El Camino Memorial Park
2nd Response to Development Service Department
Project No. GS 16B12
August 30, 2021

Mr. Michael Green
Clark & Green Associates
15420 Laguna Canyon Road, Suite 210
Irvine, California 92618

SUBJECT: El Camino Memorial Park Secret Canyon Expansion, 2nd Response to the City of San Diego Development Services Department # 670391-2 dated October 21, 2020, page 14, and # 0670391-4 dated June 11, 2021, located at 5600 Carroll Canyon Road San Diego, California 92121.

REFERENCE: Geotechnical Soilutions, Inc., Geological & Geotechnical Investigation for Proposed Expansion Project Secret Canyon, including 1000 Lots Roadway & Bride Crossing, El Camino Memorial Park, 5600 Carroll Canyon Road, San Diego, California 92121, dated April 25, 2017.

El Camino Memorial Park Secret Canyon Expansion, Response to the City of San Diego Development Services Department # 670391-2 dated October 21, 2020, page 14, located at 5600 Carroll Canyon Road San Diego, California 92121, by Geotechnical Soilution dated March 25, 2021.

With Clark and Green Associates request, we have prepared this addendum geotechnical letter in response to questions raised in the above referenced City review letter.

The following responses correspond to the numbered questions in Review Sheet 670391-2 (10/21/2020), and 0670391-4 (6/11/2021) page 14.

Review Comments:

Issue # 4: The project's geotechnical consultant must provide their professional opinion that the site will have a factor-of-safety of 1.5 or greater for both gross and surficial stability following project completion.

Response # 4: Based on the results of the stability analysis, it is our professional opinion that the proposed fill slopes including surficial, following project completion, have a minimum safety factor of 1.5 against static failure, and 1.1 against pseudo-static failure, the minimums acceptable by the Building Codes.

Issue # 5: The project's geotechnical consultant should provide a statement as to whether or not the site is suitable for the intended use.

Response # 5: The proposed development is suitable from a geotechnical standpoint, provided the recommendations in the referenced geotechnical report are implemented in design and construction.

Response # 10: This response letter addresses Issues 4 & 5 in the Review Comments Sheet referenced above.

We hope we answered your questions satisfactorily. Please do not hesitate to contact me should you have any questions at 323-937-1097.

Respectfully Submitted,
Geotechnical Soilutions, Inc.,
Mesrop A. Mesrop, RGE 2561

Review Information

Cycle Type:	4 Submitted (Multi-Discipline)	**Submitted:**	05/25/2021	Deemed Complete on 05/25/2021
Reviewing Discipline:	LDR-Geology	**Cycle Distributed:**	05/25/2021	
Reviewer:	**Mills, Kreg**	**Assigned:**	05/25/2021	
	(619) 446-5295	**Started:**	06/11/2021	
	Kmills@sandiego.gov	**Review Due:**	06/16/2021	
Hours of Review:	2.50	**Completed:**	06/11/2021	**COMPLETED ON TIME**
Next Review Method:	Submitted (Multi-Discipline)	**Closed:**	08/05/2021	

Mesrop

- The review due date was changed to 06/21/2021 from 06/21/2021 per agreement with customer.
- The reviewer has indicated they want to review this project again. Reason chosen by the reviewer: Partial Response to Cmnts/Regs.
- We request a 3rd complete submittal for LDR-Geology on this project as: Submitted (Multi-Discipline).
- The reviewer has requested more documents be submitted.
- Your project still has 3 outstanding review issues with LDR-Geology (3 of which are new issues).
- Last month LDR-Geology performed 83 reviews, 92.8% were on-time, and 68.5% were on projects at less than < 3 complete submittals.

0670391-2 (10/21/2020)

REVIEW COMMENTS:

Cleared	Issue Num	Issue Text
☐	4	The project's geotechnical consultant must provide their professional opinion that the site will have a factor-of-safety of 1.5 or greater for both gross and surficial stability following project completion. (From Cycle 2)
☐	5	The project's geotechnical consultant should provide a statement as to whether or not the site is suitable for the intended use. (From Cycle 2)

0670391-4 (6/11/2021)

REFERENCES REVIEWED:

No outstanding Issues

REVIEW COMMENTS:

Cleared	Issue Num	Issue Text
☐	10	The previous review comments that have not been cleared remain applicable. The project's geotechnical consultant must submit an addendum geotechnical report or update letter for the purpose of an environmental review that references the development plans and addresses the previous un-cleared review comments. (New Issue)

Mr. Derrick Johnson, Project Manager
City of San Diego
Development Services Department
1222 1st Avenue
San Diego, CA 92101-4154
dnjohnson@sandiego.gov

SUBJECT: El Camino Memorial Park Secret Canyon Expansion Area Storm Water Quality- Infiltration Feasibility Condition Letter, located at 5600 Carroll Canyon Road San Diego, California 92121.

REFERENCE: El Camino Memorial Park Secret Canyon Expansion Area Storm Water Quality- Infiltration Feasibility Condition Letter (C.1.1)

Geotechnical Soilutions, Inc., Geological & Geotechnical Investigation for Proposed Expansion Project Secret Canyon, including 1000 Lots Roadway & Bride Crossing, El Camino Memorial Park, 5600 Carroll Canyon Road, San Diego, California 92121, dated April 25, 2017.

This letter is to provide justification for a "No Infiltration Basis" finding for the referenced project. The 2018 SWQ Manual, Appendix C, Section C.1 and C.1.1 sets requirements for "No Infiltration" basis justification. Included are required minimum setbacks from structures of 10-feet for infiltration. The below project elements would not meet this requirement:

1) The proposed bridge structure
2) Drain inlet foundations and structures
3) Roadways

Also, the project is located in a hillside area where the C.1 criteria for slopes prohibits infiltration.

The project engineering design team will follow the required SWQ BMP hierarchy and proposes to provide a Modular Wetlands proprietary biofiltration unit to treat project stormwater, since infiltration is not feasible.

Please do not hesitate to contact me should you have any questions at 323-937-1097.

Respectfully Submitted,
Geotechnical Soilutions, Inc.,
Mesrop A. Mesrop, RGE 2561

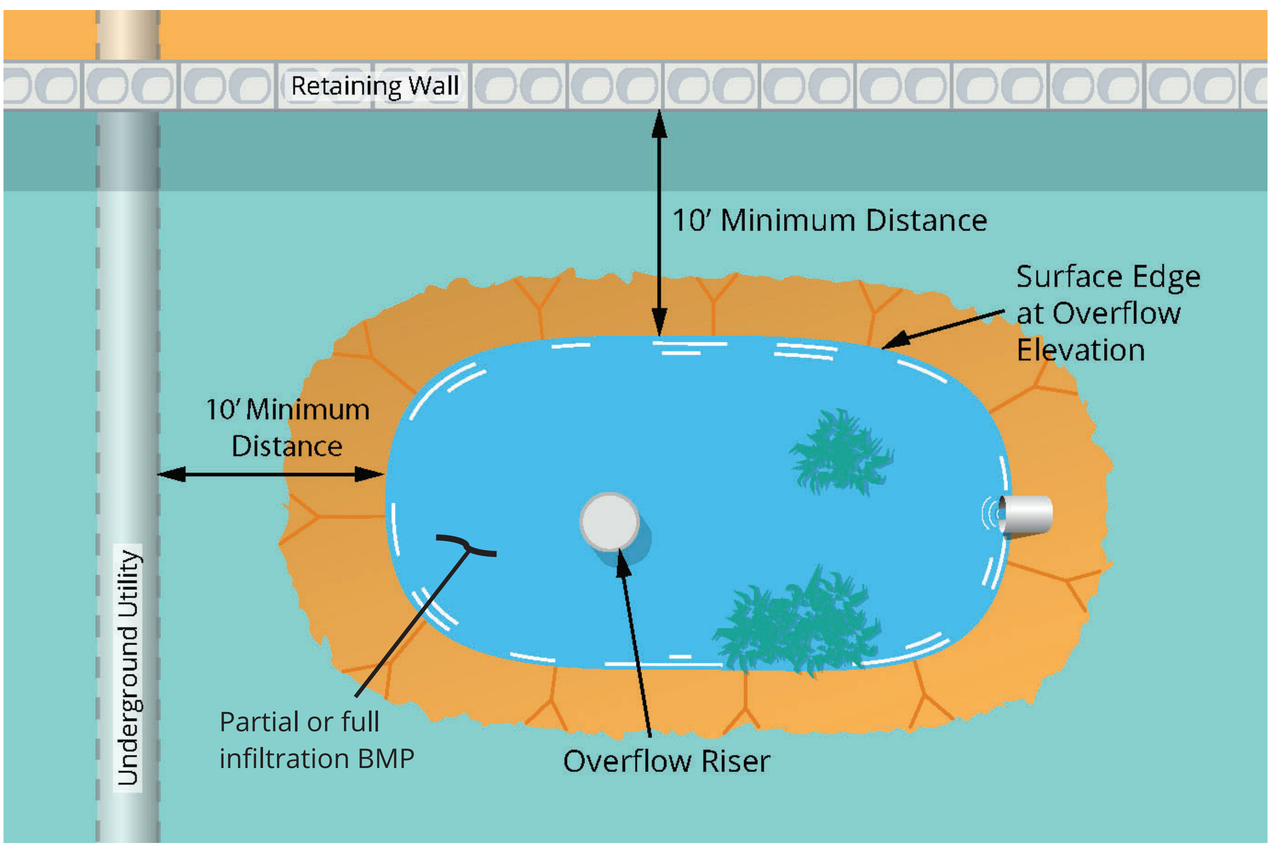
Attachments: City of San Diego Storm Water Standards Manual (10/2018) Appendix C.1, C.1.1
Exhibit -No Infiltration Justification

C.1 Simple Feasibility Criteria

When one of the following standard setbacks cannot be avoided, the applicant can classify the DMA as no infiltration condition provided an infiltration feasibility condition letter that meets the requirements in **Appendix C.1.1**. is included in the SWQMP submittal.

- Full and partial infiltration BMPs shall not be placed within existing fill materials greater than 5 feet thick; or
- Full and partial infiltration BMPs shall not be proposed within 10 feet (horizontal radial distance) of existing underground utilities, structures, or retaining walls; or
- Full and partial infiltration BMPs shall not be proposed within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope; or
- Full and partial infiltration BMPs shall not be proposed within 100 feet of contaminated soil or groundwater sites; or
- Other physical impairments (i.e., fire road egress, public safety considerations, etc.)

The setbacks must be the closest horizontal radial distance between the surface edge (at the overflow elevation) of the BMP to existing underground utilities, structures, retaining walls; or natural slopes; or fill slopes; or contaminated soil or groundwater site. The schematic for the setbacks is shown below.



C.1.1 Infiltration Feasibility Condition Letter

The geotechnical engineer shall provide an **Infiltration Feasibility Condition Letter** in the SWQMP to demonstrate that the DMA is in a no infiltration condition. The letter shall be stamped/signed by a licensed geotechnical engineer who prepared the letter.

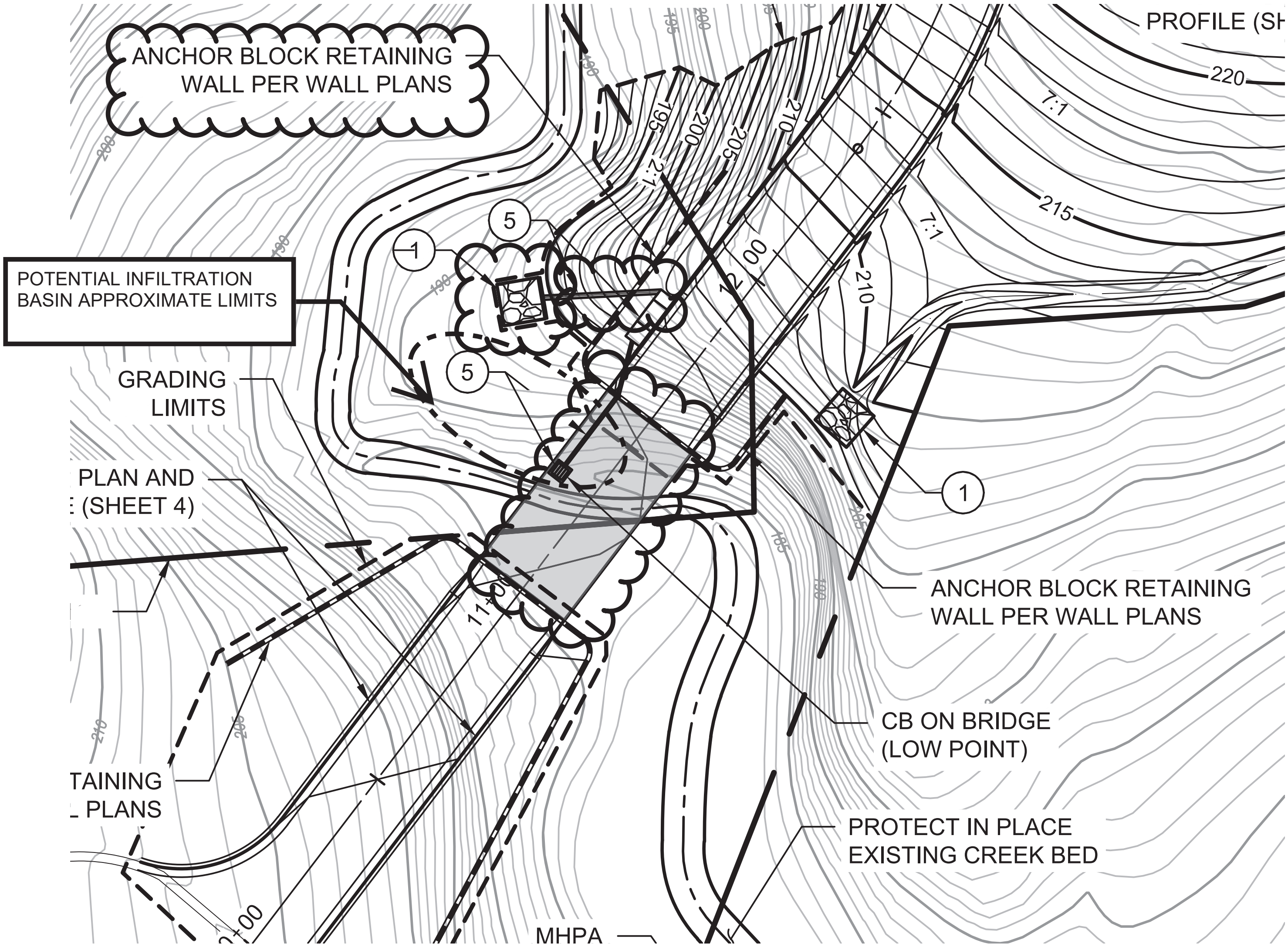
The letter shall be submitted during the discretionary phase for private projects and during the initial project submittal to the Public Works Department for public projects. The letter shall at a minimum document:

- The phase of the project in which the geotechnical engineer first analyzed the site for infiltration feasibility.
- Results of previous geotechnical analyses conducted in the project area, if any.
- The development status of the site prior to the project application (i.e., new development with raw ungraded land, or redevelopment with existing graded conditions).
- The history of design discussions for the project footprint, resulting in the final design determination.
- Full/partial infiltration BMP standard setbacks to underground utilities, structures, retaining walls, fill slopes, and natural slopes applicable to the DMA that prevent full/partial infiltration.
- The physical impairments (i.e., fire road egress, public safety considerations, etc.) that prevent full/partial infiltration.
- The consideration of site design alternatives to achieve partial/full infiltration within the DMA.
- The extent site design BMPs requirements were included in the overall design.
- Conclusion or recommendation from the geotechnical engineer regarding the DMA's infiltration condition.
- An Exhibit for all applicable DMAs that clearly labels:
    - Proposed development areas and development type.
    - All applicable features and setbacks that prevent partial or full infiltration, including underground utilities, structures, retaining walls, fill slopes, natural slopes, and existing fill materials greater than 5 feet.
    - Potential locations for structural BMPs.
    - Areas where full/partial infiltration BMPs cannot be proposed.

Completion of **Worksheet C.4-1(Form I-8A) and/or Worksheet C.4-2 (Form I-8B)** is not required in instances where the applicant submits an infiltration feasibility condition letter that meets the requirements in this section.

Exhibit: Infiltration Feasibility Condition Letter (C.1.1)

Clouded project elements do not meet required 10 foot setback for infiltration



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SUBJECT: El Camino Memorial Park Secret Canyon Expansion, Response to the City of San Diego Development Services Department # 670391-2 dated October 21, 2020, page 14, located at 5600 Carroll Canyon Road San Diego, California 92121.

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With Clark and Green Associates request, we have prepared this addendum geotechnical letter in response to questions raised in the above referenced City review letter.

The following responses correspond to the numbered questions in Review Sheet 670391-2 (10/21/2020), page 14.

Review Comments:

Issue # 2: The project's geotechnical consultant must submit an addendum geotechnical report or update letter for the purpose of an environmental review that specifically addresses the proposed development plans and the following:

Response #2: With the implementation of the recommendations of the referenced report:

(I) the proposed development will be safe against hazards from landslide, settlement or slippage, and

(II) will have no effect on the geologic stability or destabilize or result in settlement of adjacent property or the right of way.

The above statements are based on our findings, analyses and recommendations as stated in our referenced geotechnical report, as follows:

"The results of the stability analysis indicate that the existing bedrock slope and the proposed 2:1 fill slopes have a minimum safety factor of 1.5 against static failure, and 1.1 against pseudo-static failure, the minimums acceptable by the Building Codes", page 5 of the referenced report.

"The proposed development is feasible from a geotechnical standpoint, provided the recommendations in the referenced geotechnical report are implemented in design and construction", page 6 of the referenced report.

"Liquefaction of the subsurface materials is not considered probable due to the presence of bedrock near the surface" page 10 of the referenced report.

"Foundations embedded in bedrock as recommended should sustain negligible settlement", page 12 of the referenced report.

Issue # 3: The project's geotechnical consultant should provide a conclusion regarding if the proposed development will destabilize or result in settlement of adjacent property or the right of way.

Response # 3: The proposed development will be safe against hazards from landslide, settlement or slippage, and will have no effect on the geologic stability or destabilize or result in settlement of adjacent property or the right of way.

Issue # 4: The project's geotechnical consultant must provide their professional opinion that the site will have a factor-of-safety of 1.5 or greater for both gross and surficial stability following project completion.

Response # 4: The results of the stability analysis indicate that the bedrock slope and the proposed 2:1 fill slopes, including surficial, have a minimum safety factor of 1.5 against static failure, and 1.1 against pseudo-static failure, the minimums acceptable by the Building Codes.

Issue # 5: The project's geotechnical consultant should provide a statement as to whether or not the site is suitable for the intended use.

Response # 5: The proposed development is feasible from a geotechnical standpoint, provided the recommendations in the referenced geotechnical report are implemented in design and construction.

Issue # 6: Storm Water Requirements for the proposed conceptual development will be evaluated by LDR-Engineering review. Priority Development Projects may require an investigation of storm water infiltration feasibility in accordance with the current Storm Water Standards. Check with your LDR-Engineering reviewer for requirements. LDR-Engineering may determine that LDR-Geology review of a storm water infiltration evaluation is required.

Response # 6: This issue was addressed in our letter dated December 8, 2020 "El Camino Memorial Park Secret Canyon Expansion Area Storm Water Quality-Infiltration Feasibility Condition Letter".

Issue # 7: Note: These comments are draft and subject to change until presented by the City's assigned Development Project Manager in conjunction with the project Assessment Letter. Staff is unable to process formal, intermediate plan changes and updates outside the full submitted cycle. A formal response to these comments must be made through the resubmittal process in response to the full Assessment Letter. Your DSD Development Project Manager can assist with further questions.

Response # 7: We concur and acknowledge.

We hope we answered your questions satisfactorily. Please do not hesitate to contact me should you have any questions at 323-937-1097.

Respectfully Submitted,
Geotechnical Soilutions, Inc.,
Mesrop A. Mesrop, RGE 2561

GOELOGICAL & GEOTECHNICAL INVESTIGATION
FOR PROPOSED EXPANSION PROJECT
SECRET CANYON
INCLUDING:1000 LOTS, ROADWAY & BRIDGE CROSSING
EL CAMINO MEMORIAL PARK
5600 CARROLL CANYON ROAD
SAN DIEGO, CALIFORNIA 92121

PREPARED FOR:
CLARK AND GREEN ASSOCIATES
150 Paularino Avenue, # 160
Costa Mesa, CA 92626

Subject

Geological and Geotechnical Investigation for Proposed 1,000 Lot Expansion, New Roadway, and Bridge Crossing at Secret Canyon Area, El Camino Memorial Park, 5600 Carroll Canyon Road, San Diego, CA 92121.

Site Description

The project site is located on the north side of Carroll Canyon Road in hillside terrain within the inland portion of San Diego County approximately four miles inland from the coast. The proposed new burial sites will be constructed on the crest of a ridgeline on the east side of Secret Canyon that descends southerly to existing lawn burial areas within the memorial park. The ridgeline was previously developed as an olive grove that included an unimproved dirt roadway down the spine of the ridgeline. The olive grove is in a state of disrepair, however indistinct graded terraces and many olive trees remain at the site. Access to the new burial sites will be provided by a new paved roadway that will include a bridge across Secret Canyon from the cul-de-sac of an existing roadway within the developed portion of the memorial park. Vegetation is generally sparse in the area to be developed for burial sites, however the Secret Canyon drainage is heavily vegetated. A location Map is provided in Appendix A.

Proposed Development

The proposed development will consist of three primary elements as follows and as shown on the attached Geotechnical Map:

- One thousand new lawn burial sites in the southern portion of the ridgeline, with a buffer zone adjacent Secret Canyon consisting of an MHPA preserve. The lawn burial sites will be created by generally minimal grading of the existing ridgeline topography with cuts and fills less than five feet.
- A bridge crossing of Secret Canyon utilizing either a structural bridge supported on retaining walls, columns and piles, road embankment with culvert, or geogrid reinforced earth structure crossing over the creek.
- A new paved roadway on the west side of the lawn burial area that will extend northerly and uphill from the cul-de-sac of an existing roadway and the bridge across Secret Canyon. The roadway will be approximately 650 feet long and end in a cul-de-sac at the northern end of the proposed new burial areas. Construction of the road will include shallow cuts and placement of side hill fills on the westerly descending slope above Secret Canyon.

Maps and Cross Sections

The geologic information and the location of the exploratory investigation are plotted on grading plan and the cross sections prepared by Kreuzer Consulting Group. The Geotechnical Map is presented on Plate 1. A cross section passes through the center line of the roadway crossing the canyon is presented on Plate 2. The cross sections at stations 13, 14, 15 and 16 are presented on Plate 3 and 4, with horizontal scale twice as the vertical scale. The scale of station 15 was adjusted and is presented on Plate 5. Stability analysis was based on station 15.

Field Exploration

Our field exploration consisted of two phases: The first phase consisted of excavation of five (5) backhoe pits to depths ranging from 3 to 4 feet in the proposed new burial areas and roadway; the second phase consisted of two borings and three test pits in the area of the proposed bridge crossing. The locations of the borings and test pits are indicated on the attached Geotechnical Map, Plate I, in Appendix A.

The logs of the borings and test pits are presented in Appendix B. The borings and test pits were logged by our engineering geologist and drive tube and bulk samples were taken of representative soil and bedrock materials for laboratory testing.

Laboratory Testing

Laboratory tests were performed on selected soil and bedrock samples to determine their relative physical and engineering properties. The results of these tests are presented in Appendix C. Laboratory testing consisted of the following tests:

1 Maximum Dry Density
2 Direct and Remolded Shear
3 Consolidation
4 R-Value
5 Corrosivity
6 Sieve
7 Atterburg
8 Sand Equivalent

Geologic/Subsurface Conditions

Published geologic maps indicate that the site is underlain by sedimentary rock assigned to the Stadium Conglomerate Member of the Poway and La Jolla Groups. Published descriptions of the sedimentary unit indicate that it is primarily a cobble conglomerate with a sandstone matrix. Our Phase I field investigation in the proposed new burial areas and roadway on the north side of Secret Canyon, which included 5 test pits, encountered bedrock at shallow depths consisting of conglomerate similar to the published description of the unit, but also found interbedded sandstone. The conglomerate and sandstone were cemented and relatively hard and became difficult to excavate at depth with a backhoe. The bedrock encountered was generally massive to vaguely bedded. Where measured, bedding was at shallow dips 6 degrees) to the south. The geologic structure of the bedrock (bedding) is not anticipated to influence design of the proposed grading, roadway construction, or other improvements at the site. The bedrock in these areas was mantled with residual soil varying in thickness from approximately one to two feet. In general, the residual soils consisted of silty and clayey sands and sandy clays. Soil and geologic conditions in the area of the proposed burial and roadway are shown on the Geotechnical Map, Plate 1, and Cross Sections, Plates 2 through 5 in Appendix A.

The Phase II investigation in the area of Secret Canyon where the roadway will cross consisted of two borings on the south side of the canyon and three hand excavated test pits in the steep terrain of the canyon. Soil and geologic conditions encountered are shown on the attached Geotechnical Map, Plate 1. As shown on Cross Section 2, the southern canyon wall at the bridge crossing is underlain by fill placed during memorial park grading with a maximum thickness of approximately 10 feet, overlying native colluvial soils with an approximate thickness of 5 feet. The northern canyon wall is underlain by bedrock with a shallow soil cover of 1-2 feet in thickness. The canyon bottom, within the area of the active stream, is underlain by both clayey and gravelly alluvial soils with a maximum thickness of approximately 10 feet. At the time of our investigation, there was active stream flow in the canyon bottom and groundwater was found at elevations ranging from 180 feet in the canyon bottom, to 185 feet under the southern canyon wall, as shown in Cross Section 2. Our interpretation of soil and bedrock conditions at the site is shown on the attached Geologic Map and Cross Sections.

No evidence of previous slope failures was observed at the site. Based on the relatively shallow gradient of the site slopes, hard bedrock, and lack of adverse geologic structure, no slope instability is anticipated in the area of the proposed development. Groundwater was encountered at elevations ranging from approximately 180 feet in the bottom of Secret Canyon to 185 feet below the southern canyon wall.

Stability Analyses

Stability analyses of the existing natural and proposed 2:1 compacted fill slopes were performed along sections station 15, presented on Plate 5.

The following are shear strength parameters of the bedrock and soil taken from our laboratory tests.

Material	**Shearing**	**Cohesion** (psf)	**Friction** (deg.	**Location**	
Compacted fill (Remolded)	ultimate	190	29	TP-1@0-2'	Phase I
Bedrock	ultimate	180	31	TP-3@42”	Phase I
Compacted fill (Remolded)	ultimate	200	30	TP-3@2-4'	Phase II

Bedrock	ultimate	100	30	B-1@20’	Phase II
Bedrock	ultimate	200	30	B-1@30’	Phase II
Bedrock	ultimate	350	29	B-2@20’	Phase II

The following are shear strength parameters used in the stability analyses:

Material	**Shearing**	**Cohesion** (psf)	**Friction** (deg.
Compacted fill (Remolded)	ultimate	190	29
Bedrock	ultimate	180	31

The analyses were performed using the GSSTABL7 Program. The critical surfaces having the lowest safety factors are shown on stability printouts in Appendix D. The Modified Bishop Method was used to compute the safety factor of circular failure surfaces.

The Pseudo-Static analyses was based on a seismic coefficient, Keq = 0.2g, which was calculated based on: PGAm of 0.407g, Mean M of 6.57, Publication SP 117A and 15 cm threshold. References and calculations are provided in Appendix D.

The following analyses were performed along station 15:

El Camino SC1: Rotational analysis, mostly within the bedrock slope, which initiated from the toe of the natural slope (bottom of the canyon) and terminated on the proposed pad above the slope (proposed burial areas). A safety factor of 2.460 was calculated.

El Camino SC2: Rotational analysis, mostly within the proposed 2:1 compacted fill slope under the roadway, which initiates within the lower portion of the fill slope and terminated on the proposed road. A safety factor of 2.572 was calculated.

El Camino SC2Q: Same as SC2 but using pseudo-static analysis with 0.2 g lateral load. A safety factor of 1.529 is calculated.

Surficial Stability Analysis: We performed surficial stability analysis based on shear parameters of the bedrock and compacted fill materials obtained from our laboratory testing. The analyses were based on 4 feet thick compacted soil, using a 2:1 slope. The analyses calculated safety factors greater than 1.5, the minimum acceptable by Building Codes. Calculations are provided in Appendix D.

The results of the stability analysis indicate that the existing bedrock slope and the proposed 2:1 fill slopes have a minimum safety factor of 1.5 against static failure, and 1.1 against pseudo-static failure, the minimums acceptable by the Building Codes.

Conclusions and Recommendations

The proposed grading is feasible from a geotechnical standpoint, provided the recommendations in this report are implemented in design and construction.

All grading should conform to the guidelines presented in California Building Code and the minimum requirements of the City, except where specifically superseded in the text of this report. Grading specifications are provided at the end of the text.

Prior to grading, a representative of Geotechnical Soilutions Inc., should be present at the preconstruction meeting to provide additional grading guidelines, if necessary, and to review the earthwork schedule.

The proposed development will consist of three primary elements: one thousand new lawn burial sites, new paved roadway and bridge crossing over the creek.

<u>One Thousand New Lawn Burial Sites:</u>

One thousand new lawn burial sites are proposed in the southern portion of the ridgeline. The lawn burial sites will be created by generally minimal grading of the existing ridgeline topography with cuts and fills less than five feet.

Burial Site Areas:
The proposed burial site areas are underlain by few feet of residual soil overlying generally hard and difficult to excavate bedrock. The proposed grading will remove most of the residual soil and will expose the bedrock. Graded bedrock surfaces will be mantled by rocky soil and bedrock which may be difficult to landscape, and will be difficult to excavate for lawn burials. Undercutting the exposed rocky bedrock and replacing with soil more tolerant of landscaping may be a consideration.

Flatwork and Walkways:
Flatwork and walkways should be supported either on native soil, bedrock or compacted fill. As a minimum, flatwork and walkways that are subject to heavy loads should be 4 inches thick, and reinforced with No. 3 bars placed at mid-height at 18 inches on-center. Exterior flatwork should be kept a minimum of 5 feet from nearby slopes. Walkways and slabs should be provided with joints. These joints and separations should be filled with plastic joint filler and should be maintained.

Short Retaining and Planter Walls:
Short retaining walls, less than 3 feet in height, and planter walls could be supported on dense native soil and / or compacted soil and / or bedrock. Continuous footings, a minimum of 18 inches wide, may be designed for a bearing value of 2000 pounds per square foot (psf). Footings should be embedded a minimum of 18 inches into the underlying dense native soil and / or

compacted soil and / or bedrock. Passive earth pressure at the ground surface is assumed to be zero and may be increased at the rate of 200 pounds per square foot per foot of embedment, to a maximum value of 2000 psf.

Joints should be provided between the portion of the wall supported on bedrock and portion of the wall supported on soil, to mitigate potential differential settlement.

New Paved Roadway

A new paved roadway on the west side of the lawn burial area that will extend northerly and uphill from the cul-de-sac of an existing roadway. The roadway will be approximately 650 feet long and end in a cul-de-sac at the northern end of the proposed new burial areas. Construction of the road will include shallow cuts and placement of side hill fills on the westerly descending slope above Secret Canyon.

Roadways:
The Geotechnical Map show the location of the proposed roadway in the hillside area above Secret Canyon and west of the proposed lawn burial areas. Based on this location, the roadway will be located on compacted fill and bedrock. The bottom of the excavations, which will expose native soil and/ or bedrock, should be observed and approved by the geotechnical engineer or geologist prior to backfill and compaction.

Construction of the roadway will include a 2:1 Horizontal to Vertical) fill slopes descending from the western edge of the road and joining the natural slope above Secret Canyon. Placement of the fill slope will require placement of an equipment-width fill key at the daylight line of the fill slope, as shown on the Geotechnical Map and Cross Sections. A typical section of a key and benching is included in Appendix A.

The excavated on-site soils are anticipated to be suitable for placement as compacted fill.

Pavement Design:
This section applies for the roadway pavement design in the burial area. A soil sample was tested for R-Value from the type of soil to be utilized as fill. The R-value test result of the soil is 16. Design of pavement section based on variable Traffic Index is provided in Appendix E. During grading of the site, if different materials are used as subgrade soils, such as bedrock or import soils, R-Value tests could be performed for the soils within the upper 5 feet of the roadways, and design section will be revised accordingly.

Bridge Crossing

A bridge crossing of Secret Canyon utilizing either a structural bridge supported on columns and piles, road embankment with culvert, or reinforced earth structure crossing over the creek. The height of the bridge at the location of the creek is approximately 20 feet.

Option 1; Structural Bridge:

The bridge could be supported on retaining walls and/ or columns. In order to reduce the deflection of the 20-foot high walls, we suggest to design them as restrained walls from the top. The bridge could be supported on conventional footings and / or piles founded in bedrock.

***Conventional Foundation*:**
The proposed retaining walls may be supported on continuous footings embedded in bedrock. Continuous footings, a minimum of 18 inches wide, may be designed for a bearing value of 3000 pounds per square foot (psf). Footings should be embedded a minimum of 18 inches into the underlying firm bedrock. The bearing value may be increased at the rate of 300 pounds per square foot for each additional foot of embedment and / or width to a maximum of 5000 pounds per square foot. If the exposed bedrock is not firm and/ or disturbed, the bottom of the footing trench excavation should be compacted. Embedment is measured from the lowest adjacent grade.

The bearing values recommended above are for the total of dead and frequently applied live loads. Resistance to lateral loading may be provided by friction acting at the base of foundations and by passive earth pressure within the bedrock. An allowable coefficient of friction of 0.4 may be used with the dead load forces.

A one-third increase may be used for wind and seismic loading conditions. The recommended bearing value is a net value. The weight of the concrete in the footing may be taken as 50 pounds per cubic foot and the weight of the soil backfill may be neglected when determining the downward loads.

Passive earth pressure at the ground surface is assumed to be zero and may be increased at the rate of 300 pounds per square foot per foot of embedment into bedrock, to a maximum value of 3000 psf. When combining passive and friction for lateral resistance, the passive component should be reduced by one-third.

Pile Foundation:

The piles may be designed using the following design parameters:

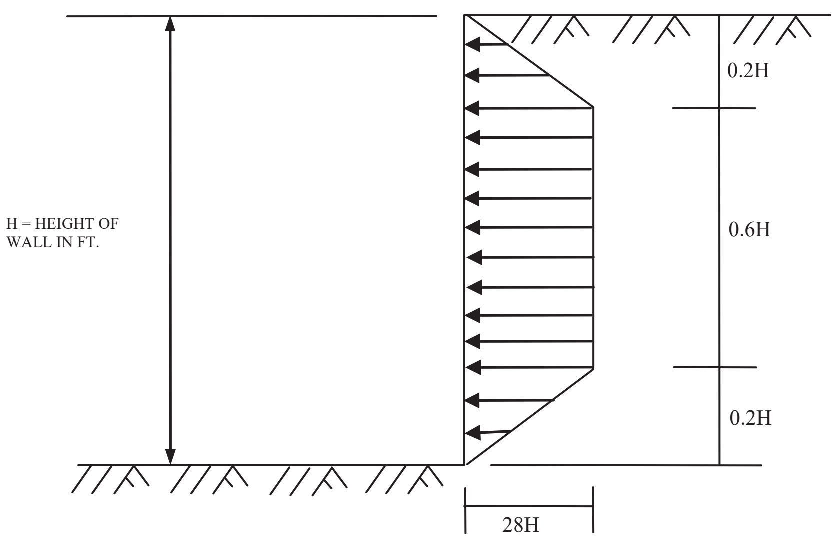
Fixity:	Two feet below bedrock surface or below the scouring line of the creek, whichever is deeper.
Minimum Depth:	5 feet below fixity into competent bedrock.
Skin Friction:	200 psf/ foot of embedment below fixity
Lateral Resistance:	500 psf/ foot of embedment below fixity; up to 8000 psf maximum

The weight of the piles can be neglected.
Bearing calculations are presented in Appendix E.

Retaining Wall:

For drained conditions, cantilevered retaining walls (supporting SM-SC) may be designed on the basis of an equivalent fluid pressure of 45 pounds per cubic foot pcf) for level backfill. Any superimposed loading, including vehicular traffic, within a 1:1 plane projected upward from the wall bottom, except retained earth materials, should be considered as surcharge and should be accounted for in the design of the walls.

For drained conditions, restrained walls should be designed to resist a trapezoidal distribution of lateral earth pressure with the maximum lateral pressure of 28H in pounds per square foot, where H is the height of the wall.



For seismic purposes, an additional lateral earth pressure may be used where a difference in retained grade greater than 6 feet exists across the wall. The pressure distribution may be considered to be an inverted triangle with the maximum pressure at the top and zero on the bottom. The resultant of this force may be assumed to be at 2/3 the height of the wall from the bottom of the wall. A maximum pressure of 20H pounds per square foot may be used, where H is the difference in height of retained grade in feet. This pressure is in addition to the static pressures presented above and may be considered as an ultimate load in design.

To assure drained conditions, a drain blanket should be placed behind the retaining walls. In addition, an impermeable membrane should be placed vertically against the walls to prevent seepage of water from the drain blanket through the wall. The drain blanket should consist of a lower gravel pack overlain by 12-inch thick blanket of granular soil which extends to within 12 inches of the surface. The top 12 inches should be filled with cohesive material compacted to 90 percent relative compaction. Miradrain or equivalent product could be used instead of the drain blanket. For walls that are supporting a sloping backfill, a surface drainage system, such as concrete V-drain, should be provided behind/ on top of the wall. The gravel pack should be outletted through a four-inch diameter perforated pipe placed within the gravel pack and discharged to an appropriate location via a four-inch diameter solid pipe. Any fill placed behind the walls should be compacted to at least 90 percent relative compaction per ASTM D1557-91. Certain types of subdrain pipe and drain products are not acceptable to some municipal agencies. It is recommended that prior to purchasing subdrainage pipe, the type and brand is cleared with the proper municipal agencies

Where limited access between the retaining wall and the temporary excavation prevents the use of compaction equipment, retaining walls should be backfilled with pea 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.

Moisture affecting retaining walls is one of the most common post construction complaints. Poorly applied or omitted waterproofing can lead to efflorescence or standing water. Efflorescence is a process in which a powdery substance is produced on the surface of the concrete by the evaporation of water. The white powder usually consists of soluble salts such as gypsum, calcite, or common salt. It is recommended that retaining walls be waterproofed. Waterproofing design and inspection of its installation is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product which would provide protection to below grade walls.

Seismic Parameters

The structure may be designed to resist earthquake forces following the 2013 edition of California Building Code (CBC), which is based on the 2012 edition of the International Building Code IBC). The Site Classification, as defined in Section 1613.3.2 of the CBC, may be assumed to be a Site Class B, “Rock” Profile. The Design Maps Summary Report and Detailed Report are included in Appendix E.

Liquefaction:

Liquefaction of the subsurface materials is not considered probable due to the presence of bedrock near the surface.

Option 2; Road Embankment with Culvert:

The southern canyon wall at the location of the roadway embankment crossing is underlain by fill placed during memorial park grading with a maximum thickness of approximately 10 feet, overlying native colluvial soils with an approximate thickness of 5 feet. The northern canyon wall is underlain by bedrock with a shallow soil cover of 1-2 feet in thickness. The canyon bottom, within the area of the active stream, is underlain by both clayey and gravelly alluvial soils with a maximum thickness of approximately 10 feet. At the time of our investigation, there was active stream flow in the canyon bottom and groundwater was found at about few feet below the bottom of the canyon.

The fill and native soils should be removed prior to any fill placement. The bottom of the excavation, which will expose bedrock, should be observed and approved by the geotechnical engineer or geologist prior to backfill and compaction.

Construction of the roadway will include a 2:1 Horizontal to Vertical) fill slopes descending from the road and joining the natural grade of the canyon.

Compaction, benching and grading specifications are provided in the following sections.

Option 3; Reinforced Earth Structure:

The type of the reinforced earth and its design is not part of the scope of this work. Foundation recommendations and design parameters should be the same as described above for the two other options. All footings and embankments should be supported on bedrock.

General Grading and Earthwork Recommendations

Dewatering:
Ground water was encountered near the bottom of the canyon, as shown in cross section A-A. A dewatering system will be required for excavation below ground water.

Benching and Subdrains:
Areas sloping steeper than 5:1 should be benched to provide a horizontal fill surface per standard grading practice. Benches should not exceed 4 feet in height. Subdrains should be provided at the contact between the bedrock and compacted fill as shown on the Typical Section of 2:1 Compacted Fill in Appendix A. Subdrains (also known as backdrains) should be installed near the toe of the compacted fill in the bench. Additional subdrain at mid-slope for slopes in excess of 40 feet. Sub-drainage should consist of perforated pipe in one foot of gravel wrapped in filter fabric. The perforated pipe should be connected to a solid pipe outletting on the slope.

Placement of the fill slope will require placement of an equipment-width fill key at the daylight line of the fill slope, as shown on the Geotechnical Map and Cross Sections. A typical section of a key and benching is included in Appendix A.

Compaction:
The soils to be used as backfill materials should be cleared of all debris, rocks larger than 8 inches and other deleterious material before being used as compacted fill. Fill should be compacted to 90 percent relative compaction per ASTM D1557-91. All fill must be placed in 6

to 8-inch thick lifts at near optimum moisture content. Grading Specifications are provided in the following sections.

Expansiveness of Soils

The on-site soils have a low potential for expansion Expansion Index of 12). All footings, retaining walls and slabs should be reinforced as recommended above in the Footing, Retaining Wall and Slab Sections.

Settlement

Foundations embedded in bedrock as recommended above should sustain negligible settlement. Flatwork supported on the soils and/ or compacted fill should be placed independently from the retaining walls foundation system that is supported on bedrock. Differential settlement is anticipated between the slab on grade and structures. Joints and separations should be filled with plastic joint filler.

Soil Chemical Testing

Selected samples of the near surface soils were collected and tested for corrosivity potential. The samples were tested for pH, resistivity, soluble chlorides, and soluble sulfates in general accordance with California Test Methods 643, 422, and 417 respectively. The results of the tests are presented in Appendix C.

Site Drainage

Water should not be allowed to sheetflow freely over the slope surfaces. All surface and drainage water should be collected and drained to a suitable location using non-erodible drainage devices.

Slabs

Slab on grade including stairs/ steps walkways and patios could be supported on bedrock and / or dense native soil and/ or compacted fill. If the subgrade is disturbed, it should be removed and compacted to 90 percent relative compaction. The on-site soils are low expansive (Expansion Index of 12). The upper 4 inches of the subgrade should consist of granular soil and or base like materials. As a minimum, flatwork and walkways that are subject to heavy loads should be 4 inches thick, and reinforced with No. 3 bars placed at mid-height at 18 inches on-center. Exterior flatwork should be kept a minimum of 5 feet from nearby slopes.

Utility Trenches

All utility trenches should be backfilled and compacted to 90 percent relative compaction per ASTM D1557-91.

Review

This firm shall be promptly notified if any conditions substantially differing from those disclosed by the test excavations that are encountered during construction. All grading and compaction work shall be observed by a representative of this firm to confirm compliance with the recommendations in this report and with local ordinances. All excavations, including footing excavations shall be observed by the geotechnical engineer or geologist prior to placing concrete or steel. This firm should be notified at least 48 hours prior to any required field review.

The following page describes the limits of our liability and warranties for data contained in this report.

If you have any questions regarding the content of this report, please contact our office. This opportunity to be of professional service is greatly appreciated.

Respectfully Submitted,
Geotechnical Soilutions, Inc.,

Mesrop A. Mesrop
RGE 2561

Tom Hill
CEG 1100

WARRANTIES

In the event that any significant changes in the design or location of the structure(s), as outlined in this report, are planned, the conclusions and recommendations contained in this report may not be considered valid unless the changes are reviewed and the conclusions of this report are modified or approved by the Geotechnical Engineer.

This report is to provide geotechnical recommendations and design values for the design of the proposed expansion at El Camino Memorial Park in San Diego, California. This investigation was performed for Clark and Green Associates. This report will provide design values and recommendations to assist the architect, civil and/ or structural engineer in his design of the proposed development.

If conditions encountered during construction appear to differ from those disclosed, this firm shall be notified so as to consider the need for modifications. No responsibility for construction compliance with the design concepts, specifications or recommendations is assumed unless on-site construction review is performed during the course of construction which pertains to the specific recommendations contained herein.

The geotechnical engineer and/or geologist prepared this report in accordance with generally accepted engineering practice, using an effort and resources commensurate with the amount of confidence in the data requested by the Client. No other warranties are made, either expressed or implied, as to the professional advice provided under the terms of the agreement and included in this report.

Grading Specifications:

1.1 General Description

1.11 These specifications have been prepared for the grading and site development. The geotechnical engineer should be consulted prior to any site work connected with site development to ensure compliance with these specifications.

1.12 The geotechnical engineer should be notified prior to any site clearing or grading operations on the property in order to coordinate the work with the grading contractor in the field.

1.13 This item shall consist of all clearing, excavating or grubbing, preparation of land to be filled, filling of the land, spreading, compaction and control of the fill, and all subsidiary work necessary to complete the grading of the filled areas to conform with the lines and grades, as shown on the accepted plans. The geotechnical engineer is not responsible for determining line, grade elevations, or slope gradients. The property owner, or his representative shall designate the person or organizations that will be responsible for these items of work.

1.14 Contents of these specifications shall be integrated with the geotechnical report of which they are a part, therefore, they shall not be used as a self-contained document.

2.1 Tests

2.11 The standard test used to define maximum densities of all compaction work shall be the ASTM Procedure D1557-91. All densities shall be expressed as a relative compaction in terms of the maximum dry density obtained in the laboratory by the foregoing standard procedure.

3.1 Clearing, Grubbing, and Preparing Areas to be Filled

3.11 All fill, roots, and debris shall be removed from all structural areas. The depth of the excavations will be determined in the field by the geotechnical engineer.

4.1 Materials Used for Fill

4.11 The soils existing on the site are suitable for use as compacted engineered fill after removal of the debris and after the approval of the geotechnical engineer.

4.12 Should import material be required, it must be approved by the geotechnical engineer prior to transporting it to the project and must meet the following requirements.

1. Should not contain rocks larger than 8 inches maximum size
2. Expansion index less than 20.

5.1 Placing, Spreading and Compacting Fill Material

5.11 The fill materials shall be placed in uniform lifts of not more than 8 inches in uncompacted thickness. Each layer shall be spread evenly and shall be thoroughly blade mixed during the spreading to obtain uniformity of material in each layer. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction by either i) aerating the material if it is too wet; or (ii) spraying the material with water if it is too dry.

5.13 Compaction shall be by sheepsfoot rollers, multiple pneumatic tired rollers or other types of acceptable compacting rollers. Rollers shall be of such design that they will be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is within the specified moisture content range. Rolling of each layer shall be continuous over its entire area and the roller shall make sufficient trips to ensure that the required density has been obtained. No ponding or jetting will be permitted.

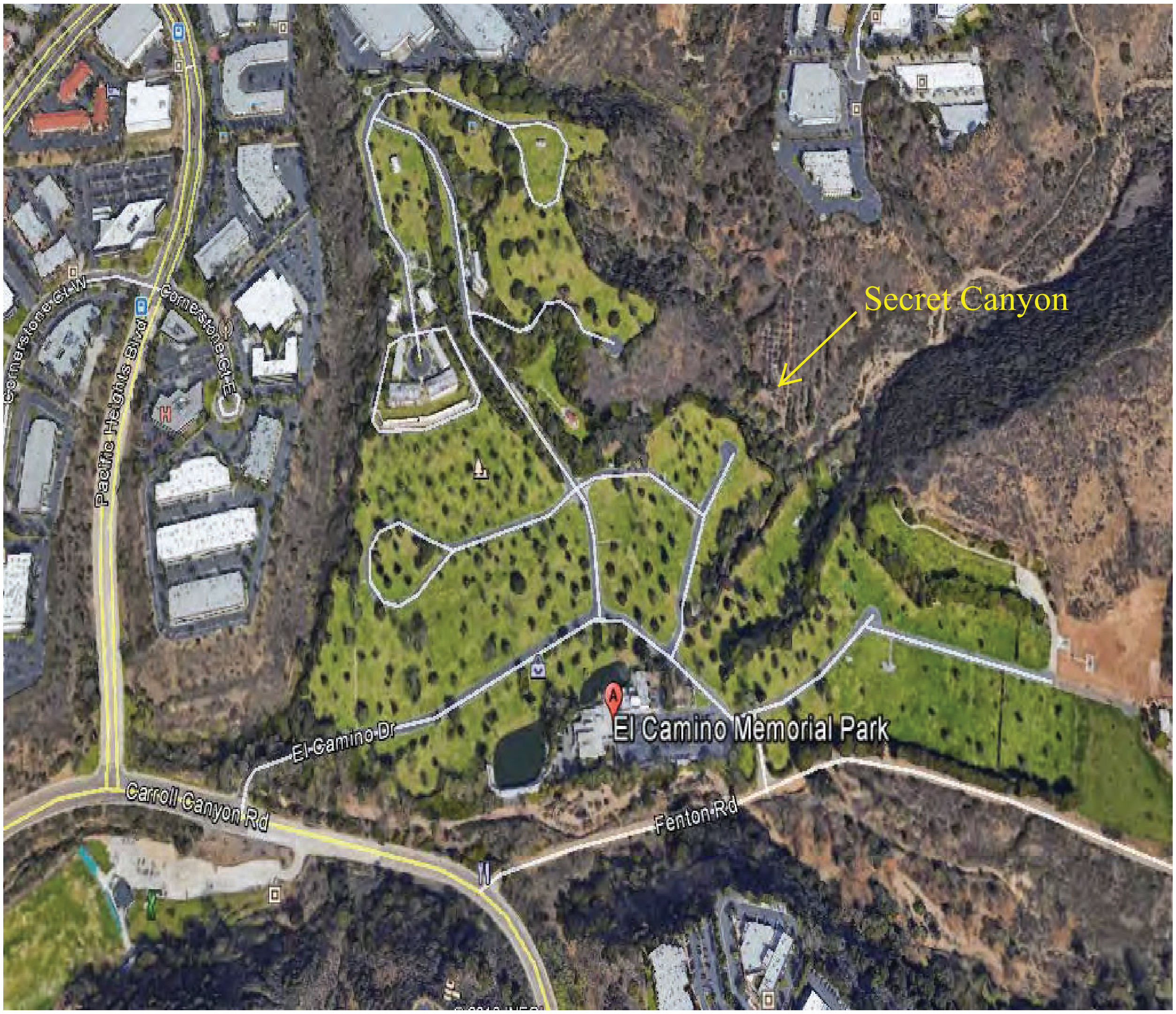
5.14 Field density tests shall be made in each compacted layer by the geotechnical engineer in accordance with ASTM Test Procedure D1556-91. When sheepsfoot rollers are used for compaction, the density tests shall be taken in the compacted material below the surface disturbed by the roller. When these tests indicate that the density of any layer of fill, or portion thereof, is below the required compaction, the particular layer, or portion thereof, shall be reworked until the required compaction has been obtained.

5.15 No soil shall be placed or compacted during periods of rain nor on ground which is not drained of all free water. Soil which has been soaked and wetted by rain or any other cause, shall not be compacted until completely drained and until the moisture content is within the limits herein before described or approved by the geotechnical engineer. Prior approval by the geotechnical engineer shall be obtained before continuing the grading operations.

6.1 Trench Backfill

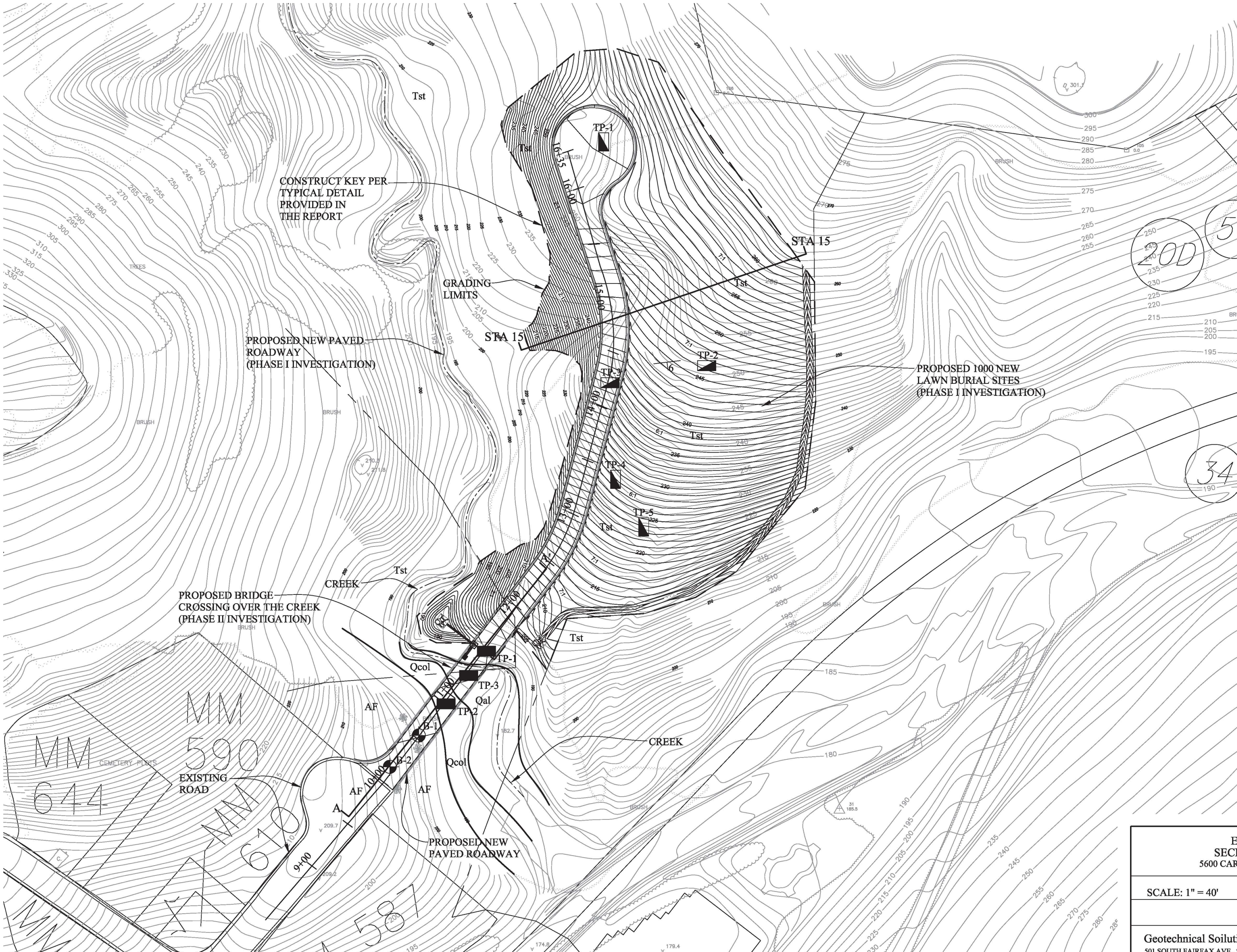
6.11 Trench backfill should be compacted to the same relative compaction as the fill.

Appendix A
Figures and Plates



Geotechnical Soilutions, Inc.
El Camino Memorial Park/
Secret Canyon
Location Map

Figure 1



LEGEND:

AF	- FILL, UNCOMPACTED
Qal	- ALLUVIUM
Qcol	- COLLUVIUM
Tst	- BEDROCK; STADIUM CONGLOMERATE
TP-5	- TEST PIT LOCATION, PHASE I
TP-3	- TEST PIT LOCATION, PHASE II
B-2	- BORING LOCATION
6	- STRIKE & DIP OF BEDDING
A A'	- CROSS SECTION

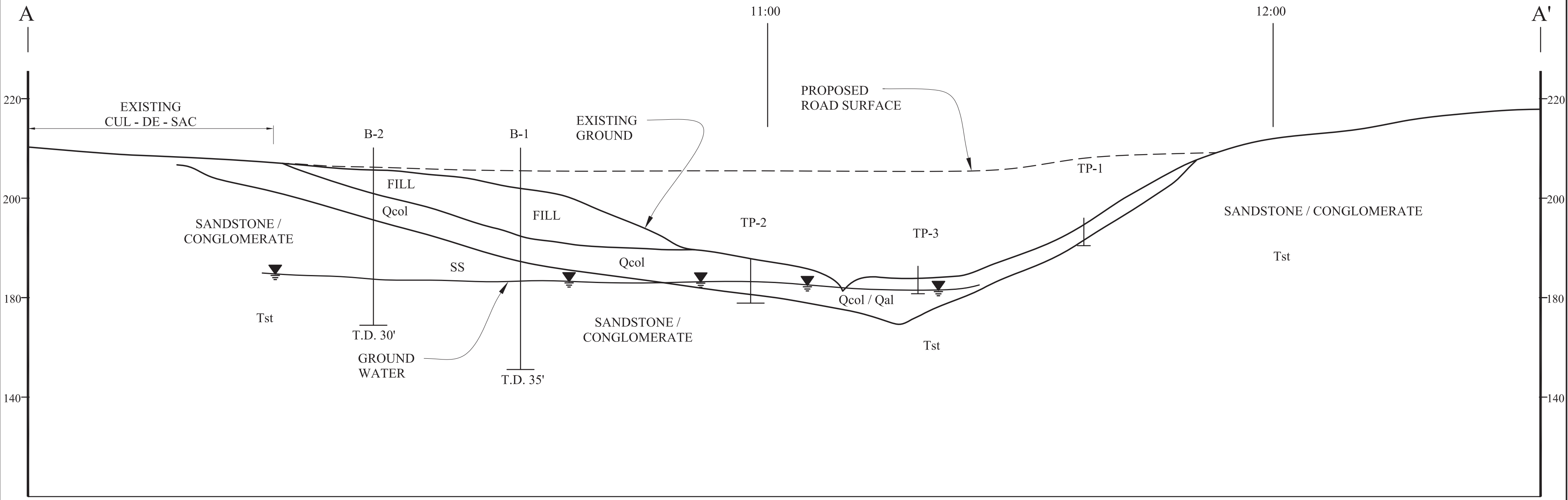
EL CAMINO MEMORIAL PARK
SECRET CANYON EXPANSION AREA
5600 CARROLL CANYON RD., SAN DIEGO, CALIFORNIA

SCALE: 1" = 40' | DATE: 4 - 24 -17 | JOB No. GS 16B12-B

GEOTECHNICAL MAP

Geotechnical Soilutions, Inc.
501 SOUTH FAIRFAX AVE., SUITE 101
LOS ANGELES, CA 90036

PLATE 1



0' 10' 20'

SCALE: 1"= 20'

EL CAMINO MEMORIAL PARK

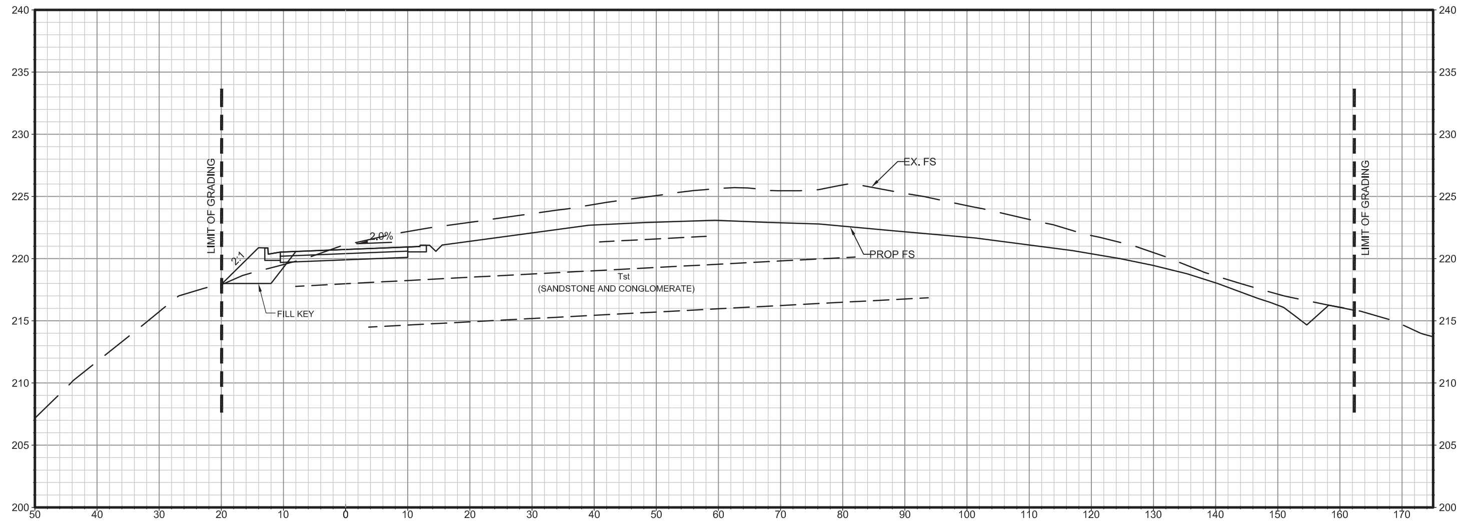
5600 CARROLL CANYON RD., SAN DIEGO, CALIFORNIA

SCALE: 1" = 20'	DATE: 4 - 24 - 17	JOB No. GS 16B12-B

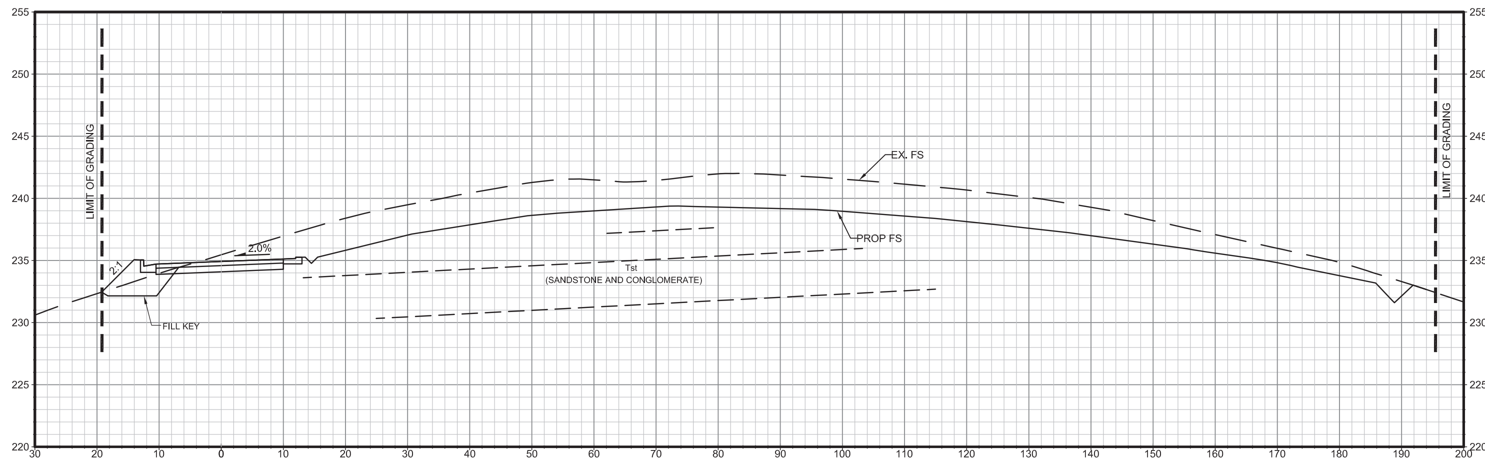
CROSS SECTION A - A'

Geotechnical Soilutions, Inc.
501 SOUTH FAIRFAX AVE., SUITE 101
LOS ANGELES, CA 90036

PLATE 2



STATION 13+00



STATION 14+00

0' 10' 20'

VERTICAL SCALE: 1"= 10'

HORIZONTAL SCALE: 1"= 20'

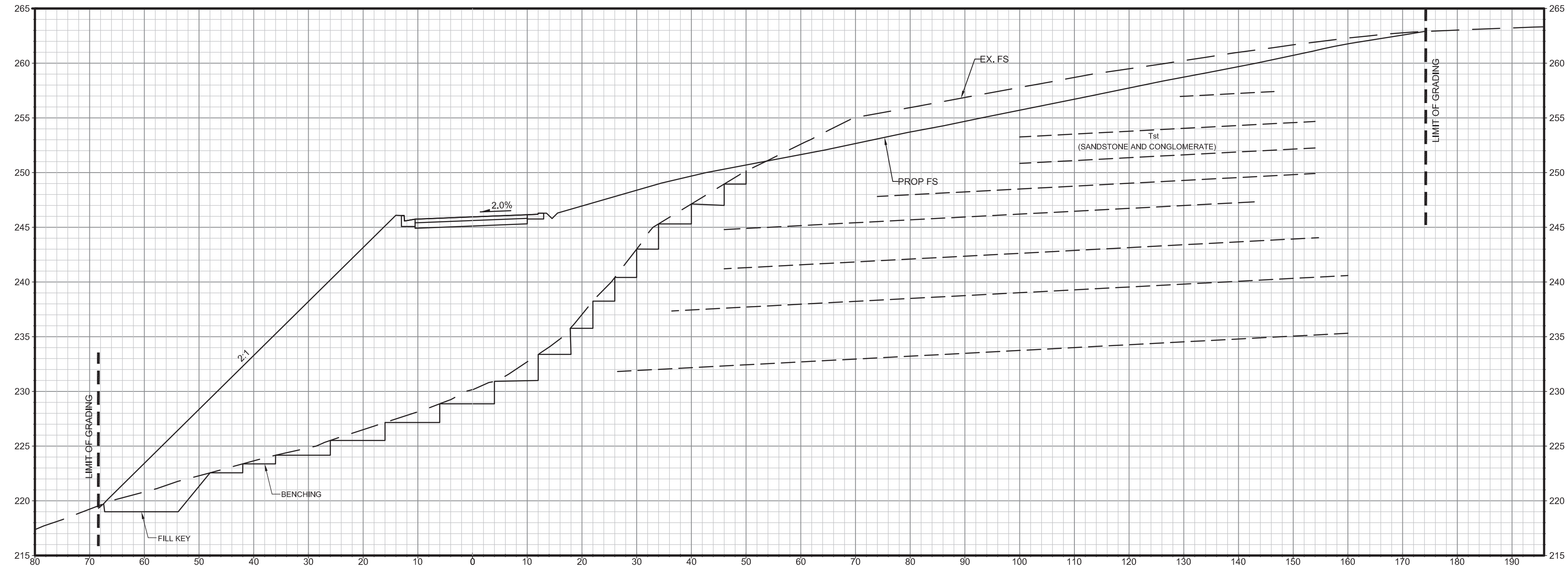
EL CAMINO MEMORIAL PARK
SECRET CANYON EXPANSION AREA
5600 CARROLL CANYON RD., SAN DIEGO, CALIFORNIA

SCALE: AS SHOWN	DATE: 4 - 24 - 17	JOB No. GS 16B12-B

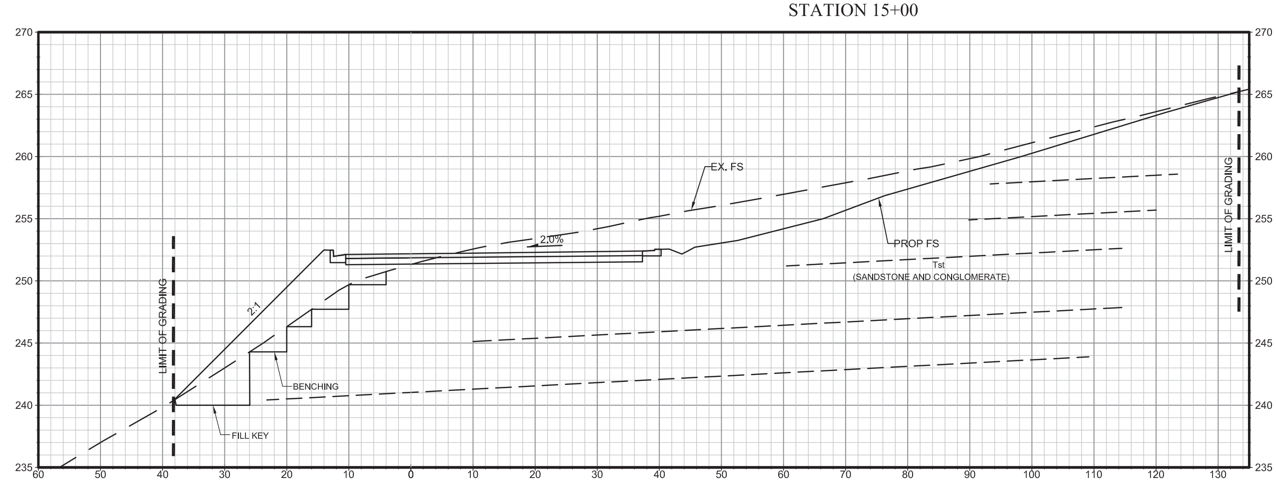
CROSS SECTIONS /
STATIONS 13 & 14

Geotechnical Soilutions, Inc.
501 SOUTH FAIRFAX AVE., SUITE 101
LOS ANGELES, CA 90036

PLATE 3



STATION 15+00



STATION 16+00

0' 10' 20'

VERTICAL SCALE: 1"= 10'
HORIZONTAL SCALE: 1"= 20'

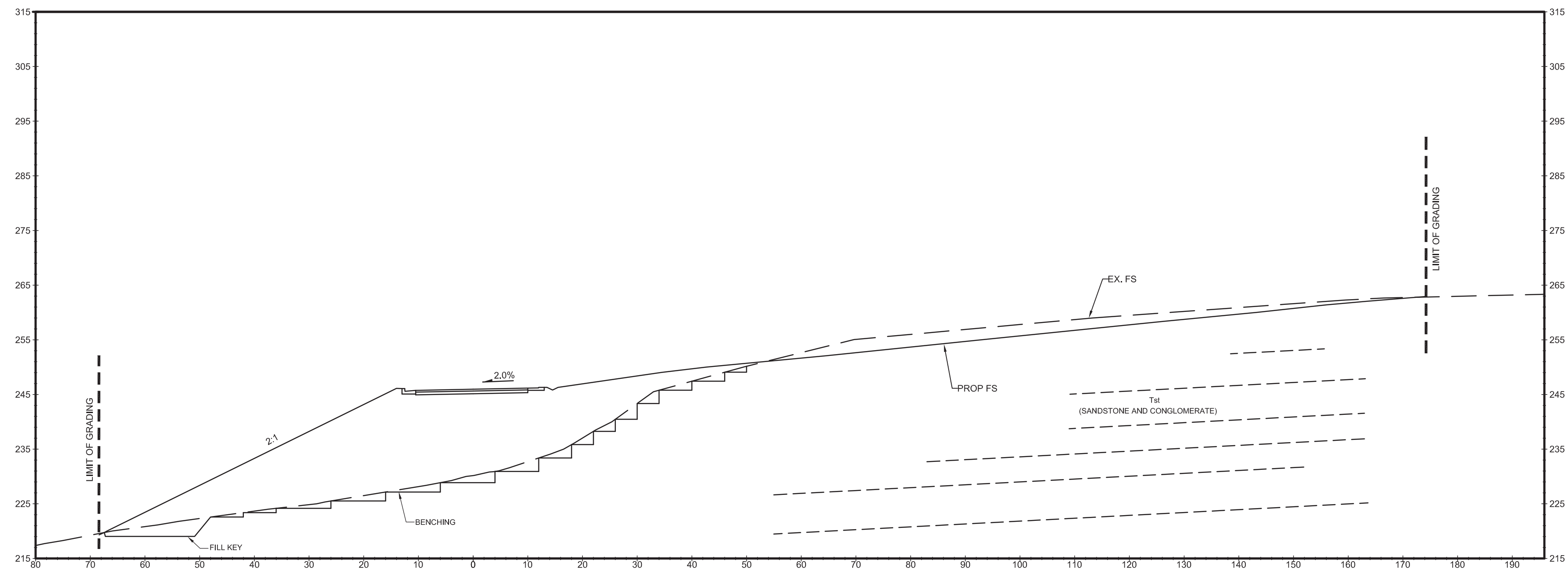
EL CAMINO MEMORIAL PARK
SECRET CANYON EXPANSION AREA
5600 CARROLL CANYON RD., SAN DIEGO, CALIFORNIA

SCALE: AS SHOWN	DATE: 4 - 24 - 17	JOB No. GS 16B12-B

CROSS SECTIONS /
STATIONS 15 & 16

Geotechnical Soilutions, Inc.
501 SOUTH FAIRFAX AVE., SUITE 101
LOS ANGELES, CA 90036

PLATE 4



STATION 15+00

0' 10' 20'

VERTICAL SCALE: 1"= 20'
HORIZONTAL SCALE: 1"= 20'

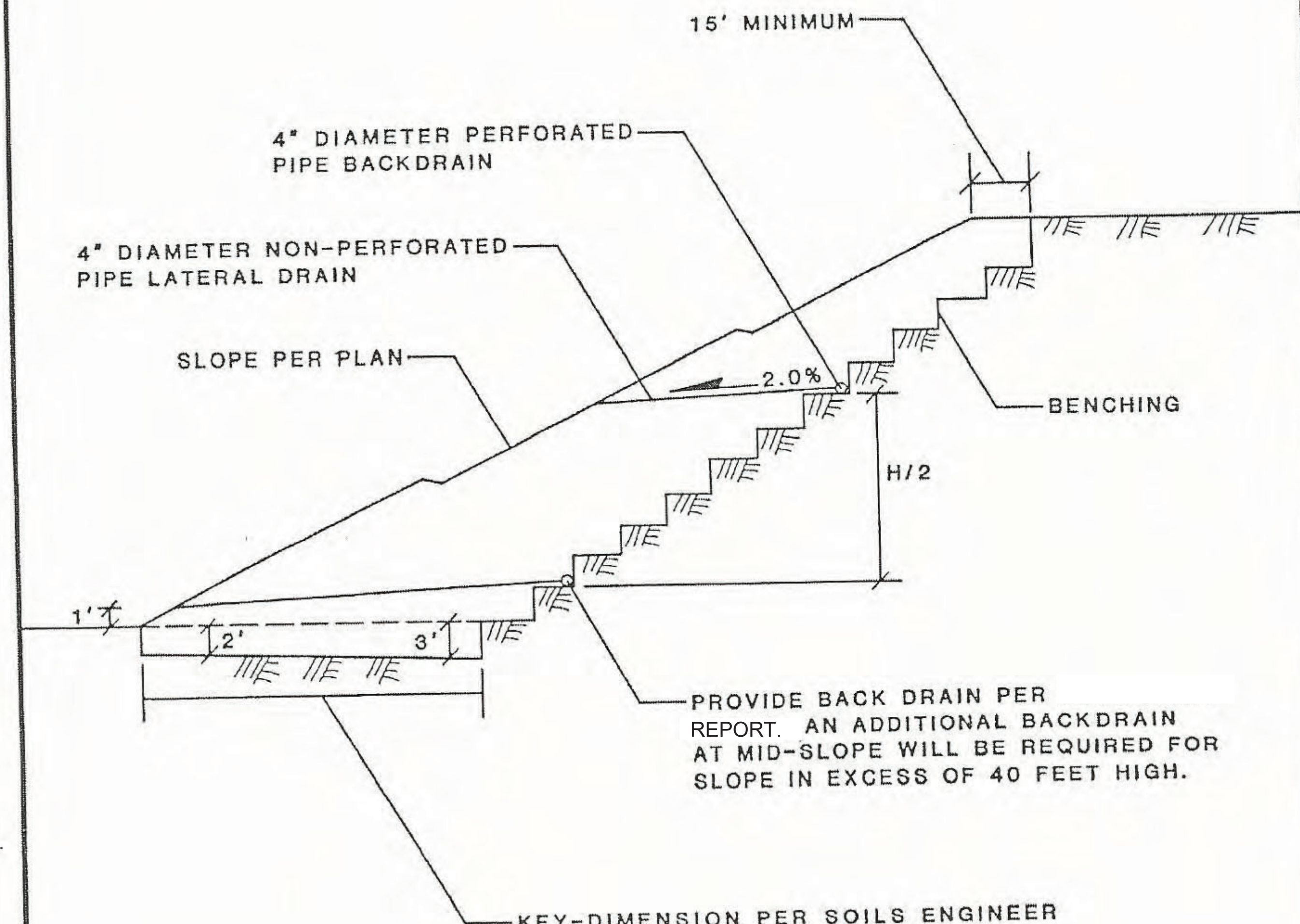
EL CAMINO MEMORIAL PARK
SECRET CANYON EXPANSION AREA
5600 CARROLL CANYON RD., SAN DIEGO, CALIFORNIA

SCALE: 1" = 20'	DATE: 4 - 24 - 17	JOB No. GS 16B12-B

CROSS SECTION /
STATION 15

Geotechnical Soilutions, Inc.
501 SOUTH FAIRFAX AVE., SUITE 101
LOS ANGELES, CA 90036

PLATE 5



Geotechnical Soilutions, Inc.
Typical Section of Compacted Fill
(Subdrain/ Key/ Benching)

Appendix B
Test Pits

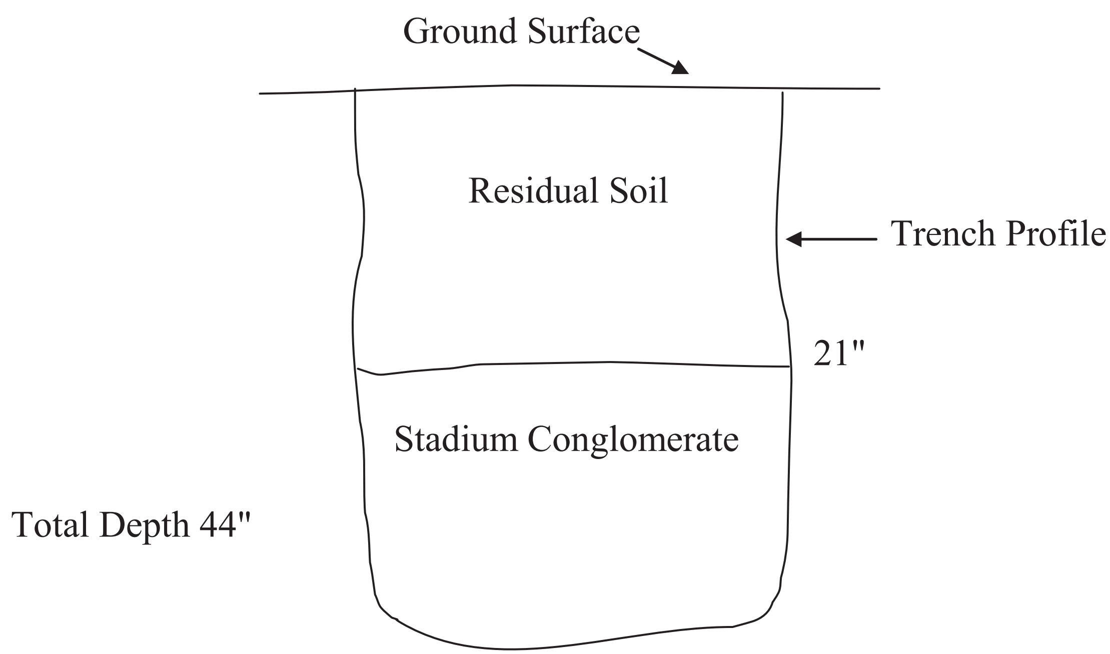
Project Name: El Camino Memorial Park	Date: 12/2/2016	Test Pit No: 1
Project No: GS 16B12B	Equipment: Backhoe	Elevation:
Location: Secret Canyon (Phase I	Logged By: Tom Hill	**GEOTECHNICAL SOILUTIONS**

0-21" **Residual Soil**
Reddish brown, clayey sand, trace rounded fine to coarse gravel. Moist, dense

21-44" **Bedrock: Stadium Conglomerate**
Mottled gray and reddish brown, conglomeratic sandstone, hard, very dense, difficult to excavate. Generally massive, clasts are gravel and cobble size, well-rounded.
GB. EW, 6-7 degrees south.

Scale: NTS

Trench Orientation: NS



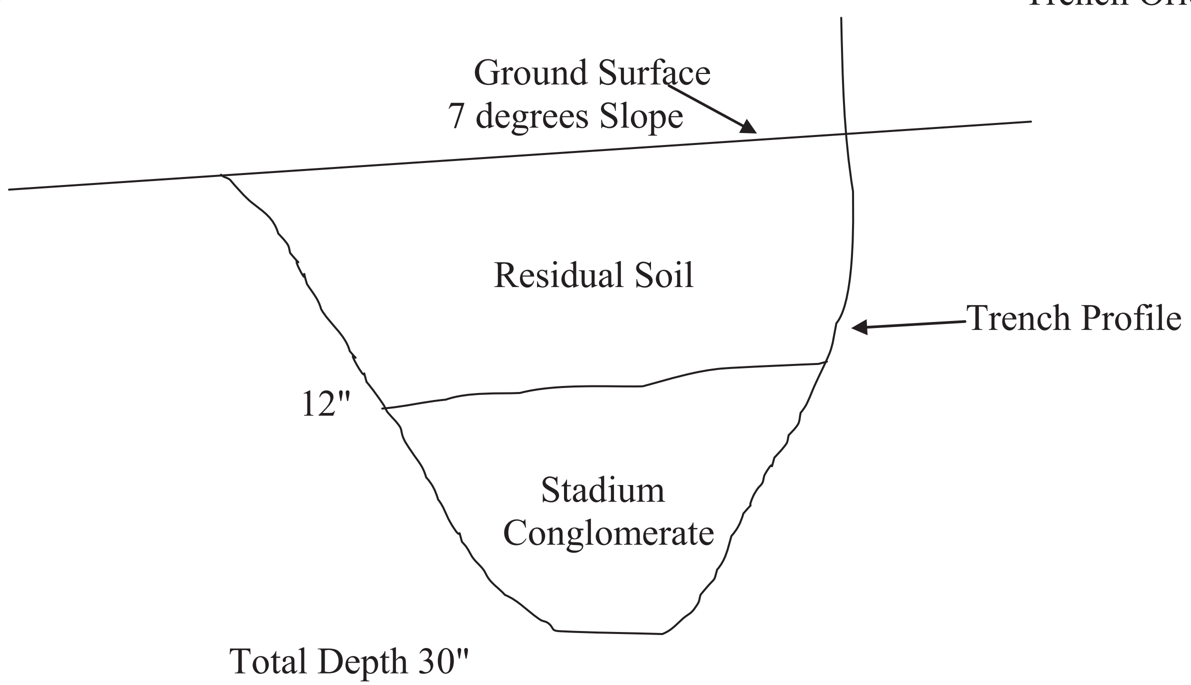
Project Name: El Camino Memorial Park	Date: 12/2/2016	Test Pit No: 2
Project No: GS 16B12B	Equipment: Backhoe	Elevation:
Location: Secret Canyon (Phase I	Logged By: Tom Hill	**GEOTECHNICAL SOILUTIONS**

0-(11-13" Varies) **Residual Soil (As in TP 1)**

12-30" **Bedrock: Stadium Conglomerate**
Mottled gray and reddish brown, cobble, conglomerate with sandstone matrix. Hard, massive, difficult to excavate.

Scale: NTS

Trench Orientation: EW



Project Name: El Camino Memorial Park | Date: 12/2/2016 | Test Pit No: 3

Project No: GS 16B12B | Equipment: Backhoe | Elevation:

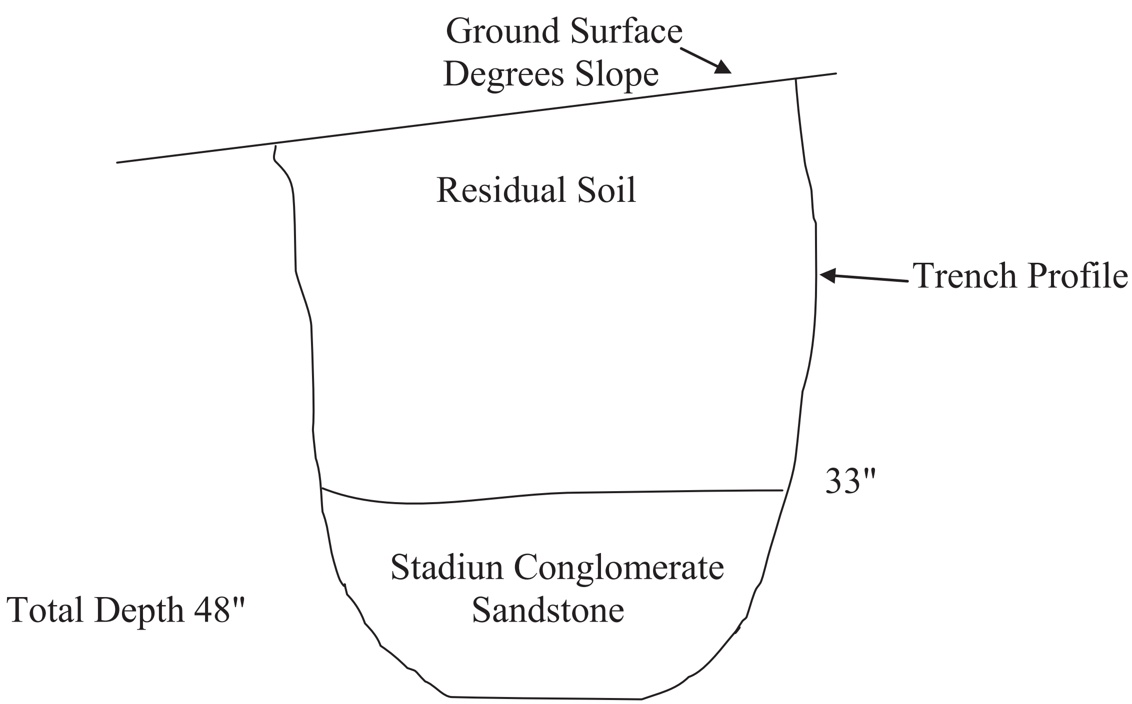
Location: Secret Canyon (Phase 1) | Logged By: Tom Hill | **GEOTECHNICAL SOILUTIONS**

0-33" **Residual Soil**
Reddish brown, clayey sand and sandy clay, moist, very stiff.

33-48" **Bedrock: Stadium Conglomerate**
Reddish brown sandstone with scattered cobbles, hard, massive.

Scale: NTS

Trench Orientation: EW



Project Name: El Camino Memorial Park | Date: 12/2/2016 | Test Pit No: 4

Project No: GS 16B12B | Equipment: Backhoe | Elevation:

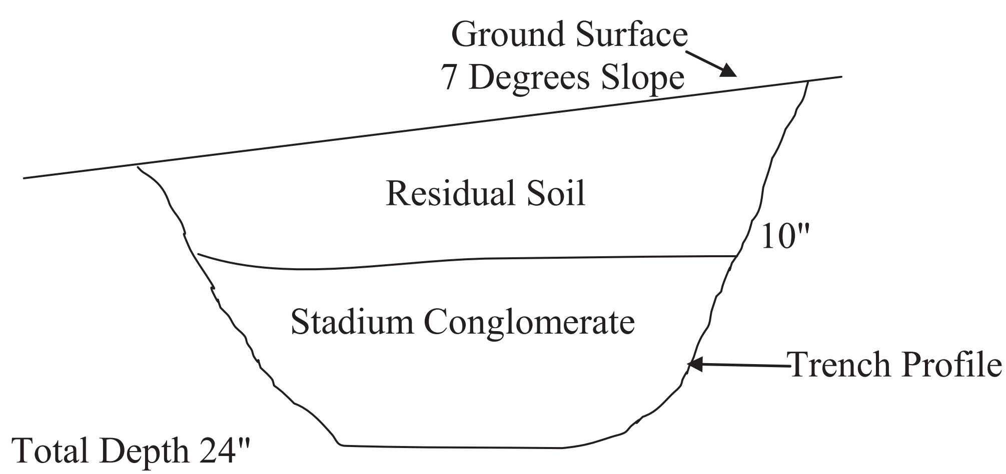
Location: Secret Canyon Phase I | Logged By: Tom Hill | **GEOTECHNICAL SOILUTIONS**

0-10" **Residual Soil**
Dark brown, sandy silt with gravel, cobbles, moist, firm.

10-24" **Bedrock: Stadium Conglomerate**
Mottled gray and reddish brown, cobble, conglomerate with sandstone matrix. Hard, massive, difficult to excavate.

Scale: NTS

Trench Orientation: NS

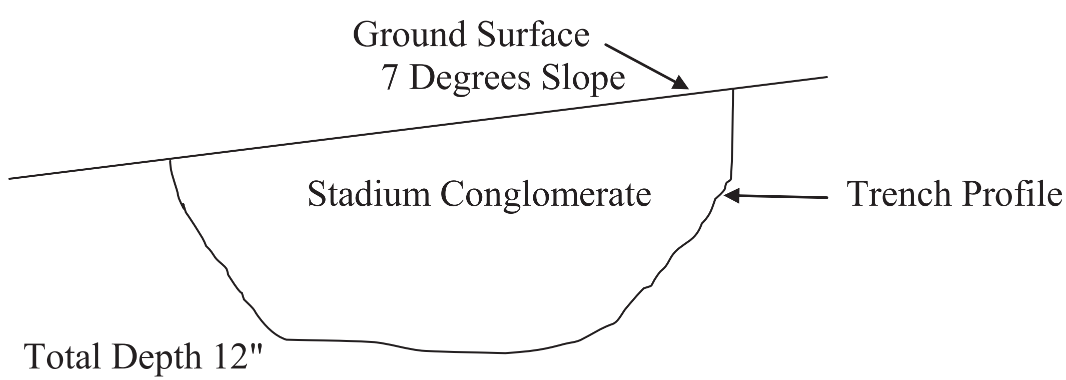


Project Name: El Camino Memorial Park	Date: 12/2/2016	Test Pit No: 5
Project No: GS 16B12B	Equipment: Backhoe	Elevation:
Location: Secret Canyon (Phase I	Logged By: Tom Hill	**GEOTECHNICAL SOILUTIONS**

0-12" **Bedrock: Stadium Conglomerate (Surface outcrop)**
Sandstone, massive, hard.

Scale: NTS

Trench Orientation: NS



Geotechnical Soilutions, Inc.		Boring No. 1	Sheet 1 of 2
		Date:	3/21/2017
LOG OF BORING # B1		Drilling Contractor: 2R Drilling	
Client:	SCI/ Clark and Green Associates	Equipment:	8" Hollow Stem Auger
Project No.	GS 16B12-B	Driving Weight:	140 lbs
Location:	**El Camino Memorial Park/ Secret Canyon (Phase II)**	Elevation:	
		Logged by:	TGH

Depth in Feet	Drive Sample	Bag Sample	Lab. Testing	Blows per 6 inches	Moisture Content %	Dry Unit Weight (pcf)	Classification	Symbol	Visual Soil Description
0-			Sand-Equivilent				SC		**Fill** Grass covered
-	R		Corrosion	9/11/09			SC		Brown, clayey sand with gravel and cobbles, moist, stiff with roots.
-			Atterberg Sieve						
5-	R		Expansion	7/6/07			SC		Brown, clayey sand with fine to coarse gravel, very moist, loose.
-	R			7/13/24 (Rock			SC		As above, cobble in sample tip.
-									**Native: Colluvium**
10-	R			24/50-3"			SC		Mottled brown and gray clayey sand with gravel, moist, very stiff/very dense, few roots, organics.
-									**Bedrock: Stadium Conglomerate**
15-	R			69-6"					No/ poor recovery. Rock in sample tip. Recovery is brownish gray, silty sand.
20-	R		Shear	39/50-3"	15.2	108.6			Yellow brown, fine-grained sandstone, moist, very dense. (Rock fragments in sample, disturbed
25-	R			76-6"					Yellow brown, fine-grained sandstone, moist, very dense.
30-	R		Shear	60-6"	17.9	107.3			Yellow brown, fine-grained sandstone, moist, very dense.

R-Ring Sample, SPT-Standard Penetration Test.

Geotechnical Soilutions, Inc.		Boring No. 1	Sheet 2 of 2
		Date:	3/21/2017
# LOG OF BORING # B1		Drilling Contractor: 2R Drilling	
Client:	SCI/ Clark and Green Associates	Equipment:	8" Hollow Stem Auger
Project No.	GS 16B12-B	Driving Weight:	140 lbs
Location:	**El Camino Memorial Park/ Secret Canyon**	Elevation:	
	(Phase II)	Logged by:	TGH

Depth in Feet	Drive Sample	Bag Sample	Lab. Testing	Blows per 6 inches	Moisture Content %	Dry Unit Weight (pcf)	Classification	Symbol	**Visual Soil Description**
30-	R		Shear	60-6"	17.9	107.3			Yellow brown, fine-grained sandstone, moist, very dense.
35-	R			63-6"					No recovery
									Groundwater at 18'-2", 10 minutes after drilling Total Depth at 35' Backfilled with cuttings.
40-									
45-									
50-									
55-									
60-									

R-Ring Sample, SPT-Standard Penetration Test.

Geotechnical Soilutions, Inc.

LOG OF BORING # B2

Boring No. 2	Sheet 1 of 1
Date:	3/21/2017
Drilling Contractor: 2R Drilling	
Equipment:	8" Hollow Stem Auger
Driving Weight:	140 lbs
Elevation:	
Logged by:	TGH

Client:	SCI/ Clark and Green Associates
Project No.	GS 16B12-B
Location:	**El Camino Memorial Park/ Secret Canyon (Phase II)**

Depth in Feet	Drive Sample	Bag Sample	Lab. Testing	Blows per 6 inches	Moisture Content %	Dry Unit Weight (pcf)	Classification	Symbol	Visual Soil Description
0									**Fill**
		Bag					SC		Brown, clayey sand with gravel, cobbles, moist.
	R	Bag		11/7/07					Brown, clayey sand with gravel, moist, some organic materials
		Bag							**Native: Colluvium**
5	R	Bag		6/9/09			SM		Change to reddish brown, silty sand with gravel, moist
	R			15/20/24			SM		Orange brown, silty sand, trace some clay, moist, medium dense
10	R			13/21/32					**Bedrock: Stadium Conglomerate** Yellow brown fine-medium sandstone with rounded gravel, moist, dense At 11-13' Rocky, drill chatter
15	R	Bag		12/73-6"					Sandy claystone with gravel, cobbles, moist, very dense.
		Bag	Sieve Sand- Equivalent						
20	R	Bag	Shear	32/100-5"	14.2	111.1			Yellow brown, fine grained sandstone, moist, very dense.
25	R			85/6"					As above, wet, very dense.
30	R			70-6"					As above.
									Total Depth at 30'. Backfilled with cuttings. Water at 21'-3", 10 minutes after drilling.

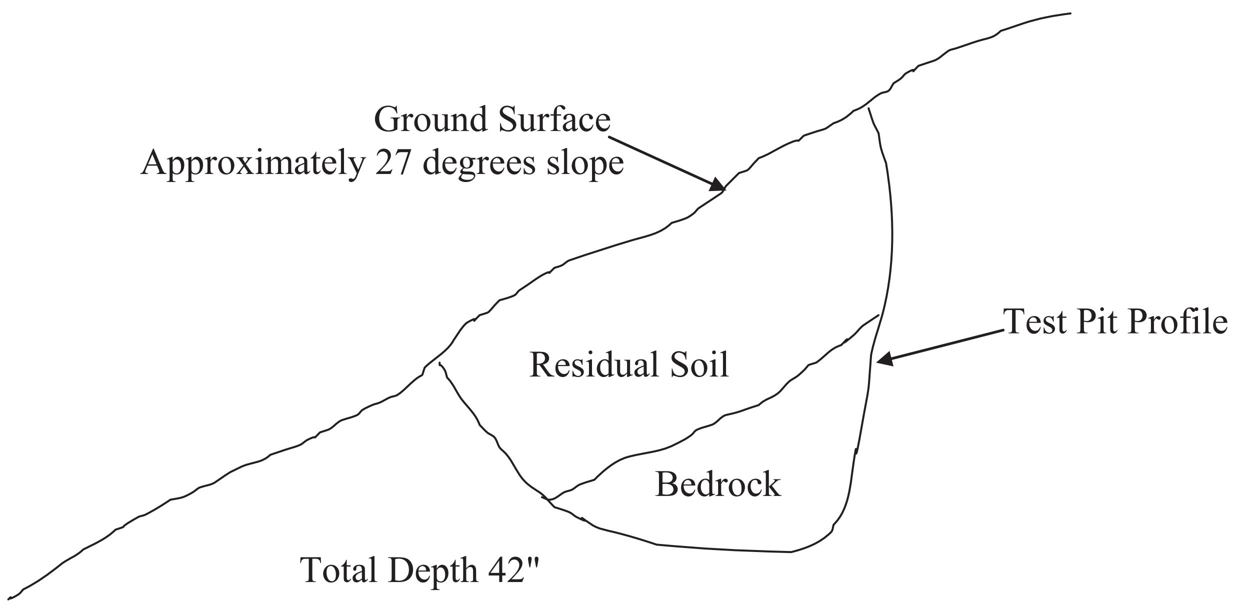
R-Ring Sample, SPT-Standard Penetration Test.

Project Name: El Camino Memorial Park	Date: 3/21/2017	Test Pit No: 1
Project No: GS 16B12-B	Equipment: Hand Tools	Elevation:
Location: Secret Canyon (Phase II	Logged By: Tom Hill	**GEOTECHNICAL SOILUTIONS**

0-23" **Native: Residual Soil**
Brown, silty sand with rounded cobbles, gravel, moist with roots to 1" diameter.

23-42" **Bedrock**
Mottled, brown and gray siltstone, massive, vaguely bedded, well indurated, difficult to excavate with hard tools, slightly-moderately fractured.
Bedding: Approximately N60W, 5-10 degrees NE

Scale: NTS

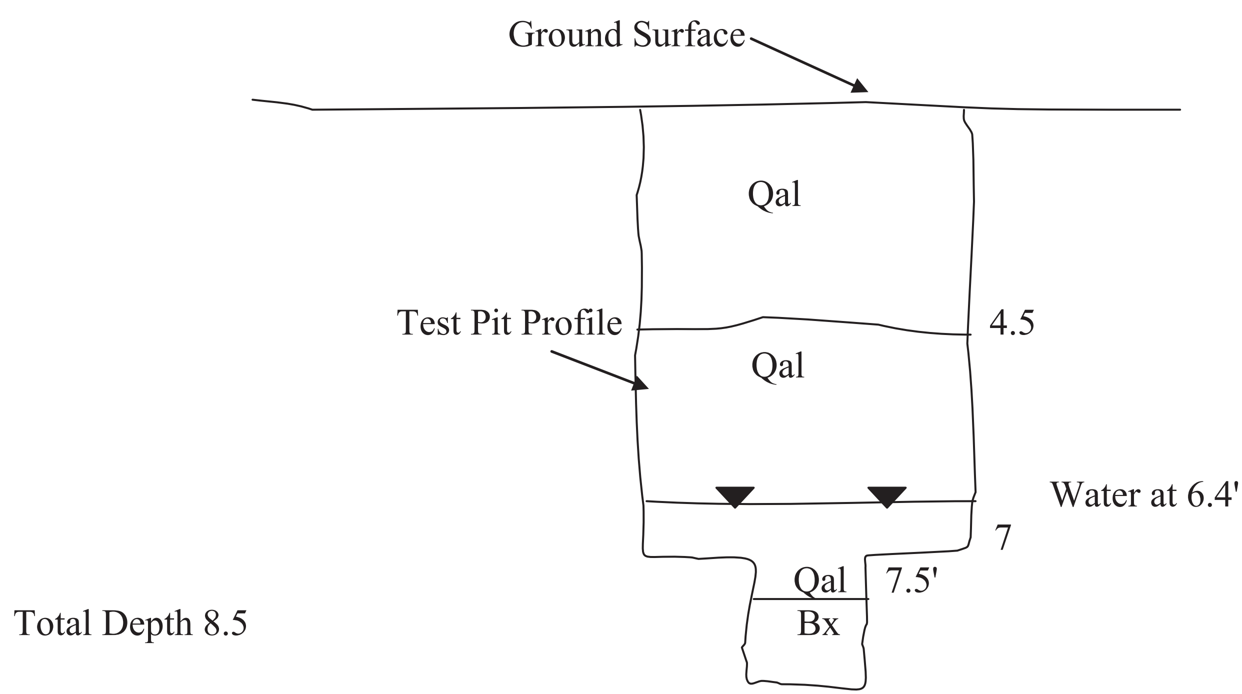


Project Name: El Camino Memorial Park	Date: 3/21/2017	Test Pit No: 2
Project No: GS 16B-12-B	Equipment: Hand Tools	Elevation:
Location: Secret Canyon (Phase II	Logged By: SB/ Tom Hill	**GEOTECHNICAL SOILUTIONS**

4.5-7.5' **Alluvium**
Brown, silty sand, few cobbles, roots to 1.5" diameter, moist to very moist, loose- medium dense.
Brown, silty sand with cobbles to 4-5" wet/ seepage, medium dense, minor sloughing.
7.5-8.5' **Bedrock:** mottled gray and brown sandstone, wet, dense.

Scale: NTS

Consolidation at 24"



Project Name: El Camino Memorial Park | Date: 3/21/2017 | Test Pit No: 3

Project No: GS 16B12-B | Equipment: Hand Tools | Elevation:

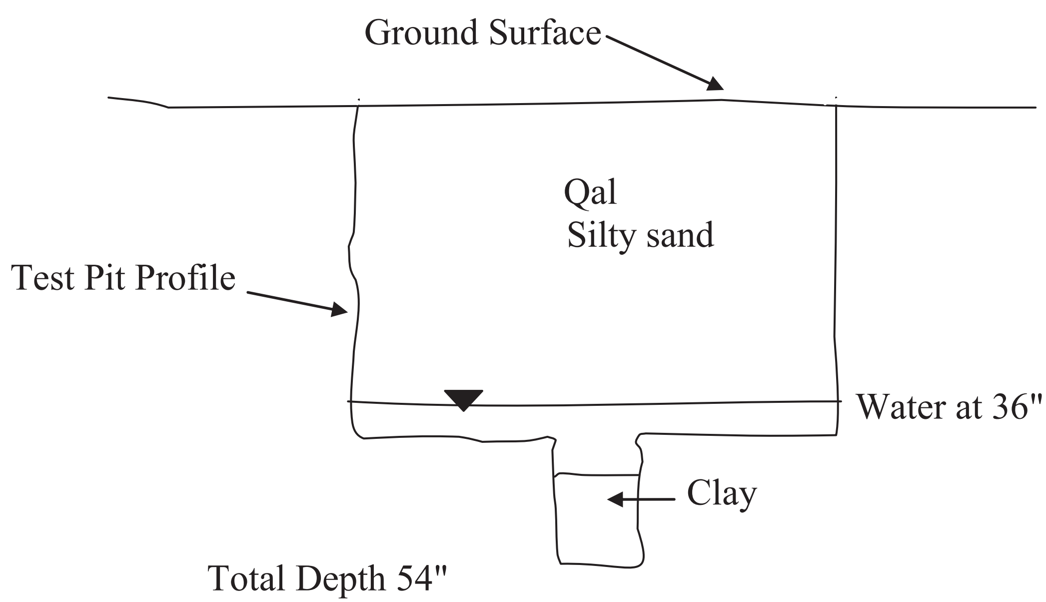
Location: Secret Canyon (Phase II | Logged By: SB/ Tom Hill | **GEOTECHNICAL SOILUTIONS**

0-40" **Alluvium**
Brown, clayey sand with gravel, cobbles, moist, roots to 12".

40-54"' Mottled brown and black, fine sandy and silty, organic clay, wet, soft.
Refusal at 54" on cobbles.

Scale: NTS

Sieve at 2' - 4
Remolded shear 2 -4
Consolidation at 48"
Max dry density 2'-4



Appendix C
Laboratory Testing
Phase 1

Geotechnical Soilutions Inc.
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323-937-1097. Fax 323-937-1099

COMPACTION TEST

Client:	Geotechnical Soilutions				
Project Name:	El Camino Memorial Park Secret Canyon	Tested By:		Date:	12/13/16
Project No. :	GS 16B12-B	Calculated By:		Date:	12/14/16
Boring No.:	TP-1	Checked By:		Date:	12/19/16
Sample Type:	Bulk	Depth(ft.):	0-2		
Visual Sample Description:	Silty Clay w/sand				

Compaction Method: [X] ASTM D1557 [ ] ASTM D698

Preparation Method: [ ] Moist [X] Dry

METHOD: A

MOLD VOLUME (CU.FT): 0.0333

Wt. Comp. Soil + Mold (gm.)	3816	3895	3837	3691		
Wt. of Mold (gm.)	1830	1830	1830	1830		
Net Wt. of Soil (gm.)	1986	2065	2007	1861		
Container No.						
Wt. of Container (gm.)	142.44	135.62	150.36	150.73		
Wet Wt. of Soil + Cont. (gm.)	401.93	362.10	345.45	313.35		
Dry Wt. of Soil + Cont. (gm.)	381.53	339.37	321.76	303.78		
Moisture Content (%)	8.53	11.16	13.82	6.25		
Wet Density (pcf)	131.35	136.57	132.74	123.08		
Dry Density (pcf)	121.02	122.87	116.62	115.84		

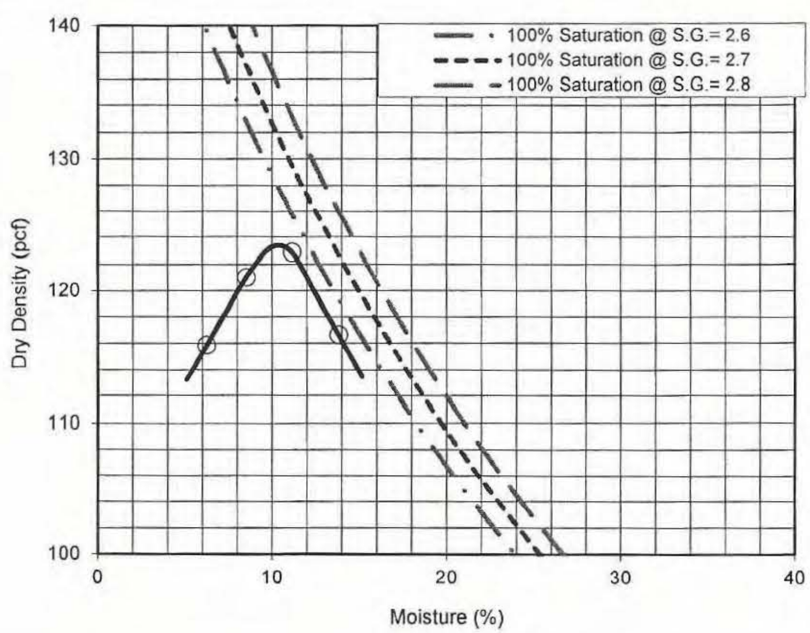
Maximum Dry Density (pcf)	123.2	Optimum Moisture Content (%)	10.4
Maximum Dry Density w/ Rock Correction (pcf)	N/A	Optimum Moisture Content w/ Rock Correction (%)	N/A

PROCEDURE USED

[X] *METHOD A: Percent of Oversize:* *0.7%*
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)

[ ] *METHOD B: Percent of Oversize:* *N/A*
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)

[ ] *METHOD C: Percent of Oversize:* *N/A*
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)



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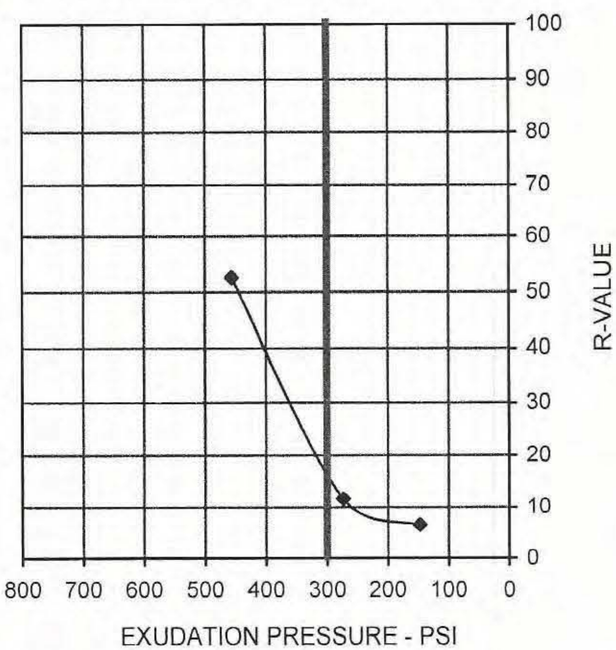
R-VALUE TEST DATA
ASTM D2844

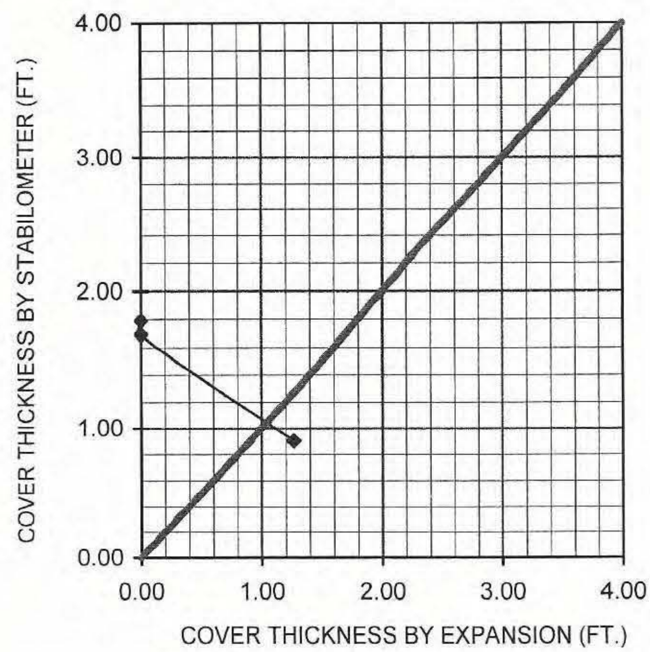
Project Name: El Camino Memorial Park Secret Canyon — Tested By: ______ Date: 12/14/16
Project Number: GS 16B12-B — Computed By: ______ Date: 12/16/16
Boring No.: TP-1 — Checked By: ______ Date: 12/19/16
Sample Type: Bulk — Depth (ft.): 0-2
Location: N/A
Soil Description: Silty Clay w/sand

Mold Number	D	E	F	
Water Added, g	63	44	22	
Compact Moisture(%)	16.8	14.8	12.6	
Compaction Gage Pressure, psi	50	80	170	
Exudation Pressure, psi	147	273	456	
Sample Height, Inches	2.6	2.6	2.5	
Gross Weight Mold, g	3062	3034	2933	
Tare Weight Mold, g	1969	1955	1869	
Net Sample Weight, g	1093	1079	1064	
Expansion, inchesx10^{-4}	0	0	38	
Stability 2,000 (160 psi)	64/140	53/127	28/60	
Turns Displacement	5.49	5.00	3.75	
R-Value Uncorrected	6	11	53	
R-Value Corrected	7	12	53	
Dry Density, pcf	109.1	109.5	114.5	
Traffic Index	8.0	8.0	8.0	
G.E. by Stability	1.79	1.69	0.90	
G.E. by Expansion	0.00	0.00	1.27	

R-VALUE		
	By Exudation:	16
	By Expansion:	47
	At Equilibrium: (by Exudation)	16

Remarks: Gf = 1.34, and 0.0 % Retained on the ¾"





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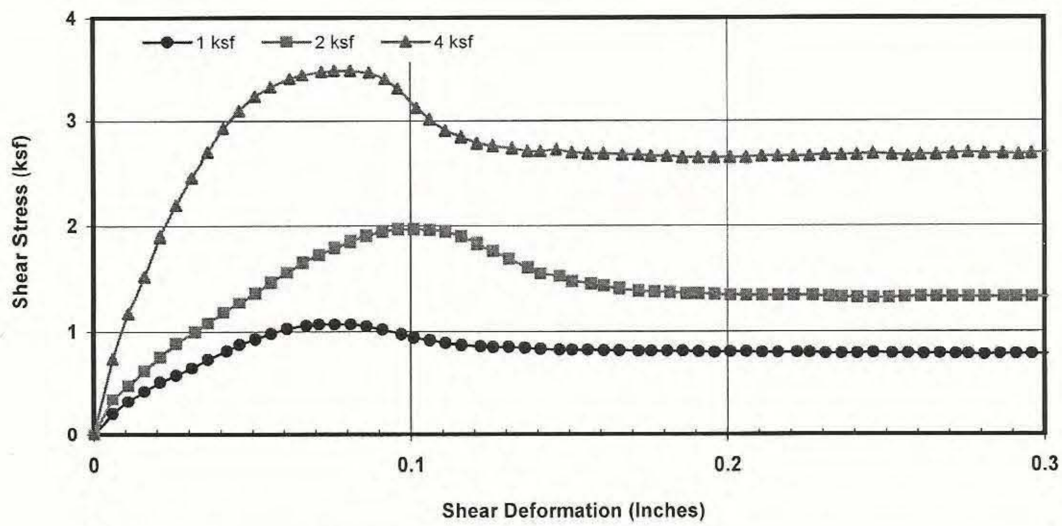
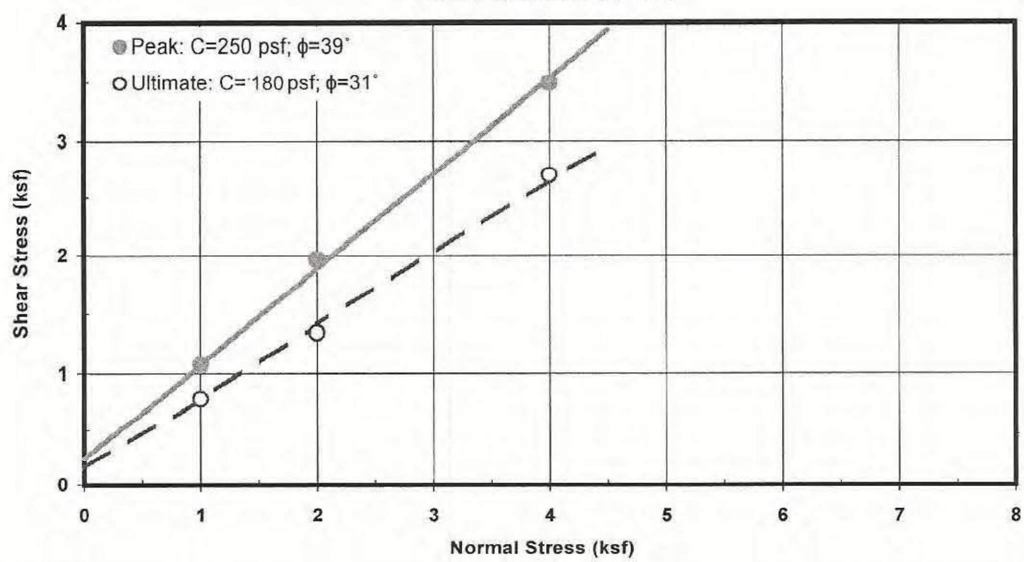
DIRECT SHEAR TEST RESULTS
ASTM D 3080

Project Name: El Camino Memorial Park Secret Canyon
Project No.: GS 16B12-B
Boring No.: TP-3
Sample No.: - **Depth:** 42"
Sample Type: Mod. Cal.
Soil Description: Silty Sand
Test Condition: Inundated **Shear Type:** Regular

Tested By: ______ **Date:** 12/15/16
Computed By: ______ **Date:** 12/19/16
Checked by: ______ **Date:** 12/19/16

Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
117.3	105.2	11.5	20.8	51	93	1	1.068	0.786
						2	1.968	1.341
						4	3.490	2.700





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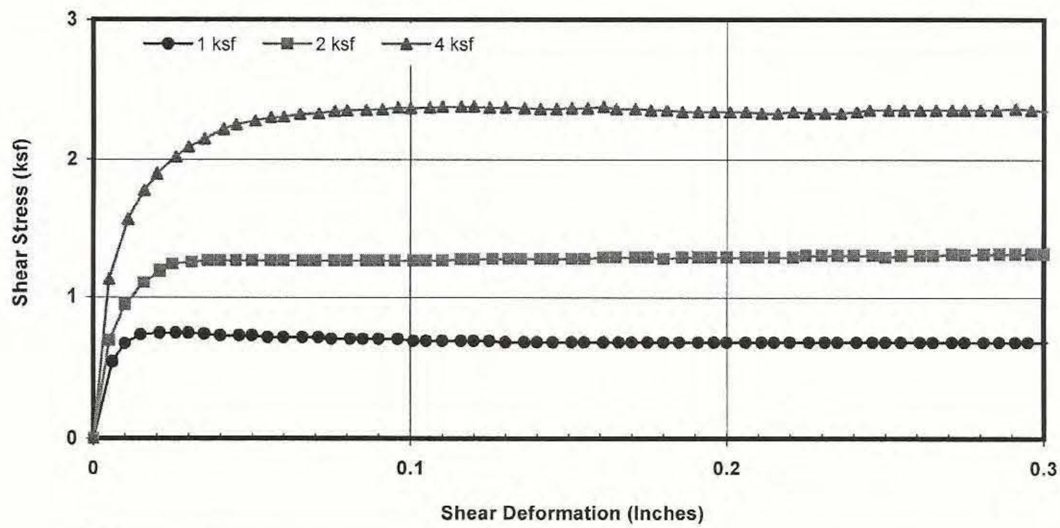
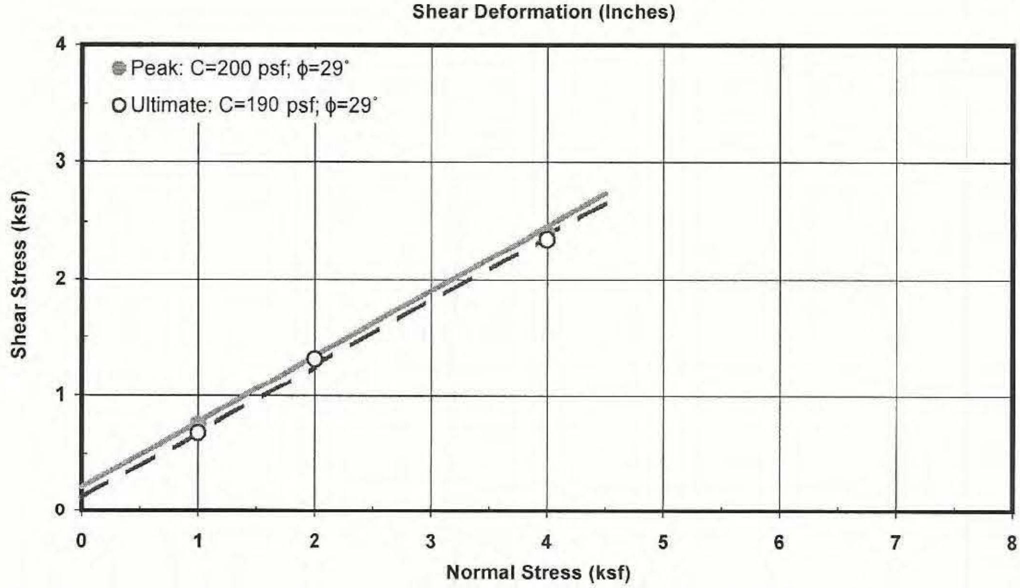
DIRECT SHEAR TEST RESULTS
ASTM D 3080

Project Name: El Camino Memorial Park Secret Canyon
Project No.: GS 16B12-B
Boring No.: TP-1
Sample No.: Bulk **Depth (ft):** 0-2
Sample Type: Remolded to 90% RC at opt. MC
Soil Description: Silty Clay w/sand
Test Condition: Inundated **Shear Type:** Regular

Tested By: ______ **Date:** 12/15/16
Computed By: ______ **Date:** 12/19/16
Checked by: ______ **Date:** 12/19/16

Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
122.5	111.2	10.2	17.4	53	91	1	0.749	0.684
						2	1.308	1.308
						4	2.400	2.352





Appendix C
Laboratory Testing
Phase 2

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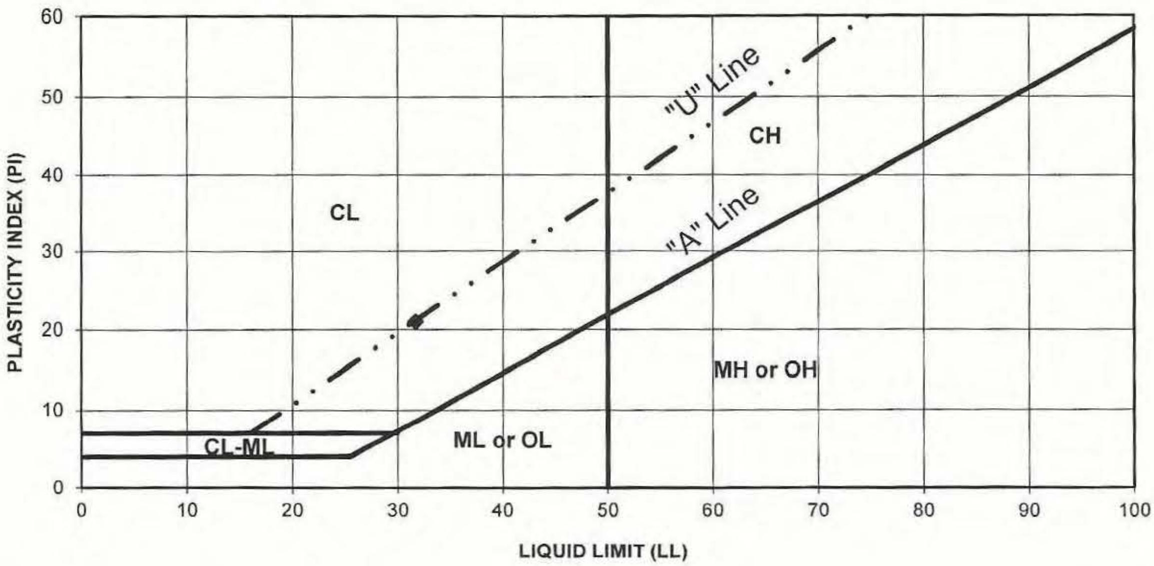
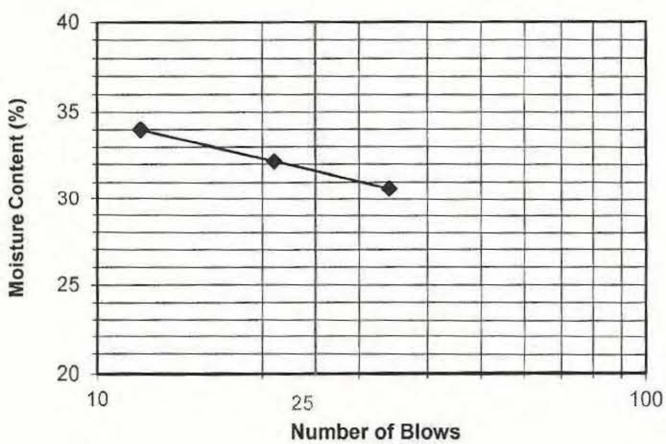
ATTERBERG LIMITS
ASTM D 4318

Project Name: SCI - Mike Green - Secret Canyon Crossing **Tested By:** ________ Date: 04/04/17
Project No.: GS-16B12-B **Checked By:** ________ Date: 04/05/17



PROCEDURE USED

- [ ] Wet Preparation
- [X] Dry Preparation
- [X] Procedure A Multipoint Test
- [ ] Procedure B One-point Test



Symbol	Boring Number	Sample Type	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
♦	B-1	Bulk	0-5	32	11	21	CL

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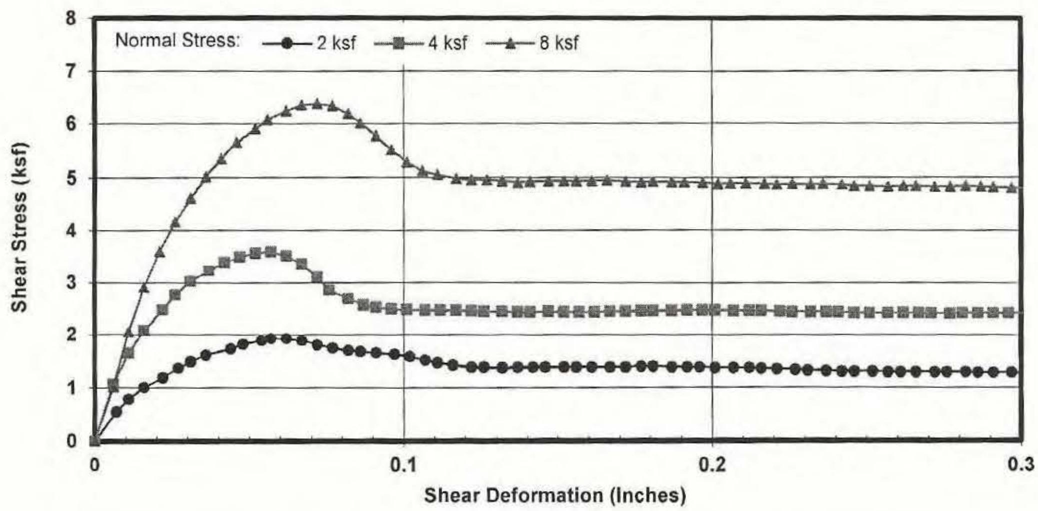
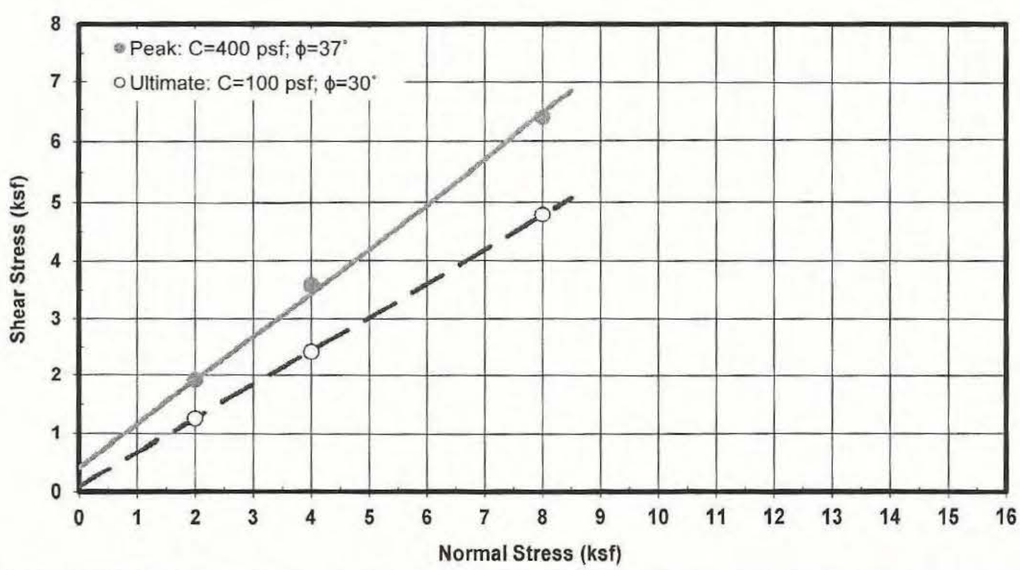
DIRECT SHEAR TEST RESULTS
ASTM D 3080

Project Name: SCI - Mike Green - Secret Canyon Crossing
Tested By: ______ **Date:** 03/31/17
Project No.: GS-16B12-B
Computed By: ______ **Date:** 04/05/17
Boring No.: B-1
Checked by: ______ **Date:** 04/05/17
Sample No.: 6 **Depth (ft):** 20
Sample Type: Mod. Cal.
Soil Description: Silty Sand
Test Condition: Inundated **Shear Type:** Regular

Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
125.1	108.6	15.2	20.4	74	100	2	1.920	1.260
						4	3.588	2.412
						8	6.372	4.788





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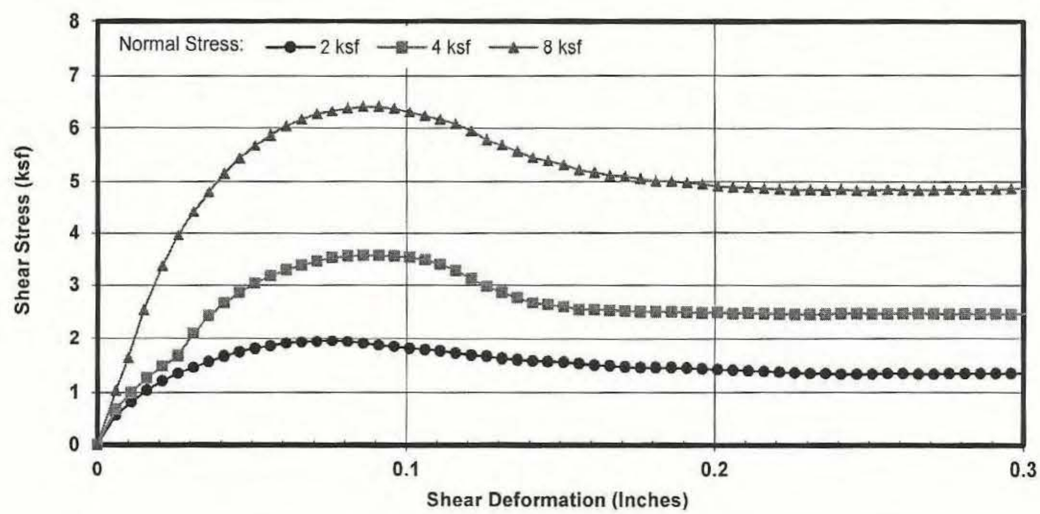
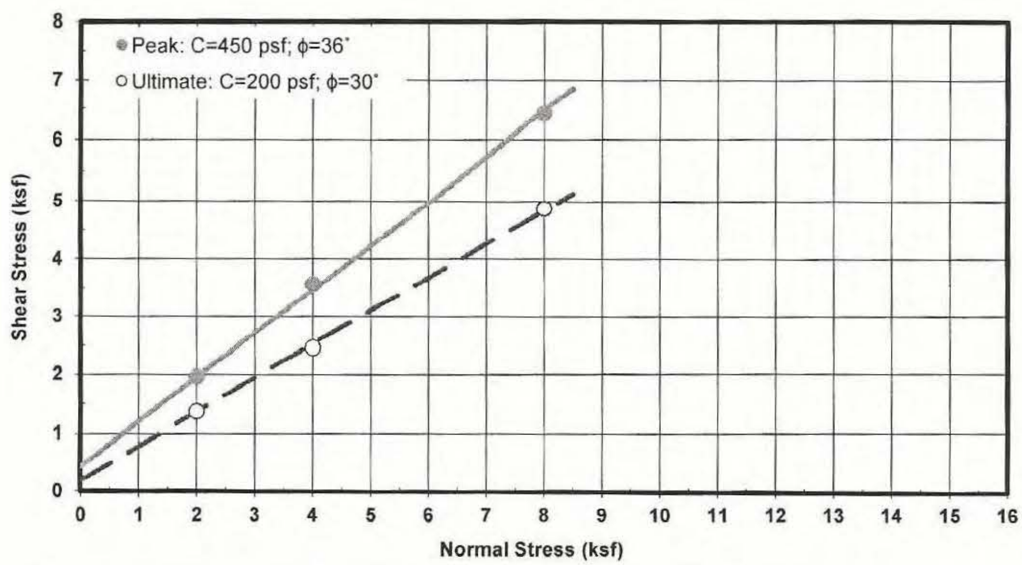
DIRECT SHEAR TEST RESULTS
ASTM D 3080

Project Name: SCI - Mike Green - Secret Canyon Crossing
Tested By: ________ **Date:** 03/31/17
Project No.: GS-16B12-B
Computed By: ________ **Date:** 04/05/17
Boring No.: B-1
Checked by: ________ **Date:** 04/05/17
Sample No.: 8 **Depth (ft):** 30
Sample Type: Mod. Cal.
Soil Description: Sand w/silt
Test Condition: Inundated **Shear Type:** Regular

Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
126.5	107.3	17.9	20.7	85	98	2	1.956	1.368
						4	3.566	2.452
						8	6.420	4.872





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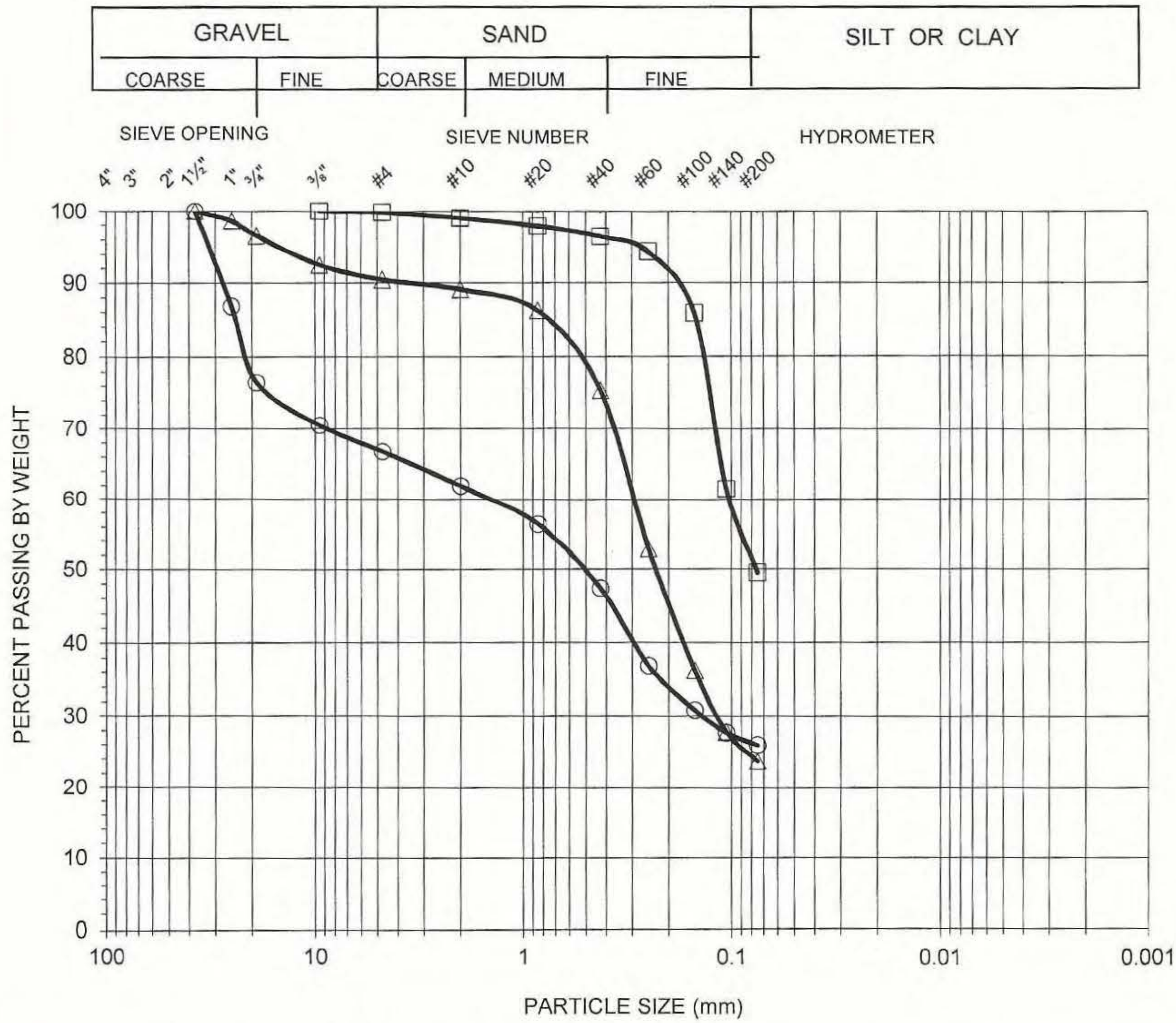
GRAIN SIZE DISTRIBUTION CURVE
ASTM D 6913

Client Name:	Geotechnical Soilutions	Tested by:		Date:	04/04/17
Project Name:	SCI - Mike Green - Secret Canyon Crossin	Computed by:		Date:	04/05/17
Project Number:	GS-16B12-B	Checked by:		Date:	04/05/17



Symbol	Boring No.	Sample Type	Sample Depth (feet)	Percent			Atterberg Limits LL:PL:PI	Soil Type U.S.C.S
				Gravel	Sand	Silt & Clay		
○	B-1	Bulk	0-5	33	41	26	32:11:21	SC
□	B-2	Bulk	15-20	0	50	50	N/A	CL*
△	TP-3	Bulk	2-4	10	66	24	N/A	SC*

**Note: Based on visual classification of sample*

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COMPACTION TEST

Client: Geotechnical Soilutions
Project Name: SCI - Mike Green - Secret Canyon Crossing
Project No. : GS-16B12-B
Boring No.: TP-3
Sample Type: Bulk
Visual Sample Description: Clayey Sand

Tested By: ______ Date: 03/31/17
Calculated By: ______ Date: 04/03/17
Checked By: ______ Date: 04/05/17
Depth(ft.): 2-4

Compaction Method: [X] ASTM D1557 [ ] ASTM D698
Preparation Method: [ ] Moist [X] Dry

METHOD: A
MOLD VOLUME (CU.FT): 0.0333

Wt. Comp. Soil + Mold (gm.)	3906	3882	3818	3720		
Wt. of Mold (gm.)	1825	1825	1825	1825		
Net Wt. of Soil (gm.)	2081	2057	1993	1895		
Container No.						
Wt. of Container (gm.)	149.08	149.37	150.00	150.40		
Wet Wt. of Soil + Cont. (gm.)	397.73	487.57	370.13	390.88		
Dry Wt. of Soil + Cont. (gm.)	374.46	451.89	354.35	377.79		
Moisture Content (%)	10.32	11.79	7.72	5.76		
Wet Density (pcf)	137.63	136.04	131.81	125.33		
Dry Density (pcf)	124.75	121.69	122.36	118.51		

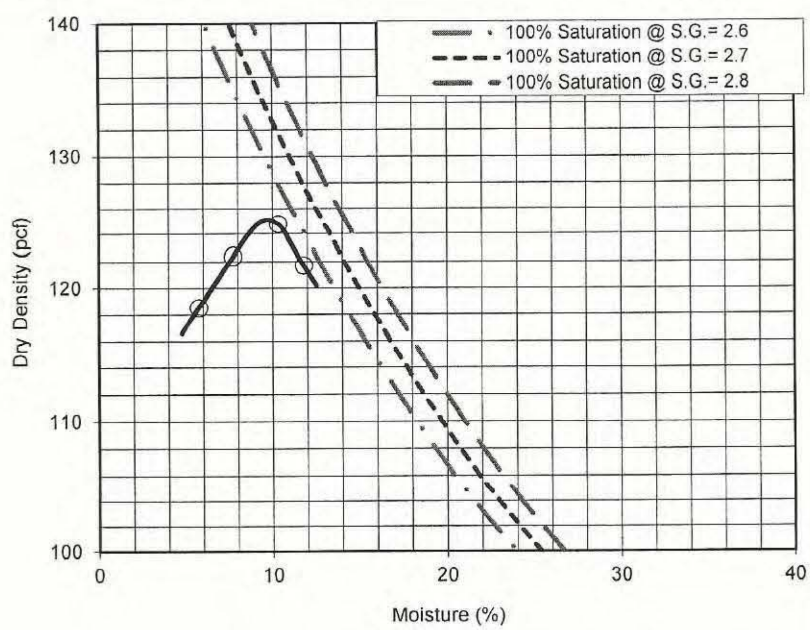
Maximum Dry Density (pcf): **125.0**
Maximum Dry Density w/ Rock Correction (pcf): **128.2**
Optimum Moisture Content (%): **9.7**
Optimum Moisture Content w/ Rock Correction (%): **8.8**

PROCEDURE USED

[X] *METHOD A: Percent of Oversize:* 9.7%
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)

[ ] *METHOD B: Percent of Oversize:* N/A
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)

[ ] *METHOD C: Percent of Oversize:* N/A
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)



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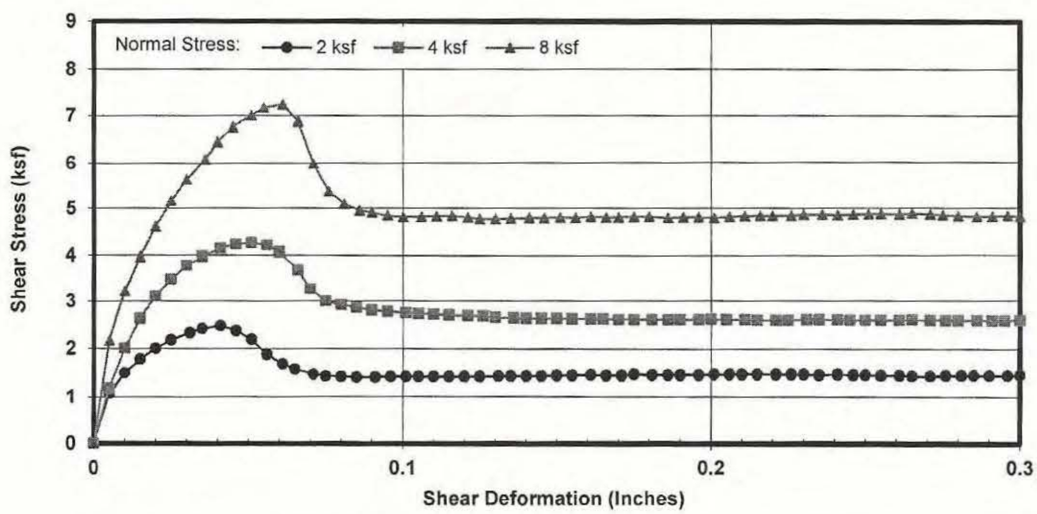
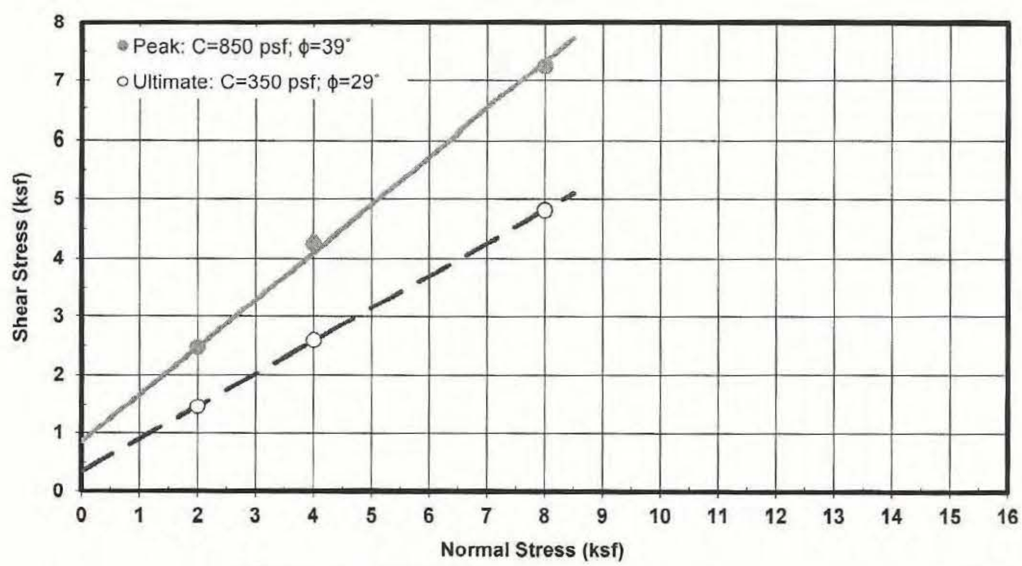
DIRECT SHEAR TEST RESULTS
ASTM D 3080

Project Name: SCI - Mike Green - Secret Canyon Crossing
Project No.: GS-16B12-B
Boring No.: B-2
Sample No.: 6 **Depth (ft):** 20
Sample Type: Mod. Cal.
Soil Description: Silty Sand
Test Condition: Inundated **Shear Type:** Regular

Tested By: ______ **Date:** 03/31/17
Computed By: ______ **Date:** 04/05/17
Checked by: ______ **Date:** 04/05/17

Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
126.8	111.1	14.2	19.1	74	100	2	2.472	1.464
						4	4.255	2.592
						8	7.248	4.812





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CORROSION TEST RESULTS

Client Name: Geotechnical Soilutions
Project Name: SCI - Mike Green - Secret Canyon Crossing
Project No.: GS-16B12-B
Date: 03/31/17

Boring No.	Sample Type	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
B-1	Bulk	0-5	SC	1476	7.3	33	55

NOTES:
Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

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EXPANSION INDEX TEST RESULTS

ASTM D 4829

Client Name: Geotechnical Soilutions
Project Name: SCI - Mike Green - Secret Canyon Crossing Date: 04/03/17
Project No.: GS-16B12-B

Boring No.	Sample Type	Depth (ft)	Soil Description	Molded Dry Density (pcf)	Molded Moisture Content (%)	Init. Degree Saturation (%)	Measured Expansion Index	Corrected Expansion Index
B-1	Bulk	0-5	Clayey Sand w/gravel	110.3	9.2	47.0	14	12

ASTM EXPANSION CLASSIFICATION

Expansion Index	Classification
0-20	V. Low
21-50	Low
51-90	Medium
91-130	High
>130	V. High

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ASTM D 2419
SAND EQUIVALENT TEST

Client Name: Geotechnical Soilutions
Project Name: SCI - Mike Green - Secret Canyon Crossing   Test Date: 03/30/17
Project No.: GS-16B12-B

Boring No.	Sample Type	Depth (feet)	Soil Description	Clay Reading	Sand Reading	Corrected Sand Reading	Sand Equivalent
B-1	Bulk	0-5	Clayey Sand w/gravel	13.5	11.8	1.8	14
B-2	Bulk	15-20	Sandy Clay	12.6	10.6	0.6	5

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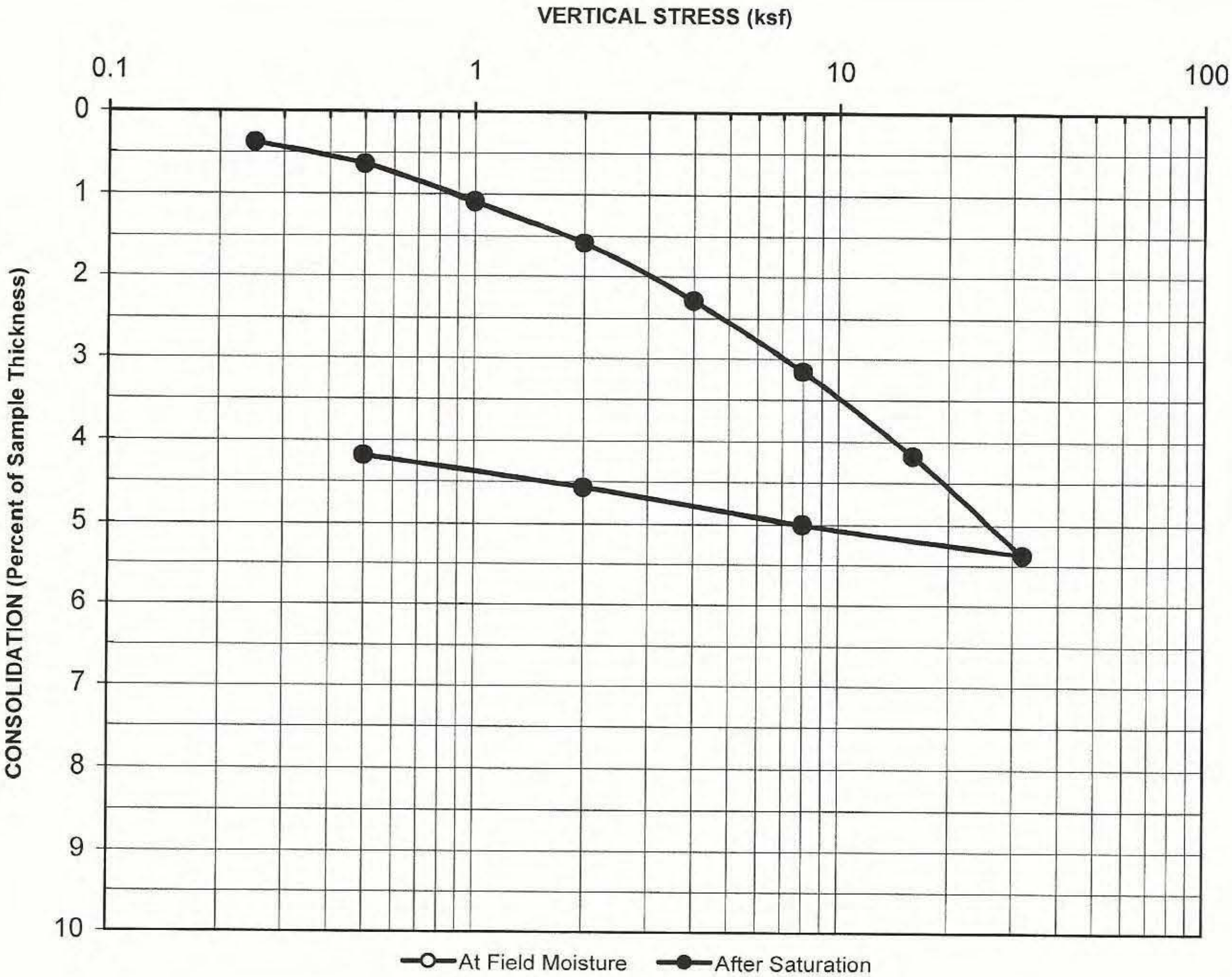

Boring No. :	TP-2	Initial Dry Unit Weight (pcf):	124.0
Sample No.:	1	Initial Moisture Content (%):	11.5
Depth:	24"	Final Moisture Content (%):	12.1
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand	Initial Void Ratio:	0.36
Remarks:	Swell= 0.00% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name: SCI - Mike Green - Secret Canyon Crossing
Project No.: GS-16B12-B
Date: 3/28/2017

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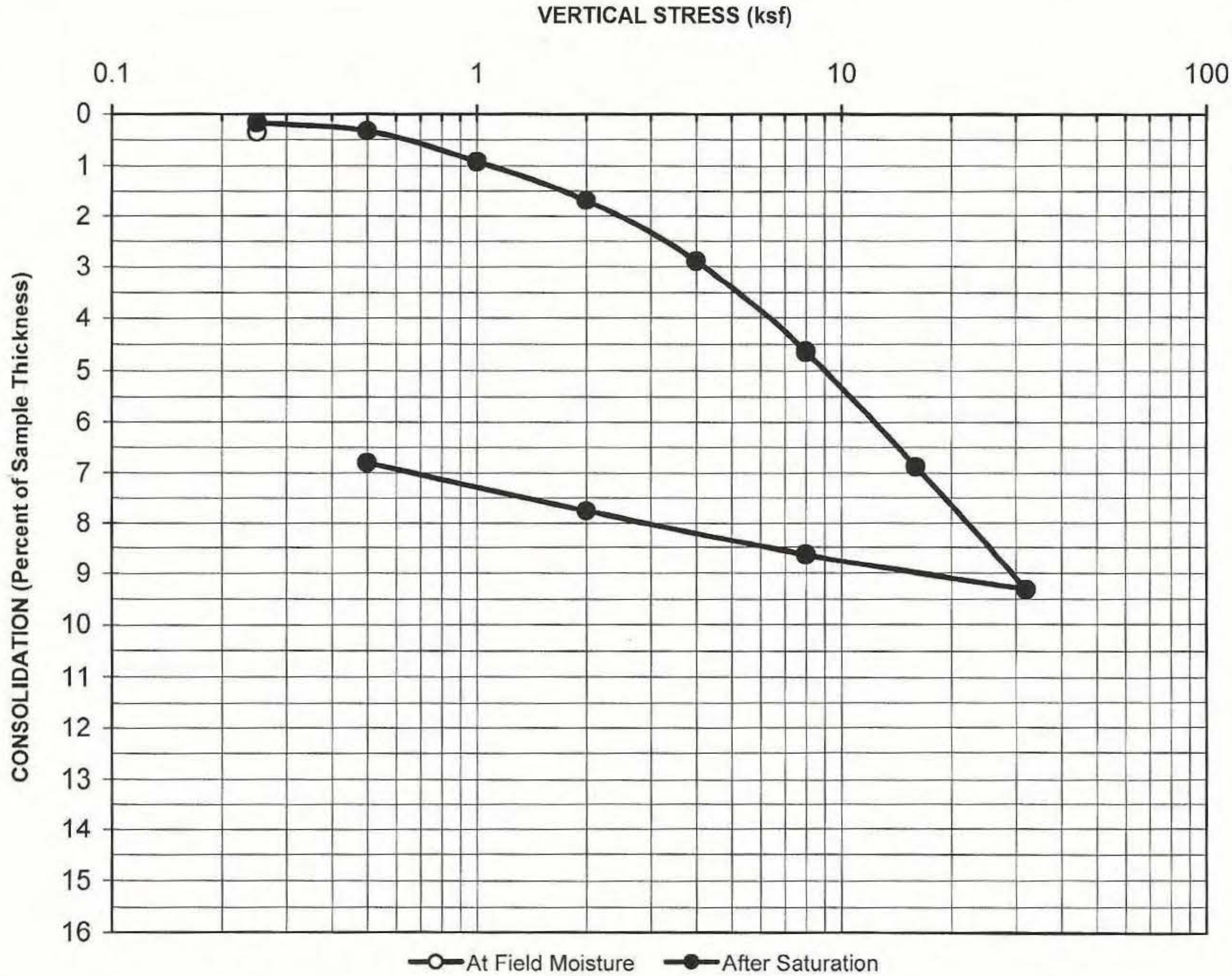

Boring No. :	TP-3	Initial Dry Unit Weight (pcf):	108.0
Sample No.:	2	Initial Moisture Content (%):	19.2
Depth:	48"	Final Moisture Content (%):	19.1
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Sandy Clay	Initial Void Ratio:	0.56
Remarks:	Swell= 0.18% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name: SCI - Mike Green - Secret Canyon Crossing
Project No.: GS-16B12-B
Date: 3/28/2017

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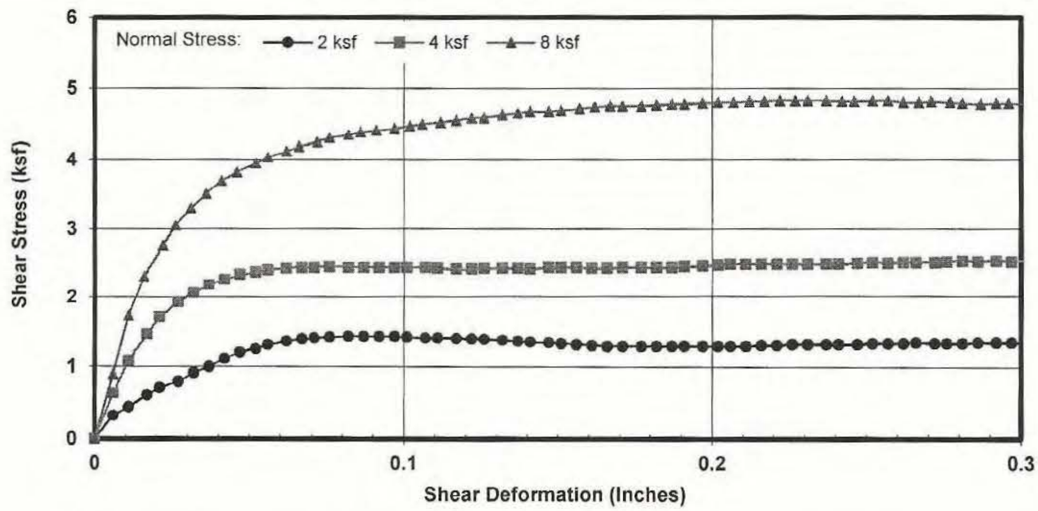
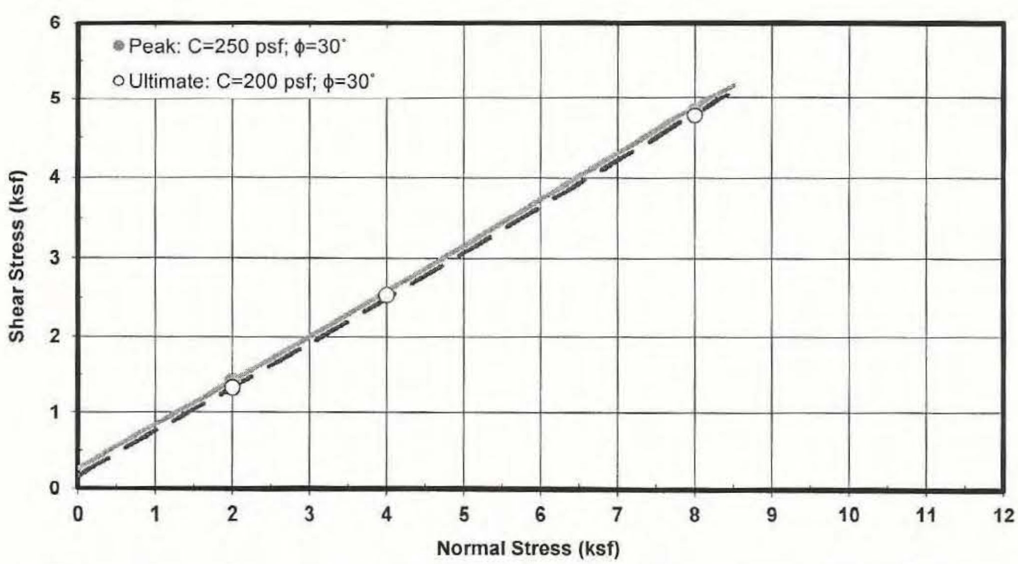
DIRECT SHEAR TEST RESULTS
ASTM D 3080

Project Name: SCI - Mike Green - Secret Canyon Crossing
Project No.: GS-16B12-B
Boring No.: TP-3
Sample No.: Bulk **Depth (ft):** 2-4
Sample Type: Remolded to 90% RC at opt. MC
Soil Description: Clayey Sand
Test Condition: Inundated **Shear Type:** Regular

Tested By: ______ **Date:** 04/04/17
Computed By: ______ **Date:** 04/05/17
Checked by: ______ **Date:** 04/05/17

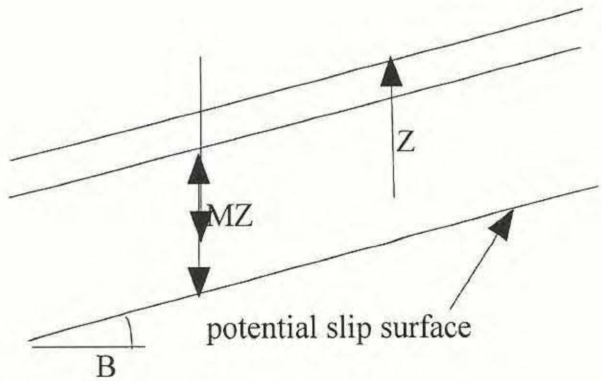
Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
122.9	112.2	9.6	17.4	51	94	2	1.421	1.332
						4	2.532	2.532
						8	4.826	4.775





Appendix D
Stability Analyses

STABILITY ANALY SIS OF SLOPE SURFACE



F= C+(G-M*Gw)* Z*(cosB)^2*Tan(Phi) / G*Z*sinB*cosB

Soil Type: Compacted Fill

F=	Factor of Safety			
G=	Unit Weight of the Soil	=	122.5	PCF
Gw=	Unit Weight of the Water	=	62.4	PCF
C=	Cohesion	=	190	PSF
Phi=	Angle of Shearing Resistance	=	29	degrees
Z=	Vertical Depth of the Slip Surface	=	4	Ft
M=	Fraction of Z such that M.Z is the Vertical Height of the Temporary Water Surface Above the slip surface			
B=	Slope Angle	=	26.6	degrees

Reference: U.S. Geological Survey Professional Paper 851

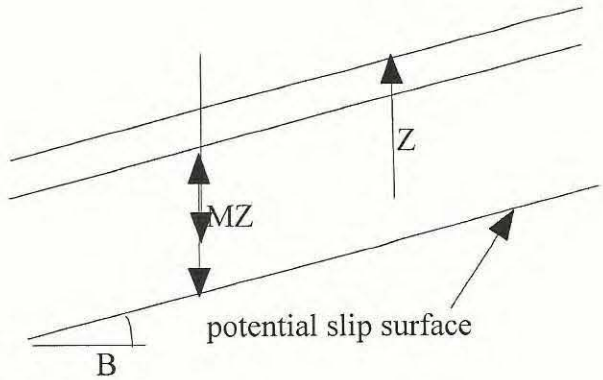
SAFETY FACTOR = 1.51

Geotechnical Soilutions, Inc.
501 S. Fairfax Ave. # 101
Los Angeles, CA 90036

For: El Camino Memorial Park
Address: San Diego

04/18/2017 GS 16B12-B

STABILITY ANALY SIS OF SLOPE SURFACE



$$F = \frac{C+(G-M*Gw)* Z*(\cos B)^2*\tan(Phi)}{G*Z*\sin B*\cos B}$$

Soil Type: Bedrock

F=	Factor of Safety			
G=	Unit Weight of the Soil	=	117.3	PCF
Gw=	Unit Weight of the Water	=	62.4	PCF
C=	Cohesion	=	180	PSF
Phi=	Angle of Shearing Resistance	=	31	degrees
Z=	Vertical Depth of the Slip Surface	=	4	Ft
M=	Fraction of Z such that M.Z is the Vertical Height of the Temporary Water Surface Above the slip surface			
B=	Slope Angle	=	26.6	degrees

Reference: U.S. Geological Survey Professional Paper 851

SAFETY FACTOR = 1.52

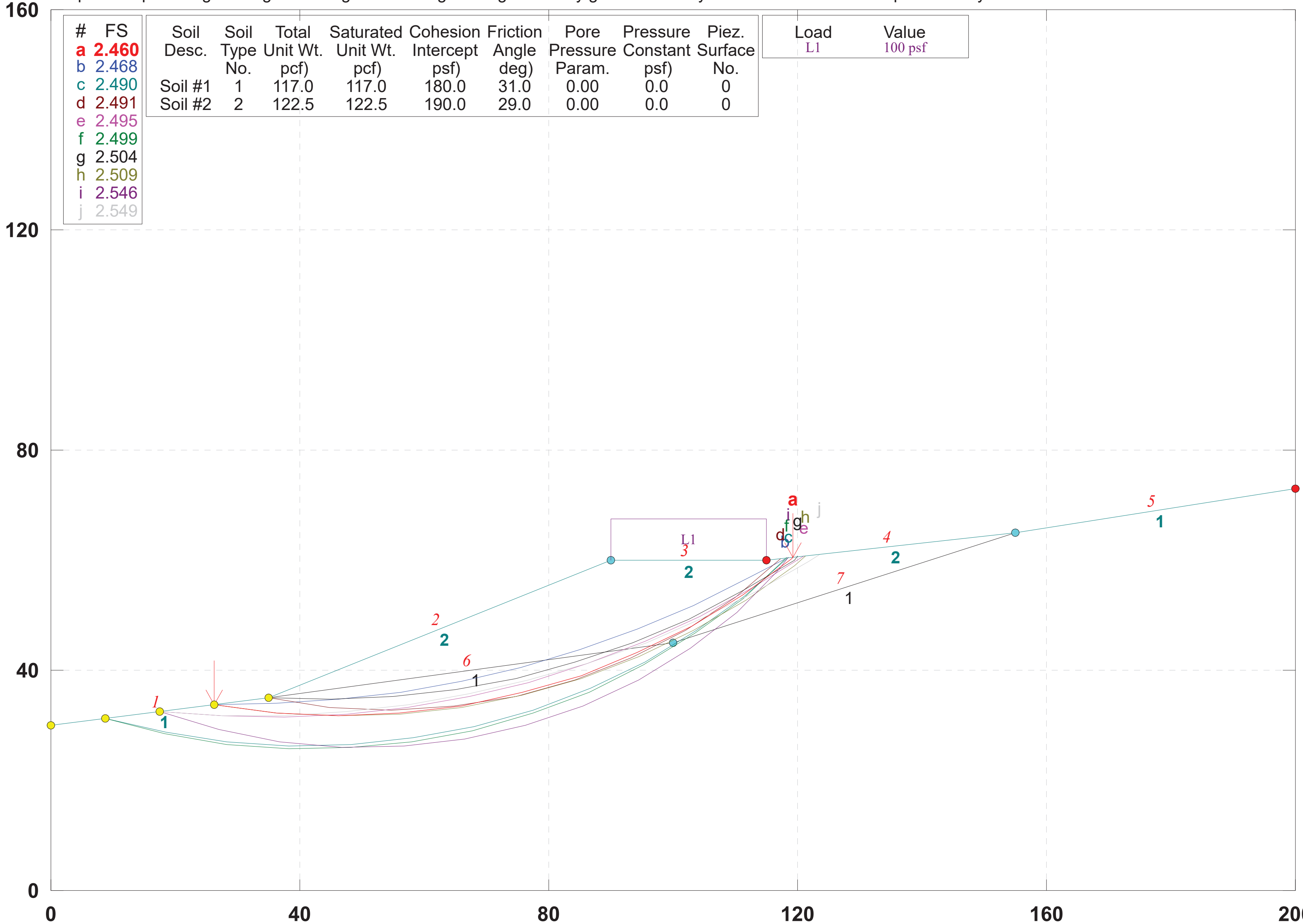
Geotechnical Soilutions, Inc.
501 S. Fairfax Ave. # 101
Los Angeles, CA 90036

For: El Camino Memorial Park
Address: San Diego

04/18/2017 GS 16B12-B

El Camino Secret Canyon ElCamino SC1

c:\users\mesrop\desktop\sharing\sharing2016\old gsi files & engineering & stability\gsi files\stability\stab 2013\elcamino sc1.pl2 Run By: Geotechnical Soilutions Inc. 4/20/2017 04:23PM



Soil Desc.	Soil Type No.	Total Unit Wt. pcf)	Saturated Unit Wt. pcf)	Cohesion Intercept psf)	Friction Angle deg)	Pore Pressure Param.	Pressure Constant psf)	Piez. Surface No.
Soil #1	1	117.0	117.0	180.0	31.0	0.00	0.0	0
Soil #2	2	122.5	122.5	190.0	29.0	0.00	0.0	0

Load	Value
L1	100 psf

GSTABL7 v.2 FSmin=2.460

Safety Factors Are Calculated By The Modified Bishop Method

```
                              ***  GSTABL7  ***
              ** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
         ** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
                (All Rights Reserved-Unauthorized Use Prohibited)
    *********************************************************************************
                         SLOPE STABILITY ANALYSIS SYSTEM
           Modified Bishop, Simplified Janbu, or GLE Method of Slices.
           (Includes Spencer & Morgenstern-Price Type Analysis)
           Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
           Nonlinear Undrained Shear Strength, Curved Phi Envelope,
           Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
           Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
    *********************************************************************************
    Analysis Run Date:        4/20/2017
    Time of Run:              04:23PM
    Run By:                   Geotechnical  Soilutions Inc.
    Input Data Filename:      C:\Users\Mesrop\Desktop\Sharing\Sharing2016\Old GSI Files &
Engineering & Stability\GSI Files\Stability\STAB 2013\elcamino sc1.in
    Output Filename:          C:\Users\Mesrop\Desktop\Sharing\Sharing2016\Old GSI Files &
Engineering & Stability\GSI Files\Stability\STAB 2013\elcamino sc1.OUT
    Unit System:              English
    Plotted Output Filename:  C:\Users\Mesrop\Desktop\Sharing\Sharing2016\Old GSI Files &
Engineering & Stability\GSI Files\Stability\STAB 2013\elcamino sc1.PLT
    PROBLEM DESCRIPTION:  El Camino Secret Canyon
                          ElCamino SC1
    BOUNDARY COORDINATES
        5 Top   Boundaries
        7 Total Boundaries
    Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
       No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
        1          0.00      30.00      35.00      35.00        1
        2         35.00      35.00      90.00      60.00        2
        3         90.00      60.00     115.00      60.00        2
        4        115.00      60.00     155.00      65.00        2
        5        155.00      65.00     200.00      73.00        1
        6         35.00      35.00     100.00      45.00        1
        7        100.00      45.00     155.00      65.00        1
    Default Y-Origin = 0.00(ft)
    Default X-Plus Value = 0.00(ft)
    Default Y-Plus Value = 0.00(ft)
   ISOTROPIC SOIL PARAMETERS
     2 Type(s) of Soil
    Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
    Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
     No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
      1   117.0    117.0     180.0     31.0    0.00       0.0      0
      2   122.5    122.5     190.0     29.0    0.00       0.0      0
   BOUNDARY LOAD(S)
        1 Load(s) Specified
    Load        X-Left      X-Right     Intensity     Deflection
     No.         (ft)         (ft)        (psf)          (deg)
      1         90.00       115.00        100.0           0.0
    NOTE - Intensity Is Specified As A Uniformly Distributed
           Force Acting On A Horizontally Projected Surface.
    A Critical Failure Surface Searching Method, Using A Random
    Technique For Generating Circular Surfaces, Has Been Specified.
     500 Trial Surfaces Have Been Generated.
     100 Surface(s) Initiate(s) From Each Of     5 Points Equally Spaced
    Along The Ground Surface Between  X =   0.00(ft)
                                and  X =  35.00(ft)
    Each Surface Terminates Between   X = 115.00(ft)
                               and   X = 200.00(ft)
    Unless Further Limitations Were Imposed, The Minimum Elevation
    At Which A Surface Extends Is  Y =      0.00(ft)
    10.00(ft) Line Segments Define Each Trial Failure Surface.
    Following Are Displayed The Ten Most Critical Of The Trial
          Failure Surfaces Evaluated. They Are
          Ordered - Most Critical First.
          * * Safety Factors Are Calculated By The Modified Bishop Method * *
          Total Number of Trial Surfaces Attempted =   500
```

```
Number of Trial Surfaces With Valid FS =  500
Statistical Data On All Valid FS Values:
   FS Max =   5.602   FS Min =   2.460   FS Ave =   3.703
   Standard Deviation =    0.676   Coefficient of Variation =   18.25 %
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         26.250      33.750
    2         36.144      32.299
    3         46.131      31.787
    4         56.122      32.218
    5         66.028      33.587
    6         75.760      35.883
    7         85.234      39.086
    8         94.363      43.166
    9        103.068      48.089
   10        111.271      53.809
   11        118.898      60.276
   12        119.133      60.517
Circle Center At X =    46.569 ; Y =   137.783 ; and Radius =   105.998
       Factor of Safety
      ***    2.460   ***
         Individual data on the    15  slices
                    Water  Water     Tie     Tie     Earthquake
                    Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight    Top    Bot     Norm     Tan     Hor      Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1      8.8    1296.5     0.0     0.0       0.       0.     0.0     0.0      0.0
  2      1.1     386.2     0.0     0.0       0.       0.     0.0     0.0      0.0
  3     10.0    6816.0     0.0     0.0       0.       0.     0.0     0.0      0.0
  4     10.0   12338.8     0.0     0.0       0.       0.     0.0     0.0      0.0
  5      9.9   16594.6     0.0     0.0       0.       0.     0.0     0.0      0.0
  6      9.7   19458.3     0.0     0.0       0.       0.     0.0     0.0      0.0
  7      9.5   20880.7     0.0     0.0       0.       0.     0.0     0.0      0.0
  8      4.8   10879.5     0.0     0.0       0.       0.     0.0     0.0      0.0
  9      4.4    9480.3     0.0     0.0       0.       0.     0.0     0.0    436.3
 10      2.3    4644.2     0.0     0.0       0.       0.     0.0     0.0    234.8
 11      6.4   10675.4     0.0     0.0       0.       0.     0.0     0.0    635.7
 12      8.2    9094.9     0.0     0.0       0.       0.     0.0     0.0    820.3
 13      3.7    2106.3     0.0     0.0       0.       0.     0.0     0.0    372.9
 14      3.9     773.7     0.0     0.0       0.       0.     0.0     0.0      0.0
 15      0.2       3.0     0.0     0.0       0.       0.     0.0     0.0      0.0
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         26.250      33.750
    2         36.249      33.894
    3         46.220      34.653
    4         56.126      36.025
    5         65.928      38.004
    6         75.590      40.582
    7         85.075      43.751
    8         94.346      47.497
    9        103.370      51.806
   10        112.111      56.663
   11        117.898      60.362
Circle Center At X =    28.910 ; Y =   196.109 ; and Radius =   162.381
       Factor of Safety
      ***    2.468   ***
Failure Surface Specified By 13 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1          8.750      31.250
    2         18.410      28.665
    3         28.272      27.007
    4         38.246      26.292
    5         48.243      26.527
    6         58.173      27.708
    7         67.947      29.825
    8         77.475      32.860
```

9	86.673	36.784
10	95.457	41.564
11	103.748	47.154
12	111.472	53.506
13	118.425	60.428

Circle Center At X = 40.781 ; Y = 131.598 ; and Radius = 105.336

Factor of Safety

*** 2.490 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	35.000	35.000
2	44.857	33.312
3	54.843	32.785
4	64.822	33.425
5	74.659	35.225
6	84.219	38.159
7	93.371	42.187
8	101.992	47.255
9	109.963	53.294
10	117.176	60.220
11	117.224	60.278

Circle Center At X = 54.357 ; Y = 118.417 ; and Radius = 85.633

Factor of Safety

*** 2.491 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	17.500	32.500
2	27.463	31.642
3	37.462	31.488
4	47.447	32.037
5	57.368	33.288
6	67.177	35.233
7	76.825	37.865
8	86.263	41.168
9	95.446	45.128
10	104.327	49.723
11	112.863	54.933
12	121.012	60.730
13	121.042	60.755

Circle Center At X = 34.657 ; Y = 173.480 ; and Radius = 142.020

Factor of Safety

*** 2.495 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.750	31.250
2	18.351	28.455
3	28.182	26.620
4	38.145	25.762
5	48.144	25.890
6	58.082	27.004
7	67.861	29.091
8	77.388	32.132
9	86.568	36.097
10	95.313	40.947
11	103.538	46.635
12	111.162	53.107
13	118.110	60.298
14	118.190	60.399

Circle Center At X = 41.843 ; Y = 127.023 ; and Radius = 101.329

Factor of Safety

*** 2.499 ***

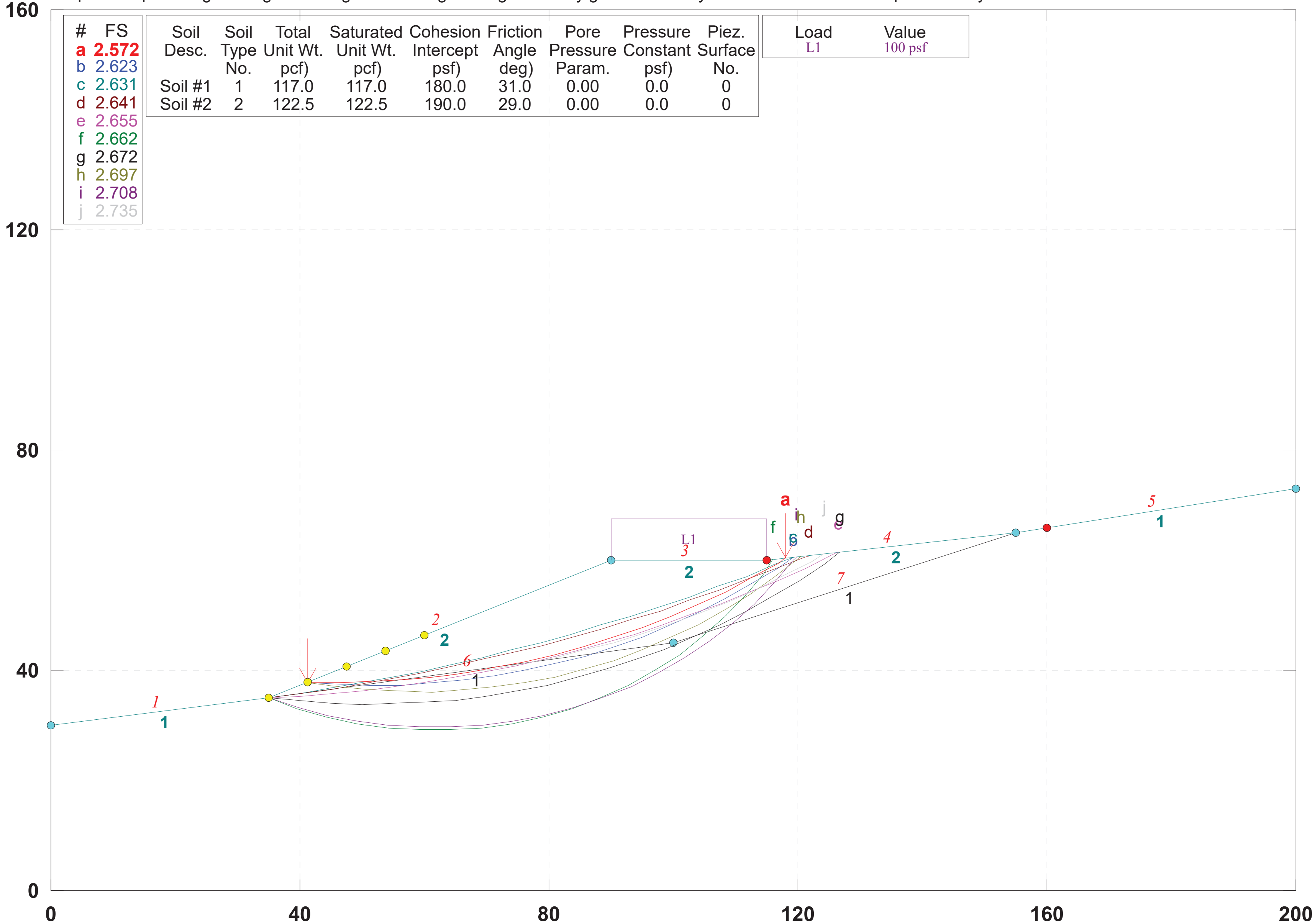
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	35.000	35.000
2	44.996	34.700
3	54.983	35.197

```
    4        64.899       36.489
    5        74.681       38.566
    6        84.266       41.417
    7        93.594       45.022
    8       102.605       49.358
    9       111.242       54.399
   10       119.449       60.111
   11       120.088       60.636
Circle Center At X =    43.756 ; Y =   160.109 ; and Radius =   125.415
       Factor of Safety
      ***    2.504   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        26.250       33.750
    2        36.137       32.250
    3        46.120       31.667
    4        56.114       32.004
    5        66.035       33.261
    6        75.798       35.426
    7        85.320       38.480
    8        94.521       42.397
    9       103.322       47.145
   10       111.648       52.683
   11       119.430       58.964
   12       121.306       60.788
Circle Center At X =    47.467 ; Y =   139.768 ; and Radius =   108.120
       Factor of Safety
      ***    2.509   ***
Failure Surface Specified By 13 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        17.500       32.500
    2        26.935       29.185
    3        36.694       27.003
    4        46.641       25.982
    5        56.640       26.138
    6        66.551       27.468
    7        76.238       29.953
    8        85.564       33.560
    9        94.403       38.238
   10       102.630       43.922
   11       110.132       50.534
   12       116.805       57.982
   13       118.535       60.442
Circle Center At X =    50.321 ; Y =   110.837 ; and Radius =    84.935
       Factor of Safety
      ***    2.546   ***
Failure Surface Specified By 13 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        17.500       32.500
    2        27.479       31.845
    3        37.479       31.832
    4        47.459       32.462
    5        57.378       33.730
    6        67.195       35.633
    7        76.870       38.162
    8        86.363       41.307
    9        95.634       45.055
   10       104.645       49.391
   11       113.359       54.296
   12       121.741       59.750
   13       123.499       61.062
Circle Center At X =    32.678 ; Y =   187.439 ; and Radius =   155.681
       Factor of Safety
      ***    2.549   ***
          **** END OF GSTABL7 OUTPUT ****
```

El Camino Secret Canyon ElCamino SC2

c:\users\mesrop\desktop\sharing\sharing2016\old gsi files & engineering & stability\gsi files\stability\stab 2013\elcamino sc2.pl2 Run By: Geotechnical Soilutions Inc. 4/20/2017 04:32PM



#	FS
a	2.572
b	2.623
c	2.631
d	2.641
e	2.655
f	2.662
g	2.672
h	2.697
i	2.708
j	2.735

Soil Desc.	Soil Type No.	Total Unit Wt. pcf)	Saturated Unit Wt. pcf)	Cohesion Intercept psf)	Friction Angle deg)	Pore Pressure Param.	Pressure Constant psf)	Piez. Surface No.
Soil #1	1	117.0	117.0	180.0	31.0	0.00	0.0	0
Soil #2	2	122.5	122.5	190.0	29.0	0.00	0.0	0

Load	Value
L1	100 psf

GSTABL7 v.2 FSmin=2.572

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **

****

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

****

Analysis Run Date: 4/20/2017
Time of Run: 04:32PM
Run By: Geotechnical Soilutions Inc.
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Output Filename: C:\Users\Mesrop\Desktop\Sharing\Sharing2016\Old GSI Files & Engineering & Stability\GSI Files\Stability\STAB 2013\elcamino sc2.OUT
Unit System: English
Plotted Output Filename: C:\Users\Mesrop\Desktop\Sharing\Sharing2016\Old GSI Files & Engineering & Stability\GSI Files\Stability\STAB 2013\elcamino sc2.PLT
PROBLEM DESCRIPTION: El Camino Secret Canyon
ElCamino SC2

BOUNDARY COORDINATES
5 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	30.00	35.00	35.00	1
2	35.00	35.00	90.00	60.00	2
3	90.00	60.00	115.00	60.00	2
4	115.00	60.00	155.00	65.00	2
5	155.00	65.00	200.00	73.00	1
6	35.00	35.00	100.00	45.00	1
7	100.00	45.00	155.00	65.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	117.0	117.0	180.0	31.0	0.00	0.0	0
2	122.5	122.5	190.0	29.0	0.00	0.0	0

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	90.00	115.00	100.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
500 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 5 Points Equally Spaced
Along The Ground Surface Between X = 35.00(ft)
and X = 60.00(ft)
Each Surface Terminates Between X = 115.00(ft)
and X = 160.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
5.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 500

Number of Trial Surfaces With Valid FS = 500
Statistical Data On All Valid FS Values:
FS Max = 7.142 FS Min = 2.572 FS Ave = 4.246
Standard Deviation = 1.017 Coefficient of Variation = 23.95 %
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	41.250	37.841
2	46.250	37.784
3	51.248	37.921
4	56.237	38.252
5	61.209	38.777
6	66.157	39.494
7	71.074	40.403
8	75.952	41.503
9	80.783	42.791
10	85.561	44.265
11	90.277	45.924
12	94.926	47.766
13	99.500	49.786
14	103.991	51.982
15	108.394	54.352
16	112.702	56.890
17	116.908	59.594
18	118.030	60.379

Circle Center At X = 45.245 ; Y = 166.286 ; and Radius = 128.507
Factor of Safety
*** 2.572 ***
Individual data on the 21 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	5.0	713.4	0.0	0.0	0.	0.	0.0	0.0	0.0
2	5.0	2080.0	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.8	3184.5	0.0	0.0	0.	0.	0.0	0.0	0.0
4	0.2	135.8	0.0	0.0	0.	0.	0.0	0.0	0.0
5	5.0	4423.9	0.0	0.0	0.	0.	0.0	0.0	0.0
6	4.9	5388.8	0.0	0.0	0.	0.	0.0	0.0	0.0
7	4.9	6216.4	0.0	0.0	0.	0.	0.0	0.0	0.0
8	2.1	2820.0	0.0	0.0	0.	0.	0.0	0.0	0.0
9	2.8	4082.2	0.0	0.0	0.	0.	0.0	0.0	0.0
10	4.8	7436.9	0.0	0.0	0.	0.	0.0	0.0	0.0
11	4.8	7823.9	0.0	0.0	0.	0.	0.0	0.0	0.0
12	4.4	7583.6	0.0	0.0	0.	0.	0.0	0.0	0.0
13	0.3	479.8	0.0	0.0	0.	0.	0.0	0.0	27.7
14	4.6	7491.3	0.0	0.0	0.	0.	0.0	0.0	464.9
15	4.6	6288.7	0.0	0.0	0.	0.	0.0	0.0	457.4
16	4.5	5015.9	0.0	0.0	0.	0.	0.0	0.0	449.2
17	4.4	3685.6	0.0	0.0	0.	0.	0.0	0.0	440.3
18	4.3	2310.9	0.0	0.0	0.	0.	0.0	0.0	430.8
19	2.3	667.5	0.0	0.0	0.	0.	0.0	0.0	229.8
20	1.9	266.1	0.0	0.0	0.	0.	0.0	0.0	0.0
21	1.1	44.3	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	41.250	37.841
2	46.235	37.450
3	51.232	37.289
4	56.232	37.359
5	61.223	37.659
6	66.194	38.189
7	71.137	38.947
8	76.039	39.932
9	80.890	41.142
10	85.680	42.575
11	90.400	44.227
12	95.038	46.094
13	99.585	48.173

```
   14        104.032       50.460
   15        108.368       52.949
   16        112.585       55.635
   17        116.674       58.512
   18        119.284       60.536
Circle Center At X =    52.234 ; Y =   145.577 ; and Radius =   108.295
       Factor of Safety
      ***    2.623   ***
Failure Surface Specified By 19 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         35.000       35.000
    2         39.932       35.820
    3         44.851       36.717
    4         49.756       37.689
    5         54.645       38.738
    6         59.517       39.862
    7         64.371       41.061
    8         69.206       42.335
    9         74.020       43.684
   10         78.813       45.107
   11         83.584       46.604
   12         88.331       48.175
   13         93.053       49.819
   14         97.749       51.537
   15        102.417       53.326
   16        107.058       55.188
   17        111.669       57.121
   18        116.250       59.126
   19        119.361       60.545
Circle Center At X =   -15.518 ; Y =   354.011 ; and Radius =   322.987
       Factor of Safety
      ***    2.631   ***
Failure Surface Specified By 20 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         35.000       35.000
    2         39.945       35.740
    3         44.877       36.561
    4         49.795       37.463
    5         54.697       38.446
    6         59.583       39.509
    7         64.451       40.653
    8         69.299       41.876
    9         74.126       43.179
   10         78.931       44.562
   11         83.713       46.023
   12         88.470       47.562
   13         93.201       49.180
   14         97.905       50.875
   15        102.580       52.647
   16        107.226       54.496
   17        111.840       56.421
   18        116.423       58.422
   19        120.971       60.498
   20        121.679       60.835
Circle Center At X =    -7.460 ; Y =   335.785 ; and Radius =   303.767
       Factor of Safety
      ***    2.641   ***
Failure Surface Specified By 21 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         35.000       35.000
    2         39.990       35.313
    3         44.971       35.745
    4         49.941       36.298
    5         54.896       36.969
    6         59.833       37.760
    7         64.749       38.669
    8         69.643       39.696
```

9	74.510	40.840
10	79.348	42.101
11	84.155	43.478
12	88.927	44.970
13	93.662	46.577
14	98.357	48.297
15	103.009	50.129
16	107.616	52.072
17	112.175	54.126
18	116.683	56.289
19	121.137	58.560
20	125.536	60.937
21	126.388	61.423

Circle Center At X = 24.491 ; Y = 242.667 ; and Radius = 207.933

Factor of Safety

*** 2.655 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	35.000	35.000
2	39.617	33.081
3	44.371	31.531
4	49.232	30.361
5	54.170	29.577
6	59.155	29.185
7	64.155	29.187
8	69.139	29.582
9	74.077	30.369
10	78.937	31.543
11	83.690	33.096
12	88.306	35.018
13	92.755	37.298
14	97.012	39.921
15	101.048	42.872
16	104.840	46.132
17	108.363	49.680
18	111.596	53.494
19	114.518	57.551
20	116.086	60.136

Circle Center At X = 61.626 ; Y = 92.463 ; and Radius = 63.332

Factor of Safety

*** 2.662 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	35.000	35.000
2	39.964	34.402
3	44.949	34.018
4	49.946	33.848
5	54.946	33.892
6	59.940	34.151
7	64.917	34.624
8	69.870	35.310
9	74.788	36.208
10	79.664	37.317
11	84.488	38.633
12	89.250	40.156
13	93.943	41.881
14	98.558	43.806
15	103.086	45.927
16	107.518	48.241
17	111.847	50.742
18	116.065	53.427
19	120.164	56.291
20	124.136	59.328
21	126.691	61.461

Circle Center At X = 51.410 ; Y = 150.335 ; and Radius = 116.496

Factor of Safety

*** 2.672 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	41.250	37.841
2	46.178	36.995
3	51.145	36.425
4	56.137	36.134
5	61.137	36.121
6	66.130	36.388
7	71.100	36.933
8	76.032	37.754
9	80.911	38.850
10	85.720	40.216
11	90.446	41.848
12	95.074	43.742
13	99.589	45.890
14	103.976	48.288
15	108.224	50.926
16	112.317	53.798
17	116.243	56.893
18	119.991	60.203
19	120.479	60.685

Circle Center At X = 58.859 ; Y = 125.647 ; and Radius = 89.554

Factor of Safety

*** 2.697 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	35.000	35.000
2	39.682	33.245
3	44.478	31.830
4	49.362	30.763
5	54.311	30.050
6	59.298	29.692
7	64.298	29.694
8	69.285	30.054
9	74.234	30.771
10	79.118	31.841
11	83.913	33.259
12	88.594	35.016
13	93.136	37.105
14	97.518	39.515
15	101.715	42.232
16	105.706	45.244
17	109.471	48.534
18	112.990	52.085
19	116.246	55.880
20	119.221	59.899
21	119.655	60.582

Circle Center At X = 61.777 ; Y = 99.315 ; and Radius = 69.667

Factor of Safety

*** 2.708 ***

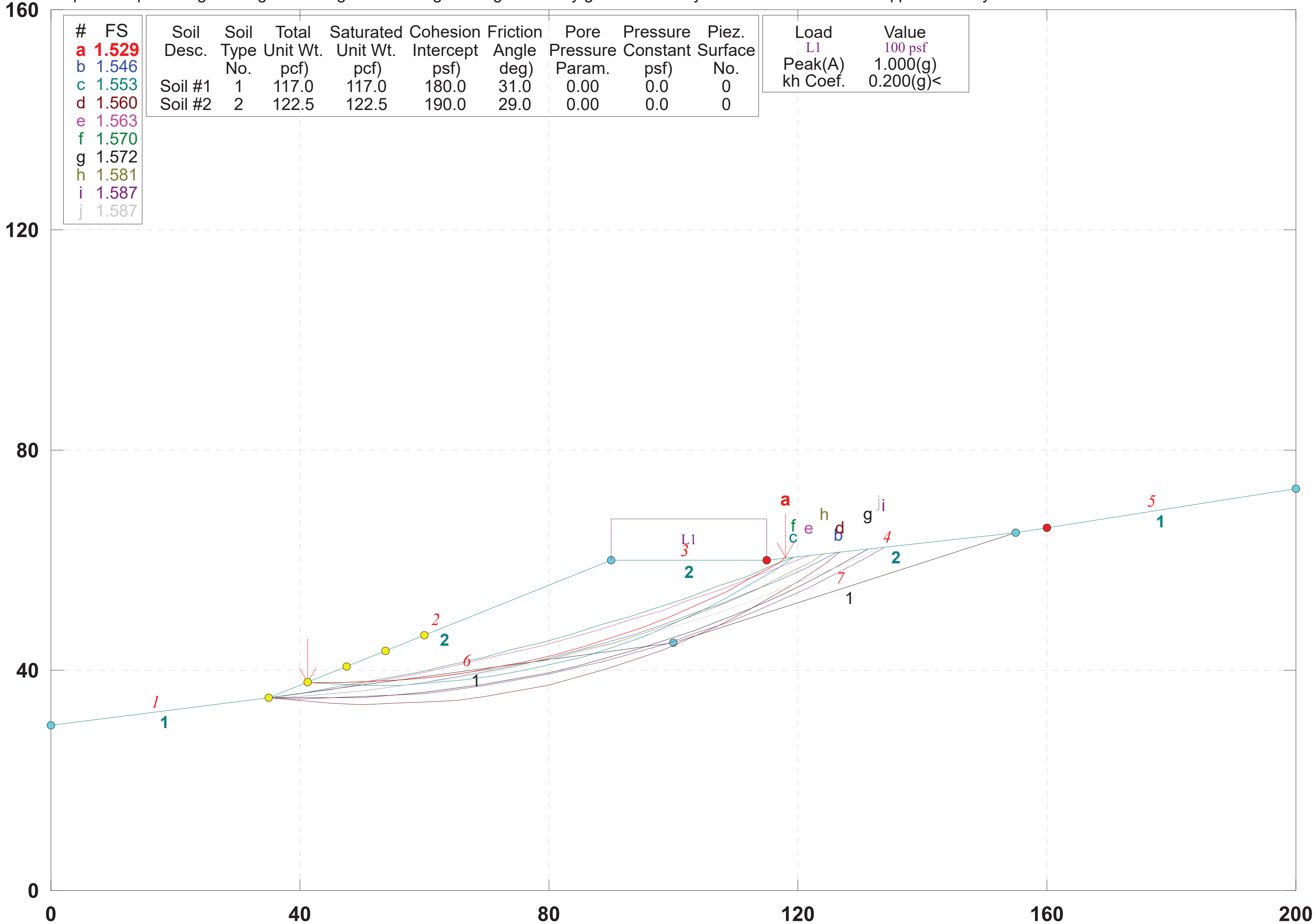
Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	41.250	37.841
2	46.250	37.811
3	51.248	37.951
4	56.238	38.260
5	61.215	38.738
6	66.174	39.385
7	71.107	40.199
8	76.010	41.180
9	80.876	42.326
10	85.701	43.637
11	90.479	45.111
12	95.204	46.746
13	99.872	48.540
14	104.475	50.491
15	109.010	52.597
16	113.471	54.856

```
   17        117.852       57.265
   18        122.150       59.820
   19        124.228       61.153
Circle Center At X =    44.628 ; Y =   185.281 ; and Radius =   147.479
       Factor of Safety
      ***    2.735   ***
          **** END OF GSTABL7 OUTPUT ****
```

El Camino Secret Canyon ElCamino SC2Q

c:\users\mesrop\desktop\sharing\sharing2016\old gsi files & engineering & stability\gsi files\stability\stab 2013\elcamino sc2q.pl2 Run By: Geotechnical Soilutions Inc. 4/20/2017 04:36PM



GSTABL7 v.2 FSmin=1.529

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **

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

Analysis Run Date: 4/20/2017
Time of Run: 04:36PM
Run By: Geotechnical Soilutions Inc.
Input Data Filename: C:\Users\Mesrop\Desktop\Sharing\Sharing2016\Old GSI Files & Engineering & Stability\GSI Files\Stability\STAB 2013\elcamino sc2q.in
Output Filename: C:\Users\Mesrop\Desktop\Sharing\Sharing2016\Old GSI Files & Engineering & Stability\GSI Files\Stability\STAB 2013\elcamino sc2q.OUT
Unit System: English
Plotted Output Filename: C:\Users\Mesrop\Desktop\Sharing\Sharing2016\Old GSI Files & Engineering & Stability\GSI Files\Stability\STAB 2013\elcamino sc2q.PLT
PROBLEM DESCRIPTION: El Camino Secret Canyon
ElCamino SC2Q

BOUNDARY COORDINATES
5 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	30.00	35.00	35.00	1
2	35.00	35.00	90.00	60.00	2
3	90.00	60.00	115.00	60.00	2
4	115.00	60.00	155.00	65.00	2
5	155.00	65.00	200.00	73.00	1
6	35.00	35.00	100.00	45.00	1
7	100.00	45.00	155.00	65.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	117.0	117.0	180.0	31.0	0.00	0.0	0
2	122.5	122.5	190.0	29.0	0.00	0.0	0

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	90.00	115.00	100.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 1.000(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.200(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
500 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 5 Points Equally Spaced
Along The Ground Surface Between X = 35.00(ft)
and X = 60.00(ft)
Each Surface Terminates Between X = 115.00(ft)
and X = 160.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
5.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial

Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 500
Number of Trial Surfaces With Valid FS = 500
Statistical Data On All Valid FS Values:
FS Max = 3.070 FS Min = 1.529 FS Ave = 2.198
Standard Deviation = 0.376 Coefficient of Variation = 17.09 %
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	41.250	37.841
2	46.250	37.784
3	51.248	37.921
4	56.237	38.252
5	61.209	38.777
6	66.157	39.494
7	71.074	40.403
8	75.952	41.503
9	80.783	42.791
10	85.561	44.265
11	90.277	45.924
12	94.926	47.766
13	99.500	49.786
14	103.991	51.982
15	108.394	54.352
16	112.702	56.890
17	116.908	59.594
18	118.030	60.379

Circle Center At X = 45.245 ; Y = 166.286 ; and Radius = 128.507
Factor of Safety
*** 1.529 ***
Individual data on the 21 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	5.0	713.4	0.0	0.0	0.	0.	142.7	0.0	0.0
2	5.0	2080.0	0.0	0.0	0.	0.	416.0	0.0	0.0
3	4.8	3184.5	0.0	0.0	0.	0.	636.9	0.0	0.0
4	0.2	135.8	0.0	0.0	0.	0.	27.2	0.0	0.0
5	5.0	4423.9	0.0	0.0	0.	0.	884.8	0.0	0.0
6	4.9	5388.8	0.0	0.0	0.	0.	1077.8	0.0	0.0
7	4.9	6216.4	0.0	0.0	0.	0.	1243.3	0.0	0.0
8	2.1	2820.0	0.0	0.0	0.	0.	564.0	0.0	0.0
9	2.8	4082.2	0.0	0.0	0.	0.	816.4	0.0	0.0
10	4.8	7436.9	0.0	0.0	0.	0.	1487.4	0.0	0.0
11	4.8	7823.9	0.0	0.0	0.	0.	1564.8	0.0	0.0
12	4.4	7583.6	0.0	0.0	0.	0.	1516.7	0.0	0.0
13	0.3	479.8	0.0	0.0	0.	0.	96.0	0.0	27.7
14	4.6	7491.3	0.0	0.0	0.	0.	1498.3	0.0	464.9
15	4.6	6288.7	0.0	0.0	0.	0.	1257.7	0.0	457.4
16	4.5	5015.9	0.0	0.0	0.	0.	1003.2	0.0	449.2
17	4.4	3685.6	0.0	0.0	0.	0.	737.1	0.0	440.3
18	4.3	2310.9	0.0	0.0	0.	0.	462.2	0.0	430.8
19	2.3	667.5	0.0	0.0	0.	0.	133.5	0.0	229.8
20	1.9	266.1	0.0	0.0	0.	0.	53.2	0.0	0.0
21	1.1	44.3	0.0	0.0	0.	0.	8.9	0.0	0.0

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	35.000	35.000
2	39.990	35.313
3	44.971	35.745
4	49.941	36.298
5	54.896	36.969
6	59.833	37.760
7	64.749	38.669
8	69.643	39.696
9	74.510	40.840

```
   10        79.348       42.101
   11        84.155       43.478
   12        88.927       44.970
   13        93.662       46.577
   14        98.357       48.297
   15       103.009       50.129
   16       107.616       52.072
   17       112.175       54.126
   18       116.683       56.289
   19       121.137       58.560
   20       125.536       60.937
   21       126.388       61.423
Circle Center At X =    24.491 ; Y =   242.667 ; and Radius =   207.933
       Factor of Safety
      ***    1.546   ***
Failure Surface Specified By 18 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        41.250       37.841
    2        46.235       37.450
    3        51.232       37.289
    4        56.232       37.359
    5        61.223       37.659
    6        66.194       38.189
    7        71.137       38.947
    8        76.039       39.932
    9        80.890       41.142
   10        85.680       42.575
   11        90.400       44.227
   12        95.038       46.094
   13        99.585       48.173
   14       104.032       50.460
   15       108.368       52.949
   16       112.585       55.635
   17       116.674       58.512
   18       119.284       60.536
Circle Center At X =    52.234 ; Y =   145.577 ; and Radius =   108.295
       Factor of Safety
      ***    1.553   ***
Failure Surface Specified By 21 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        35.000       35.000
    2        39.964       34.402
    3        44.949       34.018
    4        49.946       33.848
    5        54.946       33.892
    6        59.940       34.151
    7        64.917       34.624
    8        69.870       35.310
    9        74.788       36.208
   10        79.664       37.317
   11        84.488       38.633
   12        89.250       40.156
   13        93.943       41.881
   14        98.558       43.806
   15       103.086       45.927
   16       107.518       48.241
   17       111.847       50.742
   18       116.065       53.427
   19       120.164       56.291
   20       124.136       59.328
   21       126.691       61.461
Circle Center At X =    51.410 ; Y =   150.335 ; and Radius =   116.496
       Factor of Safety
      ***    1.560   ***
Failure Surface Specified By 20 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        35.000       35.000
```

```
    2         39.945       35.740
    3         44.877       36.561
    4         49.795       37.463
    5         54.697       38.446
    6         59.583       39.509
    7         64.451       40.653
    8         69.299       41.876
    9         74.126       43.179
   10         78.931       44.562
   11         83.713       46.023
   12         88.470       47.562
   13         93.201       49.180
   14         97.905       50.875
   15        102.580       52.647
   16        107.226       54.496
   17        111.840       56.421
   18        116.423       58.422
   19        120.971       60.498
   20        121.679       60.835
Circle Center At X =    -7.460 ; Y =   335.785 ; and Radius =   303.767
       Factor of Safety
      ***    1.563   ***
Failure Surface Specified By 19 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         35.000       35.000
    2         39.932       35.820
    3         44.851       36.717
    4         49.756       37.689
    5         54.645       38.738
    6         59.517       39.862
    7         64.371       41.061
    8         69.206       42.335
    9         74.020       43.684
   10         78.813       45.107
   11         83.584       46.604
   12         88.331       48.175
   13         93.053       49.819
   14         97.749       51.537
   15        102.417       53.326
   16        107.058       55.188
   17        111.669       57.121
   18        116.250       59.126
   19        119.361       60.545
Circle Center At X =   -15.518 ; Y =   354.011 ; and Radius =   322.987
       Factor of Safety
      ***    1.570   ***
Failure Surface Specified By 22 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         35.000       35.000
    2         39.999       34.904
    3         44.999       34.959
    4         49.994       35.166
    5         54.982       35.525
    6         59.956       36.034
    7         64.912       36.693
    8         69.846       37.503
    9         74.753       38.461
   10         79.629       39.568
   11         84.469       40.822
   12         89.269       42.222
   13         94.025       43.767
   14         98.731       45.455
   15        103.384       47.285
   16        107.980       49.255
   17        112.514       51.363
   18        116.981       53.608
   19        121.379       55.987
   20        125.703       58.498
```

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   21        129.948       61.139
   22        131.298       62.037
Circle Center At X =    40.689 ; Y =   199.750 ; and Radius =   164.848
       Factor of Safety
      ***    1.572   ***
Failure Surface Specified By 19 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         41.250      37.841
    2         46.250      37.811
    3         51.248      37.951
    4         56.238      38.260
    5         61.215      38.738
    6         66.174      39.385
    7         71.107      40.199
    8         76.010      41.180
    9         80.876      42.326
   10         85.701      43.637
   11         90.479      45.111
   12         95.204      46.746
   13         99.872      48.540
   14        104.475      50.491
   15        109.010      52.597
   16        113.471      54.856
   17        117.852      57.265
   18        122.150      59.820
   19        124.228      61.153
Circle Center At X =    44.628 ; Y =   185.281 ; and Radius =   147.479
       Factor of Safety
      ***    1.581   ***
Failure Surface Specified By 22 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         35.000      35.000
    2         39.998      34.873
    3         44.998      34.894
    4         49.995      35.065
    5         54.985      35.384
    6         59.963      35.852
    7         64.925      36.469
    8         69.866      37.233
    9         74.783      38.143
   10         79.670      39.200
   11         84.523      40.403
   12         89.338      41.749
   13         94.111      43.238
   14         98.838      44.869
   15        103.514      46.640
   16        108.135      48.550
   17        112.697      50.596
   18        117.196      52.778
   19        121.628      55.092
   20        125.989      57.538
   21        130.275      60.113
   22        133.750      62.344
Circle Center At X =    41.785 ; Y =   202.482 ; and Radius =   167.619
       Factor of Safety
      ***    1.587   ***
Failure Surface Specified By 22 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         35.000      35.000
    2         39.988      35.341
    3         44.969      35.786
    4         49.938      36.334
    5         54.896      36.985
    6         59.839      37.740
    7         64.765      38.597
    8         69.672      39.556
    9         74.558      40.617
```

10	79.421	41.780
11	84.258	43.044
12	89.069	44.407
13	93.850	45.871
14	98.599	47.434
15	103.315	49.095
16	107.995	50.854
17	112.638	52.710
18	117.241	54.663
19	121.803	56.710
20	126.321	58.852
21	130.793	61.088
22	133.004	62.250

Circle Center At X = 21.150 ; Y = 274.665 ; and Radius = 240.064

Factor of Safety

*** 1.587 ***

**** END OF GSTABL7 OUTPUT ****

Appendix E
Seismic & Geotechnical Calculations

USGS Design Maps Summary Report

User–Specified Input

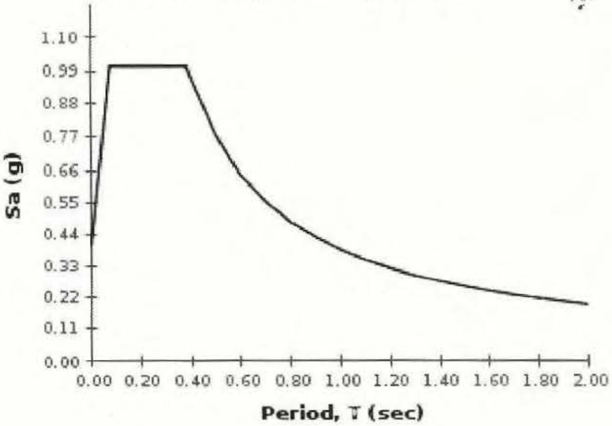
Report Title	El Camino Memorial Park Fri December 30, 2016 02:58:26 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	32.89519°N, 117.18317°W
Site Soil Classification	Site Class B – "Rock"
Risk Category	I/II/III

USGS–Provided Output

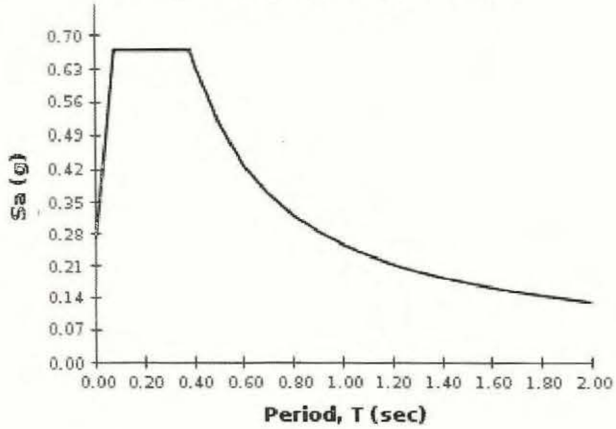
S_S = 1.005 g	S_{MS} = 1.005 g	S_{DS} = 0.670 g
S_1 = 0.386 g	S_{M1} = 0.386 g	S_{D1} = 0.258 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

MCE_R Response Spectrum



Design Response Spectrum



For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

USGS Design Maps Detailed Report

ASCE 7-10 Standard (32.89519°N, 117.18317°W)

Site Class B – "Rock", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1] $S_S = 1.005$ g

From Figure 22-2 [2] $S_1 = 0.386$ g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class B, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index $PI > 20$, • Moisture content $w \geq 40\%$, and • Undrained shear strength $\bar{s}_u < 500$ psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4-1: Site Coefficient F_a

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_S

For Site Class = B and S_S = 1.005 g, F_a = 1.000

Table 11.4-2: Site Coefficient F_v

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_1

For Site Class = B and S_1 = 0.386 g, F_v = 1.000

Equation (11.4-1): $S_{MS} = F_aS_S = 1.000 \times 1.005 = 1.005$ g

Equation (11.4-2): $S_{M1} = F_vS_1 = 1.000 \times 0.386 = 0.386$ g

Section 11.4.4 — Design Spectral Acceleration Parameters

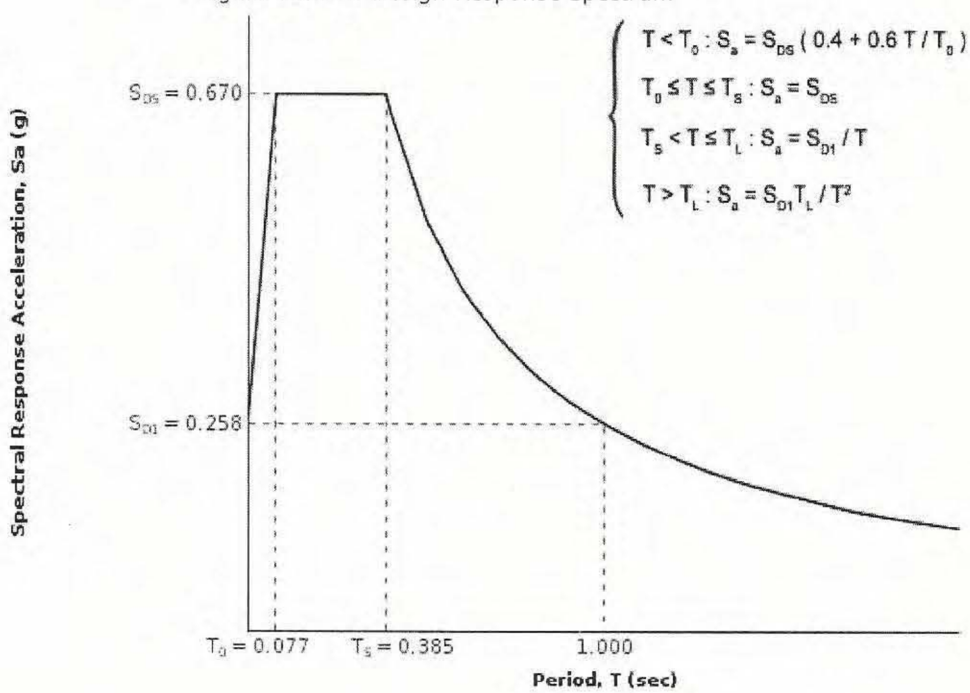
Equation (11.4-3): $S_{DS} = ⅔\ S_{MS} = ⅔ \times 1.005 = 0.670$ g

Equation (11.4-4): $S_{D1} = ⅔\ S_{M1} = ⅔ \times 0.386 = 0.258$ g

Section 11.4.5 — Design Response Spectrum

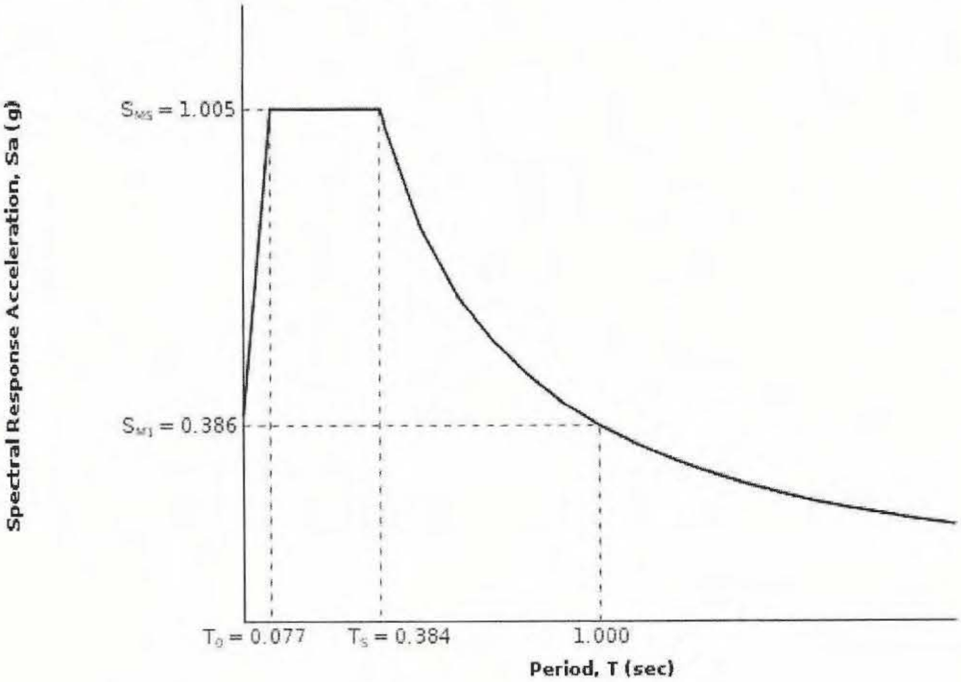
From Figure 22-12 [3] $T_L = 8$ seconds

Figure 11.4-1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] PGA = 0.407

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.407 = 0.407$ g x 2/3 = 0.27 g = MHA

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = B and PGA = 0.407 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] C_{RS} = 0.931

From Figure 22-18 [6] C_{R1} = 0.996

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 0.670 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.258 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

USGS
science for a changing world

Geologic Hazards Science Center

2008 Interactive Deaggregations

This is a preliminary version of the 2008 NSHMP PSHA Interactive Deaggregation web site. In this initial release, the 2008–update source and attenuation models of the NSHMP (Petersen and others, 2008) are used with just one exception. For the New Madrid Seismic Zone (NMSZ), the deaggregation source model is set up for the "unclustered" event branches only. These unclustered New Madrid sources are given full weight (90% weight to the 500 year mean recurrence models; 10% weight to the 1000–year mean recurrence models) whereas in the 2008 NSHMP PSHA they are only given 50% weight. Clustered–source models receive the other 50% weight in 2008 NSHMP PSHA. This is a temporary difference. The interactive deaggregation will include the NMSZ clustered–source models when a few software checkups are completed.

Seismic–hazard deaggregations are available for the following spectral periods anywhere in the conterminous U.S: 0.0 s (PGA), 0.1 s, 0.2 s, 0.3 s, 0.5 s, 1.0 s, and 2.0 s. This is the same set of periods that has been available at the USGS interactive deaggregation web sites since 1996 (for sites in the conterminous United States).

In the western US, long–period seismic–hazard deaggregations at 3.0 s, 4.0 s, and 5.0 s are also available at this web site. More...

FAQ Documentation 1996 Update 2002 Update Feedback

Site Name El Camino Memorial Park

Enter address instead

Latitude 32.89519 **Longitude** -117.18317

Exceedance Probability 10% ▾ **in** 50 years ▾

Spectral Period 0.0 seconds (Peak Ground Acceleration) ▾

V_s30 (m/s) 1000 What values can I use at various locations?

Run GMPE Deaggs? ◉ **Yes** ○ **No** What's this?

Additional Output ◉ **Geographic Deagg** What's this? ○ **Conditional Mean Spectra** ○ **None**

(Show Map)

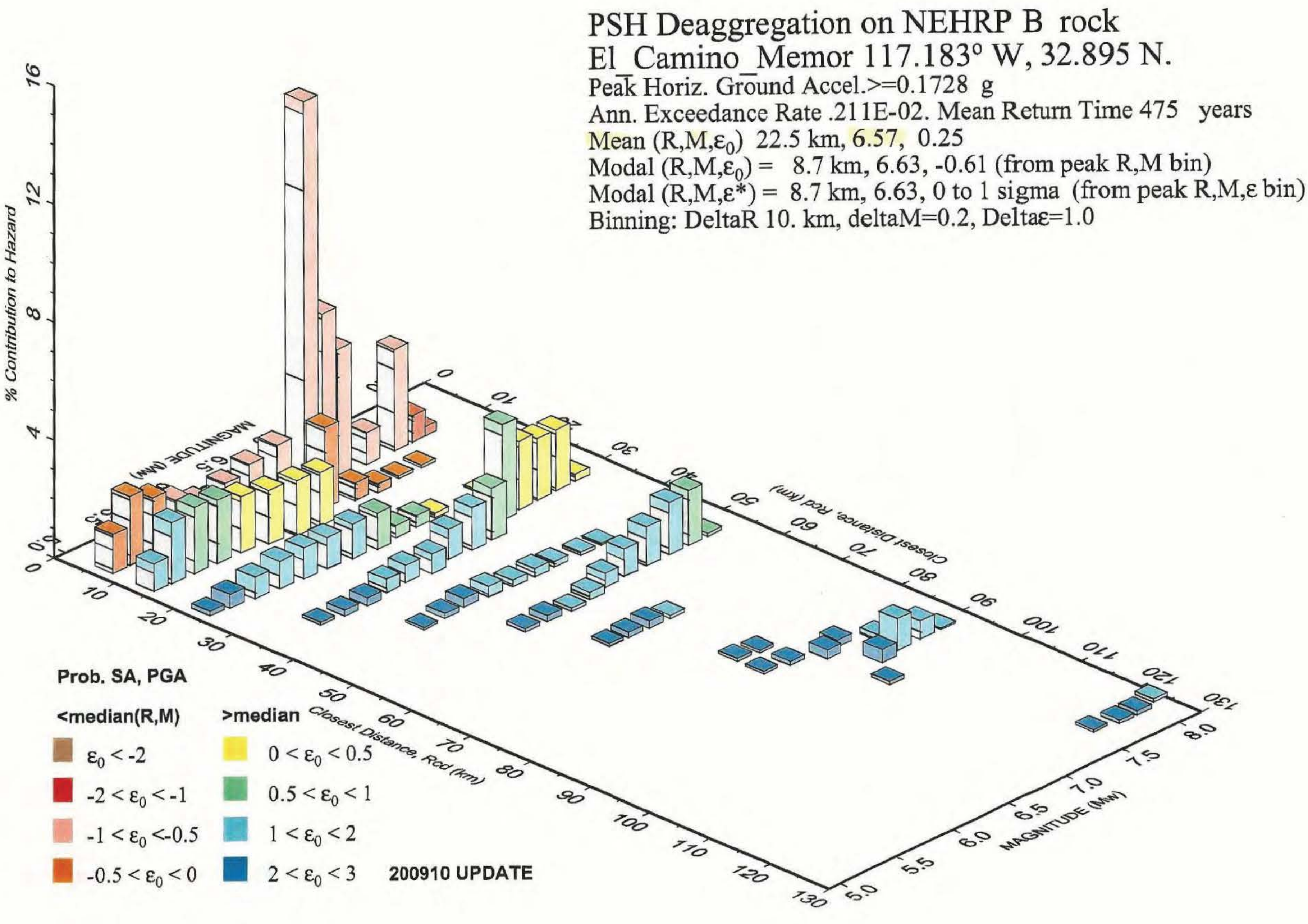
El Camino Memorial Park [TXT | PDF | GIF | GeoPDF | GeoGIF]

32.90°N 117.18°W – 10% in 50 years. Peak Ground Acceleration V_s^{30} 1000.0 m/s

Compute

SHARE

References to non-U.S. Department of the Interior (DOI) products do not constitute an endorsement by the DOI. By viewing the Google Maps API on this web site the user agrees to these Terms of Service set forth by Google.


PSH Deaggregation on NEHRP B rock
El_Camino_Memor 117.183° W, 32.895 N.
Peak Horiz. Ground Accel.>=0.1728 g
Ann. Exceedance Rate .211E-02. Mean Return Time 475 years
Mean (R,M,ε0) 22.5 km, 6.57, 0.25
Modal (R,M,ε0) = 8.7 km, 6.63, -0.61 (from peak R,M bin)
Modal (R,M,ε*) = 8.7 km, 6.63, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
ε0 < -2
-2 < ε0 < -1
-1 < ε0 <-0.5
-0.5 < ε0 < 0
0 < ε0 < 0.5
0.5 < ε0 < 1
1 < ε0 < 2
2 < ε0 < 3
200910 UPDATE

where *NRF* is a factor that accounts for the nonlinear response of the materials above the slide plane; u is displacement; and D_{5-95} is the duration of strong shaking, a function of earthquake magnitude and distance.

Blake and others (2002) have simplified the process of estimating f_{eq} for ranges of magnitude and distance by preparing sets of curves for two displacement (u) values, 5 cm and 15 cm. These curves are reproduced in Figure 1.

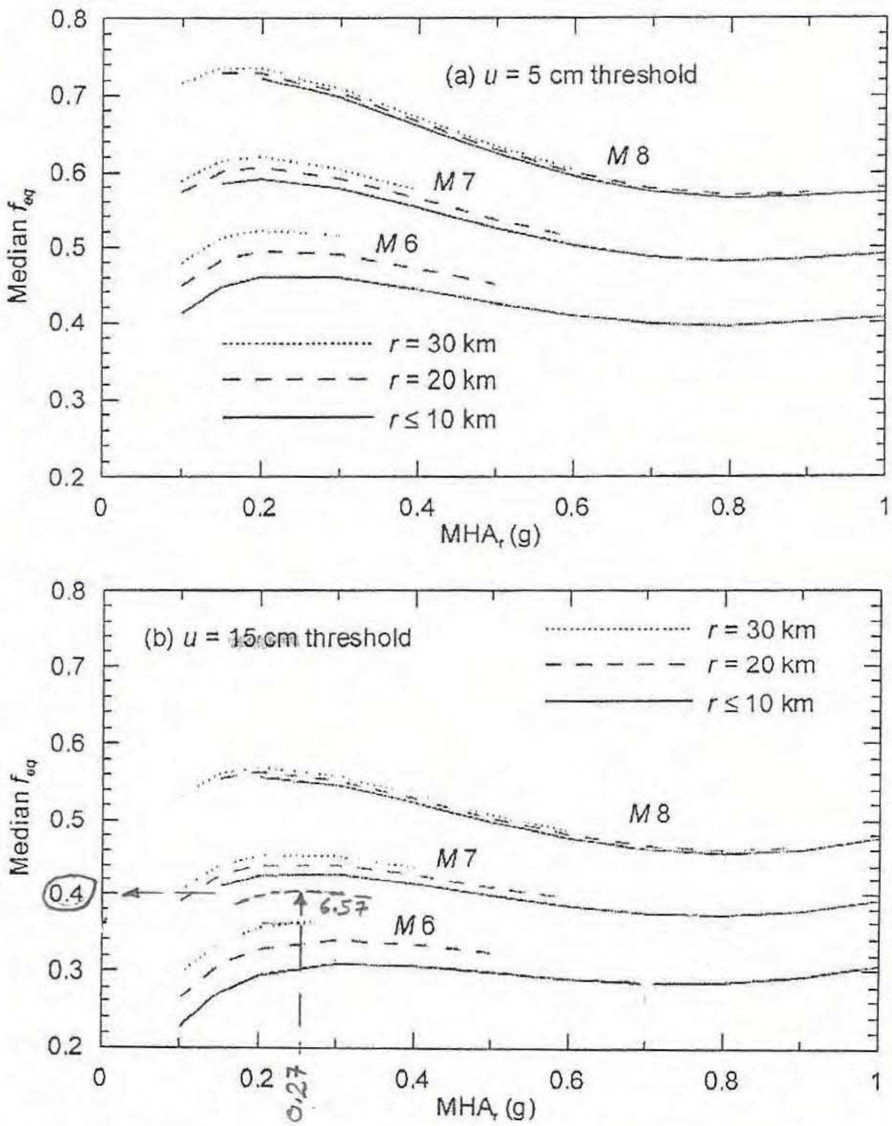


Figure 1. Values of f_{eq} as a Function of MHA_r, Magnitude and Distance for Threshold Displacements of (a) 5 cm and (b) 15 cm (Modified from Blake and others, 2002).

conservative factors of safety (Seed, 1979; Chowdhury, 1978). Furthermore, the practice of reducing the PGA by a "repeatable acceleration" factor to obtain a pseudo-static coefficient has no basis in the scientific or engineering literature.

There have been a number of published articles that provide guidance in the selection of an appropriate seismic coefficient for pseudo-static analyses. Seed's 1979 article (the 19th Rankine Lecture) summarizes the factors to be considered in evaluating dynamic stability of earth-and rock-fill embankments. After evaluating all of the available data on earthquake-induced deformations of embankment dams, Seed recommended some basic guidelines for making preliminary evaluations of embankments to ensure acceptable performance (i.e., permanent deformations which would not imperil the overall structural integrity of an embankment dam). These recommendations were: using a pseudo-static coefficient of 0.10 for magnitude 6½ earthquakes and 0.15 for magnitude 8¼ earthquakes, with an acceptable factor of safety of the order of 1.15. Seed believed that his guidelines would ensure that permanent ground deformations would be acceptably small. Seed also made extensive commentary on the choice of appropriate material strengths, and limited his recommendations to those embankments composed of materials that do not undergo severe strength loss due to seismic shaking with an expected crest acceleration of less than 0.75g.

The limitations to selecting seismic coefficients on the basis of these references are twofold. First, the magnitude of acceptable displacements for earth embankments, roughly one meter, is far greater than what is acceptable for structures meant for human occupancy. Second, they only peripherally account for differences in earthquake magnitude and distance at differing sites, implying that resulting stability analyses will be over-conservative in some cases and under-conservative in others.

To address these significant limitations, Blake and others (2002) and Stewart and others (2003) used the simplified design procedures developed by Bray and others (1998) to develop a "screen analysis procedure," based on a pseudo-static approach that accounts for the anticipated seismicity at a site and allows for different levels of acceptable displacements. By their formulation, the seismic coefficient, k_{eq}, is derived from,

$$k_{eq} = f_{eq} * MHA_r$$

2/3 of PGAm

0.4 x 0.27 = 0.11 use 0.2 g

where MHA_r is the maximum horizontal acceleration at the site for a soft rock site condition; g is the acceleration due to gravity; and f_{eq} is a factor related to the seismicity of the site. The formula for f_{eq} is,

$$f_{eq} = \frac{NRF}{3.477}\left[1.87 - \log_{10}\left(\frac{u}{(MHA_r / g) * NRF * D_{5-95}}\right)\right]$$

CALTRANS METHOD OF FLEXIBLE PAVEMENT DESIGN: *GRAVEL EQUIVALENT APPROACH*

Project: El Camino **Client:** Clark and Green
No: **Date:** 12/30/2016

Base Type: 2
Base Type: "Untreated A. B."
Base Gf: 1.1

Base R-Value: 78

A.C. FS: 0.2
Full A.C. Sect FS: 0.1

TI	Subgrade R-Value	GE_t feet)	GE_{ac} feet)	G_f	Minimum T_{ac} feet)	Use T_{ac} inches)	Actual GE_{ac} feet)	GE_b feet)	Minimum T_b feet)	Use T_b inches)	Full Sect T_{ac} feet)	Use Full Sect T_{ac} inches)
4	16	1.08	0.48	2.50	0.19	**2.5**	0.52	0.55	0.50	**6.5**	0.47	**6.0**
4.5	16	1.21	0.52	2.50	0.21	**2.5**	0.52	0.69	0.63	**8.0**	0.52	**6.5**
5	16	1.34	0.55	2.50	0.22	**3.0**	0.63	0.72	0.65	**8.0**	0.58	**7.0**
5.5	16	1.48	0.59	2.32	0.25	**3.5**	0.68	0.80	0.73	**9.0**	0.68	**8.5**
6	16	1.61	0.62	2.32	0.27	**3.5**	0.68	0.94	0.85	**10.5**	0.74	**9.0**
6.5	16	1.75	0.66	2.14	0.31	**4.0**	0.71	1.03	0.94	**11.5**	0.86	**10.5**
7	16	1.88	0.69	2.14	0.32	**4.0**	0.71	1.17	1.06	**13.0**	0.93	**11.5**
8	16	2.15	0.76	2.01	0.38	**5.0**	0.84	1.31	1.19	**14.5**	1.12	**13.5**
9	16	2.42	0.83	1.89	0.44	**5.5**	0.87	1.55	1.41	**17.0**	1.33	**16.0**
10	16	2.69	0.90	1.79	0.51	**6.5**	0.97	1.72	1.56	**19.0**	1.56	**19.0**
11	16	2.96	0.97	1.71	0.57	**7.0**	1.00	1.96	1.78	**21.5**	1.79	**21.5**
12	16	3.23	1.04	1.64	0.64	**8.0**	1.09	2.13	1.94	**23.5**	2.03	**24.5**
13	16	3.49	1.12	1.57	0.71	**9.0**	1.18	2.32	2.11	**25.5**	2.29	**27.5**

BEARING CAPACITY FOR SHALLOW FOUNDATIONS

based on Terzaghi's Method

INPUT PARAMETERS		
SOIL PROPERTIES		Bedrock
Cohesion, C	=	150 psf
Friction Angle, Phi	=	32 degrees
Soil Unit Weight, W	=	100 pcf
FOOTING DIMMENSIONS		
Depth, D	=	1.0 ft
Width, W	=	1.0 ft
SAFETY FACTOR	=	3.0

OUTPUT RESUTS

BEARING CAPACITY FACTORS

Tan Phi	=	0.6
Nc	=	44.0
Nq	=	28.5
Ng	=	28.0

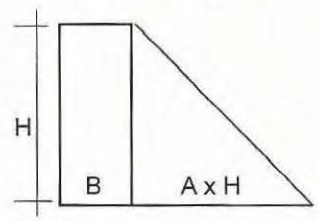
ALLOWABLE BEARING PRESSURES: SQUARE FOOTINGS

Qa =	**4200**	psf		
plus	900	psf	for add'l ft of depth over	1 ft.
plus	400	psf	for add'l ft of width over	1 ft.
		total	**not to exceed**	8400 psf

ALLOWABLE BEARING PRESSURES: CONTINUOUS FOOTINGS

Qa =	**3600**	psf		
plus	900	psf	for add'l ft of depth over	1 ft.
plus	500	psf	for add'l ft of width over	1 ft.
		total	**not to exceed**	7200 psf

PASSIVE PRESSURE	Friction /foot of depth in psf (A)	217
1.5 Safety Factor	Cohesion in psf (B)	361



COEFFICIENT OF FRICTION 0.4

Geotechnical Soilutions, Inc.	For:
501 S. Fairfax Ave. # 101	El Camino, BTS
Los Angeles, CA 90036	Address:
Phone (323) 937-1097	
Fax (323) 937-1099	Date: 12/29/2016 — Job No.: GS 16B12A

PILE SKIN FRICTION AND END BEARING

Per NAVFAC DM 7.2, 193 - 196

A - Allowable Skin Friction

ASF = ((KHC)(PO)(TAN FA) + (CA))/S.F.

Ho	= Thickness of fill or soft soil in feet (resistance ignored) =	1	ft
D	= Estimated embedment of pile in dense soil or rock in feet =	20	ft
B	=Pile Diameter in feet =	2	ft
Den. Ho	=In situ density of soft soil (Ho) in pound per cubic foot =	100	pcf
Den. D	=In situ density of supporting soil or rock (D) in pcf=	100	pcf
DW	=Depth of water below ground surface in feet=	50	ft
C	=Cohesion of the supporting soil in pound square foot =	300	psf
F	=Friction Angle in degrees =	32	degrees
S.F	=Safety factor=	3	
FA	=Friction angle between pile and soil = Use , 1 for steel, 2 for concrete piles =	2	
KHC	=Ratio of horizontal to vertical eff. stress in compression =	0.7	

Select from the following pile type:

Pile Type	KHC
Driven single H pile	0.5 - 1.0
Driven single displacement pile	1.0 - 1.5
Driven single displacement tapered pile	1.5 - 2.0
Driven jetted pile	0.4 - 0.9
Drilled pile , piles > 2 ft settlement usually controls	0.7

Nq =Bearing capacity factors for driven piles use 1, and drilled piles 2 — 2

PO =Effective stress (psf)

```
{IF G10>20*G11}{BRANCH B40}
{IF G14<G9}{BRANCH B36}
{IF G14<(G9+G10)}{BRANCH B38}
{LET B48,(2*(G9*G12)+(G10*G13))/2}
{BRANCH B50}
{LET B48,(2*((G9*G12)-(62.4*(G9-G14)))+(G10*(G13-62.4)))/2}
{BRANCH B50}
{LET B48,+(((2*(G9*G12)+(G14-G9)*G13)*.5*(G14-G9))+((2*((G9*G12)+(G14-G9)*G13))+((G9+G10-G14)*(G13-62.4)))*.5*(G9+G10-G14))/G10}
{BRANCH B50}
{IF G14<G9}{BRANCH B44}
{IF G14<(G9+20*G11)}{BRANCH B46}
{LET B48,+(((2*(G12*G9)+(G13*20*G11))*.5*20*G11)+((G12*G9)+(20*G11*G13))*(G10-20*G11))/G10}
{BRaNCH B50}
{LET B48,((2*((G9*G12)-((G9-G14)*62.4))+(20*G11*(G13-62.4)))*.5*(20*G11))/G10+((((G9*G12)-(G9-G14)*62.4)+(20*G11*(G13-62.4)))*(G10-20*G11))/G10}
{BRANCH B50}
{LET B48,+(((2*(G9*G12)+G13*(G14-G9))*.5*(G14-G9))+((2*((G9*G12)+G13*(G14-G9))+(G9+20*G11-G14)*(G13-62.4))*.5*(G9+20*G11-G14))+((G9*G12)+G13*(G14-G9)+(G9+20*G11-G14)*(G13-62.4))*(G10-20*G11))/G10}
{BRANCH B50}
```

PO= 1100 psf

FA= Friction Angle between pile and soil

```
{IF G19=1}{BRANCH B53}
{IF G19=2}{BRANCH B55}
{LET G52,"NOT VALID"}
{LET B56,20}
{BRANCH B58}                  {LET G59,((G20*B48*@TAN(@DEGTORAD(B56)))+(.9*G15))/G17}
{LET B56,.75*G16}{BRANCH B58}  {BRANCH B65}
```

FA= 24 Degrees

CA= Adhesion(psf)=0.9C

Skin Frict{BRANCH F54}

Skin Friction All	204.28	psf

B - Allowable End Bearing

AEB= ((PT)(Nq)+(C)(Ncs))/S.F.

PT =Effective vertical stress at pile tip (psf)

Nq =Bearing capacity factor for driven and drilled piles

Ncs =Bearing capacity factor for square and cylindrical

```
{IF G10<=20*G11}{BRANCH E67}
{LET B67,G14}                 {LET B67,(20*G11+G9)}
{BRANCH B68}                  {BRANCH B69}
                              {LET B67,(G10+G9)}
                              {BRANCH B69}
```

DW(rev.) 21 Degrees

```
{IF B67>(G10+G9)}{BRANCH E64}
{IF G10<20*G11}{BRANCH B71}
{IF G10>20*G11}{BRANCH B72}
{LET B73,(G9*G12)+(G10*G13)-((G10+G9-B67)*62.4)}
{BRANCH D72}        {IF G10<=20*G11}{BRANCH B74}
                    {LET B73,(G9*G12)+(20*G11*G13)-(((20*G11)+G9-B67)*62.4)}
{BRANCH B75}        {BRANCH B74}
{BRANCH D75}        {LET B76,@ROUND(G16,0)}
                    {BRANCH B77}
```

PT= 2100 psf

F(round) 32

```
{IF B76<=26}{LET B92,10}
{IF B76=27}{LET B92,13}
{IF B76=28}{LET B92,15}
{IF B76=29}{LET B92,18}
{IF B76=30}{LET B92,21}
{IF B76=31}{LET B92,24}
{IF B76=32}{LET B92,29}
{IF B76=33}{LET B92,35}    {IF B76>=40}{LET B92,145}
{IF B76=34}{LET B92,42}    {IF G28=1}{BRANCH B93}
{IF B76=35}{LET B92,50}    {LET B92,B92*.5}
{IF B76=36}{LET B92,62}    {BRANCH B93}
{IF B76=37}{LET B92,77}
{IF B76=38}{LET B92,86}
{IF B76=39}{LET B92,120}
{BRANCH D84}
```

Nq= 14.5

```
{IF (G10/G11)<3.5}{LET G93,"NOT VALID"}
```

AEB= {LET G95,+((B73*B92)+(G15*9))/G17}

End bearing all =	11050	psf