APPENDIX E2

Geologic and Soils Engineering Exploration Update

IRVINE GEOTECHNICAL Inc

GEOLOGIC AND SOILS ENGINEERING EXPLORATION UPDATE

PROPOSED 13 LOT SUBDIVISION

VESTING TENTATIVE TRACT NO. 65348

1935 STONEHOUSE ROAD/935 E GRANDVIEW AVENUE

SIERRA MADRE, CALIFORNIA

FOR GINKGO STONEHOUSE, LLC

IRVINE GEOTECHNICAL, INC. PROJECT NUMBER IC 14045-I

DECEMBER 15, 2014

TABLE OF CONTENTS

INTRODUCTION

This report has been prepared per our agreement and summarizes findings of Irvine Geotechnical's geologic and soils engineering exploration update performed on the site. The purpose of this study is to evaluate the nature, distribution, engineering properties, relative stability and geologic structure of the earth materials underlying the site with respect to the design and construction of the proposed project.

INTENT

It is the intent of this report to update our previous report and to assist in the design and completion of the proposed project. The recommendations are intended to reduce geotechnical risks affecting the project. The professional opinions and advice presented in this report are based upon commonly accepted standards and are subject to the general conditions described in the NOTICE section of this report.

EXPLORATION

The scope of this update report was determined from review of our previous report for the site and consultation with the client and the civil engineer. The Vesting Tentative Tract Map and preliminary grading and drainage plans prepared by Advanced Civil Group were considered prior to beginning work on this project. Exploration was conducted using techniques normally applied to this type of project in this setting. This report is limited to the area of the exploration and the proposed project as shown on the enclosed Geologic Maps and cross sections. Conditions affecting portions of the property outside the area explored, are beyond the scope of this report.

Exploration was conducted on August 9 through 11, 2005 and December 20, 2005 with the aid of a hollow-stem auger drill rig, a backhoe, a tractor-mounted backhoe, and an electronic cone penetrometer (CPT) rig. It included excavating 16 test pits, excavating a seismic trench, drilling 12 borings, and advancing five CPT soundings. The test pits and tenches ranged in depth from five to 20 feet, while the borings and CPT soundings extended to a maximum depth of 53 feet. Samples of the earth materials were obtained from the borings and test pits and delivered to the soils engineering laboratory of Soil Labworks, LLC for testing and analysis. The borings, test pits and test trenches were logged by engineers and geologists of Irvine Geotechnical. In addition to the subsurface exploration a geophysical investigation was performed on a portion of the property by Wilson Geosciences.

Office tasks included laboratory testing of selected soil samples, researching records on file at the City of Sierra Madre, reviewing historical air photos, preparing the Geologic Maps and cross sections and performing engineering analysis. Earth materials exposed in the test pits and borings are described on the enclosed Log of Test Pits and Log of Borings. Appendix I contains a discussion of the laboratory testing procedures and results. Appendix II contains a description and interpretation of the CPT testing and data. Appendix III contains the findings of the geophysical study performed by Wilson Geosciences.

The proposed project; surface geologic conditions; and the locations of the test pits, test trenches, borings, CPT soundings and seismic refraction line are shown on the Geologic Maps. Subsurface distribution of the earth materials, projected geologic structure and the proposed project are shown on Sections A through H. Section H forms the basis for the enclosed stability calculations.

PREVIOUS WORK

The site was previously explored by Irvine Geotechnical and Wilson Geosciences for a former owner.

The following report was prepared by Irvine Geotechnical:

> *Geologic and Soils Engineering Exploration, Proposed Hillside Residential Subdivision, Tentative Tract 65348, Portions of Lots 33, 34 & 35 Camillo Guercio Tract, & Portion of T1N; R11W, 1935 Stone House Road/935 E. Grandview Avenue, Sierra Madre, California,* dated December 29, 2005

The results of seismic refraction study are contained in the Wilson Geosciences report:

> *Seismic Refraction Investigation Northwest of the Intersection of Grandview and Sonehouse, Sierra Madre, California,* dated September, 2005 and Revised January 2006.

The project was abandoned and the site remains essentially to same as described in the reports.

PROPOSED PROJECT

Information concerning the proposed project was provided by the client and the civil engineer. The Vesting Tentative Tract Map No. 65348 and the preliminary grading and drainage plans prepared by Advanced Civil Group were a guide for preparing this update report. It is proposed to subdivide the property to create 13, hillside and canyon lots. A building pad suitable for development with a single-family residence will be created on each lot. Lots 1 through 10 will be accessed from Grand View Avenue via a new street. Lots 11 through 13 will be accessed via a private drive from the northern terminus of Stonehouse Road. Retaining walls are proposed along the uphill sides of the pad on Lots 5 and 7.

A debris basin is proposed across the mouth of the main, south-draining canyon on the northern portion of Lot 13. A crib-lock type retaining wall is planned across the mouth of the canyon to impound debris. The basin is not intended to impound water, which will be conveyed to a pond/basin south of the pad on Lot 11. Overflow from the pond/basin will flow to Stone House Road.

Formal plans have not been prepared and await the conclusions and recommendations of this report.

SITE DESCRIPTION

The study area includes approximately 96 acres of hillside and canyon terrain, at the base of the south flank fo the San Gabriel Mountains in the northeastern portion of the city of Sierra Madre, California. It is located north of Grandview Avenue, north and west of Stone House Road, north and east of Camillo Street, west and north of the northern terminus of Santa Anita Avenue, and approximately 1½ miles north of the Foothill (210) Freeway. The majority of the property consists of vacant hillside and canyon terrain. Three older residential structures and storage sheds are present on the southern portion of the property, adjacent to Grandview Avenue. The areas surrounding the proposed development consist of single family residences that are part of graded residential subdivisions.

Past grading within the property has been slight, mostly consisting of cutting and filling to create access driveways, roads, and paths. The exceptions occur along the western and eastern margins of the property, where significant grading was employed during mass grading of the offsite tracts. Steep cuts are present below the olive orchard and east of the proposed debris basin. Fill slopes were created along the west sides of pads fronting Stone House Road and Liliano Drive. Fill was also placed within a canyon on the western portion of the property to create the eastern extension of Camillo Street.

Topography within the area of the proposed development is characterized by a main south-draining canyon on the eastern portion of the site, a main south-trending ridge in the central portion of the study area and smaller south-draining canyons and ridges. Elevations range from 1,150 feet on the olive grove mesa to 770 feet near Grandview Avenue. Slope gradients range from flatter than 5:1 within the axis of the canyons and ridges to steeper than 1:1 on th natural ridge flanks.

Portions of the ridges and canyons are planted with groves of citrus, avocado, olive trees as well as vegetables and grapes. The groves are irrigated and well maintained. Large lawns are present within the main canyon and the area surrounding the residence. Mature oak, sycamore, walnut, eucalyptus and pine trees are also present. Natural slopes are covered by chaparral, sage and poison oak.

Drainage within the study area is generally down the contours of the land toward the natural drainage courses and then toward the south.

GROUNDWATER

Groundwater was encountered in the easterly canyon during exploration. Water was found at depths of 17 to 27 feet in Borings 8, 9, 11 & 12 and Test Pit 7. Seepage observed in Test Pit 7 was from northeast to southwest. The existing ponds and streams within the easterly canyon are man-made and lined with concrete. Water is re-circulated via pumps and a cistern.

Groundwater was not encountered in the westerly canyons in borings and CPT soundings to 50 feet. Also, groundwater was not detected in the seismic refraction survey to a depth of 100 feet. Seeps, springs and groundwater were not noted on the ridges in the higher elevations of the site. Water tunnels and wells are not known to be present at the site.

Seasonal fluctuations in groundwater levels may occur due to variations in climate, irrigation, and other factors not evident at the time of the exploration. Fluctuations in groundwater levels may also occur across the site.

EARTH MATERIALS

Fill

Within the majority of the study area, a minor amount of fill, associated with previous site grading and cultivation, blankets the downhill portions of the pads and access roads. The spill fill consists of sand and silty sand that are tan to grey-brown, and loose to medium dense.

Significant fill was placed along the eastern and western margins of the study during mass grading of the offsite tracts. The thickest fill is located beneath Camillo Street on the northern portion of the study area and remote to the proposed development, where fill was placed within a south-draining canyon. Along the downhill side of Camillo Street, the fill thickness is estimated to be on the order of 40 feet thick as shown on Section A. In the eastern portion of the study area, fill was also encountered in Test Pits 7 and 8 near the base of an offsite fill slope. Fill associated with offsite grading consists of silty sand that appears to have been compacted. The fill slope below Camillo Street has paved terrace drains.

Alluvial Terrace

Alluvial terrace deposits mantle the bedrock on portions of the study area. These deposits have been mapped as part of the Qal_3 and Qal_4 alluvial fan units of Pleistocene age by Crook, et. al., 1987, (*Geologic Map of the Sierra Madre Fault Zone, The Arroyo Seco to Santa Anita Canyon*: U.S.G.S. Professional Paper 1339, Plate 2.2). The Qal_3 and Qal_4 fan deposits consist of clayey to gravelly sand that are red-brown, orange-brown, and yellow-brown, slightly moist, structureless, and dense to very dense.

Alluvium

Natural alluvial deposits were encountered in the axes of the main and secondary canyons. The alluvium consists of crudely stratified deposits of silty sand and sand and minor amounts of silt and clayey sand. The alluvium is grey-brown, yellow-brown and orange-brown, medium dense to dense and slightly moist to saturated. The thickness of the alluvium within the study area ranges from a few feet to more than 100.

Soil

Natural residual and colluvial soils blanket the slopes throughout the study area. The soil layer blanketing the natural slopes is generally less than two feet thick and consists of silty sand and clayey sand. Colluvium is present near the base of slopes and within the axes of swales and re-entrant canyons. The colluvium consists of silty sand and clayey sand with weathered granitic fragments.

Bedrock

Bedrock underlying the site and encountered in the test pits and borings is granitic with a mineral composition of quartz diorite. In the San Gabriel Mountains this relatively homogenous and coarse grained quartz diorite is mapped as the Wilson Diorite. Some lenses of gneiss, which is similar to the diorite from an engineering standpoint, was also encountered. The bedrock is also exposed in steep natural slopes and cuts northeast and northwest of the study area. The bedrock is grey-brown to ‘salt and pepper’ textured, moderately hard to hard, massive to highly jointed and very to slightly weathered.

GEOLOGIC STRUCTURE

The bedrock and alluvial terrace described are common to this area Sierra Madre, near the base of the San Gabriel Mountains. The bedrock and terrace are generally massive and lack significant structural planes. Weak foliation planes within the diorite strike nearly east-west and have a steep northerly to near vertical dip. Joint planes are randomly oriented, steeply dipping, and discontinuous. Shear planes mapped are also randomly oriented and steeply dipping. The geologic structure of the bedrock is favorably oriented for stability of the site and proposed project.

GENERAL SEISMIC CONSIDERATIONS

Southern California is located in an active seismic region and numerous known and undiscovered earthquake faults are present in the region. Hazards associated with fault rupture and earthquakes include direct affects such as strong ground shaking and ground rupture, as well as secondary effects such as liquefaction, landsliding and lurching. The United States Geological Survey (USGS), California Geologic Survey (CGS), Southern California Earthquake Center (SCEC), private consultants and universities have been studying earthquakes in southern California for several decades. Early studies were directed toward earthquake prediction and early warning of strong ground shaking. Research and practice have shown that earthquake prediction is not practical or sufficiently accurate to benefit the general public. Also, several recent and damaging earthquakes have occurred on faults that were unknown prior to rupture. Current standards and the California Building Code call for earthquake resistant design of structures as opposed to prediction.

Regional Geologic Setting

The study area is located near the transition from the Peninsular Ranges to the Transverse Ranges physiographic provinces of California. The Peninsular Ranges are characterized by northwest-trending mountains and strike slip faults. The Puente Hills and Whittier fault zone toward the south are typical for the Peninsular Ranges. Conversely, the geologic structures and mountains of the Transverse Ranges trend east-west and are characterized by reverse faulting. The Sierra Madre fault, which is allowing uplift of the east-west trending San Gabriel Mountains relative to the San Gabriel Valley, is typical for the Transverse Ranges. The boundary between the Transverse and Peninsular Ranges coincides with the Raymond fault, which is present near the southern boundary of Sierra Madre.

Nearby Significant Seismic Sources

Sierra Madre Fault System

The Sierra Madre fault system is comprised of five main segments that extend along the base of the San Gabriel Mountains from San Fernando Pass on the west to San Antonio Canyon on the east. The segment of the Sierra Madre fault system proximal to the study area extends from the Arroyo Seco to Santa Anita Canyon. The fault is characterized as a north-dipping, reverse fault that is allowing uplift of the San Gabriel Mountains relative to the San Gabriel Valley as a consequence of compression of the Transverse Ranges. The California Geologic Survey and the Southern California Earthquake Center considers the Sierra Madre fault to be active with a probable earthquake magnitude of 6.0 to 7.3. The higher magnitude reflects two or more segments of the fault system rupturing contemporaneously. The 1971 San Fernando earthquake occurred on the westernmost, San Fernando section of the Sierra Madre fault. The Regional Geologic Map shows two mapped splays (intersection of the fault plane with the ground surface) and one inferred splay of the fault.

One of the splays is mapped along the northern portion of the study area, north of the development envelope. This splay forms geomorphically distinct, east-west trending linear canyons and saddles that can be traced east and west of the study area. The northerly-most fault splay is located approximately 1,900 feet north of Camillo Street and is remote to the planned development. The southerly-most splay, which is defined by the juxtaposition of bedrock over alluvial fan deposits, is inferred by Crook, et. al., 1987 across the southern portion of the study area.

The southerly splay is inferred in an area of deep alluvium and conventional trenches were not considered feasible. A series of CPT soundings in a north-south direction did not detect offsets in lithology that would indicate faulting. A geophysical study using seismic refraction techniques was performed by Wilson Geosciences to ascertain the nature of the geologic layers at depth (Appendix III). Faulting will disrupt geologic layering and subsurface profile. The younger and older alluvium, alluvial terrace and bedrock have characteristic compression wave velocities. The seismic refraction survey indicates the bedrock and alluvial soils slope naturally from north to south. Evidence of offsets in alluvial materials or the juxtaposition of bedrock over alluvial terrace due to faulting is not present. Similar to findings from other sites in Sierra Madre, the southerly splay of the Sierra Madre fault inferred by Crook is further south than mapped. In the vicinity of the study area, the southerly splay of the Sierra Madre fault is likely south of Grandview Avenue. Based upon pre-development 1928 topographic maps, there is no geomorphic evidence for a southerly splay. Morton, 1973 mapped the two northerly splays, but not the southerly splay.

A trench was excavated across the splay of the Sierra Madre fault mapped in the northern portion of the study area. Earth materials mapped in the trench are shown on the Fault Trench Log. As a result of trenching, the granite was found to be in fault contact with the alluvial terrace. The location of the surface trace of the Sierra Madre fault is shown on the Geologic Map. Evidence as to age of fault rupture has been removed through erosion. The recommended fault setback does not affect any of the proposed pads.

Clamshell-Sawpit Canyon Fault

The Clamshell-Sawpit Canyon fault is an offshoot of the Sierra Madre fault zone (SCEC) and was responsible for the 1991 Sierra Madre earthquake. The Clamshell-Sawpit Canyon fault is a reverse fault that has strong geomorphic expression, but no evidence of Holocene ground rupture. At the closest point, the Clamshell-Sawpit Canyon fault is located approximately one mile east-northeast of the study area.

Raymond Fault

At its closest point, the Raymond fault is 1¼ miles south of the subject property. The Raymond fault is an east-west trending reverse fault that forms the southern boundary of the Transverse Ranges Geomorphic Province. The Raymond fault is considered active with a probable moment earthquake magnitude of 6.5. Unlike the Sierra Madre fault, the Raymond fault has a distinct scarp that extends from Monrovia to Los Angeles. Rupture of the Raymond fault would produce strong ground shaking at the site.

San Andreas Fault

The San Andreas fault is located along the north side of the San Gabriel Mountains, approximately 21 miles northeast of the subject property. The San Andreas fault is characterized as a strike slip fault capable of producing a magnitude 8.0 earthquake. Rupture of the San Andreas fault would produce strong ground shaking of long duration at the site.

Whittier Fault

The Whittier fault is part of the northernmost portion of the Elsinore fault zone and is located approximately 12 miles south of the study area. The Whittier fault is a strike slip fault that is capable of producing magnitude 7.1 earthquakes. Rupture of the Whittier fault would produce strong ground shaking at the site.

Alquist-Priolo Fault Rupture Hazard Study Zone

California faults are classified as active, potentially active or inactive. Faults from past geologic periods of mountain building, but do not display any evidence of recent offset are considered “inactive” or “potentially active.” Faults that have historically produced earthquakes or show evidence of movement within the Holocene (past 11,000 years) are considered “active faults.” Active faults that are capable of causing large earthquakes may also cause ground rupture. The Alquist-Priolo Act of 1971 was enacted to protect structures from hazards associated with fault ground rupture. To date, portions of the Sierra Madre fault east of the San Fernando segment and west of Bradbury have not been designated as an Alquist-Priolo fault. However, this designation may change. Since no slays of the Sierra Madre fault cross the proposed building sites, the ground rupture hazard at the site is considered low.

Building Code Seismic Coefficients

Seismic design parameters within the Building Code include amplification of the seismic forces on the structure depending on the soil type, distance to seismic source and intensity of shaking. The purpose of the code seismic design parameters is to prevent collapse of structures and loss of life during strong ground shaking. Cosmetic damage should be expected.

The site is located within two kilometers of a known seismic source (Sierra Madre fault). The following table lists the applicable seismic coefficients for the 2013 Building Los Angeles Code.

SEISMIC COEFFICIENTS (2013 California Building Code)		
Latitude = 34.1684°N Longitude = 118.0366°W	Short Period (0.2s)	One-Second Period
Earth Materials and Site Class from Table 1613.5.2 and Section 1613.5.2	Alluvial Terrace/Alluvium - D	
Seismic Design Category from Table 1613.5.6(1) and 1613.5.6(2)	E	
Spectral Accelerations from Figures 1613.5 (1) through 1613.5(14)	S_s = 2.757 (g)	S_1 = 1.029 (g)
Site Coefficients from Tables 1613.5.3 (1) and 1613.5.3 (2)	F_A = 1.0	F_V = 1.5
Spectral Response Accelerations from Equations 16-36 and 16-37	S_{MS} = 2.757 (g)	S_{M1} = 1.544 (g)
Design Accelerations from Equations 16-38 and 16-39	S_{DS} = 1.838 (g)	S_{D1} = 1.029 (g)

Seismic Hazards

The principal seismic hazard to the subject property and proposed project is strong ground shaking from earthquakes produced by local faults. Modern, well-constructed buildings are designed to resist ground shaking through the use of shear panels, moment-resisting frames and reinforcement. Additional precautions may be taken to protect personal property and reduce the chance of injury, including strapping water heaters and securing furniture and appliances. It is likely that the subject property will be shaken by future earthquakes produced in southern California.

Seismic Hazard Zones

The California State Legislature enacted the Seismic Hazards Mapping Act of 1990, which was prompted by damaging earthquakes in California, and was intended to protect public safety from the effects of strong ground shaking, liquefaction, landslides, and other earthquake-related hazards. The Seismic Hazards Mapping Act requires that the State Geologist delineate various "seismic hazards zones." The maps depicting the zones are released by the California Geological Survey.

The Seismic Hazards Mapping Act requires a site investigation by a certified engineering geologist and/or civil engineer with expertise in geotechnical engineering, for projects sited within a hazard zone. The investigation is to include recommendations for a "minimum level of mitigation" that should reduce the risk of ground failure during an earthquake to a level that does not cause the collapse of buildings for human occupancy. The Seismic Hazards Mapping Act does not require mitigation to a level of no ground failure and/or no structural damage.

Seismic Hazard Zone delineations are based on correlation of a combination of factors, including: surface distribution of soil deposits; physical relief; depth to historic high groundwater; shear strength of the soils; and occurrence of past seismic deformation. The subject property is located within the United States Geologic Survey, Mount Wilson Quadrangle. Seismic hazards within the Mount Wilson Quadrangle were evaluated by the CGS in their report, *"Seismic Hazard Zone Report for the Mount Wilson 7.5-minute Quadrangle, Los Angeles County, California, Open File Report SHZR-030*" As shown on the Seismic Hazard Zones Map, the subject property is **not** within an area that has been subject to, or may be subject to liquefaction. Due to the steepness of slopes along the margins of the canyons, portions of the study area are within zones that may be susceptible to earthquake induced ground deformation.

Ground Motion

Spectral accelerations at the site were determined for the Maximum Considered Earthquake (MCE) following the procedures in ASCE 7-10 and the 2013 Building Code. The computed PGA_M for this site is 1.059g. According to the USGS deaggregation website (https://geohazards.usgs.gov/deaggint/2008/), and using a ground motion with a 10 percent probability of exceedance in 50 years, the modal de-aggregated earthquake PGA and moment magnitude are 0.616g and 6.59, respectively. The modal distance to the ground motion source is 2.7 km.

Liquefaction

Liquefaction is a process that occurs when saturated sediments are subjected to repeated strain reversals during an earthquake. The strain reversals cause increased pore water pressure such that the internal pore pressure approaches the overburden pressure and the shear strength approaches zero. Liquefied soils may be subject to flow or excessive strain, which can cause settlement. Liquefaction occurs in soils below the groundwater table. Soils commonly subject to liquefaction include loose to medium dense sand and silty sand. Predominantly fine-grained soils, such as silts and clay, are less susceptible to liquefaction. Generally, plastic soils with a clay content of greater than 15 percent, a Plasticity Index greater than 18, and/or a fines content (percent passing the 200 sieve) greater than 30 to 50 percent, are not considered subject to liquefaction.

In conformance with current building code, the liquefaction hazard was computed for a ground motion representing a recurrence interval of 2,475 years, which is roughly represented by PGA_M. A design magnitude earthquake of 6.59 was used to magnitude weight the liquefaction resistance. It was assumed that the groundwater will be within 15 feet of the ground surface (historic high groundwater).

The stresses, strains, and safety factor for liquefaction were calculated using the methodologies by T.L. Youd, et. al., (*Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils*, 1998), P.K. Robertson (*Cyclic Liquefaction and its Evaluation Based on the SPT and CPT, 1997*), P.K. Robertson, 2009, (*Guide to Cone Penetration Testing for*

Geotechnical Engineering), "*Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California*" (Southern California Earthquake Center, 2002), California Geological Survey, Special Publication 117A, (*Guidelines for Evaluating and Mitigating Seismic Hazards in California, 2008*) and R. B. Seed, et. al., 2003, *(Recent Advances in Soil Liquefaction Engineering: a Unified and Consistent Framework).*

The last column of *"Liquefaction Analysis Using SPT Data"* lists the calculated safety factor of the soils encountered in Boring 8. SPT blow counts were converted to equivalent SPT N_{60CS} blow counts using published correlations and following the recommendations of SP117A.

Liquefaction is indicated at depths of 10 to 17½ feet, 20 feet, and 27½ to 32½ feet.

Lateral Spreading Hazard

Saturated soils that have experienced liquefaction may be subject to lateral spreading where located adjacent to free-faces, such as slopes, channels, and rivers. The site is remote to free-faces and the lateral spreading hazard at the site is nil.

Dynamic Settlement

Saturated Sand Settlement

Dissipation of excess pore pressure after liquefaction can result in settlement. The volumetric strain and accompanying settlement of saturated soils was estimated using procedures developed by Ishihara and Yoshimine. The enclosed Seismic Settlement calculations indicate 1.72 inches of dynamic settlement near Boring 8. According to the referenced 2002 SCEC publication, differential settlement is typically of ½ to ⅔ of the total settlement for Holocene sediments. Therefore, the liquefaction induced differential settlement potential of the alluvium in the easterly canyon is estimated to be 0.86 to 1.15 inches.

Dry Sand Settlement

Poorly consolidated, granular soils may be susceptible to consolidation during strong ground shaking. The "dry sand" settlement potential of the site was estimated using the data collected in Borings 1 and 2 and procedures established by Tokimatsu and Seed, 1987 and modified by D. Pradel, 1998. A ground acceleration of 1.059g and a design magnitude earthquake of 6.59 were used for the analyses.

The last column of *"Dynamic Settlement Analysis Using SPT Data"* lists the calculated seismic settlement. The blow count data collected in the boring were converted to equivalent SPT N_{60} blow counts using published correlations and following the recommendations of SP117A. The computed settlement potential of the alluvium in the westerly canyon ranges from 0.64 to 0.86 inches, which is considered low to moderate.

Liquefaction and Associated Hazards

The liquefaction and associated dynamic settlement hazards within the study area are considered low to moderate. Recommendations are presented below to mitigate the hazard, such as supporting the structures on compacted fill caps and tying foundations together. The liquefaction and seismic hazards are not unique to this property or higher than the surrounding properties and community. Also, the hazard was quantified using a ground motion with a return period of 2,475 years. Probable ground shaking at the site during the lifespan of the proposed structures is considered much lower.

SLOPE STABILITY

Gross Stability

Most of the development is remote to significant slopes. The highest and steepest slopes are located near the debris basin and are represented by Section H. The gross stability of the slope shown in Section H was calculated using a computerized version of the Simplified Bishop's Spencer's method (SLIDE Version 6.032) developed by ROCSCIENCE, Inc.

The seismic stability of the site was calculated in conformance with Southern California Earthquake Center (SCEC), 2002, "*Recommended Procedures for Implementation of DMG Special Publication 117* and California Geological Survey (CGS), Special Publication 117A, 2008 "*Guidelines for Evaluating and Mitigating Seismic Hazards in California.*" Using the screening procedure and for a maximum allowable displacement of 5 cm, the horizontal acceleration (Keq) is 0.296g.

The analysis shows that the subject property and existing slopes are grossly stable with a factor of safety in excess of 1.5 under static conditions and in excess of 1.0 under seismic conditions. The calculations use the shear tests of samples believed to represent the earth materials encountered during exploration. The cross section and geologic structure used are the most critical for the slopes analyzed.

Surficial Stability

Based upon the enclosed calculations, it is reasonable to assume that existing natural slopes within the study area and the proposed cut and fill slopes are and will be surficially stable. A debris basis is planned to contain potential debris within the main, south-draining canyon.

The method of analysis used is the "parallel seepage model." The assumptions of this method are: a uniform planar slope; uniform soil density and shear strength; and uniform seepage parallel to the slope. The validity of the analysis depends, in part, by how closely the assumptions model the field conditions.

For surficial deposits overlying natural slopes, it is the opinion of Irvine Geotechnical that the assumptions of the "parallel seepage model" are not completely satisfied. Thus, though the calculation shows that the surficial materials on the site are stable with a factor of safety in excess of 1.5, the mitigating measures recommended in the CONCLUSIONS AND RECOMMENDATIONS of this report should be implemented during development of the site.

CONCLUSIONS AND RECOMMENDATIONS

General Findings

The conclusions and recommendations of this exploration are based upon subsurface exploration, field geologic mapping, research of available records, consultation, years of experience observing similar properties in similar settings and review of the development plans. It is the finding of Irvine Geotechnical that Vesting Tentative Tract Map 65348 and creation of 13 lots suitable for development with single-family residences is feasible from a geologic and soils engineering standpoint. Recommendations are presented below to create safe and suitable building pads on each lot.

Earth materials underlying the site are competent and capable of supporting the proposed development. Provided that the recommendations contained in this report are implemented, the proposed development will not be subject to geologic hazards including, ground rupture, liquefaction, seismic ground failure, landsliding, settlement, lurching, mudflows, or expansive soils.

Geotechnical Issues

The recommended bearing materials for the proposed residential structures and associated infrastructure are firm alluvium, compacted fill, alluvial terrace, and bedrock. Existing fill within the study area is not compacted and is not recommended for foundation, slab or additional fill support. Geotechnical issues affecting portions of the study area within the canyons include young alluvial deposits that are subject to hydro-consolidation and liquefaction. Remedial grading is recommended for building sites located within the canyons and in areas of fill.

Groundwater is not present in the westerly canyon and liquefaction is not considered a potential hazard. Removal and recompaction of the upper five feet of alluvial soils is recommended to create a uniform bearing condition and eliminate the hydro-collapse hazard in the westerly canyon. For the easterly canyon, the compacted fill cap should be at least 10 feet thick to mitigate hazards posed by liquefaction and hydro-collapse. Also, the Southern California Earthquake Center (SCEC) has recommended that residential structures planned for areas of potential liquefaction not contain isolated pad footings. Therefore, continuous interior foundations are recommended for new homes in the easterly canyon. For transition lots, the cut portions of the pad should be over-excavated and capped with at least 5 feet of compacted fill. For pads within narrow canyons or along the transition from canyon to slope, all of the alluvial soils should be removed to bedrock or terrace and replaced with compacted fill.

SITE PREPARATION

Surficial materials consisting of are present on the site. Remedial grading is recommended to improve site conditions.

SUMMARY OF GRADING RECOMMENDATIONS			
Lots	Grading Description	Bearing Material	Foundation
1 - 10	5 foot of removal & recompaction in west canyon	Compacted Fill	Conventional
11 - 13	10 feet removal & recompaction in east canyon	Compacted Fill	Conventional perimeter footings and continuous interior footings. No isolated pads
Interior Roads & Driveways	Remove & recompact upper 24 inches of soils below structural section	Compacted Fill	n/a
Debris Basin	Remove & recompact 5 feet of existing alluvium	Compacted Fill, terrace or bedrock	Base Slab/Mat

General Grading Specifications

The following guidelines may be used in preparation of the grading plan and job specifications. Irvine Geotechnical would appreciate the opportunity of reviewing the plans to insure that these recommendations are included. The grading contractor should be provided with a copy of this report.

A. The site should be prepared to receive compacted fill by removing all vegetation, debris, existing fill, soil, and upper 2 to 10 feet of alluvium. The exposed excavated area should be observed by the soils engineer or geologist prior to placing compacted fill. Specific removal depths can be found in the "Summary of Grading Recommendations" table. The exposed grade should be scarified to a depth of six inches, moistened to optimum moisture content, and recompacted to 90 percent of the maximum density.

B. Where the fil is intended for structural support, the proposed building site shall be excavated to a minimum depth of 3 feet below the bottom of all footings. The excavation shall extend a minimum of five to 10 feet beyond the building footprint. The excavated areas shall be observed by the soils engineer or geologist prior to placing compacted fill.

C. For transition lots from alluvium to terrace, the cut portion of the building pad shall be undercut five feet and replaced as compacted fill to provide a more uniform foundation condition. The undercut area shall include the entire cut portion of the pad.

D. Fill, consisting of soil approved by the soils engineer, shall be placed in horizontal lifts and compacted in six inch layers with suitable compaction equipment. The excavated onsite materials are considered satisfactory for reuse in the controlled fills. Any imported fill shall be observed by the soils engineer prior to use in fill areas. Rocks larger than six inches in diameter shall not be used in the fill.

E. The fill shall be compacted to at least 90 percent of the maximum laboratory density for the material used. Where cohesionless soil (less than 15 percent finer than 0.005 millimeters) is used for fill, it shall be compacted to a minimum of 95 percent relative compaction. The fill should be placed at a moisture content that is at or within 3 percent over optimum. The maximum density and optimum moisture content shall be determined by ASTM D 1557-12 or equivalent.

F. Field observation and testing shall be performed by the soils engineer during grading to assist the contractor in obtaining the required degree of compaction and the proper moisture content. Where compaction is less than required, additional compactive effort shall be made with adjustment of the moisture content, as necessary, until 90 percent compaction is obtained. One compaction test is required for each 500 cubic yards or two vertical feet of fill placed.

G. At one time, the site, existing and former residences may have been serviced by a private sewerage. Private sewage disposal systems generally consist of a septic tank and one or more cesspool or seepage pits. Any seepage pits or cesspools found during grading should be properly abandoned in conformance with the city's guidelines. As a minimum, the liner and debris should be removed to expose the bearing material. The void may then be filled with compacted fill or another approved material.

Fill Slopes

Fill slopes may be constructed at a 2:1 gradient. Compacted fill should be keyed and benched into bedrock, firm alluvium, or terrace, Alternatively fill slopes may be supported laterally by retaining walls. Keyways should be a minimum of 12 feet wide and 5 feet into the approved bearing material as measured on the downhill side. The base of all fills and the axis of drainage courses require subdrains.

Cut Slopes

Cut slopes may be created at a 2:1 gradient to the planned heights shown on the Grading Plan.

Excavation Characteristics

The test pits and borings did not encounter hard, cemented bedrock. Excavation difficulty is a function of the degree of weathering and amount of fracturing within the bedrock. The bedrock generally becomes harder and more difficult to excavate with increasing depth. Hard cemented layers are also known to occur at random locations and depths and may be encountered during foundation excavation. Should a hard cemented layer be encountered, coring or the use of jackhammers may be necessary.

SWIMMING POOL

Swimming pools, if any, may be constructed using conventional designs. The pools should derive support entirely from the compacted fill (easterly canyon) or approved compacted fill or alluvium (westerly canyon) transitions from one bearing to another are not recommended. Thus, for transition lots in the westerly canyon, this may will require over-excavation, the use of a footing, or the use of thickened pool shell. All pool walls located closer than 10 horizontal feet from the face of any descending slope should be designed as free-standing. A hydrostatic relief valve is recommended. If the spa is to be attached to the pool, the spa should be founded at the same depth as the portion of the pool it adjoins.

FOUNDATION DESIGN

General Conditions

The following foundation recommendations are minimum requirements. The structural engineer may require footings that are deeper, wider, or larger in diameter, depending on the final loads.

Spread Footings

Conventional footings may be used to support the proposed structures provided they are founded in approved compacted fill, alluvial terrace or bedrock. Continuous footings should be a minimum of 12 inches in width. Pad footings for all building sites except for the easterly canyon should be a minimum of 24 inches square. Isolated pad footings are not recommended for homes on Lots 11 - 13. The following chart contains the recommended allowable design parameters.

Bearing Material	Minimum Embedment Depth of Footing (Inches)	Vertical Bearing (psf)	Coefficient of Friction	Passive Earth Pressure (pcf)	Maximum Earth Pressure (psf)
Bedrock	12	5,000	0.5	1,000	5,000
Compacted Fill	18	2,000	0.4	300	4,000
Alluvial Terrace	18	2,500	0.4	500	4,500

Increases in the bearing value are allowable at a rate of 20 percent for each additional foot of footing width or depth to the maximum values listed in the table. For bearing calculations, the weight of the concrete in the footing may be neglected.

The bearing value shown above is for the total of dead and frequently applied live loads and may be increased by one third for short duration loading, which includes the effects of wind or seismic forces.

The on-site soils are non-expansive. Footings should be reinforced following the recommendations of the structural engineer. It is recommended that continuous footings be reinforced with a minimum of four #4 steel bars; two placed near the top and two near the bottom of the footings. Footings should be cleaned of all loose soil, moistened, free of shrinkage cracks and approved by the geologist and geotechnical engineer prior to placing forms, steel or concrete.

Footings should not be supported by retaining wall backfill or derive support within the active wedge behind the retaining wall. Foundations adjacent to basements should be deepened below a 1:1 plane projected up from the base of the retaining wall. Alternatively, foundations adjacent to basements may be designed as a grade beam and structurally connected to the wall.

Foundation Settlement

Settlement of the foundation system is expected to occur on initial application of loading. A settlement of ¼ to ½ inch may be anticipated. Differential settlement should not exceed ¼ inch. Differential settlement should not exceed ¼ inch. Differential settlement is not anticipated for the pool supported in the bedrock as recommended above,

Foundation Setback

The Building Code requires that foundations be a sufficient depth to provide horizontal setback from a descending slope steeper than 3:1. The required setback is ⅓ the height of the slope with a minimum of five feet and a maximum of 40 feet measured horizontally from the base of the foundation to the slope face. The setback for pools is half that of other structures, or H/6 with a maximum of 20 feet.

Toe of Slope Clearance

The Building Code requires a level yard setback between the toe of an ascending slope and the rear wall of the proposed structure of one half the slope height to a maximum 15 feet clearance for slopes steeper than 3:1. For retained slopes, the face of the retaining wall is considered the toe of the slope.

RETAINING WALLS

General Design - Static Loading

Cantilevered retaining walls up to 12 feet high that support alluvium, bedrock and approved retaining wall backfill, may be designed for an equivalent fluid pressures shown in the following table. Restrained walls that are pinned at the top by a non-yielding floor should be designed for an at-rest earth pressure. The recommended design at-rest earth pressure on restrained basement walls is an equivalent fluid pressure of 60 pcf.

DESIGN EARTH PRESSURES - CANTILEVERED WALLS

Surface Slope Gradient	Design EFP
Level	35
3:1	38
2:1	43
1.5:1	55

Seismic Surcharge

In conformance with the Building Code, retaining walls higher than 6 feet were considered for seismic loading for the design ground motion resulting from the Maximum Considered Earthquake. The horizontal coefficient of seismic increment (K_E) and seismic increment (P_E) were estimated following procedures by Sitar, N. et. al.,2010, (*Seismic Earth Pressures on Deep Building Basements,* SEAOC 2010 Convention Proceedings). Spectral accelerations at the site were determined for the Maximum Considered Earthquake (MCE) following the procedures in ASCE 7-10 and the 2014 Building Code. The computed PGA_M for this site is 1.059g. The horizontal coefficient of seismic increment (K_E) was assumed to be ⅓(PGA_M) = 0.353g.

The force required in addition to the static design force to raise the safety factor to at least 1.0 (P_E) was checked using a computerized version of the Mononobe-Okabe method. Ground motion was assumed to be 0.353g.

For retaining walls higher than 6 feet designed for an at-rest pressure, an additional seismic surcharge need **not** be added. For retaining walls higher than 6 feet designed for a cantilevered condition, the recommended seismic surcharge is an equivalent fluid pressure of 8 pcf. The seismic surcharge should be applied as a conventional fluid.

Surcharge Loading

Retaining walls that are surcharged by traffic and/or structural loads should be designed to withstand the surcharge. For traffic within 10 feet of retaining walls, the recommended traffic surcharge is 100 psf, distributed evenly over the upper 10 feet of wall. Irvine Geotechnical would be happy to assist the structural engineer in evaluating the surcharge pressure and the point of application from concentrated structural loads.

Subdrain

The recommended design earth pressures assume a free-draining backfill and no buildup of hydrostatic pressures. Retaining walls should be provided with a subdrain or weepholes covered with a minimum of 12 inches of ¾ inch crushed gravel. Not all subdrain systems and pipes are approved by all Building Departments. It is recommended that the Building Department be consulted when using non-conventional systems. The subdrain system should discharge to the atmosphere or to an engineered sump via gravity. Surface drains should not be connected to the subdrain system.

Backfill

Retaining wall backfill should be compacted to a minimum of 90 percent of the maximum density as determined by ASTM D 1557-12. Where access between the retaining wall and the temporary excavation prevents the use of compaction equipment, retaining walls should be backfilled with ¾ inch crushed gravel to within 2 feet of the ground surface. Where the area between the wall and the excavation exceeds 18 inches, the gravel must be vibrated or wheel-rolled, and tested for compaction. The upper 2 feet of backfill above the gravel should consist of a compacted fill blanket to the surface. Retaining wall backfill should be capped with a paved surface drain or a concrete slab.

Foundation Design

Retaining wall footings may be sized per the FOUNDATION DESIGN section of this report.

Freeboard

Retaining walls that support natural slopes should be provided with a minimum of 18 inches of freeboard for slough protection. Retaining walls that support manufactured 2:1 slopes should be provided with a minimum of 12 inches of freeboard for slough protection. An open "V" drain should be placed behind the wall so that all upslope flows are directed around the structures to the street or an approved location.

CRIB-TYPE RETAINING WALLS

Crib-type retaining walls are planned to form the debris basin. Crib-type retaining walls should be designed by an engineer and/or design-build contractor with expertise in large gravity walls intended to impound mud, rocks and debris.

TEMPORARY EXCAVATIONS

Temporary vertical excavations in alluvial terrace and bedrock are stable up to a height of 5 feet. Where vertical excavations in the bedrock and terrace exceed 5 feet in height, the upper portion should be trimmed to 1:1 (45 degrees). Existing fill and alluvium should be trimmed to 1:1 for wall excavations.

A representative of the geotechnical engineer or geologist should be present during grading to see temporary slopes. All excavations should be stabilized within 30 days of initial excavation. Water should not be allowed to pond on top of the excavations nor to flow toward them. No vehicular surcharge should be allowed within three feet of the top of the cut.

CORROSION

The pH of the soils is near neutral and not a factor in corrosion. The chloride content is low and not a factor in design. The sulfate content is negligible and not a factor in concrete design. The resistivity indicates that the soils are corrosive to ferrous metals.

FLOOR SLABS, CONCRETE DECKING AND PAVING

Floor slabs and concrete decking should be cast approved compacted fill. In areas of existing fill, soil, and alluvium, the ground should be prepared and the fill placed in conformance with the SITE PREPARATION section of this report.

Slabs should be at least 4 inches thick and reinforced with a minimum of #4 bars on 16 inch centers, each way. Care should be taken to cast the reinforcement near the center of the slab. Slabs which will be provided with a floor covering should be protected by a polyethylene plastic vapor barrier or other approved moisture barrier.

For performance and concrete curing, it recommended that the vapor barrier be placed over at least two inches of clean sand and then covered by at least two inches of clean sand. The topping sand is intended to prevent punctures during placement of the reinforcing steel and to and aid in the concrete cure.

As an alternative, floor slabs may be constructed in conformance with the Green Building Code that requires slabs be poured directly on top of the vapor barrier, which is to be underlain by four inches of gravel. Since the vapor barrier is to be placed on the gravel, it is important to exercise care to prevent damaging the moisture barrier during construction.

From a geotechnical engineering standpoint, a vapor barrier may be placed over 4 inches of gravel, provided that the vapor barrier is of sufficient strength to resist punctures and tearing. If plastic sheeting is used, this may require a greater than 10 mil thickness. Bentonitic barriers such as Miraclay or Volclay may also be used as long as they conform to the minimum requirements of durability, strength and waterproofing. Vapor barriers should conform to ASTM E 1745 and ACI 302.2R-06 (Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials).

Decking that caps a retaining wall should be provided with a flexible joint to allow for the normal one to two percent deflection of the retaining wall. Decking that does not cap a retaining wall should not be tied to the wall. The space between the wall and the deck will require periodic caulking to prevent moisture intrusion into the retaining wall backfill.

It should be noted that cracking of concrete floor slabs is very common during curing. The cracking occurs because concrete shrinks as it dries. Crack control joints which are commonly used in exterior decking to control such cracking are normally not used in interior slabs. The reinforcement recommended above is intended to reduce cracking and its proper placement is critical to the slab's performance. The minor shrinkage cracks which often form in interior slabs generally do not present a problem when carpeting, linoleum, or wood floor coverings are used. The slab cracks can, however, lead to surface cracks in brittle floor coverings such as ceramic tile. A mortar bed or slip sheet is recommended between the slab and tile to limit, the potential for cracking.

Slabs should be protected with a polyethylene plastic vapor barrier placed beneath the slab. This barrier is intended to prevent the upward migration of moisture from the subgrade soils through the porous concrete slab. It should be noted that vapor barriers are penetrated by any number of elements including water lines, drain lines, and footings. These barriers are therefore not completely watertight. It is recommended that a surface seal be placed on slabs which will receive a wood floor. The floor installer should be consulted regarding an adequate product.

The paving should be placed over a 24-inch thick (minimum) compacted fill cap. The ground should be prepared and the fill placed in conformance with the SITE PREPARATION section of this report. Trench backfill below paving, should be compacted to 90 percent of the maximum dry density. Irrigation water should be prevented from migrating under paving. The following table shows the recommended pavement sections:

Service	Pavement Thickness (Inches)	Base Course (Inches)
Light Passenger Cars	3	0
Moderate Trucks (Storage, etc.)	4	4
Heavy Trucks/Fire Trucks	4	6

Base course should be compacted to at least 95 percent of the maximum dry density.

DRAINAGE

Control of site drainage is important for the performance of the proposed project. Pad and roof drainage should be collected and transferred to the street or approved location in non-erosive drainage devices. Drainage should not be allowed to pond on the pad or against any foundation or retaining wall. The 2013 California Building Code specifies that the grade within 10 feet of the foundation be sloped to drain at a 5 percent gradient away from the building. Drainage should not be allowed to flow uncontrolled over any descending slope. Planters located within retaining wall backfill should be sealed to prevent moisture intrusion into the backfill. Planters located next to raised floor type construction also should be sealed to the depth of the footings. Drainage control devices require periodic cleaning, testing and maintenance to remain effective.

Due to the shallow depth to groundwater in the eastern canyon and the liquefaction potential, and the hydro-consolidation potential in the western canyon, onsite infiltration of surface runoff is not considered feasible.

WATERPROOFING

Interior and exterior retaining walls are subject to moisture intrusion, seepage, and leakage and should be waterproofed. Waterproofing paints, compounds, or sheeting can be effective if properly installed. Equally important is the use of a subdrain that daylights to the atmosphere. The subdrain should be covered with ¾ inch crushed gravel to help the collection of water. Yard areas above the wall should be sealed or properly drained to prevent moisture contact with the wall or saturation of wall backfill.

Construction of raised floor buildings where the grade under the floor has been lowered for joist clearance can also lead to moisture problems. Surface moisture can seep through the footing and pond in the underfloor area. Positive drainage away from the footings, waterproofing the footings, compaction of trench backfill and subdrains can help to reduce moisture intrusion.

PLAN REVIEW

Formal plans ready for submittal to the Building Department should be reviewed by Irvine Geotechnical. Any change in scope of the project may require additional work.

SITE OBSERVATIONS DURING CONSTRUCTION

Please advise Irvine Geotechnical at least 24 hours prior to any required site visit. The agency approved plans and permits should be at the jobsite and available to our representative. The project consultant will perform the observation and post a notice at the jobsite of his visit and findings. This notice should be given to the agency inspector.

During construction, a number of reviews by this office are recommended to verify site geotechnical conditions and conformance with the intent of the recommendations for construction. Although not all possible geotechnical observation and testing services are required by the reviewing agency, the more site reviews requested, the lower the risk of future problems. It is recommended that all grading, foundation, and drainage excavations be seen by a representative of the geotechnical engineer PRIOR to placing fill, forms, pipe, concrete, or steel. Any fill which is placed should be approved, tested, and verified if used for engineering purposes. Temporary excavations should be observed by a representative of the Geotechnical Engineer.

The following site reviews are advised or required. Should the observations reveal any unforeseen hazards, the geologist/engineer will recommend treatment.

Pre-construction meeting	Advised
Temporary excavations	Required
Bottom excavation for removals	Required
Keyway excavations and benching	Required
Subdrains	Required
Compaction of fill	Required
Foundation excavations	Required
Slab subgrade moisture barrier membrane	Advised
Slab subgrade rock placement	Advised
Slab steel placement	Advised
Subdrain and rock placement behind retaining walls	Required
Compaction of retaining wall backfill	Required
Compaction of utility trench backfill	Advised

Irvine Geotechnical requires at least a 24 hour notice prior to any required site visits. The approved plans and building/grading permits should be on the job and available to the project consultant.

FINAL INSPECTION

Many projects are required by the agency to have final geologic and soils engineering reports upon completion of the grading.

CONSTRUCTION SITE MAINTENANCE

It is the responsibility of the contractor to maintain a safe construction site. When excavations exist on a site, the area should be fenced and warning signs posted. All pile excavations must be properly covered and secured. Soil generated by foundation and subgrade excavations should be either removed from the site or properly placed as a certified compacted fill. Soil must not be spilled over any descending slope. Workers should not be allowed to enter any unshored trench excavations over five feet deep.

GENERAL CONDITIONS

This report and the exploration are subject to the following NOTICE. Please read the NOTICE carefully, it limits our liability.

NOTICE

In the event of any changes in the design or location of any structure, as outlined in this report, the conclusions and recommendations contained herein may not be considered valid unless the changes are reviewed by us and the conclusions and recommendations are modified or reaffirmed after such review.

The subsurface conditions, excavation characteristics, and geologic structure described herein and shown on the enclosed cross sections have been projected from excavations on the site as indicated and should in no way be construed to reflect any variations that may occur between these excavations or that may result from changes in subsurface conditions.

Fluctuations in the level of groundwater may occur due to variations in rainfall, temperature, irrigation, and other factors not evident at the time of the measurements reported herein. Fluctuations also may occur across the site. High groundwater levels can be extremely hazardous. Saturation of earth materials can cause subsidence or slippage of the site.

If conditions encountered during construction appear to differ from those disclosed herein, notify us immediately so we may consider the need for modifications. Compliance with the design concepts, specifications or recommendations during construction requires the review of the engineering geologist and geotechnical engineer during the course of construction.

THE EXPLORATION WAS PERFORMED ONLY ON A PORTION OF THE SITE, AND CANNOT BE CONSIDERED AS INDICATIVE OF THE PORTIONS OF THE SITE NOT EXPLORED.

This report is issued and made for the sole use and benefit of the client, is not transferable and is as of the exploration date. Any liability in connection herewith shall not exceed the fee for the exploration. No warranty, expressed or implied, is made or intended in connection with the above exploration or by the furnishing of this report or by any other oral or written statement.

THIS REPORT WAS PREPARED ON THE BASIS OF THE PRELIMINARY DEVELOPMENT PLAN OR CONCEPT FURNISHED. FINAL PLANS SHOULD BE REVIEWED BY THIS OFFICE AS ADDITIONAL GEOTECHNICAL WORK MAY BE REQUIRED.

Irvine Geotechnical appreciates the opportunity to provide our service on this project. Any questions concerning the data or interpretation of this report should be directed to the undersigned.

Respectfully submitted,
Irvine Geotechnical, Inc.

Jon A. Irvine
E.G. 1691/G.E. 2891
R:\ICprojects\IC14073 Ginkgo Stonehouse\IC14073 Ginkgo Stonehouse Report.wpd

Enc: Appendix I - Laboratory Testing by Soil Labworks
- Moisture-Density Relationship (Plate A)
- Shear Test Diagrams (Plates B-1 through B-4)
- Consolidation Diagrams (Plates C1 through C3)

Appendix II - Interpretation of Cone Penetration Data
- Graphic Logs of CPT Soundings (CPT1 - CPT5)
- CPT/SPT Blow Count Correlation Charts (2)

Appendix III - Seismic Refraction Study by Wilson Geosciences
Vicinity Map
Regional Geologic Map
Log of Test Pits 1-16 (16 Pages)
Log of Borings 1-12 (27 Pages)
Calculation Sheets (11)
Liquefaction Analysis Using SPT Data
Seismic Settlement Calculations
Ground Acceleration
Fault Trench Log

In Pocket Geologic Maps (Sheets 1 and 2) & Sections A through H

STATEMENT OF RESPONSIBILITY - SOIL TESTING BY SOIL LABWORKS, LLC

Laboratory testing by Soil Labworks, LLC was performed under the supervision of the undersigned engineer. Irvine Geotechnical and Jon A. Irvine has reviewed referenced laboratory testing report dated December 22, 2005 and the results appear to be reasonable for this area of Sierra Madre at the base of the San Gabriel Mountains. Irvine Geotechnical and the undersigned engineer concurs with the findings of Soil Labworks, LLC and accepts professional responsibility for utilizing the data.

REFERENCES

The following references were reviewed or utilized as guides for preparing this report:

American Society of Civil Engineers (ASCE), 2010, *Minimum Design Loads on Buildings and Other Structures,*
Blake, T. F., 2000, *EQFAULT, ver. 3.00 - A Computer Program for the Deterministic Prediction of Peak Horizontal Acceleration from Digitized California Earthquakes and*

——; 2000, EQSEARCH, ver. 3.00 - A Computer Program for the Estimation of Peak Acceleration from California Earthquake Catalogs

California Building Standards Commission, 2013 California Building Code, Volumes 1-2.

California Geologic Survey, *1986, Guidelines for Preparing Geologic and Seismic Reports;*

——; 1973, *Geology of Parts of the Azuza and Mount Wilson Quadrangles, San Gabriel Mountains, Los Angeles County, California,* by D.M. Morton, Special Report 105;

——; *1986, Guidelines for Preparing Engineering Geologic Reports*;

——, 1996, *Alquist Priolo Earthquake Fault Zones,* Open File Report, 96-08, Appendix A, California Fault Parameters;

——, 1997, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, Special Publication 117;

——, 1998, *Seismic Hazard Evaluation of the Mt. Wilson 7.5-Minute Quadrangle, Los Angeles County, California*, Seismic Hazard Zone Report 030;

——, 1999, *State of California Seismic Hazards Zones, Mt. Wilson Quadrangle, Official Map*;

—. 2008, Special Publication 117A, (*Guidelines for Evaluating and Mitigating Seismic Hazards in California*

Crook, R. Jr., et. al., 1987, *Geologic Map of the Sierra Madre Fault Zone, The Arroyo Seco to Santa Anita Canyon* in Recent Reverse Faulting in the Transverse Ranges, California: United States Geological Survey, Professional Paper 1339, p. 27-63.

Kramer, S.L., 1996, *Geotechnical Earthquake Engineering*

Robertson , P.K., 1997, *Cyclic Liquefaction and its Evaluation Based on the SPT and CPT, 1997*)

—–, 1998, *Cone Penetration Testing, Geotechnical Applications Guide*

—–, 2009, (*Guide to Cone Penetration Testing for Geotechnical Engineering*),

Seed, R. B., et. al., 2003, *(Recent Advances in Soil Liquefaction Engineering: a Unified and Consistent Framework).*

Sitar, N. et. al.,2010, (*Seismic Earth Pressures on Deep Building Basements,* SEAOC 2010 Convention Proceedings).

Southern California Earthquake Center, 2003, *Sierra Madre Fault Zone;*

—–, 2000, *Active Faults in the Los Angeles Metropolitan Region*

—–, March 1999, *Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction Hazards in California.*

—–, February 2002, *Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California.*

Youd, T.L. et. al., (*Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils*, 1998)

SOIL LABWORKS LLC

SL05.372
December 27, 2005

Irvine Geotechnical
145 N. Sierra Madre Boulevard
Suite 12
Pasadena, California 91107

Subject: Laboratory Testing

Site: Grandview and Stone House
Sierra Madre, California

Job: Irvine/Stone House Homes

Laboratory testing for the subject property was performed by Soil Labworks, LLC., under the supervision of the undersigned Engineer. Samples of the earth materials were obtained from the subject property by personnel of Irvine Geotechnical and transported to the laboratory of Soil Labworks for testing and analysis. The laboratory tests performed are described and results are attached.

Services performed by this facility for the subject property were conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions.

Respectfully Submitted:

SOIL LABWORKS, LLC

REGISTERED PROFESSIONAL ENGINEER
JON A. IRVINE
RCE 55005
Exp. 06-30-06
CIVIL
STATE OF CALIFORNIA

JON A. IRVINE
R.C.E. 55005

Enc: Appendix

SOIL LABWORKS LLC

APPENDIX

Laboratory Testing

Sample Retrieval - Drill Rig

Samples of earth materials were obtained at frequent intervals by driving a thin-walled steel sampler conforming to ASTM D 3550-01 with successive drops of a 140 pound hammer falling 30". The earth material was retained in brass rings of 2.416 inches inside diameter and 1.00 inch height. The central portion of the sample was stored in close-fitting, water-tight containers for transportation to the laboratory.

Moisture Density

The field moisture content and dry density were determined for each of the soil samples. The dry density was determined in pounds per cubic foot following ASTM 2937-00. The moisture content was determined as a percentage of the dry soil weight conforming to ASTM 2216-98. The results are presented below in the following table. The percent saturation was calculated on the basis of an estimated specific gravity.

Test Pit/Boring No.	Sample Depth (Feet)	Soil Type	Dry Density (pcf)	Moisture Content (percent)	Percent Saturation (G_s=2.65)
B3	5	Alluvium	108.6	3.3	17
B3	10	Alluvium	112.5	3.1	18
B3	15	Alluvium	115.7	5.2	32
B3	20	Alluvium	112.5	4.8	27
B3	25	Alluvium	119.8	4.7	33
B3	30	Alluvium	115.5	4.8	29
B4	5	Alluvium	116.4	3.3	21
B4	10	Alluvium	114.2	3.0	18
B4	15	Alluvium	124.2	4.0	32
B4	20	Alluvium	117.1	4.6	30
B4	25	Alluvium	116.5	4.3	27
B4	30	Alluvium	111.8	1.9	10
B5	5	Alluvium	109.6	4.8	25
B5	10	Alluvium	119.3	3.0	21

2500 Townsgate Rd., Suite E • Westlake Village, Ca 91361 • 805.370.1338 Fax 805.371.4693

Moisture Density (continued)

Test Pit/Boring No.	Sample Depth (Feet)	Soil Type	Dry Density (pcf)	Moisture Content (percent)	Percent Saturation (G_s=2.65)
B5	15	Alluvium	114.0	3.7	22
B5	20	Alluvium	128.6	3.3	30
B5	25	Alluvium	113.2	4.9	28
B5	30	Alluvium	126.5	5.3	46
B6	5	Alluvium	113.3	4.3	25
B6	10	Alluvium	110.7	4.3	23
B6	15	Alluvium	116.2	6.2	39
B6	20	Alluvium	109.3	11.0	57
B6	25	Alluvium	116.6	7.4	47
B6	30	Alluvium	120.1	9.0	63
B7	5	Alluvium	110.9	7.2	39
B7	10	Alluvium	107.9	6.7	33
B7	15	Alluvium	118.5	7.1	48
B7	20	Alluvium	120.3	9.1	65
B7	25	Alluvium	119.2	5.7	39
B9	5	Alluvium	108.1	4.4	22
B9	10	Alluvium	115.0	6.2	38
B9	20	Alluvium	122.7	14.2	100
B9	25	Alluvium	111.7	19.1	100
B9	30	Alluvium	105.3	20.4	95
B10	5	Alluvium	121.0	5.7	41
B10	10	Alluvium	110.3	6.5	34
B10	15	Alluvium	120.8	3.7	27
B10	20	Alluvium	114.4	5.0	30
B10	25	Alluvium	124.5	5.2	42

Moisture Density (continued)

Test Pit/Boring No.	Sample Depth (Feet)	Soil Type	Dry Density (pcf)	Moisture Content (percent)	Percent Saturation (G_s=2.65)
B10	30	Alluvium	104.5	5.2	24
B11	5	Alluvium	122.9	8.9	68
B11	10	Alluvium	107.3	5.3	26
B11	15	Alluvium	107.5	4.6	23
B11	20	Alluvium	113.8	4.9	29
B11	25	Alluvium	114.9	16.1	97
B11	30	Alluvium	122.5	14.7	100
B12	5	Alluvium	124.8	3.9	32
B12	10	Alluvium	117.9	4.2	28
B12	15	Alluvium	117.5	5.1	34
B12	25	Alluvium	123.8	12.4	98
B12	30	Alluvium	128.2	11.1	100
TP11	6	Terrace	117.3	10.3	67
TP12	6	Terrace	115.4	12.9	79
TP13	7	Terrace	116.1	10.3	64
TP14	14	Bedrock	124.3	6.0	48
TP16	12	Bedrock	128.4	5.4	50

Compaction Character

Compaction tests were performed on bulk samples of the earth materials in accordance with ASTM D1557-02. The results of the tests are provided on the table below and on the "Moisture-Density Relationship", A-Plates. Remolded samples were prepared at 90 percent of the maximum density for shear tests. The remolding procedure consists of selecting a representative sample from a bulk bag and sieving it through a No. 4 sieve. The moisture content of the material is then determined. A formula is then used to calculate the weight of the material that must fit in a ring when compacted to 90 percent of the maximum density. This calculated amount of material is then weighed out and pounded into a ring until all the material is used and the ring is full. The specific gravity of the alluvium was estimated from the compaction curves.

Compaction Character (continued)

Test Pit/Boring No.	Sample Depth (Feet)	Soil Type	Maximum Dry Density (pcf)	Optimum Moisture Content (Percent)
B1	1-5	Alluvium	127.5	9.5

Shear Strength

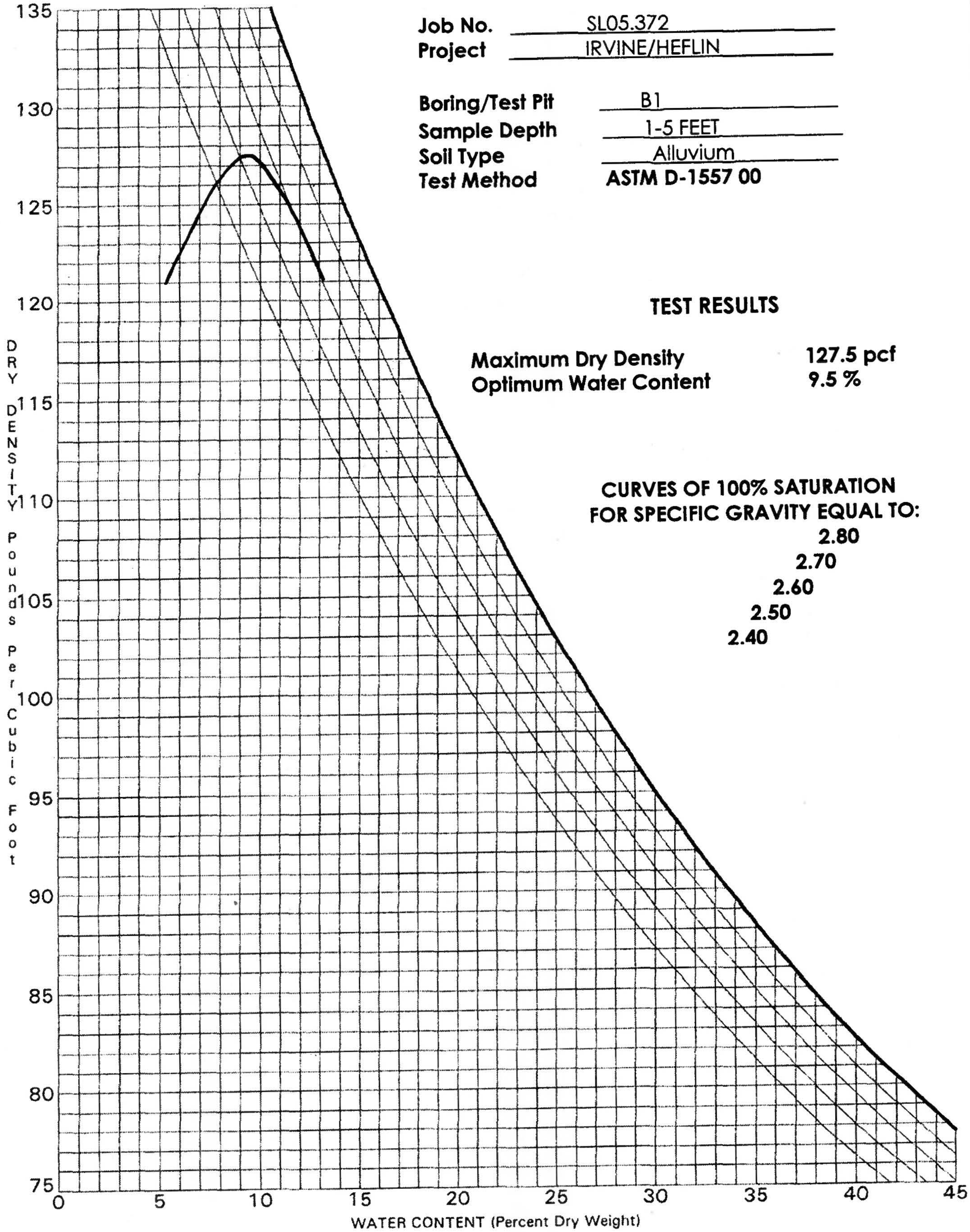
The peak and ultimate shear strengths of the alluvium, terrace and bedrock were determined by performing consolidated and drained direct shear tests in conformance with ASTM D3080-03. The tests were performed in a strain-controlled machine manufactured by GeoMatic. The rate of deformation was 0.01 inches per minute. Samples were sheared under varying confining pressures, as shown on the "Shear Test Diagrams," B-Plates. The moisture conditions during testing are shown on the following table and on the B-Plates. The samples indicated as saturated were artificially saturated in the laboratory. All saturated samples were sheared under submerged conditions.

Test Pit/ Boring No.	Sample Depth (Feet)	Dry Density (pcf)	As-Tested Moisture Content (percent)
B3	5	108.6	18
B7	20	120.3	15
B1*	1-5	114.8	17
TP12	6	115.4	16
TP13	7	116.1	16
TP14	14	124.3	13

* Sample remolded to 90 %of the laboratory maximum density.

Consolidation

One-dimensional consolidation tests were performed on samples of the allvuium in a consolidometer manufactured by GeoMatic in conformance with ASTM D2435-03. The tests were performed on 1-inch high samples retained in brass rings. The samples were initially loaded to approximately ½ of the field over-burden pressure and then unloaded to compensate for the effects of possible disturbance during sampling. Loads were then applied in a geometric progression and resulting deformation recorded. Water was added at a specific load to determine the effect of saturation. The results are plotted on the "Consolidation Test," C-Plates.



Job No. SL05.372
Project IRVINE/HEFLIN

Boring/Test Pit B1
Sample Depth 1-5 FEET
Soil Type Alluvium
Test Method ASTM D-1557 00

TEST RESULTS

Maximum Dry Density	127.5 pcf
Optimum Water Content	9.5 %

CURVES OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

2.80
2.70
2.60
2.50
2.40

MOISTURE-DENSITY RELATIONSHIP

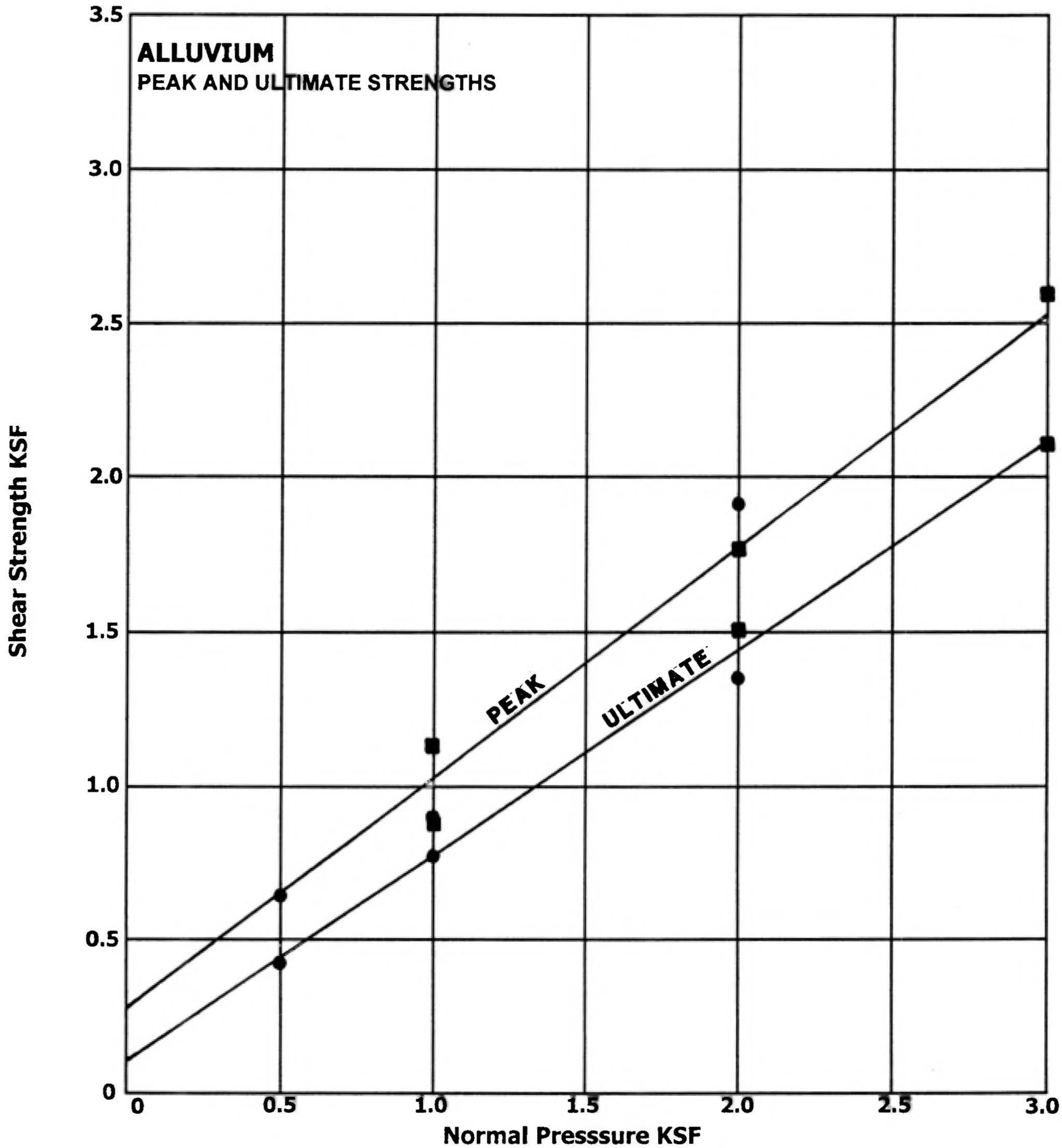
Soil Labworks, LLC

Westlake Village, California

PLATE A

SHEAR TEST DIAGRAM

Project: IRVINE/HEFLIN



○ Direct Shear at Field Moisture

● Direct Shear, Saturated

● B3 @ 5', 108.6 pcf, 18%

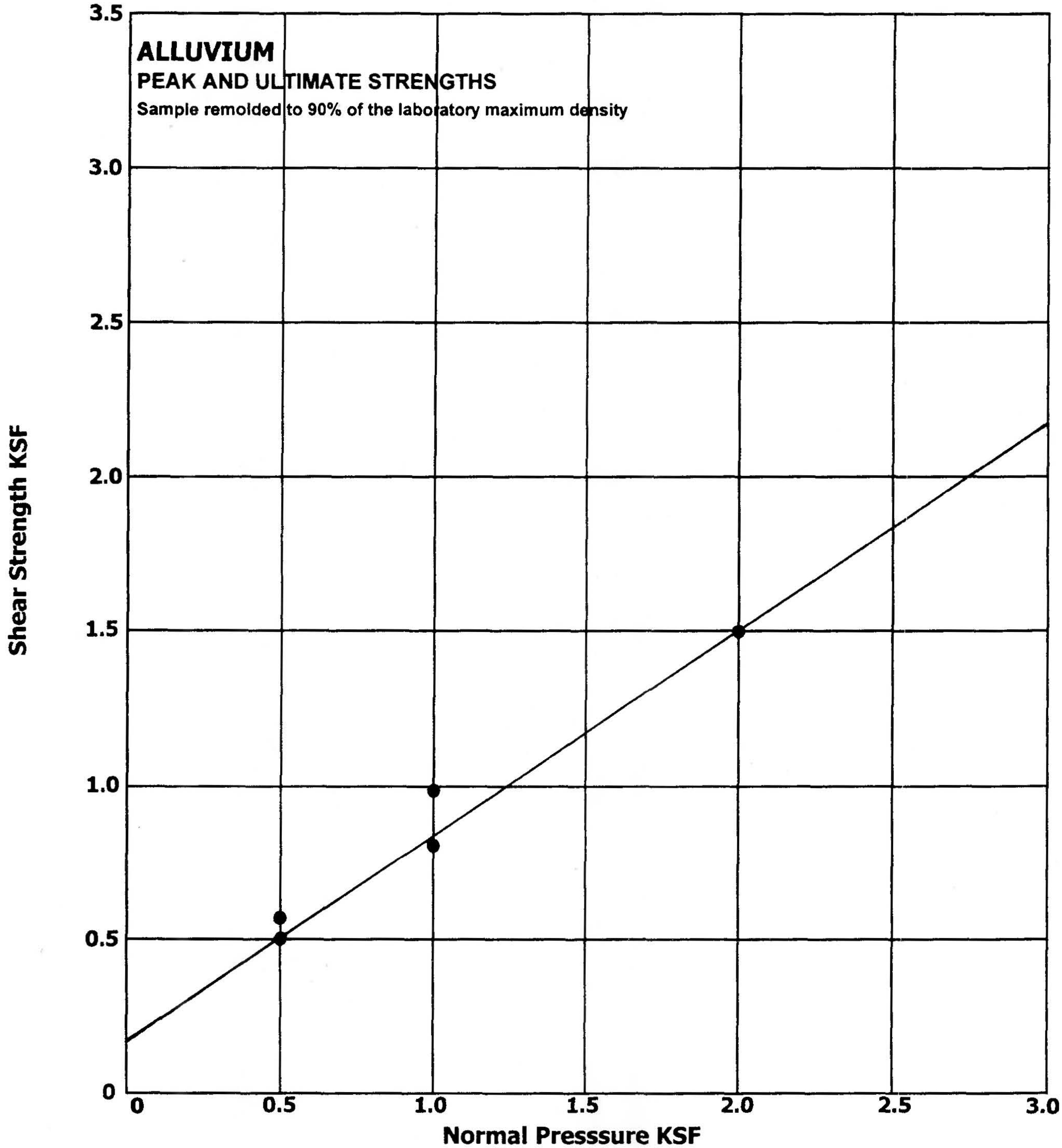
■ B7 @ 20', 120.3 pcf, 15%

SOIL LABWORKS

PLATE B-1

SHEAR TEST DIAGRAM

Project: IRVINE/HEFLIN



○ Direct Shear at Field Moisture

● Direct Shear, Saturated

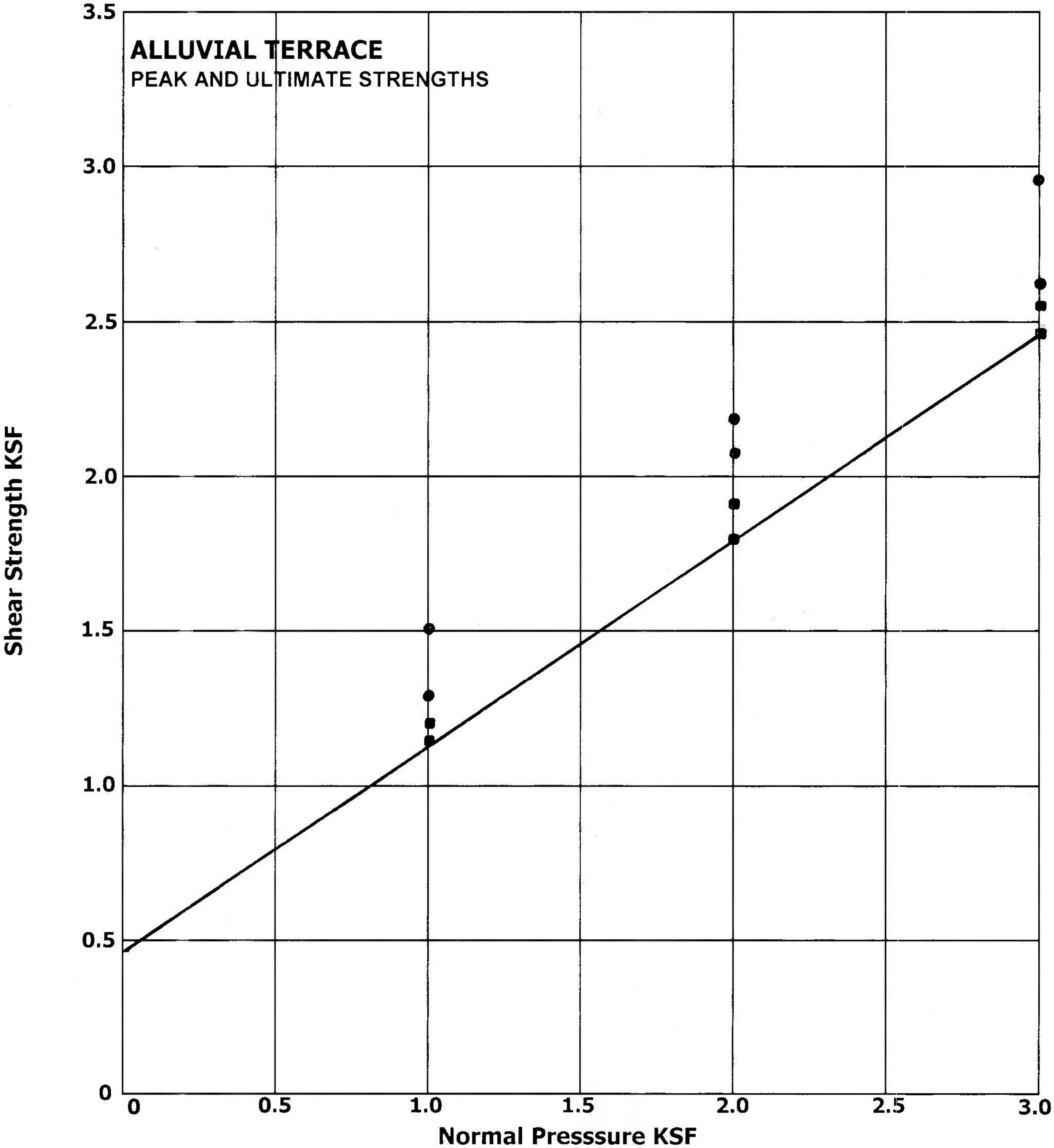
● **B1 @ 1-5', 114.8 pcf, 17%**

SOIL LABWORKS LLC

PLATE B-2

SHEAR TEST DIAGRAM

Project: IRVINE/HEFLIN



○ Direct Shear at Field Moisture

● Direct Shear, Saturated

■ **TP12 @ 6', 115.4 pcf, 16%**

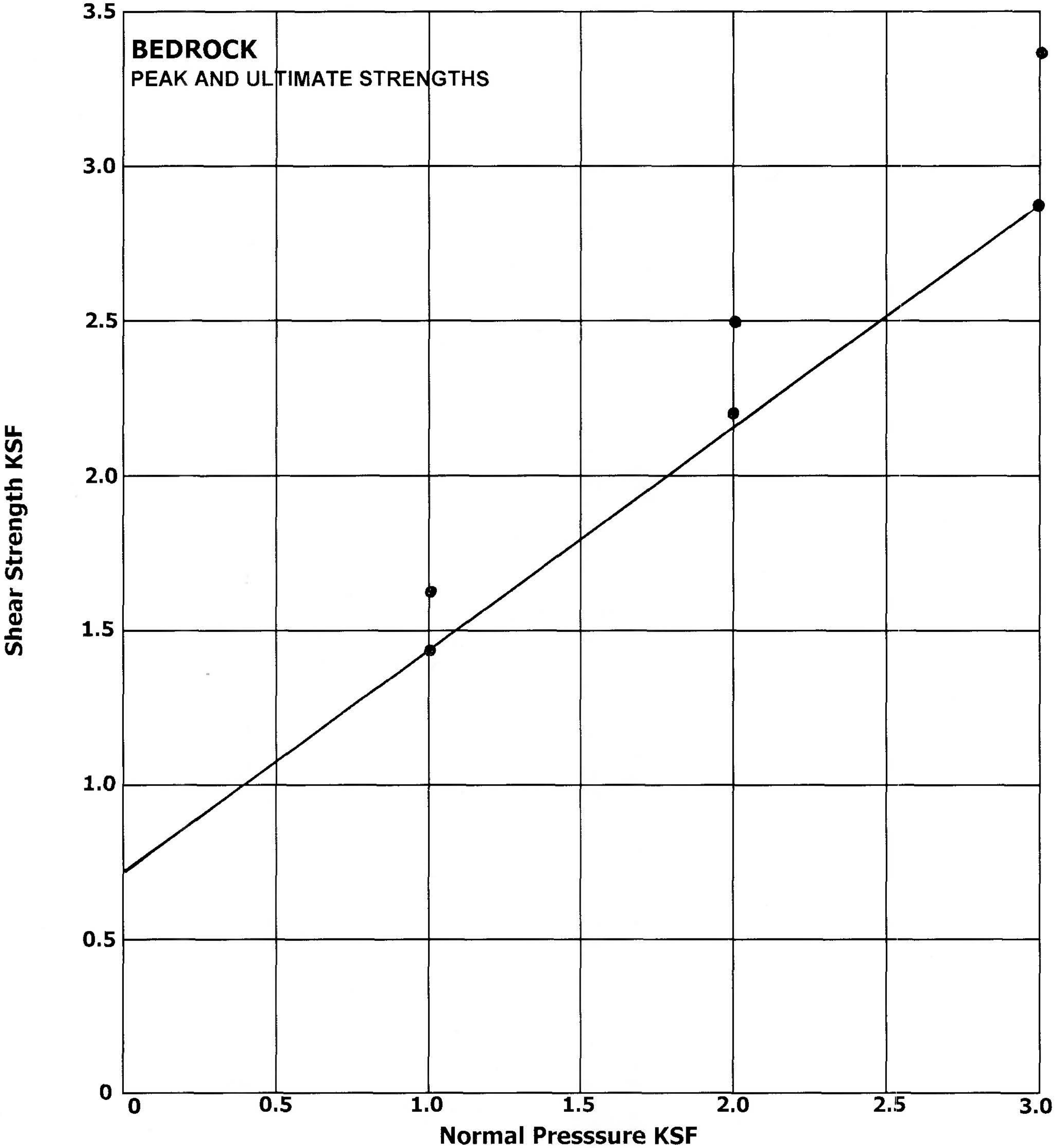
● **TP13 @ 7', 116.1 pcf, 16%**

SOIL LABWORKS LLC

PLATE B-3

SHEAR TEST DIAGRAM

Project: IRVINE/HEFLIN



○ Direct Shear at Field Moisture

● Direct Shear, Saturated

TP14 @ 14', 124.3 pcf, 13%

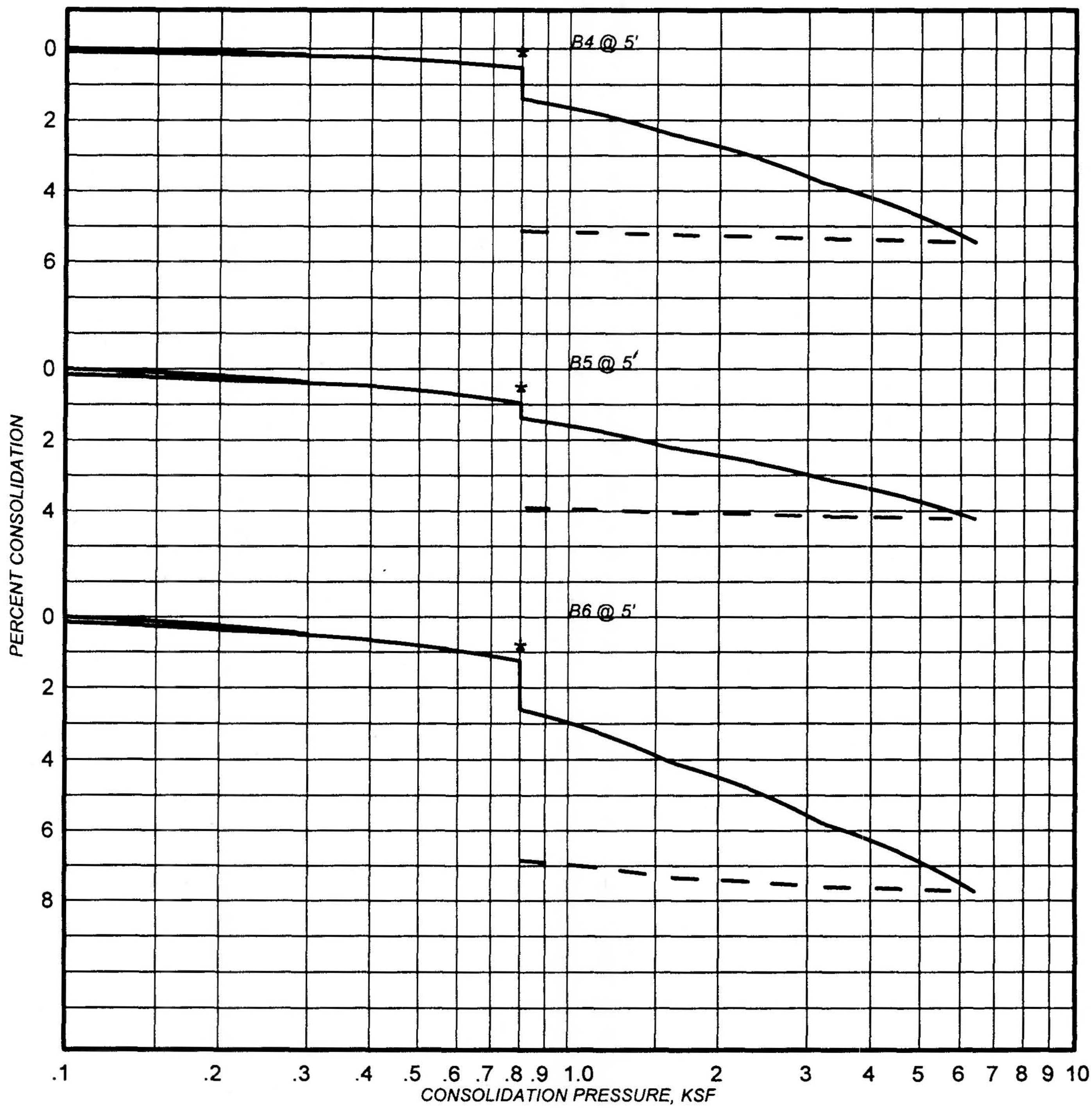
PLATE B-4

CONSOLIDATION TEST

PROJECT: IRVINE/HEFLIN

SAMPLES: B4 @ 5'; B5 @ 5'; B6 @ 5'

ALLUVIUM



* Water Added

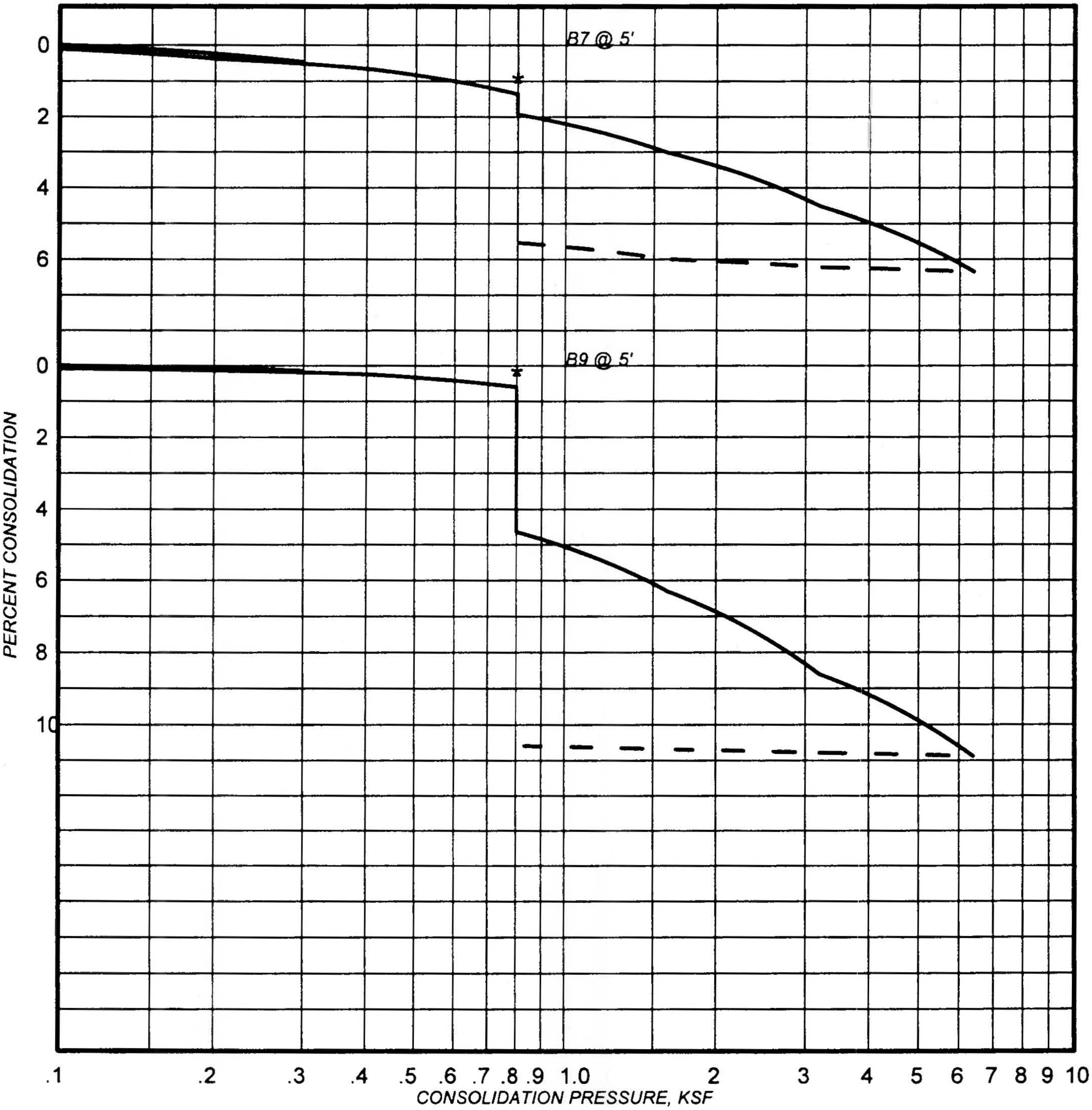
PLATE: C-1

CONSOLIDATION TEST

PROJECT: IRVINE/HEFLIN

SAMPLES: B7 @ 5'; B9 @ 5'

ALLUVIUM



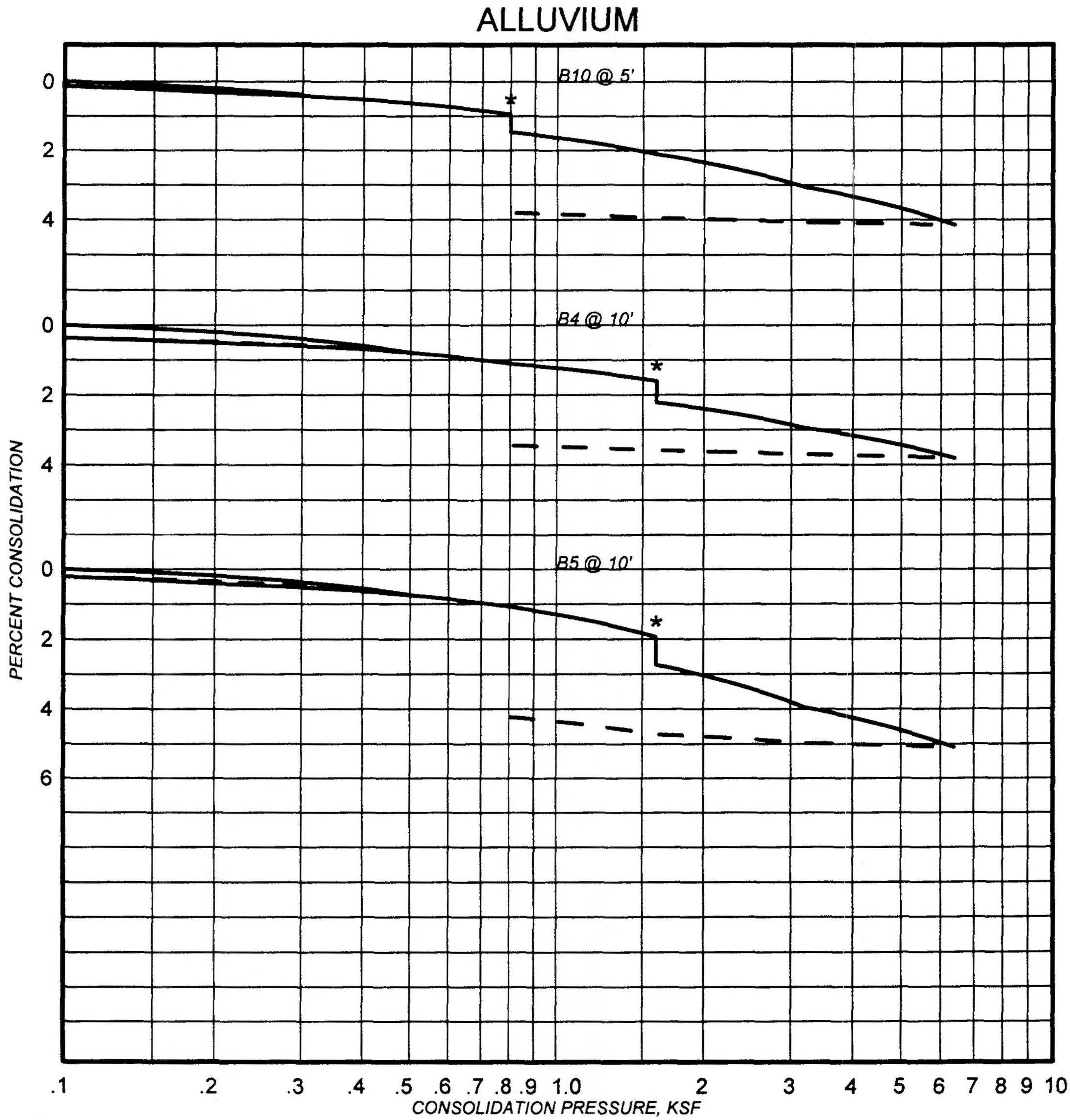
* Water Added

PLATE: C-2

CONSOLIDATION TEST

PROJECT: IRVINE/HEFLIN

SAMPLES: B10 @ 5'; B4 @ 10'; B5 @ 10'



* Water Added

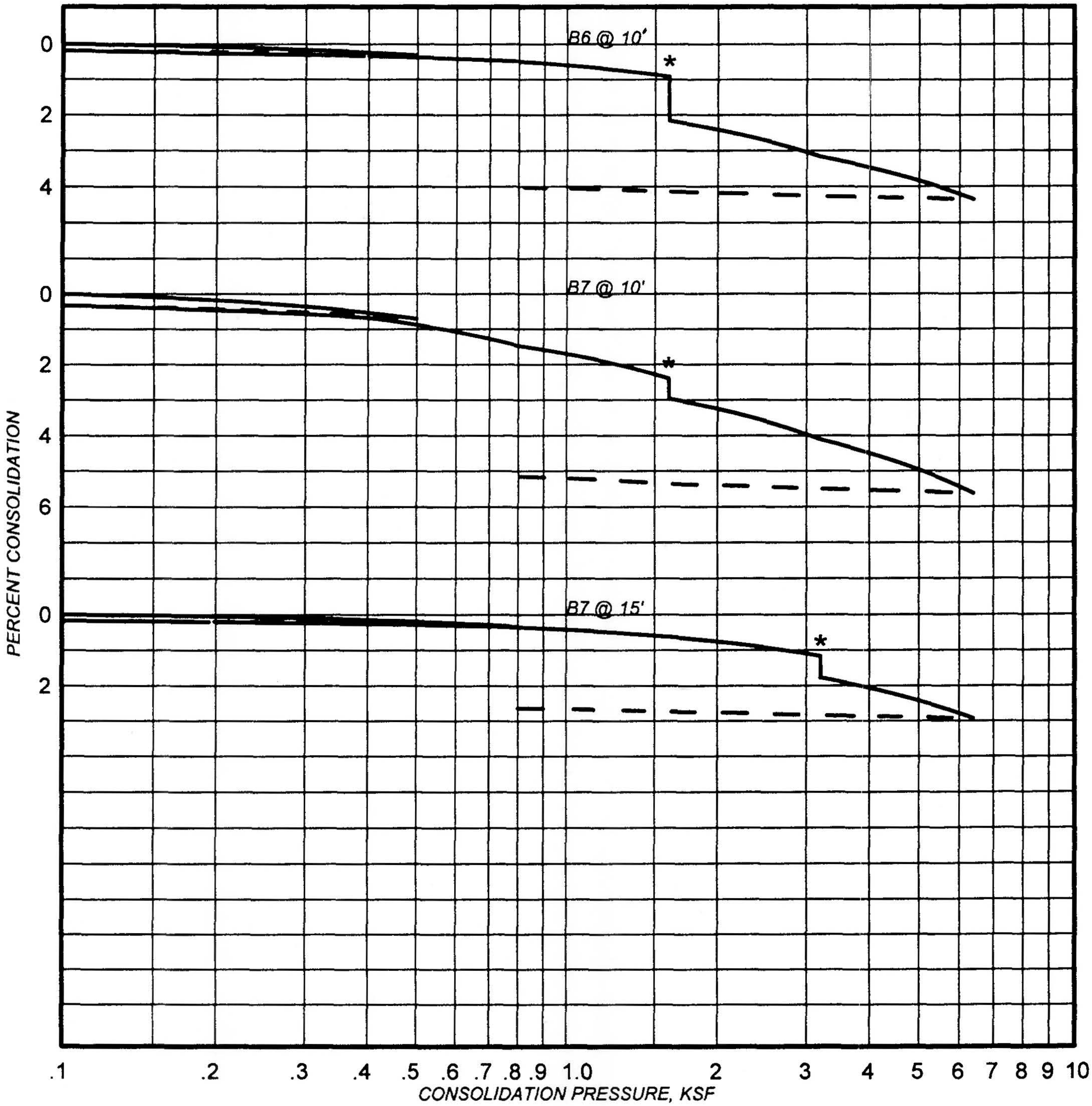
PLATE: C-3

CONSOLIDATION TEST

PROJECT: IRVINE/HEFLIN

SAMPLES: B6 @ 10'; B7 @ 10'; B7 @ 15'

ALLUVIUM



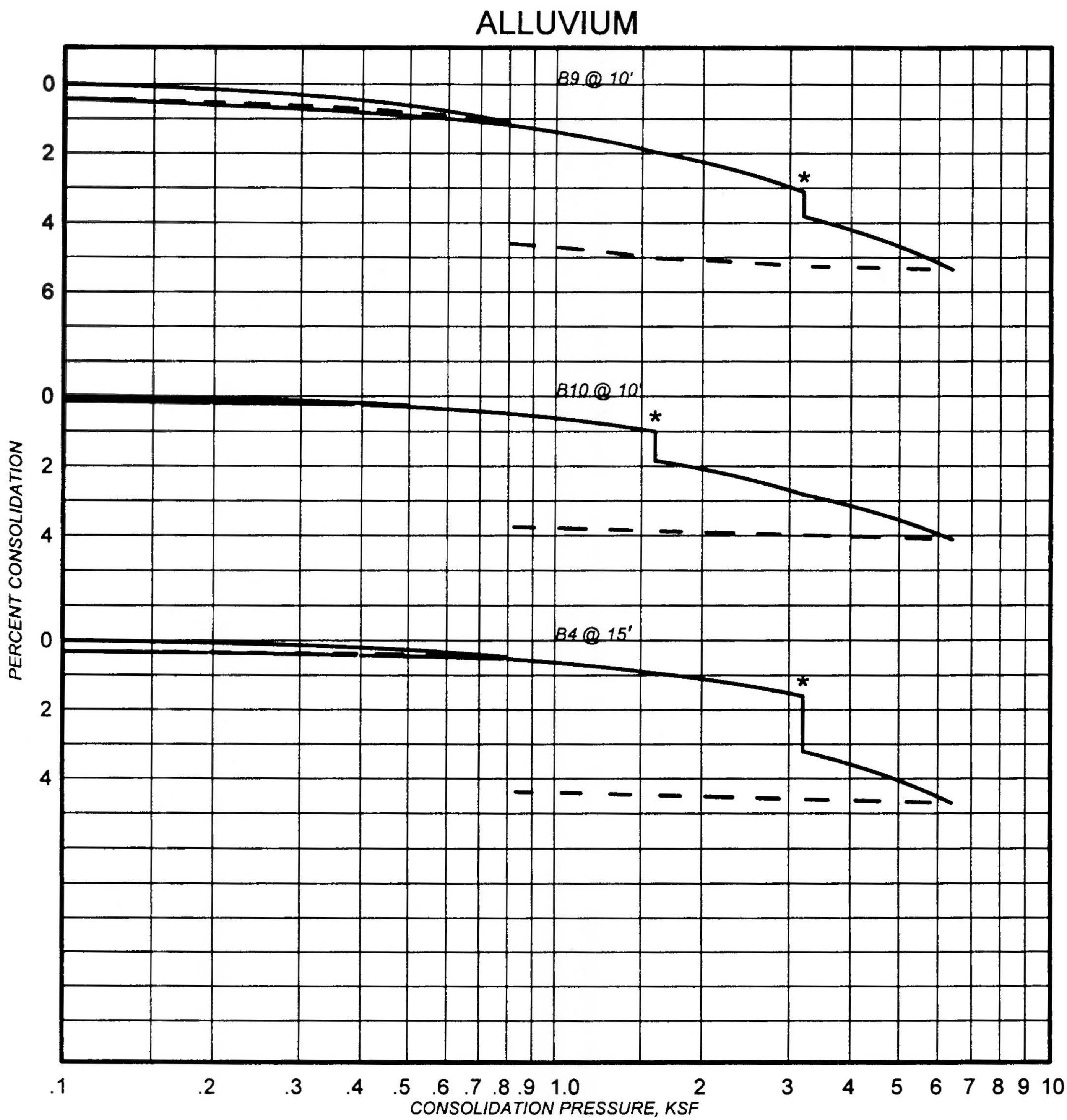
* Water Added

PLATE: C-4

CONSOLIDATION TEST

PROJECT: IRVINE/HEFLIN

SAMPLES: B9 @ 10'; B10 @ 10'; B4 @ 15'



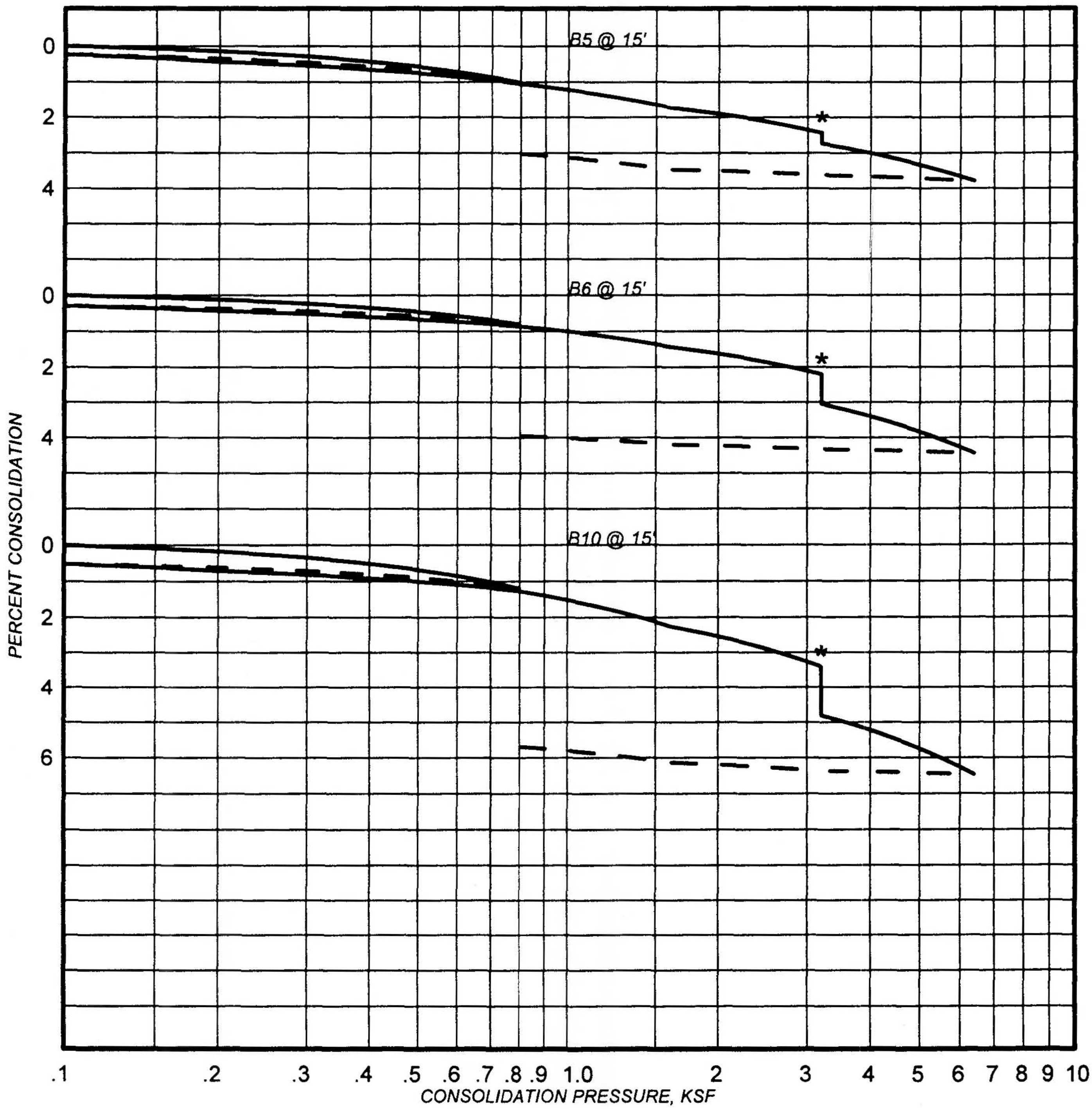
* Water Added

PLATE: C-5

CONSOLIDATION TEST

PROJECT: IRVINE/HEFLIN
SAMPLES: B5 @ 15'; B6 @ 15'; B10 @ 15'

ALLUVIUM



* Water Added

PLATE: C-6

APPENDIX II

INTERPRETATION OF CONE PENETRATION TEST DATA

A Cone Penetration Testing (CPT) program was carried out by Kehoe Testing and Engineering of Huntington Beach, California using an integrated electronic cone system. The CPT soundings were performed in accordance with ASTM standards (D5778-95). A 30 ton capacity cone was used for the soundings. This cone has a tip area of 15 square centimeters and friction sleeve area of 225 square centimeters. The cone is designed with an equivalent end area friction sleeve and a tip end area ratio of 0.85.

The cones used during the program recorded the following parameters at 2.5 cm depth intervals:

- Tip Resistance (Qc)
- Sleeve Friction (Fs)
- Dynamic Pore Pressure (Ut)
- Depth
- Inclination

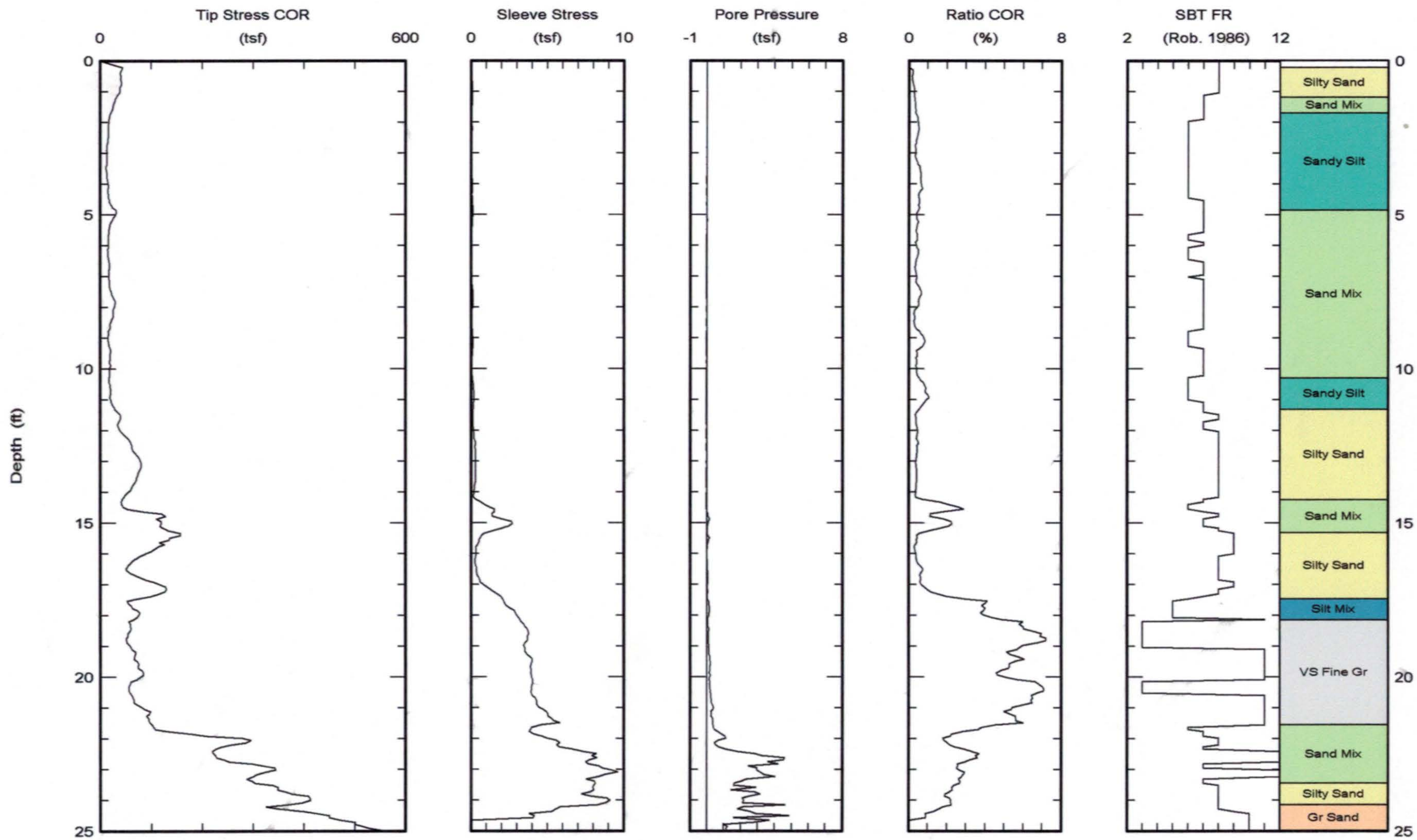
The above parameters were printed simultaneously on a printer and stored on a computer diskette for analysis and reference.

The pore water pressure element, which is 5.0 mm thick and consists of porous plastic, is located directly behind the cone tip. Each of the elements were saturated in glycerine under vacuum pressure prior to penetration. A complete set of baseline reading was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

The cone was pushed using Kehoe's CPT rig, having a down pressure capacity of approximately 30 tons. Five CPT soundings were performed on August 30, 2005 to depths of 25 to 50 feet below the ground surface. The test locations and depths were verified in the field by the personnel of Irvine Geotechnical.

The cone penetration test data were averaged into one foot increments using the computer program CPTINT, version 5.0 developed by Wang and Greig of the Civil Engineering Department of the University of British Columbia, 1991. The averaged data were interpreted by the project engineer following procedures by P. K. Robertson, 1998 (*Cone Penetration Testing, Geotechnical Applications Guide*). The results are presented in tabular and graphical form. Penetration depths are referenced to existing ground surface. The stratigraphic interpretation is based on relationships between cone bearing (Qt), sleeve friction (Fs), and penetration pore pressure (Ut). The friction ratio (Rf), which is sleeve friction divided by cone bearing, is a calculated parameter which is used to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone bearing and generate large excess pore water pressures. Cohesionless soils (sands) have low friction ratios, high cone bearing and generate little in the way of excess pore water pressures. It should be noted that it is not always possible to clearly identify a soil type based on Qt, Fs and Ut. In these situations, experience and judgement and an assessment of the pore pressure dissipation data should be used to infer the soil behavior type.

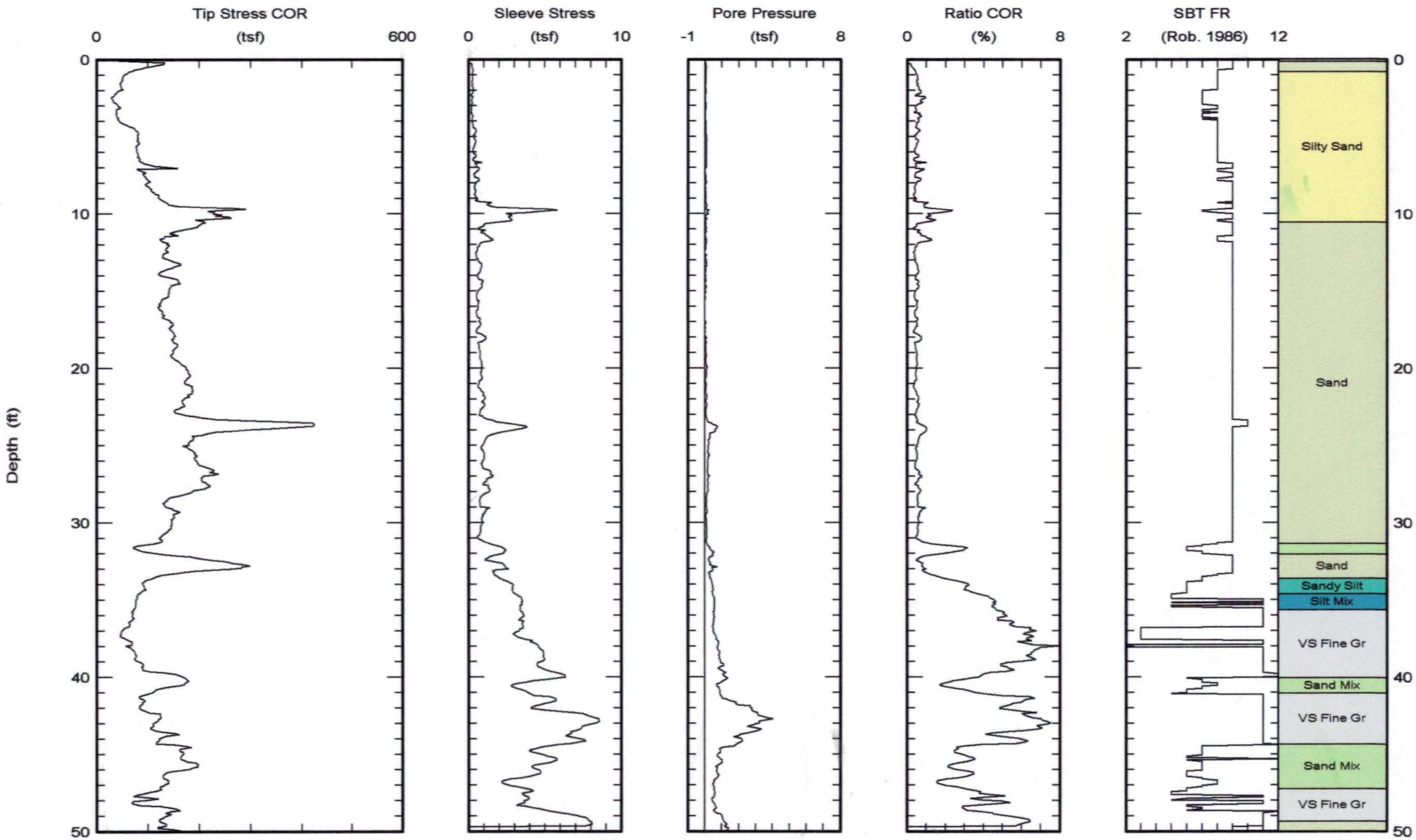
Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 10/Aug/2005 Test ID: CPT-1 Project: SierraMadre
	Client: Irvine Job Site: StoneHouse/Grandview	



Maximum depth: 24.99 (ft)

Test ID: CPT-1
File: Z10G0501C.ecp

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 10/Aug/2005 Test ID: CPT-2 Project: SierraMadre
	Client: Irvine Job Site: StoneHouse/Grandview	



Maximum depth: 50.05 (ft)

Page 1 of 2

Test ID: CPT-2

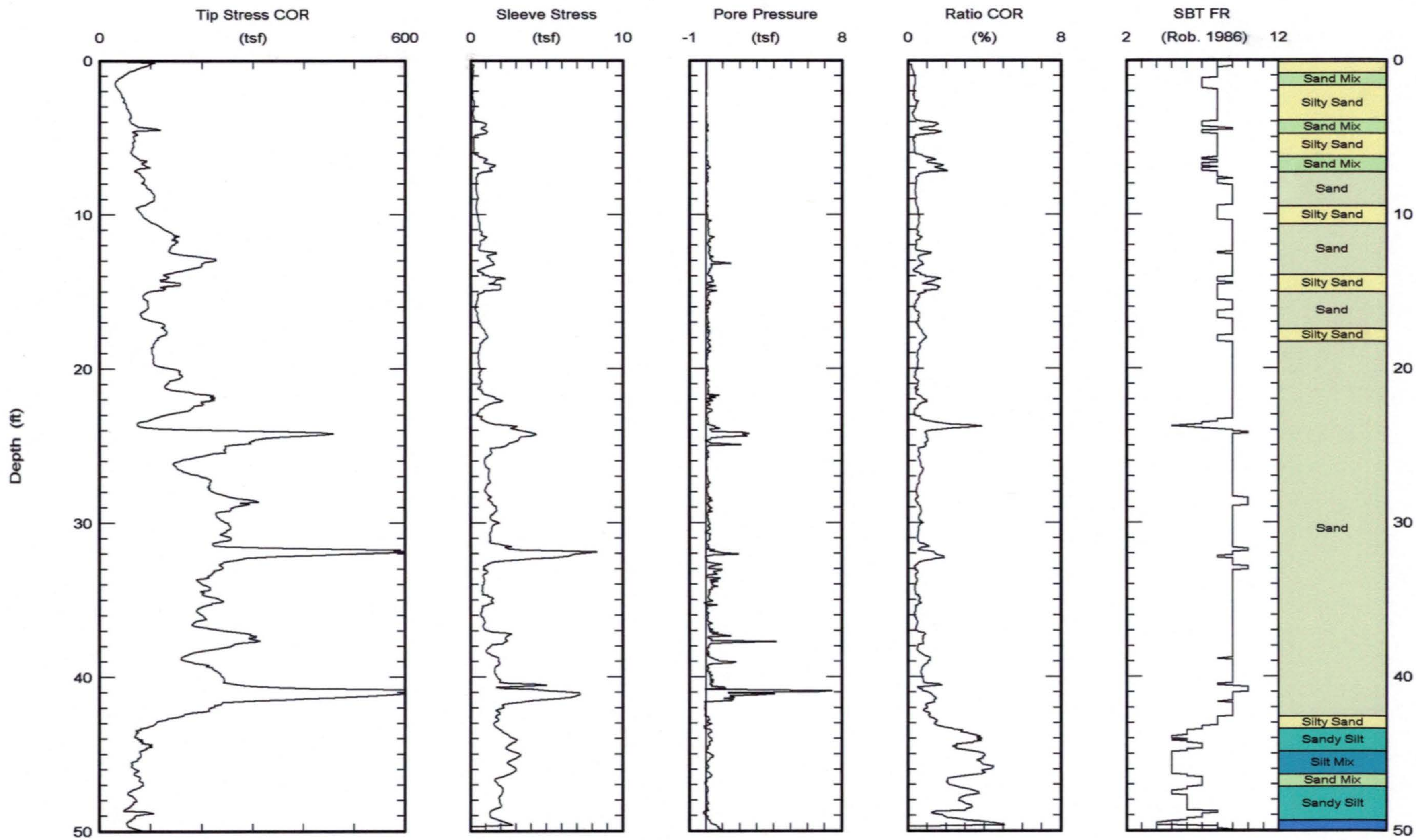
File: Z10G0502C.ecp

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
skehoe@msn.com

CPT Data
30 ton rig

Date: 10/Aug/2005
Test ID: CPT-3
Project: SierraMadre

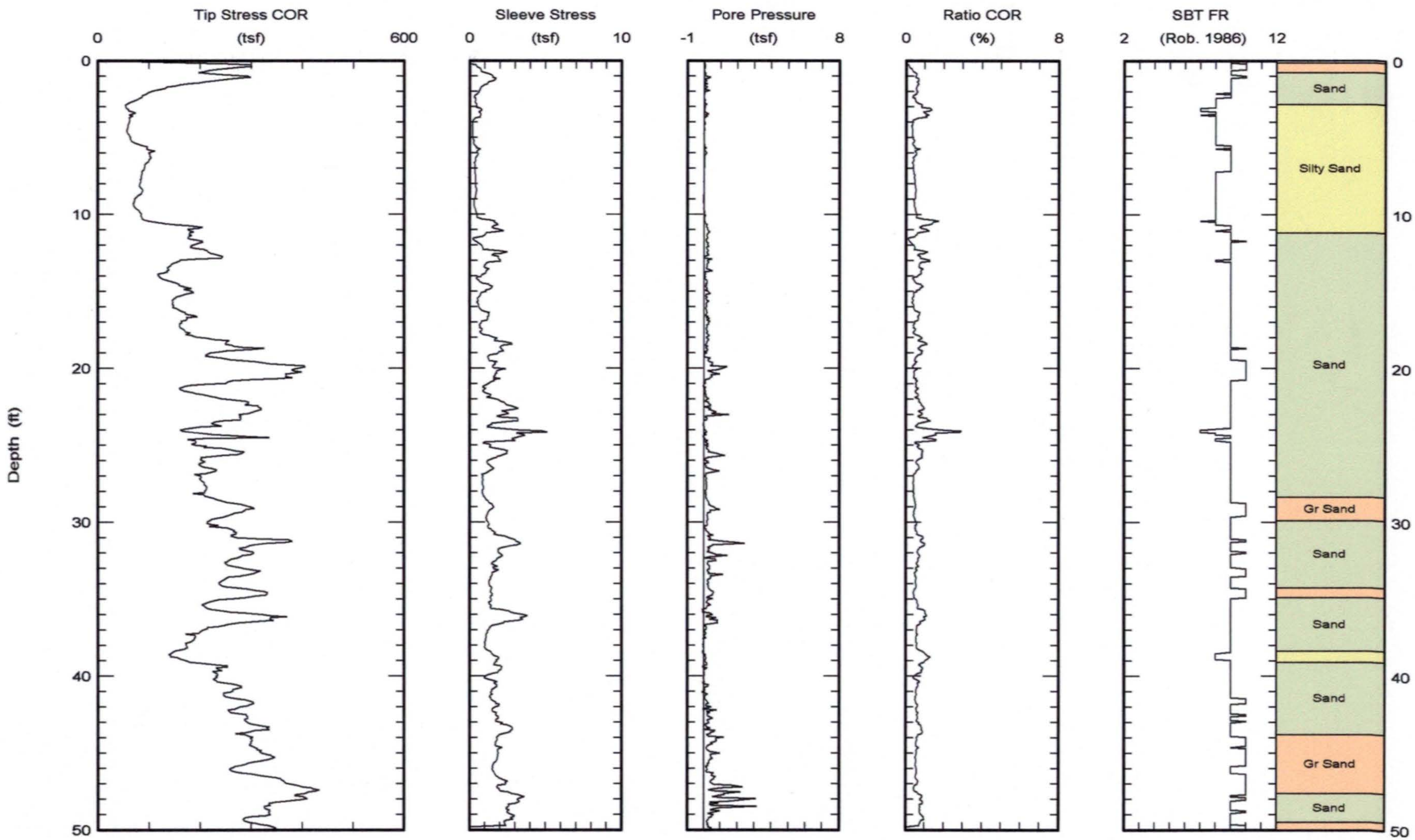
Client: Irvine
Job Site: StoneHouse/Grandview



Maximum depth: 50.02 (ft)

Test ID: CPT-3
File: Z10G0503C.ecp

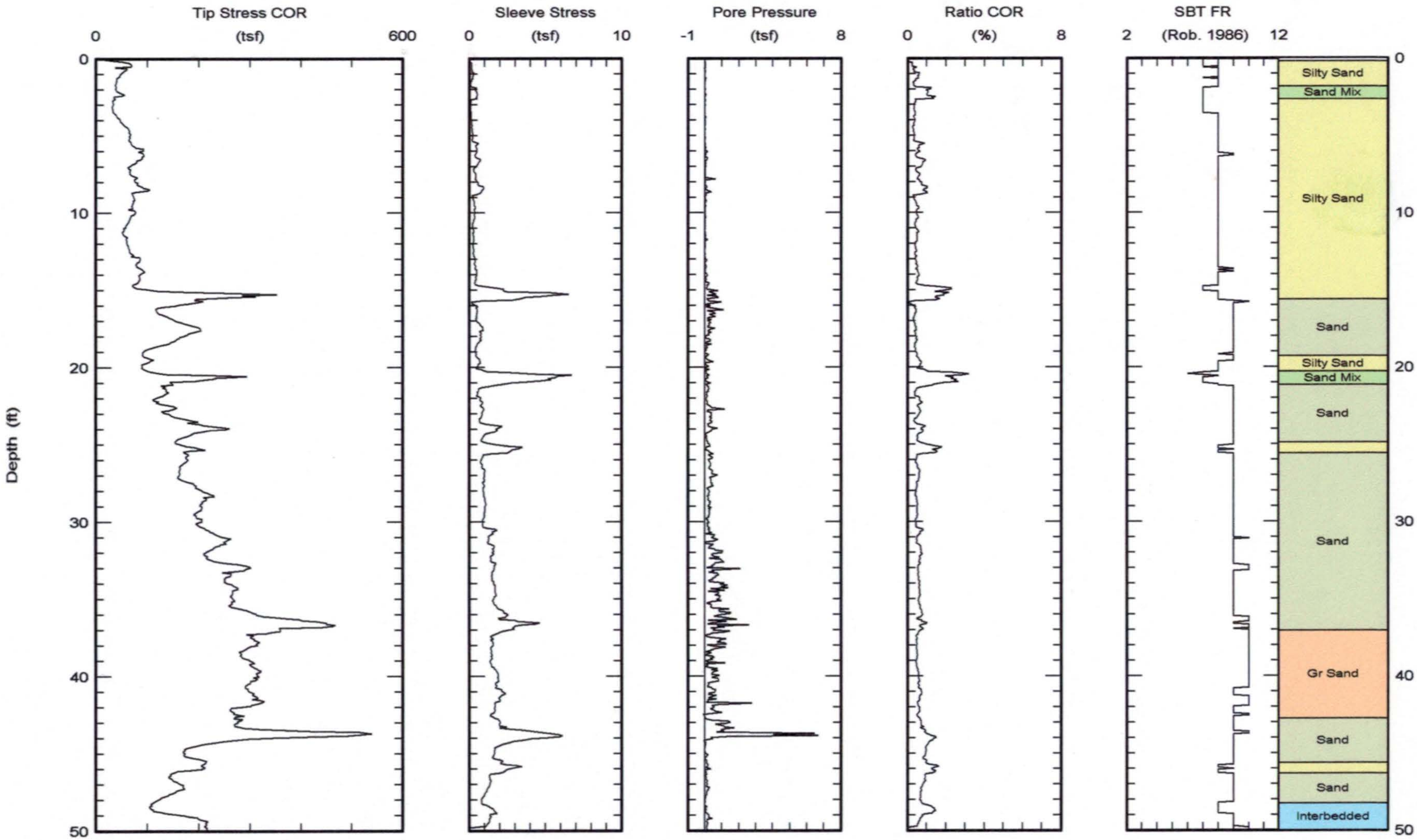
Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 10/Aug/2005 Test ID: CPT-4 Project: SierraMadre
	Client: Irvine Job Site: StoneHouse/Grandview	



Maximum depth: 50.10 (ft)
Page 1 of 2

Test ID: CPT-4
File: Z10G0505C.ecp

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 10/Aug/2005 Test ID: CPT-5 Project: SierraMadre
	Client: Irvine Job Site: StoneHouse/Grandview	



Maximum depth: 50.09 (ft)

Page 1 of 2

Test ID: CPT-5

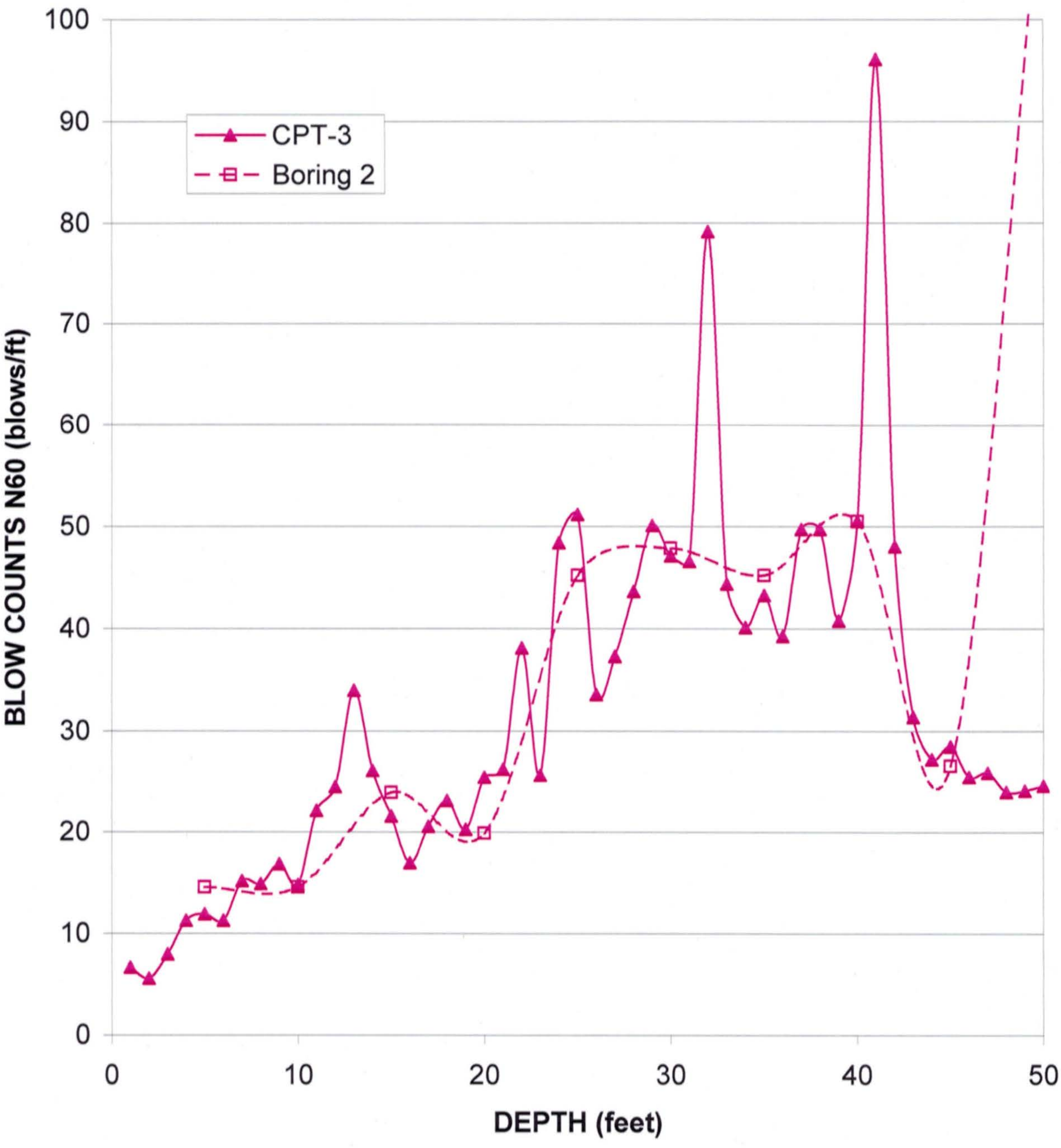
File: Z10G0506C.ecp

IRVINE GEOTECHNICAL
SOIL LABWORKS, LLC

CPT/SPT BLOW COUNT

JB:	05099-I	CONSULT:	JAI
CLIENT:	STONEHOUSE HOMES, LLC		
CORRELATION SHEET #	2		

SPT N_{60} BLOW COUNT CORRELATION



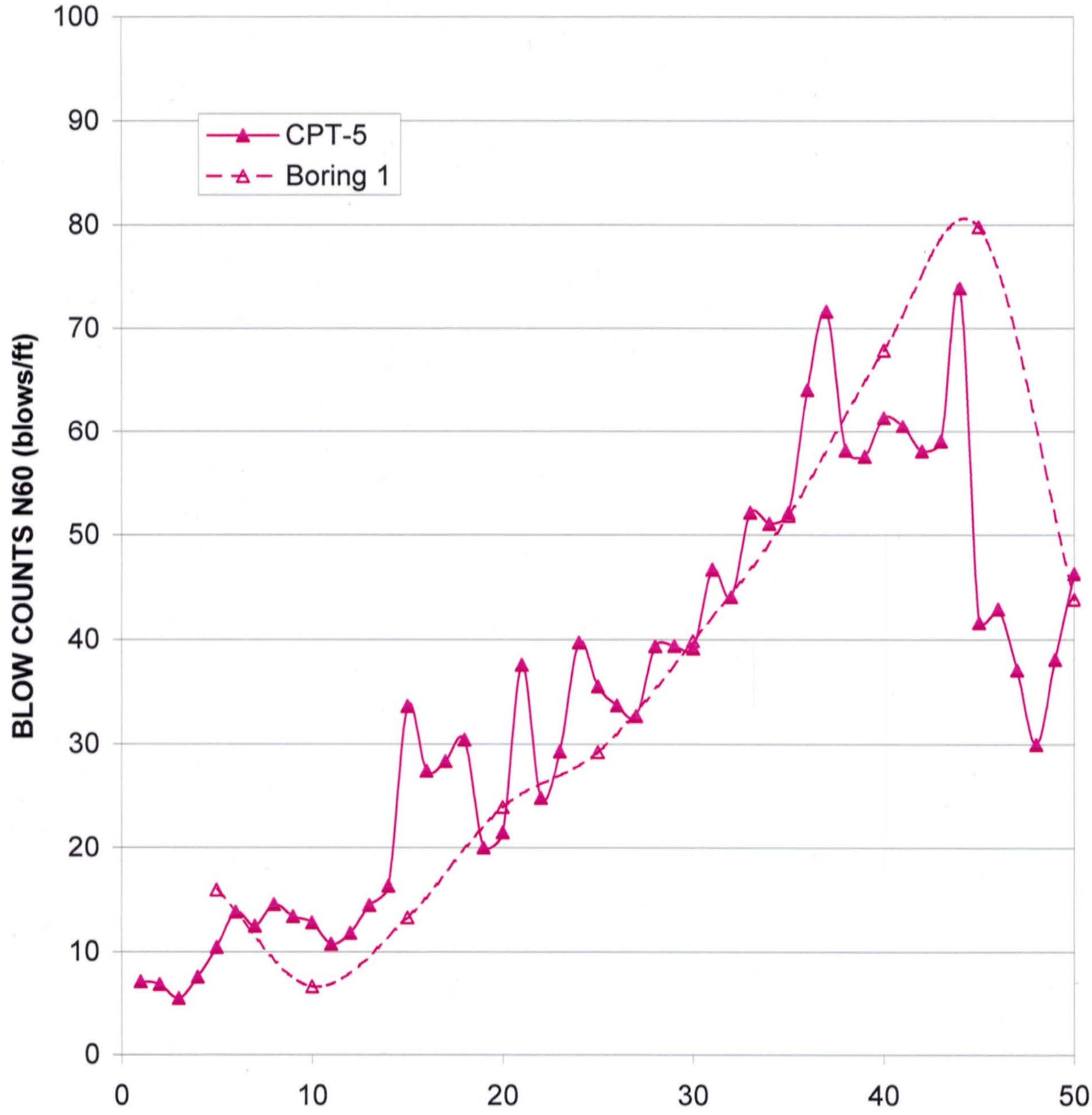
IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

CPT/SPT BLOW COUNT

JB: **05099-I** CONSULT: **JAI**
CLIENT: **STONEHOUSE HOMES, LLC**

CORRELATION SHEET # **1**

SPT N_{60} BLOW COUNT CORRELATION



APPENDIX III

TECHNICAL REPORT

SEISMIC REFRACTION INVESTIGATION NORTHWEST OF THE INTERSECTION OF GRANDVIEW AND STONEHOUSE, SIERRA MADRE, CALIFORNIA

Prepared for:

Irvine Geotechnical
145 N. Sierra Madre Blvd., Suite 12
Pasadena, CA 91107

Prepared by:

Wilson Geosciences, Inc.
Altadena, California 91001-2117
626 791-1589 (v)
626 791-2634 (f)
wilsongeo@earthlink.net

September 2005
(Revised January 2006)

SIERRA MADRE QUADRANGLE, USGS, 1928

TABLE OF CONTENTS

WILSON GEOSCIENCES
Engineering and Environmental Geology

September 7, 2005
(Revised January 3, 2006)

Jon A Irvine, PE CEG
Irvine Geotechnical
145 N. Sierra Madre Blvd., Suite 12
Pasadena, CA 91107

Subject: **SITE EVALUATION: Seismic Refraction Investigation Northwest of the Intersection of Grandview Avenue and Stone House Road, Sierra Madre, California**

Dear Mr. Irvine:

INTRODUCTION

Objectives, Scope of Work, and Approach

This report presents the results of a seismic refraction survey investigation to assist Irvine Geotechnical in its evaluation of a branch of the Sierra Madre fault that is inferred (Crook et al, 1987) to cross the southern portion of the subject property. Irvine Geotechnical requested the study for the subject property, which may have a future use for residential construction. The investigation evaluated the seismic velocity characteristics of the southern end of the property (study area) and provides a geologic interpretation the seismic refraction results to assist in the evaluation of the potential for a significant branch of the Sierra Madre fault to pass through the property.

Seismic refraction geophysical surveys "image" the subsurface and define the compressional wave velocity of the buried layers; this information may be useful to locate possible faulted and unfaulted zones in the geologic deposits corresponding to the velocity layers. Recent seismic refraction surveys in the in Sierra Madre near the study area have identified young and older alluvial fan deposits over Wilson Diorite or gneissic basement rock. The contact between the alluvial units and the alluvium and weathered or slightly weathered basement can be clear on the seismic refraction records. This branch of the Sierra Madre fault is thought by some to be an active branch that is characterized by tens to a few hundred feet of reverse slip on a north-dipping fault plane placing older basement rock on the north over alluvium on the south. The technical objectives of this study were to delineate the top of crystalline basement rock and to delineate overlying alluvial layer contacts within a depth of about 80- to 100-feet as a means to assist in determining if these contacts have been affected by faulting.

Wilson Geosciences Inc. (WGI) proposed and completed the following scope items, a) review the available geologic mapping pertaining to the study area, b) plan and conduct five individual seismic refraction survey spreads along a single profile line (Figure 1), and c) prepare this report describing the study scope, data, analysis, and results.

Several geophysical methods, while indirect and subject to interpretation, can provide a representation of subsurface stratigraphy and geologic structure. The seismic refraction geophysical method was selected for this study. Seismic refraction has depth limitations without the use of explosives; it cannot recognize low velocity zones under higher velocity materials, and dipping features are often difficult to resolve. These limitations aside, the method has proven successful for defining near-horizontal layers in an alluvial fan environment, and for helping to delineate alluvial contacts with underlying bedrock formations.

Subsurface stratigraphy can be represented by the seismic velocity layering, so-called seismic stratigraphy. Because the measurement of seismic compressional wave velocity does not correlate 100 percent to physical lithology (e.g., clay versus sand, weathered granite versus cemented old alluvium), if these seismic velocity contrasts are not large (>15 percent) the results average together ("lump") layers of similar velocity.

WGI proposed three optional approaches to the seismic data acquisition, each providing a different "imaging" resolution and/or geophone spacing. Irvine Geotechnical selected the single line, higher resolution option and a location through the more central portion of this southern section of the property (Figure 1). The selected seismic refraction profile line covers the study area oriented within a few degrees of north-to-south. The 460-foot long profile line (profile 1) consisted of four 115-foot long seismic "spreads" laid end-to-end. Due to a potential interpretation ambiguity after initial interpretation of this profile, it was decided to add an additional 230-foot spread (profile 2; 10-foot geophone spacing) to trace the crystalline basement rock along the two southernmost original spreads of profile 1 where it was absent. This added spread location is also shown on Figure 1.

Energy input into the ground was with a 20-pound sledgehammer on a steel plate along the line, and a 1000-pound weight drop at the southernmost geophones and approximately 50- to 100-feet from the north ends of each spread and the south end of profile 2. Seismic waves were recorded on 24-geophones along each profile and stored in the engineering seismograph for later processing and analysis.

Data Sources and Report Content

General geologic maps by Dibblee (1989) and Crook et al (1987) were available to characterize the geology of the study area at the time the study was planned. Following data collection and initial interpretation, Irvine Geotechnical provided Cone Penetration Test (CPT) data for the study area (Irvine Geotechnical, 2005). Boring locations were provided, but without boring results. The geophysical report (Appendix B) provides Survey Limitations to which we subscribe. Conclusions and recommendations, and other information contained in this report, are based upon the assumption that subsurface conditions do not vary appreciably between and adjacent to the data points and profiles discussed in this report. It must be recognized that variations can occur. In addition, where it is practical, fault trenching investigations or closely spaced, continuously sampled borings would provide a higher degree of confidence for conclusions regarding fault locations and fault activity.

This report contains a brief summary of the study area geologic setting, a discussion of the data available from previous studies at or near the study area, and results and conclusions, followed by a listing of references cited in the report. Appendix A contains all report figures and Appendix B contains the description of the geophysical survey and results.

SUMMARY OF THE GEOLOGIC SETTING

The subject study area is at the immediate southerly edge of the San Gabriel Mountains (Figure 2; USGS, 1995). It is on the northeastern edge of an alluvial fan deposited from the mountains on the north into the valley on the south (Figure 2). Late Pleistocene- and Holocene-age deposits underlie the subject study area (e.g., possibly Quaternary alluvial units Qal_1, Qal_{3f}, and Qal_4 per Crook et al, 1987; Figure 3). These deposits consist primarily of sand and silty sand with gravel and cobbles. Artificial fill is likely present as locally thin, isolated deposits across the study area. Crystalline basement rock (metamorphic gneiss and igneous Wilson Diorite) is present north-northwest of the study area. Depth to the relatively high seismic velocity encounter under the study area (5850-feet per second [fps] as detected in the seismic refraction survey profiles) indicates basement rock varies from 35±3-feet to 97±10-feet beneath the study area.

The Sierra Madre fault zone is the nearest active or potentially active fault (Figures 3A and 3B) of concern to the study area. This is an east-west trending fault zone, with three fault segments present in the area north (2 segments) and within (one segment) the subject study area (Crook et al, 1987; Figure 3). The nearest fault segment mapped by Crook et al is through the central portion of the study area and was a potential target for the seismic refraction study. Where shown on maps as solid lines, the fault is exposed at the surface and the location is considered accurate. A dashed line indicates an approximate location, and a dotted (or short dash) line symbol (such as for the segment through the subject study area) indicates the fault is buried and the inferred location is considered approximate.

SEISMIC REFRACTION SURVEY RESULTS

The following discussion addresses the two seismic refraction profiles beginning with profile 1 comprised of four 115-foot long end-to-end spreads and profile 2 consisting of a single 230-foot long spread (Figure 4). Both profiles were interpreted to provide a unified cross-section (near north-to-south) of the longitudinal aspect of buried canyon/alluvial fan underlying the study area. The unified cross-section provides the seismic layer velocities, which have been interpreted to represent the geologic units under the study area.

Figure 5 is the unified cross-section showing the seismic stratigraphy and the interpretation of corresponding geologic units associated with profiles 1 and 2 trending near north-to-south along the central portion of the study area. A relatively thin (4 to 20 feet) younger alluvium layer covers the study area along the entire length of the cross-section. Its seismic velocity varies from 1130 feet per second (fps) to 1490 fps and should represent Qal_1 of Crook et al (1987), although Crook shows a more restricted surface distribution. The seismic data allowed separation of the Qal_1 into 5 velocity zones along the cross-section that appear to represent lateral variations in lithology (e.g., greater or lesser gravel content and/or the presence of local channels crossing the profile). On average this upper layer is 10 to 12 feet thick.

As with the younger alluvium, the intermediate velocity zone is divided into two laterally variable zones of 2100 fps over the northerly 350-feet of the cross-section and 1670 fps over the southerly 110-feet. The nature of the contact between the two zones cannot be determined from this study; possible (but not all) interpretations include lateral depositional changes in lithology, faulting, or erosion and re-deposition (the edge of a buried channel). Based on the surface mapping by Crook et al (1987), and the somewhat elevated velocities that may indicate the possibility of a greater percentage of gravel/cobbles/boulders and the potential for slight to moderate cementation, we believe this velocity zone represents alluvial unit Qal_{3f}.

Depth to the relatively high seismic velocity (5850-feet per second [fps]) basement rock appears to vary from approximately 35±3-feet to 97±10-feet beneath the study area, as detected in the seismic refraction survey profiles. The interpreted basement rock surface is not smooth and featureless. Seismic refraction profile data indicates shallow (2- to 5-degree) south-sloping rock surfaces on the north and south ends of the cross-section, with a near 45-degree slope in the central portion of the cross-section. Just south of the near 45-degree slope there is a nearly 200-foot long irregular south-sloping surface (7- to 8-degrees).

REFERENCES CITED

Crook, R., Jr., et al., 1987, Quaternary geology and seismic hazard of the Sierra Madre and associated faults, western San Gabriel Mountains, California: U.S. Geological Survey, Professional Paper 1339, p. 27-64, Scale 1:24,000.

Dibblee, T.W., 1989, Geologic Map of the Pasadena Quadrangle, Los Angeles County, California: Dibblee Geological Foundation Map DF-23, scale 1:24,000.

Irvine Geotechnical, 2005, Site topographic map, Crook et al geology map, and CPT data, August and September 2005.

TerraPhysics, 2005, Final Report-Seismic Refraction Survey to Delineate Subsurface Velocity Zones Grandview Avenue Property– Sierra Madre, California, September 2005.

USGS, 1928, Sierra Madre Quadrangle, 1" = 2000'.

USGS, 1995, Mount Wilson 7-Minute Quadrangle, 1:24000 scale.

CLOSURE

Non-research seismic refraction survey techniques for non-critical structures (e.g., this survey for possible future residential construction) do not routinely provide detection of vertical fault offsets smaller than about 10 percent of the basement rock surface burial depth, so that study area trenching to investigate possible lesser faults may well be required by the geologic reviewing agency/consultant. You may wish to consider exploratory fault trenching studies based on the results of our surveys and the possibly agency reviewer requirements. It should be understood that our engineering geologic and engineering geophysical consulting provide professional opinions and the contents of this report are not perfect. Any errors or omissions noted by any party reviewing this report, and/or any other engineering geologic aspect of the project, should be reported to Wilson

Geosciences Inc. in a timely fashion. Irvine Geotechnical and their direct client are the only parties ("Clients") intended by this office to directly receive the advice. The Clients are the only parties that can authorize subsequent use of this report. The Clients should consider any transferring of information from this report or other directed use of this report as "advice by the Clients." No warranty is either expressed or implied.

We appreciate the opportunity to provide services for this project and would be happy to discuss the results. Please contact me (626 791-1589) at your convenience.

Sincerely,
WILSON GEOSCIENCES, INC.

PROFESSIONAL GEOLOGIST
KENNETH LEE WILSON
No. 928
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Kenneth Wilson
Principal Geologist
R.G. #3175, C.E.G. #928

Appendix A – Figures 1 through 5
Appendix B – Geophysical Report

APPENDIX A

Figures 1 through 5

APPENDIX A

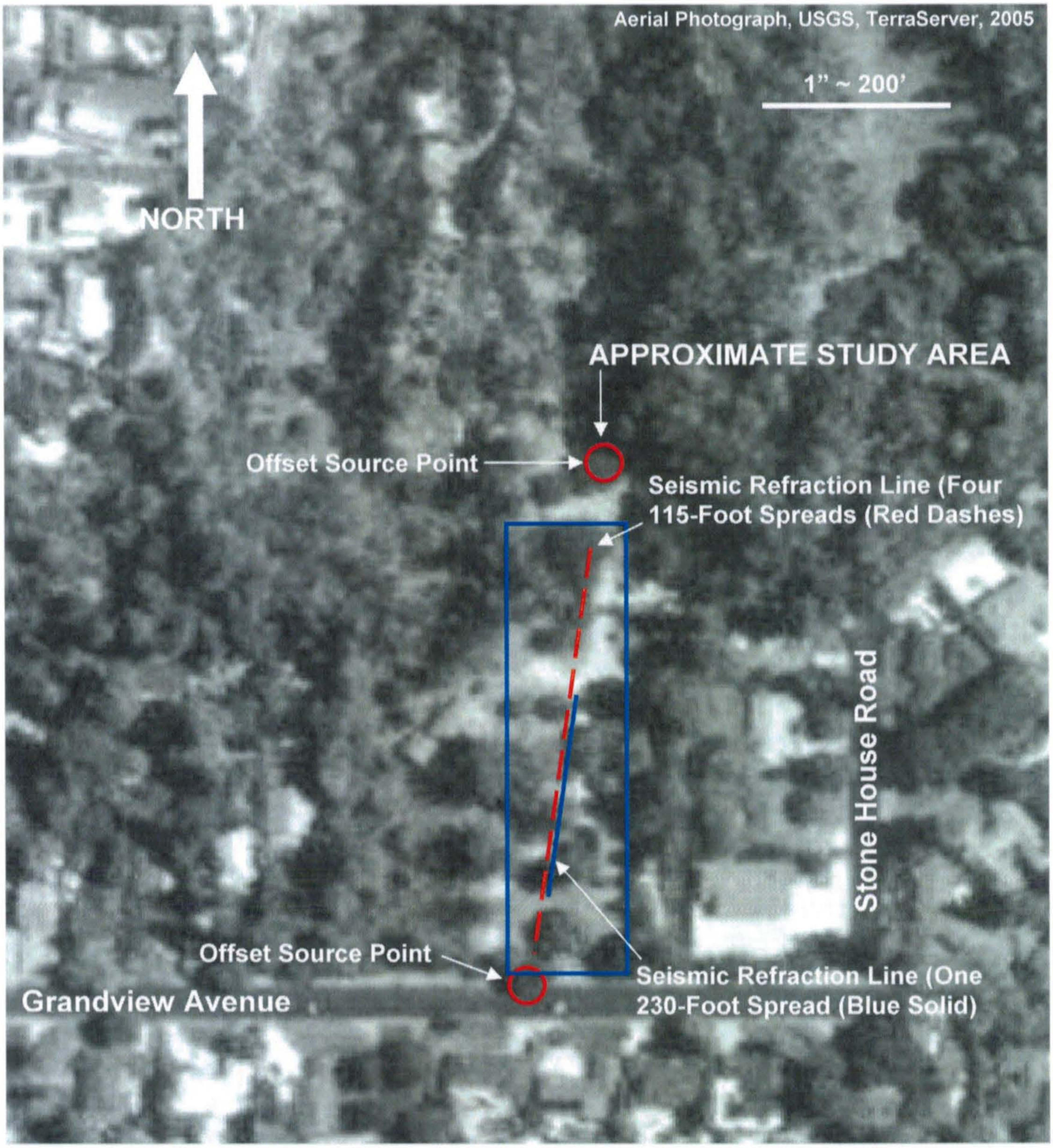


FIGURE 1 – Aerial photograph showing the study area and surrounding parcels, with the approximate location of the two seismic refraction profiles and offset source points.

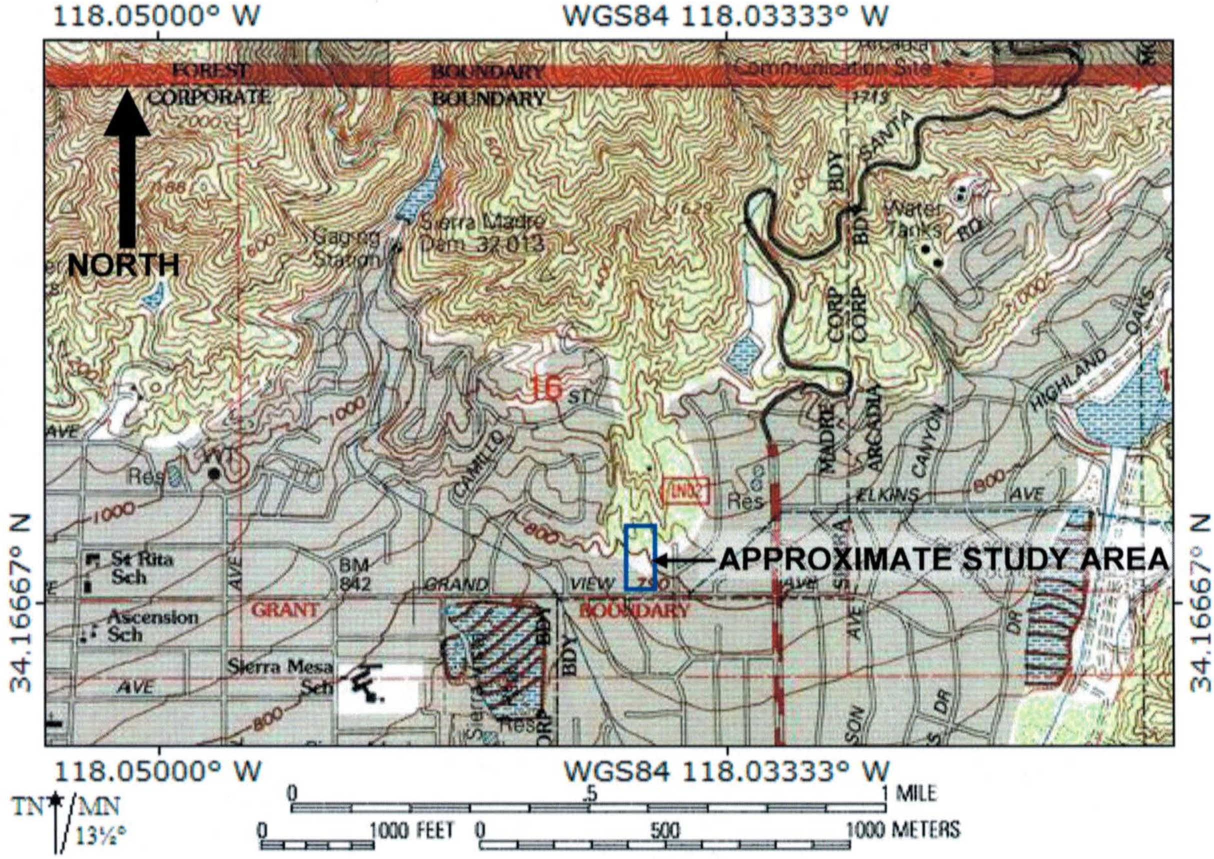


FIGURE 2 – USGS (1995) topographic map showing the study area (blue rectangle) and the topography of the San Gabriel Mountains foothills.

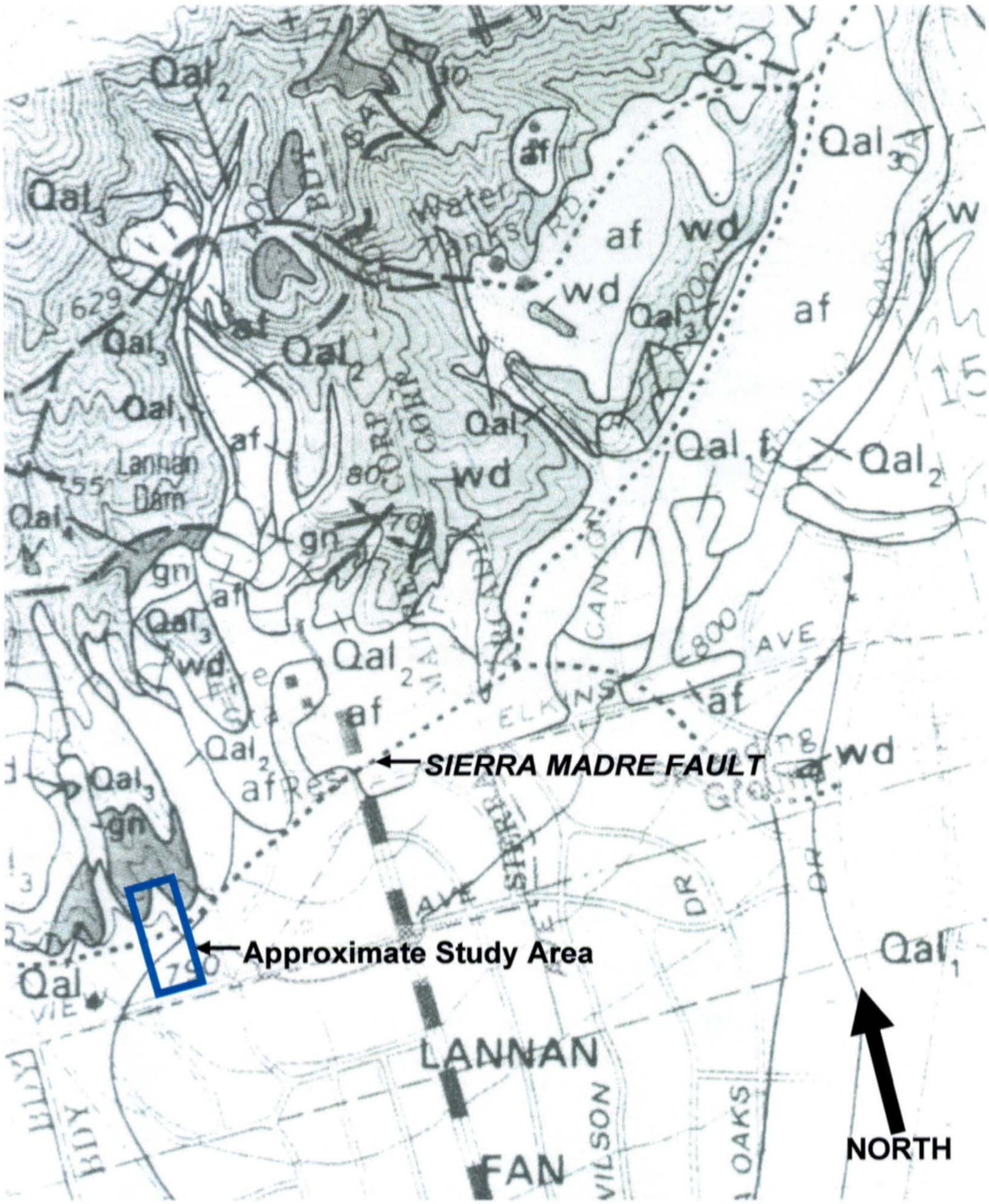


FIGURE 3 – Study area geology map (Crook et al, 1987) showing the study area (blue rectangle) and geologic units. The study area is crossed by the inferred buried trace of the Sierra Madre fault (short black dashes).

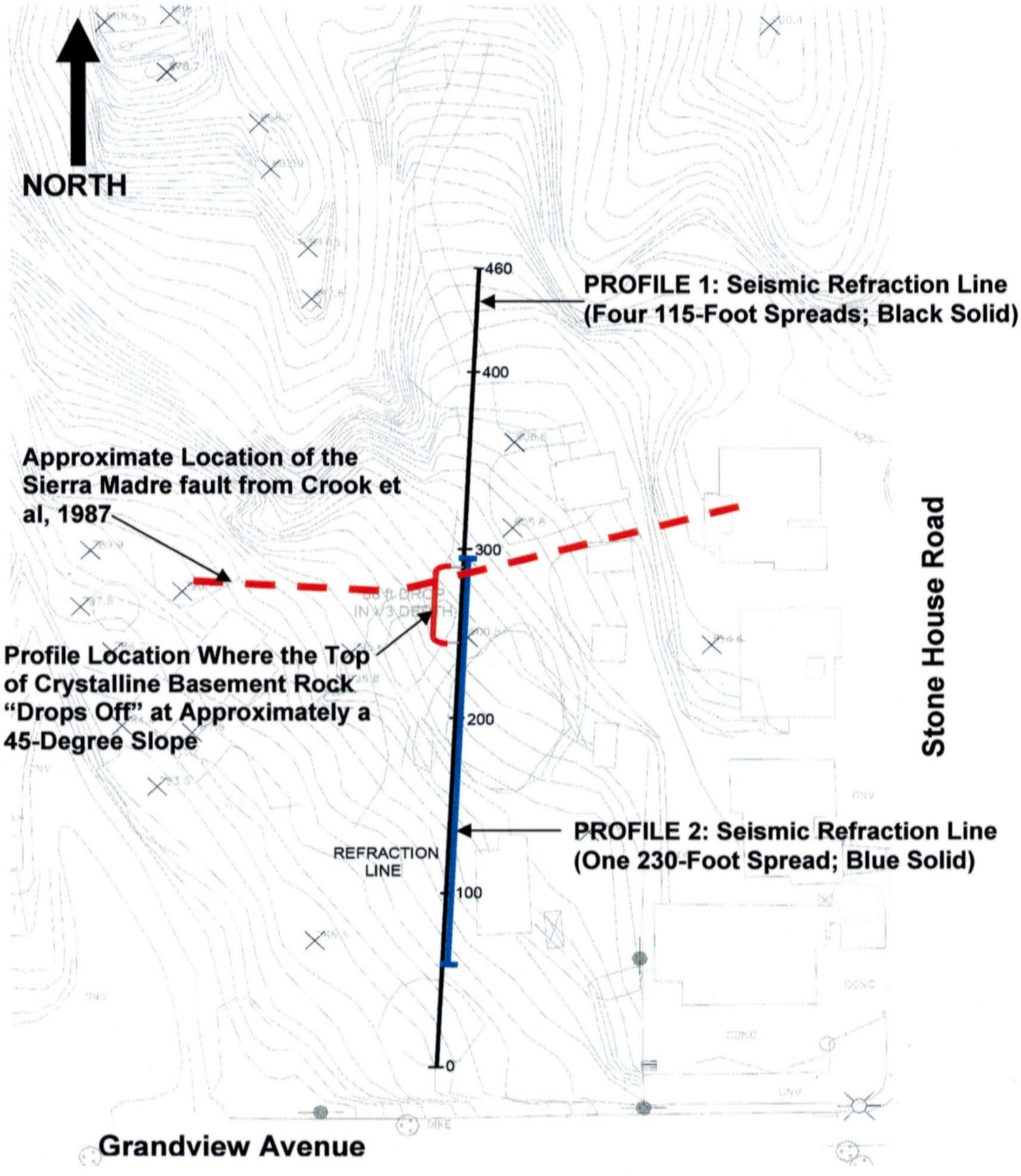


FIGURE 4 – Study area topographic map (Irvine Geotechnical, 2005) showing the approximate location of the two seismic refraction survey profiles conducted for this investigation (black and blue solid lines). The approximate location of the buried trace of the Sierra Madre fault is shown as a red dashed line. The bracket indicates the location of a steeply dipping velocity contact representing intermediate-age alluvium over weathered crystalline basement rock.

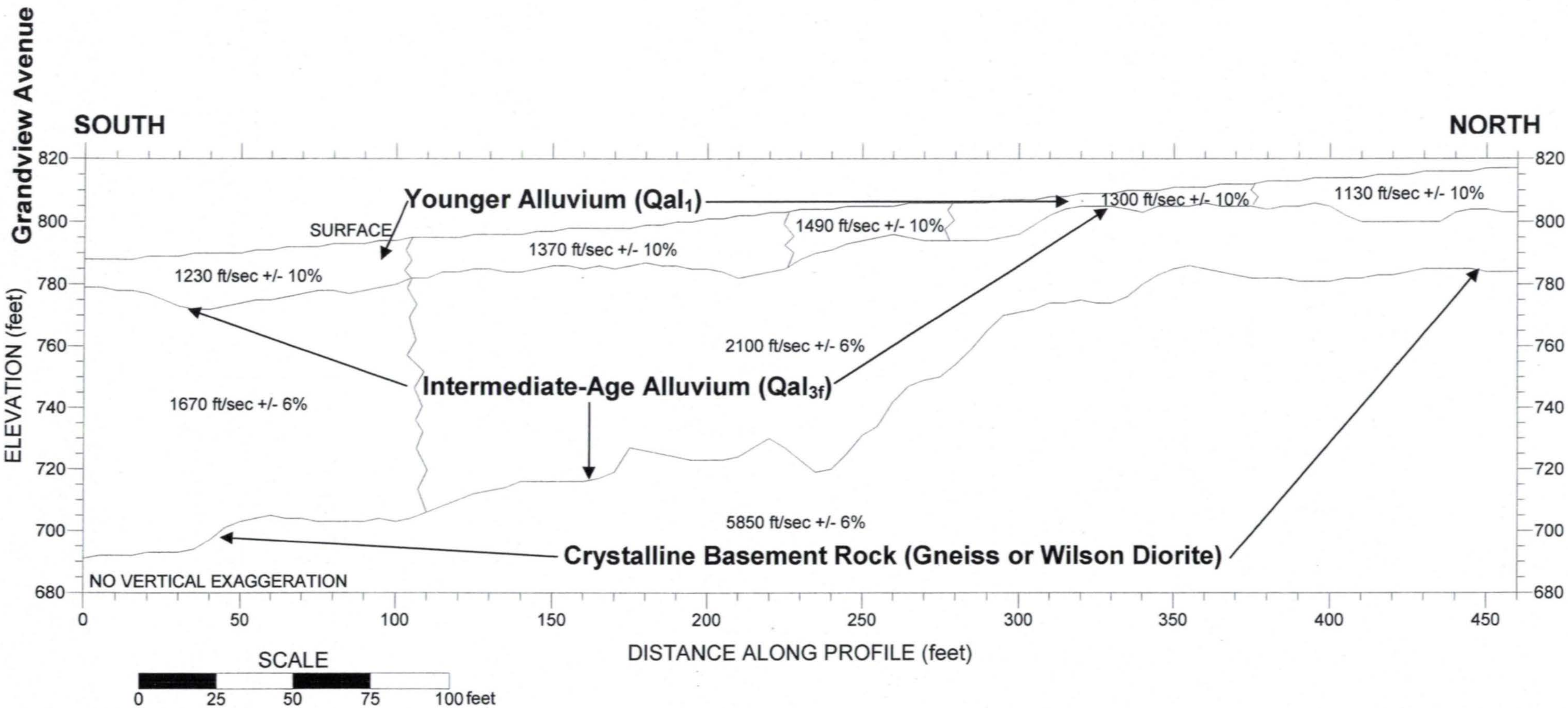


FIGURE 5 – The seismic velocity cross-section with geologic interpretation for the two refraction survey profile lines shown in Figure 4.

APPENDIX B

Geophysical Report

FINAL REPORT
SEISMIC REFRACTION SURVEY
TO DELINEATE SUBSURFACE VELOCITY ZONES
GRANDVIEW AVENUE PROPERTY– SIERRA MADRE, CALIFORNIA

Prepared For:
Mr. Ken Wilson, RG-3178, CEG-928
WILSON GEOSCIENCES INC.
1910 Pinecrest
Altadena, CA 91001

Prepared By:
Mr. Kerry Hennon, RGp-886
TERRA PHYSICS
28841 Base Line Road
Highland, CA 92346

TERRA PHYSICS Project No.: 05-45
September 3, 2005

GEOPHYSICAL SURVEY LIMITATIONS

Geophysical exploration is not an exact science, only an additional tool used to locate subsurface material boundaries and measure their physical properties. *TERRA PHYSICS* is not a guarantor of the services provided, but agrees to perform services in a professional and non-negligent manner and according to information and data available to us. Users of this report should recognize the extreme difficulty in locating undocumented, subsurface material boundaries due to factors such as changing stratigraphy and hydrology and the proximity of near-surface sources of vibrational and electrical noise.

Data and results presented in this report were compiled from existing geological data and the current surveys. Geophysical interpretation of subsurface conditions from the surface measurements is not unique. These results represent reasonable descriptions of the geological conditions and are presented for information only. The results should be verified by direct investigation methods. Complex subsurface geology may prevent reliable extrapolation of these results away from their original measurement locations.

TERRA PHYSICS reserves the right to review this report's results when additional information concerning this investigation is available in the future.

TERRA PHYSICS 28841 Base Line Road Highland, CA 92346 phone/fax (909)862-0626
TERRAPHYSICS@AOL.COM

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLE

TERRA PHYSICS 28841 Base Line Road Highland, CA 92346 phone/fax (909)862-0626
TERRAPHYSICS@AOL.COM

1.0 INTRODUCTION

This report describes the seismic refraction survey conducted by *TERRA PHYSICS* at the subject property on Grandview Avenue in Sierra Madre, California. The survey is in support of the on-going Wilson Geosciences Inc. project to evaluate geological conditions at this site. Report Section 1 describes the survey scope, design, and schedule and Section 2 explains the results. Sections 3 and 4 describe all survey procedures and list the cited references, respectively.

1.1 Scope Of Work

The property is located north of Grandview Avenue and west of Stone House Road (Figure 1) in Sierra Madre.

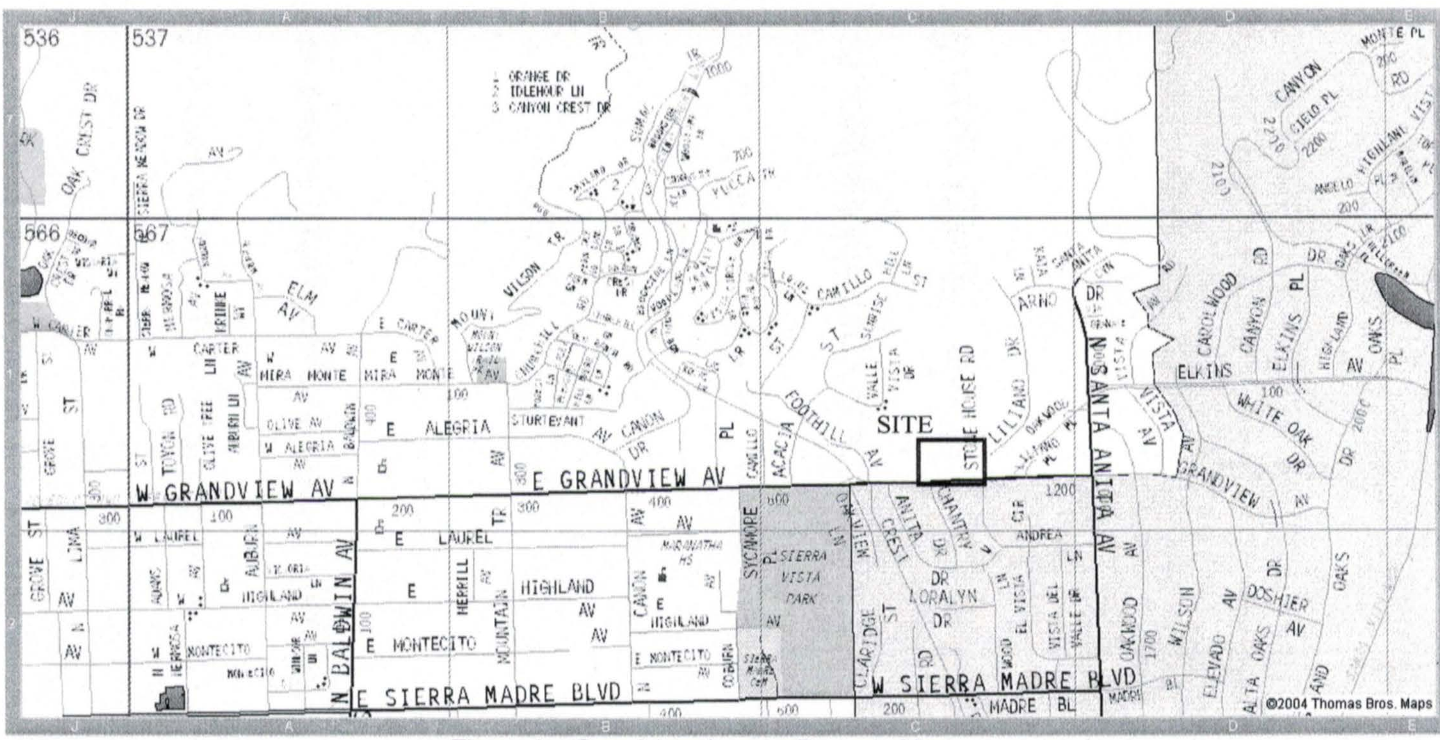


Figure 1 – Grandview Avenue Property Map

The survey objective was to delineate boundaries between subsurface velocity zones that may represent stratigraphic layers with different densities. Wave velocities were measured along one line to depths of at about 100 feet.

1.2 Survey Design

During a refraction survey, seismic waves were generated at source points and recorded by geophones positioned along a profile. The method detects changes in wave velocities caused by vertical and lateral changes in material acoustical impedance and density. The waves travel from the source point down into the ground and are refracted according to Snell's law along material boundaries where the velocities are different. If the lower material has a greater velocity, the waves are refracted upward and can be sensed by the surface geophones. If the lower material's velocity is slower, the waves are refracted downward and never measured.

Travel times of the compressional waves and geophone-source point array geometry were used to calculate seismic velocities and corresponding thickness of subsurface velocity zones using Snell's law (Dobrin,1960). Boundary depths between the surficial alluvium (low-velocity materials) and the underlying, denser granitic bedrock (medium- to high-velocity material) can be inferred from the calculated velocity zones.

The survey was designed to provide a north oriented velocity cross section roughly perpendicular to a mapped fault in the area as shown in Figure 2. The line southern end was about 26 feet north of Grandview Avenue northern curb. The line stretched 460 feet northward from this point. The line consisted of four end-to-end spreads (Spreads A, B, C, and D) with geophones 5 feet apart. Spread E was added later to better define the sudden depth change of the deepest velocity zone. This spread consisted of 24 geophones spaced 10 feet apart. The spread southern end was at the center of original Spread A and the northern end was at the center of Spread C

1.3 Schedule

08/01/05 Data collection planned for August 2.
08/02/05 Data collection started but seismograph broke.
08/23/05 Data recorded on Spreads A, B, C, and D.
08/28/05 Preliminary interpretation emailed with recommendation for Spread E with more penetration.
09/01/05 Data collected and interpreted on Spread E.
09/02/05 Report submitted.

2.0 RESULTS

The survey satisfied the objective of delineating boundaries between subsurface velocity zones that may represent stratigraphic layers with different densities. Wave velocities were measured (within ±10%) along a 460 feet long refraction line using measurement parameters with sufficient lateral resolution for defining narrow (less than 30 feet wide) structural features to depths of at least 100 feet. The survey location is shown in Figure 2. Velocity zone boundaries shown in the lower graph of Figure 3 were calculated with an estimated uncertainty of ±1 foot to ±5 feet. Table 1 lists the interpreted velocity zones.

- Surficial Velocity Zone (1130 - 1490 feet/second ±10%)
  The zone probably represents dry, unconsolidated, young alluvium. Thickness varies irregularly from about 4 to 20 feet. Velocities also vary irregularly probably representing subtle changes in density.

- Second Velocity Zone (1670 – 2100 feet/second ±6%)
  This zone is probably the same dry alluvium with slightly more consolidation. Thickness increases from about 20 feet on the north to about 87 feet on the south. Velocity is slower on the south end possibly indicating slightly less dense alluvium.

- Third Velocity Zone (5850 feet/second ±6%)
  The zone may be decomposed granitic bedrock that steeply dips southward. There is a sudden 38 feet drop in this zone's depth between distances of 290 and 245 feet. Velocity is relatively constant along the line.

TABLE 1
INTERPRETED SEISMIC VELOCITY ZONES

DEPTH (feet)	DEPTH/ELEVATION UNCERTAINTY (%)	(feet)	SEISMIC VELOCITY (feet/second)
Spread A:			
0 – 17	10	2	1230 ± 10%
17 – 87	6	3	1670 ± 6%
Below 87	6	5	5850 ± 6%
Spread B:			
0 – 13	10	1	1370 ± 10%
13 – 79	6	3	2100 ± 6%
Below 79	6	5	5850 ± 6%
Spread C:			
0 – 12	10	1	1300-1490 ± 10%
12 – 48	6	2	2100 ± 6%
Below 48	6	3	5850 ± 6%
Spread D:			
0 – 9	10	1	1130 ± 10%
9 – 33	6	1	2100 ± 6%
Below 33	6	2	5850 ± 6%

NOTES: Depths are reported near the profile center.
Spread E results have been integrated with the other 4 spreads.

3.0 DESCRIPTION OF SURVEY PROCEDURES

3.1 Equipment

Equipment consists of a seismic wave source, geophones for sensing the seismic waves, and a recording system. Seismic waves can be generated with a variety of sources (hammer, projectile impact, weight drop, and vibrator). A 20-pound sledgehammer was used as the seismic source along the profile to achieve about 40 feet of penetration. The hammer was fitted with a timing circuit that sends an electrical signal to the recorder at the instant of wave generation (uncertainty ±0.00001 seconds). To increase penetration, longer distances are required between the seismic source and geophones. A 1000-pound weight drop was used to generate the waves 100-300 feet off the profile ends.

The seismic waves were sensed by vertically oriented, Mark Products model L-28 land geophones (damped 28 Hz resonant frequency). The geophones were fitted with small metal spikes that were forcibly pushed into the ground to improve coupling and thus data quality. Twenty four geophones were linked together with a Mark Products cable to form a geophone spread.

The geophones' electrical signals were input to a Geometrics model R-48 seismograph running software version V3.1 (Geometrics, 1997). This system has one of the largest dynamic ranges of any engineering seismograph. The system is capable of filtering, processing, displaying, and recording 24 channels of data simultaneously. Data were recorded on the internal hard disk and then transferred to PC for later processing. Hard copy records were made during data collection to evaluate data quality and adjust measurement parameters when necessary. Each record was labeled with project name and number, profile number, shot point number, source type, time, date, and operator's initials.

The seismograph has been maintained and was operated according manufacturer's recommendations. At the beginning of data collection, a functional calibration test was performed to check the system's timing line accuracy. An external 100 kHz pulse generator was connected to the geophone input terminal of the seismograph. A record was made of the 0.001 second period pulse. Pulse width compared within ±1% to the timing line spacing.

Elevations of all geophone and source point locations were measured with a Pentax total station (Pentax, 1991) using standard surveying procedures.

3.2 Data Collection

Data collection, reduction, and interpretation were in accordance with *TERRA PHYSICS* (1995) Geophysical Survey Procedures, which follows ASTM Standard Guide For Refraction Method (ASTM, 1998) and California Department of Health Services (1999) guidelines.

Refraction line ends were marked in the field by Wilson Geosciences Inc. A measuring tape was stretched between these end stakes. Geophone and seismic wave generation locations (source points) have an estimated uncertainty of ±0.2 feet. Elevations have an estimated uncertainty of ±0.1 foot.

Seismic waves were generated at source points located at each spread end and center. Additional depth was obtained by recording waves from locations offset 80-300 feet from the spread ends. The boundary between the surficial alluvium and the underlying material was calculated from these shallow penetrating wave arrivals. Data were recorded from both ends of each profile so the effect of material dip on the velocities could be calculated. Between 8 and 12 individual hammer blows at each source point were stacked together to improve signal to noise ratio and minimize background noise. Data were continuously monitored during collection to obtain the best quality possible. Background vibrational noise was minimized by recording around the traffic patterns.

3.3 Data Processing

The interpretation process used the 'SEISIMAGER' software package (Geometrics, 2002). The first step in data reduction was to identify the first seismic wave arrival at each geophone. First arrivals represent compressional waves, the fastest traveling waves through geologic materials. Arrivals usually appeared as rather obvious upward excursions of the recording traces from their rest positions and were well defined at this site. Arrivals were marked on the records and the time required for the wave traveling from the source point (start of the record) to each geophone was measured within ±0.00020 seconds. Travel time repeatability between multiple records made at the same shot point was within ±0.0005 seconds. All reciprocal times between shot point pairs were within ±0.002 seconds (less than ±2% of the longest times) indicating reliable first arrival timing.

The measured travel times were plotted versus source point-to-geophone distances in the upper graph of Figure 3. The graph shows distance along the horizontal axis and seismic travel time on the vertical axis. The next reduction step was to group these data points into line segments (labeled on the graphs as numbers) representing subsurface velocity zones. Inverse slopes of these regression lines equal the zone's apparent velocities which are also shown. True velocities were calculated as the harmonic mean (Dobrin, 1960) and with the Hobson/Overton method (Geometrics, 2002) from the individual apparent velocities. Velocity uncertainty was determined from the stated measurement parameters uncertainties and ranged between ±6% and ±10%.

Boundaries between the velocity zones were calculated using true velocities and travel time delays with ray tracing techniques (Geometrics, 2002). This calculation method assumes the material boundaries are dipping, slightly irregular, undulating layers that are a valid assumption for stratigraphy at this site.

Interpreted velocity zones are shown in the lower graph of Figure 3 without vertical exaggeration so true boundary dips are shown. The vertical axis is shown as elevation instead of depth so these data can be compared between profiles. Elevation uncertainties were determined from velocity uncertainties and modeling scatter of the boundaries and ranged between ±6% and ±10% (±1 feet and ±5 feet). All features along the interpreted material boundaries in the lower graph of Figure 3 has a corresponding effect in the raw data curves shown in the upper graphs. These features were not artificially created by the modeling routine.

4.0 REFERENCES

ASTM, 1998. Standard Guide For Using The Seismic Refraction Method For Subsurface Investigation, Designation D 5777-95, Conshohocken, PA.

California Department of Health Services, 1999. Scientific And Technical Standards For Hazardous Waste Sites, Book 1, Chapter 5 - Technical Standards For Surface Geophysical Techniques, Program and Administrative Support Division, N. Highlands, CA.

Dobrin, M., 1960. Geophysical Prospecting, second edition, New York, NY.

Geometrics, 2002. SEISIMAGER Manual, San Jose, CA

Geometrics, 1997. Operations Manual For The R-48 Seismograph, San Jose, CA.

Pentax, 1991. Operating Procedures for the Model PTS-III Total Station, Japan.

TERRA PHYSICS, 1995. Geophysical Survey Procedures, Highland, CA.

FIGURE 2
SITE MAP SHOWING REFRACTION LINE LOCATION

GRANDVIEW AVE – SIERRA MADRE

TERRA PHYSICS

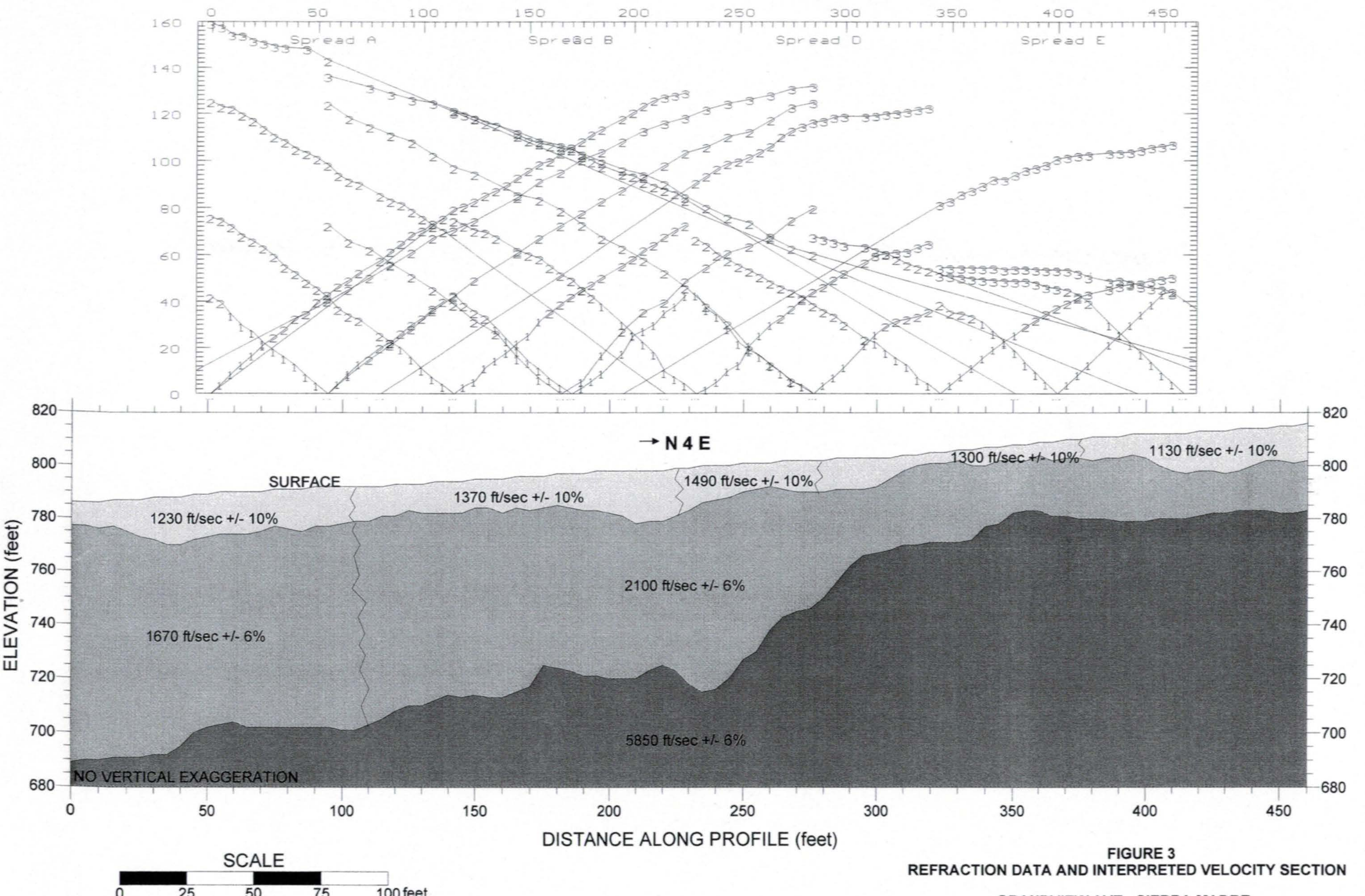


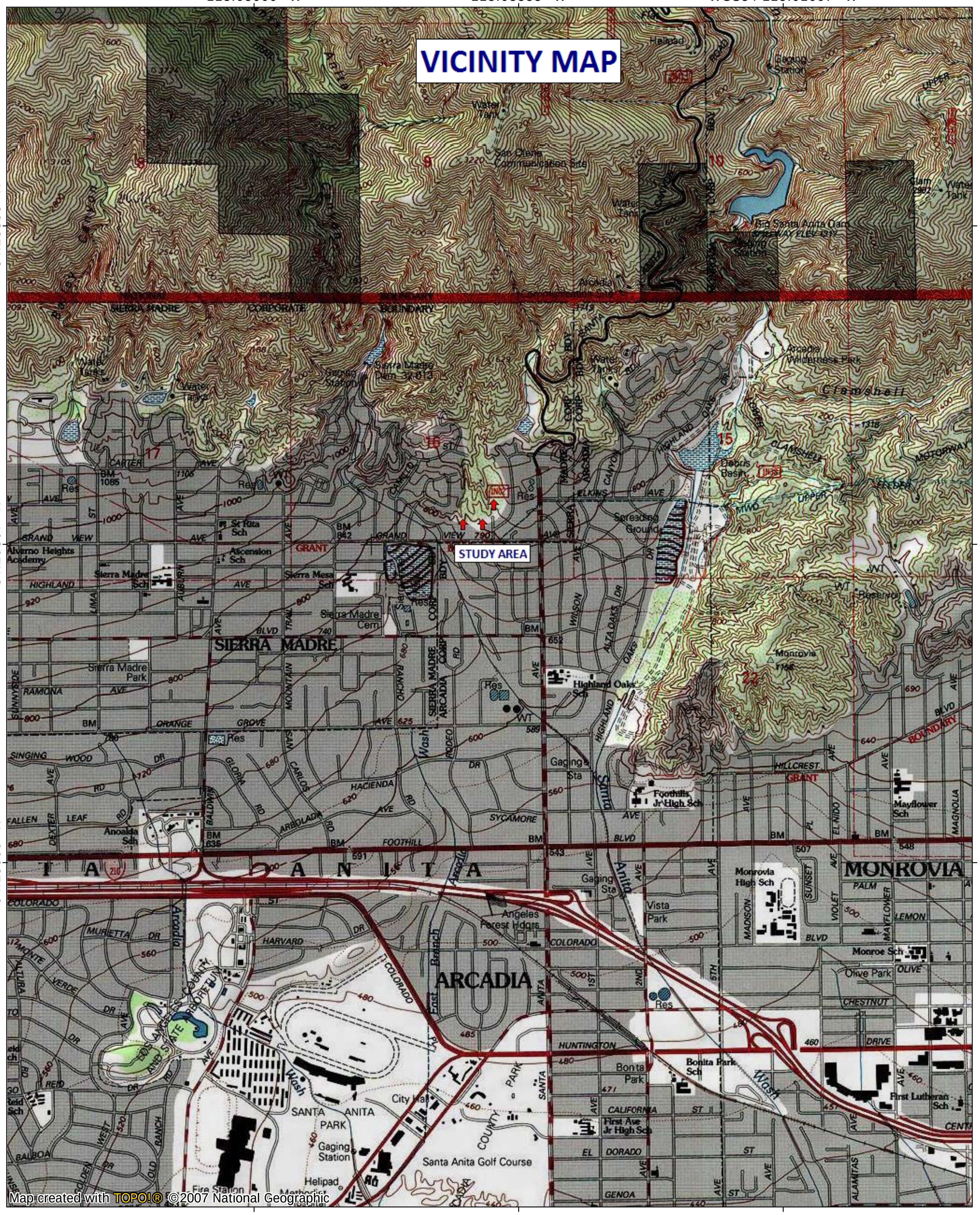
FIGURE 3
REFRACTION DATA AND INTERPRETED VELOCITY SECTION

GRANDVIEW AVE - SIERRA MADRE

TERRA PHYSICS

TOPO! map printed on 12/15/14 from "Untitled.tpo"

118.05000° W 118.03333° W WGS84 118.01667° W



34.18333° N 34.16667° N 34.15000° N

118.05000° W 118.03333° W WGS84 118.01667° W

0 .5 1 MILES

1000 0 1000 2000 3000 4000 5000 FEET

1 .5 0 1 KILOMETERS

1000 0 1000 METERS

NATIONAL GEOGRAPHIC

TN MN 12½°

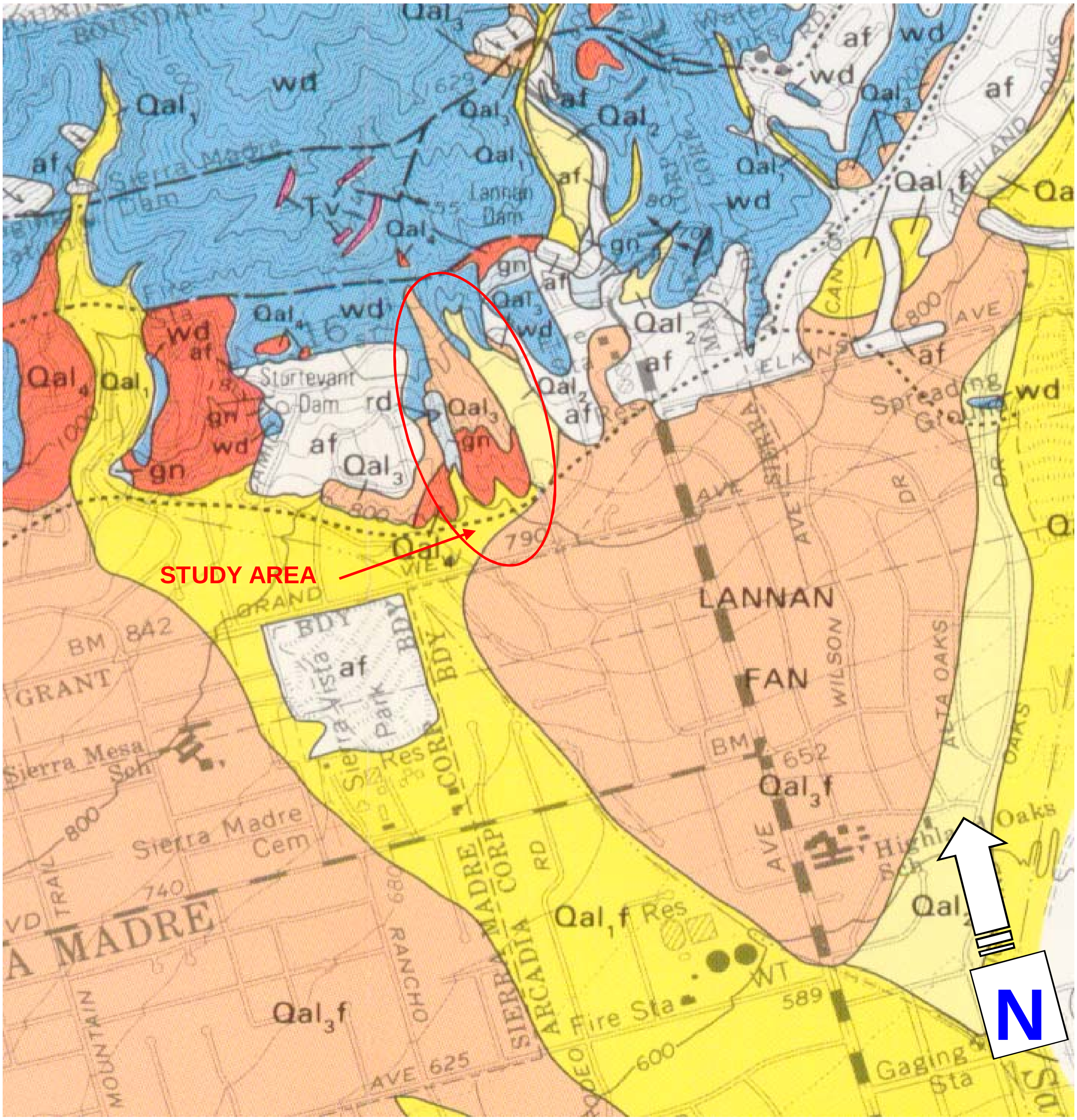
12/15/14

REGIONAL GEOLOGIC MAP

IRVINE GEOTECHNICAL Inc

IC: **14073** CONSULT: **JAI**
CLIENT **STONEHOUSE GINKGO**
SCALE: **1" = 1,000'**

REFERENCE: Geologic Map of the Sierra Madre Fault Zone, Crook, 1987



LOG OF BORING

IRVINE GEOTECHNICAL
SOIL LABWORKS, LLC

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/9/2005	
LOG DATE	8/9/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	785	feet
DRILLING CONTRACTOR	D & D Construction Specialties	
SURFACE CONDITIONS	Genlty sloping canyon	

BORING 1

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							785.0	0	ALLUVIUM: Silty Sand, grey-brown, dry to slightly moist, medium dense, some gravel
						SM	784.0	1	
							783.0	2	
							782.0	3	
							781.0	4	
SPT	5	6/7/5	---	---	---	SP	780.0	5	Coarse Sand, mottled brown, grey, orange & yellow, slightly moist, slightly dense
							779.0	6	
							778.0	7	
							777.0	8	
							776.0	9	
SPT	10	2/2/3	---	---	---	SP	775.0	10	
							774.0	11	
							773.0	12	
							772.0	13	
							771.0	14	
SPT	15	3/5/5	---	---	---	SM	770.0	15	Silty Sand, yellow-brown, slightly moist, slightly dense
							769.0	16	
							768.0	17	
							767.0	18	
							766.0	19	Silty Sand, brown, tan & yellow, slightly moist, medium dense, some granite fragments
SPT	20	6/9/9	---	---	---	SM	765.0	20	

LOG OF BORING

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 8/9/2005
LOG DATE 8/9/2005
LOGGED BY RC
DRILL TYPE Hollow-stem Auger
DIAMETER 8 INCHES

SURFACE ELEVATION 785 feet
DRILLING CONTRACTOR D & D Construction Specialties
SURFACE CONDITIONS Genlty sloping canyon

BORING 1

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	765.0	20	Silty Sand, brown, tan, yellow, slightly moist, medium dense, some granite fragments
							764.0	21	
							763.0	22	
							762.0	23	
							761.0	24	
SPT	25	8/10/12	---	---	---	SM	760.0	25	
							759.0	26	
							758.0	27	
							757.0	28	
							756.0	29	
SPT	30	10/13/17	---	---	---	SM	755.0	30	Silty Sand, yellow-brown, slightly moist, dense
							754.0	31	
							753.0	32	
							752.0	33	
							751.0	34	
SPT	35	18/19/20	---	---	---	SM	750.0	35	Silty Sand, brown, yellow & grey, slightly moist, dense, coarse
							749.0	36	
							748.0	37	
							747.0	38	
							746.0	39	Coarse Sand, brown, yellow, slightly moist, dense
SPT	40	20/23/28	---	---	---	SP	745.0	40	

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF BORING

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 8/9/2005
LOG DATE 8/9/2005
LOGGED BY RC
DRILL TYPE Hollow-stem Auger
DIAMETER 8 INCHES

SURFACE ELEVATION 785 feet
DRILLING CONTRACTOR D & D Construction Specialties
SURFACE CONDITIONS Genlty sloping canyon

BORING 1

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SP	745.0	40	Coarse Sand, brown, yellow, slightly moist, dense
							744.0	41	
							743.0	42	
							742.0	43	
							741.0	44	
SPT	45	11/25/35	---	---	---		740.0	45	Gravelly Sand, white, gray to dark gray, dry to slightly moist
							739.0	46	
							738.0	47	
							737.0	48	
							736.0	49	Silty Sand with Silt, brown, reddish, slightly moist, dense
SPT	50	11/16/17	---	---	---	SM	735.0	50	
									END B1 @ 50': No Water, No Caving, No Fill

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF BORING

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 8/9/2005
LOG DATE 8/9/2005
LOGGED BY RC
DRILL TYPE Hollow-stem Auger
DIAMETER 8 INCHES

SURFACE ELEVATION 789 feet
DRILLING CONTRACTOR D & D Construction Specialties
SURFACE CONDITIONS Genlty sloping canyon

BORING 2

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	789.0	0	**ALLUVIUM:** Silty Sand, grey-brown, slightly moist, slightly dense
							788.0	1	
							787.0	2	
							786.0	3	
							785.0	4	
SPT	5	3/5/6	---	---	---	SM	784.0	5	Silty Sand, red-brown, slightly moist, medium dense
							783.0	6	
							782.0	7	
							781.0	8	
							780.0	9	
SPT	10	14/5/6	---	---	---	ML	779.0	10	Sandy Silt/Gravelly Silt, yellow-brown and red-brown, slightly moist, firm
							778.0	11	
							777.0	12	
							776.0	13	
							775.0	14	
SPT	15	8/9/9	---	---	---	SP	774.0	15	Coarse Sand, mottled brown, yellow & tan, slightly moist, dense, gravelly
							773.0	16	
							772.0	17	
							771.0	18	
							770.0	19	Silty Sand, red-brown, moist, dense
SPT	20	5/7/8	---	---	---	SM	769.0	20	

LOG OF BORING

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/9/2005	
LOG DATE	8/9/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	789 feet
DRILLING CONTRACTOR	D & D Construction Specialties
SURFACE CONDITIONS	Genlty sloping canyon

BORING 2

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	769.0	20	Silty Sand, red-brown, moist, dense
							768.0	21	
							767.0	22	- - - - - - - - - -
							766.0	23	
							765.0	24	
SPT	25	16/17/17	---	---	---	SP	764.0	25	Coarse Sand, light brown, white, tan, yellowish, slightly moist, dense
							763.0	26	
							762.0	27	
							761.0	28	
							760.0	29	
SPT	30	14/17/19	---	---	---	SP	759.0	30	Coarse Sand, light brown, white, yellow, tan, mottled slightly moist, dense
							758.0	31	
							757.0	32	
							756.0	33	
							755.0	34	
SPT	35	10/16/18	---	---	---	SP	754.0	35	Coarse Sand, light brown, white, yellow, tan, mottled, slightly moist, dense
							753.0	36	
							752.0	37	
							751.0	38	
							750.0	39	
SPT	40	12/14/24	---	---	---	SP	749.0	40	Coarse Sand, brown-reddish, slightly moist, dense

LOG OF BORINGS

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/9/2005	
LOG DATE	8/9/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	789 feet
DRILLING CONTRACTOR	D & D Construction Specialties
SURFACE CONDITIONS	Genlty sloping canyon

BORING 2

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SP	749.0	40	Coarse Sand, brown-reddish, slightly moist, dense
							748.0	41	
							747.0	42	
							746.0	43	
							745.0	44	
SPT	45	8/9/11	---	---	---	ML	744.0	45	Sandy Silt, brown, moist, stiff
							743.0	46	
							742.0	47	
							741.0	48	
							740.0	49	
SPT	50	30/37/50	---	---	---	SM/SC	739.0	50	Silty Sand/Clayey Sand, brown-reddish, moist,

END B2 @ 50 FEET: No water, No Caving, No Fill

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF BORING

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/9/2005	
LOG DATE	8/9/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	796 feet
DRILLING CONTRACTOR	D & D Construction Specialties
SURFACE CONDITIONS	Genlty sloping canyon

BORING 3

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	796.0	0	**ALLUVIUM:** Silty Sand, grey-brown, slightly moist, medium dense
							795.0	1	
							794.0	2	
							793.0	3	
							792.0	4	
R	5	15	3.3	108.6	17	SM	791.0	5	Silty Sand, light brown & reddish-yellow, slightly moist, medium dense
							790.0	6	
							789.0	7	
							788.0	8	
							787.0	9	
R	10	18	3.1	112.5	18	SP	786.0	10	Coarse Sand, light red-brown and yellow-brown, slightly moist, dense
							785.0	11	
							784.0	12	
							783.0	13	
							782.0	14	
R	15	29	5.2	115.7	32	SM	781.0	15	Silty Sand, light red-brown & yellow-brown, moist, dense
							780.0	16	
							779.0	17	
							778.0	18	
							777.0	19	
R	20	24	4.8	112.5	27	SP	776.0	20	Coarse Sand, red-brown & yellow-brown, moist, dense

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF BORINGS

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 8/9/2005
LOG DATE 8/9/2005
LOGGED BY RC
DRILL TYPE Hollow-stem Auger
DIAMETER 8 INCHES

SURFACE ELEVATION 796 feet
DRILLING CONTRACTOR D & D Construction Specialties
SURFACE CONDITIONS Genlty sloping canyon

BORING 3

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SP	776.0	20	Coarse Sand, red-brown, moist, dense
							775.0	21	
							774.0	22	
							773.0	23	
							772.0	24	
R	25	41	4.7	119.8	33	SP	771.0	25	Coarse Sand, red-brown, moist, dense, some granite fragments.
							770.0	26	
							769.0	27	
							768.0	28	
							767.0	29	
R	30	40	4.8	115.5	29	SP	766.0	30	**END B3 @ 30 FEET:** No water, No Caving, No Fill

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF BORING

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/9/2005	
LOG DATE	8/9/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	804 feet
DRILLING CONTRACTOR	D & D Construction Specialties
SURFACE CONDITIONS	Genlty sloping canyon

BORING 4

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	804.0	0	**ALLUVIUM:** Silty Sand, grey-brown, slightly moist, medium dense
							803.0	1	
							802.0	2	
							801.0	3	
							800.0	4	
R	5	25	3.3	116.4	21	SM	799.0	5	Silty Sand, light brown-reddish, yellow, slightly moist, medium dense
							798.0	6	
							797.0	7	
							796.0	8	- - - - - - - - - - - -
							795.0	9	
R	10	36	3.0	114.2	18	SP	794.0	10	Coarse Sand, light brown-reddish, yellow, slightly moist, dense
							793.0	11	
							792.0	12	
							791.0	13	- - - - - - - - - - - -
							790.0	14	
R	15	36	4.0	124.2	32	SM	789.0	15	Silty Sand, light red brown & yellow-brown, moist, dense
							788.0	16	
							787.0	17	
							786.0	18	
							785.0	19	
R	20	41	4.6	117.1	30	SM	784.0	20	Silty Sand, light red-brown and yellow, moist, dense

LOG OF BORINGS

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT	IC 05099 Stonehouse Homes, LLC
DRILL DATE	8/9/2005
LOG DATE	8/9/2005
LOGGED BY	RC
DRILL TYPE	Hollow-stem Auger
DIAMETER	8 INCHES

SURFACE ELEVATION	804 feet
DRILLING CONTRACTOR	D & D Construction Specialties
SURFACE CONDITIONS	Genlty sloping canyon

BORING 4

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	784.0	20	Silty Sand, yellow-brown to red-brown, moist, dense
							783.0	21	
							782.0	22	
							781.0	23	
							780.0	24	
R	25	63	4.3	116.5	27	SP	779.0	25	Coarse Sand, red-brown, moist, very dense, granite fragments
							778.0	26	
							777.0	27	
							776.0	28	
							775.0	29	
R	30	62	1.9	111.8	10	SP	774.0	30	

END B4 @ 30 FEET: No water, No Caving, No Fill

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF BORING

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/2005	
LOG DATE	8/10/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	791 feet
DRILLING CONTRACTOR	D & D Construction Specialties
SURFACE CONDITIONS	Genlty sloping canyon

BORING 5

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	791.0	0	**ALLUVIUM:** Silty Sand, grey-brown, slightly moist, medium dense
							790.0	1	
							789.0	2	
							788.0	3	
							787.0	4	
R	5	17	4.8	109.6	25	SM	786.0	5	Silty Sand, light brown & reddish-yellow, slightly moist, medium dense
							785.0	6	
							784.0	7	
							783.0	8	- - - - - - - - - - - -
							782.0	9	
R	10	40	3.0	119.3	21	SP	781.0	10	Coarse Sand, light red-brown and yellow-brown, slightly moist, dense
							780.0	11	
							779.0	12	
							778.0	13	
							777.0	14	
R	15	49	3.7	114.0	22	SM	776.0	15	
							775.0	16	
							774.0	17	
							773.0	18	
							772.0	19	Coarse Sand, red-brown & yellow-brown, moist, dense
R	20	57	3.3	128.6	30	SP	771.0	20	

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF BORINGS

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/2005	
LOG DATE	8/10/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	791 feet
DRILLING CONTRACTOR	D & D Construction Specialties
SURFACE CONDITIONS	8/10/2005

BORING 5

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SP	771.0	20	Coarse Sand, red-brown, moist, dense
							770.0	21	
							769.0	22	
							768.0	23	
							767.0	24	
R	25	55	4.9	113.2	28	SP	766.0	25	Coarse Sand, red-brown, moist, dense, some granite fragments.
							765.0	26	
							764.0	27	
							763.0	28	
							762.0	29	
R	30	51	5.3	126.5	46	SP	761.0	30	**END B5 @ 30 FEET:** No water, No Caving, No Fill

LOG OF BORING

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/2005	
LOG DATE	8/10/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	787 feet
DRILLING CONTRACTOR	D & D Construction Specialties
SURFACE CONDITIONS	Genlty sloping canyon

BORING 6

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	787.0	0	**ALLUVIUM:** Silty Sand, grey-brown, slightly moist, medium dense
							786.0	1	
							785.0	2	
							784.0	3	
							783.0	4	
R	5	15	4.3	113.3	25	SM	782.0	5	Silty Sand, light brown-reddish, yellow, slightly moist, medium dense
							781.0	6	
							780.0	7	
							779.0	8	
							778.0	9	
R	10	20	4.3	110.7	23	SM	777.0	10	
							776.0	11	
							775.0	12	
							774.0	13	
							773.0	14	
R	15	28	6.2	116.2	39	SM	772.0	15	Silty Sand, light red brown & yellow-brown, moist, dense
							771.0	16	
							770.0	17	
							769.0	18	
							768.0	19	
R	20	30	11.0	109.3	57	SW	767.0	20	Coarse Sand, light brown-reddish, yellow, very moist, dense

LOG OF BORINGS

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/2005	
LOG DATE	8/10/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	787	feet
DRILLING CONTRACTOR	D & D Construction Specialties	
SURFACE CONDITIONS	Genlty sloping canyon	

BORING 6

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SW	767.0	20	
							766.0	21	
							765.0	22	
							764.0	23	
							763.0	24	
R	25	36	7.4	116.6	47	SP	762.0	25	Coarse Sand, red-brown, moist, very dense, granite fragments
							761.0	26	
							760.0	27	
							759.0	28	
							758.0	29	
R	30	49	9.0	120.1	63	SP	757.0	30	**END B6 @ 30 FEET:** No water, No Caving, No Fill

LOG OF BORING

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/2005	
LOG DATE	8/10/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	804 feet
DRILLING CONTRACTOR	D & D Construction Specialties
SURFACE CONDITIONS	Genlty sloping canyon

BORING 7

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	804.0	0	**ALLUVIUM:** Silty Sand, grey-brown, slightly moist, medium dense
							803.0	1	
							802.0	2	
							801.0	3	
							800.0	4	
R	5	19	7.2	110.9	21	SM	799.0	5	Silty Sand, light brown-reddish, yellow, slightly moist, medium dense
							798.0	6	
							797.0	7	
							796.0	8	- - - - - - - - - -
							795.0	9	
R	10	13	6.7	107.9	18	SP	794.0	10	Coarse Sand, light brown-reddish, yellow, slightly moist, dense
							793.0	11	
							792.0	12	
							791.0	13	
							790.0	14	
R	15	41	7.1	118.5	32	SP	789.0	15	
							788.0	16	
							787.0	17	
							786.0	18	
							785.0	19	
R	20	57	9.1	120.3	30	SP	784.0	20	Silty Sand, light red-brown and yellow, moist, dense

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF BORINGS

PROJECT	IC 05099 Stonehouse Homes, LLC
DRILL DATE	8/10/2005
LOG DATE	8/10/2005
LOGGED BY	RC
DRILL TYPE	Hollow-stem Auger
DIAMETER	8 INCHES

SURFACE ELEVATION	787 feet
DRILLING CONTRACTOR	D & D Construction Specialties
SURFACE CONDITIONS	Genlty sloping canyon

BORING 7

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	767.0	20	Silty Sand, yellow-brown to red-brown, moist, dense
							766.0	21	
							765.0	22	**ALLUVIAL TERRACE:** Silty Sand/Clayey Sand, yellow-brown, dense to very dense, moist, contains weathered granitic boulders
							764.0	23	
							763.0	24	
R	25	63	5.7	119.2	39	SP	762.0	25	
							761.0	26	
							760.0	27	
							759.0	28	
							758.0	29	
							757.0	30	
									END B7 @ 30 FEET: No water, No Caving, No Fill

LOG OF BORING

IRVINE GEOTECHNICAL
SOIL LABWORKS, LLC

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/2005	
LOG DATE	8/10/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	843	feet
DRILLING CONTRACTOR	D & D Construction Specialties	
SURFACE CONDITIONS	Genlty sloping canyon	

BORING 8

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							843.0	0	ALLUVIUM: Silty Sand, grey-brown, dry to slightly moist, medium dense, some gravel
						SM	842.0	1	
							841.0	2	
							840.0	3	
							839.0	4	- - - - - - - - - -
SPT	5	3/3/3	---	---	---	SM	838.0	5	Silty Sand, yellow-brown, slightly moist, slightly dense
							837.0	6	
							836.0	7	
							835.0	8	
							834.0	9	
SPT	10	4/4/4	---	---	---	SM	833.0	10	
							832.0	11	
							831.0	12	
							830.0	13	
							829.0	14	- - - - - - - - - -
SPT	15	3/5/6	---	---	---	SP	828.0	15	Coarse Sand, mottled brown, grey, orange & yellow, moist, slightly dense
							827.0	16	
SPT	17.5	4/6/7	---	---	---	SP	826.0	17	
							825.0	18	
							824.0	19	Groundwater ▼
SPT	20	9/9/11	---	---	---	SW	823.0	20	

LOG OF BORING

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 8/10/2005
LOG DATE 8/10/2005
LOGGED BY RC
DRILL TYPE Hollow-stem Auger
DIAMETER 8 INCHES

SURFACE ELEVATION 843 feet
DRILLING CONTRACTOR D & D Construction Specialties
SURFACE CONDITIONS Genlty sloping canyon

BORING 8

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SP	823.0	20	Coarse Sand, mottled brown, grey, orange & yellow, moist, slightly dense
							822.0	21	
SPT	22.5	9/11/11	---	---	---		821.0	22	
							820.0	23	
							819.0	24	
SPT	25	5/9/11	---	---	---	SW	818.0	25	
							817.0	26	
SPT	27.5	8/9/11	---	---	---		816.0	27	
							815.0	28	
							814.0	29	
SPT	30	10/10/11	---	---	---	SC	813.0	30	Clayey Sand, brown, slightly moist, dense
							812.0	31	
SPT	32.5	15/14/16	---	---	---	SP	811.0	32	
							810.0	33	Coarse Sand, mottled brown, grey, orange & yellow, moist, slightly dense
							809.0	34	
SPT	35	24/50/50	---	---	---	SP	808.0	35	
							807.0	36	
SPT	37.5	14/12/12	---	---	---		806.0	37	
							805.0	38	
							804.0	39	
SPT	40	12/14/16	---	---	---	SP	803.0	40	

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF BORING

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/2005	
LOG DATE	8/10/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	843 feet
DRILLING CONTRACTOR	D & D Construction Specialties
SURFACE CONDITIONS	Genlty sloping canyon

BORING 8

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SP	803.0	40	Coarse Sand, mottled brown, grey, orange & yellow, moist, slightly dense
							802.0	41	
SPT	42.5	13/18/25	---	---	---	SP	801.0	42	
							800.0	43	
							799.0	44	
SPT	45	12/15/15	---	---	---	SW	798.0	45	
							797.0	46	
SPT	47.5	12/14/17	---	---	---	SW	796.0	47	
							795.0	48	
							794.0	49	Clayey Sand, brown, slightly moist, dense
SPT	50	24/30/33	---	---	---	SC	793.0	50	

END B8 @ 50': Water @19', No Caving, No Fill

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF BORING

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 8/10/2005
LOG DATE 8/10/2005
LOGGED BY RC
DRILL TYPE Hollow-stem Auger
DIAMETER 8 INCHES

SURFACE ELEVATION 857 feet
DRILLING CONTRACTOR D & D Construction Specialties
SURFACE CONDITIONS Genlty sloping canyon

BORING 9

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	857.0	0	**ALLUVIUM:** Silty Sand, grey-brown, slightly moist, medium dense
							856.0	1	
							855.0	2	
							854.0	3	
							853.0	4	
R	5	8	4.4	108.1	22	SM	852.0	5	Silty Sand, light brown-reddish, yellow, slightly moist, medium dense
							851.0	6	
							850.0	7	
							849.0	8	
							848.0	9	
R	10	28	6.2	115.0	38	SM	847.0	10	
							846.0	11	
							845.0	12	
							844.0	13	Silty Sand, light brown-reddish, yellow, moist to wet, dense
							843.0	14	
R	15	33	14.2	122.7	100	SM	842.0	15	
							841.0	16	
							840.0	17	Groundwater
							839.0	18	
							838.0	19	
R	20	18	19.1	111.7	100	SM	837.0	20	Silty Sand, light red-brown and yellow, dense, saturated

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF BORINGS

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/2005	
LOG DATE	8/10/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	857 feet
DRILLING CONTRACTOR	D & D Construction Specialties
SURFACE CONDITIONS	Genlty sloping canyon

BORING 9

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	837.0	20	Silty Sand, yellow-brown to red-brown, moist, dense
							836.0	21	Coarse Sand, red-brown, saturated, dense
							835.0	22	
							834.0	23	
							833.0	24	
R	25	31	19.1	111.7	100	SP	832.0	25	
							831.0	26	
							830.0	27	
							829.0	28	Sandy Clay, red-brown, stiff
							828.0	29	
R	30	29	20.4	105.3	100	CL	827.0	30	**END B9 @ 30 FEET:** Water @17', No Caving, No Fill

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF BORING

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/2005	
LOG DATE	8/10/2005	
LOGGED BY	RC	
DRILL TYPE	Hollow-stem Auger	
DIAMETER	8 INCHES	

SURFACE ELEVATION	893 feet
DRILLING CONTRACTOR	D & D Construction Specialties
SURFACE CONDITIONS	Genlty sloping canyon

BORING 10

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	893.0	0	**ALLUVIUM:** Silty Sand, yellow-brown, slightly moist, medium dense
							892.0	1	
							891.0	2	
							890.0	3	
							889.0	4	
R	5	13	5.7	121.0	41	SM	888.0	5	Silty Sand, light brown-reddish, yellow, slightly moist, dense
							887.0	6	
							886.0	7	
							885.0	8	
							884.0	9	
R	10	15	6.5	110.3	34	SW	883.0	10	Coarse Sand, red-brown, tan & yellow, moist to moist, dense
							882.0	11	
							881.0	12	
							880.0	13	
							879.0	14	
R	15	35	3.7	120.8	27	SM	878.0	15	Silty Sand, light red-brown and yellow, dense, moist
							877.0	16	
							876.0	17	
							875.0	18	
							874.0	19	
R	20	29	5.0	114.4	30	SM	873.0	20	Silty Sand, light red-brown and yellow, dense, moist

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF BORING

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 8/10/2005
LOG DATE 8/10/2005
LOGGED BY RC
DRILL TYPE Hollow-stem Auger
DIAMETER 8 INCHES

SURFACE ELEVATION 893 feet
DRILLING CONTRACTOR D & D Construction Specialties
SURFACE CONDITIONS Genlty sloping canyon

BORING 10

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SP	873.0	20	Coarse Sand, mottled brown, grey, orange & yellow, moist, slightly dense
							872.0	21	
							871.0	22	
							870.0	23	
							869.0	24	
R	25	42	5.2	124.5	42	SW	868.0	25	
							867.0	26	
							866.0	27	
							865.0	28	
							864.0	29	
R	30	100	5.2	124.7	44	SW	863.0	30	
									END B10 @ 30': No Water, No Caving, No Fill

LOG OF BORING

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 8/10/2005
LOG DATE 8/10/2005
LOGGED BY RC
DRILL TYPE Hollow-stem Auger
DIAMETER 8 INCHES

SURFACE ELEVATION 880 feet
DRILLING CONTRACTOR D & D Construction Specialties
SURFACE CONDITIONS Genlty sloping canyon

BORING 11

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	880.0	0	**ALLUVIUM:** Silty Sand, grey-brown, slightly moist, medium dense
							879.0	1	
							878.0	2	
							877.0	3	
							876.0	4	
R	5	23	8.9	122.9	68	SM	875.0	5	Silty Sand, light brown-reddish, yellow, slightly moist, medium dense
							874.0	6	
							873.0	7	
							872.0	8	- - - - - - - - - -
							871.0	9	Coarse Sand, light brown-reddish, yellow, moist, medium dense
R	10	28	5.3	107.3	26	SP	870.0	10	
							869.0	11	
							868.0	12	
							867.0	13	
							866.0	14	
R	15	22	4.6	107.5	23	SP	865.0	15	
							864.0	16	
							863.0	17	
							862.0	18	
							861.0	19	
R	20	33	4.9	113.8	29	SP	860.0	20	Coarse Sand, light brown-reddish, yellow, moist, dense

LOG OF BORING

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 8/10/2005
LOG DATE 8/10/2005
LOGGED BY RC
DRILL TYPE Hollow-stem Auger
DIAMETER 8 INCHES

SURFACE ELEVATION 880 feet
DRILLING CONTRACTOR D & D Construction Specialties
SURFACE CONDITIONS Genlty sloping canyon

BORING 11

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SP	860.0	20	Coarse Sand, mottled brown and red-brown, moist, dense
							859.0	21	
							858.0	22	
							857.0	23	
							856.0	24	Groundwater
R	25	43	16.1	114.9	97	SW	855.0	25	Sand, coarse, minor gravel, very dense, saturated
							854.0	26	
							853.0	27	
							852.0	28	
							851.0	29	
R	30	53	14.7	122.5	100	SW	850.0	30	**END B11 @ 30':** Water @24', No Caving, No Fill

LOG OF BORING

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 8/10/2005
LOG DATE 8/10/2005
LOGGED BY RC
DRILL TYPE Hollow-stem Auger
DIAMETER 8 INCHES

SURFACE ELEVATION 871 feet
DRILLING CONTRACTOR D & D Construction Specialties
SURFACE CONDITIONS Genlty sloping canyon

BORING 12

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SM	871.0	0	**ALLUVIUM:** Silty Sand, grey-brown, slightly moist, medium dense
							870.0	1	
							869.0	2	
							868.0	3	
							867.0	4	
R	5	33	3.9	124.8	32	SM	866.0	5	Silty Sand, light brown-reddish, yellow, slightly moist, medium dense
							865.0	6	
							864.0	7	
							863.0	8	- - - - - - - - - -
							862.0	9	Coarse Sand, light brown-reddish, yellow, moist, medium dense
R	10	18	4.2	117.9	28	SP	861.0	10	
							860.0	11	
							859.0	12	
							858.0	13	
							857.0	14	
R	15	22	5.1	117.5	34	SP	856.0	15	
							855.0	16	
							854.0	17	
							853.0	18	
							852.0	19	
						SP	851.0	20	Coarse Sand, light brown-reddish, yellow, moist, dense

LOG OF BORING

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 8/10/2005
LOG DATE 8/10/2005
LOGGED BY RC
DRILL TYPE Hollow-stem Auger
DIAMETER 8 INCHES

SURFACE ELEVATION 871 feet
DRILLING CONTRACTOR D & D Construction Specialties
SURFACE CONDITIONS Genlty sloping canyon

BORING 12

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
						SP	851.0	20	Coarse Sand, mottled brown and red-brown, moist, dense
							850.0	21	
							849.0	22	
							848.0	23	
							847.0	24	
R	25	100	12.4	123.8	98	SW	846.0	25	Sand, coarse, minor gravel, very dense, wet
							845.0	26	
							844.0	27	Groundwater
							843.0	28	
							842.0	29	
R	30	54	11.1	128.2	100	SW	841.0	30	**END B12 @ 30':** Water @27', No Caving, No Fill

LOG OF TEST PITS

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/2005	
LOG DATE	8/10/2005	
LOGGED BY	JAI	
DRILL TYPE	Backhoe	
DIAMETER	30" Bucket Width	

SURFACE ELEVATION	802 feet
DRILLING CONTRACTOR	Jon Watson
SURFACE CONDITIONS	Canyon

TEST PIT 1

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							802.0	0	**COLLUVIUM:** Silty Sand, orange and grey, dry, loose
						SM	801.0	1	
							800.0	2	
						SW	799.0	3	**ALLUVIUM:** Sand, grey, dry, loose, coarse grained
							798.0	4	**ALLUVIAL TERRACE:** Silty Sand, red-brown, dense to very dense
						SM	797.0	5	
							796.0	6	
							795.0	7	**END TP @ 7':** No Water, No Caving, No fill

LOG OF TEST PITS

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/05	
LOG DATE	8/10/05	
LOGGED BY	JAI	
DRILL TYPE	Backhoe	
DIAMETER	30" Bucket Width	

SURFACE ELEVATION	825 feet
DRILLING CONTRACTOR	Jon Watson
SURFACE CONDITIONS	Secondary Canyon

TEST PIT 2

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							825.0	0	**ALLUVIUM:** Silty Sand, grey, dry, medium dense, coarse grained
						SM	824.0	1	
							823.0	2	
							822.0	3	
							821.0	4	
							820.0	5	
							819.0	6	grades to dense Silty Sand, orange-brown, some Clay binder
						SM	818.0	7	
							817.0	8	
							816.0	9	
							815.0	10	
						SM/SC	814.0	11	**ALLUVIAL TERRACE:** Silty Sand/Clayey Sand, red-brown, dense to very dense
							813.0	12	
							812.0	13	
									END TP @ 13': No Water, No Caving, No Fill.

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF TEST PITS

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 8/10/05
LOG DATE 8/10/05
LOGGED BY JAI
DRILL TYPE Backhoe
DIAMETER 30" Bucket Width

SURFACE ELEVATION 832 feet
DRILLING CONTRACTOR Jon Watson
SURFACE CONDITIONS Secondary Canyon

TEST PIT 3

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							832.0	0	**ALLUVIUM:** Silty Sand, grey, dry, medium dense, coarse grained
						SM	831.0	1	
							830.0	2	
							829.0	3	grades to dense Silty Sand, moist, orange-brown, some Clay binder
							828.0	4	
							827.0	5	
							826.0	6	
						SM	825.0	7	
							824.0	8	
							823.0	9	
							822.0	10	
							821.0	11	
							820.0	12	
							819.0	13	**ALLUVIAL TERRACE:** Silty Sand/Clayey Sand, red-brown, dense to very dense, contains weathered granitic cobbles, moist to very moist
							818.0	14	
						SM/SC	817.0	15	
							816.0	16	
							815.0	17	
							814.0	18	**END TP @ 18':** No Water, No Caving, No Fill.

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF TEST PITS

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/05	
LOG DATE	8/10/05	
LOGGED BY	JAI	
DRILL TYPE	Backhoe	
DIAMETER	30" Bucket Width	

SURFACE ELEVATION	842 feet
DRILLING CONTRACTOR	Jon Watson
SURFACE CONDITIONS	Secondary Canyon

TEST PIT 4

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							842.0	0	**ALLUVIUM:** Silty Sand, grey, dry, medium dense, coarse grained
						SM	841.0	1	
							840.0	2	
							839.0	3	grades to dense Silty Sand, moist, orange-brown, some Clay binder
							838.0	4	
							837.0	5	
							836.0	6	
						SM	835.0	7	hard Granitic boulders up to 24 inches diameter
							834.0	8	
							833.0	9	
							832.0	10	**ALLUVIAL TERRACE:** Silty Sand/Clayey Sand, red-brown, dense to very dense, contains weathered granitic cobbles, moist to very moist
						SM/SC	831.0	11	
							830.0	12	
							829.0	13	**END TP @ 13':** No Water, No Caving, No Fill.

LOG OF TEST PITS

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/05	
LOG DATE	8/10/05	
LOGGED BY	JAI	
DRILL TYPE	Backhoe	
DIAMETER	30" Bucket Width	

SURFACE ELEVATION	793 feet
DRILLING CONTRACTOR	Jon Watson
SURFACE CONDITIONS	Secondary Canyon

TEST PIT 5

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							793.0	0	**ALLUVIUM:** Silty Sand, grey to orange, dry, medium dense, contains occasional boulders up to 12" diameter
						SM	792.0	1	
							791.0	2	
							790.0	3	grades to dense Silty Sand, moist, orange-brown, some Clay binder
							789.0	4	
							788.0	5	
							787.0	6	
						SM	786.0	7	hard Granitic boulders up to 24 inches diameter
							785.0	8	
							784.0	9	
							783.0	10	Sand, dry, grey-brown, caving
						SP	782.0	11	
							781.0	12	
							780.0	13	**BEDROCK:** Granite, grey-brown, hard, fractured moderately weathered
							779.0	14	
							778.0	15	
							777.0	16	**END TP @ 16':** No Water, Caving 10-13', No Fill.

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF TEST PITS

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/05	
LOG DATE	8/10/05	
LOGGED BY	JAI	
DRILL TYPE	Backhoe	
DIAMETER	30" Bucket Width	

SURFACE ELEVATION	792 feet
DRILLING CONTRACTOR	Jon Watson
SURFACE CONDITIONS	Secondary Canyon

TEST PIT 6

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							792.0	0	**ALLUVIUM:** Silty Sand, grey-brown, dry, roots, medium dense, coarse grained
						SM	791.0	1	
							790.0	2	
							789.0	3	
							788.0	4	
							787.0	5	**ALLUVIAL TERRACE:** Silty Sand/Clayey Sand, red-brown, dense to very dense, moist
							786.0	6	
						SM/SC	785.0	7	
							784.0	8	
							783.0	9	
							782.0	10	
							781.0	11	
							780.0	12	**END TP @ 11':** No Water, No Caving, No Fill.
							779.0	13	

LOG OF TEST PITS

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT	IC 05099 Stonehouse Homes, LLC
DRILL DATE	8/10/05
LOG DATE	8/10/05
LOGGED BY	JAI
DRILL TYPE	Backhoe
DIAMETER	30" Bucket Width
SURFACE ELEVATION	880 feet
DRILLING CONTRACTOR	Jon Watson
SURFACE CONDITIONS	east side of main canyon

TEST PIT 7

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							880.0	0	**FILL** Silty Sand, grey-brown, dry, roots, medium dense, coarse grained
						SM	879.0	1	
							878.0	2	
							877.0	3	
							876.0	4	
						SM	875.0	5	**ALLUVIUM:** Silty Sand, grey-brown, dry, roots, medium dense, coarse grained
							874.0	6	
							873.0	7	
							872.0	8	
							871.0	9	
							870.0	10	
							869.0	11	
							868.0	12	
							867.0	13	
							866.0	14	**OLDER ALLUVIUM:** Silty Sand, grey-brown, moist, dense, come clay binder
						SM	865.0	15	
							864.0	16	
							863.0	17	
							862.0	18	heavy seep from north
							861.0	19	
							860.0	20	**END TP @ 20':** Heavy Seep 18', No Caving, Fill to 4 feet.

LOG OF TEST PITS

IRVINE GEOTECHNICAL
SOIL LABWORKS, LLC

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/05	
LOG DATE	8/10/05	
LOGGED BY	JAI	
DRILL TYPE	Backhoe	
DIAMETER	30" Bucket Width	

SURFACE ELEVATION	917 feet
DRILLING CONTRACTOR	Jon Watson
SURFACE CONDITIONS	east side of main canyon

TEST PIT 8

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							917.0	0	**FILL** Silty Sand, grey-brown, slightly moist, very dense, compacted
						SM	916.0	1	
							915.0	2	
							914.0	3	
							913.0	4	
							912.0	5	
							911.0	6	**ALLUVIUM:** Silty Sand, grey-brown, slightly moist, porous, medium dense, coarse grained
							910.0	7	
							909.0	8	
						SM	908.0	9	
							907.0	10	
							906.0	11	
							905.0	12	**ALLUVIAL TERRACE:** Silty Sand/Clayey Sand, yellow-brown, dense to very dense, moist, contains weathered granitic boulders
							904.0	13	
							903.0	14	
						SM/SC	902.0	15	
							901.0	16	
							900.0	17	
							899.0	18	**END TP @ 18':** No Water, No Caving, Fill to 6 feet.

LOG OF TEST PITS

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 8/10/05
LOG DATE 8/10/05
LOGGED BY JAI
DRILL TYPE Backhoe
DIAMETER 30" Bucket Width

SURFACE ELEVATION 875 feet
DRILLING CONTRACTOR Jon Watson
SURFACE CONDITIONS west side of main canyon

TEST PIT 9

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							875.0	0	**FILL** Silty Sand, grey-brown, slightly moist, slightly dense
						SM	874.0	1	
							873.0	2	**ALLUVIUM:** Gravelly Sand with cobbles, grey-brown, slightly moist, loose
						SP	872.0	3	
							871.0	4	
							870.0	5	
						SM/SC	869.0	6	**ALLUVIAL TERRACE:** Silty Sand/Clayey Sand, yellow-brown, dense to very dense, moist, contains weathered granitic boulders
							868.0	7	
									END TP @ 7': No Water, No Caving, Fill to 1½ feet.

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF TEST PITS

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	8/10/05	
LOG DATE	8/10/05	
LOGGED BY	JAI	
DRILL TYPE	Backhoe	
DIAMETER	30" Bucket Width	

SURFACE ELEVATION	852 feet
DRILLING CONTRACTOR	Jon Watson
SURFACE CONDITIONS	west side of main canyon

TEST PIT 10

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							852.0	0	**ALLUVIUM:** Gravelly Sand with cobbles, grey-brown, slightly moist, loose
							851.0	1	
							850.0	2	
						SP	849.0	3	
							848.0	4	
							847.0	5	
							846.0	6	
							845.0	7	
							844.0	8	
							843.0	9	
							842.0	10	
							841.0	11	
							840.0	12	
							839.0	13	
							838.0	14	
							837.0	15	
							836.0	16	**END TP @ 16':** Caving at 14-16 feet, No Fill

LOG OF TEST PITS

PROJECT	IC 05099 Stonehouse Homes, LLC
DRILL DATE	12/20/05
LOG DATE	12/20/05
LOGGED BY	JAI
DRILL TYPE	Tractor-backhoe
DIAMETER	30" Bucket Width

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

SURFACE ELEVATION	1042 feet
DRILLING CONTRACTOR	Jon Watson
SURFACE CONDITIONS	upper edge of pad

TEST PIT 11

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							1042.0	0	**FILL:** Silty Sand, grey-brown, dry, medium dense, coarse grained
						SM	1041.0	1	
							1040.0	2	
							1039.0	3	**ALLUVIAL TERRACE:** Silty Sand/Clayey Sand, orange-brown, slightly moist dense to very dense
							1038.0	4	
							1037.0	5	
R	6	n/a	10.3	117.3	67	SM/SC	1036.0	6	**END TP @ 6':** No Water, No Caving, Fill to 3 feet

LOG OF TEST PITS

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 12/20/05
LOG DATE 12/20/05
LOGGED BY JAI
DRILL TYPE Tractor-backhoe
DIAMETER 30" Bucket Width

SURFACE ELEVATION 1042 feet
DRILLING CONTRACTOR Jon Watson
SURFACE CONDITIONS east edge of pad

TEST PIT 12

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							1042.0	0	**ALLUVIAL TERRACE:** Silty Sand, orange-brown to yellow-brown, slightly moist dense to very dense
						SM	1041.0	1	
							1040.0	2	
							1039.0	3	
							1038.0	4	
							1037.0	5	
R	6	n/a	12.9	115.4	79		1036.0	6	**END TP @ 6':** No Water, No Caving, No Fill

LOG OF TEST PITS

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	12/20/05	
LOG DATE	12/20/05	
LOGGED BY	JAI	
DRILL TYPE	Tractor-backhoe	
DIAMETER	30" Bucket Width	

SURFACE ELEVATION	1042 feet
DRILLING CONTRACTOR	Jon Watson
SURFACE CONDITIONS	north edge of pad

TEST PIT 13

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							1042.0	0	**FILL:** Silty Sand, grey-brown, dry, medium dense, coarse grained
						SM	1041.0	1	
							1040.0	2	
							1039.0	3	
							1038.0	4	
							1037.0	5	**ALLUVIAL TERRACE:** Silty Sand, orange-brown to yellow-brown, slightly moist dense to very dense
							1036.0	6	
R	7	n/a	10.3	116.1	64		1035.0	7	
									END TP @ 7': No Water, No Caving, Fill to 4 feet

LOG OF TEST PITS

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT IC 05099 Stonehouse Homes, LLC
DRILL DATE 12/20/05
LOG DATE 12/20/05
LOGGED BY JAI
DRILL TYPE Tractor-backhoe
DIAMETER 30" Bucket Width

SURFACE ELEVATION 1042 feet
DRILLING CONTRACTOR Jon Watson
SURFACE CONDITIONS center of pad

TEST PIT 14

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							1042.0	0	**FILL:** Silty Sand, grey-brown, dry, medium dense, coarse grained
						SM	1041.0	1	
							1040.0	2	
							1039.0	3	
							1038.0	4	
							1037.0	5	
							1036.0	6	
							1035.0	7	
							1034.0	8	
							1033.0	9	
							1032.0	10	
							1031.0	11	
							1030.0	12	**BEDROCK:** Granite, orange, hard, massive, moderately weathered.
							1029.0	13	
R	14	n/a	6.0	124.3	48		1028.0	14	**END TP @ 14':** No Water, No Caving, Fill to 12 feet

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

LOG OF TEST PITS

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	12/20/05	
LOG DATE	12/20/05	
LOGGED BY	JAI	
DRILL TYPE	Tractor-backhoe	
DIAMETER	30" Bucket Width	

SURFACE ELEVATION	1077 feet
DRILLING CONTRACTOR	Jon Watson
SURFACE CONDITIONS	upper edge of pad

TEST PIT 15

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							1077.0	0	**FILL:** Silty Sand, grey-brown, dry, medium dense, coarse grained
						SM	1076.0	1	
							1075.0	2	
							1074.0	3	
							1073.0	4	**ALLUVIAL TERRACE:** Silty Sand/Clayey Sand, orange-brown, slightly moist dense to very dense
						SM/SC	1072.0	5	
							1071.0	6	**END TP @ 6':** No Water, No Caving, Fill to 4 feet

LOG OF TEST PITS

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

PROJECT	IC 05099	Stonehouse Homes, LLC
DRILL DATE	12/20/05	
LOG DATE	12/20/05	
LOGGED BY	JAI	
DRILL TYPE	Tractor-backhoe	
DIAMETER	30" Bucket Width	

SURFACE ELEVATION	1083 feet
DRILLING CONTRACTOR	Jon Watson
SURFACE CONDITIONS	center of pad

TEST PIT 16

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							1083.0	0	**FILL:** Silty Sand, grey-brown, dry, medium dense, coarse grained, contains bricks and construction debris
						SM	1082.0	1	
							1081.0	2	
							1080.0	3	
							1079.0	4	
							1078.0	5	
							1077.0	6	
							1076.0	7	
							1075.0	8	
							1074.0	9	
							1073.0	10	**BEDROCK:** Granite, salt & peper, hard, massive, moderately weathered.
							1072.0	11	
R	12	n/a	5.4	128.4	50		1071.0	12	**END TP @ 12':** No Water, No Caving, Fill to 10 feet

IRVINE GEOTECHNICAL Inc

SCREENING ACCELERATION

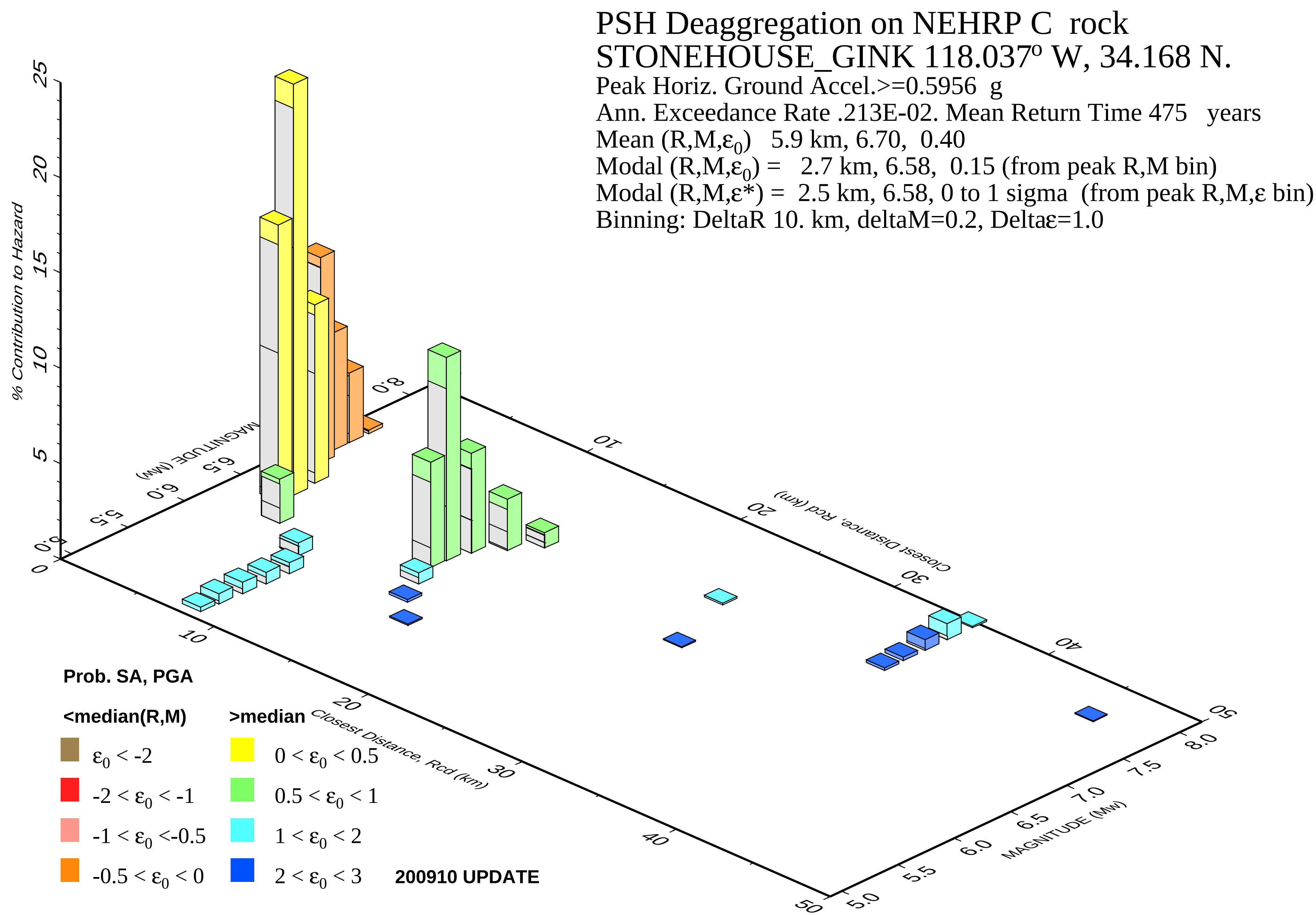
IC: **14073** CONSULT **JAI**
CLIENT **STONEHOUSE - GINKGO**

REFERENCES

CGS, SP117A, 2008 (Guidelines for Evaluating and Mitigating Seismic Hazards in California) & SCEC, 2002 (Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landsliding in California)

Longitude	118.037	W
Latitude	34.168	N
Mean Return Time	475	years
Modal EQ Magnitude (M)	6.58	
Modal Source Distance (r)	2.7	km
Max. Horizontal Acceleration (MHA)	0.596	g
Significant Duration of Shaking ($D_{5\text{-}95}$)	9.90	secs
Modal Mean Period (T_m)	0.465	
Nonlinear Response Factor (NRF)	0.623	
Design Allowable Displacement	5	cm
Seismic Factor (f_{eq})	0.498	
Screening Acceleration (Keq)	**0.296**	**g**

CONCLUSIONS: The screening acceleration for determining the seismic slope stability is 0.296g.



GMT 2014 Dec 15 18:34:56 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on rock with average vs= 700. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

LIQUEFACTION ANALYSIS USING SPT DATA

Use procedures established by T.L. Youd, et. al., 1996 NCEER-96-0022, SCEC SP117, CGS SP117A, 2008 Guidelines for Evaluating & Mitigating Seismic Hazards & I.M. Idriss & R.W. Boulanger, 2008, Soil Liquefaction During Earthquakes

Horizontal Ground Acceleration (% g)	1.059 PGA_M	Energy Ratio C_E (Auto-hammer)	1.33 *
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.00
Average Wet Unit Weight (pcf)	117.0	Groundwater Depth in Boring (feet)	19.0
Design Magnitude Earthquake	6.59	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S(N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.4	C_S (for no sample liner) = $1+(N_1)_{60}/100$	

* Energy Ratio certification provided by drilling company

Boring	Depth (feet)	Lithology	Blow Count (N80)	Total Stress (tons/ft2)	Effective Stress (tons/ft2)	Fines Content FC(%)	Plasticity Index	C_R	C_N	C_S	rd	$(N_1)_{60}$	$(N_1)_{60cs}$	NCEER 1998 CSR	NCEER 1998 CRR*MSF	Liquefaction Safety Factor
Boring 8	5	Silty Sand	6	0.293	0.293	0.0	0.0	0.75	1.47	1.10	0.99	10	10	0.6803	0.1615	No Water
8	10	Silty Sand	8	0.585	0.585	0.0	0.0	0.85	1.23	1.11	0.98	12	12	0.6723	0.1884	No Water
8	15	Sand	11	0.878	0.878	55.2	0.0	0.85	1.06	1.13	0.97	15	23	0.6643	0.3443	0.52
8	17.5	Sand	13	1.024	0.946	55.2	0.0	0.85	0.99	1.15	0.96	17	25	0.7147	0.4032	0.56
8	20	Sand	20	1.170	1.014	55.2	0.0	0.95	0.94	1.24	0.95	29	40	0.7572	2.0000	>1.3*
8	22.5	Sand	22	1.316	1.082	0.0	0.0	0.95	0.91	1.25	0.95	32	32	0.7933	0.8776	1.11
8	25	Sand	20	1.463	1.151	58.2	0.0	0.95	0.89	1.22	0.94	28	38	0.8240	2.0000	>1.3*
8	27.5	Sand	20	1.609	1.219	0.0	0.0	0.95	0.86	1.22	0.94	27	27	0.8504	0.4658	0.55
8	30	Sand	21	1.755	1.287	0.0	0.0	0.95	0.84	1.22	0.93	27	27	0.8728	0.4991	0.57
8	32.5	Clayey Sand	30	1.901	1.355	58.1	0.0	0.95	0.82	1.30	0.91	40	54	0.8783	2.0000	>1.3*
8	35	Sand	100	2.048	1.424	58.1	0.0	1.00	0.80	1.30	0.89	138	171	0.8804	2.0000	>1.3*
8	37.5	Sand	24	2.194	1.492	63.7	0.0	1.00	0.78	1.25	0.87	31	42	0.8795	2.0000	>1.3*
8	40	Sand	30	2.340	1.560	63.7	0.0	1.00	0.76	1.30	0.85	40	52	0.8761	2.0000	>1.3*
8	42.5	Sand	43	2.486	1.628	0.0	0.0	1.00	0.74	1.30	0.83	55	55	0.8704	2.0000	>1.3*
8	45	Sand	30	2.633	1.697	48.6	0.0	1.00	0.73	1.29	0.81	37	50	0.8628	2.0000	>1.3*
8	47.5	Sand	31	2.779	1.765	48.6	0.0	1.00	0.71	1.29	0.79	38	51	0.8535	2.0000	>1.3*
8	50	Clayey Sand	63	2.925	1.833	67.9	0.0	1.00	0.70	1.30	0.77	76	96	0.8426	2.0000	>1.3*

DYNAMIC SETTLEMENT ANALYSIS USING SPT DATA
"SATURATED SAND SETTLEMENT"
Use procedure established by Ishihara and Yoshimine, 1992

Horizontal Ground Acceleration (% g)	1.059 PGA_M	Energy Ratio C_E (Auto-hammer)	1.33
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.00
Average Wet Unit Weight (pcf)	117	Groundwater Depth in Boring (feet)	19.0
Design Magnitude Earthquake	6.59	Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.39		

Boring	Depth (feet)	Interval Thickness (feet)	Lithology	Blow Count (N80)	Total Stress (tons/ft2)	Effective Stress (tons/ft2)	Blow Count N_{60}	SPT $(N_1)_{60}$ (blow/ft)	NCEER 1998 CSR	NCEER 1998 CRR*MSF	Liquefaction Safety Factor	Calculated Strain (%)	Calculated Settlement (inches)	Cumulative Settlement (inches)
Boring 8	5	2.5	Silty Sand	6	0.293	0.293	8.0	9.7	0.6803	0.1615	No Water	0.0000	0.00	0.00
8	10	2.5	Silty Sand	8	0.585	0.585	10.6	12.4	0.6723	0.1884	No Water	0.0000	0.00	0.00
8	15	2.5	Sand	11	0.878	0.878	14.6	22.9	0.6643	0.3443	0.5184	0.0153	0.46	0.46
8	17.5	2.5	Sand	13	1.024	1.024	17.3	25.0	0.7147	0.4032	0.5641	0.0145	0.44	0.89
8	20	2.5	Sand	20	1.170	1.139	26.6	40.3	0.7572	2.0000	>1.3*	0.0000	0.00	0.89
8	22.5	2.5	Sand	22	1.316	1.207	29.3	31.9	0.7933	0.8776	1.1063	0.0000	0.00	0.89
8	25	2.5	Sand	20	1.463	1.275	26.6	38.0	0.8240	2.0000	>1.3*	0.0000	0.00	0.89
8	27.5	2.5	Sand	20	1.609	1.344	26.6	26.6	0.8504	0.4658	0.5478	0.0140	0.42	1.31
8	30	2.5	Sand	21	1.755	1.412	27.9	27.3	0.8728	0.4991	0.5718	0.0137	0.41	1.72
8	32.5	2.5	Clayey Sand	30	1.901	1.480	39.9	53.5	0.8783	2.0000	>1.3*	0.0000	0.00	1.72
8	35	2.5	Sand	100	2.048	1.548	133.0	171.1	0.8804	2.0000	>1.3*	0.0000	0.00	1.72
8	37.5	2.5	Sand	24	2.194	1.617	31.9	42.4	0.8795	2.0000	>1.3*	0.0000	0.00	1.72
8	40	2.5	Sand	30	2.340	1.685	39.9	52.5	0.8761	2.0000	>1.3*	0.0000	0.00	1.72
8	42.5	2.5	Sand	43	2.486	1.753	57.2	55.4	0.8704	2.0000	>1.3*	0.0000	0.00	1.72
8	45	2.5	Sand	30	2.633	1.821	39.9	50.0	0.8628	2.0000	>1.3*	0.0000	0.00	1.72
8	47.5	2.5	Sand	31	2.779	1.890	41.2	50.6	0.8535	2.0000	>1.3*	0.0000	0.00	1.72
8	50	2.5	Clayey Sand	63	2.925	1.958	83.8	96.1	0.8426	2.0000	>1.3*	0.0000	0.00	1.72

DYNAMIC SETTLEMENT ANALYSIS USING SPT DATA
"DRY SAND SETTLEMENT"

Use procedure established by Tokimatsu & Seed (1987) and modified by D. Pradel, 1998

Horizontal Ground Acceleration (% g)	1.059
Groundwater Depth in Boring (feet)	60
Average Wet Unit Weight (pcf)	117
Design Magnitude Earthquake	6.59
Magnitude Weighted Earthquake Cycles	8
Design Groundwater Depth for Liquefaction (feet)	50
Assumed Groundwater Depth for Dry Sand (feet)	60

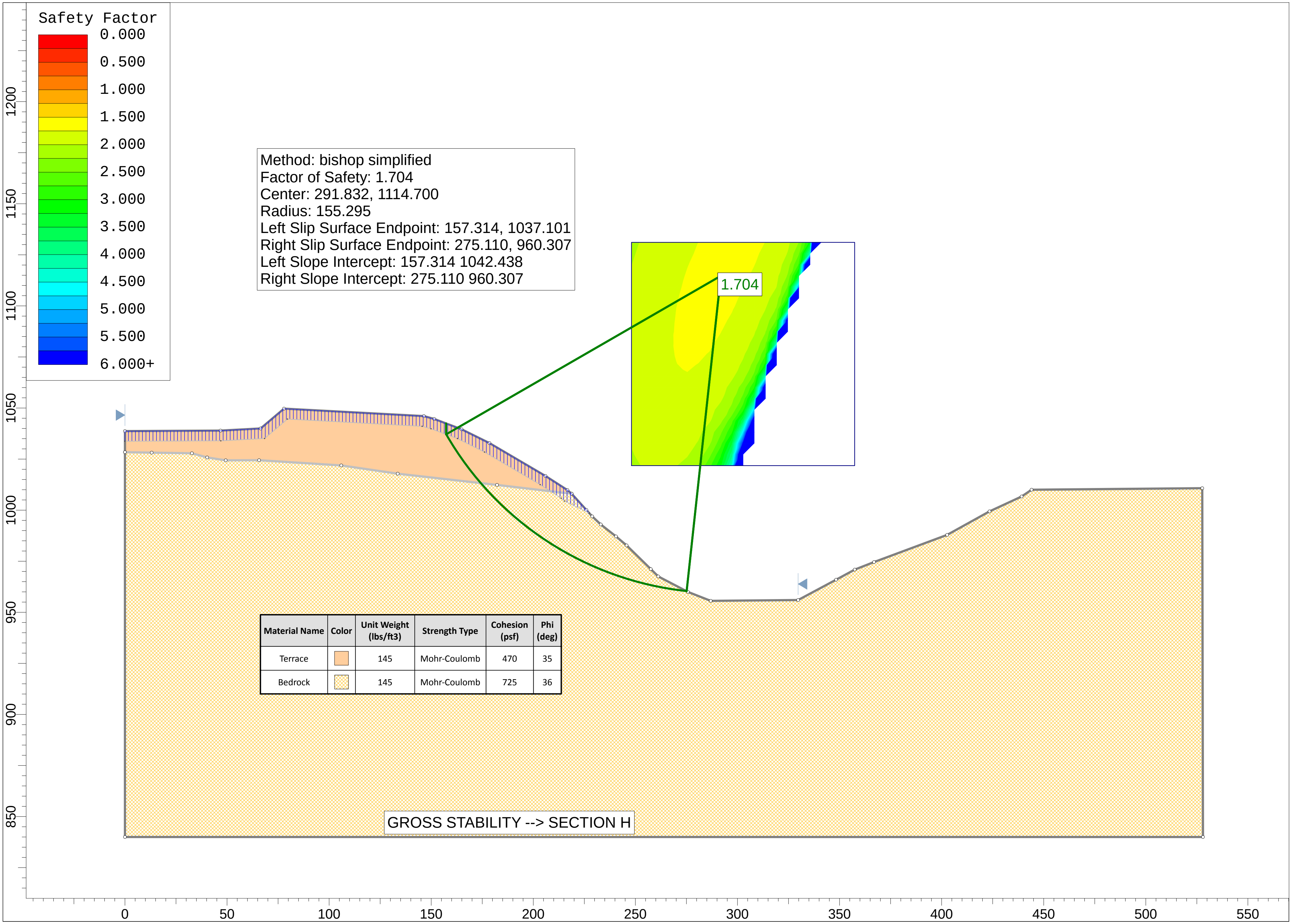
Boring	Depth (feet)	Interval Thickness (feet)	Lithology	Blow Count (N80)	Average Stress (tons/ft2)	Pradel's Coefficients a	Pradel's Coefficients b	SPT $(N_1)_{60}$ (blow/ft)	Shear Gmax (tsf)	Cyclic Shear (tsf)	Shear Strain (y) (%)	Volumetric Strain E15 (%)	Strain Cycles Enc	Calculated Settlement (feet)	Calculated Settlement (inches)	Cumulative Settlement (inches)
Boring 1	5	5	Sand	12	0.195	0.13	17061.96	21	542.609	0.0211	0.011098	0.0106	0.0079	0.010	0.114	0.11
1	10	5	Sand	5	0.390	0.14	11256.70	8	550.492	0.0209	0.010651	0.0337	0.0252	0.030	0.363	0.48
1	15	5	Silty Sand	10	0.585	0.15	8825.84	21	944.755	0.0206	0.010272	0.0096	0.0072	0.009	0.104	0.58
1	20	5	Silty Sand	18	0.780	0.15	7426.65	36	1299.999	0.0204	0.010165	0.0051	0.0038	0.005	0.055	0.64
1	25	5	Silty Sand	22	0.975	0.16	6496.01	39	1495.784	0.0201	0.010127	0.0046	0.0034	0.004	0.049	0.69
1	30	5	Silty Sand	30	1.171	0.17	5822.88	36	1599.595	0.0199	0.010109	0.0050	0.0037	0.004	0.054	0.74
1	35	5	Silty Sand	39	1.366	0.18	5308.48	60	2042.919	0.0190	0.010076	0.0027	0.0020	0.002	0.029	0.77
1	40	5	Sand	51	1.561	0.18	4899.76	55	2121.131	0.0181	0.010067	0.0030	0.0022	0.003	0.032	0.80
1	45	5	Gravelly Sand	60	1.756	0.19	4565.45	60	2313.011	0.0173	0.010056	0.0027	0.0020	0.002	0.029	0.83
1	50	5	Silty Sand	43	1.951	0.20	4285.77	53	2339.054	0.0164	0.010051	0.0032	0.0024	0.003	0.034	0.86

DYNAMIC SETTLEMENT ANALYSIS USING SPT DATA
"DRY SAND SETTLEMENT"

Use procedure established by Tokimatsu & Seed (1987) and modified by D. Pradel, 1998

Horizontal Ground Acceleration (% g)	1.059
Groundwater Depth in Boring (feet)	60
Average Wet Unit Weight (pcf)	117
Design Magnitude Earthquake	6.59
Magnitude Weighted Earthquake Cycles	8
Design Groundwater Depth for Liquefaction (feet)	50
Assumed Groundwater Depth for Dry Sand (feet)	60

Boring	Depth (feet)	Interval Thickness (feet)	Lithology	Blow Count (N80)	Average Stress (tons/ft2)	Pradel's Coefficients a	Pradel's Coefficients b	SPT $(N_1)_{60}$ (blow/ft)	Shear Gmax (tsf)	Cyclic Shear (tsf)	Shear Strain (y) (%)	Volumetric Strain E15 (%)	Strain Cycles Enc	Calculated Settlement (feet)	Calculated Settlement (inches)	Cumulative Settlement (inches)
Boring 2	5	5	Silty Sand	13	0.195	0.13	17061.96	23	559.593	0.0211	0.011053	0.0095	0.0071	0.009	0.102	0.10
2	10	5	Silt	11	0.390	0.14	11256.70	18	727.339	0.0209	0.010466	0.0121	0.0091	0.011	0.131	0.23
2	15	5	Sand	18	0.585	0.15	8825.84	36	1133.649	0.0206	0.010223	0.0050	0.0037	0.004	0.054	0.29
2	20	5	Silty Sand	15	0.780	0.15	7426.65	30	1224.586	0.0204	0.010176	0.0063	0.0047	0.006	0.068	0.35
2	25	5	Sand	34	0.975	0.16	6496.01	60	1731.932	0.0201	0.010109	0.0027	0.0020	0.002	0.029	0.38
2	30	5	Sand	36	1.171	0.17	5822.88	44	1707.650	0.0199	0.010102	0.0039	0.0029	0.004	0.042	0.43
2	35	5	Sand	34	1.366	0.18	5308.48	53	1959.558	0.0190	0.010080	0.0031	0.0024	0.003	0.034	0.46
2	40	5	Sand	42	1.561	0.18	4899.76	45	1988.203	0.0181	0.010071	0.0038	0.0028	0.003	0.041	0.50
2	45	5	Silt	20	1.756	0.19	4565.45	18	1540.739	0.0173	0.010085	0.0118	0.0088	0.011	0.127	0.63
2	50	5	Silty Sand	87	1.951	0.20	4285.77	101	2910.190	0.0164	0.010041	0.0014	0.0011	0.001	0.015	0.64



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Terrace		145	Mohr-Coulomb	470	35
Bedrock		145	Mohr-Coulomb	725	36

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: SectionHcalc
Slide Modeler Version: 6.032
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 12/16/2014, 4:43:06 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search

Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Tension Crack

Tension crack Water level: filled with water

Material Properties

Property	Terrace	Bedrock
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	145	145
Cohesion [psf]	470	725
Friction Angle [deg]	35	36
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: bishop simplified

FS: 1.704090
Center: 291.832, 1114.700
Radius: 155.295
Left Slip Surface Endpoint: 157.314, 1037.101
Right Slip Surface Endpoint: 275.110, 960.307
Left Slope Intercept: 157.314 1042.438
Right Slope Intercept: 275.110 960.307
Resisting Moment=4.88445e+007 lb-ft
Driving Moment=2.86631e+007 lb-ft
Total Slice Area=2356.74 ft2

Valid / Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 3024
Number of Invalid Surfaces: 1827

Error Codes:

Error Code -98 reported for 218 surfaces
Error Code -106 reported for 17 surfaces
Error Code -107 reported for 338 surfaces
Error Code -1000 reported for 1254 surfaces

Error Codes

The following errors were encountered during the computation:

-98 = Circular slip surface is entirely within the tension crack zone.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-1000 = No valid slip surfaces are generated at a grid center. Unable to draw a surface.

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.70409

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	4.23722	4919.27	Terrace	470	35	450.5	767.693	425.15	0	425.15
2	4.23722	7970.27	Terrace	470	35	655.028	1116.23	922.906	0	922.906
3	4.23722	10404	Terrace	470	35	831.828	1417.51	1353.18	0	1353.18
4	4.23722	12410.9	Terrace	470	35	988.023	1683.68	1733.31	0	1733.31
5	4.80223	16135.4	Bedrock	725	36	1262.56	2151.51	1963.43	0	1963.43
6	4.80223	17830.2	Bedrock	725	36	1403.63	2391.91	2294.31	0	2294.31
7	4.80223	19108.4	Bedrock	725	36	1520.76	2591.52	2569.05	0	2569.05
8	4.80223	20123	Bedrock	725	36	1622.1	2764.2	2806.72	0	2806.72
9	4.80223	20901.7	Bedrock	725	36	1708.5	2911.44	3009.39	0	3009.39
10	4.80223	21466.8	Bedrock	725	36	1780.72	3034.5	3178.75	0	3178.75
11	4.80223	21822	Bedrock	725	36	1838.34	3132.7	3313.93	0	3313.93
12	4.80223	21863.8	Bedrock	725	36	1873.55	3192.69	3396.49	0	3396.49
13	4.80223	21695.4	Bedrock	725	36	1892.76	3225.43	3441.54	0	3441.54
14	4.80223	20688.5	Bedrock	725	36	1849.83	3152.28	3340.87	0	3340.87
15	4.80223	18712.5	Bedrock	725	36	1732.53	2952.38	3065.72	0	3065.72
16	4.80223	16650.6	Bedrock	725	36	1603.94	2733.25	2764.13	0	2764.13
17	4.80223	15021.2	Bedrock	725	36	1503.34	2561.82	2528.17	0	2528.17
18	4.80223	13652.5	Bedrock	725	36	1419.07	2418.22	2330.51	0	2330.51
19	4.80223	12016.1	Bedrock	725	36	1310.86	2233.82	2076.71	0	2076.71
20	4.80223	9935.14	Bedrock	725	36	1164	1983.56	1732.27	0	1732.27
21	4.80223	7581.53	Bedrock	725	36	990.927	1688.63	1326.32	0	1326.32
22	4.80223	5106.19	Bedrock	725	36	803.066	1368.5	885.697	0	885.697
23	4.80223	3112.01	Bedrock	725	36	649.599	1106.97	525.743	0	525.743
24	4.80223	1936.71	Bedrock	725	36	560.15	954.546	315.943	0	315.943
25	4.80223	663.317	Bedrock	725	36	459.999	783.88	81.0417	0	81.0417

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.70409

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	157.314	1037.1	888.588	0	0

2	161.552	1030.18	1922.18	0	0
3	165.789	1023.98	4866.8	0	0
4	170.026	1018.37	8939.69	0	0
5	174.263	1013.24	13641.8	0	0
6	179.065	1007.93	18008.4	0	0
7	183.868	1003.07	22403.5	0	0
8	188.67	998.621	26539.6	0	0
9	193.472	994.525	30247.1	0	0
10	198.274	990.75	33403.8	0	0
11	203.077	987.267	35923.5	0	0
12	207.879	984.053	37745.4	0	0
13	212.681	981.089	38815.7	0	0
14	217.483	978.359	39124	0	0
15	222.285	975.848	38629.9	0	0
16	227.088	973.544	37370.8	0	0
17	231.89	971.439	35487.8	0	0
18	236.692	969.523	33112.5	0	0
19	241.494	967.789	30339.5	0	0
20	246.297	966.23	27281.5	0	0
21	251.099	964.842	24097.4	0	0
22	255.901	963.618	20961.4	0	0
23	260.703	962.556	18045.6	0	0
24	265.506	961.652	15401.4	0	0
25	270.308	960.903	12948.1	0	0
26	275.11	960.307	0	0	0

List Of Coordinates

Tension Crack

X	Y
0	1033.75
46.9519	1033.93
68.4289	1035.1
79.6263	1044.61
145.569	1041.07
149.899	1039.87
162.868	1035.03
176.127	1028.44
203.338	1012.48
213.699	1005.84
215.306	1004.46
227.424	998.536

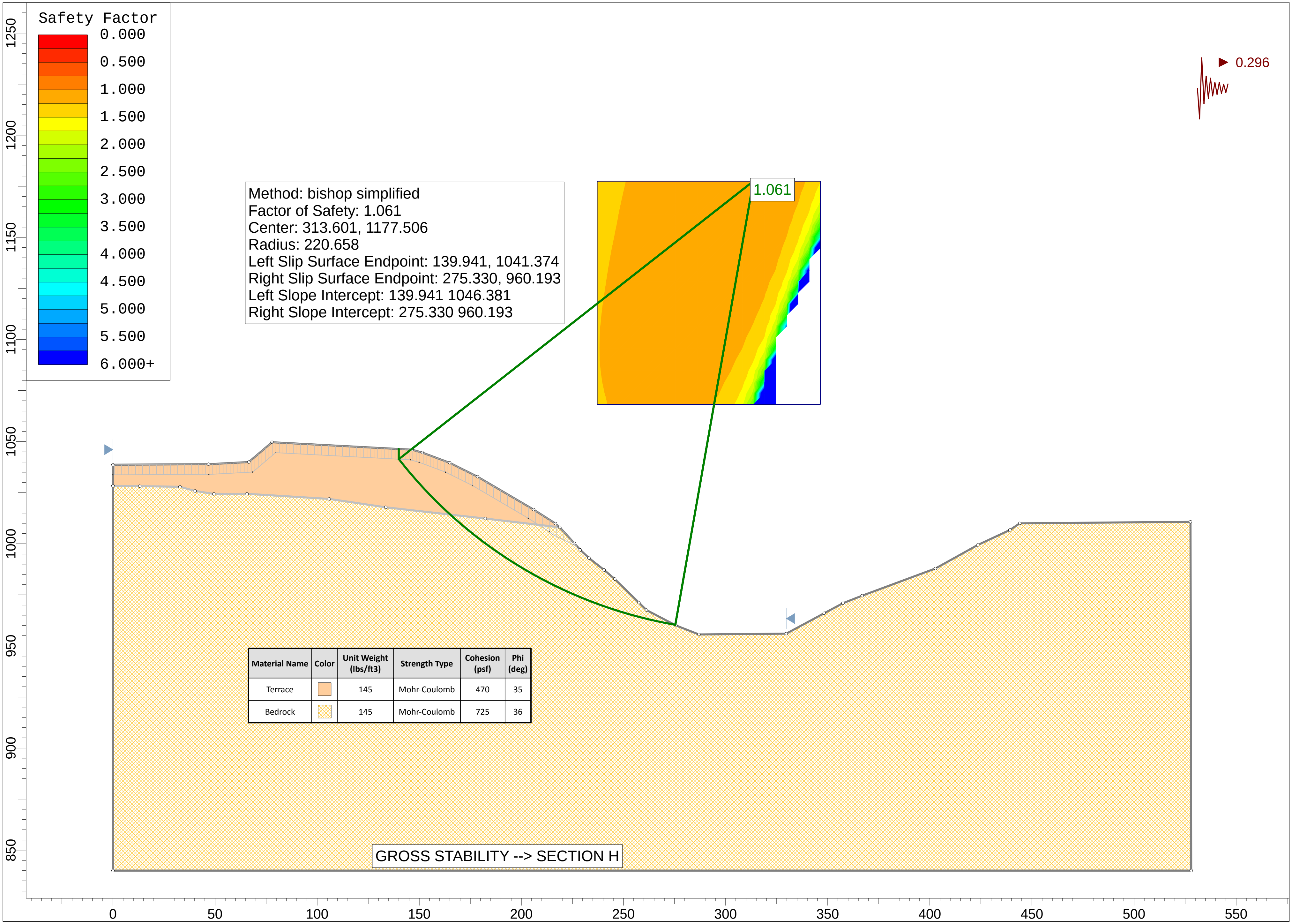
External Boundary

X	Y
0	840

528	840
527.653	1010.75
444.038	1010
439.206	1006.72
423.456	999.386
402.719	987.883
366.892	974.577
357.461	970.874
348.281	965.967
329.7	956
286.917	955.596
275.7	960
261.225	967.539
257.546	971.169
245.691	982.738
240.521	987.151
233.075	992.983
228.835	996.961
226.013	1000.11
218.8	1008.05
216.693	1009.86
205.952	1016.74
178.507	1032.84
164.86	1039.62
151.445	1044.63
146.382	1046.04
77.9069	1049.71
66.4764	1040
46.8042	1038.93
0	1038.71
0	1028.4

Material Boundary

X	Y
0	1028.4
13.1064	1028.17
32.7974	1027.87
40.2478	1025.82
49.3704	1024.37
65.716	1024.45
105.964	1021.92
133.591	1017.83
182.271	1012.34
218.8	1008.05



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Terrace		145	Mohr-Coulomb	470	35
Bedrock		145	Mohr-Coulomb	725	36

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: SectionHcalc SEIS
Slide Modeler Version: 6.032
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 12/16/2014, 4:43:06 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search

Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.296

Tension Crack

Tension crack Water level: dry

Material Properties

Property	Terrace	Bedrock
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	145	145
Cohesion [psf]	470	725
Friction Angle [deg]	35	36
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: bishop simplified

FS: 1.061130
Center: 313.601, 1177.506
Radius: 220.658
Left Slip Surface Endpoint: 139.941, 1041.374
Right Slip Surface Endpoint: 275.330, 960.193
Left Slope Intercept: 139.941 1046.381
Right Slope Intercept: 275.330 960.193
Resisting Moment=7.19399e+007 lb-ft
Driving Moment=6.77957e+007 lb-ft
Total Slice Area=2823.79 ft2

Valid / Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 3856
Number of Invalid Surfaces: 995

Error Codes:

Error Code -98 reported for 510 surfaces
Error Code -105 reported for 12 surfaces
Error Code -106 reported for 29 surfaces
Error Code -108 reported for 15 surfaces
Error Code -1000 reported for 429 surfaces

Error Codes

The following errors were encountered during the computation:

-98 = Circular slip surface is entirely within the tension crack zone.
-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-1000 = No valid slip surfaces are generated at a grid center. Unable to draw a surface.

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.06113

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	5.0375	5820.31	Terrace	470	35	665.582	706.269	337.428	0	337.428
2	5.0375	9774.13	Terrace	470	35	982.09	1042.13	817.079	0	817.079
3	5.0375	12762.9	Terrace	470	35	1240.51	1316.35	1208.71	0	1208.71
4	5.0375	15209.7	Terrace	470	35	1467.12	1556.8	1552.1	0	1552.1
5	5.0375	17403.2	Terrace	470	35	1681.43	1784.22	1876.9	0	1876.9
6	5.51007	20990.7	Bedrock	725	36	2054.48	2180.07	2002.72	0	2002.72
7	5.51007	22551.9	Bedrock	725	36	2229.44	2365.73	2258.27	0	2258.27
8	5.51007	23808.8	Bedrock	725	36	2383.85	2529.57	2483.78	0	2483.78
9	5.51007	24548.9	Bedrock	725	36	2498.38	2651.11	2651.07	0	2651.07
10	5.51007	25045.9	Bedrock	725	36	2593.65	2752.2	2790.21	0	2790.21
11	5.51007	25349.1	Bedrock	725	36	2672.77	2836.16	2905.76	0	2905.76
12	5.51007	25469.4	Bedrock	725	36	2735.9	2903.15	2997.96	0	2997.96
13	5.51007	25375.4	Bedrock	725	36	2779.42	2949.33	3061.54	0	3061.54
14	5.51007	24941.5	Bedrock	725	36	2790.94	2961.55	3078.33	0	3078.33
15	5.51007	24095.4	Bedrock	725	36	2762.14	2930.99	3036.28	0	3036.28
16	5.51007	21658.7	Bedrock	725	36	2579.25	2736.92	2769.16	0	2769.16
17	5.51007	18768.8	Bedrock	725	36	2344.48	2487.8	2426.29	0	2426.29
18	5.51007	16439.3	Bedrock	725	36	2155.31	2287.06	2149.98	0	2149.98
19	5.51007	14574.5	Bedrock	725	36	2005	2127.57	1930.47	0	1930.47
20	5.51007	12354.5	Bedrock	725	36	1812.65	1923.46	1649.54	0	1649.54
21	5.51007	9538.65	Bedrock	725	36	1551.69	1646.54	1268.39	0	1268.39
22	5.51007	6492.91	Bedrock	725	36	1257.45	1334.32	838.657	0	838.657
23	5.51007	3613.56	Bedrock	725	36	970.925	1030.28	420.18	0	420.18
24	5.51007	2131.26	Bedrock	725	36	826.056	876.553	208.594	0	208.594
25	5.51007	729.885	Bedrock	725	36	685.17	727.055	2.82799	0	2.82799

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.06113

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	139.941	1041.37	0	0	0
2	144.979	1035.18	460.047	0	0
3	150.016	1029.42	3115.37	0	0
4	155.054	1024.04	7149.77	0	0
5	160.091	1019	12083.6	0	0
6	165.129	1014.27	17640.7	0	0
7	170.639	1009.42	22242.9	0	0
8	176.149	1004.89	26877.9	0	0
9	181.659	1000.64	31342.5	0	0
10	187.169	996.662	35396.6	0	0
11	192.679	992.932	38928.9	0	0
12	198.189	989.437	41862.5	0	0
13	203.699	986.165	44139.5	0	0
14	209.209	983.104	45710.5	0	0
15	214.719	980.244	46521.4	0	0
16	220.229	977.577	46535.2	0	0
17	225.739	975.095	45610.4	0	0
18	231.25	972.792	43839.8	0	0
19	236.76	970.66	41414.8	0	0
20	242.27	968.696	38475.3	0	0
21	247.78	966.894	35118.7	0	0
22	253.29	965.251	31478.7	0	0
23	258.8	963.762	27722.1	0	0
24	264.31	962.424	24005	0	0
25	269.82	961.235	20333.1	0	0
26	275.33	960.193	0	0	0

List Of Coordinates

Tension Crack

X	Y
0	1033.75
46.9519	1033.93
68.4289	1035.1
79.6263	1044.61
145.569	1041.07
149.899	1039.87
162.868	1035.03
176.127	1028.44
203.338	1012.48
213.699	1005.84

215.306	1004.46
227.424	998.536

External Boundary

X	Y
0	840
528	840
527.653	1010.75
444.038	1010
439.206	1006.72
423.456	999.386
402.719	987.883
366.892	974.577
357.461	970.874
348.281	965.967
329.7	956
286.917	955.596
275.7	960
261.225	967.539
257.546	971.169
245.691	982.738
240.521	987.151
233.075	992.983
228.835	996.961
226.013	1000.11
218.8	1008.05
216.693	1009.86
205.952	1016.74
178.507	1032.84
164.86	1039.62
151.445	1044.63
146.382	1046.04
77.9069	1049.71
66.4764	1040
46.8042	1038.93
0	1038.71
0	1028.4

Material Boundary

X	Y
0	1028.4
13.1064	1028.17
32.7974	1027.87
40.2478	1025.82
49.3704	1024.37
65.716	1024.45
105.964	1021.92

133.591	1017.83
182.271	1012.34
218.8	1008.05

IRVINE GEOTECHNICAL SOIL LABWORKS, LLC

SURFICIAL STABILITY

IC: **05099-I** CONSULT: **JAI**
CLIENT: **STONE HOUSE HOMES**

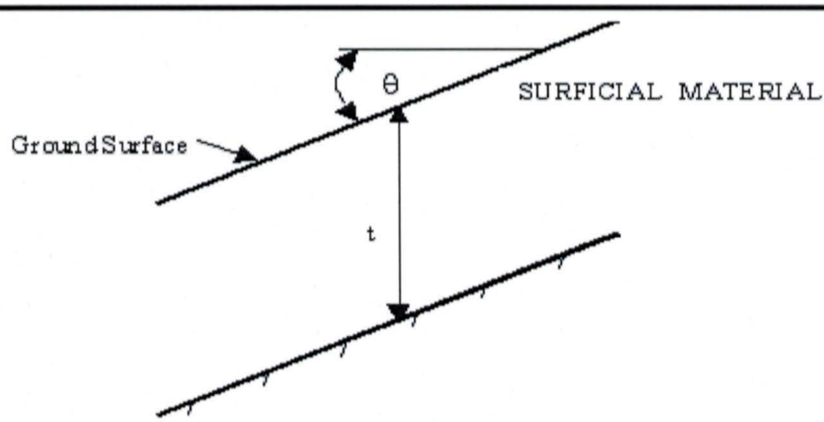
CALCULATION SHEET #

CALCULATE THE SURFICIAL STABILITY OF THE EARTH MATERIAL USING THE INFINITE SLOPE ANALYSIS WITH PARALLEL SEEPAGE. THIS METHOD WAS RECOMMENDED BY THE ASCE AND THE BUILDING AND SAFETY ADVISORY COMMITTEE (8/16/78). MODIFIED FROM SKEMPTON & DeLORY, 1957.

CALCULATION PARAMETERS

EARTH MATERIAL: COMPACTED FILL

COHESION:	240 psf	SHEAR DIAGRAM:	B-2
PHI ANGLE:	35 degrees	SLOPE ANGLE:	27 degrees
DENSITY:	135 pcf	SATURATION DEPTH (t):	4.0 feet



$$FS = \frac{C + (\gamma_{soil} - \gamma_{water}) \bullet t \bullet \cos^2\theta \tan\Phi}{\gamma_{soil} \bullet t \bullet \cos\Phi \sin\Phi}$$

SAFETY FACTOR = 1.84

CONCLUSIONS:

THE CALCULATION INDICATES THAT UNIFORM SLOPES IN COMPACTED FILL WILL BE SURFICIALLY STABLE.

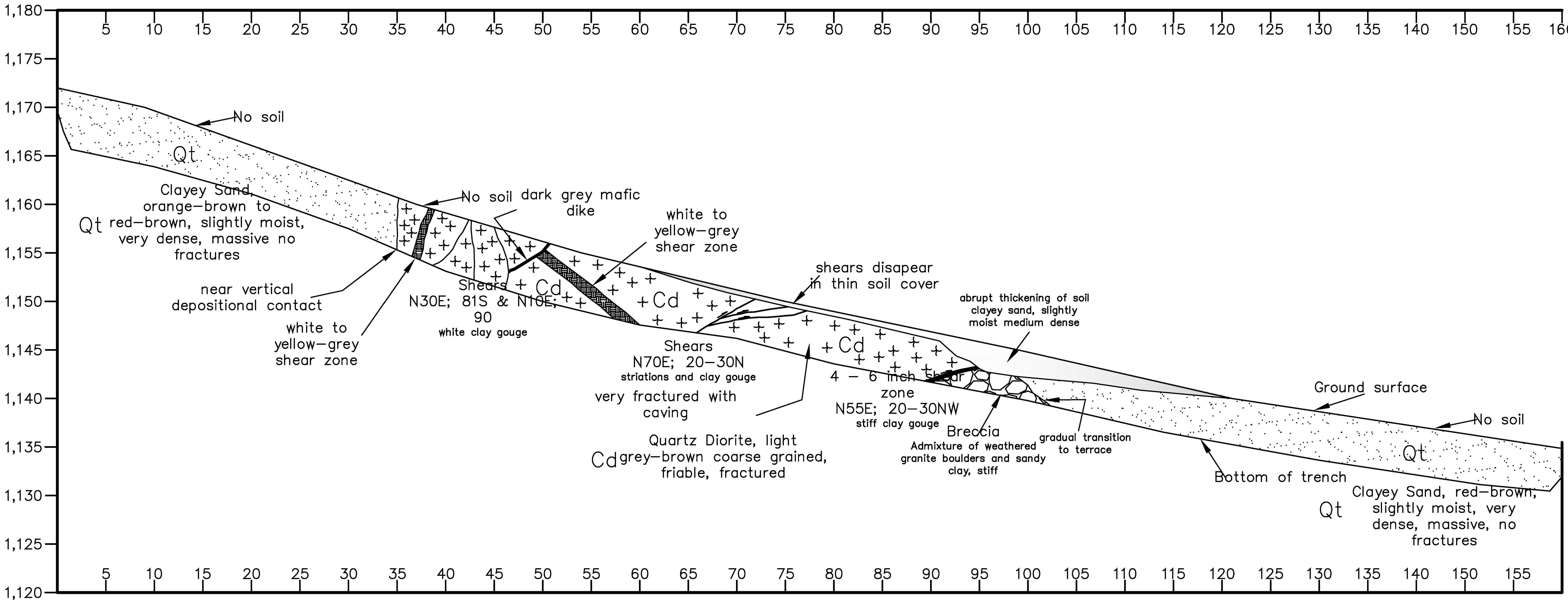
IRVINE GEOTECHNICAL Inc

FAULT TRENCH LOG

PROJECT: IC14073 - GINKGO STONEHOUSE

CONSULTANT: JAI

SCALE: 1" = 10'

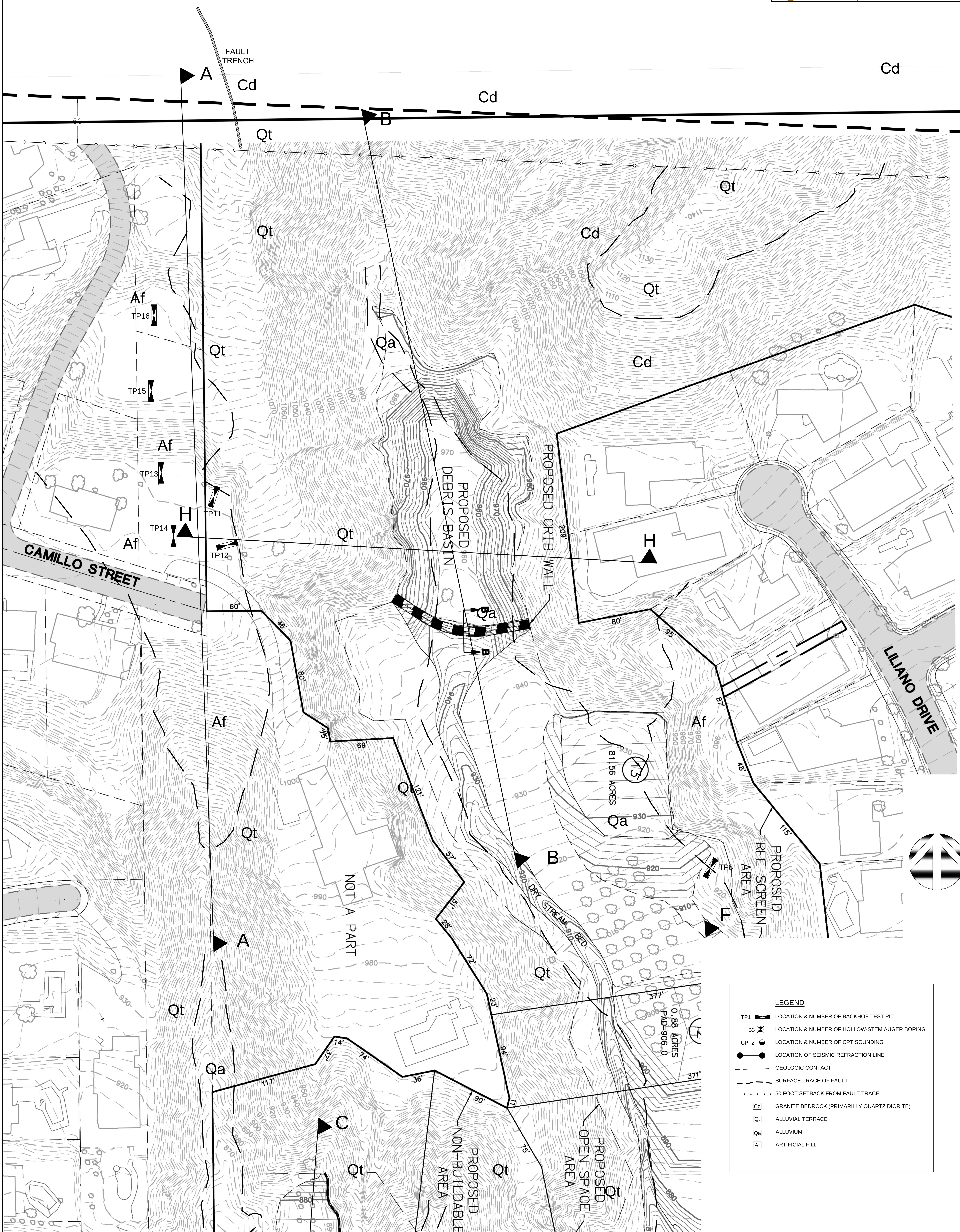


IRVINE GEOTECHNICAL Inc

GEOLOGIC MAP #1

PROJECT: IC14073 - GINKGO STONEHOUSE

CONSULTANT: JAI | SCALE: 1" = 30'

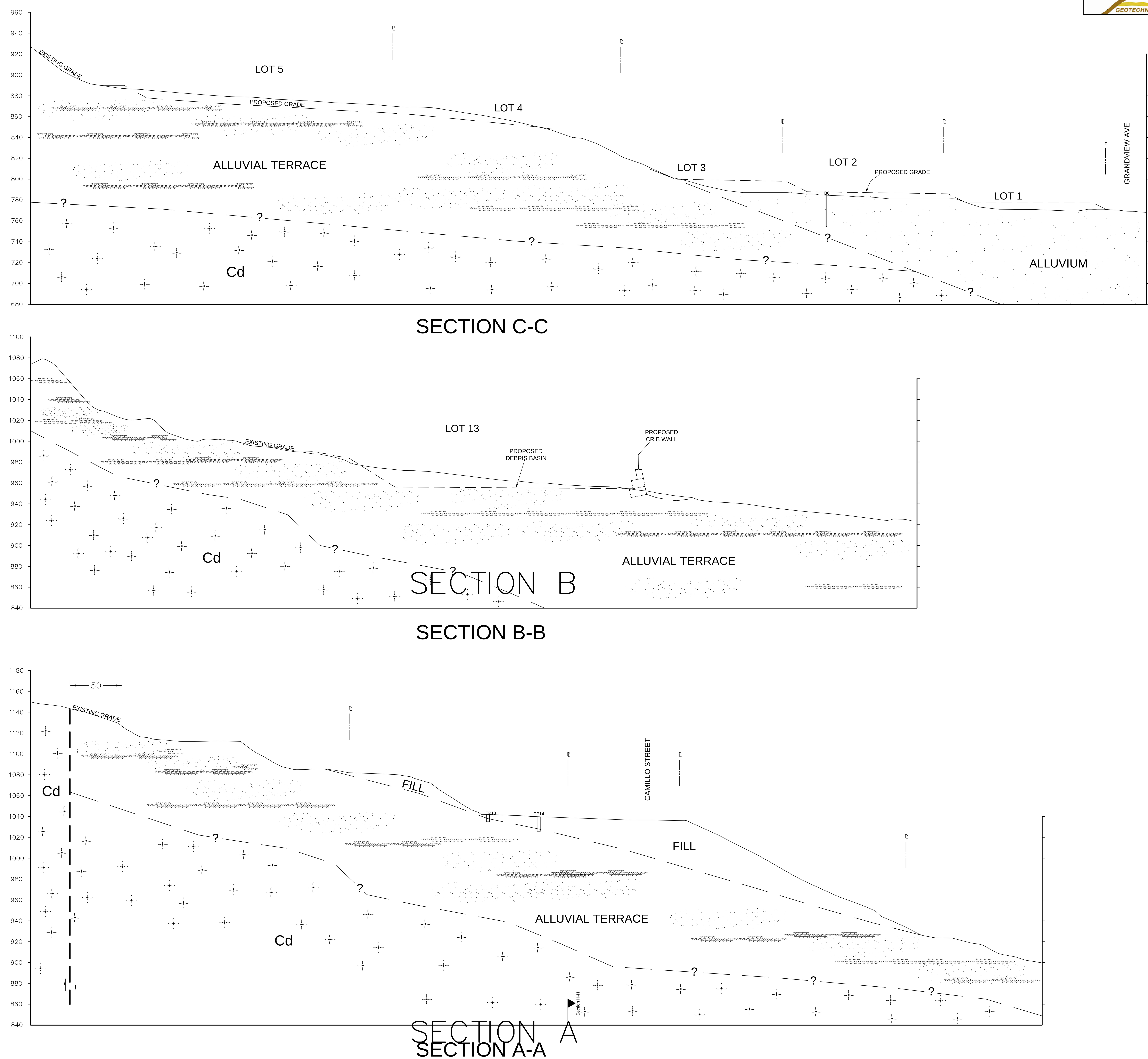



IRVINE GEOTECHNICAL Inc
GEOLOGIC MAP #2
PROJECT: IC14073 - GINKGO STONEHOUSE
CONSULTANT: JAI
SCALE: 1" = 30'
NOT A PART
PROPOSED NON-BUILDABLE AREA
PROPOSED OPEN SPACE AREA
PROPOSED SCREEN AREA
DRY STREAM BED
POND BASIN
PR CRIB WALL
ACCESS EASEMENT
STREET 'A'
GRAND VIEW AVENUE
STONEHOUSE ROAD
LILIANO DRIVE
0.88 ACRES PAD=906.0
UPPER PAD=892.0
LOWER PAD=880.0
4.38 ACRES
2.02 ACRES
2.05 ACRES
1.05 ACRES
1.07 ACRES
LOWER PAD=810.0
UPPER PAD=820.0
20,030 SF PAD=800.0
21,191 SF PAD=800.0
20,000 SF PAD=788.0
20,000 SF PAD=796.0
20,000 SF PAD=778.0
22,325 SF PAD=790.0
LEGEND
TP1 LOCATION & NUMBER OF BACKHOE TEST PIT
B3 LOCATION & NUMBER OF HOLLOW-STEM AUGER BORING
CPT2 LOCATION & NUMBER OF CPT SOUNDING
LOCATION OF SEISMIC REFRACTION LINE
GEOLOGIC CONTACT
SURFACE TRACE OF FAULT
50 FOOT SETBACK FROM FAULT TRACE
Cd GRANITE BEDROCK (PRIMARILLY QUARTZ DIORITE)
Qt ALLUVIAL TERRACE
Qa ALLUVIUM
Af ARTIFICIAL FILL
REVISIONS

IRVINE GEOTECHNICAL Inc

SECTIONS A, B & C

PROJECT: IC14073 - GINKGO STONEHOUSE
CONSULTANT: JAI | SCALE: 1" = 30'

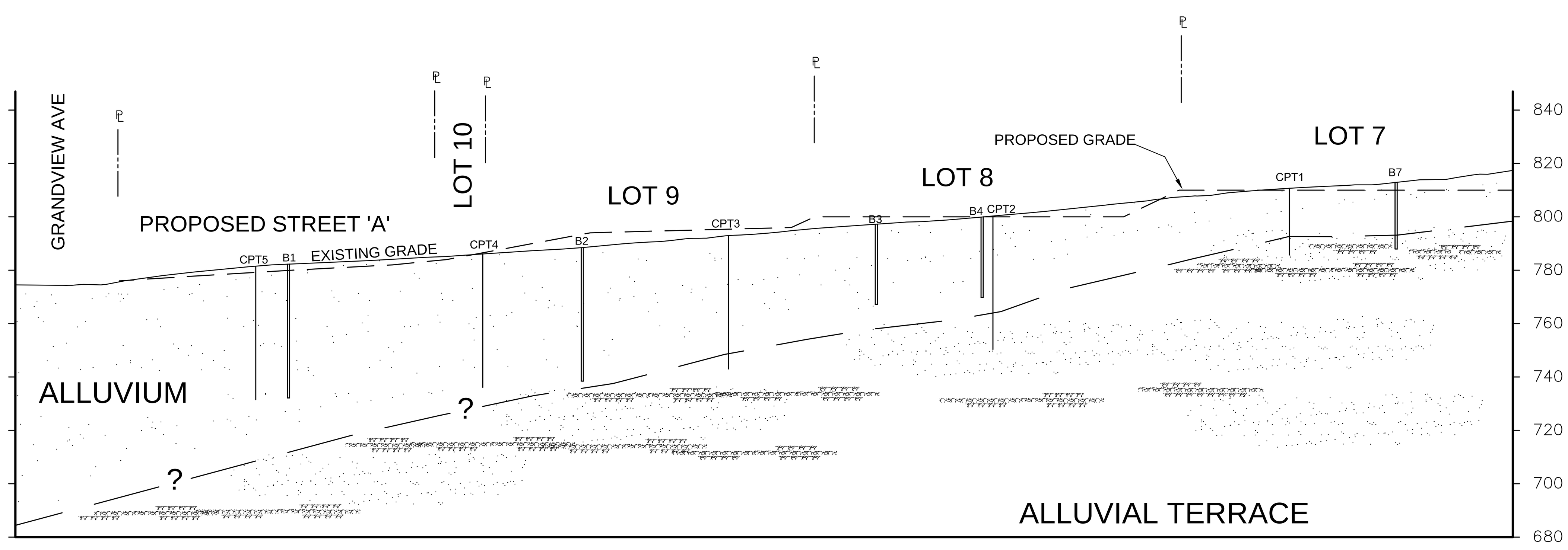


IRVINE GEOTECHNICAL Inc

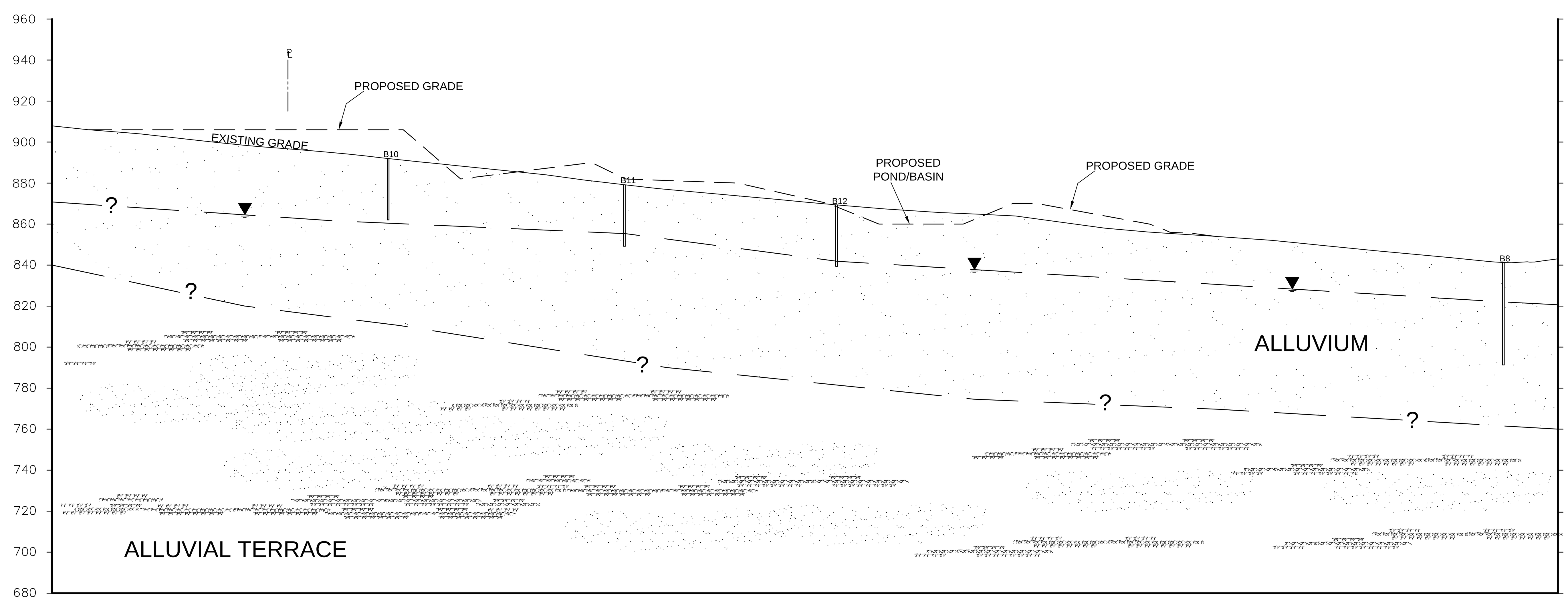
SECTIONS D - G

PROJECT: IC14073 - GINKGO STONEHOUSE

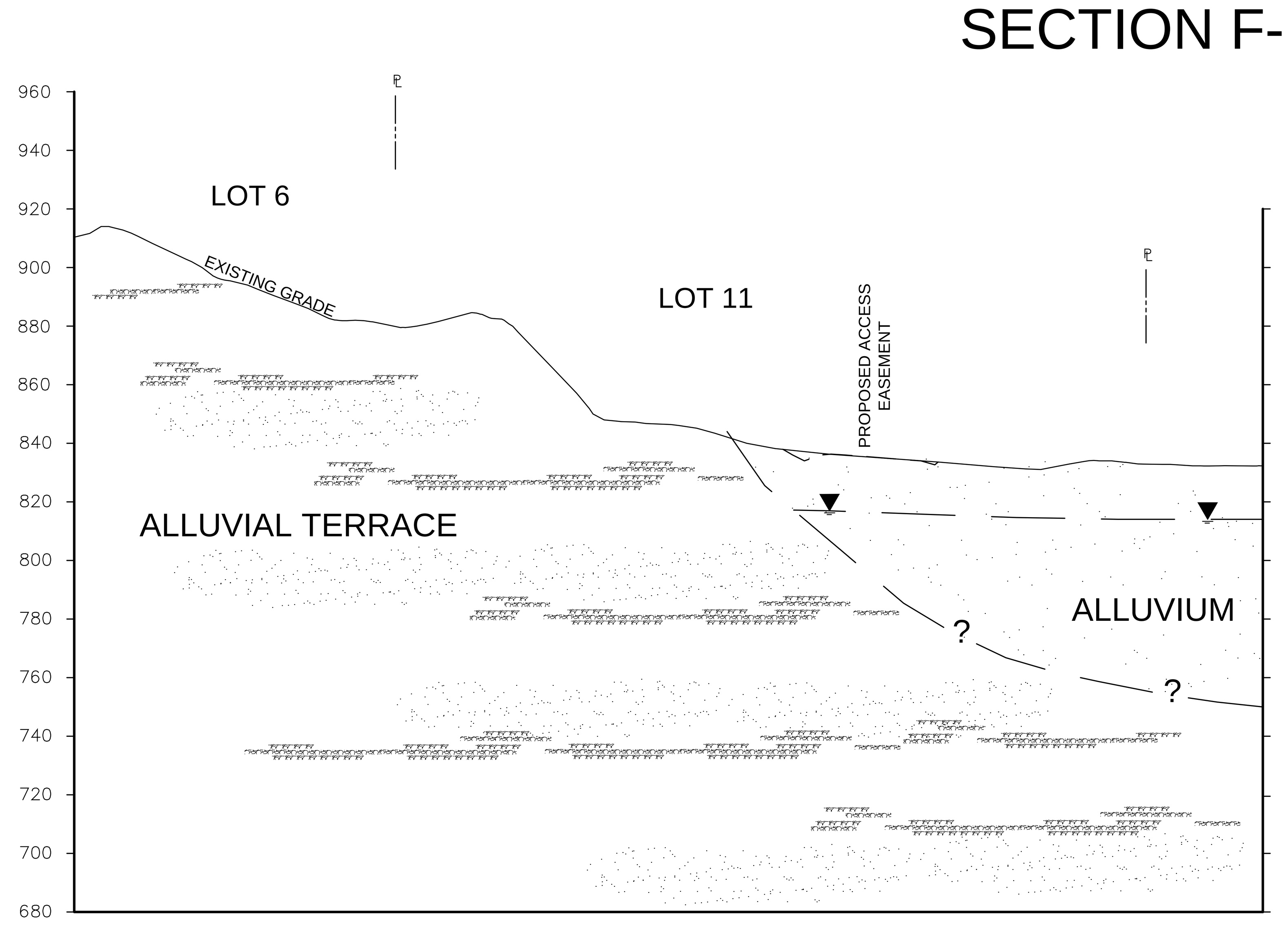
CONSULTANT: JAI | SCALE: 1" = 30'



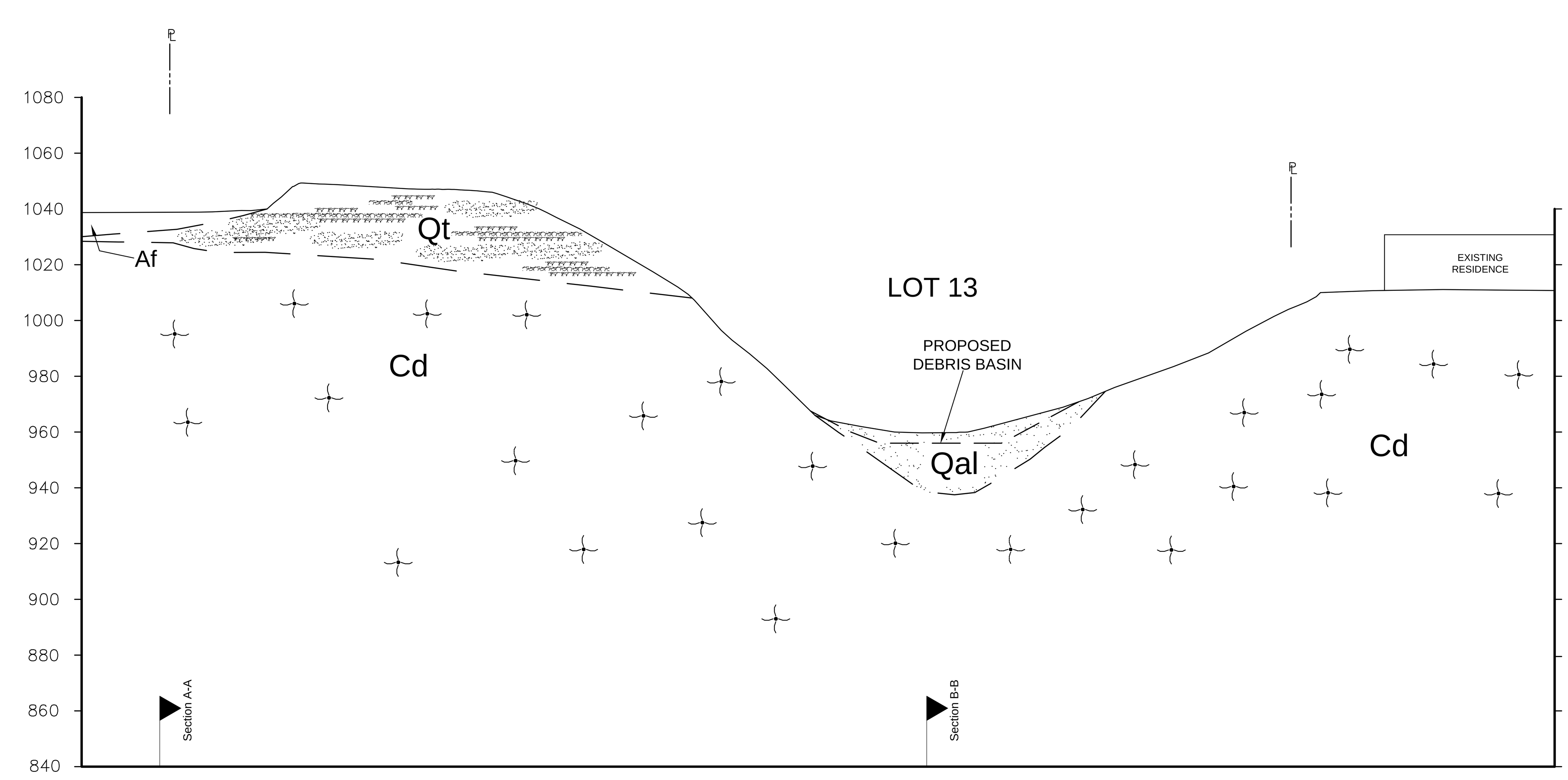
SECTION G-G



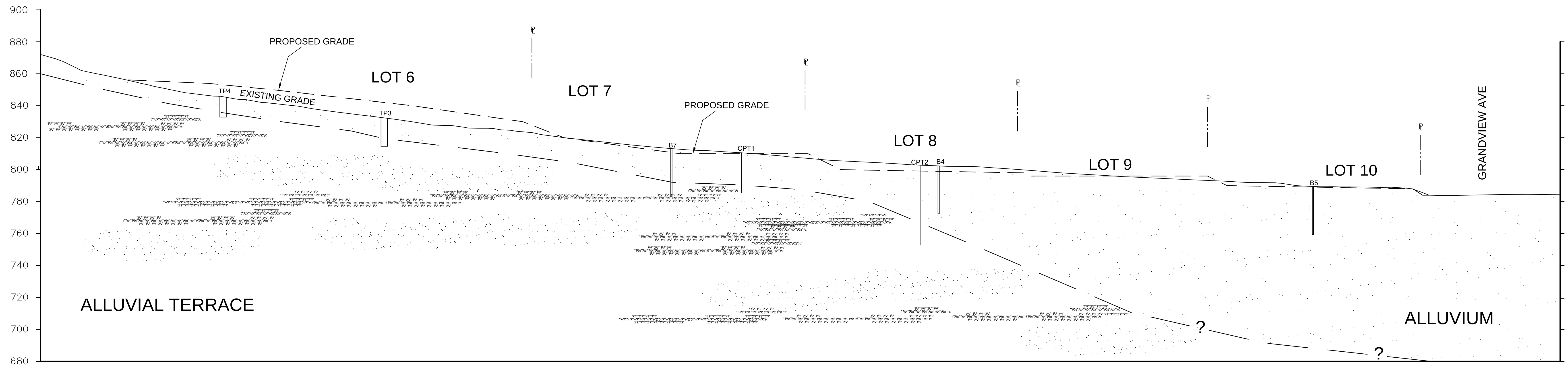
SECTION F-F



SECTION E-E



SECTION H-H



SECTION D-D