
 FAULT  14 E(NO/YR)      0.3041E-070.1420E-070.6886E-080.3454E-080.1786E-08
 FAULT  15 E(NO/YR)      0.2939E-070.1383E-070.6755E-080.3411E-080.1775E-08
 FAULT  16 E(NO/YR)      0.1022E-070.4700E-080.2249E-080.1114E-080.5699E-09
 FAULT  17 E(NO/YR)      0.5373E-080.2443E-080.1156E-080.5665E-090.2867E-09
 FAULT  18 E(NO/YR)      0.6482E-080.3030E-080.1471E-080.7384E-090.3821E-09
 FAULT  19 E(NO/YR)      0.1582E-080.6935E-090.3174E-090.1509E-090.7414E-10
 TOTAL     E(NO/YR)      0.7698E-030.5282E-030.3667E-030.2574E-030.1825E-03
 TOTAL RISK              0.7695E-030.5281E-030.3666E-030.2574E-030.1825E-03

   SPECIFIED RISKS:        0.013900  0.010000  0.005000  0.002105  0.001000
   ESTIMATED LN AMP.  :     -0.828    -0.687    -0.433    -0.166     0.031
    ESTIMATED AMP. (g):     0.43703   0.50321   0.64837   0.84727   1.03163

BOORE ET AL(1997) NEHRP D (250)Problem # 2
    AMPLITUDES (g):      0.1000E+000.2000E+000.3000E+000.4000E+000.5000E+000.6000E+000.7000E+000.8000E+000.9000E+000.1000E+01
    LN (AMPLITUDE):        -2.30     -1.61     -1.20     -0.92     -0.69     -0.51     -0.36     -0.22     -0.11      0.00
 FAULT   1 E(NO/YR)      0.2631E-020.1586E-020.1046E-020.6801E-030.4360E-030.2785E-030.1784E-030.1152E-030.7509E-040.4949E-04
 FAULT   2 E(NO/YR)      0.1292E-020.6369E-030.2960E-030.1376E-030.6563E-040.3240E-040.1656E-040.8749E-050.4766E-050.2670E-05
 FAULT   3 E(NO/YR)      0.3741E-020.1859E-020.9048E-030.4348E-030.2124E-030.1066E-030.5518E-040.2942E-040.1614E-040.9093E-05
 FAULT   4 E(NO/YR)      0.1997E-010.1125E-010.6129E-020.3283E-020.1772E-020.9748E-030.5485E-030.3158E-030.1860E-030.1119E-03
 FAULT   5 E(NO/YR)      0.4740E-020.2880E-020.1745E-020.1027E-020.6006E-030.3536E-030.2110E-030.1279E-030.7885E-040.4943E-04
 FAULT   6 E(NO/YR)      0.1014E-020.2875E-030.8379E-040.2674E-040.9353E-050.3548E-050.1444E-050.6236E-060.2837E-060.1351E-06
 FAULT   7 E(NO/YR)      0.4984E-020.1352E-020.3899E-030.1243E-030.4355E-040.1657E-040.6762E-050.2930E-050.1337E-050.6385E-06
 FAULT   8 E(NO/YR)      0.8550E-020.1858E-020.4424E-030.1206E-030.3714E-040.1266E-040.4694E-050.1870E-050.7912E-060.3529E-06
 FAULT   9 E(NO/YR)      0.4145E-020.1219E-020.3864E-030.1345E-030.5100E-040.2084E-040.9075E-050.4172E-050.2010E-050.1009E-05
 FAULT  10 E(NO/YR)      0.1382E-010.3455E-020.9112E-030.2672E-030.8682E-040.3086E-040.1184E-040.4853E-050.2104E-050.9577E-06
 FAULT  11 E(NO/YR)      0.8122E-020.4020E-020.1995E-020.9756E-030.4832E-030.2452E-030.1280E-030.6875E-040.3793E-040.2147E-04
 FAULT  12 E(NO/YR)      0.1018E-010.2032E-020.4808E-030.1323E-030.4125E-040.1423E-040.5339E-050.2149E-050.9181E-060.4130E-06
 FAULT  13 E(NO/YR)      0.9813E-030.1482E-030.2678E-040.5882E-050.1516E-050.4445E-060.1446E-060.5132E-070.1958E-070.7947E-08
 FAULT  14 E(NO/YR)      0.8921E-030.8415E-040.1091E-040.1860E-050.3908E-060.9649E-070.2708E-070.8437E-080.2866E-080.1047E-08
 FAULT  15 E(NO/YR)      0.9263E-030.1052E-030.1549E-040.2906E-050.6592E-060.1735E-060.5145E-070.1682E-070.5963E-080.2265E-08
 FAULT  16 E(NO/YR)      0.9246E-030.1088E-030.1689E-040.3330E-050.7897E-060.2163E-060.6646E-070.2244E-070.8195E-080.3199E-08
 FAULT  17 E(NO/YR)      0.3123E-030.2652E-040.3218E-050.5232E-060.1059E-060.2538E-070.6942E-080.2115E-080.7045E-090.2530E-09
 FAULT  18 E(NO/YR)      0.2525E-030.2980E-040.4493E-050.8573E-060.1970E-060.5239E-070.1567E-070.5159E-080.1841E-080.7034E-09
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APPENDIX D

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  FAULT  19 E(NO/YR)     0.3812E-030.3105E-040.3775E-050.6212E-060.1276E-060.3102E-070.8611E-080.2660E-080.8977E-090.3263E-09
  TOTAL     E(NO/YR)     0.8786E-010.3297E-010.1489E-010.7360E-020.3843E-020.2091E-020.1177E-020.6825E-030.4063E-030.2476E-03
  TOTAL RISK             0.8411E-010.3243E-010.1478E-010.7333E-020.3836E-020.2089E-020.1176E-020.6823E-030.4062E-030.2475E-03

     AMPLITUDES (g):     0.1100E+010.1200E+010.1300E+010.1400E+010.1500E+01
     LN (AMPLITUDE):        0.10       0.18       0.26       0.34       0.41
  FAULT   1 E(NO/YR)     0.3298E-040.2223E-040.1515E-040.1043E-040.7256E-05
  FAULT   2 E(NO/YR)     0.1534E-050.9026E-060.5424E-060.3323E-060.2073E-06
  FAULT   3 E(NO/YR)     0.5248E-050.3097E-050.1866E-050.1145E-050.7155E-06
  FAULT   4 E(NO/YR)     0.6866E-040.4292E-040.2729E-040.1763E-040.1156E-04
  FAULT   5 E(NO/YR)     0.3149E-040.2037E-040.1337E-040.8893E-050.5991E-05
  FAULT   6 E(NO/YR)     0.6691E-070.3433E-070.1818E-070.9900E-080.5532E-08
  FAULT   7 E(NO/YR)     0.3171E-060.1631E-060.8658E-070.4726E-070.2646E-07
  FAULT   8 E(NO/YR)     0.1647E-060.8001E-070.4028E-070.2093E-070.1119E-07
  FAULT   9 E(NO/YR)     0.5252E-060.2822E-060.1560E-060.8852E-070.5140E-07
  FAULT  10 E(NO/YR)     0.4551E-060.2247E-060.1147E-060.6039E-070.3267E-07
  FAULT  11 E(NO/YR)     0.1244E-040.7367E-050.4451E-050.2740E-050.1715E-05
  FAULT  12 E(NO/YR)     0.1943E-060.9506E-070.4817E-070.2519E-070.1354E-07
  FAULT  13 E(NO/YR)     0.3403E-080.1527E-080.7142E-090.3465E-090.1737E-09
  FAULT  14 E(NO/YR)     0.4076E-090.1675E-090.7183E-100.3211E-100.1470E-10
  FAULT  15 E(NO/YR)     0.9132E-090.3876E-090.1721E-090.7944E-100.3777E-10
  FAULT  16 E(NO/YR)     0.1323E-080.5746E-090.2608E-090.1229E-090.5993E-10
  FAULT  17 E(NO/YR)     0.9690E-100.3917E-100.1652E-100.7200E-110.3216E-11
  FAULT  18 E(NO/YR)     0.2850E-090.1215E-090.5420E-100.2513E-100.1199E-10
  FAULT  19 E(NO/YR)     0.1264E-090.5162E-100.2206E-100.9718E-110.4425E-11
  TOTAL     E(NO/YR)     0.1541E-030.9777E-040.6313E-040.4142E-040.2759E-04
  TOTAL RISK             0.1541E-030.9777E-040.6313E-040.4142E-040.2759E-04

    SPECIFIED RISKS:        0.013900  0.010000  0.005000  0.002105  0.001000
    ESTIMATED LN AMP.  :     -1.179    -1.044    -0.784    -0.513    -0.317
     ESTIMATED AMP. (g):    0.30766   0.35218   0.45637   0.59860   0.72843


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SADIGH ET AL. (1997) DEEP SOIL - Problem # 1
     AMPLITUDES (g):     0.1000E+000.2000E+000.3000E+000.4000E+000.5000E+000.6000E+000.7000E+000.8000E+000.9000E+000.1000E+01
     LN (AMPLITUDE):       -2.30      -1.61      -1.20      -0.92      -0.69      -0.51      -0.36      -0.22      -0.11       0.00
  FAULT   1 E(NO/YR)     0.3719E-020.2456E-020.1717E-020.1170E-020.7652E-030.4854E-030.3026E-030.1873E-030.1160E-030.7217E-04
  FAULT   2 E(NO/YR)     0.1749E-020.1221E-020.7958E-030.4978E-030.3063E-030.1882E-030.1163E-030.7261E-040.4589E-040.2939E-04
  FAULT   3 E(NO/YR)     0.5403E-020.3092E-020.1681E-020.8532E-030.4199E-030.2058E-030.1019E-030.5138E-040.2646E-040.1394E-04
  FAULT   4 E(NO/YR)     0.2545E-010.1586E-010.8930E-020.4788E-020.2537E-020.1353E-020.7338E-030.4058E-030.2292E-030.1323E-03
  FAULT   5 E(NO/YR)     0.6142E-020.3958E-020.2338E-020.1300E-020.7047E-030.3809E-030.2077E-030.1150E-030.6480E-040.3721E-04
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APPENDIX D

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FAULT   6 E(NO/YR)     0.1535E-020.5726E-030.1970E-030.6893E-040.2532E-040.9832E-050.4033E-050.1741E-050.7875E-060.3718E-06
FAULT   7 E(NO/YR)     0.7073E-020.2241E-020.6753E-030.2081E-030.6770E-040.2343E-040.8621E-050.3363E-050.1385E-050.5996E-06
FAULT   8 E(NO/YR)     0.1241E-010.3178E-020.7938E-030.2129E-030.6241E-040.1993E-040.6878E-050.2546E-050.1003E-050.4183E-06
FAULT   9 E(NO/YR)     0.5558E-020.1667E-020.4797E-030.1405E-030.4338E-040.1428E-040.5018E-050.1881E-050.7489E-060.3158E-06
FAULT  10 E(NO/YR)     0.1836E-010.3928E-020.7284E-030.1415E-030.3058E-040.7436E-050.2033E-050.6221E-060.2115E-060.7926E-07
FAULT  11 E(NO/YR)     0.9518E-020.3488E-020.1084E-020.3081E-030.8758E-040.2580E-040.7983E-050.2602E-050.8926E-060.3218E-06
FAULT  12 E(NO/YR)     0.9669E-020.1384E-020.1975E-030.3165E-040.5866E-050.1259E-050.3110E-060.8789E-070.2819E-070.1016E-07
FAULT  13 E(NO/YR)     0.1396E-020.2369E-030.4251E-040.8842E-050.2123E-050.5774E-060.1749E-060.5811E-070.2093E-070.8099E-08
FAULT  14 E(NO/YR)     0.1490E-020.2037E-030.3352E-040.6823E-050.1656E-050.4635E-060.1457E-060.5050E-070.1900E-070.7670E-08
FAULT  15 E(NO/YR)     0.1302E-020.1590E-030.2272E-040.4022E-050.8570E-060.2128E-060.6004E-070.1887E-070.6503E-080.2429E-08
FAULT  16 E(NO/YR)     0.7223E-030.4112E-040.3047E-050.3112E-060.4218E-070.7309E-080.1569E-080.4062E-090.1232E-090.4248E-10
FAULT  17 E(NO/YR)     0.4410E-030.4265E-040.5395E-050.8897E-060.1813E-060.4371E-070.1208E-070.3742E-080.1276E-080.4725E-09
FAULT  18 E(NO/YR)     0.3187E-030.3303E-040.4042E-050.6257E-060.1189E-060.2678E-070.6965E-080.2046E-080.6683E-090.2394E-09
FAULT  19 E(NO/YR)     0.2527E-030.9870E-050.6070E-060.5581E-070.7092E-080.1177E-080.2443E-090.6128E-100.1780E-100.5748E-11
TOTAL     E(NO/YR)     0.1125E+000.4378E-010.1973E-010.9742E-020.5061E-020.2717E-020.1498E-020.8451E-030.4875E-030.2871E-03
TOTAL RISK             0.1064E+000.4283E-010.1954E-010.9695E-020.5048E-020.2713E-020.1497E-020.8447E-030.4874E-030.2871E-03

   AMPLITUDES (g):     0.1100E+010.1200E+010.1300E+010.1400E+010.1500E+01
   LN (AMPLITUDE):       0.10      0.18      0.26      0.34      0.41
FAULT   1 E(NO/YR)     0.4528E-040.2869E-040.1839E-040.1193E-040.7830E-05
FAULT   2 E(NO/YR)     0.1907E-040.1254E-040.8344E-050.5622E-050.3832E-05
FAULT   3 E(NO/YR)     0.7515E-050.4144E-050.2336E-050.1346E-050.7909E-06
FAULT   4 E(NO/YR)     0.7789E-040.4678E-040.2863E-040.1784E-040.1130E-04
FAULT   5 E(NO/YR)     0.2178E-040.1299E-040.7886E-050.4872E-050.3061E-05
FAULT   6 E(NO/YR)     0.1826E-060.9289E-070.4885E-070.2648E-070.1477E-07
FAULT   7 E(NO/YR)     0.2719E-060.1287E-060.6341E-070.3242E-070.1717E-07
FAULT   8 E(NO/YR)     0.1835E-060.8432E-070.4043E-070.2016E-070.1042E-07
FAULT   9 E(NO/YR)     0.1405E-060.6578E-070.3227E-070.1655E-070.8841E-08
FAULT  10 E(NO/YR)     0.3247E-070.1440E-070.6841E-080.3449E-080.1830E-08
FAULT  11 E(NO/YR)     0.1216E-060.4808E-070.1985E-070.8543E-080.3826E-08
FAULT  12 E(NO/YR)     0.4064E-080.1778E-080.8382E-090.4202E-090.2200E-09
FAULT  13 E(NO/YR)     0.3339E-080.1458E-080.6699E-090.3225E-090.1619E-09
FAULT  14 E(NO/YR)     0.3293E-080.1492E-080.7097E-090.3523E-090.1818E-09
FAULT  15 E(NO/YR)     0.9744E-090.4163E-090.1882E-090.8950E-100.4456E-10
FAULT  16 E(NO/YR)     0.1606E-100.6313E-110.2479E-110.9633E-120.2806E-12
FAULT  17 E(NO/YR)     0.1881E-090.7977E-100.3580E-100.1690E-100.8168E-11
FAULT  18 E(NO/YR)     0.9308E-100.3891E-100.1734E-100.8076E-110.3826E-11
FAULT  19 E(NO/YR)     0.1860E-110.5364E-120.1158E-120.0000E+000.0000E+00
TOTAL     E(NO/YR)     0.1725E-030.1056E-030.6580E-040.4171E-040.2687E-04
TOTAL RISK             0.1725E-030.1056E-030.6580E-040.4171E-040.2687E-04

  SPECIFIED RISKS:        0.013900  0.010000  0.005000  0.002105  0.001000
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APPENDIX D

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   ESTIMATED LN AMP.  :     -1.064     -0.929     -0.690     -0.445     -0.263
    ESTIMATED AMP. (g):     0.34500    0.39494    0.50140    0.64078    0.76910

SADIGH ET AL. (1997) DEEP SOIL - Problem # 2
    AMPLITUDES (g):      0.1000E+000.2000E+000.3000E+000.4000E+000.5000E+000.6000E+000.7000E+000.8000E+000.9000E+000.1000E+01
    LN (AMPLITUDE):         -2.30      -1.61      -1.20      -0.92      -0.69      -0.51      -0.36      -0.22      -0.11       0.00
  FAULT    1 E(NO/YR)    0.2469E-020.1601E-020.1029E-020.6054E-030.3348E-030.1795E-030.9518E-040.5052E-040.2704E-040.1465E-04
  FAULT    2 E(NO/YR)    0.1253E-020.6651E-030.3227E-030.1534E-030.7387E-040.3646E-040.1852E-040.9682E-050.5203E-050.2870E-05
  FAULT    3 E(NO/YR)    0.3445E-020.1745E-020.7433E-030.2930E-030.1143E-030.4539E-040.1858E-040.7862E-050.3444E-050.1560E-05
  FAULT    4 E(NO/YR)    0.1698E-010.7607E-020.3036E-020.1194E-020.4825E-030.2028E-030.8885E-040.4055E-040.1921E-040.9428E-05
  FAULT    5 E(NO/YR)    0.4105E-020.2066E-020.9050E-030.3771E-030.1576E-030.6754E-040.2988E-040.1368E-040.6476E-050.3164E-05
  FAULT    6 E(NO/YR)    0.8621E-030.2012E-030.4585E-040.1141E-040.3140E-050.9492E-060.3116E-060.1100E-060.4134E-070.1643E-07
  FAULT    7 E(NO/YR)    0.4144E-020.9181E-030.1948E-030.4435E-040.1109E-040.3039E-050.9057E-060.2908E-060.9980E-070.3632E-07
  FAULT    8 E(NO/YR)    0.6483E-020.1010E-020.1671E-030.3199E-040.7048E-050.1754E-050.4844E-060.1463E-060.4769E-070.1663E-07
  FAULT    9 E(NO/YR)    0.3277E-020.7323E-030.1535E-030.3385E-040.8116E-050.2123E-050.6028E-060.1844E-060.6035E-070.2098E-07
  FAULT   10 E(NO/YR)    0.1087E-010.1586E-020.2036E-030.2887E-040.4698E-050.8728E-060.1827E-060.4246E-070.1083E-070.2991E-08
  FAULT   11 E(NO/YR)    0.6935E-020.3194E-020.1117E-020.3487E-030.1074E-030.3391E-040.1114E-040.3824E-050.1371E-050.5128E-06
  FAULT   12 E(NO/YR)    0.5795E-020.6082E-030.6541E-040.8226E-050.1220E-050.2098E-060.4100E-070.8949E-080.2148E-080.5592E-09
  FAULT   13 E(NO/YR)    0.5801E-030.4938E-040.5335E-050.7464E-060.1290E-060.2641E-070.6205E-080.1635E-080.4739E-090.1489E-09
  FAULT   14 E(NO/YR)    0.3855E-030.2065E-040.1815E-050.2300E-060.3801E-070.7675E-080.1812E-080.4853E-090.1437E-090.4618E-10
  FAULT   15 E(NO/YR)    0.4120E-030.2174E-040.1742E-050.1980E-060.2930E-070.5313E-080.1131E-080.2742E-090.7387E-100.2157E-10
  FAULT   16 E(NO/YR)    0.2968E-030.8829E-050.4023E-060.2733E-070.2542E-080.3023E-090.4357E-100.7148E-110.1089E-110.0000E+00
  FAULT   17 E(NO/YR)    0.1077E-030.4133E-050.2825E-060.2923E-070.4071E-080.7082E-090.1464E-090.3464E-100.9090E-110.2355E-11
  FAULT   18 E(NO/YR)    0.1056E-030.4830E-050.3341E-060.3323E-070.4363E-080.7104E-090.1371E-090.3033E-100.7481E-110.1950E-11
  FAULT   19 E(NO/YR)    0.7901E-040.1460E-050.5242E-070.3096E-080.2629E-090.2919E-100.3858E-110.4508E-120.0000E+000.0000E+00
  TOTAL      E(NO/YR)    0.6859E-010.2204E-010.7993E-020.3132E-020.1306E-020.5746E-030.2647E-030.1269E-030.6301E-040.3228E-04
  TOTAL RISK             0.6629E-010.2180E-010.7961E-020.3127E-020.1305E-020.5744E-030.2647E-030.1269E-030.6301E-040.3228E-04

    AMPLITUDES (g):      0.1100E+010.1200E+010.1300E+010.1400E+010.1500E+01
    LN (AMPLITUDE):         0.10       0.18       0.26       0.34       0.41
  FAULT    1 E(NO/YR)    0.8049E-050.4491E-050.2546E-050.1466E-050.8569E-06
  FAULT    2 E(NO/YR)    0.1622E-050.9372E-060.5529E-060.3325E-060.2035E-06
  FAULT    3 E(NO/YR)    0.7292E-060.3511E-060.1739E-060.8835E-070.4599E-07
  FAULT    4 E(NO/YR)    0.4776E-050.2491E-050.1335E-050.7327E-060.4114E-06
  FAULT    5 E(NO/YR)    0.1593E-050.8241E-060.4375E-060.2378E-060.1322E-06
  FAULT    6 E(NO/YR)    0.6858E-080.2991E-080.1357E-080.6377E-090.3095E-09
  FAULT    7 E(NO/YR)    0.1394E-070.5606E-080.2353E-080.1026E-080.4634E-09
  FAULT    8 E(NO/YR)    0.6148E-080.2394E-080.9756E-090.4134E-090.1811E-09
  FAULT    9 E(NO/YR)    0.7698E-080.2967E-080.1195E-080.5011E-090.2178E-09
  FAULT   10 E(NO/YR)    0.8860E-090.2781E-090.9102E-100.3047E-100.3802E-11
  FAULT   11 E(NO/YR)    0.1995E-060.8051E-070.3362E-070.1449E-070.6430E-08
  FAULT   12 E(NO/YR)    0.1556E-090.4600E-100.1348E-100.2981E-110.9940E-12
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APPENDIX D

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FAULT  13 E(NO/YR)     0.5000E-100.1770E-100.6450E-110.2353E-110.7236E-12
FAULT  14 E(NO/YR)     0.1588E-100.5202E-110.7958E-120.0000E+000.0000E+00
FAULT  15 E(NO/YR)     0.6404E-110.1435E-110.0000E+000.0000E+000.0000E+00
FAULT  16 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  17 E(NO/YR)     0.3636E-120.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  18 E(NO/YR)     0.3878E-120.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  19 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
TOTAL     E(NO/YR)     0.1700E-040.9190E-050.5084E-050.2874E-050.1658E-05
TOTAL RISK             0.1700E-040.9190E-050.5084E-050.2874E-050.1658E-05

  SPECIFIED RISKS:        0.013900  0.010000  0.005000  0.002105  0.001000
  ESTIMATED LN AMP.  :     -1.428    -1.296    -1.061    -0.815    -0.634
   ESTIMATED AMP. (g):    0.23972   0.27369   0.34618   0.44254   0.53047

CAMP. & BOZ. (1997 Rev.) AL - Problem # 1
     AMPLITUDES (g):      0.1000E+000.2000E+000.3000E+000.4000E+000.5000E+000.6000E+000.7000E+000.8000E+000.9000E+000.1000E+01
     LN (AMPLITUDE):        -2.30      -1.61      -1.20      -0.92      -0.69      -0.51      -0.36      -0.22      -0.11       0.00
  FAULT   1 E(NO/YR)      0.3954E-020.2744E-020.1900E-020.1232E-020.7442E-030.4274E-030.2379E-030.1303E-030.7095E-040.3864E-04
  FAULT   2 E(NO/YR)      0.1884E-020.1428E-020.9853E-030.6169E-030.3597E-030.2008E-030.1095E-030.5915E-040.3190E-040.1727E-04
  FAULT   3 E(NO/YR)      0.5584E-020.3224E-020.1802E-020.9102E-030.4298E-030.1967E-030.8923E-040.4067E-040.1876E-040.8788E-05
  FAULT   4 E(NO/YR)      0.2789E-010.1874E-010.1076E-010.5491E-020.2625E-020.1220E-020.5629E-030.2611E-030.1226E-030.5851E-04
  FAULT   5 E(NO/YR)      0.6739E-020.4615E-020.2818E-020.1540E-020.7789E-030.3778E-030.1802E-030.8575E-040.4108E-040.1991E-04
  FAULT   6 E(NO/YR)      0.1443E-020.4856E-030.1349E-030.3562E-040.9596E-050.2706E-050.8057E-060.2533E-060.8395E-070.2922E-07
  FAULT   7 E(NO/YR)      0.6061E-020.1781E-020.4613E-030.1161E-030.3018E-040.8275E-050.2409E-050.7437E-060.2429E-060.8356E-07
  FAULT   8 E(NO/YR)      0.9993E-020.2139E-020.4344E-030.9393E-040.2228E-040.5801E-050.1647E-050.5053E-060.1662E-060.5813E-07
  FAULT   9 E(NO/YR)      0.4667E-020.1350E-020.3542E-030.9053E-040.2384E-040.6613E-050.1943E-050.6051E-060.1990E-060.6888E-07
  FAULT  10 E(NO/YR)      0.1803E-010.4933E-020.1141E-020.2629E-030.6422E-040.1689E-040.4789E-050.1456E-050.4721E-060.1622E-06
  FAULT  11 E(NO/YR)      0.9209E-020.4609E-020.2008E-020.7539E-030.2679E-030.9469E-040.3405E-040.1259E-040.4803E-050.1893E-05
  FAULT  12 E(NO/YR)      0.1034E-010.2168E-020.4444E-030.9671E-040.2301E-040.5997E-050.1702E-050.5214E-060.1711E-060.5974E-07
  FAULT  13 E(NO/YR)      0.1032E-020.1477E-030.2393E-040.4620E-050.1043E-050.2684E-060.7706E-070.2427E-070.8270E-080.3016E-08
  FAULT  14 E(NO/YR)      0.1065E-020.1129E-030.1594E-040.2902E-050.6433E-060.1663E-060.4857E-070.1568E-070.5504E-080.2073E-08
  FAULT  15 E(NO/YR)      0.8852E-030.9474E-040.1346E-040.2456E-050.5445E-060.1405E-060.4096E-070.1319E-070.4616E-080.1734E-08
  FAULT  16 E(NO/YR)      0.8327E-030.9681E-040.1436E-040.2668E-050.5940E-060.1528E-060.4418E-070.1408E-070.4866E-080.1804E-08
  FAULT  17 E(NO/YR)      0.2846E-030.2455E-040.3158E-050.5475E-060.1181E-060.3005E-070.8708E-080.2801E-080.9827E-090.3707E-09
  FAULT  18 E(NO/YR)      0.2091E-030.2120E-040.2944E-050.5317E-060.1174E-060.3026E-070.8831E-080.2850E-080.1000E-080.3769E-09
  FAULT  19 E(NO/YR)      0.3150E-030.2775E-040.3652E-050.6418E-060.1394E-060.3555E-070.1029E-070.3304E-080.1155E-080.4336E-09
  TOTAL     E(NO/YR)      0.1104E+000.4874E-010.2332E-010.1125E-010.5382E-020.2564E-020.1227E-020.5938E-030.2915E-030.1455E-03
  TOTAL RISK              0.1045E+000.4757E-010.2305E-010.1119E-010.5368E-020.2561E-020.1227E-020.5936E-030.2914E-030.1455E-03

     AMPLITUDES (g):      0.1100E+010.1200E+010.1300E+010.1400E+010.1500E+01
     LN (AMPLITUDE):         0.10       0.18       0.26       0.34       0.41
  FAULT   1 E(NO/YR)      0.2114E-040.1165E-040.6477E-050.3638E-050.2065E-05
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APPENDIX D

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 FAULT   2 E(NO/YR)     0.9423E-050.5189E-050.2887E-050.1625E-050.9250E-06
 FAULT   3 E(NO/YR)     0.4191E-050.2036E-050.1008E-050.5081E-060.2608E-06
 FAULT   4 E(NO/YR)     0.2840E-040.1404E-040.7069E-050.3623E-050.1890E-05
 FAULT   5 E(NO/YR)     0.9793E-050.4893E-050.2485E-050.1283E-050.6733E-06
 FAULT   6 E(NO/YR)     0.1065E-070.4047E-080.1599E-080.6550E-090.2774E-09
 FAULT   7 E(NO/YR)     0.3017E-070.1139E-070.4479E-080.1829E-080.7737E-09
 FAULT   8 E(NO/YR)     0.2150E-070.8358E-080.3399E-080.1440E-080.6328E-09
 FAULT   9 E(NO/YR)     0.2500E-070.9477E-080.3740E-080.1532E-080.6496E-09
 FAULT  10 E(NO/YR)     0.5877E-070.2233E-070.8864E-080.3661E-080.1567E-08
 FAULT  11 E(NO/YR)     0.7701E-060.3231E-060.1396E-060.6198E-070.2824E-07
 FAULT  12 E(NO/YR)     0.2204E-070.8543E-080.3464E-080.1463E-080.6409E-09
 FAULT  13 E(NO/YR)     0.1167E-080.4756E-090.2030E-090.9024E-100.4160E-10
 FAULT  14 E(NO/YR)     0.8298E-090.3501E-090.1547E-090.7118E-100.3396E-10
 FAULT  15 E(NO/YR)     0.6917E-090.2909E-090.1282E-090.5879E-100.2790E-10
 FAULT  16 E(NO/YR)     0.7100E-090.2945E-090.1279E-090.5781E-100.2702E-10
 FAULT  17 E(NO/YR)     0.1488E-090.6304E-100.2794E-100.1284E-100.6036E-11
 FAULT  18 E(NO/YR)     0.1509E-090.6372E-100.2817E-100.1297E-100.6175E-11
 FAULT  19 E(NO/YR)     0.1731E-090.7284E-100.3206E-100.1466E-100.6891E-11
 TOTAL     E(NO/YR)     0.7389E-040.3820E-040.2009E-040.1075E-040.5847E-05
 TOTAL RISK             0.7389E-040.3820E-040.2009E-040.1075E-040.5847E-05

   SPECIFIED RISKS:        0.013900  0.010000  0.005000  0.002105  0.001000
   ESTIMATED LN AMP.  :     -1.003    -0.882    -0.676    -0.470    -0.319
    ESTIMATED AMP. (g):     0.36692   0.41391   0.50882   0.62515   0.72680

CAMP. & BOZ. (1997 Rev.) AL - Problem # 2
     AMPLITUDES (g):    0.1000E+000.2000E+000.3000E+000.4000E+000.5000E+000.6000E+000.7000E+000.8000E+000.9000E+000.1000E+01
     LN (AMPLITUDE):      -2.30      -1.61      -1.20      -0.92      -0.69      -0.51      -0.36      -0.22      -0.11       0.00
 FAULT   1 E(NO/YR)     0.2674E-020.1700E-020.1053E-020.5733E-030.2856E-030.1361E-030.6369E-040.2977E-040.1403E-040.6692E-05
 FAULT   2 E(NO/YR)     0.1394E-020.8211E-030.3910E-030.1635E-030.6504E-040.2566E-040.1024E-040.4171E-050.1743E-050.7477E-06
 FAULT   3 E(NO/YR)     0.3491E-020.1920E-020.8406E-030.3215E-030.1175E-030.4287E-040.1593E-040.6078E-050.2390E-050.9696E-06
 FAULT   4 E(NO/YR)     0.1882E-010.9253E-020.3504E-020.1183E-020.3904E-030.1309E-030.4532E-040.1627E-040.6071E-050.2350E-05
 FAULT   5 E(NO/YR)     0.4462E-020.2507E-020.1109E-020.4207E-030.1515E-030.5436E-040.1987E-040.7469E-050.2896E-050.1160E-05
 FAULT   6 E(NO/YR)     0.8025E-030.1498E-030.2378E-040.3963E-050.7290E-060.1488E-060.3350E-070.8233E-080.2189E-080.6244E-09
 FAULT   7 E(NO/YR)     0.3598E-020.7003E-030.1190E-030.2105E-040.4075E-050.8703E-060.2039E-060.5202E-070.1432E-070.4219E-08
 FAULT   8 E(NO/YR)     0.5084E-020.6149E-030.7784E-040.1156E-040.2013E-050.4038E-060.9147E-070.2300E-070.6335E-080.1888E-08
 FAULT   9 E(NO/YR)     0.2834E-020.6020E-030.1119E-030.2132E-040.4393E-050.9885E-060.2423E-060.6430E-070.1832E-070.5571E-08
 FAULT  10 E(NO/YR)     0.1198E-010.2401E-020.4103E-030.7395E-040.1474E-040.3262E-050.7950E-060.2113E-060.6064E-070.1864E-07
 FAULT  11 E(NO/YR)     0.7288E-020.4350E-020.2070E-020.8444E-030.3246E-030.1234E-030.4746E-040.1866E-040.7534E-050.3128E-05
 FAULT  12 E(NO/YR)     0.7057E-020.1170E-020.1923E-030.3494E-040.7158E-050.1642E-050.4166E-060.1156E-060.3469E-070.1116E-07
 FAULT  13 E(NO/YR)     0.4098E-030.2985E-040.2991E-050.4010E-060.6753E-070.1360E-070.3165E-080.8290E-090.2396E-090.7529E-10
 FAULT  14 E(NO/YR)     0.2426E-030.1045E-040.8222E-060.9723E-070.1530E-070.2976E-080.6816E-090.1778E-090.5159E-100.1610E-10
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APPENDIX D

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FAULT  15 E(NO/YR)     0.2686E-030.1392E-040.1223E-050.1563E-060.2610E-070.5319E-080.1267E-080.3417E-090.1021E-090.3308E-10
FAULT  16 E(NO/YR)     0.4302E-030.3327E-040.3708E-050.5547E-060.1037E-060.2305E-070.5878E-080.1677E-080.5252E-090.1780E-09
FAULT  17 E(NO/YR)     0.6713E-040.2720E-050.2168E-060.2650E-070.4337E-080.8786E-090.2096E-090.5684E-100.1702E-100.5462E-11
FAULT  18 E(NO/YR)     0.7007E-040.3773E-050.3452E-060.4577E-070.7902E-080.1661E-080.4068E-090.1126E-090.3448E-100.1145E-10
FAULT  19 E(NO/YR)     0.1330E-030.7511E-050.7342E-060.1033E-060.1877E-070.4127E-080.1052E-080.3019E-090.9544E-100.3266E-10
TOTAL     E(NO/YR)     0.7111E-010.2629E-010.9913E-020.3674E-020.1368E-020.5207E-030.2043E-030.8290E-040.3480E-040.1509E-04
TOTAL RISK             0.6864E-010.2595E-010.9864E-020.3668E-020.1367E-020.5205E-030.2043E-030.8290E-040.3480E-040.1509E-04

   AMPLITUDES (g):     0.1100E+010.1200E+010.1300E+010.1400E+010.1500E+01
   LN (AMPLITUDE):       0.10      0.18      0.26      0.34      0.41
FAULT   1 E(NO/YR)     0.3243E-050.1598E-050.8009E-060.4084E-060.2118E-06
FAULT   2 E(NO/YR)     0.3294E-060.1489E-060.6900E-070.3274E-070.1588E-07
FAULT   3 E(NO/YR)     0.4054E-060.1746E-060.7727E-070.3512E-070.1636E-07
FAULT   4 E(NO/YR)     0.9428E-060.3910E-060.1673E-060.7369E-070.3336E-07
FAULT   5 E(NO/YR)     0.4790E-060.2040E-060.8935E-070.4021E-070.1856E-07
FAULT   6 E(NO/YR)     0.1896E-090.6089E-100.2043E-100.7017E-110.2395E-11
FAULT   7 E(NO/YR)     0.1322E-080.4378E-090.1521E-090.5458E-100.1966E-10
FAULT   8 E(NO/YR)     0.6028E-090.2044E-090.7159E-100.2438E-100.7155E-11
FAULT   9 E(NO/YR)     0.1795E-080.6098E-090.2171E-090.8035E-100.3032E-10
FAULT  10 E(NO/YR)     0.6091E-080.2102E-080.7618E-090.2881E-090.1119E-09
FAULT  11 E(NO/YR)     0.1336E-050.5864E-060.2642E-060.1220E-060.5770E-07
FAULT  12 E(NO/YR)     0.3819E-080.1380E-080.5241E-090.2075E-090.8463E-10
FAULT  13 E(NO/YR)     0.2535E-100.8901E-110.2995E-110.7934E-120.0000E+00
FAULT  14 E(NO/YR)     0.5129E-110.1028E-110.0000E+000.0000E+000.0000E+00
FAULT  15 E(NO/YR)     0.1130E-100.3910E-110.8767E-120.0000E+000.0000E+00
FAULT  16 E(NO/YR)     0.6447E-100.2465E-100.9852E-110.3853E-110.1316E-11
FAULT  17 E(NO/YR)     0.1820E-110.5684E-120.0000E+000.0000E+000.0000E+00
FAULT  18 E(NO/YR)     0.4030E-110.1447E-110.4920E-120.0000E+000.0000E+00
FAULT  19 E(NO/YR)     0.1191E-100.4522E-110.1756E-110.6396E-120.8587E-13
TOTAL     E(NO/YR)     0.6749E-050.3107E-050.1470E-050.7129E-060.3540E-06
TOTAL RISK             0.6749E-050.3107E-050.1470E-050.7129E-060.3540E-06

  SPECIFIED RISKS:        0.013900  0.010000  0.005000  0.002105  0.001000
  ESTIMATED LN AMP.  :     -1.348    -1.210    -1.006    -0.791    -0.634
   ESTIMATED AMP. (g):    0.25982   0.29829   0.36553   0.45351   0.53041

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 CLOSEST DISTANCES BETWEEN SITE AND FAULT RUPTURES
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APPENDIX D

NO.	FAULT NAME	CD_1DRP	CD_2DRP	CDIST	CLODIS	CD_EPI	CD_HYPO
1	SAN GABRIEL	2.5	2.5	2.5	2.5	2.5	3.1 km
2	HOLSER	5.0	5.0	5.0	5.0	6.1	6.2 km
3	NORTHRIDGE (E. Oak Ridge)	11.3	11.3	12.4	12.4	12.1	13.4 km
4	SANTA SUSANA	11.9	2.7	9.8	9.8	3.6	9.8 km
5	SIERRA MADRE (San Fernando)	14.4	2.4	10.3	10.3	3.7	10.5 km
6	VERDUGO	20.2	16.5	18.4	18.4	17.6	19.4 km
7	OAK RIDGE (Onshore)	21.1	21.1	21.1	21.1	22.2	22.3 km
8	SAN CAYETANO	24.3	24.3	24.3	24.3	25.6	25.6 km
9	SIERRA MADRE	25.3	19.0	22.1	22.1	20.2	23.0 km
10	SAN ANDREAS - Mojave	26.8	26.8	26.8	26.8	26.8	26.9 km
11	SAN ANDREAS - 1857 Rupture	26.8	26.8	26.8	26.8	26.8	26.9 km
12	SAN ANDREAS - Carrizo	30.0	30.0	30.0	30.0	30.4	30.4 km
13	SIMI-SANTA ROSA	31.8	31.3	31.8	31.8	32.4	32.9 km
14	HOLLYWOOD	38.7	33.8	36.3	36.3	34.2	36.3 km
15	SANTA MONICA	39.7	36.5	38.5	38.5	37.2	38.9 km
16	SANTA YNEZ (East)	41.3	39.8	41.0	41.0	40.7	41.8 km
17	RAYMOND	42.6	39.7	41.5	41.5	40.6	42.1 km
18	MALIBU COAST	44.7	41.3	43.1	43.1	41.6	43.1 km
19	NEWPORT-INGLEWOOD (L.A.Basin)	45.7	45.7	45.7	45.7	46.7	46.7 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 D

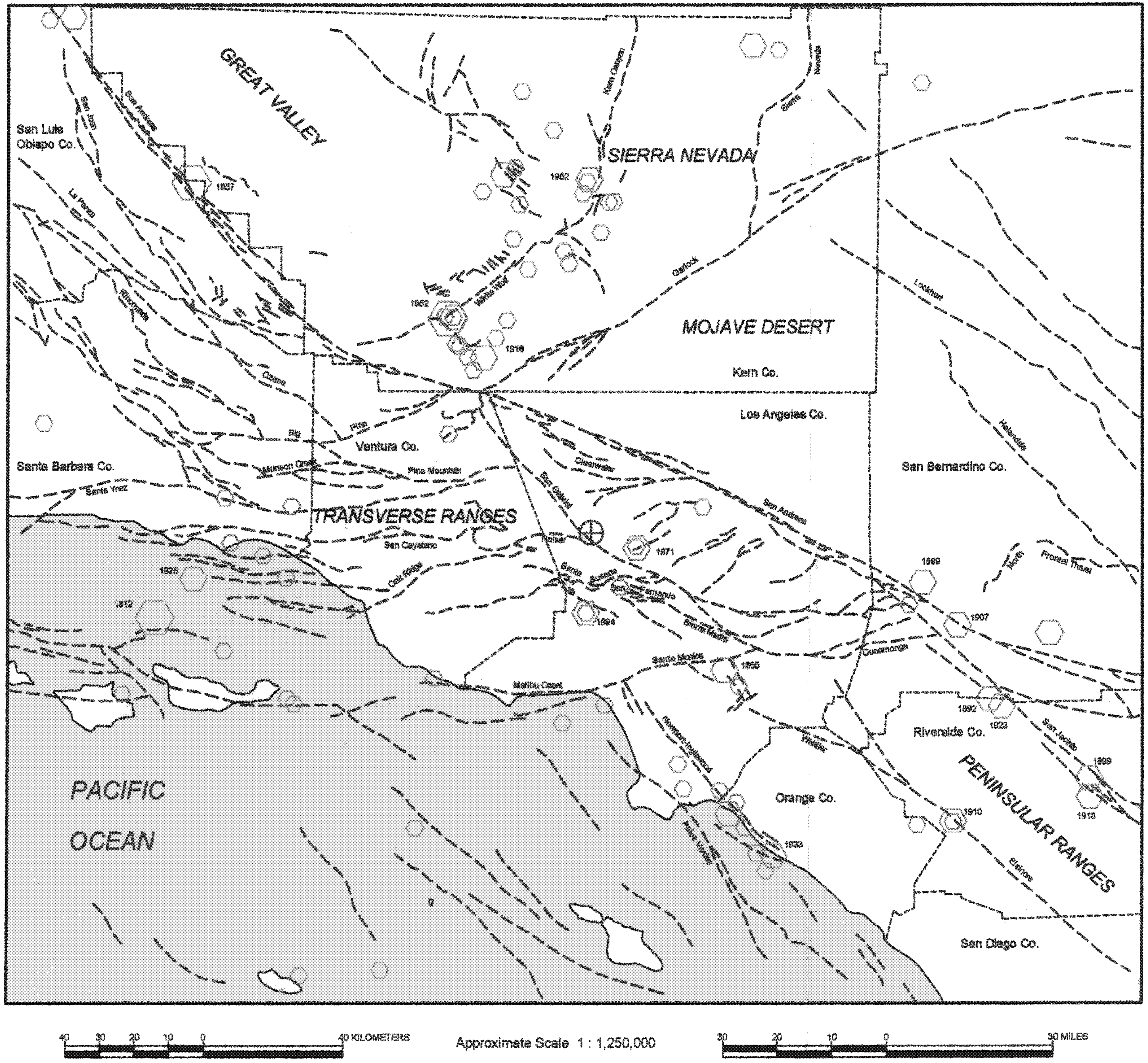
SUMMARY OF CALCULATED ACCELERATIONS

Unweighted Accelerations (g)

Attenuation Relationship	Return Period Evaluated				
	72	100	200	475	1000
Boore et al. (1997)	0.43703	0.50321	0.64837	**0.84727**	**1.03163**
Sadigh et al. (1997)	0.34500	0.39494	0.50140	**0.64078**	**0.76910**
Campbell & Bozorgnia (1997)	0.36692	0.41391	0.50882	**0.62515**	**0.72680**
Average	0.38	0.44	0.55	**0.70**	**0.84**

Accelerations (g) Weighted for a 7.5 Magnitude

Attenuation Relationship	Return Period Evaluated				
	72	100	200	475	1000
Boore et al. (1997)	0.30766	0.35218	0.45637	**0.59860**	**0.72843**
Sadigh et al. (1997)	0.23972	0.27369	0.34618	**0.44254**	**0.53047**
Campbell & Bozorgnia (1997)	0.25982	0.29829	0.36553	**0.45351**	**0.53041**
Average	0.27	0.31	0.39	**0.50**	**0.60**



N

EXPLANATION

APPROXIMATE LOCATION OF MAJOR KNOWN FAULTS

San Andreas

EARTHQUAKE EPICENTERS

Location	Magnitude
⬡	5.0 - 5.9
⬡	6.0 - 6.9
⬡	7.0 - 7.9

APPROXIMATE LOCATION OF SUBJECT SITE

⊕

Compiled and modified from: Jennings (1994), Real et al. (1978), Yerkes (1985), Ziony and Jones (1989), and Shakal et al. (1994)

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

FAULT AND EARTHQUAKE EPICENTER LOCATION MAP

Job No.: 04-803S-4
Date: 6/11/04 *Figure:* D1

MODIFIED MERCALLI SCALE, 1956 VERSION *

	Intensity	Effects	v† cm/s	g‡
M§	I.	Not felt. Marginal and long-period effects of large earthquakes(for details see text).		
3	II.	Felt by persons at rest, on upper floors, or favorably placed.		
	III.	Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.		0.0035-0.007
4	IV.	Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of wooden walls walls and frame creak.		0.007-0.015
	V.	Felt outdoors: direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.	1-3	0.015-0.035
5	VI.	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Kinickkacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked. Small bells ring (church or school). Trees, bushes shaken (visibly, or heard to rustle - CFR).	3-7	0.035-0.07
6	VII.	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments - CFR). Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.	7-20	0.07-0.15
	VIII.	Steering from motor cars affected. Damage to masonry C; partial collaspe. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks, Frame houses moved on foundations if not bolted down, loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.	20-60	0.15-0.35
7	IX.	General panic. Masonry D destroyed; masonry C heavely damaged, sometimes with complete collaspe; masonry B seriously damaged. (General damage to foundations - CFR.) Frame structures, if not bolted, shifted off foundations. Frames rocked. Serious damage to reserviors. Underground pipes broken. Conspicuous cracks in ground. In alluviated areas sand and mud ejected, earthquake fountains, sand craters.	60-200	0.35-0.7
8	X.	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails slightly bent.	200-500	0.7-1.2
	XI.	Rails bent greatly. Underground pipelines completely out of service		>1.2
	XII.	Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.	From Fig. 11.14	

NOTE: Masonry A, B, C, D. To avoid ambiguity of language, the quality of masonry, brick or otherwise, is specified by the following lettering (which has no connection to the conventional Class A, B, C construction).

- *Masonry A*: Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.
- *Masonry B*: Good workmanship and mortar; reinforced, but not designed to resist lateral forces.
- *Masonry C*: Ordinary workmanship and mortar; no extreme weaknesses such as non-tied-in corners, but masonry is neither reinforced nor designed against horizontal forces.
- *Masonry D*: Weak materials, such as adobe; poor mortar; low standard of workmanship; weak horizontally.

* From Richter (1958). Adapted with permission of W.H. Freeman and Company.

† Average peak ground velocity, cm/s.

‡ Average peak acceleration (away from source).

§ Magnitude correlation.

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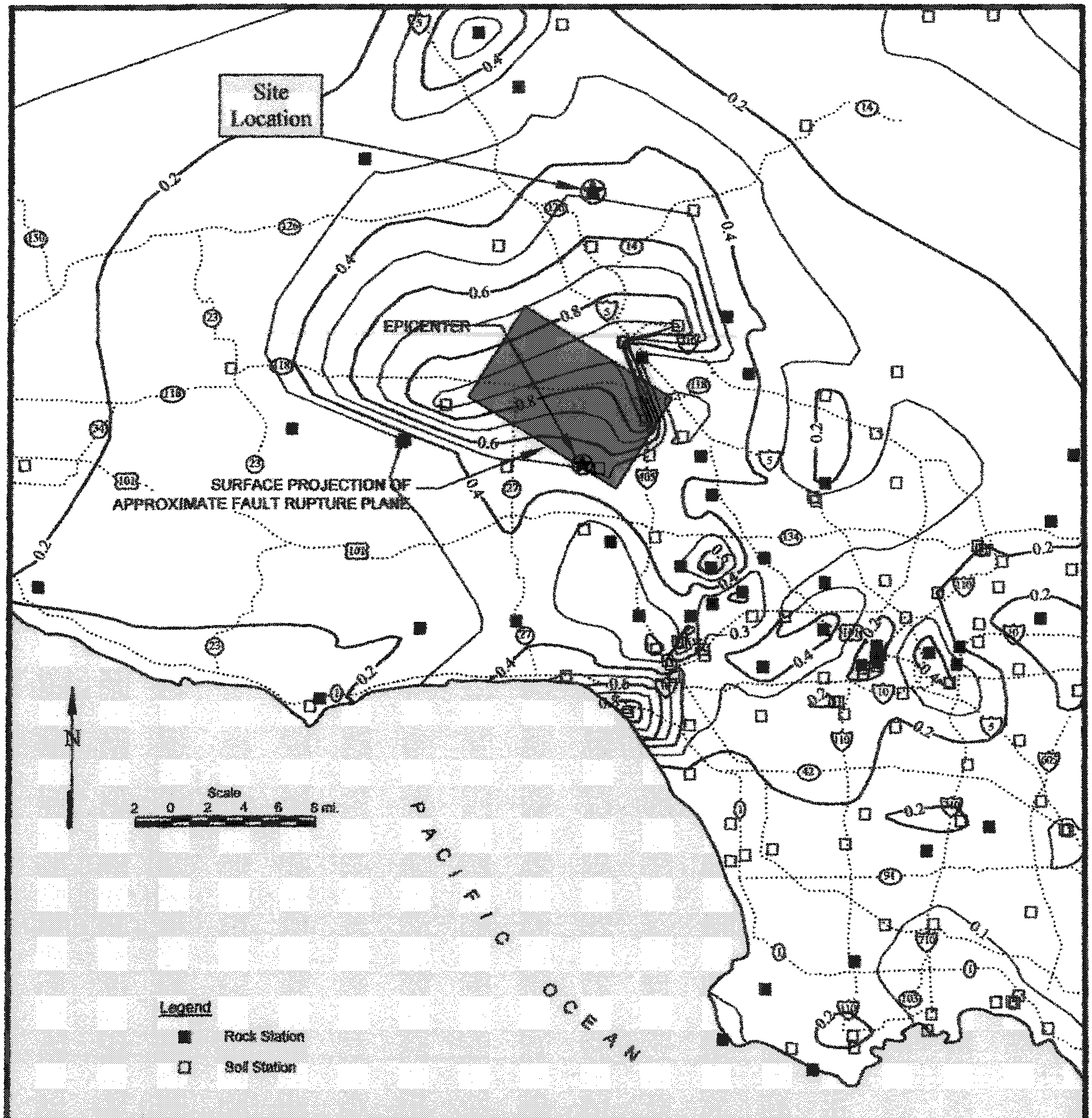
MODIFIED MERCALLI SCALE

Job No.: 04-803S-4

Date: 6/11/04 *Figure:* D2



Note: Site classification was provided by the owner/agency except for USGS stations as discussed in Section 3.3.1. Sites were typically classified by surficial geology; however, USC stations were classified based on Seed et. al. (1976) in which surficial materials with V_s > 800 m/s are designated as "rock" sites.

Contours of maximum horizontal acceleration based on recordings at rock and soil sites during the January 17, 1994 Northridge Earthquake

(Figure modified from Stewart et al., 1994)

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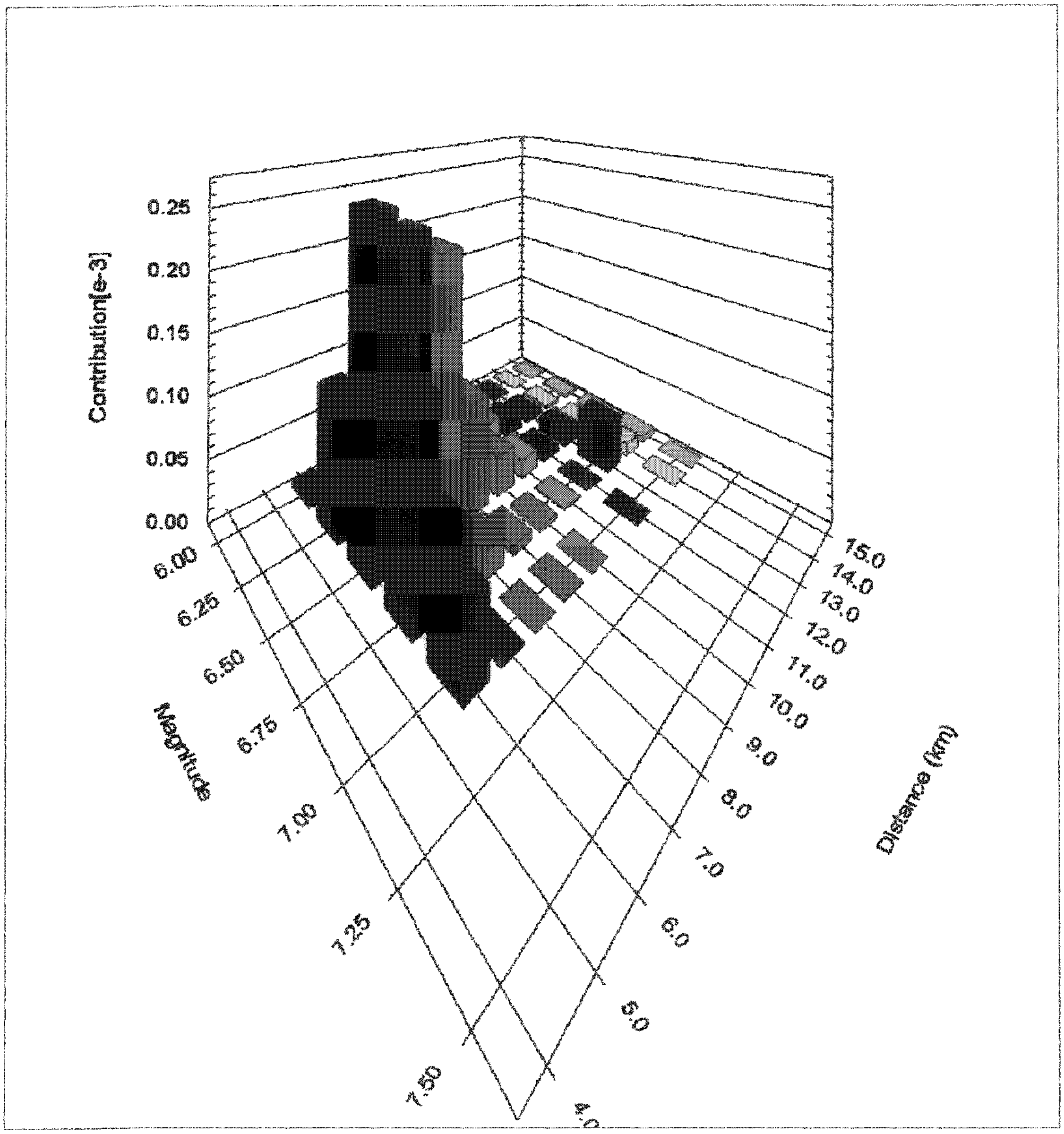
NORTHRIDGE EARTHQUAKE
ACCELERATIONS

Job No.: 04-803S-4

Date: 6/11/04

Figure: D3



An earthquake with a magnitude of 6.5 and a distance of 6 km from the hypocenter is the most significant contributor to the hazard for the DBA (10% in 50 years)

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MAGNITUDE/DISTANCE
DEAGGREGATION OF HAZARD

Job No.: 04-803S-4

Date: 6/11/04 *Figure:* D4

Appendix E

APPENDIX E

RECOMMENDED EARTHWORK SPECIFICATIONS

The following specifications are recommended to provide a basis for quality control during the placement of compacted fill or backfill as applicable.

1. Areas that are to receive compacted fill shall be observed by Allan E. Seward Engineering Geology, Inc. (AESEGI) prior to the placement of fill.

2. All drainage devices shall be properly installed and observed by AESEGI and/or owner's representative(s) prior to placement of backfill.

3. Fill soils shall consist of imported soils or on-site soils free of organics, cobbles, and deleterious material provided each material is approved by AESEGI. AESEGI shall evaluate and/or test the import material for its conformance with the report recommendations prior to its delivery to the site. The contractor shall notify AESEGI 72 hours prior to importing material to the site.

4. Fill shall be placed in controlled layers (lifts), the thickness of which is compatible with the type of compaction equipment used. The fill materials shall be brought to optimum moisture content or above, thoroughly mixed during spreading to obtain a near uniform moisture condition and uniform blend of materials, and then placed in layers with a thickness (loose) not exceeding 8 inches. Each layer shall be compacted to a minimum compaction of 90% relative to the maximum dry density determined per the latest ASTM D1557 test. Density testing shall be performed by AESEGI to verify relative compaction. The contractor shall provide proper access and level areas for testing.

5. Rocks or rock fragments less than eight (8) inches in the largest dimension may be utilized in the fill, provided they are not placed in concentrated pockets, except rocks larger than four (4) inches shall not be placed within three (3) feet of finish grade.

   Rocks greater than eight (8) inches in largest dimension shall be taken offsite, or placed in accordance with the recommendation of the Soils Engineer in areas designated as suitable for rock disposal.

6. Where space limitations do not allow for conventional fill compaction operations, special backfill materials and procedures may be required. Pea gravel or other select

APPENDIX E

fill can be used in areas of limited space. A sand and portland cement slurry (2 sacks per cubic-yard mix) shall be used in limited space areas for shallow backfill near final pad grade, and pea gravel shall be placed in deeper backfill near drainage systems.

7. AESEGI shall observe the placement of fill and conduct in-place field density tests on the compacted fill to check for adequate moisture content and the required relative compaction. Where less than specified relative compaction is indicated, additional compacting effort shall be applied and the soil moisture conditioned as necessary until adequate relative compaction is attained.

8. The Contractor shall comply with the minimum relative compaction out to the finish slope face of fill slopes, buttresses, and stabilization fills as set forth in the specifications for compacted fill. This may be achieved by overbuilding the slope and cutting back as necessary.

9. Any abandoned underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines or others not discovered prior to grading are to be removed or treated to the satisfaction of the Soils Engineer and/or the controlling agency for the project.

10. The Contractor shall have suitable and sufficient equipment during a particular operation to handle the volume of fill being placed. When necessary, fill placement equipment shall be shut down temporarily in order to permit proper compaction of fills, correction of deficient areas, or to facilitate required field testing.

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

12. Final reports shall be submitted after completion of earthwork and after the Soils Engineer and Engineering Geologist have finished their observations of the work. No additional excavation or filling shall be performed without prior notification to the Soils Engineer and/or Engineering Geologist.

13. Whenever the words "supervision", "inspection" or "control" are used, they shall mean observation of the work and/or testing of the compacted fill by AESEGI to assess whether substantial compliance with plans, specifications and design concepts has been achieved, and does not include direction of the actual work of the contractor or the contractor's workmen.

APPENDIX E

RECOMMENDED SPECIFICATIONS FOR PLACEMENT OF TRENCH BACKFILL

1. Trench excavations to receive backfill shall be free of trash, debris or other unsatisfactory materials prior to backfill placement, and shall be observed by Allan E. Seward Engineering Geology, Inc. (AESEGI) representative.

2. Except as stipulated herein, soils obtained from the excavation may be used as backfill if they are essentially free of organics and deleterious materials.

   Rocks generated from the trench excavation not exceeding three (3) inches in largest dimension may be used as backfill material. However, such material may not be placed within 12 inches of the top of the pipeline. No more than 30 percent of the backfill volume shall contain particles larger than 1 ½ inches in diameter, and rocks shall be well mixed with finer soil.

3. Soils (other than aggregates) with a Sand Equivalent (SE) greater than or equal to 30, as determined by ASTM D 2419 Standard Test Method or at the discretion of the engineer or representative in the field, may be used for bedding and shading material in the pipe zone areas. These soils are considered satisfactory for compaction by jetting procedures.

4. No jetting will be permitted in utility trenches within the top 2 feet of the subgrade of concrete slabs-on-grade.

5. Trench backfill other than bedding and shading shall be compacted by mechanical methods as tamping sheepsfoot, vibrating or pneumatic rollers or other mechanical tampers to achieve the density specified herein. The backfill materials shall be brought to optimum moisture content or above, thoroughly mixed during spreading to obtain a near uniform moisture condition and uniform blend of materials, and then placed in horizontal layers with a thickness (loose) not exceeding 8 inches. Trench backfills shall be compacted to a minimum compaction of 90 percent relative to the maximum dry density determined per the latest ASTM D1557 test.

6. The contractor shall select the equipment and process to be used to achieve the specified density without damage to the pipeline, the adjacent ground, existing improvements or completed work.

APPENDIX E

7. Observations and field tests shall be carried on during construction by AESEGI to confirm that the required degree of compaction has been obtained. Where compaction is less than that specified, additional compaction effort shall be made with adjustment of the moisture content as necessary until the specified compaction is obtained. Field density tests may be omitted at the discretion of the engineer or his representative in the field.

8. Whenever, in the opinion of AESEGI or the Owner's Representative(s), an unstable condition is being created, either by cutting or filling, the work shall not proceed until an investigation has been made and the excavation plan revised, if deemed necessary.

9. Fill material shall not be placed, spread, or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests by AES indicate the moisture content and density of the fill are as specified.

10. Whenever the words "supervision", "inspection", or "control" are used, they shall mean <u>observation</u> of the work and/or testing of the compacted fill by AESEGI to assess whether substantial compliance with plans, specifications and design concepts has been achieved.

APPENDIX E

DRAINAGE AND EROSION CONTROL RECOMMENDATIONS

Slopes and pads on this project were designed to direct surficial runoff away from structures and reduce water-induced surficial erosion/sloughing. Permanent erosion control measures should be initiated immediately following completion of grading. All constructed slopes will undergo some erosion when subjected to sustained water influx. To maintain appropriate long-term drainage and erosion control, the following points should be considered in slope protection, landscaping, irrigation and modifications to slopes, pads and structures:

1. All interceptor ditches, drainage terraces, down-drains and any other drainage devices should be maintained and kept clear of debris. A qualified Engineer should review any proposed additions or revisions to these systems, to evaluate their impact on slope erosion.

2. Retaining walls should have adequate freeboard to provide a catchment area for minor slope erosion. Periodic inspection, and if necessary, cleanout of deposited soil and debris should be performed; particularly during and after periods of rainfall.

3. The future developers should be made aware of the **potential problems**, which may develop **when drainage is altered** through landscaping and/or construction of retaining walls, and paved walkways. Ponded water, water directed over slope faces, leaking irrigation systems, **overwatering** or other conditions which could lead to excessive soil moisture, **must be avoided**.

4. Slope surficial soils may be subject to water-induced mass erosion. Therefore, a suitable proportion of slope planting should have root systems, which will develop well below three feet. We suggest consideration of drought-resistant shrubs and low trees for this purpose. Intervening areas can then be planted with lightweight surface plants with shallower root systems. All plants should be lightweight and require low moisture. Any loose slough generated during the process of planting should be properly removed from the slope face(s).

5. Construction delays, climate/weather conditions, and plant growth rates may be such that additional short-term, nonplant erosion control measures may be needed; examples would be matting, netting, plastic sheets, deep (5-feet) staking, etc.

APPENDIX E

6. Major erosion can be initiated by seemingly insignificant events; rodent burrowing, human trespass (footprints, etc.), small concentrations of uncontrolled surface/subsurface water; or poor compaction of utility trench backfill on slopes.

7. High and/or fluctuating water content in slope materials is a major factor in slope erosion and/or slope failures. Therefore, all possible precautions should be taken to maintain a moderate and uniform soil moisture. Slope irrigation systems should be properly operated and maintained and system controls should be placed under strict control.

EROSION CONTROL REFERENCES

1. "Slope Protection for Residential Developments", National Academy of Sciences, Washington D.C. (1969).

2. "Guide for Erosion and Debris Control in Hillside Areas", Department of Building and Safety, City of Los Angeles. (1970).

3. "Slope Stability Report", Orange County Department of Building and Safety (1973).

4. "Guides for Erosion and Sediment Control", Soil Conservation Service, Davis, California, U.S. Department of Agriculture (1977).

5. "Rain-Care and Protection of Hillside Homes", brochure undated, published by Building and Safety Division, Los Angeles County Engineer.

6. "Guidelines for Erosion and Sediment Control Planning and Implementation: Office of Research and Monitoring", U.S. Environmental Protection Agency (1972).

7. "Resource Conservation Glossary", Soil Conservation Society of America (1970).

8. "Standards and Specifications for Soil Erosion and Sediment Control Developing Areas", Soil Conservation Service, U.S. Department of Agriculture (1975).

9. "Homeowners Guide for Debris and Erosion Control", Los Angeles County Flood Control District (undated).

APPENDIX E

10. "Grading Guidelines (8 pages, stapled sheets)", Building and Safety Division, Department of County Engineer, County of Los Angeles (undated, but probably about 1977).

11. "Biotechnical Slope Protection and Erosion Control", Donald H. Gray and Andrew T. Leiser, Robert E. Krieger Publishing Company, Malabuv, Florida, 1989.

APPENDIX E

CONSTRUCTION DIAGRAMS

MINIMUM FOUNDATION AND SLAB RECOMMENDATIONS FOR EXPANSIVE SOILS

(ONE-, TWO-, AND THREE-STORY BUILDINGS)

Minimum Residential Footing Recommendations

Expansion Classification (UBC)	Expansion Index (UBC)	Footing Depths (Inches)				Continuous Footing Reinforcement
		One and Two Stories		Three Stories		
		Perimeter	Interior	Perimeter	Interior	
Very Low	0 to 20	18	12	24	18	Two # 4 Rebars Top and Bottom
Low	21 to 50	18	12	24	18	Two # 4 Rebars Top and Bottom
Medium	51 to 90	24	18	30	24	Four # 4 Rebars Two Top and Two Bottom
High	91 to 130	30	18	36	30	Four # 4 Rebars Two Top and Two Bottom

- Minimum footing widths: 12 inches (one-story); 15 inches (two-story); 18 inches (three-story); 24 inches for individual columns.
- All footing depths are measured below lowest adjacent final grade.
- The base of the garage door grade beam should be at the same elevation as that of the adjoining footings.
- Garage slabs should be isolated from stem wall footings with a minimum 3/8" felt expansion joint.
- Isolated exterior structural column footings should be tied back to the main foundation system in at least two (2) orthogonal directions (conventional foundations only).

Minimum Residential Slab Recommendations

Expansion Classification (UBC)	Expansion Index (UBC)	Slab Subgrade Presoaking	Slab Reinforcement	Minimum Slab Thickness (Ref: PCA)	Sand Layer Below 10 Mil Visqueen
Very Low	0 to 20	None	#3 Rebar at 24" each way	4 inches	2 inches
Low	21 to 50	120 percent of optimum moisture content[1] to 18 inches depth	#3 Rebar at 18" each way		
Medium	51 to 90	130 percent of optimum moisture content to 18 inches depth	#4 Rebar at 16" each way	5 inches	4 inches
High	91 to 130	140 percent of optimum moisture content to 24 inches depth	#4 Rebar at 14" each way	6 inches	6 inches

- Concrete for floor slabs should conform to the requirements contained in Chapter 19 of the 1997 edition of the Uniform Building Code.

Minimum Residential Slab Recommendations continued on back of this page

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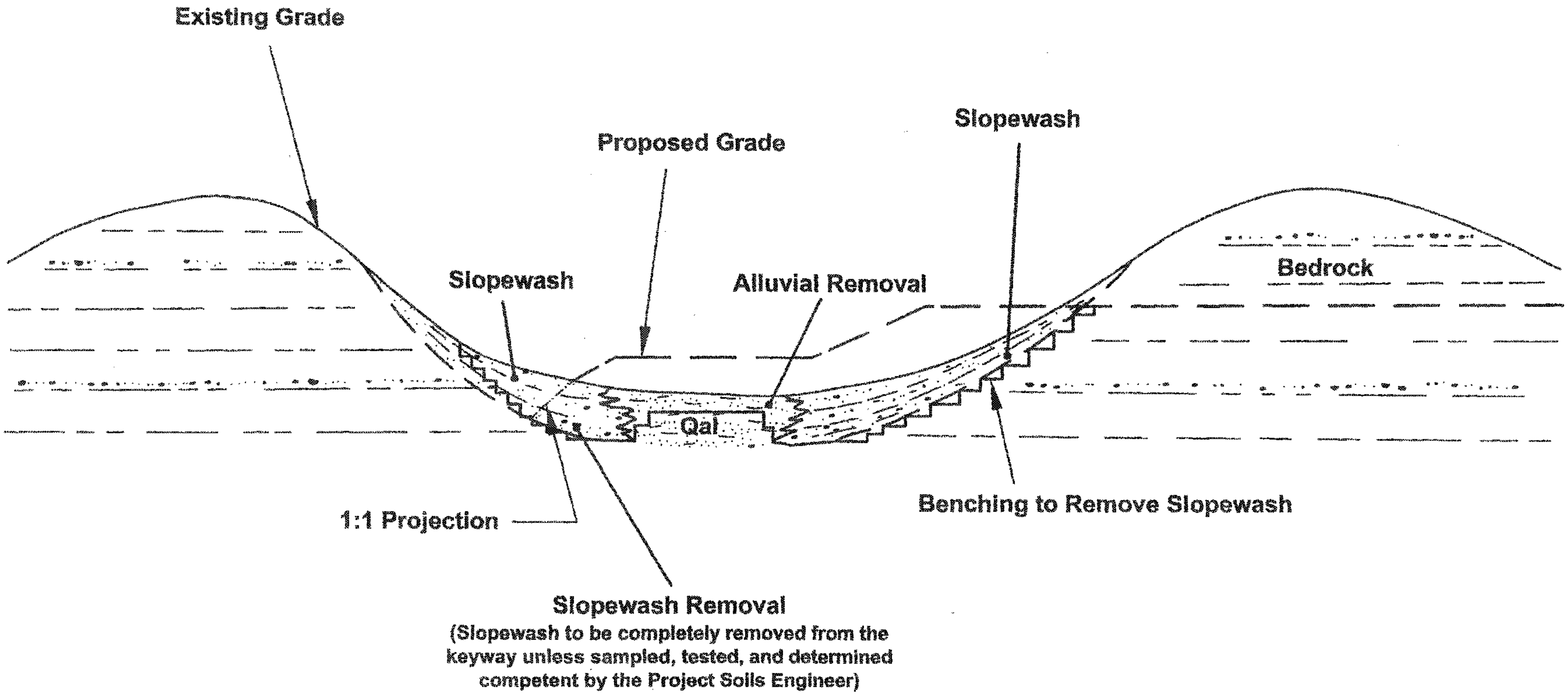
[1] Optimum moisture content as determined by ASTM D1557 Test Method on subgrade soils.

MINIMUM FOUNDATION AND SLAB RECOMMENDATIONS FOR EXPANSIVE SOILS
(ONE-, TWO-, AND THREE-STORY BUILDINGS)

Minimum Residential Slab Recommendations (continued from front side of this page)

- Sand base should have a Sand Equivalent of 30 or greater (e.g., washed concrete sand).
- Interior area slabs, except garages may be tied to the footings as directed by the Structural Engineer. For Medium and High Expansion Potential subgrades, dowels of No. 3 bars should be placed at 36 inches on centers in the footings and bent 3 feet into the slab.
- Vapor barrier for slabs-on-grade: A sheet of 10-mil visqueen sandwiched between two, 2-inch layers of compacted sand. The vapor barrier must be properly lapped and/or sealed, and sealed around all plumbing structures and other openings. Care should be taken to avoid punctures in the vapor barrier resulting from sharp objects in the subgrade and/or structures. Equivalents are acceptable.
- To reduce moisture intrusion beneath slabs on grade, utility trenches should be backfilled with lean concrete or concrete slurry at foundation perimeters. The plug shall be under the full width of the footing and be extended along a minimum of 24-inch of trench length below the slab.
- Materials from foundation and/or utility trench excavations should not be spread on slab-on-grade areas unless it is compacted and tested.
- Foundation excavations should be observed by a representative of this firm prior to placement of forms, reinforcement, or concrete, to verify that the excavations are embedded to the recommended depth into the recommended material. The excavations should be moisture-conditioned and free of all loose or sloughed material prior to placement of concrete.
- Foundations and floor slabs supported on subsoils with an expansion index greater than 130 should be individually engineered based on actual details of the foundation system.



(Slopewash to be completely removed from the keyway unless sampled, tested, and determined competent by the Project Soils Engineer)

Note: Not to Scale

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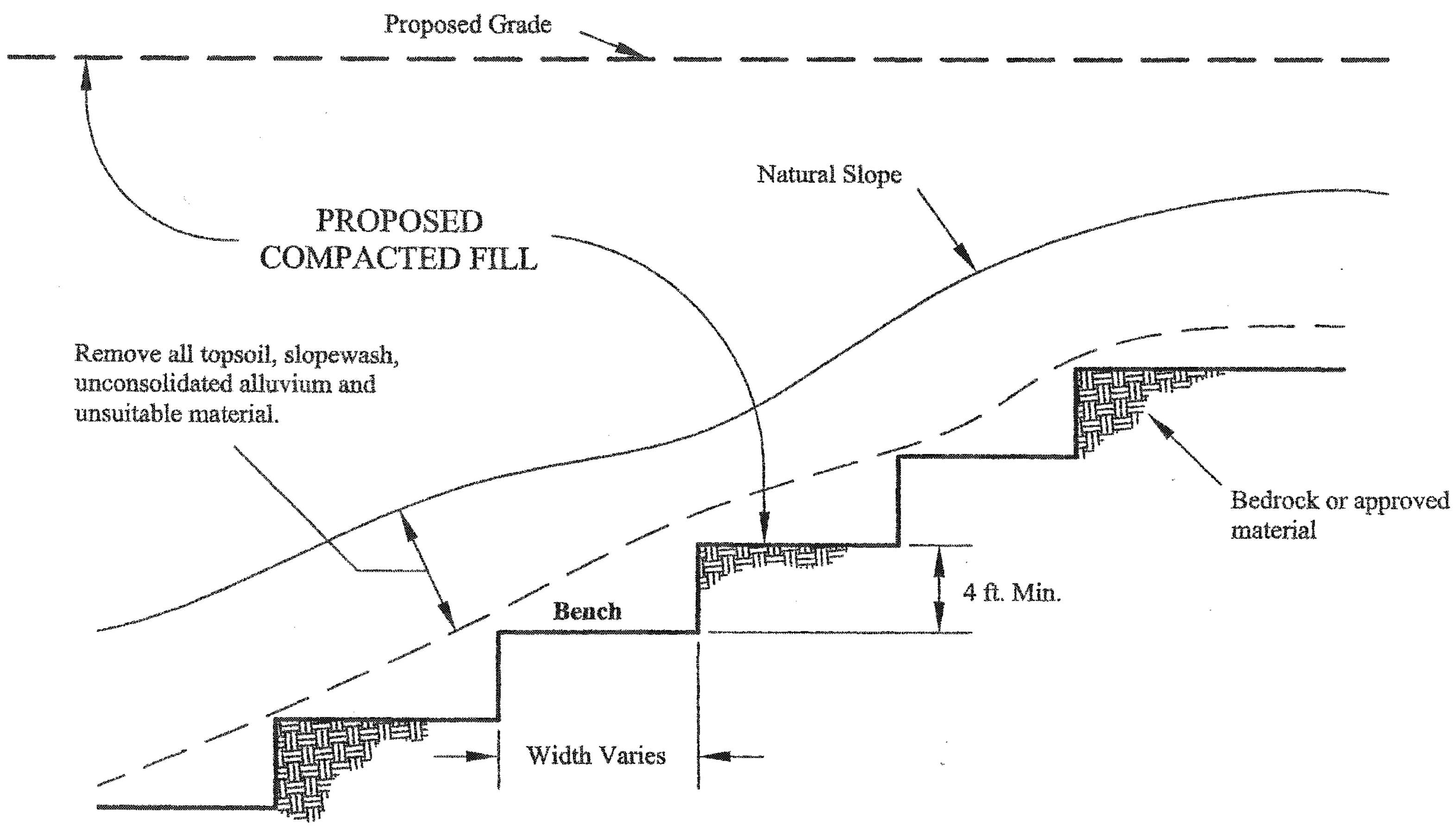
SCHEMATIC ALLUVIAL/ SLOPEWASH DETAIL

Job No.: 04-803S-4

Date: 6/11/04 *Figure:* E1



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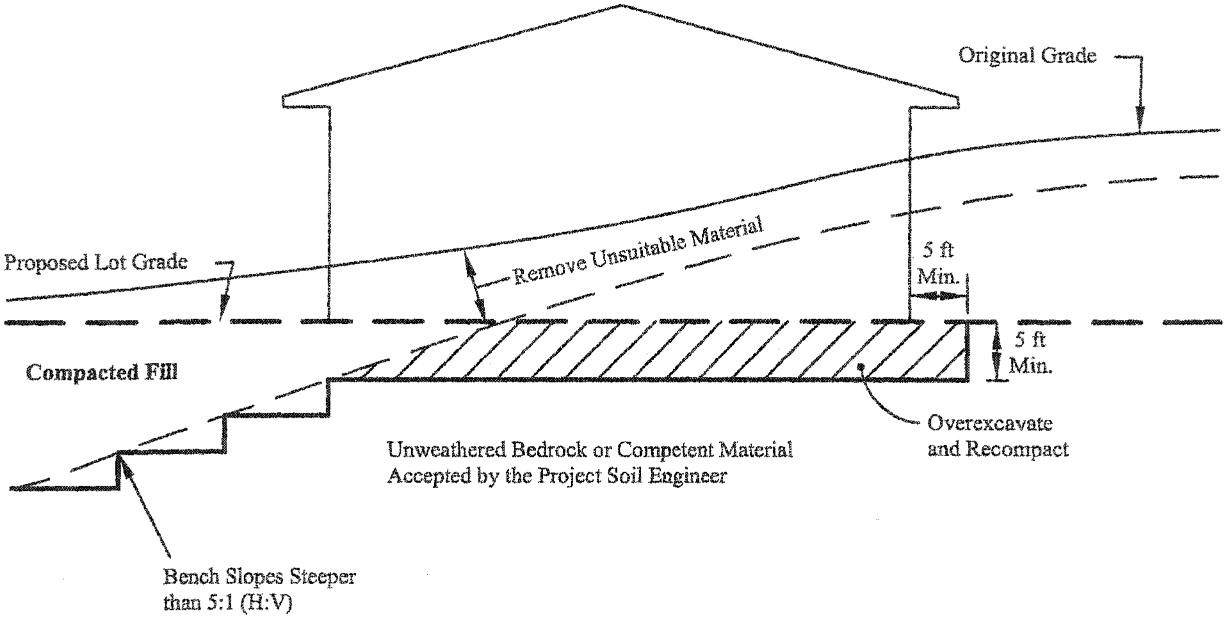
FILL OVER NATURAL SLOPE 5:1 OR STEEPER

Job No.: 04-803S-4

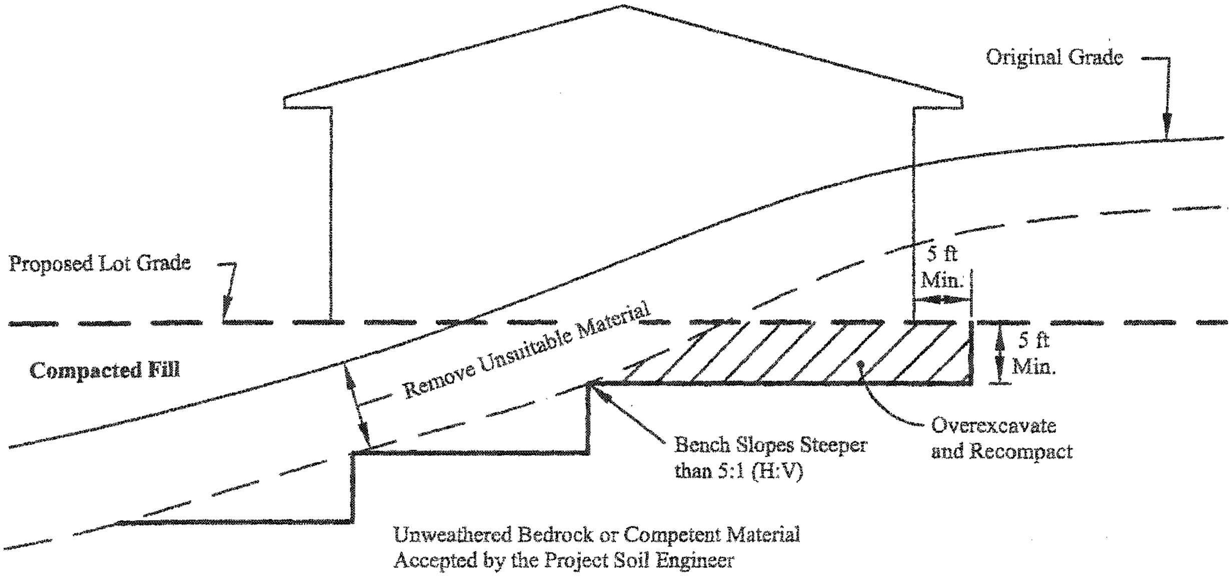
Date: 6/11/04

Figure: E2

Cut Lot



Cut Fill Lot



NOTE: Deeper Overexcavation and/or Additional Foundation Reinforcement may be Required by the Soils Engineer in Steep Cut/Fill Transition Areas (See Text)

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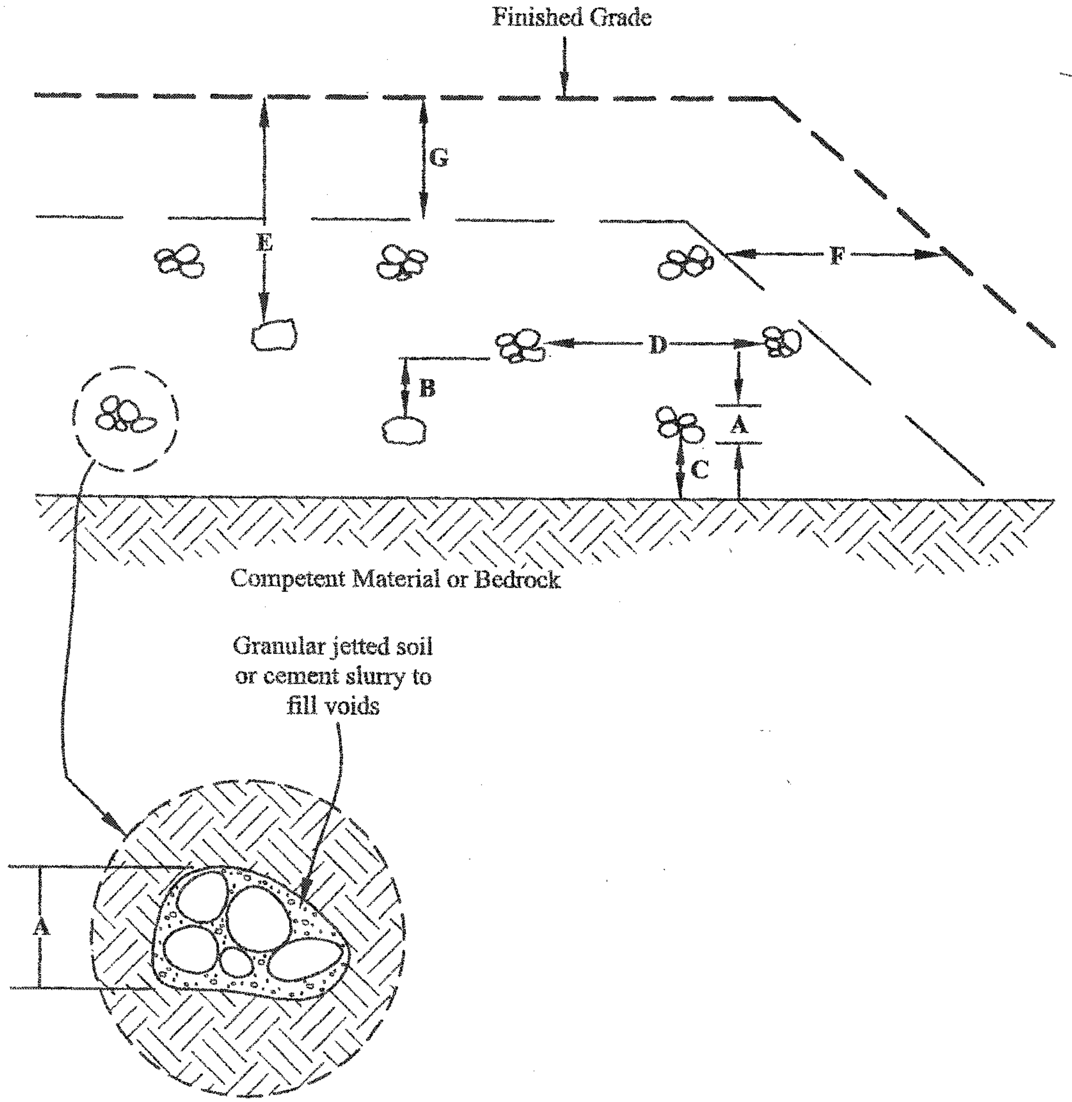
CUT LOT AND CUT FILL LOT(TRANSITIONAL)

Job No.: 04-803S-4

Date: 6/11/04 *Figure:* E3



EXPLANATION

A) ±4 ft, Height and Width may vary depending on rock size

B) Minimum of 4 ft from stagger windrow

C) Minimum of 5 ft from first set of windrow to competent material or bedrock

D) Minimum of 15 ft between windrows

E) Minimum of 23 ft from oversized rocks (> 4 ft in its largest dimension) to finished subgrade;all oversized rocks must be individually placed

F) Minimum of 25 ft from projected windrow area to finished subgrade

G) Minimum of 15 ft to clear for foundations and pools or 5 ft below the deepest adjacent utility trench, whichever is deepest

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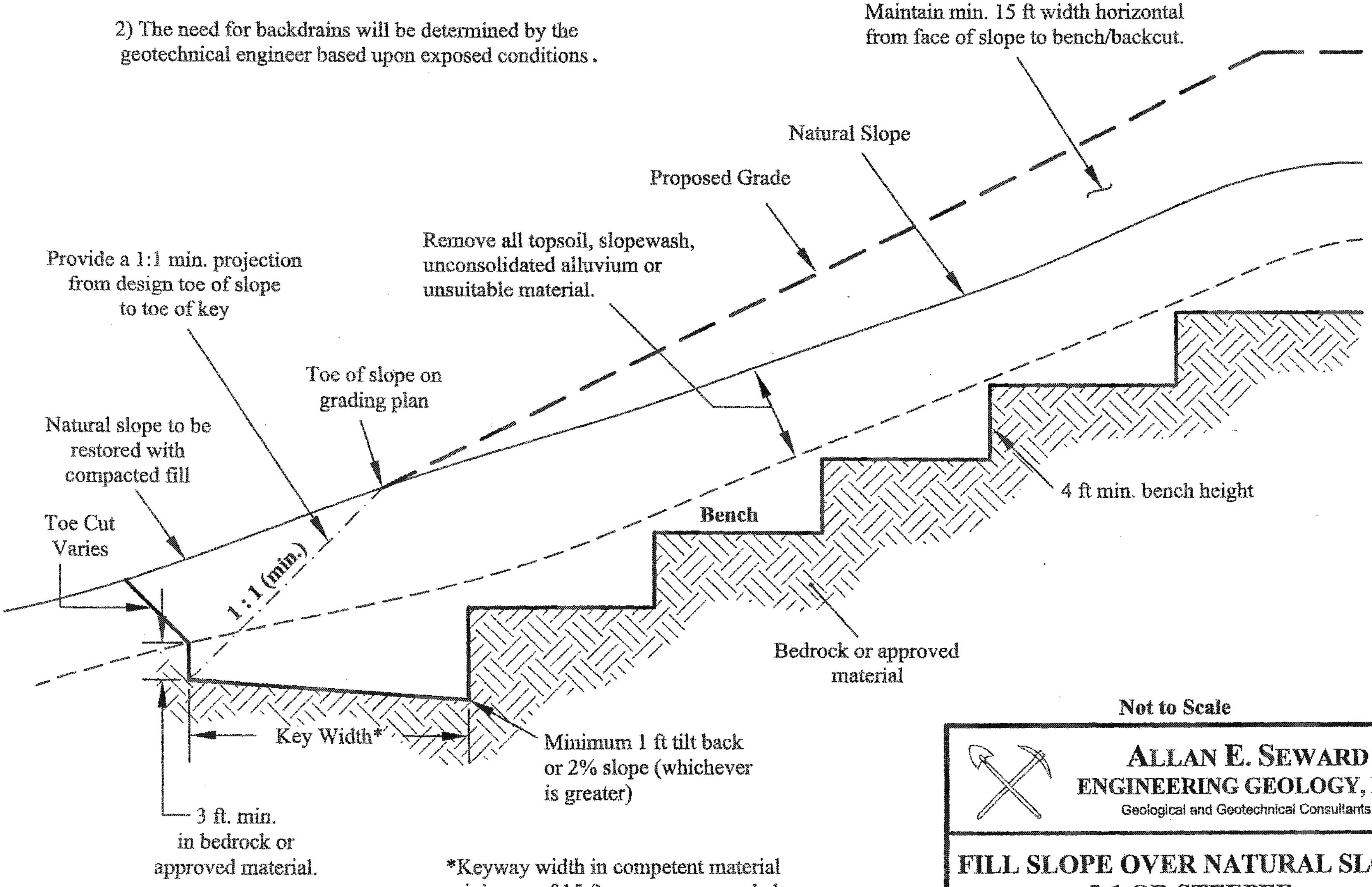
ROCK DISPOSAL (WINDROWS)

Job No.: 04-803S-4

Date: 6/11/04 *Figure:* E4

NOTE: 1) Where the natural slope approches or exceeds the design slope ratio, special recommendations will be provided by the geotechnical engineer.

2) The need for backdrains will be determined by the geotechnical engineer based upon exposed conditions.



*Keyway width in competent material minimum of 15 ft or as recommended by the Geotechnical Engineer.

Not to Scale

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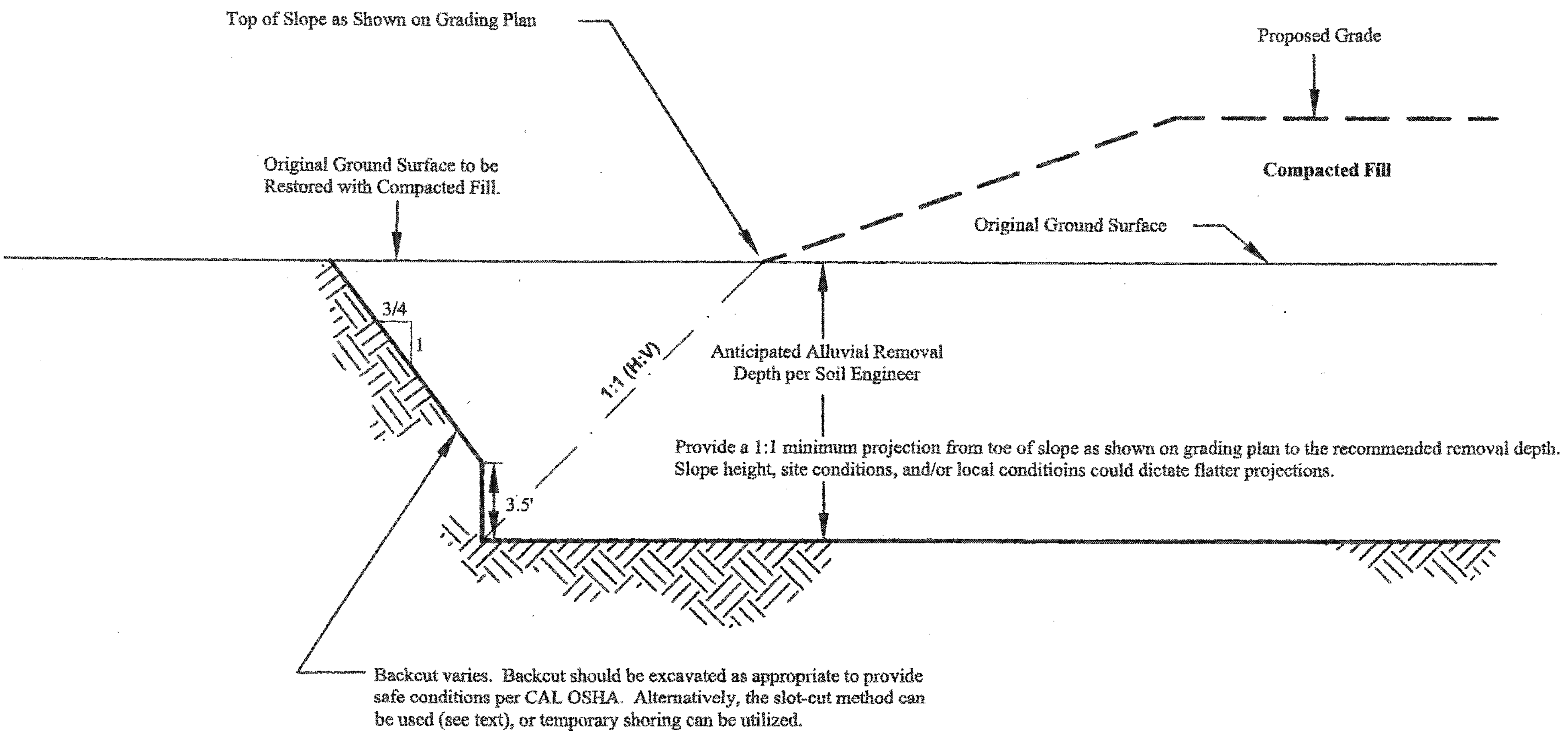
FILL SLOPE OVER NATURAL SLOPE 5:1 OR STEEPER

Job No.: 04-803S-4

Date: 6/11/04

Figure: E5



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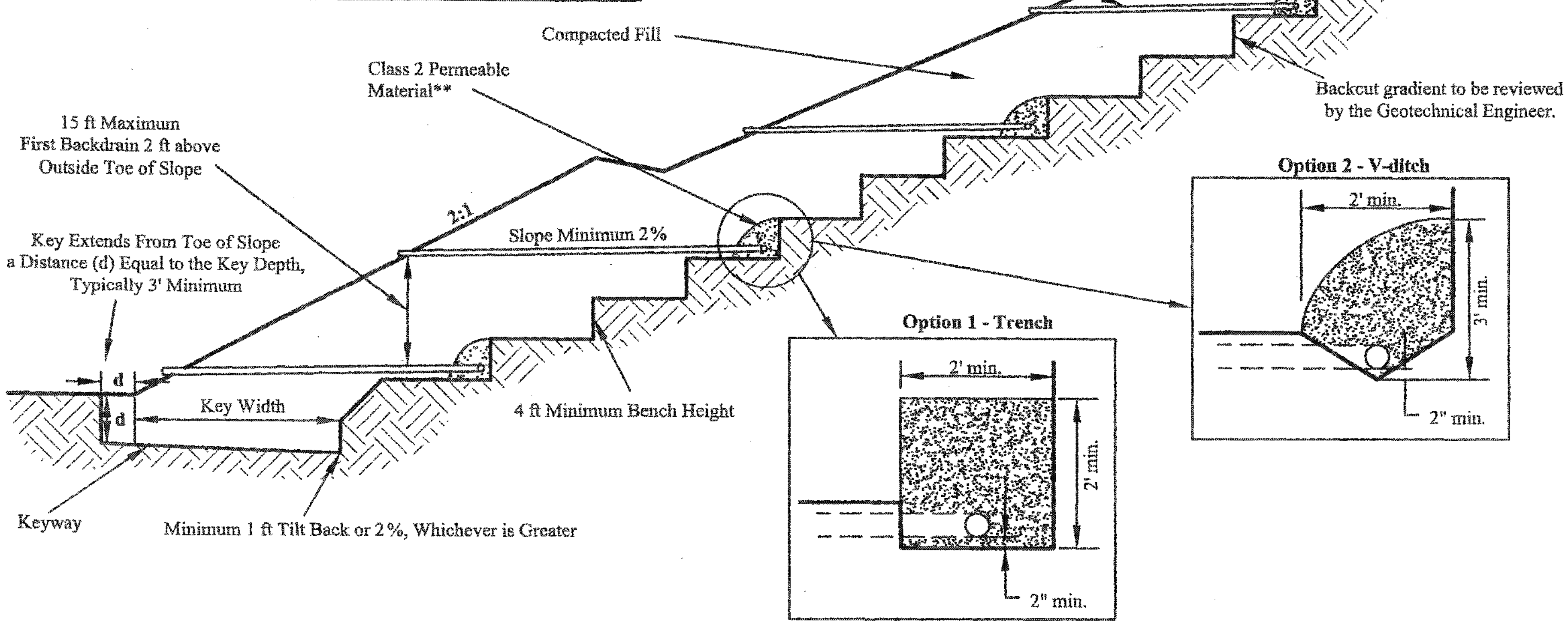
FILL SLOPE TOEING OUT ON FLAT ALLUVIATED CANYON

Job No.: 04-803S-4
Date: 6/11/04
Figure: E6

Standard Keyway Width vs. Slope Height for Stability Fill

Stability Fill Height (feet)	Minimum Keyway Width (feet)
0-20	15
20-30	20
30-50	25
50-75	30
75-100	35
100-150	45

Buttress depth and width of key as recommended by the Geotechnical Engineer



All backdrains and outlet pipes to be 4" diameter PVC pipe (SDR 35 or Schedule 40); Backdrain Perforations positioned down; Upper ends of backdrains to be sealed with an approved cap.

****Specifications for CalTrans Class 2 Permeable Material**

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

Sand Equivalent >75

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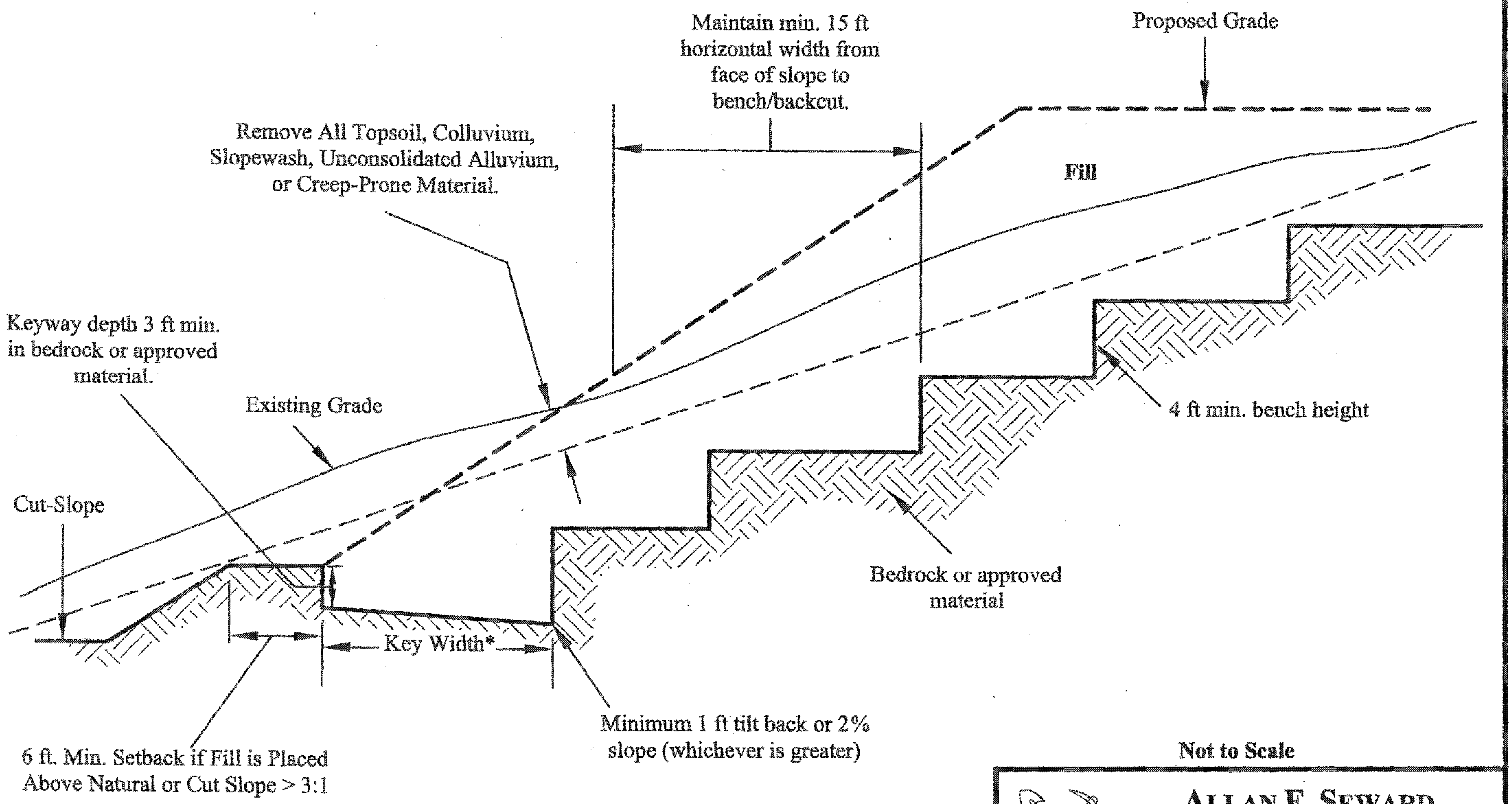
STABILITY/BUTTRESS FILL AND BACKDRAINS

Job No.: 04-803S-4
Date: 6/11/04
Figure: E7



*Keyway width in competent material minimum of 15 ft. or as recommended by Geotechnical Engineer.

Not to Scale

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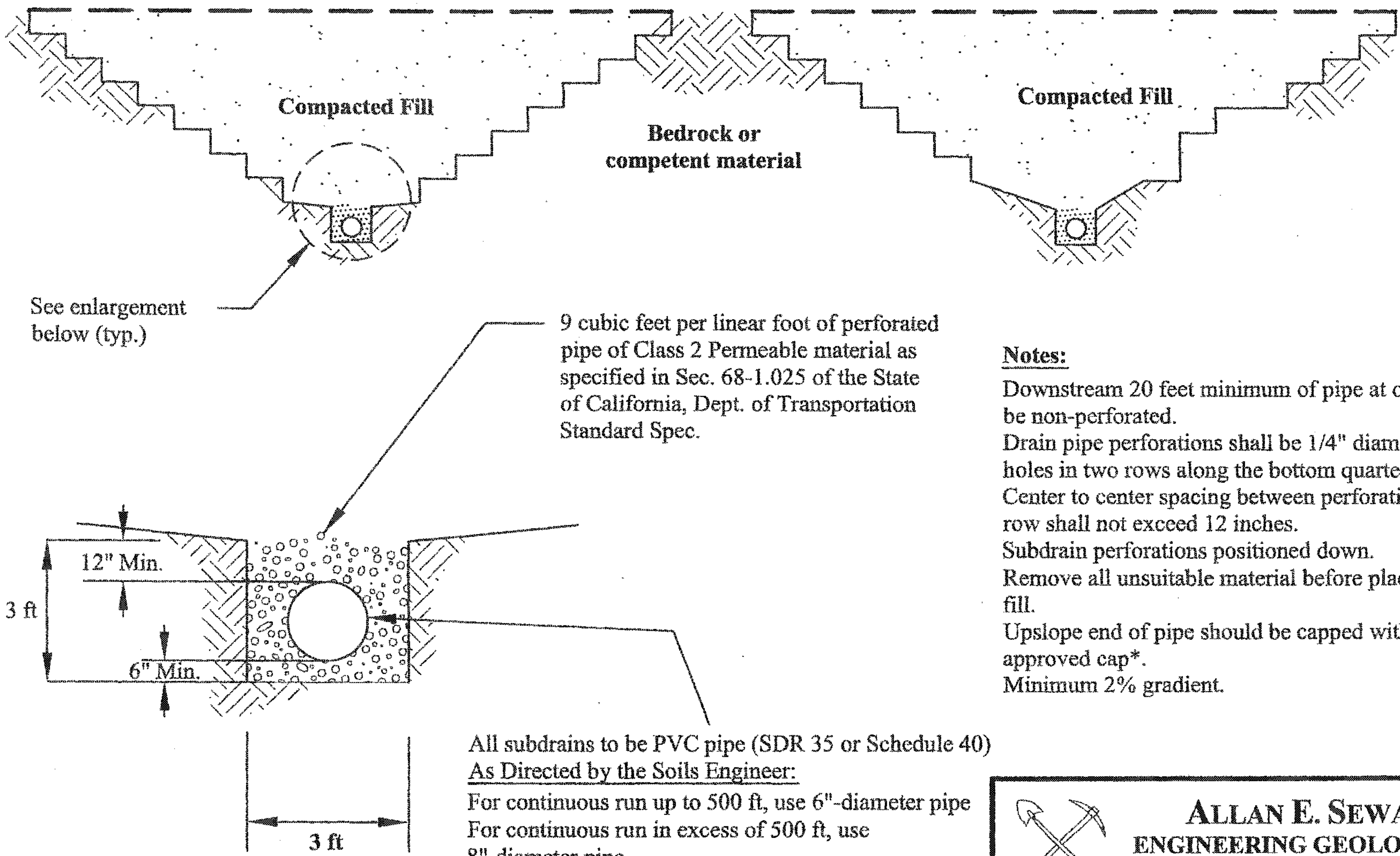
TYPICAL FILL ABOVE CUT-SLOPE

Job No.: 04-803S-4

Date: 6/11/04 *Figure:* E8



9 cubic feet per linear foot of perforated pipe of Class 2 Permeable material as specified in Sec. 68-1.025 of the State of California, Dept. of Transportation Standard Spec.

All subdrains to be PVC pipe (SDR 35 or Schedule 40)
<u>As Directed by the Soils Engineer:</u>
For continuous run up to 500 ft, use 6"-diameter pipe
For continuous run in excess of 500 ft, use 8"-diameter pipe
For continuous run in excess of 1500 ft, use 10"-diameter pipe

Notes:
Downstream 20 feet minimum of pipe at outlet shall be non-perforated.
Drain pipe perforations shall be 1/4" diameter open holes in two rows along the bottom quarter of pipe.
Center to center spacing between perforations in each row shall not exceed 12 inches.
Subdrain perforations positioned down.
Remove all unsuitable material before placing any fill.
Upslope end of pipe should be capped with an approved cap*.
Minimum 2% gradient.

* Endpoints and long runs should be surveyed

Not to scale

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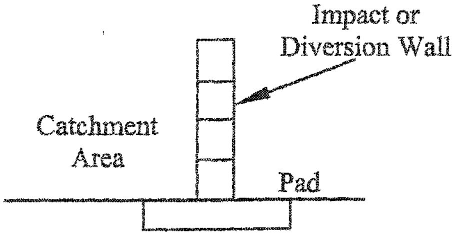
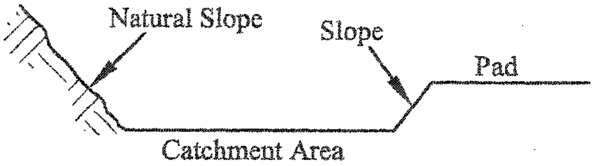
CANYON SUBDRAIN DETAIL

Job No.: 04-803S-4
Date: 6/11/04 *Figure:* E9

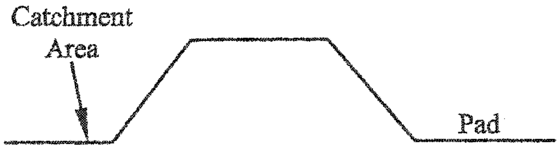




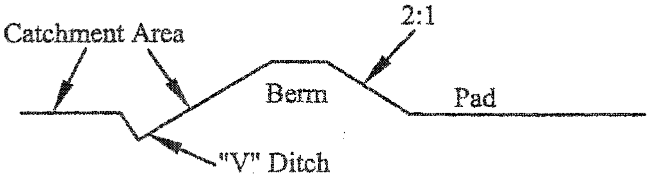
NOTE: Not to scale

ALTERNATIVE DEBRIS CONTROL DEVICES

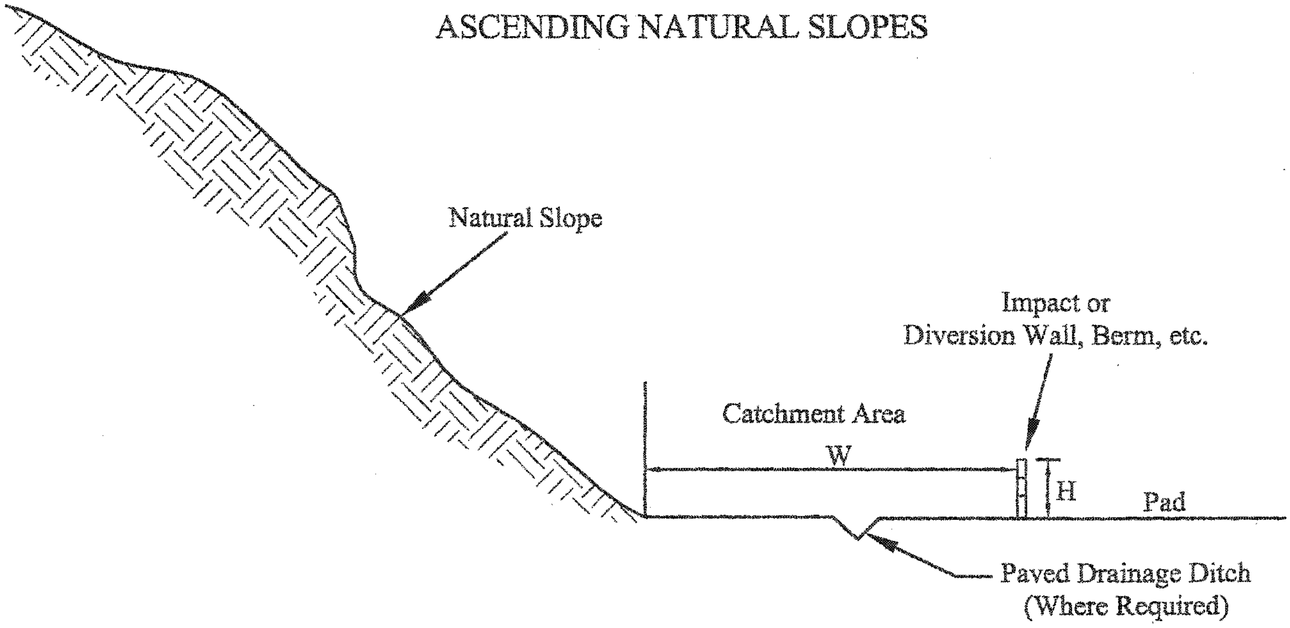
Earth Berm



Earth Berm and Trench
(For Rockfall)



ASCENDING NATURAL SLOPES



NOTE: W and H will vary according to natural slope
height, gradient, and material

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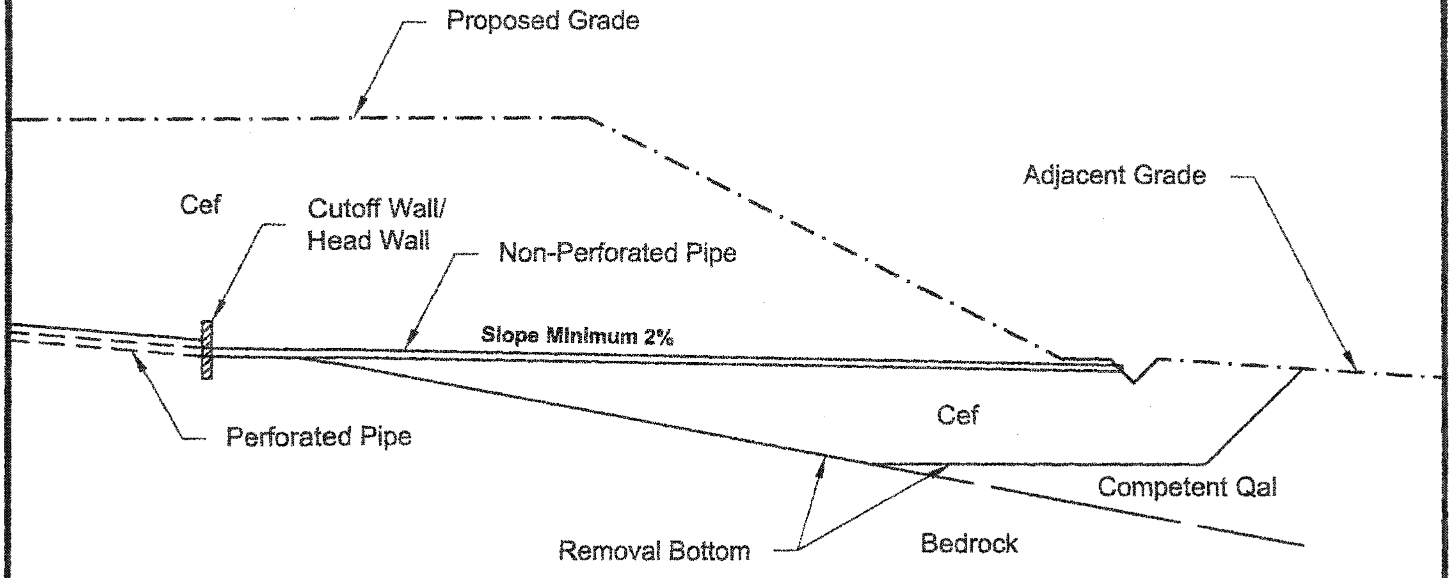
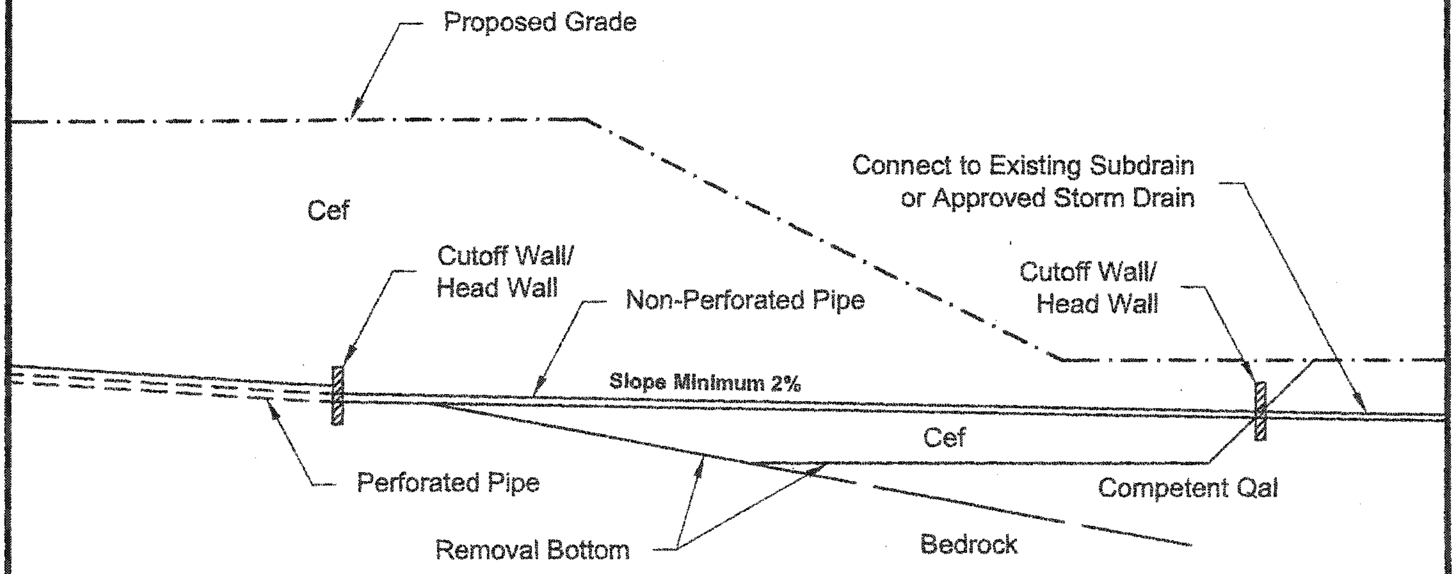
DEBRIS FLOW HAZARD CONTROL DEVICES

Job No.:	04-803S-4		
Date:	6/11/04	*Figure:*	E10

CASE I
Subdrain Daylights at Toe of Slope



CASE II
Subdrain Connects to Existing Subdrain or Storm Drain



Cef - Compacted fill to 90% or 93% or 95%
of laboratory maximum, depending
upon Soil Engineer's requirements.

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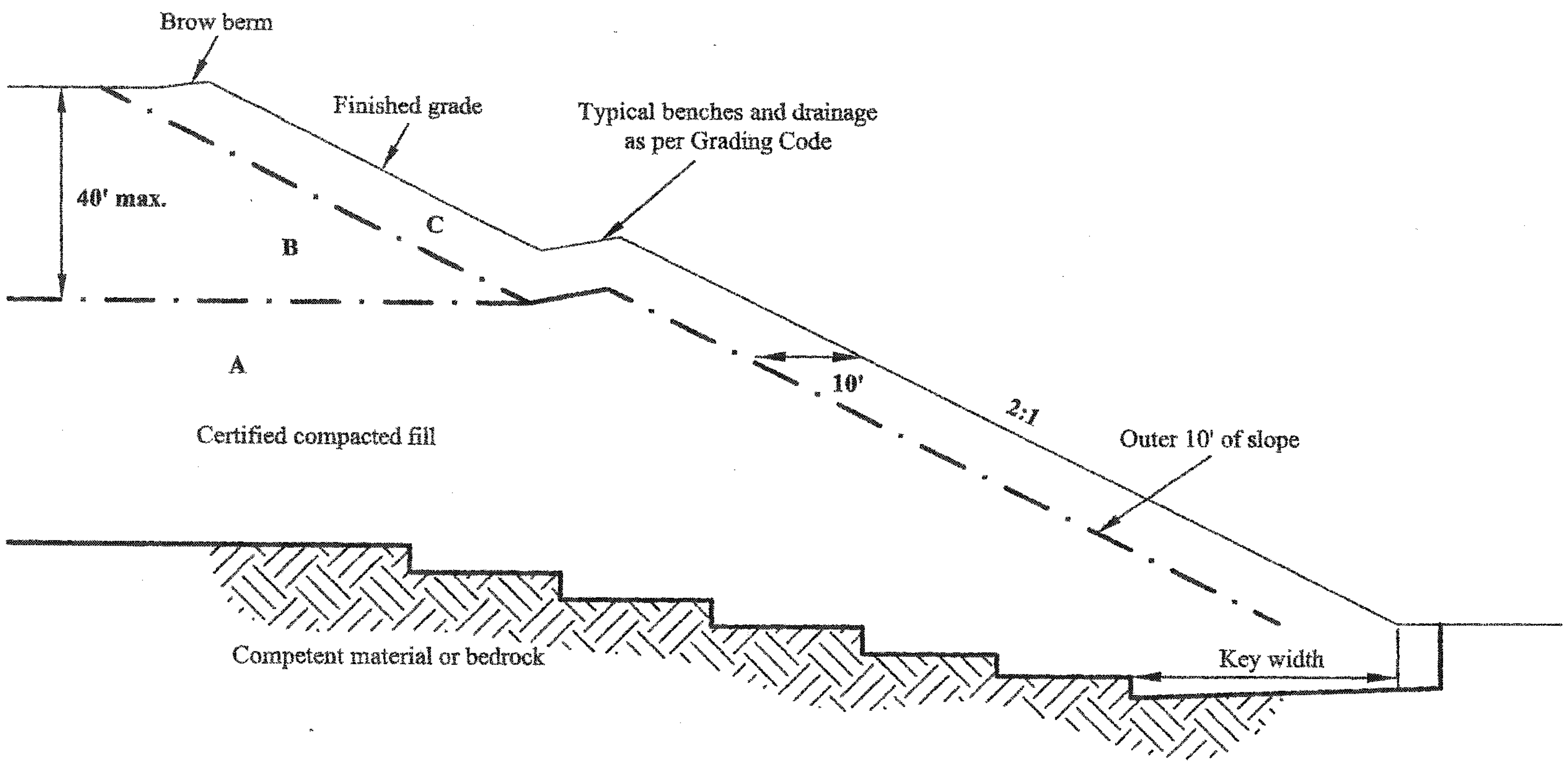
TYPICAL CANYON SUBDRAIN OUTLET

Job No.: 04-803S-4

Date: 6/11/04

Figure: E11



Type of soils	Fill Location [1]		
	A	B	C [3]
Fine Grained	93	90	90
Coarse Grained [2]	95	95	92

Notes:

1. All man-made fill shall be compacted to a minimum of 90 percent relative compaction as determined by ASTM method D 1557 except noted here.

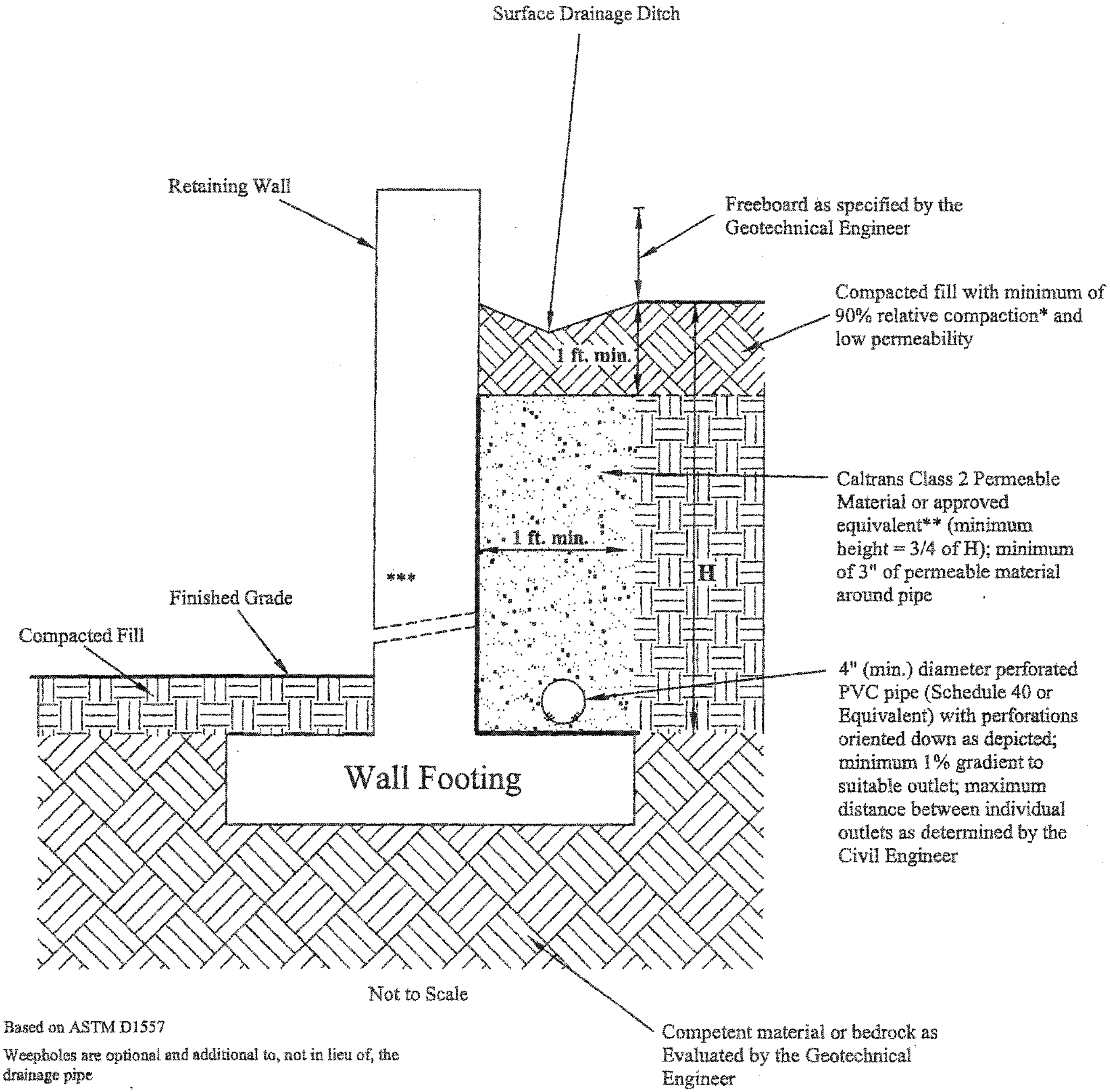
2. Coarse-grained soils (gravel, sand and silt) are those soils that have less than 15 percent fines passing 0.005 mm.

3. For slopes, compaction at the exposed surface shall be obtained either by overfilling and cutting back the slope surface until the compacted inner core is exposed, or by compacting the outer horizontal 10 feet of the slope to two percent higher relative compaction than described in above table.

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

TYPICAL FILL SLOPE COMPACTION REQUIREMENT

Job No.: 04-803S-4
Date: 6/11/04
Figure: E12



Not to Scale

* Based on ASTM D1557

*** Weepholes are optional and additional to, not in lieu of, the drainage pipe

****Specifications for CalTrans Class 2 Permeable Material**

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

Sand Equivalent >75

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

RETAINING WALL DRAINAGE DETAIL

Job No.: 04-803S-4

Date: 6/11/04 *Figure:* E13

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

GEOLOGIC AND GEOTECHNICAL REPORT

Review of Tentative Tract Map (Dated April 1, 2004)

Tentative Tract 60258
The Keystone
City of Santa Clarita, California

VOLUME II OF II

Prepared for:

Synergy, A Land & Development Company
23823 West Valencia Boulevard
Valencia, California 91355

Job No: 04-803S-4
Dated June 11, 2004

Appendix F

APPENDIX F

SLOPE STABILITY ANALYSES

Introduction

Analyses were performed on several selected cross-sections to evaluate the stability of proposed cut and fill slopes, critical natural slopes proposed to remain adjacent to the development and landslide areas which may impact the proposed development. The stability analyses utilized cross sections constructed to illustrate critical structural geometries and maximum slope heights for each analyzed slope. Our evaluation included gross stability (static and pseudostatic conditions) and surficial stability. Based on our analyses, the need for stabilization measures was explored and dimensional design of these measures was performed, as needed, in a step-by-step fashion utilizing computer-based numerical slope stability analyses. The results of our stability analyses are summarized in **Table F1** along with slope parameters and recommended mitigations. Slope stability diagrams graphically illustrating the results of our analyses for each cross section are attached for review.

Summary of Slope Conditions Analyzed

Natural Slopes

Natural slopes evaluated for this investigation include ridgelines and riverbank areas. Cross Sections 5-5' and 13-13' illustrate the anticipated conditions of critical natural slope areas. Cross Section 3-3' illustrates the anticipated critical conditions where development is proposed above a natural slope area.

Calculated factors of safety and recommended mitigation measures are presented in **Table F1** for review. For general description of the geologic/geotechnical conditions, see Section 9.2.11 within the text portion of the report.

Cut-Slopes

The three dimensional geometry of critical cut-slopes are illustrated on Cross Sections 1-1', 4-4', and 11-11'. The results of our stability analyses of these cross sections are presented in **Table F1**. Mitigation measures including stability fills have been recommended as needed to provide factors of safety which meet City of Santa Clarita standards as summarized in **Table F1**.

APPENDIX F

Fill Slopes

The highest proposed fill slope is 120 feet in height as illustrated on Cross Section 2-2'. This fill slope calculates as grossly stable per City of Santa Clarita standards.

Landslides

Three (3) landslides have been mapped on the subject site in the vicinity of proposed walkways. No proposed structures exist within the area affected by the landslides. Based on future use intended, slope stability analyses was not performed

Surficial Stability

Surficial stability analysis of fill slopes utilizing the "infinite slope" method for this site was performed and is presented in Figures **F1.1 through F1.3** within **this Appendix**. Permanent cut-slopes exposing cut/fill transitions or daylighted bedrock or terrace deposits should be constructed as Stability Fills.

Geometry and Groundwater

As shown on the respective cross sections, the analyzed geometries of cut-slopes and natural slopes included removal of vegetation, topsoil, artificial fill, alluvium, landslide debris and bedrock materials and adding certified compacted fill to achieve the proposed grades, or remedial grades as needed on portions of the slopes. Analyses included cross-bedding based on geologic data obtained near each cross section listed in **Table F1**.

Review of ground water data in the vicinity and trench and boring log data indicates that the proposed cut-slopes in bedrock are above historic high ground water levels. Perched ground water was observed within the terrace deposits and Saugus formation bedrock within our bucket auger borings BA-15, BA-16 and BA-17 at the elevated portions of the site. Where appropriate, ground water was modeled in the slope stability analyses.

Shear Strength Parameters

A total of 4 direct shear strength tests were performed for this project. Individual Direct Shear test results are presented in **Appendix B**. Data used in our analyses are summarized in the below table:

APPENDIX F

Table F2 - Summary of Design Shear Strength Values

Material	Peak		Ultimate		Unit Wt. (pcf)
	Cohesion (psf)	Phi ϕ	Cohesion (psf)	Phi ϕ	
Bedrock (TQs), Cross-Bedding	1700	33°	700	32°	135
Compacted Fill (Cef)	300	30°	300	30°	130
Alluvium (Qal)	850	35°	400	33°	130
Terrace Deposits (Qt)	800	41°	400	38°	130

Based on our subsurface borings and test pits, the site is predominantly coarse-grained. In our analyses, ultimate shear strengths were used for static gross stability and pseudostatic gross stability.

Conclusion

The analyzed cut-slopes, proposed grades, remedial grades and compacted fill slopes comply with City of Santa Clarita Building Code minimum requirements for gross stability under static and pseudostatic loading conditions and for surficial stability, as applicable, provided our recommendations are followed and incorporated into project construction.

The following attachments are located within this Appendix.

Slope Stability Analyses Results	**Table F1**
Slope Stability Diagrams and Data Sheets for Runs 1 through 17	
Infinite Slope Stability Analyses	**Figures F1.1 through F1.3**

APPENDIX F

SLOPE STABILITY ANALYSES RESULTS

Cross Section	File Name	Slope Designation	Analyzed Plane	Method	Factor of Safety		Comments	Run No.
					Static	Pseudostatic[1] (Coeff = 0.15)		
1-1′	T1S1B	CS-1	Circular	Bishop	2.25		Analyses includes stability fill into Qt, -Search at upper toe area, -Critical factor of safety	1
1-1′	T1PS1B	CS-1	Circular	Bishop		1.49	Pseudostatic analyses F.S. > 1.1 O.K.	2
1-1′	T1S1A	Natural Slope below CS-1	Circular	Bishop	3.54		Search at lower toe area; Pseudostatic is not critical and was not performed	3
2-2′	T2S1A	High Fill Slope over Alluvial Canyon	Circular	Bishop	1.78		Highest fill slope	4
2-2′	T2PS1A	High Fill Slope over Alluvial Canyon	Circular	Bishop		1.26	Pseudostatic analyses F.S > 1.1 O.K.	5
3-3′	T3S1A	Fill over Natural Slope	Circular	Bishop	1.55		Analyses include removal of artificial fill	6
3-3′	T3PS1A	Fill over Natural Slope	Circular	Bishop		1.17	Pseudostatic analyses F.S > 1.1 O.K.	7
4-4′	T4S1A	CS-4	Circular	Bishop	2.18		Analyses for cut-slope 4	8
4-4′	T4PS1A	CS-4	Circular	Bishop		1.32	Pseudostatic analyses F.S > 1.1 O.K.	9

---

[1] Peak shear strength values were not utilized.

APPENDIX F

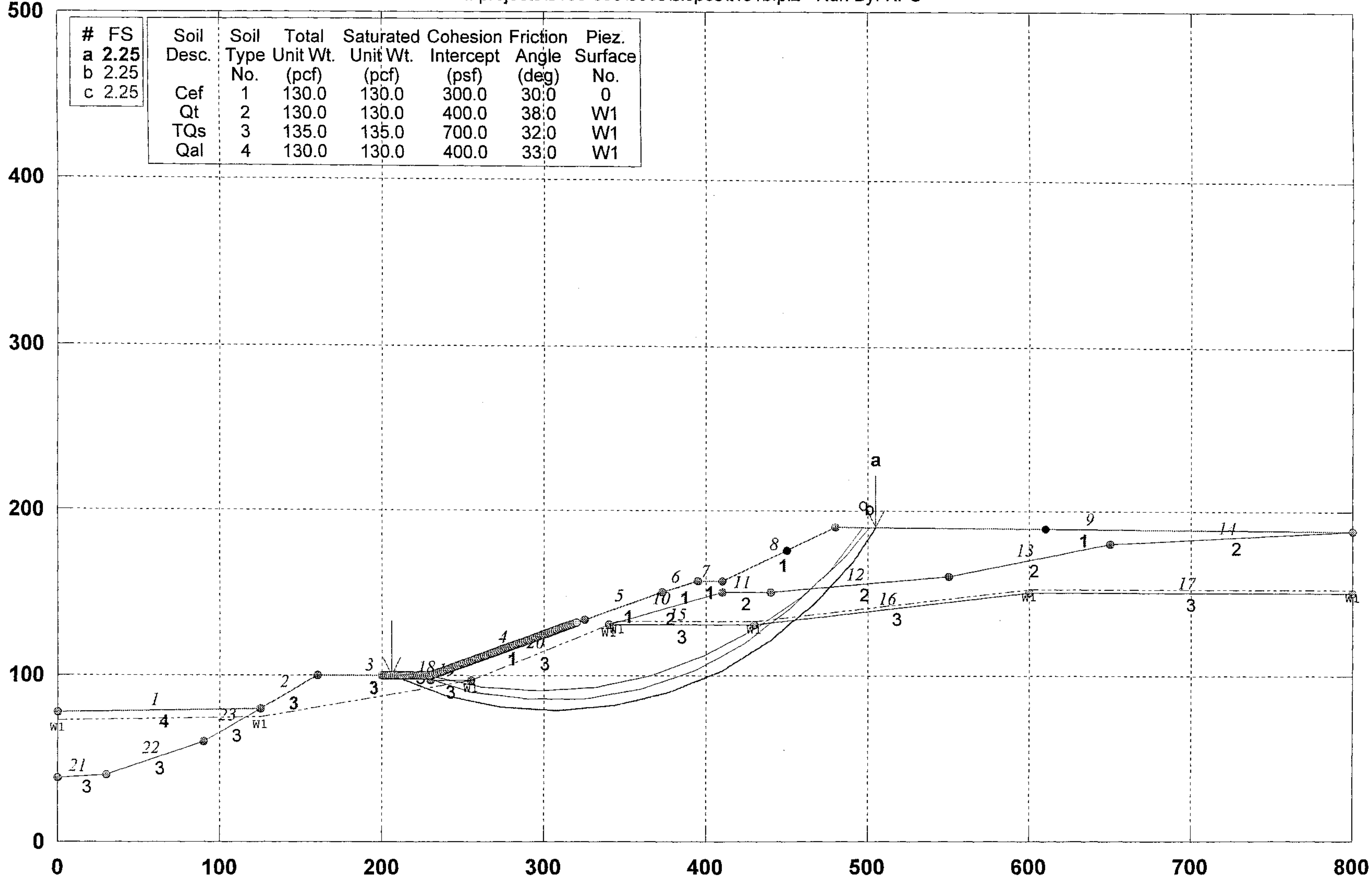
SLOPE STABILITY ANALYSES RESULTS

CROSS SECTION	FILE NAME	SLOPE DESIGNATION	ANALYZED PLANE	METHOD	FACTOR OF SAFETY		COMMENTS	RUN NO.
					STATIC	PSEUDOSTATIC[1] (COEFF = 0.15)		
4-4′	T4S1D	CS-3	Circular	Bishop	2.39		Analyses for cut-slope 3	10
4-4′	T4PS1D	CS-3	Circular	Bishop		1.66	Pseudostatic analyses F.S > 1.1 O.K.	11
5-5′	T5S1A	Natural Slope	Circular	Bishop	1.96		After removal of artificial fill at the top of slope	12
5-5′	T5PS1A	Natural Slope	Circular	Bishop		1.48	Pseudostatic analyses F.S > 1.1 O.K.	13
11-11′	T11S1D	CS-11/CS-12 Slab Fill	Circular	Bishop	2.35		Cut-slope 11 not critical in comparison to cut-slope 12	14
11-11′	T11PS1D	CS-11/CS-12 Slab Fill	Circular	Bishop		1.70	Pseudostatic analyses F.S > 1.1 O.K.	15
13-13′	T13S1A	Steepest Natural Slope	Circular	Bishop	1.68		Off-site slope stability analyses; Steepest natural slope	16
13-13′	T13PS1A	Steepest Natural Slope	Circular	Bishop		1.30	Pseudostatic analyses F.S > 1.1 O.K.	17

The above results for static conditions are based upon site-specific shear strength characteristics tabulated in Table F2. These shear strengths were developed based on the direct shear test results presented on Table B2 of "Summary of Shear Strength Test Data"in Appendix B. Residual shear strength values were used for all existing natural materials under static load. Peak shear strength values were used for bedrock, terrace deposits, landslide debris and recent alluvium for pseudostatic loads and for planned compacted fill under both static and pseudostatic loads.

TT 60258, X-Sect 1-1'; CS-1 Static

n:\projects\0100-999\803s\slopes\t1s1b.pl2 Run By: KPC



#	FS
a	**2.25**
b	2.25
c	2.25

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
Qt	2	130.0	130.0	400.0	38.0	W1
TQs	3	135.0	135.0	700.0	32.0	W1
Qal	4	130.0	130.0	400.0	33.0	W1

GSTABL7 v.2 FSmin=2.25

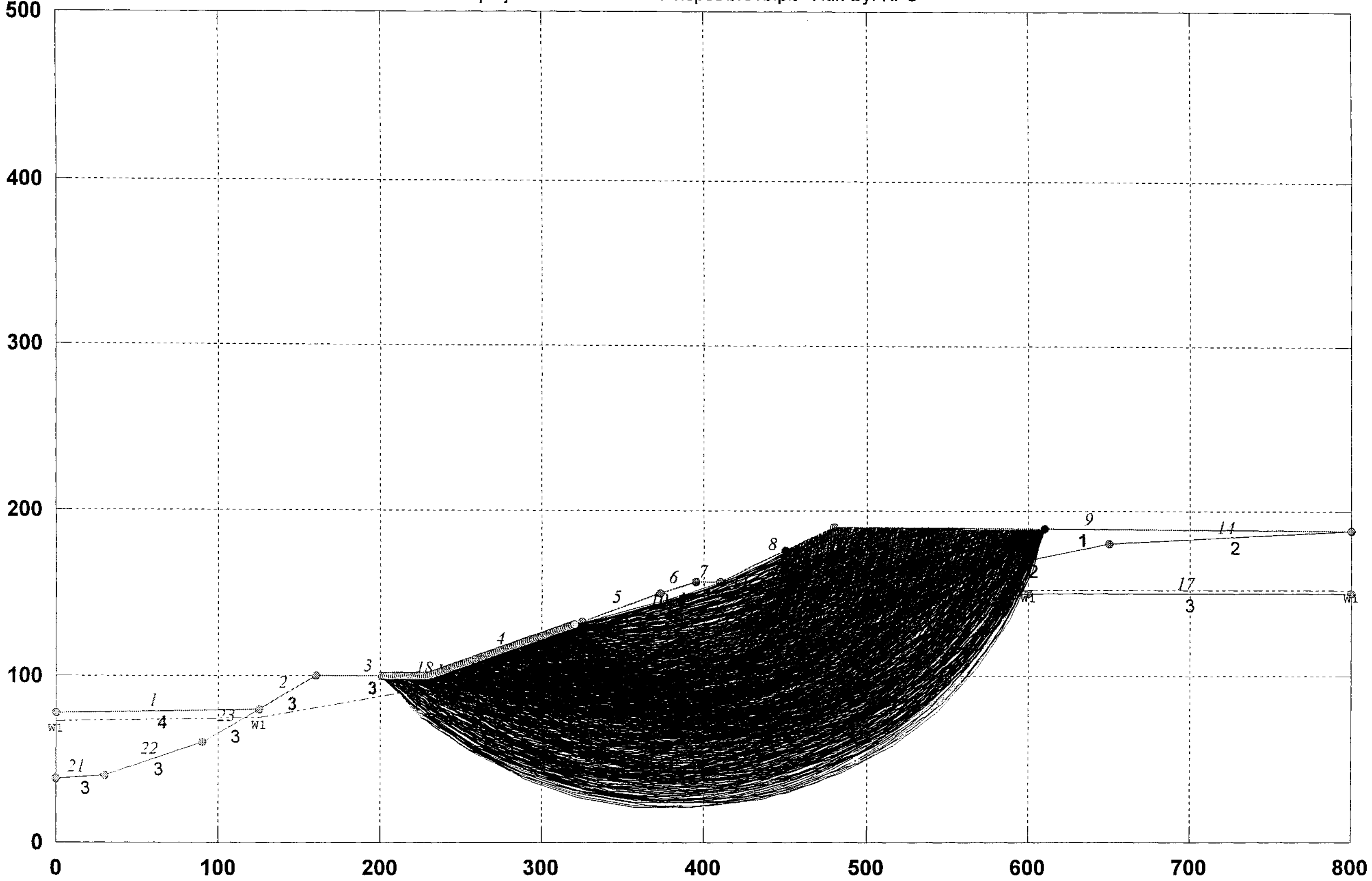
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Run No. 1

TT 60258, X-Sect 1-1'; CS-1 Static

n:\projects\0100-999\803s\slopes\t1s1b.plt Run By: KPC



GSTABL7

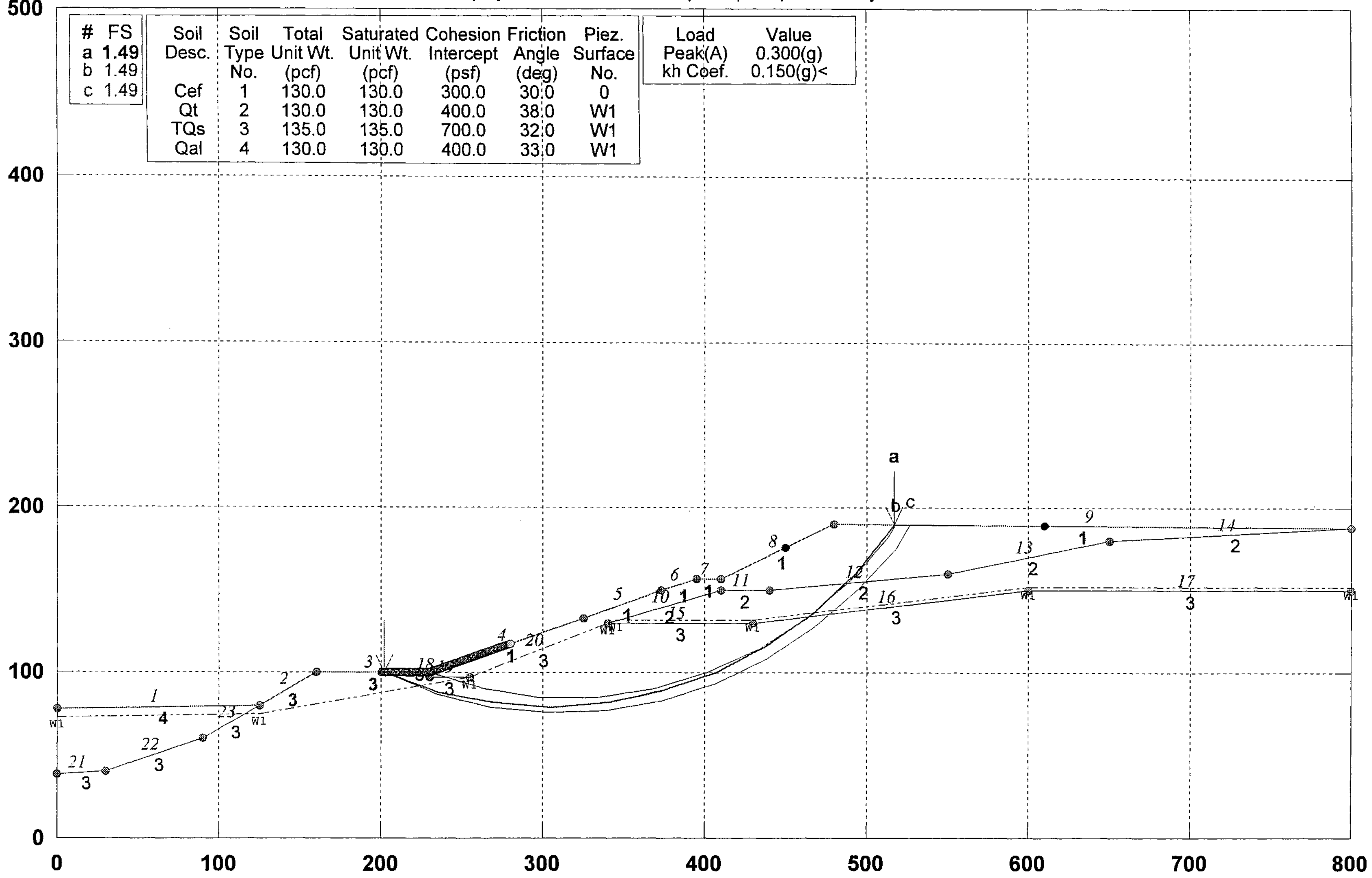
```
                                *** GSTABL7 ***
                     ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
               (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                    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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
Analysis Run Date:
Time of Run:
Run By:                   KPC
Input Data Filename:      N:\Projects\0100-999\803S\Slopes\t1s1b.in
Output Filename:          N:\Projects\0100-999\803S\Slopes\t1s1b.OUT
Unit System:              English
Plotted Output Filename:  N:\Projects\0100-999\803S\Slopes1b.PLT
PROBLEM DESCRIPTION:  TT 60258, X-Sect 1-1'; CS-1 Static
BOUNDARY COORDINATES
    9 Top   Boundaries
   23 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1          0.00      78.00     125.00      80.00        4
```

```
     2        125.00      80.00     160.00     100.00        3
     3        160.00     100.00     230.00     100.00        3
     4        230.00     100.00     325.00     133.00        1
     5        325.00     133.00     373.00     150.00        1
     6        373.00     150.00     395.00     157.00        1
     7        395.00     157.00     410.00     157.00        1
     8        410.00     157.00     480.00     190.00        1
     9        480.00     190.00     800.00     188.00        1
    10        340.12     130.00     410.00     150.00        2
    11        410.00     150.00     440.00     150.00        2
    12        440.00     150.00     550.00     160.00        2
    13        550.00     160.00     650.00     180.00        2
    14        650.00     180.00     800.00     188.00        2
    15        340.12     130.00     430.00     130.00        3
    16        430.00     130.00     600.00     150.00        3
    17        600.00     150.00     800.00     150.00        3
    18        230.00     100.00     230.10      97.00        3
    19        230.10      97.00     255.00      97.00        3
    20        255.00      97.00     340.12     130.00        3
    21          0.00      38.00      30.00      40.00        3
    22         30.00      40.00      90.00      60.00        3
    23         90.00      60.00     125.00      80.00        3
 Default Y-Origin = 0.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  4 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     300.0    30.0    0.00       0.0      0
   2  130.0    130.0     400.0    38.0    0.00       0.0      1
   3  135.0    135.0     700.0    32.0    0.00       0.0      1
   4  130.0    130.0     400.0    33.0    0.00       0.0      1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  8 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1          0.00       73.00
     2        125.00       75.00
     3        255.00       97.00
     4        340.00      130.00
     5        345.00      132.00
     6        430.00      132.00
     7        600.00      152.00
     8        800.00      152.00
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
 1000 Trial Surfaces Have Been Generated.
   10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
 Along The Ground Surface Between  X = 200.00(ft)
                               and  X = 320.00(ft)
 Each Surface Terminates Between   X = 450.00(ft)
                               and   X = 610.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =      0.00(ft)
 35.00(ft) Line Segments Define Each Trial Failure Surface.
 Restrictions Have Been Imposed Upon The Angle Of Initiation.
 The Angle Has Been Restricted Between The Angles Of -45.0
 And  15.0 deg.
 Following Are Displayed The Ten Most Critical Of The Trial
       Failure Surfaces Evaluated. They Are
       Ordered - Most Critical First.
       * * Safety Factors Are Calculated By The Modified Bishop Method * *
       Total Number of Trial Surfaces Evaluated =  1000
```

```
          Statistical Data On All Valid FS Values:
             FS Max =   4.297   FS Min =   2.252   FS Ave =   2.971
             Standard Deviation =    0.418   Coefficient of Variation =   14.08 %
          Failure Surface Specified By 11 Coordinate Points
            Point       X-Surf       Y-Surf
             No.         (ft)         (ft)
              1         206.06       100.00
              2         238.95        88.02
              3         273.23        80.97
              4         308.17        79.00
              5         343.03        82.15
              6         377.06        90.36
              7         409.52       103.44
              8         439.73       121.12
              9         467.03       143.02
             10         490.84       168.67
             11         505.38       189.84
          Circle Center At X =   304.13 ; Y =   318.13 ; and Radius =   239.16
                Factor of Safety
               ***    2.252   ***
              Individual data on the    28  slices
                              Water  Water     Tie      Tie     Earthquake
                              Force  Force    Force    Force       Force   Surcharge
 Slice  Width   Weight     Top    Bot      Norm     Tan      Hor      Ver    Load
  No.   (ft)    (lbs)    (lbs)  (lbs)     (lbs)    (lbs)    (lbs)    (lbs)   (lbs)
   1    21.1   10996.6     0.0      0.0       0.       0.      0.0      0.0      0.0
   2     2.8    3092.6     0.0    136.0       0.       0.      0.0      0.0      0.0
   3     0.1     117.4     0.0      9.9       0.       0.      0.0      0.0      0.0
   4     8.8   14056.3     0.0   2260.3       0.       0.      0.0      0.0      0.0
   5    16.1   41597.5     0.0   9347.9       0.       0.      0.0      0.0      0.0
   6    18.2   70347.7     0.0  19200.8       0.       0.      0.0      0.0      0.0
   7    34.9  192093.5     0.0  63011.9       0.       0.      0.0      0.0      0.0
   8    16.8  113514.1     0.0  40536.9       0.       0.      0.0      0.0      0.0
   9    15.0  109626.5     0.0  40301.4       0.       0.      0.0      0.0      0.0
  10     0.1     909.4     0.0    337.0       0.       0.      0.0      0.0      0.0
  11     2.9   22222.5     0.0   8258.2       0.       0.      0.0      0.0      0.0
  12     2.0   15136.7     0.0   5787.3       0.       0.      0.0      0.0      0.0
  13     2.1   16274.6     0.0   6646.2       0.       0.      0.0      0.0      0.0
  14    25.9  204785.2     0.0  76022.9       0.       0.      0.0      0.0      0.0
  15     4.1   32869.9     0.0  10972.1       0.       0.      0.0      0.0      0.0
  16    17.9  143588.8     0.0  45903.8       0.       0.      0.0      0.0      0.0
  17    14.5  108764.0     0.0  30757.3       0.       0.      0.0      0.0      0.0
  18     0.5    3396.0     0.0    986.1       0.       0.      0.0      0.0      0.0
  19    20.0  137606.5     0.0  32429.2       0.       0.      0.0      0.0      0.0
  20     9.7   64382.3     0.0   9986.1       0.       0.      0.0      0.0      0.0
  21     0.3    1789.1     0.0    259.7       0.       0.      0.0      0.0      0.0
  22    14.4   88949.7     0.0   7898.0       0.       0.      0.0      0.0      0.0
  23     2.9   16928.7     0.0    232.1       0.       0.      0.0      0.0      0.0
  24     9.7   53759.4     0.0      0.0       0.       0.      0.0      0.0      0.0
  25     9.6   47225.6     0.0      0.0       0.       0.      0.0      0.0      0.0
  26     3.4   15061.1     0.0      0.0       0.       0.      0.0      0.0      0.0
  27    10.8   38241.8     0.0      0.0       0.       0.      0.0      0.0      0.0
  28    14.5   20094.1     0.0      0.0       0.       0.      0.0      0.0      0.0
          Failure Surface Specified By 10 Coordinate Points
            Point       X-Surf       Y-Surf
             No.         (ft)         (ft)
              1         227.88       100.00
              2         262.20        93.13
              3         297.13        90.88
              4         332.04        93.29
              5         366.33       100.32
              6         399.38       111.84
              7         430.60       127.65
              8         459.45       147.47
              9         485.41       170.95
             10         501.42       189.87
          Circle Center At X =   296.53 ; Y =   352.30 ; and Radius =   261.47
```

TT 60258, X-Sect 1-1'; CS-1 Pseudostatic

n:\projects\0100-999\803s\slopes\t1ps1b.pl2   Run By: KPC



#	FS
a	**1.49**
b	1.49
c	1.49

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
Qt	2	130.0	130.0	400.0	38.0	W1
TQs	3	135.0	135.0	700.0	32.0	W1
Qal	4	130.0	130.0	400.0	33.0	W1

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.49

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Run No. 2

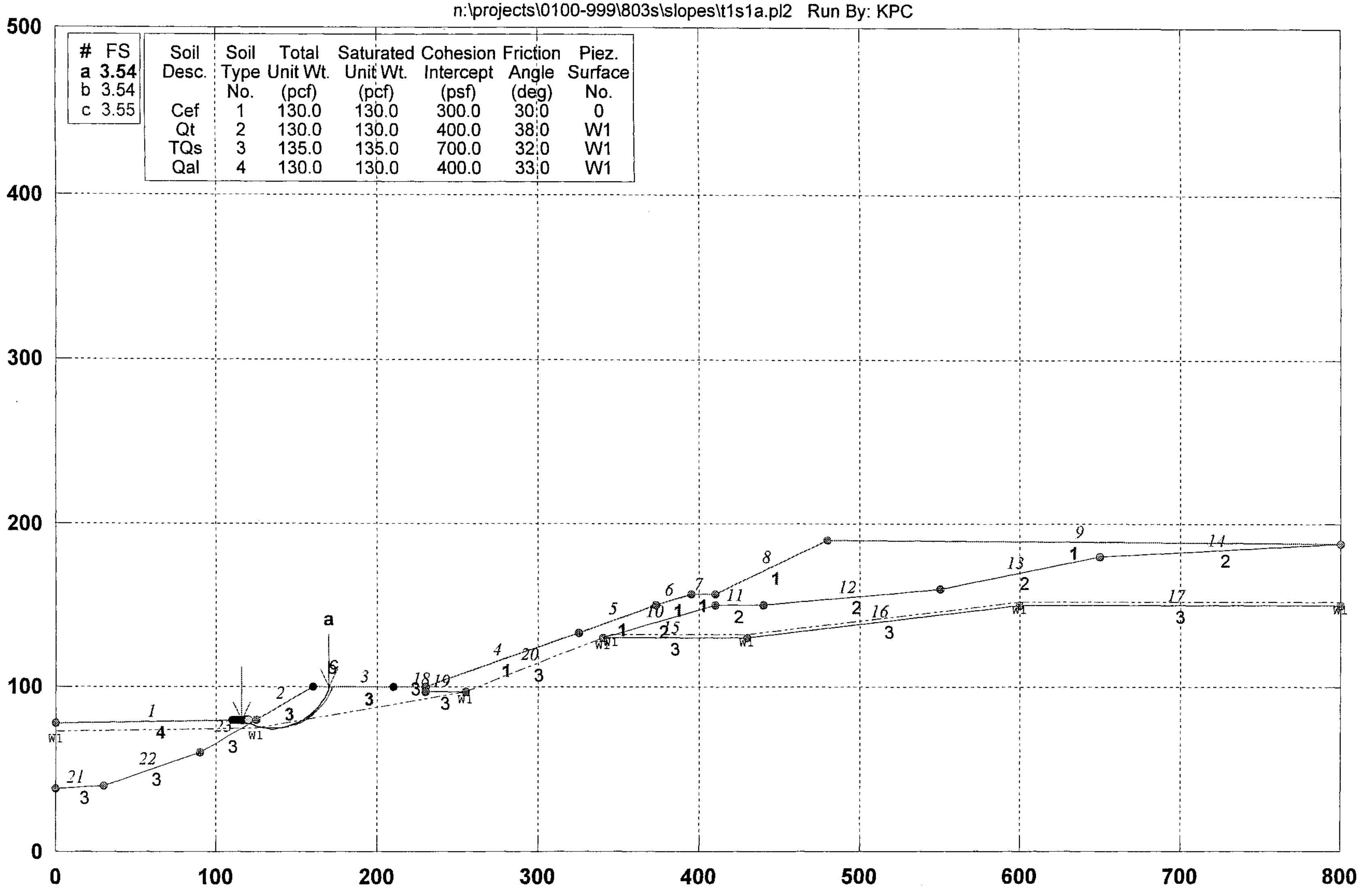
```
                         ***  GSTABL7  ***
               ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
             (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                  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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
Analysis Run Date:
Time of Run:
Run By:                   KPC
Input Data Filename:      N:\Projects\0100-999\803S\Slopes\t1ps1b.in
Output Filename:          N:\Projects\0100-999\803S\Slopes\t1ps1b.OUT
Unit System:              English
Plotted Output Filename:  N:\Projects\0100-999\803S\Slopess1b.PLT
PROBLEM DESCRIPTION:  TT 60258, X-Sect 1-1'; CS-1 Pseudostatic
BOUNDARY COORDINATES
    9 Top   Boundaries
   23 Total Boundaries
Boundary      X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.         (ft)       (ft)       (ft)       (ft)     Below Bnd
    1          0.00      78.00     125.00      80.00         4
    2        125.00      80.00     160.00     100.00         3
    3        160.00     100.00     230.00     100.00         3
    4        230.00     100.00     325.00     133.00         1
    5        325.00     133.00     373.00     150.00         1
    6        373.00     150.00     395.00     157.00         1
    7        395.00     157.00     410.00     157.00         1
    8        410.00     157.00     480.00     190.00         1
    9        480.00     190.00     800.00     188.00         1
   10        340.12     130.00     410.00     150.00         2
   11        410.00     150.00     440.00     150.00         2
   12        440.00     150.00     550.00     160.00         2
   13        550.00     160.00     650.00     180.00         2
   14        650.00     180.00     800.00     188.00         2
   15        340.12     130.00     430.00     130.00         3
   16        430.00     130.00     600.00     150.00         3
   17        600.00     150.00     800.00     150.00         3
   18        230.00     100.00     230.10      97.00         3
   19        230.10      97.00     255.00      97.00         3
   20        255.00      97.00     340.12     130.00         3
   21          0.00      38.00      30.00      40.00         3
   22         30.00      40.00      90.00      60.00         3
   23         90.00      60.00     125.00      80.00         3
Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
 4 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     300.0     30.0    0.00       0.0      0
  2   130.0    130.0     400.0     38.0    0.00       0.0      1
  3   135.0    135.0     700.0     32.0    0.00       0.0      1
  4   130.0    130.0     400.0     33.0    0.00       0.0      1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  8 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.        (ft)        (ft)
    1         0.00       73.00
```

```
        2        125.00       75.00
        3        255.00       97.00
        4        340.00      130.00
        5        345.00      132.00
        6        430.00      132.00
        7        600.00      152.00
        8        800.00      152.00
   Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
   Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
   Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
   Specified Seismic Pore-Pressure Factor =   0.000
   A Critical Failure Surface Searching Method, Using A Random
   Technique For Generating Circular Surfaces, Has Been Specified.
   1000 Trial Surfaces Have Been Generated.
     10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
   Along The Ground Surface Between  X = 200.00(ft)
                                 and  X = 280.00(ft)
   Each Surface Terminates Between   X = 450.00(ft)
                                and   X = 610.00(ft)
   Unless Further Limitations Were Imposed, The Minimum Elevation
   At Which A Surface Extends Is  Y =      0.00(ft)
   35.00(ft) Line Segments Define Each Trial Failure Surface.
   Restrictions Have Been Imposed Upon The Angle Of Initiation.
   The Angle Has Been Restricted Between The Angles Of -45.0
   And  15.0 deg.
   Following Are Displayed The Ten Most Critical Of The Trial
         Failure Surfaces Evaluated. They Are
         Ordered - Most Critical First.
         * * Safety Factors Are Calculated By The Modified Bishop Method * *
         Total Number of Trial Surfaces Evaluated =  1000
         Statistical Data On All Valid FS Values:
            FS Max =   2.294   FS Min =   1.490   FS Ave =   1.801
            Standard Deviation =    0.176   Coefficient of Variation =    9.79 %
         Failure Surface Specified By 12 Coordinate Points
           Point       X-Surf      Y-Surf
            No.         (ft)        (ft)
              1        202.42      100.00
              2        235.48       88.50
              3        269.78       81.54
              4        304.71       79.23
              5        339.62       81.64
              6        373.90       88.70
              7        406.92      100.30
              8        438.09      116.23
              9        466.84      136.19
             10        492.66      159.82
             11        515.07      186.71
             12        516.99      189.77
         Circle Center At X =   304.28 ; Y =   339.09 ; and Radius =   259.88
                Factor of Safety
               ***   1.490   ***
              Individual data on the    29  slices
                        Water  Water     Tie     Tie      Earthquake
                        Force  Force    Force   Force        Force   Surcharge
Slice  Width   Weight    Top    Bot     Norm     Tan      Hor     Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)    (lbs)   (lbs)   (lbs)   (lbs)
  1     23.0  12429.5     0.0     0.0       0.      0.  1864.4      0.0      0.0
  2      4.6   5429.1     0.0   351.9       0.      0.   814.4      0.0      0.0
  3      0.1    129.2     0.0    15.6       0.      0.    19.4      0.0      0.0
  4      5.4   8271.6     0.0  1334.4       0.      0.  1240.7      0.0      0.0
  5     19.5  48669.3     0.0 10822.9       0.      0.  7300.4      0.0      0.0
  6     14.8  55460.8     0.0 14805.3       0.      0.  8319.1      0.0      0.0
  7     34.9 184418.8     0.0 59459.6       0.      0. 27662.8      0.0      0.0
  8     20.3 134794.5     0.0 47810.8       0.      0. 20219.2      0.0      0.0
  9     14.6 106863.7     0.0 39213.3       0.      0. 16029.6      0.0      0.0
 10      0.4   2867.5     0.0  1084.6       0.      0.   430.1      0.0      0.0
 11      0.1    911.9     0.0   343.8       0.      0.   136.8      0.0      0.0
```

```
  12      4.9   37310.1     0.0 14120.3       0.       0.  5596.5     0.0       0.0
  13      2.1   16250.9     0.0  6585.7       0.       0.  2437.6     0.0       0.0
  14     25.9  206208.1     0.0 76129.8       0.       0. 30931.2     0.0       0.0
  15      0.9    7400.4     0.0  2493.0       0.       0.  1110.1     0.0       0.0
  16     21.1  171914.0     0.0 55243.2       0.       0. 25787.1     0.0       0.0
  17     11.9   93025.8     0.0 26647.4       0.       0. 13953.9     0.0       0.0
  18      3.1   22803.3     0.0  6662.8       0.       0.  3420.5     0.0       0.0
  19     20.0  144598.8     0.0 35057.6       0.       0. 21689.8     0.0       0.0
  20      8.1   57648.8     0.0 10314.1       0.       0.  8647.3     0.0       0.0
  21      1.9   13482.2     0.0  2328.6       0.       0.  2022.3     0.0       0.0
  22     23.6  157333.6     0.0 15708.9       0.       0. 23600.0     0.0       0.0
  23      3.2   20041.0     0.0   260.3       0.       0.  3006.2     0.0       0.0
  24      0.2    1138.5     0.0     1.1       0.       0.   170.8     0.0       0.0
  25     13.0   75298.5     0.0     0.0       0.       0. 11294.8     0.0       0.0
  26      6.5   32990.8     0.0     0.0       0.       0.  4948.6     0.0       0.0
  27      6.1   26128.0     0.0     0.0       0.       0.  3919.2     0.0       0.0
  28     22.4   48320.2     0.0     0.0       0.       0.  7248.0     0.0       0.0
  29      1.9     383.7     0.0     0.0       0.       0.    57.6     0.0       0.0
         Failure Surface Specified By 11 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        229.90      100.00
             2        263.53       90.30
             3        298.18       85.40
             4        333.18       85.40
             5        367.84       90.30
             6        401.46      100.01
             7        433.40      114.33
             8        463.01      132.99
             9        489.72      155.60
            10        513.01      181.74
            11        518.34      189.76
         Circle Center At X =   315.66 ; Y =   334.09 ; and Radius =   249.31
                Factor of Safety
               ***    1.492   ***
         Failure Surface Specified By 12 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        201.62      100.00
             2        234.29       87.46
             3        268.35       79.38
             4        303.17       75.91
             5        338.15       77.11
             6        372.66       82.95
             7        406.09       93.34
             8        437.83      108.08
             9        467.32      126.93
            10        494.05      149.53
            11        517.53      175.48
            12        527.29      189.70
         Circle Center At X =   311.59 ; Y =   336.78 ; and Radius =   261.07
                Factor of Safety
               ***    1.493   ***
         Failure Surface Specified By 11 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        220.20      100.00
             2        253.66       89.74
             3        288.23       84.27
             4        323.23       83.71
             5        357.96       88.06
             6        391.73       97.24
             7        423.89      111.06
             8        453.79      129.26
             9        480.84      151.47
            10        504.50      177.26
            11        513.11      189.79
```

TT 60258, X-Sect 1-1'; Static; Natural slope below CS-1

n:\projects\0100-999\803s\slopes\t1s1a.pl2   Run By: KPC



#	FS
a	**3.54**
b	3.54
c	3.55

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
Qt	2	130.0	130.0	400.0	38.0	W1
TQs	3	135.0	135.0	700.0	32.0	W1
Qal	4	130.0	130.0	400.0	33.0	W1

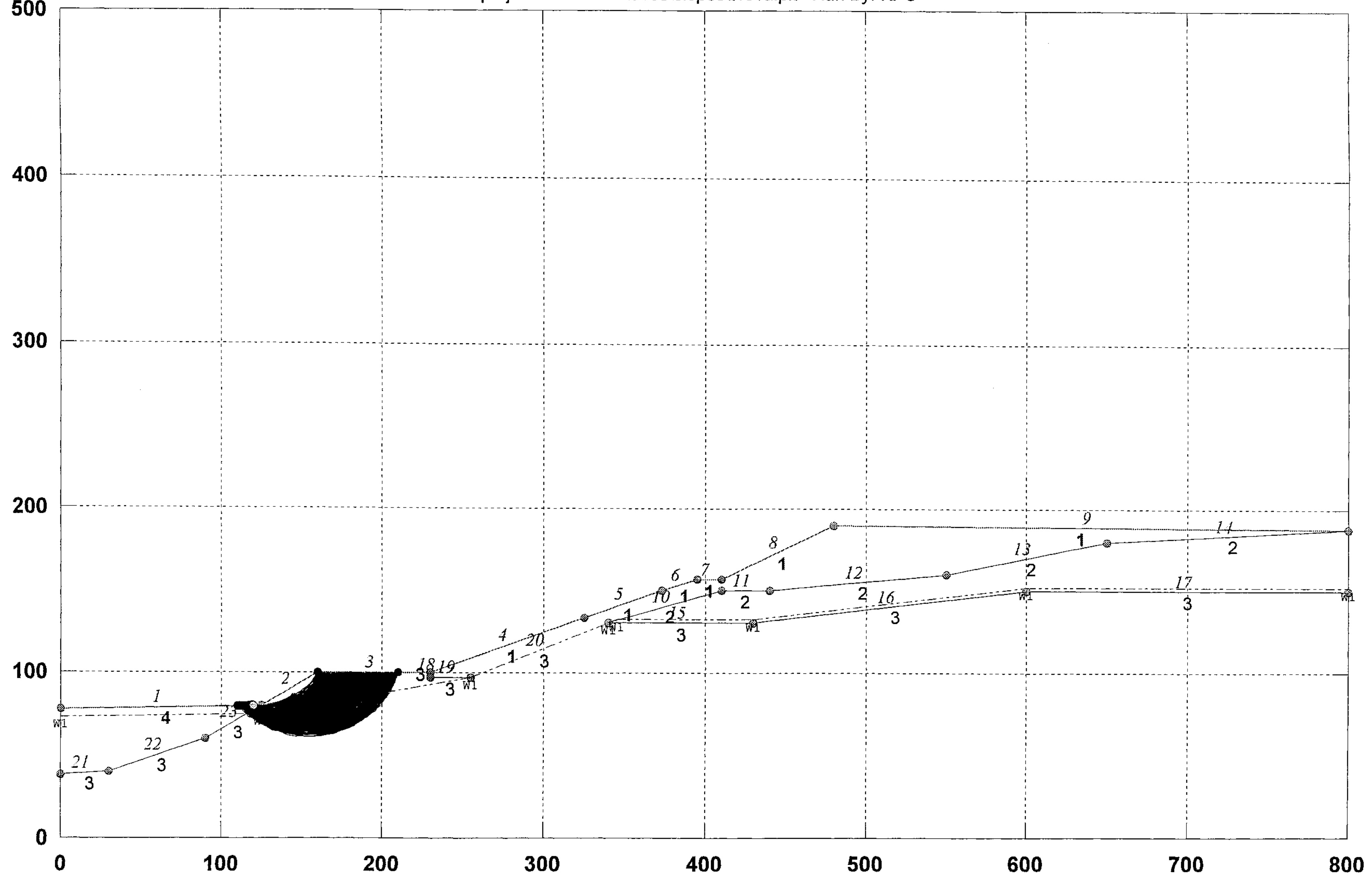
GSTABL7 v.2 FSmin=3.54

Safety Factors Are Calculated By The Modified Bishop Method

Run No. 3

TT 60258, X-Sect 1-1'; Static; Natural slope below CS-1

n:\projects\0100-999\803s\slopes\t1s1a.plt Run By: KPC



GSTABL7

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                          ***  GSTABL7  ***
                  ** GSTABL7 by Garry H. Gregory, P.E. **
    ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
               (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                     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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
 Analysis Run Date:
 Time of Run:
 Run By:                    KPC
 Input Data Filename:       N:\Projects\0100-999\803S\Slopes\t1s1a.in
 Output Filename:           N:\Projects\0100-999\803S\Slopes\t1s1a.OUT
 Unit System:               English
 Plotted Output Filename:   N:\Projects\0100-999\803S\Slopes1a.PLT
 PROBLEM DESCRIPTION:  TT 60258, X-Sect 1-1'; Static;
                       Natural slope below CS-1
 BOUNDARY COORDINATES
     9 Top   Boundaries
    23 Total Boundaries
 Boundary     X-Left     Y-Left     X-Right    Y-Right    Soil Type
    No.        (ft)       (ft)       (ft)       (ft)      Below Bnd
     1          0.00      78.00     125.00      80.00        4
     2        125.00      80.00     160.00     100.00        3
     3        160.00     100.00     230.00     100.00        3
     4        230.00     100.00     325.00     133.00        1
     5        325.00     133.00     373.00     150.00        1
     6        373.00     150.00     395.00     157.00        1
     7        395.00     157.00     410.00     157.00        1
     8        410.00     157.00     480.00     190.00        1
     9        480.00     190.00     800.00     188.00        1
    10        340.12     130.00     410.00     150.00        2
    11        410.00     150.00     440.00     150.00        2
    12        440.00     150.00     550.00     160.00        2
    13        550.00     160.00     650.00     180.00        2
    14        650.00     180.00     800.00     188.00        2
    15        340.12     130.00     430.00     130.00        3
    16        430.00     130.00     600.00     150.00        3
    17        600.00     150.00     800.00     150.00        3
    18        230.00     100.00     230.10      97.00        3
    19        230.10      97.00     255.00      97.00        3
    20        255.00      97.00     340.12     130.00        3
    21          0.00      38.00      30.00      40.00        3
    22         30.00      40.00      90.00      60.00        3
    23         90.00      60.00     125.00      80.00        3
 Default Y-Origin = 0.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  4 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     300.0     30.0    0.00       0.0       0
   2   130.0    130.0     400.0     38.0    0.00       0.0       1
   3   135.0    135.0     700.0     32.0    0.00       0.0       1
   4   130.0    130.0     400.0     33.0    0.00       0.0       1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40  (pcf)
 Piezometric Surface No.  1 Specified by  8 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
```
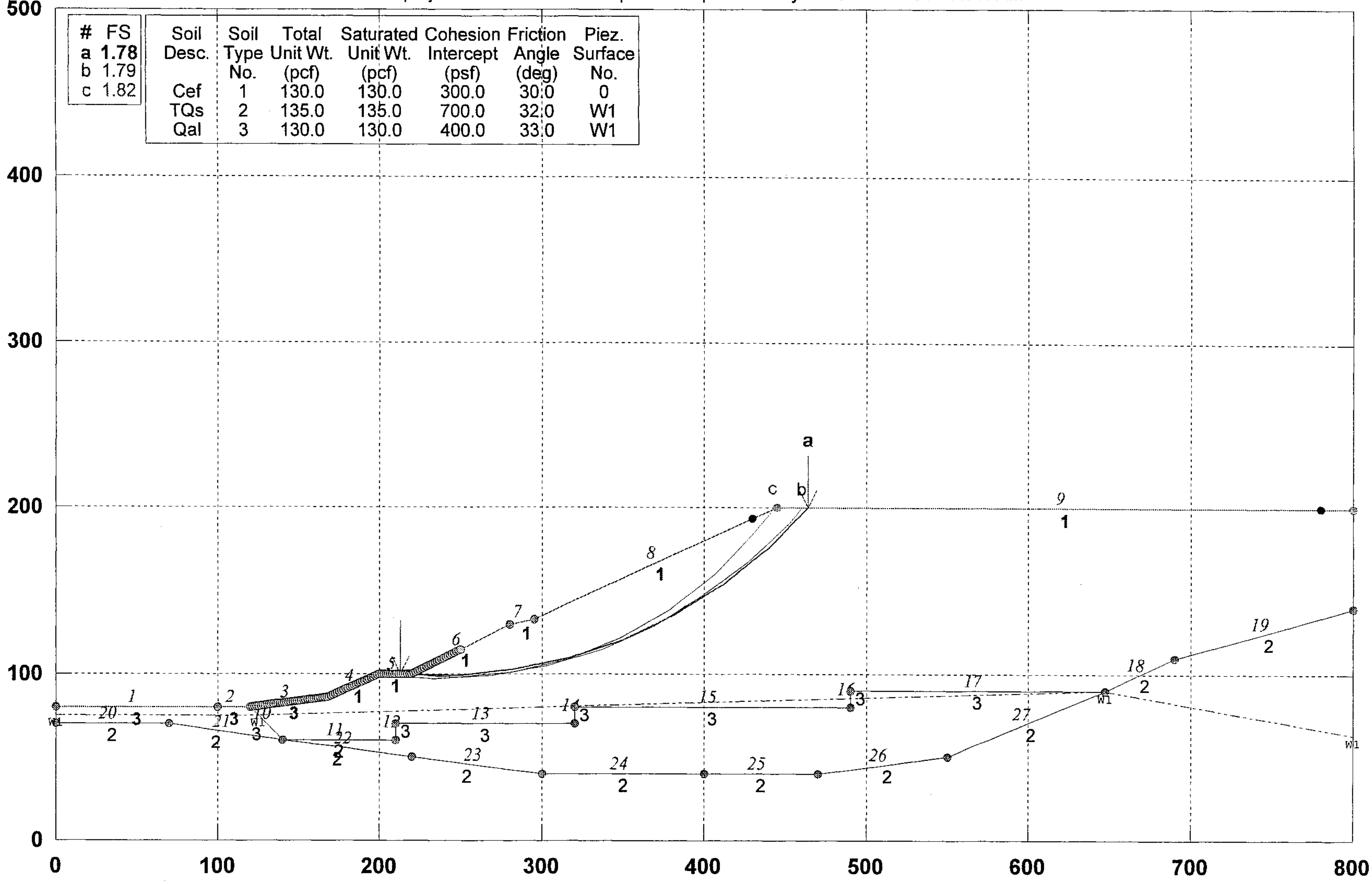

```
        1          0.00        73.00
        2        125.00        75.00
        3        255.00        97.00
        4        340.00       130.00
        5        345.00       132.00
        6        430.00       132.00
        7        600.00       152.00
        8        800.00       152.00
    A Critical Failure Surface Searching Method, Using A Random
    Technique For Generating Circular Surfaces, Has Been Specified.
    1000 Trial Surfaces Have Been Generated.
      10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
    Along The Ground Surface Between  X = 110.00(ft)
                                 and  X = 120.00(ft)
    Each Surface Terminates Between   X = 160.00(ft)
                                and   X = 210.00(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.
    Restrictions Have Been Imposed Upon The Angle Of Initiation.
    The Angle Has Been Restricted Between The Angles Of -45.0
    And  15.0 deg.
    Following Are Displayed The Ten Most Critical Of The Trial
          Failure Surfaces Evaluated. They Are
          Ordered - Most Critical First.
          * * Safety Factors Are Calculated By The Modified Bishop Method * *
          Total Number of Trial Surfaces Evaluated =  1000
          Statistical Data On All Valid FS Values:
             FS Max =   5.809   FS Min =   3.540   FS Ave =   4.224
             Standard Deviation =    0.465   Coefficient of Variation =   11.01 %
          Failure Surface Specified By 15 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        116.06       79.86
              2        120.52       77.60
              3        125.24       75.96
              4        130.15       74.97
              5        135.13       74.64
              6        140.12       74.98
              7        145.02       75.99
              8        149.74       77.65
              9        154.19       79.92
             10        158.30       82.77
             11        161.99       86.15
             12        165.19       89.98
             13        167.85       94.22
             14        169.92       98.77
             15        170.30      100.00
          Circle Center At X =   135.07 ; Y =   111.87 ; and Radius =    37.24
                 Factor of Safety
                ***   3.540   ***
               Individual data on the    19  slices
                         Water  Water     Tie     Tie     Earthquake
                         Force  Force    Force   Force       Force   Surcharge
Slice  Width    Weight    Top    Bot     Norm     Tan     Hor     Ver     Load
 No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1      4.5    675.5     0.0    0.0       0.      0.     0.0     0.0      0.0
  2      0.2     52.7     0.0    0.0       0.      0.     0.0     0.0      0.0
  3      4.3   1819.8     0.0    0.0       0.      0.     0.0     0.0      0.0
  4      0.2    134.6     0.0    0.0       0.      0.     0.0     0.0      0.0
  5      2.5   1709.7     0.0    0.0       0.      0.     0.0     0.0      0.0
  6      2.4   2311.4     0.0   69.2       0.      0.     0.0     0.0      0.0
  7      5.0   6441.7     0.0  458.7       0.      0.     0.0     0.0      0.0
  8      5.0   8354.3     0.0  715.9       0.      0.     0.0     0.0      0.0
  9      4.9   9621.5     0.0  765.0       0.      0.     0.0     0.0      0.0
 10      4.7  10169.8     0.0  605.2       0.      0.     0.0     0.0      0.0
 11      4.5   9993.8     0.0  239.5       0.      0.     0.0     0.0      0.0
```

```
12       0.0      79.9     0.0      0.0       0.       0.      0.0      0.0       0.0
13       4.1    9076.3     0.0      0.0       0.       0.      0.0      0.0       0.0
14       1.7    3665.3     0.0      0.0       0.       0.      0.0      0.0       0.0
15       2.0    3964.7     0.0      0.0       0.       0.      0.0      0.0       0.0
16       3.2    5163.2     0.0      0.0       0.       0.      0.0      0.0       0.0
17       2.7    2838.2     0.0      0.0       0.       0.      0.0      0.0       0.0
18       2.1     980.4     0.0      0.0       0.       0.      0.0      0.0       0.0
19       0.4      30.9     0.0      0.0       0.       0.      0.0      0.0       0.0
         Failure Surface Specified By 15 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        116.16       79.86
             2        120.62       77.59
             3        125.33       75.91
             4        130.21       74.85
             5        135.20       74.43
             6        140.19       74.66
             7        145.11       75.53
             8        149.88       77.03
             9        154.42       79.13
            10        158.65       81.80
            11        162.50       85.00
            12        165.90       88.66
            13        168.80       92.73
            14        171.16       97.14
            15        172.24      100.00
         Circle Center At X =   135.93 ; Y =   113.10 ; and Radius =    38.68
                Factor of Safety
               ***   3.543   ***
         Failure Surface Specified By 15 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        115.35       79.85
             2        119.89       77.75
             3        124.65       76.21
             4        129.56       75.27
             5        134.55       74.94
             6        139.54       75.21
             7        144.47       76.09
             8        149.24       77.56
             9        153.81       79.60
            10        158.09       82.18
            11        162.03       85.27
            12        165.56       88.80
            13        168.63       92.75
            14        171.21       97.04
            15        172.52      100.00
         Circle Center At X =   134.81 ; Y =   115.95 ; and Radius =    41.02
                Factor of Safety
               ***   3.545   ***
         Failure Surface Specified By 16 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        114.24       79.83
             2        118.61       77.39
             3        123.25       75.54
             4        128.09       74.30
             5        133.06       73.69
             6        138.06       73.73
             7        143.01       74.42
             8        147.83       75.74
             9        152.45       77.67
            10        156.77       80.18
            11        160.73       83.23
            12        164.27       86.76
            13        167.32       90.72
            14        169.84       95.04
```

TT 60258, X-Sect 2-2'; Static; Proposed Fill Slope

n:\projects\0100-999\803s\slopes\t2s1a.pl2 Run By: KPC 6/7/2004 11:24 AM



#	FS
a	**1.78**
b	1.79
c	1.82

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
TQs	2	135.0	135.0	700.0	32.0	W1
Qal	3	130.0	130.0	400.0	33.0	W1

GSTABL7 v.2 FSmin=1.78

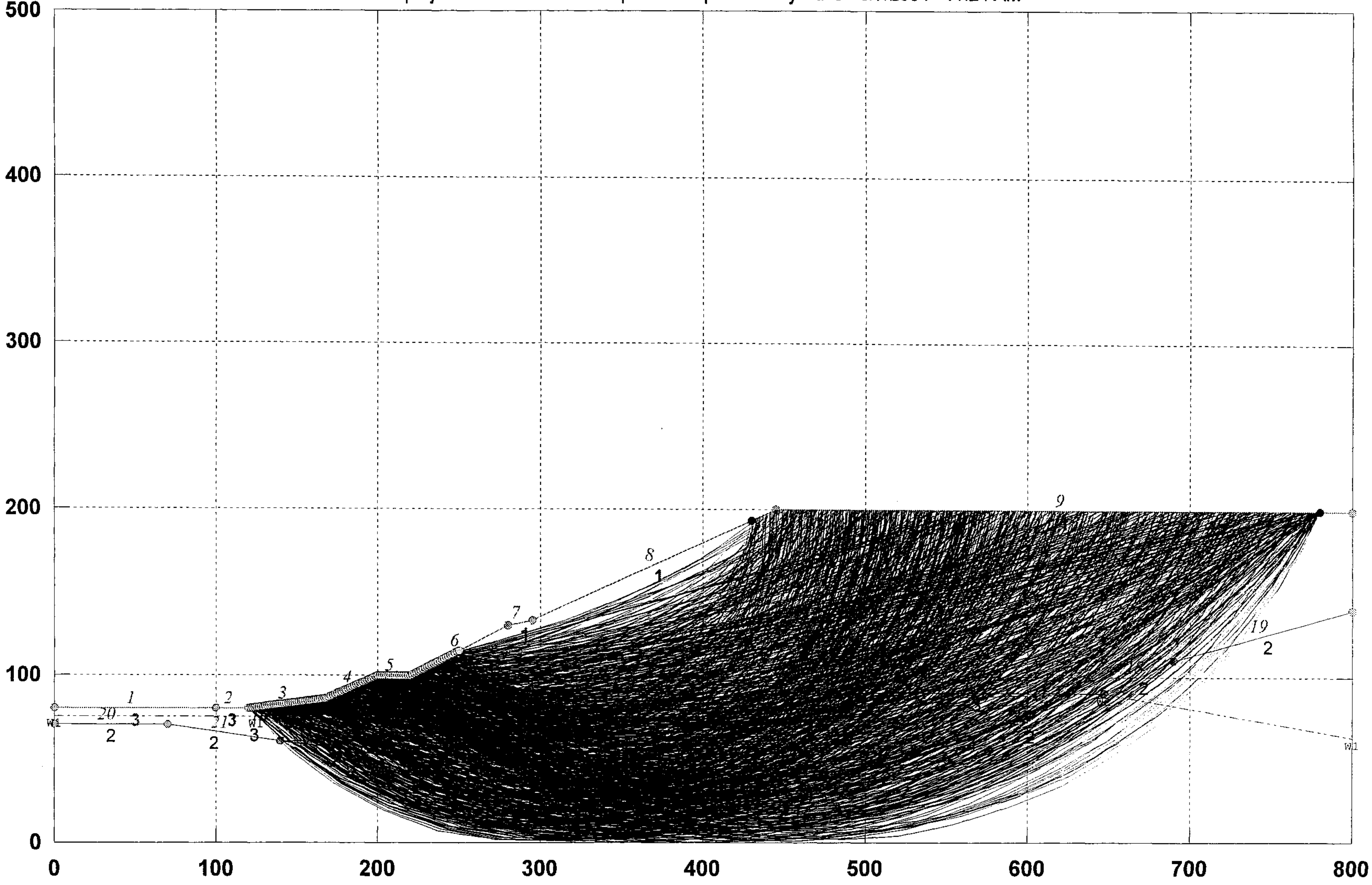
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Run No. 4

TT 60258, X-Sect 2-2'; Static; Proposed Fill Slope

n:\projects\0100-999\803s\slopes\t2s1a.plt Run By: KPC 6/7/2004 11:24 AM



GSTABL7

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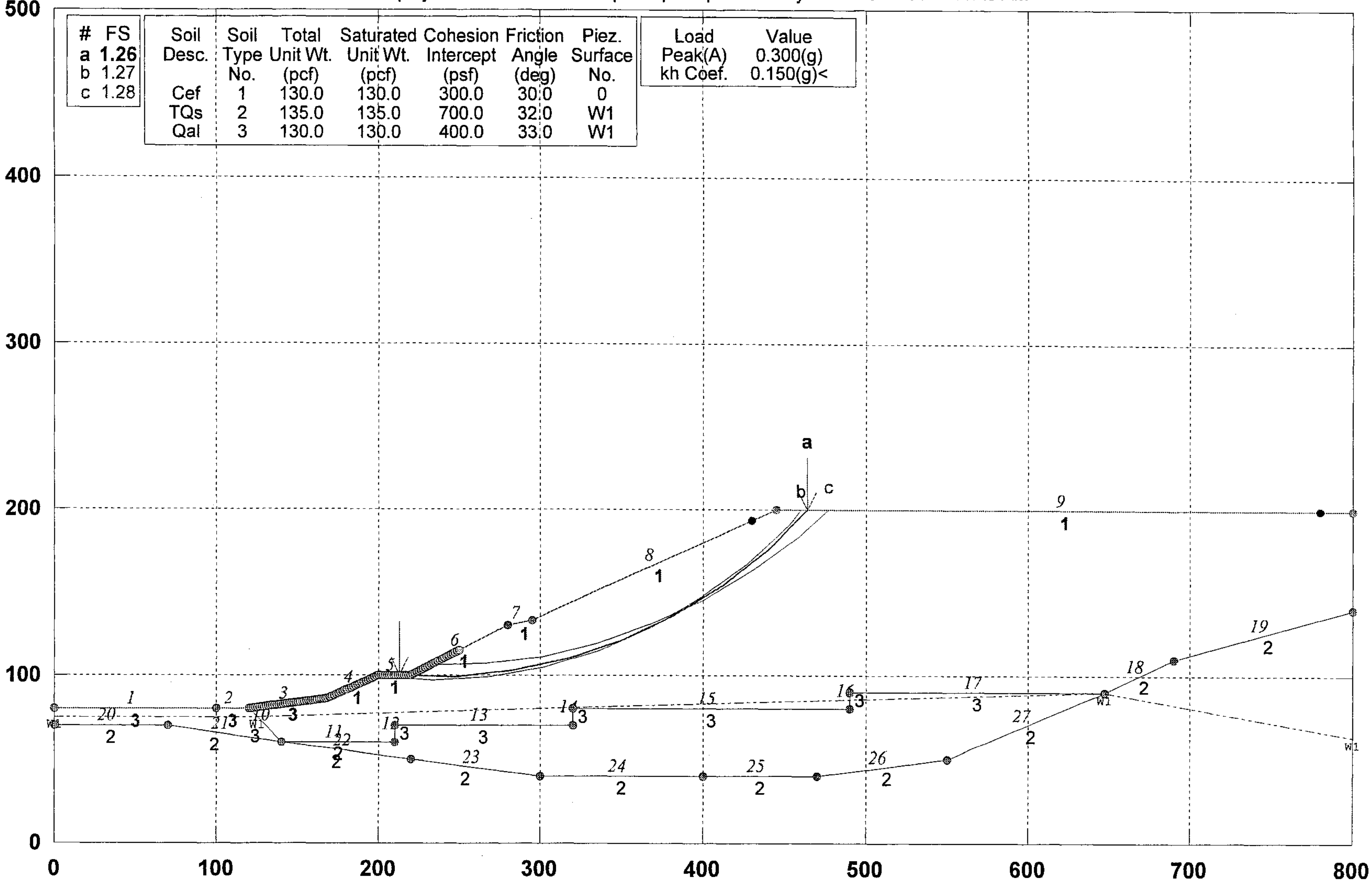
                                 ***  GSTABL7  ***
                     ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
               (All Rights Reserved-Unauthorized Use Prohibited)
**********************************************************************************
                    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 & Newmark Earthquake, and Applied Forces.
**********************************************************************************
Analysis Run Date:        6/7/2004
Time of Run:              11:24 AM
Run By:                   KPC
Input Data Filename:      N:\Projects\0100-999\803S\Slopes\t2s1a.in
Output Filename:          N:\Projects\0100-999\803S\Slopes\t2s1a.OUT
Unit System:              English
Plotted Output Filename:  N:\Projects\0100-999\803S\Slopes1a.PLT
PROBLEM DESCRIPTION:  TT 60258, X-Sect 2-2'; Static;
                      Proposed Fill Slope
BOUNDARY COORDINATES
    9 Top   Boundaries
   27 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
```

```
     1          0.00       80.00      100.00       80.00        3
     2        100.00       80.00      120.00       80.00        3
     3        120.00       80.00      168.00       86.00        3
     4        168.00       86.00      200.00      100.00        1
     5        200.00      100.00      220.00      100.00        1
     6        220.00      100.00      280.00      130.00        1
     7        280.00      130.00      295.00      133.00        1
     8        295.00      133.00      445.00      200.00        1
     9        445.00      200.00      800.00      200.00        1
    10        120.00       80.00      140.00       60.00        3
    11        140.00       60.00      210.00       60.00        2
    12        210.00       60.00      210.10       70.00        3
    13        210.10       70.00      320.00       70.00        3
    14        320.00       70.00      320.10       80.00        3
    15        320.10       80.00      490.00       80.00        3
    16        490.00       80.00      490.10       90.00        3
    17        490.10       90.00      647.00       90.00        3
    18        647.00       90.00      690.00      110.00        2
    19        690.00      110.00      800.00      140.00        2
    20          0.00       70.00       70.00       70.00        2
    21         70.00       70.00      140.00       60.00        2
    22        140.00       60.00      220.00       50.00        2
    23        220.00       50.00      300.00       40.00        2
    24        300.00       40.00      400.00       40.00        2
    25        400.00       40.00      470.00       40.00        2
    26        470.00       40.00      550.00       50.00        2
    27        550.00       50.00      647.00       90.00        2
 Default Y-Origin = 0.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  3 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     300.0     30.0     0.00      0.0      0
   2   135.0    135.0     700.0     32.0     0.00      0.0      1
   3   130.0    130.0     400.0     33.0     0.00      0.0      1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  4 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1          0.00       75.00
     2        125.00       75.00
     3        647.00       90.00
     4        800.00       63.00
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
 1000 Trial Surfaces Have Been Generated.
   10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
 Along The Ground Surface Between  X = 120.00(ft)
                              and  X = 250.00(ft)
 Each Surface Terminates Between   X = 430.00(ft)
                              and  X = 780.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =      0.00(ft)
 35.00(ft) Line Segments Define Each Trial Failure Surface.
 Restrictions Have Been Imposed Upon The Angle Of Initiation.
 The Angle Has Been Restricted Between The Angles Of -45.0
 And  15.0 deg.
 Following Are Displayed The Ten Most Critical Of The Trial
       Failure Surfaces Evaluated. They Are
       Ordered - Most Critical First.
       * * Safety Factors Are Calculated By The Modified Bishop Method * *
       Total Number of Trial Surfaces Evaluated =  1000
```

```
         Statistical Data On All Valid FS Values:
            FS Max =   6.439   FS Min =   1.783   FS Ave =   3.133
            Standard Deviation =    0.852   Coefficient of Variation =   27.20 %
         Failure Surface Specified By  9 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        213.23      100.00
             2        248.23       99.36
             3        283.07      102.70
             4        317.30      109.97
             5        350.49      121.08
             6        382.21      135.89
             7        412.03      154.20
             8        439.59      175.78
             9        464.17      200.00
         Circle Center At X =    236.34 ; Y =   406.94 ; and Radius =   307.81
                Factor of Safety
               ***   1.783   ***
              Individual data on the    12  slices
                        Water  Water     Tie     Tie     Earthquake
                        Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight    Top    Bot     Norm     Tan     Hor     Ver     Load
 No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1       6.8      54.4     0.0     0.0       0.      0.     0.0     0.0      0.0
  2      28.2   27292.9     0.0     0.0       0.      0.     0.0     0.0      0.0
  3      31.8   87461.0     0.0     0.0       0.      0.     0.0     0.0      0.0
  4       3.1   11064.9     0.0     0.0       0.      0.     0.0     0.0      0.0
  5      11.9   43191.1     0.0     0.0       0.      0.     0.0     0.0      0.0
  6      22.3   88083.2     0.0     0.0       0.      0.     0.0     0.0      0.0
  7      33.2  150363.1     0.0     0.0       0.      0.     0.0     0.0      0.0
  8      31.7  150010.2     0.0     0.0       0.      0.     0.0     0.0      0.0
  9      29.8  130174.8     0.0     0.0       0.      0.     0.0     0.0      0.0
 10      27.6   94721.0     0.0     0.0       0.      0.     0.0     0.0      0.0
 11       5.4   14310.5     0.0     0.0       0.      0.     0.0     0.0      0.0
 12      19.2   23536.4     0.0     0.0       0.      0.     0.0     0.0      0.0
         Failure Surface Specified By 10 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        198.79       99.47
             2        233.73       97.40
             3        268.67       99.38
             4        303.15      105.39
             5        336.70      115.35
             6        368.88      129.13
             7        399.24      146.54
             8        427.39      167.34
             9        452.94      191.26
            10        460.34      200.00
         Circle Center At X =    234.34 ; Y =   397.48 ; and Radius =   300.12
                Factor of Safety
               ***   1.793   ***
         Failure Surface Specified By  9 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        211.92      100.00
             2        246.87       98.08
             3        281.74      101.10
             4        315.83      108.99
             5        348.48      121.61
             6        379.03      138.69
             7        406.87      159.90
             8        431.44      184.82
             9        441.53      198.45
         Circle Center At X =    242.97 ; Y =   346.13 ; and Radius =   248.08
                Factor of Safety
               ***   1.815   ***
         Failure Surface Specified By  9 Coordinate Points
```

TT 60258, X-Sect 2-2'; Pseudostatic; Proposed Fill Slope

n:\projects\0100-999\803s\slopes\t2ps1a.pl2 Run By: KPC 6/7/2004 11:25 AM



#	FS
a	**1.26**
b	1.27
c	1.28

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
TQs	2	135.0	135.0	700.0	32.0	W1
Qal	3	130.0	130.0	400.0	33.0	W1

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.26
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Run No. 5

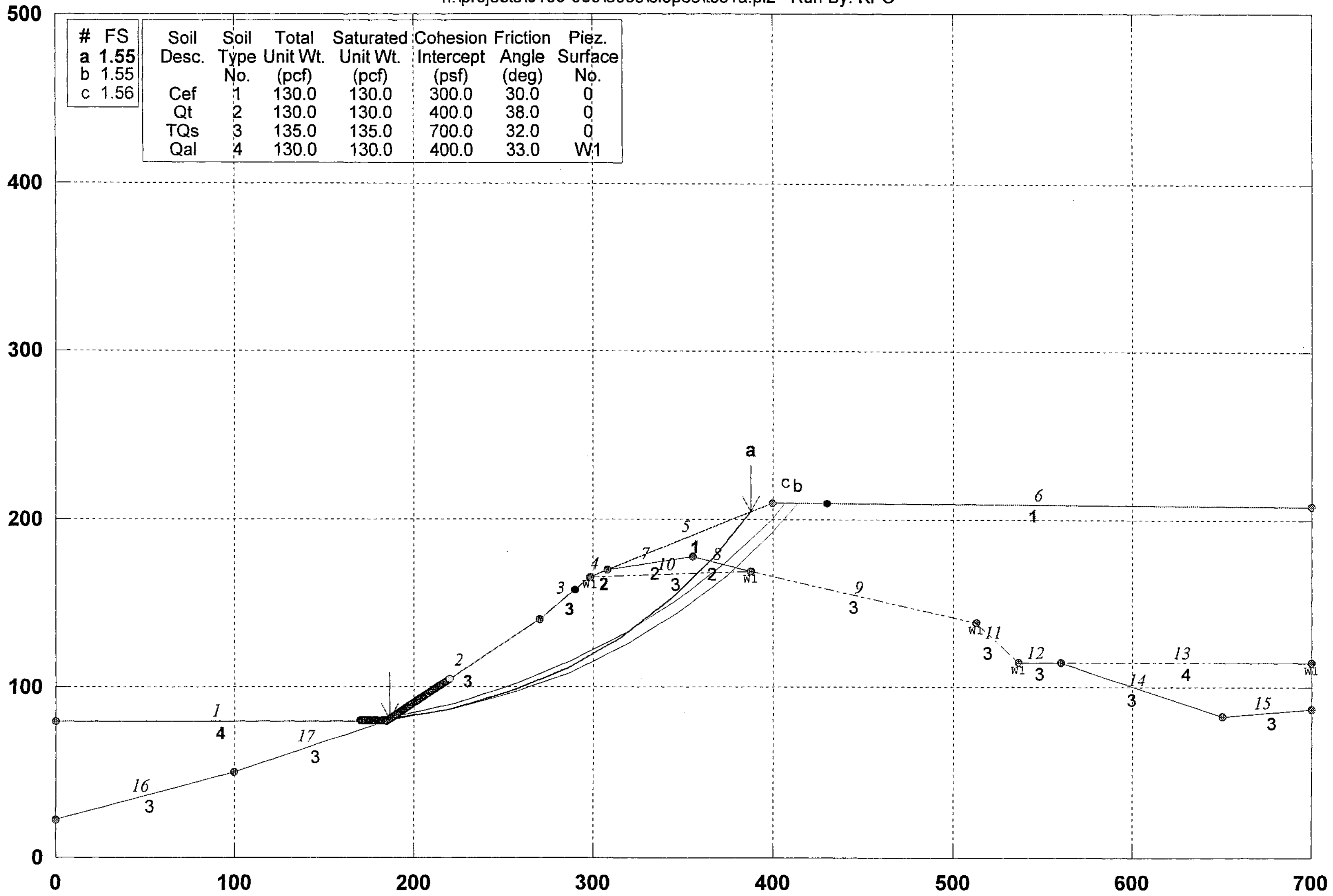
```
                            ***  GSTABL7  ***
                  ** GSTABL7 by Garry H. Gregory, P.E. **
    ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
               (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                     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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
Analysis Run Date:          6/7/2004
Time of Run:                11:25 AM
Run By:                     KPC
Input Data Filename:        N:\Projects\0100-999\803S\Slopes\t2ps1a.in
Output Filename:            N:\Projects\0100-999\803S\Slopes\t2ps1a.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\0100-999\803S\Slopess1a.PLT
PROBLEM DESCRIPTION:    TT 60258, X-Sect 2-2'; Pseudostatic;
                        Proposed Fill Slope
BOUNDARY COORDINATES
    9 Top   Boundaries
   27 Total Boundaries
Boundary     X-Left     Y-Left     X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)      Below Bnd
    1          0.00      80.00     100.00      80.00        3
    2        100.00      80.00     120.00      80.00        3
    3        120.00      80.00     168.00      86.00        3
    4        168.00      86.00     200.00     100.00        1
    5        200.00     100.00     220.00     100.00        1
    6        220.00     100.00     280.00     130.00        1
    7        280.00     130.00     295.00     133.00        1
    8        295.00     133.00     445.00     200.00        1
    9        445.00     200.00     800.00     200.00        1
   10        120.00      80.00     140.00      60.00        3
   11        140.00      60.00     210.00      60.00        2
   12        210.00      60.00     210.10      70.00        3
   13        210.10      70.00     320.00      70.00        3
   14        320.00      70.00     320.10      80.00        3
   15        320.10      80.00     490.00      80.00        3
   16        490.00      80.00     490.10      90.00        3
   17        490.10      90.00     647.00      90.00        3
   18        647.00      90.00     690.00     110.00        2
   19        690.00     110.00     800.00     140.00        2
   20          0.00      70.00      70.00      70.00        2
   21         70.00      70.00     140.00      60.00        2
   22        140.00      60.00     220.00      50.00        2
   23        220.00      50.00     300.00      40.00        2
   24        300.00      40.00     400.00      40.00        2
   25        400.00      40.00     470.00      40.00        2
   26        470.00      40.00     550.00      50.00        2
   27        550.00      50.00     647.00      90.00        2
Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
 3 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     300.0    30.0    0.00      0.0      0
  2   135.0    135.0     700.0    32.0    0.00      0.0      1
  3   130.0    130.0     400.0    33.0    0.00      0.0      1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  4 Coordinate Points
```

```
  Pore Pressure Inclination Factor =  0.50
    Point      X-Water     Y-Water
     No.         (ft)        (ft)
      1          0.00       75.00
      2        125.00       75.00
      3        647.00       90.00
      4        800.00       63.00
  Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
  Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
  Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
  Specified Seismic Pore-Pressure Factor =   0.000
  A Critical Failure Surface Searching Method, Using A Random
  Technique For Generating Circular Surfaces, Has Been Specified.
  1000 Trial Surfaces Have Been Generated.
    10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
  Along The Ground Surface Between  X = 120.00(ft)
                                  and  X = 250.00(ft)
  Each Surface Terminates Between   X = 430.00(ft)
                                  and   X = 780.00(ft)
  Unless Further Limitations Were Imposed, The Minimum Elevation
  At Which A Surface Extends Is  Y =      0.00(ft)
  35.00(ft) Line Segments Define Each Trial Failure Surface.
  Restrictions Have Been Imposed Upon The Angle Of Initiation.
  The Angle Has Been Restricted Between The Angles Of -45.0
  And  15.0 deg.
  Following Are Displayed The Ten Most Critical Of The Trial
        Failure Surfaces Evaluated. They Are
        Ordered - Most Critical First.
        * * Safety Factors Are Calculated By The Modified Bishop Method * *
        Total Number of Trial Surfaces Evaluated =  1000
        Statistical Data On All Valid FS Values:
           FS Max =   3.123   FS Min =   1.260   FS Ave =   1.950
           Standard Deviation =    0.376   Coefficient of Variation =   19.27 %
        Failure Surface Specified By  9 Coordinate Points
          Point      X-Surf      Y-Surf
           No.        (ft)        (ft)
            1        213.23      100.00
            2        248.23       99.36
            3        283.07      102.70
            4        317.30      109.97
            5        350.49      121.08
            6        382.21      135.89
            7        412.03      154.20
            8        439.59      175.78
            9        464.17      200.00
        Circle Center At X =   236.34 ; Y =   406.94 ; and Radius =   307.81
               Factor of Safety
             ***    1.260   ***
             Individual data on the    12  slices
                       Water  Water     Tie      Tie     Earthquake
                       Force  Force    Force    Force       Force   Surcharge
Slice  Width   Weight   Top    Bot     Norm      Tan     Hor      Ver    Load
 No.    (ft)    (lbs)  (lbs)  (lbs)    (lbs)    (lbs)   (lbs)   (lbs)   (lbs)
  1      6.8      54.4    0.0    0.0       0.       0.      8.2    0.0     0.0
  2     28.2   27292.9    0.0    0.0       0.       0.   4093.9    0.0     0.0
  3     31.8   87461.0    0.0    0.0       0.       0. 13119.1    0.0     0.0
  4      3.1   11064.9    0.0    0.0       0.       0.  1659.7    0.0     0.0
  5     11.9   43191.1    0.0    0.0       0.       0.  6478.7    0.0     0.0
  6     22.3   88083.2    0.0    0.0       0.       0. 13212.5    0.0     0.0
  7     33.2  150363.1    0.0    0.0       0.       0. 22554.5    0.0     0.0
  8     31.7  150010.2    0.0    0.0       0.       0. 22501.5    0.0     0.0
  9     29.8  130174.8    0.0    0.0       0.       0. 19526.2    0.0     0.0
 10     27.6   94721.0    0.0    0.0       0.       0. 14208.2    0.0     0.0
 11      5.4   14310.5    0.0    0.0       0.       0.  2146.6    0.0     0.0
 12     19.2   23536.4    0.0    0.0       0.       0.  3530.5    0.0     0.0
        Failure Surface Specified By 10 Coordinate Points
          Point      X-Surf      Y-Surf
```

```
   No.        (ft)         (ft)
    1        198.79        99.47
    2        233.73        97.40
    3        268.67        99.38
    4        303.15       105.39
    5        336.70       115.35
    6        368.88       129.13
    7        399.24       146.54
    8        427.39       167.34
    9        452.94       191.26
   10        460.34       200.00
Circle Center At X =   234.34 ; Y =   397.48 ; and Radius =   300.12
       Factor of Safety
      ***    1.269   ***
Failure Surface Specified By  9 Coordinate Points
  Point      X-Surf       Y-Surf
   No.        (ft)         (ft)
    1        231.62       105.81
    2        266.60       106.85
    3        301.31       111.38
    4        335.38       119.37
    5        368.49       130.72
    6        400.29       145.34
    7        430.48       163.06
    8        458.73       183.71
    9        476.89       200.00
Circle Center At X =   238.74 ; Y =   455.08 ; and Radius =   349.34
       Factor of Safety
      ***    1.275   ***
Failure Surface Specified By 10 Coordinate Points
  Point      X-Surf       Y-Surf
   No.        (ft)         (ft)
    1        204.04       100.00
    2        238.90        96.87
    3        273.89        97.69
    4        308.57       102.44
    5        342.49       111.07
    6        375.22       123.46
    7        406.35       139.46
    8        435.48       158.86
    9        462.24       181.42
   10        479.81       200.00
Circle Center At X =   249.29 ; Y =   405.46 ; and Radius =   308.79
       Factor of Safety
      ***    1.285   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf       Y-Surf
   No.        (ft)         (ft)
    1        156.77        84.60
    2        191.60        81.13
    3        226.59        81.41
    4        261.36        85.44
    5        295.50        93.16
    6        328.62       104.48
    7        360.33       119.29
    8        390.28       137.40
    9        418.12       158.62
   10        443.53       182.69
   11        458.26       200.00
Circle Center At X =   206.48 ; Y =   407.47 ; and Radius =   326.68
       Factor of Safety
      ***    1.286   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf       Y-Surf
   No.        (ft)         (ft)
    1        167.27        85.91
    2        202.10        82.43
```

TT 60258, X-Sect 3-3'; Static; Fill over natural slope

n:\projects\0100-999\803s\slopes\t3s1a.pl2   Run By: KPC



#	FS
a	**1.55**
b	1.55
c	1.56

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
Qt	2	130.0	130.0	400.0	38.0	0
TQs	3	135.0	135.0	700.0	32.0	0
Qal	4	130.0	130.0	400.0	33.0	W1

GSTABL7 v.2 FSmin=1.55

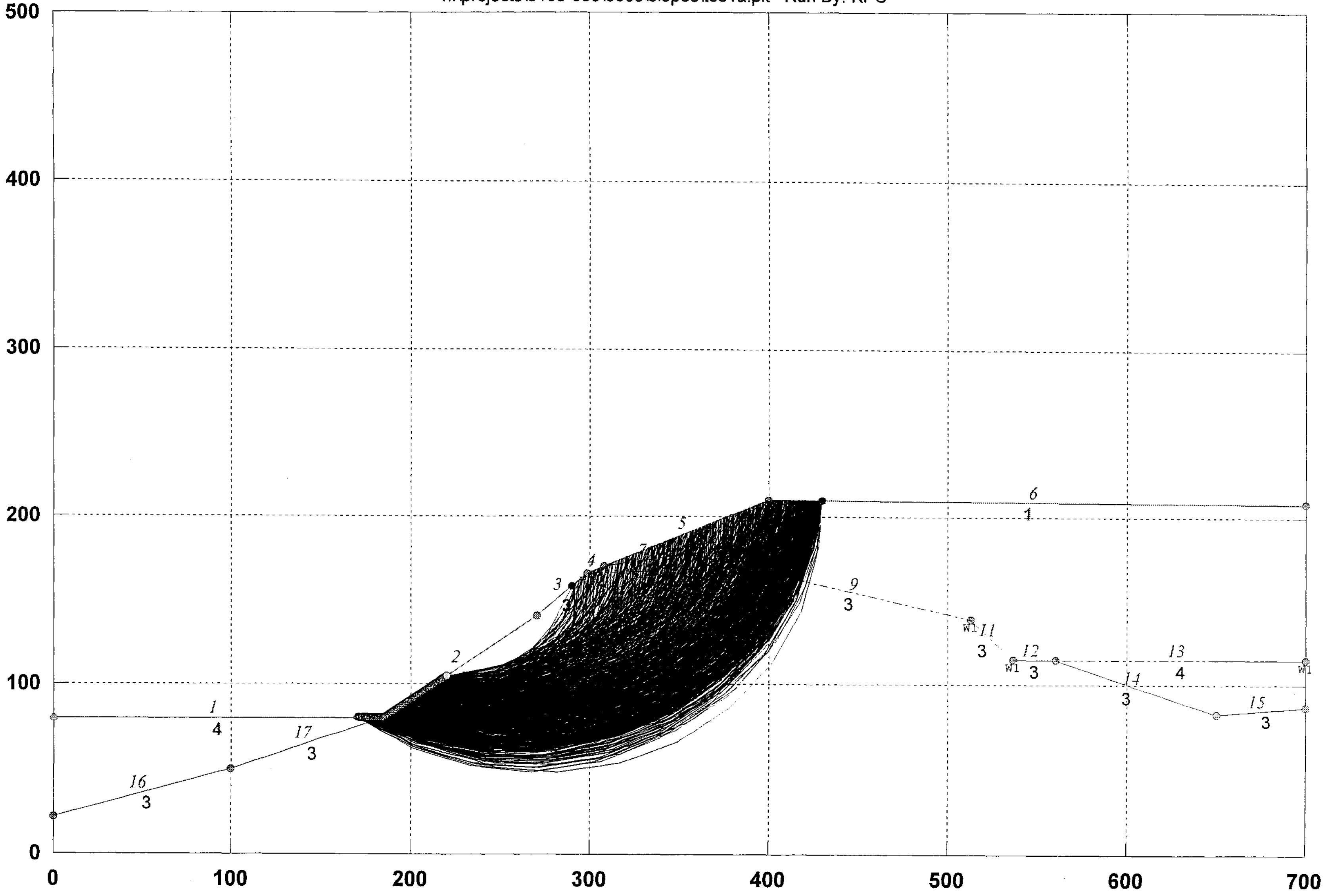
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Run No. 6

TT 60258, X-Sect 3-3'; Static; Fill over natural slope

n:\projects\0100-999\803s\slopes\t3s1a.plt Run By: KPC



GSTABL7

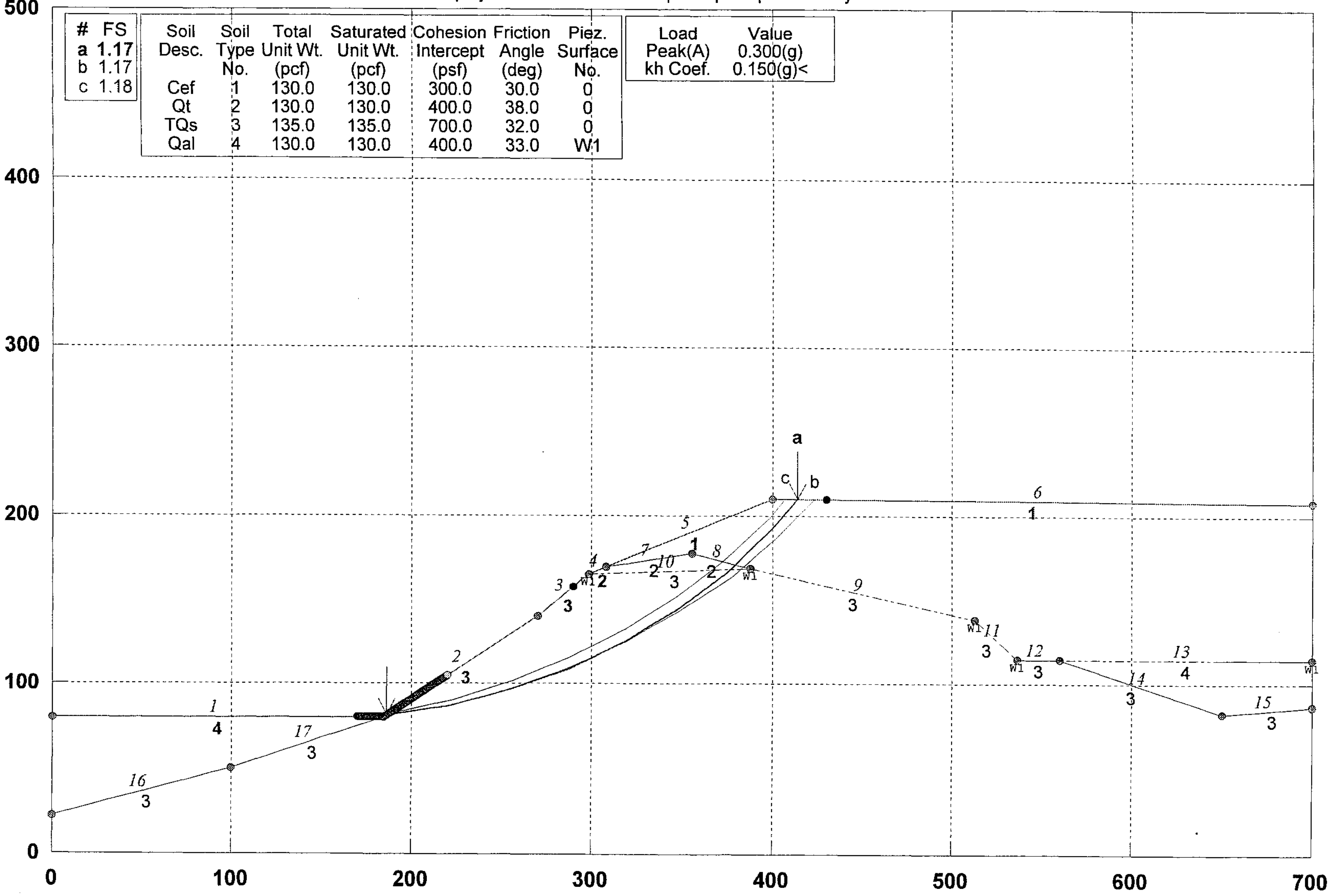
```
                         ***  GSTABL7  ***
             ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                  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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
Analysis Run Date:
Time of Run:
Run By:                   KPC
Input Data Filename:      N:\Projects\0100-999\803S\Slopes\t3s1a.in
Output Filename:          N:\Projects\0100-999\803S\Slopes\t3s1a.OUT
Unit System:              English
Plotted Output Filename:  N:\Projects\0100-999\803S\Slopes1a.PLT
PROBLEM DESCRIPTION:  TT 60258, X-Sect 3-3'; Static;
                      Fill over natural slope
BOUNDARY COORDINATES
    6 Top   Boundaries
   17 Total Boundaries
Boundary     X-Left     Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)       (ft)       (ft)        (ft)       Below Bnd
    1           0.00      80.00     185.00       80.00         4
    2         185.00      80.00     270.00      140.00         3
    3         270.00     140.00     298.00      165.00         3
    4         298.00     165.00     308.00      170.00         2
    5         308.00     170.00     400.00      210.00         1
    6         400.00     210.00     700.00      208.00         1
    7         308.00     170.00     355.00      178.00         2
    8         355.00     178.00     388.00      169.00         2
    9         388.00     169.00     513.00      138.00         3
   10         298.00     165.00     388.00      169.00         3
   11         513.00     138.00     536.00      115.00         3
   12         536.00     115.00     560.00      115.00         3
   13         560.00     115.00     700.00      115.00         4
   14         560.00     115.00     650.00       82.00         3
   15         650.00      82.00     700.00       87.00         3
   16           0.00      22.00     100.00       50.00         3
   17         100.00      50.00     185.00       80.00         3
 Default Y-Origin = 0.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  4 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      300.0     30.0    0.00        0.0      0
   2   130.0    130.0      400.0     38.0    0.00        0.0      0
   3   135.0    135.0      700.0     32.0    0.00        0.0      0
   4   130.0    130.0      400.0     33.0    0.00        0.0      1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  5 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point       X-Water     Y-Water
    No.         (ft)        (ft)
     1         298.00      165.00
     2         388.00      169.00
     3         513.00      138.00
     4         536.00      115.00
     5         700.00      115.00
```

```
   A Critical Failure Surface Searching Method, Using A Random
   Technique For Generating Circular Surfaces, Has Been Specified.
   1000 Trial Surfaces Have Been Generated.
     10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
   Along The Ground Surface Between  X = 170.00(ft)
                             and  X = 220.00(ft)
   Each Surface Terminates Between   X = 290.00(ft)
                            and   X = 430.00(ft)
   Unless Further Limitations Were Imposed, The Minimum Elevation
   At Which A Surface Extends Is  Y =     0.00(ft)
   35.00(ft) Line Segments Define Each Trial Failure Surface.
   Restrictions Have Been Imposed Upon The Angle Of Initiation.
   The Angle Has Been Restricted Between The Angles Of -45.0
   And  15.0 deg.
   Following Are Displayed The Ten Most Critical Of The Trial
         Failure Surfaces Evaluated. They Are
         Ordered - Most Critical First.
         * * Safety Factors Are Calculated By The Modified Bishop Method * *
         Total Number of Trial Surfaces Evaluated =  1000
         Statistical Data On All Valid FS Values:
            FS Max =   2.618   FS Min =   1.546   FS Ave =   1.925
            Standard Deviation =    0.210   Coefficient of Variation =   10.92 %
         Failure Surface Specified By  8 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        186.16       80.82
             2        220.65       86.77
             3        254.11       97.05
             4        285.99      111.50
             5        315.77      129.88
             6        342.97      151.90
             7        367.16      177.20
             8        387.28      204.47
         Circle Center At X =   156.88 ; Y =   353.83 ; and Radius =   274.57
                Factor of Safety
               ***    1.546   ***
              Individual data on the    13  slices
                         Water  Water     Tie     Tie     Earthquake
                         Force  Force    Force   Force      Force   Surcharge
Slice  Width   Weight     Top    Bot     Norm     Tan     Hor     Ver     Load
 No.    (ft)    (lbs)    (lbs)  (lbs)   (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1     34.5   42833.7    0.0    0.0      0.      0.      0.0     0.0      0.0
  2     33.5  113205.0    0.0    0.0      0.      0.      0.0     0.0      0.0
  3     15.9   72383.1    0.0    0.0      0.      0.      0.0     0.0      0.0
  4     16.0   84722.8    0.0    0.0      0.      0.      0.0     0.0      0.0
  5     12.0   72058.4    0.0    0.0      0.      0.      0.0     0.0      0.0
  6     10.0   61306.9    0.0    0.0      0.      0.      0.0     0.0      0.0
  7      7.8   46123.0    0.0    0.0      0.      0.      0.0     0.0      0.0
  8     27.2  139272.3    0.0    0.0      0.      0.      0.0     0.0      0.0
  9     12.0   46862.7    0.0    0.0      0.      0.      0.0     0.0      0.0
 10      3.0    9937.5    0.0    0.0      0.      0.      0.0     0.0      0.0
 11      7.2   20501.5    0.0    0.0      0.      0.      0.0     0.0      0.0
 12      1.9    4743.5    0.0    0.0      0.      0.      0.0     0.0      0.0
 13     20.1   24213.7    0.0    0.0      0.      0.      0.0     0.0      0.0
         Failure Surface Specified By  9 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        186.67       81.18
             2        221.22       86.74
             3        254.99       95.95
             4        287.58      108.70
             5        318.64      124.84
             6        347.80      144.20
             7        374.73      166.55
             8        399.13      191.64
             9        413.46      209.91
         Circle Center At X =   151.81 ; Y =   407.77 ; and Radius =   328.45
```

```
       Factor of Safety
      ***    1.550   ***
 Failure Surface Specified By  9 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
     1        188.69       82.60
     2        222.81       90.41
     3        256.03      101.40
     4        288.07      115.49
     5        318.64      132.54
     6        347.46      152.40
     7        374.28      174.89
     8        398.85      199.81
     9        407.11      209.95
 Circle Center At X =   123.30 ; Y =   446.86 ; and Radius =   370.08
       Factor of Safety
      ***    1.555   ***
 Failure Surface Specified By  8 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
     1        187.17       81.53
     2        221.54       88.17
     3        254.65       99.50
     4        285.88      115.30
     5        314.62      135.27
     6        340.32      159.03
     7        362.49      186.12
     8        368.75      196.41
 Circle Center At X =   157.56 ; Y =   329.29 ; and Radius =   249.52
       Factor of Safety
      ***    1.555   ***
 Failure Surface Specified By  7 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
     1        185.66       80.46
     2        220.11       86.64
     3        253.13       98.23
     4        283.90      114.92
     5        311.61      136.30
     6        335.56      161.82
     7        354.83      190.36
 Circle Center At X =   164.33 ; Y =   298.54 ; and Radius =   219.12
       Factor of Safety
      ***    1.558   ***
 Failure Surface Specified By  8 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
     1        187.68       81.89
     2        222.28       87.12
     3        255.60       97.86
     4        286.74      113.83
     5        314.89      134.63
     6        339.32      159.69
     7        359.39      188.37
     8        361.81      193.39
 Circle Center At X =   173.28 ; Y =   296.09 ; and Radius =   214.68
       Factor of Safety
      ***    1.559   ***
 Failure Surface Specified By  9 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
     1        189.70       83.32
     2        224.41       87.77
     3        258.27       96.63
     4        290.73      109.73
     5        321.24      126.88
     6        349.31      147.78
```

TT 60258, X-Sect 3-3'; Pseudostatic; Fill over natural slope

n:\projects\0100-999\803s\slopes\t3ps1a.pl2 Run By: KPC



#	FS
a	**1.17**
b	1.17
c	1.18

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
Qt	2	130.0	130.0	400.0	38.0	0
TQs	3	135.0	135.0	700.0	32.0	0
Qal	4	130.0	130.0	400.0	33.0	W1

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.17
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Run No. 7

```
                          ***  GSTABL7  ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                     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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
 Analysis Run Date:
 Time of Run:
 Run By:                    KPC
 Input Data Filename:       N:\Projects\0100-999\803S\Slopes\t3ps1a.in
 Output Filename:           N:\Projects\0100-999\803S\Slopes\t3ps1a.OUT
 Unit System:               English
 Plotted Output Filename:   N:\Projects\0100-999\803S\Slopess1a.PLT
 PROBLEM DESCRIPTION:   TT 60258, X-Sect 3-3'; Pseudostatic;
                        Fill over natural slope
 BOUNDARY COORDINATES
     6 Top   Boundaries
    17 Total Boundaries
 Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
    No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
     1          0.00      80.00     185.00      80.00        4
     2        185.00      80.00     270.00     140.00        3
     3        270.00     140.00     298.00     165.00        3
     4        298.00     165.00     308.00     170.00        2
     5        308.00     170.00     400.00     210.00        1
     6        400.00     210.00     700.00     208.00        1
     7        308.00     170.00     355.00     178.00        2
     8        355.00     178.00     388.00     169.00        2
     9        388.00     169.00     513.00     138.00        3
    10        298.00     165.00     388.00     169.00        3
    11        513.00     138.00     536.00     115.00        3
    12        536.00     115.00     560.00     115.00        3
    13        560.00     115.00     700.00     115.00        4
    14        560.00     115.00     650.00      82.00        3
    15        650.00      82.00     700.00      87.00        3
    16          0.00      22.00     100.00      50.00        3
    17        100.00      50.00     185.00      80.00        3
 Default Y-Origin = 0.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  4 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     300.0     30.0    0.00      0.0       0
   2   130.0    130.0     400.0     38.0    0.00      0.0       0
   3   135.0    135.0     700.0     32.0    0.00      0.0       0
   4   130.0    130.0     400.0     33.0    0.00      0.0       1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  5 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1        298.00      165.00
     2        388.00      169.00
     3        513.00      138.00
     4        536.00      115.00
     5        700.00      115.00
```

```
  Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
  Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
  Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
  Specified Seismic Pore-Pressure Factor =   0.000
  A Critical Failure Surface Searching Method, Using A Random
  Technique For Generating Circular Surfaces, Has Been Specified.
  1000 Trial Surfaces Have Been Generated.
    10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
  Along The Ground Surface Between  X = 170.00(ft)
                               and  X = 220.00(ft)
  Each Surface Terminates Between   X = 290.00(ft)
                              and   X = 430.00(ft)
  Unless Further Limitations Were Imposed, The Minimum Elevation
  At Which A Surface Extends Is  Y =      0.00(ft)
  35.00(ft) Line Segments Define Each Trial Failure Surface.
  Restrictions Have Been Imposed Upon The Angle Of Initiation.
  The Angle Has Been Restricted Between The Angles Of -45.0
  And  15.0 deg.
  Following Are Displayed The Ten Most Critical Of The Trial
        Failure Surfaces Evaluated. They Are
        Ordered - Most Critical First.
        * * Safety Factors Are Calculated By The Modified Bishop Method * *
        Total Number of Trial Surfaces Evaluated =  1000
        Statistical Data On All Valid FS Values:
           FS Max =   1.993   FS Min =   1.169   FS Ave =   1.480
           Standard Deviation =    0.164   Coefficient of Variation =   11.06 %
        Failure Surface Specified By  9 Coordinate Points
          Point       X-Surf       Y-Surf
           No.         (ft)         (ft)
            1        186.67        81.18
            2        221.22        86.74
            3        254.99        95.95
            4        287.58       108.70
            5        318.64       124.84
            6        347.80       144.20
            7        374.73       166.55
            8        399.13       191.64
            9        413.46       209.91
        Circle Center At X =   151.81 ; Y =   407.77 ; and Radius =   328.45
               Factor of Safety
              ***    1.169   ***
             Individual data on the    15  slices
                       Water  Water     Tie      Tie     Earthquake
                       Force  Force    Force    Force       Force    Surcharge
Slice  Width   Weight   Top    Bot     Norm      Tan      Hor     Ver     Load
 No.    (ft)   (lbs)   (lbs)  (lbs)    (lbs)    (lbs)    (lbs)   (lbs)   (lbs)
  1     34.6   43917.8   0.0     0.0       0.       0.  6587.7     0.0       0.0
  2     33.8  119171.6   0.0     0.0       0.       0. 17875.7     0.0       0.0
  3     15.0   72587.1   0.0     0.0       0.       0. 10888.1     0.0       0.0
  4     17.6  101107.4   0.0     0.0       0.       0. 15166.1     0.0       0.0
  5     10.4   68824.6   0.0     0.0       0.       0. 10323.7     0.0       0.0
  6     10.0   68450.3   0.0     0.0       0.       0. 10267.5     0.0       0.0
  7     10.6   71791.3   0.0     0.0       0.       0. 10768.7     0.0       0.0
  8     29.2  180725.3   0.0     0.0       0.       0. 27108.8     0.0       0.0
  9      7.2   39754.8   0.0     0.0       0.       0.  5963.2     0.0       0.0
 10     19.7   94214.2   0.0     0.0       0.       0. 14132.1     0.0       0.0
 11      1.9    7848.4   0.0     0.0       0.       0.  1177.3     0.0       0.0
 12      2.8   11006.2   0.0     0.0       0.       0.  1650.9     0.0       0.0
 13     19.7   61169.9   0.0     0.0       0.       0.  9175.5     0.0       0.0
 14      0.9    1983.5   0.0     0.0       0.       0.   297.5     0.0       0.0
 15     13.5   15093.0   0.0     0.0       0.       0.  2264.0     0.0       0.0
        Failure Surface Specified By  9 Coordinate Points
          Point       X-Surf       Y-Surf
           No.         (ft)         (ft)
            1        185.66        80.46
            2        220.10        86.68
            3        253.82        96.05
```

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     4        286.53      108.51
     5        317.95      123.94
     6        347.80      142.21
     7        375.84      163.16
     8        401.81      186.61
     9        423.18      209.85
Circle Center At X =   135.86 ; Y =   455.02 ; and Radius =   377.85
       Factor of Safety
      ***    1.169   ***
Failure Surface Specified By  9 Coordinate Points
  Point       X-Surf      Y-Surf
   No.         (ft)        (ft)
    1         188.69       82.60
    2         222.81       90.41
    3         256.03      101.40
    4         288.07      115.49
    5         318.64      132.54
    6         347.46      152.40
    7         374.28      174.89
    8         398.85      199.81
    9         407.11      209.95
Circle Center At X =   123.30 ; Y =   446.86 ; and Radius =   370.08
       Factor of Safety
      ***    1.175   ***
Failure Surface Specified By  9 Coordinate Points
  Point       X-Surf      Y-Surf
   No.         (ft)        (ft)
    1         188.69       82.60
    2         223.21       88.39
    3         257.01       97.47
    4         289.78      109.76
    5         321.21      125.15
    6         351.02      143.49
    7         378.93      164.62
    8         404.67      188.33
    9         423.93      209.84
Circle Center At X =   145.93 ; Y =   443.43 ; and Radius =   363.35
       Factor of Safety
      ***    1.177   ***
Failure Surface Specified By  9 Coordinate Points
  Point       X-Surf      Y-Surf
   No.         (ft)        (ft)
    1         191.72       84.74
    2         225.98       91.90
    3         259.38      102.34
    4         291.63      115.96
    5         322.40      132.62
    6         351.43      152.18
    7         378.43      174.45
    8         403.15      199.23
    9         411.93      209.92
Circle Center At X =   134.84 ; Y =   442.26 ; and Radius =   362.02
       Factor of Safety
      ***    1.178   ***
Failure Surface Specified By  9 Coordinate Points
  Point       X-Surf      Y-Surf
   No.         (ft)        (ft)
    1         191.72       84.74
    2         226.18       90.84
    3         259.76      100.70
    4         292.06      114.20
    5         322.67      131.17
    6         351.22      151.41
    7         377.38      174.67
    8         400.81      200.66
    9         407.48      209.95
Circle Center At X =   153.71 ; Y =   399.83 ; and Radius =   317.37
```
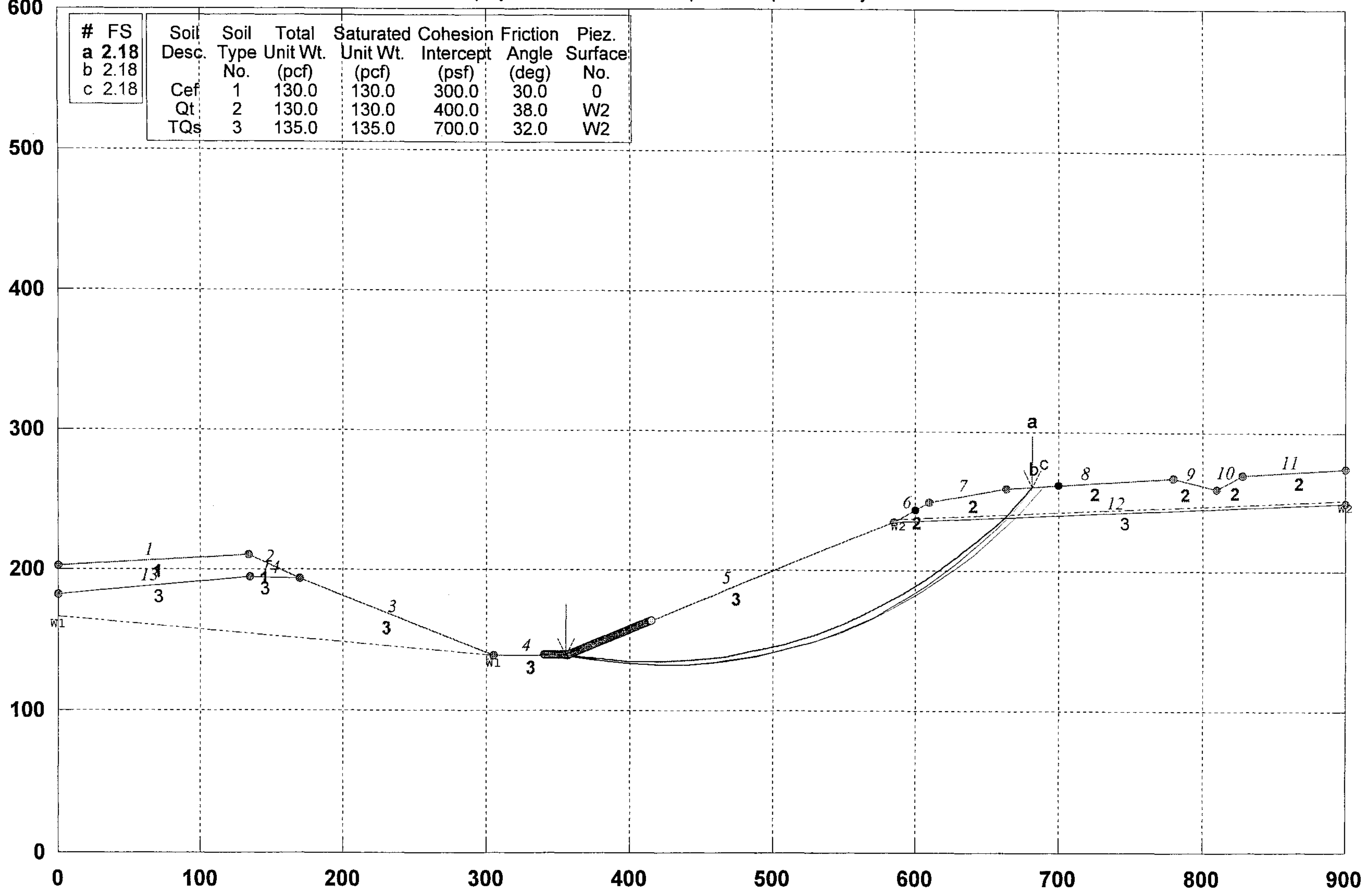

TT 60258, X-Sect 4-4'; CS-4 Static

n:\projects\0100-999\803s\slopes\t4s1a.pl2 Run By: KPC



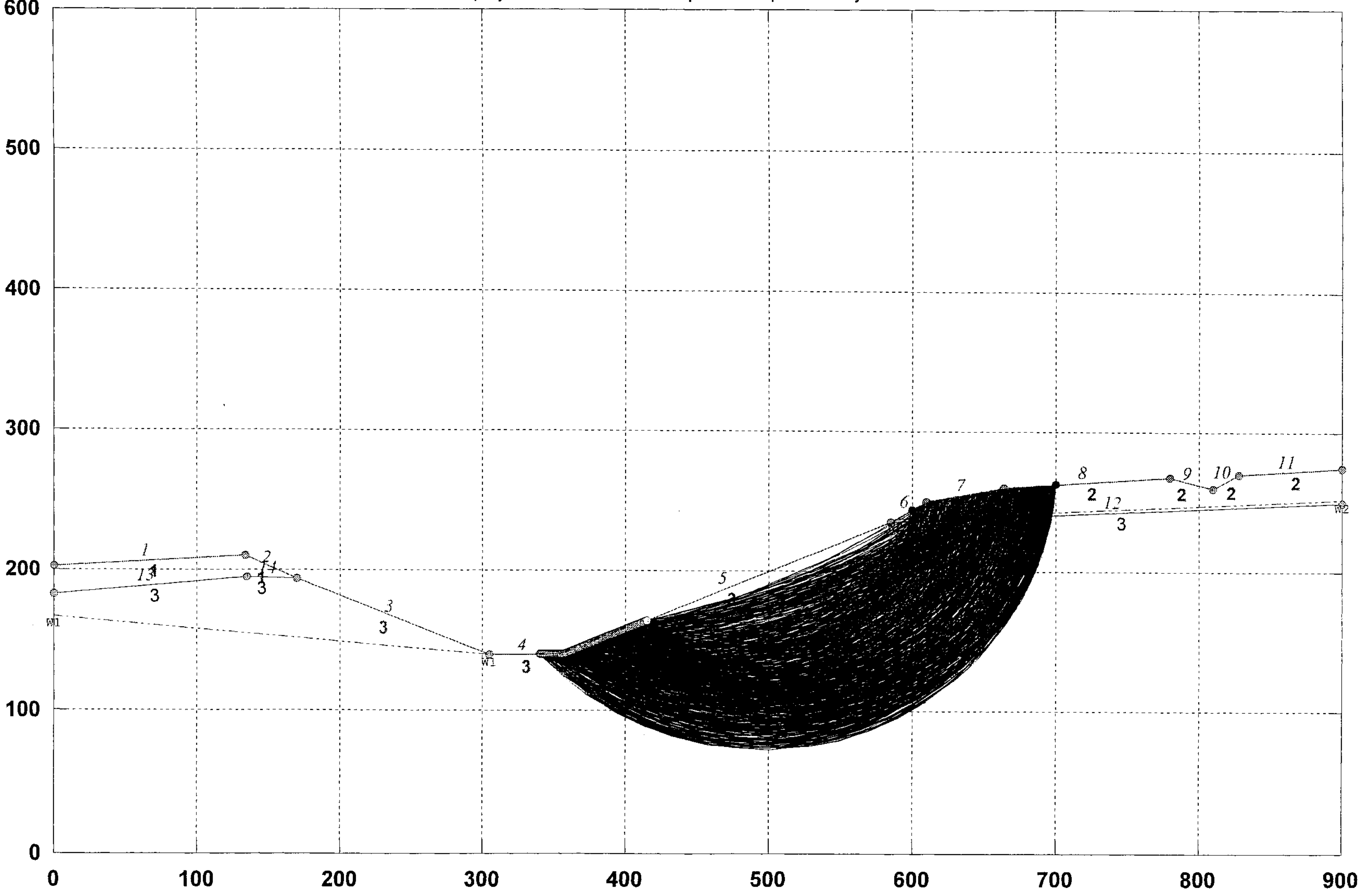
GSTABL7 v.2 FSmin=2.18

Safety Factors Are Calculated By The Modified Bishop Method

Run No. 8

TT 60258, X-Sect 4-4'; CS-4 Static

n:\projects\0100-999\803s\slopes\t4s1a.plt   Run By: KPC



GSTABL7

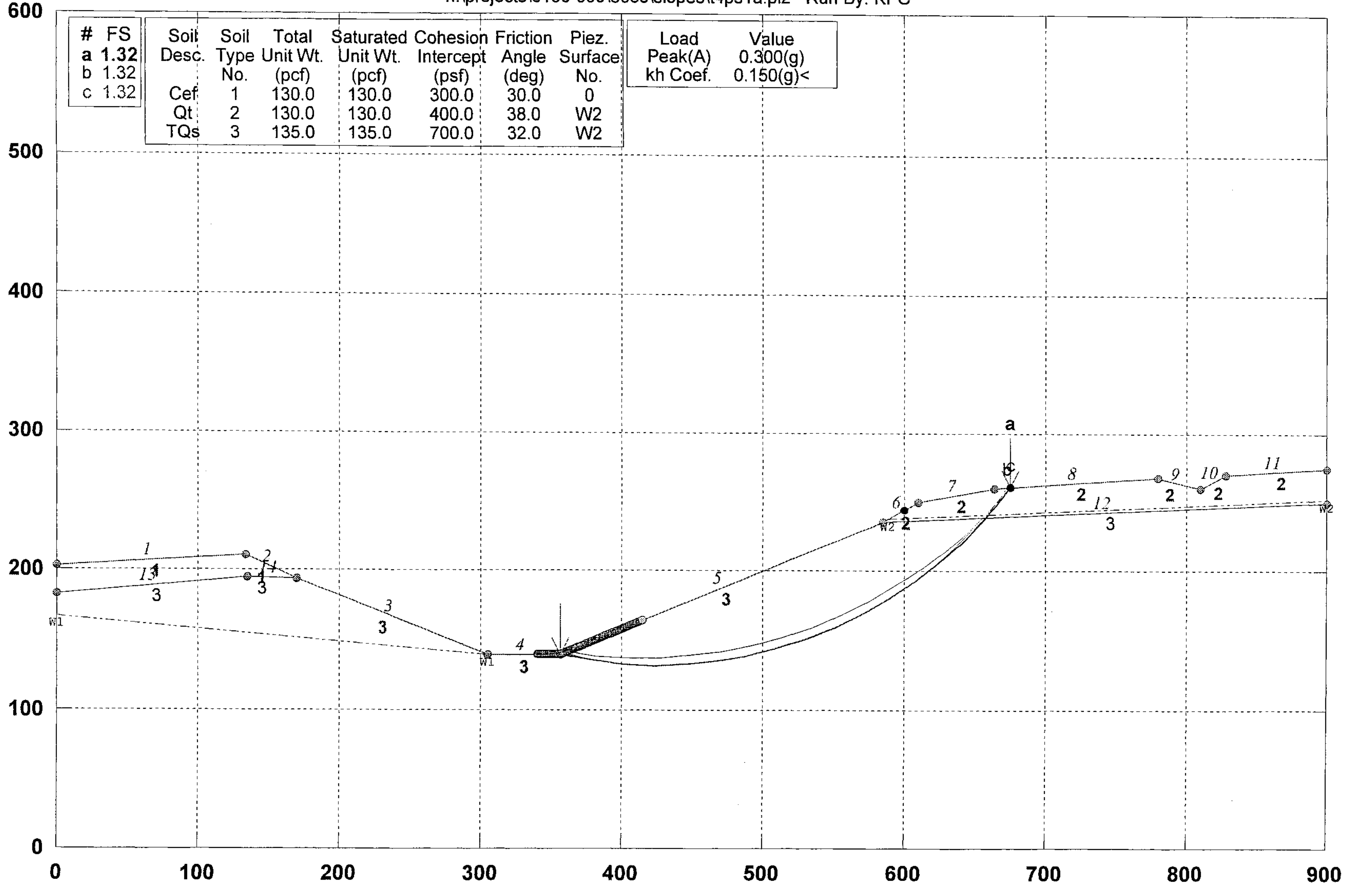
```
                            ***  GSTABL7  ***
                 ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
               (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                  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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
 Analysis Run Date:
 Time of Run:
 Run By:                   KPC
 Input Data Filename:      N:\Projects\0100-999\803S\Slopes\t4s1a.in
 Output Filename:          N:\Projects\0100-999\803S\Slopes\t4s1a.OUT
 Unit System:              English
 Plotted Output Filename:  N:\Projects\0100-999\803S\Slopes1a.PLT
 PROBLEM DESCRIPTION:  TT 60258, X-Sect 4-4'; CS-4 Static
 BOUNDARY COORDINATES
    11 Top   Boundaries
    14 Total Boundaries
 Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
    No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
     1          0.00     203.00     134.00     210.00        1
     2        134.00     210.00     170.00     194.00        1
     3        170.00     194.00     305.00     140.00        3
     4        305.00     140.00     357.00     140.00        3
     5        357.00     140.00     585.00     235.00        3
     6        585.00     235.00     610.00     250.00        2
     7        610.00     250.00     664.00     260.00        2
     8        664.00     260.00     780.00     268.00        2
     9        780.00     268.00     810.00     260.00        2
    10        810.00     260.00     828.00     270.00        2
    11        828.00     270.00     900.00     275.00        2
    12        585.00     235.00     900.00     250.00        3
    13          0.00     182.00     135.00     195.00        3
    14        135.00     195.00     170.00     194.00        3
 Default Y-Origin = 0.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  3 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     300.0     30.0    0.00       0.0      0
   2   130.0     130.0     400.0     38.0    0.00       0.0      2
   3   135.0     135.0     700.0     32.0    0.00       0.0      2
 2 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1          0.00      167.00
     2        305.00      140.00
 Piezometric Surface No.  2 Specified by  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1        588.35      237.00
     2        900.00      252.00
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
```

```
 1000 Trial Surfaces Have Been Generated.
   10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
 Along The Ground Surface Between  X = 340.00(ft)
                              and  X = 415.00(ft)
 Each Surface Terminates Between   X = 600.00(ft)
                             and   X = 700.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =      0.00(ft)
 22.00(ft) Line Segments Define Each Trial Failure Surface.
 Restrictions Have Been Imposed Upon The Angle Of Initiation.
 The Angle Has Been Restricted Between The Angles Of -45.0
 And  15.0 deg.
 Following Are Displayed The Ten Most Critical Of The Trial
       Failure Surfaces Evaluated. They Are
       Ordered - Most Critical First.
       * * Safety Factors Are Calculated By The Modified Bishop Method * *
       Total Number of Trial Surfaces Evaluated =  1000
       Statistical Data On All Valid FS Values:
          FS Max =   5.370   FS Min =   2.183   FS Ave =   2.713
          Standard Deviation =    0.344   Coefficient of Variation =   12.69 %
       Failure Surface Specified By 18 Coordinate Points
         Point      X-Surf      Y-Surf
          No.        (ft)        (ft)
           1        355.91      140.00
           2        377.70      136.97
           3        399.64      135.33
           4        421.64      135.08
           5        443.61      136.22
           6        465.46      138.75
           7        487.11      142.66
           8        508.47      147.93
           9        529.45      154.54
          10        549.98      162.47
          11        569.95      171.68
          12        589.31      182.13
          13        607.97      193.79
          14        625.85      206.61
          15        642.88      220.54
          16        658.99      235.51
          17        674.13      251.48
          18        682.30      261.26
       Circle Center At X =   414.66 ; Y =   481.74 ; and Radius =   346.76
              Factor of Safety
             ***    2.183   ***
             Individual data on the    24  slices
                       Water  Water     Tie      Tie     Earthquake
                       Force  Force    Force    Force      Force   Surcharge
Slice  Width   Weight   Top    Bot     Norm      Tan      Hor     Ver     Load
 No.    (ft)   (lbs)   (lbs)  (lbs)    (lbs)    (lbs)    (lbs)   (lbs)   (lbs)
  1     1.1      11.2  5837.3  5898.7      0.       0.      0.0     0.0      0.0
  2    20.7   16494.8 ******* *******      0.       0.      0.0     0.0      0.0
  3    21.9   50485.6 ******* *******      0.       0.      0.0     0.0      0.0
  4    22.0   80622.3 98133.8 *******      0.       0.      0.0     0.0      0.0
  5    22.0  106368.4 85973.9 *******      0.       0.      0.0     0.0      0.0
  6    21.9  127325.8 73589.8 *******      0.       0.      0.0     0.0      0.0
  7    21.7  143218.9 61174.4 *******      0.       0.      0.0     0.0      0.0
  8    21.4  153898.0 48915.4 *******      0.       0.      0.0     0.0      0.0
  9    21.0  159341.9 36994.2 *******      0.       0.      0.0     0.0      0.0
 10    20.5  159658.7 25582.1 *******      0.       0.      0.0     0.0      0.0
 11    20.0  155080.6 14837.5 94013.8      0.       0.      0.0     0.0      0.0
 12    15.0  113999.8  4618.7 64736.8      0.       0.      0.0     0.0      0.0
 13     3.3   24991.6   207.1 13339.6      0.       0.      0.0     0.0      0.0
 14     1.0    7174.3     0.0  3751.4      0.       0.      0.0     0.0      0.0
 15    18.7  138363.6     0.0 67917.9      0.       0.      0.0     0.0      0.0
 16     2.0   14934.9     0.0  6782.6      0.       0.      0.0     0.0      0.0
 17    15.8  106916.6     0.0 45557.4      0.       0.      0.0     0.0      0.0
 18    17.0   92665.0     0.0 35156.6      0.       0.      0.0     0.0      0.0
```

```
19      16.1    62738.7      0.0 16436.6       0.       0.      0.0      0.0       0.0
20       3.0     8673.3      0.0   916.1       0.       0.      0.0      0.0       0.0
21       1.9     4887.3      0.0   158.7       0.       0.      0.0      0.0       0.0
22       0.2      377.3      0.0     0.0       0.       0.      0.0      0.0       0.0
23      10.1    18719.8      0.0     0.0       0.       0.      0.0      0.0       0.0
24       8.2     4893.2      0.0     0.0       0.       0.      0.0      0.0       0.0
         Failure Surface Specified By 18 Coordinate Points
           Point      X-Surf       Y-Surf
            No.        (ft)         (ft)
             1        355.91       140.00
             2        377.55       136.05
             3        399.41       133.58
             4        421.39       132.60
             5        443.38       133.11
             6        465.29       135.11
             7        487.01       138.60
             8        508.45       143.55
             9        529.50       149.95
            10        550.06       157.77
            11        570.05       166.96
            12        589.37       177.49
            13        607.93       189.30
            14        625.64       202.35
            15        642.43       216.57
            16        658.21       231.90
            17        672.91       248.26
            18        683.14       261.32
         Circle Center At X =    424.87 ; Y =    455.95 ; and Radius =    323.39
                Factor of Safety
               ***    2.183   ***
         Failure Surface Specified By 19 Coordinate Points
           Point      X-Surf       Y-Surf
            No.        (ft)         (ft)
             1        352.12       140.00
             2        373.77       136.08
             3        395.63       133.58
             4        417.60       132.50
             5        439.60       132.85
             6        461.53       134.63
             7        483.29       137.83
             8        504.80       142.44
             9        525.97       148.44
            10        546.70       155.80
            11        566.91       164.49
            12        586.52       174.48
            13        605.43       185.72
            14        623.57       198.16
            15        640.87       211.76
            16        657.24       226.45
            17        672.63       242.17
            18        686.96       258.86
            19        689.12       261.73
         Circle Center At X =    423.19 ; Y =    470.86 ; and Radius =    338.41
                Factor of Safety
               ***    2.184   ***
         Failure Surface Specified By 19 Coordinate Points
           Point      X-Surf       Y-Surf
            No.        (ft)         (ft)
             1        352.88       140.00
             2        374.66       136.90
             3        396.59       135.12
             4        418.58       134.68
             5        440.56       135.57
             6        462.45       137.79
             7        484.16       141.34
             8        505.62       146.20
             9        526.74       152.35
```

TT 60258, X-Sect 4-4'; CS-4 Pseudostatic

n:\projects\0100-999\803s\slopes\t4ps1a.pl2   Run By: KPC



#	FS
a	1.32
b	1.32
c	1.32

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
Qt	2	130.0	130.0	400.0	38.0	W2
TQs	3	135.0	135.0	700.0	32.0	W2

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.32
Safety Factors Are Calculated By The Modified Bishop Method

Run No. 9

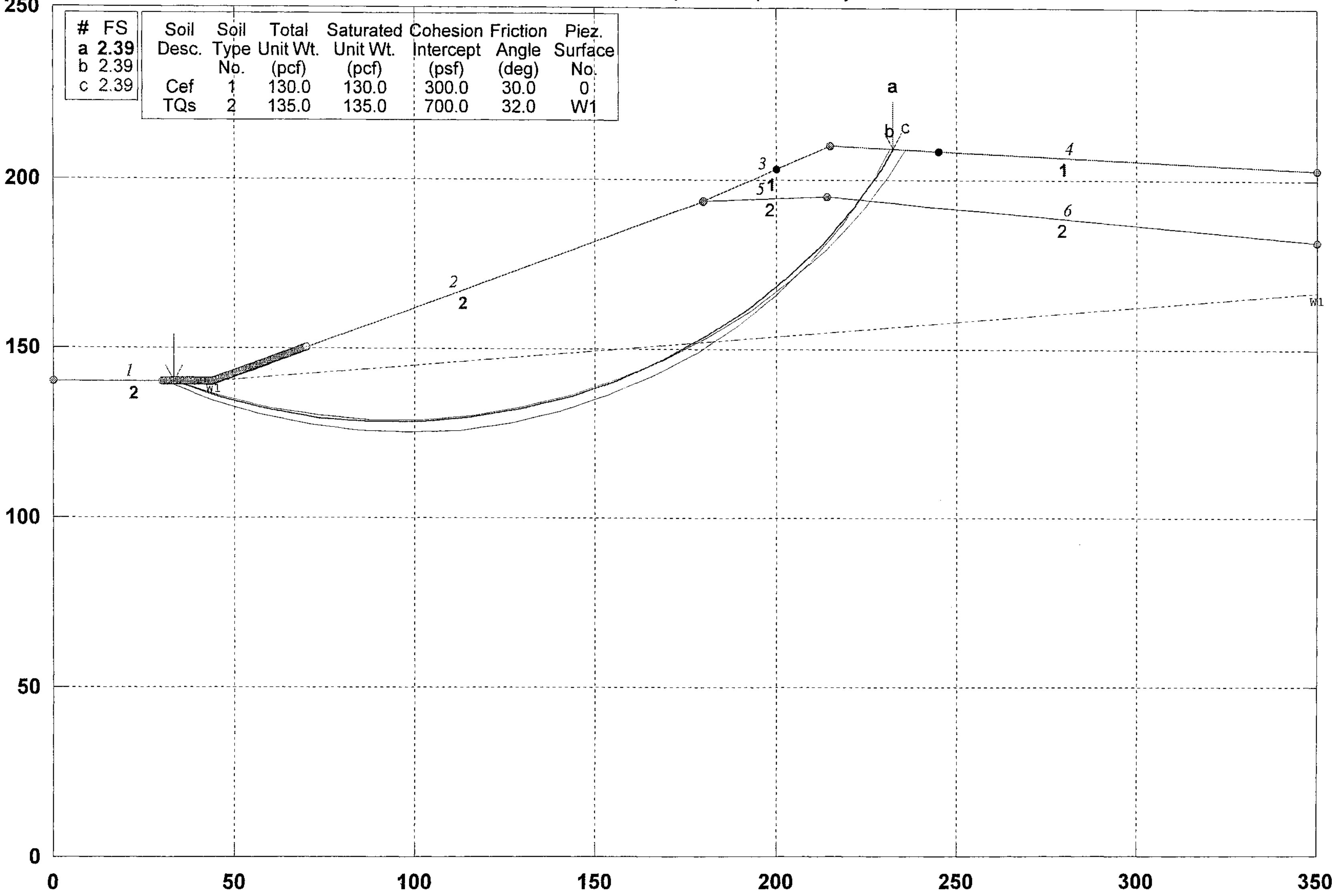
```
                          ***  GSTABL7  ***
                 ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                   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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
 Analysis Run Date:
 Time of Run:
 Run By:                    KPC
 Input Data Filename:       N:\Projects\0100-999\803S\Slopes\t4ps1a.in
 Output Filename:           N:\Projects\0100-999\803S\Slopes\t4ps1a.OUT
 Unit System:               English
 Plotted Output Filename:   N:\Projects\0100-999\803S\Slopess1a.PLT
 PROBLEM DESCRIPTION:  TT 60258, X-Sect 4-4'; CS-4 Pseudostatic
 BOUNDARY COORDINATES
    11 Top   Boundaries
    14 Total Boundaries
 Boundary      X-Left     Y-Left     X-Right    Y-Right    Soil Type
    No.         (ft)       (ft)       (ft)       (ft)      Below Bnd
     1          0.00     203.00     134.00     210.00          1
     2        134.00     210.00     170.00     194.00          1
     3        170.00     194.00     305.00     140.00          3
     4        305.00     140.00     357.00     140.00          3
     5        357.00     140.00     585.00     235.00          3
     6        585.00     235.00     610.00     250.00          2
     7        610.00     250.00     664.00     260.00          2
     8        664.00     260.00     780.00     268.00          2
     9        780.00     268.00     810.00     260.00          2
    10        810.00     260.00     828.00     270.00          2
    11        828.00     270.00     900.00     275.00          2
    12        585.00     235.00     900.00     250.00          3
    13          0.00     182.00     135.00     195.00          3
    14        135.00     195.00     170.00     194.00          3
 Default Y-Origin = 0.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  3 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     300.0     30.0    0.00       0.0      0
   2   130.0    130.0     400.0     38.0    0.00       0.0      2
   3   135.0    135.0     700.0     32.0    0.00       0.0      2
 2 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1          0.00      167.00
     2        305.00      140.00
 Piezometric Surface No.  2 Specified by  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1        588.35      237.00
     2        900.00      252.00
 Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
 Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
```

```
   Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
   Specified Seismic Pore-Pressure Factor =   0.000
   A Critical Failure Surface Searching Method, Using A Random
   Technique For Generating Circular Surfaces, Has Been Specified.
   1000 Trial Surfaces Have Been Generated.
     10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
   Along The Ground Surface Between  X = 340.00(ft)
                               and  X = 415.00(ft)
   Each Surface Terminates Between   X = 600.00(ft)
                              and   X = 675.00(ft)
   Unless Further Limitations Were Imposed, The Minimum Elevation
   At Which A Surface Extends Is  Y =      0.00(ft)
   22.00(ft) Line Segments Define Each Trial Failure Surface.
   Restrictions Have Been Imposed Upon The Angle Of Initiation.
   The Angle Has Been Restricted Between The Angles Of -45.0
   And  15.0 deg.
   Following Are Displayed The Ten Most Critical Of The Trial
         Failure Surfaces Evaluated. They Are
         Ordered - Most Critical First.
         * * Safety Factors Are Calculated By The Modified Bishop Method * *
         Total Number of Trial Surfaces Evaluated =  1000
         Statistical Data On All Valid FS Values:
            FS Max =   3.175   FS Min =   1.316   FS Ave =   1.635
            Standard Deviation =    0.218   Coefficient of Variation =   13.31 %
         Failure Surface Specified By 18 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        356.67      140.00
             2        378.26      135.81
             3        400.11      133.18
             4        422.08      132.13
             5        444.07      132.67
             6        465.97      134.78
             7        487.66      138.46
             8        509.03      143.69
             9        529.97      150.45
            10        550.37      158.69
            11        570.12      168.38
            12        589.13      179.46
            13        607.29      191.88
            14        624.50      205.57
            15        640.70      220.46
            16        655.77      236.48
            17        669.66      253.55
            18        674.70      260.74
         Circle Center At X =   425.71 ; Y =   437.37 ; and Radius =   305.28
                Factor of Safety
               ***    1.316   ***
              Individual data on the    24  slices
                           Water  Water     Tie      Tie     Earthquake
                           Force  Force    Force    Force       Force   Surcharge
Slice  Width   Weight       Top    Bot     Norm      Tan      Hor     Ver     Load
 No.    (ft)    (lbs)     (lbs)  (lbs)    (lbs)    (lbs)    (lbs)   (lbs)    (lbs)
  1      0.3       1.5   1784.6  1818.6       0.       0.      0.2     0.0      0.0
  2     21.3   18823.3 ******* *******       0.       0.   2823.5     0.0      0.0
  3     21.8   55771.5 ******* *******       0.       0.   8365.7     0.0      0.0
  4     22.0   88643.0 97774.0 *******       0.       0.  13296.4     0.0      0.0
  5     22.0  116681.8 85808.7 *******       0.       0.  17502.3     0.0      0.0
  6     21.9  139298.4 73465.0 *******       0.       0.  20894.8     0.0      0.0
  7     21.7  156078.6 60992.0 *******       0.       0.  23411.8     0.0      0.0
  8     21.4  166792.7 48634.1 *******       0.       0.  25018.9     0.0      0.0
  9     20.9  171400.6 36626.5 *******       0.       0.  25710.1     0.0      0.0
 10     20.4  170049.8 25189.9 *******       0.       0.  25507.5     0.0      0.0
 11     19.8  163072.0 14526.4 98885.7       0.       0.  24460.8     0.0      0.0
 12     14.9  118892.0  4533.3 68458.0       0.       0.  17833.8     0.0      0.0
 13      3.3   26204.5   206.3 14234.0       0.       0.   3930.7     0.0      0.0
 14      0.8    6066.5     0.0  3233.9       0.       0.    910.0     0.0      0.0
```

```
15     18.2  139704.5     0.0 71040.0       0.       0. 20955.7     0.0       0.0
16      2.7   20432.3     0.0  9733.4       0.       0.  3064.8     0.0       0.0
17     14.5   99851.5     0.0 44571.8       0.       0. 14977.7     0.0       0.0
18     16.2   88616.9     0.0 35808.0       0.       0. 13292.5     0.0       0.0
19     15.1   56793.5     0.0 15644.1       0.       0.  8519.0     0.0       0.0
20      1.6    4401.8     0.0   444.6       0.       0.   660.3     0.0       0.0
21      1.6    4027.5     0.0   147.2       0.       0.   604.1     0.0       0.0
22      5.0   10508.4     0.0     0.0       0.       0.  1576.3     0.0       0.0
23      5.7    7452.6     0.0     0.0       0.       0.  1117.9     0.0       0.0
24      5.0    2241.8     0.0     0.0       0.       0.   336.3     0.0       0.0
        Failure Surface Specified By 18 Coordinate Points
          Point       X-Surf       Y-Surf
           No.         (ft)         (ft)
            1         357.42       140.18
            2         379.00       135.87
            3         400.83       133.15
            4         422.80       132.04
            5         444.80       132.54
            6         466.69       134.66
            7         488.38       138.37
            8         509.73       143.66
            9         530.64       150.51
           10         550.99       158.87
           11         570.67       168.69
           12         589.58       179.94
           13         607.62       192.54
           14         624.68       206.43
           15         640.67       221.53
           16         655.52       237.77
           17         669.14       255.04
           18         672.90       260.61
        Circle Center At X =    426.97 ; Y =    431.41 ; and Radius =    299.42
               Factor of Safety
              ***    1.319   ***
        Failure Surface Specified By 17 Coordinate Points
          Point       X-Surf       Y-Surf
           No.         (ft)         (ft)
            1         361.21       141.75
            2         383.02       138.89
            3         404.98       137.47
            4         426.98       137.50
            5         448.93       138.97
            6         470.74       141.89
            7         492.30       146.23
            8         513.54       151.98
            9         534.35       159.12
           10         554.64       167.62
           11         574.33       177.43
           12         593.33       188.51
           13         611.57       200.83
           14         628.95       214.31
           15         645.41       228.91
           16         660.87       244.56
           17         674.87       260.75
        Circle Center At X =    415.58 ; Y =    471.39 ; and Radius =    334.09
               Factor of Safety
              ***    1.319   ***
        Failure Surface Specified By 18 Coordinate Points
          Point       X-Surf       Y-Surf
           No.         (ft)         (ft)
            1         348.33       140.00
            2         370.08       136.69
            3         392.00       134.78
            4         413.99       134.30
            5         435.97       135.25
            6         457.85       137.61
            7         479.52       141.39
```

TT 60258, X-Sect 4-4'; CS-3 Static

n:\projects\0100-999\803s\slopes\t4s1d.pl2 Run By: KPC



#	FS
a	**2.39**
b	2.39
c	2.39

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
TQs	2	135.0	135.0	700.0	32.0	W1

GSTABL7 v.2 FSmin=2.39

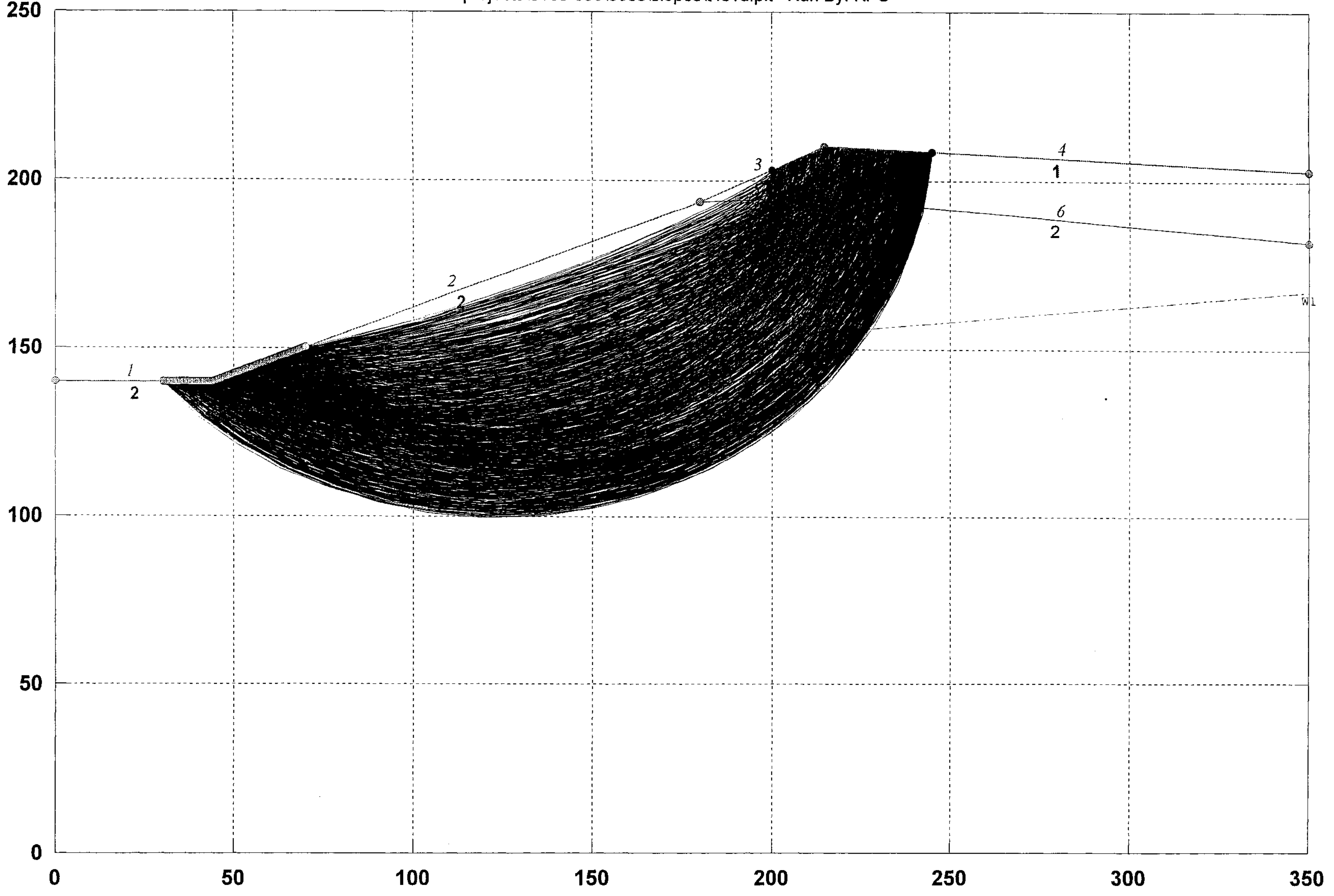
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Run No. 10

TT 60258, X-Sect 4-4'; CS-3 Static

n:\projects\0100-999\803s\slopes\t4s1d.plt Run By: KPC



GSTABL7

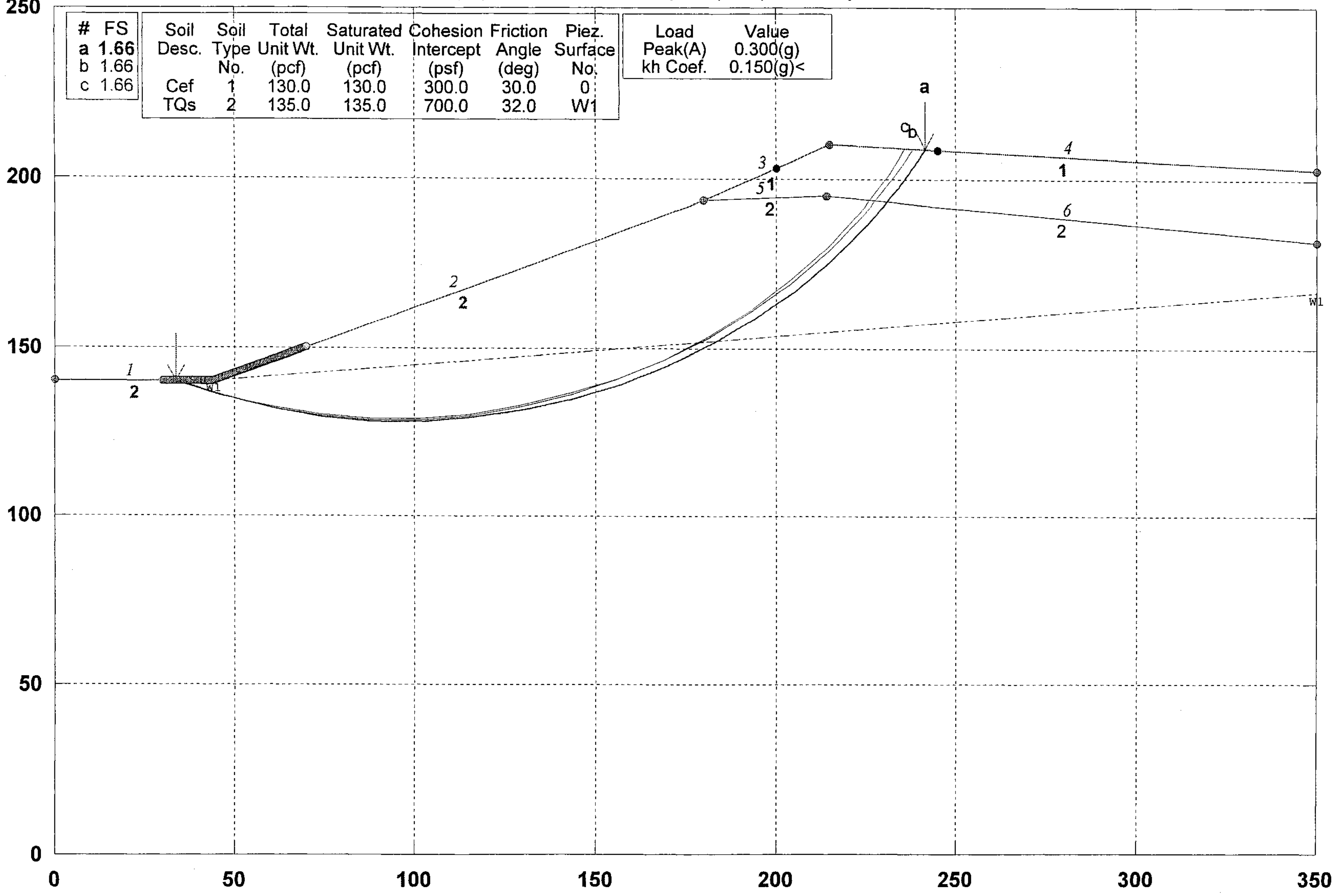
```
                              ***  GSTABL7  ***
                    ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
                 (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                      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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
 Analysis Run Date:
 Time of Run:
 Run By:                 KPC
 Input Data Filename:    N:\Projects\0100-999\803S\Slopes\t4s1d.in
 Output Filename:        N:\Projects\0100-999\803S\Slopes\t4s1d.OUT
 Unit System:            English
 Plotted Output Filename: N:\Projects\0100-999\803S\Slopes1d.PLT
 PROBLEM DESCRIPTION:  TT 60258, X-Sect 4-4'; CS-3 Static
 BOUNDARY COORDINATES
     4 Top   Boundaries
     6 Total Boundaries
 Boundary      X-Left      Y-Left     X-Right     Y-Right     Soil Type
    No.         (ft)        (ft)        (ft)        (ft)      Below Bnd
     1          0.00      140.00       44.00      140.00          2
     2         44.00      140.00      180.00      194.00          2
     3        180.00      194.00      215.00      210.00          1
     4        215.00      210.00      350.00      203.00          1
     5        180.00      194.00      214.00      195.00          2
     6        214.00      195.00      350.00      182.00          2
 Default Y-Origin = 0.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
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   130.0    130.0     300.0     30.0    0.00       0.0      0
   2   135.0    135.0     700.0     32.0    0.00       0.0      1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1         44.00      140.00
     2        350.00      167.00
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
 1000 Trial Surfaces Have Been Generated.
   10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
 Along The Ground Surface Between  X =  30.00(ft)
                               and  X =  70.00(ft)
 Each Surface Terminates Between   X = 200.00(ft)
                              and   X = 245.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =      0.00(ft)
 14.00(ft) Line Segments Define Each Trial Failure Surface.
 Restrictions Have Been Imposed Upon The Angle Of Initiation.
 The Angle Has Been Restricted Between The Angles Of -45.0
 And  15.0 deg.
 Following Are Displayed The Ten Most Critical Of The Trial
       Failure Surfaces Evaluated. They Are
       Ordered - Most Critical First.
```

```
          * * Safety Factors Are Calculated By The Modified Bishop Method * *
          Total Number of Trial Surfaces Evaluated =  1000
          Statistical Data On All Valid FS Values:
             FS Max =   5.409   FS Min =   2.390   FS Ave =   2.800
             Standard Deviation =    0.301   Coefficient of Variation =   10.75 %
          Failure Surface Specified By 18 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1         33.23      140.00
              2         46.40      135.24
              3         59.93      131.65
              4         73.73      129.27
              5         87.68      128.11
              6        101.68      128.18
              7        115.62      129.49
              8        129.39      132.01
              9        142.88      135.74
             10        155.99      140.64
             11        168.62      146.68
             12        180.68      153.81
             13        192.05      161.97
             14        202.67      171.09
             15        212.44      181.12
             16        221.29      191.97
             17        229.15      203.55
             18        232.24      209.11
          Circle Center At X =    93.83 ; Y =   286.59 ; and Radius =   158.62
                 Factor of Safety
                ***    2.390   ***
               Individual data on the    23  slices
                         Water  Water     Tie     Tie     Earthquake
                         Force  Force    Force   Force      Force   Surcharge
Slice  Width   Weight     Top    Bot     Norm     Tan     Hor     Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1     10.8   2832.5    0.0  1048.8      0.       0.     0.0     0.0      0.0
  2      2.4   1555.2    0.0   702.9      0.       0.     0.0     0.0      0.0
  3     13.5  18627.9    0.0  6410.7      0.       0.     0.0     0.0      0.0
  4     13.8  34654.1    0.0 10057.5      0.       0.     0.0     0.0      0.0
  5     14.0  48757.4    0.0 12663.8      0.       0.     0.0     0.0      0.0
  6     14.0  60438.6    0.0 14209.3      0.       0.     0.0     0.0      0.0
  7     13.9  69316.6    0.0 14682.1      0.       0.     0.0     0.0      0.0
  8     13.8  75140.6    0.0 14078.5      0.       0.     0.0     0.0      0.0
  9     13.5  77797.6    0.0 12403.1      0.       0.     0.0     0.0      0.0
 10     13.1  77315.0    0.0  9669.0      0.       0.     0.0     0.0      0.0
 11     12.6  73859.5    0.0  5897.5      0.       0.     0.0     0.0      0.0
 12      8.6  48604.7    0.0  1336.7      0.       0.     0.0     0.0      0.0
 13      2.8  15427.6    0.0     0.0      0.       0.     0.0     0.0      0.0
 14      0.7   3699.5    0.0     0.0      0.       0.     0.0     0.0      0.0
 15     11.4  59781.5    0.0     0.0      0.       0.     0.0     0.0      0.0
 16     10.6  50344.0    0.0     0.0      0.       0.     0.0     0.0      0.0
 17      9.8  39638.3    0.0     0.0      0.       0.     0.0     0.0      0.0
 18      1.6   5605.2    0.0     0.0      0.       0.     0.0     0.0      0.0
 19      1.0   3452.6    0.0     0.0      0.       0.     0.0     0.0      0.0
 20      6.3  17960.2    0.0     0.0      0.       0.     0.0     0.0      0.0
 21      1.5   3213.6    0.0     0.0      0.       0.     0.0     0.0      0.0
 22      6.4   8760.6    0.0     0.0      0.       0.     0.0     0.0      0.0
 23      3.1   1148.1    0.0     0.0      0.       0.     0.0     0.0      0.0
          Failure Surface Specified By 18 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1         30.81      140.00
              2         43.67      134.48
              3         56.99      130.17
              4         70.66      127.13
              5         84.55      125.37
              6         98.54      124.91
              7        112.52      125.75
```

```
    8        126.35       127.89
    9        139.93       131.31
   10        153.13       135.98
   11        165.83       141.85
   12        177.94       148.88
   13        189.34       157.01
   14        199.93       166.16
   15        209.63       176.26
   16        218.34       187.22
   17        226.00       198.94
   18        231.39       209.15
Circle Center At X =    96.47 ; Y =   275.03 ; and Radius =   150.15
       Factor of Safety
      ***    2.390   ***
Failure Surface Specified By 18 Coordinate Points
  Point      X-Surf       Y-Surf
   No.        (ft)         (ft)
    1         33.23       140.00
    2         46.47       135.44
    3         60.05       132.02
    4         73.86       129.75
    5         87.82       128.66
    6        101.82       128.74
    7        115.76       130.01
    8        129.55       132.45
    9        143.08       136.04
   10        156.26       140.76
   11        169.00       146.57
   12        181.20       153.43
   13        192.78       161.30
   14        203.65       170.12
   15        213.74       179.82
   16        222.98       190.34
   17        231.30       201.60
   18        235.80       208.92
Circle Center At X =    93.79 ; Y =   294.17 ; and Radius =   165.64
       Factor of Safety
      ***    2.393   ***
Failure Surface Specified By 18 Coordinate Points
  Point      X-Surf       Y-Surf
   No.        (ft)         (ft)
    1         30.81       140.00
    2         43.88       134.98
    3         57.36       131.20
    4         71.13       128.68
    5         85.07       127.44
    6         99.07       127.51
    7        113.01       128.86
    8        126.76       131.51
    9        140.20       135.41
   10        153.23       140.54
   11        165.72       146.86
   12        177.58       154.30
   13        188.69       162.82
   14        198.97       172.32
   15        208.33       182.73
   16        216.68       193.97
   17        223.95       205.93
   18        225.67       209.45
Circle Center At X =    91.39 ; Y =   278.10 ; and Radius =   150.81
       Factor of Safety
      ***    2.394   ***
Failure Surface Specified By 18 Coordinate Points
  Point      X-Surf       Y-Surf
   No.        (ft)         (ft)
    1         32.42       140.00
    2         45.37       134.68
```

TT 60258, X-Sect 4-4'; CS-3 Pseudostatic

n:\projects\0100-999\803s\slopes\t4ps1d.pl2 Run By: KPC



#	FS
a	**1.66**
b	1.66
c	1.66

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
TQs	2	135.0	135.0	700.0	32.0	W1

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.66
Safety Factors Are Calculated By The Modified Bishop Method

Run No. 11

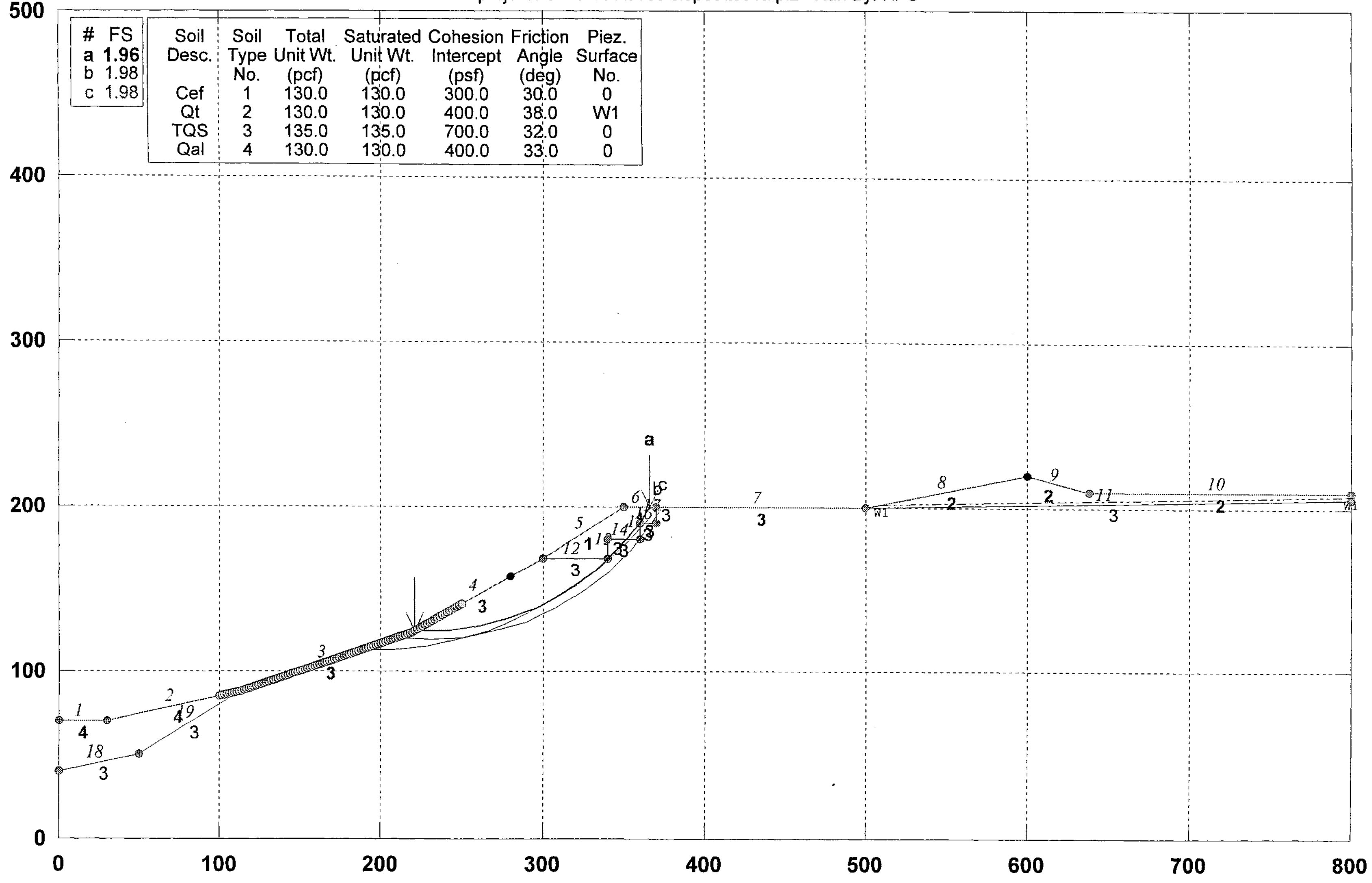
```
                              ***  GSTABL7  ***
                    ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
                  (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                      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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
 Analysis Run Date:
 Time of Run:
 Run By:                   KPC
 Input Data Filename:      N:\Projects\0100-999\803S\Slopes\t4ps1d.in
 Output Filename:          N:\Projects\0100-999\803S\Slopes\t4ps1d.OUT
 Unit System:              English
 Plotted Output Filename:  N:\Projects\0100-999\803S\Slopess1d.PLT
 PROBLEM DESCRIPTION:  TT 60258, X-Sect 4-4'; CS-3 Pseudostatic
 BOUNDARY COORDINATES
     4 Top   Boundaries
     6 Total Boundaries
 Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
    No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
     1          0.00     140.00      44.00     140.00        2
     2         44.00     140.00     180.00     194.00        2
     3        180.00     194.00     215.00     210.00        1
     4        215.00     210.00     350.00     203.00        1
     5        180.00     194.00     214.00     195.00        2
     6        214.00     195.00     350.00     182.00        2
 Default Y-Origin = 0.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
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   130.0    130.0     300.0     30.0     0.00       0.0      0
   2   135.0    135.0     700.0     32.0     0.00       0.0      1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1         44.00      140.00
     2        350.00      167.00
 Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
 Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
 Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
 Specified Seismic Pore-Pressure Factor =   0.000
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
 1000 Trial Surfaces Have Been Generated.
   10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
 Along The Ground Surface Between  X =  30.00(ft)
                                 and  X =  70.00(ft)
 Each Surface Terminates Between   X = 200.00(ft)
                                 and   X = 245.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =     0.00(ft)
 14.00(ft) Line Segments Define Each Trial Failure Surface.
 Restrictions Have Been Imposed Upon The Angle Of Initiation.
 The Angle Has Been Restricted Between The Angles Of -45.0
```

```
  And  15.0 deg.
  Following Are Displayed The Ten Most Critical Of The Trial
        Failure Surfaces Evaluated. They Are
        Ordered - Most Critical First.
        * * Safety Factors Are Calculated By The Modified Bishop Method * *
        Total Number of Trial Surfaces Evaluated =  1000
        Statistical Data On All Valid FS Values:
           FS Max =   3.873   FS Min =   1.662   FS Ave =   1.960
           Standard Deviation =    0.218   Coefficient of Variation =   11.13 %
        Failure Surface Specified By 18 Coordinate Points
          Point      X-Surf      Y-Surf
           No.        (ft)        (ft)
            1         33.64      140.00
            2         46.87      135.43
            3         60.43      131.96
            4         74.23      129.61
            5         88.18      128.39
            6        102.18      128.31
            7        116.14      129.38
            8        129.97      131.58
            9        143.57      134.91
           10        156.85      139.33
           11        169.73      144.83
           12        182.11      151.35
           13        193.92      158.87
           14        205.08      167.32
           15        215.51      176.66
           16        225.15      186.82
           17        233.92      197.73
           18        241.31      208.64
        Circle Center At X =    96.11 ; Y =   299.49 ; and Radius =   171.29
               Factor of Safety
              ***    1.662   ***
             Individual data on the    23  slices
                       Water  Water     Tie     Tie     Earthquake
                       Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight   Top    Bot     Norm     Tan     Hor     Ver    Load
 No.    (ft)   (lbs)  (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1     10.4    2502.0    0.0   907.1      0.      0.   375.3    0.0      0.0
  2      2.9    1798.7    0.0   792.5      0.      0.   269.8    0.0      0.0
  3     13.6   18557.6    0.0  6226.2      0.      0.  2783.6    0.0      0.0
  4     13.8   34430.7    0.0  9811.1      0.      0.  5164.6    0.0      0.0
  5     13.9   48529.2    0.0 12430.4      0.      0.  7279.4    0.0      0.0
  6     14.0   60422.5    0.0 14066.5      0.      0.  9063.4    0.0      0.0
  7     14.0   69773.9    0.0 14708.6      0.      0. 10466.1    0.0      0.0
  8     13.8   76349.1    0.0 14352.4      0.      0. 11452.4    0.0      0.0
  9     13.6   80023.1    0.0 13000.2      0.      0. 12003.5    0.0      0.0
 10     13.3   80782.5    0.0 10661.0      0.      0. 12117.4    0.0      0.0
 11     12.9   78725.8    0.0  7350.6      0.      0. 11808.9    0.0      0.0
 12     10.3   61626.3    0.0  2898.3      0.      0.  9243.9    0.0      0.0
 13      2.1   12446.7    0.0   192.6      0.      0.  1867.0    0.0      0.0
 14      1.5    8937.2    0.0    46.9      0.      0.  1340.6    0.0      0.0
 15     10.3   58721.1    0.0     0.0      0.      0.  8808.2    0.0      0.0
 16     11.2   59525.2    0.0     0.0      0.      0.  8928.8    0.0      0.0
 17      8.9   43009.6    0.0     0.0      0.      0.  6451.4    0.0      0.0
 18      1.0    4518.8    0.0     0.0      0.      0.   677.8    0.0      0.0
 19      0.5    2288.6    0.0     0.0      0.      0.   343.3    0.0      0.0
 20      9.6   35663.5    0.0     0.0      0.      0.  5349.5    0.0      0.0
 21      5.3   13374.3    0.0     0.0      0.      0.  2006.1    0.0      0.0
 22      3.5    6081.9    0.0     0.0      0.      0.   912.3    0.0      0.0
 23      7.4    5426.9    0.0     0.0      0.      0.   814.0    0.0      0.0
        Failure Surface Specified By 18 Coordinate Points
          Point      X-Surf      Y-Surf
           No.        (ft)        (ft)
            1         32.83      140.00
            2         46.13      135.62
            3         59.74      132.34
```

```
     4          73.57       130.18
     5          87.53       129.15
     6         101.53       129.26
     7         115.48       130.51
     8         129.27       132.89
     9         142.83       136.39
    10         156.06       140.97
    11         168.87       146.62
    12         181.18       153.29
    13         192.90       160.94
    14         203.97       169.52
    15         214.30       178.97
    16         223.82       189.23
    17         232.48       200.23
    18         238.17       208.80
 Circle Center At X =    93.17 ; Y =   300.74 ; and Radius =   171.69
        Factor of Safety
       ***    1.662   ***
 Failure Surface Specified By 18 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
     1          33.23       140.00
     2          46.47       135.44
     3          60.05       132.02
     4          73.86       129.75
     5          87.82       128.66
     6         101.82       128.74
     7         115.76       130.01
     8         129.55       132.45
     9         143.08       136.04
    10         156.26       140.76
    11         169.00       146.57
    12         181.20       153.43
    13         192.78       161.30
    14         203.65       170.12
    15         213.74       179.82
    16         222.98       190.34
    17         231.30       201.60
    18         235.80       208.92
 Circle Center At X =    93.79 ; Y =   294.17 ; and Radius =   165.64
        Factor of Safety
       ***    1.662   ***
 Failure Surface Specified By 18 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
     1          34.44       140.00
     2          47.68       135.45
     3          61.25       131.99
     4          75.05       129.64
     5          89.00       128.41
     6         103.00       128.32
     7         116.96       129.36
     8         130.79       131.53
     9         144.40       134.81
    10         157.70       139.18
    11         170.60       144.62
    12         183.02       151.08
    13         194.87       158.53
    14         206.09       166.91
    15         216.58       176.18
    16         226.30       186.26
    17         235.16       197.10
    18         243.07       208.54
 Circle Center At X =    97.14 ; Y =   300.94 ; and Radius =   172.72
        Factor of Safety
       ***    1.663   ***
 Failure Surface Specified By 18 Coordinate Points
```

TT 60258, X-Sect 5-5'; Static; Natural slope

n:\projects\0100-999\803s\slopes\t5s1a.pl2 Run By: KPC



#	FS
a	**1.96**
b	1.98
c	1.98

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
Qt	2	130.0	130.0	400.0	38.0	W1
TQS	3	135.0	135.0	700.0	32.0	0
Qal	4	130.0	130.0	400.0	33.0	0

GSTABL7 v.2 FSmin=1.96

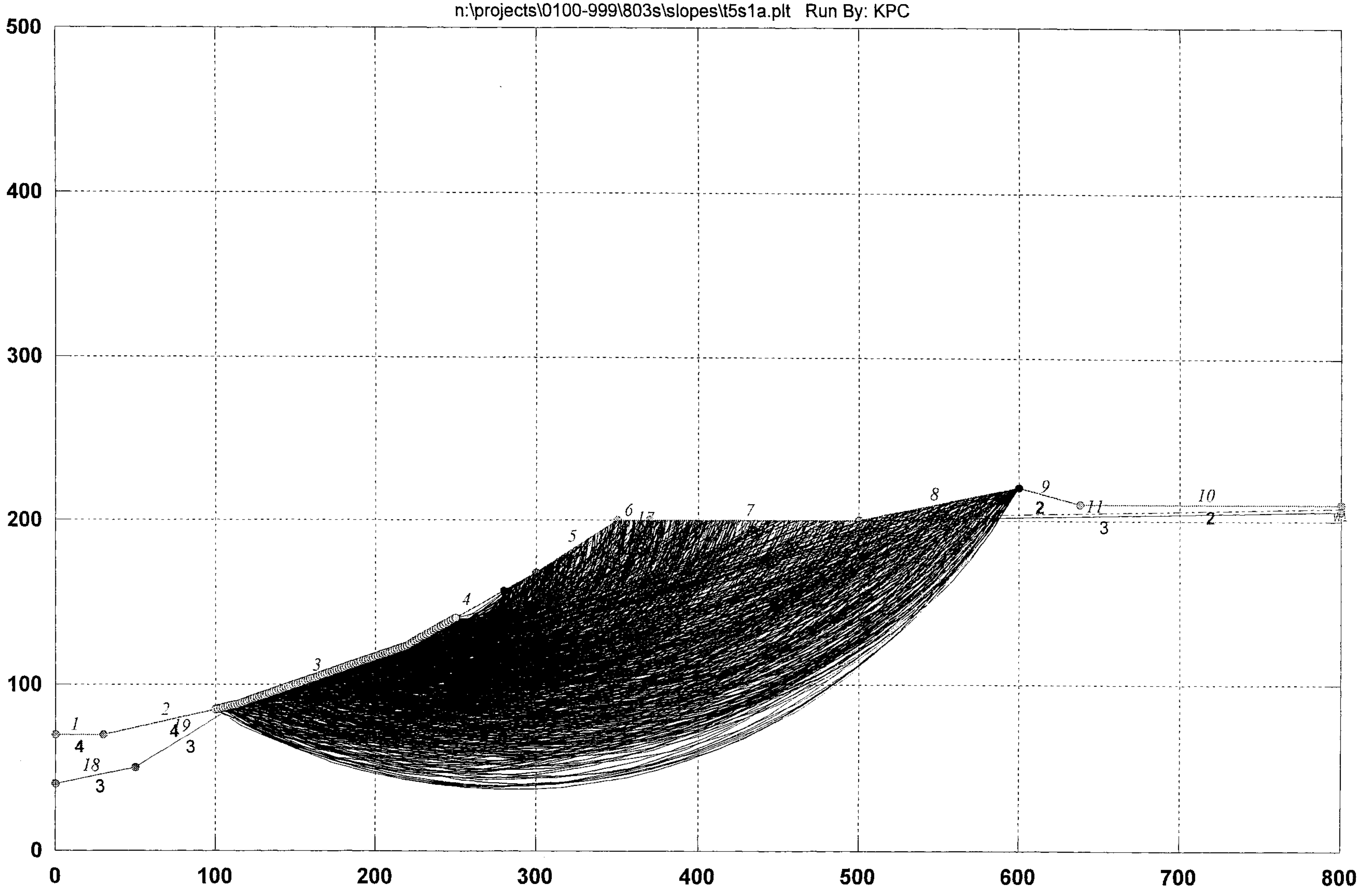
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Run No. 12

TT 60258, X-Sect 5-5'; Static; Natural slope

n:\projects\0100-999\803s\slopes\t5s1a.plt   Run By: KPC



GSTABL7

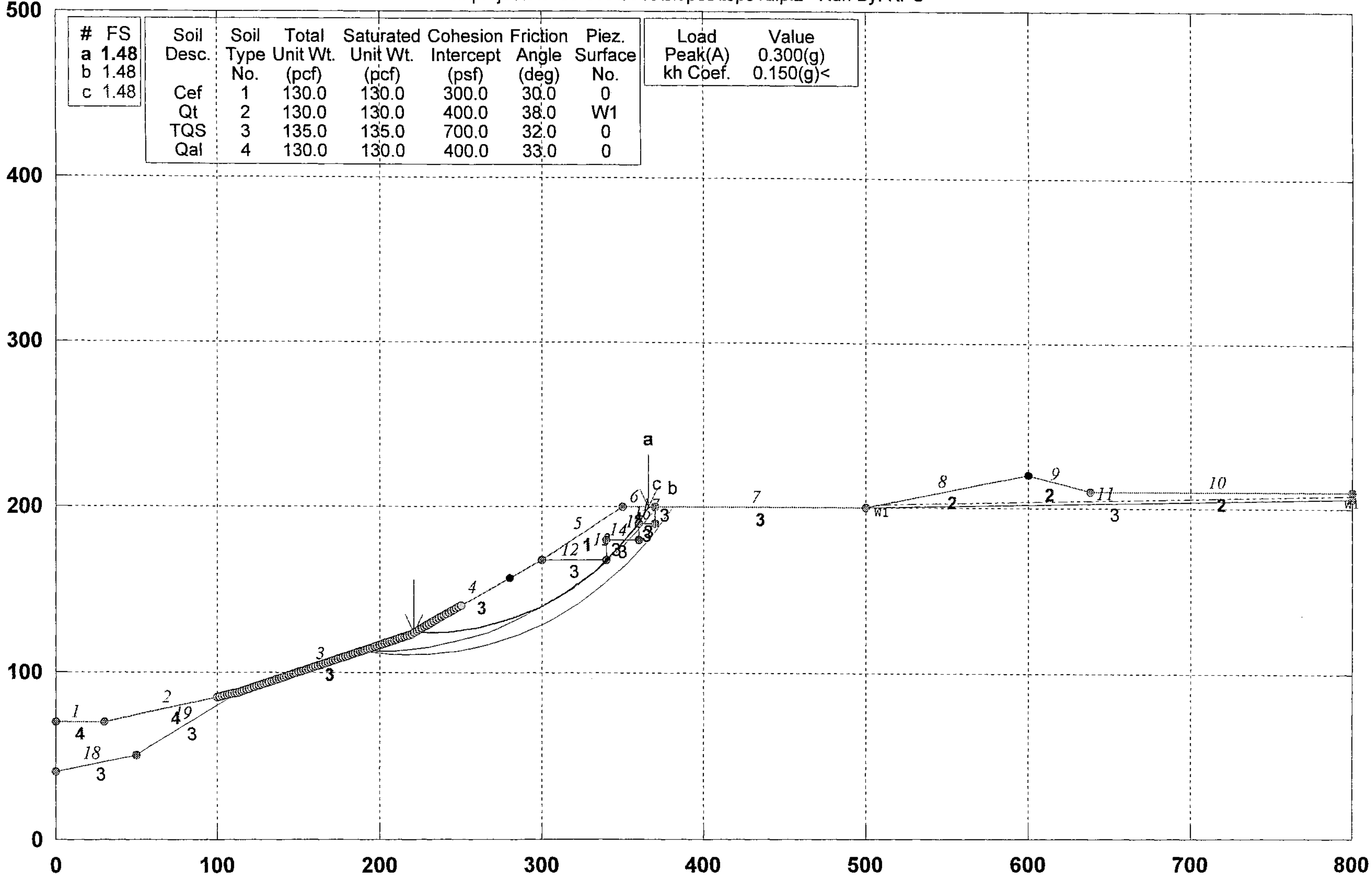
```
                              ***  GSTABL7  ***
                    ** GSTABL7 by Garry H. Gregory, P.E. **
     ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
                (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                      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 & Newmark Earthquake, and Applied Forces.
*******************************************************************************
 Analysis Run Date:
 Time of Run:
 Run By:                   KPC
 Input Data Filename:      N:\Projects\0100-999\803S\Slopes\t5s1a.in
 Output Filename:          N:\Projects\0100-999\803S\Slopes\t5s1a.OUT
 Unit System:              English
 Plotted Output Filename:  N:\Projects\0100-999\803S\Slopes1a.PLT
 PROBLEM DESCRIPTION:  TT 60258, X-Sect 5-5'; Static;
                       Natural slope
 BOUNDARY COORDINATES
    10 Top   Boundaries
    19 Total Boundaries
 Boundary     X-Left     Y-Left     X-Right    Y-Right    Soil Type
    No.        (ft)       (ft)        (ft)       (ft)     Below Bnd
     1          0.00      70.00       30.00      70.00        4
     2         30.00      70.00      113.00      88.00        4
     3        113.00      88.00      219.00     123.00        3
     4        219.00     123.00      300.00     168.00        3
     5        300.00     168.00      350.00     200.00        1
     6        350.00     200.00      370.00     200.00        1
     7        370.00     200.00      500.00     200.00        3
     8        500.00     200.00      600.00     220.00        2
     9        600.00     220.00      638.00     210.00        2
    10        638.00     210.00      800.00     210.00        2
    11        500.00     200.00      800.00     206.00        3
    12        300.00     168.00      340.00     168.00        3
    13        340.00     168.00      340.10     180.00        3
    14        340.10     180.00      360.00     180.00        3
    15        360.00     180.00      360.10     190.00        3
    16        360.10     190.00      369.90     190.00        3
    17        369.90     190.00      370.00     200.00        3
    18          0.00      40.00       50.00      50.00        3
    19         50.00      50.00      113.00      88.00        3
 Default Y-Origin = 0.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  4 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     300.0    30.0    0.00       0.0      0
   2   130.0    130.0     400.0    38.0    0.00       0.0      1
   3   135.0    135.0     700.0    32.0    0.00       0.0      0
   4   130.0    130.0     400.0    33.0    0.00       0.0      0
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.        (ft)        (ft)
     1        510.00      202.00
     2        800.00      208.00
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
```

```
   1000 Trial Surfaces Have Been Generated.
     10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
   Along The Ground Surface Between  X = 100.00(ft)
                                 and  X = 250.00(ft)
   Each Surface Terminates Between   X = 280.00(ft)
                                and   X = 600.00(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.
   Restrictions Have Been Imposed Upon The Angle Of Initiation.
   The Angle Has Been Restricted Between The Angles Of -30.0
   And  15.0 deg.
   Following Are Displayed The Ten Most Critical Of The Trial
         Failure Surfaces Evaluated. They Are
         Ordered - Most Critical First.
         * * Safety Factors Are Calculated By The Modified Bishop Method * *
         Total Number of Trial Surfaces Evaluated =  1000
         Statistical Data On All Valid FS Values:
            FS Max =    8.223   FS Min =    1.956   FS Ave =    2.865
            Standard Deviation =    0.662   Coefficient of Variation =   23.12 %
         Failure Surface Specified By 10 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        221.21      124.23
             2        241.21      124.19
             3        261.06      126.69
             4        280.42      131.69
             5        298.99      139.11
             6        316.47      148.83
             7        332.57      160.69
             8        347.04      174.50
             9        359.63      190.04
            10        365.79      200.00
         Circle Center At X =   231.73 ; Y =   279.99 ; and Radius =   156.11
                Factor of Safety
               ***    1.956   ***
               Individual data on the    14  slices
                          Water  Water     Tie     Tie     Earthquake
                          Force  Force    Force   Force      Force   Surcharge
Slice  Width   Weight      Top    Bot     Norm     Tan     Hor     Ver    Load
 No.    (ft)   (lbs)     (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1     20.0  15055.8     0.0    0.0       0.       0.     0.0     0.0      0.0
  2     19.8  41293.0     0.0    0.0       0.       0.     0.0     0.0      0.0
  3     19.4  58965.6     0.0    0.0       0.       0.     0.0     0.0      0.0
  4     18.6  67404.2     0.0    0.0       0.       0.     0.0     0.0      0.0
  5      1.0   3853.1     0.0    0.0       0.       0.     0.0     0.0      0.0
  6     16.5  64104.5     0.0    0.0       0.       0.     0.0     0.0      0.0
  7     16.1  61640.6     0.0    0.0       0.       0.     0.0     0.0      0.0
  8      7.4  26192.2     0.0    0.0       0.       0.     0.0     0.0      0.0
  9      0.1    338.6     0.0    0.0       0.       0.     0.0     0.0      0.0
 10      6.9  22588.5     0.0    0.0       0.       0.     0.0     0.0      0.0
 11      3.0   8798.7     0.0    0.0       0.       0.     0.0     0.0      0.0
 12      1.5   4080.5     0.0    0.0       0.       0.     0.0     0.0      0.0
 13      8.1  15845.6     0.0    0.0       0.       0.     0.0     0.0      0.0
 14      6.2   3988.3     0.0    0.0       0.       0.     0.0     0.0      0.0
         Failure Surface Specified By 12 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        187.88      112.72
             2        207.88      112.95
             3        227.77      114.98
             4        247.41      118.80
             5        266.61      124.39
             6        285.23      131.68
             7        303.11      140.64
             8        320.11      151.17
             9        336.09      163.20
```

```
   10        350.91      176.63
   11        364.46      191.34
   12        371.09      200.00
Circle Center At X =   195.61 ; Y =   332.44 ; and Radius =   219.85
       Factor of Safety
      ***    1.976   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        210.61      120.23
    2        230.57      118.95
    3        250.53      120.08
    4        270.22      123.61
    5        289.34      129.47
    6        307.62      137.59
    7        324.79      147.84
    8        340.60      160.09
    9        354.83      174.14
   10        367.27      189.81
   11        373.53      200.00
Circle Center At X =   231.17 ; Y =   285.08 ; and Radius =   166.13
       Factor of Safety
      ***    1.978   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        190.91      113.72
    2        210.83      111.98
    3        230.83      112.38
    4        250.67      114.92
    5        270.12      119.56
    6        288.96      126.27
    7        306.98      134.95
    8        323.97      145.51
    9        339.72      157.82
   10        354.07      171.76
   11        366.84      187.15
   12        375.36      200.00
Circle Center At X =   217.19 ; Y =   297.85 ; and Radius =   185.99
       Factor of Safety
      ***    1.980   ***
Failure Surface Specified By  9 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        227.27      127.60
    2        247.21      129.14
    3        266.81      133.14
    4        285.76      139.53
    5        303.78      148.21
    6        320.58      159.06
    7        335.91      171.90
    8        349.54      186.54
    9        359.27      200.00
Circle Center At X =   224.80 ; Y =   289.02 ; and Radius =   161.44
       Factor of Safety
      ***    1.984   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        198.48      116.23
    2        218.42      114.64
    3        238.39      115.73
    4        258.04      119.48
    5        277.01      125.82
    6        294.96      134.64
    7        311.57      145.77
    8        326.55      159.03
```

TT 60258, X-Sect 5-5'; Pseudostatic; Natural slope

n:\projects\0100-999\803s\slopes\t5ps1a.pl2 Run By: KPC



#	FS
a	**1.48**
b	1.48
c	1.48

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
Qt	2	130.0	130.0	400.0	38.0	W1
TQS	3	135.0	135.0	700.0	32.0	0
Qal	4	130.0	130.0	400.0	33.0	0

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.48

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Run No. 13

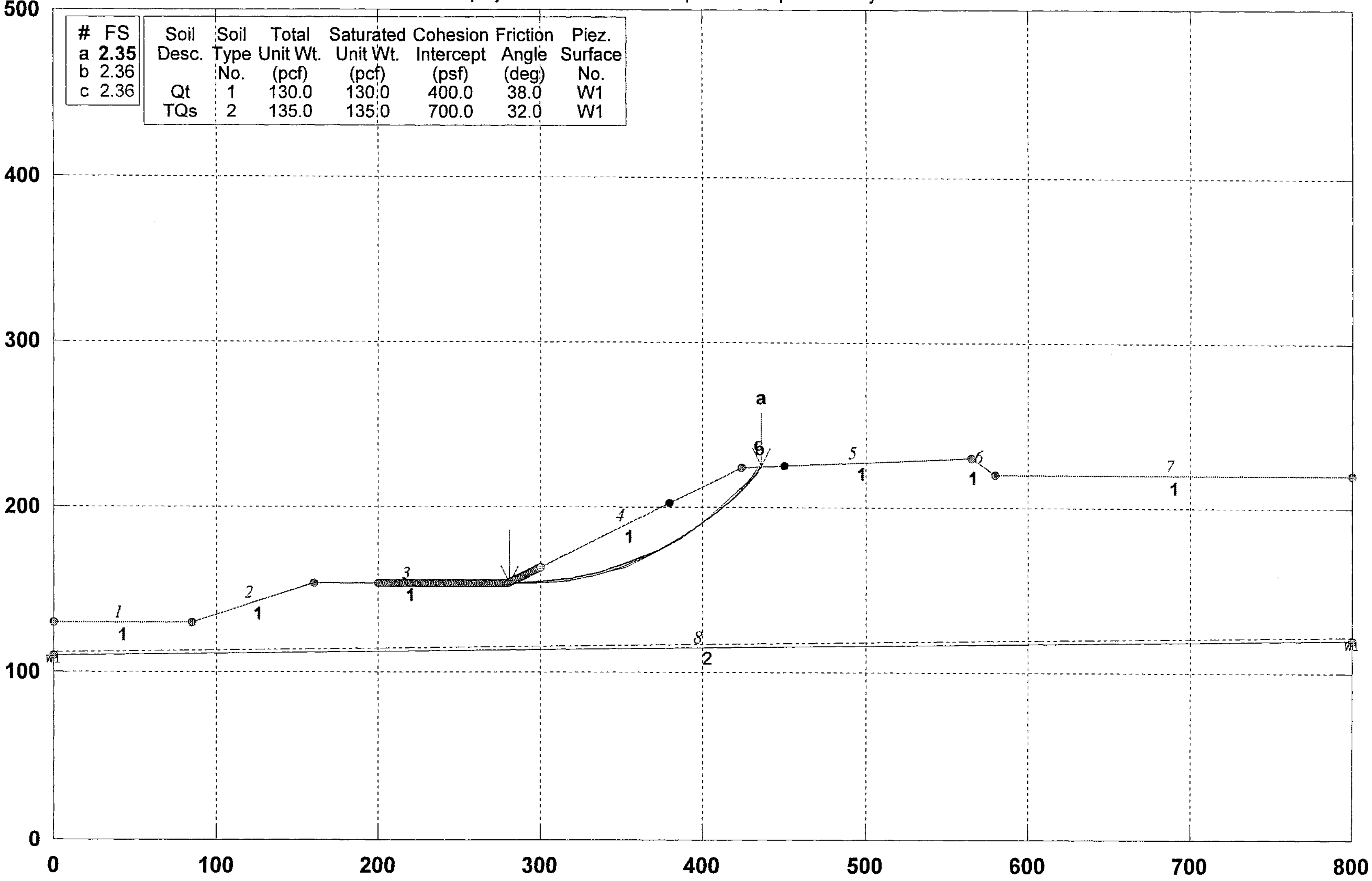
```
                           *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                      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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
Analysis Run Date:
Time of Run:
Run By:                  KPC
Input Data Filename:     N:\Projects\0100-999\803S\Slopes\t5ps1a.in
Output Filename:         N:\Projects\0100-999\803S\Slopes\t5ps1a.OUT
Unit System:             English
Plotted Output Filename: N:\Projects\0100-999\803S\Slopess1a.PLT
PROBLEM DESCRIPTION:  TT 60258, X-Sect 5-5'; Pseudostatic;
                      Natural slope
BOUNDARY COORDINATES
   10 Top   Boundaries
   19 Total Boundaries
Boundary     X-Left     Y-Left     X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)        (ft)       (ft)     Below Bnd
    1         0.00      70.00       30.00      70.00         4
    2        30.00      70.00      113.00      88.00         4
    3       113.00      88.00      219.00     123.00         3
    4       219.00     123.00      300.00     168.00         3
    5       300.00     168.00      350.00     200.00         1
    6       350.00     200.00      370.00     200.00         1
    7       370.00     200.00      500.00     200.00         3
    8       500.00     200.00      600.00     220.00         2
    9       600.00     220.00      638.00     210.00         2
   10       638.00     210.00      800.00     210.00         2
   11       500.00     200.00      800.00     206.00         3
   12       300.00     168.00      340.00     168.00         3
   13       340.00     168.00      340.10     180.00         3
   14       340.10     180.00      360.00     180.00         3
   15       360.00     180.00      360.10     190.00         3
   16       360.10     190.00      369.90     190.00         3
   17       369.90     190.00      370.00     200.00         3
   18         0.00      40.00       50.00      50.00         3
   19        50.00      50.00      113.00      88.00         3
Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
 4 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     300.0     30.0    0.00       0.0      0
  2   130.0    130.0     400.0     38.0    0.00       0.0      1
  3   135.0    135.0     700.0     32.0    0.00       0.0      0
  4   130.0    130.0     400.0     33.0    0.00       0.0      0
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  2 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1        510.00      202.00
    2        800.00      208.00
Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
```

```
   Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
   Specified Seismic Pore-Pressure Factor =   0.000
   A Critical Failure Surface Searching Method, Using A Random
   Technique For Generating Circular Surfaces, Has Been Specified.
   1000 Trial Surfaces Have Been Generated.
     10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
   Along The Ground Surface Between  X = 100.00(ft)
                                and  X = 250.00(ft)
   Each Surface Terminates Between   X = 280.00(ft)
                                and  X = 600.00(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.
   Restrictions Have Been Imposed Upon The Angle Of Initiation.
   The Angle Has Been Restricted Between The Angles Of -30.0
   And  15.0 deg.
   Following Are Displayed The Ten Most Critical Of The Trial
          Failure Surfaces Evaluated. They Are
          Ordered - Most Critical First.
          * * Safety Factors Are Calculated By The Modified Bishop Method * *
          Total Number of Trial Surfaces Evaluated =  1000
          Statistical Data On All Valid FS Values:
             FS Max =   6.279   FS Min =   1.478   FS Ave =   1.962
             Standard Deviation =    0.372   Coefficient of Variation =   18.96 %
          Failure Surface Specified By 10 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        221.21      124.23
              2        241.21      124.19
              3        261.06      126.69
              4        280.42      131.69
              5        298.99      139.11
              6        316.47      148.83
              7        332.57      160.69
              8        347.04      174.50
              9        359.63      190.04
             10        365.79      200.00
          Circle Center At X =   231.73 ; Y =   279.99 ; and Radius =   156.11
                 Factor of Safety
                ***   1.478   ***
                Individual data on the    14  slices
                           Water  Water     Tie     Tie     Earthquake
                           Force  Force    Force   Force       Force    Surcharge
Slice  Width   Weight      Top    Bot      Norm    Tan      Hor     Ver     Load
 No.    (ft)    (lbs)     (lbs)  (lbs)    (lbs)   (lbs)    (lbs)   (lbs)   (lbs)
  1     20.0   15055.8      0.0     0.0       0.       0.  2258.4     0.0      0.0
  2     19.8   41293.0      0.0     0.0       0.       0.  6193.9     0.0      0.0
  3     19.4   58965.6      0.0     0.0       0.       0.  8844.8     0.0      0.0
  4     18.6   67404.2      0.0     0.0       0.       0. 10110.6     0.0      0.0
  5      1.0    3853.1      0.0     0.0       0.       0.   578.0     0.0      0.0
  6     16.5   64104.5      0.0     0.0       0.       0.  9615.7     0.0      0.0
  7     16.1   61640.6      0.0     0.0       0.       0.  9246.1     0.0      0.0
  8      7.4   26192.2      0.0     0.0       0.       0.  3928.8     0.0      0.0
  9      0.1     338.6      0.0     0.0       0.       0.    50.8     0.0      0.0
 10      6.9   22588.5      0.0     0.0       0.       0.  3388.3     0.0      0.0
 11      3.0    8798.7      0.0     0.0       0.       0.  1319.8     0.0      0.0
 12      1.5    4080.5      0.0     0.0       0.       0.   612.1     0.0      0.0
 13      8.1   15845.6      0.0     0.0       0.       0.  2376.8     0.0      0.0
 14      6.2    3988.3      0.0     0.0       0.       0.   598.2     0.0      0.0
          Failure Surface Specified By 13 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        187.88      112.72
              2        207.78      110.75
              3        227.78      110.82
              4        247.67      112.93
              5        267.24      117.07
```

```
     6        286.28      123.20
     7        304.59      131.23
     8        321.99      141.10
     9        338.28      152.70
    10        353.30      165.90
    11        366.90      180.57
    12        378.92      196.55
    13        381.00      200.00
Circle Center At X =   217.09 ; Y =   305.74 ; and Radius =   195.22
       Factor of Safety
      ***    1.480   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        187.88      112.72
    2        207.88      112.95
    3        227.77      114.98
    4        247.41      118.80
    5        266.61      124.39
    6        285.23      131.68
    7        303.11      140.64
    8        320.11      151.17
    9        336.09      163.20
   10        350.91      176.63
   11        364.46      191.34
   12        371.09      200.00
Circle Center At X =   195.61 ; Y =   332.44 ; and Radius =   219.85
       Factor of Safety
      ***    1.480   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        190.91      113.72
    2        210.83      111.98
    3        230.83      112.38
    4        250.67      114.92
    5        270.12      119.56
    6        288.96      126.27
    7        306.98      134.95
    8        323.97      145.51
    9        339.72      157.82
   10        354.07      171.76
   11        366.84      187.15
   12        375.36      200.00
Circle Center At X =   217.19 ; Y =   297.85 ; and Radius =   185.99
       Factor of Safety
      ***    1.480   ***
Failure Surface Specified By 14 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        171.21      107.22
    2        191.16      105.79
    3        211.16      105.92
    4        231.09      107.63
    5        250.82      110.89
    6        270.23      115.69
    7        289.21      122.00
    8        307.64      129.78
    9        325.39      138.99
   10        342.37      149.55
   11        358.47      161.42
   12        373.59      174.52
   13        387.63      188.76
   14        397.10      200.00
Circle Center At X =   199.51 ; Y =   359.71 ; and Radius =   254.07
       Factor of Safety
      ***    1.482   ***
```

TT 60258, X-Sect 11-11'; CS-12 Static

n:\projects\0100-999\803s\slopes\t11s1d.pl2 Run By: KPC



#	FS
a	**2.35**
b	2.36
c	2.36

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Qt	1	130.0	130.0	400.0	38.0	W1
TQs	2	135.0	135.0	700.0	32.0	W1

GSTABL7 v.2 FSmin=2.35

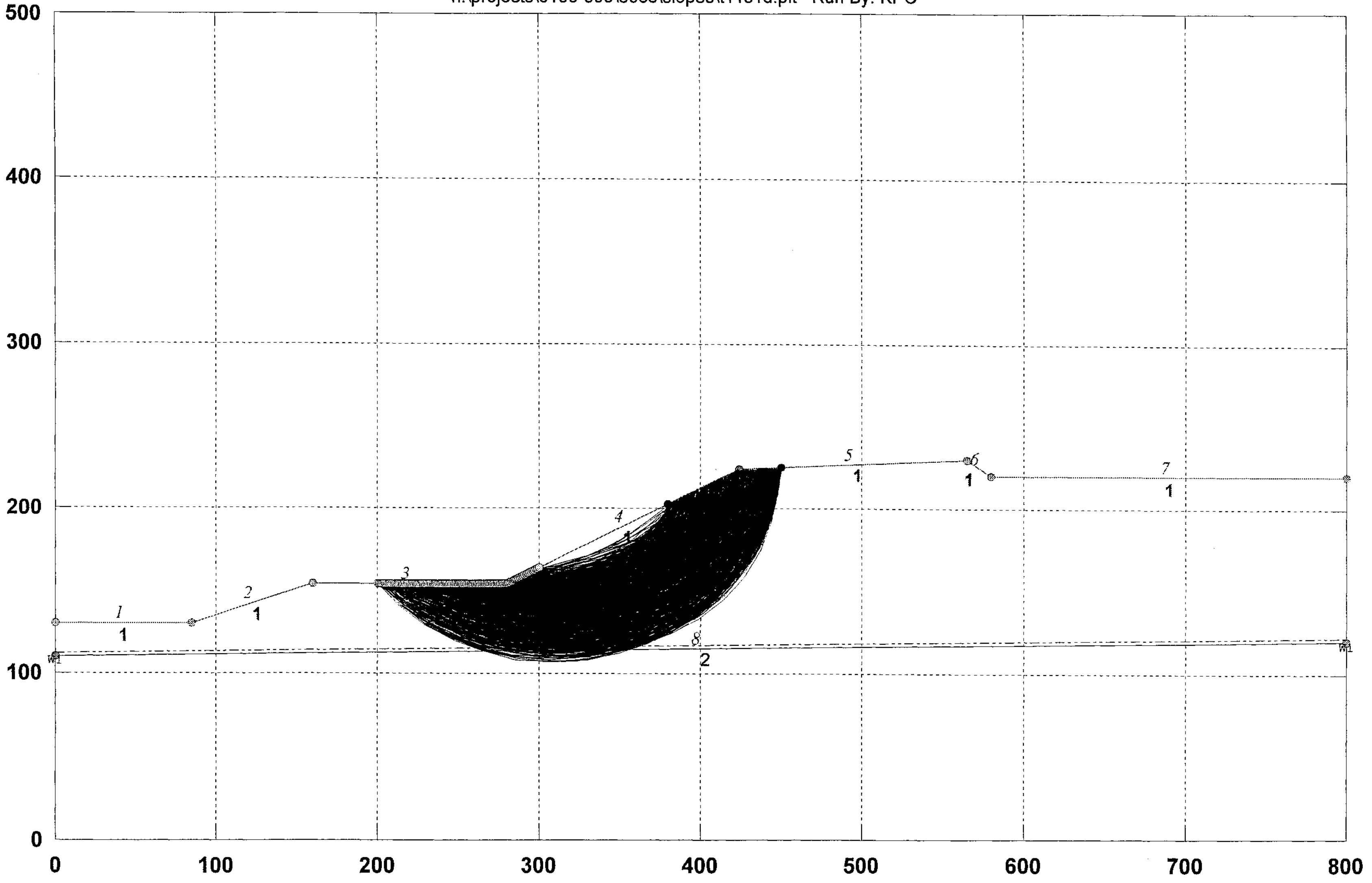
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Run No. 14

TT 60258, X-Sect 11-11'; CS-12 Static

n:\projects\0100-999\803s\slopes\t11s1d.plt   Run By: KPC



GSTABL7

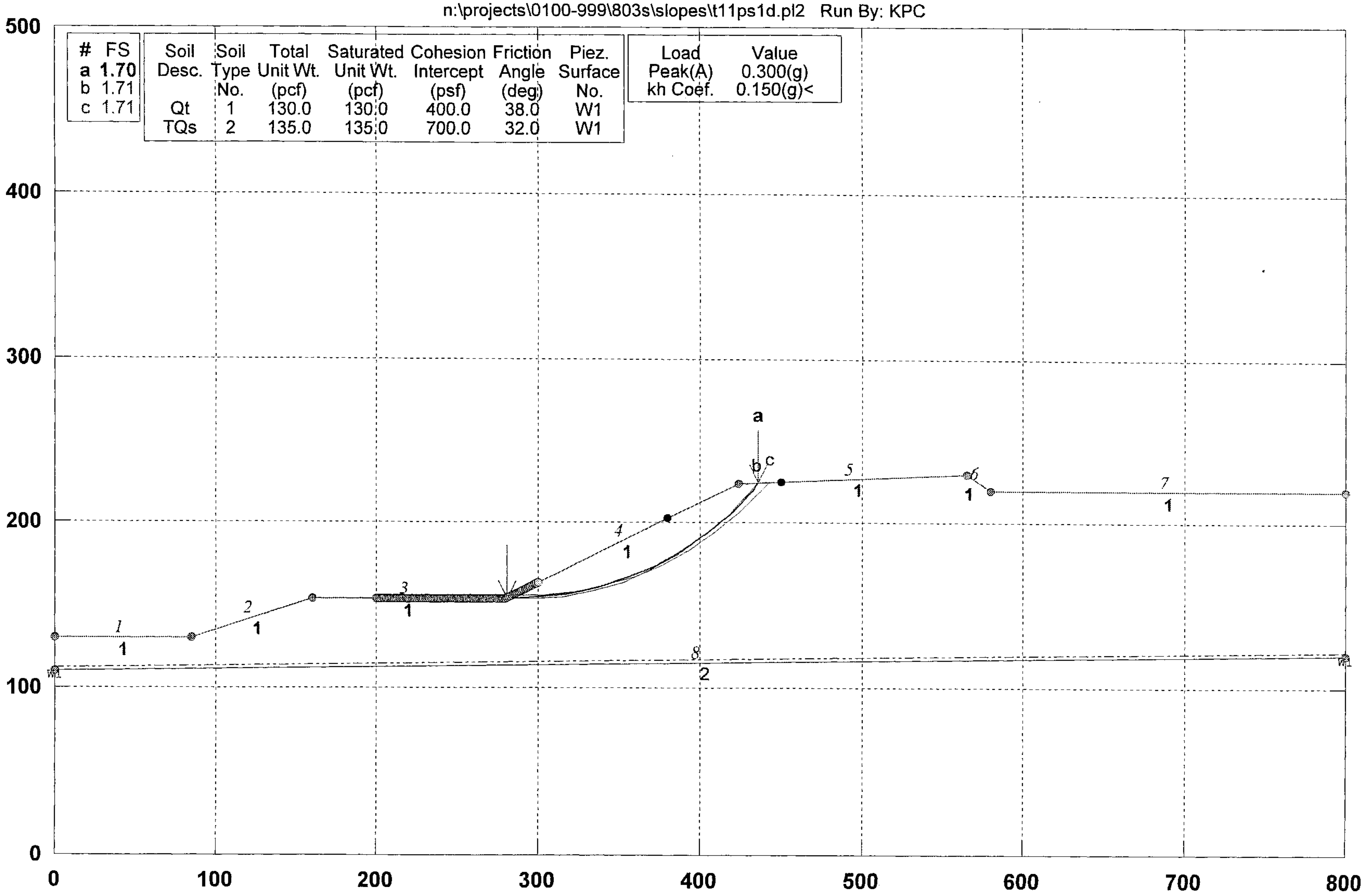
```
                         ***  GSTABL7  ***
               ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                     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 & Newmark Earthquake, and Applied Forces.
*******************************************************************************
 Analysis Run Date:
 Time of Run:
 Run By:                  KPC
 Input Data Filename:     N:\Projects\0100-999\803S\Slopes\t11s1d.in
 Output Filename:         N:\Projects\0100-999\803S\Slopes\t11s1d.OUT
 Unit System:             English
 Plotted Output Filename:  N:\Projects\0100-999\803S\Slopess1d.PLT
 PROBLEM DESCRIPTION:  TT 60258, X-Sect 11-11'; CS-12
                       Static
 BOUNDARY COORDINATES
     7 Top   Boundaries
     8 Total Boundaries
 Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
    No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
     1          0.00     130.00      85.00     130.00        1
     2         85.00     130.00     160.00     154.00        1
     3        160.00     154.00     280.00     154.00        1
     4        280.00     154.00     424.00     224.00        1
     5        424.00     224.00     565.00     230.00        1
     6        565.00     230.00     580.00     220.00        1
     7        580.00     220.00     800.00     220.00        1
     8          0.00     110.00     800.00     120.00        2
 Default Y-Origin = 0.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
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   130.0    130.0     400.0     38.0    0.00       0.0      1
   2   135.0    135.0     700.0     32.0    0.00       0.0      1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1          0.00      112.00
     2        800.00      122.00
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
 1000 Trial Surfaces Have Been Generated.
   10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
 Along The Ground Surface Between  X = 200.00(ft)
                               and  X = 300.00(ft)
 Each Surface Terminates Between   X = 380.00(ft)
                              and   X = 450.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =      0.00(ft)
 19.00(ft) Line Segments Define Each Trial Failure Surface.
 Restrictions Have Been Imposed Upon The Angle Of Initiation.
 The Angle Has Been Restricted Between The Angles Of -45.0
 And  15.0 deg.
 Following Are Displayed The Ten Most Critical Of The Trial
```

```
          Failure Surfaces Evaluated. They Are
          Ordered - Most Critical First.
          * * Safety Factors Are Calculated By The Modified Bishop Method * *
          Total Number of Trial Surfaces Evaluated =  1000
          Statistical Data On All Valid FS Values:
             FS Max =   4.804   FS Min =   2.351   FS Ave =   3.128
             Standard Deviation =    0.467   Coefficient of Variation =   14.92 %
          Failure Surface Specified By 11 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        280.81      154.39
              2        299.81      154.71
              3        318.68      156.88
              4        337.25      160.89
              5        355.35      166.68
              6        372.79      174.22
              7        389.41      183.43
              8        405.05      194.21
              9        419.57      206.47
             10        432.82      220.09
             11        436.36      224.53
          Circle Center At X =   287.06 ; Y =   348.62 ; and Radius =   194.33
                 Factor of Safety
                ***    2.351   ***
               Individual data on the    11  slices
                           Water  Water     Tie     Tie     Earthquake
                           Force  Force    Force   Force      Force   Surcharge
 Slice  Width   Weight      Top    Bot     Norm     Tan     Hor     Ver    Load
  No.    (ft)    (lbs)    (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
   1     19.0   11011.2    0.0     0.0       0.      0.     0.0     0.0      0.0
   2     18.9   30474.7    0.0     0.0       0.      0.     0.0     0.0      0.0
   3     18.6   44508.6    0.0     0.0       0.      0.     0.0     0.0      0.0
   4     18.1   52792.0    0.0     0.0       0.      0.     0.0     0.0      0.0
   5     17.4   55350.2    0.0     0.0       0.      0.     0.0     0.0      0.0
   6     16.6   52549.2    0.0     0.0       0.      0.     0.0     0.0      0.0
   7     15.6   45078.1    0.0     0.0       0.      0.     0.0     0.0      0.0
   8     14.5   33917.1    0.0     0.0       0.      0.     0.0     0.0      0.0
   9      4.4    8166.2    0.0     0.0       0.      0.     0.0     0.0      0.0
  10      8.8    9886.5    0.0     0.0       0.      0.     0.0     0.0      0.0
  11      3.5     985.5    0.0     0.0       0.      0.     0.0     0.0      0.0
          Failure Surface Specified By 11 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        277.78      154.00
              2        296.78      153.70
              3        315.70      155.37
              4        334.36      158.98
              5        352.54      164.50
              6        370.05      171.86
              7        386.71      181.00
              8        402.34      191.80
              9        416.77      204.16
             10        429.85      217.94
             11        434.87      224.46
          Circle Center At X =   290.13 ; Y =   337.43 ; and Radius =   183.85
                 Factor of Safety
                ***    2.356   ***
          Failure Surface Specified By 11 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        274.75      154.00
              2        293.74      153.55
              3        312.68      155.05
              4        331.37      158.49
              5        349.60      163.83
              6        367.19      171.02
              7        383.95      179.98
```

```
    8        399.70      190.61
    9        414.27      202.80
   10        427.51      216.42
   11        433.83      224.42
 Circle Center At X =   288.62 ; Y =   338.19 ; and Radius =   184.72
        Factor of Safety
       ***    2.364   ***
 Failure Surface Specified By 11 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
    1        283.84      155.87
    2        302.84      156.05
    3        321.73      158.03
    4        340.36      161.79
    5        358.54      167.29
    6        376.13      174.49
    7        392.96      183.31
    8        408.87      193.69
    9        423.74      205.52
   10        437.41      218.71
   11        442.63      224.79
 Circle Center At X =   291.38 ; Y =   356.51 ; and Radius =   200.79
        Factor of Safety
       ***    2.374   ***
 Failure Surface Specified By 11 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
    1        282.83      155.37
    2        301.81      154.58
    3        320.76      156.04
    4        339.39      159.72
    5        357.47      165.59
    6        374.72      173.55
    7        390.91      183.49
    8        405.81      195.28
    9        419.21      208.75
   10        430.93      223.70
   11        431.30      224.31
 Circle Center At X =   299.02 ; Y =   314.96 ; and Radius =   160.40
        Factor of Safety
       ***    2.375   ***
 Failure Surface Specified By 11 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
    1        284.85      156.36
    2        303.83      155.61
    3        322.78      157.03
    4        341.44      160.61
    5        359.57      166.29
    6        376.93      174.01
    7        393.30      183.66
    8        408.46      195.12
    9        422.20      208.23
   10        434.37      222.83
   11        435.45      224.49
 Circle Center At X =   300.89 ; Y =   321.67 ; and Radius =   166.09
        Factor of Safety
       ***    2.377   ***
 Failure Surface Specified By 11 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
    1        282.83      155.37
    2        301.80      154.27
    3        320.76      155.38
    4        339.47      158.71
    5        357.66      164.20
    6        375.08      171.78
```

TT 60258, X-Sect 11-11'; CS-12 Pseudostatic

n:\projects\0100-999\803s\slopes\t11ps1d.pl2   Run By: KPC



#	FS
a	**1.70**
b	1.71
c	1.71

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Qt	1	130.0	130.0	400.0	38.0	W1
TQs	2	135.0	135.0	700.0	32.0	W1

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.70

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Run No. 15

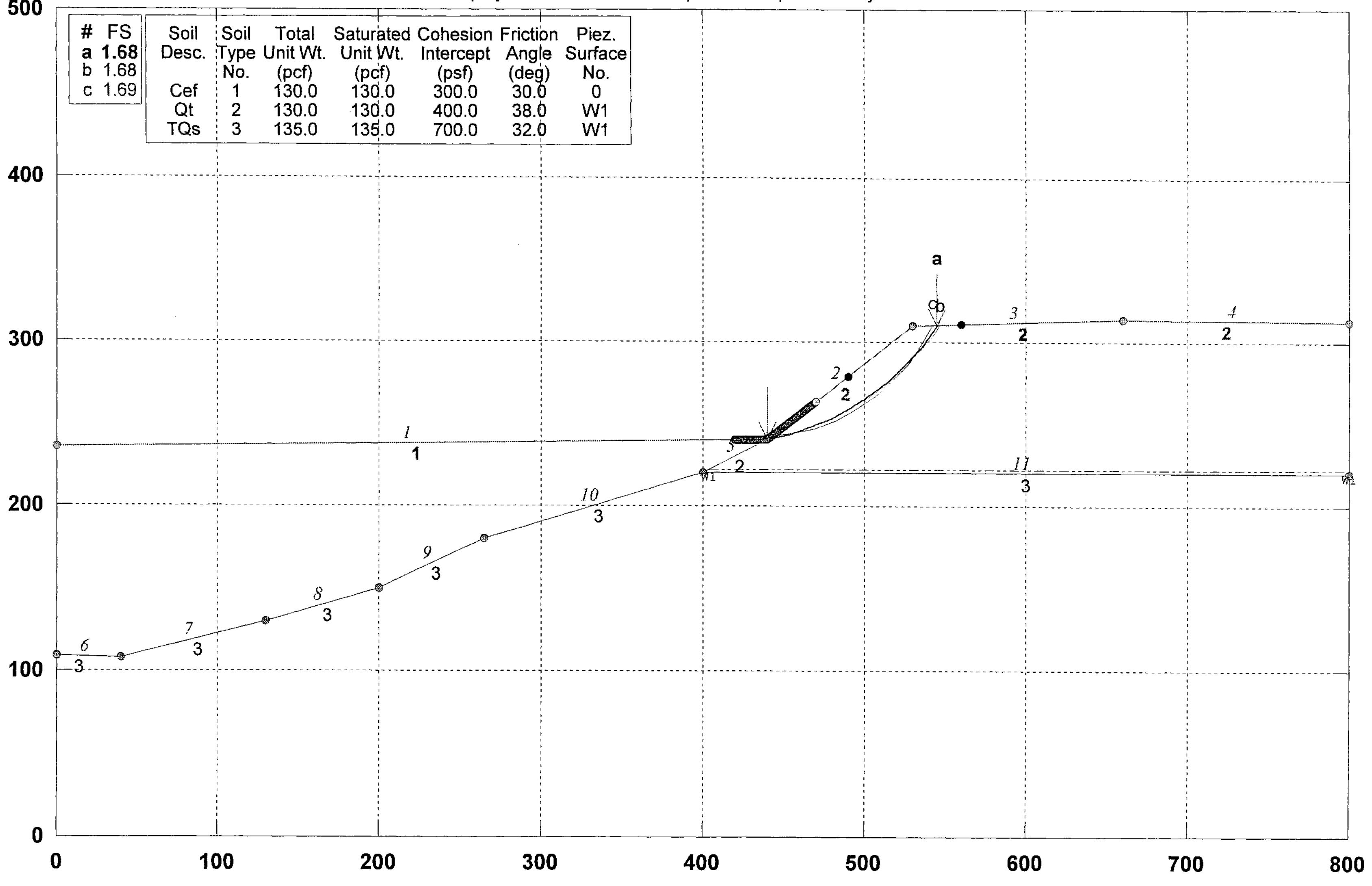
```
                              ***  GSTABL7  ***
                    ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
               (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                      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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
 Analysis Run Date:
 Time of Run:
 Run By:                  KPC
 Input Data Filename:     N:\Projects\0100-999\803S\Slopes\t11ps1d.in
 Output Filename:         N:\Projects\0100-999\803S\Slopes\t11ps1d.OUT
 Unit System:             English
 Plotted Output Filename: N:\Projects\0100-999\803S\Slopesps1d.PLT
 PROBLEM DESCRIPTION:  TT 60258, X-Sect 11-11'; CS-12
                       Pseudostatic
 BOUNDARY COORDINATES
     7 Top   Boundaries
     8 Total Boundaries
 Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
    No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
     1          0.00     130.00      85.00     130.00        1
     2         85.00     130.00     160.00     154.00        1
     3        160.00     154.00     280.00     154.00        1
     4        280.00     154.00     424.00     224.00        1
     5        424.00     224.00     565.00     230.00        1
     6        565.00     230.00     580.00     220.00        1
     7        580.00     220.00     800.00     220.00        1
     8          0.00     110.00     800.00     120.00        2
 Default Y-Origin = 0.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
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   130.0    130.0     400.0     38.0    0.00      0.0      1
   2   135.0    135.0     700.0     32.0    0.00      0.0      1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.        (ft)        (ft)
     1         0.00       112.00
     2       800.00       122.00
 Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
 Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
 Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
 Specified Seismic Pore-Pressure Factor =   0.000
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
 1000 Trial Surfaces Have Been Generated.
   10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
 Along The Ground Surface Between  X = 200.00(ft)
                              and  X = 300.00(ft)
 Each Surface Terminates Between   X = 380.00(ft)
                              and  X = 450.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =     0.00(ft)
 19.00(ft) Line Segments Define Each Trial Failure Surface.
```

```
   Restrictions Have Been Imposed Upon The Angle Of Initiation.
   The Angle Has Been Restricted Between The Angles Of -45.0
   And  15.0 deg.
   Following Are Displayed The Ten Most Critical Of The Trial
         Failure Surfaces Evaluated. They Are
         Ordered - Most Critical First.
         * * Safety Factors Are Calculated By The Modified Bishop Method * *
         Total Number of Trial Surfaces Evaluated =  1000
         Statistical Data On All Valid FS Values:
            FS Max =   3.149   FS Min =   1.703   FS Ave =   2.247
            Standard Deviation =    0.314   Coefficient of Variation =   13.97 %
         Failure Surface Specified By 11 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        280.81      154.39
             2        299.81      154.71
             3        318.68      156.88
             4        337.25      160.89
             5        355.35      166.68
             6        372.79      174.22
             7        389.41      183.43
             8        405.05      194.21
             9        419.57      206.47
            10        432.82      220.09
            11        436.36      224.53
         Circle Center At X =   287.06 ; Y =   348.62 ; and Radius =   194.33
                Factor of Safety
               ***    1.703   ***
              Individual data on the    11  slices
                        Water  Water     Tie     Tie     Earthquake
                        Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight    Top   Bot      Norm    Tan      Hor     Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1     19.0   11011.2    0.0     0.0       0.      0.  1651.7     0.0    0.0
  2     18.9   30474.7    0.0     0.0       0.      0.  4571.2     0.0    0.0
  3     18.6   44508.6    0.0     0.0       0.      0.  6676.3     0.0    0.0
  4     18.1   52792.0    0.0     0.0       0.      0.  7918.8     0.0    0.0
  5     17.4   55350.2    0.0     0.0       0.      0.  8302.5     0.0    0.0
  6     16.6   52549.2    0.0     0.0       0.      0.  7882.4     0.0    0.0
  7     15.6   45078.1    0.0     0.0       0.      0.  6761.7     0.0    0.0
  8     14.5   33917.1    0.0     0.0       0.      0.  5087.6     0.0    0.0
  9      4.4    8166.2    0.0     0.0       0.      0.  1224.9     0.0    0.0
 10      8.8    9886.5    0.0     0.0       0.      0.  1483.0     0.0    0.0
 11     3.5      985.5    0.0     0.0       0.      0.   147.8     0.0    0.0
         Failure Surface Specified By 11 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        277.78      154.00
             2        296.78      153.70
             3        315.70      155.37
             4        334.36      158.98
             5        352.54      164.50
             6        370.05      171.86
             7        386.71      181.00
             8        402.34      191.80
             9        416.77      204.16
            10        429.85      217.94
            11        434.87      224.46
         Circle Center At X =   290.13 ; Y =   337.43 ; and Radius =   183.85
                Factor of Safety
               ***    1.709   ***
         Failure Surface Specified By 11 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        283.84      155.87
             2        302.84      156.05
             3        321.73      158.03
```

```
     4        340.36      161.79
     5        358.54      167.29
     6        376.13      174.49
     7        392.96      183.31
     8        408.87      193.69
     9        423.74      205.52
    10        437.41      218.71
    11        442.63      224.79
Circle Center At X =   291.38 ; Y =   356.51 ; and Radius =   200.79
       Factor of Safety
      ***    1.710   ***
Failure Surface Specified By 12 Coordinate Points
  Point       X-Surf      Y-Surf
   No.         (ft)        (ft)
    1         276.77      154.00
    2         295.75      153.24
    3         314.72      154.33
    4         333.50      157.25
    5         351.90      161.97
    6         369.76      168.46
    7         386.90      176.65
    8         403.17      186.47
    9         418.41      197.81
   10         432.48      210.58
   11         445.24      224.66
   12         445.43      224.91
Circle Center At X =   294.09 ; Y =   348.85 ; and Radius =   195.62
       Factor of Safety
      ***    1.714   ***
Failure Surface Specified By 11 Coordinate Points
  Point       X-Surf      Y-Surf
   No.         (ft)        (ft)
    1         274.75      154.00
    2         293.74      153.55
    3         312.68      155.05
    4         331.37      158.49
    5         349.60      163.83
    6         367.19      171.02
    7         383.95      179.98
    8         399.70      190.61
    9         414.27      202.80
   10         427.51      216.42
   11         433.83      224.42
Circle Center At X =   288.62 ; Y =   338.19 ; and Radius =   184.72
       Factor of Safety
      ***    1.716   ***
Failure Surface Specified By 12 Coordinate Points
  Point       X-Surf      Y-Surf
   No.         (ft)        (ft)
    1         274.75      154.00
    2         293.73      153.12
    3         312.71      154.02
    4         331.52      156.71
    5         349.99      161.14
    6         367.97      167.30
    7         385.28      175.11
    8         401.79      184.52
    9         417.35      195.43
   10         431.81      207.76
   11         445.04      221.39
   12         447.96      225.02
Circle Center At X =   293.70 ; Y =   354.50 ; and Radius =   201.40
       Factor of Safety
      ***    1.720   ***
Failure Surface Specified By 11 Coordinate Points
  Point       X-Surf      Y-Surf
   No.         (ft)        (ft)
```

TT 60258, X-Sect 13-13'; Static; Natural slope

n:\projects\0100-999\803s\slopes\t13s1a.pl2   Run By: KPC



#	FS
a	**1.68**
b	1.68
c	1.69

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
Qt	2	130.0	130.0	400.0	38.0	W1
TQs	3	135.0	135.0	700.0	32.0	W1

GSTABL7 v.2 FSmin=1.68

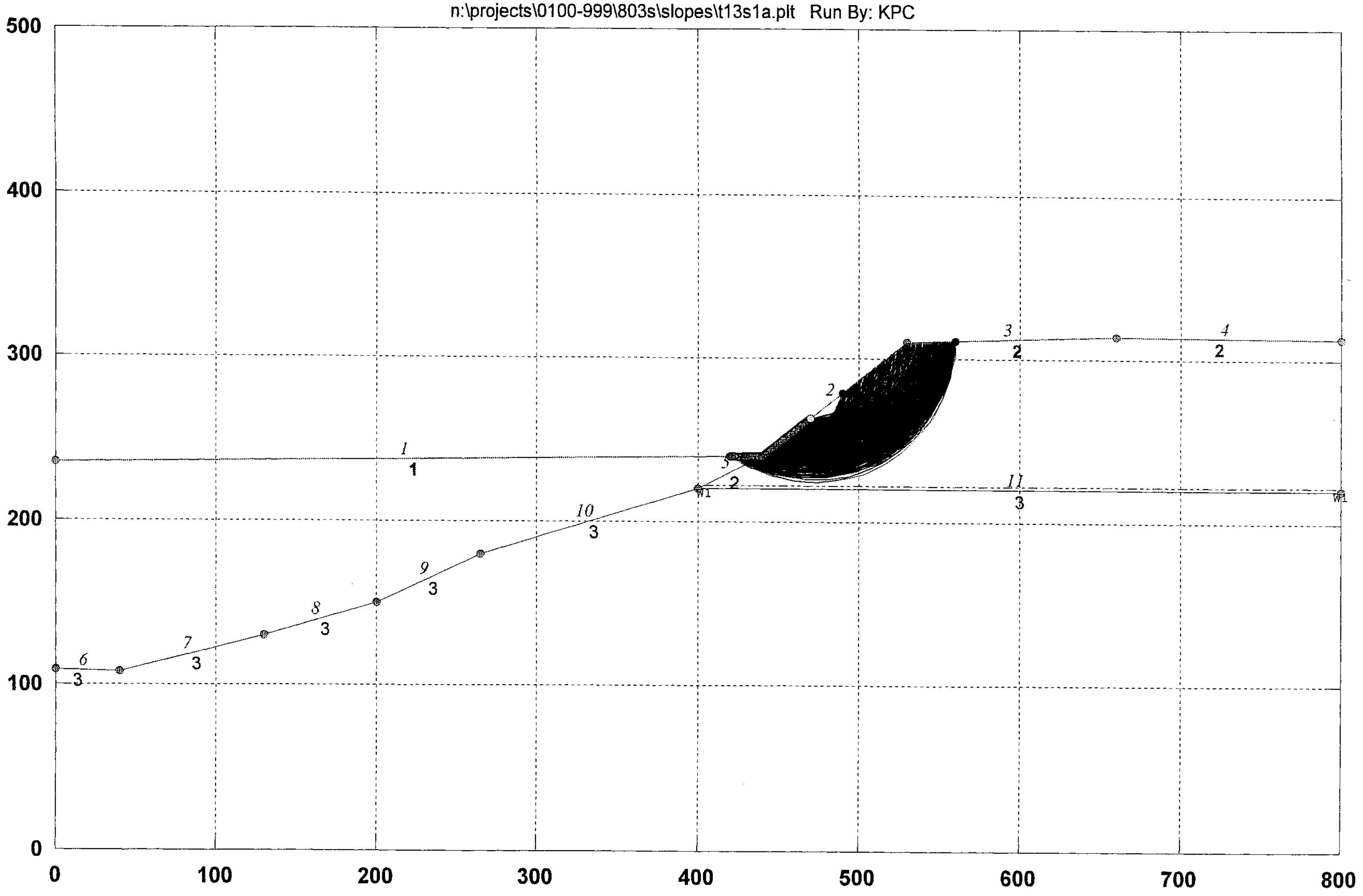
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Run No. 16

TT 60258, X-Sect 13-13'; Static; Natural slope

n:\projects\0100-999\803s\slopes\t13s1a.plt   Run By: KPC



GSTABL7

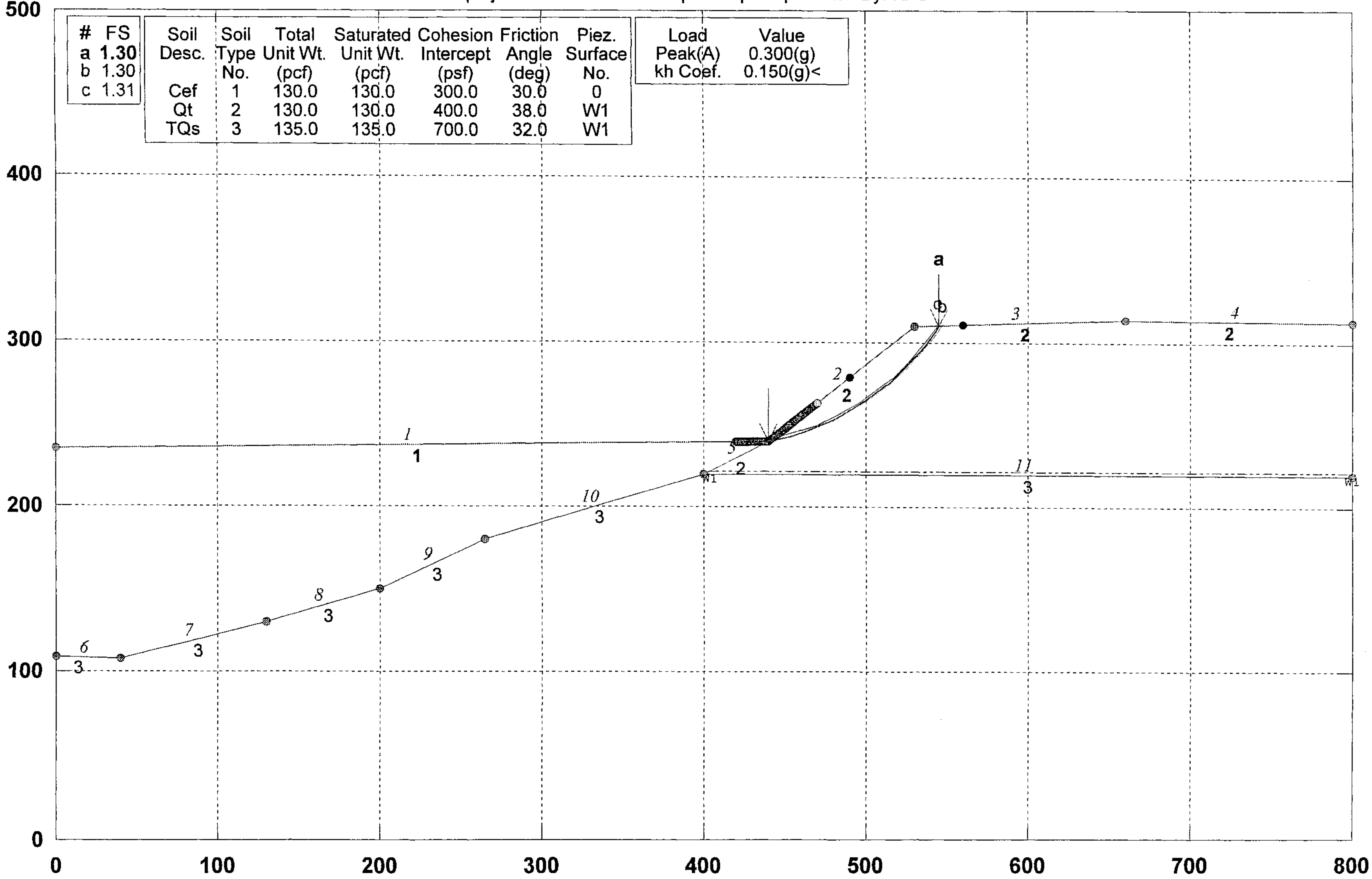
```
                                *** GSTABL7 ***
                     ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
               (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                    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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
Analysis Run Date:
Time of Run:
Run By:                   KPC
Input Data Filename:      N:\Projects\0100-999\803S\Slopes\t13s1a.in
Output Filename:          N:\Projects\0100-999\803S\Slopes\t13s1a.OUT
Unit System:              English
Plotted Output Filename:  N:\Projects\0100-999\803S\Slopess1a.PLT
PROBLEM DESCRIPTION:  TT 60258, X-Sect 13-13'; Static;
                      Natural slope
BOUNDARY COORDINATES
    4 Top   Boundaries
   11 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)      (ft)        (ft)       (ft)     Below Bnd
    1          0.00     235.00     440.00     240.00         1
    2        440.00     240.00     530.00     310.00         2
    3        530.00     310.00     660.00     314.00         2
    4        660.00     314.00     800.00     313.00         2
    5        400.00     220.00     440.00     240.00         2
    6          0.00     109.00      40.00     108.00         3
    7         40.00     108.00     130.00     130.00         3
    8        130.00     130.00     200.00     150.00         3
    9        200.00     150.00     265.00     180.00         3
   10        265.00     180.00     400.00     220.00         3
   11        400.00     220.00     800.00     220.00         3
Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
 3 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     300.0     30.0    0.00       0.0      0
  2   130.0    130.0     400.0     38.0    0.00       0.0      1
  3   135.0    135.0     700.0     32.0    0.00       0.0      1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  2 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.        (ft)         (ft)
    1        404.00      222.00
    2        800.00      222.00
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1000 Trial Surfaces Have Been Generated.
  10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
Along The Ground Surface Between  X = 420.00(ft)
                             and  X = 470.00(ft)
Each Surface Terminates Between   X = 490.00(ft)
                            and   X = 560.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
14.00(ft) Line Segments Define Each Trial Failure Surface.
```

```
   Restrictions Have Been Imposed Upon The Angle Of Initiation.
   The Angle Has Been Restricted Between The Angles Of -45.0
   And  15.0 deg.
   Following Are Displayed The Ten Most Critical Of The Trial
         Failure Surfaces Evaluated. They Are
         Ordered - Most Critical First.
         * * Safety Factors Are Calculated By The Modified Bishop Method * *
         Total Number of Trial Surfaces Evaluated =  1000
         Statistical Data On All Valid FS Values:
            FS Max =    3.240   FS Min =    1.677   FS Ave =    2.137
            Standard Deviation =    0.244   Coefficient of Variation =   11.40 %
         Failure Surface Specified By 11 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        440.20      240.16
             2        453.82      243.40
             3        467.11      247.81
             4        479.97      253.34
             5        492.31      259.96
             6        504.03      267.61
             7        515.06      276.24
             8        525.30      285.78
             9        534.68      296.17
            10        543.14      307.33
            11        545.12      310.47
         Circle Center At X =   409.27 ; Y =   400.02 ; and Radius =   162.83
                Factor of Safety
               ***    1.677   ***
              Individual data on the    11  slices
                             Water  Water     Tie      Tie     Earthquake
                             Force  Force    Force    Force       Force   Surcharge
Slice  Width    Weight        Top    Bot      Norm     Tan      Hor     Ver     Load
 No.    (ft)    (lbs)       (lbs)  (lbs)     (lbs)   (lbs)    (lbs)   (lbs)   (lbs)
  1     13.6    6500.5       0.0     0.0       0.       0.      0.0     0.0      0.0
  2     13.3   17808.5       0.0     0.0       0.       0.      0.0     0.0      0.0
  3     12.9   25931.2       0.0     0.0       0.       0.      0.0     0.0      0.0
  4     12.3   30854.7       0.0     0.0       0.       0.      0.0     0.0      0.0
  5     11.7   32710.5       0.0     0.0       0.       0.      0.0     0.0      0.0
  6     11.0   31768.3       0.0     0.0       0.       0.      0.0     0.0      0.0
  7     10.2   28426.6       0.0     0.0       0.       0.      0.0     0.0      0.0
  8      4.7   12094.5       0.0     0.0       0.       0.      0.0     0.0      0.0
  9      4.7   10038.7       0.0     0.0       0.       0.      0.0     0.0      0.0
 10      8.5    9371.5       0.0     0.0       0.       0.      0.0     0.0      0.0
 11      2.0     395.4       0.0     0.0       0.       0.      0.0     0.0      0.0
         Failure Surface Specified By 11 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        440.20      240.16
             2        453.84      243.33
             3        467.16      247.64
             4        480.07      253.06
             5        492.48      259.53
             6        504.30      267.03
             7        515.45      275.50
             8        525.86      284.87
             9        535.43      295.08
            10        544.12      306.06
            11        547.08      310.53
         Circle Center At X =   409.26 ; Y =   403.84 ; and Radius =   166.58
                Factor of Safety
               ***    1.681   ***
         Failure Surface Specified By 11 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        442.22      241.73
             2        456.07      243.78
             3        469.60      247.38
```

```
     4        482.63      252.50
     5        495.00      259.06
     6        506.55      266.97
     7        517.12      276.15
     8        526.59      286.46
     9        534.83      297.77
    10        541.74      309.95
    11        541.92      310.37
Circle Center At X =   431.10 ; Y =   364.65 ; and Radius =   123.43
       Factor of Safety
      ***    1.691   ***
Failure Surface Specified By 10 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        442.73      242.12
    2        456.30      245.55
    3        469.53      250.14
    4        482.30      255.87
    5        494.53      262.69
    6        506.11      270.55
    7        516.97      279.38
    8        527.02      289.13
    9        536.19      299.71
   10        543.94      310.43
Circle Center At X =   410.31 ; Y =   399.29 ; and Radius =   160.48
       Factor of Safety
      ***    1.691   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        441.21      240.94
    2        455.10      242.68
    3        468.68      246.09
    4        481.74      251.14
    5        494.08      257.74
    6        505.53      265.80
    7        515.91      275.19
    8        525.07      285.78
    9        532.87      297.41
   10        539.19      309.90
   11        539.33      310.29
Circle Center At X =   433.98 ; Y =   355.30 ; and Radius =   114.59
       Factor of Safety
      ***    1.694   ***
Failure Surface Specified By 10 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        442.73      242.12
    2        456.56      244.29
    3        470.03      248.11
    4        482.94      253.52
    5        495.11      260.45
    6        506.35      268.79
    7        516.52      278.41
    8        525.45      289.19
    9        533.02      300.97
   10        537.50      310.23
Circle Center At X =   431.83 ; Y =   357.27 ; and Radius =   115.66
       Factor of Safety
      ***    1.695   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        441.72      241.34
    2        455.37      244.42
    3        468.74      248.57
    4        481.75      253.76
```

TT 60258, X-Sect 13-13'; Pseudostatic; Natural slope

n:\projects\0100-999\803s\slopes\t13ps1a.pl2 Run By: KPC



#	FS
a	**1.30**
b	1.30
c	1.31

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cef	1	130.0	130.0	300.0	30.0	0
Qt	2	130.0	130.0	400.0	38.0	W1
TQs	3	135.0	135.0	700.0	32.0	W1

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.30
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Run No. 17

```
                              ***  GSTABL7  ***
                    ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
                 (All Rights Reserved-Unauthorized Use Prohibited)
*********************************************************************************
                      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 & Newmark Earthquake, and Applied Forces.
*********************************************************************************
Analysis Run Date:
Time of Run:
Run By:                   KPC
Input Data Filename:      N:\Projects\0100-999\803S\Slopes\t13ps1a.in
Output Filename:          N:\Projects\0100-999\803S\Slopes\t13ps1a.OUT
Unit System:              English
Plotted Output Filename:  N:\Projects\0100-999\803S\Slopesps1a.PLT
PROBLEM DESCRIPTION:  TT 60258, X-Sect 13-13'; Pseudostatic;
                      Natural slope
BOUNDARY COORDINATES
    4 Top   Boundaries
   11 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1          0.00     235.00     440.00     240.00        1
    2        440.00     240.00     530.00     310.00        2
    3        530.00     310.00     660.00     314.00        2
    4        660.00     314.00     800.00     313.00        2
    5        400.00     220.00     440.00     240.00        2
    6          0.00     109.00      40.00     108.00        3
    7         40.00     108.00     130.00     130.00        3
    8        130.00     130.00     200.00     150.00        3
    9        200.00     150.00     265.00     180.00        3
   10        265.00     180.00     400.00     220.00        3
   11        400.00     220.00     800.00     220.00        3
Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  3 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     300.0     30.0    0.00       0.0      0
  2   130.0    130.0     400.0     38.0    0.00       0.0      1
  3   135.0    135.0     700.0     32.0    0.00       0.0      1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  2 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.        (ft)        (ft)
    1        404.00      222.00
    2        800.00      222.00
Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
Specified Seismic Pore-Pressure Factor =   0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1000 Trial Surfaces Have Been Generated.
  10 Surface(s) Initiate(s) From Each Of   100 Points Equally Spaced
Along The Ground Surface Between   X = 420.00(ft)
                              and  X = 470.00(ft)
Each Surface Terminates Between    X = 490.00(ft)
```

```
                               and   X = 560.00(ft)
   Unless Further Limitations Were Imposed, The Minimum Elevation
   At Which A Surface Extends Is  Y =      0.00(ft)
   14.00(ft) Line Segments Define Each Trial Failure Surface.
   Restrictions Have Been Imposed Upon The Angle Of Initiation.
   The Angle Has Been Restricted Between The Angles Of -45.0
   And  15.0 deg.
   Following Are Displayed The Ten Most Critical Of The Trial
         Failure Surfaces Evaluated. They Are
         Ordered - Most Critical First.
         * * Safety Factors Are Calculated By The Modified Bishop Method * *
         Total Number of Trial Surfaces Evaluated =  1000
         Statistical Data On All Valid FS Values:
            FS Max =    2.543   FS Min =    1.299   FS Ave =    1.678
            Standard Deviation =    0.196   Coefficient of Variation =   11.66 %
         Failure Surface Specified By 11 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        440.20      240.16
             2        453.82      243.40
             3        467.11      247.81
             4        479.97      253.34
             5        492.31      259.96
             6        504.03      267.61
             7        515.06      276.24
             8        525.30      285.78
             9        534.68      296.17
            10        543.14      307.33
            11        545.12      310.47
         Circle Center At X =   409.27 ; Y =   400.02 ; and Radius =   162.83
                Factor of Safety
               ***    1.299   ***
              Individual data on the    11  slices
                         Water  Water     Tie      Tie     Earthquake
                         Force  Force    Force    Force       Force   Surcharge
Slice  Width   Weight     Top    Bot     Norm      Tan      Hor     Ver    Load
 No.    (ft)   (lbs)    (lbs)  (lbs)    (lbs)    (lbs)    (lbs)   (lbs)   (lbs)
  1     13.6    6500.5    0.0    0.0       0.       0.    975.1     0.0      0.0
  2     13.3   17808.5    0.0    0.0       0.       0.   2671.3     0.0      0.0
  3     12.9   25931.2    0.0    0.0       0.       0.   3889.7     0.0      0.0
  4     12.3   30854.7    0.0    0.0       0.       0.   4628.2     0.0      0.0
  5     11.7   32710.5    0.0    0.0       0.       0.   4906.6     0.0      0.0
  6     11.0   31768.3    0.0    0.0       0.       0.   4765.2     0.0      0.0
  7     10.2   28426.6    0.0    0.0       0.       0.   4264.0     0.0      0.0
  8      4.7   12094.5    0.0    0.0       0.       0.   1814.2     0.0      0.0
  9      4.7   10038.7    0.0    0.0       0.       0.   1505.8     0.0      0.0
 10      8.5    9371.5    0.0    0.0       0.       0.   1405.7     0.0      0.0
 11      2.0     395.4    0.0    0.0       0.       0.     59.3     0.0      0.0
         Failure Surface Specified By 11 Coordinate Points
           Point      X-Surf      Y-Surf
            No.        (ft)        (ft)
             1        440.20      240.16
             2        453.84      243.33
             3        467.16      247.64
             4        480.07      253.06
             5        492.48      259.53
             6        504.30      267.03
             7        515.45      275.50
             8        525.86      284.87
             9        535.43      295.08
            10        544.12      306.06
            11        547.08      310.53
         Circle Center At X =   409.26 ; Y =   403.84 ; and Radius =   166.58
                Factor of Safety
               ***    1.300   ***
         Failure Surface Specified By 10 Coordinate Points
           Point      X-Surf      Y-Surf
```

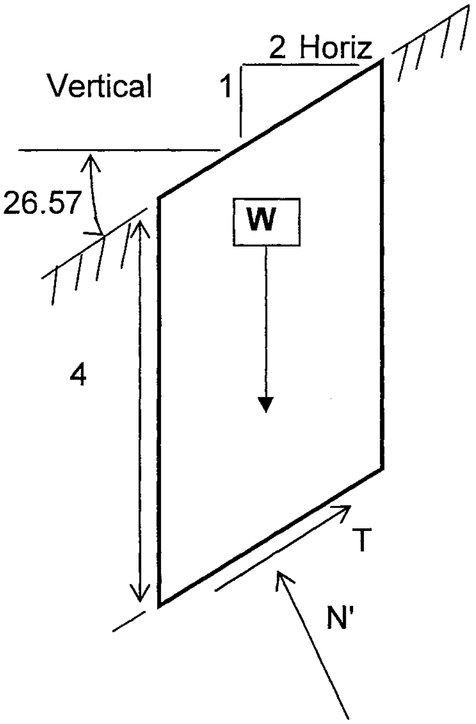
```
  No.        (ft)        (ft)
   1        442.73      242.12
   2        456.30      245.55
   3        469.53      250.14
   4        482.30      255.87
   5        494.53      262.69
   6        506.11      270.55
   7        516.97      279.38
   8        527.02      289.13
   9        536.19      299.71
  10        543.94      310.43
Circle Center At X =   410.31 ; Y =   399.29 ; and Radius =   160.48
       Factor of Safety
      ***    1.312   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        440.71      240.55
    2        454.38      243.57
    3        467.78      247.63
    4        480.82      252.70
    5        493.44      258.77
    6        505.56      265.78
    7        517.10      273.70
    8        528.00      282.49
    9        538.20      292.08
   10        547.62      302.43
   11        554.10      310.74
Circle Center At X =   408.26 ; Y =   419.91 ; and Radius =   182.27
       Factor of Safety
      ***    1.314   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        441.72      241.34
    2        455.37      244.42
    3        468.74      248.57
    4        481.75      253.76
    5        494.30      259.95
    6        506.33      267.11
    7        517.76      275.20
    8        528.52      284.16
    9        538.54      293.94
   10        547.76      304.47
   11        552.39      310.69
Circle Center At X =   409.36 ; Y =   416.29 ; and Radius =   177.92
       Factor of Safety
      ***    1.315   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        442.22      241.73
    2        456.07      243.78
    3        469.60      247.38
    4        482.63      252.50
    5        495.00      259.06
    6        506.55      266.97
    7        517.12      276.15
    8        526.59      286.46
    9        534.83      297.77
   10        541.74      309.95
   11        541.92      310.37
Circle Center At X =   431.10 ; Y =   364.65 ; and Radius =   123.43
       Factor of Safety
      ***    1.319   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
```

INFINITE SLOPE STABILITY ANALYSIS

DATA: The 2:1 slope is a proposed fill slope consisting of dense to very dense sands, silty sands and clayey sands.

Slope inclination, i, deg =	26.57	Soil Friction Angle, Φ', deg. =	30
Soil Total Density, γ_t, pcf =	130	Soil Cohesion, c, psf =	300
Soil Bouyant Density, γ_b, pcf =	62.4	Depth of Interest, d, ft =	4

ANALYSIS: per Figures 24.1, 24.2 and 24.3 of Lambe and Whitman, 1969



for a 4 ft deep slice of the given slope with unit width and length,

$N' = \gamma_b \, ad \cos i$

$T = \gamma_t \, ad \sin i$

$$FS = \frac{c + N' \tan \Phi'}{T}$$

FS = 1.84

REFERENCES:

1) Lambe and Whitman, *Soil Mechanics*, John Wiley and Sons, Inc., 1969

2) Day, Robert W., *Geotechnical and Foundation Engineering, Design and Construction,* McGraw-Hill, 1999

INFINITE SLOPE STABILITY ANALYSIS

PROJECT: Tentative Tract 60258
Santa Clarita
Los Angeles County, California

CLIENT: Synergy

JOB NO: 04-803S-4
DATE: 6/11/2004

Allan E. Seward Engineering Geology, Inc.
Geology and Geotechnical Consultants

Figure **F1.1**

INFINITE SLOPE STABILITY ANALYSIS

DATA: The 2:1 slope is a proposed cut slope in Qt deposits consisting of sand, conglomerate and sandy silts

Slope inclination, i, deg = 26.57

Soil Friction Angle, Φ', deg. = 38

Soil Total Density, γ_t, pcf = 130

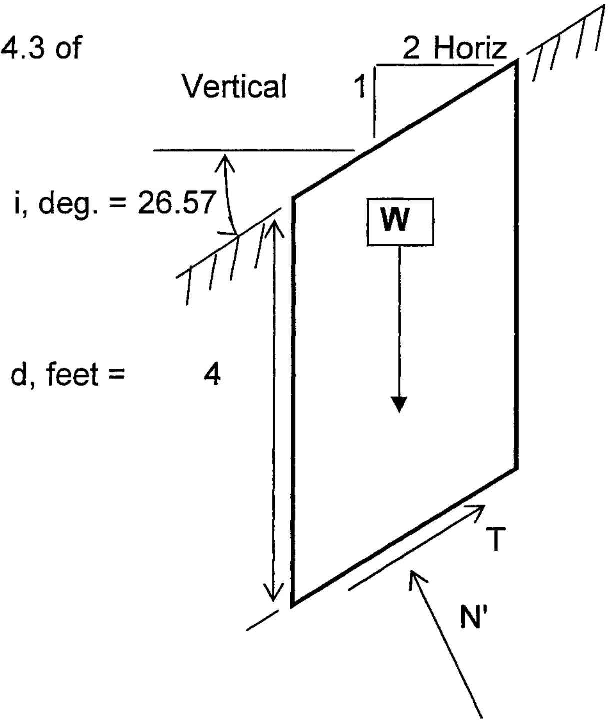
Soil Cohesion, c, psf = 400

Soil Bouyant Density, γ_b, pcf = 62.4

Depth of Interest, d, ft = 4

ANALYSIS: per Figures 24.1, 24.2 and 24.3 of Lambe and Whitman, 1969

for a 4 ft deep slice of the given slope with unit width and length,



$N' = \gamma_b \, ad \cos i$

$T = \gamma_t \, ad \sin i$

$$FS = \frac{c + N' \tan \Phi'}{T}$$

FS = 2.47

REFERENCES:

1) Lambe and Whitman, *Soil Mechanics* , John Wiley and Sons, Inc., 1969

2) Day, Robert W., *Geotechnical and Foundation Engineering, Design and Construction,* McGraw-Hill, 1999

INFINITE SLOPE STABILITY ANALYSIS

PROJECT: Tentative Tract 60258
Santa Clarita
Los Angeles County, California

CLIENT: Synergy

JOB NO: 04-803S-4
DATE: 6/11/2004

Allan E. Seward Engineering Geology, Inc.
Geology and Geotechnical Consultants

Figure **F1.2**

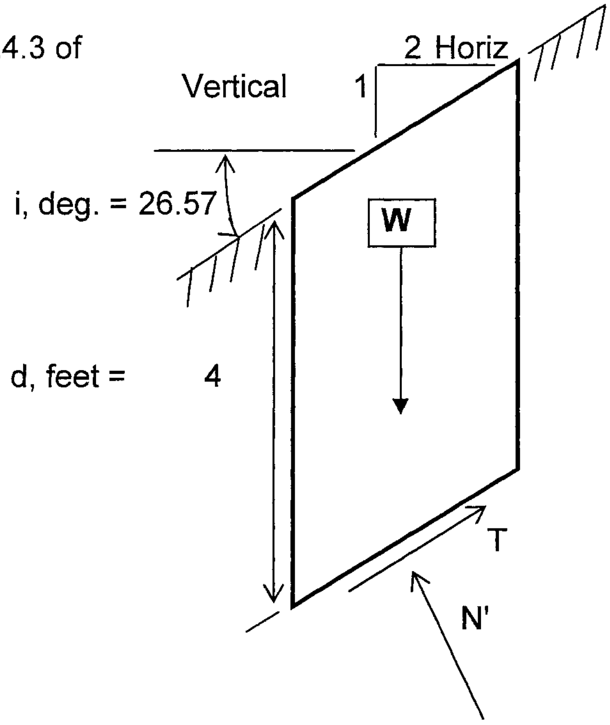
INFINITE SLOPE STABILITY ANALYSIS

DATA: The 2:1 slope is a proposed cut slope in TQs bedrock consisting of sandstone and conglomerate, siltstone, silty sandstone, sandy mudstone and mudstone.

Slope inclination, i, deg =	26.57	Soil Friction Angle, Φ', deg. =	32
Soil Total Density, γ_t, pcf =	135	Soil Cohesion, c, psf =	700
Soil Bouyant Density, γ_b, pcf =	62.4	Depth of Interest, d, ft =	4

ANALYSIS: per Figures 24.1, 24.2 and 24.3 of Lambe and Whitman, 1969

for a 4 ft deep slice of the given slope with unit width and length,



$N' = \gamma_b \, ad \cos i$

$T = \gamma_t \, ad \sin i$

$$FS = \frac{c + N' \tan \Phi'}{T}$$

FS = 3.48

REFERENCES:

1) Lambe and Whitman, *Soil Mechanics* , John Wiley and Sons, Inc., 1969
2) Day, Robert W., *Geotechnical and Foundation Engineering, Design and Construction,* McGraw-Hill, 1999

INFINITE SLOPE STABILITY ANALYSIS

PROJECT: Tentative Tract 60258
Santa Clarita
Los Angeles County, California

CLIENT: Synergy

JOB NO: 04-803S-4
DATE: 6/11/2004

Allan E. Seward Engineering Geology, Inc.
Geology and Geotechnical Consultants

Figure **F1.3**

Appendix G

DATA SUMMARY

ACRES (GROSS)	247± AC
EXISTING ZONING	RVL, IC
PROPOSED ZONING	RVL(169.0AC.0),RM(77.7AC.), IC(0.5AC.)
EXISTING GENERAL PLAN	RVL, IC
PROPOSED GENERAL PLAN	RVL(169.0AC.0),RM(77.7AC.), IC(0.5AC.)
EXISTING LAND USE	VACANT
PROPOSED LAND USE	SINGLE FAMILY & MULTI FAMILY RESIDENTIAL/ SCHOOL,OPEN SPACE/ OTHER USES

	LOT NO.	ACREAGES	DU
SINGLE FAMILY RESIDENCE	1-96	18.6	96
MULTI FAMILY RESIDENCE (97) TO (98) TO BE GATED	97,98	21.7	390
MULTI FAMILY RESIDENCE (99) TO (100) NO GATE	99-100	19.7	493
INDUSTRIAL LOT	101	0.5	
SCHOOL	102	20.6	
RECREATION/PARKINGL	102A	4.1	
GRADED SLOPE LOTS STREETS	103-114,114A, 114B,&115	85.9	
NATURAL O/S	116-121	76.1	
	TOTAL	247.2 AC.	979 D.U.

EASEMENTS PER FIRST AMERICAN TITLE COMPANY P.T.R. ORDER NO. 1045134 JUNE 30 2003,1045156 JUNE 19 2003,843413(51) MARCH 7 2003

1. STORM DRAIN EASEMENT REC. 8/15/73 INST. 4316 O.R.
2. 5'X15' WATER WELL EASEMENT P.T.R. 1045156 PCL 2
3. ELECTRCAL POLE LINE & OTHER EASEMENTS BEING REMOVED ARE NOT PLOTTED

UTILITIES AND SERVICES

WATER:	CLWA-SANTA CLARITA WATER CO.
SEWER:	LOS ANGELES COUNTY SANITATION DISTRICT NO. 26
GAS:	SOUTHERN CALIFORNIA GAS COMPANY
ELECTRICITY:	SOUTHERN CALIFORNIA EDISON COMPANY
SCHOOL DISTRICT:	WM. S. HART HIGH SCHOOL DISTRICT AND SAUGUS UNION

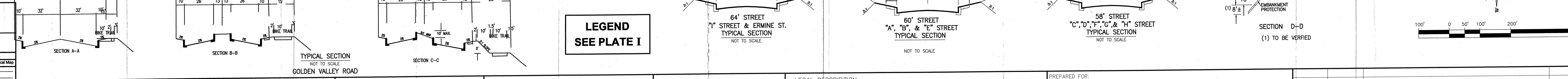
LEGEND:

LOT LINE FOR OPEN SPACE & GRADED SLOPE LOTS.
LOT LINE FOR RESIDENTIAL,& INDUSTRIAL LOTS.

NOTES

1. GRADING IS APPROXIMATE ONLY AND SUBJECT TO ADJUSTMENT.
2. TOTAL EARTHWORK APPROXIMATELY CUT 5.4 M.C.Y. FILL 5.4 M.C.Y.
3. ASSESOR PARCEL MAP NO. 2801-001-33,26 AND 24, 2805-001-63,&2812-9-3
4. CONDITIONAL USE PERMIT GRANTED FOR CLUSTER DEVELOPMENT.
5. TOPOGRAPHIC MAPPING BY AIRBORNE 1 (2000)
6. PERMISSION GRANTED TO ADJUST LOT LINES.
7. PERMISSION GRANTED TO RECORD UNITS
8. PERMISSION GRANTED TO ALLOW 30' MIN.FRONTAGE ON CUL-DE-SAC.
9. PERMISSION GRANTED TO GATE ERMINE ST. FOR EMERGENCY ACCESS ONLY.
10. PERMISSION GRANTED TO RECORD A LARGE LOT PARCEL MAP (20 AC.MIN.)

* DENOTES 2:1 MIN SLOPES WITH BENCHES & DOWN DRAIN PER CITY CODE
** 297' WIDE STRIP OF LAND FOR ROAD R/W AND SLOPE EASEMENTS PER TENT.TRACT 53425



TYPICAL SECTION
NOT TO SCALE
GOLDEN VALLEY ROAD

64' STREET
"I" STREET & ERMINE ST.
TYPICAL SECTION
NOT TO SCALE

60' STREET
"A", "B", & "E" STREET
TYPICAL SECTION
NOT TO SCALE

58' STREET
"C","D","F","G",& "H" STREET
TYPICAL SECTION
NOT TO SCALE

LEGEND
SEE PLATE I

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

Geologic/Geotechnical Map

Date: 6/11/04	Job No.: 03-803S-4
Scale: 1" = 100'	CAD File: Sheet 1 Geologic/Geotechnical Map
SHEET 1	Geology by: Staff Drawn by: GSD
Revised:	

BIOTIC CONSULTANT:
VANDERMOST & ASSOCIATES
27312 CALLE ARROYO
SAN JUAN CAPISTRANO,CA. 92675
(TEL) 949-489-2700 (FAX) 949-489-0309

LAND PLANNING:
T.R.G. LAND INC.
898 PRODUCTION PLACE
NEWPORT BEACH,CA 92663
(TEL) 949-722-0634 (FAX) 949-722-6036

UTILITY CONSULTANT:
WEST COAST UTILITY SERVICES,LLC
7724 FULTON AVENUE
NO. HOLLYWOOD,CA. 91605
(TEL) 818-764-8800 (FAX) 818-764-8808

TRAFFIC ENGINEER:
AUSTIN-FOUST ASSOCIATES,INC.
2020 NORTH TUSTIN AVENUE
SANTA ANA, CA 92705
(TEL) 714-667-0496 (FAX) 714-667-7952

SOILS ENGINEER:
ALLEN SEWARD SOILS ENGINEER COMPANY
27825 AVENUE SMYTH
VALENCIA, CA 91355
(TEL) 661-294-0065 (FAX) 661-294-0833

LANDSCAPE ARCHITECT
TOTAL CONCEPT LANDSCAPE ARCHITECTURE INC.
27905 SMYTH DRIVE
VALENCIA, CA 91355-4034
(TEL) 661-702-1011 (FAX) 661-702-0293

BIOLOGIST & OAK TREE CONSULTANT:
TOM LESLIE CORPORATION
43264 BUSINESS PARK DRIVE
SUITE 106,TEMECULA, CA 92590
(TEL) 909-296-6232 (FAX) 909-296-6233

LEGAL DESCRIPTION:
LOTS 1 THRU. 3, PORTION OF LOTS 5 THRU. 8 AND 9 OF TR.8575 MB 117-64-66 E 1/2 OF THE NW 1/4 OF SEC. 18 & POR. OF THE NE 1/4 OF THE SW 1/4 OF SEC. 18 T4NR15W S.B.M.

PREPARED FOR:
SYNERGY, A LAND & DEVELOPMENT COMPANY
19200 VON KARMAN, SUITE 600
IRVINE, CA 92612
ATTN: RICK DOREMUS TEL: (949) 622-5480

	DATE	REVISION	BY	APP
1	4-01-04	REV. GRADING,ADDED SCHOOL SITE & MISC.		

SCALE:	CHK'D BY:	APPROVED BY:	DATE:	DWG. NO.	SHEET
AS SHOWN	R.C.	RONALD R. HORN	3-25-04	5103-012-01	1 OF 1

ENGINEERING
PLANNING
SURVEYING
SIKAND
15230 BURBANK BLVD., VAN NUYS, CA 91411-3586
(818)787-8550 FAX: (818)901-7451 www.sikand.com

VESTING
TENTATIVE TRACT NO. 060258
IN THE CITY OF SANTA CLARITA
STATE OF CALIFORNIA

X:\sikand\5103-012\01\Planning\Tentative Maps\Synergy Tent Map 4-01-04.dwg 100 Scale 04/01/04 16:35:46

LEGEND

af	Artificial Fill
Qsw	Quaternary Slopewash
Qal	Quaternary Alluvium
Qls-3	Quaternary Landslide
Qt	Quaternary Terrace Deposits
TQs	Saugus Formation
— — —···?	Geologic Contact; Dotted where concealed; Queried where inferred
—↕—···	Axial Trace of Anticline; Dotted where concealed
⊕	Bedding Horizontal
⊕	Bedding Approximate Horizontal
24°	Strike and Dip of Bedding
10°	Approximate Strike and Dip of Bedding
60°	Strike and Dip of Joint
34°	Strike and Dip of Fault
16 — 16'	Geologic Cross Section
⊕ RW-3	Location of Rotary Wash Boring
⊕ RW-10	Location of Rotary Wash Boring from TT53425 Rpt. dated 4/4/03
⊕ HS-2	Location of Exploratory Hollow-Stem-Auger Boring
⊕ HS-5	Location of Hollow-Stem-Auger Boring from TT53425 Rpt. dated 4/4/03
⊕ HB-1	Location of Exploratory Hand Excavated Boring
▼ CPT-37	Location of Cone Penetration Test from TT53425 Rpt. dated 4/4/03
⊕ B-14	Location of Exploratory Bucket-Auger Boring (11/18/86)
⊕ B-17	Location of Exploratory Bucket-Auger Boring
▬ T-46	Location of Exploratory Backhoe Trench (11/18/86)
▭ T-81	Location of Exploratory Backhoe Trench
dfh	Debris Flow Hazard (color coded pink)
CS-18	Proposed Cut-Slope and Designation
⬡	Approximate Location of Oil Well "Fernival" #1
▨	Recommended 20' Wide Horizontal Bench @ Elev. 1370 (Schematic) (color coded yellow)

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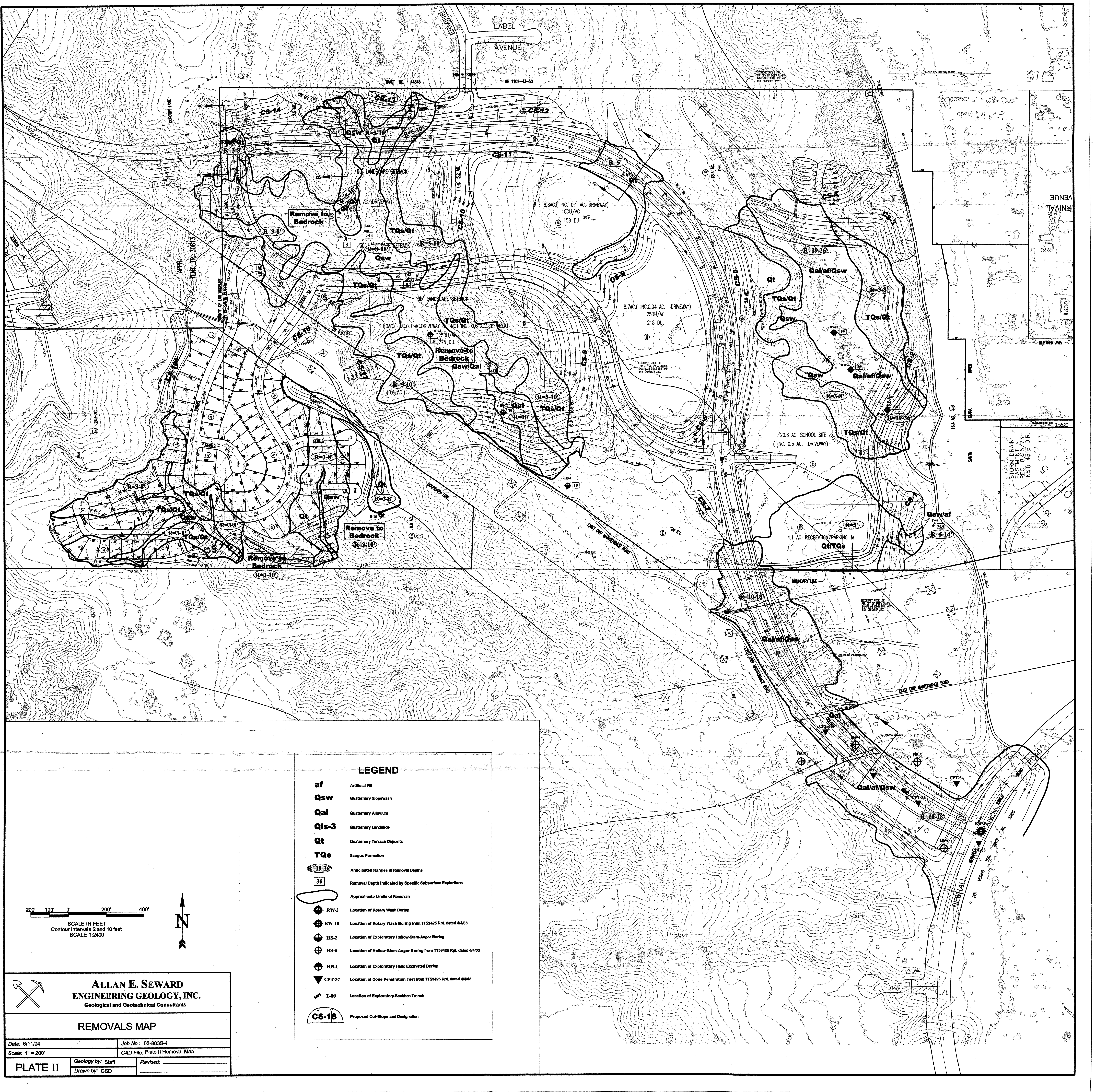
LEGEND

Date: 6/11/04	*Job No.:* 04-803S-4
Scale: na	*CAD File:* Plate I Legend

PLATE I

Geology by: na
Drawn by: GSD
Revised: ____________



LEGEND

af	Artificial Fill
Qsw	Quaternary Slopewash
Qal	Quaternary Alluvium
Qls-3	Quaternary Landslide
Qt	Quaternary Terrace Deposits
TQs	Saugus Formation
R=19-36'	Anticipated Ranges of Removal Depths
36	Removal Depth Indicated by Specific Subsurface Explortions
	Approximate Limits of Removals
RW-3	Location of Rotary Wash Boring
RW-10	Location of Rotary Wash Boring from TT53425 Rpt. dated 4/4/03
HS-2	Location of Exploratory Hollow-Stem-Auger Boring
HS-5	Location of Hollow-Stem-Auger Boring from TT53425 Rpt. dated 4/4/03
HB-1	Location of Exploratory Hand Excavated Boring
▼ CPT-37	Location of Cone Penetration Test from TT53425 Rpt. dated 4/4/03
T-80	Location of Exploratory Backhoe Trench
CS-18	Proposed Cut-Slope and Designation

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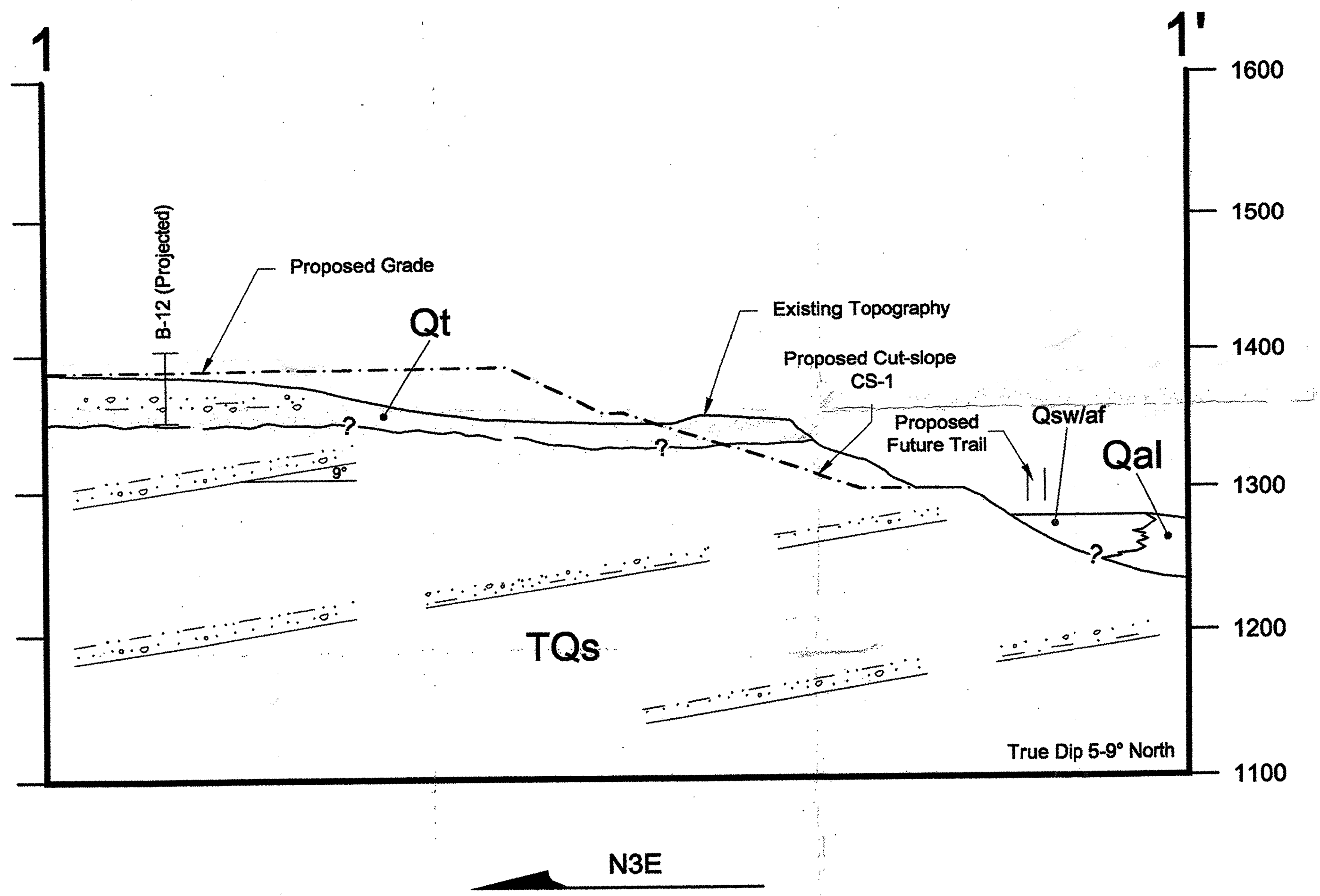
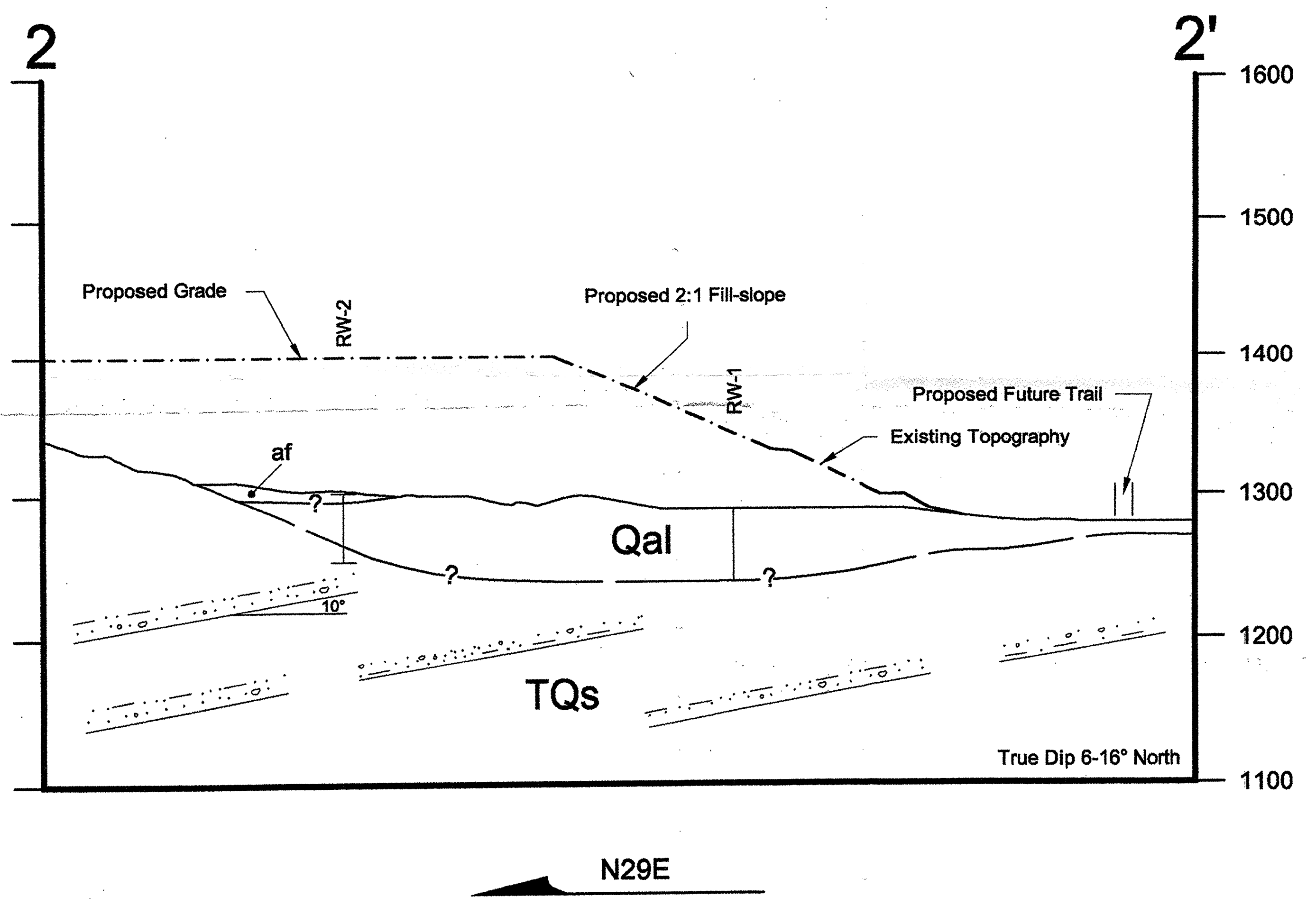
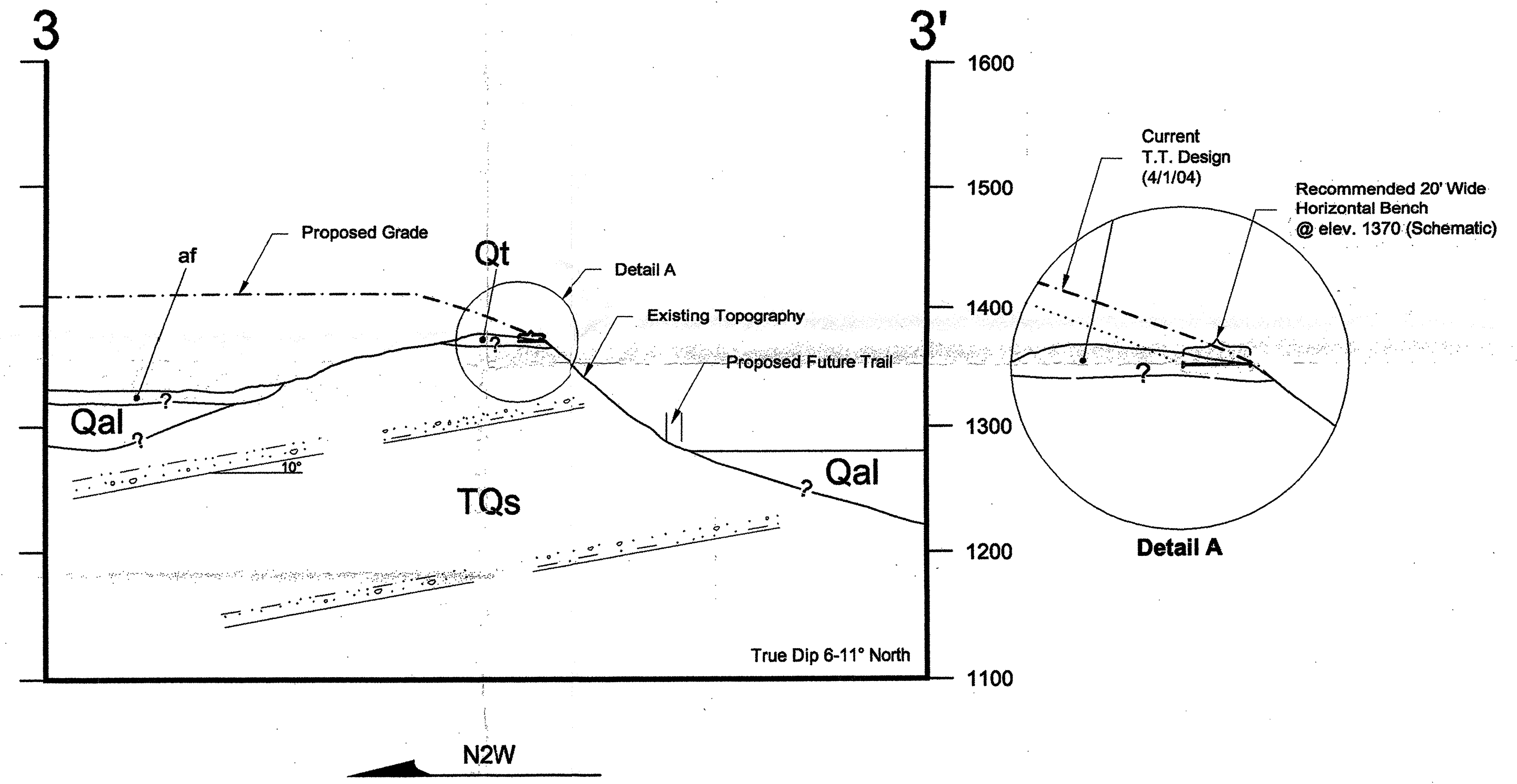
REMOVALS MAP

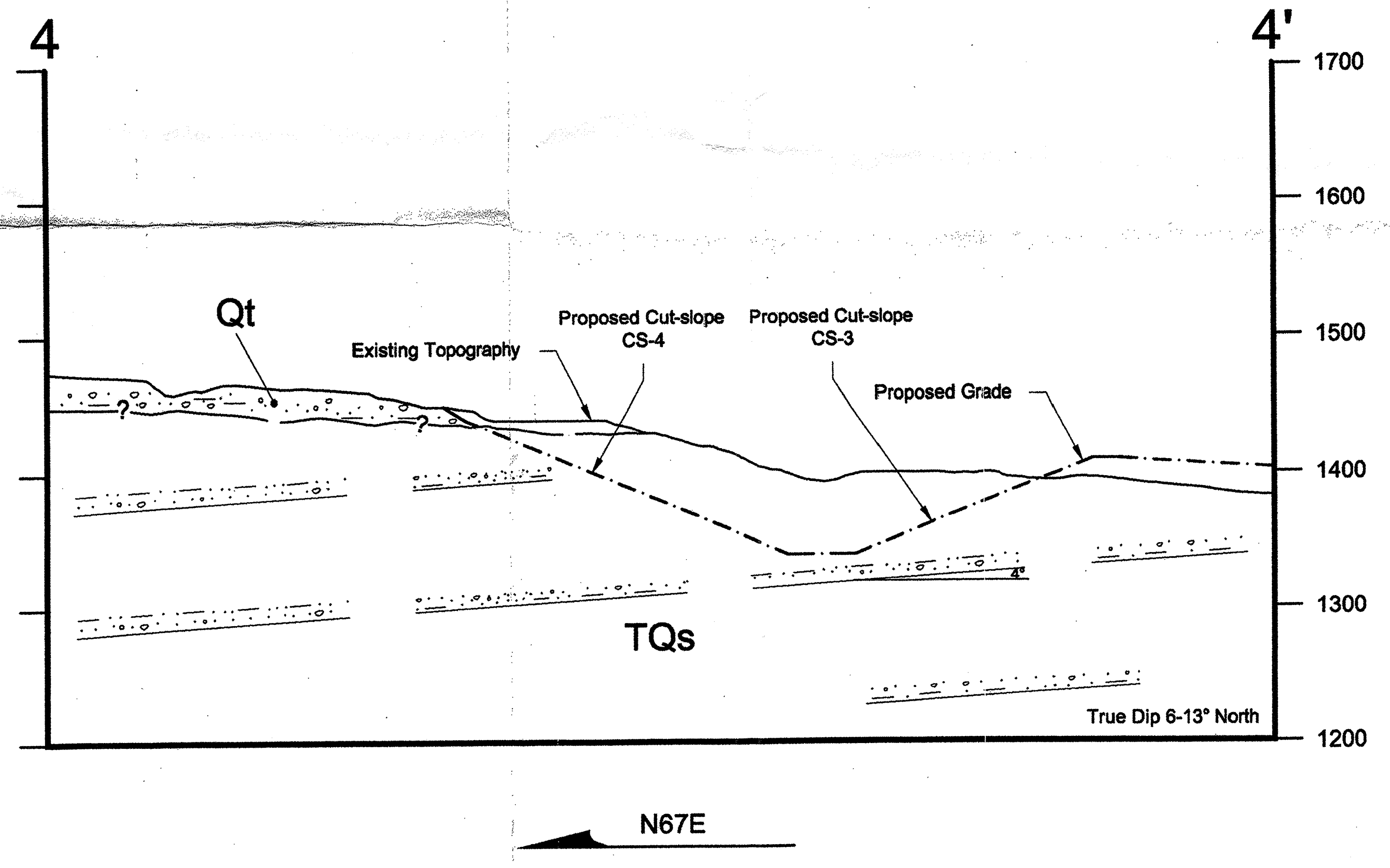
Date: 6/11/04
Job No.: 03-803S-4
Scale: 1" = 200'
CAD File: Plate II Removal Map

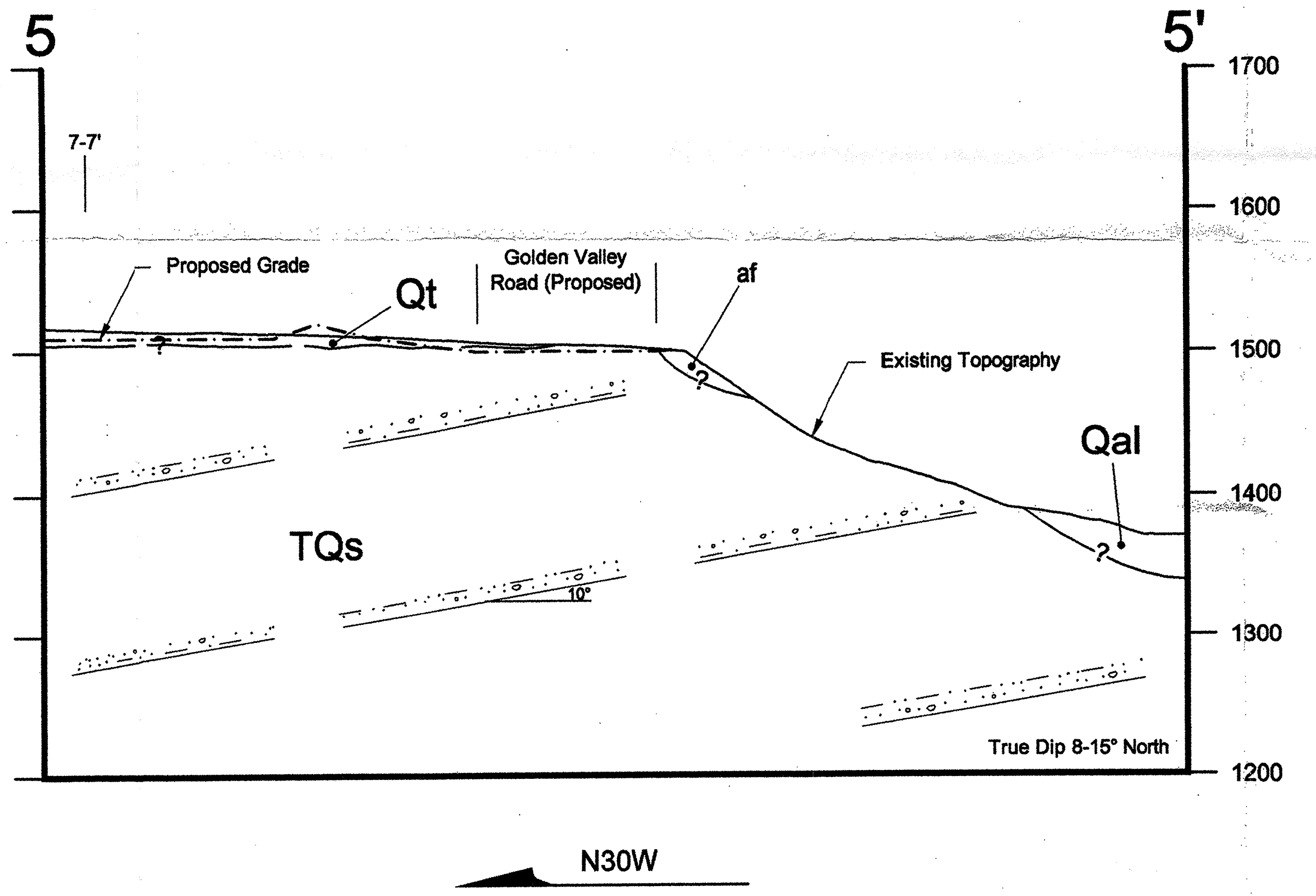
PLATE II
Geology by: Staff
Drawn by: GSD
Revised:

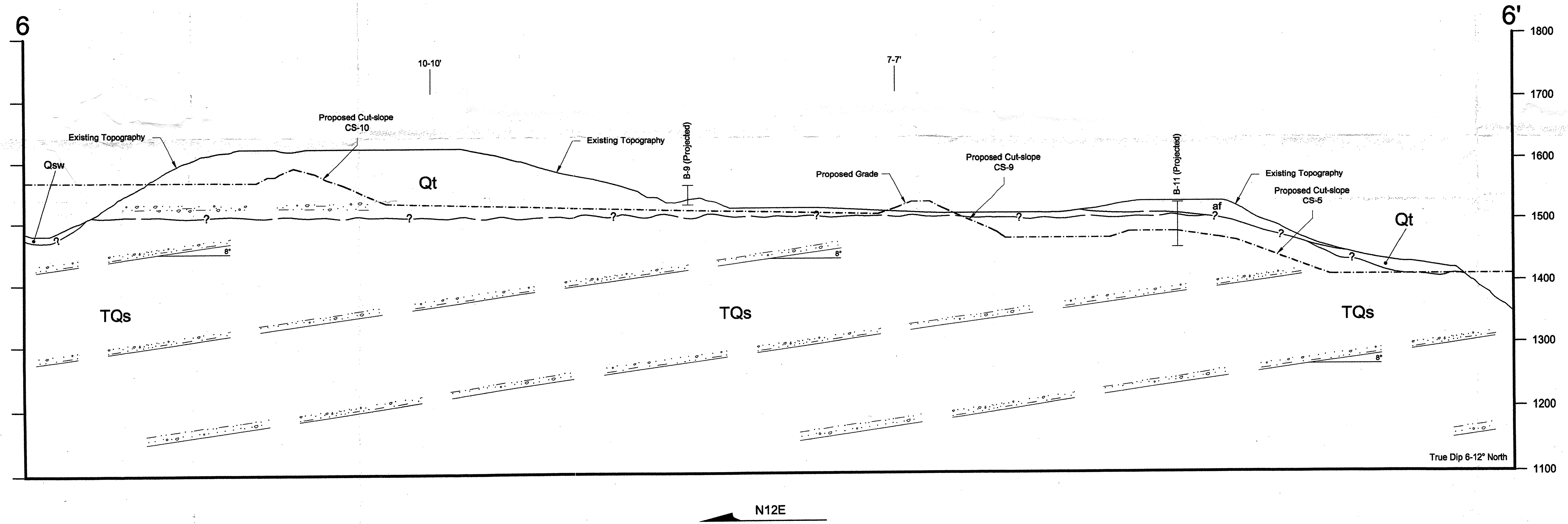












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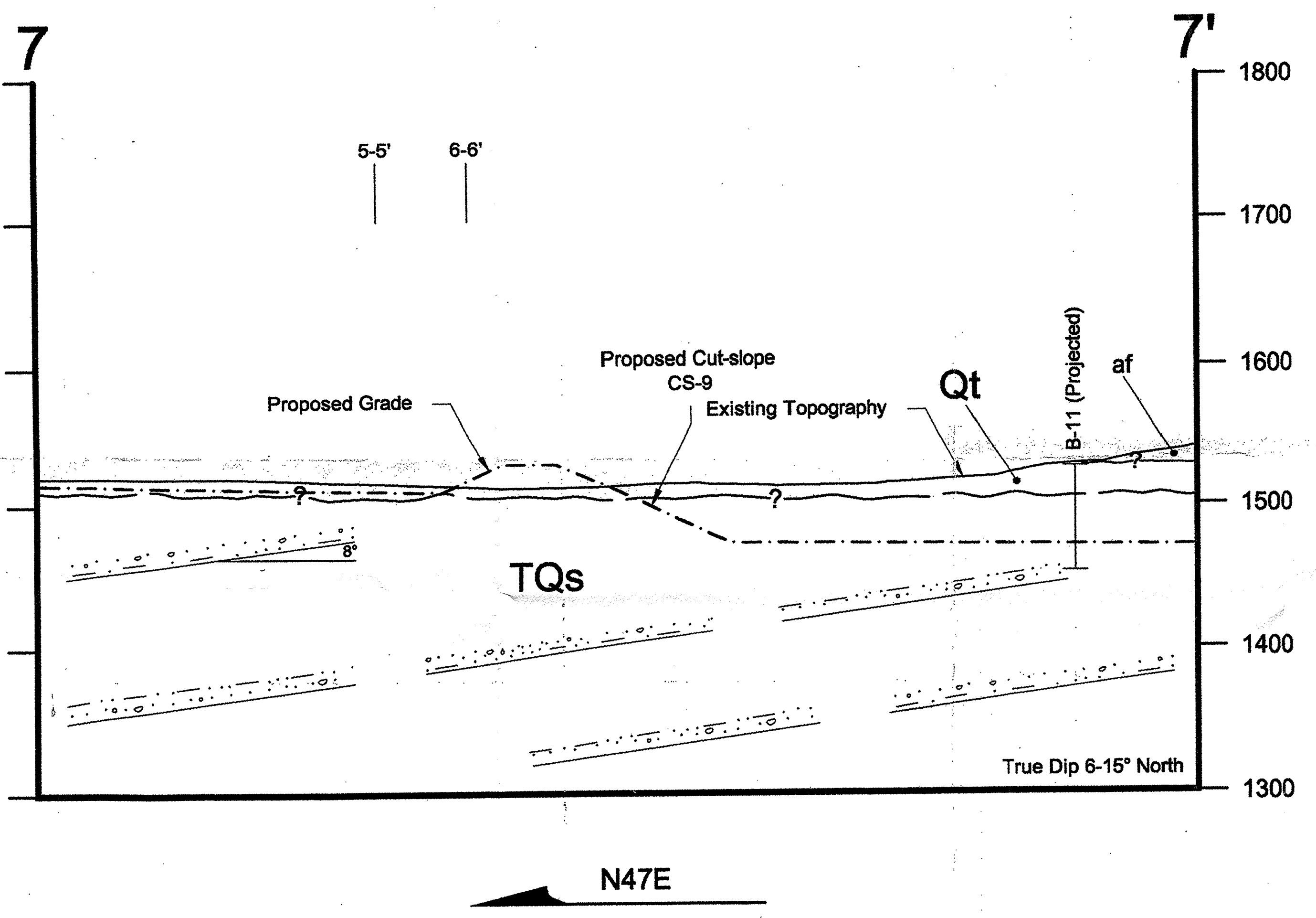
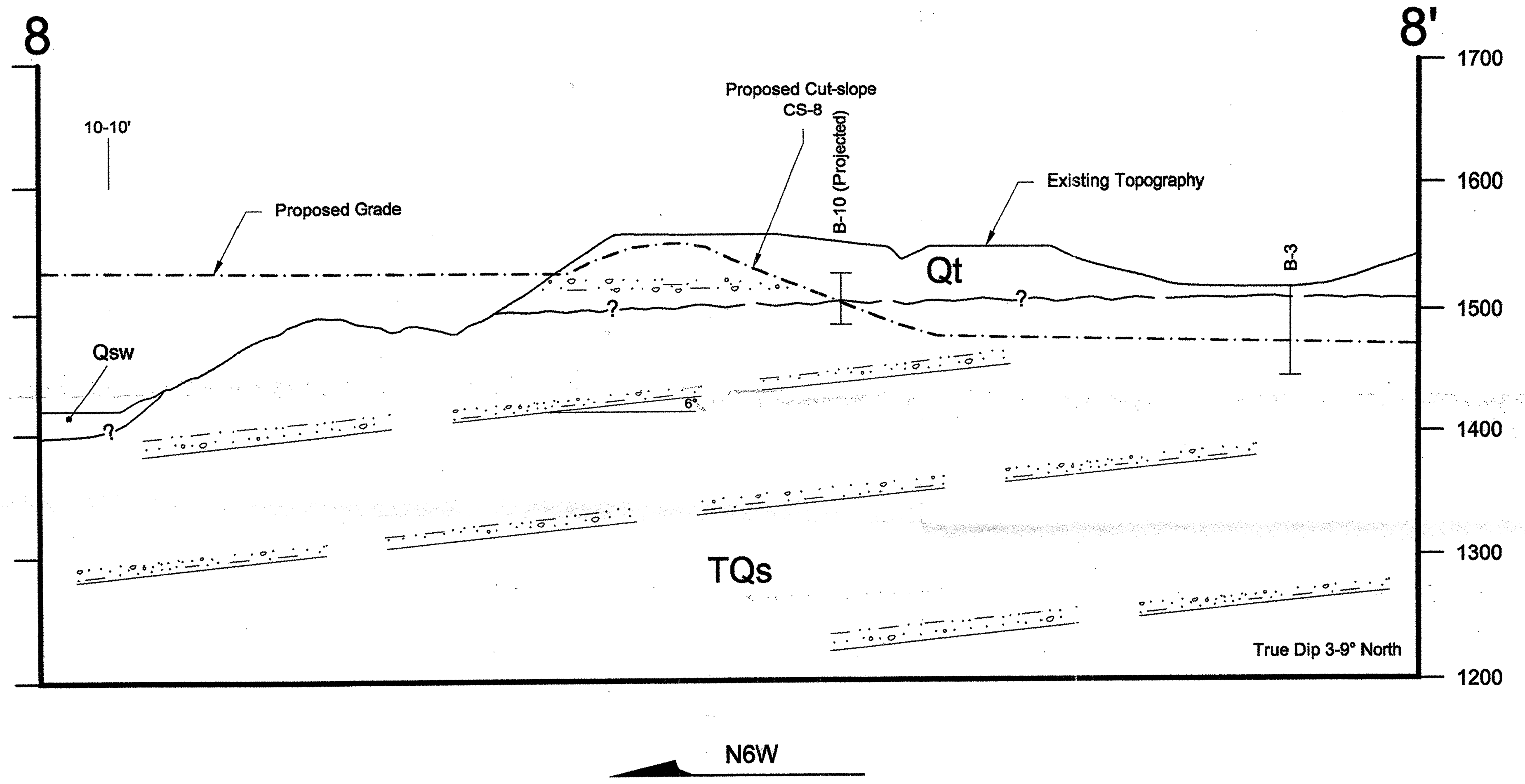
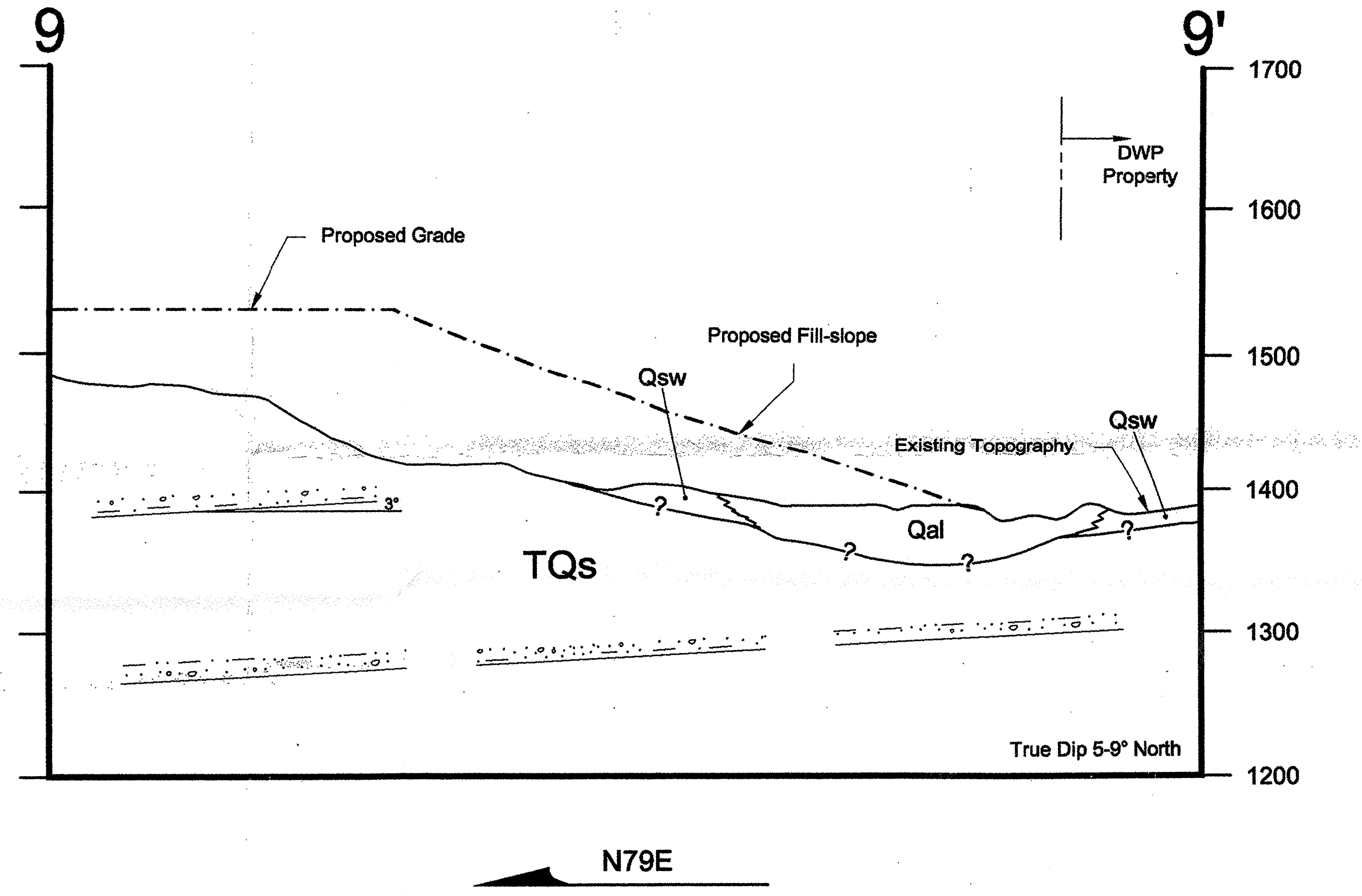
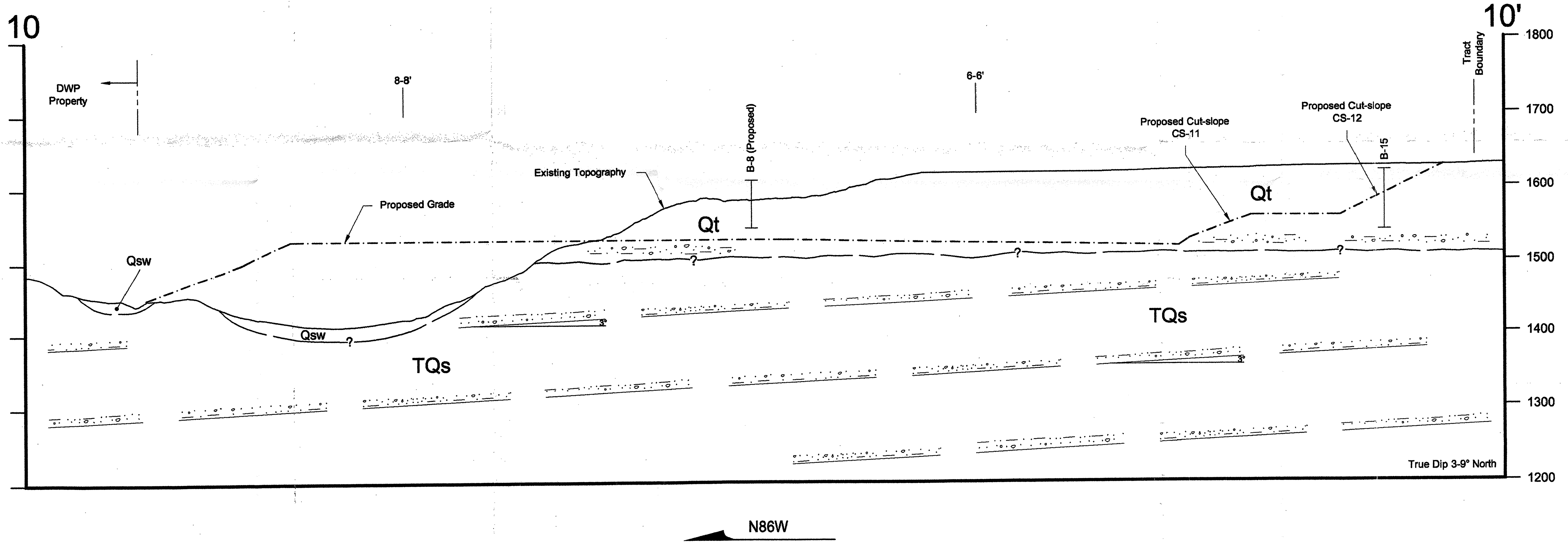
Cross Sections
1-1' thru 6-6'

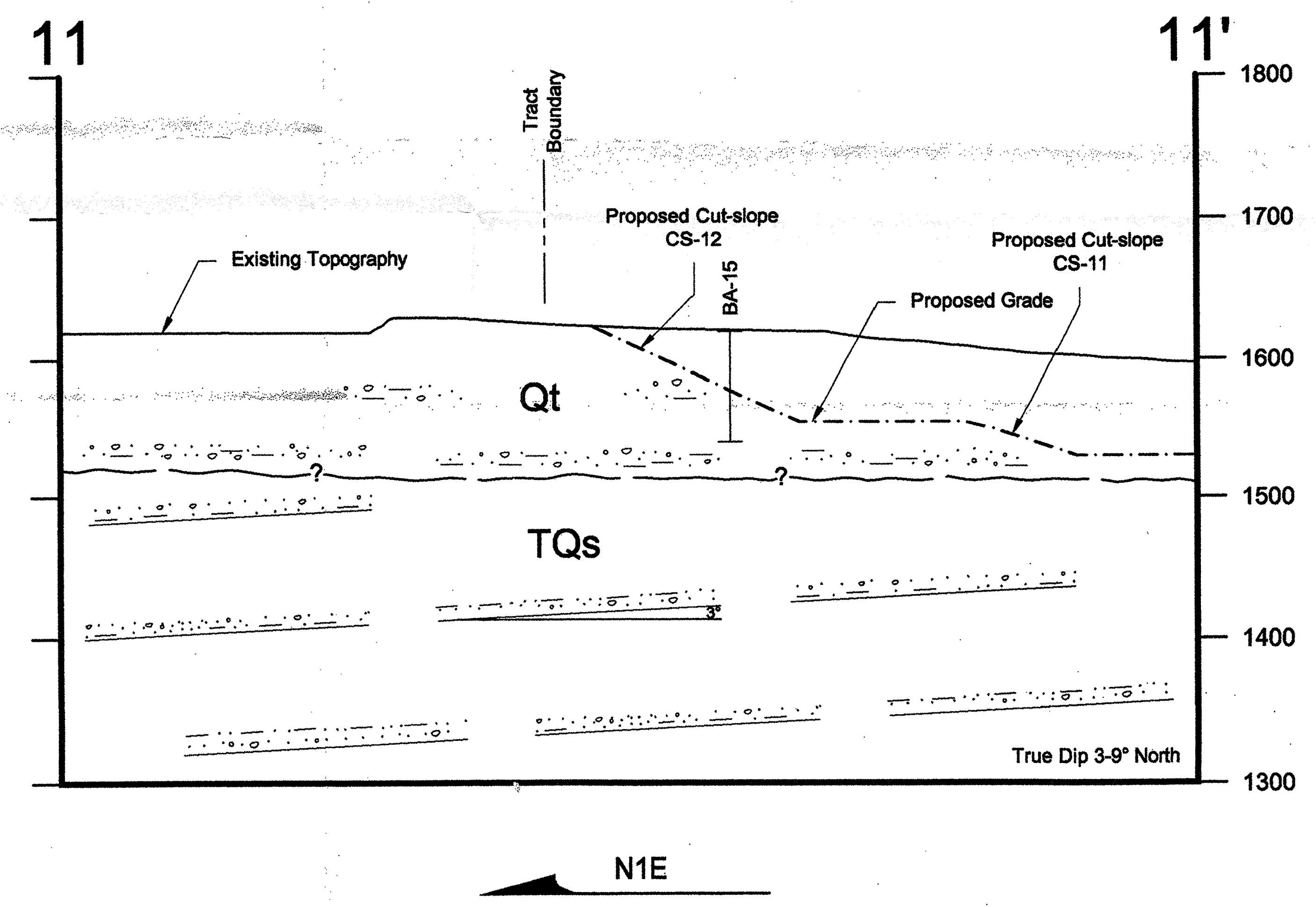
Date: 6/11/04	Job No.: 04-803S-4
Scale: 1" = 100'	CAD File: Plate III Cross Sections 1-6
PLATE III	Geology by: Staff Drawn by: GSD
	Revised:

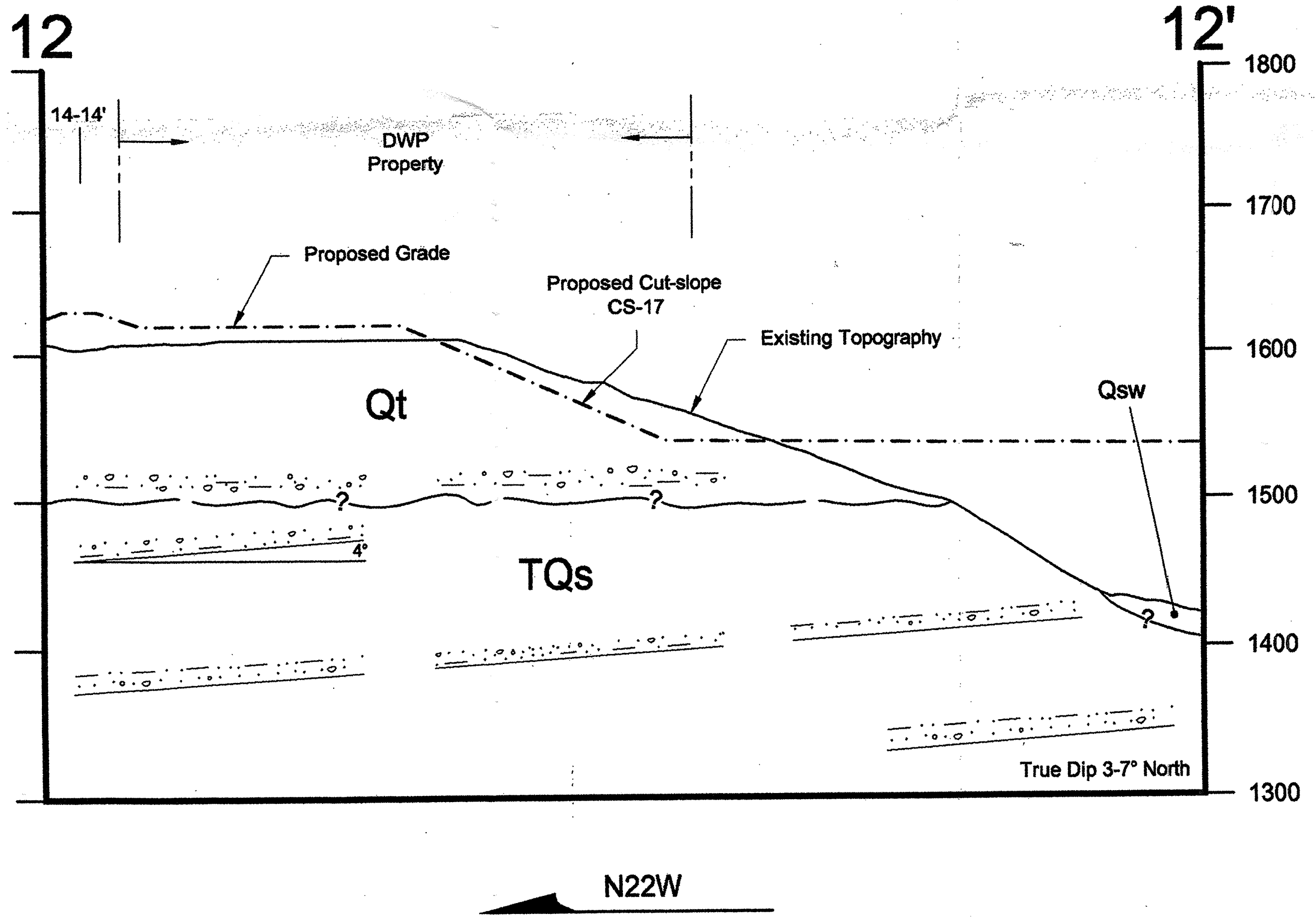


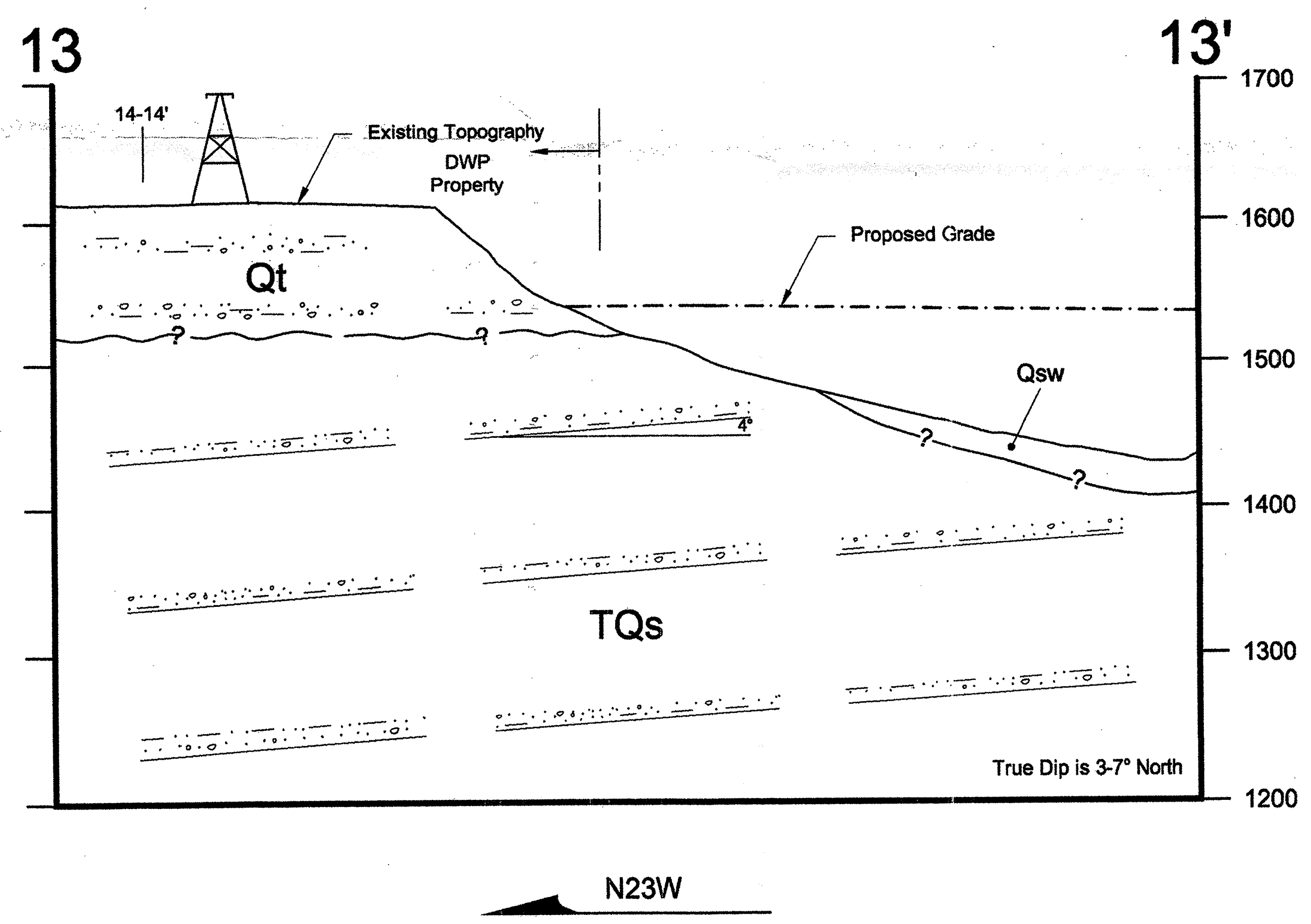












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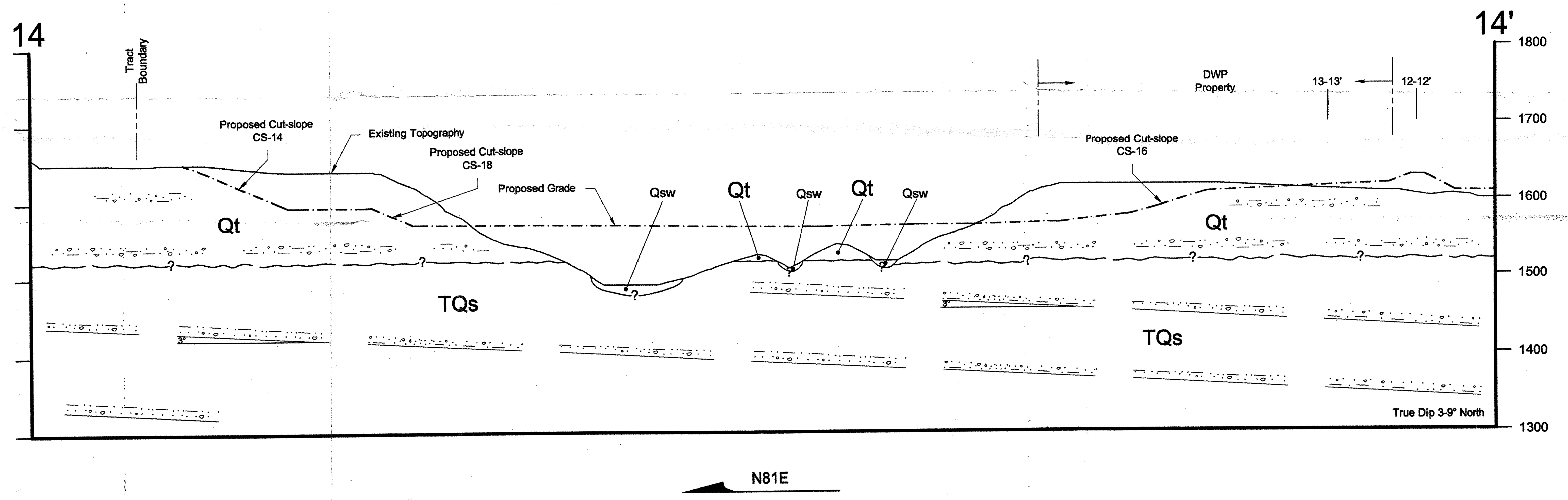
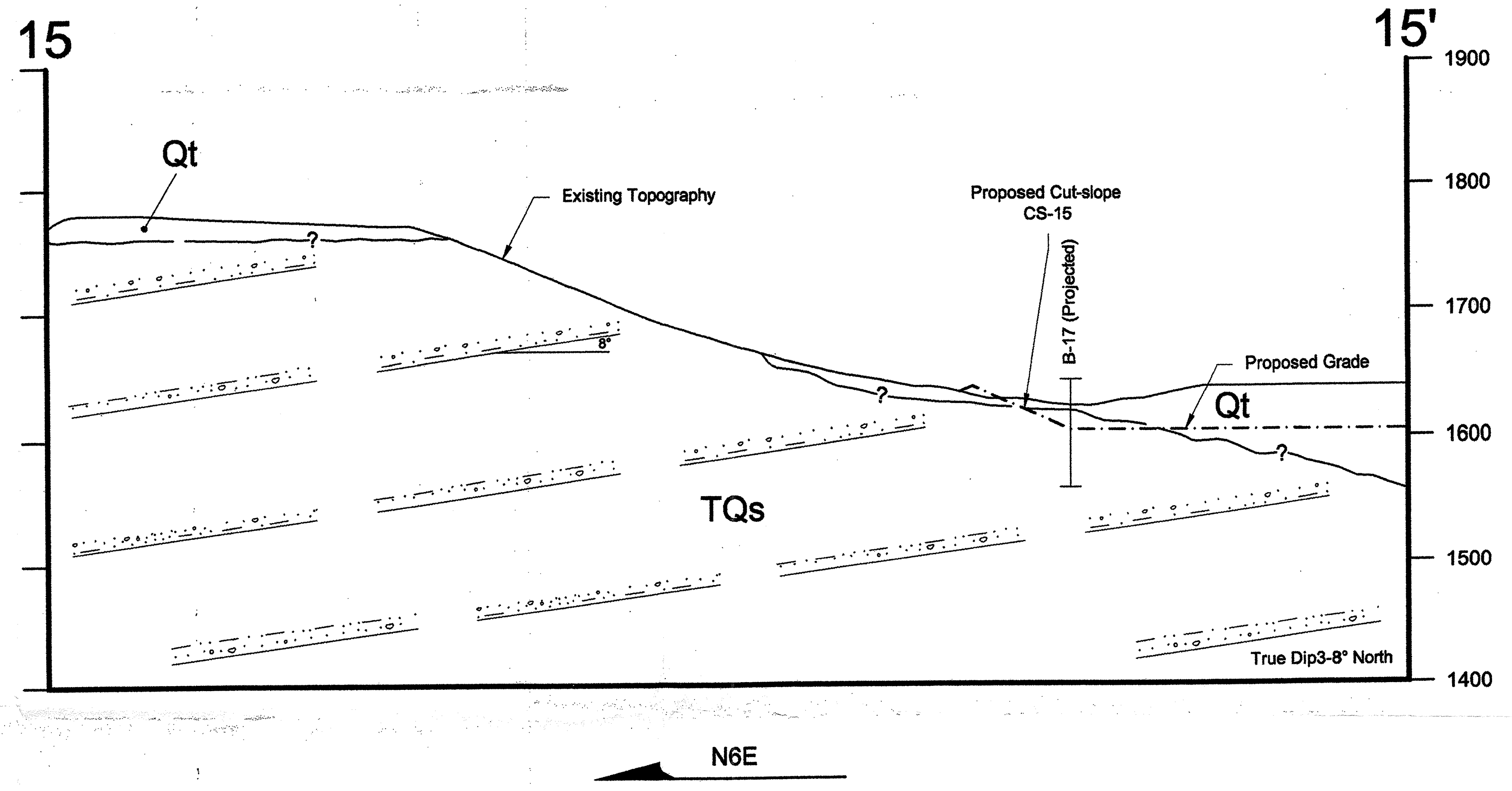
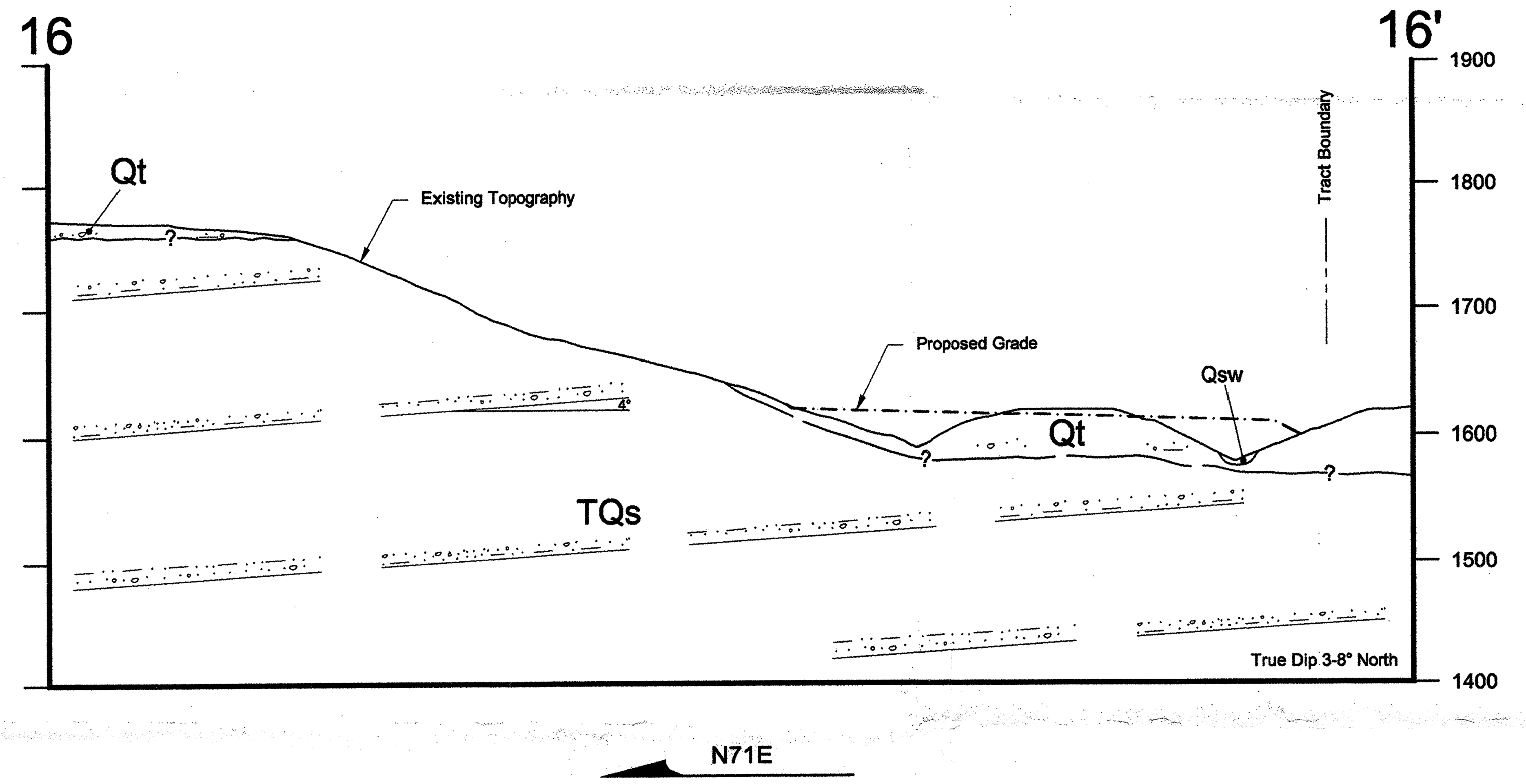
Cross Sections
7-7' thru 13-13'

Date: 6/11/04	Job No.: 04-803S-4
Scale: 1" = 100'	CAD File: Plate IV Cross Sections 7-13
PLATE IV	Geology by: Staff Drawn by: GSD
	Revised:







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Cross Sections
14-14' thru 16-16'

Date: 6/11/04
Job No.: 04-803S-4
Scale: 1" = 100'
CAD File: Plate V Cross Sections 14-16
PLATE V
Geology by: Staff
Drawn by: GSD
Revised: ____________