IRVINE GEOTECHNICAL Inc

GEOLOGIC AND SOILS ENGINEERING EXPLORATION

PROPOSED 19 LOT SUBDIVISION

VESTING TENTATIVE TRACT MAP NO. 67505

PORTION OF LOT 1083, ARBS. 7 & 8, TRACT 1000

22255 W MULHOLLAND DRIVE

LOS ANGELES, CALIFORNIA

FOR SAN FELICIANO HOLDING COMPANY, LLC

IRVINE GEOTECHNICAL, INC. PROJECT NUMBER IC 17036-I

APRIL 6, 2017

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INTRODUCTION

This report has been prepared per our agreement and summarizes findings of Irvine Geotechnical's geologic and soils engineering exploration 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 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 the field exploration was determined from our initial site visit, review of previous reports for the site, and consultation with the client. The preliminary grading plan prepared by Westcon Engineering 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 Map and cross sections. Conditions affecting portions of the property outside the area explored, are beyond the scope of this report.

Exploration was conducted on March 14, 2017 with the aid of a hollow-stem auger drill rig. It included drilling four borings to a maximum depth of 37½ feet. Samples of the earth materials were obtained and delivered to the soils engineering laboratory of Soil Labworks, LLC for testing and analysis. The borings were logged by the engineering geologist.

Office tasks included laboratory testing of selected soil samples, researching records on file at the City of Los Angeles, reviewing historical topographic maps and aerial photographs, preparing the Geologic Map and cross sections and performing engineering analysis. Earth materials exposed in the borings are described on the enclosed Log of Borings. Appendix I contains a discussion of the laboratory testing procedures and results. Appendix II contains the logs of subsurface exploration and results of laboratory testing performed by The J. Byer Group (now Byer Geotechnical).

The proposed project, surface geologic conditions, and the location of the test pits are shown on the Geologic Map. Subsurface distribution of the earth materials, projected geologic structure, and the proposed project are shown on Sections A through E. Sections C and E form the basis for the enclosed stability calculations.

RESEARCH - PREVIOUS WORK

The building and grading records of the City of Los Angeles Department of Building and Safety were researched prior to preparing this report. The records contain previous reports for the site by The J. Byer Group (Byer). The results of subsurface exploration, laboratory testing and engineering analysis are contained in the Byer reports:

> *Geologic and Soils Engineering Exploration, Proposed 37 Unit Residential Development, Tentative Tract 61553, Portion of Lot 1083, Tract 1000, 22255 Mulholland Drive, Woodland Hills, California,* dated March 22, 2005 and

> *Geologic and Soils Engineering Exploration Update, Proposed 29 Unit Residential Development, Portion of Lot 1083, Tract 1000, AKA Tentative Tract 67505, 22255 Mulholland Drive, Woodland Hills, California,* dated July 20, 2006

Byer explored the site with a hollow-stem auger drill rig, electronic cone penetrometer (CPT), and hand labor. The exploration included 12 borings, 4 test pits, and 2 CPT soundings. Byer reported the site to be underlain by a variable thickness of fill and alluvium over sedimentary bedrock. Byer reported the fill to be not compacted and the alluvium susceptible to liquefaction. Complete removal and recompaction of the fill was first recommended to create a structural fill for support of structures and infrastructures. The recommendations were changed to supporting the structures in the bedrock via deepened foundations.

The Grading Division of the City of Los Angeles reviewed the Byer reports and issued a *Geology and Soils Report Approval Letter,* Log #51978 on March 29, 2006 and a *Geology and Soils Report Approval Letter*, Log #58932 August 10, 2007. Apparently, the revised Vesting Tentative Tract Map was submitted to the Grading Division 2016 without a modern geologic and soils engineering update report. As such, the Department issued a Correction Letter on April 13, 2016.

Irvine Geotechnical and Jon A. Irvine has reviewed referenced laboratory testing and subsurface exploration contained in the Byer reports. The results of laboratory testing appear to be reasonable for this area of the Santa Monica Mountains. Logs of borings and test pits and the engineering geologic interpretation reported by Byer appear to be reasonable for this area of the Santa Monica Mountains. Irvine Geotechnical and the undersigned engineer concurs with the findings of Soil Labworks, LLC and accepts professional responsibility for utilizing the data.

Logs of Borings, Logs of Test Pits, and the results of laboratory testing by Byer are appended to this report. The locations of Byer's test pits and borings are plotted on the Geologic Map.

PROPOSED PROJECT

Information concerning the proposed project was provided by the client. The preliminary grading plan prepared by Westcon Engineering were a guide for exploring the site and preparing this report. It is proposed to subdivide the property to create 19 lots suitable for development with single-family residences. Removal and recompaction grading techniques are proposed to create level building pads and access roads and to mitigate the existing old fill. Lots 1 through 4 will be accessed from Mulholland Drive via a common driveway. Lots 11 and 12 will front on San Feliciano. The remainder of the lots will be accessed via a private street. Retaining walls up to 10 feet high are planned to increase the size of some of the pads and to minimize grading near existing oak trees. Cut and fill slopes will be created at a 2:1 or flatter gradient.

SITE DESCRIPTION

The subject property consists of approximately 5½ acres of partially graded and developed hillside terrain, near the base of the north flank of the Santa Monica Mountains, in the Woodland Hills section of the City of Los Angeles, California. The study area is north of Mulholland Drive, south of San Feliciano Drive, west of the intersection of Mulholland Drive and Topanga Canyon Road, and approximately one mile south of the Ventura (101) Freeway. The abandoned Girardi Reservoir is located along the northeastern boundary of the project. The majority of the land is vacant. Two abandoned residential structures (22241 and 22255 Mulholland Drive) are present on the east-central portion of the site.

The pre-grading topography consists of a north-draining main canyon and a secondary canyon. A north-trending bedrock spur ridge separates the main and easterly secondary canyons. The existing residential structures were built on the bedrock ridge. Minor cut and fill grading techniques were employed to create level building sites for the structures. Past grading, associated with construction of Mulholland Drive has consisted of placing fill where the roadway crosses the main and secondary canyons. Fill was also placed along the margins of the main canyon and within a secondary canyon to support residential development and San Feliciano Drive to the west. The abandoned reservoir was created by cutting and filling within the main canyon.

Vegetation on the site consists of mature oak trees and a thick assemblage of plants, grasses and shrubs. The yard is irrigated and well maintained. Surface drainage generally is by sheet flow runoff down the contours of the land toward the north.

GROUNDWATER

Groundwater was encountered during exploration performed by both Byer and Irvine. Generally, groundwater is present within the alluvium in the axis of the main canyon at depths of 16 to 23 feet below grade and is perched on the bedrock. The water level at the time of the exploration is indicated on the boring logs and is plotted on the geologic cross sections.

Historically highest groundwater in this area of Woodland Hills is unknown.

EARTH MATERIALS

Fill

Fill, associated with previous site grading, blankets the majority of the site. In the main canyon, Byer Borings 1, 2, 6, 7, and 8 and Irvine Borings 1, 2 and 4 encountered fill ranging from 7 to 10½ feet thick. Between 4 and 5 feet of fill was observed in borings by Byer on the northern portion of the site. For the easterly secondary canyon, fill observed by Byer and Irvine ranges from 3 to 5 feet thick. The fill consists of silty sand that is mottled brown and dark brown, slightly moist to moist, and slightly dense to dense. Fill on the bedrock ridge ranges from less than 12 inches to 3 feet. The fill does not appear to have been compacted and no record of compaction certification was located in the Building Department records.

Alluvium

Natural alluvium underlies the majority of the western and eastern portions of the study area. Within the main canyon, the thickness of alluvium encountered in the borings ranges from 9 to 25 feet. The alluvium likely thickens to on the order of 20 to 25 feet near the axis as shown on the geologic cross sections. For the easterly secondary canyon, the alluvium observed in the borings ranges in thickness from 8 to 23 feet. The alluvium consists of mostly silty sand with some clayey sand, sand, and clay that is mottled brown and gray, moist to saturated, and slightly dense to dense. Soft to slightly dense areas within the alluvium were observed at or near the groundwater level.

Bedrock

Bedrock underlying the site and encountered in the borings and test pits consists of siltstone and sandstone mapped as part of the Modelo Formation as mapped by T.W. Dibblee, (*Geologic Map of the Santa Monica Mountains and Vicinity,* CD Compilation, 2001). The bedrock is light gray, moderately hard to hard, massive to weakly bedded, and very to moderately weathered.

GEOLOGIC STRUCTURE

The bedrock and alluvium described are common to this area of the Santa Monica Mountains and the geologic structure is consistent with regional trends. The bedrock and alluvium are generally massive and lacks significant structural planes. The regional geologic structure is shown to strike east-west to northeast and dip shallowly toward the north.

The geologic structure of the bedrock is favorably oriented for stability of the site and proposed project. Recommendations to eliminate or support any unfavorably oriented bedding are presented in the CONCLUSIONS AND RECOMMENDATIONS section of this report.

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.

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 1972 was enacted to protect structures from hazards associated with fault ground rupture. No known active faults cross the subject property and the site is not located within an Alquist-Priolo Fault Rupture Hazard Study Zone. The ground rupture hazard at the site is considered nil.

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 following table lists the applicable seismic coefficients for the 2017 Los Angeles Building Code.

SEISMIC COEFFICIENTS (2017 Los Angeles Building Code)		
Latitude = 34.150°N Longitude = 118.611°W	Short Period (0.2s)	One-Second Period
Earth Materials and Site Class Chapter 20 - ASCE 7	Compacted Fill/Alluvium - D	
Seismic Design Category from Table 1613.3.5(1) and 1613.3.5(2)	D	
Spectral Accelerations from Figures 1613.3 (1) through 1613.3(6)	S_s = 1.677 (g)	S_1 = 0.591 (g)
Site Coefficients from Tables 1613.3.3 (1) and 1613.3.3 (2)	F_A = 1.0	F_V = 1.71
Spectral Response Accelerations from Equations 16-37 and 16-38	S_{MS} = 1.677 (g)	S_{M1} = 1.010 (g)
Design Accelerations from Equations 16-39 and 16-40	S_{DS} = 1.118 (g)	S_{D1} = 0.673 (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. However, secondary effects such as surface rupture, lurching, liquefaction, consolidation, ridge shattering, and landsliding should not occur at the subject property.

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, Canoga Park

Quadrangle. Seismic hazards within the Canoga Park Quadrangle were evaluated by the CGS in their report, *"Seismic Hazard Zone Report for the Canoga Park 7.5-minute Quadrangle, Los Angeles County, California, Seismic Hazard Zone Report* 07." According to the Seismic Hazard Zones Map, the subject property is **not** within an area that has been subject to, or may be subject to earthquake induced ground deformation. The westerly, main canyon is shown within an area that has been subject to, or may be subject to liquefaction.

Ground Motion

Spectral accelerations and peak ground accelerations at the site were determined for the Risk-Targeted Maximum Considered Earthquake (MCE_R) and Geometric Mean Peak Ground Acceleration (MCE_G) following the procedures in ASCE 7-10 and the 2017 Building Code. The computed PGA_M for this site is 0.762g. According to the USGS deaggregation website (https://earthquake.usgs.gov/hazards/interactive/), 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 0.388g and 6.77, respectively. For a ground motion with a 2 percent probability of exceedance in 50 years, the modal de-aggregated earthquake PGA and moment magnitude are 0.685g and 7.02, respectively. The modal distance to the ground motion source is 13 to 17 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 Grading Division's policy, the liquefaction hazard was computed for ground motions represented by ⅔(PGA_M) and PGA_M. Following the 2017 Building Code, the ground motion is based on a recurrence probably of 1 percent in 50 years (Risk-Targeted Maximum Considered Earthquake (MCE_R)and Geometric Mean Peak Ground Acceleration (MCE_G)). A design magnitude earthquake of 6.77 was used to magnitude weight the liquefaction resistance. It was assumed that the groundwater will be within 15 feet of the ground surface.

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 Borings 1 through 4. The N_{60} tip resistance was converted to an equivalent SPT N_{60CS} blow count using published correlations and following he recommendations of SP117A. The calculations were performed for PGA_M, and ⅔PGA_M, ground motions.

LIQUEFACTION POTENTIAL - BORING 1			
Ground Motion 2/3(PGA_M)		Ground Motion (PGA_M)	
Layers (Feet) (FS<1.3)	Settlement (Inches) (FS < 1.1)	Layers (Feet) (FS<1.0)	Settlement (Inches) (FS < 1.0)
15	0.45	15	0.45
17.5	0.51	17.5	0.51
20	0.44	20	0.44
22.5	0.49	22.5	0.49
25	0.0	25	0.41
Total Settlement	1.89	Total Settlement	2.30

LIQUEFACTION POTENTIAL - BORING 2			
Ground Motion 2/3(PGA_M)		Ground Motion (PGA_M)	
Layers (Feet) (FS<1.3)	Settlement (Inches) (FS < 1.1)	Layers (Feet) (FS<1.0)	Settlement (Inches) (FS < 1.0)
15	0.66	15	0.66
17.5	0.63	17.5	0.63
20	0.58	20	0.58
22.5	0.53	22.5	0.53
25	0.0	25	0.41
		27.5	0.40
Total Settlement	2.40	Total Settlement	3.21

LIQUEFACTION POTENTIAL - BORING 4			
Ground Motion 2/3(PGA_M)		Ground Motion (PGA_M)	
Layers (Feet) (FS<1.3)	Settlement (Inches) (FS < 1.1)	Layers (Feet) (FS<1.0)	Settlement (Inches) (FS < 1.0)
15	0.63	15	0.63
17.5	0.56	17.5	0.56
20	0.59	20	0.59
Total Settlement	1.78	Total Settlement	1.78

The upper alluvial soils in main, westerly canyon are subject to liquefaction for the design ground motions and the assumed groundwater conditions. The alluvial soils in the easterly, secondary canyon are not subject to liquefaction. This is consistent with the seismic hazard mapping performed by the CGS.

Dynamic 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. According to the referenced 2002 SCEC publication, differential settlement is typically of ½ to ⅔ of the total settlement for Holocene sediments. The liquefaction induced total and differential settlement potentials of the site are summarized in the table.

DYNAMIC SETTLEMENT POTENTIAL				
Boring	Total Settlement (inches)		Differential Settlement Range (½ - ⅔ total - inches)	
	⅔(PGA_M)	(PGA_M)	⅔(PGA_M)	(PGA_M)
1	1.89	2.30	0.95 - 1.26	1.15 - 1.53
2	2.40	3.21	1.20 - 1.60	1.61 - 2.14
4	1.78	1.78	0.89 - 1.19	0.89 - 1.19

The liquefaction potential of the site is moderate to high. Remedial grading and mat-type foundations are recommended to support structures within the westerly canyon to mitigate the liquefaction and dynamic settlement potentials.

For the higher ground motion and associated settlements, the structural engineer should verify that the foundations supporting the buildings do not lose their ability to carry gravity loads and that collapse of the building is prevented.

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.

SLOPE STABILITY

Gross Stability

Slopes within the property are generally flatter than 2:1. The steepest highest and steepest slopes are located offsite above Lots 17 and 18 on the southwestern portion of the site

(Section E) and between Mulholland Drive and Lots 10 and 19. The most critical slope with respect to geologic structure is represented by Section C.

The gross stability of the slope shown in Section E was calculated using a computerized version of the Simplified Bishop's method (SLIDE Version 6.039 developed by ROCSCIENCE, Inc.). The gross stability of the slope shown in Section C was calculated using a computerized version of the Spencer's method. The gross stability of the offsite fill slopes was calculated using a computerized version of Taylor's method.

For Section C, an anisotropic function was used to represent north-dipping bedding within the bedrock. Failure surfaces between 7 and 15 degrees were assigned a bedding plane cohesion value/phi angle shear strength combination of 225 psf/17 degrees. All other failure surfaces were assigned a cross bedding shear strength of 606 psf/27 degrees.

The analysis shows that the subject property and existing slopes are grossly stable with a factor of safety in excess of 1.5. The calculations use the shear tests of samples believed to represent the weakest earth materials encountered during exploration. The cross sections, geologic structure, and slope angles used used are the most critical for the slopes analyzed.

Surficial Stability

Slopes within the property with surficial materials are 2:1 or flatter.

CONCLUSIONS AND RECOMMENDATIONS

General Findings

The conclusions and recommendations of this exploration are based upon four borings, review of previous exploration on the site, 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 construction of the proposed project is feasible from a geologic and soils engineering standpoint provided the advice and recommendations contained in this report are included in the plans and are implemented during construction.

The recommended bearing material is approved compacted fill. The majority of the proposed building sites is underlain by a variable thickness of fill over alluvium and bedrock. The existing fill is not compacted and is not recommended for foundation, slab or paving support. Because of the liquefaction and dynamic settlement potentials of the western canyon, mat foundations are recommended to support structures on Lots 5 through 19. Conventional foundations and slabs may be used for residential structures on the eastern secondary canyon (Lots 1 through 4).

Geotechnical Issues

Geotechnical issues affecting the site include a variable thickness of undocumented fill and the presence of a City of Los Angeles Main storm drain.

Remedial grading is recommended to improve site conditions to create a structural fill for support of mat foundations, conventional foundations, slabs, and pavements.

The existing 81-inch diameter storm drain crosses the pads on Lots 10, 18 and 19 and is present at the rear of Lots 14 through 17. The recommended remedial grading may remove support from the drain. Shoring and/or sequenced excavations may be required to perform the recommended remedial grading.

Open City of Los Angeles Geology and Soils Report Correction Letter

The following items are in response to the open Correction Letter issued in response to submittal of the revised Tentative Tract Map without a recent geologic and soils engineering update report.

Item 1 - This geology and soils engineering update report is based on the latest Vesting Tentative Tract Map and is intended to satisfy Item 1.

Item 2 - The oldest Tentative Tract Map Tract No. 61553 is dated September 2, 2003 and was prepared by Iacobellis and Associates. This project was for a 37-unit condominium development. The units were to be distributed across the property and accessed via a private street, extending from San Feliciano Drive to Mulholland Drive. There does not appear to be a geologic and soils engineering report for this concept.

The original Tentative Tract Map Tract No. 67505, which was the basis for both of Byer's previous reports, consisted of a 35 lot subdivision. The residential structures and associated building pads were evenly distributed across the property. A private street was planned to provide access into the development from San Feliciano Drive, winding through the lots and existing onto Mulholland Drive.

Psomas Associates prepared Tentative Tract Map No. 67505 and is dated July 6, 2006. This project was a 29-lot subdivision. Nine of the lots were to be accessed from Mulholland Drive via a common driveway and 3 of the lots fronted along San Feliciano Drive. The remaining 17 lots were to be accessed via a private street.

VTTM 67505 was updated by Psomas on June 18, 2007. Ten of the lots were to be accessed from Mulholland Drive via a common driveway and 3 of the lots fronted along San Feliciano Drive. The remaining 16 lots were to be accessed via a private street.

The historical Vesting Tentative Tract Maps and correspondence from the Planning Department will be provided to the Grading Division on the CD submitted to the Department along with this report.

Item 3 - Recommendations are presented herein to bring the entire site into conformance with the current Building Code. Existing fill is to be removed and recompacted. Any slopes steeper than 2:1 should be trimmed or re-graded to 2:1 or flatter. Existing structures are to be removed. The enclosed calculations shown the site to be grossly stable in conformance with the Code.

Item 4 - The latest Tentative Tract Map shows the proposed structures to have the required setbacks from slopes in conformance with Sections 7006.3.2 of the Code.

Item 5 - The Geologic Map and Sections A through E are based on the latest Vesting Tentative Tract Map. Existing and proposed grades, existing and proposed structures, and the private street are shown.

Item 6 - Slopes within the subject property are flatter than 2:1 or will be graded to 2:1 or flatter. The gross and surficial stability of the site has been determined in conformance with the Code.

Item 7 - Recommendations are presented herein for the design of the dispersal all along the downhill sides of Lots 1 through 4.

SITE PREPARATION

Surficial materials consisting of fill and disturbed soils are present on the site. Remedial grading is recommended to improve site conditions for support of mat foundations, slabs, decking, and pavements.

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, and disturbed soils. The exposed excavated area should be observed by the soils engineer or geologist prior to placing compacted fill. 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. The proposed building site shall be excavated to a minimum depth of 3 feet below the bottom of all footings and/or mat slab. The excavation shall extend a minimum of five 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, 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 and the former residence 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 and should be keyed and benched into alluvium or bedrock or supported laterally by retaining walls. Keyways should be a minimum of 12 feet wide and 3 feet into alluvium or bedrock as measured on the downhill side. The base of all fills and the axis of drainage courses require subdrains.

Cut/Trim Slopes

Cut slopes and trims may be created at a 2:1 gradient.

Excavation Characteristics

The 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 POOLS

Swimming pools may be constructed using a free-standing design. Pools should derive support entirely from approved compacted fill. This will require over-excavation and recompaction. In addition to a free-standing design, pool walls supporting soil should be designed for an inward pressure of 60 pcf. 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.

Mat Foundation

Mat-type foundation systems are recommended to support the residential structures and is intended to distribute the structural weight of the building uniformly to the soil and to withstand differential settlements from liquefaction. A net foundation pressure of 2,000 psf may be assumed along the base of the mat. Coefficient of sliding friction along the base of the mat may be assumed to be 0.30. For computing deflection of the foundation system, a modulus of subgrade reaction k_s of 75 pounds/in^3 (125 kips/ft^3) may be assumed.

Spread Footings

Continuous and/or pad footings may be used to support accessory structures located outside the residence. Continuous footings should be a minimum of 12 inches in width. Pad footings should be a minimum of 24 inches square. 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)
Approved Compacted Fill	18	1,500	0.30	250	1,500

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. For bearing calculations, the weight of the concrete in the footing may be neglected.

The on-site soils are moderately 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.

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. Foundation setbacks do not appear to apply to the residential structures on this project.

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.

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.

RETAINING WALLS

General Design - Static Loading

Cantilevered retaining walls up to 12 feet high that support 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

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 2016 Building Code. The computed PGA_M for this site is 0.762g. The horizontal coefficient of seismic increment (K_E) was assumed to be ⅓(PGA_M) = 0.254g.

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 0.254g.

The recommended static and seismic forces for 12 foot high retaining walls are shown in the following table. Where the unbalanced seismic force is higher than the static design pressure, the seismic increment was converted to an equivalent fluid pressure.

DESIGN EARTH PRESSURES - WALLS > 6 FEET			
Surface Slope Gradient	Static Design Force	Seismic Force*	Seismic Surcharge
Level	12ft^2 * 35 pcf /2=2.520 kips	2.442 kips	0 pcf
2:1	12ft^2 * 43 pcf /2=3.096 kips	4.245 kips	16 pcf
Restrained	12t^2 * 60 pcf /2=4.320 kips	2.442 kips	0 pcf

*	See Calculation sheets

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 surcharged by a sloping condition 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 structure to the street or approved location.

TEMPORARY EXCAVATIONS

Temporary excavations will be required to construct the proposed retaining walls and to perform the remedial grading. The excavations could be up to 12 feet in height and will expose fill over alluvium and bedrock. Where not surcharged by existing footings or structures, the fill, alluvium and bedrock are capable of maintaining vertical excavations up to a cumulative height of 5 feet. Where vertical excavations in the fill, alluvium and bedrock exceed 5 feet in height, the upper portion should be trimmed to 1:1 (45 degrees).

Significant excavations into bedrock are not anticipated for this project. North-facing excavations into bedrock, may unsupport bedding in the down-dip direction. North-facing excavations into bedrock, if any, should be trimmed to 2:1.

It should be noted that regardless of stability, excavations that remove lateral support from property lines or existing structures are not allowed by the Code. The following section from Chapter 33 of the Building Code governs temporary excavations:

3307.3 Temporary excavations and shoring.

3307.3.1 General. Excavations shall not remove the lateral support from a public way, from an adjacent property or from an existing structure. For the purpose of this section, the lateral support shall be considered to have been removed when any of the following conditions exist:

1. The excavation exposes any adverse geological formations, which would affect the lateral support of a public way or an adjacent structure.

2. The excavation extends below a plane extending downward at an angle of 45 degrees from the edge of the public way or an adjacent property.

Exception: Normal footing excavations not exceeding two feet in depth will not be construed as removing lateral support.

3. The excavation extends below a plane extending downward at an angle of 45 degrees from the bottom of an existing structure.

Vertical excavations removing lateral or vertical support from existing foundations, storm drains, or property lines will require the use of temporary shoring.

Shoring

Temporary shoring should be designed for an equivalent fluid pressure of 30 pounds per cubic foot per the enclosed calculations. Shoring that is integrated into the permanent retaining walls should be designed for earth pressures conforming to the RETAINING WALL section of this report.

Shoring may consist of cast-in-place concrete piles with wood lagging. Shoring piles should be a minimum of 12 inches in diameter and a minimum of 6 feet into alluvium or bedrock below the base of the excavation. Piles may be assumed fixed 3 feet the base of the excavation. For the vertical forces, piles may be designed for a skin friction of 250 pounds per square foot for that portion of pile in contact with the alluvium or bedrock. Soldier piles should be spaced a maximum of 10 feet on center.

The friction value 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. Resistance to lateral loading may be provided by passive earth pressure within the terrace below the base of the excavation.

Passive earth pressure may be computed as an equivalent fluid having a density of 250 pounds per cubic foot. The maximum allowable earth pressure is 4,000 pounds per square foot. For design of isolated piles, the allowable passive and maximum earth pressures may be increased by 100 percent. Piles spaced more than 2½ pile diameters on center may be considered isolated.

Slot Cutting

Vertical excavations exposing removing support from property lines required to perform the removal and recompaction may employ the slot cutting (ABC method).

The slot cutting method uses the earth as a buttress and allows the excavation to proceed in phases. The initial excavation is made at a slope of 1:1. Alternate slots of 8 feet in width and 7 feet in height may be worked. The remaining earth buttresses should be 16 feet in width. The remedial grading should be completed and backfilled in the slots before the "B" earth buttresses are excavated. The "C" earth buttresses may be excavated upon completion of the remedial grading and backfilling of the "B" areas.

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 (Lots 1 through 4) and concrete decking should be cast over approved compacted fill. 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. For interior slabs and slabs with a floor covering, a moisture barrier is recommended. For performance and concrete curing, it recommended that the vapor barrier be 10-mil thick and 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.

Slabs which will be provided with a moisture-sensitive floor covering should be designed to resist moisture in conformance with ACI 302.2R-06 (*Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Material*). Specifications for under-slab vapor retarder/barrier are typically the responsibility of the architect or flooring specialist. We would be happy to assist the architect and/or flooring specialist on their specifications for moisture protection of slabs that are to receive moisture sensitive coverings.

Many agencies require floor slabs 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 section should be placed over approved compacted fill. 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	4
Trucks	3	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 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. Drainage control devices require periodic cleaning, testing and maintenance to remain effective.

Infiltration

Due to the shallow depth to groundwater and the liquefaction potential, onsite infiltration of surface runoff is not considered feasible.

Dispersal Walls

A dispersal wall is proposed along the northern side of pads on Lots 1 through 4. The dispersal wall should be designed in conformance with Information Bulletin P/BC 2017-103. The dispersal wall should be founded in approved compacted fill. All existing fill downslope from the dispersal system should be removed and replaced as compacted fill.

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.

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
Shoring pile and lagging installation	Required
Underpinning pile installation	Required
Bottom excavation for removals	Required
Keyway excavations and benching	Required
Subdrains	Required

Compaction of fill	Required
Foundation excavations	Required
Slab subgrade pre-saturation	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
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Enc: Appendix I - Laboratory Testing by Soil Labworks
Moisture-Density Relationship (Plate A)
Shear Test Diagrams (Plates B-1 & B-2)
Atterberg Limit Chard
Appendix II - Laboratory Testing and Exploration by Byer
Appendix III - Liquefaction Analysis
Liquefaction Analysis Using SPT Data - Borings 1 - 4 (16 Pages)
Vicinity Map
Regional Geologic Map
Ground Motion Plates
Log of Borings (8 Pages)
Calculation Sheets (18)
In pocket Geologic Map Sections A - E

Included on CD for submittal to Grading: Correspondence from Planning & VTTM's

xc: (3) Addressee

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 March 30, 2017 and the results appear to be reasonable for this area of the Santa Monica Mountains. Irvine Geotechnical and the undersigned engineer concurs with the findings of Soil Labworks, LLC and accepts professional responsibility for utilizing the data.

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SOIL LABWORKS LLC

SL17.2401
March 30, 2017

Irvine Geotechnical
145 N. Sierra Madre Boulevard
Suite 1
Pasadena, California 91107

Subject: Laboratory Testing

Site: 22255 Mulholland Drive
Woodland Hills, California

Job: IRVINE/HARRIDGE

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 ALAN IRVINE
GE 2891
Exp. 6-30-18
GEOTECHNICAL
STATE OF CALIFORNIA

JON A. IRVINE
G.E. 2891

Enc: Appendix

SOIL LABWORKS LLC

APPENDIX

Laboratory Testing

Sample Retrieval - Drill Rig

Samples of earth materials were obtained at frequent intervals by driving a thick-walled steel sampler conforming to the most recent 2016 version of ASTM D 3550-01 (2007)(withdrawn 2016) 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. Standard Penetration Tests (SPT) were performed at discrete intervals within the 8 inch diameter, hollow stem auger borings drilled on the site. The tests were performed using the 1-3/8 inch inside diameter, split-barrel sampler in accordance with ASTMD1586-11. Standard penetration test samples were retained in air-tight bags.

Classification

The field classification was verified in the laboratory in accordance with the Unified Soil Classification System. The classification is shown on the Plates. Tests performed in the laboratory to assist in classification include Atterberg Limits and grain size distribution.

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 2937-10. The moisture content was determined as a percentage of the dry soil weight conforming to ASTM 2216-10. The results are presented below in the following table. The percent saturation was calculated on the basis of an estimated specific gravity. Description of earth materials used in this report and shown on the attached Plates were provided by the client.

Test Pit/Boring No.	Sample Depth (Feet)	Soil Type	Dry Density (pcf)	Moisture Content (percent)	Percent Saturation (G_s=2.65)
B1	2	Fill	109.4	16.4	85
B1	5	Fill	99.4	18.9	76
B1	7	Fill	96.5	7.9	29
B2	2	Fill	88.4	27.9	85
B2	5	Fill	97.3	17.0	64
B2	7	Fill	96.0	16.5	60

Compaction Character

Compaction tests were performed on bulk samples of the earth materials in accordance with ASTM D1557-12ei. The results of the tests are provided on the table below and on the "Moisture-Density Relationship", A-Plates. The specific gravity of the fill was estimated from the compaction curves.

Test Pit/Boring No.	Sample Depth (Feet)	Soil Type	Maximum Dry Density (pcf)	Optimum Moisture Content (Percent)
B2/B4 (mix)	10-22.5/0-10	Fill	119.8	11.8

Shear Strength

The peak and ultimate shear strengths of the fill were determined by performing consolidated and drained direct shear tests in conformance with ASTM D3080/D3080M-11. 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. 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 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)
B1	7	96.5	32.1
B2/B4 (mix)*	10-22.5/0-10	107.8	20.4

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

Expansion Index

The expansive character of the fill was determined by performing Expansion Index Tests in accordance with UBC 18.2 and ASTM 4829-11. A bulk sample of earth material was compacted at a specific moisture content using one fifth the compacted energy for the modified proctor test. The sample was then saturated and the expansion measured. The results of the tests are provided on the following table.

Test Pit No.	Sample Depth (Feet)	Soil Type	Expansion Index
B2/B4 (mix)*	10-22.5/0-10	Fill	25

Atterberg Limits

Atterberg limits determinations were performed on samples of the soil/alluvium in accordance with ASTMD4318-10e1. The test results are presented on the table below.

Test Pit/Boring No.	Sample Depth (Ft)	Soil Type	Liquid Limit	Plastic Limit	Plasticity Index
B4	20	Alluvium	35	26	9

Grain Size Distribution

The amount of material in the soil finer than 1 No. 200 sieve was determined on selected samples in conformance with ASTM D1140-14. Wash sieving disperses clay and other fine material that are removed from the soil during the test. The percent of fine material in the soil sample is the calculated base on the loss of mass. The results are present in the table below.

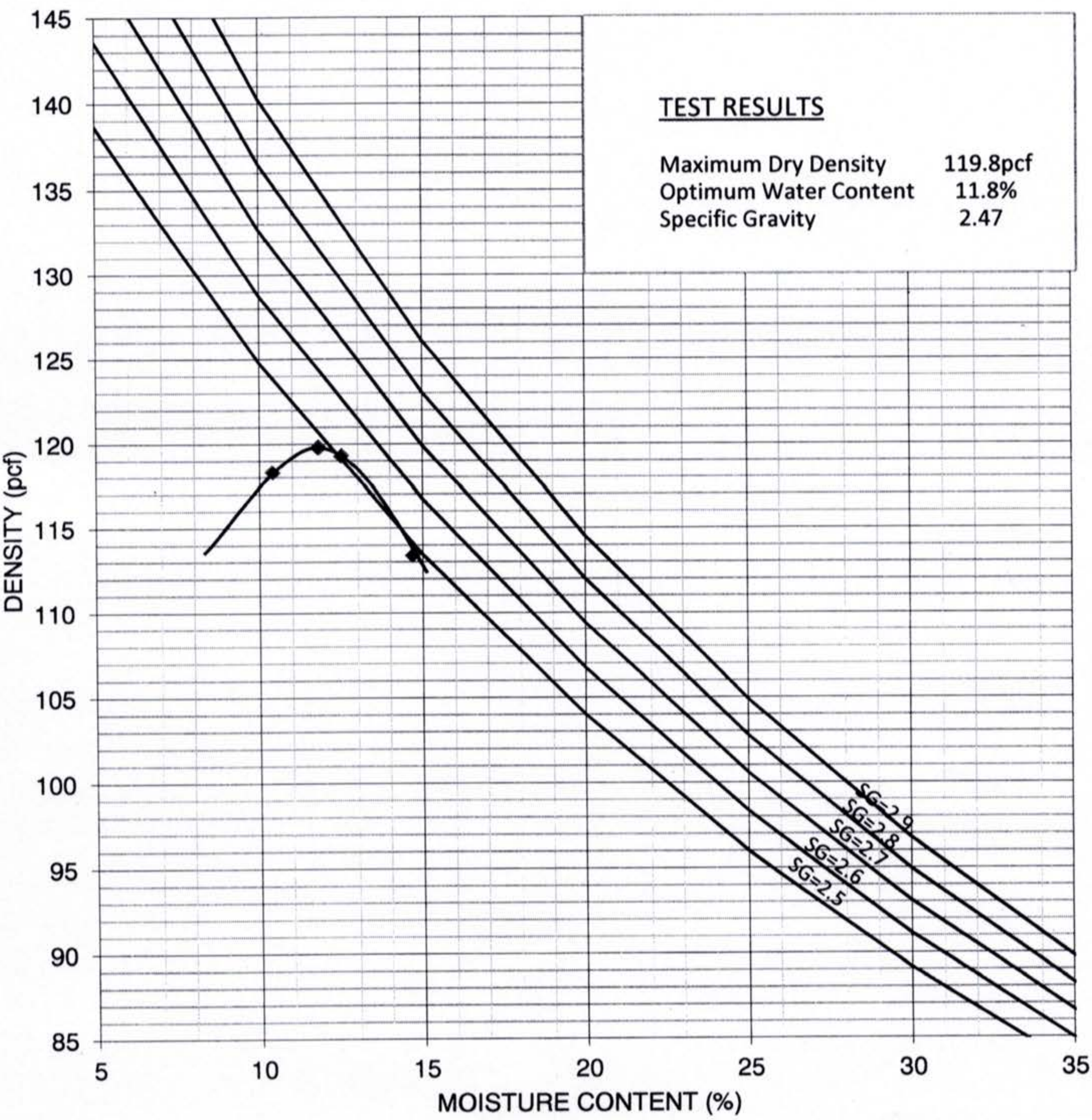
Boring No	Depth	Soil Type	(%) Passing 200 Sieve
B1	15	Alluvium	31.4
B1	20	Alluvium	39.7
B1	25	Alluvium	15.0
B1	30	Alluvium	29.5
B2	15	Alluvium	26.0
B2	20	Alluvium	37.3
B2	25	Alluvium	22.0
B2	30	Alluvium	21.5
B4	15	Alluvium	83.7
B4	17.5	Alluvium	74.6
B4	20	Alluvium	52.7
B4	25	Alluvium	16.6

SOIL LABWORKS LLC

MOISTURE-DENSITY RELATIONSHIP A-1

JN: **SL17.2401** CONSULTANT: **JAI**
CLIENT: **IRVINE/Harridge-22255 Mulholland Dr**
B2 @ 10-22.5/B4 @ 0-10' Mix
EARTH MATERIAL: **FILL**

NOTE: ASTM Test Method D-1557-12



TEST RESULTS

Maximum Dry Density	119.8pcf
Optimum Water Content	11.8%
Specific Gravity	2.47

SOIL LABWORKS LLC

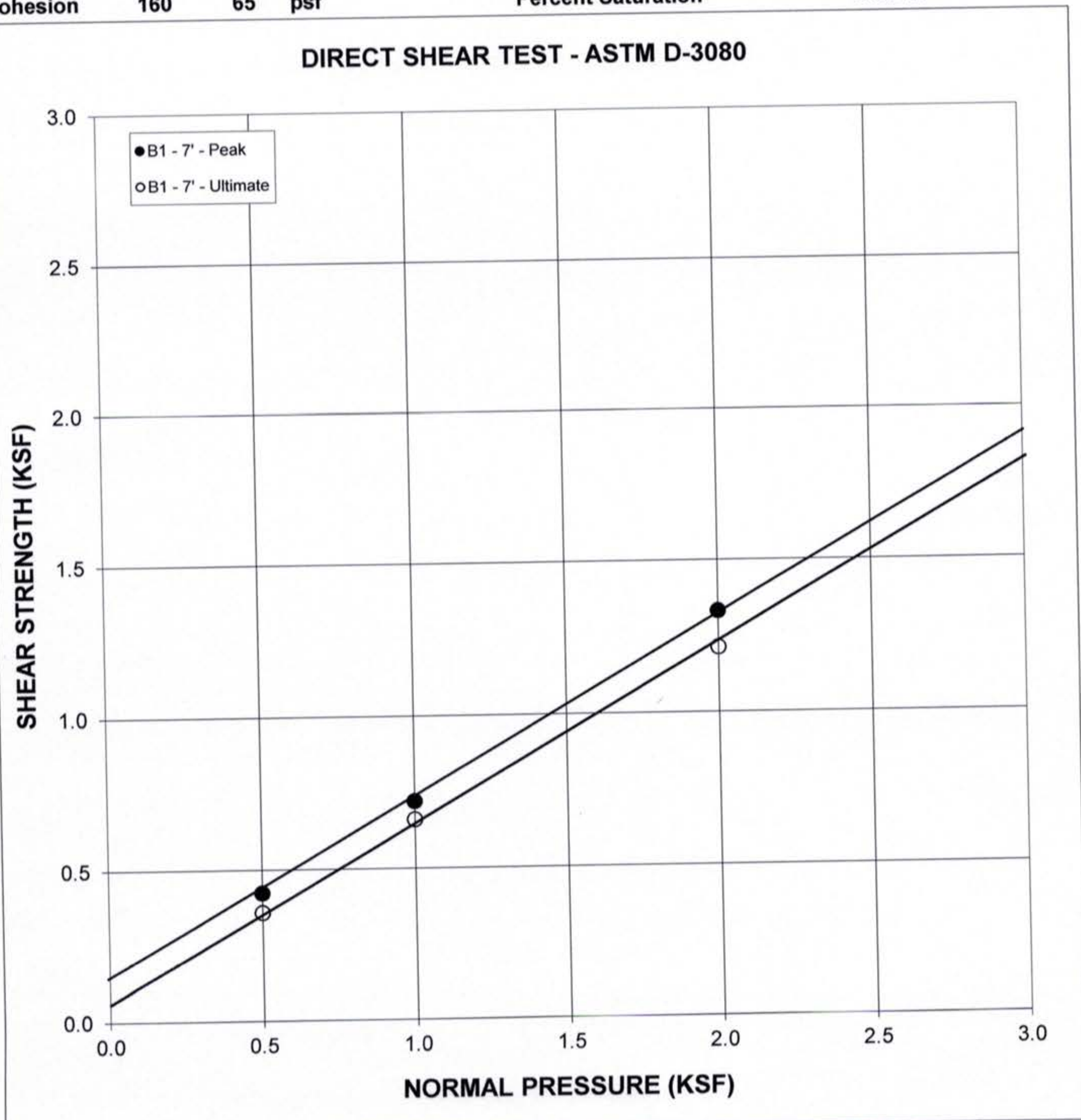
SHEAR DIAGRAM B-1

JN: SL17.2401 CONSULTANT JAI
CLIENT: Irvine/Harridge-22255 Mulholland Dr

EARTH MATERIAL: FILL

	PEAK	ULTIMATE	
Phi Angle	30	30	degrees
Cohesion	160	65	psf

Average Moisture Content	32.1%
Average Dry Density (pcf)	96.6
Percent Saturation	100.0%



SHEAR DIAGRAM B-2

SOIL LABWORKS LLC

JN: SL17.2401 CONSULTANT JAI
CLIENT: Irvine/Harridge-22255 Mulholland Dr

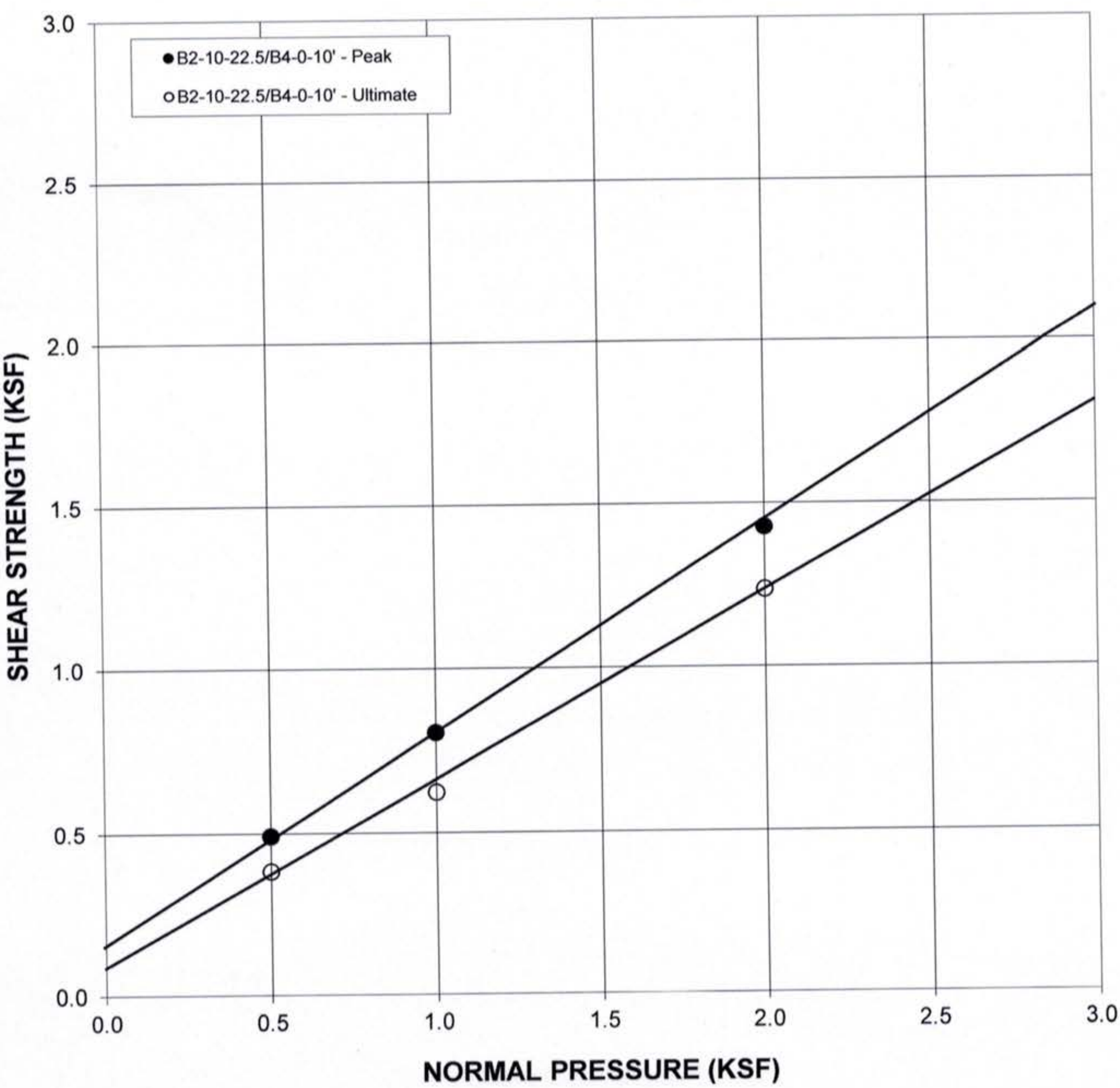
EARTH MATERIAL: FILL

Sample remolded to 90 % of the laboratory maximum density

	PEAK	ULTIMATE	
Phi Angle	32	30	degrees
Cohesion	160	90	psf

Average Moisture Content	20.4%
Average Dry Density (pcf)	107.8
Percent Saturation	100.0%

DIRECT SHEAR TEST - ASTM D-3080



File No.: SL17.2401

March 30, 2017

PLASTICITY INDEX

ASTM D-4318

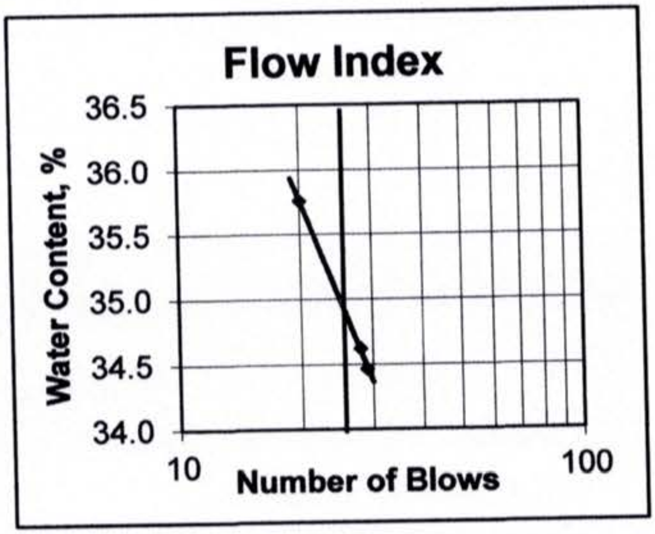
Job Name: Irvine/Harridge-2225 Mulholland Dr
Sample ID: B4 @ 20
Soil Description: ML

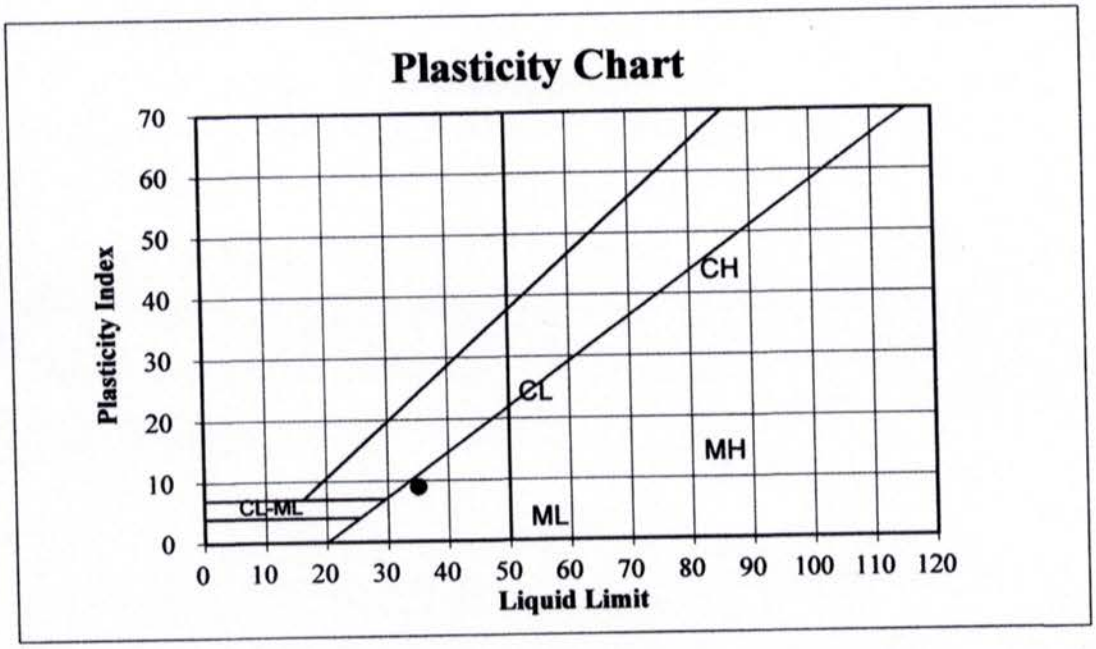
DATA SUMMARY

Number of Blows:	20	28	29
Water Content, %	35.8	34.6	34.5
Plastic Limit:	26.4	26.5	

TEST RESULTS

LIQUID LIMIT	35
PLASTIC LIMIT	26
PLASTICITY INDEX	9





IRVINE GEOTECHNICAL Inc

STABILITY - TAYLOR'S METHOD

IC: **17036** CONSULT: **JAI**
CLIENT: **HARRIDGE - SAN FELICIANO**

CALCULATION SHEET #

CALCULATE THE MAXIMUM HEIGHT TO WHICH UNIFORM SLOPES ARE GROSSLY STABLE USING TAYLOR'S METHOD FOR THE STABILITY OF EARTHEN EMBANKMENTS (*FUNDAMENTALS OF SOIL MECHANICS*).

CALCULATION PARAMETERS

EARTH MATERIAL:	FILL	SAFETY FACTOR:	1.5
SHEAR DIAGRAM:	B-1	SLOPE ANGLE:	34 degrees
COHESION:	160 psf	Cd Base (C/fs):	106.7 psf
PHI ANGLE:	30 degrees	PhiD = atan(tan(phi)fs) =	21.1 degrees
DENSITY (w):	128 pcf		

INTERPOLATE STABILITY NUMBER (sn) FROM TAYLOR'S CHARTS:

TAYLOR'S CHART

		SLOPE ANGLES						
	Degrees	20	30	40	50	60	70	80
PhiD	5	0.090	0.110	0.130	0.145	0.160	0.185	0.210
	10	0.045	0.075	0.100	0.120	0.140	0.160	0.188
	15	0.020	0.045	0.070	0.095	0.115	0.140	0.168
	20	0.000	0.025	0.050	0.075	0.098	0.120	0.150
	25	0.000	0.010	0.033	0.055	0.080	0.105	0.130

FROM CHART sn = **0.032**

SAFE SLOPE HEIGHT = $\frac{Cd}{w \times (sn)}$ **26.3 feet**

CONCLUSIONS:

THE CALCULATION INDICATES THAT UNIFORM 1.5:1 SLOPES IN FILL ARE STABLE (FS > 1.5) UP TO 26 FEET. THEREFORE, EXISTING 20 FOOT HIGH SLOPES ARE GROSSLY STABLE.

IRVINE GEOTECHNICAL Inc

RETAINING WALL

IC: **17036** CONSULT: **JAI**
CLIENT: **HARRIDGE - SAN FELICIANO**

CALCULATION SHEET #

CALCULATE THE DESIGN MINIMUM EQUIVALENT FLUID PRESSURE (EFP) FOR PROPOSED RETAINING WALLS. THE WALL HEIGHT AND BACKSLOPE AND SURCHARGE CONDITIONS ARE LISTED BELOW. ASSUME THE BACKFILL IS SATURATED WITH NO EXCESS HYDROSTATIC PRESSURE. USE THE MONONOBE-OKABE METHOD FOR SEISMIC FORCES.

CALCULATION PARAMETERS

EARTH MATERIAL:	COMPACTED FILL	WALL HEIGHT	12 feet
SHEAR DIAGRAM:	B-2	BACKSLOPE ANGLE:	0 degrees
COHESION:	160 psf	SURCHARGE:	0 pounds
PHI ANGLE:	32 degrees	SURCHARGE TYPE:	P Point
DENSITY	130 pcf	INITIAL FAILURE ANGLE:	30 degrees
SAFETY FACTOR:	1	FINAL FAILURE ANGLE:	70 degrees
WALL FRICTION	0 degrees	INITIAL TENSION CRACK:	2 feet
CD (C/FS):	160.0 psf	FINAL TENSION CRACK:	5 feet

PHID = ATAN(TAN(PHI)/FS) = 32.0 degrees

HORIZONTAL PSEUDO STATIC SEISMIC COEFFICIENT (k_h) 0.254 %g

VERTICAL PSEUDO STATIC SEISMIC COEFFICIENT (k_v) 0 %g

CALCULATED RESULTS

CRITICAL FAILURE ANGLE	57 degrees
AREA OF TRIAL FAILURE WEDGE	40.8 square feet
TOTAL EXTERNAL SURCHARGE	0.0 pounds
WEIGHT OF TRIAL FAILURE WEDGE	5297.7 pounds
NUMBER OF TRIAL WEDGES ANALYZED	164 trials
LENGTH OF FAILURE PLANE	9.2 feet
DEPTH OF TENSION CRACK	4.3 feet
HORIZONTAL DISTANCE TO UPSLOPE TENSION CRACK	5.0 feet
CALCULATED HORIZONTAL THRUST ON WALL	**2441.5 pounds**

THE CALCULATION INDICATES THAT FOR THE DESIGN GROUND MOTION, THE UNBALANCED FORCE ON RETAINING WALLS UP TO 12 FEET HIGH WITH A LEVEL BACKSLOPE IS 2.442 KIPS.

IRVINE GEOTECHNICAL Inc

RETAINING WALL

IC: **17036** CONSULT: **JAI**
CLIENT: **HARRIDGE - SAN FELICIANO**

CALCULATION SHEET #

CALCULATE THE DESIGN MINIMUM EQUIVALENT FLUID PRESSURE (EFP) FOR PROPOSED RETAINING WALLS. THE WALL HEIGHT AND BACKSLOPE AND SURCHARGE CONDITIONS ARE LISTED BELOW. ASSUME THE BACKFILL IS SATURATED WITH NO EXCESS HYDROSTATIC PRESSURE. USE THE MONONOBE-OKABE METHOD FOR SEISMIC FORCES.

CALCULATION PARAMETERS

EARTH MATERIAL:	COMPACTED FILL	WALL HEIGHT	12 feet
SHEAR DIAGRAM:	B-2	BACKSLOPE ANGLE:	27 degrees
COHESION:	160 psf	SURCHARGE:	0 pounds
PHI ANGLE:	32 degrees	SURCHARGE TYPE:	P Point
DENSITY	130 pcf	INITIAL FAILURE ANGLE:	30 degrees
SAFETY FACTOR:	1	FINAL FAILURE ANGLE:	70 degrees
WALL FRICTION	0 degrees	INITIAL TENSION CRACK:	1 feet
CD (C/FS):	160.0 psf	FINAL TENSION CRACK:	10 feet

PHID = ATAN(TAN(PHI)/FS) = 32.0 degrees

HORIZONTAL PSEUDO STATIC SEISMIC COEFFICIENT (k_h) 0.254 %g

VERTICAL PSEUDO STATIC SEISMIC COEFFICIENT (k_v) 0 %g

CALCULATED RESULTS

CRITICAL FAILURE ANGLE	50 degrees
AREA OF TRIAL FAILURE WEDGE	85.9 square feet
TOTAL EXTERNAL SURCHARGE	0.0 pounds
WEIGHT OF TRIAL FAILURE WEDGE	11165.5 pounds
NUMBER OF TRIAL WEDGES ANALYZED	410 trials
LENGTH OF FAILURE PLANE	15.6 feet
DEPTH OF TENSION CRACK	5.2 feet
HORIZONTAL DISTANCE TO UPSLOPE TENSION CRACK	10.0 feet
CALCULATED HORIZONTAL THRUST ON WALL	**4244.4 pounds**

THE CALCULATION INDICATES THAT FOR THE DESIGN GROUND MOTION, THE UNBALANCED FORCE ON RETAINING WALLS UP TO 12 FEET HIGH WITH A 2:1 BACKSLOPE IS 4.245 KIPS.

IRVINE GEOTECHNICAL Inc	SHORING PILE
	IC: **17036** CONSULT: **JAI** CLIENT: **HARRIDGE - SAN FELICIANO** CALCULATION SHEET #

CALCULATE THE DESIGN MINIMUM EQUIVALENT FLUID PRESSURE (EFP) FOR PROPOSED RETAINING WALLS. THE WALL HEIGHT AND BACKSLOPE AND SURCHARGE CONDITIONS ARE LISTED BELOW. ASSUME THE BACKFILL IS SATURATED WITH NO EXCESS HYDROSTATIC PRESSURE. USE THE MONONOBE-OKABE METHOD FOR SEISMIC FORCES.

CALCULATION PARAMETERS

EARTH MATERIAL:	FILL	RETAINED LENGTH	12 feet
SHEAR DIAGRAM:	B-1	BACKSLOPE ANGLE:	0 degrees
COHESION:	160 psf	SURCHARGE:	0 pounds
PHI ANGLE:	30 degrees	SURCHARGE TYPE:	P Point
DENSITY	125 pcf	INITIAL FAILURE ANGLE:	30 degrees
SAFETY FACTOR:	1.25	FINAL FAILURE ANGLE:	70 degrees
PILE FRICTION	0 degrees	INITIAL TENSION CRACK:	1 feet
CD (C/FS):	128.0 psf	FINAL TENSION CRACK:	10 feet

PHID = ATAN(TAN(PHI)/FS) = 24.8 degrees

HORIZONTAL PSEUDO STATIC SEISMIC COEFFICIENT (k_h) 0 %g

VERTICAL PSEUDO STATIC SEISMIC COEFFICIENT (k_v) 0 %g

CALCULATED RESULTS

CRITICAL FAILURE ANGLE	57 degrees
AREA OF TRIAL FAILURE WEDGE	44.3 square feet
TOTAL EXTERNAL SURCHARGE	0.0 pounds
WEIGHT OF TRIAL FAILURE WEDGE	5535.3 pounds
NUMBER OF TRIAL WEDGES ANALYZED	410 trials
LENGTH OF FAILURE PLANE	11.0 feet
DEPTH OF TENSION CRACK	2.8 feet
HORIZONTAL DISTANCE TO UPSLOPE TENSION CRACK	6.0 feet
CALCULATED THRUST ON PILE	**1974.0 pounds**
CALCULATED EQUIVALENT FLUID PRESSURE	**27.4 pcf**
DESIGN EQUIVALENT FLUID PRESSURE	**30.0 pcf**

THE CALCULATION INDICATES THAT THE PROPOSED SHORING PILES MAY MAY BE DESIGNED FOR AN EQUIVALENT FLUID PRESSURE OF 30 POUNDS PER CUBIC FOOT. THE FLUID PRESSURE SHOULD BE MULTIPLIED BY THE PILE SPACING.

IRVINE GEOTECHNICAL Inc

SLOT CUT ANALYSIS

IC: **17036** CONSULT: **JAI**
CLIENT: **HARRIDGE - SAN FELICIANO**

CALCULATION SHEET #

CALCULATE THE FACTOR OF SAFETY OF SLOT CUT EXCAVATIONS. ASSUME COHESIVE AND FRICTIONAL RESISTANCE ALONG THE SIDES OF SLOTS AS WELL AS THE FAILURE SURFACE. THE HORIZONTAL PRESSURE ON THE SIDES OF THE SLOTS IS THE AT-REST PRESSURE (1-SIN(phi)).

CALCULATION PARAMETERS

EARTH MATERIAL:	FILL
SHEAR DIAGRAM:	B-1
COHESION:	160 psf
PHI ANGLE:	30 degrees
DENSITY:	125 pcf
SLOT BOUNDARY CONDITIONS	
SLOT CUT WIDTH:	8 feet
COHESION:	160 psf
PHI ANGLE:	30 degrees

EXCAVATION HEIGHT:	7 feet
BACKSLOPE ANGLE:	0 degrees
SURCHARGE:	0 pounds
SURCHARGE TYPE:	L Line Load
INITIAL FAILURE ANGLE:	17 degrees
FINAL FAILURE ANGLE:	70 degrees
INITIAL TENSION CRACK:	2 feet
FINAL TENSION CRACK:	20 feet

CALCULATED RESULTS

CRITICAL FAILURE ANGLE	59 degrees
HORIZONTAL DISTANCE TO UPSLOPE TENSION CRACK	2.0 feet
DEPTH OF TENSION CRACK	3.7 feet
TOTAL EXTERNAL SURCHARGE	0.0 pounds
VOLUME OF FAILURE WEDGE	85.4 ft^3
WEIGHT OF FAILURE WEDGE	10671.4 pounds
LENGTH OF FAILURE PLANE	3.9 feet
SURFACE AREA OF FAILURE PLANE	31 ft^2
SURFACE AREA OF SIDES OF SLOTS	10.7 ft^2
NUMBER OF TRIAL WEDGES ANALYZED	9154 trials
TOTAL RESISTING FORCE ALONG WEDGE BASE (FrB)	3883.2 pounds
TOTAL RESISTING FORCE ALONG WEDGE SIDES (FrS)	2845.0 pounds
RESULTANT HORIZONTAL COMPONENT OF FORCE	**-66.6 pounds**
CALCULATED FACTOR OF SAFETY	**1.28**

CONCLUSIONS:

THE CALCULATION INDICATES THAT SLOTS CUTS UP TO 8 FEET WIDE AND 7 FEET HIGH HAVE A SAFETY FACTOR GREATER THAN 1.25 AND ARE TEMPORARILY STABLE.

CITY OF LOS ANGELES
INTER-DEPARTMENTAL CORRESPONDENCE

CORRECTION LETTER

April 13, 2016

LIQ

To: Jim Tokunaga, Deputy Advisory Agency
Department of City Planning
200 N. Spring Street, 7th Floor, Room 750

From: John Weight, Grading Division Chief
Department of Building and Safety

Tentative Tract: VTT-67505-REV
LOTS: 1 - 19
LOCATION: 22255 W. Mulholland Drive

PREVIOUS REFERENCE REPORT/LETTER(S)	REPORT No.	DATE(S) OF DOCUMENT	PREPARED BY
Dept. Approval Letter	58932	08/10/2007	LADBS
Geology/Soils Report	JB 19553-Z	07/20/2006	The J. Byer Group
Dept. Approval Letter	51978	03/29/2006	LADBS
Geology/Soils Report	JB 19553-Z	03/22/2005	The J. Byer Group

The Grading Division of the Department of Building and Safety has reviewed the Revised Vesting Tentative Tract Map No. VTT-67505-REV with Los Angeles Department of City Planning receipt stamp dated 05/11/2015 that depicts a new project consisting of a 19 lot subdivision. The Department previously conditionally approved the above referenced reports dated 03/22/2005 and 07/20/2006 for a different projects consisting of 37 townhomes (VTT-61553) and a 29 lot subdivision in letters dated 03/29/2006 (Log # 51978) and 08/10/2007 (Log #58932), respectively.

The site is located in a designated liquefaction hazard zone as shown on the "Seismic Hazard Zones" map issued by the State of California.

The review of the Revised Vesting Tentative Tract Map No. VTT-67505-REV can not be completed at this time and will be continued upon submittal of a geology/soils report that is based on the new site configuration of 19 lots and shall include, but not be limited to, the following:

(Note: Numbers in parenthesis ( ) refer to applicable sections of the 2014 City of LA Building Code. P/BC numbers refer the applicable Information Bulletin. Information Bulletins can be accessed on the internet at LADBS.ORG.)

1. Provide an updated geology and soils report that is based on the revised Vesting Tentative Tract Map No. 67505.

2. Provide a chronological history of previous Tentative Tract Maps and a description of the proposed project associated with the Tentative Tract No. 61553 and 67505 that were filed with the Los Angeles Department of City Planning. Provide copies of all City Planning correspondence in relation to the filed Tentative Tract Maps.

3. Provide recommendations to bring the entire site into conformance with the current Building Code.

4. Provide recommendations and revise the plan and cross section for providing the required building setback from the toe of the ascending slope as specified by Code Section 1808.7.1. Note: It does not appear that all proposed structures have the required setback.

5. Provide a geologic map and cross sections based on the Revised Tentative Tract Map showing top and bottom of slopes; lithologic contacts; bedding attitudes; locations of slumps, landslides, or faults relative to the subject site; existing and proposed topographic profiles; existing and proposed structures; and, required Code setbacks. (7006.3.2)

6. Provide surficial and global slope stability calculations performed along an assumed failure plane that yields the lowest factor of safety and shall be based on shear strength parameters which represents the weakest material on the site. P/BC 2014-049

7. Provide recommendations for the proposed dispersal wall.

The geologist and soils engineer shall prepare a report containing the corrections indicated in this letter. The report shall be in the form of an itemized response. It is recommended that once all correction items have been addressed in a response report, to contact the report review engineer and/or geologist to schedule a verification appointment to demonstrate compliance with all the corrections. Do not schedule an appointment until all corrections have been addressed. Bring three paper copies and 1 electronic PDF copy of the response report, including one unbound wet-signed original for microfilming in the event that the report is found to be acceptable.

CLJ

CLJ/clj
213-482-0480

APPENDIX I

LABORATORY TESTING

Undisturbed and bulk samples of the fill, alluvium, and bedrock were obtained from the test pits and borings and transported to the laboratory for testing and analysis. The samples were obtained by driving a ring lined barrel sampler conforming to ASTM D-3550-01 with successive drops of the sampler weight. Experience has shown that sampling causes some disturbance of the sample, however the test results remain within a reasonable range. The samples were retained in brass rings of 2.50 inches outside diameter and 1.00 inches in height. The central portions of the samples were stored in close fitting, waterproof containers for transportation to the laboratory.

Moisture-Density

The dry density of the samples was determined using the procedures outlined in ASTM D-2937-00. The moisture content of the samples was determined using the procedures outlined in ASTM D-2216-98. The results are shown on the Log of Borings.

Maximum Density

The maximum dry density and optimum moisture content of the future compacted fill was determined by remolding bulk samples of the alluvium using the procedures outlined in ASTM D 1557-00, a five-layer standard. Remolded samples were prepared at 90% of the maximum density. The remolded samples were tested for shear strength.

Boring	Depth (Feet)	Soil Type	Maximum Density (pcf)	Optimum Moisture %	Expansion Index
1	1-5	Clayey Silt	114.0	17.0	40 - Low
3	1-5	Silty Sand	132.0	10.0	Nil

Expansion Test

To find the expansiveness of the soil, swell tests were performed using the procedures outlined in ASTM D-4829-95.

Shear-Tests

Shear tests were performed on samples of future compacted fill, alluvium, and bedrock using the procedures outlined in ASTM D-3080-98 and a strain controlled, direct shear machine manufactured by Soil Test, Inc. The rate of deformation ranged between 0.010 and 0.025 inches per minute. The samples were tested in an artificially saturated condition. Following the shear test, the moisture content of the samples was determined to verify saturation. The results are plotted on the "Shear Test Diagrams."

Consolidation

Consolidation tests were performed on insitu samples of the using the procedures outlined in ASTM D-2435-96. Results are graphed on the "Consolidation Curves."

THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM
1461 E. CHEVY CHASE DRIVE, SUITE 200 GLENDALE, CA 91206
(818) 549-9959 Tel (818) 543-3747 FAX

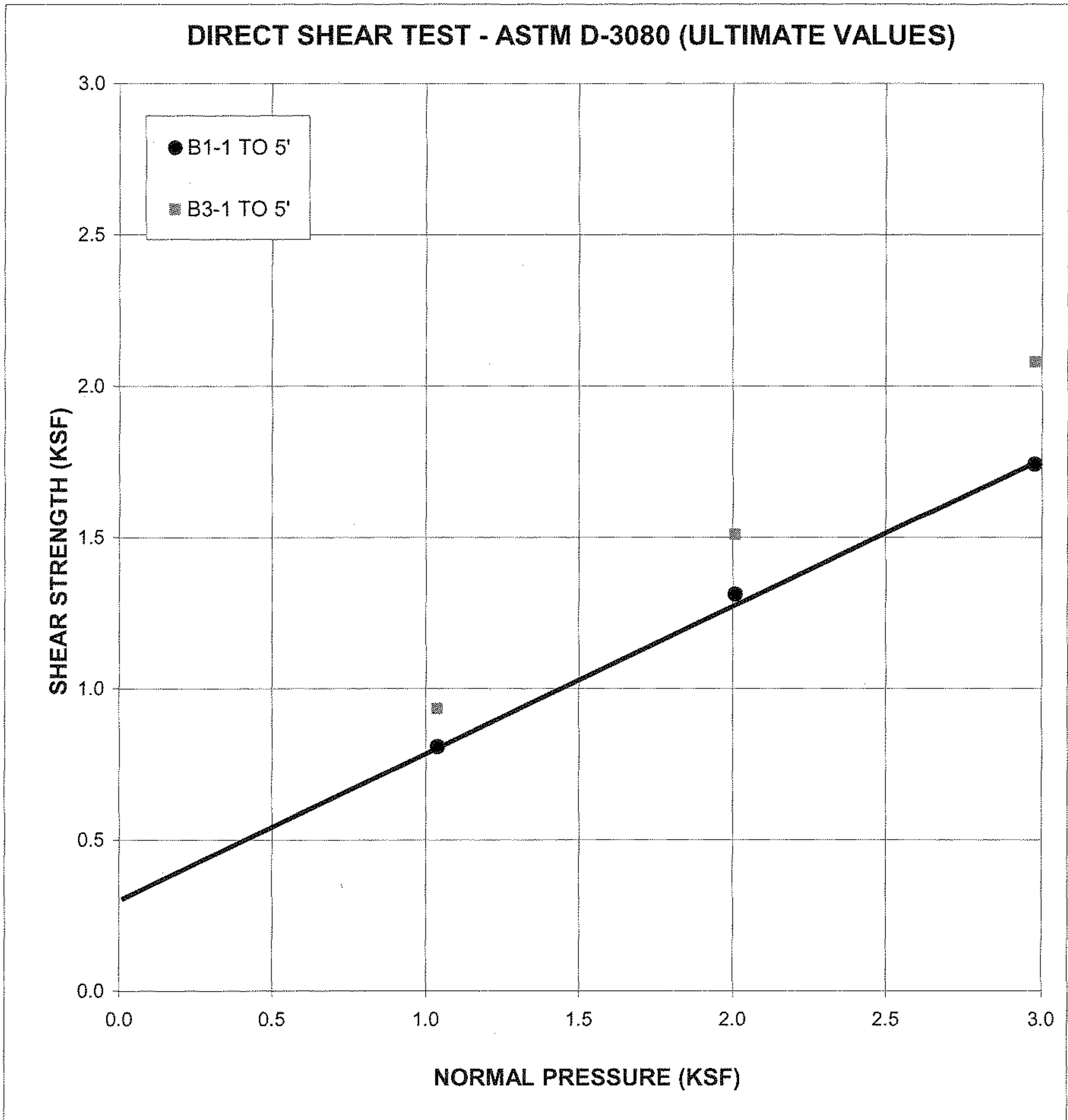
SHEAR DIAGRAM #1

JB: **19553-B** CONSULT: **RIZ**
CLIENT: **DS VENTURES**

EARTH MATERIAL: **FUTURE COMPACTED FILL**

SAMPLES REMOLDED TO 90% OF THE MAXIMUM DENSITY

Phi Angle =	**26 degrees**	**Moisture Content**	**18.5%**
Cohesion =	**308 psf**	**Dry Density (pcf)**	**110.7**
		Percent Saturation	**99.3%**



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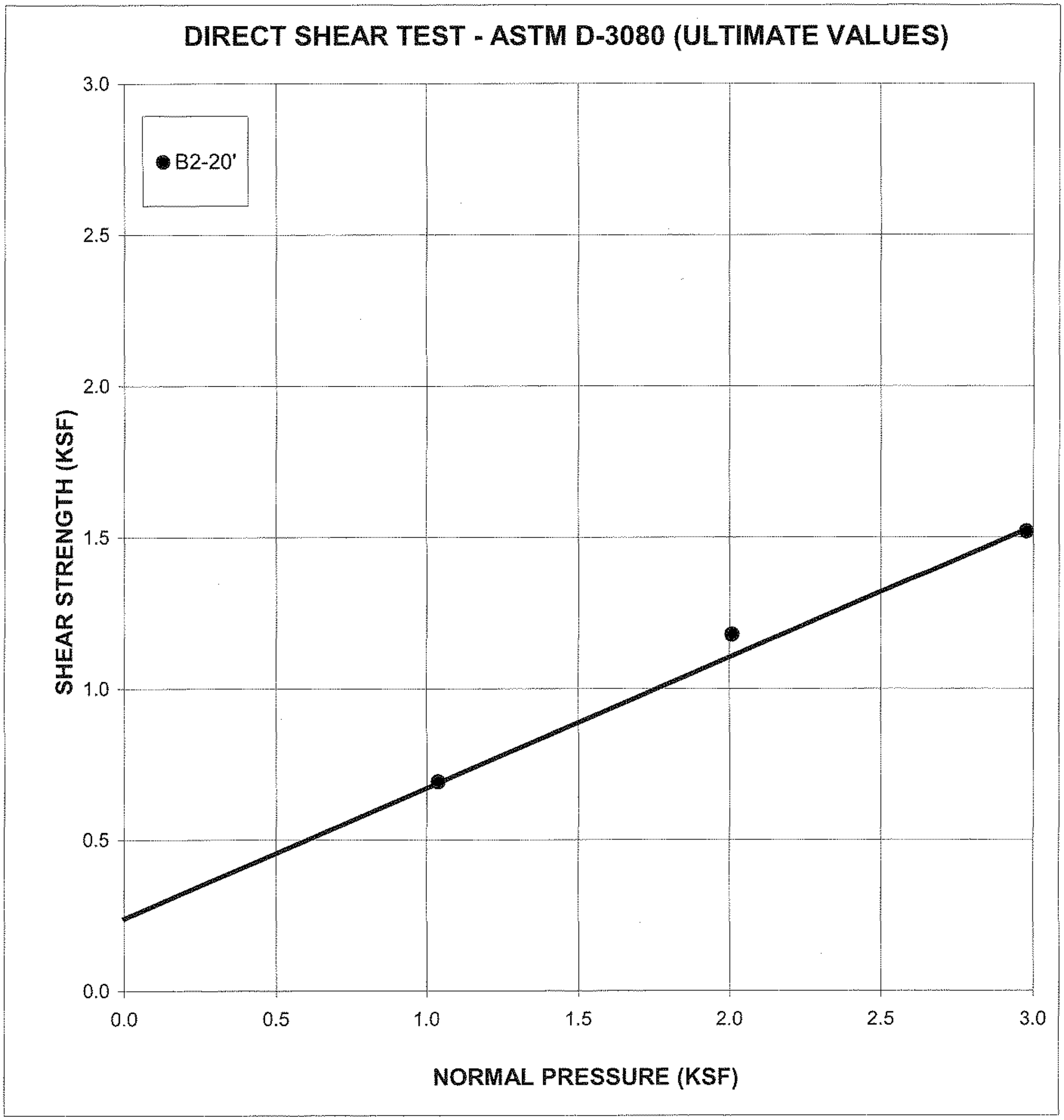
(818) 549-9959 Tel (818) 543-3747 FAX

SHEAR DIAGRAM #2

JB: **19553-B** CONSULT: **RIZ**
CLIENT: **DS VENTURES**

EARTH MATERIAL: **ALLUVIUM**

Phi Angle =	**23 degrees**	**Moisture Content**	**24.2%**
Cohesion =	**249 psf**	**Dry Density (pcf)**	**100.5**
		Percent Saturation	**99.4%**



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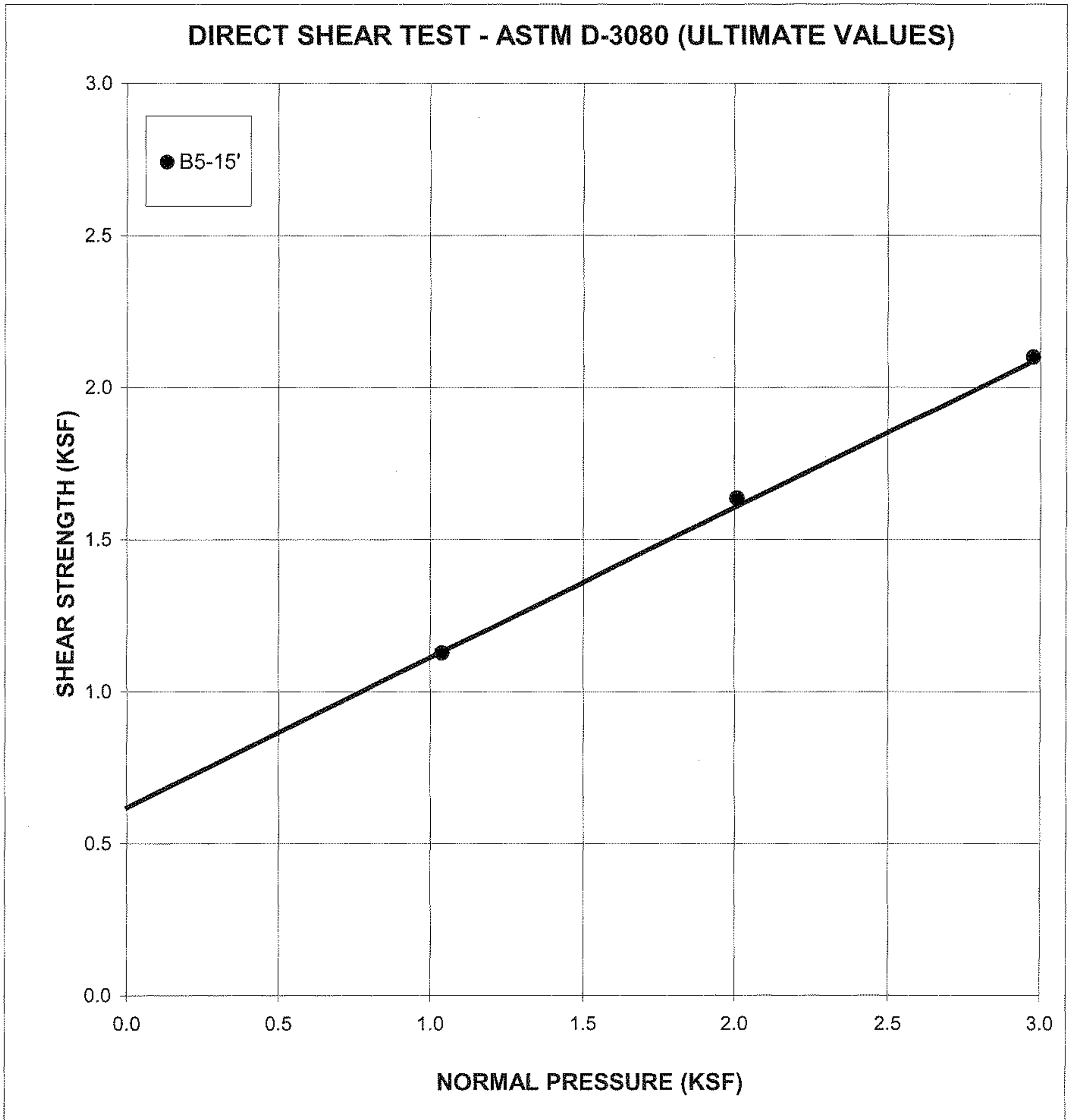
SHEAR DIAGRAM #3

JB: **19553-B** CONSULT: **RIZ**
CLIENT: **DS VENTURES**

EARTH MATERIAL: **BEDROCK**

Phi Angle =	**27 degrees**	**Moisture Content**	**36.6%**
Cohesion =	**606 psf**	**Dry Density (pcf)**	**83.5**
		Percent Saturation	**98.9%**



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1461 E. CHEVY CHASE DRIVE, SUITE 200 GLENDALE, CA 91206
(818) 549-9959 Tel (818) 543-3747 FAX

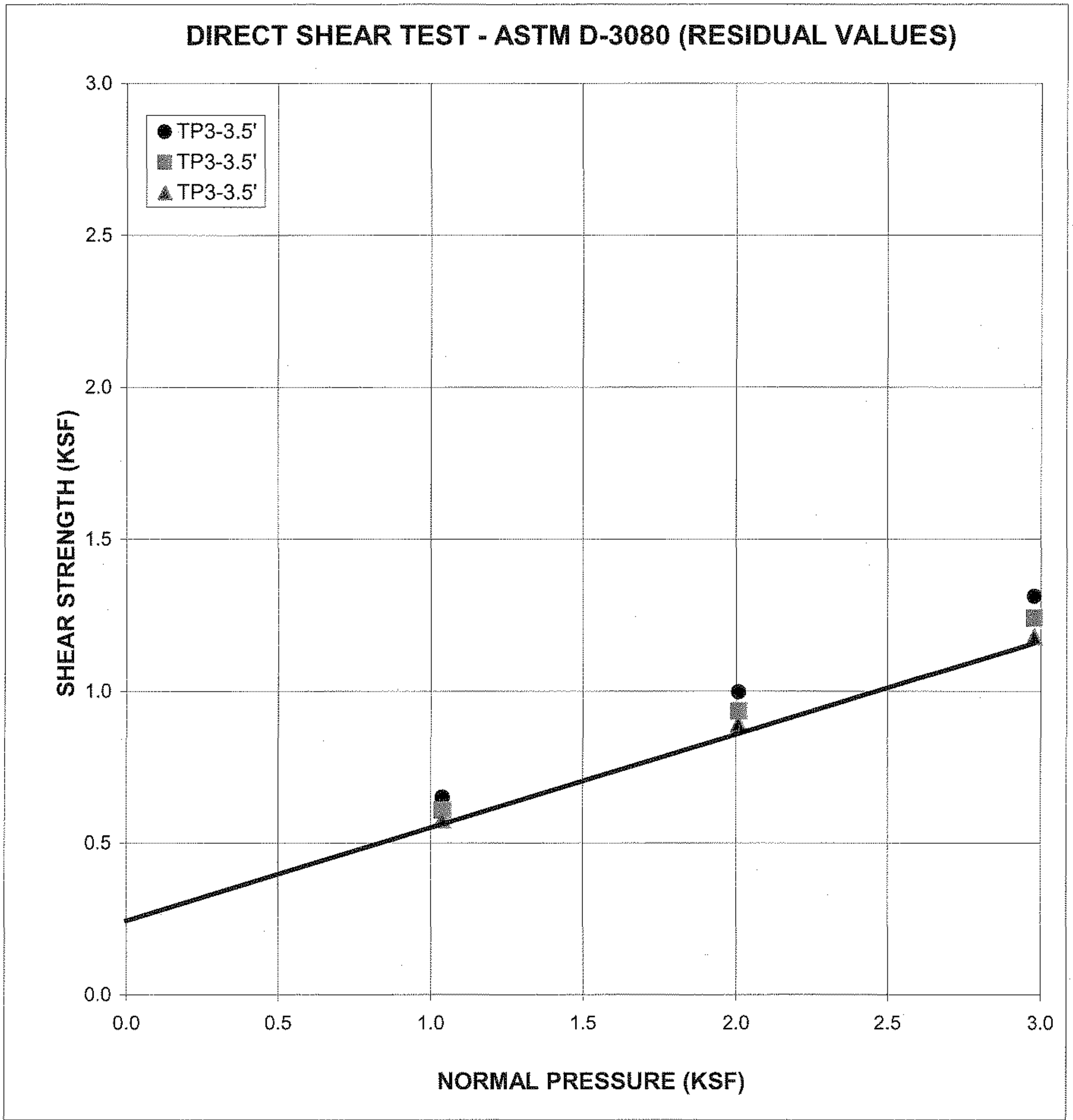
SHEAR DIAGRAM #4

JB: **19553-B** CONSULT: **RIZ**
CLIENT: **DS VENTURES**
EARTH MATERIAL: **BEDDING**

BEDROCK SAMPLES REPEATEDLY SHEARED PARALLEL TO BEDDING TO OBTAIN RESIDUAL SHEAR STRENGTH

Phi Angle = **17 degrees**
Cohesion = **255 psf**

Moisture Content **29.8%**
Dry Density (pcf) **92.2**
Percent Saturation **99.5%**



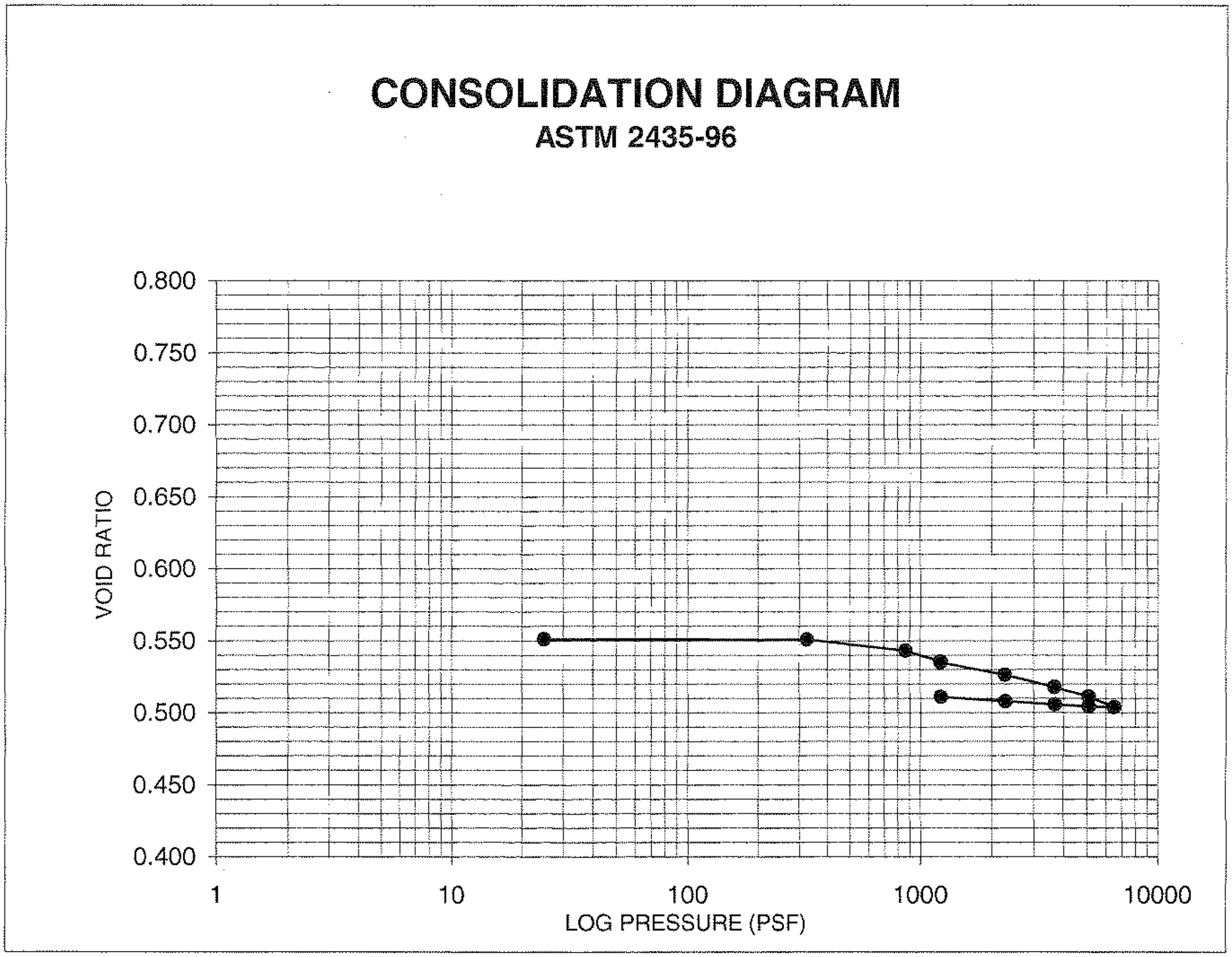
THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM

CONSOLIDATION DIAGRAM #1

JB: **19553-Z** CONSULTANT: **JAI**

CLIENT: **DS VENTURES, LLC**

Earth Material:	ALLUVIUM		
Sample Location:	B1-10	Specific Gravity:	2.65
Dry Weight (pcf):	106.6	Initial Void Ratio:	0.551
Initial Moisture:	18.0%	Water Added At (psf):	1222.0
Initial Saturation:	86.6%	Consolidation Coef. (Cc):	0.0513
		Rebound Coef. (Cr):	0.0095



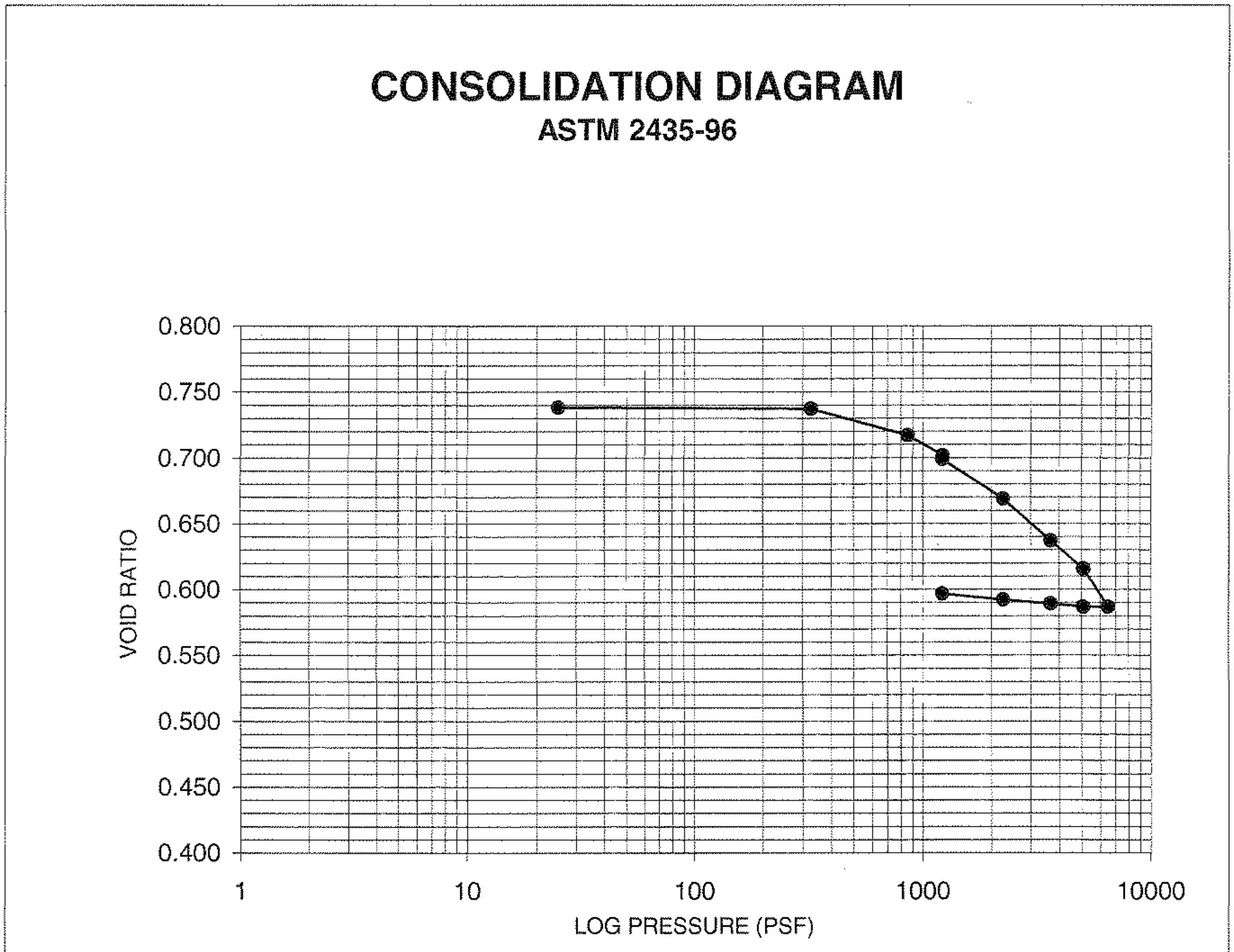
THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM

CONSOLIDATION DIAGRAM #2

JB: **19553-Z** CONSULTANT **JAI**

CLIENT: **DS VENTURES, LLC**

Earth Material:	ALLUVIUM		
Sample Location:	B1-15	Specific Gravity:	2.65
Dry Weight (pcf):	95.1	Initial Void Ratio:	0.738
Initial Moisture:	27.7%	Water Added At (psf):	1228.0
Initial Saturation:	99.5%	Consolidation Coef. (Cc):	0.1868
		Rebound Coef. (Cr):	0.0132



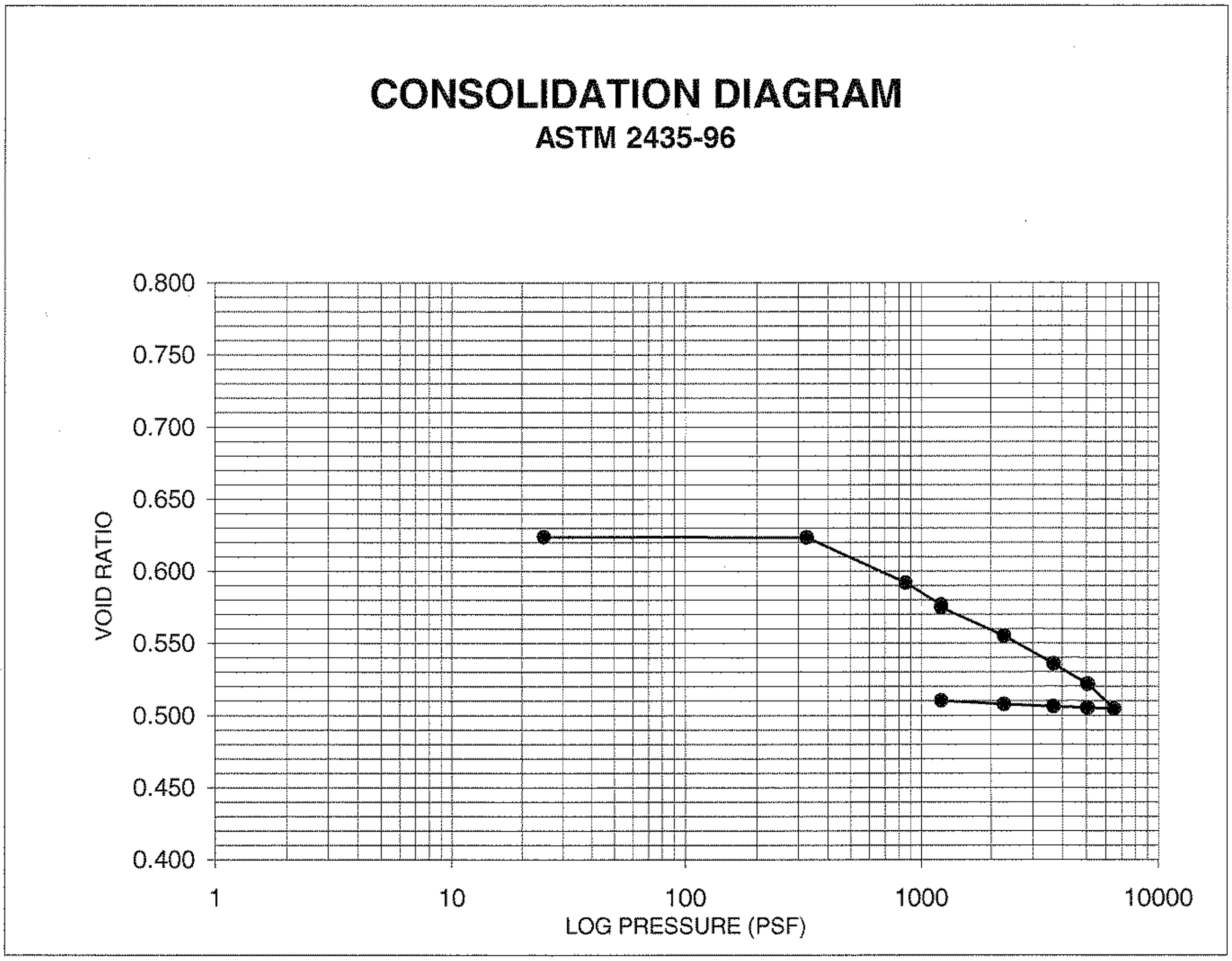
THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM

CONSOLIDATION DIAGRAM #3

JB: **19553-Z** CONSULTANT **JAI**

CLIENT: **DS VENTURES, LLC**

Earth Material:	ALLUVIUM		
Sample Location:	B1-20	Specific Gravity:	2.65
Dry Weight (pcf):	101.8	Initial Void Ratio:	0.624
Initial Moisture:	25.6%	Water Added At (psf):	1225.0
Initial Saturation:	86.6%	Consolidation Coef. (Cc):	0.1150
		Rebound Coef. (Cr):	0.0073



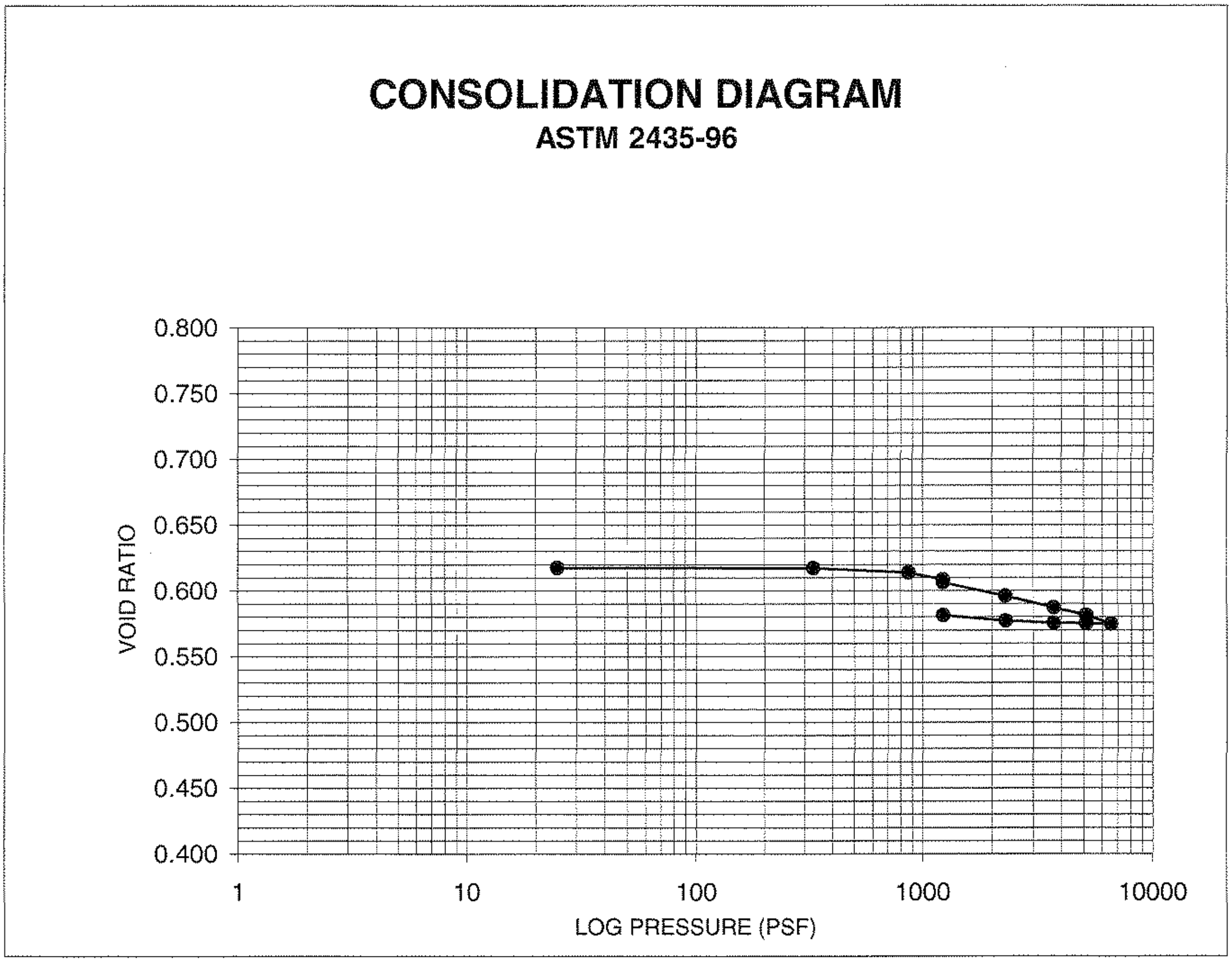
THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM

CONSOLIDATION DIAGRAM #4

JB: **19553-Z** CONSULTANT **JAI**

CLIENT: **DS VENTURES, LLC**

Earth Material:	ALLUVIUM		
Sample Location:	B7-20	Specific Gravity:	2.65
Dry Weight (pcf):	102.2	Initial Void Ratio:	0.618
Initial Moisture:	21.2%	Water Added At (psf):	1228.0
Initial Saturation:	91.0%	Consolidation Coef. (Cc):	0.0482
		Rebound Coef. (Cr):	0.0089



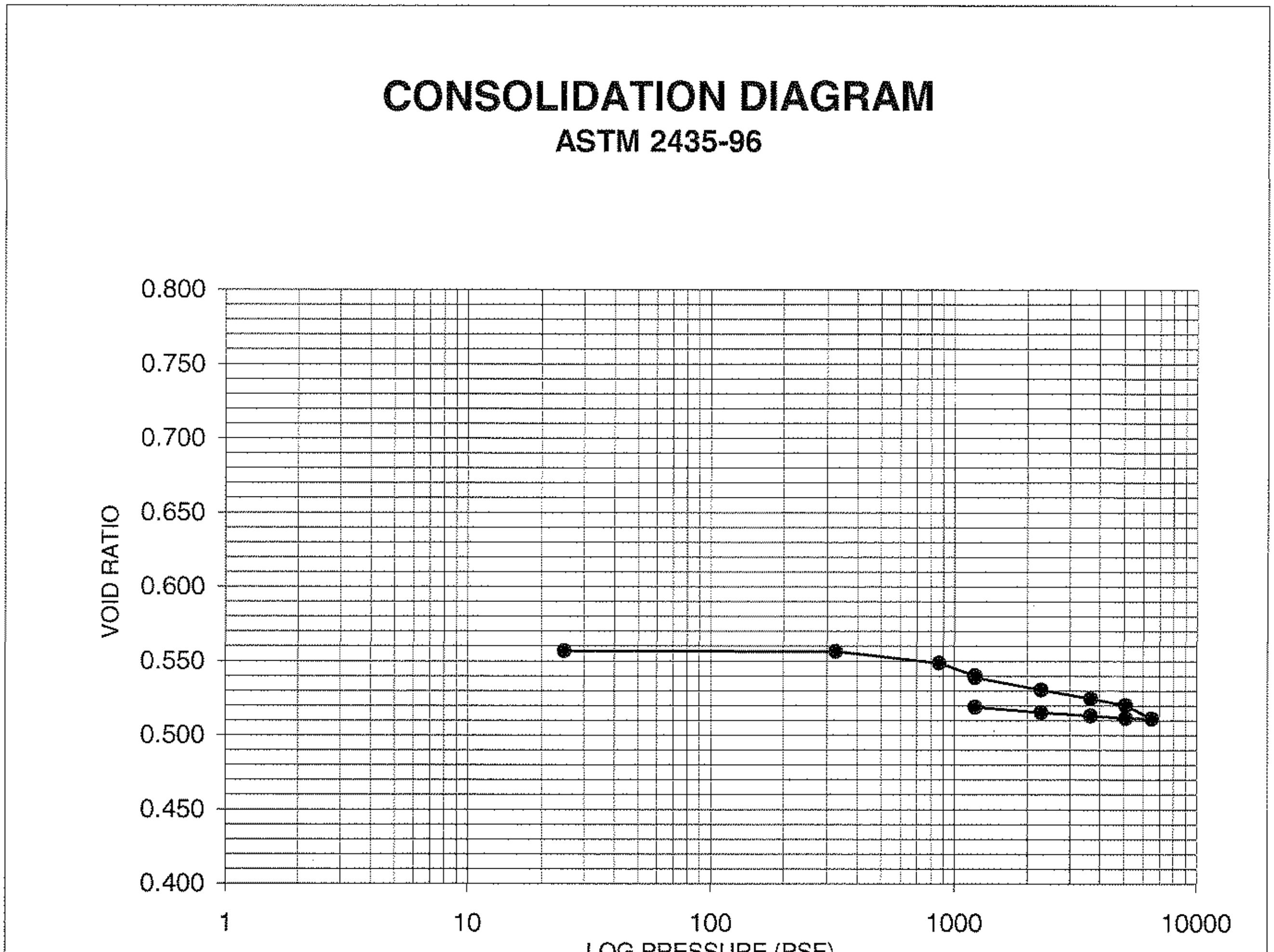
THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM

CONSOLIDATION DIAGRAM #5

JB: **19553-Z** CONSULTANT: **JAI**

CLIENT: **DS VENTURES, LLC**

Earth Material:	ALLUVIUM		
Sample Location:	B7-25	Specific Gravity:	2.65
Dry Weight (pcf):	106.2	Initial Void Ratio:	0.557
Initial Moisture:	20.5%	Water Added At (psf):	1222.0
Initial Saturation:	97.6%	Consolidation Coef. (Cc):	0.0455
		Rebound Coef. (Cr):	0.0101



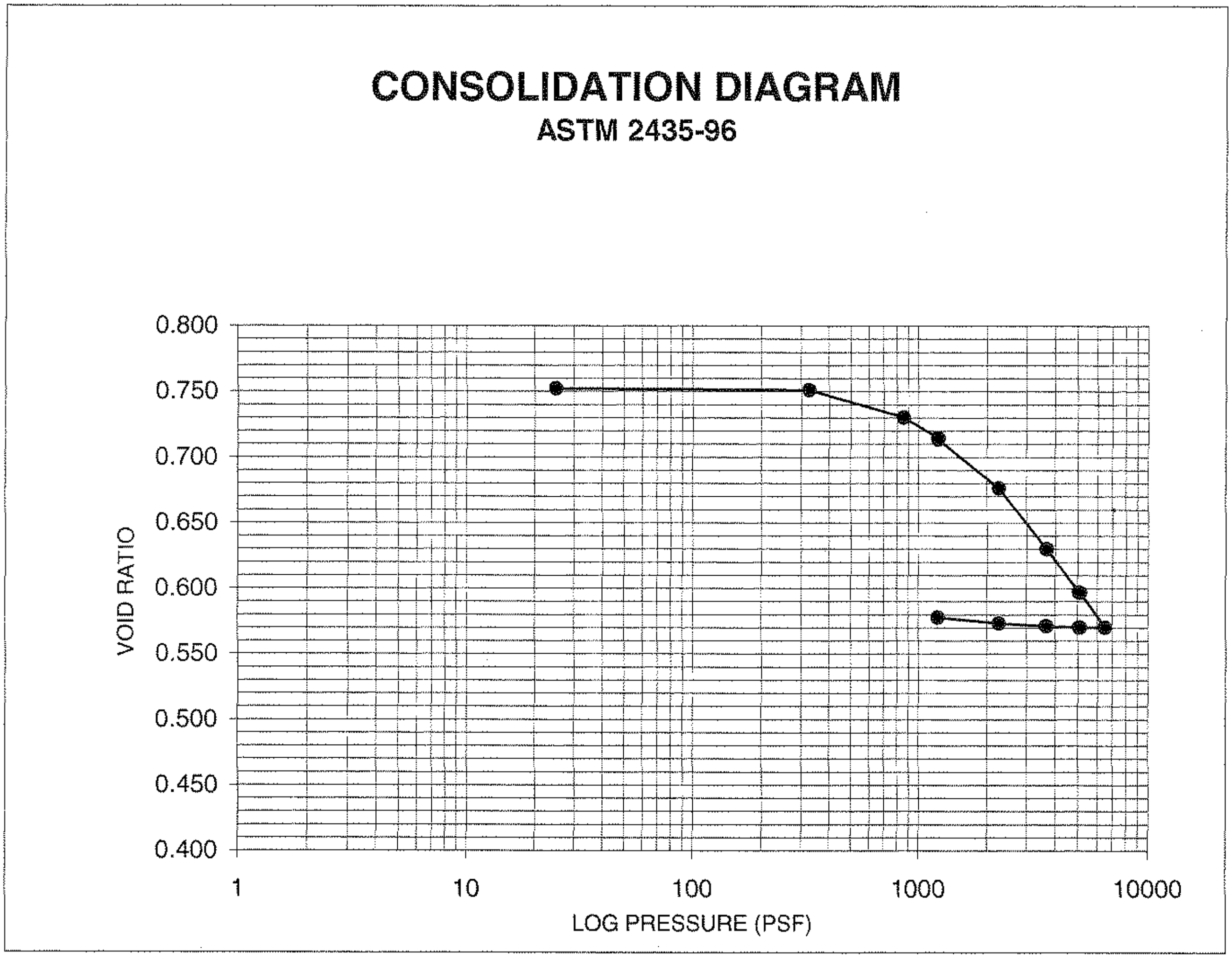
THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM

CONSOLIDATION DIAGRAM #6

JB: **19553-Z** CONSULTANT **JAI**

CLIENT: **DS VENTURES, LLC**

Earth Material:	ALLUVIUM		
Sample Location:	B11-5	Specific Gravity:	2.65
Dry Weight (pcf):	94.4	Initial Void Ratio:	0.752
Initial Moisture:	10.4%	Water Added At (psf):	1228.0
Initial Saturation:	36.6%	Consolidation Coef. (Cc):	0.2357
		Rebound Coef. (Cr):	0.0104



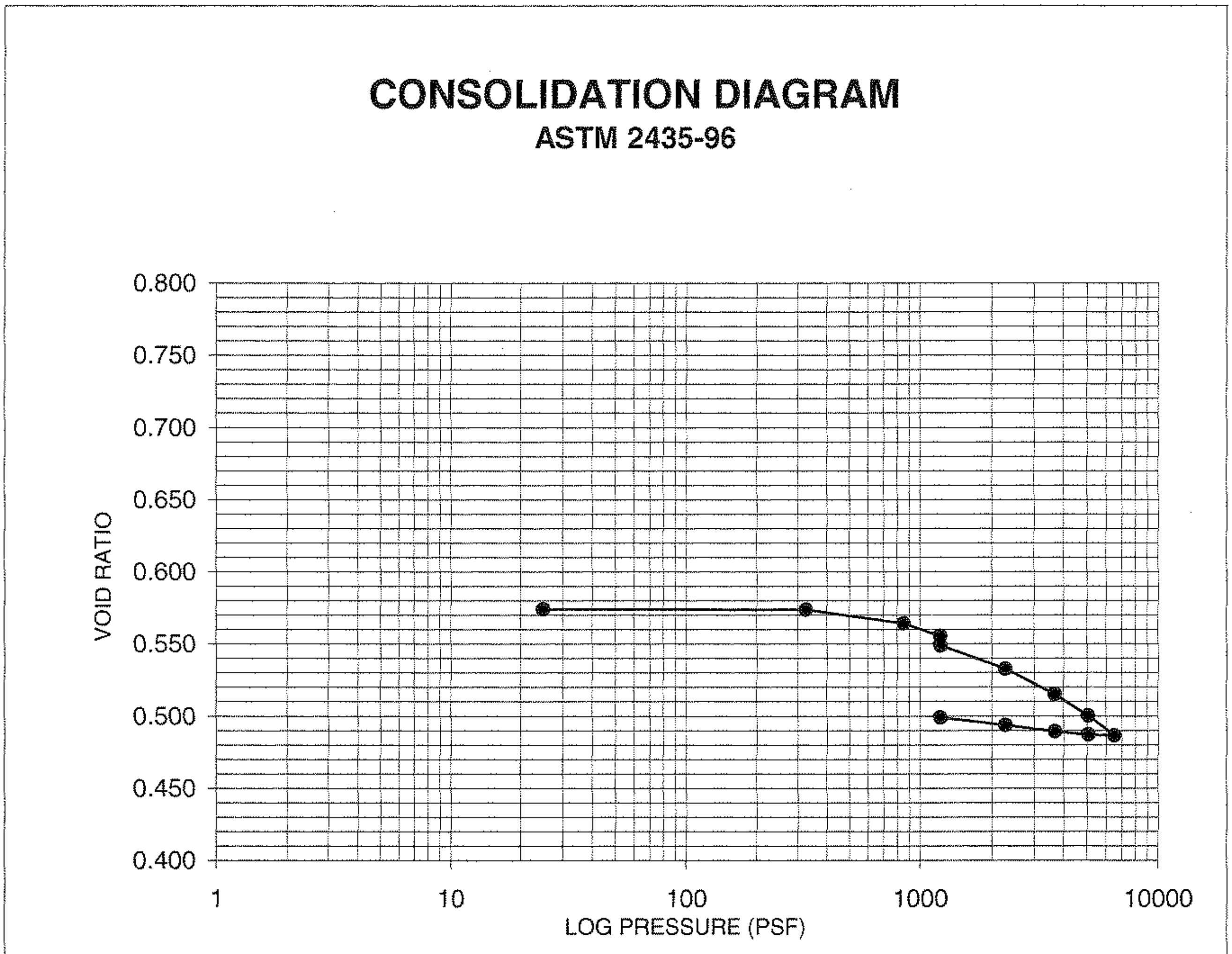
THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM

CONSOLIDATION DIAGRAM #7

JB: **19553-Z** CONSULTANT **JAI**

CLIENT: **DS VENTURES, LLC**

Earth Material:	ALLUVIUM		
Sample Location:	B11-10	Specific Gravity:	2.65
Dry Weight (pcf):	105.1	Initial Void Ratio:	0.574
Initial Moisture:	14.7%	Water Added At (psf):	1225.0
Initial Saturation:	97.6%	Consolidation Coef. (Cc):	0.1051
		Rebound Coef. (Cr):	0.0166



THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM

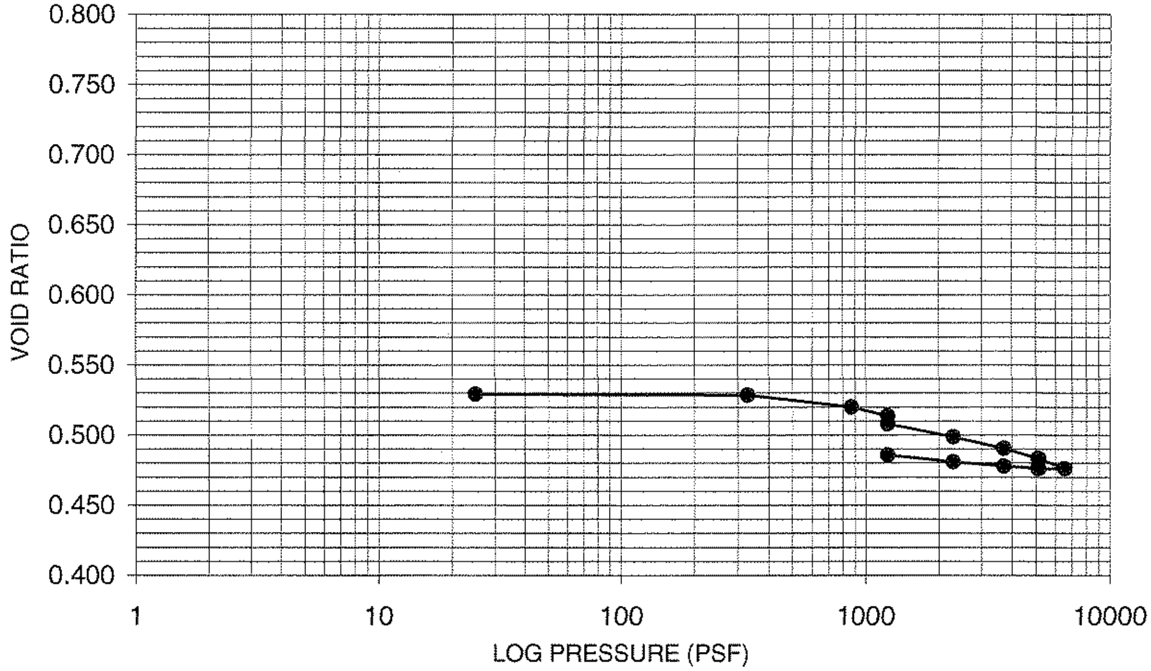
CONSOLIDATION DIAGRAM #8

JB: **19553-Z** CONSULTANT **JAI**

CLIENT: **DS VENTURES, LLC**

Earth Material:	ALLUVIUM		
Sample Location:	B11-15	Specific Gravity:	2.65
Dry Weight (pcf):	108.1	Initial Void Ratio:	0.529
Initial Moisture:	12.9%	Water Added At (psf):	1228.0
Initial Saturation:	64.6%	Consolidation Coef. (Cc):	0.0528
		Rebound Coef. (Cr):	0.0132

CONSOLIDATION DIAGRAM
ASTM 2435-96



THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM

CONSOLIDATION DIAGRAM #9

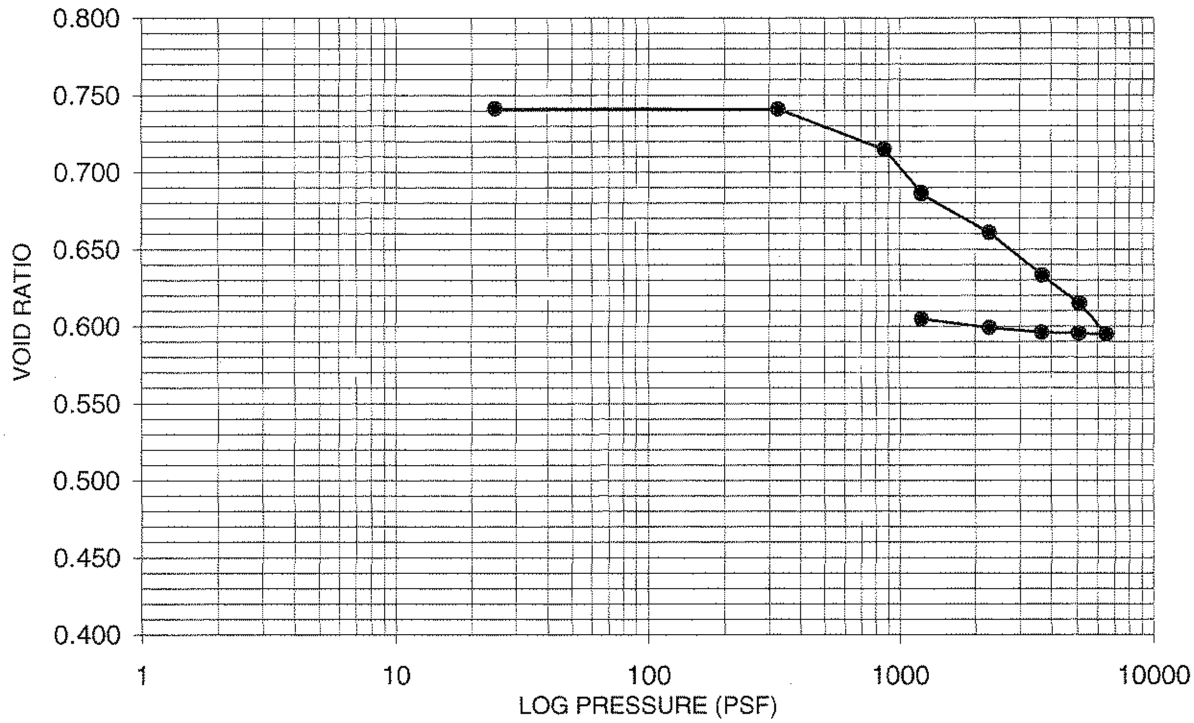
JB: **19553-Z** CONSULTANT: **JAI**

CLIENT: **DS VENTURES, LLC**

Earth Material:	ALLUVIUM		
Sample Location:	B11-20	Specific Gravity:	2.65
Dry Weight (pcf):	95.0	Initial Void Ratio:	0.741
Initial Moisture:	28.9%	Water Added At (psf):	1222.0
Initial Saturation:	103.3%	Consolidation Coef. (Cc):	0.1474
		Rebound Coef. (Cr):	0.0137

CONSOLIDATION DIAGRAM

ASTM 2435-96



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

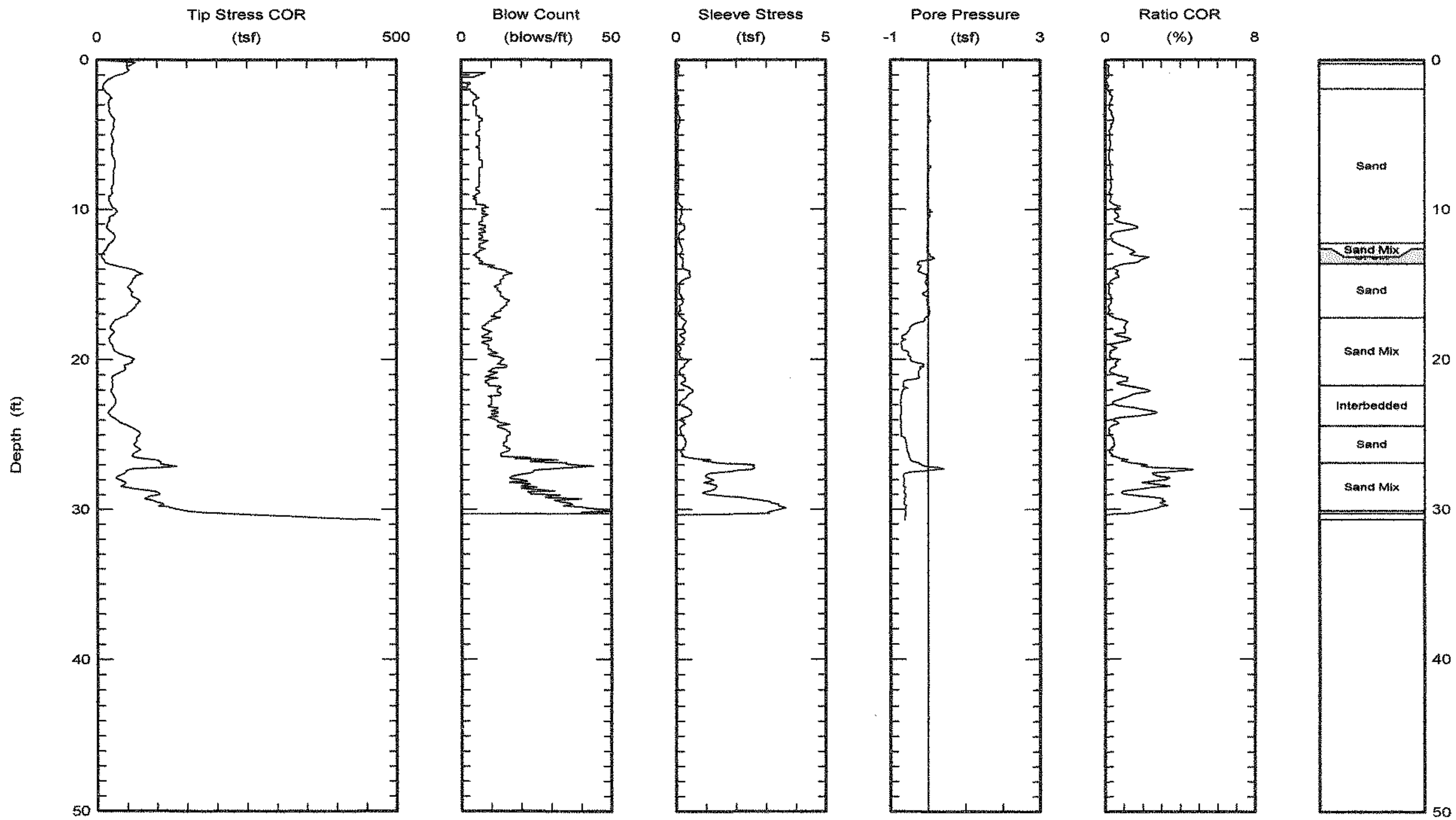
The above parameters were printed simultaneously on a printer and stored on a computer diskette for analysis and reference.

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 CPT rig, having a down pressure capacity of approximately 30 tons. Two CPT soundings were performed within the study area on September 9, 2003, to depths of 31 to 34 feet below the ground surface. The cones met refusal (tip resistance greater than 700 tsf) in bedrock. The test locations and depths were verified in the field by the personnel of The J. Byer Group, Inc.

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. The stratigraphy and interpreted results are consistent with the borings.

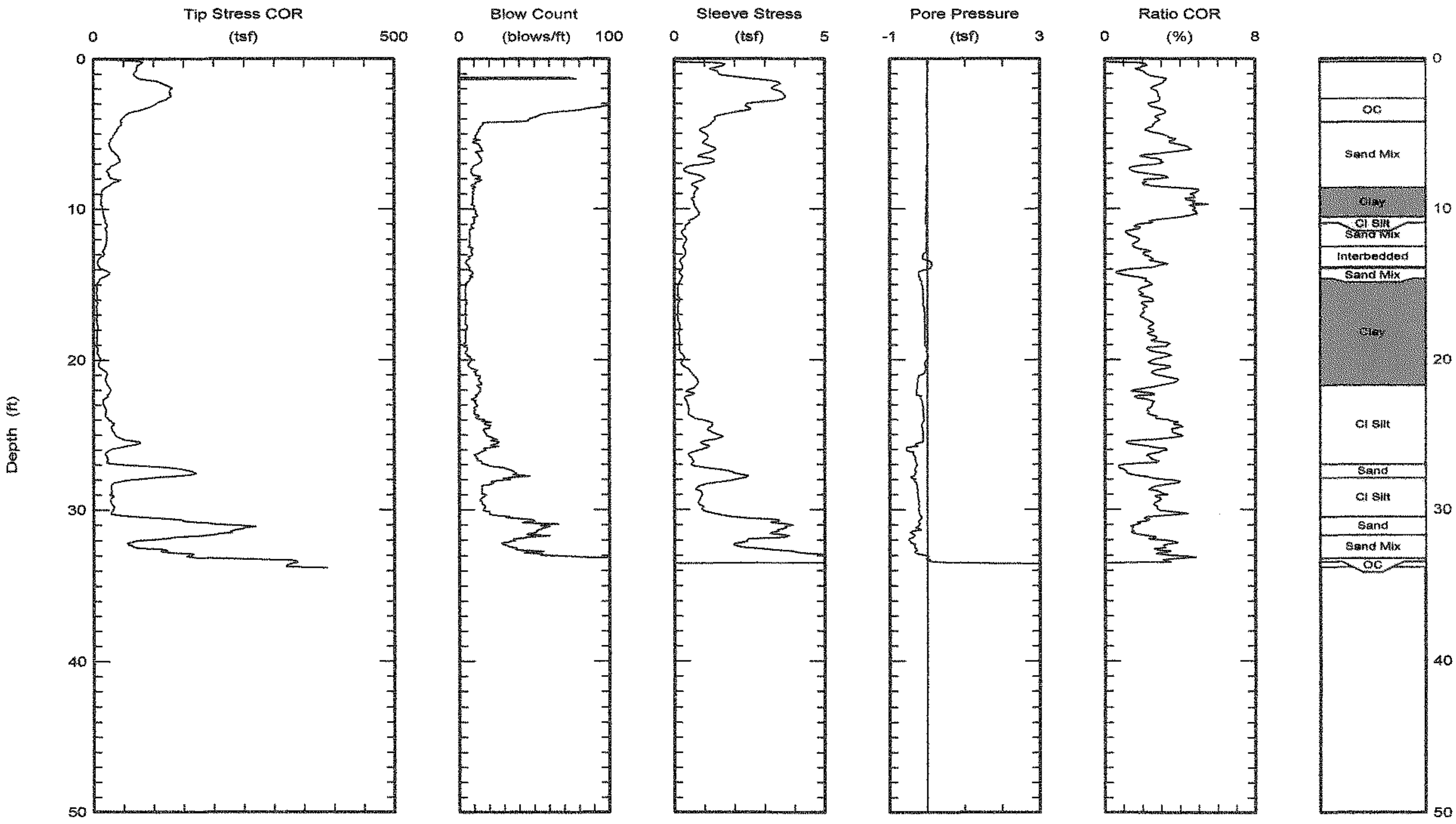
Kehoe Testing & Engineering Office: (714) 901-7220 Fax: (714) 901-7289 skehoe@msn.com www.ara.com	Northing: Easting: Elevation:	Date: 09/Sep/2003 Test ID: CPT-1 Project: DSVentures
	Client: J. Byer Group Site: 22255 Mulholland Drive	



Maximum depth: 30.71 (ft)

Test ID: CPT-1
File: C09S0301C.ecp

Kehoe Testing & Engineering Office: (714) 901-7220 Fax: (714) 901-7289 skehoe@msn.com www.ara.com	Northing: Easting: Elevation:	Date: 09/Sep/2003 Test ID: CPT-2 Project: DSVentures
	Client: J. Byer Group Site: 22255 Mulholland Drive	



Maximum depth: 33.81 (ft)

Test ID: CPT-2
File: C09S0302C.ecp

INTERPRETATION OF ELECTRONIC PIEZOCONE (CPT) DATA
DATA AND INTERPRETED SOIL TYPES

CPT Company: Kehoe Testing and Engineering
Date of Soundings: September 9, 2003 CPT-1

a' for calculating Qt: 0.85
Depth to Ground Water at Time of Exploration (feet) 20
Perched Water Zone (feet) 0
Elevation of Groundsurface (feet) 1016.0

NOTE: '---' or 'ERR' denotes missing field or non-defined result

Depth (feet)	Qc (TSF)	Fs (Avg) (TSF)	Pore Pressure U2 (PSI)	Rfn (%)	Moist Unit Wt. (pcf)	Qtn (TSF)	OS (TSF)	EOS (TSF)	I_c SBT	Soil Behavior Type (SBT)	SPT N_{60} (blow/ft)
1	35.869	0.054	0.064	0.151	104	35.870	0.052	0.052	1.334	Fill-Sand	6
2	14.292	0.030	0.085	0.211	104	14.293	0.104	0.104	1.903	Fill-Sand	3
3	21.079	0.060	0.030	0.287	104	21.079	0.156	0.156	1.870	Fill-Sand	4
4	26.938	0.106	0.278	0.397	104	26.941	0.208	0.208	1.885	Fill-Sand	5
5	26.064	0.065	-0.020	0.252	104	26.064	0.260	0.260	1.868	Fill-Sand	5
6	25.308	0.060	-0.064	0.240	104	25.307	0.312	0.312	1.911	Fill-Sand	5
7	29.421	0.074	0.228	0.255	104	29.423	0.364	0.364	1.889	Fill-Sand	6
8	27.371	0.084	-0.109	0.312	104	27.370	0.416	0.416	1.976	Fill-Sand	6
9	22.977	0.065	-0.011	0.289	108	22.977	0.470	0.470	2.060	Silty Sand	5
10	27.714	0.164	0.189	0.603	108	27.716	0.524	0.524	2.136	Silty Sand	6
11	19.129	0.199	0.000	1.073	108	19.129	0.578	0.578	2.418	Sandy Silt	5
12	25.992	0.112	-0.182	0.442	108	25.990	0.632	0.632	2.138	Silty Sand	6
13	11.907	0.184	0.417	1.639	108	11.912	0.686	0.686	2.652	Clayey Silt	3
14	46.979	0.318	-2.759	0.688	108	46.949	0.740	0.740	2.030	Sand	10
15	57.000	0.182	-0.379	0.324	108	56.996	0.794	0.794	1.817	Sand	11
16	63.979	0.171	-0.556	0.271	108	63.973	0.848	0.848	1.754	Sand	12
17	48.836	0.154	-0.109	0.321	108	48.835	0.902	0.902	1.903	Sand	10
18	24.664	0.244	-6.638	1.033	124	24.592	0.964	0.964	2.411	Sandy Silt	6
19	24.321	0.165	-9.447	0.711	124	22.605	1.026	1.026	2.377	Sandy Silt	6
20	50.657	0.234	-5.418	0.473	124	45.506	1.088	1.088	2.037	Sand	11
21	33.979	0.200	-4.148	0.610	124	29.303	1.150	1.119	2.263	Silty Sand	8
22	25.229	0.384	-9.278	1.606	128	20.767	1.214	1.152	2.633	Clayey Silt	7
23	27.053	0.291	-10.012	1.134	128	21.671	1.278	1.184	2.517	Sandy Silt	7
24	34.407	0.280	-10.082	0.850	128	27.075	1.342	1.217	2.376	Sandy Silt	8
25	67.100	0.202	-9.425	0.308	128	52.474	1.406	1.250	1.933	Sand	14
26	64.427	0.237	-7.650	0.377	128	49.013	1.470	1.283	1.999	Sand	13
27	91.223	1.741	-2.351	1.942	128	68.154	1.534	1.316	2.270	Silty Sand	21
28	40.692	1.158	-8.709	2.969	128	28.923	1.598	1.348	2.727	Clayey Silt	12
29	86.738	1.637	-8.592	1.926	128	61.529	1.662	1.381	2.309	Sandy Silt	20
30	167.791	2.736	-8.398	1.648	132	117.212	1.728	1.416	2.060	Bedrock	36
31	404.175	3.000	-8.578	0.746	132	277.287	1.794	1.451	1.556	Bedrock	72

INTERPRETATION OF ELECTRONIC PIEZOCONE (CPT) DATA
DATA AND INTERPRETED SOIL TYPES

CPT Company: Kehoe Testing and Engineering
Date of Soundings: September 9, 2003 CPT-2

a' for calculating Qt: 0.85
Depth to Ground Water at Time of Exploration (feet) 16
Perched Water Zone (feet) 0
Elevation of Groundsurface (feet) 1035.0

NOTE: '---' or 'ERR' denotes missing field or non-defined result

Depth (feet)	Qc (TSF)	Fs (Avg) (TSF)	Pore Pressure U2 (PSI)	Rfn (%)	Moist Unit Wt. (pcf)	Qtn (TSF)	OS (TSF)	EOS (TSF)	I_c SBT	Soil Behavior Type (SBT)	SPT N_{60} (blow/ft)
1	75.638	1.865	0.085	2.467	111	75.639	0.056	0.056	1.878	Fill-Sand	15
2	124.892	3.463	0.012	2.775	111	124.892	0.111	0.111	1.889	Fill-Sand	25
3	104.385	2.884	-0.150	2.767	111	104.383	0.167	0.167	1.972	Fill-Sand	21
4	50.638	1.448	-0.064	2.872	94	50.637	0.214	0.214	2.205	Fill-Silty Sand	11
5	35.642	1.013	-0.023	2.863	94	35.642	0.261	0.261	2.336	Fill-Sandy Silt	9
6	31.123	1.129	0.139	3.664	94	31.125	0.308	0.308	2.479	Fill-Sandy Silt	8
7	35.823	0.848	-0.150	2.391	94	35.821	0.355	0.355	2.327	Fill-Sandy Silt	9
8	30.500	0.724	-0.139	2.406	94	30.498	0.402	0.402	2.400	Fill-Sandy Silt	8
9	14.900	0.672	-0.246	4.653	107	14.897	0.455	0.455	2.718	Clayey Silt	4
10	15.438	0.734	-0.331	4.918	107	15.434	0.509	0.509	2.758	Silty Clay	5
11	20.700	0.447	-0.353	2.220	107	20.696	0.562	0.562	2.563	Sandy Silt	6
12	21.538	0.328	-0.224	1.568	107	21.536	0.616	0.616	2.476	Sandy Silt	5
13	14.100	0.304	-0.791	2.265	107	14.091	0.669	0.669	2.662	Clayey Silt	4
14	16.723	0.228	-0.769	1.426	120	16.715	0.729	0.729	2.576	Sandy Silt	4
15	7.438	0.156	-2.084	2.354	120	7.415	0.789	0.789	2.961	Clay	2
16	6.200	0.135	-1.528	2.532	124	6.183	0.851	0.851	3.073	Clay	2
17	5.846	0.120	-1.015	2.438	124	5.835	0.913	0.882	3.099	Clay	2
18	6.531	0.162	-0.844	2.921	124	6.522	0.975	0.913	3.112	Clay	2
19	6.185	0.168	-0.566	3.267	124	6.179	1.037	0.943	3.170	Clay	2
20	9.485	0.279	-0.267	3.328	124	9.482	1.099	0.974	3.032	Clay	3
21	19.762	0.623	-2.191	3.354	128	18.446	1.163	1.007	2.814	Silty Clay	6
22	25.423	0.585	-3.687	2.422	128	23.232	1.227	1.040	2.659	Clayey Silt	7
23	18.262	0.428	-1.849	2.525	128	15.804	1.291	1.073	2.816	Silty Clay	6
24	26.338	0.874	-1.560	3.501	128	22.586	1.355	1.105	2.789	Silty Clay	8
25	42.100	1.289	-1.699	3.170	128	35.725	1.419	1.138	2.618	Clayey Silt	11
26	37.962	0.798	-5.439	2.191	128	31.102	1.483	1.171	2.546	Sandy Silt	10
27	71.325	0.828	-4.318	1.187	128	57.926	1.547	1.204	2.175	Silty Sand	16
28	86.469	1.773	-4.606	2.091	128	68.582	1.611	1.237	2.279	Silty Sand	20
29	30.025	0.849	-3.496	2.999	128	22.304	1.675	1.269	2.798	Silty Clay	9
30	35.285	1.079	-3.056	3.220	128	25.736	1.739	1.302	2.777	Silty Clay	10
31	197.600	3.357	-3.160	1.715	128	146.639	1.803	1.335	1.996	Sand	41
32	121.323	2.808	-5.589	2.352	128	87.290	1.867	1.368	2.255	Silty Sand	28
33	190.100	6.441	-1.731	3.423	132	134.143	1.933	1.403	2.255	Bedrock	44
34	337.060	6.000	123.417	1.784	132	234.029	1.999	1.437	1.886	Bedrock	67

INTERPRETATION OF ELECTRONIC PIEZOCONE (CPT) DATA
LIQUEFACTION ANALYSIS

CPT Company: Kehoe Testing and Engineering
Date of Soundings: September 9, 2003 CPT-1

a' for calculating Qt:	0.85
Maximum Horizontal Acceleration (%g)	0.46
Depth to Ground Water for Liquefaction Analysis (feet)	20
Perched Water Zone (feet)	0
Magnitude Scaling Factor	1.2
Design Magnitude Earthquake	6.9
Elevation of Groundsurface (feet)	1016.0

NOTE: '---' or 'ERR' denotes missing field or non-defined result

Depth (feet)	Qtn (TSF)	Rfn (%)	OS (TSF)	EOS (TSF)	I_c SBT	Soil Behavior Type (SBT)	SPT $(N_1)_{60}$ (blow/ft)	$q_{(c1N)}$	K_c	$Q_{(c1Ncs)}$	Stress CSR	Resist. CRR*MSF	F.S. Liquef.
1	35.870	0.15	0.052	0.052	1.334	Fill-Sand	10	60.98	1.000	60.977	0.298	0.125	0.42
2	14.293	0.21	0.104	0.104	1.903	Fill-Sand	5	24.30	1.192	28.957	0.298	0.092	0.31
3	21.079	0.29	0.156	0.156	1.870	Fill-Sand	7	35.83	1.162	41.627	0.297	0.105	0.35
4	26.941	0.40	0.208	0.208	1.885	Fill-Sand	9	45.79	1.175	53.828	0.296	0.117	0.39
5	26.064	0.25	0.260	0.260	1.868	Fill-Sand	9	44.31	1.160	51.395	0.296	0.115	0.39
6	25.307	0.24	0.312	0.312	1.911	Fill-Sand	9	43.02	1.199	51.584	0.295	0.115	0.39
7	29.423	0.25	0.364	0.364	1.889	Fill-Sand	10	50.02	1.178	58.933	0.294	0.123	0.42
8	27.370	0.31	0.416	0.416	1.976	Fill-Sand	10	46.53	1.269	59.070	0.293	0.123	0.42
9	22.977	0.29	0.470	0.470	2.060	Silty Sand	8	39.06	1.387	54.192	0.293	0.117	0.40
10	27.716	0.60	0.524	0.524	2.136	Silty Sand	10	45.00	1.523	68.544	0.292	0.136	0.47
11	19.129	1.07	0.578	0.578	2.418	Sandy Silt	7	28.86	2.386	68.862	0.291	0.137	0.47
12	25.990	0.44	0.632	0.632	2.138	Silty Sand	8	36.67	1.529	56.053	0.291	0.119	0.41
13	11.912	1.64	0.686	0.686	2.652	Clayey Silt	5	17.36	3.660	63.523	0.290	---	---
14	46.949	0.69	0.740	0.740	2.030	Sand	12	58.88	1.342	78.995	0.289	0.156	0.54
15	56.996	0.32	0.794	0.794	1.817	Sand	13	67.77	1.119	75.860	0.289	0.149	0.52
16	63.973	0.27	0.848	0.848	1.754	Sand	14	72.40	1.074	77.791	0.288	0.153	0.53
17	48.835	0.32	0.902	0.902	1.903	Sand	11	52.76	1.192	62.885	0.287	0.128	0.44
18	24.592	1.03	0.964	0.964	2.411	Sandy Silt	6	25.35	2.358	59.770	0.286	0.124	0.43
19	22.605	0.71	1.026	1.026	2.377	Sandy Silt	6	23.86	2.221	52.976	0.286	0.116	0.41
20	45.506	0.47	1.088	1.088	2.037	Sand	10	47.55	1.352	64.273	0.285	0.130	0.45
21	29.303	0.61	1.150	1.119	2.263	Silty Sand	7	31.24	1.836	57.336	0.292	0.121	0.41
22	20.767	1.61	1.214	1.152	2.633	Clayey Silt	6	21.91	3.537	77.479	0.299	---	---
23	21.671	1.13	1.278	1.184	2.517	Sandy Silt	6	23.83	2.858	68.095	0.305	0.135	0.44
24	27.075	0.85	1.342	1.217	2.376	Sandy Silt	7	29.69	2.219	65.879	0.311	0.132	0.42
25	52.474	0.31	1.406	1.250	1.933	Sand	12	56.76	1.222	69.339	0.317	0.137	0.43
26	49.013	0.38	1.470	1.283	1.999	Sand	11	53.45	1.299	69.428	0.322	0.138	0.43
27	68.154	1.94	1.534	1.316	2.270	Silty Sand	17	74.26	1.855	137.756	0.327	0.400	1.22
28	28.923	2.97	1.598	1.348	2.727	Clayey Silt	9	30.18	4.200	126.737	0.331	---	---
29	61.529	1.93	1.662	1.381	2.309	Sandy Silt	16	68.08	1.977	134.603	0.335	0.380	1.13
30	117.212	1.65	1.728	1.416	2.060	Bedrock	28	129.26	1.387	179.343	0.339	0.763	2.25
31	277.287	0.75	1.794	1.451	1.556	Bedrock	60	335.56	1.000	335.557	0.341	4.447	13.04

INTERPRETATION OF ELECTRONIC PIEZOCONE (CPT) DATA
LIQUEFACTION ANALYSIS

CPT Company: Kehoe Testing and Engineering
Date of Soundings: September 9, 2003 CPT-2

a' for calculating Qt: 0.85
Maximum Horizontal Acceleration (%g) 0.46
Depth to Ground Water for Liquefaction Analysis (feet) 16
Perched Water Zone (feet) 0
Magnitude Scaling Factor 1.2
Design Magnitude Earthquake 6.9
Elevation of Groundsurface (feet) 6.9

NOTE: '---' or 'ERR' denotes missing field or non-defined result

Depth (feet)	Qtn (TSF)	Rfn (%)	OS (TSF)	EOS (TSF)	I_c SBT	Soil Behavior Type (SBT)	SPT $(N_1)_{60}$ (blow/ft)	$q_{(c1N)}$	K_c	$Q_{(c1Ncs)}$	Stress CSR	Resist. CRR*MSF	F.S. Liquef.
1	75.639	2.47	0.056	0.056	1.878	Fill-Sand	26	128.58	1.169	150.309	0.298	0.490	1.64
2	124.892	2.78	0.111	0.111	1.889	Fill-Sand	42	212.32	1.179	250.315	0.298	1.904	6.40
3	104.383	2.77	0.167	0.167	1.972	Fill-Sand	37	177.45	1.266	224.585	0.297	1.403	4.72
4	50.637	2.87	0.214	0.214	2.205	Fill-Silty Sanc	19	86.08	1.679	144.529	0.296	0.446	1.51
5	35.642	2.86	0.261	0.261	2.336	Fill-Sandy Silt	14	60.59	2.069	125.339	0.296	0.326	1.10
6	31.125	3.66	0.308	0.308	2.479	Fill-Sandy Silt	13	52.91	2.663	140.878	0.295	0.421	1.43
7	35.821	2.39	0.355	0.355	2.327	Fill-Sandy Silt	14	60.90	2.038	124.085	0.294	0.319	1.08
8	30.498	2.41	0.402	0.402	2.400	Fill-Sandy Silt	13	51.85	2.312	119.865	0.293	0.297	1.01
9	14.897	4.65	0.455	0.455	2.718	Clayey Silt	7	25.33	4.126	104.504	0.293	---	---
10	15.434	4.92	0.509	0.509	2.758	Silty Clay	8	26.24	4.438	116.465	0.292	---	---
11	20.696	2.22	0.562	0.562	2.563	Sandy Silt	8	31.89	3.109	99.153	0.291	0.211	0.72
12	21.536	1.57	0.616	0.616	2.476	Sandy Silt	8	30.99	2.649	82.116	0.291	0.163	0.56
13	14.091	2.26	0.669	0.669	2.662	Clayey Silt	6	21.08	3.730	78.624	0.290	---	---
14	16.715	1.43	0.729	0.729	2.576	Sandy Silt	6	21.20	3.180	67.407	0.289	0.134	0.46
15	7.415	2.35	0.789	0.789	2.961	Clay	3	9.43	6.322	59.600	0.289	---	---
16	6.183	2.53	0.851	0.851	3.073	Clay	3	7.29	7.588	55.285	0.288	---	---
17	5.835	2.44	0.913	0.882	3.099	Clay	2	6.63	7.909	52.435	0.297	---	---
18	6.522	2.92	0.975	0.913	3.112	Clay	3	7.16	8.076	57.796	0.306	---	---
19	6.179	3.27	1.037	0.943	3.170	Clay	2	6.56	8.840	57.955	0.314	---	---
20	9.482	3.33	1.099	0.974	3.032	Clay	3	9.74	7.110	69.222	0.322	---	---
21	18.446	3.35	1.163	1.007	2.814	Silty Clay	6	19.62	4.904	96.242	0.328	---	---
22	23.232	2.42	1.227	1.040	2.659	Clayey Silt	7	24.45	3.709	90.685	0.335	---	---
23	15.804	2.52	1.291	1.073	2.816	Silty Clay	5	17.03	4.921	83.788	0.341	---	---
24	22.586	3.50	1.355	1.105	2.789	Silty Clay	7	23.83	4.689	111.712	0.346	---	---
25	35.725	3.17	1.419	1.138	2.618	Clayey Silt	10	36.99	3.441	127.274	0.351	---	---
26	31.102	2.19	1.483	1.171	2.546	Sandy Silt	9	33.72	3.012	101.562	0.356	0.220	0.62
27	57.926	1.19	1.547	1.204	2.175	Silty Sand	14	62.06	1.607	99.737	0.360	0.213	0.59
28	68.582	2.09	1.611	1.237	2.279	Silty Sand	17	73.74	1.884	138.890	0.364	0.407	1.12
29	22.304	3.00	1.675	1.269	2.798	Silty Clay	7	23.65	4.771	112.846	0.368	---	---
30	25.736	3.22	1.739	1.302	2.777	Silty Clay	8	27.10	4.593	124.449	0.371	---	---
31	146.639	1.71	1.803	1.335	1.996	Sand	33	159.10	1.294	205.907	0.372	1.104	2.96
32	87.290	2.35	1.867	1.368	2.255	Silty Sand	22	95.92	1.811	173.740	0.373	0.703	1.88
33	134.143	3.42	1.933	1.403	2.255	Bedrock	34	147.50	1.811	267.126	0.373	2.293	6.14
34	234.029	1.78	1.999	1.437	1.886	Bedrock	51	256.76	1.176	301.870	0.373	3.265	8.75

THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM

SEISMIC SETTLEMENT

JB: **19553-I** CONSULT: **RIZ**
CLIENT: **DS VENTURES**

CALCULATION SHEET # **1**

Calculate Volumetric Strain and Dynamic Settlement of Saturated Sand Using Ishihara and Yoshimine Method

CPT1

DEPTH (feet)	LAYER THICKNESS (feet)	LIQUE. F.S.	N60	N1	VOLUMETRIC STRAIN Ev*	SETTLEMENT (inches)
20	1	0.45	10	8	4.05%	0.49
21	1	0.41	7	6	4.55%	0.55
23	1	0.44	6	5	4.85%	0.58
24	1	0.42	7	6	4.55%	0.55
25	1	0.43	12	10	3.55%	0.43
26	1	0.43	11	9	3.80%	0.46
29	1	1.13	16	13	0.60%	0.07
					Total Settlement	3.11

CPT2

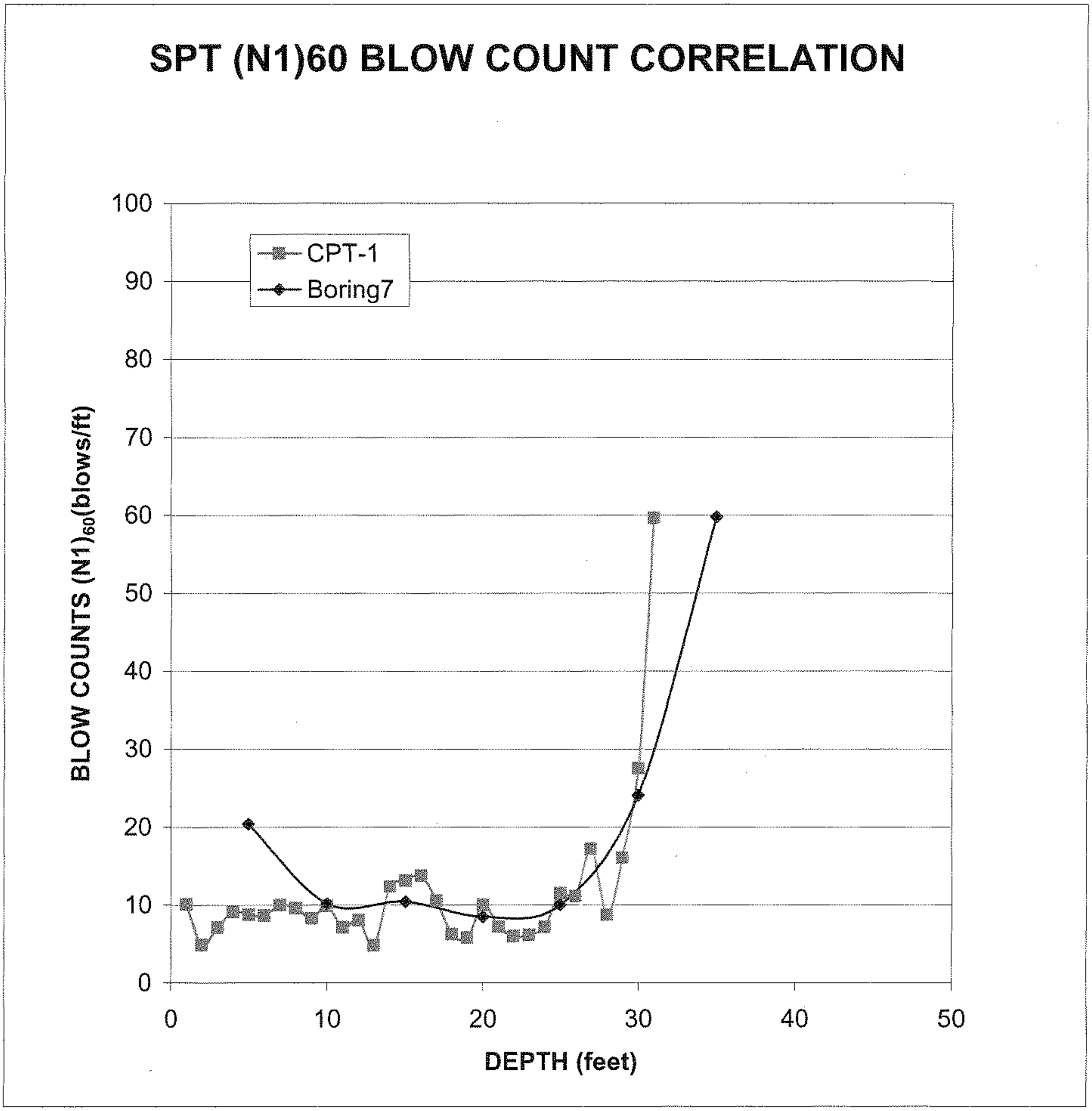
DEPTH (feet)	LAYER THICKNESS (feet)	LIQUE. F.S.	N60	N1	VOLUMETRIC STRAIN Ev*	SETTLEMENT (inches)
26	1	0.62	9	8	4.05%	0.49
27	1	0.59	14	12	3.20%	0.38
28	1	1.12	17	14	0.55%	0.07
					Total Settlement	0.94

THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM

CPT/SPT BLOW COUNT

JB: **19553-I** CONSULT: **RIZ**
CLIENT: **DS VENTURES**

CORRELATION SHEET # 1

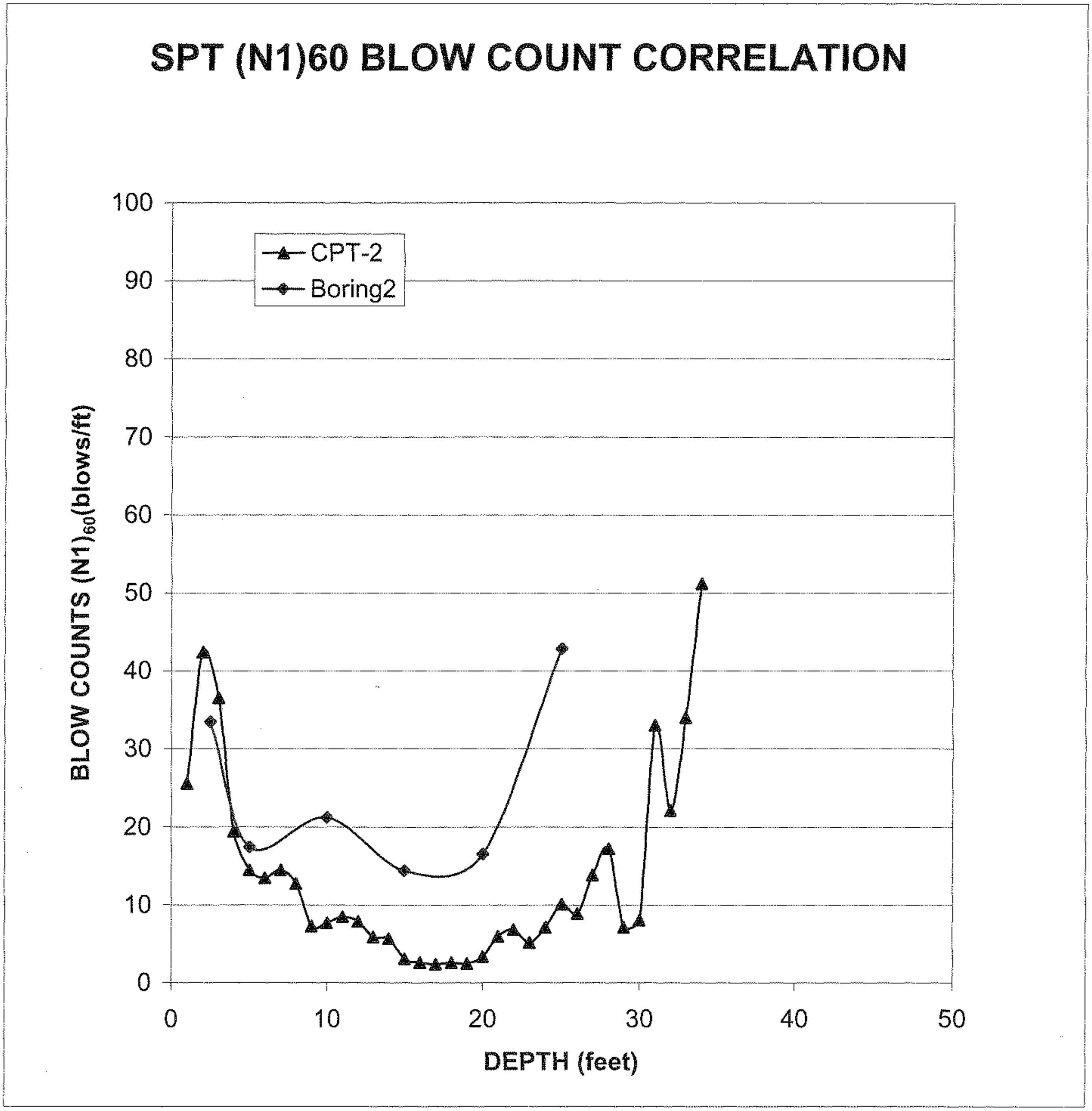


THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM

CPT/SPT BLOW COUNT

JB: **19553-I** CONSULT: **RIZ**
CLIENT: **DS VENTURES**

CORRELATION SHEET # **2**



JB No: 19553-Z

Log of Boring: 1

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE						
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
1029.0	1	*FILL:* Silty Sand, brown, slightly moist, medium dense								
1028.0	2									
1027.0	3			SM	R	25	10.7	102.9	47.0	
1026.0	4									
1025.0	5			SM	R	13	13.6	94.5	48.0	
1024.0	6									
1023.0	7	*ALLUVIUM:* Silty Sand, brown, very moist, dense								
1022.0	8									
1021.0	9									
1020.0	10			SM	R	50	18.0	106.4	86.0	
1019.0	11									
1018.0	12	Sandy Clay, brown, very moist, soft, plastic								
1017.0	13									
1016.0	14									
1015.0	15			CH	R	11	27.7	95.2	100.0	
1014.0	16									
1013.0	17									
1012.0	18									
1011.0	19	water at 19 feet								
1010.0	20									
1009.0	21			CH	R	8	25.6	101.9	100.0	
1009.0	21	*BEDROCK:* Sandstone, orange-brown, very moist, hard, massive								
1008.0	22									
1007.0	23									
1006.0	24									
1005.0	25									

Surface: Dirt, Dry Grass Vacant Lot

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,030 Feet

Drill Date: 8-11-03

Sheet: 1 of 1

JB No: 19553-Z

Log of Boring: 2

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE						
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
		FILL: Silty Sand, brown, slightly moist, medium dense								
1034.0	1									
1033.0	2			SM	R	24	11.3	99.6	45.0	
1032.0	3									
1031.0	4									
1030.0	5			SW	R	10	11.7	83.9	32.0	
1029.0	6									
1028.0	7									
1027.0	8									
1026.0	9									
1025.0	10	*ALLUVIUM:* Sand, brown, moist, slightly to medium dense, coarse		SP	R	16	3.6	103.3	16.0	
1024.0	11									
1023.0	12									
1022.0	13	Sandy Clay, brown-gray, very moist, soft		CL						
1021.0	14									
1020.0	15			CL	R	10	----	----	----	No Recovery
1019.0	16	water at 16 feet								
1018.0	17									
1017.0	18									
1016.0	19									
1015.0	20									
1014.0	21			CL	R	12	23.6	100.5	97.0	
1013.0	22	Sand, orange-brown,saturated, dense								
1012.0	23									
1011.0	24	*BEDROCK:* Sandstone, gray-brown, moist, moderately hard								
1010.0	25									

Surface:

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,035 Feet

Drill Date: 8-11-03

JB No: 19553-Z

Log of Boring: 2

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE							
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
1009.0	26	End at 25 Feet; Water at 16 Feet; No Caving; Fill to 9 Feet.								
1008.0	27									
1007.0	28									
1006.0	29									
1005.0	30									
1004.0	31									
1003.0	32									
1002.0	33									
1001.0	34									
1000.0	35									
999.0	36									
998.0	37									
997.0	38									
996.0	39									
995.0	40									
994.0	41									
993.0	42									
992.0	43									
991.0	44									
990.0	45									
989.0	46									
988.0	47									
987.0	48									
986.0	49									
985.0	50									

Surface:

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,035 Feet

Drill Date: 8-11-03

JB No: 19553-Z

Log of Boring: 3

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE							
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
		FILL: Silty Sand, brown, slightly moist, medium dense								
1006.0	1									
1005.0	2									
1004.0	3									
1003.0	4									
1002.0	5	*ALLUVIUM:* Silty Sand, reddish-brown, slightly moist, medium dense		SM	R	18	14.2	108.4	72.0	
1001.0	6									
1000.0	7									
999.0	8									
998.0	9	*BEDROCK:* Sandstone/Siltstone, brown, gray, orange layers, moist, moderately hard								
997.0	10			----	R	28	25.1	95.4	91.0	
996.0	11									
995.0	12									
994.0	13									
993.0	14									
992.0	15	End at 15 Feet; No Water; No Caving; Fill to 4½ Feet.		----	R	50 9"	18.4	101.5	77.0	
991.0	16									
990.0	17									
989.0	18									
988.0	19									
987.0	20									
986.0	21									
985.0	22									
984.0	23									
983.0	24									
982.0	25									

Surface: Dirt/Dry Grass, Leaves

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,007 Feet

Drill Date: 8-11-03

Sheet: 1 of 1

JB No: 19553-Z

Log of Boring: 4

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE							
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
	0	*FILL:* Silty Sand, light brown-gray, slightly moist, medium dense								
999.0	1									
998.0	2									
997.0	3									
996.0	4	*ALLUVIUM:* Silty Sand, brown-gray, moist to very moist, slightly to medium dense								
995.0	5			SM	R	20	9.7	98.2	37.0	
994.0	6									
993.0	7									
992.0	8									
991.0	9									
990.0	10			SM	SPT	2 2 2	----	----	----	
989.0	11									
988.0	12									
987.0	13									
986.0	14									
985.0	15			----	SPT	2 2 3	----	----	----	
984.0	16									
983.0	17									
982.0	18									
981.0	19	Sandy Clay, dark gray, very moist, soft, plastic								
980.0	20	fragments of bedrock								
979.0	21			----	SPT	4 6 9	----	----	----	
978.0	22									
977.0	23									
976.0	24	*BEDROCK:* Siltstone, gray, brown, orange layers, moist, moderately hard								
975.0	25									

Surface: Dry Grass, Dirt

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,000 Feet

Drill Date: 8-11-03

Log of Boring: 4

JB No: 19553-Z

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
974.0	26									
973.0	27									
972.0	28									
971.0	29									
970.0	30	dark gray, moderately hard End at 30 Feet; No Water; Fill to 4 Feet.		----	SPT	19 33 50	----	----	----	
969.0	31									
968.0	32									
967.0	33									
966.0	34									
965.0	35									
964.0	36									
963.0	37									
962.0	38									
961.0	39									
960.0	40									
959.0	41									
958.0	42									
957.0	43									
956.0	44									
955.0	45									
954.0	46									
953.0	47									
952.0	48									
951.0	49									
950.0	50									

Surface: Dry Grass, Dirt

Drill Method: Hollow-Stem Auger Drill Rig

Drill Date: 8-11-03

Size: 8 Inch

Elevation: 1,000 Feet

JB No: 19553-Z

Log of Boring: 5

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE						
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
1004.0 – 1001.0	0–4	*FILL:* Silty Sand, gray, brown, slightly moist, slightly dense to dense, with roots								
1000.0	5	*ALLUVIUM:* Silty Sand, light brown-gray, moist, medium dense		SM	R	21	18.2	97.2	69.0	
995.0	10	*BEDROCK:* Siltstone/Claystone, gray, very moist, soft, weathered		----	R	44	19.4	107.3	95.0	
990.0	15	Siltstone/Claystone, light gray, moist, moderately hard		----	R	30	37.7	83.5	100.0	
985.0	20	End at 20 Feet; No Water; Fill to 4 Feet.		----	R	49	35.1	87.2	100.0	

Elevation scale: 1004.0, 1003.0, 1002.0, 1001.0, 1000.0, 999.0, 998.0, 997.0, 996.0, 995.0, 994.0, 993.0, 992.0, 991.0, 990.0, 989.0, 988.0, 987.0, 986.0, 985.0, 984.0, 983.0, 982.0, 981.0, 980.0

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25

Surface: Dirt/Dry Grass Vacant Lot

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,005 Feet

Drill Date: 8-11-03

JB No: 19553-Z

Log of Boring: 6

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE						
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
		FILL: Silty Sand, brown, slightly moist, medium dense, with roots								
1009.0	1									
1008.0	2									
1007.0	3									
1006.0	4									
1005.0	5			SM	R	23	19.6	91.4	64.0	
1004.0	6									
1003.0	7									
1002.0	8									
1001.0	9	*ALLUVIUM:* Sandy Clay, brown, very moist, soft, roots								
1000.0	10			CH	R	8	31.9	85.1	90.0	
999.0	11									
998.0	12									
997.0	13									
996.0	14									
995.0	15	roots, saturated, firm		CH	R	5	31.0	91.9	100.0	
994.0	16									
993.0	17									
992.0	18									
991.0	19									
990.0	20									
989.0	21			CH	R	6		89.8		
988.0	22									
987.0	23	water at 23 feet								
986.0	24									
985.0	25									

Surface: Dirt/Dry Grass

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,010 Feet

Drill Date: 8-11-03

Sheet: 1 of 2

JB No: 19553-Z

Log of Boring: 6

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE							
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
		BEDROCK: Siltstone/Claystone, gray-brown, orange layers, wet, moderately hard								
984.0	26									
983.0	27									
982.0	28									
981.0	29									
980.0	30	End at 30 Feet; Water at 23 Feet; Fill to 8½ Feet.		----	R	50 6"	11.3	132.1	100.0	
979.0	31									
978.0	32									
977.0	33									
976.0	34									
975.0	35									
974.0	36									
973.0	37									
972.0	38									
971.0	39									
970.0	40									
969.0	41									
968.0	42									
967.0	43									
966.0	44									
965.0	45									
964.0	46									
963.0	47									
962.0	48									
961.0	49									
960.0	50									

Surface: Dirt/Dry Grass

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,010 Feet

Drill Date: 8-11-03

JB No: 19553-Z

Log of Boring: 7

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE						
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
1015.0	1	*FILL:* Silty Sand, light brown, slightly moist, slightly to medium dense, with minor rock chips								
1014.0	2									
1013.0	3									
1012.0	4									
1011.0	5			SM	R	16	6.4	97.8	25.0	
1010.0	6									
1009.0	7									
1008.0	8									
1007.0	9	*ALLUVIUM:* Silty Sand, reddish brown, moist, slightly dense								
1006.0	10			SM	R	8	12.5	95.7	45.0	
1005.0	11									
1004.0	12									
1003.0	13									
1002.0	14									
1001.0	15			SM	R	13	----	----	----	No Recovery
1000.0	16									
999.0	17									
998.0	18	Sandy Clay, brown, wet, soft								
997.0	19									
996.0	20	water at 20 Feet								
995.0	21	Sand, light brown, saturated, medium dense		SW	R	8	21.2	102.3	91.0	
994.0	22									
993.0	23									
992.0	24									
991.0	25									

Surface: Dirt/Dry Grass

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,016 Feet

Drill Date: 8-12-03

Log of Boring: 7

JB No: 19553-Z

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE						Remarks
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	
990.0	26									
989.0	27									
988.0	28									
987.0	29									
986.0	30			SW	SPT	7 8 10	----	----	----	
985.0	31									
984.0	32									
983.0	33	*BEDROCK:* Sandstone, brown and green, very moist, hard								
982.0	34									
981.0	35	Refusal at 35 Feet; End at 35 Feet; Water at 20 Feet; Fill to 8½ Feet.		SP	SPT	50 5"	----	----	----	
980.0	36									
979.0	37									
978.0	38									
977.0	39									
976.0	40									
975.0	41									
974.0	42									
973.0	43									
972.0	44									
971.0	45									
970.0	46									
969.0	47									
968.0	48									
967.0	49									
966.0	50									

Surface: Dirt/Dry Grass

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,016 Feet

Drill Date: 8-12-03

JB No: 19553-Z

Log of Boring: 8

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE						
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
	0	*FILL:* Silty Sand, light brown, slightly moist, slightly to medium dense								
1017.0	1									
1016.0	2									
1015.0	3									
1014.0	4									
1013.0	5			SM	R	10	13.9	93.1	47.0	
1012.0	6									
1011.0	7									
1010.0	8									
1009.0	9	*ALLUVIUM:* Silty Sand, reddish brown, moist, slightly dense								
1008.0	10			SM	SPT	2 1 2				
1007.0	11									
1006.0	12									
1005.0	13									
1004.0	14									
1003.0	15	Sandy Clay, reddish-brown, very moist, soft		CL	SPT	2 2 2				
1002.0	16									
1001.0	17									
1000.0	18	water at 18 feet								
999.0	19									
998.0	20	Silty Sand, brown, wet, slightly dense		SM	SPT	2 4 7				
997.0	21									
996.0	22									
995.0	23									
994.0	24									
993.0	25									

Surface: Dry Grass/Dirt

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,018 Feet

Drill Date: 8-12-03

JB No: 19553-Z

Log of Boring: 8

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE						Remarks
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	
		BEDROCK: Sandstone/Siltstone, light brown, green with orange layers, moist, moderately hard								
992.0	26									
991.0	27									
990.0	28									
989.0	29									
988.0	30	End at 30 Feet; Water at 18 Feet; Fill to 9 Feet.		----	SPT	22 31 50				
987.0	31									
986.0	32									
985.0	33									
984.0	34									
983.0	35									
982.0	36									
981.0	37									
980.0	38									
979.0	39									
978.0	40									
977.0	41									
976.0	42									
975.0	43									
974.0	44									
973.0	45									
972.0	46									
971.0	47									
970.0	48									
969.0	49									
968.0	50									

Surface: Dry Grass/Dirt

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,018 Feet

Drill Date: 8-12-03

Log of Boring: 9

JB No: 19553-Z

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
	0	*FILL:* Silty Sand, brown, gray, slightly moist, slightly dense								
1016.0	1									
1015.0	2									
	2.5	*ALLUVIUM:* Silty Sand, reddish brown, moist, slightly dense with roots and pores								
1014.0	3									
1013.0	4									
1012.0	5			SM	R	10	9.0	96.3	33.0	
1011.0	6									
1010.0	7									
1009.0	8									
1008.0	9									
1007.0	10	*BEDROCK:* Siltstone/Sandstone, light brown, orange layers, slightly moist, moderately hard, with roots End at 10 Feet; No Water; Fill to 2½ Feet.		----	R	26	17.4	102.4	25.0	
1006.0	11									
1005.0	12									
1004.0	13									
1003.0	14									
1002.0	15									
1001.0	16									
1000.0	17									
999.0	18									
998.0	19									
997.0	20									
996.0	21									
995.0	22									
994.0	23									
993.0	24									
992.0	25									

Surface: Dirt/Dry Grass/Leaves

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,017 Feet

Drill Date: 8-12-03

Sheet: 1 of 1

JB No: 19553-Z

Log of Boring: 10

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE							
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
		FILL: Silty Sand, gray-brown, slightly moist, slightly to medium dense								
1022.0	1									
1021.0	2									
1020.0	3	*ALLUVIUM:* Silty Sand, reddish brown, moist, slightly to medium dense, with roots								
1019.0	4									
1018.0	5			SM	R	7	3.9	92.3	13.0	
1017.0	6									
1016.0	7									
1015.0	8									
1014.0	9									
1013.0	10			SM	R	15	13.8	104.0	62.0	
1012.0	11									
1011.0	12									
1010.0	13									
1009.0	14									
1008.0	15			SM	R	20	15.3	101.6	65.0	
1007.0	16									
1006.0	17									
1005.0	18									
1004.0	19									
1003.0	20									
1002.0	21			SM	R	16	----	----	----	No Recovery
1001.0	22									
1000.0	23	water at 23 feet								
999.0	24									
998.0	25									

Surface:

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,023 Feet

Drill Date: 8-12-03

JB No: 19553-Z

Log of Boring: 10

Client: DS VENTURES, LLC　　Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE						Remarks
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	
		BEDROCK: Siltstone/Sandstone, light brown, orange layers, moist, moderately hard, with roots								
997.0	26									
996.0	27	End at 25 Feet; Water at 23 Feet; Fill to 2½ Feet.								
995.0	28									
994.0	29									
993.0	30									
992.0	31									
991.0	32									
990.0	33									
989.0	34									
988.0	35									
987.0	36									
986.0	37									
985.0	38									
984.0	39									
983.0	40									
982.0	41									
981.0	42									
980.0	43									
979.0	44									
978.0	45									
977.0	46									
976.0	47									
975.0	48									
974.0	49									
973.0	50									

Surface:　　Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig　　Elevation: 1,023 Feet

Drill Date: 8-12-03　　

Log of Boring: 11

JB No: 19553-Z

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE						
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
	0–3	*FILL:* Silty Sand, brown gray, moist, slightly dense								
1013.0	3	*ALLUVIUM:* Sandy Clay, brown, moist, slightly to medium firm								
1011.0	5			CL	R	5	10.4	94.4	37.0	
1006.0	10	Silty Sand, orange-brown, moist, medium dense		SM	R	10	14.7	105.2	68.0	
1001.0	15	Silty Sand, orange-brown, moist, medium dense		SM	R	15	12.9	108.2	65.0	
996.0	20	Sandy Silt with bedrock fragments, gray to tan, saturated, firm		ML	R	7	28.9	95.0	100.0	
994.0	22	water at 22 feet								

Elevation scale: 1015.0 (1), 1014.0 (2), 1013.0 (3), 1012.0 (4), 1011.0 (5), 1010.0 (6), 1009.0 (7), 1008.0 (8), 1007.0 (9), 1006.0 (10), 1005.0 (11), 1004.0 (12), 1003.0 (13), 1002.0 (14), 1001.0 (15), 1000.0 (16), 999.0 (17), 998.0 (18), 997.0 (19), 996.0 (20), 995.0 (21), 994.0 (22), 993.0 (23), 992.0 (24), 991.0 (25)

Surface: Dirt/Dry Grass

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,023 Feet

Drill Date: 8-12-03

Sheet: 1 of 2

JB No: 19553-Z

Log of Boring: 11

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE						
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
990.0	26	*BEDROCK:* Siltstone/Sandstone, light brown, orange layers, moist, moderately hard, with roots								
989.0	27	End at 25 Feet; Water at 23 Feet; Fill to 3 Feet.								
988.0	28									
987.0	29									
986.0	30									
985.0	31									
984.0	32									
983.0	33									
982.0	34									
981.0	35									
980.0	36									
979.0	37									
978.0	38									
977.0	39									
976.0	40									
975.0	41									
974.0	42									
973.0	43									
972.0	44									
971.0	45									
970.0	46									
969.0	47									
968.0	48									
967.0	49									
966.0	50									

Surface: Dirt/Dry Grass

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,023 Feet

Drill Date: 8-12-03

Log of Boring: 12

JB No: 19553-Z

Client: DS VENTURES, LLC

Logged By: JC

Site Location: 22255 Mulholland Drive, Woodland Hills

The J. Byer Group, Inc.
1461 E. Chevy Chase Dr., Ste 200
Glendale, CA. 91206
(818) 549-9959

SUBSURFACE PROFILE				SAMPLE						
Elevation	Depth	Description	Symbol	USCS	Type	Blow Count	Moisture Content (%)	Dry Density	% Saturation	Remarks
		FILL: Silty Sand, light brown, moist, medium dense								
1026.0	1									
1025.0	2									
		ALLUVIUM: Silty Sand, light brown gray, moist, slightly to medium dense, with roots								
1024.0	3									
1023.0	4									
1022.0	5			SM	R	13	6.8	105.0	32.0	
1021.0	6									
1020.0	7									
1019.0	8	*BEDROCK:* Sandstone, Siltstone, light brown, orange, weathered, soft to moderately hard								
1018.0	9									
1017.0	10	End at 10 Feet; No Water; Fill to 2½ Feet.		---	R	34	8.6	100.3	35.0	
1016.0	11									
1015.0	12									
1014.0	13									
1013.0	14									
1012.0	15									
1011.0	16									
1010.0	17									
1009.0	18									
1008.0	19									
1007.0	20									
1006.0	21									
1005.0	22									
1004.0	23									
1003.0	24									
1002.0	25									

Surface: Pavement 2 Inches AC/No Base

Size: 8 Inch

Drill Method: Hollow-Stem Auger Drill Rig

Elevation: 1,027 Feet

Drill Date: 8-12-03

Sheet: 1 of 1

THE J. BYER GROUP, INC.
A GEOTECHNICAL CONSULTING FIRM
1461 E. CHEVY CHASE DRIVE, SUITE 200, GLENDALE, CA 91206
818•549•9959 Tel 818•543•3747 Fax

LOG OF TEST PITS

JB: 19553-Z CLIENT: DS VENTURES, LLC

GEOLOGIST: JC DATE LOGGED: 8/11/03

REPORT DATE: 03/22/05

TEST PIT #1 Surface Conditions: Dirt, Dry Grass

DEPTH INTERVAL (feet)	EARTH MATERIAL	LITHOLOGIC DESCRIPTION
0 - 1½	FILL:	Silty Sand, light brown to light gray, slightly moist, slightly dense to dense
1½ - 4½	ALLUVIUM:	Silty Sand with Gravel, light brown-gray, slightly moist to medium moist, dense
4½ - 5	BEDROCK:	Siltstone, Sandstone, light brown and gray, moist, hard, massive, moderately weathered

End at 5 Feet; No Water; No Caving; Fill to 1½ Feet.

TEST PIT #2

0 - 2	FILL:	Clayey Sand, very stiff, slightly moist
2 - 4½	ALLUVIUM:	Silty Sand, light brown gray, slightly moist, and dense
4½ - 5		Sand with Gravel, light brown, moist, dense

End at 5 Feet; No Water; No Caving; Fill to 2 Feet.

TEST PIT #3

0 - 2½	FILL:	Soil, Silty sand, gray-brown, slightly moist
2½ - 3½	BEDROCK:	Siltstone and Sandstone, gray-brown, moderately hard, massive, moderately weathered

End at 3½ Feet; No Water; No Caving; Fill to 2½ Feet.

TEST PIT #4

DEPTH INTERVAL (feet)	EARTH MATERIAL	LITHOLOGIC DESCRIPTION
0 - ¾	FILL:	Clayey Sand, brown-gray, slightly moist, stiff
¾ - 2½	SOIL/ALLUVIUM:	Silty Sand, light gray, slightly moist, medium dense
2½ - 5	BEDROCK:	Siltstone and Sandstone, light brown, moist, moderately hard to hard, massive, moderately weathered

End at 5 Feet; No Water; No Caving; Fill to ¾ Feet.

NOTE: The stratification depths shown on the Log of Test Pits are approximate and are based upon visual classification of samples and cuttings. The actual depths may vary. Variations between test pits may also occur.

CITY OF LOS ANGELES

INTER-DEPARTMENTAL CORRESPONDENCE

GEOLOGY AND SOILS REPORT APPROVAL LETTER

August 10, 2007

Log No. 58932
SOILS/GEOLOGY FILE - 2
LIQ

To: Mike Young, Deputy Advisory Agency
Department of City Planning
200 N. Spring Street, 7th Floor, Room 750

From: Dana Prevost, Engineering Geologist III
Department of Building and Safety, Grading Division

Subject: Vesting Tentative Tract Map : 67505
LOTS: 1 - 29
LOCATION: 22241 - 22255 W. Mulholland Drive

CURRENT REFERENCE REPORT/LETTER(S)	REPORT NO.	DATE(S) OF DOCUMENT	PREPARED BY
Geology/Soil Report	JB 19553-Z	07/20/2006	The J. Byer Group
Oversized Doc's	"	"	"

PREVIOUS REFERENCE REPORT/LETTER(S)	REPORT NO.	DATE(S) OF DOCUMENT	PREPARED BY
Int-Dept. Appr. Ltr. (61553)	Log # 51978	03/29/2006	LADBS
Geology/Soil Report	JB 19553-Z	03/22/2005	The J. Byer Group

The referenced 07/20/2006 report and vesting tentative tract map (with Department of City Planning receipt stamp dated 03/15/2007) have been reviewed by the Grading Division of the Department of Building and safety.

Previously, the Department conditionally approved (see our Inter-Dept. Approval letter dated 03/29/2006, Log # 51978) the two-lot subdivision and development of the approximately 6-acre property with 37 pad areas (for residential townhomes). This development was previously proposed and presented in vesting tentative tract map 61553 (with a City Planning receipt stamp dated 04/13/2005) and, in the 03/22/2005 report by the J. Byer Group. Currently, a twenty nine lot subdivision for residential development is planned.

Earth materials encountered at the locations explored include artificial fill, naturally-occurring alluvium and sedimentary bedrock. Groundwater was encountered during exploration and exists in the naturally-occurring alluvium, above the bedrock.

The site is located in a designated liquefaction hazard zone as shown on the "Seismic Hazard Zones" map issued by the State of California. The above reports includes a liquefaction analysis that define liquefaction hazards and provides recommendations to eliminate those hazards. The requirements of the State of California Public Resources Code, Section 2690 et. seq., have been satisfied. The consultant's recommendation to remove all existing fill and alluvium overlying bedrock and replace it with a properly compacted fill, eliminates liquefaction potential and the resulting seismically induced ground settlement potential.

The referenced 07/20/2006 report and vesting tentative tract map 67505 with a Department of City Planning receipt stamp dated 03/15/2007 are approved subject to the following conditions:

1. Site preparation of building pads shall consist of removal all existing fill, alluvium and unsuitable materials to competent bedrock and replacement with a competent compacted fill benched into bedrock as recommended.

2. All recommendations of the report prepared by the J. Byer Group, Inc. dated 07/20/2006 signed by Peter Kilbury (CEG 2401) and Robert I. Zweigler (GE 2120) which are in addition to or more restrictive than the conditions contained herein shall also be incorporated into the plans for the project.

3. The geologist and soils engineer shall review and approve the detailed plans prior to issuance of any permits. This approval shall be by signature on the plans which clearly indicates that the geologist and soils engineer have reviewed the plans prepared by the design engineer and that the plans include the recommendations contained in their reports.

4. A copy of the subject and appropriate referenced reports and this approval letter shall be attached to the District Office and field set of plans. Submit one copy of the above reports to the Building Department Plan Checker prior to issuance of the permit. (7006.1)

5. Satisfactory arrangements shall be made with the Department of Building and Safety with respect to grading in conformance with the Grading Ordinance of the Los Angeles Building Code, prior to recordation of the final map.

6. A grading permit shall be secured and a grading bond posted. (106.1.2)

7. All new graded slopes shall be no steeper than 2H:1V (7010.2 & 7011.2).

8. All man-made fill shall be compacted to a minimum 90 percent of the maximum dry density of the fill material per the latest version of ASTM D 1557. Where cohesionless soil having 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 based on maximum dry density (D1556). Placement of gravel in lieu of compacted fill is allowed only if complying with Section 91.7011.3 of the Code. (7011.3)

9. Subdrains must be installed in all natural drainage courses within which compacted fill is to be placed and where recommended by the geologist and soils engineer. (7013.8)

10. Any unsupported bedding planes either existing or exposed by grading, shall be supported by a designed retaining wall or buttress fill. (7010.2)

11. Existing uncertified fill or loose disturbed unsuitable naturally-occurring alluvium shall not be used for support of footings, concrete slabs or new fill. (7011.3 & 1806.1)

12. All existing fill and alluvium shall be removed in areas to receive new certified compacted fill, as recommended.

13. Compacted fill pads for Lots 2 and 5-15, or where designated by the geologist and soils engineer in the field during construction shall consist of removing all existing fill and unsuitable soils to a minimum depth with no less than feet of compacted fill under footings and replacing with properly compacted fill, as recommended. Compacted fill shall be placed on competent native soils approved for support by the soils engineer by bottom inspection.

14. Compacted fill for the support of foundations shall extend beyond the footings a minimum distance equal to the depth of the fill below the bottom of footings or a minimum of 5 feet, as recommended, whichever is greater. (1806.1)

15. Grading shall be scheduled for completion prior to the start of the rainy season, or detailed temporary erosion control plans shall be filed in a manner satisfactory to the Grading Division of the Department and the Department of Public Works, Bureau of Engineering, B-Permit Section, for any grading work in excess of 200 cu yd. (7007.1)
    6262 Van Nuys Blvd. Ste 351, Van Nuys (818) 374-4605

16. All loose foundation excavation material shall be removed prior to commencement of framing. Slopes disturbed by construction activities shall be restored. (7005.3)

17. The applicant is advised that the approval of this report does not waive the requirements for excavations contained in the State Construction Safety Orders enforced by the State Division of Industrial Safety. (3301.1)

18. Construction of trenches or excavations which are 5 feet or deeper and into which a person is required to descend requires a permit from the State Division of Industrial Safety prior to obtaining a grading permit. (3301.1)

19. Prior to the issuance of any permit which authorizes an excavation where the excavation is to be of a greater depth than are the walls or foundation of any adjoining building or structure and located closer to the property line than the depth of the excavation, the owner of the subject site shall provide the Department with evidence that the adjacent property owner has been given a 30-day written notice of such intent to make an excavation. (3301.2.1)

20. Approval shall be obtained from the Department of Public Works, Bureau of Engineering, Constituent Service Division for the proposed removal of lateral support from an adjoining public way. (3301.2.3.3)
    6262 Van Nuys Blvd. Ste 351, Van Nuys (818) 374-460521.

22. Temporary excavations shall be shored or sloped back to a gradient no steeper than 1:1 (horizontal to vertical), as recommended.

23. Soldier pile shoring shall be designed for the lateral earth pressures specified in the section titled "Soldier Piles" starting on page 19 and the related sections continuing through to page 23 of the 07/20/2006 report.

24. The soils engineer shall review and approve the shoring and/or underpinning plans prior to issuance of the permit. (7006.2)

25. Installation of shoring shall be performed under the inspection and approval of the soils engineer and deputy grading inspector. (7006.2)

26. All foundations shall be founded entirely either in newly-placed certified compacted fill or in competent bedrock, as recommended.

27. Frictional and lateral resistance of soils may be combined, provided the lateral bearing resistance does not exceed two-thirds of the allowable lateral bearing.

28. Footings supported on approved compacted fill or expansive soil shall be reinforced with a minimum of four (4) ½-inch diameter (#4) deformed reinforcing bars. Two (2) bars shall be placed near the bottom and two (2) bars placed near the top.

29. All footings supported in approved compacted fill shall extend below a 1:1 plane projected upward from the base of the approved compacted fill. (1806.1)

30. Footings adjacent to a descending slope steeper than 3:1 in gradient shall be a minimum distance of one-third the vertical height of the slope but need not exceed 40 feet measured horizontally from the footing bottom to the face of the graded slope. (1806.5.3)

31. Buildings adjacent to ascending slopes shall be set back from the toe of the slope a level distance equal to one half the vertical height of the slope, but need not exceed 15 feet in accordance with Code Section 1806.5.2.

32. Pile caisson and/or isolated foundation ties are required by Code Section 91.1807.2. Exceptions and modification to this requirement are provided in Information Bulletin P/BC2002-030.

33. Pile and/or caisson shafts shall be designed for a lateral load of 1000 pounds per linear foot of shaft exposed to fill, soil and weathered bedrock. (P/BC2002-050)

34. When water over 3 inches in depth is present in drilled pile holes, a concrete mix with a strength of 1000 p.s.i. over the design p.s.i. shall be tremied from the bottom up; an admixture that reduces the problem of segregation of paste/aggregates and dilution of paste shall be included.

35. Slabs placed on approved compacted fill shall be at least 3½ inches thick and shall be reinforced with ½-inch diameter (#4) reinforcing bars spaced maximum of 16 inches on center each way.

36. The LABC Soil Type underlying the site is S_D, and the minimum horizontal distance to known seismic sources shall be in accordance with "Maps of Known Active Fault Near Source Zones" published by ICBO. (1636A)

37. Retaining walls up to a maximum height of 20 feet with a backslope angle no steeper than 2:1 (horizontal to vertical) shall be designed for a minimum equivalent fluid pressure of 43 pcf, as recommended.

38. The recommended equivalent fluid pressure (EFP) for the proposed retaining wall shall apply from the top of the freeboard to the bottom of the wall footing.

39. All retaining walls shall be provided with a standard surface backdrain system and all drainage shall be conducted to the street in an acceptable manner and in a non-erosive device. (7013.11)

40. All retaining walls shall be provided with a subdrain system to prevent possible hydrostatic pressure behind the wall. Prior to issuance of any permit, the retaining wall subdrain system recommended in the soil report shall be incorporated into the foundation plan which shall be reviewed and approved by the soils engineer of record. (7015.5 & 108.9)

41. Installation of the subdrain system shall be inspected and approved by the soils engineer of record and the City grading/building inspector. (7015.5 & 108.9)

42. The dwellings shall be connected to the public sewer system. (P/BC 2001-27)

43. All roof and pad drainage shall be conducted to the street in an acceptable manner. (7013.10)

44. Prior to excavation, an initial inspection shall be called with LADBS Inspector at which time sequence of shoring, protection fences and dust and traffic control will be scheduled.

45. The geologist and soils engineer shall inspect all excavations to determine that conditions anticipated in the report have been encountered and to provide recommendations for the correction of hazards found during grading. (7008.2)

46. All soldier, friction pile or caisson drilling and installation shall be performed under the continuous inspection and approval of the geologist and soils engineer. The geologist shall indicate the distance that friction piles or caissons penetrate into competent bedrock in a written field memorandum to the City Building Inspector. (1807.1)

47. A registered grading deputy inspector approved by and responsible to the soils engineer shall be required to provide continuous inspection for the proposed shoring, tie-back, and/or buttress. (1701.5.13)

48. The installation and testing of tie-back anchors shall comply with the recommendations included in the report or the standard sheets titled "Requirements For Temporary Tieback Earth Anchors", whatever is more restrictive. (Research Report #23835)

49. Prior to the placing of compacted fill, a representative of the geologist and soils engineer shall inspect and approve the bottom excavations. They shall post a notice on the job site for the LADBS Grading Inspector and the Contractor stating that the soil inspected meets the conditions of the report, but that no fill shall be placed until the LADBS Grading Inspector has also inspected and approved the bottom excavations. A written certification to this effect shall be filed in the final compaction report filed with the Grading Engineering Division of the Department. All fill shall be placed under the inspection and approval of the soils engineer. A compaction report together with the approved soil report and Department approval letter shall be submitted to the Grading Engineering Division of the Department upon completion of the compaction. The engineer's certificate of compliance shall include the grading permit number and the legal description as described in the permit (7011.3).

50. Prior to the pouring of concrete, a representative of the geologist and soils engineer shall inspect and approve the footing excavations. They shall post a notice on the job site for the LADBS Building Inspector and the Contractor stating that the work so inspected meets the conditions of the report, but that no concrete shall be poured until the LADBS Building Inspector has also inspected and approved the footing excavations. A written certification to this effect shall be filed with the Department upon completion of the work. (108.9 & 7008.2)

51. No foundations or slabs-on-grade supported in new compacted fill shall be poured until the compaction report is submitted and approved by the Grading Division of the Department.

SD/CD:sd/cd
Log # 58932
(213) 482-0480

cc: Applicant
The J. Byer Group, Inc.
VN District Office

CITY OF LOS ANGELES
INTER-DEPARTMENTAL CORRESPONDENCE

GEOLOGY AND SOILS REPORT APPROVAL LETTER

March 29, 2006

Log No. 51978
SOILS/GEOLOGY FILE - 2
LIQ

To: Emily Gable-Luddy, Deputy Advisory Agency
Department of City Planning
200 N. Spring Street, 7th Floor, Room 763 A

From: Dana Prevost, Engineering Geologist III
Department of Building and Safety

Subject: Tentative Tract: 61553
LOT: 1 and 2 (37 detached units)
LOCATION: 22255 Mulholland Drive

CURRENT REFERENCE REPORT/LETTER(S)	REPORT NO.	DATE(S) OF DOCUMENT	PREPARED BY
Geology/Soil Report	JB 19553-Z	03/22/2005	The J. Byer Group
Oversized Doc's	"	"	"

The referenced report and the vesting tentative tract map with a Department of City Planning receipt stamp dated 04/13/2005 have been reviewed by the Grading Division of the Department of Building and safety.

A two-lot subdivision and development of the approximately 6-acre property with 37 pad areas (for residential townhomes) is planned along with a private 30-foot-wide "private drive" extending in from improved streets, for access purposes. The property is located between Mulholland Drive and San Feliciano Drive, in the Woodland Hills area of Los Angeles.

Earth materials encountered at the locations explored include artificial fill, naturally-occurring alluvium and sedimentary bedrock. Groundwater was encountered during exploration and exists in the naturally-occurring alluvium, above the bedrock.

The site is located in a designated liquefaction hazard zone as shown on the "Seismic Hazard Zones" map issued by the State of California. The above report includes a liquefaction analysis that define liquefaction hazards and provides recommendations to eliminate those hazards. The requirements of the State of California Public Resources Code, Section 2690 et. seq., have been satisfied.

It is noted that the consultant's analysis indicating liquefaction potential is based on CPT sounding data which the Department does not accept. However, this showed a seismically induced ground settlement exceeding the limits for new tract development. The consultant's recommendation to remove all existing fill and alluvium overlying bedrock and replace it with a properly compacted fill, eliminates liquefaction potential and the resulting seismically induced ground settlement potential.

The referenced tract map and report are approved subject to the following conditions:

1. Site preparation shall consist of removal all existing fill, alluvium and unsuitable materials to competent bedrock and replacement with a competent compacted fill benched into bedrock as recommended.

2. The geologist and soils engineer shall review and approve the detailed plans prior to issuance of any permits. This approval shall be by signature on the plans which clearly indicates that the geologist and soils engineer have reviewed the plans prepared by the design engineer and that the plans include the recommendations contained in their reports.

3. A copy of the subject and appropriate referenced reports and this approval letter shall be attached to the District Office and field set of plans. Submit one copy of the above reports to the Building Department Plan Checker prior to issuance of the permit. (7006.1)

4. Satisfactory arrangements shall be made with the Department of Building and Safety with respect to grading in conformance with the Grading Ordinance of the Los Angeles Building Code, prior to recordation of the final map.

5. A grading permit shall be secured and a grading bond posted. (106.1.2)

6. All recommendations of the report prepared by the J. Byer Group, Inc. dated 03/22/2005 signed by Robert I. Zweigler (CEG 1210 and GE 2120) which are in addition to or more restrictive than the conditions contained herein shall also be incorporated into the plans for the project.

7. All new graded slopes shall be no steeper than 2H:1V (7010.2 & 7011.2).

8. Any unsupported bedding planes either existing or exposed by grading, shall be supported by a designed retaining wall or buttress fill. (7010.2)

9. All existing fill and alluvium shall be removed in areas to receive new certified compacted fill, as recommended.

10. Existing uncertified fill or loose disturbed unsuitable naturally-occurring alluvium shall not be used for support of footings, concrete slabs or new fill. (7011.3 & 1806.1)

11. Compacted fill shall extend beyond proposed footings a minimum distance equal to the depth of the fill below the bottom of footings or a minimum of 3 feet whichever is greater. (1806.1)

12. Subdrains must be installed in all natural drainage courses within which compacted fill is to be placed. (7013.8)

13. All graded, brushed or bare slopes shall be planted with low-water consumption, native-type plant varieties recommended by a landscape architect. Suitable arrangements shall be made with the Grading Division of the Department with respect to inspection and maintenance of the plant until it is established as an effective ground vegetation cover. (7012)

14. Adequate temporary erosion control devices acceptable to the Department, and if applicable the Department of Public Works, shall be provided and maintained during the rainy season. (7013.12)
6262 Van Nuys Blvd. Ste 351, Van Nuys (818) 374-4605

15. Grading shall be scheduled for completion prior to the start of the rainy season, or detailed temporary erosion control plans shall be filed in a manner satisfactory to the Grading Inspection Section of the Department and the Department of Public Works, Bureau of Engineering, B-Permit Section, for any grading work in excess of 200 cu yd. (7007.1)
6262 Van Nuys Blvd. Ste 351, Van Nuys (818) 374-4605

16. All loose foundation excavation material shall be removed prior to commencement of framing. Slopes disturbed by construction activities shall be restored. (7005.3)

17. The applicant is advised that the approval of this report does not waive the requirements for excavations contained in the State Construction Safety Orders enforced by the State Division of Industrial Safety. (3301.1)

18. Construction of trenches or excavations which are 5 feet or deeper and into which a person is required to descend requires a permit from the State Division of Industrial Safety prior to obtaining a grading permit. (3301)

19. An excavation shall be considered as removing lateral support from an adjacent public way, property or structure where: adverse geologic conditions exist; the excavation extends below a plane extending downward at an angle of 45 degrees from the edge of the public way or an adjacent property; the excavation extends below a plane extending downward at an angle of 45 degrees from the bottom of a footing of an existing structure (3301.2.3.1). Where an excavation removes lateral support from an adjacent structure, it shall be understood that the structure surcharges the excavation, shoring or finished retaining/basement wall.

20. Where any excavation, not addressed in the approved reports, would remove lateral support to the public way or adjacent structures, a supplemental report shall be submitted to the Grading Division of the Department containing recommendations for shoring, underpinning, and sequence of construction in the event that. A plot plan and cross-section(s) showing the construction type, number of stories, and location of the structures adjacent to the excavation shall be provided. (7006.2)

    An analysis shall be provided that ***include the loads of adjacent structures*** that demonstrate that excavation or shoring have an acceptable factor of safety against failure. Report shall indicate the maximum allowable lateral deflection of shoring system to prevent damage to adjacent structures, properties and/or public ways.

21. Approval shall be obtained from the Department of Public Works, Bureau of Engineering, Constituent Service Division for the proposed removal of lateral support from an adjoining public way. (3301.2.3.3)
    6262 Van Nuys Blvd. Ste 351, Van Nuys (818) 374-4605

22. Prior to the issuance of any permit which authorizes an excavation where the excavation is to be of a greater depth than are the walls or foundation of any adjoining building or structure and located closer to the property line than the depth of the excavation, the owner of the subject site shall provide the Department with evidence that the adjacent property owner has been given a 30-day written notice of such intent to make an excavation. (3301.2.1)

23. Temporary excavations shall be shored or sloped back to a gradient no steeper than 1:1 (horizontal to vertical), as recommended.

24. Soldier pile shoring shall be designed for the lateral earth pressures specified in the section titled "Soldier Piles" starting on page 19 and the related sections continuing through to page 23 of the report.

25. The soils engineer shall review and approve the shoring and/or underpinning plans prior to issuance of the permit. (7006.2)

26. Installation of shoring shall be performed under the inspection and approval of the soils engineer and deputy grading inspector. (7006.2)

27. All foundations shall be founded entirely either in newly-placed certified compacted fill or in competent bedrock, as recommended.

28. Frictional and lateral resistance of soils may be combined, provided the lateral bearing resistance does not exceed two-thirds of the allowable lateral bearing.

29. Footings supported on approved compacted fill or expansive soil shall be reinforced with a minimum of four (4) ½-inch diameter (#4) deformed reinforcing bars. Two (2) bars shall be placed near the bottom and two (2) bars placed near the top.

30. All footings supported in approved compacted fill shall extend below a 1:1 plane projected upward from the base of the approved compacted fill. (1806.1)

31. Footings adjacent to a descending slope steeper than 3:1 in gradient shall be a minimum distance of one-third the vertical height of the slope but need not exceed 40 feet measured horizontally from the footing bottom to the face of the graded slope. (1806.5.3)

32. Buildings adjacent to ascending slopes shall be set back from the toe of the slope a level distance equal to one half the vertical height of the slope, but need not exceed 15 feet in accordance with Code Section 1806.5.2.

33. Slabs placed on approved compacted fill shall be at least 3½ inches thick and shall be reinforced with ½-inch diameter (#4) reinforcing bars spaced maximum of 16 inches on center each way.

34. Retaining walls up to a maximum height of 20 feet with a backslope angle no steeper than 2:1 (horizontal to vertical) shall be designed for a minimum equivalent fluid pressure of 43 pcf, as recommended.

35. The recommended equivalent fluid pressure (EFP) for the proposed retaining wall shall apply from the top of the freeboard to the bottom of the wall footing.

36. All retaining walls shall be provided with a standard surface backdrain system and all drainage shall be conducted to the street in an acceptable manner and in a non-erosive device. (7013.11)

37. All retaining walls shall be provided with a subdrain system to prevent possible hydrostatic pressure behind the wall. Prior to issuance of any permit, the retaining wall subdrain system recommended in the soil report shall be incorporated into the foundation plan which shall be reviewed and approved by the soils engineer of record. (7015.5 & 108.9)

38. Installation of the subdrain system shall be inspected and approved by the soils engineer of record and the City grading/building inspector. (7015.5 & 108.9)

39. The dwellings shall be connected to the public sewer system. (P/BC 2001-27)

40. All roof and pad drainage shall be conducted to the street in an acceptable manner. (7013.10)

41. Prior to excavation, an initial inspection shall be called with LADBS Inspector at which time sequence of shoring, protection fences and dust and traffic control will be scheduled.

42. The geologist and soils engineer shall inspect all excavations to determine that conditions anticipated in the report have been encountered and to provide recommendations for the correction of hazards found during grading. (7008.2)

43. All soldier, friction pile or caisson drilling and installation shall be performed under the continuous inspection and approval of the geologist and soils engineer. The geologist shall indicate the distance that friction piles or caissons penetrate into c ompetent bedrock in a written field memorandum to the City Building Inspector. (1807.1)

44. A registered grading deputy inspector approved by and responsible to the soils engineer shall be required to provide continuous inspection for the proposed shoring, tie-back, and/or buttress. (1701.5.13)

45. The installation and testing of tie-back anchors shall comply with the recommendations included in the report or the standard sheets titled "Requirements For Temporary Tieback Earth Anchors", whatever is more restrictive. (Research Report #23835)

46. Prior to the placing of compacted fill, a representative of the geologist and soils engineer shall inspect and approve the bottom excavations. They shall post a notice on the job site for the LADBS Grading Inspector and the Contractor stating that the soil inspected meets the conditions of the report, but that no fill shall be placed until the LADBS Grading Inspector has also inspected and approved the bottom excavations. A written certification to this effect shall be filed in the final compaction report filed with the Grading Engineering Division of the Department. All fill shall be placed under the inspection and approval of the soils engineer. A compaction report together with the approved soil report and Department approval letter shall be submitted to the Grading Engineering Division of the Department upon completion of the compaction. The engineer's certificate of compliance shall include the grading permit number and the legal description as described in the permit (7011.3).

47. Prior to the pouring of concrete, a representative of the geologist and soils engineer shall inspect and approve the footing excavations. They shall post a notice on the job site for the LADBS Building Inspector and the Contractor stating that the work so inspected meets the conditions of the report, but that no concrete shall be poured until the LADBS Building Inspector has also inspected and approved the footing excavations. A written certification to this effect shall be filed with the Department upon completion of the work. (108.9 & 7008.2)

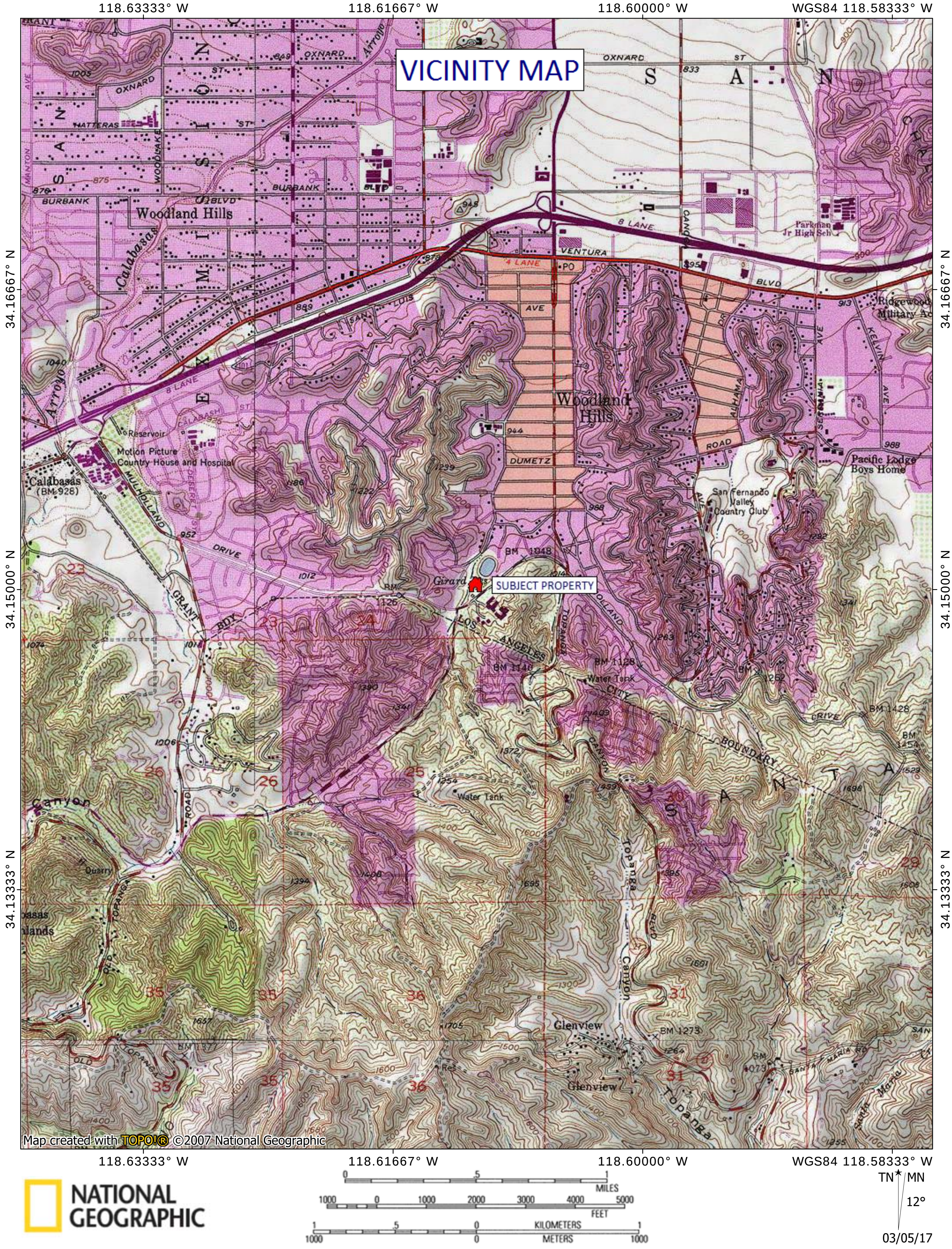
48. No foundations or slabs-on-grade supported in new compacted fill shall be poured until the compaction report is submitted and approved by the Grading Division of the Department.

49. The LABC Soil Type underlying the site is S_D, and the minimum horizontal distance to known seismic sources shall be in accordance with "Maps of Known Active Fault Near Source Zones" published by ICBO. (1636A)

SD/CD:sd/cd
Log # 51978
(213) 482-0480

cc: Applicant
The J. Byer Group, Inc.
VN District Office

TOPO! map printed on 03/05/17 from "Irvine.tpo"

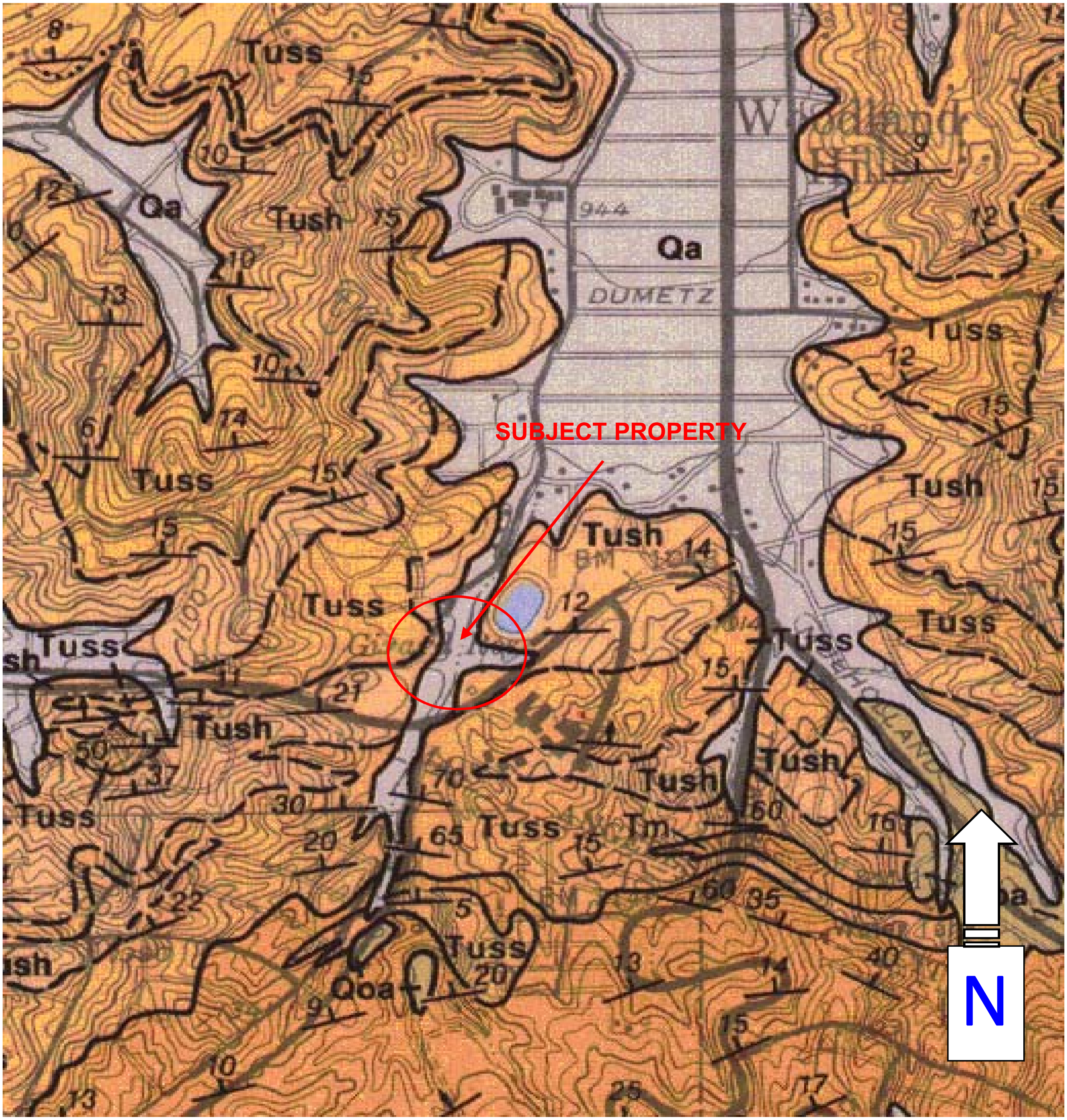


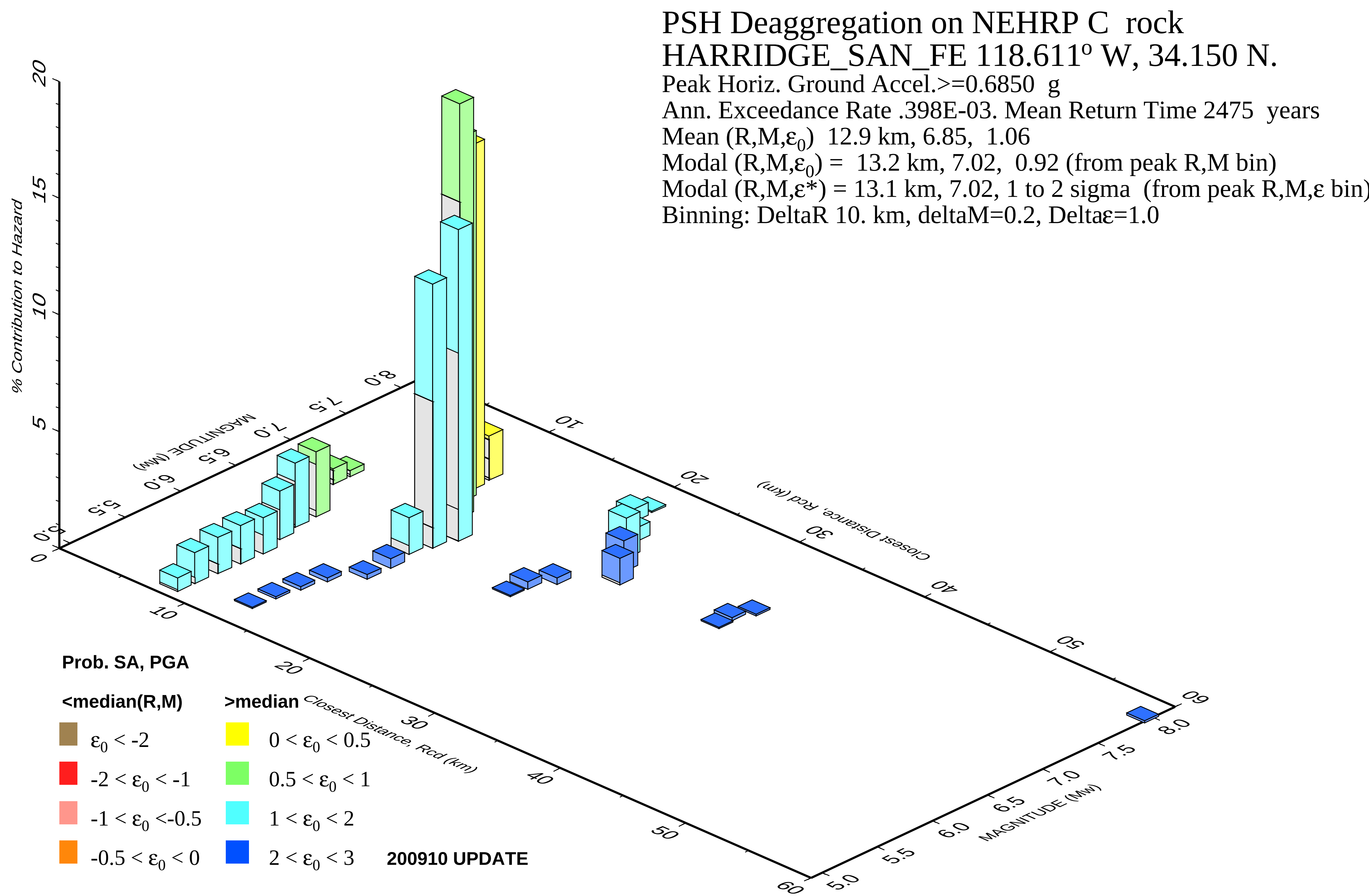
REGIONAL GEOLOGIC MAP

IRVINE GEOTECHNICAL Inc

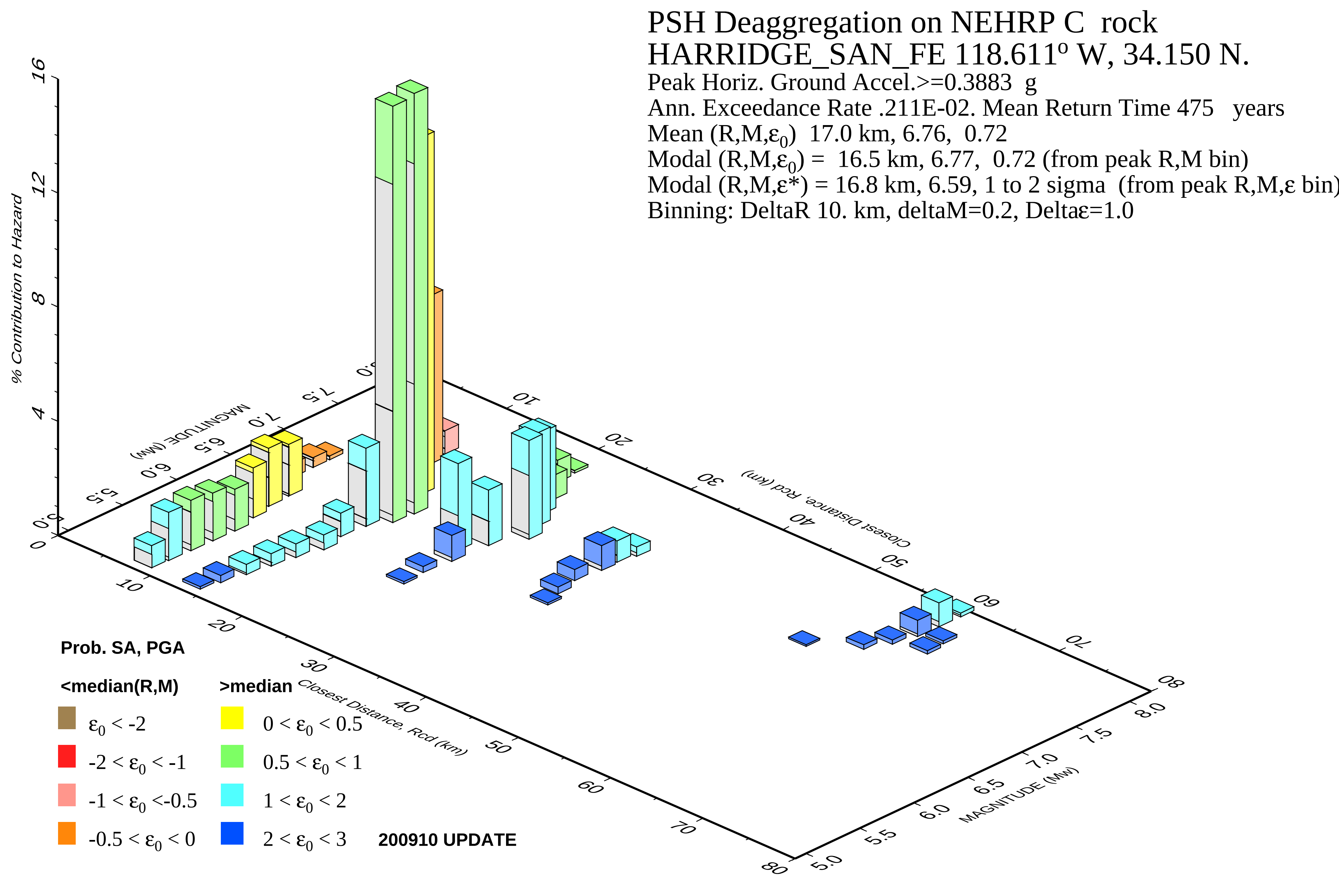
IC:	**17036-I**	CONSULT:	**JAI**
CLIENT	**PEREZ-MORIN**		
SCALE:	**1" = 1,000'**		

REFERENCE: Geologic Maps of the Santa Monica Mountains and Vicinity, CD Compilation T.W. Dibblee, 2001





GMT 2017 Mar 5 23:12:12 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



GMT 2017 Mar 5 23:12:54 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

LOG OF BORING

IRVINE GEOTECHNICAL Inc

PROJECT	IC17036 HARRIDGE SAN FELICIANO
DRILL DATE	3/14/2017
LOG DATE	3/14/2017
LOGGED BY	KJONES
DRILL TYPE	HOLLOW-STEM
DIAMETER	8 INCHES

SURFACE ELEVATION	1010 feet
DRILLING CONTRACTOR	Choice Drilling
SURFACE CONDITIONS	level pad

BORING 1

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							1010.0	0	**FILL:** Silty Sand, orange-brown, brown, moist, medium dense, roots and rootlets
							1009.0	1	
R	2	5/6/6	16.4	109.4	85	SM	1008.0	2	Silty Sand with Clay binder, brown, very moist, medium dense
							1007.0	3	
							1006.0	4	
R	5	5/7/9	18.9	99.4	76	SM	1005.0	5	Silty Sand with minor Clay binder, mottled, brown, light brown, orange-brown, very moist, medium
							1004.0	6	
R	7	5/7/10	7.9	96.5	29	SM	1003.0	7	Silty Sand, light brown, slightly moist, medium dense
							1002.0	8	
							1001.0	9	
SPT	10	2/3/4				SM	1000.0	10	**ALLUVIUM:** Silty Sand, light brown, slightly moist, medium dense
							999.0	11	
SPT	12.5	2/2/3				SM	998.0	12	
							997.0	13	
							996.0	14	
SPT	15	4/4/7				SM	995.0	15	
							994.0	16	
SPT	17.5	5/5/4				SM	993.0	17	
							992.0	18	Silty Sand with minor Clay binder, light brown, brown, wet to saturated
							991.0	19	
SPT	20	4/5/6				SM	990.0	20	(continued next page...)

IRVINE GEOTECHNICAL Inc

LOG OF BORING

PROJECT IC17036 HARRIDGE SAN FELICIANO
DRILL DATE 3/14/2017
LOG DATE 3/14/2017
LOGGED BY KJONES
DRILL TYPE HOLLOW-STEM
DIAMETER 8 INCHES

SURFACE ELEVATION 1010 feet
DRILLING CONTRACTOR Choice Drilling
SURFACE CONDITIONS level pad

BORING 1

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
SPT	20	4/5/6				SM	990.0	20	Silty Sand, gray-brown, brown, light brown, saturated, medium dense
							989.0	21	
SPT	22.5	3/4/5				SM	988.0	22	
							987.0	23	
							986.0	24	
SPT	25	6/8/8				SM	985.0	25	Silty Sand, light brown, saturated, medium dense, occasional cobbles to 3" in diameter
							984.0	26	
SPT	27.5	8/8/10				SM	983.0	27	
							982.0	28	
							981.0	29	
SPT	30	5/8/15				SM	980.0	30	Silty Sand, gray-brown, brown, saturated, medium dense to dense
							979.0	31	
SPT	32.5	10/25/50-4"					978.0	32	**BEDROCK:** Sandstone, gray, gray-brown, orange-brown, brown, fine to medium grained, massive, hard, iron oxide staining
							977.0	33	
							976.0	34	
SPT	35	50/6"					975.0	35	
							974.0	36	
SPT	37.5	50/5"					973.0	37	
									END B1 @ 37.5': Water @ 17.5; No Caving; Fill to 10'

LOG OF BORING

PROJECT IC17036 HARRIDGE SAN FELICIANO
DRILL DATE 3/14/2017
LOG DATE 3/14/2017
LOGGED BY KJONES
DRILL TYPE HOLLOW-STEM
DIAMETER 8 INCHES

SURFACE ELEVATION 1005 feet
DRILLING CONTRACTOR Choice Drilling
SURFACE CONDITIONS level pad

BORING 2

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
							1005.0	0	**FILL:** Silty Sand, orange brown, very moist, medium dense, roots and rootlets
							1004.0	1	
R	2	2/3/4	27.9	88.4	85	SM	1003.0	2	
							1002.0	3	
							1001.0	4	
R	5	4/4/5	17.0	97.3	64	SM	1000.0	5	
							999.0	6	
R	7	5/6/6	16.5	96.0	60	SM	998.0	7	Silty Sand, light brown, orange-brown, moist, medium dense, gravel to 1" in diameter
							997.0	8	
							996.0	9	
SPT	10	2/4/4				SM	995.0	10	
							994.0	11	**ALLUVIUM:** Silty Sand, light brown, moist to very moist, medium dense
SPT	12.5	5/6/6				SM	993.0	12	
							992.0	13	Silty Sand, light brown, gray brown, slightly moist to moist, medium dense, occasional bedrock fragments to 1" in diameter
							991.0	14	
SPT	15	2/2/3				SM	990.0	15	becomes orange-brown, rootlets
							989.0	16	
SPT	17.5	1/2/4				SM	988.0	17	
							987.0	18	becomes brown, saturated
							986.0	19	
SPT	20	2/3/3				SM	985.0	20	(continued next page...)

IRVINE GEOTECHNICAL Inc

LOG OF BORING

PROJECT IC17036 HARRIDGE SAN FELICIANO
DRILL DATE 3/14/2017
LOG DATE 3/14/2017
LOGGED BY KJONES
DRILL TYPE HOLLOW-STEM
DIAMETER 8 INCHES

SURFACE ELEVATION 1005 feet
DRILLING CONTRACTOR Choice Drilling
SURFACE CONDITIONS level pad

BORING 2

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
SPT	20	2/3/3				SM	985.0	20	Silty Sand, light brown, brown, saturated, medium dense
							984.0	21	
SPT	22.5	2/3/6				SM	983.0	22	
							982.0	23	becomes gray-brown
							981.0	24	
SPT	25	7/7/8				SM	980.0	25	Silty Sand, light brown, orange-brown, saturated, medium dense, occasional bedrock fragements to 1" in diameter
							979.0	26	
SPT	27.5	5/8/8				SM	978.0	27	
							977.0	28	becomes gray
							976.0	29	
SPT	30	6/9/12				SM	975.0	30	
							974.0	31	**BEDROCK:** Sandstone, gray, orange-brown, fine grained, massive, hard, iron oxide staining
SPT	32.5	15/25/50-6"					973.0	32	
							972.0	33	
SPT	35	16/35/50-5"					971.0	34	
							970.0	35	
							969.0	36	
SPT	37.5	32/50-2.5"					968.0	37	
									END B2 @ 37.5': Water @ 17.5; No Caving; Fill to 10.5'

IRVINE GEOTECHNICAL Inc

LOG OF BORING

PROJECT IC17036 HARRIDGE SAN FELICIANO
DRILL DATE 3/14/2017
LOG DATE 3/14/2017
LOGGED BY KJONES
DRILL TYPE HOLLOW-STEM
DIAMETER 8 INCHES

SURFACE ELEVATION 1016 feet
DRILLING CONTRACTOR Choice Drilling
SURFACE CONDITIONS level pad

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/CL	1016.0	0	**FILL:** Silty Sand with minor Clay binder, light brown, brown, moist, medium dense, roots and rootlets
							1015.0	1	
							1014.0	2	
							1013.0	3	
							1012.0	4	
							1011.0	5	
						SM/CL	1010.0	6	**ALLUVIUM:** Silty Sand with minor Clay binder, orange-brown, slightly moist to moist, medium dense, roots and rootlets
							1009.0	7	
							1008.0	8	
							1007.0	9	
SPT	10	3/3/3				SM	1006.0	10	
							1005.0	11	
SPT	12.5	2/3/3				SM	1004.0	12	
							1003.0	13	becomes gray-brown, occasional bedrock fragments to 2" in diameter
							1002.0	14	
SPT	15	4/8/11					1001.0	15	
							1000.0	16	**BEDROCK:** Siltstone, gray, white, yellow-brown, orange-brown, moderately weathered in upper 6", moderately hard to hard
SPT	17.5	8/10/18					999.0	17	
							998.0	18	
							997.0	19	
SPT	20	10/18/30					996.0	20	(continued next page...)

IRVINE GEOTECHNICAL Inc

LOG OF BORING

PROJECT	IC17036 HARRIDGE SAN FELICIANO
DRILL DATE	3/14/2017
LOG DATE	3/14/2017
LOGGED BY	KJONES
DRILL TYPE	HOLLOW-STEM
DIAMETER	8 INCHES

SURFACE ELEVATION	1016 feet
DRILLING CONTRACTOR	Choice Drilling
SURFACE CONDITIONS	level pad

BORING 3

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
SPT	20	10/18/30					996.0	20	Sandstone, orange-brown, gray-brown, light gray-brown, fine-grained, massive, moderately weathered in upper 6", moderately hard to hard
							995.0	21	
SPT	22.5	20/50-6"					994.0	22	
							993.0	23	
							992.0	24	
SPT	25	24/50-5"					991.0	25	
									END B3 @ 25': No Water; No Caving; Fill to 5'

LOG OF BORING

IRVINE GEOTECHNICAL Inc

PROJECT	IC17036 HARRIDGE SAN FELICIANO
DRILL DATE	3/14/2017
LOG DATE	3/14/2017
LOGGED BY	KJONES
DRILL TYPE	HOLLOW-STEM
DIAMETER	8 INCHES

SURFACE ELEVATION	1020 feet
DRILLING CONTRACTOR	Choice Drilling
SURFACE CONDITIONS	level pad

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	1020.0	0	**FILL:** Silty Sand, brown, slightly moist, medium dense, roots and rootlets, gravel to 1/2" in diameter
							1019.0	1	
							1018.0	2	
							1017.0	3	
							1016.0	4	
							1015.0	5	
							1014.0	6	
							1013.0	7	
							1012.0	8	
							1011.0	9	
SPT	10	1/2/2				SM	1010.0	10	**ALLUVIUM:** Silty Sand, light brown, brown, slightly moist, medium dense, occasional bedrock chuncks to 1/2" in diameter
							1009.0	11	
SPT	12.5	3/4/4				SM	1008.0	12	
							1007.0	13	Silty Clay, dark brown, moist, firm
							1006.0	14	
SPT	15	1/2/3				CL	1005.0	15	Silty to Sandy Clay, brown, light gray-brown, moist, soft
							1004.0	16	
SPT	17.5	2/3/4				CL	1003.0	17	becomes wet to saturated, firm to stiff
							1002.0	18	
							1001.0	19	
SPT	20	2/2/4				CL	1000.0	20	(continued next page...)

IRVINE GEOTECHNICAL Inc

LOG OF BORING

PROJECT	IC17036 HARRIDGE SAN FELICIANO
DRILL DATE	3/14/2017
LOG DATE	3/14/2017
LOGGED BY	KJONES
DRILL TYPE	HOLLOW-STEM
DIAMETER	8 INCHES

SURFACE ELEVATION	1020 feet
DRILLING CONTRACTOR	Choice Drilling
SURFACE CONDITIONS	level pad

BORING 4

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
SPT	20	2/2/4				SM	1000.0	20	Silty Sand with Clay binder, light brown, moist to wet, medium dense
							999.0	21	
SPT	22.5	5/12/15				SM	998.0	22	
							997.0	23	Silty Sand, light brown, orange-brown, wet to saturated, medium dense to dense, bedrock fragements to 2" in diameter
							996.0	24	
SPT	25	8/10/11				SM	995.0	25	
							994.0	26	
SPT	27.5	5/10/20				SM	993.0	27	
							992.0	28	
							991.0	29	**BEDROCK:** Sandstone, light orange-brown, orange-brown, light brown, light gray-brown, gray, fine-grained, massive, hard
SPT	30	18/27/30					990.0	30	
							989.0	31	
SPT	32.5	34/50-3"					988.0	32	
							987.0	33	
							986.0	34	
SPT	35	50-6"					985.0	35	
							984.0	36	
SPT	37.5	40/50-2"					983.0	37	
									END B4 @ 37.5': Water @ 22.5; No Caving; Fill to 9.5'

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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S(N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 1																
1	2	Fill/Silty Sand	8	0.125	0.125	0.0	0	0.75	1.66	1.14	1.00	16	16	0.4930	0.2131	No Water
1	5	Fill/Silty Sand	10	0.313	0.313	0.0	0	0.75	1.45	1.16	0.99	19	19	0.4895	0.2520	No Water
1	7.5	Fill/Silty Sand	11	0.469	0.469	0.0	0	0.75	1.32	1.16	0.98	18	18	0.4866	0.2410	No Water
1	10	Fill/Silty Sand	7	0.625	0.625	0.0	0	0.85	1.21	1.11	0.98	12	12	0.4838	0.1709	No Water
1	12.5	Silty Sand	5	0.781	0.781	0.0	0	0.85	1.11	1.10	0.97	8	8	0.4809	0.1339	No Water
1	15	Silty Sand	11	0.938	0.938	31.4	0	0.85	1.03	1.14	0.97	16	24	0.4780	0.3479	0.73
1	17.5	Silty Sand	9	1.094	1.016	31.4	0	0.85	0.96	1.11	0.96	12	19	0.5116	0.2522	0.49
1	20	Silty Sand	11	1.250	1.094	39.7	0	0.95	0.93	1.14	0.95	17	25	0.5395	0.3740	0.69
1	22.5	Silty Sand	9	1.406	1.172	39.7	0	0.95	0.90	1.11	0.95	13	20	0.5630	0.2731	0.49
1	25	Silty Sand	16	1.563	1.251	15.0	0	0.95	0.87	1.20	0.94	24	27	0.5828	0.4645	0.80
1	27.5	Silty Sand	18	1.719	1.329	15.0	0	0.95	0.84	1.22	0.94	26	30	0.5996	0.6293	1.05
1	30	Silty Sand	23	1.875	1.407	29.5	0	0.95	0.82	1.27	0.93	34	44	0.6137	2.0000	>1.3*
1	32.5	Sandstone	75	2.031	1.485	0.0	0	0.95	0.80	1.30	0.91	110	110	0.6161	2.0000	>1.3*
1	35	Sandstone	100	2.188	1.564	0.0	0	1.00	0.77	1.30	0.89	150	150	0.6162	2.0000	>1.3*
1	37.5	Sandstone	100	2.344	1.642	0.0	0	1.00	0.75	1.30	0.87	146	146	0.6143	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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125	Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77	Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30		

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 1														
1	2	2.5	Fill/Silty Sand	8	0.125	0.125	9.8	15.9	0.4930	0.2131	No Water	0.0000	0.00	0.00
1	5	2.5	Fill/Silty Sand	10	0.313	0.313	13.0	19.0	0.4895	0.2520	No Water	0.0000	0.00	0.00
1	7.5	2.5	Fill/Silty Sand	11	0.469	0.469	13.8	18.2	0.4866	0.2410	No Water	0.0000	0.00	0.00
1	10	2.5	Fill/Silty Sand	7	0.625	0.625	9.1	11.9	0.4838	0.1709	No Water	0.0000	0.00	0.00
1	12.5	2.5	Silty Sand	5	0.781	0.781	6.5	7.8	0.4809	0.1339	No Water	0.0000	0.00	0.00
1	15	2.5	Silty Sand	11	0.938	0.938	14.3	24.0	0.4780	0.3479	0.7279	0.0149	0.45	0.45
1	17.5	2.5	Silty Sand	9	1.094	1.094	11.7	19.0	0.5116	0.2522	0.4930	0.0171	0.51	0.96
1	20	2.5	Silty Sand	11	1.250	1.172	14.3	24.9	0.5395	0.3740	0.6931	0.0145	0.44	1.39
1	22.5	2.5	Silty Sand	9	1.406	1.250	11.7	20.4	0.5630	0.2731	0.4851	0.0164	0.49	1.89
1	25	2.5	Silty Sand	16	1.563	1.329	20.8	27.3	0.5828	0.4645	0.7971	0.0137	0.41	2.30
1	27.5	2.5	Silty Sand	18	1.719	1.407	23.4	30.0	0.5996	0.6293	1.0495	0.0000	0.00	2.30
1	30	2.5	Silty Sand	23	1.875	1.485	29.9	43.7	0.6137	2.0000	>1.3*	0.0000	0.00	2.30
1	32.5	2.5	Sandstone	75	2.031	1.563	97.5	110.2	0.6161	2.0000	>1.3*	0.0000	0.00	2.30
1	35	2.5	Sandstone	100	2.188	1.642	130.0	150.5	0.6162	2.0000	>1.3*	0.0000	0.00	2.30
1	37.5	2.5	Sandstone	100	2.344	1.720	130.0	146.4	0.6143	2.0000	>1.3*	0.0000	0.00	2.30

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)	0.508	2/3*PGA_M	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	15.0		Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0		Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77		$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S (N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3		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 1																
1	2	Fill/Silty Sand	8	0.125	0.125	0.0	0	0.75	1.66	1.14	1.00	16	16	0.3287	0.2131	No Water
1	5	Fill/Silty Sand	10	0.313	0.313	0.0	0	0.75	1.45	1.16	0.99	19	19	0.3264	0.2520	No Water
1	7.5	Fill/Silty Sand	11	0.469	0.469	0.0	0	0.75	1.32	1.16	0.98	18	18	0.3244	0.2410	No Water
1	10	Fill/Silty Sand	7	0.625	0.625	0.0	0	0.85	1.21	1.11	0.98	12	12	0.3225	0.1709	No Water
1	12.5	Silty Sand	5	0.781	0.781	0.0	0	0.85	1.11	1.10	0.97	8	8	0.3206	0.1339	No Water
1	15	Silty Sand	11	0.938	0.938	31.4	0	0.85	1.03	1.14	0.97	16	24	0.3187	0.3479	1.09
1	17.5	Silty Sand	9	1.094	1.016	31.4	0	0.85	0.96	1.11	0.96	12	19	0.3410	0.2522	0.74
1	20	Silty Sand	11	1.250	1.094	39.7	0	0.95	0.93	1.14	0.95	17	25	0.3597	0.3740	1.04
1	22.5	Silty Sand	9	1.406	1.172	39.7	0	0.95	0.90	1.11	0.95	13	20	0.3753	0.2731	0.73
1	25	Silty Sand	16	1.563	1.251	15.0	0	0.95	0.87	1.20	0.94	24	27	0.3885	0.4645	1.20
1	27.5	Silty Sand	18	1.719	1.329	15.0	0	0.95	0.84	1.22	0.94	26	30	0.3997	0.6293	1.57
1	30	Silty Sand	23	1.875	1.407	29.5	0	0.95	0.82	1.27	0.93	34	44	0.4092	2.0000	>1.3*
1	32.5	Sandstone	75	2.031	1.485	0.0	0	0.95	0.80	1.30	0.91	110	110	0.4107	2.0000	>1.3*
1	35	Sandstone	100	2.188	1.564	0.0	0	1.00	0.77	1.30	0.89	150	150	0.4108	2.0000	>1.3*
1	37.5	Sandstone	100	2.344	1.642	0.0	0	1.00	0.75	1.30	0.87	146	146	0.4096	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)	0.508	2/3*PGA_M	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	15.0		Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125		Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77		Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30			

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 1														
1	2	2.5	Fill/Silty Sand	8	0.125	0.125	9.8	15.9	0.3287	0.2131	No Water	0.0000	0.00	0.00
1	5	2.5	Fill/Silty Sand	10	0.313	0.313	13.0	19.0	0.3264	0.2520	No Water	0.0000	0.00	0.00
1	7.5	2.5	Fill/Silty Sand	11	0.469	0.469	13.8	18.2	0.3244	0.2410	No Water	0.0000	0.00	0.00
1	10	2.5	Fill/Silty Sand	7	0.625	0.625	9.1	11.9	0.3225	0.1709	No Water	0.0000	0.00	0.00
1	12.5	2.5	Silty Sand	5	0.781	0.781	6.5	7.8	0.3206	0.1339	No Water	0.0000	0.00	0.00
1	15	2.5	Silty Sand	11	0.938	0.938	14.3	24.0	0.3187	0.3479	1.0918	0.0149	0.45	0.45
1	17.5	2.5	Silty Sand	9	1.094	1.094	11.7	19.0	0.3410	0.2522	0.7395	0.0171	0.51	0.96
1	20	2.5	Silty Sand	11	1.250	1.172	14.3	24.9	0.3597	0.3740	1.0397	0.0145	0.44	1.39
1	22.5	2.5	Silty Sand	9	1.406	1.250	11.7	20.4	0.3753	0.2731	0.7277	0.0164	0.49	1.89
1	25	2.5	Silty Sand	16	1.563	1.329	20.8	27.3	0.3885	0.4645	1.1956	0.0000	0.00	1.89
1	27.5	2.5	Silty Sand	18	1.719	1.407	23.4	30.0	0.3997	0.6293	1.5742	0.0000	0.00	1.89
1	30	2.5	Silty Sand	23	1.875	1.485	29.9	43.7	0.4092	2.0000	>1.3*	0.0000	0.00	1.89
1	32.5	2.5	Sandstone	75	2.031	1.563	97.5	110.2	0.4107	2.0000	>1.3*	0.0000	0.00	1.89
1	35	2.5	Sandstone	100	2.188	1.642	130.0	150.5	0.4108	2.0000	>1.3*	0.0000	0.00	1.89
1	37.5	2.5	Sandstone	100	2.344	1.720	130.0	146.4	0.4096	2.0000	>1.3*	0.0000	0.00	1.89

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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S(N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 2																
2	2	Fill/Silty Sand	4	0.125	0.125	0.0	0	0.75	1.66	1.10	1.00	9	9	0.4930	0.1441	No Water
2	5	Fill/Silty Sand	6	0.313	0.313	0.0	0	0.75	1.45	1.10	0.99	10	10	0.4895	0.1542	No Water
2	7	Fill/Silty Sand	8	0.438	0.438	0.0	0	0.75	1.34	1.11	0.98	13	13	0.4872	0.1777	No Water
2	10	Fill/Silty Sand	8	0.625	0.625	0.0	0	0.85	1.21	1.12	0.98	14	14	0.4838	0.1896	No Water
2	12.5	Silty Sand	12	0.781	0.781	0.0	0	0.85	1.11	1.17	0.97	20	20	0.4809	0.2643	No Water
2	15	Silty Sand	5	0.938	0.938	26.0	0	0.85	1.03	1.10	0.97	7	12	0.4780	0.1766	0.37
2	17.5	Silty Sand	6	1.094	1.016	26.0	0	0.85	0.96	1.10	0.96	8	13	0.5116	0.1862	0.36
2	20	Silty Sand	6	1.250	1.094	37.3	0	0.95	0.93	1.10	0.95	9	15	0.5395	0.2076	0.38
2	22.5	Silty Sand	9	1.406	1.172	22.0	0	0.95	0.90	1.11	0.95	13	18	0.5630	0.2375	0.42
2	25	Silty Sand	15	1.563	1.251	22.0	0	0.95	0.87	1.19	0.94	22	28	0.5828	0.4955	0.85
2	27.5	Silty Sand	16	1.719	1.329	21.5	0	0.95	0.84	1.19	0.94	23	29	0.5996	0.5420	0.90
2	30	Silty Sand	21	1.875	1.407	21.5	0	0.95	0.82	1.24	0.93	30	37	0.6137	2.2680	3.70
2	32.5	Sandstone	75	2.031	1.485	0.0	0	0.95	0.80	1.30	0.91	110	110	0.6161	2.0000	>1.3*
2	35	Sandstone	85	2.188	1.564	0.0	0	1.00	0.77	1.30	0.89	128	128	0.6162	2.0000	>1.3*
2	37.5	Sandstone	82	2.344	1.642	0.0	0	1.00	0.75	1.30	0.87	120	120	0.6143	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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125	Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77	Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30		

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 2														
2	2	2.5	Fill/Silty Sand	4	0.125	0.125	5.7	9.0	0.4930	0.1441	No Water	0.0000	0.00	0.00
2	5	2	Fill/Silty Sand	6	0.313	0.313	7.3	10.1	0.4895	0.1542	No Water	0.0000	0.00	0.00
2	7	3	Fill/Silty Sand	8	0.438	0.438	9.8	12.6	0.4872	0.1777	No Water	0.0000	0.00	0.00
2	10	2.5	Fill/Silty Sand	8	0.625	0.625	10.4	13.8	0.4838	0.1896	No Water	0.0000	0.00	0.00
2	12.5	2.5	Silty Sand	12	0.781	0.781	15.6	19.8	0.4809	0.2643	No Water	0.0000	0.00	0.00
2	15	2.5	Silty Sand	5	0.938	0.938	6.5	12.5	0.4780	0.1766	0.3695	0.0220	0.66	0.66
2	17.5	2.5	Silty Sand	6	1.094	1.094	7.8	13.4	0.5116	0.1862	0.3639	0.0211	0.63	1.29
2	20	2.5	Silty Sand	6	1.250	1.172	7.8	15.4	0.5395	0.2076	0.3848	0.0194	0.58	1.87
2	22.5	2.5	Silty Sand	9	1.406	1.250	11.7	17.9	0.5630	0.2375	0.4219	0.0177	0.53	2.40
2	25	2.5	Silty Sand	15	1.563	1.329	19.5	27.9	0.5828	0.4955	0.8501	0.0136	0.41	2.81
2	27.5	2.5	Silty Sand	16	1.719	1.407	20.8	28.8	0.5996	0.5420	0.9039	0.0133	0.40	3.21
2	30	2.5	Silty Sand	21	1.875	1.485	27.3	37.0	0.6137	2.2680	3.6954	0.0000	0.00	3.21
2	32.5	2.5	Sandstone	75	2.031	1.563	97.5	110.2	0.6161	2.0000	>1.3*	0.0000	0.00	3.21
2	35	2.5	Sandstone	85	2.188	1.642	110.5	127.9	0.6162	2.0000	>1.3*	0.0000	0.00	3.21
2	37.5	2.5	Sandstone	82	2.344	1.720	106.6	120.1	0.6143	2.0000	>1.3*	0.0000	0.00	3.21

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)	0.508 2/3*PGA_M	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S (N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 2																
2	2	Fill/Silty Sand	4	0.125	0.125	0.0	0	0.75	1.66	1.10	1.00	9	9	0.3287	0.1441	No Water
2	5	Fill/Silty Sand	6	0.313	0.313	0.0	0	0.75	1.45	1.10	0.99	10	10	0.3264	0.1542	No Water
2	7	Fill/Silty Sand	8	0.438	0.438	0.0	0	0.75	1.34	1.11	0.98	13	13	0.3248	0.1777	No Water
2	10	Fill/Silty Sand	8	0.625	0.625	0.0	0	0.85	1.21	1.12	0.98	14	14	0.3225	0.1896	No Water
2	12.5	Silty Sand	12	0.781	0.781	0.0	0	0.85	1.11	1.17	0.97	20	20	0.3206	0.2643	No Water
2	15	Silty Sand	5	0.938	0.938	26.0	0	0.85	1.03	1.10	0.97	7	12	0.3187	0.1766	0.55
2	17.5	Silty Sand	6	1.094	1.016	26.0	0	0.85	0.96	1.10	0.96	8	13	0.3410	0.1862	0.55
2	20	Silty Sand	6	1.250	1.094	37.3	0	0.95	0.93	1.10	0.95	9	15	0.3597	0.2076	0.58
2	22.5	Silty Sand	9	1.406	1.172	22.0	0	0.95	0.90	1.11	0.95	13	18	0.3753	0.2375	0.63
2	25	Silty Sand	15	1.563	1.251	22.0	0	0.95	0.87	1.19	0.94	22	28	0.3885	0.4955	1.28
2	27.5	Silty Sand	16	1.719	1.329	21.5	0	0.95	0.84	1.19	0.94	23	29	0.3997	0.5420	1.36
2	30	Silty Sand	21	1.875	1.407	21.5	0	0.95	0.82	1.24	0.93	30	37	0.4092	2.2680	5.54
2	32.5	Sandstone	75	2.031	1.485	0.0	0	0.95	0.80	1.30	0.91	110	110	0.4107	2.0000	>1.3*
2	35	Sandstone	85	2.188	1.564	0.0	0	1.00	0.77	1.30	0.89	128	128	0.4108	2.0000	>1.3*
2	37.5	Sandstone	82	2.344	1.642	0.0	0	1.00	0.75	1.30	0.87	120	120	0.4096	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)	0.508 2/3*PGA_M	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125	Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77	Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30		

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 2														
2	2	2.5	Fill/Silty Sand	4	0.125	0.125	5.7	9.0	0.3287	0.1441	No Water	0.0000	0.00	0.00
2	5	2	Fill/Silty Sand	6	0.313	0.313	7.3	10.1	0.3264	0.1542	No Water	0.0000	0.00	0.00
2	7	3	Fill/Silty Sand	8	0.438	0.438	9.8	12.6	0.3248	0.1777	No Water	0.0000	0.00	0.00
2	10	2.5	Fill/Silty Sand	8	0.625	0.625	10.4	13.8	0.3225	0.1896	No Water	0.0000	0.00	0.00
2	12.5	2.5	Silty Sand	12	0.781	0.781	15.6	19.8	0.3206	0.2643	No Water	0.0000	0.00	0.00
2	15	2.5	Silty Sand	5	0.938	0.938	6.5	12.5	0.3187	0.1766	0.5542	0.0220	0.66	0.66
2	17.5	2.5	Silty Sand	6	1.094	1.094	7.8	13.4	0.3410	0.1862	0.5459	0.0211	0.63	1.29
2	20	2.5	Silty Sand	6	1.250	1.172	7.8	15.4	0.3597	0.2076	0.5772	0.0194	0.58	1.87
2	22.5	2.5	Silty Sand	9	1.406	1.250	11.7	17.9	0.3753	0.2375	0.6328	0.0177	0.53	2.40
2	25	2.5	Silty Sand	15	1.563	1.329	19.5	27.9	0.3885	0.4955	1.2752	0.0000	0.00	2.40
2	27.5	2.5	Silty Sand	16	1.719	1.407	20.8	28.8	0.3997	0.5420	1.3559	0.0000	0.00	2.40
2	30	2.5	Silty Sand	21	1.875	1.485	27.3	37.0	0.4092	2.2680	5.5431	0.0000	0.00	2.40
2	32.5	2.5	Sandstone	75	2.031	1.563	97.5	110.2	0.4107	2.0000	>1.3*	0.0000	0.00	2.40
2	35	2.5	Sandstone	85	2.188	1.642	110.5	127.9	0.4108	2.0000	>1.3*	0.0000	0.00	2.40
2	37.5	2.5	Sandstone	82	2.344	1.720	106.6	120.1	0.4096	2.0000	>1.3*	0.0000	0.00	2.40

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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	25.0
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S(N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 3																
3	10	Silty Sand	6	0.625	0.625	0.0	0	0.85	1.21	1.10	0.98	10	10	0.4838	0.1544	No Water
3	12.5	Silty Sand	6	0.781	0.781	0.0	0	0.85	1.11	1.10	0.97	9	9	0.4809	0.1472	No Water
3	15	Siltstone	19	0.938	0.938	0.0	0	0.85	1.03	1.25	0.97	31	31	0.4780	0.7239	1.51
3	17.5	Siltstone	28	1.094	1.016	0.0	0	0.85	0.96	1.30	0.96	44	44	0.5116	2.0000	>1.3*
3	20	Siltstone	48	1.250	1.094	0.0	0	0.95	0.90	1.30	0.95	80	80	0.5395	2.0000	>1.3*
3	22.5	Sandstone	70	1.406	1.172	0.0	0	0.95	0.84	1.30	0.95	109	109	0.5630	2.0000	>1.3*
3	25	Sandstone	74	1.563	1.251	0.0	0	0.95	0.80	1.30	0.94	109	109	0.5828	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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125	Groundwater Depth in Boring (feet)	25.0
Design Magnitude Earthquake	6.77	Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30		

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 3														
3	10	2.5	Silty Sand	6	0.625	0.625	7.8	10.1	0.4838	0.1544	No Water	0.0000	0.00	0.00
3	12.5	2.5	Silty Sand	6	0.781	0.781	7.8	9.3	0.4809	0.1472	No Water	0.0000	0.00	0.00
3	15	2.5	Siltstone	19	0.938	0.938	24.7	31.0	0.4780	0.7239	1.5144	0.0000	0.00	0.00
3	17.5	2.5	Siltstone	28	1.094	1.094	36.4	44.4	0.5116	2.0000	>1.3*	0.0000	0.00	0.00
3	20	2.5	Siltstone	48	1.250	1.250	62.4	79.6	0.5395	2.0000	>1.3*	0.0000	0.00	0.00
3	22.5	2.5	Sandstone	70	1.406	1.406	91.0	109.1	0.5630	2.0000	>1.3*	0.0000	0.00	0.00
3	25	2.5	Sandstone	74	1.563	1.563	96.2	108.8	0.5828	2.0000	>1.3*	0.0000	0.00	0.00

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)	0.508 $2/3PGA_M$	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	25.0
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S(N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 3																
3	10	Silty Sand	6	0.625	0.625	0.0	0	0.85	1.21	1.10	0.98	10	10	0.3225	0.1544	No Water
3	12.5	Silty Sand	6	0.781	0.781	0.0	0	0.85	1.11	1.10	0.97	9	9	0.3206	0.1472	No Water
3	15	Siltstone	19	0.938	0.938	0.0	0	0.85	1.03	1.25	0.97	31	31	0.3187	0.7239	2.27
3	17.5	Siltstone	28	1.094	1.016	0.0	0	0.85	0.96	1.30	0.96	44	44	0.3410	2.0000	>1.3*
3	20	Siltstone	48	1.250	1.094	0.0	0	0.95	0.90	1.30	0.95	80	80	0.3597	2.0000	>1.3*
3	22.5	Sandstone	70	1.406	1.172	0.0	0	0.95	0.84	1.30	0.95	109	109	0.3753	2.0000	>1.3*
3	25	Sandstone	74	1.563	1.251	0.0	0	0.95	0.80	1.30	0.94	109	109	0.3885	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)	0.508	2/3PGA$_M$	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	15.0		Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125		Groundwater Depth in Boring (feet)	25.0
Design Magnitude Earthquake	6.77		Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30			

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 3														
3	10	2.5	Silty Sand	6	0.625	0.625	7.8	10.1	0.3225	0.1544	No Water	0.0000	0.00	0.00
3	12.5	2.5	Silty Sand	6	0.781	0.781	7.8	9.3	0.3206	0.1472	No Water	0.0000	0.00	0.00
3	15	2.5	Siltstone	19	0.938	0.938	24.7	31.0	0.3187	0.7239	2.2716	0.0000	0.00	0.00
3	17.5	2.5	Siltstone	28	1.094	1.094	36.4	44.4	0.3410	2.0000	>1.3*	0.0000	0.00	0.00
3	20	2.5	Siltstone	48	1.250	1.250	62.4	79.6	0.3597	2.0000	>1.3*	0.0000	0.00	0.00
3	22.5	2.5	Sandstone	70	1.406	1.406	91.0	109.1	0.3753	2.0000	>1.3*	0.0000	0.00	0.00
3	25	2.5	Sandstone	74	1.563	1.563	96.2	108.8	0.3885	2.0000	>1.3*	0.0000	0.00	0.00

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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	22.5
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S (N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 4																
4	10	Silty Sand	4	0.625	0.625	0.0	0	0.85	1.21	1.10	0.98	7	7	0.4838	0.1255	No Water
4	12.5	Silty Clay	8	0.781	0.781	0.0	0	0.85	1.11	1.11	0.97	13	13	0.4809	0.1776	No Water
4	15	Silty Clay	5	0.938	0.938	83.7	0	0.85	1.03	1.10	0.97	7	14	0.4780	0.1884	0.39
4	17.5	Silty Clay	7	1.094	1.016	74.6	0	0.85	0.96	1.10	0.96	9	16	0.5116	0.2171	0.42
4	20	Silty Sand	6	1.250	1.094	52.7	0	0.95	0.90	1.10	0.95	8	15	0.5395	0.2039	0.38
4	22.5	Silty Sand	27	1.406	1.172	0.0	0	0.95	0.84	1.30	0.95	42	42	0.5630	2.0000	>1.3*
4	25	Silty Sand	21	1.563	1.251	16.6	0	0.95	0.82	1.24	0.94	30	35	0.5828	1.4662	2.52
4	27.5	Silty Sand	30	1.719	1.329	0.0	0	0.95	0.80	1.30	0.94	44	44	0.5996	2.0000	>1.3*
4	30	Sandstone	57	1.875	1.407	0.0	0	0.95	0.77	1.30	0.93	81	81	0.6137	2.0000	>1.3*
4	32.5	Sandstone	84	2.031	1.485	0.0	0	0.95	0.75	1.30	0.91	117	117	0.6161	2.0000	>1.3*
4	35	Sandstone	100	2.188	1.564	0.0	0	1.00	0.73	1.30	0.89	143	143	0.6162	2.0000	>1.3*
4	37.5	Sandstone	90	2.344	1.642	0.0	0	1.00	0.72	1.30	0.87	125	125	0.6143	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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125	Groundwater Depth in Boring (feet)	22.5
Design Magnitude Earthquake	6.77	Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30		

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 4														
4	10	2.5	Silty Sand	4	0.625	0.625	5.2	6.7	0.4838	0.1255	No Water	0.0000	0.00	0.00
4	12.5	2.5	Silty Clay	8	0.781	0.781	10.4	12.6	0.4809	0.1776	No Water	0.0000	0.00	0.00
4	15	2.5	Silty Clay	5	0.938	0.938	6.5	13.6	0.4780	0.1884	0.3941	0.0209	0.63	0.63
4	17.5	2.5	Silty Clay	7	1.094	1.094	9.1	16.3	0.5116	0.2171	0.4244	0.0188	0.56	1.19
4	20	2.5	Silty Sand	6	1.250	1.250	7.8	15.1	0.5395	0.2039	0.3780	0.0196	0.59	1.78
4	22.5	2.5	Silty Sand	27	1.406	1.406	35.1	42.1	0.5630	2.0000	>1.3*	0.0000	0.00	1.78
4	25	2.5	Silty Sand	21	1.563	1.485	27.3	35.1	0.5828	1.4662	2.5157	0.0000	0.00	1.78
4	27.5	2.5	Silty Sand	30	1.719	1.563	39.0	44.1	0.5996	2.0000	>1.3*	0.0000	0.00	1.78
4	30	2.5	Sandstone	57	1.875	1.641	74.1	81.5	0.6137	2.0000	>1.3*	0.0000	0.00	1.78
4	32.5	2.5	Sandstone	84	2.031	1.719	109.2	116.9	0.6161	2.0000	>1.3*	0.0000	0.00	1.78
4	35	2.5	Sandstone	100	2.188	1.798	130.0	142.6	0.6162	2.0000	>1.3*	0.0000	0.00	1.78
4	37.5	2.5	Sandstone	90	2.344	1.876	117.0	125.1	0.6143	2.0000	>1.3*	0.0000	0.00	1.78

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

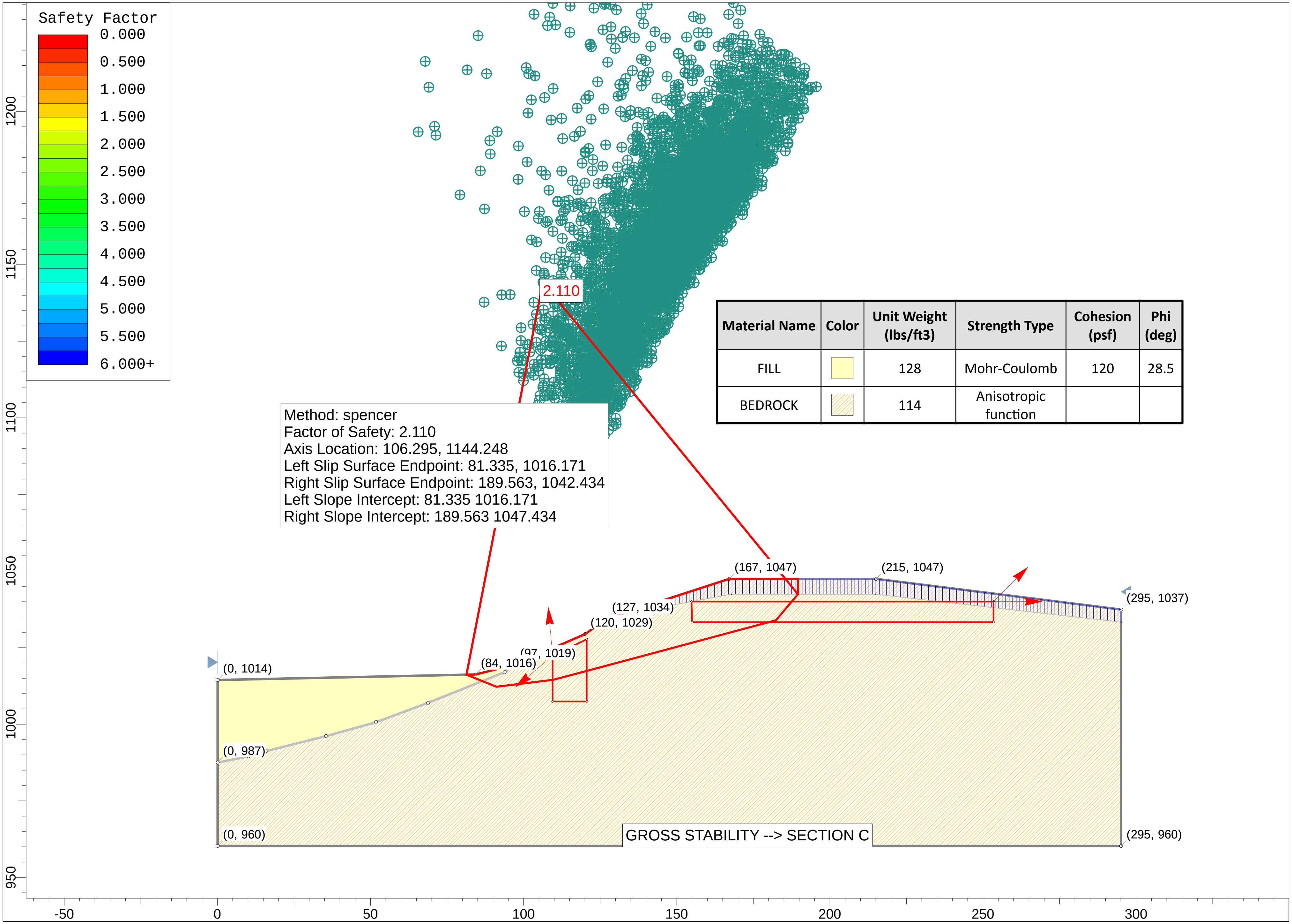
Horizontal Ground Acceleration (% g)	0.508 2/3PGA$_M$	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	22.5
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S(N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 4																
4	10	Silty Sand	4	0.625	0.625	0.0	0	0.85	1.21	1.10	0.98	7	7	0.3225	0.1255	No Water
4	12.5	Silty Clay	8	0.781	0.781	0.0	0	0.85	1.11	1.11	0.97	13	13	0.3206	0.1776	No Water
4	15	Silty Clay	5	0.938	0.938	83.7	0	0.85	1.03	1.10	0.97	7	14	0.3187	0.1884	0.59
4	17.5	Silty Clay	7	1.094	1.016	74.6	0	0.85	0.96	1.10	0.96	9	16	0.3410	0.2171	0.64
4	20	Silty Sand	6	1.250	1.094	52.7	0	0.95	0.90	1.10	0.95	8	15	0.3597	0.2039	0.57
4	22.5	Silty Sand	27	1.406	1.172	0.0	0	0.95	0.84	1.30	0.95	42	42	0.3753	2.0000	>1.3*
4	25	Silty Sand	21	1.563	1.251	16.6	0	0.95	0.82	1.24	0.94	30	35	0.3885	1.4662	3.77
4	27.5	Silty Sand	30	1.719	1.329	0.0	0	0.95	0.80	1.30	0.94	44	44	0.3997	2.0000	>1.3*
4	30	Sandstone	57	1.875	1.407	0.0	0	0.95	0.77	1.30	0.93	81	81	0.4092	2.0000	>1.3*
4	32.5	Sandstone	84	2.031	1.485	0.0	0	0.95	0.75	1.30	0.91	117	117	0.4107	2.0000	>1.3*
4	35	Sandstone	100	2.188	1.564	0.0	0	1.00	0.73	1.30	0.89	143	143	0.4108	2.0000	>1.3*
4	37.5	Sandstone	90	2.344	1.642	0.0	0	1.00	0.72	1.30	0.87	125	125	0.4096	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)	0.508 2/3PGA$_M$	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125	Groundwater Depth in Boring (feet)	22.5
Design Magnitude Earthquake	6.77	Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30		

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 4														
4	10	2.5	Silty Sand	4	0.625	0.625	5.2	6.7	0.3225	0.1255	No Water	0.0000	0.00	0.00
4	12.5	2.5	Silty Clay	8	0.781	0.781	10.4	12.6	0.3206	0.1776	No Water	0.0000	0.00	0.00
4	15	2.5	Silty Clay	5	0.938	0.938	6.5	13.6	0.3187	0.1884	0.5911	0.0209	0.63	0.63
4	17.5	2.5	Silty Clay	7	1.094	1.094	9.1	16.3	0.3410	0.2171	0.6366	0.0188	0.56	1.19
4	20	2.5	Silty Sand	6	1.250	1.250	7.8	15.1	0.3597	0.2039	0.5670	0.0196	0.59	1.78
4	22.5	2.5	Silty Sand	27	1.406	1.406	35.1	42.1	0.3753	2.0000	>1.3*	0.0000	0.00	1.78
4	25	2.5	Silty Sand	21	1.563	1.485	27.3	35.1	0.3885	1.4662	3.7736	0.0000	0.00	1.78
4	27.5	2.5	Silty Sand	30	1.719	1.563	39.0	44.1	0.3997	2.0000	>1.3*	0.0000	0.00	1.78
4	30	2.5	Sandstone	57	1.875	1.641	74.1	81.5	0.4092	2.0000	>1.3*	0.0000	0.00	1.78
4	32.5	2.5	Sandstone	84	2.031	1.719	109.2	116.9	0.4107	2.0000	>1.3*	0.0000	0.00	1.78
4	35	2.5	Sandstone	100	2.188	1.798	130.0	142.6	0.4108	2.0000	>1.3*	0.0000	0.00	1.78
4	37.5	2.5	Sandstone	90	2.344	1.876	117.0	125.1	0.4096	2.0000	>1.3*	0.0000	0.00	1.78



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
FILL		128	Mohr-Coulomb	120	28.5
BEDROCK		114	Anisotropic function		

Slide Analysis Information
HARRIDGE - SAN FELICIANO

Project Summary

File Name: SECTION C CALC
Slide Modeler Version: 6.039
Project Title: HARRIDGE - SAN FELICIANO
Analysis: GROSS STABILITY --> SECTION C
Date Created: 4/6/2017, 10:38:10 AM

General Settings

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

Analysis Options

Analysis Methods Used

Spencer

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: Non-Circular Block Search

Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 95
Left Projection Angle (End Angle): 220
Right Projection Angle (Start Angle): 0
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Tension Crack

Tension crack Water level: filled with water

Material Properties

Property	FILL	BEDROCK
Color		
Strength Type	Mohr-Coulomb	Anisotropic function
Unit Weight [lbs/ft3]	128	114
Cohesion [psf]	120	
Friction Angle [deg]	28.5	
Water Surface	None	None
Ru Value	0	0

Anisotropic Functions

Name: User Defined 1

Angle From	Angle To	c	phi
-90	7	606	27
7	15	255	17
15	90	606	27

Global Minimums

Method: spencer

FS: 2.110040
Axis Location: 106.295, 1144.248
Left Slip Surface Endpoint: 81.335, 1016.171
Right Slip Surface Endpoint: 189.563, 1042.434
Left Slope Intercept: 81.335 1016.171
Right Slope Intercept: 189.563 1047.434
Resisting Moment=1.05186e+007 lb-ft
Driving Moment=4.98499e+006 lb-ft
Resisting Horizontal Force=76876.2 lb
Driving Horizontal Force=36433.5 lb
Total Slice Area=1343.47 ft2

Global Minimum Coordinates

Method: spencer

X	Y
81.3353	1016.17
91.1285	1012.24
109.664	1014.52
120.762	1017.43
131.189	1020.22
141.68	1023.04
152.905	1026.04
163.355	1028.84
172.88	1031.4
182.405	1033.95
189.563	1042.43
189.564	1047.43

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 4119
Number of Invalid Surfaces: 882

Error Codes:

Error Code -108 reported for 67 surfaces
Error Code -111 reported for 87 surfaces
Error Code -112 reported for 728 surfaces

Error Codes

The following errors were encountered during the computation:

-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).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 2.11004

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	5.1902	801.276	FILL	120	28.5	122.523	258.529	255.139	0	255.139
2	4.60291	2356.75	BEDROCK	606	27	508.697	1073.37	917.265	0	917.265
3	4.6338	3266.04	BEDROCK	255	17	223.537	471.673	708.706	0	708.706
4	4.6338	3599.18	BEDROCK	255	17	233.824	493.377	779.695	0	779.695

5	4.6338	4338.01	BEDROCK	255	17	256.635	541.511	937.136	0	937.136
6	4.6338	5101.72	BEDROCK	255	17	280.216	591.267	1099.88	0	1099.88
7	3.69941	4512.22	BEDROCK	255	17	286.246	603.99	1141.5	0	1141.5
8	3.69941	4781	BEDROCK	255	17	296.13	624.847	1209.71	0	1209.71
9	3.69941	5056.81	BEDROCK	255	17	306.273	646.249	1279.72	0	1279.72
10	5.21345	8107.81	BEDROCK	255	17	331.392	699.251	1453.08	0	1453.08
11	5.21345	9119.27	BEDROCK	255	17	357.736	754.838	1634.9	0	1634.9
12	5.24571	9382.2	BEDROCK	255	17	363.082	766.117	1671.79	0	1671.79
13	5.24571	9561.17	BEDROCK	255	17	367.714	775.892	1703.76	0	1703.76
14	3.74175	6929.3	BEDROCK	255	17	371.683	784.266	1731.15	0	1731.15
15	3.74175	7020.36	BEDROCK	255	17	374.987	791.238	1753.96	0	1753.96
16	3.74175	7111.42	BEDROCK	255	17	378.292	798.211	1776.76	0	1776.76
17	3.48313	6701.73	BEDROCK	255	17	381.482	804.943	1798.78	0	1798.78
18	3.48313	6780.64	BEDROCK	255	17	384.558	811.433	1820.01	0	1820.01
19	3.48313	6859.54	BEDROCK	255	17	387.634	817.924	1841.24	0	1841.24
20	4.76254	9487.58	BEDROCK	255	17	390.725	824.446	1862.57	0	1862.57
21	4.76254	9054.14	BEDROCK	255	17	378.367	798.37	1777.28	0	1777.28
22	4.76254	8361.3	BEDROCK	255	17	358.613	756.688	1640.95	0	1640.95
23	4.76254	7668.46	BEDROCK	255	17	338.859	715.006	1504.61	0	1504.61
24	3.57901	4636.86	BEDROCK	606	27	451.245	952.144	679.346	0	679.346
25	3.57901	2905.64	BEDROCK	606	27	365.489	771.197	324.218	0	324.218

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 2.11004

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	81.3353	1016.17	0	0	0
2	86.5256	1014.09	1167.24	267.797	12.9216
3	91.1285	1012.24	5202.77	1193.66	12.9216
4	95.7623	1012.81	5835.37	1338.79	12.9216
5	100.396	1013.38	6475.24	1485.6	12.9216
6	105.03	1013.95	7131.25	1636.1	12.9216
7	109.664	1014.52	7803.92	1790.43	12.9216
8	113.363	1015.49	7754.33	1779.05	12.9216
9	117.062	1016.46	7675.05	1760.86	12.9216
10	120.762	1017.43	7565.31	1735.69	12.9216
11	125.975	1018.83	7263.14	1666.36	12.9216
12	131.189	1020.22	6844.33	1570.27	12.9215
13	136.434	1021.63	6399.11	1468.13	12.9216
14	141.68	1023.04	5933.25	1361.25	12.9216
15	145.422	1024.04	5588.34	1282.12	12.9216
16	149.164	1025.04	5232.93	1200.58	12.9216
17	152.905	1026.04	4867.02	1116.63	12.9216
18	156.389	1026.98	4516.97	1036.31	12.9215
19	159.872	1027.91	4157.81	953.913	12.9216
20	163.355	1028.84	3789.55	869.426	12.9216

21	168.117	1030.12	3273.53	751.036	12.9216
22	172.88	1031.4	2807.49	644.114	12.9216
23	177.642	1032.67	2421.35	555.523	12.9216
24	182.405	1033.95	2115.11	485.264	12.9216
25	185.984	1038.19	847.597	194.462	12.9216
26	189.563	1042.43	780	0	0

List Of Coordinates

Tension Crack

X	Y
131.022	1035.66
167.889	1042.43
214.786	1042.43
295.097	1033.29

Block Search Window

X	Y
109.465	1022.3
109.465	1007.42
120.588	1007.42
120.588	1027.73

Block Search Window

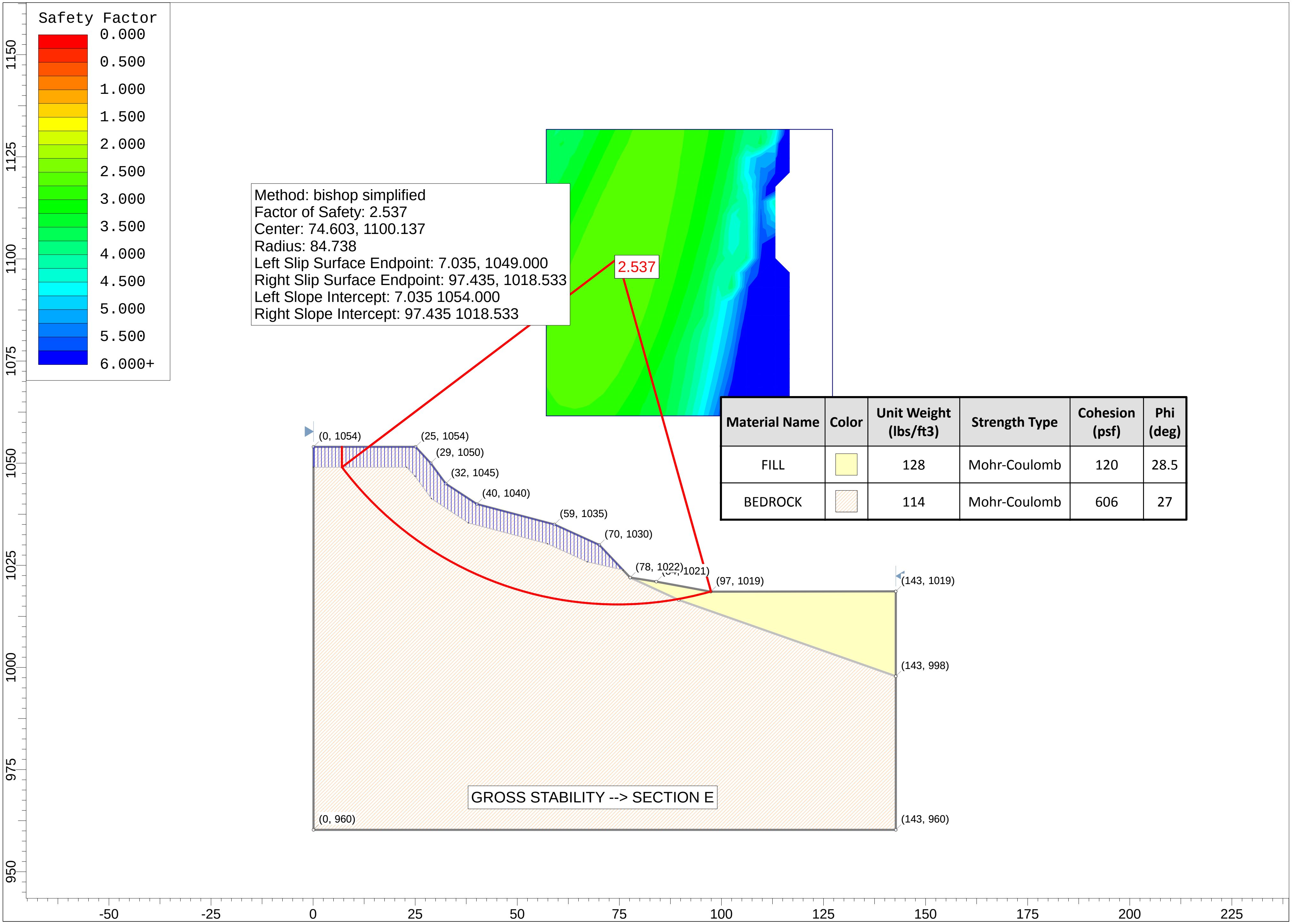
X	Y
154.993	1033.29
253.423	1033.29
253.423	1040.03
154.824	1040.03

External Boundary

X	Y
0.0969007	960.252
295.097	960.252
295.097	1037.43
215.097	1047.43
167.097	1047.43
127.097	1034.43
120.097	1029.43
97.0969	1019.43
84.2969	1016.23
0.0969007	1014.43
0.0969007	987.487

Material Boundary

X	Y
0.0969007	987.487
10.1696	989.505
15.7953	991.213
35.5305	996.119
51.8321	1000.66
68.8215	1007.01
93.8118	1017
97.0969	1019.43



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
FILL		128	Mohr-Coulomb	120	28.5
BEDROCK		114	Mohr-Coulomb	606	27

Slide Analysis Information
HARRIDGE - SAN FELICIANO

Project Summary

File Name: SECTION E CALC
Slide Modeler Version: 6.039
Project Title: HARRIDGE - SAN FELICIANO
Analysis: GROSS STBAILITY --> SECTION E

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Tension Crack

Tension crack Water level: filled with water

Material Properties

Property	FILL	BEDROCK
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	114
Cohesion [psf]	120	606
Friction Angle [deg]	28.5	27
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: bishop simplified

FS: 2.537210
Center: 74.603, 1100.137
Radius: 84.738
Left Slip Surface Endpoint: 7.035, 1049.000
Right Slip Surface Endpoint: 97.435, 1018.533
Left Slope Intercept: 7.035 1054.000
Right Slope Intercept: 97.435 1018.533
Resisting Moment=1.08099e+007 lb-ft
Driving Moment=4.26053e+006 lb-ft
Total Slice Area=1232.66 ft2

Valid / Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 2912
Number of Invalid Surfaces: 1939

Error Codes:

Error Code -98 reported for 745 surfaces
Error Code -105 reported for 347 surfaces
Error Code -106 reported for 7 surfaces
Error Code -107 reported for 835 surfaces
Error Code -108 reported for 5 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.
-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.
-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).

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.53721

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	3.57237	2933.35	BEDROCK	606	27	323.648	821.162	422.28	0	422.28
2	3.57237	4617.79	BEDROCK	606	27	409.493	1038.97	849.752	0	849.752
3	3.57237	6102.96	BEDROCK	606	27	487.982	1238.11	1240.59	0	1240.59
4	3.57237	7423.13	BEDROCK	606	27	559.997	1420.83	1599.2	0	1599.2
5	3.57237	8602.35	BEDROCK	606	27	626.221	1588.85	1928.96	0	1928.96
6	3.57237	8957.44	BEDROCK	606	27	652.555	1655.67	2060.09	0	2060.09
7	3.57237	8165.53	BEDROCK	606	27	621.268	1576.29	1904.3	0	1904.3
8	3.57237	7430.34	BEDROCK	606	27	591.375	1500.44	1755.44	0	1755.44
9	3.57237	7222.31	BEDROCK	606	27	587.244	1489.96	1734.87	0	1734.87
10	3.57237	7097.37	BEDROCK	606	27	586.884	1489.05	1733.08	0	1733.08
11	3.57237	7287.09	BEDROCK	606	27	602.598	1528.92	1811.33	0	1811.33
12	3.57237	7419.72	BEDROCK	606	27	615.305	1561.16	1874.6	0	1874.6
13	3.57237	7480.66	BEDROCK	606	27	624.181	1583.68	1918.8	0	1918.8
14	3.57237	7472.75	BEDROCK	606	27	629.313	1596.7	1944.36	0	1944.36
15	3.57237	7372.47	BEDROCK	606	27	629.363	1596.83	1944.61	0	1944.61
16	3.57237	6999.44	BEDROCK	606	27	614.383	1558.82	1870.01	0	1870.01
17	3.57237	6517.68	BEDROCK	606	27	593.058	1504.71	1763.82	0	1763.82
18	3.57237	5918.72	BEDROCK	606	27	564.796	1433.01	1623.09	0	1623.09
19	3.57237	4620.92	BEDROCK	606	27	496.869	1260.66	1284.84	0	1284.84
20	3.57237	3116.5	BEDROCK	606	27	416.103	1055.74	882.665	0	882.665
21	3.57237	2476.45	BEDROCK	606	27	383.213	972.292	718.889	0	718.889
22	3.57237	2170.55	BEDROCK	606	27	368.985	936.192	648.038	0	648.038
23	3.57237	1766.79	BEDROCK	606	27	348.874	885.167	547.897	0	547.897
24	4.11749	1362.77	FILL	120	28.5	123.415	313.129	355.699	0	355.699
25	4.11749	468.854	FILL	120	28.5	75.7614	192.223	133.017	0	133.017

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.53721

	X	Y	Interslice	Interslice	Interslice

Number	coordinate [ft]	coordinate - Bottom [ft]	Normal Force [lbs]	Shear Force [lbs]	Force Angle [degrees]
1	7.03506	1049	780	0	0
2	10.6074	1044.59	1485.08	0	0
3	14.1798	1040.73	3308.94	0	0
4	17.7522	1037.3	5818.59	0	0
5	21.3246	1034.24	8707.05	0	0
6	24.8969	1031.51	11747.2	0	0
7	28.4693	1029.06	14466.4	0	0
8	32.0417	1026.86	16428.6	0	0
9	35.614	1024.9	17761.2	0	0
10	39.1864	1023.16	18694.4	0	0
11	42.7588	1021.61	19277.3	0	0
12	46.3312	1020.26	19581.9	0	0
13	49.9035	1019.08	19589.6	0	0
14	53.4759	1018.08	19287.2	0	0
15	57.0483	1017.24	18669.5	0	0
16	60.6207	1016.56	17738.9	0	0
17	64.193	1016.04	16517.6	0	0
18	67.7654	1015.68	15045.4	0	0
19	71.3378	1015.46	13375.6	0	0
20	74.9102	1015.4	11682.1	0	0
21	78.4825	1015.49	10118.8	0	0
22	82.0549	1015.73	8578.69	0	0
23	85.6273	1016.12	7007.58	0	0
24	89.1996	1016.67	5462.8	0	0
25	93.3171	1017.49	4661.34	0	0
26	97.4346	1018.53	0	0	0

List Of Coordinates

Tension Crack

X	Y
0.0969007	1049
22.9108	1049
24.9352	1046.81
28.9765	1041.31
38.0224	1035.37
57.401	1030.27
67.1133	1025.85
75.8987	1023.85

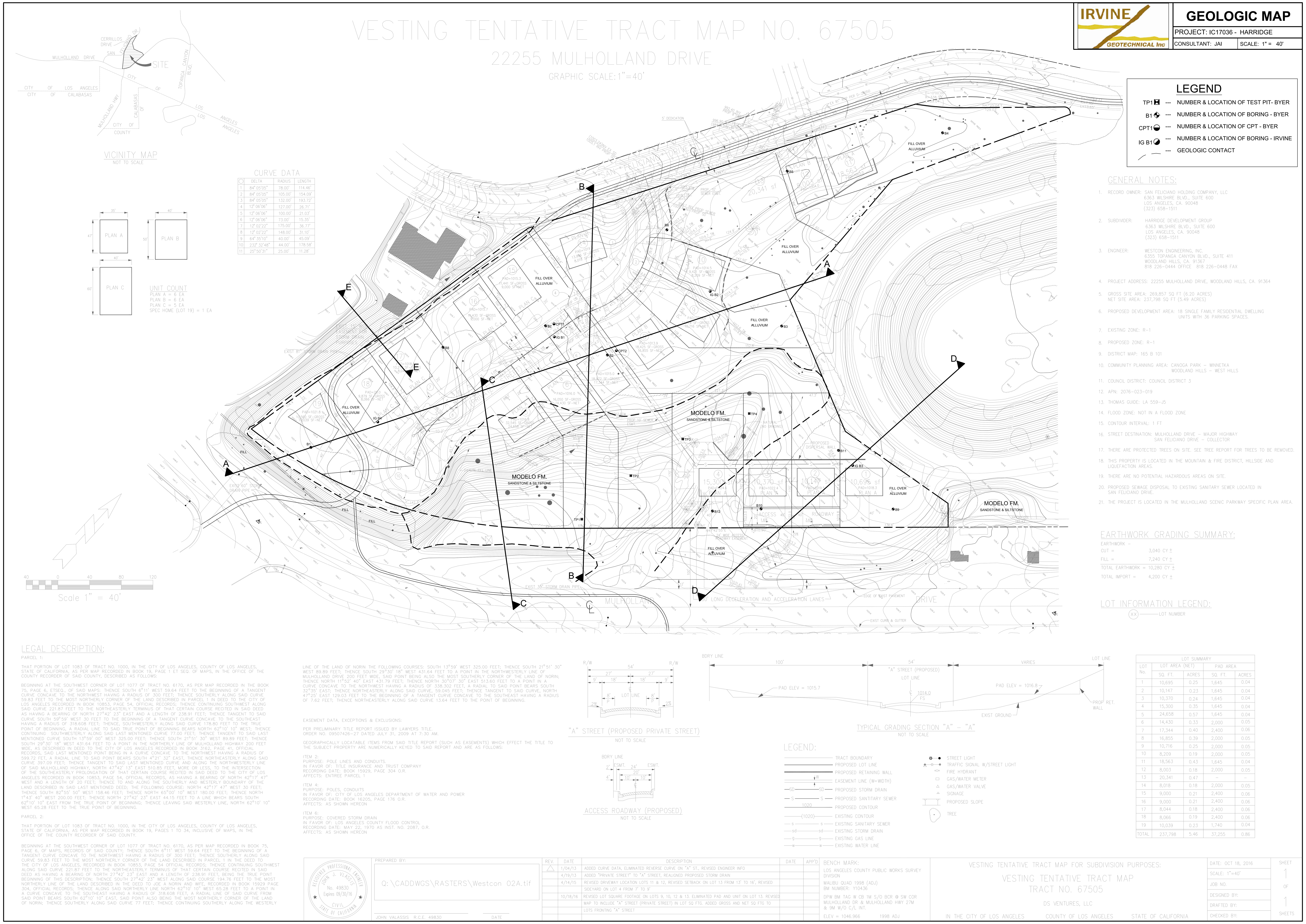
External Boundary

X	Y
142.697	1018.63
97.3676	1018.53

84.0485	1021
77.6485	1022
70.0727	1030
59.0848	1035
40.0848	1040
32.4727	1045
28.7969	1050
25.0969	1054
0.0969007	1054
0.0969007	960.252
142.697	960.252
142.697	997.849

Material Boundary

X	Y
77.6485	1022
89.5398	1016.51
142.697	997.849



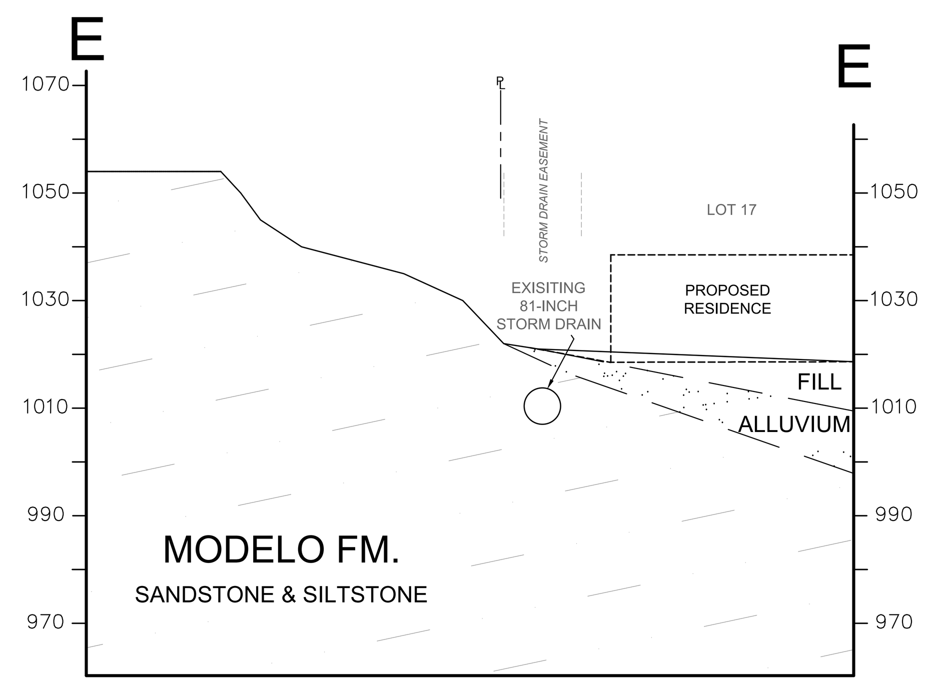
IRVINE GEOTECHNICAL Inc
GEOLOGIC MAP
PROJECT: IC17036 - HARRIDGE
CONSULTANT: JAI
SCALE: 1" = 40'
LEGEND
TP1 — NUMBER & LOCATION OF TEST PIT- BYER
B1 — NUMBER & LOCATION OF BORING - BYER
CPT1 — NUMBER & LOCATION OF CPT - BYER
IG B1 — NUMBER & LOCATION OF BORING - IRVINE
— GEOLOGIC CONTACT
VESTING TENTATIVE TRACT MAP NO. 67505
22255 MULHOLLAND DRIVE
GRAPHIC SCALE: 1"=40'
VICINITY MAP
CURVE DATA
UNIT COUNT
MODELO FM.
SANDSTONE & SILTSTONE
FILL OVER ALLUVIUM
GENERAL NOTES:
EARTHWORK GRADING SUMMARY:
LOT INFORMATION LEGEND:
LEGAL DESCRIPTION:
"A" STREET (PROPOSED PRIVATE STREET)
TYPICAL GRADING SECTION "A" - "A"
ACCESS ROADWAY (PROPOSED)
LOT SUMMARY
Scale 1" = 40'
VESTING TENTATIVE TRACT MAP
TRACT NO. 67505
DS VENTURES, LLC
IN THE CITY OF LOS ANGELES
COUNTY OF LOS ANGELES
STATE OF CALIFORNIA

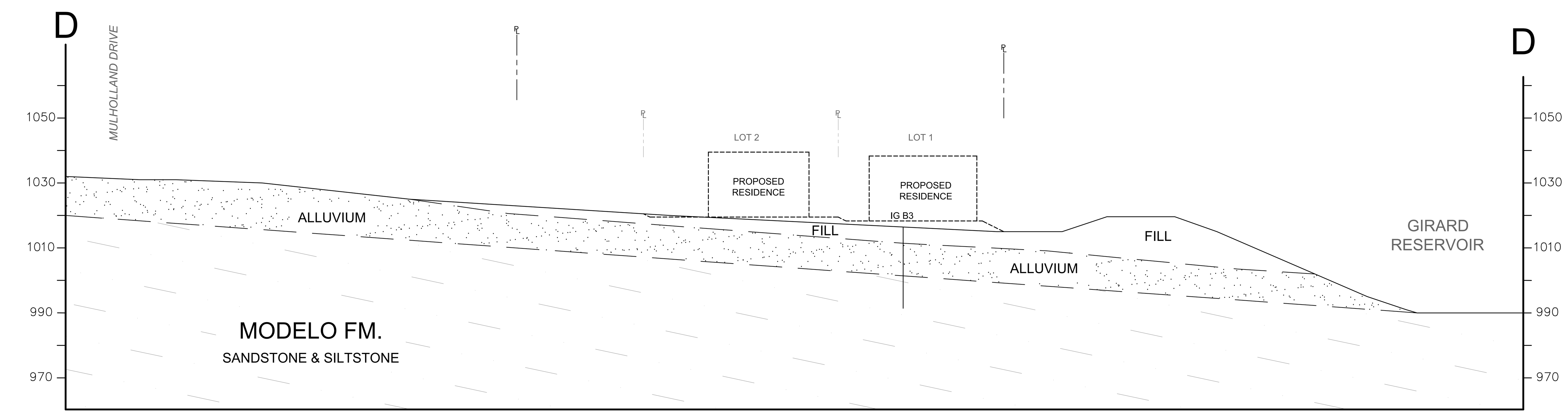
SECTIONS A - E

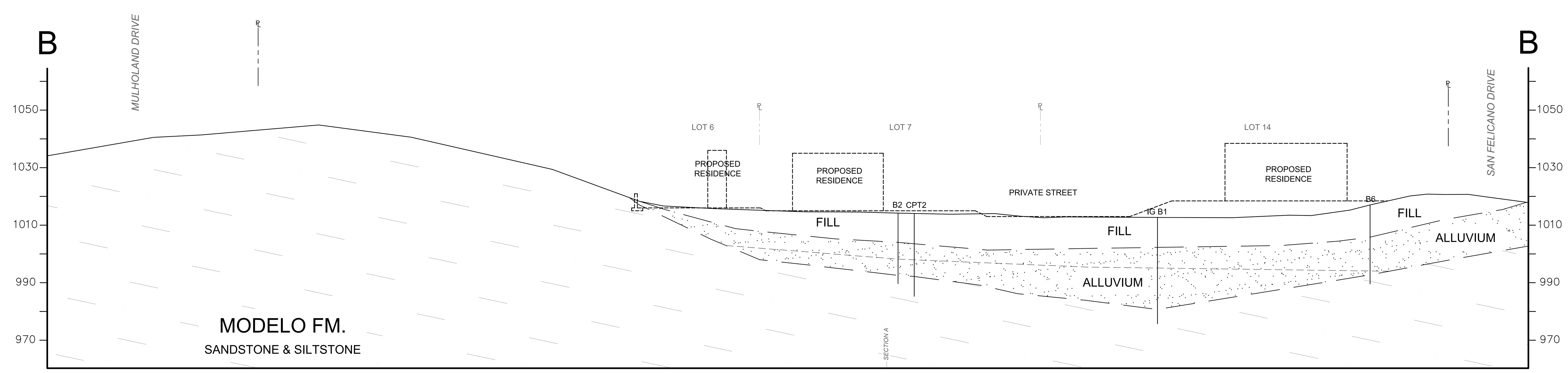
IRVINE GEOTECHNICAL Inc

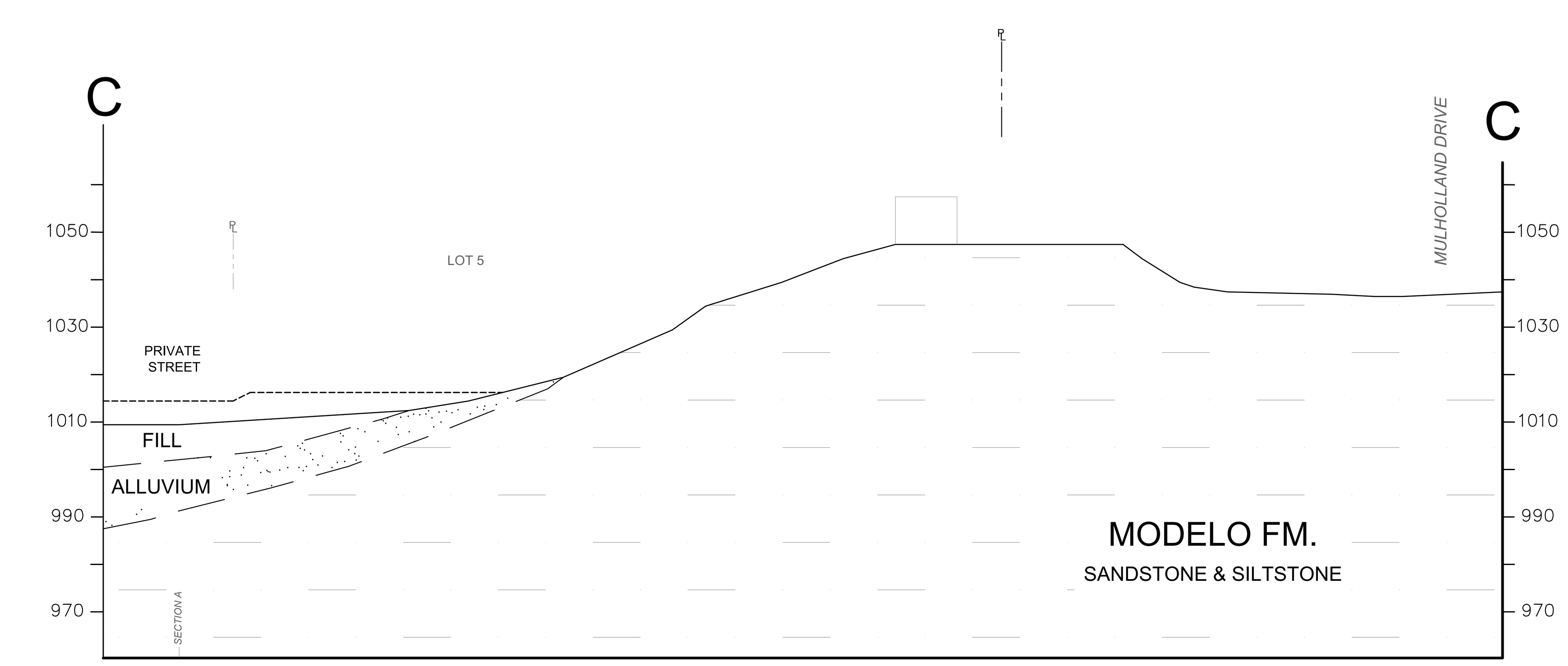
PROJECT: IC17036 - HARRIDGE

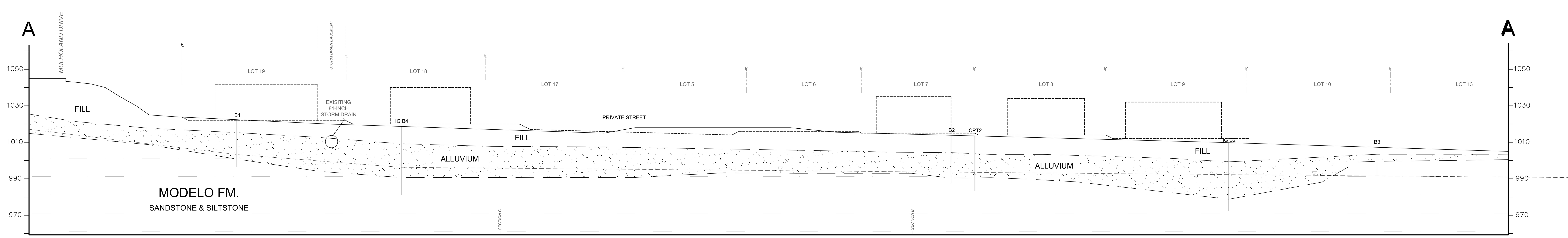
CONSULTANT: JAI | SCALE: 1" = 40'











August 21, 2017
IC 17036-I

San Feliciano Holding Company, LLC
6363 Wilshire Blvd. Suite 600
Los Angeles, California 90048

Subject

Addendum Geologic and Soils Engineering Exploration
Proposed 19 Lot Subdivision
Vesting Tentative Tract Map No. 67505
Portion of Lot 1083, Arbs. 7 & 8, Tract 1000
22255 W Mulholland Drive
Los Angeles, California

References: Report by Irvine Geotechnical, Inc.:

Geologic and Soils Engineering Exploration, Proposed 19 Lot Subdivision, Vesting Tentative Tract Map No. 67505, Portion of Lot 1083, Arbs. 7 & 8, Tract 1000, 22255 W Mulholland Drive, Los Angeles, California, dated April 6, 2017

City of Los Angeles Department of Building and Safety, Grading Division:

Geology and Soils Report Correction Letter, Log #97648, dated May 23, 2017

Dear Gentle Persons;

Irvine Geotechnical has prepared this addendum report to provide additional geotechnical engineering recommendations to the Grading Division for the design and construction of the proposed project. This addendum report follows additional exploration and review of the latest plans prepared by Wescon Engineering. Responses to the 10 items of the Grading Division review letter are provided below. A copy of the May 23, 2017 Department review letter is appended to this report for reference.

Item 1 - Existing slopes within the property are mostly 2:1 or flatter. The exception is located on proposed Lots 4 through 7, where existing natural slopes average between 2:1 and 1½:1. These slopes are underlain by bedrock. These slopes cannot be trimmed to a flatter gradient and/or buttressed at a 2:1 gradient due to existing groves of oak trees. Calculations within this and the referenced reports show the existing natural slopes to be grossly and surficially stable.

Formal grading plans have not been prepared and await approval of the Vesting Tract. Based on the Vesting/Tentative Maps section of the City of Los Angeles Department of City Planning, *Instructions for Filing Tentative Tract Maps*, the Tentative Map need only be based on a preliminary grading plan. The requirements include showing existing buildings and slope contours plus the proposed building pads, building footprints, tops and toes of slopes, streets, and lot boundaries. A detailed grading plan or the locations of pools and accessory structures are not required for the Vesting Tentative Tract Map.

Sub-items a. through e. and g. of Item 1 request information and details that is part of a formal grading plan. Upon approval of the Vesting Tentative Tract Map and subdivision, complete grading plans will be prepared for review by Building and Safety. Updated geologic and soils engineering reports will be prepared based on the formal grading and development plans for review by the Grading Division. The formal grading and development plans will show the limits of grading, proposed slopes, depths and limits of removal and recompaction, location of canyon subdrains, and accessory buildings.

Item 1f. - Section E extends offsite onto a flag lot with an address of 22345 Mulholland Drive (Lot 2, Tract 23496). Geotechnical reports specific to Lot 2 were not found in the records. The Grading Plan for Tract 23496, which was prepared by Vorheis Trindle Company, was located in the City of Los Angeles records. According to the grading plan, the pre-development terrain between Mulholland Drive and San Feliciano Drive consisted of an east-trending ridge, which is consistent with historical maps aerial photographs. The building pad on Lot 2 was created mostly as a "daylight cut" and the east-facing slopes were left in a natural condition. Based on the current topography and the grading, a cut/fill line was created and plotted onto the Geologic Map.

ADDITIONAL RESEARCH

Additional research was performed of Tract 23496, which was graded in the 1960's under the geotechnical guidance of the Donald R Warren Company (Warren) and the geologic guidance of Pacific Soils.

A description of the grading and the results of compaction testing are contained in the *Warren report, "Report on Compaction, Tract No. 23496, Lots 1-23, inclusive (Complete Tract), Mulholland and San Feliciano Drive, Los Angeles, California,"* dated March 21, 1962.

The Grading Division approved the fill for Primary Structural Support in their letter, dated March 21, 1962. The allowable bearing pressure of the fill was 1,000 psf.

Pacific Soils prepared a preliminary report for the tract in 1959 and provided general recommendation for grading and manufactured slopes. Removal excavations and the grading was observed by Pacific Soils who reported the bedrock to be favorably oriented for stability.

4606 San Feliciano (Lot 13, Tract 23496)

The J. Byer Group (Byer) explored 4606 San Feliciano in 1994, which is located north of Section E and above proposed Lots 15 and 16. The results of subsurface exploration, laboratory testing, and engineering analysis are contained in the Byer report, *"Geologic and Soils Engineering Exploration, Proposed Foundation Underpin and New Gazebo, 4606 San Feliciano Drive, Woodland Hills, California,"* dated March 16, 1994. Byer reported a variable thickness of compacted fill, soil, alluvium, over bedrock. Distress was attributed to differential settlement of fill. Byer prepared an addendum report, "*Response to City Review Letter, Proposed Underpinning, Lot 13, Tract 23496, 4606 San Feliciano Drive, Woodland Hills, California,"* dated March 6, 1995. The Grading Division approved the Byer report in their letter dated March 17, 1995 (Log #38912).

Copies of Byer's laboratory testing and the City approval letter are appended to this report.

22331 Mulholland Drive (Lot 1, Tract 23496)

California Geosystems (Geosystems) explored 22331 Mulholland Drive in 1995, which is located above proposed Lot 19. The results of subsurface exploration, laboratory testing, and engineering analysis are contained in the Geosystems report, *"Preliminary Soils Engineering Geologic Investigation of Earthquake Distress, Lot 1, Tract 23496, 22331 Mulholland Drive, Los Angeles, California,"* dated April 13, 1995. Geosytems reported 15 to 20 feet of compacted fill, soil, alluvium, over bedrock. The bedrock was reported to be favorable for stability. Earthquake distress was attributed to differential settlement of the fill. The Grading Division approved the Geosystems report in their letter dated May 3, 1995 (Log #39292).

Copies of Geosystem's laboratory testing and the City approval letter are appended to this report.

Item 2 - An additional boring (Boring 5) was drilled on the upper pad on June 28, 2017 with the aid of a hollow-stem auger drill rig. Representative samples of the earth materials were retrieved from the boring and transferred to the soils testing laboratory of Soil Labworks, LLC. A continuous core from the boring was logged by staff and shown on the Log of Borings. The angles of the dip of bedding were measured to range from 13 to 20 degrees.

The additional repeat-shear testing was performed in the samples that contained well-developed bedding. The results of the shear testing are appended to this report. The additional shear testing resulted in residual higher strengths than assumed for bedding in the calculations within the preliminary report. The range of the anisotropic function has been increased to include a weaker strength between 7 and 20 degrees.

Item 3 - Bedrock slopes offsite and above the southwestern portion of the development are locally as steep as 0.9:1 and average 1:1. Compacted fill slopes offsite and above the southwestern portion of the development are locally as steep as 0.9:1 average 1.5:1. Non documented fill slopes located offsite within the Mulholland Drive right-of-way are locally as steep as 1.1:1 and average 1.5:1.

SUMMARY OF SURFICIAL STABILITY		
Earth Material	Slope Gradient	Safety Factor
Compacted Fill (Warren)	1.5:1 (34 degrees)	>1.5
Compacted Fill (Warren)	0.9:1 (48 degrees)	1.34
Bedrock	0.9:1 (48 degrees)	>1.5
Undocumented Fill	1.5:1 (34 degrees)	1.34
Undocumented Fill	1.1:1 (42 degrees)	1.17

The non-conforming fill and bedrock slopes are located offsite and cannot be mitigated through grading. A 3-foot slough wall is recommended along the tract boundary where located below non-conforming slopes. Typical slough walls are shown on the Geologic Map. The slough wall should have 3 feet of freeboard designed for an equivalent fluid pressure of 125 pcf.

One building site (Lot 19) is located adjacent to the undocumented fill slope along Mulholland Drive, and the residence is planned about 39 feet from the tract boundary (55 feet from the toe of slope). The residence planned for Lot 19 is also located at least 20 feet from the toe of the non-conforming compacted fill slope.

Item 4 - Slope stability analysis of Section C were revised to include circular- and planar-type failures. As discussed above, the range of the anisotropic function for bedding was increased to 7 to 20 degrees.

Item 5 - Foundations for new buildings will not be able to surcharge the existing storm drain. The mat foundations recommended for Lots 10, 18, 19, and 14 through 17 will have to be deepened as needed to derive support in compacted fill below a 1:1 plane projected up tangentially from the storm drain. Section A has been revised to shown a typical stepped mat. The removal and recompacted will have to be deepened as needed to maintain a 3-foot thick compacted fill cap beneath the mat.

Item 6 - There is no historical data to determine the shallowest groundwater level. Byer assumed a depth to groundwater of 16 feet in their analyses, which were approved by the Department as referenced in the preliminary report. A depth of 15 feet used for this project is considered reasonable for the site and the known geotechnical data.

Item 7 - The Grading Plan has been revise to show a conforming dispersal wall. As shown on the Geologic Map, a retaining wall is planned along the downhill sides of pads on Lots 2 through 4. A 40-foot dispersal wall is now shown extending from the north end of the retaining wall. Drainage from portions of Lots 1 through 4 will be conveyed to the dispersal wall, where it will be dispersed to gently sloping terrain. Dispersal walls should conform to Code Section 7013.7.

Item 8 - It is our understanding that the previous Vesting Tentative Tract Map was not approved by the Land Development Group (LDG) of the Bureau of Engineering (BOE) for issues pertaining to the width of the private street easement, proposed main line sewer alignment, and extending a service road within the Mulholland Drive right-of-way. From the available records, the Geotechnical Engineering Group (GEO) does not appear to have reviewed plans and geotechnical reports and they have not issued letters. Furthermore, there are no reports from Byer (previous consultant) providing design recommendations to or responding to GEO review/correction letters. The attached May 4, 2009 Interdepartmental Correspondence from LDG to Department of City Planning provides general grading requirements and conditions (12a through 12i) that shall be implemented and indicates that the Byer report of July 20, 2006 should be implemented where not in conflict with conditions 12a through 12i. Condition 12k indicates that GEO is to review grading and foundation plans as to their affects on the City right-of-way and infrastructure.

Item 9 - Byer sampled and tested clay deposits in Boring 1 at depths of 15 and 20 feet, Boring 7 at depths of 20 and 25 feet, and Boring 11 at a depth of 20 feet. The settlement properties were measured on their consolidation diagrams, which were appended to our update report. An additional boring (IG B6) was drilled near Byer B6 on June 28, 2017, and the boring log is appended to this report. Irvine Geotechnical Boring 6 encountered 17½ feet of sandy and silty clay over bedrock. The clay was observed to be medium firm to stiff. Consolidation tests were performed at depths of 10, 15, 20 and 25 feet, with the results attached to the laboratory testing section of this report. The dry densities, void ratios and coefficients of consolidation are similar to those reported by Byer.

Based on the grading plan, Lots 5 through 9 and 11 through 19 will be lowered or raised within 4 feet of the existing ground surface. Also, the existing 6 to 9 feet of fill will be removed and replaced with compacted fill. Where the grade is not raised by more than 4 feet, the change in stress within the native alluvium below the fill is expected to be negligible. For Lot 10, the grade will be raised up to 8 feet in elevation, and the net increase in stress is expected to induce strain and consolidation. It is recommended that Lot 10, or any other lot raised more than 4 feet above the original ground surface, be surveyed for at least 6 months to ensure grading-induced settlement has ceased. A cessation of settlement is defined at least 3 consecutive months of no measurable settlement.

The settlement of mat foundations over compacted fill and clayey alluvium was estimated using Jambu's method. The building footprints shown on the grading plans are 20 feet by 20 feet. The thickness of compacted fill and alluvium is estimated to average 26 feet. For a 20-foot square mat and 26 feet of soil, the u_0 and u_1 coefficients are estimated to be 0.70 and 0.91, respectively. Young's modulus for medium clay is assumed to be 400 ksf. For a bearing pressure of 2 ksf (recommended in preliminary report), the computed settlement of the mat is 0.764 inches. For a bearing pressure of 1.5 ksf, the computed settlement is 0.573 inches.

Item 10 - Mat foundations were recommended to support residential structures in the main canyon on Lots 5 through 19. The secondary canyon was found to not be susceptible to liquefaction (Boring 3), which is consistent with mapping by the CGS. Conventional foundations and slabs are considered appropriate to support structures on Lots 1 through 4, which are underlain a relatively thin deposit of alluvium over bedrock.

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

Respectfully submitted,
Irvine Geotechnical, Inc.

REGISTERED PROFESSIONAL ENGINEER
JON ALAN IRVINE
GE 2891
Exp. 6-30-18
GEOTECHNICAL
STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST
JON ALAN IRVINE
CERTIFIED ENGINEERING GEOLOGIST
EG 1691
Exp. 12-31-18
STATE OF CALIFORNIA

Jon A. Irvine
E.G. 1691/G.E. 2891
R:\ICprojects\IC17036 Harridge San Feliciano\IC17036 Harridge San Feliciano Addendum Save.wpd

Enc: Appendix I - Laboratory Testing by Soil Labworks
Shear Test Diagrams (Plates B-3 through B-6)
Consolidation Diagrams (C-1 through C-4)
Appendix II - Research, Laboratory Testing and Exploration by Others
Geology and Soils Report Correction Letter, Log #97648, dated May 23, 2017
Correspondence from BOE
Calculation Sheets (19)
In pocket: Geologic Map and Sections A through E

xc: (3) Addressee

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 Juhly 18, 2017 and the results appear to be reasonable for this area of the Santa Monica Mountains. Irvine Geotechnical and the undersigned engineer concurs with the findings of Soil Labworks, LLC and accepts professional responsibility for utilizing the data.

SOIL LABWORKS LLC

SL17.2401
July 18, 2017

Irvine Geotechnical
145 N. Sierra Madre Boulevard
Suite 1
Pasadena, California 91107

Subject: Laboratory Testing

Site: 22255 Mulholland Drive
Woodland Hills, California

Job: IRVINE/HARRIDGE

Reference: Laboratory Testing, Soil Labworks, LLC., March 30, 2017

Laboratory testing for the subject property was performed by Soil Labworks, LLC., under the supervision of the undersigned Engineer. Previous work is presented in the referenced report. 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 ALAN IRVINE
GE 2891
Exp. 6-30-18
GEOTECHNICAL
STATE OF CALIFORNIA

JON A. IRVINE
G.E. 2891

Enc: Appendix

SOIL LABWORKS LLC

APPENDIX

Laboratory Testing

Sample Retrieval - Drill Rig

Samples of earth materials were obtained at frequent intervals by driving a thick-walled steel sampler conforming to the most recent 2016 version of ASTM D 3550-01 (2007)(withdrawn 2016) 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. Standard Penetration Tests (SPT) were performed at discrete intervals within the 8 inch diameter, hollow stem auger borings drilled on the site. The tests were performed using the 1-3/8 inch inside diameter, split-barrel sampler in accordance with ASTMD1586-11. Standard penetration test samples were retained in air-tight bags.

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 2937-17. The moisture content was determined as a percentage of the dry soil weight conforming to ASTM 2216-10. The results are presented below in the following table. The percent saturation was calculated on the basis of an estimated specific gravity. Description of earth materials used in this report and shown on the attached Plates were provided by the client.

Test Pit/Boring No.	Sample Depth (Feet)	Soil Type	Dry Density (pcf)	Moisture Content (percent)	Percent Saturation (G_s=2.65)
B5	5	Bedrock	117.6	11.3	74
B5	10	Bedrock	97.3	8.7	33
B5	15	Bedrock	111.2	5.0	27
B5	20	Bedrock	103.6	9.5	42
B5	25	Bedrock	104.8	10.6	48
B5	28	Bedrock	99.7	10.7	43
B6	5	Alluvium	96.4	8.2	30
B6	10	Alluvium	88.3	15.1	46
B6	15	Alluvium	93.1	20.6	70
B6	20	Alluvium	91.2	29.9	97
B6	25	Alluvium	97.0	27.1	100

2500 Townsgate Road, Suite E, Westlake Village, California 91361
(805) 370-1338 FAX (805) 371-4693

SHEAR DIAGRAM B-3

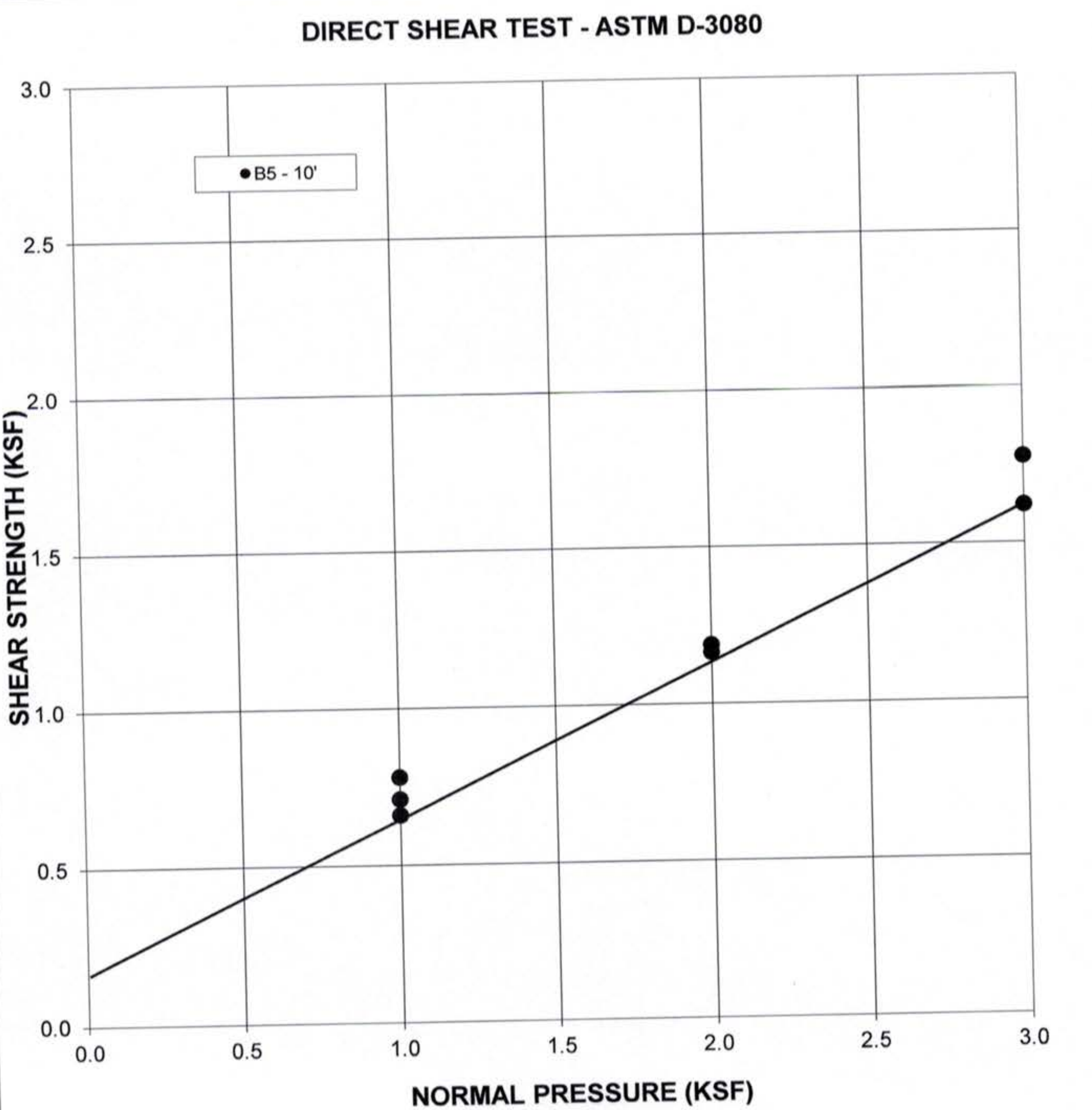
JN: **SL17.2401** CONSULTANT **JAI**
CLIENT: **Irvine/Harridge-22255 Mulholland**

EARTH MATERIAL: **BEDROCK**

Sample repeatedly sheared to determine residual strength.

	RESIDUAL	
Phi Angle	26	degrees
Cohesion	160	psf

Average Moisture Content	26.3%
Average Dry Density (pcf)	97.3
Percent Saturation	99.6%



SHEAR DIAGRAM B-4

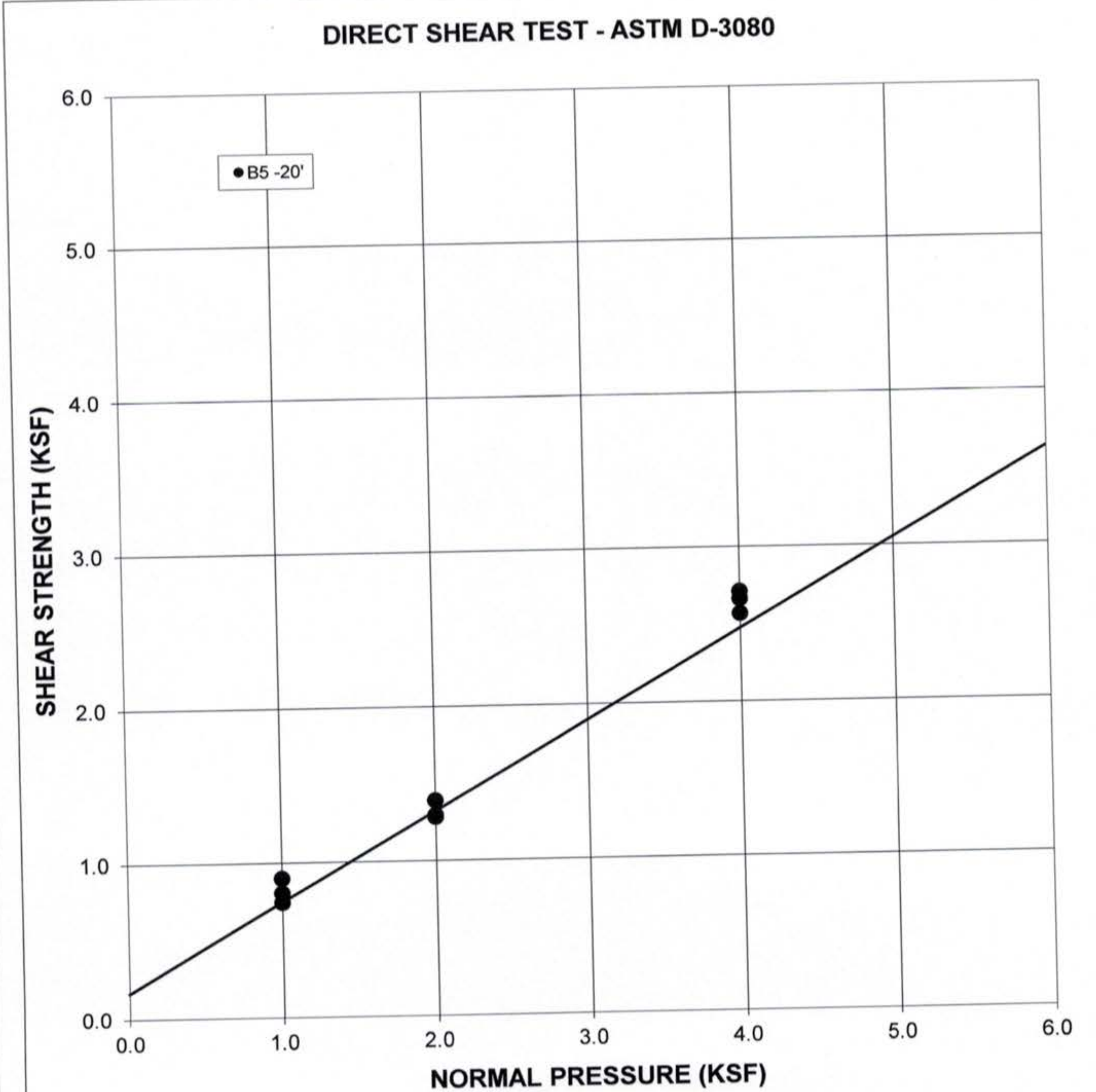
JN: SL17.2401 CONSULTANT JAI
CLIENT: Irvine/Harridge-22255 Mulholland

EARTH MATERIAL: BEDROCK

Sample repeatedly sheared to determine residual strength.

	RESIDUAL	
Phi Angle	30	degrees
Cohesion	190	psf

Average Moisture Content	23.5%
Average Dry Density (pcf)	103.6
Percent Saturation	100.0%



SOIL LABWORKS LLC

SHEAR DIAGRAM B-5

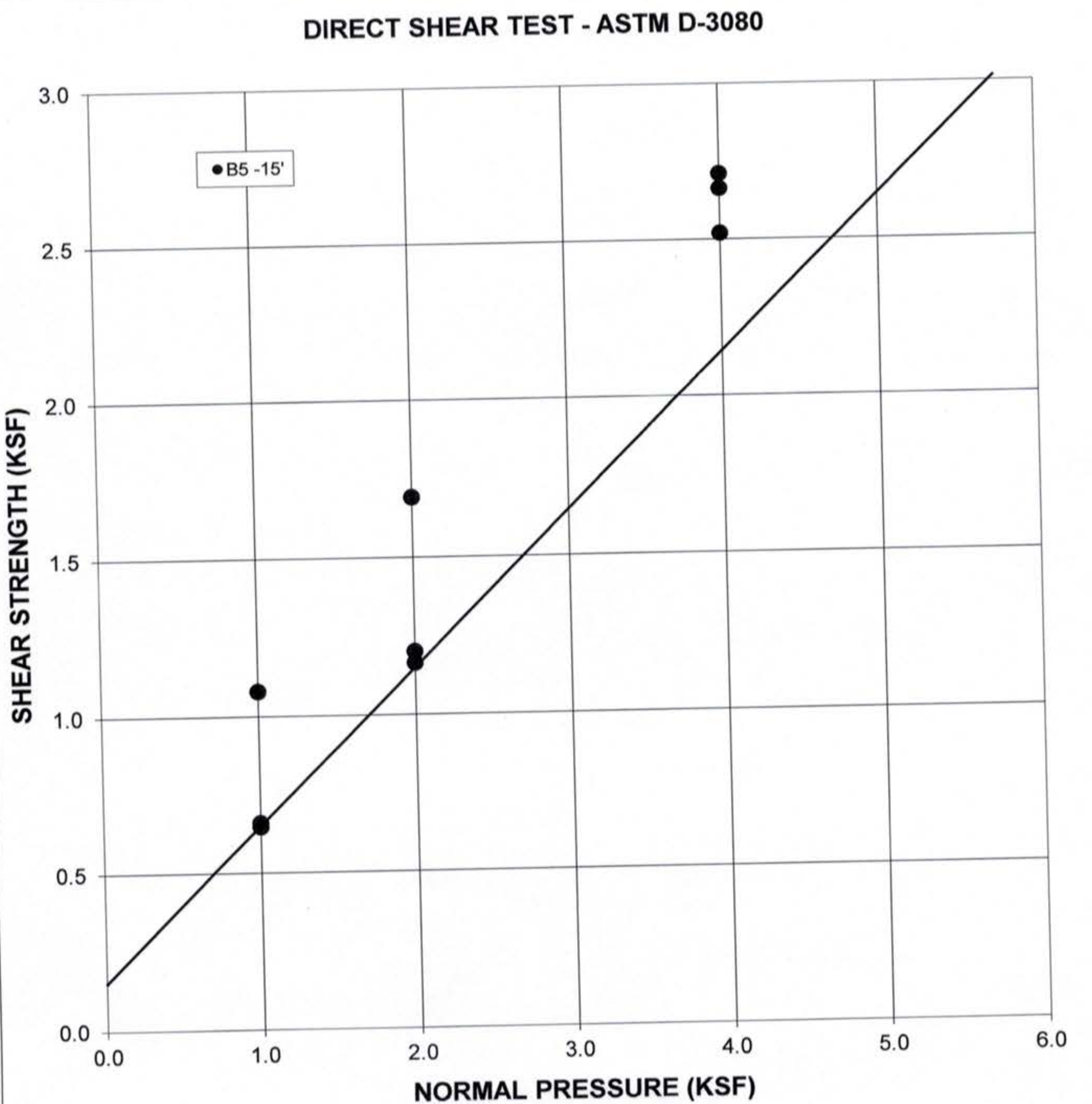
JN: **SL17.2401** CONSULTANT **JAI**
CLIENT: **Irvine/Harridge-22255 Mulholland**

EARTH MATERIAL: **BEDROCK**

Sample repeatedly sheared to determine residual strength.

	RESIDUAL	
Phi Angle	45	degrees
Cohesion	170	psf

Average Moisture Content	18.9%
Average Dry Density (pcf)	111.2
Percent Saturation	100.0%



SHEAR DIAGRAM B-6

SOIL LABWORKS LLC

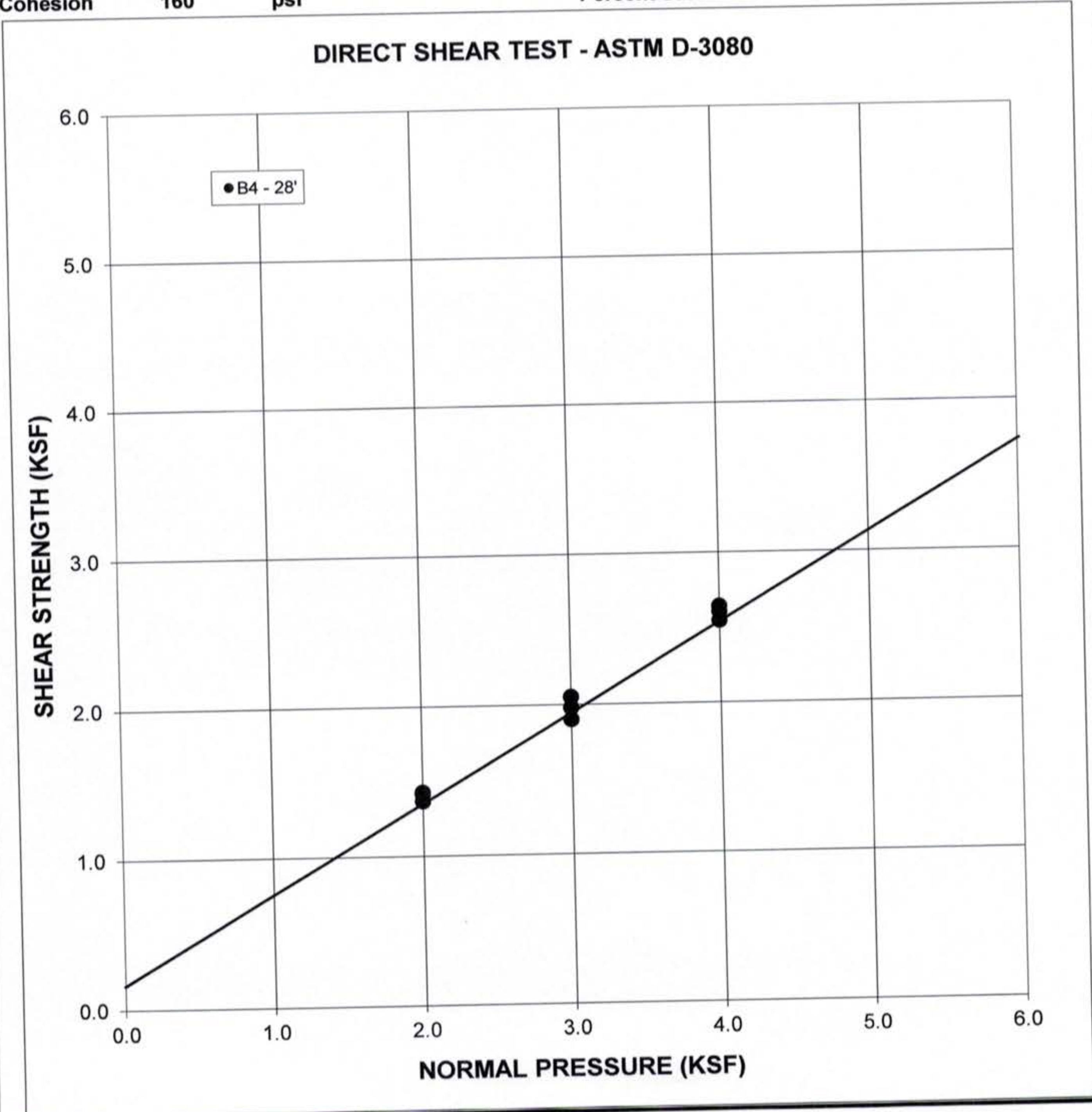
JN: **SL17.2401** CONSULTANT **JAI**
CLIENT: **Irvine/Harridge-22255 Mulholland**

EARTH MATERIAL: **BEDROCK**

Sample repeatedly sheared to determine residual strength.

	RESIDUAL	
Phi Angle	**31**	**degrees**
Cohesion	**160**	**psf**

Average Moisture Content	**25.0%**
Average Dry Density (pcf)	**99.7**
Percent Saturation	**100.0%**

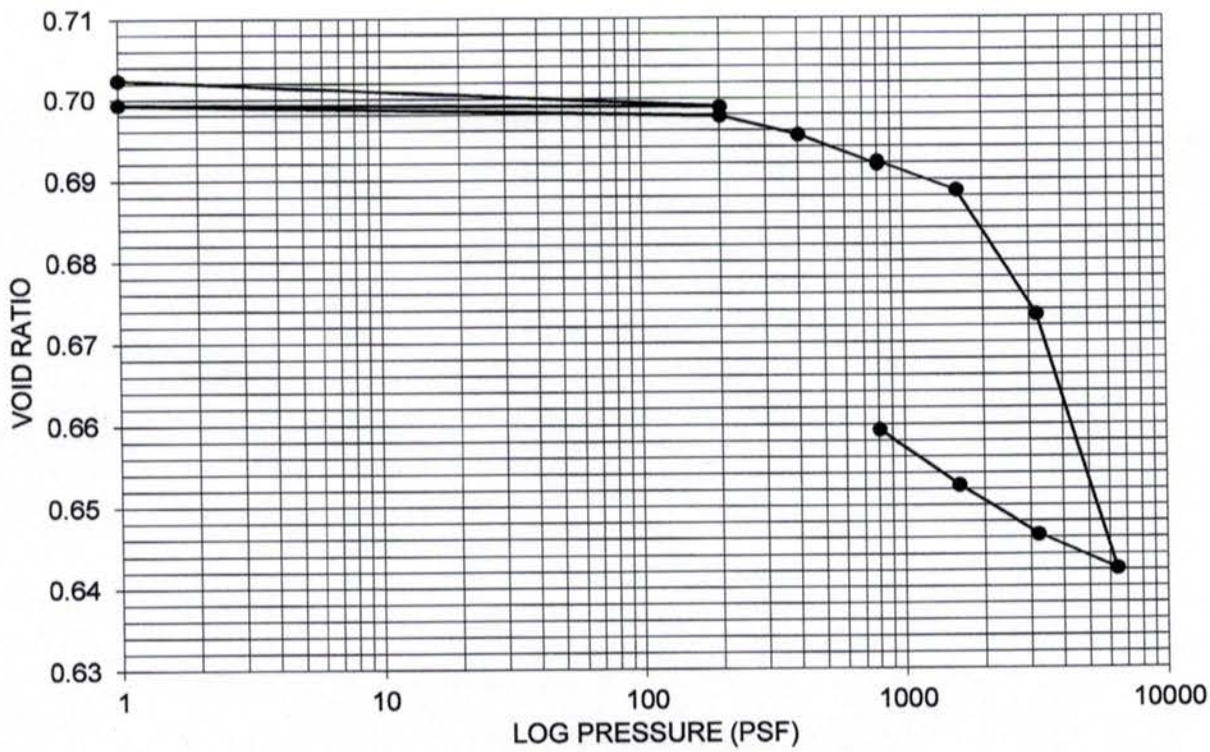


SOIL LABWORKS LLC	**CONSOLIDATION DIAGRAM #1**
	IC: **SL17.2401** CONSULTANT: **JAI**
	CLIENT: **Irvine\Harridge-22255 Mulholland**

PLATE C-1

Earth Material:	ALLUVIUM		
Sample Location:	B6-10	Specific Gravity:	2.55
Dry Weight (pcf):	93.5	Initial Void Ratio:	0.702
Initial Moisture:	8.7%	Water Added At (psf):	800
Initial Saturation:	31.6%	Consolidation Coef. (Cc):	0.1035
		Reloading Coef. (Cr):	0.0168

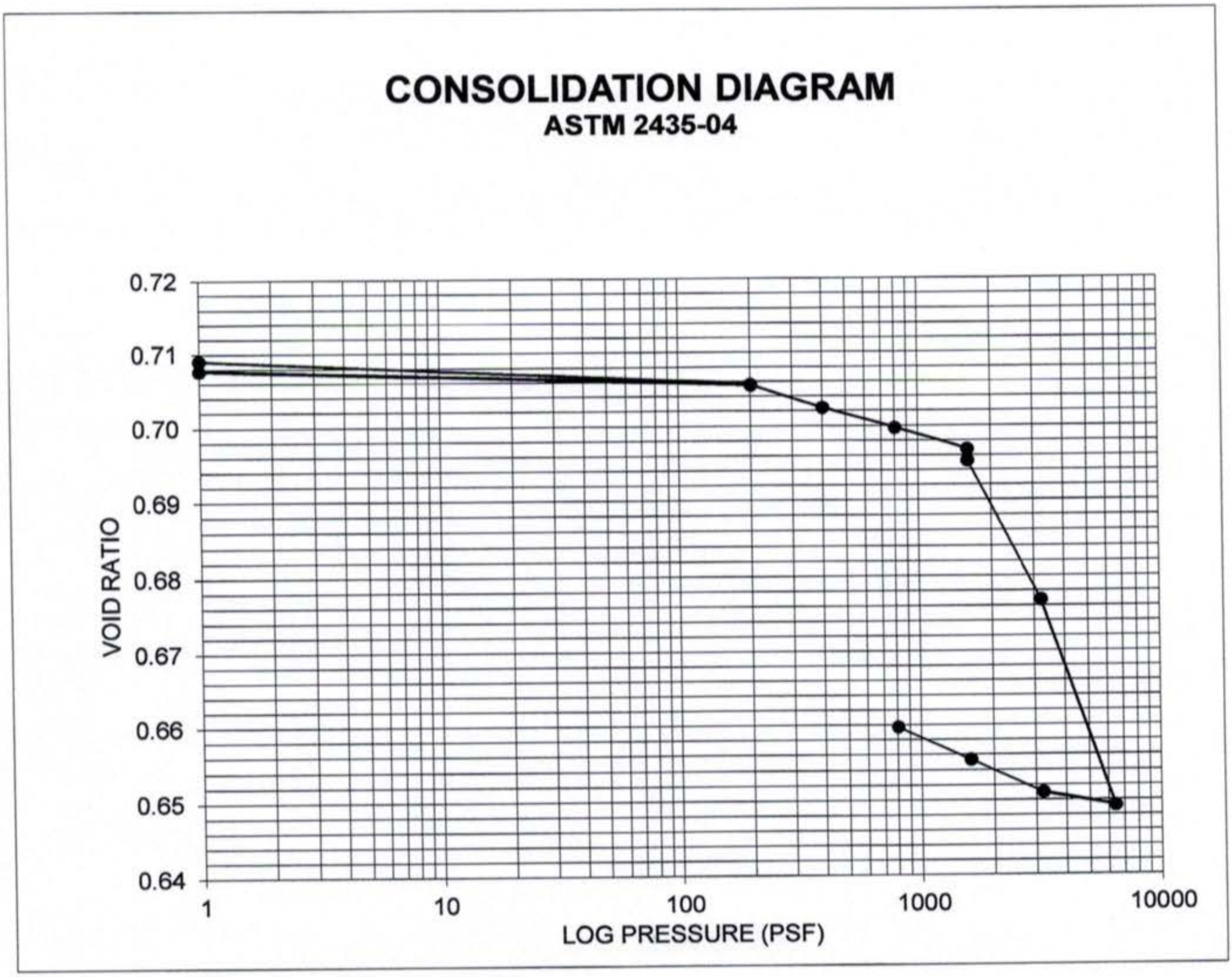
CONSOLIDATION DIAGRAM
ASTM 2435-04



SOIL LABWORKS LLC	CONSOLIDATION DIAGRAM #2
	IC: SL17.2401 CONSULTANT: JAI CLIENT: Irvine\Harridge-22255 Mulholland

PLATE C-2

Earth Material:	ALLUVIUM		
Sample Location:	B6-15	Specific Gravity:	2.55
Dry Weight (pcf):	93.1	Initial Void Ratio:	0.709
Initial Moisture:	20.6%	Water Added At (psf):	1600
Initial Saturation:	74.1%	Consolidation Coef. (Cc):	0.0914
		Reloading Coef. (Cr):	0.0091



SOIL LABWORKS LLC

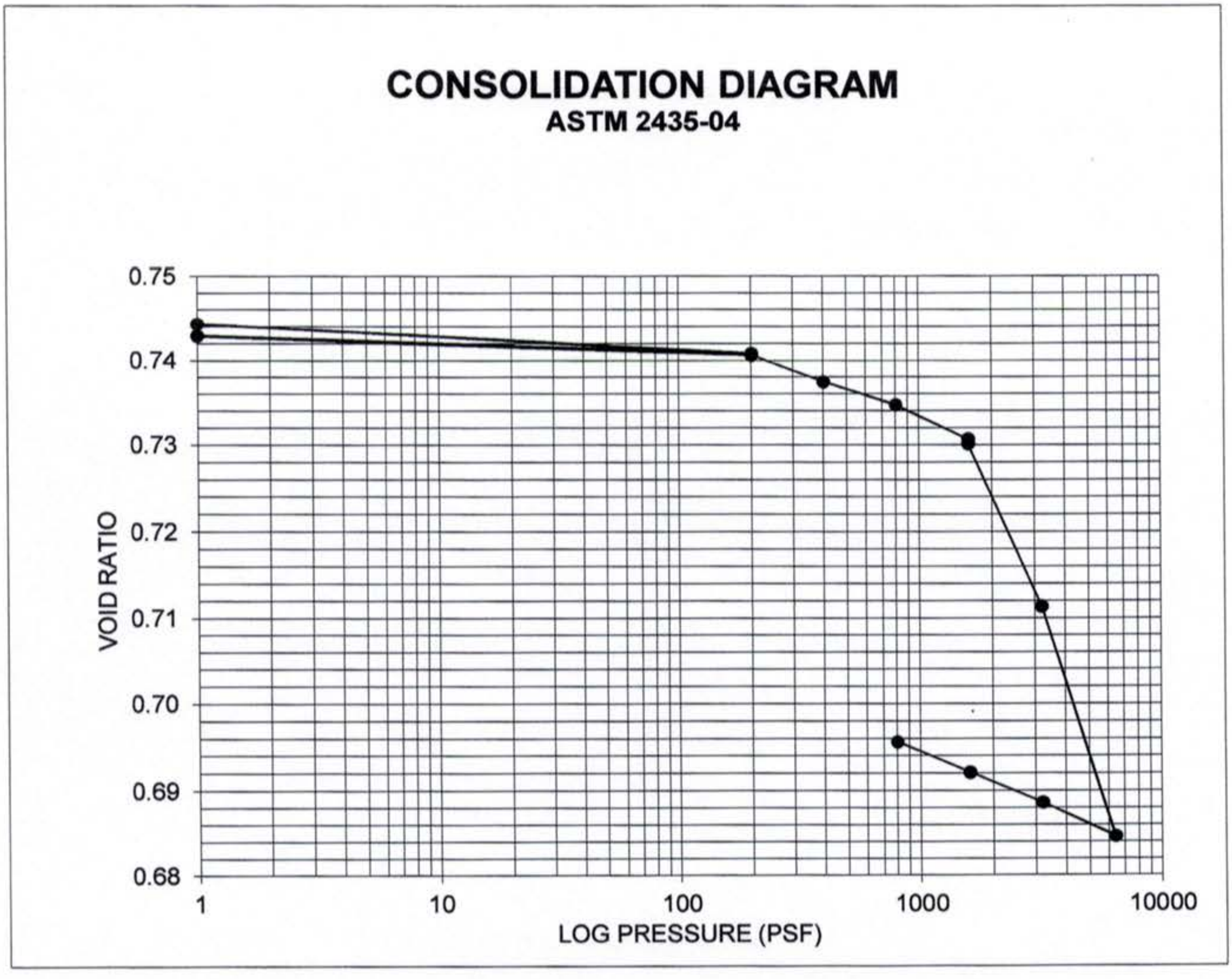
CONSOLIDATION DIAGRAM #3

IC: **SL17.2401** CONSULTANT: **JAI**

CLIENT: **Irvine\Harridge-22255 Mulholland**

PLATE C-3

Earth Material:	ALLUVIUM		
Sample Location:	B6-20	Specific Gravity:	2.55
Dry Weight (pcf):	91.2	Initial Void Ratio:	0.744
Initial Moisture:	29.9%	Water Added At (psf):	1600
Initial Saturation:	102.4%	Consolidation Coef. (Cc):	0.0887
		Reloading Coef. (Cr):	0.0127



SOIL LABWORKS LLC

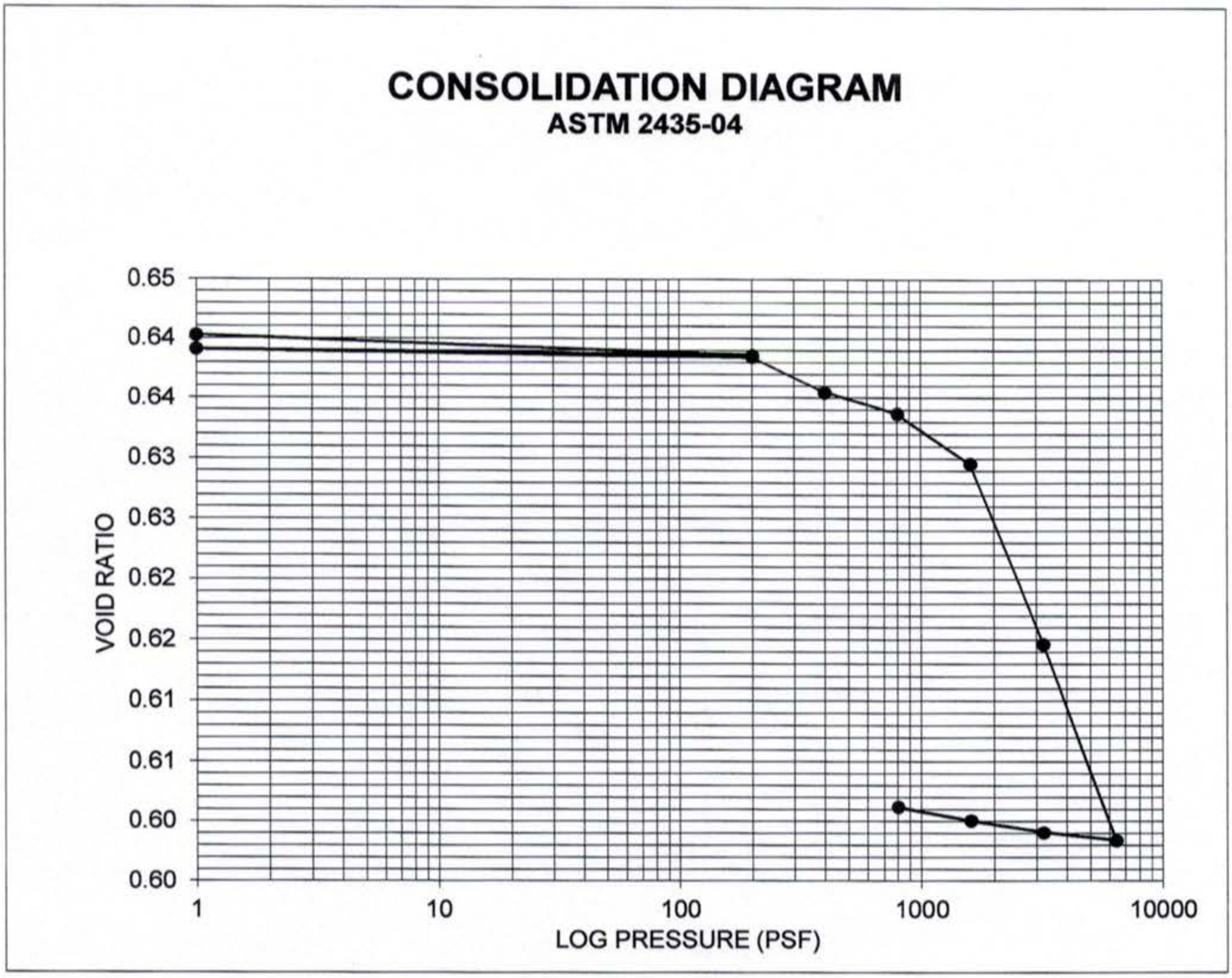
CONSOLIDATION DIAGRAM #4

IC: SL17.2401 CONSULTANT: JAI

CLIENT: Irvine\Harridge-22255 Mulholland

PLATE C-4

Earth Material:	ALLUVIUM		
Sample Location:	B6-25	Specific Gravity:	2.55
Dry Weight (pcf):	97.0	Initial Void Ratio:	0.640
Initial Moisture:	27.1%	Water Added At (psf):	1600
Initial Saturation:	107.9%	Consolidation Coef. (Cc):	0.0539
		Reloading Coef. (Cr):	0.0027



CITY OF LOS ANGELES

CALIFORNIA

ERIC GARCETTI
MAYOR

DEPARTMENT OF
BUILDING AND SAFETY
201 NORTH FIGUEROA STREET
LOS ANGELES, CA 90012

FRANK M. BUSH
GENERAL MANAGER
SUPERINTENDENT OF BUILDING

OSAMA YOUNAN, P.E.
EXECUTIVE OFFICER

GEOLOGY AND SOILS REPORT REVIEW LETTER

May 23, 2017

LOG # 97648
SOILS/GEOLOGY FILE - 2
LIQ

San Feliciano Holding Company, LLC
22255 W. Mulholland Drive
Los Angeles, CA 91364

PROPOSED LEGAL: Vesting Tentative Tract VTT-67505, Lots 1 through 19
CURRENT LEGAL: Tract 1000, Portion of Lot 1083 (Arbs. 7 and 8)
LOCATION: 22255 W. Mulholland Drive (aka 22241 W. Mulholland Drive)

CURRENT REFERENCE REPORT/LETTER(S)	REPORT No.	DATE OF DOCUMENT	PREPARED BY
Geology/Soils Report	IC 17036-I	04/06/2017	Irvine Geotechnical, Inc.
Oversized Documents	``	``	``
Laboratory Test Report	SL17.2401	03/30/2017	Soil Labworks, LLC

PREVIOUS REFERENCE REPORT/LETTER(S)	REPORT No.	DATE OF DOCUMENT	PREPARED BY
Dept. Correction Letter	--	04/13/2016	LADBS
Dept. Approval Letter	58932	08/10/2007	"
Geology/Soil Report	JB 19553-Z	07/20/2006	The J. Byer Group
Dept. Approval Letter	51978	03/29/2006	LADBS
Geology/Soil Report	JB 19553-Z	03/22/2005	The J. Byer Group

The Grading Division of the Department of Building and Safety has reviewed the current reference reports that provide recommendations for a proposed 19 lot subdivision (VTT-67505). The proposed subdivision is located in a partially filled canyon with steep side slopes as steep as 1:1. The earth materials at the subsurface exploration locations consist of up to 10.5 feet of uncertified fill underlain by up to 25 feet of alluvium and Modelo Formation sandstone, siltstone and claystone bedrock. The consultants recommend to grade all site slopes to no steeper than 2H:1V and support the proposed structures on conventional and/or mat-type foundations bearing on a blanket of properly placed fill a minimum of 3 feet thick.

The site is located in a designated liquefaction hazard zone as shown on the Seismic Hazard Zones map issued by the State of California.

The review of the subject reports cannot be completed at this time and will be continued upon submittal of an addendum to the report which shall include, but not be limited to, the following:

(Note: Numbers in parenthesis ( ) refer to applicable sections of the 2017 City of LA Building Code. P/BC numbers refer the applicable Information Bulletin. Information Bulletins can be accessed on the internet at LADBS.ORG.)

1. Provide a geologic map that is based upon the proposed subdivision map that shows how all existing site slopes will be graded to 2H:1V, as recommended. In addition, the geologic map and cross sections shall show the following:

   a. Limits of the proposed over excavation and re-compaction recommended by the consultants.

   b. Location of all proposed shoring and slot cuts required to achieve the proposed removals and grading.

   c. Location of the proposed canyon subdrain(s).

   d. H/2 structure slope setbacks. Note: Lot 5 does not appear to have the required slope setback.

   e. All proposed grading within the adjacent street right-of-ways including all recommended remedial grading to support safe and stable access.

   f. Clarify whether the up to 0.9H:1V slope above proposed lots 17-19 is a fill slope or bedrock slope. Note: The previous Byer report and Irvine Geologic Map indicates the slope is a fill slope and the Irvine Section E indicates the slope is a bedrock slope.

   g. Location of all proposed pools and accessory structures.

2. It is unclear how the anisotropic bedding angle range of 7 to 15 used in the slope stability analysis was determined. Bedding on regional geologic maps appears to range from 12 to 20 in the area of the site. The geologist shall determine the bedrock orientation with test pit exploration and/or field mapping and show the strikes and dips on the map. Provide deep exploration to expose all beds that will daylight in the proposed 2H:1V slopes; collect samples of the weakest bedrock material; and provided re-shear laboratory testing of the weakest bedrock sample for slope stability analysis. Note: Cal/OSHA regulations regarding shaft/tunnel safety shall be implemented prior to anyone entering deep borings or test pits.

3. Provide surficial stability analysis using appropriate shear strengths and soil thickness and indicate the evaluated factor of safety for the existing bedrock/fill slopes as steep as 0.9H:1V upslope of the proposed subdivision.

4. Revise the slope stability analyses to consider both planar and circular potential failure planes, the weakest material profile, and the critical geologic cross sections based on the revised tentative tract map.

5. It appears that the proposed foundations/improvements will surcharge the existing storm drain line. Provide recommendations so that the proposed improvements do not surcharge the existing utilities.

6. How was the assumed depth of 15 feet below the ground surface determined to be the high groundwater level?

7. How will the proposed dispersal wall be constructed along a contour as required by Figure F of Code Section 7013.7? What is the length of contour line affected by grading that the dispersal wall length must meet (7013.7, Figure F, Note 3)?

8. Provide copies of the approval from the Geotechnical Engineering Group (GEO) of the Department of Public Works, Bureau of Engineering for the subject Tentative Tract.

9. Some of the borings / CPTs encountered saturated soft clays (CPT-2, Byer B-6, Irvine B-4 etc.). Provide static settlement analysis considering structural loads, raising of site grades (in some cases), and settlement characteristics of these clays.

10. Due to the predicted liquefaction settlements, conventional spread footings shall not be used. Revise recommendations accordingly.

The geologist and soils engineer shall prepare a report containing an itemized response to the review items indicated in this letter. If clarification concerning the review letter is necessary, the report review engineer and/or geologist may be contacted. Two copies of the response report, including one unbound wet-signed original for archiving purposes, a pdf-copy of the complete report in a CD or flash drive, and the appropriate fees will be required for submittal.

CASEY LEE JENSEN
Engineering Geologist Associate II

YING LIU
Geotechnical Engineer I

CLJ/YL:clj/yl
Log No. 97648
213-482-0480

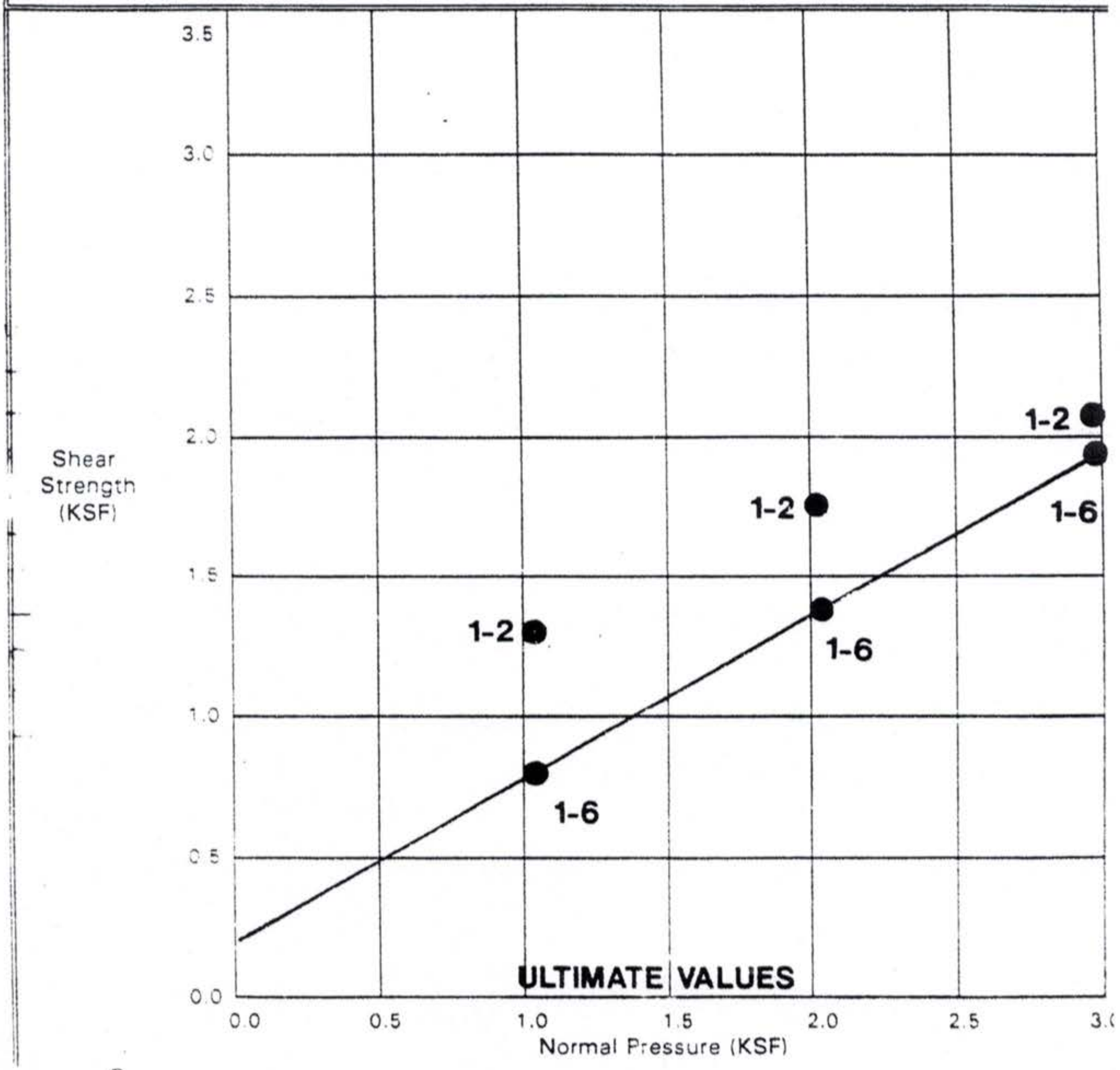
cc: Irvine Geotechnical, Inc., Project Consultant
Soil Labworks, LLC, Project Consultant
VN District Office

THE J. BYER GROUP, INC.
A Geotechnical Consulting Firm
512 E. WILSON AVENUE, SUITE 201
GLENDALE, CALIFORNIA 91206
(818) 549-9959 FAX: (818) 543-3747

SHEAR TEST DIAGRAM # 1

JB: **15812-Z BRELIANT**

SAMPLE: **TP 1-2.5', 6' FILL**



○ Direct Shear (Field Moisture)

● Direct Shear (Saturated)

Dry Density = 77.5pcf 10

Water Content = 42.2 23.

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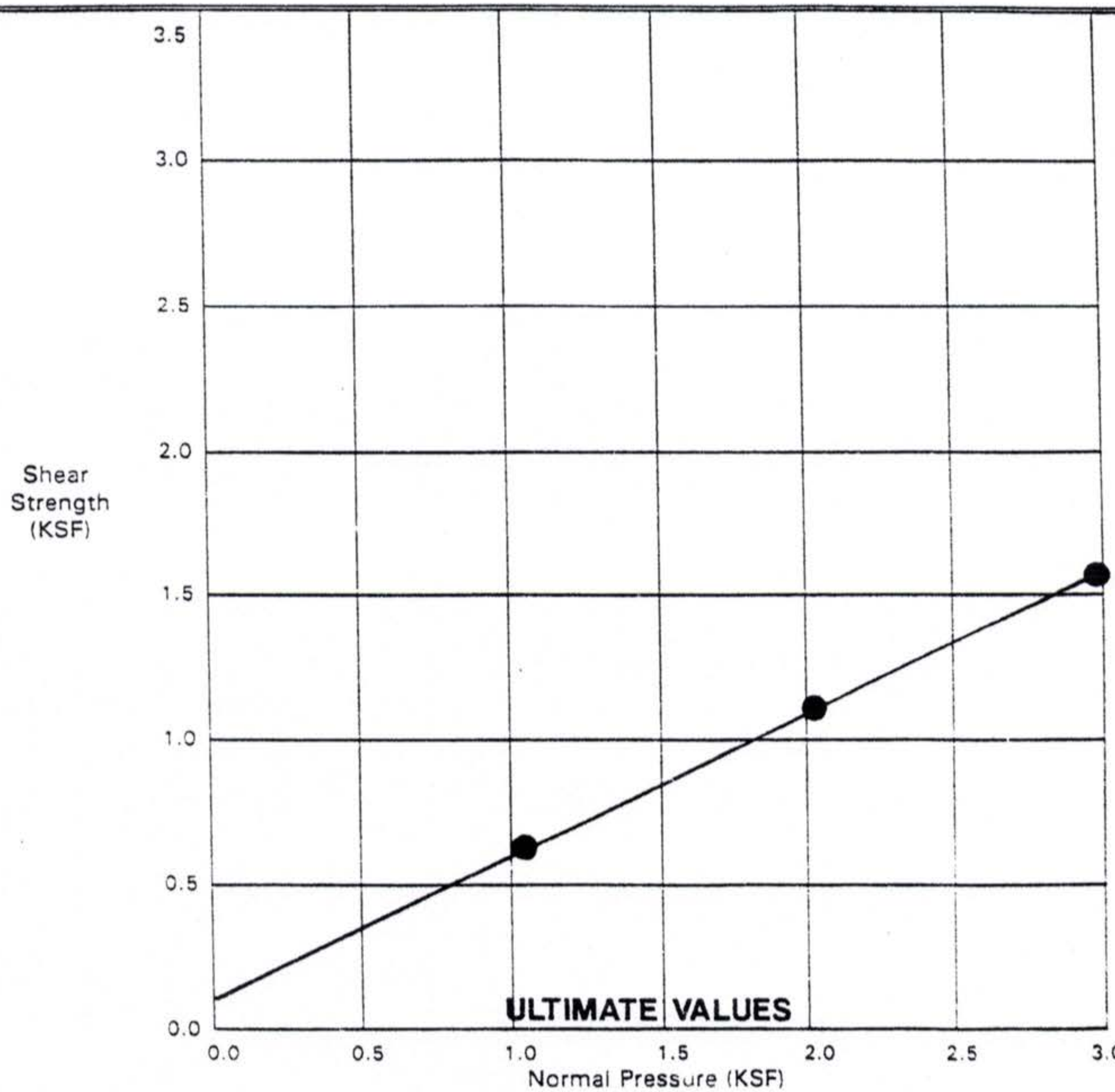
SHEAR TEST DIAGRAM # **2**

JB: **15812-Z BRELIANT**

SAMPLE: **TP 2-2' ALLUVIUM**



○ Direct Shear (Field Moisture)

● Direct Shear (Saturated)

Dry Density = **85.3** pcf

Water Content = **31.8** %

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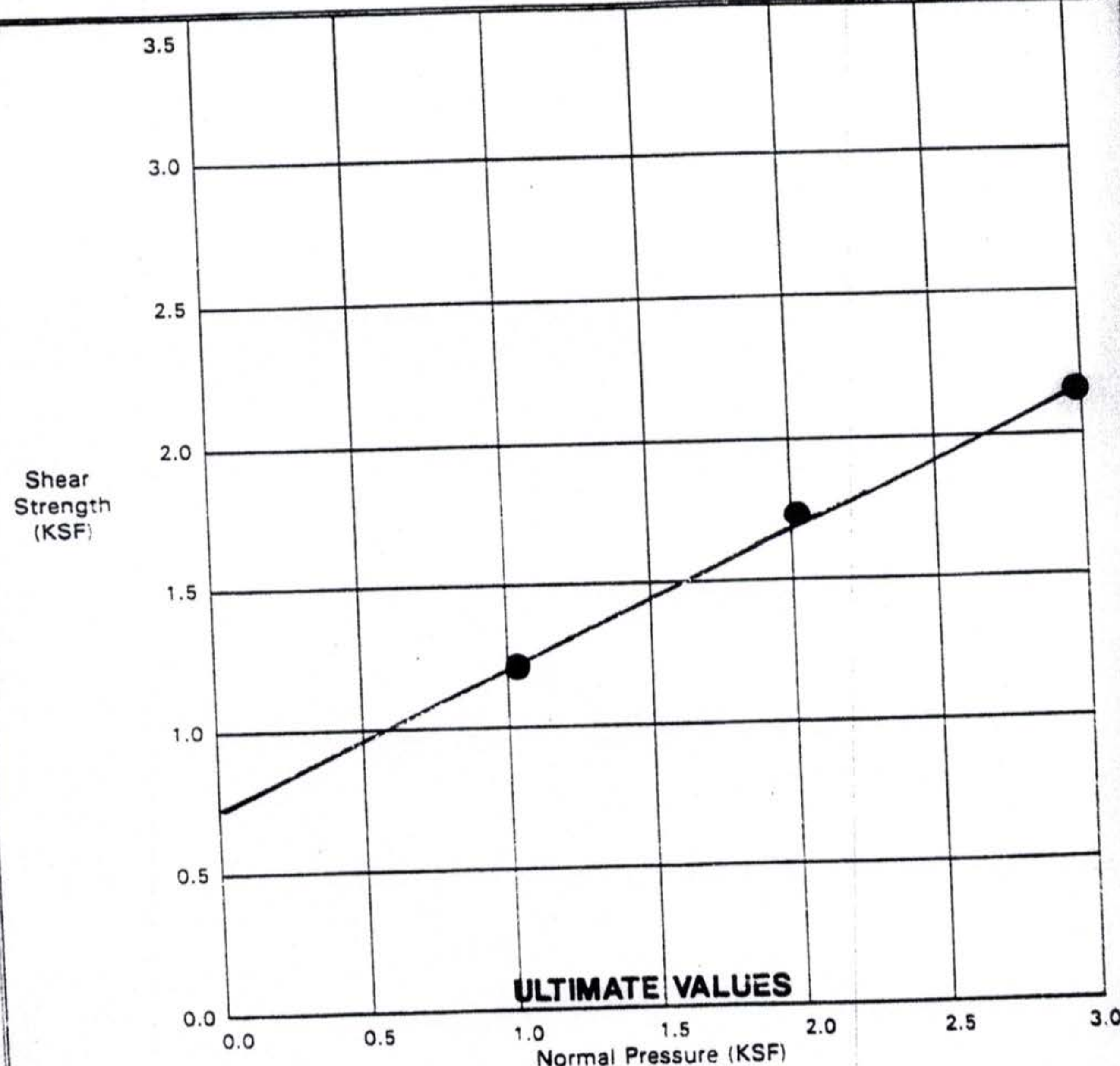
SHEAR TEST DIAGRAM # 3

JB: 15812-Z BRELIANT

SAMPLE: TP 3-5' BEDROCK



○ Direct Shear (Field Moisture)

● Direct Shear (Saturated)

Dry Density = 90.4 pcf

Water Content = 26.7 %

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GLENDALE, CALIFORNIA 91206
(818) 549-9959 FAX: (818) 543-3747

TEST PIT LOGS

JB: 15812-Z BRELIANT

GEOLOGIST: RIZ DATE LOGGED: 2/11/94

TEST PIT #1 - BRICK WALKWAY ADJACENT TO RESIDENCE

DEPTH INTERVAL (feet)	SAMPLE DEPTH (feet)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	EARTH MATERIAL	LITHOLOGIC DESCRIPTION
0 - ½				FILL:	(1 ½ inch diameter line below bricks parallel to footing) Sandy, silty clay with chips of shale, light olive brown, moist, moderately hard, occasional rocks to four inches 4 inch diameter black drain pipe from pool and brick walk area drains
	2 ½	77.5	26.4		
4 ½					Dark brown, sandy clay, moist, firm
6 ½	6	102.0	9.9		Start Hand Auger
8 - 9				SOIL:	Sandy Clay, dark brown, moist, firm
9 - 10				BEDROCK:	Sandstone and mudstone, light brown and light grey, thinly bedded, moderately hard

End at 10 feet; No Water; No Caving; Fill to 8 feet. Footing is 12 inches deep (14 inches below top of brick walk where footing has slid past original pour, ½ inch gap on downhill side of footing. Horizontal crack is at 19 inches above base of footing.

TEST PIT #2 - TOE OF SLOPE BELOW EAST SIDE OF RESIDENCE

DEPTH INTERVAL (feet)	SAMPLE DEPTH (feet)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	EARTH MATERIAL	LITHOLOGIC DESCRIPTION
0 - 1				FILL:	Clayey sand, mottled, light and dark olive brown, moist, firm, chips of rock
1 - 6½	2	85.3	16.2	ALLUVIUM:	Sandy, clayey silt, dark olive brown, very moist, soft, porous
4½	4	78.4	16.0		Begin hand auger
6½ - 7½				BEDROCK:	Sandstone and mudstone, light brown and light grey, thinly bedded, moderately hard

End at 7½ feet; No Water; No Caving; Fill to 10 feet.

TEST PIT #3 - BELOW WOOD GAZEBO

DEPTH INTERVAL (feet)	SAMPLE DEPTH (feet)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	EARTH MATERIAL	LITHOLOGIC DESCRIPTION
0 - 3				SOIL/COLLUVIUM:	Sandy silt, light olive, dry, slightly dense, very porous
3 - 5½	2	77.1	12.6	BEDROCK:	Mudstone with sandstone inter light grey, orange and olive, thinly bedded, moderately hard, moderately weathered, upper 1 foot very weathered and stained along fractures with calcium deposit
	5	90.4	10.6		

End at 5½ feet; No Water; No Caving; No Fill. Bedding N43E 8NW 12NW N53E

NOTE: The stratification depths shown on the Test Pit Logs are approximate and are based upon visual classification of samples and cuttings. The actual depths may vary. Variations between test pits may also occur.

DRILLING METHOD: LIMITED ACCESS RIG

SAMPLING METHOD:

WATER LEVEL: NONE

DRILLING CONDITIONS: NO CAVING

BORING NO. B-1

SHEET 1 OF 1

SURFACE CONDITIONS:

SAMPLE NO.	SAMPLE DEPTH	RECOVERY	BLOWS PER FOOT	TUBE	BULK
1	4'	BAG			/
2	5'	8"	21	/	
3	10'	8"	31	/	
4	15'	8"	32	/	
5	20'	8"	150	/	
6	25'	8"	160	/	

DEPTH IN FEET: 0 – 40 (SOIL GRAPH: B-1)

DESCRIPTION AND REMARKS	CLASSIFICATION, MOISTURE, TIGHTNESS, ETC.
@ 0- 17' (Af)	ARTIFICIAL FILL- TAN, SILTY SAND, MOIST, FIRM.
@ 5' (Af)	TAN SILTY SAND, FINE GRAINED, MOIST, FIRM.
@ 10' (Af)	DARK BROWN, SILTY DAND CLAY, DAMP, FIRM.
@ 15' (Af)	DARK BROWN, SILTY CLAY, FIRM, DAMP.
@ 17' (Tm)	MODELO FORMATION-
@ 19' (Tm)	TAN, SAND, MEDIUM TO FINE GRAINED, FRIABLE, MOIST.
@ 21'(B)N80E	38NW- TAN TO BROWN, TO GRAY CLAYSTONE, VERY FIRM, DAMP, MODELO FORMATION (Tm).
@ 25' T.D.	TOTAL DEPTH = 25 FEET.

CALIFORNIA GEOSYSTEMS
ENVIRONMENTAL AND GEOTECHNICAL CONSULTANTS

BORING LOG

SITE: 22331 MULHOLLAND DRIVE

DATE LOGGED: 6-16-94

GS 94-616

PLATE 4

DRILLING METHOD: LIMITED ACCESS RIG

SAMPLING METHOD: SPOON

WATER LEVEL: ______

DRILLING CONDITIONS: NO CAVING

BORING NO. B-2

SHEET 1 OF 1

SURFACE CONDITIONS:

SAMPLE NO.	SAMPLE DEPTH	RECOVERY	BLOWS PER FOOT	TUBE	BULK
1	5'	8"	7	/	
2	6'	BAG			BAG
3	10'	8"	25	/	
4	17'	8"	13	/	
5	24'	8"	35	/	
6	27'	BAG			/
7	29'	6"	51	/	
8	31'	8"	60	/	

DESCRIPTION AND REMARKS
CLASSIFICATION, MOISTURE, TIGHTNESS, ETC.

DEPTH	DESCRIPTION
@ 0- 20' (Af)	ARTIFICIAL FILL- TAN, SAND, FINE GRAINED, MOIST, SOFT.
@ 10' (Af)	TAN, SILTY SAND, FIRM, MOIST.
NOTE:	WOOD PIECES IN SAMPLE.
@ 12'	CEMENT & WOOD PIECES IN BUCKET.
@ 15'	BOULDERS - 12" DIAMETER.
@ 17' (Af)	TAN, SILTY SAND, FIRM, MOIST, WOOD & DEBRIS.
@ 19'	END OF FILL, DEBRIS & ROCKS (CEMENT).
@ 20'-31' (Tm)	MODELO FORMATION- BEDROCK- BROWN, CLAYSTONE, FIRM, MOIST.
@ 22' (Tm) (b) N60E26NW	BLACK, SILICEOUS, SILTSTONE, VERY HARD.
@ 26' (Tm) (b) N62E31NW	DARK BROWN, CLAYSTONE, FIRM, DAMP.
@ 27'	TAN TO GRAY SANDSTONE, FINE GRAINED, MOIST, VERY FRIABLE.
@ 31' T.D.	CLAYSTONE, SILTSTONE, FIRM, MOIST. TOTAL DEPTH = 31 FEET.

CALIFORNIA GEOSYSTEMS
ENVIRONMENTAL AND GEOTECHNICAL CONSULTANTS

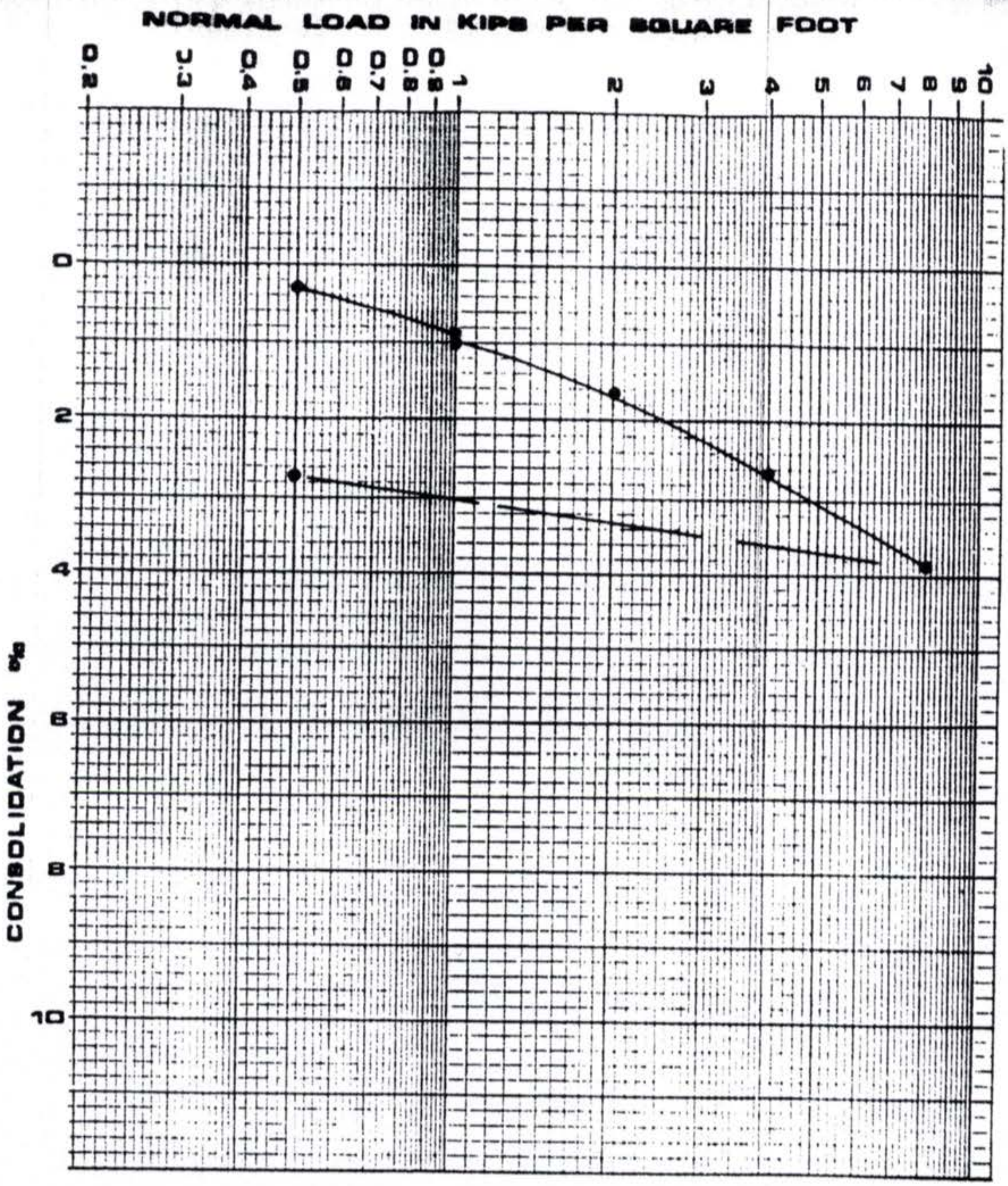
BORING LOG

SITE: 22331 MULHOLLAND DR.

DATE LOGGED: 6-16-94

GS94-616

PLATE 5



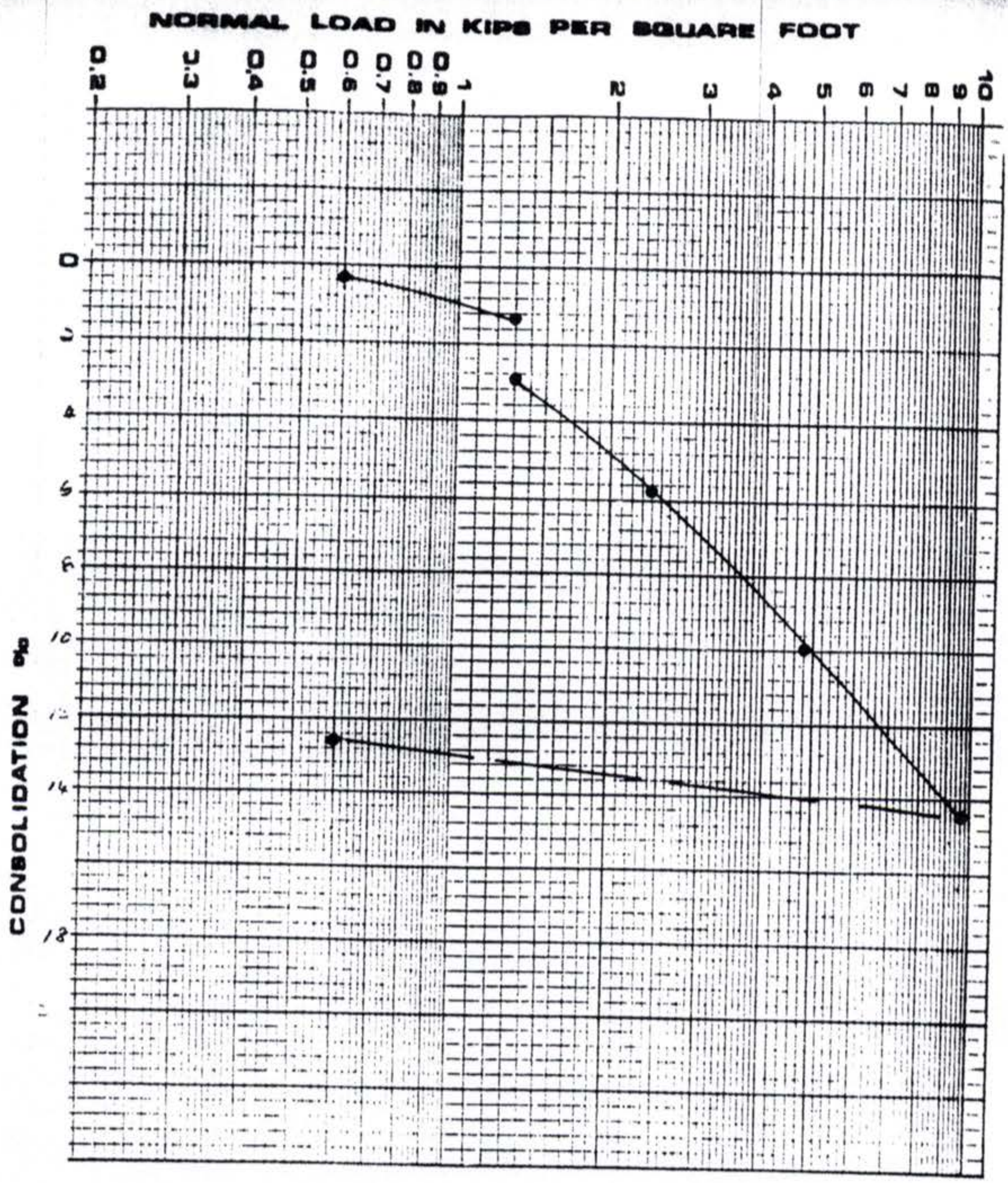
SAMPLE NO.: __________

PLOTTED BY: __________

CALIFORNIA GEOSYSTEMS

consolidation-pressure curve

DATE:	GS	PLATE 8



SAMPLE NO.: ____________

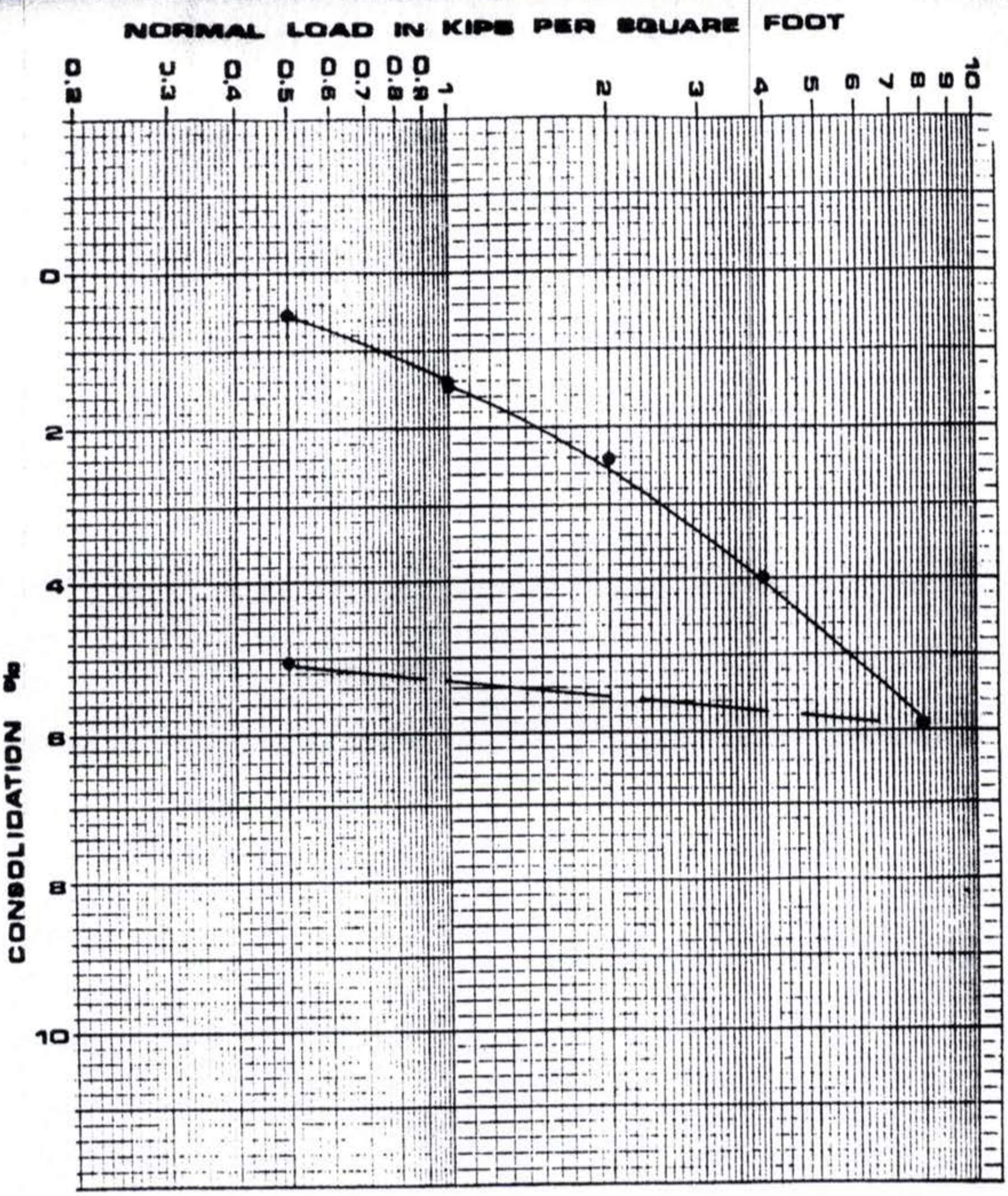
PLOTTED BY: ____________

Ws = ... PCF
wi = 18.0 %
wf = ...%

CALIFORNIA
GEOSYSTEMS

consolidation-pressure curve

DATE:	GS	PLATE 9



γ_d = 92.0 pcf

SAMPLE NO.: ____________________

PLOTTED BY: ____________________

CALIFORNIA GEOSYSTEMS ENVIRONMENTAL AND GEOTECHNICAL CONSULTANTS 112 WESTERN AVE. GLENDALE, CA	consolidation-pressure curve

DATE:	GS	PLATE 10

DIRECT SHEAR TEST

SITE: 23331 MULHOLLAND DR. JOB NO.: GS 94-616

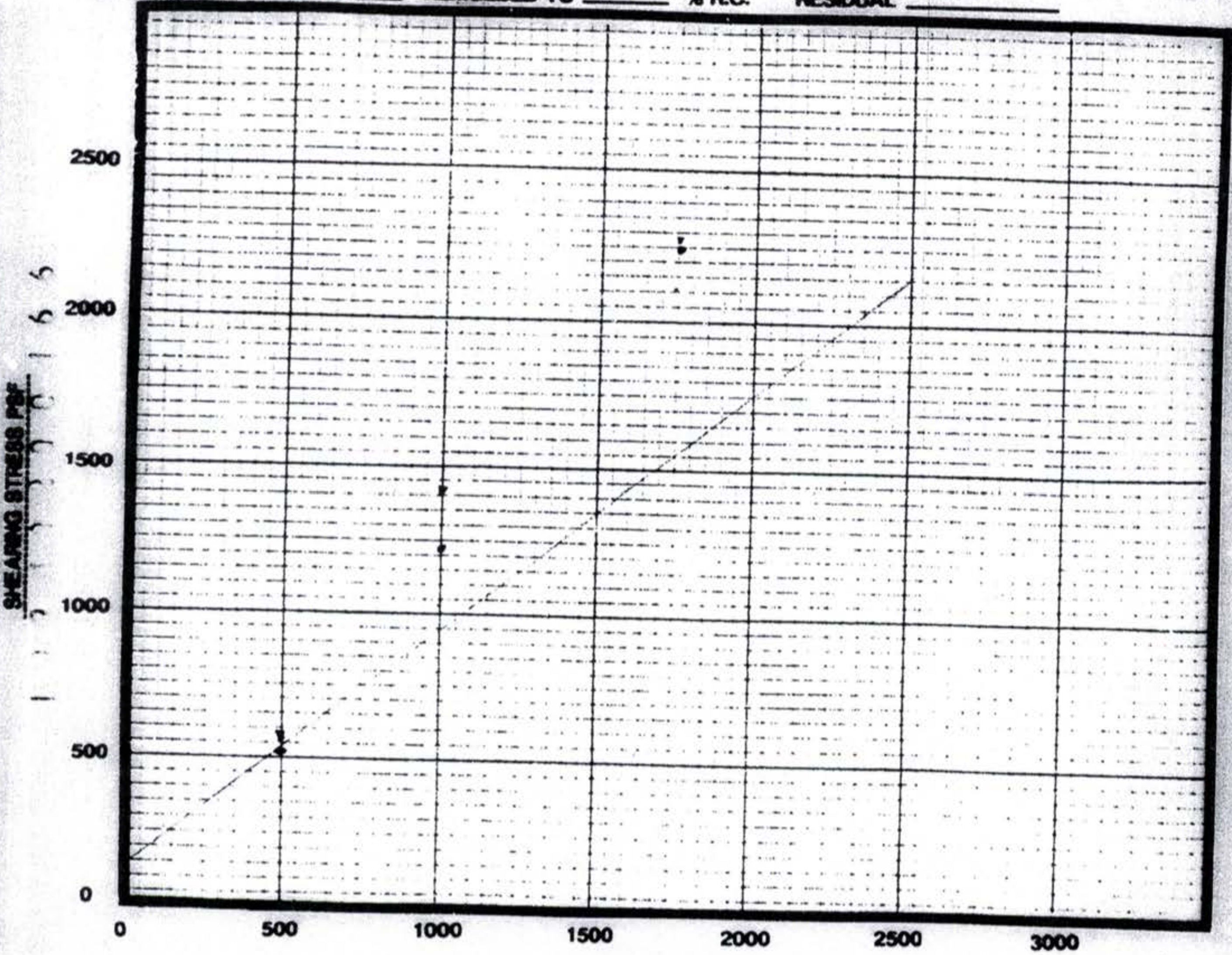
CLASSIFICATION: FILL SAMPLE NO. B-2 5' / B-1 @ 10' / B-2 17'

PLOTTED BY: ST DATE: JUNE 94 CHECKED BY: ST

w_{nat}= 19 % $\gamma_{d,nat}$= 88.4 PCF C= ____ PSF(peak) Ø= ____ (peak)

w_f= 23.4 % C= 150 PSF(ultimate) Ø= 40 (ultimate)

UNDISTURBED ✓ REMOLDED TO ____ % R.C. RESIDUAL ____



● Cu & Øu = ULTIMATE VALUES

▲ Cp & Øp = PEAK VALUES

CALIFORNIA GEOSYSTEMS
ENVIRONMENTAL AND GEOTECHNICAL CONSULTANTS

PLATE 11

DIRECT SHEAR TEST

SITE: 23331 MULHOLLAND DRIVE — JOB NO.: GS 94-616

CLASSIFICATION: BEDROCK — SAMPLE NO. B-1 @ 20, B-1 @ 25', B-2 @ 33' @ B-2 @ ..., B-2 @ ...

PLOTTED BY: LT — DATE: JUNE 1994 — CHECKED BY: ______

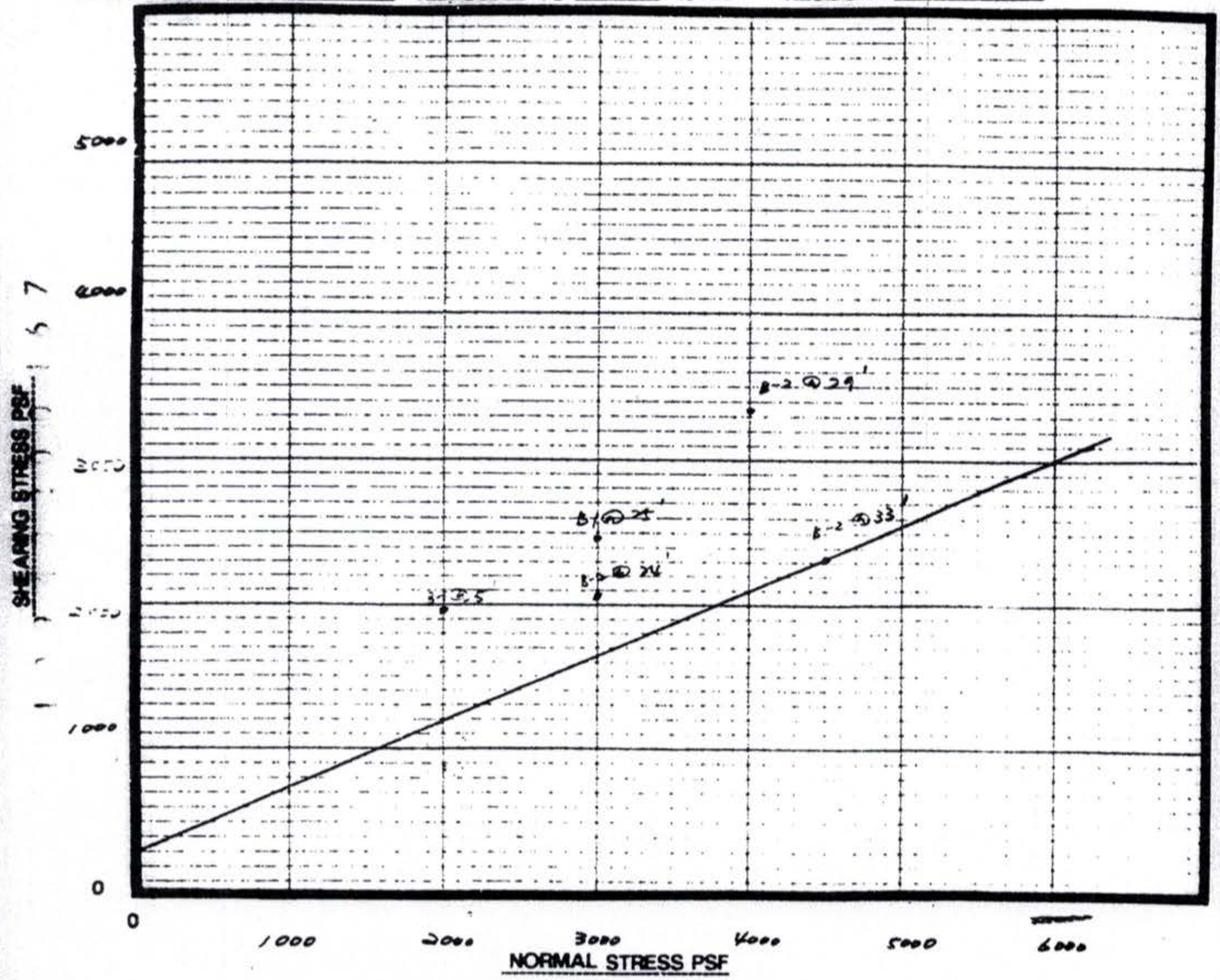
$w_{a/2}$ = 20.8 %
w_f = 26.1 %

γ_d = 94 PCF

C= ______ PSF(peak) Ø= ______ (peak)

C= 300 PSF(ultimate) Ø= 25 (ultimate)

UNDISTURBED ______ REMOLDED TO ______ % R.C. RESIDUAL ______



● Cu & Øu = ULTIMATE VALUES

▲ Cp & Øp = PEAK VALUES

CALIFORNIA GEOSYSTEMS

PLATE 12

RICHARD J. RIORDAN
MAYOR

LOS ANGELES, CA
ARTHUR J. JOHNSON, JR.
GENERAL MANAGER
ARTHUR C. DEVINE
EXECUTIVE OFFICER

May 3, 1995

Log # 39292
C.D. –

(SOILS/GEOLOGY FILE - 2)

Greg Watson
22014 Avenue San Luis
Woodland Hills, CA 91364

TRACT: 23496
LOT: 1
LOCATION: 22331 MULHOLLAND DRIVE

CURRENT REFERENCE REPORT/LETTER(S)	REPORT NO.	DATE(S) OF DOCUMENT	PREPARED BY
Soils/Geo Report	GS94-616R	04/13/95	CA Geosystems

The above report concerning recommendations for repair of damage caused to the residence by the January 17, 1994 Northridge earthquake has been reviewed by the Grading Division of the Department of Building and Safety. According to the report, a pile and grade beam system will be used to underpin the residence. The eastern portion of the residence has the greatest settlement. This is the area of deepest fill and adjacent to a descending slope.

The report is acceptable, provided the following conditions are complied with during site development:

1. The geologist and soils engineer shall review and approve the detailed plans prior to issuance of any permits. This approval shall be by signature on the plans which clearly indicates that the geologist and soils engineer have reviewed the plans

prepared by the design engineer and that the plans include the recommendations contained in their reports.

2. No new slopes are proposed or approved.

3. All recommendations of the report which are in addition to or more restrictive than the conditions contained herein shall be incorporated into the plans.

4. A copy of the subject and appropriate referenced reports and this approval letter shall be attached to the District Office and field set of plans. Submit one copy of the above reports to the Building Department Plan Checker prior to issuance of the permit.

5. The geologist and soil engineer shall inspect all excavations to determine that conditions anticipated in the report have been encountered and to provide recommendations for the correction of hazards found during grading.

6. All man-made fill shall be compacted to a minimum 90 percent of the maximum dry density of the fill material per the latest version of ASTM 1557, prior to us for support of any structure or new slabs for the residence.

7. The residence shall be underpinned with friction piles, founded in bedrock, and grade beams.

8. The geologist and soil engineer shall inspect the excavations for the footings to determine that they are founded in the recommended strata before calling the Department for footing inspection.

9. Pile and/or caisson foundation ties are required by Code Section 91.2908(b). Exceptions and modification to this requirement are provided in Rule of General Application 662.

10. Pile and/or caisson shafts shall be designed for a lateral load of 1000 pounds per linear foot of shaft exposed to fill, soil and weathered bedrock.

11. Footings adjacent to a descending slope steeper than 3:1 in gradient shall be located a distance of one-third the vertical height of the slope with a minimum of 5 feet but need not exceed 40 feet measured horizontally from the face of the slope.

LARRY WESTPHAL
Chief of Grading Division

THEODORE D. NICKERSON
Engineering Geologist II

DAVID T. HSU
Geotechnical Engineer II

TDN/DTH:rlm
A:\MAY39292
(213) 485-2160

cc: CA Geosystems
VN District Office

CITY OF LOS ANGELES
CALIFORNIA

RICHARD J. RIORDAN
MAYOR

DEPARTMENT OF
BUILDING AND SAFETY
GRADING DIVISION
ROOM 460-A, CITY HALL
200 N SPRING STREET
LOS ANGELES, CA 90012-4869

March 17, 1995

Log # 38912
C.D. --

(SOILS/GEOLOGY FILE - 2)

David Breliant
4606 San Feliciano Drive
Woodland Hills, CA 91364

TRACT: 23496
LOT: 13
LOCATION: 4616 SAN FELICIANO DRIVE

CURRENT REFERENCE REPORT/LETTER(S)	REPORT NO.	DATE(S) OF DOCUMENT	PREPARED BY
Soils/Geo Report	15812-Z	03/06/95	J. Byer Group
Grading Ovrszd Doc	15812	03/16/94	--

PREVIOUS REFERENCE REPORT/LETTER(S)	REPORT NO.	DATE(S) OF DOCUMENT	PREPARED BY
Department Letter	38597	02/16/95	Bldg & Safety

The subject report concerning earthquake damage repair has been reviewed by the Grading Division of the Department of Building and Safety.

According to the report, the existing footings will be underpinned into firm bedrock along the easterly margins of the building. It is noted that unsupported bedding planes are exposed on the ascending rear slope which has not been recognized nor evaluated by the consultants.

The recommendations outlined in the above report are intended to improve the existing site conditions and are acceptable to the Department provided the conditions outlined below are followed:

1. The Soil Engineer shall review and approve the shoring and/or underpinning plans prior to issuance of the permit.

2. All recommendations of the report which are in addition to or more restrictive than

the conditions contained herein shall be incorporated into the plans.

3. A copy of the subject and appropriate referenced reports and this approval letter shall be attached to the District Office and field set of plans. Submit one copy of the above reports to the Building Department Plan Checker prior to issuance of the permit.

4. All roof and pad drainage shall be conducted to the street in an acceptable manner.

5. All friction pile or caisson drilling and installation shall be performed under the periodic inspection and approval of the Foundation Engineer.

6. Piles and/or caissons shall be embedded into bedrock a minimum depth such that its bottom shall be a minimum horizontal distance of H/3 from the face of the bedrock slope.

7. Pile and/or caisson shafts shall be designed for a lateral load of 1000 pounds per linear foot of shaft exposed to fill, soil and weathered bedrock.

8. Pile and/or caisson foundation ties are required by Code Section 91.2908(b). Exceptions and modification to this requirement are provided in Rule of General Application 662.

9. Prior to the pouring of concrete, a representative of the consulting Soil Engineer shall inspect and approve the footing excavations. He shall post a notice on the job site for the City Building Inspector and the Contractor stating that the work so inspected meets the conditions of the report, but that no concrete shall be poured until the City Building Inspector has also inspected and approved the footing excavations. A written certification to this effect shall be filed with the Department upon completion of the work.

LARRY WESTPHAL
Chief of Grading Division

J. W. COBARRUBIAS
Engineering Geologist III

THEO R. SEELEY
Geotechnical Engineer I

JWC/TRS:rlm
A:\MAR38912
(213) 485-2160

cc: J. Byer Group
VN District Office

1 0 9 1 0 1 0 0 0 0 7 5

CITY OF LOS ANGELES
CALIFORNIA

SAMUEL WILLIAM YORTY
MAYOR

DEPARTMENT OF
BUILDING AND SAFETY
200 CITY HALL
LOS ANGELES 12
MADISON 4-5211

J. C. MONNING
GENERAL MANAGER AND
SUPERINTENDENT OF BUILDING

April 26, 1962

Donald R. Warren Co.
930 West Sunset Blvd.
Los Angeles 12, Calif.

Subject: Tract 23496
Lot 13
Location Mulholland & San Feliciano Drive

Lots having compacted fill same

Final approval is granted for compacted fill constructed on above lots of subject property, as described in your report dated 4-20-62 F61-1225.

The approval is limited exclusively to the area shown in the report and subject to the following requirements:

A. One-story wood frame structures may comply to the arbitrary dimensions of Table 17-B without reference to the soil bearing value.
B. All other structures to observe maximum vertical soil bearing value of 1000 lbs. per sq. ft. at 12 inches minimum below approved compacted surface.
C. Continuous footings are required throughout as per Grading Bulletin No. 7.
D. All footings supported partly or wholly on compacted fill shall be reinforced continously with at least one 1/2 inch diameter bar at the top and bottom of the footing.
E. Slope erosion control, planting of fill slopes, and runoff control are required.
F. No footing shall be placed nearer than 5 ft. to the face of a 1-1/2 horizontal to 1 vertical plane projected upward from the toe of the compated fill for a fill slope 20 feet or less in vertical height. For vertical heights exceeding 20 feet, the 5 ft. setback from the plane shall be increased 1 ft. for each additional 5 ft. in height over 20 feet but need not exceed 10ft.

J. C. MONNING
Superintendent of Building

By______________________ DM#______________________

THOMAS L. CRUM, Grading Engineer
B&S Form B-142 R 6.61

CITY OF LOS ANGELES
INTERDEPARTMENTAL CORRESPONDENCE

Date: May 4, 2009

To: Ms. S. Gail Goldberg, Director
Department of City Planning
Attention: Deputy Advisory Agency

From: Edmond Yew, Manager
Land Development Group
Bureau of Engineering

Subject: Tentative Tract Map No. 67505 - Transmittal of Map.

Transmitted is a print of tentative map of Tract Map No. 67505 stamp dated March 15, 2008 lying northwesterly of Mulholland Drive and southeasterly of San Feliciano Drive in Council District No. 3.

This report supersedes any previous report from City Engineer.

This map has been filed for a 29-lot single-family residential subdivision purposes. The subdivision layout **is not satisfactory** as submitted for the following reasons:

1. A 36-foot wide private street easement shall be provided in lieu of 20-foot wide as shown on the tentative map to serve lots 1 to 7 and lots 9 and 10 including a turning area. This may result in decreased number of lots fronting the private street.

2. Number of proposed lots and lot lay-outs will be affected by providing 36-foot wide private street easement.

3. Proposed mainline sewer alignments are not satisfactory.

4. Lots 1 to 7, 9 and 10 shall be served by sewer system located within the newly improved Mulholland Drive service road adjoining the tract. The applicant shall also investigate the possibility for gravity flow at this location.

5. The map is not showing proposed improvements for the extension of **Mulholland Drive service road** along the tract property.

Not: All the street dedications and improvements recommended herein for Mulholland Drive by the City Engineer are in accordance with the **Mulholland Drive Specific Plan**.

There are existing sewers available in the streets adjoining the subdivision and in sanitary sewer easements within the tract property. The construction of mainline and house connection sewers within suitable easement will be required to serve the tract. This tract will connect to the public sewer system and will not result in violation of the California Water Code. I therefore recommend that you make the necessary determination.

In the event you approve the tentative map of Tract No. 67505, standard conditions issued by your department and the following special conditions shall be included as part of your approval:

1. That a **revised map** be submitted and be approved by Advisory Agency and the City Engineer showing the followings:

   a) A 36-foot wide private street easement for "B" Street including the turning area.

   a) Number of new propose lots after the new private street easement width as stated above.

   b) New lot areas and lot lay-outs.

   c) Satisfactory mainline sewer alignments serving the entire tract. Proposed mainline sewer alignment shown on the tentative map is not satisfactory.

   d) Proposed Mulholland Drive service road and the improvements with the new entrances to the tract property.

2. That a minimum 36-foot wide private street easement be provided for proposed private streets "B", including minimum turning area at the terminus.

3. That the private street easement be part of the adjoining parcels to the satisfaction of the City Engineer.

4. That the owners of the property record an agreement satisfactory to the City Engineer stating that they will grant the necessary easements for ingress, egress and public facilities over the private street areas upon the sale of the respective lots and they will maintain the private street, free and clear of obstructions and in a safe condition for vehicular use at all times.

5. That a Covenant and Agreement be recorded stating that private streets will be posted in a manner prescribed in Section 18.07 of the Los Angeles Municipal Code "Private Street Regulations".

6. That the private street be named on the final map satisfactory to the City Engineer.

7. That a 54-foot wide right-of-way be dedicated for the proposed "A" Street including a 44-foot radius property line cul-de-sac at the terminus.

8. That a 5-foot and variable width strip of land be dedicated along San Feliciano Drive adjoining the tract to complete a55-foot to 60-foot wide total right-of-way. Additional sidewalk easement may be necessary to allow for construction of meandering sidewalk to save the existing trees.

9. That arrangement be made with the Los Angeles County Department of Public Works prior to recordation of the final map for any necessary permits with respect to discharge into the their existing storm drain system within the tract property.

10. That a Covenant and Agreement be recorded advising all future owners and builders that prior to issuance of a building permit, a Notice of Acknowledgment of Easement must be recorded and an application to do work in any drainage or sanitary sewer easements and to construct over the existing sanitary sewers and drainage facilities must be submitted to the City Engineer for approval.

11. That Board of Public Works approval be obtained, prior to the recordation of the final map, the removal of any tree in the existing or proposed right-of-way area associated with improvement requirements outlined herein. The Bureau of Street Services, Urban Forestry Division, is the lead agency for obtaining Board of Public Works approval for removal of such trees.

12. That the following requirements in connection with grading and construction in and adjacent to public rights-of-way or private streets be complied with in a manner satisfactory to the City Engineer:

a. Cut or fill slopes in artificial fill and residual soils shall be no steeper than 2:1 (H:V). Cut slopes shall be no steeper than 1.5:1 (H:V) in competent bedrock.

b. The toes and crests of all cut and fill slopes shall be located on private property and shall be set back 2 and 3 feet respectively, from the property line.

c. Where fill overlies a cut slope, the fill shall be keyed horizontally into bedrock a minimum of 12 feet or the slope shall be over excavated a minimum of 12 feet and replaced as a compacted fill slope.

d. The consulting soils engineer shall provide methods of mitigating the effects of expansive soil, which underlies the public property and private streets. Prior to the approval of plans, the City Engineer must approve the proposed method.

e. All streets shall be founded upon firm natural materials or properly compacted fill. Any loose fill, loose soil, or organic material shall be removed prior to the placement of engineered fill.

f. Fill material shall be compacted to a minimum of 90 Percent relative compaction as defined in the Bureau of Engineering Standard Plan S-610. Fill shall be benched into competent material.

g. All slopes shall be planted and an irrigation system installed as soon as possible after grading to alleviate erosion.

h. Adequate perforated pipe and gravel sub-drain systems approved by the City Engineer shall be placed beneath canyon fills and behind retaining walls.

i. Slopes that daylight adversely dipping bedding shall be supported by either a retaining wall or a designed buttress fill.

j. Where not in conflict with the above, the recommendations contained in Byer Group Inc.' geotechnical reports dated July 20, 2006, by the consulting engineering geologist Peter Kilbury (CEG 2401) and Geotechnical Engineer Robert Zweigler (GE

2120), shall be implemented.

k. GED required procedures for review and approval of grading and foundation construction as it relates to City Property and the Right-of-way are specified in the Inter-Departmental Correspondence-Geotechnical Engineering Division Requirements for Review and Approval of Grading and Foundation Construction, dated October 12, 2001 (attached). These procedures shall be followed during tract design and construction.

13. That the following improvements be either constructed prior to recordation of the final map or that the construction be suitably guaranteed:

a. After submittal of hydrology and hydraulic calculations and drainage plans for review by the City Engineer prior to recordation of the final map.
Construction of public and/or private drainage facilities or removal and reconstruction of any existing system within the existing easements may be required to drain the private streets and the public street to outlets satisfactory to the City Engineer.

b. Improve the private streets "B" being provided by the construction of the following:

(1) Concrete curbs, concrete gutters, and 5-foot concrete sidewalks along the northwesterly side and graded area along the southeasterly side.

(2) Suitable surfacing to provide 28-foot roadways.

(3) Any necessary removal and reconstruction of existing improvements.

(4) The necessary transitions to join the existing improvements all satisfactory to the City Engineer.

(5) Suitable improvements of the turning areas.

c. Improve "A" Street by the construction of the following:

(1) Concrete curbs, concrete gutters, and 4-foot concrete sidewalks.

(2) Suitable surfacing to join the existing pavement and to complete a 36-foot roadway.

(3) Any necessary removal and reconstruction of the existing improvements.

(4) The necessary transitions to join the existing improvement.

(5) The suitable improvement of the 35-foot curb radius cul-de-sac.

d. Improve Mulholland Drive **(service road portion)**adjoining the tract by the construction of the following:

(1) Concrete curb, concrete gutter and 5.5-foot wide concrete sidewalk.

(2) Suitable surfacing to join the existing pavement and to complete a 28-foot roadway.

(3) Any necessary removal and reconstruction of the existing improvements.

(4) The necessary transitions to join the existing Improvements specially existing service road to the west.

e. Improve main Mulholand Drive adjoining the tract and adjoining the service road as described above by the construction of the following:

(1) Construct an 18-foot wide traffic island including concrete curbs and gutters facing the service road and the main Mulholland Drive.

(2) Suitable surfacing to join the existing pavement and to complete a 44-foot and variable width half-roadway(matching roadway to the west).

(3) Any necessary removal and reconstruction of the existing improvements.

(4) The necessary transitions to join the existing Improvements specially existing road to the west.

f. Improve San Feliciano Drive adjoining the tract by construction of 5.5-foot wide concrete sidewalk including any necessary removal and reconstruction of the existing improvements.

g. Construct mainline and house connection sewers to serve the development.

Any questions regarding this report should be directed to Mr. Georgic Avanesian of the Land Development Section, located at 201 North Figueroa Street, Suite 200, or by calling (213) 977-6335.

Enc.

cc: Valley Engineering District Office

IRVINE GEOTECHNICAL Inc

LOG OF BORING

PROJECT IC17036 HARRIDGE SAN FELICIANO
DRILL DATE 3/14/2017
LOG DATE 3/14/2017
LOGGED BY KJONES
DRILL TYPE HOLLOW-STEM
DIAMETER 8 INCHES

SURFACE ELEVATION 1020 feet
DRILLING CONTRACTOR Choice Drilling
SURFACE CONDITIONS level pad

BORING 4

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
SPT	20	2/2/4				SM	1000.0	20	Silty Sand with Clay binder, light brown, moist to wet, medium dense
							999.0	21	
SPT	22.5	5/12/15				SM	998.0	22	
							997.0	23	Silty Sand, light brown, orange-brown, wet to saturated, medium dense to dense, bedrock fragments to 2" in diameter
							996.0	24	
SPT	25	8/10/11				SM	995.0	25	
							994.0	26	
SPT	27.5	5/10/20				SM	993.0	27	
							992.0	28	**BEDROCK:** Sandstone, light orange-brown, orange-brown, light brown, light gray-brown, gray, fine-grained, massive, hard
							991.0	29	
SPT	30	18/27/30					990.0	30	
							989.0	31	
SPT	32.5	34/50-3"					988.0	32	
							987.0	33	
							986.0	34	
SPT	35	50-6"					985.0	35	
							984.0	36	
SPT	37.5	40/50-2"					983.0	37	
									END B4 @ 37.5': Water @ 22.5; No Caving; Fill to 9.5'

LOG OF BORING

IRVINE GEOTECHNICAL Inc

PROJECT IC17036 HARRIDGE SAN FELICIANO
DRILL DATE 6/28/2017
LOG DATE 6/28/2017
LOGGED BY KJONES
DRILL TYPE HOLLOW-STEM
DIAMETER 8 INCHES

SURFACE ELEVATION 1048 feet
DRILLING CONTRACTOR Choice Drilling
SURFACE CONDITIONS level pad

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	1048.0	0	**SOIL:** Silty Sand with Clay binder, brown, slightly moist, medium dense, roots
							1047.0	1	
							1046.0	2	**BEDROCK:** Sandstone, orange-brown, fine-grained, massive to thickly bedded, hard, moderately weathered
							1045.0	3	
							1044.0	4	
R	5	15/19/21	11.3	117.6	74		1043.0	5	
							1042.0	6	
							1041.0	7	
							1040.0	8	
							1039.0	9	
R	10	20-25-40	8.7	97.3	33		1038.0	10	Sandstone with Shale Interbeds, yellow-brown and grey-brown, thickly bedded, moderately weathered, moderately hard, dips between 13 and 17 degrees
							1037.0	11	
							1036.0	12	
							1035.0	13	
							1034.0	14	Sandstone, yellow-brown and orange-brown, massive to weakly bedded, moderately weathered, hard, dips between 14 and 18 degrees
R	15	33-50	5.0	111.2	27		1033.0	15	
							1032.0	16	
							1031.0	17	
							1030.0	18	
							1029.0	19	weak bedding with dips between 14 and 20 degrees
R	20	33-50	9.3	103.6	42		1028.0	20	(continued next page...)

LOG OF BORING

IRVINE GEOTECHNICAL Inc

PROJECT IC17036 HARRIDGE SAN FELICIANO
DRILL DATE 6/28/2017
LOG DATE 6/28/2017
LOGGED BY KJONES
DRILL TYPE HOLLOW-STEM
DIAMETER 8 INCHES

SURFACE ELEVATION 1020 feet
DRILLING CONTRACTOR Choice Drilling
SURFACE CONDITIONS level pad

BORING 5

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
R	20	33-50	9.5	103.6	42		1000.0	20	Sandstone, yellow-brown and orange-brown, massive to weakly bedded, slightly weathered, hard, dips between 14 and 18 degrees
							999.0	21	
							998.0	22	
							997.0	23	
							996.0	24	
R	25	25-50	10.6	104.8	48		995.0	25	
							994.0	26	
							993.0	27	Sandstone with Shale Interbeds, yellow-brown and grey-brown, thickly bedded, slightly weathered, hard, dips between 15 and 19 degrees
R	30	60	100.7	99.7	43		992.0	28	
							991.0	29	
							990.0	30	**END B5 @ 30': No** Water; No Caving; No Fill

LOG OF BORING

IRVINE GEOTECHNICAL Inc

PROJECT IC17036 HARRIDGE SAN FELICIANO
DRILL DATE 6/28/2017
LOG DATE 6/28/2017
LOGGED BY KJONE
DRILL TYPE HOLLOW-STEM
DIAMETER 8 INCHES

SURFACE ELEVATION 1009 feet
DRILLING CONTRACTOR Choice Drilling
SURFACE CONDITIONS level to gentle slope

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	1009.0	0	**FILL:** Silty Sand, brown, slightly moist, medium dense, roots and rootlets, gravel to 1/2" in diameter
							1008.0	1	
							1007.0	2	
							1006.0	3	
							1005.0	4	
R	5	2/4/6	8.2	96.4	30		1004.0	5	
							1003.0	6	
							1002.0	7	
							1001.0	8	
							1000.0	9	
R	10	2/4/6	15.1	88.3	46	CL	999.0	10	**ALLUVIUM:** Sandy Clay, brown, moist, firm
							998.0	11	
							997.0	12	
							996.0	13	Silty Clay, dark brown, moist, firm to stiff
							995.0	14	
R	15	3/6/9	20.6	93.1	70	CL	994.0	15	
							993.0	16	
							992.0	17	
							991.0	18	
							990.0	19	
R	20	4/4/6	29.9	91.2	97	CL	989.0	20	

(continued next page...)

IRVINE GEOTECHNICAL Inc

LOG OF BORING

PROJECT IC17036 HARRIDGE SAN FELICIANO
DRILL DATE 6/28/2017
LOG DATE 6/28/2017
LOGGED BY KJONES
DRILL TYPE HOLLOW-STEM
DIAMETER 8 INCHES

SURFACE ELEVATION 1020 feet
DRILLING CONTRACTOR Choice Drilling
SURFACE CONDITIONS level to gentle slope

BORING 6

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
R	20	4/4/6	29.9	91.2	97	CL	1000.0	20	Sandy Clay, grey-brown to yellow-brown, very moist to wet, stiff
							999.0	21	
							998.0	22	Sandy Clay, mottled yellow-brown and grey-brown, wet to saturated, stiff, bedrock fragments to 2" in diameter
							997.0	23	
							996.0	24	
R	25	8/10/11	27.1	97.0	100	CL	995.0	25	
							994.0	26	
							993.0	27	**BEDROCK:** Sandstone and Siltstone, orange-brown to gray-brown, gray, massive, hard, very to moderately weathered
							992.0	28	
							991.0	29	
R	30	18/47/50	7.2	103.2	13		990.0	30	
							989.0	31	
							988.0	32	
							987.0	33	
							986.0	34	
R	35	50-6"	7.5	104.0	34		985.0	35	**END B6 @ 35':** Water @ 21.5; No Caving; Fill to 9'

IRVINE GEOTECHNICAL Inc

SURFICIAL STABILITY

IC: **17036** CONSULT: **JAI**

CLIENT: **HARRIDGE SAN FELICIANO**

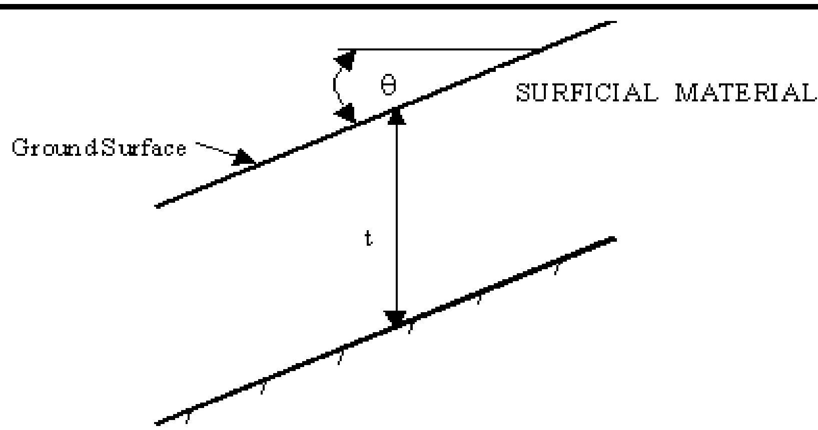
CALCULATION SHEET #

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: BEDROCK

COHESION:	606 psf	SHEAR DIAGRAM:	JBG 3
PHI ANGLE:	27 degrees	SLOPE ANGLE:	48 degrees
DENSITY:	120 pcf	SATURATION DEPTH (t):	3.0 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 = 3.61

CONCLUSIONS:

THE CALCULATION INDICATES THAT UNIFORM SLOPES IN BEDROCK AS STEEP AS 0.9:1 ARE SURFICIALLY STABLE.

IRVINE GEOTECHNICAL Inc

SURFICIAL STABILITY

IC: **17036** CONSULT: **JAI**
CLIENT: **HARRIDGE SAN FELICIANO**

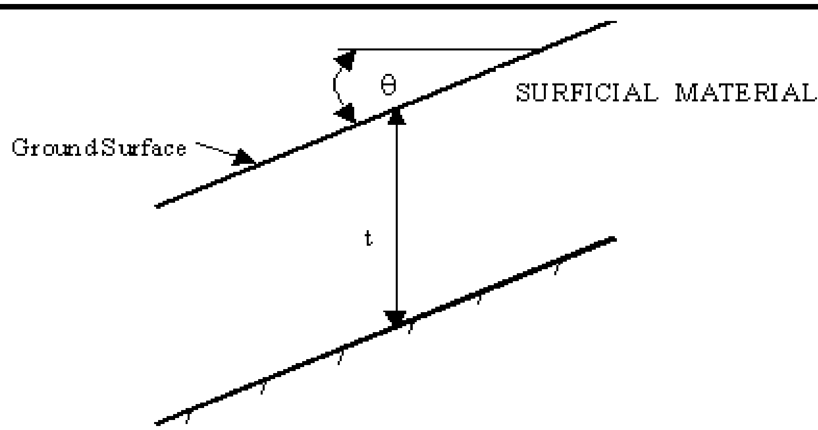
CALCULATION SHEET #

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: EXISTING FILL

COHESION:	200 psf	SHEAR DIAGRAM:	JBG 1
PHI ANGLE:	30 degrees	SLOPE ANGLE:	48 degrees
DENSITY:	124 pcf	SATURATION DEPTH (t):	3.0 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 = 1.34

CONCLUSIONS:

THE CALCULATION INDICATES THAT UNIFORM SLOPES IN FILL AS STEEP AS 0.9:1 ARE MARGINALLY STABLE.

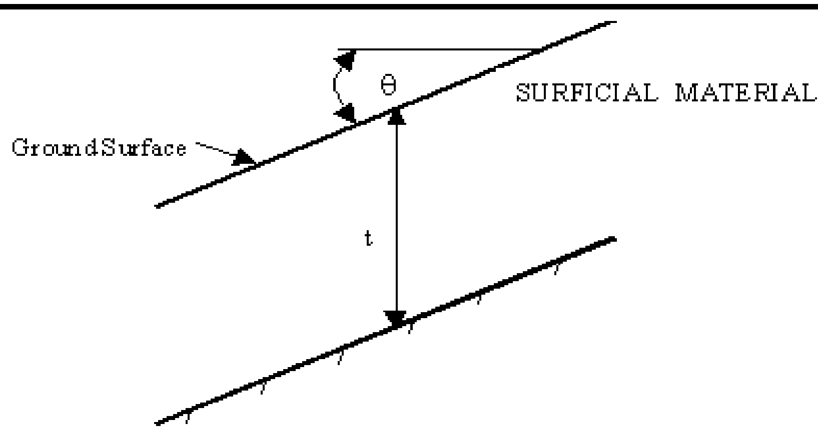
IRVINE GEOTECHNICAL Inc	SURFICIAL STABILITY IC: **17036** CONSULT: **JAI** CLIENT: **HARRIDGE SAN FELICIANO** CALCULATION SHEET #

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: EXISTING FILL

COHESION:	200 psf	SHEAR DIAGRAM:	JBG 1
PHI ANGLE:	30 degrees	SLOPE ANGLE:	34 degrees
DENSITY:	124 pcf	SATURATION DEPTH (t):	3.0 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 = 1.58

CONCLUSIONS:

THE CALCULATION INDICATES THAT UNIFORM SLOPES IN FILL AS STEEP AS 1.5:1 ARE SURFICIALLY STABLE.

IRVINE GEOTECHNICAL Inc

SURFICIAL STABILITY

IC: 17036 CONSULT: JAI
CLIENT: HARRIDGE SAN FELICIANO

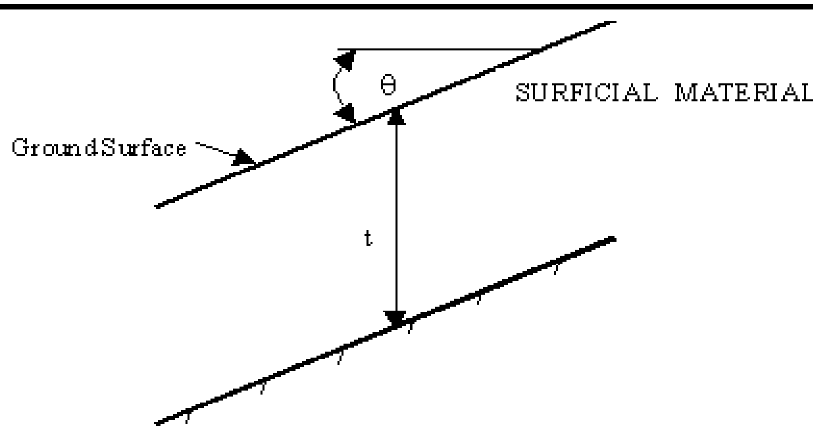
CALCULATION SHEET #

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: FILL - NON COMPACTED

COHESION:	160 psf	SHEAR DIAGRAM:	B-1
PHI ANGLE:	30 degrees	SLOPE ANGLE:	42 degrees
DENSITY:	127 pcf	SATURATION DEPTH (t):	3.0 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 = 1.17

CONCLUSIONS:

THE CALCULATION INDICATES THAT UNIFORM SLOPES IN NON COMPACTED FILL AS STEEP AS 1.1:1 ARE MARGINALLY STABLE.

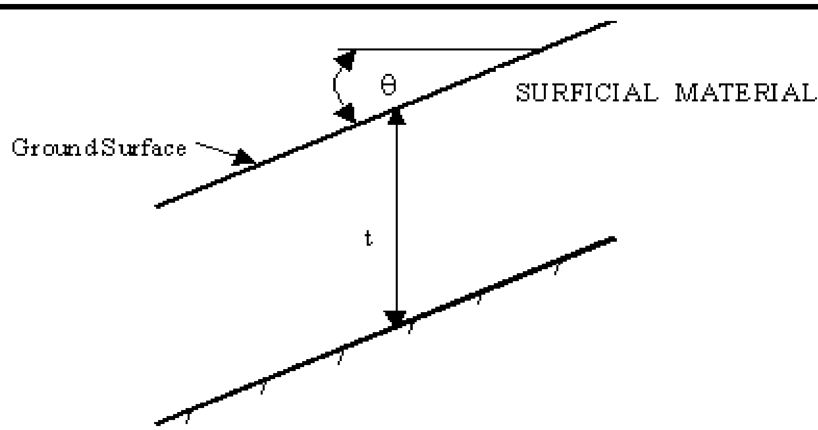
IRVINE GEOTECHNICAL Inc	SURFICIAL STABILITY
	IC: **17036** CONSULT: **JAI** CLIENT: **HARRIDGE SAN FELICIANO** CALCULATION SHEET #

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: FILL - NON COMPACTED

COHESION:	160 psf	SHEAR DIAGRAM:	B-1
PHI ANGLE:	30 degrees	SLOPE ANGLE:	34 degrees
DENSITY:	127 pcf	SATURATION DEPTH (t):	3.0 feet

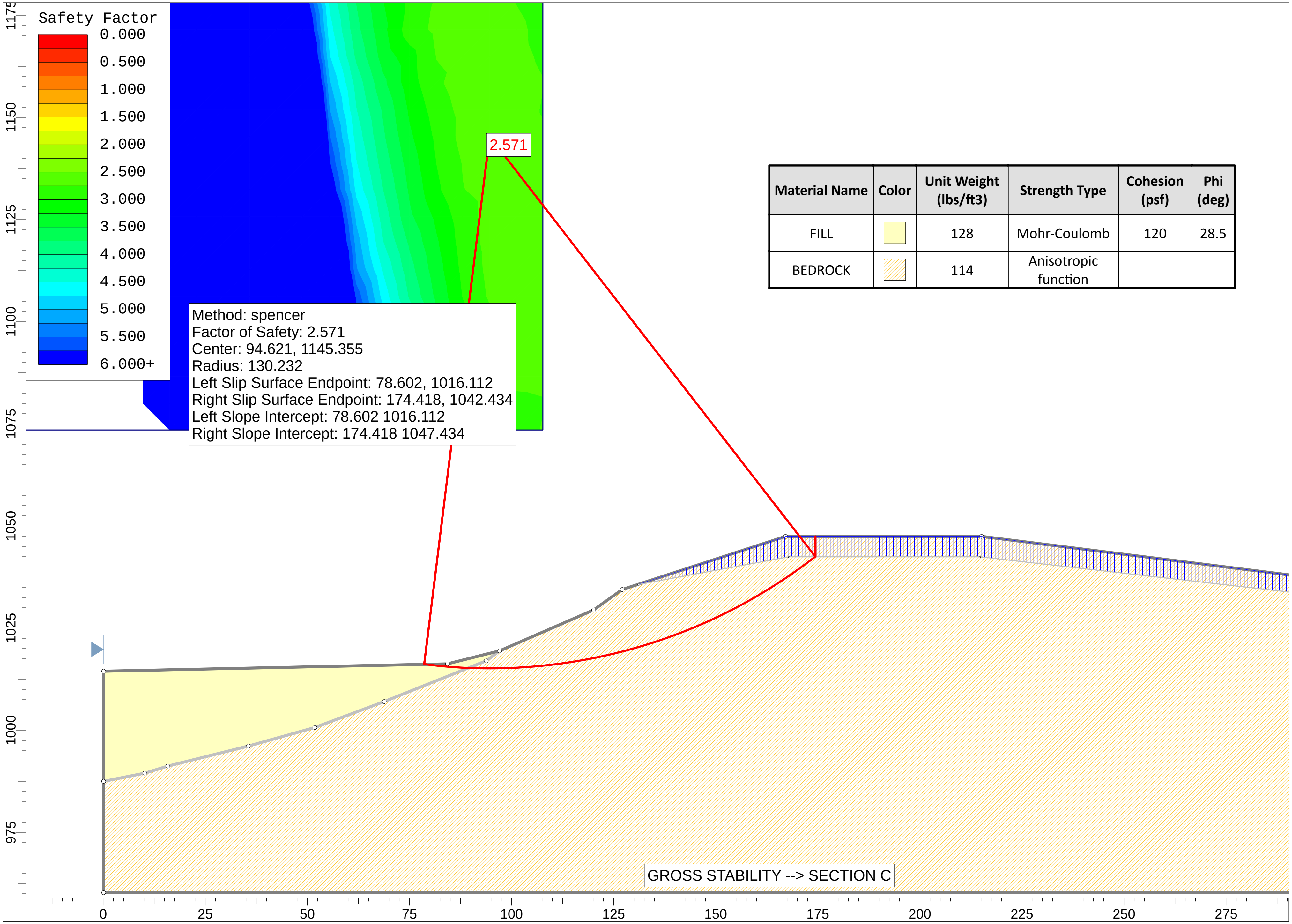


$$FS = \frac{C + (\gamma_{soil} - \gamma_{water}) \bullet t \bullet \cos^2\theta \tan\Phi}{\gamma_{soil} \bullet t \bullet \cos\Phi \sin\Phi}$$

SAFETY FACTOR = 1.34

CONCLUSIONS:

THE CALCULATION INDICATES THAT UNIFORM SLOPES IN NON COMPACTED FILL AS STEEP AS 1.5:1 ARE MARGINALLY STABLE.



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
FILL		128	Mohr-Coulomb	120	28.5
BEDROCK		114	Anisotropic function		

Slide Analysis Information
HARRIDGE - SAN FELICIANO

Project Summary

File Name: SECTION C CALC cir
Slide Modeler Version: 6.039
Project Title: HARRIDGE - SAN FELICIANO
Analysis: GROSS STABILITY --> SECTION C
Date Created: 4/6/2017, 10:38:10 AM

General Settings

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

Analysis Options

Analysis Methods Used

Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Tension Crack

Tension crack Water level: filled with water

Material Properties

Property	FILL	BEDROCK
Color		
Strength Type	Mohr-Coulomb	Anisotropic function
Unit Weight [lbs/ft3]	128	114
Cohesion [psf]	120	
Friction Angle [deg]	28.5	
Water Surface	None	None
Ru Value	0	0

Anisotropic Functions

Name: User Defined 1

Angle From	Angle To	c	phi
-90	7	606	27
7	20	255	17
20	90	606	27

Global Minimums

Method: spencer

FS: 2.570650
Center: 94.621, 1145.355
Radius: 130.232
Left Slip Surface Endpoint: 78.602, 1016.112
Right Slip Surface Endpoint: 174.418, 1042.434
Left Slope Intercept: 78.602 1016.112
Right Slope Intercept: 174.418 1047.434
Resisting Moment=1.15847e+007 lb-ft
Driving Moment=4.50651e+006 lb-ft
Resisting Horizontal Force=82563.2 lb
Driving Horizontal Force=32117.6 lb
Total Slice Area=942.139 ft2

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3527
Number of Invalid Surfaces: 1324

Error Codes:

Error Code -102 reported for 29 surfaces
Error Code -103 reported for 3 surfaces
Error Code -106 reported for 18 surfaces
Error Code -108 reported for 401 surfaces
Error Code -111 reported for 4 surfaces
Error Code -1000 reported for 869 surfaces

Error Codes

The following errors were encountered during the computation:

-102 = Two surface / slope intersections, but resulting arc is actually outside soil region.
-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-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).
-111 = safety factor equation did not converge
-1000 = No valid slip surfaces are generated at a grid center. Unable to draw a surface.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 2.57065

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	3.59213	108.393	FILL	120	28.5	57.9045	148.852	53.139	0	53.139
2	3.59213	334.549	FILL	120	28.5	72.113	185.377	120.41	0	120.41
3	3.59213	795.119	FILL	120	28.5	100.913	259.413	256.767	0	256.767
4	3.86542	1344.77	BEDROCK	606	27	323.668	832.037	443.622	0	443.622
5	3.86542	1731.35	BEDROCK	606	27	341.82	878.699	535.202	0	535.202
6	3.86542	2232.81	BEDROCK	606	27	365.567	939.744	655.008	0	655.008
7	3.86542	2890.14	BEDROCK	606	27	396.814	1020.07	812.66	0	812.66
8	3.86542	3496.58	BEDROCK	606	27	424.54	1091.34	952.539	0	952.539
9	3.86542	4051.77	BEDROCK	255	17	223.491	574.517	1045.09	0	1045.09
10	3.86542	4555.2	BEDROCK	255	17	236.804	608.74	1157.03	0	1157.03
11	3.86542	5006.88	BEDROCK	255	17	248.259	638.187	1253.35	0	1253.35
12	3.86542	5667.31	BEDROCK	255	17	265.529	682.583	1398.56	0	1398.56
13	3.86542	6467.55	BEDROCK	255	17	286.407	736.253	1574.11	0	1574.11
14	3.86542	6759.2	BEDROCK	255	17	292.21	751.17	1622.9	0	1622.9
15	3.86542	6803.67	BEDROCK	255	17	290.829	747.619	1611.29	0	1611.29
16	3.86542	6789.78	BEDROCK	255	17	287.777	739.775	1585.63	0	1585.63
17	3.86542	6715.68	BEDROCK	606	27	536.392	1378.88	1516.85	0	1516.85
18	3.86542	6579.21	BEDROCK	606	27	524.236	1347.63	1455.53	0	1455.53

19	3.86542	6377.91	BEDROCK	606	27	509.345	1309.35	1380.4	0	1380.4
20	3.86542	6108.89	BEDROCK	606	27	491.711	1264.02	1291.43	0	1291.43
21	3.86542	5768.83	BEDROCK	606	27	471.318	1211.59	1188.55	0	1188.55
22	3.86542	5353.87	BEDROCK	606	27	448.145	1152.02	1071.63	0	1071.63
23	3.86542	4859.51	BEDROCK	606	27	422.159	1085.22	940.527	0	940.527
24	3.86542	4059.23	BEDROCK	606	27	384.348	988.024	749.765	0	749.765
25	3.86542	2838.71	BEDROCK	606	27	322.995	830.306	440.225	0	440.225

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 2.57065

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	78.6022	1016.11	0	0	0
2	82.1944	1015.72	228.976	59.9204	14.6648
3	85.7865	1015.42	523.446	136.98	14.6648
4	89.3786	1015.23	935.869	244.906	14.6648
5	93.244	1015.13	2230.59	583.719	14.6648
6	97.1095	1015.15	3543.05	927.174	14.6648
7	100.975	1015.28	4870.12	1274.45	14.6647
8	104.84	1015.53	6203.68	1623.43	14.6648
9	108.706	1015.89	7499.61	1962.56	14.6648
10	112.571	1016.37	7862.79	2057.6	14.6648
11	116.437	1016.96	8087.15	2116.31	14.6648
12	120.302	1017.68	8148.15	2132.28	14.6648
13	124.167	1018.52	8001.46	2093.89	14.6648
14	128.033	1019.48	7592.68	1986.91	14.6647
15	131.898	1020.57	6953.06	1819.53	14.6648
16	135.764	1021.79	6110.53	1599.05	14.6647
17	139.629	1023.15	5074.45	1327.92	14.6647
18	143.494	1024.64	4881.86	1277.53	14.6648
19	147.36	1026.28	4524.11	1183.91	14.6648
20	151.225	1028.07	4024.56	1053.18	14.6648
21	155.091	1030.01	3412.99	893.139	14.6648
22	158.956	1032.12	2726.31	713.444	14.6648
23	162.822	1034.41	2009.62	525.894	14.6648
24	166.687	1036.88	1317.41	344.75	14.6648
25	170.552	1039.55	801.408	209.719	14.6648
26	174.418	1042.43	780	0	0

List Of Coordinates

Tension Crack

X	Y
131.022	1035.66
167.889	1042.43

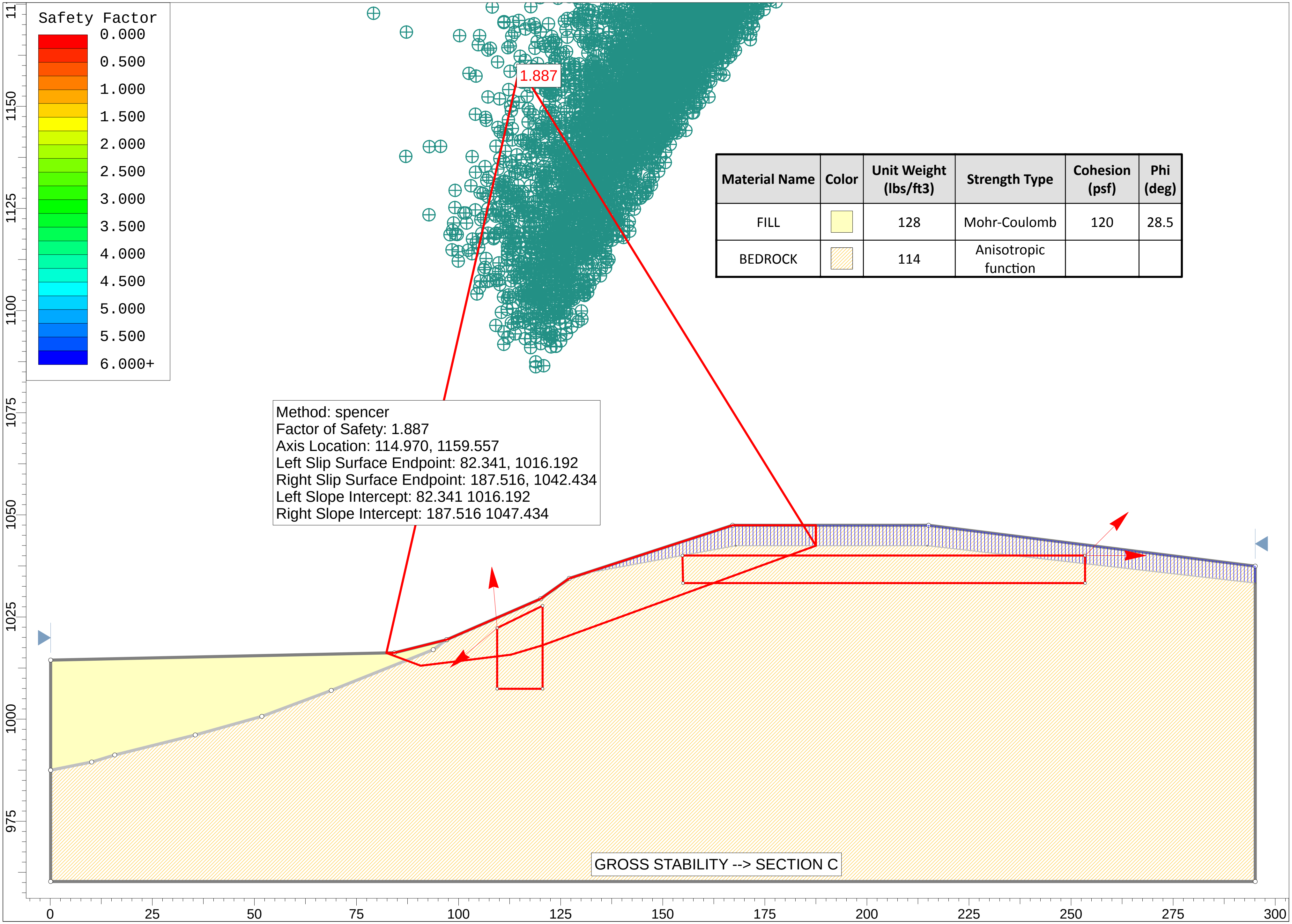
214.786	1042.43
295.097	1033.29

External Boundary

X	Y
0.0969007	960.252
295.097	960.252
295.097	1037.43
215.097	1047.43
167.097	1047.43
127.097	1034.43
120.097	1029.43
97.0969	1019.43
84.2969	1016.23
0.0969007	1014.43
0.0969007	987.487

Material Boundary

X	Y
0.0969007	987.487
10.1696	989.505
15.7953	991.213
35.5305	996.119
51.8321	1000.66
68.8215	1007.01
93.8118	1017
97.0969	1019.43



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
FILL		128	Mohr-Coulomb	120	28.5
BEDROCK		114	Anisotropic function		

Slide Analysis Information

HARRIDGE - SAN FELICIANO

Project Summary

File Name: SECTION C CALC
Slide Modeler Version: 6.039
Project Title: HARRIDGE - SAN FELICIANO
Analysis: GROSS STABILITY --> SECTION C
Date Created: 4/6/2017, 10:38:10 AM

General Settings

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

Analysis Options

Analysis Methods Used

Spencer

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: Non-Circular Block Search

Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 95
Left Projection Angle (End Angle): 220
Right Projection Angle (Start Angle): 0
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Tension Crack

Tension crack Water level: filled with water

Material Properties

Property	FILL	BEDROCK
Color		
Strength Type	Mohr-Coulomb	Anisotropic function
Unit Weight [lbs/ft3]	128	114
Cohesion [psf]	120	
Friction Angle [deg]	28.5	
Water Surface	None	None
Ru Value	0	0

Anisotropic Functions

Name: User Defined 1

Angle From	Angle To	c	phi
-90	7	606	27
7	20	255	17
20	90	606	27

Global Minimums

Method: spencer

FS: 1.886510
Axis Location: 114.970, 1159.557
Left Slip Surface Endpoint: 82.341, 1016.192
Right Slip Surface Endpoint: 187.516, 1042.434
Left Slope Intercept: 82.341 1016.192
Right Slope Intercept: 187.516 1047.434
Resisting Moment=9.03996e+006 lb-ft
Driving Moment=4.7919e+006 lb-ft
Resisting Horizontal Force=62576.3 lb
Driving Horizontal Force=33170.4 lb
Total Slice Area=1054.03 ft2

Global Minimum Coordinates

Method: spencer

X	Y
82.3406	1016.19
90.7335	1013.06
102.864	1014.55
112.829	1015.77
120.408	1018.01
127.073	1020.43
138.857	1024.72
150.653	1029.02
162.401	1033.29
174.218	1037.59
185.94	1041.86
187.516	1042.43
187.517	1047.43

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 4071
Number of Invalid Surfaces: 930

Error Codes:

Error Code -108 reported for 73 surfaces
Error Code -111 reported for 99 surfaces
Error Code -112 reported for 758 surfaces

Error Codes

The following errors were encountered during the computation:

-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).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.88651

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	4.88605	728.529	FILL	120	28.5	139.629	263.412	264.133	0	264.133
2	3.50688	1590.15	BEDROCK	606	27	564.98	1065.84	902.488	0	902.488
3	4.04353	2421.56	BEDROCK	255	17	234.375	442.151	612.144	0	612.144

4	4.04353	2610.49	BEDROCK	255	17	241.876	456.302	658.427	0	658.427
5	4.04353	3116.86	BEDROCK	255	17	261.98	494.227	782.475	0	782.475
6	4.98238	4640.3	BEDROCK	255	17	287.747	542.838	941.474	0	941.474
7	4.98238	5523.23	BEDROCK	255	17	316.195	596.505	1117.01	0	1117.01
8	3.78963	4651.16	BEDROCK	255	17	318.216	600.317	1129.48	0	1129.48
9	3.78963	4881.48	BEDROCK	255	17	327.311	617.475	1185.6	0	1185.6
10	3.33236	4646.46	BEDROCK	255	17	336.357	634.541	1241.42	0	1241.42
11	3.33236	5089.93	BEDROCK	255	17	355.747	671.12	1361.07	0	1361.07
12	5.89201	9320.86	BEDROCK	255	17	363.691	686.106	1410.08	0	1410.08
13	5.89201	9166.65	BEDROCK	255	17	359.877	678.911	1386.55	0	1386.55
14	3.93213	6031.7	BEDROCK	255	17	356.697	672.913	1366.93	0	1366.93
15	3.93213	5963.01	BEDROCK	255	17	354.152	668.112	1351.23	0	1351.23
16	3.93213	5894.32	BEDROCK	255	17	351.607	663.31	1335.52	0	1335.52
17	3.91583	5801.63	BEDROCK	255	17	349.067	658.519	1319.85	0	1319.85
18	3.91583	5733.51	BEDROCK	255	17	346.532	653.737	1304.21	0	1304.21
19	3.91583	5665.39	BEDROCK	255	17	343.998	648.955	1288.57	0	1288.57
20	5.90883	8392.64	BEDROCK	255	17	340.147	641.69	1264.8	0	1264.8
21	5.90883	7352.51	BEDROCK	255	17	314.499	593.306	1106.55	0	1106.55
22	3.90714	4066.08	BEDROCK	255	17	284.829	537.332	923.466	0	923.466
23	3.90714	3432.67	BEDROCK	255	17	261.208	492.772	777.719	0	777.719
24	3.90714	2799.25	BEDROCK	255	17	237.588	448.213	631.969	0	631.969
25	1.57587	949.764	BEDROCK	255	17	201.969	381.016	412.181	0	412.181

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.88651

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	82.3406	1016.19	0	0	0
2	87.2266	1014.37	1163.93	307.397	14.7942
3	90.7335	1013.06	4326.53	1142.65	14.7942
4	94.777	1013.56	4970.32	1312.67	14.7941
5	98.8205	1014.05	5621.45	1484.64	14.7942
6	102.864	1014.55	6292.29	1661.81	14.7942
7	107.846	1015.16	7149.99	1888.33	14.7942
8	112.829	1015.77	8042.04	2123.92	14.7941
9	116.618	1016.89	7985.06	2108.87	14.7941
10	120.408	1018.01	7899.8	2086.35	14.7941
11	123.74	1019.22	7514.97	1984.72	14.7942
12	127.073	1020.43	7049.64	1861.82	14.7941
13	132.965	1022.58	6168.56	1629.13	14.7941
14	138.857	1024.72	5315.47	1403.83	14.7942
15	142.789	1026.15	4761.73	1257.58	14.7941
16	146.721	1027.59	4220.46	1114.63	14.7941
17	150.653	1029.02	3691.65	974.972	14.7941
18	154.569	1030.44	3177.43	839.165	14.7941
19	158.485	1031.87	2675.57	706.623	14.7941

20	162.401	1033.29	2186.08	577.347	14.7941
21	168.31	1035.44	1475.81	389.763	14.7941
22	174.218	1037.59	954.342	252.044	14.7942
23	178.126	1039.02	753.962	199.123	14.7941
24	182.033	1040.44	668.56	176.568	14.7941
25	185.94	1041.86	698.138	184.38	14.7942
26	187.516	1042.43	780	0	0

List Of Coordinates

Tension Crack

X	Y
131.022	1035.66
167.889	1042.43
214.786	1042.43
295.097	1033.29

Block Search Window

X	Y
109.465	1022.3
109.465	1007.42
120.588	1007.42
120.588	1027.73

Block Search Window

X	Y
154.993	1033.29
253.423	1033.29
253.423	1040.03
154.824	1040.03

External Boundary

X	Y
0.0969007	960.252
295.097	960.252
295.097	1037.43
215.097	1047.43
167.097	1047.43
127.097	1034.43
120.097	1029.43
97.0969	1019.43
84.2969	1016.23
0.0969007	1014.43
0.0969007	987.487

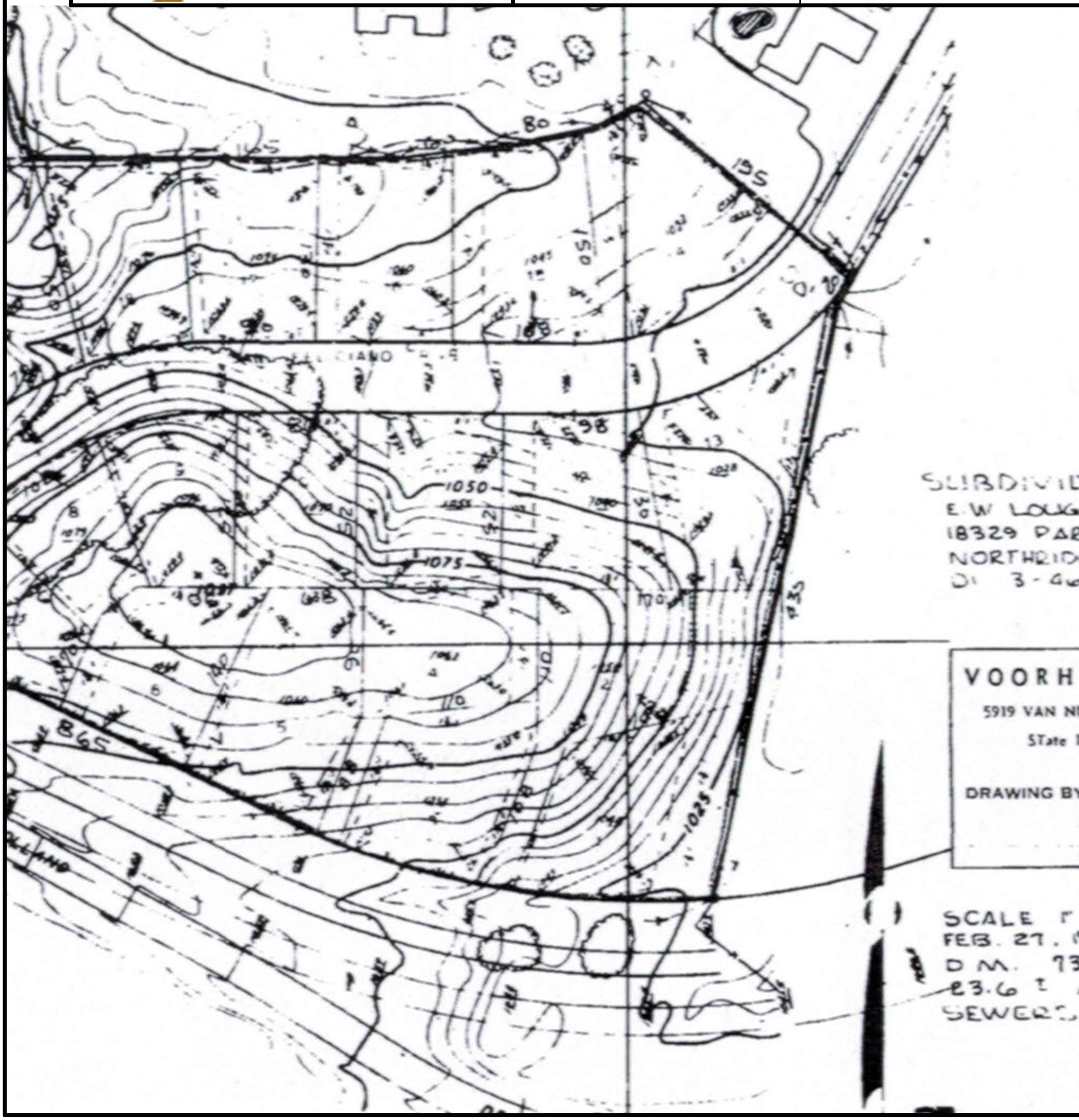
Material Boundary

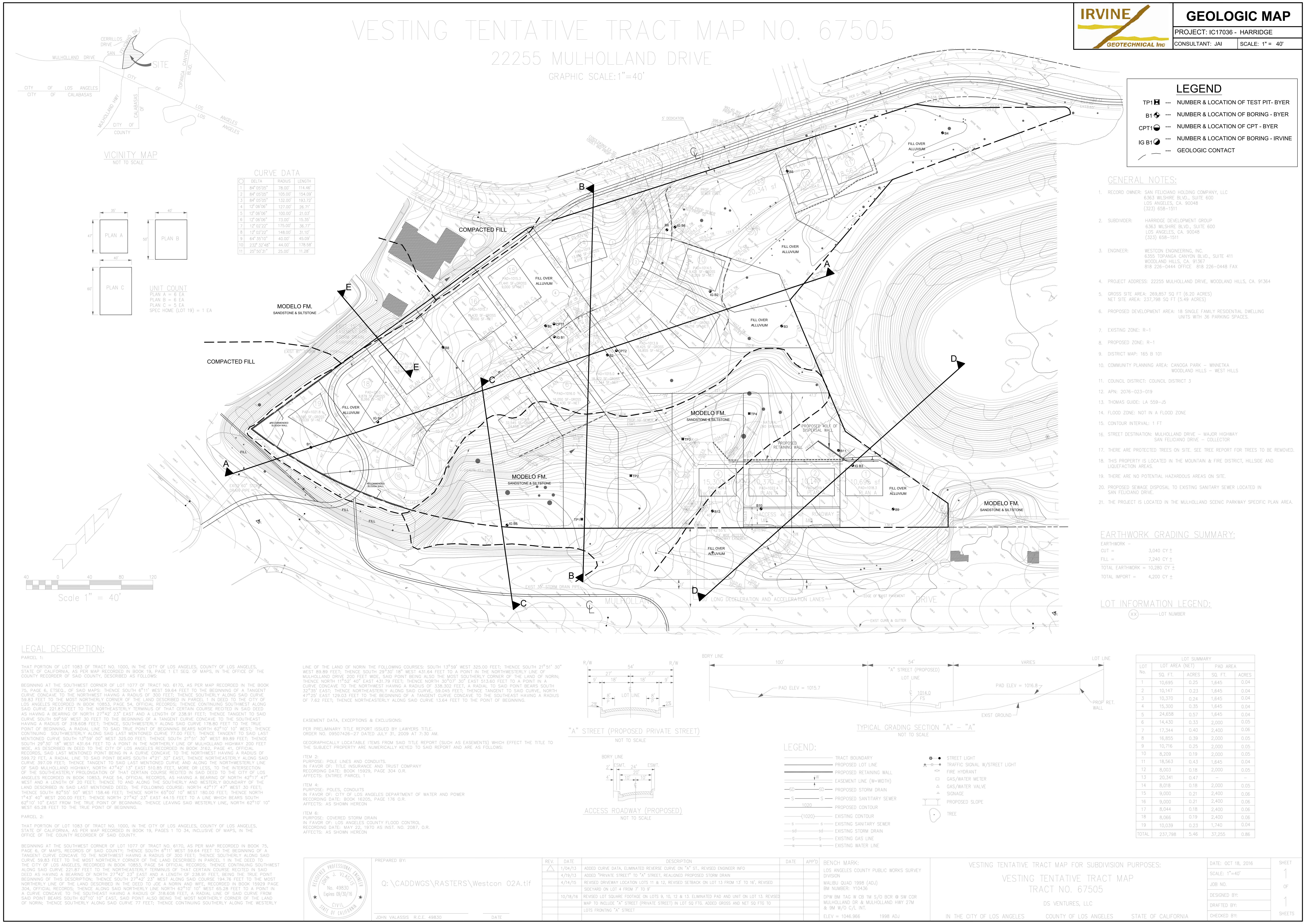
X	Y
0.0969007	987.487
10.1696	989.505
15.7953	991.213
35.5305	996.119
51.8321	1000.66
68.8215	1007.01
93.8118	1017
97.0969	1019.43

GRADING PLAN

PROJECT: IC17036 - HARRIDGE

CONSULTANT: JAI | SCALE: 1" = 100'





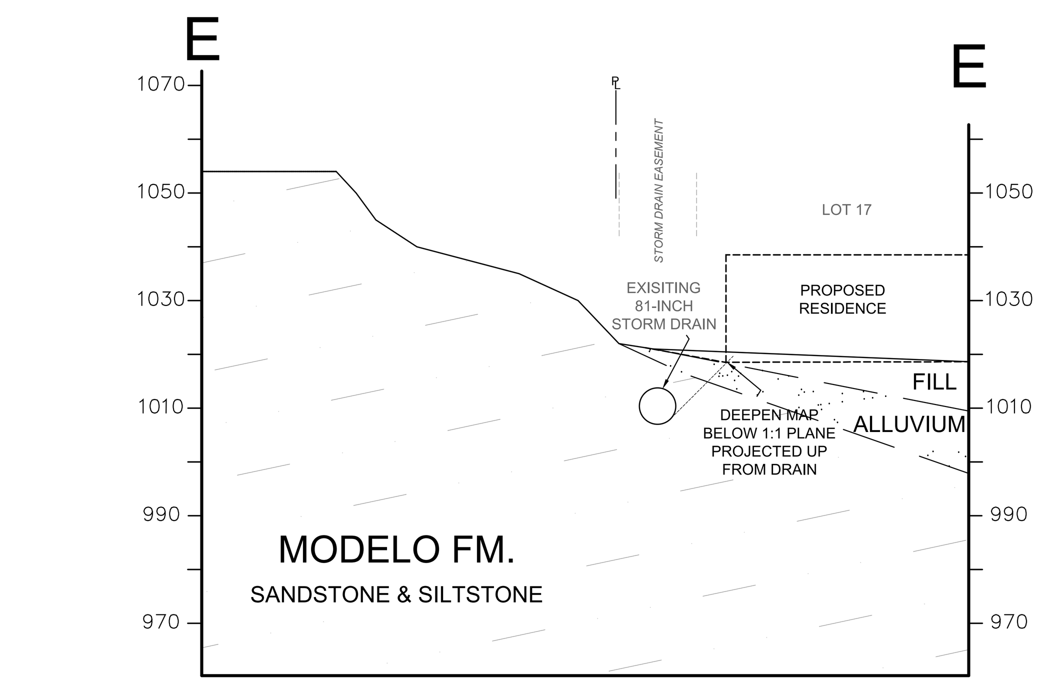
IRVINE GEOTECHNICAL Inc
GEOLOGIC MAP
PROJECT: IC17036 - HARRIDGE
CONSULTANT: JAI
SCALE: 1" = 40'
LEGEND
TP1 --- NUMBER & LOCATION OF TEST PIT- BYER
B1 --- NUMBER & LOCATION OF BORING - BYER
CPT1 --- NUMBER & LOCATION OF CPT - BYER
IG B1 --- NUMBER & LOCATION OF BORING - IRVINE
--- GEOLOGIC CONTACT
VESTING TENTATIVE TRACT MAP NO. 67505
22255 MULHOLLAND DRIVE
GRAPHIC SCALE: 1"=40'
VICINITY MAP
CURVE DATA
GENERAL NOTES:
1. RECORD OWNER: SAN FELICIANO HOLDING COMPANY, LLC
6363 WILSHIRE BLVD., SUITE 600
LOS ANGELES, CA. 90048
(323) 658-1511
2. SUBDIVIDER: HARRIDGE DEVELOPMENT GROUP
COMPACTED FILL
MODELO FM.
SANDSTONE & SILTSTONE
FILL OVER ALLUVIUM
EARTHWORK GRADING SUMMARY:
LOT INFORMATION LEGEND:
LEGAL DESCRIPTION:
"A" STREET (PROPOSED PRIVATE STREET)
TYPICAL GRADING SECTION "A" - "A"
ACCESS ROADWAY (PROPOSED)
LOT SUMMARY
Scale 1" = 40'
VESTING TENTATIVE TRACT MAP
TRACT NO. 67505
DS VENTURES, LLC

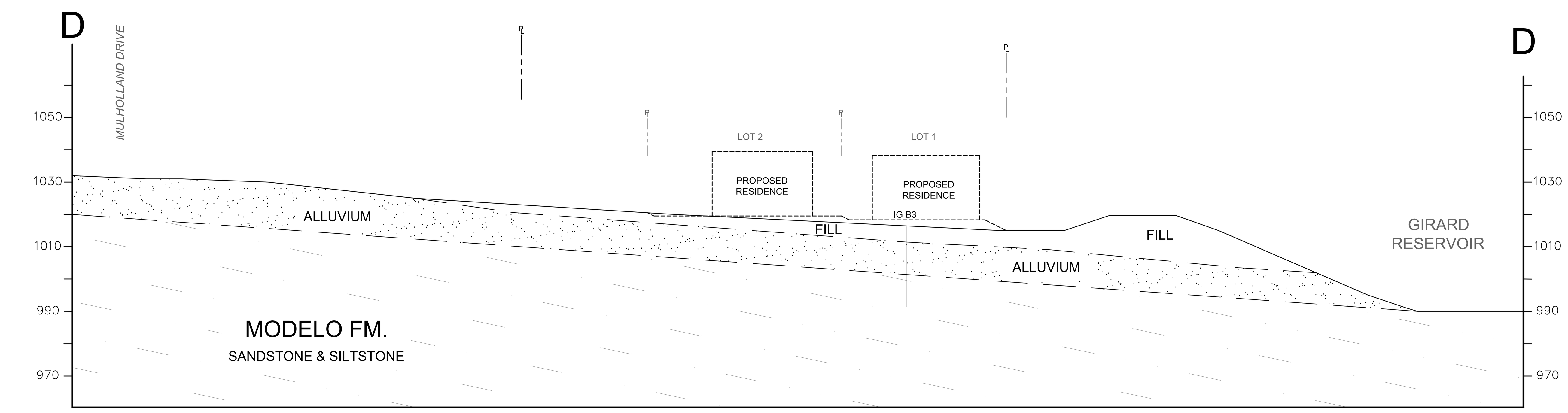
IRVINE GEOTECHNICAL Inc

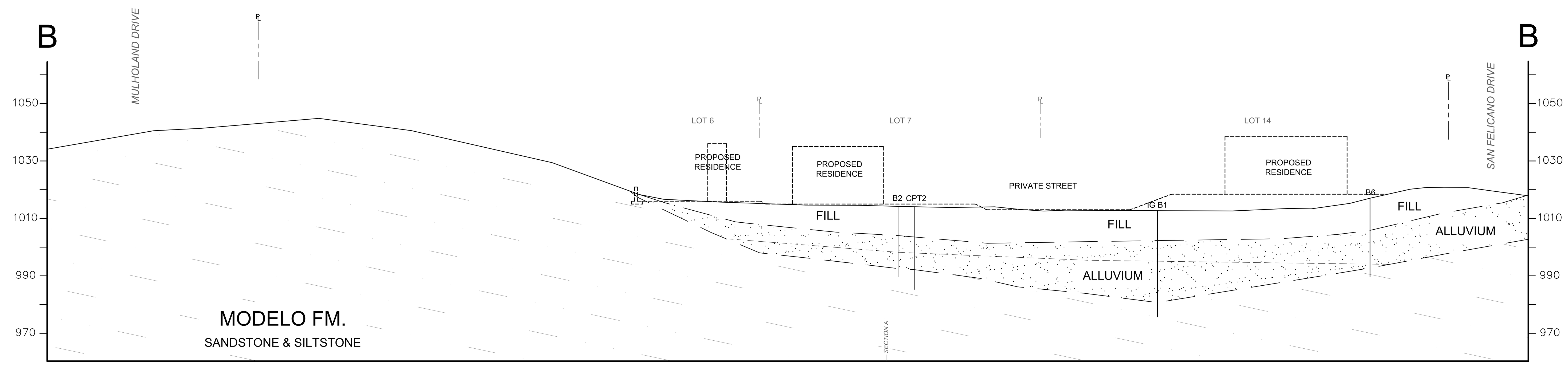
SECTIONS A - E

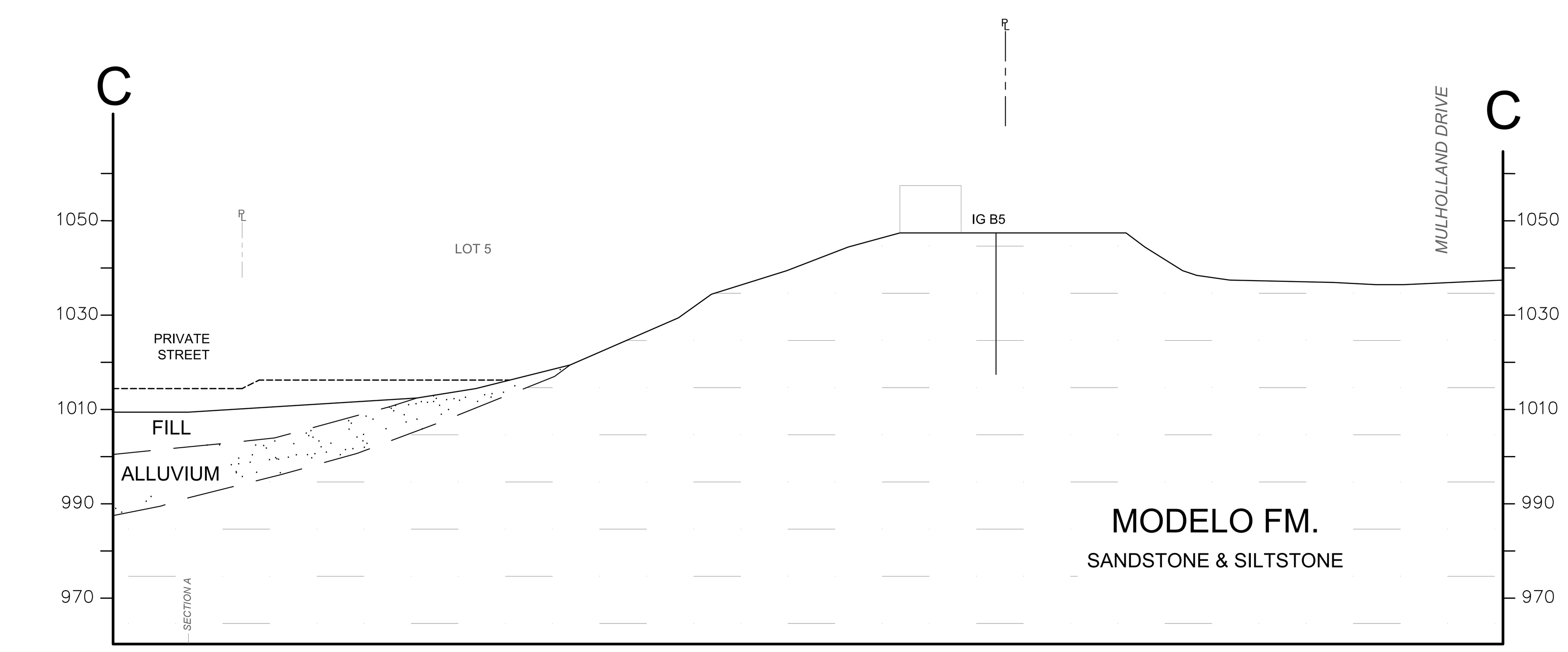
PROJECT: IC17036 - HARRIDGE

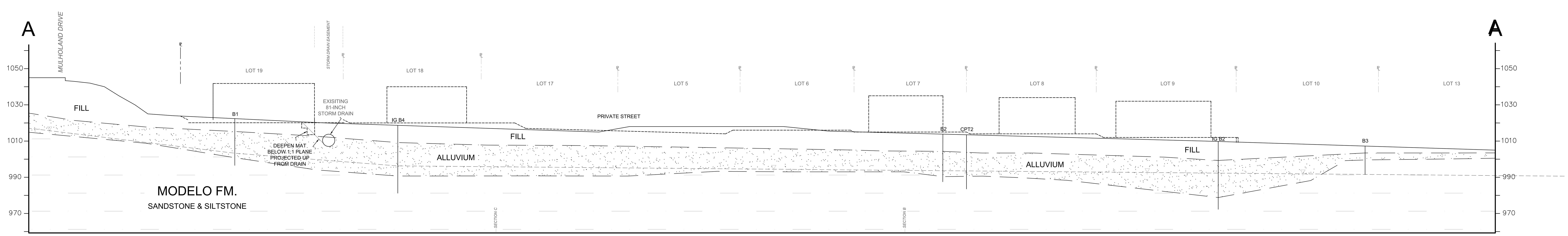
CONSULTANT: JAI | SCALE: 1" = 40'











November 2, 2017
IC 17036-I

San Feliciano Holding Company, LLC
6363 Wilshire Blvd. Suite 600
Los Angeles, California 90048

Subject

Addendum Geologic and Soils Engineering Exploration #2
Proposed 19 Lot Subdivision
Vesting Tentative Tract Map No. 67505
Portion of Lot 1083, Arbs. 7 & 8, Tract 1000
22255 W Mulholland Drive
Los Angeles, California

References: Reports by Irvine Geotechnical, Inc.:

Geologic and Soils Engineering Exploration, Proposed 19 Lot Subdivision, Vesting Tentative Tract Map No. 67505, Portion of Lot 1083, Arbs. 7 & 8, Tract 1000, 22255 W Mulholland Drive, Los Angeles, California, dated April 6, 2017 and

Addendum Geologic and Soils Engineering Exploration, Proposed 19 Lot Subdivision, Vesting Tentative Tract Map No. 67505, Portion of Lot 1083, Arbs. 7 & 8, Tract 1000, 22255 W Mulholland Drive, Los Angeles, California, dated August 21, 2017

City of Los Angeles Department of Building and Safety, Grading Division:

Geology and Soils Report Correction Letter, Log #97648, dated May 23, 2017 and *Geology and Soils Report Correction Letter,* Log #97648-01, dated September 13, 2017

Dear Gentle Persons;

Irvine Geotechnical has prepared this addendum report to provide additional geotechnical engineering recommendations to the Grading Division for the design and construction of the proposed project. This addendum report follows consultation with the client and civil engineer and review of the latest plans prepared by Wescon Engineering. Responses to the 10 items of the Grading Division review letter are provided below. A copy of the September 13, 2017 Department review letter is appended to this report for reference.

Item 1a - Proposed retaining, slough and dispersal walls are shown on the Geologic Map, which is based on the latest subdivision map.

Item 1b - The limits of grading and removal and recompaction are shown on the Removal Map. The limits of grading extend to the edge of protected oak trees such that shoring will not be required.

Item 1c - Grading planned to create the building pads and roads will not require shoring. Safe temporary excavations can be made following the TEMPORARY EXCAVATIONS section of our preliminary report.

Item 1d - The canyon subdrains are plotted on the Geologic Map.

Item 1e - The Tentative Tract map has been revised to show at least a 15-foot setback from the residence and the toe of slope.

Item 1f - The limits of grading planned to create the proposed street and access drive are shown on the Geologic Map and Removal Map.

Item 1g - Pools and accessory structures are no longer planned. A supplemental report will be required should pools or accessory structures be proposed.

Item 2 - Section G was prepared to show the steepest and highest west-facing slope on Lot 5. The geologic structure is neutral to the west-facing slopes. Thus, the cross-bedding shear strength was assumed for bedrock. The enclosed calculations indicate that the west-facing slopes are grossly stable.

Section H was prepared to show the highest and steepest topography with respect to the north-facing slopes and north-dipping bedding. For Section H, an anisotropic function was used to represent bedding planes within the bedrock. Failure surfaces between 7 and 20 degrees were assigned a bedding plane cohesion value/phi angle shear strength combination of 225 psf/17 degrees. All other failure surfaces were assigned a cross bedding shear strength of 606 psf/27 degrees. The enclosed calculations indicate that the north-facing slopes in the vicinity of Section H are grossly stable. Both planar and circular failure surfaces were checked.

Item 3 - It is not clear that the statement that "Historically groundwater probably flowed down the canyon and completely saturated the alluvium" is accurate. The Los Angeles County Department of Public Works database does not show active or inactive wells within this canyon. Regardless, the canyon has been mass graded and developed to the south side of Parched Drive, about ⅓ mile up-gradient from the subject property. As part of the developments, County and City Drains have been placed within the canyon. At the southern portion of the subject property, the invert of the 81-inch diameter drain is 1,007 feet (13 feet below grade). Also, as stated in this and the preliminary reports, a subdrain will be replaced at the base of the fill and on top of the alluvium. Thus, assuming a groundwater elevation of the ground surface is not reasonable. The liquefaction analyses have been revised using a depth of 10 feet to groundwater (depth to subdrain).

Item 4 - The length of the contour line affected by grading is 150 feet.

Item 5 - The Land Development Group of the Bureau of Engineering (BOE) recommended conditional approval of Tentative Tract Map No. 67505 in their attached letter dated May 25, 2016. The letter references an approval letter from GEO dated October 12, 2001. However, the letter from GEO could not be located. Because of the age of the GEO approval and the fact that BOE still references reports by Byer Group as the basis for geotechnical approval, reports by Irvine Geotechnical will be submitted to BOE and GEO to obtain updated approvals.

Item 6 - Section F was prepared to show the critical fill slope ascending offsite from the southwestern portion of the property. The shear strength of the fill was assumed from the Geosystems exploration of 22331 Mulholland Drive, which was referenced in our report dated August 21, 2017. The ultimate strength of the fill shown on Geosystems Direct Shear Diagram Plate 11 is a cohesion value of 150 psf and a phi angle of 40 degrees. Based on the enclosed calculations, the computed gross stability of the offsite fill slopes is greater than 1.5.

Item 7 - Berms and drainage devices are present along the Mulholland Drive shoulder, and drainage is not allowed to flow onto the fill slopes. Also, the undocumented fill is heavily vegetated with mature oak trees. There is no evidence that the offsite fill slopes along the southern and southwestern boundaries of the project have experienced surficial failures. Thus, there is no historical basis for estimating the thickness of a potential surficial failure on the subject property.

In order for a surficial failure to occur, a perched groundwater table needs to develop (Campbell, R.H., *Soil Slips, Debris Flows, and Rainstorms in the Santa Monica Mountains* *and Vicinity, Southern California,* USGS Professional Paper 851, 1975 and Skempton, A.W., *Stability of Natural Slopes and Embankment Foundations,* International Conference on Soil Mechanics and Foundation Engineering, 1969). In the Santa Monica Mountains, perched groundwater more readily develops on natural slopes with relatively shallow bedrock. The maximum thickness of the perched groundwater zone on homogeneous fill slopes is 3 feet.

According to Campbell, 1975, surficial failures initiate as a slab of soil that becomes detached and moves downslope as a laminar flow. Slough and deflection walls and debris fences have been historically used in the City of Los Angeles (Hollingsworth, R. and Kovacs, G.S., (*Soils Slumps and Debris Flows: Prediction and Protection*, 1981) to protect against potential surficial failures. These devices are not designed to retain the debris, but rather to break up the laminar flow and allow the water to drain. The freeboard of deflection and slough walls and debris fences are typically 3 feet (Hollingsworth, 1981).

Since the computed safety factors are greater than 1.0 for all slope angle and shear strength combinations at the site, failure is not expected. The slough walls are only recommended because the safety factor is less than the required 1.5.

Item 8 - The log of IG boring B6 is appended to this report.

Item 9 - The revised liquefaction analysis included below as our response to Item 10 indicates a potential total for settlements of 1.15 to 1.85 inches for the ⅔PGA_M ground motion. The Department allows up to 4 inches of total settlement for structures supported by mat foundations. Thus, the additional allowable settlement of the building pads under static loads is up to 2.15 inches. Differential settlement is not expected since the thickness of the alluvial deposits across the building pads are uniform and the loads from mats are being added uniformly.

Based on the grading plan, Lots 1 through 9 and 11 through 19 will be lowered or raised within 4 feet of the existing ground surface. Also, the existing fill and alluvium will be removed and replaced with compacted fill to create a 15-foot compacted fill cap. Where the grade is not raised by more than 4 feet, the change in stress within the native alluvium below the fill is expected to be negligible. For Lot 10, the grade will be raised up to 9.5 feet in elevation, and the net increase in stress is expected to induce strain and consolidation. It is recommended that Lot 10, or any other lot raised more than 4 feet above the original ground surface, be surveyed for at least 6 months to ensure grading-induced settlement has ceased. A cessation of settlement is defined at least 3 consecutive months of no measurable settlement.

145 N. Sierra Madre Blvd., Suite #1 • Pasadena • California • 91107 • Phone: 626-844-6641/Fax: 626-604-0394

The settlement potential of the mat foundations under static loading was modeled using consolidation theory and the consolidation tests of the alluvial deposits. A 15-foot thick compacted fill cap is now recommended to mitigate the liquefaction potential as described below. The increase in stress with depth was modeled using Boussinesq methods. The inclosed calculations indicate that a uniform bearing pressure of 1,350 psf will induce 2.10 inches of settlement, which is the just under the allowable combined static plus dynamic settlement of 4.0 inches.

The recommended allowable net pressure along the base of the mat should be reduced from 2,000 psf to 1,350 psf.

Item 10 - The liquefaction analysis has been revised using a depth to groundwater of 10 feet (base of subdrain). Due to the soft alluvial materials at the base of the fill, it is recommended that the removal and recompaction extend to a depth of 15 feet to reduce the liquefaction and dynamic settlement potentials. An uncorrected SPT N blow count of 20 blows/ft has been assumed for the compacted fill.

The last column of *"Liquefaction Analysis Using SPT Data"* lists the calculated safety factor of the soils encountered in Borings 1 through 4. The N_{60} tip resistance was converted to an equivalent SPT N_{60CS} blow count using published correlations and following he recommendations of SP117A. The calculations were performed for PGA_M, and ⅔PGA_M, ground motions.

LIQUEFACTION POTENTIAL - BORING 1			
Ground Motion 2/3(PGA_M)		Ground Motion (PGA_M)	
Layers (Feet) (FS<1.3)	Settlement (Inches) (FS < 1.1)	Layers (Feet) (FS<1.0)	Settlement (Inches) (FS < 1.0)
17.5	0.51	17.5	0.51
20	0.44	20	0.44
22.5	0.49	22.5	0.49
25	0.41	25	0.41
27.5	0.0	27.5	0.39
Total Settlement	1.85	Total Settlement	2.24

LIQUEFACTION POTENTIAL - BORING 2			
Ground Motion 2/3(PGA_M)		Ground Motion (PGA_M)	
Layers (Feet) (FS<1.3)	Settlement (Inches) (FS < 1.1)	Layers (Feet) (FS<1.0)	Settlement (Inches) (FS < 1.0)
17.5	0.63	17.5	0.63
20	0.58	20	0.58
22.5	0.53	22.5	0.53
25	0.0	25	0.41
27.5	0.0	27.5	0.40
Total Settlement	1.74	Total Settlement	2.55

LIQUEFACTION POTENTIAL - BORING 4			
Ground Motion 2/3(PGA_M)		Ground Motion (PGA_M)	
Layers (Feet) (FS<1.3)	Settlement (Inches) (FS < 1.1)	Layers (Feet) (FS<1.0)	Settlement (Inches) (FS < 1.0)
17.5	0.56	17.5	0.56
20	0.59	20	0.59
Total Settlement	1.15	Total Settlement	1.15

The upper alluvial soils in main, westerly canyon are subject to liquefaction for the design ground motions and the assumed groundwater conditions. The alluvial soils in the easterly, secondary canyon with the removals extended to 15 feet are not subject to liquefaction. This is consistent with the seismic hazard mapping performed by the CGS.

Dynamic Settlement

Dissipation of excess pore pressure after liquefaction can result in settlement. The volumetric strain and accompanying settlement of saturated soils were estimated using procedures developed by Ishihara and Yoshimine. According to the referenced 2002 SCEC publication, differential settlement is typically of ½ to ⅔ of the total settlement for Holocene sediments. The liquefaction induced total and differential settlement potentials of the site are summarized in the table.

DYNAMIC SETTLEMENT POTENTIAL				
Boring	Total Settlement (inches)		Differential Settlement Range (½ - ⅔ total - inches)	
	⅔(PGA_M)	(PGA_M)	⅔(PGA_M)	(PGA_M)
1	1.85	2.24	0.93 - 1.23	1.12 - 1.49
2	1.74	2.55	0.87 - 1.16	1.28 - 1.70
4	1.15	1.15	0.58 - 0.77	0.58 - 0.77

The liquefaction potential of the site is moderate to high. Remedial grading and mat-type foundations are recommended to support structures within the westerly canyon to mitigate the liquefaction and dynamic settlement potentials.

For the higher ground motions and associated settlements, the structural engineer should verify that the foundations supporting the buildings do not lose their ability to carry gravity loads and that collapse of the building is prevented.

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

Respectfully submitted,
Irvine Geotechnical, Inc.

Jon A. Irvine
E.G. 1691/G.E. 2891
R:\ICprojects\IC17036 Harridge San Feliciano\IC17036 Harridge San Feliciano Addendum #2.wpd

Enc: *Geology and Soils Report Correction Letter,* Log #97648-01, dated September 13, 2017
Correspondence from BOE
Revised Liquefaction Analysis
Liquefaction Analysis Using SPT Data - Borings 1 - 4 (16 Pages)
Settlement Calculation
Calculation Sheets (24)
In pocket: Geologic Map, Removal Map, and Sections A through H

xc: (3) Addressee

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 Juhly 18, 2017 and the results appear to be reasonable for this area of the Santa Monica Mountains. Irvine Geotechnical and the undersigned engineer concurs with the findings of Soil Labworks, LLC and accepts professional responsibility for utilizing the data.

CITY OF LOS ANGELES
CALIFORNIA

ERIC GARCETTI
MAYOR

DEPARTMENT OF
BUILDING AND SAFETY
201 NORTH FIGUEROA STREET
LOS ANGELES, CA 90012

FRANK M. BUSH
GENERAL MANAGER
SUPERINTENDENT OF BUILDING

OSAMA YOUNAN, P.E.
EXECUTIVE OFFICER

GEOLOGY AND SOILS REPORT REVIEW LETTER

September 13, 2017

LOG # 97648-01
SOILS/GEOLOGY FILE - 2
LIQ

San Feliciano Holding Company, LLC
6363 Wilshire Boulevard, Suite 600
Los Angeles, CA 90048

PROPOSED LEGAL: Vesting Tentative Tract VTT-67505, Lots 1 through 19
CURRENT LEGAL: Tract 1000, Portion of Lot 1083 (Arbs. 7 and 8)
LOCATION: 22255 W. Mulholland Drive (aka 22241 W. Mulholland Drive)

CURRENT REFERENCE REPORT/LETTER	REPORT No.	DATE OF DOCUMENT	PREPARED BY
Addendum Report	IC 17036-I	08/21/2017	Irvine Geotechnical, Inc.
Oversized Documents	``	``	``

PREVIOUS REFERENCE REPORT/LETTER(S)	REPORT No.	DATE OF DOCUMENT	PREPARED BY
Dept. Review Letter	97648	05/23/2017	LADBS
Geology/Soils Report	IC 17036-I	04/06/2017	Irvine Geotechnical, Inc.
Laboratory Test Report	SL17.2401	03/30/2017	Soil Labworks, LLC
Dept. Correction Letter	--	04/13/2016	LADBS
Dept. Approval Letter	58932	08/10/2007	"
Geology/Soil Report	JB 19553-Z	07/20/2006	The J. Byer Group
Dept. Approval Letter	51978	03/29/2006	LADBS
Geology/Soil Report	JB 19553-Z	03/22/2005	The J. Byer Group

The Grading Division of the Department of Building and Safety has reviewed the referenced 2017 reports that provide recommendations for a proposed 19 lot subdivision (VTT-67505) with a single family residence on each lot. The proposed subdivision is located in a partially filled canyon with side slopes as steep as 0.9H:1V. The earth materials at the subsurface exploration locations consist of up to 10.5 feet of uncertified fill underlain by up to 25 feet of alluvium and Modelo Formation sandstone, siltstone and claystone bedrock that dips 7 to 20 degrees. The consultants recommend to support the proposed structures on conventional and/or mat-type foundations bearing on a blanket of properly placed fill a minimum of 3 feet thick.

The review of the subject reports cannot be completed because the stability or safety of the proposed development cannot be determined at this time. The review will be continued upon submittal of an addendum to the reports which includes, but need not be limited to, the following:

(Note: Numbers in parenthesis ( ) refer to applicable sections of the 2017 City of LA Building Code. P/BC numbers refer the applicable Information Bulletin. Information Bulletins can be accessed on the internet at LADBS.ORG.)

1. As previously requested, provide a geologic map that is based upon the proposed subdivision map that shows how all existing and proposed site slopes will be graded. Provide recommendations to grade all existing cut and fill slopes to no steeper than 2H:1V. Note: The consultants indicate that the requested information is not required per the "Instructions for Filing Tentative Tract Maps." We ask the consultants to see the Section D Hillside Areas that requires that the tract map show contour lines and must provide colored tract maps to distinguish cut and fill slopes.

   In addition, the geologic map and cross sections shall show the following:

   a. All proposed retaining, slough and dispersal walls.

   b. Limits of the proposed over excavation and re-compaction recommended by the consultants.

   c. Location of all proposed shoring and slot cuts required to achieve the proposed removals and grading.

   d. Location of the proposed canyon subdrain(s).

   e. H/2 structure slope setbacks. Note: Lot 5 does not appear to have the required slope setback.

   f. All proposed grading within the adjacent street right-of-ways including all recommended remedial grading to support safe and stable access.

   g. Location of all proposed pools and accessory structures or remove them from the project recommendations/description.

2. Revise the slope stability analyses to consider both planar and circular potential failure planes, the weakest material profile, and the **critical geologic cross sections** based on the revised tentative tract map. Provide slope stability analysis for the up to 1.2H:1V west facing cut slope on Lot 5 and other critical slopes. Note: Section C does not appear to the most critical section.

3. How was the assumed depth of 15 feet below the ground surface determined to be the historic high groundwater level? Use the ground surface as the historic groundwater level or provide justification for a deeper depth. Note: Historically, groundwater probably flowed down the canyon and completely saturated the alluvium.

4. As previously requested, what is the length of contour line affected by grading that the dispersal wall length must meet (7013.7, Figure F, Note 3)? The consultants indicate that the 40 foot long dispersal wall will disperse the drainage from portions of Lots 1 through 4. Show the collected wall area as it appears that Lots 1 through 4 are longer than 40 feet.

5. Provide copies of the approval from the Geotechnical Engineering Group (GEO) of the Department of Public Works, Bureau of Engineering for the subject Tentative Tract. If no approval has been received, file the applicable reports with GEO.

6. Provide a critical geologic cross-section for the offsite fill slope above the southwestern portion of the subject site and perform global slope stability analysis.

7. Justify with calculations that the proposed 3-foot high slough wall will provide adequate protection against surficial instability (as indicated on page 4 of the 08/21/2017 report).

8. Provide boring log of IG B6.

9. Provide additional settlement calculations using consolidation settlement theory based on the compression indices derived from the consolidation tests as presented in the 08/21/2017 report.

10. Revise liquefaction analysis and foundation recommendations based on responses to items 3 and 9.

The geologist and soils engineer shall prepare a report containing an itemized response to the review items indicated in this letter. If clarification concerning the review letter is necessary, the report review engineer and/or geologist may be contacted. Two copies of the response report, including one unbound wet-signed original for archiving purposes, a pdf-copy of the complete report in a CD or flash drive, and the appropriate fees will be required for submittal.

CASEY LEE JENSEN
Engineering Geologist Associate II

YING LIU
Geotechnical Engineer I

CLJ/YL:clj/yl
Log No. 97648-01
213-482-0480

cc: Irvine Geotechnical, Inc., Project Consultant
VN District Office

5 CITY OF LOS ANGELES
INTERDEPARTMENTAL CORRESPONDENCE

Date: May 25, 2016

To: Mr. Vince P. Bertoni, Director
Department of City Planning
Attention: Deputy Advisory Agency

From: Edmond Yew
Land Development Group
Bureau of Engineering

Subject: **Revised-II** Tentative Tract Map No. 67505

Transmitted is a print of revised vesting tentative map of Tract Map No. 67505 stamp dated **May 11, 2015** lying northwesterly of Mulholland Drive and southeasterly of San Feliciano Drive in Council District No. 3.

This report supersedes any previous report from City Engineer.

This vesting tentative tract map has been filed to change the proposed public street "A" street to a private street from the first revised map.

The revised map layout is satisfactory except the proposed drainage System and the drainage easement.

Not: All the street dedications and improvements recommended herein for Mulholland Drive by the City Engineer are in accordance with the **Mulholland Drive Specific Plan**.

There are existing sewers available in the streets adjoining the subdivision and in sanitary sewer easements within the tract property. The construction of mainline and house connection sewers within suitable easement will be required to serve the tract. This tract will connect to the public sewer system and will not result in violation of the California Water Code. I therefore recommend that you make the necessary determination.

I recommend that the revised tentative map of Tract No. 67505 stamp dated **May 11, 2015** be approved, subject to the standard conditions issued by your department and the following special conditions:

1. That a 54-foot wide private street easement be provided for the proposed “A” Street including a 44-foot radius property easement cul-de-sac at the terminus on an alignment satisfactory to the Valley District Engineering Office.

2. That sanitary sewer easement be dedicated full-width of the proposed private street.

3. That the private street easement be part of the adjoining parcels.

4. That the owners of the property record an agreement satisfactory to the City Engineer stating that they will grant the necessary easements for ingress, egress and public facilities over the private street area upon the sale of the respective lots and they will maintain the private street, free and clear of obstructions and in a safe condition for vehicular use at all times.

5. That a 5-foot and variable width strip of land be dedicated along San Feliciano Drive adjoining the tract to complete a55-foot to 60-foot wide total right-of-way. Additional sidewalk easement may be necessary to allow for construction of meandering sidewalk to save the existing trees.

6. That arrangement be made with the Los Angeles County Department of Public Works prior to recordation of the final map for any necessary permits with respect to discharge into the their existing storm drain system within the tract property.

7. That a Covenant and Agreement be recorded advising all future owners and builders that prior to issuance of a building permit, a Notice of Acknowledgment of Easement must be recorded and an application to do work in any drainage or sanitary sewer easements and to construct over the existing sanitary sewers and drainage facilities must be submitted to the City Engineer for approval.

8. That Board of Public Works approval be obtained, prior to the recordation of the final map, for the removal of any tree in the existing or proposed right-of-way area. The Bureau of Street Services, Urban Forestry Division, is the lead agency for obtaining Board of Public Works approval for removal of such trees.

9. That the following requirements in connection with grading and construction in and adjacent to public rights-of-way or private streets be complied with in a manner satisfactory to the City Engineer:

a. Cut or fill slopes in artificial fill and residual soils shall be no steeper than 2:1 (H:V). Cut slopes shall be no steeper than 1.5:1 (H:V) in competent bedrock.

b. The toes and crests of all cut and fill slopes shall be located on private property and shall be set back 2 and 3 feet respectively, from the property line.

c. Where fill overlies a cut slope, the fill shall be keyed horizontally into bedrock a minimum of 12 feet or the slope shall be over excavated a minimum of 12 feet and replaced as a compacted fill slope.

d. The consulting soils engineer shall provide methods of mitigating the effects of expansive soil, which underlies the public property and private streets. Prior to the approval of plans, the City Engineer must approve the proposed method.

e. All streets shall be founded upon firm natural materials or properly compacted fill. Any loose fill, loose soil, or organic material shall be removed prior to the placement of engineered fill.

f. Fill material shall be compacted to a minimum of 90 Percent relative compaction as defined in the Bureau of Engineering Standard Plan S-610. Fill shall be benched into competent material.

g. All slopes shall be planted and an irrigation system installed as soon as possible after grading to alleviate erosion.

h. Adequate perforated pipe and gravel sub-drain systems approved by the City Engineer shall be placed beneath canyon fills and behind retaining walls.

i. Slopes that daylight adversely dipping bedding shall be supported by either a retaining wall or a designed buttress fill.

j. Where not in conflict with the above, the recommendations contained in Byer Group Inc.' geotechnical reports dated July 20, 2006, by the consulting engineering geologist Peter Kilbury (CEG 2401) and Geotechnical Engineer Robert Zweigler (GE 2120), shall be implemented.

k. GED required procedures for review and approval of grading and foundation construction as it relates to City Property and the Right-of-way are specified in the Inter-Departmental Correspondence-Geotechnical Engineering Division Requirements for Review and Approval of Grading and Foundation Construction, dated October 12, 2001 (attached). These procedures shall be followed during tract design and construction.

10. That the following improvements be either constructed prior to recordation of the final map or that the construction be suitably guaranteed:

a. After submittal of hydrology and hydraulic calculations and drainage plans for review by the City Engineer prior to recordation of the final map.
Construction of public and/or private drainage facilities or removal and reconstruction of any existing system within the existing easements may be required to drain the public street and any existing and new storm drain systems within the property to outlets satisfactory to the City Engineer.

b. Improve the private street by the construction of the following:

(1) Concrete curbs, concrete gutters, and 4-foot concrete sidewalks.

(2) Suitable surfacing to join the existing pavement and to complete a 36-foot roadway.

(3) Any necessary removal and reconstruction of the existing improvements.

(4) The necessary transitions to join the existing improvement.

(5) The suitable improvement of the 35-foot curb radius cul-de-sac.

d. Improve Mulholland Drive **(service road portion)**adjoining the tract by the construction of the following:

(1) Concrete curb, concrete gutter and 5.5-foot wide concrete sidewalk.

(2) Suitable surfacing to join the existing pavement and to complete a 28-foot roadway.

(3) Any necessary removal and reconstruction of the existing improvements.

(4) The necessary transitions to join the existing Improvements specially existing service road to the west.

e. Improve main Mulholland Drive adjoining the tract and adjoining the service road as described above by the construction of the following:

(1) Construct an 18-foot wide traffic island including concrete curbs and gutters facing the service road and the main Mulholland Drive.

(2) Suitable surfacing to join the existing pavement and to complete a 44-foot and variable width half-roadway(matching roadway to the west).

(3) Any necessary removal and reconstruction of the existing improvements.

(4) The necessary transitions to join the existing Improvements specially existing road to the west.

f. Improve San Feliciano Drive adjoining the tract by construction of 5.5-foot wide concrete sidewalk including any necessary removal and reconstruction of the existing improvements.

g. Construct mainline and house connection sewers to serve the development.

Any questions regarding this report should be directed to Mr. Georgic Avanesian of the Land Development Section, located at 201 North Figueroa Street, Suite 200, or by calling (213) 202-3484.

LOG OF BORING

IRVINE GEOTECHNICAL Inc

PROJECT	IC17036 HARRIDGE SAN FELICIANO
DRILL DATE	6/28/2017
LOG DATE	6/28/2017
LOGGED BY	KJONE
DRILL TYPE	HOLLOW-STEM
DIAMETER	8 INCHES

SURFACE ELEVATION	1009 feet
DRILLING CONTRACTOR	Choice Drilling
SURFACE CONDITIONS	level to gentle slope

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	1009.0	0	**FILL:** Silty Sand, brown, slightly moist, medium dense, roots and rootlets, gravel to 1/2" in diameter
							1008.0	1	
							1007.0	2	
							1006.0	3	
							1005.0	4	
R	5	2/4/6	8.2	96.4	30		1004.0	5	
							1003.0	6	
							1002.0	7	
							1001.0	8	
							1000.0	9	
R	10	2/4/6	15.1	88.3	46	CL	999.0	10	**ALLUVIUM:** Sandy Clay, brown, moist, firm
							998.0	11	
							997.0	12	
							996.0	13	Silty Clay, dark brown, moist, firm to stiff
							995.0	14	
R	15	3/6/9	20.6	93.1	70	CL	994.0	15	
							993.0	16	
							992.0	17	
							991.0	18	
							990.0	19	
R	20	4/4/6	29.9	91.2	97	CL	989.0	20	

(continued next page...)

LOG OF BORING

IRVINE GEOTECHNICAL Inc

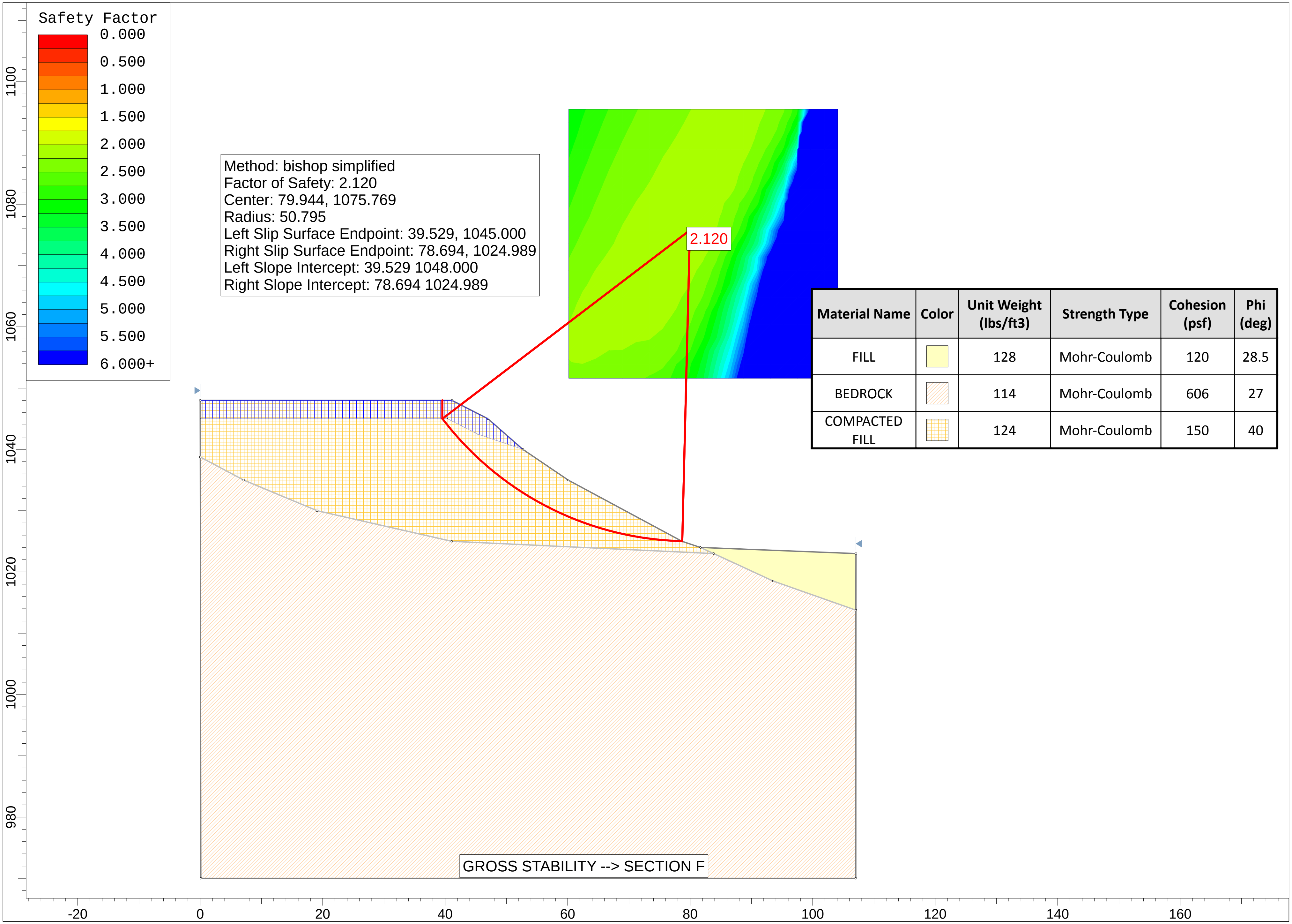
PROJECT IC17036 HARRIDGE SAN FELICIANO
DRILL DATE 6/28/2017
LOG DATE 6/28/2017
LOGGED BY KJONES
DRILL TYPE HOLLOW-STEM
DIAMETER 8 INCHES

SURFACE ELEVATION 1020 feet
DRILLING CONTRACTOR Choice Drilling
SURFACE CONDITIONS level to gentle slope

BORING 6

Sample Type	Sample Depth (feet)	Blows per foot	Moisture (%)	Dry Unit Weight (pcf)	Saturation (%)	USCS Code	Elevation (feet)	Depth (feet)	Lithologic Description
R	20	4/4/6	29.9	91.2	97	CL	1000.0	20	Sandy Clay, grey-brown to yellow-brown, very moist to wet, stiff
							999.0	21	
							998.0	22	Sandy Clay, mottled yellow-brown and grey-brown, wet to saturated, stiff, bedrock fragments to 2" in diameter
							997.0	23	
							996.0	24	
R	25	8/10/11	27.1	97.0	100	CL	995.0	25	
							994.0	26	
							993.0	27	**BEDROCK:** Sandstone and Siltstone, orange-brown to gray-brown, gray, massive, hard, very to moderately weathered
							992.0	28	
							991.0	29	
R	30	18/47/50	7.2	103.2	13		990.0	30	
							989.0	31	
							988.0	32	
							987.0	33	
							986.0	34	
R	35	50-6"	7.5	104.0	34		985.0	35	

END B6 @ 35': Water @ 21.5; No Caving; Fill to 9'



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
FILL		128	Mohr-Coulomb	120	28.5
BEDROCK		114	Mohr-Coulomb	606	27
COMPACTED FILL		124	Mohr-Coulomb	150	40

Slide Analysis Information

HARRIDGE - SAN FELICIANO

Project Summary

File Name: SECTION F CALC
Slide Modeler Version: 6.039
Project Title: HARRIDGE - SAN FELICIANO
Analysis: GROSS STBAILITY --> SECTION E

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Tension Crack

Tension crack Water level: filled with water

Material Properties

Property	FILL	BEDROCK	COMPACTED FILL
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	114	124
Cohesion [psf]	120	606	150
Friction Angle [deg]	28.5	27	40
Water Surface	None	None	None
Ru Value	0	0	0

Global Minimums

Method: bishop simplified

FS: 2.120260
Center: 79.944, 1075.769
Radius: 50.795
Left Slip Surface Endpoint: 39.529, 1045.000
Right Slip Surface Endpoint: 78.694, 1024.989
Left Slope Intercept: 39.529 1048.000
Right Slope Intercept: 78.694 1024.989
Resisting Moment=1.32591e+006 lb-ft
Driving Moment=625353 lb-ft
Total Slice Area=204.316 ft2

Valid / Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 4677
Number of Invalid Surfaces: 174

Error Codes:

Error Code -98 reported for 111 surfaces
Error Code -105 reported for 4 surfaces
Error Code -108 reported for 59 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.
-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).

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.12026

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	1.5666	772.732	COMPACTED FILL	150	40	178.01	377.427	271.036	0	271.036
2	1.5666	1057.66	COMPACTED FILL	150	40	233.348	494.759	410.868	0	410.868
3	1.5666	1232.22	COMPACTED FILL	150	40	271.118	574.84	506.305	0	506.305
4	1.5666	1378.65	COMPACTED FILL	150	40	304.733	646.114	591.246	0	591.246
5	1.5666	1497.17	COMPACTED FILL	150	40	333.827	707.801	664.76	0	664.76
6	1.5666	1517.3	COMPACTED FILL	150	40	344.546	730.527	691.846	0	691.846
7	1.5666	1485.28	COMPACTED FILL	150	40	344.848	731.168	692.611	0	692.611
8	1.5666	1435.11	COMPACTED FILL	150	40	341.005	723.02	682.897	0	682.897
9	1.5666	1379.26	COMPACTED FILL	150	40	335.425	711.188	668.797	0	668.797
10	1.5666	1352.97	COMPACTED FILL	150	40	335.348	711.026	668.605	0	668.605
11	1.5666	1316.94	COMPACTED FILL	150	40	332.915	705.866	662.457	0	662.457
12	1.5666	1267.2	COMPACTED FILL	150	40	327.227	693.807	648.084	0	648.084
13	1.5666	1204.46	COMPACTED FILL	150	40	318.35	674.984	625.654	0	625.654
14	1.5666	1145.91	COMPACTED FILL	150	40	309.936	657.145	604.391	0	604.391
15	1.5666	1100.87	COMPACTED FILL	150	40	304.102	644.775	589.65	0	589.65
16	1.5666	1044.71	COMPACTED FILL	150	40	295.485	626.504	567.875	0	567.875
17	1.5666	977.518	COMPACTED FILL	150	40	284.034	602.225	538.941	0	538.941
18	1.5666	899.645	COMPACTED FILL	150	40	269.748	571.935	502.842	0	502.842
19	1.5666	811.372	COMPACTED FILL	150	40	252.616	535.612	459.554	0	459.554
20	1.5666	712.945	COMPACTED FILL	150	40	232.618	493.211	409.022	0	409.022
21	1.5666	604.567	COMPACTED FILL	150	40	209.722	444.666	351.169	0	351.169
22	1.5666	486.407	COMPACTED FILL	150	40	183.887	389.889	285.889	0	285.889
23	1.5666	358.602	COMPACTED FILL	150	40	155.06	328.768	213.047	0	213.047
24	1.5666	221.258	COMPACTED FILL	150	40	123.175	261.164	132.48	0	132.48
25	1.5666	74.4652	COMPACTED FILL	150	40	88.159	186.92	43.9995	0	43.9995

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.12026

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	39.5286	1045	280.8	0	0
2	41.0952	1043.04	532.012	0	0
3	42.6618	1041.27	895.42	0	0
4	44.2284	1039.65	1290.62	0	0

5	45.795	1038.17	1691.04	0	0
6	47.3616	1036.8	2075.68	0	0
7	48.9282	1035.54	2406.34	0	0
8	50.4948	1034.38	2670	0	0
9	52.0614	1033.31	2867.34	0	0
10	53.628	1032.32	3002.92	0	0
11	55.1946	1031.41	3086.76	0	0
12	56.7611	1030.57	3120.7	0	0
13	58.3277	1029.8	3107.03	0	0
14	59.8943	1029.1	3049.17	0	0
15	61.4609	1028.46	2951.85	0	0
16	63.0275	1027.87	2818.92	0	0
17	64.5941	1027.35	2654.07	0	0
18	66.1607	1026.88	2461.9	0	0
19	67.7273	1026.46	2247.91	0	0
20	69.2939	1026.1	2018.52	0	0
21	70.8605	1025.79	1781.02	0	0
22	72.4271	1025.53	1543.62	0	0
23	73.9937	1025.32	1315.46	0	0
24	75.5603	1025.16	1106.68	0	0
25	77.1269	1025.05	928.473	0	0
26	78.6935	1024.99	0	0	0

List Of Coordinates

Tension Crack

X	Y
0.0969007	1045
40.3767	1045
45.2885	1042.5
52.6848	1040

External Boundary

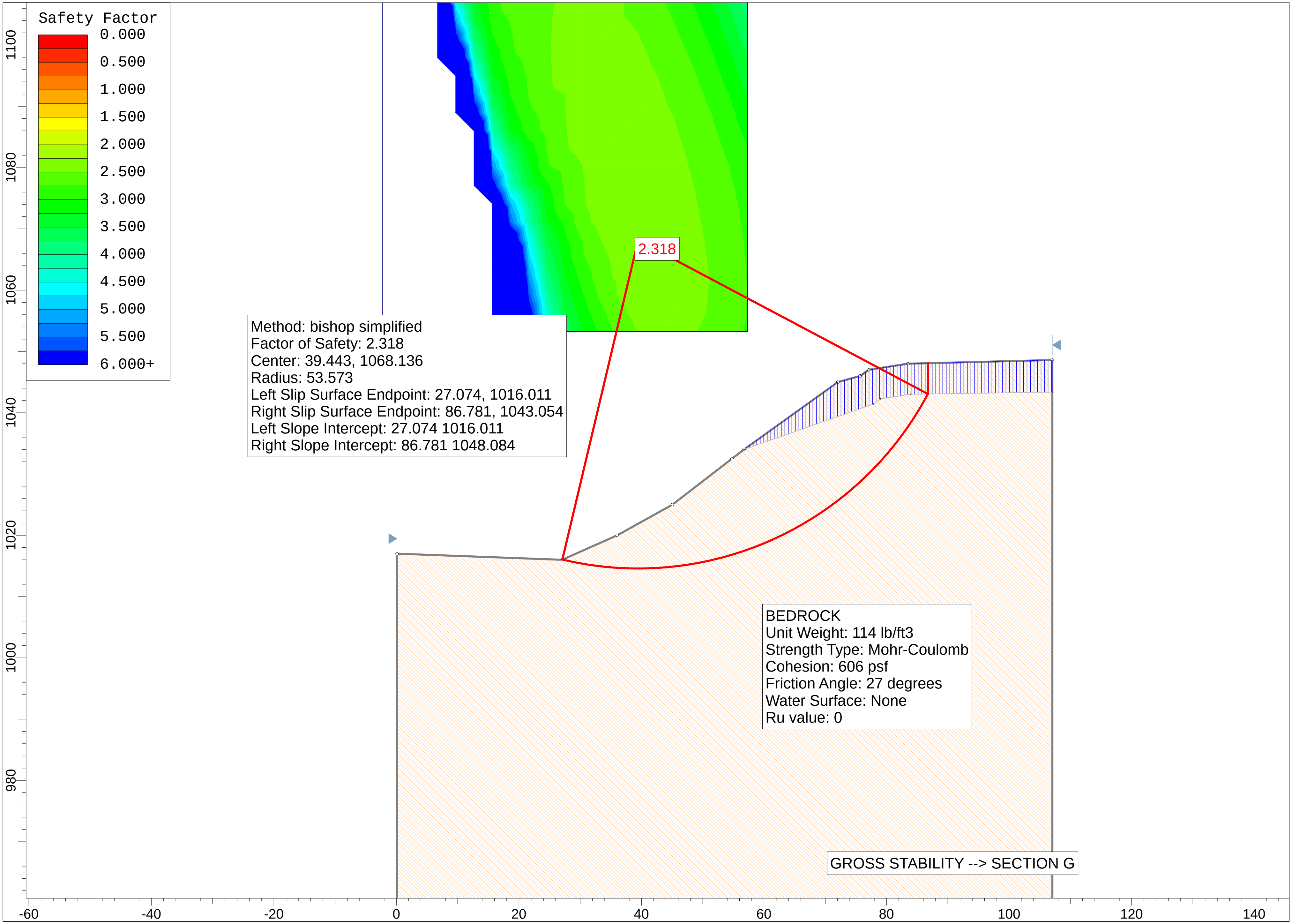
X	Y
0.0969007	970
107.028	970
107.055	1013.77
107.061	1023
81.6606	1024
78.6606	1025
60.0727	1035
52.6848	1040
46.9848	1045
41.0969	1048
0	1048
0.0114877	1038.75

Material Boundary

X	Y
0.0114877	1038.75
7.08479	1035
19.0727	1030
41.0606	1025
83.8261	1023

Material Boundary

X	Y
81.6606	1024
83.8261	1023
93.5519	1018.51
107.055	1013.77


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
2.318
Method: bishop simplified
Factor of Safety: 2.318
Center: 39.443, 1068.136
Radius: 53.573
Left Slip Surface Endpoint: 27.074, 1016.011
Right Slip Surface Endpoint: 86.781, 1043.054
Left Slope Intercept: 27.074 1016.011
Right Slope Intercept: 86.781 1048.084
BEDROCK
Unit Weight: 114 lb/ft3
Strength Type: Mohr-Coulomb
Cohesion: 606 psf
Friction Angle: 27 degrees
Water Surface: None
Ru value: 0
GROSS STABILITY --> SECTION G
1100
1080
1060
1040
1020
1000
980
-60
-40
-20
0
20
40
60
80
100
120
140

Slide Analysis Information

HARRIDGE - SAN FELICIANO

Project Summary

File Name: SECTION G CALC
Slide Modeler Version: 6.039
Project Title: HARRIDGE - SAN FELICIANO
Analysis: GROSS STBAILITY --> SECTION G

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Tension Crack

Tension crack Water level: filled with water

Material Properties

Property	BEDROCK
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	114
Cohesion [psf]	606
Friction Angle [deg]	27
Water Surface	None
Ru Value	0

Global Minimums

Method: bishop simplified

FS: 2.317700
Center: 39.443, 1068.136
Radius: 53.573
Left Slip Surface Endpoint: 27.074, 1016.011
Right Slip Surface Endpoint: 86.781, 1043.054
Left Slope Intercept: 27.074 1016.011
Right Slope Intercept: 86.781 1048.084
Resisting Moment=4.51102e+006 lb-ft
Driving Moment=1.94633e+006 lb-ft
Total Slice Area=742.807 ft2

Valid / Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 3376
Number of Invalid Surfaces: 1475

Error Codes:

Error Code -98 reported for 357 surfaces
Error Code -102 reported for 4 surfaces
Error Code -105 reported for 3 surfaces
Error Code -106 reported for 2 surfaces
Error Code -107 reported for 613 surfaces
Error Code -108 reported for 34 surfaces

Error Code -1000 reported for 462 surfaces

Error Codes

The following errors were encountered during the computation:

-98 = Circular slip surface is entirely within the tension crack zone.
-102 = Two surface / slope intersections, but resulting arc is actually outside soil region.
-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.
-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.
-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: 2.3177

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	2.38828	213.858	BEDROCK	606	27	294.969	683.65	152.397	0	152.397
2	2.38828	626.283	BEDROCK	606	27	331.21	767.645	317.246	0	317.246
3	2.38828	1008.47	BEDROCK	606	27	363.909	843.433	465.99	0	465.99
4	2.38828	1363.11	BEDROCK	606	27	393.426	911.843	600.251	0	600.251
5	2.38828	1737.87	BEDROCK	606	27	424.259	983.304	740.5	0	740.5
6	2.38828	2104.31	BEDROCK	606	27	453.741	1051.64	874.608	0	874.608
7	2.38828	2441.71	BEDROCK	606	27	480.006	1112.51	994.08	0	994.08
8	2.38828	2765.75	BEDROCK	606	27	504.526	1169.34	1105.62	0	1105.62
9	2.38828	3165.87	BEDROCK	606	27	535.285	1240.63	1245.53	0	1245.53
10	2.38828	3555.48	BEDROCK	606	27	564.413	1308.14	1378.03	0	1378.03
11	2.38828	3914.36	BEDROCK	606	27	590.133	1367.75	1495.02	0	1495.02
12	2.38828	4240.93	BEDROCK	606	27	612.343	1419.23	1596.05	0	1596.05
13	2.38828	4524.35	BEDROCK	606	27	630.143	1460.48	1677.02	0	1677.02
14	2.38828	4751.61	BEDROCK	606	27	642.48	1489.08	1733.14	0	1733.14
15	2.38828	4940.12	BEDROCK	606	27	650.889	1508.57	1771.38	0	1771.38
16	2.38828	5089.99	BEDROCK	606	27	655.393	1519	1791.87	0	1791.87
17	2.38828	5198.29	BEDROCK	606	27	655.754	1519.84	1793.52	0	1793.52
18	2.38828	5261.34	BEDROCK	606	27	651.669	1510.37	1774.93	0	1774.93
19	2.38828	5270.32	BEDROCK	606	27	642.421	1488.94	1732.86	0	1732.86
20	2.38828	5038.74	BEDROCK	606	27	613.469	1421.84	1601.17	0	1601.17
21	2.38828	4702.35	BEDROCK	606	27	575.953	1334.89	1430.52	0	1430.52
22	2.38828	4296.9	BEDROCK	606	27	532.779	1234.82	1234.13	0	1234.13
23	2.38828	3657.57	BEDROCK	606	27	472.005	1093.96	957.685	0	957.685
24	2.38828	2896.05	BEDROCK	606	27	402.621	933.155	642.079	0	642.079
25	2.38828	1914.37	BEDROCK	606	27	318.621	738.469	259.985	0	259.985

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 2.3177

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	27.0739	1016.01	0	0	0
2	29.4622	1015.5	781.26	0	0
3	31.8504	1015.1	1697.32	0	0
4	34.2387	1014.82	2699.29	0	0
5	36.627	1014.64	3745.39	0	0
6	39.0153	1014.57	4810.97	0	0
7	41.4035	1014.6	5863.41	0	0
8	43.7918	1014.74	6868.3	0	0
9	46.1801	1014.99	7797.02	0	0
10	48.5684	1015.35	8628.44	0	0
11	50.9567	1015.82	9328.52	0	0
12	53.3449	1016.4	9864.1	0	0
13	55.7332	1017.1	10204.9	0	0
14	58.1215	1017.93	10324.7	0	0
15	60.5098	1018.88	10203.3	0	0
16	62.898	1019.97	9822.49	0	0
17	65.2863	1021.21	9167.2	0	0
18	67.6746	1022.61	8226.15	0	0
19	70.0629	1024.18	6992.84	0	0
20	72.4512	1025.94	5468.75	0	0
21	74.8394	1027.92	3757.85	0	0
22	77.2277	1030.16	1934.09	0	0
23	79.616	1032.69	75.2942	0	0
24	82.0043	1035.6	-1582.59	0	0
25	84.3925	1038.99	-2797.81	0	0
26	86.7808	1043.05	789.22	0	0

List Of Coordinates

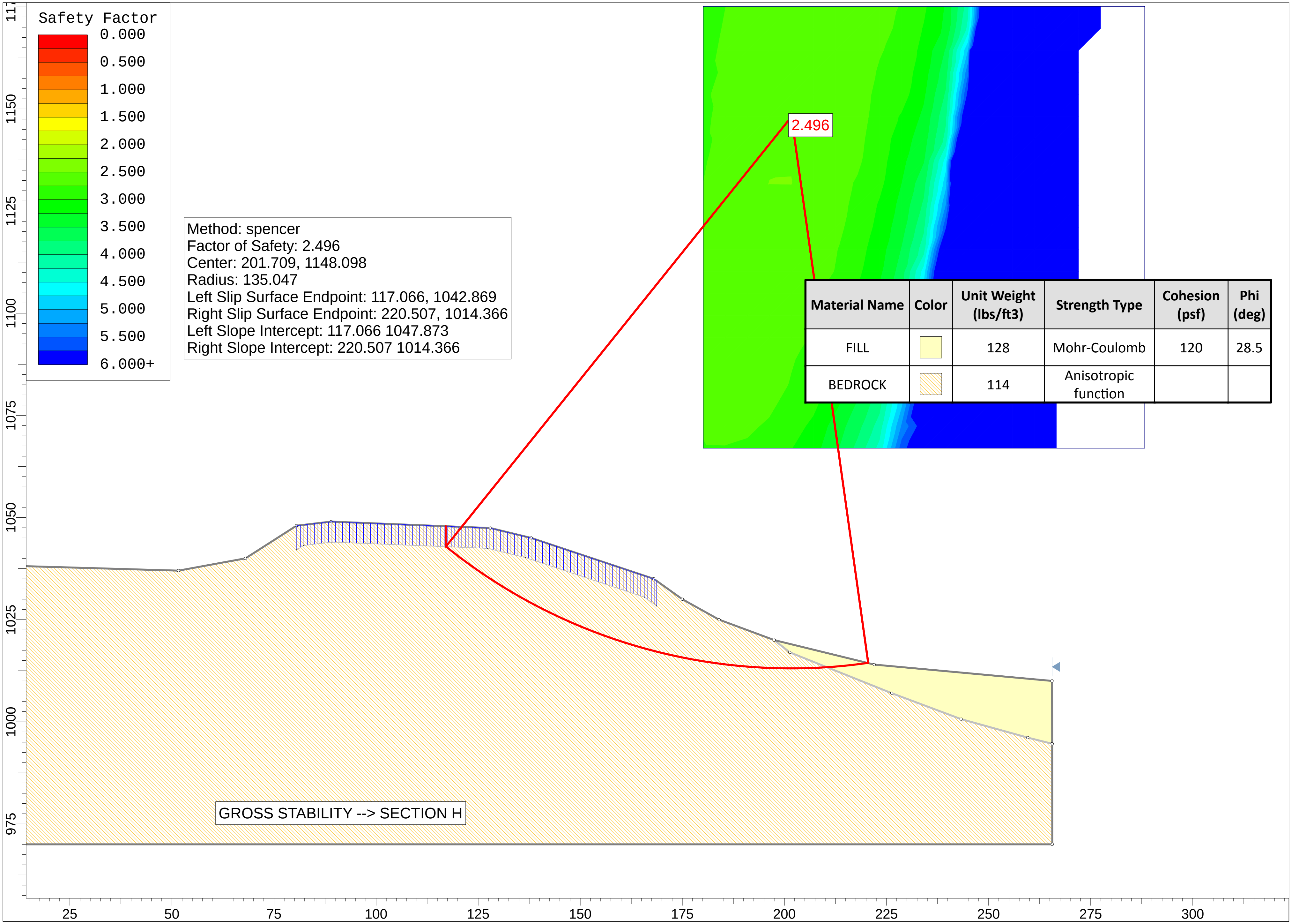
Tension Crack

X	Y
56.7445	1034.01
77.8676	1041.41
79.027	1042.24
83.9362	1043.01
107.061	1043.37

External Boundary

X	Y
83.4848	1048
77.0848	1047
75.6848	1046

72.0485	1045
56.7445	1034.01
54.7606	1032.5
45.0485	1025
36.0485	1020
27.0485	1016
0.0969007	1017
0.0969007	960.252
107.061	960.252
107.061	1048.6



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
FILL		128	Mohr-Coulomb	120	28.5
BEDROCK		114	Anisotropic function		

Slide Analysis Information
HARRIDGE - SAN FELICIANO

Project Summary

File Name: SECTION H CALC cir
Slide Modeler Version: 6.039
Project Title: HARRIDGE - SAN FELICIANO
Analysis: GROSS STABILITY --> SECTION H

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

Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Tension Crack

Tension crack Water level: filled with water

Material Properties

Property	FILL	BEDROCK
Color		
Strength Type	Mohr-Coulomb	Anisotropic function
Unit Weight [lbs/ft3]	128	114
Cohesion [psf]	120	
Friction Angle [deg]	28.5	
Water Surface	None	None
Ru Value	0	0

Anisotropic Functions

Name: User Defined 1

Angle From	Angle To	c	phi
-90	-20	606	27
-20	-7	255	17
-7	90	606	27

Global Minimums

Method: spencer

FS: 2.495650
Center: 201.709, 1148.098
Radius: 135.047
Left Slip Surface Endpoint: 117.066, 1042.869
Right Slip Surface Endpoint: 220.507, 1014.366
Left Slope Intercept: 117.066 1047.873
Right Slope Intercept: 220.507 1014.366
Resisting Moment=1.43704e+007 lb-ft
Driving Moment=5.75818e+006 lb-ft
Resisting Horizontal Force=98829.7 lb
Driving Horizontal Force=39600.7 lb
Total Slice Area=1197.45 ft2

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3884
Number of Invalid Surfaces: 967

Error Codes:

Error Code -98 reported for 12 surfaces
Error Code -102 reported for 5 surfaces
Error Code -103 reported for 2 surfaces
Error Code -106 reported for 23 surfaces
Error Code -108 reported for 214 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 61 surfaces
Error Code -1000 reported for 649 surfaces

Error Codes

The following errors were encountered during the computation:

-98 = Circular slip surface is entirely within the tension crack zone.
-102 = Two surface / slope intersections, but resulting arc is actually outside soil region.
-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-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).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-1000 = No valid slip surfaces are generated at a grid center. Unable to draw a surface.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 2.49565

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	4.06046	3005.55	BEDROCK	606	27	331.587	827.526	434.768	0	434.768
2	4.06046	4329.24	BEDROCK	606	27	395.595	987.267	748.278	0	748.278
3	4.06046	5529.59	BEDROCK	606	27	449.057	1120.69	1010.13	0	1010.13
4	4.06046	6359.98	BEDROCK	606	27	488.944	1220.23	1205.5	0	1205.5
5	4.06046	7007.47	BEDROCK	606	27	522.228	1303.3	1368.53	0	1368.53
6	4.06046	7509	BEDROCK	606	27	550.084	1372.82	1504.96	0	1504.96
7	4.06046	7822.76	BEDROCK	606	27	570.409	1423.54	1604.51	0	1604.51
8	4.06046	8057.39	BEDROCK	606	27	587.592	1466.42	1688.67	0	1688.67
9	4.06046	8218.39	BEDROCK	606	27	601.735	1501.72	1757.95	0	1757.95
10	4.06046	8308.71	BEDROCK	255	17	327.875	818.26	1842.34	0	1842.34
11	4.06046	8330.93	BEDROCK	255	17	331.627	827.624	1872.97	0	1872.97
12	4.06046	8287.25	BEDROCK	255	17	333.531	832.376	1888.51	0	1888.51
13	4.06046	8105.12	BEDROCK	255	17	331.478	827.253	1871.76	0	1871.76
14	4.06046	7325	BEDROCK	255	17	312.183	779.099	1714.25	0	1714.25

15	4.06046	6457.94	BEDROCK	255	17	289.866	723.403	1532.08	0	1532.08
16	4.06046	5738.78	BEDROCK	255	17	271.323	677.127	1380.72	0	1380.72
17	4.06046	5017.78	BEDROCK	255	17	252.267	629.571	1225.17	0	1225.17
18	4.06046	4499.73	BEDROCK	606	27	477.627	1191.99	1150.07	0	1150.07
19	4.06046	3965.09	BEDROCK	606	27	455.061	1135.67	1039.54	0	1039.54
20	4.06046	3380.08	BEDROCK	606	27	429.204	1071.14	912.896	0	912.896
21	4.06046	2972.36	BEDROCK	606	27	411.933	1028.04	828.301	0	828.301
22	4.06046	2563.98	BEDROCK	606	27	394.119	983.583	741.048	0	741.048
23	4.06046	2074.15	BEDROCK	606	27	371.363	926.793	629.593	0	629.593
24	5.02507	1715.25	FILL	120	28.5	133.802	333.924	393.998	0	393.998
25	5.02507	592.119	FILL	120	28.5	81.2013	202.65	152.222	0	152.222

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 2.49565

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	117.066	1042.87	781.257	0	0
2	121.126	1039.73	799.747	199.467	14.0046
3	125.187	1036.82	1365.89	340.67	14.0046
4	129.247	1034.14	2254.65	562.339	14.0046
5	133.308	1031.66	3260.94	813.321	14.0046
6	137.368	1029.36	4275.88	1066.46	14.0046
7	141.428	1027.25	5219.8	1301.89	14.0046
8	145.489	1025.31	6017.87	1500.93	14.0045
9	149.549	1023.53	6635.11	1654.88	14.0046
10	153.61	1021.91	7044.53	1757	14.0046
11	157.67	1020.43	8427.72	2101.98	14.0046
12	161.731	1019.1	9570.02	2386.89	14.0046
13	165.791	1017.92	10460.6	2609.01	14.0046
14	169.852	1016.86	11084.4	2764.59	14.0046
15	173.912	1015.94	11392.6	2841.47	14.0046
16	177.973	1015.15	11424.4	2849.38	14.0045
17	182.033	1014.49	11235.2	2802.21	14.0046
18	186.094	1013.96	10866.1	2710.14	14.0046
19	190.154	1013.55	9397.95	2343.97	14.0046
20	194.215	1013.26	7847.74	1957.33	14.0046
21	198.275	1013.09	6254.22	1559.88	14.0046
22	202.335	1013.05	4615.71	1151.22	14.0046
23	206.396	1013.13	2955.38	737.111	14.0046
24	210.456	1013.33	1319.39	329.073	14.0046
25	215.481	1013.76	481.006	119.969	14.0046
26	220.507	1014.37	0	0	0

List Of Coordinates

Tension Crack

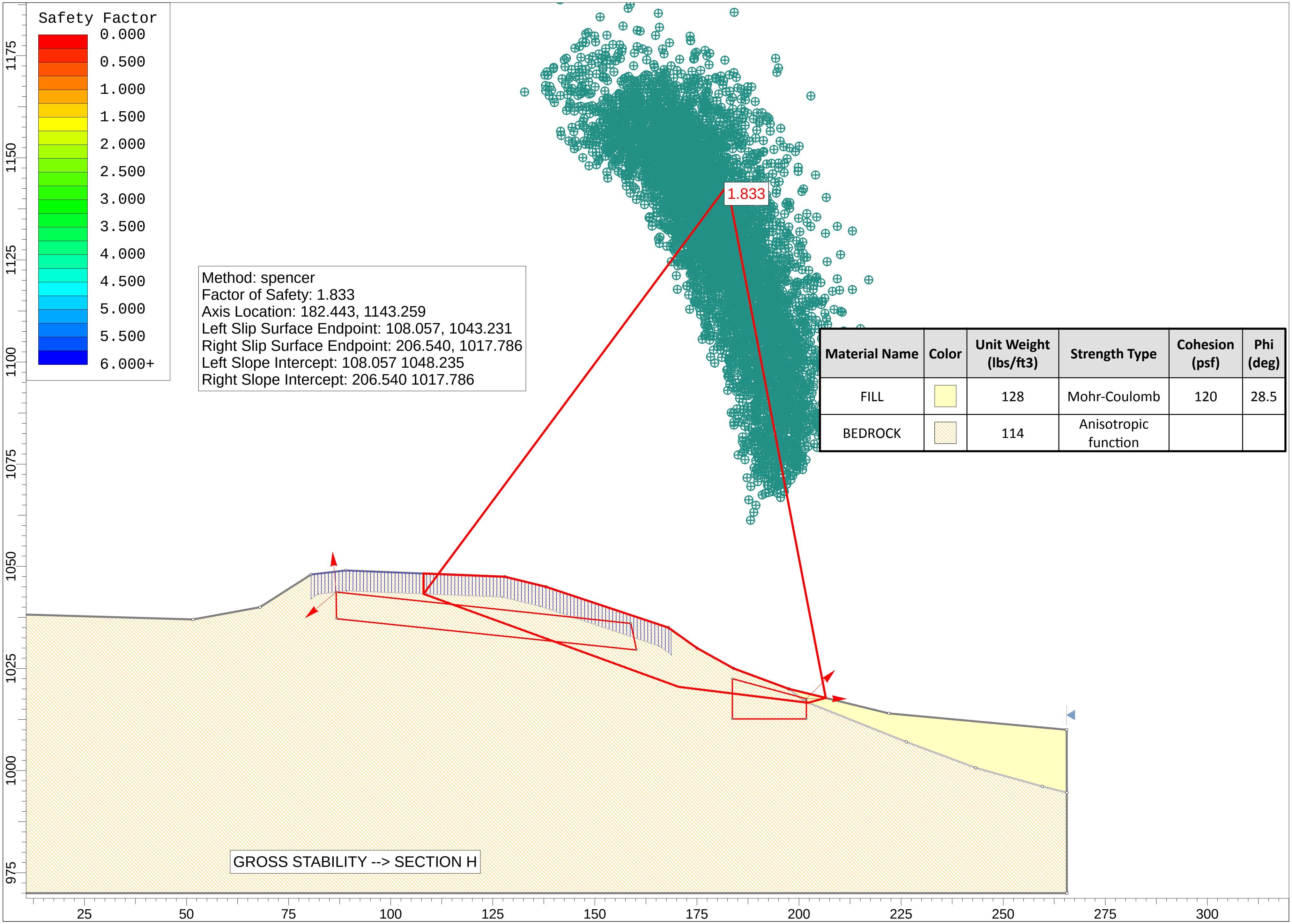
X	Y
80.5324	1042.08
82.2265	1043.17
89.193	1043.99
127.302	1042.46
136.616	1040.19
165.706	1030.49
168.683	1028.37

External Boundary

X	Y
0	970
265.597	970
265.567	994.628
265.548	1010
222	1014
197.5	1020
184	1025
175	1030
168	1035
138	1045
128	1047.43
89	1049
80.5	1048
68	1040
51.6	1037
0	1038.5

Material Boundary

X	Y
197.5	1020
201.285	1017
226.275	1007.01
243.265	1000.66
259.566	996.119
265.567	994.628



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
FILL		128	Mohr-Coulomb	120	28.5
BEDROCK		114	Anisotropic function		

Slide Analysis Information

HARRIDGE - SAN FELICIANO

Project Summary

File Name: SECTION H CALC
Slide Modeler Version: 6.039
Project Title: HARRIDGE - SAN FELICIANO
Analysis: GROSS STABILITY --> SECTION H

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

Spencer

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: Non-Circular Block Search
Number of Surfaces: 5000

Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 95
Left Projection Angle (End Angle): 220
Right Projection Angle (Start Angle): 0
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Tension Crack

Tension crack Water level: filled with water

Material Properties

Property	FILL	BEDROCK
Color		
Strength Type	Mohr-Coulomb	Anisotropic function
Unit Weight [lbs/ft3]	128	114
Cohesion [psf]	120	
Friction Angle [deg]	28.5	
Water Surface	None	None
Ru Value	0	0

Anisotropic Functions

Name: User Defined 1

Angle From	Angle To	c	phi
-90	-20	606	27
-20	-7	255	17
-7	90	606	27

Global Minimums

Method: spencer

FS: 1.833460
Axis Location: 182.443, 1143.259
Left Slip Surface Endpoint: 108.057, 1043.231
Right Slip Surface Endpoint: 206.540, 1017.786
Left Slope Intercept: 108.057 1048.235
Right Slope Intercept: 206.540 1017.786
Resisting Moment=6.83603e+006 lb-ft
Driving Moment=3.72849e+006 lb-ft
Resisting Horizontal Force=54082.8 lb
Driving Horizontal Force=29497.7 lb
Total Slice Area=913.183 ft2

Global Minimum Coordinates

Method: spencer

X	Y
108.057	1043.23
114.504	1040.88
122.508	1037.97
138.517	1032.14
154.526	1026.32
170.535	1020.49
186.379	1018.55
202.223	1016.6
206.54	1017.79

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 4858
Number of Invalid Surfaces: 143

Error Codes:

Error Code -108 reported for 73 surfaces
Error Code -111 reported for 65 surfaces
Error Code -112 reported for 5 surfaces

Error Codes

The following errors were encountered during the computation:

-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).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.83346

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	3.22321	2030.47	BEDROCK	255	17	221.565	406.23	494.651	0	494.651
2	3.22321	2413.99	BEDROCK	255	17	249.24	456.971	660.616	0	660.616
3	4.00223	3531.19	BEDROCK	255	17	269.196	493.56	780.296	0	780.296
4	4.00223	4122.5	BEDROCK	255	17	291.304	534.095	912.879	0	912.879
5	4.00223	4713.8	BEDROCK	255	17	313.412	574.629	1045.46	0	1045.46
6	4.00223	5231.97	BEDROCK	255	17	332.786	610.149	1161.64	0	1161.64
7	4.00223	5477.81	BEDROCK	255	17	341.977	627.002	1216.76	0	1216.76
8	4.00223	5696.58	BEDROCK	255	17	350.157	641.999	1265.82	0	1265.82

9	4.00223	5814.77	BEDROCK	255	17	354.576	650.101	1292.32	0	1292.32
10	4.00223	5870.72	BEDROCK	255	17	356.668	653.936	1304.86	0	1304.86
11	4.00223	5926.66	BEDROCK	255	17	358.759	657.771	1317.4	0	1317.4
12	4.00223	5982.61	BEDROCK	255	17	360.851	661.606	1329.95	0	1329.95
13	4.00223	6038.55	BEDROCK	255	17	362.943	665.441	1342.49	0	1342.49
14	4.00223	6094.5	BEDROCK	255	17	365.034	669.276	1355.04	0	1355.04
15	4.00223	6150.44	BEDROCK	255	17	367.126	673.111	1367.58	0	1367.58
16	4.00223	6066.85	BEDROCK	255	17	364.001	667.381	1348.84	0	1348.84
17	3.96099	5205.06	BEDROCK	255	17	359.791	659.662	1323.59	0	1323.59
18	3.96099	4255.22	BEDROCK	255	17	320.142	586.967	1085.81	0	1085.81
19	3.96099	3478.87	BEDROCK	255	17	287.734	527.549	891.467	0	891.467
20	3.96099	2764.55	BEDROCK	255	17	257.917	472.88	712.653	0	712.653
21	3.96099	2295.31	BEDROCK	255	17	238.329	436.966	595.186	0	595.186
22	3.96099	1852.48	BEDROCK	255	17	219.844	403.075	484.332	0	484.332
23	3.96099	1416.03	BEDROCK	255	17	201.625	369.672	375.074	0	375.074
24	3.96099	1203.02	BEDROCK	255	17	192.733	353.369	321.75	0	321.75
25	4.31666	619.759	FILL	120	28.5	135.045	247.599	235.009	0	235.009

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.83346

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	108.057	1043.23	781.257	0	0
2	111.28	1042.06	647.408	176.18	15.2233
3	114.504	1040.88	619.061	168.466	15.2233
4	118.506	1039.43	678.328	184.594	15.2233
5	122.508	1037.97	842.243	229.201	15.2234
6	126.51	1036.51	1110.81	302.286	15.2233
7	130.513	1035.06	1471.08	400.326	15.2233
8	134.515	1033.6	1874.86	510.207	15.2233
9	138.517	1032.14	2317.35	630.625	15.2234
10	142.519	1030.69	2780.77	756.734	15.2233
11	146.522	1029.23	3254.09	885.538	15.2233
12	150.524	1027.77	3737.3	1017.04	15.2234
13	154.526	1026.32	4230.42	1151.23	15.2233
14	158.528	1024.86	4733.44	1288.12	15.2234
15	162.53	1023.4	5246.36	1427.7	15.2233
16	166.533	1021.95	5769.18	1569.97	15.2233
17	170.535	1020.49	6277.21	1708.22	15.2233
18	174.496	1020	5495.81	1495.58	15.2233
19	178.457	1019.52	4755.81	1294.21	15.2234
20	182.418	1019.03	4049.67	1102.04	15.2233
21	186.379	1018.55	3374.66	918.35	15.2233
22	190.34	1018.06	2720.11	740.227	15.2233
23	194.301	1017.57	2084.86	567.357	15.2234
24	198.262	1017.09	1468.65	399.664	15.2233

25	202.223	1016.6	861.714	234.499	15.2233
26	206.54	1017.79	0	0	0

List Of Coordinates

Tension Crack

X	Y
80.5324	1042.08
82.2265	1043.17
89.193	1043.99
127.302	1042.46
136.616	1040.19
165.706	1030.49
168.683	1028.37

Block Search Window

X	Y
86.728	1037.17
160.196	1029.51
158.834	1036.01
86.6565	1043.69

Block Search Window

X	Y
183.673	1022.49
183.673	1012.64
201.804	1012.64
201.804	1017.58

External Boundary

X	Y
0	970
265.597	970
265.567	994.628
265.548	1010
222	1014
197.5	1020
184	1025
175	1030
168	1035
138	1045
128	1047.43
89	1049
80.5	1048
68	1040

51.6	1037
0	1038.5

Material Boundary

X	Y
197.5	1020
201.285	1017
226.275	1007.01
243.265	1000.66
259.566	996.119
265.567	994.628

IRVINE GEOTECHNICAL Inc

SETTLEMENT CALCULATION

IC **17036-I** CONSULT **JAI**

CLIENT: **HARRIDGE - SAN FELICIANO**

STATIC SETTLEMENT - MAT FOUNDATION

MAT FOUNDATION OVER 15-FOOT COMPACTED FILL CAP

AVERAGE THICKNESS OF STRESS ADDED	1	FEET
ALLOWABLE UNIFORM BEARING PRESSURE	1350	PCF
INCREASE IN STRESS FROM MAT	1350	PSF

Layer #	Thickness (feet)	Effective Stress** (psf)	BoussInesq Coeff.**	Added Stress (psf)	Consolidation Coefficient	Void Ratio	Settlement (feet)	Settlement (inches)
1	15	900	0.900	1215	0.0250	0.700	0.08	0.98
2	3	1980	0.750	1013	0.1103	0.659	0.04	0.43
3	4	2400	0.700	945	0.0998	0.682	0.03	0.41
4	4	2880	0.600	810	0.0497	0.599	0.01	0.16
5	4	3360	0.500	675	0.0497	0.599	0.01	0.12
						TOTAL	0.18	2.10

** Midpoint of soil layer

CONCLUSIONS:

CALCULATIONS INDICATE THAT SETTLEMENT OF FILL AND ALLUVIUM BENEATH THE MAT FOUNDATION IS 2.10 INCHES.

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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	10.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S(N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 1																
1	2	Compacted Fill	20	0.125	0.125	0.0	0	0.75	1.66	1.30	1.00	48	48	0.4930	2.0000	No Water
1	5	Compacted Fill	20	0.313	0.313	0.0	0	0.75	1.45	1.30	0.99	42	42	0.4895	2.0000	No Water
1	7.5	Compacted Fill	20	0.469	0.469	0.0	0	0.75	1.32	1.30	0.98	38	38	0.4866	2.0000	No Water
1	10	Compacted Fill	20	0.625	0.625	0.0	0	0.85	1.21	1.30	0.98	40	40	0.4838	2.0000	>1.3*
1	12.5	Compacted Fill	20	0.781	0.703	0.0	0	0.85	1.11	1.28	0.97	36	36	0.5342	1.8682	3.50
1	15	Compacted Fill	20	0.938	0.782	31.4	0	0.85	1.03	1.26	0.97	33	43	0.5734	2.0000	>1.3*
1	17.5	Silty Sand	9	1.094	0.860	31.4	0	0.85	0.96	1.11	0.96	12	19	0.6044	0.2522	0.42
1	20	Silty Sand	11	1.250	0.938	39.7	0	0.95	0.93	1.14	0.95	17	25	0.6293	0.3740	0.59
1	22.5	Silty Sand	9	1.406	1.016	39.7	0	0.95	0.90	1.11	0.95	13	20	0.6494	0.2731	0.42
1	25	Silty Sand	16	1.563	1.095	15.0	0	0.95	0.87	1.20	0.94	24	27	0.6659	0.4645	0.70
1	27.5	Silty Sand	18	1.719	1.173	15.0	0	0.95	0.84	1.22	0.94	26	30	0.6794	0.6293	0.93
1	30	Silty Sand	23	1.875	1.251	29.5	0	0.95	0.82	1.27	0.93	34	44	0.6903	2.0000	>1.3*
1	32.5	Sandstone	75	2.031	1.329	0.0	0	0.95	0.80	1.30	0.91	110	110	0.6884	2.0000	>1.3*
1	35	Sandstone	100	2.188	1.408	0.0	0	1.00	0.77	1.30	0.89	150	150	0.6845	2.0000	>1.3*
1	37.5	Sandstone	100	2.344	1.486	0.0	0	1.00	0.75	1.30	0.87	146	146	0.6788	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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	10.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125	Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77	Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30		

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 1														
1	2	2.5	Compacted Fill	20	0.125	0.125	26.0	48.4	0.4930	2.0000	No Water	0.0000	0.00	0.00
1	5	2.5	Compacted Fill	20	0.313	0.313	26.0	42.4	0.4895	2.0000	No Water	0.0000	0.00	0.00
1	7.5	2.5	Compacted Fill	20	0.469	0.469	26.0	38.3	0.4866	2.0000	No Water	0.0000	0.00	0.00
1	10	2.5	Compacted Fill	20	0.625	0.625	26.0	39.8	0.4838	2.0000	>1.3*	0.0000	0.00	0.00
1	12.5	2.5	Compacted Fill	20	0.781	0.781	26.0	36.2	0.5342	1.8682	3.4973	0.0000	0.00	0.00
1	15	2.5	Compacted Fill	20	0.938	0.938	26.0	43.3	0.5734	2.0000	>1.3*	0.0000	0.00	0.00
1	17.5	2.5	Silty Sand	9	1.094	1.094	11.7	19.0	0.6044	0.2522	0.4173	0.0171	0.51	0.51
1	20	2.5	Silty Sand	11	1.250	1.172	14.3	24.9	0.6293	0.3740	0.5943	0.0145	0.44	0.95
1	22.5	2.5	Silty Sand	9	1.406	1.250	11.7	20.4	0.6494	0.2731	0.4206	0.0164	0.49	1.44
1	25	2.5	Silty Sand	16	1.563	1.329	20.8	27.3	0.6659	0.4645	0.6976	0.0137	0.41	1.85
1	27.5	2.5	Silty Sand	18	1.719	1.407	23.4	30.0	0.6794	0.6293	0.9263	0.0130	0.39	2.24
1	30	2.5	Silty Sand	23	1.875	1.485	29.9	43.7	0.6903	2.0000	>1.3*	0.0000	0.00	2.24
1	32.5	2.5	Sandstone	75	2.031	1.563	97.5	110.2	0.6884	2.0000	>1.3*	0.0000	0.00	2.24
1	35	2.5	Sandstone	100	2.188	1.642	130.0	150.5	0.6845	2.0000	>1.3*	0.0000	0.00	2.24
1	37.5	2.5	Sandstone	100	2.344	1.720	130.0	146.4	0.6788	2.0000	>1.3*	0.0000	0.00	2.24

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)	0.508 2/3*PGA_M	Energy Ratio C_E (Auto-hammer)	1.30 *	
Analyzed Groundwater Depth (feet)	10.0	Borehole Diameter C_B (6 - 8")	1.15	
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	17.5	
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$		$(N_1)_{60CS} = K_S(N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 1																
1	2	Compacted Fill	20	0.125	0.125	0.0	0	0.75	1.66	1.30	1.00	48	48	0.3287	2.0000	No Water
1	5	Compacted Fill	20	0.313	0.313	0.0	0	0.75	1.45	1.30	0.99	42	42	0.3264	2.0000	No Water
1	7.5	Compacted Fill	20	0.469	0.469	0.0	0	0.75	1.32	1.30	0.98	38	38	0.3244	2.0000	No Water
1	10	Compacted Fill	20	0.625	0.625	0.0	0	0.85	1.21	1.30	0.98	40	40	0.3225	2.0000	>1.3*
1	12.5	Compacted Fill	20	0.781	0.703	0.0	0	0.85	1.11	1.28	0.97	36	36	0.3561	1.8682	5.25
1	15	Compacted Fill	20	0.938	0.782	31.4	0	0.85	1.03	1.26	0.97	33	43	0.3823	2.0000	>1.3*
1	17.5	Silty Sand	9	1.094	0.860	31.4	0	0.85	0.96	1.11	0.96	12	19	0.4029	0.2522	0.63
1	20	Silty Sand	11	1.250	0.938	39.7	0	0.95	0.93	1.14	0.95	17	25	0.4195	0.3740	0.89
1	22.5	Silty Sand	9	1.406	1.016	39.7	0	0.95	0.90	1.11	0.95	13	20	0.4329	0.2731	0.63
1	25	Silty Sand	16	1.563	1.095	15.0	0	0.95	0.87	1.20	0.94	24	27	0.4439	0.4645	1.05
1	27.5	Silty Sand	18	1.719	1.173	15.0	0	0.95	0.84	1.22	0.94	26	30	0.4529	0.6293	1.39
1	30	Silty Sand	23	1.875	1.251	29.5	0	0.95	0.82	1.27	0.93	34	44	0.4602	2.0000	>1.3*
1	32.5	Sandstone	75	2.031	1.329	0.0	0	0.95	0.80	1.30	0.91	110	110	0.4589	2.0000	>1.3*
1	35	Sandstone	100	2.188	1.408	0.0	0	1.00	0.77	1.30	0.89	150	150	0.4563	2.0000	>1.3*
1	37.5	Sandstone	100	2.344	1.486	0.0	0	1.00	0.75	1.30	0.87	146	146	0.4526	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)	0.508	2/3*PGA$_M$	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	10.0		Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125		Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77		Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30			

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 1														
1	2	2.5	Compacted Fill	20	0.125	0.125	26.0	48.4	0.3287	2.0000	No Water	0.0000	0.00	0.00
1	5	2.5	Compacted Fill	20	0.313	0.313	26.0	42.4	0.3264	2.0000	No Water	0.0000	0.00	0.00
1	7.5	2.5	Compacted Fill	20	0.469	0.469	26.0	38.3	0.3244	2.0000	No Water	0.0000	0.00	0.00
1	10	2.5	Compacted Fill	20	0.625	0.625	26.0	39.8	0.3225	2.0000	>1.3*	0.0000	0.00	0.00
1	12.5	2.5	Compacted Fill	20	0.781	0.781	26.0	36.2	0.3561	1.8682	5.2459	0.0000	0.00	0.00
1	15	2.5	Compacted Fill	20	0.938	0.938	26.0	43.3	0.3823	2.0000	>1.3*	0.0000	0.00	0.00
1	17.5	2.5	Silty Sand	9	1.094	1.094	11.7	19.0	0.4029	0.2522	0.6260	0.0171	0.51	0.51
1	20	2.5	Silty Sand	11	1.250	1.172	14.3	24.9	0.4195	0.3740	0.8914	0.0145	0.44	0.95
1	22.5	2.5	Silty Sand	9	1.406	1.250	11.7	20.4	0.4329	0.2731	0.6309	0.0164	0.49	1.44
1	25	2.5	Silty Sand	16	1.563	1.329	20.8	27.3	0.4439	0.4645	1.0464	0.0137	0.41	1.85
1	27.5	2.5	Silty Sand	18	1.719	1.407	23.4	30.0	0.4529	0.6293	1.3894	0.0000	0.00	1.85
1	30	2.5	Silty Sand	23	1.875	1.485	29.9	43.7	0.4602	2.0000	>1.3*	0.0000	0.00	1.85
1	32.5	2.5	Sandstone	75	2.031	1.563	97.5	110.2	0.4589	2.0000	>1.3*	0.0000	0.00	1.85
1	35	2.5	Sandstone	100	2.188	1.642	130.0	150.5	0.4563	2.0000	>1.3*	0.0000	0.00	1.85
1	37.5	2.5	Sandstone	100	2.344	1.720	130.0	146.4	0.4526	2.0000	>1.3*	0.0000	0.00	1.85

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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	10.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S(N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 2																
2	2	Compacted Fill	20	0.125	0.125	0.0	0	0.75	1.66	1.30	1.00	48	48	0.4930	2.0000	No Water
2	5	Compacted Fill	20	0.313	0.313	0.0	0	0.75	1.45	1.30	0.99	42	42	0.4895	2.0000	No Water
2	7	Compacted Fill	20	0.438	0.438	0.0	0	0.75	1.34	1.30	0.98	39	39	0.4872	2.0000	No Water
2	10	Compacted Fill	20	0.625	0.625	0.0	0	0.85	1.21	1.30	0.98	40	40	0.4838	2.0000	>1.3*
2	12.5	Compacted Fill	20	0.781	0.703	0.0	0	0.85	1.11	1.28	0.97	36	36	0.5342	1.8682	3.50
2	15	Compacted Fill	20	0.938	0.782	26.0	0	0.85	1.03	1.26	0.97	33	41	0.5734	2.0000	>1.3*
2	17.5	Silty Sand	6	1.094	0.860	26.0	0	0.85	0.96	1.10	0.96	8	13	0.6044	0.1862	0.31
2	20	Silty Sand	6	1.250	0.938	37.3	0	0.95	0.93	1.10	0.95	9	15	0.6293	0.2076	0.33
2	22.5	Silty Sand	9	1.406	1.016	22.0	0	0.95	0.90	1.11	0.95	13	18	0.6494	0.2375	0.37
2	25	Silty Sand	15	1.563	1.095	22.0	0	0.95	0.87	1.19	0.94	22	28	0.6659	0.4955	0.74
2	27.5	Silty Sand	16	1.719	1.173	21.5	0	0.95	0.84	1.19	0.94	23	29	0.6794	0.5420	0.80
2	30	Silty Sand	21	1.875	1.251	21.5	0	0.95	0.82	1.24	0.93	30	37	0.6903	2.2680	3.29
2	32.5	Sandstone	75	2.031	1.329	0.0	0	0.95	0.80	1.30	0.91	110	110	0.6884	2.0000	>1.3*
2	35	Sandstone	85	2.188	1.408	0.0	0	1.00	0.77	1.30	0.89	128	128	0.6845	2.0000	>1.3*
2	37.5	Sandstone	82	2.344	1.486	0.0	0	1.00	0.75	1.30	0.87	120	120	0.6788	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)	0.762	PGA_M	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	10.0		Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125		Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77		Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30			

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 2														
2	2	2.5	Compacted Fill	20	0.125	0.125	26.0	48.4	0.4930	2.0000	No Water	0.0000	0.00	0.00
2	5	2	Compacted Fill	20	0.313	0.313	26.0	42.4	0.4895	2.0000	No Water	0.0000	0.00	0.00
2	7	3	Compacted Fill	20	0.438	0.438	26.0	39.2	0.4872	2.0000	No Water	0.0000	0.00	0.00
2	10	2.5	Compacted Fill	20	0.625	0.625	26.0	39.8	0.4838	2.0000	>1.3*	0.0000	0.00	0.00
2	12.5	2.5	Compacted Fill	20	0.781	0.781	26.0	36.2	0.5342	1.8682	3.4973	0.0000	0.00	0.00
2	15	2.5	Compacted Fill	20	0.938	0.938	26.0	41.4	0.5734	2.0000	>1.3*	0.0000	0.00	0.00
2	17.5	2.5	Silty Sand	6	1.094	1.094	7.8	13.4	0.6044	0.1862	0.3080	0.0211	0.63	0.63
2	20	2.5	Silty Sand	6	1.250	1.172	7.8	15.4	0.6293	0.2076	0.3299	0.0194	0.58	1.21
2	22.5	2.5	Silty Sand	9	1.406	1.250	11.7	17.9	0.6494	0.2375	0.3657	0.0177	0.53	1.74
2	25	2.5	Silty Sand	15	1.563	1.329	19.5	27.9	0.6659	0.4955	0.7441	0.0136	0.41	2.15
2	27.5	2.5	Silty Sand	16	1.719	1.407	20.8	28.8	0.6794	0.5420	0.7978	0.0133	0.40	2.55
2	30	2.5	Silty Sand	21	1.875	1.485	27.3	37.0	0.6903	2.2680	3.2856	0.0000	0.00	2.55
2	32.5	2.5	Sandstone	75	2.031	1.563	97.5	110.2	0.6884	2.0000	>1.3*	0.0000	0.00	2.55
2	35	2.5	Sandstone	85	2.188	1.642	110.5	127.9	0.6845	2.0000	>1.3*	0.0000	0.00	2.55
2	37.5	2.5	Sandstone	82	2.344	1.720	106.6	120.1	0.6788	2.0000	>1.3*	0.0000	0.00	2.55

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)	0.508 $2/3*PGA_M$	Energy Ratio C_E (Auto-hammer)	1.30 *	
Analyzed Groundwater Depth (feet)	10.0	Borehole Diameter C_B (6 - 8")	1.15	
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	17.5	
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S(N_1)_{60}$	
Magnitude Scaling Factor (MSF)	1.3	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 2																
2	2	Compacted Fill	20	0.125	0.125	0.0	0	0.75	1.66	1.30	1.00	48	48	0.3287	2.0000	No Water
2	5	Compacted Fill	20	0.313	0.313	0.0	0	0.75	1.45	1.30	0.99	42	42	0.3264	2.0000	No Water
2	7	Compacted Fill	20	0.438	0.438	0.0	0	0.75	1.34	1.30	0.98	39	39	0.3248	2.0000	No Water
2	10	Compacted Fill	20	0.625	0.625	0.0	0	0.85	1.21	1.30	0.98	40	40	0.3225	2.0000	>1.3*
2	12.5	Compacted Fill	20	0.781	0.703	0.0	0	0.85	1.11	1.28	0.97	36	36	0.3561	1.8682	5.25
2	15	Compacted Fill	20	0.938	0.782	26.0	0	0.85	1.03	1.26	0.97	33	41	0.3823	2.0000	>1.3*
2	17.5	Silty Sand	6	1.094	0.860	26.0	0	0.85	0.96	1.10	0.96	8	13	0.4029	0.1862	0.46
2	20	Silty Sand	6	1.250	0.938	37.3	0	0.95	0.93	1.10	0.95	9	15	0.4195	0.2076	0.49
2	22.5	Silty Sand	9	1.406	1.016	22.0	0	0.95	0.90	1.11	0.95	13	18	0.4329	0.2375	0.55
2	25	Silty Sand	15	1.563	1.095	22.0	0	0.95	0.87	1.19	0.94	22	28	0.4439	0.4955	1.12
2	27.5	Silty Sand	16	1.719	1.173	21.5	0	0.95	0.84	1.19	0.94	23	29	0.4529	0.5420	1.20
2	30	Silty Sand	21	1.875	1.251	21.5	0	0.95	0.82	1.24	0.93	30	37	0.4602	2.2680	4.93
2	32.5	Sandstone	75	2.031	1.329	0.0	0	0.95	0.80	1.30	0.91	110	110	0.4589	2.0000	>1.3*
2	35	Sandstone	85	2.188	1.408	0.0	0	1.00	0.77	1.30	0.89	128	128	0.4563	2.0000	>1.3*
2	37.5	Sandstone	82	2.344	1.486	0.0	0	1.00	0.75	1.30	0.87	120	120	0.4526	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)	0.508	2/3*PGA_M	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	10.0		Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125		Groundwater Depth in Boring (feet)	17.5
Design Magnitude Earthquake	6.77		Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30			

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 2														
2	2	2.5	Compacted Fill	20	0.125	0.125	26.0	48.4	0.3287	2.0000	No Water	0.0000	0.00	0.00
2	5	2	Compacted Fill	20	0.313	0.313	26.0	42.4	0.3264	2.0000	No Water	0.0000	0.00	0.00
2	7	3	Compacted Fill	20	0.438	0.438	26.0	39.2	0.3248	2.0000	No Water	0.0000	0.00	0.00
2	10	2.5	Compacted Fill	20	0.625	0.625	26.0	39.8	0.3225	2.0000	>1.3*	0.0000	0.00	0.00
2	12.5	2.5	Compacted Fill	20	0.781	0.781	26.0	36.2	0.3561	1.8682	5.2459	0.0000	0.00	0.00
2	15	2.5	Compacted Fill	20	0.938	0.938	26.0	41.4	0.3823	2.0000	>1.3*	0.0000	0.00	0.00
2	17.5	2.5	Silty Sand	6	1.094	1.094	7.8	13.4	0.4029	0.1862	0.4620	0.0211	0.63	0.63
2	20	2.5	Silty Sand	6	1.250	1.172	7.8	15.4	0.4195	0.2076	0.4949	0.0194	0.58	1.21
2	22.5	2.5	Silty Sand	9	1.406	1.250	11.7	17.9	0.4329	0.2375	0.5486	0.0177	0.53	1.74
2	25	2.5	Silty Sand	15	1.563	1.329	19.5	27.9	0.4439	0.4955	1.1161	0.0000	0.00	1.74
2	27.5	2.5	Silty Sand	16	1.719	1.407	20.8	28.8	0.4529	0.5420	1.1967	0.0000	0.00	1.74
2	30	2.5	Silty Sand	21	1.875	1.485	27.3	37.0	0.4602	2.2680	4.9285	0.0000	0.00	1.74
2	32.5	2.5	Sandstone	75	2.031	1.563	97.5	110.2	0.4589	2.0000	>1.3*	0.0000	0.00	1.74
2	35	2.5	Sandstone	85	2.188	1.642	110.5	127.9	0.4563	2.0000	>1.3*	0.0000	0.00	1.74
2	37.5	2.5	Sandstone	82	2.344	1.720	106.6	120.1	0.4526	2.0000	>1.3*	0.0000	0.00	1.74

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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	10.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	25.0
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S (N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 3																
3	10	Compacted Fill	20	0.625	0.625	0.0	0	0.85	1.21	1.30	0.98	40	40	0.4838	2.0000	>1.3*
3	12.5	Compacted Fill	20	0.781	0.703	0.0	0	0.85	1.11	1.28	0.97	36	36	0.5342	1.8682	3.50
3	15	Siltstone	19	0.938	0.782	0.0	0	0.85	1.03	1.25	0.97	31	31	0.5734	0.7239	1.26
3	17.5	Siltstone	28	1.094	0.860	0.0	0	0.85	0.96	1.30	0.96	44	44	0.6044	2.0000	>1.3*
3	20	Siltstone	48	1.250	0.938	0.0	0	0.95	0.90	1.30	0.95	80	80	0.6293	2.0000	>1.3*
3	22.5	Sandstone	70	1.406	1.016	0.0	0	0.95	0.84	1.30	0.95	109	109	0.6494	2.0000	>1.3*
3	25	Sandstone	74	1.563	1.095	0.0	0	0.95	0.80	1.30	0.94	109	109	0.6659	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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	10.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125	Groundwater Depth in Boring (feet)	25.0
Design Magnitude Earthquake	6.77	Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30		

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 3														
3	10	2.5	Compacted Fill	20	0.625	0.625	26.0	39.8	0.4838	2.0000	>1.3*	0.0000	0.00	0.00
3	12.5	2.5	Compacted Fill	20	0.781	0.781	26.0	36.2	0.5342	1.8682	3.4973	0.0000	0.00	0.00
3	15	2.5	Siltstone	19	0.938	0.938	24.7	31.0	0.5734	0.7239	1.2624	0.0000	0.00	0.00
3	17.5	2.5	Siltstone	28	1.094	1.094	36.4	44.4	0.6044	2.0000	>1.3*	0.0000	0.00	0.00
3	20	2.5	Siltstone	48	1.250	1.250	62.4	79.6	0.6293	2.0000	>1.3*	0.0000	0.00	0.00
3	22.5	2.5	Sandstone	70	1.406	1.406	91.0	109.1	0.6494	2.0000	>1.3*	0.0000	0.00	0.00
3	25	2.5	Sandstone	74	1.563	1.563	96.2	108.8	0.6659	2.0000	>1.3*	0.0000	0.00	0.00

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)	0.508 2/3PGA$_M$	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	10.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	25.0
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S (N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 3																
3	10	Compacted Fill	20	0.625	0.625	0.0	0	0.85	1.21	1.30	0.98	40	40	0.3225	2.0000	>1.3*
3	12.5	Compacted Fill	20	0.781	0.703	0.0	0	0.85	1.11	1.28	0.97	36	36	0.3561	1.8682	5.25
3	15	Siltstone	19	0.938	0.782	0.0	0	0.85	1.03	1.25	0.97	31	31	0.3823	0.7239	1.89
3	17.5	Siltstone	28	1.094	0.860	0.0	0	0.85	0.96	1.30	0.96	44	44	0.4029	2.0000	>1.3*
3	20	Siltstone	48	1.250	0.938	0.0	0	0.95	0.90	1.30	0.95	80	80	0.4195	2.0000	>1.3*
3	22.5	Sandstone	70	1.406	1.016	0.0	0	0.95	0.84	1.30	0.95	109	109	0.4329	2.0000	>1.3*
3	25	Sandstone	74	1.563	1.095	0.0	0	0.95	0.80	1.30	0.94	109	109	0.4439	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)	0.508 2/3PGA$_M$	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	10.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125	Groundwater Depth in Boring (feet)	25.0
Design Magnitude Earthquake	6.77	Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30		

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 3														
3	10	2.5	Compacted Fill	20	0.625	0.625	26.0	39.8	0.3225	2.0000	>1.3*	0.0000	0.00	0.00
3	12.5	2.5	Compacted Fill	20	0.781	0.781	26.0	36.2	0.3561	1.8682	5.2459	0.0000	0.00	0.00
3	15	2.5	Siltstone	19	0.938	0.938	24.7	31.0	0.3823	0.7239	1.8936	0.0000	0.00	0.00
3	17.5	2.5	Siltstone	28	1.094	1.094	36.4	44.4	0.4029	2.0000	>1.3*	0.0000	0.00	0.00
3	20	2.5	Siltstone	48	1.250	1.250	62.4	79.6	0.4195	2.0000	>1.3*	0.0000	0.00	0.00
3	22.5	2.5	Sandstone	70	1.406	1.406	91.0	109.1	0.4329	2.0000	>1.3*	0.0000	0.00	0.00
3	25	2.5	Sandstone	74	1.563	1.563	96.2	108.8	0.4439	2.0000	>1.3*	0.0000	0.00	0.00

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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	22.5
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S(N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 4																
4	10	Compacted Fill	20	0.625	0.625	0.0	0	0.85	1.21	1.30	0.98	40	40	0.4838	2.0000	No Water
4	12.5	Compacted Fill	20	0.781	0.781	0.0	0	0.85	1.11	1.28	0.97	36	36	0.4809	1.8682	No Water
4	15	Compacted Fill	20	0.938	0.938	83.7	0	0.85	1.03	1.26	0.97	33	45	0.4780	2.0000	>1.3*
4	17.5	Silty Clay	7	1.094	1.016	74.6	0	0.85	0.96	1.10	0.96	9	16	0.5116	0.2171	0.42
4	20	Silty Sand	6	1.250	1.094	52.7	0	0.95	0.90	1.10	0.95	8	15	0.5395	0.2039	0.38
4	22.5	Silty Sand	27	1.406	1.172	0.0	0	0.95	0.84	1.30	0.95	42	42	0.5630	2.0000	>1.3*
4	25	Silty Sand	21	1.563	1.251	16.6	0	0.95	0.82	1.24	0.94	30	35	0.5828	1.4662	2.52
4	27.5	Silty Sand	30	1.719	1.329	0.0	0	0.95	0.80	1.30	0.94	44	44	0.5996	2.0000	>1.3*
4	30	Sandstone	57	1.875	1.407	0.0	0	0.95	0.77	1.30	0.93	81	81	0.6137	2.0000	>1.3*
4	32.5	Sandstone	84	2.031	1.485	0.0	0	0.95	0.75	1.30	0.91	117	117	0.6161	2.0000	>1.3*
4	35	Sandstone	100	2.188	1.564	0.0	0	1.00	0.73	1.30	0.89	143	143	0.6162	2.0000	>1.3*
4	37.5	Sandstone	90	2.344	1.642	0.0	0	1.00	0.72	1.30	0.87	125	125	0.6143	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)	0.762 PGA_M	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	15.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125	Groundwater Depth in Boring (feet)	22.5
Design Magnitude Earthquake	6.77	Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30		

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 4														
4	10	2.5	Compacted Fill	20	0.625	0.625	26.0	39.8	0.4838	2.0000	No Water	0.0000	0.00	0.00
4	12.5	2.5	Compacted Fill	20	0.781	0.781	26.0	36.2	0.4809	1.8682	No Water	0.0000	0.00	0.00
4	15	2.5	Compacted Fill	20	0.938	0.938	26.0	44.6	0.4780	2.0000	>1.3*	0.0000	0.00	0.00
4	17.5	2.5	Silty Clay	7	1.094	1.094	9.1	16.3	0.5116	0.2171	0.4244	0.0188	0.56	0.56
4	20	2.5	Silty Sand	6	1.250	1.250	7.8	15.1	0.5395	0.2039	0.3780	0.0196	0.59	1.15
4	22.5	2.5	Silty Sand	27	1.406	1.406	35.1	42.1	0.5630	2.0000	>1.3*	0.0000	0.00	1.15
4	25	2.5	Silty Sand	21	1.563	1.485	27.3	35.1	0.5828	1.4662	2.5157	0.0000	0.00	1.15
4	27.5	2.5	Silty Sand	30	1.719	1.563	39.0	44.1	0.5996	2.0000	>1.3*	0.0000	0.00	1.15
4	30	2.5	Sandstone	57	1.875	1.641	74.1	81.5	0.6137	2.0000	>1.3*	0.0000	0.00	1.15
4	32.5	2.5	Sandstone	84	2.031	1.719	109.2	116.9	0.6161	2.0000	>1.3*	0.0000	0.00	1.15
4	35	2.5	Sandstone	100	2.188	1.798	130.0	142.6	0.6162	2.0000	>1.3*	0.0000	0.00	1.15
4	37.5	2.5	Sandstone	90	2.344	1.876	117.0	125.1	0.6143	2.0000	>1.3*	0.0000	0.00	1.15

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)	0.508 2/3PGA$_M$	Energy Ratio C_E (Auto-hammer)	1.30 *
Analyzed Groundwater Depth (feet)	10.0	Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125.0	Groundwater Depth in Boring (feet)	22.5
Design Magnitude Earthquake	6.77	$(N_1)_{60} = N_M C_N C_E C_B C_R C_S$	$(N_1)_{60CS} = K_S(N_1)_{60}$
Magnitude Scaling Factor (MSF)	1.3	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 4																
4	10	Compacted Fill	20	0.625	0.625	0.0	0	0.85	1.21	1.30	0.98	40	40	0.3225	2.0000	>1.3*
4	12.5	Compacted Fill	20	0.781	0.703	0.0	0	0.85	1.11	1.28	0.97	36	36	0.3561	1.8682	5.25
4	15	Compacted Fill	20	0.938	0.782	83.7	0	0.85	1.03	1.26	0.97	33	45	0.3823	2.0000	>1.3*
4	17.5	Silty Clay	7	1.094	0.860	74.6	0	0.85	0.96	1.10	0.96	9	16	0.4029	0.2171	0.54
4	20	Silty Sand	6	1.250	0.938	52.7	0	0.95	0.90	1.10	0.95	8	15	0.4195	0.2039	0.49
4	22.5	Silty Sand	27	1.406	1.016	0.0	0	0.95	0.84	1.30	0.95	42	42	0.4329	2.0000	>1.3*
4	25	Silty Sand	21	1.563	1.095	16.6	0	0.95	0.82	1.24	0.94	30	35	0.4439	1.4662	3.30
4	27.5	Silty Sand	30	1.719	1.173	0.0	0	0.95	0.80	1.30	0.94	44	44	0.4529	2.0000	>1.3*
4	30	Sandstone	57	1.875	1.251	0.0	0	0.95	0.77	1.30	0.93	81	81	0.4602	2.0000	>1.3*
4	32.5	Sandstone	84	2.031	1.329	0.0	0	0.95	0.75	1.30	0.91	117	117	0.4589	2.0000	>1.3*
4	35	Sandstone	100	2.188	1.408	0.0	0	1.00	0.73	1.30	0.89	143	143	0.4563	2.0000	>1.3*
4	37.5	Sandstone	90	2.344	1.486	0.0	0	1.00	0.72	1.30	0.87	125	125	0.4526	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)	0.508	2/3PGA$_M$	Energy Ratio C_E (Auto-hammer)	1.30
Analyzed Groundwater Depth (feet)	10.0		Borehole Diameter C_B (6 - 8")	1.15
Average Wet Unit Weight (pcf)	125		Groundwater Depth in Boring (feet)	22.5
Design Magnitude Earthquake	6.77		Foundation Depth (feet)	1.5
Magnitude Scaling Factor (MSF)	1.30			

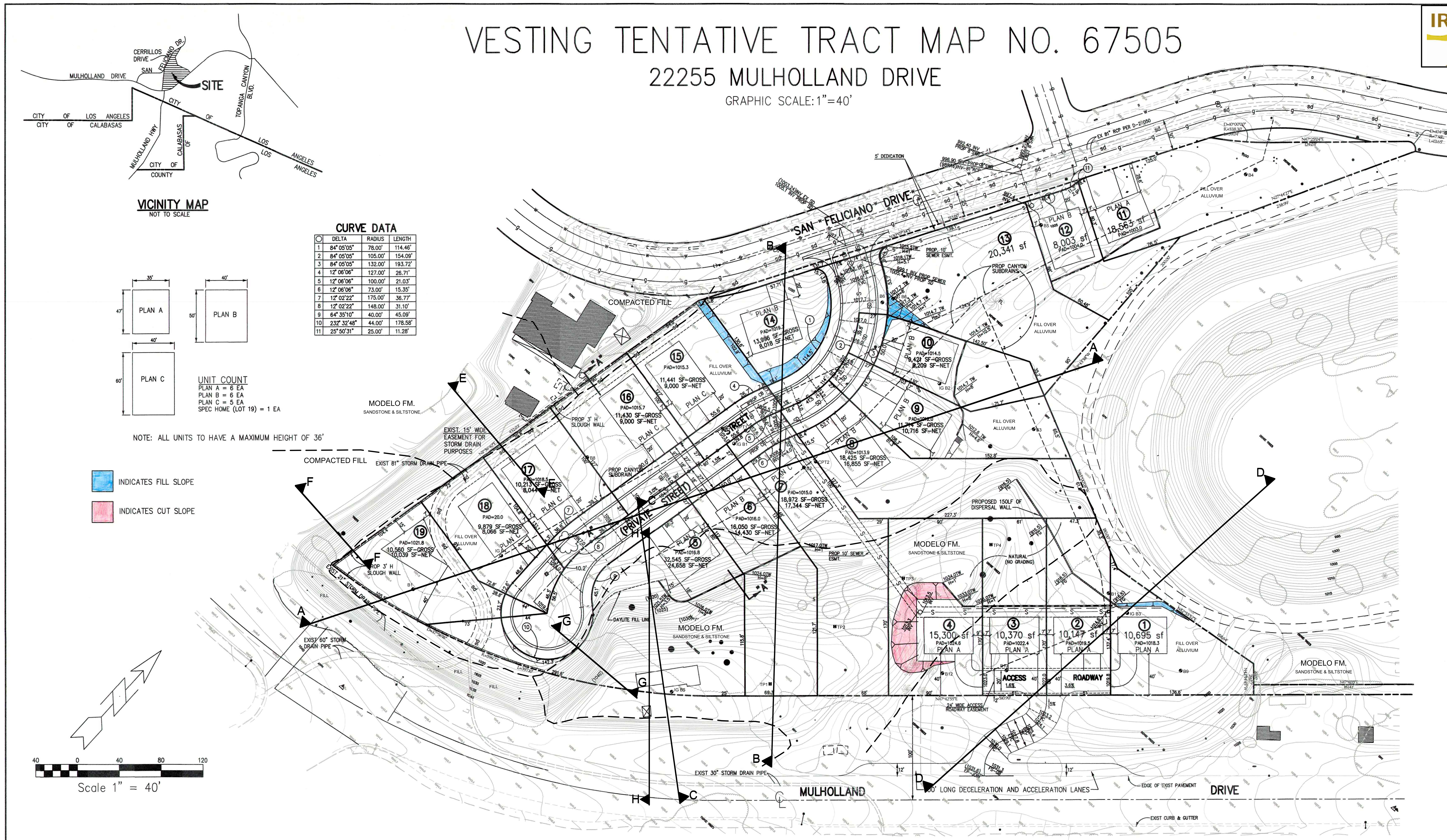
Boring	Depth (feet)	Interval Thickness (feet)	Lithology	Blow Count (N80)	Total Stress (tons/ft2)	Effective Stress (tons/ft2)	Blow Count N_{60}	SPT $(N_1)_{60}$ (blow/ft)	NCEER 1998 CSR	NCEER 1998 CRR*MSF	Liquefaction Safety Factor	Calculated Strain (%)	Calculated Settlement (inches)	Cumulative Settlement (inches)
Boring 4														
4	10	2.5	Compacted Fill	20	0.625	0.625	26.0	39.8	0.3225	2.0000	>1.3*	0.0000	0.00	0.00
4	12.5	2.5	Compacted Fill	20	0.781	0.781	26.0	36.2	0.3561	1.8682	5.2459	0.0000	0.00	0.00
4	15	2.5	Compacted Fill	20	0.938	0.938	26.0	44.6	0.3823	2.0000	>1.3*	0.0000	0.00	0.00
4	17.5	2.5	Silty Clay	7	1.094	1.094	9.1	16.3	0.4029	0.2171	0.5388	0.0188	0.56	0.56
4	20	2.5	Silty Sand	6	1.250	1.250	7.8	15.1	0.4195	0.2039	0.4861	0.0196	0.59	1.15
4	22.5	2.5	Silty Sand	27	1.406	1.406	35.1	42.1	0.4329	2.0000	>1.3*	0.0000	0.00	1.15
4	25	2.5	Silty Sand	21	1.563	1.485	27.3	35.1	0.4439	1.4662	3.3028	0.0000	0.00	1.15
4	27.5	2.5	Silty Sand	30	1.719	1.563	39.0	44.1	0.4529	2.0000	>1.3*	0.0000	0.00	1.15
4	30	2.5	Sandstone	57	1.875	1.641	74.1	81.5	0.4602	2.0000	>1.3*	0.0000	0.00	1.15
4	32.5	2.5	Sandstone	84	2.031	1.719	109.2	116.9	0.4589	2.0000	>1.3*	0.0000	0.00	1.15
4	35	2.5	Sandstone	100	2.188	1.798	130.0	142.6	0.4563	2.0000	>1.3*	0.0000	0.00	1.15
4	37.5	2.5	Sandstone	90	2.344	1.876	117.0	125.1	0.4526	2.0000	>1.3*	0.0000	0.00	1.15

VESTING TENTATIVE TRACT MAP NO. 67505

22255 MULHOLLAND DRIVE

GRAPHIC SCALE: 1"=40'

IRVINE GEOTECHNICAL Inc	GEOLOGIC MAP	
	PROJECT: IC17036 - HARRIDGE	
	CONSULTANT: JAI	SCALE: 1" = 40'



LEGEND

TP1 — NUMBER & LOCATION OF TEST PIT - BYER

B1 — NUMBER & LOCATION OF BORING - BYER

CPT1 — NUMBER & LOCATION OF CPT - BYER

IG B1 — NUMBER & LOCATION OF BORING - IRVINE

— GEOLOGIC CONTACT

CURVE DATA

○	DELTA	RADIUS	LENGTH
1	84° 05'05"	78.00'	114.46'
2	84° 05'05"	105.00'	154.09'
3	84° 05'05"	132.00'	193.72'
4	12° 06'06"	127.00'	26.71'
5	12° 06'06"	100.00'	21.03'
6	12° 06'06"	73.00'	15.35'
7	12° 02'22"	175.00'	36.77'
8	12° 02'22"	148.00'	31.10'
9	64° 35'10"	40.00'	45.09'
10	232° 32'48"	44.00'	178.58'
11	25° 50'31"	25.00'	11.28'

GENERAL NOTES:

1. RECORD OWNER: SAN FELICIANO HOLDING COMPANY, LLC
   6363 WILSHIRE BLVD., SUITE 600
   LOS ANGELES, CA. 90048
   (323) 658-1511
2. SUBDIVIDER: HARRIDGE DEVELOPMENT GROUP
   6363 WILSHIRE BLVD., SUITE 600
   LOS ANGELES, CA. 90048
   (323) 658-1511
3. ENGINEER: WESTCON ENGINEERING, INC.
   6355 TOPANGA CANYON BLVD., SUITE 411
   WOODLAND HILLS, CA. 91367
   818 226-0444 OFFICE 818 226-0448 FAX
4. PROJECT ADDRESS: 22255 MULHOLLAND DRIVE, WOODLAND HILLS, CA. 91364
5. GROSS SITE AREA: 269,857 SQ FT (6.20 ACRES)
   NET SITE AREA: 237,798 SQ FT (5.49 ACRES)
6. PROPOSED DEVELOPMENT AREA: 18 SINGLE FAMILY RESIDENTIAL DWELLING UNITS WITH 36 PARKING SPACES.
7. EXISTING ZONE: R-1
8. PROPOSED ZONE: R-1
9. DISTRICT MAP: 165 B 101
10. COMMUNITY PLANNING AREA: CANOGA PARK – WINNETKA
    WOODLAND HILLS – WEST HILLS
11. COUNCIL DISTRICT: COUNCIL DISTRICT 3
12. APN: 2076-023-019
13. THOMAS GUIDE: LA 559-J5
14. FLOOD ZONE: NOT IN A FLOOD ZONE
15. CONTOUR INTERVAL: 1 FT
16. STREET DESTINATION: MULHOLLAND DRIVE – MAJOR HIGHWAY
    SAN FELICIANO DRIVE – COLLECTOR
17. THERE ARE PROTECTED TREES ON SITE. SEE TREE REPORT FOR TREES TO BE REMOVED.
18. THIS PROPERTY IS LOCATED IN THE MOUNTAIN & FIRE DISTRICT, HILLSIDE AND LIQUEFACTION AREAS.
19. THERE ARE NO POTENTIAL HAZARDOUS AREAS ON SITE.
20. PROPOSED SEWAGE DISPOSAL TO EXISTING SANITARY SEWER LOCATED IN SAN FELICIANO DRIVE.
21. THE PROJECT IS LOCATED IN THE MULHOLLAND SCENIC PARKWAY SPECIFIC PLAN AREA.
22. APPROX. LOCATION OF PROPOSED CANYON SUBDRAIN TO BE DETERMINED DURING GRADING

EARTHWORK GRADING SUMMARY:

EARTHWORK –

CUT = 3,040 CY ±

FILL = 7,240 CY ±

TOTAL EARTHWORK = 10,280 CY ±

TOTAL IMPORT = 4,200 CY ±

LOT INFORMATION LEGEND:

(XX) — LOT NUMBER

LEGAL DESCRIPTION:

PARCEL 1:

THAT PORTION OF LOT 1083 OF TRACT NO. 1000, IN THE CITY OF LOS ANGELES, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 19, PAGE 1 ET SEQ. OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 1077 OF TRACT NO. 6170, AS PER MAP RECORDED IN THE BOOK 75, PAGE 6, ETSEQ., OF SAID MAPS: THENCE SOUTH 6°11' WEST 59.64 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE TO THE NORTHWEST HAVING A RADIUS OF 300 FEET; THENCE SOUTHERLY ALONG SAID CURVE 59.83 FEET TO THE MOST NORTHERLY CORNER OF THE LAND DESCRIBED IN PARCEL 1 IN DEED TO THE CITY OF LOS ANGELES RECORDED IN BOOK 10853, PAGE 54, OFFICIAL RECORDS; THENCE CONTINUING SOUTHWEST ALONG SAID CURVE 221.87 FEET TO THE NORTHEASTERLY TERMINUS OF THAT CERTAIN COURSE RECITED IN SAID DEED AS HAVING A BEARING OF NORTH 27°42' 23" EAST AND A LENGTH OF 238.91 FEET; THENCE TANGENT TO SAID CURVE SOUTH 59°59' WEST 30 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE TO THE SOUTHEAST HAVING A RADIUS OF 318.608 FEET; THENCE, SOUTHWESTERLY ALONG SAID CURVE 178.80 FEET TO THE TRUE POINT OF BEGINNING, A RADIAL LINE TO SAID TRUE POINT OF BEGINNING BEARS NORTH 62°10' 10" WEST; THENCE CONTINUING SOUTHWESTERLY ALONG SAID LAST MENTIONED CURVE 77.00 FEET; THENCE TANGENT TO SAID LAST MENTIONED CURVE SOUTH 13°59' 00" WEST 325.00 FEET; THENCE SOUTH 21°51' 30" WEST 89.89 FEET; THENCE SOUTH 29°30' 18" WEST 431.64 FEET TO A POINT IN THE NORTHERLY LINE OF MULHOLLAND HIGHWAY 200 FEET WIDE, AS DESCRIBED IN DEED TO THE CITY OF LOS ANGELES RECORDED IN BOOK 3162, PAGE 41, OFFICIAL RECORDS, SAID LAST MENTIONED POINT BEING IN A CURVE CONCAVE TO THE NORTHWEST HAVING A RADIUS OF 599.72 FET, A RADIAL LINE TO SAID POINT BEARS SOUTH 4°21' 32" EAST, THENCE NORTHEASTERLY ALONG SAID CURVE 397.09 FEET; THENCE TANGENT TO SAID LAST MENTIONED CURVE AND ALONG THE NORTHWESTERLY LINE OF SAID MULHOLLAND HIGHWAY, NORTH 47°42' 13" EAST 510.85 FEET, MORE OR LESS, TO THE INTERSECTION OF THE SOUTHEASTERLY PROLONGATION OF THAT CERTAIN COURSE RECITED IN SAID DEED TO THE CITY OF LOS ANGELES RECORDED IN BOOK 10853, PAGE 54, OFFICIAL RECORDS, AS HAVING A BEARING OF NORTH 42°17' 47" WEST AND A LENGTH OF 20 FEET; THENCE TO AND ALONG THE SOUTHERLY AND WESTERLY BOUNDARY OF THE LAND DESCRIBED IN SAID LAST MENTIONED DEED; THE FOLLOWING COURSE: NORTH 42°17' 47" WEST 30 FEET; THENCE SOUTH 82°55' 50" WEST 158.46 FEET; THENCE NORTH 65°00' 10" WEST 180.00 FEET; THENCE NORTH 1°43' 40" WEST 200.00 FEET; THENCE NORTH 27°42' 23" EAST 44.15 FEET TO A LINE WHICH BEARS SOUTH 62°10' 10" EAST FROM THE TRUE POINT OF BEGINNING; THENCE LEAVING SAID WESTERLY LINE, NORTH 62°10' 10" WEST 65.28 FEET TO THE TRUE POINT OF BEGINNING.

PARCEL 2:

THAT PORTION OF LOT 1083 OF TRACT NO. 1000, IN THE CITY OF LOS ANGELES, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 19, PAGES 1 TO 34, INCLUSIVE OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

BEGINNING AT THE SOUTHWEST CORNER OF LOT 1077 OF TRACT NO. 6170, AS PER MAP RECORDED IN BOOK 75, PAGE 6, OF MAPS, RECORDS OF SAID COUNTY; THENCE SOUTH 6°11' WEST 59.64 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE TO THE NORTHWEST HAVING A RADIUS OF 300 FEET; THENCE SOUTHERLY ALONG SAID CURVE 59.83 FEET TO THE MOST NORTHERLY CORNER OF THE LAND DESCRIBED IN PARCEL 1 IN THE DEED TO THE CITY OF LOS ANGELES, RECORDED IN BOOK 10853, PAGE 54 OFFICIAL RECORDS; THENCE CONTINUING SOUTHWEST ALONG SAID CURVE 221.87 FEET TO THE NORTHEASTERLY TERMINUS OF THAT CERTAIN COURSE RECITED IN SAID DEED AS HAVING A BEARING OF NORTH 27°42' 23" EAST AND A LENGTH OF 238.91 FEET, BEING THE TRUE POINT BEGINNING OF THIS DESCRIPTION; THENCE SOUTH 27°42' 23" WEST ALONG SAID COURSE 194.76 FEET TO THE MOST NORTHERLY LINE OF THE LAND DESCRIBED IN THE DEED TO JOE A NORIN AND WIFE, RECORDED IN BOOK 15929 PAGE 304, OFFICIAL RECORDS; THENCE ALONG SAID NORTHERLY LINE NORTH 62°10' 10" WEST 65.28 FEET TO A POINT IN A CURVE CONCAVE TO THE SOUTHEAST HAVING A RADIUS OF 318.608 FEET, A RADIAL LINE OF SAID CURVE FROM SAID POINT BEARS SOUTH 62°10' 10" EAST, SAID POINT ALSO BEING THE MOST NORTHERLY CORNER OF THE LAND OF NORIN; THENCE SOUTHERLY ALONG SAID CURVE 77 FEET; THENCE CONTINUING SOUTHERLY ALONG THE WESTERLY LINE OF THE LAND OF NORIN THE FOLLOWING COURSES: SOUTH 13°59' WEST 325.00 FEET; THENCE SOUTH 21°51' 30" WEST 89.89 FEET; THENCE SOUTH 29°30' 18" WEST 431.64 FEET TO A POINT IN THE NORTHWESTERLY LINE OF MULHOLLAND DRIVE 200 FEET WIDE, SAID POINT BEING ALSO THE MOST SOUTHERLY CORNER OF THE LAND OF NORIN; THENCE NORTH 11°52' 40" EAST 431.79 FEET; THENCE NORTH 30°07' 30" EAST 513.60 FEET TO A POINT IN A CURVE CONCAVE TO THE NORTHWEST HAVING A RADIUS OF 338.302 FEET, A RADIAL TO SAID POINT BEARS SOUTH 32°35' EAST; THENCE NORTHEASTERLY ALONG SAID CURVE, 59.045 FEET; THENCE TANGENT TO SAID CURVE, NORTH 47°25' EAST 129.03 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE TO THE SOUTHEAST HAVING A RADIUS OF 7.62 FEET; THENCE NORTHEASTERLY ALONG SAID CURVE 13.64 FEET TO THE POINT OF BEGINNING.

EASEMENT DATA, EXCEPTIONS & EXCLUSIONS:

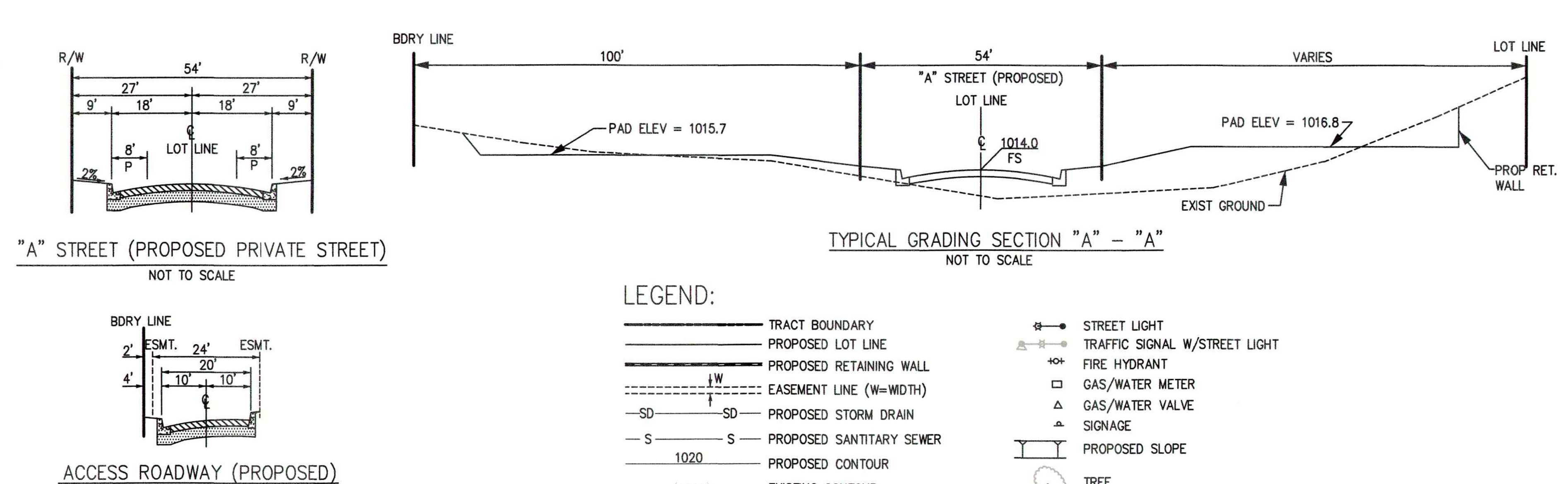
PER PRELIMINARY TITLE REPORT ISSUED BY LAWYERS TITLE.
ORDER NO. 09507426-27 DATED JULY 31, 2009 AT 7:30 AM.

GEOGRAPHICALLY LOCATABLE ITEMS FROM SAID TITLE REPORT (SUCH AS EASEMENTS) WHICH EFFECT THE TITLE TO THE SUBJECT PROPERTY ARE NUMERICALLY KEYED TO SAID REPORT AND ARE AS FOLLOWS:

ITEM 2:
PURPOSE: POLE LINES AND CONDUITS.
IN FAVOR OF: TITLE INSURANCE AND TRUST COMPANY
RECORDING DATE: BOOK 15929, PAGE 304 O.R.
AFFECTS: ENTIREE PARCEL 1

ITEM 4:
PURPOSE: POLES, CONDUITS
IN FAVOR OF: CITY OF LOS ANGELES DEPARTMENT OF WATER AND POWER
RECORDING DATE: BOOK 16205, PAGE 176 O.R.
AFFECTS: AS SHOWN HEREON

ITEM 6:
PURPOSE: COVERED STORM DRAIN
IN FAVOR OF: LOS ANGELES COUNTY FLOOD CONTROL
RECORDING DATE: MAY 22, 1970 AS INST. NO. 2087, O.R.
AFFECTS: AS SHOWN HEREON



LEGEND:

TRACT BOUNDARY
PROPOSED LOT LINE
PROPOSED RETAINING WALL
EASEMENT LINE (W=WIDTH)
PROPOSED STORM DRAIN
PROPOSED SANTITARY SEWER
PROPOSED CONTOUR
EXISTING CONTOUR
EXISTING SANITARY SEWER
EXISTING STORM DRAIN
EXISTING GAS LINE
EXISTING WATER LINE
STREET LIGHT
TRAFFIC SIGNAL W/STREET LIGHT
FIRE HYDRANT
GAS/WATER METER
GAS/WATER VALVE
SIGNAGE
PROPOSED SLOPE
TREE

LOT SUMMARY				
LOT No.	LOT AREA (NET)		PAD AREA	
	SQ. FT.	ACRES	SQ. FT.	ACRES
1	10,695	0.25	1,645	0.04
2	10,147	0.23	1,645	0.04
3	10,370	0.24	1,645	0.04
4	15,300	0.35	1,645	0.04
5	24,658	0.57	1,645	0.04
6	14,430	0.33	2,000	0.05
7	17,344	0.40	2,400	0.06
8	16,855	0.39	2,000	0.05
9	10,716	0.25	2,000	0.05
10	8,209	0.19	2,000	0.05
11	18,563	0.43	1,645	0.04
12	8,003	0.18	2,000	0.05
13	20,341	0.47	–	–
14	8,018	0.18	2,000	0.05
15	9,000	0.21	2,400	0.06
16	9,000	0.21	2,400	0.06
17	8,044	0.18	2,400	0.06
18	8,066	0.19	2,400	0.06
19	10,039	0.23	1,740	0.04
TOTAL	237,798	5.48	35,610	0.88

REGISTERED PROFESSIONAL ENGINEER ATANAS STERYO No. 23221 Expires 12/31/17 CIVIL STATE OF CALIFORNIA

PREPARED BY:
WESTCON ENGINEERING, INC.
LAND PLANNING ENGINEERING LAND SURVEYING
6355 TOPANGA CANYON BLVD.; SUITE 345
WOODLAND HILLS, CA 91367
818-226-0444 VOICE 818-226-0448 FAX
E-MAIL: info@westconeng.com

ATANAS STERYO R.C.E. 23221 DATE

REV.	DATE	DESCRIPTION	DATE	APP'D
△	1/04/13	ADDED CURVE DATA, ELIMINATED REVERSE CURVE ON "A" ST., REVISED ENGINEER INFO		
	4/19/13	ADDED "PRIVATE STREET" TO "A" STREET, REALIGNED PROPOSED STORM DRAIN		
	4/14/15	REVISED DRIVEWAY LOCATION LOTS 11 & 12, REVISED SETBACK ON LOT 13 FROM 13' TO 16', REVISED		
		SIDEYARD ON LOT 4 FROM 7' TO 9'		
	10/18/16	REVISED LOT SQUARE FOOTAGE ON LOTS 9, 10, 12 & 13. ELIMINATED PAD AND UNIT ON LOT 13. REVISED		
		MAP TO INCLUDE "A" STREET (PRIVATE STREET) IN LOT SQ FTG. ADDED GROSS AND NET SQ FTG TO LOTS FRONTING "A" STREET		
	4/20/17	REVISED LOT SUMMARY TO REFLECT ELIMINATED PAD ON LOT 13		
	7/07/17	ADDED UNIT MAXIMUM HEIGHT NOTE, REVISED DISPERSAL WALL LOCATION		
	10/11/17	ADDED 3' H SLOUGH WALL LOTS 14-19, REVISED WALL LOCATION LOT 5, AND EXTENDED DISPERSAL WALL TO RIDGE LINE, ADDED CANYON SUBDRAIN LOCATION, AND ADDED COLORED CUT/FILL SLOPES.		

BENCH MARK:
LOS ANGELES COUNTY PUBLIC WORKS SURVEY DIVISION
MALIBU QUAD 1998 (ADJ)
BM NUMBER: Y10436
DPW BM TAG W CB 1M S/O BCR @ SW COR MULHOLLAND DR & MULHOLLAND HWY 27M & 9M W/O C/L INT.
ELEV = 1046.966 1998 ADJ

VESTING TENTATIVE TRACT MAP FOR SUBDIVISION PURPOSES:

VESTING TENTATIVE TRACT MAP
TRACT NO. 67505

DS VENTURES, LLC

IN THE CITY OF LOS ANGELES COUNTY OF LOS ANGELES STATE OF CALIFORNIA

DATE: OCT 18, 2016	SHEET 1 OF 1 SHEETS
SCALE: 1"=40'	
JOB NO.	
DESIGNED BY:	
DRAFTED BY:	
CHECKED BY:	

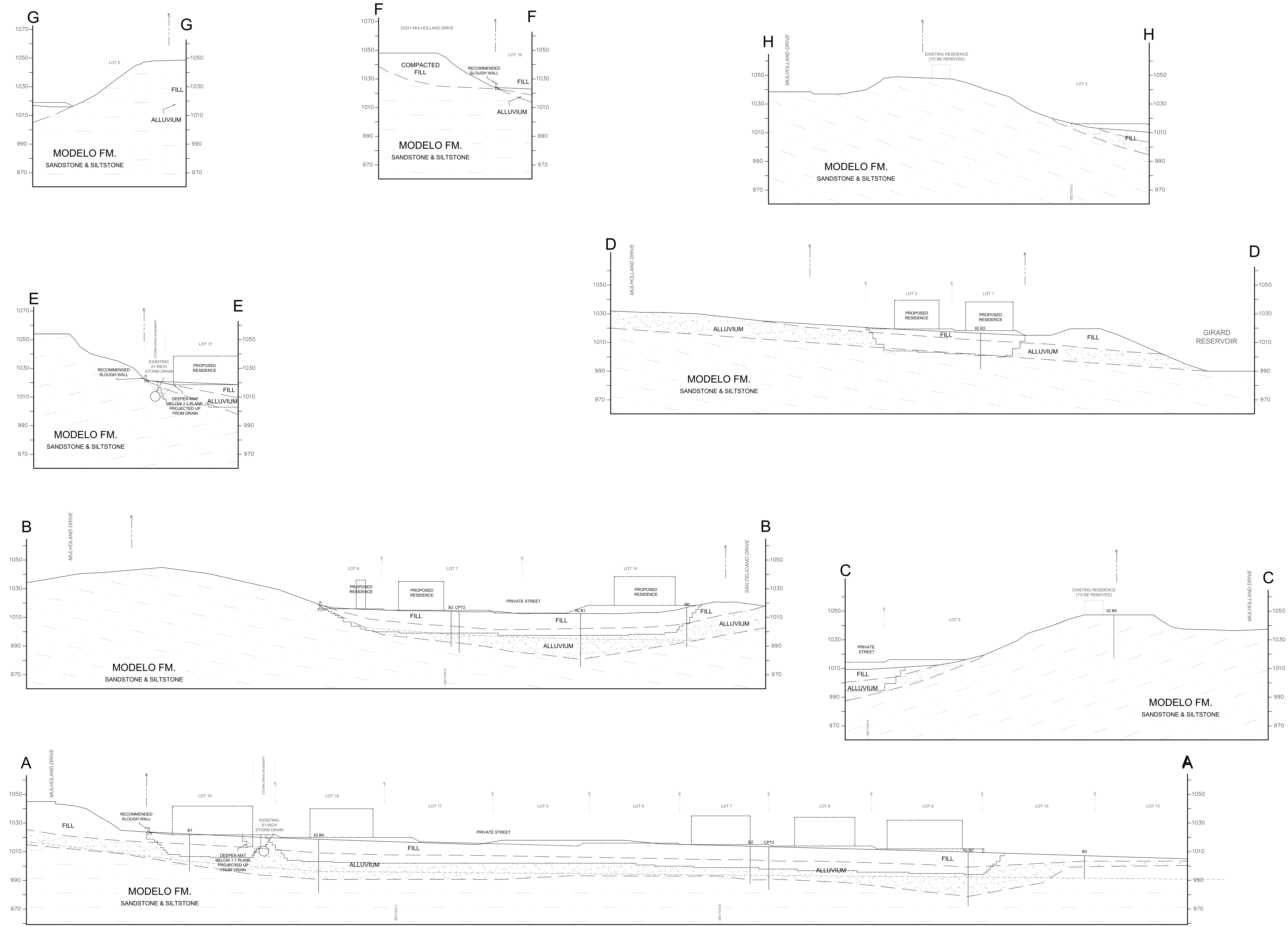
IRVINE GEOTECHNICAL Inc

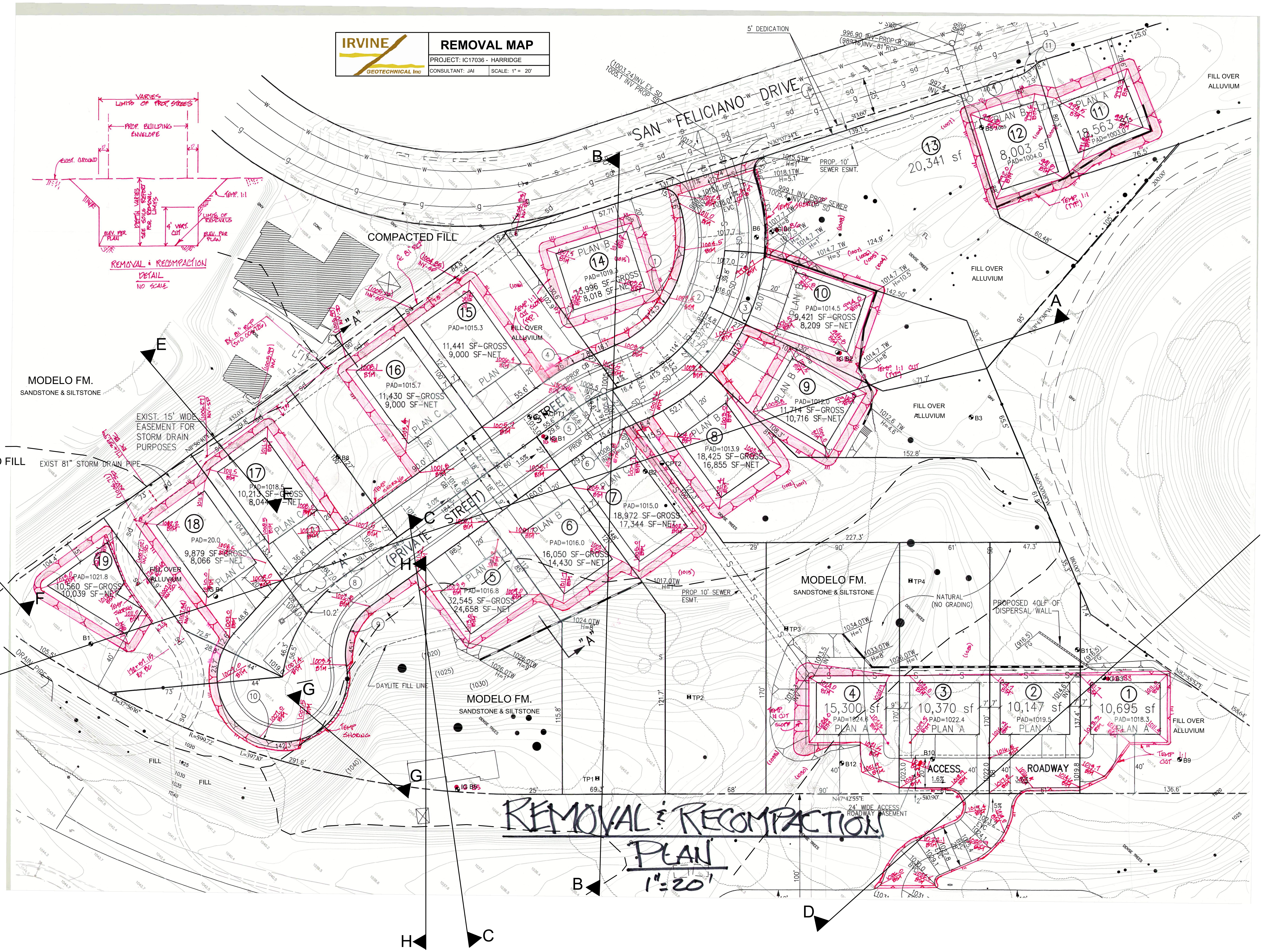
SECTIONS A - H

PROJECT: IC17036 - HARRIDGE

CONSULTANT: JAI

SCALE: 1" = 20'





IRVINE GEOTECHNICAL Inc
REMOVAL MAP
PROJECT: IC17036 - HARRIDGE
CONSULTANT: JAI
SCALE: 1" = 20'
SAN FELICIANO DRIVE
(PRIVATE STREET)
COMPACTED FILL
MODELO FM.
SANDSTONE & SILTSTONE
FILL OVER ALLUVIUM
EXIST. 15' WIDE EASEMENT FOR STORM DRAIN PURPOSES
EXIST 81" STORM DRAIN PIPE
PROP. 10' SEWER ESMT.
5' DEDICATION
PROPOSED 40LF OF DISPERSAL WALL
NATURAL (NO GRADING)
24' WIDE ACCESS ROADWAY EASEMENT
ACCESS ROADWAY
DAYLITE FILL LINE
REMOVAL & RECOMPACTION DETAIL
NO SCALE
REMOVAL & RECOMPACTION PLAN
1"=20'