Appendix E
Geology

SLOVER DISTRIBUTION CENTER
DRAFT
ENVIRONMENTAL IMPACT REPORT

GEOTECHNICAL INVESTIGATION
BLOOMINGTON BUSINESS CENTER
SEC Slover Avenue and Laurel Avenue
Bloomington, California
for
JM Realty Group, Inc.

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

March 16, 2015

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation
SoCalGeo

JM Realty Group, Inc.
3535 Inland Empire Boulevard
Ontario, California 91764

Attention: Mr. Joe McKay

Project No.: **15G119-1**

Subject: **Geotechnical Investigation**
Bloomington Business Center
SEC Slover Avenue and Laurel Avenue
Bloomington, California

Gentlemen:

In accordance with your request, we have conducted a geotechnical investigation at the subject site. We are pleased to present this report summarizing the conclusions and recommendations developed from our investigation.

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Pablo Montes Jr.
Staff Engineer

John A. Seminara, GE 2294
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
JOHN A. SEMINARA
No. 2294
GEOTECHNICAL
STATE OF CALIFORNIA

Distribution: (2) Addressee

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

Presented below is a brief summary of the conclusions and recommendations of this investigation. Since this summary is not all inclusive, it should be read in complete context with the entire report.

Site Preparation

- Initial site preparation should include demolition of the existing residence and the existing pavements, including all foundations, floor slabs, utilities, and any other subsurface improvements that will not remain in place for use with the new development. Debris resultant from demolition should be disposed of off-site.
- The majority of the site possesses heavy native grass and weed growth. Initial site stripping should include removal of all surficial vegetation and organic debris. These materials should be disposed of off-site.
- Based on the variable strengths and marginal consolidation/collapse characteristics of the near-surface soils, remedial grading is recommended to be performed within the proposed building pad area. The existing soils within the proposed building area should be overexcavated to a depth of 3 feet below existing grade and to a depth of 3 feet below proposed pad grade. Within the building area, the proposed foundation influence zones should be overexcavated to a depth of 3 feet below proposed foundation bearing grade.
- After overexcavation has been completed, the resulting subgrade soils should be evaluated by the geotechnical engineer to identify any additional soils that should be overexcavated. The resulting subgrade should then be scarified to a depth of 12 inches, and moisture conditioned to 2 to 4 percent above the optimum moisture content. The previously excavated soils may then be replaced as compacted structural fill.
- The new parking and drive area subgrade soils are recommended to be scarified to a depth of 12± inches, thoroughly moisture conditioned and recompacted.

Building Foundations

- Conventional shallow foundations, supported in newly placed compacted fill.
- 3,000 lbs/ft^2 maximum allowable soil bearing pressure.
- Reinforcement consisting of at least two (2) No. 5 rebars (1 top and 1 bottom) in strip footings. Additional reinforcement may be necessary for structural considerations.

Building Floor Slab

- Conventional Slab-on-Grade, 5 inches thick.
- Reinforcement is not considered necessary, for geotechnical considerations. The actual floor slab reinforcement should be determined by the structural engineer, based on the imposed slab loading.
- Modulus of Subgrade Reaction: 150 lbs/in^3.

Pavements

ASPHALT PAVEMENTS (R = 50)					
Materials	**Thickness (inches)**				
	Parking Stalls (TI = 4.0)	Auto Drive Lanes (TI = 5.0)	Truck Traffic		
			(TI = 6.0)	(TI = 7.0)	(TI = 8.0)
Asphalt Concrete	3	3	3½	4	5
Aggregate Base	3	3	4	5	5
Compacted Subgrade	12	12	12	12	12

PORTLAND CEMENT CONCRETE PAVEMENTS			
Materials	**Thickness (inches)**		
	Automobile and Light Truck Traffic (TI =5.0 & 6.0)	Truck Traffic	
		(TI =7.0)	(TI =8.0)
PCC	5	6	7
Compacted Subgrade (95% minimum compaction)	12	12	12

2.0 SCOPE OF SERVICES

The scope of services performed for this project was in accordance with our Proposal No. 14P406R2 dated February 19, 2015. The scope of services included a visual site reconnaissance, subsurface exploration, laboratory testing, and geotechnical engineering analysis to provide criteria for preparing the design of the building foundations, building floor slab, and parking lot pavements along with site preparation recommendations and construction considerations for the proposed development. The evaluation of the environmental aspects of this site was beyond the scope of services for this geotechnical investigation.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Conditions

The subject site is located at the southeast corner of Slover Avenue and Laurel Avenue in Bloomington, an unincorporated area of San Bernardino County, California. The site is bounded to the south by single family residences and a vacant lot, to the west by Laurel Avenue, to the north by Slover Avenue, and to the east by Locust Avenue. The general location of the site is illustrated on the Site Location Map, included as Plate 1 of this report.

The subject site is a rectangular-shaped parcel, 17± acres in size. The majority of the site is vacant and undeveloped. However, the southeast corner of the site is developed with a single family residential lot. The area of the residential lot is approximately 1 acre in size. The residential lot consists of a one and two-story structure that is of wood frame, stucco, and brick construction, presumably supported on conventional shallow foundations with a concrete slab-on-grade floor. Several small wooden sheds are located west of the two-story structure. The residence in surrounded by landscaped areas with several large trees. An asphaltic concrete driveway, located on the east side of the residence, connects the residence to Locust Avenue. The residential lot is surrounded by a chain link fence. Based on a review of the Fontana 7.5' Quadrangle, the northwest corner of the site may have been previously developed with a commercial/industrial building. Ground surface cover throughout the majority of the site consists of heavy native grass and weed growth. Several small to large trees are located within the residential lot and in the northeast corner of the site. Several small piles of debris were observed scattered throughout the site.

Topographic information for the site was obtained from a preliminary grading plan prepared by Huitt-Zollars, Inc. (HZ), the project civil engineer. The preliminary grading plan indicates that the site topography generally slopes downward to the south to southeast at a gradient of 1± percent, with 10± feet of elevation differential across the subject site. The maximum site elevation is 1077.5± feet mean sea level (msl) located in the northwest corner of the subject site and the minimum site elevation is 1067± feet msl in the southeast corner of the subject site.

3.2 Proposed Development

Based on the preliminary grading plan prepared by HZ, the site will be developed with one (1) commercial/industrial building, 340,000± ft^2 in size. The building will generally encompass the central region of the site. Loading docks will be constructed on the north side of the building. It is expected that the building will be surrounded by asphaltic concrete pavements in the parking and drive areas and Portland cement concrete pavements in the loading dock areas. Concrete flatwork and some landscaping are expected to be included at the site.

Detailed structural information has not been provided. It is assumed that the new building will be a single-story structure of tilt-up concrete construction, typically supported on a shallow foundation system with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 80 kips and 3 to 5 kips per linear foot, respectively.

The proposed development is not expected to include any significant amounts of below grade construction such as basements or crawl spaces. Based on our review of the preliminary grading plan, fills of 1 to 4± feet will be required in order to achieve the proposed building pad grade. Retaining walls of 4± feet in height are also expected to be necessary in the areas of the new truck loading docks.

4.0 SUBSURFACE EXPLORATION

4.1 Scope of Exploration/Sampling Methods

The subsurface exploration conducted for this project consisted of eight (8) borings advanced to depths of 15 to 30± feet below current existing site grades. All of the borings were logged during drilling by a member of our staff.

The borings were advanced with hollow-stem augers, by a truck-mounted drilling rig. Representative bulk and in-situ soil samples were taken during drilling. Relatively undisturbed in-situ samples were taken with a split barrel "California Sampler" containing a series of one inch long, 2.416± inch diameter brass rings. This sampling method is described in ASTM Test Method D-3550. In-situ samples were also taken using a 1.4± inch inside diameter split spoon sampler, in general accordance with ASTM D-1586. Both of these samplers are driven into the ground with successive blows of a 140-pound weight falling 30 inches. The blow counts obtained during driving are recorded for further analysis. Bulk samples were collected in plastic bags to retain their original moisture content. The relatively undisturbed ring samples were placed in molded plastic sleeves that were then sealed and transported to our laboratory.

The approximate locations of the borings are indicated on the Boring Location Plan, included as Plate 2 in Appendix A of this report. The Boring Logs, which illustrate the conditions encountered at the boring locations, as well as the results of some of the laboratory testing, are included in Appendix B.

4.2 Geotechnical Conditions

Alluvium

Native alluvial soils were encountered at the ground surface at all of the boring locations. The near-surface alluvium generally consists of loose to medium dense silty fine sands, extending to depths of 2½± to 5½± feet. Beneath these soils, the alluvium consists of medium dense to dense gravelly fine to coarse sands, with varying silt content and occasional cobbles, extending to depths of 12 to 17± feet below the existing site grades. Some of the borings encountered a loose sandy silt stratum, possessing moist to very moist moisture contents, located between the depths of 12 to 17± feet. At greater depths, the alluvial soils consist of medium dense silty fine sands and fine to coarse sands, extending to the maximum depth explored of 30± feet. The alluvial soils generally possess moisture contents ranging from dry to damp with some occasional zones of moist to very moist soils.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the lack of any water within the borings, and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 30± feet at the time of the subsurface exploration.

5.0 LABORATORY TESTING

The soil samples recovered from the subsurface exploration were returned to our laboratory for further testing to determine selected physical and engineering properties of the soils. The tests are briefly discussed below. It should be noted that the test results are specific to the actual samples tested, and variations could be expected at other locations and depths.

Classification

All recovered soil samples were classified using the Unified Soil Classification System (USCS), in accordance with ASTM D-2488. Field identifications were then supplemented with additional visual classifications and/or by laboratory testing. The USCS classifications are shown on the Boring Logs and are periodically referenced throughout this report.

In-situ Density and Moisture Content

The density has been determined for selected relatively undisturbed ring samples. These densities were determined in general accordance with the method presented in ASTM D-2937. The results are recorded as dry unit weight in pounds per cubic foot. The moisture contents are determined in accordance with ASTM D-2216, and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Consolidation

Selected soil samples have been tested to determine their consolidation potential, in accordance with ASTM D-2435. The testing apparatus is designed to accept either natural or remolded samples in a one-inch high ring, approximately 2.416 inches in diameter. Each sample is then loaded incrementally in a geometric progression and the resulting deflection is recorded at selected time intervals. Porous stones are in contact with the top and bottom of the sample to permit the addition or release of pore water. The samples are typically inundated with water at an intermediate load to determine their potential for collapse or heave. The results of the consolidation testing are plotted on Plates C-1 through C-8 in Appendix C of this report.

Soluble Sulfates

A representative sample of the near-surface soils was submitted to a subcontracted analytical laboratory for determination of soluble sulfate content. Soluble sulfates are naturally present in soils, and if the concentration is high enough, can result in degradation of concrete which comes into contact with these soils. The result of the soluble sulfate testing is presented below, and is discussed further in a subsequent section of this report.

Sample Identification	Soluble Sulfates (%)	ACI-318 Classification
B-1 @ 0 to 5 feet	<0.001	Negligible
B-8 @ 0 to 5 feet	<0.001	Negligible

Expansion Index

The expansion potential of the on-site soils was determined in general accordance with ASTM D-4829. The testing apparatus is designed to accept a 4-inch diameter, 1-in high, remolded sample. The sample is initially remolded to 50± 1 percent saturation and then loaded with a surcharge equivalent to 144 pounds per square foot. The sample is then inundated with water, and allowed to swell against the surcharge. The resultant swell or consolidation is recorded after a 24-hour period. The results of the EI testing are as follows:

Sample Identification	**Expansion Index**	**Expansion Potential**
B-7 @ 0 to 5 feet	0	Very Low (Non-expansive)

Maximum Dry Density and Optimum Moisture Content

A representative bulk sample has been tested for its maximum dry density and optimum moisture content. The results have been obtained using the Modified Proctor procedure, per ASTM D-1557 and are presented on Plate C-9 in Appendix C of this report. This test is generally used to compare the in-situ densities of undisturbed field samples, and for later compaction testing. Additional testing of other soil types or soil mixes may be necessary at a later date.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our review, field exploration, laboratory testing and geotechnical analysis, the proposed development is considered feasible from a geotechnical standpoint. The recommendations contained in this report should be taken into the design, construction, and grading considerations. The recommendations are contingent upon all grading and foundation construction activities being monitored by the geotechnical engineer of record. The Grading Guide Specifications, included as Appendix D, should be considered part of this report, and should be incorporated into the project specifications. The contractor and/or owner of the development should bring to the attention of the geotechnical engineer any conditions that differ from those stated in this report, or which may be detrimental for the development.

6.1 Seismic Design Considerations

The subject site is located in an area which is subject to strong ground motions due to earthquakes. The performance of a site specific seismic hazards analysis was beyond the scope of this investigation. However, numerous faults capable of producing significant ground motions are located near the subject site. Due to economic considerations, it is not generally considered reasonable to design a structure that is not susceptible to earthquake damage. Therefore, significant damage to structures may be unavoidable during large earthquakes. The proposed structure should, however, be designed to resist structural collapse and thereby provide reasonable protection from serious injury, catastrophic property damage and loss of life.

Faulting and Seismicity

Research of available maps indicates that the subject site is not located within an Alquist-Priolo Earthquake Fault Zone. Therefore, the possibility of significant fault rupture on the site is considered to be low.

Seismic Design Parameters

Based on standards in place at the time of this report, the proposed development is expected to be designed in accordance with the requirements of the 2013 edition of the California Building Code (CBC). The CBC provides procedures for earthquake resistant structural design that include considerations for on-site soil conditions, occupancy, and the configuration of the structure including the structural system and height. The seismic design parameters presented below are based on the soil profile and the proximity of known faults with respect to the subject site.

The 2013 CBC Seismic Design Parameters have been generated using U.S. Seismic Design Maps, a web-based software application developed by the United States Geological Survey. This software application, available at the USGS web site, calculates seismic design parameters in accordance with the 2013 CBC, utilizing a database of deterministic site accelerations at 0.01 degree intervals. The table below is a compilation of the data provided by the USGS application. A copy of the output generated from this program is included in Appendix E of this report. A copy of the Design Response Spectrum, as generated by the USGS application is also included in Appendix E. Based on this output, the following parameters may be utilized for the subject site:

2013 CBC SEISMIC DESIGN PARAMETERS

Parameter		**Value**
Mapped Spectral Acceleration at 0.2 sec Period	S_S	1.500
Mapped Spectral Acceleration at 1.0 sec Period	S_1	0.620
Site Class	---	D
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	1.500
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	0.931
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.000
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.620

Liquefaction

Liquefaction is the loss of the strength in generally cohesionless, saturated soils when the pore-water pressure induced in the soil by a seismic event becomes equal to or exceeds the overburden pressure. The primary factors which influence the potential for liquefaction include groundwater table elevation, soil type and grain size characteristics, relative density of the soil, initial confining pressure, and intensity and duration of ground shaking. The depth within which the occurrence of liquefaction may impact surface improvements is generally identified as the upper 50 feet below the existing ground surface. Liquefaction potential is greater in saturated, loose, poorly graded fine sands with a mean (d_{50}) grain size in the range of 0.075 to 0.2 mm (Seed and Idriss, 1971). Clayey (cohesive) soils or soils which possess clay particles (d<0.005mm) in excess of 20 percent (Seed and Idriss, 1982) are generally not considered to be susceptible to liquefaction, nor are those soils which are above the historic static groundwater table.

The California Geological Survey (CGS) has not yet conducted detailed seismic hazards mapping in the area of the subject site. The general liquefaction susceptibility of the site was determined by research of the San Bernardino County Official Land Use Plan, General Plan, Geologic Hazard Overlay Map FH29D for the Fontana Quadrangle, which indicates that the subject site is not located within an area of liquefaction susceptibility. Additionally, the subsurface conditions encountered at the borings drilled at the subject site are not considered to be conducive to liquefaction. These conditions generally consist of medium dense to dense, well graded, granular soils, and no evidence of a static water table within the upper 30± feet. Based on the mapping performed by the county of San Bernardino and the subsurface conditions encountered at the boring locations, liquefaction is not considered to be a design concern for this project.

6.2 Geotechnical Design Considerations

General

The near-surface native soils exhibit variable in-situ dry densities and marginal consolidation and collapse characteristics. The existing near-surface soils, in their present condition, are not considered suitable to support the foundation loads of the new structure. Based on these considerations, remedial grading is necessary within the proposed building area in order to remove and replace the near-surface alluvial soils as compacted structural fill.

Settlement

Laboratory testing indicates that some of the near surface soils possess a potential for collapse when exposed to moisture infiltration. These soils also possess a potential for consolidation when exposed to load increases in the range of those that will be exerted by the foundations of the new structure. The recommended remedial grading will remove most of these soils from within the zone of influence of the new foundations. The native alluvium that will remain in place below the recommended depth of overexcavation will not be significantly influenced by the foundation loads of the new structure. Provided that the recommended remedial grading is completed, the post construction settlements of the proposed structure are expected to be within tolerable limits.

Soluble Sulfates

The results of the soluble sulfate testing, as discussed in Section 5.0 of this report, indicate a soluble sulfate concentration of less than 0.001 percent. This concentration is considered to be negligible with respect to the American Concrete Institute (ACI) Publication 318-05 Building Code Requirements for Structural Concrete and Commentary, Section 4.3. Therefore, specialized concrete mix designs are not considered to be necessary, with regard to sulfate protection purposes. It is, however, recommended that additional soluble sulfate testing be conducted at the completion of grading to verify the soluble sulfate

Expansion

The near-surface soils generally consist of silty sands. Laboratory testing indicates that the tested soils possess a very low expansion index (EI) of 0. Therefore, the near surface soils are considered to possess a very low potential for expansion. Therefore, no design considerations related to expansive soils are considered warranted for this site.

Shrinkage/Subsidence

Based on a comparison of in-situ densities and the maximum dry density test results, and recent experience with similar soils on adjacent sites, removal of the near surface alluvial soils and recompaction is estimated to result in an average shrinkage of 8 to 12 percent.

Minor ground subsidence is expected to occur in the soils below the zone of removal due to settlement and machinery working. The subsidence is estimated to be 0.1 feet. This estimate is based on previous experience in the area of the subject site and the subsurface conditions encountered at the test boring locations. The actual amount of subsidence is expected to be variable and will be dependant on the type of machinery used, repetitions of use, and dynamic effects, all of which are difficult to assess precisely.

Grading and Foundation Plan Review

Grading or foundation plans were not available at the time of this report. It is therefore recommended that we be provided with copies of the preliminary grading and foundation plans, when they become available, for review with regard to the conclusions, recommendations, and assumptions contained within this report.

6.3 Site Grading Recommendations

The grading recommendations presented below are based on the subsurface conditions encountered at the boring locations and our understanding of the proposed development. We recommend that all grading activities be completed in accordance with the Grading Guide Specifications included as Appendix D of this report, unless superseded by site-specific recommendations presented below.

Site Stripping and Demolition

Initial site preparation should include removal of the heavy surficial vegetation. Based on conditions encountered at the time of the subsurface exploration, significant stripping of native grass and weed growth will be necessary within the majority of the site. Additionally, the residential lot is surrounded by landscaped areas and several large trees. These should be removed and disposed of off-site. The actual extent of site stripping should be determined in the field by the geotechnical engineer, based on the organic content and stability of the materials encountered.

The proposed development will require demolition of the existing residence. Additionally, any existing improvements that will not remain in place for use with the new development should be removed in their entirety. This should include all foundations, floor slabs, utilities, and any other subsurface improvements associated with the existing structure. Debris resultant from demolition should be disposed of offsite.

Treatment of Existing Soils: Building Pad

Remedial grading should be performed within the proposed building area in order to remove the near-surface compressible/collapsible native soils. Based on conditions encountered at the boring locations, the existing soils within the proposed building area are recommended to be overexcavated to a depth of at least 3 feet below existing grade and to a depth of at least 3 feet below proposed building pad subgrade elevation, whichever is greater.

Additional overexcavation should be performed within the influence zones of the new foundations, to provide for a new layer of compacted structural fill extending to a depth of 3 feet below proposed bearing grade.

The overexcavation areas should extend at least 5 feet beyond the building and foundation perimeters, and to an extent equal to the depth of fill placed below the foundation bearing grade, whichever is greater. If the proposed structure incorporates any exterior columns (such as for a canopy or overhang) the area of overexcavation should also encompass these areas.

Following completion of the overexcavation, the subgrade soils within the building area should be evaluated by the geotechnical engineer to verify their suitability to serve as the structural fill subgrade, as well as to support the foundation loads of the new structure. This evaluation should include proofrolling and probing to identify any soft, loose or otherwise unstable soils that must be removed. Some localized areas of deeper excavation may be required if loose, porous, or low density native soils are encountered at the base of the overexcavation.

After a suitable overexcavation subgrade has been achieved, the exposed soils should be scarified to a depth of at least 12 inches and thoroughly moisture conditioned to achieve a moisture content of 2 to 4 percent above optimum moisture content. The subgrade soils should then be recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. The previously excavated soils may then be replaced as compacted structural fill.

Treatment of Existing Soils: Retaining Walls and Site Walls

The existing soils within the areas of any proposed retaining walls should be overexcavated to a depth of 3 feet below foundation bearing grade and replaced as compacted structural fill as discussed above for the proposed building pad. The foundation areas for non-retaining site walls should be overexcavated to a depth of 2 foot below proposed foundation bearing grade. The overexcavation subgrade soils should be evaluated by the geotechnical engineer prior to scarifying, moisture conditioning, and recompacting the upper 12 inches of exposed subgrade soils. The previously excavated soils may then be replaced as compacted structural fill.

Treatment of Existing Soils: Parking and Drive Areas

Based on economic considerations, overexcavation of the existing soils in the new parking and drive areas is not considered warranted, with the exception of areas where lower strength, or unstable, soils are identified by the geotechnical engineer during grading. Subgrade preparation in the new parking and drive areas should initially consist of removal of all soils disturbed during stripping and demolition operations.

The geotechnical engineer should then evaluate the subgrade to identify any areas of additional unsuitable soils. Any such materials should be removed to a level of firm and unyielding soil. The exposed subgrade soils should then be scarified to a depth of 12± inches, moisture conditioned to at least 2 to 4 percent above optimum, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. Based on the presence of variable strength surficial soils throughout the site, it is expected that some isolated areas of additional overexcavation may be required to remove zones of lower strength, unsuitable soils.

The grading recommendations presented above for the proposed parking area assume that the owner and/or developer can tolerate minor amounts of settlement within the proposed parking areas. The grading recommendations presented above do not completely mitigate the extent of the low strength alluvium in the parking areas. As such, settlement and associated pavement distress could occur. Typically, repair of such distressed areas involves significantly lower costs than completely mitigating these soils at the time of construction. If the owner cannot tolerate the risk of such settlements, the parking area should be graded in a manner similar to that described for the building area.

Fill Placement

- Fill soils should be placed in thin (6± inches), near-horizontal lifts, moisture conditioned to 2 to 4 percent above the optimum moisture content, and compacted.
- On-site soils may be used for fill provided they are cleaned of any debris to the satisfaction of the geotechnical engineer.
- All grading and fill placement activities should be completed in accordance with the requirements of the 2013 CBC and the grading code of the county of San Bernardino.
- All fill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Fill soils should be well mixed.
- Compaction tests should be performed periodically by the geotechnical engineer as random verification of compaction and moisture content. These tests are intended to aid the contractor. Since the tests are taken at discrete locations and depths, they may not be indicative of the entire fill and therefore should not relieve the contractor of his responsibility to meet the job specifications.

Imported Structural Fill

All imported structural fill should consist of very low expansive (EI < 20), well graded soils possessing at least 10 percent fines (that portion of the sample passing the No. 200 sieve). Additional specifications for structural fill are presented in the Grading Guide Specifications, included as Appendix D.

Utility Trench Backfill

In general, all utility trench backfill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. It is recommended that materials in excess of 3 inches in size not be used for utility trench backfill. Compacted trench backfill should conform to the requirements of the local grading code, and more restrictive requirements may be indicated by the county of San Bernardino. All utility trench backfills should be witnessed by the geotechnical engineer. The trench backfill soils should be compaction tested where possible; probed and visually evaluated elsewhere.

Utility trenches which parallel a footing, and extending below a 1h:1v plane projected from the outside edge of the footing should be backfilled with structural fill soils, compacted to at least 90 percent of the ASTM D-1557 standard. Pea gravel backfill should not be used for these trenches.

6.4 Construction Considerations

Excavation Considerations

The near surface soils generally consist of loose to medium dense silty sands. These materials are expected to be subject to caving within shallow excavations. Where caving occurs within shallow excavations, flattened excavation slopes may be sufficient to provide excavation stability. On a preliminary basis, temporary excavation slopes should be no steeper than 2h:1v. Deeper excavations may require some form of external stabilization such as shoring or bracing. Maintaining adequate moisture content within the near-surface soils will improve excavation stability. All excavation activities on this site should be conducted in accordance with Cal-OSHA regulations.

Moisture Sensitive Subgrade Soils

Some of the near surface soils possess appreciable silt content and may become unstable if exposed to significant moisture infiltration or disturbance by construction traffic. In addition, based on their granular content, some of the on-site soils will also be susceptible to erosion. The site should, therefore, be graded to prevent ponding of surface water and to prevent water from running into excavations.

Groundwater

The static groundwater table at this site is considered to exist at a depth in excess of 30± feet. Therefore, groundwater is not expected to impact grading or foundation construction activities.

6.5 Foundation Design and Construction

Based on the preceding grading recommendations, it is assumed that the new building pad will be underlain by structural fill soils used to replace low strength, collapsible/compressible, near-surface alluvial soils. These new structural fill soils are expected to extend to depths of at least 3 feet below proposed foundation bearing grade, underlain by 1± foot of additional soil that has been densified and moisture conditioned in place. Based on this subsurface profile, the proposed structure may be supported on conventional shallow foundations.

Foundation Design Parameters

New square and rectangular footings may be designed as follows:

- Maximum, net allowable soil bearing pressure: 3,000 lbs/ft^2.
- Minimum wall/column footing width: 14 inches/24 inches.
- Minimum longitudinal steel reinforcement within strip footings: Two (2) No. 5 rebars (1 top and 1 bottom).

- Minimum foundation embedment: 12 inches into suitable structural fill soils, and at least 18 inches below adjacent exterior grade. Interior column footings may be placed immediately beneath the floor slab.

- It is recommended that the perimeter building foundations be continuous across all exterior doorways. Any flatwork adjacent to the exterior doors should be doweled into the perimeter foundations in a manner determined by the structural engineer.

The allowable bearing pressures presented above may be increased by 1/3 when considering short duration wind or seismic loads. The minimum steel reinforcement recommended above is based on geotechnical considerations; additional reinforcement may be necessary for structural considerations. The actual design of the foundations should be determined by the structural engineer.

Foundation Construction

The foundation subgrade soils should be evaluated at the time of overexcavation, as discussed in Section 6.3 of this report. It is further recommended that the foundation subgrade soils be evaluated by the geotechnical engineer immediately prior to steel or concrete placement. Soils suitable for direct foundation support should consist of newly placed structural fill, compacted to at least 90 percent of the ASTM D-1557 maximum dry density, or suitable native alluvium. Any unsuitable materials should be removed to a depth of suitable bearing compacted structural fill or suitable native alluvium (where reduced bearing pressures are utilized), with the resulting excavations backfilled with compacted fill soils. As an alternative, lean concrete slurry (500 to 1,500 psi) may be used to backfill such isolated overexcavations.

The foundation subgrade soils should also be properly moisture conditioned to 2 to 4 percent above the Modified Proctor optimum, to a depth of at least 12 inches below bearing grade. Since it is typically not feasible to increase the moisture content of the floor slab and foundation subgrade soils once rough grading has been completed, care should be taken to maintain the moisture content of the building pad subgrade soils throughout the construction process.

Estimated Foundation Settlements

Post-construction total and differential settlements of shallow foundations designed and constructed in accordance with the previously presented recommendations are estimated to be less than 1.0 and 0.5 inches, respectively. Differential movements are expected to occur over a 30-foot span, thereby resulting in an angular distortion of less than 0.002 inches per inch.

Lateral Load Resistance

Lateral load resistance will be developed by a combination of friction acting at the base of foundations and slabs and the passive earth pressure developed by footings below grade. The following friction and passive pressure may be used to resist lateral forces:

- Passive Earth Pressure: 300 lbs/ft^3
- Friction Coefficient: 0.30

These are allowable values, and include a factor of safety. When combining friction and passive resistance, the passive pressure component should be reduced by one-third. These values assume that footings will be poured directly against compacted structural fill. The maximum allowable passive pressure is 3000 lbs/ft^2.

6.6 Floor Slab Design and Construction

Subgrades which will support new floor slabs should be prepared in accordance with the recommendations contained in the ***Site Grading Recommendations*** section of this report. Based on the anticipated grading which will occur at this site, the floor of the new structure may be constructed as a conventional slab-on-grade supported on newly placed structural fill, extending to a depth of at least 3 feet below proposed finished grade. Based on geotechnical considerations, the floor slab may be designed as follows:

- Minimum slab thickness: 5 inches.

- Minimum slab reinforcement: Not required for geotechnical considerations. The actual floor slab reinforcement should be determined by the structural engineer, based upon the imposed loading.

- Modulus of Subgrade Reaction: 150 lbs/in^3.

- Slab underlayment: If moisture sensitive floor coverings will be used then minimum slab underlayment should consist of a moisture vapor barrier constructed below the entire area of the proposed slab where such moisture sensitive floor coverings are expected. The moisture vapor barrier should meet or exceed the Class A rating as defined by ASTM E 1745-97 and have a permeance rating less than 0.01 perms as described in ASTM E 96-95 and ASTM E 154-88. A polyolefin material such as Stego® Wrap Vapor Barrier or equivalent will meet these specifications. The moisture vapor barrier should be properly constructed in accordance with all applicable manufacturer specifications. Given that a rock free subgrade is anticipated and that a capillary break is not required, sand below the barrier is not required. The need for sand and/or the amount of sand above the moisture vapor barrier should be specified by the structural engineer or concrete contractor. The selection of sand above the barrier is not a geotechnical engineering issue and hence outside our purview. Where moisture sensitive floor coverings are not anticipated, the vapor barrier may be eliminated.

- Moisture condition the floor slab subgrade soils to 2 to 4 percent above the Modified Proctor optimum moisture content, to a depth of 12 inches. The moisture content of the floor slab subgrade soils should be verified by the geotechnical engineer within 24 hours prior to concrete placement.

- Proper concrete curing techniques should be utilized to reduce the potential for slab curling or the formation of excessive shrinkage cracks.

The actual design of the floor slab should be completed by the structural engineer to verify adequate thickness and reinforcement.

6.7 Retaining Wall Design and Construction

Based on the proposed use of the site, it is expected that some small retaining walls (less than 3 to 5 feet in height) will be required in the area of the new truck docks. The parameters recommended for use in the design of these walls are presented below.

Retaining Wall Design Parameters

Based on the soil conditions encountered at the boring locations, the following parameters may be used in the design of new retaining walls for this site. We have provided parameters assuming the use of on-site soils for retaining wall backfill. The near surface soils generally consist of silty fine sands. Based on their classifications, these materials are expected to possess a friction angle of at least 30 degrees when compacted to 90 percent of the ASTM-1557 maximum dry density.

If desired, SCG could provide design parameters for an alternative select backfill material behind the retaining walls. The use of select backfill material could result in lower lateral earth pressures. In order to use the design parameters for the imported select fill, this material must be placed within the entire active failure wedge. This wedge is defined as extending from the heel of the retaining wall upwards at an angle of approximately 60° from horizontal. If select backfill material behind the retaining wall is desired, SCG should be contacted for supplementary recommendations.

RETAINING WALL DESIGN PARAMETERS

Design Parameter		**Soil Type** On-Site Silty Sands
Internal Friction Angle (ϕ)		30°
Unit Weight		120 lbs/ft^3
Equivalent Fluid Pressure:	Active Condition (level backfill)	40 lbs/ft^3
	Active Condition (2h:1v backfill)	65 lbs/ft^3
	At-Rest Condition (level backfill)	60 lbs/ft^3

Regardless of the backfill type, the walls should be designed using a soil-footing coefficient of friction of 0.30 and an equivalent passive pressure of 300 lbs/ft^3. The structural engineer should incorporate appropriate factors of safety in the design of the retaining walls.

The active earth pressure may be used for the design of retaining walls that do not directly support structures or support soils that in turn support structures and which will be allowed to deflect. The at-rest earth pressure should be used for walls that will not be allowed to deflect such as those which will support foundation bearing soils, or which will support foundation loads directly.

Where the soils on the toe side of the retaining wall are not covered by a "hard" surface such as a structure or pavement, the upper 1 foot of soil should be neglected when calculating passive resistance due to the potential for the material to become disturbed or degraded during the life of the structure.

Seismic Lateral Earth Pressures

In accordance with the 2013 CBC, any retaining walls more than 6 feet in height must be designed for seismic lateral earth pressures. If walls 6 feet or more are required for this site, the geotechnical engineer should be contacted for supplementary seismic lateral earth pressure recommendations.

Retaining Wall Foundation Design

The retaining wall foundations should be supported within newly placed compacted structural fill, extending to a depth of at least 3 feet below the proposed bearing grade. Foundations to support new retaining walls should be designed in accordance with the general Foundation Design Parameters presented in a previous section of this report.

Backfill Material

On-site soils may be used to backfill the retaining walls. However, all backfill material placed within 3 feet of the back wall face should have a particle size no greater than 3 inches. The retaining wall backfill materials should be well graded.

It is recommended that a properly installed prefabricated drainage composite such as the MiraDRAIN 6000XL (or approved equivalent), which is specifically designed for use behind retaining walls be used. If the drainage composite material is not covered by an impermeable surface, such as a structure or pavement, a 12-inch thick layer of a low permeability soil should be placed over the backfill to reduce surface water migration to the underlying soils. The drainage composite should be separated from the backfill soils by a suitable geotextile, approved by the geotechnical engineer.

All retaining wall backfill should be placed and compacted under engineering controlled conditions in the necessary layer thicknesses to ensure an in-place density between 90 and 93 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D1557). Care should be taken to avoid over-compaction of the soils behind the retaining walls, and the use of heavy compaction equipment should be avoided.

Subsurface Drainage

As previously indicated, the retaining wall design parameters are based upon drained backfill conditions. Consequently, some form of permanent drainage system will be necessary in conjunction with the appropriate backfill material. Subsurface drainage may consist of either:

- A weep hole drainage system typically consisting of a series of 4-inch diameter holes in the wall situated slightly above the ground surface elevation on the exposed side of the wall and at an approximate 8-foot on-center spacing. The weep holes should include a pocket of gravel, 2± cubic feet in size, surrounded by a geotextile fabric, at each weep hole location.

- A 4-inch diameter perforated pipe surrounded by 2 cubic feet of gravel per linear foot of drain placed behind the wall, above the retaining wall footing. The gravel layer should be wrapped in a suitable geotextile fabric to reduce the potential for migration of fines. The footing drain should be extended to daylight or tied into a storm drainage system.

6.8 Pavement Design Parameters

Site preparation in the pavement area should be completed as previously recommended in the ***Site Grading Recommendations*** section of this report. The subsequent pavement recommendations assume proper drainage and construction monitoring, and are based on either PCA or CALTRANS design parameters for a twenty (20) year design period. However, these designs also assume a routine pavement maintenance program to obtain the anticipated 20-year pavement service life.

Pavement Subgrades

It is anticipated that the new pavements will be primarily supported on recompacted native alluvial soils that consist of silty sands. These existing soils are considered to possess good pavement support characteristics, with estimated R-values of 50 to 60. Since R-value testing was not included in the scope of services for this project, the subsequent pavement design is based upon an assumed R-value of 50. Any fill material imported to the site should have support characteristics equal to or greater than that of the on-site soils and be placed and compacted under engineering controlled conditions. It may be desirable to perform R-value testing after the completion of rough grading to verify the R-value of the as-graded parking subgrade. If the subgrade soils possess higher R-values, a thinner pavement section could be utilized.

Asphaltic Concrete

Presented below are the recommended thicknesses for new flexible pavement structures consisting of asphaltic concrete over a granular base. The pavement designs are based on the traffic indices (TI's) indicated. The client and/or civil engineer should verify that these TI's are representative of the anticipated traffic volumes. If the client and/or civil engineer determine that the expected traffic volume will exceed the applicable traffic index, we should be contacted for supplementary recommendations. The design traffic indices equate to the following approximate daily traffic volumes over a 20 year design life, assuming six operational traffic days per week.

Traffic Index	No. of Heavy Trucks per Day
4.0	0
5.0	1
6.0	3
7.0	11
8.0	35

For the purpose of the traffic volumes indicated above, a truck is defined as a 5-axle tractor trailer unit with one 8-kip axle and two 32-kip tandem axles. All of the traffic indices allow for 1,000 automobiles per day.

ASPHALT PAVEMENTS (R = 50)					
Materials	**Thickness (inches)**				
	Parking Stalls (TI = 4.0)	Auto Drive Lanes (TI = 5.0)	Truck Traffic		
			(TI = 6.0)	(TI = 7.0)	(TI = 8.0)
Asphalt Concrete	3	3	3½	4	5
Aggregate Base	3	3	4	5	5
Compacted Subgrade	12	12	12	12	12

The aggregate base course should be compacted to at least 95 percent of the ASTM D-1557 maximum dry density. The asphaltic concrete should be compacted to at least 95 percent of the Marshall maximum density, as determined by ASTM D-2726. The aggregate base course may consist of crushed aggregate base (CAB) or crushed miscellaneous base (CMB), which is a recycled gravel, asphalt and concrete material. The gradation, R-Value, Sand Equivalent, and Percentage Wear of the CAB or CMB should comply with appropriate specifications contained in the current edition of the "Greenbook" Standard Specifications for Public Works Construction.

Portland Cement Concrete

The preparation of the subgrade soils within concrete pavement areas should be performed as previously described for proposed asphalt pavement areas. The minimum recommended thicknesses for the Portland Cement Concrete pavement sections are as follows:

PORTLAND CEMENT CONCRETE PAVEMENTS			
Materials	**Thickness (inches)**		
	Automobile and Light Truck Traffic (TI =5.0 & 6.0)	Truck Traffic	
		(TI =7.0)	(TI =8.0)
PCC	5	6	7
Compacted Subgrade (95% minimum compaction)	12	12	12

The concrete should have a 28-day compressive strength of at least 3,000 psi. The maximum joint spacing within all of the PCC pavements is recommended to be equal to or less than 30 times the pavement thickness.

7.0 GENERAL COMMENTS

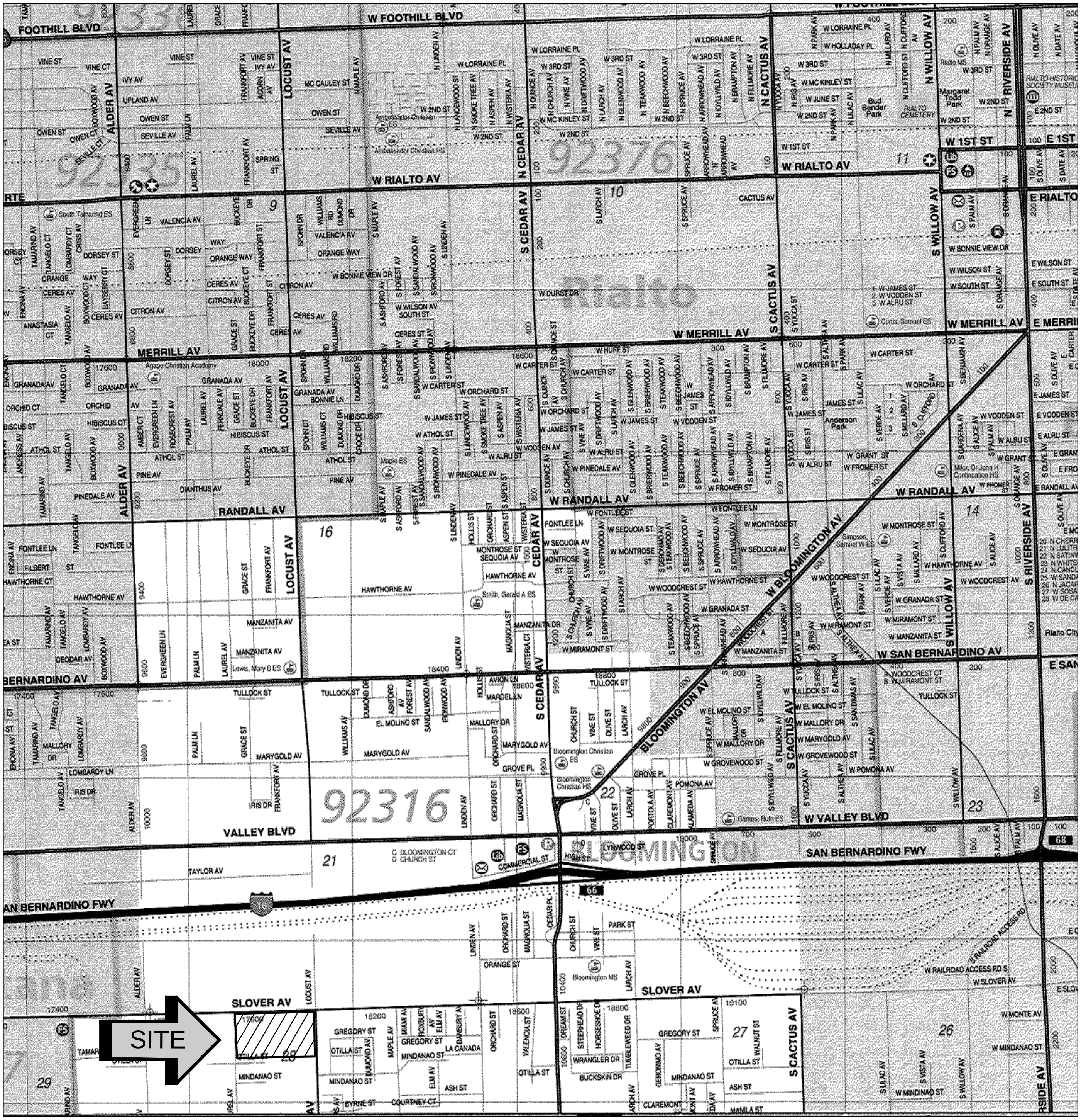
This report has been prepared as an instrument of service for use by the client, in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, civil engineer, and/or structural engineer. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur. The client(s)' reliance upon this report is subject to the Engineering Services Agreement, incorporated into our proposal for this project.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and sample depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted.

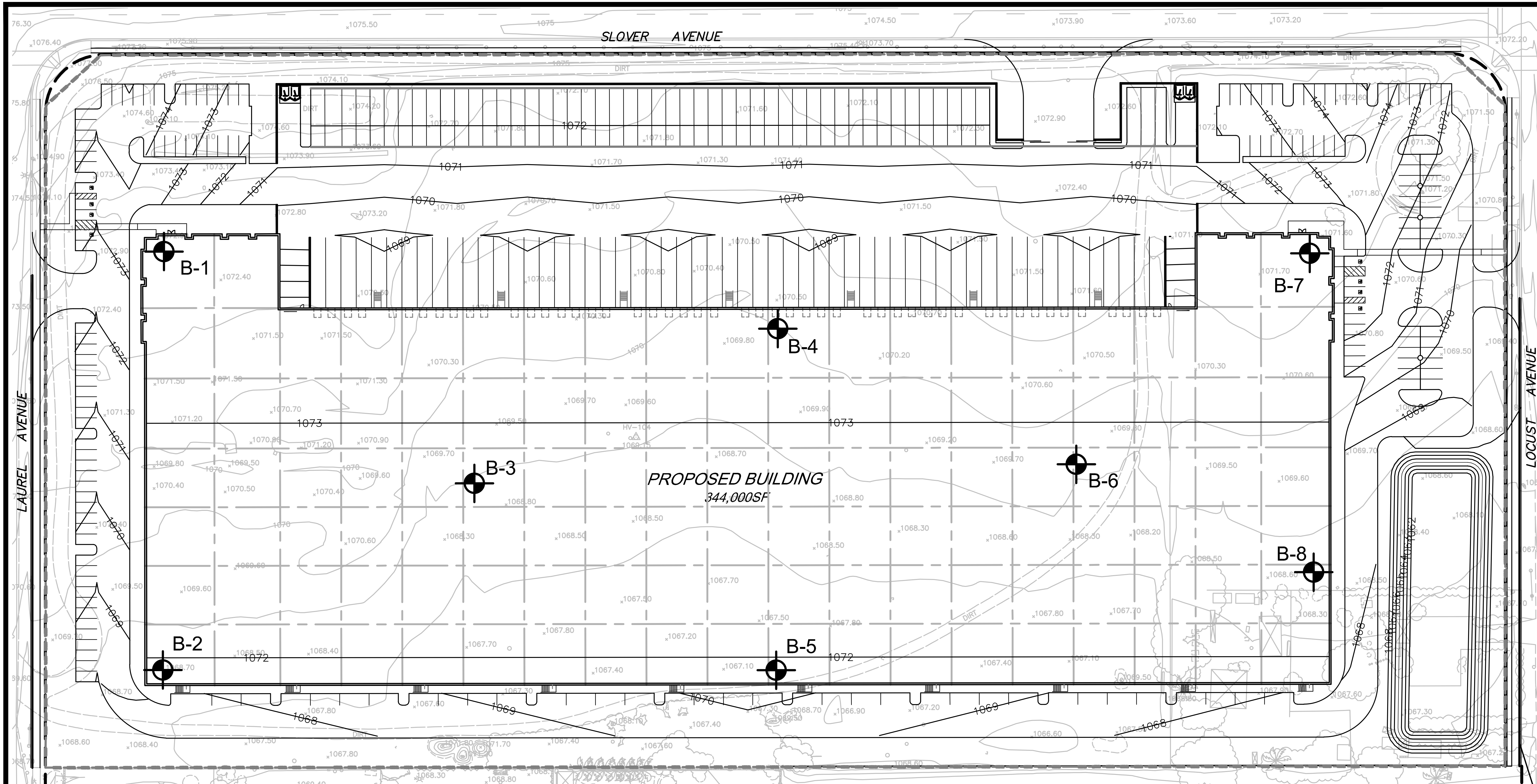
The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

APPENDIX A



SOURCE: SAN BERNARDINO COUNTY
THOMAS GUIDE, 2013

SITE LOCATION MAP	
BLOOMINGTON BUSINESS CENTER	
BLOOMINGTON, CALIFORNIA	
SCALE: 1" = 2400'	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: MRM CHKD: JAS	
SCG PROJECT 15G119-1	
PLATE 1	



GEOTECHNICAL LEGEND

APPROXIMATE BORING LOCATION

NORTH

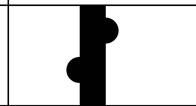
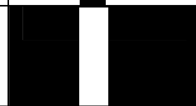
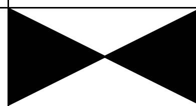
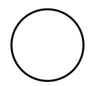
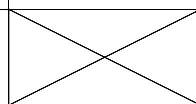
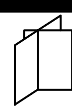
SoCalGeo

NOTE: BASE MAP PROVIDED BY HUITT-ZOLLARS, INC.

BORING LOCATION PLAN	
BLOOMINGTON BUSINESS CENTER	
BLOOMINGTON, CALIFORNIA	
SCALE: 1" = 80'	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: PM CHKD: JAS	
SCG PROJECT 15G119-1	
PLATE 2	

APPENDIX B

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-1

JOB NO.: 15G119
PROJECT: Bloomington Business Center
LOCATION: San Bernardino County, California

DRILLING DATE: 2/25/15
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Matt Manni

WATER DEPTH: Dry
CAVE DEPTH: 4 feet
READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
		27			ALLUVIUM: Dark Brown Silty fine Sand, trace medium to coarse Sand, trace fine Gravel, medium dense-damp		5					
		32			Gray Brown Gravelly fine to coarse Sand, occasional Cobbles, medium dense-damp	126	3					
5		22			Gray Brown fine to medium Sand, trace coarse Sand, little fine to coarse Gravel, medium dense-damp	103	3					
		53			Gray Brown fine to coarse Sand, some fine to coarse Gravel, ocacsional Cobbles, dense-dry to damp	117	2					
10		27			Gray Brown fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, medium dense-damp	109	4					
15		24			Gray Brown fine to coarse Sand, little fine to coarse Gravel, medium dense-dry to damp		2					
20		45			Light Brown fine to coarse Sand, little Silt, little fine to coarse Gravel, dense-damp		3					
25		39					3					
30		20			Gray Brown Silty fine Sand, medium dense-damp to moist		7					
					Boring Terminated at 30'							

TBL 15G119.GPJ SOCALGEO.GDT 3/16/15

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-2

JOB NO.: 15G119
PROJECT: Bloomington Business Center
LOCATION: San Bernardino County, California
DRILLING DATE: 2/25/15
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Matt Manni
WATER DEPTH: Dry
CAVE DEPTH: 7 feet
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
		9			ALLUVIUM: Light Brown fine Sand, little Silt, trace medium to coarse Sand, trace fine to coarse Gravel, loose-dry	107	1					
		24			Brown Silty fine Sand, little medium to ocarse Sand, some fine Gravel, medium dense-dry to damp	122	2					
5		31			Gray Gravelly fine to coarse Sand, some Silt, medium dense-damp	119	3					
		38			Gray fine to coarse Sand, some fine to coarse Gravel, medium dense to dense-damp	114	3					
10		26				108	2					
15		46					3					
		41			Gray Brown Silty fine to coarse Sand, some fine to coarse Gravel, dense-damp		4					
20												

Boring Terminated at 20'

TBL 15G119.GPJ SOCALGEO.GDT 3/16/15

TEST BORING LOG

PLATE B-2

BORING NO. B-3

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 15G119
PROJECT: Bloomington Business Center
LOCATION: San Bernardino County, California

DRILLING DATE: 2/25/15
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Matt Manni

WATER DEPTH: Dry
CAVE DEPTH: 4 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					ALLUVIUM: Light Brown SIlty fine Sand to fine Sandy Silt, very loose to medium dense-dry to damp							
	X	3					4					
	X	12					3					
5					Gray fine to coarse Sand, some fine to coarse Gravel, medium dense to dense-dry							
	X	28					1					
	X	36					1					
10					Gray fine to coarse Sand, little fine Gravel, medium dense-dry to damp							
	X	21					2					
15					Boring Terminated at 15'							

TBL 15G119.GPJ SOCALGEO.GDT 3/16/15

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-4

JOB NO.: 15G119	DRILLING DATE: 2/25/15	WATER DEPTH: Dry
PROJECT: Bloomington Business Center	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 7 feet
LOCATION: San Bernardino County, California	LOGGED BY: Matt Manni	READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
		5			ALLUVIUM: Light Brown Silty fine Sand to fine Sandy Silt, trace fine root fibers, very loose-dry	99	2					
		27			Gray Brown Silty fine Sand, trace medium to coarse Sand, trace fine root fibers, medium dense-dry	84	2					
5		43			Gray Brown Gravelly fine to coarse Sand, occasional Cobbles, medium dense to dense-dry	119	1					
		71					1					
10		60										No Sample Recovered
					Gray fine to coarse Sandy Gravel, occasional Cobbles, medium dense-dry							
15		18			Brown Silty fine Sand to fine Sandy Silt, trace Clay, trace medium Sand, trace calcareous veining, medium dense-moist to very moist		1 13					
20		16			Brown Silty fine Sand, medium dense-very moist		15					
25		27			Brown fine Sand, trace medium to coarse Sand, trace fine Gravel, trace Silt, medium dense-damp		3					

Boring Terminated at 25'

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-5

JOB NO.: 15G119
PROJECT: Bloomington Business Center
LOCATION: San Bernardino County, California
DRILLING DATE: 2/25/15
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Matt Manni
WATER DEPTH: Dry
CAVE DEPTH: 8 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					ALLUVIUM: Light Gray Brown fine Sandy Silt to Silty fine Sand, trace medium to coarse Sand, trace fine root fibers, loose-dry to damp							
	X	8					2					
					Light Gray Brown Silty fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, medium dense-dry							
	X	17					2					
5												
					Gray fine to coarse Sand, some fine to coarse Gravel, occasional Cobbles, dense-dry							
	X	45					1					
					Gray Brown fine to coarse Sand, some fine to coarse Gravel, occasional Cobbles, medium dense to dense-dry to damp							
	X	17					2					
10												
	X	38					3					
15												
					Gray Brown fine to coarse Sand, little fine to coarse Gravel, dense-dry to damp							
	X	40					2					
20												
					Gray Brown to Brown fine Sand, trace medium to coarse Sand, trace Silt, trace fine Gravel, dense-damp							
	X	37					3					
25												
					Boring Terminated at 25'							

TBL 15G119.GPJ SOCALGEO.GDT 3/16/15

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-6

JOB NO.: 15G119
PROJECT: Bloomington Business Center
LOCATION: San Bernardino County, California
DRILLING DATE: 2/25/15
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Matt Manni
WATER DEPTH: Dry
CAVE DEPTH: 10 feet
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
	X	20			ALLUVIUM: Light Brown Silty fine Sand to fine Sandy Silt, little fine to coarse Gravel, medium dense-dry		1					
	X	15			Brown fine to coarse Sand, trace to little fine to coarse Gravel, medium dnese-dry to damp		2					
5	X	46			Gray Brown fine to coarse Sand, some fine to coarse Gravel, occasional Cobbles, dense-dry to damp		2					
	X	32			Gray fine to coarse Sand, trace to little fine to coarse Gravel, occasional Cobbles, dense-dry to damp		2					
10												
	X	15			Brown Silty fine Sand, trace medium to coarse Sand, little fine to coarse Gravel, medium dense-damp to moist		7					
15	X	28					6					
20					Boring Terminated at 20'							

TBL 15G119.GPJ SOCALGEO.GDT 3/16/15

TEST BORING LOG

BORING NO. B-7

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 15G119
PROJECT: Bloomington Business Center
LOCATION: San Bernardino County, California
DRILLING DATE: 2/25/15
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Matt Manni
WATER DEPTH: Dry
CAVE DEPTH: 11 feet
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					ALLUVIUM: Light Brown Silty fine Sand, trace medium Sand, trace fine root fibers, loose-dry							
		10				99	2					EI = 0 @ 0 to 5'
		21			Light Gray Brown fine to coarse Sand, little to some fine to coarse Gravel, trace Silt, occasional Cobbles, medium dense-dry	119	1					
5		20										No Sample Recovered
		46			Light Gray Gravelly fine to coarse Sand, dense-dry	112	1					
		50			Light Gray Brown Gravelly fine to coarse Sand, dense-damp	115	3					
10												
					Brown fine Sandy Silt, trace Clay, loose-moist to very moist							
		10					16					
15		14				96	15					
					Brown Silty fine to coarse Sand, little fine to coarse Gravel, medium dense to dense-damp							
		30					3					
20												

Boring Terminated at 20'

TBL 15G119.GPJ SOCALGEO.GDT 3/16/15

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-8

JOB NO.: 15G119
PROJECT: Bloomington Business Center
LOCATION: San Bernardino County, California

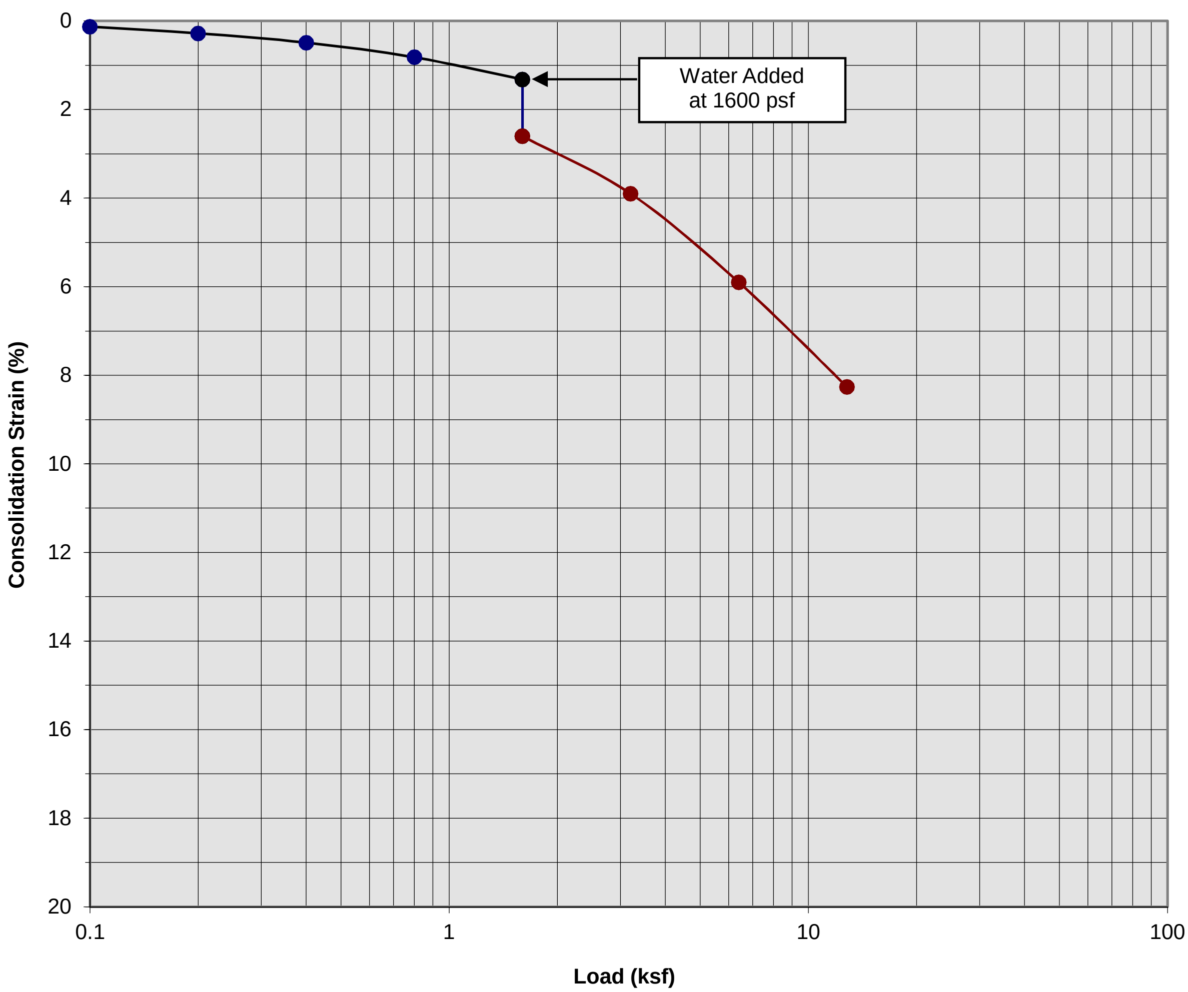
DRILLING DATE: 2/25/15
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Matt Manni

WATER DEPTH: Dry
CAVE DEPTH: 17 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
		6			ALLUVIUM: Light Brown Silty fine Sand, trace fine Gravel, trace fine root fibers, very loose to loose-dry to damp	99	2					
		17				117	2					
5		28			Gray fine to coarse Sand, trace to little fine to coarse Gravel, occasional Cobbles, medium dense-dry to damp							No Sample Recovered
		33			Gray Gravelly fine to coarse Sand, some Silt, occasional Cobbles, medium dense-dry	120	1					
10		22			Gray Brown fine Sand, little medium to coarse Sand, trace to little fine to coarse Gravel, medium dense-dry to damp	97	2					
15		15			Light Brown fine Sandy Silt, trace medium Sand, medium dense-damp to moist		11					
20		20			Light Brown Silty fine Sand, trace medium to coarse Sand, medium dense-damp to moist		9					
25		33			Light Brown fine to medium Sand, little fine to coarse Gravel, trace Silt, little coarse Sand, dense-damp		2					
30		40			@ 28½ to 30 feet, trace fine to coarse Gravel		2					
					Boring Terminated at 30'							

APPENDIX C

Consolidation/Collapse Test Results

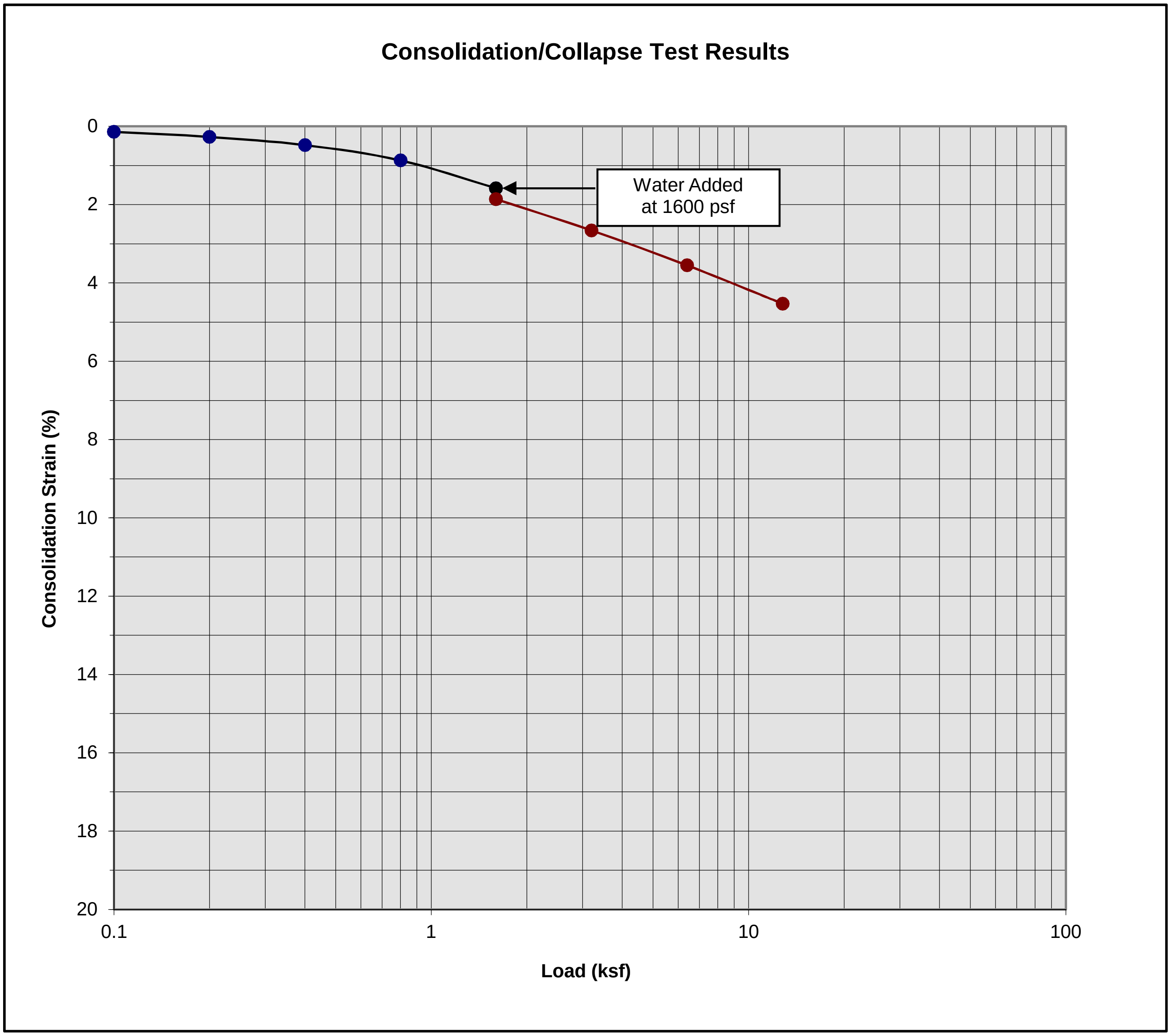


Classification: Gray Brown Gravelly fine to coarse Sand

Boring Number:	B-1	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	10
Depth (ft)	3 to 4	Initial Dry Density (pcf)	126.2
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	137.2
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.28

Bloomington Business Center
Bloomington, California
Project No. 15G119
PLATE C- 1

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



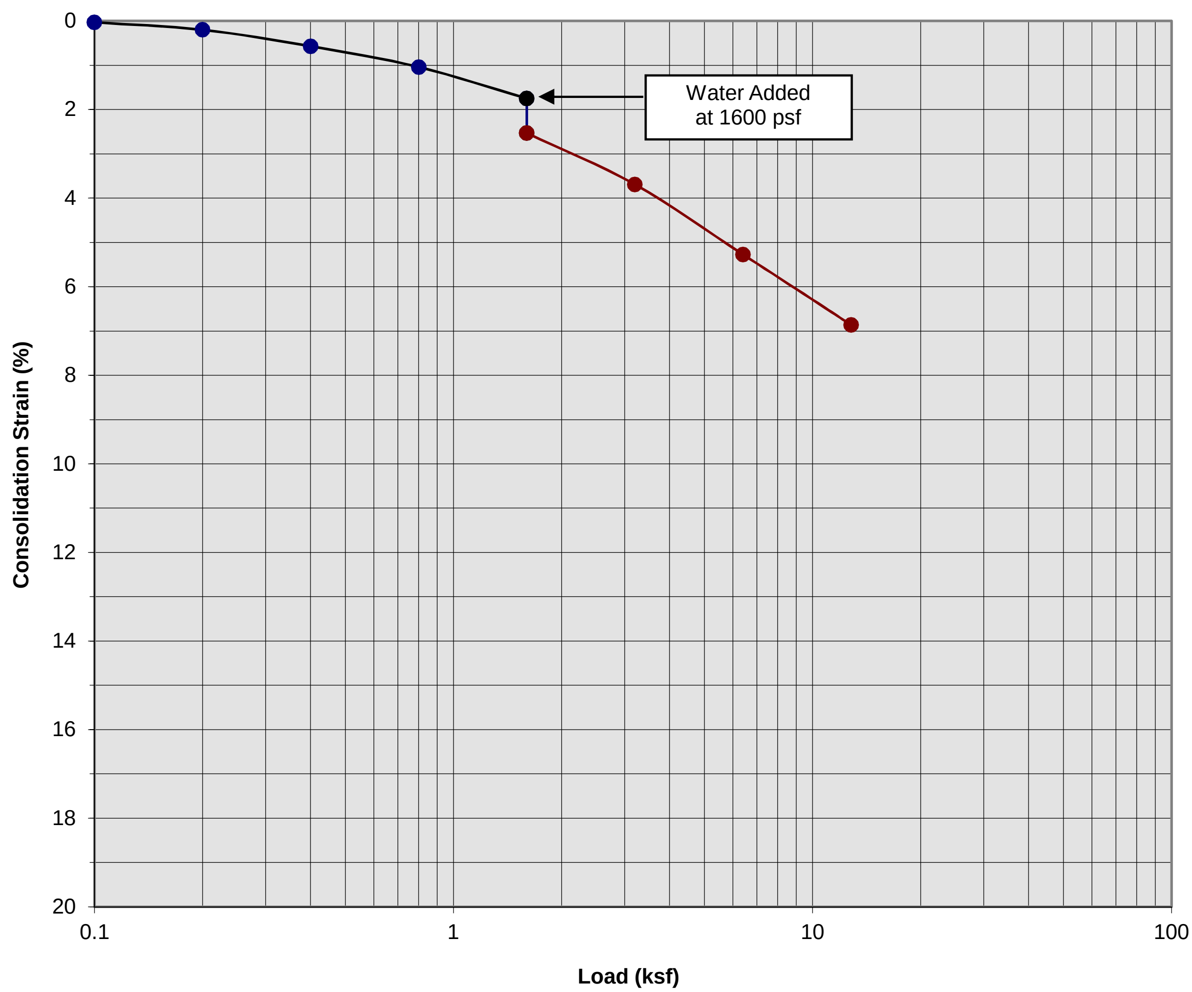
Classification: Gray Brown fine to medium Sand, trace coarse Sand

Boring Number:	B-1	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	19
Depth (ft)	5 to 6	Initial Dry Density (pcf)	103.4
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	108.2
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.28

Bloomington Business Center
Bloomington, California
Project No. 15G119
PLATE C- 2

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results

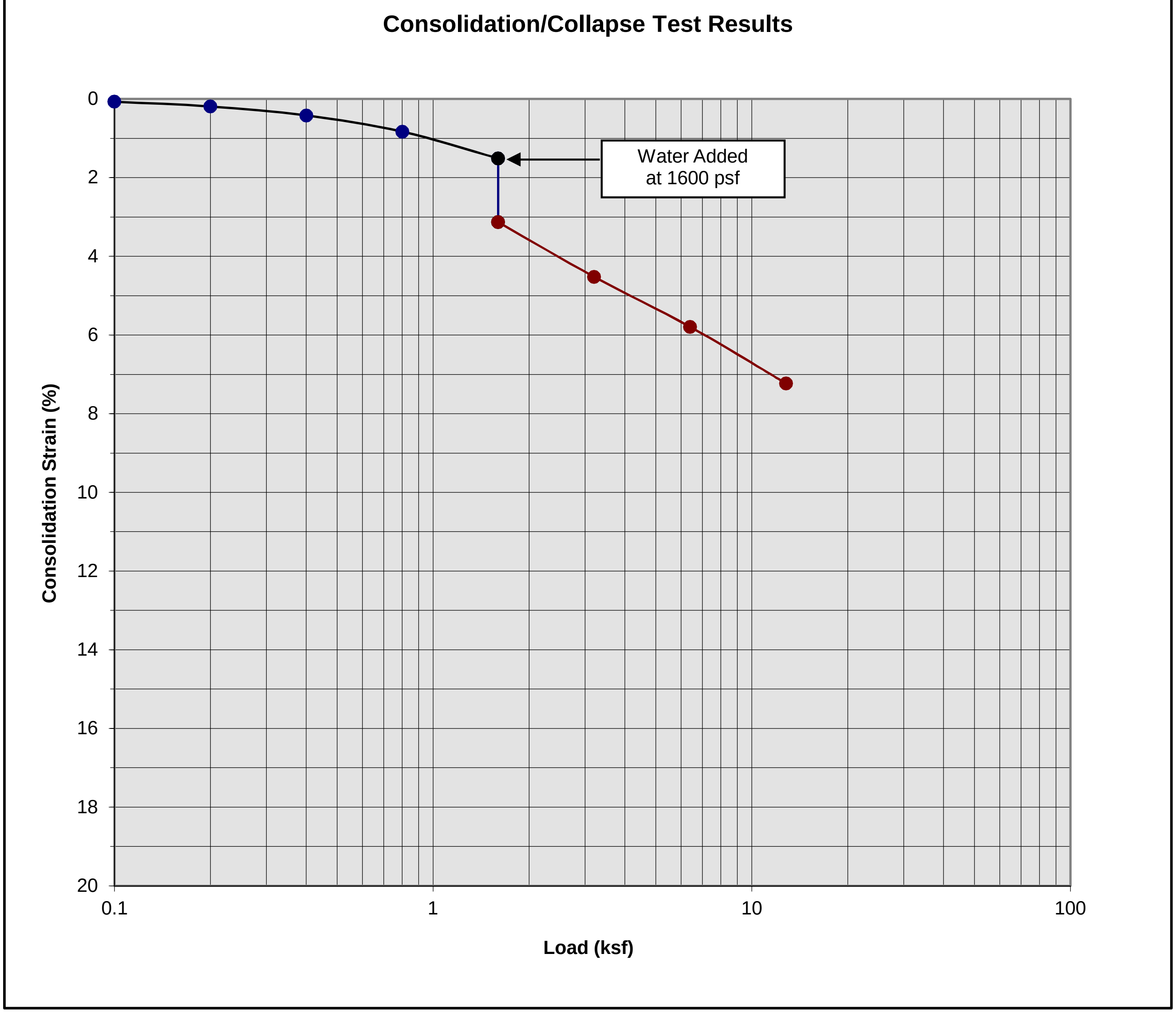


Classification: Gray Brown fine to coarse Sand

Boring Number:	B-1	Initial Moisture Content (%)	2
Sample Number:	---	Final Moisture Content (%)	10
Depth (ft)	7 to 8	Initial Dry Density (pcf)	117.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	125.6
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.78

Bloomington Business Center
Bloomington, California
Project No. 15G119
PLATE C- 3

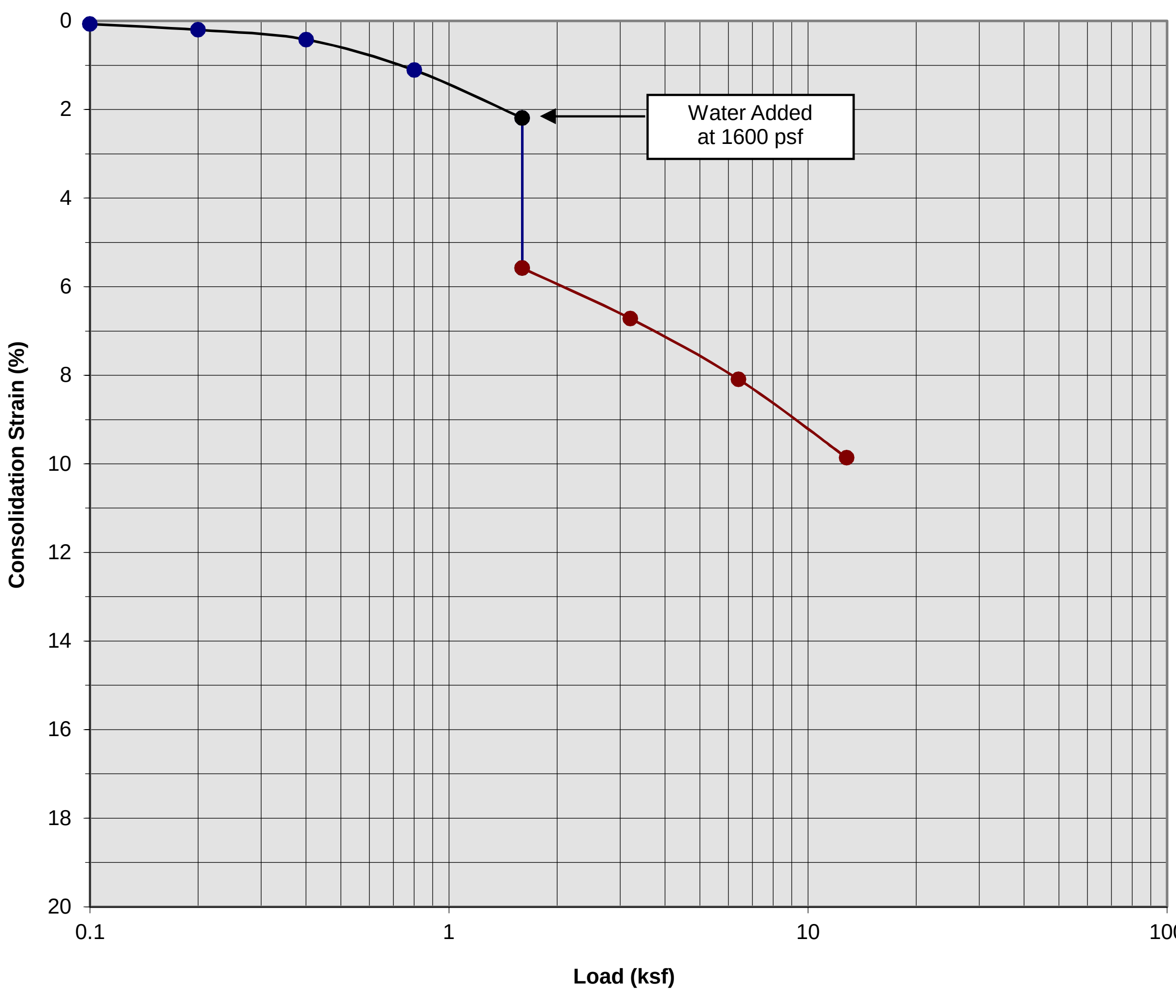
SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Classification: Gray Brown fine Sand, trace medium to coarse Sand

Boring Number:	B-1	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	13
Depth (ft)	9 to 10	Initial Dry Density (pcf)	108.2
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	117.5
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.62

Consolidation/Collapse Test Results

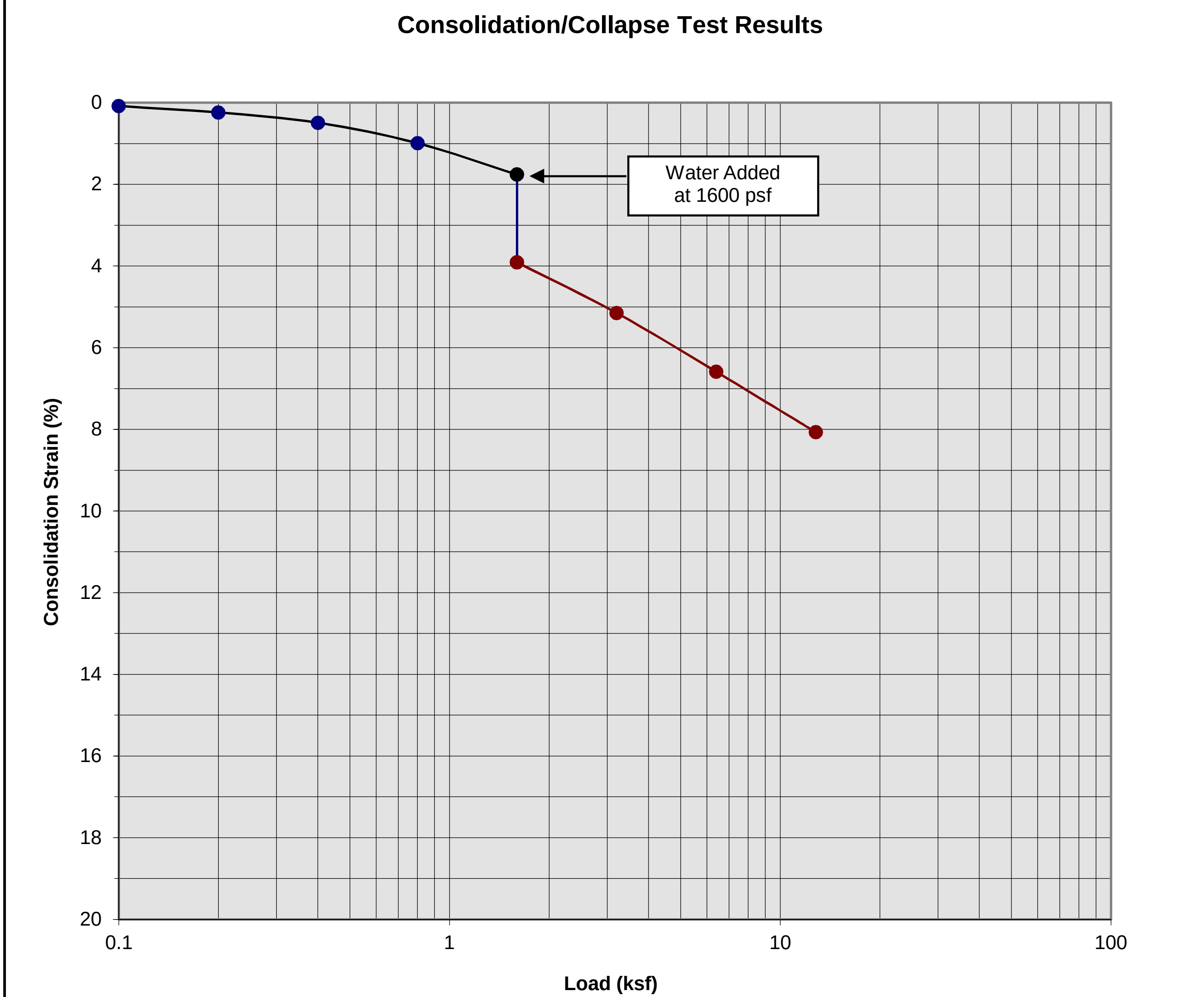


Classification: Light Brown Silty fine Sand, trace fine Gravel

Boring Number:	B-8	Initial Moisture Content (%)	2
Sample Number:	---	Final Moisture Content (%)	18
Depth (ft)	1 to 2	Initial Dry Density (pcf)	99.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	109.8
Specimen Thickness (in)	1.0	Percent Collapse (%)	3.39

Bloomington Business Center
Bloomington, California
Project No. 15G119
PLATE C- 5

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

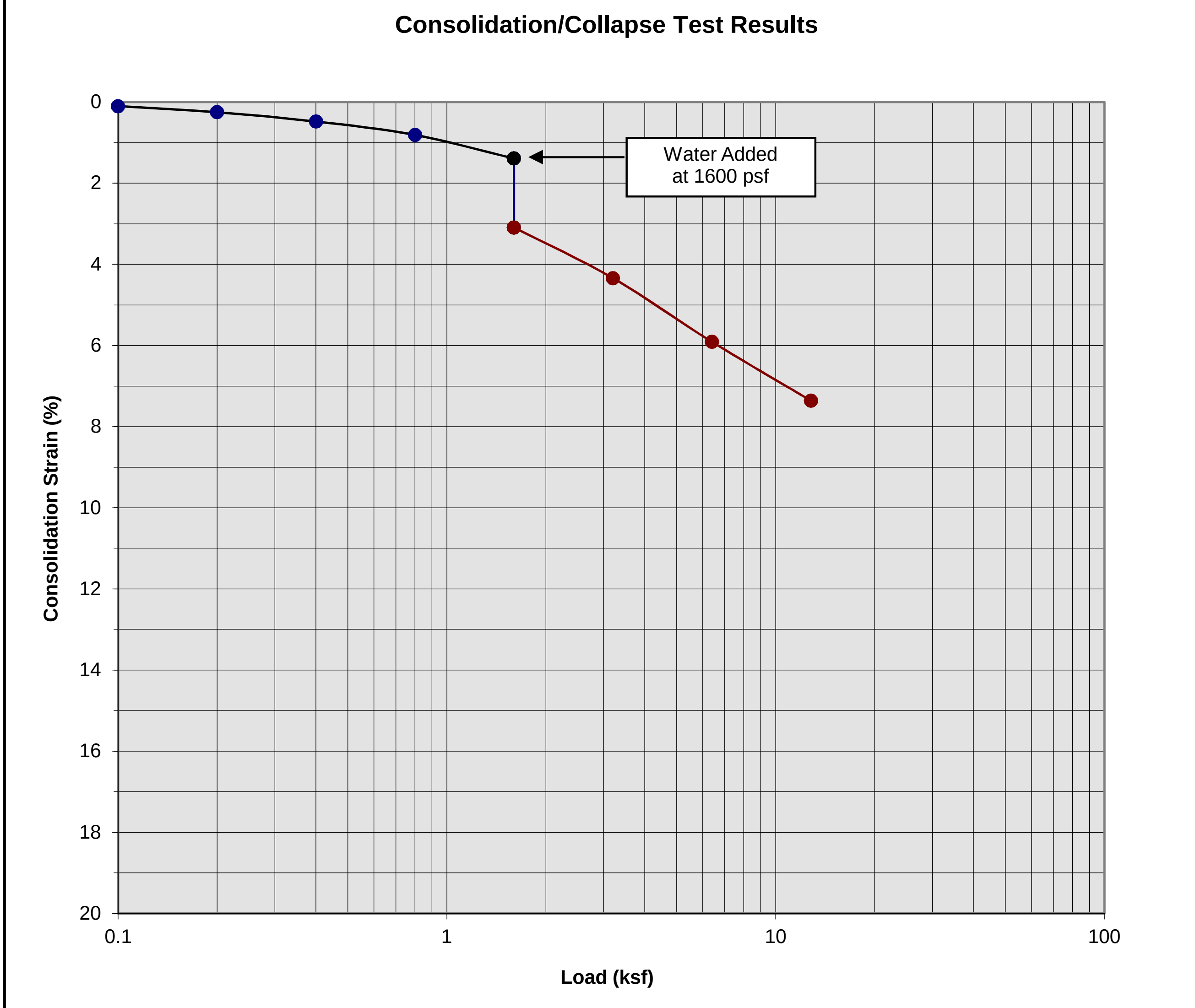


Classification: Gray fine to coarse Sand, trace to little fine to coarse Gravel

Boring Number:	B-8	Initial Moisture Content (%)	2
Sample Number:	---	Final Moisture Content (%)	11
Depth (ft)	3 to 4	Initial Dry Density (pcf)	117.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	127.3
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.15

Bloomington Business Center
Bloomington, California
Project No. 15G119
PLATE C- 6

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL A California Corporation



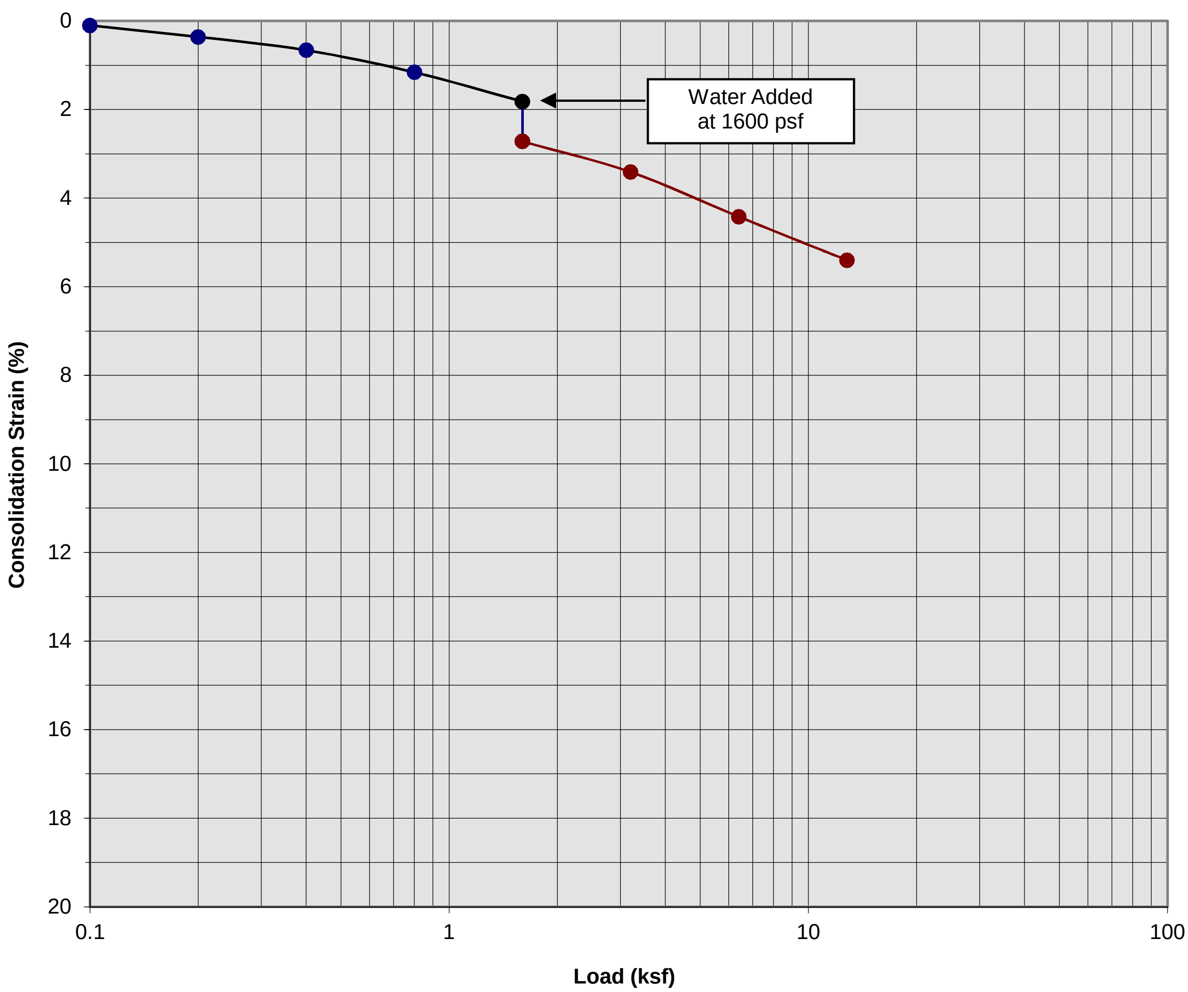
Classification: Gray Gravelly fine to coarse Sand, some Silt

Boring Number:	B-8	Initial Moisture Content (%)	2
Sample Number:	---	Final Moisture Content (%)	12
Depth (ft)	7 to 8	Initial Dry Density (pcf)	120.4
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	130.2
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.70

Bloomington Business Center
Bloomington, California
Project No. 15G119
PLATE C- 7

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results

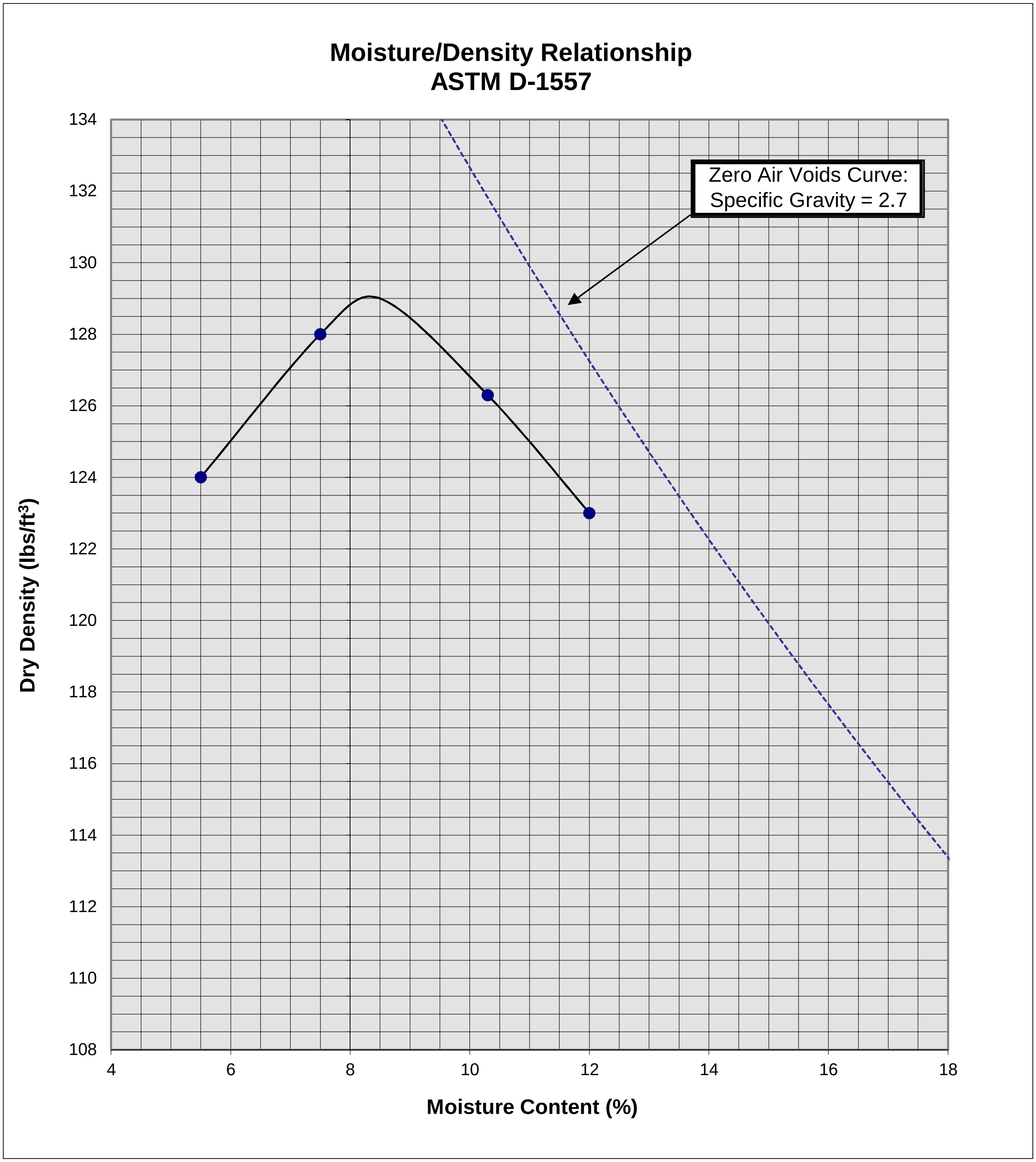


Classification: Gray Brown fine Sand, little medium to coarse Sand

Boring Number:	B-8	Initial Moisture Content (%)	2
Sample Number:	---	Final Moisture Content (%)	22
Depth (ft)	9 to 10	Initial Dry Density (pcf)	96.5
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	102.0
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.90

Bloomington Business Center
Bloomington, California
Project No. 15G119
PLATE C- 8

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Soil ID Number	B-7 @ 0 to 5'
Optimum Moisture (%)	8.5
Maximum Dry Density (pcf)	129
Soil Classification	Light Brown Silty fine Sand, some Gravel

Bloomington Business Center
Bloomington, California
Project No. 15G119
PLATE C-9

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

APPENDIX D

GRADING GUIDE SPECIFICATIONS

These grading guide specifications are intended to provide typical procedures for grading operations. They are intended to supplement the recommendations contained in the geotechnical investigation report for this project. Should the recommendations in the geotechnical investigation report conflict with the grading guide specifications, the more site specific recommendations in the geotechnical investigation report will govern.

General

- The Earthwork Contractor is responsible for the satisfactory completion of all earthwork in accordance with the plans and geotechnical reports, and in accordance with city, county, and applicable building codes.

- The Geotechnical Engineer is the representative of the Owner/Builder for the purpose of implementing the report recommendations and guidelines. These duties are not intended to relieve the Earthwork Contractor of any responsibility to perform in a workman-like manner, nor is the Geotechnical Engineer to direct the grading equipment or personnel employed by the Contractor.

- The Earthwork Contractor is required to notify the Geotechnical Engineer of the anticipated work and schedule so that testing and inspections can be provided. If necessary, work may be stopped and redone if personnel have not been scheduled in advance.

- The Earthwork Contractor is required to have suitable and sufficient equipment on the job-site to process, moisture condition, mix and compact the amount of fill being placed to the approved compaction. In addition, suitable support equipment should be available to conform with recommendations and guidelines in this report.

- Canyon cleanouts, overexcavation areas, processed ground to receive fill, key excavations, subdrains and benches should be observed by the Geotechnical Engineer prior to placement of any fill. It is the Earthwork Contractor's responsibility to notify the Geotechnical Engineer of areas that are ready for inspection.

- Excavation, filling, and subgrade preparation should be performed in a manner and sequence that will provide drainage at all times and proper control of erosion. Precipitation, springs, and seepage water encountered shall be pumped or drained to provide a suitable working surface. The Geotechnical Engineer must be informed of springs or water seepage encountered during grading or foundation construction for possible revision to the recommended construction procedures and/or installation of subdrains.

Site Preparation

- The Earthwork Contractor is responsible for all clearing, grubbing, stripping and site preparation for the project in accordance with the recommendations of the Geotechnical Engineer.

- If any materials or areas are encountered by the Earthwork Contractor which are suspected of having toxic or environmentally sensitive contamination, the Geotechnical Engineer and Owner/Builder should be notified immediately.

- Major vegetation should be stripped and disposed of off-site. This includes trees, brush, heavy grasses and any materials considered unsuitable by the Geotechnical Engineer.

- Underground structures such as basements, cesspools or septic disposal systems, mining shafts, tunnels, wells and pipelines should be removed under the inspection of the Geotechnical Engineer and recommendations provided by the Geotechnical Engineer and/or city, county or state agencies. If such structures are known or found, the Geotechnical Engineer should be notified as soon as possible so that recommendations can be formulated.

- Any topsoil, slopewash, colluvium, alluvium and rock materials which are considered unsuitable by the Geotechnical Engineer should be removed prior to fill placement.

- Remaining voids created during site clearing caused by removal of trees, foundations basements, irrigation facilities, etc., should be excavated and filled with compacted fill.

- Subsequent to clearing and removals, areas to receive fill should be scarified to a depth of 10 to 12 inches, moisture conditioned and compacted

- The moisture condition of the processed ground should be at or slightly above the optimum moisture content as determined by the Geotechnical Engineer. Depending upon field conditions, this may require air drying or watering together with mixing and/or discing.

<u>Compacted Fills</u>

- Soil materials imported to or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable in the opinion of the Geotechnical Engineer. Unless otherwise approved by the Geotechnical Engineer, all fill materials shall be free of deleterious, organic, or frozen matter, shall contain no chemicals that may result in the material being classified as “contaminated,” and shall be very low to non-expansive with a maximum expansion index (EI) of 50. The top 12 inches of the compacted fill should have a maximum particle size of 3 inches, and all underlying compacted fill material a maximum 6-inch particle size, except as noted below.

- All soils should be evaluated and tested by the Geotechnical Engineer. Materials with high expansion potential, low strength, poor gradation or containing organic materials may require removal from the site or selective placement and/or mixing to the satisfaction of the Geotechnical Engineer.

- Rock fragments or rocks less than 6 inches in their largest dimensions, or as otherwise determined by the Geotechnical Engineer, may be used in compacted fill, provided the distribution and placement is satisfactory in the opinion of the Geotechnical Engineer.

- Rock fragments or rocks greater than 12 inches should be taken off-site or placed in accordance with recommendations and in areas designated as suitable by the Geotechnical Engineer. These materials should be placed in accordance with Plate D-8 of these Grading Guide Specifications and in accordance with the following recommendations:

  - Rocks 12 inches or more in diameter should be placed in rows at least 15 feet apart, 15 feet from the edge of the fill, and 10 feet or more below subgrade. Spaces should be left between each rock fragment to provide for placement and compaction of soil around the fragments.

  - Fill materials consisting of soil meeting the minimum moisture content requirements and free of oversize material should be placed between and over the rows of rock or concrete. Ample water and compactive effort should be applied to the fill materials as they are placed in order that all of the voids between each of the fragments are filled and compacted to the specified density.

- Subsequent rows of rocks should be placed such that they are not directly above a row placed in the previous lift of fill. A minimum 5-foot offset between rows is recommended.

- To facilitate future trenching, oversized material should not be placed within the range of foundation excavations, future utilities or other underground construction unless specifically approved by the soil engineer and the developer/owner representative.

- Fill materials approved by the Geotechnical Engineer should be placed in areas previously prepared to receive fill and in evenly placed, near horizontal layers at about 6 to 8 inches in loose thickness, or as otherwise determined by the Geotechnical Engineer for the project.

- Each layer should be moisture conditioned to optimum moisture content, or slightly above, as directed by the Geotechnical Engineer. After proper mixing and/or drying, to evenly distribute the moisture, the layers should be compacted to at least 90 percent of the maximum dry density in compliance with ASTM D-1557-78 unless otherwise indicated.

- Density and moisture content testing should be performed by the Geotechnical Engineer at random intervals and locations as determined by the Geotechnical Engineer. These tests are intended as an aid to the Earthwork Contractor, so he can evaluate his workmanship, equipment effectiveness and site conditions. The Earthwork Contractor is responsible for compaction as required by the Geotechnical Report(s) and governmental agencies.

- Fill areas unused for a period of time may require moisture conditioning, processing and recompaction prior to the start of additional filling. The Earthwork Contractor should notify the Geotechnical Engineer of his intent so that an evaluation can be made.

- Fill placed on ground sloping at a 5-to-1 inclination (horizontal-to-vertical) or steeper should be benched into bedrock or other suitable materials, as directed by the Geotechnical Engineer. Typical details of benching are illustrated on Plates D-2, D-4, and D-5.

- Cut/fill transition lots should have the cut portion overexcavated to a depth of at least 3 feet and rebuilt with fill (see Plate D-1), as determined by the Geotechnical Engineer.

- All cut lots should be inspected by the Geotechnical Engineer for fracturing and other bedrock conditions. If necessary, the pads should be overexcavated to a depth of 3 feet and rebuilt with a uniform, more cohesive soil type to impede moisture penetration.

- Cut portions of pad areas above buttresses or stabilizations should be overexcavated to a depth of 3 feet and rebuilt with uniform, more cohesive compacted fill to impede moisture penetration.

- Non-structural fill adjacent to structural fill should typically be placed in unison to provide lateral support. Backfill along walls must be placed and compacted with care to ensure that excessive unbalanced lateral pressures do not develop. The type of fill material placed adjacent to below grade walls must be properly tested and approved by the Geotechnical Engineer with consideration of the lateral earth pressure used in the design.

Foundations

- The foundation influence zone is defined as extending one foot horizontally from the outside edge of a footing, and proceeding downward at a ½ horizontal to 1 vertical (0.5:1) inclination.

- Where overexcavation beneath a footing subgrade is necessary, it should be conducted so as to encompass the entire foundation influence zone, as described above.

- Compacted fill adjacent to exterior footings should extend at least 12 inches above foundation bearing grade. Compacted fill within the interior of structures should extend to the floor subgrade elevation.

Fill Slopes

- The placement and compaction of fill described above applies to all fill slopes. Slope compaction should be accomplished by overfilling the slope, adequately compacting the fill in even layers, including the overfilled zone and cutting the slope back to expose the compacted core

- Slope compaction may also be achieved by backrolling the slope adequately every 2 to 4 vertical feet during the filling process as well as requiring the earth moving and compaction equipment to work close to the top of the slope. Upon completion of slope construction, the slope face should be compacted with a sheepsfoot connected to a sideboom and then grid rolled. This method of slope compaction should only be used if approved by the Geotechnical Engineer.

- Sandy soils lacking in adequate cohesion may be unstable for a finished slope condition and therefore should not be placed within 15 horizontal feet of the slope face.

- All fill slopes should be keyed into bedrock or other suitable material. Fill keys should be at least 15 feet wide and inclined at 2 percent into the slope. For slopes higher than 30 feet, the fill key width should be equal to one-half the height of the slope (see Plate D-5).

- All fill keys should be cleared of loose slough material prior to geotechnical inspection and should be approved by the Geotechnical Engineer and governmental agencies prior to filling.

- The cut portion of fill over cut slopes should be made first and inspected by the Geotechnical Engineer for possible stabilization requirements. The fill portion should be adequately keyed through all surficial soils and into bedrock or suitable material. Soils should be removed from the transition zone between the cut and fill portions (see Plate D-2).

Cut Slopes

- All cut slopes should be inspected by the Geotechnical Engineer to determine the need for stabilization. The Earthwork Contractor should notify the Geotechnical Engineer when slope cutting is in progress at intervals of 10 vertical feet. Failure to notify may result in a delay in recommendations.

- Cut slopes exposing loose, cohesionless sands should be reported to the Geotechnical Engineer for possible stabilization recommendations.

- All stabilization excavations should be cleared of loose slough material prior to geotechnical inspection. Stakes should be provided by the Civil Engineer to verify the location and dimensions of the key. A typical stabilization fill detail is shown on Plate D-5.

- Stabilization key excavations should be provided with subdrains. Typical subdrain details are shown on Plates D-6.

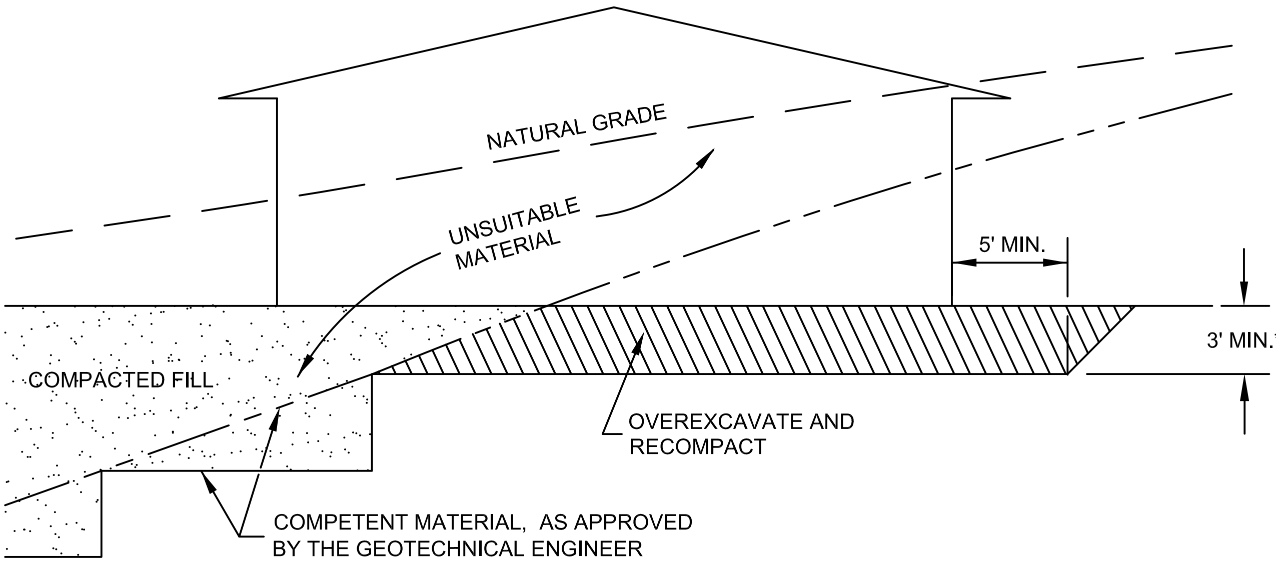
Subdrains

- Subdrains may be required in canyons and swales where fill placement is proposed. Typical subdrain details for canyons are shown on Plate D-3. Subdrains should be installed after approval of removals and before filling, as determined by the Soils Engineer.

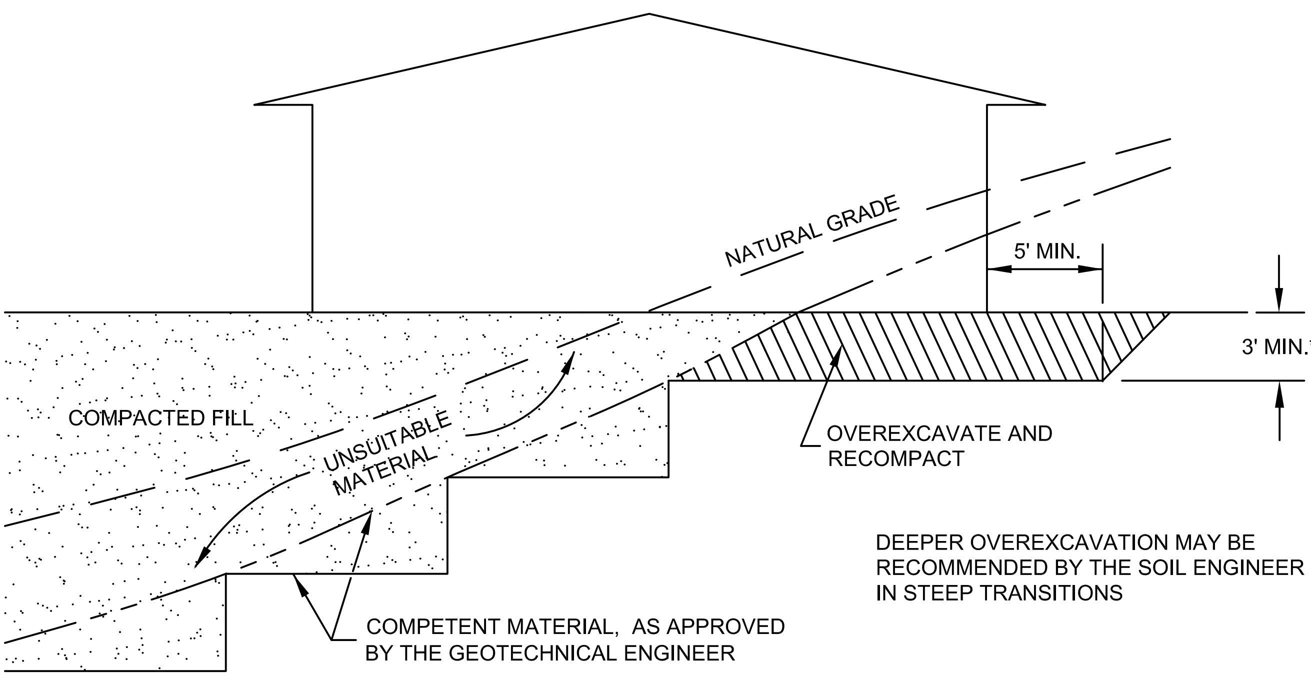
- Plastic pipe may be used for subdrains provided it is Schedule 40 or SDR 35 or equivalent. Pipe should be protected against breakage, typically by placement in a square-cut (backhoe) trench or as recommended by the manufacturer.

- Filter material for subdrains should conform to CALTRANS Specification 68-1.025 or as approved by the Geotechnical Engineer for the specific site conditions. Clean ¾-inch crushed rock may be used provided it is wrapped in an acceptable filter cloth and approved by the Geotechnical Engineer. Pipe diameters should be 6 inches for runs up to 500 feet and 8 inches for the downstream continuations of longer runs. Four-inch diameter pipe may be used in buttress and stabilization fills.

CUT LOT



CUT/FILL LOT (TRANSITION)



DEEPER OVEREXCAVATION MAY BE RECOMMENDED BY THE SOIL ENGINEER IN STEEP TRANSITIONS

*SEE TEXT OF REPORT FOR SPECIFIC RECOMMENDATION.
ACTUAL DEPTH OF OVEREXCAVATION MAY BE GREATER.

TRANSITION LOT DETAIL

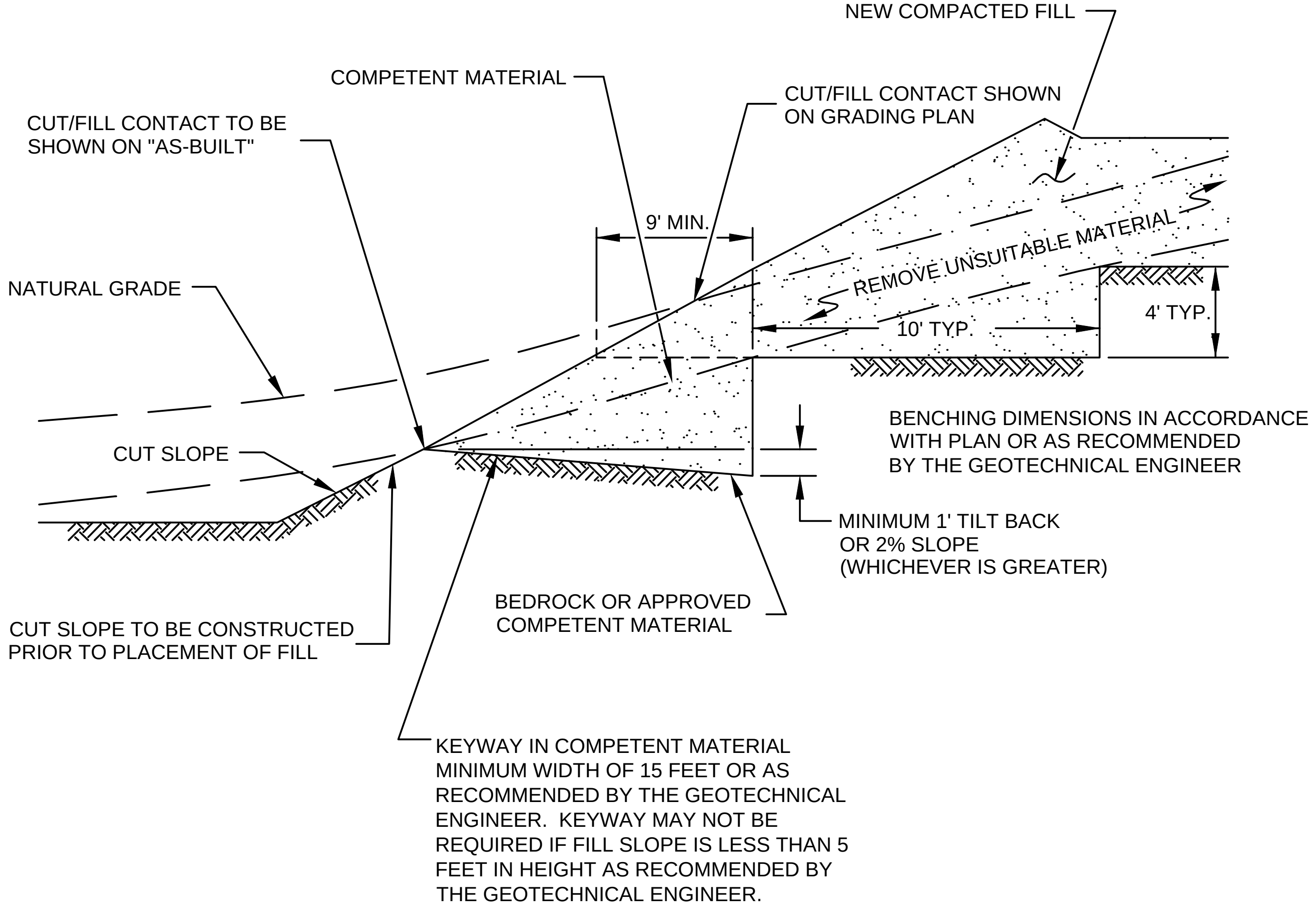
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-1

SOUTHERN CALIFORNIA GEOTECHNICAL



FILL ABOVE CUT SLOPE DETAIL

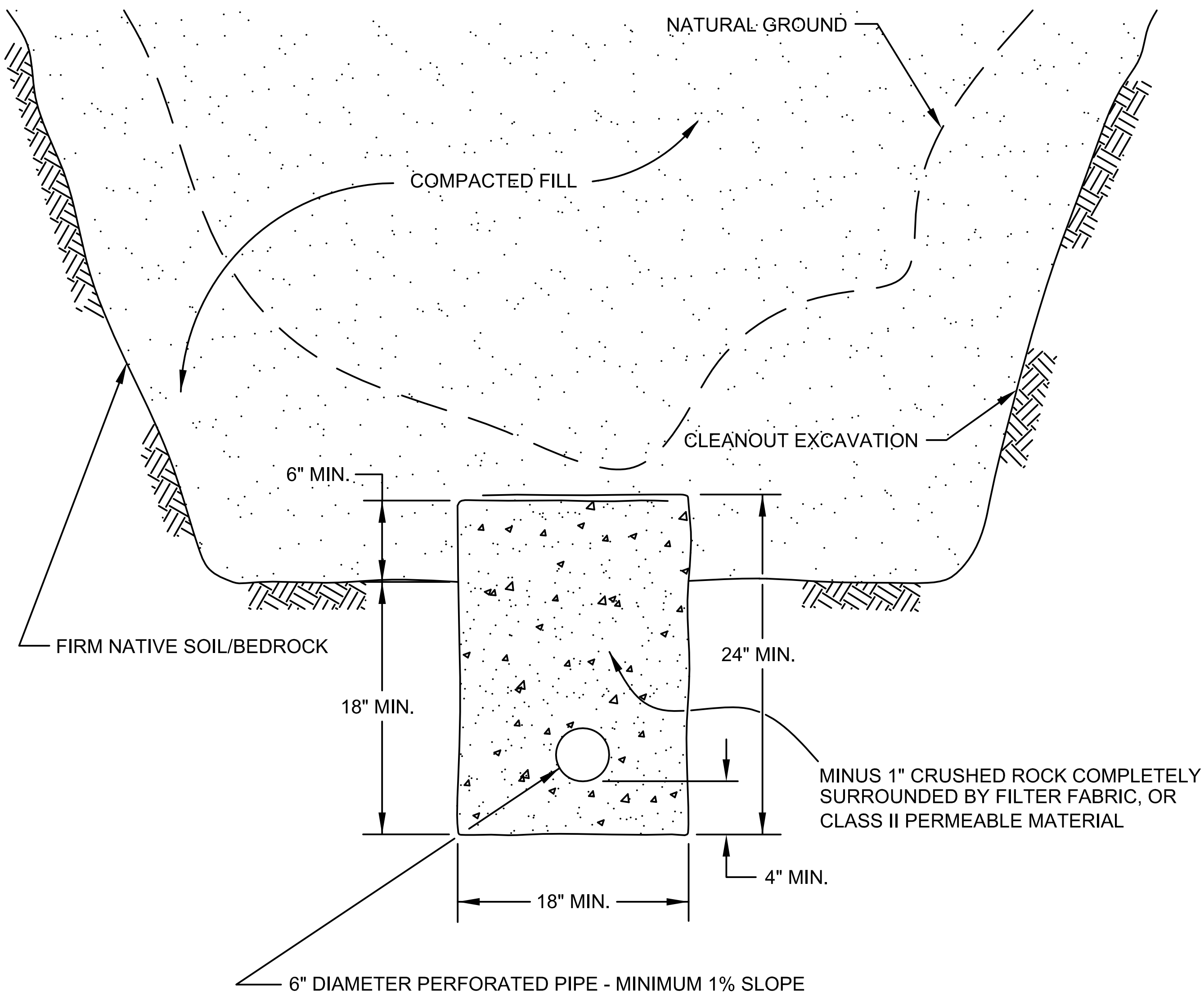
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



PIPE MATERIAL	DEPTH OF FILL OVER SUBDRAIN
ADS (CORRUGATED POLETHYLENE)	8
TRANSITE UNDERDRAIN	20
PVC OR ABS: SDR 35	35
SDR 21	100

SCHEMATIC ONLY
NOT TO SCALE

CANYON SUBDRAIN DETAIL

GRADING GUIDE SPECIFICATIONS

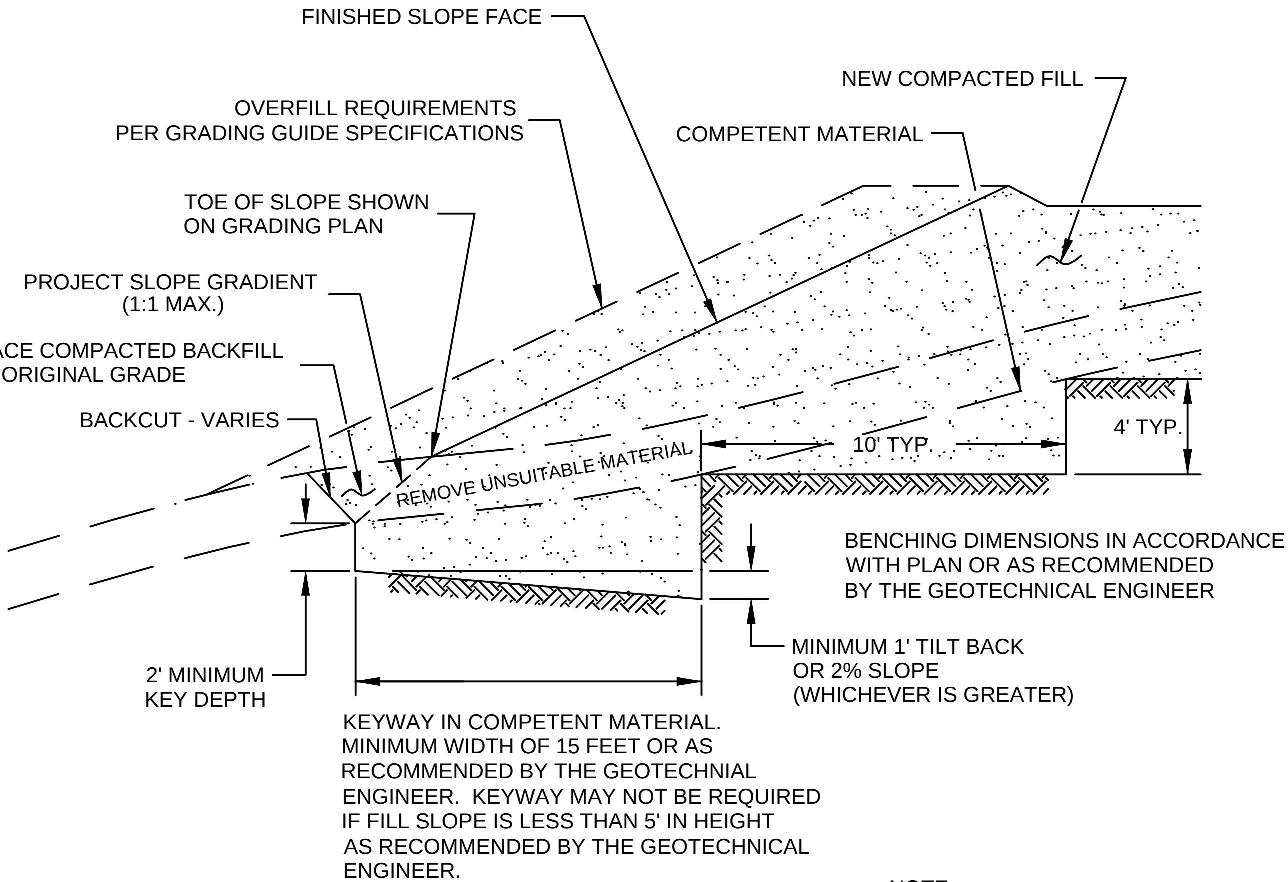
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-3

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



NOTE:
BENCHING SHALL BE REQUIRED
WHEN NATURAL SLOPES ARE
EQUAL TO OR STEEPER THAN 5:1
OR WHEN RECOMMENDED BY
THE GEOTECHNICAL ENGINEER.

FILL ABOVE NATURAL SLOPE DETAIL

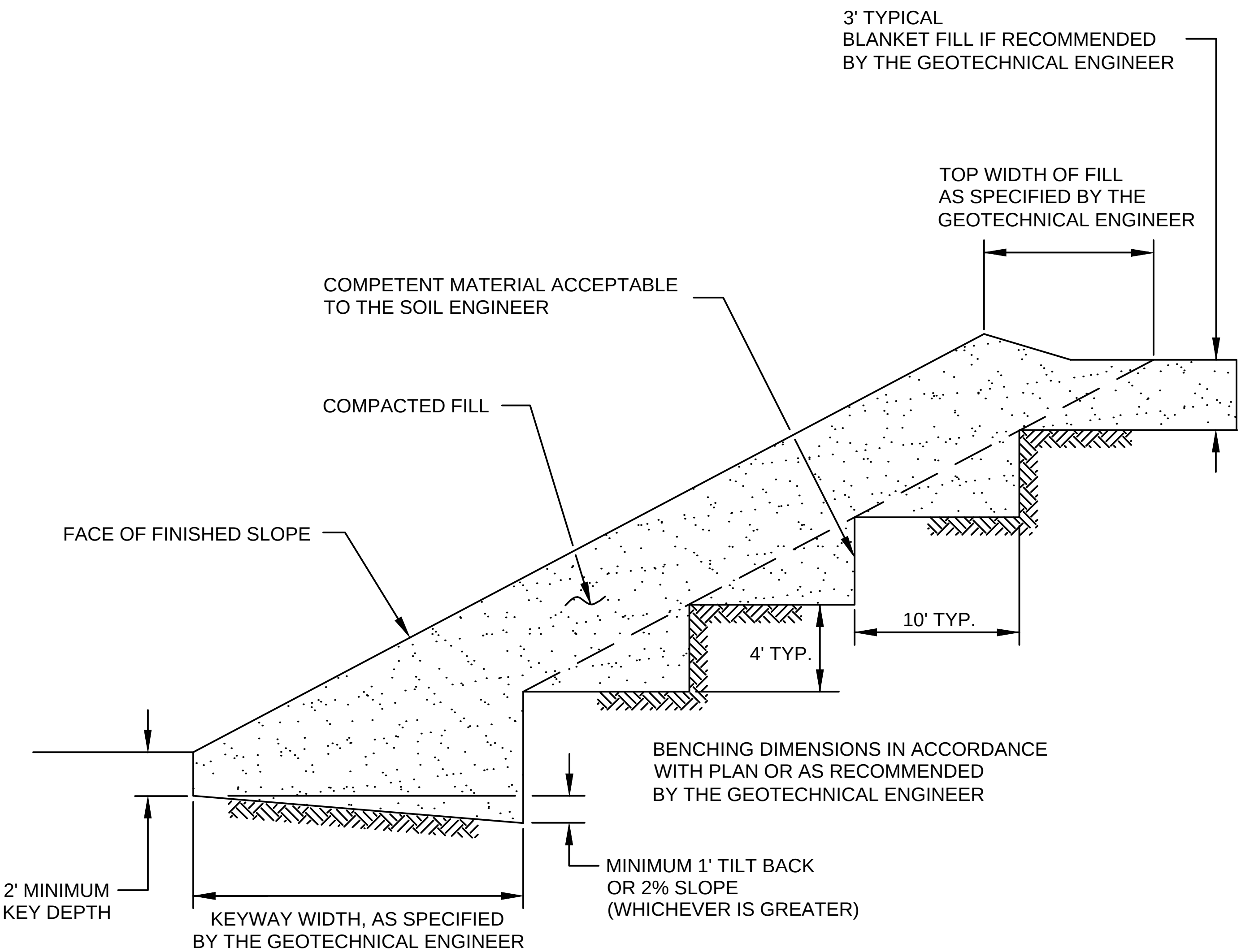
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



STABILIZATION FILL DETAIL

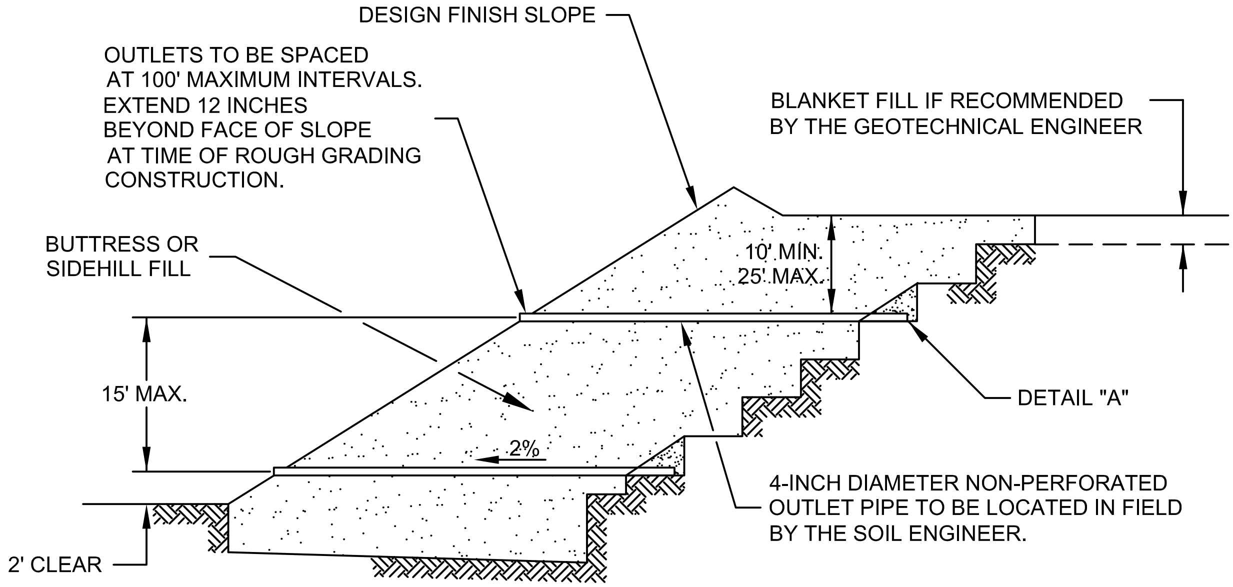
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-5

SoCalGeo
SOUTHERN
CALIFORNIA
GEOTECHNICAL



"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

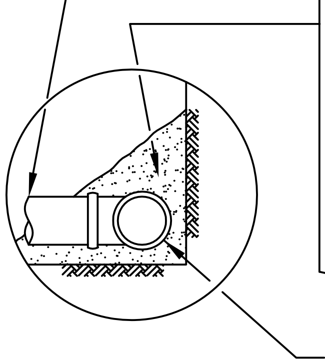
SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1 1/2"	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT = MINIMUM OF 50

OUTLET PIPE TO BE CONNECTED TO SUBDRAIN PIPE WITH TEE OR ELBOW



FILTER MATERIAL - MINIMUM OF FIVE CUBIC FEET PER FOOT OF PIPE. SEE ABOVE FOR FILTER MATERIAL SPECIFICATION.

ALTERNATIVE: IN LIEU OF FILTER MATERIAL FIVE CUBIC FEET OF GRAVEL PER FOOT OF PIPE MAY BE ENCASED IN FILTER FABRIC. SEE ABOVE FOR GRAVEL SPECIFICATION.

FILTER FABRIC SHALL BE MIRAFI 140 OR EQUIVALENT. FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 12 INCHES ON ALL JOINTS.

MINIMUM 4-INCH DIAMETER PVC SCH 40 OR ABS CLASS SDR 35 WITH A CRUSHING STRENGTH OF AT LEAST 1,000 POUNDS, WITH A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE INSTALLED WITH PERFORATIONS ON BOTTOM OF PIPE. PROVIDE CAP AT UPSTREAM END OF PIPE. SLOPE AT 2 PERCENT TO OUTLET PIPE.

DETAIL "A"

NOTES:
1. TRENCH FOR OUTLET PIPES TO BE BACKFILLED WITH ON-SITE SOIL.

SLOPE FILL SUBDRAINS

GRADING GUIDE SPECIFICATIONS

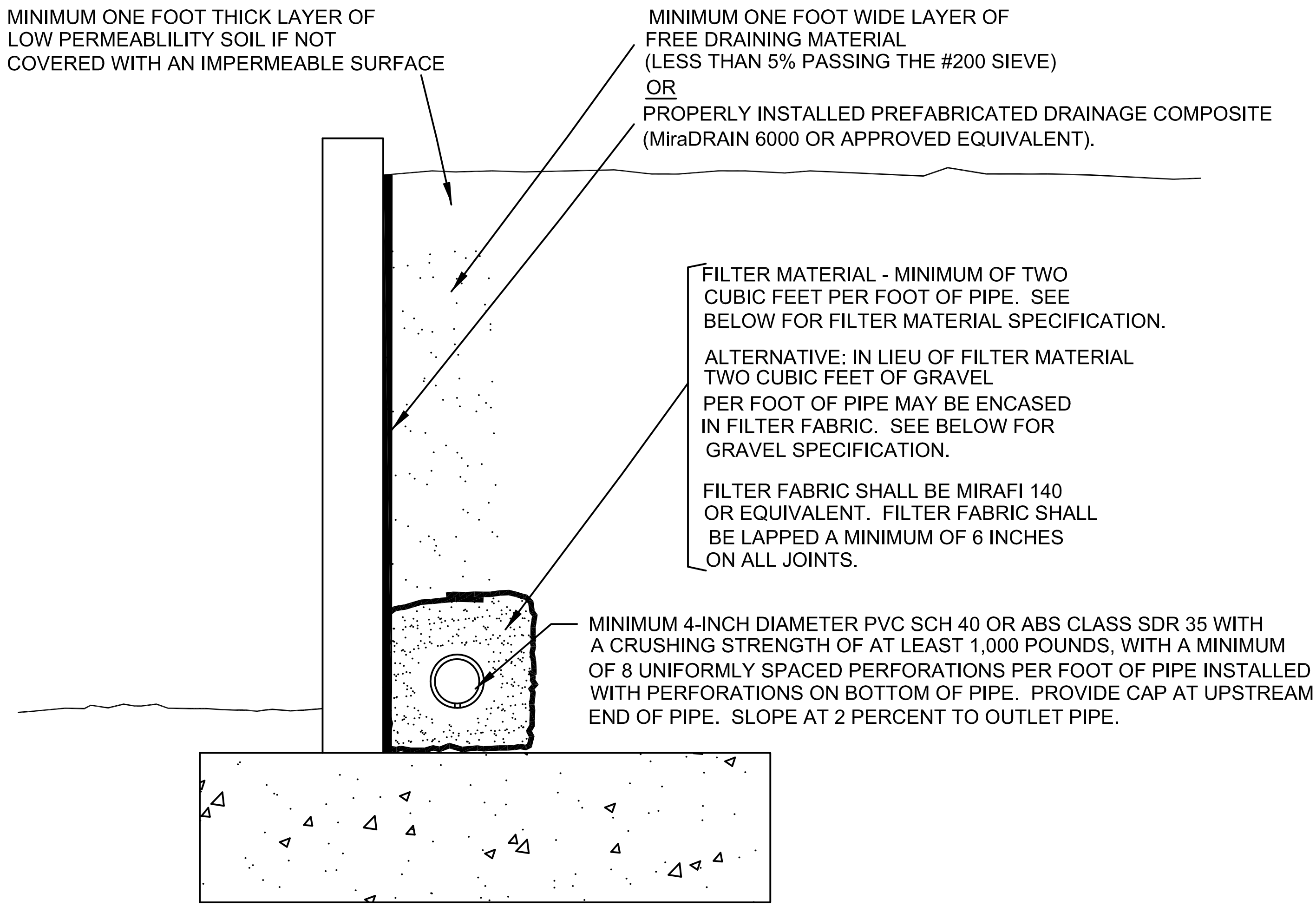
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-6

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1 1/2"	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT = MINIMUM OF 50

RETAINING WALL BACKDRAINS

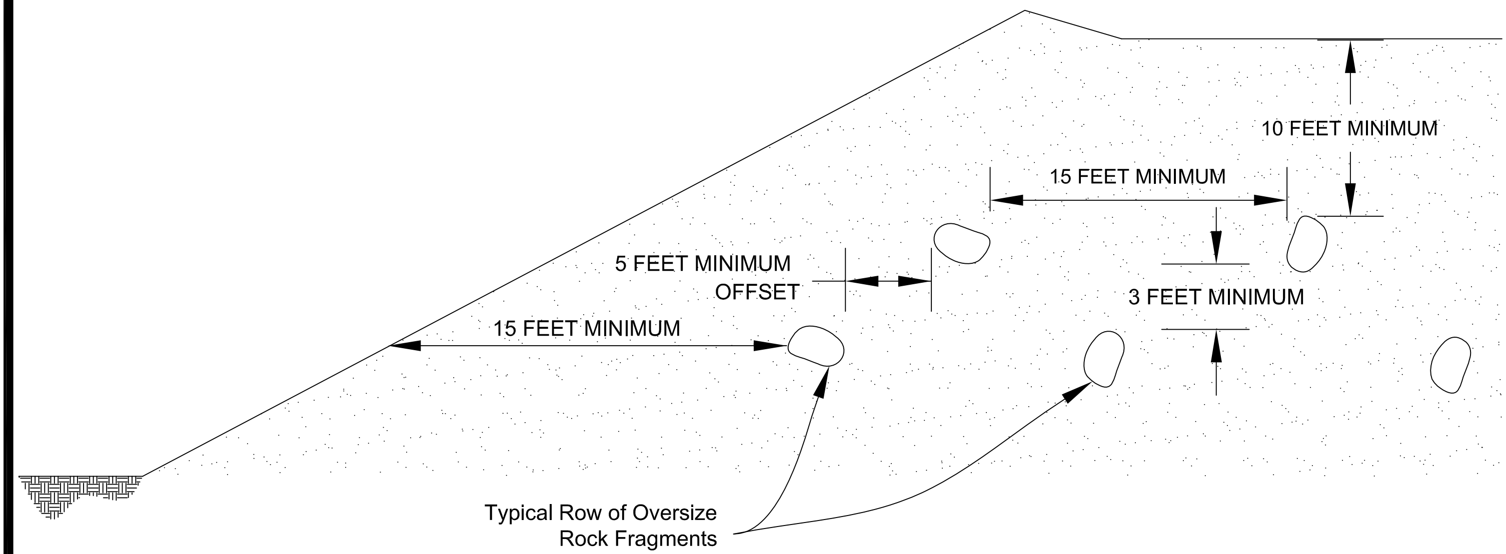
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

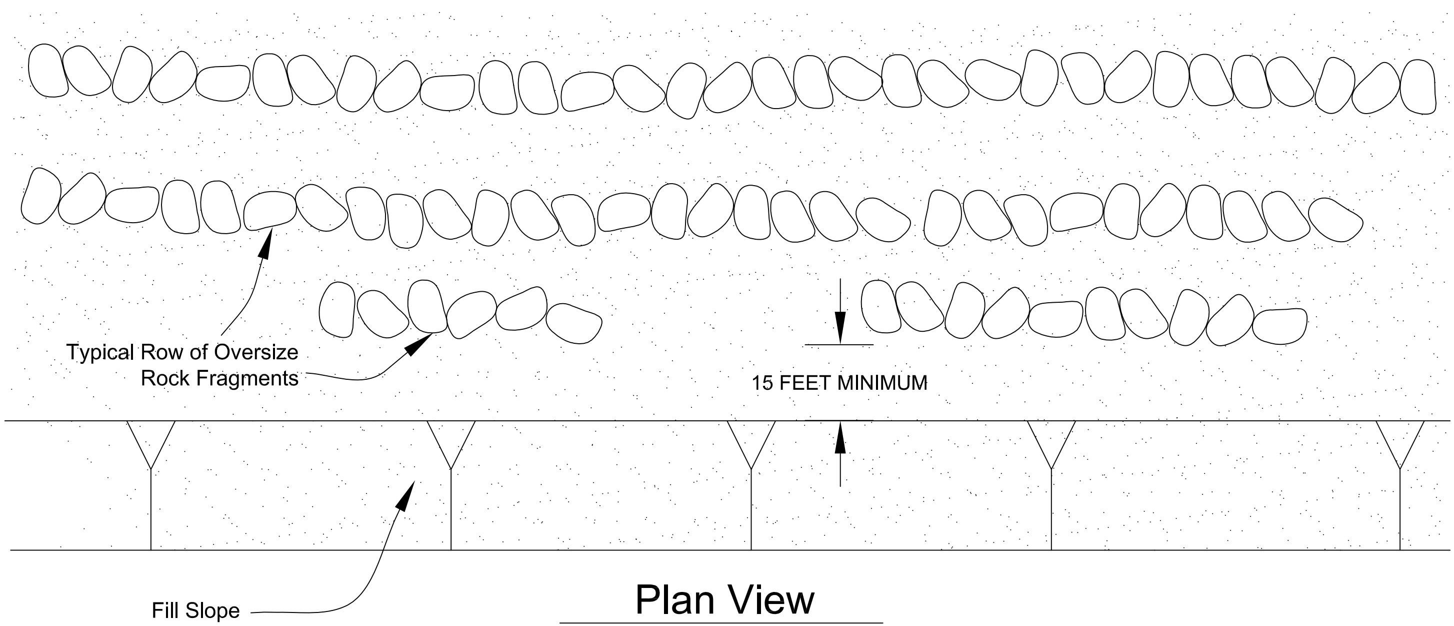
DRAWN: JAS
CHKD: GKM

PLATE D-7

SOUTHERN CALIFORNIA GEOTECHNICAL



Section View



Plan View

PLACEMENT OF OVERSIZED MATERIAL

GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: PM
CHKD: GKM

PLATE D-8

SoCalGeo

SOUTHERN
CALIFORNIA
GEOTECHNICAL

APPENDIX E

USGS Design Maps Summary Report

User–Specified Input

Report Title Bloomington Business Center
Thu March 12, 2015 15:46:08 UTC

Building Code Reference Document ASCE 7-10 Standard
(which utilizes USGS hazard data available in 2008)

Site Coordinates 34.06224°N, 117.41187°W

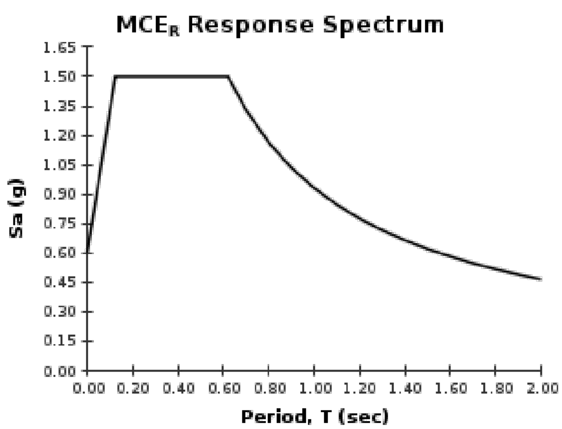
Site Soil Classification Site Class D – "Stiff Soil"

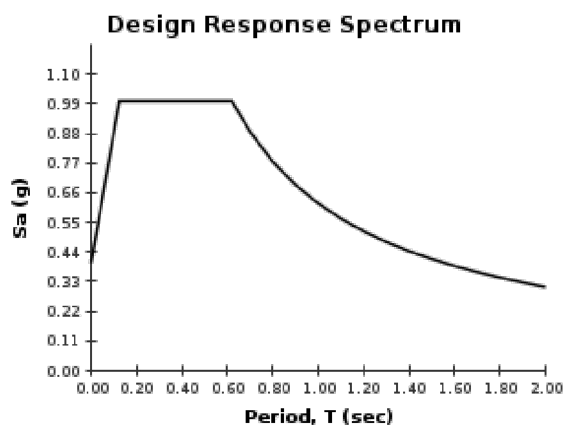
Risk Category I/II/III

USGS–Provided Output

S_S =	1.500 g	S_{MS} =	1.500 g	S_{DS} =	1.000 g
S_1 =	0.620 g	S_{M1} =	0.931 g	S_{D1} =	0.620 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.





SOURCE: U.S. GEOLOGICAL SURVEY (USGS)
<http://geohazards.usgs.gov/designmaps/us/application.php>

SEISMIC DESIGN PARAMETERS
BLOOMINGTON BUSINESS CENTER
BLOOMINGTON, CALIFORNIA

DRAWN: PM
CHKD: JAS
SCG PROJECT 15G119-1
PLATE E-1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL

March 16, 2015

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JM Realty Group, Inc.
3535 Inland Empire Boulevard
Ontario, California 91764

Attention: Mr. Joe McKay

Project No.: **15G119-2**

Subject: **Results of Infiltration Testing**
Bloomington Business Center
SEC Slover Avenue and Laurel Avenue
San Bernardino County, California

Reference: Geotechnical Investigation, Bloomington Business Center, SEC Laurel Avenue and Slover Avenue, San Bernardino County, California, prepared for JM Realty Group, Inc., by Southern California Geotechnical, Inc. (SCG), SCG Project No. 15G119-1, dated March 16, 2015.

Gentlemen:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 14P406R2 dated February 19, 2015. The scope of services included surface reconnaissance, subsurface exploration, field testing, and geotechnical engineering analysis to determine the infiltration rate of the on-site soils. The infiltration tests were performed in general accordance with the Technical Guidance Document for Water Quality Management Plans prepared for the County of San Bernardino Areawide Stormwater Program dated June 7, 2013. The San Bernardino County standards defer to guidelines published by Riverside County Department of Environmental Health (RCDEH).

Site and Project Description

The subject site is located at the southeast corner of Slover Avenue and Laurel Avenue in Bloomington, an unincorporated area of San Bernardino County, California. The site is bounded to the south by single family residences and a vacant lot, to the west by Laurel Avenue, to the north by Slover Avenue, and to the east by Locust Avenue. The general location of the site is illustrated on the Site Location Map, included as Plate 1 of this report.

The subject site is a rectangular-shaped parcel, 17± acres in size. The majority of the site is currently vacant and undeveloped. However, the southeast corner of the site is developed with a single family residential lot. The area of the single family residential lot is approximately 1 acre in size. The residential lot consists of a one and two-story structure that is of wood frame, stucco, and brick construction, presumably supported on conventional shallow foundations with a concrete slab-on-grade floor. Several small wooden sheds are located west of the two-story structure. An asphaltic concrete driveway, located on the east side of the residence, connects the residence to Locust Avenue. The residential lot is surrounded by a chain link fence. Based on a review of the Fontana 7.5′ Quadrangle, the northwest corner of the site may have been previously developed with a commercial/industrial building. Ground surface cover throughout the majority of the site consists of exposed soil with moderate to heavy native grass and weed growth. Several small to large trees are located within the residential lot and in the northeast corner of the site. Several small piles of debris were observed scattered throughout the site.

Topographic information for the site was obtained from a preliminary grading plan prepared by Huitt-Zollars Inc. (HZ), the project civil engineer. The preliminary grading plan indicates that the site topography generally slopes downward to the southeast with 10± feet of elevation differential across the subject site. The maximum site elevation is 1077.5± feet mean sea level (msl) located in the northwest corner of the subject site and the minimum site elevation is 1067.3± feet msl in the southeast corner of the subject site.

Based on the plan prepared by HZ, it is our understanding that the site will be developed with one (1) commercial/industrial building, 340,000± ft^2 in size. The building will be surrounded by asphaltic concrete pavements for parking and drive lanes and Portland cement concrete pavements for the loading dock area. Several landscape planters and concrete flatwork will be included throughout the site.

Based on our review of the preliminary grading plan, the site will utilize an infiltration basin and a below-grade chamber system to dispose of storm water. The infiltration basin will be located in the southeast corner of the site and will be constructed at depths of 4½ to 5½± feet below existing site grades. The below-grade chamber system will generally be located in the northern area of the site and will be constructed at depths of approximately 11 to 14± feet below existing site grades.

Concurrent Study

Southern California Geotechnical, Inc. (SCG) recently conducted a geotechnical investigation at the subject site. As part of this investigation, a total of eight (8) borings were advanced to depths of 15 to 30± feet below existing site grades. These borings were logged during drilling by a member of our staff. The borings were advanced using a truck-mounted drill rig, equipped with 8-inch diameter hollow stem augers.

Native alluvial soils were encountered at the ground surface at all of the boring locations. The alluvial soils generally consist of loose to dense silty fine sands, fine sandy silts, and gravelly fine to coarse sands, with varying silt content and occasional cobbles, extending to the maximum depth explored of 30± feet. Groundwater was not encountered at any of the boring locations.

Subsurface Exploration

Scope of Exploration

The subsurface exploration conducted for this project consisted of a total of four (4) infiltration borings. The borings were advanced to depths of 4 to 12± feet below the existing site grades. The borings were located in the areas designated by HZ. These borings were logged during drilling by a member of our staff. The borings were advanced using a truck-mounted drill rig, equipped with 8-inch diameter hollow stem augers. The approximate locations of the infiltration test borings (identified as I-1 through I-4) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon completion of the borings, a sufficient length of 3-inch-diameter 0.02-inch perforated PVC casing was placed into the test boring so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

Native alluvial soils were encountered at the ground surface at all of the infiltration boring locations. The upper alluvial soils generally consist of loose to medium dense silty fine sands, with varying amounts of medium to coarse sand and fine to coarse gravel, extending to depths of 2½ to 6± feet below existing site grades. Below these soils, the alluvial soils generally consist of medium dense to dense gravelly fine to coarse sands, with varying silt content and occasional cobbles, extending to the maximum depth explored of 12± feet. Groundwater was not encountered at any of the boring locations. The Boring Logs, which illustrate the conditions encountered at the trench locations, are included with this report.

Infiltration Testing

We understand that the results of the infiltration testing will be used to prepare a preliminary design for the proposed detention basin and the below-grade chamber system that will be used to store and/or dispose of storm water at the subject site. As previously stated, the infiltration tests were performed in general accordance with Technical Guidance Document for Water Quality Management Plans, prepared for the County of San Bernardino Areawide Stormwater Program, dated June 7, 2013. The San Bernardino County standards defer to guidelines published by Riverside County Department of Environmental Health (RCDEH).

Pre-soaking

In accordance with the infiltration county standards for sandy soils, the infiltration test borings were pre-soaked 2 hours prior to infiltration testing. The pre-soaking process consisted of filling the test boring by inverting a full 5 gallon bottle of clear water supported over the hole so that the water flow into the hole holds constant at a level at a maximum depth of 4 feet below the ground surface or at least 5 times the hole's radius above the gravel at the bottom of the hole. Pre-soaking was completed after all of the water had percolated through the test hole.

Infiltration Testing

Following the pre-soaking process of the infiltration test borings, SCG performed the infiltration testing. The test holes were filled with water to a depth of at least 5 times the holes radius above the gravel at the bottom of the test hole prior to each test interval. In accordance with the San Bernardino County guidelines, since "sandy soils" were encountered at the bottom of all infiltration test borings (where 6 inches of water infiltrated into the surrounding soils for two consecutive 25-minute readings), readings were taken at an interval ranging from 1 to 10 minutes for a total of 1 hour at the test locations. Readings for Infiltration Test Nos. I-1 and I-2 were taken at 1 minute intervals due to the high gravel content. After each reading, water was added to each boring so that the depth of the water was at least 5 times the radius of the hole. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates for all of the tests are tabulated in inches per hour. In accordance with typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration test be used for design. These rates are summarized below:

Infiltration Test No.	**Soil Description**	**Infiltration Rate (inches/hour)**
I-1	Gravelly fine to coarse Sand, occasional Cobbles	22.7
I-2	Fine to coarse Sand, some fine to coarse Gravel, occasional Cobbles	15.4
I-3	Silty fine to medium Sand	5.3
I-4	Silty fine to coarse Sand, little fine Gravel	2.6

Laboratory Testing

Grain Size Analysis

The grain size distribution of selected soils from the base of each infiltration test boring has been determined using a range of wire mesh screens. The analysis was performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of the analysis are presented at the end of this report.

Design Recommendations

A total of four (4) infiltration tests were performed at the subject site. As noted above, the infiltration rates at these locations vary from 2.6 to 22.7 inches per hour. The varying infiltration rates are primarily due to the subsurface profile at the project site. The primary factor affecting the varying infiltration rates is the varying silt and gravel content. Infiltration Test Nos. I-3 and I-4 possess high silt content and exhibited slower infiltration rates. Higher gravel content was observed within the soils encountered at the bottom of Infiltration Test Nos. I-1 and I-2, which exhibited faster infiltration rates.

Based on the infiltration test results at Infiltration Test Nos. I-1 and I-2, an infiltration rate of 15 inches per hour is recommended for the design of the proposed below-grade chamber system located in the northern area of the site. Based on the infiltration test results at Infiltration Test Nos. I-3 and I-4, an infiltration rate of 2 inches per hour is recommended for the design of the proposed detention basin located in the southeast corner of the site.

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed detention basins to identify the soil classification at the base of the basins. It should be confirmed that the soils at the base of the proposed detention basins correspond with those presented in this report to ensure that the performance of the system will be consistent with the rates reported herein.

The design of the proposed detention basins should be performed by the project civil engineer, in accordance with the San Bernardino County guidelines. **It is recommended that the project civil engineer apply an appropriate factor of safety.** It is recommended that the systems be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the systems. The presence of such materials would decrease the effective infiltration rates. **The infiltration rates recommended above are based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rates.** It should be noted that the recommended infiltration rates are based on infiltration testing at four (4) discrete locations and that the overall infiltration rate of the proposed detention basins could vary considerably.

Infiltration versus Permeability

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. The infiltration rates presented herein were determined in accordance with the Los Angeles County standard, and are considered valid for the time and place of the actual test. Changes in soil moisture content will affect these infiltration rates. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration areas could potentially be damaged due to saturation of subgrade soils. If possible, all of the proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls. Even with this provision of locating the infiltration systems at least 25 feet from the buildings, it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted.

The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

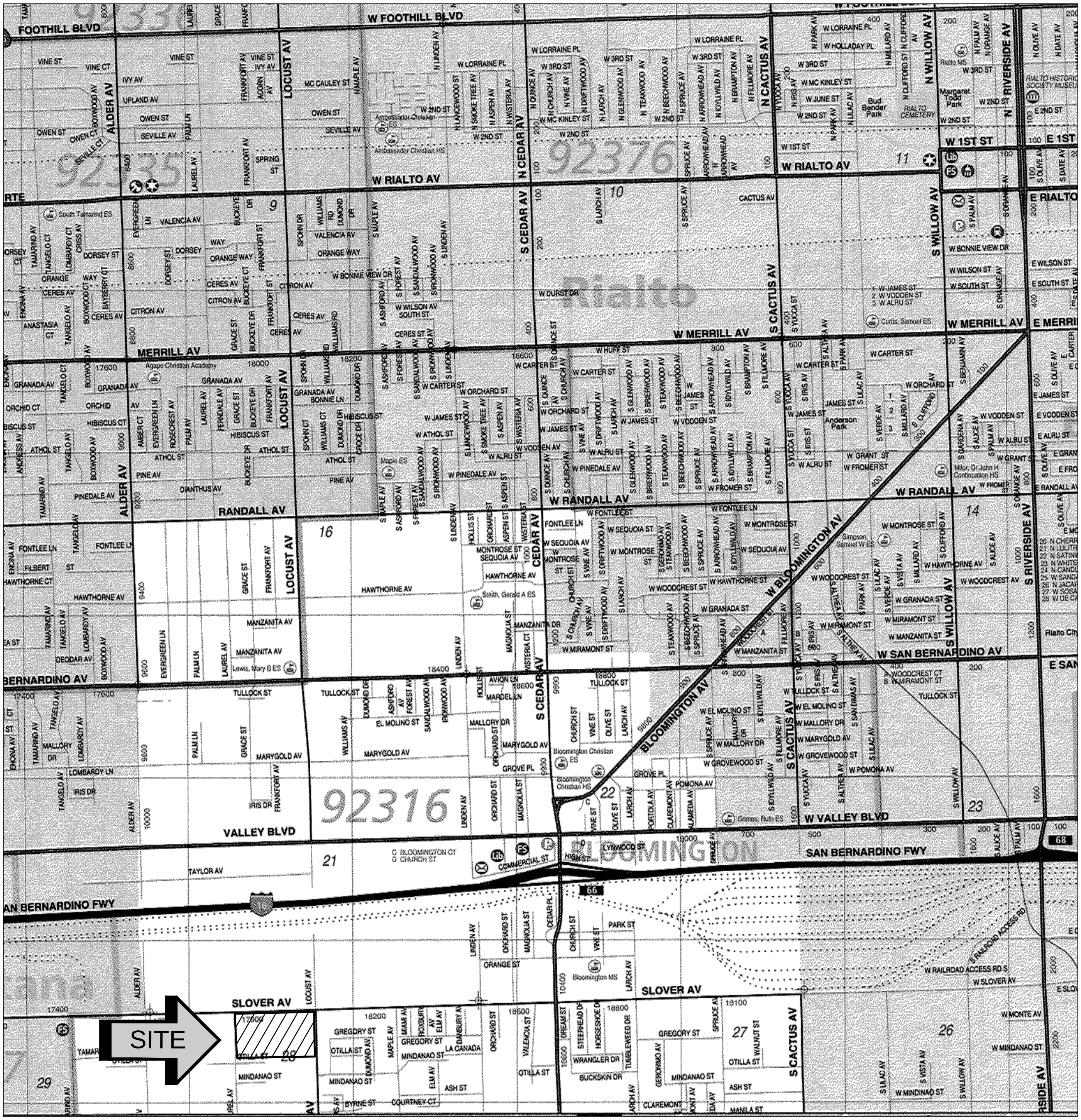
Matt Manni
Staff Geologist

John A. Seminara, GE 2294
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
JOHN A. SEMINARA
No. 2294
GEOTECHNICAL
STATE OF CALIFORNIA

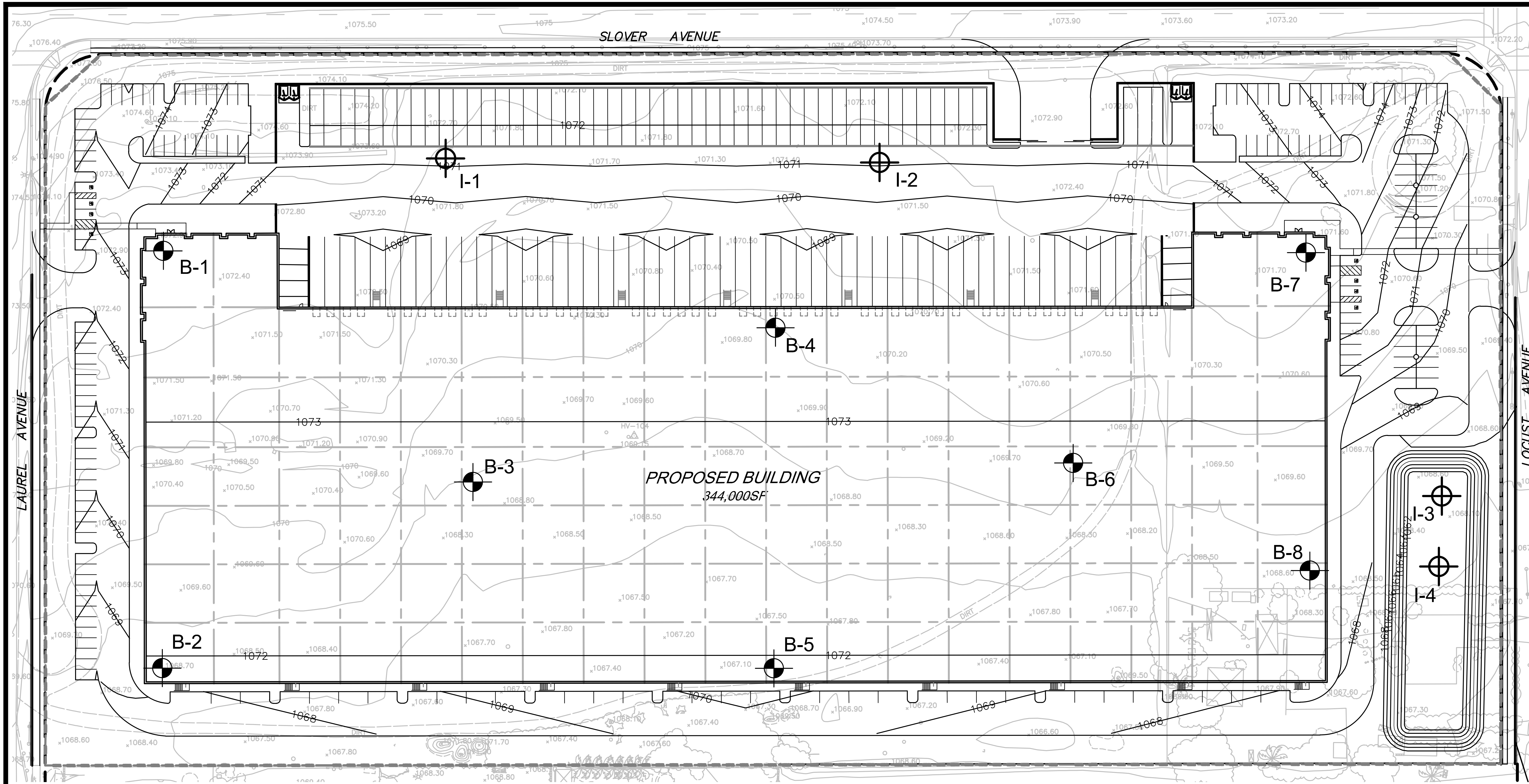
Distribution: (1) Addressee

Enclosures:
- Plate 1 Site Location Map
- Plate 2 Infiltration Test Location Plan
- Boring Log Legend and Logs (5 pages)
- Infiltration Test Results Spreadsheets (8 pages)
- Grain Size Distribution Graphs (4 pages)



SOURCE: SAN BERNARDINO COUNTY
THOMAS GUIDE, 2013

SITE LOCATION MAP	
BLOOMINGTON BUSINESS CENTER	
BLOOMINGTON, CALIFORNIA	
SCALE: 1" = 2400'	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: MRM CHKD: JAS	
SCG PROJECT 15G119-2	
PLATE 1	



GEOTECHNICAL LEGEND

APPROXIMATE INFILTRATION TEST LOCATION

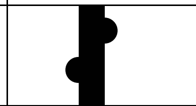
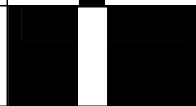
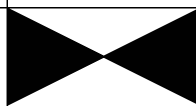
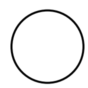
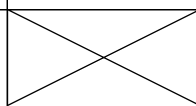
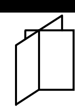
APPROXIMATE BORING LOCATION FROM CONCURRENT STUDY (SCG PROJECT NO. 15G119-1)

NORTH SoCalGeo

NOTE: BASE MAP PROVIDED BY HUITT-ZOLLARS, INC.

INFILTRATION TEST LOCATION PLAN	
BLOOMINGTON BUSINESS CENTER	
BLOOMINGTON, CALIFORNIA	
SCALE: 1" = 80'	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: PM CHKD: JAS	
SCG PROJECT 15G119-2	
PLATE 2	

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-1

JOB NO.: 15G119-2
PROJECT: Bloomington Business Center
LOCATION: San Bernardino County, California

DRILLING DATE: 2/25/15
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Matt Manni

WATER DEPTH: Dry
CAVE DEPTH: N/A
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

FIELD RESULTS: DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS: DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					ALLUVIUM: Light Brown Silty fine Sand, medium dense-damp							
	X	13					5					
					Light Gray Brown Silty fine Sand, trace medium to coarse Sand, trace fine Gravel, medium dense-damp							
5	X	19					3					
					Gray Gravelly fine to coarse Sand, occasional Cobbles, dense-dry to damp							
	X	32					1					
10												
	X	28			@ 10½ to 12', medium dense		2					

Boring Terminated at 12'

TBL 15G119-2.GPJ SOCALGEO.GDT 3/17/15

TEST BORING LOG

PLATE I-1

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-2

JOB NO.: 15G119-2	DRILLING DATE: 2/25/15	WATER DEPTH: Dry
PROJECT: Bloomington Business Center	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: N/A
LOCATION: San Bernardino County, California	LOGGED BY: Matt Manni	READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
	X	21			ALLUVIUM: Light Brown Silty fine Sand, trace medium to coarse Sand, little fine to coarse Gravel, trace fine root fibers, medium dense-dry		2					
5	X	30			Gray Brown Gravelly fine to coarse Sand, occasional Cobbles, little Silt, medium dense to dense-dry to damp		2					
	X	26					2					
10	X	22			Gray Brown fine to coarse Sand, little fine to coarse Gravel, occasional Cobbles, trace Silt, medium dense-damp		3					
					Boring Terminated at 12'							

TBL 15G119-2.GPJ SOCALGEO.GDT 3/17/15

SOUTHERN CALIFORNIA GEOTECHNICAL

A California Corporation

BORING NO. I-3

JOB NO.: 15G119-2	DRILLING DATE: 2/25/15	WATER DEPTH: Dry
PROJECT: Bloomington Business Center	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: N/A
LOCATION: San Bernardino County, California	LOGGED BY: Matt Manni	READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					ALLUVIUM: Light Brown Silty fine to medium Sand, trace fine root fibers, loose to medium dense-damp							
	X	6					3					
	X	17					3					
5												
					Boring Terminated at 5'							

TBL 15G119-2.GPJ SOCALGEO.GDT 3/17/15

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-4

JOB NO.: 15G119-2
PROJECT: Bloomington Business Center
LOCATION: San Bernardino County, California

DRILLING DATE: 2/25/15
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Matt Manni

WATER DEPTH: Dry
CAVE DEPTH: N/A
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					ALLUVIUM: Light Brown Silty fine to coarse Sand, trace fine root fibers, loose-damp							
	X	7					3					
	X	9			@ 3½ to 5 feet, trace fine to coarse Gravel, trace medium to coarse Sand		2					
5												
					Boring Terminated at 5'							

TBL 15G119-2.GPJ SOCALGEO.GDT 3/17/15

INFILTRATION CALCULATIONS

Project Name	Bloomington Business Center
Project Location	Bloomington, CA
Project Number	15G119-2
Engineer	Matt Manni

Test Hole Diameter	8	(in)
Test Hole Radius	4	(in)
Test Depth	11.05	(ft)

Infiltration Test Hole	I-1

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	12:45 PM	10.00	7.00	4.05	2.03	22.17
	Final	12:55 PM		11.05			
2	Initial	1:00 PM	10.00	4.50	6.55	3.28	22.84
	Final	1:10 PM		11.05			
3	Initial	1:11 PM	1.00	7.00	0.80	3.65	25.15
	Final	1:12 PM		7.80			
4	Initial	1:13 PM	1.00	7.80	0.65	2.93	25.23
	Final	1:14 PM		8.45			
5	Initial	1:15 PM	1.00	8.45	0.50	2.35	23.84
	Final	1:16 PM		8.95			
6	Initial	1:17 PM	1.00	8.95	0.40	1.90	23.23
	Final	1:18 PM		9.35			
7	Initial	1:19 PM	1.00	7.00	0.75	3.68	23.43
	Final	1:20 PM		7.75			
8	Initial	1:21 PM	1.00	7.75	0.65	2.98	24.83
	Final	1:22 PM		8.40			
9	Initial	1:23 PM	1.00	8.40	0.50	2.40	23.38
	Final	1:24 PM		8.90			
10	Initial	1:25 PM	1.00	7.25	0.70	3.45	23.23
	Final	1:26 PM		7.95			
11	Initial	1:27 PM	1.00	7.00	0.75	3.68	23.43
	Final	1:28 PM		7.75			
12	Initial	1:29 PM	1.00	7.75	0.60	3.00	22.74
	Final	1:30 PM		8.35			

Per County Standards, Infiltration Rate calculated as follows:

$$\boxed{Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Bloomington Business Center
Project Location	Bloomington, CA
Project Number	15G119-2
Engineer	Matt Manni

Test Hole Diameter	8	(in)
Test Hole Radius	4	(in)
Test Depth	12.16	(ft)

Infiltration Test Hole	I-2

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	1:35 PM	10.00	6.95	5.21	2.61	22.56
	Final	1:45 PM		12.16			
2	Initial	1:46 PM	10.00	4.45	7.71	3.86	23.01
	Final	1:56 PM		12.16			
3	Initial	1:57 PM	2.00	6.95	1.55	4.44	20.21
	Final	1:59 PM		8.50			
4	Initial	2:00 PM	2.00	8.80	1.00	2.86	19.82
	Final	2:02 PM		9.80			
5	Initial	2:03 PM	2.00	4.00	2.30	7.01	19.23
	Final	2:05 PM		6.30			
6	Initial	2:06 PM	2.00	6.70	1.60	4.66	19.89
	Final	2:08 PM		8.30			
7	Initial	2:09 PM	2.00	8.30	1.10	3.31	18.98
	Final	2:11 PM		9.40			
8	Initial	2:12 PM	2.00	4.50	1.80	6.76	15.59
	Final	2:14 PM		6.30			
9	Initial	2:15 PM	2.00	6.35	1.35	5.14	15.28
	Final	2:17 PM		7.70			
10	Initial	2:18 PM	2.00	7.80	1.05	3.84	15.74
	Final	2:20 PM		8.85			
11	Initial	2:21 PM	2.00	5.50	1.55	5.89	15.37
	Final	2:23 PM		7.05			
12	Initial	2:24 PM	2.00	7.05	1.20	4.51	15.40
	Final	2:26 PM		8.25			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Bloomington Business Center
Project Location	Bloomington, CA
Project Number	15G119-2
Engineer	Matt Manni

Test Hole Diameter	8	(in)
Test Hole Radius	4	(in)
Test Depth	4.55	(ft)

Infiltration Test Hole: I-3

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	9:10 AM	10.00	2.40	0.85	1.73	5.39
	Final	9:20 AM		3.25			
2	Initial	9:21 AM	10.00	2.40	0.84	1.73	5.31
	Final	9:31 AM		3.24			
3	Initial	9:32 AM	10.00	2.40	0.84	1.73	5.31
	Final	9:42 AM		3.24			
4	Initial	9:43 AM	10.00	2.40	0.84	1.73	5.31
	Final	9:53 AM		3.24			
5	Initial	9:54 AM	10.00	2.40	0.84	1.73	5.31
	Final	10:04 AM		3.24			
6	Initial	10:05 AM	10.00	2.40	0.84	1.73	5.31
	Final	10:15 AM		3.24			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:
- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval
- H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Bloomington Business Center
Project Location	Bloomington, CA
Project Number	15G119-2
Engineer	Matt Manni

Test Hole Diameter	8	(in)
Test Hole Radius	4	(in)
Test Depth	4.15	(ft)

Infiltration Test Hole	I-4

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	10:15 AM	10.00	2.10	0.45	1.83	2.71
	Final	10:25 AM		2.55			
2	Initial	10:26 AM	10.00	2.10	0.45	1.83	2.71
	Final	10:36 AM		2.55			
3	Initial	10:37 AM	10.00	2.10	0.45	1.83	2.71
	Final	10:47 AM		2.55			
4	Initial	10:48 AM	10.00	2.10	0.44	1.83	2.64
	Final	10:58 AM		2.54			
5	Initial	10:59 AM	10.00	2.10	0.44	1.83	2.64
	Final	11:09 AM		2.54			
6	Initial	11:10 AM	10.00	2.10	0.44	1.83	2.64
	Final	11:20 AM		2.54			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)

ΔH = Change in Height (Water Level) over the time interval

r = Test Hole (Borehole) Radius

Δt = Time Interval

H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS (PRE-SOAKING)

Project Name	Bloomington Business Center
Project Location	Bloomington, CA
Project Number	15G119-2
Engineer	Matt Manni

Test Hole Diameter	8	(in)
Test Hole Radius	4	(in)
Test Depth	11.05	(ft)

Infiltration Test Hole: I-1

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Did 6 inches of water seep away in less than 25 minutes?	Sandy Soils or Non-Sandy Soils?
1	Initial	12:05 PM	15.00	7.00	48.60	YES	SANDY SOILS
	Final	12:20 PM		11.05			
2	Initial	12:21 PM	15.00	7.00	48.60	YES	SANDY SOILS
	Final	12:36 PM		11.05			

Is 15 hour Pre-Soaking Required? (Sandy Soils = NO, Non-Sandy Soils = YES)	NO

Pre-Soaking		Time	Time Interval (hrs)	Was Pre-Soaking accomplished?
	Initial	10:00 AM	2.00	YES
	Final	12:00 PM		

INFILTRATION CALCULATIONS (PRE-SOAKING)

Project Name	Bloomington Business Center
Project Location	Bloomington, CA
Project Number	15G119-2
Engineer	Matt Manni

Test Hole Diameter	8	(in)
Test Hole Radius	4	(in)
Test Depth	12.16	(ft)

Infiltration Test Hole	I-2

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Did 6 inches of water seep away in less than 25 minutes?	Sandy Soils or Non-Sandy Soils?
1	Initial	12:25 PM	15.00	6.95	62.52	YES	SANDY SOILS
	Final	12:40 PM		12.16			
2	Initial	12:41 PM	15.00	6.95	62.52	YES	SANDY SOILS
	Final	12:56 PM		12.16			

Is 15 hour Pre-Soaking Required? (Sandy Soils = NO, Non-Sandy Soils = YES)	NO

Pre-Soaking		Time	Time Interval (hrs)	Was Pre-Soaking accomplished?
	Initial	10:15 AM	2.00	YES
	Final	12:15 PM		

INFILTRATION CALCULATIONS (PRE-SOAKING)

Project Name	Bloomington Business Center
Project Location	Bloomington, CA
Project Number	15G119-2
Engineer	Matt Manni

Test Hole Diameter	8	(in)
Test Hole Radius	4	(in)
Test Depth	4.55	(ft)

Infiltration Test Hole	I-3

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (in)	Did 6 inches of water seep away in less than 25 minutes?	Sandy Soils or Non-Sandy Soils?
1	Initial	8:23 AM	24.00	2.40	18.00	YES	SANDY SOILS
	Final	8:47 AM		3.90			
2	Initial	8:49 AM	20.00	2.40	16.20	YES	SANDY SOILS
	Final	9:09 AM		3.75			

Is 15 hour Pre-Soaking Required? (Sandy Soils = NO, Non-Sandy Soils = YES)	NO

Pre-Soaking		Time	Time Interval (hrs)	Was Pre-Soaking accomplished?
	Initial	7:20 AM	0.83	YES
	Final	8:10 AM		

INFILTRATION CALCULATIONS (PRE-SOAKING)

Project Name	Bloomington Business Center
Project Location	Bloomington, CA
Project Number	15G119-2
Engineer	Matt Manni

Test Hole Diameter	8	(in)
Test Hole Radius	4	(in)
Test Depth	4.15	(ft)

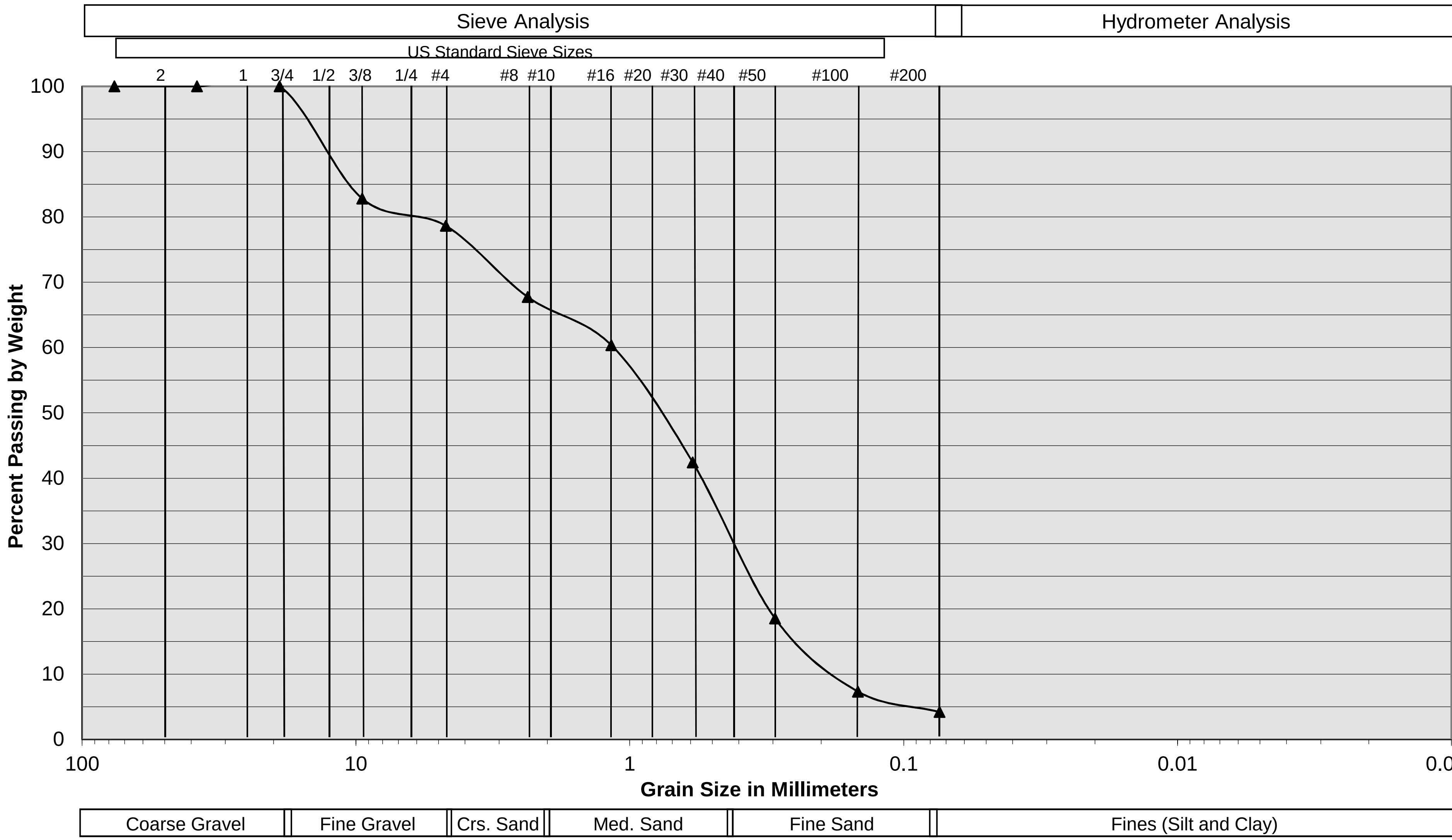
Infiltration Test Hole	I-4

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (in)	Did 6 inches of water seep away in less than 25 minutes?	Sandy Soils or Non-Sandy Soils?
1	Initial	9:35 AM	17.00	2.10	8.40	YES	SANDY SOILS
	Final	9:52 AM		2.80			
2	Initial	9:53 AM	15.00	2.10	7.56	YES	SANDY SOILS
	Final	10:08 AM		2.73			

Is 15 hour Pre-Soaking Required? (Sandy Soils = NO, Non-Sandy Soils = YES)	NO

Pre-Soaking		Time	Time Interval (hrs)	Was Pre-Soaking accomplished?
	Initial	7:30 AM	2.00	YES
	Final	9:30 AM		

Grain Size Distribution

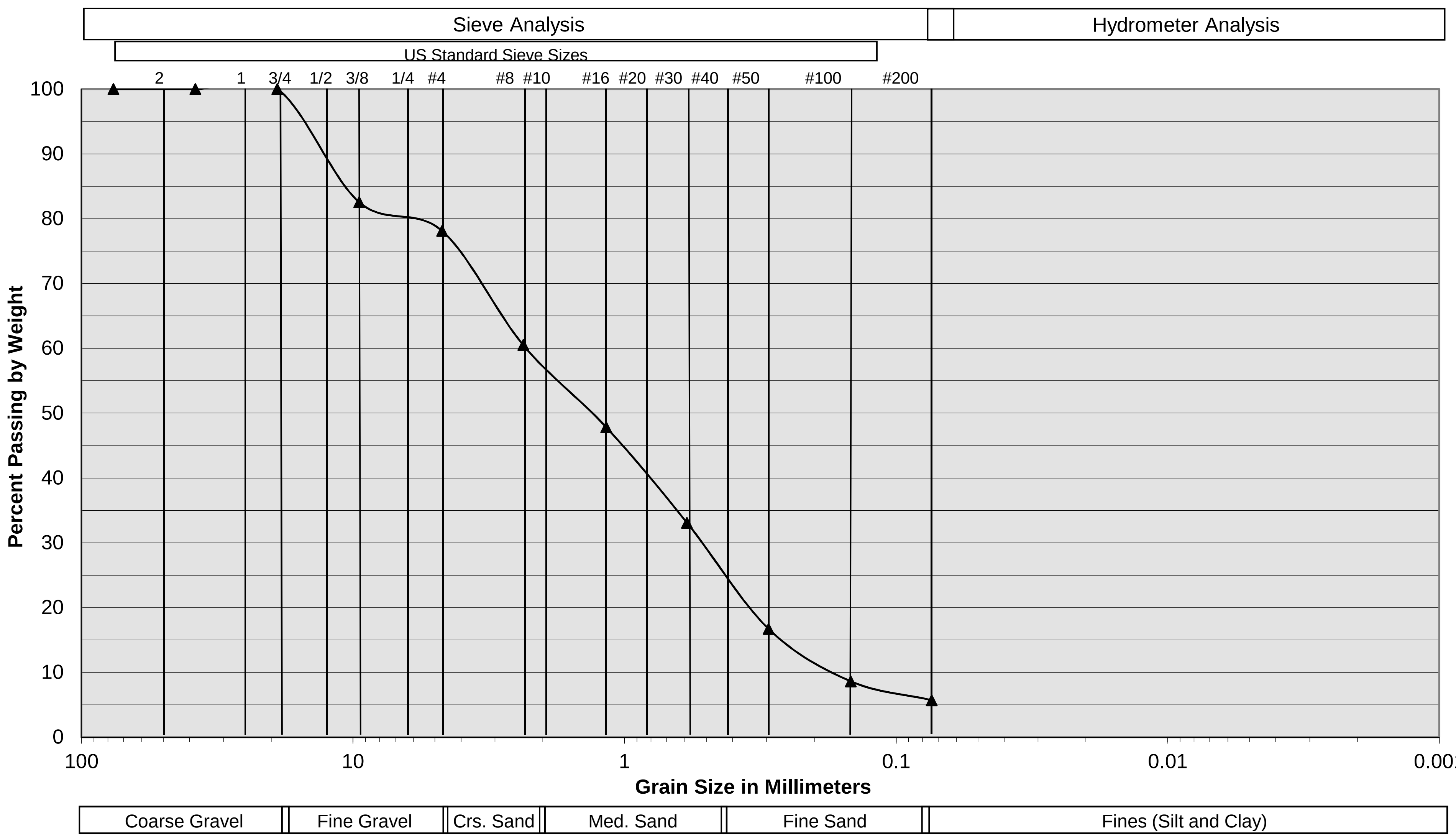


Sample Description	I-1 @ 10½ feet
Soil Classification	Gray Gravelly fine to coarse Sand, occasional Cobbles

Bloomington Business Center
Bloomington, California
Project No. 15G119-2
PLATE C-1

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

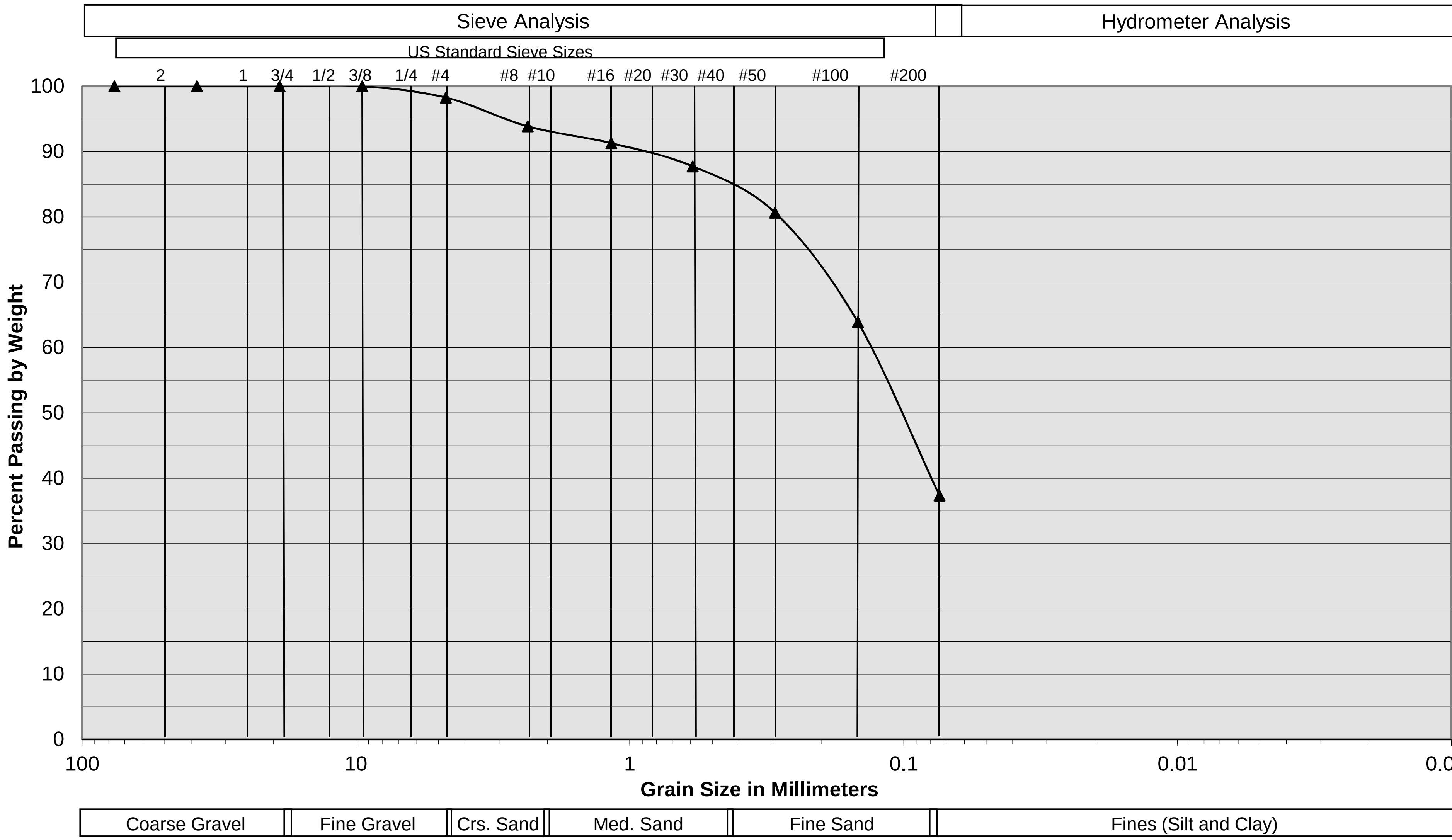


Sample Description	I-2 @ 10½ feet
Soil Classification	Gray Brown fine to coarse Sand, some fine to coarse Gravel, occasional Cobbles

Bloomingotn Business Center
Bloomington, California
Project No. 15G119-2
PLATE C-2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

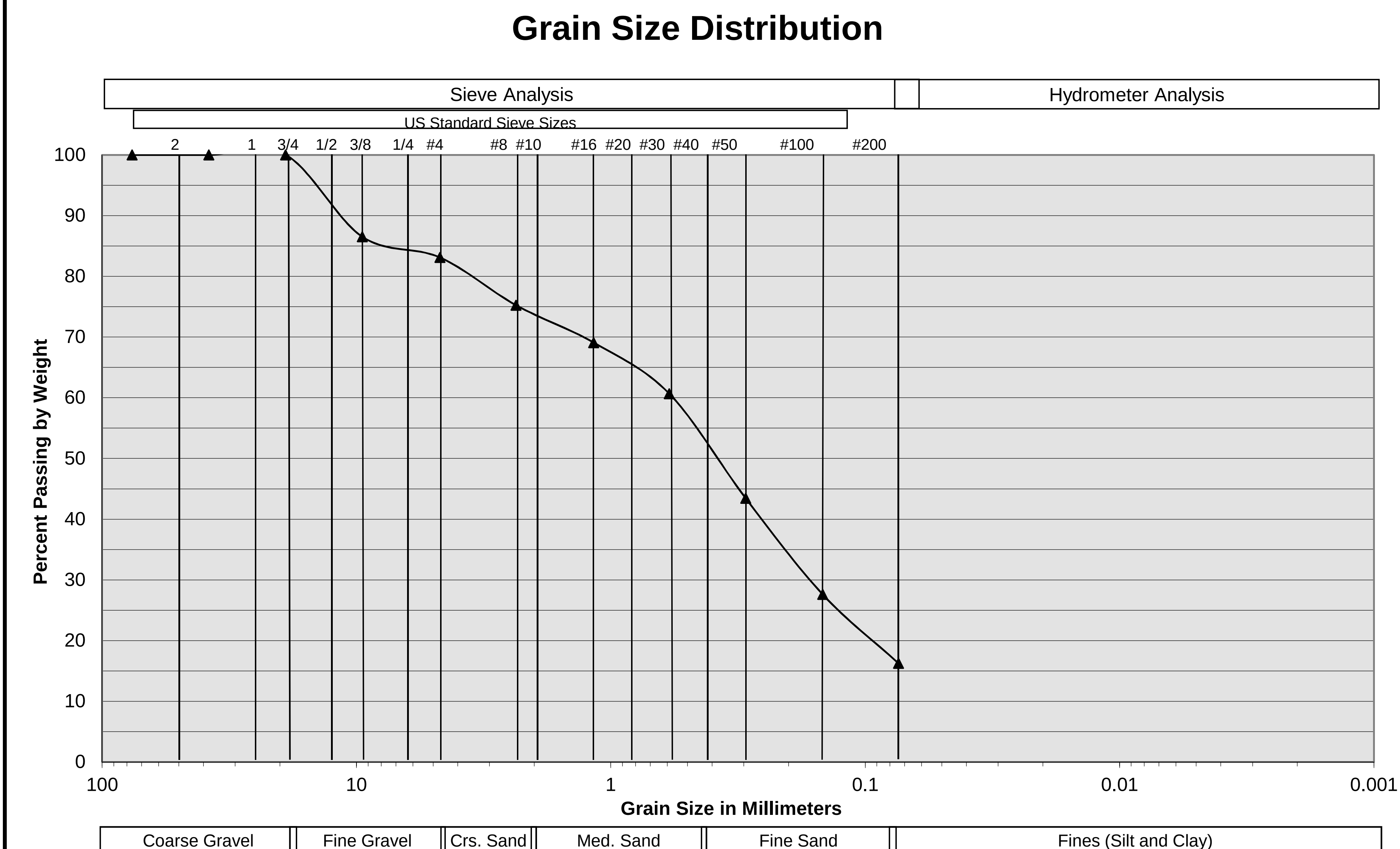
Grain Size Distribution



Sample Description	I-3 @ 7 feet
Soil Classification	Light Brown Silty fine to medium Sand

Bloomington Business Center
Bloomington, California
Project No. 15G119-2
PLATE C-3

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Sample Description	I-4 @ 3½ feet
Soil Classification	Light Brown Silty fine to coarse Sand, little fine Gravel

Bloomington Business Center
Bloomington, California
Project No. 15G119-2
PLATE C-4

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation